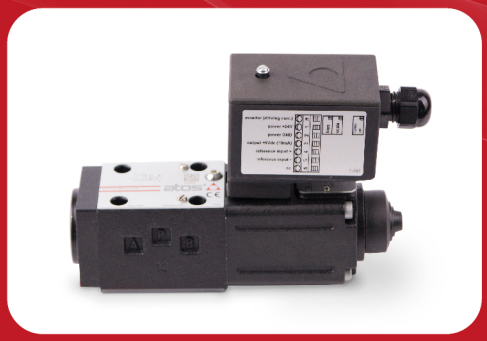
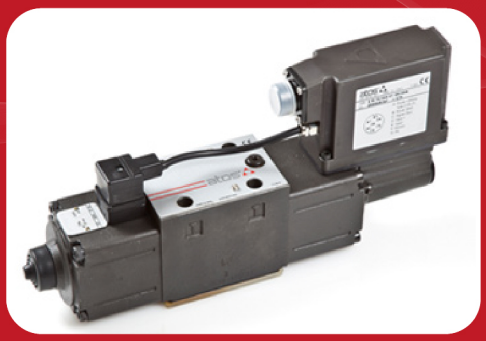
HYDRO

www.hydro.com.pl

Hydraulika proporcjonalna

Proportional electrohydraulics





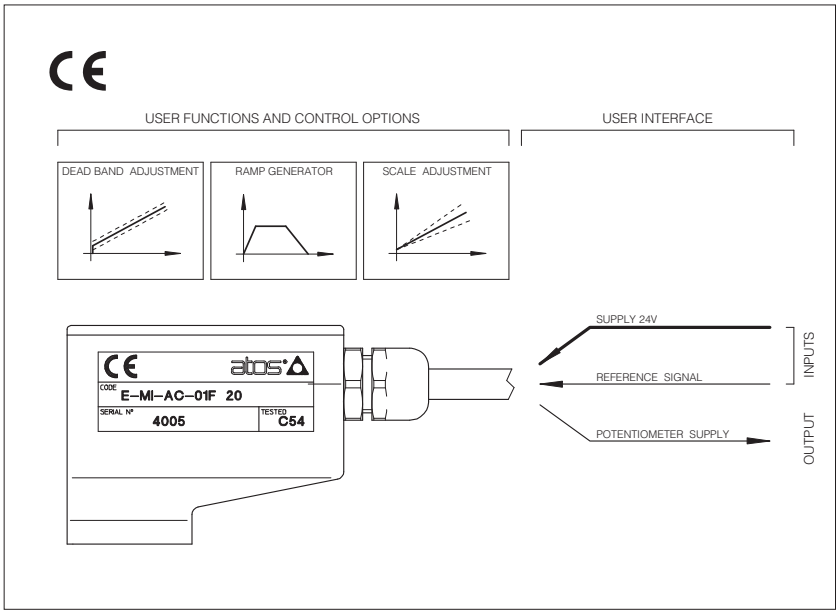
atos®

część 3

2014

Electronic drivers type E-MI-AC

analog, DIN 43650 plug-in format, for proportional valves without transducer



E-MI-AC drivers control the current to the solenoid of Atos proportional valves without pressure or position transducer, regulating the spool position, the flow or the pressure according to the electronic reference signal.

Features:

- bias and scale regulations by potentiometers;
- symmetrical (standard) or dissymmetrical (/RR option) rising and falling ramp generator;
- factory pre-setted
- alluminium box with IP65 protection degree
- electronic filters on input and output lines;
- CE marking grating the conformity to the EMC Directive (Electromagnetic compatibility).

Applications:

Pressure, flow, position open or closed-loop systems, according to the block diagram 2.

1 MODEL CODE

E-MI – AC – 01F – ** /*

E-MI = electronic driver plug format as per DIN 43650

AC = for proportional valve without transducer

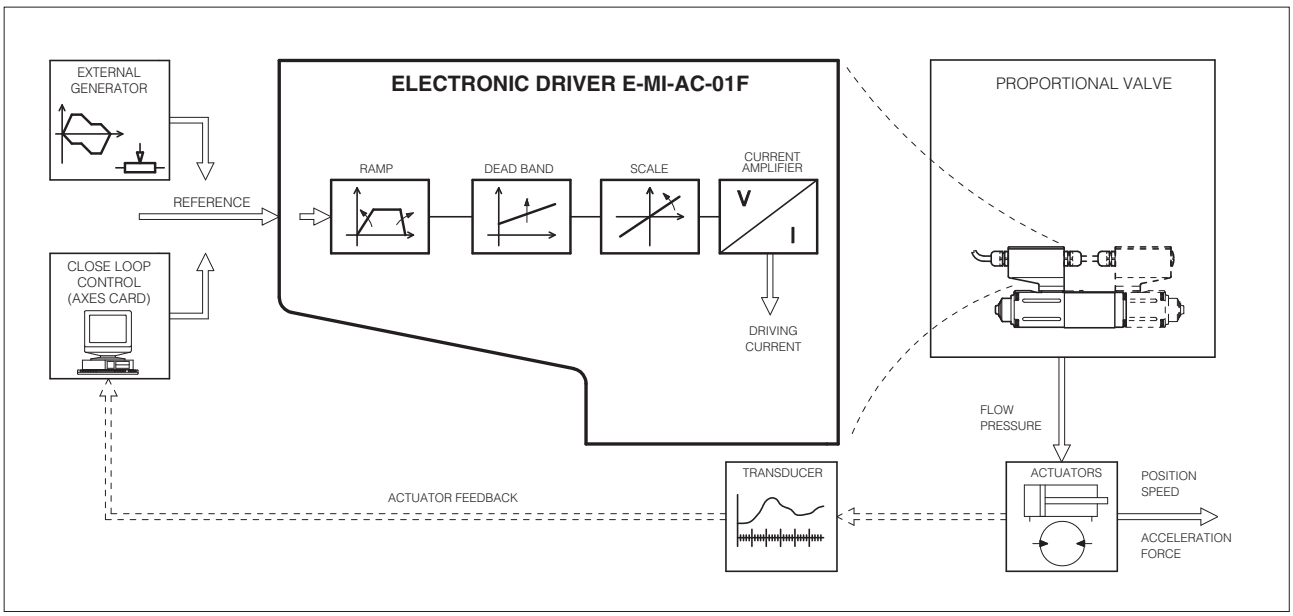
01F = for single solenoid proportional valve

Options:
- standard symmetrical ramps
/RR = adjustable dissimmetrical ramps, adjustable dither, suitable also for current signal 0÷20 mA
/7 = pre arranged for double solenoid valves control

Series number

set code (see 4.4)

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-MI-AC-01F ELECTRONIC DRIVERS

Power supply (positive on contact 1) (negative on contact 2)	Nominal : $24V_{DC}$ Rectified and filtered: : V_{RMS} = 21 ÷ 33 (ripple max peak to peak = ± 10%) : 12 V_{DC} (see note 4.1)
Max. power consumption	40 W
Current supplied to solenoid	Imax= 2,7A type PWM square wave (with solenoid type ZO(R)-A with resistance 3,2 Ω)
Nominal reference signal (factory pre-set)	0÷10 V_{DC}
Reference signal variation range (scale adjustment)	0 ÷ 10V (0 ÷5 Vmin) – (0÷20 mA for current signal)
Input signal impedence	Voltage signal Ri > 50 KOhm – (Ri = 250 Ω for current signal)
Potentiometers supply	+5V / 10 mA at contact 3
Ramp time	10 sec. max (0÷10V of reference signal)
Electrical wirings (customer care)	Shielded cable 5 pins + shield; section 0,5 to 1,0 mm^2 (20 AWG - 18 AWG)
Connections	7 contacts – terminal strip
Box format	Box equipped with DIN 43650-IP65 plug; VDE 0110 wired on solenoid
Operating temperature	0 ÷ 50 °C (storage -20 ÷ + 70 °C)
Weight	190 g
Features	Outputs to solenoids protected against accidental short circuits

4 GENERAL SPECIFICATIONS

4.1 Power supply and wiring

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier use a 10000 µF/40V capacitor; if pulse voltage is generated by a three phase rectifier, connect a 4700 µF capacitor (see [11]).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC), connecting the shield to noiseless earth (TE), see [13].
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radio-transmitter, etc.).
The 12 V_{DC} electric voltage supply is allowed only after evaluation of the performances required from the proportional valves, and however after check with our technical office.

4.2 Reference signal, see [5].

The electronic driver is designed to receive a voltage reference signal according to the following options:
- potentiometers mounted externally and wired according to the application diagrams.
- external reference signals generated by PLC, see [11].
- voltage from 0 to 10V
- current from 0 to 20 mA (only with option /RR).

4.3 Monitor signal

This voltage output signal allows to measure the current supplied to the coil, read by a voltmeter between the test point M and pin 2 (see [9]).
Reading scale is 1 mV = 10 mA (ex.: if the voltage signal is 70 mV, coil current is 700 mA).
To visualize the signals use voltmeters with impedance >10 KΩ.

4.4 Set code

Basic calibration of the electronic driver is factory pre-set, according to the proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follows:

1 = RZGO (KZGO) 2 = RZMO, AG*ZO, LI*ZO
3 = DHZO, DKZOR 4 = DPZO-A-*5
6 = QV*ZO(R), LEQZO

4.5 Calibrations available to the user, see [7], [8], [9], [11].

Scale
The relation between driving current and reference signal can be regulated with the Scale adjustment.

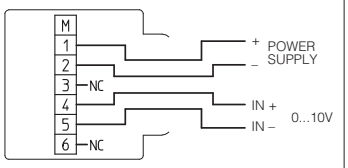
Bias (dead band)
Regulation of dead band adjusts the hydraulic zero of the valve (starting position adjustment) to the corresponding electrical zero. The electronic card is factory pre-set for the valve it is coupled with, according to the set code (see section 4.4). An output current is obtained when the input voltage is 100 mV or greater.

Ramps see [7], [9].
The internal ramp generator circuit converts a step input signal into a slowly increasing output signal (solenoid current).
The rise/fall time of the current is set via internal potentiometer P1 up to a max. time of 10 sec. for 0-10V of reference signal. The option /RR provides dissimmetrical ramps, ramp up is set via P1 potentiometer and ramp down is set via P2.

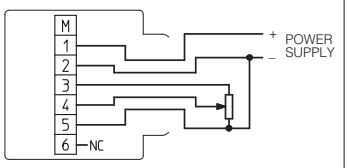
Dither
With the /RR option the dither frequency adjust is allowed from 100 Hz to 500 Hz.

5 EXTERNAL REFERENCE SIGNALS

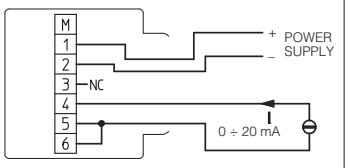
EXTERNAL GENERATOR VOLTAGE SIGNAL



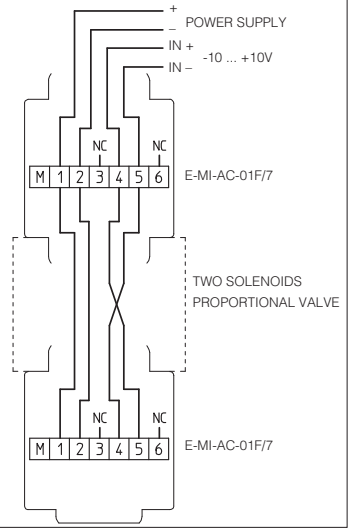
EXTERNAL POTENTIOMETER CONNECTION
POTENTIOMETER



EXTERNAL GENERATOR CURRENT SIGNAL
(OPTION /RR)



CONNECTION FOR TWO SOLENOIDS
PROPORTIONAL VALVE (OPTION /7)



6 INSTALLATION AND START-UP

It is advisable to perform calibration procedures in the order given below:

6.1 Warning

- Never insert or remove the driver while the electronic system is powered on.
- Protect the regulator on power line with an external 2A fuse.
- Refer to [9] to identify components mentioned in calibration procedures.
- The E-MI-AC electronic drivers are designed to work in open loop system, where the coupled proportional valve is not required to work at its limits.

6.2 Start-up

Factory pre-set adjustments might not meet the requirements desired for the specific application. Performances can be optimized by on-site re-adjustments of Bias, Scale and Ramps potentiometers, in sequence.

- Remove the cover and connect the electronic driver according to the desired connection diagram, see [5].

For double solenoid valves two electronic drivers type E-MI-AC-01F/7 must be used connected as shown in [5].

Start-up instructions are the same for each driver.

On the first driver two cable clamps must be mounted, one for the external wirings and one to give power and signal to the second driver which is equipped with one cable clamp and one blind plug.

A differential voltage signal -10 V ÷ +10 V must be supplied to the first driver.

Note that the first driver will work with signal from 0 to 10V while the second driver will work with signal from 0 to -10 V.

- The current supplied to the coil can be measured by a voltmeter connected between pins M and 2 of the screw terminal. The reading range will be: I[mA]=10xV[mV] (for example reading 70 mV the current in the coil will be 700 mA).

Bias adjustment (dead band compensation) see [8], [9].

- Supply electrical power to the driver; supply a reference signal voltage = 0,1 VDC. Gradually turn the P4 bias potentiometer until a movement of the controlled actuator is obtained.
- Turn in the opposite direction until the actuator is stopped.

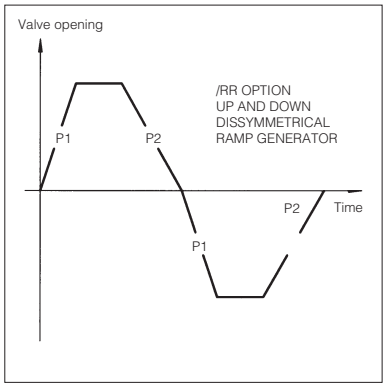
Scale adjustment, see [8], [9].

Supply max. current reference signal; check if the current in the coil reaches the max. value desired, turning P3 clockwise (see the regulation curve of the employed valve used).

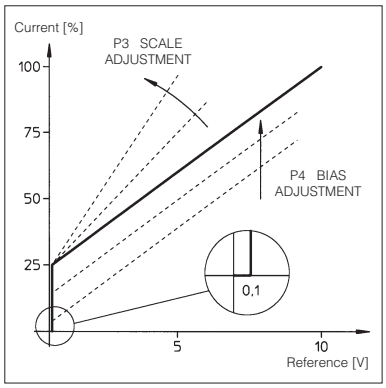
Ramps see [7], [9].

Turning the ramp potentiometer clockwise, acceleration and deceleration time can be increased to obtain the optimization of the complete system.

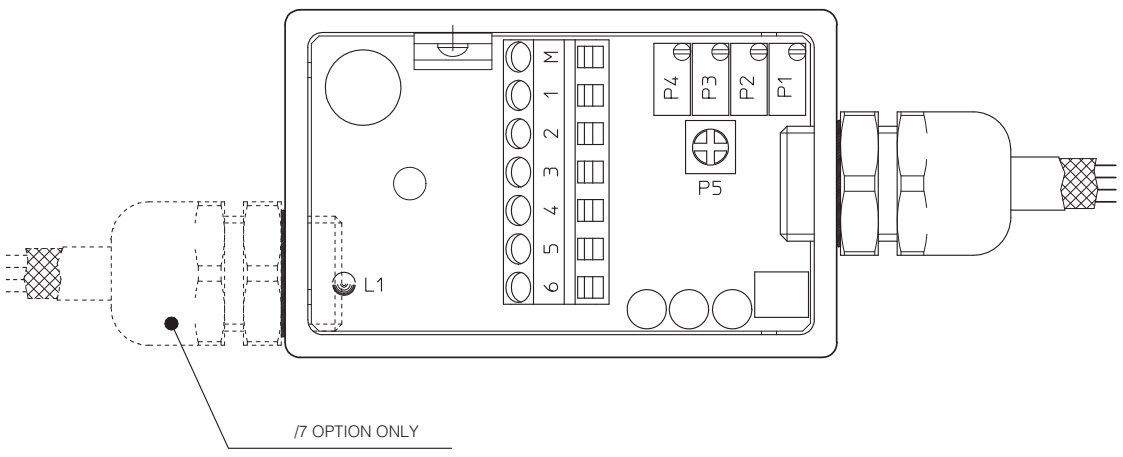
7 RAMPS



8 E-MI-AC ADJUSTMENT



9 E-MI-AC-01F TOPOGRAPHICAL VIEW OF REGULATIONS



CONNECTIONS

M monitor (driving current)
1 Power V+ ┐
2 Power GND ┘ supply 24 VDC
3 Output +5VDC (10mA)
4 Reference signal input +
5 Reference signal input –
6 Connect to contact 5 for current signal (/RR option only)

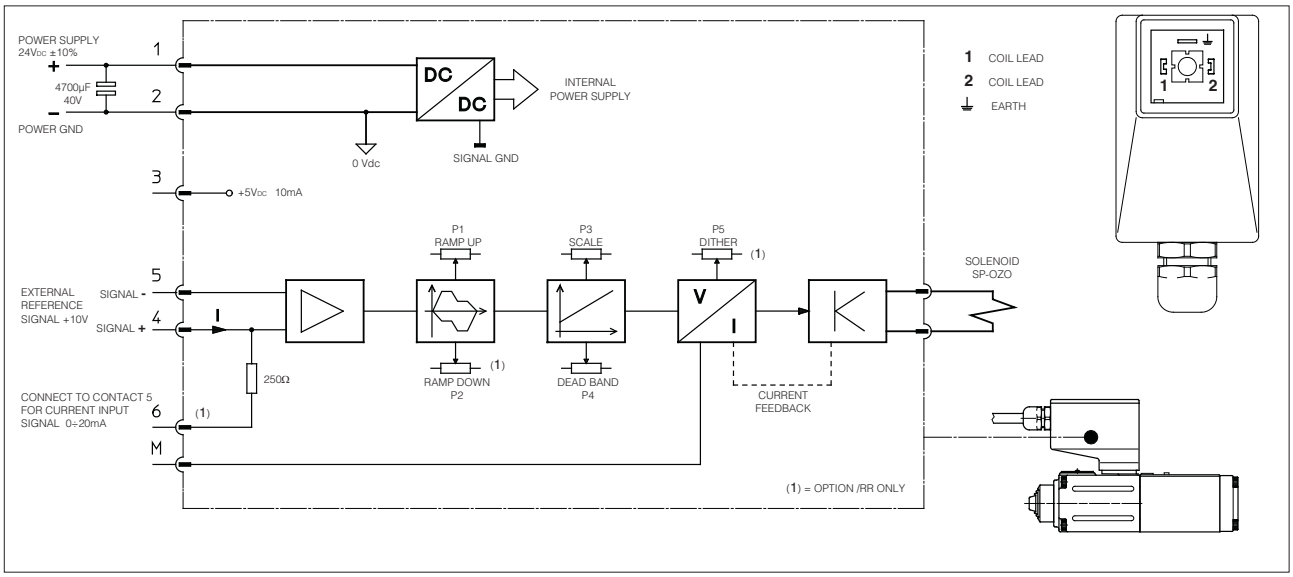
ADJUSTMENTS

P1 Ramp up
P2 Ramp down (/RR option only)
P3 Scale
P4 Bias
P5 Dither (/RR option only)
L1 Channel enabled led

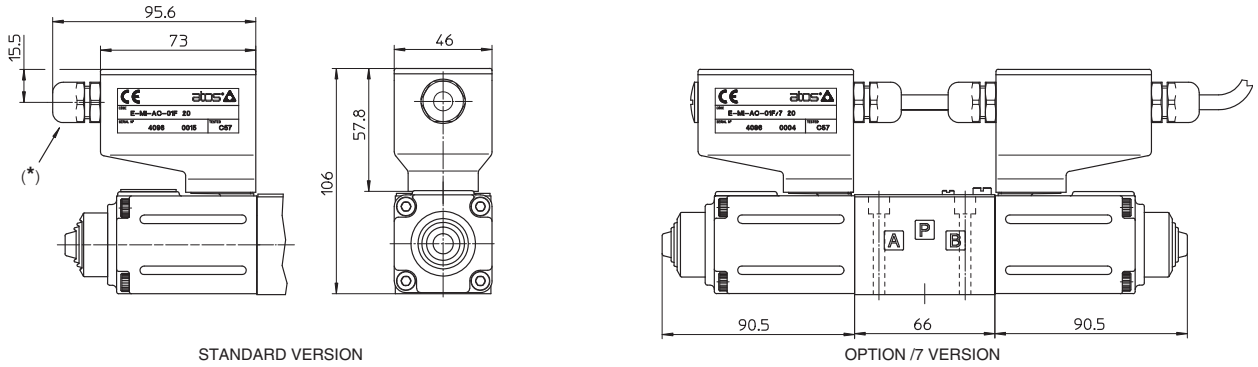
10 IMPORTANT INSTRUCTIONS

ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

11 WIRING BLOCK DIAGRAM



12 DIMENSIONS [mm]

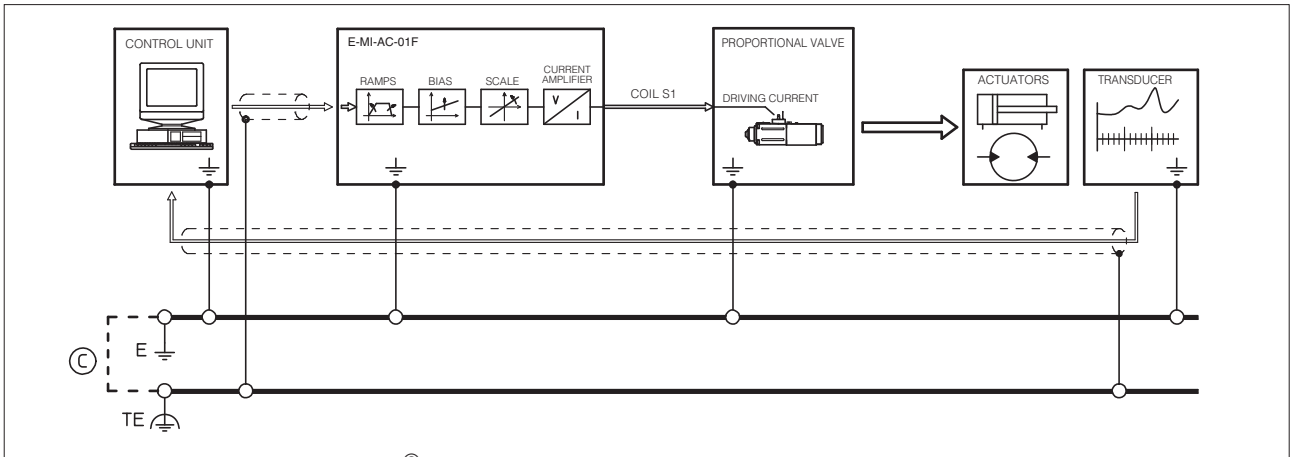


STANDARD VERSION

OPTION /7 VERSION

(*) Cable clamp PG9 hex. 19

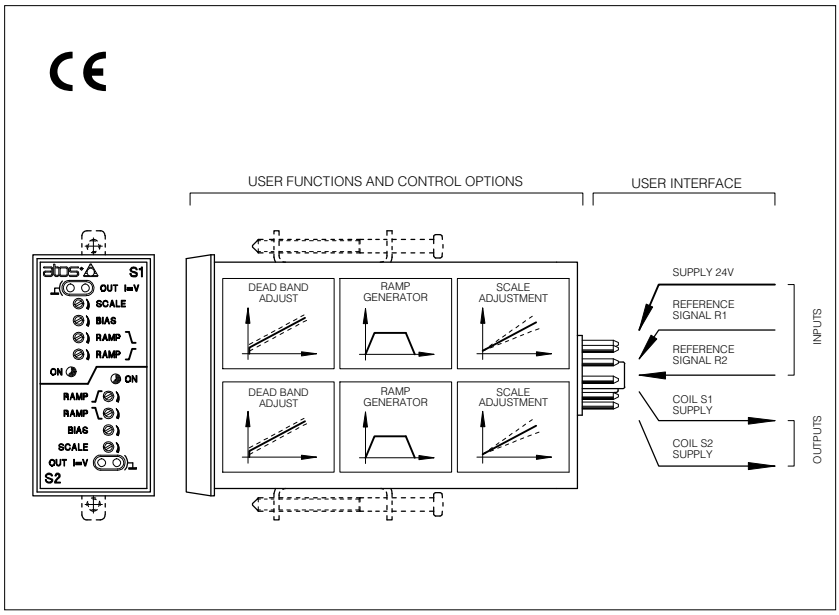
13 EARTH CONNECTIONS



E: PROTECTIVE EARTH **TE**: NOISELESS EARTH © : ALTERNATIVE BONDING CONNECTION TO NOISELESS EARTH TERMINAL

Electronic drivers type E-BM-AC

analog, DIN 43700 UNDECAL fast plug-in, for proportional valves without transducer



E-BM-AC drivers control the current to the solenoid of Atos proportional valves without pressure or position transducer, regulating the spool position, the flow or the pressure according to the electronic reference signal.

Features:

- bias and scale regulations by potentiometers
- symmetrical (standard) or dissymmetrical (/RR option) rising and falling ramp generator
- factory pre-setted
- alluminium box (DIN 43700 modular unit)
- can be mounted on back panel DIN guide or on front panel
- power supply 24 VDC or 12 VDC (/12 option)
- electronic filters on input and output lines
- CE marking granting the conformity to the EMC Directive (Electromagnetic Compatibility)

Applications:

Pressure, flow, position open or closed-loop regulation systems, according to the block diagram [2].

1 MODEL CODE

E-BM – AC – 01F – – ** /*

E-BM = electronic driver
Fast plug-in format

AC = for prortional valves
without transducer

01F = for single solenoid proportional valves
011F = for two single solenoid proportional valves
05F = for double solenoid proportional valves

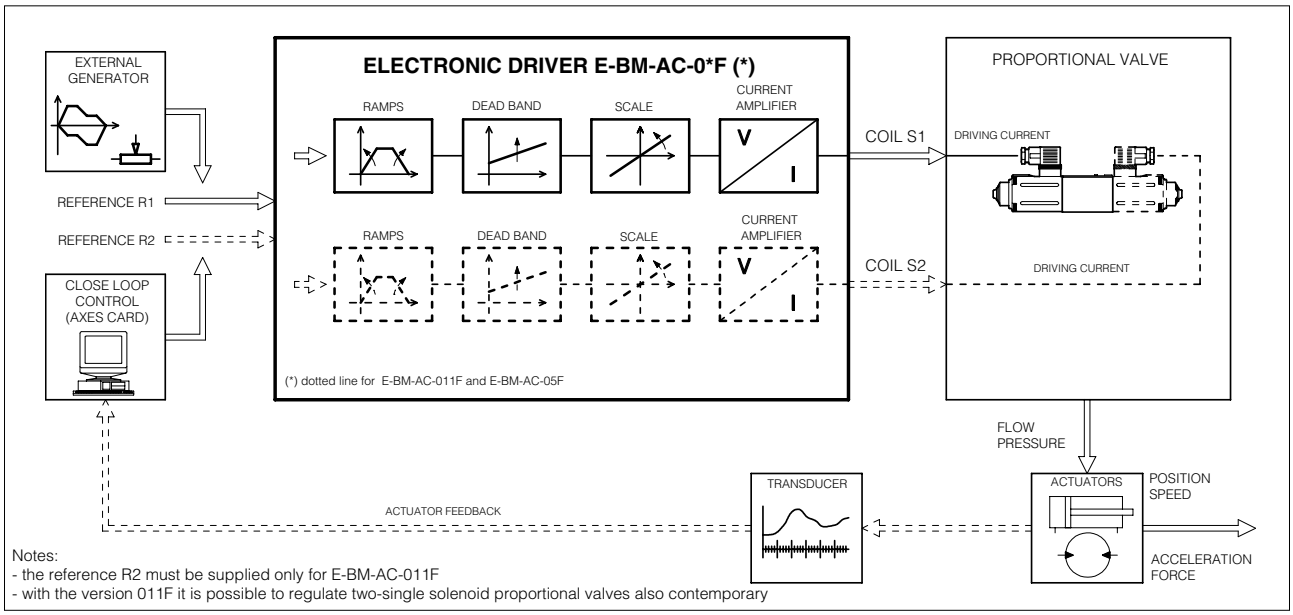
- = 24 VDC power supply
/12 = 12 VDC power supply (see 4.1)

Options:
- = standard symmetrical ramp
/RR = with adjustable dissymmetrical ramps

Series number

set code (see 4.4)

2 BLOCK DIAGRAM



Notes:
- the reference R2 must be supplied only for E-BM-AC-011F
- with the version 011F it is possible to regulate two-single solenoid proportional valves also contemporary

3 MAIN CHARACTERISTICS OF E-BM-AC ELECTRONIC DRIVERS

Power supply (positive on contact 11, negative on contact 1)	Nominal Rectified and filtered	:24V_{DC} or 12 V_{DC} (see 4.1) :V_{RMS} = 21 ÷ 33 (ripple max peak to peak = ±20%)	
Max. power consumption	40 W		
Current supplied to solenoids	Imax = 3,3A type PWM square wave (with solenoid type ZO(R)-A with resistance 3,2 Ω) Imax = 2,5A type PWM square wave (with explosion-proof solenoid with resistance 3,2 Ω)		
Nominal reference signal, factory pre-set	E-BM-AC-01F E-BM-AC-11F E-BM-AC-05F	R1 R1, R2 R1	0 ÷+5V at contact 3 (GND on 2) 0 ÷+5V at contact 3 (GND on 2) and 0 ÷ +5V at contact 8 (GND on 7) ± 5V at contact 3 (GND on 2)
Reference signal variation range (Scale adjustment)	± 10 V max	± 2,5 V min	
Input signal impedence	Voltage signal Ri > 10 KΩ		
External potentiometers supply	+5V / 10mA at contact 6 (-5V / 10mA at contact 7 only for version E-BM-AC-05F)		
Ramp time	10 sec. max (0 ÷100% of reference signal)		
Electrical wiring	Coils : 2 x 1 mm² cable up to 20 m; 2 x 1,5 mm² shielded cable to 40 m		
Box format	Aluminium box DIN 43700		
Connector elements available	UNDECAL socket for guide DIN EN 50022-50035 type E-K-11B mounting **To be ordered separately**		
Operating temperature	-10 ÷ +60 °C (storage -20 ÷ +70 °C)		
Dimensions	32 x 72 x 127 mm		
Weight	270 g		
Features	Rapid solenoid excitation and switching off. Outputs to solenoids protected against accidental short circuits		

4 GENERAL SPECIFICATIONS

4.1 Power supply and wiring

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier use a 10000 µF/40V capacitor; if pulse voltage is generated by a three phase rectifier, connect a 4700 µF/40V capacitor (see 13).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC).
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radio-transmitter, etc.). Wire the earth connection as shown in 13, according to CEI EN 60204-1 standards. Connect the shield of the driver to the noiseless earth terminal (TE) 16.
The driver is designed to correctly work with 24 V_{DC} (±20%) or 12 V_{DC} (±20%) nominal voltage supply coupled with coils having a resistance from 2,0 Ω to 13,4 Ω, as shown in the side table.

Nominal supply	Valve code	R at 20 °C [Ω]
24 V_{DC}	*ZMO, *ZGO, *ZO(R)-A-* (1)	3,2
	*ZMA, *ZGA, *ZO(R)-A-* (1)	3,2
	*ZMO, *ZGO, *ZO(R)-A-*/18	13,4
12 V_{DC}	*ZMO, *ZGO, *ZO(R)-A-*/6	2,1
(1) Standard coupling		

4.2 Reference signal

The electronic driver is designed to receive a voltage reference signal according to the following options:
- potentiometers mounted externally and wired according to the application diagrams, see 5.
- external reference signals generated by PLC, see 14 and 15.

4.3 Monitor signal

This voltage output signal allows to measure the current supplied to the coil, read by a voltmeter on the front panel test points (see 9). Reading scale is 1 mV = 1 mA.
To visualize the signals use voltmeters with impedance >10 KΩ.

4.4 Set code

Basic calibration of the electronic driver is factory pre-set, according to the proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follows:
1 = RZGO, KZGO 3 = DHZO, DKZOR 4 = DPZO-A-*5, DPZO-A-*7
2 = RZMO, AG*ZO, LI*ZO 3B = DHZO-A-06, DKZOR-A-16 4B = DPZO-A-*6
6 = QV*ZO(R), LIQZO
For ex-proof valves, insert an "A" before the code of adjustment.
For example, the code of adjustment for RZGA is A1 (see table E120).
The calibrations 3B and 4B allow the coupling with single solenoid valves with two external positions.

4.5 Calibrations available to the user, see 7, 9, 10, 11.

Scale
The relation between driving current and reference signal can be regulated with the Scale adjustment.
For single solenoid valves with two external operating positions, the reference signal is ± 5V (calibration codes 3B and 4B).
Separate Scale potentiometers P3 and P4 for solenoids S1 and S2 enable the electronic card to be set for different output currents, obtaining differential hydraulic operations.

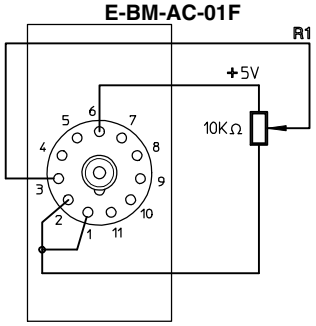
Bias (dead band)
Regulation of dead band adjusts the hydraulic zero of the valve (starting position adjustment) to a minimum signal of 200 mV. The electronic card is factory pre-set for the valve it is coupled with, according to the set code (see section 4.4). E-BM-AC-05F/* driver for double solenoid are equipped with an internal channel selector enabling the relevant channel with input reference voltage signal greater than ± 200 mV and supplying the bias current set by front panel Bias potentiometers P1 and P2 for each solenoid.
For drivers type E-BM-AC-01F with calibration codes 3B and 4B there is not threshold and the bias is used for the adjustment of the central position of the valve.

Ramps see 7, 9.
The internal ramp generator circuit converts a step input signal into a slowly increasing output signal (solenoid current). The rise/fall time of the current is set via potentiometers on front panel up to a max. time of 10 sec. for 0-100% of reference signal.
The option /RR allows up and down dissymetrical ramps for each solenoid.

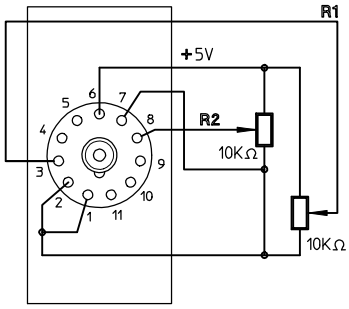
5 EXTERNAL REFERENCE SIGNALS

SOCKET CONNECTIONS **EXTERNAL POTENTIOMETER**

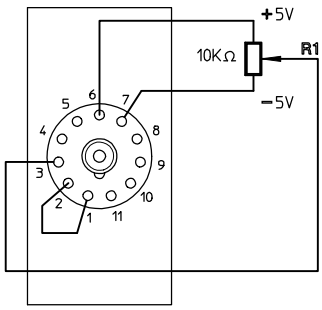
E-BM-AC-01F



E-BM-AC-011F



E-BM-AC-05F
E-BM-AC-01F/3B
E-BM-AC-01F/4B



6 INSTALLATION AND START-UP

It is advisable to perform calibration procedures in the order given below.

6.1 Warning

– Never insert or remove the driver while the electronic system is powered on.
– Protect the regulator on power line with an external fuse (2,5A RTV for version E-BM-AC-01F and E-BM-AC-05F; 5A RTV for E-BM-AC-011F)
– Refer to section [9] to identify components mentioned in calibration procedures.
– It is possible to install the E-BM-AC driver on front panel (drilling plane 33,5x68,5 mm) or on back panel DIN guide (see fig. [8]).

The electrical connection is made on the clamps of the proper UNDECAL type E-K-11B socket, equipped with antivibrating spring.

6.2 Start-up

Factory pre-set adjustments might not meet the requirements desired for the specific application. Performances can be optimized by on-site re-adjustments of Bias, Scale and ramps potentiometers, in sequence.

– Connect the electronic driver according to the desired connection diagram, (see [5], [14], [15]).
– The current supplied to the coil can be measured by a voltmeter connected between the test points on the front panel.

The reading range will be: I[mA] = V[mV].

Bias adjustment (dead band compensation), see [9], [10], [11].
For E-BM-AC-01F and E-BM-AC-11F:

– supply a reference signal voltage R1 = +0,2 V_{DC};
– turn clockwise the potentiometer P1 for solenoid S1 until the movement of the controlled actuator is obtained.
– turn the potentiometer P1 in the opposite direction until the actuator is stopped.
– for version E-BM-AC-011F repeat the operation and supply a reference signal voltage R2 = +0,2 V_{DC} by the potentiometer P2.

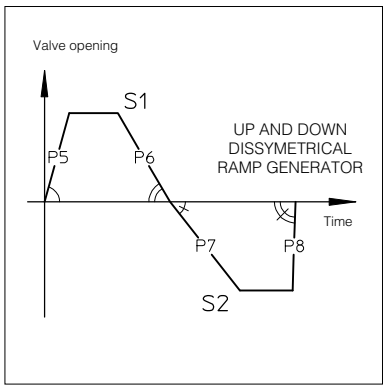
For E-BM-AC-05F:

– supply a reference voltage R1 = +0,2 V_{DC};
– turn clockwise the potentiometer P1 for solenoid S1 until the movement of the controlled actuator is obtained.
– turn the potentiometer P1 in the opposite direction until the actuator is stopped.
– repeat the operation and supply a reference signal voltage R1 = -0,2 V_{DC} by the potentiometer P2.

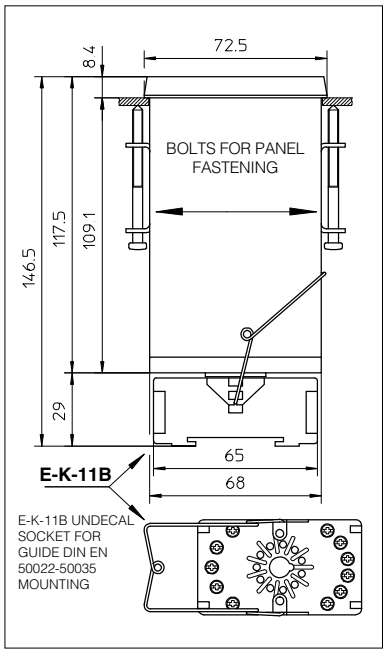
Scale adjustment (see [9], [10], [11])
Supply max. reference signal voltage R1 (for E-BM-AC-05F driver repeat for max. negative reference voltage signal R1) in the specified range and turn scale potentiometer P3 (P4 for negative reference signal) until the actuator speed reaches the desired value.
For version E-BM-AC-011F repeat the operation and supply the max positive reference signal R2 by the potentiometer P4.

Ramps, see [7], [9].
Turning the ramp potentiometer(s) clockwise, acceleration(s) and deceleration(s) can be reduced to obtain the optimization of the complete system.

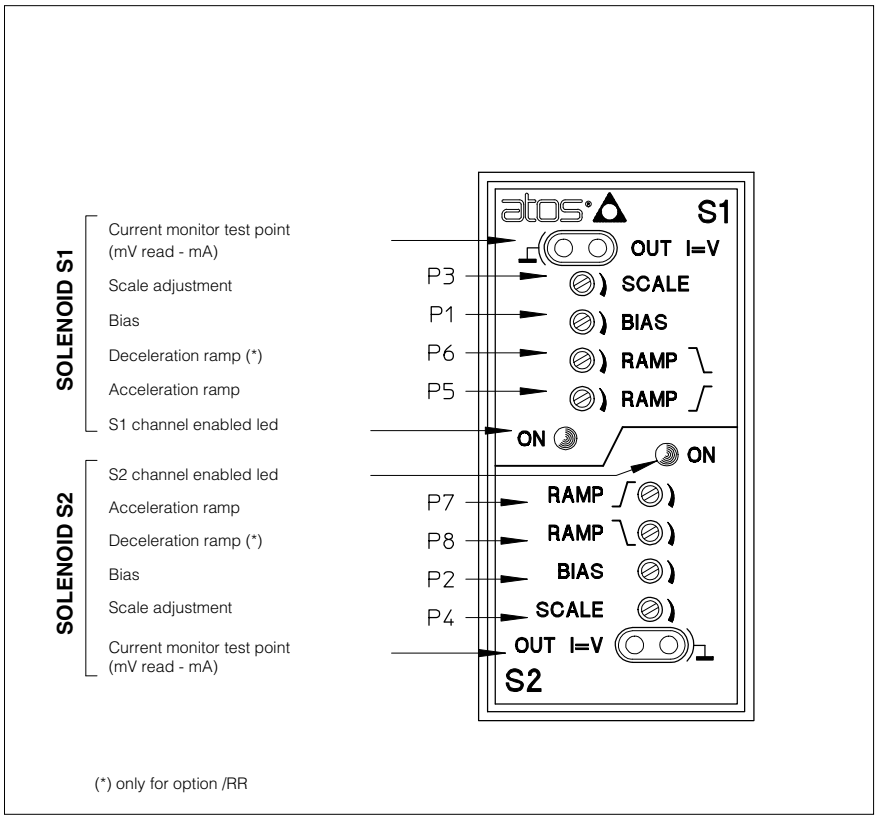
7 RAMPS



8 DIMENSIONS (mm)

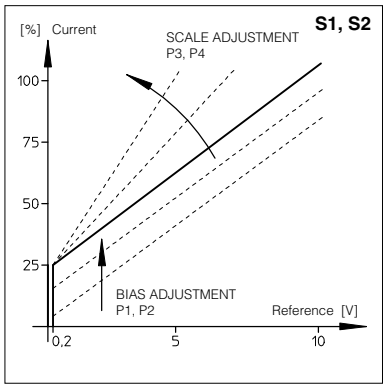


9 E-BM-AC-05F TOPOGRAPHICAL VIEW OF REGULATIONS

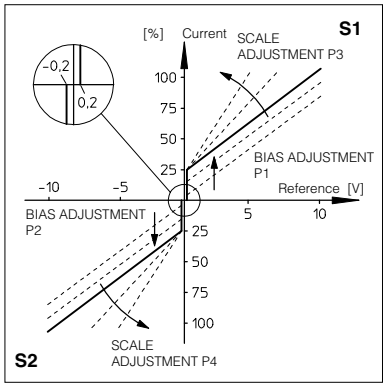


(*) only for option /RR

10 E-BM-AC-01F and 011F ADJUSTMENT



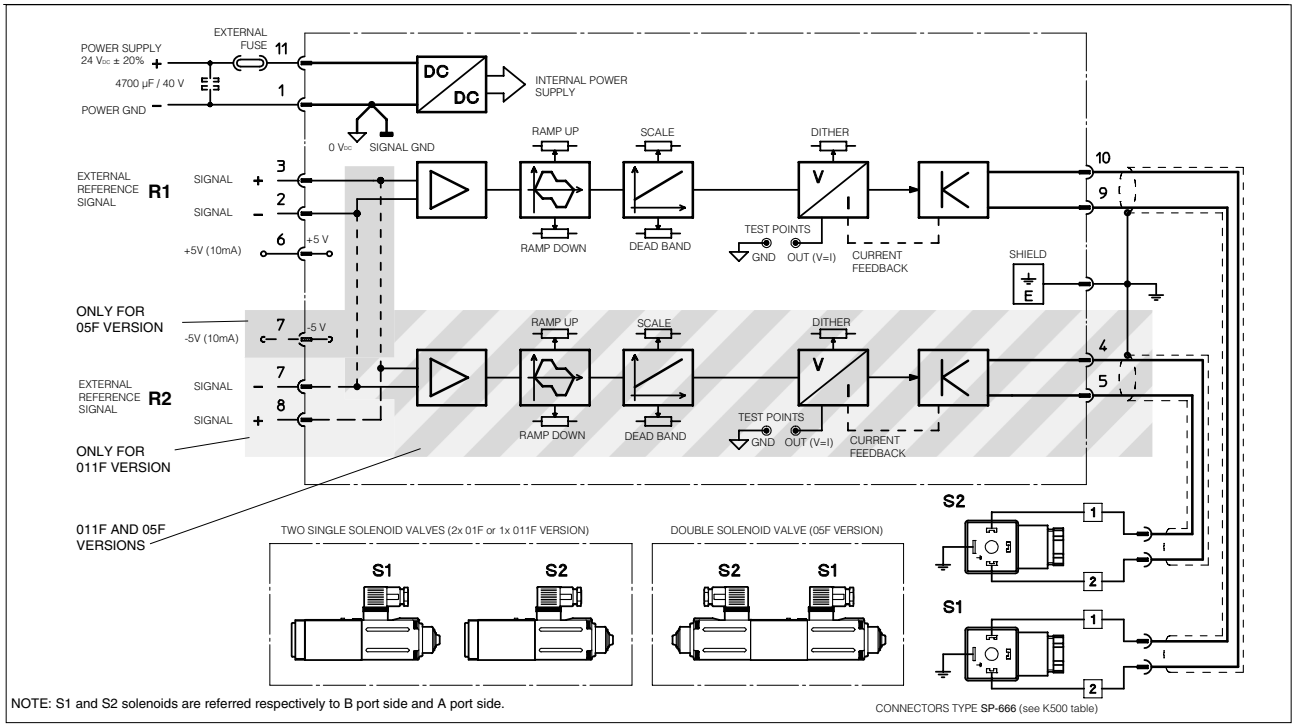
11 E-BM-AC-05F ADJUSTMENT



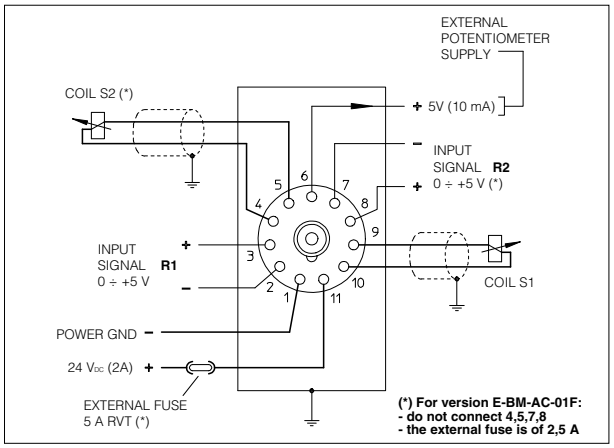
12 IMPORTANT INSTRUCTIONS

ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

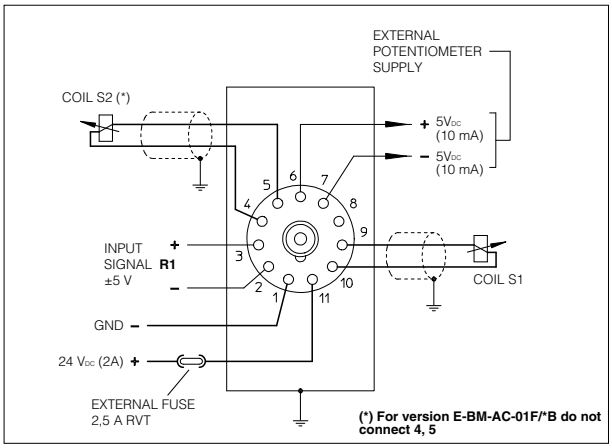
13 E-BM-AC-0*F WIRING BLOCK DIAGRAM



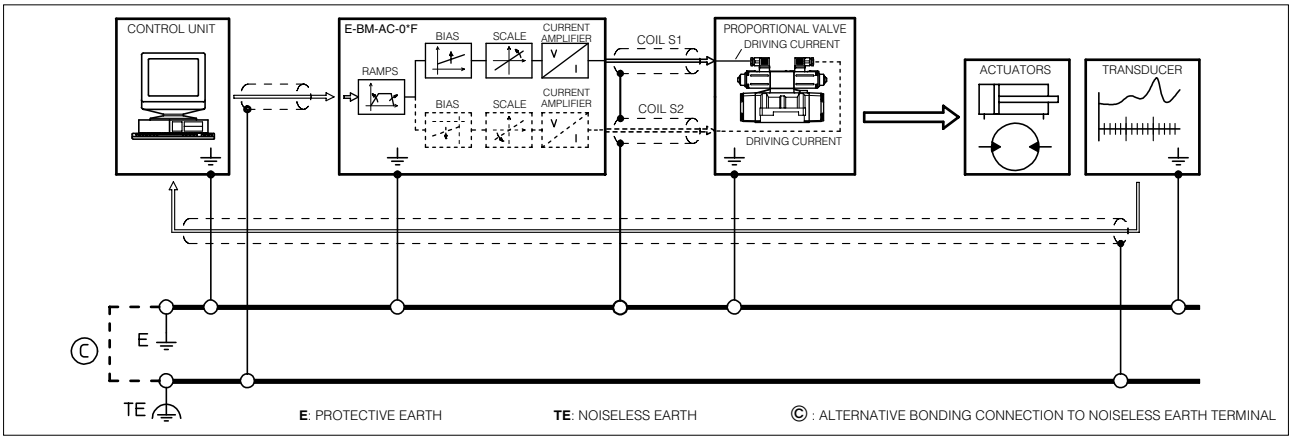
14 E-BM-AC-01F and E-BM-AC-011F GENERAL CONNECTIONS



15 E-BM-AC-05F and E-BM-AC-01F/*B GENERAL CONNECTIONS

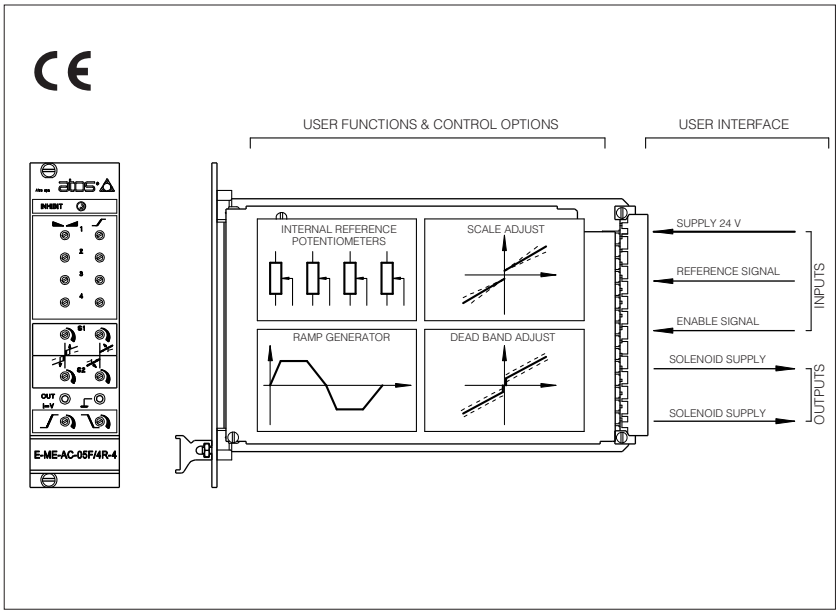


16 EARTH CONNECTIONS



Electronic drivers type E-ME-AC

analog, Eurocard format, for proportional valves without transducer



E-ME-AC drivers control the current to the solenoid of Atos proportional valves without pressure or position transducer, regulating the spool position, the flow or the pressure according to the electronic reference signal.

Features:

- bias and scale regulations by potentiometers
- symmetrical (standard) or dissymmetrical (/RR and /RR-4 options) rising and falling ramp generator
- factory pre-setted
- Eurocard format (DIN 41494 modular unit)
- 4 internally generated reference signals, selectables by external ON-OFF signals (-4, /RR-4, /4R-4 options)
- electronic filters on input and output lines
- CE marking granting the conformity to the EMC Directive (Electromagnetic Compatibility)
- both sides of the card with shielded cover with E faston connector

Applications:

Pressure, flow, position open or closed-loop regulation systems, according to the block diagram 2.

1 MODEL CODE

E-ME – AC – 01F – ** /*

E-ME = Electronic driver in Eurocard format

AC = for proportional valves without transducer

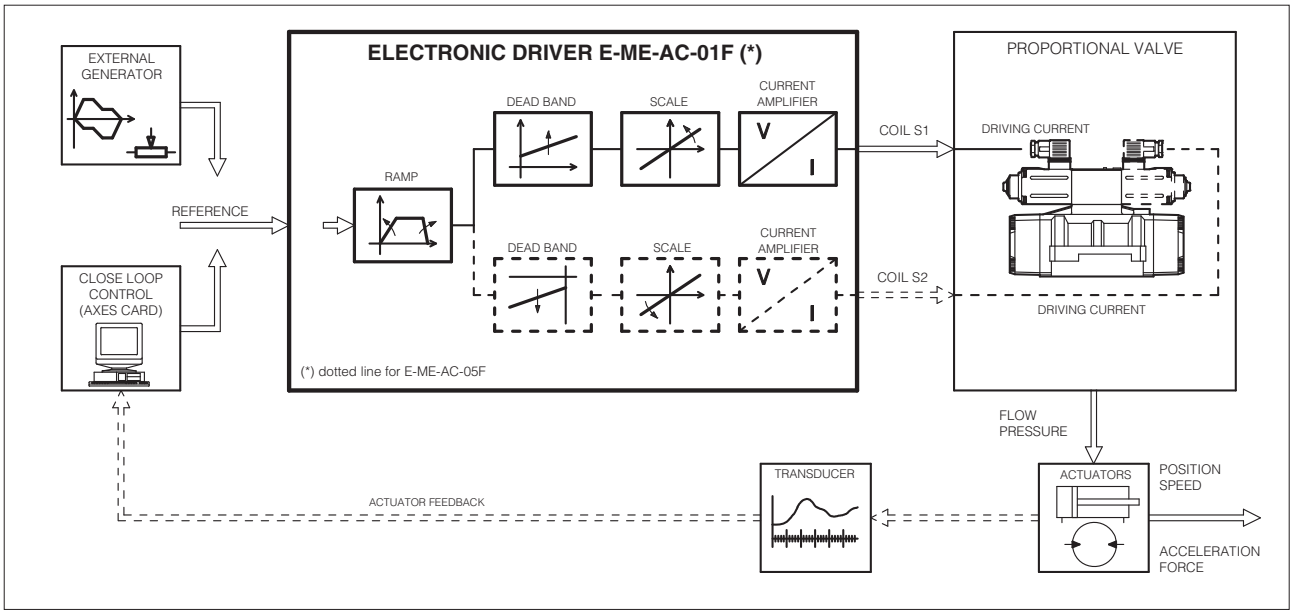
01F = for single solenoid proportional valves
05F = for double solenoid proportional valves

Options:
- = standard symmetrical ramp
/RR = with adjustable dissymmetrical ramps
-4 = with 4 reference potentiometers
/RR-4 = with rising and falling ramps and 4 reference potentiometers
/4R-4 = with 4 ramps and 4 reference potentiometers
/I = suitable to receive current reference signal 4÷20 mA (not suitable with -4, /RR-4, /4R-4 options)

** Series number

* Set code (see 4.4)

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-ME-AC ELECTRONIC DRIVERS

Power supply (positive at contacts 2a, 2c) (negative at contacts 4a, 4c)	Nominal: :24V_{DC} Rectified & filtered: :V_{RMS} = 21 ÷ 33 (max ripple = 2Vpp)
Max power consumption	50 W
Current supplied to solenoid	Imax= 3.3A square wave PWM type; (for ex-proof valves Imax = 2,5 A)
Nominal reference signal, factory preset	E-ME-AC-01F: 0 ÷+5V at contact 12c (GND on 8a) E-ME-AC-05F: ± 5V at contact 12c (GND on 8a) 4 ÷20 mA for /I: at contacts 12c (+) and 8a (-)
Reference signal variation range (Scale adjust)	± 10V max ± 2,5V min
Input signal impendence	Voltage signal Ri > 50 KOhm - (/I option Ri = 316 Ohm)
Potentiometers supply	+5V / 50 mA at contact 10c and -5V / 20mA at contact 14c
Ramp time	5 sec. max (0 ÷100% of reference signal)
Enabling signal	V = 5 ÷24V_{DC} on contact 18a with led indicator on panel
Electrical wiring	Coil : 2 x 1 mm² to 20 m 2 x 1,5 mm² shielded to 40 mt
Card format	Europe 100x160 mm (Plug-in unit DIN 41494)
Card connector	Male DIN 41612 /D
Connector elements available	Type E-K-32M frame snap connector (see table G800) **To be ordered separately**
Operating temperature	0 ÷50°C (storage -20° ÷+70°C)
Front panel dimensions	128,4 x 35,3 mm
Weight	540 g
Features	Rapid solenoid excitation and switching off. Outputs to solenoids protected against accidental short circuits

4 GENERAL SPECIFICATIONS

4.1 Power supply and wirings

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier, use a 10000 µF/40V capacitor; if pulse voltage is generated by a three phase rectifier, connect a 4700 µF/40V capacitor (see 13).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC).
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radio-transmitter, etc.).
Wire the earth connection as shown in 13, according to CEI EN 60204-1 standards.
Connect the shield of the driver to the noiseless earth terminal (TE) 15.

4.2 Reference signal

The electronic driver is designed to receive voltage or current reference signals according to the following options:
– internal potentiometers mounted on board, see 13.
– external reference signals, see 5
Note that drivers designed to receive current reference (options /I) have signal values in the range 4 to 20 mA and do not have mounted on board potentiometer option.
It is possible to use current option also for double channels drivers type E-ME-AC-05F using the reference inversion signal on contact 18c (5 ÷ 24 V_{DC}).

4.3 Monitor signal

This voltage output signal allows to measure the current supplied to the coil, read by a voltmeter on the front panel test points (see 9). Reading scale is 1 mV = 1 mA.
To visualize the signals use voltmeters with impedance >10 KΩ.

4.4 Set code

Basic calibration of the electronic driver is factory preset according to the proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follows:
1 = RZGO, KZGO 2 = RZMO,AG*ZO, LI*ZO
3 = DHZO, DKZOR 4 = DPZO-A-*5, DPZO-A-*7
6 = QV*ZO(R), LIQZO
For ex-proof valves, insert an “A” before the code of adjustment.
For example, the code of adjustment for RZGA is A1 (see table E120).

4.5 Calibrations/settings available to the user, see 6, 8, 9, 10, 11.

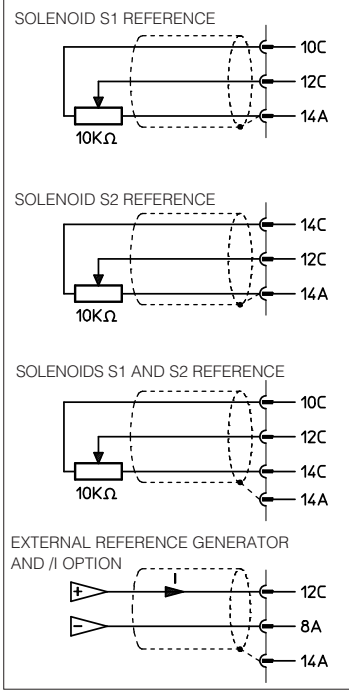
Scale
The Scale regulation, available on the front panel, permits to modify the relation between the reference signal and the regulated current to the solenoid.
Modifying this regulation (see 10, 11) it is possible to fit the valve hydraulic behaviour to the effective system conditions; in addition, the two regulations available for double solenoid valves (driver E-ME-AC-05F) permit to set different hydraulic adjustments for positive and negative movements.
The Scale regulation is factory set at standard values depending to the proportional valve to be controlled and it is identified by the driver set code (see 4.4)

Bias
The bias regulations, available on the front panel, permit to set the correspondence between the electrical zero of the reference signal with the beginning of the valve’s hydraulic regulation, compensating the dead band and the component’s mechanical tolerances .
Modifying this regulation (see 10, 11) it is possible to fit the valve hydraulic behaviour to the effective system conditions; in case of drivers for double solenoid valves (E-ME-AC-05F) the bias are active only when the reference signal is over the threshold value of ± 100 mV.
The Scale regulation is factory set at the standard values depending to the proportional valve to be controlled and it is identified by the driver set code (see 4.4)

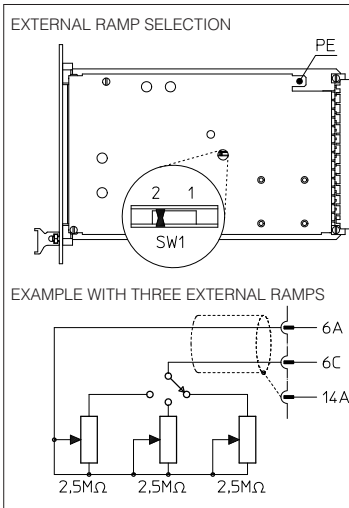
Ramps
The ramp regulation, available on the front panel, permit to modify the time in which the regulated current reaches the set value in front of a step change of the reference signal.
The ramp regulation is factory set at value close to zero and it can be increased up to 5 sec max for a step change of the reference signal from 0% to 100%

5 EXTERNAL REFERENCE SIGNALS

EXTERNAL POTENTIOMETER CONNECTIONS



6 EXTERNAL RAMPS



The available ramp regulations depend to the driver version:
- in the standard version it is available a single regulation for rise/fall ramp (P7)
- in the /RR version it is possible to separately regulate the rise ramp and the fall ramp (P7 and P17)

In the version /4R-4 it is possible to separately regulate the ramp for each of the internal reference signals (P11-P12-P13-P14).

External ramps, see 6
This feature allows to regulate the ramp time by means of external potentiometers. In order to use this capability:
- set switch SW1 in position 2
- connect one or more external potentiometers as shown (use only 2,5 MΩ potentiometers).

Internal reference signals
In the version -4, /RR-4 and /4R-4 the driver can self generate 4 different internal reference signals, selectable by means of 4 relevant on-off commands 24 VDC, to be supplied to the contacts 22c, 24c, 24a, 22a (see scheme 13, 14): each internal reference signal can be adjusted by means of a relevant potentiometer available on the front panel.

7 INSTALLATION AND START-UP

It is advisable to perform calibration procedures in the order given below.

7.1 Warning
– Never insert or remove the driver while the electronic system is powered on.
– Voltages must always be measured with reference to GND (connector contact 8a or front panel test point ⏊).
– Refer to 9 to identify components mentioned in calibration procedures.

7.2 Start-up
Factory pre-set adjustments might not meet the desired requirements for the specific application and performances can be optimized by on-site re-adjustements of Bias, scale and ramps potentiometers, in sequence.
– Connect the electronic driver according to the desired connection diagram, 13, 14.

The current supplied to the coil can be measured by a voltmeter connected between the test points on the front panel.
For E-ME-AC-05F the channel enabled led (L5 or L6) shows the supplied coil.

Enabling signal, see 13, 14.
The electronic driver operate when the contact 18a is supplied with an enabling signal (usually 24VDC). It could be useful in emergency conditions to inhibit the driver by zeroing this signal.

Bias adjustment (Dead band compensation), see 9, 10, 11.
– Supply a reference signal voltage (0VDC for E-ME-AC-01F and ± 0,1VDC for E-ME-AC-05F). Gradually turn bias potentiometer(s) until a movement of the controlled actuator is obtained
– Turn in the opposite direction until the actuator is stopped.

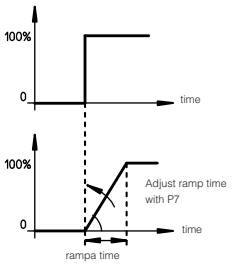
Scale adjustment, see 9, 10, 11.
Supply max reference voltage signal (for E-ME-AC-05F driver repeat for max negative voltage) in the specified range and turn scale potentiometer(s) until the actuator speed reaches the desired value.

Ramps, see 8, 9.
Turning the ramp potentiometer(s) clockwise, acceleration(s) and deceleration(s) can be reduced to obtain optimization of the complete system.

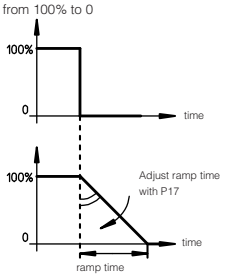
8 RAMPS AND SETTINGS

INTERNAL RAMPS - /RR OPTION

Reference from 0 to 100%

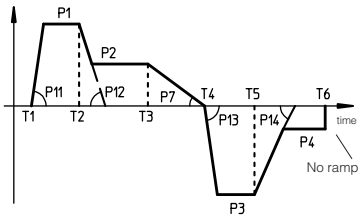


Reference from 100% to 0



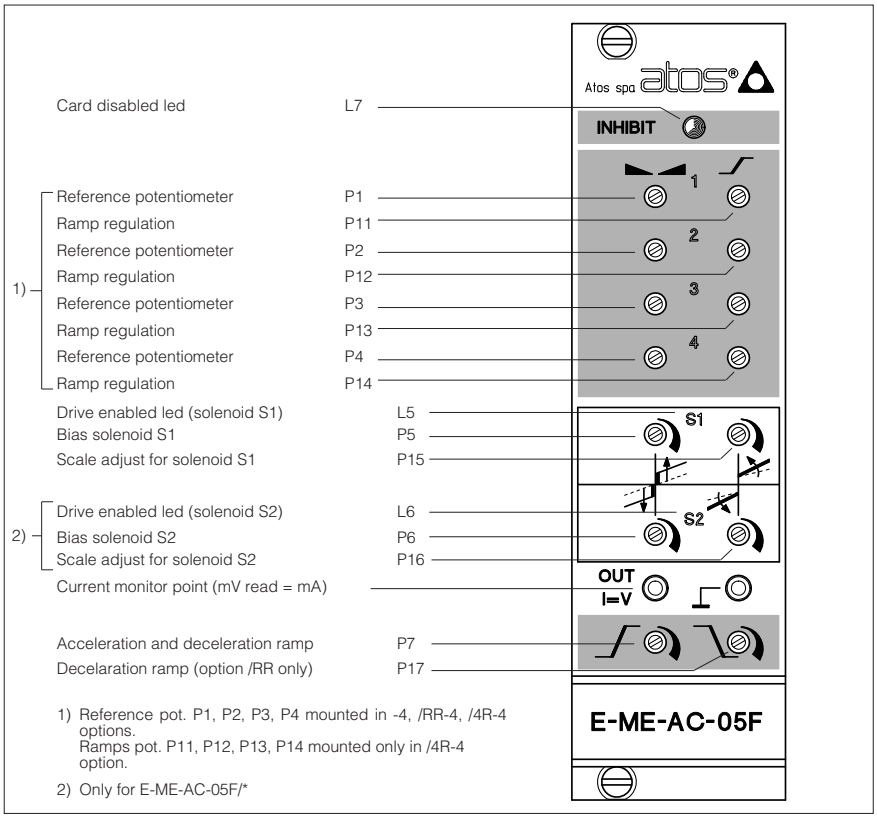
/4R-4 OPTION

Reference

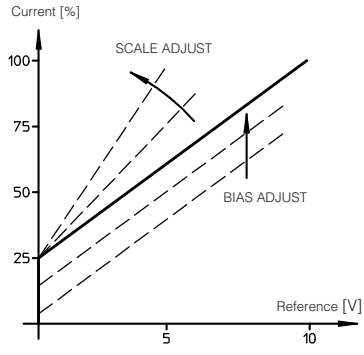


Time	Selected inputs					Active regulations	
	REF.1	REF.2	REF.3	REF.4	6a-6c	Speed	Ramp
T1	ON	OFF	OFF	OFF	Open	P1	P11
T2	ON	ON	OFF	OFF	Open	P2	P12
T3	OFF	OFF	OFF	OFF	Open	EXT.REF.	P7
T4	OFF	OFF	ON	OFF	Open	P3	P13
T5	OFF	OFF	ON	ON	Open	P4	P14
T6	OFF	OFF	OFF	OFF	Close	EXT.REF.	(tr=0)

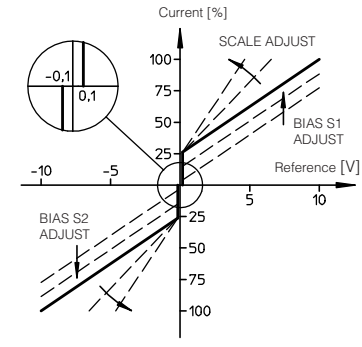
9 E-ME-AC-05F TOPOGRAPHICAL VIEW OF REGULATIONS



10 E-ME-AC-01F ADJUSTMENT



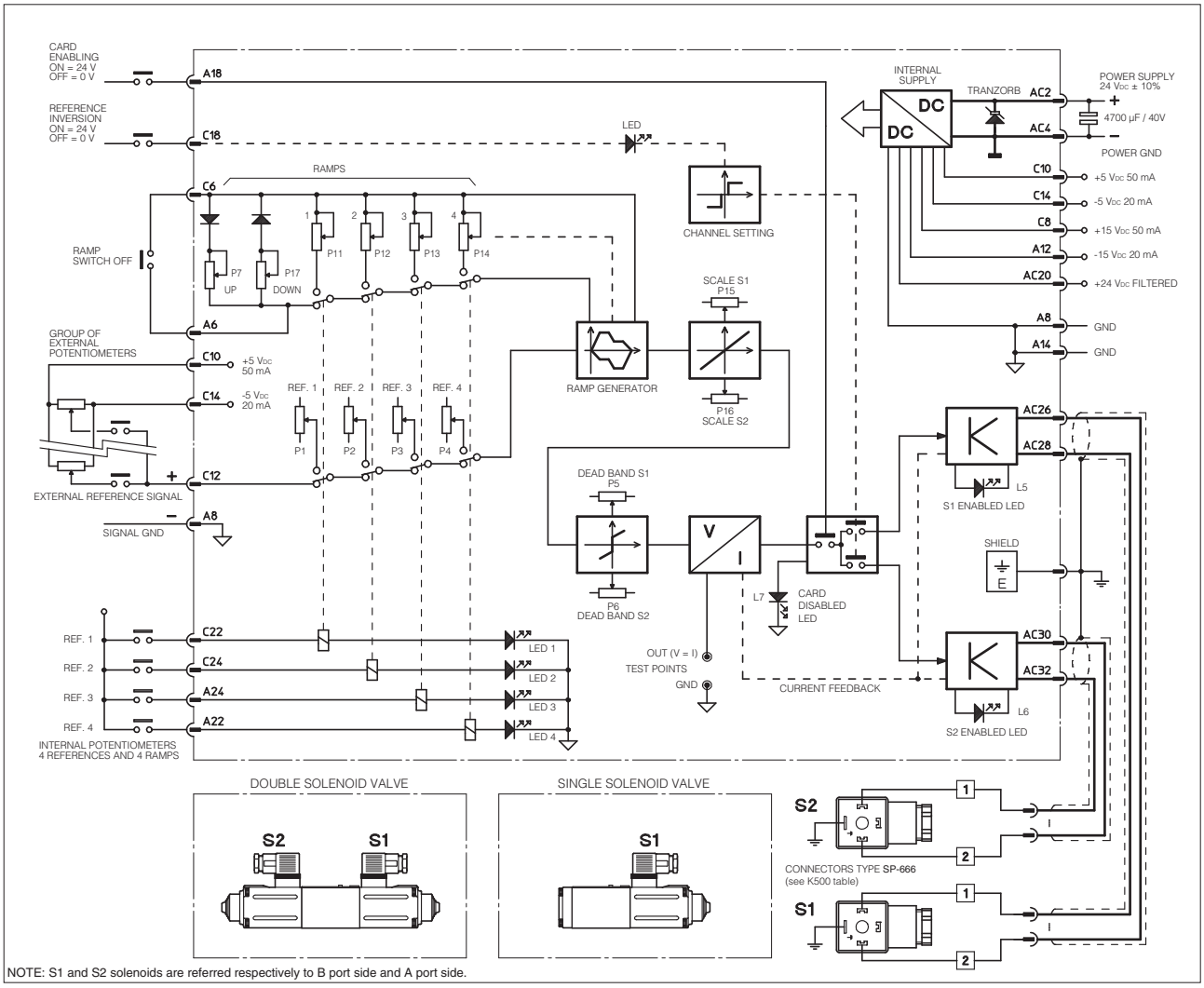
11 E-ME-AC-05F ADJUSTMENT



12 IMPORTANT INSTRUCTIONS

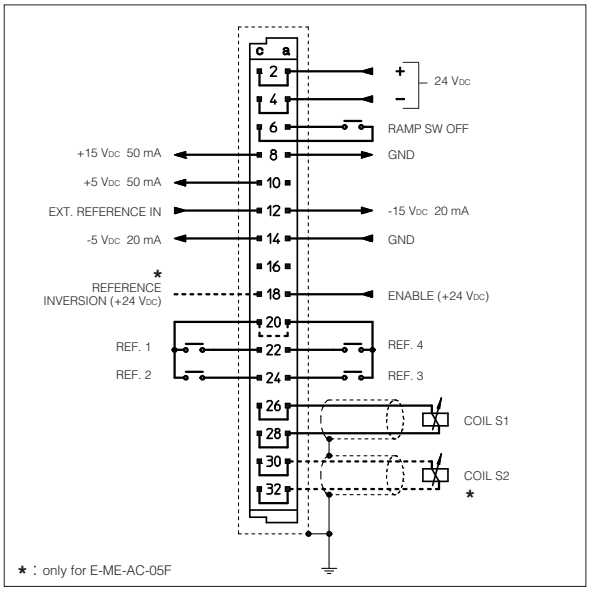
ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

13 WIRING BLOCK DIAGRAM



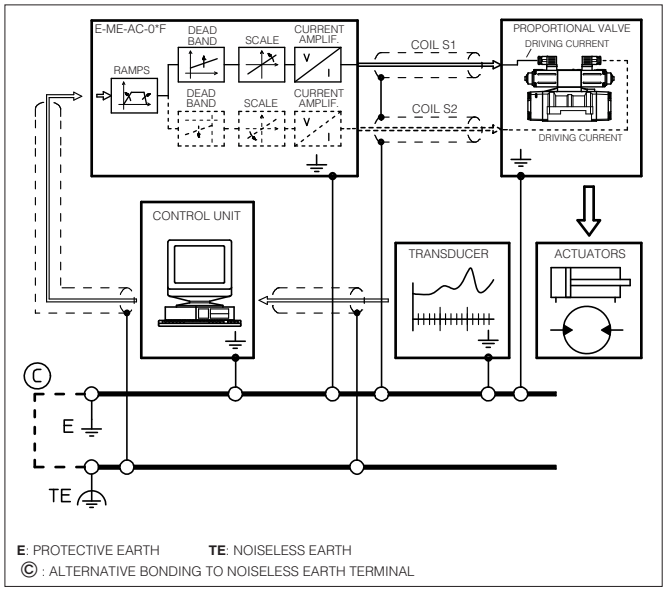
NOTE: S1 and S2 solenoids are referred respectively to B port side and A port side.

14 GENERAL CONNECTIONS



* : only for E-ME-AC-05F

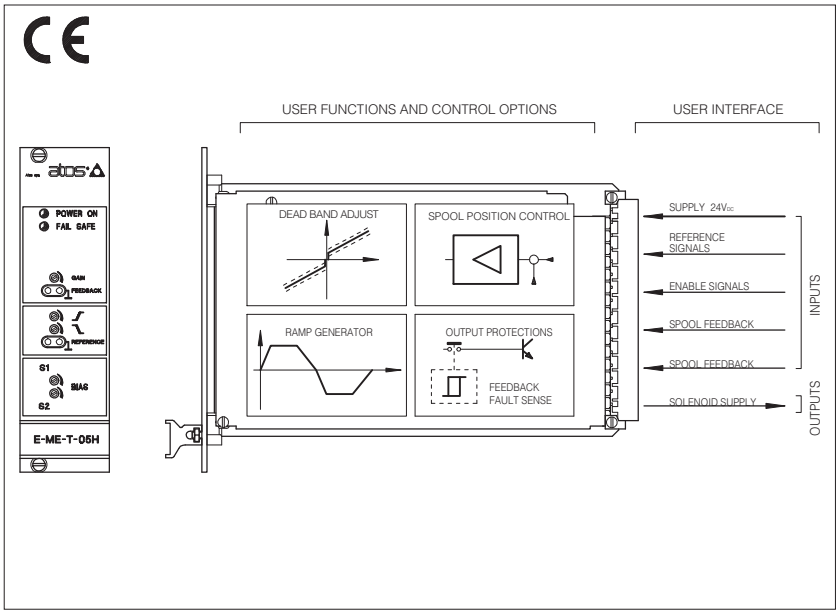
15 EARTH CONNECTIONS



E: PROTECTIVE EARTH **TE**: NOISELESS EARTH
Ⓒ : ALTERNATIVE BONDING TO NOISELESS EARTH TERMINAL

Electronic drivers type E-ME-T

analog, Eurocard format, for proportional valves with transducer



E-ME-T drivers control the current to the solenoid of Atos proportional valves with position transducer, regulating the spool position or the flow according to the electronic reference signal, adjusted by transducer's feedback.

Features:

- bias regulation
- scale and dissymmetrical ramps regulation
- voltage (standard) or current (/I option) reference signal
- voltage (standard) or current (/C option) feedback signal
- test point for reference and feedback control on front panel
- factory pre-setted
- Eurocard format (DIN 41494 - plug-in unit)
- electronic filters on input and output lines
- CE marking granting the conformity to the EMC Directive (Electromagnetic compatibility)
- both sides of the card with shielded cover with E faston connector

Applications:

Position or flow open or closed-loop regulation systems, according to the block diagram 2.

1 MODEL CODE

E-ME – T – 01H – ** /*

E-ME = electronic driver in Eurocard format

T = driver for -T proportional valve with transducer

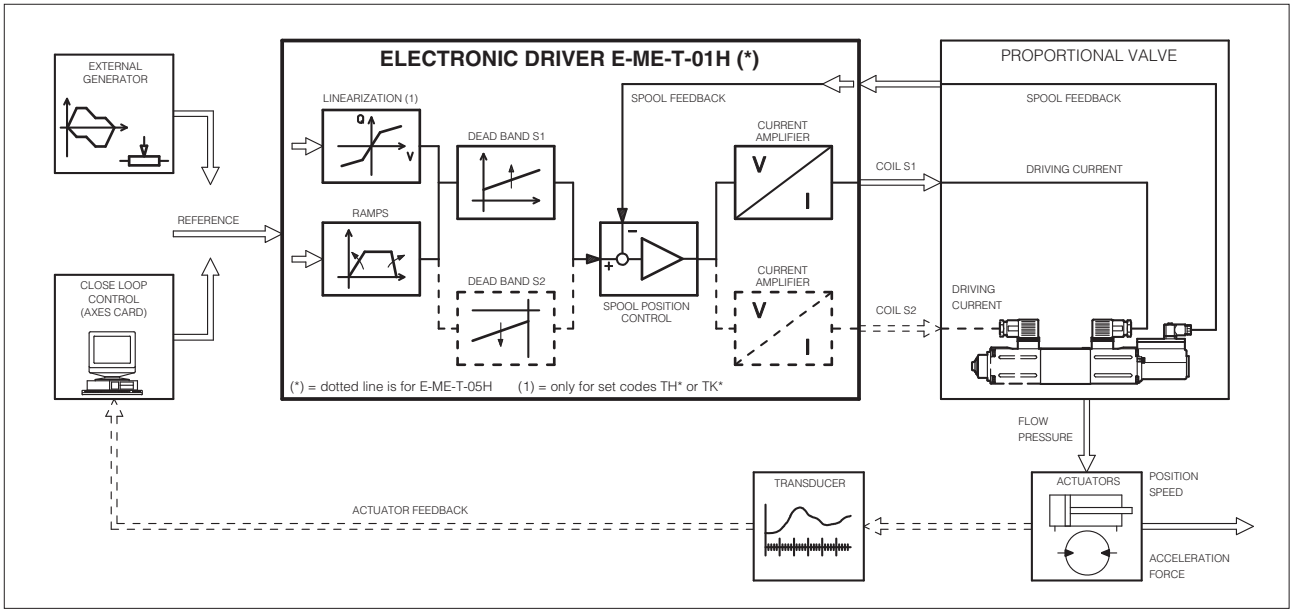
01H = for single solenoid proportional valves
05H = for double solenoid proportional valves

Options:
- = standard with rising and falling ramps
/C = suitable to receive current feedback signals 4 ÷ 20 mA (available only for ex-proof and armoured valves).
/I = suitable to receive current reference signal 4 ÷ 20 mA.

Series number

Set code (see 4.4)

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-ME-T ELECTRONIC DRIVERS

Power supply (positive at contacts 2a, 2c) (negative at contacts 4a, 4c)	Stabilized : $24V_{DC}$ Rectified and filtered : V_{RMS} = 21 ÷ $33V_{DC}$ (max ripple 2Vpp)
Max power consumption	50 W
Current supplied to solenoids	Imax= 3,3 A square wave PWM type (for ex-proof valves Imax = 2,5 A)
Nominal reference signal, factory preset	E-ME-T-01H : 0 ÷ 10V at contact 12c (GND on 8a) (±10V option, see 4.4) E-ME-T-05H : ±10V at contact 12c (GND on 8a or 16c) for option /I : 4 ÷ 20 mA at contact 12c (+) and 18c (-)
Reference signal variation range (internal scale adjust option)	±10V (SW pos. 1) and ±5V (SW pos. 2)
Input signal impedence	Voltage Ri > 50K - (/I option Ri = 316)
Potentiometer supply	+10V / 10 mA at contact 10c and -10V / 10mA at contact 14c
Ramp time	14 sec. max (0 ÷ 100% of reference signal)
Enabling signal	V = 5 ÷ $24V_{DC}$ on contact 8c with led indicator on panel
Electrical wiring	Coil: : 2 x 1 mm^2 to 20 m 2 x 1,5 mm^2 shielded to 40 m Transducer: : 4 x 0,25 mm^2 to 20 m 4 x 0,5 mm^2 shielded to 40 m
Card format	Europa 100x160 mm (Plug-in unit DIN 41494)
Card connector	Male DIN 41612 /D
Connector elements available	Type E-K-32M frame snap connector (see table G800) **to be ordered separately**
Operating temperature	0 ÷ 50 °C (storage -20 ÷ +70 °C)
Front panel dimensions	128,4 x 35,3 mm
Weight	520 g
Features	Position control by PID action - Fast solenoid excitation and switching off. Outputs to solenoids protected against accidental short circuits. Feedback cable break produces an inhibition of the driver, zeroing the current and creating a fail-safe position in the valve. Only for set codes TH* or TK*: circuit to make linear the regulation characteristic of the valve.

4 GENERAL SPECIFICATIONS

4.1 Power supply and wirings

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier, use a 10000µF/40V capacitor; if pulse voltage is generated by a three phase rectifier connect a 4700µF/40V capacitor (see 12).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC).
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radiotransmitter, etc.).
Wire the earth connection as shown in 12, according to CEI EN 60204-1 standards.
Connect the shield of the driver to the noiseless earth terminal (TE) 14.

4.2 Reference signal

The electronic driver is designed to receive external voltage or current reference signals according to 5.
Note that drivers suitable to receive current reference (option /I) have reference signal values in the range 4 ÷ 20 mA.

4.3 Enabling signal

The digital signal on contact 8c allows to enable (24 V_{DC}) or disable (0 V) the driver without switching off the power supply; use this signal to cyclically inhibit the driver or in emergency conditions

4.4 Set code

Basic calibration of the electronic driver is factory preset according to the proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follows:

DHZO-T-05*	= DH05SA	DPZO-T-17*	= DP17SD	DLHZO-T-0*-T7	=TH04SA
DHZO-T-05*/B	= DH05SA	DPZO-T-17*/B	= DP17BD	DLKZOR-T-1*-T	=TK14SC
DKZOR-T-15*	= DK15SB	DPZO-T-27*	= DP27SC	DLHZO-T-T51	=TH06SA
DKZOR-T-15*/B	= DK15SB	DPZO-T-27*/B	= DP27BC		
		DPZO-T-37*	= DP37SC	LIQZO-T-162	=TQ16SA
DHZO-T-070	= DH06SA	DPZO-T-37*/B	= DP37BC	LIQZO-T-252	=TQ25SA
DHZO-T-070/B	= DH06BA	DPZO-T-67*	= DP67SA	LIQZO-T-322	=TQ32SA
DKZOR-T-170	= DK16SA	DPZO-T-67*/B	= DP67BA	LIQZO-T-402	=TQ42SA
DKZOR-T-170/B	= DK16BA			LIQZO-T-502	=TQ52SB
DHZO-T-07*	= DH07SA	DLHZO-T-0*	= DH04SA		
DHZO-T-07*/B	= DH07BA	DLHZO-T-0*/B	= DH04SA	QVHZO-T-06/*	=QV0NSA
DKZOR-T-17*	= DK17SB	DLKZOR-T-1*	= DK14SC	QVKZOR-T-10/*	=QV1NSB
DKZOR-T-17*/B	= DK17BB	DLKZOR-T-1*/B	= DK14SC		

For **ex-proof valves**, insert an "A" in the fifth digit of the code adjustment; for example, the code adjustment for DLHZA-T is DH04AA (see table E120).

4.5 Calibration/settings available to the user, see 7, 8, 9, 10

Scale , see 7
The Scale regulation, available on the card side, permits to modify the relation between the reference signal and the position or the regulated flow.
Modifying this regulation it is possible to fit the valve hydraulic behaviour to the effective system conditions; in addition the two regulations available for double solenoid valves (driver E-ME-T-05H) permit to set different hydraulic adjustments for positive and negative movements.
The Scale regulation is factory set in order to control the max valve opening with 100% of the reference signal (10V)

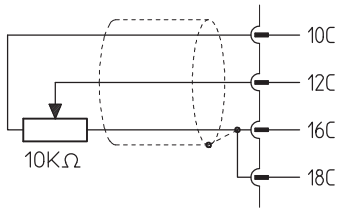
Bias, (dead band compensation).
The bias regulations, available on the front panel (P1, P2), permit to set the correspondence between the electrical zero of the reference signal with the beginning of the valve's hydraulic regulation, compensating the dead band and the component's mechanical tolerances .
Modifying this regulation (see 9, 10) it is possible to fit the valve hydraulic behaviour to the effective system conditions; in case of drivers for double solenoid valves (E-ME-T-05H) the bias are active only when the reference signal is over the threshold value = ±200 mV.
This regulation is factory set at the standard values depending to the proportional valve to be controlled and it is identified by the driver set code (see 4.4)

Ramps, see 7, 11, 12.
The ramp regulation, available on the front panel, permit to modify the time in which the valve reaches the set opening value in front of a step change of the reference signal.
The ramp regulation is factory set at value close to zero and it can be increased up to 14 sec max for a step change of the reference signal from 0% to 100%.

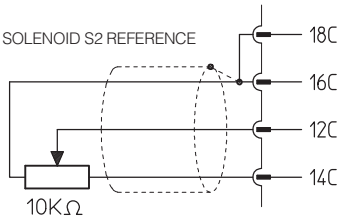
5 EXTERNAL REFERENCE SIGNALS

EXTERNAL POTENTIOMETERS **CONNECTIONS**

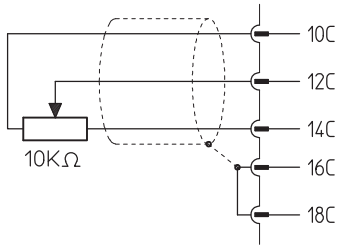
SOLENOID S1 REFERENCE



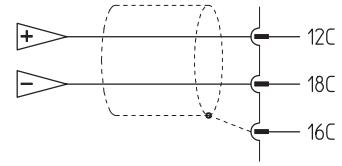
SOLENOID S2 REFERENCE



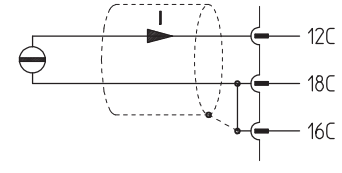
SOLENOIDS S1 AND S2 REFERENCE



DIFFERENTIAL EXTERNAL REFERENCE



/I OPTION 4 ÷ 20 MA



The two available regulations P3 and P4 permit to respectively regulate the ramp times for positive and negative variations of the reference signal. In case of application of the driver in closed loop systems, it is advisable to disable the ramp function: it is possible to permanently disable this function by means of a switch on the card side (7) or temporarily, connecting the pin 6c and 6a (12)

Gain, see 8 (only for adjustments TH* and TK*).
Pressure gain adjustment around "zero" increases sensitivity and positioning accuracy of the axis and optimize the valve operation according to the stiffness of the system by increasing the hydraulic gain of the valve around the hydraulic zero.

6 INSTALLATION AND START-UP

6.1 Warning:

- Do not insert or remove the driver while the electronic system is energized
- Connect the electronic driver according to the desired connection scheme (see 11, 12)
- The voltages must be always measured in reference to the GND (pin 8a of the connector)
- Refer to 8 to identify the components mentioned in the setting procedure
- To check the reference signal and the regulated valve opening , use the test points T1 and T2 the on front panel.
- To check the correct solenoid command for positive and negative regulations, use the two led S1 and S2 (only for drivers E-ME-T-05H)

6.2 Start-up

It is possible that the factory settings do not match the required performances for the specific application. The system can be optimized on field, by setting in sequence the bias, scale and ramp potentiometers.
It is advisable to perform calibration procedures in the order given below.

Bias adjustment (dead band compensation), see 8, 9, 10.

- Supply a reference signal voltage (0 VDC for E-ME-T-01H and ±0,2 VDC for E-ME-T-05H;
- Gradually turn potentiometer(s) (P1 for coil S1 and P2 for coil S2) until a movement of the controlled actuator is obtained.
- Turn slowly in the opposite sense until stop is obtained.

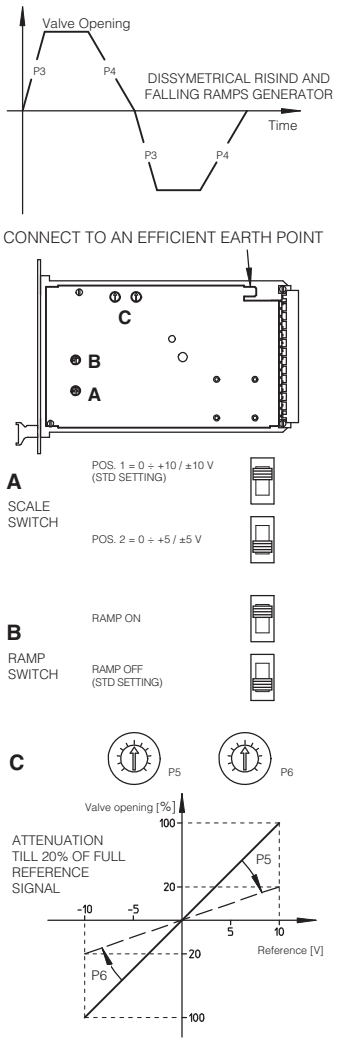
Scale adjustment, see 7, 9, 10
Set the switch A (see…..) depending to the selected range of the reference signal.
In case it is required the regulation of the valve max opening, proceed as follow:

- supply max reference signal (for E-ME-T-05H driver repeat for max negative voltage) in the specificated range and turn counterclockwise internal scale potentiometers P5 and P6 (factory preset to 100%) to reduce valve opening (see 7-C).

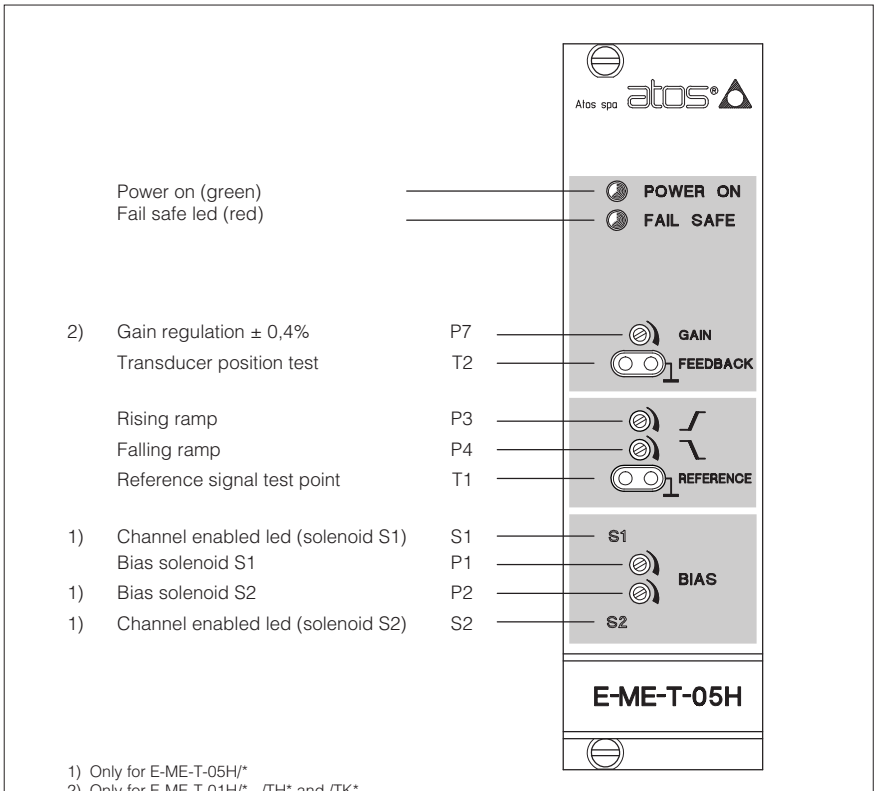
Gain see 8, 9 (only for adjustment TH* and TK*).
Front panel potentiometer P7 could be rotated to increase sensitivity and positioning accuracy of the axis (clockwise rotation = increase in sensitivity). Factory preset completely counterclockwise).

Ramps (see 7, 8).
If the card is being used in a open loop system push the switch from position ramp off (standard) to position ramp on, (see 7-B). Calibrate the ramp settings only if dynamic impacts and tendencies towards instability persist after optimizations of the whole system. Adjust the ramp settings using the ramp potentiometers (P3 and P4) until the phenomenon has been eliminated (Clockwise rotation = increase in ramp time).

7 RAMPS AND SETTINGS

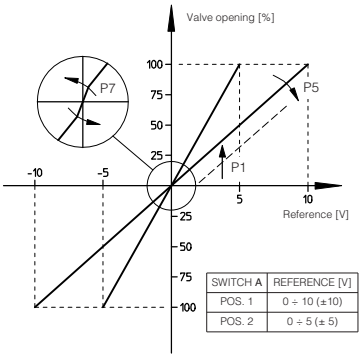


8 E-ME-T-05H TOPOGRAPHICAL VIEW OF REGULATIONS



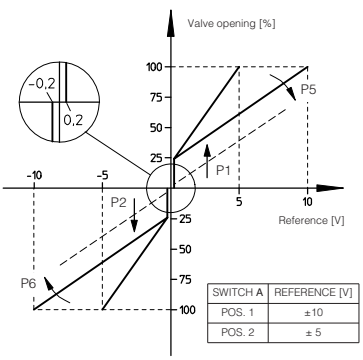
1) Only for E-ME-T-05H/*
2) Only for E-ME-T-01H/* /TH* and /TK*

9 E-ME-T-01H DIAGRAM



SWITCH A	REFERENCE [V]
POS. 1	0 ÷ 10 (±10)
POS. 2	0 ÷ 5 (± 5)

10 E-ME-T-05H DIAGRAM

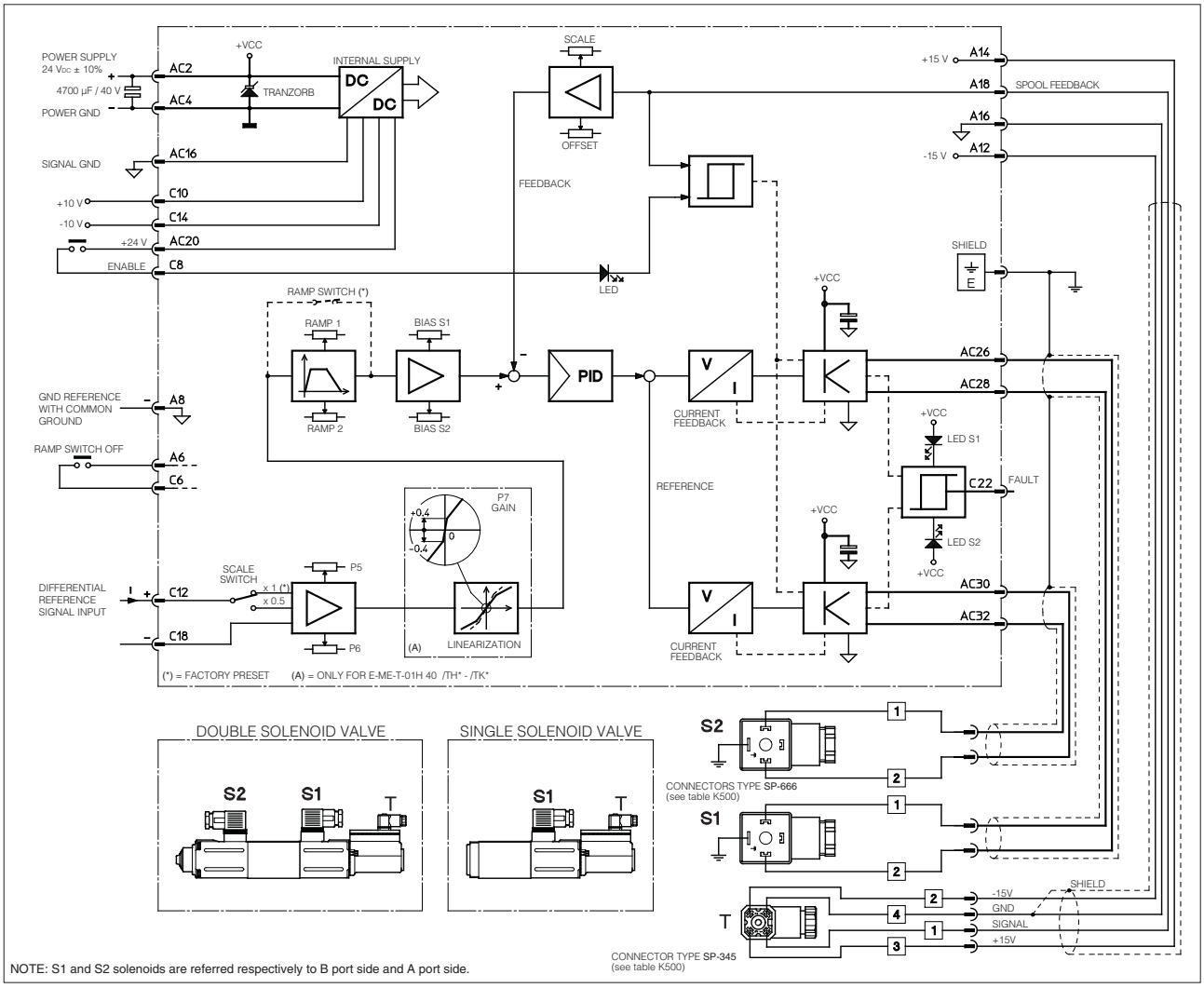


SWITCH A	REFERENCE [V]
POS. 1	±10
POS. 2	± 5

11 IMPORTANT INSTRUCTIONS

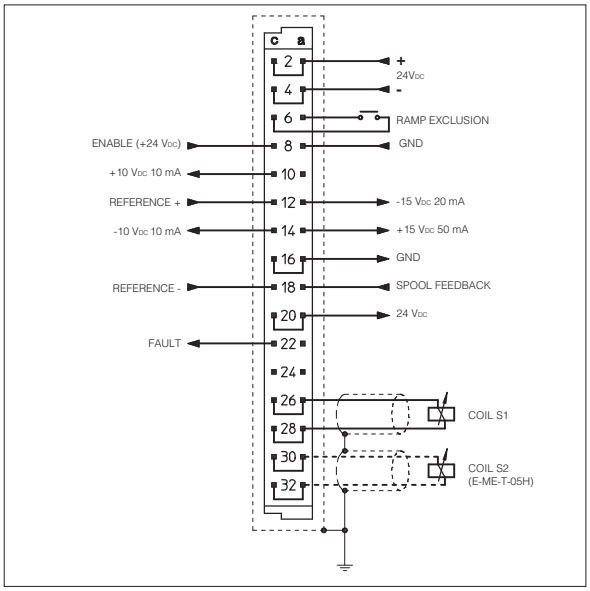
ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

12 WIRING BLOCK DIAGRAM

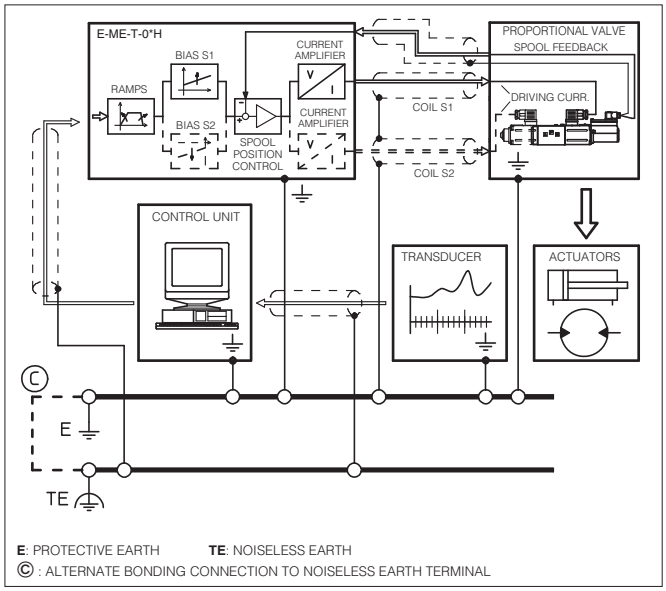


NOTE: S1 and S2 solenoids are referred respectively to B port side and A port side.

13 GENERAL CONNECTIONS



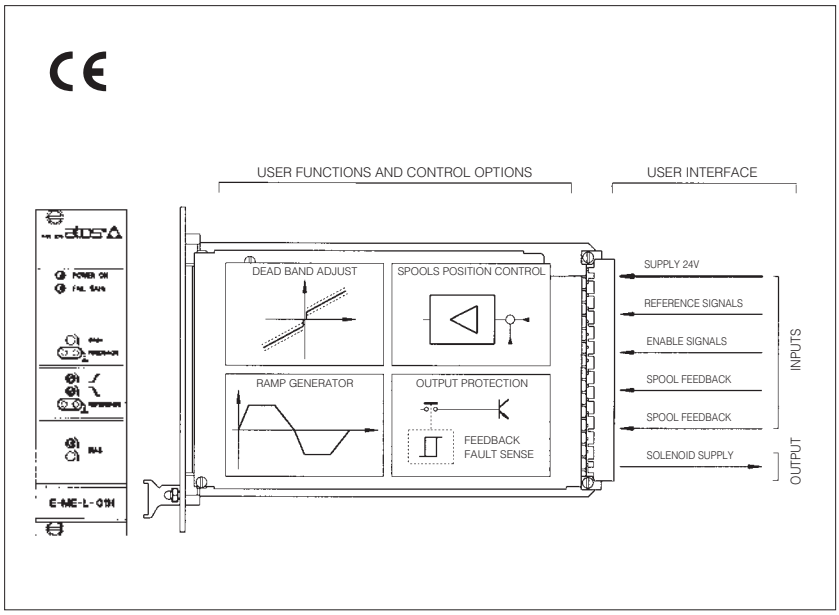
14 EARTH CONNECTIONS



E: PROTECTIVE EARTH **TE**: NOISELESS EARTH
Ⓒ : ALTERNATE BONDING CONNECTION TO NOISELESS EARTH TERMINAL

Electronic drivers type E-ME-L

analog, Eurocard format, for proportional valves with two transducers



E-ME-L drivers control the current to the solenoid of Atos proportional valves with position transducer, regulating the spool position or the flow according to the electronic reference signal, adjusted by transducers's feedbacks.

Features:

- bias regulation
- scale and dissymmetrical ramps regulation
- voltage (standard) or current (/I option) reference signal
- voltage (standard) or current (/C option) feedback signal
- test point for reference and feedback control on front panel
- factory pre-setted
- Eurocard format (DIN 41494 - plug-in unit)
- electronic filters on input and output lines
- CE marking granting the conformity to the EMC Directive (Electromagnetic compatibility)
- both sides of the card with shielded cover with E faston connector

Applications:

Position or flow open or closed-loop regulation systems, according to the block diagram 2.

1 MODEL CODE

E-ME – L – 01H – ** /*

E-ME = electronic driver in Eurocard format

L = driver for -L proportional valve with two transducers

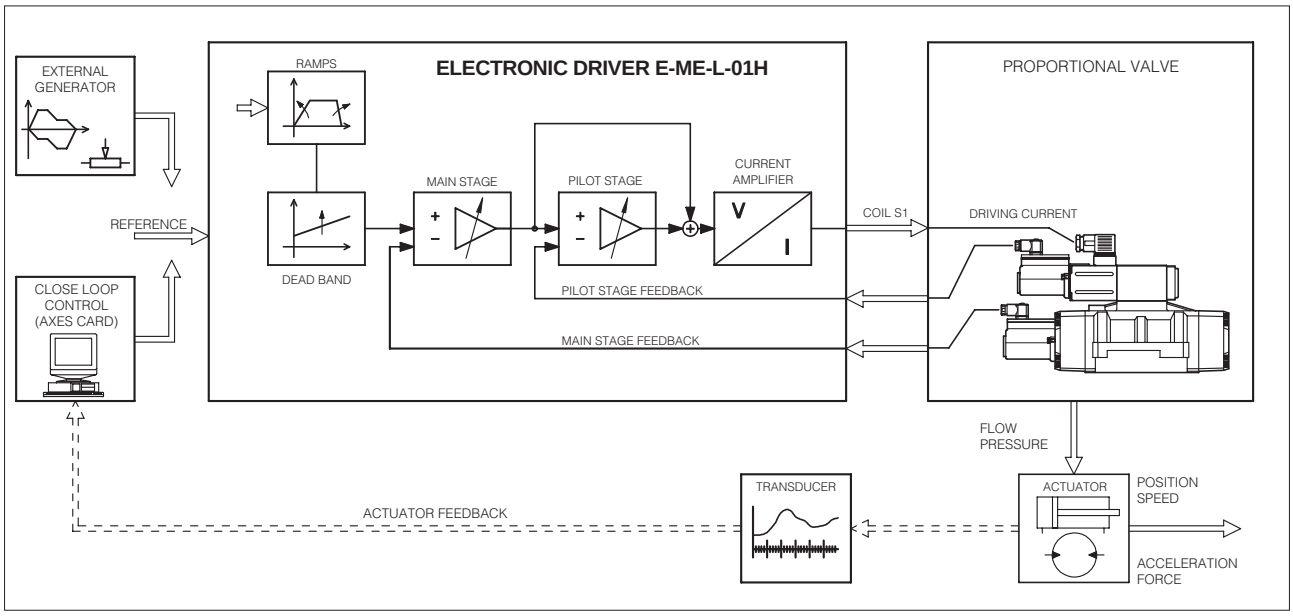
01H = for single solenoid proportional valves

Series number

Set code (see 4.4)

Options:
- **-** = standard with rising and falling ramps
- **/C** = suitable to receive current feedback signals 4 ÷ 20 mA (available only for ex-proof and armoured valves)
- **/I** = suitable to receive current reference signal 4 ÷ 20 mA

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-ME-L ELECTRONIC DRIVERS

Power supply (positive at contacts 2a, 2c) (negative at contacts 4a, 4c)	Nominal : 24 V_{DC} Rectified & filtered : V_{RMS} = 21÷33 (max ripple = 2Vpp)
Max power consumption	50 W
Current supplied to solenoid	Imax= 3.3A square wave PWM type
Nominal reference signal, factory preset	E-ME-L-01H : 0 ÷ 10 V at contact 12c (GND on 16ac) (± 10 V option see 4.2) for /I option : 4 ÷20 mA at contact 12c (+) and 8a (-)
Reference signal variation range, (internal scale adjust option)	± 10 V (SW pos. 1) and ± 5V (SW pos.2) 0 ÷ 10 V (0 ÷ 5 V) for valves with one external position (DPZO-L-*5, LIQZO-L-**2)
Input signal impedence	Voltage Ri > 50 KOhm - (/I option Ri = 316 Ohm)
Potentiometers supply	+10 V / 10 mA at contact 10c and -10 V / 10 mA at contact 14c
Ramp time	14 sec. max (0 ÷100% of reference signal)
Enabling signal	V = 5 ÷24 V_{DC} on contact 8c with led indicator on panel; Ri ≥ 30 kΩ (max 3 mA)
Electrical wiring	Coil : 2 x 1 mm² to 20 m 2 x 1,5 mm² shielded to 40 m Transducer : 4 x 0,25 mm² to 20 m 4 x 0,5 mm² shielded to 40 m
Card format	Europe 100x160 mm (Plug in unit DIN 41494)
Card connector	Male DIN 41612 /D
Connector elements available	Type E-K-32M frame snap connector (see table G800) **to be ordered separately**
Operating temperature	0 ÷ 50 °C (storage -20 ÷ +70 °C)
Front panel dimensions	128,4 x 35,3 mm
Weight	520 gr.
Features	Position control by PID action - Rapid solenoid excitation and switching off - Outputs to solenoids protected against accidental short circuits - Feedback cable break produces an inhibit of the driver, zeroing the current and creating a fail-safe position in the valve.

4 GENERAL SPECIFICATIONS

4.1 Power supply and wirings

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier, use a 10000µF/40V capacitor; if pulse voltage is generated by a three phase rectifier connect a 4700µF/40V capacitor (see 11).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC).
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radio-transmitter, etc.).
Wire the earth connection as shown in 11, according to CEI EN 60204-1 standards.
Connect the shield of the driver to the noiseless earth terminal (TE) 13.

4.2 Reference signal

The electronic driver is designed to receive external voltage or current reference signals according to 5 .
Note that drivers suitable to receive current reference (option /I) have signal values in the range 4 to 20mA. For single solenoid valves with two external positions (*60), the reference signal is symmetrical ±10 V (±5 V).

4.3 Enabling signal

The digital signal on contact 8c allows to enable (24 V_{DC}) or disable (0 V) the driver without switching off the power supply; use this signal to cyclically inhibit the driver or in emergency conditions

4.4 Set code

Basic calibration of the electronic driver is factory preset according to proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follow:

DPZO-L-15*	= DL15SA	DPZO-L-370*/B	= DL36SB
DPZO-L-15*/B	= DL15SA	DPZO-L-37*	= DL37SB
DPZO-L-160/170	= DL16SA	DPZO-L-37*/B	= DL37SB
DPZO-L-17*	= DL17SA	DPZO-L-65*	= DL65SA
DPZO-L-17*/B	= DL17SA	DPZO-L-660/670	= DL66SA
DPZO-L-25*	= DL25SB	DPZO-L-67	= DL67SA
DPZO-L-25*/B	= DL25SB	LIQZO-L-162L4	= LQ12SA
DPZO-L-260*	= DL26SB	LIQZO-L-252L4	= LQ22SB
DPZO-L-270*	= DL26SB	LIQZO-L-253L4	= LQ23SB
DPZO-L-260*/B	= DL26SB	LIQZO-L-322L4	= LQ32SA
DPZO-L-270*/B	= DL26SB	LIQZO-L-323L4	= LQ33SA
DPZO-L-27*	= DL27SB	LIQZO-L-402L4	= LQ42SB
DPZO-L-27*/B	= DL27SB	LIQZO-L-403L4	= LQ43SA
DPZO-L-35*	= DL35SB	LIQZO-L-502L4	= LQ52SB (*)
DPZO-L-35*/B	= DL35SB	LIQZO-L-503L4	= LQ53SB (*)
DPZO-L-360*	= DL36SB	LIQZO-L-632L4	= LQ62SC (*)
DPZO-L-370*	= DL36SB	LIQZO-L-633L4	= LQ63SC (*)
DPZO-L-360*/B	= DL36SB	LIQZO-L-802L4	= LQ82SC (*)
		LIQZO-L-803L4	= LQ83SD (*)
		LIQZO-L-10002	= LQ92SC (*)

(*) These codes have the main stage tranducer connection different from standard (see 11, 12 - connection type B)
For **ex-proof valves**, insert an "A" in the fifth digit of the code adjustment; for example, the code adjustment for DPZA-L-15* is DL15AA (see table E120).

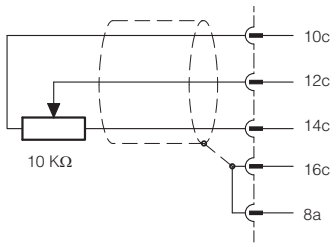
4.5 Calibrations/settings available to the user, see 7, 8, 9, 10.

Scale, see 7
The Scale regulation, available on the card side, permits to modify the relation between the reference signal and the position or the regulated flow.
Modifying this regulation it is possible to fit the valve hydraulic behaviour to the effective system conditions; in addition the two regulations available for positive and negative reference signals permit to set different hydraulic adjustments for positive and negative movements.
The Scale regulation is factory set in order to control the max valve opening with 100% of the reference signal (10 V).

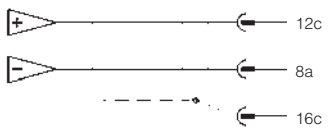
5 EXTERNAL REFERENCE SIGNALS

EXTERNAL POTENTIOMETER CONNECTIONS

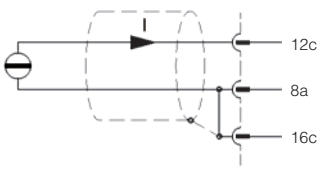
±10 V REFERENCE



DIFFERENTIAL EXTERNAL REFERENCE



/I OPTION 4 ÷ 20 mA



Bias (dead band compensation)
The bias regulations, available on the front panel (P1), permit to set the correspondence between the electrical zero of the reference signal with the beginning of the valve's hydraulic regulation, compensating the dead band and the component's mechanical tolerances .
Modifying this regulation (see 9) it is possible to fit the valve hydraulic behaviour to the effective system conditions.
This regulation is factory set at the standard values depending to the proportional valve to be controlled and it is identified by the driver set code (see 4.4)

Ramps, see 7, 11.
The ramp regulation, available on the front panel, permit to modify the time in which the valve reaches the set opening value in front of a step change of the reference signal.
The ramp regulation is factory set at value close to zero and it can be increased up to 14 sec max for a step change of the reference signal from 0% to 100%.
The two available regulations P3 and P4 permit to respectively regulate the ramp times for positive and negative variations of the reference signal. In case of application of the driver in closed loop systems, it is advisable to disable the ramp function: it is possible to permanently disable this function by means of a switch on the card side (7) or temporarily, connecting the pin 6c and 6a (12)

6 INSTALLATION AND START-UP

6.1 Warning

- Do not insert or remove the driver while the electronic system is energized.
- Connect the electronic driver according to the desired connection diagram (see 10, 11)
- The voltages must be always measured in reference to the GND (pin 16a of the connector).
- Refer to 8 to identify components mentioned in the setting procedure.
- To check the reference signal and the regulated valve opening , use the test points T1 and T2 the on front panel.

6.2 Start-up

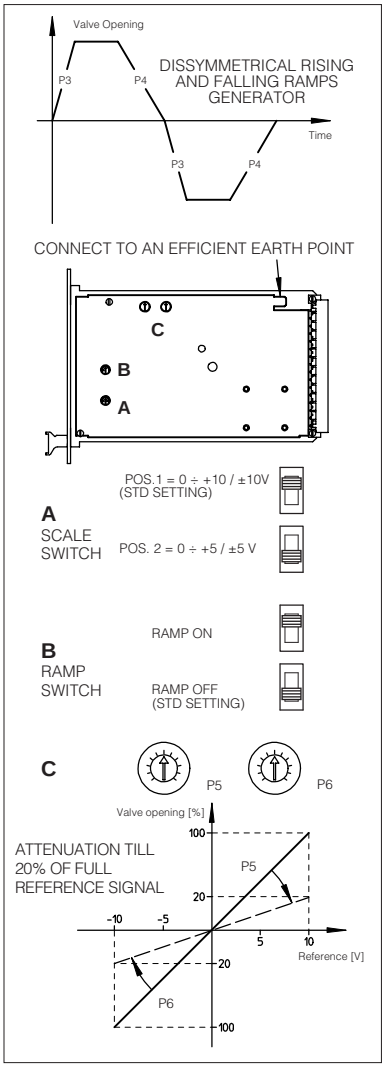
Factory preset adjustments may not meet the desired requirements for the specific application and performances can be optimized by on-site re-adjustements of bias, scale and ramps potentiometers, in sequence. It is advisable to perform calibration procedures in the order given below.

Bias adjustment (dead band compensation)**,** see 8, 9, 10.
- Supply a reference signal voltage = $0V_{DC}$.
- Gradually turn bias potentiometer P1 until a movement of the controlled actuator is obtained.
- Turn slowly in the opposite sense, until stop is obtained.

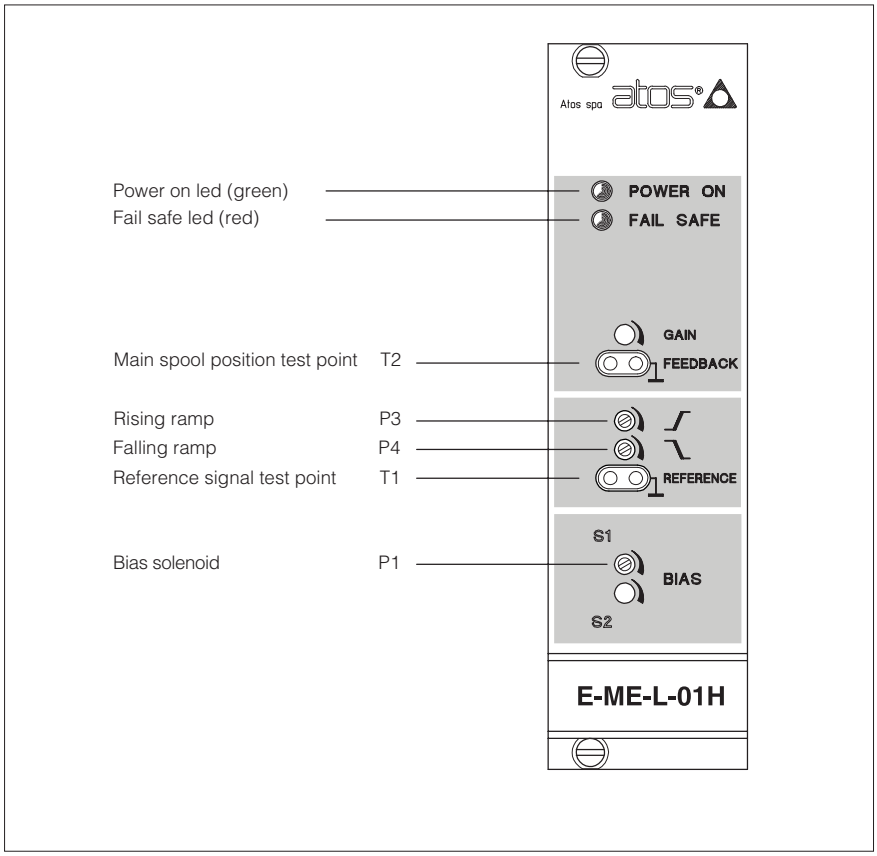
Scale adjustment see 7, 9, 10.
Factory preset reference signal is ± 10V (selector in positon 1). If a 0 ÷ 5V (± 5V) reference signal is available, set selector in position 2 (see 7-A).
- Only in particular cases when a non standard reference signal is available it is possible to adjust maximum valve opening with scale regulation proceeding as follow :
- supply max reference signal voltage (repeat for max negative voltage) in the specificated range and turn counterclockwise internal scale potentiometers P5 and P6 (factory preset to 100%) to reduce valve opening (see 7-C).

Ramps (see 7, 8)
If the card is being used in a open loop system push the switch from position ramp off (standard) to ramp on, (see 7-B). Calibrate the ramp settings only if dynamic impacts and tendencies towards instability persist after optimizations of the whole system. Adjust the ramp settings using the ramp potentiometers (P3 and P4) until the phenomenon has been eliminated (Clockwise rotation = increase in ramp time).

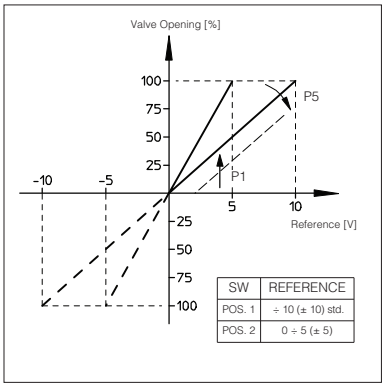
7 RAMPS AND SETTINGS



8 E-ME-L-01H TOPOGRAPHICAL VIEW OF REGULATIONS



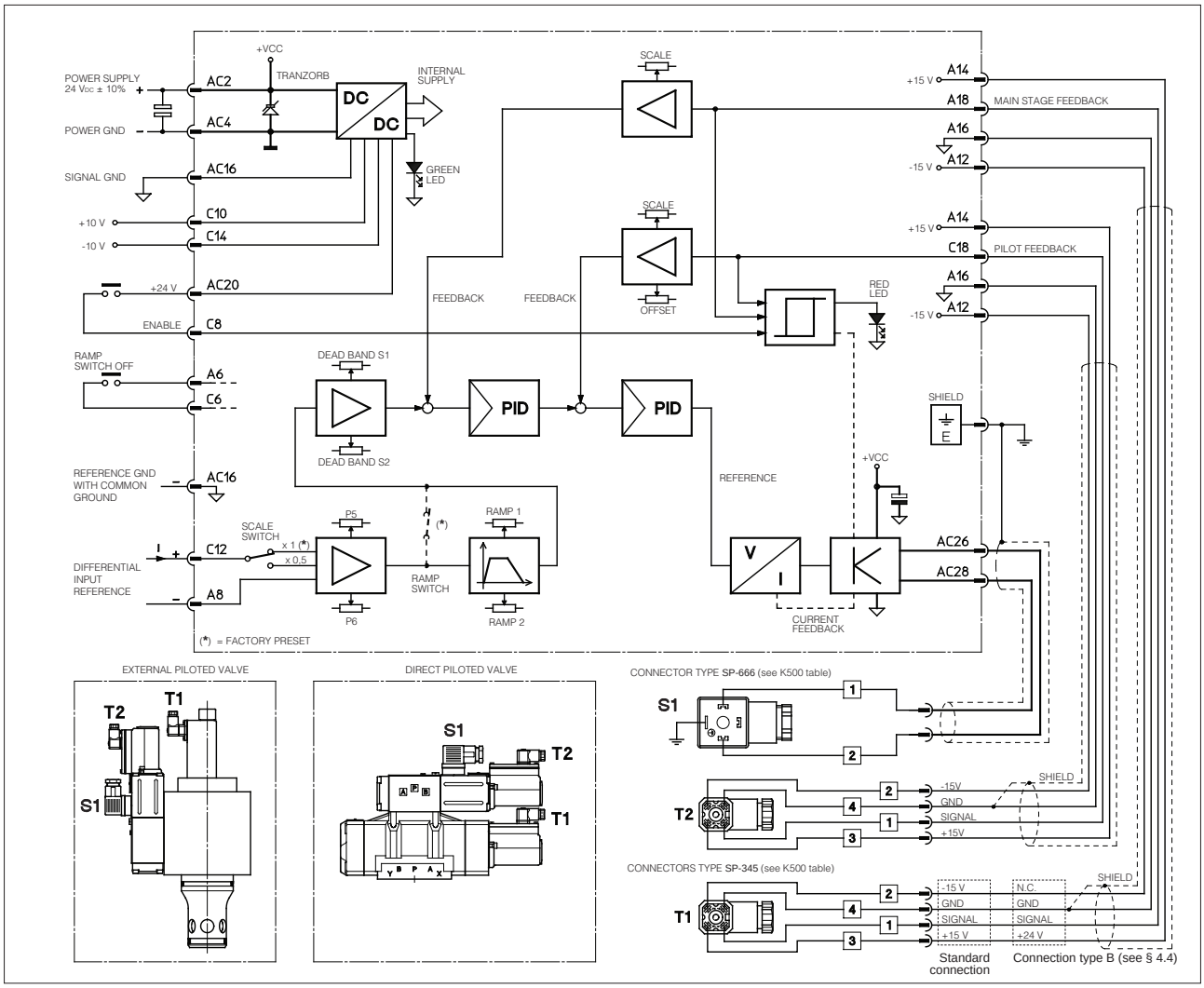
9 E-ME-L-01H DIAGRAM



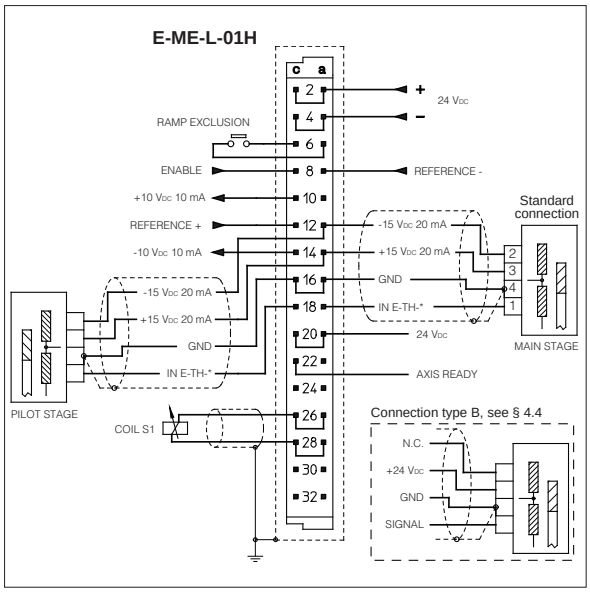
10 IMPORTANT INSTRUCTIONS

ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

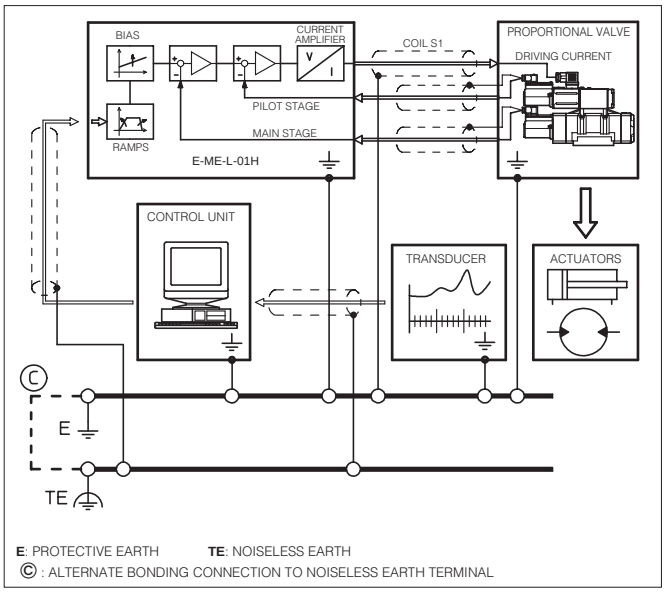
11 WIRING BLOCK DIAGRAM



12 GENERAL CONNECTIONS

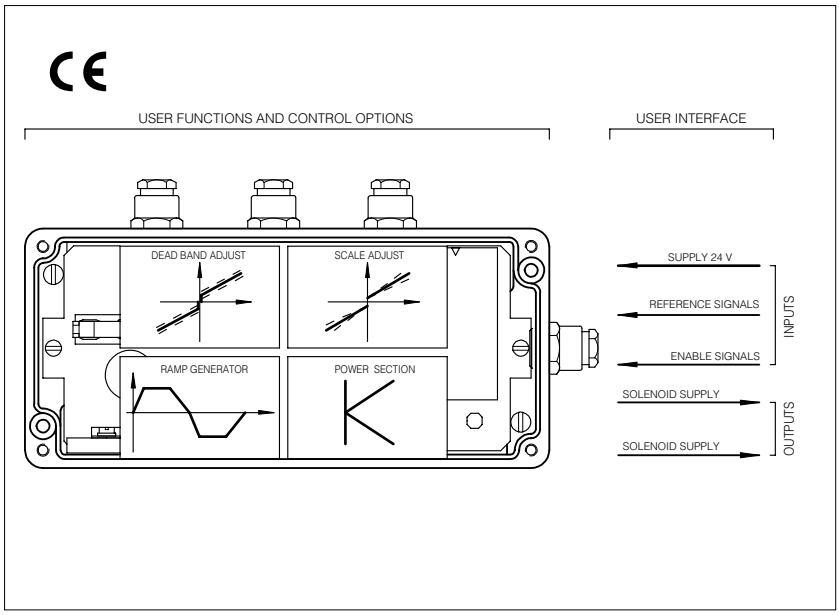


13 EARTH CONNECTIONS



Electronic drivers type E-RP-AC

analog, sealed and rugged box, for proportional valves without transducer



E-RP-AC drivers control the current to the solenoid of Atos proportional valves without pressure or position transducer, regulating the spool position, the flow or the pressure according to the electronic reference signal.

Features:

- bias and scale regulations by potentiometers
- symmetrical (standard) or dissymmetrical (/RR option) rising and falling ramp generator
- factory pre-setted
- alluminium box with IP65 protection degree
- power supply 24 VDC or 12 VDC (/12 option)
- electronic filters on input and output lines
- CE marking granting the conformity to the EMC Directive (Electromagnetic compatibility)

Applications:

Pressure, flow, position open or closed-loop regulation systems, according to the block diagram 2.

1 MODEL CODE

E-RP – AC – 01F – – ** /*

E-RP = Electronic driver in sealed box

AC = for proportional valves without transducer

01F = for single solenoid proportional valves
05F = for double solenoid proportional valves

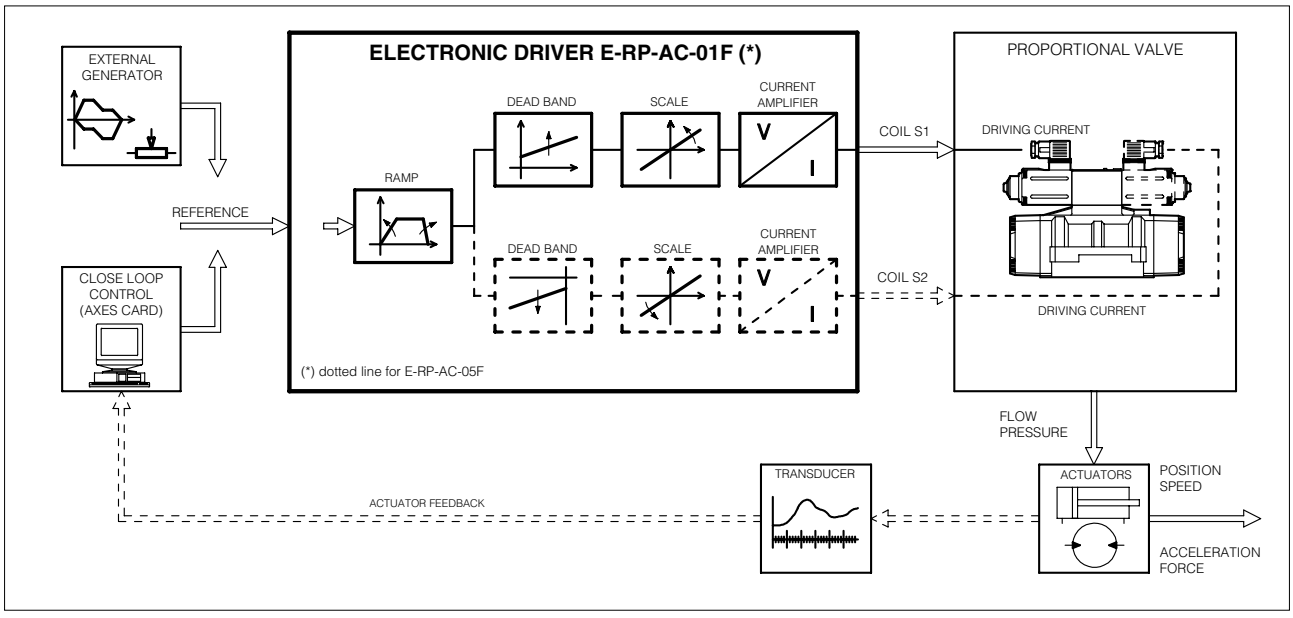
Options:
- = standard symmetrical ramp
/RR = with adjustable dissymmetrical ramps
/RRE = with external ramp setting
/I = suitable to receive current reference signal 4 ÷ 20 mA

Options:
- = 24 VDC power supply
/12 = 12 VDC power supply (see 4.1)

Series number

Set code (see 4.4)

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-RP-AC ELECTRONIC DRIVERS

Power supply (positive at contacts 1) (negative at contacts 2)	Stabilized : 24V_{DC} (12 V_{DC} ± 10% for 12 $_{DC}$ option) Rectified & filtered : V_{RMS} = 21 ÷ 33 (max ripple = 2Vpp)
Max power consumption	50 W
Current supplied to solenoid	Imax= 3.3A square wave PWM type; (for ex-proof valves Imax = 2,5A)
Nominal reference signal, factory preset	E-RP-AC-01F: : 0 +5V at contact 10 (GND on 11) E-RP-AC-05F: : ± 5V at contact 10 (GND on 11) 4-20 mA for /I at contacts 10 (+) and 11 (-)
Reference signal variation range, (scale adjustment)	± 10V max ± 2,5 V min
Input signal impedence	Voltage Ri > 50 KOhm - (/I option Ri = 316 Ohm)
Potentiometers supply	+5V / 50 mA at contact 8 and -5V / 10mA at contact 9
Ramp time	5 or 90 sec. max (0 ÷100% of reference signal) see 8
Enabling signal	V = 5 ÷ 24V_{DC} on contact 7
Electrical wiring	Coil: 2 x 1 mm^2 to 20 m 2 x 1,5 mm^2 shielded to 40 m
Card format	Sealed box IP 65
Connections	14 contacts - terminal strip
Cable Clamp	Dimension PG7 - water proof - Cable Ø 5 ÷ 6,5
Operating temperature	0 ÷ 50 °C (storage -20 ÷ +70 °C)
Box dimensions	175 x 80 x 57 mm
Weight	940 gr.
Features	Rapid solenoid excitation and switching off Outputs to solenoids protected against accidental short circuits.

4 GENERAL SPECIFICATIONS

4.1 Power supply and wirings

The power supply must be appropriately stabilized or rectified and filtered. If the power supply is generated by a single phase rectifier, use a 10000µF/40V capacitor; if pulse voltage is generated by a three phase rectifier connect a 4700µF/40V capacitor (see table 11).
Connect the reference signal to the main electronic control by means of shielded and twisted cables. Pay attention: the negative and the positive poles must not be exchanged each other.
Shield the wirings to avoid electromagnetic noise (EMC).
It is suitable to keep the driver and its cables far from any electromagnetic radiation source (like cables where high currents flow, electric motors, transformers, relays, solenoids, portable radio-transmitter, etc.). Wire the earth connection as shown in 11, according to CEI EN 60204-1 standards.
Connect the shield of the driver to the noiseless earth terminal (TE) 13.
The driver is designed to correctly work with 24 V_{DC} (±20%) or 12 V_{DC} (±20%) nominal voltage supply coupled with coils having a resistance from 2,0 Ω to 13,4 Ω, as shown in the side table.

Nominal supply	Valve code	R at 20 °C [Ω]
24 V_{DC}	*ZMO, *ZGO, *ZO(R)-A-* (1)	3,2
	*ZMA, *ZGA, *ZO(R)-A-* (1)	3,2
	*ZMO, *ZGO, *ZO(R)-A-*/18	13,4
12 V_{DC}	*ZMO, *ZGO, *ZO(R)-A-*/6	2,1
(1) Standard coupling		

4.2 Reference signal

The electronic driver is designed to receive voltage or current reference signals, see table 5
Note that drivers suitable to receive current reference (option /I) have signal values in the range 4 to 20mA.
It is possible to use current option also for double channels drivers type E-RP-AC-05F using the reference inversion signal on contact 12.

4.3 Monitor signal

This voltage output signal allows to measure the current supplied to the coil, read by a voltmeter between the test points on the card (see 9).
Reading scale is 1 mV = 1 mA. To visualize the signals use voltmeters with impedance >10 KΩ.

4.4 Set code

Basic calibration of the electronic driver is factory pre-set according to proportional valve it has to be coupled with. These pre-calibrations are identified by a standard number in the model code as follows:
1 = RZGO, KZGO 2 = RZMO, AG*ZO, LI*ZO
3 = DHZO, DKZOR 4 = DPZO-A-*5, DPZO-A-*7
6 = QV*ZO(R), LIQZO
For ex-proof valves, insert an “A” before the code of adjustment.
For example, the code of adjustment for RZGA is A1 (see table E120).

4.5 Calibrations accessible to the user, see 8, 9.

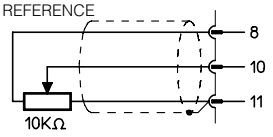
Scale
The relation between driving current and reference signal can be regulated with the Scale adjusment. For single solenoid valves with two external operating positions, the reference signal is the same as the double solenoid driver. Separate Scale potentiometer for solenoid S1 and S2 enable the electronic driver to be set for different output currents, obtaining differential hydraulic operations.

Bias (dead band)
Regulation of dead band adjusts the hydraulic zero of the valve (adjustment of starting position) to the corresponding electrical zero. The electronic driver is factory preset for the valve it is coupled according to the set code (see section 4.4). For double solenoid driver E-RP-AC-05F/* a step function generator becomes active at an input reference voltage signal greater than ± 100 mV enabling start current set by Bias potentiometers S1 and S2 for indipendent solenoid Dead Band regulation.

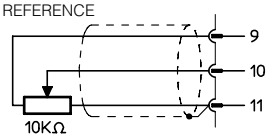
5 EXTERNAL REFERENCE SIGNALS

EXTERNAL POTENTIOMETERS **CONNECTIONS**

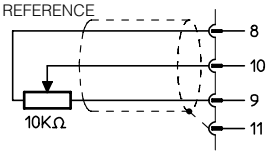
SOLENOID S1 REFERENCE



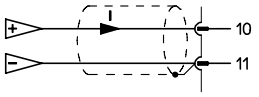
SOLENOID S2 REFERENCE



SOLENOIDS S1 AND S2 REFERENCE

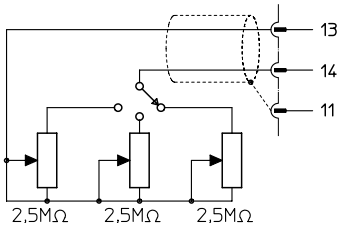


EXTERNAL REFERENCE GENERATOR AND /I OPTION



6 EXTERNAL RAMPS - /RRE option

EXAMPLE WITH THREE EXTERNAL RAMPS



Ramps, see 6, 8, 9.
The internal ramp generator circuit converts a step input signal into a slowly increasing output signal (solenoid current) .
The rise/fall time of the current is set via potentiometer P1, to a maximum time of 5 or 90 sec (switch SW1) for 0 - 100% of reference signal. The option /RR provides dissymetrical ramps, (P2) /RRE allows external ramp setting as shown in table 6.
To switch off the ramp circuit connect contacts 13 and 14 on the electric connector.

7 INSTALLATION AND START-UP

It is advisable to perform calibration procedures in the order given below.

7.1 Warning

- Never insert or remove the driver connector while the electronic system is powered on.
- Voltages must always be measured with reference to GND (connector contact 11) or test point.
- Refer to 9 to identify components mentioned in calibration procedures.

7.2 Start-up

Factory preset adjustments may not meet the desired requirements for the specific application and performances can be optimized by on-site re-adjustements of bias, scale and ramps potentiometers, in sequence.

- Connect the electronic driver according to the desired connection diagram (see 11, 12)
- The current supplied to the coil can be measured by a voltmeter connected between test point (current monitor and GND)

For E-RP-AC-05F the drive enabled led (S1 or S2) shows the supplied coil.

Enabling signal, see 11, 12.
The electronic driver operate when the contact 7 is supplied with an enabling signal (usually 24 V_{DC}). It could be useful in emergency conditions to inhibit the driver by zeroing this signal

Bias adjustment (Dead band compensation)**,** see 8, 9.

- Supply a reference signal voltage (0V_{DC} for E-RP-AC-01F and ±0,1 V_{DC} for E-RP-AC-05F).
- Gradually turn bias potentiometer(s) until a movement of the controlled actuator is obtained.
- Turn in the opposite direction, until the actuator is stopped.

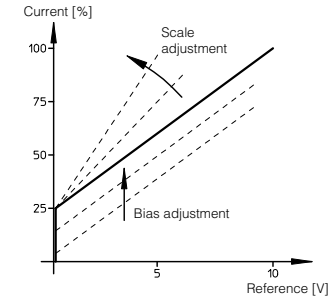
Scale adjustment see 8, 9.
Supply max reference signal voltage (for E-RP-AC-05F driver repeat for max negative voltage) in the specificated range and turn scale potentiometer(s) until the actuator speed reaches the desired value.

Ramps (see 8, 9).

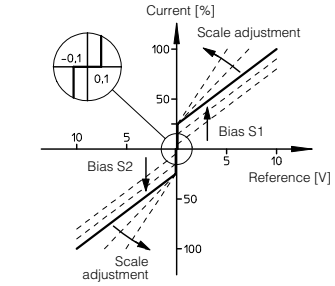
- Turning ramp potentiometer(s) clockwise acceleration(s) and deceleration(s) can be reduced to obtain optimization of the complete system.

8 RAMP AND SETTINGS

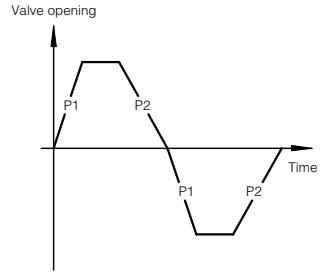
E-RP-AC-01F ADJUSTMENT



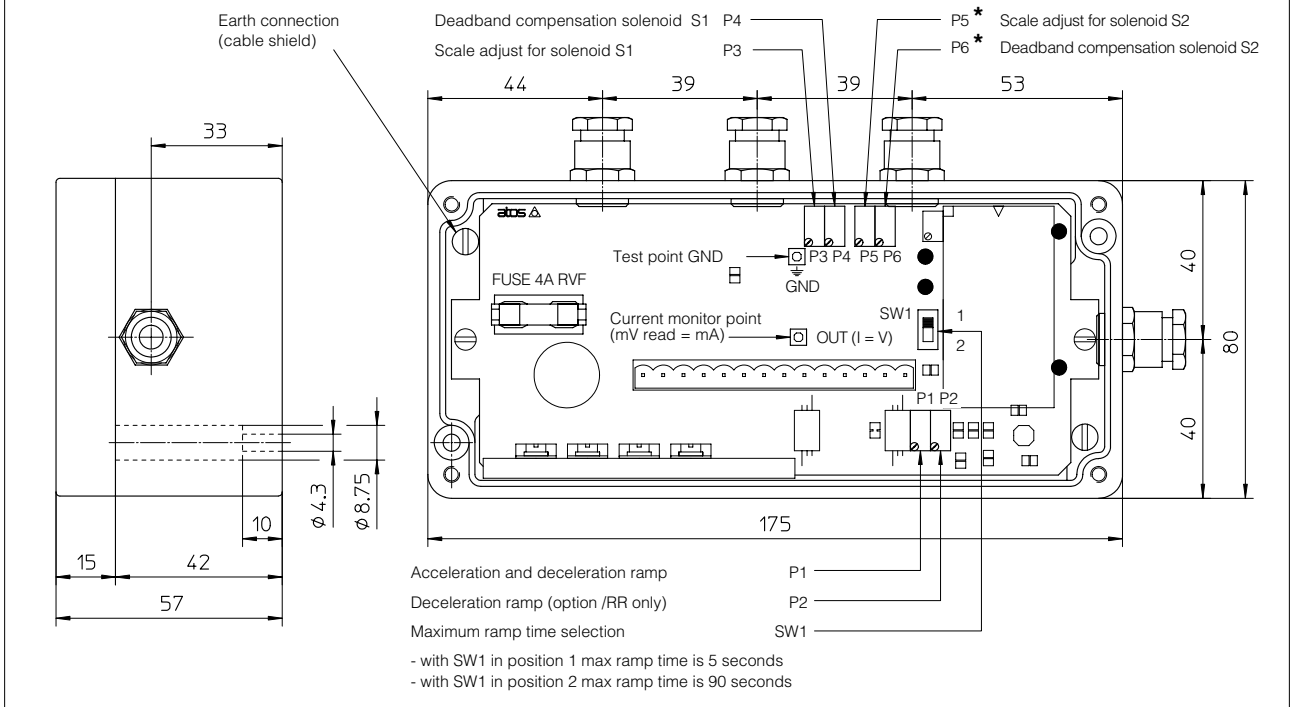
E-RP-AC-05F ADJUSTMENT



/RR OPTION - UP AND DOWN RAMPS



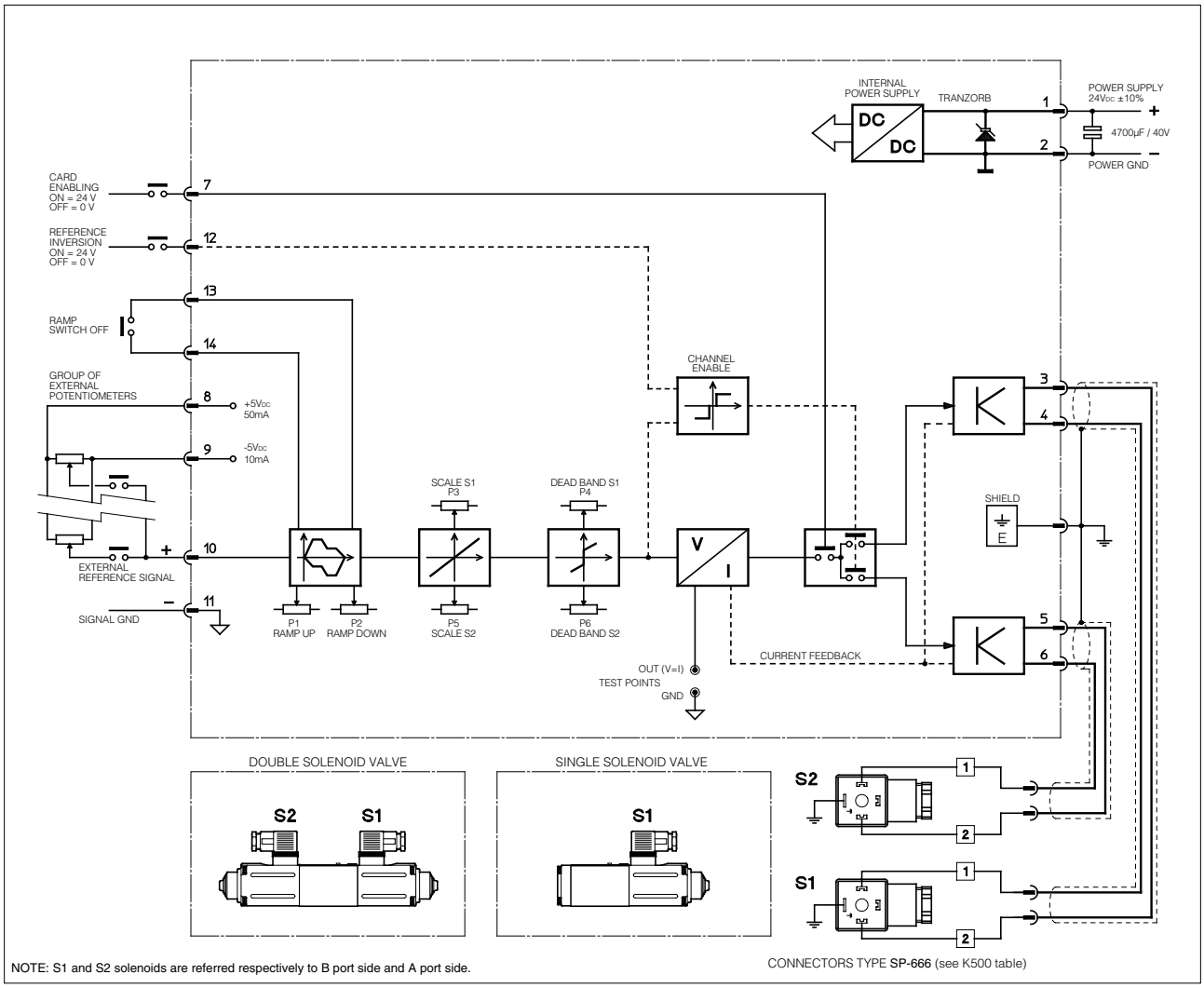
9 E-RP-AC-05F TOPOGRAPHICAL VIEW OF REGULATIONS AND DIMENSIONS [mm]



10 IMPORTANT INSTRUCTIONS

ELETTROMAGNETIC COMPATIBILITY
Atos electronic drivers and proportional valves are designed according to the 2004/108/CE Directive (Electromagnetic Compatibility) and according to EN 50081-2 (Emission) and EN 50082-2 (Immunity) standards. The electromagnetic compatibility of electronic drivers is valid only for wirings realized according to the typical electric connections shown in this technical table.
The device must be verified on the machine because the magnetic field may be different from the test conditions.
SAFETY
The electrical signals (for example reference signals, feedback and enable signal) of electronic drivers must not be used to realize safety conditions of the machine. This is in accordance with the provisions of european directives (Safety requirements of fluid technology systems and components-hydraulics, EN 982). Special attention must be payed to switch-on/switch-off of electronic drivers because they could produce uncontrolled movements of actuators operated by the proportional valves.

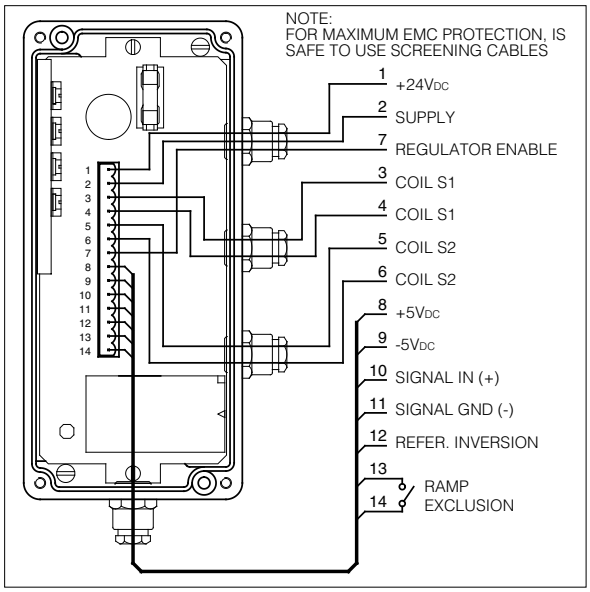
11 WIRING BLOCK DIAGRAM



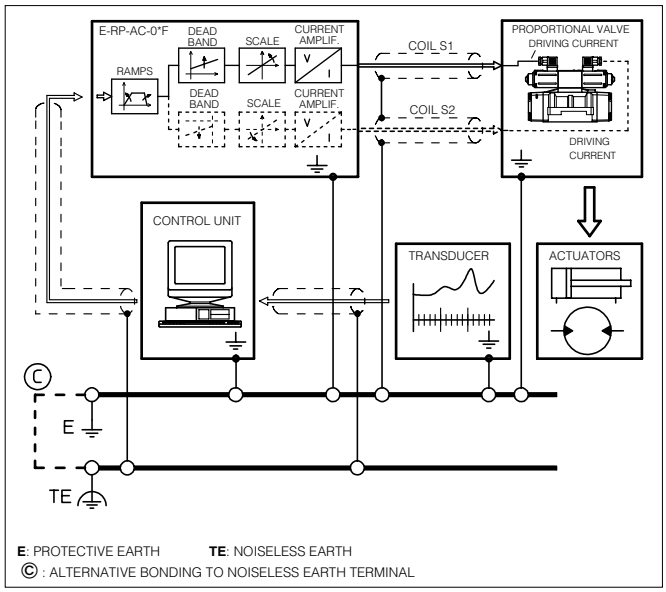
NOTE: S1 and S2 solenoids are referred respectively to B port side and A port side.

CONNECTORS TYPE **SP-666** (see K500 table)

12 GENERAL CONNECTIONS



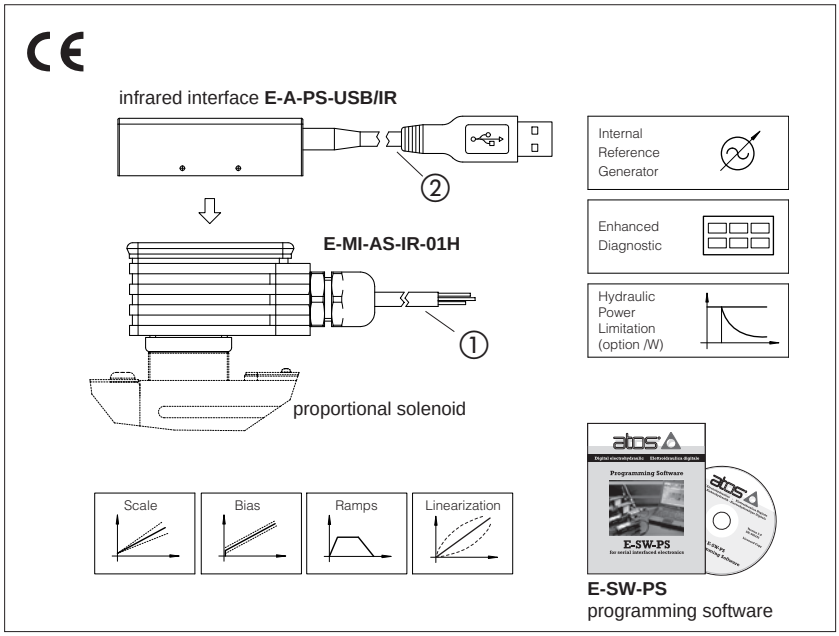
13 EARTH CONNECTIONS



E: PROTECTIVE EARTH **TE**: NOISELESS EARTH
Ⓒ : ALTERNATIVE BONDING TO NOISELESS EARTH TERMINAL

Digital electronic drivers type E-MI-AS-IR

DIN 43650 plug-in format, for proportional valves without transducer



E-MI-AS digital drivers are designed for mounting on the solenoid's DIN connector of proportional valves without transducer. They supply and control the current to the solenoid according to the electronic reference input signal. The solenoid proportionally transforms the current into a force, acting on the valve spool or poppet, against a reacting spring, thus providing the valve's hydraulic regulation.
E-MI-AS drivers can drive single or double solenoid proportional valve.

Electrical Features:

- Standard 5m cable connection ① or M12 connector (/M12 option)
- Infrared communication interface ② to program the driver with Atos PC software
- 2 leds for diagnostics: driver status and solenoid status
- +5 VDC output supply for external reference potentiometer (not available for /M12 option)
- Current reference input (/I option)
- Plastic box with IP65 protection degree and standard DIN43650 plug-in format with double earth connection to allow double-side orientation
- CE mark according to EMC directive

Software Features:

- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- 2 selectable modes for electronic reference signal: external analog input or internal generation
- Max power limitation (/W option)
- Selectable range of electronic reference analog input: voltage or current (/I option)
- Complete diagnostics of driver status, solenoid and driver fault conditions
- Intuitive graphic interface

1 MODEL CODE

E - MI - A S - IR - 01H /* **

Electronic driver in plug-in format DIN 43650

A = driver for valves without transducer

S = digital execution

IR = Serial infrared communication interface

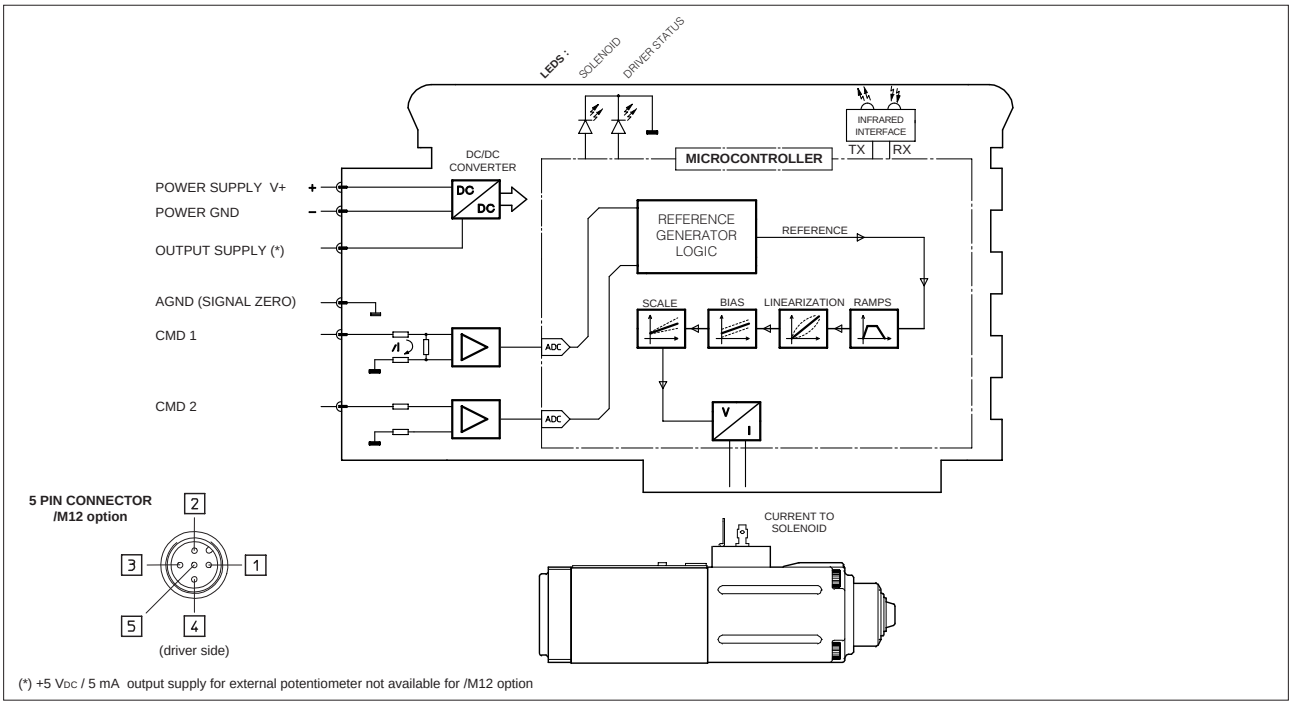
01H = for single solenoid proportional valves

Options, see section 4
- = standard version (with 5 m cable)
I = current reference input
M12 = with 5 poles M12 connector (*)
W = power limitation function (see 6.7)

Series number

(*) Note: ZH-5P female connector must be ordered separately.

2 BLOCK DIAGRAM



(*) +5 VDC / 5 mA output supply for external potentiometer not available for /M12 option

3 MAIN CHARACTERISTICS OF E-MI-AS-IR ELECTRONIC DRIVERS

Power supply (see 4.1)	Nominal: +24 VDC Nominal: +12 VDC	Rectified and filtered: VRMS = 20 ÷ 27 VMAX (ripple max 10 % VPP) Rectified and filtered: VRMS = 10 ÷ 14 VMAX (ripple max 10 % VPP)			
Max power consumption	50 W				
Current supplied to solenoids	IMAX = 2.7 A with +24 VDC power supply to drive standard proportional valves (3,2 Ω solenoid) IMAX = 3.3 A with +12 VDC power supply to drive proportional valves with /6 option (2,1 Ω solenoid)				
Reference input signal (*) (CMD1 - see 4.2)	Standard (voltage) **/I option** (current)	Input range: Input range:	0 ÷ 10 VDC 4 ÷ 20 mA / 0 ÷ 20 mA	Input impedance: Input impedance:	Ri > 50 kΩ Ri = 500 Ω
Enble Input Signal (CMD2 - see 4.5) ON/OFF Input Signal (CMD1,CMD2 - see 4.6)		Input range: Input impedance:	0 ÷ 24 VDC (OFF state: 0 ÷ 5 VDC; ON state: 9 ÷ 24 VDC) Ri > 10 kΩ		
Pressure transducer input (CMD2 - see 4.3)	**/W option**	Input range:	0 ÷ 10 VDC	Input impedance:	Ri > 50 kΩ
Output supply (see 4.4)	+5 V @ max 5 mA: output supply for external potentiometer (not available for **/M12 option**)				
Alarms	Solenoid coil not connected, short circuit and cable break with current reference signal (**/I option**)				
Format	Plastic box ; IP65 protection degree (when fixed on solenoid); DIN43650 format				
Operating temperature	-20 ÷ 50 °C (storage -25 ÷ 85 °C)				
Mass	Standard version: 450 g; /M12 option: 70 g				
Additional characteristics	Short circuit protection of current output to solenoid				
Electromagnetic compatibility (EMC)	According to Directive 2004/108/CE - Immunity: EN 61000-6-2 (2005); Emission: EN 61000-6-4 (2001)				
Communication interface	Infrared, Atos protocol with ASCII coding; E-A-PS-USB/IR adapter is required (see section 5)				
Wiring cable characteristics	2 poles x 0,5 mm^2 plus 4 poles x 0,35 mm^2, external diameter 7,4 mm				

(*) Note: Negative reference input signal not allowed.

4 SIGNALS SPECIFICATIONS

4.1 Power supply and wirings

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 (4 A fuse when 12VDC power supply is applied)

4.2 Reference Input Signal (CMD1: yellow/pin 4, referred to AGND: white/pin 3)

The driver proportionally transforms the external reference signal input into the current supplied to the solenoid.
The driver is designed to receive one analog reference input (CMD1 on yellow/pin 4) referred to the analog electric ground (AGND on white/pin3) and with a maximum range of 0 ÷ 10 VDC . Internal reference generation is software selectable (see 6.6).

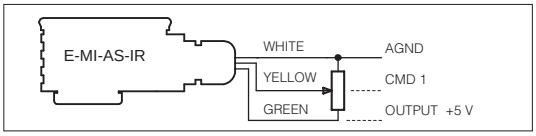
Option /I (current reference input)
The reference input signal maximum range is software selectable among current 4 ÷ 20 mA (with cable break detection) or 0 ÷ 20 mA.

4.3 Pressure Input Signal (CMD2: blue/pin 5, /W option)

When hydraulic power limitation is active (see 6.7), enable input (CMD2) is managed as an analog input and has to be connected to an external pressure transducer installed on the hydraulic system; maximum input range 0 ÷ 10 VDC.

4.4 Output supply for external potentiometer - (OUTPUT SUPPLY: green, referred to AGND: white) not available for /M12 option

The reference analog signal can be generated by an external potentiometer directly connected to the driver, using the +5VDC supply output available at green wire thus generating the desired reference signal.



4.5 Enable Input Signal (CMD2: blue/pin 5, referred to AGND: white/pin 3)

Enable input signal allows to enable/disable the current supply to the solenoid, without removing the electrical power supply to the driver; it is used to maintain active the infrared connection and the other driver functions when the valve must be disabled for safety reasons.
To enable the driver, supply a 24VDC on CMD2 (blue/pin 5, referred to white/pin 3).
The polarity of the enable input can be customized and the enable function can be deactivated, see table at side.

ENABLE CONFIGURATION			
Signal	default polarity	reverse polarity	deactiveted
9 ÷ 24 VDC	solenoid ON	solenoid OFF	solenoid ON
0 ÷ 5 V	solenoid OFF	solenoid ON	solenoid ON

4.6 ON/OFF Input Signals (CMD1: yellow/pin 4, CMD2: blue/pin 5)

When the driver is configured in internal reference generation mode (see 6.6), both reference input (CMD1) and enable input (CMD2) are managed as ON/OFF input signals. In this mode they are used to select the active reference signal, among the available stored values.

4.7 Possible combined options: /IM12, /IM12W, /IW and /M12W.

5 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the **E-SW-PS** programming software.
The **E-A-PS-USB/IR** dedicated adapter (usb to infrared) is required between the PC and the electronic driver
For a more detailed decription of software interface, PC requirements and adapter characteristics please refer to tab. **G500**.

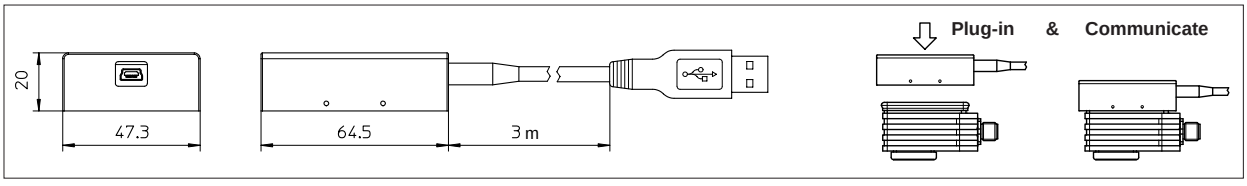
Programming software, must be ordered separately :

E-SW-PS (mandatory - first supply) = Dvd including E-SW-PS 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.

Adapter, must be ordered separately

E-A-PS-USB/IR = adapter from USB connector (PC communication port) to driver infrared communication interface: plug the adapter on the driver to establish the infrared communication



6 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main settings and features of E-MI-AS drivers.
For a detailed descriptions of all available settings, wirings and installation procedures, please refer to the programming manuals E-MAN-MI-AS included in the E-SW-PS Dvd (see section 5)

6.1 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 usefull to reduce the maximum valve regulation in front of maximum reference signal.

6.2 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's regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal (external input or internally generated).
The Bias function is activated when the reference signal overcome the Threshold value, preset into the driver.
The Bias setting allows to calibrate the Bias current supplied to the solenoid of 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.
If internal reference generation is active (see 6.6), threshold should be set to 0.

6.3 Ramps

The ramp generator allows to convert sudden change of electronic reference signal into smooth time-dependent increasing/decreasing of the current supplied to the solenoid.
Different ramp mode can be set:
- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.
If the proportional valve is driven by a closed loop controller, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting)

6.4 Dither

The dither is an high frequency modulation of the current supplied to the solenoid, to reduce the hysteresis of the valve's regulation: a small vibration in the valve's regulating parts considerably reduces static friction effects.
Dither frequency can be set in a range from 80 to 500 Hz (default value is 200Hz).
Lower dither setting reduces the hysteresis but also reduces the regulation stability. In some application this can lead to vibration and noise: right setting usually depends on system setup.
Default dither is a valid setting for a wide range of hydraulic applications

6.5 Linearization

Linearization function allows to set the relation between the reference input signal and the current supplied to the solenoid.
Linearization is useful for applications where it is required to linearize the valve's regulation in a defined working condition (e.g. maximum pressure control at defined working flow)

6.6 Internal Reference Generation

Internal generation of reference values is software selectable.
In this mode the 2 driver inputs (see 4.6) allow to select the desired solenoid current reference signal, among the different internal stored values: external control unit can thus manage complex machine profile by simple switching of the reference signal, by 2 digital inputs (see 4.6).

Each digital input combination corresponds to a different reference value; up to 4 different internal values are available:

	Internal generated references			
	REF1	REF2	REF3	REF4
CMD1	0	24 VDC	24 VDC	0
CMD2	0	0	24 VDC	24 VDC

A different ramp time value can be set by software for each available stored reference value.

6.7 Hydraulic Power Limitation (option /W)

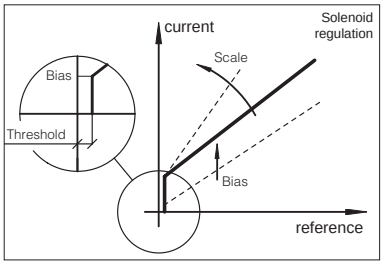
E-MI-AS drivers with /W option electronically perform hydraulic power limitation on single solenoid valves:

- flow control valves (direct and pilot operated)
- directional control valves (direct and pilot operated) + mechanical pressure compensator
- variable displacement pumps with proportional flow regulator (e.g. PVPC-*-LQZ, tab. A170)

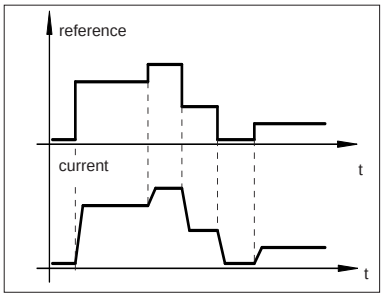
The driver receives the flow reference signal by the analog external input CMD1 (see 4.2) and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input CMD2 (see 4.3).
When the actual requested hydraulic power **p**x**Q** (CMD2xCMD1) reaches the max power limit (p1xQ1), internally set by software, the driver automatically reduces the flow regulation of the valve.
The higher is the pressure transducer feedback the lower is the valve's regulated flow:

$$\text{Flow regulation} = \text{Min}\left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [CMD2]}} \; ; \text{Flow Reference [CMD1]} \right)$$

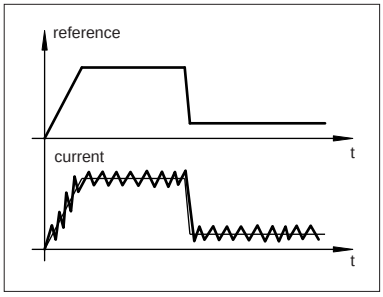
6.1, 6.2 - Scale, Bias & Threshold



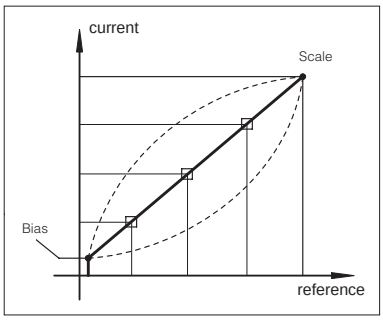
6.3 - Ramps



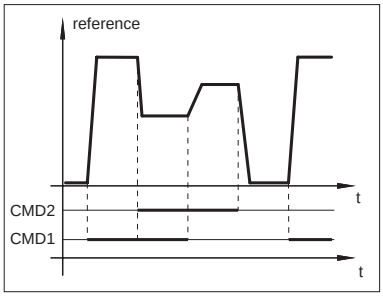
6.4 - Dither



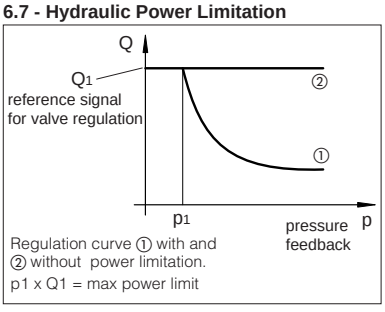
6.5 - Linearization



6.6 - Internal Reference Generation



6.7 - Hydraulic Power Limitation



Regulation curve ① with and ② without power limitation.
p1 x Q1 = max power limit

7 DRIVER CONNECTIONS

Standard cable wire color	/M12 option pin	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
RED	1	V+	Power supply +24 VDC or +12 VDC (see 4.1)	Input - power supply
BLACK	2	V0	Power supply 0 VDC	
WHITE	3	AGND (Signal zero)	Ground for CMD1,CMD2 and OUTPUT SUPPLY	Input - analog signal
GREEN	N.A.	OUTPUT SUPPLY	+5 VDC @ 5 mA output supply for external potentiometer (not available for option /M12) (see 4.4)	Output - analog signal

The two input signals CMD1 and CMD2 can be managed as analog input or ON/OFF signals; their function depends on the selected software setting:

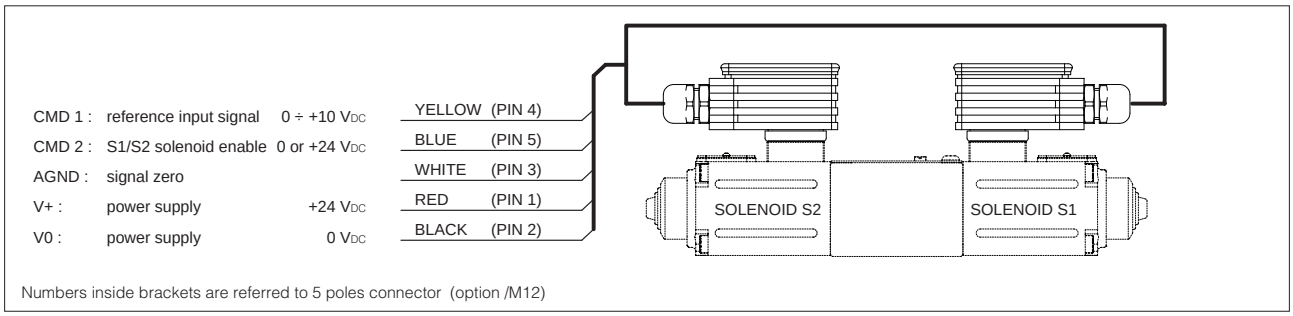
Standard cable wire color	/M12 option pin	SIGNAL	TECHNICAL SPECIFICATIONS (software setting dependent)			NOTES
			Default (see 4.2 ; 4.5)	Internal Reference Generation (see 4.6 ; 6.6)	Hyraulic Power Limitation (only for /W option - see 4.3 ; 6.7)	
YELLOW	4	CMD 1	Reference analog input: 0 ÷ 10 VDC (4 ÷ 20 mA; 0 ÷ 20 mA for /I option)	ON/OFF: 24 VDC / 0 VDC	Reference analog input: 0 ÷ 10 VDC (4 ÷ 20 mA; 0 ÷ 20 mA for option /I)	Input - analog or digital
BLUE	5	CMD 2	Enable/disable the driver: 24VDC / 0VDC	ON/OFF: 24 VDC / 0 VDC	Pressure transducer input: 0 ÷ 10 VDC	

8 DOUBLE SOLENOID VALVES OPERATION

It is possible to use two E-MI-AS drivers to operate one double solenoid proportional valve supplying the same analog signal to both CMD1 inputs reference. The enable input signal is used to select which driver/solenoid has to be active.

To operate double solenoid valves it is required to:

- parallel wire the two drivers (see following scheme).
- select opposite polarity (default and reverse) for the two enable signals (see 4.5)
- manage from PLC or machine unit: 1 analog reference signal corresponding to desired valve's regulation and 1 ON/OFF signal to select the active solenoid.

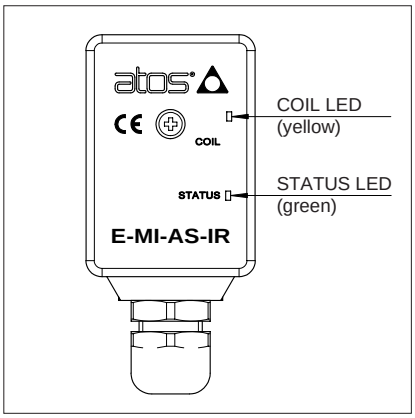


Numbers inside brackets are referred to 5 poles connector (option /M12)

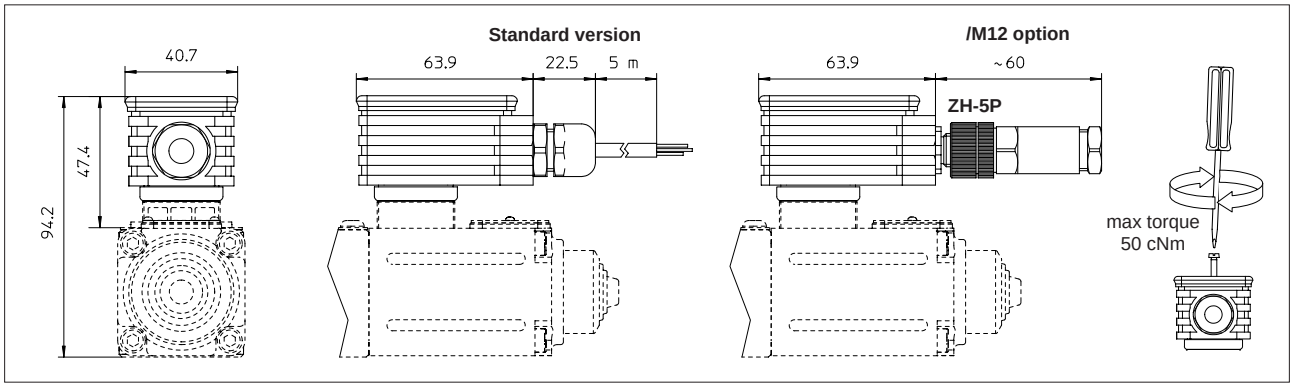
9 DIAGNOSTIC LEDS

It is possible to verify the actual status of solenoid command (yellow LED) and the driver status (green LED).
The following table details the possible displayed conditions:

COIL (YELLOW LED)	
Light signal displayed	Coil status
Light Off	PWM command OFF
Light On	PWM command ON
Slow blinking	Solenoid not connected
Fast blinking	Short circuit on the solenoid
STATUS (GREEN LED)	
Light signal displayed	Driver status
Light Off	Absence of power supply
Light On	Malfunctioning
Slow blinking	Driver disabled or Alarm present
Fast blinking	Driver enabled

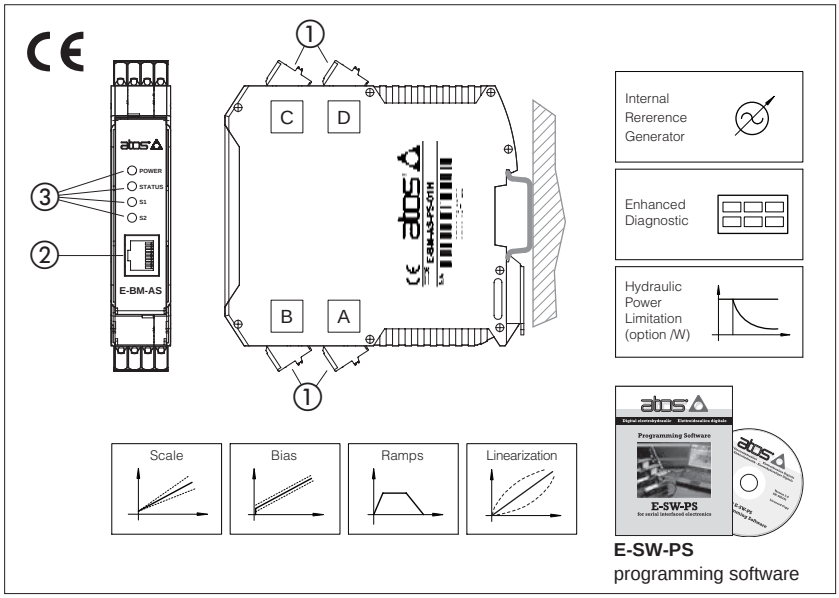


10 DIMENSIONS [mm] AND INSTALLATION



Digital electronic drivers type E-BM-AS

DIN-rail panel format, for proportional valves without transducer



E-SW-PS
programming software

E-BM-AS digital drivers supply and control the current to the solenoid of Atos proportional valves without transducer, according to the electronic reference input signal. The solenoid proportionally transforms the current into a force, acting on the valve spool or poppet, against a reacting spring, thus providing the hydraulic regulation.
E-BM-AS can drive up to two single or one double solenoid proportional valves.

Electrical Features:

- 4 fast plug-in connectors ①
- RJ45 connector ② for RS232 Serial communication to program the driver with the Atos PC software
- 4 leds for diagnostics ③: power supply presence, driver status, solenoid status (S1 and S2)
- ±5 VDC output supply for external reference potentiometers (/P option)
- Electrical protection against reverse polarity of power supply
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

Software Features:

- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- 2 selectable modes for electronic reference signal: external analog input or internal generation
- Max power limitation (/W option)
- Selectable range of electronic reference analog inputs: voltage or current
- Complete diagnostics of driver status, solenoid and driver fault conditions
- Intuitive graphic interface

1 MODEL CODE

E - BM - A S - PS - 01H / * **

Electronic driver in DIN rail panel format

A = driver for valves without transducer

S = digital execution

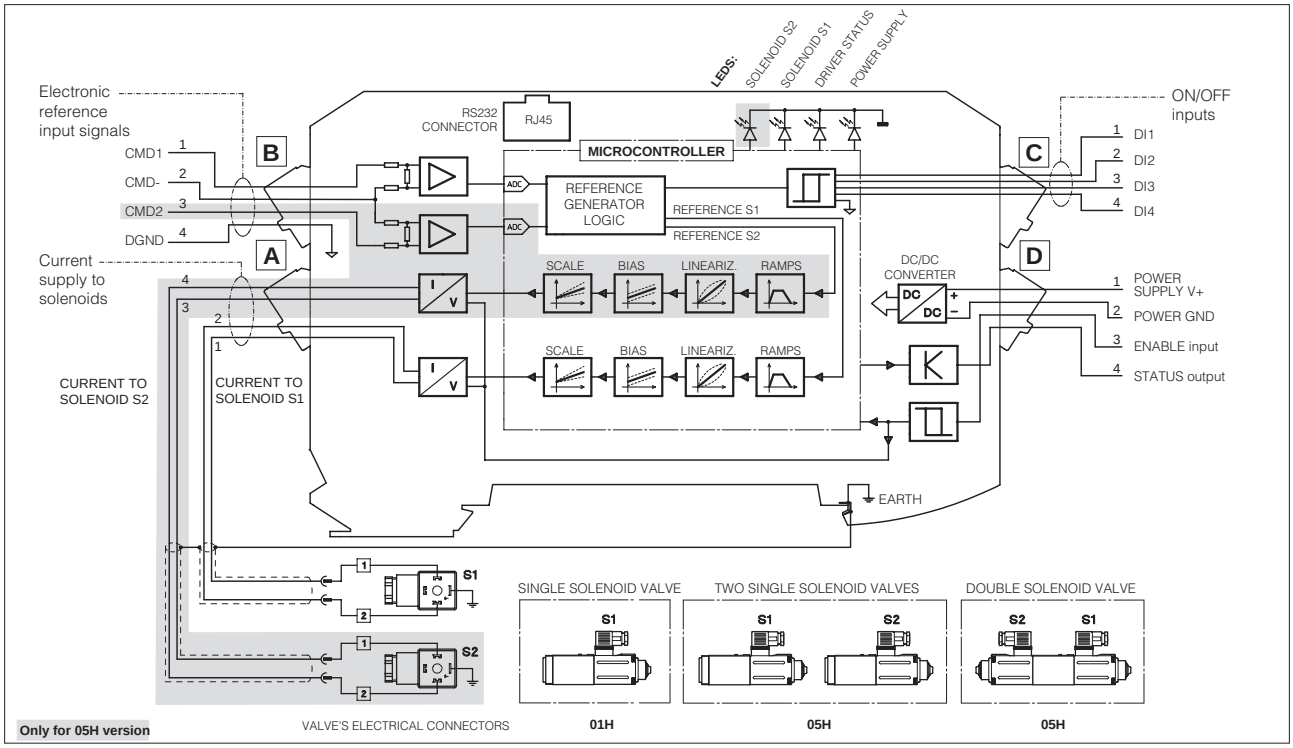
PS = Serial communication interface

01H = for single solenoid proportional valve
05H = for double solenoid or two single solenoid proportional valves

Series number

Options see section 4
- = standard 24 VDC power supply
12 = 12 VDC power supply
A = max current limitation for ex-proof valves
P = electrical supply for external potentiometers to generate reference signal
W = power limitation function (see 6.7)

2 BLOCK DIAGRAM



3 MAIN CHARACTERISTICS OF E-BM-AS ELECTRONIC DRIVERS

Power supply (see 4.1)	**Standard** Nominal: +24 VDC Rectified and filtered: VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP) **option /12** Nominal: +12 VDC Rectified and filtered: VRMS = 10 ÷ 14 VMAX (ripple max 10 % VPP)
Max power consumption	50 W for 01H version; 100 W for 05H version
Current supplied to solenoids	IMAX = 2.7 A with +24 VDC power supply to drive standard proportional valves (3,2 Ω solenoid) IMAX = 3.3 A with +12 VDC power supply to drive proportional valves with /6 option (2,1 Ω solenoid) IMAX = 2.5 A with +24 VDC power supply to drive ex-proof proportional valves (3,2 Ω solenoid) for **/A option**
Reference input signal (see 4.2)	Voltage: range ±10 VDC Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Enable and ON/OFF inputs (see 4.5, 4.7)	Range : 0 ÷ 24 VDC (OFF state: 0 ÷ 5 VDC ; ON state: 9 ÷ 24 VDC) Input impedance: Ri > 10 kΩ ;
Output supply (see 4.4)	±5 VDC @ max 10 mA : output supply for external potentiometers (only for **/P option**)
Status output (see 4.6)	Output range : 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 1,4 A
Alarms	Solenoid not connected, short circuit and cable break with current reference signal
Format	Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm rail mounting as per EN60715
Operating temperature	-20 ÷ 60 °C (-20 ÷ 40 °C on 05H version for two single solenoid proportional valves; storage -25 ÷ 85 °C)
Mass	130 g
Additional characteristics	Short circuit protection of current output to solenoids; protection against reverse polarity of power supply
Electromagnetic compatibility (EMC)	According to Directive 2004/108/CE - Immunity: EN 61000-6-2 (2005); Emission: EN 61000-6-4 (2001)
Communication interface	RS232 serial connection (not insulated), Atos protocol with ASCII coding (see section 5)
Recommended wiring cable	LiYCY shielded cables: 0,5 mm^2 for length up to 40 m [1,5 mm^2 for power supply and solenoids]

4 SIGNALS SPECIFICATIONS

4.1 Power supply and wirings

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 for 01H version and 5 A fuse for 05H version.

Option /12: This driver execution is designed to receive a 12 VDC power supply and it is commonly used in mobile application.
A safety fuse is required in series to each driver power supply: 4 A fuse for 01H version and 6,3 A fuse for 05H version

4.2 Reference Input Signals (pin B1 and B3, both referred to pin B2)

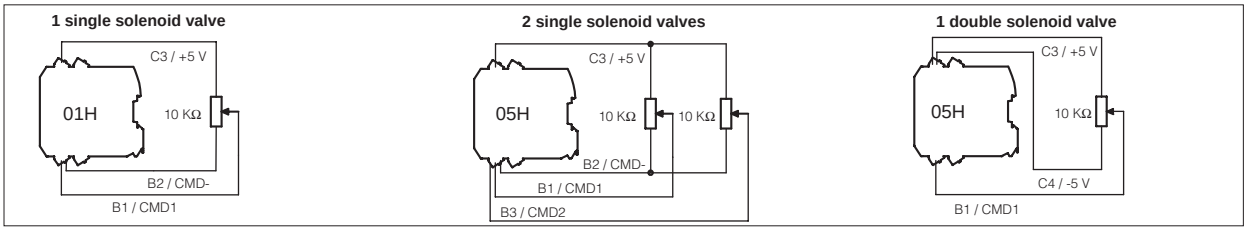
The driver proportionally transforms the external reference input signal into the current supplied to the solenoid.
The driver is designed to receive one (01H) or two (05H) analog reference inputs (CMD1 on pin B1, CMD2 on pin B3); both signals are referred to a common electric ground (CMD- on pin B2).
The input range is software selectable among voltage (0 ÷ ±10 VDC) or current (4 ÷ 20 mA with cable break detection or 0 ÷ ±20 mA).
Default settings: 0 ÷ 10 VDC for two position valves; 0 ÷ ±10 VDC for three position valves (see valve's tech. table). Other ranges can be set by software. Internal reference generation is software selectable (see 6.6).
Note: software selection of analog input range (voltage or current) is applied to both signals CMD1 and CMD2.

4.3 Pressure Input Signal (pin B3 referred to pin B2, /W option)

When hydraulic power limitation is active (see 6.7), input signal CMD2 must be connected to an external pressure transducer installed on the hydraulic system; maximum input range 0 ÷ 10 VDC.

4.4 Output supply Signal for external reference potentiometers (/P option)

The reference analog signals can be generated by one (01H) or two (05H) external potentiometers directly connected to the driver, using the ±5 VDC supply output available at pin C3 and C4.



4.5 Enable Input Signal (pin D3 referred to pin D2)

Enable input signal allows to enable/disable the current supply to the solenoids, without removing the electrical power supply to the driver; it is used to maintain active the serial connection and the other driver functions when the valve must be disabled for safety reasons.
To enable the driver, supply a 24VDC on pin D3 referred to pin D2.

4.6 Status Output Signal (pin D4 referred to pin D2)

Status output signal indicates fault conditions of the driver (short circuits, solenoids not connected, cable broken for 4 ÷ 20mA input) and is not affected by Enable input signal status: fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.
When hydraulic power limitation function is active (see 6.7), status output signal can be software configured to indicate power limitation status: not active (0 VDC) or active (24 VDC).

4.7 ON/OFF Input Signals (pin C1...C4 referred to DGND pin B4)

When the driver is configured in internal reference generation mode (see 6.6), the 4 ON/OFF input signals (DI) are used to select the active reference signal, among the available stored values. If the 4 ON/OFF input signals (DI) are not active, the driver can be commanded by external analog reference. The polarity of the digital inputs can be customized: active status = 24 VDC is the default setting.
Note: with /P option two ON/OFF signals are available as digital inputs (DI).

4.8 Possible combined options: /12W, /12PW, /AW, /PW and /APW (only for 05H); /12P and /AP (for 01H and 05H).

5 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the Atos **E-SW-PS** programming software.
A serial RS232 connection is required between the PC and the electronic driver.
For a more detailed decription of software interface, PC requirements and cable/adapter characteristics please refer to technical tab. **G500**.

Programming software, must be ordered separately :

E-SW-PS (mandatory - first supply) = Dvd including E-SW-PS 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.

Cable and adapter, can be ordered separately :

E-C-PS-DB9/RJ45 = cross cable from DB9 connector (PC communication port) to RJ45 connector (driver communication port)
E-A-PS-USB/DB9 = adapter from DB9 to USB connector (PC communication port); required if the DB9 communication port is not available on the PC

6 MAIN SOFTWARE PARAMETER SETTINGS

The following is a brief description of the main settings and features of E-BM-AS drivers.
For a detailed descriptions of all available settings, wirings and installation procedures, please refer to the programming manual E-MAN-BM-AS included in the E-SW-PS Dvd programming software(see section 5)

6.1 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.
For double solenoid valves two different Scale regulations are available : ScaleA for positive reference signal and ScaleB for negative reference signal

6.2 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's regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal (external input or internally generated).
The Bias function is activated when the reference signal overcome the Threshold value, preset into the driver.
The Bias setting allows to calibrate the Bias current supplied to the solenoid of 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.
If internal reference generation is active (see 6.6), threshold should be set to 0.
For double solenoid valves two different Bias regulations are available: positive reference signal activates BiasA for solenoid S1 and negative reference signal activates BiasB for solenoid S2

6.3 Ramps

The ramp generator allows to convert sudden change of electronic reference signal into smooth time-dependent increasing/decreasing of the current supplied to the solenoid.
Different ramp mode can be set:
- single ramp for any reference variation
- two ramps for increasing and for decreasing reference variations
- four ramps for positive/negative signal values and increasing/decreasing reference variations

Ramp generator is useful for application where smooth hydraulic actuation is necessary to avoid machine vibration and shocks.
If the proportional valve is driven by a closed loop controller, the ramps can lead to unstable behaviour, for these applications ramp function can be software disabled (default setting)

6.4 Dither

The dither is an high frequency modulation of the current supplied to the solenoid, to reduce the hysteresis of the valve's regulation: a small vibration in the valve's regulating parts considerably reduces static friction effects.
Dither frequency can be set in a range from 80 to 500 Hz (default value is 200Hz).
Lower dither setting reduces the hysteresis but also reduces the regulation stability. In some application this can lead to vibration and noise: right setting usually depends on system setup.
Default dither is a valid setting for a wide range of hydraulic applications

6.5 Linearization

Linearization function allows to set the relation between the reference input signal and the current supplied to the solenoid.
Linearization is useful for applications where it is required to linearize the valve's regulation in a defined working condition (e.g. maximum pressure control at defined working flow)

6.6 Internal Reference Generation

Internal generation of reference values is software selectable.
In this mode the 4 digital inputs of the driver (DI1..DI4) allow to activate the desired internal reference signal, among the different driver's stored values: external control unit can thus manage complex machine profile by simple switching the reference signal, by 4 digital inputs (see 4.7).

The digital inputs are 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 (2+2 with E-BM-AS-PS-05H driving two single solenoid valves)
- *Binary mode*
  each digital input combination corresponds to a different value; up to 15 different internal values are available (3+3 with E-BM-AS-PS-05H when driving two single solenoid valves)

A dedicated ramp time value can be set by software for each available stored reference value.

Note: with all input signals (DI) set to zero, the driver can be commanded by external analog reference also if internal reference generation is selected (for more information please refer to the programming manual E-MAN-BM-AS).

6.7 Hydraulic Power Limitation (/W option, only for drivers E-BM-AS-PS-05H)

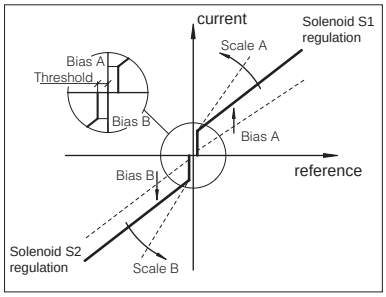
E-BM-AS drivers with /W option electronically perform hydraulic power limitation on:

- direct and pilot operated flow control valves
- direct and pilot operated directional control valves + mechanical pressure compensator
- variable displacement pumps with proportional flow regulator (e.g. PVPC-*-LQZ, tech.tab. A170)

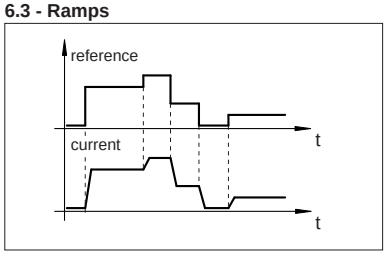
The driver receives the flow reference signal by the analog external input CMD1 (see 4.2) or by the internal generator (see 6.6), and a pressure transducer, installed in the hydraulic system, has to be connected to the driver's analog input CMD2.
When the actual requested hydraulic power **p**x**Q** (CMD2xCMD1) 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:

$$\text{Flow regulation} = \text{Min}\left(\frac{\text{PowerLimit [sw setting]}}{\text{Transducer Pressure [CMD2]}} \; ; \text{Flow Reference [CMD1]} \right)$$

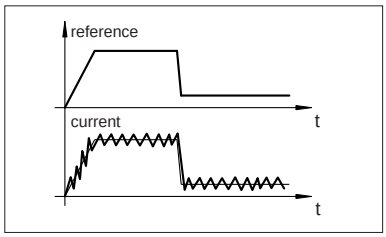
6.1, 6.2 - Scale, Bias & Threshold



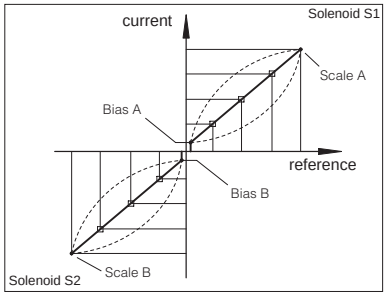
6.3 - Ramps



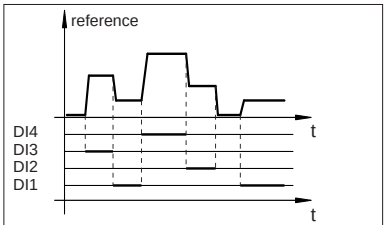
6.4 - Dither



6.5 - Linearization



6.6 - Internal Reference Generation

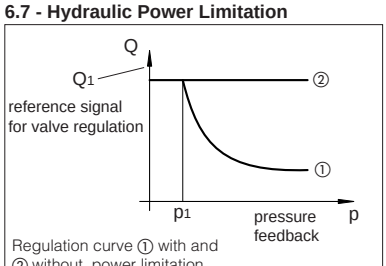


Single internal generator selection (standard mode)				
DI1	DI2	DI3	DI4	Reference
OFF	OFF	OFF	OFF	External
ON	OFF	OFF	OFF	Generation 1
(*)	ON	OFF	OFF	Generation 2
(*)	(*)	ON	OFF	Generation 3
(*)	(*)	(*)	ON	Generation 4

Double internal generator selection (standard mode)					
DI1	DI2	S1	DI3	DI4	S2
OFF	OFF	External	OFF	OFF	External
ON	OFF	Generation 1	ON	OFF	Generation 1
(*)	ON	Generation 2	(*)	ON	Generation 2

(*) Note: Don't care

6.7 - Hydraulic Power Limitation



Regulation curve ① with and ② without power limitation.
p1 x Q1 = max power limit

7 DRIVER CONNECTIONS

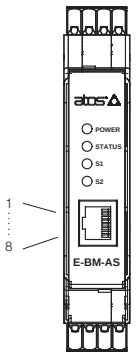
The 4 fast plug-in connectors (A,B,C,D), included in the supply, provide simple wirings, easy driver's replacement and the possibility to test the signals directly on the connectors.

CONNECTOR	PIN	SIGNAL	TECHNICAL SPECIFICATIONS		NOTES	
A	A1	SOL S1	Current to solenoid S1		Output - power PWM	
	A2					
	A3	SOL S2 (*)	Current to solenoid S2			
	A4					
B	B1	CMD1	Reference analog input: ±10 VDC / ± 20 mA maximum range software selectable (see 4.2)		Input - analog signal	
	B2	CMD-	Standard	/P option (see 4.4)		
			Zero signal, ground for reference signals	Reference for ±5 VDC output (AGND)		
	B3	CMD2 (*)	Reference analog input: ±10 VDC / ± 20 mA maximum range software selectable (see 4.2)			
	B4	DGND	Optical insulated ground for on/off inputs (DI1 ÷ DI4)			
C			Standard	/P option (see 4.4)	Standard	Option /P
	C1	DI1	Optical insulated on/off input 0 ÷ 24 VDC referred to pin B4 (DGND) (see 4.7)	as standard	Input - on/off signal	
	C2	DI2		as standard		
	C3	DI3		+5 VDC @ 10 mA output supply to pin B2 (AGND)	Input - on/off	Output - reference analog
	C4	DI4		-5 VDC @ 10 mA output supply to pin B2 (AGND)		
D	D1	V+	Power supply 24 VDC (see 4.1)		Input - power supply	
	D2	V0	Power supply 0 VDC			
	D3	ENABLE	Enable (24 VDC) or disable (0 VDC) the driver (see 4.5)		Input - on/off signal	
	D4	STATUS	Fault (default) or software selected output (see 4.6)		Output - on/off signal	

(*) Note: Only for double or two single solenoid driver (version 05H).

8 FRONT PANNEL CONNECTOR AND LEDS

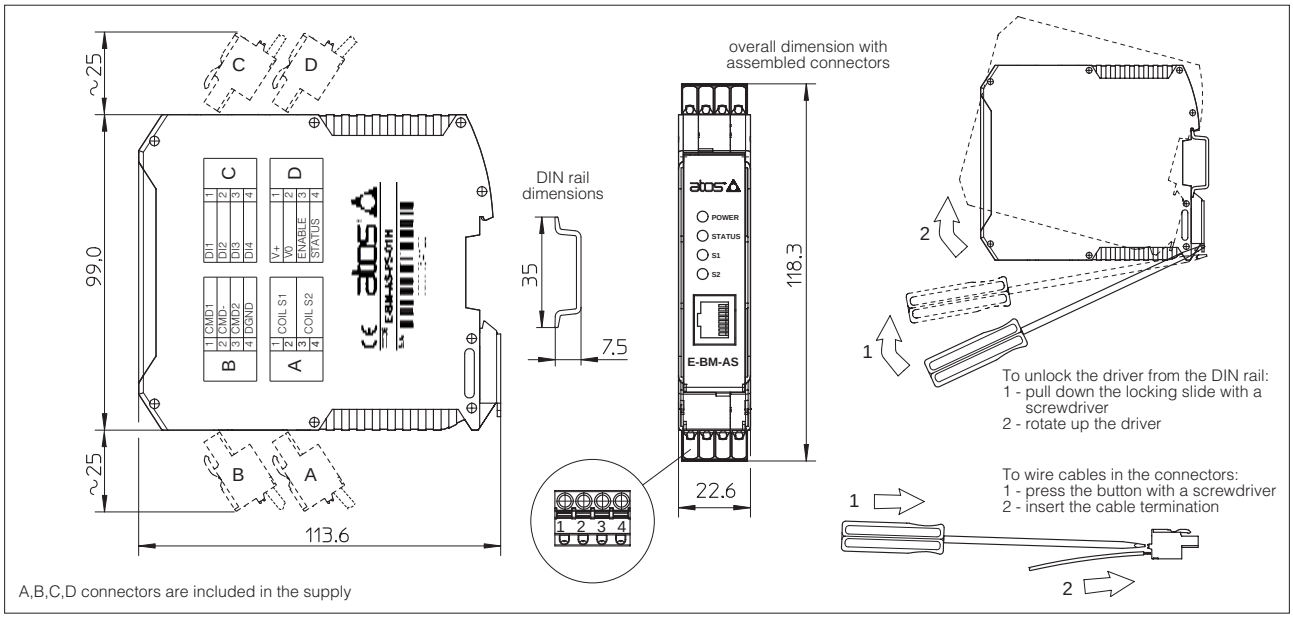
RJ45 CONNECTOR		
PIN	SIGNAL	DESCRIPTION
1	/	Not connected
2	/	Not connected
3	/	Not connected
4	GND	Signal zero data line
5	RX	Driver receiving data line
6	TX	Driver transmitting data line
7	/	Not connected
8	/	Not connected



RJ45 connector (IEC 60603 standard) for RS232 serial communication

DIAGNOSTIC LEDS	
POWER (GREEN LED)	
Light signal displayed	Power supply status
Light Off	Power OFF
Light On	Power ON
STATUS (GREEN LED)	
Light signal displayed	Driver status
Light Off or Light On	Fault conditions
Slow blinking	Driver disabled
Fast blinking	Driver enabled
S1 & S2 (YELLOW LEDS)	
Light signal displayed	Coil status
Light Off	PWM command OFF
Light On	PWM command ON
Slow blinking	Coil not connected
Fast blinking	Short circuit on the solenoid

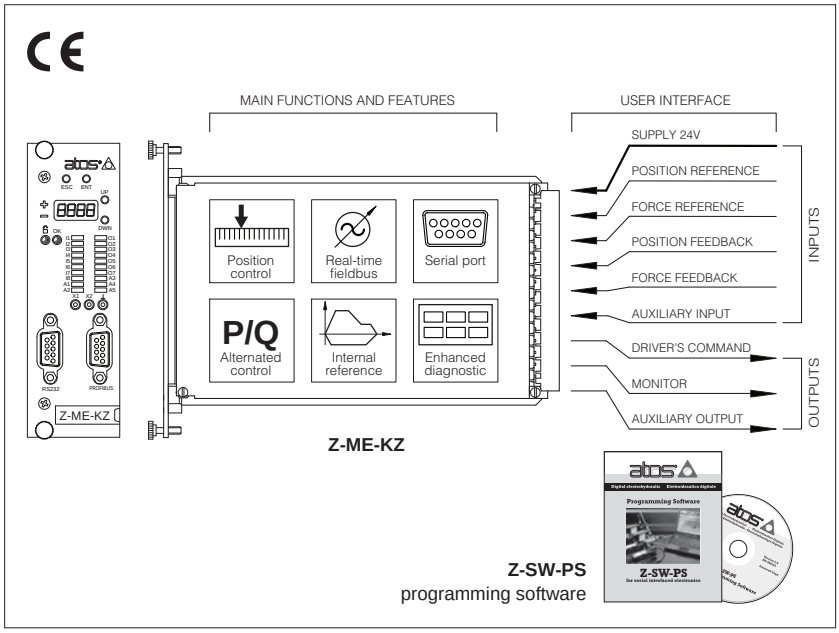
9 DIMENSIONS [mm] AND INSTALLATION



A,B,C,D connectors are included in the supply

Digital position controllers type Z-ME-KZ

Eurocard format, for electrohydraulic closed loop controls



Z-ME-KZ digital axis controllers perform the position closed loop of linear or rotative hydraulic axes.

The controller receives a position feedback from the axis transducer and it generates a reference signal to the proportional valve which regulates the hydraulic flow to the actuator.

The position feedback interfaces are SSI, incremental encoder, potentiometer or standard analog inputs (voltage or current) software selectable.

A front panel serial port is always present for configuration and monitoring of the controller.

The controller can be operated in real time by external or internally generated reference signal.

With external reference signal the actuator's motion cycle can be managed by either analog or fieldbus reference input.

With internally generated reference signal the actuator's motion cycle can be managed by external or fieldbus on/off commands.

A pressure/force alternated control may be set by software additionally to the position control: a pressure/force transducer has to be assembled into the actuator and connected to the controller; a second reference pressure/force signal is required.

Several auxiliary digital inputs/outputs are available and they can be used to synchronize other machine functions and to transmit information on the controller state.

Electrical Features:

- 4 digits front panel display to check and change parameters as well as for diagnostics
- Front panel DB9 connector for serial programming interface
- Front panel test points for debug and maintenance
- Eurocard format (DIN 41494 - Plug-in-units)
- CE mark according to EMC directive

Software Features:

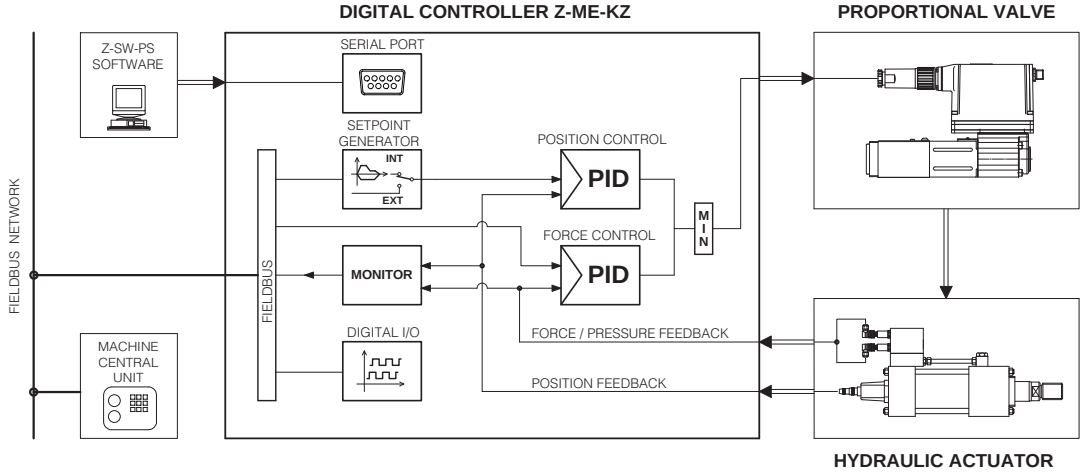
- Internal generation of motion cycle
- Setting of axis's dynamic response (PID) to optimize the application performances
- Software selectable range of electronic reference analog inputs: voltage or current
- Enhanced diagnostics of the axis status
- Intuitive graphic interface
- In field firmware update through standard serial communication
- Internal oscilloscope function

1 MODEL CODE

Z - ME - KZ - PS / ** / ** / *

- Electronic axis controller in Eurocard format
- Alternated position / force (or position / pressure) control module
- Serial communication interface for configuration and monitoring function
- Optional fieldbus communication interfaces:
  - = standard without fieldbus interface
  BC = CANopen communication interface
  BP = PROFIBUS DP communication interface
- Series number
- Set code

2 BLOCK DIAGRAM



Note: Block diagram example for alternated position/force control, with fieldbus interface.

3 POSITION REFERENCE MODE

3.1 External reference generation

Z-ME-KZ controller regulates in closed loop the actuator position according to an external reference position signal and to the position feedback from the actuator transducer. It generates a reference signal for the proportional valve which regulates the hydraulic flow to the actuator.

The external reference signal can be software selected among:

Analog reference ***(a)***

The controller receives in real time the reference signal from the machine electronic central unit by means of the analog input (see section 10) limiting speed, acceleration and deceleration values.

Fieldbus reference ***(b)***

The controller receives in real time the reference signal from the machine electronic central unit by means of the digital fieldbus communication (-BC and -BP executions) limiting speed, acceleration and deceleration values.

For fieldbus communication details, please refer to the controller user manual (see section 12).

3.2 Internal reference generation

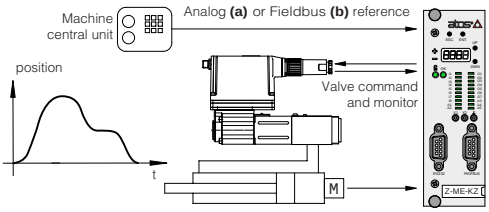
Z-ME-KZ controller regulates in closed loop the actuator position according to an internally generated reference position signal and to the position feedback from the actuator transducer. It generates a reference signal for the proportional valve which regulates the hydraulic flow to the actuator.

The internal reference signal is generated by a pre-programmed cycle; only start, stop and switch-over commands are required from the machine electronic central unit by means of:

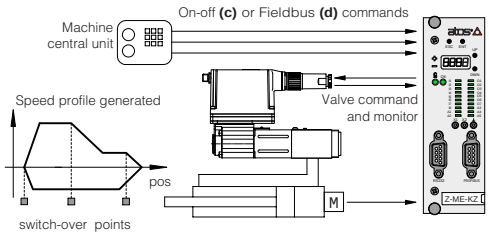
- on-off commands ***(c)***

- fieldbus commands ***(d)***

External reference generation



Internal reference generation



Atos PC software allows to design a customized sequence of motion phases adapted to the specific application requirements: a range of predefined standard sequences are available in the Z-SW software.

Start/stop/switch-over commands and reference generation type can be set for each phase in order to realize an automatic cycle according to the application requests. Refer to the controller user manual for further details on the available selection of start/stop/switch-over commands and reference generation type.

Start/stop/switch-over commands examples

External digital input	on-off commands, on rear connector, are used to start/stop the cycle generation or to change the motion phase
External fieldbus input	on-off commands, by fieldbus communication, are used to start/stop the cycle generation or to change the motion phase
Switch by position	switch-over from actual to following motion phase occurs when the actual position reaches a programmed value
Switch by time	switch-over from actual to following motion phase occurs after a fixed time, starting from the actual phase activation
Switch by internal status	switch-over from internal status are used to start/stop the cycle generation or to change the motion phase

Internal reference generation types examples

Absolute	a target position reference signal is internally generated for each motion phase; maximum speed, acceleration and deceleration can be set to obtain a smooth and precise position control
Relative	as 'Absolute' but the target position corresponds to the actuator position plus a fixed quote internally set by software
Hold	the controller holds the actual position

4 POSITION / PRESSURE OR FORCE CONTROL

Alternated pressure or force control can be added to the actuator's standard position control (see below functional schemes).

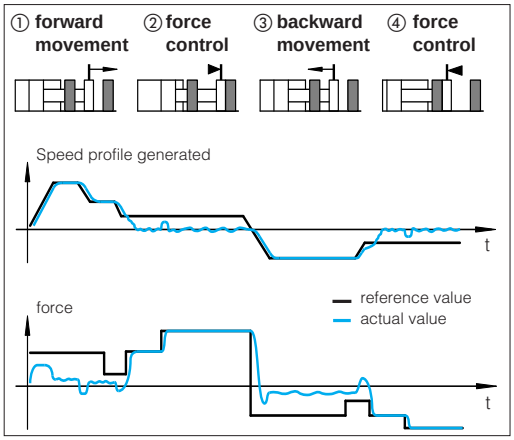
Remote transducers (pressure or force) have to be installed on the actuator.

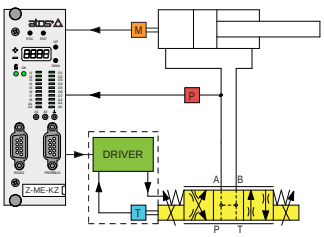
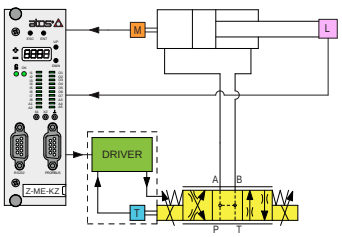
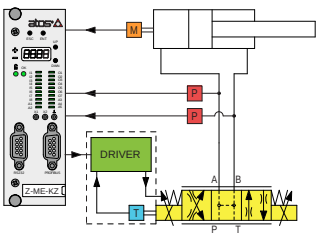
The position/pressure (or position/force) controls are operated according to two separate reference signals and a dedicated algorithm automatically selects which control is active time by time.

The dynamics of the switching between the two controls can be regulated thanks to specific software setting, in order to avoid instability and vibrations.

Position control is active (see phase ① and ③ at side) when the actuator actual pressure or force is lower than the relevant reference signal.

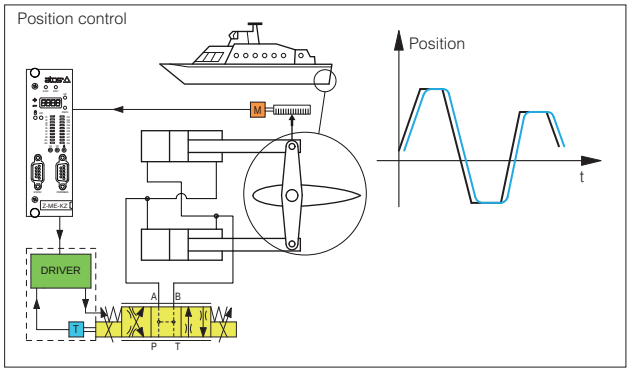
Pressure or force control is active (see phase ② and ④ at side) when the actuator actual pressure or force, measured by remote transducers, grows up to the relevant reference signal - the controller reduces the valve's regulation in order to limit the actuator pressure or force; if the pressure or force tends to decrease under its reference signal, the position control returns active.



Alternated Position/Pressure Control	Alternated Position/Force Control - Load cell	Alternated Position/Force Control - Two pressure transducers
		
one remote pressure transducer has to be installed on the actuator's port to be controlled	one load cell transducer has to be installed between the actuator and the controlled load	two remote pressure transducers have to be installed on the actuator's ports; the actuator force is calculated by the pressure feedbacks (Pa - Pb)

T valve's spool transducer M actuator's position transducer P pressure transducer L load cell

5 APPLICATION EXAMPLES

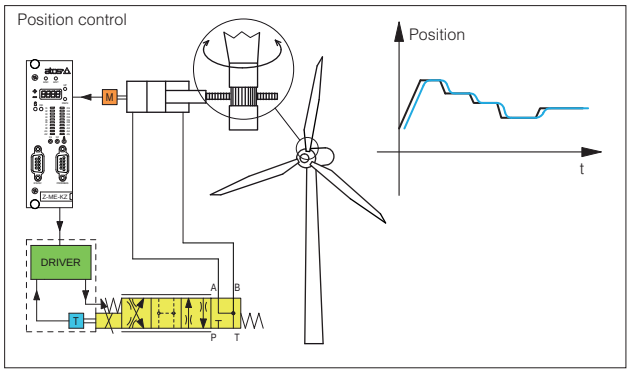


Hydraulic steering wheel in marine applications

Rudder controls on motor yachts and sail boats requires smooth control for precise and reliable operations.

Z-ME-KZ controllers perform the rudder position control system, ensuring accurate and repetitive regulations for a comfortable ride, thanks to:

- analog position reference mode for real time controls
- potentiometer position transducer for simple and compact solution
- position PID control parameters to optimize the system response
- complete diagnostic information for advanced system monitoring

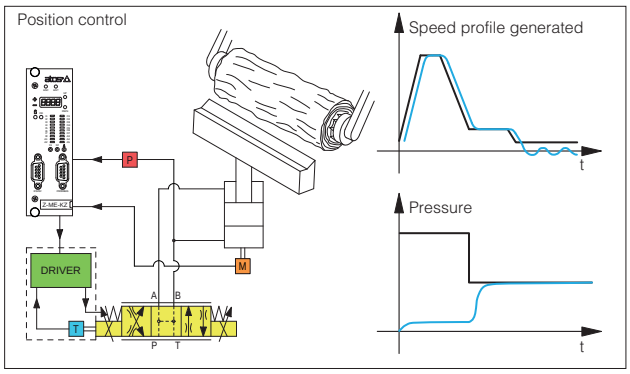


Wind turbines

The pitch control of the rotor blades is required to maximize the energy production. Accurate positioning, decentralized intelligence as well as long service life and reliability are required.

Z-ME-KZ controllers perform high quality regulation of the blade pitch simplifying the system architecture, thanks to:

- SSI digital position transducer for high precision control
- complete remote system management with fieldbus interface
- position PID selection to adapt the position control to the different wind conditions

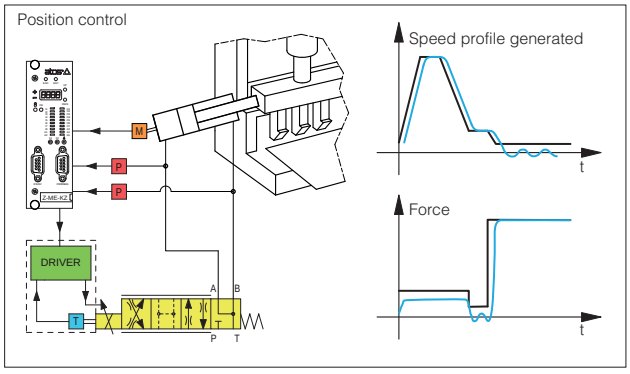


Wood machinery

Hydraulic wood machines require configurable and repetitive motion profiles, accurate position controls, and digital signals for synchronization purpose.

Z-ME-KZ controllers allow remote control, thanks to:

- internal reference generation with maximum speed and acceleration settings
- analog position transducer for simple and reliable solution
- pressure transducer for alternated pressure control
- fieldbus connection for remote parameterization, commands, and controller state indication

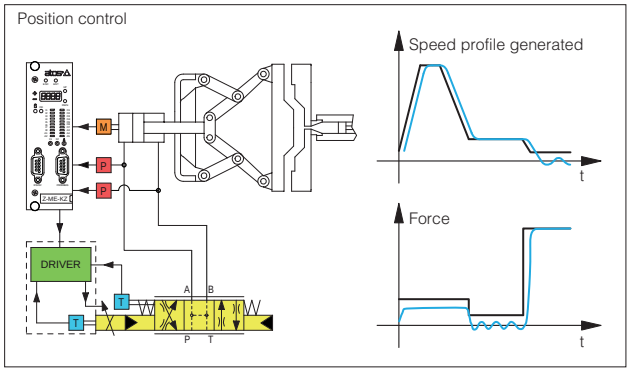


Bending Machines

Machine tools for cold-forming flat sheets require complete, automatic, programmable and flexible machine control to produce sheet metal panels from punched blank.

Z-ME-KZ controller combine high level position regulation with accurate force control to provide in a single device a complete and dedicated solution, thanks to:

- internal reference generation to simplify the machine control cycle
- digital position sensor for high resolution measurement system
- two pressure transducers for alternated force control
- fieldbus interface for easy machine control integration
- auxiliary digital outputs for system status indication (target reached, force control active)



Die-casting machinery

Clamp movements in die-casting phases involve fast/slow motion cycle with accurate and repetitive alternated position/force controls for the mould safety functions.

Z-ME-KZ controllers, with alternated position/force control, simplify the hydraulic + electronic system architecture, thanks to:

- internal reference generation for repetitive working cycles
- SSI digital position transducer for accurate axis control
- two pressure transducers for alternated force control
- auxiliary digital inputs/output to synchronize the machine functions
- fieldbus connection for machine remote control and advanced diagnostics

6 CONTROLLER CHARACTERISTICS

Power supply (see 11.1)	Nominal: +24 VDC Rectified and filtered: VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)		
Max power consumption	10 W		
Position transducer	SSI, incremental encoder, potentiometer, analog		
Analog Inputs	Input range : voltage ±10 VDC input impedance: Ri > 100 kΩ current 0 ÷ 20 mA input impedance: Ri < 500 Ω		
Analog Outputs	Output range : voltage ±10 VDC @ max 10 mA current 0 ÷ 20 mA @ max 500 Ω load resistance		
Digital Inputs	Input range : 0 ÷ 5 VDC (OFF state), 16 ÷ 24 VDC (ON state), 5 ÷ 16 VDC (not accepted); Input impedance: Ri > 10 kΩ		
Digital Outputs (*)	Output range : 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 30 mA		
Enable input	Range : 0 ÷ 5 VDC (OFF state), 16 ÷ 24 VDC (ON state), 5 ÷ 16 VDC (not accepted); Input impedance: Ri > 10 kΩ		
Fault output (*)	Output range : 0 ÷ 24 VDC (no fault state > [power supply - 2 V] ; fault state < 1 V) @ max 50 mA		
Analog reference outputs	±10 VDC @ max 30 mA		
Inceremental encoder power supply	+5 VDC @ max 100 mA		
Alarms	Position transducer out of range, analog input out of range		
Card format	Eurocard 100x160 mm (Plug-in unit DIN 41494)		
Card rear connector	Male DIN 41612 /D. Available frame snap connector type E-K-64M (see table G800) **To be ordered separately**		
Operating temperature	0 ÷ 50 °C (storage -20 ÷ 70 °C)		
Front panel dimensions	128,4 x 40 mm		
Mass	Approx. 250 g		
Electromagnetic compatibility (EMC)	According to Directive 2004/108/CE (Immunity: EN 50082-2; Emission: EN 50081-2)		
Communication interface	Serial	-BC CANopen - see tab. G510	-BP PROFIBUS - see tab. G510
Communication physical layer	serial RS232 (not insulated)	CAN ISO11898 (optical insulated)	RS485 (optical insulated)
Communication protocol	Atos ASCII coding	CANopen EN50325-4 + DS408	PROFIBUS DP EN50170-2/IEC61158

(*) Note: External negative voltage not allowed (e.g. due to inductive loads).

7 TRANSDUCER CHARACTERISTICS

7.1 Position transducers

The accuracy of the position control is strongly dependent to the selected position transducer. Four different transducer interfaces are available on the controller, depending to the system requirements: potentiometer, analog signal, SSI, and encoder, see 7.3.
Transducers with digital interface (SSI and encoder) allow the user to get high resolution and accurate measures. Transducers with analog interface (potentiometer and analog signal) grant simple and cost effective solutions.

7.2 Pressure/force transducers

The accuracy of the pressure/force controls is strongly dependent to the selected pressure/force transducers (see section 4). Alternated pressure/force controls require to install pressure transducers or load cell to measure the actual pressure/force values.
Pressure transducers allow easy system integration and cost effective solution for both alternated position/pressure and position/force controls (see G465 for pressure transducers details). Load cell transducers allow the user to get high accuracy and precise regulations for alternated position/force controls.
The characteristics of the remote pressure/force transducers must be always selected to match the application requirements and to obtain the best performances: transducer nominal range should be at least 115%÷120% of the maximum regulated pressure/force.

7.3 Transducers characteristics & interfaces - following values are just for reference, for details please consult the transducer's datasheet

	Position				Pressure/force
Input type	Potentiometer	Analog (3)	SSI, digital (3)	Incremental Encoder, digital	Analog
Controller Interface	±10 V DC	0 ÷ 10 V DC - 4 ÷ 20 mA	Serial SSI	TTL 5Vpp - 150 KHz	±10 V DC - 4 ÷ 20 mA
Max speed	0,5 m/s	1 m/s	2 m/s	2 m/s	-
Max Resolution	< 0.4 % FS	< 0.2 % FS	5 µm	1 µm (@ 0.15 m/s)	< 0.4 % FS
Linearity error (1)	±0.1 %	< ±0.03 %	< ±0.01 %	< ±0.001 %	< ±0.25 %
Repeatability (1)	±0.05 %	< ±0.005 %	< ±0.001 %	< ±0.001 %	< ±0.1 %
Power supply (2)	±10 V DC	+24 V DC	+24 V DC	+5 V DC	+24 V DC

Notes: (1) percentage of the total stroke; (2) provided by Z-ME-KZ controller; (3) magnetosonic transducer; for additional details contact Atos technical support.

8 FRONT PANEL DESCRIPTION

8.1 Keyboard and display

On the Z-ME-KZ front panel are available 4 function keys (ESC, ENT, UP, DWN), and a numeric display (4 digits plus sign) to allow the user to view and change the controller's parameters as well as to display diagnostic messages.
The following parameters can be accessed (viewed or changed) via corresponding menu structure:
- command and actual values
- analog input / output values
- digital input / output status
- position sensor indication
- force / pressure sensor indication

Parameter's changes of the configuration, control gains, trigger conditions, internal cycle, fault monitoring are not allowed via front panel operations.

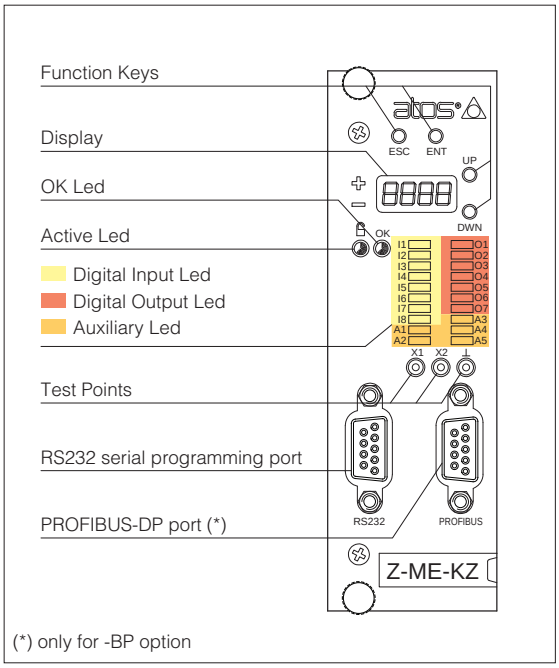
8.2 LED indication

The led indications are used to display the internal status (Active, OK) of the controller or the status of the digital IO of the Z-ME-KZ. There are 22 led divided in four different types:
- internal controller's status (Active - OK)
- digital input status (I1 ÷ I8)
- digital output status (O1 ÷ O7)
- software programmable led (A1 ÷ A5) for specific functions

8.3 Test points

The test points present on the controller front panel can be used to monitor the actual position (X1) and the force / pressure (X2) value measured by the relevant transducers. Both signals are referred to the analog ground (⊥) pin. The two signals are respectively connected to P_MONITOR+ (X1) and F_MONITOR+ (X2) analog output present on the rear connector of the controller card. These signals can be software set to show other signals available in the controller (see 11.8 and 11.9).

9 FRONT PANEL VIEW



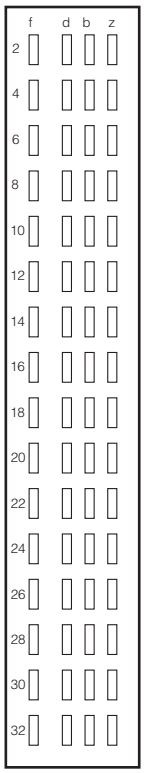
(*) only for -BP option

8.4 Communication ports

On the front panel of the Z-ME-KZ is always present a serial RS232 port to program the controller by the Atos Z-SW software (see section 12). All the functional parameters of digital controller, like internal reference generation, controller dynamics, IO configurations, can be easily set and optimized by the user.
For -BP or -BC options a second communication port dedicated to the selected fieldbus connection is present on the controller. For -BP option the PROFIBUS-DP port is located on the front panel of the Z-ME-KZ controller. For -BC option the CANopen connection is located on the rear connector of the Z-ME-KZ controller.
Through the fieldbus communication only the real-time parameters may be exchanged:
- position, velocity and force / pressure reference
- position, velocity and force / pressure feedback
- controller commands and status
- diagnostic / error messages

For more information about the front panel settings and fieldbus communication, please refer to the controller user manual.

10 ELECTRONIC CONNECTIONS - 64 PIN REAR CONNECTOR



rear view

pin	f	d	b	z
2	DO 7 (O)	DI 1 (I)	F_TR2 + (I)	nc
4	SSI clock + (D)	DI 2 (I)	F_TR2 - (I)	nc
6	SSI clock - (D)	DI 3 (I)	F_INPUT + (I)	nc
8	SSI data + / Inc Ua1 (D)	DI 4 (I)	F_INPUT - (I)	nc
10	SSI data - / Inc /Ua1 (D)	DI 5 (I)	P_INPUT + (I)	nc
12	Inc Ua2 (D)	DI 6 (I)	P_INPUT - (I)	nc
14	Inc /Ua2 (D)	DI 7 (I)	F_TR1 + (I)	nc
16	Inc Ua0 (D)	DI 8 (I)	F_TR1 - (I)	nc
18	Inc /Ua0 (D)	ENABLE (I)	P_TR + (I)	nc
20	Inc +5VDC (O)	DO 1 (O)	P_TR - (I)	GND
22	nc	FAULT (O)	VALVE_MONITOR + (I)	DO 3 (O)
24	nc	nc	VALVE_MONITOR - (I)	DO 4 (O)
26	nc	DO 2 (O)	P_MONITOR + (O)	DO 5 (O)
28	CAN_GND (F)	nc	AGND	DO 6 (O)
30	CAN_L (F)	CONTROL_OUTPUT + (O)	VREF -10VDC (O)	V+ (PS)
32	CAN_H (F)	F_MONITOR + (O)	VREF +10VDC (O)	V0 (PS)

(I) Input - (O) Output - (D) Digital transducers - (PS) Power supply - (F) Fieldbus interface, only for -BC option

11 SIGNAL SPECIFICATIONS

Atos digital controllers 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 prescriptions shown in table F003 and in the user manuals included in the Z-SW programming software.
The electrical signals of the controller (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.

11.1 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.
The controller is protected against overloads by a internal safety fuse: 3,15 A fuse.

11.2 Position reference input signal (P_INPUT+, P_INPUT-)

The controller allows to regulate the axis position in closed loop according to an external voltage or current reference input signal (P_INPUT+ and P_INPUT-), see 3.1. The analog input is a differential input type.
The input range and polarity are software selectable within the maximum range ±10 VDC for voltage or 0 ÷ 20 mA for current; default setting is 0 ÷ 10 VDC.
Controller with fieldbus interface (-BC or -BP) can be software set to receive reference value directly by the machine electronic control unit (fieldbus master); in this case the analog reference input signal can be used for start-up and maintenance operations.

11.3 Pressure or force reference input signals (F_INPUT+, F_INPUT-)

For alternated position/force (or position/pressure) control the Z-ME-KZ receives a second analog voltage or current reference input signal (F_INPUT+,F_INPUT-) dedicated to the force (or pressure) closed loop control (see section 4).The analog input is a differential input type.
The input range and polarity are software selectable within the maximum range ±10 VDC for voltage or 0 ÷ 20 mA for current; default setting is 0 ÷ 10 VDC.
Controller with fieldbus interface (-BC or -BP) can be software set to receive reference value directly by the machine electronic control unit (fieldbus master); in this case the analog reference input signals can be used for start-up and maintenance operations.

11.4 Position transducer input signal

A position transducer must be always directly connected to the controller: digital SSI (SSI clock+, SSI clock-, SSI data+, SSIdata-), digital Encoder (Inc Ua1, Inc /Ua1, Inc Ua2, Inc /Ua2,Inc Ua0, Inc /Ua0), potentiometer or a generic transducer with analog interface (P_TR+, P_TR-) can be used.
For transducers with analog interface the input range and polarity are software selectable within the maximum range ±10 VDC for voltage or 0 ÷ 20 mA for current; default setting is 0 ÷ 10 VDC.
Refer to position transducer characteristics to select the transducer type that maches the specific application requirements (see 7.1).

11.5 Force / pressure transducer input signal (F_TR1+, F_TR1-, F_TR2+, F_TR2-)

Analog remote pressure transducers or load cell with maximum ±10 VDC signal range must be directly connected to the controller in case of alternated postion/force (or position/pressure) control.
Refer to pressure/force transducer characteristics to select the transducer type that mach the specific application requirements (see 7.2).
The input range and polarity are software selectable within the maximum range ±10 VDC for voltage or 0 ÷ 20 mA for current; default setting is 0 ÷ 10 VDC.

11.6 Analog valve monitor input signal (VALVE_MONITOR+, VALVE_MONITOR-)

The controller allows to monitor the regulation of the proportional valve which operates the hydraulic flow to the actuator (VALVE_MON+,VALVE_MON-).
The analog input is a differential input type.
The input range and polarity are software selectable within the maximum range ±10 VDC for voltage or 0 ÷ 20 mA for current; default setting is 0 ÷ 10 VDC.

11.7 Control output signal (CONTROL_OUTPUT+)

The error signal processed by the control algorithms generates the control output signal (CONTROL_OUTPUT+) for the external driver of the proportional valve which operates the hydraulic flow to the actuator.
The output range and polarity are software selectable within ±10 VDC (for voltage) or 0 ÷ 20 mA (for current) maximum range referred to the analog ground (AGND); default setting is ±10 VDC.

11.8 Position monitor output signal (P_MONITOR+)

The controller generates an analog voltage output signal proportional to the actual axis position; the monitor output signal can be software set to show other signals available in the controller (e.g. analog reference, fieldbus reference, position error, valve spool position).
The output polarity is software selectable within ±10 VDC maximum range referred to the analog ground (AGND); default setting is ±10 VDC.
The P_MONITOR signal is also present on the front panel at test point X1.

11.9 Pressure or force monitor output signal (F_MONITOR+)

For alternated position/force (or position/pressure) control, the Z-ME-KZ generates an analog voltage output signal proportional to the actual pressure or force applied to the actuator end; the monitor output signals can be software set to show other signals available in the controller (e.g. analog reference, force reference).
The output polarity is software selectable within ±10 VDC maximum range referred to the analog ground (AGND); default setting is ±10 VDC.
The F_MONITOR signal is also present on the front panel at test point X2.

11.10 Enable Input Signal (ENABLE)

To enable the controller, a 24VDC voltage has to be applied on pin d18 referred to pin b28.
When the Enable signal is set to zero the controller can be software set to perform one of the following actions:
- move forward or backward in open loop - default setting
- move forward and maintain in closed loop a predefined actuator's position (hold position)
- maintain the actuator actual position in close loop control
- disable the controller functioning (control output set to zero)

11.11 Fault output signal (FAULT)

Fault output signal indicates fault conditions of the controller (alarm active, reference or transducer signal cable broken, max error exceeded, etc.).
Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC (pin d22 referred to pin b28).

11.12 Power supply signal for potentiometer position transducer (VREF -10VDC, VREF +10VDC)

Power supply for potentiometer position transducer may be generated from the controller card using the VREF -10VDC and VREF +10VDC signal @ max 30 mA.

11.13 Power supply for incremental encoder position transducer (Inc +5VDC, GND)

Power supply for incremental encoder position transducer may be generated from the controller card using the +5VDC @ max 100 mA.

11.14 Digital input signals (DI1 - DI8)

The 8 digital inputs can be used to trigger a command or to read a system state. For each input by the Z-SW software, it is possible to set the polarity and to match a proper condition within the following:
- start/stop/switch-over command in case of internal reference generation (see 3.2)
- specific operative command for hydraulic axis mode (referencing mode, jog mode, automatic mode)
- jog command
- disable pressure / force alternated control

11.15 Digital output signals (DO1 - DO7)

The 7 digital outputs can be used to generate digital signals useful to the system synchronization and for monitoring purpose. The digital outputs can be configured in polarity and all the channels can be independently programmed by the Z-SW software.
Typically the digital outputs are used to:
- set alarm condition related with the hydraulic axis working phase
- identify a particular working condition to synchronize other machine functionalities
- signal target position reached
- signal pressure / force control active
- signal tracking error

11.16 CANopen communication signals (only for /BC option)

For controllers with CANopen communication interface (only for /BC option), the connections are located on the rear connector: pin f28 (CAN_GND), pin f30 (CAN_L) and pin f32 (CAN_H).

12 PROGRAMMING DEVICES

The functional parameters of digital controllers, like internal reference generation or controller dynamics, can be easily set and optimized with the Atos Z-SW programming software, available in three different versions according to the driver's communication interface: Z-SW-PS (Serial), Z-SW-BC (CANopen) and Z-SW-BP (PROFIBUS DP).
A proper connection is required between the PC and the electronic controller communication port: for a more detailed description of software interface, PC requirements, adapters, cables and terminators, please refer to technical table G500.
Digital controllers with fieldbus communication interface (-BC and -BP) can be managed in real-time 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; please contact Atos technical office for assistance.

Programming software, must be ordered separately:

Z-SW-* (mandatory - first supply) = Dvd including Z-SW-* software installer and operator manuals; it allows the registration to Atos digital service
Z-SW-*-N (optional - next supplies) = as above but not including the registration form for Atos digitals service
On first supply of the Z-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 it is also possible to download the latest releases of the Atos software, manuals, drivers and configuration files.

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

13 MAIN SOFTWARE PARAMETER SETTINGS

For a detailed descriptions of the available settings, wirings and installation procedures, please refer to the programming manual Z-MAN-ME-KZ included in the Z-SW-* Dvd programming software (see section 12).

13.1 External reference and transducer parameters

Allow to configure the controller reference and transducer inputs, analog or digital, to match the specific application requirements:
- *Scaling parameters* define the correspondence of these signals with the specific actuator stroke or force to be controlled
- *Limit parameters* define maximum/minimum stroke and force to detect possible alarm conditions
- *Homing parameters* define the startup procedure to initialize incremental transducer (e.g. encoder)

13.2 Position PID control dynamics parameters

Allow to optimize and adapt the position controller closed loop to the wide range of hydraulic system characteristics:
- *PID (position)* each part of the position controller closed loop algorithm (proportional, fine positioning advanced integral, derivative, feed forward, etc.) can be modified in order to match the application requirements.

13.3 Multiple pressure/force PID control dynamics parameters

Allow to optimize and adapt the pressure/force controller closed loop to the wide range of hydraulic system characteristics:
- *PID (pressure/force)* each part of the pressure/force controller closed loop algorithm (proportional, integral, derivative, feed forward, etc) can be modified in order to match the application requirements. Through Atos software or using dedicated digital inputs it is possible to select up to four different pressure/force PID parameters setting, stored into the controller. Switching the active setting of pressure/force PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).

13.4 Control output signal parameters

Allow to configure the controller command for the proportional valve which regulates the hydraulic flow to the actuator:
- *Scaling parameters* define the correspondence of the command signal to the specific valve reference signal range
- *Limit parameters* define maximum/minimum range to detect possible alarm conditions

13.5 Monitoring parameters

Allow to configure the controller monitoring function of the positioning error (difference between actual reference and feedback) and detects anomalous conditions:
- *Monitoring parameters* maximum allowed errors can be set for both static and dynamic positioning phases, and dedicated waiting times can be set to delay the activation of the alarm condition and relevant reaction (see 13.6)

13.6 Fault parameters

Allow to configure how the controller detect and react to alarm conditions:
- *Diagnostics parameters* define different conditions, threshold and delay time to detect alarm conditions
- *Reaction parameters* define different actions to be performed in case of alarm presence (stop at actual or preprogrammed position, emergency forward/backward, controller disabling, etc.)

13.7 Digital IO configuration

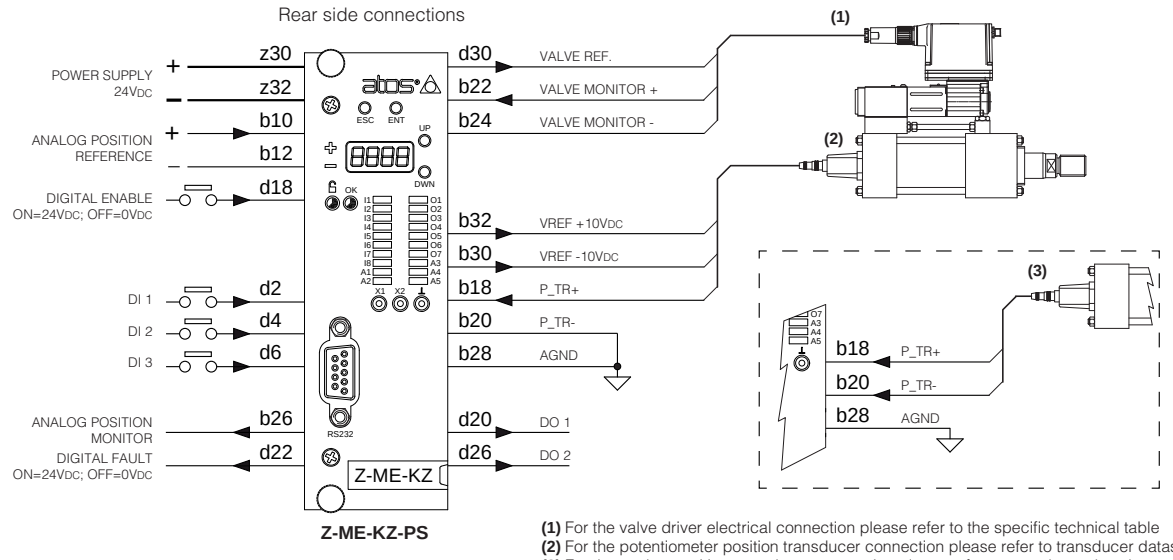
Allow to configure the controller's digital inputs/outputs to trigger/generate signals from /for the external machine central unit:
- *Polarity* define the signal active state
- *Trigger condition* define the input state to run a predefined internal command (see 11.14)
- *Output state* define the digital output based on the internal controller state (see 11.15)

13.8 Motion phases parameters

When the internal reference generation is active a pre-programmed cycle can be generated; start/stop/switch-over commands and reference generation types parameters can be set to design a customized sequence of motion phases adapted to the specific application requirements (see 3.2).

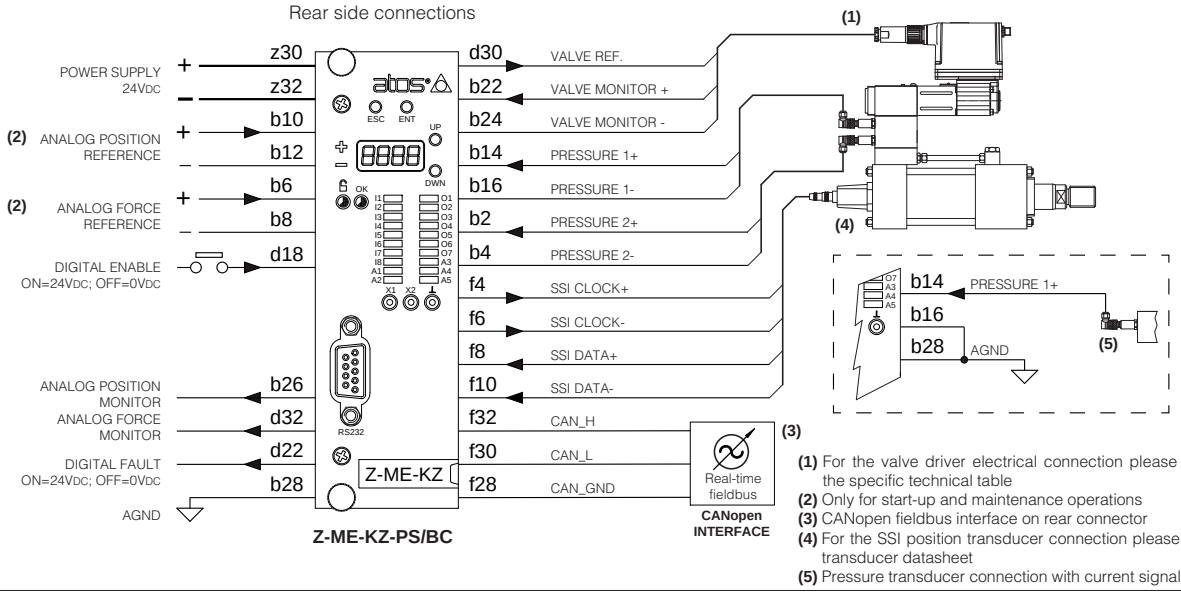
14 WIRING BLOCK EXAMPLES

14.1 Position control - external analog reference - potentiometer actuator transducer



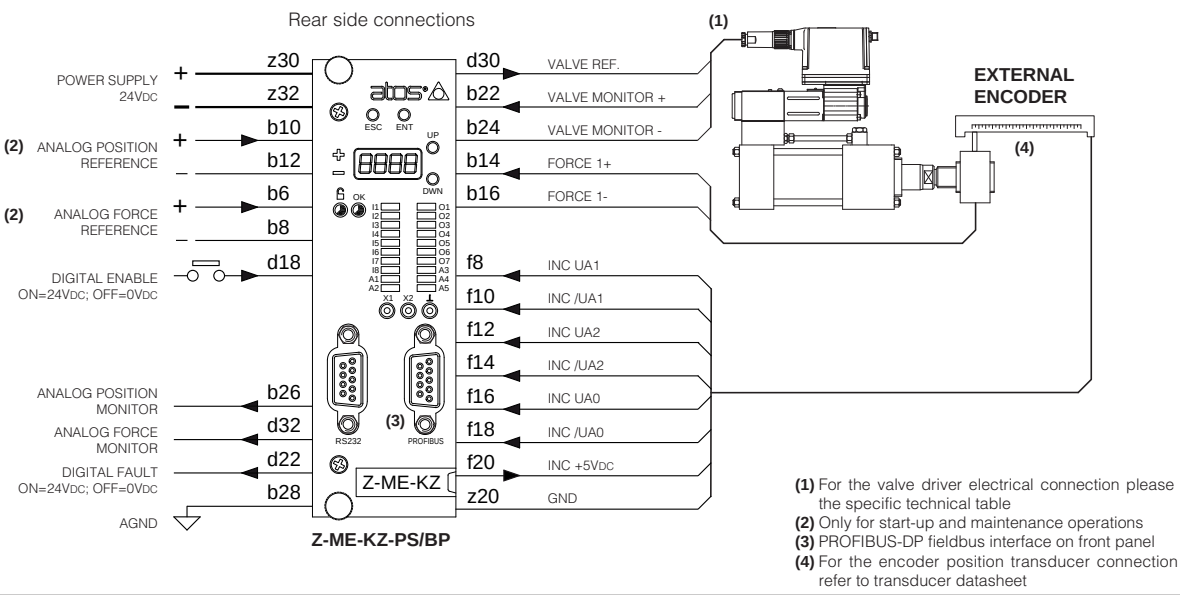
(1) For the valve driver electrical connection please refer to the specific technical table
(2) For the potentiometer position transducer connection please refer to transducer datasheet
(3) For the analog position transducer connection please refer to transducer datasheet

14.2 Alternated position/force control - external reference - SSI actuator transducer - 2 pressure transducers - CANopen



(1) For the valve driver electrical connection please refer to the specific technical table
(2) Only for start-up and maintenance operations
(3) CANopen fieldbus interface on rear connector
(4) For the SSI position transducer connection please refer to transducer datasheet
(5) Pressure transducer connection with current signal output

14.3 Alternated position/force control - internal reference generation - encoder actuator transducer - load cell - PROFIBUS-DP



(1) For the valve driver electrical connection please refer to the specific technical table
(2) Only for start-up and maintenance operations
(3) PROFIBUS-DP fieldbus interface on front panel
(4) For the encoder position transducer connection please refer to transducer datasheet

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

Oddział Handlowy
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	

*ul. Świt 37

Punkt Handlowy
Czeladź, ul. Wojkowicka 14a

czeladz@hydro.com.pl
tel. +48 32 763 72 17 fax. +48 32 360 01 61
tel. +48 32 763 72 19

www.hydro.com.pl