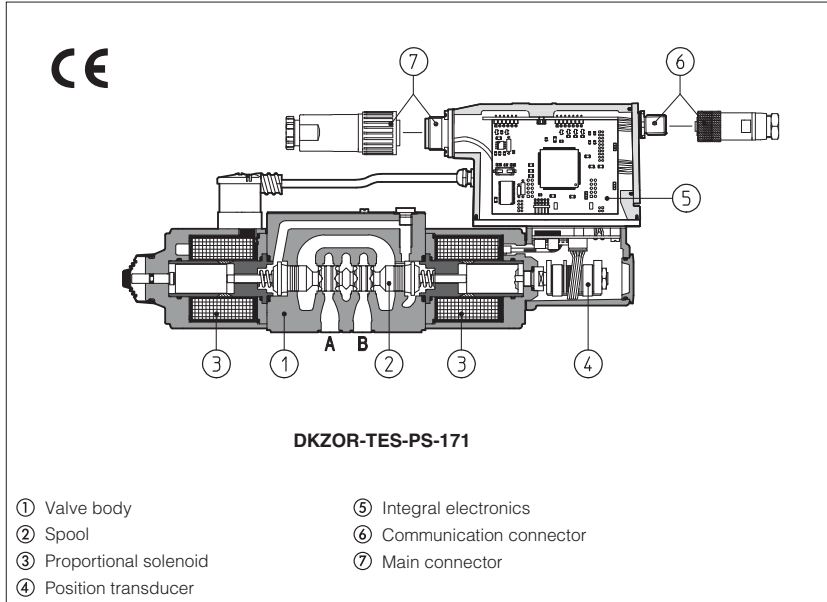


Proportional directional valves type DHZO-TES and DKZOR-TES

direct operated, with position transducer, ISO 4401 size 06 and 10

TE and TES executions included in this table are available only for running supplies or spare parts
For new applications it is suggested new TEB and TES executions, see table FS165



DHZO-T* and DKZOR-T* are proportional valves, direct operated, with LVDT position transducer, which provide both directional and non-compensated flow control according to the electronic reference signal.

They operate in association with electronic drivers, see section 2, which supply the proportional valves with proper current to align valve regulation to the reference signal supplied to the electronic driver.

They are available in different executions:

- -T, with integral position transducer ④;
- -TE, -TES as -T plus analog (TE) or digital (TES) integral electronics ⑤.

The 4-way spool ②, sliding into a 5-chambers body ①, is directly operated by solenoids ③ and it is controlled in closed loop position by means of the LVDT position transducer ④

The integral electronics ⑤ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

The electronic main connector ⑦ is fully interchangeable for -TE and -TES executions.

Standard 7 pin main connector is used for power supply, analog input reference and monitor signals.

12 pin connector is used for options /Z and /S*.

The special /S* options add a closed loop control of pressure (/SP) or force (/SF and /SL) to the basic closed loop spool position one.

Following communication interfaces ⑥ are available for the digital -TES execution:

- -PS, Serial communication interface for configuration, monitoring and firmware updating through Atos PC software
- -BC, CANopen interface
- -BP, PROFIBUS DP interface

The valves with -BC and -BP interfaces can be integrated into a fieldbus communication network and thus digitally operated by the machine control unit.

The coils are fully plastic encapsulated (insulation class H) and the valves have antivibration, antishock and weather-proof features.

Mounting surface: ISO 4401 sizes 06 and 10.

Max flow respectively up to 50 l/min and 130 l/min with valve differential pressure $\Delta p = 30$ bar, see table 3.

Max pressure = 350 bar for DHZO;
315 bar for DKZOR.

1 MODEL CODE

DHZO - TES - PS - 0 7 1 - S 5 / * / ** / *

DHZO = size 06
DKZOR = size 10

T = with position transducer
TE = as T plus integral analog electronics
TES = as T plus integral digital electronics
TEZ = as TES plus digital axis controller (1)

Communication interfaces (only for TES)

PS = Serial
BC = CANopen
BP = PROFIBUS DP

Valve size

0 = ISO 4401 size 06
1 = ISO 4401 size 10

Configuration, see section 3

5 = external plus central position, spring centered
7 = 3 position, spring centered

Spool overlapping in central position, see section 3

0 = zero overlapping (0 to 5 % spool stroke) (2)
1 = P,A,B,T positive overlapping (20% of spool stroke)
2 = P,A,B,T positive overlapping with A-B draining (3)
3 = P positive overlapping (20% of spool stroke); A, B, T, negative

Spool type (regulating characteristics)

L = linear;
S = progressive;
D = differential-progressive (as **S**, but with P-A = Q, P-B = Q/2)
Q = linear spool, for alternate P/Q controls (3)
V = differential-progressive, for alternate P/Q controls (4)

Spool size: **14, 1, 2, 3, 5, 9** = see section 3

Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

Series number

Hydraulic options, see section 4:

B = solenoid, integral electronics and position transducer at side of port A
Y = external drain

Electronics options, for -TE execution

see section 7:
F = fault signal
I = current reference input and monitor (4÷20 mA)
Q = enable signal
Z = enable, fault and monitor signals (12 pin connector)

Electronics options, for -TES execution

see section 7:
I = current reference input and monitor (4÷20 mA)
Z = double power supply, enable fault and monitor signals (12 pin connector)

Special options for -TES execution

see section 7:
SF = additional closed loop force control, with two remote pressure transducers
SL = additional closed loop force control with one remote load cell
SP = additional closed loop pressure control with one remote pressure transducer
C = current feedback interface for transducer(s) **only for options /SF, /SL, /SP**

Notes: (1) For detailed description of proportional valves with TEZ digital axis controller, see table F230

(2) For zero overlapping spool **0L3, 0L5, 0D5**, the valve offset position (with switch-off power supply) is $\pm 6\%$ P-B/A-T

(3) Only for **DKZOR--S5** the spool overlapping type 2 provides the same characteristic of type 1, but in central position the internal leakages from P to A and B are drained to tank, avoiding the drift of cylinders with differential areas.

(4) The spool type **Q** and **V** are specific for alternate P/Q controls and they can be used in combination with option /S* of digital integral drivers (see section 13.1, 14.1 and G212), or digital axis controllers type Z-RI-TEZ (see tab. F230) or Z-ME-KZ (see tab. G340)

2 ELECTRONIC DRIVERS

| Valve model | -T | -TE | -TES | -TES / SF, SL, SP |
|---------------|--------|---------|----------|---------------------|
| Drivers model | E-ME-T | E-RI-TE | E-RI-TES | E-RI-TES/SF, SL, SP |
| Data sheet | G140 | G200 | G210 | G212 |

Note: For power supply and communication connector see section 16 and 18

3 HYDRAULIC CHARACTERISTICS (based on mineral oil ISO VG 46 at 50 °C)

| Valve model | DHZO-T* | | | | | | | | DKZOR-T* | | | | | |
|------------------------------|---|------|------|------------|----|--------|------------|--------|---|----|--------|----|------------|--------|
| Spool overlapping | 1, 3 | 1, 3 | 1, 3 | 1, 3 | 0 | 0 | 1, 3 | 3 | 1, 3 | 0 | 0 | 2 | 1, 3 | 3 |
| Spool type and size | L14 | L1 | S2 | S3, L3, D3 | L3 | L5, D5 | S5, L5, D5 | Q5, V9 | S3, L3, D3 | L3 | L5, D5 | S5 | S5, L5, D5 | Q5, V9 |
| 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) | | | | | |
| Max flow (1) [l/min] | ports P, A, B = 350; T = 210 (250 with external drain /Y) | | | | | | | | | | | | | |
| at $\Delta p = 10$ bar (P-T) | 1 | 4,5 | 8 | 17 | | 28 | | 30 | 45 | | 75 | | 130 | |
| at $\Delta p = 30$ bar (P-T) | 2 | 8 | 14 | 30 | | 50 | | 52 | 80 | | 130 | | 170 | |
| at $\Delta p = 70$ bar (P-T) | 3 | 12 | 21 | 45 | | 74 | | 80 | 120 | | 170 | | 170 | |
| Response time (2) [ms] | < 15 | | | | | | | | < 20 | | | | | |
| Hysteresis [%] | $\leq 0,2\%$ | | | | | | | | $\leq 0,2\%$ | | | | | |
| Repeatability [%] | $\pm 0,1\%$ | | | | | | | | $\pm 0,1\%$ | | | | | |
| Thermal drift | zero point displacement < 1% at $\Delta T = 40^\circ C$ | | | | | | | | | | | | | |

Notes:

- For version DHZO-TE and DKZOR-TE, configuration /B, see the notes at sections 13.1 and 14.1
 - Above performance data refer to valves coupled with Atos electronic drivers, see sections [2].
 - The flow regulated by the directional proportional valves is not pressure compensated, thus it is affected by the load variations. To keep constant the regulated flow under different load conditions, modular pressure compensators are available (see tab. D150).
- (1) For different Δp , the max flow is in accordance to the diagrams in sections 13.2 and 14.2
 (2) 0-100% step signal

4 HYDRAULIC OPTIONS

- 4.1 Option /B** Solenoid (for valve configuration *5*), integral electronics and position transducer at side of port A. For version -T and -TE see section 13.1 and 14.1
- 4.2 Option /Y** External drain advisable when the valve is used in double flow path, see section 13.5 and 14.5. Option /Y is mandatory if the pressure in port T exceeds 160 bar.

5 GENERAL NOTES

DHZO and DKZOR 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-892).

6 CONNECTIONS FOR -T EXECUTION

| SOLENOID POWER SUPPLY CONNECTOR | |
|---------------------------------|--------------------|
| PIN | Signal description |
| 1 | SUPPLY |
| 2 | SUPPLY |
| 3 | GND |

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

7 ANALOG INTEGRAL DRIVERS -TE - OPTIONS

Standard driver execution provides on the 7 pin main connector:

- Power supply** - 24Vdc 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 $\mu F/40$ V capacitance to single phase rectifiers or a 4700 $\mu F/40$ 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:

7.1 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.

7.2 Option /I

It provides the 4 \pm 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.

7.3 Option /Q

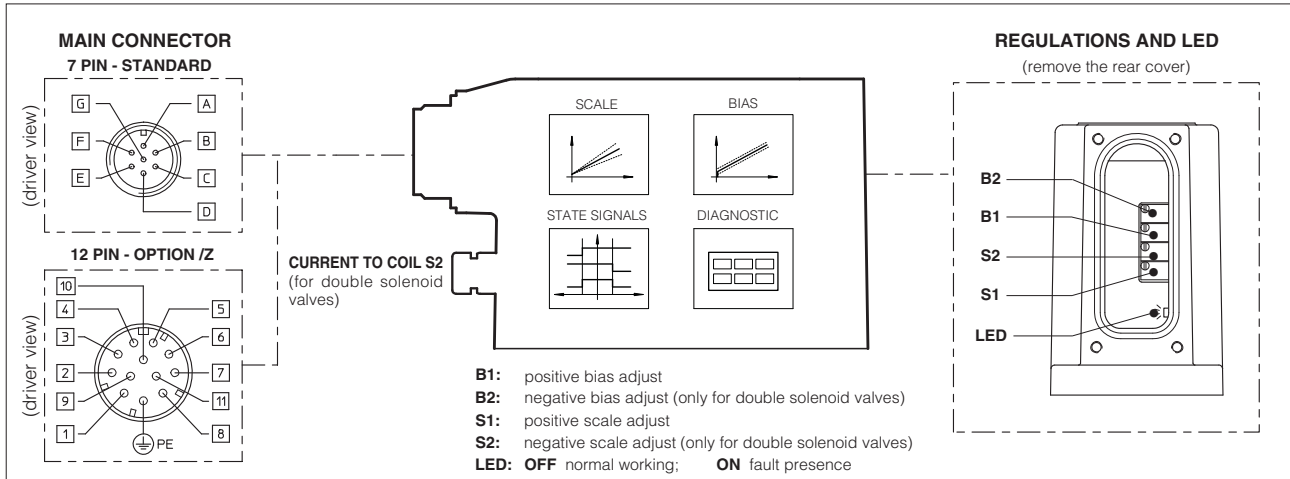
It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24Vdc on the enable input signal.

7.4 Option /Z

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

7.5 Possible combined options: /FI and /IZ

8 ANALOG INTEGRAL DRIVERS -TE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



8.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

| Standard 7pin | /Z option 12pin | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES |
|---------------|-----------------|----------|--|------------------------|
| A | 1 | V+ | Power supply 24 Vdc for solenoid power stage and driver logic | Input - power supply |
| B | 2 | V0 | Power supply 0 Vdc for solenoid power stage and driver logic | Gnd - power supply |
| C (1) | 7 | AGND | Ground - signal zero for MONITOR signal (for standard, /Z option) | Input - analog signal |
| | 3 | ENABLE | Enable (24 Vdc) or disable (0 Vdc) the driver (for /Q and /Z options) | Input - on/off signal |
| D | 4 | INPUT+ | Reference analog differential input: ± 10 Vdc maximum range (4 \div 20 mA for /I option) | Input - analog signal |
| E | 5 | INPUT - | For single solenoid valves the reference input is 0 \div +10 Vdc (4 \div 20 mA for /I option) For double solenoid valves the reference input is ± 10 Vdc (4 \div 20 mA for /I option) | |
| F (2) | 6 | MONITOR | Monitor analog output: ± 10 Vdc maximum range (4 \div 20 mA for /I option) | Output - analog signal |
| | 11 | FAULT | Fault (0V) or normal working (24V) (for /F and /Z options) | Output - on/off 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 |
| G | PE | EARTH | Internally connected to the driver housing | |

Notes

(1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is referred to pin B

(2) with /F option FAULT signal replaces MONITOR on pin F.

- A minimum time of 50ms to 100ms have be considered between the driver energizing with the 24 Vdc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

9 DIGITAL INTEGRAL DRIVERS -TES - OPTIONS

Standard driver execution provides on the 7 pin main connector:

- Power supply** - 24Vdc 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 μ F/40 V capacitance to single phase rectifiers or a 4700 μ F/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 /I

It provides 4 \div 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.

9.2 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 24Vdc 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 \div 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

9.3 Options /SP, /SF and /SL

These options add the closed loop control of pressure (/SP) or force (/SF and /SL) to the basic functions of proportional directional valves: a dedicated software alternates pressure (force) and valve's spool position controls 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 plus two analog signals specific for the pressure (force) control: one for reference (pin 7) and one for monitor (pin 8).

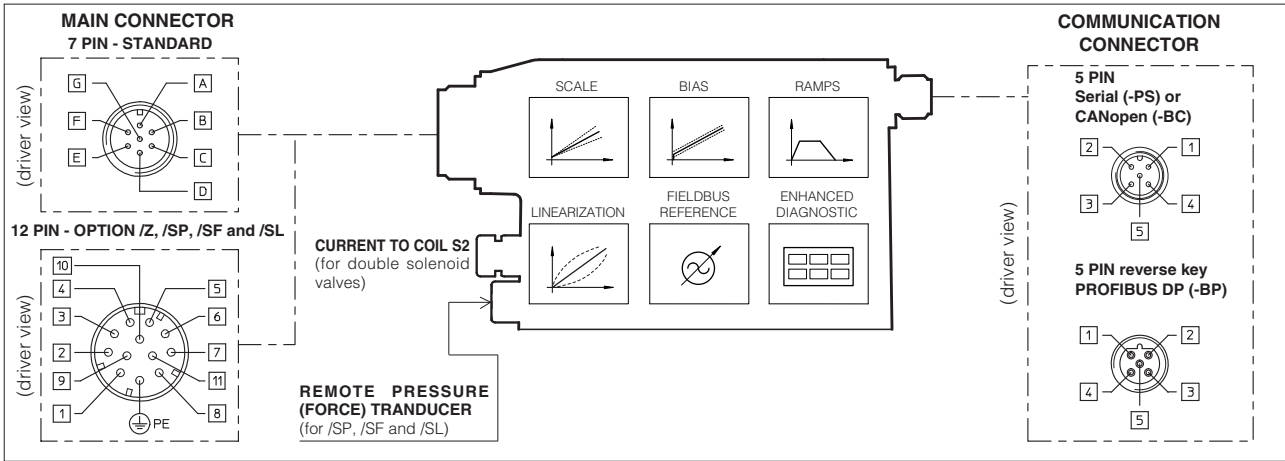
For further details please refer to the driver technical table **G212**.

9.4 Options /C

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

9.5 Possible combined options: /ISP, /ISF, /ISL, /CSP, /CSF, /CSL, /CISP, /CISF, /CISL and /IZ

10 DIGITAL INTEGRAL DRIVERS -TES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



10.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

| Standard 7pin | /Z option 12pin | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES |
|---------------|-----------------|---------|--|------------------------|
| A | 1 | V+ | Power supply 24 Vdc for solenoid power stage (and for driver logic on 7 pin connection) | Input - power supply |
| B | 2 | V0 | Power supply 0 Vdc for solenoid power stage (and for driver logic on 7 pin connection) | Gnd - power supply |
| - | 3 | ENABLE | Enable (24 Vdc) or disable (0 Vdc) the driver | Input - on/off signal |
| D | 4 | INPUT+ | Reference analog input: ± 10 Vdc maximum range ($4 \div 20$ mA for /I option) For single solenoid valves the reference input is $0 \div +10$ Vdc ($4 \div 20$ mA for /I option) For double solenoid valves the reference input is ± 10 Vdc ($4 \div 20$ mA for /I option) standard: differential input; /Z option: common mode INPUT+ referred to AGND | Input - analog signal |
| E | - | INPUT - | | |
| C | 5 | AGND | Ground - signal zero for MONITOR signal signal zero for INPUT+ signal (only for /Z option) | Gnd - analog signal |
| F | 6 | MONITOR | Monitor analog output: ± 10 Vdc maximum range ($4 \div 20$ mA for /I option) | Output - analog signal |
| - | 7 | NC | do not connect (pressure/force input for /SP, /SF and /SL options, see 9.3) | |
| - | 8 | NC | do not connect (pressure/force monitor for /SP, /SF and /SL options, see 9.3) | |
| - | 9 | VL+ | Power supply 24 Vdc for driver logic | Input - power supply |
| - | 10 | VLO | Power supply 0 Vdc for driver logic | Gnd - power supply |
| - | 11 | FAULT | Fault (0V) or normal working (24V) | Output - on/off signal |
| G | PE | EARTH | Internally connected to the 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.

10.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

| PIN | -PS Serial | | -BC CANopen | | -BP PROFIBUS DP | |
|-----|------------|-------------------------------|-------------|-------------------------|-----------------|---------------------------------------|
| | SIGNAL | TECHNICAL SPECIFICATION | SIGNAL | TECHNICAL SPECIFICATION | SIGNAL | TECHNICAL SPECIFICATION |
| 1 | NC | do not connect | CAN_SHLD | Shield | +5V | for termination |
| 2 | NC | do not connect | NC | do not connect | LINE-A | Bus line (high) |
| 3 | RS_GND | Signal zero data line | CAN_GND | Signal zero data line | DGND | data line and termination Signal zero |
| 4 | RS_RX | Valves receiving data line | CAN_H | Bus line (high) | LINE-B | Bus line (low) |
| 5 | RS_TX | Valves transmitting data line | CAN_L | Bus line (low) | SHIELD | |

11 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the Atos E-SW programming software, available in three different versions according to the driver's communication execution: E-SW-PS (Serial), E-SW-BC (CANopen) and E-SW-BP (PROFIBUS DP).

For a more detailed description of software interface, PC requirements, adapters, cables and terminators, please refer to technical table G500.

Programming software, must be ordered separately:

E-SW-* (mandatory - first supply) = Dvd including E-SW-* software installer and operator manuals; it allows the registration to Atos digital service

E-SW-*-N (optional - next supplies) = as above but not allowing the registration to Atos digital service

On first supply of the E-SW-* software, it is required to apply for the registration in the Atos download area: www.download.atos.com.

Once the registration is completed, the password will be sent by email.

The software remains active for 10 days from the installation date and then it stops until the user inputs his password.

With the password you can also download, in your personal area, the latest releases of the Atos software, manuals, drivers and configuration files.

12 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES

| | | |
|----------------------------------|---|-----------------------|
| Assembly position | Any position | |
| Subplate surface finishing | Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101) | |
| Ambient temperature | $-20^{\circ}\text{C} \div +70^{\circ}\text{C}$ for -T execution; $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$ for -TE and TES executions | |
| Fluid | Hydraulic oil as per DIN 51524 ... 535 for other fluids see section I | |
| Recommended viscosity | $15 \div 100$ mm ² /s at 40°C (ISO VG 15÷100) | |
| Fluid contamination class | ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm (β ₁₀ ≥75 recommended) | |
| Fluid temperature | $-20^{\circ}\text{C} \div +60^{\circ}\text{C}$ (standard seals and water glycol) $-20^{\circ}\text{C} \div +80^{\circ}\text{C}$ (/PE seals) | |
| Valve model | DHZO-T* | DKZOR-T* |
| Coil resistance R at 20°C | $3 \div 3,3 \Omega$ | $3,8 \div 4,1 \Omega$ |
| Max. solenoid current | 2,6 A | 3 A |
| Max. power | 35 Watt | 40 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 (CEI EN-60529) | IP65 for -T execution; IP67 for -TE and -TES executions | |
| Duty factor | Continuous rating (ED=100%) | |

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

13.1 Regulation diagrams

- 1 = linear spool L14
- 2 = linear spool L1
- 3 = progressive spool S2
- 4 = linear spool L3
- 5 = progressive spool S3, D3
- 6 = linear spool, zero overlapping OL3
- 7 = linear spool L5
- 8 = linear spool, zero overlapping OL5
- 9 = progressive spool S5, D5
- 10 = progressive spool, zero overlapping OD5

Note:

Hydraulic configuration vs. reference signal for double solenoid valves (also for option /B)

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

Hydraulic configuration vs. reference signal for mono solenoid valves **option /B**

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

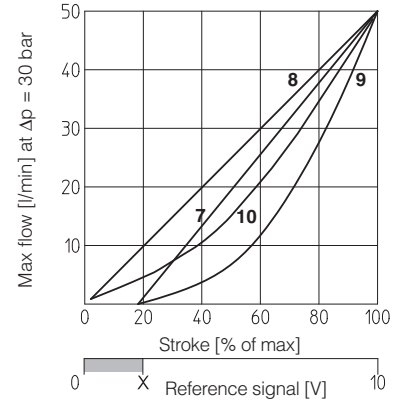
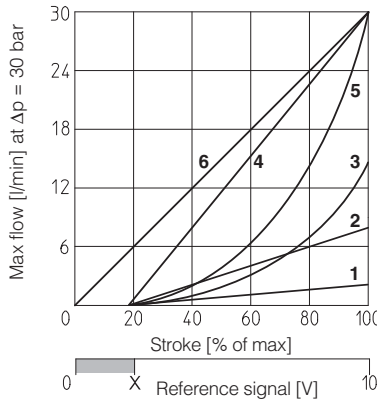
11 = linear spool Q5

Q5 spool type is specific for alternate P/Q controls and it can be used in combination with /S* option of digital integral drivers, see tab. G212, or digital position controllers type Z-RI-TEZ (see tab. G330) or Z-ME-KZ (see tab. G340). 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.

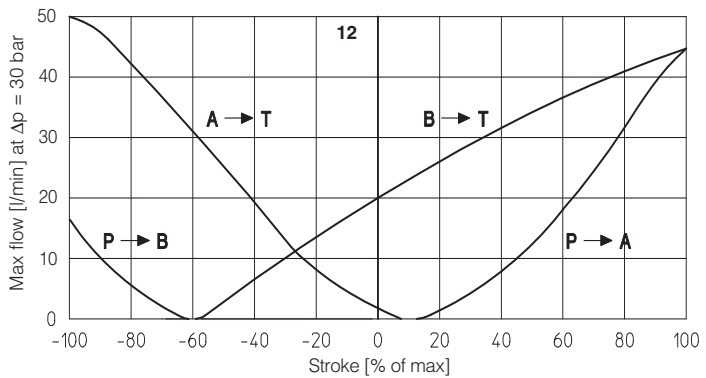
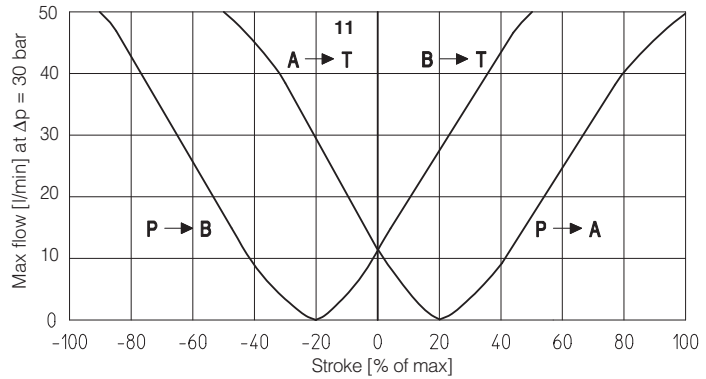
12 = differential - progressive spool V9

V9 spool type is specific for alternate P/Q controls and it can be used in combination with /S* option of digital integral drivers, see tab. G212, or digital position controllers type Z-RI-TEZ (see tab. G330) or Z-ME-KZ (see tab. G340). 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



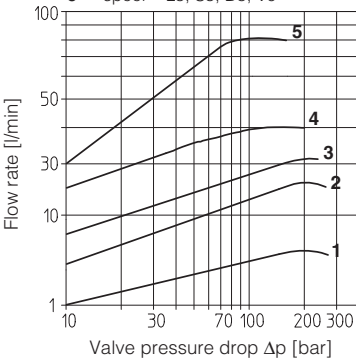
X = Threshold for bias activation depending to the valve type and amplifier type



13.2 Flow /Δp diagrams

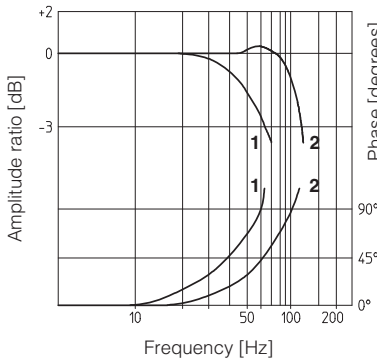
stated at 100% of valve stroke

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



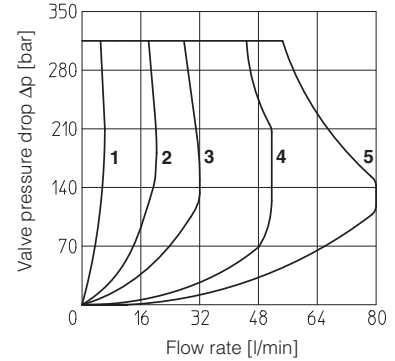
13.3 Bode diagrams

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



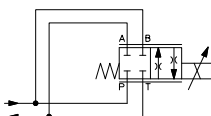
13.4 Operating limits

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



13.5 Operation as throttle valve

Single solenoid valves (DHZO-*-051) can be used as simple throttle valves: Pmax = 250 bar (option /Y advisable)



| | SPOOL TYPE | | | | | | |
|----------------------------|------------|----|----|----|-----|----|----|
| | L14 | L1 | S2 | L3 | S3 | L5 | S5 |
| Max flow Δp= 70bar [l/min] | 6 | 20 | 40 | 80 | 100 | | |

13.6 Dynamic response

The response times in section 3 and the frequency responses in the bode diagrams 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.

14 DIAGRAMS FOR DKZOR (based on mineral oil ISO VG 46 at 50 °C)

14.1 Regulation diagrams

- 1 = linear spool L3
- 2 = progressive spool S3, D3
- 3 = linear spool, zero overlapping OL3
- 4 = linear spool L5
- 5 = linear spool, zero overlapping OL5
- 6 = progressive spool S5, D5
- 7 = progressive spool, zero overlapping OD5

Note:

Hydraulic configuration vs. reference signal for double solenoid valves (also for option /B)

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

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

Hydraulic configuration vs. reference signal for mono solenoid valves option /B

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

8 = linear spool Q5

Q5 spool type is specific for alternate P/Q controls and it can be used in combination with /S* option of digital integral drivers, see tab. G212, or digital position controllers type Z-RI-TEZ (see tab. G330) or Z-ME-KZ (see tab. G340).

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.

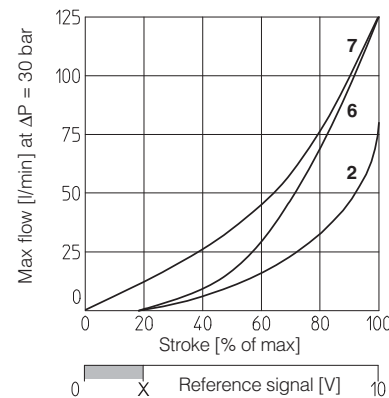
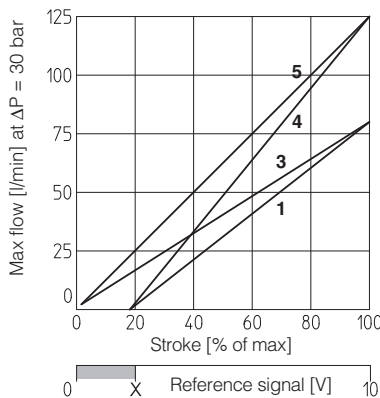
The strong meter-in characteristic makes the spool suitable for both pressure control and motion regulations in several applications.

9 = differential - progressive spool V9

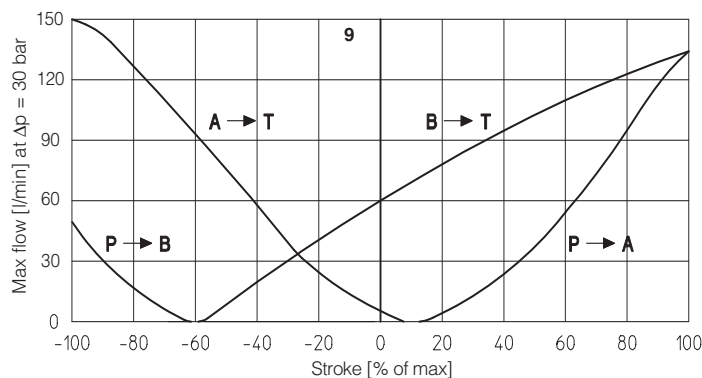
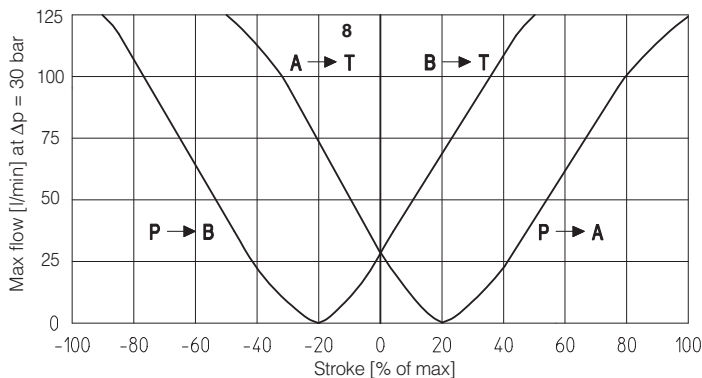
V9 spool type is specific for alternate P/Q controls and it can be used in combination with /S* option of digital integral drivers, see tab. G212, or digital position controllers type Z-RI-TEZ (see tab. G330) or Z-ME-KZ (see tab. G340).

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



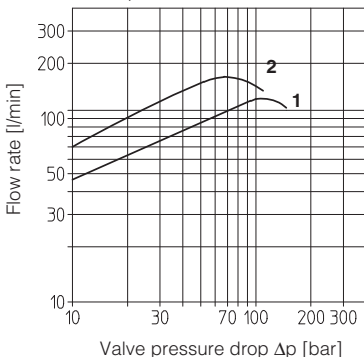
X = Threshold for bias activation depending to the valve type and amplifier type



14.2 Flow /Δp diagrams

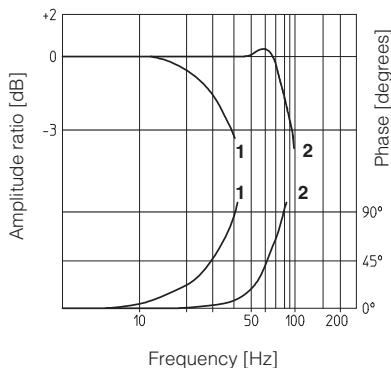
stated at 100% of valve stroke

- 1 = spool S3, L3, D3
- 2 = spool S5, L5, D5, V9



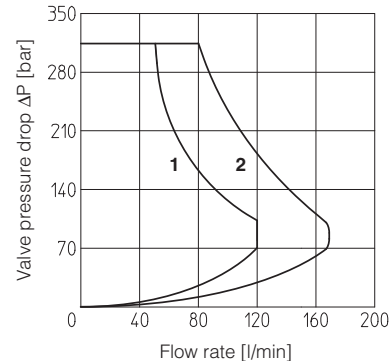
14.3 Bode diagrams

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



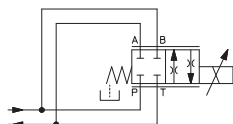
14.4 Operating limits

- 1 = spool L3, S3, D3
- 2 = spool L5, S5, D5, V9



14.5 Operation as throttle valve

Single solenoid valves (DKZOR*-151) can be used as simple throttle valves: Pmax = 250 bar (option /Y advisable)



| | SPOOL TYPE | | | |
|-----------------------------|------------|----|-----|----|
| | L3 | S3 | L5 | S5 |
| Max flow Δp= 30 bar [l/min] | 150 | | 250 | |

14.6 Dynamic response

The response times in section 3 and frequency responses in the bode diagrams 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.

15 INSTALLATION DIMENSIONS FOR DHZO [mm]

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

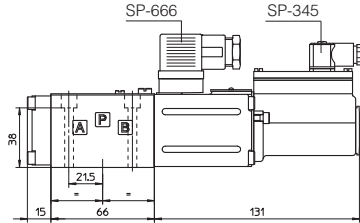
Tightening torque = 8 Nm

Seals: 4 OR 108; 1 OR 2025

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

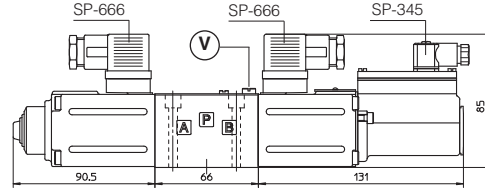
Diameter of port Y: Ø = 3,2 mm (only for /Y option)

DHZO-T-05



Mass: 1,9 kg

DHZO-T-07



Mass: 2,6 kg

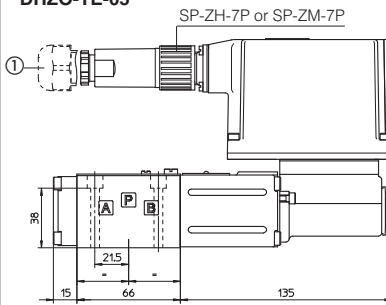
Note: for option /B the solenoid and the position transducer are at side of port A

(V) = Air bleed off

-TE EXECUTION

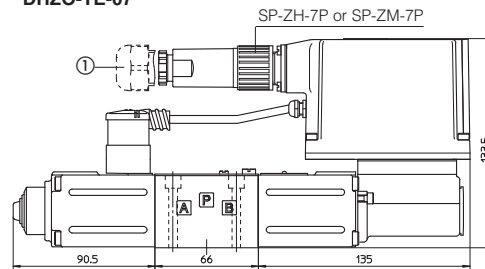
① Dotted line = 12 pin connector SP-ZH-12P for option /Z

DHZO-TE-05



Mass: 2,3 kg

DHZO-TE-07



Mass: 3,1 kg

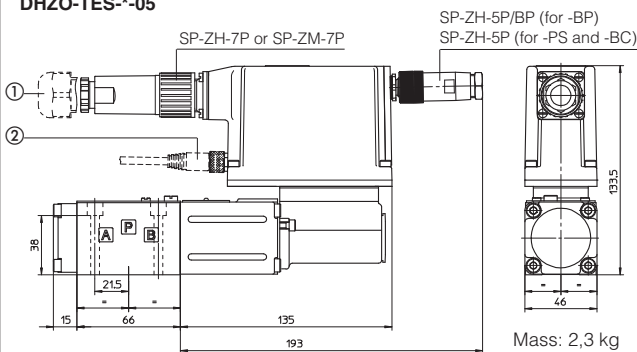
-TES EXECUTION

① Dotted line = 12 pin connector SP-ZH-12P for options /SF, /SL, /SP, /Z

② Dotted line = M8 connector SP-ZH-4P-M8/5 moulded on cable 5 mt length for pressure or force transducer (options /SL, /SP)

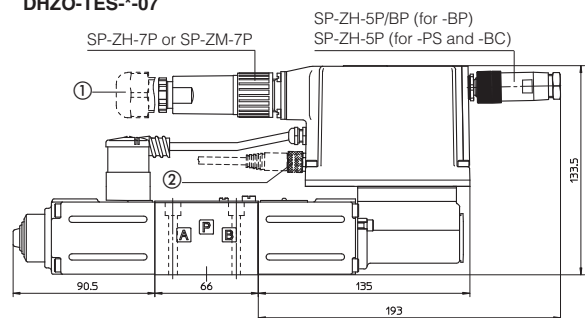
M8 connector SP-ZH-4P-M8/2-2 moulded with 2 cables, 2 mt length for 2 pressure transducers (options /SF)

DHZO-TES*-05



Mass: 2,3 kg

DHZO-TES*-07



Mass: 3,1 kg

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

16 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

| VALVE VERSION | -T Power supply Transducer | | -TE, -TES | | -TE /Z -TES /Z, /SF, /SL, /SP | serial (-PS) or CANopen (-BC) | PROFIBUS DP (-BP) | TES /SF, /SL, /SP (transducer) |
|-------------------|---------------------------------|--------|------------------|----------|----------------------------------|----------------------------------|-------------------|-----------------------------------|
| CONNECTOR CODE | SP-666 | SP-345 | SP-ZH-7P | SP-ZM-7P | SP-ZH-12P | SP-ZH-5P | SP-ZH-5P/BP | SP-ZH-4P-M8* (1) |
| PROTECTION DEGREE | IP65 | IP65 | IP67 | IP67 | IP67 | IP67 | IP67 | IP67 |
| DATA SHEET | K500 | | G200, G210, K500 | | | G210, K500 | | G212, K500 |

(1) M8 connector SP-ZH-4P-M8/5 moulded on cable 5 mt length for pressure or force transducer (options /SL, /SP)

M8 connector SP-ZH-4P-M8/2-2 moulded with 2 cables, 2 mt length for 2 pressure transducers (options /SF)

connectors supplied with the valve

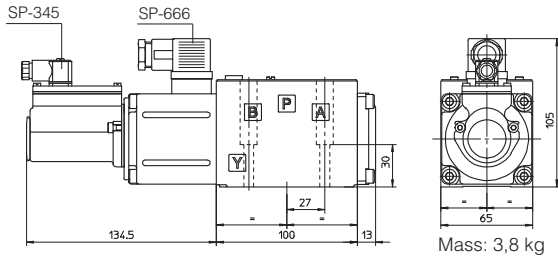
17 INSTALLATION DIMENSIONS FOR DKZOR [mm]

ISO 4401: 2000

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

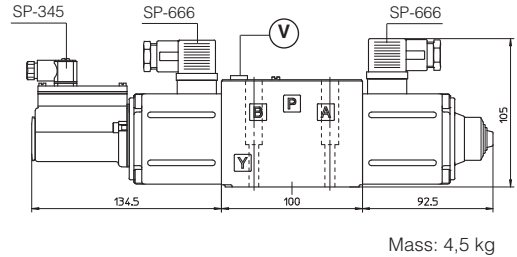
Fastening bolts: 4 socket head screws M6x40 class 12.9
 Tightening torque = 15 Nm
 Seals: 5 OR 2050; 1 OR 108
 Diameter of ports A, B, P, T: \varnothing 11,2 mm (max)
 Diameter of port Y: \varnothing = 5 mm (only for /Y option)

DKZOR-T-15



Mass: 3,8 kg

DKZOR-T-17



Mass: 4,5 kg

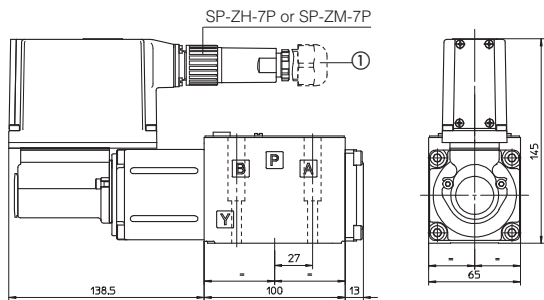
Note: for option /B the solenoid and the position transducer are at side of port A

Ⓥ = Air bleed off

-TE EXECUTION

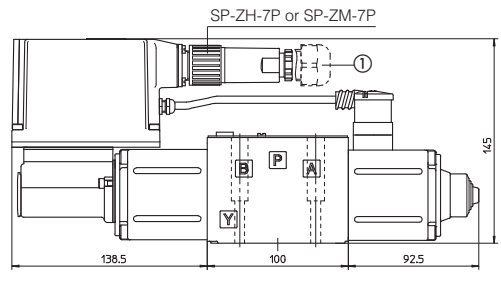
① Dotted line = 12 poles connector SP-ZH-12P for option /Z

DKZOR-TE-15



Mass: 4,3 kg

DKZOR-TE-17

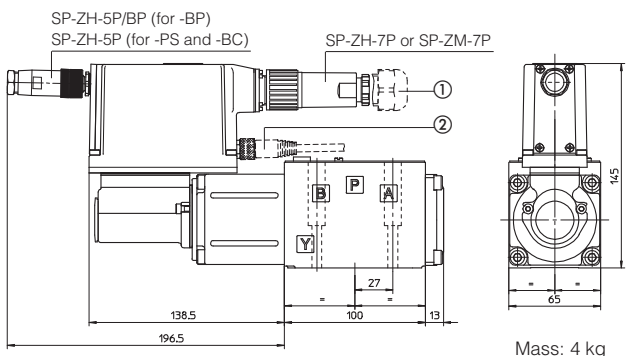


Mass: 5,0 kg

-TES EXECUTION

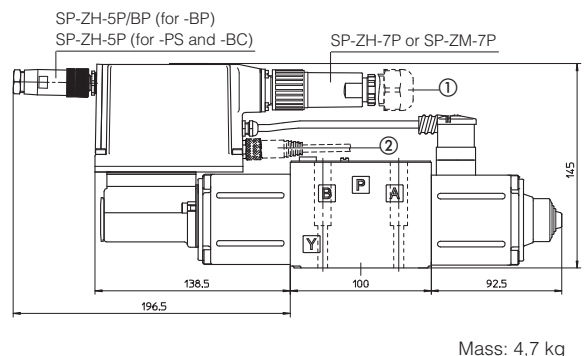
① Dotted line = 12 pin connector SP-ZH-12P for options /SF, /SL, /SP, /Z
 ② Dotted line = M8 connector SP-ZH-4P-M8/5 moulded on cable 5 mt length for pressure or force transducer (options /SL, /SP)
 M8 connector SP-ZH-4P-M8/2-2 moulded with 2 cables, 2 mt length for 2 pressure transducers (options /SF)

DKZOR-TES*-15



Mass: 4 kg

DKZOR-TES*-17



Mass: 4,7 kg

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

18 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

| VALVE VERSION | -T Power supply Transducer | | -TE, -TES | | -TE /Z -TES /Z, /SF, /SL, /SP | serial (-PS) or CANopen (-BC) | PROFIBUS DP (-BP) | TES /SF, /SL, /SP (transducer) |
|-------------------|-------------------------------|--------|------------------|----------|----------------------------------|----------------------------------|-------------------|-----------------------------------|
| CONNECTOR CODE | SP-666 | SP-345 | SP-ZH-7P | SP-ZM-7P | SP-ZH-12P | SP-ZH-5P | SP-ZH-5P/BP | SP-ZH-4P-M8/* (1) |
| PROTECTION DEGREE | IP65 | IP65 | IP67 | IP67 | IP67 | IP67 | IP67 | IP67 |
| DATA SHEET | K500 | | G200, G210, K500 | | | G210, K500 | | G212, K500 |

(1) M8 connector SP-ZH-4P-M8/5 moulded on cable 5 mt length for pressure or force transducer (options /SL, /SP)
 M8 connector SP-ZH-4P-M8/2-2 moulded with 2 cables, 2 mt length for 2 pressure transducers (options /SF)

■ connectors supplied with the valve