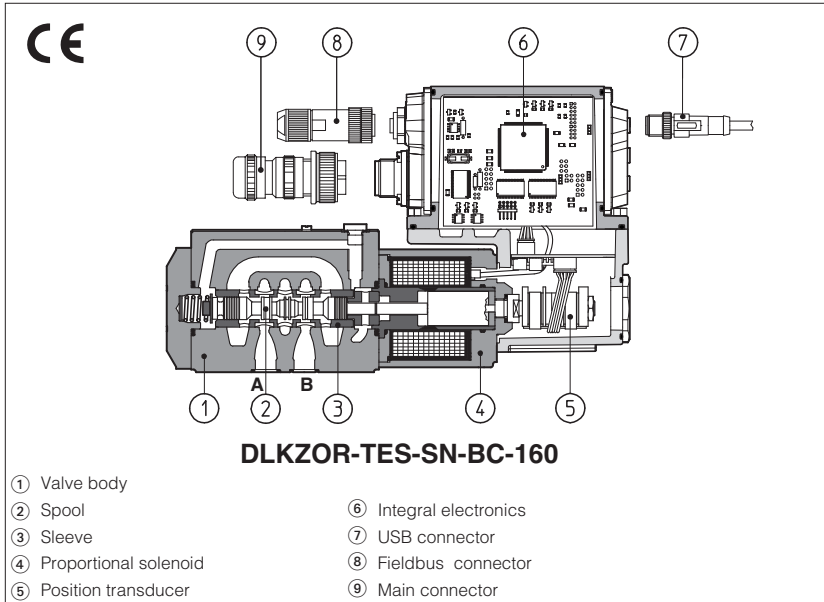**www.atos.com**

Servoproportional directional valves in sleeve execution

digital,direct operated, with position transducer and **zero spool overlap with fail safe**, rugged design

DLKZOR-TES-SN-BC-160

① Valve body
② Spool
③ Sleeve
④ Proportional solenoid
⑤ Position transducer
⑥ Integral electronics
⑦ USB connector
⑧ Fieldbus connector
⑨ Main connector

DLHZO-TEB, DLHZO-TES
DLKZOR-TEB, DLKZOR-TES
Servoproportional direct operated digital proportional valves in sleeve execution with position transducer and zero spool overlap for best performances in any position closed loop control.
The integral digital electronic driver performs the valve's hydraulic regulation according to the reference signal and assures valve-to-valve interchangeability thanks to the factory presetting.
They are available in TEB basic execution with analog reference signals and USB port for software functional parameters setting or in TES full execution which includes also optional alternated P/Q controls and fieldbus interfaces for functional parameters setting, reference signals and real-time diagnostics.
Digital TEZ (see tech. table FS230) version integrates the closed loop axis control functions, while TEB and TES versions can be used in combination with remote Z-ME-KZ digital axis controller (see tech. table G340).

Size: **06** and **10**
Max flow: **70** and **160 l/min**
Max pressure: **350 bar** (DLHZO)
                     315 bar (DLKZOR)

1 MODEL CODE for STANDARD SPOOLS

DLHZO - **T** **ES** - **SN** - **NP** - **0** **40** - **L** **7** **3** ┃ ***** / ****** / *****

DLHZO = size 06
DLKZOR = size 10

T = closed-loop
one LVDT transducer

Integral digital drivers:
EB = basic **(1)**
ES = full

Alternated P/Q controls, see section ④:
SN = none **(1)**
SP = pressure control (1 pressure tranducer)
SF = force control (2 pressure tranducers)
SL = force control (1 load cell)

Fieldbus interfaces USB port always present:
NP = Not present **(1)**   **EW** = POWERLINK
BC = CANopen   **EH** = EtherCAT
BP = PROFIBUS DP   **EI** = EtherNet/IP

Valve size ISO 4401:   **0** = 06   **1** = 10

Configuration:

Standard   Option **/B**

40 =
with fail safe configuration 1 or 3

60 =
without fail safe

Spool type - regulating characteristics:

L = linear   **V** = progressive   **T** = not linear **(2)**

D = differential-linear **(2)**
P-A = Q,   B-T = Q/2
P-B = Q/2, A-T = Q

DT = differential-not linear **(2)**
P-A = Q,   B-T = Q/2
P-B = Q/2, A-T = Q

Seals material,
see sect. ⑥, ⑦:
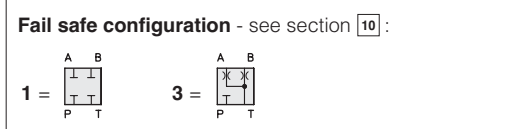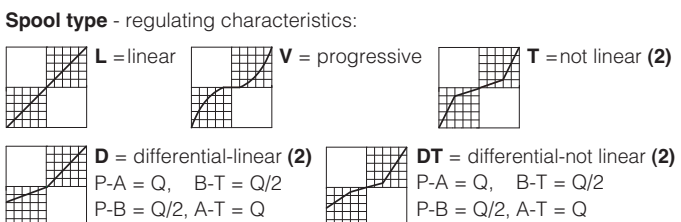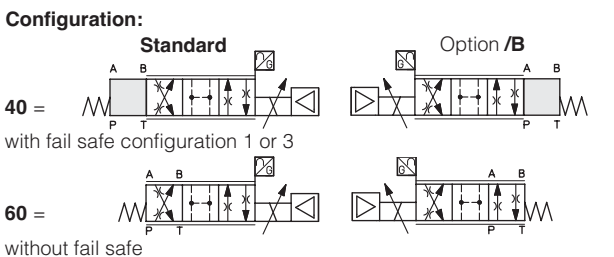
- = NBR
PE = FKM
BT = HNBR

Series number

Hydraulic options, see section ⑪:
B = solenoid, integral electronics and position transducer at side of port A **(3)**
Y = external drain

Electronic options, see section ⑫:
I = current reference input and monitor 4÷20 mA (omit for standard voltage reference input and monitor ±10 V)

Only for **SN (4)**:
F = fault signal
Q = enable signal
Z = double power supply **(5)**, enable, fault and monitor signals - 12 pin connector

Only for **SP, SF, SL**:
C = current feedback for remote transducer(s)

Fail safe configuration - see section ⑩ :

1 =   **3** =

Spool size:	**0** (L)	**1** (L)	**1** (V)	**3** (L)	**3** (V)	**5** (L,T)	**7** (L,T,V,D,DT)
DLHZO =	4	7	8	14	20	28	40
DLKZOR =	-	-	-	60	-	-	100

Nominal flow (l/min) at Δp 70bar P-T

(1) TEB available only in version **SN-NP**
(2) Only for configuration **40**
(3) In standard configuration the solenoid with integral electronics and position transducer are at side A of main stage (side B of pilot valve)
(4) F, Q, Z options are standard for **SP, SF, SL**   **(5)** double power supply only for **TES**

FS180

2 GENERAL NOTES

DLHZO-TES, TEB and DLKZOR-TES, TEB proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the installation notes supplied with relevant components. The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, or components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

3 AXIS CONTROLLER

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. S* option add alternated P/Q control to the basic position ones.
For detailed information about integral axis controller see tech table **FS230**.
Atos also supply complete servoactuators integrating servocylinder, digital servoproportional valve and axis controller, fully assembled and tested. For more information consult Atos Technical Office.

4 ALTERNATED P/Q CONTROLS - only for TES

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). Main 12 pin connector is the same as /Z option plus two analog signals specific for the pressure (force) control.
For detailed information and connector wiring of options SP, SF, SL see tech table **GS212**.

5 FIELDBUS - only for TES

Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector. For detailed information about fieldbus features and specification see tech table **GS510**.

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

Assembly position	Any position
Subplate surface finishing	Roughness index, Ra 0,4 flatness ratio 0,01/100 (ISO 1101)
MTTFd values according to EN ISO 13849	150 years, see technical table P007
Ambient temperature range	**standard** = -20°C ÷ +60°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Coil resistance R at 20°C	DLHZO = 3 ÷ 3,3 Ω DLKZOR = 3,8 ÷ 4,1 Ω
Max. solenoid current	DLHZO = 2,6 A DLKZOR = 3 A
Max. power	50 Watt
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
Protection degree to DIN EN60529	IP66/67 with mating connectors
Tropicalization	Tropical coating on electronics PCB
Duty factor	Continuous rating (ED=100%)
EMC, climate and mechanical load	See technical table G004
Communication interface	USB Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158	EtherCAT, POWERLINK EtherNet/IP IEC 61158
Communication physical layer	not insulated USB 2.0 + USB OTG	optical insulated CAN ISO11898	optical insulated RS485	Fast Ethernet, insulated 100 Base TX

Valve model		DLHZO-T*												DLKZOR-T*					
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	L7	T7	V7	D7	DT7
Max flow **(1)** — Δp P-T	at Δp = 30 bar [l/min]	2,5	4,5	5	9	13	18		26			26÷13		40	60			60÷33	
	at Δp = 70 bar	4	7	8	14	20	28		40			40÷20		60	100			100÷50	
	max permissible flow	8	14	16	30	40	50		70			70÷40		90	160			160÷80	
Leakage [cm³/min] at P = 100 bar **(2)**		<100	<200	<100	<300	<150	<500	<200	<900	<200	<200	<700	<200	<1000	<1500	<400	<400	<1200	<400
Response time **(3)** [ms]		≤ 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																	

Notes:
Above performance data refer to valves coupled with Atos electronic drivers, see sections 8.
(1) For different Δp, the max flow is in accordance to the diagrams in section 9.2
(2) Referred to spool in neutral position and 50°C oil temperature.
(3) 0-100% step signal

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

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

8 **ELECTRONIC DRIVERS**

Valve model	**TEB**	**TES**	**TES-SP, SF, SL**	**TEZ**
Drivers model	E-RI-TEB-N	E-RI-TES-N	E-RI-TES-S	E-RI-TEZ
Type	Digital			
Format	Integral to valve			
Data sheet	GS208	GS210	GS212	FS230

Note: for main and communication connectors see sections 14 , 15

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

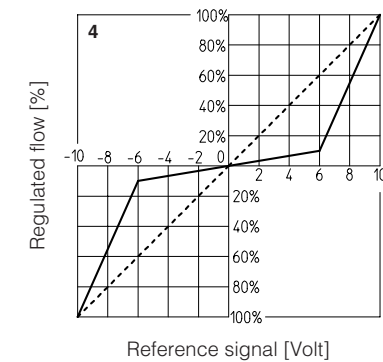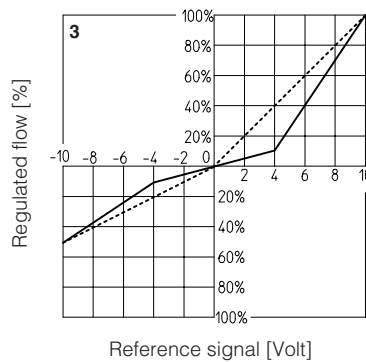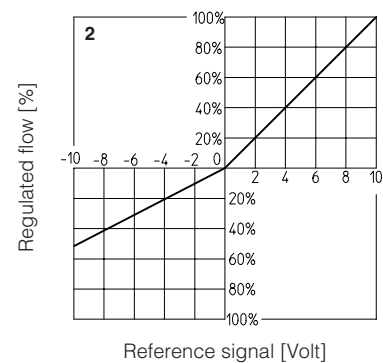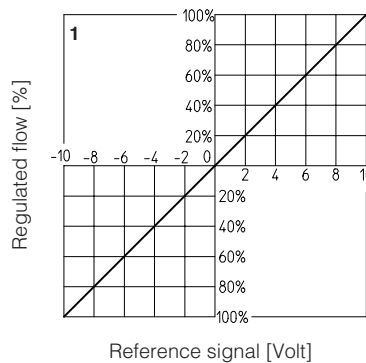### 9.1 Regulation diagrams

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

3 = Differential non linear spool DT7
4 = Non linear spool T5 (only for DLHZO)

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:
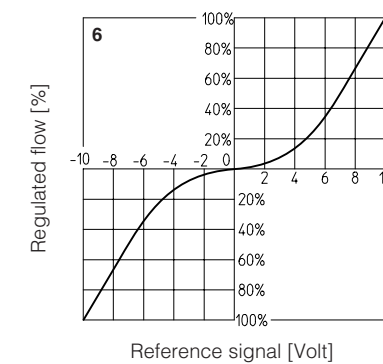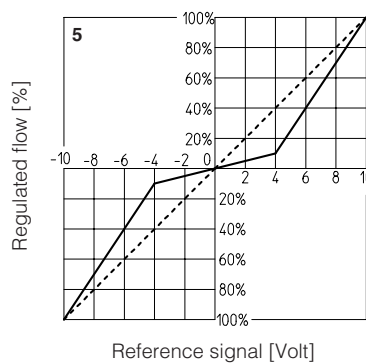Hydraulic configuration vs. reference signal:
Standard:
Reference signal $\left. \begin{array}{l} 0 \div +10\ V \\ 12 \div 20\ mA \end{array} \right\}$ P → A / B → T

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

option /B:
Reference signal $\left. \begin{array}{l} 0 \div +10\ V \\ 12 \div 20\ mA \end{array} \right\}$ P → B / A → T

Reference signal $\left. \begin{array}{l} 0 \div -10\ V \\ 12 \div 4\ mA \end{array} \right\}$ P → A / B → T
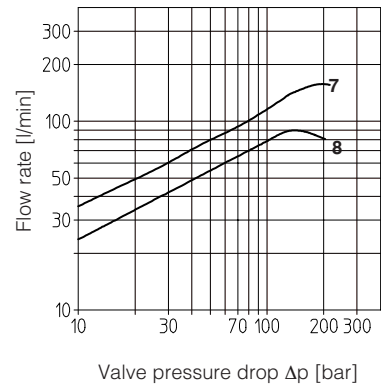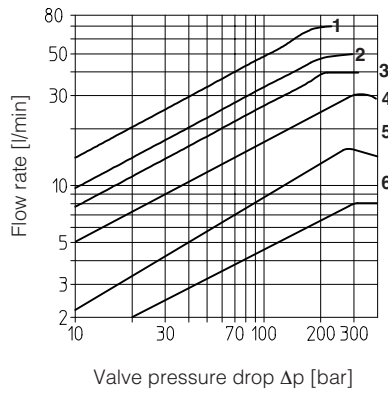
9.2 Flow /Δp diagrams
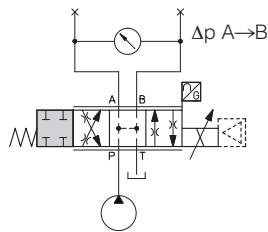Stated at 100% of spool stroke

DLHZO:
1 = spool L7, T7, V7, D7, DT7
2 = spool L5, T5
3 = spool V3
4 = spool L3
5 = spool L1, V1
6 = spool L0

DLKZOR:
7 = spool L7, T7, V7, D7, DT7
8 = spool L3

Flow rate [l/min]

Valve pressure drop Δp [bar]

Flow rate [l/min]

Valve pressure drop Δp [bar]

9.3 Pressure gain

Δp A→B

Δp A→B [%P]

Spool stroke [%]

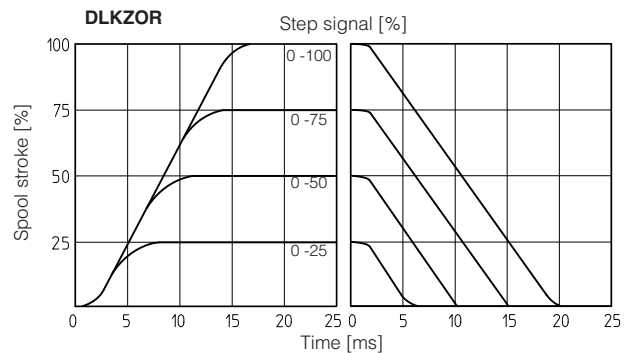### 9.4 Response time
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

DLHZO

Step signal [%]

Spool stroke [%]

0 -100
0 -75
0 -50
0 -25

Time [ms]

DLKZOR

Step signal [%]

Spool stroke [%]

0 -100
0 -75
0 -50
0 -25

Time [ms]

9.5 Bode diagrams
Stated at nominal hydraulic conditions

DLHZO:
1 = ± 100% nominal stroke
2 = ±   5% nominal stroke

DLKZOR:
3 = ± 100% nominal stroke
4 = ±   5% nominal stroke

Amplitude ratio [dB]

Phase [degree]

Frequency [Hz]

Amplitude ratio [dB]

Phase [degree]

Frequency [Hz]

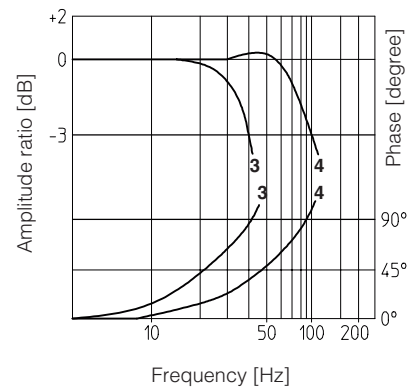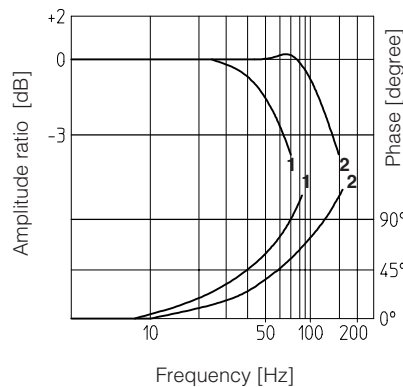| CONFIGURATION	LINEAR	NOT LINEAR
fail safe **1** fail safe **3** without fail safe	**t** = 7-10 ms (DLHZO) **t** = 15-20 ms (DLKZOR) mechanical stop / fail safe / regulation range	**t** = 7-10 ms (DLHZO) **t** = 15-20 ms (DLKZOR) mechanical stop / fail safe / regulation range

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

 mechanical stop / regulation range

 mechanical stop / regulation range

Fail safe connections		$P \rightarrow A$	$P \rightarrow B$	$A \rightarrow T$	$B \rightarrow T$
Leakage [cm³/min] at P = 100 bar **(1)**	Fail safe 1	50	70	70	50
	Fail safe 3	50	70	-	-
Flow [l/min] **(2)** DLHZO / DLKZOR	Fail safe 3	-	-	15÷30	10÷20
		-	-	40÷60	25÷40

Notes:
(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

11 | **HYDRAULIC OPTIONS**

11.1 Option /B
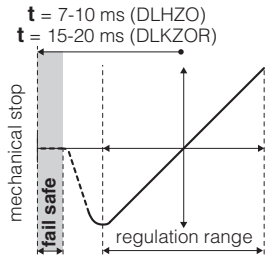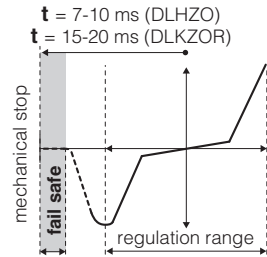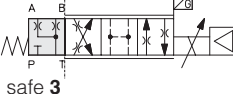Solenoid, integral electronics and position transducer at side of port A of the main stage. For hydraulic configuration vs reference signal, see section 9.1
11.2 Option /Y
Option /Y is mandatory if the pressure in port T exceeds 160 bar.

12 | **ELECTRONIC OPTIONS**

Standard driver execution provides on the 7 pin main connector:

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

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

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

Note: a minimum booting time between 400 and 800 ms has be considered from the driver energizing with the 24 VDC power supply before the valve has been ready to operate. During this time the current to the valve coils is switched to zero.

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

12.2 Option /I
It provides 4 ÷ 20 mA current reference and monitor signals, instead of the standard ±10 V.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 V or ±20 mA.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

12.3 Option /Q
To enable the driver, supply 24 VDC on pin C referred to pin B: 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 maintain active the communication and the other driver functions when the valve has to be disabled. This condition does not comply with European Norms EN13849-1 (ex EN954-1).

12.4 Option /Z
It provides, on the 12 pin main connector, the following additional features:
Enable Input Signal
To enable the driver, supply 24 VDC on pin 3 referred to pin 2: 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 maintain active the communication and the other driver functions when the valve has to be disabled. This condition does not comply with European Norms EN13849-1 (ex EN954-1).
Fault Output Signal
Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷20mA input, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC (pin 11 referred to pin 2): Fault status is not affected by the Enable input signal
Power supply for driver's logics and communication - only for **TES**
Separate power supply (pin 9,10) allow to cut solenoid power supply (pin 1,2) while maintaining active diagnostics, USB and fieldbus communication. A safety fuse is required in series to each driver power supply: 500 mA fast fuse.

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

12.6 Possible combined options
For SN: **/FI, /IQ** and **/IZ**
For SP, SF, SL: **/CI**

13 ELECTRONIC CONNECTIONS AND LEDS

13.1 Main connector signals - 7 pin - standard, /F and /Q options (A1)

PIN	Standard	/Q	/F	TECHNICAL SPECIFICATIONS	NOTES
A	V+			Power supply 24 V_{DC} Rectified and filtered: V_{RMS} = 20 ÷ 32 V_{MAX} (ripple max 10 % V_{PP})	Input - power supply
B	V0			Power supply 0 V_{DC}	Gnd - power supply
C	AGND		AGND	Analog ground	Gnd - analog signal
C		ENABLE		Enable (24 V_{DC}) or disable (0 V_{DC}) the valve, referred to V0	Input - on/off signal
D	Q_INPUT+			Flow reference input signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
E	INPUT-			Negative reference input signal for Q_INPUT+	Input - analog signal
F	Q_MONITOR referred to: AGND	V0		Flow monitor output signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
F			FAULT	Fault (0 V_{DC}) or normal working (24 V_{DC})	Output - on/off signal
G	EARTH			Internally connected to the driver housing	

13.2 Main connector signals - 12 pin - /Z option and SP, SF, SL (A2)

PIN	TEB-SN /Z	TES-SN /Z	TES-SP, SF, SL Fieldbus	NP	TECHNICAL SPECIFICATIONS	NOTES
1	V+				Power supply 24 V_{DC} Rectified and filtered: V_{RMS} = 20 ÷ 32 V_{MAX} (ripple max 10 % V_{PP})	Input - power supply
2	V0				Power supply 0 V_{DC}	Gnd - power supply
3	ENABLE referred to: V0	VL0	VL0	V0	Enable (24 V_{DC}) or disable (0 V_{DC}) the valve	Input - on/off signal
4	Q_INPUT+				Flow reference input signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
5	INPUT-				Negative reference input signal for Q_INPUT+ and F_INPUT+	Input - analog signal
6	Q_MONITOR referred to: AGND	VL0	VL0	V0	Flow monitor output signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
7	AGND				Analog ground	Gnd - analog signal
7		NC			Do not connect	
7			F_INPUT+		Pressure/Force reference input signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
8	R_ENABLE				Repeat enable, output repeter signal of enable input, referred to V0	Output - on/off signal
8		NC			Do not connect	
8			F_MONITOR referred to: VL0	V0	Pressure/Force monitor output signal: ±10 V_{DC} / ±20 mA maximum range Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
9	NC				Do not connect	
9		VL+			Power supply 24 V_{DC} for driver's logic and communication	Input - power supply
9				D_IN0	Multiple pressure/force PID selection, referred to V0	Input - analog signal
10	NC				Do not connect	
10		VL0			Power supply 0 V_{DC} for driver's logic and communication	Gnd - power supply
10				D_IN1	Multiple pressure/force PID selection (not available for SF), referred to V0	Input - on/off signal
11	FAULT referred to: V0	VL0	VL0	VL0	Fault (0 V_{DC}) or normal working (24 V_{DC})	Output - on/off signal
PE	EARTH				Internally connected to the driver housing	

Note: do not disconnect VL0 before VL+ when the driver is connected to PC USB port

13.3 Communications connectors (B) - (C)

(B) USB connector - M12 - 5 pin   always present

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

(C1) (C2) BC fieldbus execution, connector - M12 - 5 pin

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	CAN_SHLD	Shield
2	not used	(C1)-(C2) pass-through connection (2)
3	CAN_GND	Signal zero data line
4	CAN_H	Bus line (high)
5	CAN_L	Bus line (low)

(C1) (C2) BP fieldbus execution, connector - M12 - 5 pin

PIN	SIGNAL	TECHNICAL SPECIFICATION (1)
1	+5V	Termination supply signal
2	LINE-A	Bus line (high)
3	DGND	Data line and termination signal zero
4	LINE-B	Bus line (low)
5	SHIELD	

(C1) (C2) EH, EW, EI fieldbus execution, connector - M12 - 4 pin

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

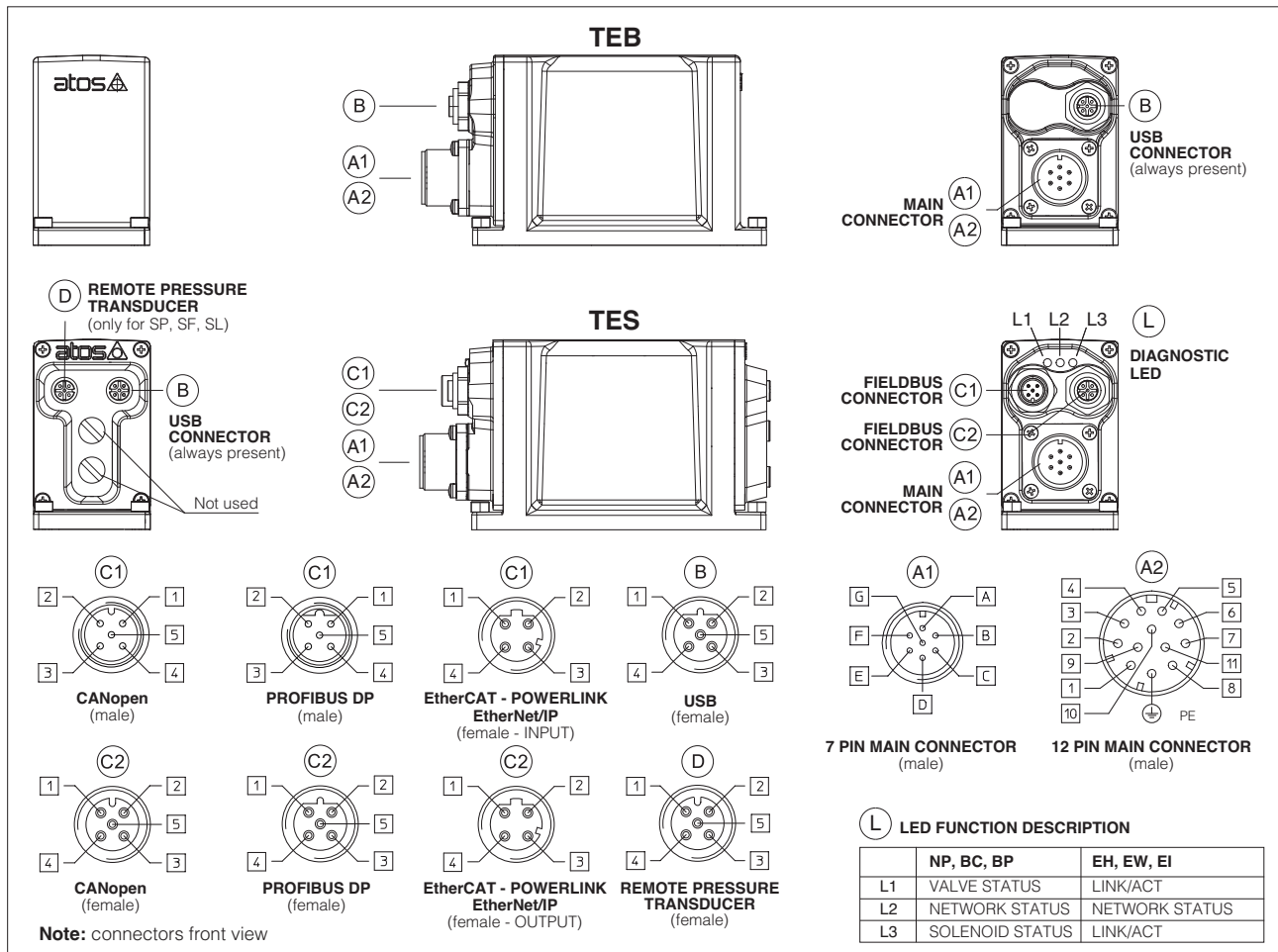**Notes: (1)** shield connection on connector's housing is recommended   **(2):** pin 2 can be fed with external +5V supply of CAN interface

13.4 Remote pressure/force transducer connector - M12 - 5 pin - only for SP, SF, SL (D)

PIN	SIGNAL	TECHNICAL SPECIFICATION	Single transducer (1) Voltage	Current	Double transducers (1) Voltage	Current
1	VF +24V	Power supply +24V_{DC}	Connect	Connect	Connect	Connect
2	TR1	1st signal transducer: ±10 V_{DC} / ±20 mA maximum range, software selectable Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /C option	Connect	Connect	Connect	Connect
3	AGND	Common GND for transducer power and signals	Connect	/	Connect	/
4	TR2	2nd signal transducer: ±10 V_{DC} / ±20 mA maximum range, software selectable Defaults are ±10 V_{DC} for standard and 4 ÷ 20 mA for /C option	/	/	Connect	Connect
5	NC	Not connect	/	/	/	/

Note (1) single/double transducer configuration is software selectable

13.5 Connections layout

TEB

B —

A1
A2

USB CONNECTOR (always present)

MAIN CONNECTOR A1 A2

D — REMOTE PRESSURE TRANSDUCER (only for SP, SF, SL)

B — USB CONNECTOR (always present)

Not used

TES

C1
C2
A1
A2

L1 L2 L3 L
DIAGNOSTIC LED

FIELDBUS CONNECTOR C1
FIELDBUS CONNECTOR C2
MAIN CONNECTOR A1 A2

C1 — CANopen (male)
C1 — PROFIBUS DP (male)
C1 — EtherCAT - POWERLINK EtherNet/IP (female - INPUT)
B — USB (female)
A1 — 7 PIN MAIN CONNECTOR (male)
A2 — 12 PIN MAIN CONNECTOR (male)

C2 — CANopen (female)
C2 — PROFIBUS DP (female)
C2 — EtherCAT - POWERLINK EtherNet/IP (female - OUTPUT)
D — REMOTE PRESSURE TRANSDUCER (female)

L — LED FUNCTION DESCRIPTION

	NP, BC, BP	EH, EW, EI
L1	VALVE STATUS	LINK/ACT
L2	NETWORK STATUS	NETWORK STATUS
L3	SOLENOID STATUS	LINK/ACT

Note: connectors front view

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14 CONNECTORS

ZM-7P PG11 7 pin (Metallic) A1 ~60

ZM-12P PG13,5 12 pin (Metallic) A2 ~93

ZH-7P PG11 7 pin (Plastic) A3 ~76

ZH-12P PG16 12 pin (Plastic) A4 ~100

ZM-5PF C1 ~58
ZM-5PF/BP C1 ~58
ZM-4PM/E C1 C2 ~61

ZM-5PM C2 ~62
ZM-5PM/BP C2 ~62

MAIN CONNECTORS
FIELDBUS CONNECTORS

TEB
TES

E-C-SB-USB/M12 USB CABLE cable lenght 4 m B ~47

ZH-5PM/1.5 SINGLE PRESSURE/FORCE TRANSDUCER cable lenght 1,5m D1 ~47

ZH-5PM-2/2 DOUBLE PRESSURE TRANSDUCER cable lenght 2m D2 ~47

Note: the use of metallic connectors is strongly recommended to meet EMC performance

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

VALVE VERSION	TEB TES	TEB /Z TES /Z	BC - CANopen	BP - PROFIBUS DP	EH - EtherCat EW - POWERLINK EI - EtherNet/IP	P/Q controls SP, SL, SF
CONNECTOR CODE	ZM-7P (A1)	ZM-12P (A2)	ZM-5PF (C1)	ZM-5PF/BP (C1)	ZM-4PM/E (C1)	ZH-5PM/1.5 (1) (D1)
	ZH-7P (A3)	ZH-12P (A4)	ZM-5PM (C2)	ZM-5PM/BP (C2)	ZM-4PM/E (C2)	ZH-5PM-2/2 (2) (D2)
PROTECTION DEGREE	IP67					
DATA SHEET	GS208, GS210, GS212, K500					

☐ only for **TES** **(1)** only for SP or SL **(2)** only for SF

16 PROGRAMMING TOOLS - see table GS500

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver. 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:

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)

E-SW-*/PQ   support: valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)

WARNING: drivers USB port is not isolated!
The use of isolator adapter is highly recommended for PC protection (see table **GS500**)

USB connection

TES
TEB
E-C-SB-USB/M12 cable
E-A-SB-USB/OPT isolator

17 INSTALLATION DIMENSIONS [mm]

DLHZO-TEB, DLHZO-TES

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05 (see table P005)
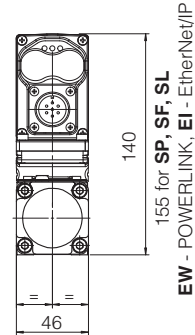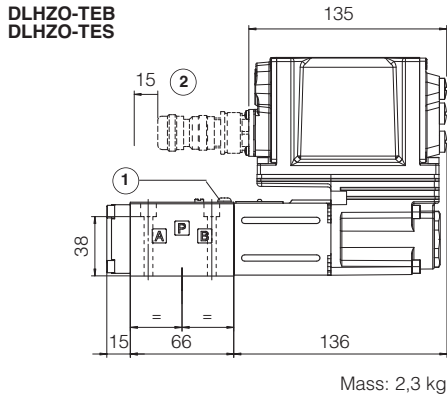**(for /Y surface 4401-03-03-0-05 without X port)**

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

DLHZO-TEB
DLHZO-TES

Mass: 2,3 kg

DLKZOR-TEB, DLKZOR-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)
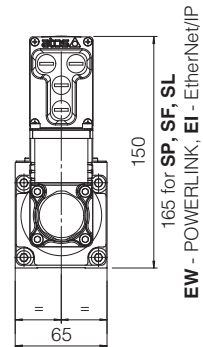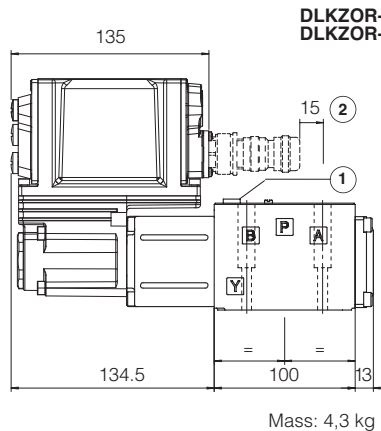
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050; 1 OR 108
Diameter of ports A, B, P, T: Ø 11,2 mm (max)
Diameter of port Y: Ø = 5 mm (only for /Y option)

DLKZOR-TEB
DLKZOR-TES

Mass: 4,3 kg

(1) = Air bleed off

(2) = Space to remove the 7 or 12 pin main connector. For main and communication connectors see section 14, 15

Note: for option /B the solenoid, the position transducer and the integral electronics are at side of port A