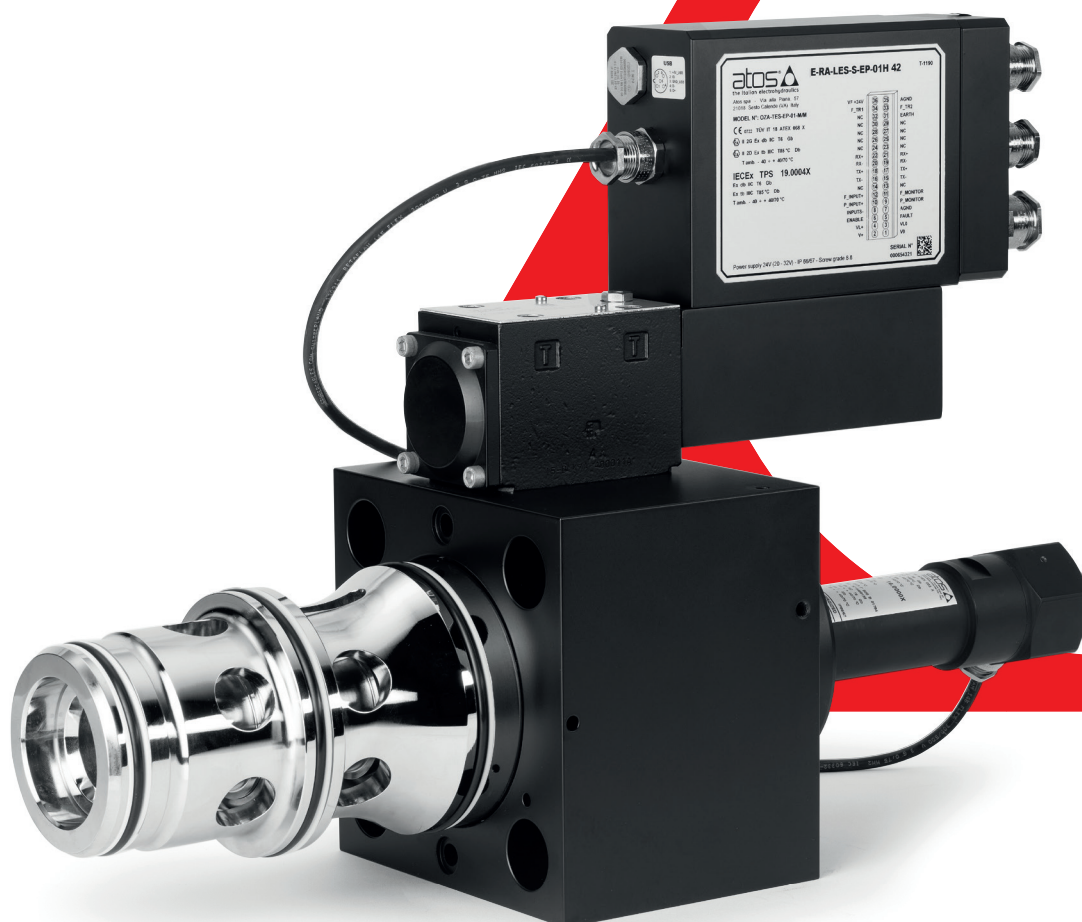


Гидравлика пропорциональная взрывозащищенная ATOS

Технические характеристики



Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тургут (3462)77-98-35
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия (495)268-04-70

Казахстан (772)734-952-31

Киргизия (996)312-96-26-47

INDEX

PROPORTIONAL VALVES

Ex-d

Size Qmax [l/min] Table **Pag**

SERVOPROPORTIONAL DIRECTIONALS

zero overlap with LVDT transducer

DLHZA-TES, DLKZA-TES	direct, sleeve execution, on-board driver	06 ÷ 10	50 ÷ 100	FX150	9
DLHZA-T, DLKZA-T	direct, sleeve execution, off-board driver	06 ÷ 10	50 ÷ 100	FX140	21
DHZA-TES, DKZA-TES	direct, on-board driver	06 ÷ 10	60 ÷ 150	FX135	27
DPZA-LES	piloted, on-board driver, 2 LVDT transducers	10 ÷ 27	180 ÷ 800	FX235	37
LIQZA-LES	3 way cartridge, piloted, on-board driver, 2 LVDT transducers	25 ÷ 80	500 ÷ 5000	FX380	49
LIQZA-L	3 way cartridge, piloted, off-board driver, 2 LVDT transducers	25 ÷ 80	500 ÷ 5000	FX370	59

HIGH PERFORMANCE DIRECTIONALS

positive overlap with LVDT transducer

DHZA-TES, DKZA-TES	direct, on-board driver	06 ÷ 10	60 ÷ 150	FX130	65
DHZA-T, DKZA-T	direct, off-board driver	06 ÷ 10	60 ÷ 150	FX120	77
DPZA-LES	piloted, on-board driver, 2 LVDT transducers	10 ÷ 27	180 ÷ 800	FX230	83
DPZA-T	piloted, off-board driver, 1 LVDT transducer	10 ÷ 32	180 ÷ 1000	FX220	95
LIQZA-LES	2 way ISO cartridge, piloted, on-board driver, 2 LVDT transducers	25 ÷ 100	1200 ÷ 16000	FX360	103
LIQZA-L	2 way ISO cartridge, piloted, off-board driver, 2 LVDT transducers	25 ÷ 100	1200 ÷ 16000	FX350	113

DIRECTIONAL VALVES

positive overlap without transducer

DHZA-AES, DKZA-AES	direct, on-board driver	06 ÷ 10	60 ÷ 120	FX110	121
DHZA-A, DKZA-A	direct, off-board driver	06 ÷ 10	60 ÷ 120	FX100	133
DPZA-AES	piloted, on-board driver	10 ÷ 32	180 ÷ 1500	FX210	141
DPZA-A	piloted, off-board driver	10 ÷ 32	180 ÷ 1500	FX200	153

HIGH PERFORMANCE PRESSURE VALVES

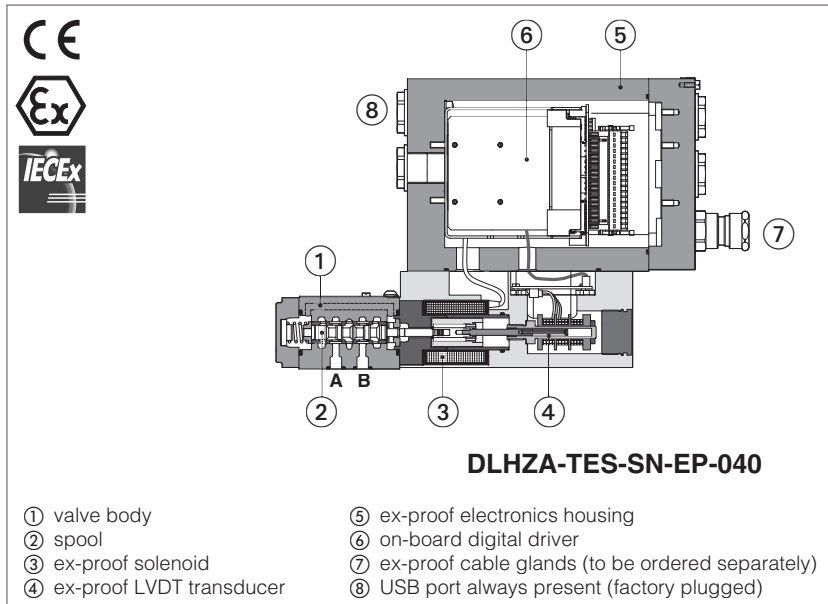
with pressure transducer

RZMA-RES, AGMZA-RES	relief, direct or piloted, on-board driver	06 ÷ 32	4 ÷ 600	FX030	161
RZGA-RES, AGRCZA-RES	reducing, direct or piloted, on-board driver	06 ÷ 20	12 ÷ 300	FX060	173
LIMZA-RES	relief ISO cartridge, piloted, on-board driver	16 ÷ 80	200 ÷ 4500		
LIRZA-RES	reducing ISO cartridge, piloted, on-board driver	16 ÷ 40	160 ÷ 800	FX320	185
LICZA-RES	compensator ISO cartridge, piloted, on-board driver	16 ÷ 50	200 ÷ 2000		

		Size	Qmax [l/min]	Table	Pag
PRESSURE VALVES					
without transducer					
RZMA-AES, AGMZA-AES	relief, direct or piloted, on-board driver	06 ÷ 32	4 ÷ 600	FX020	197
RZMA-A, AGMZA-A	relief, direct or piloted, off-board driver	06 ÷ 32	4 ÷ 600	FX010	209
HZMA-A	relief, piloted, off-board driver, modular	06	40		
RZGA-AES, AGRCZA-AES	reducing, direct or piloted, on-board driver	06 ÷ 20	12 ÷ 300	FX050	217
RZGA-A, AGRCZA-A	reducing, direct or piloted, off-board driver	06 ÷ 20	12 ÷ 300	FX040	227
HZGA-A, KZGA-A	reducing, piloted, off-board driver, modular	06 ÷ 10	40 ÷ 100		
LIMZA-AES	relief ISO cartridge, piloted, on-board driver	16 ÷ 80	200 ÷ 4500	FX310	235
LIRZA-AES	reducing ISO cartridge, piloted, on-board driver	16 ÷ 40	160 ÷ 800		
LICZA-AES	compensator ISO cartridge, piloted, on-board driver	16 ÷ 50	200 ÷ 2000	FX300	247
LIMZA-A	relief ISO cartridge, piloted, off-board driver	16 ÷ 80	200 ÷ 4500		
LIRZA-A	reducing ISO cartridge, piloted, off-board driver	16 ÷ 40	160 ÷ 800		
LICZA-A	compensator ISO cartridge, piloted, off-board driver	16 ÷ 50	200 ÷ 2000		
for pilot lines, without transducer					
DHRZA-AES	3 way reducing, direct, on-board driver	06	24	FX080	255
DHRZA-A	3 way reducing, direct, off-board driver	06	24	FX070	263
FLOW VALVES					
pressure compensated					
QVHZA-TES, QVKZA-TES	direct, on-board driver, LVDT transducer	06 ÷ 10	45 ÷ 90	FX430	269
QVHZA-T, QVKZA-T	direct, off-board driver, LVDT transducer	06 ÷ 10	45 ÷ 90	FX420	279
QVHZA-AES, QVKZA-AES	direct, on-board driver, without transducer	06 ÷ 10	45 ÷ 90	FX410	285
QVHZA-A, QVKZA-A	direct, off-board driver, without transducer	06 ÷ 10	45 ÷ 90	FX400	295
ELECTRONIC DRIVERS					
off-board digital, DIN-rail EN 60715					
E-BM-TES/A, E-BM-LES/A	for directional and flow valves with LVDT transducers, fieldbus, P/Q control			GS240	301
E-BM-TEB/A, E-BM-LEB/A	for directional and flow valves with LVDT transducers			GS230	309
E-BM-AES/A	for valves without transducer, fieldbus			GS050	315
E-BM-AS/A	for valves without transducer			G030	321

Ex-proof digital servoproportional directional valves sleeve execution

direct, with on-board driver, LVDT transducer and zero spool overlap - ATEX and IECEx



DLHZA-TES, DLKZA-TES

Ex-proof digital servoproportional directional valves, direct, sleeve execution, with LVDT position transducer and zero spool overlap for best performances in any position closed loop control.

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

● **Multicertification ATEX and IECEx**

for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

TEZ execution includes valve driver plus axis card to perform position control (see section [6]).

DLHZA: Size: 06 -ISO 4401 Max flow: 50 l/min Max pressure: 350 bar	DLKZA: Size: 10 -ISO 4401 Max flow: 100 l/min Max pressure: 315 bar
---	--

1 MODEL CODE

DLHZA	-	TES	-	SN	-	NP	-	0	40	-	L	7	3	/	M	/	*	/	*
<p>Ex-proof proportional directional valves, direct</p> <p>DLHZA = size 06 DLKZA = size 10</p> <p>TES = on-board driver and LVDT transducer</p> <p>Alternated P/Q controls, see section [5]: SN = none SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)</p> <p>Fieldbus interface, USB port always present: NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p> <p>Configuration: Standard Option /B </p> <p>40 = </p> <p>with fail safe configuration 1 or 3</p> <p>60 = </p> <p>without fail safe</p> <p>Spool type, regulating characteristics: L = linear V = progressive T = not linear (1)</p> <p> D = differential-linear (1) DT = differential-not linear (1) P-A = Q, B-T = Q/2 P-A = Q, B-T = Q/2 P-B = Q/2, A-T = Q P-B = Q/2, A-T = Q</p> <p>Seals material, see section [10]: - = NBR PE = FKM BT = HNBR</p> <p>Series number</p> <p>Hydraulic options (2): B = solenoid with integral electronics and position transducer at side of port A (3) Y = external drain</p> <p>Electronic options (2): C = current feedback for pressure transducer 4 ÷ 20 mA, only for SP, SF, SL (omit for std voltage ±10 VDC) I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage ±10 VDC)</p> <p>Cable entrance threaded connection: M = M20x1,5</p> <p>Fail safe configuration, see section [18]: 1 = 3 = </p> <p>Note: select 1 for configuration 60 even without fail safe</p>																			

Spool size: 0(L) 1(L) 1(V) 3(L) 3(T) 3(V) 5(L,T) 7(L,T,V,D,DT)

DLHZA	= 4	7	8	14	-	20	28	40
DLKZA	= -	-	-	60	60	-	-	100

Nominal flow (l/min) at Δp 70bar P-T

(1) Only for configuration 40 (2) For possible combined options, see section [16]

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC support: NP (USB) 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)

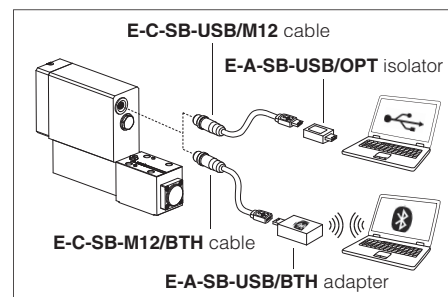


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



4 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SF** and **SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP, 2 pressure transducers for SF or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

6 AXIS CONTROLLER - see tech. table **FX610**

Digital servoproportional with integral electronics **TEZ** include valve's driver plus axis controller, performing position closed loop of any hydraulic actuator equipped with analog, encoder or SSI position transducer. Alternated pressure or force closed loop control can be set by software additionally to the position control.

Atos also supplies complete servoactuators integrating servocylinder, digital servoproportional valve and axis controller, fully assembled and tested. For more information consult Atos Technical Office.

7 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, 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 - salt spray test (ISO 9227) > 200 h
Compliance	Explosion proof protection, see section ¹¹ -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DLHZA											DLKZA								
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y)											ports P, A, B = 315; T = 210 (250 with external drain /Y)								
Spool type	L0	L1	V1	L3	V3	L5	T5	L7	T7	V7	D7	DT7	L3	T3	L7	T7	V7	D7	DT7	
Nominal flow [l/min]																				
at $\Delta p = 30$ bar	2,5	4,5	8	9	13	18	26	26	26	26	26	26	40	60	60	60	60	60	60	60
Δp P-T at $\Delta p = 70$ bar	4	7	12	14	20	28	40	40	40	40	40	40	60	100	100	100	100	100	100	100
max permissible flow	5	9	16	18	26	32	50	50	50	50	50	50	70	100	100	100	100	100	100	100
Δp max P-T [bar]	120	120	120	120	120	100	100	100	100	100	100	100	90	70	70	70	70	70	70	70
Leakage [cm ³ /min] at P = 100 bar (1)	<100	<200	<100	<300	<150	<500	<200	<900	<200	<200	<700	<200	<1000	<400	<1500	<400	<400	<1200	<400	<400
Response time [ms] (2)	≤ 13											≤ 20								
Hysteresis [% of max regulation]	≤ 0,1											≤ 0,1								
Repeatability [% of max regulation]	± 0,1											± 0,1								
Thermal drift	zero point displacement < 1% at $\Delta T = 40^\circ C$																			

(1) referred to spool in neutral position and 50°C oil temperature

(2) 0-100% step signal


9 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ Input impedance: Ri = 500 Ω	
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account			
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 transducer power supply	+24Vdc @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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's current supply; spool position control (SN) or pressure/force control (SP, SF, SL) 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	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	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 800 ms (depending on communication type) have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C 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 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
	longer life	ISO4406 class 16/14/11	NAS1638 class 5
			see also filter section at KTF catalog
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 (1)	NBR, HNBR	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

11 CERTIFICATION DATA

Valve type	DLHZA, DLKZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-TES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1 IEC 60079-31
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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

12 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

12.1 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

13 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

14 HYDRAULIC OPTIONS

B = Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see 17.1

Y = Option /Y is mandatory if the pressure in port T exceeds 210 bar

15 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±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.

C = Only for **SP, SF, SL**

Option /C is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

16 POSSIBLE COMBINED OPTIONS

For SN: /BI, /BY, /IY

For SP, SF, SL: /BI, /BY, /IY, /CI, /BCI, CIY, BCIY

17 **DIAGRAMS** (based on mineral oil ISO VG 46 at 50 °C)

17.1 Regulation diagrams

1 = Linear spools L

2 = Differential - linear spool D7

3 = Differential non linear spool DT7

4 = Non linear spool T5 (only for DLHZA)

5 = Non linear spool T3 (only for DLKZA) and T7

6 = Progressive spool V

T5 and T7 spool types are specific for fine low flow control in the range from 0 to 60% (T5) and 0 to 40% (T3 and T7) of max spool stroke.

The non linear characteristics of the spool is compensated by the electronic driver, so the final valve regulation is resulting linear respect the reference signal (dotted line).

DT7 has the same characteristic of T7 but it is specific for applications with cylinders with area ratio 1:2

Note

Hydraulic configuration vs. reference signal:

Standard

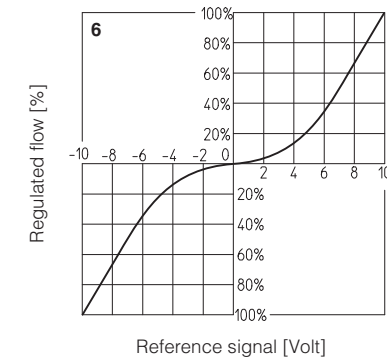
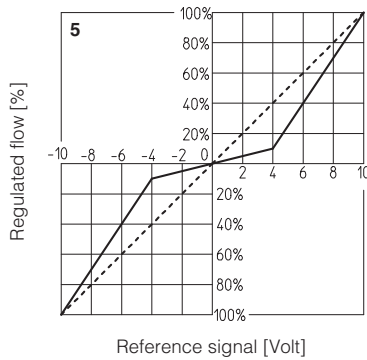
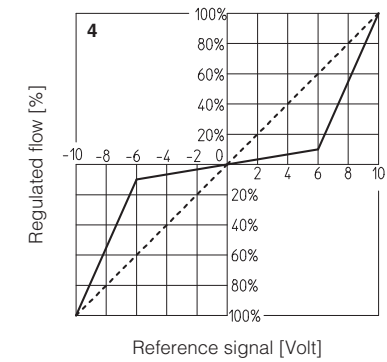
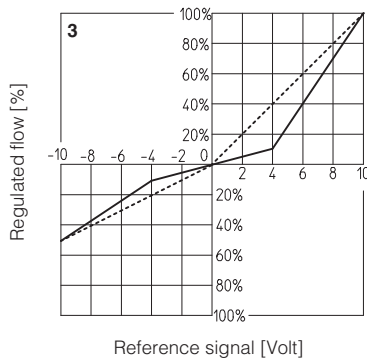
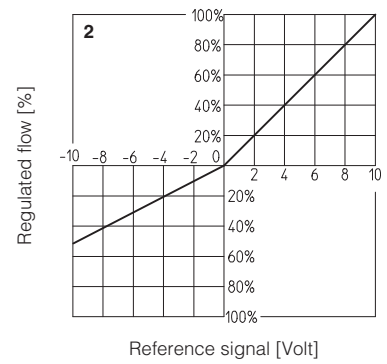
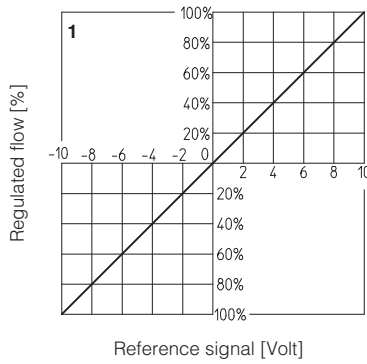
Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$

Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

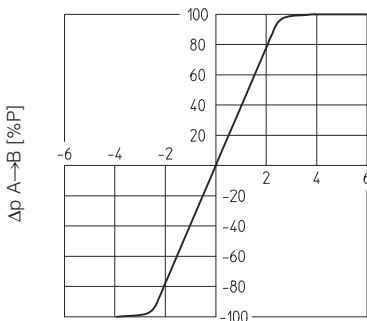
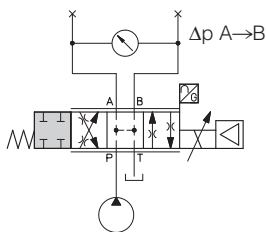
option /B

Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$



17.2 Pressure gain



17.3 Bode diagrams

Stated at nominal hydraulic conditions

DLHZA:

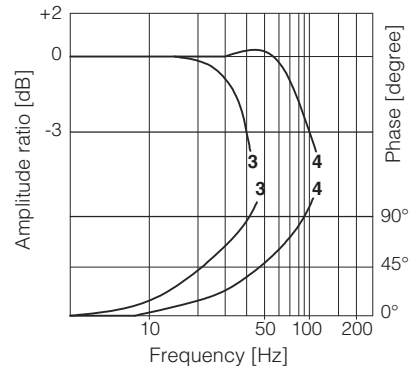
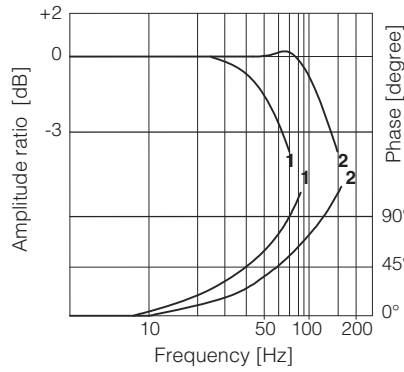
1 = ± 100% nominal stroke

2 = ± 5% nominal stroke

DLKZA:

3 = ± 100% nominal stroke

4 = ± 5% nominal stroke



18 FAIL SAFE POSITION

CONFIGURATION	LINEAR	NOT LINEAR
<p>fail safe 1</p>	<p>$t = 7-10$ ms (DLHZA) $t = 15-20$ ms (DLKZA)</p>	<p>$t = 7-10$ ms (DLHZA) $t = 15-20$ ms (DLKZA)</p>
<p>fail safe 3</p>		
<p>without fail safe</p>		

t = time required by the valve to switch from central to fail safe position at the power switch-off, with pressure 0 to 100 bar

Fail safe connections		P → A	P → B	A → T	B → T
Leakage [cm ³ /min] at P = 100 bar (1)	Fail safe 1	50	70	70	50
	Fail safe 3	50	70	-	-
Flow [l/min] (2)	DLHZA	-	-	15÷30	10÷20
	DLKZA	-	-	40÷60	25÷40

(1) Referred to spool in fail safe position and 50°C oil temperature

(2) Referred to spool in fail safe position at $\Delta p = 35$ bar per edge

19 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, EN-982).

19.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: 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.



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

19.2 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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.

19.3 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 ± 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 ± 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 $0 \div 24$ VDC.

19.4 Pressure or force reference input signal (F_INPUT+) - only SP, SF, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24$ VDC.

19.5 Flow monitor output signal (Q_MONITOR)

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 $4 \div 20$ 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.

19.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SF, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

19.7 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.

19.8 Fault output signal (FAULT)

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.

19.9 Remote pressure/force transducer input signal - only for SP, SF, SL

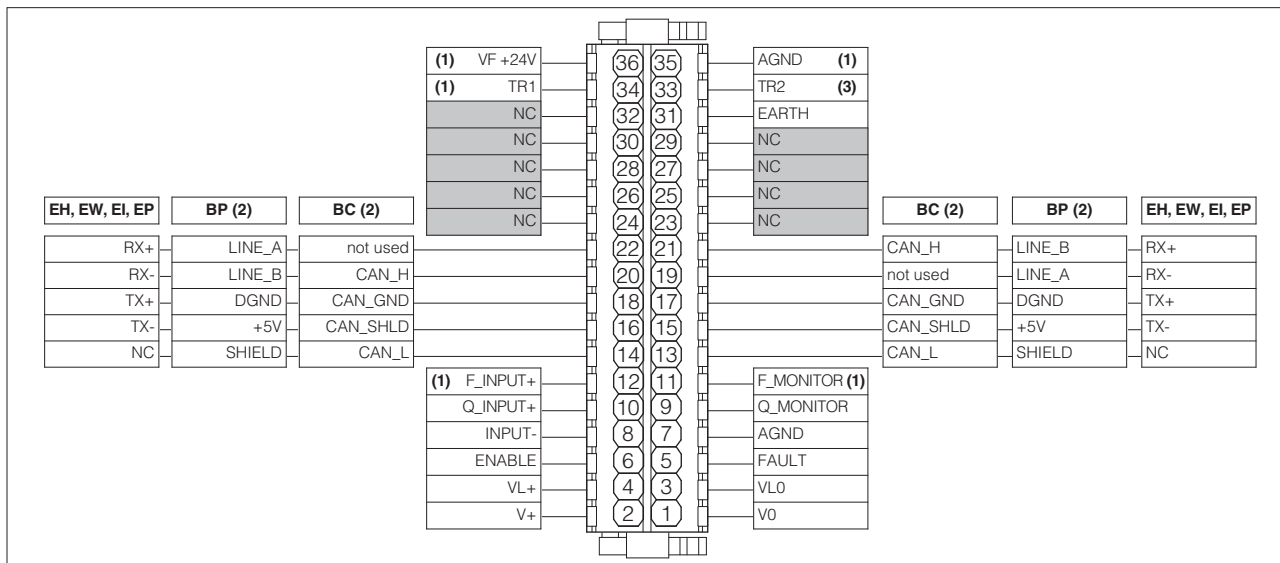
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are ± 10 VDC for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 Vdc or ± 20 mA.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

20 TERMINAL BOARD OVERVIEW



(1) connections available only SP, SF, SL

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

(3) connection available only SF

21 ELECTRONIC CONNECTIONS

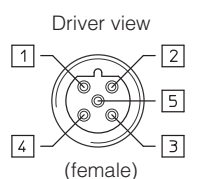
21.1 Main connections signals

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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	10	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
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
	31	EARTH	Internally connected to driver housing	

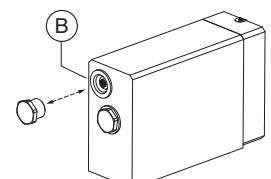
(1) Available only for SP, SF, SL

21.2 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 +



Driver view
(female)



21.3 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

21.4 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)

21.5 EH, EW, EI, EP fieldbus execution connections

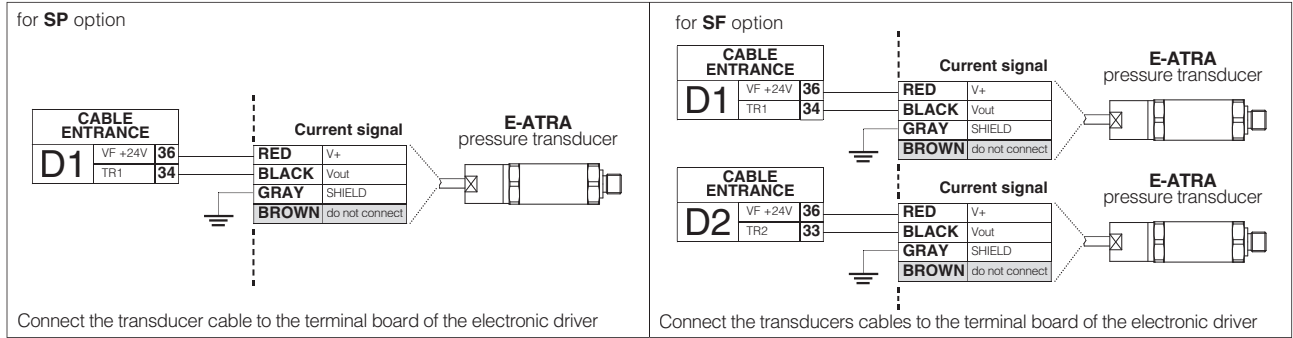
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

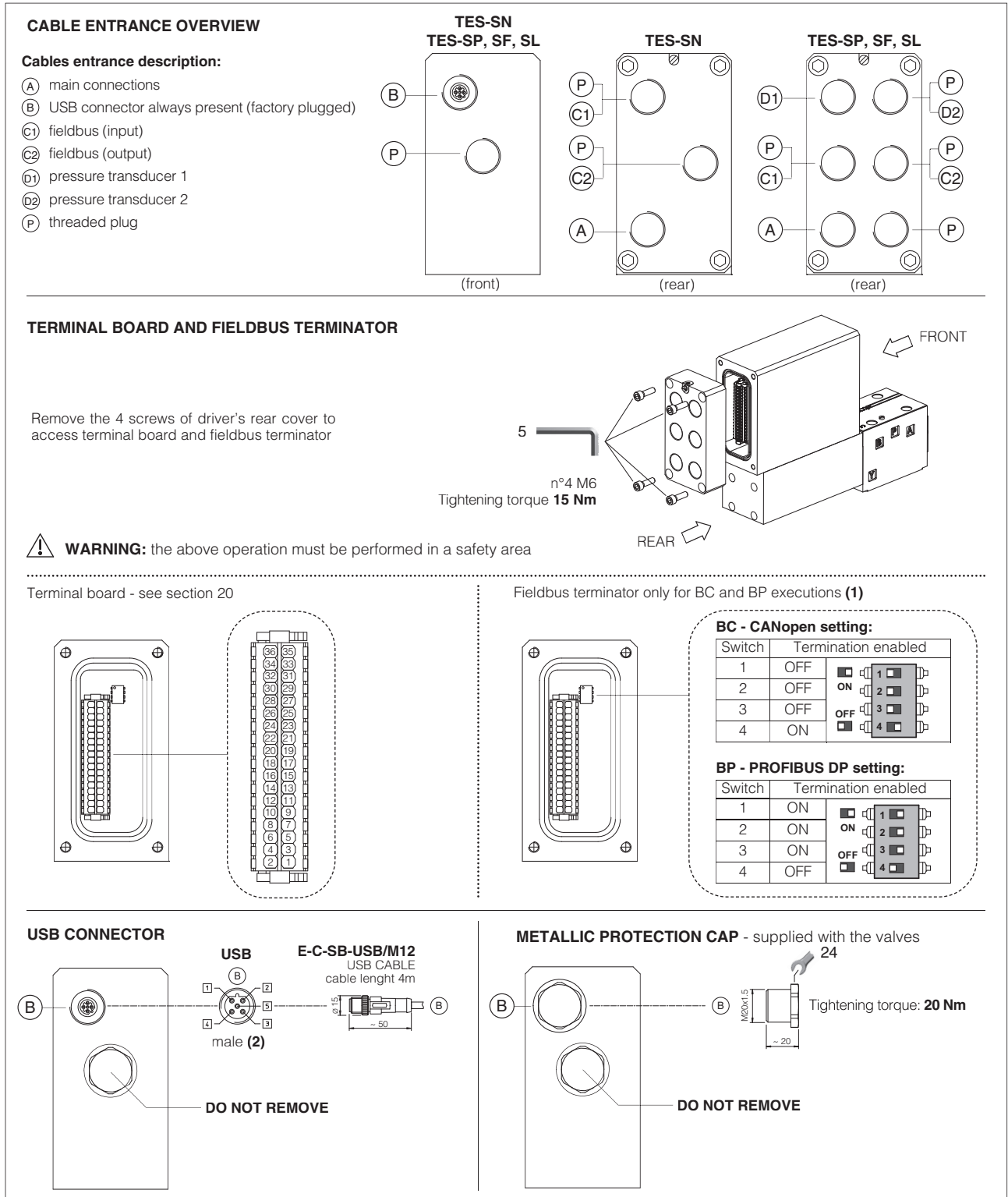
21.6 Remote pressure transducer connector - only for SP, SF, SL

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	33	TR2	2nd signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	/	/	Connect	Connect
	34	TR1	1st signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
D2	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table GX800

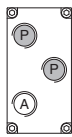
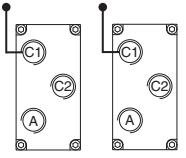
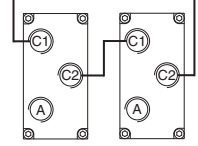


22 CONNECTIONS LAYOUT

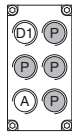
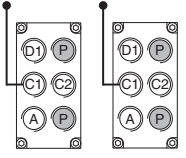
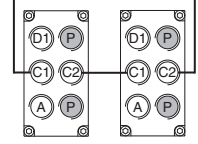


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

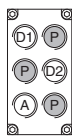
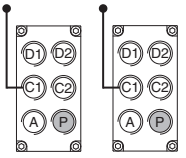
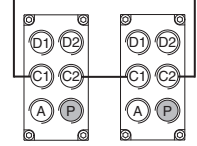
22.1 Cable glands and threaded plug for TES-SN - see tech table KX800

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

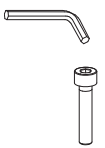
22.2 Cable glands and threaded plug for TES-SP, SL - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

22.3 Cable glands and threaded plug for TES-SF - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	3	D1 D2 A	none	none		Cable entrance A, D1, D2 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	4	D1 - D2 C1 A	1	C2		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	5	D1 - D2 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged

23 FASTENING BOLTS AND SEALS

	<p>DLHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DLKZA</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: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B, P, T: \varnothing 11,2 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

24 INSTALLATION DIMENSIONS [mm]

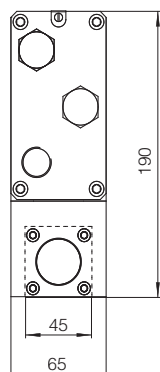
DLHZA-TES

ISO 4401: 2005

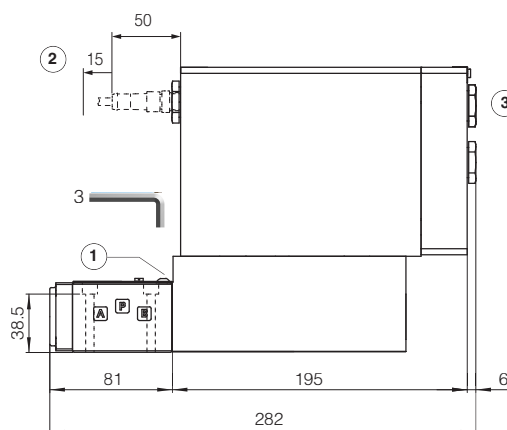
Mounting surface: 4401-03-02-0-05 (see table P005)

(for /Y surface: 4401-03-03-0-05 without port X)

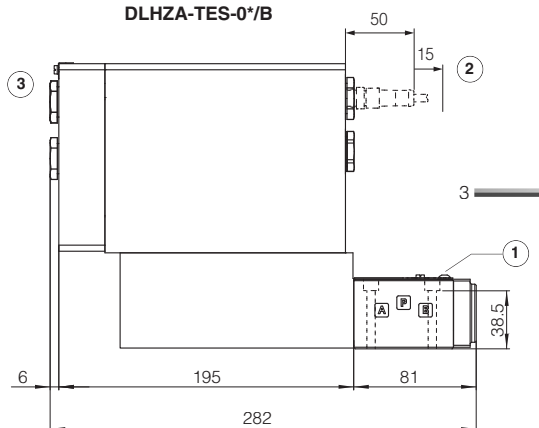
Mass [kg]	
DLHZA-TES	7,2



DLHZA-TES-0*



DLHZA-TES-0*/B



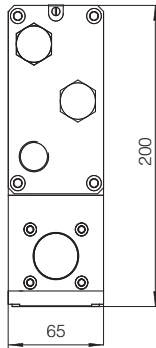
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

DLKZA-TES

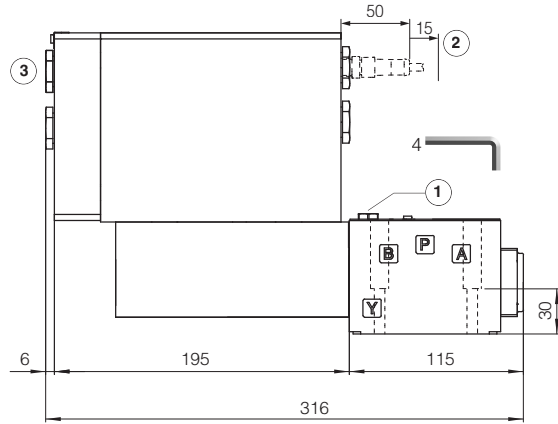
ISO 4401: 2000

Mounting surface: 4401-05-04-0-05 (see table P005)
(for Y surface 4401-05-05-0-05 without X port)

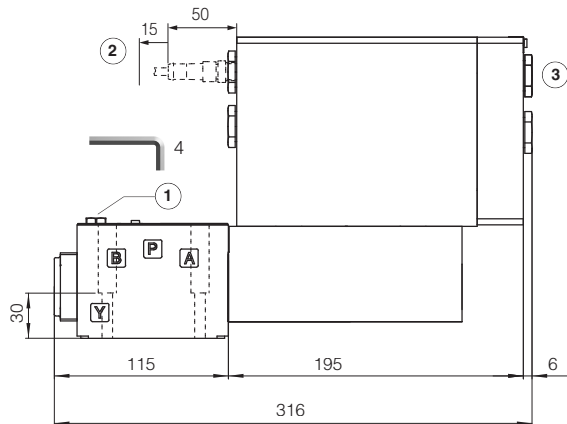
Mass [kg]	
DLKZA-TES	9



DLKZA-TES-1*



DLKZA-TES-1*/B



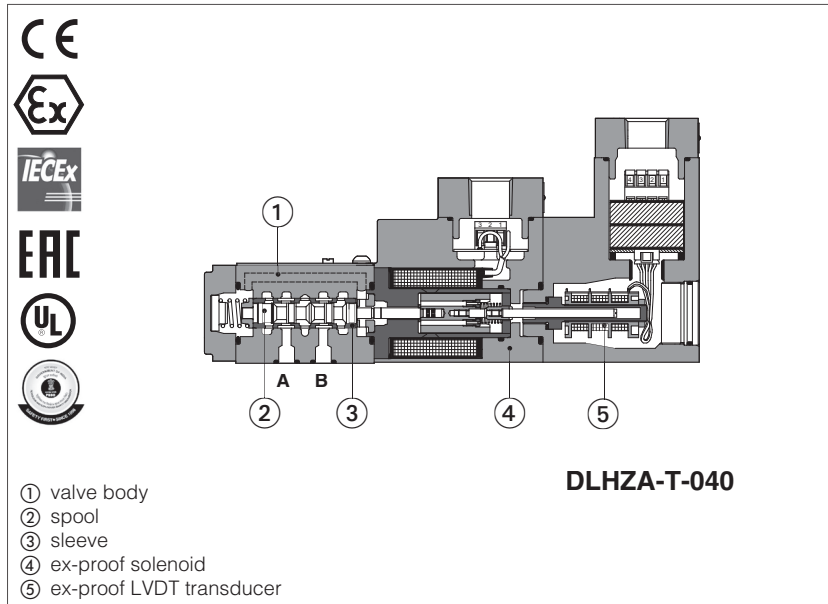
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

25 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS500	Programming tools
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	GS510	Fieldbus
FX500	Ex-proof digital proportionals with P/Q control	GX800	Ex-proof pressure transducer type E-ATRA-7
FX610	Ex-proof servoproportionals with on-board axis card	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves

Ex-proof servoproportional directional valves sleeve execution

direct, with LVDT transducer and zero spool overlap - **ATEX, IECEx, EAC, PESO** or **cULus**



DLHZA-T, DLKZA-T

Ex-proof servoproportional directional valves, direct, sleeve execution, with LVDT position transducer and zero spool overlap for best performances in any position closed loop control.

They are equipped with ex-proof proportional solenoids and LVDT transducer certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid and transducer, prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoids are also designed to limit the surface temperature within the classified limits.

DLHZA:	DLKZA:
Size: 06 - ISO 4401	Size: 10 - ISO 4401
Max flow: 50 l/min	Max flow: 100 l/min
Max pressure: 350 bar	Max pressure: 315 bar

1 MODEL CODE

<p>DLHZA</p> <p>Ex-proof proportional directional valves direct</p> <p>DLHZA = size 06 DLKZA = size 10</p> <p>Certification: Multicertification ATEX, IECEx, EAC, PESO: - = omit for Group II 2G IID (1) M = Group I (mining) North American Certification: UL = cULus</p> <p>T = with LVDT transducer</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p> <p>Configuration: Standard</p> <p>40 = with fail safe configuration 1 or 3</p> <p>60 = without fail safe</p> <p>Configuration: Option /B</p> <p>40 = </p> <p>60 = </p> <p>Spool type, regulating characteristics:</p> <p>L = linear V = progressive T = not linear (2)</p> <p>D = differential-linear (2) DT = differential-not linear (2)</p> <p>P-A = Q, B-T = Q/2 P-A = Q, B-T = Q/2 P-B = Q/2, A-T = Q P-B = Q/2, A-T = Q</p>	/	*	-	T	-	0	-	40	-	L	-	7	/	3	/	M	/	*	/	*	/	*
<p>Seals material, see section 6 :</p> <p>- = NBR PE = FKM BT = HNBR (3)</p> <p>Series number _____</p> <p>Options (4): B = solenoid and position transducer at side of port A (5) C = position transducer with current feedback 4÷20 mA Y = external drain</p> <p>Solenoid and transducer threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (6) M = M20x1,5 - not for cULus NPT = 1/2" NPT</p> <p>Fail safe configuration, see section 12 :</p> <p>1 = 3 = </p> <p>Spool size: 0(L) 1(L) 1(V) 3(L) 3(T) 3(V) 5(L,T) 7(L,T,V,D,DT)</p> <p>DLHZA = 4 7 8 14 - 20 28 40 DLKZA = - - - 60 60 - - 100</p> <p>Nominal flow (l/min) at Δp 70bar P-T</p>																						

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization)
 (2) Only for configuration **40** (3) Not for multicertification **M** group I (mining) (4) Possible combined options: /BC, /BY, /CY, /BCY
 (5) In standard configuration the solenoid and position transducer are at side of port B (6) Approved only for the Italian market

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-TEB-* /A	E-BM-TES-* /A	Z-BM-TEZ-* /A
Type	digital	digital	digital
Format	DIN-rail panel		
Data sheet	GS230	GS240	GS330

3 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +60°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DLHZA											DLKZA							
	ports P, A, B = 350; T = 210 (250 with external drain /Y)											ports P, A, B = 315; T = 210 (250 with external drain /Y)							
Pressure limits [bar]																			
Spool type	L0	L1	V1	L3	V3	L5	T5	L7	T7	V7	D7	DT7	L3	T3	L7	T7	V7	D7	DT7
Max flow [l/min]																			
Δp P-T	at Δp = 30 bar	2,5	4,5	8	9	13	18				26	26÷13	40		60			60÷33	
	at Δp = 70 bar	4	7	12	14	20	28				40	40÷20	60		100			100÷50	
	max permissible flow	5	9	16	18	26	32				50	50÷28	70		100			100÷50	
Δp max P-T [bar]	120	120	120	120	120	100				100	100	100	90		70			70	
Leakage [cm³/min] at P = 100 bar (1)	<100	<200	<100	<300	<150	<500	<200	<900	<200	<200	<700	<200	<1000	<400	<1500	<400	<400	<1200	<400
Response time (2) [ms]	≤ 13											≤ 20							
Hysteresis [% of max regulation]	≤ 0,1											≤ 0,1							
Repeatability [% of max regulation]	± 0,1											± 0,1							
Thermal drift	zero point displacement < 1% at ΔT = 40°C																		

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 2

(1) Referred to spool in neutral position and 50°C oil temperature (2) 0-100% step signal

5 ELECTRICAL CHARACTERISTICS

Max. power	35W
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

6 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DLHZA, DLKZA		DLHZA/M, DLKZA/M	DLHZA/UL, DLKZA/UL	
Certifications	Multicertification Group II ATEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-T		OZAM-T	OZA-T/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEX Ex d IIC T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30 CSA 22.2 n°139	
Cable entrance: threaded connection	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT			1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C
In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS AND LVDT TRANSDUCER WIRING

Multicertification

n°8 M4x20
locking torque 4Nm

- 1 solenoid cover with threaded connection for cable gland fitting
- 2 transducer cover with threaded connection for cable gland fitting
- 3 solenoid terminal board for cables wiring
- 4 transducer terminal board for cables wiring
- 5 screw terminal for additional equipotential grounding

Solenoid wiring

	1 = Coil	PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = GND	
	3 = Coil	

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

cULus certification

n°8 M4x20
locking torque 4Nm

- 1 solenoid cover with threaded connection for cable gland fitting
- 2 transducer cover with threaded connection for cable gland fitting
- 3 solenoid terminal board for cables wiring
- 4 transducer terminal board for cables wiring

Solenoid wiring

⚠ Pay attention to respect the polarity

	1 = Coil +	PCB 3 poles terminal board suggested cable section up to 1,5 mm ² (max AWG16), see section [9] note 1
	2 = GND	
	3 = Coil -	

alternative GND screw terminal connected to solenoid housing

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suggested cable section up to 1,5 mm ² (max AWG16), see section [9] note 1
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> Suitable for use in Class I Division 1, Gas Groups C Armored Marine Shipboard Cable which meets UL 1309 Tinned Stranded Copper Conductors Bronze braided armor Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	-	90 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

10 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

11 OPTIONS

B = Solenoid and position transducer at side of port A of the main stage

C = Position transducer with current feedback 4÷20 mA, suggested in case of long distance between the electronic driver and the proportional valve

Y = External drain, to be selected if the pressure at T port is higher than the max allowed limits

11.1 Possible combined options: /BC, /BY, /CY, /BCY

12 FAIL SAFE POSITION

CONFIGURATION	LINEAR	NOT LINEAR
<p>fail safe 1</p>	<p>t = 7-10 ms (DLHZA) t = 15-20 ms (DLKZA)</p>	<p>t = 7-10 ms (DLHZA) t = 15-20 ms (DLKZA)</p>
<p>fail safe 3</p>	<p>t = 7-10 ms (DLHZA) t = 15-20 ms (DLKZA)</p>	<p>t = 7-10 ms (DLHZA) t = 15-20 ms (DLKZA)</p>
<p>without fail safe</p>		

t = time required by the valve to switch from central to fail safe position at the power switch-off, with pressure 0 to 100 bar

Fail safe connections		P → A	P → B	A → T	B → T
Leakage [cm ³ /min] at P = 100 bar (1)	Fail safe 1	50	70	70	50
	Fail safe 3	50	70	-	-
Flow [l/min] (2)	Fail safe 3	DLHZA	-	15÷30	10÷20
		DLKZA	-	40÷60	25÷40

(1) Referred to spool in fail safe position and 50°C oil temperature

(2) Referred to spool in fail safe position at Δp = 35 bar per edge

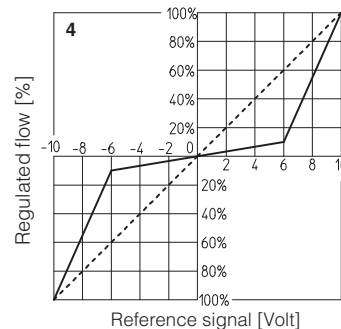
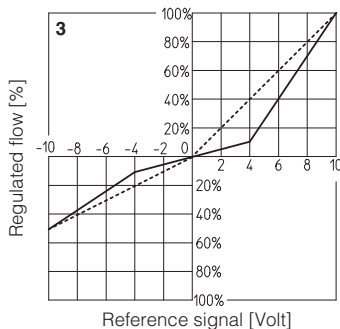
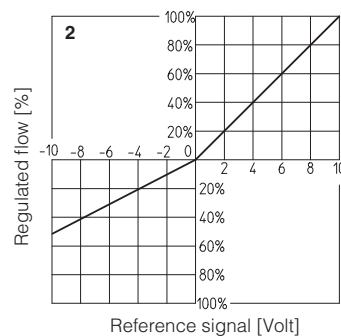
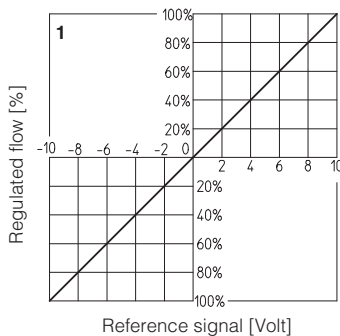
13 DIAGRAMS - based on mineral oil ISO VG 46 at 50 °C

13.1 Regulation diagrams

- 1 = Linear spools L
- 2 = Differential - linear spool D7

- 3 = Differential non linear spool DT7
- 4 = Non linear spool, T5 (only for DLHZA)

- 5 = Non linear spool, T3 (only for DLKZA) and T7
- 6 = Progressive spool V



T3, T5 and T7 spool types are specific for fine low flow control in the range from 0 to 60% (T5) and 0 to 40% (T3 and T7) of max spool stroke.

The non linear characteristics of the spool is compensated by the electronic driver, so the final valve regulation is resulting linear respect the reference signal (dotted line).

DT7 has the same characteristic of T7 but it is specific for applications with cylinders with area ratio 1:2

Note:

Hydraulic configuration vs. reference signal:

Standard:

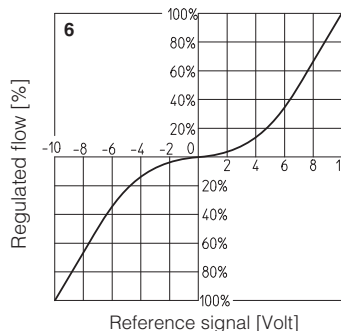
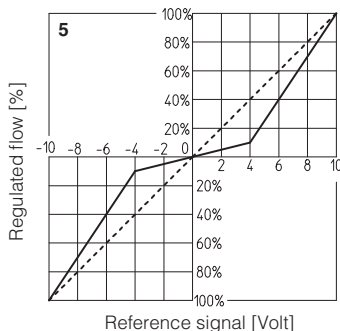
Reference signal $0 \div +10 \text{ V}$ } $12 \div 20 \text{ mA}$ } P → A / B → T

Reference signal $0 \div -10 \text{ V}$ } $12 \div 4 \text{ mA}$ } P → B / A → T

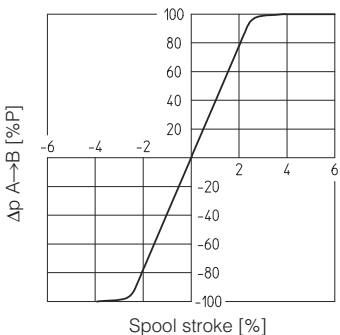
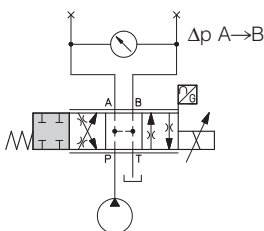
option /B:

Reference signal $0 \div +10 \text{ V}$ } $12 \div 20 \text{ mA}$ } P → B / A → T

Reference signal $0 \div -10 \text{ V}$ } $12 \div 4 \text{ mA}$ } P → A / B → T



13.2 Pressure gain



14 FASTENING BOLTS AND SEALS

	<p>DLHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DLKZA</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) 1 OR 2025 Diameter of port Y: Ø = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B, P, T: Ø 11,2 mm (max) 1 OR 108 Diameter of port Y: Ø = 5 mm (only for /Y option)</p>

DLHZA

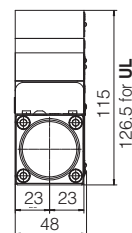
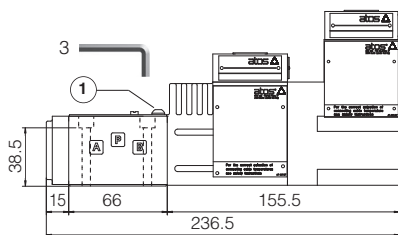
ISO 4401: 2005 (see table P005)

Mounting surface: 4401-03-02-0-05

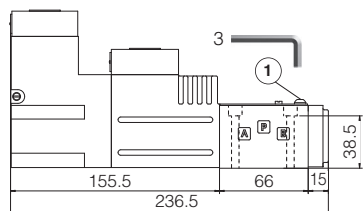
(for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DLHZA-T-*	4,0

DLHZA-T-*



DLHZA-T-*/B



DLKZA

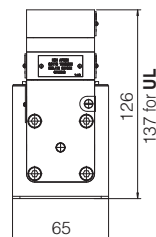
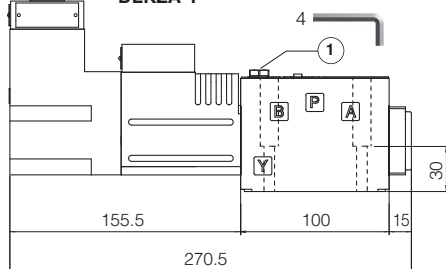
ISO 4401: 2005 (see table P005)

Mounting surface: 4401-05-04-0-05

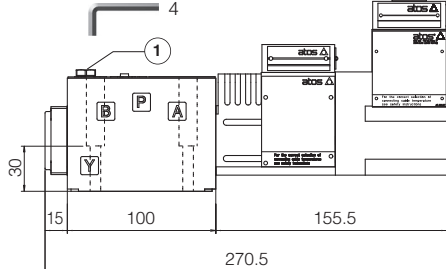
(for /Y surface: 4401-05-05-0-05 without port X)

Mass [kg]	
DLKZA-T-*	6,1

DLKZA-T-*



DLKZA-T-*/B



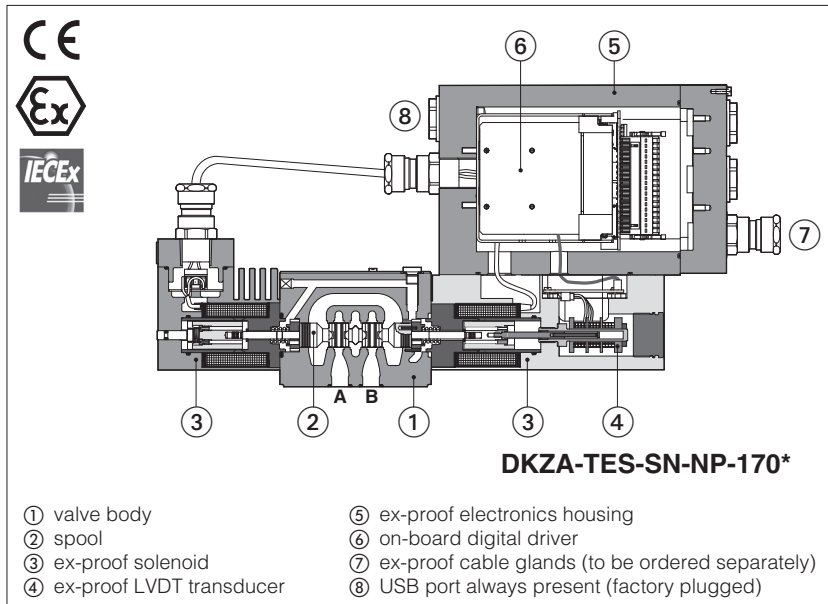
① = Air bleed off

16 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEX, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital servoproportional directional valves

direct, with on-board driver, LVDT transducer and zero spool overlap - **ATEX and IECEx**



DHZA-TES, DKZA-TES

Ex-proof digital servoproportional directional valves, direct, with LVDT position transducer and zero spool overlap for position closed loop controls. The double solenoid construction involves larger flows and spool safety rest position.

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

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

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

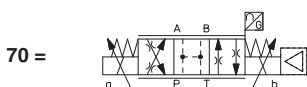
TEZ execution includes valve driver plus axis card to perform position control (see section 10).

DHZA:	DKZA:
Size: 06 -ISO 4401	Size: 10 -ISO 4401
Max flow: 60 l/min	Max flow: 150 l/min
Max pressure: 350 bar	Max pressure: 315 bar

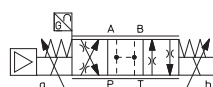
1 MODEL CODE

DHZA	-	TES	-	SN	-	NP	-	0	-	70	-	L	/	5	/	M	/	*	/	*				
<p>Ex-proof proportional directional valves, direct</p> <p>DHZA = size 06 DKZA = size 10</p> <p>TES = on-board driver and LVDT transducer</p> <p>Alternated P/Q controls, see section 5:</p> <p>SN = none SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)</p> <p>Fieldbus interface, USB port always present:</p> <p>NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p>																								
<p>Seals material, see section 10:</p> <p>- = NBR PE = FKM BT = HNBR</p> <p>Series number</p> <p>Hydraulic options (1): B = solenoid with integral digital electronics at side of port A (2) Y = external drain</p> <p>Electronic options (1): C = current feedback for pressure transducer 4 ÷ 20 mA, only for SP, SF, SL (omit for std voltage ±10 Vdc) I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage ±10 Vdc)</p> <p>Cable entrance threaded connection: M = M20x1,5</p>																								
<p>Spool size: 3 (L) 5 (L,D)</p> <p>DHZA = 18 28</p> <p>DKZA = 45 75</p> <p>Nominal flow (l/min) at Δp 10 bar P-T</p>																								

Configuration: Standard



Option /B



Spool type, regulating characteristics:

L = linear



D = differential-progressive



P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q

(1) For possible combined options, see section 16

(2) In standard configuration the solenoid with on-board digital driver and position transducer are at side port B

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support:	NP (USB)	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)		

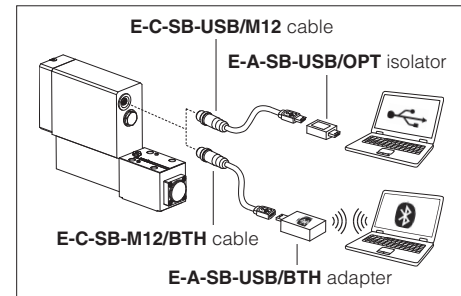


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



4 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SF** and **SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP, 2 pressure transducers for SF or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

6 AXIS CONTROLLER - see tech. table **FX620**

Digital servoproportional with integral electronics **TEZ** include valve's driver plus axis controller, performing position closed loop of any hydraulic actuator equipped with analog, encoder or SSI position transducer. Alternated pressure or force closed loop control can be set by software additionally to the position control.

Atos also supplies complete servoactuators integrating servocylinder, digital servoproportional valve and axis controller, fully assembled and tested. For more information consult Atos Technical Office.

7 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	150 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 11 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DHZA			DKZA		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y); Y = 10			ports P, A, B = 315; T = 210 (250 with external drain /Y); Y = 10		
Spool type	L3	L5	D5	L3	L5	D5
Nominal flow						
[l/min] at $\Delta p = 10$ bar	18	28	28	45	75	75
Δp P-T at $\Delta p = 30$ bar	30	50	50	80	130	130
max permissible flow	40	60	60	90	150	150
Δp max P-T [bar]	70	50	50	40	40	40
Response time [ms] (1)	≤ 18			≤ 25		
Leakage [cm ³]	<500 (at P = 100 bar); <1500 (at P = 350 bar)			<800 (at P = 100 bar); <2500 (at P = 315 bar)		
Hysteresis	≤ 0,2 [% of max regulation]					
Repeatability	± 0,1 [% of max regulation]					
Thermal drift	zero point displacement < 1% at $\Delta T = 40^\circ C$					

(1) 0-100% step signal


9 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % V_{PP})			
Max power consumption	35 W			
Analog input signals	Voltage: range ± 10 VDC (24 V_{MAX} tollerant) Current: range ± 20 mA		Input impedance: $R_i > 50$ k Ω Input impedance: $R_i = 500 \Omega$	
Insulation class	H (180°) Due to the occuring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account			
Monitor outputs	Output range: voltage ± 10 VDC @ max 5 mA current ± 20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 \div 5 Vdc (OFF state), 9 \div 24 Vdc (ON state), 5 \div 9 Vdc (not accepted); Input impedance: $R_i > 10$ k Ω			
Fault output	Output range: 0 \div 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 transducer power supply	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position control (SN) or pressure/force control (SP, SF, SL) 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, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT 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 800 ms (depending on communication type) have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C \div +60°C, with HFC hydraulic fluids = -20°C \div +50°C FKM seals (/PE option) = -20°C \div +80°C HNBR seals (/BT option) = -40°C \div +60°C, with HFC hydraulic fluids = -40°C \div +50°C		
Recommended viscosity	20 \div 100 mm ² /s - max allowed range 15 \div 380 mm ² /s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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

11 CERTIFICATION DATA

Valve type	DHZA, DKZA				
Certifications	Multicertification Group II ATEX IECEx				
Solenoid certified code	OZA-TES				
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X		
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db		
Temperature class	Single solenoid valve	T6	-	T5	T4
	Double solenoid valve	-	T4	-	T3
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 100 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C		-40 ÷ +55 °C		-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1	IEC 60079-31	
Cable entrance: threaded connection	M = M20x1,5				

(1) The type examiner certificates can be downloaded from

(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.

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

12.1 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

13 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

14 HYDRAULIC OPTIONS

B = Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see 17.1

Y = Option /Y is mandatory if the pressure in port T exceeds 210 bar

15 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±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.

C = Only for **SP, SF, SL**

Option /C is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 Vdc.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

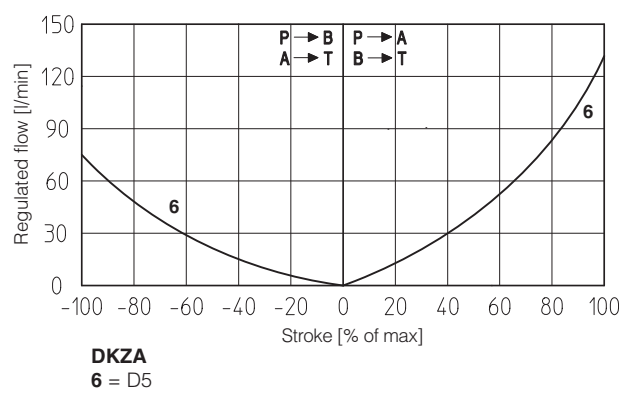
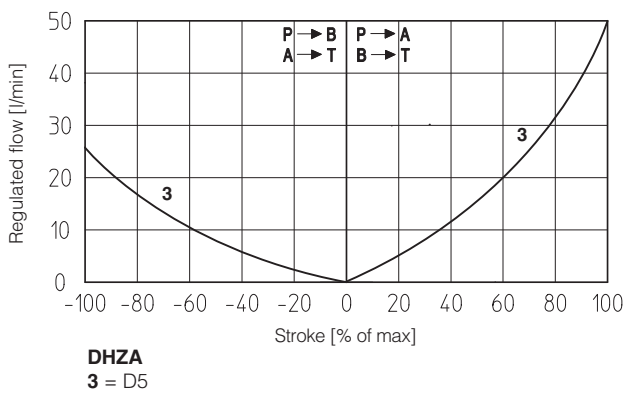
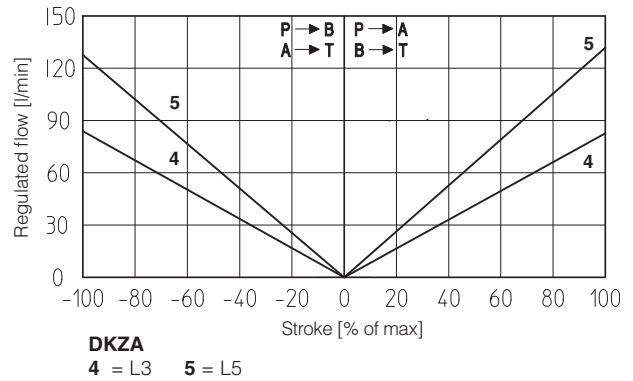
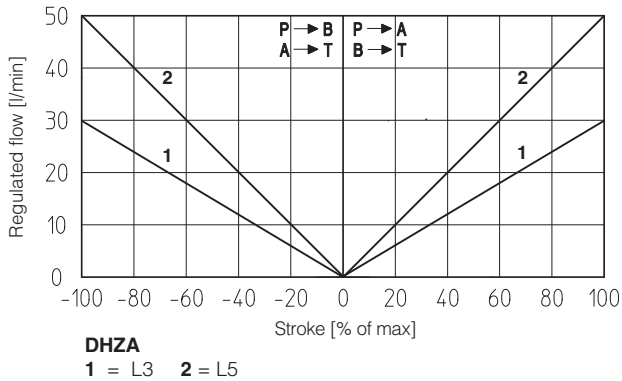
16 POSSIBLE COMBINED OPTIONS

For SN: /BI, /BY, /IY

For SP, SF, SL: /BI, /BY, /IY, /CI, /BCI, CIY, BCIY

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

17.1 Regulation diagrams (values measure at Δp 30 bar P-T)



Note:

Hydraulic configuration vs. reference signal for configurations 71 and 73 (standard and option /B)

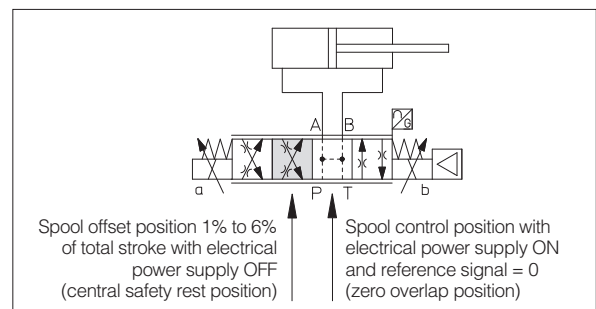
Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$ Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

17.2 Spool safety rest position

In absence of electric power supply (+24 VDC), the valve spool is moved by the springs force to the **safety rest position** characterized by a small offset of about 1% to 6% of the total stroke in P-B / A-T configuration.

This is specifically designed to avoid that in case of accidental interruption of the electrical power supply to the valve, the actuator moves towards an undefined direction (due to the tolerances of the zero overlap spool), with potential risk of damages or personnel injury.

Thanks to the **safety rest position** the actuator movement is suddenly stopped and it is recovered at very low speed towards the direction corresponding to the P-B/ A-T connection.




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, EN-982).

18.1 Power supply (V+ and V0)


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

 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)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

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 $\pm 10\text{ Vdc}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

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 $0 \div 24\text{Vdc}$.

18.4 Pressure or force reference input signal (F_INPUT+) - only SP, SF, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are $\pm 10\text{ Vdc}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24\text{Vdc}$.

18.5 Flow monitor output signal (Q_MONITOR)

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 $\pm 10\text{ Vdc}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

18.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SF, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are $\pm 10\text{ Vdc}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

18.7 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.

18.8 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for $4 \div 20\text{ mA}$ 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.

18.9 Remote pressure/force transducer input signal - only for SP, SF, SL

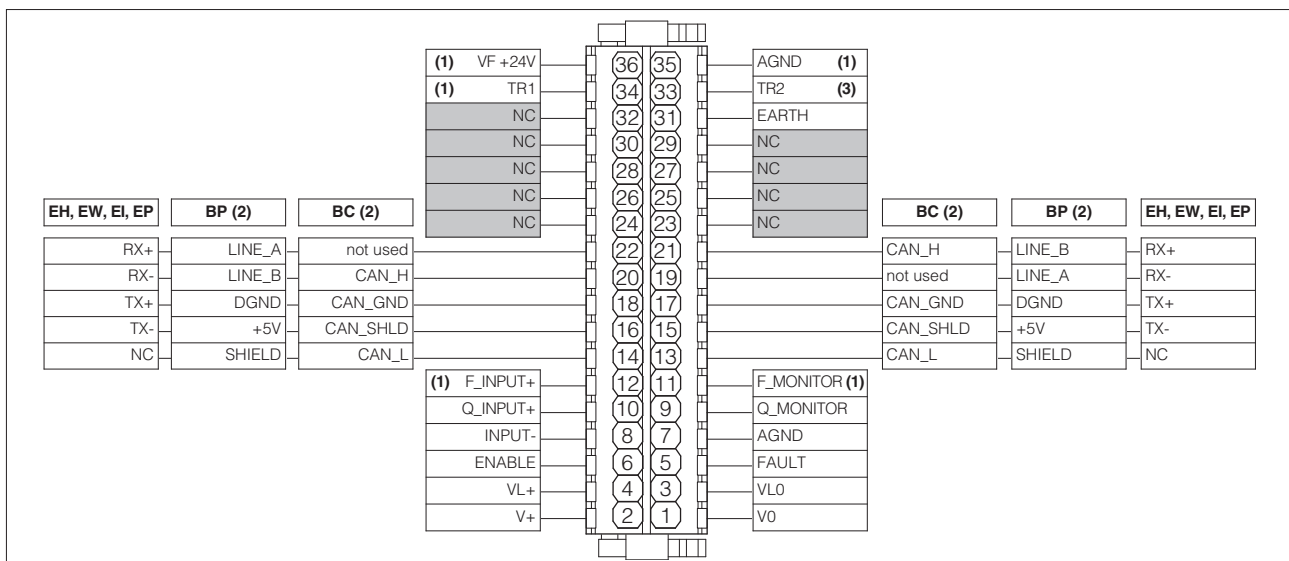
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are $\pm 10\text{ Vdc}$ for standard and $4 \div 20\text{ mA}$ for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

19 TERMINAL BOARD OVERVIEW



(1) connections available only **SP, SF, SL**

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

(3) connection available only **SF**

20 ELECTRONIC CONNECTIONS

20.1 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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	10	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
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
31	EARTH	Internally connected to driver housing		

(1) Available only for **SP, SF, SL**

20.2 USB connector - M12 - 5 pin always present

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

20.3 BC fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	CAN_L	Bus line (low)	C2	13	CAN_L	Bus line (low)
	16	CAN_SHLD	Shield		15	CAN_SHLD	Shield
	18	CAN_GND	Signal zero data line		17	CAN_GND	Signal zero data line
	20	CAN_H	Bus line (high)		19	not used	Pass-through connection (1)
	22	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

20.4 BP fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	SHIELD		C2	13	SHIELD	
	16	+5V	Power supply		15	+5V	Power supply
	18	DGND	Data line and termination signal zero		17	DGND	Data line and termination signal zero
	20	LINE_B	Bus line (low)		19	LINE_A	Bus line (high)
	22	LINE_A	Bus line (high)		21	LINE_B	Bus line (low)

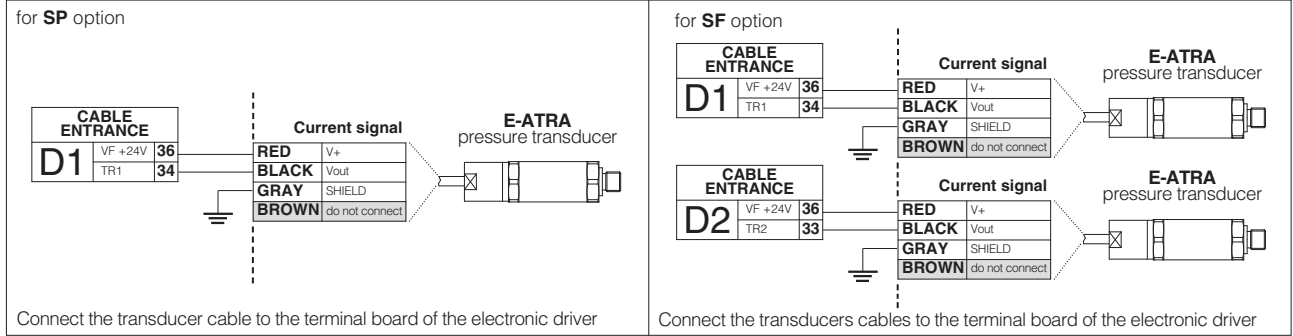
20.5 EH, EW, EI, EP fieldbus execution connections

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect	C2 (output)	13	NC	do not connect
	16	TX-	Transmitter		15	TX-	Transmitter
	18	TX+	Transmitter		17	TX+	Transmitter
	20	RX-	Receiver		19	RX-	Receiver
	22	RX+	Receiver		21	RX+	Receiver

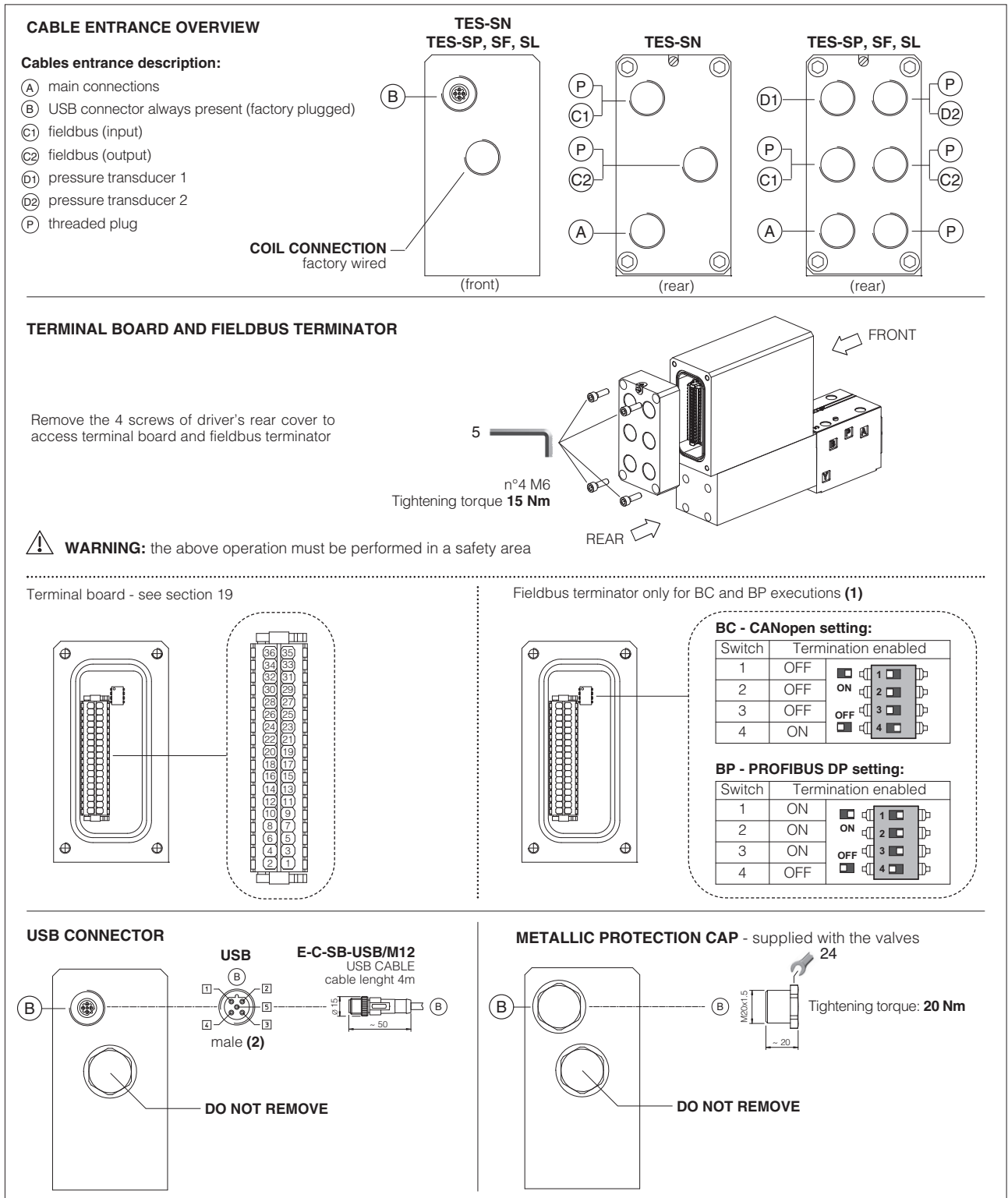
20.6 Remote pressure transducer connector - only for SP, SF, SL

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	33	TR2	2nd signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	/	/	Connect	Connect
	34	TR1	1st signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
D2	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table GX800

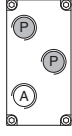
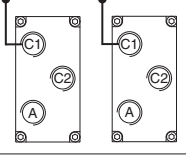
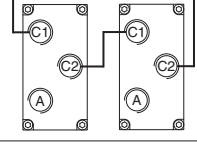


21 CONNECTIONS LAYOUT

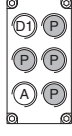
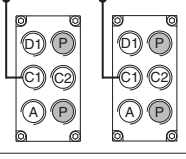
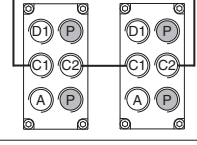


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

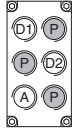
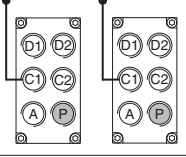
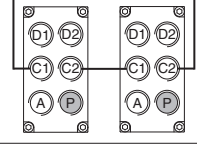
21.1 Cable glands and threaded plug for TES-SN - see tech table KX800

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

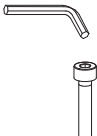

21.2 Cable glands and threaded plug for TES-SP, SL - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

21.3 Cable glands and threaded plug for TES-SF - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	3	D1 D2 A	none	none		Cable entrance A, D1, D2 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	4	D1 - D2 C1 A	1	C2		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	5	D1 - D2 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged

22 FASTENING BOLTS AND SEALS

	<p>DHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DKZA</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: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B, P, T: \varnothing 11,2 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

23 INSTALLATION DIMENSIONS [mm]

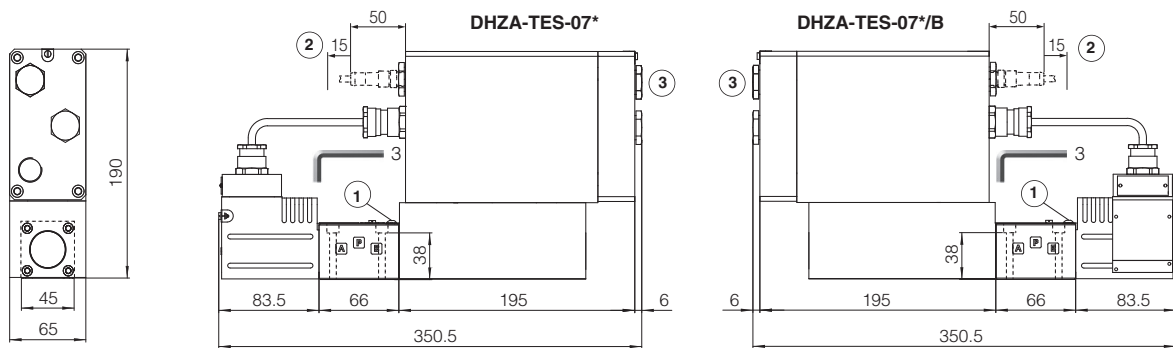
DHZA-TES

ISO 4401: 2005

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

(for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DHZA-TES-07	8,9



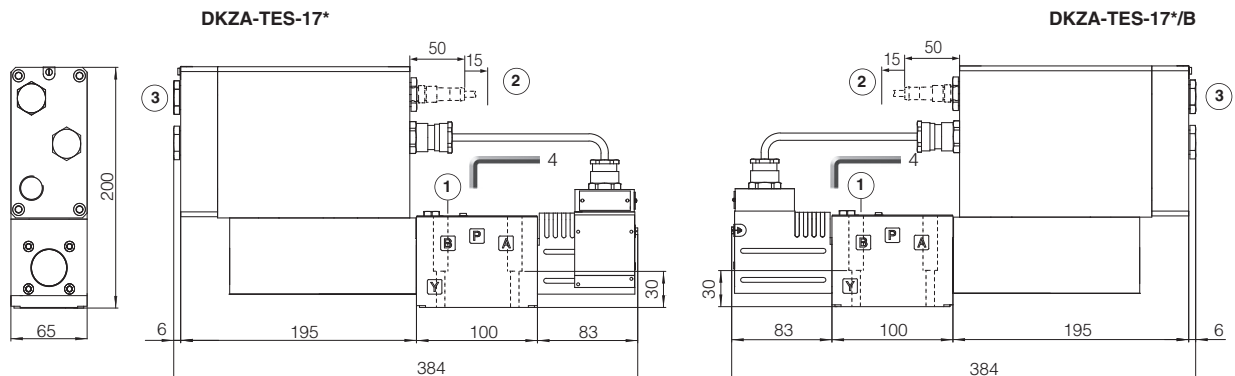
DKZA-TES

ISO 4401: 2005

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

(for /Y surface: 4401-05-05-0-05 without port X)

Mass [kg]	
DKZA-TES-17	10,7



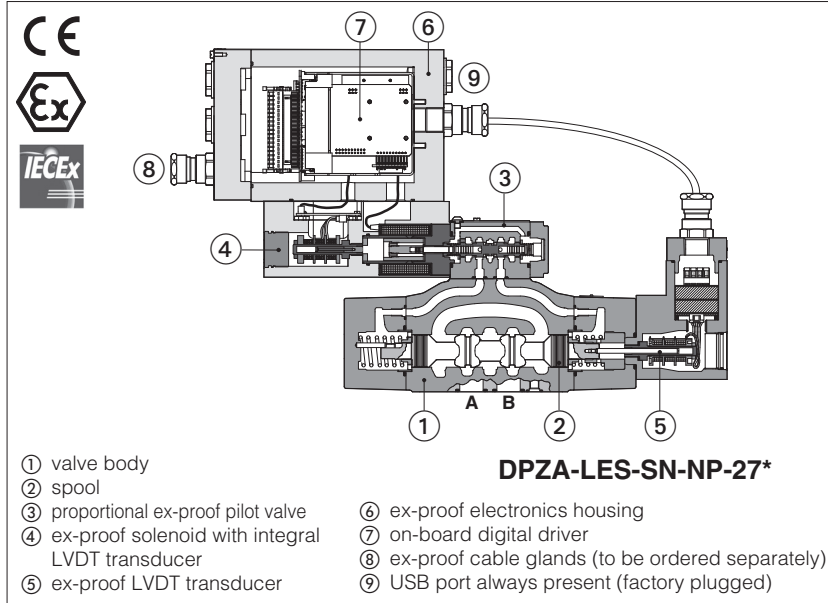
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

24 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS500	Programming tools
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	GS510	Fieldbus
FX500	Ex-proof digital proportionals with P/Q control	GX800	Ex-proof pressure transducer type E-ATRA-7
FX620	Ex-proof servoproportionals with on-board axis c	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves

Ex-proof digital servoproportional directional valves

piloted, with on-board driver, two LVDT transducers and zero spool overlap - **ATEX and IECEx**



DPZA-LES

Ex-proof digital servoproportional directional valves, piloted with two LVDT position transducers (pilot valve and main stage) and zero spool overlap for position closed loop controls.

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

● **Multicertification ATEX and IECEx** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducers, 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.

LEZ execution includes valve driver plus axis card to perform position control (see section 6).

Size: **10 ÷ 27** -ISO4401

Max flow: **180 ÷ 800** l/min

Max pressure: **350 bar**

1 MODEL CODE

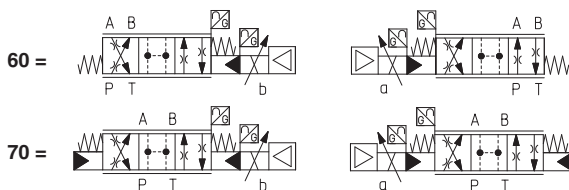
DPZA	-	LES	-	SN	-	NP	-	2	70	-	L	5	/	M	/	*	/	*
Ex-proof proportional directional valve, piloted		LES = on-board driver and two LVDT transducers		Alternated P/Q controls, see section 5: SN = none SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)														Seals material, see section 8: - = NBR PE = FKM BT = HNBR
Fieldbus interface, USB port always present: NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT																		
Valve size ISO 4401: 1 = 10 2 = 16 4 = 25 4M = 27																		
Hydraulic options (1): B = solenoid at side of port A (2) D = internal drain E = external pilot pressure G = pressure reducing valve for piloting (standard for size 10)																		
Electronic options (1): C = current feedback for pressure transducer 4÷20 mA, only for SP, SF, SL (omit for std voltage ±10 Vdc) I = current reference input and monitor 4÷20mA (omit for std voltage ±10Vdc)																		
Cable entrance threaded connection: M = M20x1,5																		

Spool size

	3 (L)	5 (L,DL)	5 (T)
DPZA-1 =	-	100	-
DPZA-2 =	130	200	150
DPZA-4 =	-	340	-
DPZA-4M =	-	390	-

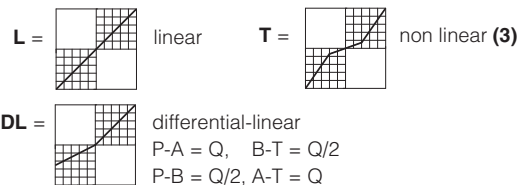
Nominal flow (l/min) at Δp 10bar P-T

Configuration: Standard



Option /B

Spool type, regulating characteristics:



(1) For possible combined options, see section 16

(2) In standard configuration the solenoid with on-board digital driver and position transducer are at side A of main stage (side B of pilot valve)

(3) only for configuration 70

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support:	NP (USB)	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)		

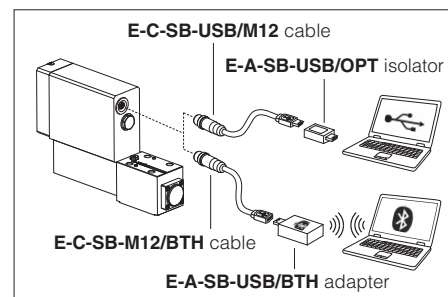


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



4 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SF** and **SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP, 2 pressure transducers for SF or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

6 AXIS CONTROLLER - see tech. table **FX630**

Digital servoproportional with integral electronics **LEZ** include valve's driver plus axis controller, performing position closed loop of any hydraulic actuator equipped with analog, encoder or SSI position transducer. Alternated pressure or force closed loop control can be set by software additionally to the position control.

Atos also supplies complete servoactuators integrating servocylinder, digital servoproportional valve and axis controller, fully assembled and tested. For more information consult Atos Technical Office.

7 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 11 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model		DPZA*-1	DPZA*-2		DPZA*-4	DPZA*-4M	
Pressure limits [bar]		ports P, A, B, X = 350; T = 250 (10 for option /D); Y = 10;					
Spool type		L5, DL5	L3	L5, DL5	T5	L5, DL5	
Nominal flow [l/min]							
Δp P-T	Δp = 10 bar	100	130	200	150	340	390
	Δp = 30 bar	160	220	350	260	590	670
	Max permissible flow	180	320	440	360	680	800
Δp max P-T [bar]		50	60	60	60	60	60
Piloting pressure [bar]		min. = 25; max = 350 (option /G advisable for pilot pressure > 200 bar)					
Piloting volume [cm³]		1,4		3,7		9,0	11,3
Piloting flow (1) [l/min]		1,7		3,7		6,8	8
Leakage (2)	Pilot [cm³/min]	100/300		150/450		200/600	
	Main stage [l/min]	0,4/1,2		0,6/2,5		1,0/4,0	
Response time (1) [ms]		≤ 30		≤ 30		≤ 35	
Hysteresis		≤ 0,1 [% of max regulation]					
Repeatability		± 0,1 [% of max regulation]					
Thermal drift		zero point displacement < 1% at ΔT = 40°C					

(1) 0 ÷ 100 % step signal and pilot pressure 100 bar

(2) at P = 100/350 bar


9 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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	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 transducer power supply	+24Vdc @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position control (SN) or pressure/force control (SP, SF, SL) 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	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	
Communication physical layer	not insulated	optical insulated	optical insulated	Fast Ethernet, insulated
	USB 2.0 + USB OTG	CAN ISO11898	RS485	100 Base TX

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

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
			see also filter section at KTF catalog
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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

11 CERTIFICATION DATA

Valve type	DPZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-LES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 EN 60079-1	IEC 60079-0 IEC 60079-1	IEC 60079-31
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

12.1 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

13 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

14 HYDRAULIC OPTIONS

B = Solenoid, integral electronics and position transducer at side of port B of the main stage.

D and E = Pilot and drain configuration can be modified as shown in section 21. The valve's standard configuration provides internal pilot and external drain. For different pilot / drain configuration select:

Option /D Internal drain.

Option /E External pilot (through port X).

G = Pressure reducing valve installed between pilot valve and main body with fixed setting:

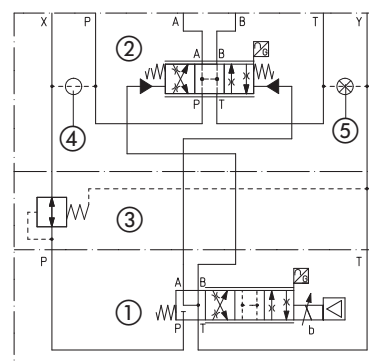
DPZA-2 = 28 bar

DPZA-1, -4 and -4M = 40 bar

It is advisable for valves with internal pilot in case of system pressure higher than 150 bar.

Pressure reducing valve is standard for DPZA-1, for other sizes add **/G** option.

FUNCTIONAL SCHEME - example of configuration 70



① Pilot valve

② Main stage

③ Pressure reducing valve

④ Plug to be added for external pilot trough port X

⑤ Plug to be removed for internal drain through port T

15 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±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.

C = Only for **SP, SF, SL**

Option /C is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

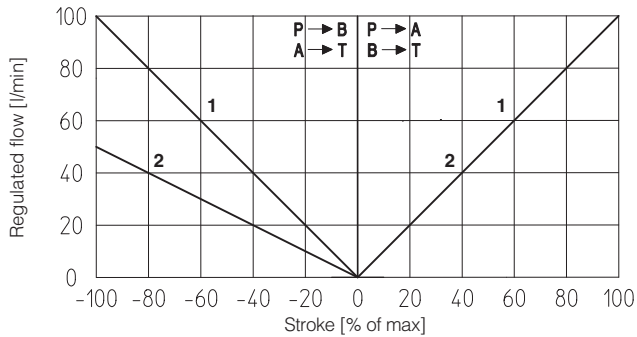
16 POSSIBLE COMBINED OPTIONS

Hydraulic options: all combination possible

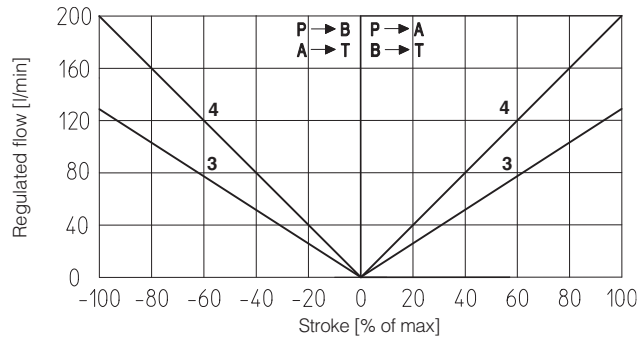
Electronics options: /CI (only for **SP, SF, SL**)

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

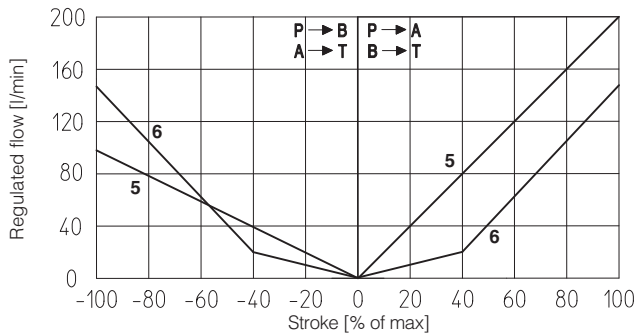
17.1 Regulation diagrams (values measure at Δp 10 bar P-T)



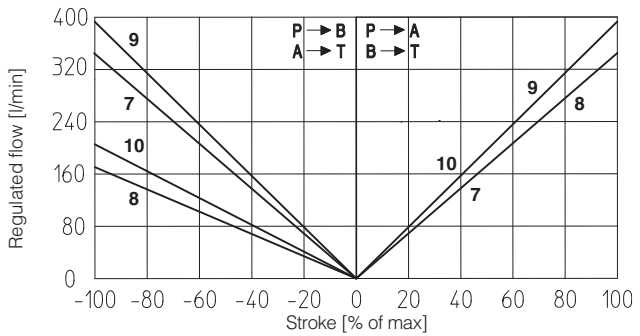
DPZA-1: 1 = L5 2 = DL5



DPZA-2: 3 = L3 4 = L5



DPZA-2: 5 = DL5 6 = T5



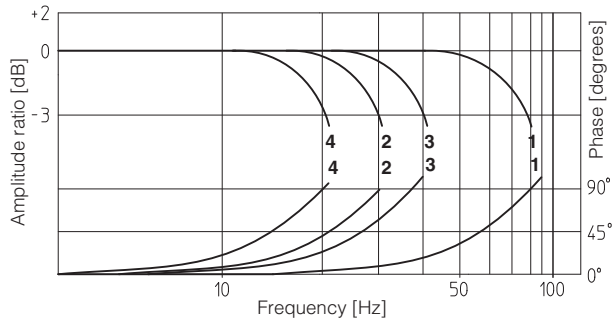
DPZA-4: 7 = L5 8 = DL5 **DPZA-4M:** 9 = L5 10 = DL5

Note: Hydraulic configuration vs. reference signal for configurations 60 and 70 (standard and option /B)

Reference signal $\begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \} P \rightarrow A / B \rightarrow T$ Reference signal $\begin{matrix} 0 \div -10 \text{ V} \\ 4 \div 12 \text{ mA} \end{matrix} \} P \rightarrow B / A \rightarrow T$

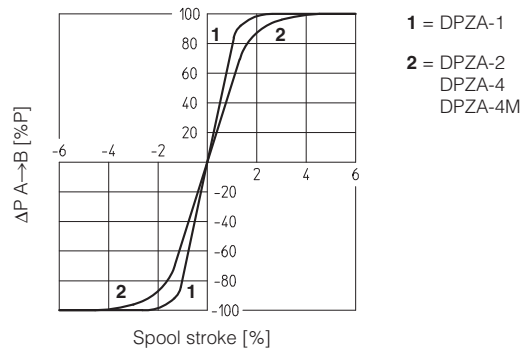
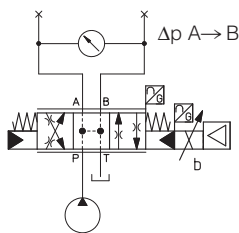
17.2 Bode diagrams

Stated at nominal hydraulic conditions.



1 = DPZA-1 } $\pm 5\%$ 2 = DPZA-1 } $\pm 100\%$
 DPZA-2 } $\pm 5\%$ DPZA-2 } $\pm 100\%$
 3 = DPZA-4 } $\pm 5\%$ 4 = DPZA-4 } $\pm 100\%$
 DPZA-4M } $\pm 5\%$ DPZA-4M } $\pm 100\%$

17.3 Pressure gain



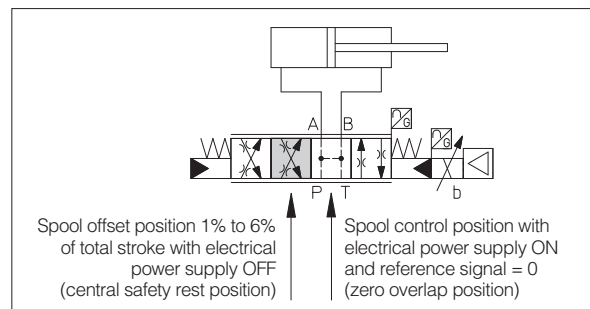
17.4 Safety rest position - configuration 70

In absence of electric power supply (+24 VDC), the valve main spool is moved by the springs force to the **central safety rest position** characterized by a small offset of about 1% to 6% of the total stroke in P-B / A-T configuration.

This is specifically designed to avoid that in case of accidental interruption of the electrical power supply to the valve, the actuator moves towards an undefined direction (due to the tolerances of the zero overlap spool), with potential risk of damages or personnel injury.

Thanks to the **central safety rest position** the actuator movement is suddenly stopped and it is recovered at very low speed towards the direction corresponding to the P-B/ A-T connection.

The main spool moves to the closed loop control position (zero overlap) when the pilot pressure is activated, the valve is fed with power supply +24 VDC and reference input = 0V (or 12 mA for option /I) is applied to the driver.




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, EN-982).

18.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: 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.

 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)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: 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.

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.

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 ± 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 ± 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 $0 \div 24$ VDC.

18.4 Pressure or force reference input signal (F_INPUT+) - only SP, SF, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24$ VDC.

18.5 Flow monitor output signal (Q_MONITOR)

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 $4 \div 20$ 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.

18.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SF, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

18.7 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.

18.8 Fault output signal (FAULT)

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.

18.9 Remote pressure/force transducer input signal - only for SP, SF, SL

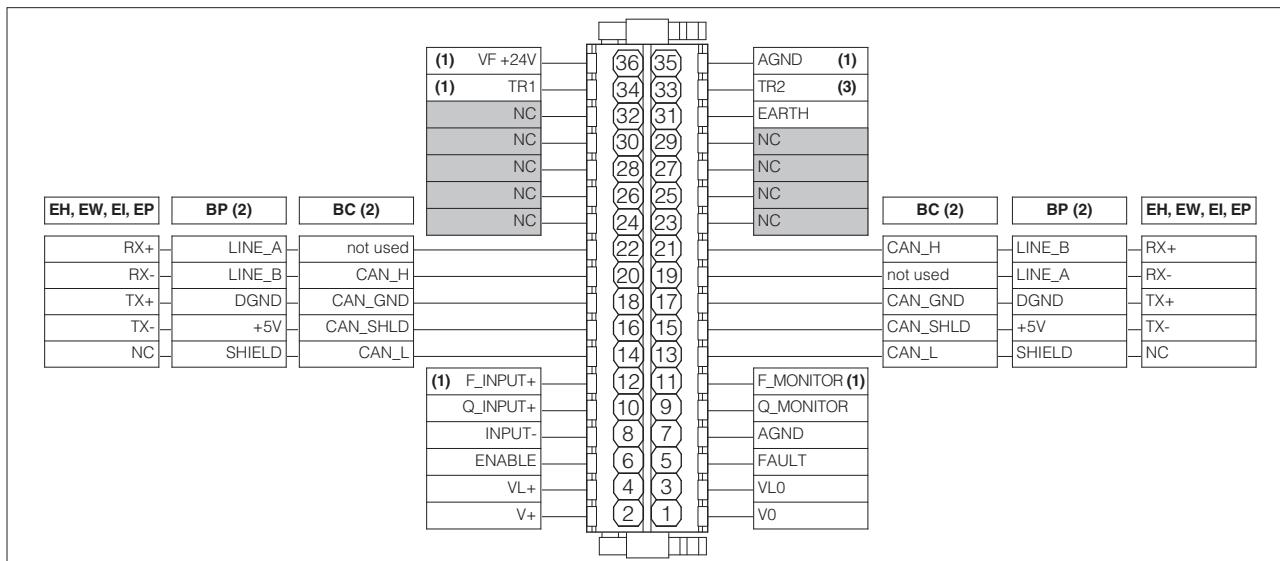
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are ± 10 VDC for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 Vdc or ± 20 mA.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

19 TERMINAL BOARD OVERVIEW



(1) connections available only SP, SF, SL

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

(3) connection available only SF

20 ELECTRONIC CONNECTIONS

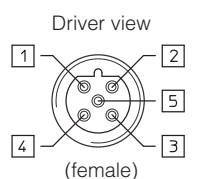
20.1 Main connections signals

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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	10	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
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
31	EARTH	Internally connected to driver housing		

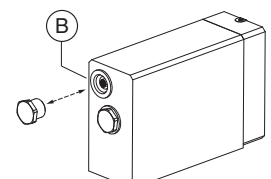
(1) Available only for **SP, SF, SL**

20.2 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 +



Driver view
(female)



B

20.3 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

20.4 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)

20.5 EH, EW, EI, EP fieldbus execution connections

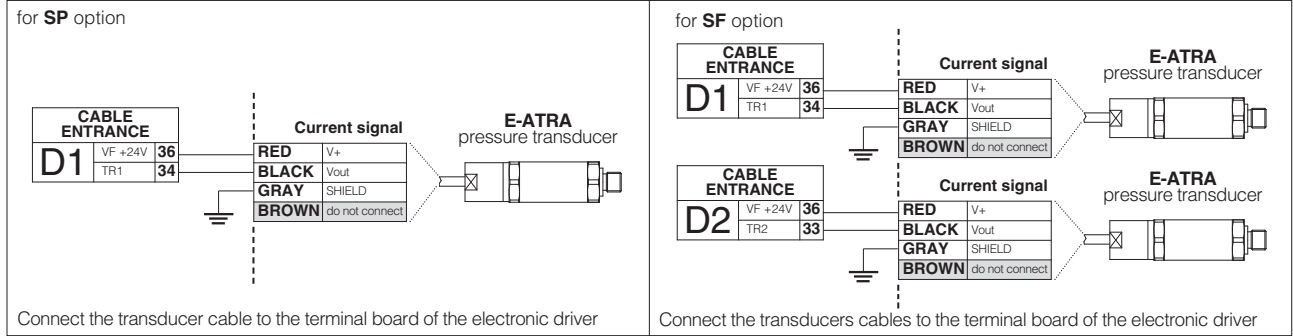
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

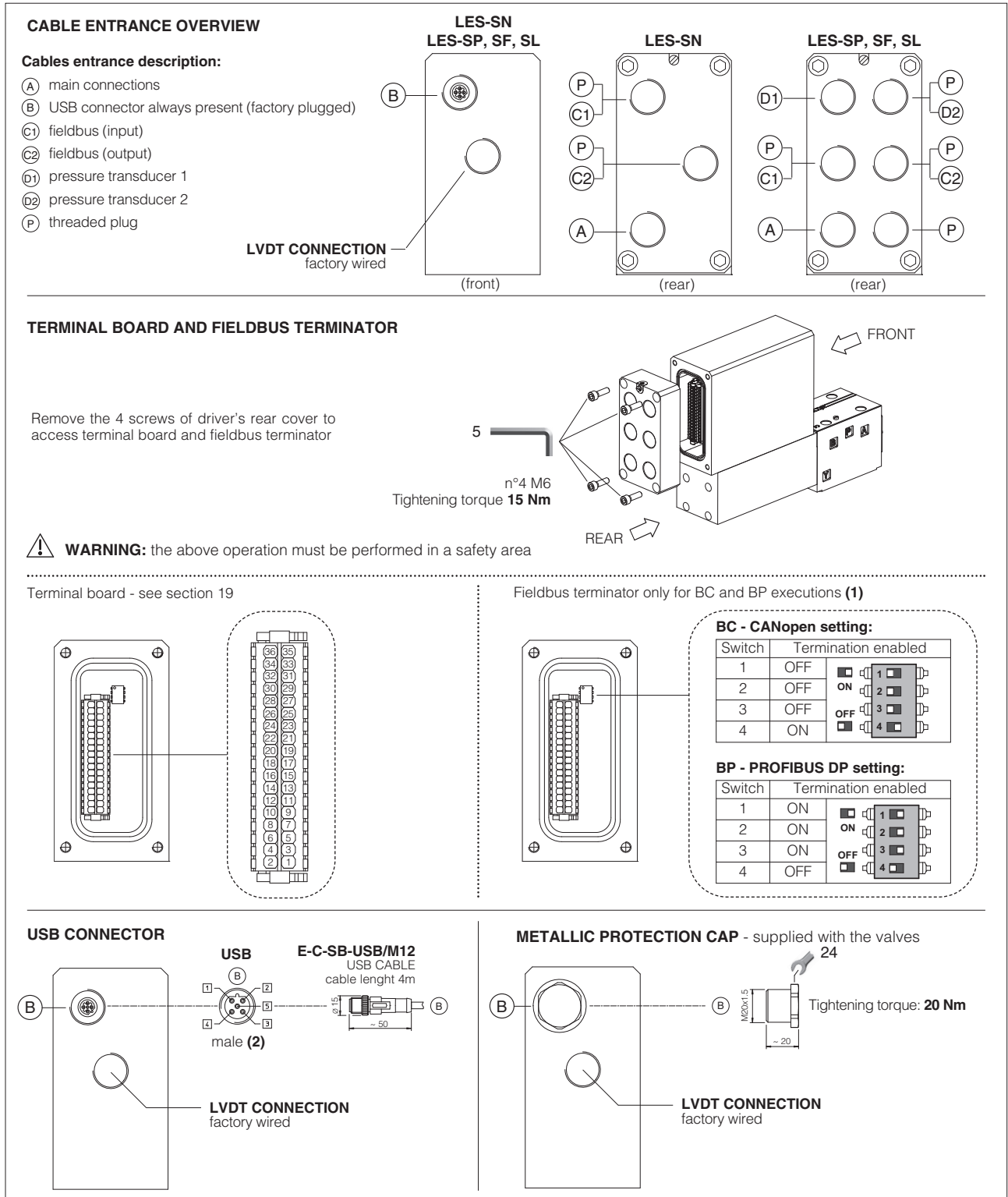
20.6 Remote pressure transducer connector - only for **SP, SF, SL**

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	33	TR2	2nd signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	/	/	Connect	Connect
	34	TR1	1st signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
D2	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table GX800

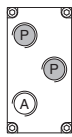
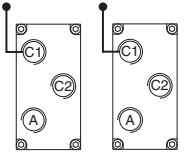
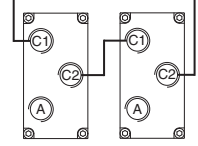


21 CONNECTIONS LAYOUT

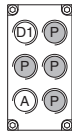
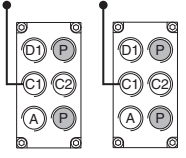
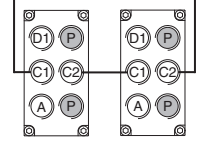


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

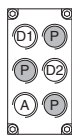
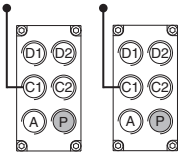
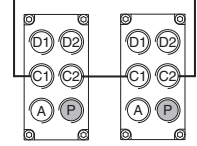
21.1 Cable glands and threaded plug for LES-SN - see tech table KX800

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

21.2 Cable glands and threaded plug for LES-SP, SL - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

21.3 Cable glands and threaded plug for LES-SF - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	3	D1 D2 A	none	none		Cable entrance A, D1, D2 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	4	D1 - D2 C1 A	1	C2		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	5	D1 - D2 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged

22 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

DPZA-1	Pilot channels	Drain channels	<p>Internal piloting: blinded plug SP-X300F ① in X; External piloting: blinded plug SP-X300F ② in Pp; Internal drain: blinded plug SP-X300F ③ in Y; External drain: blinded plug SP-X300F ④ in Dr.</p>
DPZA-2	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X300F ①; External piloting: Add blinded plug SP-X300F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-4	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X500F ①; External piloting: Add blinded plug SP-X500F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>

23 FASTENING BOLTS AND SEALS

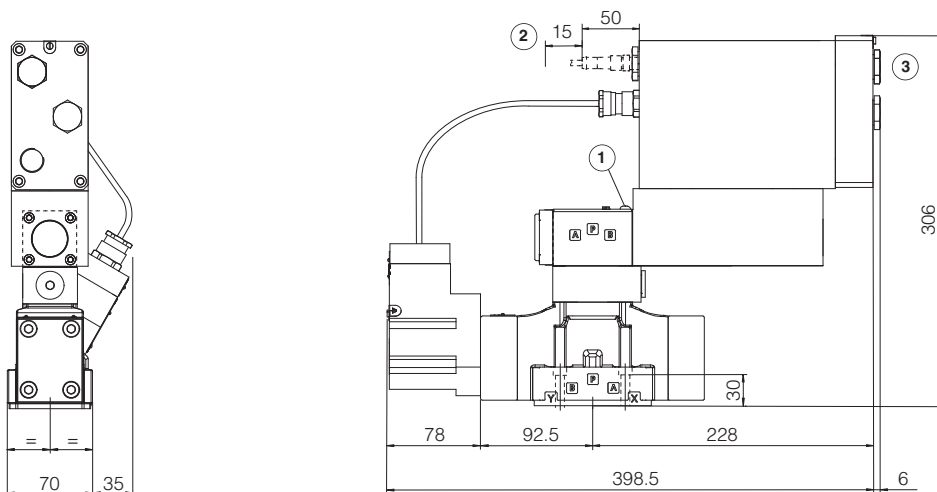
Type	Size	Fastening bolts	Seals
DPZA	1 = 10	4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm	5 OR 2050; Diameter of ports A, B, P, T: Ø 11 mm (max) 2 OR 108 Diameter of ports X, Y: Ø = 5 mm (max)
	2 = 16	4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm	4 OR 130; Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø = 7 mm (max)
	4 = 25	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 4112; Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)
	4M = 27	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 3137; Diameter of ports A, B, P, T: Ø 32 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)

DPZA-LES-*-1

ISO 4401: 2005

Mounting surface: 4401-05-05-0-05
(see table P005)

Mass [kg]	
DPZA-*-17*	13,7
Option /G	+0,9

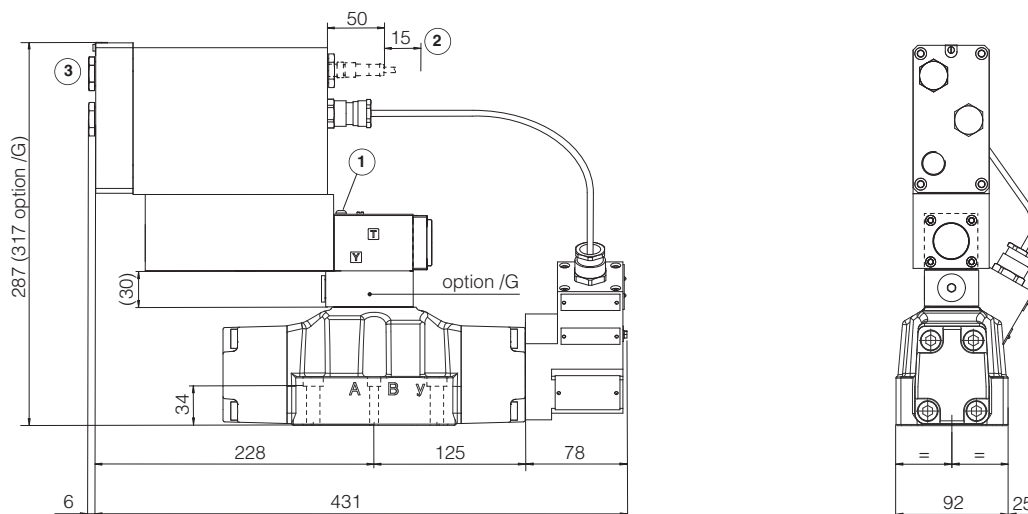


DPZA-LES-*-2

ISO 4401: 2005

Mounting surface: 4401-07-07-0-05
(see table P005)

Mass [kg]	
DPZA-*-27*	17,9
Option /G	+0,9



- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

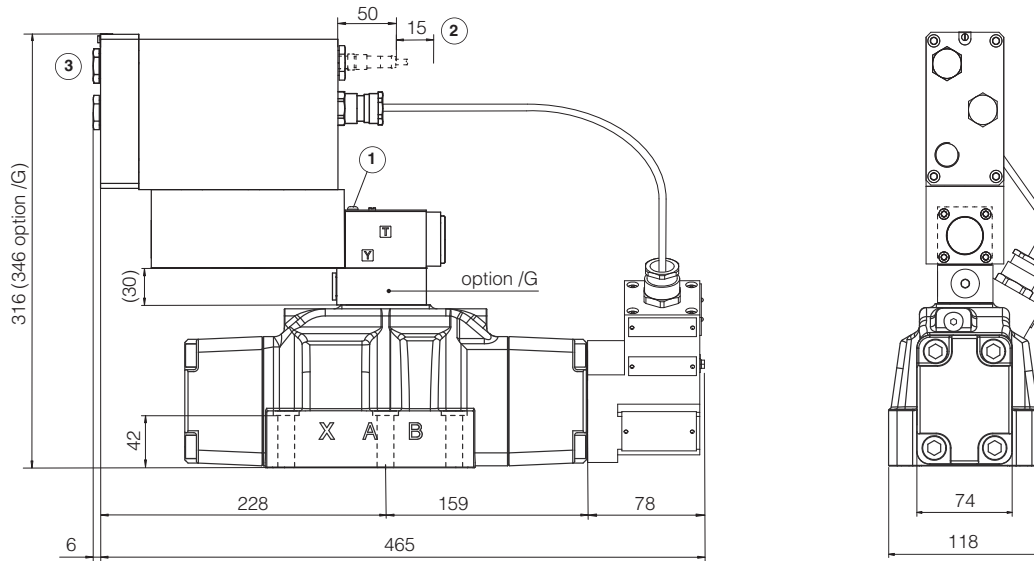
DPZA-LES-*-4 DPZA-LES-*-4M

ISO 4401: 2005

Mounting surface: 4401-08-08-0-05

(see table P005)

Mass [kg]	
DPZA-*-4*	23,1
DPZA-*-4M*	23,1
Option /G	+0,9



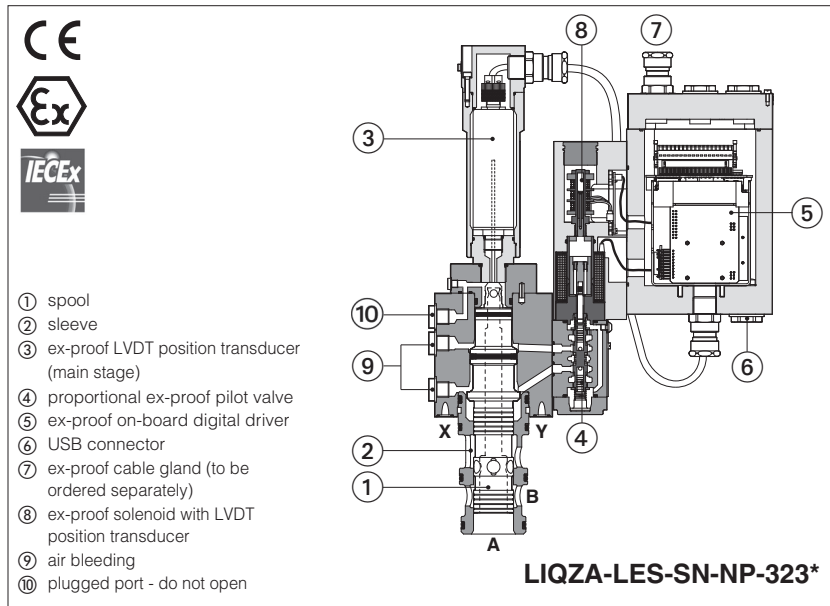
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

25 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS500	Programming tools
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	GS510	Fieldbus
FX500	Ex-proof digital proportionals with P/Q control	GX800	Ex-proof pressure transducer type E-ATRA-7
FX630	Ex-proof servoproportionals with on-board axis card	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves

Ex-proof digital servoproportional 3-way cartridges

piloted, with on-board driver and two LVDT transducers - **ATEX** and **IECEX**



- ① spool
- ② sleeve
- ③ ex-proof LVDT position transducer (main stage)
- ④ proportional ex-proof pilot valve
- ⑤ ex-proof on-board digital driver
- ⑥ USB connector
- ⑦ ex-proof cable gland (to be ordered separately)
- ⑧ ex-proof solenoid with LVDT position transducer
- ⑨ air bleeding
- ⑩ plugged port - do not open

LIQZA-LES

Ex-proof digital servoproportional 3-way cartridges, with two LVDT position transducers (pilot valve and main stage) for best accuracy in directional controls and in not compensated flow regulations.

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

- Multicertification **ATEX** and **IECEX** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

Size: **25 ÷ 80** - not ISO cavity

Max flow: **500 ÷ 5000 l/min**

Max pressure: **420 bar**

1 MODEL CODE

LIQZA	-	LES	-	SN	-	NP	-	32	3	L4	/	M	/	*	/	*	/	*
Ex-proof proportional cartridge																		Seals material, see section 9: - = NBR PE = FKM BT = HNBR
																		Series number

Ex-proof proportional cartridge

LES = on-board driver and two LVDT transducers

Alternated P/Q controls:

- SN** = none
- SP** = pressure control (1 pressure transducer)
- SL** = force control (1 load cell)

Fieldbus interfaces, USB port always present:

- NP** = Not present
- BC** = CANopen
- BP** = PROFIBUS DP
- EH** = EtherCAT
- EW** = POWERLINK
- EI** = EtherNet/IP
- EP** = PROFINET RT/IRT

Valve size and nominal flow (l/min) at Δp 5 bar:

- 25** = 185
- 32** = 330
- 40** = 420
- 50** = 780
- 63** = 1250
- 80** = 2100

(1) For possible combined options, see section 15

Hydraulic options (1):

A = reversal hydraulic configuration of main spool: P-A in rest position

Electronic options (1):

- C** = current feedback for pressure transducer 4÷20mA (omit for std voltage ±10VDC) only for **SP, SL**
- I** = current reference input and monitor 4÷20mA (omit for std voltage ±10VDC)

Cable entrance threaded connection:

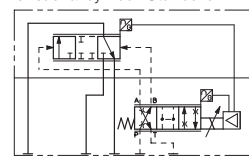
M = M20X1,5

Spool type ,regulating characteristics:

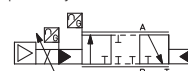


Configuration: 3 = 3 way

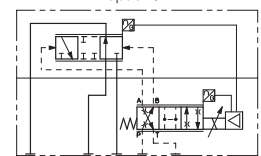
functional symbol: **Standard**



simplified symbol: **Standard**



option /A



option /A



2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

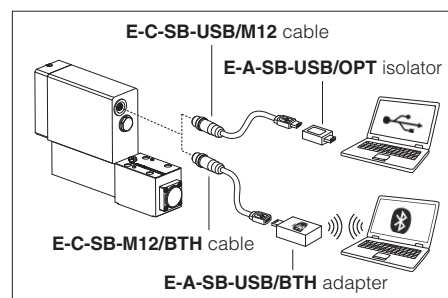
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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: Bluetooth adapter is available only for European, USA and Canadian markets! Bluetooth adapter is certified according RED (Europe), FCC (USA) and ISED (Canada) directives

USB or Bluetooth connection



4 FIELDBUS - 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

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 valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h		
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 2015/65/EU REACH Regulation (EC) n°1907/2006		

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

	25	32	40	50	63	80
Max regulated flow [l/min]						
Δp P-A or A-T at Δp = 5 bar	185	330	420	780	1250	2100
at Δp = 10 bar	260	470	590	1100	1750	3000
Max permissible flow	500	850	1050	2000	3100	5000
Max pressure [bar]	Ports P, A, T = 420 X = 350 Y ≤ 10					
Nominal flow of pilot valve at Δp = 70 bar [l/min]	4	8	28	40	100	100
Leakage of pilot valve at P = 100 bar [l/min]	0,2	0,2	0,5	0,7	0,7	0,7
Piloting pressure [bar]	min: 40% of system pressure max 350 recommended 140 ÷ 160					
Piloting volume [cm³]	2,16	7,2	8,9	17,7	33,8	42,7
Piloting flow (1) [l/min]	6,5	20	25	43	68	76
Response time (2) [ms]	≤ 25	≤ 27	≤ 27	≤ 30	≤ 35	≤ 40
Hysteresis [% of the max regulation]	≤ 0,1					
Repeatability [% of the max regulation]	± 0,1					
Thermal drift	zero point displacement < 1% at ΔT = 40°C					

(1) 0÷100% step signal

(2) With pilot pressure = 140 bar

WARNING

The loss of the pilot pressure causes the undefined position of the main spool.

The sudden interruption of the power supply during the valve operation causes the immediate main spool opening A → T or P → A (for option /A). This could cause pressure surges in the hydraulic system or high decelerations which may lead to machine damages.


8 ELECTRICAL CHARACTERISTICS

Power supplies	Nominal : +24 VDC Rectified and filtered : $V_{RMS} = 20 \div 32 V_{MAX}$ (ripple max 10 % VPP)			
Max power consumption	35 W			
Analog input signals	Voltage: range ± 10 VDC (24 VMAX tollerant) Current: range ± 20 mA		Input impedance: $R_i > 50$ k Ω Input impedance: $R_i = 500$ 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	Output range: voltage ± 10 VDC @ max 5 mA current ± 20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 \div 5 Vbc (OFF state), 9 \div 24 VDC (ON state), 5 \div 9 VDC (not accepted); Input impedance: $R_i > 10$ k Ω			
Fault output	Output range: 0 \div 24 Vbc (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, SL)	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position control (SN) or pressure/force control (SP, SL) 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	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	EC 61158
Communication physical layer	not insulated	optical insulated	optical insulated	Fast Ethernet, insulated
	USB 2.0 + USB OTG	CAN ISO11898	RS485	100 Base TX

Note: a maximum time of 800 ms (depending on communication type) have 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 \div +60°C, with HFC hydraulic fluids = -20°C \div +50°C FKM seals (/PE option) = -20°C \div +80°C HNBR seals (/BT option) = -40°C \div +60°C, with HFC hydraulic fluids = -40°C \div +50°C			
Recommended viscosity	20 \div 100 mm ² /s - max allowed range 15 \div 380 mm ² /s			
Max fluid contamination level	normal operation	ISO4406 class 18/16/13	NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11	NAS1638 class 5	
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	HFDD, HFDR		ISO 12922
Flame resistant with water (1)	NBR, HNBR	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

Components type	Pilot valve solenoid and LVDT transducer			LVDT main stage transducer
Certifications	Multicertification ATEX IECEX			
Components Certified code	OZA-LES			ETHA-15
Type examination certificate (1)	<ul style="list-style-type: none"> • ATEX: TUV IT 18 ATEX 068 X • IECEX: IECEX TPS 19.0004X 			<ul style="list-style-type: none"> • ATEX: TUV IT 16 ATEX 053 X • IECEX: IECEX TPS 16.0003X
Method of protection	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db 		<ul style="list-style-type: none"> • IECEX Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db 	
Temperature class	T6	T5	T4	T6
Surface temperature	≤ 85 °C	≤ 100 °C	≤ 135 °C	≤ 85 °C
Ambient temperature (2)	-40 \div +40 °C	-40 \div +55 °C	-40 \div +70 °C	-40 \div +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1	IEC 60079-31
Cable entrance: threaded connection	M = M20x1,5			factory wired

(1) The type examiner certificates can be downloaded from

(2) The driver solenoid and LVDT transducers 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

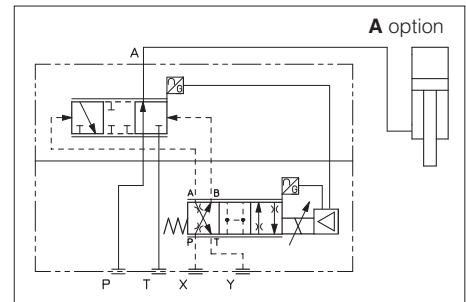
12 CABLE GLANDS

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

- A** = The standard valve version provides the hydraulic configuration A-T of main spool in absence of electric power supply to the valve.
The option /A provides the reverse configuration P-A of main spool in absence of electric power supply to the valve.
This execution is particularly requested in vertical presses for safety reasons, because in case of electric power breakdown the P-A configuration of the main spool prevents the uncontrolled and dangerous downstroke of the press ram.



14 ELECTRONICS OPTIONS

- 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.
- C** = Only for **SP, SL**
This option is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

15 POSSIBLE COMBINED OPTIONS

For **SN**: /AI

For **SP, SL**: /AC, AI, /CI, /ACI

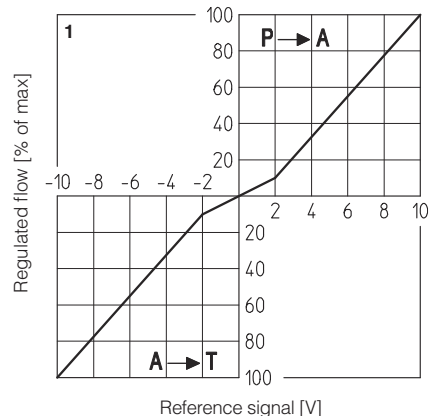
16 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

16.1 Regulation diagrams, see note

1 = LIQZA (all sizes)

Hydraulic configuration vs. reference signal:

	standard	option /A
Reference signal 0 ÷ +10 V } P → A		A → T
12 ÷ 20 mA }		
Reference signal 0 ÷ -10 V } A → T		P → A
4 ÷ 12 mA }		




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, EN-982).

17.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: 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.

 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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 (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 ± 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 ± 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 $0 \div 24$ VDC.

17.4 Pressure or force reference input signal (F_INPUT+) - only SP, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are ± 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 ± 10 Vdc or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24$ VDC.

18.5 Flow monitor output signal (Q_MONITOR)

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 $4 \div 20$ 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.

17.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 Vdc or ± 20 mA.

17.7 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.

17.8 Fault output signal (FAULT)

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.

17.9 Remote pressure/force transducer input signal - only for SP, SL

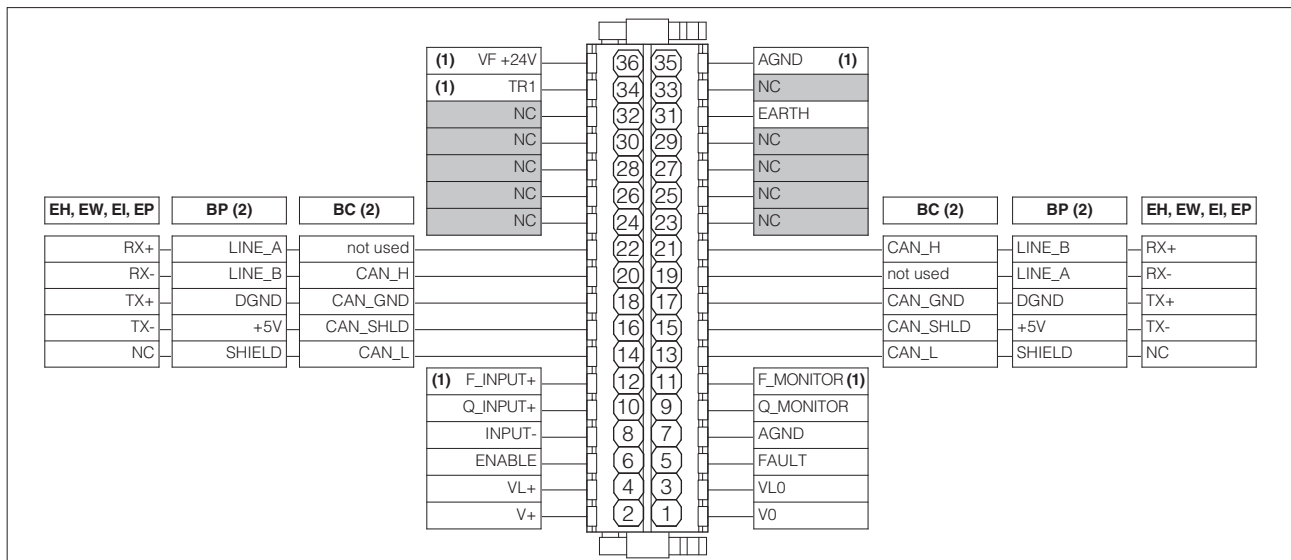
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are ± 10 VDC for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 Vdc or ± 20 mA.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

18 TERMINAL BOARD OVERVIEW



(1) Connections available only SP, SL

(2) 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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	10	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
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
	31	EARTH	Internally connected to driver housing	

(1) Available only for SP, SL

19.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	Driver view	
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	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	CAN_L	Bus line (low)	C2	13	CAN_L	Bus line (low)
	16	CAN_SHLD	Shield		15	CAN_SHLD	Shield
	18	CAN_GND	Signal zero data line		17	CAN_GND	Signal zero data line
	20	CAN_H	Bus line (high)		19	not used	Pass-through connection (1)
	22	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

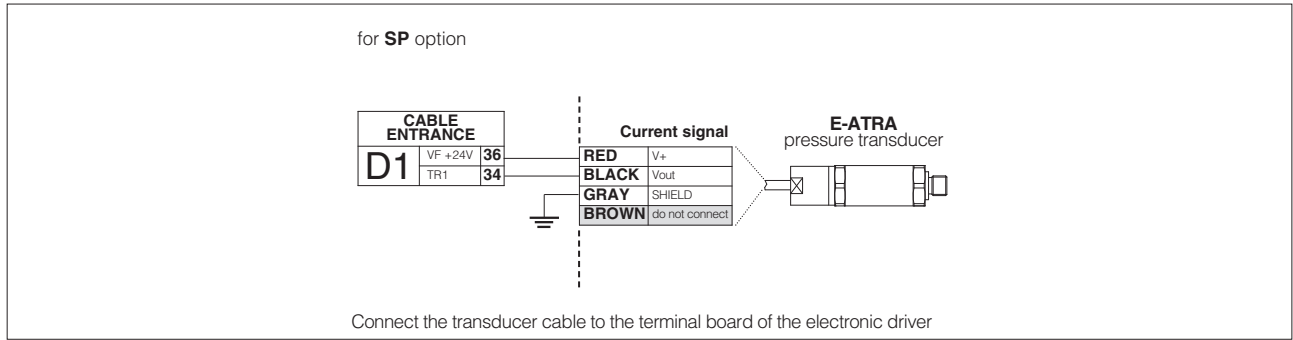
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1	14	SHIELD		C2	13	SHIELD	
	16	+5V	Power supply		15	+5V	Power supply
	18	DGND	Data line and termination signal zero		17	DGND	Data line and termination signal zero
	20	LINE_B	Bus line (low)		19	LINE_A	Bus line (high)
	22	LINE_A	Bus line (high)		21	LINE_B	Bus line (low)

19.5 EH, EW, EI, EP fieldbus execution connections

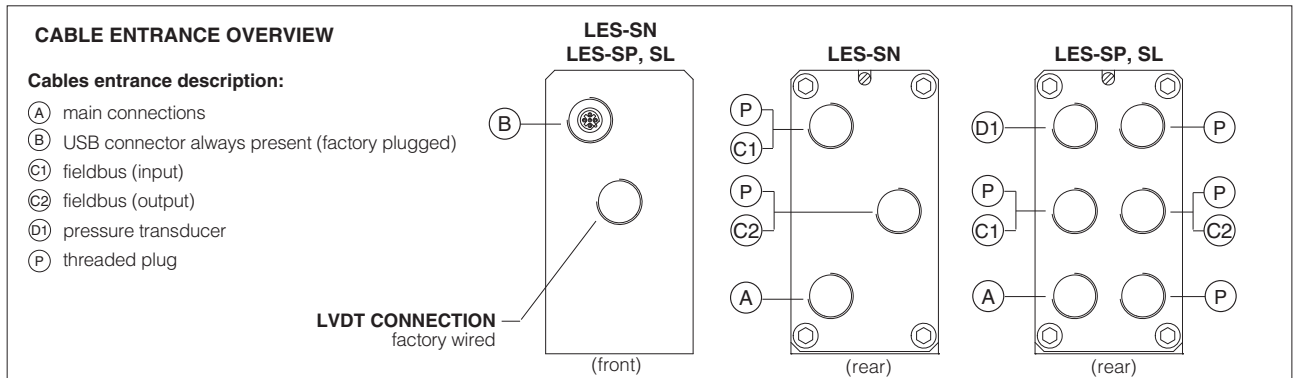
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect	C2 (output)	13	NC	do not connect
	16	TX-	Transmitter		15	TX-	Transmitter
	18	TX+	Transmitter		17	TX+	Transmitter
	20	RX-	Receiver		19	RX-	Receiver
	22	RX+	Receiver		21	RX+	Receiver

19.6 Remote pressure transducer connector - only for SP, SL

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	34	TR1	1st ignal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

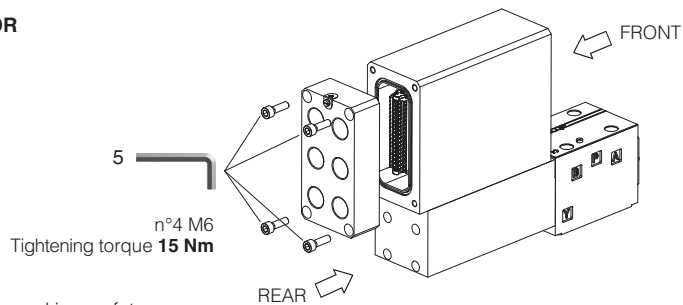


20 CONNECTIONS LAYOUT



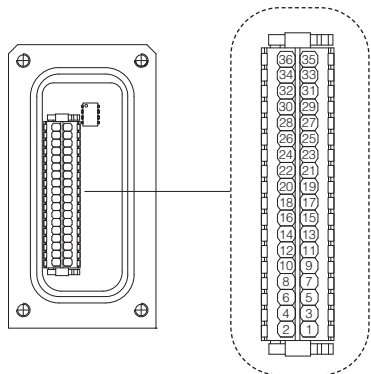
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

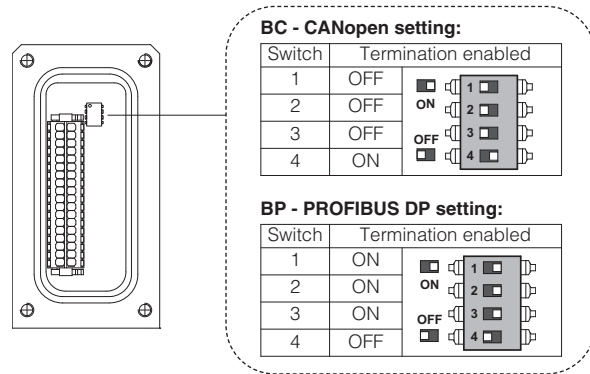


WARNING: the above operation must be performed in a safety area

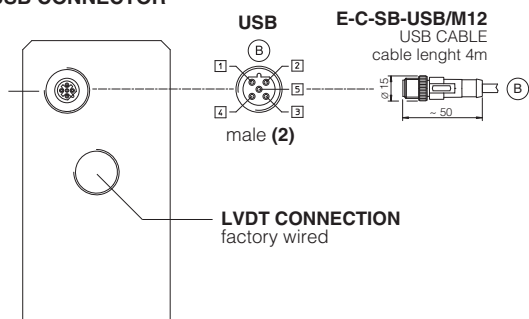
Terminal board - see section 18



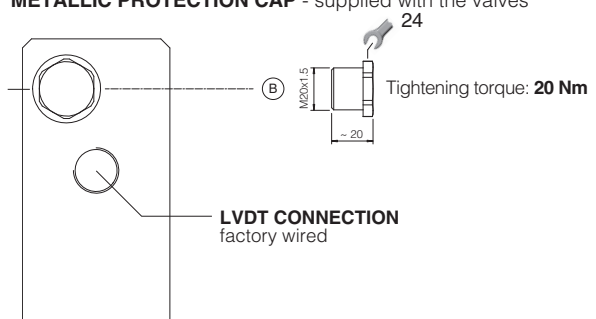
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

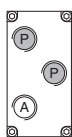
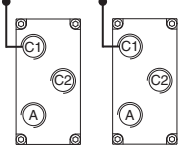
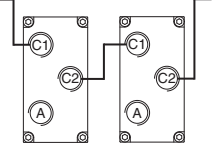


METALLIC PROTECTION CAP - supplied with the valves

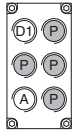
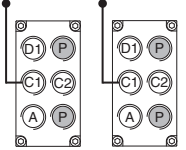
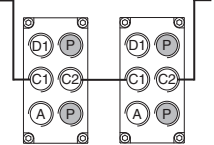


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

20.1 Cable glands and threaded plug for LES-SN - see tech table KX800

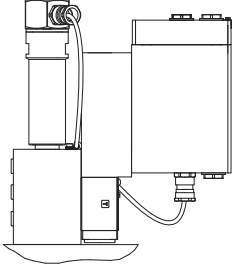
Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	1	A	none	none		Cable entrance A is open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	2	C1 A	1	C2		Cable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

20.2 Cable glands and threaded plug for LES-SP, SL - see tech table KX800

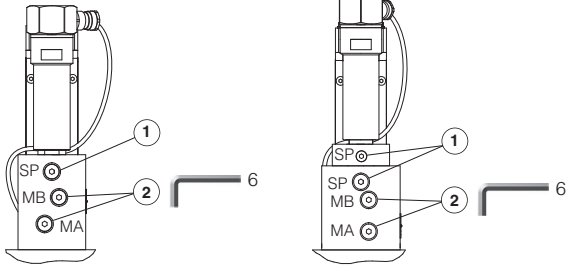
Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

21 AIR BLEEDING

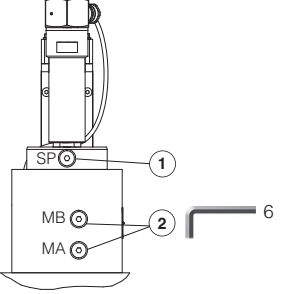
Size 25



Sizes 32, 40



Sizes 50 to 80

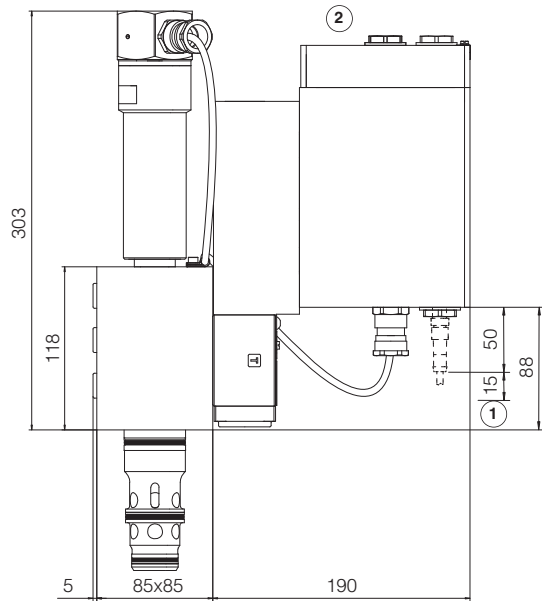


1 Plugged port - do not open

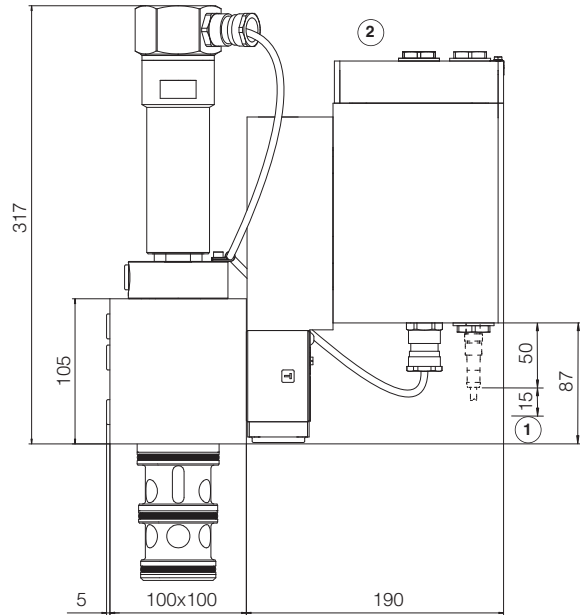
2 Air bleeding (MA, MB):
N° 2 plugs G1/4"

At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.
Operate the valve for few seconds at low pressure and then lock the plugs.

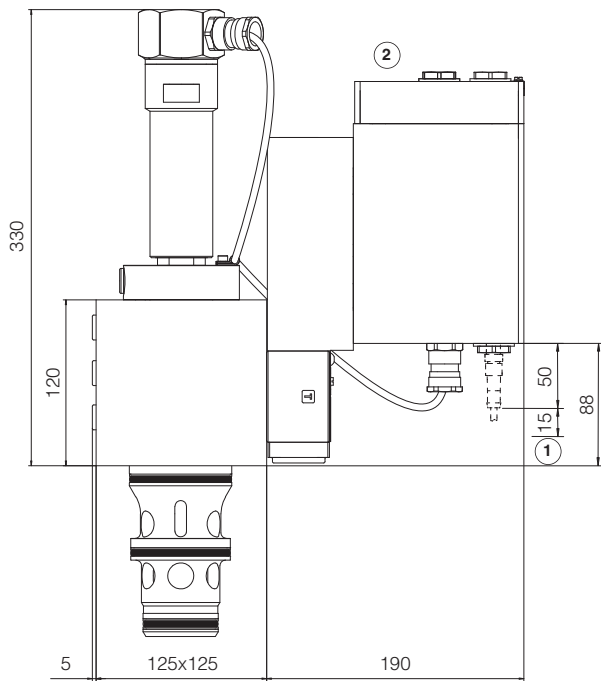
LIQZA-LES-253



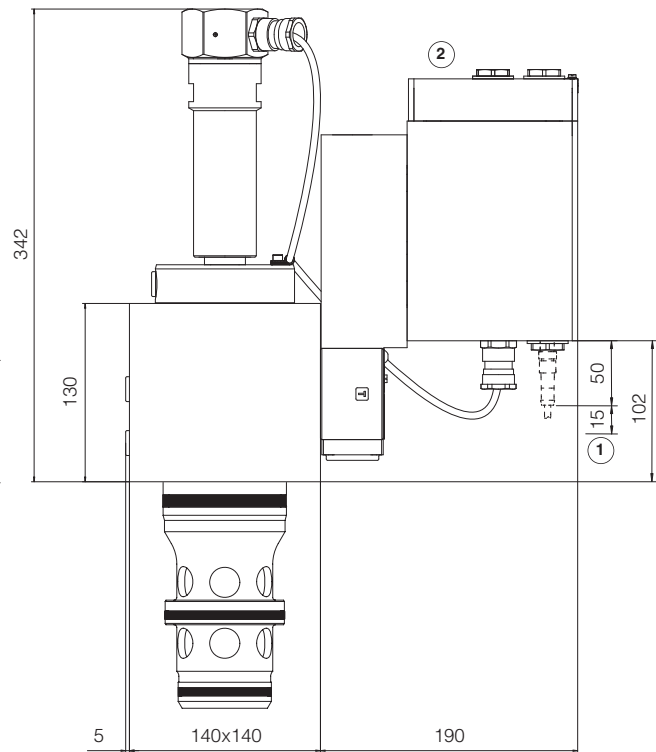
LIQZA-LES-323



LIQZA-LES-403

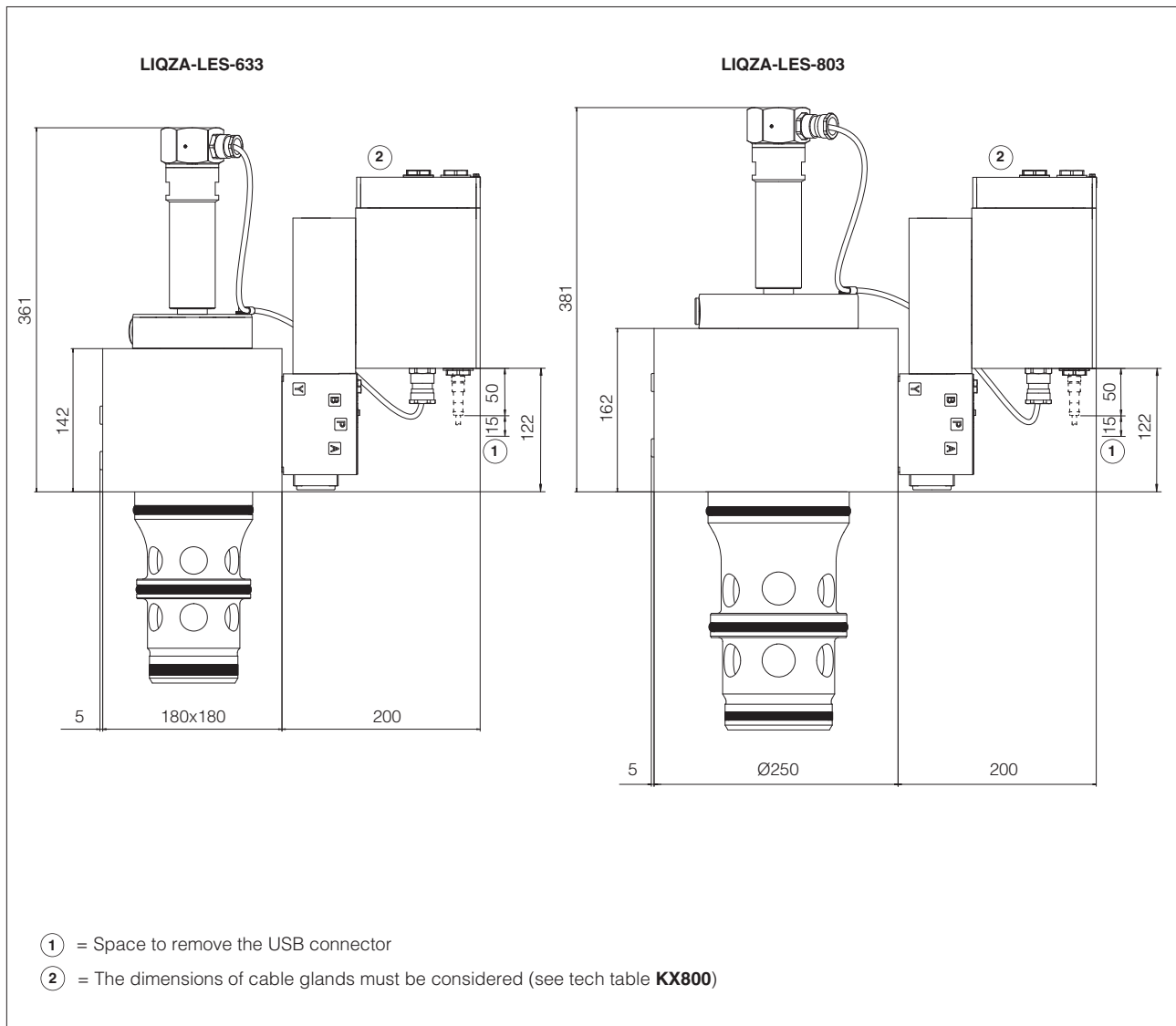


LIQZA-LES-503



① = Space to remove the USB connector

② = The dimensions of all cable glands must be considered (see tech. table KX800)



23 FASTENING BOLTS AND VALVE MASS

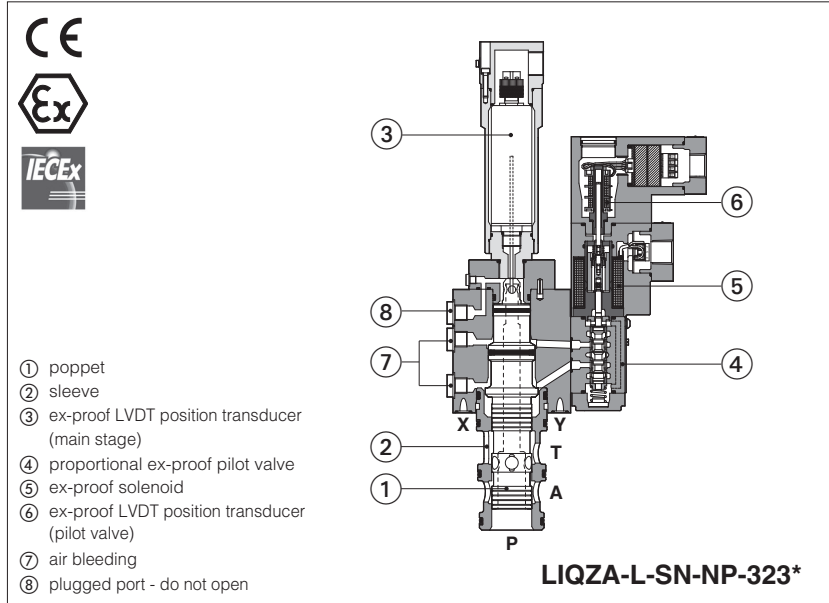
Type	Size	Fastening bolts (1) supplied with the valve	Mass [kg]
LIQZA	25	4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm	15,8
	32	4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm	18,2
	40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	23,7
	50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	31,6
	63	4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	51,6
	80	8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm	79,2

24 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS500	Programming tools
X020	Summary of Atos ex-proof components certified to ATEX, IECEX, EAC, PESO	GS510	Fieldbus
FX500	Ex-proof digital proportionals with P/Q control	GX800	Ex-proof pressure transducer type E-ATRA-7
FX900	Operating and maintenance information for ex-proof proportional valves	KX800	Cable glands for ex-proof valves
		P006	Mounting surfaces and cavities for cartridge valves

Ex-proof servoproportional 3-way cartridges

piloted, with two LVDT transducers - ATEX and IECEx



- ① poppet
- ② sleeve
- ③ ex-proof LVDT position transducer (main stage)
- ④ proportional ex-proof pilot valve
- ⑤ ex-proof solenoid
- ⑥ ex-proof LVDT position transducer (pilot valve)
- ⑦ air bleeding
- ⑧ plugged port - do not open

LIQZA-L

Ex-proof digital servoproportional 3-way cartridges, with two LVDT position transducers (pilot valve and main stage) for best accuracy in not compensated flow regulations.

They are equipped with ex-proof proportional solenoid and LVDT transducers certified for safe operations in hazardous environments with potentially explosive atmosphere.

- Multicertification **ATEX** and **IECEx** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)

The flameproof enclosure of solenoid and transducers prevent the propagation of accidental internal sparks or fire to the external environment.


They are also designed to limit the surface temperature within the classified limits.

Size: **25 ÷ 80** - not ISO cavity

Max flow: **500 ÷ 5000 l/min**

Max pressure: **420 bar**

1 MODEL CODE

LIQZA	/	*	-	L	-	25	3	L4	/	M	/	*	/	*	/	*	
Ex-proof proportional cartridge																	Seals material, see section a : - = NBR PE = FKM BT = HNBR
Certification: Multicertification ATEX, IECEx: - = omit for Group II 2G M = Group I (mining)																	
Options: A = reversal hydraulic configuration of main spool: P-A in rest position																	
Solenoid and transducer (main stage and pilot valve) threaded connection for cable gland fitting: GK = GK-1/2" (1) M = M20x1,5 NPT = 1/2" NPT																	
Poppet type, regulating characteristics: L4 = linear 																	

L = with two LVDT transducers

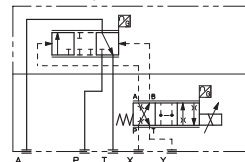
Valve size and nominal flow (l/min) at Δp 5 bar:

- 25** = 185
- 32** = 330
- 40** = 420
- 50** = 780
- 63** = 1250
- 80** = 2100

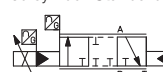
(1) Approved only for the Italian market

Configuration: 3 = 3 way

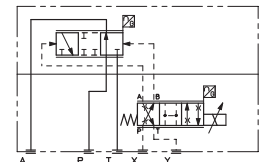
functional symbol: **Standard**



simplified symbol: **Standard**



option **/A**



option **/A**



2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.
Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-LEB-* /A	E-BM-LES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	GS230	GS240

3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 9 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Size	25	32	40	50	63	80
Max regulated flow [l/min]						
at Δp = 5 bar	185	330	420	780	1250	2100
at Δp = 10 bar	260	470	590	1100	1750	3000
Max permissible flow	500	850	1050	2000	3100	5000
Max pressure [bar]	Ports P, A, T = 420 X = 350 Y ≤ 10					
Nominal flow of pilot valve at Δp = 70 bar [l/min]	4	8	28	40	100	100
Leakage of pilot valve at P = 100 bar [l/min]	0,2	0,2	0,5	0,7	0,7	0,7
Piloting pressure [bar]	min: 40% of system pressure max 350 recommended 140 ÷ 160					
Piloting volume [cm³]	2,16	7,2	8,9	17,7	33,8	42,7
Piloting flow (1) [l/min]	6,5	20	25	43	68	76
Response time (2) [ms]	≤ 25	≤ 27	≤ 27	≤ 30	≤ 35	≤ 40
Hysteresis [% of the max regulation]	≤ 0,1					
Repeatability [% of the max regulation]	± 0,1					
Thermal drift	zero point displacement < 1% at ΔT = 40°C					

(1) 0÷100% step signal (2) With pilot pressure = 140 bar

5 ELECTRICAL CHARACTERISTICS

Max. power	35W
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	IP66/67 to DIN EN60529 with relevant cable glandtight enclosure, UL approved
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

6 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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



WARNING

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

7 CERTIFICATION DATA

Valve type	LIQZA		LIQZA/M	LIQZA, LIQZA/M
Component type	Pilot solenoid and LVDT transducer			LVDT main stage transducer
Certifications	Multicertification Group II ATEX IECEx		Multicertification Group I ATEX IECEx	Multicertification Group I and II ATEX IECEx
Solenoid certified code	OZA-T		OZAM-T	ETHA-15
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	ATEX: TUV IT 16 ATEX 053X IECEX: IECEX TPS 16.0003X
Method of protection	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T85°C/T200°C Db 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex db IIC T6 Gb Ex II 2D Ex tb IIIC T85°C Db Ex I M2 Ex db IMb • IECEx Ex db IIC T6 Gb Ex tb IIIC T85°C Db Ex db IMb
Temperature class	T4	T3	-	T6
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 85 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +70 °C (3)
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31			IEC 60079-0 IEC 60079-1 IEC 60079-31
Cable entrance: threaded connection			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -40°C, select **/BT** in the model code

(3) For Group I (mining) the temperaturerange is -20°C ÷ +70°C



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

8 EX PROOF SOLENOIDS AND LVDT TRANSDUCER WIRING

Pilot valve solenoid and LVDT transducer

① solenoid cover with threaded connection for cable gland fitting
 ② transducer cover with threaded connection for cable gland fitting
 ③ solenoid terminal board for cables wiring
 ④ transducer terminal board for cables wiring
 ⑤ screw terminal for additional equipotential grounding

Solenoid wiring

	1 = Coil	PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = GND	
	3 = Coil	

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

LVDT main stage transducer

① transducer cover with threaded connection for cable gland fitting
 ② transducer terminal board for cables wiring
 ③ ex-proof protection for LVDT transducer
 ④ LVDT transducer
 ⑤ screw terminal for additional equipotential grounding

Transducer wiring - view from X

	1 = Do not connect
	2 = Supply +15 V
	3 = GND
	4 = Output signal
	5 = Supply -15 V

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	-	90 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

10 CABLE GLANDS

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

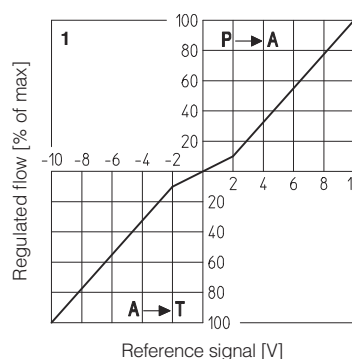
11 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

11.1 Regulation diagrams, see note

1 = LIQZA (all sizes)

Hydraulic configuration vs. reference signal:

	standard	option /A
Reference signal 0 ÷ +10 V	} P → A	A → T
12 ÷ 20 mA		
Reference signal 0 ÷ -10 V	} A → T	P → A
4 ÷ 12 mA		



12 AIR BLEEDING

Size 25

Sizes 32, 40

Sizes 50 to 80

1 Plugged port - do not open

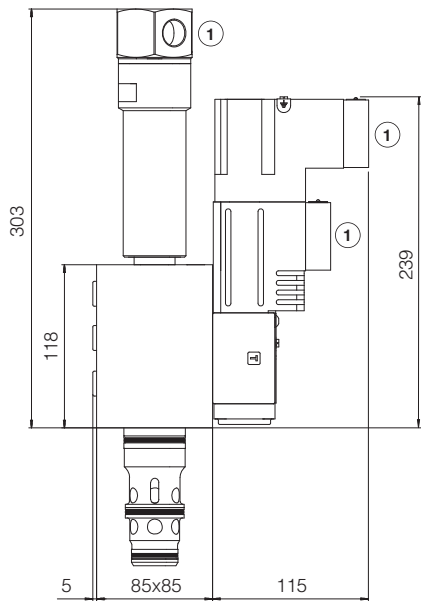
2 Air bleeding (MA, MB):
N° 2 plugs G1/4"
At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.
Operate the valve for few seconds at low pressure and then lock the plugs.

13 FASTENING BOLTS AND VALVE MASS

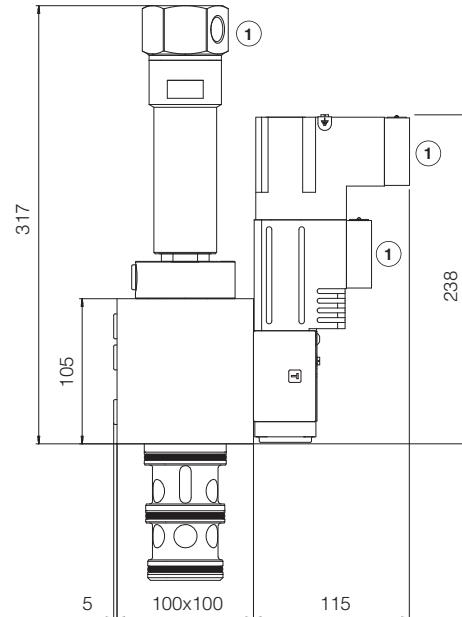
Type	Size	Fastening bolts (1) supplied with the valve	Mass [kg]
LIQZA	25	4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm	15,8
	32	4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm	18,2
	40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	23,7
	50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	31,6
	63	4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	51,6
	80	8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm	79,2

14 INSTALLATION DIMENSIONS [mm]

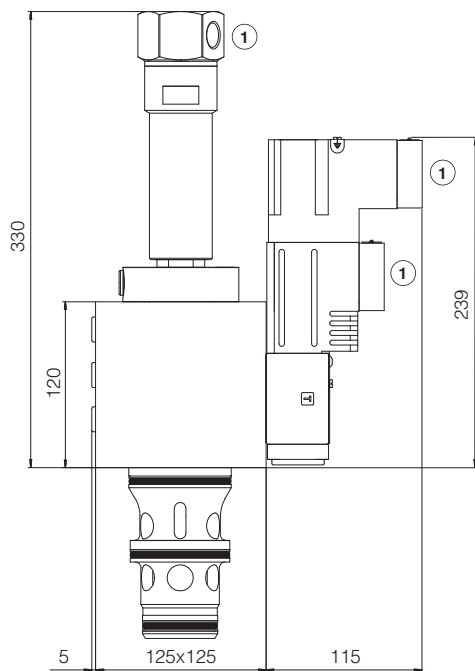
LIQZA-LES-253



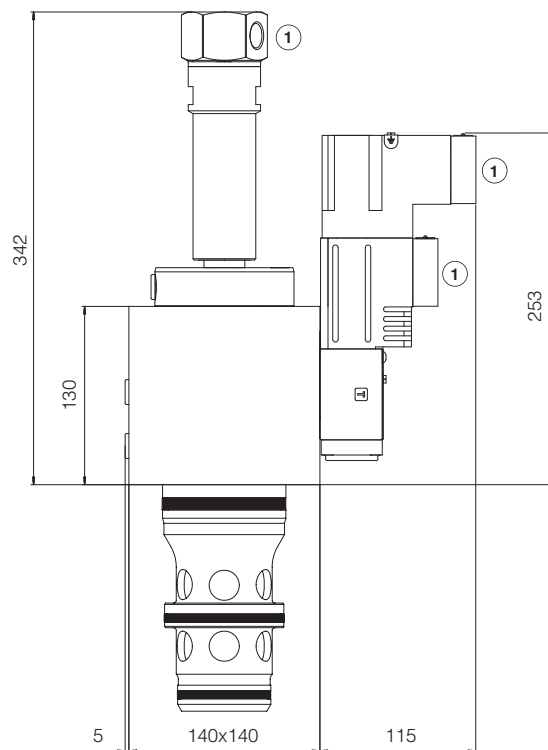
LIQZA-LES-323



LIQZA-LES-403

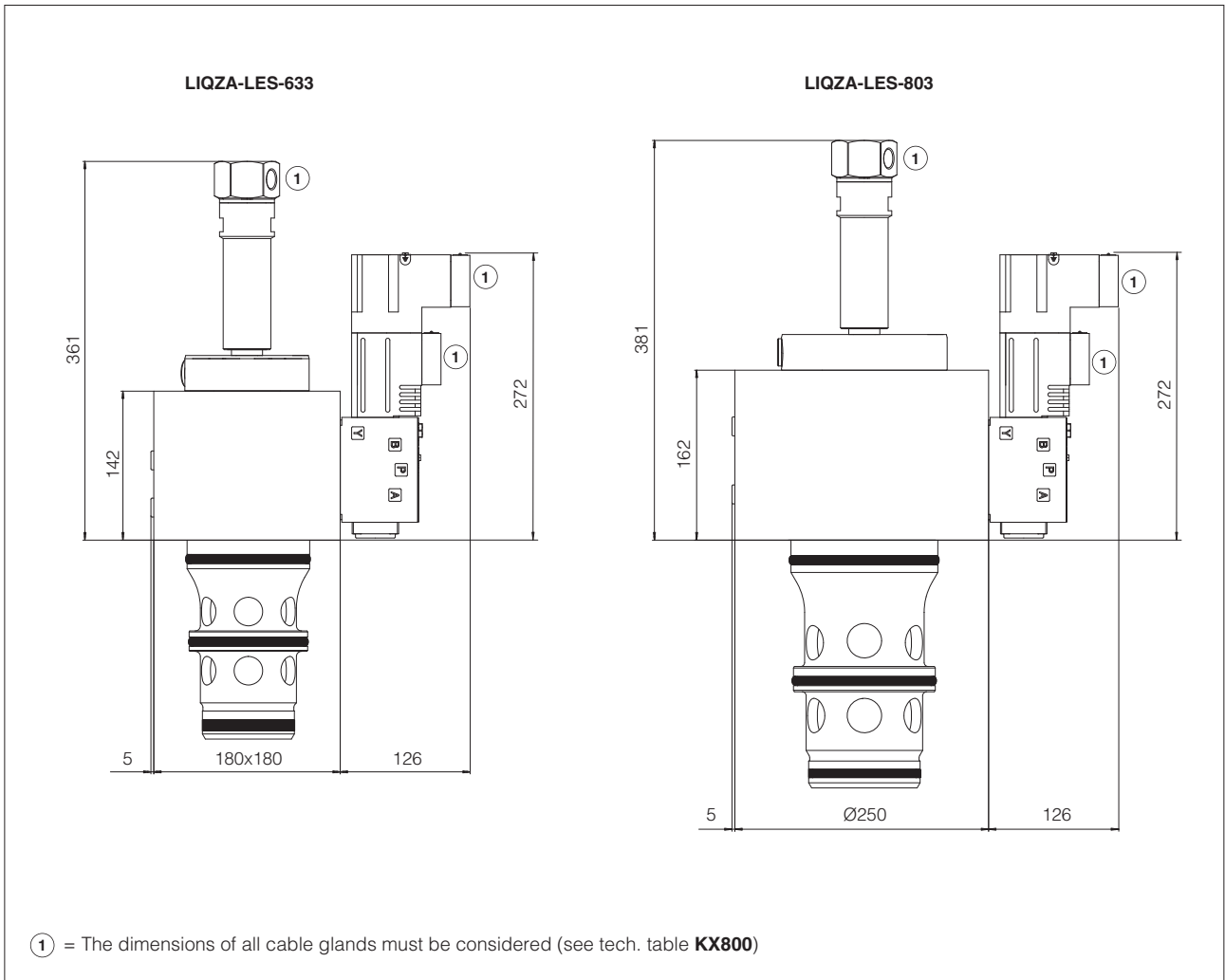


LIQZA-LES-503



① = The dimensions of all cable glands must be considered (see tech. table **KX800**)

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



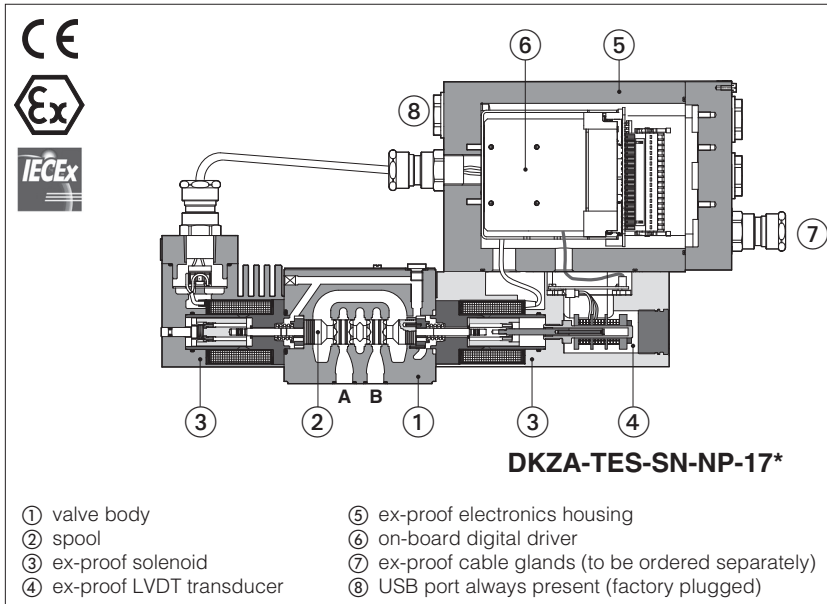
Note: for mounting surface and cavity dimensions, see table P006

15 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	KX800	Cable glands for ex-proof valves
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	P006	Mounting surfaces and cavities for cartridge valves
FX900	Operating and maintenance information for ex-proof proportional valves		

Ex-proof digital proportional directional valves high performance

direct, with on-board driver, LVDT transducer and positive spool overlap - **ATEX and IECEx**



DHZA-TES, DKZA-TES

Ex-proof digital high performances proportional valves, direct, with LVDT position transducer and positive spool overlap for best dynamics in directional controls and not compensated flow regulations.

They are equipped with ex-proof on-board digital driver, with LVDT transducer and proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

● **Multicertification ATEX and IECEx**

for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

DHZA:

Size: **06** - ISO 4401

Max flow: **60 l/min**

Max pressure: **350 bar**

DKZA:

Size: **10** - ISO 4401

Max flow: **150 l/min**

Max pressure: **315 bar**

1 MODEL CODE

DHZA	-	TES	-	SN	-	NP	-	0	71	-	L	5	/	M	/	*	/	*	
Ex-proof proportional directional valves, direct DHZA = size 06 DKZA = size 10																		Series number	Seals material, see section 9: - = NBR PE = FKM BT = HNBR
TES = on-board driver and LVDT transducer																			
Alternated P/Q controls , see section 5: SN = none SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)																			
Fieldbus interface , USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT EW = POWERLINK EI = EtherNet/IP EP = PROFINET RT/IRT																			
Valve size ISO 4401: 0 = 06 1 = 10																			
Configuration:																			
	Standard			Option /B															
51 =																			
53 =																			
71 =																			
72 =																			
73 =																			

Hydraulic options (2):
B = solenoid with integral digital electronics at side of port A (3)
Y = external drain

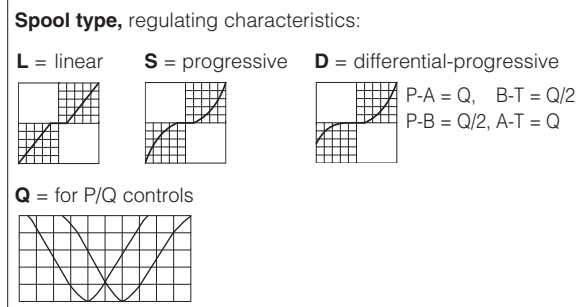
Electronic options (2):
C = current feedback for pressure transducer 4 ÷ 20 mA, only for **SP, SF, SL** (omit for std voltage ±10 Vdc)
I = current reference input and monitor 4÷20mA (omit for std voltage ±10Vdc)

Cable entrance threaded connection:
M = M20x1,5

Spool size: **14** (L) **1** (L) **2** (S) **3** (L,S,D) **5** (L,S,D,Q)

DHZA =	1	4,5	8	18	28
DKZA =	-	-	-	45	75

Nominal flow (l/min) at Δp 10 bar P-T



(1) Only for **DKZA-*S5** the spool overlapping type 2 provides the same characteristic of type 1, but in central position the internal leakages from P to A and B are drained to tank, avoiding the drift of cylinders with differential areas
(2) For possible combined options, see section 15
(3) In standard configuration the solenoid with on-board digital driver and position transducer are at side port B

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



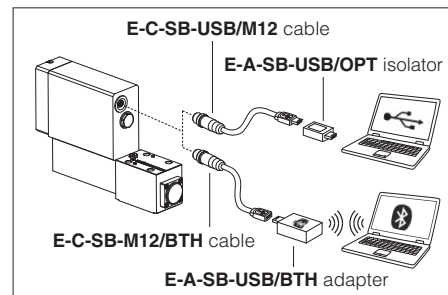
WARNING: the below operation must be performed in a safety area

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support: NP (USB)	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)		

USB or Bluetooth connection



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

4 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SF** and **SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP, 2 pressure transducers for SF or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

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 valves according to EN ISO 13849	150 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 11 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DHZA					DKZA		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y) Y = 10					ports P, A, B = 315; T = 210 (250 with external drain /Y) Y = 10		
Configuration	51, 53, 71, 73					51, 53, 71, 73		72
Spool Type	L14	L1	S2	L3, S3, D3	L5, S5, D5, Q5	L3, S3, D3	L5, S5, D5, Q5	S5
Nominal flow [l/min] at Δp= 10 bar	1	4,5	8	18	28	45	75	75
Δp P-T at Δp= 30 bar	1,7	8	14	30	50	80	130	130
max permissible flow	2,6	12	21	40	60	90	150	150
Δp max P-T [bar]	70	70	70	50	50	40	40	40
Leakage [cm ³ /min]	<30 (at p = 100 bar); <135 (at p = 350 bar)					<80 (at p = 100 bar); <600 (at p = 315 bar)		
Response time (1) [ms]	≤ 20					≤ 25		
Hysteresis	≤ 0,2 [% of max regulation]							
Repeatability	± 0,1 [% of max regulation]							
Thermal drift	zero point displacement < 1% at ΔT = 40°C							

(1) (0-100% step signal)


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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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	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-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position control (SN) or pressure/force control (SP, SF, SL) 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, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT 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 800 ms (depending on communication type) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	DHZA, DKZA				
Certifications	Multicertification Group II ATEX IECEx				
Solenoid certified code	OZA-AES				
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X		
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db		
Temperature class	Single solenoid valve	T6	-	T5	T4
	Double solenoid valve	-	T4	-	T3
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 100 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C		-40 ÷ +55 °C		-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1	IEC 60079-31	
Cable entrance: threaded connection	M = M20x1,5				

(1) The type examiner certificates can be downloaded from - catalog on line, **technical information** section

(2) The solenoids **Group II** are certified for minimum ambient temperature -40°C



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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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

B = Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see 17.1

Y = Option /Y is mandatory if the pressure in port T exceeds 210 bar

14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±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.

C = Only for **SP, SF, SL**

Option /C is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

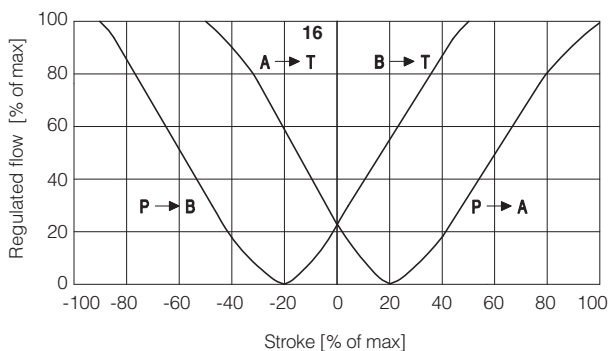
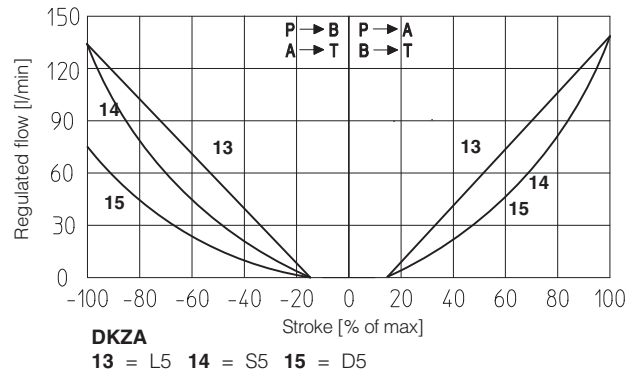
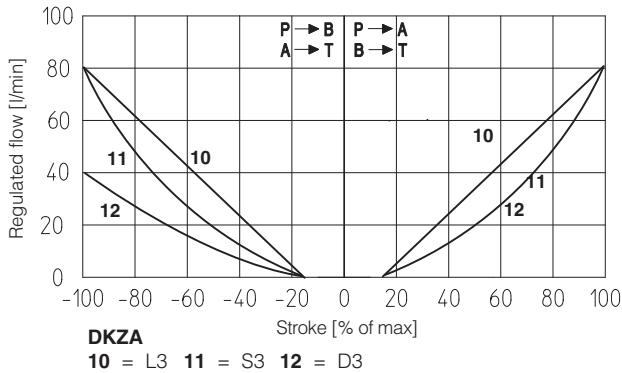
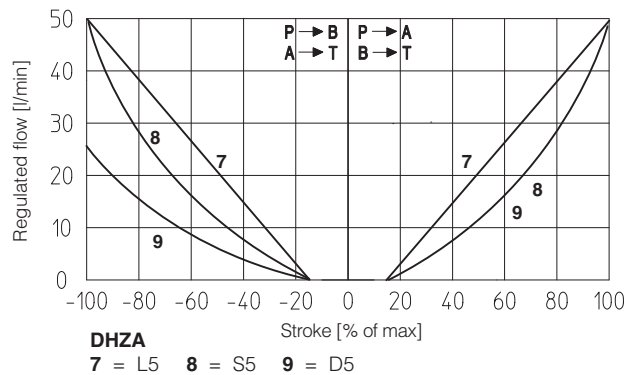
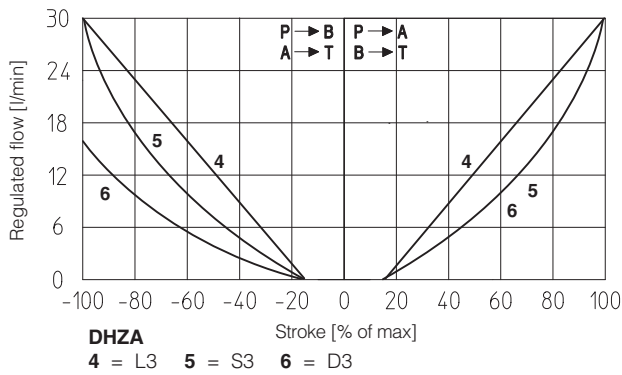
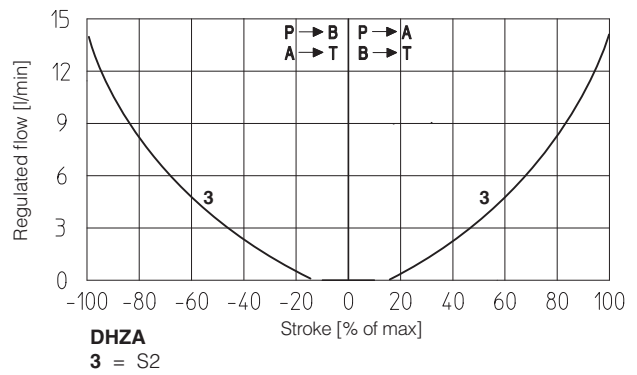
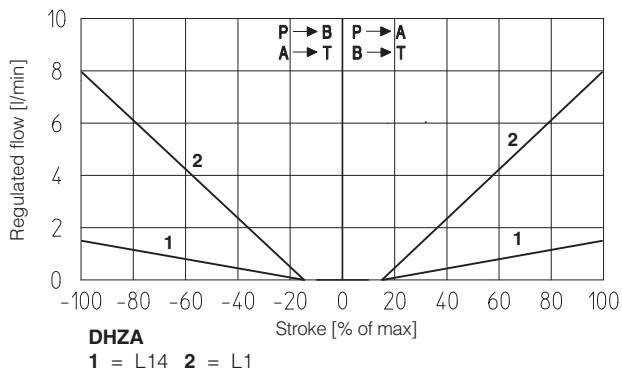
15 POSSIBLE COMBINED OPTIONS

For SN: /BI, /BY, /IY

For SP, SF, SL: /BI, /BY, /IY, /CI, /BCI, CIY, BCIY

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

16.1 Regulation diagrams - values measure at Δp 30 bar P-T



Q5 spool type is specific for alternate P/Q controls in combination with S* option of digital integral drivers (see tech table **FX500**). It allows to control the pressure in A port or B port and it provides a safety central position (A-T/B-T) to depressurize the actuator chambers. The strong meter-in characteristic makes the spool suitable for both pressure control and motion regulations in several applications.

Note:

Hydraulic configuration vs. reference signal for configurations 71 and 73 (standard and option /B)


Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$ Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

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, EN-982).

17.1 Power supply (V+ and V0)


The power supply must be appropriately stabilized or rectified and filtered: 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.

 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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 (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 ± 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 ± 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 $0 \div 24$ VDC.

17.4 Pressure or force reference input signal (F_INPUT+) - only SP, SF, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24$ VDC.

17.5 Flow monitor output signal (Q_MONITOR)

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 $4 \div 20$ 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.

17.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SF, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

17.7 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 activate 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.

17.8 Fault output signal (FAULT)

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.

17.9 Remote pressure/force transducer input signal - only for SP, SF, SL

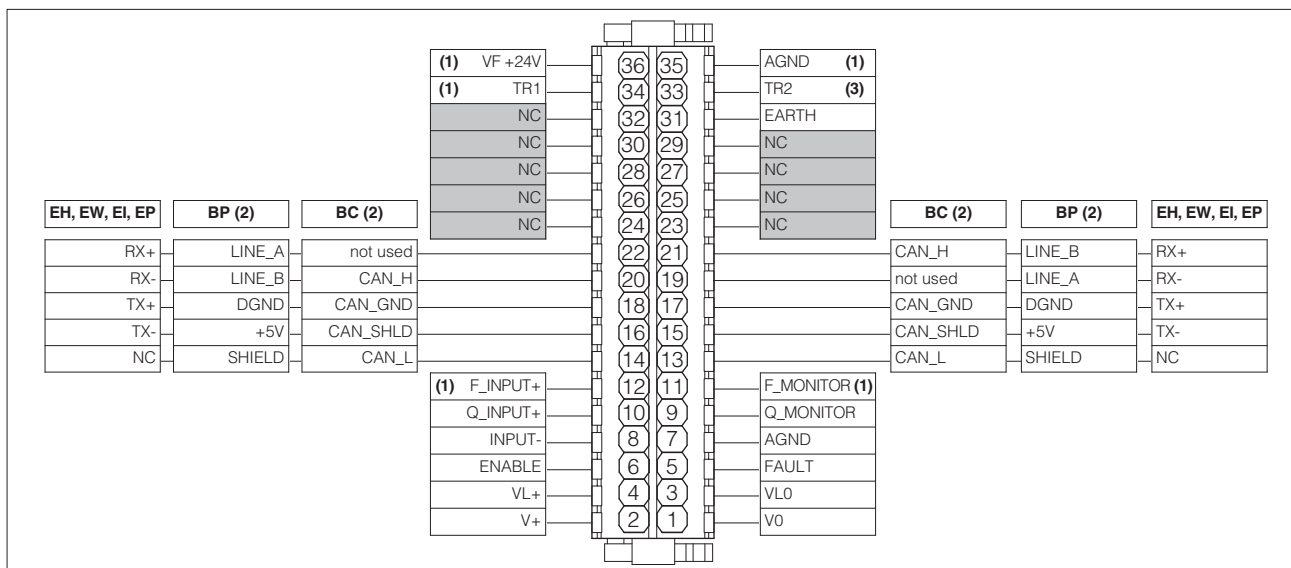
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are ± 10 VDC for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

18 TERMINAL BOARD OVERVIEW



(1) Connections available only SP, SF, SL

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

(3) Connection available only SF

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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and 4 ÷ 20 mA for /I option	Output - analog signal Software selectable
	10	Q_INPUT+	Flow reference input signal: ± 10 Vdc / ± 20 mA maximum range Defaults are: ± 10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and 4 ÷ 20 mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
	31	EARTH	Internally connected to driver housing	

(1) Available only for **SP, SF, SL**

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 +

Driver view
(female)

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, EW, EI, EP fieldbus execution connections

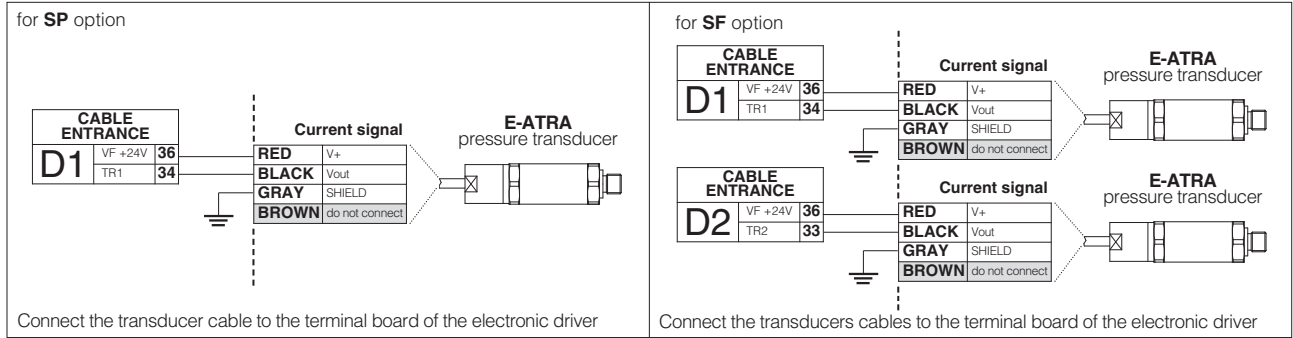
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

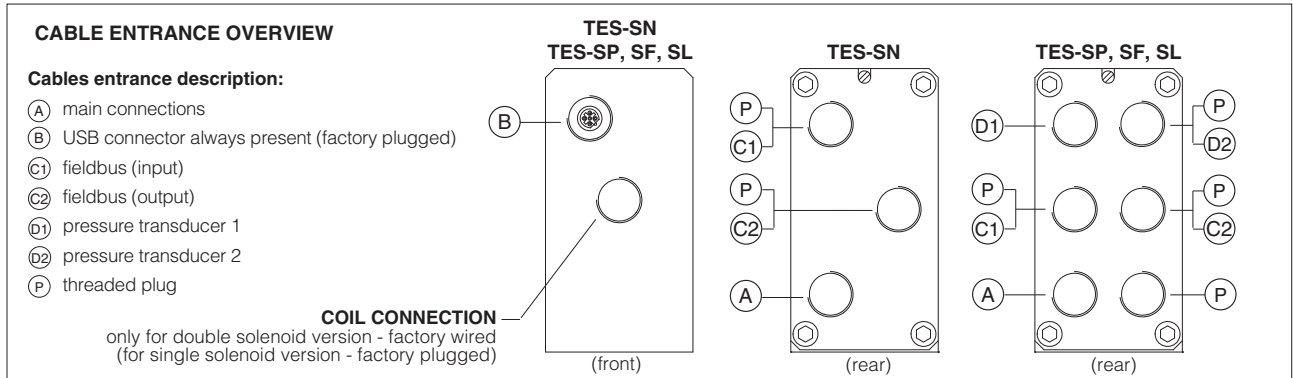
19.6 Remote pressure transducer connector - only for SP, SF, SL

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	33	TR2	2nd signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	/	/	Connect	Connect
	34	TR1	1st signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
D2	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table GX800

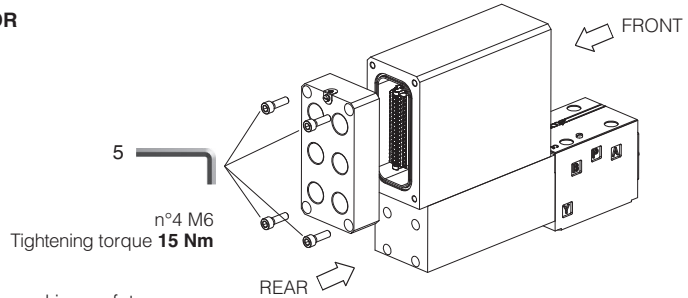


20 CONNECTIONS LAYOUT



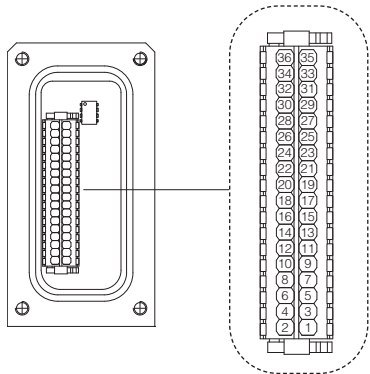
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

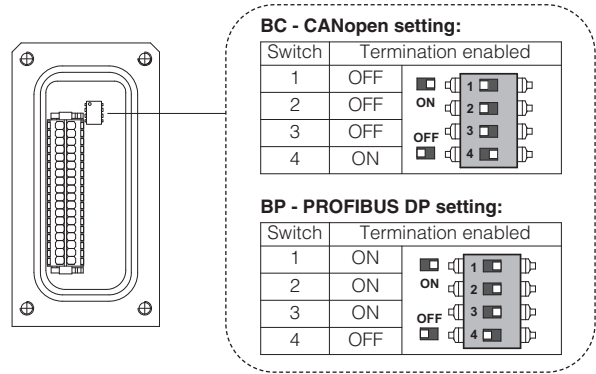


WARNING: the above operation must be performed in a safety area

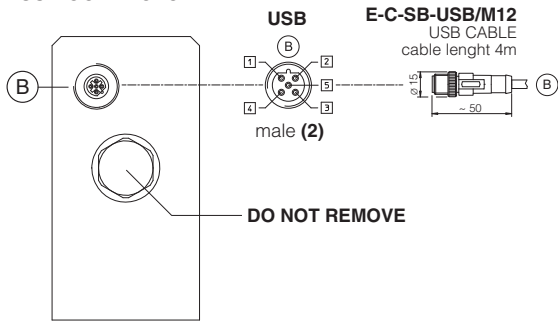
Terminal board - see section 18



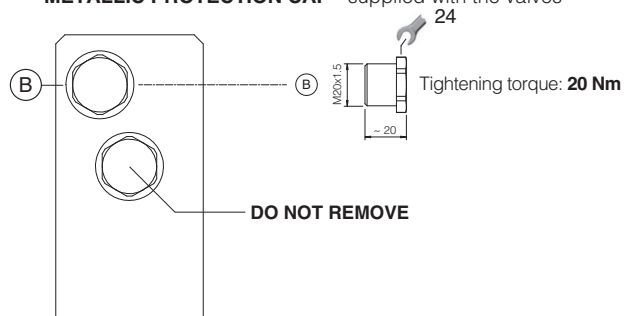
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

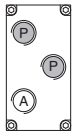
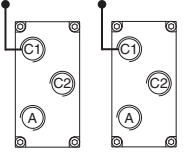
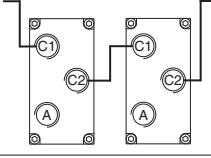


METALLIC PROTECTION CAP - supplied with the valves

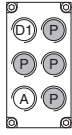
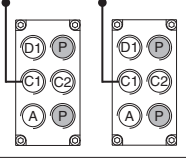
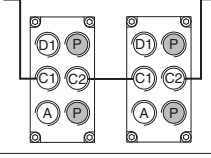


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

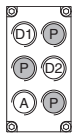
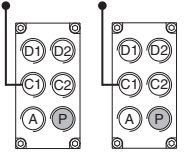
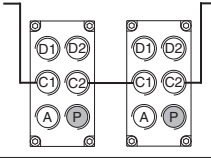
20.1 Cable glands and threaded plug for TES-SN - see tech table KX800

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

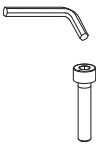

20.2 Cable glands and threaded plug for TES-SP, SL - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

20.3 Cable glands and threaded plug for TES-SF - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	3	D1 D2 A	none	none		Cable entrance A, D1, D2 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	4	D1 - D2 C1 A	1	C2		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	5	D1 - D2 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged

21 FASTENING BOLTS AND SEALS

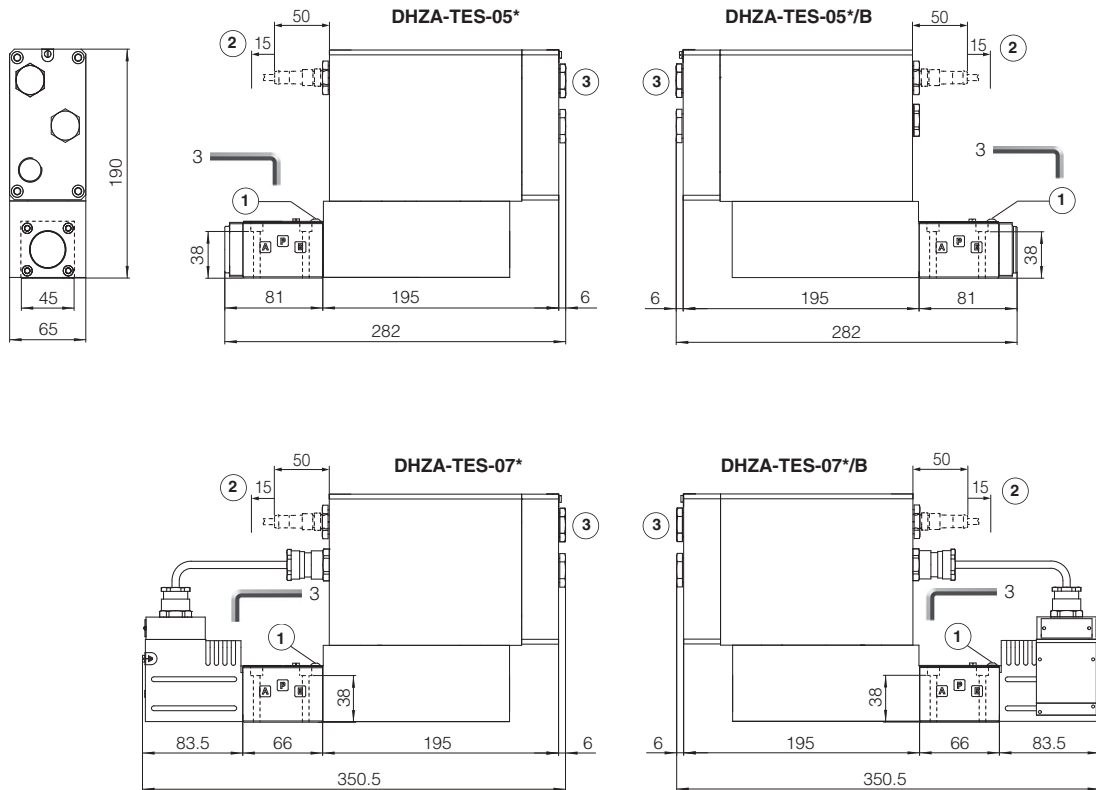
	<p>DHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DKZA</p> <p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p>
	<p>Seals: 4 OR 108; Diameter of ports A, B, P, T: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B, P, T: \varnothing 11,2 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

22 INSTALLATION DIMENSIONS FOR DHZA [mm]

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DHZA-TES-05	7,2
DHZA-TES-07	8,9



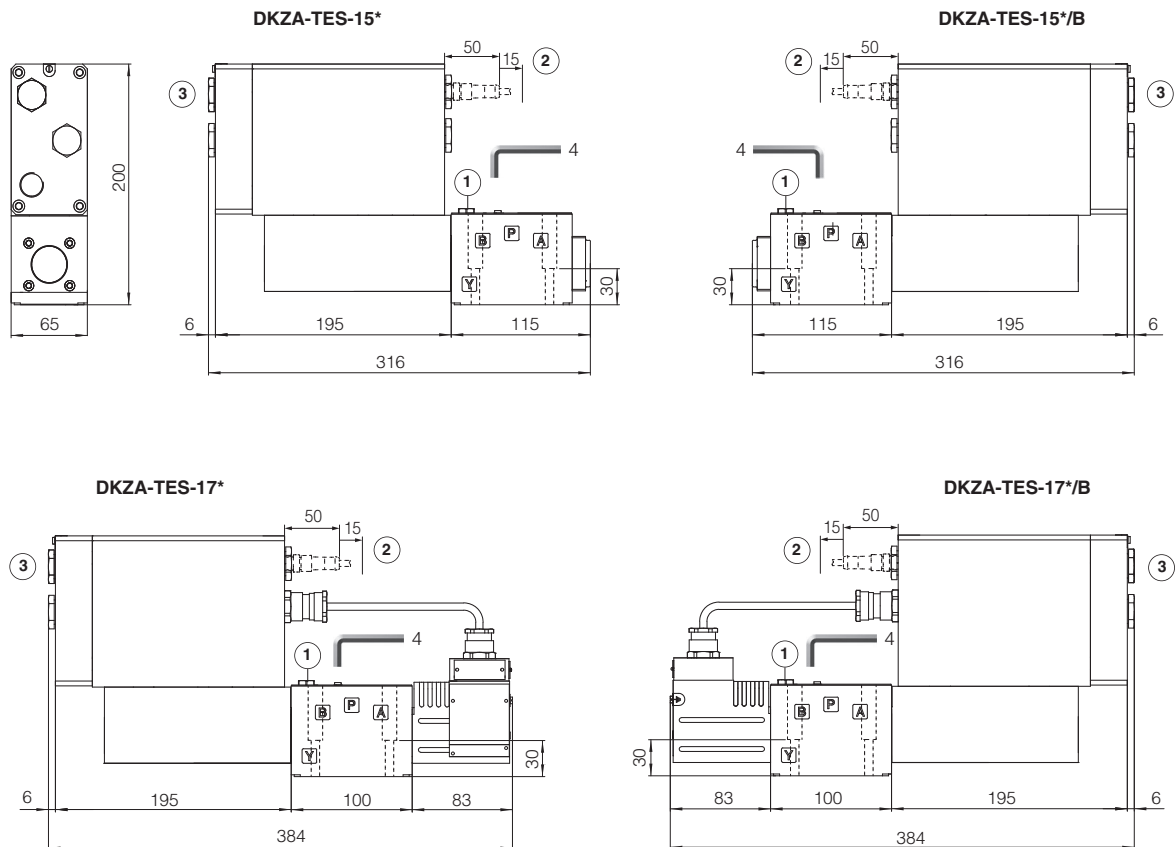
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

23 INSTALLATION DIMENSIONS FOR DKZA [mm]

ISO 4401: 2005

Mounting surface: 4401-05-04-0-05 (see table P005)
(for /Y surface: 4401-05-05-0-05 without port X)

Mass [kg]	
DKZA-TES-15	9
DKZA-TES-17	10,7



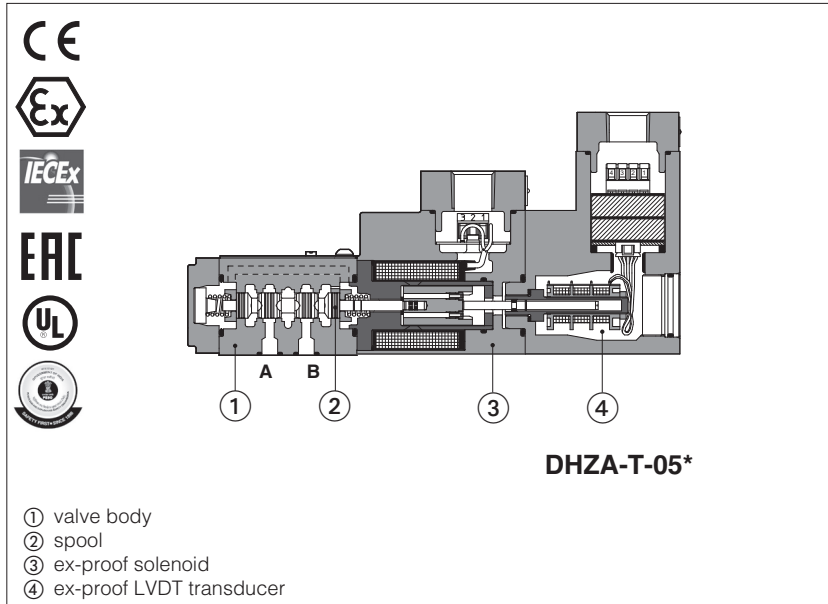
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

24 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS500	Programming tools
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	GS510	Fieldbus
FX900	Operating and maintenance norms for ex-proof proportional valves	GX800	Ex-proof pressure transducer type E-ATRA-7
FX500	Ex-proof for digital proportionals with P/Q control	KX800	Cable glands for ex-proof valves
		P005	Mounting surfaces for electrohydraulic valves

Ex-proof proportional directional valves high performance

direct, with LVDT transducer and positive spool overlap - **ATEX, IECEx, EAC, PESO** or **cULus**



DHZA-T, DKZA-T

Ex-proof high performance proportional valves direct, with LVDT position transducer and positive spool overlap, for best dynamics in directional controls and not compensated flow regulations.

They are equipped with ex-proof proportional solenoids and LVDT transducer certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid and transducer, prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoids are also designed to limit the surface temperature within the classified limits.

DHZA:	DKZA:
Size: 06 - ISO 4401	Size: 10 - ISO 4401
Max flow: 60 l/min	Max flow: 150 l/min
Max pressure: 350 bar	Max pressure: 315 bar

1 MODEL CODE

DHZA	/	*	-	T	-	0	71	-	L	5	/	M	/	*	/	*	/	*
<p>Ex-proof proportional directional valves, direct</p> <p>DHZA = size 06 DKZA = size 10</p> <p>Certification type: Multicertification ATEX, IECEx, EAC, PESO: - = omit for Group II 2G / 2D (1) M = Group I (mining) North American Certification: UL = cULus</p> <p>T = with LVDT transducer</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p>																		
<p style="text-align: right;">Seals material, see section 6:</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = optional coil for 24 Vdc low current drivers</p>																		

Options (3):

- B** = solenoid and position transducer at side of port A
- C** = position transducer with current feedback 4÷20 mA
- Y** = external drain

Solenoid and transducer threaded connection

for cable gland fitting:

- GK** = GK-1/2" - not for **cULus (4)**
- M** = M20x1,5 - not for **cULus**
- NPT** = 1/2" NPT

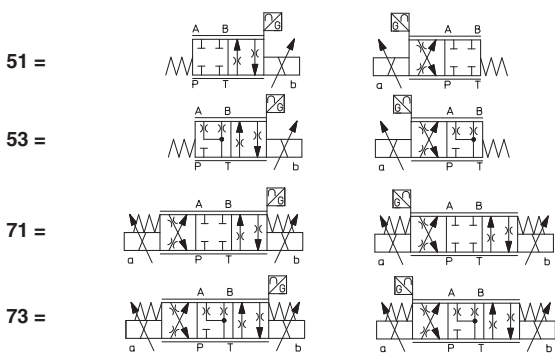
Spool size: 14 (L) 1 (L) 2 (S) 3 (L,S,D) 5 (L,S,D)

DHZA = 1 4,5 8 18 28

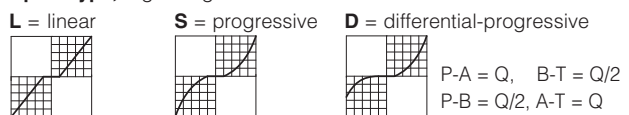
DKZA = - - - 45 75

Nominal flow (l/min) at Δp 10 bar P-T

Configuration: Standard Option /B



Spool type, regulating characteristics:



(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) **(3)** Possible combined options: /BC, /BY, /CY, /BCY **(4)** Approved only for the Italian market

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-TEB-* /A	E-BM-TEB-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	GS230	GS240

3 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +60°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section [7] -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DHZA					DKZA		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y) Y = 10					ports P, A, B = 315; T = 210 (250 with external drain /Y) Y = 10		
Configuration	51, 53, 71, 73					51, 53, 71, 73		
Spool type	L14	L1	S2	L3, S3, D3	L5, S5, D5	L3, S3, D3	L5, S5, D5	
Max flow [l/min]								
Δp P-T	Δp = 10 bar	1	4,5	8	18	28	45	75
	Δp = 30 bar	1,7	8	14	30	50	80	130
	max permissible flow	2,6	1	21	40	60	90	150
	Δp max P-T [bar]	70	70	70	50	50	40	40
Leakage [cm³/min]	<30 (at p = 100 bar); <135 (at p = 350 bar)					<80 (at p = 100 bar); <600 (at p = 315 bar)		
Response time (1) [ms]	≤ 20					≤ 25		
Hysteresis [% of max regulation]						≤ 0,2		
Repeatability [% of max regulation]						± 0,1		
Thermal drift	zero point displacement < 1% at ΔT = 40°C							

Note: above performance data refer to valves coupled with Atos electronic drivers, see section [2]

(1) 0-100% step signal

5 ELECTRICAL CHARACTERISTICS

Max. power	35W
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

6 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult Atos 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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	HF DU, HF DR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DHZA DKZA		DHZA/M DKZA/M	DHZA/UL DKZA/UL	
Certifications	Multicertification Group II ATEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-T		OZAM-T	OZA-T/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEX Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135°C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30 CSA 22.2 n°139-13	
Cable entrance: threaded connection	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT			1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C
In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS WIRING

Multicertification	cULus certification
<p>n°8 M4x20 locking torque 4Nm</p>	<p>n°8 M4x20 locking torque 4Nm</p>
<p>① solenoid cover with threaded connection for cable gland fitting ② transducer cover with threaded connection for cable gland fitting ③ solenoid terminal board for cables wiring ④ transducer terminal board for cables wiring ⑤ screw terminal for additional equipotential grounding</p> <p>Solenoid wiring</p> <p>1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14) 2 = GND 3 = Coil</p> <p>Position transducer wiring</p> <p>1 = Output signal PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14) 2 = Supply -15 V 3 = Supply +15 V 4 = GND</p>	<p>① solenoid cover with threaded connection for cable gland fitting ② transducer cover with threaded connection for cable gland fitting ③ solenoid terminal board for cables wiring ④ transducer terminal board for cables wiring</p> <p>Solenoid wiring ⚠ Pay attention to respect the polarity</p> <p>1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1 2 = GND 3 = Coil - alternative GND screw terminal connected to solenoid housing</p> <p>Position transducer wiring</p> <p>1 = Output signal PCB 4 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1 2 = Supply -15 V 3 = Supply +15 V 4 = GND</p>

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> • Suitable for use in Class I Division 1, Gas Groups C • Armored Marine Shipboard Cable which meets UL 1309 • Tinned Stranded Copper Conductors • Bronze braided armor • Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	-	90 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

10 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

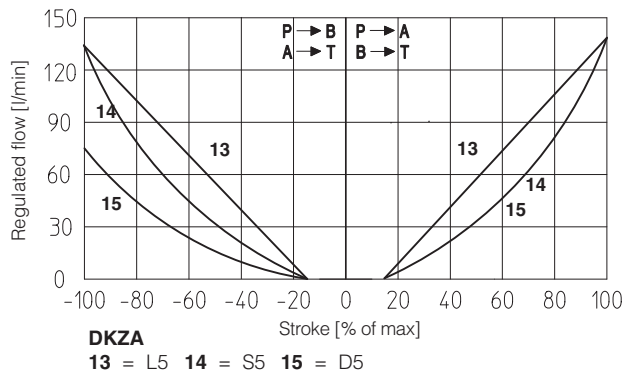
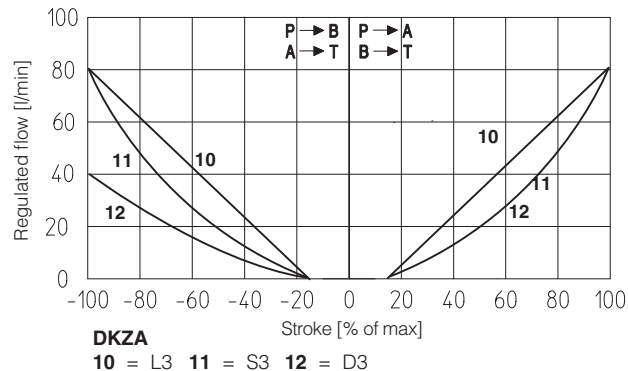
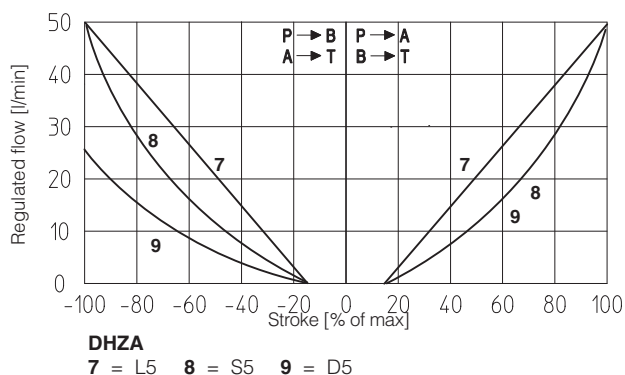
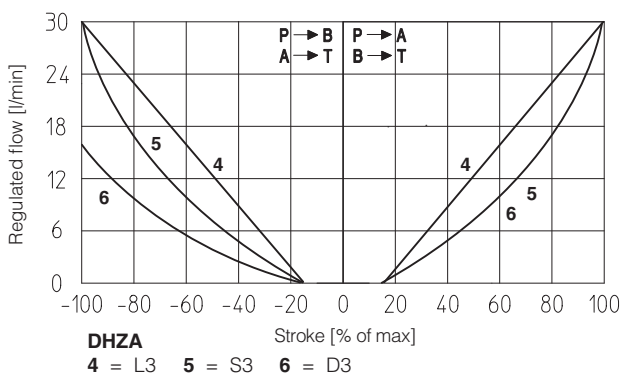
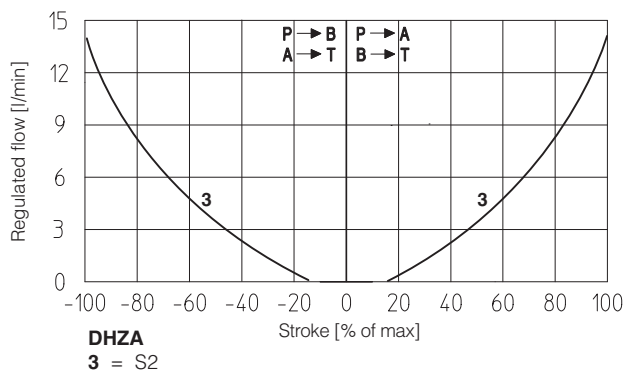
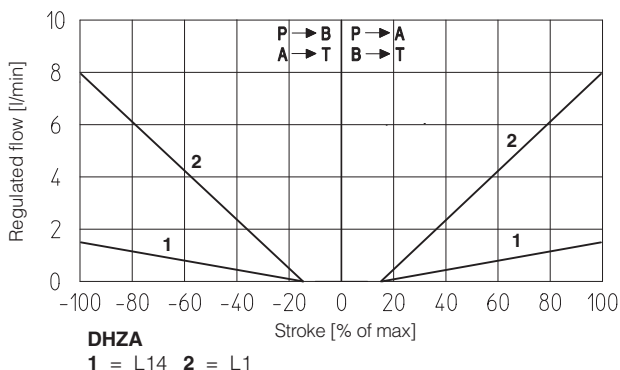
11 OPTIONS

- B** = Solenoid and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see section **12**
- C** = Position trasducer with current feedback 4÷20 mA, suggested in case of long distance between the electric driver and the proportional valve
- Y** = External drain, to be selected if the pressure at T port is higher than the max allowed limits

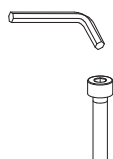
11.1 Possible combined options: /BC, /BY, /CY, /BCY

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

Regulation diagrams of valves with configurations 51, 53, 71, 73 (positive spool overlap) - values measure at Δp 30 bar P-T



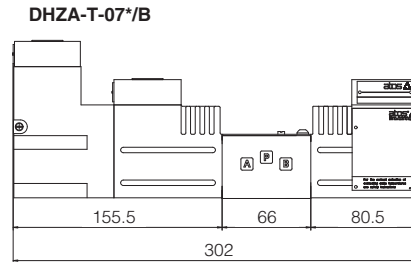
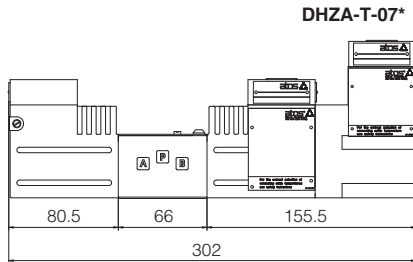
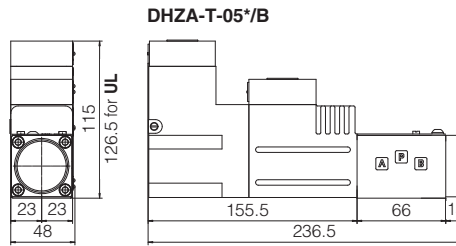
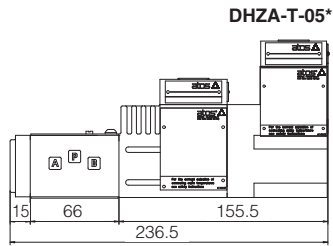
13 **FASTENING BOLTS AND SEALS**

	<p>DHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DKZA</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 P, A, B, T: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports P, A, B, T: \varnothing 11,5 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

14 INSTALLATION DIMENSIONS FOR DHZA [mm]

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (for /Y surface: 4401-03-03-0-05 without port X)

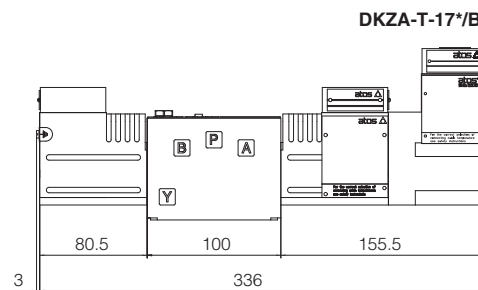
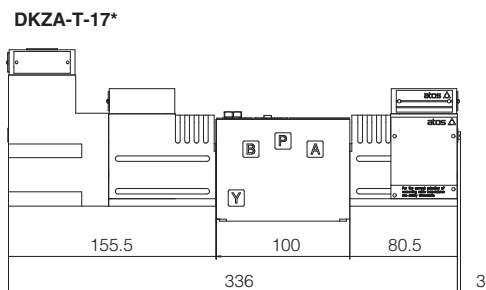
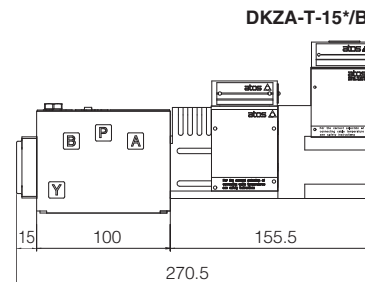
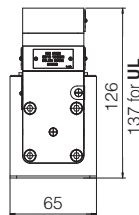
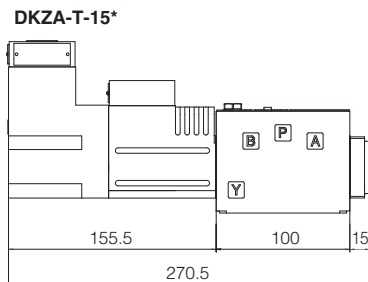
Mass [kg]	
DHZA-T-05	4,0
DHZA-T-07	5,1



15 INSTALLATION DIMENSIONS FOR DKZA [mm]

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-05-04-0-05
 (for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DKZA-T-15	6,2
DKZA-T-17	7,8

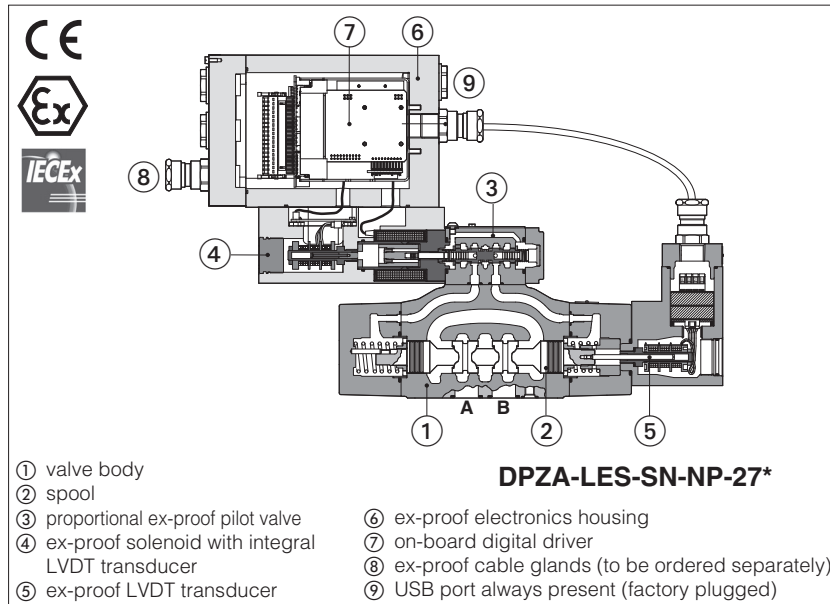


16 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional directional valves high performance

piloted, with on-board driver, two LVDT transducers and positive spool overlap - **ATEX and IECEx**



DPZA-LES

Ex-proof digital high performances proportional valves, piloted with two LVDT position transducers (pilot valve and main stage) and positive spool overlap for best dynamics in directional controls and not compensated flow regulations.

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

• Multicertification **ATEX and IECEx** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducers, 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.

Size: **10 ÷ 27** - ISO 4401

Max flow: **180 ÷ 800 l/min**

Max pressure: **350 bar**

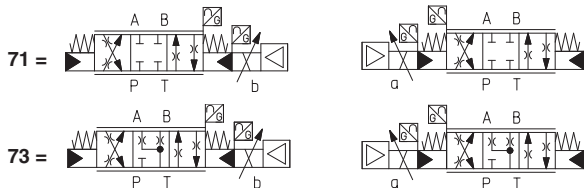
1 MODEL CODE

DPZA	-	LES	-	SN	-	NP	-	2	-	71	-	L	-	5	/	M	/	*	/	*														
<p>Ex-proof proportional directional valve, piloted</p> <p>LES = on-board driver and two LVDT transducers</p> <p>Alternated P/Q controls - see section 5:</p> <p>SN = none SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)</p> <p>Fieldbus interface, USB port always present:</p> <p>NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT</p> <p>Valve size ISO 4401: 1 = 10 2 = 16 4 = 25 4M = 27</p> <p style="text-align: right;">Seals material, see sect. 9: - = NBR PE = FKM BT = HNBR</p> <p>Hydraulic options (1): B = solenoid at side of port A (2) D = internal drain E = external pilot pressure G = pressure reducing valve for piloting (standard for size 10)</p> <p>Electronic options (1): C = current feedback for pressure transducer 4 ÷ 20 mA, only for SP, SF, SL (omit for std voltage ±10 Vdc) I = current reference input and monitor 4÷20mA (omit for std voltage ±10Vdc)</p> <p>Cable entrance threaded connection: M = M20x1,5</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Spool size:</th> <th>3 (L,S,D)</th> <th>5 (L,DL,S,D,Q)</th> </tr> </thead> <tbody> <tr> <td>DPZA-1 =</td> <td>-</td> <td>100</td> </tr> <tr> <td>DPZA-2 =</td> <td>130</td> <td>200</td> </tr> <tr> <td>DPZA-4 =</td> <td>-</td> <td>340</td> </tr> <tr> <td>DPZA-4M =</td> <td>-</td> <td>390</td> </tr> </tbody> </table> <p>Nominal flow (l/min) at Δp 10bar P-T</p>																				Spool size:	3 (L,S,D)	5 (L,DL,S,D,Q)	DPZA-1 =	-	100	DPZA-2 =	130	200	DPZA-4 =	-	340	DPZA-4M =	-	390
Spool size:	3 (L,S,D)	5 (L,DL,S,D,Q)																																
DPZA-1 =	-	100																																
DPZA-2 =	130	200																																
DPZA-4 =	-	340																																
DPZA-4M =	-	390																																

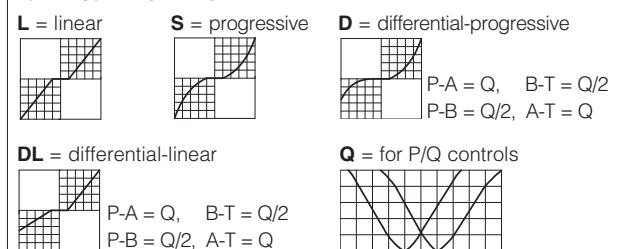
Configuration:

Standard

Option /B



Spool type, regulating characteristics:



(1) For possible combined options, see section 15

(2) In standard configuration the solenoid with on-board digital driver and position transducer are at side A of main stage (side B of pilot valve)

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



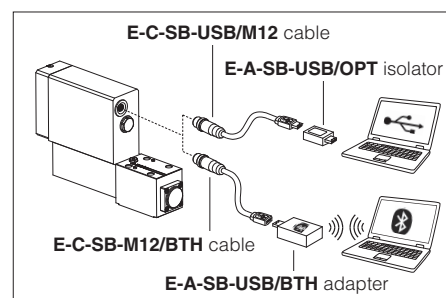
WARNING: the below operation must be performed in a safety area

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support: NP (USB)	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)		

USB or Bluetooth connection



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

4 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.

5 ALTERNATED P/Q CONTROLS - see tech. table **FX500**

S* options add the closed loop control of pressure (**SP**) or force (**SF** and **SL**) to the basic functions of proportional directional valves flow regulation. A dedicated algorithm alternates pressure (force) depending on the actual hydraulic system conditions.

An additional connector is available for transducers to be interfaced to the valve's driver (1 pressure transducer for SP, 2 pressure transducers for SF or 1 load cell for SL). The alternated pressure control (SP) is possible only for specific installation conditions.

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 valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 11 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DPZA-*-1	DPZA-*-2	DPZA-*-4	DPZA-*-4M		
Pressure limits [bar]	ports P, A, B, X = 350; T = 250 (10 for option /D); Y = 10;					
Spool type	L5, DL5, S5, D5, Q5	L3, S3, D3	L5, DL5, S5, D5, Q5			
Nominal flow [l/min]						
Δp P-T	Δp = 10 bar	100	130	200	340	390
	Δp = 30 bar	160	220	350	590	670
	Max permissible flow	180	320	440	680	800
Δp max P-T [bar]	50	60	60	60	60	
Piloting pressure [bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 150 bar)					
Piloting volume [cm ³]	1,4	3,7	9,0	11,3		
Piloting flow (1) [l/min]	1,7	3,7	6,8	8		
Leakage (2)	Pilot [cm ³ /min]	100/300	100/300	200/500	200/600	
	Main stage [l/min]	0,15/0,5	0,2/0,6	0,3/1,0	0,3/1,0	
Response time (1) [ms]	≤ 55	≤ 65	≤ 85	≤ 90		
Hysteresis	≤ 0,1 [% of max regulation]					
Repeatability	± 0,1 [% of max regulation]					
Thermal drift	zero point displacement < 1% at ΔT = 40°C					

(1) 0 ÷ 100 % step signal and pilot pressure 100 bar

(2) at P = 100/350 bar


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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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	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-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position control (SN) or pressure/force control (SP, SF, SL) 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	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	EC 61158
Communication physical layer	not insulated	optical insulated	optical insulated	Fast Ethernet, insulated
	USB 2.0 + USB OTG	CAN ISO11898	RS485	100 Base TX

Note: a maximum time of 800 ms (depending on communication type) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	DPZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-LES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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

B = Solenoid, integral electronics and position transducer at side of port B of the main stage.

D and E = Pilot and drain configuration can be modified as shown in section 21.
The valve's standard configuration provides internal pilot and external drain.
For different pilot / drain configuration select:

Option /D Internal drain.

Option /E External pilot (through port X).

G = Pressure reducing valve installed between pilot valve and main body with fixed setting:

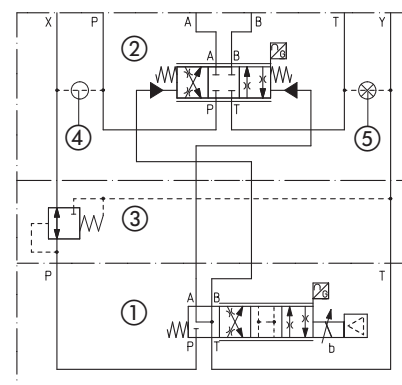
DPZA-2 = 28 bar

DPZA-1, -4 and -4M = 40 bar

It is advisable for valves with internal pilot in case of system pressure higher than 150 bar.

Pressure reducing valve is standard for DPZA-1, for other sizes add **/G** option.

FUNCTIONAL SCHEME - example of configuration 71



① Pilot valve

② Main stage

③ Pressure reducing valve

④ Plug to be added for external pilot trough port X

⑤ Plug to be removed for internal drain through port T

14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±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.

C = Only for **SP, SF, SL**

Option /C is available to connect pressure (force) transducers with 4 ÷ 20 mA current output signal, instead of the standard ±10 VDC.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ±20 mA.

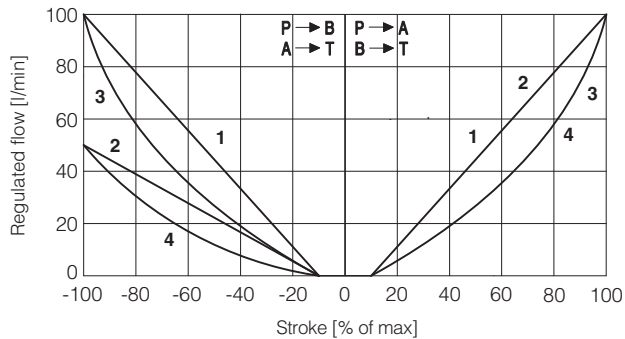
15 POSSIBLE COMBINED OPTIONS

Hydraulic options: all combination possible

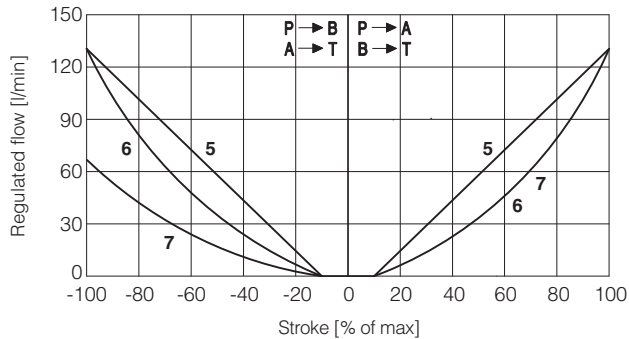
Electronics options: /CI (only for **SP, SF, SL**)

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

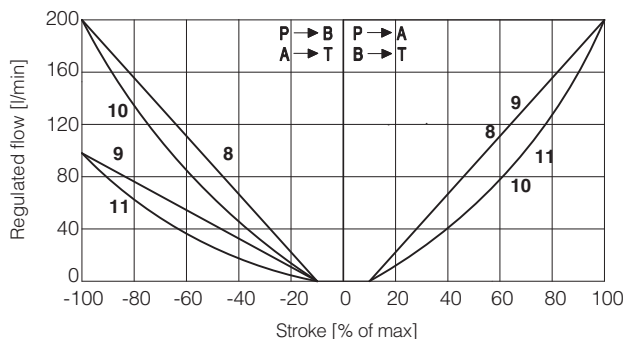
16.1 Regulation diagrams (values measure at Δp 10 bar P-T)



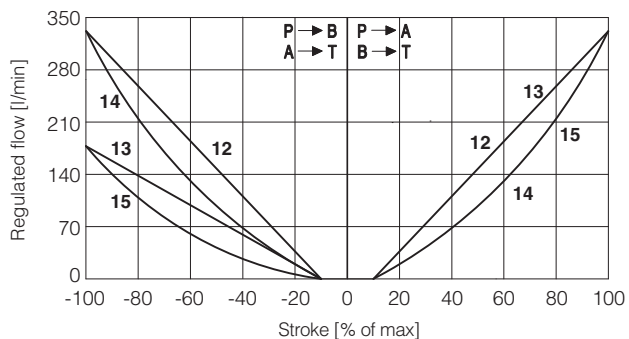
DPZA-1:
 1=L5 2 = DL5
 3=S5 4 = D5



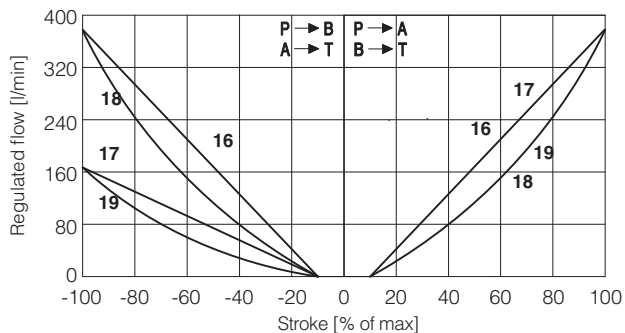
DPZA-2:
 5=L3 6 = S3
 7=D3



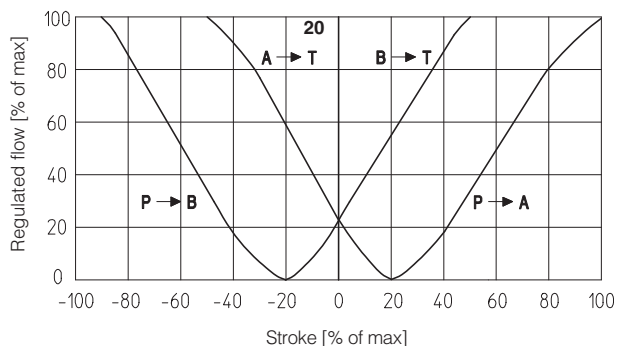
DPZA-2:
 8 = L5 9 = DL5
 10 = S5 11 = D5



DPZA-4:
 12 = L5 13 = DL5
 14 = S5 15 = D5



DPZA-4M:
 16 = L5 17 = DL5
 18 = S5 19 = D5



20 = Q5

Note: Hydraulic configuration vs. reference signal (standard and option /B)

Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$

Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

20 = linear spool Q5

Q5 spool type is specific for alternate P/Q controls in combination with /S* option, (see tech. table **FX500**).

It allows to control the pressure in A port or B port and it provides a safety central position (A-T/B-T) to depressurize the actuator chambers.


The strong meter-in characteristic makes the spool suitable for both pressure control and motion regulations in several applications.

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, EN-982).

17.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: 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.

 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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 (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 ± 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 ± 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 $0 \div 24$ Vdc.

17.4 Pressure or force reference input signal (F_INPUT+) - only SP, SF, SL

Functionality of F_INPUT+ signal (pin 12), is used as reference for the driver pressure/force closed loop (see tech. table FX500).

Reference input signal is factory preset according to selected valve code, defaults are ± 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 ± 10 Vdc or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range $0 \div 24$ Vdc.

17.5 Flow monitor output signal (Q_MONITOR)

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 $4 \div 20$ 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.

17.6 Pressure or force monitor output signal (F_MONITOR) - only for SP, SF, SL

The driver generates an analog output signal proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 Vdc or ± 20 mA.

17.7 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.

17.8 Fault output signal (FAULT)

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

17.9 Remote pressure/force transducer input signal - only for SP, SF, SL

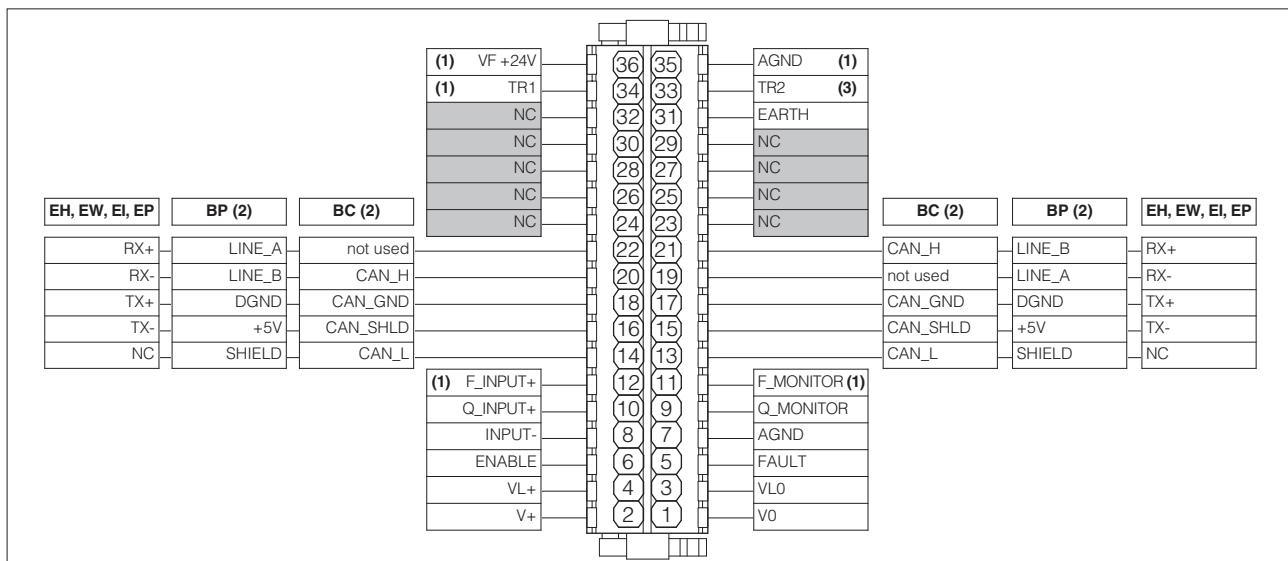
Analog remote pressure transducers or load cell can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 Vdc or ± 20 mA.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see table FX500).

18 TERMINAL BOARD OVERVIEW



(1) connections available only SP, SF, SL

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

(3) connection available only SF

19 ELECTRONIC CONNECTIONS

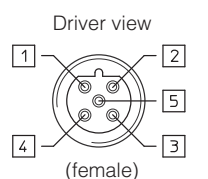
19.1 Main connections signals

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 Q_INPUT+ and F_INPUT+	Input - analog signal
	9	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	10	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
	11	F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	12	F_INPUT+	Pressure/Force reference input signal: ± 10 Vdc / ± 20 mA maximum range (1) Defaults are: ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Input - analog signal Software selectable
	31	EARTH	Internally connected to driver housing	

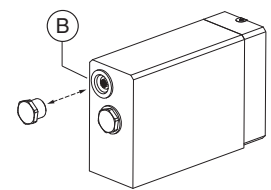
(1) Available only for SP, SF, SL

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 +



Driver view
(female)



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, EW, EI, EP fieldbus execution connections

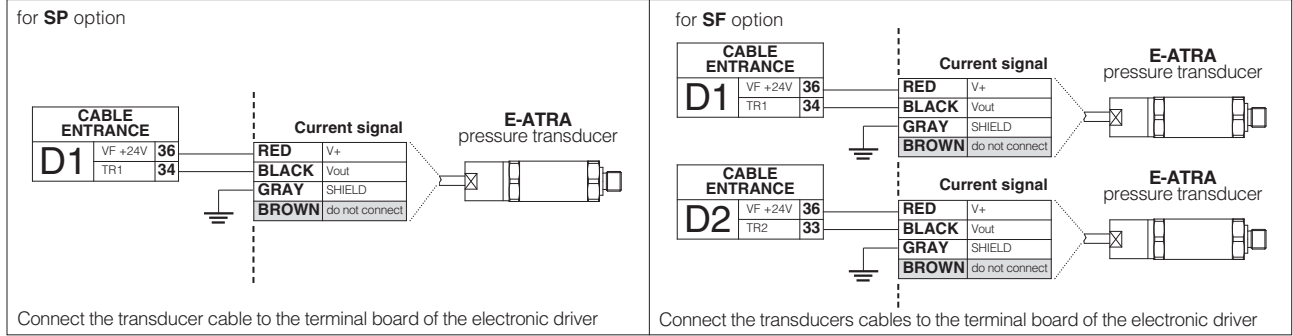
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

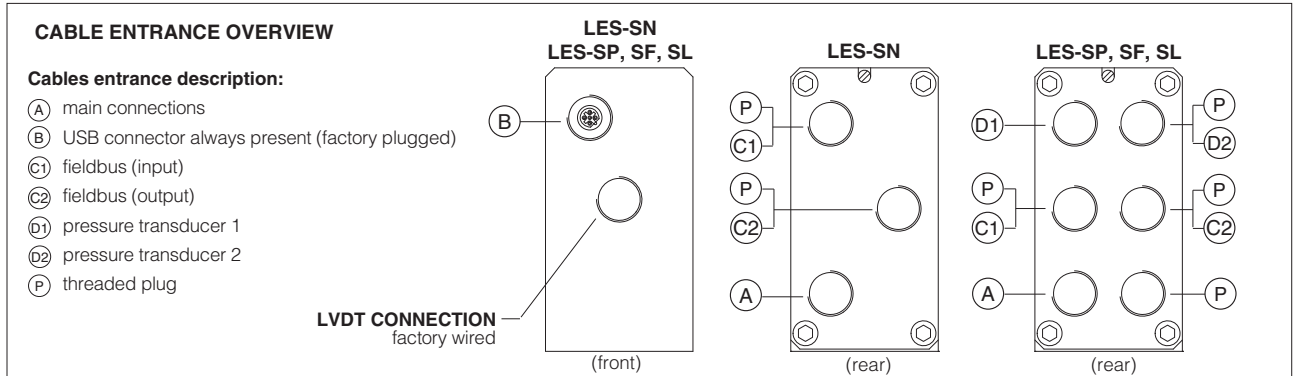
19.6 Remote pressure transducer connector - only for SP, SF, SL

CABLE ENTRANCES	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	SP, SL - Single transducer (1)		SF - Double transducers (1)	
					Voltage	Current	Voltage	Current
D1	33	TR2	2nd signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	/	/	Connect	Connect
	34	TR1	1st signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect	Connect	Connect
D2	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table **GX800**

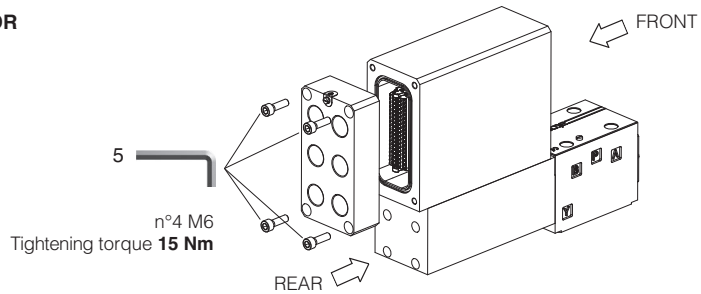


20 CONNECTIONS LAYOUT



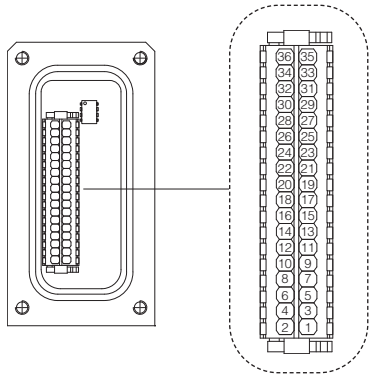
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

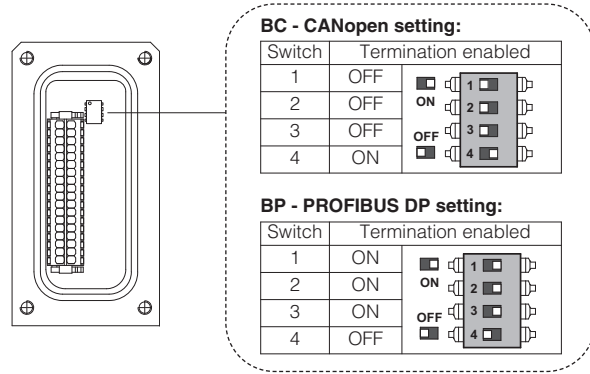


WARNING: the above operation must be performed in a safety area

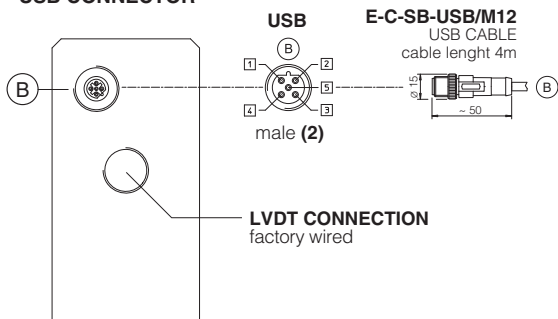
Terminal board - see section 18



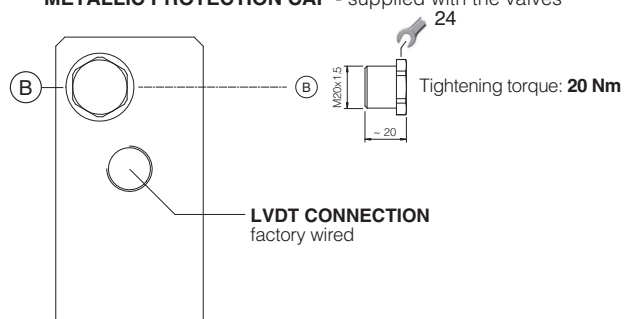
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

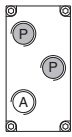
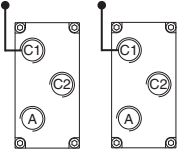
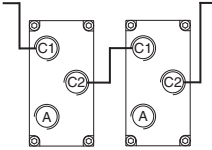


METALLIC PROTECTION CAP - supplied with the valves

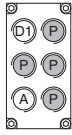
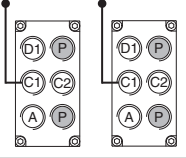
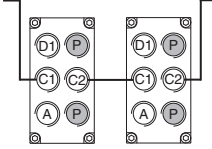


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

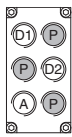
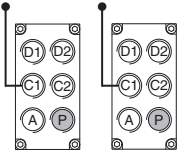
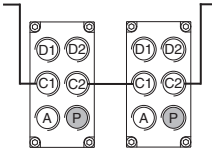
20.1 Cable glands and threaded plug for LES-SN - see tech table **KX800**

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

20.2 Cable glands and threaded plug for LES-SP, SL - see tech table **KX800**

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D1 A	none	none		Cable entrance A, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	3	D1 C1 A	1	C2		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	4	D1 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1 are open for costumers Cable entrance P are factory plugged

20.3 Cable glands and threaded plug for LES-SF - see tech table **KX800**

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	3	D1 D2 A	none	none		Cable entrance A, D1, D2 are open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	4	D1 - D2 C1 A	1	C2		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged
BC, BP, EH, EW, EI, EP "daisy chain" connection	5	D1 - D2 C1 - C2 A	none	none		Cable entrance A, C1, C2, D1, D2 are open for costumers Cable entrance P is factory plugged

21 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

DPZA-1	Pilot channels	Drain channels	<p>Internal piloting: blinded plug SP-X300F ① in X; External piloting: blinded plug SP-X300F ② in Pp; Internal drain: blinded plug SP-X300F ③ in Y; External drain: blinded plug SP-X300F ④ in Dr.</p>
DPZA-2	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X300F ①; External piloting: Add blinded plug SP-X300F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-4 DPZA-4M	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X500F ①; External piloting: Add blinded plug SP-X500F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>

22 FASTENING BOLTS AND SEALS

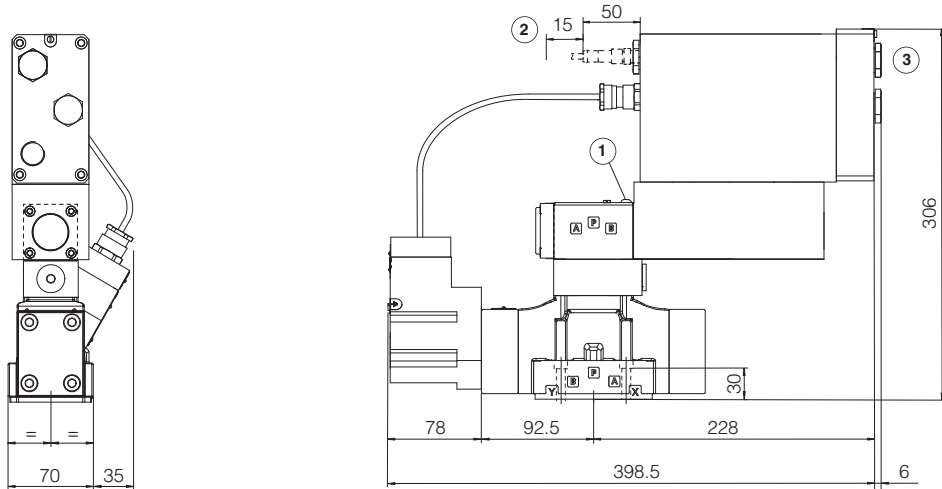
Type	Size	Fastening bolts	Seals
DPZA	1 = 10	4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm	5 OR 2050; Diameter of ports A, B, P, T: Ø 11 mm (max) 2 OR 108 Diameter of ports X, Y: Ø = 5 mm (max)
	2 = 16	4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm	4 OR 130; Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø = 7 mm (max)
	4 = 25	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 4112; Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)
	4M = 27	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 3137; Diameter of ports A, B, P, T: Ø 32 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)

DPZA-LES-*-1

ISO 4401: 2005

Mounting surface: 4401-05-05-0-05
(see table P005)

Mass [kg]	
DPZA-*-17*	9,5
Option /G	+0,9

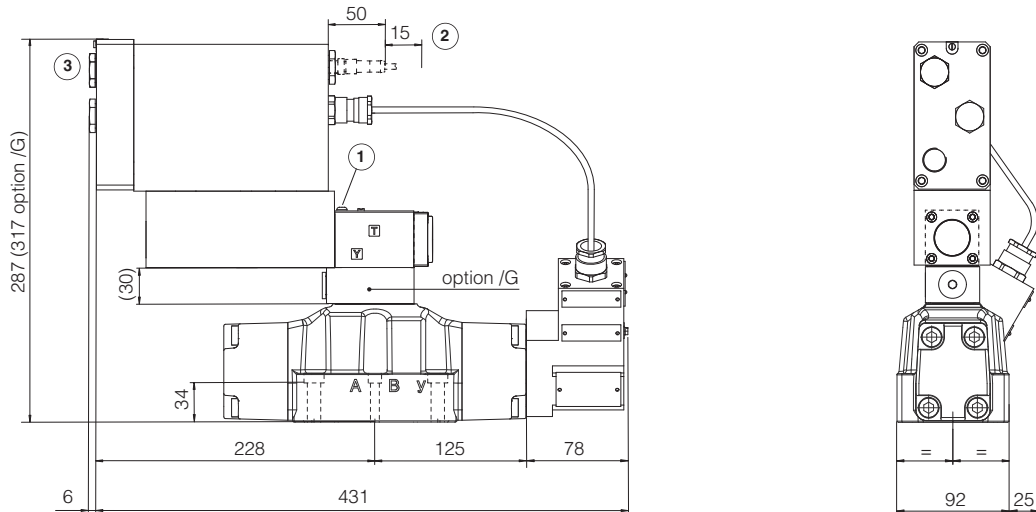


DPZA-LES-*-2

ISO 4401: 2005

Mounting surface: 4401-07-07-0-05
(see table P005)

Mass [kg]	
DPZA-*-27*	17,9
Option /G	+0,9



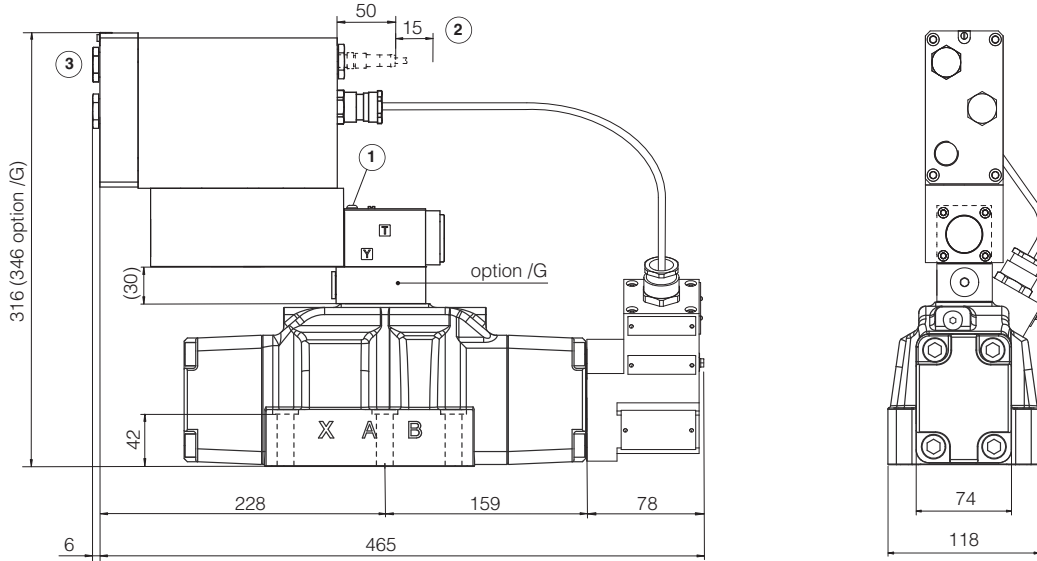
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

DPZA-LES-*-4 DPZA-LES-*-4M

ISO 4401: 2005

Mounting surface: 4401-08-08-0-05
(see table P005)

Mass [kg]	
DPZA-*-4*	23,1
DPZA-*-4M*	23,1
Option /G	+0,9



① = Air bleed off

② = Space to remove the USB connector

③ = The dimensions of cable glands must be considered (see tech table **KX800**)

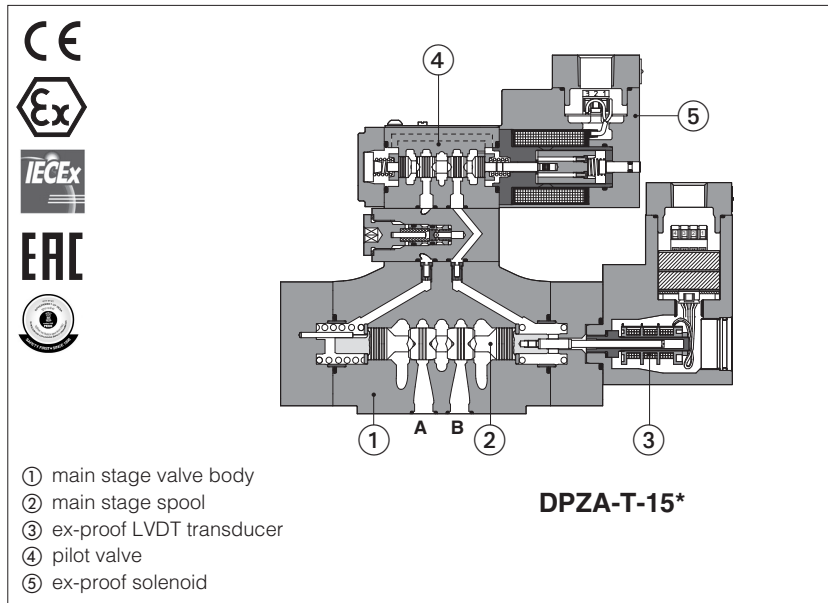
24 RELATED DOCUMENTATION

X010 Basics for electrohydraulics in hazardous environments
X020 Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
FX500 Ex-proof digital proportionals with P/Q control
FX900 Operating and maintenance information for ex-proof proportional valves

GS500 Programming tools
GS510 Fieldbus
GX800 Ex-proof pressure transducer type E-ATRA-7
KX800 Cable glands for ex-proof valves
P005 Mounting surfaces for electrohydraulic valves

Ex-proof proportional directional valves

piloted, with LVDT transducer and positive spool overlap - **ATEX, IECEx, EAC, PESO**



DPZA-T

Ex-proof proportional valves, piloted, with LVDT position transducer and positive spool overlap, for directional and not compensated speed controls.

They are equipped with ex-proof proportional solenoid and LVDT transducer, certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)

The flameproof enclosure of solenoid and transducer, prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **10 ÷ 32** - ISO 4401

Max flow: **180 ÷ 1000 l/min**

Max pressure: **350 l/min**

1 MODEL CODE

DPZA	/	*	-	T	-	2	71	-	L	5	/	M	/	*	*	/	*
<p>Ex-proof proportional directional valve, piloted</p> <p>Certification type: Multicertification ATEX, IECEx, EAC, PESO: - = omit for Group II 2G / 2D (1) M = Group IM2 (mining)</p> <p>T = with LVDT transducer</p> <p>Valve size ISO 4401: 1 = 10 2 = 16 4 = 25 6 = 32</p>																	<p>Seals material, see section 6:</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p>

Options (4):

- B** = solenoid and position transducer at side of port A of the main stage (3)
- C** = current feedback for position transducer 4 ÷ 20 mA
- D** = internal drain
- E** = external pilot pressure

Solenoid and transducer threaded connection

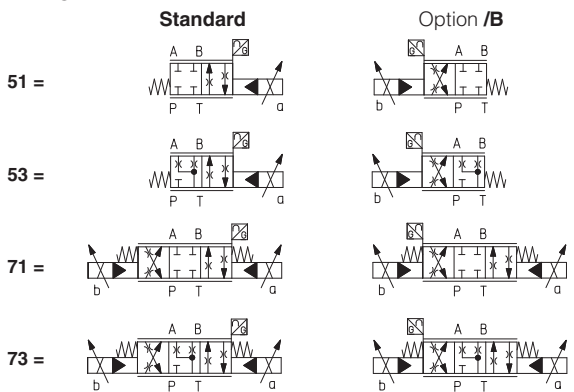
for cable gland fitting:

GK = GK-1/2" (5)

M = M20x1,5

NPT = 1/2" NPT ANSI B2.1 (tapered)

Configuration:



Spool size:

	3 (L,S,D)	5 (L,S,D)
DPZA-1 =	-	100
DPZA-2 =	130	200
DPZA-4 =	-	340
DPZA-6 =	-	400

Nominal flow (l/min) at Δp 10bar P-T

Spool type, regulating characteristics:

L = linear

S = progressive

D = differential-progressive



P-A = Q, B-T = Q/2
 P-B = Q/2, A-T = Q

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) (3) In standard configuration the solenoid and transducer are at side B of the main stage

(4) Possible combined options: /BC, /BD, /BE, /CD, /CE, /DE (5) Approved only for the Italian market

⚠ For valve with internal drain (option /D) the pressure at T port makes difficult the manual override operation that can be possible only if the pressure at T port is lower than 50 bar

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-TEB-* /A	E-BM-TES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	GS230	GS240

3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - Salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DPZA-*-1	DPZA-*-2		DPZA-*-4	DPZA-*-6	
Pressure limits [bar]	ports P, A, B, X = 350; T = 250 (10 for option /D); Y = 10;					
Spool type standard	L5, S5, D5	L3, S3, D3	L5, S5, D5	L5, S5, D5	L5, S5, D5	
Nominal flow [l/min]						
Δp P-T	Δp = 10 bar	100	130	200	340	400
	Δp = 30 bar	160	220	350	590	700
	max permissible flow	180	320	440	680	1000
Δp max P-T [bar]	50	60	60	60	70	
Piloting pressure [bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 200 bar)					
Piloting volume [cm³]	1,4	3,7		9,0	21,6	
Piloting flow (1) [l/min]	1,7	3,7		6,8	14,4	
Leakage (2) Pilot [cm³/min]	100/300	100/300		200/500	900/2800	
	Main stage [l/min]	0,15/0,5	0,2/0,6		0,3/1,0	1,0/3,0
Response time (1) [ms]	≤ 70	≤ 85		≤ 100	≤ 130	
Hysteresis	≤ 1 [% of max regulation]					
Repeatability	± 0,5 [% of max regulation]					
Thermal drift	zero point displacement < 1% at ΔT = 40°C					

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 2

(1) 0 ÷ 100 % step signal and pilot pressure 100 bar (2) at Δp = 100/350 bar

5 ELECTRICAL CHARACTERISTICS

Max. power	35W
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

6 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DPZA		DPZA/M
Certifications	Multicertification Group II ATEX IECEx EAC PESO		Multicertification Group I ATEX IECEx
Solenoid certified code	OZA-A + ETHA-4		OZAM-A + ETHAM
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb
Temperature class	T4	T3	-
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C
Mechanical construction Flameproof enclosure Ex d	EN 60079-0, EN 60079-1		
Cable entrance: threaded connection	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT		

(1) The type examiner certificates can be downloaded from

(2) In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS AND TRANSDUCERS WIRING

SOLENOID

① cover with threaded connection for vertical cable gland fitting
 ② terminal board for cables wiring
 ③ standard manual override
 ④ screw terminal for additional equipotential grounding

Solenoid wiring

0	1	1 = Coil	PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
0	2	2 = GND	
0	3	3 = Coil	

TRANSDUCER

① cover with threaded connection for vertical cable gland fitting
 ② terminal board for cables wiring
 ③ screw terminal for additional equipotential grounding

Position transducer wiring

0	1	1 = Output signal	PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
0	2	2 = Supply -15 V	
0	3	3 = Supply +15 V	
0	4	4 = GND	

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

Multicertification Group I and Group II

Power supply: section of coil connection wires = 2,5 mm²

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

9.1 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.

SOLENOID - Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	90 °C	90 °C
45 °C	-	T4	-	135 °C	-	95 °C
55 °C	-	T3	-	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

TRANSDUCER - Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	N.A.	T6	150 °C	85 °C	-	-
70 °C	N.A.	T6	150 °C	85 °C	90 °C	90 °C

10 CABLE GLANDS

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

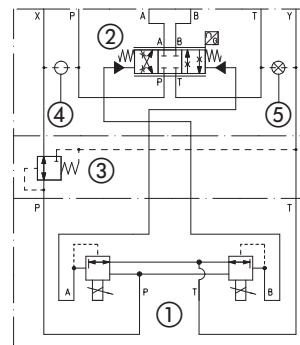
11 OPTIONS

- B** = DPZA-*-*5 = solenoid and integral electronics at side of port B of the main stage.
DPZA-*-*7 = integral electronics at side of port B of the main stage.
- C** = Position transducer with current feedback 4÷20 mA, suggested in case of long distance between the electronic driver and the proportional valve
- D and E** = Pilot and drain configuration can be modified as shown in section **13**.
The valve's standard configuration provides internal pilot and external drain.
For different pilot / drain configuration select:
 - Option /D Internal drain.
 - Option /E External pilot (through port X).

11.1 Possible combined options: /BC, /BD, /BE, /CD, /CE, /DE

FUNCTIONAL SCHEME

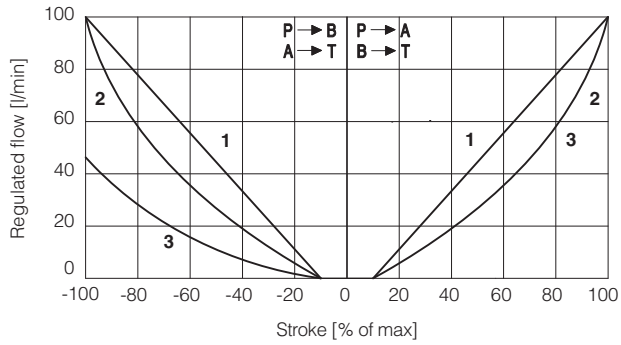
example of configuration 7*
3 positions, spring centered



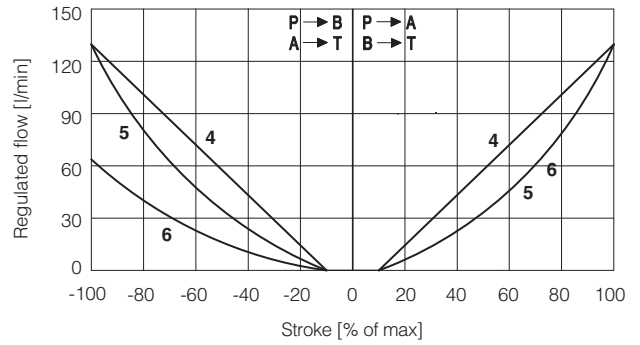
- ① Pilot valve
- ② Main stage
- ③ Pressure reducing valve
- ④ Plug to be added for external pilot trough port X
- ⑤ Plug to be removed for internal drain through port T

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

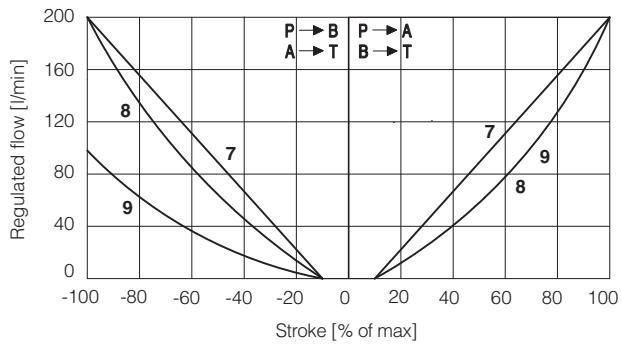
Regulation diagrams (values measure at Δp 10 bar P-T)



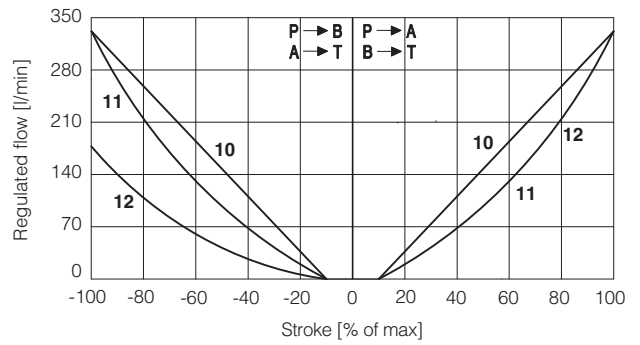
DPZA-1:
1 = L5 2 = S5 3 = D5



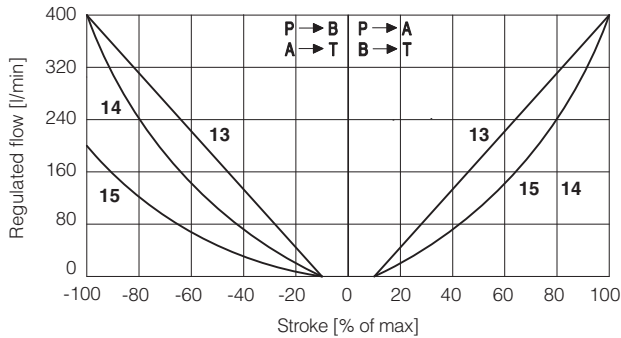
DPZA-2:
4 = L3 5 = S3 6 = D3



DPZA-2:
7 = L5 8 = S5 9 = D5



DPZA-4:
10 = L5 11 = S5 12 = D5



DPZA-6:
13 = L5 14 = S5 15 = D5

Note: Hydraulic configuration vs. reference signal for configuration 71 and 73 (standard and option /B)

Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$

Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

13 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below. To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270. Standard valves configuration provides internal pilot and external drain

DPZA-1	Pilot channels	Drain channels	<p>Internal piloting: blinded plug SP-X300F ① in X; External piloting: blinded plug SP-X300F ② in Pp; Internal drain: blinded plug SP-X300F ③ in Y; External drain: blinded plug SP-X300F ④ in Dr.</p>
DPZA-2	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X300F ①; External piloting: Add blinded plug SP-X300F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-4	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X500F ①; External piloting: Add blinded plug SP-X500F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-6	Pilot channels	Drain channels	<p>Internal piloting: Without plug ①; External piloting: Add DIN-908 M16x1,5 in pos ①; Add plug SP-X325A in pos ②; Internal drain: Without blinded plug SP-X300F ③; External drain: Add blinded plug SP-X300F ③. To reach the orifice ② remove plug ④ = G1/8"</p>

14 FASTENING BOLTS AND SEALS

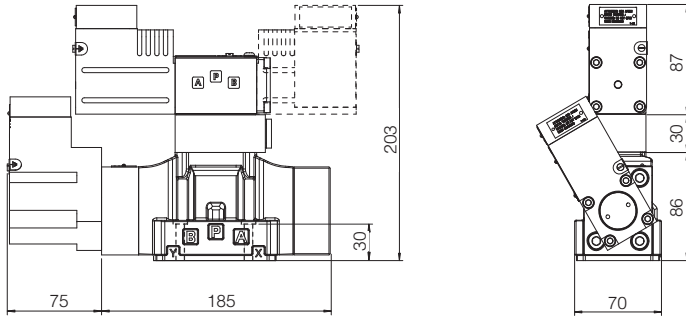
	DPZA-1	DPZA-2	DPZA-4	DPZA-6
	<p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p>	<p>Fastening bolts: 4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm</p>	<p>Fastening bolts: 6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm</p>	<p>Fastening bolts: 6 socket head screws M12x90 class 12.9 Tightening torque = 600 Nm</p>
	<p>Seals: 5 OR 2050 Diameter of ports A, B, P, T: Ø 11 mm (max) 2 OR 108 Diameter of ports X, Y: Ø 5 mm (max)</p>	<p>Seals: 4 OR 130 Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø 7 mm (max)</p>	<p>Seals: 4 OR 4112 Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø 7 mm (max)</p>	<p>Seals: 4 OR 144 Diameter of ports A, B, P, T: Ø 34 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø 7 mm (max)</p>

DPZA-1

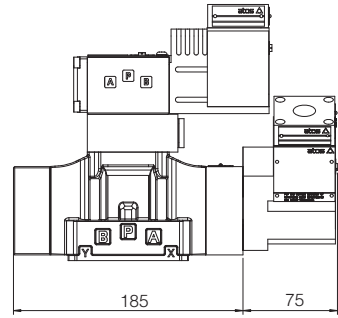
ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-05-05-0-05

Mass [kg]	
DPZA-*-15*	10,4
DPZA-*-17*	11,8

DPZA-T-15*
 DPZA-T-17* (dotted line)



DPZA-T-15* /B

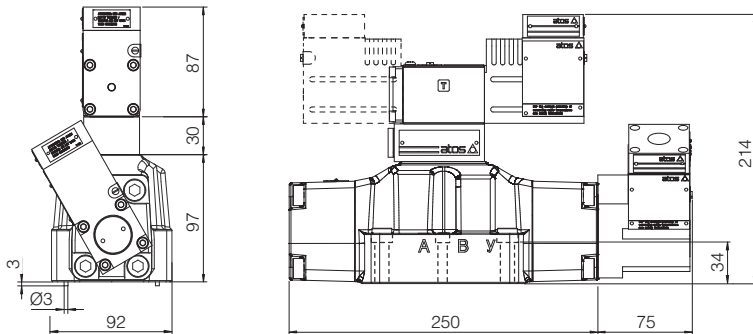


DPZA-2

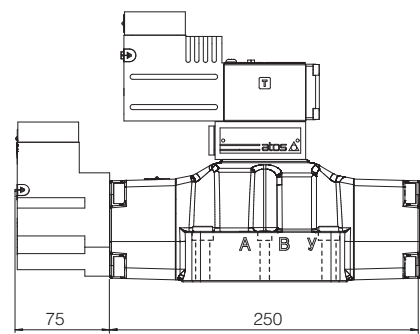
ISO 4401: 2005
 Mounting surface: 4401-07-07-0-05 (see table P005)

Mass [kg]	
DPZA-*-25*	13,3
DPZA-*-27*	14,7

DPZA-T-25*
 DPZA-T-27* (dotted line)



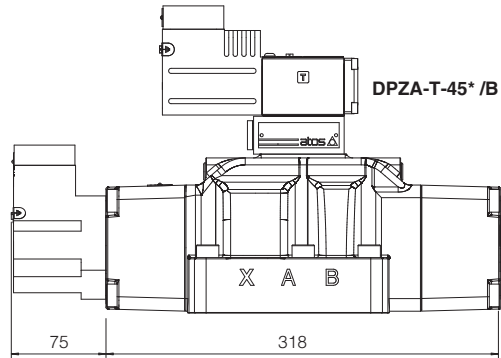
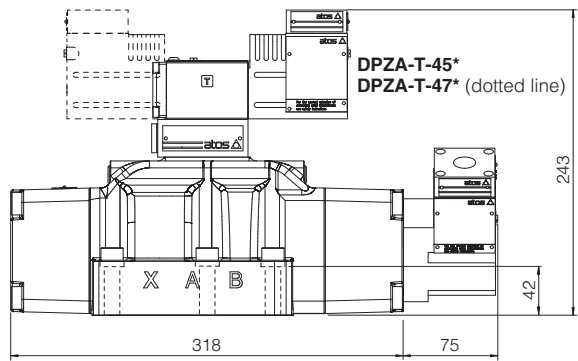
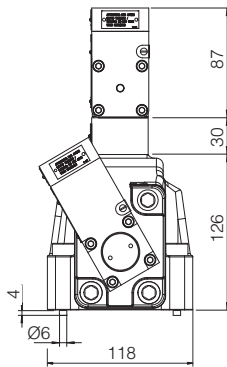
DPZA-T-25* /B



DPZA-4

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-08-08-0-05

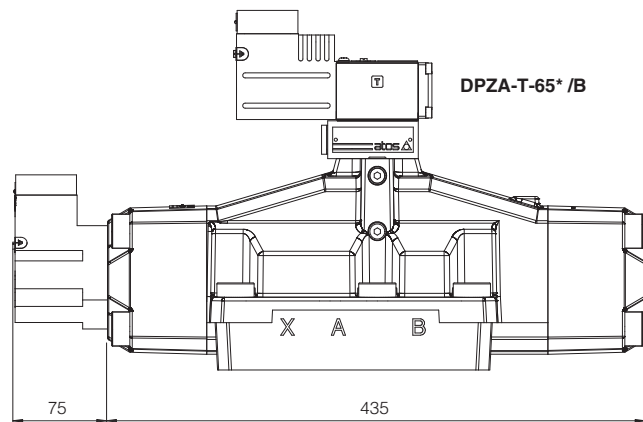
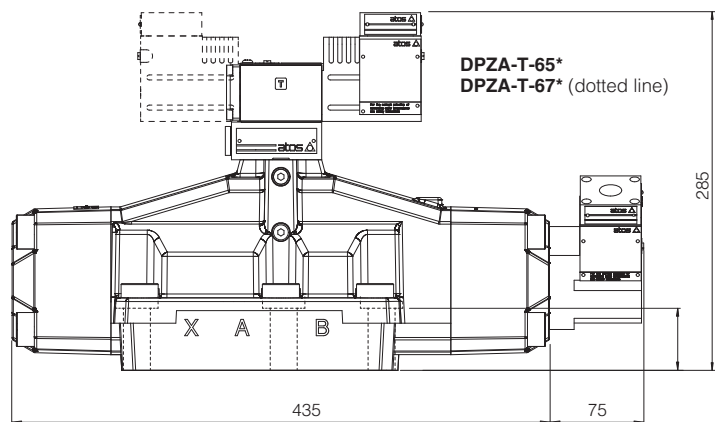
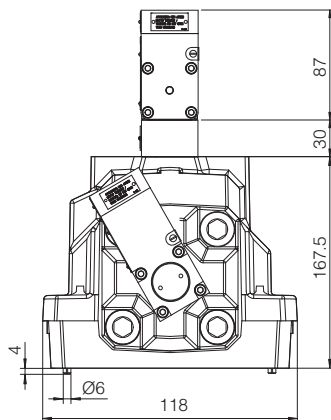
Mass [kg]	
DPZA-*-45*	20,8
DPZA-*-47*	22,2



DPZA-6

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-10-09-0-05

Mass [kg]	
DPZA-*-65*	47,3
DPZA-*-67*	48,7

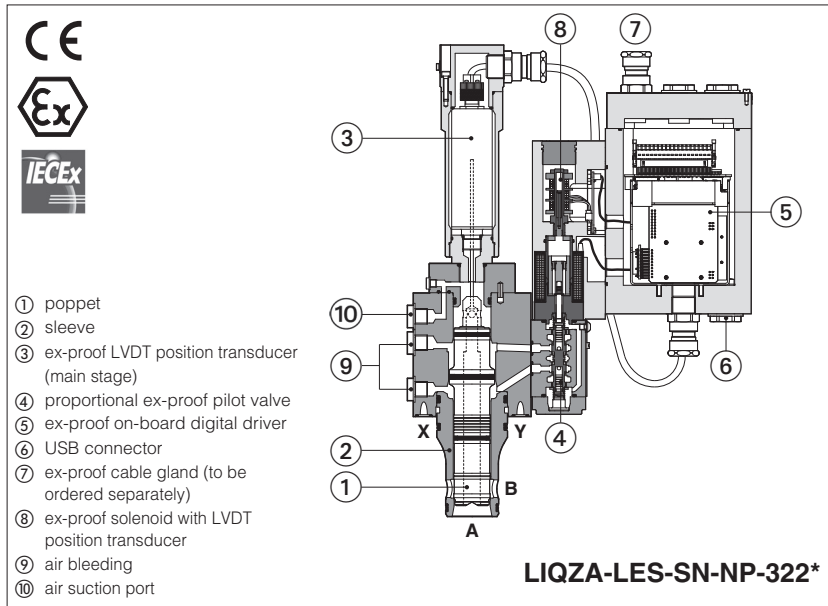


16 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional 2-way cartridges high performance

piloted, with on-board driver and two LVDT transducers - ATEX and IECEx



- ① poppet
- ② sleeve
- ③ ex-proof LVDT position transducer (main stage)
- ④ proportional ex-proof pilot valve
- ⑤ ex-proof on-board digital driver
- ⑥ USB connector
- ⑦ ex-proof cable gland (to be ordered separately)
- ⑧ ex-proof solenoid with LVDT position transducer
- ⑨ air bleeding
- ⑩ air suction port

LIQZA-LES

Ex-proof digital proportional 2-way cartridges, high performance with two LVDT position transducers (pilot valve and main stage) for best accuracy in not compensated flow regulations.

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

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

The flameproof enclosure of on-board digital driver, solenoid and transducers, 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.

Size: **25 ÷ 100** - ISO 7368

Max flow: **1200 ÷ 16000** l/min

Max pressure: **420 bar**

1 MODEL CODE

LIQZA	-	LES	-	SN	-	NP	-	25	2	L4	/	M	/	*	/	*	/	*
<p>Ex-proof proportional cartridge</p>		<p>LES = on-board driver and two LVDT transducers</p>		<p>SN = none</p>		<p>NP = Not present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT</p>		<p>Valve size and nominal flow (l/min) at Δp 5 bar: 25=500 32=800 40=1200 50=2000 63=3000 80=4500 100=7200</p>		<p>Pool type, regulating characteristics: L4 = linear</p>		<p>Cable entrance threaded connection: M = M20X1,5</p>		<p>Electronic options: I = current reference input and monitor 4÷20 mA (omit for std voltage 0÷10 Vdc)</p>		<p>Seals material, see section 8: - = NBR PE = FKM BT = HNBR</p>		<p>Series number</p>
										<p>functional symbol</p>		<p>simplified symbol</p>						

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.



WARNING

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

3 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support: NP (USB)	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)		

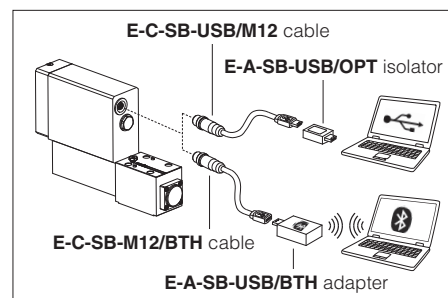


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



WARNING: Bluetooth adapter is available only for European, USA and Canadian markets! Bluetooth adapter is certified according RED (Europe), FCC (USA) and ISED (Canada) directives

USB or Bluetooth connection



4 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.

5 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 9 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Size	25	32	40	50	63	80	100
Max regulated flow [l/min]							
at Δp = 5 bar	500	800	1200	2000	3000	4500	7200
at Δp = 10 bar	700	1100	1700	2800	4250	6350	10200
Max permissible flow	1200	1800	2500	4000	6000	10000	16000
Max pressure [bar]	Ports A, B = 420 X = 350 Y ≤ 10						
Nominal flow of pilot valve at Δp = 70 bar [l/min]	8	20	40	40	100	100	100
Leakage of pilot valve at P = 100 bar [l/min]	0,2	0,3	0,7	0,7	1	1	1
Piloting pressure [bar]	min: 40% of system pressure max 350 recommended 140 ÷ 160						
Piloting volume [cm³]	2,2	7,0	9,4	17,7	32,5	39,5	49,5
Piloting flow (1) [l/min]	5,3	14	19	35,5	56	60	60
Response time 0 ÷ 100% step signal (2) [ms]	≤ 30	≤ 32	≤ 35	≤ 35	≤ 40	≤ 45	≤ 55
Hysteresis [% of the max regulation]	≤ 0,1						
Repeatability [% of the max regulation]	± 0,1						
Thermal drift	zero point displacement < 1% at ΔT = 40°C						

(1) 0 ÷ 100% step signal

(2) With pilot pressure = 140 bar


7 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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	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)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position 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	CANopen	PROFIBUS DP	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158
	Atos ASCII coding	EN50325-4 + DS408	EN50170-2/IEC61158	
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 800 ms (depending on communication type) have 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

8 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

9 CERTIFICATION DATA

Components type	Pilot valve solenoid and LVDT transducer			LVDT main stage transducer
Certifications	Multicertification ATEX IECEx			
Components Certified code	OZA-LES			ETHA-15
Type examination certificate (1)	<ul style="list-style-type: none"> • ATEX: TUV IT 18 ATEX 068 X • IECEx: IECEx TPS 19.0004X 			<ul style="list-style-type: none"> • ATEX: TUV IT 16 ATEX 053 X • IECEx: IECEx TPS 16.0003X
Method of protection	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db 	<ul style="list-style-type: none"> • IECEx Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db 	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex db IIC T6 Gb Ex II 2D Ex tb IIIC T85°C Db Ex I M2 Ex db IMb • IECEx Ex db IIC T6 Gb Ex tb IIIC T85°C Db Ex db IMb 	
Temperature class	T6	T5	T4	T6
Surface temperature	≤ 85 °C	≤ 100 °C	≤ 135 °C	≤ 85 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +55 °C	-40 ÷ +70 °C	-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1	IEC 60079-31
Cable entrance: threaded connection	M = M20x1,5			factory wired

(1) The type examiner certificates can be downloaded from

(2) The driver solenoid and LVDT transducers 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**

10 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

10.1 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

11 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

12 ELECTRONIC OPTIONS

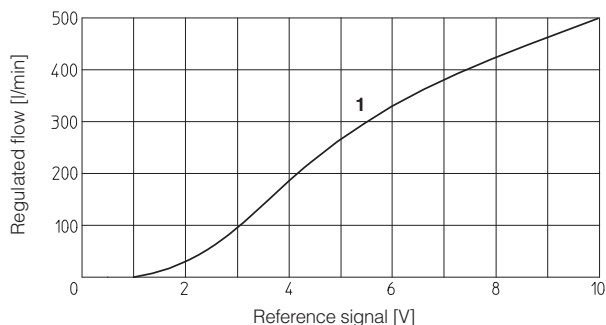
I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 Vdc.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vdc or ±20 mA.

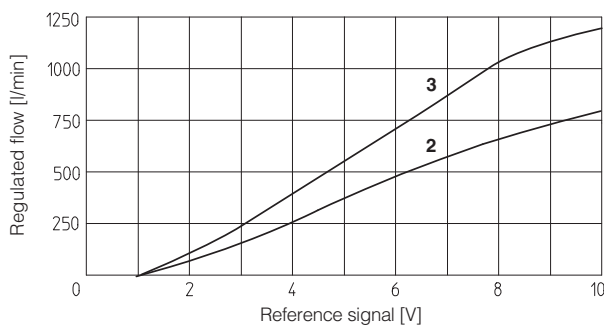
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

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

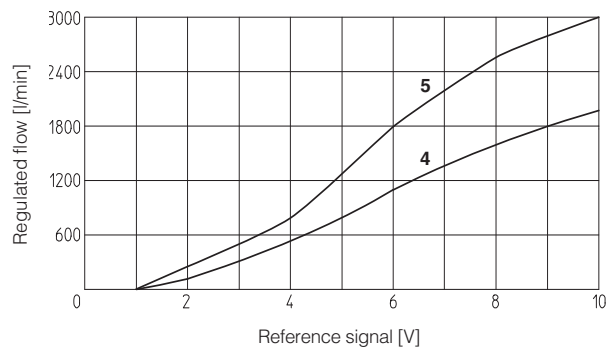
13.1 Regulation diagrams (values measured at Δp 5 bar)



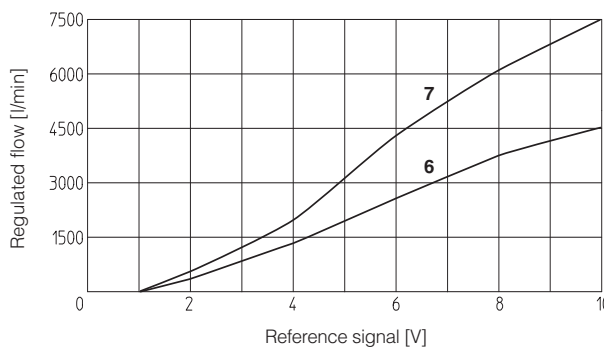
1 = LIQZA-LES-25*



2 = LIQZA-LES-32* **3** = LIQZA-LES-40*



4 = LIQZA-LES-50* **5** = LIQZA-LES-63*




6 = LIQZA-LES-80* **7** = LIQZA-LES-100*

14 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, EN-982).

14.1 Power supply (V+ and V0)


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

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

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

14.3 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 $0 \div 10\text{ VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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 $0 \div 24\text{VDC}$.

14.4 Flow monitor output signal (Q_MONITOR)

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 $0 \div 10\text{ VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

14.5 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.

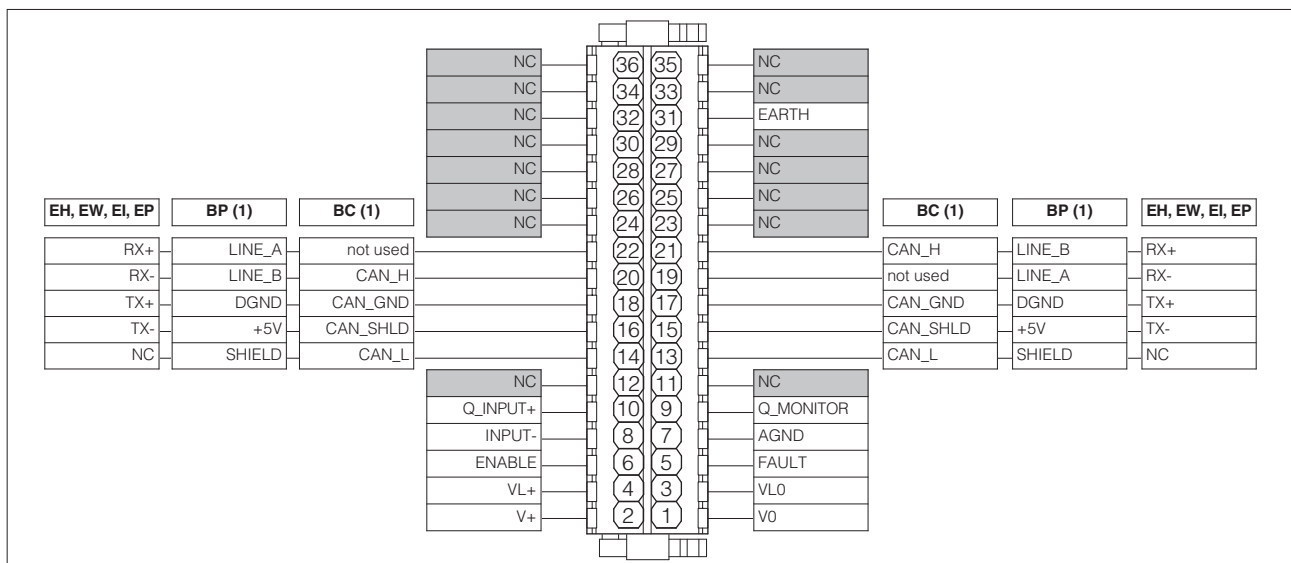
Enable input signal can be used as generic digital input by software selection.

14.6 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for $4 \div 20\text{ mA}$ 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.

15 TERMINAL BOARD OVERVIEW



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

16 ELECTRONIC CONNECTIONS

16.1 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	Q_MONITOR	Flow monitor output signal: 0 ÷ 10 Vdc / ±20 mA maximum range, referred to AGND Defaults are: ±10 Vdc for standard and 4 ÷ 20 mA for /I option	Output - analog signal Software selectable
	10	Q_INPUT+	Flow reference input signal: 0 ÷ 10 Vdc / ±20 mA maximum range Defaults are: ±10 Vdc for standard and 4 ÷ 20 mA for /I option	Input - analog signal Software selectable
	31	EARTH	Internally connected to driver housing	

16.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS		
B	1	+5V_USB	Power supply	<p>Driver view (female)</p>	
	2	ID	Identification		
	3	GND_USB	Signal zero data line		
	4	D-	Data line -		
	5	D+	Data line +		

16.3 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

16.4 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)

16.5 EH, EW, EI, EP fieldbus execution connections

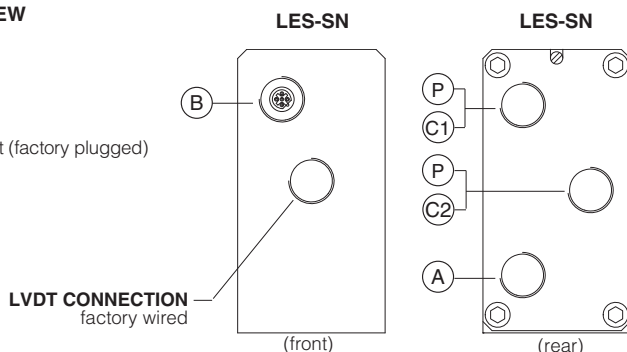
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

CABLE ENTRANCE OVERVIEW

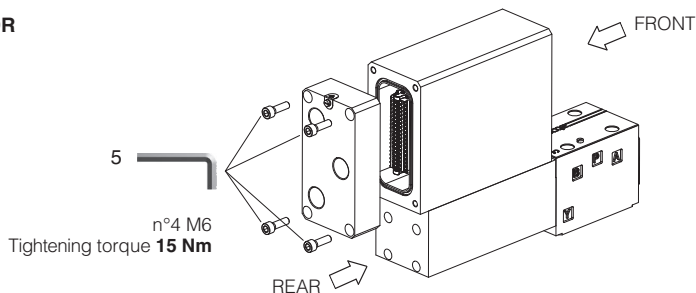
Cables entrance description:

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



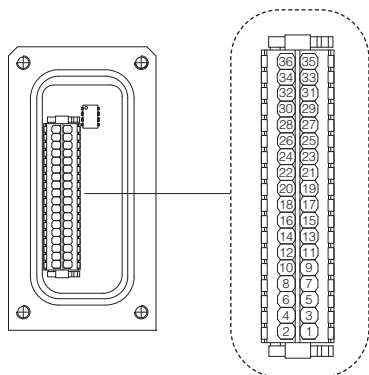
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 15

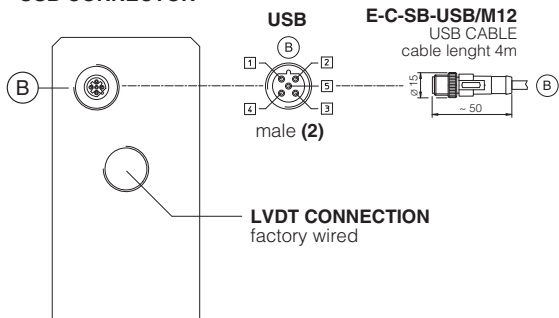


Fieldbus terminator only for BC and BP executions (1)

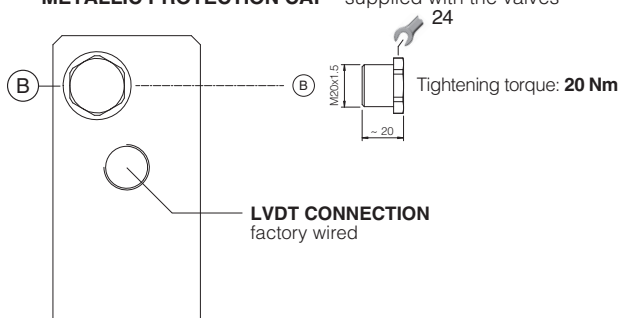
BC - CANopen setting:		
Switch	Termination enabled	
1	OFF	<input type="checkbox"/> 1
2	OFF	<input checked="" type="checkbox"/> 2
3	OFF	<input type="checkbox"/> 3
4	ON	<input checked="" type="checkbox"/> 4

BP - PROFIBUS DP setting:		
Switch	Termination enabled	
1	ON	<input checked="" type="checkbox"/> 1
2	ON	<input checked="" type="checkbox"/> 2
3	ON	<input type="checkbox"/> 3
4	OFF	<input checked="" type="checkbox"/> 4

USB CONNECTOR

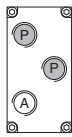
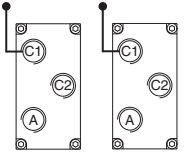
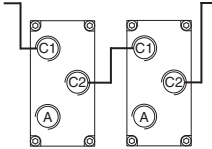


METALLIC PROTECTION CAP - supplied with the valves



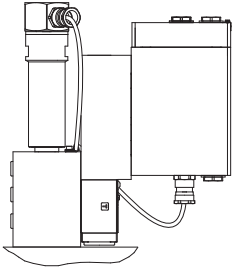
(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

17.1 Cable glands and threaded plug - see tech table **KX800**

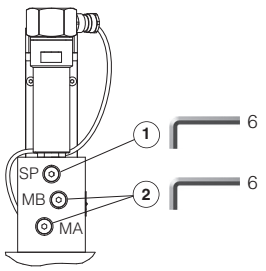
Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	1	A	none	none		Cable entrance A is open for costumers Cable entrance P are factory plugged
BC, BP, EH, EW, EI, EP "via stub" connection	2	C1 A	1	C2		Cable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

18 AIR BLEEDING

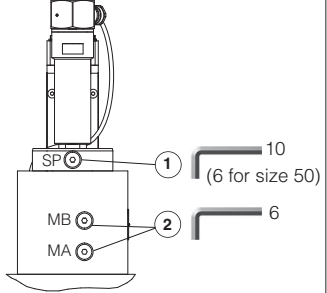
Size 25



Sizes 32, 40

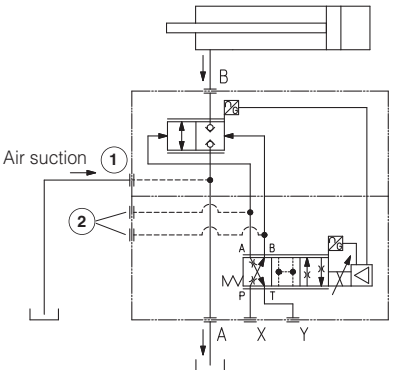


Sizes 50 to 100



1 Air suction port (SP):
 N° 1 plug G1/4" for sizes 25 to 50
 N° 1 plug G1/2" for sizes 63 to 100
 To be used only in case port A is connected to tank and subjected to negative pressure, consult our technical office.

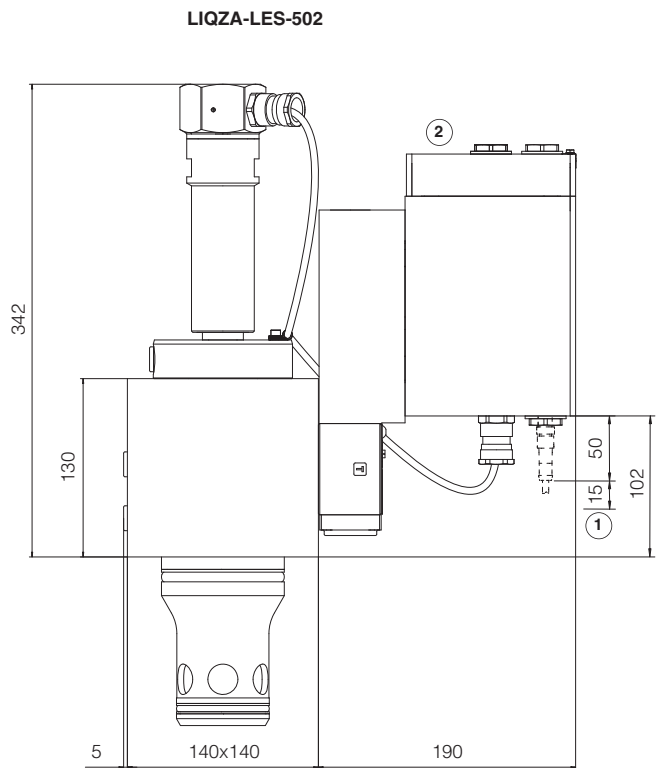
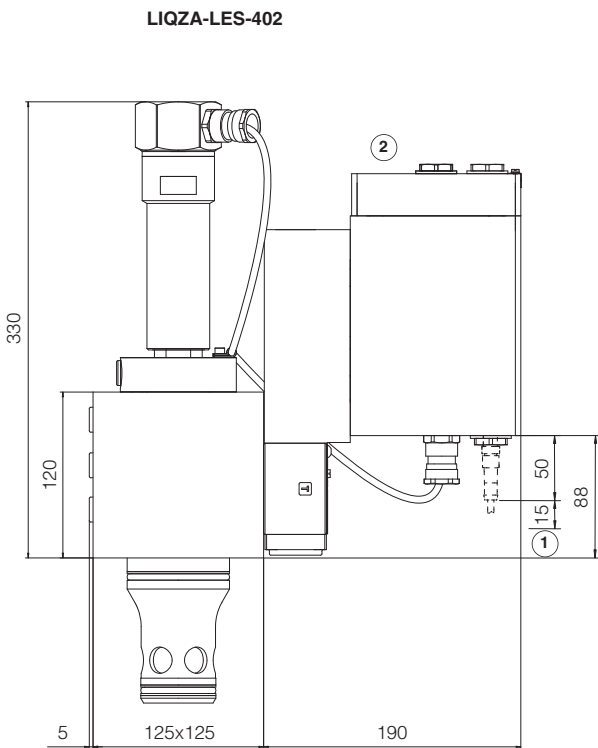
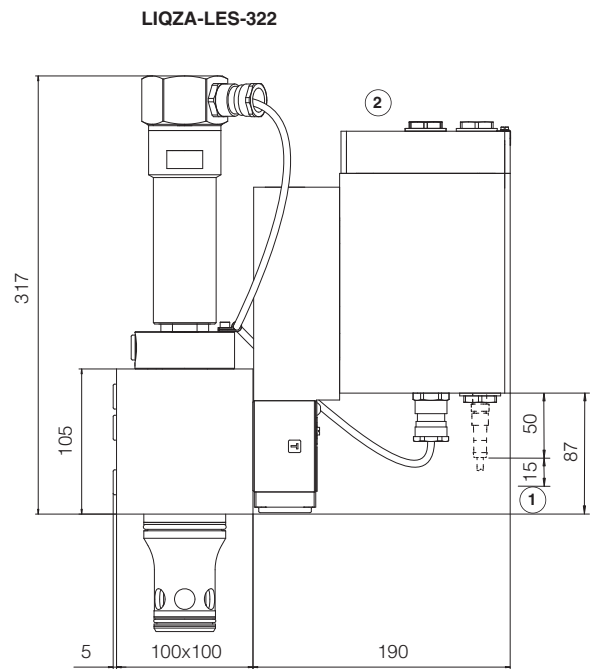
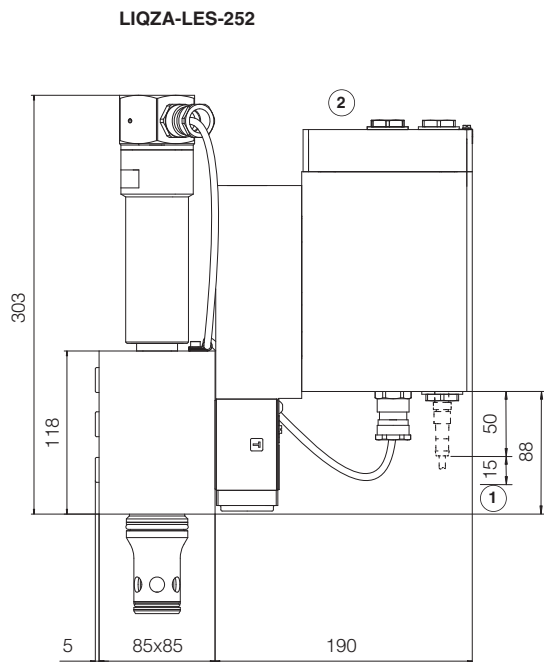
2 Air bleeding (MA, MB):
 N° 2 plugs G1/4"
 At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.
 Operate the valve for few seconds at low pressure and then lock the plugs.



19 FASTENING BOLTS AND VALVE MASS

Type	Size	Fastening bolts (supplied with the valve)	Mass [kg]
LIQZA	25	4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm	15,2
	32	4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm	18
	40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	23,7
	50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	31
	63	4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	51
	80	8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm	78,6
	100	8 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	130

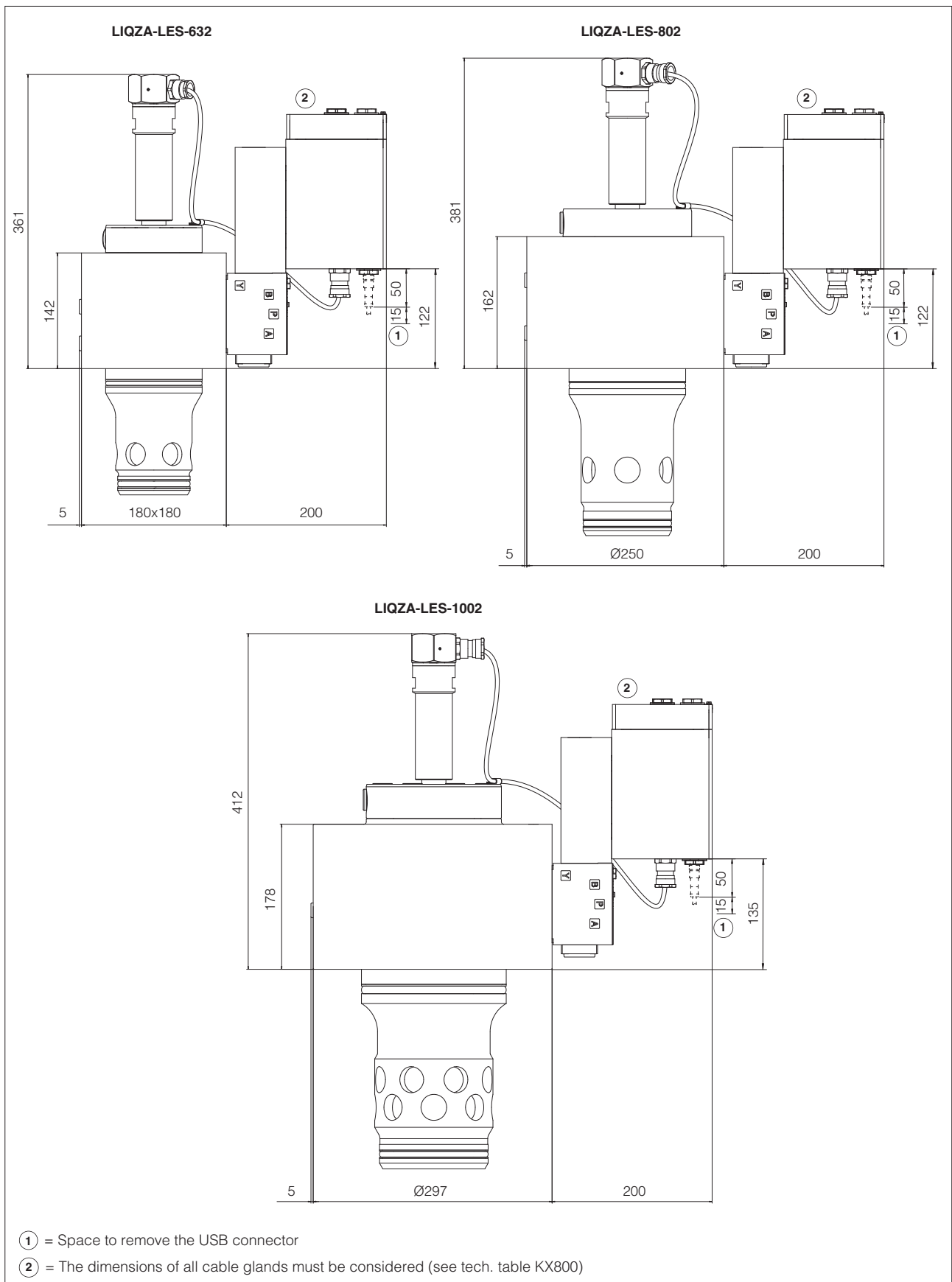
20 INSTALLATION DIMENSIONS [mm]



① = Space to remove the USB connector

② = The dimensions of all cable glands must be considered (see tech. table KX800)

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



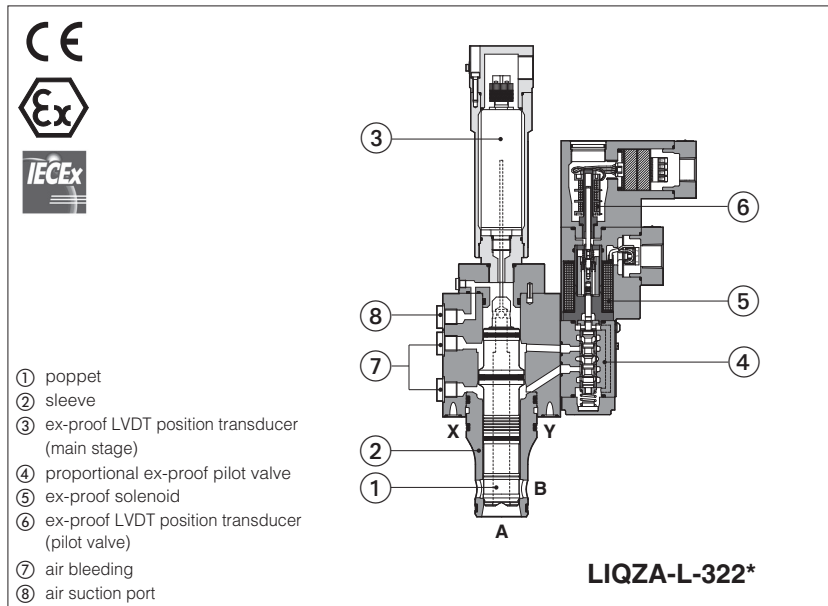
Note: for mounting surface and cavity dimensions, see table P006

21 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P006	Mounting surfaces and cavities for cartridge valves
GS500	Programming tools		

Ex-proof proportional 2-way cartridges high performance

piloted, with two LVDT transducers - ATEX and IECEx



LIQZA-L

Ex-proof digital proportional 2-way cartridges, high performance with two LVDT position transducers (pilot valve and main stage) for best accuracy in not compensated flow regulations.

They are equipped with ex-proof proportional solenoid and LVDT transducers certified for safe operations in hazardous environments with potentially explosive atmosphere.

- Multicertification **ATEX** and **IECEx** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)

The flameproof enclosure of solenoid and transducers prevent the propagation of accidental internal sparks or fire to the external environment.

They are designed to limit the surface temperature within the classified limits.

Size: **25 ÷ 100** - ISO 7368

Max flow: **1200 ÷ 16000 l/min**

Max pressure: **420 bar**

1 MODEL CODE

LIQZA	/	*	-	L	-	25	2	/	L4	/	M	/	*	/	*
<p>Ex-proof proportional cartridge</p> <p>Certification: Multicertification ATEX, IECEx: - = omit for Group II 2G M = Group I (mining)</p> <p>L = with two LVDT transducers</p> <p>Valve size and nominal flow (l/min) at Δp 5 bar: 25 = 500 32 = 800 40 = 1200 50 = 2000 63 = 3000 80 = 4500 100 = 7200</p>															
<p>Seals material, see section 8:</p> <p>- = NBR PE = FKM BT = HNBR</p> <p>Solenoid and transducers (main stage and pilot valve) threaded connection for cable gland fitting: GK = GK-1/2" (1) M = M20x1,5 NPT = 1/2" NPT</p> <p>Poppet type, regulating characteristics:</p> <p>L4 = linear </p> <p>Configuration: 2 = 2 way</p> <p>functional symbol </p> <p>simplified symbol </p>															

(1) Approved only for the Italian market

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves. Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-LEB-* /A	E-BM-LES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	GS230	GS240

3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤ 0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 9 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Size	25	32	40	50	63	80	100
Max regulated flow [l/min]							
Δp A-B at Δp = 5 bar	500	800	1200	2000	3000	4500	7200
at Δp = 10 bar	700	1100	1700	2800	4250	6350	10200
Max permissible flow	1200	1800	2500	4000	6000	10000	16000
Max pressure [bar]	Ports A, B = 420 X = 350 Y ≤ 10						
Nominal flow of pilot valve at Δp = 70 bar [l/min]	8	20	40	40	100	100	100
Leakage of pilot valve at P = 100 bar [l/min]	0,2	0,3	0,7	0,7	1	1	1
Piloting pressure [bar]	min: 40% of system pressure max 350 recommended 140 ÷ 160						
Piloting volume [cm³]	2,2	7,0	9,4	17,7	32,5	39,5	49,5
Piloting flow (1) [l/min]	5,3	14	19	35,5	56	60	60
Response time 0 ÷ 100% step signal (2) [ms]	≤ 30	≤ 32	≤ 35	≤ 35	≤ 40	≤ 45	≤ 55
Hysteresis [% of the max regulation]	≤ 0,1						
Repeatability [% of the max regulation]	± 0,1						
Thermal drift	zero point displacement < 1% at ΔT = 40°C						

(1) 0÷100% step signal

(2) With pilot pressure = 140 bar

5 ELECTRICAL CHARACTERISTICS

Max. power	35W
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 with relevant cable gland	IP66/67 to DIN EN60529
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

6 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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	HFDR, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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



WARNING

The loss of the pilot pressure causes the undefined position of the main poppet.

The sudden interruption of the power supply during the valve operation causes the immediate shut-off of the main poppet.

This could cause pressure surges in the hydraulic system or high decelerations which may lead to machine damages.

7 CERTIFICATION DATA

Valve type	LIQZA		LIQZA/M	LIQZA, LIQZA/M
Component type	Pilot solenoid and		LVDT transducer	LVDT main stage transducer
Certifications	Multicertification Group II ATEX IECEx		Multicertification Group I ATEX IECEx	Multicertification Group I and II ATEX IECEx
Solenoid certified code	OZA-T		OZAM-T	ETHA-15
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	ATEX: TUV IT 16 ATEX 053X IECEX: IECEX TPS 16.0003X
Method of protection	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T85°C/T200°C Db 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • ATEX Ex II 2G Ex db IIC T6 Gb Ex II 2D Ex tb IIIC T85°C Db Ex I M2 Ex db IMb • IECEx Ex db IIC T6 Gb Ex tb IIIC T85°C Db Ex db IMb
Temperature class	T4	T3	-	T6
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 85 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +70 °C (3)
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31			IEC 60079-0 IEC 60079-1 IEC 60079-31
Cable entrance: threaded connection			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -40°C, select **/BT** in the model code

(3) For Group I (mining) the temperaturerange is -20°C ÷ +70°C

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

8 EX PROOF SOLENOIDS AND LVDT TRANSDUCER WIRING

Pilot valve solenoid and LVDT transducer

n°8 M4x20
locking torque 4Nm

- ① solenoid cover with threaded connection for cable gland fitting
- ② transducer cover with threaded connection for cable gland fitting
- ③ solenoid terminal board for cables wiring
- ④ transducer terminal board for cables wiring
- ⑤ screw terminal for additional equipotential grounding

Solenoid wiring

	1 = Coil	PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
	2 = GND	
	3 = Coil	

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

LVDT main stage transducer

n°5 M4x20
locking torque 4Nm

- ① transducer cover with threaded connection for cable gland fitting
- ② transducer terminal board for cables wiring
- ③ ex-proof protection for LVDT transducer
- ④ LVDT transducer
- ⑤ screw terminal for additional equipotential grounding

Transducer wiring - view from X

1	= Do not connect
2	= Supply +15 V
3	= GND
4	= Output signal
5	= Supply -15 V

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ²
Main LVDT transducer: section of cable connection wires = 1 mm ²	section of external ground wire = 4 mm ²

9.1 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]		
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II	LVDT main stage
40 °C	-	T4	150 °C	135 °C	-	90 °C	-
60 °C	-	-	150 °C	-	110 °C	-	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C	90°C

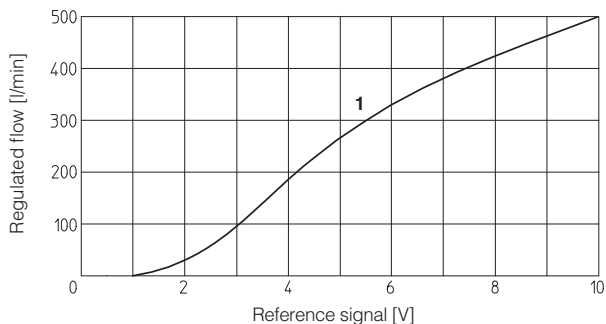
10 CABLE GLANDS

Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **KX800**

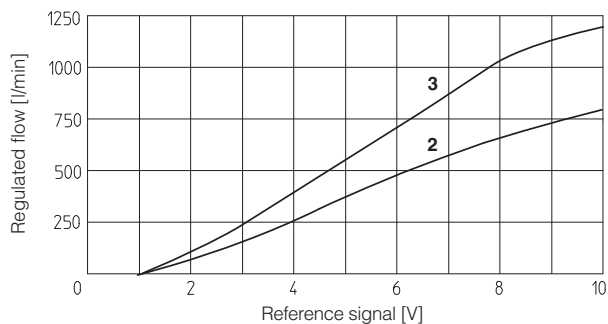
Note: a Loctite sealant type 545, should be used on the cable gland entry threads

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

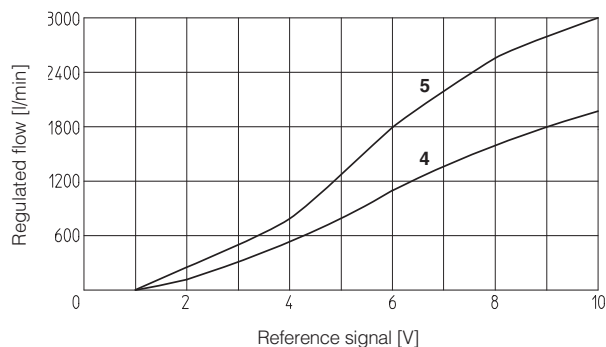
11.1 Regulation diagrams (values measured at Δp 5 bar)



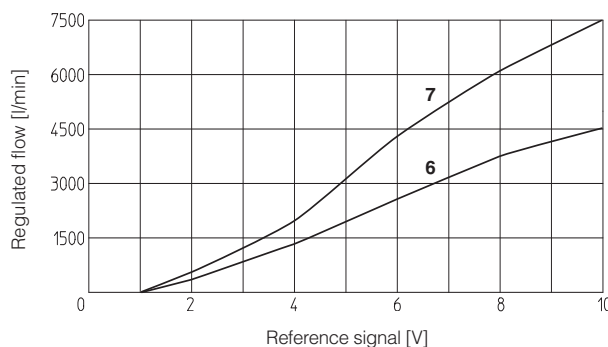
1 = LIQZA-L-25*



2 = LIQZA-L-32* 3 = LIQZA-L-40*



4 = LIQZA-L-50* 5 = LIQZA-L-63*



6 = LIQZA-L-80* 7 = LIQZA-L-100*

12 AIR BLEEDING

Size 25

Sizes 32, 40

Sizes 50 to 100

1 Air suction port (SP):
 N° 1 plug G1/4" for sizes 25 to 50
 N° 1 plug G1/2" for sizes 63 and 100

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

2 Air bleeding (MA, MB):
 N° 2 plugs G1/4"

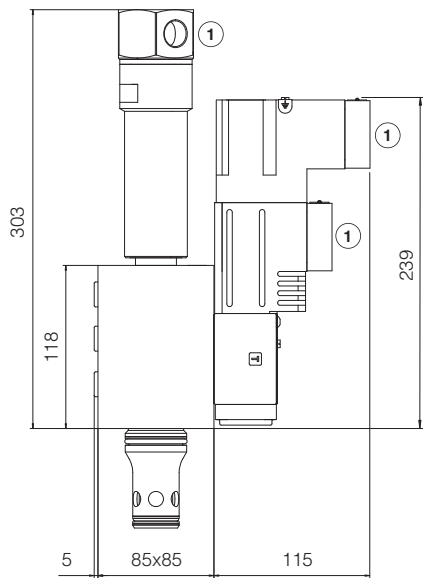
At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.
 Operate the valve for few seconds at low pressure and then lock the plugs.

13 FASTENING BOLTS AND VALVE MASS

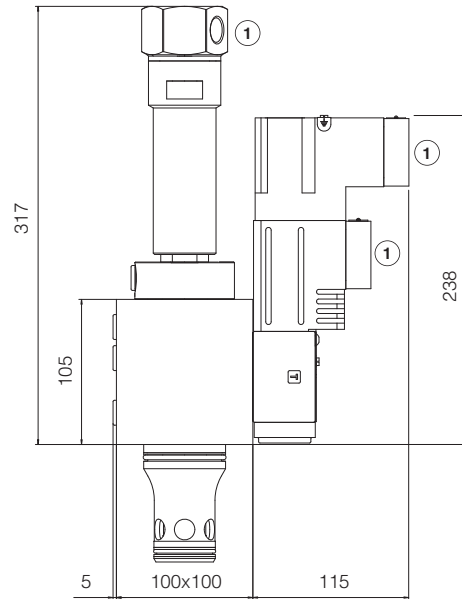
Type	Size	Fastening bolts (supplied with the valve)	Mass [kg]
LIQZA	25	4 socket head screws M12x100 class 12.9 Tightening torque = 125 Nm	12
	32	4 socket head screws M16x60 class 12.9 Tightening torque = 300 Nm	14,8
	40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	20,5
	50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	22,8
	63	4 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	48,1
	80	8 socket head screws M24x80 class 12.9 Tightening torque = 1000 Nm	75,7
	100	8 socket head screws M30x120 class 12.9 Tightening torque = 2100 Nm	127,1

14 INSTALLATION DIMENSIONS [mm]

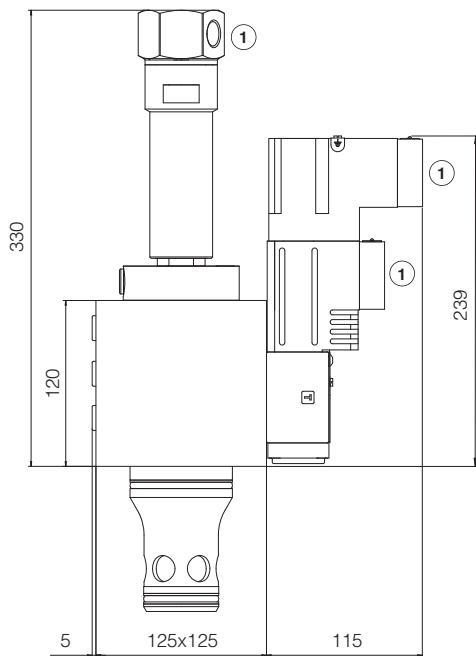
LIQZA-L-252



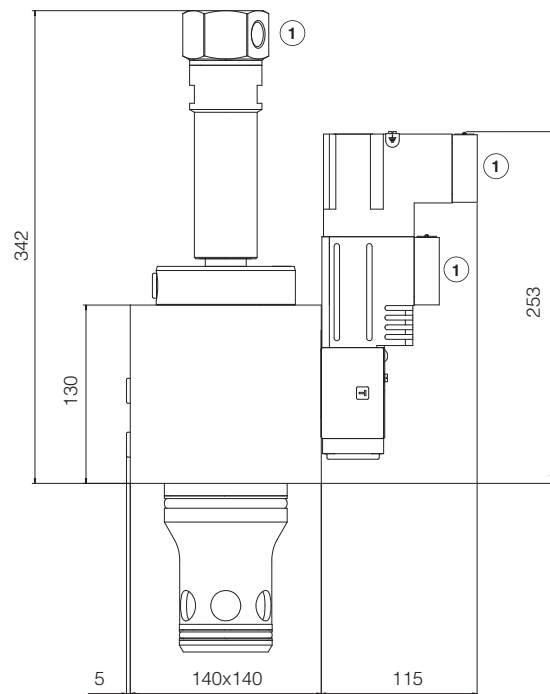
LIQZA-L-322



LIQZA-L-402

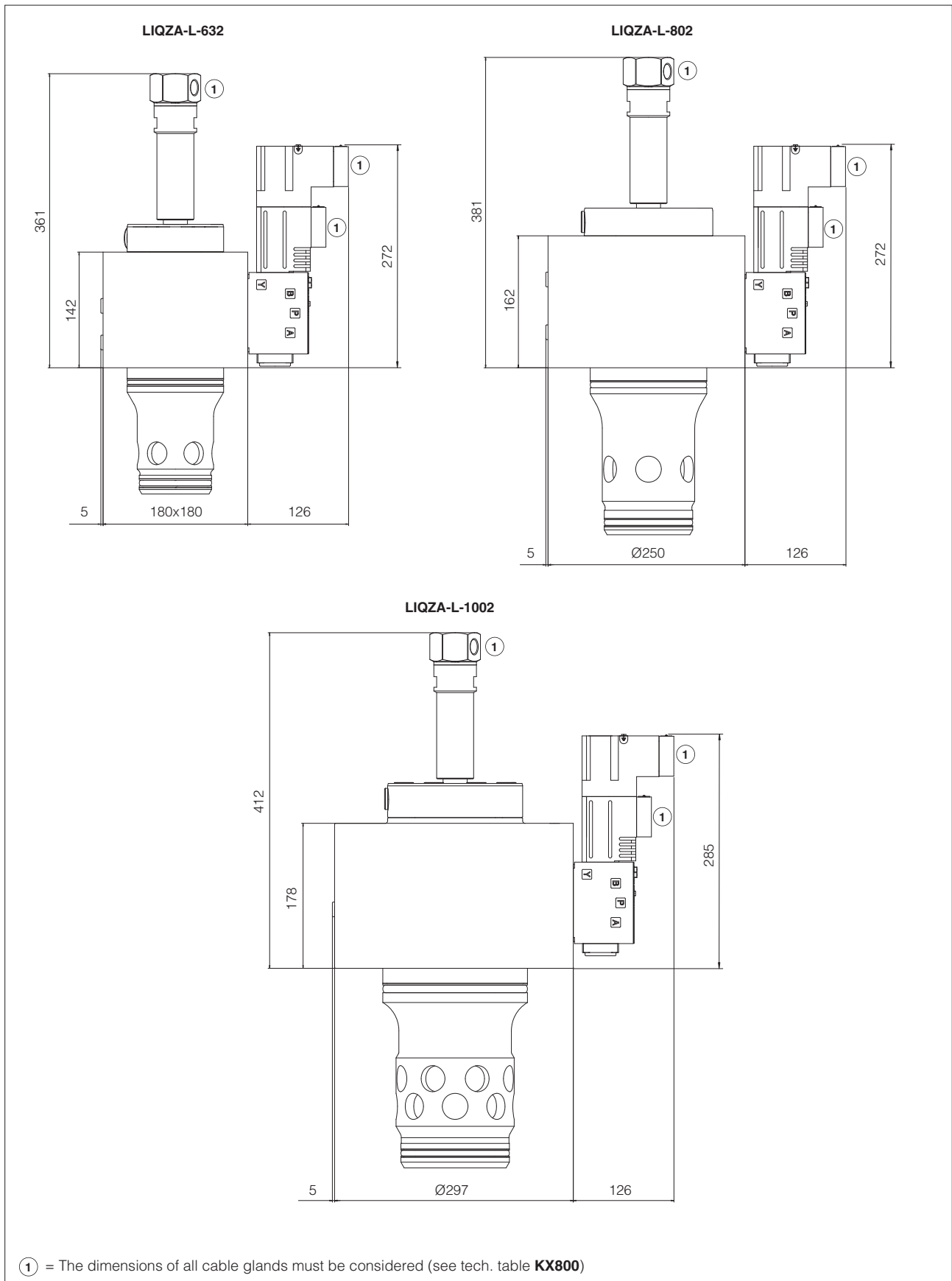


LIQZA-L-502



① = The dimensions of all cable glands must be considered (see tech. table **KX800**)

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



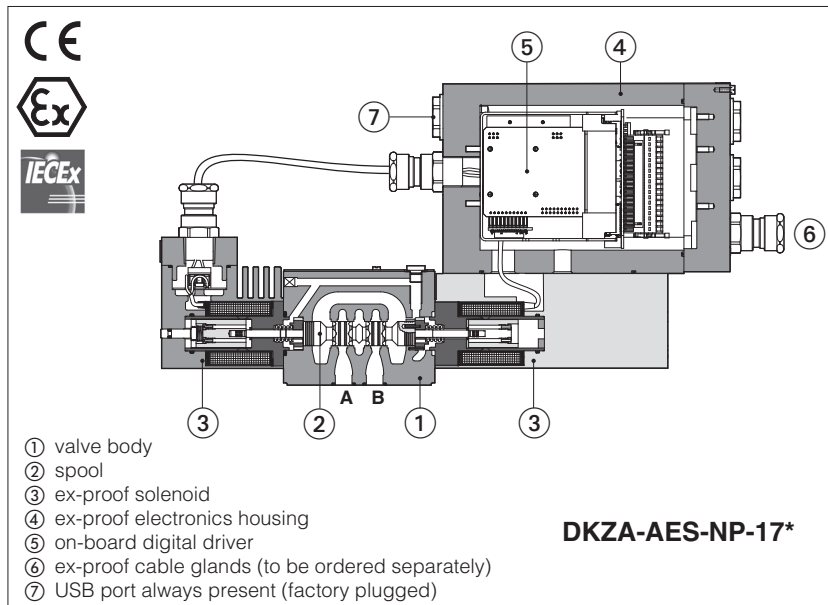
Note: for mounting surface and cavity dimensions, see table P006

15 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	KX800	Cable glands for ex-proof valves
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	P006	Mounting surfaces and cavities for cartridge valves
FX900	Operating and maintenance information for ex-proof proportional valves		

Ex-proof digital proportional directional valves

direct, with on-board driver, without transducer and with positive spool overlap **ATEX and IECEx**



DHZA-AES, DKZA-AES

Ex-proof digital proportional valves direct, without position transducer and with positive spool overlap, for open loop directional controls and not compensated flow regulations.

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

● **Multicertification ATEX and IECEx**

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.

DHZA:

Size: **06** -ISO 4401

Max flow: **60 l/min**

Max pressure: **350 bar**

DKZA:

Size: **10** -ISO 4401

Max flow: **120 l/min**

Max pressure: **315 bar**

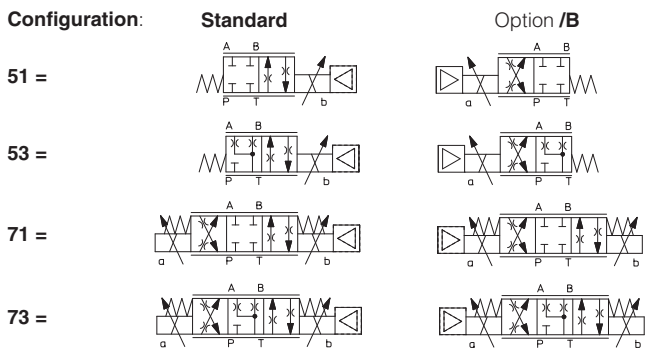
1 MODEL CODE

DHZA	-	AES	-	NP	-	0	71	-	L	5	/	M	/	*	/	*
<p>Ex-proof proportional directional valves, direct DHZA = size 06 DKZA = size 10</p> <p>AES = on-board driver, without transducer</p> <p>Fieldbus interfaces, USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p>																
<p style="text-align: right;">Seals material, see section 8: - = NBR PE = FKM BT = HNBR</p> <p style="text-align: right;">Series number</p>																

Hydraulic options (1):
B = solenoid with integral digital electronics at side of port A (2)
Y = external drain

Electronic options (1):
C = current feedback for pressure transducer 4 ÷ 20 mA, only for **W** (omit for std voltage 0 ÷ 10 V_{DC})
I = current reference input 4 ÷ 20 mA (omit for std voltage ±10 V_{DC})
W = power limitation function

Cable entrance threaded connection:
M = M20x1,5

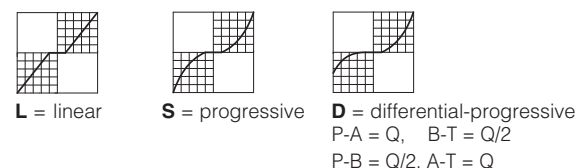


Spool size: 14 (L) 1 (L) 2 (S) 3 (L,S,D) 5 (L,S,D)

DHZA =	1	4,5	8	18	28
DKZA =	-	-	-	45	60

Nominal flow (l/min) at Δp 10 bar P-T

Spool type, regulating characteristics:



(1) For possible combined options, see section 14

(2) In standard configuration the solenoid with on-board digital driver and position transducer are at side port B

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC support: NP (USB) 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)

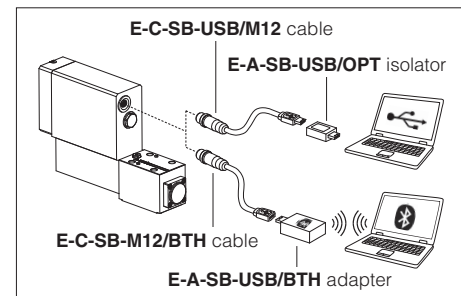


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



4 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.

5 GENERAL CHARACTERISTICS

Assembly position	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years; 150 years only for RZMA-010, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 8 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DHZA						DKZA		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y); Y = 10						ports P, A, B = 315; T = 210 (250 with external drain /Y); Y = 10		
Configuration	51, 53, 71, 73					70	51, 53, 71, 73		70
Spool type	L14	L1	S2	L3,S3,D3	L5,S5,D5	L5	L3,S3,D3	L5,S5,D5	L3,L5,D5
Nominal flow [l/min]									
Δp P-T	Δp= 10 bar	1	4,5	8	18	28	45	60	
	Δp= 30 bar	1,7	8	14	30	50	80	100	
Max permissible flow	2,6	12	21	40	60	60	90	120	
Δp max P-T [bar]	70	70	70	50	50	50	40	40	
Response time [ms] (1)	≤ 35						≤ 45		
Leakage [cm³/min]	<30 (at P = 100 bar); <135 (at P = 350 bar)						<80 (at P = 100 bar); <600 (at P = 315 bar)		
Hysteresis	≤ 5 [% of max regulation]								
Repeatability	± 1 [% of max regulation]								

(1) 0 ÷ 100% step signal


7 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ Input impedance: Ri = 500 Ω	
Insulation class	H (180°) Due to the occuring 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)			
Pressure transducer power supply (only /W option)	+24Vdc @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, current control monitoring, power supplies level, pressure transducer failure (/W option)			
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) have 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

8 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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


9 CERTIFICATION DATA

Valve type	DHZA, DKZA				
Certifications	Multicertification Group II ATEX IECEx				
Solenoid certified code	OZA-AES				
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X		
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db		
Temperature class	Single solenoid valve	T6	-	T5	-
	Double solenoid valve	-	T4	-	T3
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 100 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C		-40 ÷ +55 °C		-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31		IEC 60079-0 IEC 60079-1	IEC 60079-31
Cable entrance: threaded connection	M = M20x1,5				

(1) The type examiner certificates can be downloaded from

(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.**

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

10.1 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

11 CABLE GLANDS

Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX600**

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

12 HYDRAULIC OPTIONS

B = Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see 15.1

Y = Option /Y is mandatory if the pressure in port T exceeds 210 bar

13 ELECTRONIC OPTIONS

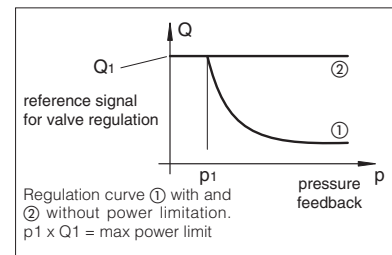
I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} or ±20 mA. It is normally used in case of long distance between the machine control unit and 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.

C = Only in combination with option /W
It is available to connect pressure transducer with 4 ÷ 20 mA current output signal, instead of the standard 0 ÷ 10V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} or ±20 mA.

W = Only for valves coupled with pressure compensator type HC-011 or KC-011 (see tech table D150). It provides the hydraulic power limitation function. The driver receives the flow reference signal by the analog input INPUT+ and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input TR. When the actual requested hydraulic power **p x Q** (TR x INPUT+) reaches the max power limit (p₁xQ₁), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve's regulated flow:

$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [TR]}} ; \text{Flow Reference [INPUT+]} \right)$$

Hydraulic Power Limitation - option /W

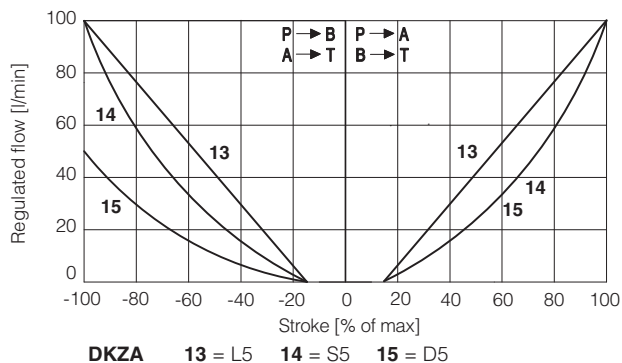
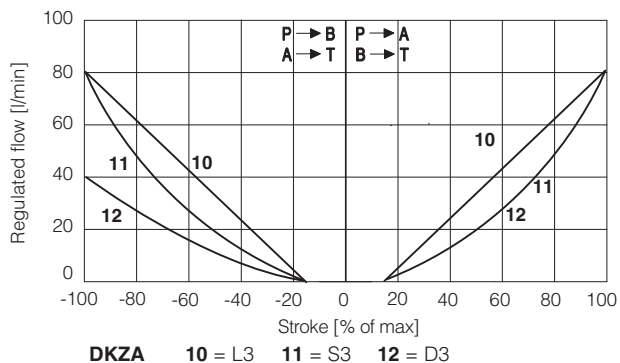
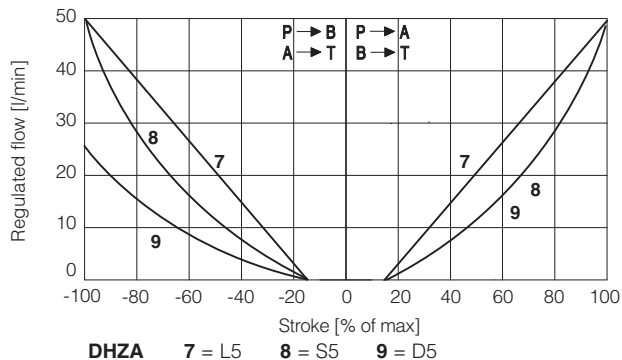
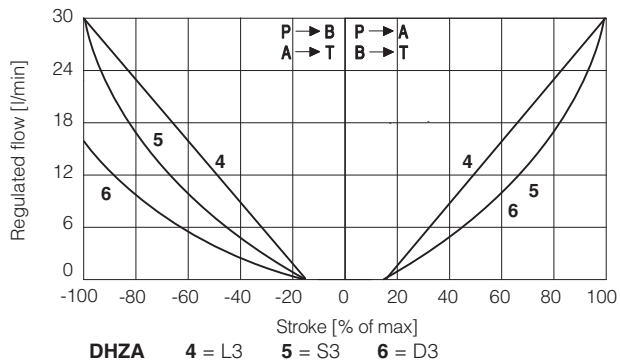
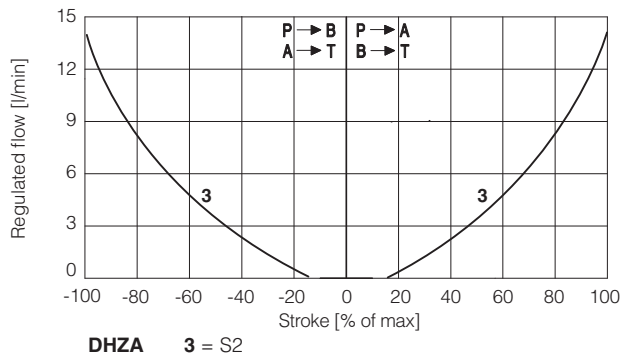
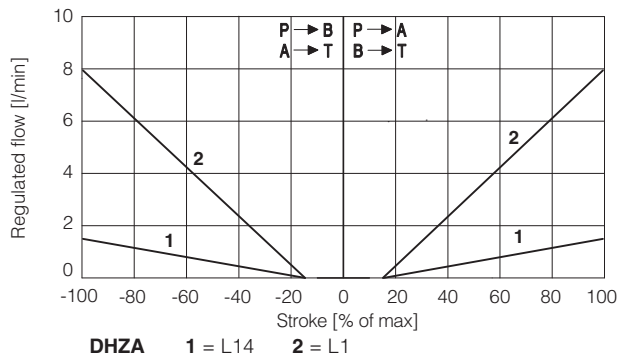


14 POSSIBLE COMBINED OPTIONS

/BI, /BW, /BY, /IW, /IY, /WY, /BIW, /BIY, /BWY, /IWY, /CWB, /CWY, /BIWY, /CWBWY

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

15.1 Regulation diagrams - values measure at Δp 30 bar P-T




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, EN-982).

16.1 Power supply (V+ and V0)

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

 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 VLO)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

16.3 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 $\pm 10\text{ VDC}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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 $0 \div 24\text{VDC}$.

16.4 Monitor output signals (MONITOR and MONITOR2)

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 $\pm 5\text{ VDC}$ ($1\text{V} = 1\text{A}$).

Output signal can be reconfigured via software, within a maximum range of $\pm 5\text{ VDC}$.

Option /W

The driver generates a second analog output signal (MONITOR2) proportional to the actual system pressure.

The output maximum range is $\pm 5\text{ VDC}$; default setting is $0 \div 5\text{ VDC}$

16.5 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.

16.6 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for $4 \div 20\text{ mA}$ input, spool position transducer cable broken, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.

Fault status is not affected by the Enable input signal. Fault output signal can be used as digital output by software selection.

16.7 Remote Pressure Transducer Input signal (TR) - only for /W option

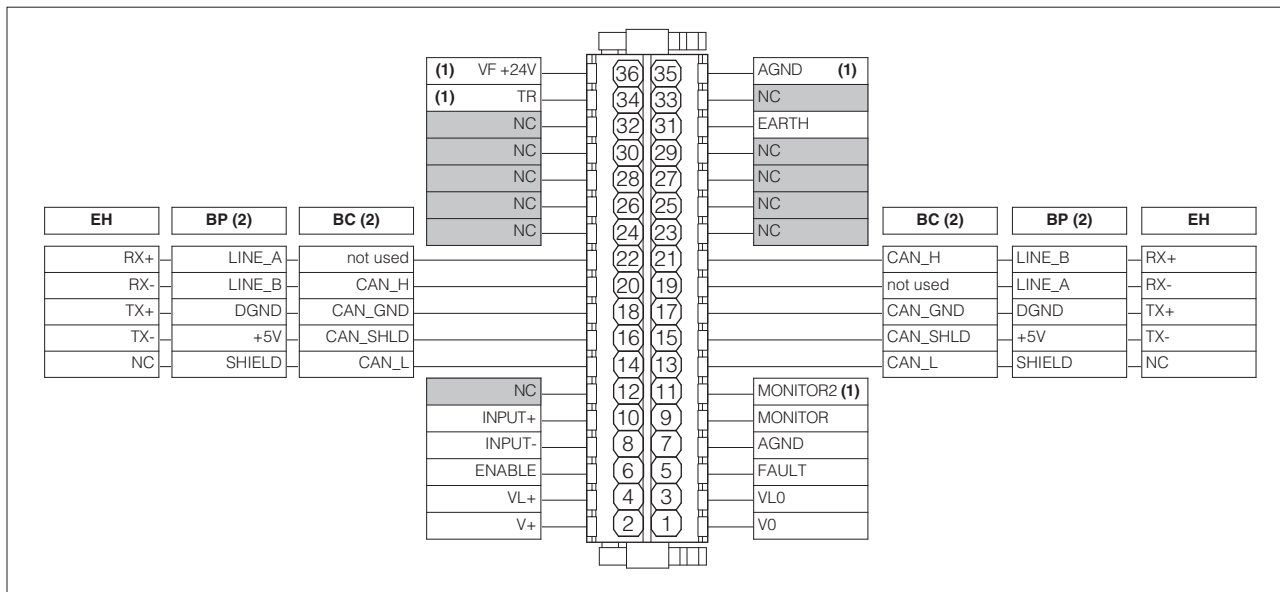
Analog pressure transducers can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are $0 \div 10\text{ VDC}$ for standard and $4 \div 20\text{ mA}$ for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

Note: transducer feedback can be read as a digital information through fieldbus communication - software selectable.

17 TERMINAL BOARD OVERVIEW



(1) Connections available only for /W option

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

18 ELECTRONIC CONNECTIONS

18.1 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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
	11	MONITOR2	2nd monitor output signal: ± 5 Vdc maximum range, referred to AGND (1) Default is: $0 \div 5$ Vdc	Output - analog signal Software selectable
31	EARTH	Internally connected to driver housing		

(1) 2nd monitor output signal is available only for /W option

18.2 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 +

Driver view
(female)

18.3 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

18.4 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)

18.5 EH fieldbus execution connections

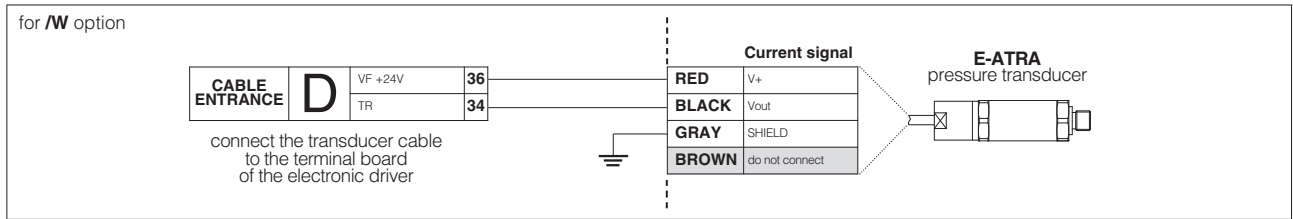
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

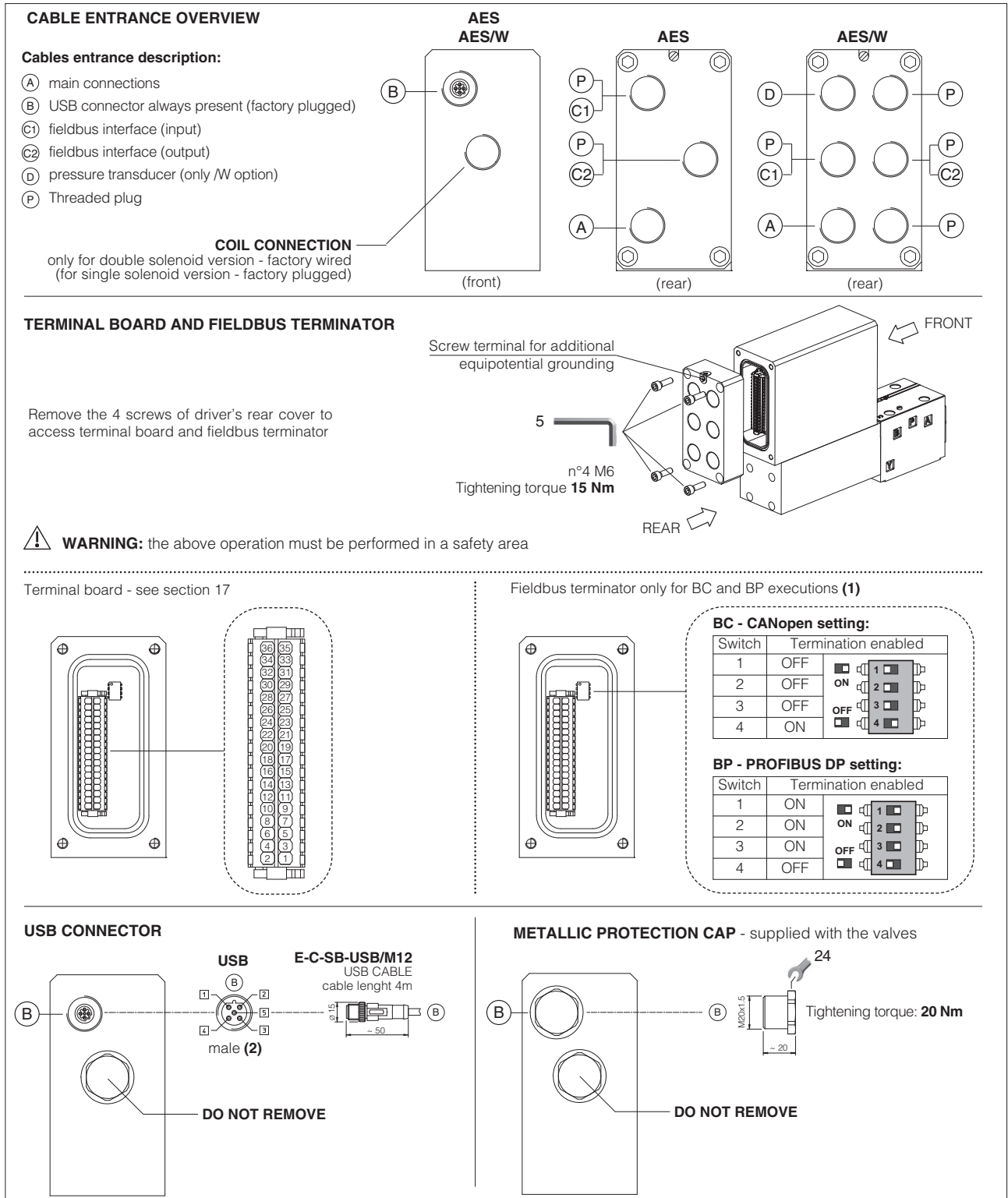
18.6 Remote pressure transducer connector - only for /W option

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	Voltage	Current
D	34	TR	Signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect
	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table **GX800**

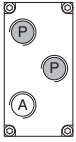
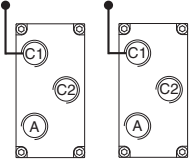
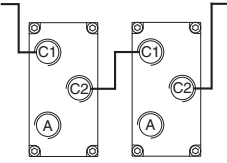


19 CONNECTIONS LAYOUT

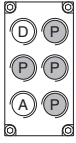
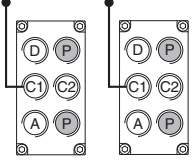
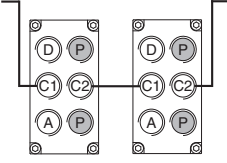


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

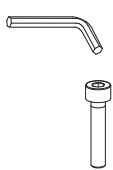

19.1 Cable glands and threaded plug for AES - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug 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

19.2 Cable glands and threaded plug for AES with /W option - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D A	none	none		Cable entrance P are factory plugged Cable entrance A, D are open for costumers
BC, BP, EH "via stub" connection	3	D C1 A	1	C2		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers
BC, BP, EH "daisy chain" connection	4	D C1 - C2 A	none	none		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers

20 FASTENING BOLTS AND SEALS

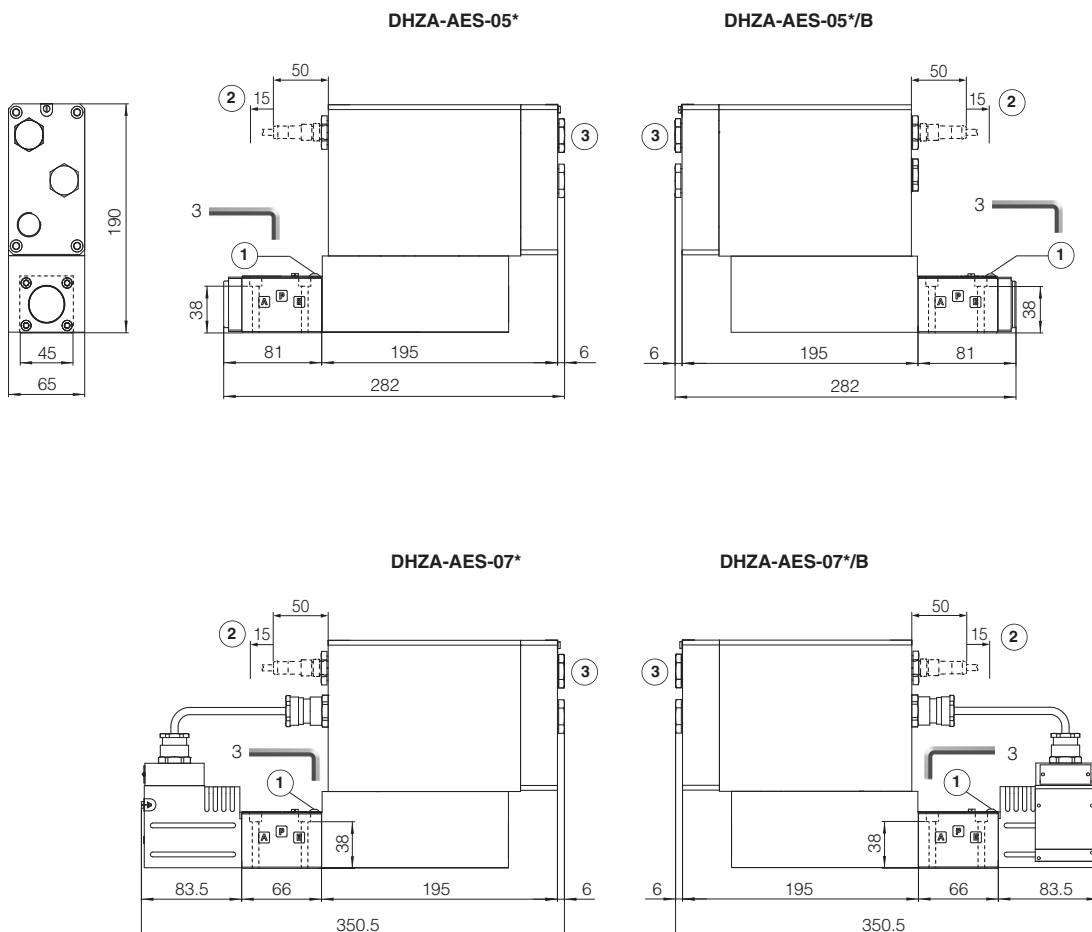
	DHZA	DKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p>
	<p>Seals: 4 OR 108; Diameter of ports A, B, P, T: Ø 7,5 mm (max) 1 OR 2025 Diameter of port Y: Ø = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B, P, T: Ø 11,2 mm (max) 1 OR 108 Diameter of port Y: Ø = 5 mm (only for /Y option)</p>

ISO 4401: 2005

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

(for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DHZA-AES-05	8,2
DHZA-AES-07	9,9



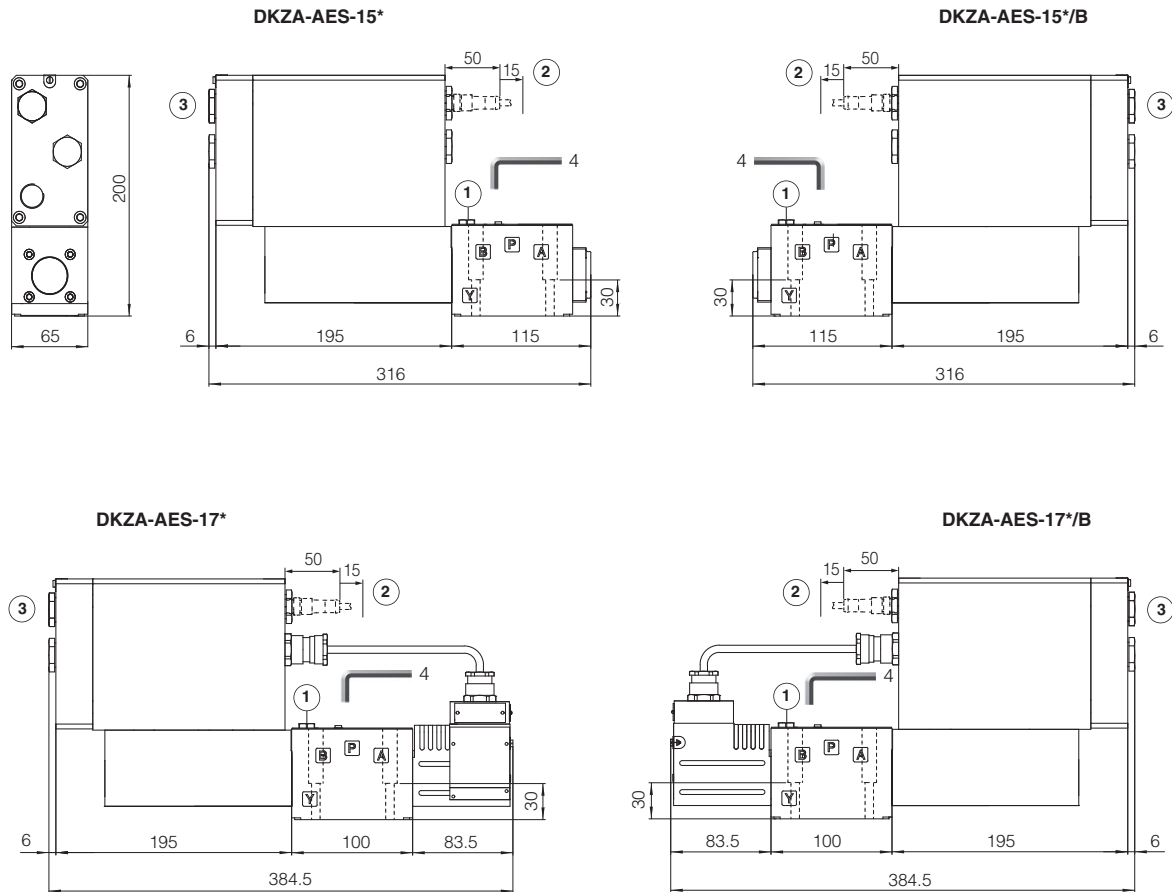
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

22 INSTALLATION DIMENSIONS FOR DKZA [mm]

ISO 4401: 2005

Mounting surface: 4401-05-04-0-05 (see table P005)
 (for Y surface: 4401-05-05-0-05 without port X)

Mass [kg]	
DKZA-AES-15	10
DKZA-AES-17	11,7



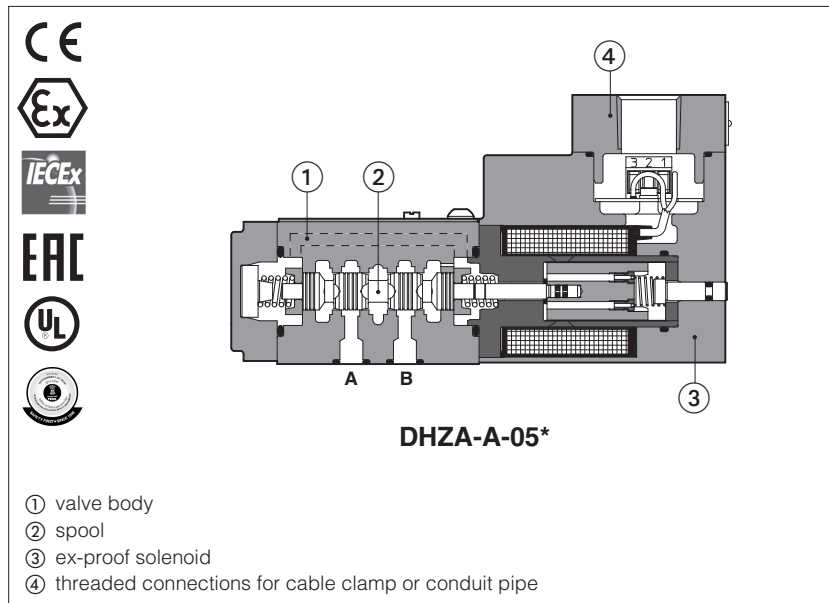
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

23 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GX800	Ex-proof pressure transducer type E-ATRA-7
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		
GS510	Fieldbus		

Ex-proof proportional directional valves

direct, without transducer and with positive spool overlap - **ATEX, IECEx, EAC, PESO** or **cULus**



DHZA-A, DKZA-A

Ex-proof proportional valves direct, without position transducer and with positive spool overlap, for open loop directional controls and not compensated flow regulations. They are equipped with ex-proof proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

DHZA:	DKZA:
Size: 06 - ISO 4401	Size: 10 - ISO 4401
Max flow: 60 l/min	Max flow: 120 l/min
Max pressure: 350 bar	Max pressure: 315 bar

1 MODEL CODE

<p>DHZA</p> <p>Ex-proof proportional directional valves, direct</p> <p>DHZA = size 06 DKZA = size 10</p> <p>Certification type: Multicertification ATEX, IECEx, EAC, PESO: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size ISO 4401: 0 = 06 1 = 10</p> <p>Configuration:</p> <p>Standard</p> <p>51 = </p> <p>53 = </p> <p>71 = </p> <p>73 = </p> <p>Option /B</p> <p></p>	<p>51 - L</p> <p>5 - M</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (5) M = M20x1,5- not for cULus NPT = 1/2" NPT</p> <p>Spool size:</p> <table border="0"> <tr> <td>14 (L)</td> <td>1 (L)</td> <td>2 (S)</td> <td>3 (L,S,D)</td> <td>5 (L,S,D)</td> </tr> <tr> <td>DHZA = 1</td> <td>4,5</td> <td>8</td> <td>18</td> <td>28</td> </tr> <tr> <td>DKZA = -</td> <td>-</td> <td>-</td> <td>45</td> <td>60</td> </tr> </table> <p>Nominal flow (l/min) at Δp 10 bar P-T</p> <p>Spool type - regulating characteristics:</p> <p>L = linear S = progressive D = differential-progressive</p> <p></p> <p>P-A = Q, B-T = Q/2 P-B = Q/2, A-T = Q</p>	14 (L)	1 (L)	2 (S)	3 (L,S,D)	5 (L,S,D)	DHZA = 1	4,5	8	18	28	DKZA = -	-	-	45	60	<p>Seals material, see section 6 :</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = optional coil for 24 Vdc low current drivers</p> <p>Options (3): B = solenoid at side of port A MV = vertical hand lever (only for DHZA) (4) O = horizontal cable entrance (2) WP = manual override protected by metallic cap Y = external drain</p>	<p>Series number</p> <p>Seals material, see section 6 :</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = optional coil for 24 Vdc low current drivers</p> <p>Options (3): B = solenoid at side of port A MV = vertical hand lever (only for DHZA) (4) O = horizontal cable entrance (2) WP = manual override protected by metallic cap Y = external drain</p>
14 (L)	1 (L)	2 (S)	3 (L,S,D)	5 (L,S,D)														
DHZA = 1	4,5	8	18	28														
DKZA = -	-	-	45	60														

- (1)** The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from
- (2)** Not for multicertification **M** group I (mining) **(3)** Possible combined options: all combination are available, with exception of MV + WP
- (4)** MV option is available only for **DHZA** with spool type **S3, S5, D3, D5, L3, L5**, not available in combination with **WP** option
- (5)** Approved only for Italian market

The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

3 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DHZA						DKZA		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y); Y = 10						ports P, A, B = 315; T = 210 (250 with external drain /Y); Y = 10		
Configuration	51, 53, 71, 73					70	51, 53, 71, 73		70
Spool type	L14	L1	S2	L3,S3,D3	L5,S5,D5	L5	L3,S3,D3	L5,S5,D5	L3,L5,D5
Nominal flow [l/min]									
Δp P-T	Δp= 10 bar	1	4,5	8	18	28	45		60
	Δp= 30 bar	1,7	8	14	30	50	80		100
Max permissible flow	2,6	12	21	40	60	90		120	
Δp max P-T [bar]	70	70	70	50	50	50	40		40
Response time (1) [ms]	≤ 35						≤ 45		
Leakage [cm³/min]	<30 (at p = 100 bar); <135 (at p = 350 bar)						<80 (at p = 100 bar); <600 (at p = 315 bar)		
Hysteresis	≤ 5 [% of max regulation]								
Repeatability	± 1 [% of max regulation]								

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 3

(1) 0-100% step signal

5 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

6 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLDP	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DHZA, DKZA		DHZA/M, DKZA/M	DHZA/UL, DKZA/UL	
Certifications	Multicertification Group II ATEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-A		OZAM-A	OZA-A/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEX Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS WIRING

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override
 ⑤ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
2 = GND
3 = Coil

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override

1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1
2 = GND
3 = Coil -

alternative GND screw terminal connected to solenoid housing

⚠ Pay attention to respect the polarity

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> Suitable for use in Class I Division 1, Gas Groups C Armored Marine Shipboard Cable which meets UL 1309 Tinned Stranded Copper Conductors Bronze braided armor Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	90 °C	90 °C
45 °C	-	T4	-	135 °C	-	95 °C
55 °C	-	T3	-	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

10 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

11 OPTIONS

B = Solenoid at side of port A of the main stage

MV = Auxiliary vertical hand levers (only for DHZA)

This option allows to operate the valves in absence of electrical power supply, i.e. during commissioning, maintenance or in case of emergency.

When the valve is electrically operated the hand lever remains stopped in its rest position

The hand lever execution does not affect the performances of the original valves

Total angle stroke	[°deg]	± 28°	Lever actuating force	[N]	1 ÷ 8
Working angle stroke	[°deg]	± 15°	Lever device weight	[g]	880

O = Horizontal cable entrance, to be selected in case of limited vertical space

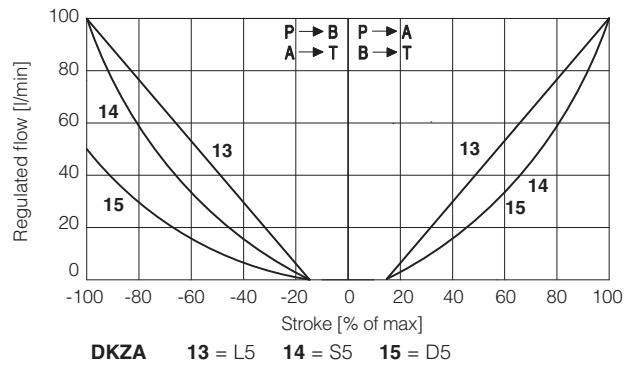
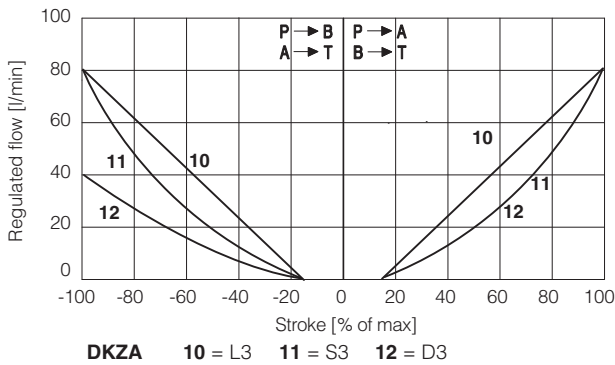
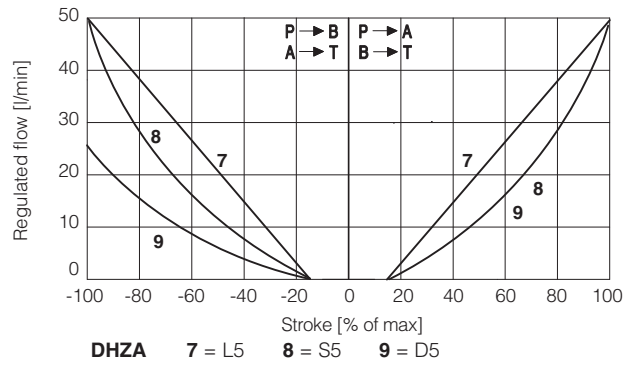
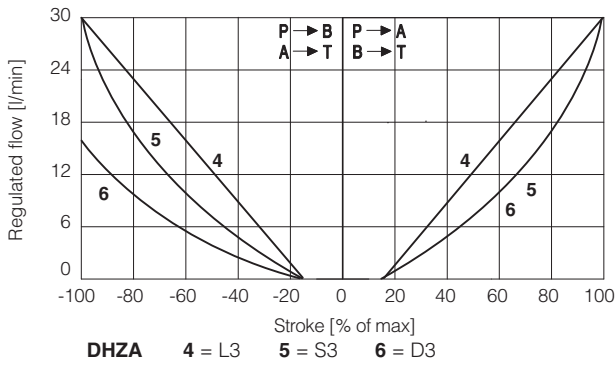
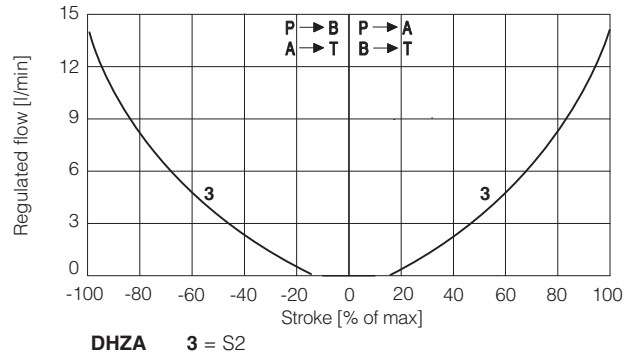
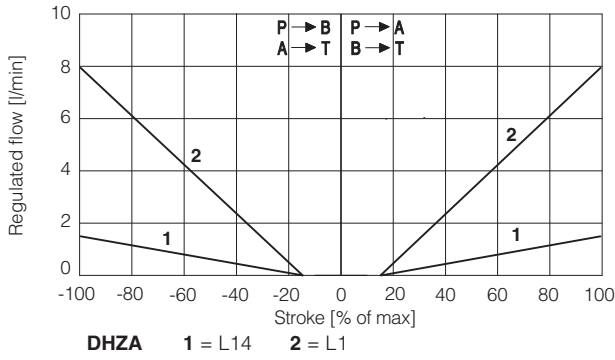
WP = Manual override protect by metallic cap.

Y = External drain, to be selected if the pressure at T port is higher than the max allowed limits

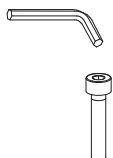

11.1 Possible combined options: all combination are available

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

Regulation diagrams - values measure at Δp 30 bar P-T



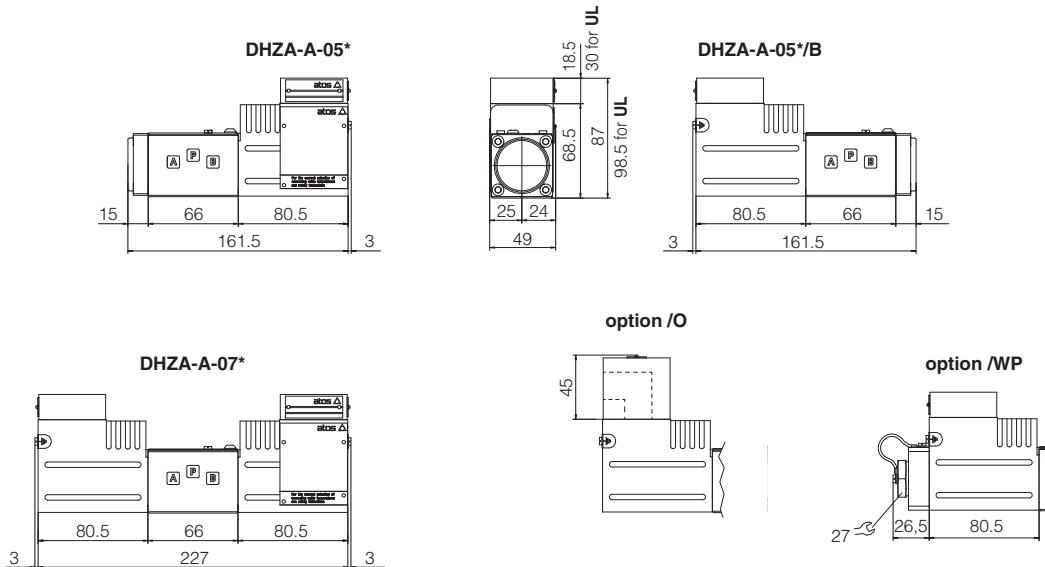
13 FASTENING BOLTS AND SEALS

	DHZA	DKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</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 P, A, B, T: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports P, A, B, T: \varnothing 11,5 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

14 INSTALLATION DIMENSIONS FOR DHZA [mm]

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (for /Y surface: 4401-03-03-0-05 without port X)

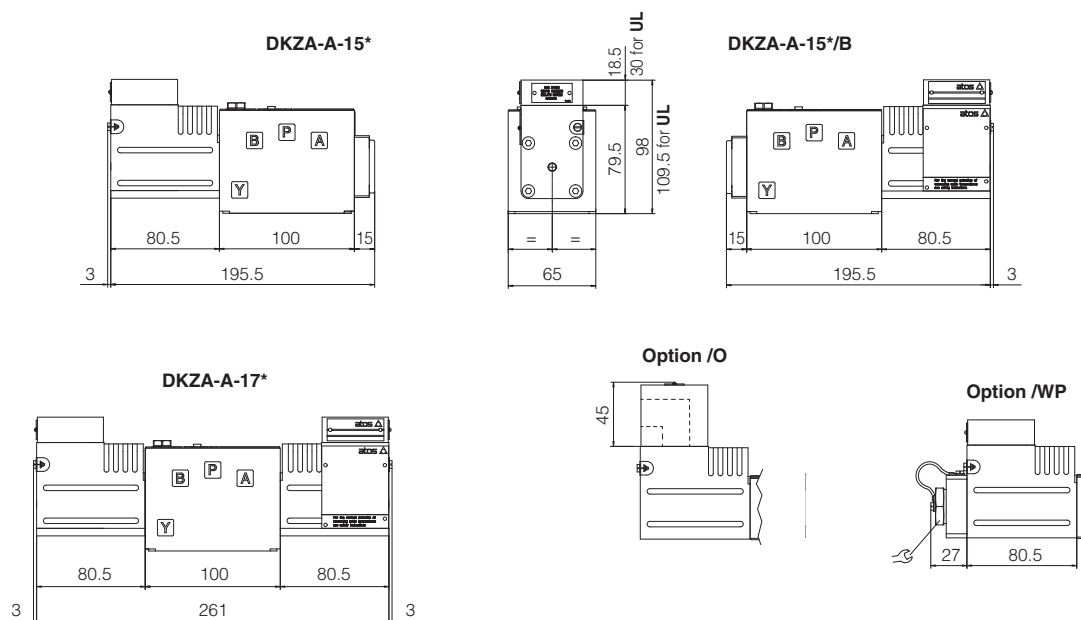
Mass [kg]	
DHZA-A-05	2,65
DHZA-A-07	4,3
Option /O	+0,35
Option /WP	+0,25



15 INSTALLATION DIMENSIONS FOR DKZA [mm]

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-05-04-0-05
 (for /Y surface: 4401-05-05-0-05 without port X)

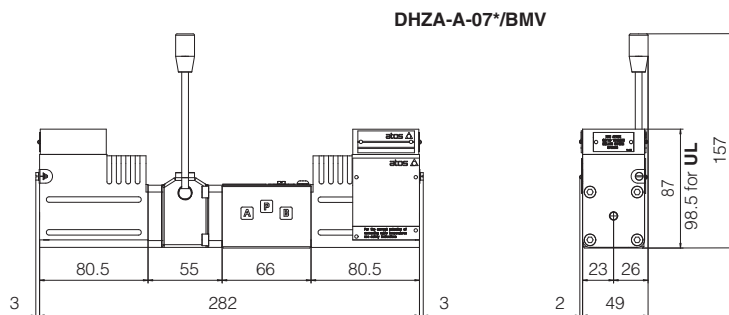
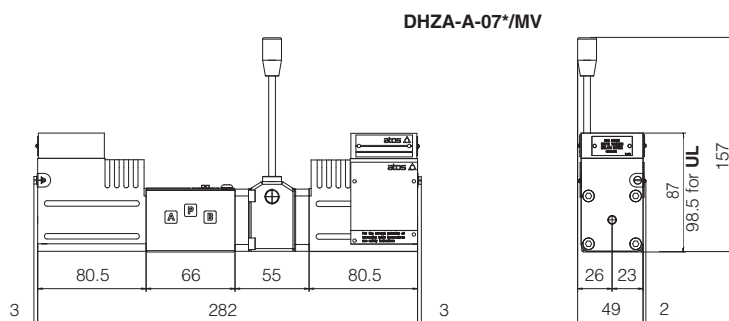
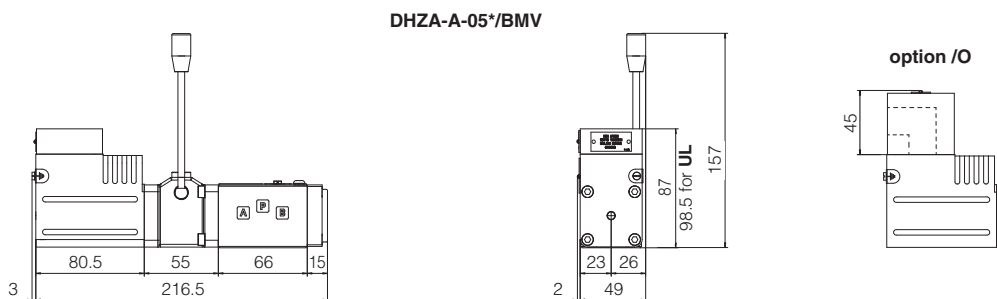
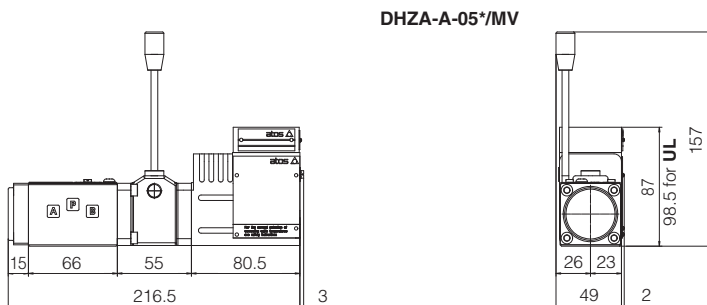
Mass [kg]	
DKZA-A-15	4,8
DKZA-A-17	6,5
Option /O	+0,35
Option /WP	+0,25



16 INSTALLATION DIMENSIONS FOR DHZA WITH OPTION /MV [mm]

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DHZA-A-05	2,9
DHZA-A-07	4,6
Option /O	+0,35

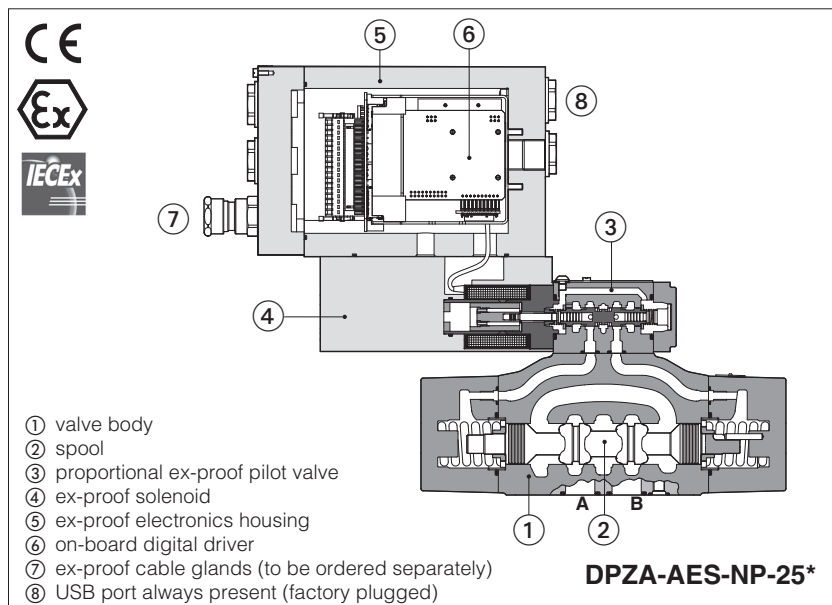


17 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEX, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional directional valves

Piloted, with on-board driver, without position transducer and with positive spool overlap **ATEX and IECEx**



DPZA-AES

Ex-proof digital proportional valves, piloted, without position transducer and with positive spool overlap, for open loop directional controls and not compensated flow regulations.

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

- **Multicertification ATEX and IECEx** 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.

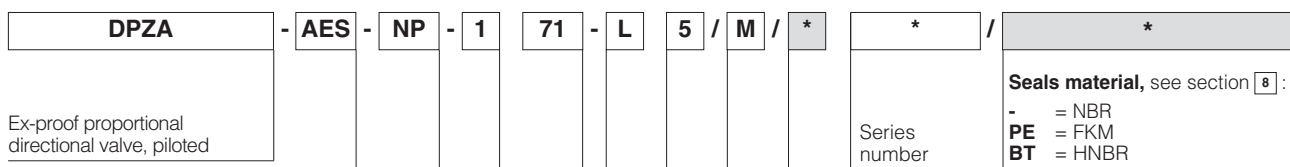
The driver and solenoid are also designed to limit the surface temperature within the classified limits.

Size: 10 ÷ 32 -ISO 4401

Max flow: 180 ÷ 1500 l/min

Max pressure: 350 bar

1 MODEL CODE



Hydraulic options (1):

- B** = solenoid and integral electronics at side of port B of the main stage (side A of pilot valve) **(2)**
- D** = internal drain
- E** = external pilot pressure
- G** = pressure reducing valve for piloting

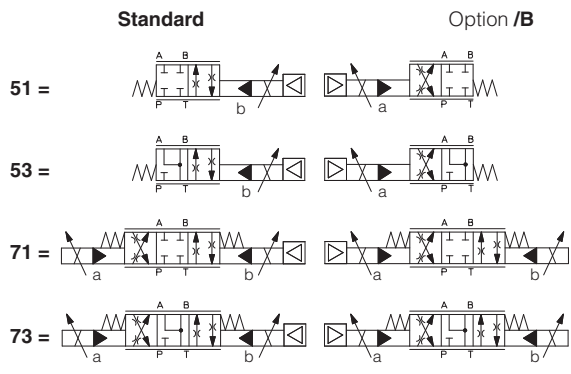
Electronic options (1):

- C** = current feedback for pressure transducer $4 \div 20$ mA, only for **W** (omit for std voltage $0 \div 10$ Vdc)
- I** = current reference input $4 \div 20$ mA (omit for std voltage ± 10 Vdc)
- W** = power limitation function

Cable entrance threaded connection:

M = M20x1,5

Configuration (1):

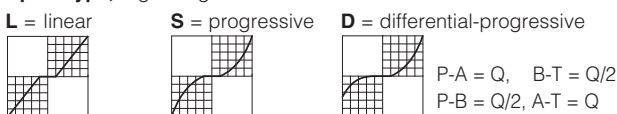


Spool size:

	3 (L,S,D)	5 (L,S,D)
DPZA-1 =	-	100
DPZA-2 =	160	250
DPZA-4 =	-	480
DPZA-6 =	-	640

Nominal flow (l/min) at Δp 10bar P-T

Spool type, regulating characteristics:



(1) For possible combined options, see section 14

(2) In standard configuration the solenoid (config. 51 and 53) and the on-board digital driver are at side A of the main stage (side B of pilot valve)

2 GENERAL NOTES

Atos digital proportionals valves are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **FX900** and in the user manuals included in the E-SW-* programming software.

3 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

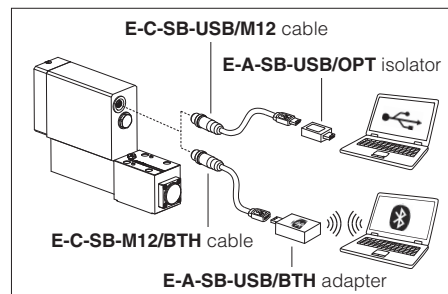
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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



4 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.

5 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 9 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DPZA-*-1	DPZA-*-2	DPZA-*-4	DPZA-*-6		
Pressure limits [bar]	ports P, A, B, X = 350; T = 250 (10 for option /D); Y = 10;					
Spool type	L5, S5, D5	L3, S3, D3	L5, S5, D5			
Nominal flow [l/min]						
Δp P-T	Δp = 10 bar	100	160	250	480	640
	Δp = 30 bar	160	270	430	830	1100
	max permissible flow	180	400	550	900	1500
Δp max P-T [bar]	50	60	60	60	60	60
Piloting pressure [bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 150 bar)					
Piloting volume [cm³]	1,4	3,7	9,0	21,6		
Piloting flow (1) [l/min]	1,7	3,7	6,8	14,4		
Leakage (2) Main stage [l/min]	0,15/0,5	0,2/0,6	0,3/1,0	1,0/3,0		
Response time (1) [ms]	≤ 90	≤ 110	≤ 130	≤ 190		
Hysteresis	≤ 5 [% of max regulation]					
Repeatability	± 1 [% of max regulation]					

(1) 0 ÷ 100 % step signal and pilot pressure 100 bar

(2) at p = 100/350 bar


7 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ Input impedance: Ri = 500 Ω	
Insulation class	H (180°) Due to the occuring 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)			
Pressure transducer power supply (only /W option)	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, current control monitoring, power supplies level, pressure transducer failure (/W option)			
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) have 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

8 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

9 CERTIFICATION DATA

Valve type	DPZA				
Certifications	Multicertification Group II ATEX IECEx				
Solenoid certified code	OZA-AES				
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X		
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx Ex db IIC T6/T5/T4 Gb Ex tb IIIC T85°C/T100°C/T135°C Db		
Temperature class	Single solenoid valve	T6	-	T5	T4
	Double solenoid valve	-	T4	-	T3
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 100 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C		-40 ÷ +55 °C		-40 ÷ +70 °C
Applicable Standards	EN 60079-0 EN 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1	IEC 60079-31	
Cable entrance: threaded connection	M = M20x1,5				

(1) The type examiner certificates can be downloaded from

(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**

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

10.1 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

11 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

12 HYDRAULIC OPTIONS

B = DPZA-*-5 = solenoid and integral electronics at side of port B of the main stage.
 DPZA-*-7 = integral electronics at side of port B of the main stage.

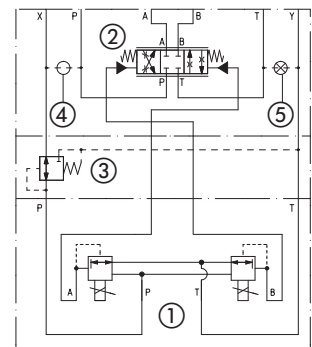
D and E = Pilot and drain configuration can be modified as shown in section **13**.
 The valve's standard configuration provides internal pilot and external drain.
 For different pilot / drain configuration select:

- Option /D Internal drain.
- Option /E External pilot (through port X).

G = Pressure reducing valve installed between pilot valve and main body with fixed setting:
 DPZA-1 and -2 = 28 bar
 DPZA-4 and -6 = 40 bar
 It is advisable for valves with internal pilot in case of system pressure higher than 150 bar.

FUNCTIONAL SCHEME

example of configuration 7*
 3 positions, spring centered



- ① Pilot valve
- ② Main stage
- ③ Pressure reducing valve
- ④ Plug to be added for external pilot trough port X
- ⑤ Plug to be removed for internal drain through port T

13 ELECTRONIC OPTIONS

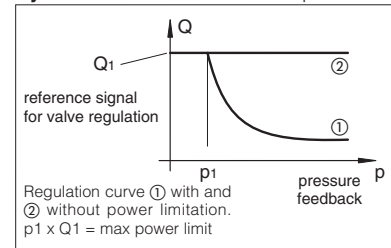
I = It provides 4 ÷ 20 mA current reference signal, instead of the standard ±10 Vdc. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vdc or ±20 mA. It is normally used in case of long distance between the machine control unit and the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

C = Only in combination with option /W
 It is available to connect pressure transducer with 4 ÷ 20 mA current output 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.

W = Only for valves coupled with pressure compensator type HC-011 or KC-011 (see tech table D150).
 It provides the hydraulic power limitation function. The driver receives the flow reference signal by the analog input INPUT+ and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input TR. When the actual requested hydraulic power **p x Q** (TR x INPUT+) reaches the max power limit (p1 x Q1), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve's regulated flow:

$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [TR]}} ; \text{Flow Reference [INPUT+]} \right)$$

Hydraulic Power Limitation - option /W



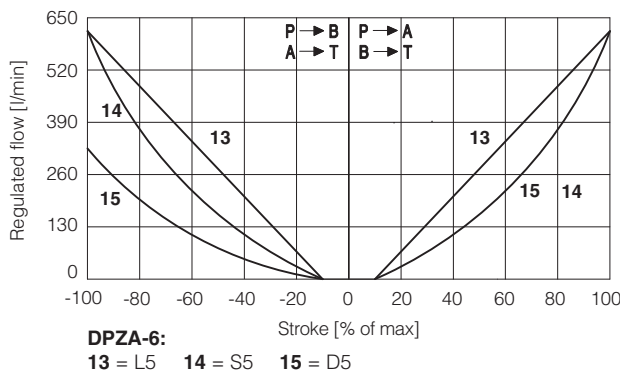
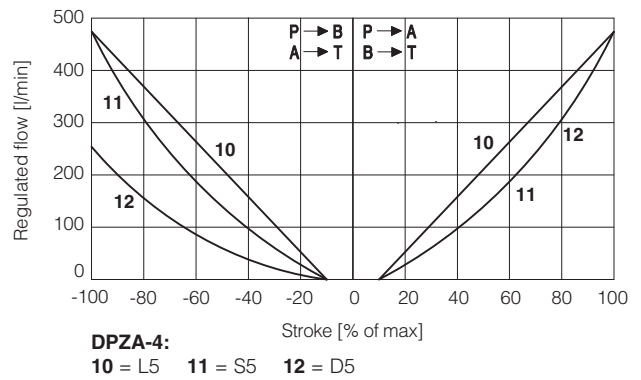
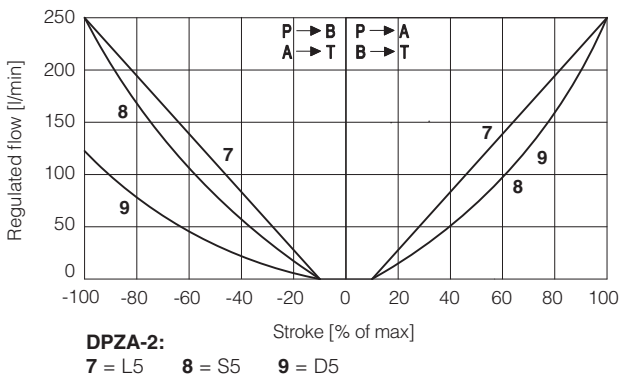
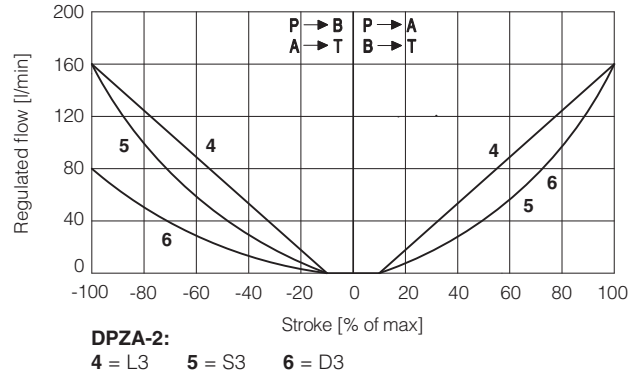
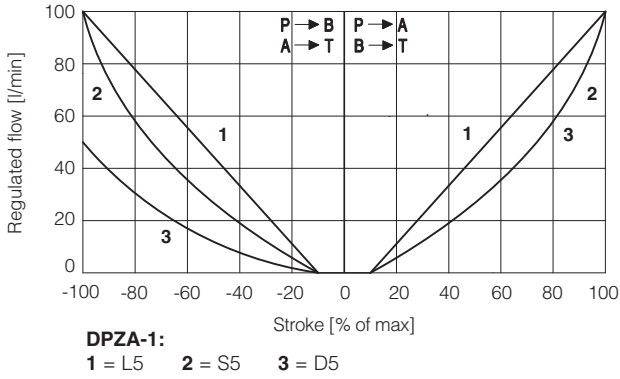
14 POSSIBLE COMBINED OPTIONS

Hydraulic options: all combination possible

Electronics options: /IW, /CW, /CWI

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

15.1 Regulation diagrams (values measure at Δp 10 bar P-T)



Note: Hydraulic configuration vs. reference signal for configuration 71 and 73 (standard and option /B)

Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$


Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

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, EN-982).

16.1 Power supply (V+ and V0)


The power supply must be appropriately stabilized or rectified and filtered: 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.

 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)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: 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.

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.

16.3 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 ± 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 ± 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 $0 \div 24$ VDC.

16.4 Monitor output signals (MONITOR and MONITOR2)

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 ± 5 VDC ($1V = 1A$).

Output signal can be reconfigured via software, within a maximum range of ± 5 VDC.

Option /W

The driver generates a second analog output signal (MONITOR2) proportional to the actual system pressure.

The output maximum range is ± 5 VDC; default setting is $0 \div 5$ VDC

16.5 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.

16.6 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for $4 \div 20$ 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.

16.7 Remote Pressure Transducer Input signal (TR) - only for /W option

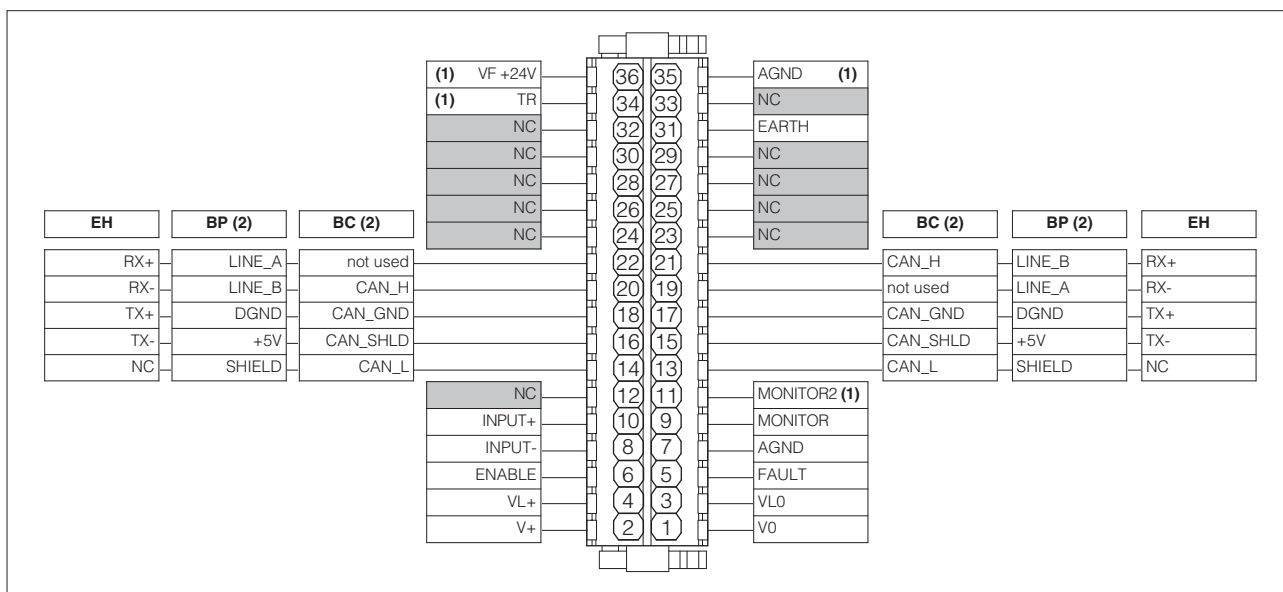
Analog pressure transducers can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are $0 \div 10$ VDC for standard and $4 \div 20$ mA for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA.

Note: transducer feedback can be read as a digital information through fieldbus communication - software selectable.

17 TERMINAL BOARD OVERVIEW



(1) Connections available only for /W option

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

18 ELECTRONIC CONNECTIONS

18.1 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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
	11	MONITOR2	2nd monitor output signal: ± 5 Vdc maximum range, referred to AGND (1) Default is: $0 \div 5$ Vdc	Output - analog signal Software selectable
31	EARTH	Internally connected to driver housing		

(1) 2nd monitor output signal is available only for /W option

18.2 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 +

Driver view

(female)

18.3 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

18.4 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)

18.5 EH fieldbus execution connections

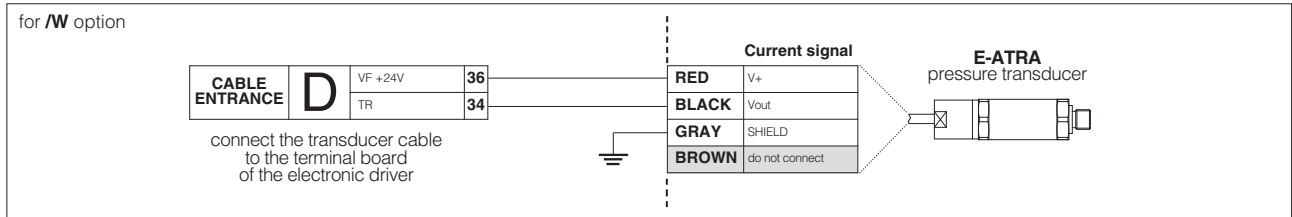
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

17.6 Remote pressure transducer connector - only for /W option

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	Voltage	Current
D	34	TR	Signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect
	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table **GX800**



19 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)
- (D) pressure transducer (only /W option)
- (P) Threaded plug

COIL CONNECTION
only for double solenoid version - factory wired (for single solenoid version - factory plugged)

TERMINAL BOARD AND FIELDBUS TERMINATOR

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

Screw terminal for additional equipotential grounding

5

n°4 M6

Tightening torque **15 Nm**

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

Terminal board - see section 17

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

USB CONNECTOR

USB

E-C-SB-USB/M12
USB CABLE
cable length 4m

male (2)

DO NOT REMOVE

METALLIC PROTECTION CAP - supplied with the valves

M20x1.5

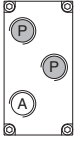
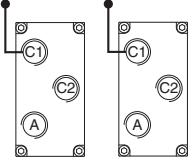
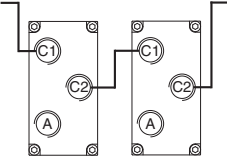
~ 20

Tightening torque: **20 Nm**

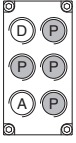
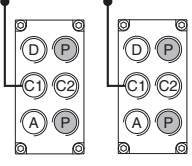
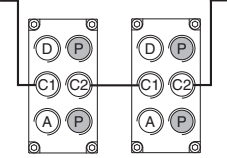
DO NOT REMOVE

(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

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

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug 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

19.2 Cable glands and threaded plug for AES with /W option - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D A	none	none		Cable entrance P are factory plugged Cable entrance A, D are open for costumers
BC, BP, EH "via stub" connection	3	D C1 A	1	C2		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers
BC, BP, EH "daisy chain" connection	4	D C1 - C2 A	none	none		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers

20 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below. To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270. Standard valves configuration provides internal pilot and external drain

DPZA-1	Pilot channels	Drain channels	<p>Internal piloting: blinded plug SP-X300F ① in X; External piloting: blinded plug SP-X300F ② in Pp; Internal drain: blinded plug SP-X300F ③ in Y; External drain: blinded plug SP-X300F ④ in Dr.</p>
DPZA-2	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X300F ①; External piloting: Add blinded plug SP-X300F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-4	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X500F ①; External piloting: Add blinded plug SP-X500F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZO-6	Pilot channels	Drain channels	<p>Internal piloting: Without plug ①; External piloting: Add DIN-908 M16x1,5 in pos ①; Add plug SP-X325A in pos ②; Internal drain: Without blinded plug SP-X300F ③; External drain: Add blinded plug SP-X300F ③.</p> <p>To reach the orifice ② remove plug ④ = G1/8"</p>

21 FASTENING BOLTS AND SEALS

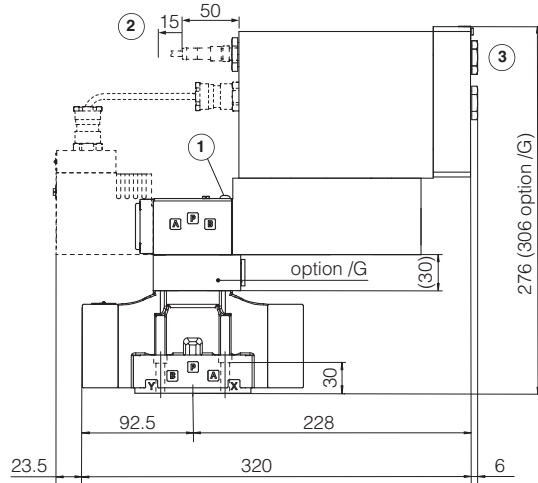
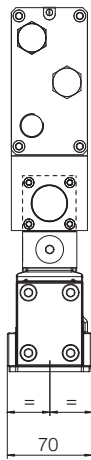
Type	Size	Fastening bolts	Seals
DPZA	1 = 10	4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm	5 OR 2050; Diameter of ports A, B, P, T: Ø 11 mm (max) 2 OR 108 Diameter of ports X, Y: Ø = 5 mm (max)
	2 = 16	4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm	4 OR 130; Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø = 7 mm (max)
	4 = 25	6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm	4 OR 4112; Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)
	6 = 32	6 socket head screws M20x90 class 12.9 Tightening torque = 600 Nm	4 OR 144; Diameter of ports A, B, P, T: Ø 34 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø = 7 mm (max)

DPZA-AES-*-1

ISO 4401: 2005

Mounting surface: 4401-05-05-0-05 (see table P005)

Mass [kg]	
DPZA-*-15*	14,7
DPZA-*-17*	16,4
Option /G	+0,9



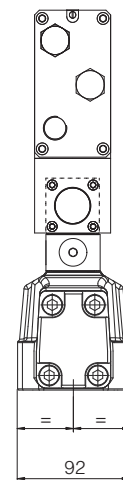
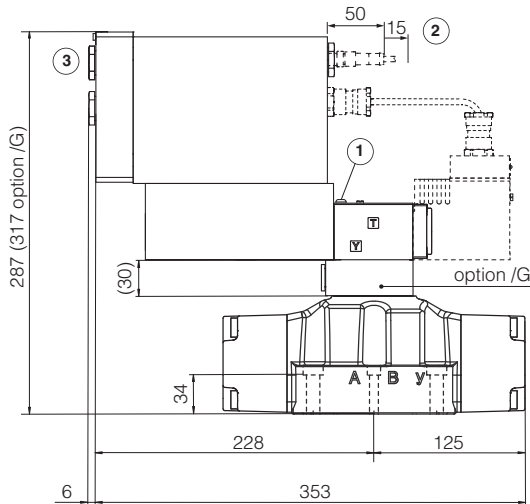
Dotted line = double solenoid version

DPZA-AES-*-2

ISO 4401: 2005

Mounting surface: 4401-07-07-0-05 (see table P005)

Mass [kg]	
DPZA-*-25*	18,9
DPZA-*-27*	20,6
Option /G	+0,9



Dotted line = double solenoid version

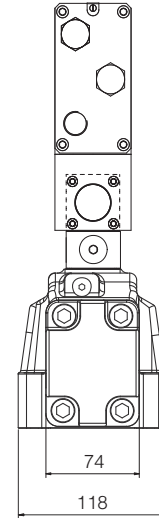
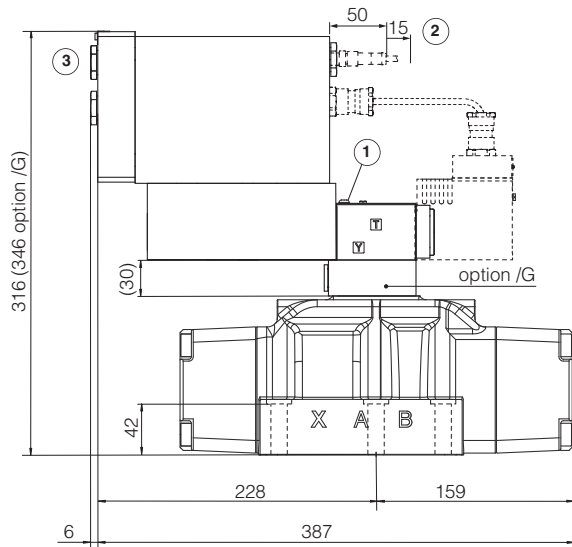
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

DPZA-AES-*-4

ISO 4401: 2005

Mounting surface: 4401-08-08-0-05 (see table P005)

Mass [kg]	
DPZA-*-45*	24,1
DPZA-*-47*	25,8
Option /G	+0,9



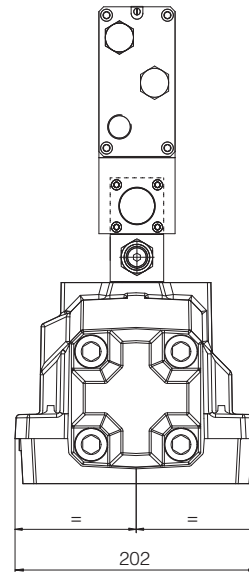
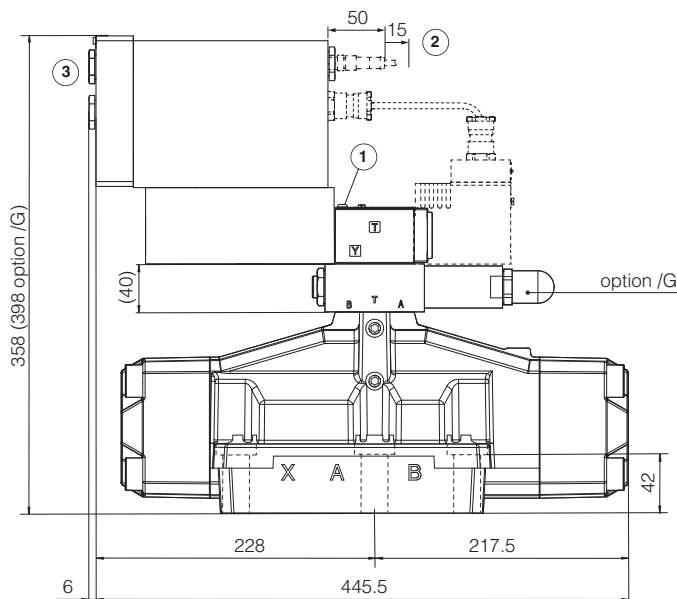
Dotted line = double solenoid version

DPZA-AES-*-6

ISO 4401: 2005

Mounting surface: 4401-10-09-0-05

Mass [kg]	
DPZA-*-65*	49,2
DPZA-*-67*	50,9
Option /G	+0,9



Dotted line = double solenoid version

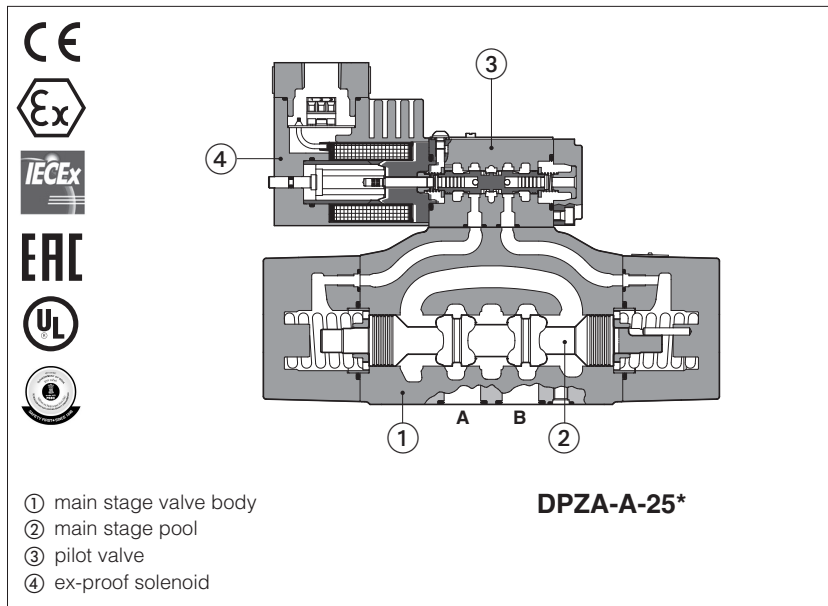
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

23 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GX800	Ex-proof pressure transducer type E-ATRA-7
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		
GS510	Fieldbus		

Ex-proof proportional directional valves

piloted, without transducer and with positive spool overlap - **ATEX, IECEx, EAC, PESO** or **cULus**



- ① main stage valve body
- ② main stage spool
- ③ pilot valve
- ④ ex-proof solenoid

DPZA-A-25*

DPZA-A

Ex-proof proportional valves, piloted, without position transducer and with positive spool overlap, for open loop directional controls and not compensated flow regulations.

They are equipped with ex-proof proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx** and **EAC** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **10 ÷ 32** - ISO 4401

Max flow: **180 ÷ 1500 l/min**

Max pressure: **350 bar**

1 MODEL CODE

DPZA	/	*	-	A	-	2	-	71	-	L	-	5	-	GK	/	*	/	*	/	*												
<p>Ex-proof proportional directional valve, piloted</p> <p>Certification type: Multicertification ATEX, IECEx, EAC: - = omit for Group II 2G / 2D (1) M = Group IM2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size ISO 4401: 1 = 10 2 = 16 4 = 25 6 = 32</p> <p>Configuration:</p> <table style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;">Standard</td> <td style="width: 50%; text-align: center;">Option /B</td> </tr> <tr> <td style="text-align: center;">51 = </td> <td style="text-align: center;">51 = </td> </tr> <tr> <td style="text-align: center;">53 = </td> <td style="text-align: center;">53 = </td> </tr> <tr> <td style="text-align: center;">71 = </td> <td style="text-align: center;">71 = </td> </tr> <tr> <td style="text-align: center;">73 = </td> <td style="text-align: center;">73 = </td> </tr> </table>																				Standard	Option /B	51 =	51 =	53 =	53 =	71 =	71 =	73 =	73 =			
Standard	Option /B																															
51 =	51 =																															
53 =	53 =																															
71 =	71 =																															
73 =	73 =																															
<p>Seals material, see section 6 : - = NBR PE = FKM BT = HNBR (2)</p> <p>Voltage code: - = standard coil for 24 VDC Atos drivers 24 = optional coil for 24 VDC low current drivers</p> <p>Options (3): B = solenoid at side of port A D = internal drain E = external pilot pressure G = pressure reducing valve for piloting O = horizontal cable entrance (2) WP = manual override protected by metallic cap</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus M = M20x1,5 - not for cULus NPT = 1/2" NPT</p> <p>Spool size:</p> <table style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;">3 (L,S,D)</td> <td style="width: 50%; text-align: center;">5 (L,S,D)</td> </tr> <tr> <td>DPZA-1 = -</td> <td>DPZA-1 = 100</td> </tr> <tr> <td>DPZA-2 = 160</td> <td>DPZA-2 = 250</td> </tr> <tr> <td>DPZA-4 = -</td> <td>DPZA-4 = 480</td> </tr> <tr> <td>DPZA-6 = -</td> <td>DPZA-6 = 640</td> </tr> </table> <p>Nominal flow (l/min) at Δp 10bar P-T</p> <p>Spool type, regulating characteristics: L = linear S = progressive D = differential-progressive</p> <table style="width: 100%;"> <tr> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table> <p>P-A = Q, B-T = Q/2 P-B = Q/2, A-T = Q</p>																				3 (L,S,D)	5 (L,S,D)	DPZA-1 = -	DPZA-1 = 100	DPZA-2 = 160	DPZA-2 = 250	DPZA-4 = -	DPZA-4 = 480	DPZA-6 = -	DPZA-6 = 640			
3 (L,S,D)	5 (L,S,D)																															
DPZA-1 = -	DPZA-1 = 100																															
DPZA-2 = 160	DPZA-2 = 250																															
DPZA-4 = -	DPZA-4 = 480																															
DPZA-6 = -	DPZA-6 = 640																															

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining)

(3) For possible combined options, see 11.1

For valve with internal drain (option /D) the pressure at T port makes difficult the manual override operation that can be possible only if the pressure at T port is lower than 50 bar.

2 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

3 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	DPZA*-1	DPZA*-2	DPZA*-4	DPZA*-6		
Pressure limits [bar]	ports P, A, B, X = 350; T = 250 (10 for option /D); Y = 10;					
Spool type	L5, S5, D5	L3, S3, D3	L5, S5, D5			
Nominal flow [l/min]						
Δp P-T	Δp = 10 bar	100	160	250	480	640
	Δp = 30 bar	160	270	430	830	1100
	Max permissible flow	180	400	550	900	1500
Δp max P-T [bar]						
Piloting pressure [bar]	min. = 25; max = 350 (option /G advisable for pilot pressure > 150 bar)					
Piloting volume [cm³]	1,4	3,7	9,0	21,6		
Piloting flow (1) [l/min]	1,7	3,7	6,8	14,4		
Leakage (2) Main stage [l/min]	0,15/0,5	0,2/0,6	0,3/1,0	1,0/3,0		
Response time (1) [ms]	≤ 90	≤ 110	≤ 130	≤ 190		
Hysteresis	≤ 5 [% of max regulation]					
Repeatability	± 1 [% of max regulation]					

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 2

(1) 0-100% step signal and pilot pressure 100 bar (2) at p = 100/350 bar

5 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

6 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 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 ÷ 300 mm²/s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DPZA		DPZAM	DPZA/UL	
Certifications	Multicertification Group II ATEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-A		OZAM-A	OZA-A/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEX Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.1, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT			1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C. In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS WIRING

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override
 ⑤ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
2 = GND
3 = Coil

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override

⚠ Pay attention to respect the polarity
1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1
2 = GND
3 = Coil -
 alternative GND screw terminal connected to solenoid housing

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> Suitable for use in Class I Division 1, Gas Groups C Armored Marine Shipboard Cable which meets UL 1309 Tinned Stranded Copper Conductors Bronze braided armor Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	-	90 °C	-
45 °C	-	T4	150 °C	135 °C	-	90 °C
55 °C	-	T3	150 °C	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

10 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

11 OPTIONS

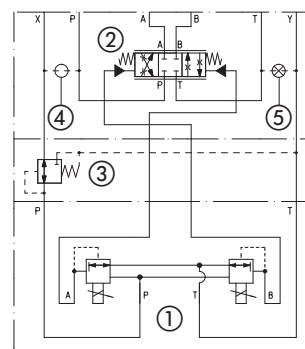
- B** = DPZA-*5 = solenoid and integral electronics at side of port B of the main stage.
DPZA-*7 = integral electronics at side of port B of the main stage.
- D and E** = Pilot and drain configuration can be modified as shown in section 13.
The valve's standard configuration provides internal pilot and external drain.
For different pilot / drain configuration select:
Option /D Internal drain.
Option /E External pilot (through port X).
- G** = Pressure reducing valve installed between pilot valve and main body with fixed setting:
DPZA-1 and -2 = 28 bar
DPZA-4 and -6 = 40 bar
It is advisable for valves with internal pilot in case of system pressure higher than 150 bar.
- O** = Horizontal cable entrance, to be selected in case of limited vertical space.
- WP** = Manual override protected by metallic cap.

11.1 Possible combined options

- /BD, /BE, /BG, /BO, /BWP
- /BDE, /BDG, /BDO, /BDWP,
- /BDEG, /BDEO, /BDEWP, /BDEGO, /BDEGWP, BDEGOWP
- /BEG, /BEO, /BEWP, /BEGO, /BEGWP, /BEGOWP
- /BGO, /BGWP, BGOWP
- /DE, /DG, /DO, /DWP, /DEG, /DEO, /DEWP, /DEGO, /DEGWP, /DEGOWP
- /EG, /EO, /EWP, /EGO, /EGWP, /EGOWP
- /GO, /GWP, /GOWP
- /OWP

FUNCTIONAL SCHEME

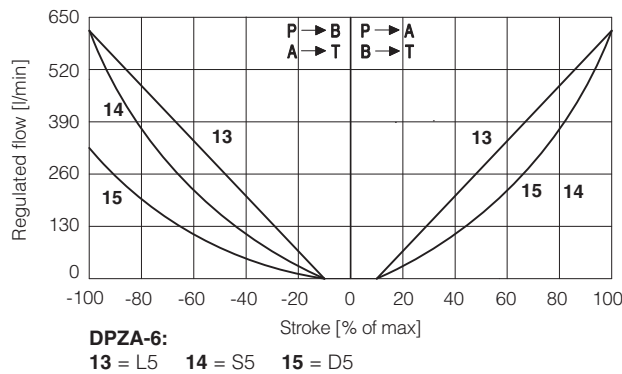
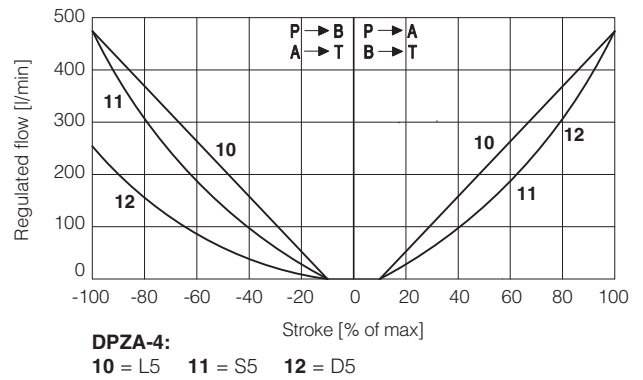
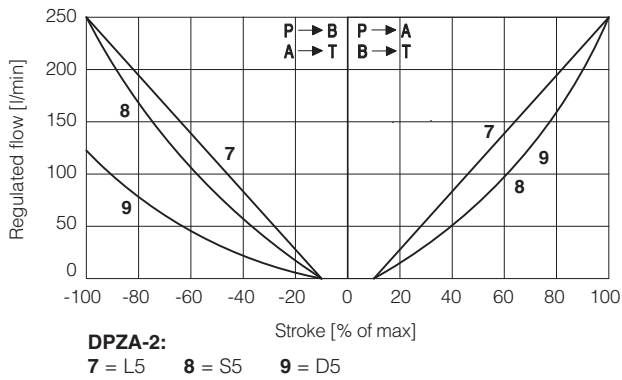
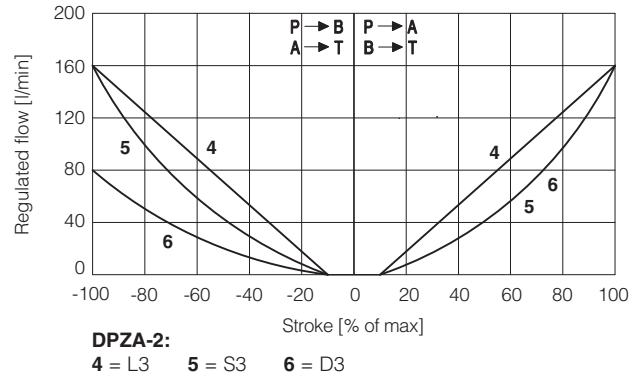
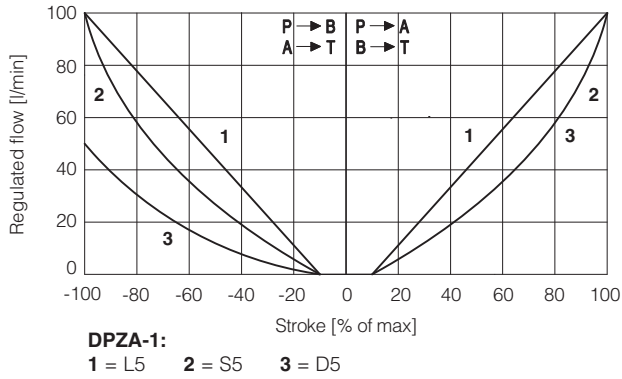
example of configuration 7*
3 positions, spring centered



- ① Pilot valve
- ② Main stage
- ③ Pressure reducing valve
- ④ Plug to be added for external pilot trough port X
- ⑤ Plug to be removed for internal drain through port T

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

12.1 Regulation diagrams (values measure at Δp 10 bar P-T)



Note: Hydraulic configuration vs. reference signal for configuration 71 and 73 (standard and option /B)

Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$



Reference signal $\left. \begin{matrix} 0 \div -10 \text{ V} \\ 12 \div 4 \text{ mA} \end{matrix} \right\} P \rightarrow B / A \rightarrow T$

13 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

DPZA-1	Pilot channels	Drain channels	<p>Internal piloting: blinded plug SP-X300F ① in X; External piloting: blinded plug SP-X300F ② in Pp; Internal drain: blinded plug SP-X300F ③ in Y; External drain: blinded plug SP-X300F ④ in Dr.</p>
DPZA-2	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X300F ①; External piloting: Add blinded plug SP-X300F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZA-4	Pilot channels	Drain channels	<p>Internal piloting: Without blinded plug SP-X500F ①; External piloting: Add blinded plug SP-X500F ①; Internal drain: Without blinded plug SP-X300F ②; External drain: Add blinded plug SP-X300F ②.</p>
DPZO-6	Pilot channels	Drain channels	<p>Internal piloting: Without plug ①; External piloting: Add DIN-908 M16x1,5 in pos ①; Add plug SP-X325A in pos ②; Internal drain: Without blinded plug SP-X300F ③; External drain: Add blinded plug SP-X300F ③.</p> <p>To reach the orifice ② remove plug ④ = G1/8"</p>

14 FASTENING BOLTS AND SEALS

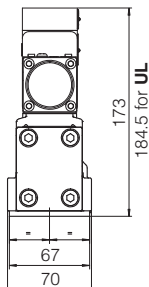
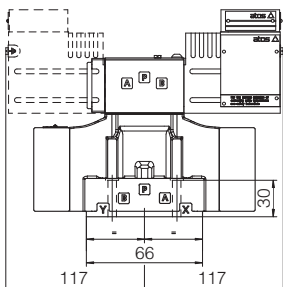
	DPZA-1	DPZA-2	DPZA-4	DPZA-6
	<p>Fastening bolts: 4 socket head screws M6x60 class 12.9 Tightening torque = 15 Nm</p>	<p>Fastening bolts: 4 socket head screws M10x50 class 12.9 Tightening torque = 70 Nm 2 socket head screws M6x45 class 12.9 Tightening torque = 15 Nm</p>	<p>Fastening bolts: 6 socket head screws M12x60 class 12.9 Tightening torque = 125 Nm</p>	<p>Fastening bolts: 6 socket head screws M20x90 class 12.9 Tightening torque = 600 Nm</p>
	<p>Seals: 5 OR 2050 Diameter of ports A, B, P, T: Ø 11 mm (max) 2 OR 108 Diameter of ports X, Y: Ø 5 mm (max)</p>	<p>Seals: 4 OR 130 Diameter of ports A, B, P, T: Ø 20 mm (max) 2 OR 2043 Diameter of ports X, Y: Ø 7 mm (max)</p>	<p>Seals: 4 OR 4112 Diameter of ports A, B, P, T: Ø 24 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø 7 mm (max)</p>	<p>Seals: 4 OR 144 Diameter of ports A, B, P, T: Ø 34 mm (max) 2 OR 3056 Diameter of ports X, Y: Ø 7 mm (max)</p>

DPZA-1

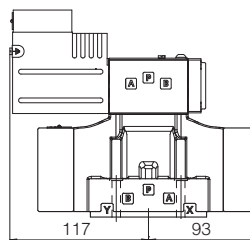
ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-05-05-0-05

Mass [kg]	
DPZA-*-15*	8,5
DPZA-*-17*	10,2
Option /G	+0,9
Option /O	+0,35
Option /WP	+0,25

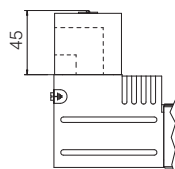
DPZA-A-15*
 DPZA-A-17* (dotted line)



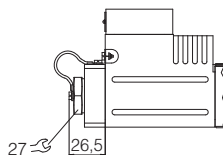
DPZA-A-15* /B



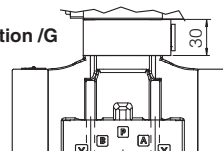
option /O



option /WP



option /G

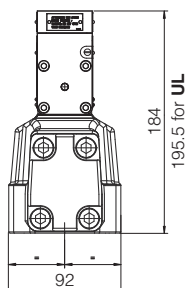
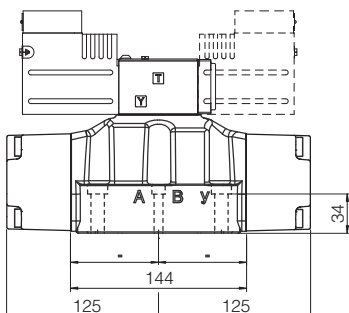


DPZA-2

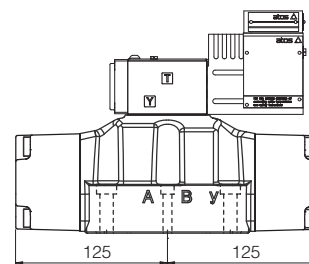
ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-07-07-0-05

Mass [kg]	
DPZA-*-25*	12,7
DPZA-*-27*	14,4
Option /G	+0,9
Option /O	+0,35
Option /WP	+0,25

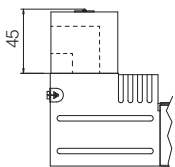
DPZA-A-25*
 DPZA-A-27* (dotted line)



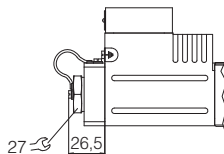
DPZA-A-25* /B



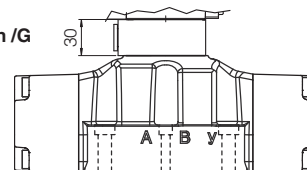
option /O



option /WP



option /G

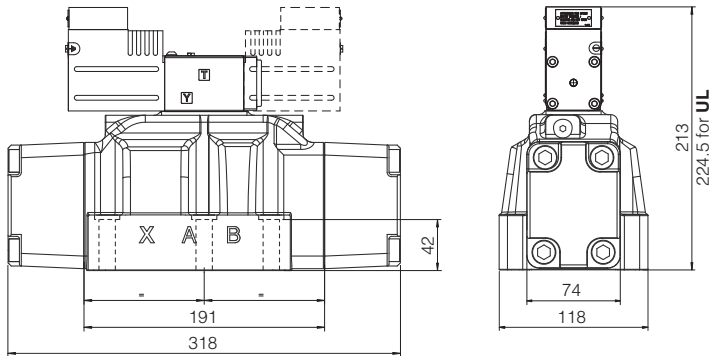


DPZA-4

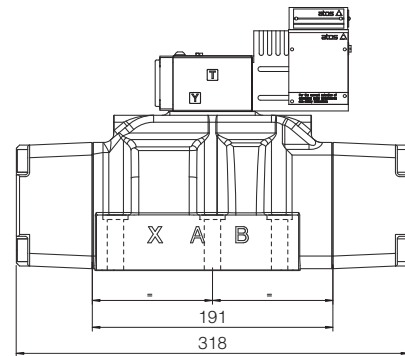
ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-08-08-0-05

Mass [kg]	
DPZA*-45*	17,9
DPZA*-47*	19,6
Option /G	+0,9
Option /O	+0,35
Option /WP	+0,25

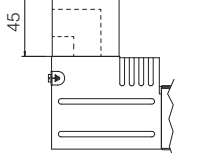
DPZA-A-45*
 DPZA-A-47* (dotted line)



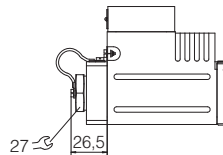
DPZA-A-45* /B



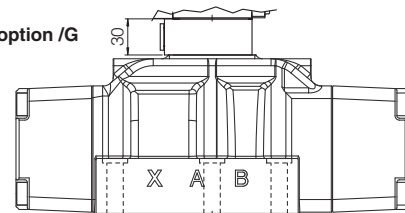
option /O



option /WP



option /G

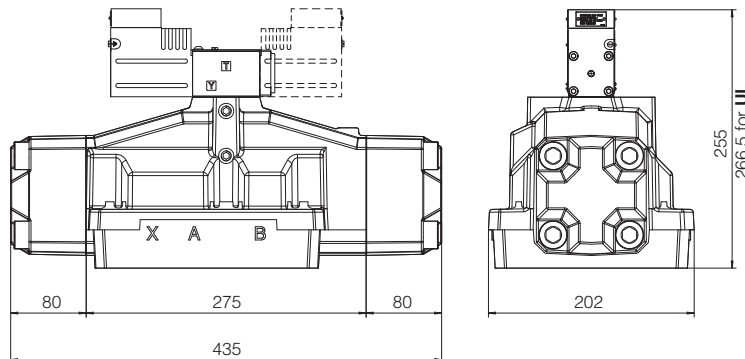


DPZA-6

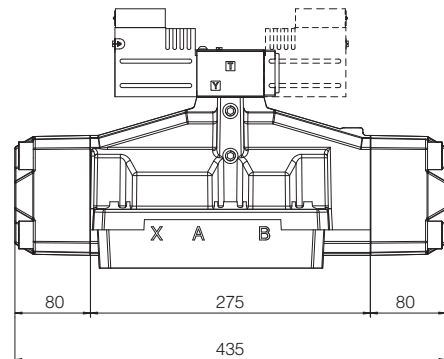
ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-10-09-0-05

Mass [kg]	
DPZA*-45*	43,0
DPZA*-47*	44,7
Option /G	+0,9
Option /O	+0,35
Option /WP	+0,25

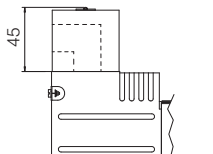
DPZA-A-65*
 DPZA-A-67* (dotted line)



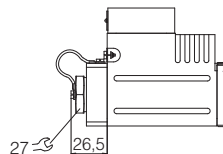
DPZA-A-65* /B



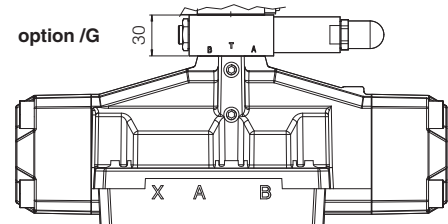
option /O



option /WP



option /G

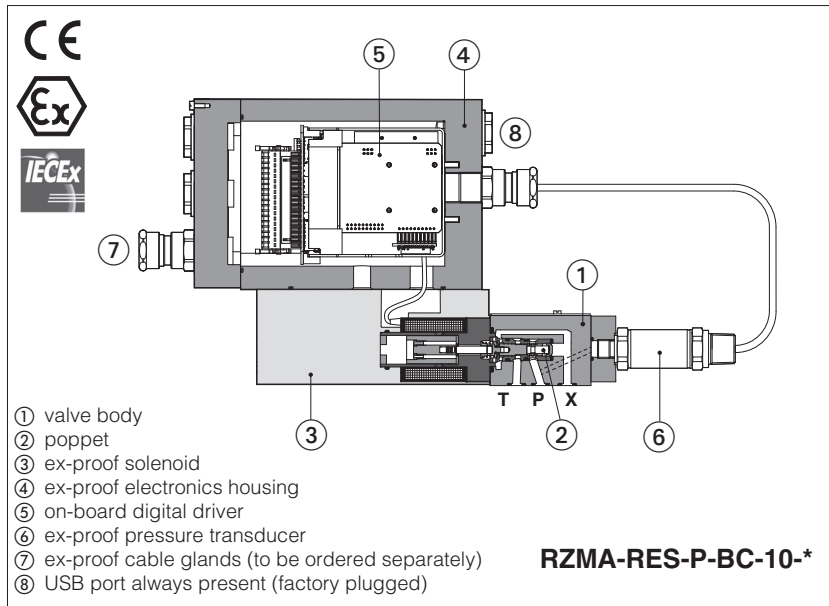


16 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
X030	Summary of Atos ex-proof components certified to cULus
FX900	Operating and maintenance information for ex-proof proportional valves
KX800	Cable glands for ex-proof valves
P005	Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional relief valves high performance

direct or piloted, with on board driver and pressure transducer - **ATEX and IECEx**



RZMA-RES, AGMZA-RES

Ex-proof high performance digital proportional relief valves direct or piloted with pressure transducer for pressure closed loop controls.

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

● Multicertification **ATEX** and **IECEx** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

RZMA, direct or piloted:
Size: **06** - ISO 4401
Max flow: **4** and **40 l/min**

AGMZA, piloted:
Size: **10, 20, 32** - ISO 6264
Max flow: **200, 400** and **600 l/min**

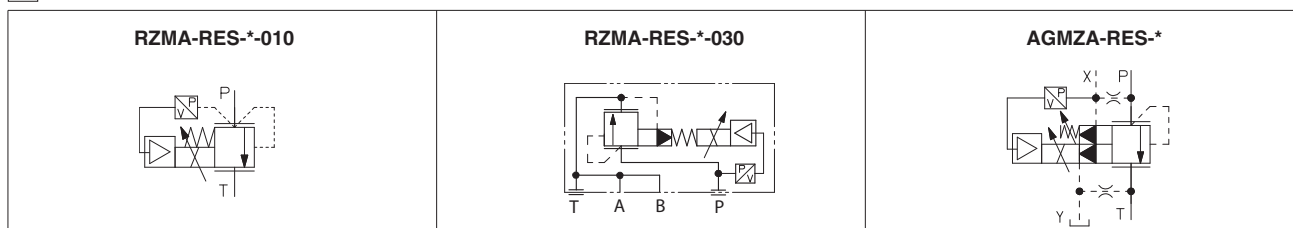
Max pressure: **250 bar**

1 MODEL CODE

RZMA	-	RES	-	P	-	NP	-	010	/	315	/	M	/	*	/	*	/	*	/	*	
Ex-proof proportional pressure relief valves																				Seals material, see section 9): - = NBR PE = FKM BT = HNBR	
RZMA = subplate size 06 AGMZA = subplate size 10, 20, 32																				Series number	
RES = on-board driver																				Dynamic response preset, see section 18): - = omit for PID 1 fast (default) 2 = PID 2 standard 3 = PID 3 smooth	
P = on-board ex-proof pressure transducer																				Hydraulic options - only AGMZA (1): E = external pilot Y = external drain	
Fieldbus interfaces, USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT																				Electronic options (1): I = current reference input and monitor 4÷20mA (omit for std voltage 0÷10Vdc)	
Valve size and configuration: RZMA: direct 010 = Qmax 4 l/min RZMA: piloted 030 = Qmax 40 l/min AGMZA: piloted 10, 20, 32 = Qmax 200, 400, 600 l/min																				Cable entrance threaded connection: M = M20x1,5	
																				Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar	

(1) Possible combined options: /EY, /EI, /YI

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS

WARNING: The below operation must be performed in a safety area

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

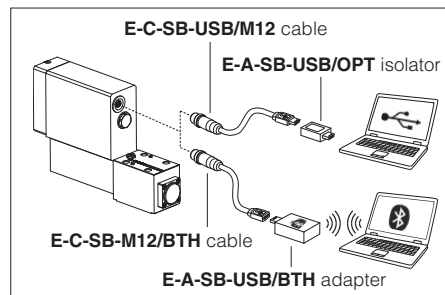
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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 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 valves according to EN ISO 13849	RZMA-010 150 years, RZMA-030 and AGZMA 75 years, 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZMA		AGMZA		
	010	030	10	20	32
Size code					
Valve size	06		10	20	32
Max regulated pressure [bar]	80 180 250				
Min regulated pressure [bar]	see min. pressure / flow diagrams at sections 20 21 22				
Max pressure at port P, A, B, X [bar]	315				
Max pressure at port T, Y [bar]	210				
Max flow [l/min]	4	40	200	400	600
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 60		≤ 90	≤ 110	≤ 125
Hysteresis[% of the max pressure]	≤ 0,3				
Linearity[% of the max pressure]	≤ 1,0				
Repeatability[% of the max pressure]	≤ 0,2				

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response


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 tollerant) 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: range 0 ÷ 10 VDC @ max 5 mA Current: range 0 ÷ 20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 9 VDC (OFF state), 15 ÷ 24 VDC (ON state), 9 ÷ 15 VDC (not accepted); Input impedance: Ri > 87 kΩ			
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)			
Pressure transducer power supply	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, power supplies level, pressure transducer failure			
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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	RZMA, AGMZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-RES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx 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 EN 60079-1	IEC 60079-0 IEC 60079-31 IEC 60079-1	
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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

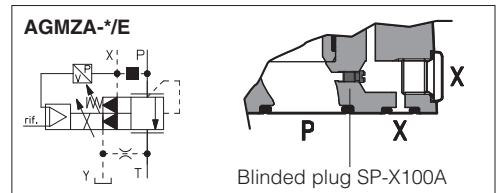
12 CABLE GLANDS

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

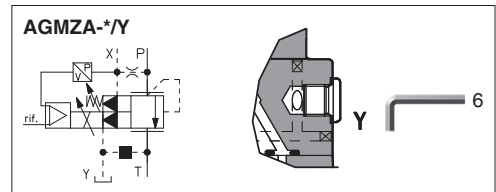
13 HYDRAULIC OPTIONS - only for AGMZA

- E** = External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged. The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G 1/4").
- Y** = The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G 1/4" available on the pilot stage body.



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.



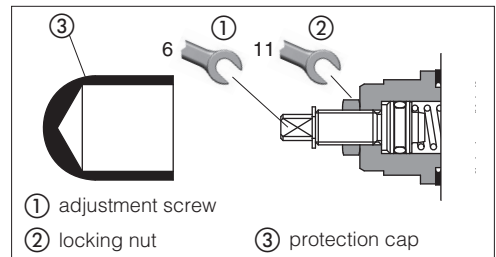
15 POSSIBLE COMBINED OPTIONS

EY, /EI, /YI

16 MECHANICAL PRESSURE LIMITER - only for AGMZA

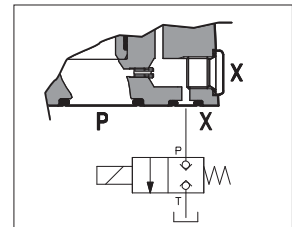
The AGMZA are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure). At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control. For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



17 REMOTE PRESSURE UNLOADING - only for AGMZA

The **P** main line can be remotely unloaded by connecting the valve X port to a solenoid valve as shown in the below scheme (venting valve). This function can be used in emergency to unload the system pressure by-passing the proportional control.



18 DYNAMIC RESPONSE - 4 pressure PIDs

The valve is provided with 4 PIDs configurations to match different hydraulic conditions. The required PID configuration can be selected before the valve commissioning, through Atos E-SW software via USB port. Only for **RES** the PID can be also selected in real time, through PLC via fieldbus.

PID	Dynamic response
1	Fast - default (1)
2	Standard
3	Smooth
4	Open Loop

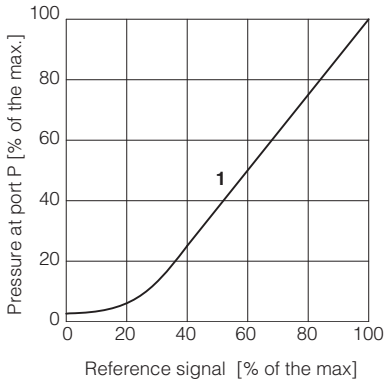
(1) interchangeable with previous TERS version

19 PRESSURE TRANSDUCER FAILURE

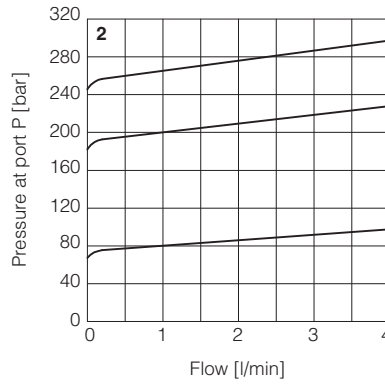
In case of pressure transducer failure, the valve's reaction can be configured through Atos E-SW software to:
 - cut off the current to solenoid, therefore the regulated pressure will be reduced to minimum value (default setting)
 - automatically switch the pressure control from closed loop (PID1,2,3) to open loop (PID4), to let the valve to temporarily operate with reduced regulation accuracy

20 DIAGRAMS RZMA-010 (based on mineral oil ISO VG 46 at 50 °C)

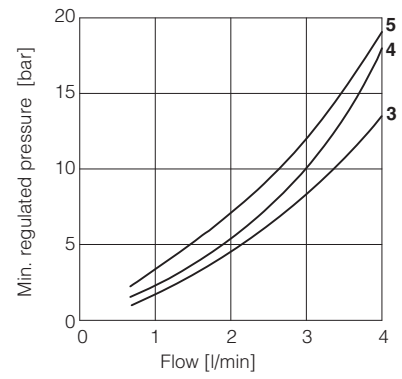
1 Regulation diagrams
with flow rate Q = 1 l/min



2 Pressure/flow diagrams
with reference signal set at Q = 1 l/min



3-5 Min. pressure/flow diagrams
with zero reference signal

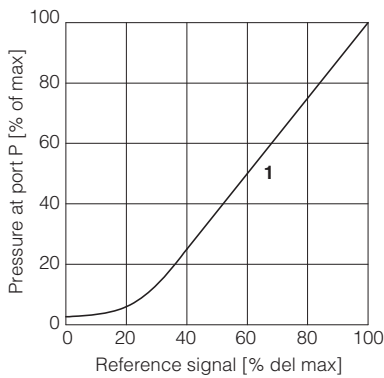


3 = RZMA/80
4 = RZMA/180
5 = RZMA/250

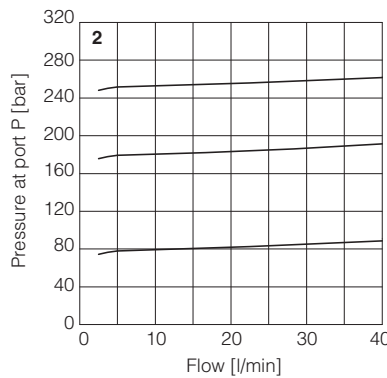
Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

21 DIAGRAMS RZMA-030 (based on mineral oil ISO VG 46 at 50 °C)

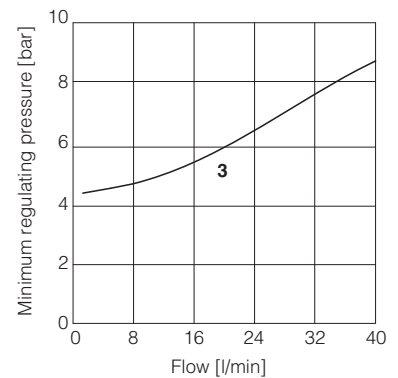
1 Regulation diagrams
with flow rate Q = 10 l/min



2 Pressure/flow diagrams
with reference signal set at Q = 10 l/min



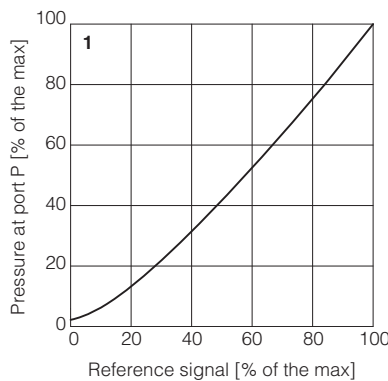
3 Min. pressure/flow diagrams
with zero reference signal



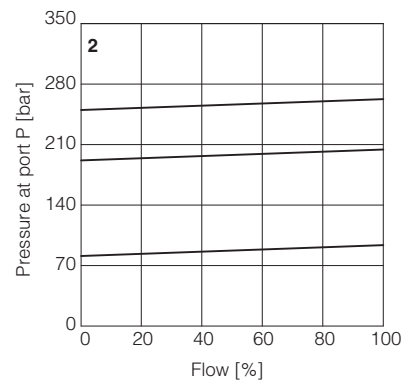
Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

22 DIAGRAMS AGMZA (based on mineral oil ISO VG 46 at 50 °C)

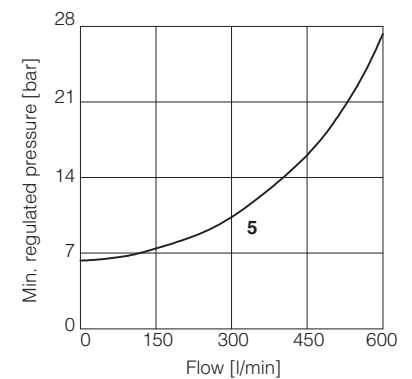
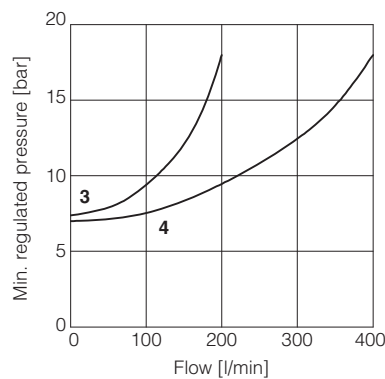
1 = Regulation diagrams
with flow rate Q = 50 l/min



2 = Pressure/flow diagrams
with reference signal set at Q = 50 l/min



3-5 = Min. pressure/flow diagrams
with zero reference signal




3 = AGMZA-*-10
4 = AGMZA-*-20
5 = AGMZA-*-32

23 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, EN-982).

23.1 Power supply (V+ and V0)


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

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

23.2 Power supply for driver's logic and communication (VL+ and VLO)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

23.3 Pressure reference input signal (P_INPUT+)

The driver controls in closed loop the current to the valve pressure 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 $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 \div 24Vdc.

23.4 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to the actual pressure 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, defaults settings 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 0 \div 10 Vdc or 0 \div 20 mA.

23.5 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.

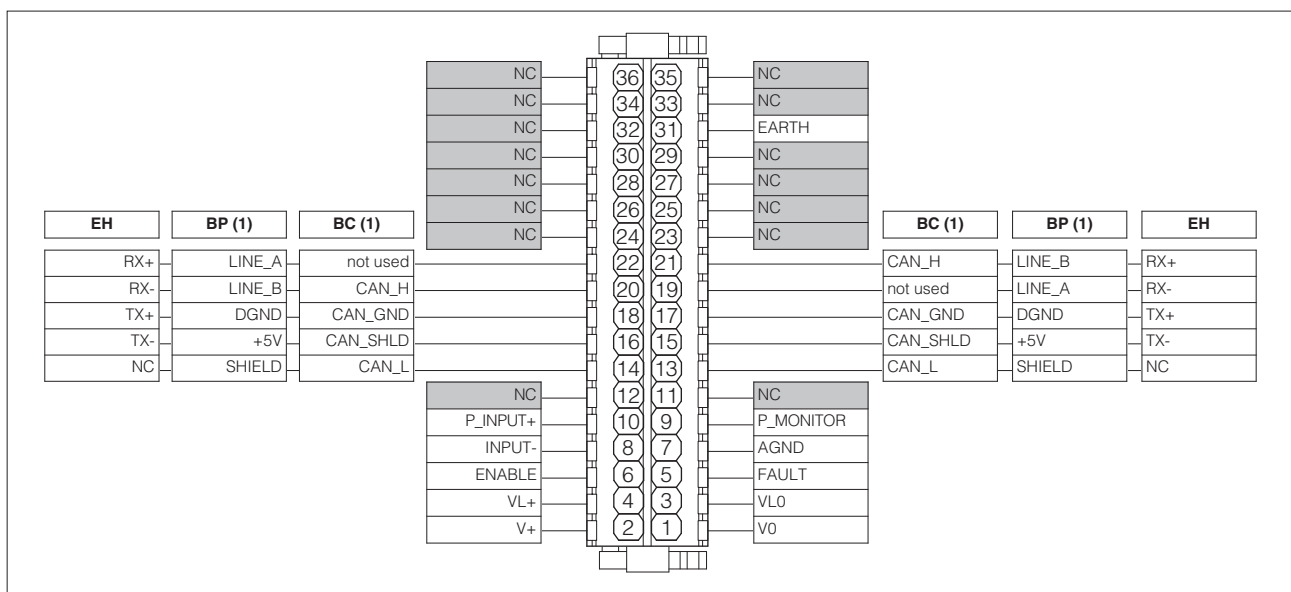
Enable input signal can be used as generic digital input by software selection.

23.6 Fault output signal (FAULT)

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

24 TERMINAL BOARD OVERVIEW



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

25 ELECTRONIC CONNECTIONS

25.1 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 pressure reference input signal for INPUT+	Input - analog signal
	9	P_MONITOR	Pressure monitor output signal: 0 ÷ 10 Vdc / 0 ÷ 20 mA maximum range, referred to AGND Default is: 0 ÷ 10 Vdc or 4 ÷ 20 mA	Output - analog signal Software selectable
	10	P_INPUT+	Pressure 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		

25.2 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 +		

25.3 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

25.4 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)

25.5 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

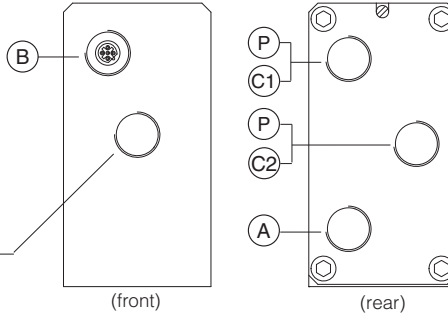
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

CABLE ENTRANCE OVERVIEW

Cables entrance description:

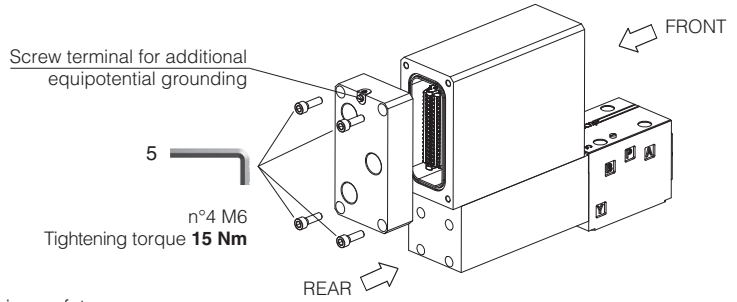
- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus interface (input)
- (C2) fieldbus interface (output)
- (P) threaded plug

PRESSURE TRANSDUCER CONNECTION
factory wired



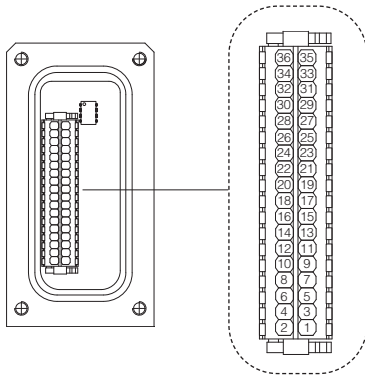
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 24



Fieldbus terminator only for BC and BP executions (1)

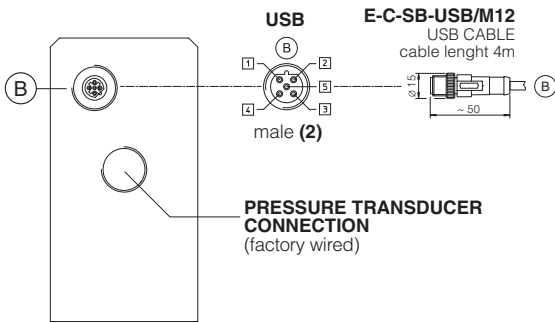
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

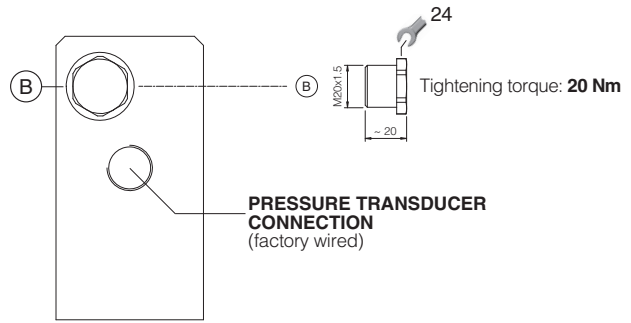
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	OFF
4	OFF

USB CONNECTOR

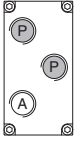
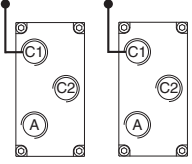
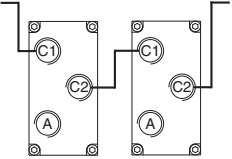


METALLIC PROTECTION CAP - supplied with the valves



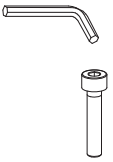

(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

26.1 Cable glands and threaded plug - see tech table **KX800**

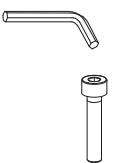

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection	2	C1 A	1	C2		Cable entrance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

27 FASTENING BOLTS AND SEALS

27.1 RZMA valves

	RZMA-RES-*-010	RZMA-RES-*-030
	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm
	Seals: 2 OR 108 Diameter of ports P, T: Ø 5 mm	Seals: 4 OR 108 Diameter of ports P, T: Ø 7,5 mm

27.2 AGMZA valves

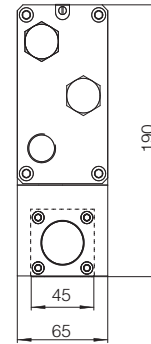
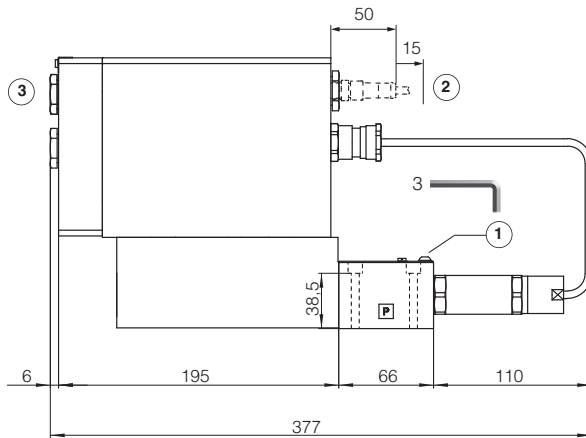
	AGMZA-RES-*-10	AGMZA-RES-*-20	AGMZA-RES-*-32
	Fastening bolts: 4 socket head screws M12x35 class 12.9 Tightening torque = 125 Nm	Fastening bolts: 4 socket head screws M16x50 class 12.9 Tightening torque = 300 Nm	Fastening bolts: 4 socket head screws M20x60 class 12.9 Tightening torque = 600 Nm
	Seals: 2 OR 123 Diameter of ports P, T: Ø 14 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm	Seals: 2 OR 4112 Diameter of ports P, T: Ø 24 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm	Seals: 2 OR 4131 Diameter of ports P, T: Ø 28 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm

RZMA-RES-*-010

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(without ports A and B)

Mass [kg]	
RZMA-RES-*-010	8.5

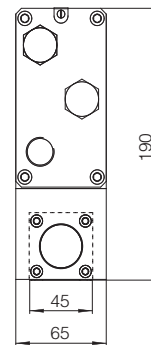
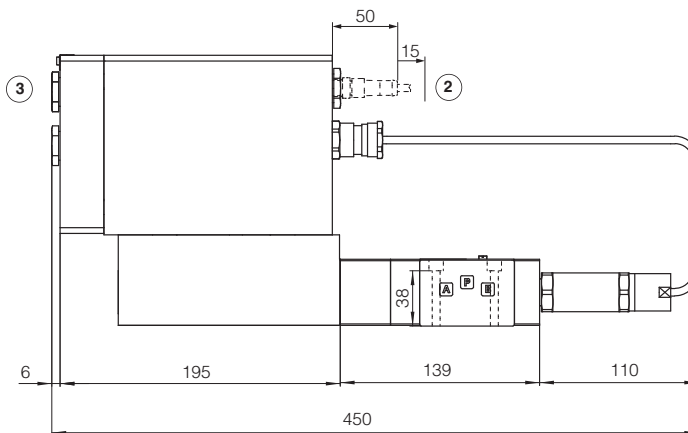


RZMA-RES-*-030

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(ports A and B connected to port T)

Mass [kg]	
RZMA-RES-*-030	9,5



- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

29 INSTALLATION DIMENSIONS FOR AGMZA [mm]

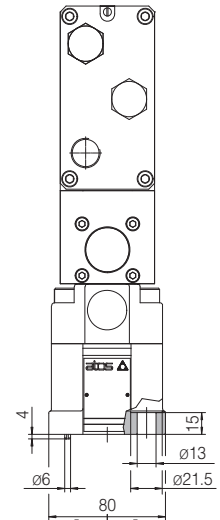
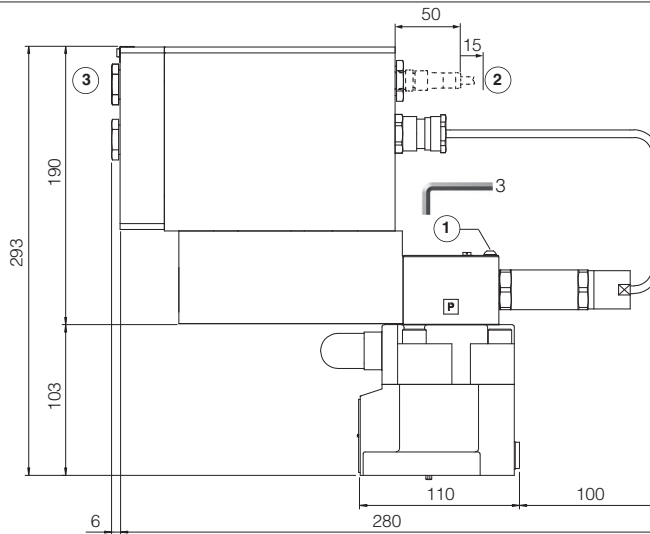
AGMZA-RES-*-10

ISO 6264: 2007

Mounting surface: 6264-06-09-1-97

(see table P005)

Mass [kg]	
AGMZA-RES-*-10	12,1



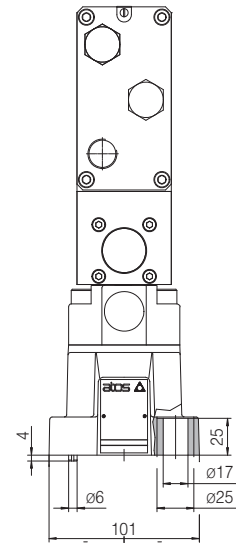
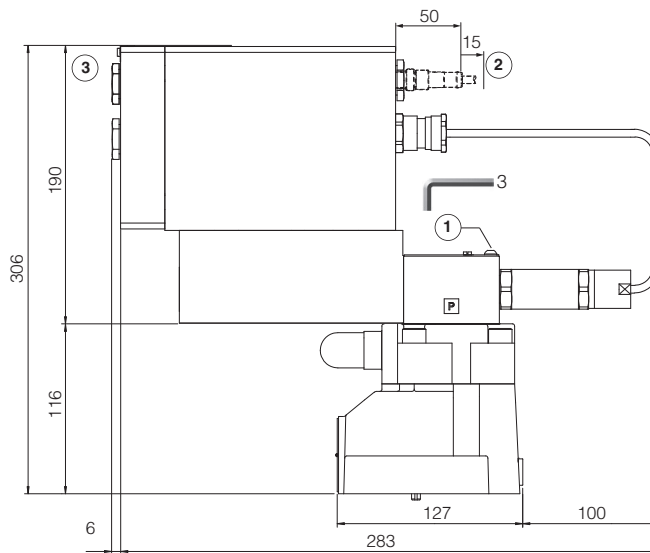
AGMZA-RES-*-20

ISO 6264: 2007

Mounting surface: 6264-08-13-1-97

(see table P005)

Mass [kg]	
AGMZA-RES-*-20	13,3



AGMZA-RES-*-32

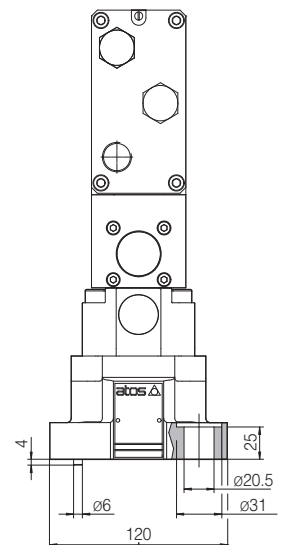
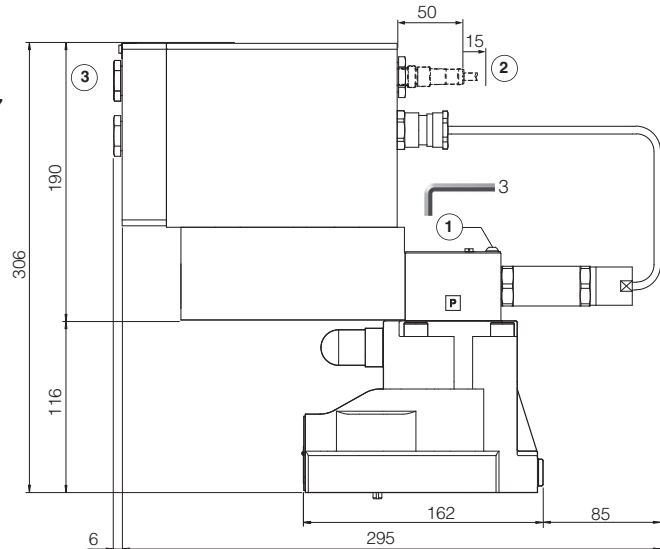
ISO 6264: 2007

Mounting surface: 6264-10-17-1-97

(see table P005)

(with M20 fixing holes instead of standard M18)

Mass [kg]	
AGMZA-RES-*-32	15,3



- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

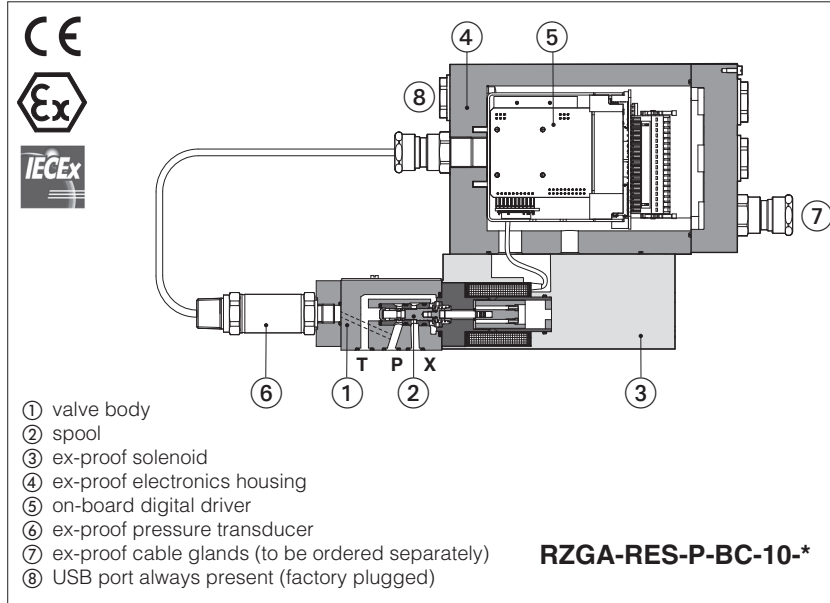
30 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- FX900** Operating and maintenance information for ex-proof proportional valves
- GS500** Programming tools
- GS510** Fieldbus

- GX800** Ex-proof pressure transducer type E-ATRA-7
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional reducing valves high performance

direct or piloted, with on-board driver and pressure transducer - **ATEX and IECEx**



RZGA-RES, AGRCZA-RES

Ex-proof digital, high performance proportional reducing valves, direct or piloted, with pressure transducer for pressure closed loop controls.

They are equipped with ex-proof on-board digital driver, pressure transducer and proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

● Multicertification ATEX and IECEx for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

RZGA, direct or piloted:

Size: **06** - ISO 4401
 Max flow: **12** and **40 l/min**

AGRCZA, piloted:

Size: **10** and **20** - ISO 5871
 Max flow: **160** and **300 l/min**

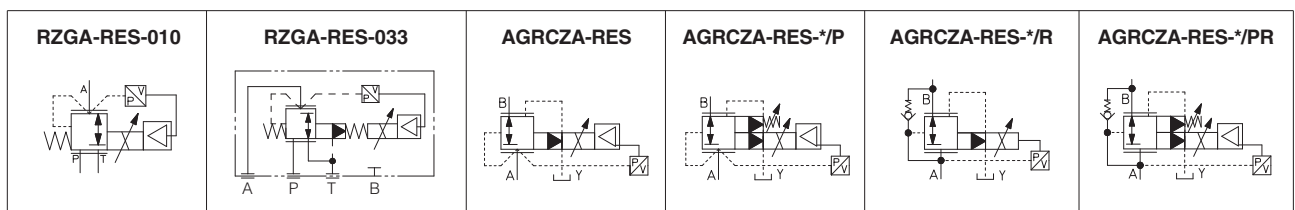
Max pressure: **250 bar**

1 MODEL CODE

RZGA	-	RES	-	P	-	NP	-	010	/	210	/	M	/	*	*	*	/	*
Ex-proof proportional pressure reducing valves RZGA = subplate size 06 AGRCZA = subplate size 10, 20		RES = on-board driver		P = on-board ex-proof pressure transducer		NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT												Seals material, see section 9: - = NBR PE = FKM BT = HNBR
																		Dynamic response preset, see sect. 16: - = omit for PID 1 fast (default) 2 = PID 2 standard 3 = PID 3 smooth
																		Hydraulic options - only AGRCZA (1): P = with integral mechanical pressure limiter R = with integral check valve for free reverse flow
																		Electronic options (1): I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 Vbc)
																		Cable entrance threaded connection: M = M20x1,5
																		Max regulated pressure: only for RZGA-010 32 = 32 bar 100 = 100 bar 210 = 210 bar only for RZGA-033 and AGRCZA 80 = 80 bar 180 = 180 bar 250 = 250 bar

(1) Possible combined options: /IP, /IR, /PR

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS



WARNING: The below operation must be performed in a safety area

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC support: NP (USB) 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)

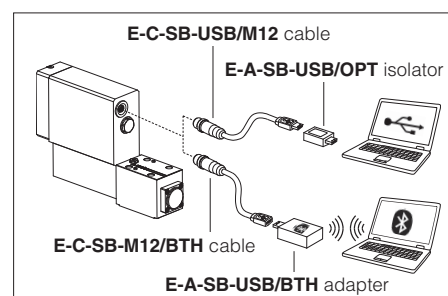


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



5 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 valves according to EN ISO 13849	RZGA-010 150 years, RZGA-033 and AGRCZA 75 years 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZGA			AGRCZA	
	010	033		10	20
Size code	06	06		10	20
Valve size	06	06		10	20
Max regulated pressure [bar]	32	100	210	80	180
Max pressure at port P, A, B, X [bar]	315				
Max pressure at port T, Y [bar]	210				
Min regulated pressure [bar]	0,8	2,5		1,0	
Max flow [l/min]	12	40		160	300
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 50			≤ 60	
Hysteresis [% of the max pressure]	≤ 0,3				
Linearity [% of the max pressure]	≤ 1,0				
Repeatability [% of the max pressure]	≤ 0,2				

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response


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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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: range 0 ÷ 10 VDC @ max 5 mA Current: range 0 ÷ 20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 9 Vdc (OFF state), 15 ÷ 24 Vdc (ON state), 9 ÷ 15 Vdc (not accepted); Input impedance: Ri > 87 kΩ			
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)			
Pressure transducer power supply	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, power supplies level, pressure transducer failure			
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 610006-3)			
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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	20 ÷ 100 mm ² /s - max allowed range 15 ÷ 500 mm ² /s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	RZMA, AGMZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-RES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/UE Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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 **KX600**

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

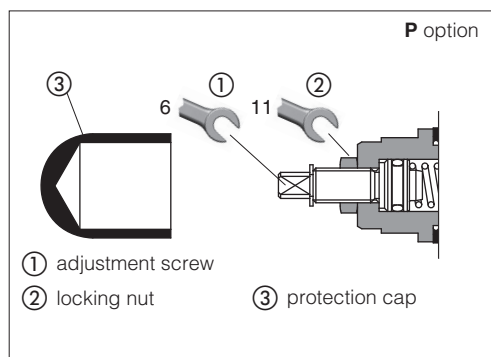
13 HYDRAULIC OPTIONS - only for AGRCZA

P = The AGRCZA are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

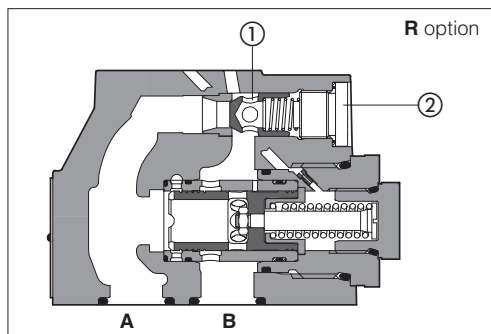
For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working



R = The AGRCZA are provided with integral check valve for free reverse flow A→B

- ① Check valve - cracking pressure = 0,5 bar
- ② Plug



14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} 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

/IP, /IR, /PR

16 DYNAMIC RESPONSE - 4 pressure PIDs

The valve is provided with 4 PIDs configurations to match different hydraulic conditions. The required PID configuration can be selected before the valve commissioning, through Atos E-SW software via USB port. Only for **RES** the PID can be also selected in real time, through PLC via fieldbus.

(1) interchangeable with previous TERS version

PID	Dynamic response
1	Fast - default (1)
2	Standard
3	Smooth
4	Open Loop

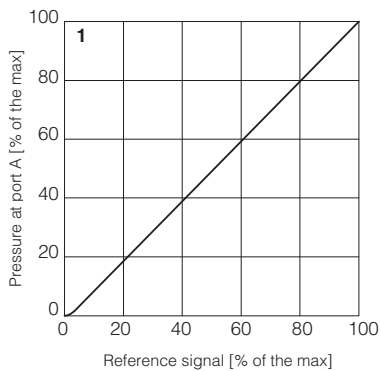
17 PRESSURE TRANSDUCER FAILURE

In case of pressure transducer failure, the valve's reaction can be configured through Atos E-SW software to:

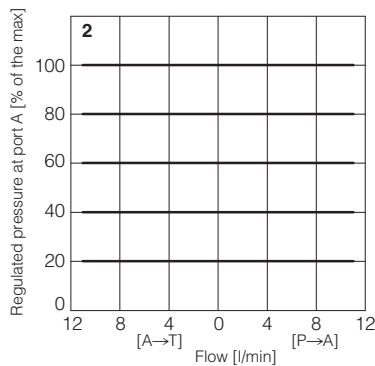
- cut off the current to solenoid, therefore the regulated pressure will be reduced to minimum value (default setting)
- automatically switch the pressure control from closed loop (PID1,2,3) to open loop (PID4), to let the valve to temporarily operate with reduced regulation accuracy

18 DIAGRAMS RZGA-010 (based on mineral oil ISO VG 46 at 50 °C)

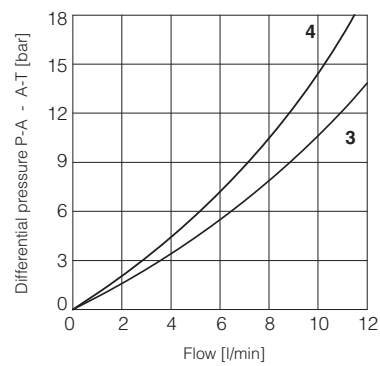
1 Regulation diagrams
with flow rate $Q = 1$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 1$ l/min



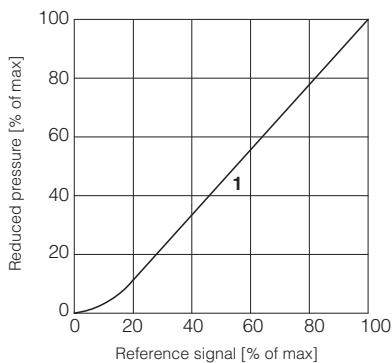
3-4 Min. pressure/flow diagrams
with zero reference signal



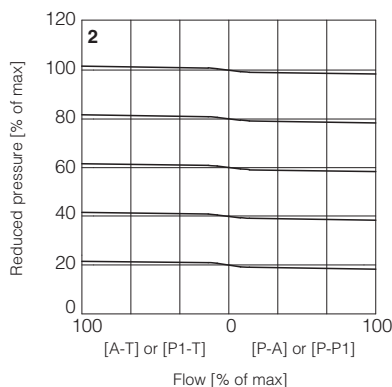
3 = Pressure drops vs. flow P→A
4 = Pressure drops vs. flow A→T

19 DIAGRAMS RZGA-033 (based on mineral oil ISO VG 46 at 50 °C)

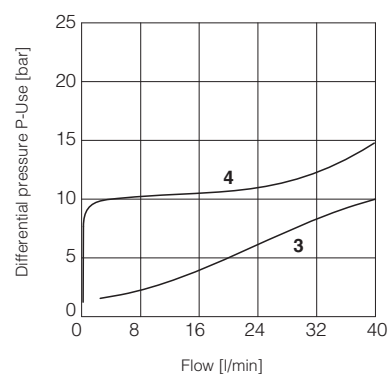
1 Regulation diagrams
with flow rate $Q = 10$ l/min



2 Pressure/flow diagrams
with reference pressure set with $Q = 10$ l/min



3-4 Pressure drop/flow diagram

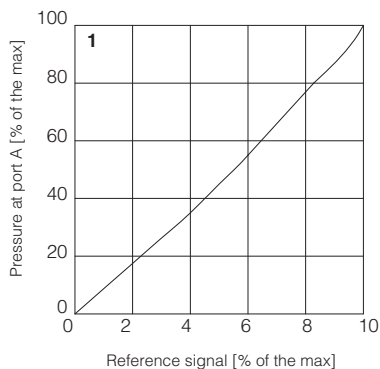


3 = A-T or P1-T (dotted line /350)
4 = P-P1 or P-A

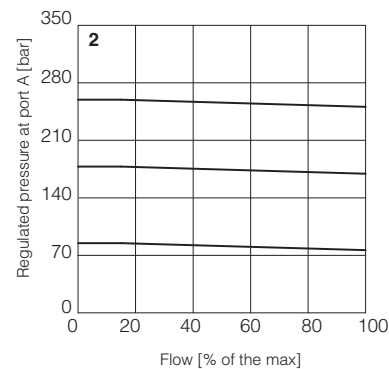
Note: the presence of counter pressure at port T can affect the effective pressure regulation

20 DIAGRAMS AGRCZA (based on mineral oil ISO VG 46 at 50 °C)

1 Regulation diagrams
with flow rate $Q = 10$ l/min



2 Pressure/flow diagrams
with reference pressure set with $Q = 10$ l/min



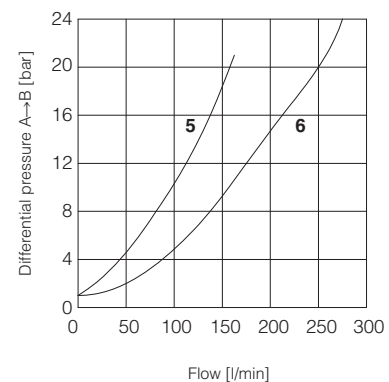
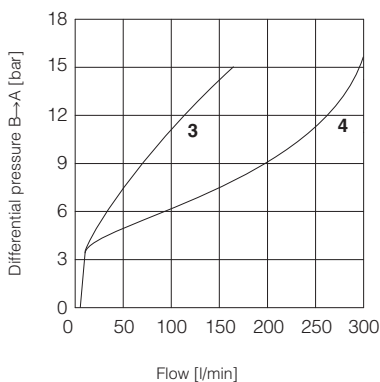
3-6 Pressure drop/flow diagrams
with zero reference signal

Differential pressure B→A

3 = AGRCZA-*-10
4 = AGRCZA-*-20

Differential pressure A→B
(through check valve)

5 = AGRCZA-*-10*/R
6 = AGRCZA-*-20*/R




21 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, EN-982).

21.1 Power supply (V+ and V0)

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

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

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

21.3 Pressure reference input signal (P_INPUT+)

The driver controls in closed loop the current to the valve pressure 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 $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 \div 24VDC.

21.4 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to the actual pressure 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, defaults settings 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 0 \div 10 Vdc or 0 \div 20 mA.

21.5 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.

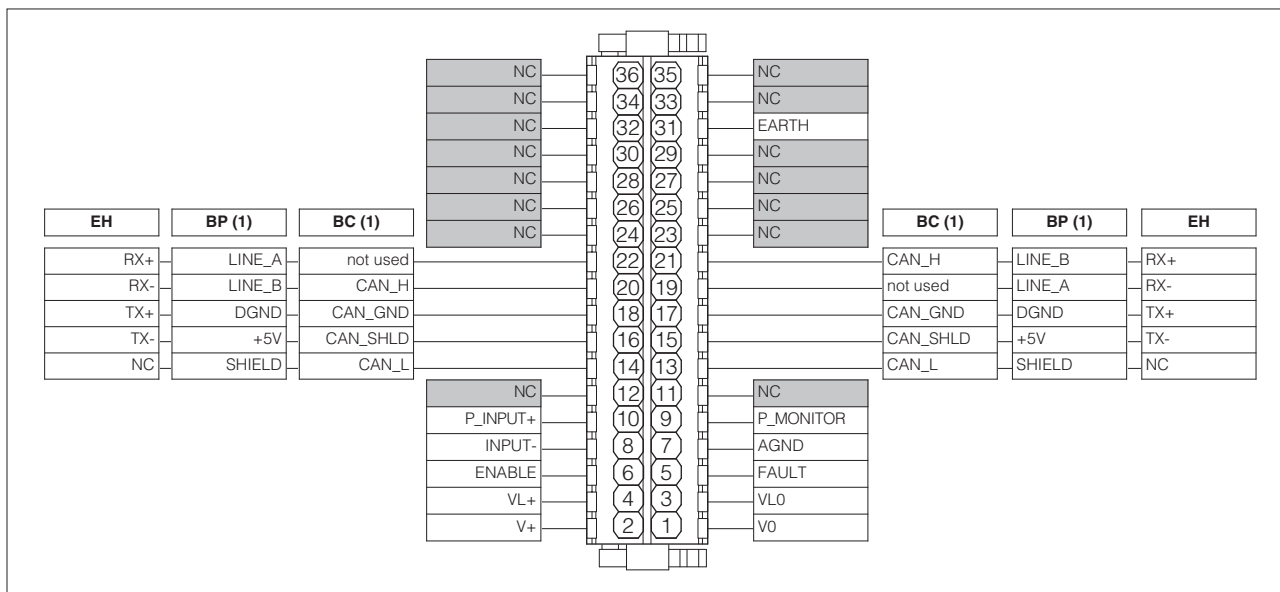
Enable input signal can be used as generic digital input by software selection.

21.6 Fault output signal (FAULT)

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

22 TERMINAL BOARD OVERVIEW



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

23 ELECTRONIC CONNECTIONS

23.1 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 pressure reference input signal for INPUT+	Input - analog signal
	9	P_MONITOR	Pressure monitor output signal: 0 ÷ 10 Vdc / 0 ÷ 20 mA maximum range, referred to AGND Default is: 0 ÷ 10 Vdc or 4 ÷ 20 mA	Output - analog signal Software selectable
	10	P_INPUT+	Pressure 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		

23.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS		
B	1	+5V_USB	Power supply	<p>Driver view (female)</p>	
	2	ID	Identification		
	3	GND_USB	Signal zero data line		
	4	D-	Data line -		
	5	D+	Data line +		

23.3 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

23.4 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)

23.5 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

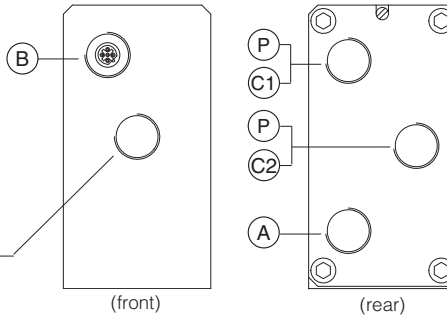
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

CABLE ENTRANCE OVERVIEW

Cables entrance description:

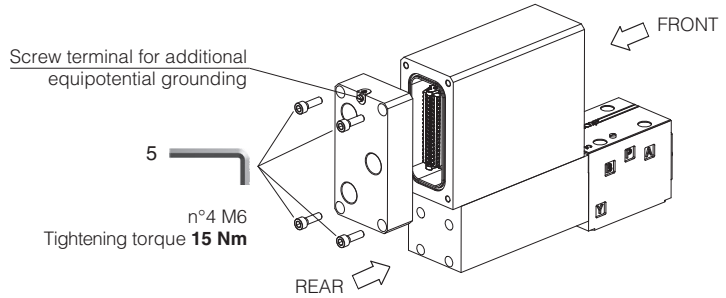
- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus interface (input)
- (C2) fieldbus interface (output)
- (P) threaded plug

PRESSURE TRANSDUCER CONNECTION
factory wired



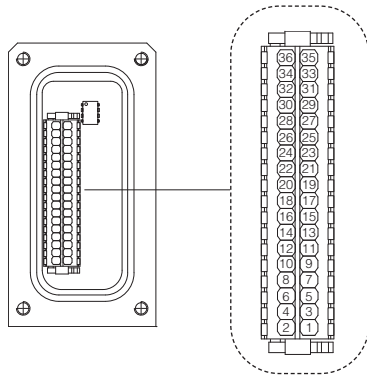
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 22



Fieldbus terminator only for BC and BP executions (1)

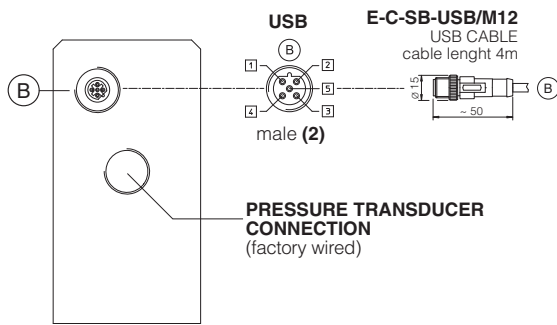
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

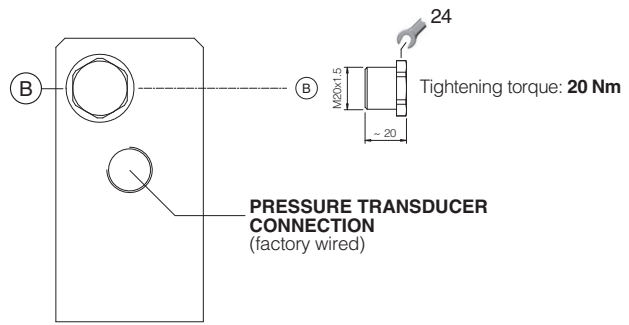
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	OFF
4	OFF

USB CONNECTOR

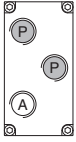
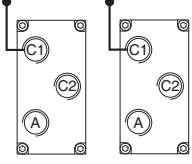
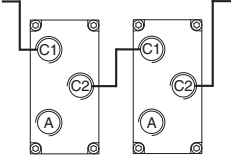


METALLIC PROTECTION CAP - supplied with the valves



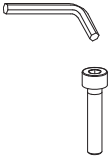

(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

24.1 Cable glands and threaded plug - see tech table **KX800**

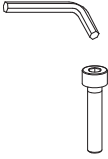

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	Cable gland entrance	Threaded plug quantity	Threaded plug entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection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

25 FASTENING BOLTS AND SEALS

25.1 RZGA valves

	RZGA-RES-*-010	RZGA-RES-*-033
	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm
	Seals: 4 OR 108 Diameter of ports P, A, T: Ø 5 mm	Seals: 4 OR 108 Diameter of ports P, A, T: Ø 7,5 mm

25.2 AGRCZA valves

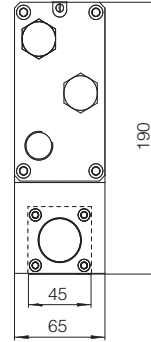
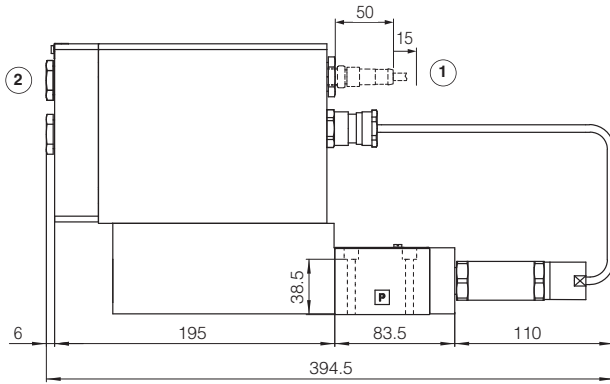
	AGRCZA-RES-*-10	AGRCZA-RES-*-20
	Fastening bolts: 4 socket head screws M10x45 class 12.9 Tightening torque = 70 Nm	Fastening bolts: 4 socket head screws M10x45 class 12.9 Tightening torque = 70 Nm
	Seals: 2 OR 3068 Diameter of ports A, B: Ø 14 mm 2 OR 109/70 Diameter of port X, Y: Ø 5 mm	Seals: 2 OR 4100 Diameter of ports A, B: Ø 22 mm 2 OR 109/70 Diameter of port X, Y: Ø 5 mm

RZGA-RES-*-010

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(port B not used)

Mass [kg]	
RZGA-RES-*-010	8,5

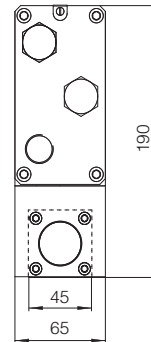
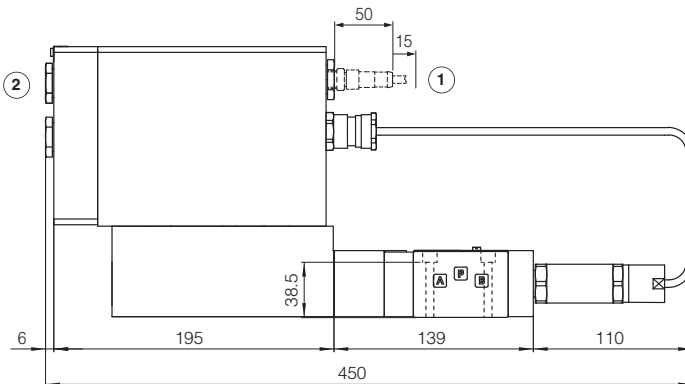


RZGA-RES-*-033

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(ports A and B connected to port T)

Mass [kg]	
RZGA-RES-*-033	9,5



① = Space to remove the USB connector

② = The dimensions of cable glands must be considered (see tech table **KX800**)

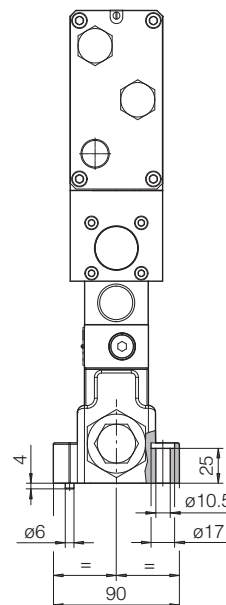
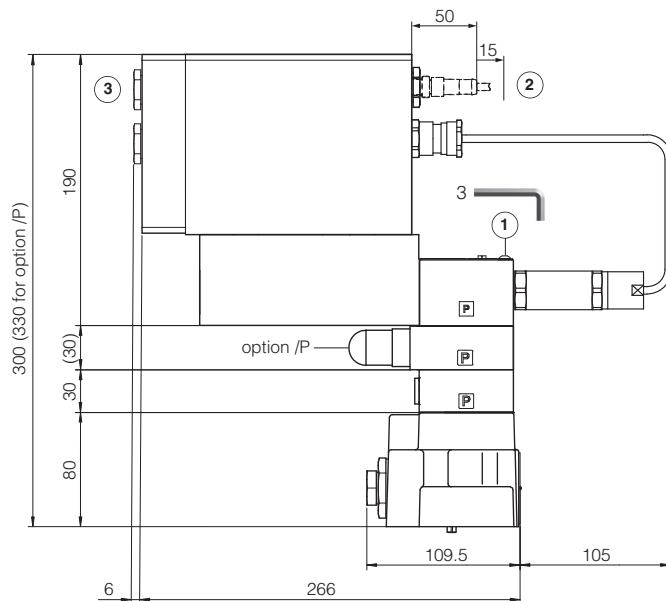
27 INSTALLATION DIMENSIONS FOR AGRCZA [mm]

AGRCZA-RES-*-10

ISO 5781: 2000

Mounting surface: 5781-06-07-0-00 (see table P005)

Mass [kg]	
AGRCZA-RES-*-10	12,1

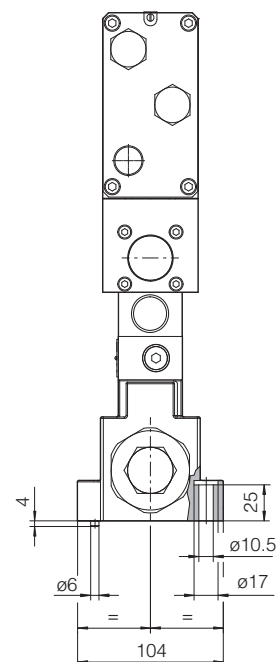
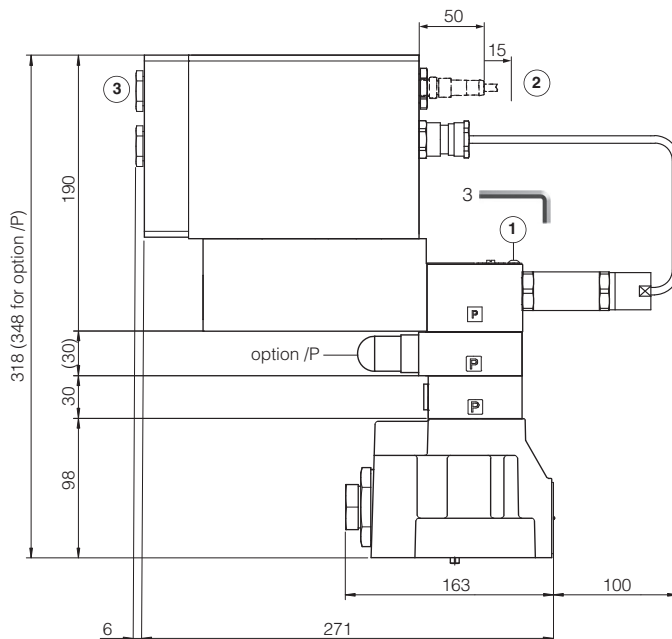


AGRCZA-RES-*-20

ISO 5781: 2000

Mounting surface: 5781-08-10-0-00 (see table P005)

Mass [kg]	
AGRCZA-RES-*-20	13,3



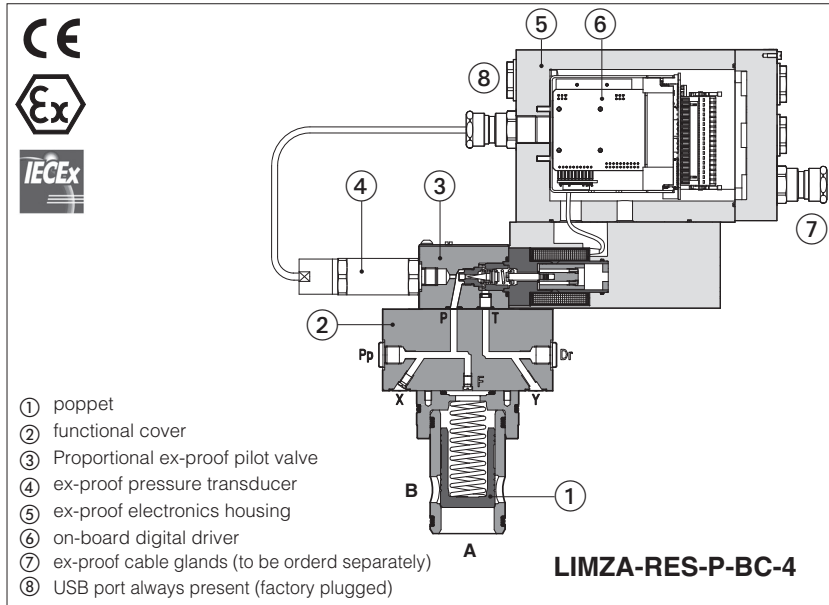
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

28 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GX800	Ex-proof pressure transducer type E-ATRA-7
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		
GS510	Fieldbus		

Ex-proof digital proportional pressure cartridges high performance

with on-board driver and pressure transducer - **ATEX** and **IECEX**



- ① poppet
- ② functional cover
- ③ Proportional ex-proof pilot valve
- ④ ex-proof pressure transducer
- ⑤ ex-proof electronics housing
- ⑥ on-board digital driver
- ⑦ ex-proof cable glands (to be ordered separately)
- ⑧ USB port always present (factory plugged)

LICZA-RES, LIMZA-RES, LIRZA-RES
2-way ex-proof digital proportional pressure cartridges, high performance with pressure transducer, respectively performing: pressure compensator, relief or reducing functions.

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

● Multicertification **ATEX** and **IECEX** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of on-board digital driver, solenoid and transducer, 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.

Size: **16 ÷ 80** -ISO7368

Max flow: up to **4500 l/min**

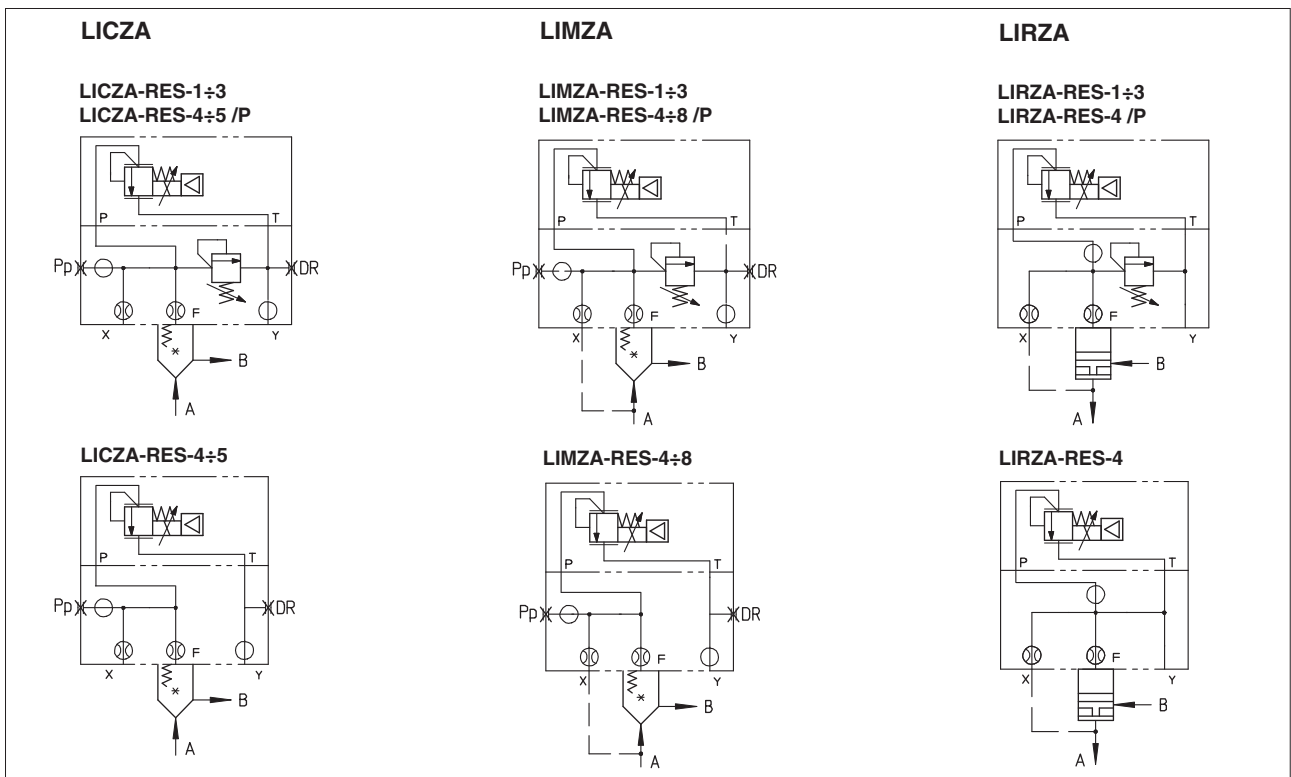
Max pressure: **250 bar**

1 MODEL CODE FOR COVERS

LIMZA	-	RES	-	P	-	NP	-	3	/	315	/	M	/	*	/	*	/	*	/	*
<p>Ex-proof proportional pressure cartridges LICZA = pressure compensator LIMZA = pressure relief LIRZA = pressure reducing</p> <p>RES = on-board driver</p> <p>P = on-board ex-proof pressure transducer</p> <p>Fieldbus interfaces, USB port always present: NP = Not present BC = CANopen BP = PROFIBUS DP EH = EtherCAT</p> <p>Valve size ISO 7368: 1 = 16 2 = 25 3 = 32 4 = 40 5 = 50 (not for LIRZA) 6 = 63 (only for LIMZA) 8 = 80; (only for LIMZA)</p>																				
																		<p>Seals material, see section 11 : - = NBR PE = FKM BT = HNBR</p> <p>Series number</p>		
																		<p>Dynamic response preset, see section 18: - = omit for PID 1 fast (default) 2 = PID 2 standard 3 = PID 3 smooth</p>		
																		<p>Hydraulic options (1): P =with integral mechanical pressure limiter (standard for size 1, 2, 3)</p> <p>Electronics options (1): I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 Vdc)</p>		
																		<p>Cable entrance threaded connection: M = M20x1,5</p>		
																		<p>Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar</p>		

(1) Possible combined options: /IP

2 HYDRAULICS SYMBOLS



3 MODEL CODE OF CARTRIDGES

SC LI	-	32	31	2	** / *	
Cartridge according to ISO 7368						Seals material, see section 11 : - = NBR PE = FKM BT = HNBR
Cartridges size ISO 7368: 16 25 32 40 50 63 80					Series number	
Type of poppet: 31 = for LIMZA and LICZA 36 = for LICZA 37 = for LIRZA						Spring cracking pressure: 2 = 1,5 bar for poppet 31 3 = 3 bar 4 = 4 bar 6 = 6 bar for poppet 31 and 36 7 = 7 bar for poppet 37

4 TYPE OF POPPET

Type of poppet	31	36	37
Functional sketch (Hydraulic symbol)			
Typical section			
Area ratio A: AP	1:1	1:1	1:1

5 GENERAL NOTES

Atos digital proportional 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-* programming software.

6 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

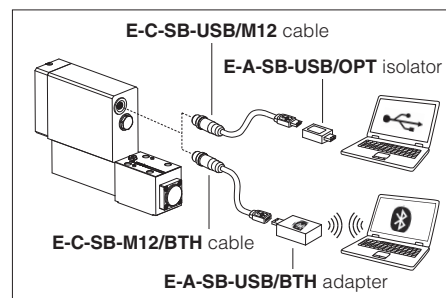
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) PS (Serial) IR (Infrared)
E-SW-FIELDBUS support: BC (CANopen) BP (PROFIBUS DP) EH (EtherCAT)
 EW (POWERLINK) EI (EtherNet/IP) EP (PROFINET IRT)
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



7 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.

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	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 12 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	LICZA					LIMZA								LIRZA			
	1	2	3	4	5	1	2	3	4	5	6	8	1	2	3	4	
Valve size [l/min]																	
Max flow [bar]	200	400	750	1000	2000	200	400	750	1000	2000	3000	4500	160	300	550	800	
Min regulated pressure	see section 20																
Max regulated pres. at port A [bar]	80; 180; 250					80; 180; 250								80; 180; 250			
Max pressure [bar]	Ports: T, Y = 210 Ports: P, A, B, X = 350																
Response time 0-100% step signal (1) (depending on installation) [ms]	≤ 100 ÷ 350					≤ 100 ÷ 350								≤ 100 ÷ 250			
Hysteresis [% of regulated max pres.]	≤ 0,5																
Linearity [% of regulated max pres.]	≤ 1,0																
Repeatability [% of regulated max pres.]	≤ 0,2																

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response


10 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 tollerant) 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: range 0 ÷ 10 Vdc @ max 5 mA Current: range 0 ÷ 20 mA @ max 500 Ω load resistance			
Enable input	Range: 0 ÷ 9 Vdc (OFF state), 15 ÷ 24 Vdc (ON state), 9 ÷ 15 Vdc (not accepted); Input impedance: Ri > 87 kΩ			
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)			
Pressure transducer power supply	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	20 ÷ 100 mm ² /s - max allowed range 15 ÷ 500 mm ² /s		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

12 CERTIFICATION DATA

Valve type	LICZA, LIMZA, LIRZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-RES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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**

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

13.1 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

14 CABLE GLANDS

Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX600**

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

15 HYDRAULIC OPTIONS

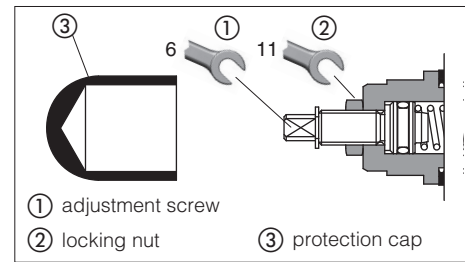
P = Integral mechanical pressure limiter (standard for size 1, 2 and 3)

The LICZA, LIMZA and LIRZA standard size 1, 2, 3 and option /P are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

- apply the max reference input signal to the valve’s driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



16 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} 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.

17 POSSIBLE COMBINED OPTIONS

/IP

18 DYNAMIC RESPONSE - 4 pressure PIDs

The valve is provided with 4 PIDs configurations to match different hydraulic conditions. The required PID configuration can be selected before the valve commissioning, through Atos E-SW software via USB port. Only for **RES** the PID can be also selected in real time, through PLC via fieldbus.

(1) interchangeable with previous TERS version

PID	Dynamic response
1	Fast - default (1)
2	Standard
3	Smooth
4	Open Loop

19 PRESSURE TRANSDUCER FAILURE

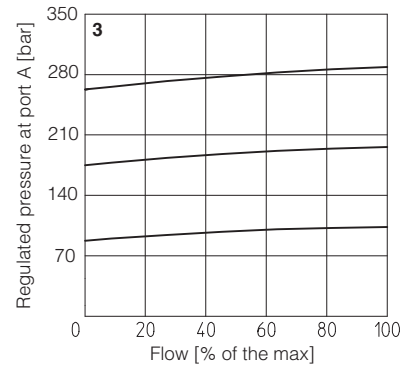
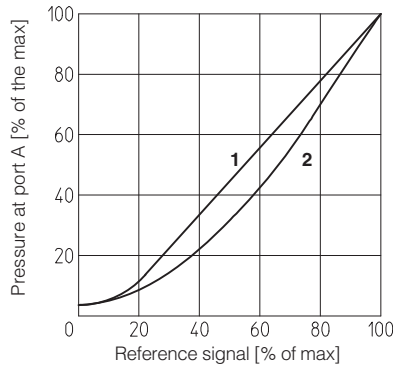
In case of pressure transducer failure, the valve’s reaction can be configured through Atos E-SW software to:

- cut off the current to solenoid, therefore the regulated pressure will be reduced to minimum value (default setting)
- automatically switch the pressure control from closed loop (PID1,2,3) to open loop (PID4), to let the valve to temporarily operate with reduced regulation accuracy

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

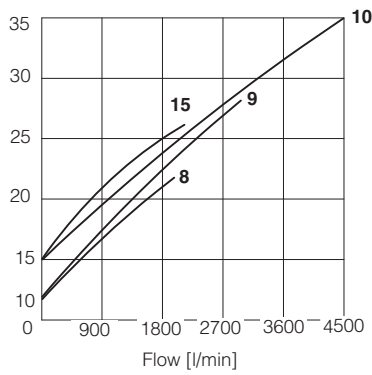
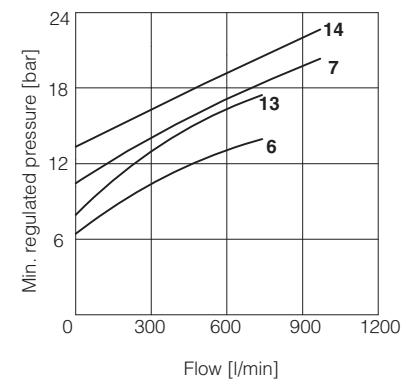
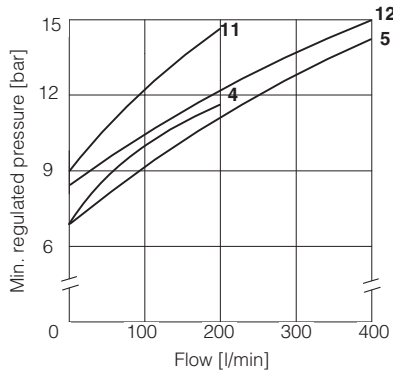
- 1 Regulation diagrams LIMZA**
- 2 Regulation diagrams LICZA**

- 3 Pressure/flow diagrams LICZA, LIMZA**



4-14 Min. pressure/flow diagrams with zero reference signal

- 4 = LIMZA*-1 11 = LICZA*-1**
- 5 = LIMZA*-2 12 = LICZA*-2**
- 6 = LIMZA*-3 13 = LICZA*-3**
- 7 = LIMZA*-4 14 = LICZA*-4**
- 8 = LIMZA*-5**
- 9 = LIMZA*-6**
- 10 = LIMZA*-8**

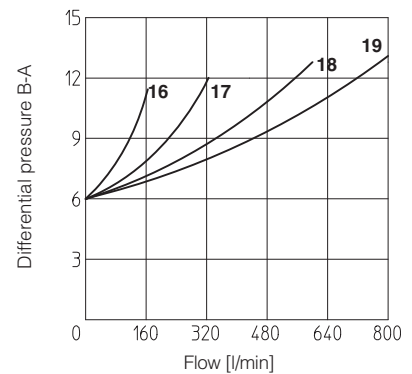
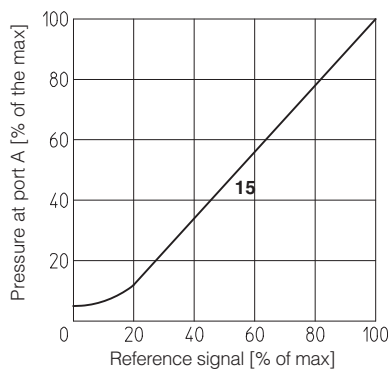


Regulation diagrams LIRZA

- 15 = LIRZA-A**

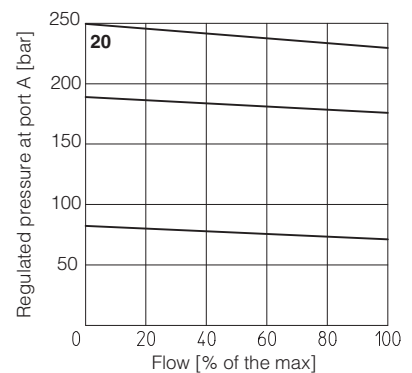
16-19 Min. pressure/flow diagrams with reference signal "null"

- 16 = LIRZA*-1**
- 17 = LIRZA*-2**
- 18 = LIRZA*-3**
- 19 = LIRZA*-4**



Pressure/flow diagrams

- 20 = LIRZA-A**




21 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, EN-982).

21.1 Power supply (V+ and V0)

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

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

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

21.3 Pressure reference input signal (P_INPUT+)

The driver controls in closed loop the current to the valve pressure 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 $\pm 10\text{ Vdc}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 \div 24VDC.

21.4 Pressure monitor output signal (P_MONITOR)

The driver generates an analog output signal proportional to the actual pressure 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, defaults settings 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 0 \div 10 Vdc or 0 \div 20 mA.

21.5 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.

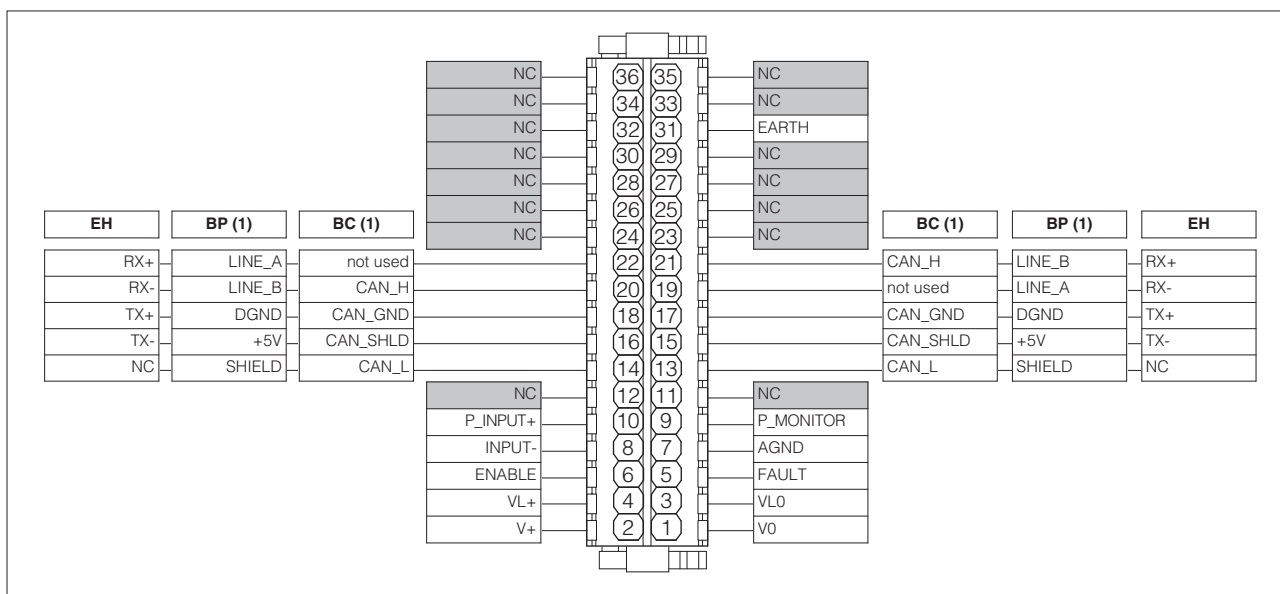
Enable input signal can be used as generic digital input by software selection.

21.6 Fault output signal (FAULT)

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

22 TERMINAL BOARD OVERVIEW



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

23 ELECTRONIC CONNECTIONS

23.1 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 pressure reference input signal for INPUT+	Input - analog signal
	9	P_MONITOR	Pressure monitor output signal: 0 ÷ 10 Vdc / 0 ÷ 20 mA maximum range, referred to AGND Default is: 0 ÷ 10 Vdc or 4 ÷ 20 mA	Output - analog signal Software selectable
	10	P_INPUT+	Pressure 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		

23.2 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 +

Driver view

(female)

23.3 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

23.4 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)

23.5 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

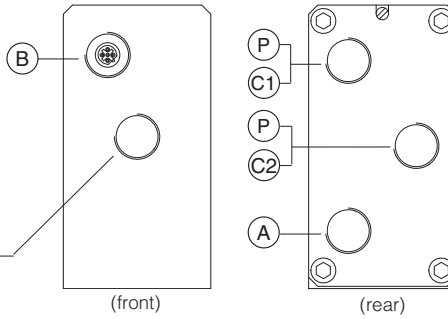
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

CABLE ENTRANCE OVERVIEW

Cables entrance description:

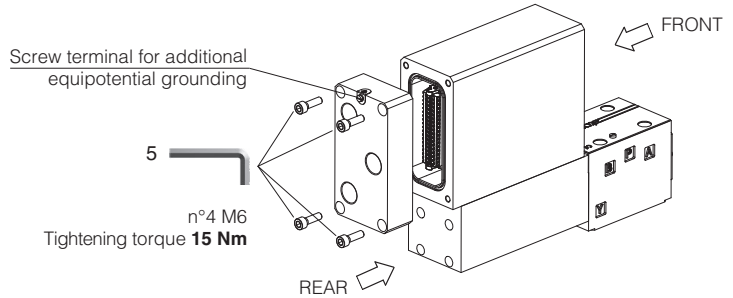
- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus interface (input)
- (C2) fieldbus interface (output)
- (P) threaded plug

PRESSURE TRANSDUCER CONNECTION
factory wired



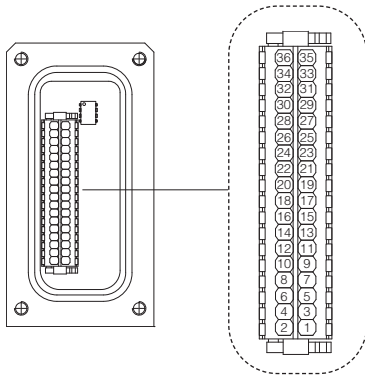
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 22



Fieldbus terminator only for BC and BP executions (1)

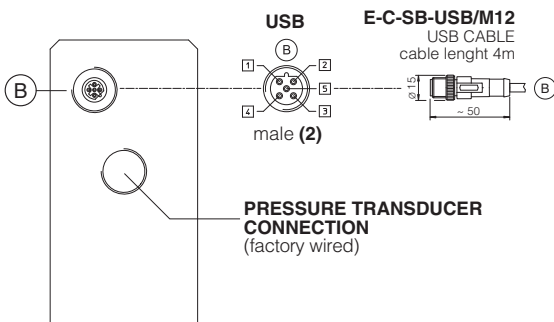
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

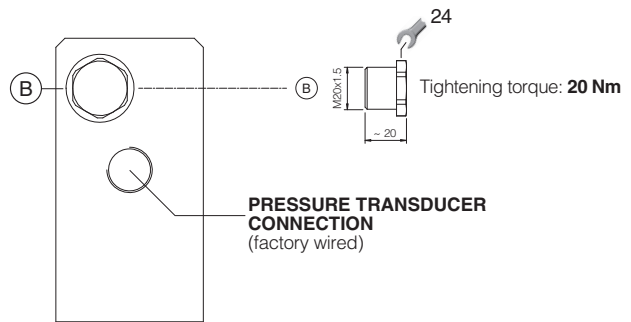
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	OFF
4	OFF

USB CONNECTOR

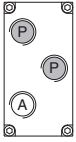
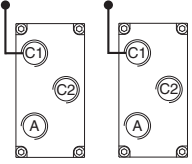
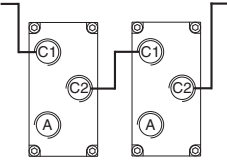


METALLIC PROTECTION CAP - supplied with the valves



(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

24.1 Cable glands and threaded plug - see tech table **KX800**

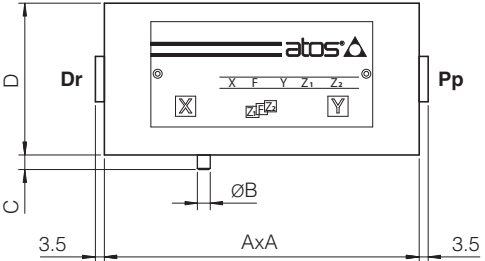
Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection	2	C1 A	1	C2		Cable entrance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

25 FASTENING BOLTS AND SEALS

Type	Size	Fastening bolts	Seals
LIMZA LICZA LIRZA	1 = 16	4 socket head screws M8x45 class 12.9 Tightening torque = 35 Nm	2 OR 108
	2 = 25	4 socket head screws M12x45 class 12.9 Tightening torque = 125 Nm	2 OR 108
	3 = 32	4 socket head screws M16x55 class 12.9 Tightening torque = 300 Nm	2 OR 2043
	4 = 40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA LICZA	5 = 50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA	6 = 63	4 socket head screws M30x90 class 12.9 Tightening torque = 2100 Nm	2 OR 3050
	8 = 80	8 socket head screws M24x90 class 12.9 Tightening torque = 1000 Nm	2 OR 4075

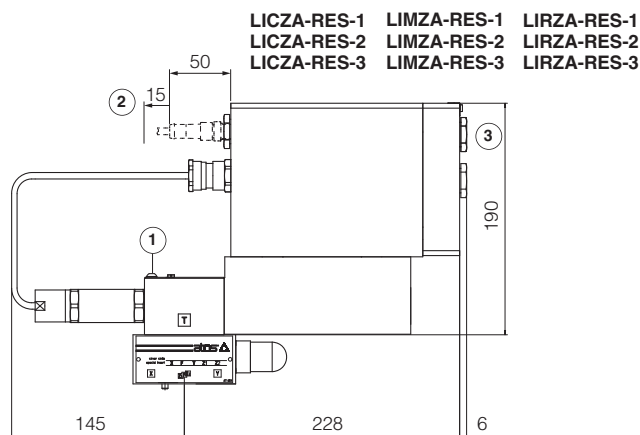
26 COVERS DIMENSIONS [mm]

Size	AxA	ØB	C	D	Port Pp - Dr
1 = 16	65x80	3	4	40	-
2 = 25	85x85	5	6	40	-
3 = 32	100x100	5	6	50	-
4 = 40	125x125	5	6	60	G 1/4"
5 = 50	140x140	6	4	70	G 1/4"
6 = 63	180x180	6	4	80	G 3/8"
8 = 80	Ø250	8	6	80	G 3/8"

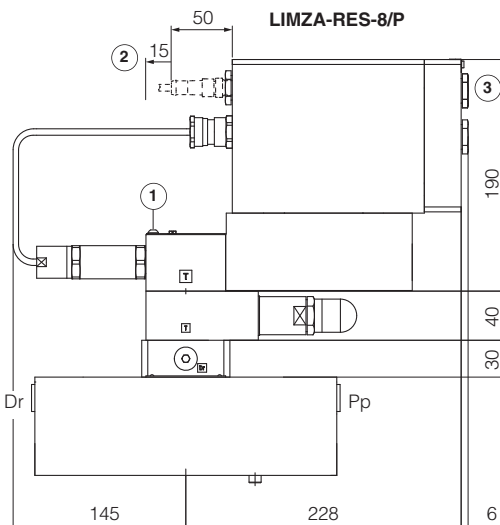
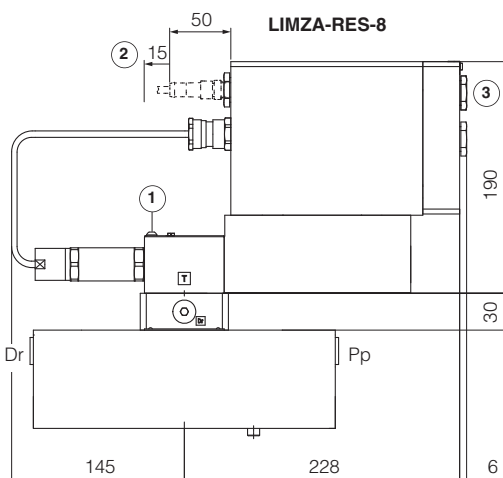
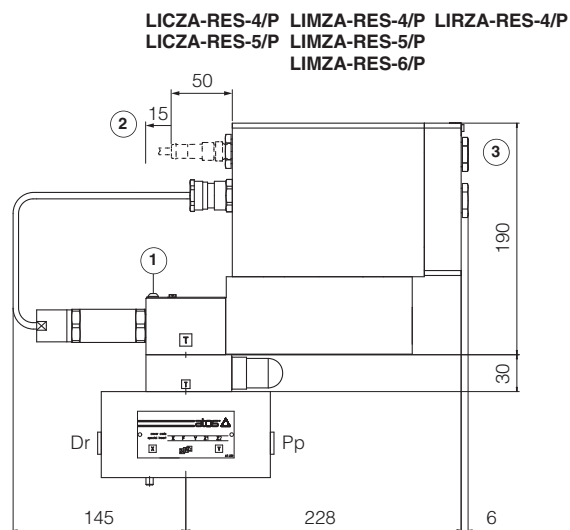
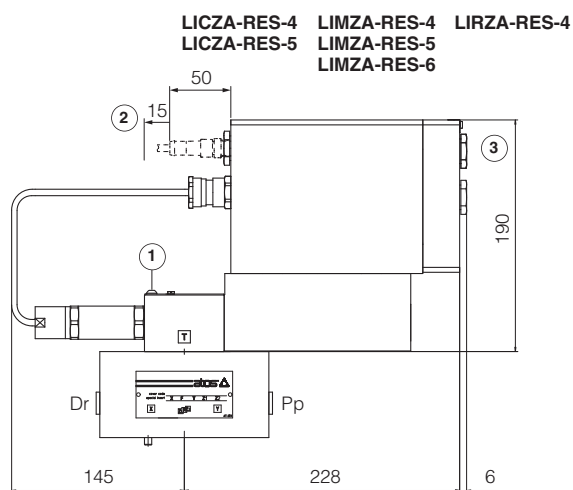


Notes:
size 1 cover is not squared but rectangular, dimensions 65x80
size 8 cover is not squared but circular, dimension Ø250

27 INSTALLATION DIMENSIONS [mm]



Mass [kg]			
Size	LICZA, LIMZA, LIRZA		Cartridge
	Standard	Option /P	SC LI
1 = 16	11	-	0,2
2 = 25	11,5	-	0,5
3 = 32	12,8	-	0,9
4 = 40	18,2	12,5	1,7
5 = 50	21,7	16	2,9
6 = 63	31,2	25,5	6,7
8 = 80	39,8	34,1	13,1



Note: for ISO 7368 mounting surface and cavity dimensions, see tech. table P006

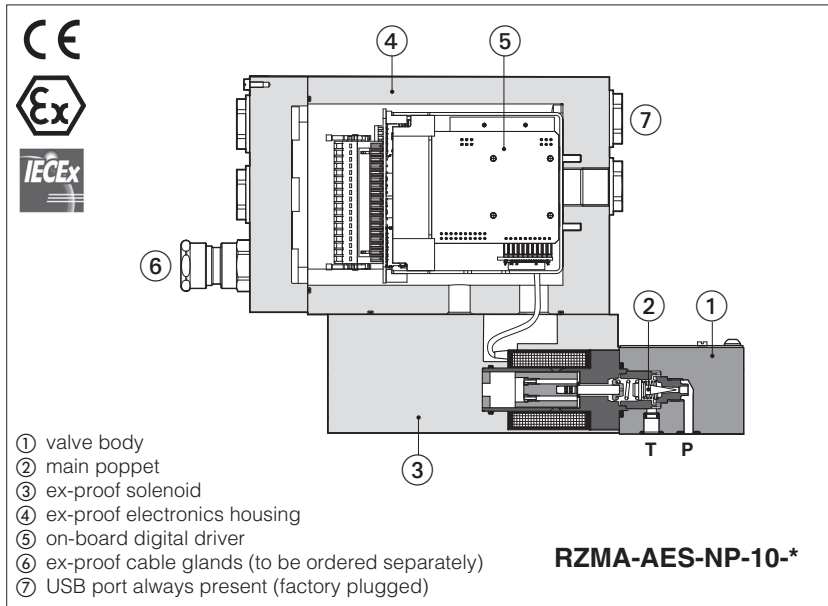
- ① = Screw for air bleeding: at the first valve commissioning the air eventually trapped inside the solenoid must be bled-off though the screw
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

28 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GX800	Ex-proof pressure transducer type E-ATRA-7
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P006	Mounting surfaces and cavities for cartridge valves
GS500	Programming tools		
GS510	Fieldbus		

Ex-proof digital proportional relief valves

direct or piloted, with on-board driver and without transducer - **ATEX and IECEx**



RZMA-AES, AGMZA-AES

Ex-proof digital proportional relief valves direct or piloted without transducer for pressure open loop controls.

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

- Multicertification **ATEX** and **IECEx** 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.

RZMA, direct or piloted:

Size: **06** -ISO 4401
Max flow: **4** and **40 l/min**

AGMZA, piloted:

Size: **10, 20** and **32** -ISO 6264
Max flow: **200, 400** and **600 l/min**

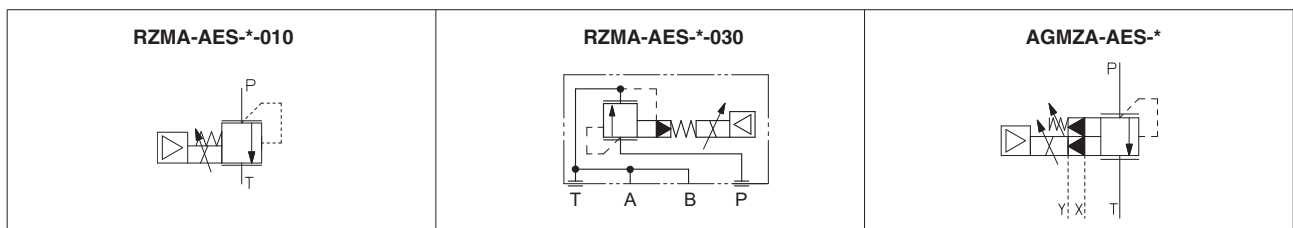
Max pressure: **250 bar**

1 MODEL CODE

RZMA	-	AES	-	NP	-	010	/	250	/	M	/	*	/	*	/	*
Ex-proof proportional pressure relief valves RZMA = subplate size 06 AGMZA = subplate size 10, 20, 32																Seals material, see section 9: - = NBR PE = FKM BT = HNBR
AES = on-board driver, without transducer																Series number
Fieldbus interfaces , USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT																Hydraulic options - only AGMZA (1): E = external pilot Y = external drain Electronic options (1): I = current reference input 4÷20 mA (omit for std voltage 0÷10V _{bc})
Valve size and configuration: RZMA: direct 010 = Q _{max} 4 l/min RZMA: piloted 030 = Q _{max} 40 l/min AGMZA: piloted 10, 20, 32 = Q _{max} 200, 400, 600 l/min																Cable entrance threaded connection: M = M20x1,5
																Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar

(1) Possible combined options: /EY, /EI, /YI

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

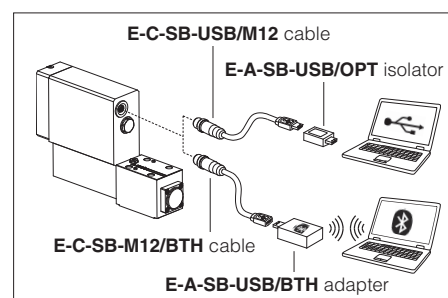
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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 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 valves according to EN ISO 13849	RZMA-010 150 years, RZMA-030 and AGMZA 75 years, 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZMA		AGMZA		
	010	030	10	20	32
Size code					
Valve size	06		10	20	32
Max regulated pressure [bar]	80 180 250				
Min regulated pressure [bar]	see min. pressure / flow diagrams at sections 18 19 20				
Max pressure at port P, A, B, X [bar]	315				
Max pressure at port T, Y [bar]	210				
Max flow [l/min]	4	40	200	400	600
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 80		≤ 130	≤ 145	≤ 160
Hysteresis [% of the max pressure]	≤ 1,5				
Linearity [% of the max pressure]	≤ 3				
Repeatability [% of the max pressure]	≤ 2				

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response

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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	RZMA, AGMZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-AES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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

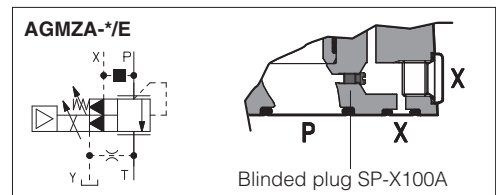
Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX600**

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

13 HYDRAULIC OPTIONS - only for AGMZA

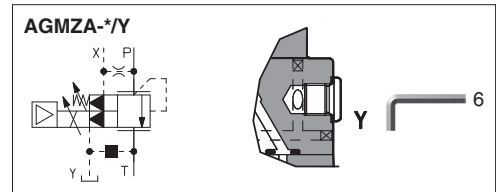
E = External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged. The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G 1/4").

Y = The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G 1/4" available on the pilot stage body.



14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} 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

/EY, /EI, /YI

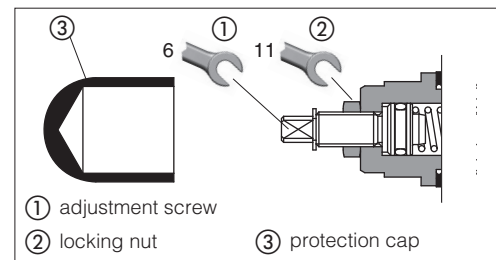
16 MECHANICAL PRESSURE LIMITER - only for AGMZA

The AGMZA are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

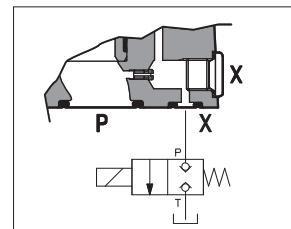
- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



17 REMOTE PRESSURE UNLOADING - only for AGMZA

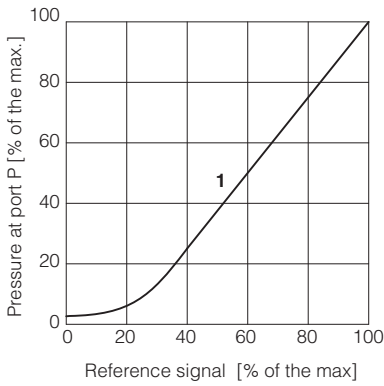
The **P** main line can be remotely unloaded by connecting the valve X port to a solenoid valve as shown in the below scheme (venting valve).

This function can be used in emergency to unload the system pressure by-passing the proportional control.

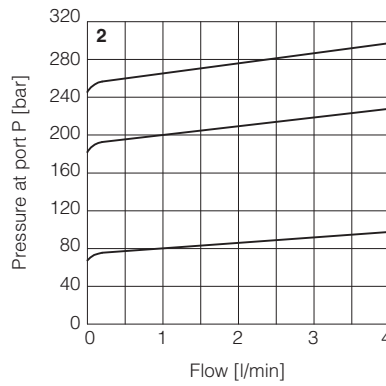


18 DIAGRAMS RZMA-010 (based on mineral oil ISO VG 46 at 50 °C)

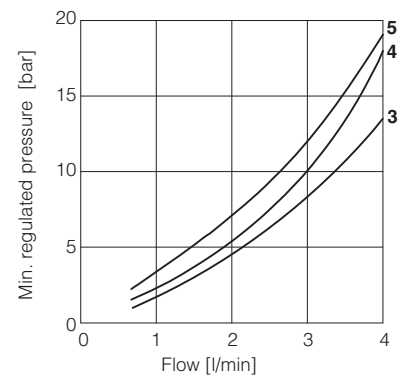
1 Regulation diagrams
with flow rate $Q = 1$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 1$ l/min



3-5 Min. pressure/flow diagrams
with zero reference signal

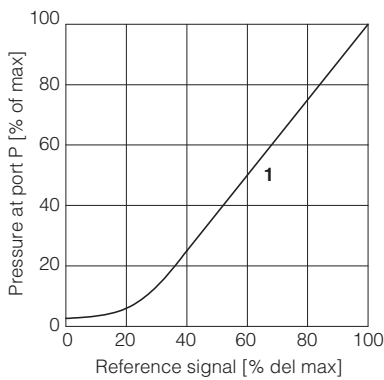


3 = RZMA/80
4 = RZMA/180
5 = RZMA/250

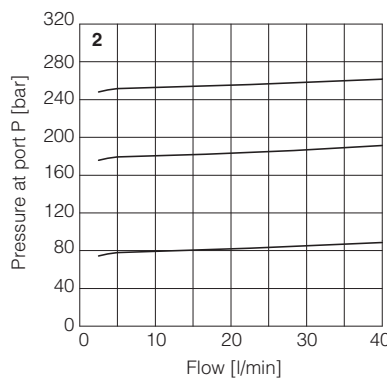
Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

19 DIAGRAMS RZMA-030 (based on mineral oil ISO VG 46 at 50 °C)

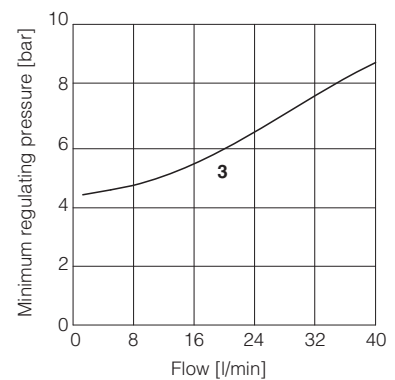
1 Regulation diagrams
with flow rate $Q = 10$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 10$ l/min



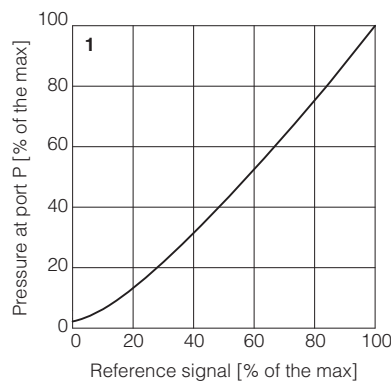
3 Min. pressure/flow diagrams
with zero reference signal



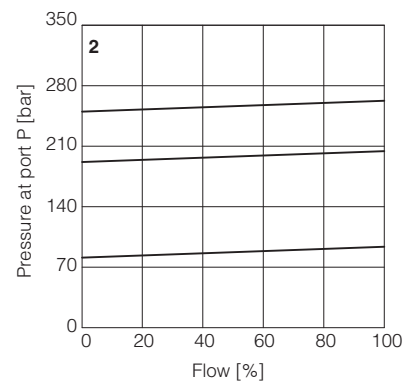
Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

20 DIAGRAMS AGMZA (based on mineral oil ISO VG 46 at 50 °C)

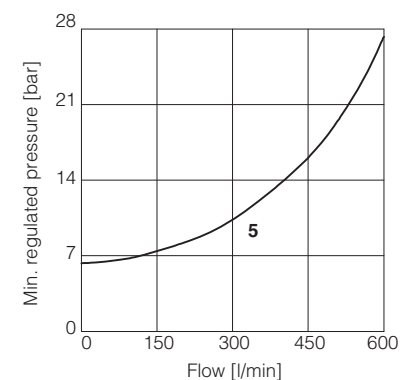
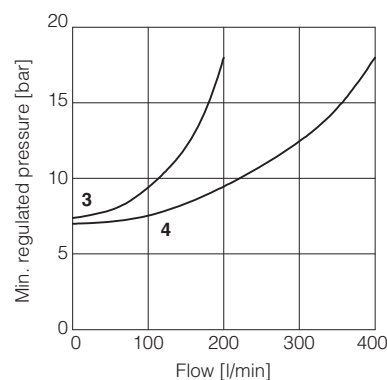
1 = Regulation diagrams
with flow rate $Q = 50$ l/min



2 = Pressure/flow diagrams
with reference signal set at $Q = 50$ l/min



3-5 = Min. pressure/flow diagrams
with zero reference signal



3 = AGMZA-*-10
4 = AGMZA-*-20
5 = AGMZA-*-32

21 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, EN-982).

21.1 Power supply (V+ and V0)

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

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

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

21.3 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 $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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.

21.4 Monitor output signal (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 $\pm 5\text{ VDC}$.

21.5 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.

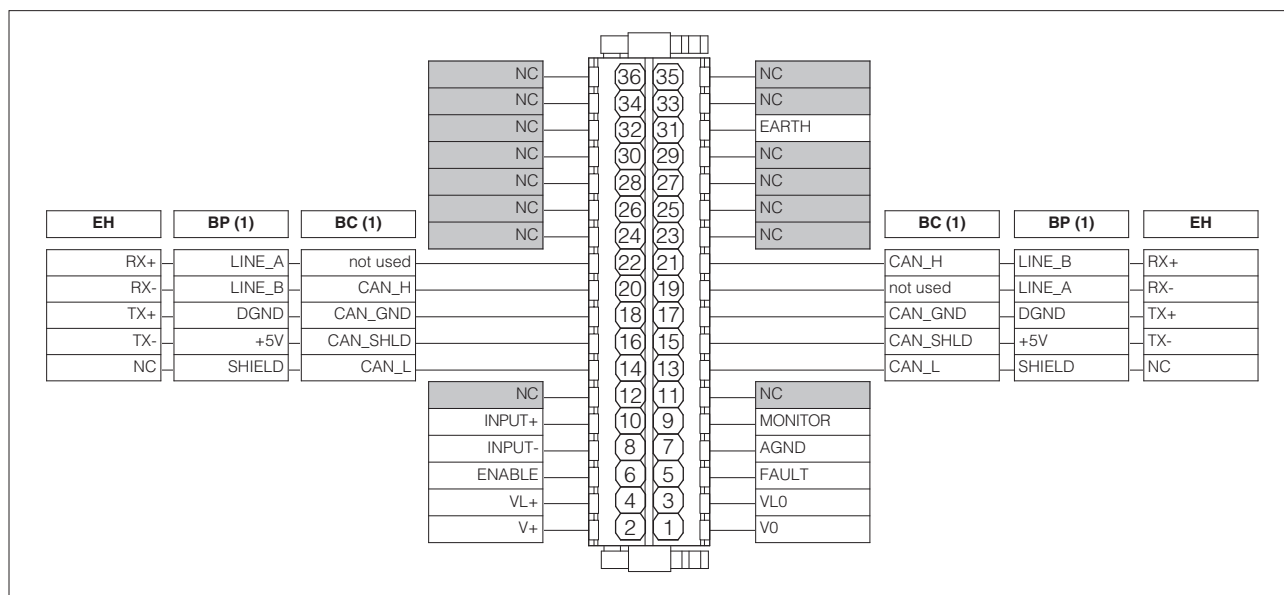
Enable input signal can be used as generic digital input by software selection.

21.6 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.

22 TERMINAL BOARD OVERVIEW



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

23 ELECTRONIC CONNECTIONS

23.1 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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
	31	EARTH	Internally connected to driver housing	

23.2 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 +

Driver view

(female)

23.3 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

23.4 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)

23.5 EH fieldbus execution connections

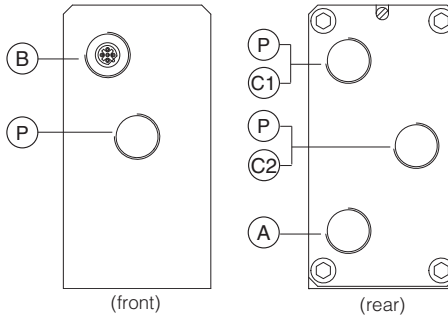
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

CABLE ENTRANCE OVERVIEW

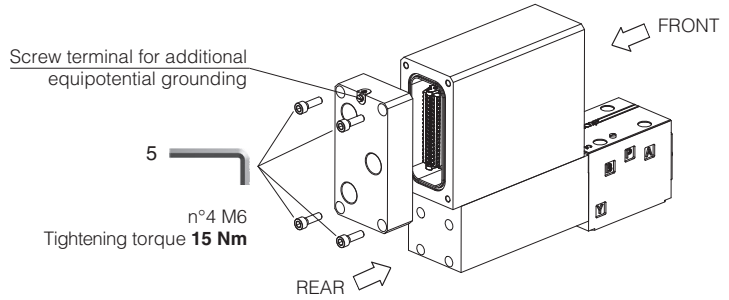
Cables entrance description:

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



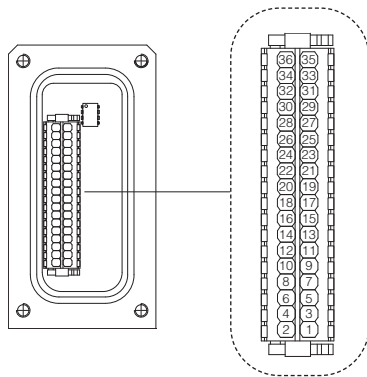
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

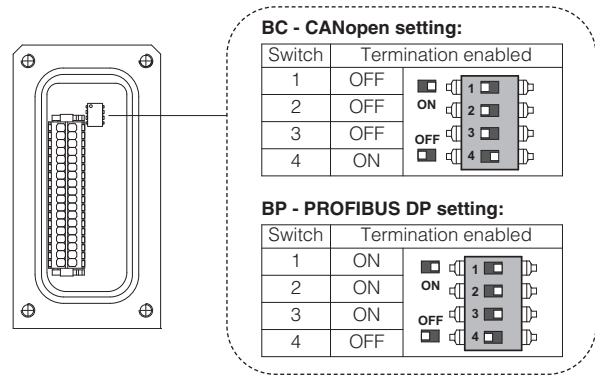


WARNING: the above operation must be performed in a safety area

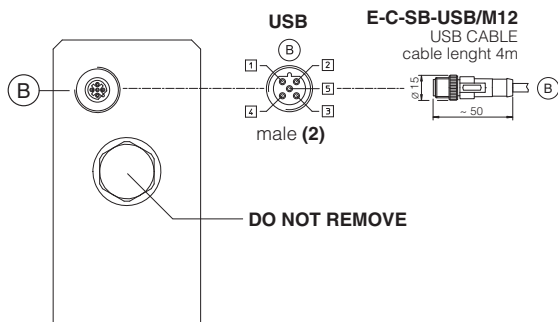
Terminal board - see section 22



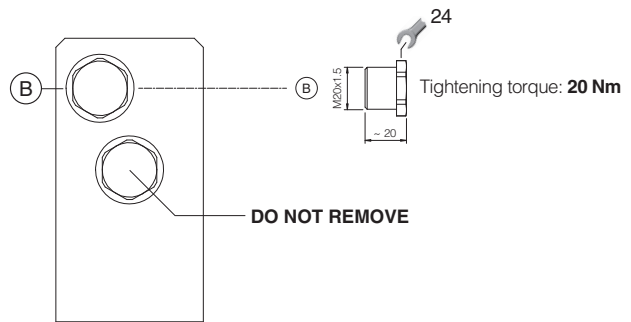
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

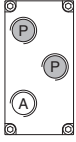
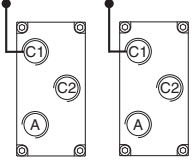
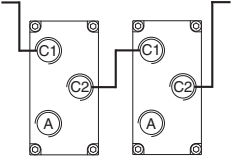


METALLIC PROTECTION CAP - supplied with the valves



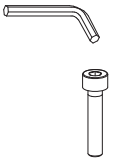

(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

24.1 Cable glands and threaded plug - see tech table **KX800**

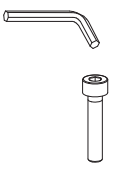

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection	2	C1 A	1	C2		Cable entrance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

25 FASTENING BOLTS AND SEALS

25.1 RZMA valves

	RZMA-AES-*-010	RZMA-AES-*-030
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>
	<p>Seals: 2 OR 108 Diameter of ports P, T: Ø 5 mm</p>	<p>Seals: 4 OR 108 Diameter of ports P, T: Ø 7,5 mm</p>

25.2 AGMZA valves

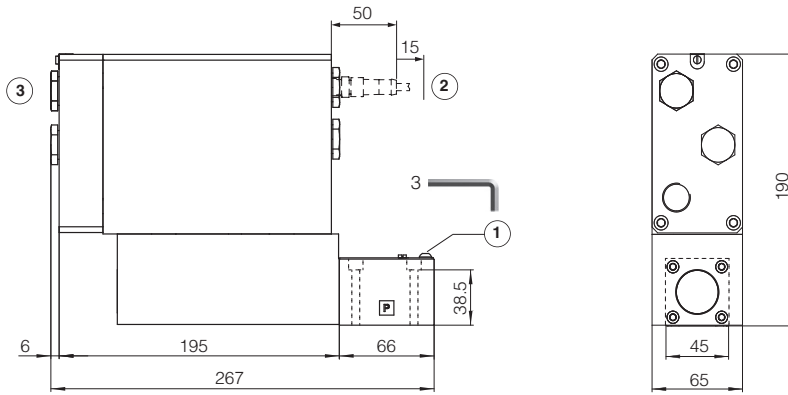
	AGMZA-AES-*-10	AGMZA-AES-*-20	AGMZA-AES-*-32
	<p>Fastening bolts: 4 socket head screws M12x35 class 12.9 Tightening torque = 125 Nm</p>	<p>Fastening bolts: 4 socket head screws M16x50 class 12.9 Tightening torque = 300 Nm</p>	<p>Fastening bolts: 4 socket head screws M20x60 class 12.9 Tightening torque = 600 Nm</p>
	<p>Seals: 2 OR 123 Diameter of ports P, T: Ø 14 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm</p>	<p>Seals: 2 OR 4112 Diameter of ports P, T: Ø 24 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm</p>	<p>Seals: 2 OR 4131 Diameter of ports P, T: Ø 28 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm</p>

RZMA-AES-*-010

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(without ports A and B)

Mass [kg]	
RZMA-AES-*-010	8

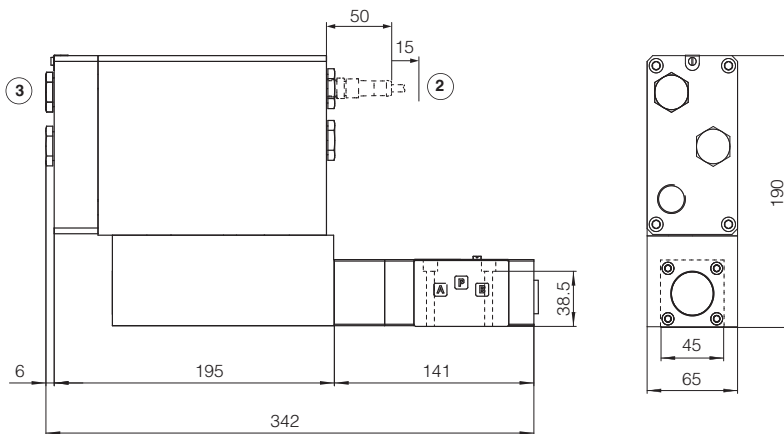


RZMA-AES-*-030

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05 (see table P005)
(ports A and B connected to port T)

Mass [kg]	
RZMA-AES-*-030	9



- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

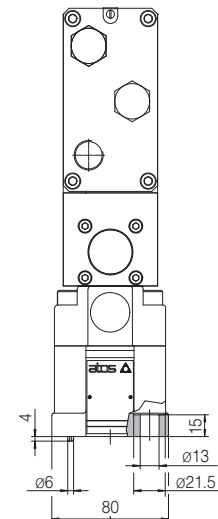
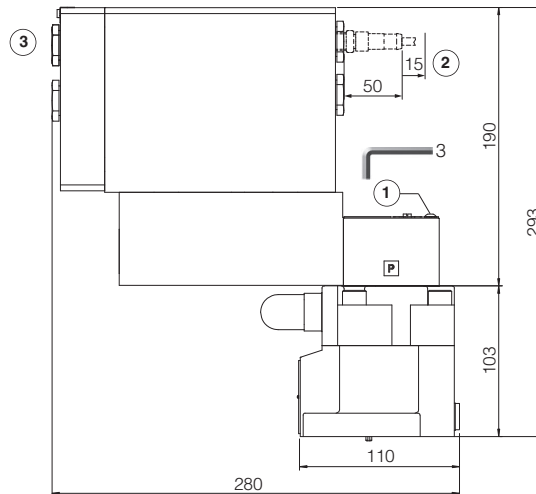
27 INSTALLATION DIMENSIONS FOR AGMZA [mm]

AGMZA-AES-*-10

ISO 6264: 2007

Mounting surface: 6264-06-09-1-97
(see table P005)

Mass [kg]	
AGMZA-AES-*-10	11,6

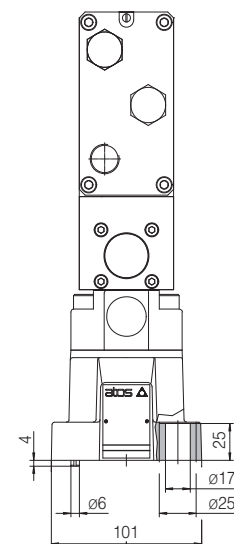
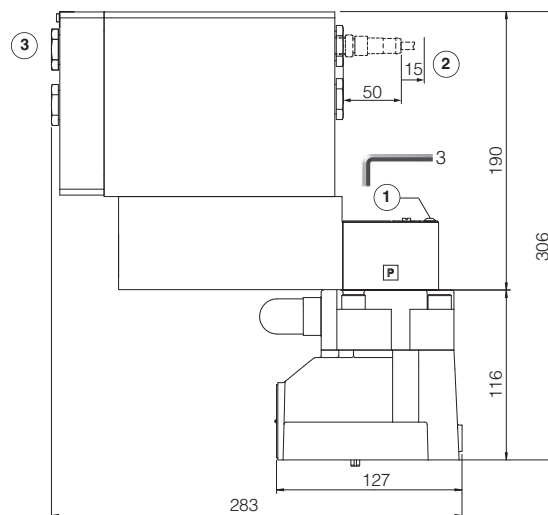


AGMZA-AES-*-20

ISO 6264: 2007

Mounting surface: 6264-08-13-1-97
(see table P005)

Mass [kg]	
AGMZA-AES-*-20	12,8

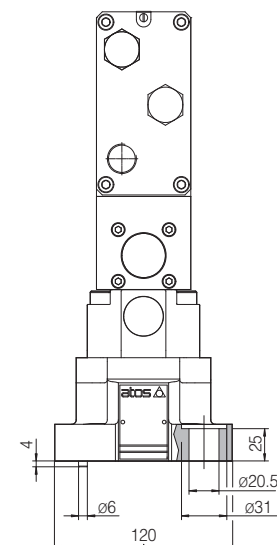
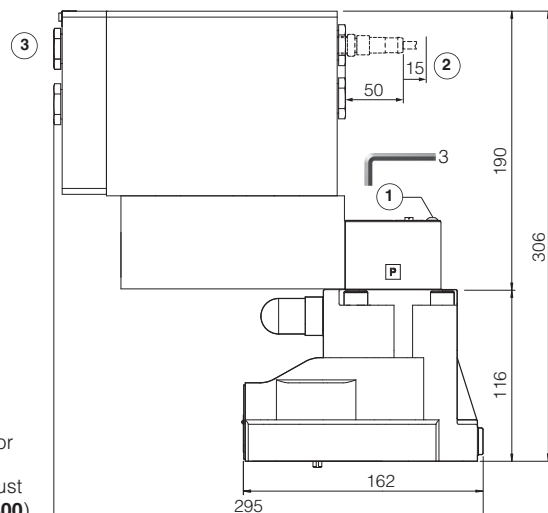


AGMZA-AES-*-32

ISO 6264: 2007

Mounting surface: 6264-10-17-1-97
(see table P005)

Mass [kg]	
AGMZA-AES-*-32	14,8



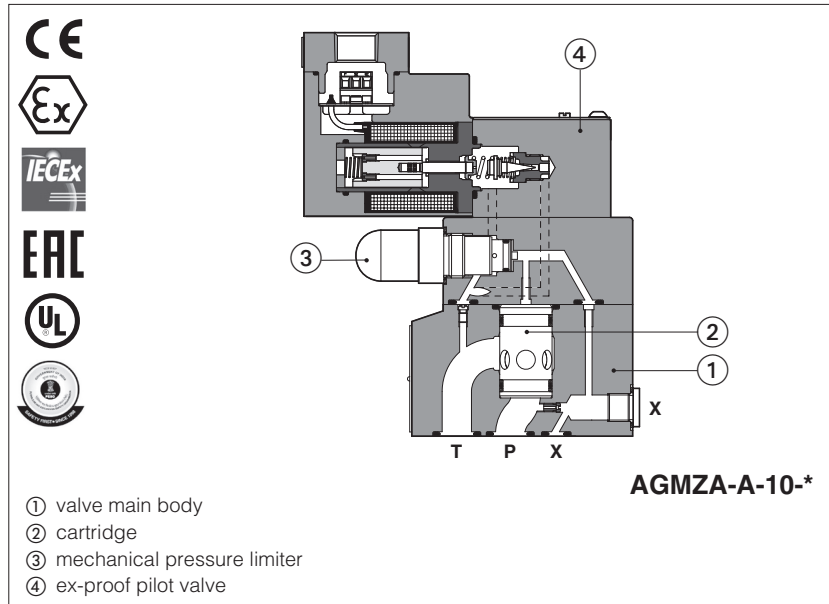
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

28 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		

Ex-proof proportional relief valves

direct or piloted, without transducer - **ATEX, IECEx, EAC, PESO** or **cULus**



RZMA-A, HZMA-A, AGMZA-A

Ex-proof proportional relief valves direct or piloted, without transducer for open loop pressure controls.

They are equipped with ex-proof proportional solenoid, certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

RZMA, direct or piloted:

Size: **06** - ISO 4401

Max flow: **4** and **40 l/min**

HZMA, direct or piloted:

Size: **06** - ISO 4401

Max flow: **40 l/min**

AGMZA, piloted:

Size: **10, 20** and **32** - ISO 6264

Max flow: **200, 400** and **600 l/min**

Max pressure: **250 bar**

1 MODEL CODE

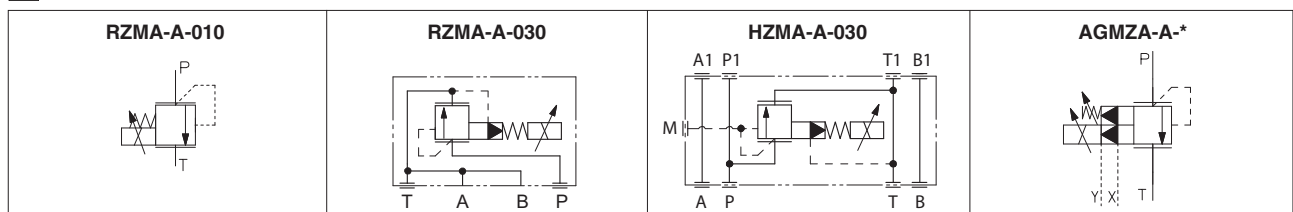
RZMA	/	*	-	A	-	10	-	250	/	GK	/	*	/	*	/	*	/	*																
<p>Ex-proof proportional pressure relief valves</p> <p>RZMA = subplate size 06 HZMA = modular size 06 AGMZA = subplate size 10, 20, 32</p> <p>Certification type: Multicertification: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size and configuration:</p> <table border="0"> <tr> <td>010 = RZMA direct</td> <td>size 06</td> <td>Qmax 4 l/min</td> </tr> <tr> <td>030 = RZMA piloted</td> <td>size 06</td> <td>Qmax 40 l/min</td> </tr> <tr> <td>030 = HZMA piloted</td> <td>size 06</td> <td>Qmax 40 l/min</td> </tr> <tr> <td>10 = AGMZA piloted</td> <td>size 10</td> <td>Qmax 200 l/min</td> </tr> <tr> <td>20 = AGMZA piloted</td> <td>size 20</td> <td>Qmax 400 l/min</td> </tr> <tr> <td>32 = AGMZA piloted</td> <td>size 32</td> <td>Qmax 600 l/min</td> </tr> </table> <p>Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar</p>																	010 = RZMA direct	size 06	Qmax 4 l/min	030 = RZMA piloted	size 06	Qmax 40 l/min	030 = HZMA piloted	size 06	Qmax 40 l/min	10 = AGMZA piloted	size 10	Qmax 200 l/min	20 = AGMZA piloted	size 20	Qmax 400 l/min	32 = AGMZA piloted	size 32	Qmax 600 l/min
010 = RZMA direct	size 06	Qmax 4 l/min																																
030 = RZMA piloted	size 06	Qmax 40 l/min																																
030 = HZMA piloted	size 06	Qmax 40 l/min																																
10 = AGMZA piloted	size 10	Qmax 200 l/min																																
20 = AGMZA piloted	size 20	Qmax 400 l/min																																
32 = AGMZA piloted	size 32	Qmax 600 l/min																																
<p>Seals material, see section [7]: - = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = optional coil for 24 Vdc low current drivers</p> <p>Options (3): E = external pilot (only for AGMZA) O = horizontal cable entrance (2) Y = external drain (only for AGMZA)</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (4) M = M20x1,5- not for cULus NPT = 1/2" NPT</p>																																		

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) **(3)** Possible combined options: /EO, /EY, /OY **(4)** Approved only for the Italian market

The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



3 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

4 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years; 150 years only for RZMA-010, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 8 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZMA		HZMA	AGMZA		
	010	030	030	10	20	32
Size code						
Valve size	06			10	20	32
Max regulated pressure [bar]			80 180 250			
Min regulated pressure [bar]	see min. pressure / flow diagrams at sections 15 16 17					
Max pressure at port P, A, B, X [bar]	315					
Max pressure at port T, Y [bar]	210					
Max flow [l/min]	4	40	40	200	400	600
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 80			≤ 130	≤ 145	≤ 160
Hysteresis[% of the max pressure]	≤ 1,5					
Linearity[% of the max pressure]	≤ 3					
Repeatability[% of the max pressure]	≤ 2					

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 3

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response

6 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

7 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

8 CERTIFICATION DATA

Valve type	RZMA, HZMA, AGMZA	RZMA/M, HZMA/M, AGMZA/M	RZMA/UL, HZMA/UL, AGMZA/UL
Certifications	Multicertification Group II ATEX IECEx EAC PESO	Multicertification Group I ATEX IECEx	North American cULus
Solenoid certified code	MZA-A	MZAM-A	OZA-A/EC
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131	ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 	<ul style="list-style-type: none"> • ATEX 2014/34/EU Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.1, Groups C & D Class I, Zone I, Groups IIA & IIB
Temperature class	T4	T3	-
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31	IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT		1/2" NPT

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -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

9 EX PROOF SOLENOIDS WIRING

Multicertification

n°4 M4 locking torque 4Nm

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
2 = GND
3 = Coil

cULus certification

n°4 M4 locking torque 4Nm

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring

⚠ Pay attention to respect the polarity

1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 10 note 1
2 = GND
3 = Coil -

alternative GND screw terminal connected to solenoid housing

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> • Suitable for use in Class I Division 1, Gas Groups C • Armored Marine Shipboard Cable which meets UL 1309 • Tinned Stranded Copper Conductors • Bronze braided armor • Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

10.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	-	90 °C	-
45 °C	-	T4	150 °C	135 °C	-	90 °C
55 °C	-	T3	150 °C	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

11 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **KX600**

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

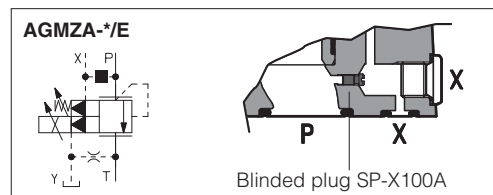
12 OPTIONS

For alla valves:

O = Horizontal cable entrance to be selected in case of limited vertical space.

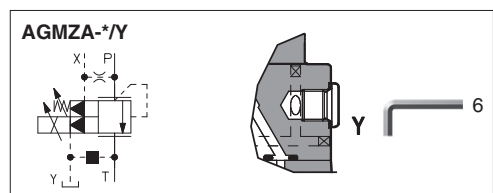
Only for AGMZA:

E = External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged.
The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G 1/4").



Only for AGMZA:

Y = The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G 1/4" available on the pilot stage body.



12.1 Possible combined options: /EO, /EY, /OY

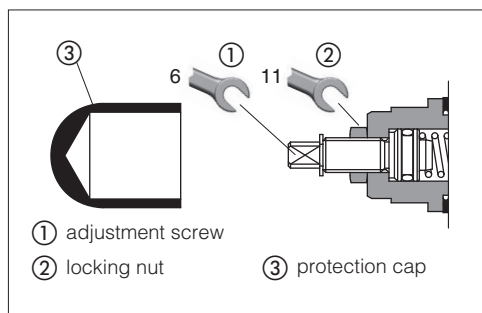
13 MECHANICAL PRESSURE LIMITER - only for AGMZA

The AGMZA are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

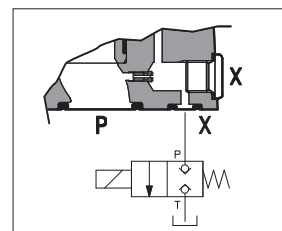
- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



14 REMOTE PRESSURE UNLOADING - only for AGMZA

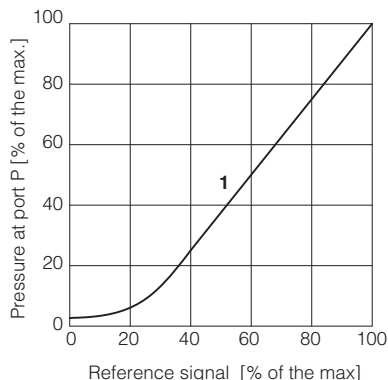
The **P** main line can be remotely unloaded by connecting the valve X port to a solenoid valve as shown in the below scheme (venting valve).

This function can be used in emergency to unload the system pressure by-passing the proportional control.

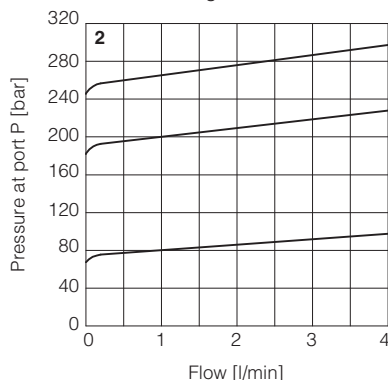


15 DIAGRAMS RZMA-010 (based on mineral oil ISO VG 46 at 50 °C)

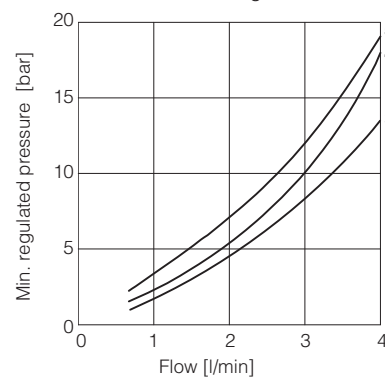
1 Regulation diagrams
with flow rate $Q = 1$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 1$ l/min



3-5 Min. pressure/flow diagrams
with zero reference signal

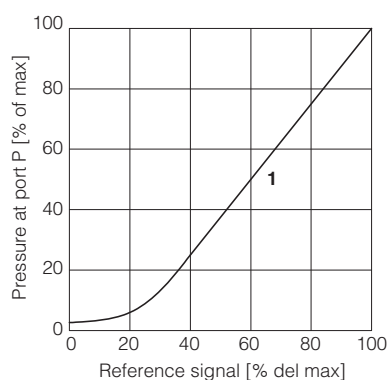


- 3 = RZMA/80
- 4 = RZMA/180
- 5 = RZMA/250

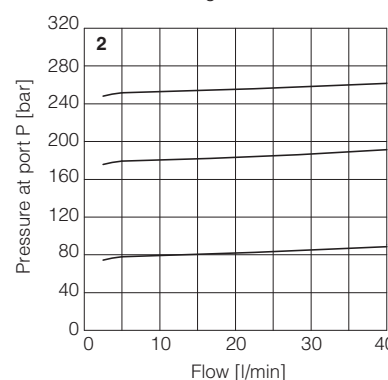
Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

16 DIAGRAMS RZMA-030, HZMA-030 (based on mineral oil ISO VG 46 at 50 °C)

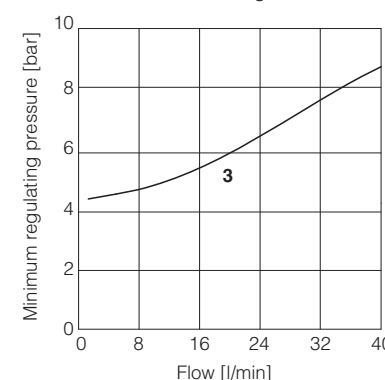
1 Regulation diagrams
with flow rate $Q = 10$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 10$ l/min



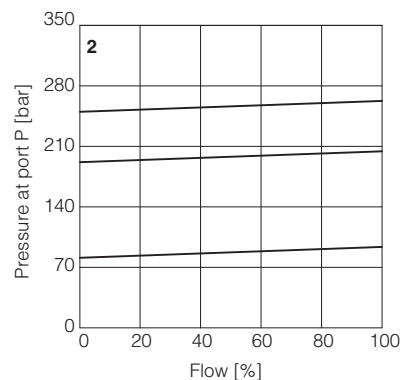
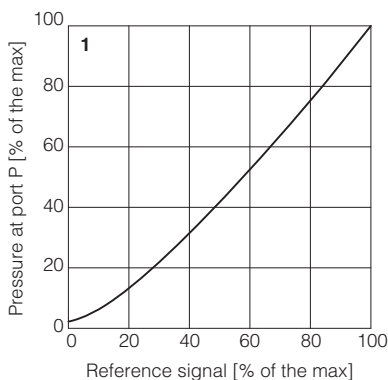
3 Min. pressure/flow diagrams
with zero reference signal



Note: the presence of counter pressure at port T can affect the pressure regulation and the minimum pressure

17 DIAGRAMS AGMZA (based on mineral oil ISO VG 46 at 50 °C)

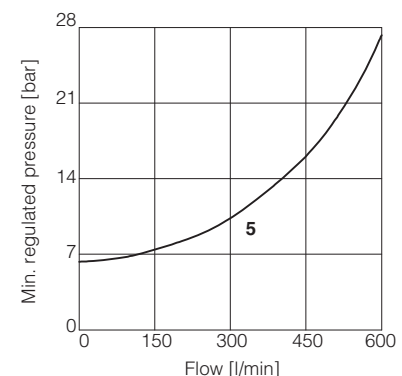
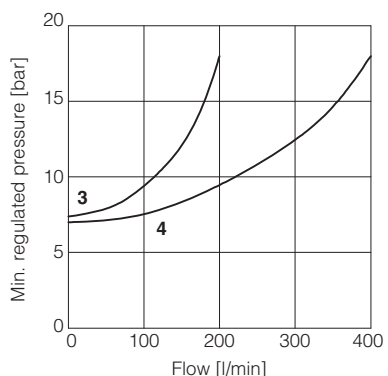
1 = Regulation diagrams
with flow rate Q = 50 l/min



2 = Pressure/flow diagrams
with reference signal set at Q = 50 l/min

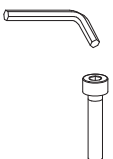

3-5 = Min. pressure/flow diagrams
with zero reference signal

- 3 = AGMZA*-10
- 4 = AGMZA*-20
- 5 = AGMZA*-32

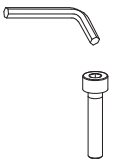



18 FASTENING BOLTS AND SEALS

18.1 RZMA and HZMA valves

	RZMA-A-010	RZMA-A-030	HZMA-A-030
	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5 class 12.9 Tightening torque = 8 Nm
	Seals: 2 OR 108 Diameter of ports P, T: Ø 5 mm	Seals: 4 OR 108 Diameter of ports P, T: Ø 7,5 mm	Seals: 4 OR 108 Diameter of ports P, A, B, T: Ø 6,5 mm

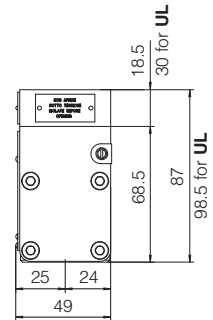
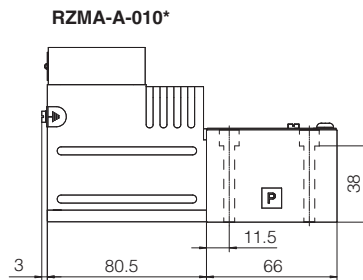
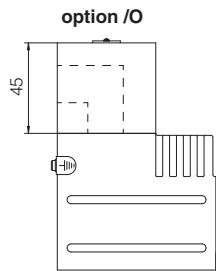
18.2 AGMZA valves

	AGMZA-A-10	AGMZA-A-20	AGMZA-A-32
	Fastening bolts: 4 socket head screws M12x35 class 12.9 Tightening torque = 125 Nm	Fastening bolts: 4 socket head screws M16x50 class 12.9 Tightening torque = 300 Nm	Fastening bolts: 4 socket head screws M20x60 class 12.9 Tightening torque = 600 Nm
	Seals: 2 OR 123 Diameter of ports P, T: Ø 14 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm	Seals: 2 OR 4112 Diameter of ports P, T: Ø 24 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm	Seals: 2 OR 4131 Diameter of ports P, T: Ø 28 mm 1 OR 109/70 Diameter of port X: Ø 3,2 mm

RZMA-A-010

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (without ports A and B)

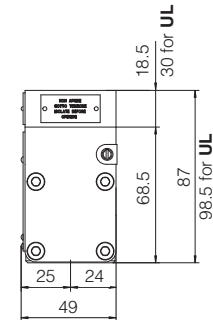
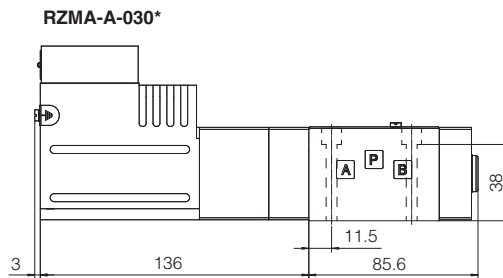
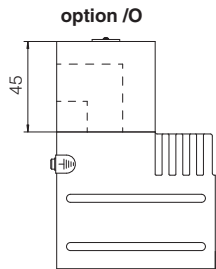
Mass [kg]	
RZMA-A-010	2,7
Option /O	+0,35



RZMA-A-030

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (ports A and B connected to port T)

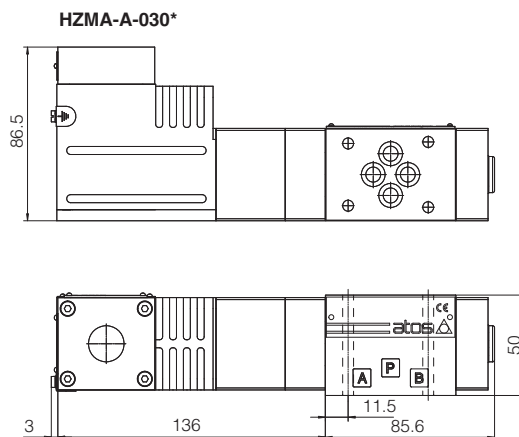
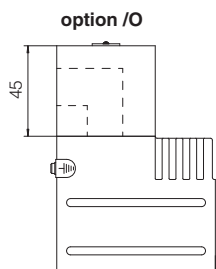
Mass [kg]	
RZMA-A-030	3,7
Option /O	+0,35



HZMA-A-030

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

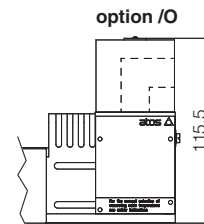
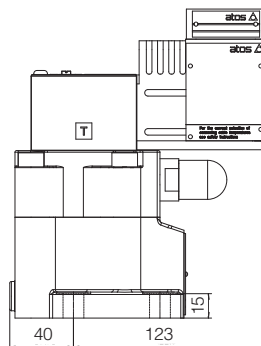
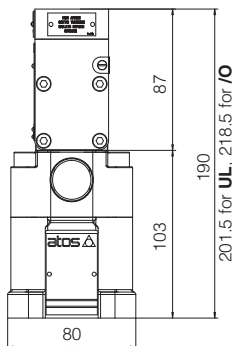
Mass [kg]	
HZMA-A-030	3,7
Option /O	+0,35



AGMZA-A-10

ISO 6264: 2007 (see table P005)
 Mounting surface: 6264-06-09-1-97

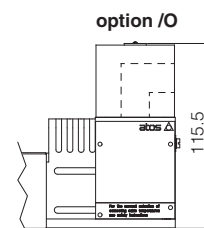
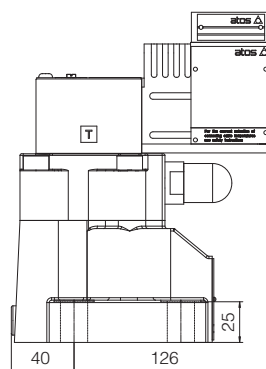
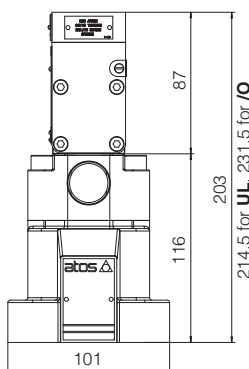
Mass [kg]	
AGMZA-A-10	6,3
Option /O	+0,35



AGMZA-A-20

ISO 6264: 2007 (see table P005)
 Mounting surface: 6264-08-13-1-97

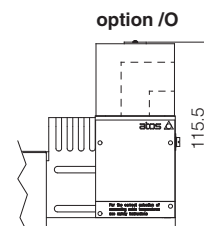
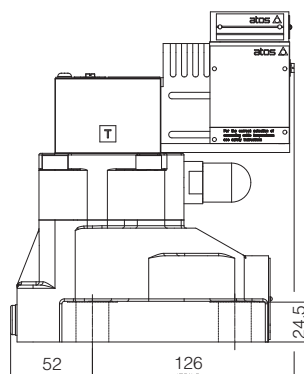
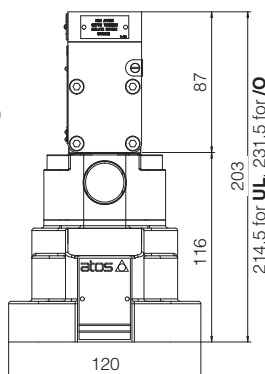
Mass [kg]	
AGMZA-A-20	7,5
Option /O	+0,35



AGMZA-A-32

ISO 6264: 2007 (see table P005)
 Mounting surface: 6264-10-17-1-97
 (with M20 fixing holes instead of standard M18)

Mass [kg]	
AGMZA-A-32	8,9
Option /O	+0,35

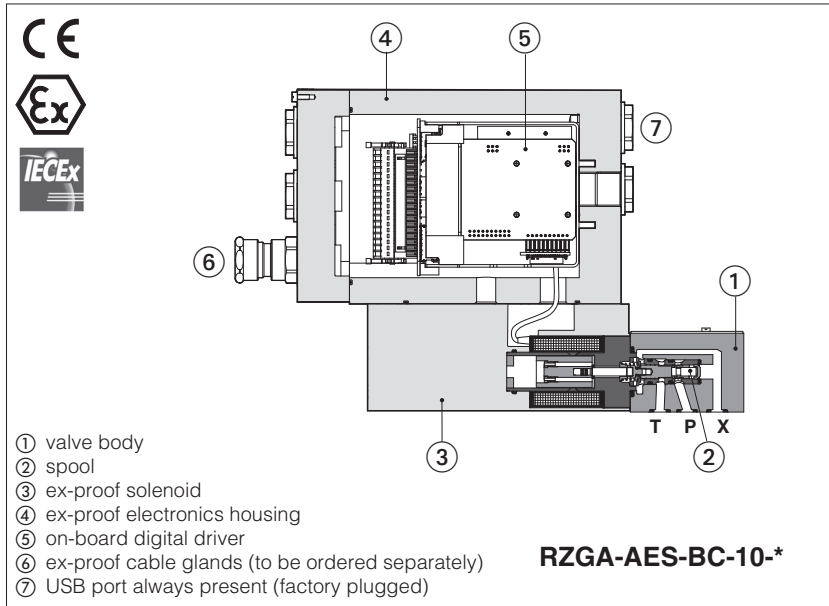


21 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional reducing valves

direct or piloted, with on-board driver and without pressure transducer - **ATEX and IECEx**



RZGA-AES, AGRCZA-AES

Ex-proof digital proportional reducing valves, direct or piloted, without transducer for pressure open loop controls.

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

● Multicertification **ATEX** and **IECEx** for gas group **II 2G** and dust category **II 2D**

The flameproof enclosure of integral 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.

RZGA, direct or piloted:
Size: **06** - ISO 4401

Max flow: **12** and **40 l/min**

AGRCZA, piloted:
Size: **10** and **20** - ISO 5781

Max flow: **160** and **300 l/min**

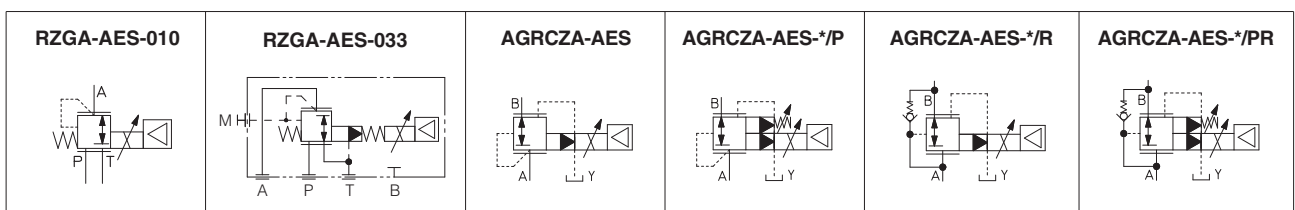
Max pressure: **250 bar**

1 MODEL CODE

RZGA	-	AES	-	NP	-	010	/	210	/	M	/	*	/	*	/	*
<p>Ex-proof proportional pressure reducing valves</p> <p>RZGA = subplate size 06 AGRCZA = subplate size 10, 20</p> <p>AES = on-board driver, without transducer</p> <p>Fieldbus interfaces, USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT</p> <p>Valve size and configuration: RZGA: direct 010 = Qmax 12 l/min RZGA: piloted 033 = Qmax 40 l/min AGRCZA: piloted 10, 20 = Qmax 160, 300 l/min</p>													<p>Series number</p> <p>Seals material, see section 9: - = NBR PE = FKM BT = HNBR</p>			
<p>Hydraulic options - only AGRCZA (1): P = with integral mechanical pressure limiter R = with integral check valve for free reverse flow</p> <p>Electronic options (1): I = current reference input 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 Vdc)</p>													<p>Cable entrance threaded connection: M = M20x1,5</p>			
<p>Max regulated pressure: only for RZGA-010 32 = 32 bar 100 = 100 bar 210 = 210 bar only for RZGA-033 and AGRCZA 80 = 80 bar 180 = 180 bar 250 = 250 bar</p>																

(1) Possible combined options: /IP, /IR, /PR

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS

WARNING: The below operation must be performed in a safety area

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

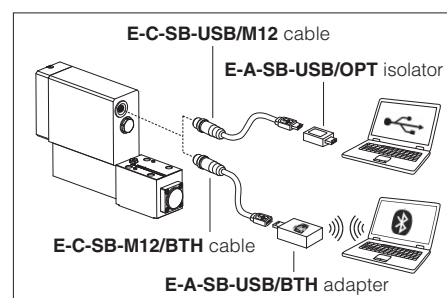
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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 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 valves according to EN ISO 13849	RZGA-010 150 years, RZGA-033 and AGRCZA 75 years, 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZGA		AGRCZA	
	010	033	10	20
Size code	06	06	10	20
Valve size	06	06	10	20
Max regulated pressure [bar]	32 100 210	80	180	250
Min regulated pressure [bar]	see min. pressure / flow diagrams at sections 16 17 18			
Max pressure at port P, A, B, X [bar]	315			
Max pressure at port T, Y [bar]	210			
Max flow [l/min]	12	40	160	300
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 55		≤ 70	
Hysteresis[% of the max pressure]	≤ 1,5			
Linearity[% of the max pressure]	≤ 3			
Repeatability[% of the max pressure]	≤ 2			

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response


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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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) 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

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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	RZMA, AGMZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-AES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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**

19 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, EN-982).

19.1 Power supply (V+ and V0)

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

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

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

19.3 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 ÷ 10VDC 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 $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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.

19.4 Monitor output signal (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 ÷ 10VDC (1V = 1A).

Output signal can be reconfigured via software, within a maximum range of $\pm 5\text{ VDC}$.

19.5 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.

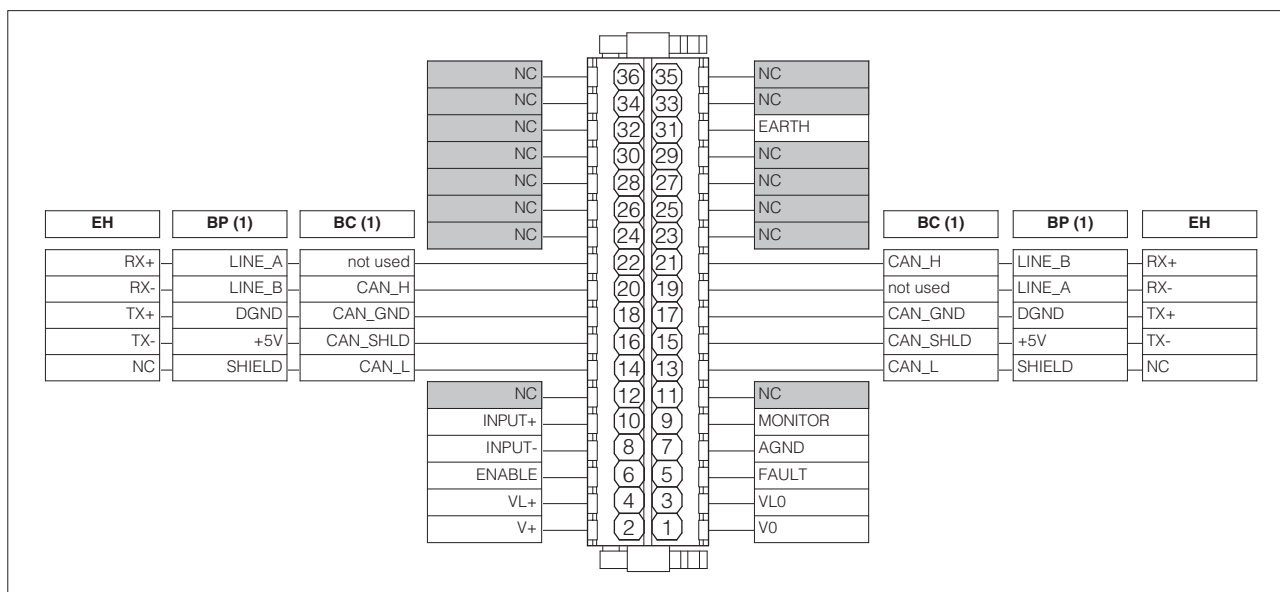
Enable input signal can be used as generic digital input by software selection.

19.6 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.

20 TERMINAL BOARD OVERVIEW



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

21 ELECTRONIC CONNECTIONS

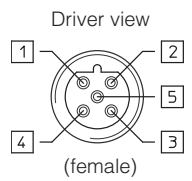
21.1 Main connections signals

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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
	31	EARTH	Internally connected to driver housing	

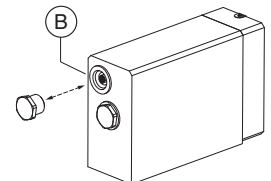
21.2 USB connector - M12 - 5 pin always present

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 +

Driver view



(female)



21.3 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

21.4 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)

21.5 EH fieldbus execution connections

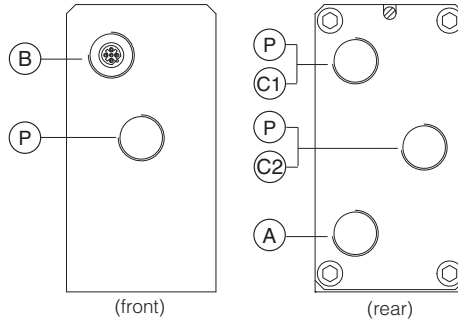
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

CABLE ENTRANCE OVERVIEW

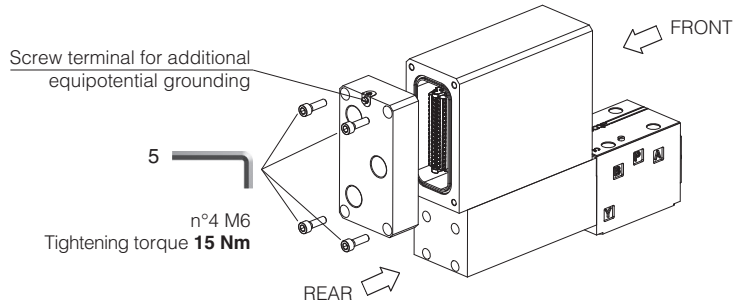
Cables entrance description:

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



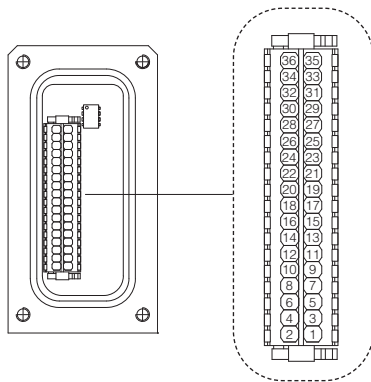
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

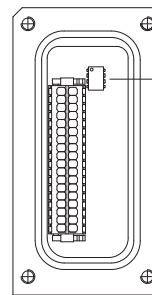


WARNING: the above operation must be performed in a safety area

Terminal board - see section 20



Fieldbus terminator only for BC and BP executions (1)



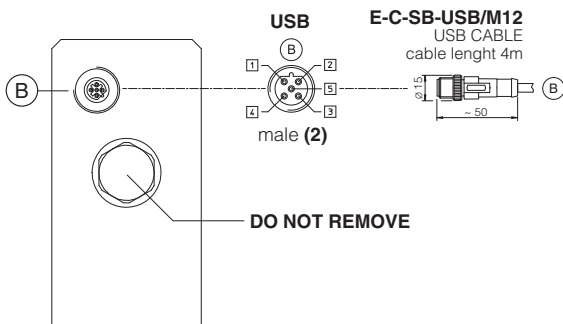
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

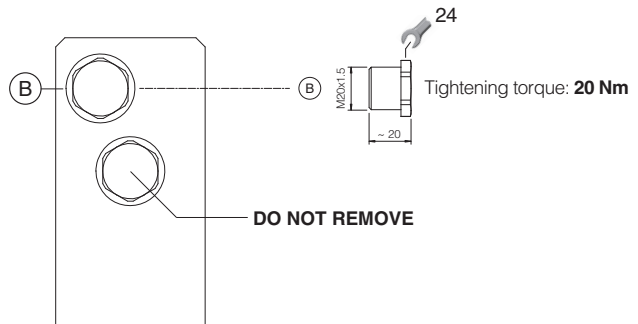
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	ON
4	OFF

USB CONNECTOR



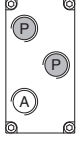
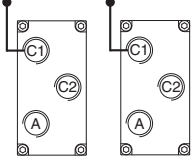
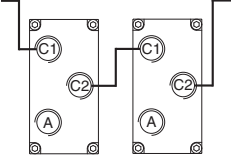
METALLIC PROTECTION CAP - supplied with the valves



(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF

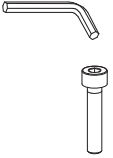

(2) Pin layout always referred to driver's view

22.1 Cable glands and threaded plug - see tech table **KX800**

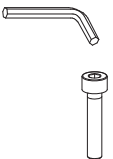

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	Cable gland entrance	Threaded plug quantity	Threaded plug entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection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

23 FASTENING BOLTS AND SEALS

23.1 RZGA valves

	RZGA-AES-*-010	RZGA-AES-*-033
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>
	<p>Seals: 4 OR 108 Diameter of ports P, A, T: Ø 5 mm</p>	<p>Seals: 4 OR 108 Diameter of ports P, A, T: Ø 7,5 mm</p>

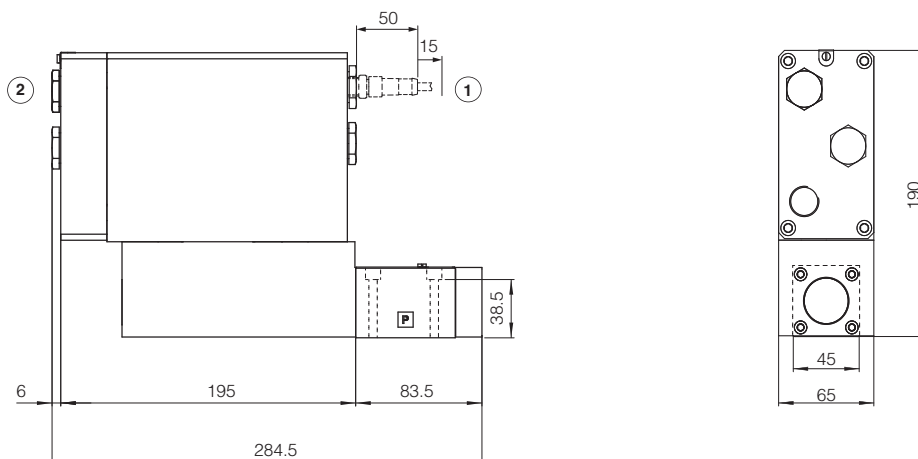
23.2 AGRCZA valves

	AGRCZA-AES-*-10	AGRCZA-AES-*-20
	<p>Fastening bolts: 4 socket head screws M10x45 class 12.9 Tightening torque = 70 Nm</p>	<p>Fastening bolts: 4 socket head screws M10x45 class 12.9 Tightening torque = 70 Nm</p>
	<p>Seals: 2 OR 3068 Diameter of ports A, B: Ø 14 mm 2 OR 109/70 Diameter of port X, Y: Ø 5 mm</p>	<p>Seals: 2 OR 4100 Diameter of ports A, B: Ø 22 mm 2 OR 109/70 Diameter of port X, Y: Ø 5 mm</p>

RZGA-AES-*-010

ISO 4401: 2005
 Mounting surface: 4401-03-02-0-05 (see table P005)
 (port B not used)

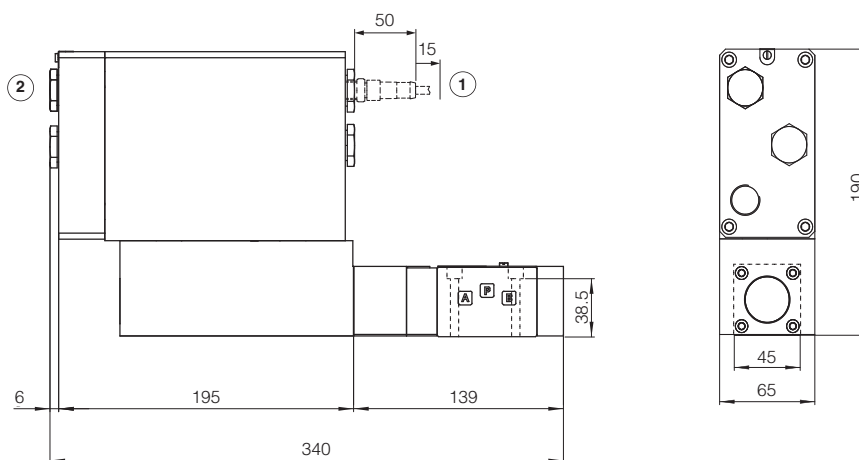
Mass [kg]	
RZGA-AES-*-010	8,2



RZGA-AES-*-033

ISO 4401: 2005
 Mounting surface: 4401-03-02-0-05 (see table P005)
 (ports A and B connected to port T)

Mass [kg]	
RZGA-AES-*-033	9



- ① = Space to remove the USB connector
- ② = The dimensions of cable glands must be considered (see tech table **KX800**)

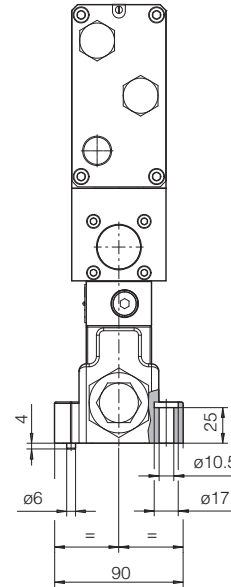
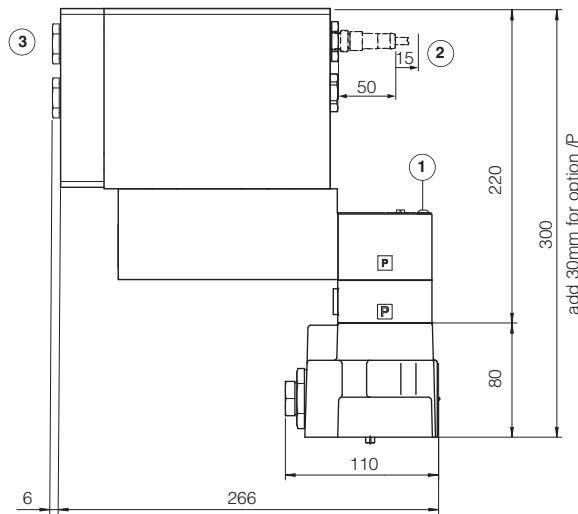
25 INSTALLATION DIMENSIONS FOR AGRCZA [mm]

AGRCZA-AES-*-10

ISO 5781: 2000

Mounting surface: 5781-06-07-0-00 (see table P005)

Mass [kg]	
AGRCZA-AES-*-10	11,6

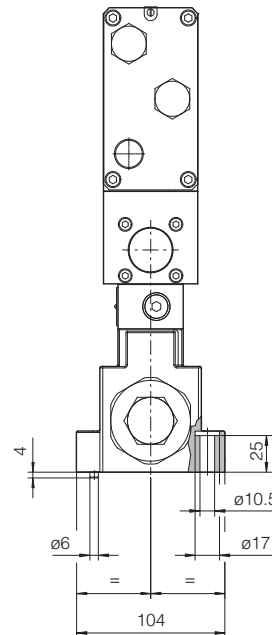
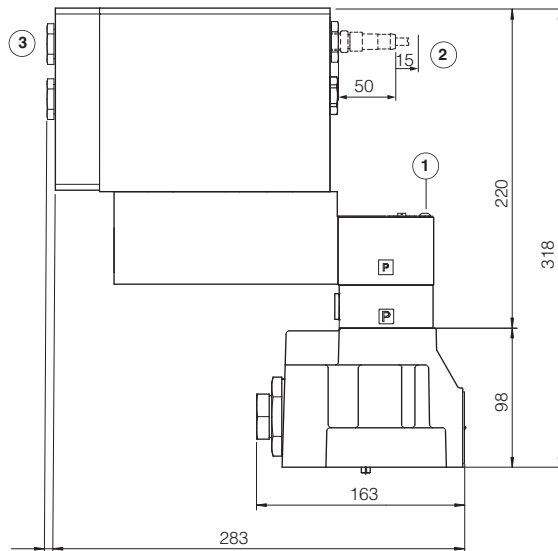


AGRCZA-AES-*-20

ISO 5781: 2000

Mounting surface: 5781-08-10-0-00 (see table P005)

Mass [kg]	
AGRCZA-AES-*-20	12,8



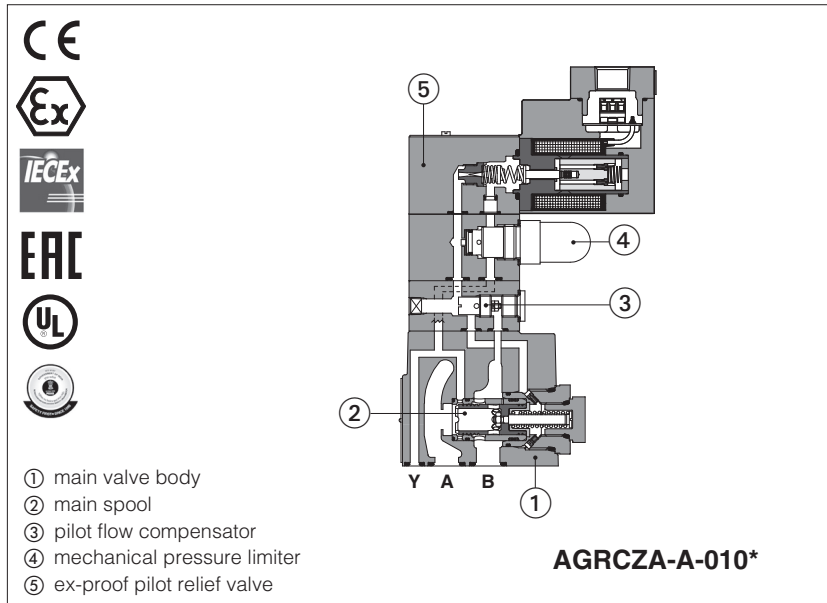
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

26 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		

Ex-proof proportional reducing valves

direct or piloted, without transducer - **ATEX, IECEx, EAC, PESO** or **cULus**



RZGA-A, HZGA-A KZGA-A, AGRCZA-A

Ex-proof proportional reducing valves direct or piloted, for open loop pressure controls. They are equipped with ex-proof proportional solenoid, certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

RZGA, HZGA, direct or piloted:

Size: **06** - ISO 4401
Max flow: **12** and **40 l/min**

KZGA, piloted:
Size: **10** - ISO 4401
Max flow: **100 l/min**

AGRCZA, piloted:
Size: **10** and **20** - ISO 5781
Max flow: **160** and **300 l/min**

Max pressure: **250 bar**

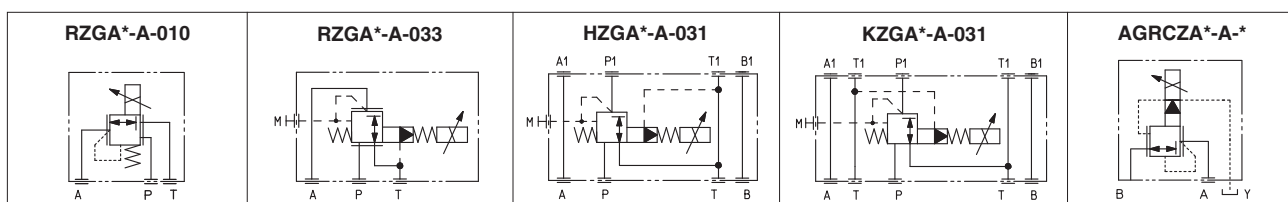
1 MODEL CODE

RZGA	/	*	-	A	-	010	/	250	/	M	/	*	/	*	*	*
<p>Ex-proof proportional pressure reducing valves</p> <p>RZGA = subplate size 06 HZGA = modular size 06 KZGA = modular size 10 AGRCZA = subplate size 10, 20</p> <p>Certification type Multicertification: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size and configuration: 010 = RZGA direct size 06 Qmax 12 l/min 033 = RZGA piloted size 06 Qmax 40 l/min 031 = HZGA piloted size 06 Qmax 40 l/min 031 = KZGA piloted size 10 Qmax 100 l/min 10 = AGRCZA piloted size 10 Qmax 160 l/min 20 = AGRCZA piloted size 20 Qmax 300 l/min</p>															<p>Seals material, see section 7 :</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = with 24 Vdc coils</p> <p>Options (3): O = horizontal cable entrance (2) P = with integral mechanical pressure limiter (only for AGRCZA) R = with check valve (only for AGRCZA)</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (4) M = M20x1,5 - not for cULus NPT = 1/2" NPT</p> <p>Max regulated pressure: for all versions except RZGA-010 80 = 80 bar 180 = 180 bar 250 = 250 bar only for RZGA-010 32 = 32 bar 100 = 100 bar 210 = 210 bar</p>	

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from [www.peso.gov.in](#)

(2) Not for multicertification **M** group I (mining) **(3)** Possible combined options: /OP, /OR, /PR, /OPR **(4)** Approved only for the Italian market

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



3 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.
Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

4 GENERAL CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd valves according to EN ISO 13849	75 years; 150 years only for RZGA-010, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 8 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	RZGA		HZGA	KZGA	AGRCZA	
Size code	010	033	031		10	20
Valve size	06		10		20	
Max regulated pressure [bar]	32; 100; 210	80		180	250	
Max pressure at port P, A, B, X [bar]			315			
Max pressure at port T, Y [bar]			210			
Min regulated pressure [bar]	0,8	2,5	2,5	3	1,0	
Max flow [l/min]	12	40	40	100	160	300
Response time 0-100% step signal (depending on installation) (1) [ms]	≤ 55			≤ 70		
Hysteresis[% of the max pressure]				≤ 1,5		
Linearity[% of the max pressure]				≤ 3		
Repeatability[% of the max pressure]				≤ 2		

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 3

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response

6 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

7 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

8 CERTIFICATION DATA

Valve type	RZGA, HZGA, KZGA, AGRCZA	RZGA/M, HZGA/M, KZGA/M, AGRCZA/M	RZGA/UL, HZGA/UL, KZGA/UL, AGRCZA/UL
Certifications	Multicertification Group II ATEX IECEx EAC PESO	Multicertification Group I ATEX IECEx	North American cULus
Solenoid certified code	MZA-A	MZAM-A	OZA-A/EC
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131	ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 	<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB
Temperature class	T4	T3	-
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31	IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT		1/2" NPT

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -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

9 EX PROOF SOLENOIDS WIRING

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board
2 = GND suitable for wires cross sections
3 = Coil up to 2,5 mm² (max AWG14)

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring

⚠ Pay attention to respect the polarity

1 = Coil + PCB 3 poles terminal board suggested
2 = GND cable section up to 1,5 mm²
3 = Coil - (max AWG16), see section 10 note 1

alternative GND screw terminal connected to solenoid housing

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> • Suitable for use in Class I Division 1, Gas Groups C • Armored Marine Shipboard Cable which meets UL 1309 • Tinned Stranded Copper Conductors • Bronze braided armor • Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

10.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	-	90 °C	-
45 °C	-	T4	150 °C	135 °C	-	90 °C
55 °C	-	T3	150 °C	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

11 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armored 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

12 OPTIONS

O = Horizontal cable entrance, to be selected in case of limited vertical space.

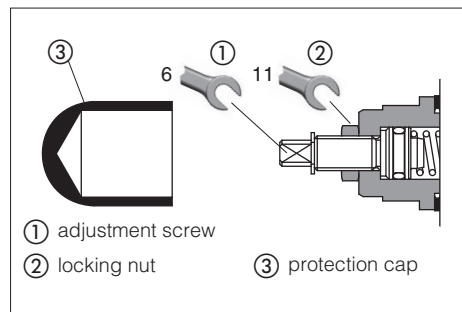
P = Integral mechanical pressure limiter

The AGRCZA-*/**P** are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

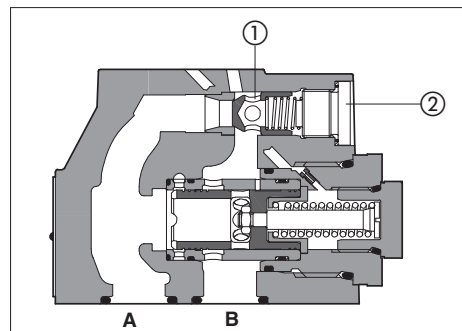
- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



R = Integral check valve for free reverse flow

The AGRCZA-*/**R** are provided with integral check valve for free reverse flow A→B

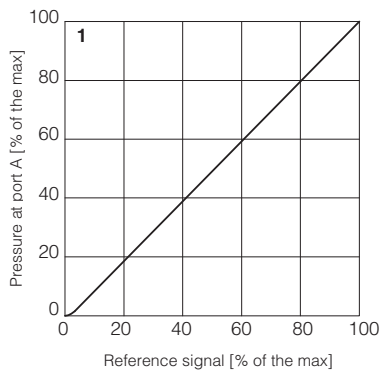
- ① Check valve - cracking pressure = 0,5 bar
- ② Plug



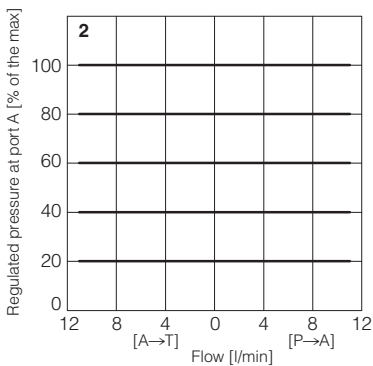
12.1 Possible combined options: /OP, /OR, /PR, /OPR

13 DIAGRAMS RZGA-010 (based on mineral oil ISO VG 46 at 50 °C)

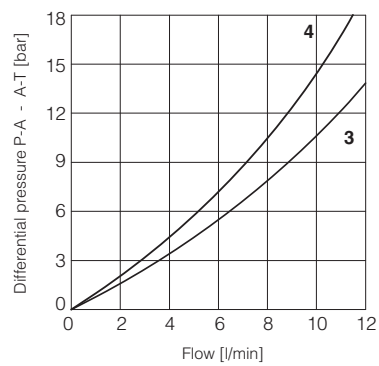
1 Regulation diagrams
with flow rate $Q = 1$ l/min



2 Pressure/flow diagrams
with reference signal set at $Q = 1$ l/min



3-4 Min. pressure/flow diagrams
with zero reference signal



3 = Pressure drops vs. flow P→A
4 = Pressure drops vs. flow A→T

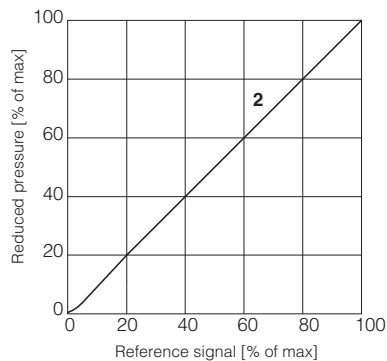
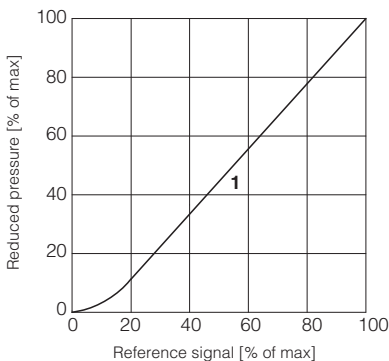
14 DIAGRAMS RZGA-033, HZGA, KZGA (based on mineral oil ISO VG 46 at 50 °C)

14.1 Regulation diagrams
with flow rate $Q = 10$ l/min

1 = RZGA, HZGA
2 = KZGA

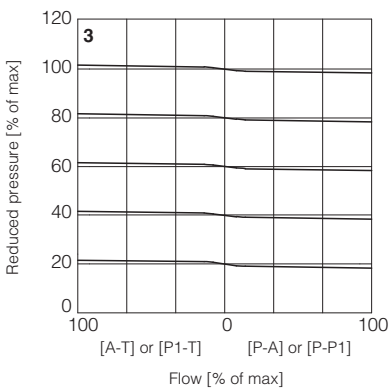
Note:

The presence of counter pressure at port T can affect the effective pressure regulation.



14.2 Pressure/flow diagrams
with reference pressure set with $Q = 10$ l/min

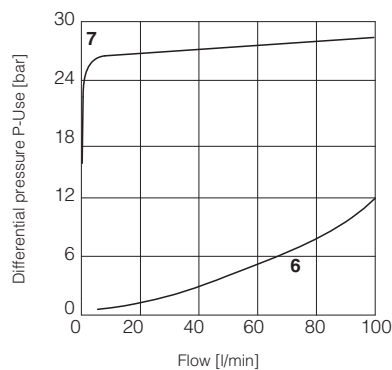
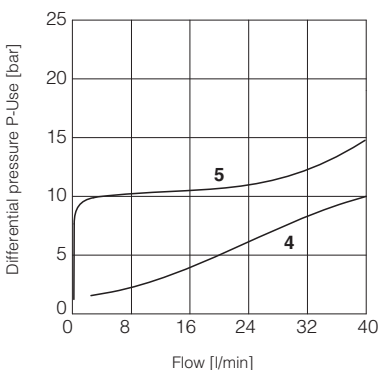
3 = RZGA, KZGA



14.3 Pressure drop/flow diagram

RZGA, HZGA
4 = A-T or P1-T
5 = P-P1 or P-A

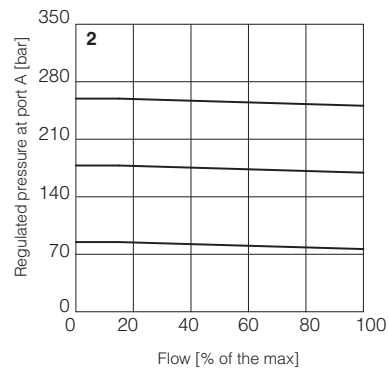
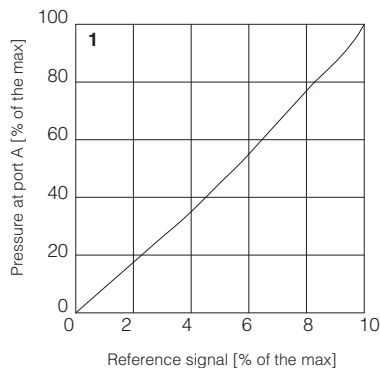
KZGA
6 = P1-T
7 = P-P1



15 DIAGRAMS AGRCZA (based on mineral oil ISO VG 46 at 50 °C)

1 Regulation diagrams
with flow rate Q = 10 l/min

2 Pressure/flow diagrams
with reference pressure set with Q = 10 l/min



3-6 Pressure drop/flow diagrams
with zero reference signal

Differential pressure B→A

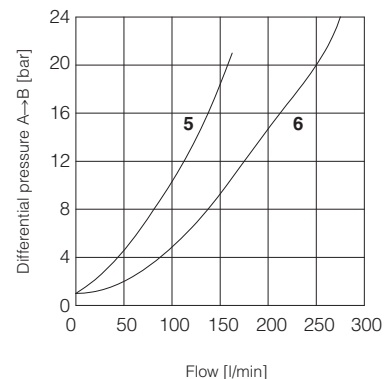
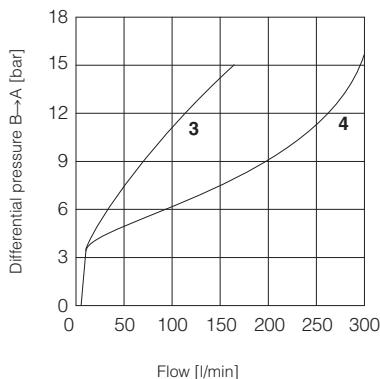
3 = AGRCZA-*-10

4 = AGRCZA-*-20

Differential pressure A→B (through check valve)

5 = AGRCZA-*-10/*R

6 = AGRCZA-*-20/*R



16 FASTENING BOLTS AND SEALS

16.1 RZGA, HZGA and KZGA valves

	RZGA-A-010	RZGA-A-033	HZGA-A-031	KZGA-A-031
	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M5 class 12.9 Tightening torque = 8 Nm	Fastening bolts: 4 socket head screws M6 class 12.9 Tightening torque = 16 Nm
	Seals: 2 OR 108 Diameter of ports P, T: Ø 5 mm (max)	Seals: 4 OR 108 Diameter of ports P, T: Ø 7,5 mm (max)	Seals: 4 OR 108 Diameter of ports P, T: Ø 7,5 mm	Seals: 5 OR 2050 Diameter of ports P, A, B, T: Ø 11,5 mm (max) 1 OR 108 Diameter of port Y: Ø 5 mm

16.2 AGRCZA valves

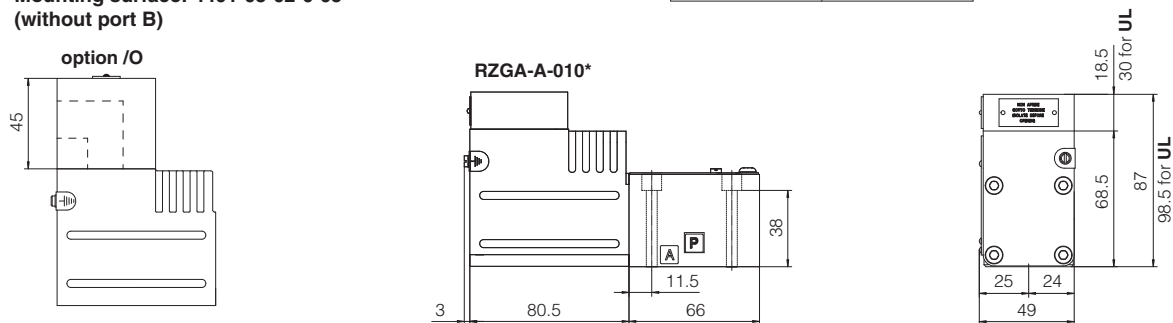
	AGRCZA-A-10	AGRCZA-A-20
	Fastening bolts: 4 socket head screws M110x45 class 12.9 Tightening torque = 70 Nm	Fastening bolts: 4 socket head screws M110x45 class 12.9 Tightening torque = 70 Nm
	Seals: 2 OR 3068 Diameter of ports A, B: Ø 14 mm 2 OR 109/70 Diameter of ports X, Y: Ø 5 mm	Seals: 2 OR 4100 Diameter of ports A, B: Ø 22 mm 2 OR 109/70 Diameter of ports X, Y: Ø 5 mm

17 INSTALLATION DIMENSIONS FOR RZGA [mm]

RZGA-A-010

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (without port B)

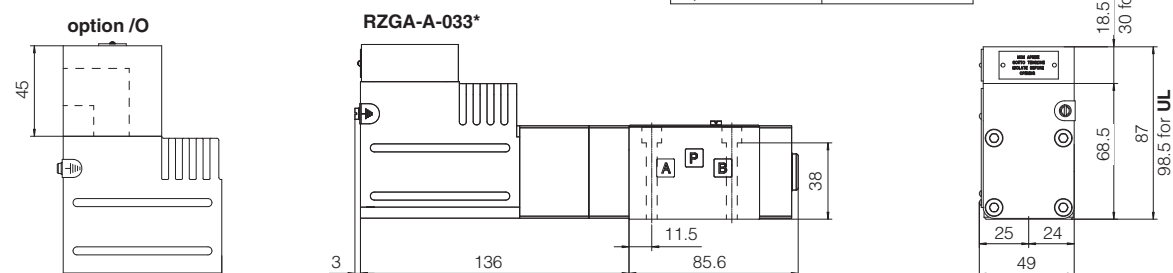
Mass [kg]	
RZGA-A-010	2,7
Option /O	+0,35



RZGA-A-033

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (ports A and B connected to port T)

Mass [kg]	
RZGA-A-033	3,7
Option /O	+0,35

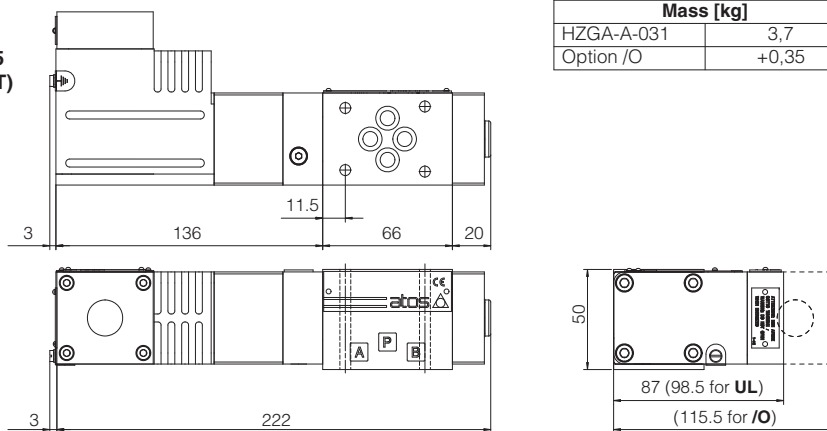


18 INSTALLATION DIMENSIONS FOR HZGA and KZGA [mm]

HZGA-A-031

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-03-02-0-05
 (ports A and B connected to port T)

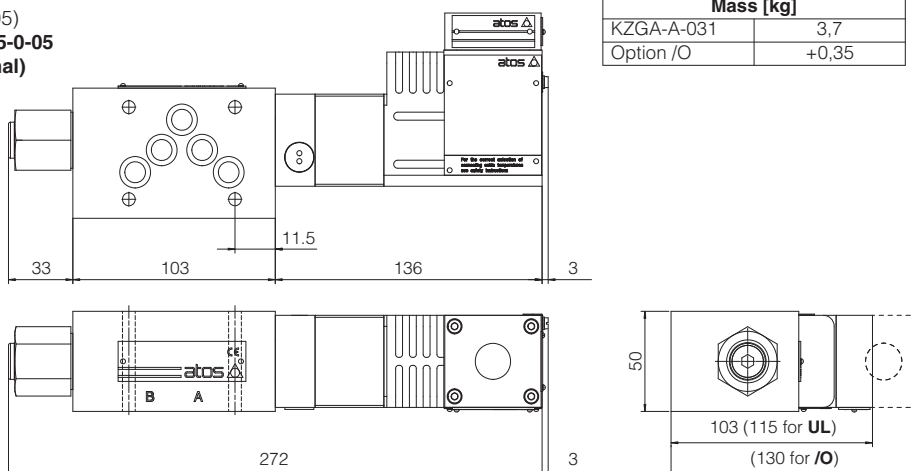
Mass [kg]	
HZGA-A-031	3,7
Option /O	+0,35



KZGA-A-031

ISO 4401: 2005 (see table P005)
 Mounting surface: 4401-05-05-0-05
 (without X port, Y port optional)

Mass [kg]	
KZGA-A-031	3,7
Option /O	+0,35



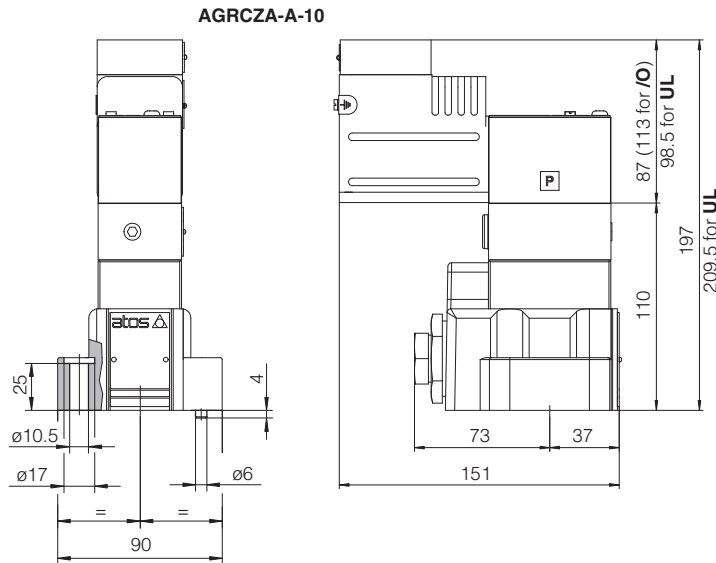
19 INSTALLATION DIMENSIONS FOR AGRCZA [mm]

AGRCZA-A-10

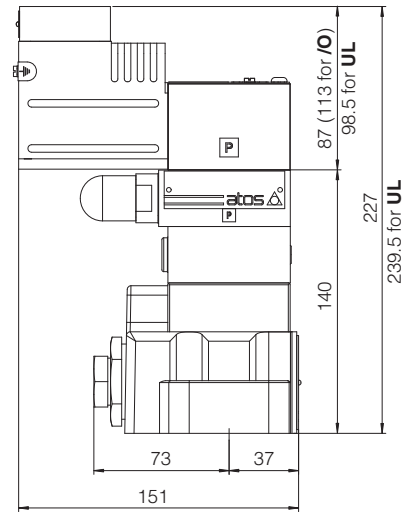
ISO 5781: 2000 (see table P005)

Mounting surface: 5781-06-07-0-00

Mass [kg]	
AGRCZA-A-10	5,7
Option /P	+0,5



option /P

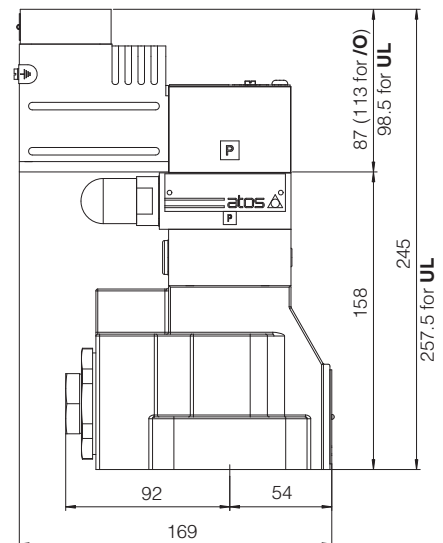
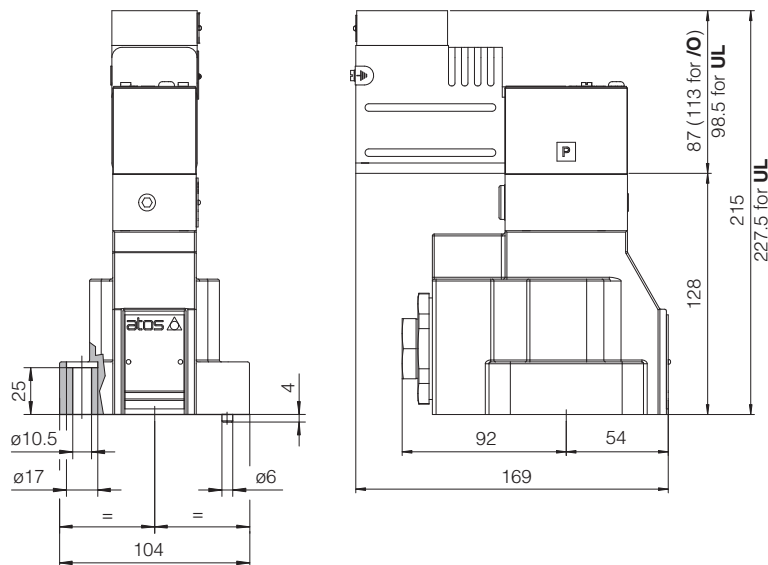


AGRCZA-A-20

ISO 5781: 2000 (see table P005)

Mounting surface: 5781-08-10-0-00

Mass [kg]	
AGRCZA-A-20	8,2
Option /P	+0,5

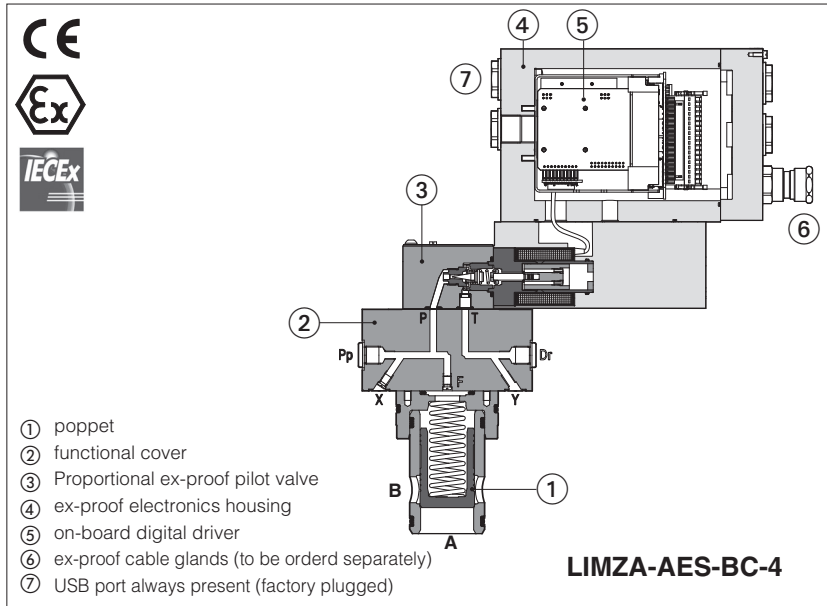


20 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance norms for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional pressure cartridges

with on-board driver and without transducer - ATEX and IECEx



LICZA-AES, LIMZA-AES, LIRZA-AES

2-way ex-proof digital proportional pressure cartridges without transducer respectively performing: pressure compensator, relief or reducing functions.

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

- Multicertification **ATEX** and **IECEx** 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.

Size: **16 ÷ 80** -ISO7368

Max flow: up to **4500 l/min**

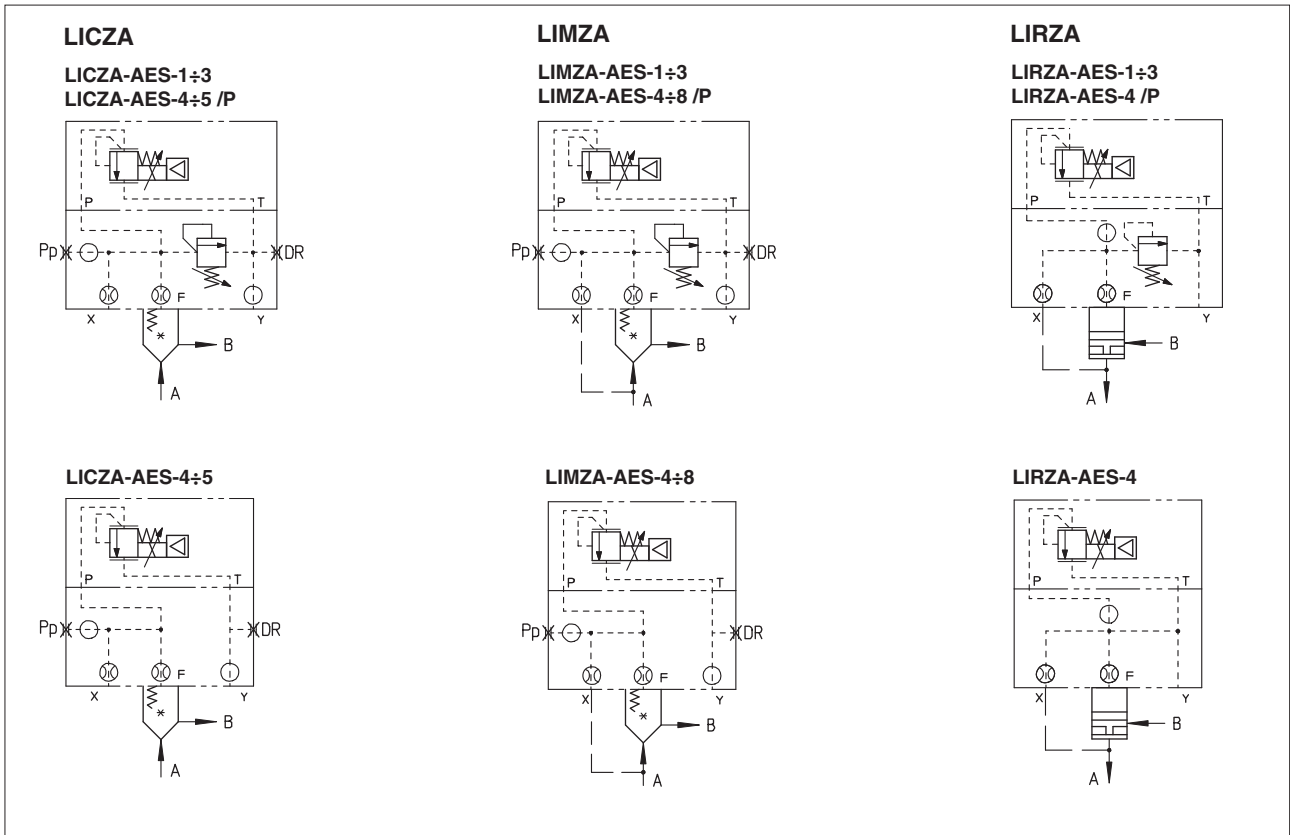
Max pressure: **250 bar**

1 MODEL CODE OF COVERS

LIMZA	-	AES	-	NP	-	3	/	315	/	M	/	*	/	*
<p>Ex-proof proportional pressure cartridges</p> <p>LICZA = pressure compensator LIMZA = pressure relief LIRZA = pressure reducing</p> <p>AES = on-board driver, without transducer</p> <p>Fieldbus interfaces, USB port always present: NP = Not present BC = CANopen BP = PROFIBUS DP EH = EtherCAT</p> <p>Valve size ISO 7368: 1 = 16 2 = 25 3 = 32 4 = 40 5 = 50 (not for LIRZA) 6 = 63 (only for LIMZA) 8 = 80; (only for LIMZA)</p>													<p style="text-align: center;">Seals material, see section 11:</p> <p>- = NBR PE = FKM BT = HNBR</p> <p>Series number</p>	
<p>Hydraulic options (1): P =with integral mechanical pressure limiter (standard for size 1, 2, 3)</p> <p>Electronics options (1): I = current reference input 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 V_{DC})</p>													<p>Cable entrance threaded connection: M = M20x1,5</p>	
<p>Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar</p>														

(1) Possible combined options: /IP

2 HYDRAULICS SYMBOLS



3 MODEL CODE OF CARTRIDGES

SC LI	-	32	31	2	**	/	*
Cartridge according to ISO 7368							Seals material, see section 11 :
Cartridges size ISO 7368:							- = NBR
16							PE = FKM
25							BT = HNBR
32							
40							
50							
63							
80							
Type of poppet:							
31 = for LIMZA and LICZA							
36 = for LICZA							
37 = for LIRZA							
						Series number	
					Spring cracking pressure:		
					2 = 1,5 bar for poppet 31		
					3 = 3 bar		
					4 = 4 bar		
					6 = 6 bar for poppet 31 and 36		
					7 = 7 bar for poppet 37		

4 TYPE OF POPPET

Type of poppet	31	36	37
Functional sketch (Hydraulic symbol)			
Typical section			
Area ratio A: AP	1:1	1:1	1:1

5 GENERAL NOTES

Atos digital proportional 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-* programming software.

6 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

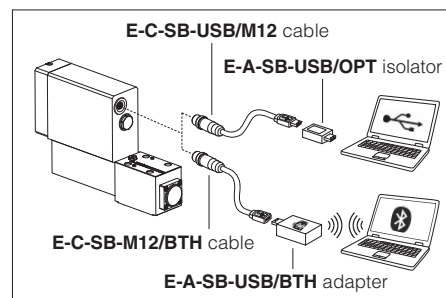
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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



7 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.

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	75 years, 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 - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 12 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	LICZA					LIMZA								LIRZA			
	1	2	3	4	5	1	2	3	4	5	6	8	1	2	3	4	
Valve size [l/min]																	
Max flow [bar]	200	400	750	1000	2000	200	400	750	1000	2000	3000	4500	160	300	550	800	
Min regulated pressure	see section 18																
Max regulated pres. at port A [bar]	80; 180; 250					80; 180; 250								80; 180; 250			
Max pressure [bar]	Ports: T, Y = 210																
	Ports: P, A, B, X = 350																
Response time 0-100% step signal (1) (depending on installation) [ms]	≤ 120 ÷ 430					≤ 120 ÷ 480								≤ 120 ÷ 380			
Hysteresis [% of regulated max pres.]	≤ 2					≤ 1,5								≤ 2			
Linearity [% of regulated max pres.]	≤ 3					≤ 3								≤ 3			
Repeatability [% of regulated max pres.]	≤ 2					≤ 2								≤ 2			

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response


10 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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ Input impedance: Ri = 500 Ω	
Insulation class	H (180°) Due to the occuring 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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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	HFDR, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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


12 CERTIFICATION DATA

Valve type	LICZA, LIMZA, LIRZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-AES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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**

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

Power supply and signals: section of wire = 1,0 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

13.1 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

14 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

15 HYDRAULIC OPTIONS

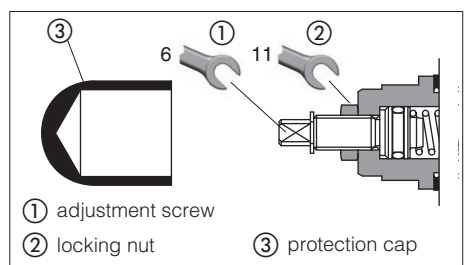
P = Integral mechanical pressure limiter (standard for size 1, 2 and 3)

The LICZA, LIMZA and LIRZA standard size 1, 2, 3 and option /P are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



16 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} 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.

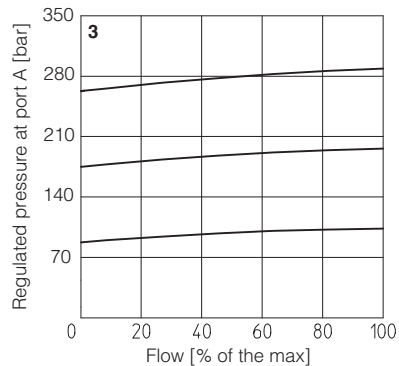
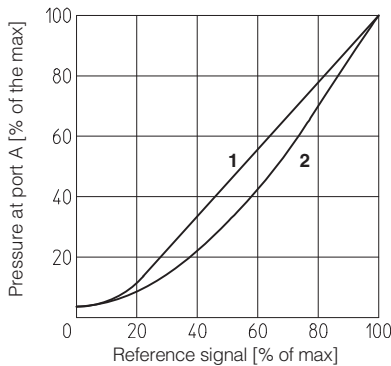
17 POSSIBLE COMBINED OPTIONS

/IP

18 **DIAGRAMS** (based on mineral oil ISO VG 46 at 50 °C)

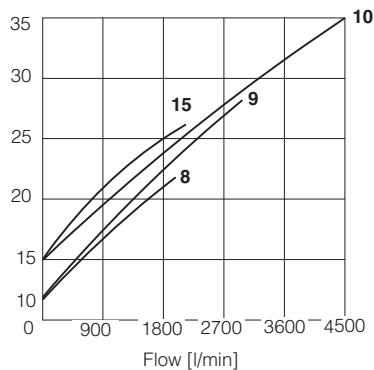
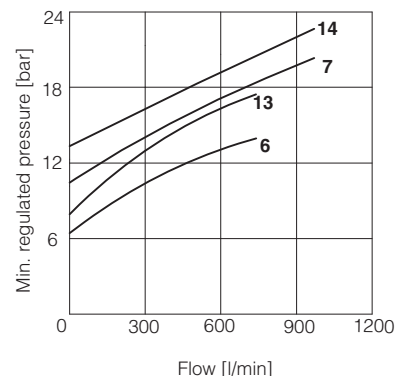
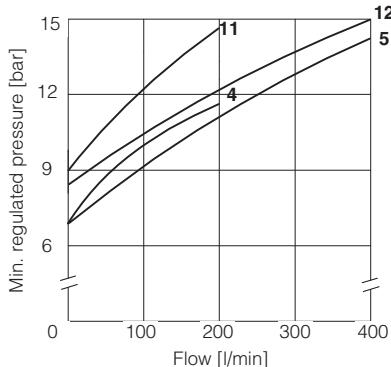
- 1** Regulation diagrams LIMZA
- 2** Regulation diagrams LICZA

- 3** Pressure/flow diagrams LICZA, LIMZA



4-14 **Min. pressure/flow diagrams**
with zero reference signal

- 4** = LIMZA*-1 **11** = LICZA*-1
- 5** = LIMZA*-2 **12** = LICZA*-2
- 6** = LIMZA*-3 **13** = LICZA*-3
- 7** = LIMZA*-4 **14** = LICZA*-4
- 8** = LIMZA*-5 **15** = LICZA*-5
- 9** = LIMZA*-6
- 10** = LIMZA*-8

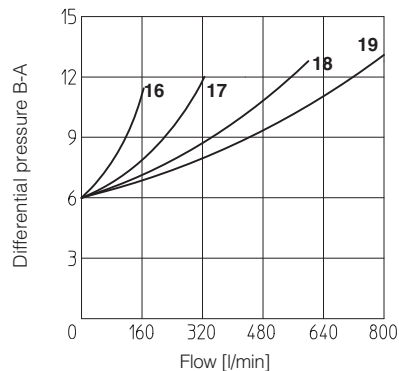
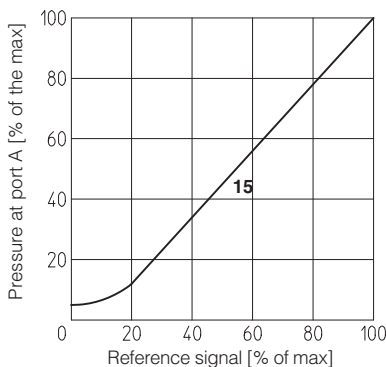


Regulation diagrams LIRZA

- 15** = LIRZA-A

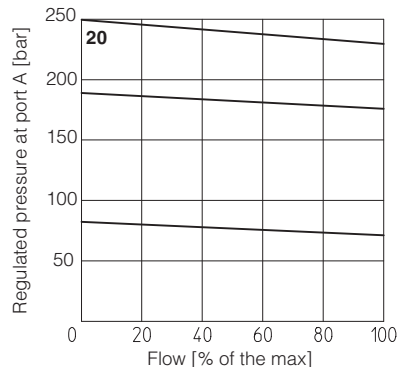
16-19 **Min. pressure/flow diagrams**
with reference signal "null"

- 16** = LIRZA*-1
- 17** = LIRZA*-2
- 18** = LIRZA*-3
- 19** = LIRZA*-4



Pressure/flow diagrams

- 20** = LIRZA-A



19 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, EN-982).

19.1 Power supply (V+ and V0)

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

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

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

19.3 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 ÷ 10VDC 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 $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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.

19.4 Monitor output signal (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 $\pm 5\text{ VDC}$ (1V = 1A).

Output signal can be reconfigured via software, within a maximum range of 0 ÷ 5VDC.

19.5 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.

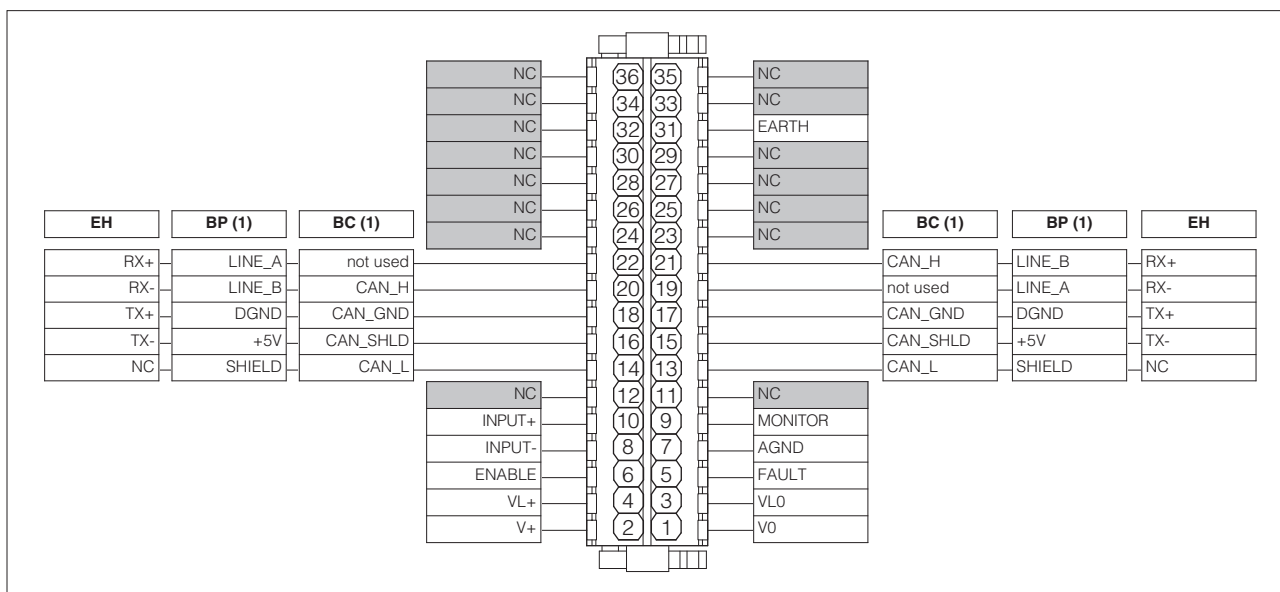
Enable input signal can be used as generic digital input by software selection.

19.6 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.

20 TERMINAL BOARD OVERVIEW



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

21 ELECTRONIC CONNECTIONS

21.1 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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
31	EARTH	Internally connected to driver housing		

21.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS		
B	1	+5V_USB	Power supply	<p>Driver view (female)</p>	
	2	ID	Identification		
	3	GND_USB	Signal zero data line		
	4	D-	Data line -		
	5	D+	Data line +		

21.3 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

21.4 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)

21.5 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

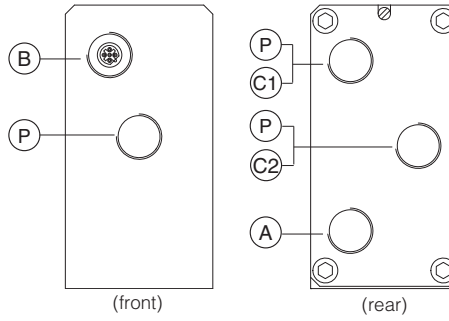
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

22 CONNECTIONS LAYOUT

CABLE ENTRANCE OVERVIEW

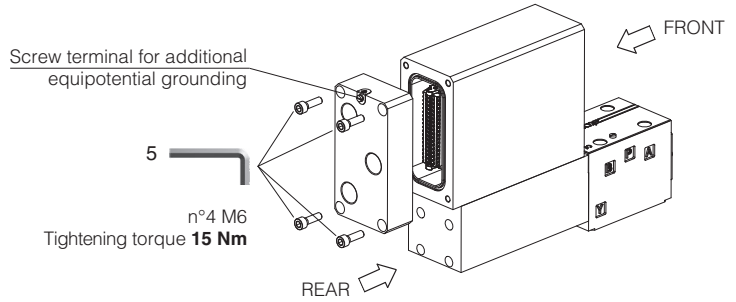
Cables entrance description:

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



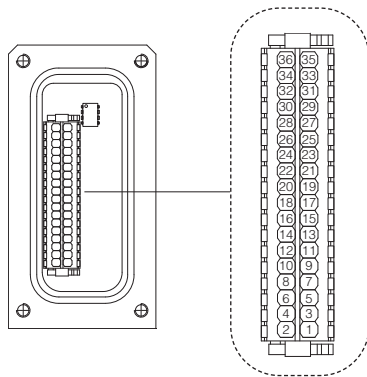
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

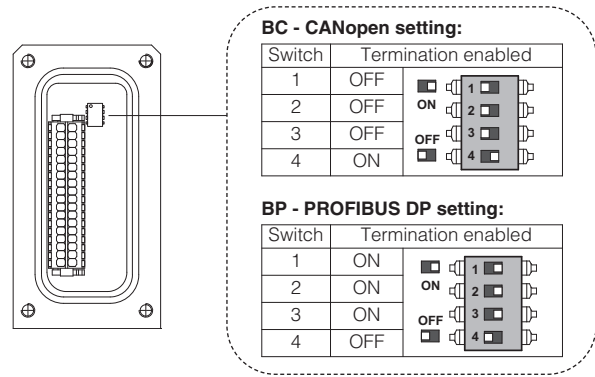


WARNING: the above operation must be performed in a safety area

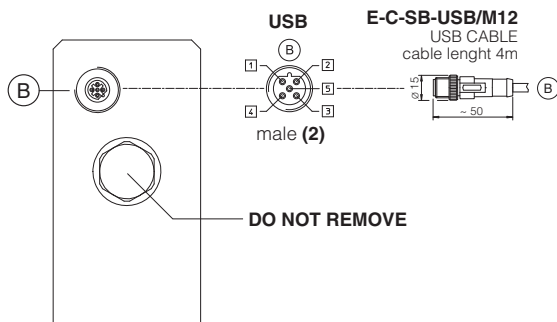
Terminal board - see section 20



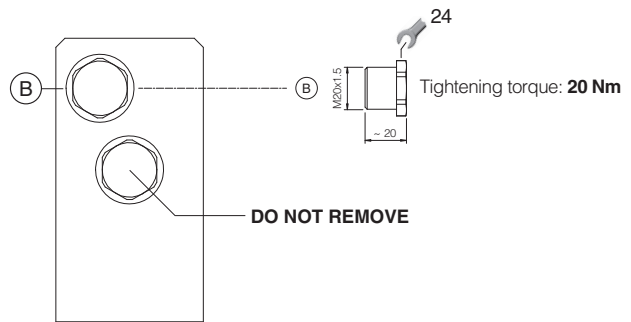
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

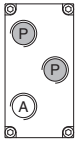
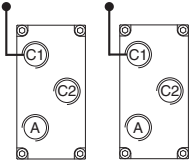
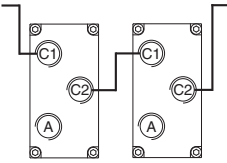


METALLIC PROTECTION CAP - supplied with the valves



(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

22.1 Cable glands and threaded plug - see tech table **KX800**

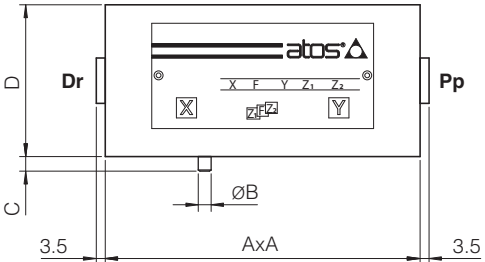
Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	Cable gland entrance	Threaded plug quantity	Threaded plug entrance		
NP	1	A	none	none		Cable entrance P are factory plugged Cable entrance A is open for costumers
BC, BP, EH "via stub" connection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

23 FASTENING BOLTS AND SEALS

Type	Size	Fastening bolts	Seals
LIMZA LICZA LIRZA	1 = 16	4 socket head screws M8x45 class 12.9 Tightening torque = 35 Nm	2 OR 108
	2 = 25	4 socket head screws M12x45 class 12.9 Tightening torque = 125 Nm	2 OR 108
	3 = 32	4 socket head screws M16x55 class 12.9 Tightening torque = 300 Nm	2 OR 2043
	4 = 40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA LICZA	5 = 50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA	6 = 63	4 socket head screws M30x90 class 12.9 Tightening torque = 2100 Nm	2 OR 3050
	8 = 80	8 socket head screws M24x90 class 12.9 Tightening torque = 1000 Nm	2 OR 4075

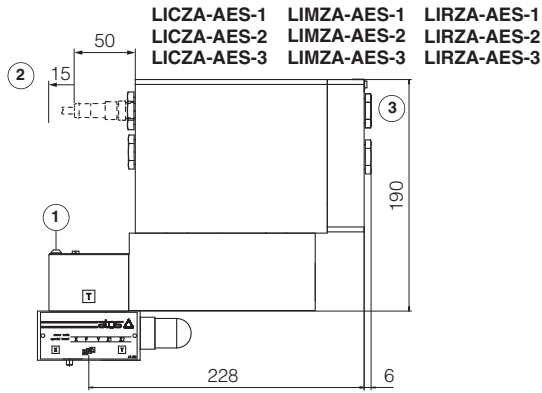
24 COVERS DIMENSIONS [mm]

Size	AxA	ØB	C	D	Port Pp - Dr
1 = 16	65x80	3	4	40	-
2 = 25	85x85	5	6	40	-
3 = 32	100x100	5	6	50	-
4 = 40	125x125	5	6	60	G 1/4"
5 = 50	140x140	6	4	70	G 1/4"
6 = 63	180x180	6	4	80	G 3/8"
8 = 80	Ø250	8	6	80	G 3/8"

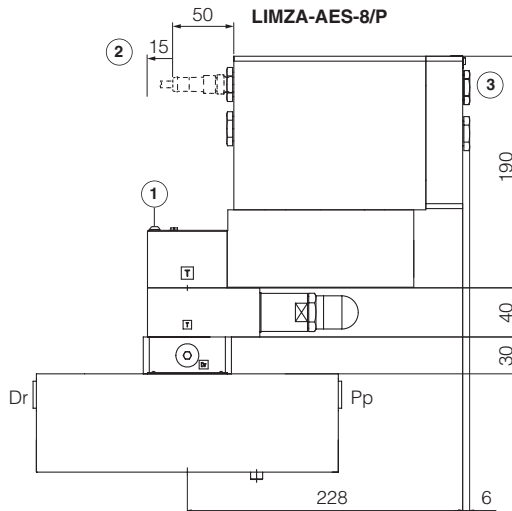
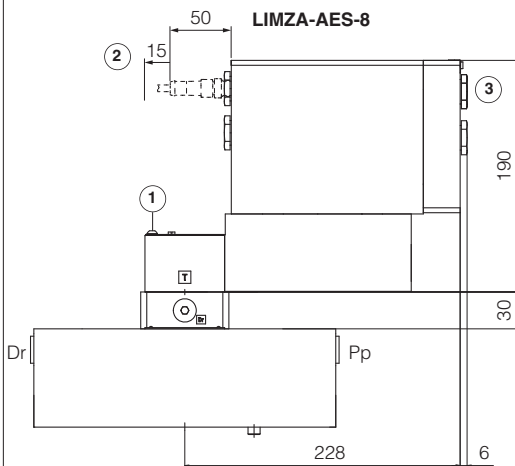
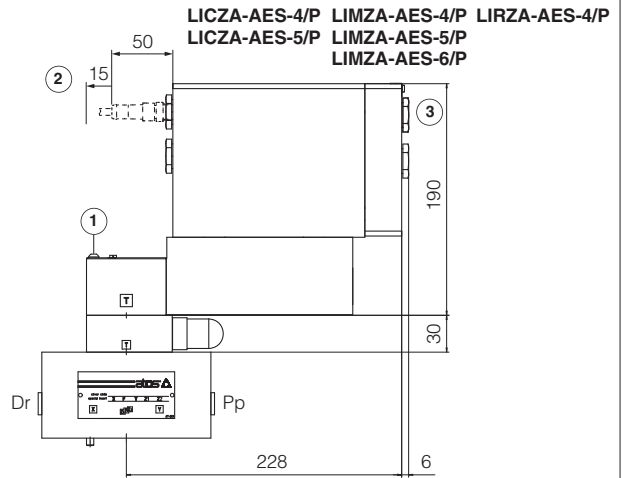
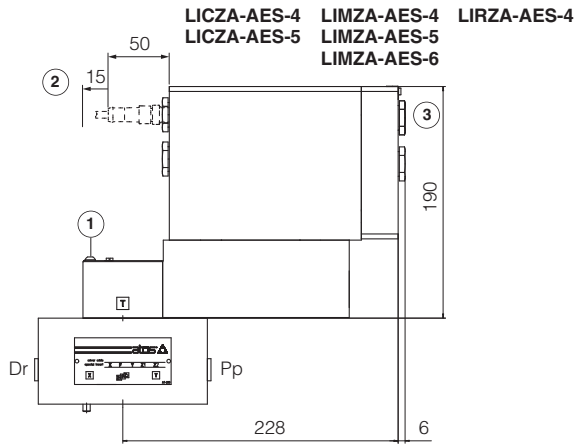


Notes:
size 1 cover is not squared but rectangular, dimensions 65x80
size 8 cover is not squared but circular, dimension Ø250

25 INSTALLATION DIMENSIONS [mm]



Mass [kg]			
Size	LICZA, LIMZA, LIRZA		Cartridge
	Standard	Option /P	SC LI
1 = 16	10,5	-	0,2
2 = 25	11	-	0,5
3 = 32	12,3	-	0,9
4 = 40	17,7	12,5	1,7
5 = 50	21,2	16	2,9
6 = 63	30,7	25,5	6,7
8 = 80	39,3	34,1	13,1



Note: for ISO 7368 mounting surface and cavity dimensions, see tech. table P006

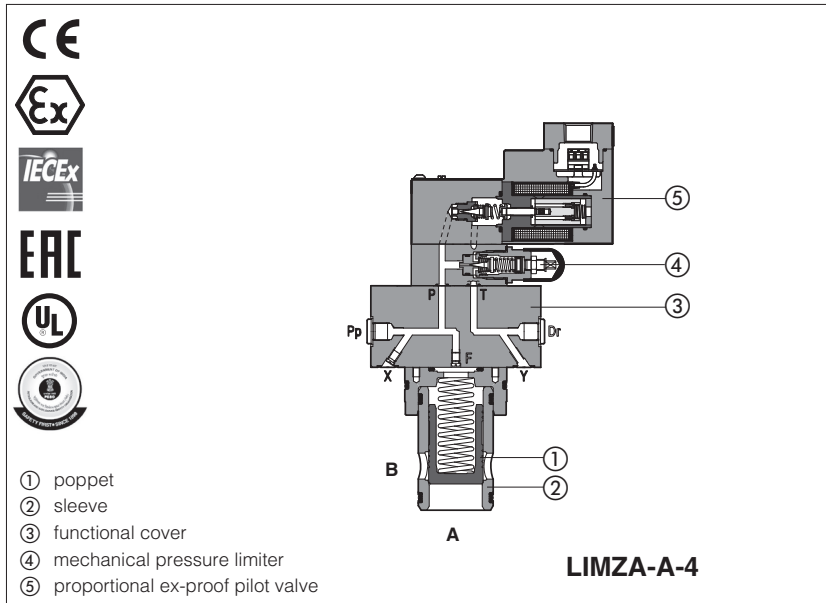
- ① = Screw for air bleeding: at the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

26 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P006	Mounting surfaces and cavities for cartridge valves
GS500	Programming tools		

Ex-proof proportional pressure cartridges

without transducer - ATEX, IECEx, EAC, PESO or cULus



LICZA-A, LIMZA-A, LIRZA-A

2-way ex-proof proportional pressure cartridges without transducer respectively performing: pressure compensator, relief or reducing functions.

They are equipped with ex-proof proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **16 ÷ 80** - ISO 7368

Max flow: up to **4500 l/min**

Max pressure: **250 bar**

1 MODEL CODE OF FUNCTIONAL COVERS

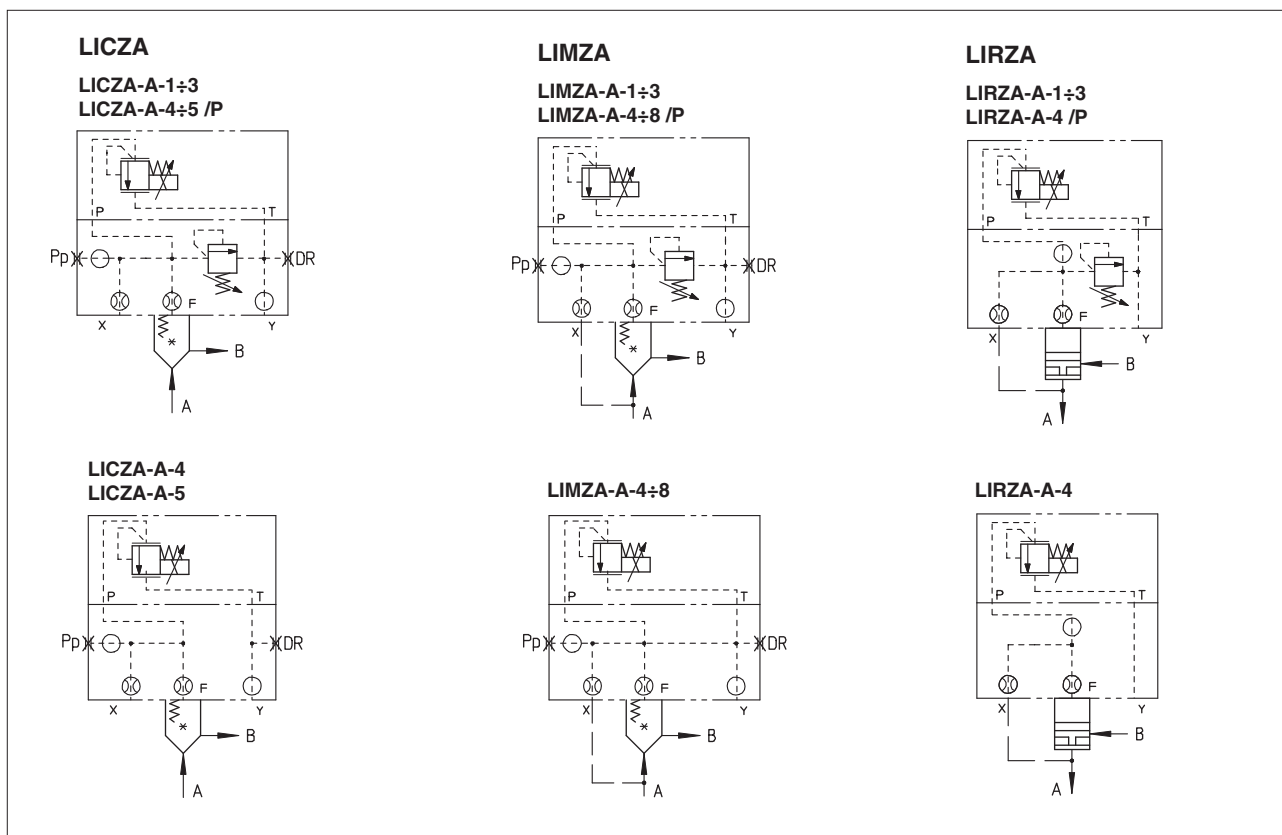
LIMZA	/	*	-	A	-	3	/	180	/	M	/	*	/	*	/	*	/	*
<p>Ex-proof proportional pressure cartridges valves:</p> <p>LICZA = pressure compensator LIMZA = pressure relief LIRZA = pressure reducing</p> <p>Certification type: Multicertification ATEX, IECEx, EAC: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size ISO 7368: 1 = size 16 2 = size 25 3 = size 32 4 = size 40 5 = size 50 (not for LIRZA) 6 = size 63 (only for LIMZA) 8 = size 80 (only for LIMZA)</p> <p>Max regulated pressure: 80 = 80 bar 180 = 180 bar 250 = 250 bar</p>																		<p>Seals material, see section 9 :</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p> <p>Voltage code: - = standard coil for 24 VDC Atos drivers 24 = optional coil for 24 VDC low current drivers</p> <p>Options (3): O = horizontal cable entrance (2) P =with integral mechanical pressure limiter (standard. for size 1, 2 and 3)</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (4) M = M20x1,5 - not for cULus NPT = 1/2" NPT</p>

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) **(3)** Possible combined options: /OP **(4)** Approved only for Italian market

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 HYDRAULICS SYMBOLS



3 MODEL CODE OF CARTRIDGES

SC LI	-	32	31	2	**	/	*
Cartridge according to ISO 7368					Seals material, see section 9:		
Cartridges size ISO 7368:					- = NBR		
16					PE = FKM		
25					BT = HNBR		
32					Series number		
40							
50							
63							
80							
Type of poppet:					Spring cracking pressure:		
31 = for LIMZA and LICZA					2 = 1,5 bar for poppet 31		
36 = for LICZA					3 = 3 bar		
37 = for LIRZA					4 = 4 bar		
					6 = 6 bar for poppet 31 and 36		
					7 = 7 bar for poppet 37		

4 TYPE OF POPPET

Type of poppet	31	36	37
Functional sketch (Hydraulic symbol)			
Typical section			
Area ratio A: AP	1:1	1:1	1:1

5 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

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 valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	LICZA					LIMZA								LIRZA			
	1	2	3	4	5	1	2	3	4	5	6	8	1	2	3	4	
Valve size [l/min]																	
Max flow [bar]	200	400	750	1000	2000	200	400	750	1000	2000	3000	4500	160	300	550	800	
Min regulated pressure	see section 15																
Max regulated pres. at port A [bar]	80; 180; 250					80; 180; 250								80; 180; 250			
Max pressure [bar]	Ports: T, Y = 210 Ports: P, A, B, X = 315																
Response time 0-100% step signal (1) (depending on installation) [ms]	≤ 120 ÷ 430					≤ 120 ÷ 480								≤ 120 ÷ 380			
Hysteresis [% of regulated max pres.]	≤ 2					≤ 1,5								≤ 2			
Linearity [% of regulated max pres.]	≤ 3					≤ 3								≤ 3			
Repeatability [% of regulated max pres.]	≤ 2					≤ 2								≤ 2			

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 5

(1) Average response time value; the pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response

8 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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	HFDR, HFDR	ISO 12922
Flame resistant with water (1)	NBR, HNBR	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	DPZA		DPZA/M	DPZA/UL	
Certifications	Multicertification Group II ATEX IECEx EAC PESO		Multicertification Group I ATEX IECEx	North American cULus	
Solenoid certified code	OZA-A		OZAM-A	OZA-A/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • EAC Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -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 EX PROOF SOLENOIDS WIRING OF VALVES -A without integral driver

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board
2 = GND suitable for wires cross sections
3 = Coil up to 2,5 mm² (max AWG14)

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring

⚠ Pay attention to respect the polarity

1 = Coil + PCB 3 poles terminal board suggested
2 = GND cable section up to 1,5 mm²
3 = Coil - (max AWG16), see section 10 note 1

alternative GND screw terminal connected to solenoid housing

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> • Suitable for use in Class I Division 1, Gas Groups C • Armored Marine Shipboard Cable which meets UL 1309 • Tinned Stranded Copper Conductors • Bronze braided armor • Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

12.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	90 °C	90 °C
45 °C	-	T4	-	135 °C	-	95 °C
55 °C	-	T3	-	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

13 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

14 OPTIONS

O = Horizontal cable entrance, to be selected in case of limited vertical space.

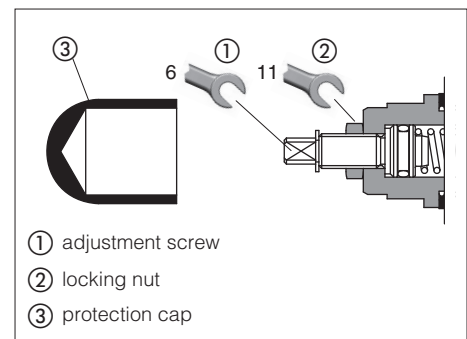
P = Integral mechanical pressure limiter (standard for size 1, 2 and 3)

The LICZA-A*, LIMZA-A* and LIRZA-A* standard size 1, 2, 3 and option /P are provided with mechanical pressure limiter acting as protection against overpressure. For safety reasons the factory setting of the mechanical pressure limiter is fully unloaded (min pressure).

At the first commissioning it must be set at a value lightly higher than the max pressure regulated with the proportional control.

For the pressure setting of the mechanical pressure limiter, proceed according to following steps:

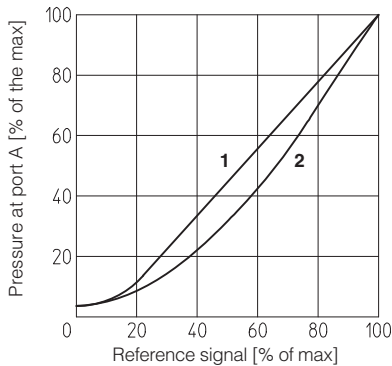
- apply the max reference input signal to the valve's driver. The system pressure will not increase until the mechanical pressure limiter remains unloaded.
- turn clockwise the adjustment screw ① until the system pressure will increase up to a stable value corresponding to the pressure setpoint at max reference input signal.
- turn clockwise the adjustment screw ① of additional 1 or 2 turns to ensure that the mechanical pressure limiter remains closed during the proportional valve working.



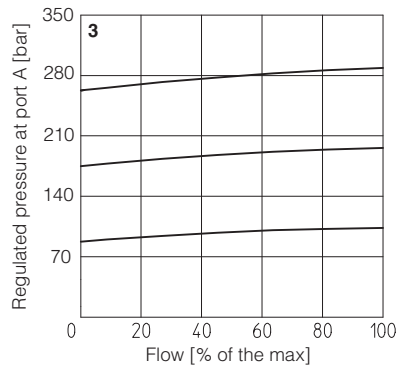
14.1 Possible combined options: /OP

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

- 1 Regulation diagrams LIMZA**
- 2 Regulation diagrams LICZA**

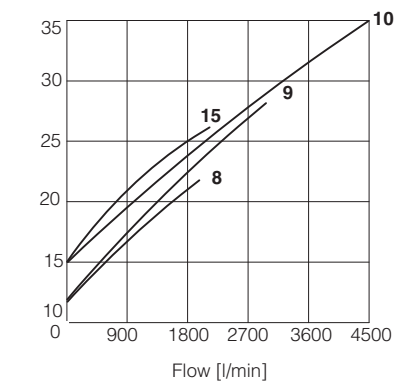
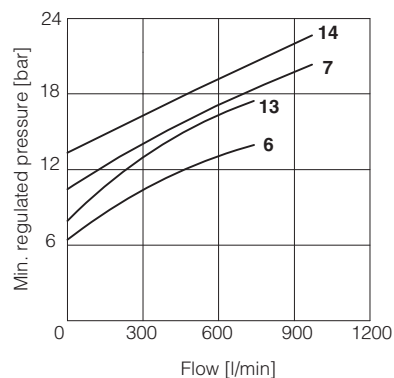
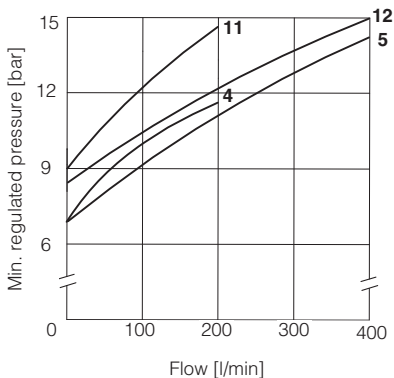


- 3 Pressure/flow diagrams LICZA, LIMZA**



4-14 Min. pressure/flow diagrams
with zero reference signal

- 4 = LIMZA-*-1**
- 5 = LIMZA-*-2**
- 6 = LIMZA-*-3**
- 7 = LIMZA-*-4**
- 8 = LIMZA-*-5**
- 9 = LIMZA-*-6**
- 10 = LIMZA-*-8**
- 11 = LICZA-*-1**
- 12 = LICZA-*-2**
- 13 = LICZA-*-3**
- 14 = LICZA-*-4**
- 15 = LICZA-*-5**

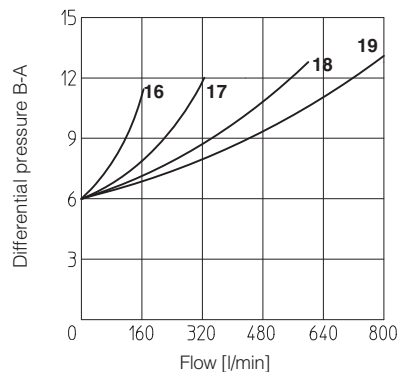
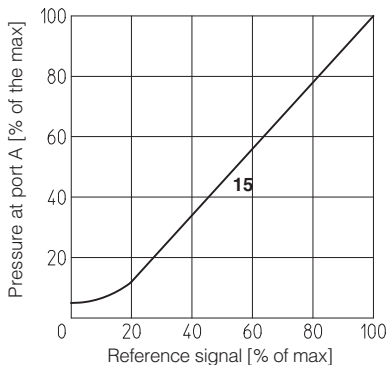


Regulation diagrams LIRZA

- 15 = LIRZA-A**

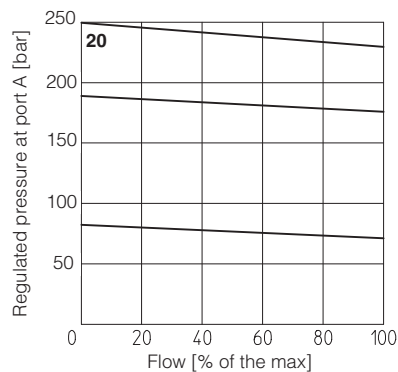
16-19 Min. pressure/flow diagrams
with reference signal "null"

- 16 = LIRZA-*-1**
- 17 = LIRZA-*-2**
- 18 = LIRZA-*-3**
- 19 = LIRZA-*-4**



Pressure/flow diagrams

- 20 = LIRZA-A**

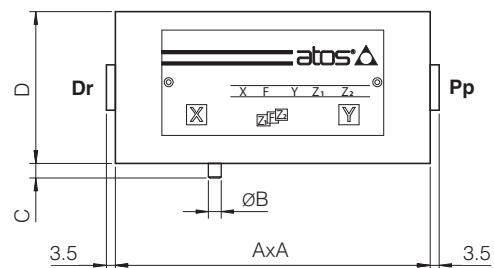


16 FASTENING BOLTS AND SEALS

Type	Size	Fastening bolts	Seals
LIMZA LICZA LIRZA	1 = 16	4 socket head screws M8x45 class 12.9 Tightening torque = 35 Nm	2 OR 108
	2 = 25	4 socket head screws M12x45 class 12.9 Tightening torque = 125 Nm	2 OR 108
	3 = 32	4 socket head screws M16x55 class 12.9 Tightening torque = 300 Nm	2 OR 2043
	4 = 40	4 socket head screws M20x70 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA LICZA	5 = 50	4 socket head screws M20x80 class 12.9 Tightening torque = 600 Nm	2 OR 3043
LIMZA	6 = 63	4 socket head screws M30x90 class 12.9 Tightening torque = 2100 Nm	2 OR 3050
	8 = 80	8 socket head screws M24x90 class 12.9 Tightening torque = 1000 Nm	2 OR 4075

17 COVERS DIMENSIONS [mm]

Size	AxA	ØB	C	D	Port Pp - Dr
1 = 16	65x80	3	4	40	-
2 = 25	85x85	5	6	40	-
3 = 32	100x100	5	6	50	-
4 = 40	125x125	5	6	60	G 1/4"
5 = 50	140x140	6	4	70	G 1/4"
6 = 63	180x180	6	4	80	G 3/8"
8 = 80	Ø250	8	6	80	G 3/8"

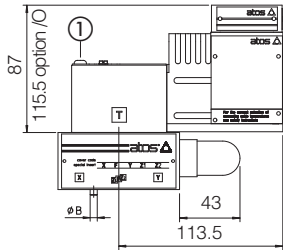


Notes:

size 1 cover is not squared but rectangular, dimensions 65x80
size 8 cover is not squared but circular, dimension Ø250

18 COVERS INSTALLATION DIMENSIONS [mm]

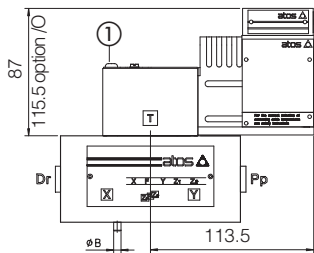
LICZA-A-1 LIMZA-A-1 LIRZA-A-1
 LICZA-A-2 LIMZA-A-2 LIRZA-A-2
 LICZA-A-3 LIMZA-A-3 LIRZA-A-3



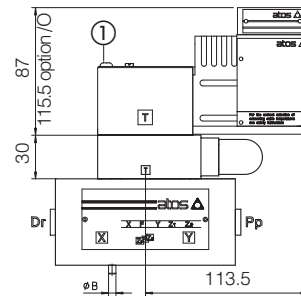
Mass [kg]			
Size	LICZA, LIMZA, LIRZA		Cartridge
	Standard	Option /P	SC LI
1	4,1	standard	0,2
2	4,8	standard	0,5
3	6,1	standard	0,9
4	11,5	12,5	1,7
5	15	16	2,9
6	24,5	25,5	6,7
8	33,1	34,1	13,1

① = Screw for air bleeding: at the first valve commissioning the air eventually trapped inside the solenoid must be bled-off through the screw ①

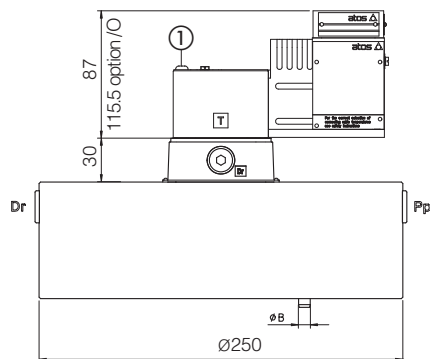
LICZA-A-4 LIMZA-A-4 LIRZA-A-4
 LICZA-A-5 LIMZA-A-5 LIMZA-A-6



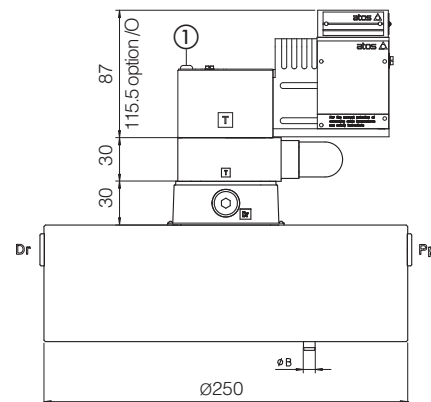
LICZA-A-4/P LIMZA-A-4/P LIRZA-A-4/P
 LICZA-A-5/P LIMZA-A-5/P
 LIMZA-A-6/P



LIMZA-A-8



LIMZA-A-8/P



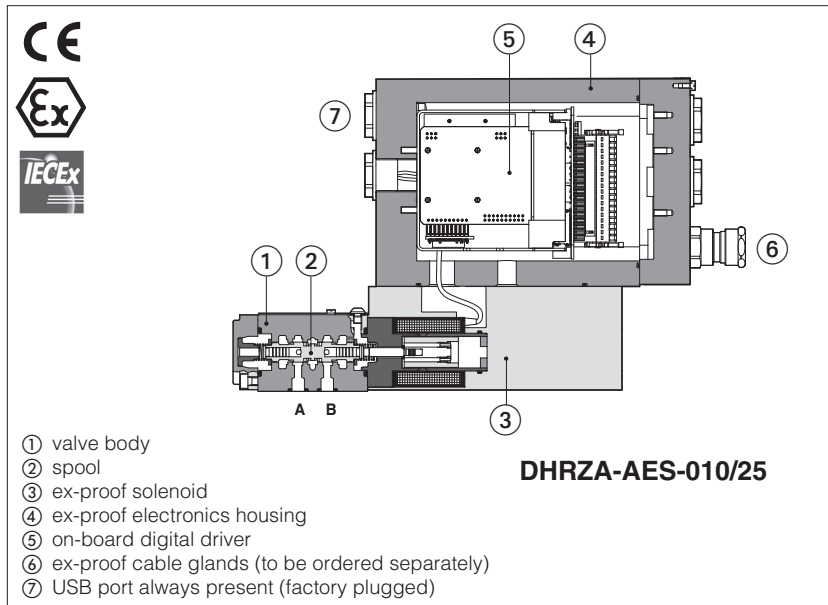
Note: for mounting surface and cavity dimensions, see tech. table P006

19 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P006** Mounting surfaces and cavities for cartridge valves

Ex-proof digital proportional reducing valves

direct, with on-board driver and without transducer - ATEX and IECEx



- ① valve body
- ② spool
- ③ ex-proof solenoid
- ④ ex-proof electronics housing
- ⑤ on-board digital driver
- ⑥ ex-proof cable glands (to be ordered separately)
- ⑦ USB port always present (factory plugged)

DHRZA-AES

Ex-proof digital proportional pressure reducing valves, direct, without transducer, for pressure reduction in low flow systems or piloting lines.

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

● **Multicertification ATEX and IECEx**
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.

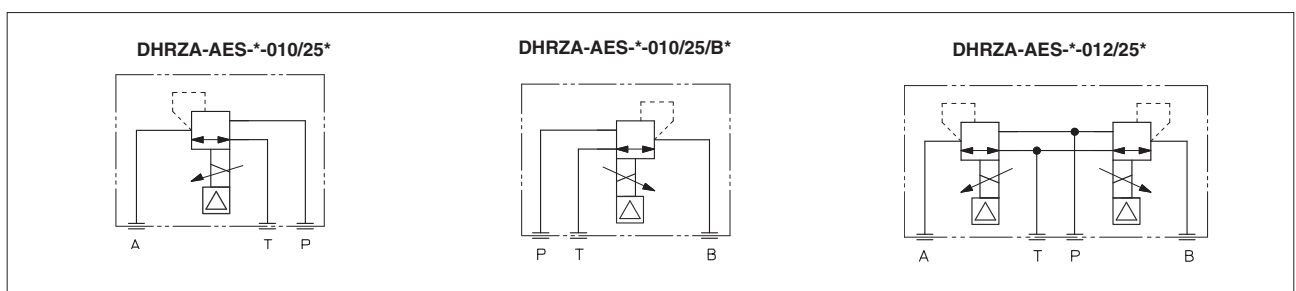
Size: **06** - ISO 4401
Max flow: **24 l/min**
Max pressure: **25 bar**

1 MODEL CODE

DHRZA	-	AES	-	NP	-	010	/	25	-	M	/	*	/	*
Ex-proof proportional pressure reducing valves, direct DHRZA = size 06														Seals material , see section 9: - = NBR PE = FKM BT = HNBR
AES = on-board driver, without transducer														
Fieldbus interfaces , USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT														
010 = reduced port A 012 = reduced ports A and B														
25 = reduced pressure range 3÷25 bar														
Hydraulic options (1): B = flow reduced on port B (solenoid on side A)														
Electronic options (1): I = current reference input 4 ÷ 20 mA (omit for std voltage ±10 Vdc)														
Cable entrance threaded connection: M = M20x1,5														

(1) Possible combined options: /BI

2 CONFIGURAZIONI E SIMBOLI IDRAULICI (rappresentazione secondo ISO 1219-1)



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

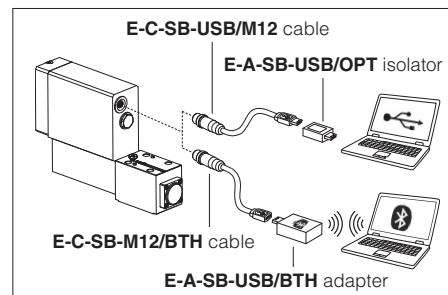
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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 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 valves according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

7 HYDRAULIC CHARACTERISTICS

Max regulated pressure (Q=1 l/min) [bar]	25
Min. regulated pressure (Q=1 l/min) [bar]	3
Max. pressure at port P [bar]	315
Max. pressure at port T [bar]	210
Max. flow [l/min]	24
Response time 0-100% step signal (depending on installation) [ms]	≤ 45
Hysteresis [% of the max pressure]	≤ 1,5
Linearity [% of the max pressure]	≤ 3
Repeatability [% of the max pressure]	≤ 2

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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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, pressure transducer failure (W option)			
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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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	DHRZA		
Certifications	Multicertification Group II ATEX IECEx		
Solenoid certified code	OZA-AES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X		• IECEx: IECEx TPS 19.0004X
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db		• IECEx 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 EN 60079-1	IEC 60079-0 IEC 60079-1	IEC 60079-31:2013
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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 **KX600**

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

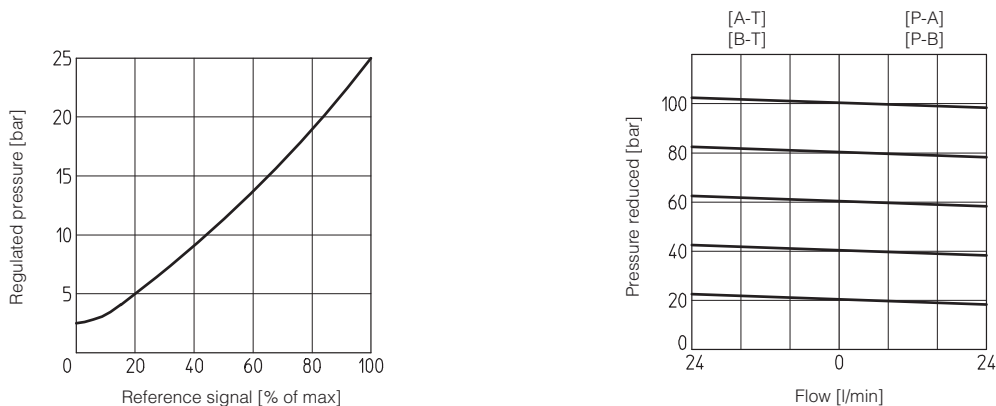
13 HYDRAULIC OPTIONS

B = Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see 15.1

14 ELECTRONIC OPTIONS

I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 V_{DC}. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V_{DC} 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 DIAGRAMS based on mineral oil ISO VG 46 at 50°C




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, EN-982).

16.1 Power supply (V+ and V0)


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

 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 VLO)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

16.3 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 \div 10Vdc 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 $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

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 24VDC.

16.4 Monitor output signal (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 \div 5Vdc (1V = 1A).

Output signal can be reconfigured via software, within a maximum range of $\pm 5\text{ Vdc}$.

16.5 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.

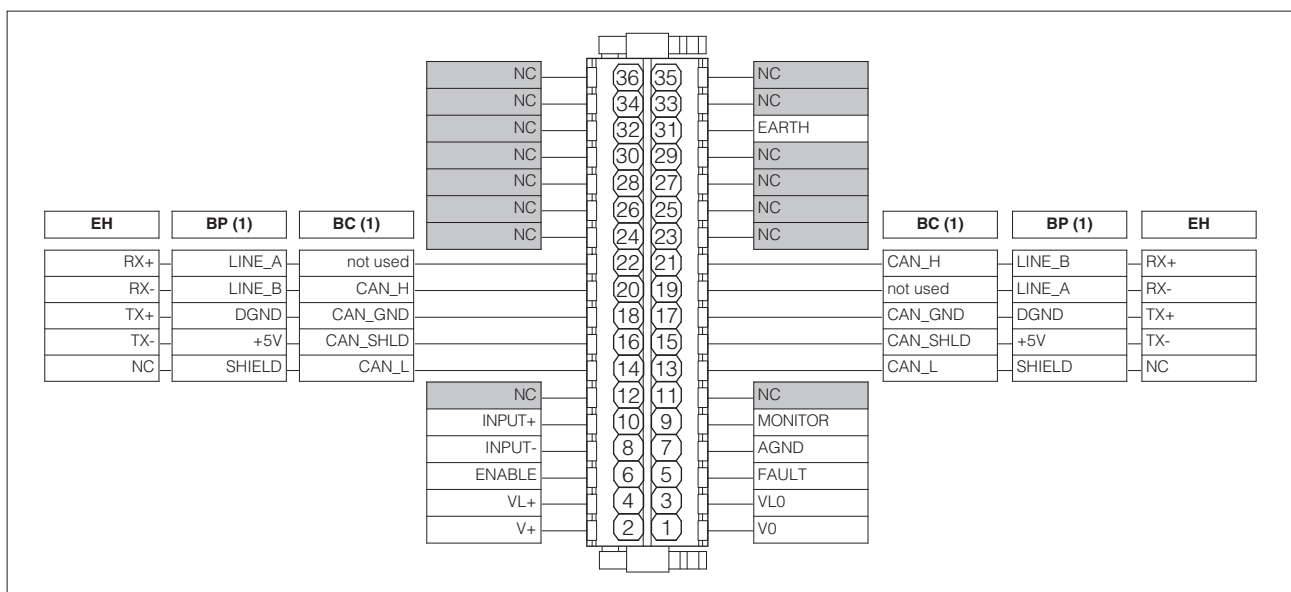
Enable input signal can be used as generic digital input by software selection.

16.6 Fault output signal (FAULT)

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

17 TERMINAL BOARD OVERVIEW



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

18 ELECTRONIC CONNECTIONS

18.1 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: ± 5 Vdc	Output - analog signal Software selectable
	10	INPUT+	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
	31	EARTH	Internally connected to driver housing	

18.2 USB connector - M12 - 5 pin always present

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	Driver view	
B	1	+5V_USB	Power supply	<p>(female)</p>	
	2	ID	Identification		
	3	GND_USB	Signal zero data line		
	4	D-	Data line -		
	5	D+	Data line +		

18.3 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

18.4 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)

18.5 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

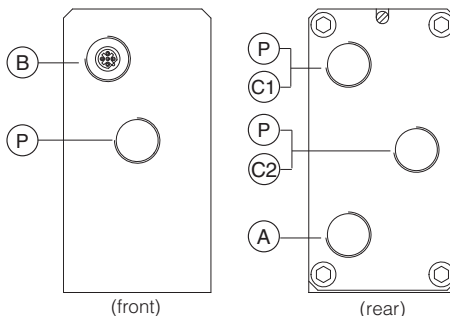
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

19 CONNECTIONS LAYOUT

CABLE ENTRANCE OVERVIEW

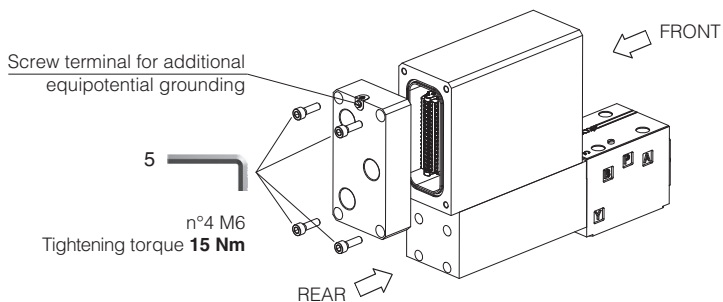
Cables entrance description:

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



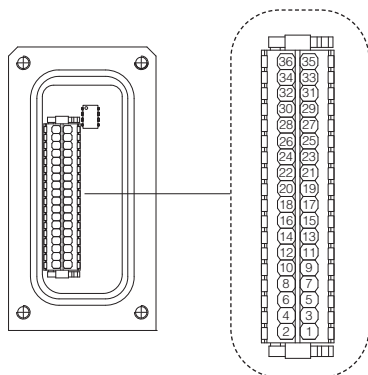
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 17



Fieldbus terminator only for BC and BP executions (1)

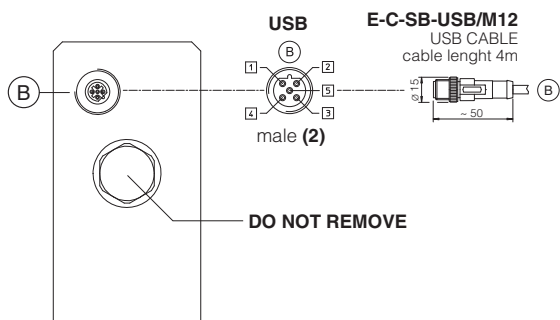
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

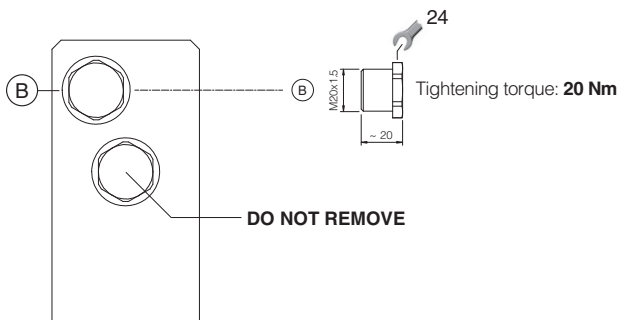
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	OFF
4	OFF

USB CONNECTOR

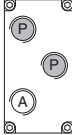
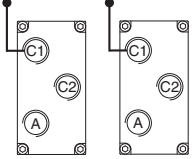
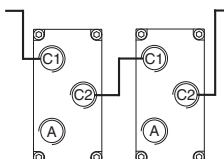


METALLIC PROTECTION CAP - supplied with the valves




(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

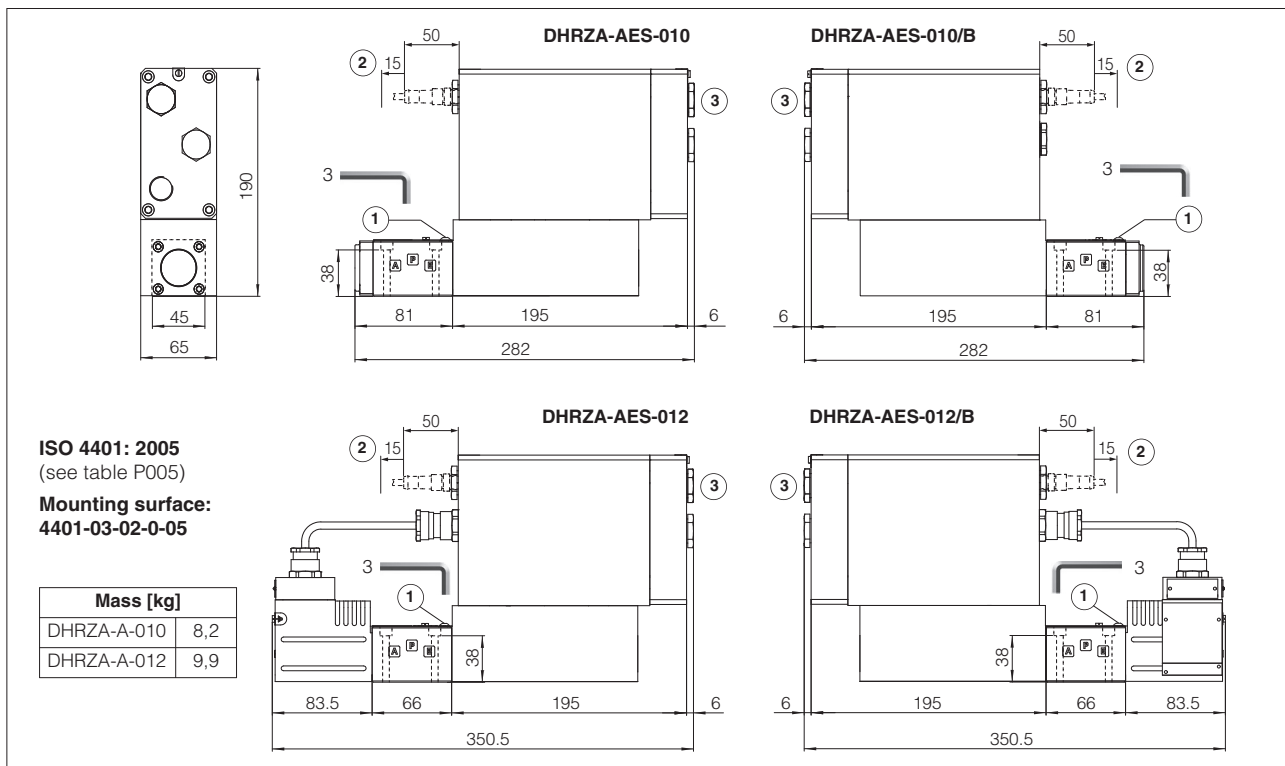
19.1 Cable glands and threaded plug - see tech table **KX800**

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug 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

20 FASTENING BOLTS AND SEALS

	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>		<p>Seals: 4 OR 108; Diameter of ports P, A, B, T: $\varnothing 7,5$ mm (max) 1 OR 2025 Diameter of port Y: $\varnothing = 3,2$ mm (only for /Y option)</p>
--	---	--	---

21 INSTALLATION DIMENSIONS FOR DHRZA [mm]




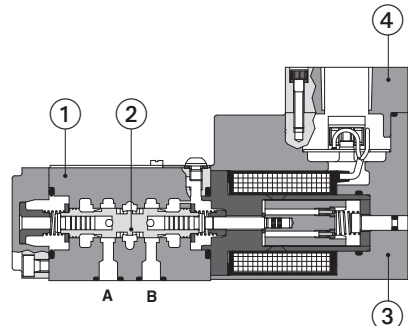
22 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		

Ex-proof proportional reducing valves

direct, without transducer - **ATEX, IECEx, EAC, PESO** or **cULus**





DHRZA-A-010/25

① valve body
 ② spool
 ③ ex-proof solenoid
 ④ threaded connections for cable clamp or conduit pipe

DHRZA-A

Ex-proof proportional pressure reducing valves, direct, without transducer, for pressure reduction in low flow systems or piloting lines.

They are equipped with ex-proof proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **06** - ISO 4401
 Max flow: **24 l/min**
 Max pressure: **25 bar**

1 MODEL CODE

DHRZA	/	*	-	A	-	010	/	25	-	M	/	*	/	*	/	*	/	*
Ex-proof proportional pressure reducing valves, direct DHRZA = size 06 Certification type: Multicertification: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus																		Seals material, see section 6 : - = NBR PE = FKM BT = HNBR Series number
A = without transducer 010 = reduced port A 012 = reduced ports A and B 25 = reduced pressure range 3÷25 bar																		Voltage code: - = standard coil for 24 VDC Atos drivers 24 = optional coil for 24 VDC low current drivers Options (3): B = flow reduced on port B (solenoid on side A) O = horizontal cable entrance (2) WP = ⚠ manual override protected by metallic cap
																		Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (4) M = M20x1,5 - not for cULus NPT = 1/2" NPT

- (1)** The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from [www.peso.org](#)
- (2)** Not for multicertification **M** group I (mining) **(3)** Possible combined options: all combinations are available
- (4)** Approved only for Italian market

2 ELECTRONIC DRIVERS

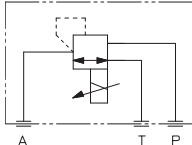
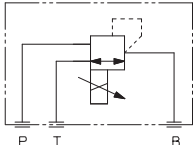
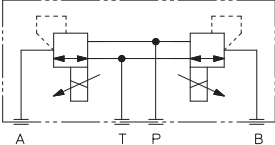
Electronic drivers are factory set with max current limitation for ex-proof valves. Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS* /A	E-BM-AES* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

3 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Hydraulic symbols			
	DHRZA-A-010/25*	DHRZA-A-010/25/B*	DHRZA-A-012/25*
Max regulated pressure (Q=1 l/min) [bar]	25		
Min. regulated pressure (Q=1 l/min) [bar]	3		
Max. pressure at port P [bar]	315		
Max. pressure at port T [bar]	210		
Max. flow [l/min]	24		
Response time 0-100% step signal (depending on installation) [ms]	≤ 45		
Hysteresis [% of the max pressure]	≤ 1,5		
Linearity [% of the max pressure]	≤ 3		
Repeatability [% of the max pressure]	≤ 2		


Above performance data refer to valves coupled with Atos electronic drivers, see section [2](#)

5 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

6 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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

7 CERTIFICATION DATA

Valve type	DHRZA, DKZA		DHRZA/M, DKZA/M	DHRZA/UL, DKZA/UL	
Certifications	Multicertification Group II TEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-A		OZAM-A	OZA-A/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEX Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C
In case the complete valve must withstand with minimum ambient temperature of -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

8 EX PROOF SOLENOIDS WIRING

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
2 = GND
3 = Coil

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override

1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1
2 = GND
3 = Coil -

alternative GND screw terminal connected to solenoid housing

⚠ Pay attention to respect the polarity

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> Suitable for use in Class I Division 1, Gas Groups C Armored Marine Shipboard Cable which meets UL 1309 Tinned Stranded Copper Conductors Bronze braided armor Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

9.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	90 °C	90 °C
45 °C	-	T4	-	135 °C	-	95 °C
55 °C	-	T3	-	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

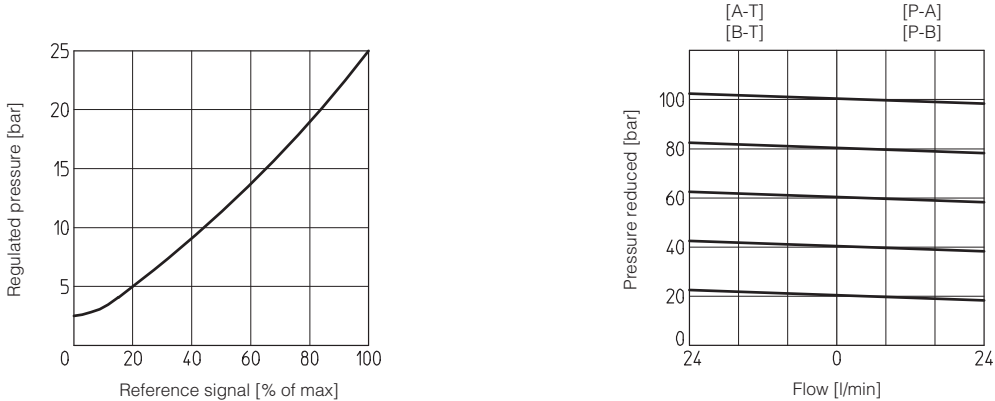
Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

10 CABLE GLANDS - only **Multicertification**

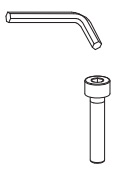
Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **KX800**

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

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



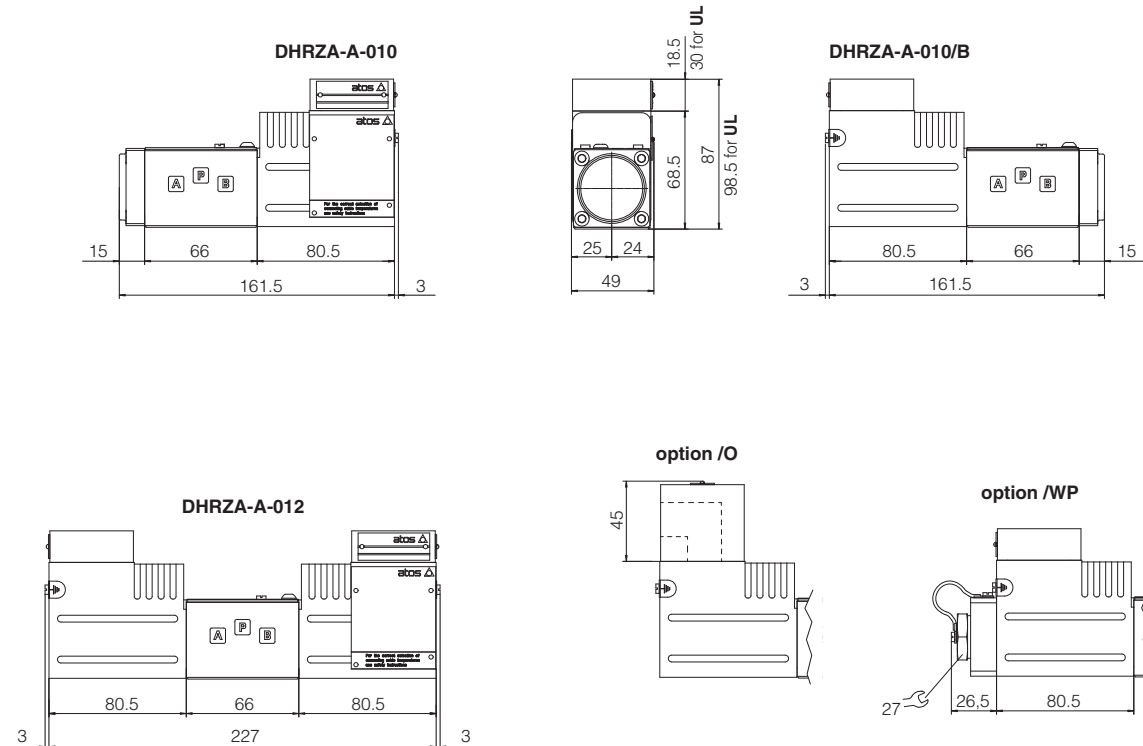
12 FASTENING BOLTS AND SEALS

	<p>DHZA</p> <p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>DKZA</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 P, A, B, T: \varnothing 7,5 mm (max) 1 OR 2025 Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)</p>	<p>Seals: 5 OR 2050; Diameter of ports P, A, B, T: \varnothing 11,5 mm (max) 1 OR 108 Diameter of port Y: \varnothing = 5 mm (only for /Y option)</p>

13 INSTALLATION DIMENSIONS FOR DHRZO [mm]

ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
 (for /Y surface: 4401-03-03-0-05 without port X)

Mass [kg]	
DHRZA-A-05	2,65
DHRZA-A-07	4,3
Option /O	+0,35
Option /WP	+0,25

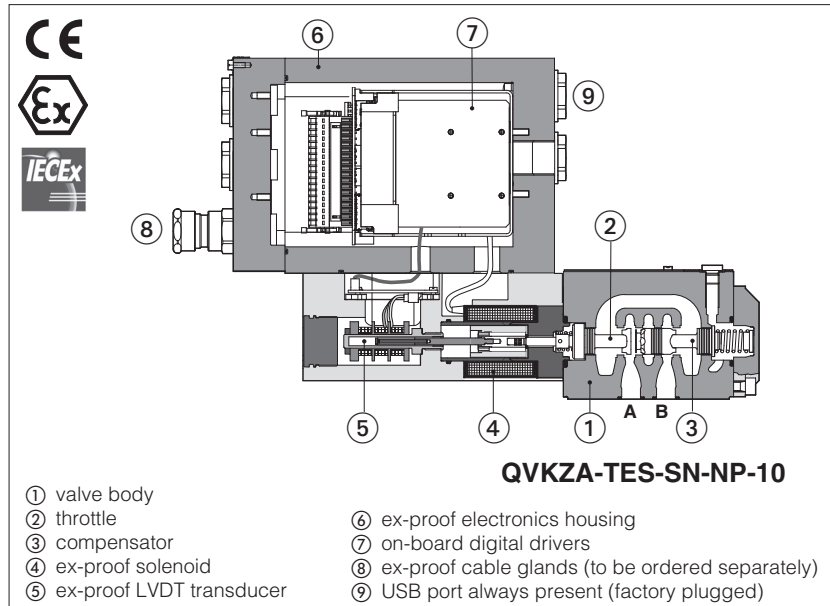


14 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional flow valves high performance

pressure compensated, with on-board driver and LVDT transducer - **ATEX and IECEx**



QVHZA-TES, QVKZA-TES

Ex-proof digital high performance proportional flow valves, with LVDT position transducer for pressure compensated flow regulations.

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

● Multicertification **ATEX** and **IECEx** for gas group **II 2G** and dust category **II 2D**

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

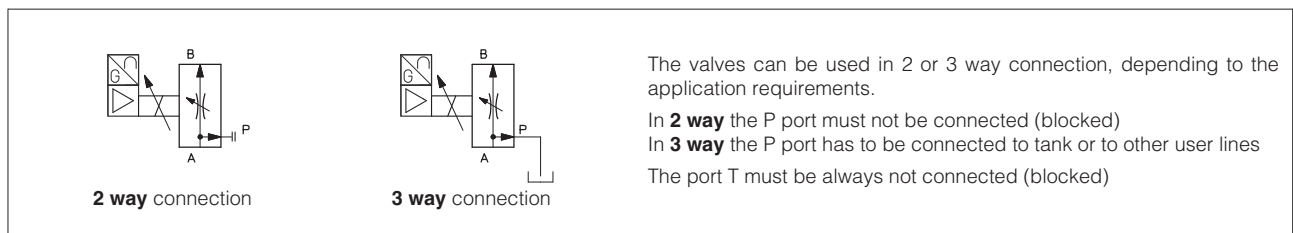
The driver and solenoid are also designed to limit the surface temperature within the classified limits.

QVHZA:	QVKZA:
Size: 06 - ISO4401	Size: 10 - ISO4401
Max flow: 45 l/min	Max flow: 90 l/min
Max pressure: 210 bar	Max pressure: 210 bar

1 MODEL CODE

QVKZA	-	TES	-	SN	-	NP	-	10	/	65	/	M	*	/	*								
<p>Ex-proof pressure compensated proportional flow valves, direct</p> <p>QVHZA = size 06 QVKZA = size 10</p> <p>TES = on-board driver and LVDT transducer</p> <p>Alternated P/Q controls: SN = none</p> <p>Fieldbus interface, USB port always present: NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT</p> <p>Valve size ISO 4401: 06 = size 06 10 = size 10</p>															<p>Seals material, see section 9 :</p> <p>- = NBR PE = FKM BT = HNBR</p> <p>Electronic options: I = current reference input and monitor 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 Vdc)</p> <p>Cable entrance threaded connection: M = M20x1,5</p> <p>Max regulated flow:</p> <table border="0" style="width: 100%;"> <tr> <td>QVHZA:</td> <td>QVKZA:</td> </tr> <tr> <td>3 = 3,5 l/min 36 = 35 l/min</td> <td>65 = 65 l/min</td> </tr> <tr> <td>12 = 12 l/min 45 = 45 l/min</td> <td>90 = 90 l/min</td> </tr> <tr> <td>18 = 18 l/min</td> <td></td> </tr> </table>	QVHZA:	QVKZA:	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	
QVHZA:	QVKZA:																						
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																							

2 HYDRAULIC SYMBOLS



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS



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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC support: NP (USB) 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)

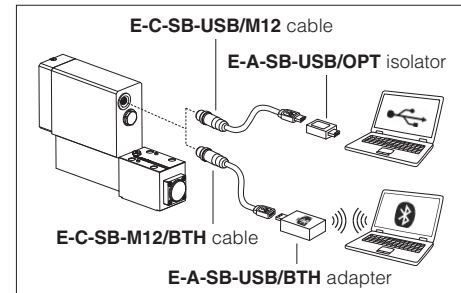


WARNING: drivers USB port is not isolated! For E-C-SB-USB/M12 cable, the use of isolator adapter is highly recommended for PC protection



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

USB or Bluetooth connection



5 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 valves according to EN ISO 13849	150 years, 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	QVHZA					QVKZA			
	[l/min]	3,5	12	18	35	45	65	90	
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]	≤ 30					≤ 45		
Hysteresis		≤ 0,5 [% of the regulated max flow]							
Linearity		≤ 0,5 [% of the regulated max flow]							
Repeatability		≤ 0,1 [% of the regulated max flow]							

(1) for different Δp, the max flow is in accordance to diagrams in section 14.3


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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ 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	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)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions			
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; spool position 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, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT 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 800 ms (depending on communication type) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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		
Solenoid certified code	OZA-TES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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

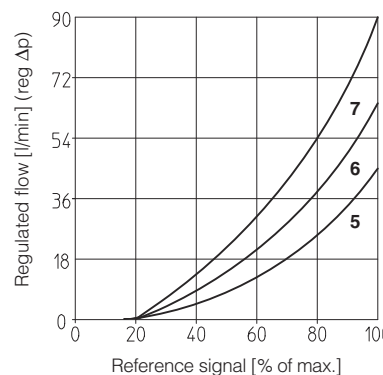
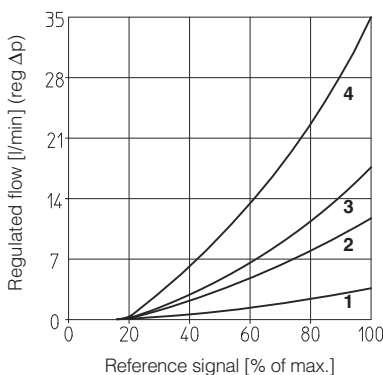
13 ELECTRONIC OPTIONS

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.

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

14.1 Regulation diagrams

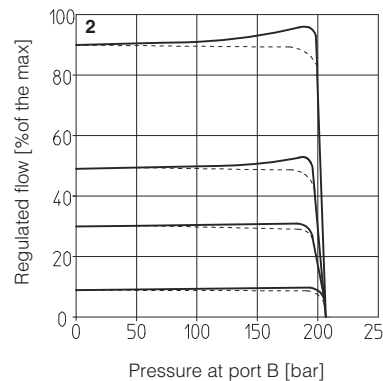
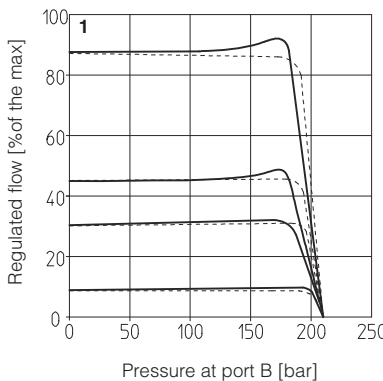
- 1 = QVHZA-*-06/3
- 2 = QVHZA-*-06/12
- 3 = QVHZA-*-06/18
- 4 = QVHZA-*-06/36
- 5 = QVHZA-*-06/45
- 6 = QVKZA-*-10/65
- 7 = QVKZA-*-10/90



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

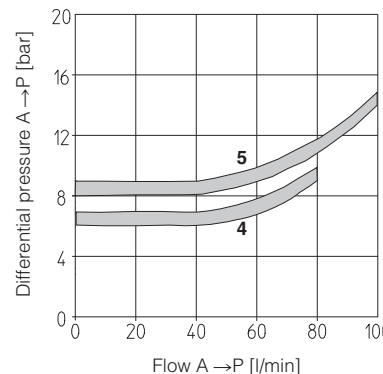
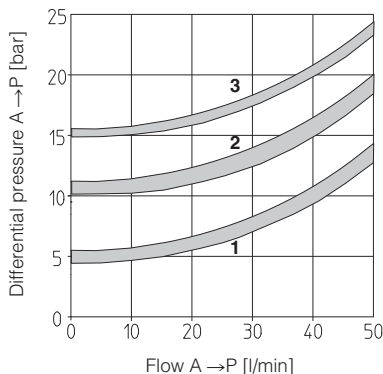
- 1 = QVHZA
- 2 = QVKZA

Dotted line for 3-way versions



14.3 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




15 POWER SUPPLY AND SIGNALS SPECIFICATIONS

Generic electrical output signals of the valve (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

15.1 Power supply (V+ and V0)

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

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

15.2 Power supply for driver's logic and communication (VL+ and VLO)

The power supply for driver's logic and communication must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ 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.

15.3 Flow reference input signal (Q_INPUT+)

The driver controls in closed loop the valve spool position proportionally to the external reference input signal.

Reference input signal is factory preset according to selected valve code, defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference). Analog reference input signal can be used as on-off commands with input range 0 ÷ 24VDC.

15.4 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal proportional to the actual spool position of the valve; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, pilot spool position).

Monitor output signal is factory preset according to selected valve code, defaults are 0 ÷ 10 VDC for standard and 4 ÷ 20 mA for /I option.

Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ VDC}$ or $\pm 20\text{ mA}$.

15.5 Enable input signal (ENABLE)

To enable the driver, supply a 24 VDC on pin 5: 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 activate the communication and the other driver functions when the valve must be disabled for safety reasons. This condition **does not comply** with norms IEC 61508 and ISO 13849.

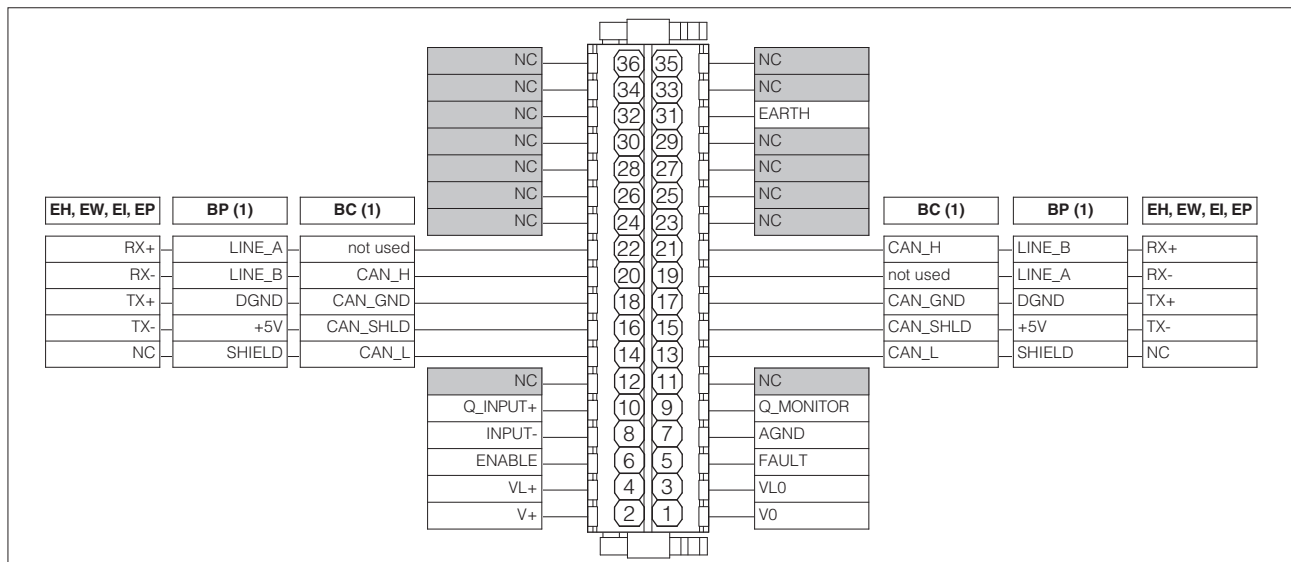
Enable input signal can be used as generic digital input by software selection.

15.6 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.

16 TERMINAL BOARD OVERVIEW



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

17 ELECTRONIC CONNECTIONS

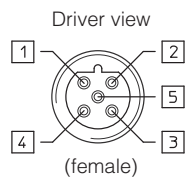
17.1 Main connections signals

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	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Defaults are: 0 ÷ 10 Vdc for standard and 4 ÷ 20 mA for /I option	Output - analog signal Software selectable
	10	Q_INPUT+	Flow reference input signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND 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		

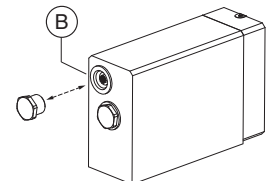
17.2 USB connector - M12 - 5 pin always present

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 +

Driver view



(female)



17.3 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

17.4 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)

17.5 EH fieldbus execution connections

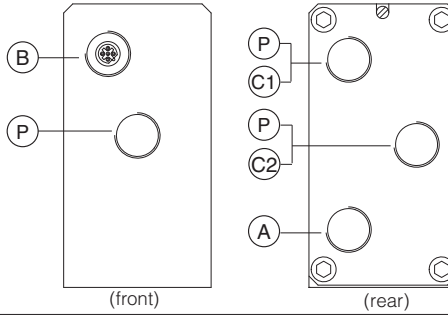
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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

CABLE ENTRANCE OVERVIEW

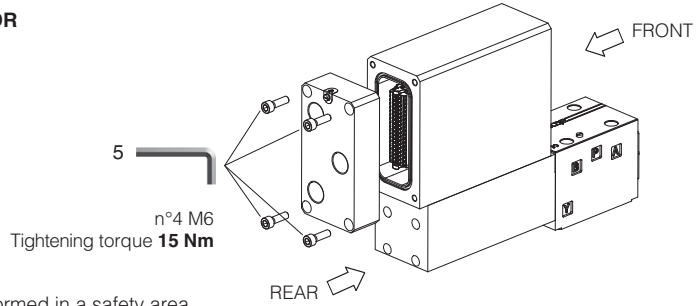
Cables entrance description:

- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus (input)
- (C2) fieldbus (output)
- (D1) pressure transducer 1
- (D2) pressure transducer 2
- (P) threaded plug



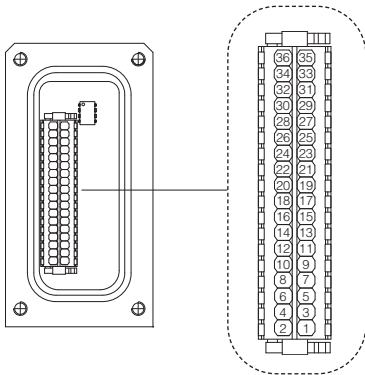
TERMINAL BOARD AND FIELDBUS TERMINATOR

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 16



Fieldbus terminator only for BC and BP executions (1)

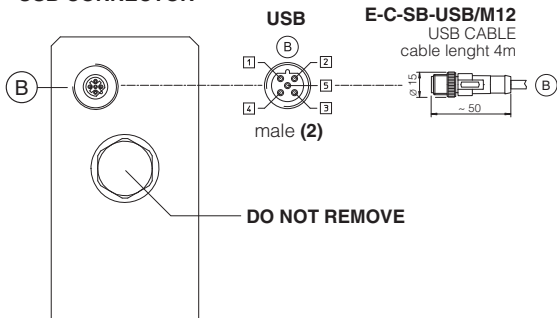
BC - CANopen setting:

Switch	Termination enabled
1	OFF
2	OFF
3	OFF
4	ON

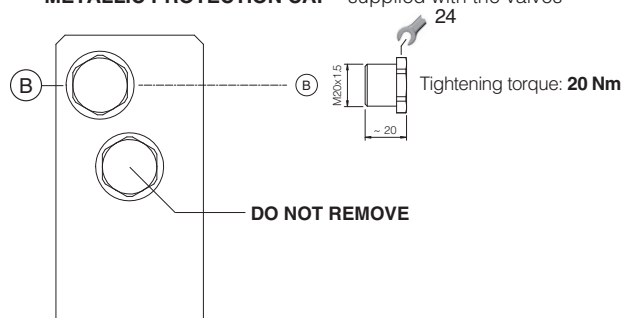
BP - PROFIBUS DP setting:

Switch	Termination enabled
1	ON
2	ON
3	OFF
4	OFF

USB CONNECTOR

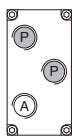
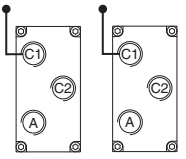
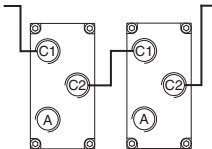


METALLIC PROTECTION CAP - supplied with the valves

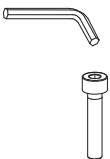



(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

18.1 Cable glands and threaded plug - see tech table **KX800**

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

19 FASTENING BOLTS AND SEALS

	QVHZA	QVKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</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>

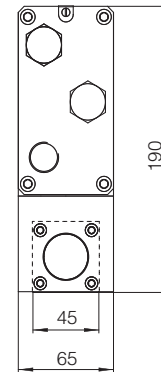
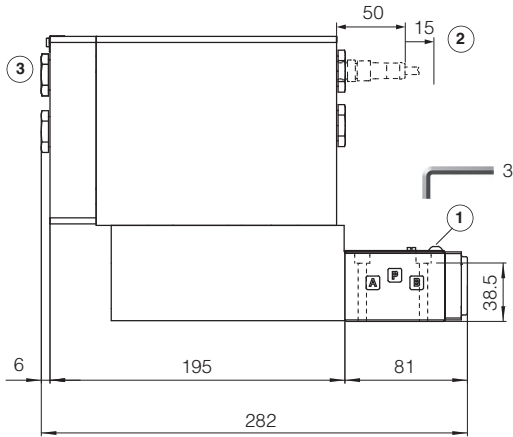
20 INSTALLATION DIMENSIONS [mm]

QVHZA-TES

ISO 4401: 2005

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

Mass [kg]	
QVHZA-TES	7,2

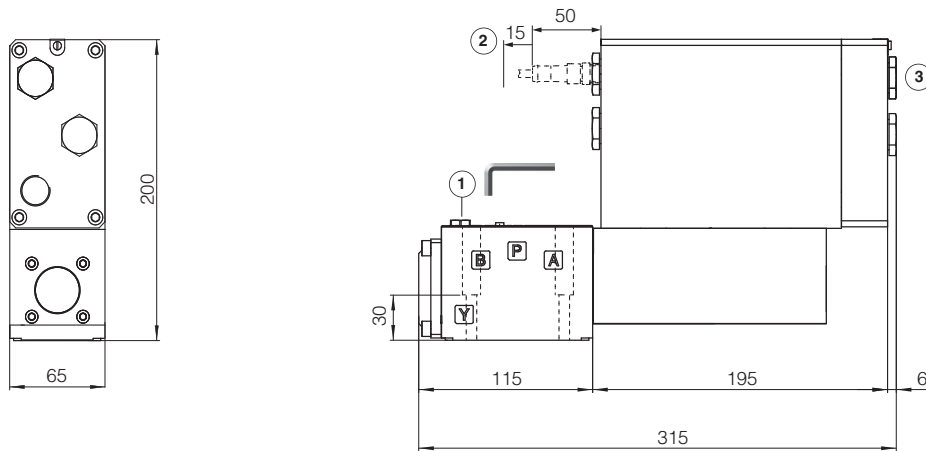


QVKZA-TES

ISO 4401: 2005

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

Mass [kg]	
QVKZA	9



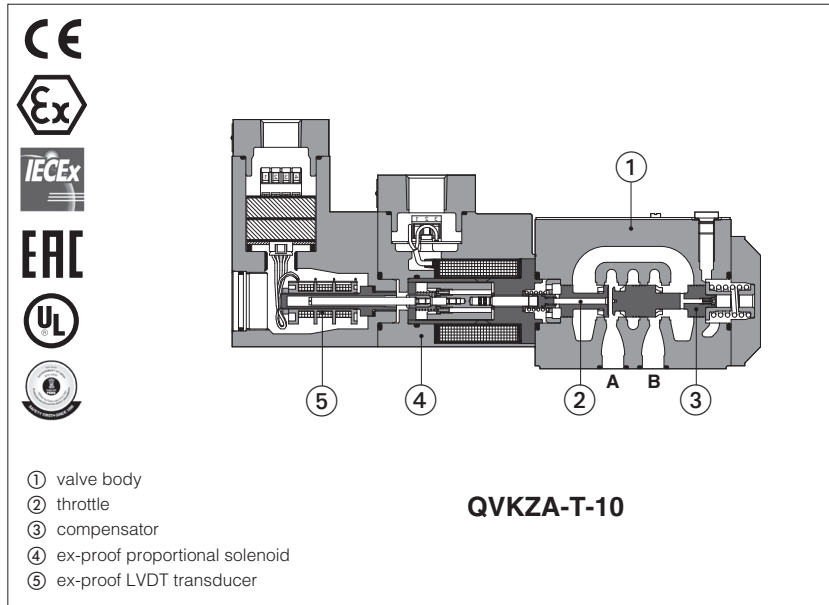
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

21 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GX800	Ex-proof pressure transducer type E-ATRA-7
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		
GS510	Fieldbus		

Ex-proof proportional flow valves high performance

pressure compensated, with LVDT transducer - **ATEX, IECEx, EAC, PESO** or **cULus**



QVHZA-T, QVKZA-T

Ex-proof high performance proportional flow control valves, with LVDT position transducer for pressure compensated flow regulations. They are equipped with ex-proof proportional solenoids LVDT transducer certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid and transducer prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

QVHZA:	QVKZA:
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

QVKZA	/	*	-	T	-	10	/	90	/	M	/	*	/	*											
<p>Ex-proof pressure compensated proportional flow valves, direct</p> <p>QVHZA = size 06 QVKZA = size 10</p> <p>Certification type: Multicertification ATEX, IECEx, EAC, PESO: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>T = with LVDT transducer</p> <p>Valve size ISO 4401: 06 = size 06 10 = size 10</p> <p>Max regulated flow:</p> <table border="0" style="width: 100%;"> <tr> <td>QVHZA:</td> <td>QVKZA:</td> </tr> <tr> <td>3 = 3,5 l/min</td> <td>65 = 65 l/min</td> </tr> <tr> <td>12 = 12 l/min</td> <td>90 = 90 l/min</td> </tr> <tr> <td>18 = 18 l/min</td> <td></td> </tr> <tr> <td>36 = 35 l/min</td> <td></td> </tr> <tr> <td>45 = 45 l/min</td> <td></td> </tr> </table>														QVHZA:	QVKZA:	3 = 3,5 l/min	65 = 65 l/min	12 = 12 l/min	90 = 90 l/min	18 = 18 l/min		36 = 35 l/min		45 = 45 l/min	
QVHZA:	QVKZA:																								
3 = 3,5 l/min	65 = 65 l/min																								
12 = 12 l/min	90 = 90 l/min																								
18 = 18 l/min																									
36 = 35 l/min																									
45 = 45 l/min																									
<p>Seals material, see section 7 :</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p>																									
<p>Options (3):</p> <p>C = position transducer with current feedback 4 ÷ 20mA D = quick venting of port B</p>																									
<p>Solenoid threaded connection for cable gland fitting:</p> <p>GK = GK-1/2" - not for cULus (4) M = M20x1,5 - not for cULus NPT = 1/2" NPT</p>																									

- (1)** The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from [www.peso.org](#)
- (2)** Not for multicertification **M** group I (mining) **(3)** Possible combined options: /CD **(4)** Approved only for the Italian market

2 HYDRAULIC SYMBOLS

<p>2 way connection</p>	<p>3 way connection</p>
<p>The valves can be used in 2 or 3 way connection, depending to the application requirements.</p> <p>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</p> <p>The port T must be always not connected (blocked)</p> <p>For application examples of 2 and 3 way connections, see section 7</p>	

3 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

4 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 8 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

5 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 [l/min]	40			50	55	70	100
Max pressure [bar]	210						
Response time (1) [ms]	≤ 30					≤ 40	
Hysteresis	≤ 0,5 [% of the regulated max flow]						
Linearity	≤ 0,5 [% of the regulated max flow]						
Repeatability	≤ 0,1 [% of the regulated max flow]						

Note: above performance data refer to valves coupled with Atos electronic drivers, see section [3](#)


(1) 0 ÷ 100 % step signal

6 ELECTRICAL CHARACTERISTICS

Max. power	35W
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved
Duty factor	Continuous rating (ED=100%)
Voltage code	standard
Coil resistance R at 20°C	3,2 Ω
Max. solenoid current	2,5 A

7 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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 = 180 bar
- max fluid temperature = 50°C

8 CERTIFICATION DATA

Valve type	QVHZA, QVKZA		QVHZA/M, QVHZA/M	QVHZA/UL, QVHZA/UL	
Certifications	Multicertification Group II ATEX IECEX EAC PESO		Multicertification Group I ATEX IECEX	North American cULus	
Solenoid certified code	OZA-T		OZAM-T	OZA-T/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEX Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135°C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection			GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT	1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C.

In case the complete valve must withstand with minimum ambient temperature of -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

9 EX PROOF SOLENOIDS AND LVDT TRANSDUCER WIRING

Multicertification

① solenoid cover with threaded connection for cable gland fitting
② transducer cover with threaded connection for cable gland fitting
③ solenoid terminal board for cables wiring
④ transducer terminal board for cables wiring
⑤ screw terminal for additional equipotential grounding

Solenoid wiring

	1 = Coil	PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = GND	
	3 = Coil	

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suitable for wires cross sections up to 2,5 mm ² (max AWG14)
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

cULus certification

① solenoid cover with threaded connection for cable gland fitting
② transducer cover with threaded connection for cable gland fitting
③ solenoid terminal board for cables wiring
④ transducer terminal board for cables wiring

Solenoid wiring **⚠ Pay attention to respect the polarity**

	1 = Coil +	PCB 3 poles terminal board suggested cable section up to 1,5 mm ² (max AWG16), see section 10 note 1
	2 = GND	
	3 = Coil -	

alternative GND screw terminal connected to solenoid housing

Position transducer wiring

	1 = Output signal	PCB 4 poles terminal board suggested cable section up to 1,5 mm ² (max AWG16), see section 10 note 1
	2 = Supply -15 V	
	3 = Supply +15 V	
	4 = GND	

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> • Suitable for use in Class I Division 1, Gas Groups C • Armored Marine Shipboard Cable which meets UL 1309 • Tinned Stranded Copper Conductors • Bronze braided armor • Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

10.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	-	90 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

11 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or 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

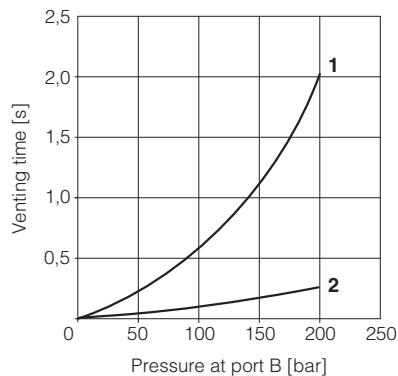
12 OPTIONS

C = Position transducer with current feedback 4±20 mA, suggested in case of long distance between the electronic driver and the proportional valve

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:

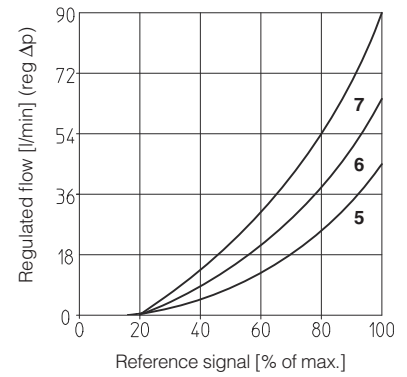
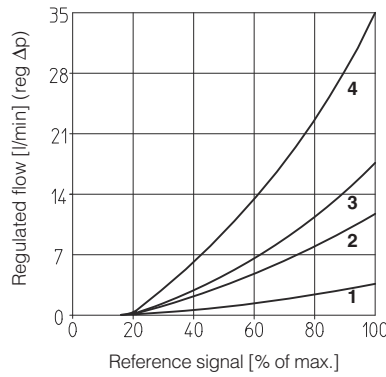
- 1** = standard versions
- 2** = option /D



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

13.1 Regulation diagrams

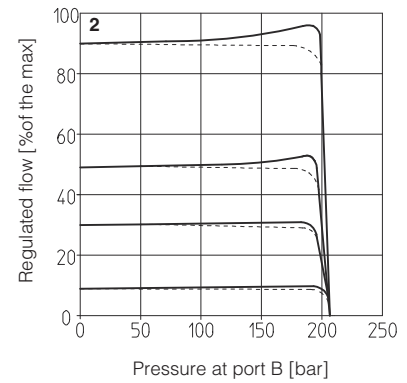
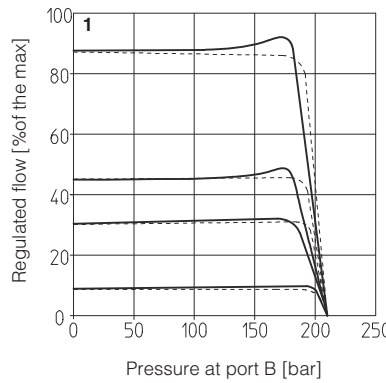
- 1 = QVHZA-*-06/3
- 2 = QVHZA-*-06/12
- 3 = QVHZA-*-06/18
- 4 = QVHZA-*-06/36
- 5 = QVHZA-*-06/45
- 6 = QVKZA-*-10/65
- 7 = QVKZA-*-10/90



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

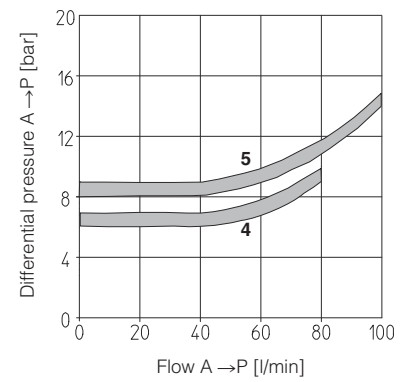
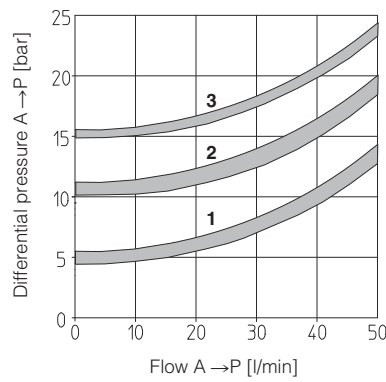
- 1 = QVHZA
- 2 = QVKZA

Dotted line for 3-way versions



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

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



14 FASTENING BOLTS AND SEALS

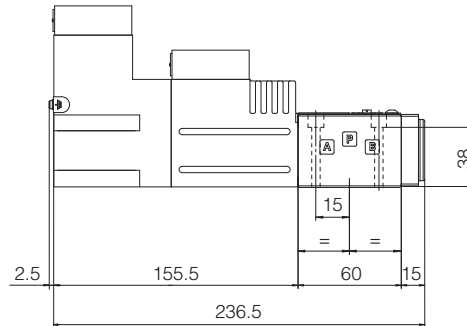
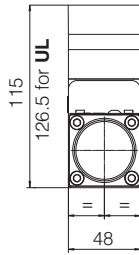
	QVHZA	QVKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p>
	<p>Seals: 4 OR 108; Diameter of ports A, B, P, T: Ø 7,5 mm (max)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B,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

15 INSTALLATION DIMENSIONS FOR QVHZA [mm]

ISO 4401: 2005

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

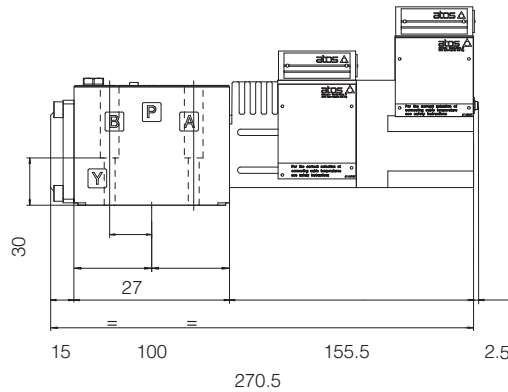
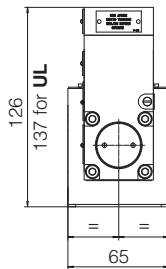
Mass [kg]	
QVHZA	3,4



ISO 4401: 2005

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

Mass [kg]	
QVKZA	4,9

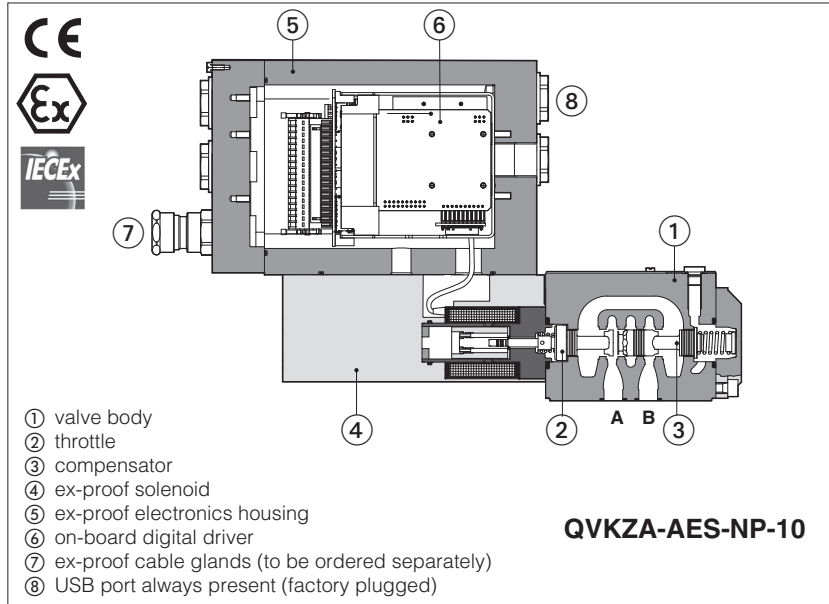


16 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEX, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Ex-proof digital proportional flow valves

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



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** and **IECEx** 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.

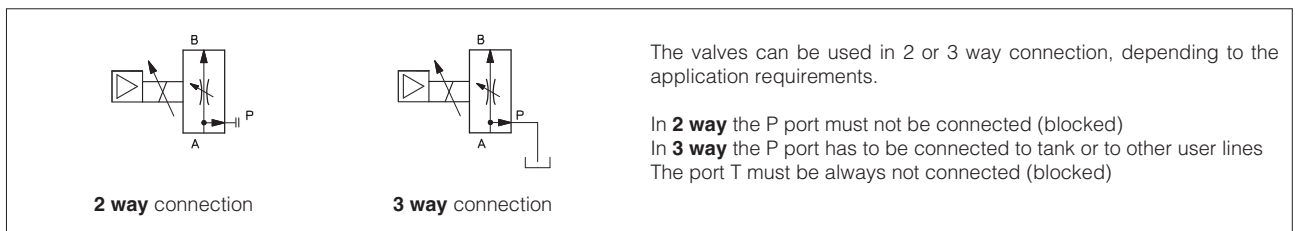
QVHZA:	QVKZA:
Size: 06 - ISO4401	Size: 10 - ISO4401
Max flow: 45 l/min	Max flow: 90 l/min
Max pressure: 210 bar	Max pressure: 210 bar

1 MODEL CODE

QVKZA	-	AES	-	NP	-	10	/	65	/	M	/	*	/	*												
<p>Ex-proof pressure compensate proportional flow valve, direct</p> <p>QVHZA = size 06 QVKZA = size 10</p> <p>AES = on-board driver, without transducer</p> <p>Fieldbus interfaces, USB port always present: NP = Not Present BC = CANopen BP = PROFIBUS DP EH = EtherCAT</p> <p>Valve size ISO 4401: 06 = size 06 10 = size 10</p>														<p>Seals material, see section 9 :</p> <p>- = NBR PE = FKM BT = HNBR</p> <p>Hydraulic options (1): D = quick venting of port B</p> <p>Electronic options (1): C = current feedback for pressure transducer 4 ÷ 20 mA, only for W (omit for std voltage 0 ÷ 10 Vdc) I = current reference input 4 ÷ 20 mA (omit for std voltage 0 ÷ 10 Vdc) W = power limitation function</p> <p>Cable entrance threaded connection: M = M20x1,5</p> <p>Max regulated flow:</p> <table border="0" style="width: 100%;"> <tr> <td>QVHZA:</td> <td></td> <td>QVKZA:</td> </tr> <tr> <td>3 = 3,5 l/min</td> <td>36 = 35 l/min</td> <td>65 = 65 l/min</td> </tr> <tr> <td>12 = 12 l/min</td> <td>45 = 45 l/min</td> <td>90 = 90 l/min</td> </tr> <tr> <td>18 = 18 l/min</td> <td></td> <td></td> </tr> </table>	QVHZA:		QVKZA:	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		
QVHZA:		QVKZA:																								
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) For possible combined options, see section 15

2 HYDRAULIC SYMBOLS



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-* programming software.

4 VALVE SETTINGS AND PROGRAMMING TOOLS

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

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

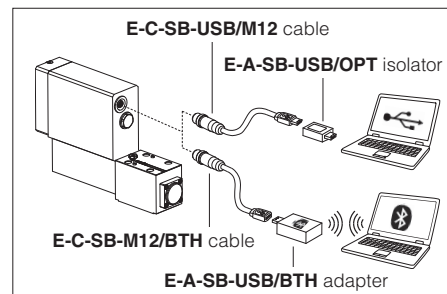
The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC support: NP (USB) 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 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 valves according to EN ISO 13849	150 years, 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 - salt spray test (EN ISO 9227) > 200 h
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 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	QVHZA					QVKZA		
	3,5	12	18	35	45	65	90	
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 tollerant) Current: range ±20 mA		Input impedance: Ri > 50 kΩ Input impedance: Ri = 500 Ω	
Insulation class	H (180°) Due to the occuring 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)			
Pressure transducer power supply (only /W option)	+24VDC @ max 100 mA (E-ATRA-7 see tech table GX800)			
Alarms	Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, current control monitoring, power supplies level, pressure transducer failure (/W option)			
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) have 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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°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 KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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		
Solenoid certified code	OZA-AES		
Type examination certificate (1)	• ATEX: TUV IT 18 ATEX 068 X	• IECEx: IECEx TPS 19.0004X	
Method of protection	• ATEX 2014/34/EU Ex II 2G Ex db IIC T6/T5/T4 Gb Ex II 2D Ex tb IIIC T85°C/T100°C/T135°C Db	• IECEx 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 60079-1	EN 60079-31	IEC 60079-0 IEC 60079-1
Cable entrance: threaded connection	M = M20x1,5		

(1) The type examiner certificates can be downloaded from

(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 mm ²	Grounding: section of external ground wire = 4 mm ²
--	---

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

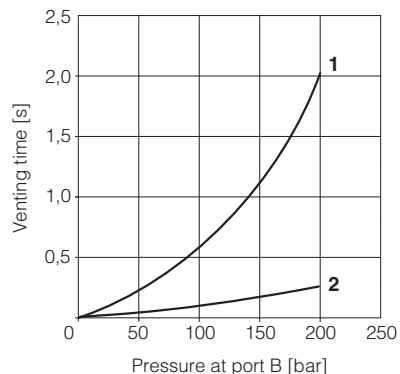
Cable glands with threaded connections M20x1,5 for standard or armoured cables have to be ordered separately, see tech table **KX600**

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

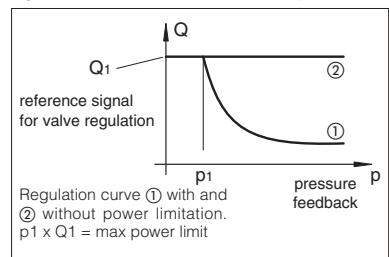
I = It provides 4 ÷ 20 mA current reference signal, instead of the standard 0 ÷ 10 Vdc. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vdc or ±20 mA. It is normally used in case of long distance between the machine control unit and the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

C = Only in combination with option /W
It is available to connect pressure transducer with 4 ÷ 20 mA current output signal, instead of the standard 0 ÷ 10VDC .Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vdc or ±20 mA.

W = Only for valves coupled with pressure compensator type HC-011 or KC-011 (see tech table D150). It provides the hydraulic power limitation function. The driver receives the flow reference signal by the analog input INPUT+ and a pressure transducer, installed in the hydraulic system, has to be connected to the driver’s analog input TR. When the actual requested hydraulic power **p x Q** (TR x INPUT+) reaches the max power limit (**p1 x Q1**), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve’s regulated flow:

$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [TR]}} ; \text{Flow Reference [INPUT+]} \right)$$

Hydraulic Power Limitation - option /W



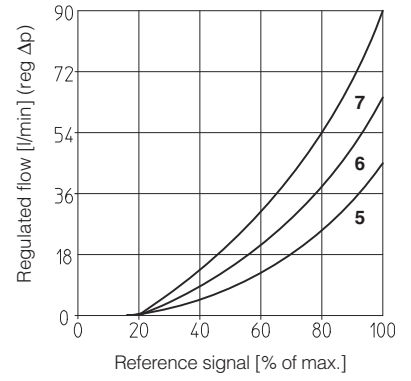
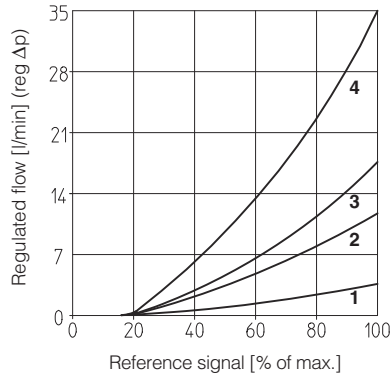
15 POSSIBLE COMBINED OPTIONS

/DI, /DW, /IW, /ICW, /ICWD

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

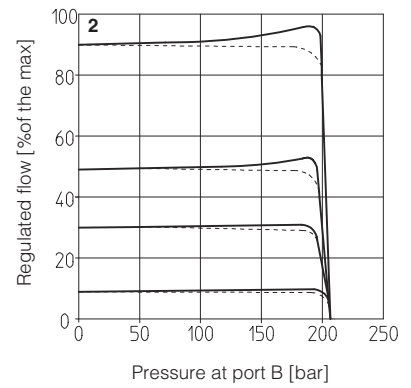
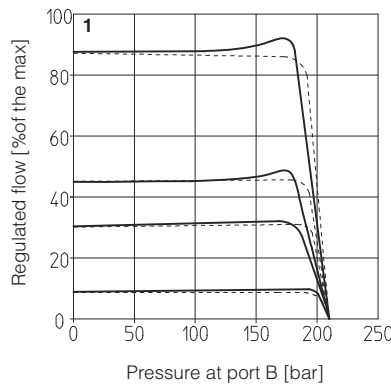


16.2 Regulated flow/outlet pressure diagrams

with inlet pressure = 210 bar

- 1 = QVHZA
- 2 = QVKZA

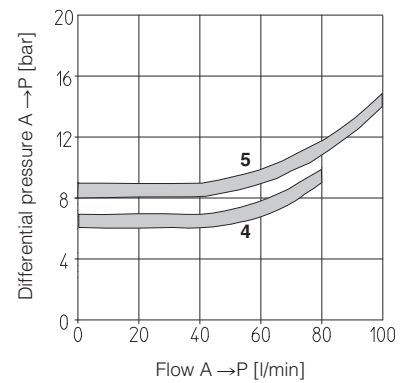
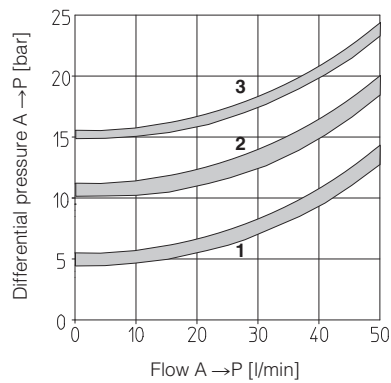
Dotted line for 3-way versions



16.3 Flow A → P/Δp diagrams

3-way configuration

- 1 = QVHZA-*-06/3
- 2 = QVHZA-*-06/12
- 3 = QVHZA-*-06/18
- 4 = QVHZA-*-06/36
- 5 = QVHZA-*-06/45
- 6 = QVKZA-*-10/65
- 7 = 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, EN-982).

17.1 Power supply (V+ and V0)


The power supply must be appropriately stabilized or rectified and filtered: 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.

 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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 \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 24VDC.

17.4 Monitor output signals (MONITOR and MONITOR2)

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 \pm 5 VDC (1V = 1A).

Output signal can be reconfigured via software, within a maximum range of \pm 5 Vdc.

Option /W

The driver generates a second analog output signal (MONITOR2) proportional to the actual system pressure.

The output maximum range is \pm 5 VDC; default setting is 0 \div 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 \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.

17.7 Remote Pressure Transducer Input signal (TR) - only for /W option

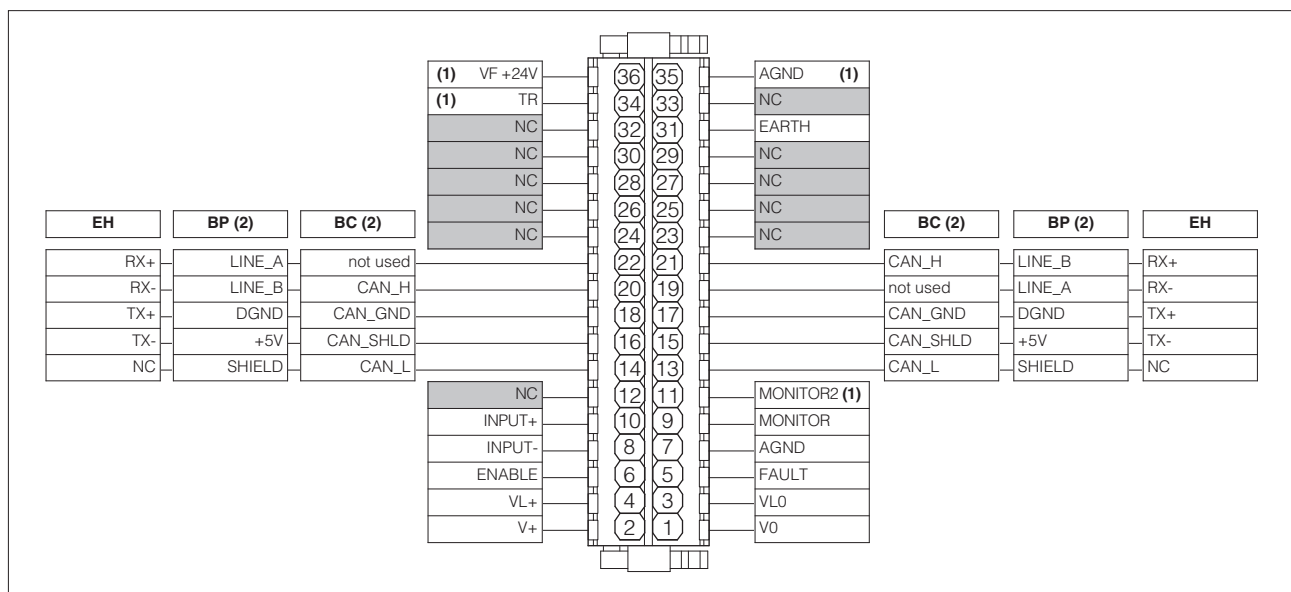
Analog pressure transducers can be directly connected to the driver.

Analog input signal is factory preset according to selected valve code, defaults are 0 \div 10 VDC for standard and 4 \div 20 mA for /C 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.

Note: transducer feedback can be read as a digital information through fieldbus communication - software selectable.

18 TERMINAL BOARD OVERVIEW



(1) Connections available only for /W option

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

19 ELECTRONIC CONNECTIONS

19.1 Main connections signals

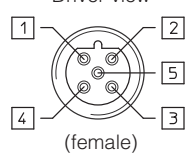
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V0	Power supply 0 Vdc	Gnd - power supply
	2	V+	Power supply 24 Vdc	Input - power supply
	3	VL0	Power supply 0 Vdc for driver's logic and communication	Gnd - power supply
	4	VL+	Power supply 24 Vdc for driver's logic and communication	Input - 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: ± 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
	11	MONITOR2	2nd monitor output signal: ± 5 Vdc maximum range, referred to AGND (1) Default is: 0 ÷ 5 Vdc	Output - analog signal Software selectable
31	EARTH	Internally connected to driver housing		

(1) 2nd monitor output signal is available only for /W option

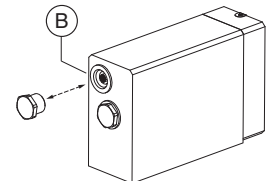
19.2 USB connector - M12 - 5 pin always present

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 +

Driver view



(female)



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

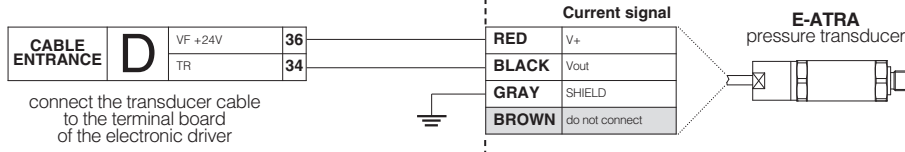
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C2 (output)	13	NC	do not connect
	15	TX-	Transmitter
	17	TX+	Transmitter
	19	RX-	Receiver
	21	RX+	Receiver

19.6 Remote pressure transducer connector - only for /W option

CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES	Voltage	Current
D	34	TR	Signal transducer ± 10 Vdc / ± 20 mA maximum range	Input - analog signal Software selectable	Connect	Connect
	35	AGND	Common gnd for transducer power and signals	Common gnd	Connect	/
	36	VF +24V	Power supply +24Vdc	Output - power supply	Connect	Connect

E-ATRA remote pressure transducer connection - see tech table **GX800**

for /W option

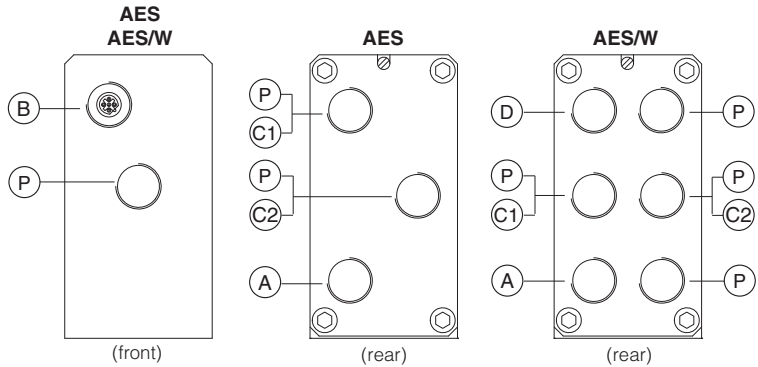


20 CONNECTIONS LAYOUT

CABLE ENTRANCE OVERVIEW

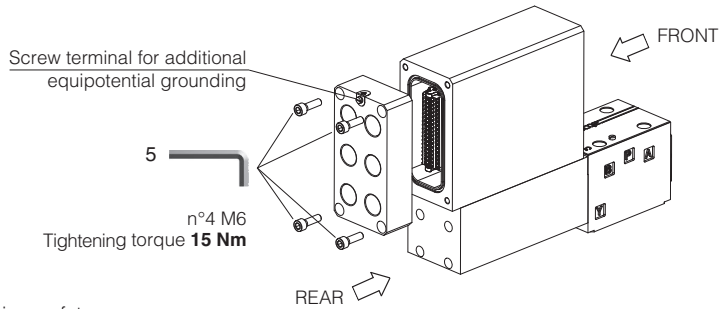
Cables entrance description:

- (A) main connections
- (B) USB connector always present (factory plugged)
- (C1) fieldbus interface (input)
- (C2) fieldbus interface (output)
- (D) pressure transducer (only /W option)
- (P) Threaded plug



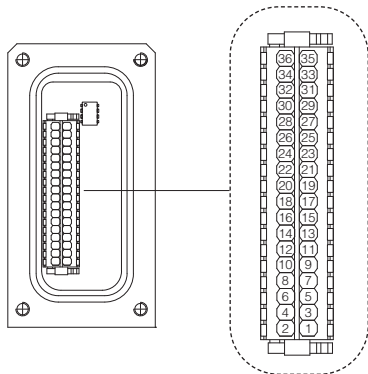
TERMINAL BOARD AND FIELDBUS TERMINATOR

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

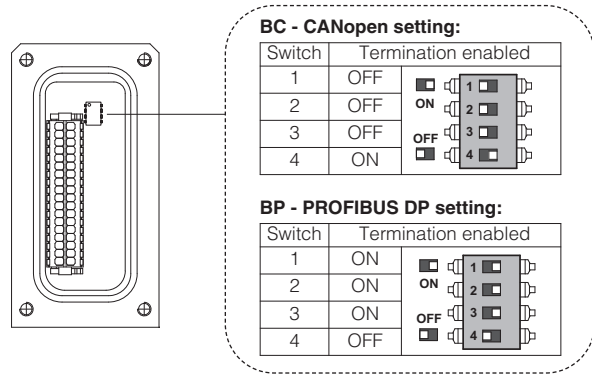


WARNING: the above operation must be performed in a safety area

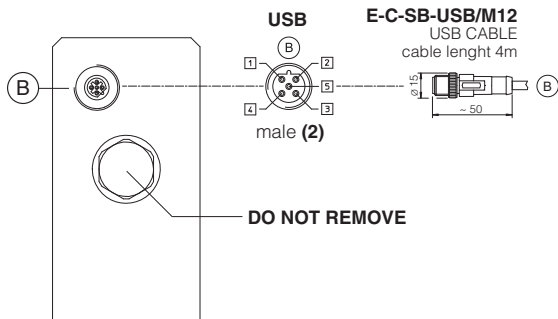
Terminal board - see section 18



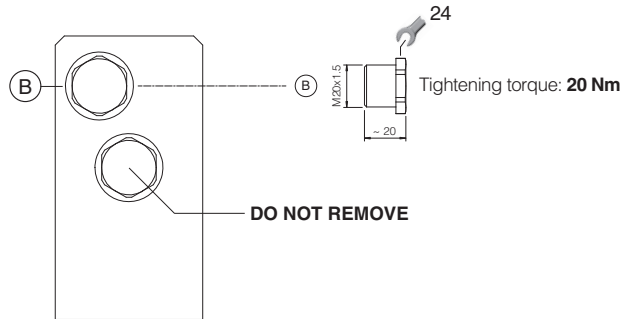
Fieldbus terminator only for BC and BP executions (1)



USB CONNECTOR

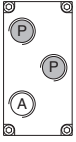
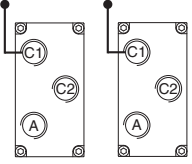
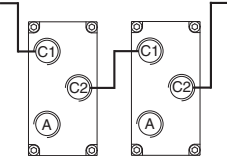


METALLIC PROTECTION CAP - supplied with the valves

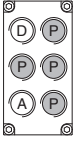
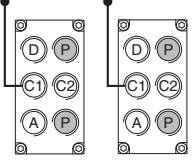
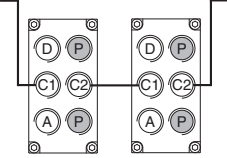


(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
 (2) Pin layout always referred to driver's view

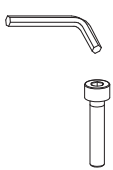

20.1 Cable glands and threaded plug for AES - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug 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

20.2 Cable glands and threaded plug for AES with /W option - see tech table KX800

Communication interfaces	To be ordered separately				Cable entrance overview	Notes
	Cable gland quantity	entrance	Threaded plug quantity	entrance		
NP	2	D A	none	none		Cable entrance P are factory plugged Cable entrance A, D are open for costumers
BC, BP, EH "via stub" connection	3	D C1 A	1	C2		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers
BC, BP, EH "daisy chain" connection	4	D C1 - C2 A	none	none		Cable entrance P are factory plugged Cable entrance A, C1, C2, D are open for costumers

21 FASTENING BOLTS AND SEALS

	QVHZA	QVKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</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>

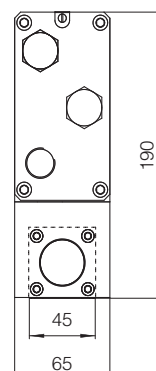
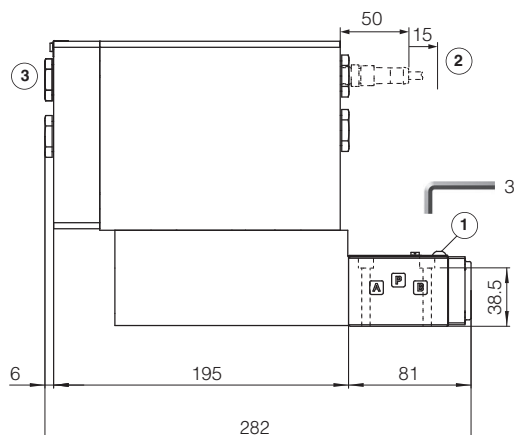
22 INSTALLATION DIMENSIONS [mm]

QVHZA-AES

ISO 4401: 2005

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

Mass [kg]	
QVHZA-AES	8,2

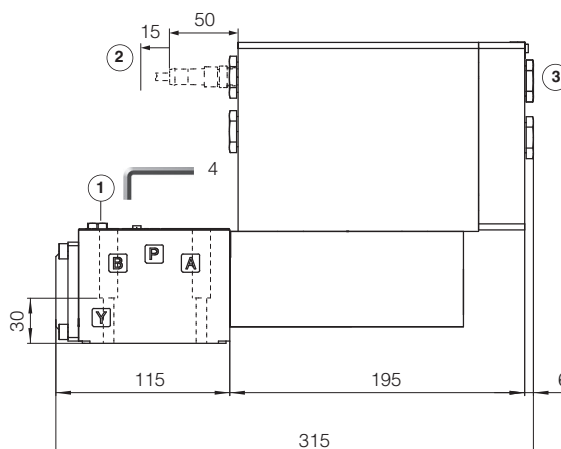
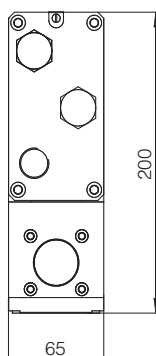


QVKZA-AES

ISO 4401: 2005

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

Mass [kg]	
QVKZA-AES	10



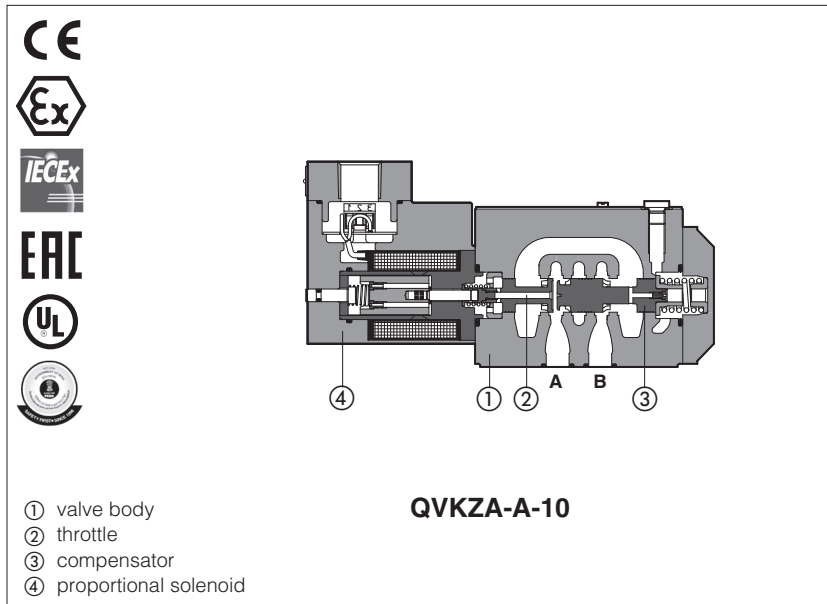
- ① = Air bleed off
- ② = Space to remove the USB connector
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

23 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	GS510	Fieldbus
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	KX800	Cable glands for ex-proof valves
FX900	Operating and maintenance information for ex-proof proportional valves	P005	Mounting surfaces for electrohydraulic valves
GS500	Programming tools		

Ex-proof proportional flow valves

pressure compensated, without transducer - **ATEX, IECEX, EAC, PESO** or **cULus**



QVHZA-A, QVKZA-A

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

They are equipped with ex-proof proportional solenoids certified for safe operations in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX, IECEX, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEX** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

QVHZA:	QVKZA:
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

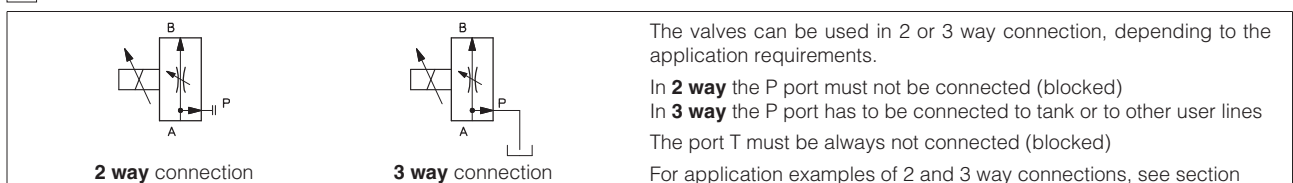
QVKZA	/	*	-	A	-	10	/	90	/	M	/	*	/	*	/	*	/	*										
<p>Ex-proof pressure compensated proportional flow valves, direct</p> <p>QVHZA = size 06 QVKZA = size 10</p> <p>Certification type: Multicertification ATEX, IECEX, EAC, PESO: - = omit for Group II 2G / 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>A = without transducer</p> <p>Valve size ISO 4401: 06 = size 06 10 = size 10</p> <p>Max regulated flow:</p> <table border="0"> <tr> <td>QVHZA</td> <td>QVKZA</td> </tr> <tr> <td>3 = 3,5 l/min</td> <td>65 = 65 l/min</td> </tr> <tr> <td>12 = 12 l/min</td> <td>90 = 90 l/min</td> </tr> <tr> <td>18 = 18 l/min</td> <td></td> </tr> <tr> <td>36 = 35 l/min</td> <td></td> </tr> <tr> <td>45 = 45 l/min</td> <td></td> </tr> </table>																	QVHZA	QVKZA	3 = 3,5 l/min	65 = 65 l/min	12 = 12 l/min	90 = 90 l/min	18 = 18 l/min		36 = 35 l/min		45 = 45 l/min	
QVHZA	QVKZA																											
3 = 3,5 l/min	65 = 65 l/min																											
12 = 12 l/min	90 = 90 l/min																											
18 = 18 l/min																												
36 = 35 l/min																												
45 = 45 l/min																												
<p>Seals material, see section [7]:</p> <p>- = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p> <p>Voltage code: - = standard coil for 24 Vdc Atos drivers 24 = optional coil for 24 Vdc low current drivers</p> <p>Options (3): D = quick venting of port B O = horizontal cable entrance (2) WP = manual override protected by metallic cap</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus (4) M = M20x1,5 - not for cULus NPT = 1/2" NPT</p>																												

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) **(3)** Possible combined options: /DO, /DWP, /DOWP, /OWP

(4) Approved only for the Italian market

2 HYDRAULIC SYMBOLS



3 ELECTRONIC DRIVERS

Electronic drivers are factory set with max current limitation for ex-proof valves.

Please include in the driver order also the complete code of the connected ex-proof proportional valve.

Drivers model	E-BM-AS-* /A	E-BM-AES-* /A
Type	digital	digital
Format	DIN-rail panel	
Data sheet	G030	GS050

4 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, see technical table P007
Ambient temperature range	Standard = -20°C ÷ +70°C /PE option = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C
Storage temperature range	Standard = -20°C ÷ +80°C /PE option = -20°C ÷ +80°C /BT option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 8 -Flame proof enclosure "Ex d" -Dust ignition protection by enclosure "Ex t" RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

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

Valve model	QVHZA					QVKZA		
	[l/min]							
Max regulated flow	3,5	12	18	35	45	65	90	
Min regulated flow	[cm³/min]	15	20	30	50	60	85	
Regulating Δp	[bar]	4 - 6		10 - 12		15	6 - 8	
Max flow on port A	[l/min]	40			50	55	70	
Max pressure	[bar]	210						
Response time (1)	[ms]	≤ 35					≤ 50	
Hysteresis		≤ 5 [% of the regulated max flow]						
Linearity		≤ 3 [% of the regulated max flow]						
Repeatability		≤ 1 [% of the regulated max flow]						

Note: above performance data refer to valves coupled with Atos electronic drivers, see section 3

(1) 0 ÷ 100 % step signal

6 ELECTRICAL CHARACTERISTICS

Max. power	35W	
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 with relevant cable gland	Multicertification: IP66/67 to DIN EN60529 UL: raintight enclosure, UL approved	
Duty factor	Continuous rating (ED=100%)	
Voltage code	standard	option /24
Coil resistance R at 20°C	3,2 Ω	17,6 Ω
Max. solenoid current	2,5 A	1,1 A

7 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 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		
Max fluid contamination level	normal operation	ISO4406 class 18/16/13 NAS1638 class 7	see also filter section at KTF catalog
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	
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 (1)	NBR, HNBR	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 = 180 bar
- max fluid temperature = 50°C

8 CERTIFICATION DATA

Valve type	QVHZA, QVKZA		QVHZA/M, QVHZA/M	QVHZA/UL, QVHZA/UL	
Certifications	Multicertification Group II ATEX IECEx EAC PESO		Multicertification Group I ATEX IECEx	North American cULus	
Solenoid certified code	OZA-A		OZAM-A	OZA-A/EC	
Type examination certificate (1)	ATEX: CESI 02 ATEX 014 IECEX: IECEX CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX, EAC Ex II 2G Ex d IIC T4/T3 Gb Ex II 2D Ex tb IIIC T135°C/T200°C Db • IECEx Ex d IIC T4/T3 Gb Ex tb IIIC T135°C/T200°C Db • PESO Ex II 2G Ex d IIC T4/T3 Gb 		<ul style="list-style-type: none"> • ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb 	<ul style="list-style-type: none"> • UL 1203 Class I, Div.1, Groups C & D Class I, Zone I, Groups IIA & IIB 	
Temperature class	T4	T3	-	T4	T3
Surface temperature	≤ 135 °C	≤ 200 °C	≤ 150 °C	≤ 135 °C	≤ 200 °C
Ambient temperature (2)	-40 ÷ +40 °C	-40 ÷ +70 °C	-20 ÷ +60 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	GK = GK-1/2" M = M20x1,5 NPT = 1/2" NPT			1/2" NPT	

(1) The type examiner certificates can be downloaded from

(2) The solenoids **Group II** and **cULus** are certified for minimum ambient temperature -40°C

In case the complete valve must withstand with minimum ambient temperature of -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

9 EX PROOF SOLENOIDS WIRING

Multicertification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override
 ⑤ screw terminal for additional equipotential grounding

1 = Coil PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)
2 = GND
3 = Coil

cULus certification

Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
 ② cover with threaded connection for horizontal cable gland fitting
 ③ terminal board for cables wiring
 ④ standard manual override

1 = Coil + PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 10 note 1
2 = GND
3 = Coil -
 alternative GND screw terminal connected to solenoid housing

⚠ Pay attention to respect the polarity

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

Multicertification Group I and Group II	
Power supply: section of coil connection wires = 2,5 mm ²	Grounding: section of internal ground wire = 2,5 mm ² section of external ground wire = 4 mm ²
cULus certification:	
<ul style="list-style-type: none"> Suitable for use in Class I Division 1, Gas Groups C Armored Marine Shipboard Cable which meets UL 1309 Tinned Stranded Copper Conductors Bronze braided armor Overall impervious sheath over the armor 	
Any Listed (UBVZ/UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm ² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("BT" Models require a temperature range from -40°C to +110°C)	
Note 1: For Class I wiring the 3C 1,5 mm ² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.	

10.1 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.

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min. cable temperature [°C]	
	Goup I	Goup II	Goup I	Goup II	Goup I	Goup II
40 °C	-	T4	150 °C	135 °C	90 °C	90 °C
45 °C	-	T4	-	135 °C	-	95 °C
55 °C	-	T3	-	200 °C	-	110 °C
60 °C	-	-	150 °C	-	110 °C	-
70 °C	N.A.	T3	N.A.	200 °C	N.A.	120 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min. cable temperature
55 °C	T4	135 °C	100 °C
70 °C	T3	200 °C	100 °C

11 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **KX600**

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

12 OPTIONS

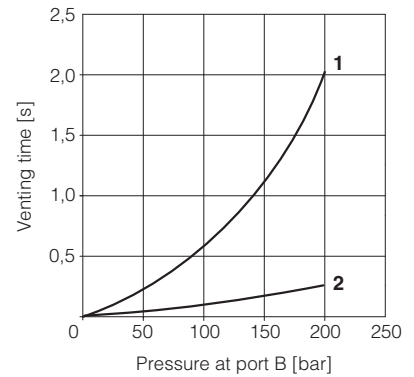
D = This option provides a quick venting of the use port B when the valve is closed or de-energized. The valve must be connected in 3 way, with P port connected to tank. When the proportional throttle is fully closed, the valve's port B is internally connected to port P (tank), permitting a quickly decompression 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

O = Horizontal cable entrance, to be selected in case of limited vertical space.

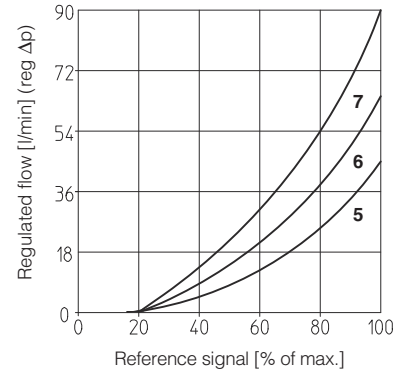
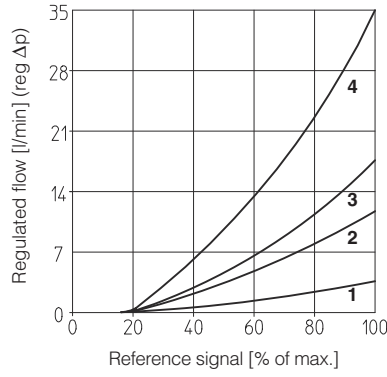
WP = Manual override protected by metallic cap.



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

13.1 Regulation diagrams

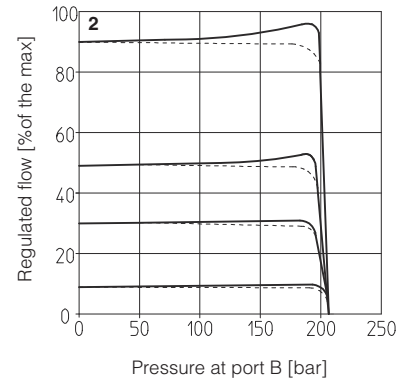
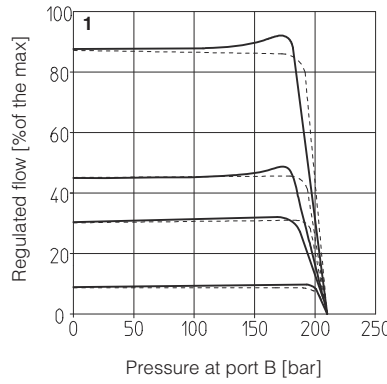
- 1 = QVHZA-*-06/3
- 2 = QVHZA-*-06/12
- 3 = QVHZA-*-06/18
- 4 = QVHZA-*-06/36
- 5 = QVHZA-*-06/45
- 6 = QVKZA-*-10/65
- 7 = QVKZA-*-10/90



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

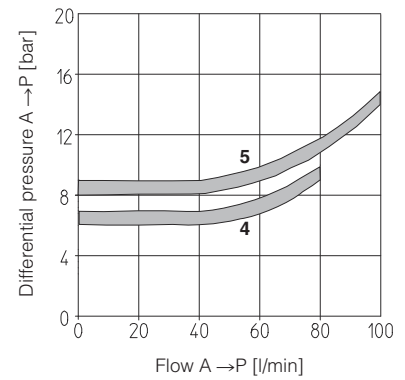
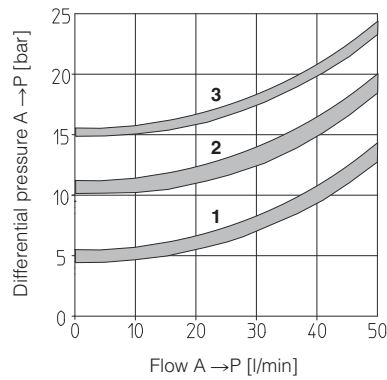
- 1 = QVHZA
- 2 = QVKZA

Dotted line for 3-way versions



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

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



14 FASTENING BOLTS AND SEALS

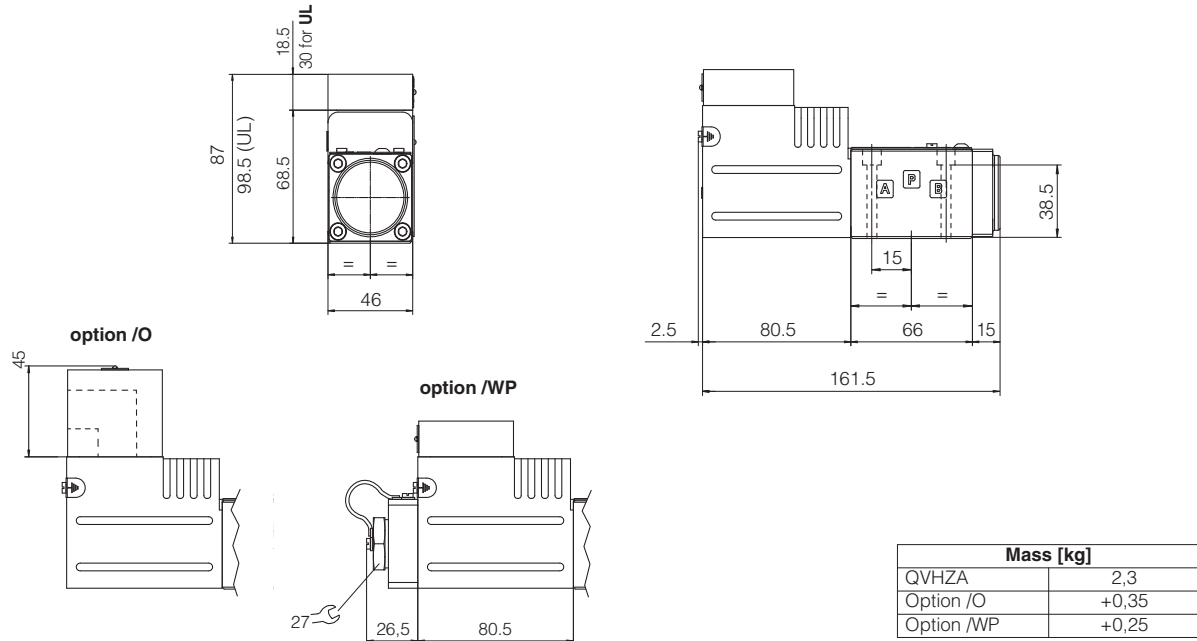
	QVHZA	QVKZA
	<p>Fastening bolts: 4 socket head screws M5x50 class 12.9 Tightening torque = 8 Nm</p>	<p>Fastening bolts: 4 socket head screws M6x40 class 12.9 Tightening torque = 15 Nm</p>
	<p>Seals: 4 OR 108; Diameter of ports A, B, P, T: Ø 7,5 mm (max)</p>	<p>Seals: 5 OR 2050; Diameter of ports A, B,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

15 INSTALLATION DIMENSIONS [mm]

QVHZA-A

ISO 4401: 2005 (see tab. P005)

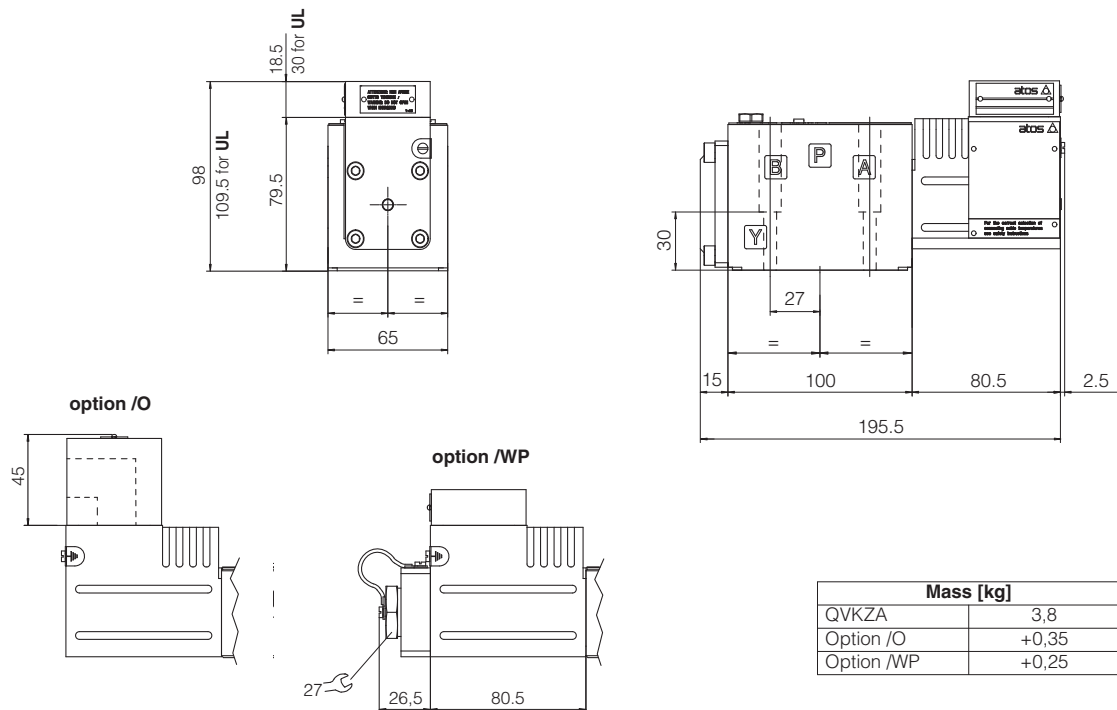
Mounting surface: 4401-03-02-0-05



QVKZA-A

ISO 4401: 2005

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



16 RELATED DOCUMENTATION

- X010** Basics for electrohydraulics in hazardous environments
- X020** Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
- X030** Summary of Atos ex-proof components certified to cULus
- FX900** Operating and maintenance information for ex-proof proportional valves
- KX800** Cable glands for ex-proof valves
- P005** Mounting surfaces for electrohydraulic valves

Digital E-BM-TES/LES drivers

DIN-rail format, for proportional valves with one or two LVDT transducers

E-BM-TES-N- NP Not Present

E-BM-TES-S-
EH EtherCAT
EW POWERLINK
EI EtherNet/IP
EP PROFINET RT/IRT

E-BM-TES-N- BC BP CANopen PROFIBUS DP

E-SW programming software

Connectors ② included

E-BM-TES/LES

Digital drivers ① control in closed loop the position of the spool or poppet of direct and pilot operated proportional valves, according to the electronic reference input signal.

TES execution controls direct operated directional/flow valves with one LVDT transducer.

LES execution controls pilot operated directional valves with two LVDT transducers.

Option S adds the closed loop control of pressure (SP) or force (SF and SL) to the basic functions of proportional directional valves flow regulation (see section 4).

Atos PC software allows to customize the driver configuration to the specific application requirements.

Electrical Features:

- up to 9 fast plug-in connectors ②
- Mini USB port ③ always present
- DB9 fieldbus communication connector ④ for CANopen and ⑤ PROFIBUS DP
- RJ45 ethernet communication connectors ⑥ output and ⑦ input for EtherCAT, POWERLINK, EtherNet/IP, PROFINET
- 8 leds for diagnostics ⑧ (see 6.1)
- Electrical protection against reverse polarity of power supply
- Operating temperature range: -20 ÷ +50 °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

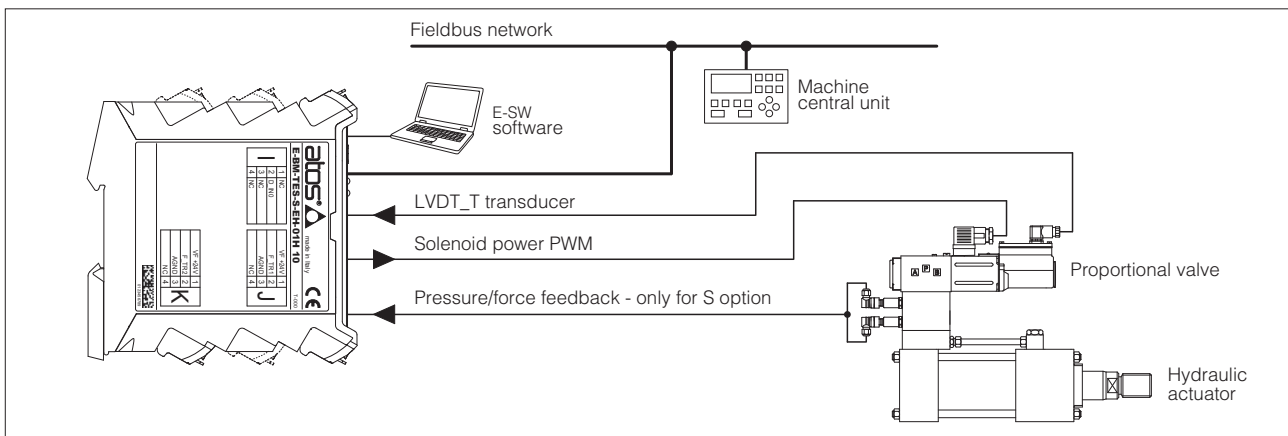
Software Features:

- Intuitive graphic interface
- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for hydraulic regulation
- Setting of PID gains
- Selection of analog IN / OUT range
- Complete diagnostic of driver status
- Internal oscilloscope function
- In field firmware update through USB port

1 MODEL CODE

E-BM	-	TES	-	N	-	NP	-	01H	*	/	*	/	*	/	*
Off-board electronic driver in DIN rail format TES = digital full driver, for valves with one LVDT transducer LES = digital full driver, for valves with two LVDT transducers Alternated P/Q control: N = none S = closed loop pressure/force (see tech table GS002) Fieldbus interface , USB port always present: NP = Not Present BC = CANopen EW = POWERLINK BP = PROFIBUS DP EI = EtherNet/IP EH = EtherCAT EP = PROFINET RT/IRT									Set code (see section 7) Series number Options , see section 6: A = max current limitation for Ex-proof valves C = current feedback 4 ÷ 20 mA for remote transducers (only for option S) and LVDT transducers (only for option A) I = current reference input and monitor 4 ÷ 20 mA (omit for voltage reference and monitor input ± 10 V _{DC})						
01H = for single solenoid proportional valves 05H = for double solenoid proportional valves (only for TES)									- = omit for direct valves and for pilot operated valves with two LVDT transducers P = for pilot operated valves with one LVDT transducer (only for TES-N)						

2 BLOCK DIAGRAM EXAMPLE



3 VALVES RANGE

Valves	Directional			Flow	Directional	Cartridge
Standard	DHZO-T, DKZOR-T	DLHZO-T, DLKZOR-T	DPZO-T	QVHZO-T, QVKZOR-T	DPZO-L	LIQZO-L, LIQZP-L
Data sheet	F165	F180	F172	F1412	F175	F330, F340
Ex-proof	DHZA-T, DKZA-T	DLHZA-T, DLKZA-T	DPZA-T	QVHZA-T, QVKZA-T	-	-
Data sheet	FX120	FX140	FX220	FX420		
Driver model	E-BM-TEB				E-BM-LEB	

Option S not available

4 ALTERNATED P/Q CONTROL - only for S option

S option on digital drivers adds the closed loop control of pressure (SP) or force (SF and SL) to the basic functions of proportional directional valves flow regulation. The alternated P/Q control operates according to the two electronic reference signals by a dedicated algorithm that automatically selects which control will be active time by time. The dynamics of the switching between the two controls can be regulated thanks to specific software setting, in order to avoid instability or vibrations.

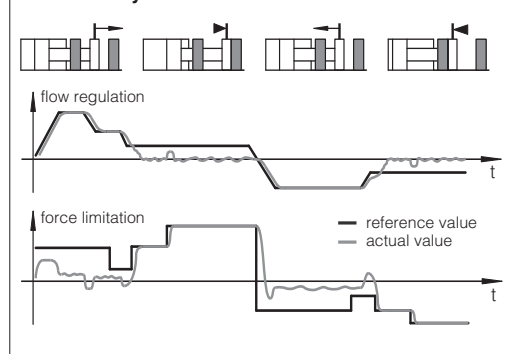
Flow regulation is active when the actual system pressure/force is lower than the relevant input reference signal - the valve works normally to regulate the flow by controlling in closed-loop the spool/poppet position through the integral LVDT transducer.

Pressure/force control is activated when the actual system pressure/force, measured by remote transducers, grows up to the relevant input reference signal - the driver reduces the valve's flow regulation in order to keep steady the system pressure/force. If the pressure/force tends to decrease under its input reference signal, the flow control returns active.

The dynamic response of pressure/force control can be adapted to different system's characteristics, by setting the internal PID parameters using Atos PC software.

Up to 4 different PIDs are selectable to optimize the system dynamic response according to different hydraulic working conditions.

Flow Priority



Alternated control configurations - software selectable

SP	SF	SL
one remote pressure transducer has to be installed on the actuator's port to be controlled	two remote pressure transducers have to be installed on the actuator's ports; the actuator force is calculated by the pressure feedbacks (Pa - Pb)	one load cell transducer has to be installed between the actuator and the controlled load
T valve's spool transducer	P pressure transducer	L load cell

SP – flow/pressure control

Adds pressure control to standard flow control and permits to limit the max force in one direction controlling in closed loop the pressure acting on one side of the hydraulic actuator. A single pressure transducer has to be installed on hydraulic line to be controlled.

SF – flow/force control

Adds force control to standard flow control and permits to limit the max force in two directions controlling in closed loop the delta pressure acting on both sides of the hydraulic actuator. Two pressure transducers have to be installed on both hydraulic line.

SL – flow/force control

Adds force control to standard flow control and permits to limit the max force in one or two directions controlling in closed loop the force performed by the hydraulic actuator. A load cell has to be installed on hydraulic actuator.

General Notes:

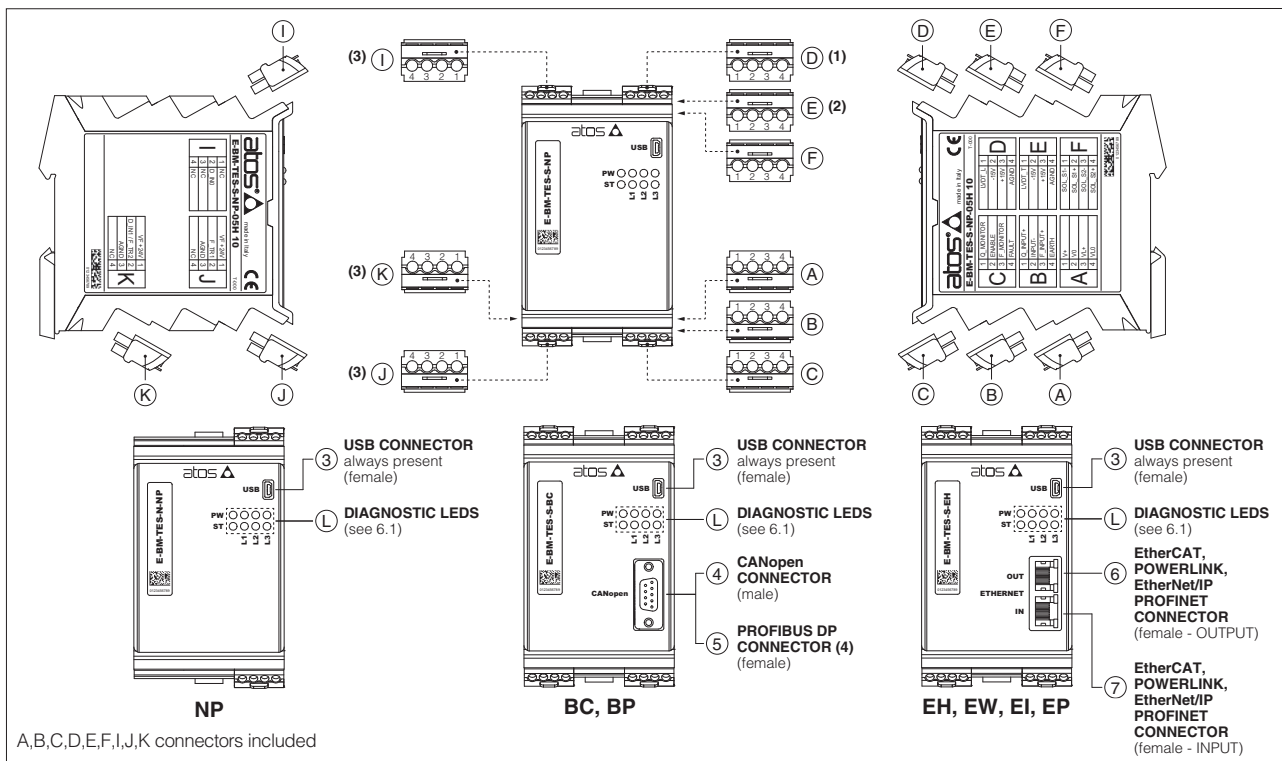
- auxiliary check valves are recommended in case of specific hydraulic configuration requirements in absence of power supply or fault - see tech table **EY105**
- for additional information about alternated P/Q controls configuration please refer to tech table **GS002**
- Atos technical service is available for additional evaluations related to specific applications usage

5 MAIN CHARACTERISTICS

Power supplies (see 8.1, 8.2)	Nominal : +24 V _{DC} Rectified and filtered : V _{RMS} = 20 ÷ 32 V _{MAX} (ripple max 10 % V _{PP})			
Max power consumption	50 W			
Current supplied to solenoids	I _{MAX} = 3.0 A for standard driver I _{MAX} = 2.5 A for ex-proof driver (IA option)			
Analog input signals (see 8.3, 8.4)	Voltage: range ±10 V _{DC} (24 V _{MAX} tollerant) Input impedance: R _i > 50 kΩ Current: range ±20 mA Input impedance: R _i = 500 Ω			
Monitor outputs (see 8.5, 8.6)	Output range: voltage ±10 V _{DC} @ max 5 mA current ±20 mA @ max 500 Ω load resistance			
Enable input (see 8.7) Digital inputs (see 8.11)	Range: 0 ÷ 5 V _{DC} (OFF state), 9 ÷ 24 V _{DC} (ON state), 5 ÷ 9 V _{DC} (not accepted); Input impedance: R _i > 10 kΩ			
Fault output (see 8.8)	Output range: 0 ÷ 24 V _{DC} (ON state > [power supply - 2 V] ; OFF state < 1 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, valve spool transducer malfunctions, alarms history storage function			
Pressure/Force transducers power supply (only for S option)	+24V _{DC} @ max 100 mA (E-ATR-8 see tech table GS465)			
Format	Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm DIN-rail mounting as per EN60715			
Operating temperature	-20 ÷ +50 °C (storage -25 ÷ +85 °C)			
Mass	Approx. 400 g			
Additional characteristics	8 leds for diagnostic; 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)			
Compliance	RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006			
Communication interface	USB Atos ASCII coding not insulated USB 2.0 + USB OTG	CANopen EN50325-4 + DS408 optical insulated CAN ISO11898	PROFIBUS DP EN50170-2/IEC61158 optical insulated RS485	EtherCAT, POWERLINK, EtherNet/IP, PROFINET IO RT / IRT EC 61158 Fast Ethernet, insulated 100 Base TX
Communication physical layer				
Recommended wiring cable	LIYCY shielded cables: 0,5 mm ² max 50 m for logic - 1,5 mm ² max 50 m for power supply Note: for transducers wiring cable please consult the transducers datasheet			
Max conductor size (see 12)	2,5 mm ²			

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

6 CONNECTIONS AND LEDS



A,B,C,D,E,F,I,J,K connectors included

- (1) D connector is available only for TES-N versions 01HP / 05HP and LES-*
- (2) E connector is available only for TES-* versions 01H / 05H and LES-*
- (3) I, J and K connectors are available only for TES-S and LES-S
- (4) To interface with Siemens 6ES7972-0BA12-0XA connector, it is mandatory to use also one of the following adapters to avoid interference with the USB connector:
DG909MF1 - the connector will be oriented upwards
DG909MF3 - the connector will be oriented downwards

6.1 Diagnostic LEDs (L)

Eight 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	PW L1 L2 L3
L1		VALVE STATUS			LINK/ACT			
L2		NETWORK STATUS			NETWORK STATUS			
L3		SOLENOID STATUS			LINK/ACT			
PW	OFF = Power supply OFF	ON = Power supply ON						
ST	OFF = Fault present	ON = No fault						

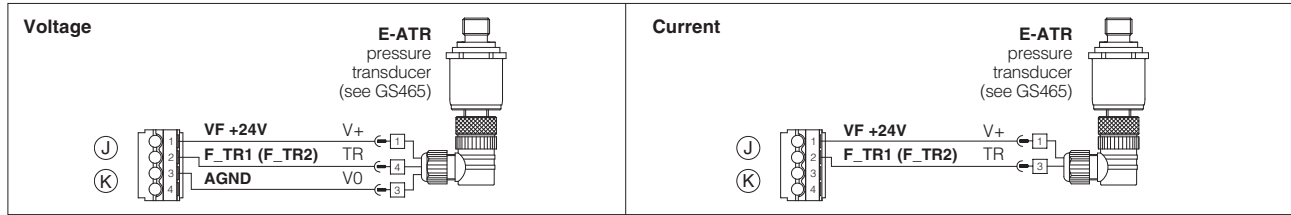
6.2 Connectors - 4 pin

CONNECTOR	PIN	ALTERNATED P/Q CONTROL		TECHNICAL SPECIFICATIONS	NOTES
		N none	S pressure/force		
A	A1	V+		Power supply 24 Vdc (see 8.1)	Input - power supply
	A2	V0		Power supply 0 Vdc (see 8.1)	Gnd - power supply
	A3	VL+		Power supply 24 Vdc for driver's logic and communication (see 8.2)	Input - power supply
	A4	VL0		Power supply 0 Vdc for driver's logic and communication (see 8.2)	Gnd - power supply
B	B1	Q_INPUT+		Flow reference input signal: ± 10 Vdc / ± 20 mA maximum range Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 8.3)	Input - analog signal Software selectable
	B2	INPUT-		Negative reference input signal for Q_INPUT+ and F_INPUT+	Input - analog signal
	B3	NC		Do not connect	
			F_INPUT+	Pressure/Force reference input signal ± 10 Vdc / ± 20 mA maximum range Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 8.4)	Input - analog signal Software selectable
B4	EARTH		Connect to system ground		
C	C1	Q_MONITOR		Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND. Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 8.5)	Output - analog signal Software selectable
	C2	ENABLE		Enable (24 Vdc) or disable (0 Vdc) the controller, referred to VL0 (see 8.7)	Input - on/off signal
	C3	NC		Do not connect	
			F_MONITOR	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 8.6)	Output - analog signal Software selectable
C4	FAULT		Fault (0 Vdc) or normal working (24 Vdc), referred to VL0 (see 8.8)	Output - on/off signal	
D ⁽¹⁾	D1	LVDT_L		Main stage valve position transducer signal (see 8.9)	Input - analog signal
	D2	-15V		Main stage valve position transducer power supply -15V	Output power supply
	D3	+15V		Main stage valve position transducer power supply +15V	Output power supply
	D4	AGND		Common gnd for transducer power and monitor outputs	Common gnd
E ⁽²⁾	E1	LVDT_T		Direct valve or pilot valve position transducer signal (see 8.9)	Input - analog signal
	E2	-15V		Direct valve or pilot valve position transducer power supply -15V	Output power supply
	E3	+15V		Direct valve or pilot valve position transducer power supply +15V	Output power supply
	E4	AGND		Common gnd for transducer power and monitor outputs	Common gnd
F	F1	SOL_S1-		Negative current to solenoid S1	Output - power PWM
	F2	SOL_S1+		Positive current to solenoid S1	Output - power PWM
	F3	SOL_S2-		Negative current to solenoid S2	Output - power PWM
	F4	SOL_S2+		Positive current to solenoid S2	Output - power PWM
I	I1		NC	Do not connect	
	I2		D_IN0	NP execution: multiple pressure/force PID selection, referred to VL0 (see 8.11) Fieldbus execution: general purpose digital input $0 \div 24$ Vdc, referred to VL0 (see 8.11)	Input - on/off signal
	I3		NC	Do not connect	
	I4		NC	Do not connect	
J	J1		VF +24V	Power supply: +24Vdc or OFF (default OFF)	Output - power supply Software selectable
	J2		F_TR1	1st signal pressure/force transducer: ± 10 Vdc / ± 20 mA maximum range Default are ± 10 Vdc for standard and $4 \div 20$ mA for /C option (see 8.10)	Input - analog signal Software selectable
	J3		AGND	Common gnd for transducer power and signals	Common gnd
	J4		NC	Do not connect	
K	K1		VF +24V	Power supply: +24Vdc or OFF (default OFF)	Output - power supply Software selectable
	K2		F_TR2	2nd signal pressure transducer (only for SF): ± 10 Vdc / ± 20 mA maximum range Default are ± 10 Vdc for standard and $4 \div 20$ mA for /C option (see 8.10)	Input - analog signal Software selectable
			D_IN1	NP execution: multiple pressure/force PID selection (only for SP and SL), referred to VL0 (see 8.11) Fieldbus execution: general purpose digital input $0 \div 24$ Vdc, referred to VL0 (see 8.11)	Input - on/off signal
	K3		AGND	Common gnd for transducer power and signals	Common gnd
K4	NC	Do not connect			

(1) D connector is available only for TES-N versions 01HP / 05HP and LES-*

(2) E connector is available only for TES-* versions 01H / 05H and LES-*

6.3 Pressure/force transducers connection - example - only for S option



6.4 Communication connectors ③ - ④ - ⑤ - ⑥ - ⑦

③ **USB connector - Mini USB type B** always present

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	+5V_USB	Power supply
2	D-	Data line -
3	D+	Data line +
4	ID	Identification
5	GND_USB	Signal zero data line

④ **BC fieldbus execution, connector - DB9 - 9 pin**

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
2	CAN_L	Bus line (low)
3	CAN_GND	Signal zero data line
5	CAN_SHLD	Shield
7	CAN_H	Bus line (high)

⑤ **BP fieldbus execution, connector - DB9 - 9 pin**

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	SHIELD	
3	LINE-B	Bus line (low)
5	DGND	Data line and termination signal zero
6	+5V	Termination supply signal
8	LINE-A	Bus line (high)

⑥ ⑦ **EH, EW, EI, EP fieldbus execution, connector - RJ45 - 8 pin**

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	TX+	Transmitter - white/orange
2	RX+	Receiver - white/green
3	TX-	Transmitter - orange
6	RX-	Receiver - green

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

7 SET CODE

The basic calibration of electronic driver is factory preset, according to the proportional valve to be coupled. These pre-calibrations are identified by the set code at the end of driver's model code (see section 1). For correct set code selection, please include in the driver order also the complete code of the coupled proportional valve. For further information about set code, please contact Atos technical office.

8 SIGNALS SPECIFICATIONS

Atos digital drivers 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 F003 and in the user manuals included in the E-SW-* programming software. 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).

8.1 Power supply (V+ and V0)

The power supply (pin A1 and A2) 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.

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

The power supply (pin A3 and A4) 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, allow to remove solenoid power supply from pin A1 and A2 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.

8.3 Flow reference input signals (Q_INPUT+)

The driver is designed to receive an analog reference input signal (pin B1) for the valve's spool position.

Reference input signal is factory preset according to selected valve code, defaults are ±10 V_{DC} 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 V_{DC} or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 ÷ 24 V_{DC}.

8.4 Pressure or force reference input signal (F_INPUT+) - only for S option

Functionality of pressure or force input reference signal (pin B3), is used as reference for the driver pressure/force closed loop, see section 4.

Reference input signal is factory preset according to selected valve code, defaults are ±10 V_{DC} 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 V_{DC} or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 ÷ 24 V_{DC}.

8.5 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal (pin C1) proportional to the actual spool position; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, fieldbus reference, valve spool position). Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

8.6 Pressure or force monitor output signal (F_MONITOR) - only for S option

The driver generates an analog output signal (C3) proportional to alternated pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference). Monitor output signal is factory preset according to selected valve code, defaults are ± 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 ± 10 VDC or ± 20 mA.

8.7 Enable input signal (ENABLE)

To enable the driver, supply 24 VDC on pin C2: 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 activate 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 digital input by software selection.

8.8 Fault output signal (FAULT)

Fault output signal (pin C4) indicates fault conditions of the driver (solenoid short circuits/not connected, reference or transducer signal cable broken, maximum error exceeded, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC. Fault status is not affected by the status of the Enable input signal. Fault output signal can be used as digital output by software selection.

8.9 Main stage and direct or pilot position transducer input signals (LVDT_L and LVDT_T)

Main stage (LVDT_L pin D1) and direct or pilot (LVDT_T pin E1) position transducer integrated to the valve have to be directly connected to the driver using ± 15 VDC supply output available at pin D2, D3 and pin E2, E3. Note: transducer input signals working range is ± 10 VDC for standard or $4 \div 20$ mA for /C option and **cannot** be reconfigured via software (input signals setting depends to the driver set code).

8.10 Remote pressure/force transducer input signals (F_TR1 and F_TR2) - only for S option

Analog remote pressure transducers or load cell can be directly connected to the driver. Analog input signal is factory preset according to selected driver code, defaults are ± 10 VDC for standard and $4 \div 20$ mA for /C option. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ± 10 VDC or ± 20 mA. Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see tech table **GS002**).

8.11 Multiple PID selection or digital input signals (D_IN0 and D_IN1) - only for S option

Two on-off input signals are available on the connectors I and K. For NP executions pin I2 and/or pin K2 are used to select one of the four pressure (force) PID parameters setting, stored into the driver. Switching the active setting of pressure PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.). Supply a 24 VDC or a 0 VDC on pin I2 and/or pin K2, to select one of the PID settings as indicated by binary code table at side. Gray code can be selected by software. For fieldbus executions pin I2 and/or K2 can be used as generic purpose on-off input signals.

PIN	PID SET SELECTION			
	SET 1	SET 2	SET 3	SET 4
I2	0	24 VDC	0	24 VDC
K2	0	0	24 VDC	24 VDC

8.12 Possible combined options: /AC, /AI, /ACI, /CI - combined options /CI is available only for E-BM-TES/LES-S.

9 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 port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support: NP (USB)	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/BM 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

Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at ; service and DVD not included
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

E-SW-*/PQ DVD first supply = software has to be activated via web registration at ; 1 year service included
Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*-N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
Software has to be activated with Activation Code received upon first supply web registration

Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at **USB**

Adapters, Cables and Terminators, can be ordered separately

10 MAIN SOFTWARE PARAMETER SETTINGS

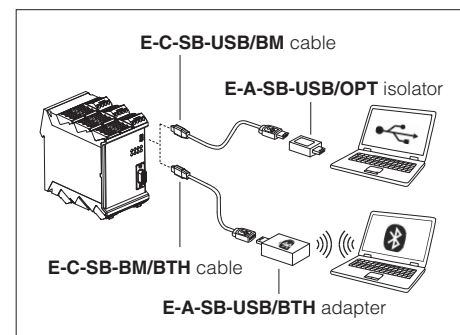
For basic information about main setting parameters by E-SW programming software, see tech table **GS003**

For detailed descriptions of settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:

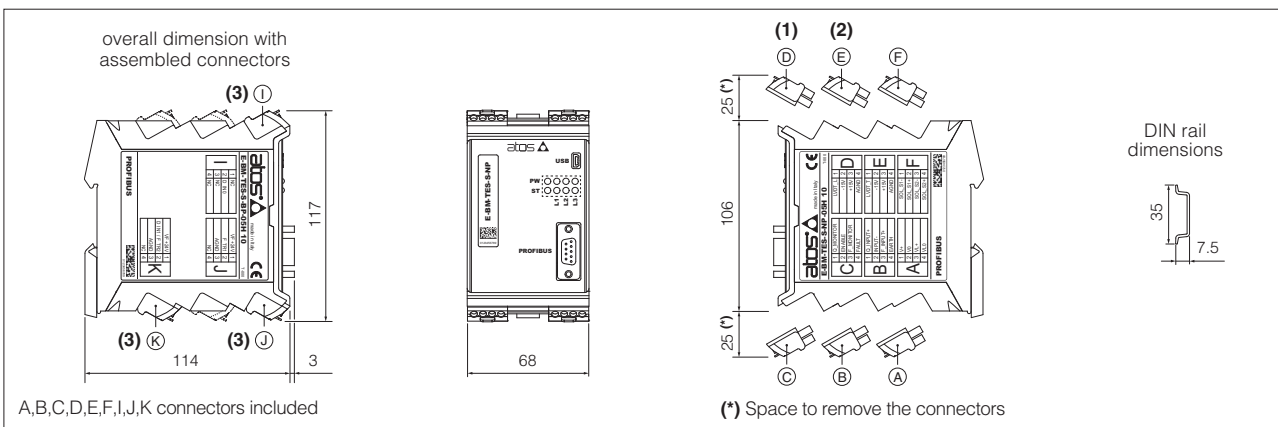
E-MAN-BM-LES - user manual for **E-BM-TES-N** and **E-BM-LES-N** digital drivers

E-MAN-BM-LES-S - user manual for **E-BM-TES-S** and **E-BM-LES-S** digital drivers

USB or Bluetooth connection

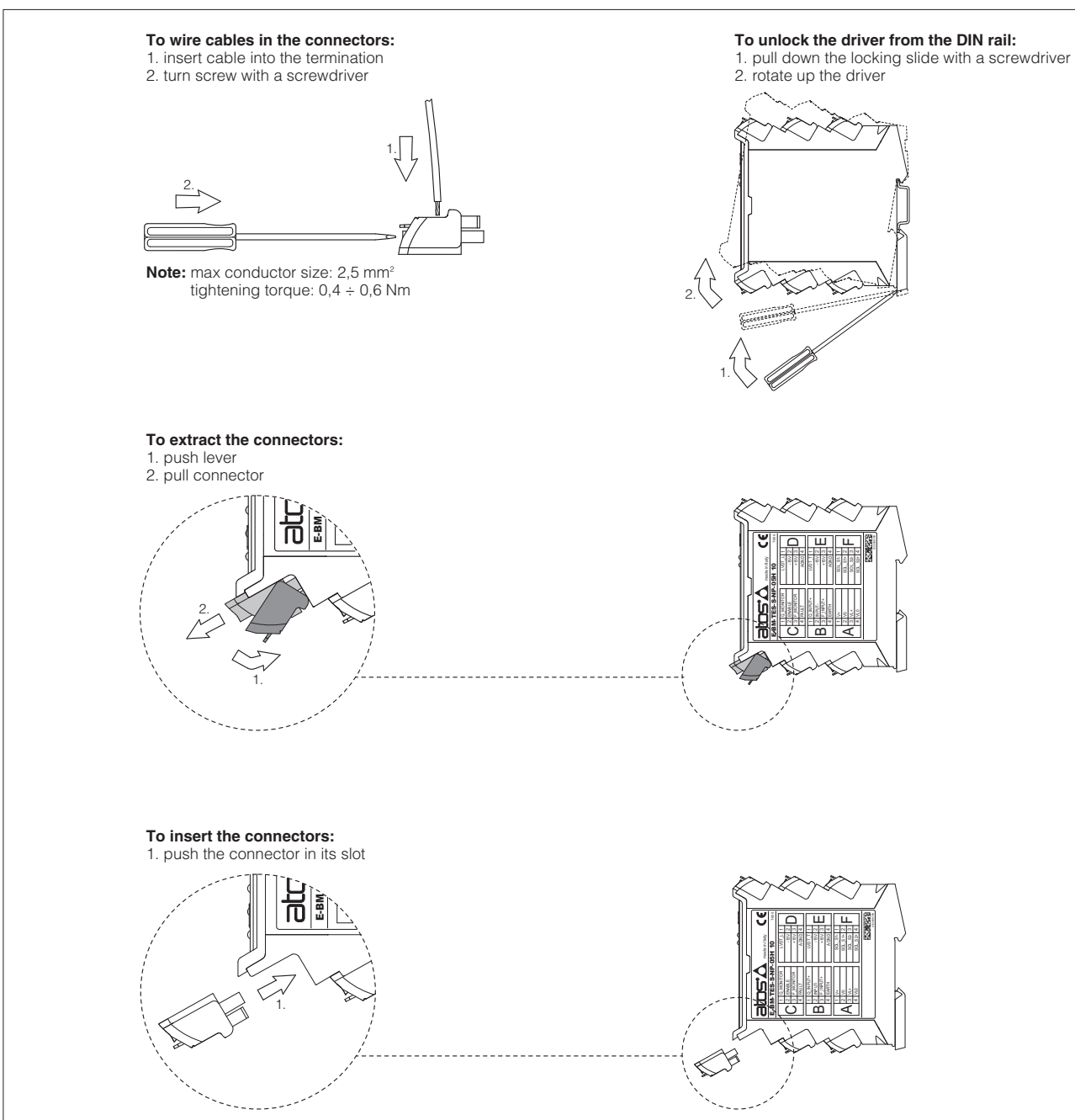


11 OVERALL DIMENSIONS [mm]



- (1) D connector is available only for TES-N versions 01HP / 05HP and LES-*
- (2) E connector is available only for TES-* versions 01H / 05H and LES-*
- (3) I, J and K connectors are available only for TES-S and LES-S

12 INSTALLATION



Note: all connectors are supplied with a mechanical coding. This feature ensures a unique insertion of each connector in the own slot. (e.g. connector A can not be inserted into connector slot of B,C,D,E,F,I,J,K)

Digital E-BM-TEB/LEB drivers

DIN-rail format, for proportional valves with one or two LVDT transducers

E-BM-TEB-N-NP

Scale

Bias

Linearization

Ramps

Enhanced Diagnostic

USB port

E-SW
programming software

Connectors ② included

E-BM-TEB/LEB

Digital drivers ① control in closed loop the position of the spool or poppet of direct and pilot operated proportional valves, according to the electronic reference input signal.

TEB execution controls direct operated directional/flow valves with one LVDT transducer.

LEB execution controls pilot operated directional valves with two LVDT transducers. Atos PC software allows to customize the driver configuration to the specific application requirements.

Electrical Features:

- 6 fast plug-in connectors ②
- Mini USB port ③ always present
- 2 leds for diagnostics ④ (see 5.1)
- Electrical protection against reverse polarity of power supply
- Operating temperature range: $-20 \div +60$ °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

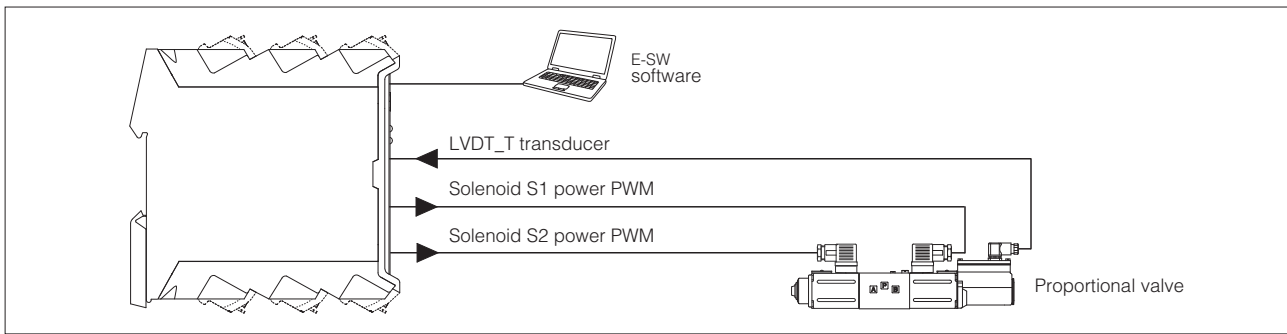
Software Features:

- Intuitive graphic interface
- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for hydraulic regulation
- Setting of PID gains
- Selection of analog IN / OUT range
- Complete diagnostic of driver status
- Internal oscilloscope function
- In field firmware update through USB port

1 MODEL CODE

E-BM	-	TEB	-	N	-	NP	-	01H	/	*	/	*	/	*	/	*
Off-board electronic driver in DIN rail format										Set code (see section 6)						
TEB = digital basic driver, for valves with one LVDT transducer LEB = digital basic driver, for valves with two LVDT transducers										Series number						
Alternated P/Q control: N = none										Options, see section 5: A = max current limitation for Ex-proof valves C = current feedback $4 \div 20$ mA for LVDT transducers only in combination with option A I = current reference input and monitor $4 \div 20$ mA (omit for voltage reference and monitor input ± 10 Vdc)						
Fieldbus interface, USB port always present: NP = Not Present										- = omit for direct valves and for pilot operated valves with two LVDT transducers P = for pilot operated valves with one LVDT transducer (only for TEB)						
01H = for single solenoid proportional valves 05H = for double solenoid proportional valves (only for TEB)																

2 BLOCK DIAGRAM EXAMPLE



3 VALVES RANGE

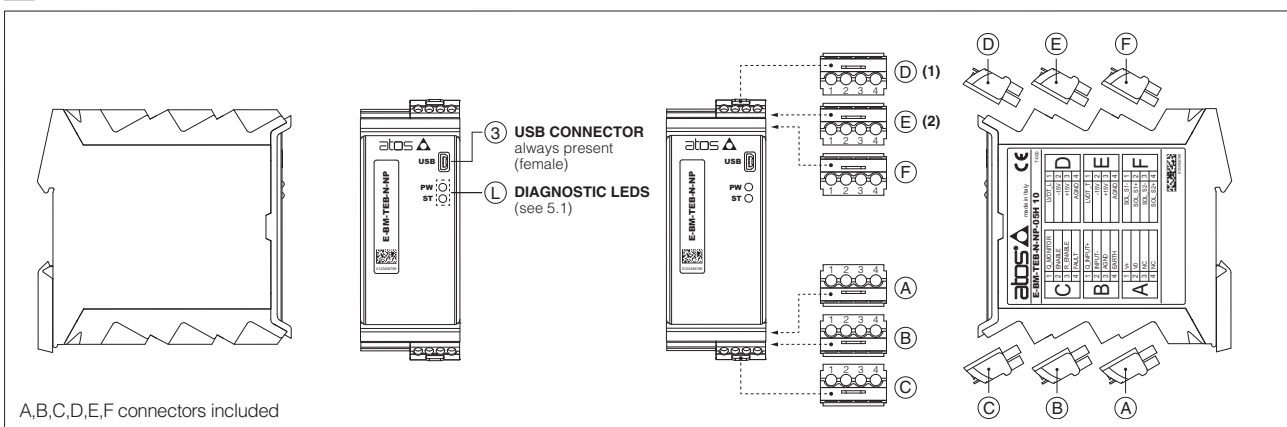
Valves	Directional			Flow	Directional	Cartridge
Standard Data sheet	DHZO-T, DKZOR-T F165	DLHZO-T, DLKZOR-T F180	DPZO-T F172	QVHZO-T, QVKZOR-T F412	DPZO-L F175	LIQZO-L, LIQZP-L F330, F340
Ex-proof Data sheet	DHZA-T, DKZA-T FX120	DLHZA-T, DLKZA-T FX140	DPZA-T FX220	QVHZA-T, QVKZA-T FX420	-	-
Driver model	E-BM-TEB			E-BM-LEB		

4 MAIN CHARACTERISTICS

Power supply (see 7.1)	Nominal : +24 V _{DC} Rectified and filtered : V _{RMS} = 20 ÷ 32 V _{MAX} (ripple max 10 % V _{PP})
Max power consumption	50 W
Current supplied to solenoids	I _{MAX} = 3.0 A for standard driver I _{MAX} = 2.5 A for ex-proof driver (IA option)
Analog input signal (see 7.2)	Voltage: range ±10 V _{DC} (24 V _{MAX} tollerant) Input impedance: R _i > 50 kΩ Current: range ±20 mA Input impedance: R _i = 500 Ω
Monitor output (see 7.3)	Output range: voltage ±10 V _{DC} @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Enable input (see 7.4)	Range: 0 ÷ 5 V _{DC} (OFF state), 9 ÷ 24 V _{DC} (ON state), 5 ÷ 9 V _{DC} (not accepted); Input impedance: R _i > 10 kΩ
Repeat enable output (see 7.5) Fault output (see 7.6)	Output range: 0 ÷ 24 V _{DC} (ON state > [power supply - 2 V] ; OFF state < 1 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, valve spool transducer malfunctions, alarms history storage function
Format	Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm DIN-rail mounting as per EN60715
Operating temperature	-20 ÷ +60 °C (storage -25 ÷ +85 °C)
Mass	Approx. 400 g
Additional characteristics	2 leds for diagnostic; 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)
Compliance	RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006
Communication interface	USB Atos ASCII coding
Communication physical layer	USB 2.0 + USB OTG not insulated
Recommended wiring cable	LiYCY shielded cables: 0,5 mm ² max 50 m for logic - 1,5 mm ² max 50 m for power supply Note: for transducers wiring cable please consult the transducers datasheet
Max conductor size (see 11)	2,5 mm ²

Note: a maximum time of 400 ms have be considered between the driver energizing with the 24 V_{DC} power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

5 CONNECTIONS AND LEDS

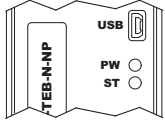


(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N

(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

5.1 Diagnostic LEDs L

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

LEDS	DESCRIPTION		
PW	OFF = Power supply OFF	ON = Power supply ON	
ST	OFF = Fault present	ON = No fault	

5.2 Connectors - 4 pin

CONNECTOR	PIN	SIGNALS	TECHNICAL SPECIFICATIONS	NOTES
A	A1	V+	Power supply 24 Vdc (see 7.1)	Input - power supply
	A2	V0	Power supply 0 Vdc (see 7.1)	Gnd - power supply
	A3	NC	Do not connect	
	A4	NC	Do not connect	
B	B1	Q_INPUT+	Flow reference input signal: ± 10 Vdc / ± 20 mA maximum range Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 7.2)	Input - analog signal Software selectable
	B2	INPUT-	Negative reference input signal for Q_INPUT+	Input - analog signal
	B3	AGND	Common gnd for monitor output	Common gnd
	B4	EARTH	Connect to system ground	
C	C1	Q_MONITOR	Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range, referred to AGND Default are ± 10 Vdc for standard and $4 \div 20$ mA for /I option (see 7.3)	Output - analog signal Software selectable
	C2	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the controller, referred to V0 (see 7.4)	Input - on/off signal
	C3	R_ENABLE	Repeat enable, output repeater signal of enable input, referred to V0 (see 7.5)	Output - on/off signal
	C4	FAULT	Fault (0 Vdc) or normal working (24 Vdc), referred to V0 (see 7.6)	Output - on/off signal
D ⁽¹⁾	D1	LVDT_L	Main stage valve position transducer signal (see 7.7)	Input - analog signal
	D2	-15V	Main stage valve position transducer power supply -15V	Output power supply
	D3	+15V	Main stage valve position transducer power supply +15V	Output power supply
	D4	AGND	Common gnd for transducer power	Common gnd
E ⁽²⁾	E1	LVDT_T	Direct valve or pilot valve position transducer signal (see 7.7)	Input - analog signal
	E2	-15V	Direct valve or pilot valve stage position transducer power supply -15V	Output power supply
	E3	+15V	Direct valve or pilot valve tage position transducer power supply +15V	Output power supply
	E4	AGND	Common gnd for transducer power	Common gnd
F	F1	SOL_S1-	Negative current to solenoid S1	Output - power PWM
	F2	SOL_S1+	Positive current to solenoid S1	Output - power PWM
	F3	SOL_S2-	Negative current to solenoid S2	Output - power PWM
	F4	SOL_S2+	Positive current to solenoid S2	Output - power PWM

(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N

(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

6 SET CODE

The basic calibration of electronic driver is factory preset, according to the proportional valve to be coupled. These pre-calibrations are identified by the set code at the end of driver's model code (see section 1). For correct set code selection, please include in the driver order also the complete code of the coupled proportional valve. For further information about set code, please contact Atos technical office.


7 SIGNALS SPECIFICATIONS

Atos digital drivers 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 **F003** and in the user manuals included in the E-SW-* programming software.

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).

7.1 Power supply (V+ and V0)

The power supply (pin A1 and A2) must be appropriately stabilized or rectified: 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.

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

7.2 Flow reference input signal (Q_INPUT+)

The driver is designed to receive an analog reference input signal (pin B1) for the valve's spool position.

Reference input signal is factory preset according to selected valve code, defaults are ± 10 V_{bc} 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 ± 10 V_{bc} or ± 20 mA.

7.3 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal (pin C1) proportional to the actual spool position; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, valve spool position).

Monitor output signal is factory preset according to selected valve code, defaults are ± 10 V_{bc} 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 ± 10 V_{bc} or ± 20 mA.

7.4 Enable input signal (ENABLE)

To enable the driver, supply 24 V_{bc} on pin C2: 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.

7.5 Repeat enable output signal (R_ENABLE)

Repeat enable (pin C3) is used as output repeater signal of enable input signal (see 7.4).

7.6 Fault output signal (FAULT)

Fault output signal (pin C4) indicates fault conditions of the driver (solenoid short circuits/not connected, reference or transducer signal cable broken, maximum error exceeded, etc.). Fault presence corresponds to 0 V_{bc}, normal working corresponds to 24 V_{bc}.

Fault status is not affected by the status of the Enable input signal.

7.7 Main stage and direct or pilot position transducer input signals (LVDT_L and LVDT_T)

Main stage (LVDT_L pin D1) and direct or pilot (LVDT_T pin E1) position transducer integrated to the valve have to be directly connected to the driver using ± 15 V_{bc} supply output available at pin D2, D3 and pin E2, E3.

Note: transducer input signals working range is ± 10 V_{bc} for standard or $4 \div 20$ mA for /C option and **cannot** be reconfigured via software (input signals setting depends to the driver set code).

7.8 Possible combined options: /AC, /AI, /ACI


8 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 port to the digital driver (see table **GS003**). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC	support: NP (USB)	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/BM 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

Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at ; service and DVD not included
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

E-SW-*/PQ DVD first supply = software has to be activated via web registration at ; 1 year service included
Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*-N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
Software has to be activated with Activation Code received upon first supply web registration

Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at **USB**

Adapters, Cables and Terminators, can be ordered separately

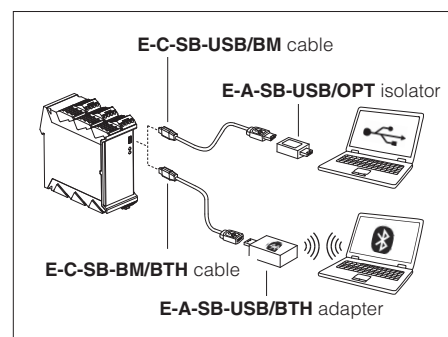
9 MAIN SOFTWARE PARAMETER SETTINGS

For basic information about main setting parameters by E-SW programming software, see tech table **GS003**

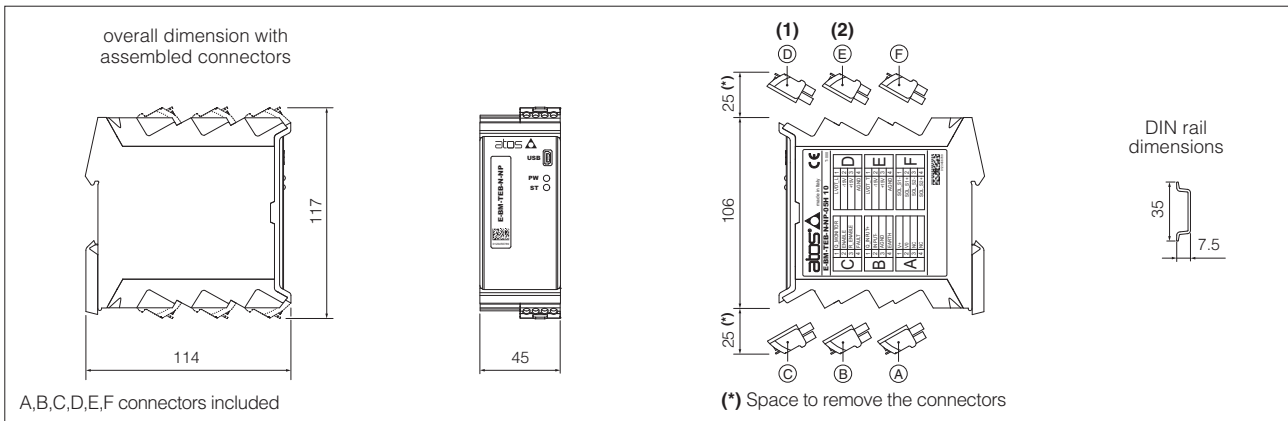
For detailed descriptions of settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:

E-MAN-BM-LEB - user manual for **E-BM-TEB** and **E-BM-LEB** digital drivers

USB or Bluetooth connection



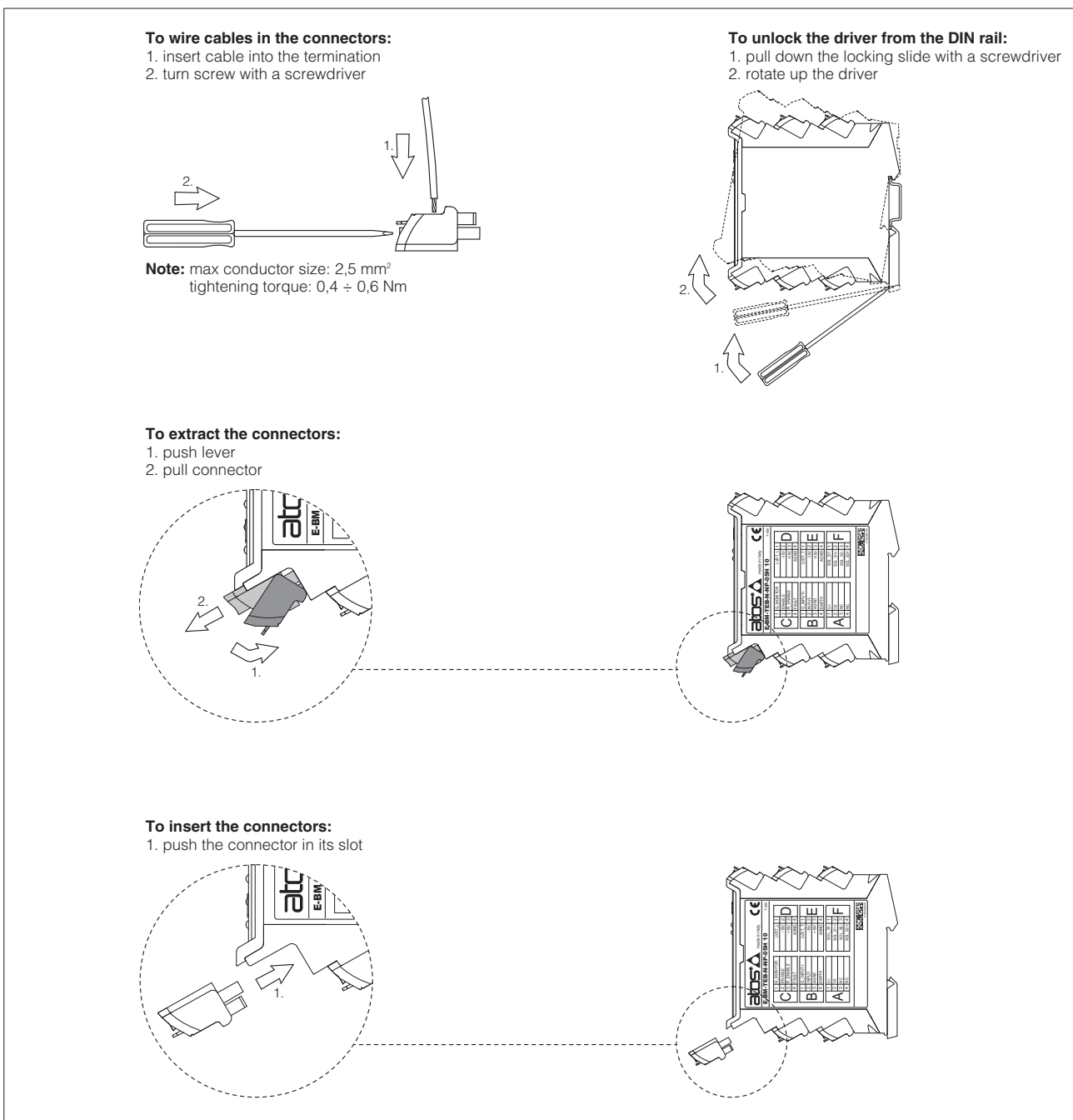
10 OVERALL DIMENSIONS [mm]



(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N

(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

11 INSTALLATION



Note: all connectors are supplied with a mechanical coding. This feature ensures a unique insertion of each connector in the own slot. (e.g. connector A can not be inserted into connector slot of B,C,D,E,F)

Digital electronic E-BM-AES drivers

DIN-rail format, for proportional valves without transducer

E-BM-AES- NP
Not Present

E-BM-AES- BC
CANopen

E-BM-AES- BP
PROFIBUS DP

E-BM-AES- EH
EtherCAT

Connectors ② included

E-SW
programming software

E-BM-AES

Digital drivers ① control the current to the solenoid of Atos proportional valves without transducer, according to the electronic reference input signal.

E-BM-AES operate direct and pilot operated proportional valves ZO-A without transducer.

Atos PC software allows to customize the driver configuration to the specific application requirements.

Electrical Features:

- 7 fast plug-in connectors ②
- Mini USB port ③ always present
- DB9 CANopen ④ and PROFIBUS DP ⑤ communication connector
- RJ45 EtherCAT communication connectors ⑥ output and ⑦ input
- 4 leds for diagnostics ⑧ (see 4.1)
- ± 5 Vdc output supply for external reference potentiometer
- Electrical protection against reverse polarity of power supply
- Operating temperature range: $-20 \div +60$ °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

Software Features:

- Intuitive graphic interface
- Setting of valve's functional parameters: bias, scale, ramps, dither, PID gains
- Linearization function for hydraulic regulation
- /W option max power limitation function
- Complete diagnostics of driver status
- Internal oscilloscope function
- In field firmware update through USB port

Fieldbus Features:

- Valve direct communication with machine control unit for digital reference, diagnostics and settings
- Fieldbus execution allow to operate the valves via fieldbus or via analog signals available on the connectors (see 4.2)

1 MODEL CODE

E-BM	-	AES	-	NP	-	01H	/	*	/	*
-------------	---	------------	---	-----------	---	------------	---	----------	---	----------

Off-board electronic driver in DIN rail format

AES = digital full driver, for valves without transducer

Fieldbus interface - USB port always present:
NP = Not Present
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT

Options:
A = max current limitation for Ex-proof valves
C = current feedback $4 \div 20$ mA for remote transducer, only in combination with option **W**
I = current reference input $4 \div 20$ mA (omit for standard voltage reference input ± 10 Vdc)
W = power limitation function

01H = for single solenoid proportional valves
05H = for double solenoid proportional valves

Series number

Set code (1)

(1) set code identifies the correspondence between the driver and the relevant valve

2 VALVES RANGE

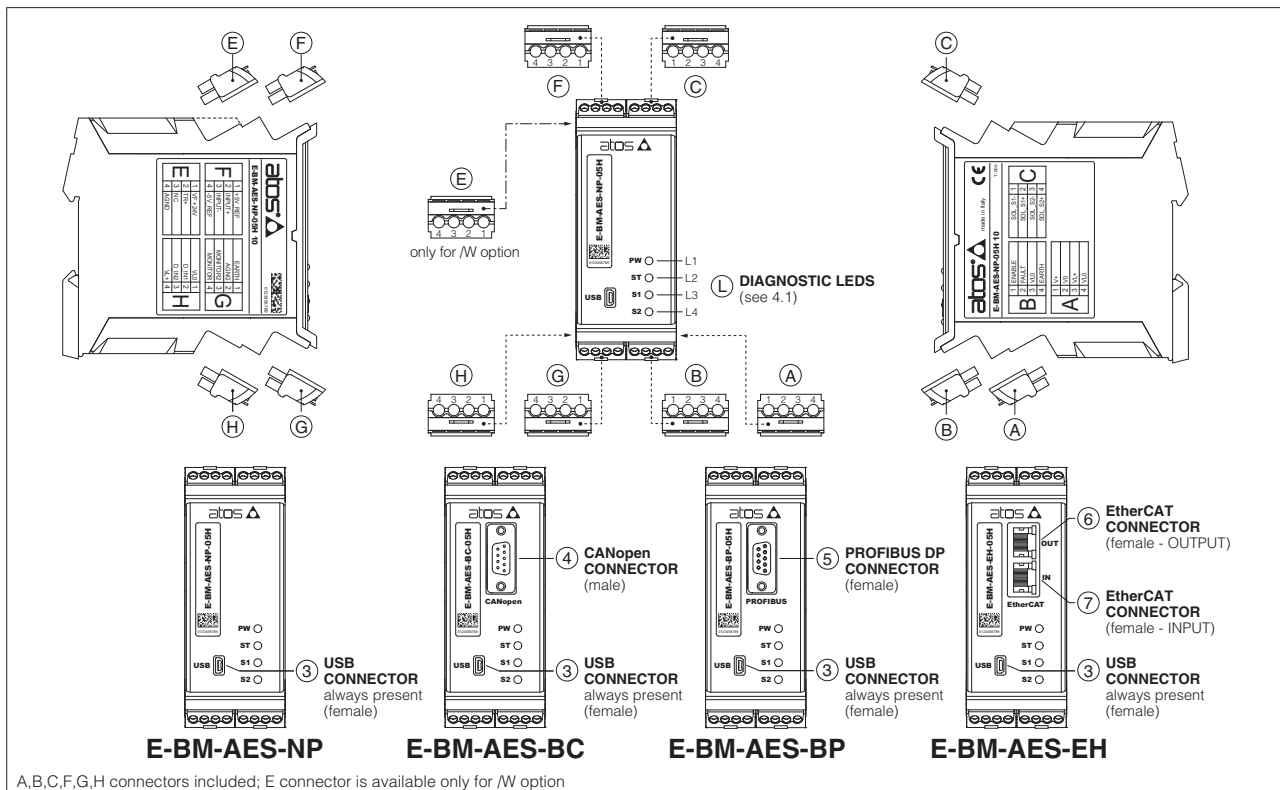
Valves	Pressure				Directional			Cartridge	Flow
Standard Data sheet	RZMO FS007, FS065	RZGO FS015, FS070	AGMZO FS035	AGRCZO FS050	DHRZO TF040	DHZO, DKZOR FS160	DPZO FS170	LICZO, LIMZO, LIRZO FS300	QVHZO, QVKZOR FS410
Ex-proof Data sheet	RZMA FX010	RZGA FX040	AGMZA FX010	AGRCZA FX040	DHRZA FX070	DHZA, DKZA FX100	DPZA FX200	LICZA, LIMZA, LIRZA FX300	QVHZA, QVKZA FX400
Driver model	E-BM-AES								

3 MAIN CHARACTERISTICS

Power supply (see 5.1, 5.2)	Nominal : +24 V _{DC} Rectified and filtered : V _{RMS} = 20 ÷ 32 V _{MAX} (ripple max 10 % V _{PP})			
Max power consumption	50 W			
Current supplied to solenoids	I _{MAX} = 2.7 A with +24 V _{DC} power supply to drive standard proportional valves (3,2 Ω solenoid) I _{MAX} = 2.5 A with +24 V _{DC} power supply to drive ex-proof proportional valves (3,2 Ω solenoid) for /A option			
Analog input signals (see 5.3)	Voltage: maximum range ±10 V _{DC} Input impedance: R _i > 50 kΩ Current: maximum range ±20 mA Input impedance: R _i = 500 Ω			
Monitor output (see 5.4)	Voltage: maximum range ±5 V _{DC} @ max 5 mA			
Enable input (see 5.5)	Range : 0 ÷ 9 V _{DC} (OFF state), 15 ÷ 24 V _{DC} (ON state), 9 ÷ 15 V _{DC} (not accepted); Input impedance: R _i > 87 kΩ			
Output supply (see 5.8)	±5 V _{DC} @ max 10 mA : output supply for external potentiometer			
Fault output (see 5.6)	Output range : 0 ÷ 24 V _{DC} (ON state ≡ VL+ [logic power supply] ; OFF state ≡ 0 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads)			
Pressure transducer power supply (only for /W option)	+24V _{DC} @ 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, power supplies level, pressure transducer failure			
Format	Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm DIN-rail mounting as per EN60715			
Operating temperature	-20 ÷ +60 °C (storage -25 ÷ +85 °C)			
Mass	Approx. 330 g			
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)			
Compliance	RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006			
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT IEC61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO 11898	optical insulated RS485	Fast Ethernet 100 Base TX
Recommended wiring cable	LiYCY shielded cables: 0,5 mm ² max 50 m for logic - 1,5 mm ² max 50 m for power supply and solenoids			
Max conductor size (see 9)	2,5 mm ²			

Note: a maximum time of 500 ms (depending on communication type) have be considered between the driver energizing with the 24 V_{DC} power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

4 CONNECTIONS AND LEDS



4.1 Diagnostic LEDs (L)

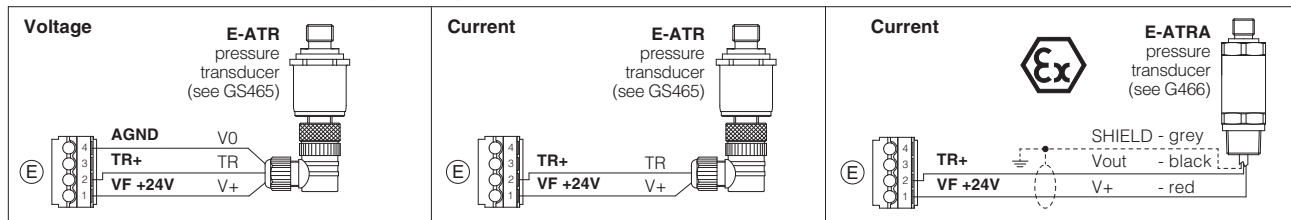
Four leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

LED	COLOR	FUNCTION	FLASH RATE	DESCRIPTION
L1	GREEN	PW	OFF	Power supply OFF
			ON	Power supply ON
L2	GREEN	ST	OFF	Fault present
			ON	No fault
L3 and L4	YELLOW	S1 and S2	OFF	PWM command OFF
			ON	PWM command ON

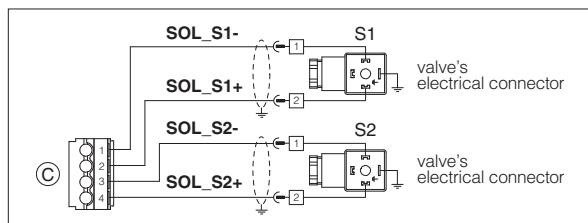
4.2 Connectors - 4 pin

CONNECTOR	PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	A1	V+	Power supply 24 Vdc (see 5.1)	Input - power supply
	A2	V0	Power supply 0 Vdc (see 5.1)	Gnd - power supply
	A3	VL+	Power supply 24 Vdc for driver's logic and communication (see 5.2)	Input - power supply
	A4	VL0	Power supply 0 Vdc for driver's logic and communication (see 5.2)	Gnd - power supply
B	B1	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver, referred to VL0 (see 5.5)	Input - on/off signal
	B2	FAULT	Fault (0 Vdc) or normal working (24 Vdc), referred to VL0 (see 5.6)	Output - on/off signal
	B3	VL0	Ground for ENABLE and FAULT	Gnd - digital signals
	B4	EARTH	Connect to system ground	
C	C1	SOL_S1-	Negative current to solenoid S1	Output - power PWM
	C2	SOL_S1+	Positive current to solenoid S1	Output - power PWM
	C3	SOL_S2-	Negative current to solenoid S2	Output - power PWM
	C4	SOL_S2+	Positive current to solenoid S2	Output - power PWM
E available only for /W option	E1	VF +24V	Power supply +24 Vdc	Output - power supply
	E2	TR+	Positive pressure transducer input signal: ± 10 Vdc / ± 20 mA maximum range (see 5.7) Default are 0 \div 10 Vdc for standard and 4 \div 20 mA for /C option	Input - analog signal Software selectable
	E3	NC	Do not connect	
	E4	AGND	Common GND for transducer power, signals and external potentiometer	
F	F1	+5V_REF	External potentiometer power supply +5 Vdc @ 10mA (see 5.8)	Output - power supply
	F2	INPUT+	Positive reference input signal: ± 10 Vdc / ± 20 mA maximum range (see 5.3) Default are ± 10 Vdc for standard and 4 \div 20 mA for /I option	Input - analog signal Software selectable
	F3	INPUT-	Negative reference input signal for INPUT+	Input - analog signal
	F4	-5V_REF	External potentiometer power supply -5 Vdc @ 10mA (see 5.8)	Output - power supply
G	G1	EARTH	Connect to system ground	
	G2	AGND	Analog ground for MONITOR and external potentiometer	Gnd - analog signal
	G3	MONITOR2	Only for /W option, 2nd monitor output signal: ± 5 Vdc maximum range (see 5.4) Default is 0 \div 5 Vdc	Output - analog signal Software selectable
	G4	MONITOR	Monitor output signal: ± 5 Vdc maximum range (see 5.4) Default is ± 5 Vdc (1V = 1A)	Output - analog signal Software selectable
H	H1	VL0	Power supply 0 Vdc for digital input (see 5.2)	Gnd - power supply
	H2	D_IN1	Digital input 0 \div 24Vdc, referred to VL0	Input - on/off signal
	H3	D_IN0	Digital input 0 \div 24Vdc, referred to VL0	Input - on/off signal
	H4	VL+	Power supply 24 Vdc for digital input (see 5.2)	Output - power supply

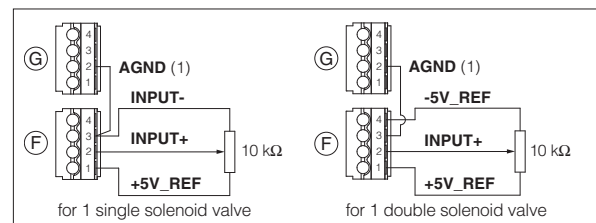
Pressure transducer connections - only for /W option



Coils connection



Potentiometer connection



4.3 Communication connectors ③ - ④ - ⑤ - ⑥ - ⑦

③ USB connector - Mini USB type B always present		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	+5V_USB	Power supply
2	D-	Data line -
3	D+	Data line +
4	ID	Identification
5	GND_USB	Signal zero data line

⑤ BP fieldbus execution, connector - DB9 - 9 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	SHIELD	
3	LINE-B	Bus line (low)
5	DGND	Data line and termination signal zero
6	+5V	Termination supply signal
8	LINE-A	Bus line (high)

④ BC fieldbus execution, connector - DB9 - 9 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
2	CAN_L	Bus line (low)
3	CAN_GND	Signal zero data line
5	CAN_SHLD	Shield
7	CAN_H	Bus line (high)

⑥ ⑦ EH fieldbus execution, connector - RJ45 - 8 pin		
PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	TX+	Transmitter - white/orange
2	RX+	Receiver - white/green
3	TX-	Transmitter - orange
6	RX-	Receiver - green

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

5 SIGNALS SPECIFICATIONS

Atos digital drivers 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 **F003** and in the user manuals included in the E-SW-* programming software.

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, EN-982).

5.1 Power supply (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ capacitance to three phase rectifiers.
In case of double power supply see 5.2.

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

5.2 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 $\mu\text{F}/40\text{ V}$ capacitance to single phase rectifiers or a 4700 $\mu\text{F}/40\text{ V}$ capacitance to three phase rectifiers.

The separate power supply for driver's logic on pin A3 and A4, allow to remove solenoid power supply from pin A1 and A2 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.

5.3 Reference input signal (INPUT+)

The driver controls in closed loop the current to the valve proportionally to the external reference input signal.

Reference input signal is factory preset according to selected valve code, defaults are $\pm 10\text{ V}_{\text{DC}}$ for standard and $4 \div 20\text{ mA}$ for /I option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ V}_{\text{DC}}$ or $\pm 20\text{ mA}$.

Drivers with fieldbus interface (BC, BP, EH) 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 $0 \div 24\text{V}_{\text{DC}}$.

5.4 Monitor output signals (MONITOR and MONITOR2)

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 $\pm 5\text{ V}_{\text{DC}}$ ($1\text{V} = 1\text{A}$).

Output signal can be reconfigured via software, within a maximum range of $\pm 5\text{ V}_{\text{DC}}$.

Option /W

The driver generates a second analog output signal (MONITOR2) proportional to the actual system pressure.

The output maximum range is $\pm 5\text{ V}_{\text{DC}}$; default setting is $0 \div 5\text{ V}_{\text{DC}}$.

5.5 Enable input signal (ENABLE)

To enable the driver, supply 24 V_{DC} on pin B1: 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 European Norms EN13849-1 (ex EN954-1).

5.6 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal broken for $4 \div 20\text{ mA}$ input, etc.).

Fault presence corresponds to 0 V_{DC} , normal working corresponds to 24 V_{DC} .

Fault status is not affected by the Enable input signal.

5.7 Remote pressure transducer input signal (TR+) - only for /W option

Analog pressure transducers can be directly connected to the driver.

Analog input signal is factory preset according to selected driver code, defaults are $0 \div 10\text{ V}_{\text{DC}}$ for standard and $4 \div 20\text{ mA}$ for /C option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of $\pm 10\text{ V}_{\text{DC}}$ or $\pm 20\text{ mA}$.

Note: transducer feedback can be read as a digital information through fieldbus communication - software selectable.

5.8 Output supply for external potentiometer ($\pm 5\text{V}_{\text{REF}}$) - not available for EH version

The reference analog signal can be generated by one external potentiometer directly connected to the driver, using the $\pm 5\text{ V}_{\text{DC}}$ supply output available at pin F1 and F4.

Note: using an external potentiometer, the reference input signal must be set via software at $\pm 5\text{ V}_{\text{DC}}$ (default $\pm 10\text{ V}_{\text{DC}}$, see 5.3)

5.9 Possible combined options: /AI, /AW, /IW, /AIW, /ACW, /CIW, /ACIW, /CW

6 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 port to the digital driver (see table **GS003**).

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

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

E-SW-BASIC	support: NP (USB)	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/BM cable, the use of isolator adapter is highly recommended for PC protection

Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at ; service and DVD not included
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

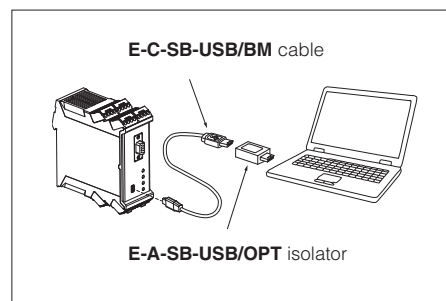
E-SW-*/PQ DVD first supply = software has to be activated via web registration at ; 1 year service included
Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*/N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
Software has to be activated with Activation Code received upon first supply web registration

Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at **USB**

Adapters, Cables and Terminators, can be ordered separately

USB connection



7 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main settings and features of digital drivers. For a detailed descriptions of available settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:

E-MAN-BM-AES - user manual for **E-BM-AES**

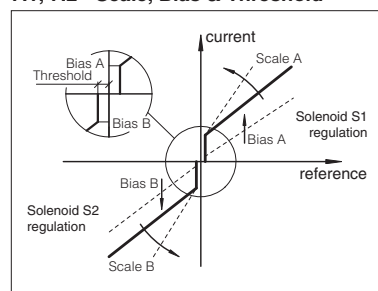
7.1 Scale

Scale function allows to set the maximum current supplied to the solenoid, corresponding to the max valve regulation, at maximum reference signal value.

This regulation allows to adapt the maximum current supplied from the driver to the specific nominal current of the proportional valves to which the driver is coupled; it is also useful to reduce the maximum valve regulation in front of maximum reference signal.

Two different Scale regulations are available for double solenoid valves: ScaleA for positive reference signal and ScaleB for negative reference signal.

7.1, 7.2 - Scale, Bias & Threshold



7.2 Bias and Threshold

Proportional valves may be provided with a dead band in the hydraulic regulation corresponding to their switch-off status.

This dead band discontinuity in the valve's regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal (analog or fieldbus external input).

The Bias function is activated when the reference signal overcomes the Threshold value, preset into the driver.

The Bias setting allows to calibrate the Bias current to the specific proportional valve to which the driver is coupled.

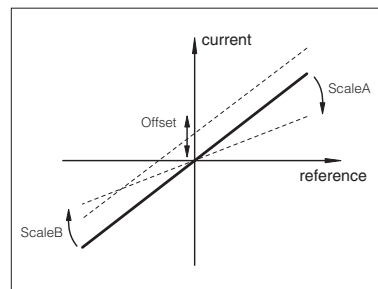
The Threshold setting is useful to avoid undesired valve regulation at zero reference signal when electric noise is present on the analog input signal: smaller threshold reduces the reference signal dead band, greater values are less affected by electric noise presence.

If fieldbus reference signal is active (see 5.3), threshold should be set to zero.

Two different Bias regulations are available for double solenoid valves: positive reference signals activate BiasA and negative reference signals activate BiasB.

Refer to the programming manuals for a detailed description of other software selectable Bias functions.

7.3 - Offset



7.3 Offset

Proportional valves may be provided with zero overlapping in the hydraulic regulation corresponding to zero reference input signal (valve's central spool position).

The Offset function allows to calibrate the Offset current, required to obtain valve's spool central position, to the specific hydraulic system setup (e.g. valve applied to cylinder with differential areas).

7.4 Ramps

The ramp generator allows to convert sudden change of electronic reference signal into smooth time-dependent increasing/decreasing of the current supplied to the solenoid.

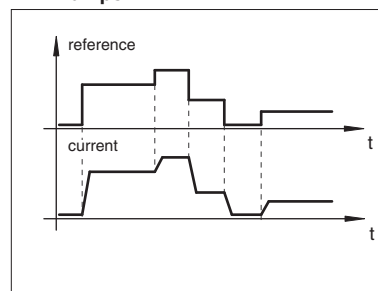
Different ramp mode can be set:

- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations
- four ramps for positive/negative signal values and increasing/decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.

If the proportional valve is driven by a closed loop controller, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting).

7.4 - Ramps

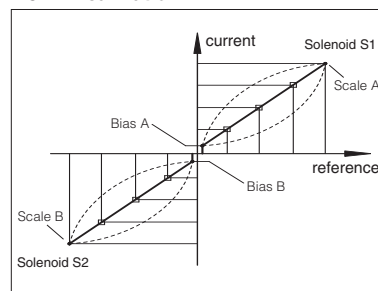


7.5 Linearization - E-SW level 2 functionality

Linearization function allows to set the relation between the reference input signal and the controlled valve's regulation.

Linearization is useful for applications where it is required to linearize the valve's regulation in a defined working condition.

7.5 - Linearization



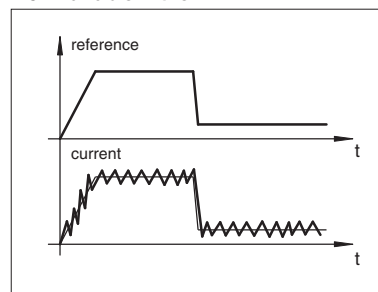
7.6 Variable Dither

The dither is the frequency modulation of the current supplied to the solenoid. To reduce the hysteresis should be selected a lower value of frequency, despite a lower regulation stability, because a small vibration in the valve regulating parts considerably reduces static friction effects.

To improve the regulation stability, should be selected a high value of frequency, despite a higher hysteresis. This solution in some application can lead to vibration and noise. Normally, the right setting is a compromise and depends on system setup.

E-BM-AES drivers allow to realize a variable dither frequency that linearly depends on the demanded current: variable dither frequency allows an higher degree to optimize the valve hysteresis.

7.6 - Variable Dither



7.7 Hydraulic Power Limitation - only for W option

Digital E-BM-AES drivers with W option electronically perform hydraulic power limitation on:

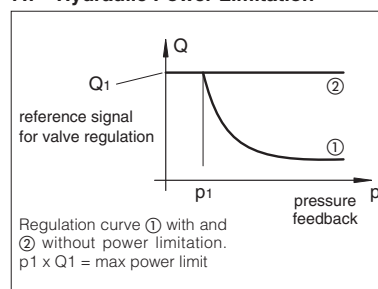
- direct and pilot operated flow control valves
- direct and pilot operated directional control valves + mechanical pressure compensator
- variable displacement pumps with proportional flow regulator (e.g. PVPC*-LQZ, tech table A170)

The driver receives the flow reference signal by the analog external input INPUT+ (see 5.3) and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input TR (see 5.7).

When the actual requested hydraulic power $p \times Q$ (TR x INPUT+) reaches the max power limit ($p_1 \times Q_1$), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve's regulated flow:

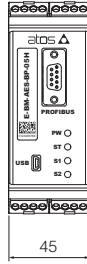
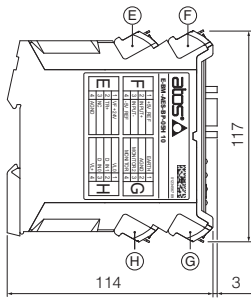
$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [TR]}} ; \text{Flow Reference [INPUT+]} \right)$$

7.7 - Hydraulic Power Limitation



8 OVERALL DIMENSIONS [mm]

overall dimension with assembled connectors



DIN rail dimensions



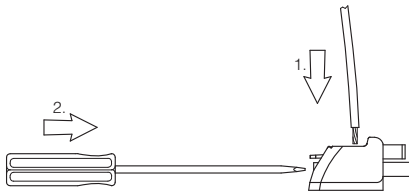
A,B,C,F,G,H connectors included; E connector is available only for /W option

(*) Space to remove the connectors

9 INSTALLATION

To wire cables in the connectors:

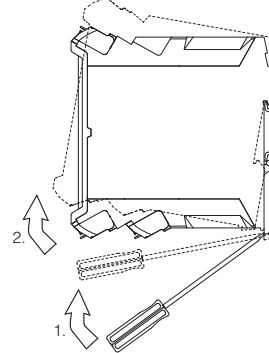
1. insert cable into the termination
2. turn screw with a screwdriver



Note: max conductor size: 2,5 mm²
tightening torque: 0,4 ÷ 0,6 Nm

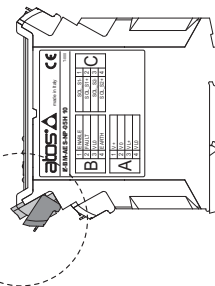
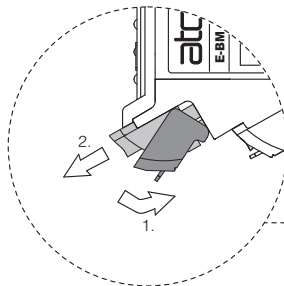
To unlock the driver from the DIN rail:

1. pull down the locking slide with a screwdriver
2. rotate up the driver



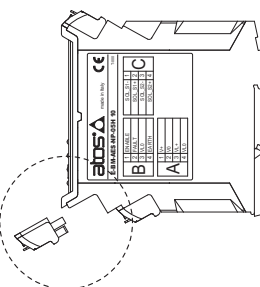
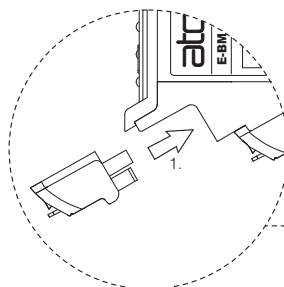
To extract the connectors:

1. push lever
2. pull connector



To insert the connectors:

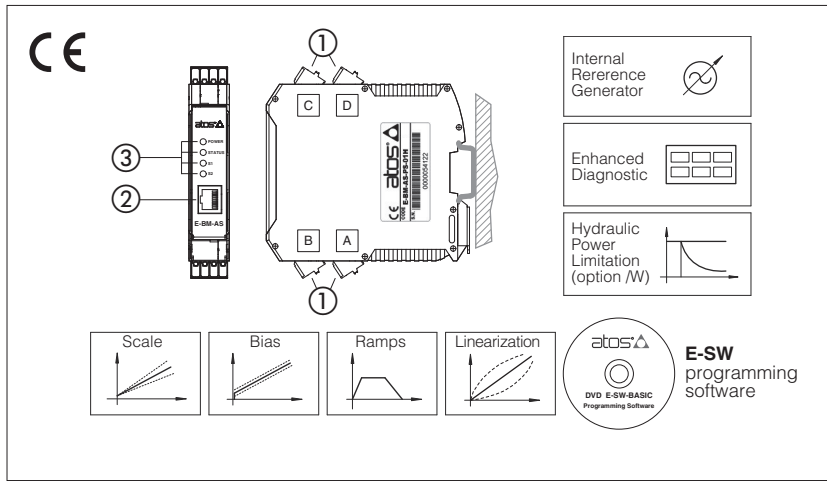
1. push the connector in its slot



Note: all connectors are supplied with a mechanical coding. This feature ensures a unique insertion of each connector in the own slot (eg. connector A can not be inserted into connector slot of B, C, E, F, G, H)

Digital electronic E-BM-AS drivers

DIN-rail format, for proportional valves without transducer



E-BM-AS

Digital drivers control the current to the solenoid of Atos proportional valves without transducer, according to the electronic reference input signal.

The solenoid proportionally transforms the current into a force, acting on the valve spool or poppet, against a reacting spring, thus providing the hydraulic regulation.

E-BM-AS can drive up to two single or one double solenoid proportional valves.

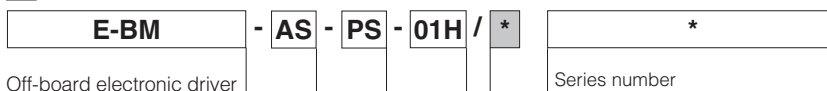
Electrical Features:

- 4 fast plug-in connectors ①
- RJ45 connector ② for RS232 Serial communication to program the driver with the Atos PC software
- 4 leds for diagnostics ③ (see section 10)
- ± 5 Vdc output supply for external reference potentiometers (/P option)
- Electrical protection against reverse polarity of power supply
- Operating temperature range: $-20 \div +60$ °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

Software Features:

- Intuitive graphic interface
- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- 2 selectable modes for electronic reference signal: external analog input or internal generation
- /W option max power limitation function
- Complete diagnostics of driver status

1 MODEL CODE



Off-board electronic driver in DIN rail format

AS = digital basic driver, for valves without transducer

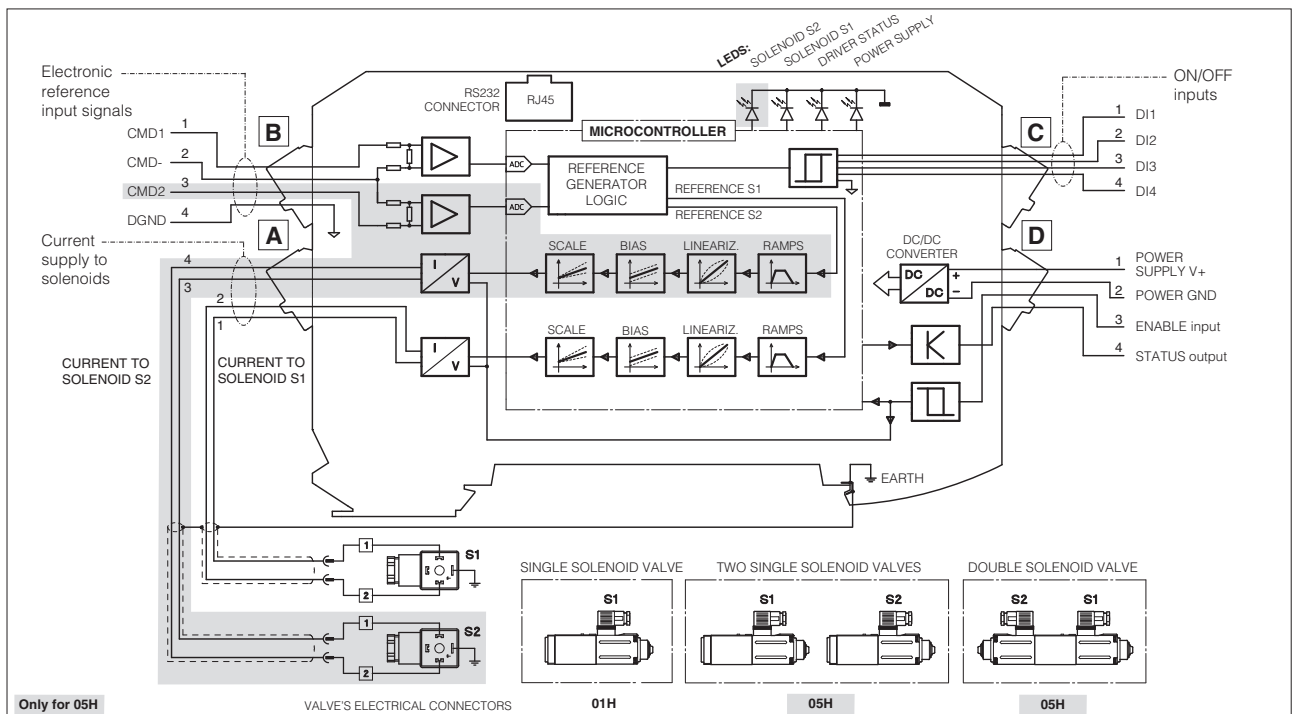
PS = Serial communication interface

01H = for single solenoid proportional valves
05H = for double solenoid or two single solenoid proportional valves

Options:

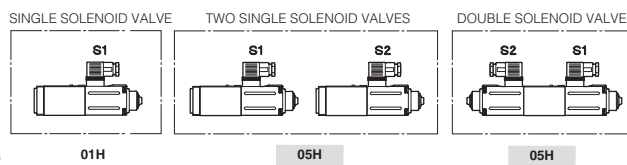
- = standard 24 Vdc power supply
- 12 = 12 Vdc power supply
- A = max current limitation for ex-proof valves
- C = current feedback $4 \div 20$ mA for remote transducer, only for **IW**
- I = current reference input $4 \div 20$ mA (omit for standard voltage reference input ± 10 Vdc)
- P = electrical supply for external potentiometers to generate reference signal, not available with I option (see 4.4)
- W = power limitation function, only for **05H** (see 7.7)

2 BLOCK DIAGRAM



Only for 05H

VALVE'S ELECTRICAL CONNECTORS



3 MAIN CHARACTERISTICS

Power supply (see 4.1)	Standard Nominal: +24 Vdc Rectified and filtered: VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP) option /12 Nominal: +12 VDC Rectified and filtered: VRMS = 10 ÷ 14 VMAX (ripple max 10 % VPP)
Max power consumption	50 W 01H single solenoid valve and 05H double solenoid valve 100 W 05H two single solenoid valves
Current supplied to solenoids	IMAX = 2.7 A with +24 Vdc power supply for standard proportional valves (3,2 Ω solenoid) IMAX = 3.3 A with +12 Vdc power supply for proportional valves with /6 option (2,1 Ω solenoid) IMAX = 2.5 A with +24 Vdc power supply for ex-proof proportional valves (3,2 Ω solenoid) for /A option
Analog input signal (see 4.2)	Voltage: range ±10 VDC Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Enable and optical insulated ON/OFF inputs (see 4.5, 4.7)	Range : 0 ÷ 24 Vdc (OFF state: 0 ÷ 5 Vdc ; ON state: 9 ÷ 24 Vdc) Input impedance: Ri > 10 kΩ
Output supply (see 4.4)	±5 Vdc @ max 10 mA : output supply for external potentiometers (only for /P option)
Status output (see 4.6)	Output range : 0 ÷ 24 Vdc (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 1,4 A
Alarms	Solenoid not connected, short circuit and cable break with current reference signal
Format	Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm rail mounting as per EN60715
Operating temperature	-20 ÷ +60 °C (-20 ÷ +40 °C for 05H version if drive two single solenoid proportional valves; storage -25 ÷ +85 °C)
Mass	130 g
Additional characteristics	Short circuit protection of current output to solenoids; protection against reverse polarity of power supply
Electromagnetic compatibility (EMC)	According to Directive 2014/30/UE - Immunity: EN 61000-6-2 (2005); Emission: EN 61000-6-4 (2001)
Compliance	RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006
Communication interface	RS232 serial connection (not insulated), Atos protocol with ASCII coding (see section 9)
Recommended wiring cable	LiYCY shielded cables: 0,5 mm ² for length up to 40 m [1,5 mm ² for power supply and solenoids]
Max conductor size (see section 12)	2,5 mm ²

4 SIGNALS SPECIFICATIONS

4.1 Power supply

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 for 01H single solenoid valve and 05H double solenoid valve
5 A time lag fuse for 05H two single solenoid valves

Option /12

This driver execution is designed to receive a 12 Vdc power supply and it is commonly used in mobile application.
A safety fuse is required in series to each driver power supply:



A safety fuse is required in series to each power supply: 4 A time lag fuse for 01H single solenoid valve and 05H double solenoid valve
6,3 A time lag fuse for 05H two single solenoid valves

4.2 Reference Input Signals (pin B1 and B3, both referred to pin B2)

The driver proportionally transforms the external reference input signal into the current supplied to the solenoid.

The driver is designed to receive one (01H) or two (05H) analog reference inputs (CMD1 on pin B1, CMD2 on pin B3); both signals are referred to a common electric ground (CMD- on pin B2). CMD1 has to be used in case of 05H version that drives one double solenoid valve. CMD2 has to be used in case of 05H version that drives two single solenoid valves or transducer input for /W option (see 4.3).

The input range is software selectable among voltage (0 ÷ ±10 VDC) or current (4 ÷ 20 mA with cable break detection or 0 ÷ ±20 mA).

Defaults for standard: 0 ÷ 10 VDC for two position valves; 0 ÷ ±10 VDC for three position valves (see valve's tech. table).

Default for /I option: 4 ÷ 20 mA (see valve's tech. table)

Other ranges can be set by software. Internal reference generation is software selectable (see 7.6).

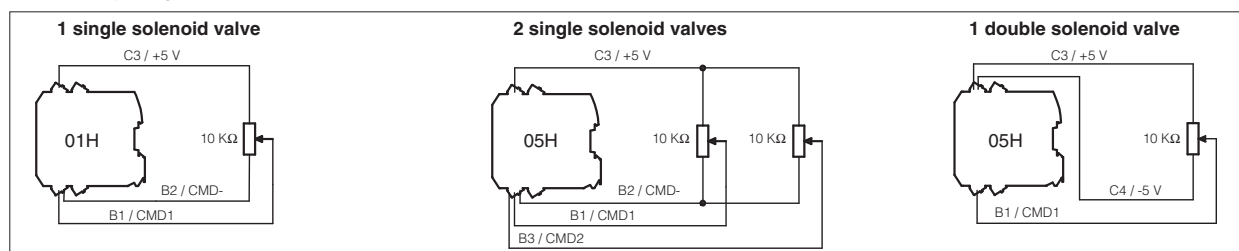
Note: software selection of analog input range (voltage or current) is applied to both signals CMD1 and CMD2.

4.3 Pressure Input Signal (pin B3 referred to pin B2) only for, /W option)

When hydraulic power limitation is active (see 7.7), input signal CMD2 must be connected to an external pressure transducer installed on the hydraulic system; maximum input range 0 ÷ 10 Vdc.

4.4 Output supply Signal for external reference potentiometers (/P option)

The reference analog signals can be generated by one (01H) or two (05H) external potentiometers directly connected to the driver, using the ±5 Vdc supply output available at pin C3 and C4. Reference input signal can be set up via software to ±5 Vdc, in order to match potentiometer output signal.



4.5 Enable Input Signal (pin D3 referred to pin D2)

Enable input signal allows to enable/disable the current supply to the solenoids, without removing the electrical power supply to the driver; it is used to maintain active the serial connection and the other driver functions when the valve must be disabled for safety reasons.

To enable the driver, supply a 24Vdc on pin D3 referred to pin D2.

4.6 Status Output Signal (pin D4 referred to pin D2)

Status output signal indicates fault conditions of the driver (short circuits, solenoids not connected, cable broken for 4 ÷ 20mA input) and is not affected by Enable input signal status: fault presence corresponds to 0 Vdc, normal working corresponds to 24 Vdc.

When hydraulic power limitation function is active (see 7.7), status output signal can be software configured to indicate power limitation status: not active (0 Vdc) or active (24 Vdc).

4.7 ON/OFF Input Signals (pin C1...C4 referred to DGND pin B4)

Analog Drivers Compatibility - default for series 12 or higher

The four ON/OFF digital input signals (DI) can be used to activate compatibility functionalities with E-BM-AC and E-ME-AC analog drivers (see section 5). If digital inputs are not connected, the driver behavior corresponds to an E-BM-AS series 11 or lower

or

Internal Reference Generation - software selectable

When the driver is configured in internal reference generation mode (see 7.6), the 4 ON/OFF input signals (DI) are used to select the active reference signal, among the available stored values. If the 4 ON/OFF input signals (DI) are not active, the driver can be commanded by external analog reference. The polarity of the digital inputs can be customized: active status = 24 Vdc is the default setting.

Note: for /P option DI3 and DI4 are not available

4.8 Possible combined options:

/12W, /12PW, /12CIW, /AW, /ACIW, /APW, /CIW, /PW only for 05H

/12I, /12P, /AI, /AP for 01H and 05H

5 ANALOG DRIVERS COMPATIBILITY - only for E-BM-AS series 12 or higher

E-BM-AS digital inputs (DI1..DI4) activate compatibility functionalities with E-BM-AC and E-ME-AC analog drivers:

REFERENCE COMPATIBILITY

Digital Inputs Signals	Digital driver	Analog driver	24 Vdc to DI1:	0 Vdc to DI1:
DI1	24 Vdc	E-BM-AS 01H E-BM-AS 05H	E-BM-AC 01F E-BM-AC 05F E-BM-AC 011F E-ME-AC 01F E-ME-AC 05F	01H Voltage 0 ÷ 5 Vdc / 0 ÷ 100% Current 4 ÷ 20 mA / 0 ÷ 100% 05H Voltage ± 5 Vdc / ± 100% Current 4 ÷ 20 mA / 0 ÷ 100%
DI2	0 Vdc			
DI3	0 Vdc			
DI4	0 Vdc			

Note: set 0 Vdc to DI1 and power-off/on the driver to restore latest settings

REFERENCE INVERSION

Digital Inputs Signals	Digital driver	Analog driver	24 Vdc to DI2:	0 Vdc to DI2:
DI1	24 Vdc	E-BM-AS 05H	E-BM-AC 05F	Voltage 0 ÷ 5 Vdc / 0 ÷ -100% Current 4 ÷ 20 mA / 0 ÷ -100%
DI2	24 Vdc			
DI3	0 Vdc			
DI4	0 Vdc			

Note: to enable reference inversion, set 24 Vdc to DI1 before driver power-on

RAMP SWITCH OFF

Digital Inputs Signals	Digital driver	Analog driver	24 Vdc to DI3:	0 Vdc to DI3:
DI1	24 Vdc	E-BM-AS 01H E-BM-AS 05H	E-ME-AC 01F E-ME-AC 05F	Ramp excluded
DI2	0 Vdc			
DI3	24 Vdc			
DI4	0 Vdc			

Notes: to enable ramp switch off, set 24 Vdc to DI1 before driver power-on; DI3 not available for /P option

011F CONFIGURATION

Digital inputs signals	Digital driver	Analog driver	24 Vdc to DI4:	0 Vdc to DI4:
DI1	(*)	E-BM-AS 05H	E-BM-AC 011F	Driver configuration 011F
DI2	(*)			
DI3	(*)			
DI4	24 Vdc			

Notes: set 0 Vdc to DI4 and power-off/on the driver to restore latest settings; DI4 not available for /P option

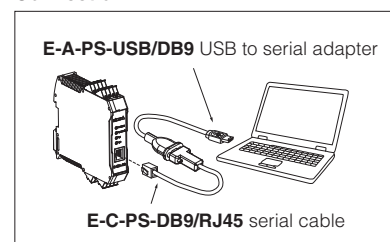
6 VALVE SETTINGS AND PROGRAMMING TOOLS

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via RS232 serial port to the digital driver (see table GS003). For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

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

E-SW-BASIC support: NP (USB) 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)

Connection



WARNING: drivers RS232 port is not isolated!

Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at ; service and DVD not included
 Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

E-SW-*/PQ DVD first supply = software has to be activated via web registration at ; 1 year service included
 Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*/N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
 Software has to be activated with Activation Code received upon first supply web registration

Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at **USB**

Adapters, Cables and Terminators, can be ordered separately

7 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main settings and features of digital drivers. For a detailed descriptions of available settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:

E-MAN-BM-AS - user manual for **E-BM-AS**

7.1 Scale

Scale function allows to set the maximum current supplied to the solenoid, corresponding to the max valve regulation, at maximum reference signal value.

This regulation allows to adapt the maximum current supplied from the driver to the specific nominal current of the proportional valves to which the driver is coupled; it is also useful to reduce the maximum valve regulation in front of maximum reference signal.

For double solenoid valves two different Scale regulations are available:

ScaleA for positive reference signal and ScaleB for negative reference signal

7.2 Bias and Threshold

Proportional valves may be provided with a dead band in the hydraulic regulation corresponding to their switch-off status.

This dead band discontinuity in the valve's regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal (external input or internally generated).

The Bias function is activated when the reference signal overcome the Threshold value, preset into the driver.

The Bias setting allows to calibrate the Bias current supplied to the solenoid of the specific proportional valve to which the driver is coupled.

The Threshold setting is useful to avoid undesired valve regulation at zero reference signal when electric noise is present on the analog input signal: smaller threshold reduces the reference signal dead band, greater values are less affected by electric noise presence.

If internal reference generation is active (see 7.6), threshold should be set to 0.

For double solenoid valves two different Bias regulations are available: positive reference signal activates BiasA for solenoid S1 and negative reference signal activates BiasB for solenoid S2

7.3 Ramps

The ramp generator allows to convert sudden change of electronic reference signal into smooth time-dependent increasing/decreasing of the current supplied to the solenoid.

Different ramp mode can be set:

- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations
- four ramps for positive/negative signal values and increasing/decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.

If the proportional valve is driven by a closed loop controller, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting)

7.4 Dither

The dither is an high frequency modulation of the current supplied to the solenoid, to reduce the hysteresis of the valve's regulation: a small vibration in the valve's regulating parts considerably reduces static friction effects.

Dither frequency can be set in a range from 80 to 500 Hz (default value is 200Hz).

Lower dither setting reduces the hysteresis but also reduces the regulation stability. In some application this can lead to vibration and noise: right setting usually depends on system setup.

Default dither is a valid setting for a wide range of hydraulic applications

7.5 Linearization

Linearization function allows to set the relation between the reference input signal and the current supplied to the solenoid.

Linearization is useful for applications where it is required to linearize the valve's regulation in a defined working condition (e.g. maximum pressure control at defined working flow)

7.6 Internal Reference Generation

Internal generation of reference values is software selectable.

In this mode the 4 digital inputs of the driver (DI1..DI4) allow to activate the desired internal reference signal, among the different driver's stored values: external control unit can thus manage complex machine profile by simple switching the reference signal, by 4 digital inputs (see 4.7).

The digital inputs are software configurable into 2 different reference selection mode:

- **Standard mode**

each digital input corresponds to a different value; up to 4 different internal values are available (2+2 with E-BM-AS-PS-05H driving two single solenoid valves)

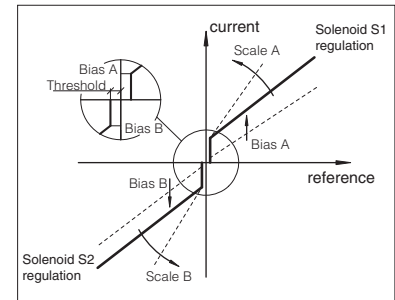
- **Binary mode**

each digital input combination corresponds to a different value; up to 15 different internal values are available (3+3 with E-BM-AS-PS-05H when driving two single solenoid valves)

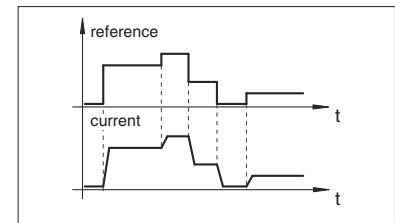
A dedicated ramp time value can be set by software for each available stored reference value.

Note: with all input signals (DI) set to zero, the driver can be commanded by external analog reference also if internal reference generation is selected (for more information please refer to the programming manual E-MAN-BM-AS).

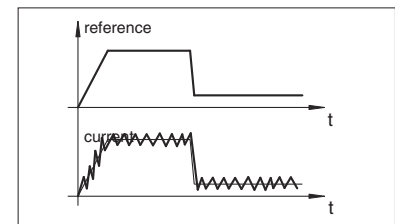
7.1, 7.2 - Scale, Bias & Threshold



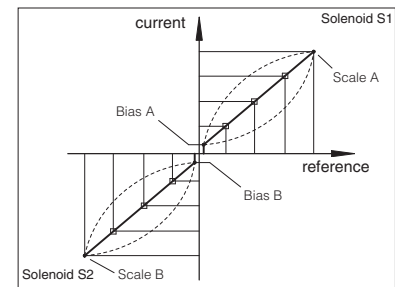
7.3 - Ramps



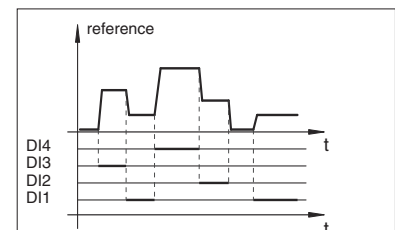
7.4 - Dither



7.5 - Linearization



7.6 - Internal Reference Generation



Single internal generator selection (standard mode)				
DI1	DI2	DI3	DI4	Reference
OFF	OFF	OFF	OFF	External
ON	OFF	OFF	OFF	Generation 1
(*)	ON	OFF	OFF	Generation 2
(*)	(*)	ON	OFF	Generation 3
(*)	(*)	(*)	ON	Generation 4

Double internal generator selection (standard mode)					
DI1	DI2	S1	DI3	DI4	S2
OFF	OFF	External	OFF	OFF	External
ON	OFF	Generation 1	ON	OFF	Generation 1
(*)	ON	Generation 2	(*)	ON	Generation 2

(*) don't care

7.7 Hydraulic Power Limitation (/W option, only for drivers E-BM-AS-PS-05H)

E-BM-AS drivers with /W option electronically perform hydraulic power limitation on:

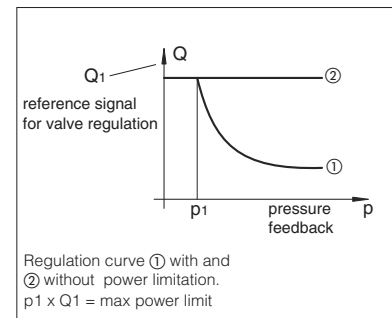
- direct and pilot operated flow control valves
- direct and pilot operated directional control valves + mechanical pressure compensator
- variable displacement pumps with proportional flow regulator (e.g. PVPC-*-LQZ, tech. table A170)

The driver receives the flow reference signal by the analog external input CMD1 (see 4.2) or by the internal generator (see 7.6) and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input CMD2.

When the actual requested hydraulic power $p \times Q$ (CMD2xCMD1) reaches the max power limit ($p1 \times Q1$), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve's regulated flow:

$$\text{Flow regulation} = \text{Min} \left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [CMD2]}} ; \text{Flow Reference [CMD1]} \right)$$

7.7 - Hydraulic Power Limitation



8 CONNECTIONS

The 4 fast plug-in connectors (A,B,C,D), included in the supply, provide simple wirings, easy driver's replacement and the possibility to test the signals directly on the connectors.

CONNECTOR	PIN	SIGNAL	TECHNICAL SPECIFICATIONS		NOTES	
A	A1	SOL S1	Current to solenoid S1		Output - power PWM	
	A2					
	A3	SOL S2	Current to solenoid S2 (only for 05H version)			
	A4					
B	B1	CMD1	Reference analog input: $\pm 10 \text{ Vdc} / \pm 20 \text{ mA}$ maximum range software selectable (see 4.2)		Input - analog signal	
	B2	CMD-	Standard	/P option (see 4.4)		
			Zero signal, ground for reference signals	Reference for $\pm 5 \text{ Vdc}$ output (AGND)		
	B3	CMD2 (1)	Reference analog input: $\pm 10 \text{ Vdc} / \pm 20 \text{ mA}$ maximum range software selectable (see 4.2)			
B4	DGND	Optical insulated ground for on/off inputs (DI1 ÷ DI4)				
C			Standard	/P option (see 4.4)	Standard	Option /P
	C1	DI1	Optical insulated on/off input 0 ÷ 24 Vdc referred to pin B4 DGND (see 4.7) For analog driver compatibility see section 5	Optical insulated on/off input 0 ÷ 24 Vdc referred to pin B4 DGND (see 4.7) For analog driver compatibility see section 5	Input - on/off signal	
	C2	DI2				
	C3	DI3			+5 Vdc @ 10 mA output supply to pin B2 (AGND)	Input - on/off
C4	DI4	-5 Vdc @ 10 mA output supply to pin B2 (AGND)				
D	D1	V+	Power supply 24 Vdc (see 4.1)		Input - power supply	
	D2	V0	Power supply 0 Vdc			
	D3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver (see 4.5)		Input - on/off signal	
	D4	STATUS	Fault (default) or software selected output (see 4.6)		Output - on/off signal	

(1) Only for 05H version, when used to drive two single solenoid valves or transducer input for /W option

WARNING: if CMD2 is not used has to be connect to CMD- (ground)

9 RJ45 CONNECTOR

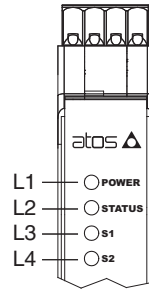
RJ45 CONNECTOR		
PIN	SIGNAL	DESCRIPTION
1	/	Not connected
2	/	Not connected
3	/	Not connected
4	GND	Signal zero data line
5	RX	Driver receiving data line
6	TX	Driver transmitting data line
7	/	Not connected
8	/	Not connected

RJ45 connector (IEC 60603 standard) for RS232 serial communication

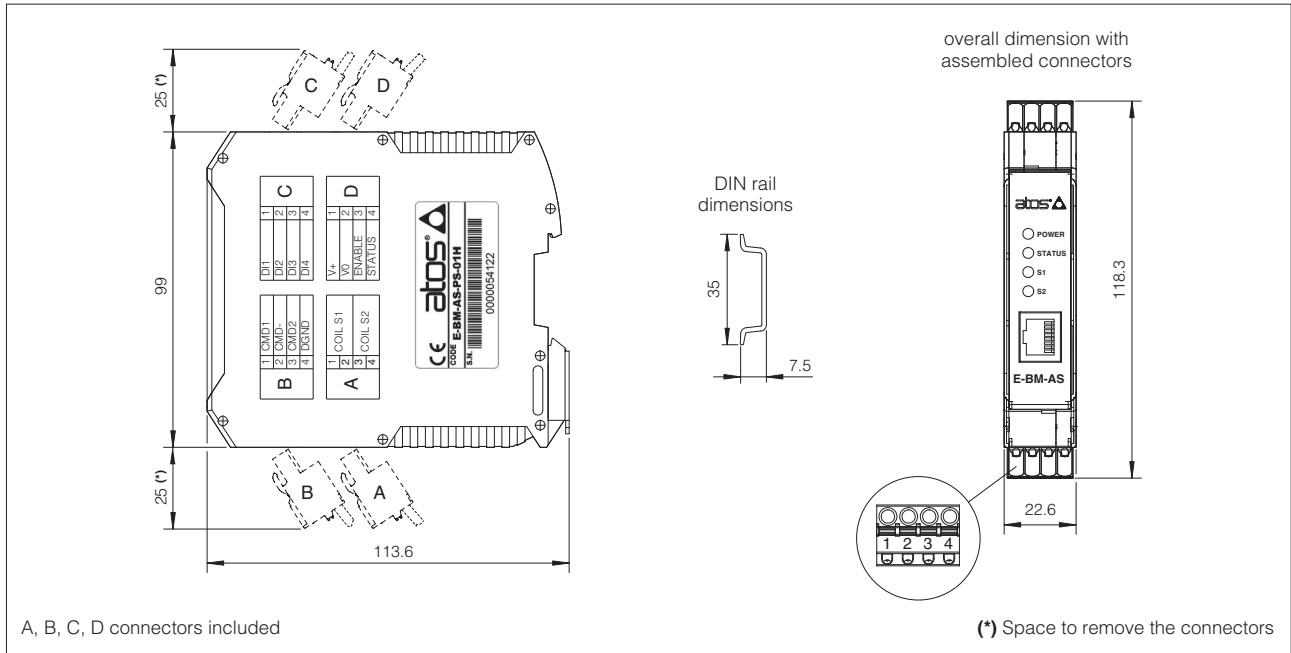
10 DIAGNOSTIC LEDS

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

LED	COLOR	FUNCTION	FLASH RATE	DESCRIPTION
L1	GREEN	POWER	OFF	Power supply OFF
			ON	Power supply ON
L2	GREEN	STATUS	OFF or ON	Fault conditions
			Slow blinking	Driver disabled
			Fast blinking	Driver enabled
L3 and L4	YELLOW	S1 and S2	OFF	PWM command OFF
			ON	PWM command ON
			Slow blinking	Coil not connected
			Fast blinking	Short circuit on the solenoid



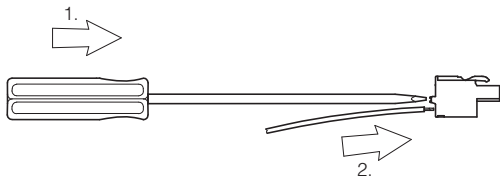
11 OVERALL DIMENSIONS [mm]



12 INSTALLATION

To wire cables in the connectors:

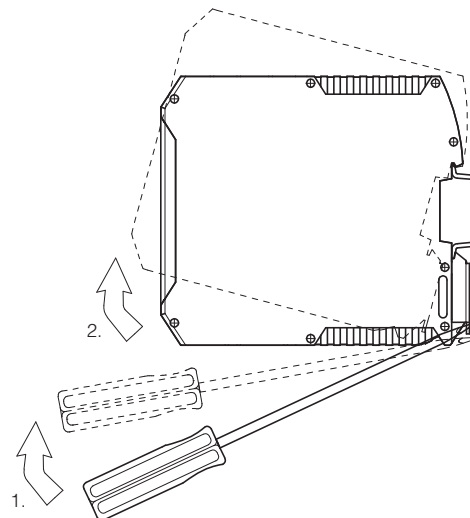
1. press the button with a screwdriver
2. insert the cable termination



Note: max conductor size: 2,5 mm²

To unlock the driver from the DIN rail:

1. pull down the locking slide with a screwdriver
2. rotate up the driver



Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Сургут (3462)77-98-35
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия (495)268-04-70

Казахстан (772)734-952-31

Киргизия (996)312-96-26-47