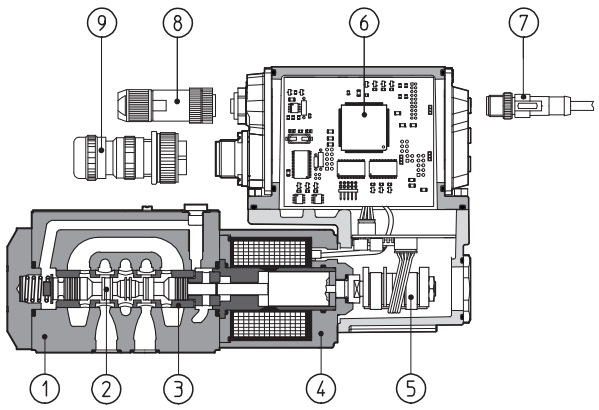
Servoproportional directional valves in sleeve execution

direct operated, with position transducer and zero spool overlap with fail safe



DLKZOR-TES-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-T*; DLKZOR-T*

Servoproportional valves in sleeve execution with position transducer and zero spool overlap for best performances in any position closed loop control, thanks to their high dynamic response.

Digital TEZ version integrates the closed loop axis control functions, while -T, -TE and -TES versions can be used in combination with remote Z-ME-KZ digital axis controller (see table G340).

These valves are also specifically designed to implement alternated Pressure(Force)/Flow controls - options /S* coupled with any zero overlap spool.

The 4-way spool ② is sliding into the hardened sleeve ③ with accurate zero overlap. It is directly operated by a proportional solenoids ④ and it is controlled in closed loop position by means of the LVDT transducer feedback ⑤.

The electronic driver supplies the servoproportional valve with proper current to align valve regulation to the reference signal, the integral execution ⑥ has rugged construction and grants factory presetting for valve-to-valve interchangeability.

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

1 MODEL CODE for STANDARD SPOOLS

DLHZO	-	TES	-	NP	-	0	40	-	L	7	/	3	*	/	**	/	*

DLHZO = size 06
DLKZOR = size 10

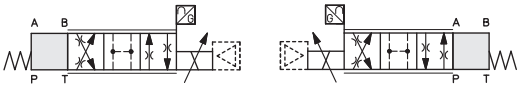
T = without integral electronics
TE = with integral analog electronics
TES = with integral digital electronics
TEZ = as TES plus digital axis controller (see table F230)

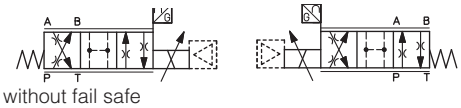
Fieldbus interfaces for TES and TEZ:
USB port always present
NP= Not present **BP** = PROFIBUS DP
BC= CANopen **EH** = EtherCAT

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


T = not linear (1)


D = differential-linear **(1)**

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

V = progressive


DT = differential-not linear (1)

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

(1) Only for configuration 40

Seals material, see sect. 5, 6:
- = NBR
PE = FKM
BT = HNBR (only for TES and TEZ)

Series number

Hydraulic options, see section 2:
B = solenoid, integral electronics and position transducer at side of port A
Y = external drain

Electronic options, see sections 9, 11:
F =fault signal
I =current reference input and monitor (4÷20 mA)
Q =enable signal
Z = **for TE execution**
enable, fault and monitor signal (12 pin connector)
Z = **for TES execution**
double power supply, enable, fault and monitor signals (12 pin connector)

Options for TES and TEZ executions
SP, SF, SL = additional closed loop pressure/ /force control, see section 12 and table G212
C = current feedback for pressure transducer(s) for options /SP, /SF, /SL

Fail safe configuration - de-energized solenoid

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

2 HYDRAULIC OPTIONS

2.1 Option /B Solenoid, integral electronics and position transducer at side of port A.
2.2 Option /Y External drain is mandatary if the pressure in port T exceeds 160 bar.

3 GENERAL NOTES

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

4 MAIN CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing	Roughness index, Ra 0,4 flatness ratio 0,01/100 (ISO 1101)
MTTFd valves to EN ISO 13849	300 years, see technical table P007
Ambient temperature range	-T execution = -20°C ÷ +70°C -TE and -TES executions = -20°C ÷ +60°C /BT option only for -TES and -TEZ executions = -40°C ÷ +60°C
Storage temperature range	Standard execution = -20°C ÷ +70°C /BT option only for -TES and -TEZ executions = -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	-T execution = 35 Watt -TE, -TES and -TEZ executions = 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	-T execution = IP65 -TE execution = IP67 -TES and -TEZ executions = IP66/67
Duty factor	Continuous rating (ED=100%)
EMC, climate and mechanical load	See technical table G004

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)**	[l/min]	2,5	4,5	5	9	13	18		26			26÷13		40	60			60÷33	
at Δp = 30 bar		4	7	8	14	20	28		40			40÷20		60	100			100÷50	
at Δp = 70 bar		8	14	16	30	40	50		70			70÷40		90	160			160÷80	
max permissible flow																			
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 **(5)**	[ms]	≤ 10												≤ 15					
Hysteresis	[%]	≤ 0,1%												≤ 0,1%					
Thermal drift		zero point displacement < 1% at ΔT = 40°C																	

Fail safe connections		**P → A**	**P → B**	**A → T**	**B → T**
Leakage [cm³/min] at P = 100 bar **(3)**	Fail safe 1	50	70	70	50
	Fail safe 3	50	70	-	-
Flow [l/min] **(4)** DLHZO	Fail safe 3	-	-	15÷30	10÷20
DLKZOR		-	-	40÷60	25÷40

Notes:
• Above performance data refer to valves coupled with Atos electronic drivers, see sections 6.
(1) For different Δp, the max flow is in accordance to the diagrams in section 7.2
(2) Referred to spool in neutral position and 50°C oil temperature.
(3) Referred to spool in fail safe position and 50°C oil temperature.
(4) Referred to spool in fail safe position at Δp = 35 bar per edge and 50°C oil temperature.
(5) 0-100% step signal

5 SEALS AND HYDRAULIC FLUIDS

Seals, recommended fluid temperature	NBR seals = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals = -20°C ÷ +80°C HNBR seals = -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	

Note: For other fluids not included in above table, consult our technical office

6 ELECTRONIC DRIVERS

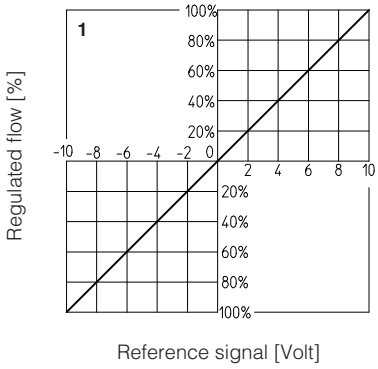
Valve model	-T	-TE	-TES	-TES / SP, SL, SF
Drivers model	E-ME-T	E-RI-TE	E-RI-TES	E-RI-TES /S*
Type	Analog		Digital	
Format	Eurocard	Integral to valve		
Data sheet	G140	G200	G210	G212

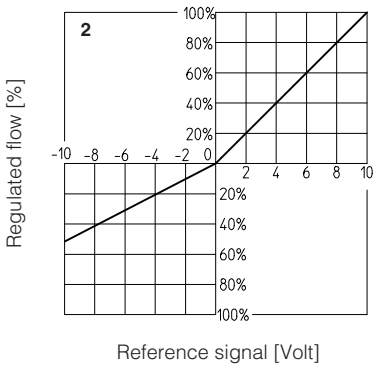
Note: for main and communication connectors see sections 14, 15

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

7.1 Regulation diagrams

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



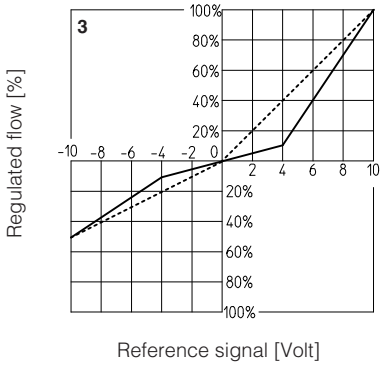


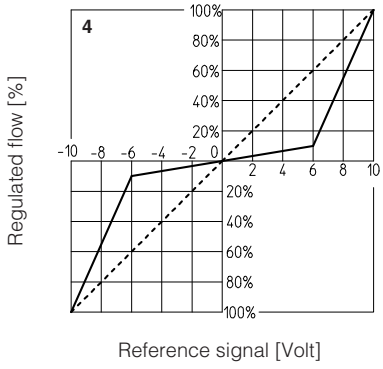
3 = Differential non linear spool DT7
4 = Non linear spool T5 (only for DLHZO)

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).

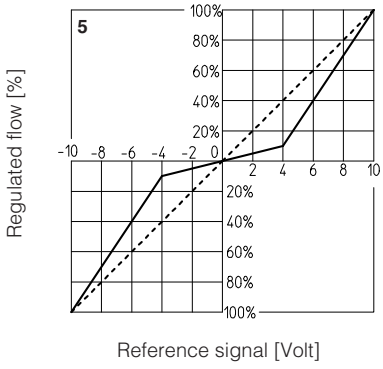
DT7 has the same characteristic of T7 but it is specific for applications with cylinders with area ratio 1:2

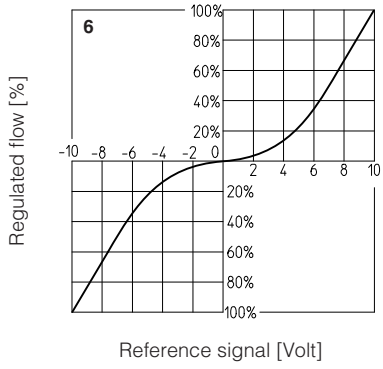




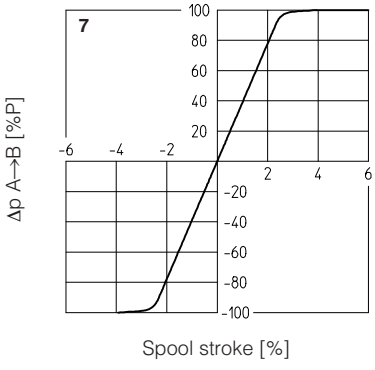
Note:
Hydraulic configuration vs. reference signal:
Standard:
Reference signal 0 ÷+10 V / 12÷20 mA } P → A / B → T
Reference signal 0 ÷-10 V / 4÷12 mA } P → B / A → T

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





7 = Pressure gain

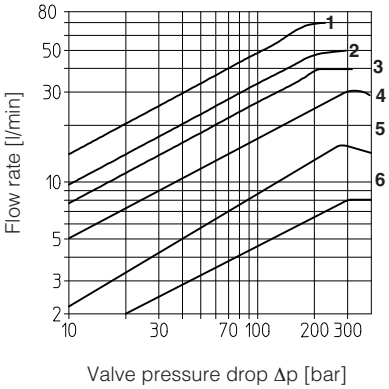


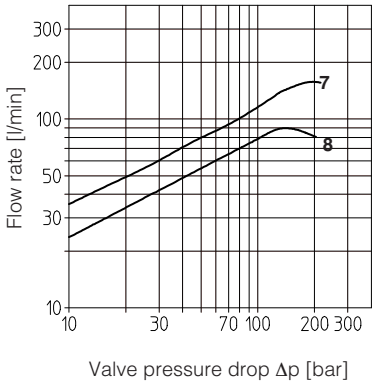
7.2 Flow /Δp diagrams

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

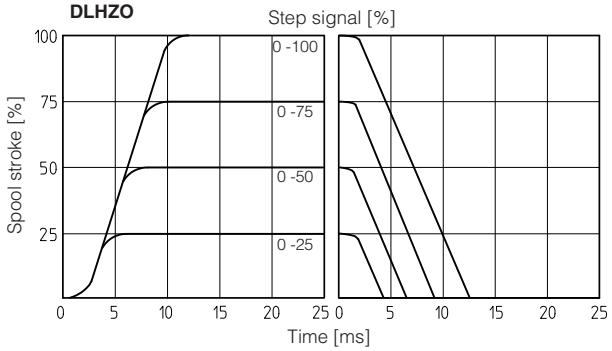
DLKZOR:
7 = spool L7, T7, V7, D7, DT7
8 = spool L3

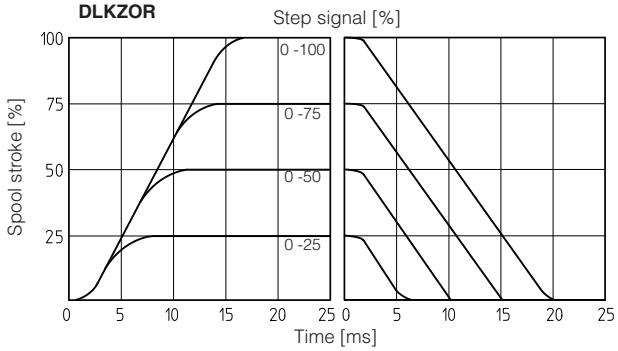




7.3 Response time

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.



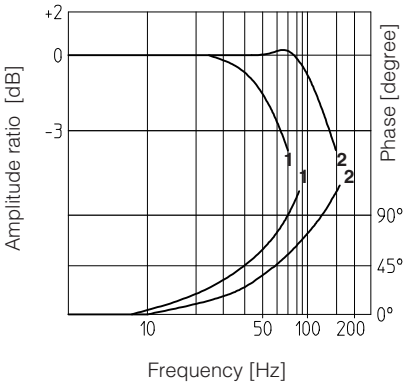


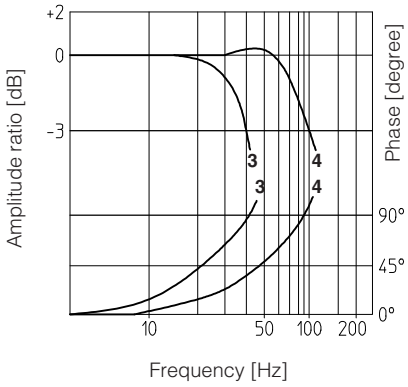
7.4 Bode diagrams

Stated at nominal hydraulic conditions

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

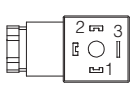
DLKZOR:
3 = ± 100% nominal stroke
4 = ± 5% nominal stroke



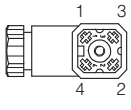


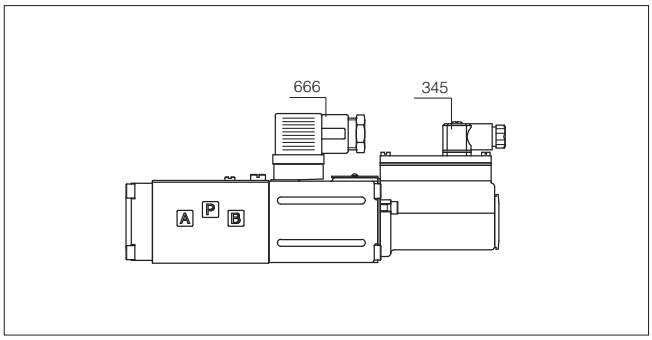
8 CONNECTIONS FOR -T EXECUTION

SOLENOID POWER SUPPLY CONNECTOR		666
PIN	Signal description	
1	SUPPLY	
2	SUPPLY	
3	GND	



POSITION TRANSDUCER CONNECTOR		345
PIN	Signal description	
1	OUTPUT SIGNAL	
2	SUPPLY -15 VDC	
3	SUPPLY +15 VDC	
4	GND	





9 ANALOG INTEGRAL DRIVERS -TE - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24 VDC must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to the 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 ±10 VDC nominal range

Following options are available to adapt standard execution to special application requirements:

9.1 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.

9.2 Option /I

It provides the 4÷20 mA current reference and monitor signals instead of the standard ±10 VDC
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.

9.3 Option /Q

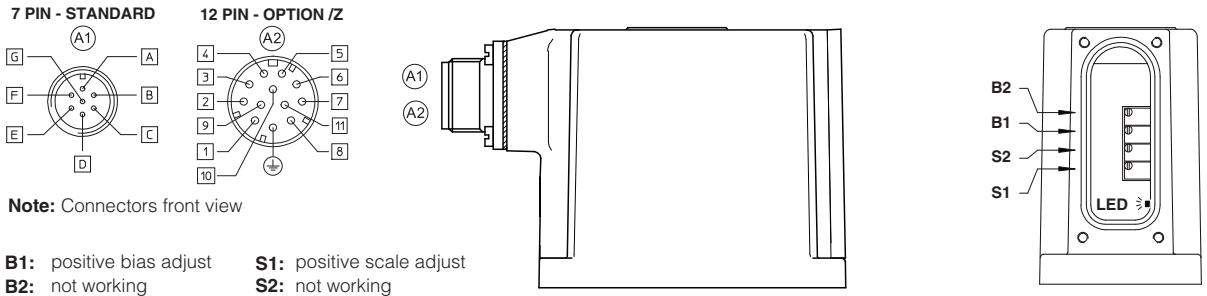
It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24 VDC on the enable input signal.

9.4 Option /Z (12 pin connector)

This option includes **/F** and **/Q** features, plus the Monitor output signal.
When the driver is disabled (0 VDC on Enable signal) Fault output is forced to 0 VDC.

9.5 Possible combined options: /FI and /IZ

10 ANALOG INTEGRAL DRIVERS -TE - ELECTRONIC CONNECTIONS



Note: Connectors front view

B1: positive bias adjust **S1:** positive scale adjust
B2: not working **S2:** not working
LED: **OFF** normal working; **ON** fault presence

SETTINGS AND LED
(remove the rear cover)

10.1 MAIN CONNECTOR - 7 pin (A1)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	V+	Power supply 24 VDC for solenoid power stage and driver logic	Input - power supply
B	V0	Power supply 0 VDC for solenoid power stage and driver logic	Gnd - power supply
C	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q option) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B	Input - on/off signal
D	INPUT+	Reference analog differential input: ±10 VDC maximum range (4 ÷ 20 mA for /I option) For single solenoid valves the reference input is 0 ÷ +10 VDC (4 ÷ 20 mA for /I option) For double solenoid valves the reference input is ±10 VDC (4 ÷ 20 mA for /I option)	Input - analog signal
E	INPUT -		
F	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
	FAULT	Fault (0 VDC) or normal working (for /F option) with /F option FAULT signal replaces MONITOR on pin F	Output - on/off signal
G	EARTH	Internally connected to the driver housing	

10.2 MAIN CONNECTOR - 12 pin (/Z option) (A2)

PIN	SIGNAL option /Z	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for solenoid power stage and driver logic	Input - power supply
2	V0	Power supply 0 VDC for solenoid power stage and driver logic	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
4	INPUT+	Reference analog differential input: ±10 VDC maximum range (4 ÷ 20 mA for /I option) For single solenoid valves the reference input is 0 ÷ +10 VDC (4 ÷ 20 mA for /I option) For double solenoid valves the reference input is ±10 VDC (4 ÷ 20 mA for /I option)	Input - analog signal
5	INPUT -		
6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
7	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
8	R_ENABLE	Repeat Enable - output repetition of Enable input	Output - on/off signal
9	NC	do not connect	Output - on/off signal
10	NC	do not connect	Output - on/off signal
11	FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
PE	EARTH	Internally connected to the driver housing	

- a minimum time of 26ms to 120ms 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 DIGITAL INTEGRAL DRIVERS -TES - OPTIONS

Standard driver execution provides on the 7 pin main connector:

Power supply - 24 VDC must be appropriately stabilized or rectified and filtered; a 2,5 A safety fuse is required in series to each driver power supply. Apply at least a 10000 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 ±10 VDC nominal range

Following options are available to adapt standard execution special to application requirements:

11.1 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.

11.2 Option /I

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

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.

11.3 Option /Q

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

11.4 Option /Z

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

Logic power supply

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

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

Enable Input Signal

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

Fault Output Signal

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

11.5 Options /SP, /SF and /SL (see table **G212**)

/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.

A dedicated connector is available for the additional transducers that are required to be interfaced to the valve's driver (1 pressure transducer for /SP, 2 pressure transducers for /SF or 1 load cell for /SL).

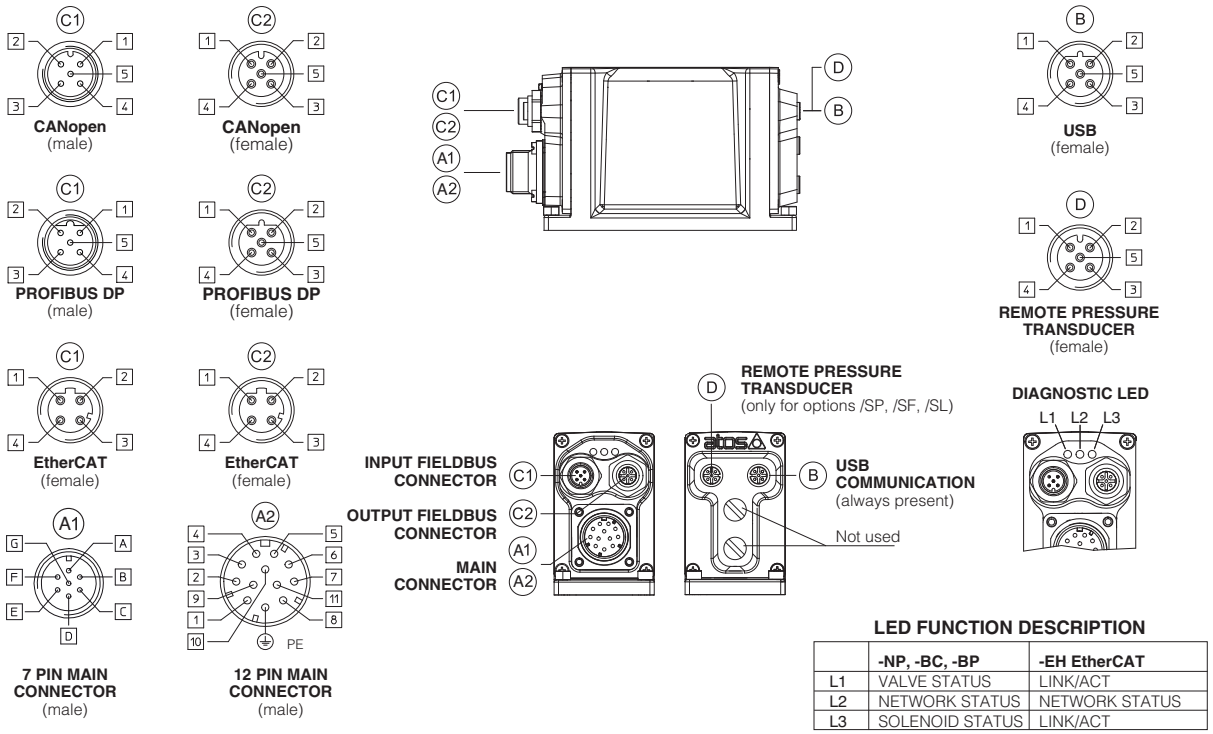
Main 12 pin connector is the same as /Z option one plus two analog signals specific for the pressure (force) control: pin 7 for reference signal and pin 8 for monitor.

11.6 Options /C

Options /CSP, /CSF and /CSL are available to connect pressure (force) transducers with 4 ÷ 20mA current output signal.

11.7 Possible combined options: /ISP, /ISF, /ISL, /CSP, /CSF, /CSL, /CISP, /CISF, /CISL, /FI, /IQ and /IZ.

12 DIGITAL INTEGRAL DRIVERS -TES - ELECTRONIC CONNECTIONS AND LEDS



LED FUNCTION DESCRIPTION

	-NP, -BC, -BP	-EH EtherCAT
L1	VALVE STATUS	LINK/ACT
L2	NETWORK STATUS	NETWORK STATUS
L3	SOLENOID STATUS	LINK/ACT

Note: connectors front view

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

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	V+	Power supply 24 VDC for solenoid, driver's logic and communication	Input - power supply
B	V0	Power supply 0 VDC for solenoid, driver's logic and communication	Gnd - power supply
C	AGND	Ground - signal zero for MONITOR signal (applying 24 VDC to AGND electronics will damaged)	Gnd - analog signal
	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q option)	Input - on/off signal
D	INPUT+	Reference analog input, differential: ±10 VDC / ±20 mA, maximum range software selectable	Input - analog signal
E	INPUT -		
F	MONITOR	Monitor analog output: ±10 VDC / ±20 mA, maximum range software selectable, referred to AGND for Standard and /F option or to V0 for /Q option	Output - analog signal
	FAULT	Driver status: Fault (0 VDC) or normal working (24 VDC) (for /F option)	Output - on/off signal
G	EARTH	Internally connected to driver housing	

12.2 MAIN CONNECTOR - 12 pin (/Z option) (A2)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for solenoid	Input - power supply
2	V0	Power supply 0 VDC for solenoid	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the controller	Input - on/off signal
4	INPUT+	Reference analog input, differential: ±10 VDC / ±20 mA, maximum range software selectable	Input - analog signal
5	INPUT-		
6	MONITOR	Monitor analog output: ±10 VDC / ±20 mA, maximum range software selectable, referred to VL0	Output - analog signal
7	NC	do not connect	
8	NC	do not connect	
9	VL+	Power supply 24 VDC for driver's logic and communication	Input - power supply
10	VL0	Power supply 0 VDC for driver's logic and communication	Gnd - power supply
11	FAULT	Driver status: Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
PE	EARTH	Internally connected to driver housing	

Note: A minimum time of 300 to 500 ms 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.

12.3 COMMUNICATION 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	NC	do not connect
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 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	

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

12.4 REMOTE PRESSURE TRANSDUCER CONNECTOR - M12 - 5 pin (D)

PIN	SIGNAL	TECHNICAL SPECIFICATION	**Single transducer** (1)	**Double transducer** (1)
1	VF +24V	Power supply +24VDC	Connect	Connect
2	TR1	1st signal transducer: ±10 VDC / ±20 mA, maximum range software selectable	Connect	Connect
3	AGND	Common GND for transducer power and signals	Connect	Connect
4	TR2	2nd signal transducer: ±10 VDC / ±20 mA, maximum range software selectable	/	Connect
5	NC	Not connect	/	/

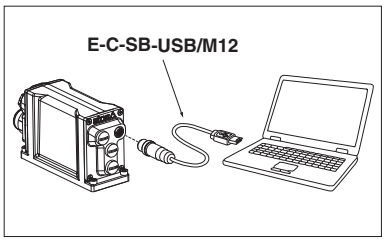
Note (1) single/double pressure transducer configuration and analog input range are software selectable

13 PROGRAMMING TOOLS (see table **G500**)

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB communication port to the digital driver. E-SW software is available in different versions according to the driver's fieldbus interface: -NP (not present) E-SW-PS, -BC (CANopen) E-SW-BC, -BP (PROFIBUS DP) E-SW-BP and -EH (EtherCAT) E-SW-EH.

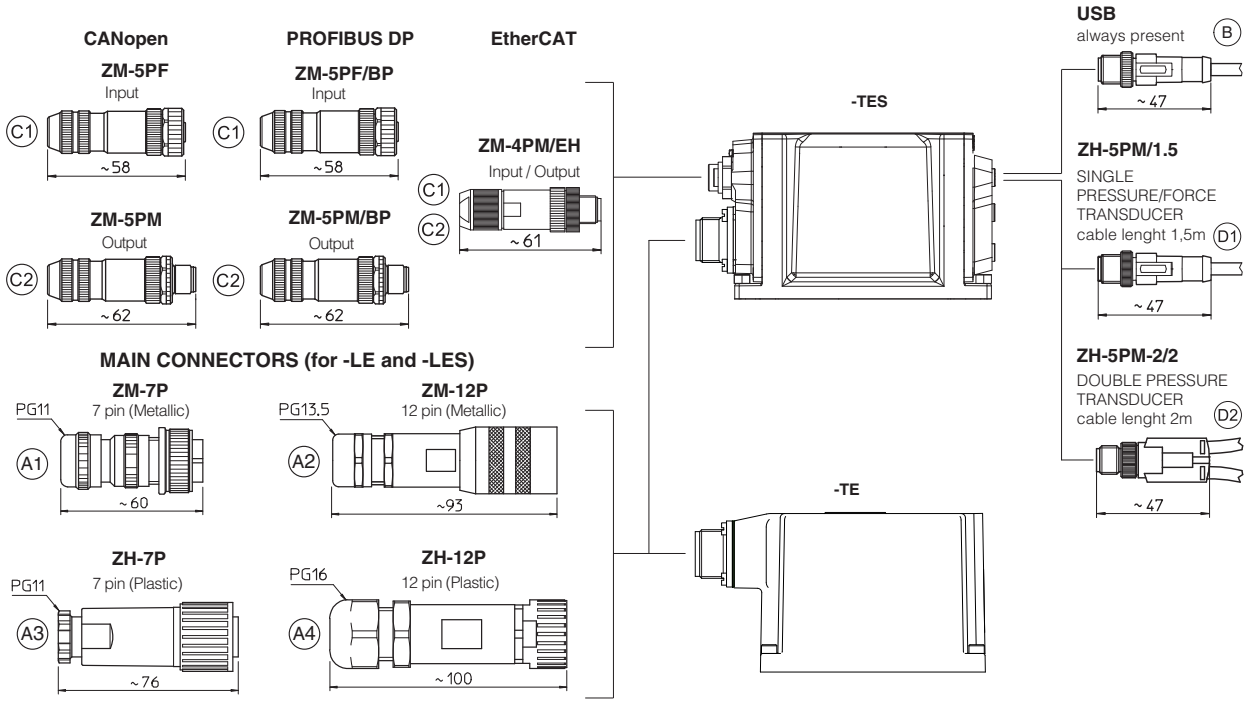
For fieldbus versions, E-SW software permits valve's parameterization through USB communication port also if the driver is connected to the central machine unit via fieldbus.

USB connection



14 CONNECTORS

FIELDBUS CONNECTORS (for -TES)



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

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

VALVE VERSION	-T		-TE, -TES	-TE /Z -TES /Z	CANopen (-BC)	PROFIBUS DP (-BP)	EtherCat (-EH)	/SP, /SL, /SF
	Power supply	Transducer						
CONNECTOR CODE	666	345	ZM-7P A1	ZM-12P A2	ZM-5PF C1	ZM-5PF/BP C1	ZM-4PM/EH C1	ZH-5PM/1.5 **(1)** D1
			ZH-7P A3	ZH-12P A4	ZM-5PM C2	ZM-5PM/BP C2	ZM-4PM/EH C2	ZH-5PM-2/2 **(2)** D2
PROTECTION DEGREE	IP65	IP67	IP67					
DATA SHEET	K500		G200, G210, G212, K500					

connectors supplied with the valve

(1) only for /SP or /SL options

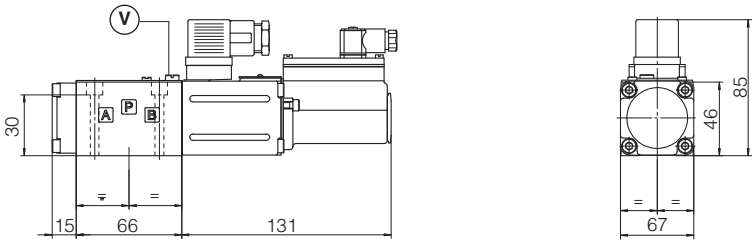
(2) only for /SF option

DLHZO-T*

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

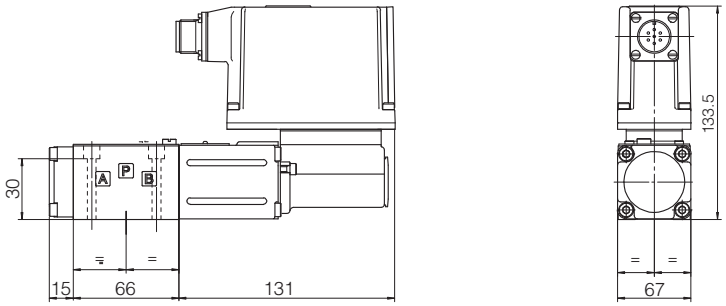
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108; 1 OR 2025/70
Diameter of ports A, B, P, T: Ø 7,5 mm (max)
Diameter of port Y: Ø 3,2 mm (only for /Y option)

DLHZO-T



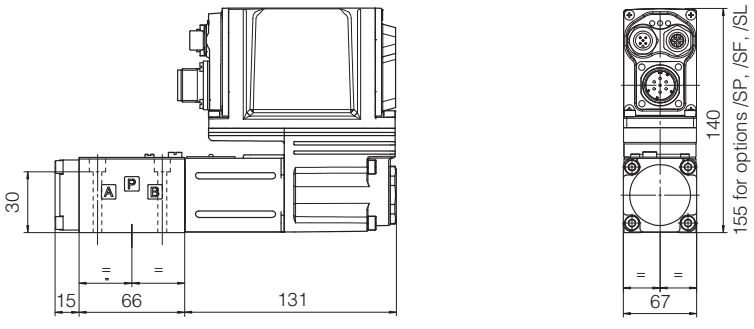
Mass: 2,3 kg

DLHZO-TE



Mass: 2,8 kg

DLHZO-TES



Mass: 2,8 kg

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

for main and communication connectors see section 14, 15

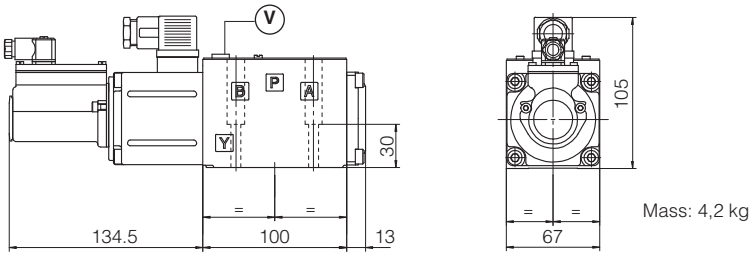
V = Air bleed off

DLKZOR-T*

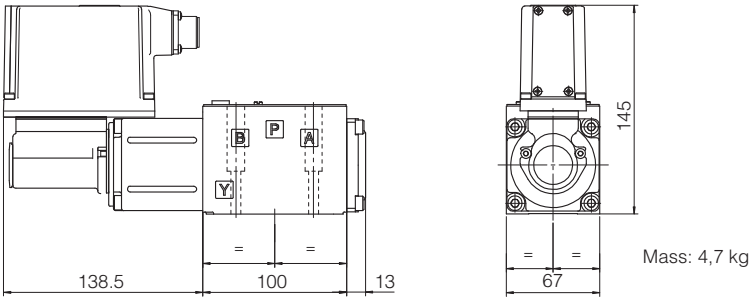
ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see table P005)
(for /Y version, surface: 4401-05-05-0-05 without X port)

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)

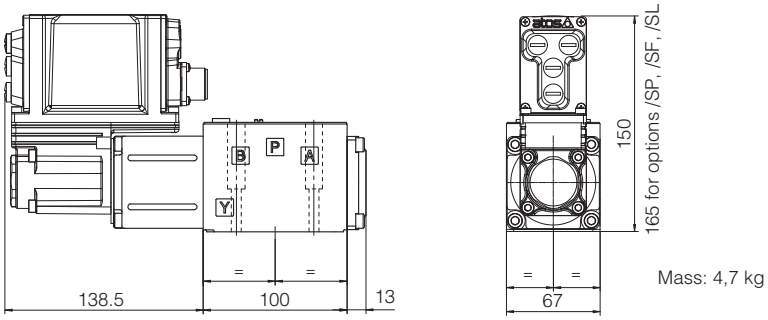
DLKZOR-T



DLKZOR-TE



DLKZOR-TES



Note: for option /B the solenoid and the position transducer are at side of port A
for main and communication connectors see section 14, 15

V = Air bleed off