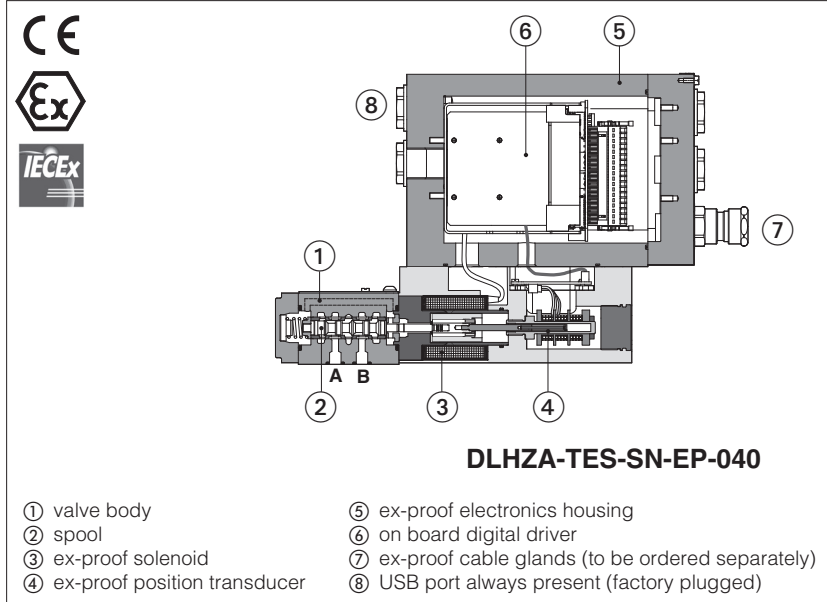


Ex-proof digital servoproportionals sleeve execution

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



- ① valve body
- ② spool
- ③ ex-proof solenoid
- ④ ex-proof position 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)

DLHZA-TES, DLKZA-TES

Ex-proof digital servoproportional valve, direct, in 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 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.

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

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

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 = with one 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 interfaces, USB port always present: NP = Not present BC = CANopen EH = EtherCAT BP = PROFIBUS DP EI = EtherNet/IP EW = POWERLINK 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:</p> <p>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
(3) In standard configuration the solenoid with integral electronics 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 **F003** 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.

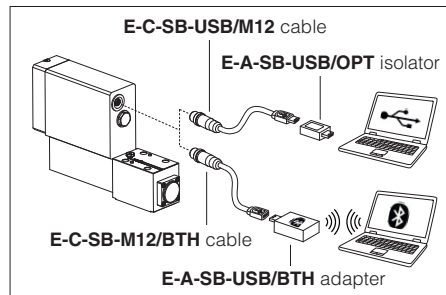
The software is available in different versions according to the driver's options (see table **GS500**):

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 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]																				
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	70							
Leakage [cm³/min] at P = 100 bar (1)	<100	<200	<100	<300	<150	<500	<200	<900	<200	<200	<700	<200	<1000	<100	<1500	<400	<400	<1200	<400	
Response time [ms] (2)	≤ 10												≤ 15							
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																			

(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	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	see also filter section at
	longer life	ISO4406 class 16/14/11 NAS1638 class 5	www.atos.com or KTF catalog
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, 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

11 CERTIFICATION DATA

Valve type	DLHZA, DLKZA		
Certifications	Multicertification and 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 60079-31 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 www.atos.com

(2) The driver and solenoids are certified for minimum ambient temperature -40°C.

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

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

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 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% (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:

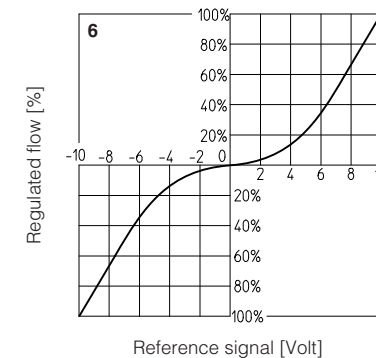
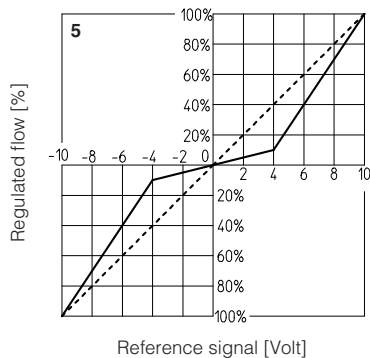
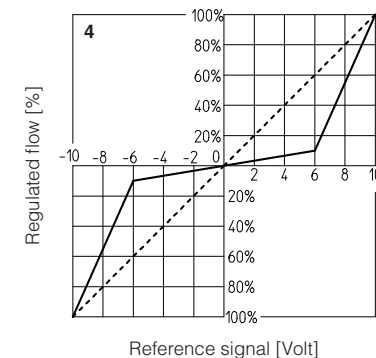
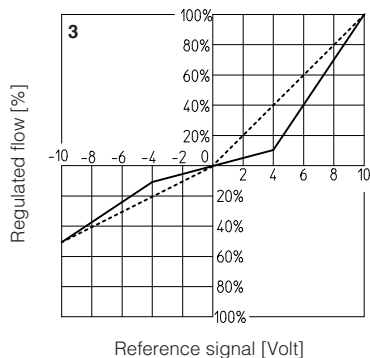
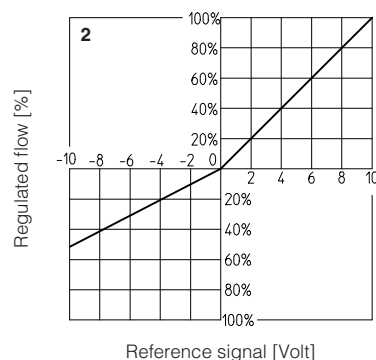
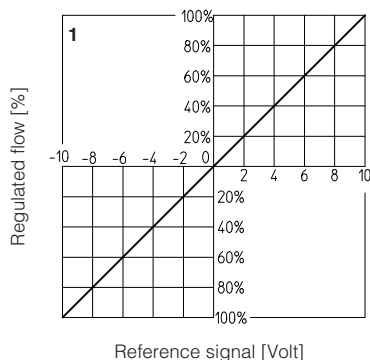
Reference signal $\left. \begin{matrix} 0 \div +10 \text{ V} \\ 12 \div 20 \text{ mA} \end{matrix} \right\} P \rightarrow A / B \rightarrow T$

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

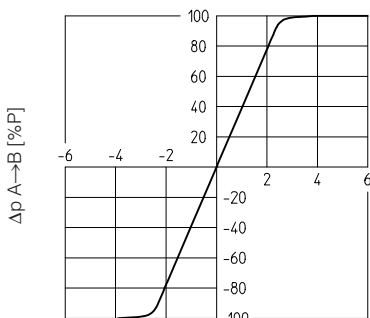
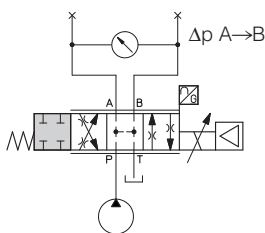
option /B:

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:

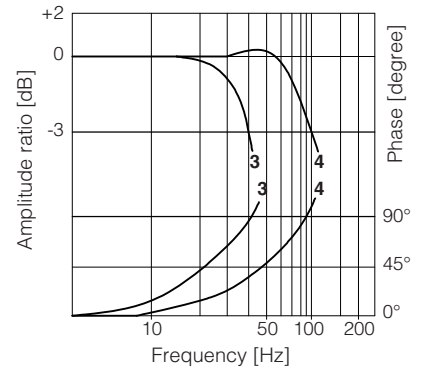
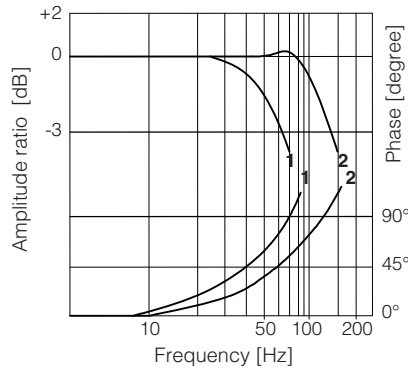
1 = ± 100% nominal stroke

2 = ± 5% nominal stroke

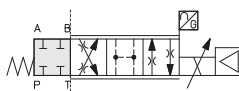
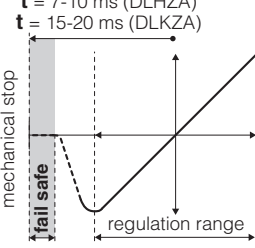
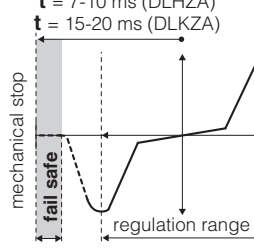
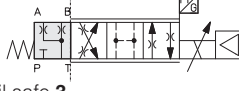

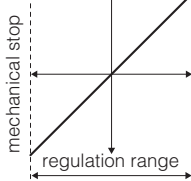
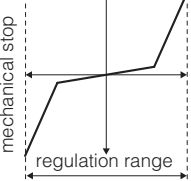
DLKZA:

3 = ± 100% nominal stroke

4 = ± 5% nominal stroke



18 FAIL SAFE POSITION

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

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, CAN_ref 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

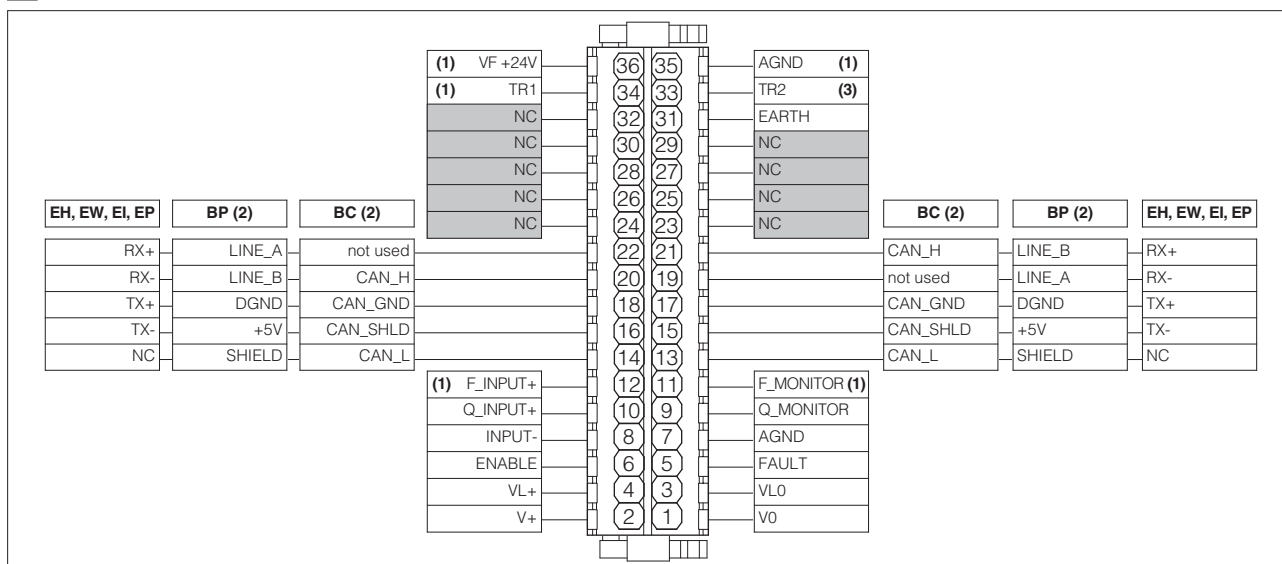
Analog remote pressure transducers or load cell can be directly connected to the driver.

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	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 +		

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

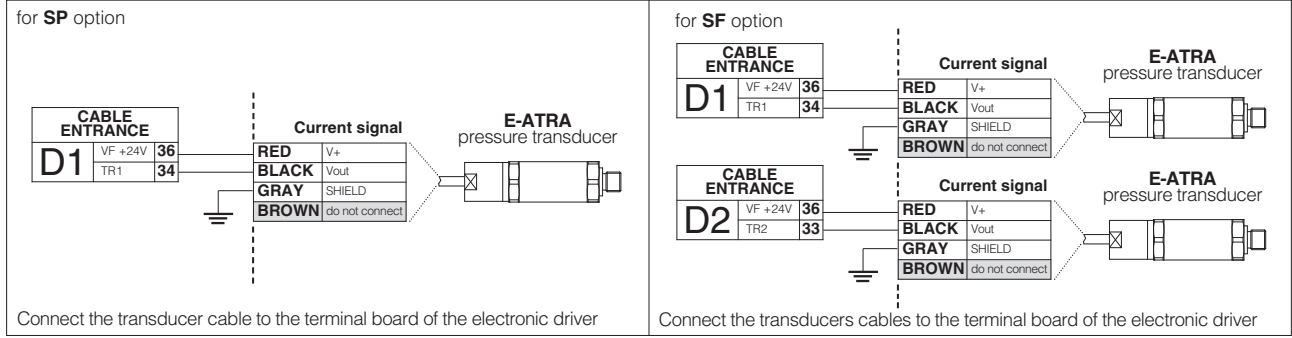
CABLE ENTRANCE	PIN	SIGNAL	TECHNICAL SPECIFICATIONS
C1 (input)	14	NC	do not connect
	16	TX-	Transmitter
	18	TX+	Transmitter
	20	RX-	Receiver
	22	RX+	Receiver

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 - example



22 POWER SUPPLY AND SIGNALS SPECIFICATIONS

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

TES-SN
TES-SP, SF, SL

(front)

TES-SN

(rear)

TES-SP, SF, SL

(rear)

TERMINAL BOARD AND FIELDBUS TERMINATOR

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

5 n°4 M6
Tightening torque **15 Nm**

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

USB
male **(2)**

E-C-SB-USB/M12
USB CABLE
cable length 4m

DO NOT REMOVE

METALLIC PROTECTION CAP

- supplied with the valves 24

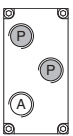
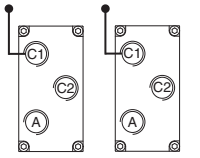
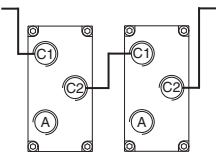
DO NOT REMOVE

Tightening torque: **20 Nm**

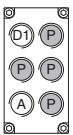
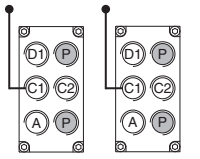
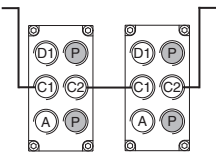
(1) Drivers with BC and BP fieldbus interface are delivered by default 'Not Terminated'. All switches are set OFF
(2) Pin layout always referred to driver's view

FX150

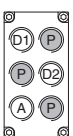
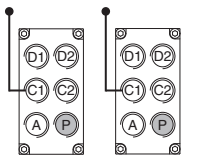
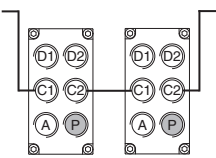
22.1 Cable glands and threaded plug for TES-SN

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

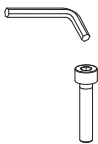
22.2 Cable glands and threaded plug for TES-SP, SL - with one pressure transducer

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 - with double pressure transducers

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]

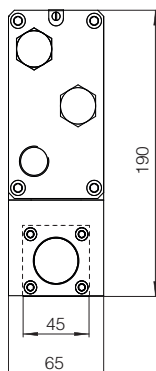
DLHZA-TES

ISO 4401: 2005

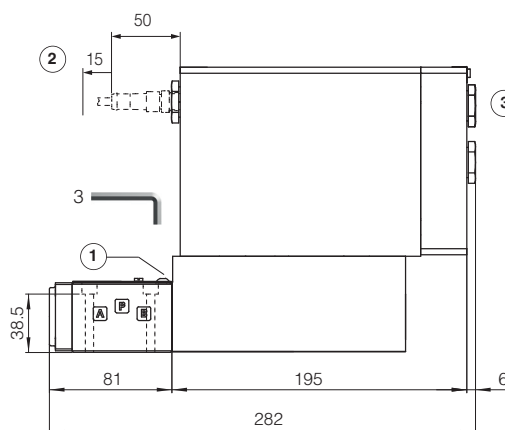
Mounting surface: 4401-03-02-0-05 (see table P005)

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

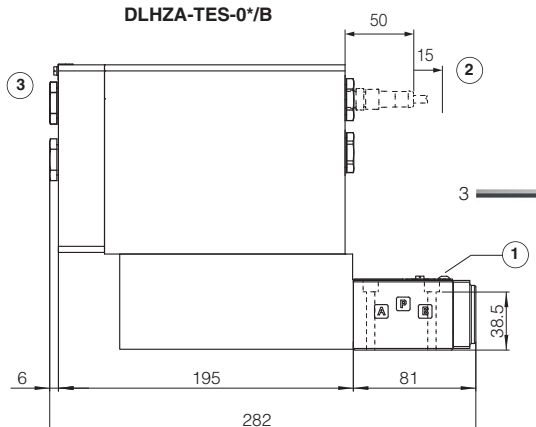
Mass [kg]	
DLHZA-TES	7,2



DLHZA-TES-0*



DLHZA-TES-0*/B



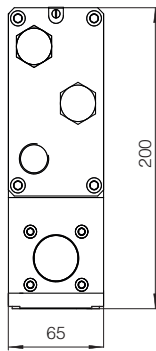
- ① = Air bleed off
- ② = Space to remove the connectors
- ③ = The dimensions of cable glands must be considered (see tech table **KX800**)

DLKZA-TES

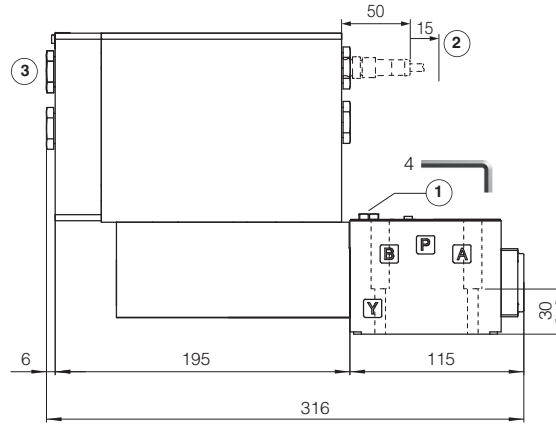
ISO 4401: 2000

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

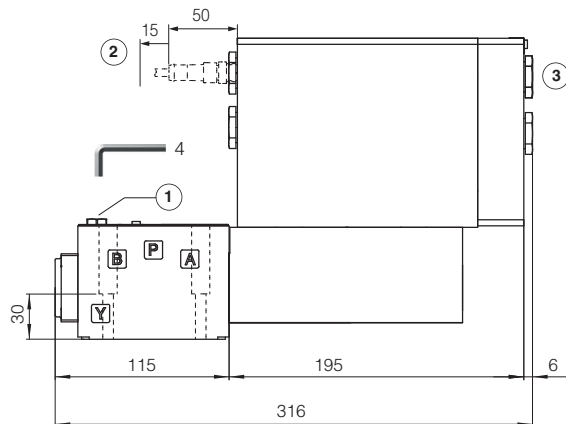
Mass [kg]	
DLKZA-TES	9



DLKZA-TES-1*



DLKZA-TES-1*/B



- ① = Air bleed off
- ② = Space to remove the connectors
- 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	KX800	Cable glands for ex-proof valves
FX610	Ex-proof servoproportionals with on-board axis card	P005	Mounting surfaces for electrohydraulic valves
FX900	Operating and maintenance information for ex-proof proportional valves		