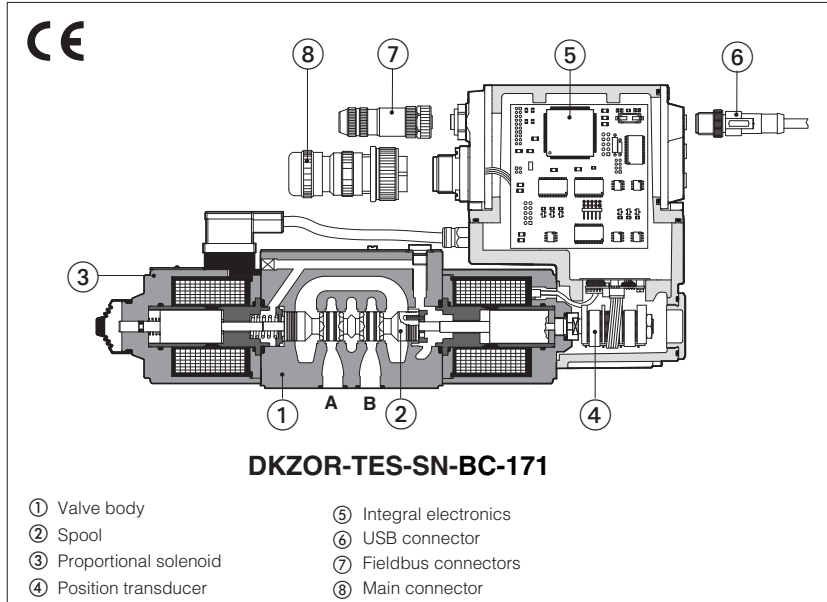


Proportional directional valves high performance

rugged digital, direct operated, with position transducer and **positive spool overlap**



DKZOR-TEB-SN-BC-171

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

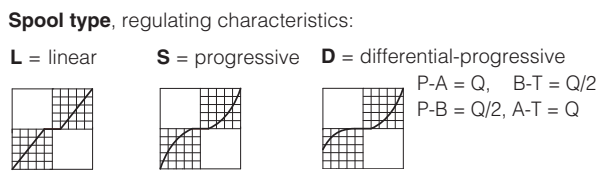
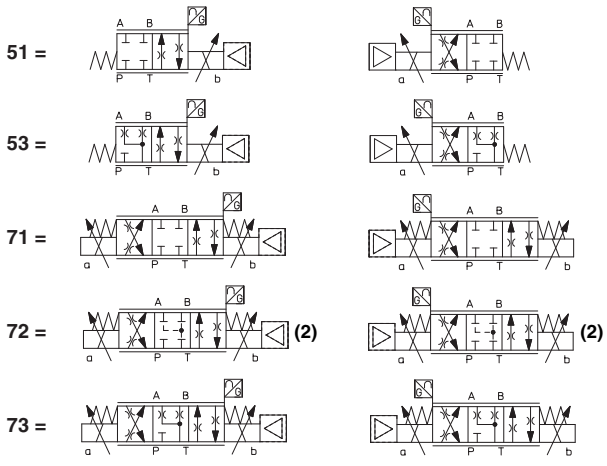
**DHZO-TEB, DHZO-TES
DKZOR-TEB, DKZOR-TES**

High performance direct operated digital proportional valves specifically designed for high speed closed loop controls. They are equipped with LVDT position transducer and positive spool overlap for best dynamics in directional controls and not compensated flow regulations. 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. High performances valves 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.

Size: **06** and **10**
 Max flow: up to **80** and **170 l/min**
 Max pressure: **350 bar** (DHZO)
315 bar (DKZOR)

1 MODEL CODE for STANDARD SPOOLS

DHZO	-	T	-	ES	-	SN	-	NP	-	0	-	71	-	L	-	5	/	*	/	*	
DHZO = size 06 DKZOR = size 10																				Seals material, see sect. 6, 7: - = NBR PE = FKM BT = HNBR	
T = closed-loop one LVDT transducer																				Series number	
Integral digital drivers: EB = basic (1) ES = full																				Hydraulic options , see section 10: B = solenoid, integral electronics and position transducer at side of port A Y = external drain	
Alternated P/Q controls , see section 4: SN = none (1) SP = pressure control (1 pressure transducer) SF = force control (2 pressure transducers) SL = force control (1 load cell)																				Electronic options , see section 11: I = current reference input and monitor 4-20 mA (omit for standard voltage reference input and monitor ±10 V)	
Fieldbus interfaces , USB port always present: NP = Not present (1) BP = PROFIBUS DP BC = CANopen EH = EtherCAT																				Only for SN (3): F = fault signal Q = enable signal Z = double power supply, enable, fault and monitor signals - 12 pin connector (4)	
Valve size, ISO 4401: 0 = 06 1 = 10																				Only for SP, SF, SL: C = current feedback for remote transducer(s)	
Configuration: Standard																				Spool size: 14 (L) 1 (L) 2 (S) 3 (L,S,D) 5 (L,S,D) DHZO = 1 4,5 8 17 28 DKZOR = - - - 45 75	



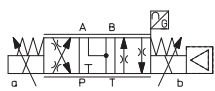
(1) TEB basic execution available only in version SN-NP
 (2) only for DKZOR
 (3) F, Q, Z options are standard for SP, SF, SL
 (4) double power supply only for TES

2 MODEL CODE for OPTIONAL SPOOLS - refer to section 1 for valve model code and options

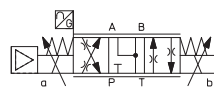
DHZO - **TES** - **SP** - **NP** - **0** **73 - V9** / * / * / *

Configuration, spool type and size:

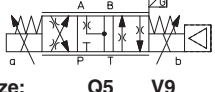
73-Q5



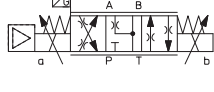
73-Q5/B



73-V9



73-V9/B



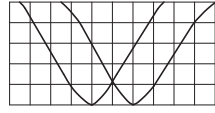
Spool size: **Q5** **V9**

DHZO = 30 30

DKZOR = 75 75

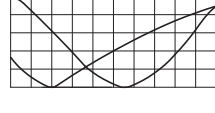
Nominal flow (l/min) at Δp 10bar P-T

Q5



For alternate P/Q control see section 9, diagram 16

V9



For alternate P/Q control of injection cycle in plastic machinery see section 9, diagram 17

3 GENERAL NOTES

DHZO-TEB, TES and DKZOR-TEB, TES 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, 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 ALTERNATED P/Q CONTROLS - only for **TES** with valve configuration **73**

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. The alternated P/Q controls are specific for valve configuration 73, optional spools type Q5 and V9 recommended, see section 2. For detailed information and connector wiring of options SP, SF, SL see tech table **GS212**.

5 FIELDBUS - only for **TES**

Fieldbus allows the direct communication of the proportional valve with machine control unit for digital reference signal, diagnostics and settings of functional parameters. Analog reference signal remain available on the main connector for quick commissioning and maintenance. 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 valves according to EN ISO 13849	150 years, see technical table P007			
Ambient temperature range	standard execution = -20°C ÷ +60°C /BT option = -40°C ÷ +60°C			
Storage temperature range	Standard execution = -20°C ÷ +70°C /BT option = -40°C ÷ +70°C			
Coil resistance R at 20°C	DHZO = 3 ÷ 3,3 Ω		DKZOR = 3,8 ÷ 4,1 Ω	
Max. solenoid current	DHZO = 2,6 A		DKZOR = 3 A	
Max. power	50 Watt			
Insulation class	H (180°) Due to the occurring surface temperatures of the solenoid coils, the European standards ISO 13732-1 and EN982 must be taken into account			
Protection degree to DIN EN60529	IP66/67			
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 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	DHZO						DKZOR		
Pressure limits [bar]	ports P, A, B = 350; T = 210 (250 with external drain /Y); Y = 10						ports P, A, B = 315; T = 210 (250 with external drain /Y); Y = 10		
Spool type	L14	L1	S2	L3,S3,D3	L5,S5,D5	Q5,V9	L3,S3,D3	L5,S5,D5	Q5,V9
Nominal flow [l/min] (1)									
$\Delta p= 10$ bar	1	4,5	8	17	28	30	45	75	75
Δp P-T $\Delta p= 30$ bar	1,7	8	14	30	50	52	80	130	130
max $\Delta p= 70$ bar	2,6	12	21	45	75	80	120	170	170
permissible flow (2)	4	18	30	50	80	80	130	180	180
Response time [ms] (0-100% step signal) (3)	≤ 15						≤ 20		
Leakage [cm³]	<30 (at p = 100 bar); <135 (at p = 350 bar)						<80 (at p = 100 bar); <600 (at p = 315 bar)		
Hysteresis	≤ 0,2 [% of max regulation]								
Repeatability	± 0,1 [% of max regulation]								
Thermal drift	zero point displacement < 1% at $\Delta T = 40^\circ C$								

Notes: above performance data refer to valves coupled with Atos electronic drivers, see section 8

- (1) for different Δp , the max flow is in accordance to the diagrams in section 9.2 (2) see detailed diagrams in section 9.3
 (3) see detailed diagrams in section 9.4

7 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 mm ² /s - max allowed range 15 ÷ 380 mm ² /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	

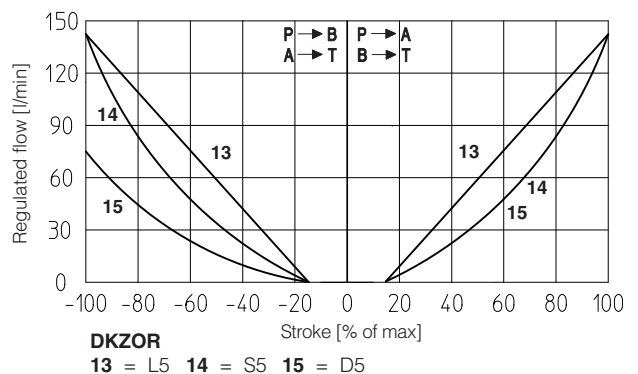
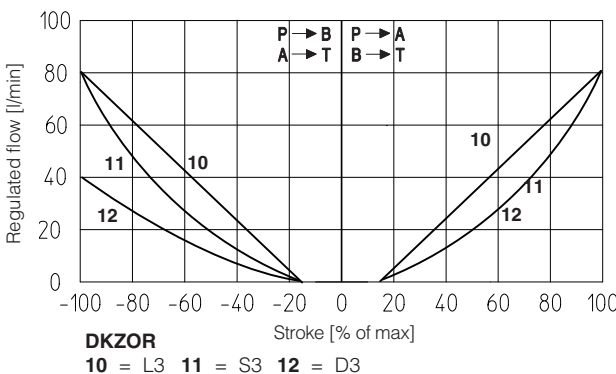
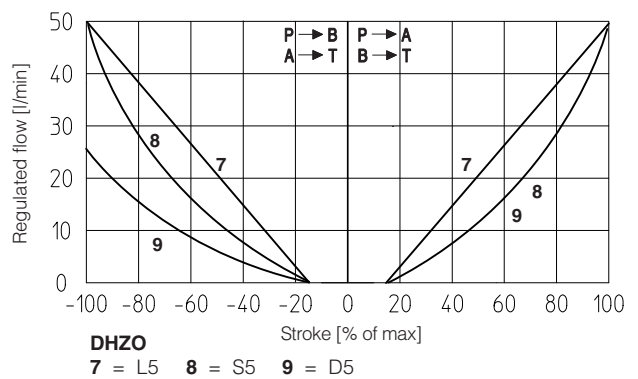
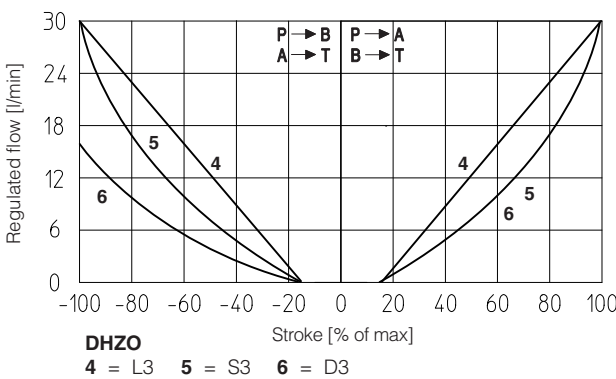
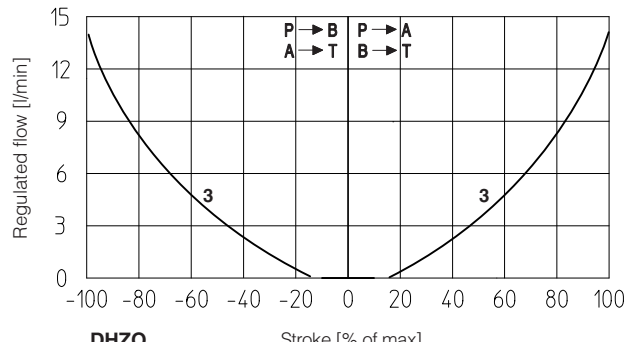
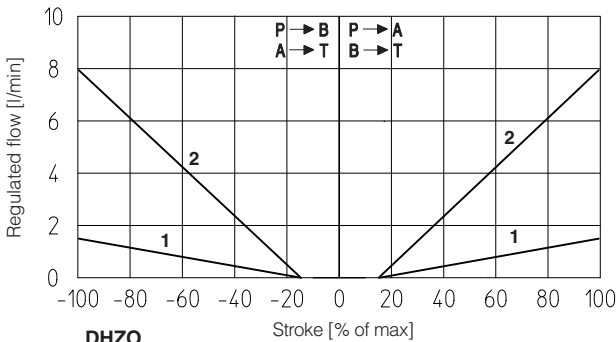
8 ELECTRONIC DRIVERS

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

Note: for main and communication connector see sections [13](#), [14](#)

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

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



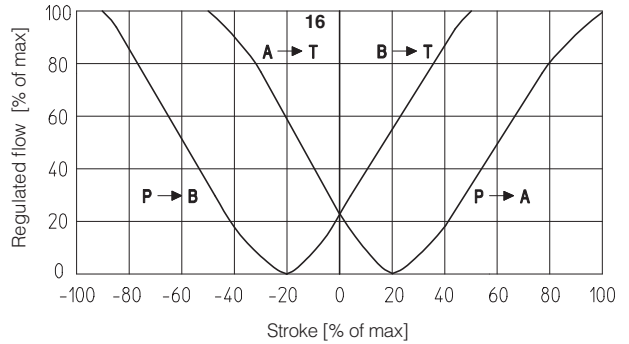
Note:

Hydraulic configuration vs. reference signal for configurations 71, 72 and 73 (standard and option /B)

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

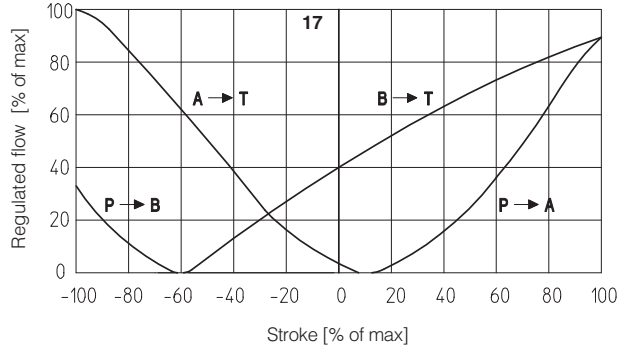
16 = linear spool Q5

Q5 spool type is specific for alternate P/Q controls in combination with S* option of digital integral drivers (see tech table **GS212**). It allows to control the pressure in A port or B port and it provides a safety central position (A-T/B-T) to depressurize the actuator chambers. The strong meter-in characteristic makes the spool suitable for both pressure control and motion regulations in several applications.



17 = differential - progressive spool V9

V9 spool type is specific for alternate P/Q controls in combination with S* option of digital integral drivers (see tech table **GS212**) or Z-ME-KZ/GI axis card (see tech table **G345**). This spool is specially designed to manage the whole injection cycle in plastic machinery, thanks to the following specific features:
 - strong meter-in characteristic to allow the pressure control in A port during the holding pressure (P-A) and the plasticizing (A-T) phases
 - safety central position (A-T/B-T) to depressurize the actuator chambers
 - large A-T and B-T flow capability, required during the plasticizing phase, to discharge big volumes from high differential injection cylinders with low pressure drops and permitting the contemporary oil suction from tank



9.2 Flow /Δp diagrams

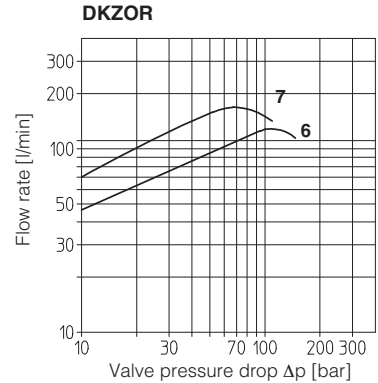
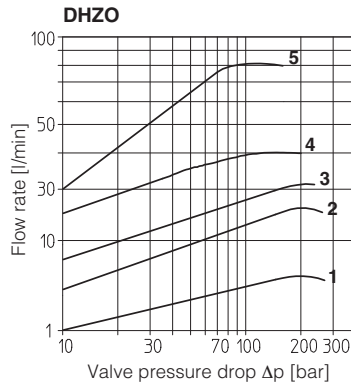
stated at 100% of valve stroke

DHZO

- 1 = spool L14
- 2 = spool L1
- 3 = spool S2
- 4 = spool L3, S3, D3
- 5 = spool L5, S5, D5, V9

DKZOR

- 6 = spool S3, L3, D3
- 7 = spool S5, L5, D5, V9



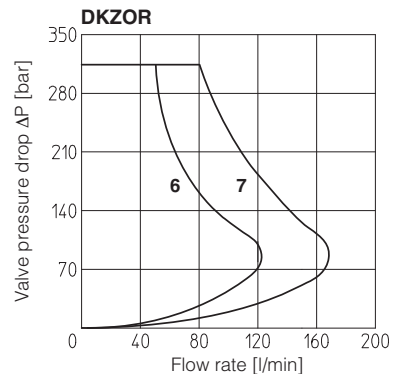
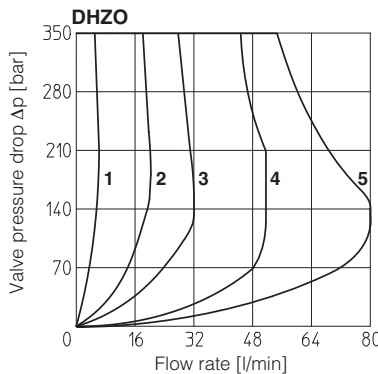
9.3 Operating limits

DHZO

- 1 = spool L14
- 2 = spool L1
- 3 = spool S2
- 4 = spool L3, S3, D3
- 5 = spool L5, S5, D5, V9

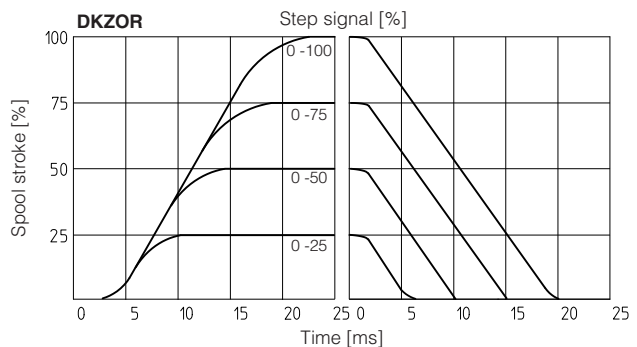
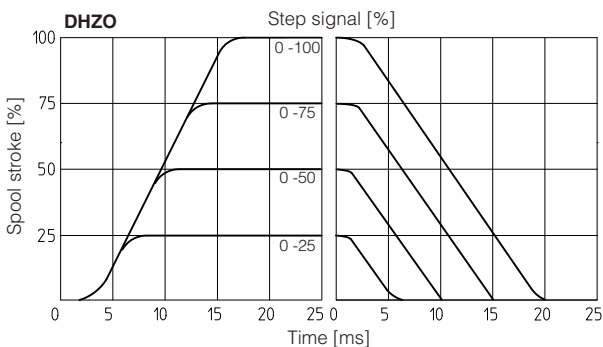
DKZOR

- 6 = spool S3, L3, D3
- 7 = spool S5, L5, D5, V9



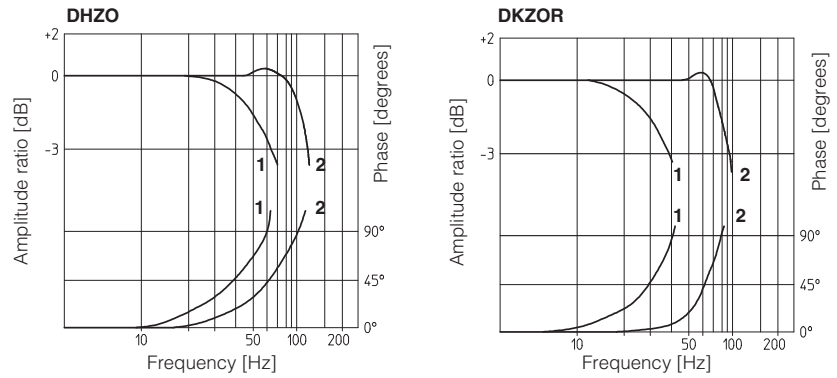
9.4 Response time

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.



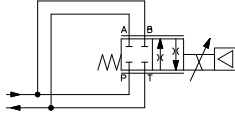
9.5 Bode diagrams

- 1 = 10% ↔ 90% nominal stroke
 2 = 50% ± 5% nominal stroke



9.6 Operation as throttle valve

Single solenoid valves configuration
 51 and 53 can be used as simple
 throttle valves:
 Pmax = 250 bar (option /Y advisable)



Spool type	DHZO					DKZOR	
	L14	L1	S2	L3 S3	L5 S5	L3 S3	L5 S5
Max flow Δp= 70bar [l/min]	6	20	40	80	100	150	250

10 HYDRAULIC OPTIONS

10.1 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

10.2 Option /Y

External drain advisable when the valve is used in double flow path, see section 9.6. Option /Y is mandatory if the pressure in port T exceeds 210 bar.

11 ELECTRONIC 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 ±10VDC nominal range

A minimum time of 300 to 500 ms have to be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

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.

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.

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:

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 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

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 aids to realize safety systems in compliance with European Norms EN13849-1 (ex EN954-1).

11.5 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.

11.6 Possible combined options

For **SN**: /FI, /IQ and /IZ

For **SP, SF, SL**: /CI

12 ELECTRONIC CONNECTIONS AND LEADS

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

PIN	Standard	/Q	/F	TECHNICAL SPECIFICATIONS	NOTES
A	V+			Power supply 24 Vdc	Input - power supply
B	V0			Power supply 0 Vdc	Gnd - power supply
C	AGND		AGND	Analog ground	Gnd - analog signal
		ENABLE		Enable (24 Vdc) or disable (0 Vdc) the valve, referred to V0	Input - on/off signal
D	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
E	INPUT-			Negative reference input signal for Q_INPUT+	Input - analog signal
F	Q_MONITOR referred to: AGND	V0		Flow monitor output signal: ± 10 Vdc / ± 20 mA maximum range Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
			FAULT	Fault (0 Vdc) or normal working (24 Vdc)	Output - on/off signal
G	EARTH			Internally connected to the driver housing	

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

PIN	TEB-SN /Z	TES-SN /Z	TES-SP, SF, SL BC, BP, EH	NP	TECHNICAL SPECIFICATIONS	NOTES
1	V+				Power supply 24 Vdc	Input - power supply
2	V0				Power supply 0 Vdc	Gnd - power supply
3	ENABLE referred to: V0	VL0	VL0	V0	Enable (24 Vdc) or disable (0 Vdc) the valve	Input - on/off signal
4	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
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 Vdc / ± 20 mA maximum range Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	AGND				Analog ground	Gnd - analog signal
7		NC			Do not connect	
			F_INPUT+		Pressure/Force 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
8	R_ENABLE				Repeat enable, output repeter signal of enable input, referred to V0	Output - on/off signal
		NC			Do not connect	
9			F_MONITOR referred to: VL0	V0	Pressure/Force monitor output signal: ± 10 Vdc / ± 20 mA maximum range Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /I option	Output - analog signal Software selectable
	NC				Do not connect	
10		VL+			Power supply 24 Vdc for driver's logic and communication	Input - power supply
			D_IN0		Multiple pressure/force PID selection, referred to V0	Input - analog signal
11					Do not connect	
		VL0			Power supply 0 Vdc for driver's logic and communication	Gnd - power supply
12					Multiple pressure/force PID selection (not available for SF), referred to V0	Input - on/off signal
	FAULT referred to: V0	VL0	VL0	VL0	Fault (0 Vdc) or normal working (24 Vdc)	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.

12.3 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	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	

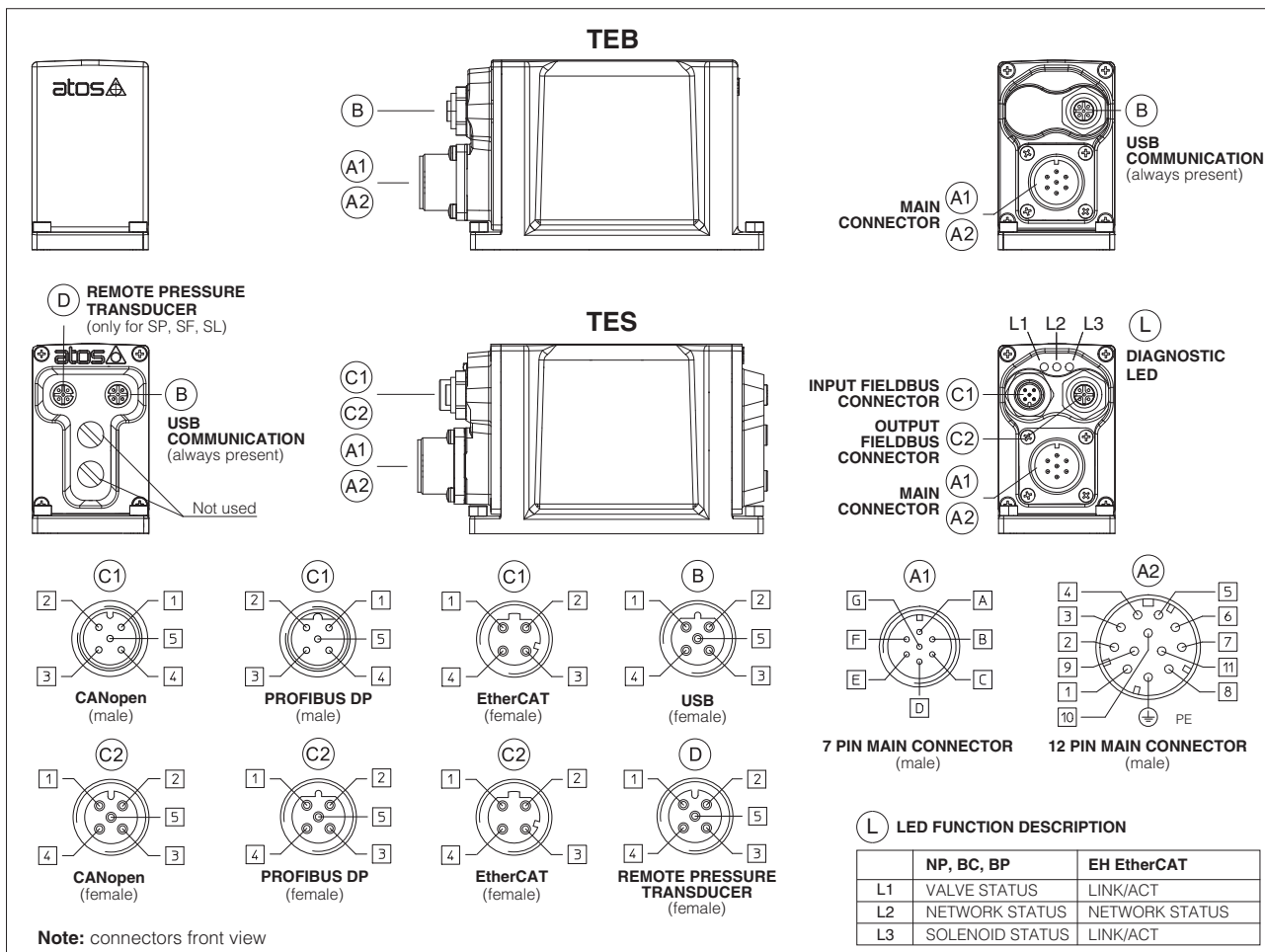
Note (1) shield connection on connector's housing is recommended

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

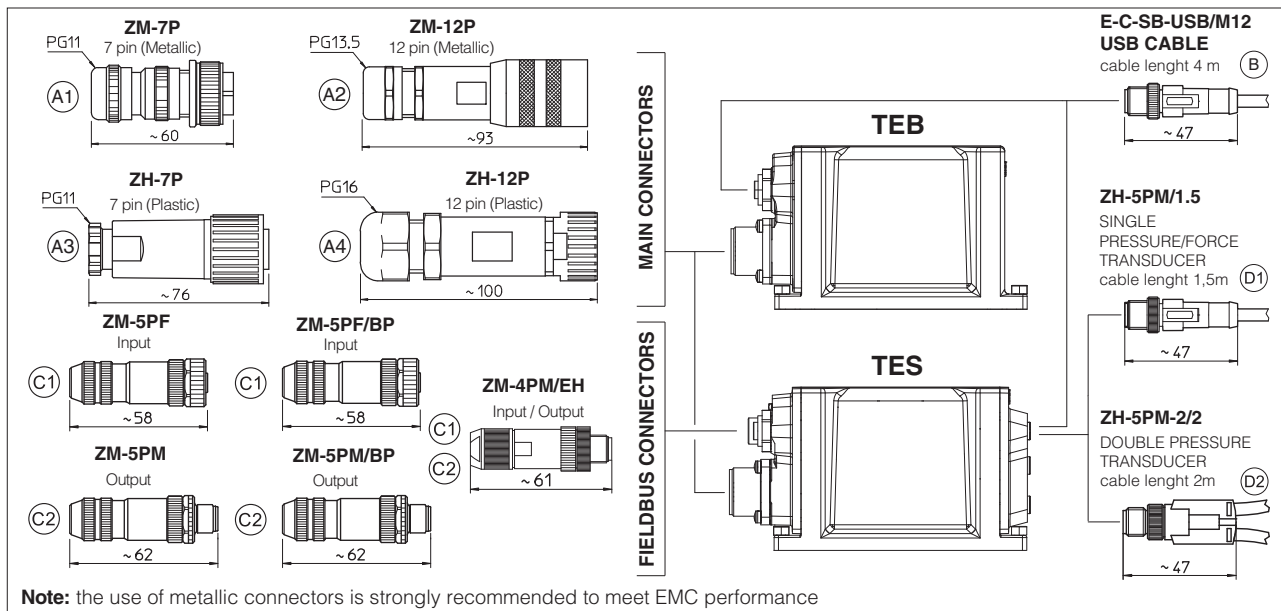
PIN	SIGNAL	TECHNICAL SPECIFICATION	Single transducer (1)	Double transducers (1)
1	VF +24V	Power supply +24Vdc	Connect	Connect
2	TR1	1st signal transducer: ± 10 Vdc / ± 20 mA maximum range, software selectable Defaults are ± 10 Vdc for standard and $4 \div 20$ mA for /C option	Connect	Connect
3	AGND	Common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

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

12.5 Connections layout



13 CONNECTORS



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

VALVE VERSION	TEB TES	TEB /Z TES /Z	CANopen (-BC)	PROFIBUS DP (-BP)	EtherCat (-EH)	P/Q controls SP, SL, SF
CONNECTOR CODE	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	IP67					
DATA SHEET	GS208, GS210, GS212, K500					

only for TES

(1) only for SP or SL

(2) only for SF

15 PROGRAMMING TOOLS - see table **GS500**



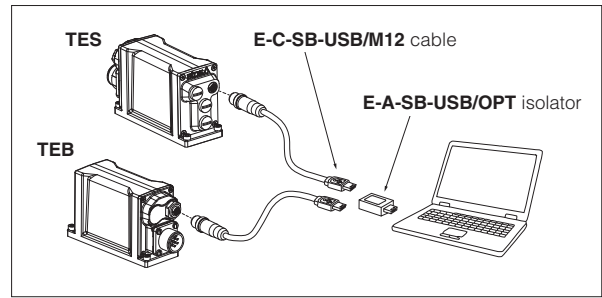
Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB communication port to the digital driver. E-SW software is available in different versions according to the driver's fieldbus interface:
 NP (not present) E-SW-PS,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

WARNING: drivers USB port is not isolated!

Use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection.

USB connection



16 INSTALLATION DIMENSIONS [mm]

DHZO-TEB, DHZO-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)

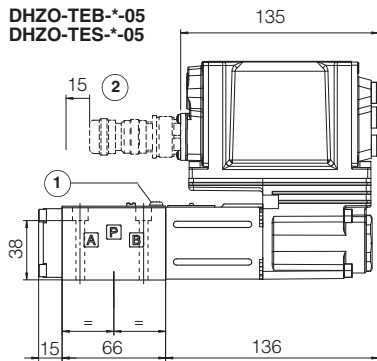
Fastening bolts: 4 socket head screws M5x50 class 12.9

Tightening torque = 8 Nm

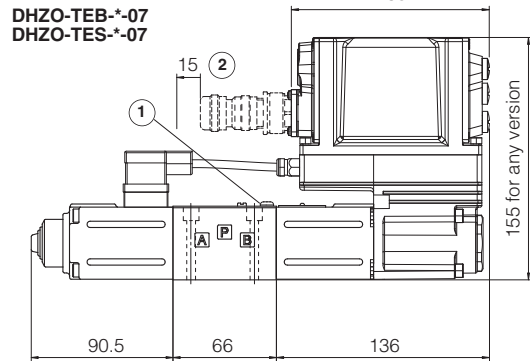
Seals: 4 OR 108; 1 OR 2025

Diameter of ports A, B, P, T: \varnothing 7,5 mm (max)

Diameter of port Y: \varnothing = 3,2 mm (only for /Y option)



Mass: 2,3 kg



Mass: 3,1 kg

DKZOR-TEB, DKZOR-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)

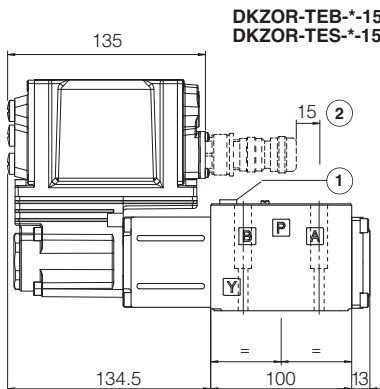
Fastening bolts: 4 socket head screws M6x40 class 12.9

Tightening torque = 15 Nm

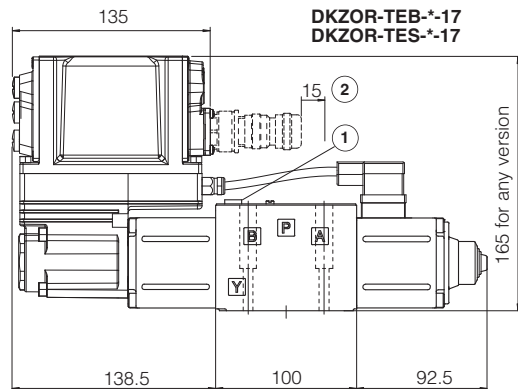
Seals: 5 OR 2050; 1 OR 108

Diameter of ports A, B, P, T: \varnothing 11,2 mm (max)

Diameter of port Y: \varnothing = 5 mm (only for /Y option)



Mass: 4,3 kg



Mass: 5,0 kg

① = Air bleed off

② = Space to remove the 7 or 12 pin main connector. For main and communication connectors see section 13, 14

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