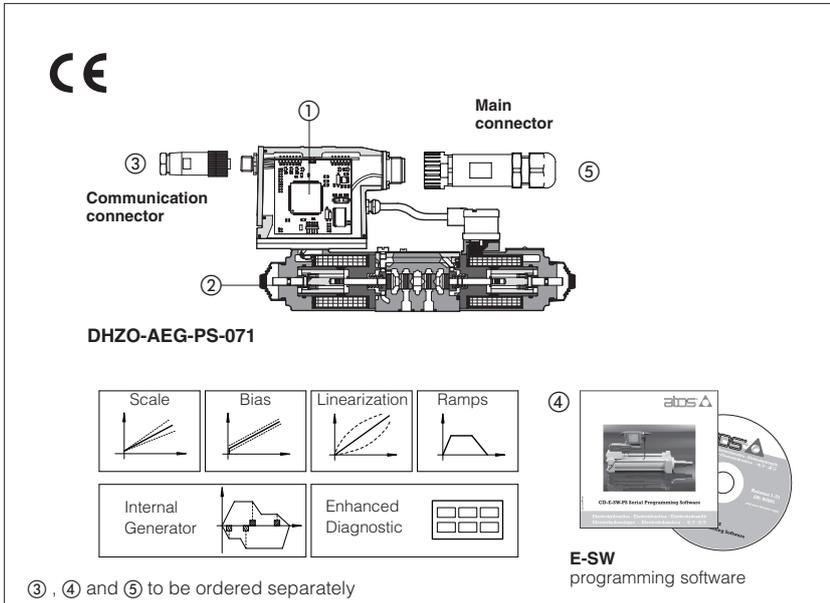


Digital electronic drivers type E-RI-AEG

integral-to-valve format with cycle generator - for proportional directional valves without transducer



E-RI-AEG integral digital drivers ① supply and control the current to the solenoid of Atos proportional valves without transducer, according to the electronic reference input generated internally by means of six on-off input signals.

The solenoid ② 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.

Two modes of use are software selectable:

- **Mode A - automatic cycle**
The driver automatically handles a cylinder's forward/backward working cycle with fast-slow speed phases (speed+ramp), configured and stored in the driver. The digital driver receives ON-OFF inputs from the local proximity microswitches (f1...f4) and from the machine control unit (f5/f6 = start forward/backward)
- **Mode B - sequenced cycle**
The machine control unit handles the desired cylinder's working cycle as a sequence of the six different phases (speed+ramp), configured and stored in the driver. The driver actuates the different phases (speed+ramp), according to the state of the six ON-OFF inputs received from the machine control unit (f1...f6).

01H single solenoid driver can be used in association with proportional pressure control valves, when configured in mode B.

Digital communication interface ③ allows to program all the drivers functional parameters with the Atos PC software ④.

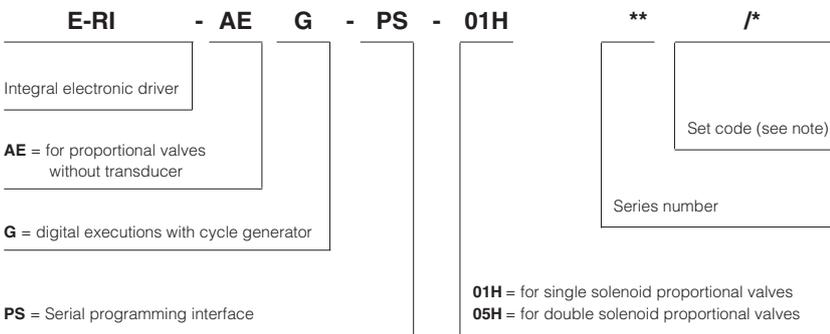
Electrical Features:

- Integral-to-valve digital electronic
- Standard 12 pin main connector ⑤ for power supply and on-off inputs/outputs
- 5 pin connector ③ for serial -PS communication interface
- IP67 protection degree
- CE mark to EMC and Low Voltage directives

Software Features:

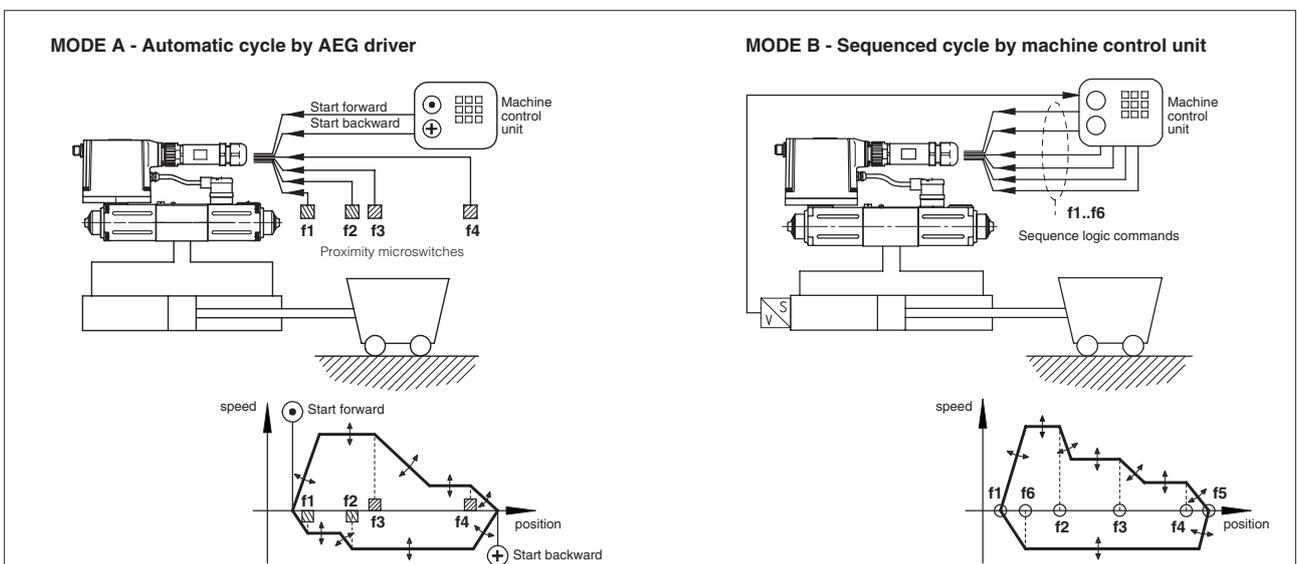
- Internal reference signal generation
- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for the hydraulic regulation
- Setting of valve's dynamic response to optimize the application performances
- Complete diagnostics of driver status, solenoid and fault conditions
- Intuitive graphic interface

1 MODEL CODE

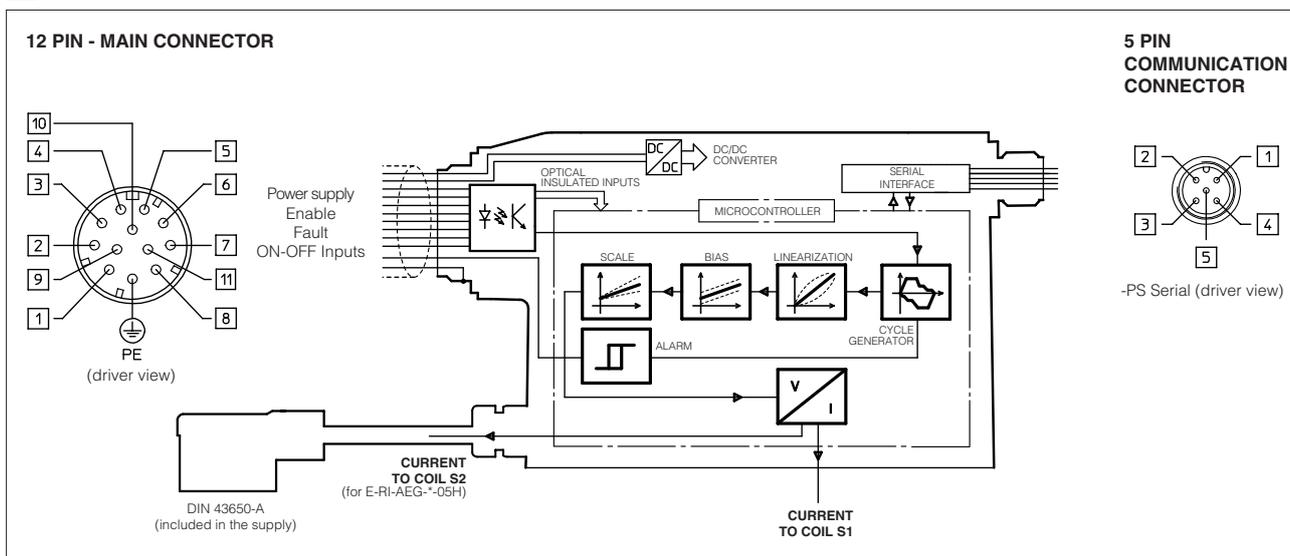


Note: the set code identifies the correspondance between the digital integral driver and the relevant valve; it is assigned by Atos when the driver is ordered as spare part.

2 INTERNAL GENERATION MODES



3 BLOCK DIAGRAM



4 ELECTRONIC CONNECTIONS - 12 PIN MAIN CONNECTOR

PIN	SIGNAL	TECHNICAL SPECIFICATIONS	NOTES
1	V+	Power supply 24 Vdc for solenoid power stage (see 5.1)	Input - power supply
2	V0	Power supply 0 Vdc for solenoid power stage (see 5.1)	Gnd - power supply
3	ENABLE	Enable (24 Vdc) or disable (0 Vdc) the driver internal generator(see 5.2) Manual driver operation (Floating)	Input - on/off signal
4	F1	On-Off inputs; 0 ÷ 24 Vdc (optical insulated) - referred to pin 10 (see 5.3) Mode A: F1..F4 for proximity switches connection F5..F6 for start forward/backward connection from the machine central unit Mode B: F1..F6 for command signals connection from the machine central unit	Input - on/off signal
5	F2		
6	F3		
7	F4		
8	F5 (START FWD)		
9	F6 (START BKW)		
10	F_GND	Optical insulated input GND (0 V) for F1 ÷ F6	Gnd - on/off signal
11	FAULT	Driver status : Fault (0Vdc) or normal working (24 Vdc) (see 5.4)	Output - on/off signal
PE	EARTH	Internally connected to driver housing	

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

5 SIGNALS SPECIFICATIONS

Atos proportional valves are CE marked according to the applicable directives (e.g. Immunity/Emission EMC Directive and Low Voltage Directive). Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in table F003 and in the user manuals included in the E-SW programming software.

The electrical signals of the valve (e.g. monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, EN-892)

5.1 Power supply and wirings (pin 1 referred to pin 2)

The power supply must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.

A safety fuse is required in series to each driver power supply: 2,5 A fuse

5.2 Enable Input Signal (pin 3 referred to pin 2)

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

Only for internal reference generation Mode A:

- when the Enable signal is set to zero, the valve functioning is disabled and the internal generator is reset
- when the Enable signal is switched to 24Vdc, the ON/OFF input signals are verified before enabling the internal generator
- when the Enable signal is floating, the internal generator is disabled and the valve can be manually operated in forward and backward direction using F5/F6 ON-OFF inputs (start forward and start backward)

5.3 ON/OFF Input Signals (pin 4...9 referred to pin 10)

The 6 ON/OFF input signals (F1...F6) are used to select the active phase of internal reference generation, among the available stored values.

The polarity of the digital inputs can be customized: active status = 24 Vdc is the default setting

5.4 Fault Output Signal (pin 11 referred to pin 2)

Fault output signal indicates fault conditions of the driver (solenoid short circuits/not connected, generator fault, etc.).

Fault presence corresponds to 0 Vdc, normal working corresponds to 24 Vdc

6 SOFTWARE TOOLS

The driver configuration and parameters can be easily set with the Atos E-SW-PS programming software.

A proper connection is required between the PC and the electronic driver communication port: for a more detailed description of software interface, PC requirements, adapters and cables, please refer to technical table G500.

Programming software, must be ordered separately :

E-SW-* (mandatory - first supply) = Dvd including E-SW-* software installer, operator manuals, registration form for Atos digitals service

E-SW-*-N (optional - next supplies) = as above but not including the registration form for Atos digitals service

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

7 MAIN SOFTWARE PARAMETER SETTINGS

For a detailed descriptions of the available settings, wirings and installation procedures, please refer to the programming manuals included in the E-SW programming software (see [6]).

7.1 Scale

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

7.2 Bias and Threshold

Proportional valves may be provided with a dead band in the hydraulic regulation corresponding to their switch-off status. This dead band discontinuity in the valve's regulation can be compensated by activating the Bias function, which adds a fixed preset Bias value to the reference signal input. 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 to the specific proportional valve to which the driver is coupled. Threshold default setting is 0. Two different Bias regulations are available for double solenoid valves or three position single solenoid valves: positive reference signals activate BiasA and negative reference signals activate BiasB. Refer to the programming manuals for a detailed description of other software selectable Bias functions.

7.3 Linearization

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

7.4 Dither

The dither is a 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 130 to 488 Hz (default value is 195Hz). 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.

7.5 Internal generator - Mode A - automatic cycle

When Mode A is active (default setting), the driver automatically handles forward/backward working cycles with fast-slow speed control according to the programmed cycle.

The digital driver reads the start signals from the machine central unit (f5..f6: start forward/backward) and the actual position phase from the local proximity microswitches (f1...f4) connected to the main connector.

Each time the status of the on-off inputs change, the driver activates the next phase as programmed by software.

The working cycle is thus self generated and actuated by the above signals, in particular:

- start forward signal (connected to F5) activates the forward movement
- microswitch signals (connected to F1....) sequence the forward cycle phases
- start backward signal (connected to F6) activates the backward movement
- microswitch signals (connected toF4) sequence the backward cycle phases

Software features:

- up to total four phases for the valve cycle (forward plus backward)
- up to three phases for each direction
- parameter setting for each of the four phases:
 - speed regulation V_n : corresponding to the solenoid current and therefore to the valve's regulation
 - ramp time R_n : time for a 0÷100% speed step ($V_n - V_{n-1}$)
- parameter setting for each proximity switch :
 - polarity: as normally closed / normally open
 - type: each proximity switch signal can be set as impulsive / continuous
- automatic start: for each direction (forward or backward) it is possible to choose if the start movement of that direction is activated with start inputs (F5/F6) or automatically at the end of the last phase of the opposite direction
- diagnostic:
 - actual phase, showing the active phase during the cycle
 - actual direction, showing the active direction during the cycle (forward or backward)
 - inputs state, showing F1 ÷ F6 electrical state (ON/OFF)

7.6 Internal generator - Mode B - sequenced cycle

When Mode B is active, the driver actuates up to six different phases (speed + ramp), according to the configuration of the ON-OFF input signals connected to the main connector.

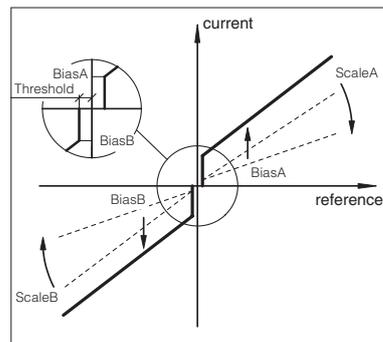
The machine control unit may control the desired working cycle by generating the command signals to the digital driver.

Therefore, Mode B operation is the same available with the DIN-rail digital driver type E-BM-AS (see table G030), but with the important advantage of integral-to-valve format.

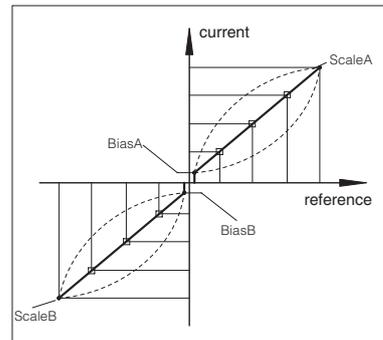
Software features:

- up to six phases
- parameter setting for each of the six phases:
 - speed regulation V_n : corresponding to the solenoid current and therefore to the valve's regulation
 - ramp time R_n : time for a 0÷100% speed step ($V_n - V_{n-1}$)
- for each proximity switch the following parameters can be set:
 - polarity: as normally closed / normally open (input type is always continuous)
- diagnostic:
 - actual phase, showing the active phase during the cycle
 - inputs state, showing F1 ÷ F6 electrical state (ON/OFF)

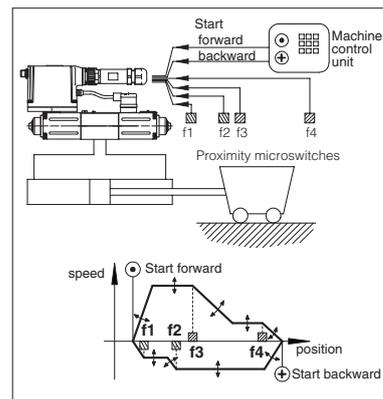
7.1, 7.2 - Scale, Bias & Threshold



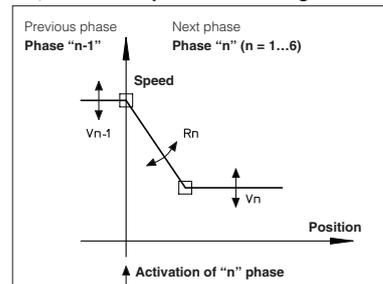
7.3 - Linearization



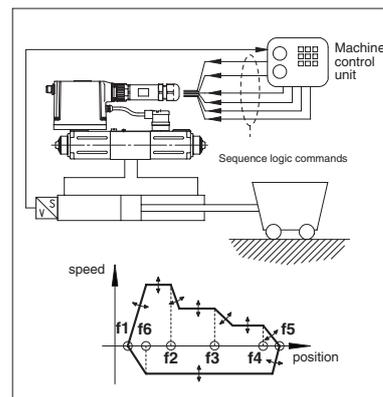
7.5 - Mode A - automatic cycle



7.5, 7.6 - Phase parameter setting



7.6 - Mode B - sequenced cycle



8 DRIVER CHARACTERISTICS

Power supply (see 5.1)	Nominal: +24 V _{DC} Rectified and filtered: $V_{rms} = 20 \div 32 V_{MAX}$ (ripple max 10 % V_{PP})
Max power consumption	50 W
Enable input (see 5.2)	Input impedance: $R_i > 10 \text{ k}\Omega$; range : $0 \div 5 \text{ V}_{DC}$ (ON state), $9 \div 24 \text{ V}_{DC}$ (OFF state), $5 \div 9 \text{ V}_{DC}$ (not accepted)
On-Off inputs (see 5.3)	Input impedance: $R_i > 10 \text{ k}\Omega$; range : $0 \div 5 \text{ V}_{DC}$ (ON state), $9 \div 24 \text{ V}_{DC}$ (OFF state), $5 \div 9 \text{ V}_{DC}$ (not accepted)
Fault output (see 5.4)	Output range : $0 \div +24 \text{ V}_{DC}$ (ON state > power supply-2V ; OFF state < 1V) @ max 50mA
Alarms	Solenoid coil not connected/short circuit, overtemperature, under temperature
Format	Sealed box on the valve; IP67 protection degree
Operating temperature	$-20 \div 60 \text{ }^\circ\text{C}$ (storage $-25 \div 70 \text{ }^\circ\text{C}$)
Mass	approx. 385 g
Additional characteristics	Short circuit protection of solenoid's current supply; current control by P.I.D. with rapid solenoid switching
Electromagnetic compatibility (EMC)	Immunity: EN 50082-2; Emission: EN 50081-2
Communication interface Physical Layer Protocol	serial RS232C Atos ASCII coding
Recommended wiring cable	LiCY shielded cables: $0,5 \text{ mm}^2$ for length up to 40m [$1,5 \text{ mm}^2$ for power supply and solenoid]

9 ELECTRONIC CONNECTIONS - 5 PIN COMMUNICATION M12 CONNECTOR

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

10 CONNECTORS CHARACTERISTICS - MAIN AND COMMUNICATION (to be ordered separately)

CODE	SP-ZH-12P	SP-ZH-5P
Type	Female straight circular socket plug 12pin	Female straight circular socket plug 5 pin
Standard	DIN 43651	M12 – IEC 60947-5-2
Material	Plastic reinforced with fiber glass	Plastic
Cable gland	PG16	PG9
Cable	LiCY $10 \times 0,14 \text{ mm}^2$ (signal) LiYY $3 \times 1 \text{ mm}^2$ (alimentation)	LiYCY $5 \times 0,25 \text{ mm}^2$ shielded
Connection type	to crimp	screw terminal
Protection (DIN 40050)	IP 65	IP 67

11 OVERALL DIMENSIONS [mm]

