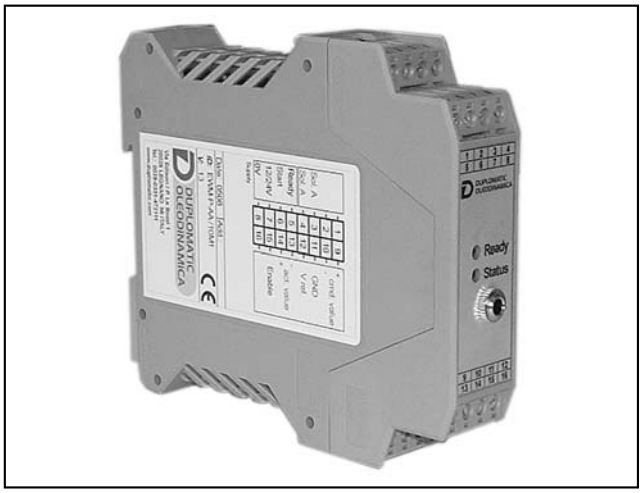


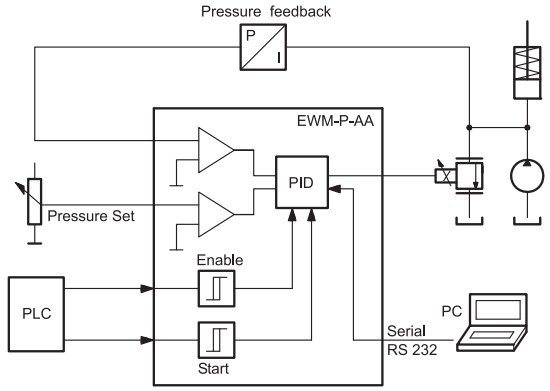
EWM-P-AA

DIGITAL CARD FOR PRESSURE AND FORCE CONTROL IN CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



— The EWM-P-AA is used to closed loop control of pressure reducing and pressure relief valves. The card integrates also an embedded power amplifier for a direct control of proportional valves.

— This card works as a bypass control module. The command value is directly transferred to the control output (pressure valve) and the closed loop compensates only the linearity failures. In most of cases the optimization is possible without any measuring instruments (only one manometer is necessary).

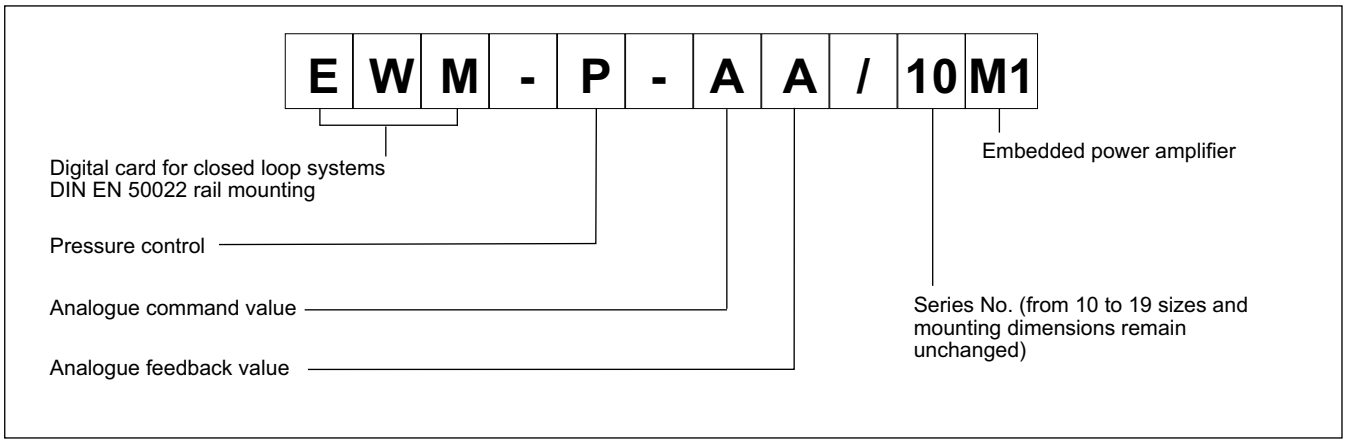
— The card allows to set the following parameters: ramp up, ramp down, PID parameters, dither, frequency and amplitude, PWM, maximum and minimum pressure.

— The card use the RS232C interface, and is settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 3,0 A
Current consumption	A	1,0 ÷ 2,6 depending from solenoid current
Command value	V mA	0 ÷ 10 (R_I = 100 kΩ) 4 ÷ 20 (R_I = 390 Ω)
Pressure signal accuracy	%	0,1
Feedback value	V mA	0 ÷ 10 (R_I = 33 kΩ) 4 ÷ 20 (R_I = 250 Ω)
Output current	A	1,0 -1,6 - 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



This module is useful for pressure control in very different applications. The output signal can control various kind of pressure valves, but the controller structure is optimized for pressure closed loop control system with typical pressure valves. An integrated power stage for a direct control of the valve and high dynamic control loops (1 msec for pressure control and 0,167 msec for the current loop control) offers a simple solution.

This module is recommended where open loop applications are not sufficient concerning the accuracy.

Pressure controls with constant pumps or remote controllable servo pumps and for force and torque controls with cylinders and motor drives are typical applications.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Digital Input

The card accepts digital input voltage from 12 to 24 V, with current <0,1A. Low level <4; High level >12V. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command Input

The card accepts analogue command input, with voltage 0÷10V (R_I= 100Ω) and current 4÷20 mA (R_I= 390Ω).

2.5 - Input feedback values

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10V (R_I= 100Ω) or 4 ÷ 20 mA (R_I= 390Ω).

The parameters are settable via software (see the parameter table)

2.6 - Output values

The output current value for this card is settable via software. The available values are 1,0, 1,6 and 2,6 A.

2.7 - Digital Output

A digital output is available (READY) and its signal is displayed from the green led.

3 - LED SIGNALS

There are two leds on the card, but only the GREEN one works.

GREEN: Shows if the card is ready.

ON - The card is supplied and the system is ready
OFF - No power supply or ENABLE non activated
FLASHING - Failure detected (solenoid or 4÷20 mA) only if the parameter SENS is ON.

YELLOW: No function.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the command and its uses. The parameters changes depending on the card model.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

EXAMPLE OF PARAMETERS TABLE

Command	Parameters	Default	Units	Description
mode x	x = EXT|STD	STD	-	Operating mode changing. Various commands are blanked out in STD.
ts x	x= 4… 30	10	0,1 ms	Permette di modificare il tempo di campionamento del controllo.
sens x	x = ON|OFF	On	-	This command is used to activate and disable monitoring functions (4… 20 mA sensors, solenoid current flow monitoring and internal module monitoring).Normally, monitoring is always active as otherwise no errors are signaled via the PIN 1 (READY) output. It can, however, be disabled for fault finding.
ain:i A B C X	I= W|X A= -10000…10000 B= -10000…10000 C= -500…10000 X= V|C	 1000 1000 0 V	 - - 0,01% -	This command can be used to scale the individual inputs. The following linear equation is used for scal-ing. Output = A/B · (Input – C) The "C" value is the offset (e. g. to compensate the 4 mA in case of a 4… 20 mA input). The variables A and B define the gain factor.
aa:i x	i= UP|DOWN x= 0..60000	 100	 ms	Two quadrant ramp function. The ramp time is separately set for UP and DOWN ramps.
lim:i x	i= I|S :I 0… 10000 :S 0… 10000	 2500 2500	 0,01% 0,01%	The integrator function is controlled by this command. **LIM:I** Limitation of the integrator range (faster control function by reduced pressure overshoots). By a high nonlinearity of the valve the LIM value must be sufficient to compensate it. **LIM:S** Controls the integrator function. To reduce pressure overshoots, an activation point for the in-tegrator can be programmed via the LIM:S value. (e.i. 2500=25% of command pressure = activation point)
c:i x	I= P|I|D|T1|FF :P x= 0… 10000 :I x= 2… 21000 :D x= 0… 120 :T1 x= 0… 100 :SC x= 0… 10000	 :P 100 :I 4020 :D 0 :T1 100 :SC 8000	 0,01 0,1 ms 0,1 ms 0,1 ms 0,01%	**PID**-compensator for pressure limitation: **P**-gain, 50 = gain of 0,5. **I** -gain, integrator time in ms, >2010 deactivate the function. **D**-gain, **T1**-filter for D-gain. **SC** feed forward (direct control of the output).
c_ext:i x	i = P1|T1 :P1 x= 0… 10000 :T1 x= 0… 1000	- 0 20	 0,01 ms	Extended PID compensator function. A second PT1control path parallel to the standard P gain can be activated. P1 gain of this path, T1 time constant factor of this path.
min x **max x** **trigger x**	X= 0… 6000 X= 3000… 10000 X= 0… 10000	0 10000 200	0,01% 0,01% 0,01%	Dead band compensation for proportional valves with positive overlap- A good compensation improve the positioning accuracy. **min** = Zero point setting /following error compensation **max** = Maximum output signal limitation. **trigger** = Trigger threshold for activating the MIN parameter.
current:i x	i= A x= 0-1-2	 0	 -	Output current range: **0** = 1,0 A, **1** = 1,6 A e **2** = 2,6A.
dampl:i x	i= A x= 0..2000	 600	 0,01%	Dither amplitude. Standard values between 500 and 1200 (good performances are obtained with a set value = 700).
dfreq:i x	x= 60… 400	120	Hz	Dither frequency. . Different amplitudes or frequencies may be required depending on the valve.
pwm:i x	i= A x= 100..7700	 2600	 Hz	PWM frequency. A PWM frequency ≥ 2000 Hz improve the current loop dynamic. Valves with low dynamic and high hysteresis work better with PWM freq between 100 and 500 Hz. In this case, DAMPL must be = 0.
ppwm:i x **ipwm:i x**	i= A x= 1… 30 x= 5… 100	 7 40	 - -	The PI current controllers for the solenoids. These parameters should not be changed without appropriate measurement ca-pabilities and experience. If the PWM frequency is > 2500 Hz the dynamic response of the current controller can be increased.Typical values are: PPWM = 7… 15 and IPWM = 20… 40. If the PWM frequency is < 250 Hz the dynamic response of the current controller must be reduced.Typical values are: PPWM = 1… 3 and IPWM = 40… 80.

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

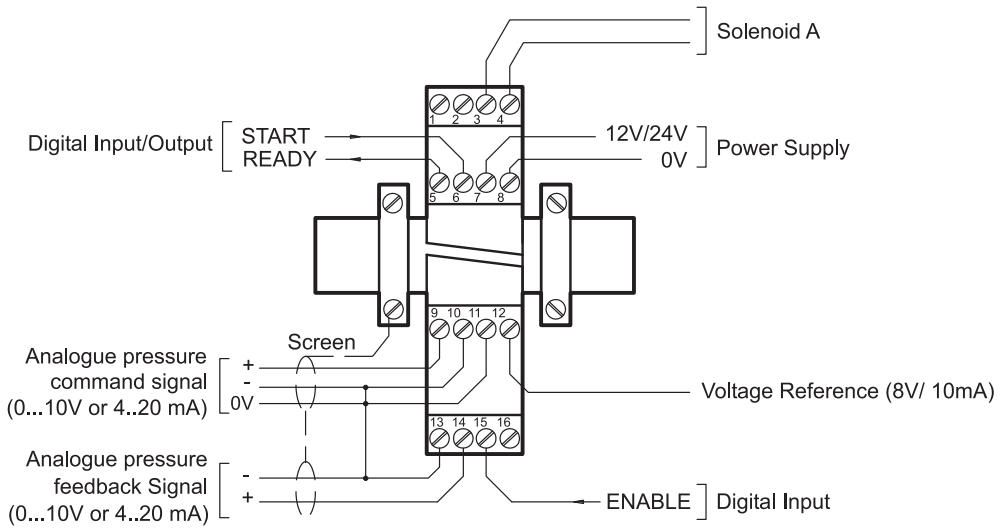
The software kit includes a USB cable (2.70 mt lenght) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 5 — READY output:
General operationally, ENABLE is active and there is no sensor error (by use of 4÷ 20 mA sensors).
This output corresponds with the green LED.

PIN 6 — START Input:
The controller is active; the external analogue command value is taken over.

PIN 15 — ENABLE Input:
This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. The system works in open loop (like a simple power amplifier).

ANALOGUE INPUT

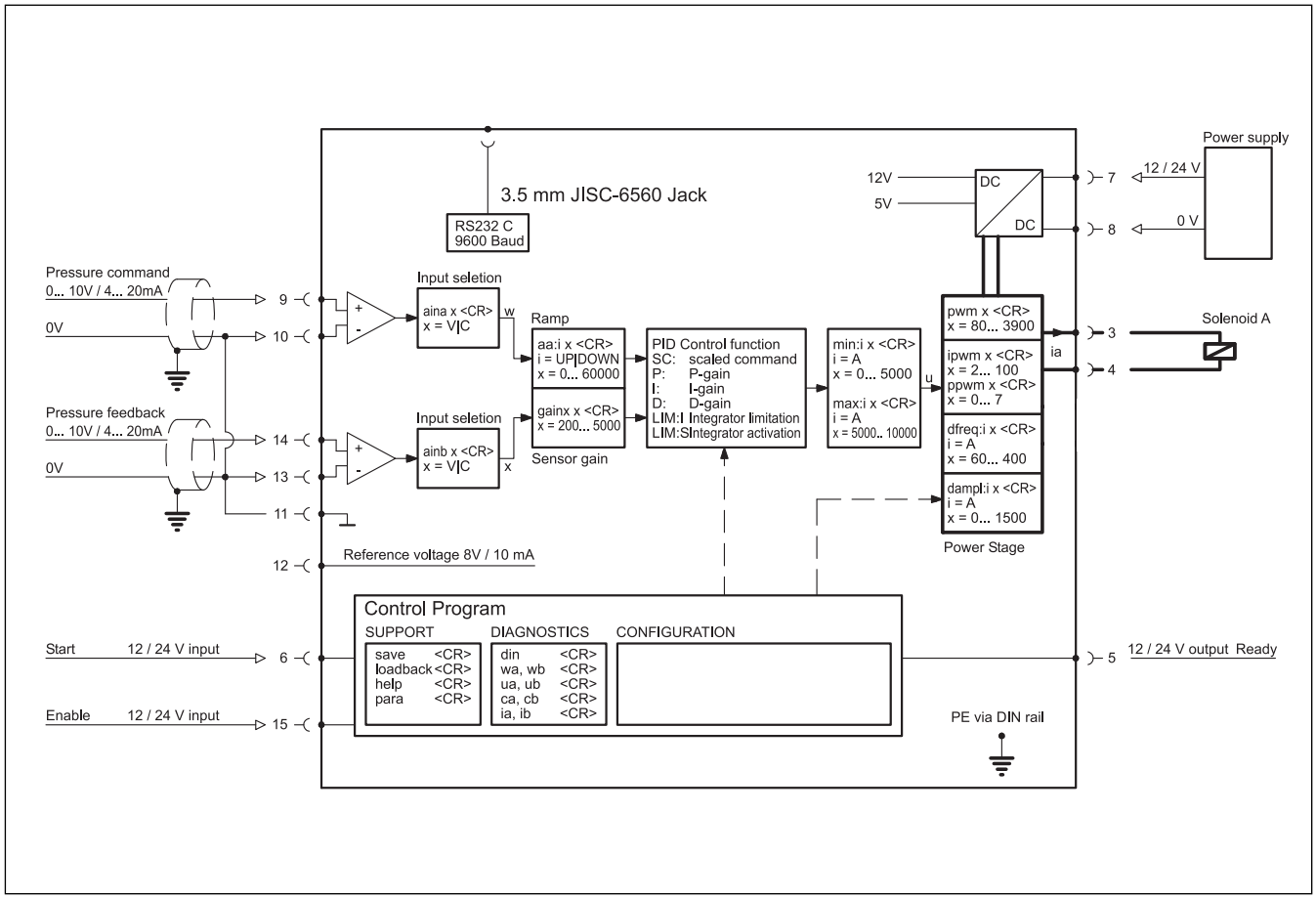
PIN 9/10 — Pressure command (W)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷20 mA

PIN 13/14 — Pressure feedback (X)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷20 mA

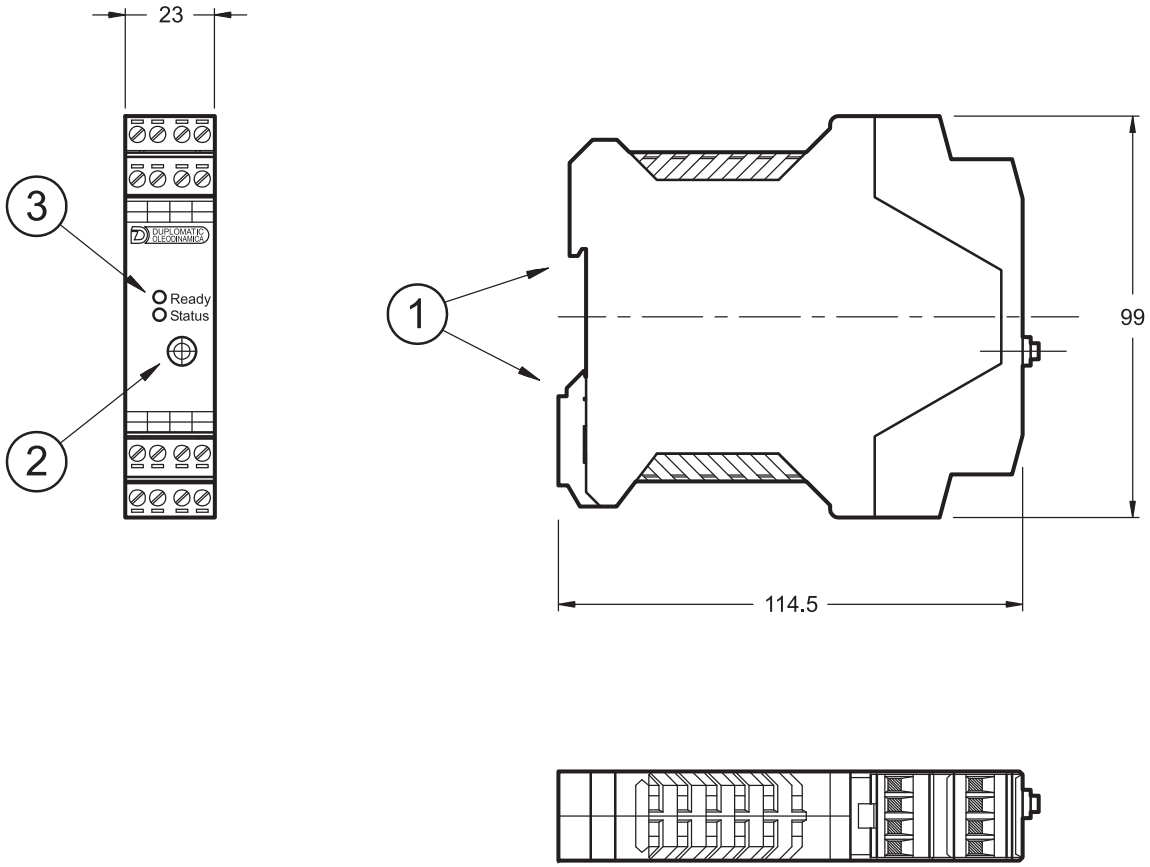
ANALOGUE OUTPUT

PIN 3/4 — PWM output for controlling of the valve.

8 - CARD BLOCK DIAGRAM



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for connection PC cable
3	LED for OUTPUT signal

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