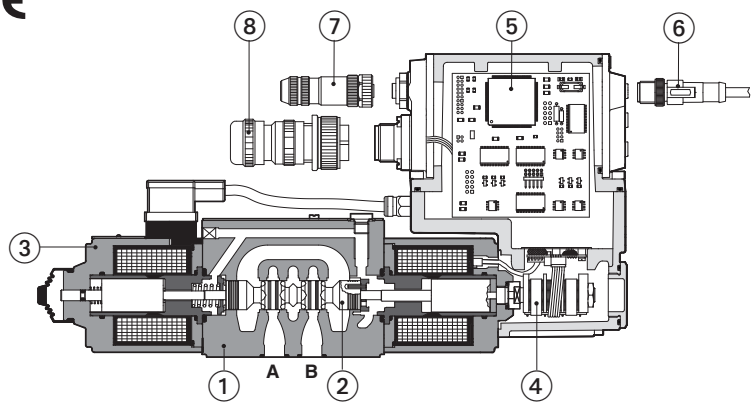
# High Performance proportional directional valves

direct operated, with position transducer and positive spool overlap




DKZOR-TES-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-T*; DKZOR-T*

High performance proportional valves with position transducer and positive spool overlap for best accuracy and dynamics in directional controls and not compensated flow regulations.

They are specifically designed to achieve high speed closed loop controls and to implement alternated Pressure (Force) /Flow controls - options /S* coupled with spools 'Q' or 'V'.

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

The electronic driver supplies the proportional valve with proper current to align valve regulation to the reference signal, the integral execution ⑤ has rugged construction and grants factory presetting for valve-to-valve interchangeability.

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 | - | TES | - | NP | - | 0 | 71 | - | L | 5 | / | * | / | * | / | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

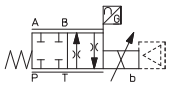
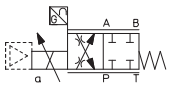
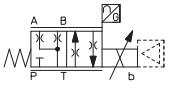
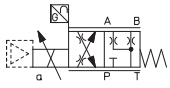
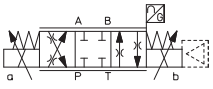
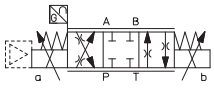
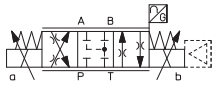
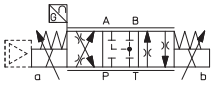
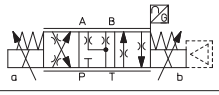
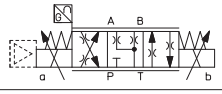
**DHZO** = size 06
**DKZOR** = size 10

**T** = without integral electronics
**TE** = with integral analog electronics
**TES** = with integral digital electronics

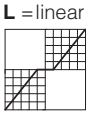
**Fieldbus interfaces** for TES:
USB port always present
**NP**= Not present **BP** = PROFIBUS DP
**BC**= CANopen **EH** = EtherCAT

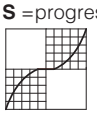
Valve size, ISO 4401: **0** = 06 **1** = 10

**Configuration:**

| | Standard | Option **/B** |
|---|---|---|
| **51 =** |  |  |
| **53 =** |  |  |
| **71 =** |  |  |
| **72 = (1)** |  |  |
| **73 =** |  |  |

**Spool type** -regulating characteristics:

**L** =linear 

**S** =progressive 

**D** = differential-progressive 
P-A = Q, B-T = Q/2
P-B = Q/2, A-T = Q

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

Series number

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

**Electronic options,** see sections [10] ,[12]:
**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 execution**
**SP, SF, SL** = additional closed loop pressure/force control coupled with spools Q or V, see section [12] and table G212
**C** = current feedback for pressure transducer(s) for options /SP, /SF, /SL

| **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 |

Nominal flow (l/min) at Δp 10bar P-T

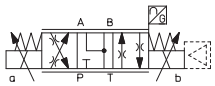
**(1)** - Only for DKZOR

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

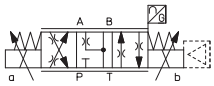
| DHZO | - | TES | - | NP | - | 0 | 73 - V9 | / | * | / | * | / | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Configuration, spool type and size:**

**73-Q5**



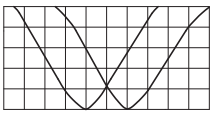

**73-V9**




| **Spool size:** | | **Q5** | **V9** |
|---|---|---|---|
| DHZO | = | 30 | 30 |
| DKZOR | = | 75 | 75 |

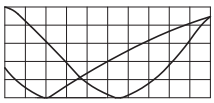
Nominal flow (l/min) at Δp 10bar P-T

**Q5**



For alternate P/Q control
see section 8, diagram 28

**V9**



For alternate P/Q control of injection cycle in plastic machinery
see section 8, diagram 29

## 3 HYDRAULIC OPTIONS

**3.1 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 8.1

**3.2 Option /Y**

External drain advisable when the valve is used in double flow path, see section 8.6. Option /Y is mandatory if the pressure in port T exceeds 210 bar.

## 4 GENERAL NOTES

DHZO-T* and DKZOR-T* 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).

## 5 MAIN CHARACTERISTICS

| | |
|---|---|
| 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 | 300 years, see technical table P007 |
| Ambient temperature range | -T execution = -20°C ÷ +70°C<br>-TE and -TES executions = -20°C ÷ +60°C<br>/BT option only for -TES executions = -40°C ÷ +60°C |
| Storage temperature range | Standard execution = -20°C ÷ +70°C<br>/BT option only for -TES execution = -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 | -T execution = 35 Watt -TE and -TES 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 execution = IP66/67 |
| Duty factor | Continuous rating (ED=100%) |
| EMC, climate and mechanical load | See technical table G004 |

| Valve model | | **DHZO-T** | | | | | | **DKZOR-T** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 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)** | Δp= 10 bar | 1 | 4,5 | 8 | 17 | 28 | 30 | 45 | 75 | 75 |
| | Δp= 30 bar | 1,7 | 8 | 14 | 30 | 50 | 52 | 80 | 130 | 130 |
| | Δp= 70 bar | 2,6 | 12 | 21 | 45 | 75 | 80 | 120 | 170 | 170 |
| Response time [ms] (0-100% step signal) **(2)** | | < 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% | | | | | | | | |
| Repeatability | | ± 0,1% | | | | | | | | |
| Thermal drift | | zero point displacement < 1% at ΔT = 40°C | | | | | | | | |

**Notes:** • above performance data refer to valves coupled with Atos electronic drivers, see section 7.
**(1)** for different Δp, the max flow is in accordance to the diagrams in section 8.2
**(2)** see detailed diagrams in section 8.4

**6** **SEALS AND HYDRAULIC FLUID** for other fluids not included in above table, consult our technical office

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

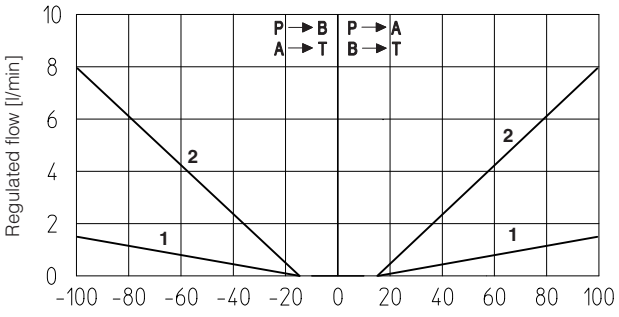
**7** **ELECTRONIC DRIVERS**

| 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 |

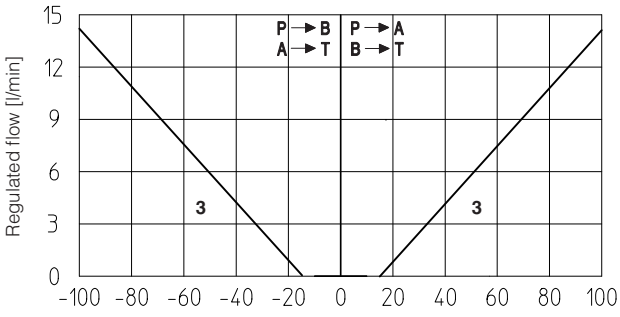
**Note:** For main and communication connector see sections **15** , **16**

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

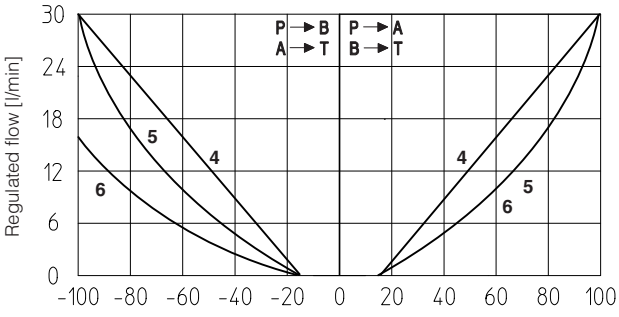
**8.1** **Regulation diagrams** (values measure at Δp 30 bar P-T)



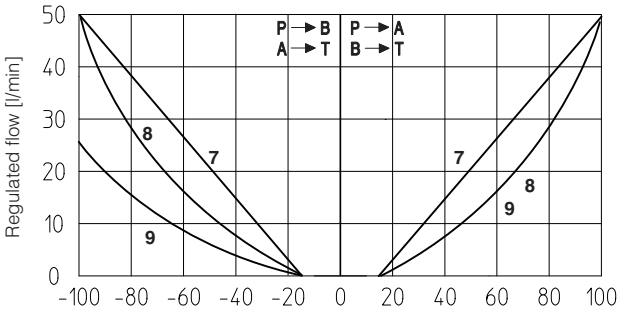

**DHZO**
**1** = L14 **2** = L1



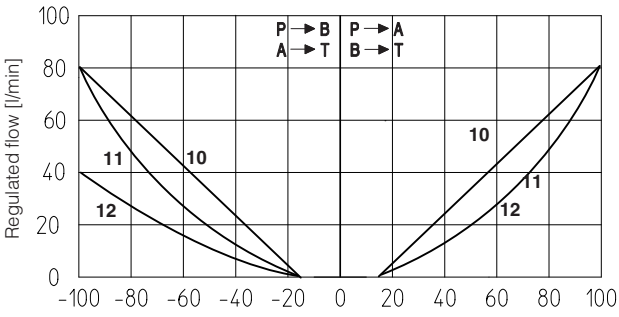

**DHZO**
**3** = S5



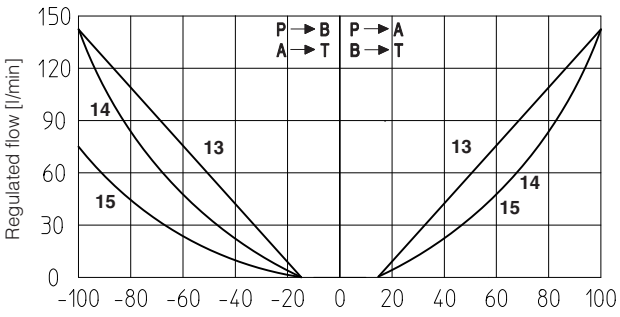

**DHZO**
**4** = L3 **5** = S3 **6** = D3




**DHZO**
**7** = L5 **8** = S5 **9** = D5




**DKZOR**
**10** = L3 **11** = S3 **12** = D3




**DKZOR**
**13** = L5 **14** = S5 **15** = D5

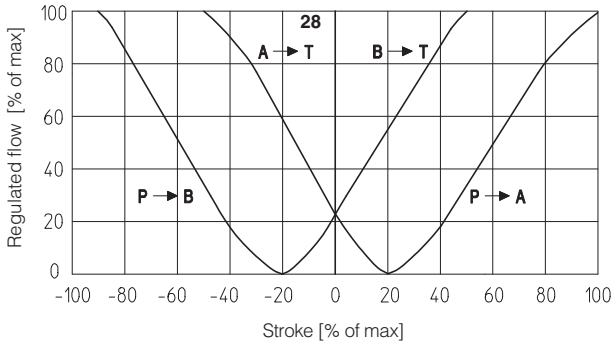
**Note**:

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

Reference signal $\begin{matrix}0 \div +10\ V \\ 12 \div 20\ mA\end{matrix}\Big\}$ P → A / B → T  Reference signal $\begin{matrix}0 \div -10\ V \\ 4 \div 12\ mA\end{matrix}\Big\}$ P → B / A → T

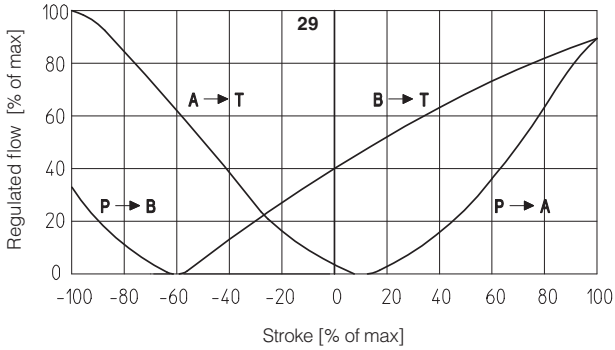
**28** = linear spool **Q5**

Q5 spool type is specific for alternate P/Q controls in combination with /S* option of digital integral drivers, see tab. G212, or Z-ME-KZ axis card (see table 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.




**29** = differential - progressive spool **V9**

V9 spool type is specific for alternate P/Q controls in combination with /S* option of digital integral drivers, see tab. G212, or Z-ME-KZ /GI axis card (see 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




## 8.2 Flow /Δp diagrams

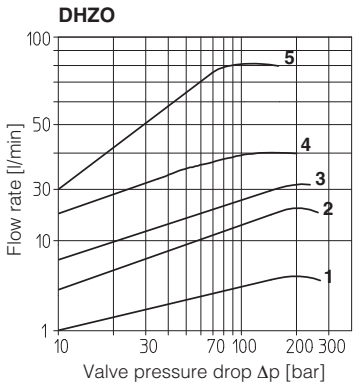
stated at 100% of valve stroke

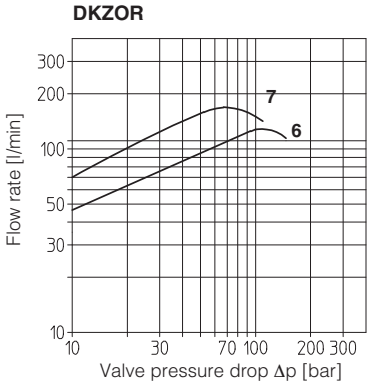
**DHZO**

**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



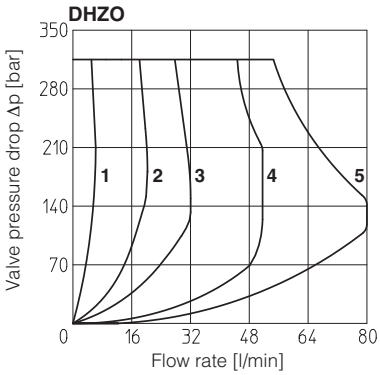

## 8.3 Operating limits

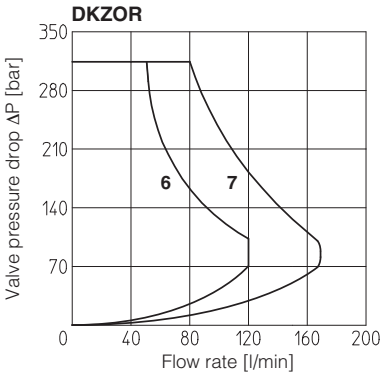
**DHZO**

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

**DKZOR**

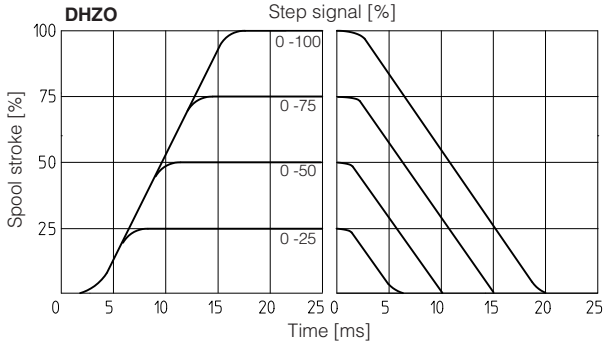
**6** = spool S3, L3, D3
**7** = spool S5, L5, D5, V9

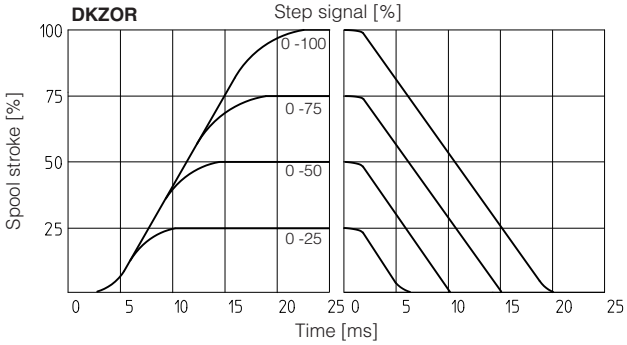



## 8.4 Response time

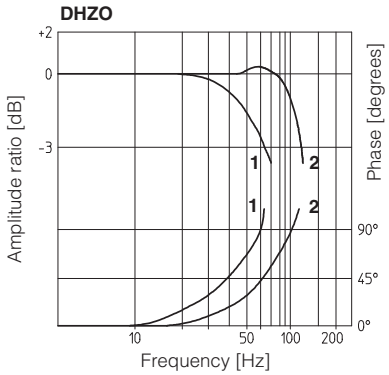
The response times in below diagrams are measured at different steps of the reference input signal. They have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

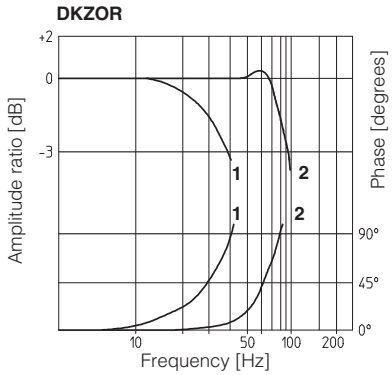


### 8.5 Bode diagrams

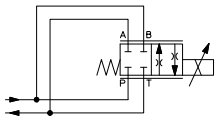
**1** = 10% ⟷ 90% nominal stroke
**2** = 50% ± 5% nominal stroke




### 8.6 Operation as throttle valve

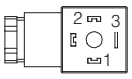
Single solenoid valves can be used as simple throttle valves: Pmax = 250 bar (option /Y advisable)



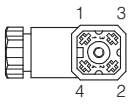

| Spool type | DHZO | | | | | DKZOR | |
|---|---|---|---|---|---|---|---|
| | **L14** | **L1** | **S2** | **L3 S3** | **L5 S5** | **L3 S3** | **L5 S5** |
| Max flow Δp= 70bar [l/min] | 6 | 20 | 40 | 80 | 100 | 150 | 250 |

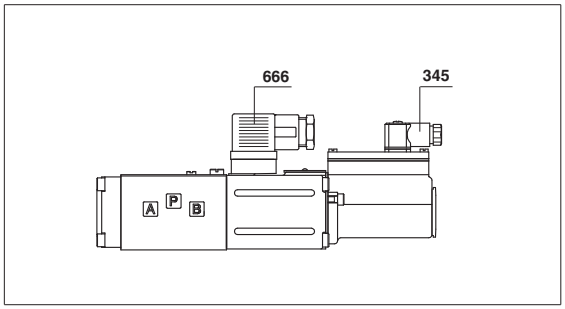
## 9 CONNECTIONS FOR -T EXECUTION

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




| **POSITION TRANSDUCER CONNECTOR** (pilot and main stage) | | |
|---|---|---|
| PIN | Signal description | **345** |
| **1** | OUTPUT SIGNAL | |
| **2** | SUPPLY -15 VDC | |
| **3** | SUPPLY +15 VDC | |
| **4** | GND | |




## 10 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 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:

**10.1 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.

**10.2 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.

**10.3 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.

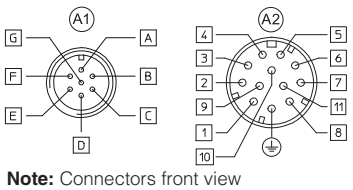
**10.4 Option /Z** (12 pin connector)

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.

**10.5 Possible combined options:** /FI and /IZ

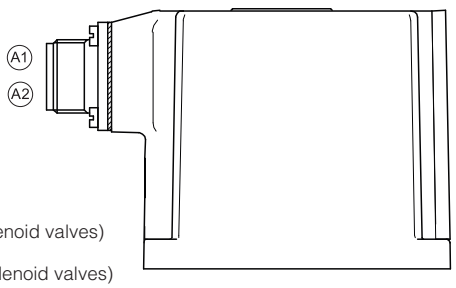
## 11 ANALOG INTEGRAL DRIVERS -TE - ELECTRONIC CONNECTIONS

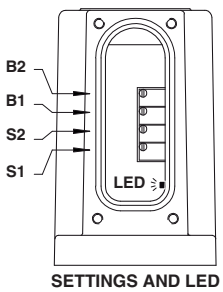
**7 PIN - STANDARD** **12 PIN - OPTION /Z**




**Note:** Connectors front view

**B1:** positive bias adjust
**B2:** negative bias adjust (only for double solenoid valves)
**S1:** positive scale adjust
**S2:** negative scale adjust (only for double solenoid valves)
**LED: OFF** normal working; **ON** fault presence




**SETTINGS AND LED**
(remove the rear cover)

### 11.1 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)<br>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)<br>For single solenoid valves the reference input is 0 ÷ +10 VDC (4 ÷ 20 mA for /I option)<br>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)<br>with /F option FAULT signal replaces MONITOR on pin F | Output - on/off signal |
| G | EARTH | Internally connected to the driver housing | |

### 11.2 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)<br>For single solenoid valves the reference input is 0 ÷ +10 VDC (4 ÷ 20 mA for /I option)<br>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.

## 12 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 ±10VDC nominal range

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

**12.1 Option /F**

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

**12.2 Option /I**

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

It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

**12.3 Option /Q**

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.

**12.4 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

**12.5 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).

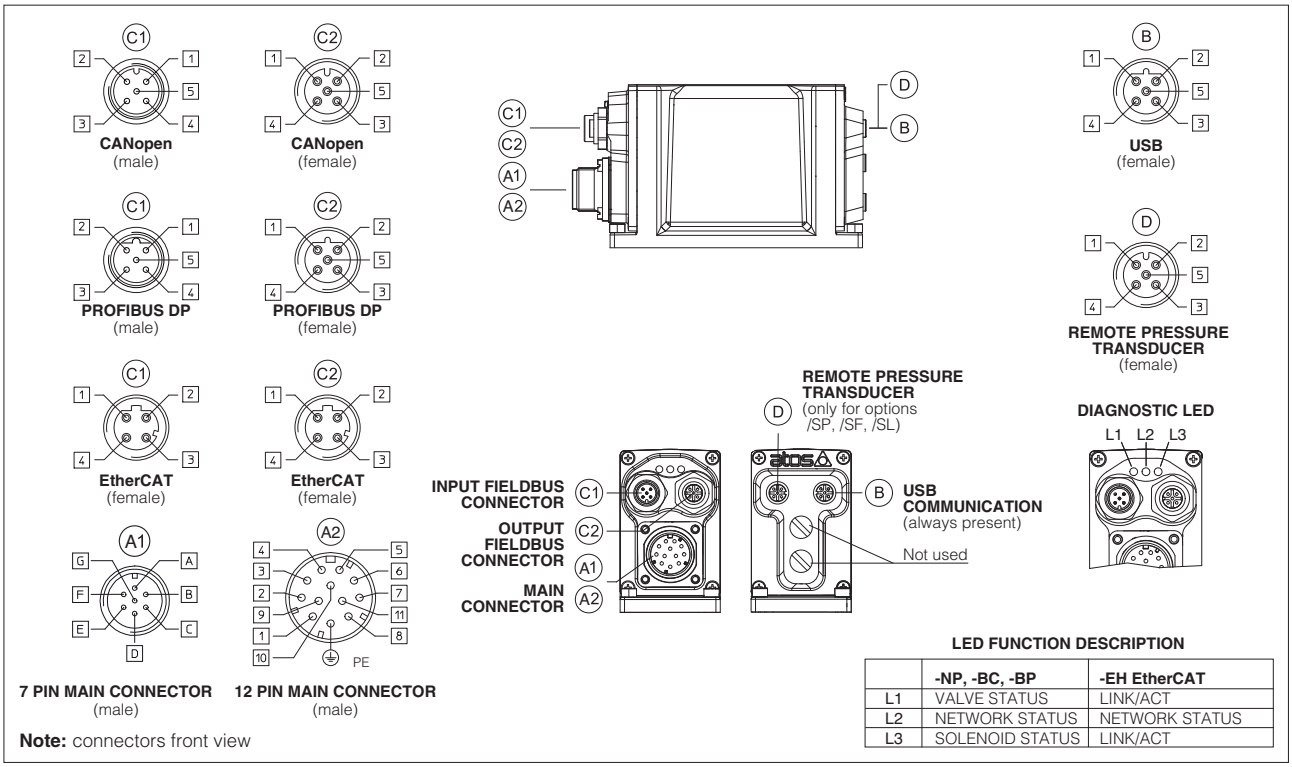
Main 12 pin connector is the same as /Z option one plus two analog signals specific for the pressure (force) control: pin 7 for reference signal and pin 8 for monitor.

**12.6 Options /C**

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

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

## 13 DIGITAL INTEGRAL DRIVERS -TES - ELECTRONIC CONNECTIONS AND LEDS




**Note:** connectors front view

**LED FUNCTION DESCRIPTION**

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

### 13.1 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 | | |

### 13.2 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.

### 13.3 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

### 13.4 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 | |

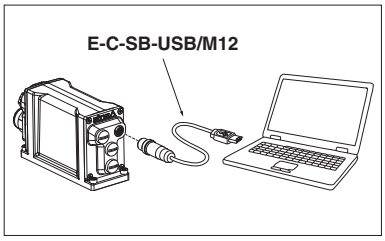
**Note (1)** shield connection on connector's housing is recommended

### 14 PROGRAMMING TOOLS (see table **G500**)

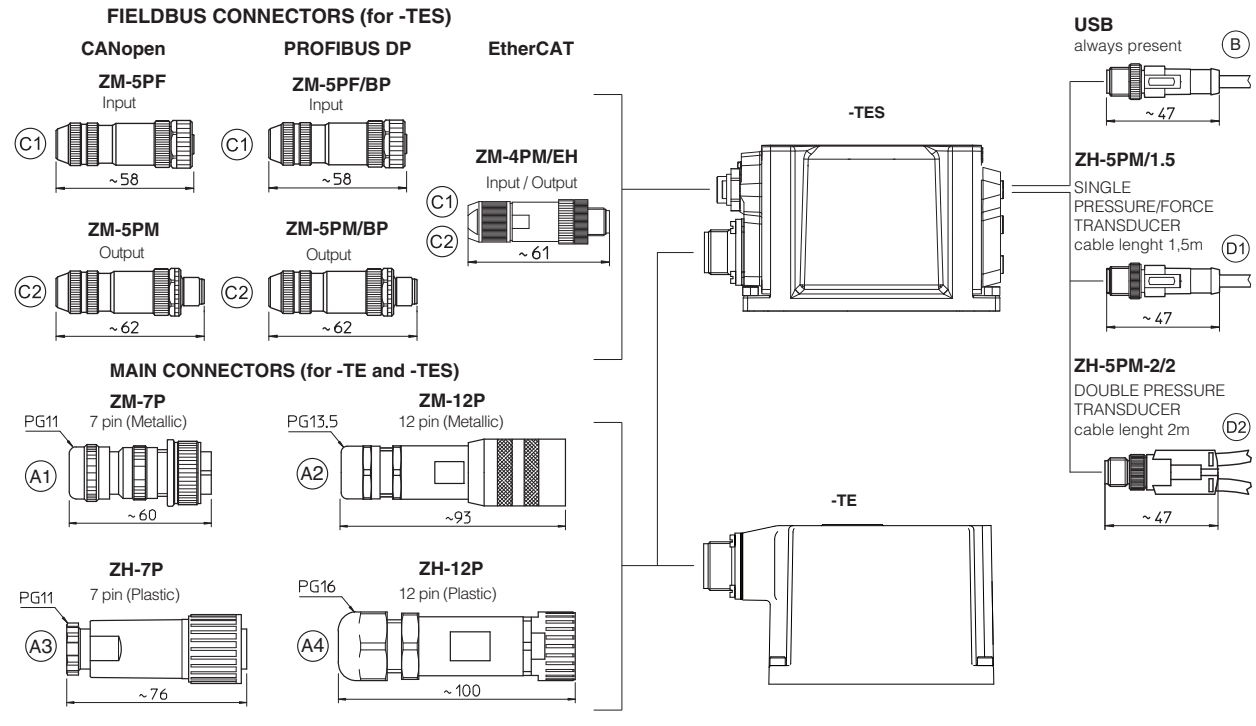

Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB communication port to the digital driver. E-SW software is available in different versions according to the driver's fieldbus interface: -NP (not present) E-SW-PS,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




### 15 CONNECTORS




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

### 16 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

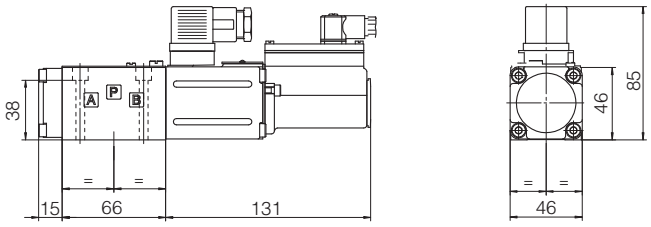
**(1)** only for /SP or /SL options **(2)** only for /SF option

# DHZO-T*

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

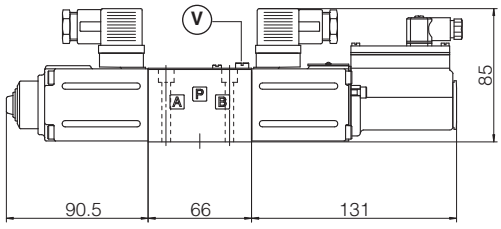
Fastening bolts: 4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108; 1 OR 2025
Diameter of ports A, B, P, T: Ø 7,5 mm (max)
Diameter of port Y: Ø = 3,2 mm (only for /Y option)

**DHZO-T-05**



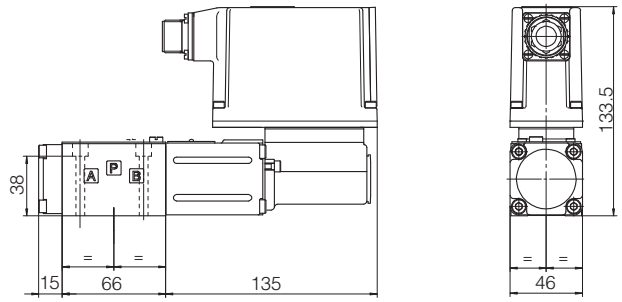

Mass: 1,9 kg

**DHZO-T-07**



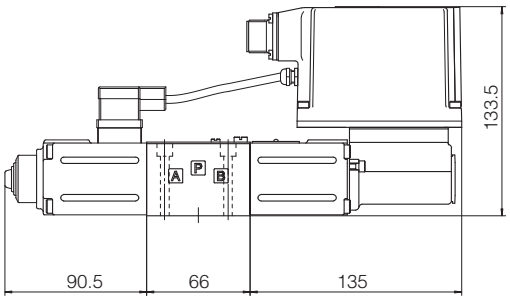

Mass: 2,6 kg

**DHZO-TE-05**



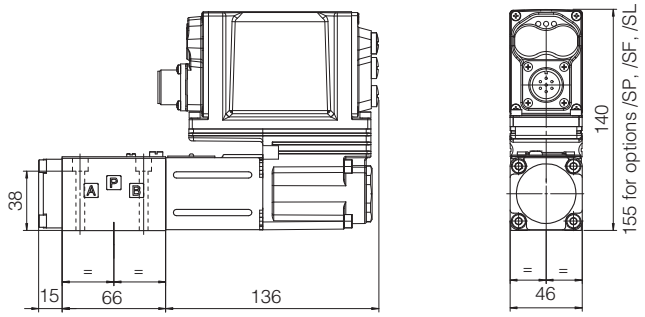

Mass: 2,3 kg

**DHZO-TE-07**



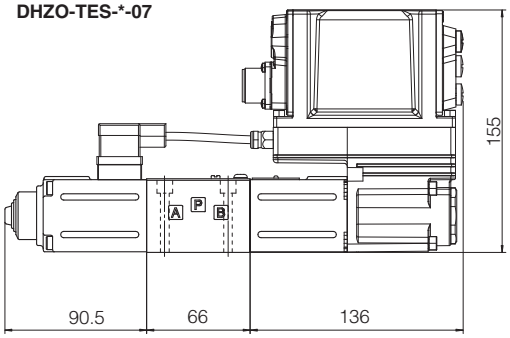

Mass: 3,1 kg

**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

for main and communication connectors see section 15, 16

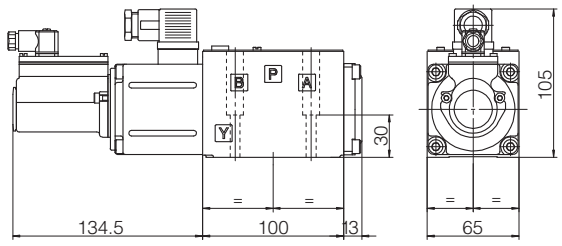
(V) = Air bleed off

# DKZOR-T*

**ISO 4401: 2000**
**Mounting surface: 4401-05-04-0-05** (see table P005)
**(for /Y surface 4401-05-05-0-05 without X port)**

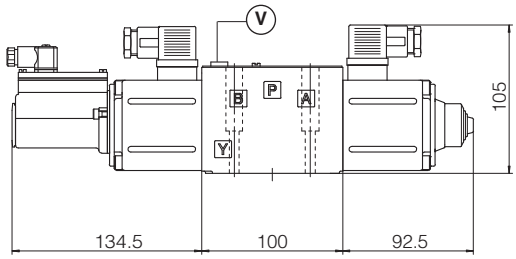
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050;  1 OR 108
Diameter of ports A, B, P, T:  Ø 11,2 mm (max)
Diameter of port Y:  Ø = 5 mm (only for /Y option)

**DKZOR-T-15**



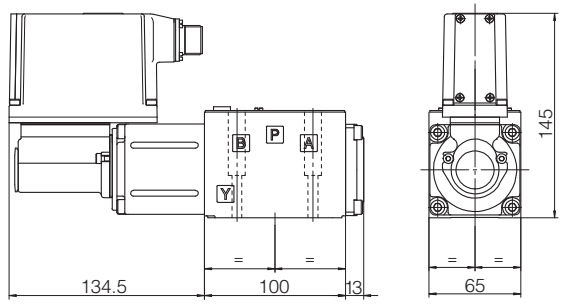

Mass: 3,8 kg

**DKZOR-T-17**



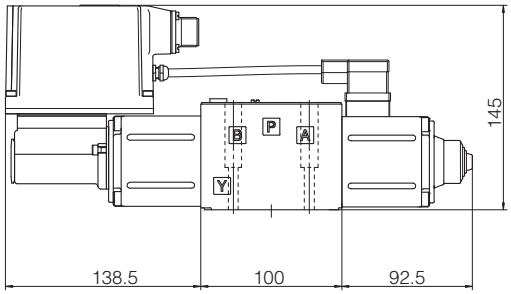

Mass: 4,5 kg

**DKZOR-TE-15**



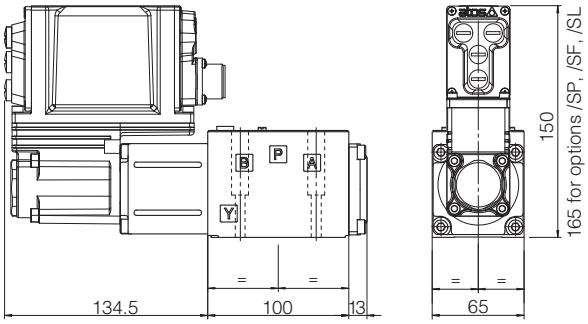

Mass: 4,3 kg

**DKZOR-TE-17**



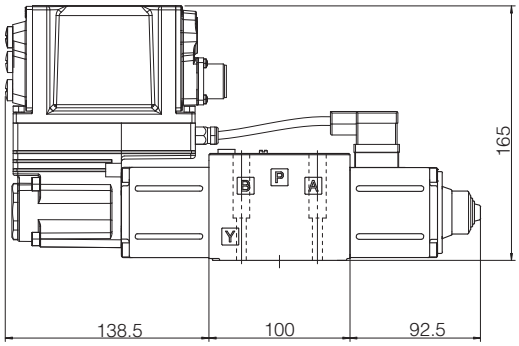

Mass: 5,0 kg

**DKZOR-TES-*-15**




Mass: 4,3 kg

**DKZOR-TES-*-17**




Mass: 5,0 kg

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

for main and communication connectors see section 15, 16

(V) = Air bleed off