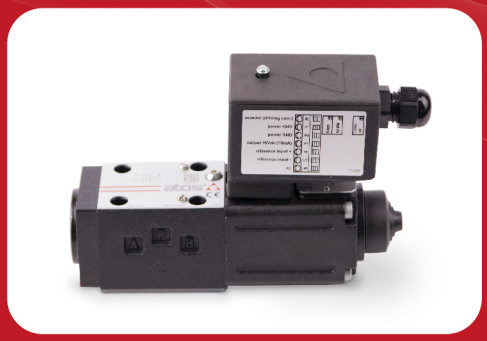
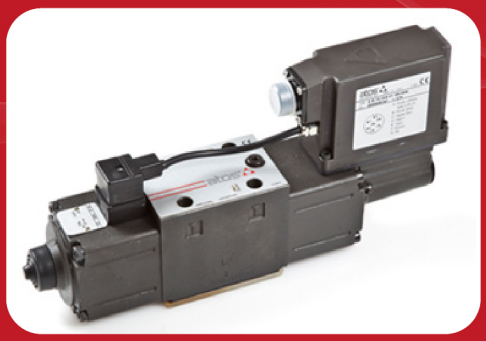
HYDRO

www.hydro.com.pl

Hydraulika proporcjonalna

Proportional electrohydraulics





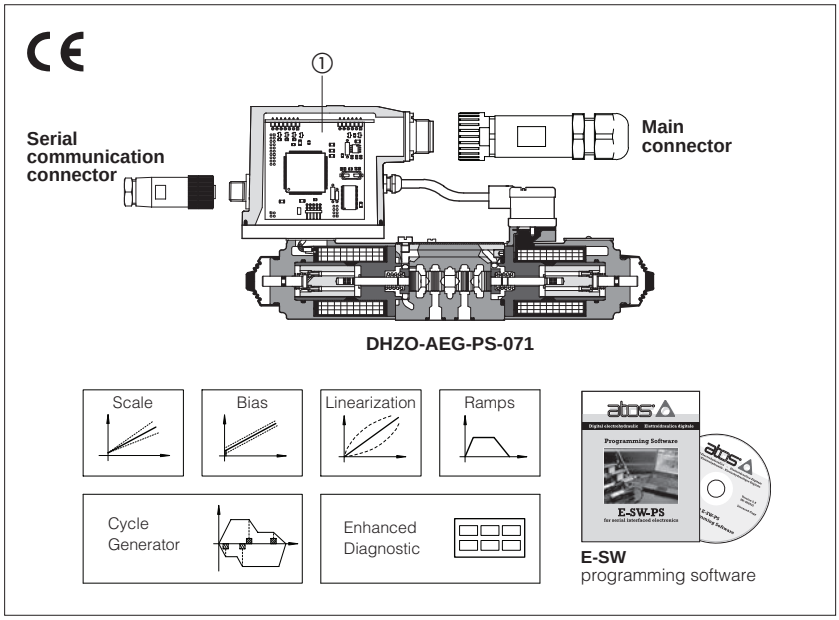
atos®

część 2

2014

Digital proportionals with integral cycle generator

for directional proportional valves without transducer



Digital electronics include valve's driver + cycle generator ① to perform the open loop motion cycle of any linear or rotative hydraulic actuator.
They are integrated to direct or pilot operated directional proportional valves and operated by digital inputs commanded by the machine electronic control unit.
2 different executions are available:
AEG drivers - 16 sets of valve's flow regulation (axis speed) and ramp values are preset into the driver by Atos software; each set represents a phase of the whole motion cycle. The machine control unit handles, through the 4 digital inputs, the desired actuator motion cycle as a phases sequence.
AEZ controllers - as AEG but the selection of the 6 different phases, for each actuator direction, is internally made by position switches preset by Atos software. An analog position transducer has to be installed on the actuator and connected to the controller. The machine control unit commands forward and backward axis motion start.

Electrical Features:
- Functional factory preset parameters for best performances
- 12 pin main connector for power supply, on-off inputs, enable and fault signals
- 5 pin connector for serial communication interface
- 5 pin connector for external analog position transducer or potentiometer (AEZ execution)
- Electrical protection against reverse polarity of power supply
- IP67 protection degree
- CE mark to EMC directive

Software Features:
- Intuitive graphic interface
- Internal generation of reference signal
- Setting of valve functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- Complete diagnostics of driver/controller status
- Internal oscilloscope function
- In field firmware update through serial port

1 EXAMPLE OF PROPORTIONAL VALVE CODE

For the complete proportional valve code refer to the specific technical tables

DHZO - AEG - PS - 0 - 7 - *

Proportional Valve:
DHZO, DKZOR - see **F160**
DPZO - see **F170**

For proportional directional valves with:
AEG = digital driver with internal reference generation by digital input
AEZ = digital controller with internal reference cycle generation by position feedback

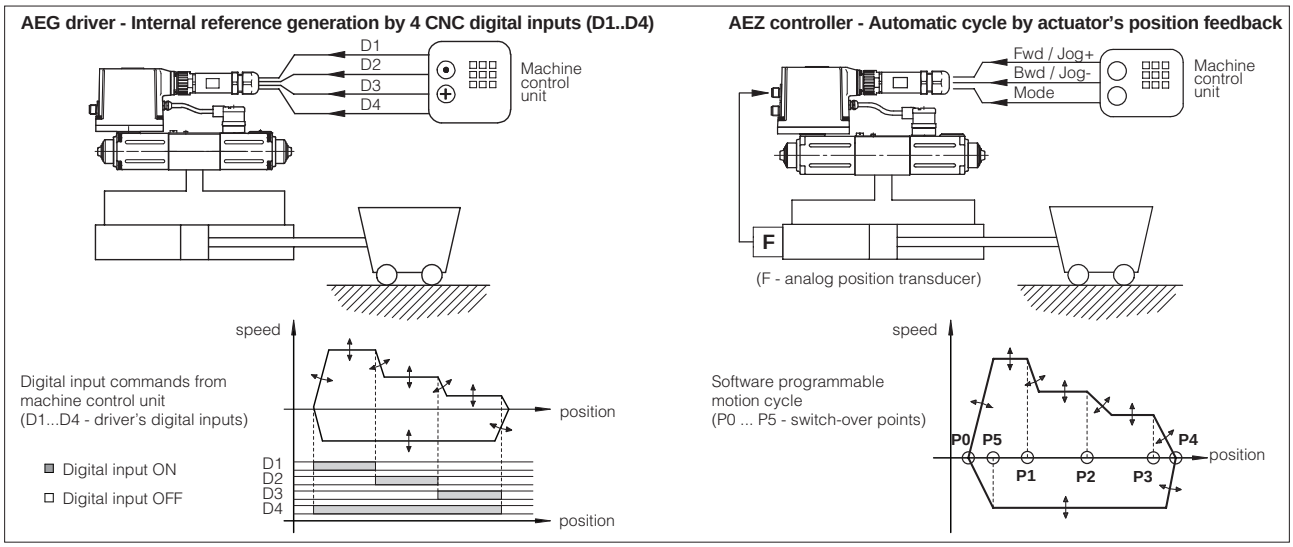
Communication interface:
PS = Serial communication interface

Valve size (0, 1, 2, 4, 6)

Configuration (5, 7)

Spool configuration and other options

2 AEG/AEZ - CYCLE GENERATION MODES

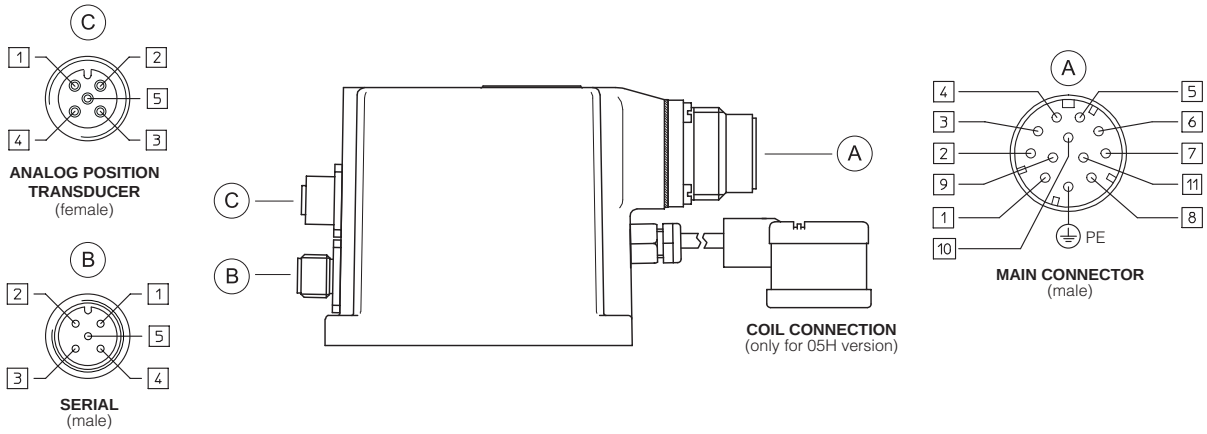


3 AEG/AEZ INTEGRAL ELECTRONICS - CHARACTERISTICS

Power supply (see 5.1)	Nominal : +24 VDC Rectified and filtered : VRMS = 21 ÷ 32 VMAX (ripple max 10 % VPP)
Max power consumption	50 W
Analog input signal	Voltage: range ±10 VDC Input impedance: Ri > 50 kΩ Current: range 4 ÷ 20 mA Input impedance: Ri = 500 Ω
Enable input (see 5.2)	Range : 0 ÷ 9 VDC (OFF state), 15 ÷ 24 VDC (ON state), 9 ÷ 15 VDC (not accepted); Input impedance: Ri > 37 kΩ
On-Off inputs (see 5.3)	Range : 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: Ri > 10 kΩ
Output supply	±5 VDC @ max 10 mA : output supply for external potentiometers (**AEZ execution**)
Status output (see 5.6)	Output range : 0 ÷ 24 VDC (ON state ≅ [power supply] ; OFF state ≅ 0 V) @ max 50 mA
Alarms	Solenoid not connected/short circuit, overtemperature, under temperature
Format	Sealed box on the valve; IP67 protection degree
Operating temperature	-20 ÷ 60 °C (storage -20 ÷ 70 °C)
Mass	approx. 430 g
Additional characteristics	Short circuit protection of solenoid current supply; current control by P.I.D. with rapid solenoid switching; protection against reverse polarity of power supply
Electromagnetic compatibility (EMC)	According to Directive 2004/108/CE (Immunity: EN 61000-6-2; Emission: EN 61000-6-3)
Communication interface Physical Layer Protocol	 serial RS232 (not insulated) Atos ASCII coding
Recommended wiring cable	LiYCY shielded cables: 0,5 mm^2 for length up to 40 m [1,5 mm^2 for power supply and solenoid]

Note: A maximum time of 380 ms (depending on communication type) 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.

4 AEG/AEZ INTEGRAL ELECTRONICS - CONNECTIONS



Note: Connectors front view

4.1 AEG MAIN CONNECTOR - 12 pin (A)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for solenoid power stage (see 5.1)	Input - power supply
2	V0	Power supply 0 VDC for solenoid power stage (see 5.1)	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (see 5.2)	Input - on/off signal
4	D1	Digital input referred to pin 2 (see 5.3)	Input - on/off signal
5	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
6	MONITOR	Monitor analog output: ±5 VDC maximum range (see 5.4)	Output - analog signal
7	D2	Digital input referred to pin 2 (see 5.3)	Input - on/off signal
8	NC	do not connect	
9	D3	Digital input referred to pin 2 (see 5.3)	Input - on/off signal
10	D4	Digital input referred to pin 2 (see 5.3)	Input - on/off signal
11	STATUS	Driver status: Fault or software selectable output (see 5.6)	Output - on/off signal
PE	EARTH	Internally connected to driver housing	

4.2 AEZ MAIN CONNECTOR - 12 pin (A)

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 VDC for solenoid power stage (see 5.1)	Input - power supply
2	V0	Power supply 0 VDC for solenoid power stage (see 5.1)	Gnd - power supply
3	ENABLE	Enable (24 VDC) or disable (0 VDC) the controller (see 5.2)	Input - on/off signal
4	MODE	Jog or Homing mode selection (see 5.7)	Input - on/off signal
5	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
6	MONITOR	Monitor analog output: ±5 VDC maximum range (see 5.4)	Output - analog signal
7	NC	do not connect	
8	MONITOR2	2nd monitor analog output: ±5 VDC maximum range (see 5.5)	Output - analog signal
9	FWD/JOG+	Start and stop forward cycle or Jog+ command (see 5.8)	Input - on/off signal
10	BWD/JOG-	Start and stop backward cycle or Jog- command (see 5.8)	Input - on/off signal
11	STATUS	Controller status: Fault or software selectable output (see 5.6)	Output - on/off signal
PE	EARTH	Internally connected to controller housing	

4.3 SERIAL COMMUNICATION CONNECTOR - M12 - 5 pin (B)

PIN	SIGNAL	TECHNICAL SPECIFICATION	NOTES
1	NC	do not connect	
2	NC	do not connect	
3	RS_GND	Signal zero data line	Gnd - digital signal
4	RS_RX	Valves receiving data line	Input - digital signal
5	RS_TX	Valves transmitting data line	Output - digital signal

4.4 ANALOG POSITION TRANSDUCER CONNECTOR - M12 - 5 pin (C) (only for AEZ execution)

PIN	SIGNAL	TECHNICAL SPECIFICATION	NOTES
1	VT	Remote transducer power supply 24 VDC	Output - power supply
2	TR	Remote transducer signal (see 5.9)	Input - analog signal
3	AGND	Analog ground	Gnd - analog signal
4	VTP+	Power supply reference + 5 VDC @ 10 mA output supply to pin 3 (AGND)	Output - reference analog
5	VTP-	Power supply reference - 5 VDC @ 10 mA output supply to pin 3 (AGND)	Output - reference analog

5 AEG/AEZ INTEGRAL ELECTRONICS - SIGNALS SPECIFICATIONS

Atos proportional valves are CE marked according to the applicable directives (e.g. Immunity/Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the user manuals included in the E-SW programming software.
The electrical signals of the driver/controller (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

5.1 Power supply and wirings (V+ and V0)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.
A safety fuse is required in series to each driver power supply: 2,5 A fuse.

5.2 Enable Input Signal (ENABLE)

To enable the driver/controller, supply a 24 VDC on pin 3 referred to pin 2: Enable input signal allows to enable/disable the current supply to the solenoid, without removing the electrical power supply to the driver/controller; it is used to active the communication and the other driver/controller functions when the valve must be disabled for safety reasons. This condition does not comply with European Norms EN13849-1 (ex EN954-1).

5.3 Digital Input Signals (D1, D2, D3, D4 only for AEG execution)

The 4 ON-OFF input signals (D1...D4) are used to select the active reference signal, among the available stored values. They can be software configured to activate up to 4 (standard mode) or 16 (binary mode) different motion phases. The polarity of the digital inputs can be customized using the Atos PC programming software: active status = 24 VDC is the default setting.

5.4 Monitor Output Signal (MONITOR)

The driver/controller generates an analog output signal (MONITOR) to monitor the actual valve coil current referred to AGND; the monitor output signal can be software set to show other signals available in the driver/controller (e.g. internal reference).
The output maximum range is ±5 VDC : 0 ÷ 5 VDC for two position single solenoid valves and ±5 VDC for double solenoid valves and three position single solenoid valves (see valve's tech. table).

5.5 Actuator Monitor Signal (MONITOR2 only for AEZ execution)

The controller generates a second analog output signal (MONITOR2) to monitor the actual position of the actuator referred to AGND; the monitor output signal can be software set to show other signals available in the controller (e.g. internal reference).
The output maximum range is ±5VDC; default settings is 0 ÷ 5 VDC .

5.6 Status Output Signal (STATUS)

Status output signal indicates fault conditions of the driver/controller (short circuits, solenoid not connected, etc.) and it is not affected by Enable input signal status: fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC (pin 11 referred to pin 2).
Status output signal can be also software configured to be active in specific motion cycle phase (see 7.6 and 7.7).

5.7 Jog Mode or Homing Mode Selection Input Signal (MODE only for AEZ execution)

The digital input MODE selects two control types.
Jog Mode: allows the user to manually manage the axis movements by 2 ON/OFF digital inputs (see 5.8) during startup operation, for emergency procedures or for maintenance purpose.
Homing Mode: allows the axis to move towards starting position (home). The Homing procedure is executed at system power on or if the axis actual position is outside of the admitted start tolerance threshold.
When 0VDC is supplied to MODE input, the internal generator is enabled and the controller can perform the programmed cycle.
See E-MAN-RI-AEZ manual for complete description of MODE activation procedure.

5.8 Cycle generator Start/Stop or Jog commands (FWD/JOG+ and BWD/JOG- only for AEZ execution)

When the internal generator is selected (MODE input set to 0VDC - see 5.7) the inputs FWD/JOG+ and BWD/JOG- are used as start and stop command signal in order to manage to axis cycle. When Jog Mode is selected, the inputs FWD/JOG+ (forward) and BWD/JOG- (backward) are used to manually move the axis in both direction. To activate FWD/JOG+ or BWD/JOG- commands, provide 24VDC on pin 9 or pin 10 referred to pin 2.
Jog Mode set point is configurable by Atos programming software.

5.9 Analog Position Transducer Input Signal (TR only for AEZ execution)

Remote position transducer must be connected to the controller using the dedicated M12 connector (see 4.3). The input range is software selectable within 0 - 10 VDC or 0 - 20 mA maximum range; default setting is 0 - 10 VDC .

6 PROGRAMMING DEVICES

The driver/controller configuration and parameters can be easily set with the Atos E-SW-PS programming software. 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-PS (mandatory - first supply) = Dvd including E-SW-* software installer and operator manuals; it allows the registration to Atos digital service
E-SW-PS-N (optional - next supplies) = as above but not allowing the registration to Atos digital service.

On first supply of the E-SW-PS 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.

USB Adapters, Cables and Terminators can be ordered separately (see tab. G500)

7 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main settings and features of E-RI-AEG drivers and E-RI-AEZ controllers.
For a detailed descriptions of available settings, wirings and installation procedures, please refer to the programming manual E-MAN-RI-AEG and E-MAN-RI-AEZ included in the E-SW-PS Dvd programming software (see section 6).

7.1 Scale

Scale function allows to set the maximum current supplied to the solenoid, corresponding to the max valve regulation, at maximum reference signal value.
This regulation allows to adapt the maximum current supplied from the driver to the specific nominal current of the proportional valves to which the driver is coupled; it is also useful to reduce the maximum valve regulation in front of maximum reference signal.
Two different Scale regulations are available for double solenoid valves: ScaleA for positive reference signal and ScaleB for negative reference signal.

7.2 Bias and Threshold

Proportional valves may be provided with a dead band in the hydraulic regulation corresponding to their switch-off status.
This dead band discontinuity in the valve regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal (analog or fieldbus external input).
The Bias function is activated when the reference signal overcome the Threshold value, preset into the driver.
The Bias setting allows tocalibrate the Bias current to the specific proportional valve to which the driver is coupled.
The Threshold setting is useful to avoid undesired valve regulation at zero reference signal when electric noise is present on the analog input signal: smaller threshold reduces the reference signal dead band, greater values are less affected by electric noise presence.
Two different Bias regulations are available for double solenoid valves: positive reference signals activate BiasA and negative reference signals activate BiasB.
Refer to the programming manuals for a detailed description of other software selectable Bias functions.

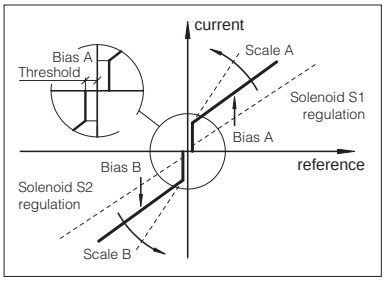
7.3 Offset

Proportional valves may be provided with zero overlapping in the hydraulic regulation corresponding to zero reference input signal (valve central spool position).
The Offset function allows to calibrate the Offset current, required to obtain valve spool central position, to the specific hydraulic system setup (e.g. valve applied to cylinder with differential areas).

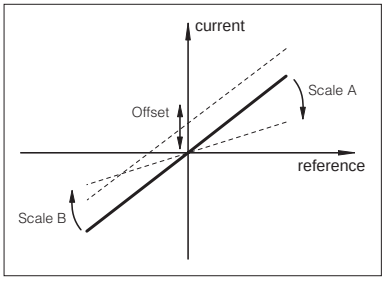
7.4 Linearization

Linearization function allows to set the relation between the reference input signal and the controlled valve regulation.
Linearization is useful for applications where it is required to linearize the valve regulation in a defined working condition.

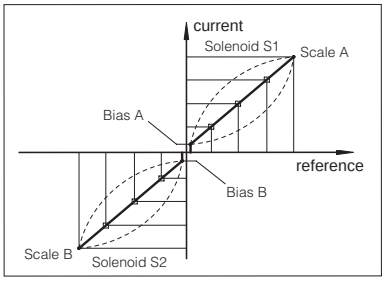
7.1, 7.2 - Scale, Bias and Threshold



7.3 - Offset



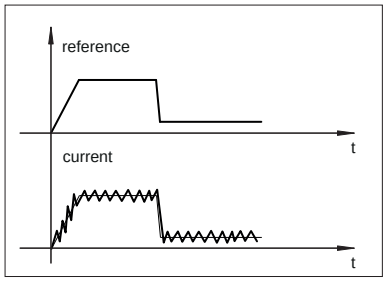
7.4 - Linearization



7.5 Variable Dither

The dither is the frequency modulation of the current supplied to the solenoid. To reduce the hysteresis should be selected a lower value of frequency, despite a lower regulation stability, because a small vibration in the valve regulating parts considerably reduces static friction effects.
To improve the regulation stability, should be selected a high value of frequency, despite a higher hysteresis. This solution in some application can lead to vibration and noise. Normally, the right setting is a compromise and depends on system setup.
E-RI-AEG drivers allow to realize a variable dither frequency that linearly depends on the demanded current: variable dither frequency allows an higher degree to optimize the valve hysteresis.

7.5 - Variable Dither



7.6 References generator - AEG driver

E-RI-AEG driver actuates up to 16 different phases (speed + ramps), according to the status of the 4 ON-OFF input signals available on the main connector. The machine control unit can manage complex motion cycle by simply switching the reference signals, through 4 digital inputs (see 5.3).
For each phase Atos PC software allows to store internally the desired speed regulation (corresponding to the valve reference signal), ramp time and STATUS digital output level (see 5.6).

The digital inputs are also software configurable into 2 different reference selection mode:

- *Standard mode*
  each digital input corresponds to a different value; up to 4 different internal values are available
- *Binary mode*
  each digital input combination corresponds to a different value; up to 16 different internal values are available

Software features (see section 8 for example of cycle generation)

- parameter setting for each phase:
  - speed regulation Vn: corresponding to the solenoid current and therefore to the valve regulation
  - ramp time Rn: time for a 0 ÷100 % speed step (Vn - Vn-1)
  - status Sn: corresponding to the STATUS digital output level (see 5.6)
- parameter setting common for all digital inputs:
  - selection mode: as Standard Mode / Binary Mode
  - polarity: as Active High / Active Low
  - output mode: as standard Fault / Status signal
- diagnostic:
  - actual phase, showing the active phase during the cycle
  - inputs state, showing D1 ÷ D4 electrical state (ON/OFF)

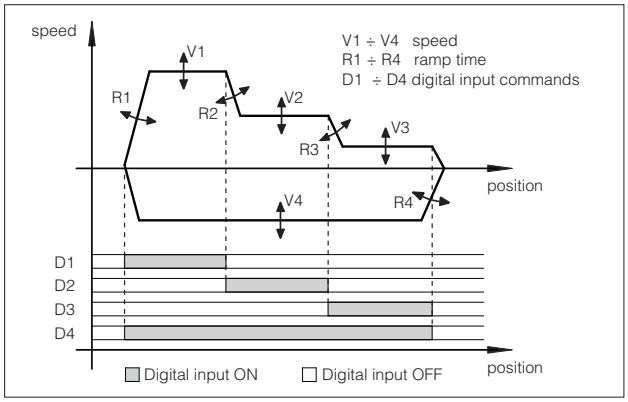
7.7 Motion cycle generator - AEZ controller

E-RI-AEZ controller automatically handles forward / backward motion cycles with fast-slow speed control according to the programmed cycle.
The digital controller reads the actual cylinder position (see 5.9), and it actuates up to six different available motion phases for the forward cycle and up to six different available motion phases for the backward cycle.
Atos PC software allows to program for each phase the desired actuator speed (corresponding to the valve reference signal), the ramp time, the switch-over position and the STATUS digital output level (see 5.6).
The machine control unit set the commands through digital pin to actuate the pre-setted motion cycle, using FWD/JOG+ and BWD/JOG- commands.
For maintenance or service purpose the controller could be set also in Jog Mode (see 5.7) to move manually the cylinder forward or backward by FWD/JOG+ and BWD/JOG- commands (see 5.8).

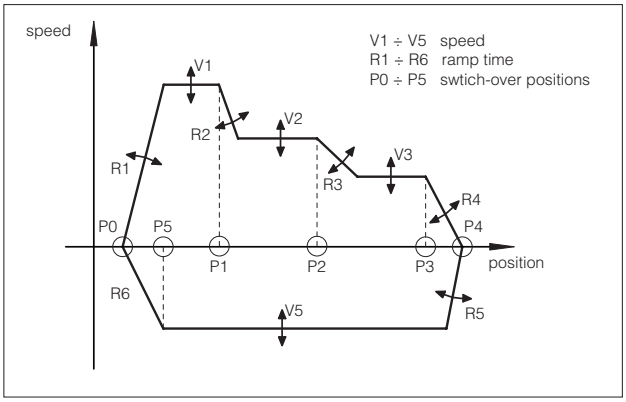
Software features (see section 9 for example of cycle generation)

- parameter setting for each phase:
  - speed regulation Vn: corresponding to the solenoid current and thus to the valve regulation
  - ramp time Rn: time for a 0 ÷ 100 % speed step (Vn - Vn-1)
  - switch-over position Pn: corresponding to the cylinder position at which the driver will active the motion phase
  - status Sn: corresponding to the STATUS digital output level (see 5.6)
- parameter setting common for all digital input:
  - output mode: as Fault / Sequence
  - JOG speed V_J: corresponding to the speed used when Jog Mode is active
  - JOG RAMPS: time for a 0 ÷ 100 % speed step used when Jog Mode is active
- diagnostic:
  - actual phase, showing the active phase during the cycle
  - cylinder position monitor (see 5.5)
  - switch-over position state

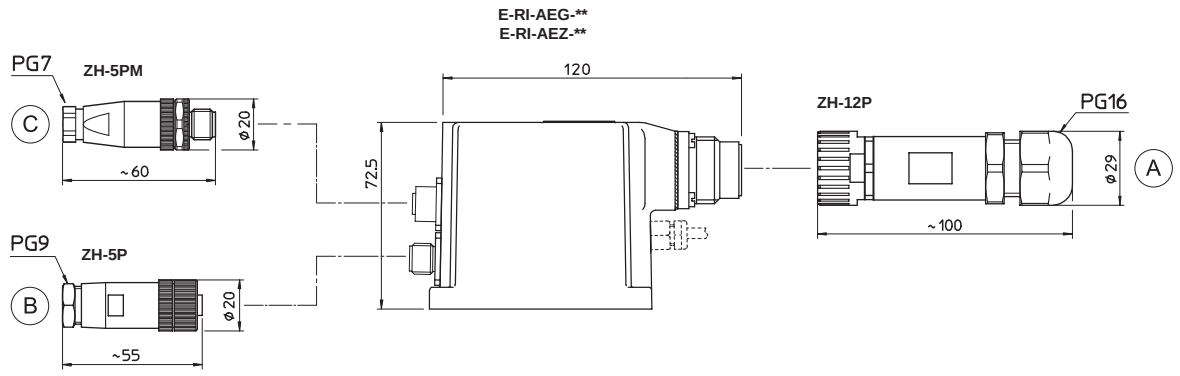
8 AEG - EXAMPLE OF CYCLE GENERATION



9 AEZ - EXAMPLE OF CYCLE GENERATION



10 AEG/AEZ INTEGRAL ELECTRONICS - OVERALL DIMENSIONS [mm]



(A) Main connector

(B) Serial communication connector (-PS)

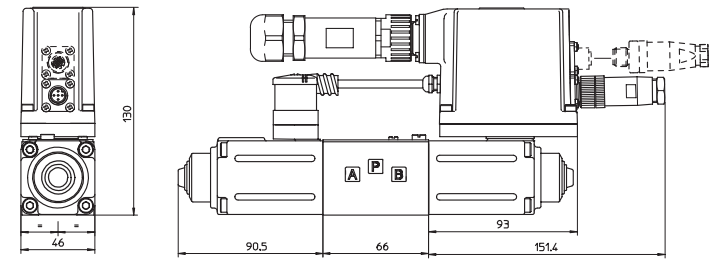
(C) Analog position transducer connector **(AEZ execution)**

11 AEG/AEZ INTEGRAL ELECTRONICS - CONNECTORS CHARACTERISTICS (to be ordered separately)

CONNECTOR TYPE	POWER SUPPLY	-PS serial	ANALOG POSITION TRANSDUCER (AEZ execution)
CODE	(A) **ZH-12P**	(B) **ZH-5P**	(C) **ZH-5PM**
Type	12 pin female straight circular	5 pin female straight circular	5 pin male straight circular
Standard	DIN 43651	M12 coding A – IEC 60947-5-2	M12 coding A – IEC 60947-5-2
Material	Plastic reinforced with fiber glass	Plastic	Plastic
Cable gland	PG16	PG9	PG7
Cable	LiCY 10 x 0,14 mm² (signal) LiYY 3 x 1 mm² (power supply)	LiYCY 5x0,25 mm² shielded	diameter 4 ÷ 6 mm
Connection type	to crimp	screw terminal	screw terminal
Protection (DIN 40050)	IP 67	IP 67	IP 67

12 INSTALLATION DIMENSIONS FOR DHZO-AEG (AEZ) -* [mm]

DHZO-AEG (-AEZ) -07

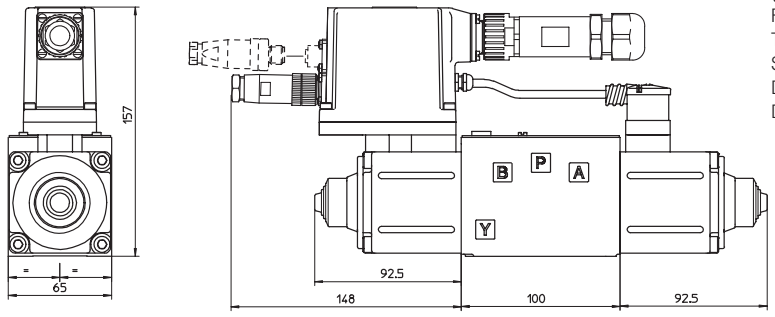


Mass: 3,1 kg

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05 (see table P005)
(for /Y version, surface 4401-03-03-0-05 without X port)
Fastening bolts: 4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108; 1 OR 2025
Diameter of ports A, B, P, T: Ø 7,5 mm (max)
Diameter of port Y: Ø = 3,2 mm (only for /Y option)

13 INSTALLATION DIMENSIONS FOR DKZOR-AEG (AEZ) -* [mm]

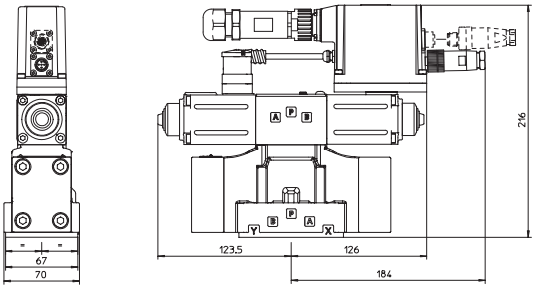
DKZOR-AEG (-AEZ) -17



Mass: 5,0 kg

ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see table P005)
(for /Y version, surface 4401-05-05-0-05 without X port)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050; 1 OR 108
Diameter of ports A, B, P, T: Ø 11,2 mm (max)
Diameter of port Y: Ø = 5 mm (only for /Y option)

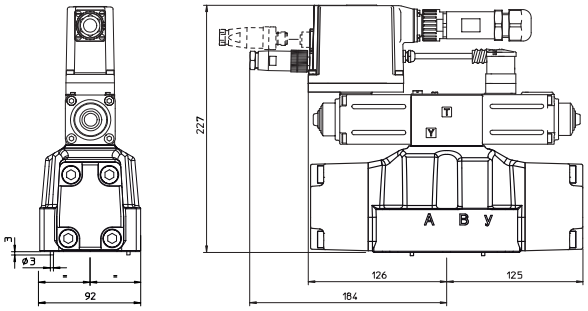
DPZO-AEG (AEZ) -17*



Mass: 9,0 kg

ISO 4401: 2005
Mounting surface: 4401-05-05-0-05 (see table P005)
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050; 2 OR 108
Diameter of ports A, B, P, T: Ø = 11 mm;
Diameter of ports X, Y: Ø = 5 mm;

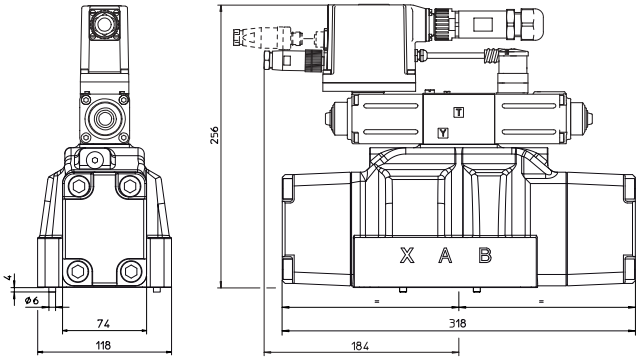
DPZO-AEG (AEZ) -27*



Mass: 13,2 kg

ISO 4401: 2005
Mounting surface: 4401-07-07-0-05 (see table P005)
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 4 OR 130; 3 OR 109/70
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;

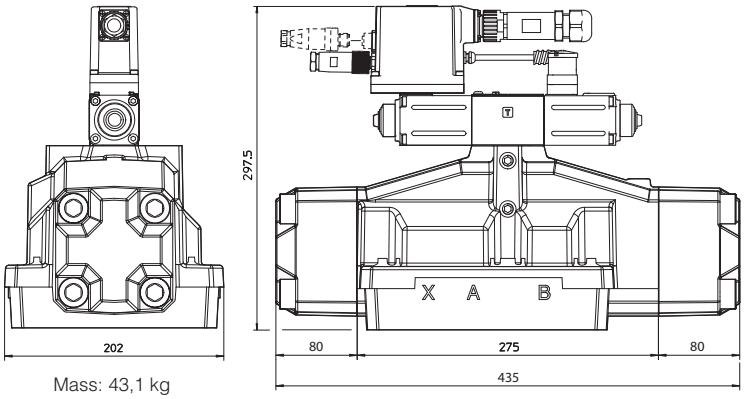
DPZO-AEG (AEZ) -47*



Mass: 18,9 kg

ISO 4401: 2005
Mounting surface: 4401-08-08-0-05 (see table P005)
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

DPZO-AEG (AEZ) -67*

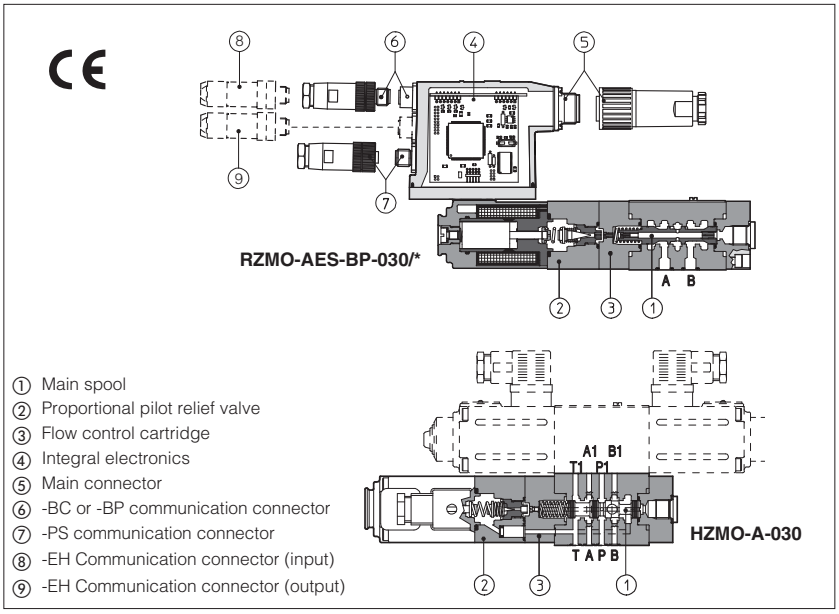


Mass: 43,1 kg

ISO 4401: 2005
Mounting surface: 4401-10-09-0-05 (see table P005)
Fastening bolts:
6 socket head screws M20x90 class 12.9
Tightening torque = 600 Nm
Seals: 4 OR 144; 3 OR 3056
Diameter of ports A, B, P, T: Ø = 34 mm;
Diameter of ports X, Y: Ø = 7 mm;

Proportional relief valves type RZMO-AES and HZMO-A

pilot operated, without integral pressure transducer, subplate or modular mounting, ISO 4401 size 06



① Main spool
② Proportional pilot relief valve
③ Flow control cartridge
④ Integral electronics
⑤ Main connector
⑥ -BC or -BP communication connector
⑦ -PS communication connector
⑧ -EH Communication connector (input)
⑨ -EH Communication connector (output)

1 MODEL CODE

RZ MO - AES - PS - 030 / 315 / * ** / *

Proportional pressure relief valves size 06
RZ = subplate
HZ = modular

MO = pressure relief

A = without integral transducer

Only for RZMO:
AE = as A plus integral electronics
AES = as A plus integral digital electronics

Communication interfaces (only for AES)
PS = Serial (1)
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT

Configuration, see section 3:
030 = regulation on port P, discharge in T

Pressure range
50 = 50 bar
100 = 100 bar
210 = 210 bar
315 = 315 bar
350 = 350 bar

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

Series number

Options:

Coil voltage (only for -A execution) see section 5:
- = standard coil for 24V$_{DC}$ Atos drivers
6 = optional coil for 12V$_{DC}$ Atos drivers
18 = optional coil for low current drivers

for -AE execution, see section 7:
I = current reference (4÷20 mA)
Q = enable signal

for -AES execution, see section 9:
Q = enable signal
Z = adds double power supply, enable and fault signals (12 pin connector)

(1) Serial communication interface always present, also for -BC, -BP and -EH options

Proportional pressure relief valves, pilot operated without integral pressure transducer, available in two different executions:
- RZMO subplate mounting;
- HZMO modular mounting.

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

They are available in different executions:
- -A, without integral pressure transducer.
- -AE, -AES, as -A plus analogue (AE) or digital (AES) integral electronics ⑤ (only for RZMO).

The system pressure is controlled by the spool ①, piloted by the proportional pilot relief valve ②.

The intermediate compensated flow control cartridge ③ assures constant pilot flow and therefore high pressure stability.

The integral electronics ④ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

The electronic main connector ⑤ is fully interchangeable for -AE and -AES executions. Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used option /Z (AES).

Following communication interfaces ⑥, ⑦, ⑧, ⑨ are available for the digital -AES execution:
- -PS, Serial communication interface for configuration, monitoring and firmware updating through Atos PC software - always present also for -BC, -BP and -EH options
- -BC, CANopen interface
- -BP, PROFIBUS DP interface
- -EH, EtherCAT 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 with insulation class H.

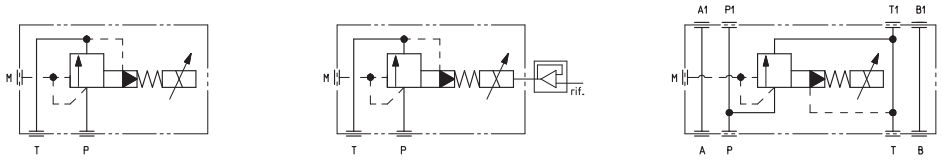
Surface mounting: ISO 4401 size 06
Max flow: 40 l/min
Max pressure: 350 bar

2 ELECTRONIC DRIVERS FOR *ZMO

Valve model	-A						-AE	-AES
Drivers model	E-MI-AC-01F	E-MI-AS-IR	E-BM-AC-01F	E-BM-AS-PS	E-ME-AC-01F	E-RP-AC-01F	E-RI-AE	E-RI-AES
Data sheet	G010	G020	G025	G030	G035	G100	G110	G115

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

Hydraulic symbols



RZMO-A-030 **RZMO-AE-030** **HZMO-A-030**

Valve model		RZMO-A, RZMO-AE, RZMO-AES, HZMO-A				
Max. regulated pressure (Q = 10 l/min)		50	100	210	315	350
Min. regulated pressure (Q = 10 l/min)	[bar]	6				
Max. pressure at ports P, T	[bar]	port P = 350 bar; port T 210 bar				
Minimum flow	[l/min]	2,5				
Maximum flow	[l/min]	40				
Response time 0-100% step signal (depending on installation) - see section 6.4	[ms]	60				
Hysteresis	[% of the max regulated pressure]	≤ 2				
Linearity	[% of the max regulated pressure]	≤ 3				
Repeatability	[% of the max regulated pressure]	≤ 2				

Above performance data refer to valves coupled with Atos electronic drivers, see section 2.

4 MAIN CHARACTERISTICS

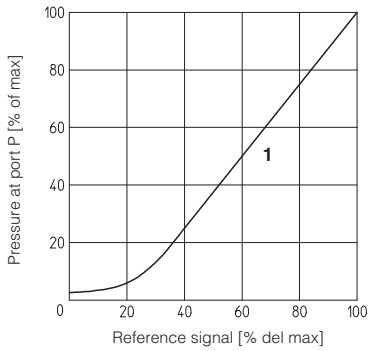
Assembly position	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -A execution; -20°C ÷ +60°C for -AE and -AES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1
Recommended viscosity	15 ÷100 mm²/s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3.3 Ω for standard; 2 ÷ 2,2 Ω for option /6; 13 ÷ 13,4 Ω for option /18
Max solenoid current	2,6 A for standard 12 V_{DC} coil; 3,25 A for 6 V_{DC} coil; 1,5 A for 18 V_{DC} coil
Max power	30 Watt for -A execution; 50 Watt for -AE and AES executions
Protection degree (CEI EN-60529)	IP65 for -A execution; IP67 for -AE and AES executions
Duty factor	Continuous rating (ED=100%)

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

5.1 Regulation diagrams
with flow rate Q = 10 l/min

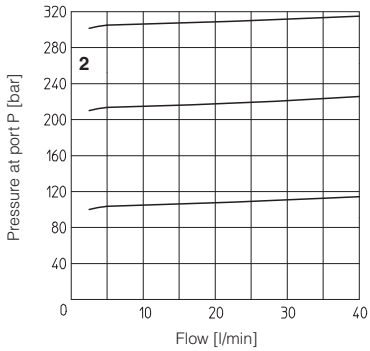
1 = RZMO-A; RZMO-AE; RZMO-AES; HZMO-A

Note:
The presence of counter pressure at port T can affect the effective pressure regulation.



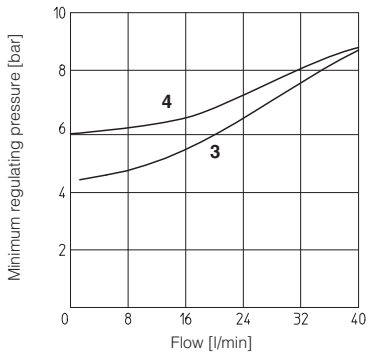
5.2 Pressure/flow diagrams
with reference signal set at Q = 10 l/min

2 = RZMO-A, RZMO-AE, RZMO-AES, HZMO-A



5.3 Minimum pressure/flow diagrams
with zero reference signal

3 = All the models (except /350)
4 = All the models (only /350)



5.4 Dynamic response
The response times in section 3 have to be considered as average values.

The pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response.

6 GENERAL NOTES

RZMO and HZMO 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.

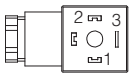
The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

7 OPTIONS FOR -A EXECUTION

7.1 Option /6 optional coil to be used with Atos drivers with power supply 12 VDC

7.2 Option /18 optional coil to be used with electronic drivers not supplied by Atos

8 CONNECTIONS FOR -A EXECUTION

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

9 ANALOG INTEGRAL DRIVERS -AE - 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 0÷+10VDC nominal range (pin D,E), proportional to desired coil current

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

9.1 Option /I

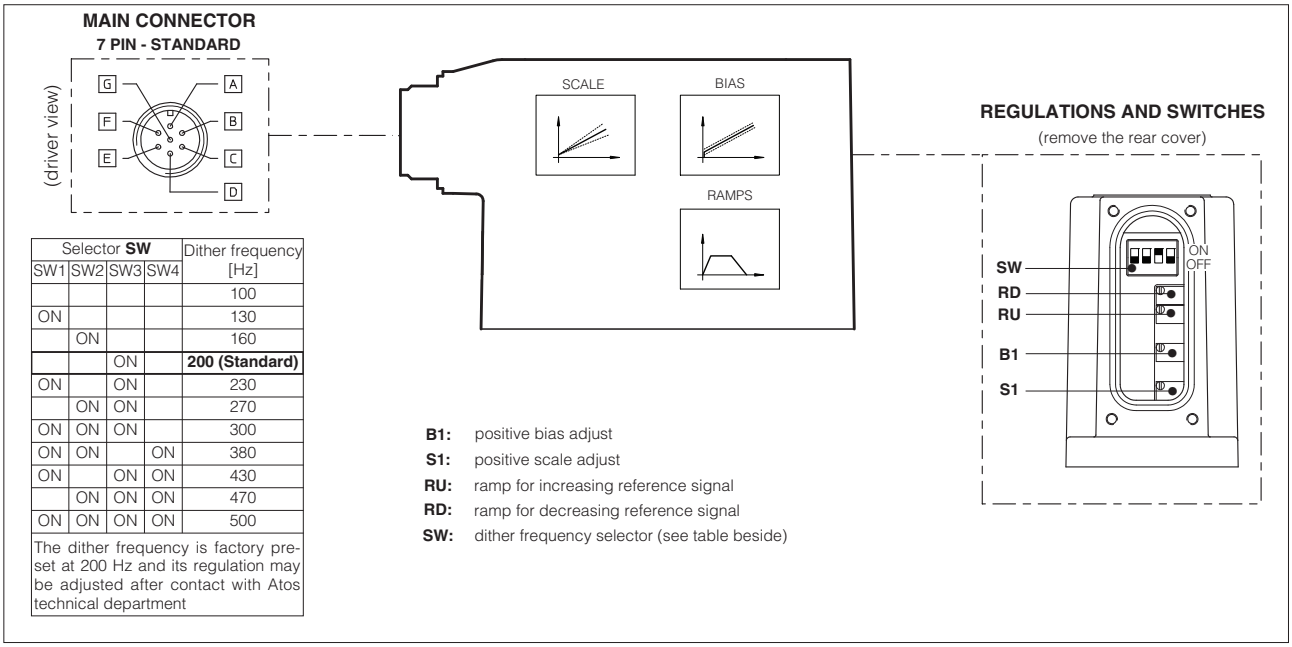
It provides the 4÷20 mA current reference signal instead of the standard 0÷+10 VDC. Monitor output signal is still the standard 0÷+10VDC.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

9.2 Option /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.

9.3 Possible combined option: /IQ

10 ANALOG INTEGRAL DRIVERS -AE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



Selector **SW**				Dither frequency
SW1	SW2	SW3	SW4	[Hz]
				100
ON				130
	ON			160
		ON		**200 (Standard)**
ON		ON		230
	ON	ON		270
ON	ON	ON		300
ON	ON		ON	380
ON		ON	ON	430
	ON	ON	ON	470
ON	ON	ON	ON	500

The dither frequency is factory preset at 200 Hz and its regulation may be adjusted after contact with Atos technical department

B1: positive bias adjust
S1: positive scale adjust
RU: ramp for increasing reference signal
RD: ramp for decreasing reference signal
SW: dither frequency selector (see table beside)

10.1 7 PIN MAIN CONNECTOR

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 (1)	AGND	Ground - signal zero for MONITOR signal		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: 0÷+10 VDC maximum range	(4÷20 mA for /I option)	Input - analog signal
E	INPUT -	Normal working range 0÷+10 VDC	(4÷20 mA for /I option)	
F	MONITOR	Monitor analog output: 0÷+5 VDC maximum range; 1 V = 1 A		Output - analog signal
G	EARTH	Internally connected to the driver housing		

Note: (1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B.

A minimum time of 60ms to 160ms have be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero

11 DIGITAL INTEGRAL DRIVERS -AES - 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 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 0÷+10 VDC nominal range (pin D,E), proportional to desired coil current (4÷20 mA with cable break detection, ± 10 mA, ± 20 mA or 0÷20 mA software selectable)

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

11.1 Option /Q

To enable the driver, supply 24Vdc on pin C referred to pin B: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

11.2 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).

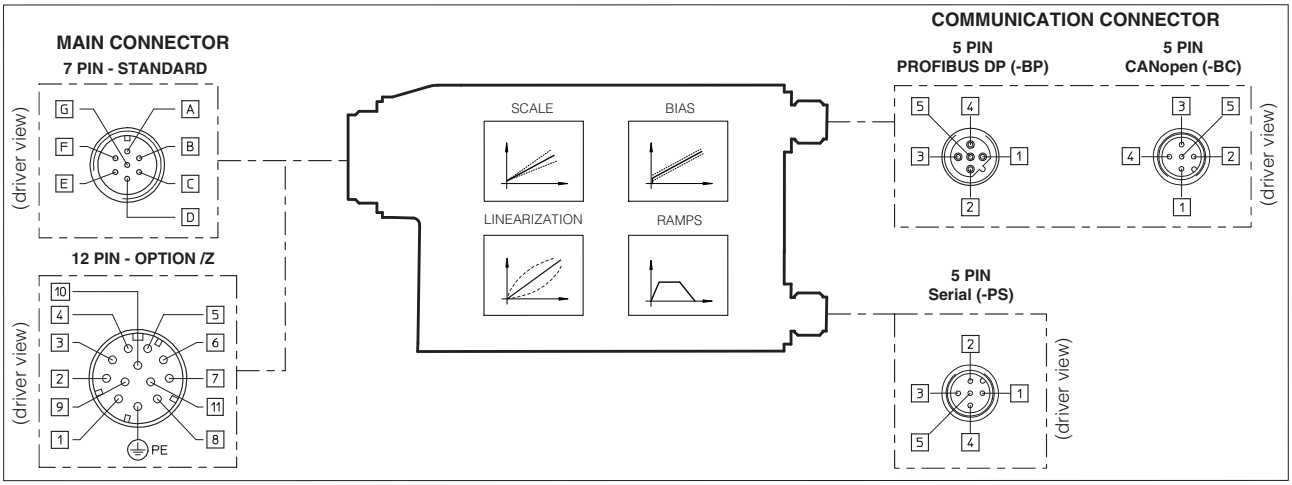
Enable Input Signal

To enable the driver, supply 24Vdc on pin 3 referred to pin 2: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

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 DIGITAL INTEGRAL DRIVERS -AES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



12.1 7 or 12 PIN MAIN CONNECTOR

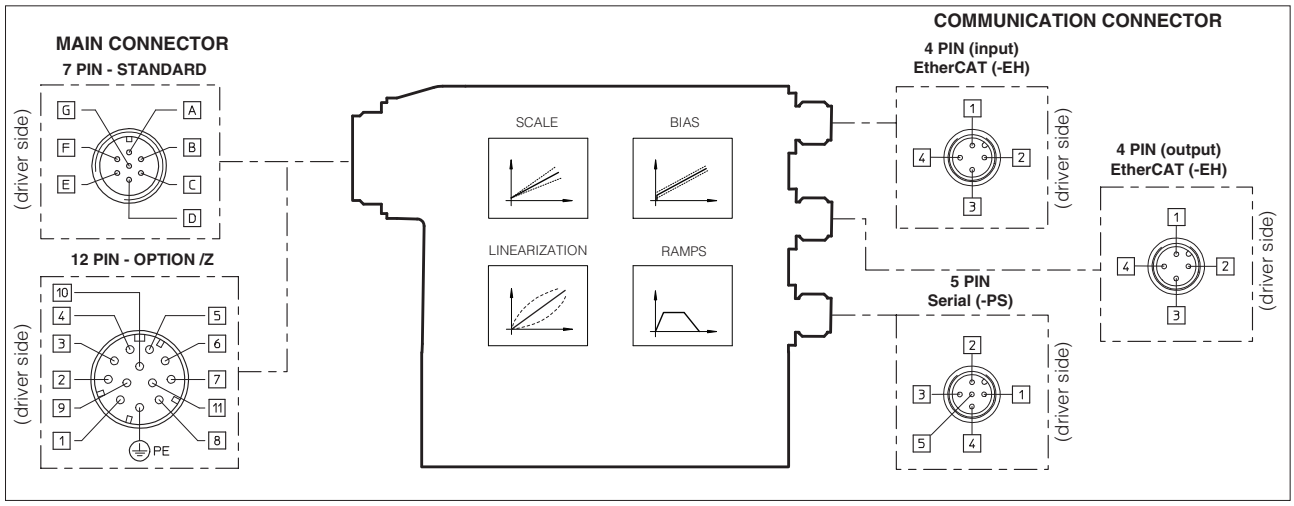
Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Input - power supply
B	2	V0	Power supply 0 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Gnd - power supply
D	4	INPUT+	Reference analog input: ±10 VDC / ± 20 mA maximum range software selectable Default setting 0÷+10 VDC differential input /Z option: common mode INPUT+ referred to AGND	Input - analog signal
E	-	INPUT -		
C	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
	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: 0÷+5 VDC maximum range; 1V = 1A	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver logic	Gnd - power supply
-	11	FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

Note: A minimum time of 270 to 340 ms have be considered between the driver energizing with the 24VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

12.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	**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	

13 DIGITAL INTEGRAL DRIVER -AES-EH - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



Note: for the electronic connections of 7 or 12 pin main connector, see section 12.1

13.1 4 & 5 PIN M12 COMMUNICATION CONNECTORS

Serial (-PS)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	NC	do not connect
2	NC	do not connect
3	RS_GND	Signal zero data line
4	RS_RX	Valves receiving data line
5	RS_TX	Valves transmitting data line

EtherCAT (-EH)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
Housing	Shield	Positioned on control cabinet side

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

VALVE VERSION	-A	-AE, -AES		-AES/Z	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)	EtherCAT (-EH)
CONNECTOR CODE	666	ZH-7P	ZM-7P	ZH-12P	ZH-5P	ZH-5P/BP	ZM-4PM/EH
PROTECTION DEGREE	IP65	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	K500	G110, G115, K500			G115, K500		

connectors supplyed with the valve

15 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the Atos E-SW programming software, available in four different versions according to the driver's communication execution: **E-SW-PS** (Serial), **E-SW-BC** (CANopen), **E-SW-BP** (PROFIBUS DP), **E-SW-EH** (EtherCAT). Programming software E-SW-BC, E-SW-BP, E-SW-EH for BC, BP and -EH drivers, can be also used to modify the valve's parameterization through the serial communication interface, without disconnecting the valve from the machine's bus line.

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.

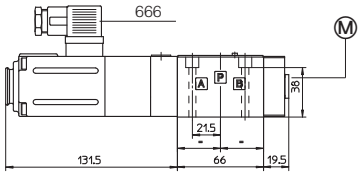
The software remains active for 10 days from the installation date and then it stops until the user inputs his password.

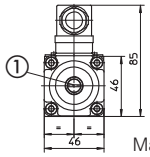
With the password you can also download, in your personal area, the latest releases of the Atos software, manuals, drivers and configuration files.

16 INSTALLATION DIMENSIONS [mm]

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05
(see table P005)
Fastening bolts:
4 socket head screws M5X50 bolts class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports A, B not used

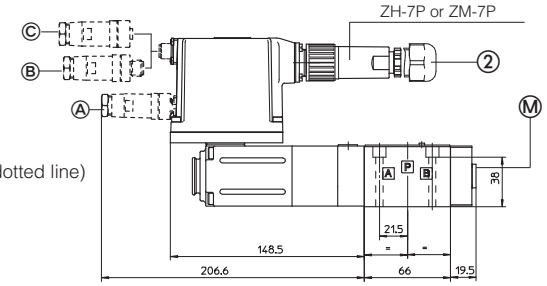
RZMO-A

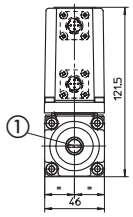




Mass: 2,8 Kg

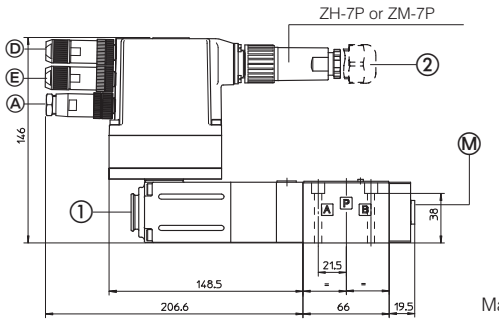
RZMO-AE
RZMO-AES-* (dotted line)





Mass: 4 Kg

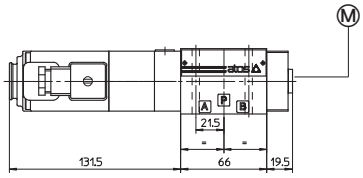
RZMO-AES-EH*

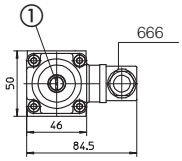


Mass: 4,1 Kg

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05
(see table P005)
Fastening bolts:
4 socket head screws M5 bolts class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108

HZMO-A





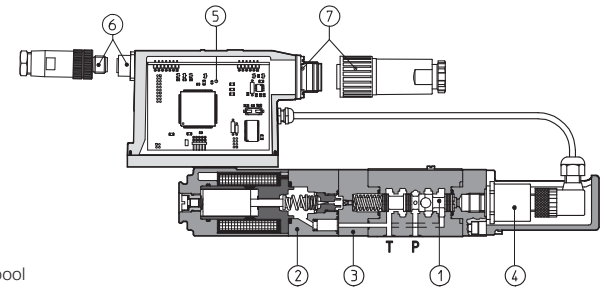
Mass: 2,8 Kg

Ⓐ -PS communication interface, ZH-5P connector
Ⓑ -BP communication interface, ZH-5P/BP connector
Ⓒ -BC communication interface, ZH-5P connector
Ⓓ -EH communication interface (input), ZM-4PM/EH connector
Ⓔ -EH communication interface (output), ZM-4PM/EH connector

① = screw for air bleeding
② dotted line = 12 pin connector ZH-12P for option /Z

Proportional relief valves type RZMO-TERS, AERS

pilot operated, with integral or remote pressure transducer, ISO 4401 size 06



RZMO-TERS-PS-030/*

① Main spool
② Proportional pilot relief valve
③ Flow control cartridge
④ Integral pressure transducer
⑤ Integral electronics
⑥ Communication connector
⑦ Main connector

RZMO are spool type proportional pressure relief valves, pilot operated with integral or remote pressure transducer, which provide pressure regulation proportional to electronic reference signals.

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

They are available in different executions:

- -TERS with integral pressure transducer ④ plus digital electronics ⑤ preset in closed loop, featuring improved static and dynamic performances.
- -AERS as -TERS but without integral pressure transducer (predisposed for connection of remote pressure transducer).

The system pressure is controlled by the main spool ①, piloted by the proportional pilot relief valve ②.

The intermediate compensated flow control cartridge ③ assures constant pilot flow and therefore high pressure stability.

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

The electronic main connector ⑦ is fully interchangeable for -TERS and -AERS. Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z.

Following communication interfaces ⑥ are available:

- -PS, Serial communication interface for configuration, monitoring and firmware updating trough Atos PL 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, size 06
Max flow: 40 l/min
Max pressure: 350 bar.

1 MODEL CODE

RZMO - TERS - PS - 030 / 315 / * ** / *

Proportional pressure relief valve size 06

TERS = with integral digital electronics and pressure transducer

AERS = as TERS but predisposed for connection of remote pressure transducer (to be ordered separately, see tab. G460)

Communication interfaces:

PS = Serial
BC = CANopen
BP = PROFIBUS-DP

Configuration:

030 = regulation on port P, discharge in T

Pressure range:

100 = 100 bar
210 = 210 bar
315 = 315 bar
350 = 350 bar

Electronics options, see section 6:

I = current reference input and monitor (4 ÷ 20 mA) signals

Z = double power supply, enable fault and monitor signals (12 pin connector)

C = remote pressure transducer with current feedback 4÷20 mA (only for AERS executions)

Series number

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

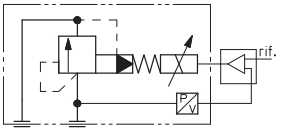
2 ELECTRONIC DRIVERS FOR RZMO

Valve model	-TERS	-AERS
Drivers model	E-RI-TERS	E-RI-AERS
Data sheet	G205	

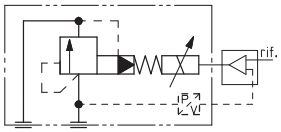
Note: for power supply and communication connector see section 11

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

Hydraulic symbols



RZMO-TERS-030



RZMO-AERS-030

Valve model		RZMO-TERS, RZMO-AERS			
Max. regulated pressure (Q = 10 l/min)		100	210	315	350
Min. regulated pressure (Q = 10 l/min)	[bar]	6			
Max. pressure at ports P, T	[bar]	port P = 350 bar; port T 210 bar			
Minimum flow	[l/min]	2,5			
Maximum flow	[l/min]	40			
Response time 0-100% step signal (depending on installation) - see section 9.4	[ms]	45			
Hysteresis	[% of the max regulated pressure]	≤ 0,5			
Linearity	[% of the max regulated pressure]	≤ 1,0			
Repeatability	[% of the max regulated pressure]	≤ 0,2			
Thermal drift		zero point displacement < 1% at ΔT = 40°C			

4 MAIN CHARACTERISTICS OF PROPORTIONAL RELIEF VALVES

Assembly position	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +50°C for -TERS and -AERS 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 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3.3 Ω
Max solenoid current	2,6 A
Max power	40 Watt
Protection degree (CEI EN-60529)	IP67
Duty factor	Continuous rating (ED=100%)

5 GENERAL NOTES

RZMO proportional valve 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).

6 DIGITAL INTEGRAL DRIVERS -TERS and -AERS -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 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 0÷+10 VDC nominal range (pin D,E), proportional to desired valve pressure regulation

Monitor output signal - analog output signal proportional to the actual valve pressure regulation = 0÷+10 VDC nominal range

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

6.1 Option /I

It provides 4÷20 mA current reference and monitor signals instead of the standard 0÷+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.

6.2 Option /Z

It provides on 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.

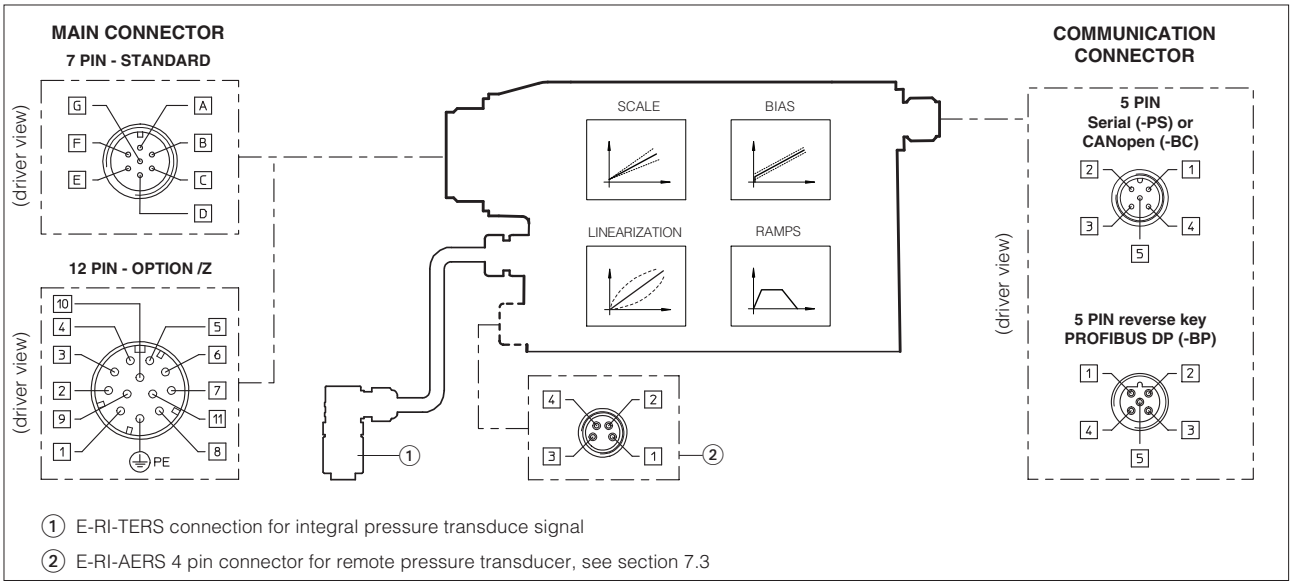
Fault Output Signal
Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷20mA input, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24VDC (pin 11 referred to pin 2): Fault status is not affected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

6.3 Option /C (only for -AERS version)

The valve electronics is set to receive the 4÷20 mA feedback signal from the remote pressure transducer, instead of the standard 0÷10 V.

6.4 Possible combined options: /CI, /CIZ, /CZ (only for -AERS) and /IZ.

7 DIGITAL INTEGRAL DRIVERS -TERS and -AERS -main functions and electronic connectors



(1) E-RI-TERS connection for integral pressure transduce signal

(2) E-RI-AERS 4 pin connector for remote pressure transducer, see section 7.3

7.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTOR

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 ÷ 20 mA for /I option) Normal working range 0÷+10 VDC (4 ÷ 20 mA for /I option) differential INPUT+ and INPUT - (for 7 pin standard execution) common mode INPUT+ referred to AGND (only for /Z option)	Input - analog signal
E	-	INPUT -		
C	5	AGND	Ground : signal zero for MONITOR signal (pin F of 7 pin standard or pin 6 of /Z option) signal zero for INPUT+ signal (only for /Z option)	Gnd - analog signal
F	6	MONITOR	Monitor analog output: ±10 VDC maximum range	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver's logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver's logic	Gnd - power supply
-	11	FAULT	Driver status: Fault (0VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to driver housing	

Note: A minimum time of 270 to 590 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

7.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

7.3 ELECTRONIC CONNECTIONS - 4 PIN REMOTE PRESSURE TRANSDUCER M8 CONNECTOR (only for AERS)

PIN	standard version		/C option (Ri = 316 Ω)	
1	TR	remote trasducer pressure signal (0÷+10 VDC)	TR	remote trasducer pressure signal (4÷20 mA)
2	NC	reserved (do not connect)	NC	reserved (do not connect)
3	VT	remote transducer power supply +24 VDC	VT	remote transducer power supply +24 VDC
4	AGND	signal zero for power supply and signal	NC	reserved (do not connect)

See tab. G465 for the pressure transducer characteristics and connections.

8 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.

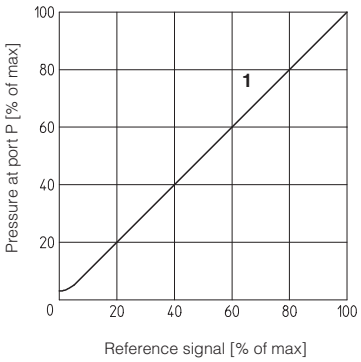
9 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

9.1 Regulation diagrams
with flow rate Q = 10 l/min

1 = RZMO-TERS, RZMO-AERS

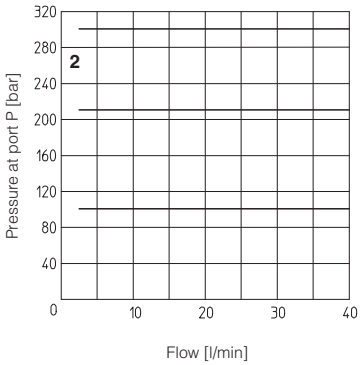
Note:

The presence of counter pressure at port T can affect the effective pressure regulation.



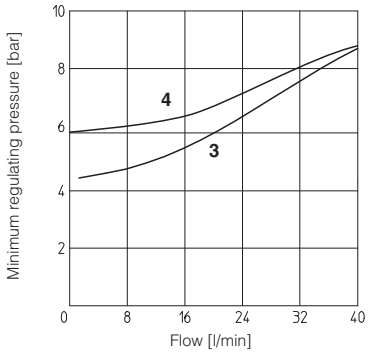
9.2 Pressure/flow diagrams
with reference signal set at Q = 10 l/min

2 = RZMO-TERS, RZMO-AERS



9.3 Minimum pressure/flow diagrams
with zero reference signal

3 = All the models (except /350)
4 = All the models (only /350)



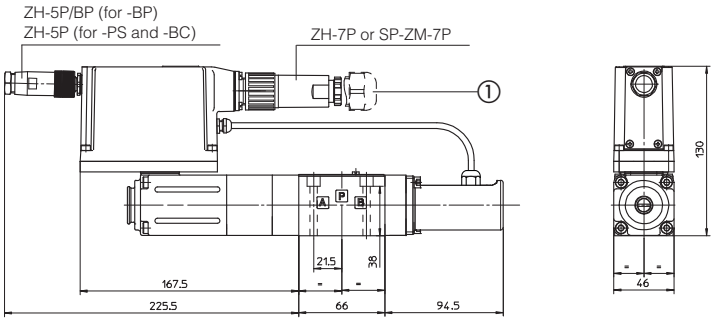
9.4 Dynamic response
The response times in section 3 have to be considered as average values.

The pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response. The valves dynamic performances can be optimized depending on the stiffness characteristics of the hydraulic circuit, by setting the internal software parameters. This regulation is particularly helpful in case of circuits with accumulators and/or with great fluid volumes and/or with long hoses.

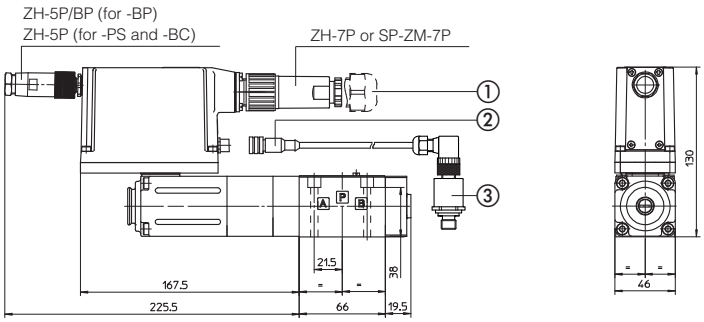
10 INSTALLATION DIMENSIONS [mm]

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05
(see table P005)
Fastening bolts:
4 socket head screws M5X50 bolts class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports A, B not used

RZMO-TERS-*
Mass: 3,3 Kg



RZMO-AERS-*
Mass: 3,9 Kg



① = 12 pin connector ZH-12P (option/Z)

② = 4 pin connector ZH-4P-M8/5 (see tab. G205)

③ = remote pressure transducer, to be ordered separately (see tab. G465)

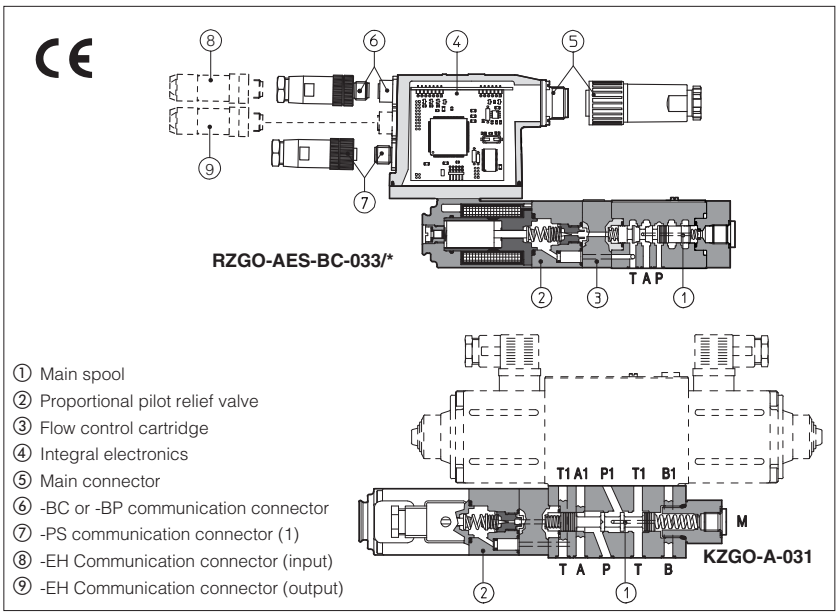
11 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-AERS, -TERS		-AERS/Z -TERS/Z	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)	Pressure transducer only for -AERS
CONNECTOR CODE	ZH-7P	ZM-7P	ZH-12P	ZH-5P	ZH-5P/BP	ZH-4P-M8/5 (1)
PROTECTION DEGREE	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	G205, K500					

(1) M8 connector ZH-4P-M8/5 moulded on cable 5 mt lenght for pressure transducer

Proportional reducing valves type RZGO-AES, HZGO-A, KZGO-A

pilot operated, without integral pressure transducer, subplate or modular mounting, ISO 4401 size 06, 10



① Main spool
② Proportional pilot relief valve
③ Flow control cartridge
④ Integral electronics
⑤ Main connector
⑥ -BC or -BP communication connector
⑦ -PS communication connector (1)
⑧ -EH Communication connector (input)
⑨ -EH Communication connector (output)

They are proportional pressure reducing valves, 3-way, pilot operated, available in two different executions:
- R subplate mounting;
- H or K modular mounting.

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

They are available in different executions:
- -A, without integral pressure transducer.
- -AE, -AES, as -A plus analogue (AE) or digital (AES) integral electronics ④.

The reduced pressure is controlled by the spool ① piloted by the proportional pilot relief valve ②. The intermediate compensated flow control cartridge ③ assures constant pilot flow and therefore high pressure stability.

The integral electronics ④ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.

The electronic main connector ⑤ is fully interchangeable for -AE and -AES executions. Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z (AES).

Following communication interfaces ⑥, ⑦, ⑧, ⑨ are available for the digital -AES execution:
- -PS, Serial communication interface for configuration, monitoring and firmware updating through Atos PC software - always present
- -BC, CANopen interface
- -BP, PROFIBUS DP interface
- -EH, EtherCAT 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 with insulation class H.

Reduced pressure on port A for valves 033 and on port P1 for valves 031.

Mounting surface: ISO 4401 size 06, 10
Max flow: 100 l/min
Max pressure: 350 bar

1 MODEL CODE

RZGO - AES - PS - 033 / 315 / * ** /*

Proportional pressure reducing valve
RZGO = subplate (size 06)
HZGO = modular (size 06)
KZGO = modular (size 10)

A = without integral transducer
Only for RZGO:
AE = as A plus integral electronics
AES = as A plus integral digital electronics

Communication interfaces (only for AES)
PS = Serial (1)
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT

Configuration, see section 3:
031 = **regulation on port P1**, pressure from P, discharge in T (only for HZGO, KZGO)
033 = **regulation on port A**, pressure from P, discharge in T (only for RZGO)

Pressure range
50 = 50 bar
210 = 210 bar
100 = 100 bar
315 = 315 bar
350 = 350 bar

Coil voltage (only for -A execution),
see section 5:
- = standard coil for 24V$_{DC}$ Atos drivers
6 = optional coil for 12V$_{DC}$ Atos drivers
18 = optional coil for low current drivers

Electronics options for -AE execution,
see section 7:
I = current reference input (4÷20 mA)
Q = enable signal

Electronics options for -AES execution,
see section 9:
Q = enable signal
Z = adds double power supply, enable and fault signals (12 pin connector)

Series number

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

(1) Serial communication interface always present, also for -BC, -BP and -EH options

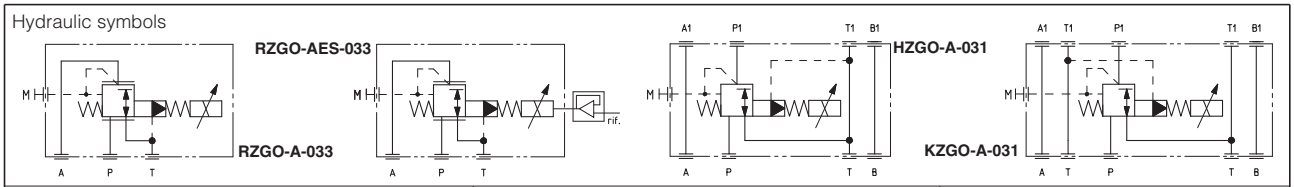
2 ELECTRONIC DRIVERS FOR *ZGO

Valve model	-A						-AE	-AES
Drivers model	E-MI-AC-01F	E-MI-AS-IR	E-BM-AC-01F	E-BM-AS-PS	E-ME-AC-01F	E-RP-AC-01F	E-RI-AE	E-RI-AES
Data sheet	G010	G020	G025	G030	G035	G100	G110	G115

Note: for power supply and communication connector see section 14

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

Hydraulic symbols



Valve model		RZGO-A, -AE, -AES, HZGO-A				KZGO-A		
Max. reduced pressure (Q = 10 l/min)		50	100	210	315	100	210	315
Min. reduced pressure (Q = 10 l/min)	[bar]	1 or actual value at T port; (3 for /350)						
Max. pressure at ports P, T	[bar]	port P = 350 bar; port T = 210 bar						
Minimum flow	[l/min]	2,5				3		
Maximum flow	[l/min]	40				100		
Response time 0 - 100% step signal (depending on installation)	[ms]	≤ 50				≤ 80		
Hysteresis	[% of the max regulated pressure]	≤ 2						
Linearity	[% of the max regulated pressure]	≤ 3						
Repeatability	[% of the max regulated pressure]	≤ 2						

Above performance data refer to valves coupled with Atos electronic drivers, see section 2.

4 MAIN CHARACTERISTICS

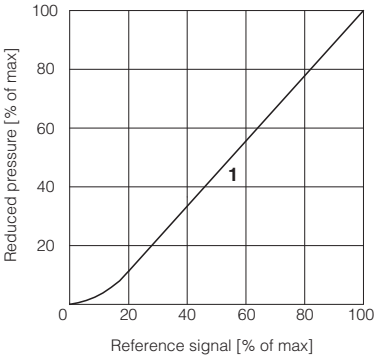
Assembly position	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -A execution; -20°C ÷ +60°C for -AE and -AES executions
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1
Recommended viscosity	15 ÷100 mm²/s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3.3 Ω for standard; 2 ÷ 2,2 Ω for option /6; 13 ÷ 13,4 Ω for option /18
Max solenoid current	2,4 A (1,8 A for version /32) for standard 12 V_{DC} coil; 3 A (2,25 A for version /32) for 6 V_{DC} coil;1 A (0,8 A for version /32) for 18 V_{DC} coil
Max power	30 Watt for -A execution; 50 Watt for -AE and AES executions
Protection degree (CEI EN-60529)	IP65 for -A execution; IP67 for -AE and AES executions
Duty factor	Continuous rating (ED=100%)

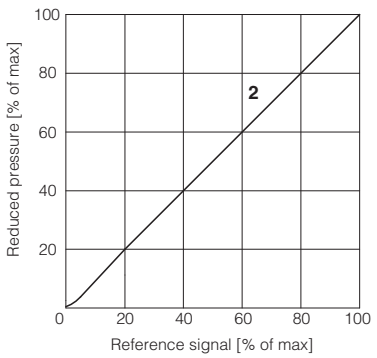
5 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

5.1 Regulation diagrams
with flow rate Q = 10 l/min

1 = RZGO-A; RZGO-AE; RZGO-AES, HZGO-A
2 = KZGO-A

Note:
The presence of counter pressure at port T can affect the effective pressure regulation.





5.2 Pressure/flow diagrams
with reference pressure set with Q = 10 l/min

3 = RZGO-A; RZGO-AE; RZGO-AES, KZGO-A

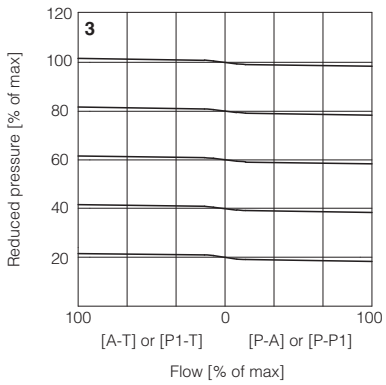
5.3 Pressure drop/flow diagram

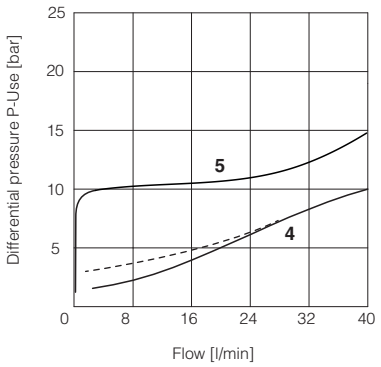
RZGO-A*, HZGO-A

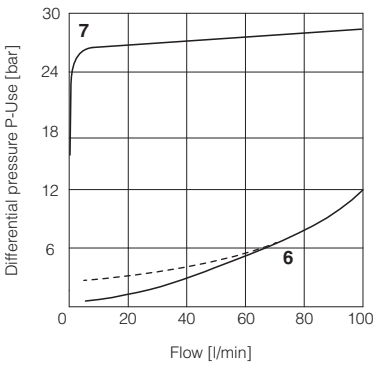
4 = A-T or P1-T (dotted line /350)
5 = P-P1 or P-A

KZGO-A

6 = P1-T (dotted line /350)
7 = P-P1







6 GENERAL NOTES

RZGO, HZGO and KZGO 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.

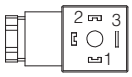
The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

7 OPTIONS FOR -A EXECUTION

5.1 Option /6 optional coil to be used with Atos drivers with power supply 12 VDC

5.2 Option /18 optional coil to be used with electronic drivers not supplied by Atos

8 CONNECTIONS FOR -A EXECUTION

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

9 ANALOG INTEGRAL DRIVERS -AE - 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 0÷+10 VDC nominal range (pin D,E), proportional to desired coil current

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

9.1 Option /I

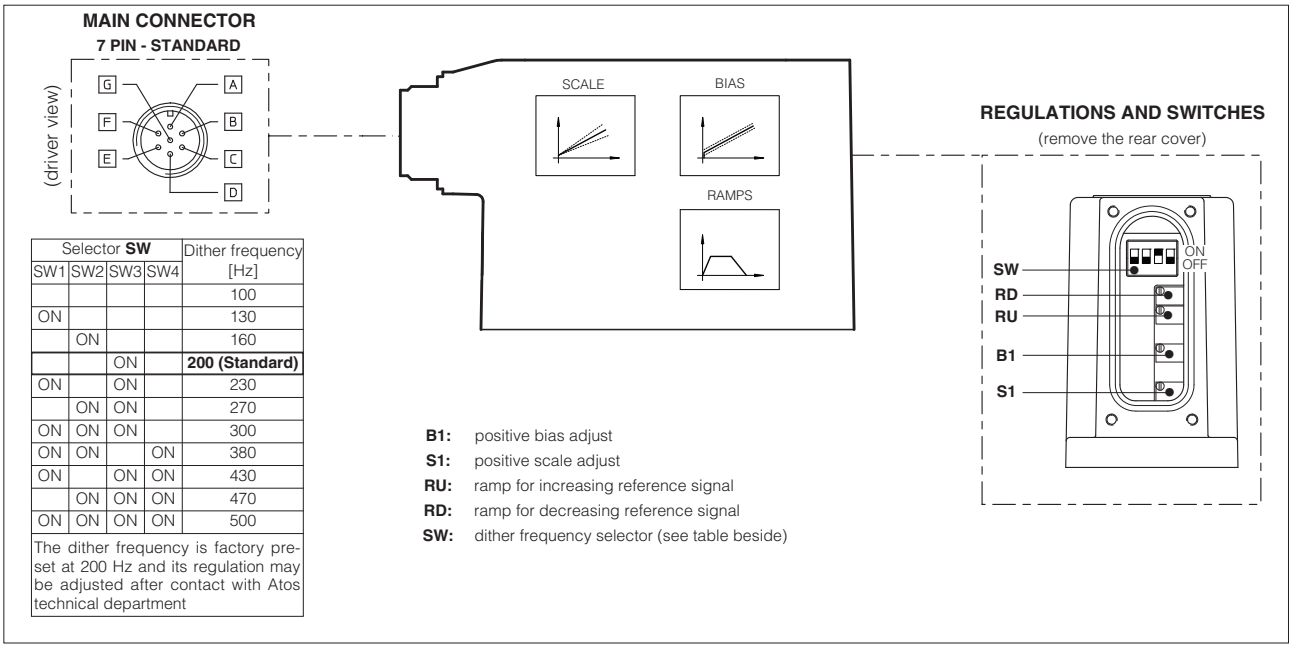
It provides the 4÷20 mA current reference signal instead of the standard 0÷+10 VDC. Monitor output signal is still the standard 0÷+10 VDC
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

9.2 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.

9.3 Possible combined option: /IQ

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



Selector **SW**				Dither frequency
SW1	SW2	SW3	SW4	[Hz]
				100
ON				130
	ON			160
		ON		**200 (Standard)**
ON		ON		230
	ON	ON		270
ON	ON	ON		300
ON	ON		ON	380
ON		ON	ON	430
	ON	ON	ON	470
ON	ON	ON	ON	500

The dither frequency is factory preset at 200 Hz and its regulation may be adjusted after contact with Atos technical department

10.1 7 PIN MAIN CONNECTOR

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 (1)	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q option)	Input - on/off signal
D	INPUT+	Reference analog differential input: 0÷+10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	INPUT -	Normal working range 0÷+10 VDC (4 ÷ 20 mA for /I option)	
F	MONITOR	Monitor analog output: 0÷+5 VDC maximum range; 1 V = 1 A	Output - analog signal
G	EARTH	Internally connected to the driver housing	

Note: (1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B.

A minimum time of 60ms to 160ms have be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero

11 DIGITAL INTEGRAL DRIVERS -AES - 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 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 0÷+10 VDC nominal range (pin D,E), proportional to desired coil current (4÷20 mA with cable break detection, ± 10 mA, ± 20 mA or 0÷20 mA software selectable)

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

11.1 Option /Q

To enable the driver, supply 24Vdc on pin C referred to pin B: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

11.2 Option /Z

It provides on a 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).

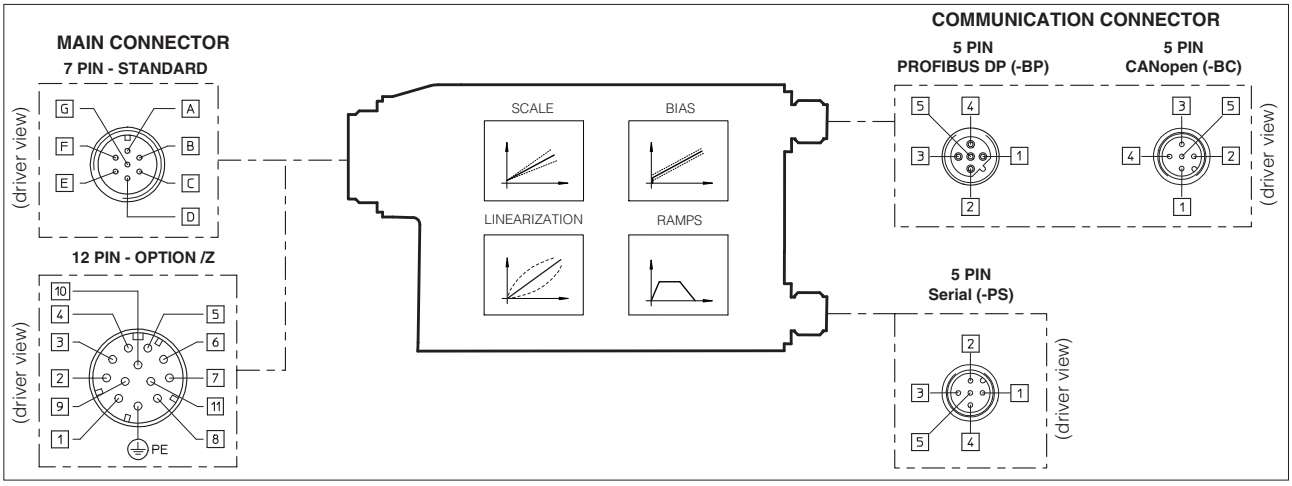
Enable Input Signal

To enable the driver, supply 24Vdc on pin 3 referred to pin 2: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

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 DIGITAL INTEGRAL DRIVERS -AES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



12.1 7 or 12 PIN MAIN CONNECTOR

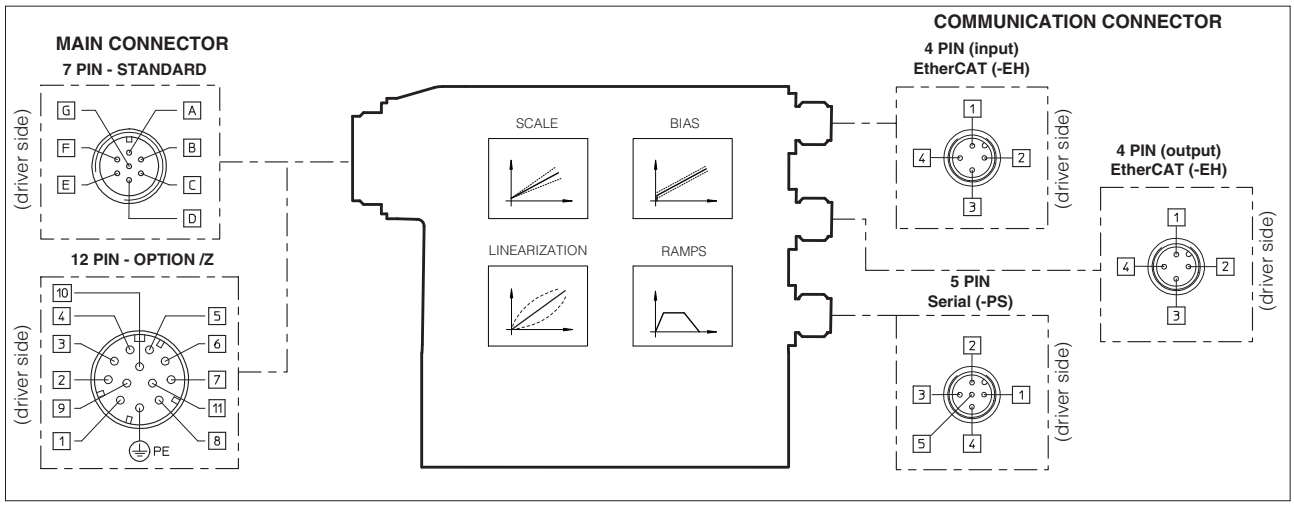
Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Input - power supply
B	2	V0	Power supply 0 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Gnd - power supply
D	4	INPUT+	Reference analog input: ±10 VDC / ± 20 mA maximum range software selectable Default setting 0÷+10 VDC differential input /Z option: common mode INPUT+ referred to AGND	Input - analog signal
E	-	INPUT -		
C	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
	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: 0÷+5 VDC maximum range; 1 V = 1 A	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver logic	Gnd - power supply
-	11	FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

Note: A minimum time of 270 to 340 ms have be considered between the driver energizing with the 24VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

12.2 5 PIN M12 COMMUNICATION CONNECTOR

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	**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	

13 DIGITAL INTEGRAL DRIVERS -AES-EH - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



Note: for the electronic connections of 7 or 12 pin main connector, see section 12.1

13.1 4 & 5 PIN M12 COMMUNICATION CONNECTORS

Serial (-PS)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	NC	do not connect
2	NC	do not connect
3	RS_GND	Signal zero data line
4	RS_RX	Valves receiving data line
5	RS_TX	Valves transmitting data line

EtherCAT (-EH)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
Housing	Shield	Positioned on control cabinet side

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

VALVE VERSION	-A	-AE, -AES		-AES/Z	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)	EtherCAT (-EH)
CONNECTOR CODE	666	ZH-7P	ZM-7P	ZH-12P	ZH-5P	ZH-5P/BP	ZM-4PM/EH
PROTECTION DEGREE	IP65	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	K500	G110, G115, K500			G115, K500		

connectors supplyed with the valve

15 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the Atos E-SW programming software, available in four different versions according to the driver's communication execution: **E-SW-PS** (Serial), **E-SW-BC** (CANopen), **E-SW-BP** (PROFIBUS DP), **E-SW-EH** (EtherCAT). Programming software E-SW-BC, E-SW-BP, E-SW-EH for BC, BP and -EH drivers, can be also used to modify the valve's parameterization through the serial communication interface, without disconnecting the valve from the machine's bus line.

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.

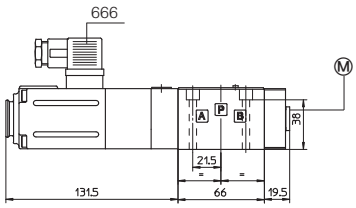
The software remains active for 10 days from the installation date and then it stops until the user inputs his password.

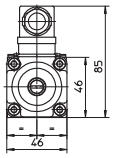
With the password you can also download, in your personal area, the latest releases of the Atos software, manuals, drivers and configuration files.

16 INSTALLATION DIMENSIONS [mm]

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05 (see tab. P005)
Fastening bolts:
4 socket head screws M5X50 bolts class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P, A, B, T: ø 5 mm

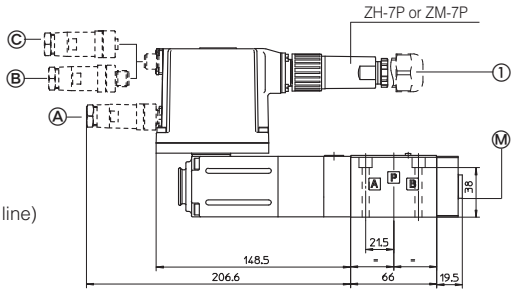
RZGO-A

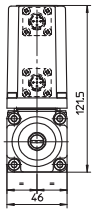




Mass: 2,7 Kg

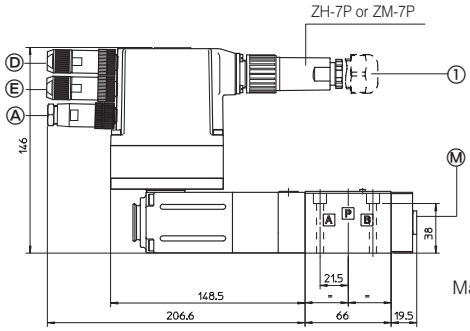
RZGO-AE
RZGO-AES-* (dotted line)





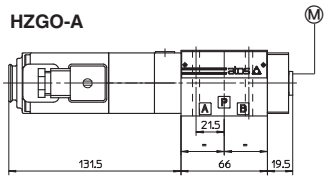
Mass: 3,2 Kg

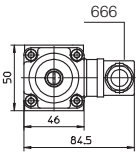
RZGO-AES-EH



Mass: 3,2 Kg

HZGO-A

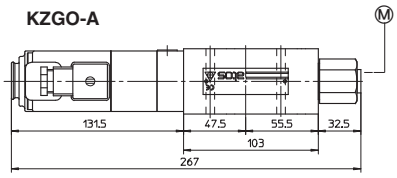


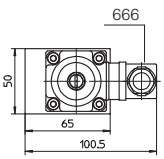


Mass: 3,8 Kg

ISO 4401: 2000
Mounting surface: 4401-03-02-0-05 (see tab. P005)
Fastening bolts: M5 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P, A, B, T: Ø = 5 mm

KZGO-A





Mass: 4,4 Kg

ISO 4401: 2000
Mounting surface: 4401-05-04-0-05 (see tab. P005)
Fastening bolts: M6 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050.1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)

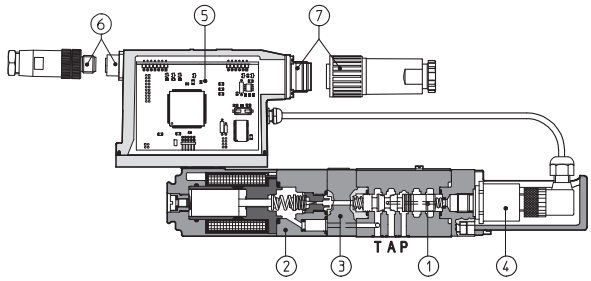
Ⓐ -PS communication interface, ZH-5P connector
Ⓑ -BP communication interface, ZH-5P/BP connector
Ⓒ -BC communication interface, ZH-5P connector
Ⓓ -EH communication interface (input), ZM-4PM/EH connector
Ⓔ -EH communication interface (output), ZM-4PM/EH connector

Ⓜ Pressure gauge connection port = G1/4"

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

Proportional reducing valves type RZGO-TERS, -AERS, 3-way

pilot operated, with integral or remote pressure transducer, ISO 4401 size 06



RZGO-TERS-PS-033/*

① Main spool
② Poportional pilot relief valve
③ Flow control cartridge
④ Integral pressure transducer
⑤ Integral electronics
⑥ Communication connector
⑦ Main connector

RZGO are 3-way proportional pressure reducing valves, pilot operated with integral or remote pressure transducer, which provide pressure regulation proportional to electronic reference signal.

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

They are available in different executions:

- -TERS with integral pressure transducer ④ plus digital electronics ⑤ preset in closed loop, featuring improved static and dynamic performances.
- -AERS as -TERS but without integral pressure transducer (predisposed for connection of remote pressure transducer).

The reduced pressure is controlled by the main spool ① piloted by the proportional pilot relief valve ②. The intermediate compensated flow control cartridge ③ assures constant pilot flow and therefore high pressure stability.

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

The electronic main connector ⑦ is fully interchangeable for -TERS and -AERS executions. Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z.

Following communication interfaces ⑥ are available:

- -PS, Serial communication interface for configuration, monitoring and firmware updating trough 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 size 06, 10.
Max flow: 100 l/min.
Max pressure: 350 bar.

1 MODEL CODE

RZGO – TERS – PS – 033 / 100 / * ** / *

Proportional pressure reducing valve size 06

TERS = with integral digital electronics and pressure transducer
AERS = as TERS but predisposed for connection of remote pressure transducer (to be ordered separately, see tab. G460)

Communication interfaces:
PS = Serial
BC = CANopen
BP = PROFIBUS DP

Configuration:
033 = regulation on port A, pressure from P, discharge in T

Pressure range:
100 = 100 bar
210 = 210 bar
315 = 315 bar
350 = 350 bar

Electronics options, see section 6:
I = current reference input and monitor (4 ÷ 20 mA) signals
Z = double power supply, enable fault and monitor signals (12 pin connector)
C = remote pressure transducer with current feedback 4÷20 mA (only for AERS executions)

Series number

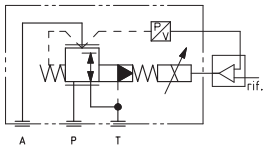
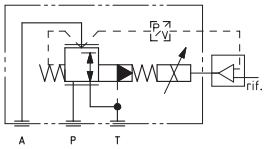
Seals material:
omit for NBR (mineral oil & water glycol)
PE = FPM

2 ELECTRONIC DRIVERS FOR RZGO

Valve model	-TERS	-AERS
Drivers model	E-RI-TERS	E-RI-AERS
Data sheet	G205	

Note: for power supply and communication connector see section 11

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

Hydraulic symbols	 RZGO-TERS-*-033		 RZGO-AERS-*-033		
Valve model	RZGO-TERS, RZGO-AERS				
Max. reduced pressure (Q = 10 l/min)	100	210	315	350	
Min. reduced pressure (Q = 10 l/min) [bar]	1 or actual value at T port; (3 for /350)				
Max. pressure at ports P, T [bar]	port P = 350 bar; port T = 210 bar				
Minimum flow [l/min]	2,5				
Maximum flow [l/min]	40				
Response time 0 - 100% step signal (depending on installation) see section 9.4 [ms]	≤ 35				
Hysteresis [% of the max regulated pressure]	≤ 0,5				
Linearity [% of the max regulated pressure]	≤ 1				
Repeatability [% of the max regulated pressure]	≤ 0,5				
Thermal drift	zero point displacement < 1% at ΔT = 40°C				

4 MAIN CHARACTERISTICS OF PROPORTIONAL PRESSURE REDUCING VALVES TYPE RZGO

Assembly position	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +50°C for -TERS and -AERS
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 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3.3 Ω
Max solenoid current	2,6 A
Max power	40 Watt
Protection degree (CEI EN-60529)	IP67
Duty factor	Continuous rating (ED=100%)

5 GENERAL NOTES

RZGO 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).

6 DIGITAL INTEGRAL DRIVERS -AERS and -TERS -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 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 0÷+10 VDC nominal range (pin D,E), proportional to desired valve pressure regulation

Monitor output signal - analog output signal proportional to the actual valve pressure regulation = 0÷+10 VDC nominal range

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

6.1 Option /I

It provides 4÷20 mA current reference and monitor signals instead of the standard 0÷+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.

6.2 Option /Z

It provides on 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

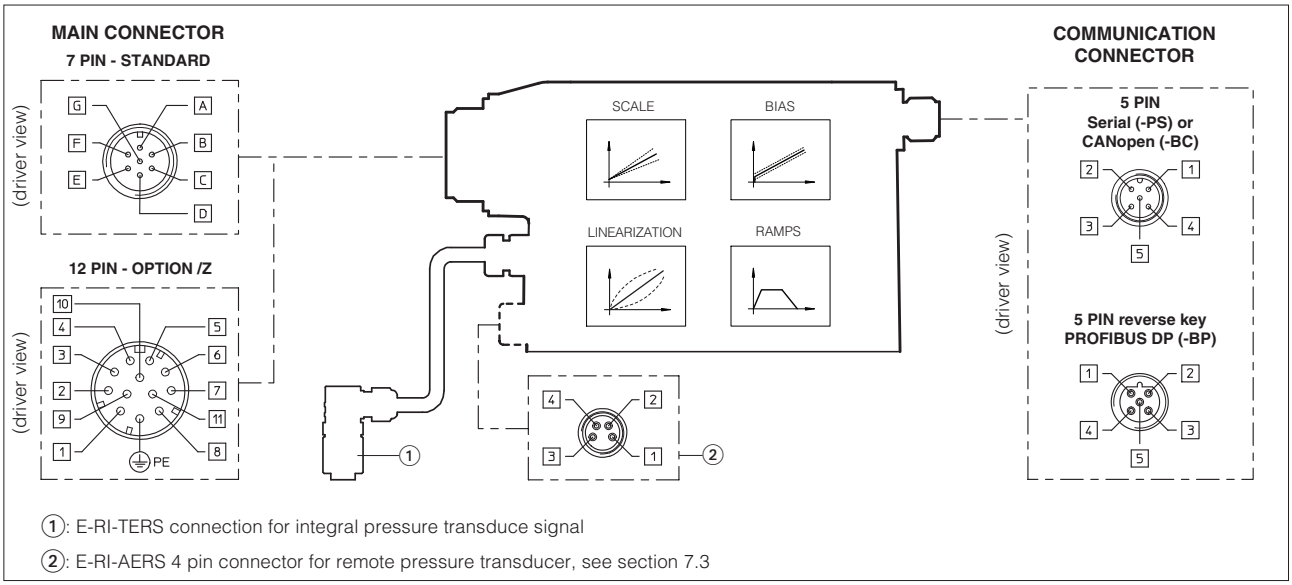
Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷20mA input, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24VDC (pin 11 referred to pin 2): Fault status is not affected by the Enable input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

6.3 Option /C (only for -AERS version)

The valve electronics is set to receive the 4÷20 mA feedback signal from the remote pressure transducer, instead of the standard 0÷10 V.

6.4 Possible combined options: /CI, /CIZ, /CZ (only for -AERS) and /IZ.

7 BLOCK DIAGRAM



①: E-RI-TERS connection for integral pressure transduce signal

②: E-RI-AERS 4 pin connector for remote pressure transducer, see section 7.3

7.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTOR

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 ÷ 20 mA for /I option) Normal working range 0÷+10 VDC (4 ÷ 20 mA for /I option) differential INPUT+ and INPUT - (for 7 pin standard execution) common mode INPUT+ referred to AGND (only for /Z option)	Input - analog signal
E	-	INPUT -		
C	5	AGND	Ground : signal zero for MONITOR signal (pin F of 7 pin standard or pin 6 of /Z option) signal zero for INPUT+ signal (only for /Z option)	Gnd - analog signal
F	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver's logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver's logic	Gnd - power supply
-	11	FAULT	Driver status: Fault (0VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to driver housing	

Note: A minimum time of 270 to 590 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

7.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

7.3 ELECTRONIC CONNECTIONS - 4 PIN REMOTE PRESSURE TRANSDUCER M8 CONNECTOR (only for AERS)

PIN	standard version		/C option (Ri = 316 Ω)	
1	TR	remote trasducer pressure signal (0÷+10 VDC)	TR	remote trasducer pressure signal (4÷20 mA)
2	NC	reserved (do not connect)	NC	reserved (do not connect)
3	VT	remote transducer power supply +24 VDC	VT	remote transducer power supply +24 VDC
4	AGND	signal zero for power supply and signal	NC	reserved (do not connect)

See tab. G465 for the pressure transducer characteristics and connections.

8 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.

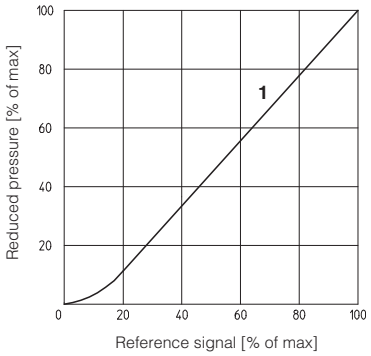
9 DIAGRAMS (based on mineral oil ISO VG 46 at 50 °C)

9.1 Regulation diagrams
with flow rate Q = 10 l/min

1 = RZGO-AERS, RZGO-TERS,

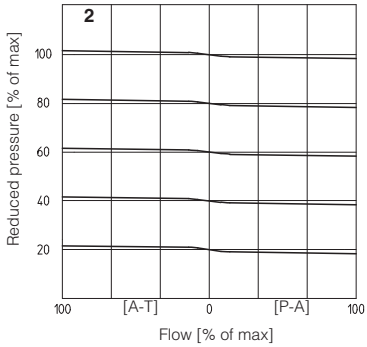
Note:

The presence of counter pressure at port T can affect the effective pressure regulation.



9.2 Pressure/flow diagrams
with reference pressure set with Q = 10 l/min

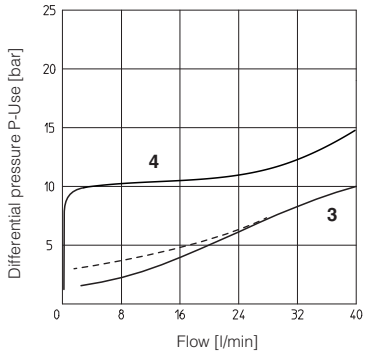
2 = RZGO-AERS, RZGO-TERS



9.3 Pressure drop/flow diagram

RZGO-AERS, RZGO-TERS

3 = A-T (dotted line /350)
4 = P-A



9.4 Dynamic response

The response times in section 3 have to be considered as average values.

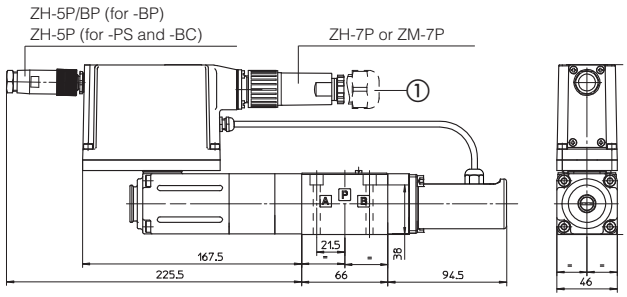
The pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response. The valves dynamic performances can be optimized depending on the stiffness characteristics of the hydraulic circuit, by setting the internal software parameters. This regulation is particularly helpful in case of circuits with accumulators and/or with great fluid volumes and/or with long hoses.

10 INSTALLATION DIMENSIONS [mm]

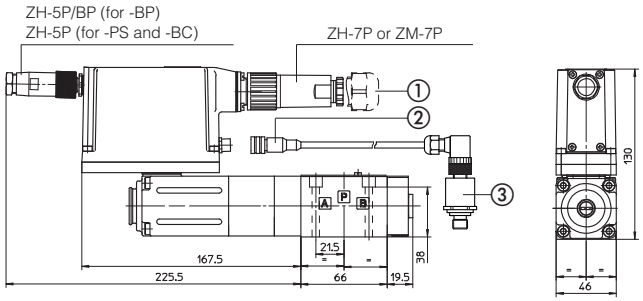
ISO 4401: 2000
Mounting surface: 4401-03-02-0-05
(see table P005)

Fastening bolts:
4 socket head screws M5X50 bolts class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P, A, B, T: ø 5 mm

RZGO-TERS-*
Mass: 3,5 Kg



RZGO-AERS-*
Mass: 3,3 Kg



① = 12 pin connector ZH-12P (option/Z)

② = 4 pin connector ZH-4P-M8/5 (see tab. G205)

③ = remote pressure transducer, to be ordered separately (see tab. G465)

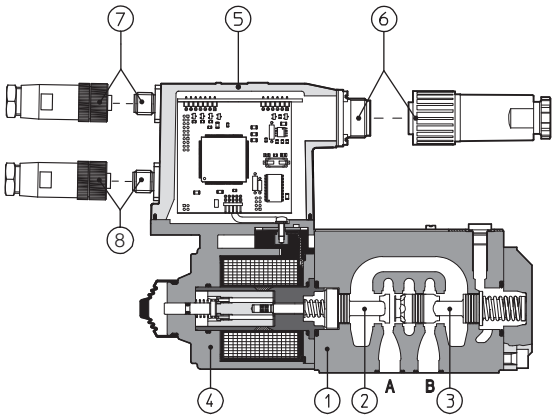
11 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-AERS, -TERS		-AERS/Z -TERS/Z	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)	Pressure transducer only for -AERS
CONNECTOR CODE	ZH-7P	ZM-7P	ZH-12P	ZH-5P	ZH-5P/BP	ZH-4P-M8/5 (1)
PROTECTION DEGREE	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	G205, K500					

(1) M8 connector ZH-4P-M8/5 moulded on cable 5 mt lenght for pressure transducer

Proportional flow valves type QVHZO-A*, QVKZOR-A*

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



① Valve body
② Throttle
③ Compensator
④ Proportional solenoid
⑤ Integral electronics
⑥ Main connector
⑦ -BC or -BP communication connector
⑧ -PS communication connector

QVKZOR-AES-BC

QVHZO and QVKZOR are 2 or 3 flow proportional valves, direct operated without position transducer, which provide 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 correct current signal 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;

The flow is controlled by a throttle ②, directly operated by the proportional solenoid ④. The mechanical pressure compensator ③ keeps a constant Δp across the throttle ①, thus the regulated flow is indipendent to the load conditions.

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 interchangable for -AE and -AES executions.
Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z (AES).

Following communication interfaces ⑥ are available for the digital -AES execution:
- standard -PS, Serial communication interface for configuration, monitoring and firmware updating through Atos PC software - always present
- optional -BC, CANopen interface
- optional -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 valves have anti-vibration, antishock and weather-proof features.

Surface mounting: ISO 4401, size 06 and 10.
Max flow respectively up to:
QVHZO = 45 l/min
QVKZOR = 90 l/min
Max pressure = 210 bar

1 MODEL CODE

QVKZOR - AES - PS - 10 / 65 / * ** / *

Pressure compensated flow control valves
QVHZO = size 06
QVKZOR = 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 = Serial (1)
BC = CANopen
BP = PROFIBUS DP

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

Max regulated flow:

for **QVHZO**:		for **QVKZOR**:
3 = 3,5 l/min	**36** = 35 l/min	**65** = 65 l/min
12 = 12 l/min	**45** = 45 l/min	**90** = 90 l/min
18 = 18 l/min		

Synthetic fluids
WG = water-glycol
PE = phosphate ester

Series number

Options for -A execution, see section [5]:
6 = with 6 V_{DC} coil instead of standard 12 V_{DC} coil
18 = with 18 V_{DC} coil instead of standard 12 V_{DC} coil
D = quick venting
N = manual micrometric adjustment
NV = as N plus handwheel and graduated scale

Electronics options for -AE execution, see section [7]:
I = current reference (4÷20 mA)
Q = enable signal

Electronics options for -AES execution, see section [9]:
Q = enable signal
Z = double power supply, enable fault and monitor (12 pin connector)
W = power limitation function (12 pin connector) see section 10.3

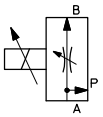
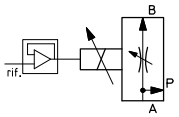
Note: (1) Serial interface always present, also for -BC and -BP options

2 ELECTRONIC DRIVERS FOR QVHZO AND QVKZOR

Valve model	-A				-AE	-AES
Drivers model	E-MI-AC-01F	E-BM-AC-01F	E-ME-AC-01F	E-RP-AC-01F	E-RI-AE	E-RI-AES
Data sheet	G010	G025	G035	G100	G110	G115

Note: For power supply and communication connector see section [15]

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

Hydraulic symbols **Note:** **In three-way versions port P is open.** **In two-way versions port P must be plugged.** **Port T must always be plugged.**	 **QVHZO-A** **QVKZOR-A**	 **QVHZO-AE** **QVKZOR-AE**

Valve model		**QVHZO-A*-06**					**QVKZOR-A*-10**	
Max regulated flow	[l/min]	3,5	12	18	35	45	65	90
Min regulated flow (1)	[cm³/min]	15	20	30	50	60	85	100
Regulating Δp	[bar]	4 - 6		10 - 12		15	6 - 8	10 - 12
Max flow on port A	[l/min]	40		35	50	55	70	100
Max pressure	[bar]	210						
Response time 0÷100% step signal (2)	[ms]	30					45	
Hysteresis	[% of the regulated max flow]	≤ 5					≤ 5	
Linearity	[% of the regulated max flow]	≤ 3					≤ 3	
Repeatability	[% of the regulated max flow]	≤ 1					≤ 1	

Notes: Above performance data refer to valves coupled with Atos electronic drivers, see sections 2.
(1) Values are referred to 3-way configuration. In the 2-way configuration, the values of min regulated flow are higher.
(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.

4 GENERAL NOTES

QVHZO and QVKZOR 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 OPTIONS FOR -A EXECUTION

5.1 Option /6 6 VDC coil instead of standard 12 VDC, to be used in case of power supply 12 VDC

5.2 Option /18 18 VDC coil instead of standard 12 VDC, to be used with electronic drivers not supplied by Atos

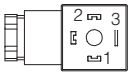
5.3 Option /D This option provides a quick venting of the user line when the valve is closed or de-energized.

The following options allow to operate the valve in absence of electrical power supply by means of a micrometric screw replacing the standard solenoid manual override, see table K500

5.4 Option /N manual micrometric adjustment

5.5 Option /NV as N plus handwheel and graduated scale

6 CONNECTION FOR -A EXECUTION

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

7 ANALOG INTEGRAL DRIVERS -AE - 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 0÷+10VDC nominal range (pin D,E), proportional to desired coil current

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

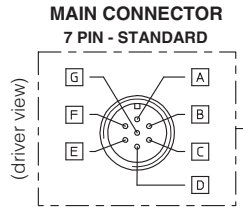
Following options are available to adapt standard execution to special application requirements:

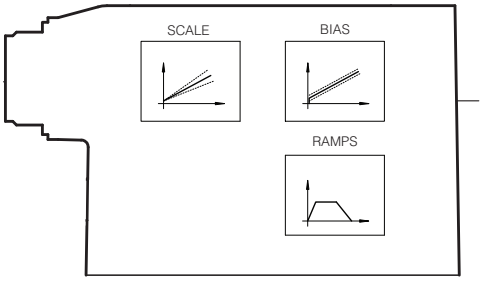
7.1 Option /I
It provides the 4÷20 mA current reference signal instead of the standard 0÷+10 VDC. Monitor output signal is still the standard 0÷+10VDC.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

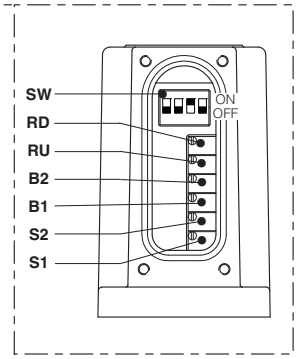
7.2 Option /Q
It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24VDC on the enable input signal.

7.3 Possible combined option: /IQ

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







Selector **SW**				Dither frequency
SW1	SW2	SW3	SW4	[Hz]
				100
ON				130
	ON			160
		ON		**200 (Standard)**
ON		ON		230
	ON	ON		270
ON	ON	ON		300
ON	ON		ON	380
ON		ON	ON	430
	ON	ON	ON	470
ON	ON	ON	ON	500

The dither frequency is factory preset at 200 Hz and its regulation may be adjusted after contact with Atos technical department

B1: positive bias adjust
B2: not working
S1: positive scale adjust
S2: not working
RU: ramp for increasing reference signal
RD: ramp for decreasing reference signal
SW: dither frequency selector (see table beside)

8.1 ELECTRONIC CONNECTIONS - 7 PIN MAIN CONNECTORS

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 (1)	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q option)	Input - on/off signal
D	INPUT+	Reference analog differential input: ±10 VDC maximum range (4 ÷ 20 mA for /I option) Default setting for single solenoid valves: 0÷+10 VDC	Input - analog signal
E	INPUT -		
F	MONITOR	Monitor analog output: 0÷+5 VDC maximum range; 1 V = 1 A	Output - analog signal
G	EARTH	Internally connected to the driver housing	

Note: (1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B.

A minimum time of 60ms to 160ms 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 -AES - 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 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 0÷+10 VDC nominal range (pin D, E), proportional to desired coil current (4÷20 mA with cable break detection, ±10 mA, ±20 mA or 0÷20 mA software selectable)

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

9.1 Option /Q

To enable the driver, supply 24Vdc on pin C referred to pin B: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

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 status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

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.

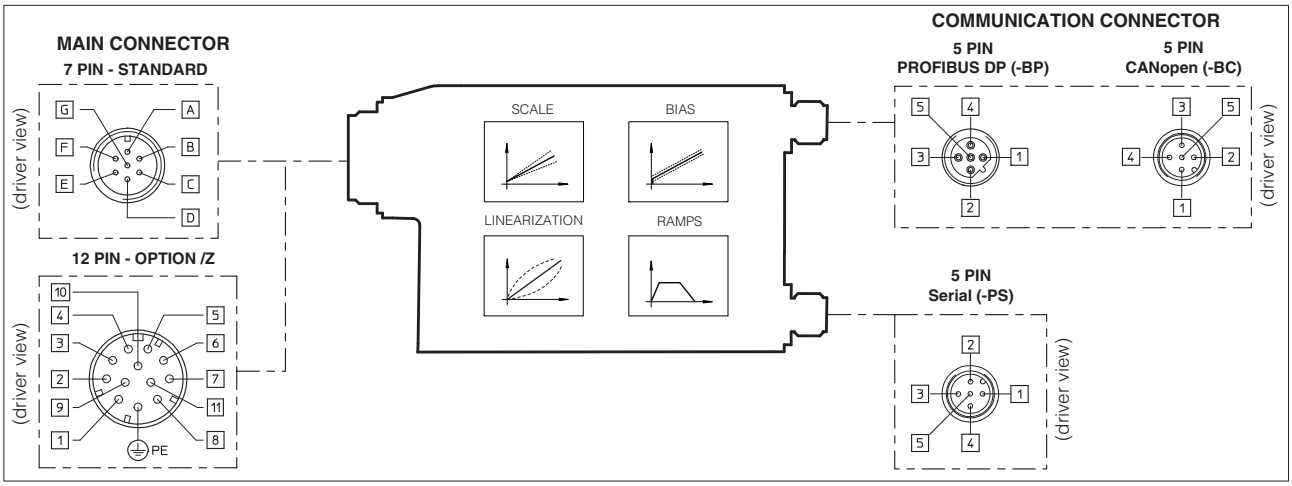
9.3 Option /W

It provides, on the 12 pin main connector, the above option /Z features plus the hydraulic power limitation function.
The driver receives the flow reference signal by the analog external input INPUT+ and a pressure transducer remotely installed in the hydraulic system, has to be connected to the driver's analog input TR.
When the actual requested hydraulic power **p**x**Q** (TR x INPUT+) reaches the max power limit (p1xQ1), internally set by software, the driver automatically reduces the flow regulation of the valve. The higher is the pressure feedback the lower is the valve's regulated flow:

$$\text{Flow regulation} = \text{Min}\left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [TR]}}; \text{Flow Reference [INPUT+]}\right)$$

For detailed information on hydraulic power limitation, see tab. G115

10 DIGITAL INTEGRAL DRIVERS -AES - 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
C (option /Q)	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
D	4	INPUT+	Reference analog input: ±10 VDC / ±20 mA maximum range software selectable Default setting for single solenoid valves: 0÷+10 VDC, differential input /Z and /W options: common mode INPUT+ referred to AGND	Input - analog signal
E	-	INPUT -		
C	5	AGND	Ground - signal zero for MONITOR signal (INPUT+ signal only for /Z and /W options)	Gnd - analog signal
F	6	MONITOR	Monitor analog output: 0÷+10 VDC maximum range; Default setting 1V = 1A	Output - analog signal
-	7	NC	do not connect	
-	8	MONITOR 2	2nd monitor analog output: ±5 VDC maximum range (only for /W option)	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver logic	Gnd - power supply
-	11	FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

Note: A minimum time of 270 to 340 ms have be considered between the driver energizing with the 24VDC 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 AND PRESSURE TRANSDUCER CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP		/W pressure connector	
PIN	SIGNAL	TECHNICAL SPECIF.	SIGNAL	TECHNICAL SPECIF.	SIGNAL	TECHNICAL SPECIF.	SIGNAL	TECHNICAL SPECIF.
1	NC	do not connect	CAN_SHLD	Shield	+5V	for termination	VT	transducer power supply 24 VDC
2	NC	do not connect	NC	do not connect	LINE-A	Bus line (high)	TR	transducer signal 0÷10 VDC
3	RS_GND	Signal zero data line	CAN_GND	Signal zero data line	DGND	Data line and termination Signal zero	AGND	Signal zero for power supply and signal
4	RS_RX	Receiving data line	CAN_H	Bus line (high)	LINE-B	Bus line (low)	NC	do not connect
5	RS_TX	Transmitting data line	CAN_L	Bus line (low)	SHIELD	do not connect	NC	do not connect

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). Programming software E-SW-BC and E-SW-BP, for BC and BP drivers, can be also used to modify the valve's parameterization through the serial communication interface, without disconnecting the valve from the machine's bus line.

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.

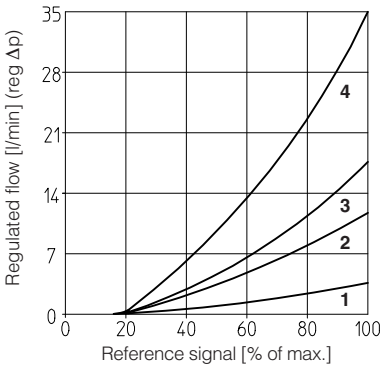
12 MAIN CHARACTERISTICS OF PROPORTIONAL FLOW VALVES TYPE QVHZO-A* AND QVKZOR-A*

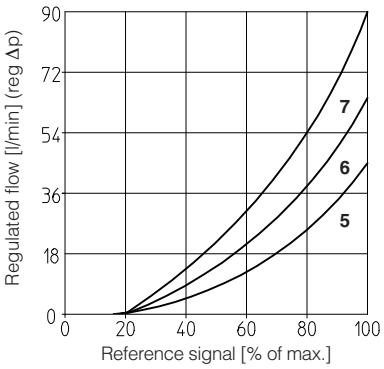
Assembly position	Any position					
Subplate surface finishing	Roughness index, $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)					
Ambient temperature	-20°C ÷ +70°C for -A executions; -20°C ÷ +60°C for -AE and -AES					
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1					
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)					
Valve model	QVHZO-A*			QVKZOR-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	1,2 A	2,6 A	3,25 A	1,2 A
Max. power	30 Watt			35 Watt		
Protection degree (CEI EN-60529)	IP65 for -A executions; IP67 for -AE and -AES					
Duty factor	Continuous rating (ED=100%)					

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

13.1 Regulation diagrams

1 = QVHZO-*-06/3
2 = QVHZO-*-06/12
3 = QVHZO-*-06/18
4 = QVHZO-*-06/36
5 = QVHZO-*-06/45
6 = QVKZOR-*-10/65
7 = QVKZOR-*-10/90

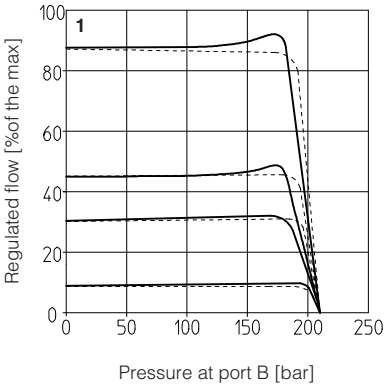


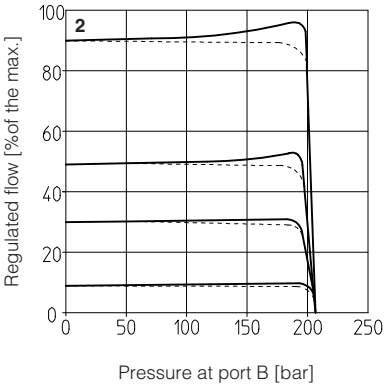


13.2 Regulated flow/outlet pressure diagrams
with inlet pressure = 210 bar

1 = QVHZO-*
2 = QVKZOR-*

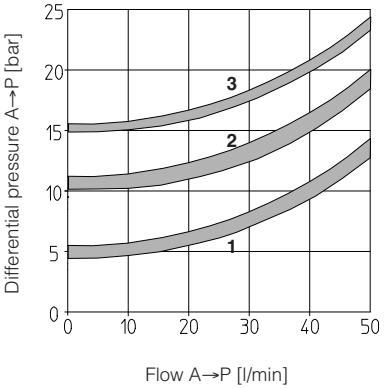
Dotted line for 3-way versions

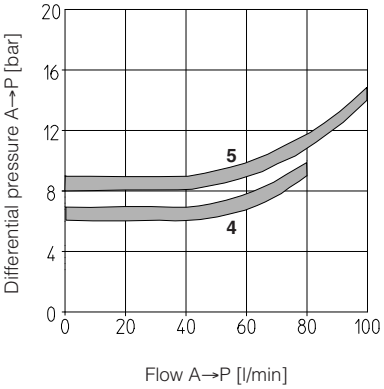




13.3 Flow A→P/Δp diagrams
3-way configuration

1 = QVHZO-*-06/3
QVHZO-*-06/12
2 = QVHZO-*-06/18
QVHZO-*-06/36
3 = QVHZO-*-06/45
4 = QVKZOR-*-10/65
5 = QVKZOR-*-10/90

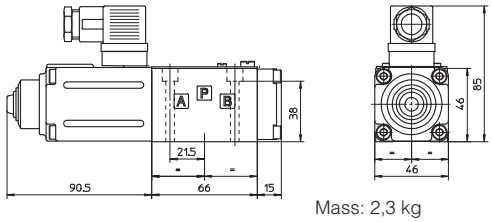




14 INSTALLATION DIMENSIONS [mm]

QVHZO-A*

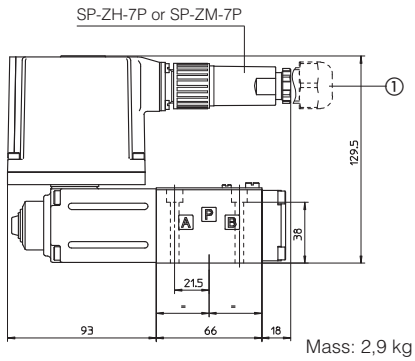
QVHZO-A



Mass: 2,3 kg

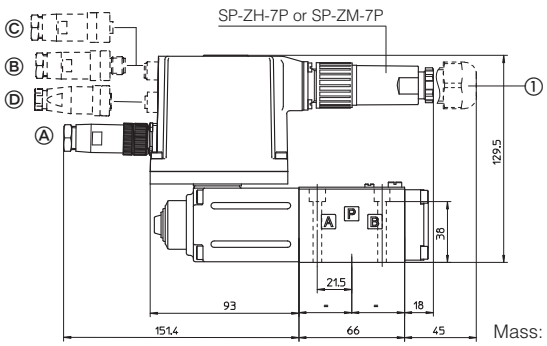
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05 (see tab. P005)
Fastening bolts: 4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108;
Diameter of ports A, B, P, T:
Ø 7,5 mm (max)

QVHZO-AE



Mass: 2,9 kg

QVHZO-AES



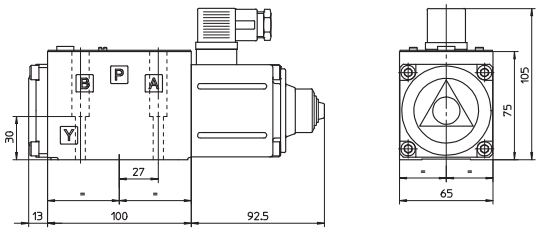
Mass: 3,1 kg

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

Ⓐ -PS communication interface, SP-ZH-5P connector
Ⓑ -BP communication interface, SP-ZH-5P/BP connector (only for -AES)
Ⓒ -BC communication interface, SP-ZH-5P connector (only for -AES)
Ⓓ Pressure transducer interface (option /W), SP-ZM-5PM connector

QVKZOR-A*

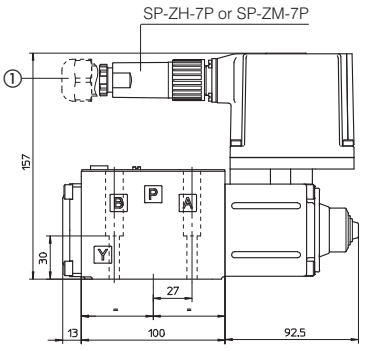
QVKZOR-A



Mass: 3,8 kg

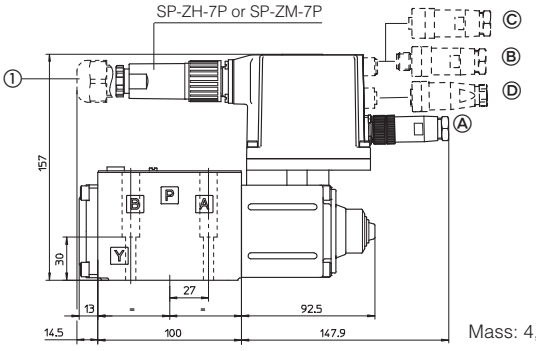
ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see tab. P005)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050;
Diameter of ports A, B, P, T:
Ø 11,2 mm (max)

QVKZOR-AE



Mass: 4,4 kg

QVKZOR-AES



Mass: 4,6 kg

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

Ⓐ -PS communication interface, SP-ZH-5P connector
Ⓑ -BP communication interface, SP-ZH-5P/BP connector (only for -AES)
Ⓒ -BC communication interface, SP-ZH-5P connector (only for -AES)
Ⓓ Pressure transducer interface (option /W), SP-ZM-5PM connector

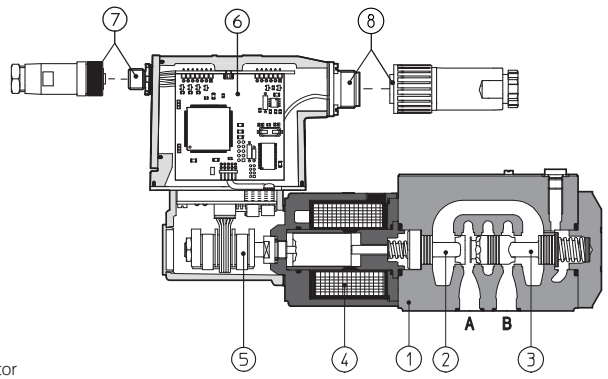
15 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-A	-AE, -AES		-AES/Z, /W	-AES/W (transducer)	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)
CONNECTOR CODE	SP-666	SP-ZH-7P	SP-ZM-7P	SP-ZH-12P	SP-ZH-5PM	SP-ZH-5P	SP-ZH-5P/BP
PROTECTION DEGREE	IP65	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	K500	G110, G115, G120, K500				G115, K500	

connectors supplyed with the valve

Proportional flow valves type QVHZO-T*, QVKZOR-T*

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



① Valve body
② Throttle
③ Compensator
④ Proportional solenoid
⑤ Position transducer
⑥ Integral electronics
⑦ Communication connector
⑧ Main connector

QVKZOR-TES

QVHZO and QVKZOR are 2 or 3 way flow proportional valves, direct operated, with position transducer which provide 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 correct current signal to align valve regulation to the reference signal supplied to the electronic driver.

They are available in different executions:
- -T, with integral position transducer;
- -TE, -TES, as -T plus analogue (TE) or digital (TES) integral electronics;

The flow is controlled by a throttle ②, directly operated by the proportional solenoid ④. The mechanical pressure compensator ③ keeps a constant Δp across the throttle ②, thus the regulated flow is indipendent to the load conditions.

The integral electronics ⑥ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.
The electronic main connector ⑧ is fully interchangeable for –AE and –AES executions.

Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z (TES).

Following communication interfaces ⑦ 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 valves have anti-vibration, antishock and weather-proof features.

Surface mounting: ISO 4401, size 06 and 10.

Max flow respectively up to:
QVHZO = 45 l/min
QVKZOR = 90 l/min.
Max pressure = 210 bar.

1 MODEL CODE

QVKZOR - TES - PS - 10 / 65 / * ** / *

Pressure compensated flow control valves
QVHZO = size 06
QVKZOR = size 10

T = with position transducer
TE = as T plus integral analog electronics
TES = as T plus integral digital electronics

Communication interfaces (only for TES)
PS = Serial
BC = CANbus
BP = PROFIBUS-DP

Valve size
06 = ISO 4401, size 06 **10** = ISO 4401, size 10

Max regulated flow:
for **QVHZO**:
3 = 3,5 l/min
12 = 12 l/min
18 = 18 l/min
36 = 35 l/min
45 = 45 l/min
for **QVKZOR**:
65 = 65 l/min
90 = 90 l/min

Electronics options for -TE execution
see section [6]:
F = fault signal
I = current reference (4÷20 mA)
Q = enable signal
Z = enable, fault and monitor signals (12 pin connector)

Electronics options for -TES execution
see section [8]:
I = current reference (4÷20 mA)
Z = double power supply, enable, fault and monitor signals (12 pin connector)

Series number

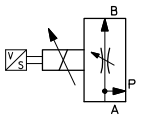
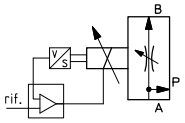
Synthetic fluids
WG = water-glycol
PE = phosphate ester

2 ELECTRONIC DRIVERS FOR QVHZO AND QVKZOR

Valve model	-T	-TE	-TES
Drivers model	E-ME-T	E-RI-TE	E-RI-TES
Data sheet	G140	G200	G210

Note: For power supply and communication connector see section [14]

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

Hydraulic symbols **Note:** **In three-way versions port P is open.** **In two-way versions port P must be plugged.** **Port T must always be plugged.**	 **QVHZO-T** **QVKZOR-T**	 **QVHZO-TE, QVHZO-TES** **QVKZOR-TE, QVKZOR-TES**

Valve model		**QVHZO-T*-06**					**QVKZOR-T*-10**	
Max regulated flow	[l/min]	3,5	12	18	35	45	65	90
Min regulated flow (1)	[cm³/min]	15	20	30	50	60	85	100
Regulating Δp	[bar]	4 - 6		10 - 12		15	6 - 8	10 - 12
Max flow on port A	[l/min]	50				60	70	100
Max pressure	[bar]	210					210	
Response time 0÷100% step signal (2)	[ms]	25					35	
Hysteresis	[% of the regulated max flow]	≤ 0,5					≤ 0,5	
Linearity	[% of the regulated max flow]	≤ 0,5					≤ 0,5	
Repeatability	[% of the regulated max flow]	≤ 0,1					≤ 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 sections 2.
(1) Values are referred to 3-way configuration. In the 2-way configuration, the values of min regulated flow are higher.
(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.

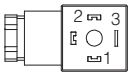
4 GENERAL NOTES

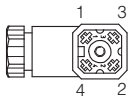
QVHZO and QVKZOR proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

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 CONNECTION 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	

6 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:

6.1 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.

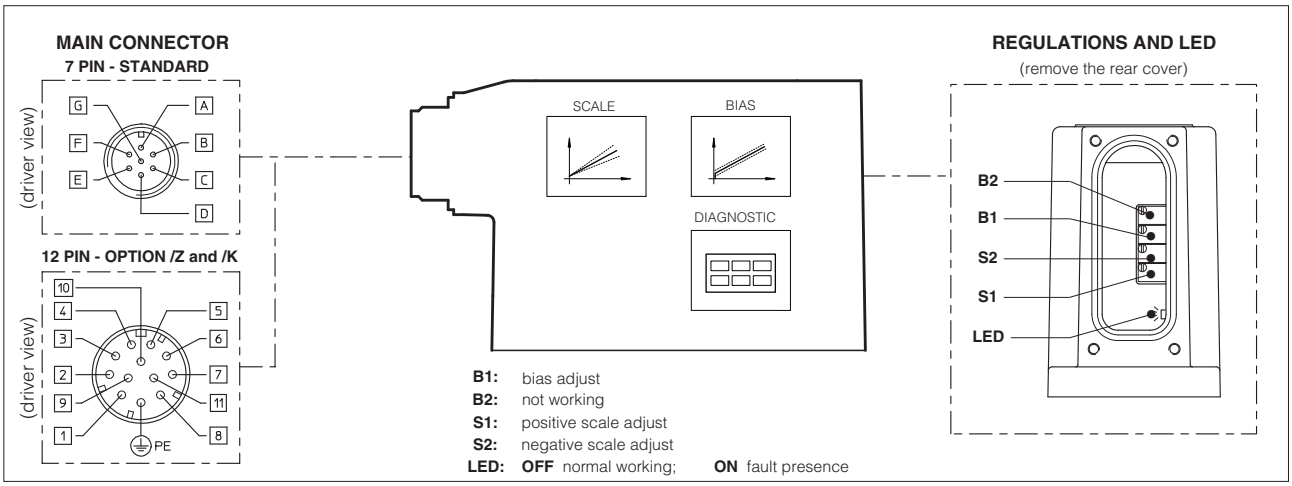
6.2 Option /I
It provides the 4÷20 mA current reference and monitor signals instead of the standard 0 ÷ +10VDC.
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

6.3 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.

6.4 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 output is forced to 0 VDC.

6.5 Possible combined options: /FI and /IZ

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



7.1 ELECTRONIC CONNECTIONS - 7 & 12 PIN MAIN CONNECTORS

Standard 7pin	/Z,/K 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 and /Z options)	Gnd - analog signal
	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q, /Z and /K options)	Input - on/off signal
D	4	INPUT+	Reference analog differential input: ±10 VDC maximum range (4 ÷ 20 mA for /I option) Normal working range 0 ÷ +10VDC (4 ÷ 20 mA for /I option)	Input - analog signal
E	5	INPUT -		
F (2)	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 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 reffered 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.

8 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 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 ±10VDC 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 to special application requirements:

8.1 Option /I

It provides 4÷20 mA current reference and monitor signals instead of the standard 0 ÷ +10VDC.

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.

8.2 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

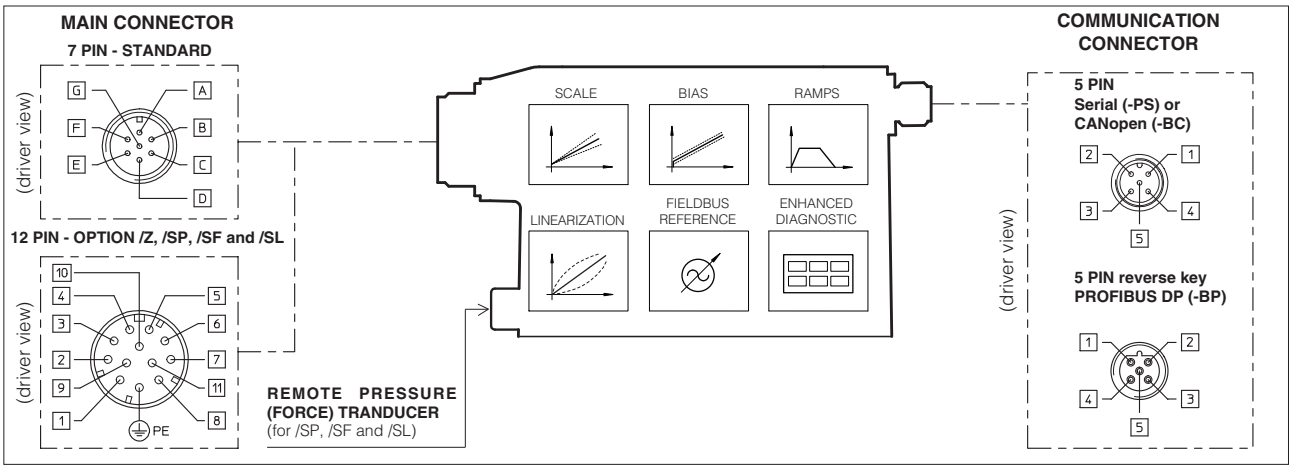
To enable the driver, supply 24VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active.

Fault Output Signal

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷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

8.3 Possible combined options: /IZ

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



9.1 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 ÷ 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 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	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.

9.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

10 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.

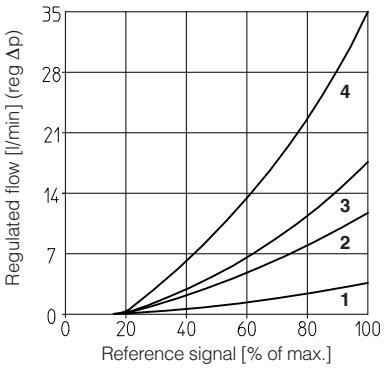
11 MAIN CHARACTERISTICS OF PROPORTIONAL FLOW VALVES TYPE QVHZO-T* AND QVKZOR-T*

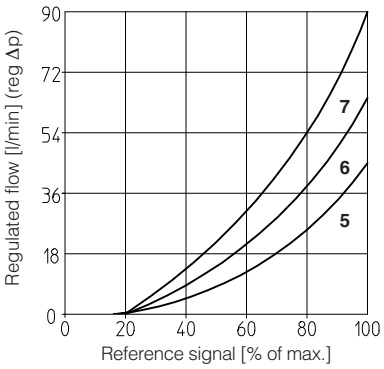
Assembly position	Any position	
Subplate surface finishing	Roughness index, $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)	
Ambient temperature	-20°C ÷ +70°C for -T executions; -20°C ÷ +60°C for -TE and -TES	
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1	
Recommended 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)	
Valve model	QVHZO-T*	QVKZOR-T*
Coil resistance R at 20°C	3 ÷ 3,3 Ω	3,8 ÷ 4,1 Ω
Max. solenoid current	2,6 A	2 A
Max. power	30 Watt	35 Watt
Protection degree (CEI EN-60529)	IP65 for -T executions; IP67 for -TE and -TES	
Duty factor	Continuous rating (ED=100%)	

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

12.1 Regulation diagrams

1 = QVHZO-*-06/3
2 = QVHZO-*-06/12
3 = QVHZO-*-06/18
4 = QVHZO-*-06/36
5 = QVHZO-*-06/45
6 = QVKZOR-*-10/65
7 = QVKZOR-*-10/90

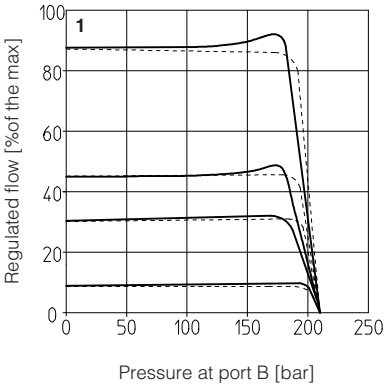


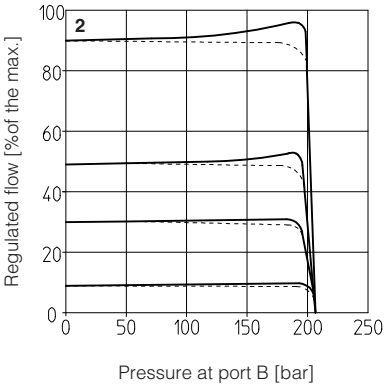


12.2 Regulated flow/outlet pressure diagrams
with inlet pressure = 210 bar

1 = QVHZO-*
2 = QVKZOR-*

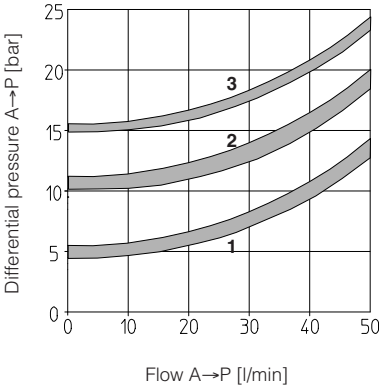
Dotted line for 3-way versions

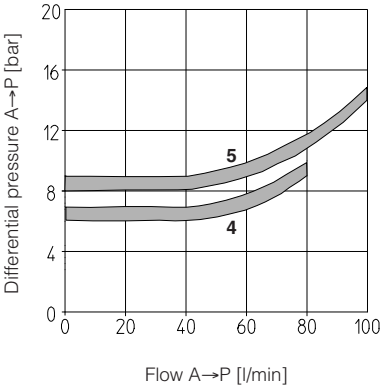




12.3 Flow A→P/Δp diagrams
3-way configuration

1 = QVHZO-*-06/3,
QVHZO-*-06/12
2 = QVHZO-*-06/18,
QVHZO-*-06/36,
3 = QVHZO-*-06/45
4 = QVKZOR-*-10/65
5 = QVKZOR-*-10/90





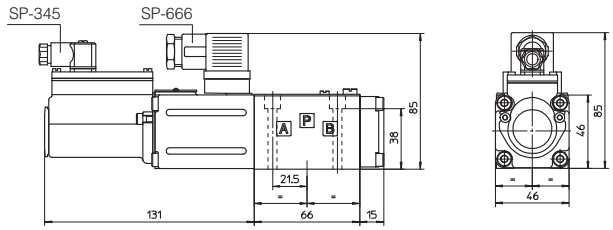
12.4 Dynamic response

The response times in section 3 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.

13 INSTALLATION DIMENSIONS [mm]

QVHZO-T*

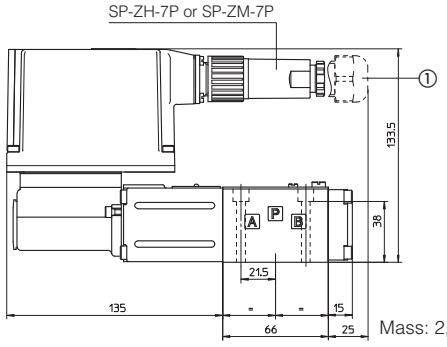
QVHZO-T



Mass: 2,3 kg

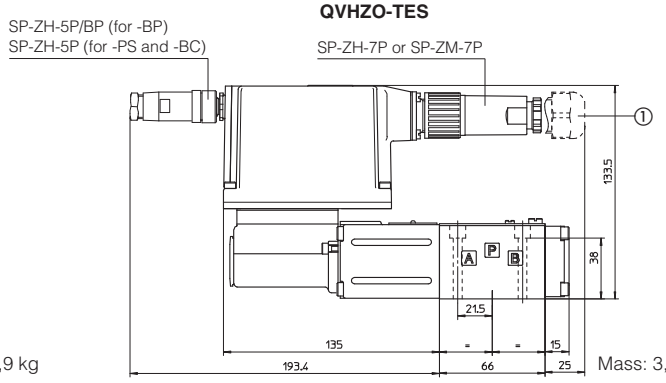
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05 (see tab. P005)
Fastening bolts: 4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108;
Diameter of ports A, B, P, T:
Ø 7,5 mm (max)

QVHZO-TE



Mass: 2,9 kg

QVHZO-TES

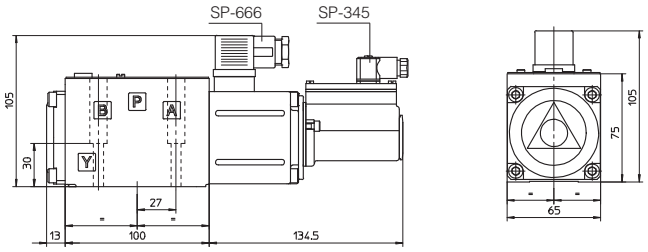


Mass: 3,1 kg

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

QVKZOR-T*

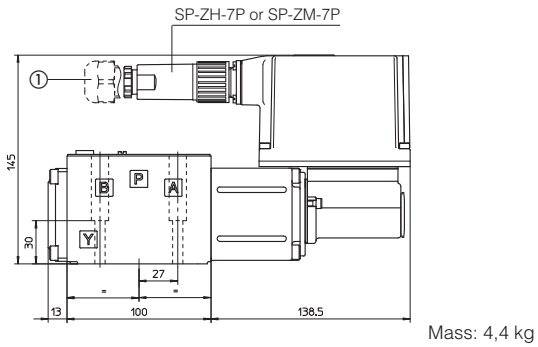
QVKZOR-T



Mass: 3,8 kg

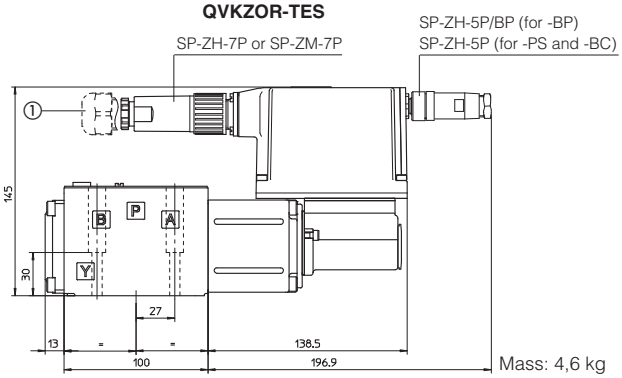
ISO 4401: 2005
Mounting surface: 4401-05-04-0-05 (see tab. P005)
Fastening bolts: 4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050;
Diameter of ports A, B, P, T:
Ø 11,2 mm (max)

QVKZOR-TE



Mass: 4,4 kg

QVKZOR-TES



Mass: 4,6 kg

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

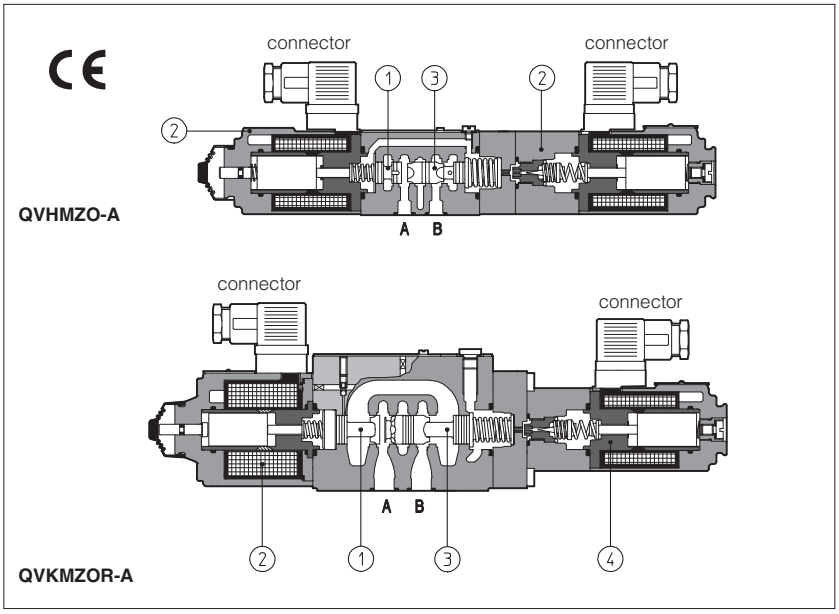
14 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

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

connectors supplied with the valve

Proportional pressure and flow control type QVHMZO, QVKMZOR

indipendent pressure and 3-way compensated flow regulation, ISO 4401 size 06 and 10



QVHMZO and QVKMZOR are proportional valves, direct operated, which provide indipendent pressure and 3-way compensated flow controls according to the electronic reference signals.

They operate in association with electronic drivers, see section 8 which supply the proportional valves with correct current signal to align valve regulation to the reference signal supplied to the electronic driver.

The flow is controlled by a throttle ①, directly operated by the proportional solenoid ②. The mechanical pressure compensator ③ keeps a constant Δp across the throttle ①, thus the regulated flow is indipendent to the load conditions.

The exceding flow is returned to tank through the port P.

The pressure is controlled by the compensator ③, piloted by the proportional pressure relief valve ④.
The coils are fully plastic encapsulated (insulation class H) and valves have anti-vibration, antishock and weather-proof features.

Surface mounting: ISO 4401, size 06 and 10.
Max flow respectively up to 45 l/min and 90 l/min.
Max pressure = 210 bar.

1 MODEL CODE

QVKMZOR - A - 10 / 65 / 210 / * ** / *

Pressure compensated flow control valves
QVHMZO = size 06
QVKMZOR = size 10

A = without position transducer

Valve size, see section 2
06 = ISO 4401, size 06
10 = ISO 4401, size 10

Max regulated flow:
for **QVHMZO**: **30** = 35 l/min, **40** = 45 l/min
for **QVKMZOR**: **65** = 65 l/min, **90** = 90 l/min

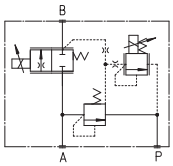
max pressure:
210 = 210 bar

Coil voltage (only for -A execution)
- = standard coil for 24V⎓ Atos drivers
6 = optional coil for 12V⎓ Atos drivers
18 = optional coil for low current drivers

Series number

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

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

Hydraulic symbols **Note:** **Port T must always be plugged.**					
Valve model		**QVHMZO-A-06**		**QVKMZOR-A-10**	
Max regulated flow	[l/min]	35	45	65	90
Min regulated flow	[cm³/min]	50	60	85	100
Regulating Δp	[bar]	10-12	15	6 - 8	10 - 12
Max flow on port A	[l/min]	50	55	70	100
Max regulating pressure	[bar]	210			
Response time 0÷100% step signal (1)	[ms]	30		45	
Hysteresis	[% of the regulated max flow]	≤ 5		≤ 5	
Linearity	[% of the regulated max flow]	≤ 3		≤ 3	
Repeatability	[% of the regulated max flow]	≤ 1		≤ 1	

Above performance data refer to valves coupled with Atos electronic drivers, see sections 8.
(1) 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 PRESSURE AND FLOW VALVES TYPE QVHMZO-A AND QVKMZOR-A

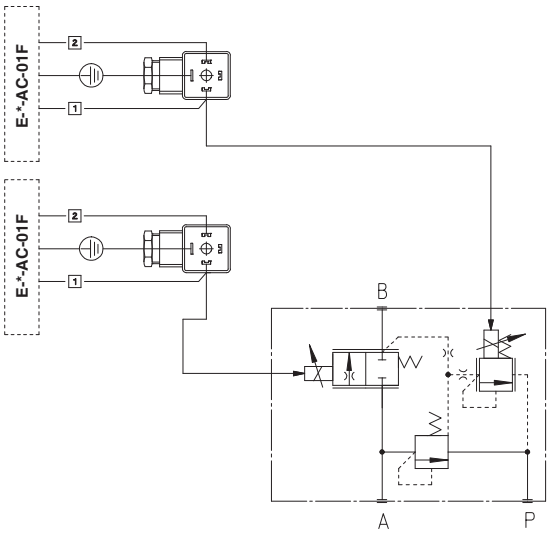
Assembly position	Any position
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	-20°C ÷ +70°C for -A execution
Fluid	Hydraulic oil as per DIN 51524 ... 535 for other fluids see section 1
Recommended viscosity	15 ÷100 mm²/s at 40°C (ISO VG 15÷100)
Fluid contamination class	ISO 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)

3.1 Coils characteristics

Valve model		QVHMZO-A			QVKMZOR-A		
		Standard	option /6	option /18	Standard	option /6	option /18
Coil resistance R at 20°C	pressure	3 ÷ 3,3 Ω	2 ÷ 2,2 Ω	13 ÷ 13,4 Ω	3 ÷ 3,3 Ω	2 ÷ 2,2 Ω	13 ÷ 13,4 Ω
Max. solenoid current	pressure	2,6 A	3,25 A	1,5 A	2,6 A	3,25 A	1,5 A
Coil resistance R at 20°C	flow	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	flow	2,2 A	2,75 A	1,2 A	2,6 A	3,25 A	1,2 A
Max. power		30 Watt			35 Watt		
Protection degree (CEI EN-60529)		IP65					
Duty factor		Continuous rating (ED=100%)					

4 ELECTRIC WIRING

Electric wiring to reference generators must be made using shielded cables: the sheat must be connected to the power supply zero **on the generator side**. The power supply must be properly stabilized or rectified and filtered. For complete electric wiring with all available options, see section G

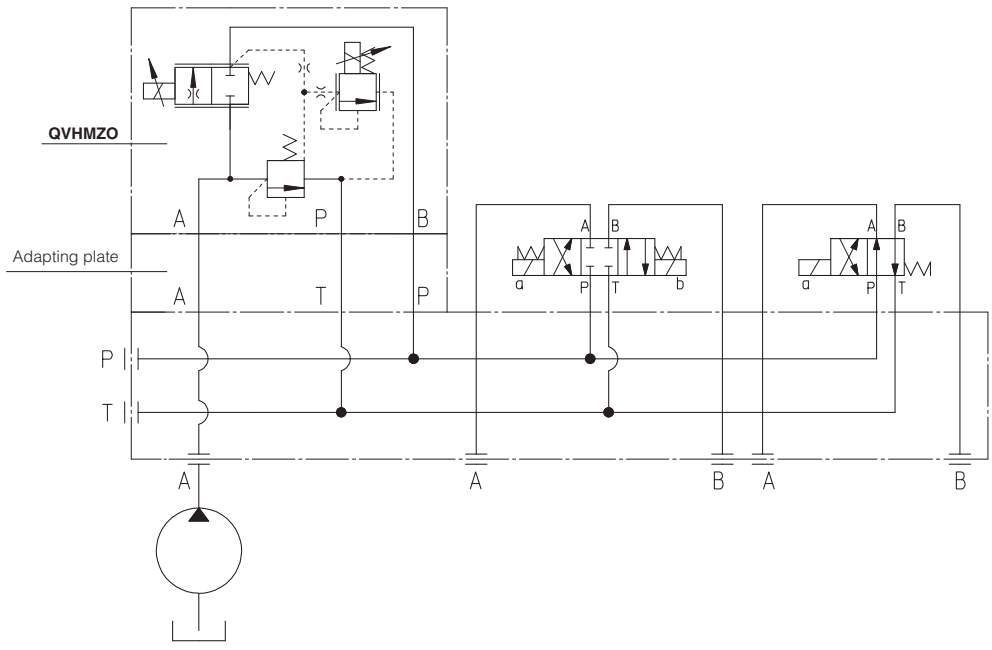


PIN	Connector
1	COIL LEAD
2	COIL LEAD
⏚	EARTH CONDUCTOR

Note:
In case the A inlet flow is < 18 l/min for QVHMZO and < 25 l/min for QVKMZOR, a check valve with cracking pressure 2 bar is suggested in P port to improve the valve stability.

Note:
basic information for commissioning and start-up are present on installation notes always enclosed to the specific technical tables and relevant components.

5 TYPICAL APPLICATION SKETCH

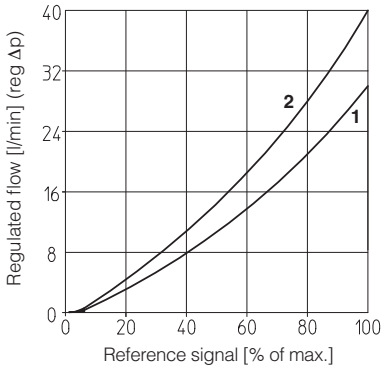


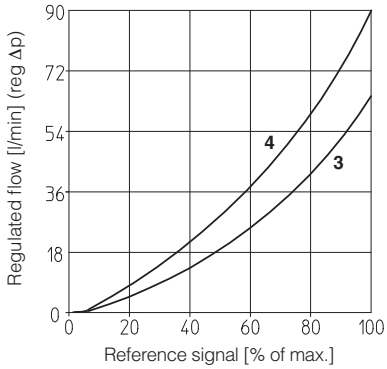
Example of P/Q control performed on standard multistations manifold type BA-214 (see tab. K290 and K295), using QVHMZO plus adapting plate (not supplied by Atos)

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

6.1 Flow regulation diagrams

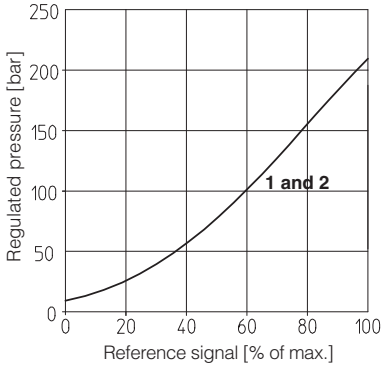
1 = QVHMZO-A-06/30
2 = QVHMZO-A-06/40
3 = QVKMZOR-A-10/65
4 = QVKMZOR-A-10/90

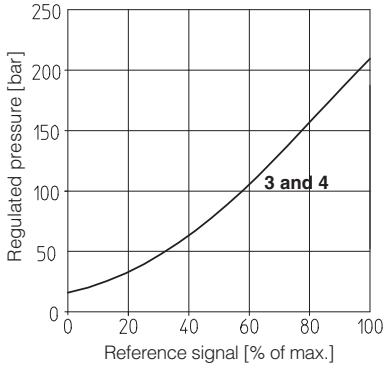




6.2 Pressure regulation diagrams

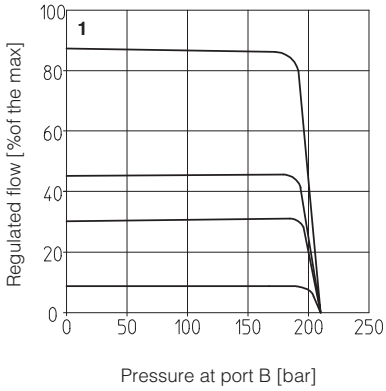
1 = QVHMZO-A-06/30
2 = QVHMZO-A-06/40
3 = QVKMZOR-A-10/65
4 = QVKMZOR-A-10/90

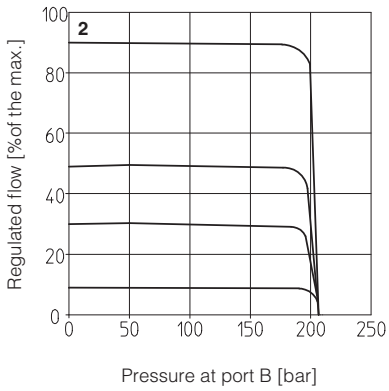




6.3 Regulated flow/outlet pressure diagrams
with inlet pressure = 210 bar

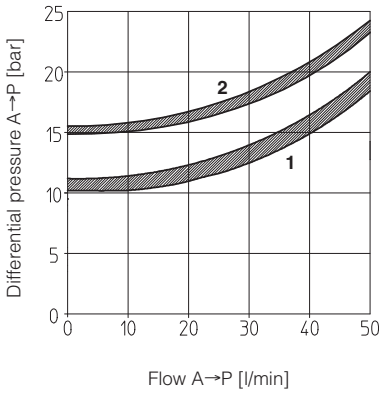
1 = QVHMZO-A
2 = QVKMZOR-A

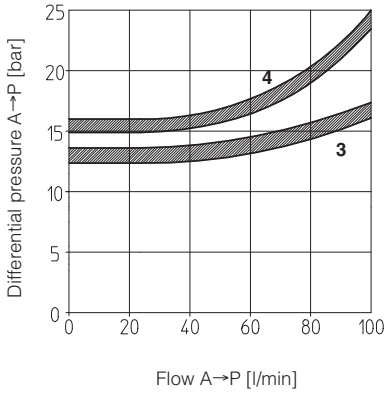




6.4 Flow A→P/Δp diagrams
3-way configuration

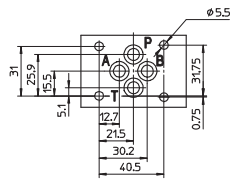
1 = QVHMZO-A-06/30
2 = QVHMZO-A-06/40
3 = QVKMZOR-A-10/65
4 = QVKMZOR-A-10/90





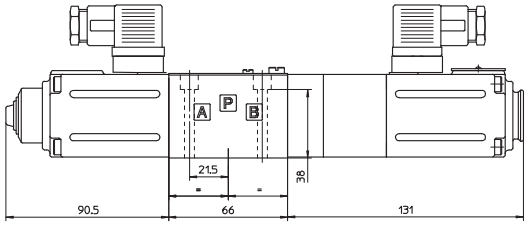
7 INSTALLATION DIMENSIONS [mm]

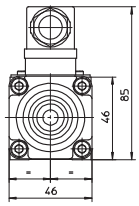
QVHMZO



ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108;
Diameter of ports A, B, P, T:
Ø 7,5 mm (max)

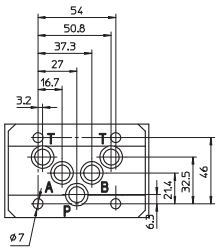
A = INLET PORT
B = OUTLET PORT
P = DISCHARGE PORT
T = NOT USED
(it must be plugged)





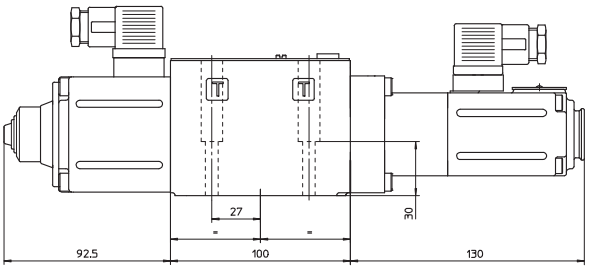
Mass: 2,8 kg

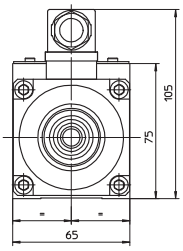
QVKMZOR



ISO 4401: 2005
Mounting surface: 4401-05-04-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050;
Diameter of ports A, B, P, T: Ø 11,2 mm (max)

A = INLET PORT
B = OUTLET PORT
P = DISCHARGE PORT
T = NOT USED
(it must be plugged)





Mass: 4,3 kg

8 ELECTRONIC DRIVERS FOR QVHMZO-A AND QVKMZOR-A

Valve model	-A					
Drivers model	E-MI-AC-01F	E-MI-AS-IR	E-BM-AC-011F	E-BM-AS	E-ME-AC-01F	E-RP-AC-01F
Data sheet	G010	G020	G025	G030	G035	G100

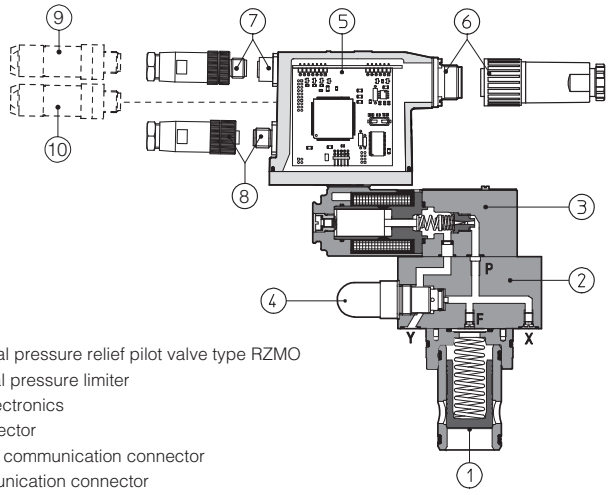
For complete information about the drivers characteristics and relevant options, see the technical data sheet specified in the table.

9 MOUNTING PLATES

Size	Model	Ports location	Gas ports A, B, P, T	Ø Counterbore [mm] A, B, P, T	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	Ports A, B, P, T (X, Y) underneath;	1/2" (1/8")	30 (16,5)	1,8
10	BA-308	Ports A, B, P, T underneath;	1/2"	30	2,5
	BA-428	Ports A, B, P, T underneath;	3/4"	36,5	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

Proportional pressure control cartridges type LI*ZO-AES

compensator, relief, reducing, without integral pressure transducer, ISO 7368 sizes from 16 to 80



① Cartridge
② Cover
③ proportional pressure relief pilot valve type RZMO
④ Mechanical pressure limiter
⑤ Integral electronics
⑥ Main connector
⑦ -BC or -BP communication connector
⑧ -PS communication connector
⑨ -EH Communication connector (input)
⑩ -EH Communication connector (output)

LIMZO-AES-BC-2

LICZO, LIMZO and LIRZO are 2-way proportional cartridges without integral pressure transducer which provide respectively pressure compensation, relief and reducing controls according to the electronic reference signals.

They operate in association with electronic drivers, see table 4 which supply the proportional valve with proper current to align valve regulation to the reference signal supplied to the electronic driver.

These valves are composed by a 2-way cartridge ① housed into a standard ISO/DIN cavity and by a closing cover ② with a piloting proportional pressure relief valve ③ type RZMO, see tab. F007.

They are available in different executions:
- -A, without integral pressure transducer.
- -AE, -AES, as -A plus analogue (AE) or digital (AES) integral electronics ⑤.

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

The electronic main connector ⑥ is fully interchangeable for -AE and -AES executions. Standard 7 pin connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for option /Z (AES).

Following communication interfaces ⑦, ⑧, ⑨, ⑩ are available for the digital -AES execution:
- -PS, Serial communication interface for configuration, monitoring and firmware updating through Atos PC software - always present also for -BC
- -BC, CANopen interface
- -BP, PROFIBUS-DP interface
- -EH, EtherCAT 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 with insulation class H.

Size: 16, 25, 32, 40, 50, 63, 80.
Max flow: up to 3000 l/min.
Max pressure: 350 bar.

1 MODEL CODE FOR COVERS

LIMZO - AES - PS - 3 / 210 / * ** / *

Proportional cartridge valves
LICZO = pressure compensator
LIMZO = pressure relief
LIRZO = pressure reducing

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

Communication interfaces (only for AES)
PS = Serial (1)
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT

Size:
1 = 16; **2** = 25; **3** = 32; **4** = 40; **5** = 50 (not for LIRZO)
6 = 63; (only for LIMZO) **8** = 80; (only for LIMZO)

Pressure range:
50 = 50 bar
100 = 100 bar **315** = 315 bar
210 = 210 bar **350** = 350 bar

(1) Serial interface always present, also for -BC and -BP options

Hydraulic options:
P = with integral mechanical pressure limiter (standard for size 1, 2 and 3)

Coil voltage (only for -A execution) see section 7:
- = standard coil for 24V$_{DC}$ Atos drivers
6 = optional coil for 12V$_{DC}$ Atos drivers
18 = optional coil for low current drivers

Electronics options for -AE execution, see section 9:
I = current reference (4÷20 mA)
Q = enable signal

Electronics options for -AES execution, see section 13:
Q = enable signal
Z = adds double power supply, enable and fault signals (12 pin connector)

Series number

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

2 MODEL CODE FOR CARTRIDGES

SC LI - 32 31 2 ** / *

Cartridge according to ISO 7368

Size: the same of relative cover

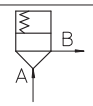
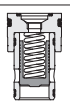
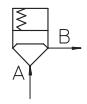
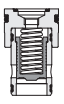
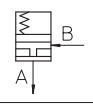
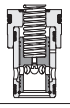
Type of cartridge, see section 3 for functions
31 = for LIMZO and LICZO **36** = for LICZO **37** = for LIRZO

Spring cracking pressure:
2 = 1,5 bar for poppet 31
3 = 3 bar; **6** = 6 bar for poppet 31 and 36
4 = 4 bar: **7** = 7 bar for poppet 37

Series number

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

3 TYPICAL FUNCTIONS OF CARTRIDGES

Type	Functional sketch (hydraulic symbol)	Typical section	Area ratio (1)
31			1:1
36			1:1
37			1:1

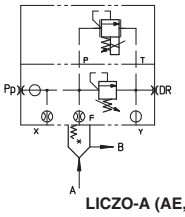
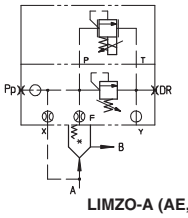
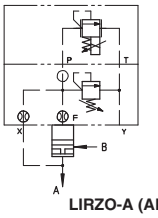
(1) It is the ratio of the area A to the area on which the pilot pressure is applied.

4 ELECTRONIC DRIVERS FOR LI*ZO

Valve model	-A						-AE	-AES (2)	-AES (-EH)
Drivers model	E-MI-AC-01F	E-MI-AS-IR	E-BM-AC-01F	E-BM-AS-PS	E-ME-AC-01F	E-RP-AC-01F	E-RI-AE	E-RI-AES	E-RI-AES-EH
Data sheet	G010	G020	G025	G030	G035	G100	G110	G115	G116

Note: for power supply and communication connector see section 15
(2) Only for AES-PS, -BC, -BP

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

Hydraulic symbols																
	 LICZO-A (AE, AES)					 LIMZO-A (AE, AES)							 LIRZO-A (AE, AES)			
Valve model	LICZO-A, -AE, -AES					LIMZO-A, -AE, -AES							LIRZO-A, -AE, -AES			
Valve size	**16**	**25**	**32**	**40**	**50**	**16**	**25**	**32**	**40**	**50**	**63**	**80**	**16**	**25**	**32**	**40**
Max flow [l/min]	200	400	750	1000	2000	200	400	750	1000	2000	3000	4500	160	300	550	800
Min regulated pres. at port A [bar]	9	8,5	8	13	15	7	7	7	10,5	12	12	(1)	7			
Min regulated pres. at port A for /350 [bar]	11	10	10	13	16	10	10	9	12	13	13	16	12			
Max regulated pres. at port A [bar]	50; 100; 210; 315; 350					50; 100; 210; 315; 350							50; 100; 210; 315; 350			
Response time 0-100% step signal (depending on installation) [ms]	100-400					100-450							100-350			
Hysteresis [% of regulated max pres.]	≤ 2					≤ 1,5							≤ 2			
Linearity [% of regulated max pres.]	≤ 3					≤ 3							≤ 3			
Repeatibility [% of regulated max pres.]	≤ 2					≤ 2							≤ 2			

(1) consult our technical office

Above performance data refer to valves coupled with Atos electronic drivers, see section 2.

6 MAIN CHARACTERISTICS

Assembly position	Any position
Subplate surface finishing	Roughness index Ra 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;
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 4406 class 20/18/15 NAS 1638 class 9, in line filters of 10 μm ($\beta_{10} \geq 75$ recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Coil resistance R at 20°C	3 ÷ 3.3 Ω for standard; 2 ÷ 2,2 Ω for option /6; 13 ÷ 13,4 Ω for option /18
Max solenoid current	2,6 A for standard 12 V_{DC} coil; 3,25 A for 6 V_{DC} coil; 1,5 A for 18 V_{DC} coil
Max power	40 Watt
Protection degree (CEI EN-60529)	IP65 for -A execution; IP67 for -AE and AES executions
Relative duty factor	Continuous rating (ED=100%)

7 GENERAL NOTES

LI*ZO 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.

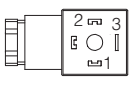
The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-982).

8 OPTIONS FOR -A EXECUTION

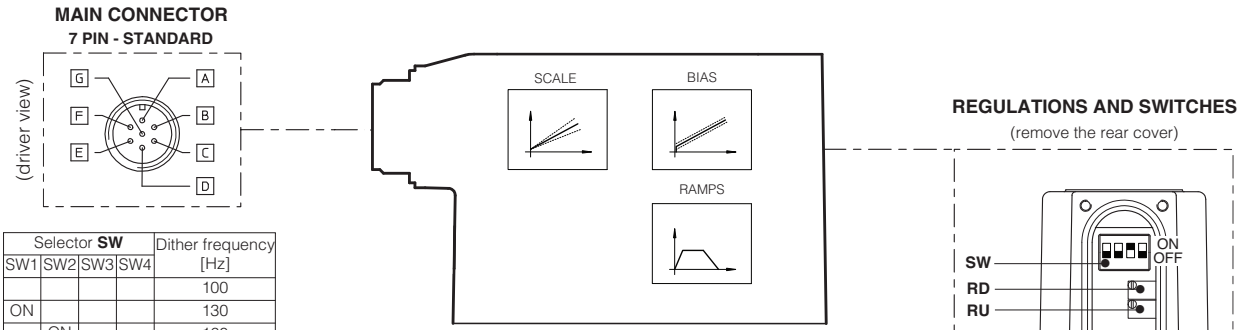
8.1 Option /6 optional coil to be used with Atos drivers with power supply 12 V_{DC}

8.2 Option /18 optional coil to be used with electronic drivers not supplied by Atos

9 CONNECTIONS FOR -A EXECUTION

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

11 ANALOG INTEGRAL DRIVERS -AE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



Selector **SW**				Dither frequency
SW1	SW2	SW3	SW4	[Hz]
				100
ON				130
	ON			160
		ON		**200 (Standard)**
ON		ON		230
	ON	ON		270
ON	ON	ON		300
ON	ON		ON	380
ON		ON	ON	430
	ON	ON	ON	470
ON	ON	ON	ON	500

The dither frequency is factory preset at 200 Hz and its regulation may be adjusted after contact with Atos technical department

B1: positive bias adjust
S1: positive scale adjust
RU: ramp for increasing reference signal
RD: ramp for decreasing reference signal
SW: dither frequency selector (see table beside)

11.1 7 PIN MAIN CONNECTORS

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 (1)	AGND	Ground - signal zero for MONITOR signal	Gnd - analog signal
	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (for /Q option)	Input - on/off signal
D	INPUT+	Reference analog differential input: 0÷+10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	INPUT -	Normal working range 0÷+10 VDC (4 ÷ 20 mA for /I option)	
F	MONITOR	Monitor analog output: 0÷+5 VDC maximum range; 1 V = 1 A	Output - analog signal
G	EARTH	Internally connected to the driver housing	

Note: (1) with /Q option ENABLE signal replaces AGND on pin C; MONITOR signal is reffered to pin B.
A minimum time of 60ms to 160ms 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 ANALOG INTEGRAL DRIVERS -AE - 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 0÷+10 VDC nominal range (pin D,E), proportional to desired coil current

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

10.1 Option /I

It provides the 4÷20 mA current reference signal instead of the standard 0÷+10 VDC. Monitor output signal is still the standard 0÷+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.

10.2 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.

10.3 Possible combined option: /IQ

12 DIGITAL INTEGRAL DRIVERS -AES - 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 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 0÷+10 VDC nominal range (pin D,E), proportional to desired coil current (4÷20 mA with cable break detection, ± 10 mA, ± 20 mA or 0÷20 mA software selectable

Monitor output signal - analog output signal proportional to the actual valve's coil current (1V monitor = 1A coil current)

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

12.1 Option /Q

To enable the driver, supply 24Vdc on pin C referred to pin B: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

12.2 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).

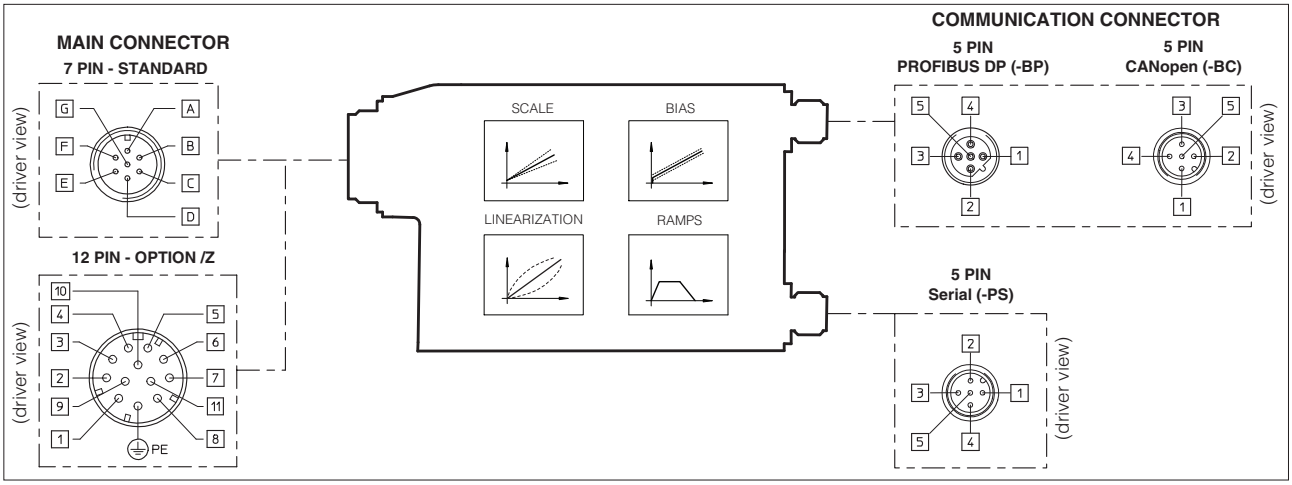
Enable Input Signal

To enable the driver, supply 24VDC on pin 3 referred to pin 2: when the enable signal is set to zero the valve status is software selectable, by factory default the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. For the complete list of selectable status, see tab. G115.

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.

13 DIGITAL INTEGRAL DRIVERS -AES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



13.1 7 & 12 PIN MAIN CONNECTORS

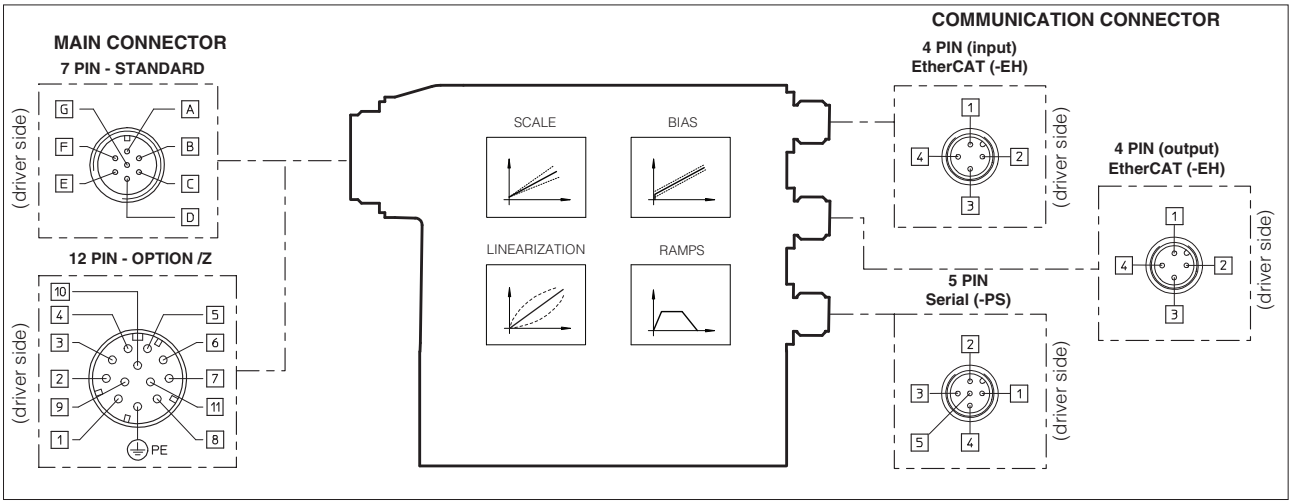
Standard 7pin	/Z option 12pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
A	1	V+	Power supply 24 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Input - power supply
B	2	V0	Power supply 0 VDC for solenoid power stage (and for driver logic on 7 pin connection)	Gnd - power supply
-	3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver	Input - on/off signal
D	4	INPUT+	Reference analog input: ±10 VDC / ± 20 mA maximum range software selectable Default setting 0÷+10 VDC 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: ±5 VDC maximum range; 1 V = 1 A	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	Power supply 0 VDC for driver logic	Gnd - power supply
-	11	FAULT	Fault (0 VDC) or normal working (24 VDC)	Output - on/off signal
G	PE	EARTH	Internally connected to the driver housing	

Note: A minimum time of 270 to 340 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.

13.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

14 DIGITAL INTEGRAL DRIVER -AES-EH - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



Note: for the electronic connections of 7 or 12 pin main connector, see section 13.1

14.1 4 & 5 PIN M12 COMMUNICATION CONNECTORS

Serial (-PS)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	NC	do not connect
2	NC	do not connect
3	RS_GND	Signal zero data line
4	RS_RX	Valves receiving data line
5	RS_TX	Valves transmitting data line

EtherCAT (-EH)		
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION**
1	TX+	Transmitter
2	RX+	Receiver
3	TX-	Transmitter
4	RX-	Receiver
Housing	Shield	Positioned on control cabinet side

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

VALVE VERSION	-A	-AE, -AES		-AES/Z	-Serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)	EtherCAT (-EH)
CONNECTOR CODE	666	ZH-7P	ZM-7P	ZH-12P	ZH-5P	ZH-5P/BP	ZM-4PM/EH
PROTECTION DEGREE	IP65	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	K500	G110, G115, K500			G115, K500		G116

connectors supplyed with the valve

16 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). Programming software E-SW-BC and E-SW-BP, for BC and BP drivers, can be also used to modify the valve's parameterization through the serial communication interface, without disconnecting the valve from the machine's bus line.

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.

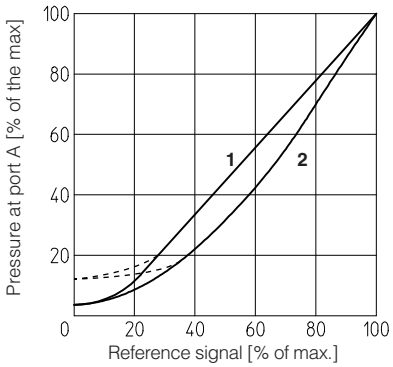
With the password you can also download, in your personal area, the latest releases of the Atos software, manuals, drivers and configuration files.

17 DIAGRAMS OF LICZO/LIMZO (based on mineral oil ISO VG 46 at 50 °C)

17.1 Regulation diagrams

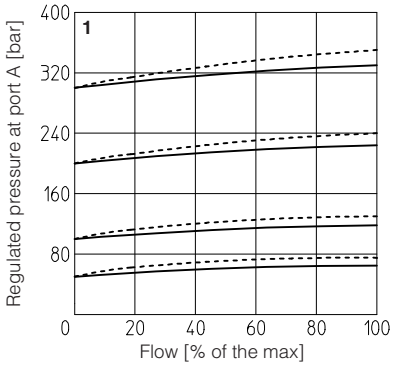
1 = LIMZO-A, LIMZO-AE, LIMZO-AES
2 = LICZO-A, LICZO-AE, LICZO-AES
- - - - - dotted line = /350

Note:
The presence of counter pressure at port T can affect the effective pressure regulation.



17.2 Pressure/flow diagrams

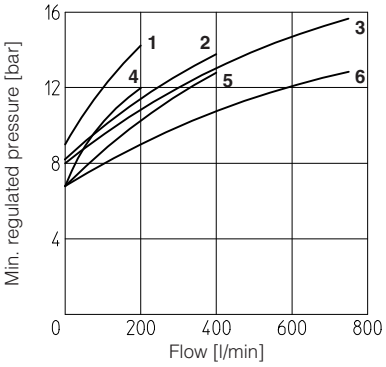
1 = LICZO-A, LICZO-AE, LICZO-AES
LIMZO-A, LIMZO-AE, LIMZO-AES

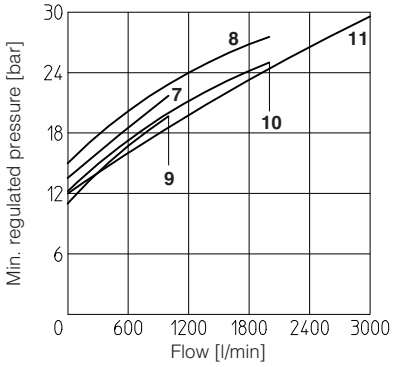


17.3 Min. pressure/flow diagrams
with reference signal "null"

1 = LIMZO-*-1
2 = LIMZO-*-2
3 = LIMZO-*-3
4 = LICZO-*-1
5 = LICZO-*-2
6 = LICZO-*-3
7 = LICZO-*-4
8 = LICZO-*-5
9 = LIMZO-*-4
10 = LIMZO-*-5
11 = LIMZO-*-6

Note: for LIMZO-*-8 consult our technical office





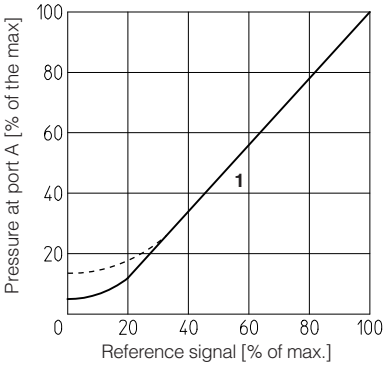
18 DIAGRAMS OF LIRZO (based on mineral oil ISO VG 46 at 50 °C)

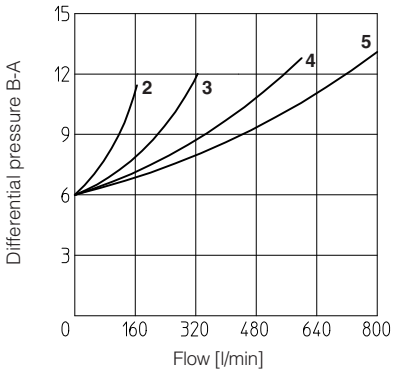
18.1 Regulation diagrams

1 = LIRZO-A, LIRZO-AE, LIRZO-AES

16.2 Min. pressure/flow diagrams
with reference signal "null"

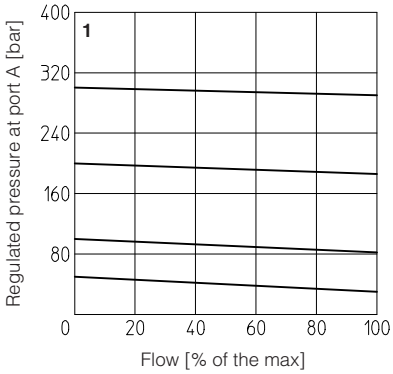
2 = LIRZO-*-1
3 = LIRZO-*-2
4 = LIRZO-*-3
5 = LIRZO-*-4
- - - - - dotted line = /350





18.3 Pressure/flow diagrams

1 = LIRZO-A, LIRZO-AE, LIRZO-AES

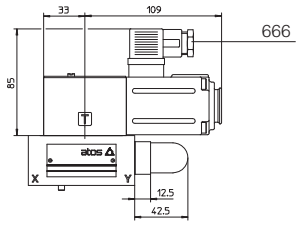


18.4 Dynamic response

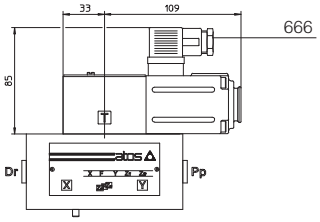
The response times in section 3 have to be considered as average values.
The pressure variation in consequence of a modification of the reference input signal to the valve is affected by the stiffness of the hydraulic circuit: greater is the stiffness of the circuit, faster is the dynamic response.

19 COVER DIMENSIONS of LI*ZO-A, AE and -AES [mm]

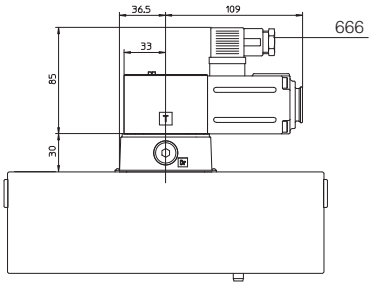
LI*ZO-A-1...3



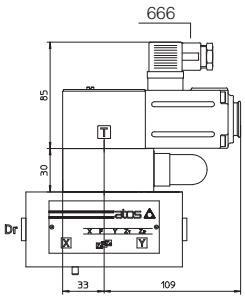
LI*ZO-A-4...6



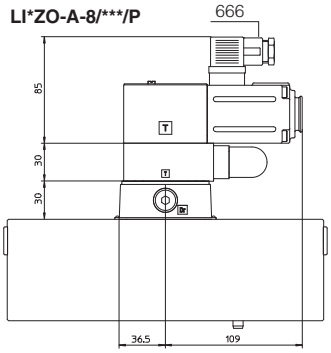
LI*ZO-A-8

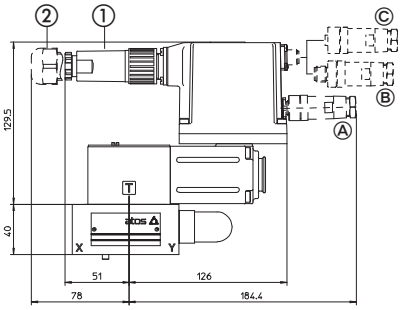


LI*ZO-A-4...6/*/P**

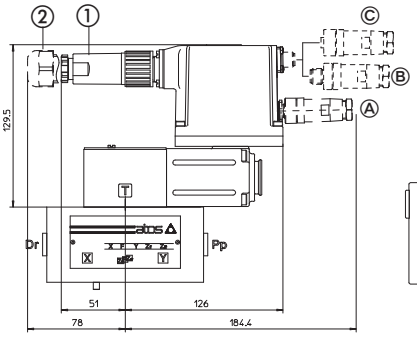


LI*ZO-A-8/*/P**

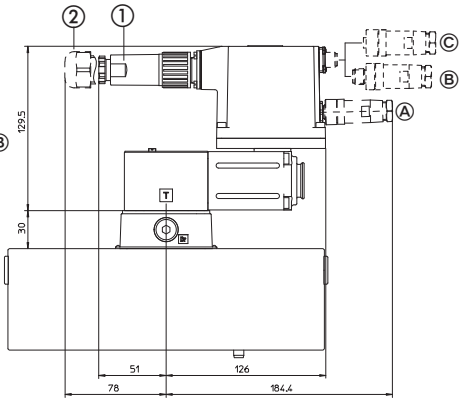




LI*ZO-AE-1...3
LI*ZO-AES-*-1...3 (dotted line)



LI*ZO-AE-4...6 **LI*ZO-AES-4...6** (dotted line)



LI*ZO-AE-8, **LI*ZO-AES-8** (dotted line)

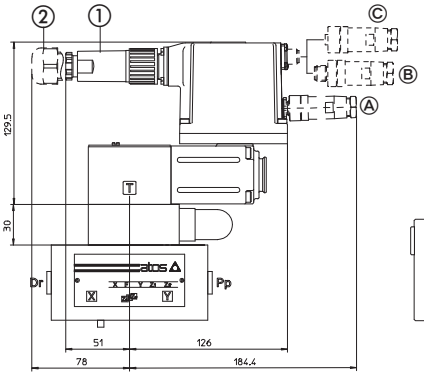
① ZH-7P or ZM-7P

② Dotted line = ZH-12P for option/Z

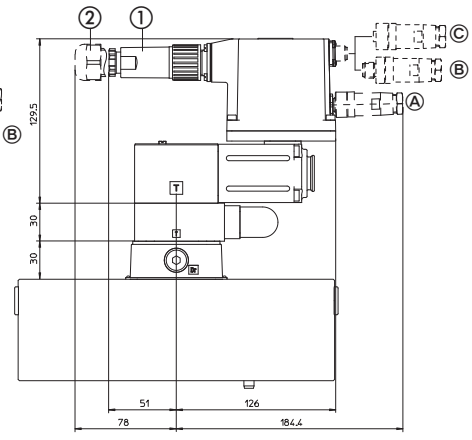
Ⓐ -PS communication interface
ZH-5P connector

Ⓑ -BP communication interface
ZH-5P/BP connector

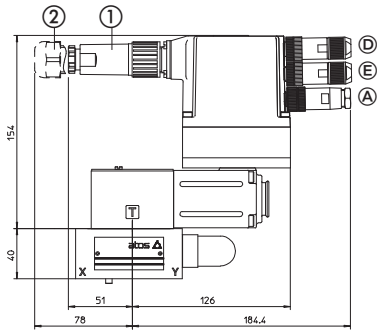
Ⓒ -BC communication interface
ZH-5P connector



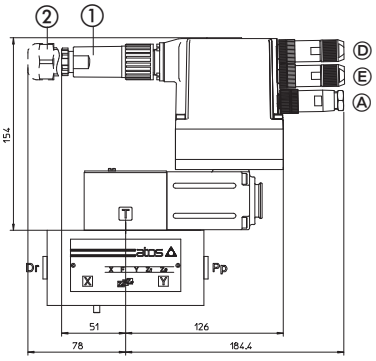
LI*ZO-AE-4...6/*/P**
LI*ZO-AES-4...6/*/P** (dotted line)



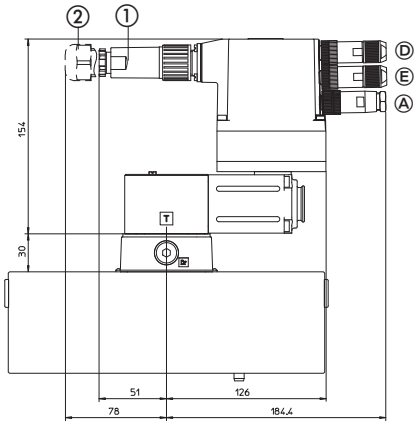
LI*ZO-AE-8/*/P** **LI*ZO-AES-8/***/P** (dotted line)



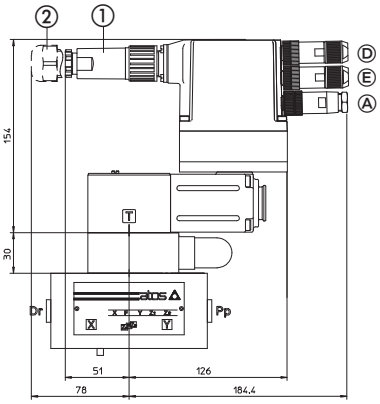
LI*ZO-AES-EH-1...3



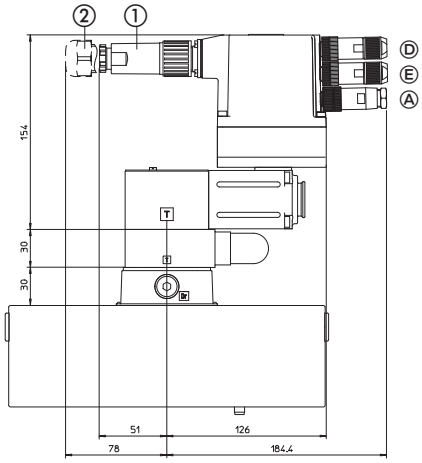
LI*ZO-AES-EH-4...6



LI*ZO-AES-EH-8



LI*ZO-AES-EH-4...6/*/P**



LI*ZO-AES-EH-8/*/P**

Ⓐ -PS communication interface, ZH-5P connector

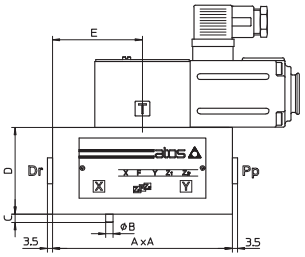
Ⓓ -EH communication interface (input), ZM-4PM/EH connector

Ⓔ -EH communication interface (output), ZM-4PM/EH connector

① = screw for air bleeding

② dotted line = 12 pin connector ZH-12P for option /Z

Sizes	A	Ø B	C	D	E	Port Pp-Dr	Seal	Fastening bolts class 12.9	Tightening torque Nm	Mass (Kg) -A	Mass (Kg) -AE, -AES
16	65(1)	3	4	40	45,25	-	2 OR 108	n° 4 M8x45	35	3,5	4,1
25	85	5	6	40	42,5	-	2 OR 108	n° 4 M12x45	125	4	4,6
32	100	5	6	50	50	-	2 OR 2043	n° 4 M16x55	300	5,3	5,9
40	125	5	6	60	62,5	G 1/4	2 OR 2050	n° 4 M20x70	600	8,9 (2)	9,5 (2)
50	140	6	4	70	70	G 1/4	2 OR 2050	n° 4 M20x80	600	12,4 (2)	13 (2)
63	180	6	4	80	90	G 3/8	2 OR2056	n° 4 M30x90	2100	21,6 (2)	22,2 (2)
80	Ø250	8	6	80	125	G 3/8	2 OR123	n° 8 M24x90	1000	33 (2)	33,6 (2)

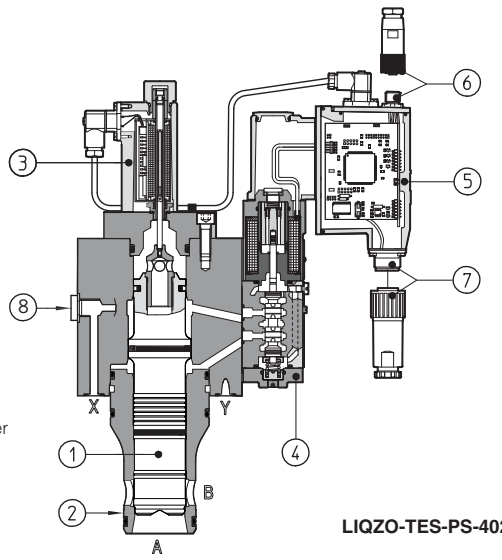


(1) Cover is not squared, dimensions 65x80

(2) For option /P the weight is increased by 1,4 Kg

Proportional throttle cartridges type LIQZO-T*, 2-way

with position transducer, ISO 7368 sizes from 16 to 50



① Poppet
② Sleeve
③ Main stage position transducer
④ Pilot valve
⑤ Integral electronics
⑥ Communication connector
⑦ Main connector
⑧ External pilot port

LIQZO-TES-PS-402L4

1 MODEL CODE

LIQZO - TES - PS - 25 2 L4 / * ** /*

Flow control valve

T = with position transducer
TE = as T plus integral analog electronics
TES = as T plus integral digital electronics

Communication interfaces (only for TES)
PS = Serial
BC = CANopen
BP = PROFIBUS DP

Valve size , see section 3
16 25 32 40 50

Valve configuration, see section 3
2 = 2 way

Spool type (regulating characteristics):
L4 = linear

Electronics options, for -TE execution
see section 6:
I = current reference input and monitor (4÷20 mA)
F = fault signal
Q = enable signal
Z = enable, fault and monitor signals (12 pin connector)

Electronics options, for -TES execution
see section 8:
I = current reference input and monitor (4÷20 mA)
Z = double power supply, enable fault and monitor signals (12 pin connector)

Series number

Synthetic fluids:
WG = water-glycol
PE = phosphate ester

Versions with reduced flow are available on request *2L2.

LIQZO-TE are 2-way proportional cartridge valves, designed for mounting in manifold blocks which provide proportional not 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 position transducer ③;
- -TE, -TES as -T plus analogue (TE) or digital (TES) integral electronics ⑤.

The regulation is operated by means of a poppet ① with double piloting area, sliding into a sleeve ② and provided of integral LVDT position transducer ③.
The poppet is controlled in closed loop by means of a proportional directional valve ④ type DHZO, see table F160.

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 option /Z.

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.

Typical applications: plastic injection and blow moulding, foundry and steel plants.
Mounting surface: ISO 7368
Sizes from 16 to 50
Max flow up to 2000 l/min with differential pressure Δp = 5 bar, see section 3.

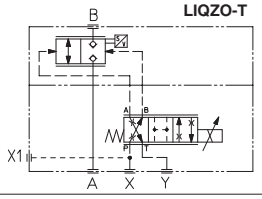
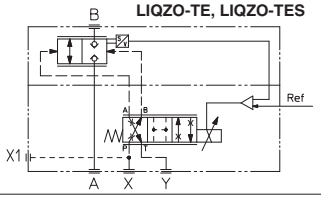
Max pressure = 350 bar.

2 ELECTRONIC DRIVERS

Valve model	-T	-TE	-TES
Drivers model	E-ME-T	E-RI-TE	E-RI-TES
Data sheet	G140	G200	G210

Note: For power supply and communication connector see section 15

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

Hydraulic symbols		LIQZO-T			LIQZO-TE, LIQZO-TES	
						
Model		LIQZO-T*				
Size		16	25	32	40	50
Max regulated flow	[l/min]					
at Δp = 5 bar		250	500	800	1200	2000
at Δp =10 bar		350	700	1100	1700	2800
Max permissible flow		600	1200	1800	2500	4000
Max pressure	[bar]	350				
Nominal flow of pilot valve at Δp = 70 bar	[l/min]	15				
Leakage of pilot valve at P = 100 bar	[l/min]	1				
Response time 0 ÷ 100% step signal	[ms]	22	25	30	32	40
Piloting volume	[cm³]	1,58	2,16	7,0	9,4	17,7
Hysteresis	[% of the max flow]	≤ 0,5%				
Repeatability	[% of the max flow]	± 0,5%				
Thermal drift		zero point displacement < 1% at ΔT = 40°C				

Notes:
- Above performance data refer to valves coupled with Atos electronic drivers, see section 2.
- Recommended piloting pressure is 140 ÷ 160 bar.
- In case of long time shutdown of the hydraulic supply to the pilot valve, the driver has to be switched off to avoid its overheating.

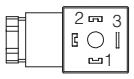
4 GENERAL NOTES

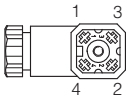
LIQZO-T* proportional valves are CE marked according to the applicable Directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive).

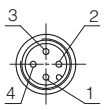
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the installation notes supplied with relevant components.

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 CONNECTIONS FOR -T EXECUTION

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

POSITION TRANSDUCER CONNECTOR SP-345		
SIZES 16 ÷ 40		
PIN	Signal description	
1	OUTPUT SIGNAL	
2	SUPPLY -15 VDC	
3	SUPPLY +15 VDC	
4	GND	

POSITION TRANSDUCER CONNECTOR ZBE 06		
SIZE 50		
PIN	Signal description	
1	OUTPUT SIGNAL	
2	SUPPLY +24 VDC	
3	GND	
4	NC	

6 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:

6.1 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

6.2 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.

6.3 Option /Q

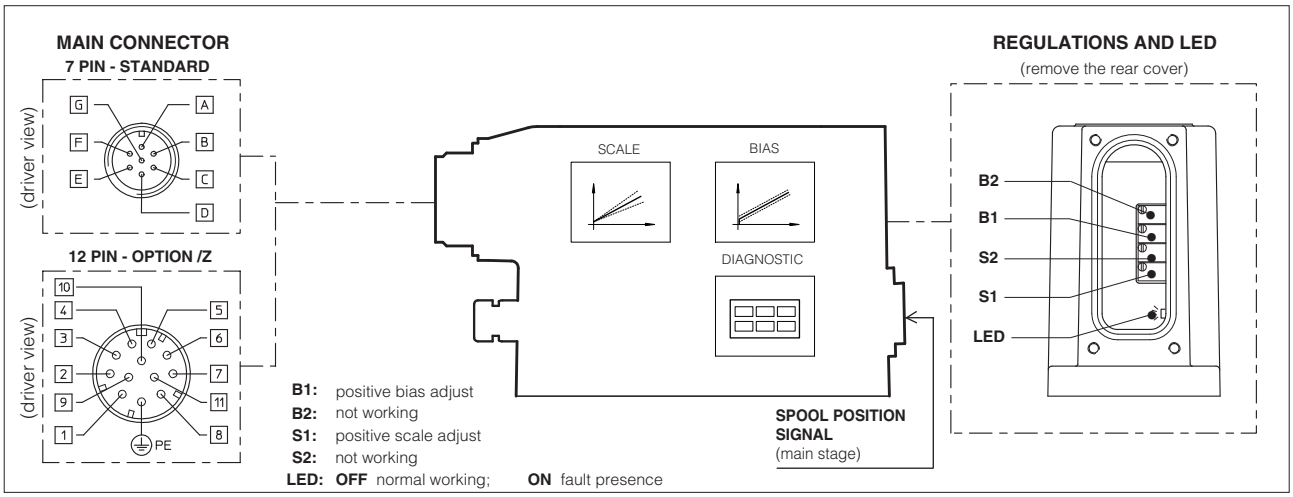
It provides the possibility to enable or disable the valve functioning without cutting the power supply (the valve functioning is disabled but the driver current output stage is still active). To enable the driver supply a 24VDC on the enable input signal.

6.4 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 output is forced to 0 VDC.

6.5 Possible combined options: /FI and /IZ

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



7.1 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)	Gnd - 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: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	5	INPUT -		
F (2)	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 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 reffered 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.

8 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 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 ±10VDC 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 to special application requirements:

8.1 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.

8.2 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

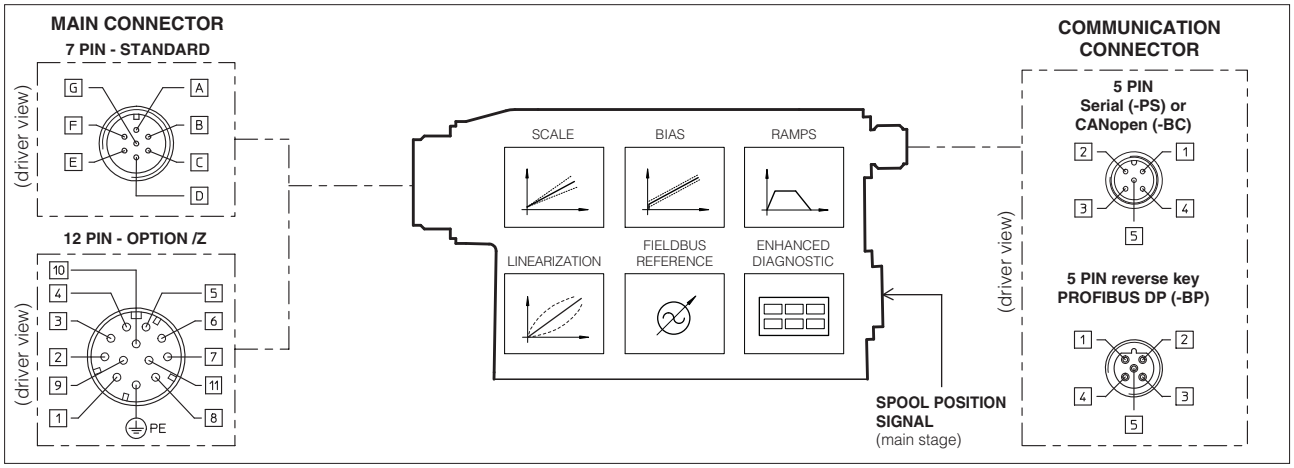
To enable the driver, supply 24VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active.

Fault Output Signal

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, reference signal cable broken for 4÷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

8.3 Possible combined options: /IZ

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



9.1 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: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	-	INPUT -	standard: differential input; /Z option: common mode INPUT+ referred to AGND	
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 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	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.

9.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

10 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.

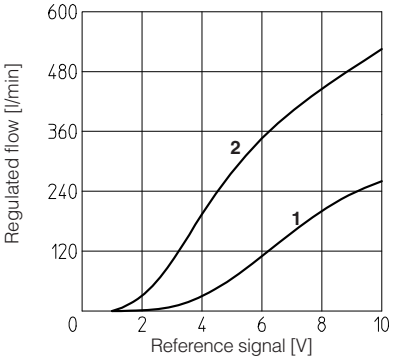
11 MAIN CHARACTERISTICS OF PROPORTIONAL THROTTLE CARTRIDGE VALVES

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 -T execution; -20°C ÷ +60°C for -TE and TES 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)
Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	35 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 (CEI EN-60529)	IP65 for -T execution; IP67 for -TE and TES executions
Duty factor	Continuous rating (ED=100%)

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

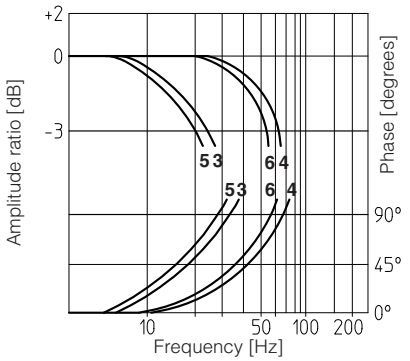
12.1 Regulation diagrams, see note

1 = LIQZO-T*-162L4
2 = LIQZO-T*-252L4



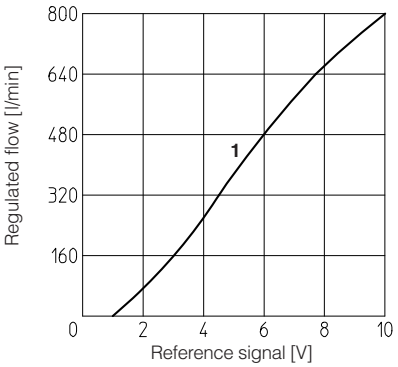
12.2 Bode diagrams
stated at nominal hydraulic conditions

3 = LIQZO-T*-162L4: 10% ÷ 90%
4 = LIQZO-T*-162L4: 50% ± 5%
5 = LIQZO-T*-252L4: 10% ÷ 90%
6 = LIQZO-T*-252L4: 50% ± 5%



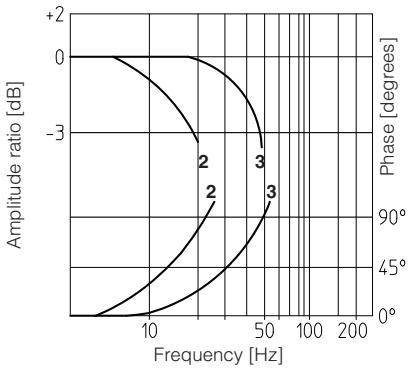
12.3 Regulation diagrams, see note

1 = LIQZO-T*-322L4



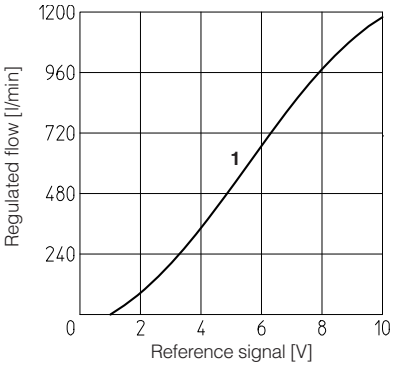
12.4 Bode diagrams
stated at nominal hydraulic conditions

2 = LIQZO-T*-322L4: 10% ÷ 90%
3 = LIQZO-T*-322L4: 50% ± 5%



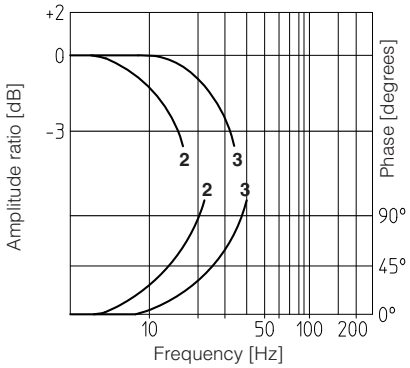
12.5 Regulation diagrams, see note

1 = LIQZO-T*-402L4



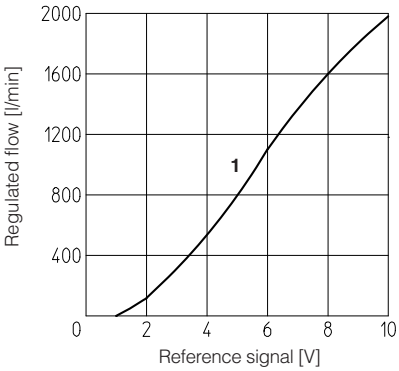
12.6 Bode diagrams
stated at nominal hydraulic conditions

2 = LIQZO-T*-402L4: 10% ÷ 90%
3 = LIQZO-T*-402L4: 50% ± 5%



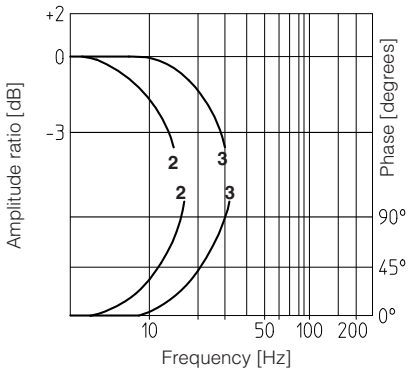
12.7 Regulation diagrams, see note

1 = LIQZO-T*-502L4



12.8 Bode diagrams
stated at nominal hydraulic conditions

2 = LIQZO-T*-502L4: 10% ÷ 90%
3 = LIQZO-T*-502L4: 50% ± 5%



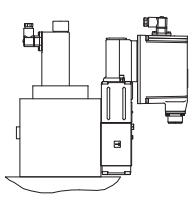
Note:
For the valves with digital electronics, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.

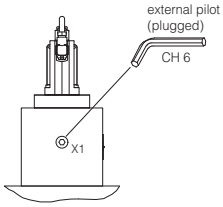
12.9 Dynamic response

The response times in section 3 and the frequency responses of the bode diagrams in sections 12.2, 12.4, 12.6, 12.8, 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.

13 ADDITIONAL EXTERNAL PILOT PORT CONNECTION

Sizes 16 - 50



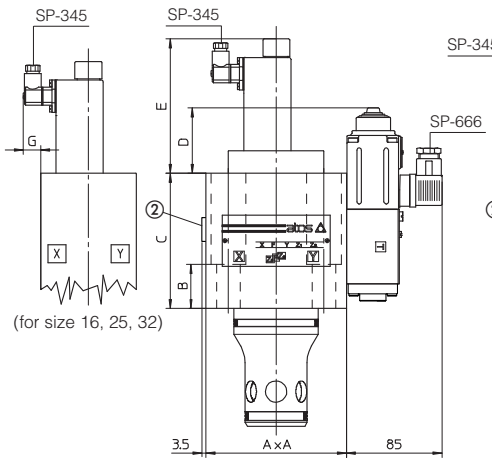


X1 = additional external pilot port connection G1/4"

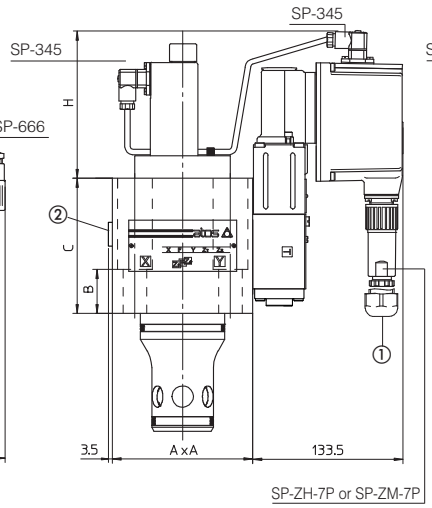
14 INSTALLATION DIMENSIONS [mm]

Size 16, 25, 32, 40

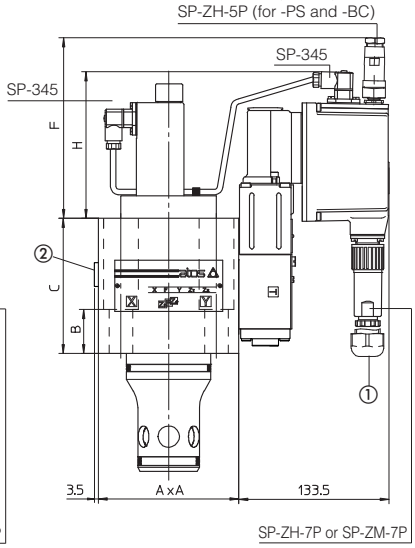
LIQZO-T



LIQZO-TE

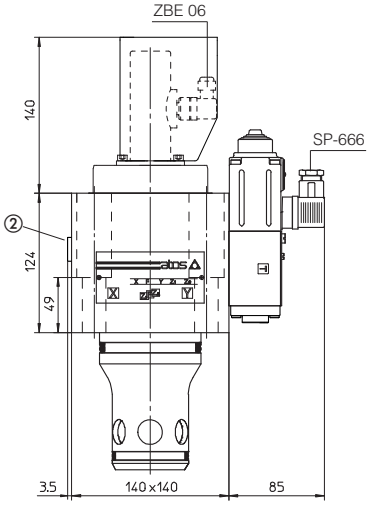


LIQZO-TES

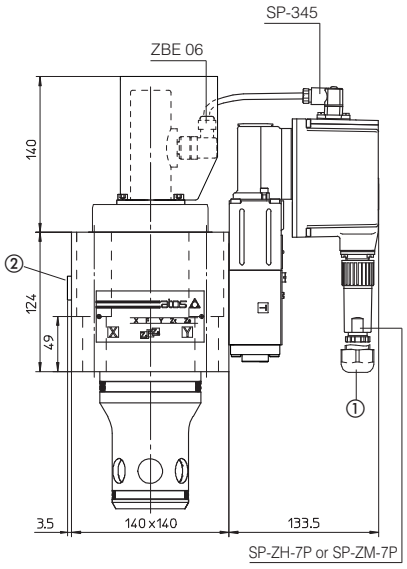


Size 50

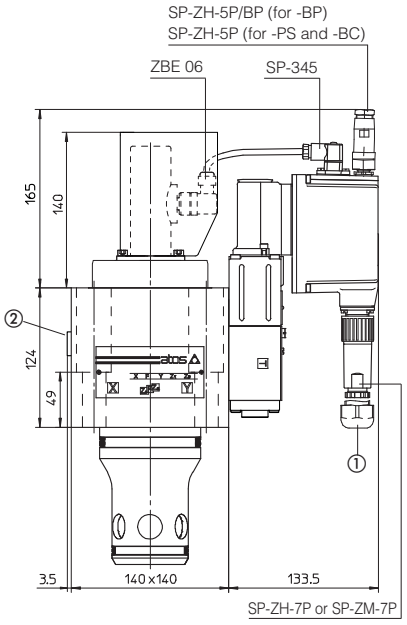
LIQZO-T



LIQZO-TE



LIQZO-TES



Size	A	B	C	D	E	F (TES)	G	H	Fastening bolts class 12.9	Tightening torque	Weight (Kg) T	Weight (Kg) TE-TES
16	65	75	98	80	100	178	25	150	N°4 M8x90	35 Nm	5,2	5,8
25	85	80	95	79	114	182	16	150	N°4 M12x100	125 Nm	7,5	8,1
32	100	30	105	72	121	171	7	145	N°4 M16x60	300 Nm	10,2	10,8
40	125	39	120	58	120	157	-	130	N°4 M20x70	600 Nm	16	16,6
50	see drawing						-	135	N°4 M20x80	600 Nm	23,2	23,8

-TE and -TES EXECUTION

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

-ALL EXECUTIONS

② External piloting X1 = G1/4

Mounting surface and cavity: ISO 7368
(see table P006)

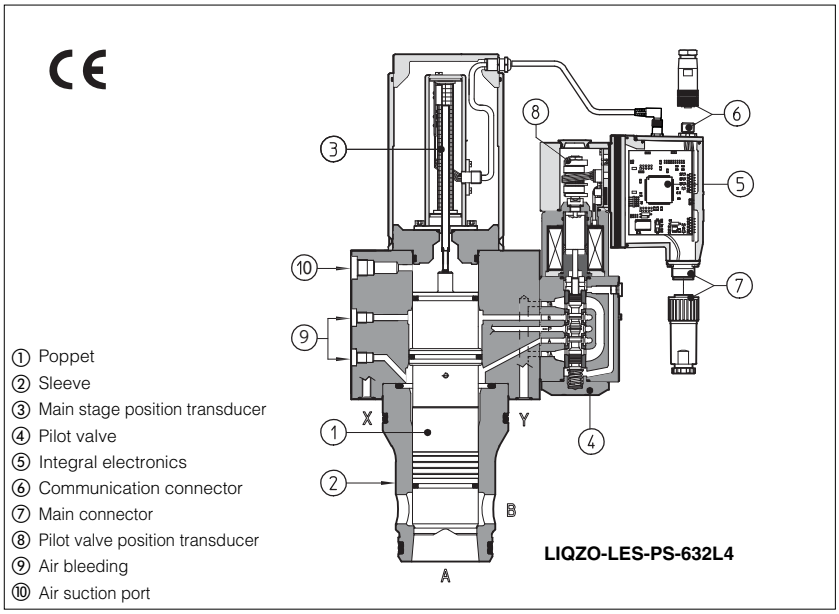
15 MODEL CODES OF POWER SUPPLY AND COMMUNICATION CONNECTORS (to be ordered separately)

VALVE VERSION	-T			-TE, -TES		-TE/Z -TES /Z	serial (-PS) or CANopen (-BC)	PROFIBUS DP (-BP)
	Power supply	Transducer						
CONNECTOR CODE	SP-666	SP-345	ZBE 06	SP-ZH-7P	SP-ZM-7P	SP-ZH-12P	SP-ZH-5P	SP-ZH-5P/BP
PROTECTION DEGREE	IP65	IP65	IP67	IP67	IP67	IP67	IP67	IP67
DATA SHEET	K500			G200, G210, K500			G210, K500	

connectors supplied with the valve

Proportional throttle cartridges type LIQZO-L*, 2-way

high dynamics, with two position transducers, ISO 7368 sizes from 16 to 100



1 MODEL CODE

LIQZO - LES - PS - 25 2 L4 / * ** /*

Flow control valve

L = with two integral position transducers
LE = as L plus integral electronics
LES = as L plus integral digital electronics

Communication interfaces (only for LES)
PS = Serial
BC = CANopen
BP = PROFIBUS DP

Valve size , see section [3]

16	**25**	**32**	**40**
50	**63**	**80**	**100**

Valve configuration, see section [3]
2 = 2 way

Spool type (regulating characteristics):
L4 = linear

Electronic options for -LE execution see section [6]:
F = fault signal
I = current reference input and monitor (4÷20 mA)
Q = enable signal
Z = enable, fault and monitor signal (12 pin connector)

Electronic options for -LES execution see section [8]:
I = current reference input and monitor (4÷20 mA)
Z = double power supply, enable, fault and monitor signals (12 pin connector)

Series number

Synthetic fluids:
WG = water-glycol
PE = phosphate ester

LIQZO-L* are 2-way proportional cartridge valves, with double position transducer designed for mounting in mainfold blocks which provide proportional non compensated flow control according to 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:
- -L, with two integral position transducers ③, ⑧;
- -LE, -LES as -L plus analogue (LE) or digital (LES) integral electronics ⑤.

The regulation is operated by means of a poppet ① with double piloting area sliding into a sleeve ② and provided of integral LVDT position transducer ③.

The spool is operated by means of a high performances proportional directional valve in “rugged” executions to withstand high vibrations and mechanical stresses (type DLHZO for cartridge dimensions up to size 50 and type DLKZOR for cartridge dimensions up to size 100) - see tab. F180, provided of high precision sleeve and LVDT position transducer ③ for maximum regulating accuracy and dynamic response. It is controlled in double closed loop position by means of the LVDT position transducers ③ and ⑧.

The integral electronics ⑤ ensures factory presetting, fine functionality plus valve-to-valve interchangeability and simplified wiring and installation.
Standard 7 pin main connector is used for power supply, analog input reference and monitor signals.
12 pin connector is used for options /Z.

Following communication interfaces ⑥ are available for the digital -LES execution:
- -PS, Serial communication interface. The valve reference signal is provided with analogue commands
- -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.

Typical applications: plastic injection and blow moulding, ceramics, punching & nibbling machines, die-casting, foundry and sheet machinery;

Mounting surface: ISO 7368

Sizes from 16 to 100;

Max flow up to 7200 l/min with differential pressure Δp = 5 bar, see section [2];

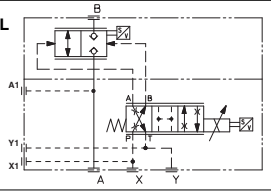
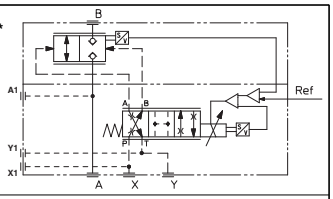
Max pressure = 350 bar.

2 ELECTRONIC DRIVERS

Valve model	-L	-LE	-LES
Drivers model	E-ME-L	E-RI-LE	E-RI-LES
Data sheet	G150	G200	G210

Note: For power supply and communication connector see section [15]

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

Hydraulic symbols	LIQZO-L 				LIQZO-LE* 			
Model	LIQZO-L*							
Size	16	25	32	40	50	63	80	100
Max regulated flow [l/min] at Δp = 5 bar at Δp =10 bar Max permissible flow	 250 350 600	 500 700 1200	 800 1100 1800	 1200 1700 2500	 2000 2800 4000	 3000 4250 6000	 4500 6350 10000	 7200 10200 16000
Max pressure [bar]	350							
Nominal flow of pilot valve at Δp = 70 bar [l/min]	4	7	14	40	40	100	100	100
Leakage of pilot valve at P = 100 bar [l/min]	0,2	0,2	0,3	0,7	0,7	1	1	1
Response time 0 ÷ 100% step signal [ms]	13	14	15	18	20	24	30	50
Pilot volume [cm³]	1,6	2.2	7,0	9,4	17.7	32,5	39,5	59,4
Hysteresis [% of the max flow]	≤ 0,1%							
Repeatability [% of the max flow]	± 0,1%							
Thermal drift	zero point displacement < 1% at ΔT = 40°C							

Note:
Above performance data refer to valves coupled with Atos electronic drivers, see section 2.
- Recommended piloting pressure is 140 ÷ 160 bar.
- In case of long time shutdown of the hydraulic supply to the pilot valve, the driver has to be switched off to avoid its overheating.

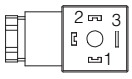
4 GENERAL NOTES

LIQZO-L* proportional cartridges 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 CONNECTIONS FOR -L EXECUTION

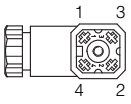
SOLENOID POWER SUPPLY CONNECTOR

PIN	Signal description
1	SUPPLY
2	SUPPLY
3	GND



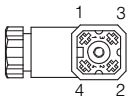
PILOT VALVE POSITION TRANSDUCER CONNECTOR

PIN	Signal description
1	OUTPUT SIGNAL
2	SUPPLY -15 VDC
3	SUPPLY +15 VDC
4	GND



MAIN STAGE POSITION TRANSDUCER CONNECTOR

SIZES 16 ÷ 40		SIZE 50 ÷ 100	
PIN	Signal description	PIN	Signal description
1	OUTPUT SIGNAL	**1**	OUTPUT SIGNAL
2	SUPPLY -15 VDC	**2**	NOT CONNECTED
3	SUPPLY +15 VDC	**3**	SUPPLY +24 VDC
4	GND	**4**	GND



6 ANALOG INTEGRAL DRIVERS -LE - 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:

6.1 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.

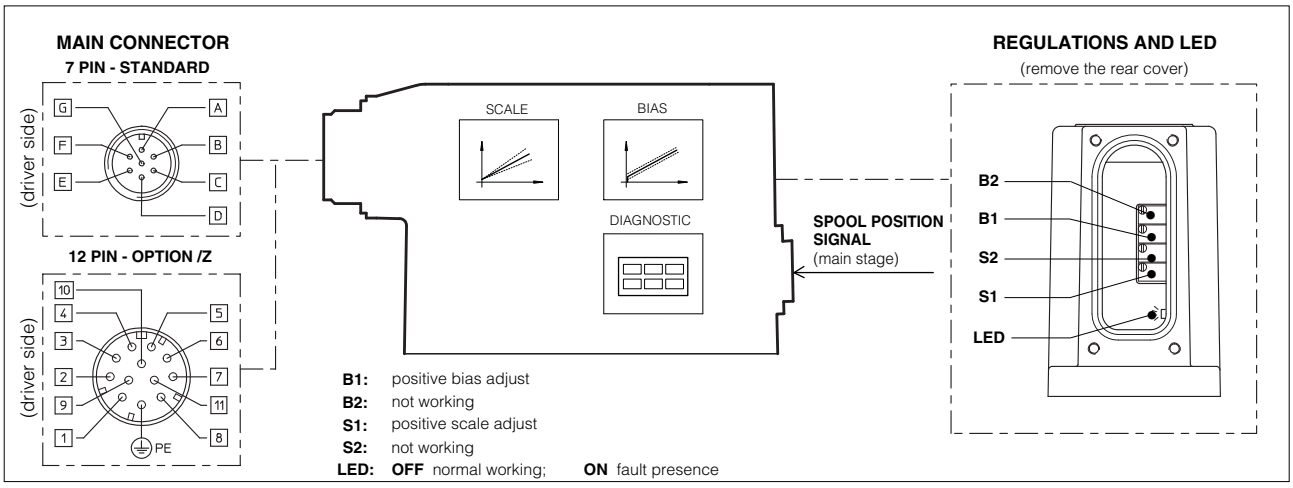
6.2 Option /I
It provides the 4÷20 mA current reference and monitor signals instead of the standard ±10 VDC
It is normally used in case of long distance between the machine control unit and the valve or where the reference signal can be affected by electrical noise; the valve functioning is disabled in case of reference signal cable breakage.

6.3 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.

6.4 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 output is forced to 0 VDC.

6.5 Possible combined options: /FI and /IZ

7 ANALOG INTEGRAL DRIVERS -LE - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



7.1 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)	Gnd - 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: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	5	INPUT -		
F (2)	6	MONITOR	Monitor analog output: ±10 VDC maximum range (4 ÷ 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 reffered 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.

8 DIGITAL INTEGRAL DRIVERS -LES - 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 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 ±10VDC 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 to special application requirements:

8.1 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.

8.2 Option /Z

It provides on a 12 pin main connector the above standard features plus:

Logic power supply

Option /Z provides separate 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

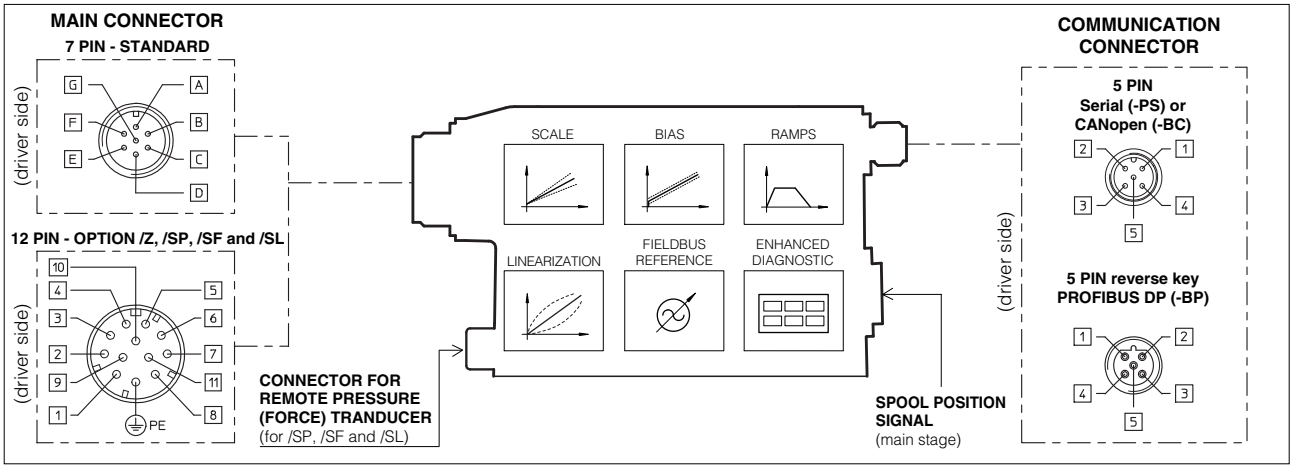
To enable the driver supply a 24VDC on pin 3 referred to pin 2: when the Enable signal is set to zero the valve functioning is disabled (zero current to the solenoid) but the driver current output stage is still active. This condition does not comply with European Norms EN13849-1 (ex EN954-1).

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

8.3 Possible combined options: /IZ

9 DIGITAL INTEGRAL DRIVERS -LES - MAIN FUNCTIONS AND ELECTRONIC CONNECTIONS



9.1 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: 0 ÷ +10 VDC maximum range (4 ÷ 20 mA for /I option)	Input - analog signal
E	-	INPUT -	standard: differential input; /Z option: common mode INPUT+ referred to AGND	
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 ÷ 20 mA for /I option)	Output - analog signal
-	7	NC	do not connect	
-	8	NC	do not connect	
-	9	VL+	Power supply 24 VDC for driver logic	Input - power supply
-	10	VL0	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.

9.2 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION CONNECTORS

	-PS Serial		-BC CANopen		-BP PROFIBUS DP	
PIN	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	

10 SOFTWARE TOOLS

The functional parameters of digital valves, as the bias, scale ramp and linearization of the regulation characteristic, can be easily set and optimized with the Atos E-SW programming software, available in three different versions according to the driver's communication interfacing: E-SW-PS (Serial), E-SW-BC (CANopen) and E-SW-BP (PROFIBUS DP).
A proper connection is required between the PC and the electronic driver communication port: for a more detailed description of software interface, PC requirements, adapters, cables and terminators, please **see table G500.**
Proportional valves with fieldbus communication interface (-BC and -BP) can be directly managed by the machine control unit; it is required to implement in the machine control the standard communication as described in the user manuals supplied with the relevant programming software. For detailed description of available fieldbus feature, **see table G510.**
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.

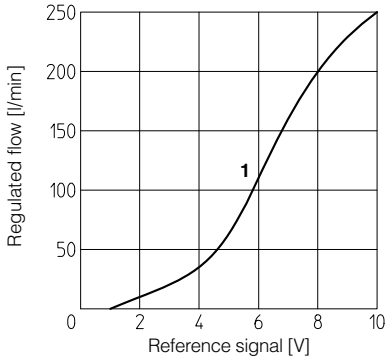
11 MAIN CHARACTERISTICS OF PROPORTIONAL DIRECTIONAL VALVES

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 -L execution; -20°C ÷ +60°C for -LE and LES 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)
Coil resistance R at 20°C	3 ÷ 3,3 Ω
Max. solenoid current	2,6 A
Max. power	35 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 (CEI EN-60529)	IP65 for -L execution; IP65÷67 for -LE and -LES executions, depending to the connector type (see sect. 15)
Duty factor	Continuous rating (ED=100%)

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

12.1 Regulation diagrams

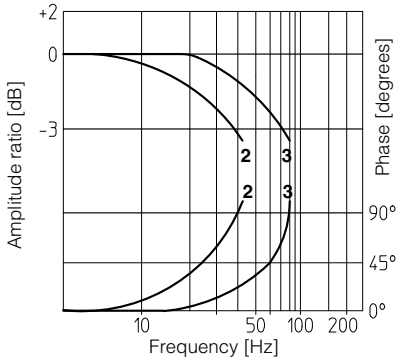
1 = LIQZO-L*-16*



12.2 Bode diagrams

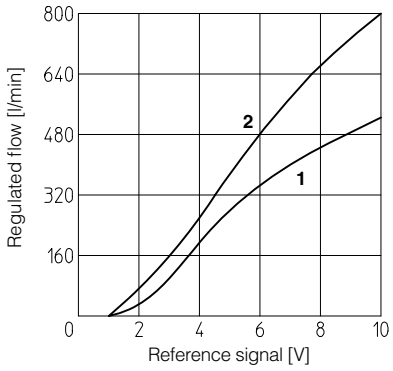
stated at nominal hydraulic conditions

2 = LIQZO-L*-16*: 10% ↔ 90%
3 = LIQZO-L*-16*: 50% ± 5%



12.3 Regulation diagrams

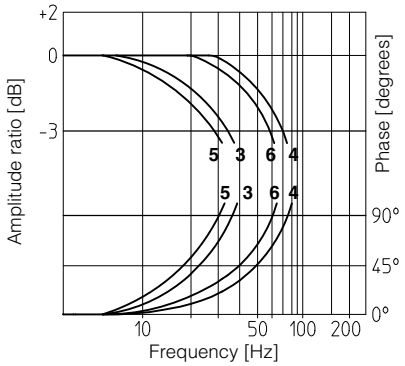
1 = LIQZO-L*-25*
2 = LIQZO-L*-32*



12.4 Bode diagrams

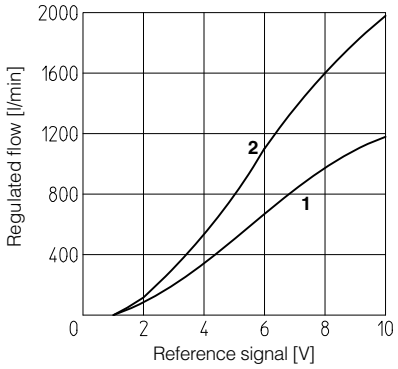
stated at nominal hydraulic conditions

3 = LIQZO-L*-25*: 10% ↔ 90%
4 = LIQZO-L*-25*: 50% ± 5%
5 = LIQZO-L*-32*: 10% ↔ 90%
6 = LIQZO-L*-32*: 50% ± 5%



12.5 Regulation diagrams

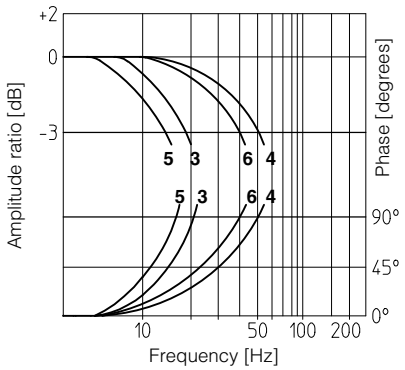
1 = LIQZO-L*-40*
2 = LIQZO-L*-50*



12.6 Bode diagrams

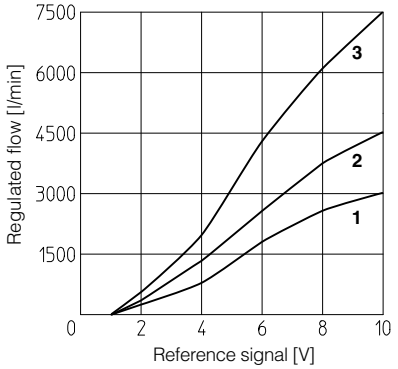
stated at nominal hydraulic conditions

3 = LIQZO-L*-40*: 10% ↔ 90%
4 = LIQZO-L*-40*: 50% ± 5%
5 = LIQZO-L*-50*: 10% ↔ 90%
6 = LIQZO-L*-50*: 50% ± 5%



12.7 Regulation diagrams

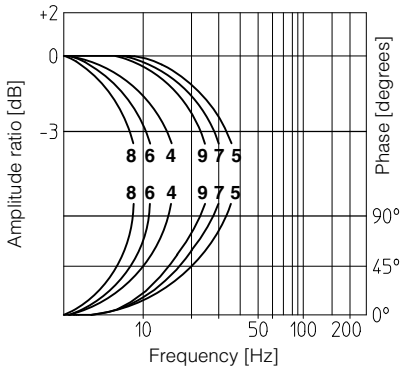
1 = LIQZO-L*-63*
2 = LIQZO-L*-80*
3 = LIQZO-L*-100*



12.8 Bode diagrams

stated at nominal hydraulic conditions

4 = LIQZO-L*-63*: 10% ↔ 90%
5 = LIQZO-L*-63*: 50% ± 5%
6 = LIQZO-L*-80*: 10% ↔ 90%
7 = LIQZO-L*-80*: 50% ± 5%
8 = LIQZO-L*-100*: 10% ↔ 90%
9 = LIQZO-L*-100*: 50% ± 5%



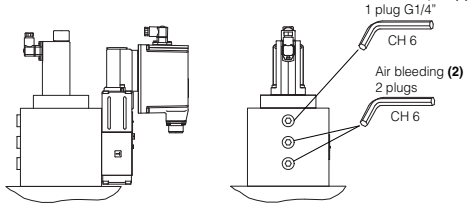
Note:
For the valves with digital electronics, the regulation characteristic can be modified by setting the internal software parameters, see tab. G500.

12.9 Dynamic response

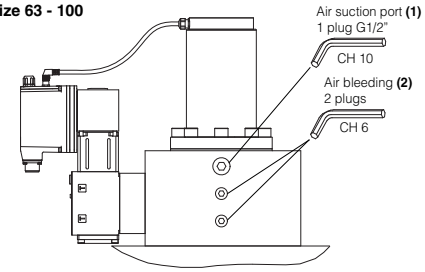
The response times in section 2 and the frequency responses of the bode diagrams in section 12.2, 12.4, 12.6, 12.8, have to be considered as average values. For the valves with digital electronics the dynamics performances can be optimized by setting the internal software parameters.

13 AIR BLEEDING

Sizes 16 - 50



Size 63 - 100



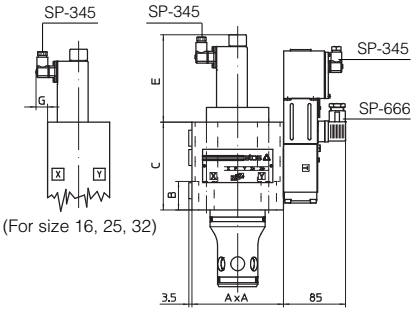
(1) To be used only in case port A is connected to tank and subjected to negative pressure, consult our technical office.

(2) At the machine commissioning it is advisable to bleed the air from piloting chambers, by loosening the 2 plugs shown in the picture.
Operate the valve for few seconds at low pressure and then lock the plugs.

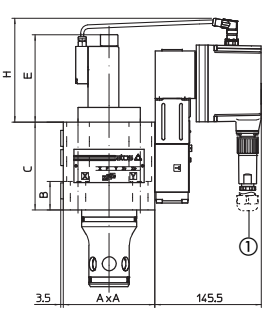
14 INSTALLATION DIMENSIONS [mm]

Size 16, 25, 32 and 40

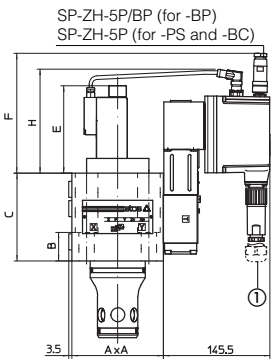
LIQZO-L



LIQZO-LE

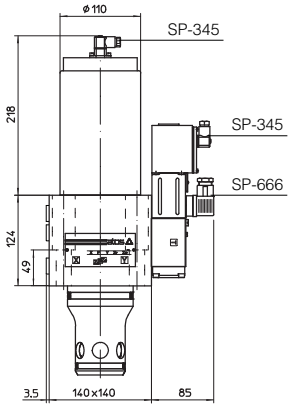


LIQZO-LES

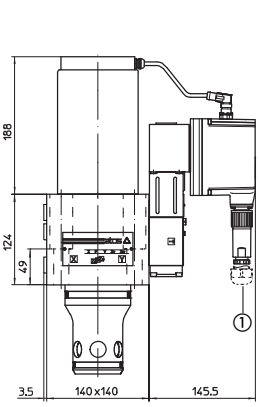


Size 50

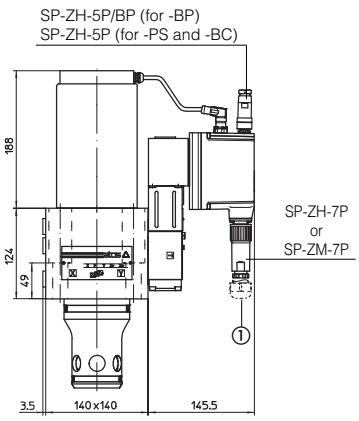
LIQZO-L



LIQZO-LE

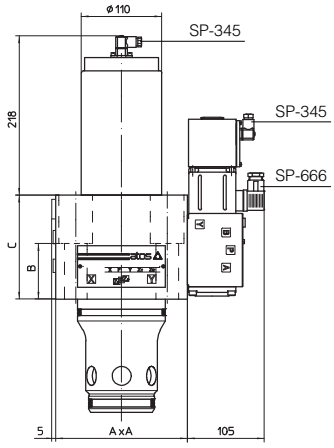


LIQZO-LES

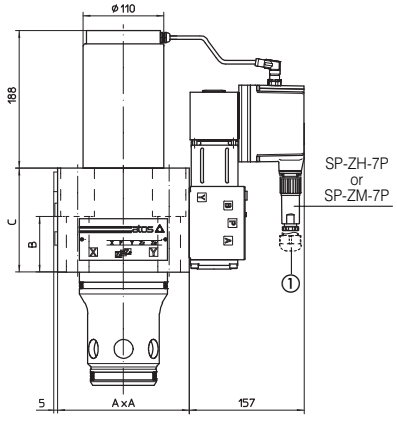


Size 63, 80 and 100

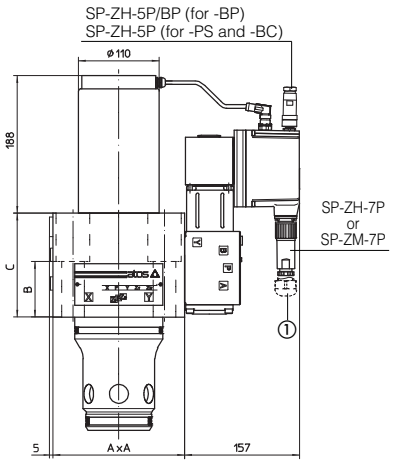
LIQZO-L



LIQZO-LE



LIQZO-LES



Size	A	B	C	D	E	F	G	H	Fastening bolts class 12.9	Tightening torque	Weight (Kg) L	Weight (Kg) LE-LES
16	65	75	98	-	99,5	152	25	158	N°4 M8x90	35 Nm	5,6	6,2
25	85	80	95	241	128	159	16	160	N°4 M12x100	25 Nm	8,2	8,8
32	100	30	105	226	135	166	7	150	N°4 M16x60	300 Nm	10,9	11,2
40	125	39	120	241	148	178	-	135	N°4 M20x70	600 Nm	16,7	17,3
50	see drawing						-	-	N°4 M20x80	600 Nm	23,9	24,6
63	180	76	142	-	-	-	-	-	N°4 M30x120	2100 Nm	44	44,6
80	Ø 250	55	165	-	-	-	-	-	N°8 M24x80	1000 Nm	71,6	72,2
100	Ø 300	70	195	-	-	-	-	-	N°8 M30x120	2100 Nm	122,5	123,1

-LE* EXECUTION

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

Mounting surface and cavity: ISO 7368
(see table P006)

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

VALVE VERSION	-L		-LE, -LES		-LE/Z -LES /Z	LES -PS, -BC	LES -BP
	Power supply	Transducer					
CONNECTOR CODE	SP-666	SP-345	SP-ZH-7P	SP-ZM-7P	SP-ZH-12P	SP-ZH-5P	SP-ZH-5P/BP
PROTECTION DEGREE	IP65	IP65	IP67	IP67	IP65	IP67	IP67
DATA SHEET	K500		G200, G210, K500			G210, K500	

connectors supplied with the valve

Dział Handlowy i Produkcja
Bielsko-Biała, ul. Strażacka 60

hydro@hydro.com.pl

Sekretariat Spółki	tel. +48 33 829 56 60	fax. +48 33 829 56 69
Marketing:		
• produkcja zasilaczy, układów hydraulicznych	tel. +48 33 829 56 74	
• elektrozawory, chłodnice, zawory nabojowe, bloki zaworowe	**tel. +48 33 829 56 63**	**tel. +48 33 829 56 79**
• produkcja cylindrów	tel. +48 33 829 56 65	
• elementy cylindrów: rury, tłoczyska, dławnice, tłoki, końcówki	tel. +48 33 829 56 62	tel. +48 33 829 56 72
Dział Konstrukcyjny	tel. +48 33 829 56 65	
Sprzedaż:		
• komponenty (elektrozawory, chłodnice, zawory nabojowe, bloki zaworowe, dławnice, tłoki)	tel. +48 33 829 56 78	
• cylindry, zasilacze, agregaty filtracyjne	tel. +48 33 829 56 68	
• rury i tłoczyska *	tel. +48 33 829 56 67	tel. +48 33 829 56 97

*ul. Strażacka 41

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Bielsko-Biała, ul. Strażacka 41

biuro@hydro.com.pl

Sekretariat Oddziału	tel. +48 33 829 56 87	fax. +48 33 815 88 68
Marketing:		
• dostawy do klientów OEM	tel. +48 33 829 56 80,	tel. +48 33 829 87 34
• produkcja przewodów hydr., węże i końcówki	tel. +48 33 829 56 95	
• filtracja, pompy zębate, rozdzielacze, elementy zasilaczy	tel. +48 33 829 56 84	
• pompy zębate, rozdzielacze, zawory, dzielniki strumienia*	tel. +48 33 829 87 36	
• urządzenia do produkcji przewodów hydr.	tel. +48 33 829 56 85	
• uszczelnienia do cylindrów*	tel. +48 33 829 87 30	
• eksport	tel. +48 33 829 56 98	tel. +48 33 829 56 99
	export@hydro.com.pl	
Sprzedaż:		
• filtry, elementy zasilaczy*	tel. +48 33 829 87 38	
• elementy złączne, złącza pomiarowe, zawory*	tel. +48 33 829 87 33	
• uszczelnienia, manometry*	tel. +48 33 829 87 40	
• szybkozłącza, przewody hydr*	tel. +48 33 829 56 94	
• eksport*	tel. +48 33 829 87 32	
Spedycja Oddziału Handlowego*	tel. +48 33 829 56 93	

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