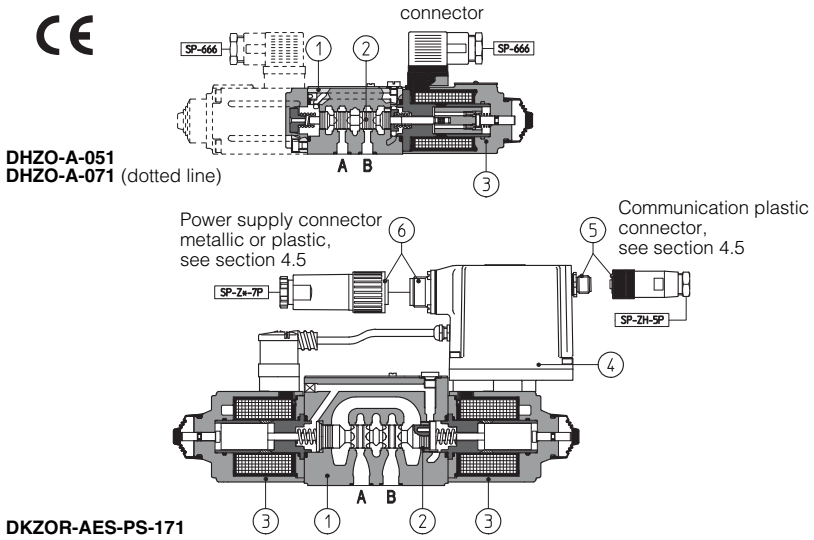
Proportional directional valves type DHZO-A* and DKZOR-A*

direct operated, without position transducer, ISO 4401 size 06 and 10



DHZO-A* and DKZOR-A* are proportional valves, direct operated without 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 9 and 12, 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:
- -A, without position transducer;
- -AE, -AES as -A plus analogue (AE) or digital (AES) integral electronics ④.

The 4-way spool ②, sliding into a 5-chambers body ①, is directly operated by proportional solenoids ③.
The integral electronics ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

Following communication interfaces ⑤ are available for the digital -AES execution:
- -PS, RS232 serial communication interface. The valve reference signal is provided with analogue commands via the 7 (or 12) pins connector ⑥.
- -BC, CANbus interface
- -BP, PROFIBUS-DP interface

In the -BC and -BP interfaces the valve reference signal is provided via fieldbus; during start up or maintenance, the valves can be operated with analogue signals via the 7 (or 12) pins connector ⑥.

To compensate flow variations due to modification of the load conditions, modular pressure compensators are available to keep a constant Δp across the valve (see tab. D150).

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 105 l/min with valve differential pressure Δp = 30 bar, see table 2.
Max pressure = 350 bar for DHZO;
315 bar for DKZOR.

1 MODEL CODE

DHZO –AES – PS – 0 7 1 – S 5 / * / ** / * / ***

DHZO = size 06
DKZOR = size 10

A = without position transducer
AE = as A plus integral electronics
AES = as A plus integral digital electronics

Communication interfaces (only for AES)
PS = RS232 serial
BC = CANbus
BP = PROFIBUS-DP

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

Configuration, see section 2
5 = external plus central position, spring centered
7 = 3 position, spring centered

Spool overlapping in central position, see section 2
1 = P, A, B, T positive overlapping
3 = P positive overlapping; A, B, T, negative overlapping

Spool type
L = linear; **S** = progressive;
D = as S, but with P-A = Q, P-B = Q/2

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

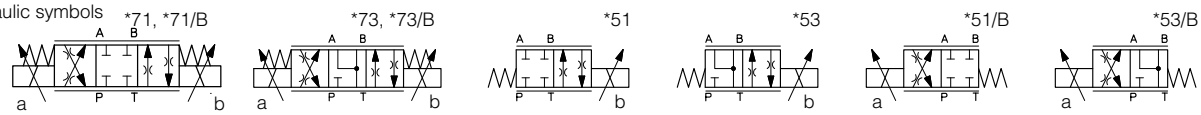
Options, see section 4:
Y = external drain
B = solenoid and integral electronics at side of port A
for -A execution:
6 = with 6 VDC coil instead of standard 12 VDC coil
18 = with 18 VDC coil instead of standard 12 VDC coil
N = manual micrometric adjustment
NV = as N plus handwheel and graduated scale
for -AE execution:
I = current reference (4÷20 mA)
Q = enable signal
for -AES execution:
Z = double power supply, enable and fault (12 poles connector)

Series number

Synthetic fluids
WG = water-glycol
PE = phosphate ester

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

Hydraulic symbols



Valve model		DHZO				DKZOR	
		-A	-AE	-AES		-A	-AE -AES
Spool overlapping		1, 3	1, 3	1, 3	1, 3	1, 3	1, 3
Spool type and size		L14	L1	S3, L3, D3	S5, L5, D5	S3, L3	S5, L5, D5
Pressure limits	[bar]	ports P, A, B = 350; T = 160 (250 with external drain /Y)				ports P, A, B = 315; T = 160 (250 with external drain /Y)	
Max flow	[l/min]						
at Δp = 10 bar (P-T)	(1)	1	4,5	17	28	45	60
at Δp = 30 bar (P-T)		2	8	30	50	80	105
at Δp = 70 bar (P-T)		3	12	45	70	120	160
Response time (2)	[ms]	< 30				< 40	
Hysteresis	[%]	5%				5%	
Repeatability		± 1%				± 1%	

Above performance data refer to valves coupled with Atos electronic drivers, see section 9 and 12.
(1) For different Δp, the max flow is in accordance to the diagrams in sections 6.2 and 7.2.
(2) Response times at step signal (0%→100%) are measured from 10% to 90% of step value and are strictly referred to the valve regulation.

3 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES TYPE DHZO-A* AND DKZOR-A*

Assembly position	Any position
Subplate surface finishing	Roughness index, $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -A execution; -20°C ÷ +60°C for -AE and -AES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1
Recommended viscosity	15 ÷100 mm²/s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 18/15 achieved with in line filters of 10 μm and $\beta_{10} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)

3.1 Coils characteristics

Valve model	DHZO-A*			DKZOR-A*		
	with 12 Vdc coil	with 6 Vdc coil	with 18 Vdc coil	with 12 Vdc coil	with 6 Vdc coil	with 18 Vdc coil
Coil resistance R at 20°C	3 ÷ 3,3 Ω	2 ÷ 2,2 Ω	13 ÷ 13,4 Ω	3,8 ÷ 4,1 Ω	2,2 ÷ 2,4 Ω	12 ÷ 12,5 Ω
Max. solenoid current	2,2 A	2,75 A	1 A	2,6 A	3,25 A	1,2 A
Max. power	30 Watt			35 Watt		
Protection degree (CEI EN-60529)	IP65 for -A execution; IP65÷67 for -AE and -AES executions, depending to the connector type (see sect. 4.5)					
Duty factor	Continuous rating (ED=100%)					

4 INTEGRAL ELECTRONICS OPTIONS AND WIRING

4.1 Option /I

It provides the 4÷20 mA current reference signal instead of the standard 0÷10 V (±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. In case of breakage of the reference signal cable, the valve functioning is disabled.

4.2 Option /Q

Safety option providing the possibility to enable or disable the valve functioning without cutting the power supply.

4.3 Option /Z

Safety option, specifically introduced for -BC and -BP communication interfaces, provides two separated electric power supplies for the digital electronic circuits and for the solenoid power supply stage. The Enable and Fault signals are also available. The option **/Z** allows to interrupt the valve functioning by cutting the solenoid power supply (e.g. for emergency, as provided by the European Norms EN954-1 for components with safety class 2), but keeping energized the digital electronic circuits, thus avoiding fault conditions of the machine fieldbus controller.
For the electrical wiring of -AES, electronics with option **/Z** (12 poles connector), see tab. G115.

4.4 Integral electronics wiring

For the electric wiring shielded cables must be provided: the shield must be connected to the power supply zero **on the generator side**, see tab. **F003**

POWER SUPPLY CONNECTOR				
PIN	SIGNAL DESCRIPTION	**-AE, -AES**	**-AE/I**	**-AE/Q**
A	Power supply 24 Vdc	Stabilized: +24Vdc		
B	Power supply zero	Filtered and rectified: V_{rms} = 21 ÷ 33 (ripple max $2V_{pp}$)		
C	Signal zero	Reference 0 Vdc	Reference 0 Vdc	Enabling input normal working 9 ÷ 24 Vdc
D	Input signal +	0 ÷ 10 Vdc (for single solenoid valve)	4 ÷ 20 mA	0 ÷ 10 Vdc (for single solenoid valve)
E	Input signal -	± 10 Vdc (for double solenoid valve)		± 10 Vdc (for double solenoid valve)
F	Monitor driving current	0 ÷ 5 Vdc (for single solenoid valve) ± 5 Vdc (for double solenoid valve) 1V = 1A (referred to pin C)		0 ÷ 5 Vdc (for single solenoid valve) ± 5 Vdc (for double solenoid valve) 1V = 1A (referred to pin B)
G	Earth	Connect only when the power supply is not conform to VDE 0551 (CEI 14/6)		

COMMUNICATION CONNECTORS (for -AES)				
Communication options		**-PS** (RS232) male connector	**-BC** (CAN Bus) male connector	**-BP** (PROFIBUS-DP) female connector (reverse key)
Pin number / Signal description	1	NC Not Connected	CAN_SHLD Shield	+5V Termination voltage
	2	NC Not Connected	NC Not Connected	LINE -A Bus line (high)
	3	RS_GND Signal zero data line	CAN_GND Signal zero data line	DGND Signal zero data line / termination voltage
	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 Shield

Note:
- electrical signals (e.g. actual - feedback signals) acquired via valve electronics must not be used to switch off the machine safety functions. This is in accordance with the European standards (Safety requirements of fluid technology systems and components - hydraulics, EN-892).
- installation notes with basic information for commissioning and start-up, are always supplied with relevant components, together with the specific technical tables.

4.5 Model codes of power supply and communication connectors

VALVE VERSION	**-A**	**-AE, -AES**		**-AES/Z**	**-RS232 (-PS) OR CANBUS (-BC)**	**PROFIBUS (-BP)**
CONNECTOR CODE	**SP-666**	**SP-ZH-7P** (1)	**SP-ZM-7P** (1)	**SP-ZH-12P** (1)	**SP-ZH-5P** (1)	**SP-ZH-5P/BP** (1)
CONNECTOR CODE	**IP65**	**IP67**	**IP66**	**IP65**	**IP67**	**IP67**

(1) to be ordered separately

5 PROGRAMMING DEVICES

The functional parameters of the digital valves, as the bias, scale, ramp and linearization of the regulation characteristic, can be easily set and optimized with graphic interface by using the following software programming devices suitable for standard PC:
KIT-E-SW-PS for electronics with RS232 interface (option **-PS**)
KIT-E-SW-BC for electronics with CANbus interface (option **-BC**)
KIT-E-SW-BP for electronics with PROFIBUS-DP interface (option **-BP**)
see tab. G500 for complete information about the programming device kits and for the PC minimum requirements.
Only for the -BC and -BP communication options, the functional parameters can be alternatively set via fieldbus through the machine control unit, using the standard communication protocol implemented by Atos.
The protocol operating instructions to be implemented in the standard protocols (DS301V4.02, DSP408 for CANbus and DPVO for PROFIBUS-DP) are described in the user manuals MAN-S-BC (for -BC option) and MAN-S-BP (for -BP option) supplied with the relevant programming device kits.
The above programming devices have to be ordered separately.

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

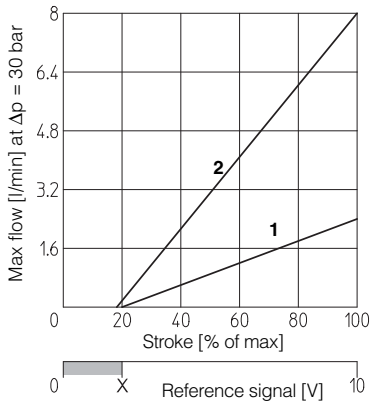
6.1 Regulation diagrams

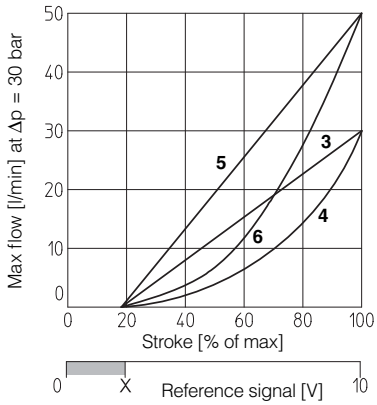
1 = linear spool L14
2 = linear spool L1
3 = linear spool L3
4 = progressive spool S3, D3
5 = linear spool L5
6 = progressive spool S5, D5

Note:
1) For the valves with digital electronics, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.

2) Hydraulic configuration vs reference signal (for double solenoid valves):
Reference signal 0 ÷+10 V P → A / B → T
12÷20 mA (also for option /B)

Reference signal 0 ÷-10 V P → B / A → T
4÷12 mA (also for option /B)



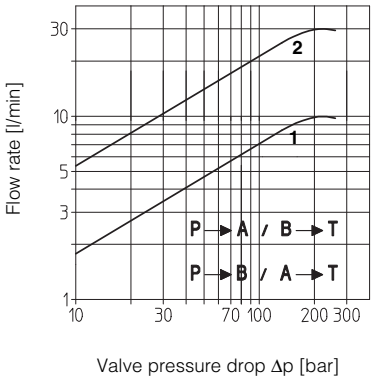


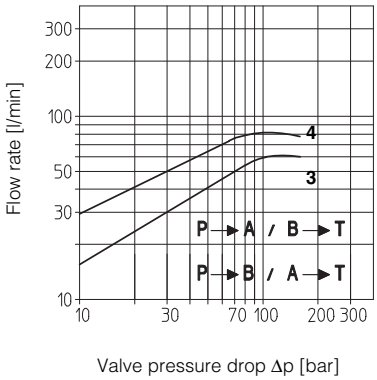
X = Threshold for bias activation depending to the valve type and amplifier type

6.2 Flow /Δp diagrams

stated at 100% of valve stroke

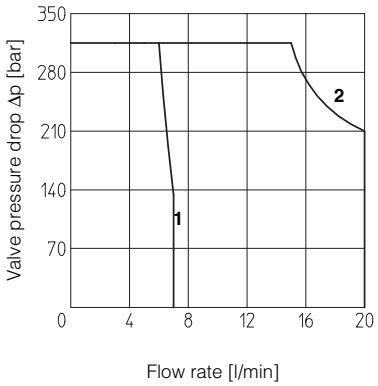
1 = spool L14
2 = spool L1
3 = spool S3, L3, D3
4 = spool S5, L5, D5

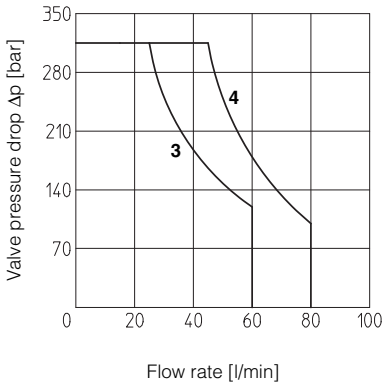




6.3 Operating limits

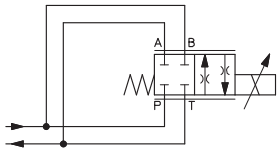
1 = spool L14
2 = spool L1
3 = spool L3, S3, D3
4 = spool L5, S5, D5





6.4 Operation as throttle valve

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



	SPOOL TYPE				
	L1	**L3**	**S3**	**L5**	**S5**
Max flow/Δp [l/min]	25	80		100	

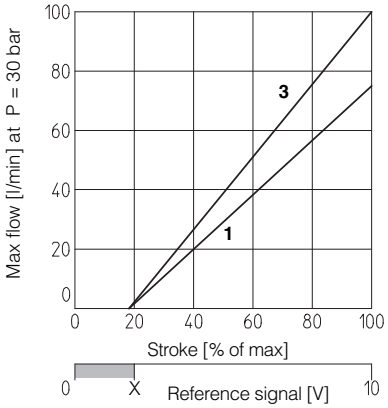
7 DIAGRAMS FOR DKZOR (based on mineral oil ISO VG 46 at 50 °C)

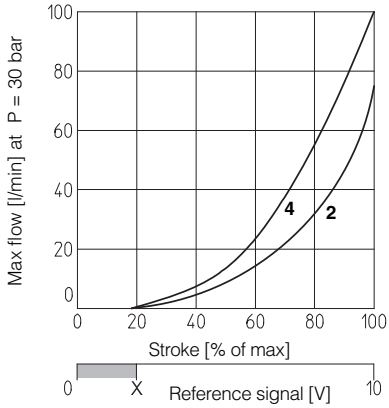
7.1 Regulation diagrams

1 = linear spool L3
2 = progressive spool S3
3 = linear spool L5
4 = progressive spool S5, D5 (*)

(*) D spool has the same flow of S in P → A and half flow in P → B

Note:
1) For the valves with digital electronics the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.
2) Hydraulic configuration vs reference signal (for double solenoid valves):
Reference signal 0 ÷+10 V P → A / B → T
12÷20 mA (also for option /B)
Reference signal 0 ÷-10 V P → B / A → T
4÷12 mA (also for option /B)

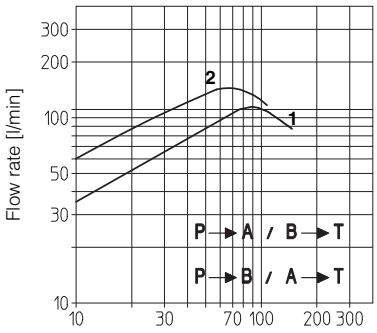




X = Threshold for bias activation depending to the valve type and amplifier type

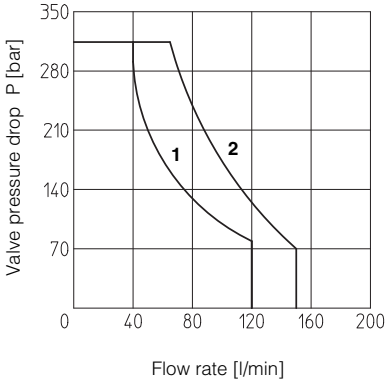
7.2 Flow /Δp diagrams
stated at 100% of valve stroke

1 = spool S3, L3
2 = spool S5, L5, D5



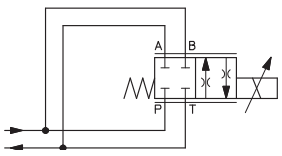
7.3 Operating limits

1 = spool L3, S3
2 = spool L5, S5, D5



7.4 Operation as throttle valve

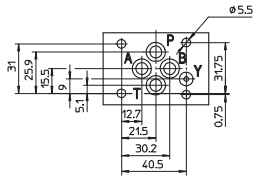
Single solenoid valves (DKZOR-*-051) can be used as simple throttle valves:
Pmax = 250 bar (option /Y advisable)



	SPOOL TYPE			
	L3	**S3**	**L5**	**S5**
Max flow/Δp [l/min]	100		160	

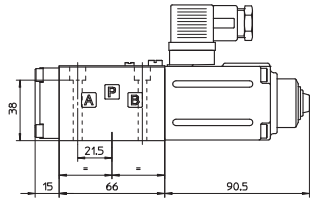
8 INSTALLATION DIMENSIONS FOR DHZO [mm]

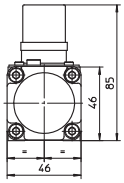
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
(for /Y version, surface 4401-03-03-0-05 without X port)
Fastening bolts: 4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108; 1 OR 2025
Diameter of ports A, B, P, T: Ø 7,5 mm (max)
Diameter of port Y: Ø = 3,2 mm (only for /Y option)



P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
Y = DRAIN PORT (see note)
V = AIR BLEED-OFF

DHZO-A-05

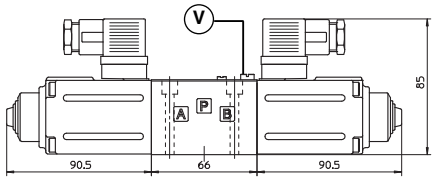




Mass: 1,9 kg

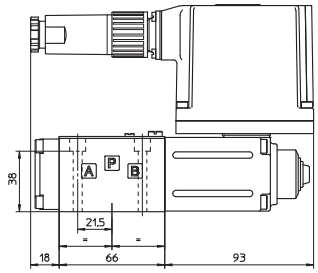
Note: for option /B the solenoid is at side of port A

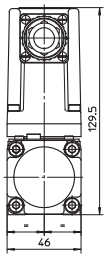
DHZO-A-07



Mass: 2,6 kg

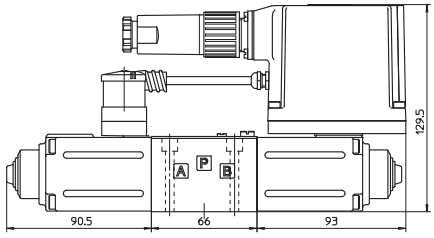
DHZO-AE-05





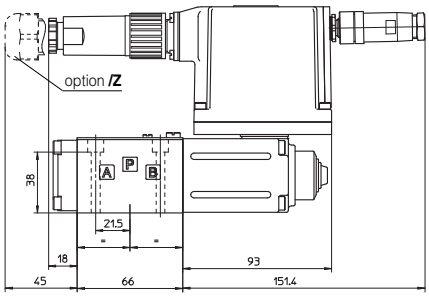
Mass: 2,3 kg

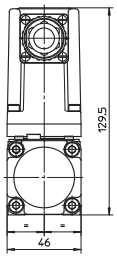
DHZO-AE-07



Mass: 3,1 kg

DHZO-AES-*-05

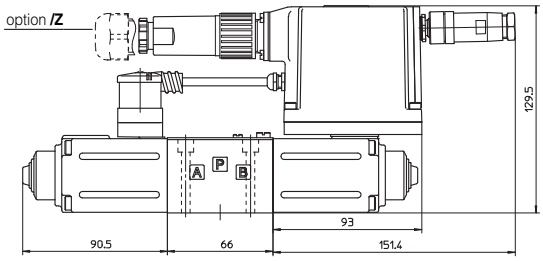




Mass: 2,3 kg

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

DHZO-AES-*-07



Mass: 3,1 kg

Note: for option /B the integral electronics is at side of port A

9 ELECTRONIC DRIVERS FOR DHZO-A*

Valve model	-A				-AE	-AES
Drivers model	E-MI-AC-0*F	E-BM-AC-0*F	E-ME-AC-0*F	E-RP-AC-0*F	E-RI-AE	E-RI-AES
Data sheet	G010	G025	G035	G100	G110	G115

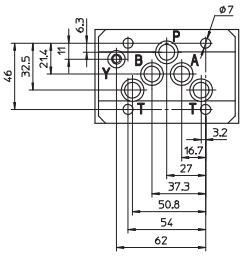
For complete information about the drivers characteristics and relevant options, see the technical data sheet specified in the table.

10 MOUNTING PLATES FOR DHZO (select /Y in the plate model code for valves with option /Y)

Size	Model	Ports location	Gas ports A, B, P, T (X, Y)	Ø Counterbore [mm] A, B, P, T (X, Y)	Mass [kg]
06	BA-202	Ports A, B, P, T underneath;	3/8"	–	1,2
	BA-204	Ports P, T underneath; ports A, B on lateral side	3/8"	25,5	1,8
	BA-302 (/Y)	Ports A, B, P, T (X, Y) underneath;	1/2" (1/8")	30 (16,5)	1,8

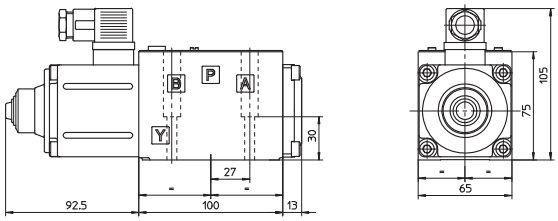
11 INSTALLATION DIMENSIONS FOR DKZOR [mm]

ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
(for /Y version, surface 4401-05-05-0-05 without X port)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050; 1 OR 108
Diameter of ports A, B, P, T: Ø 11,2 mm (max)
Diameter of port Y: Ø = 5 mm (only for /Y option)



P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
Y = DRAIN PORT (see note)
V = AIR BLEED-OFF

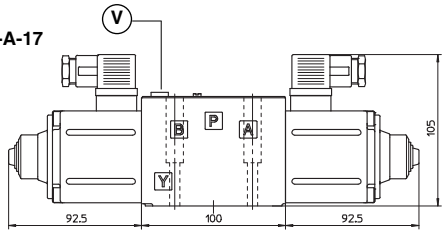
DKZOR-A-15



Mass: 3,8 kg

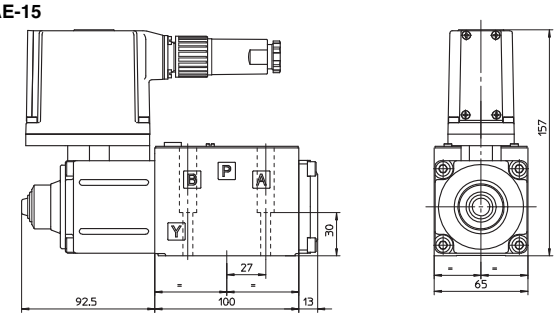
Note: for option /B the solenoid is at side of port A

DKZOR-A-17



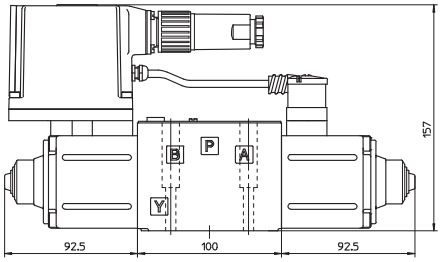
Mass: 4,5 kg

DKZOR-AE-15



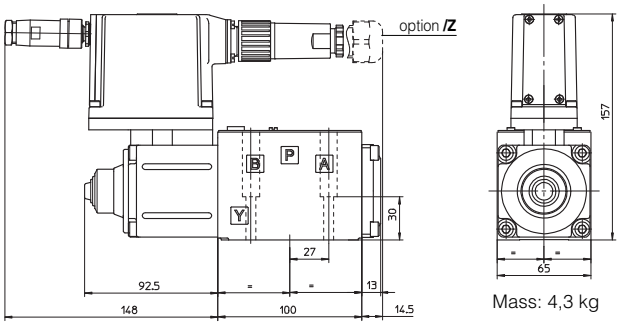
Mass: 4,3 kg

DKZOR-AE-17



Mass: 5,0 kg

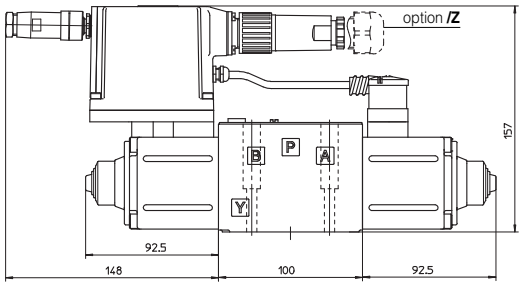
DKZOR-AES-*-15



Mass: 4,3 kg

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

DKZOR-AES-*-17



Mass: 5,0 kg

Note: for option /B the integral electronics is at side of port A

12 ELECTRONIC DRIVERS FOR DKZOR-A*

Valve model	-A				-AE	-AES
Drivers model	E-MI-AC-0*F	E-BM-AC-0*F	E-ME-AC-0*F	E-RP-AC-0*F	E-RI-AE	E-RI-AES
Data sheet	G010	G025	G035	G100	G110	G115

For complete information about the drivers characteristics and relevant options, see the technical data sheet specified in the table.

13 MOUNTING PLATES FOR DKZOR (select /Y in the plate model code for valves with option /Y)

Size	Model	Ports location	Gas ports A, B, P, T (X, Y)	Ø Counterbore [mm] A, B, P, T (X, Y)	Mass [kg]
10	BA-308 (/Y)	Ports A, B, P, T (X, Y) underneath;	1/2" (1/4")	30 (21,5)	2,5
	BA-428 (/Y)	Ports A, B, P, T (X, Y) underneath;	3/4" (1/4")	36,5 (21,5)	5,5
	BA-434 (/Y)	Ports P, T (X, Y) underneath; A, B on lateral side	3/4" (1/4")	36,5 (21,5)	8,5