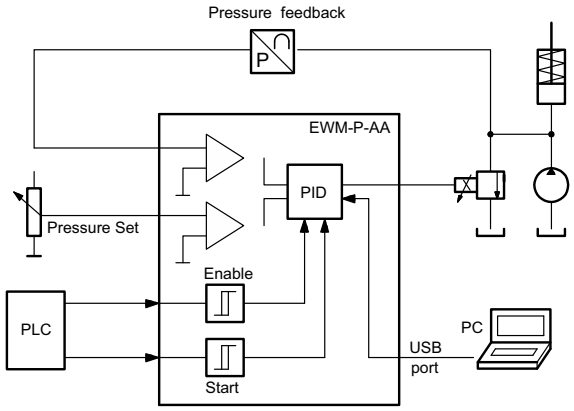
EWM-P-AA

DIGITAL CARD FOR PRESSURE (FORCE) CONTROL IN CLOSED LOOP SYSTEMS

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



— This card is designed for pressure controlled servo pumps. It manages closed loop control of pressure reducing and pressure relief valves.

— The 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 (a pressure sensor is necessary only).

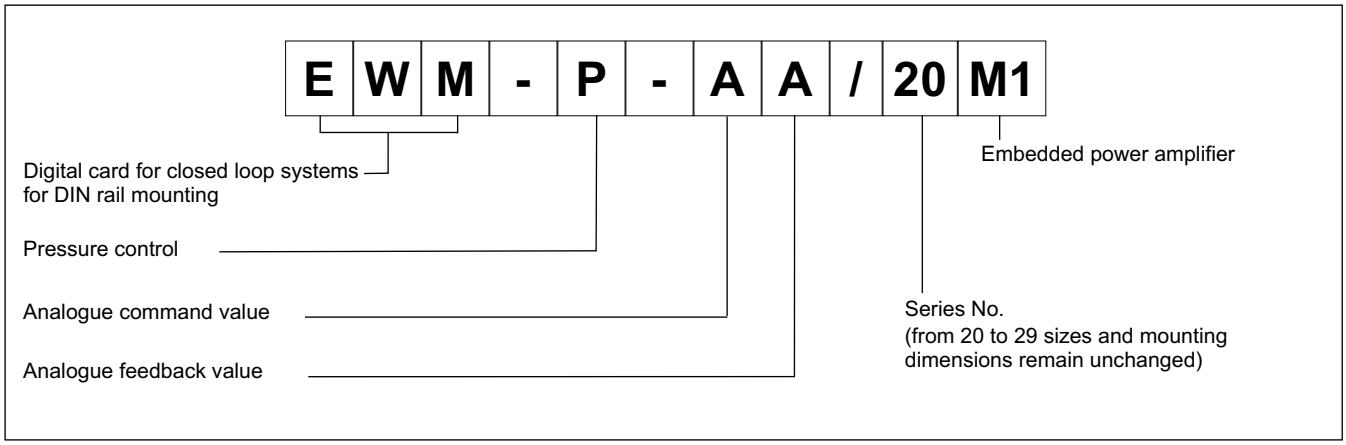
— It has an integral power amplifier for direct control of proportional valves.

— Card setup via software only, through an on-board USB-B port. Customizable parameters are: ramp up, ramp down, PID parameters, dither, frequency and amplitude, PWM, maximum and minimum pressure.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
External fuse	A	3,0 (medium time lag)
Current consumption	A	60 + current for solenoid
Command (pressure) value	V mA	0 ÷ 10 (R_I = 150 kΩ) 4 ÷ 20 (R_I = 390 Ω)
Pressure signals accuracy	%	0,006 oversampling included
Feedback value	V mA	0 ÷ 10 (R_I = 90 k Ω) 4 ÷ 20 (R_I = 390 Ω)
Output current	A	0.5 ÷ 2.6 stepless
Sample time (pressure)	ms	1
Interface		USB-B (2.0)
Electromagnetic compatibility (EMC)		Immunity EN 61000-6-2 Emissions EN 61000-6-4
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



2 - FEATURES OVERVIEW

Controller Functions

- Pressure control in closed loop system
- Fine regulation – capable of accuracy not achievable with open loop set-up
- Highly dynamic control loop
- Adjustable PID controller
- Ability to modify command signal ramp times
- Emergency function (EOUT)
- Analog signal command
- Analog feedback input
- Simple and intuitive scaling of the input

Adaptation to the valve characteristics

- Advanced dead-band compensation – able to define output range and position
- Adjustable sampling time, PWM, dither
- Adjustable command signal response time

Power amplifier

- Embedded power amplifier
- Fine control of output signal
- PWM current output of up to 2.6A

Other characteristics

- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - 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, freewheeling 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.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - Command input (pressure)

The card accepts analogue command input, with voltage 0÷10V (R_I= 150 Ω) and current 4 ÷ 20 mA (R_I= 390 Ω).

3.5 - Feedback value

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10V (R_I = 90 kΩ) or 4 ÷ 20 mA (R_I = 390 Ω).

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

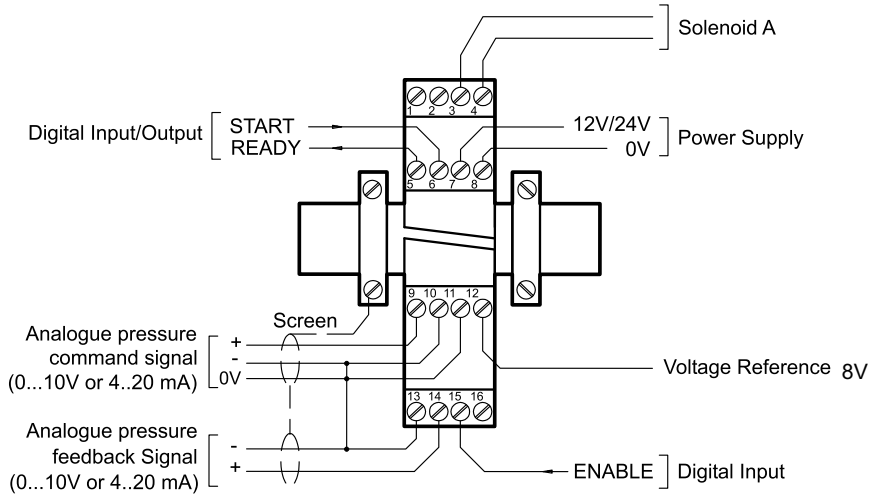
3.6 - Output values

The output current value for this card is settable via software. The value range is 0.5 ÷ 2.6 stepless. Broken wire and short circuit monitored. PWM frequency 61 ÷ 2604 Hz.

3.7 - Digital Output

A digital output is available (READY) and its signal is displayed from the green led. Low level: <2V, high level >10V (50 mA)

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 5 — READY output:
If the ENABLE is active and there are no discernable errors then the output is on. Otherwise it is off.
This output corresponds with the 'Ready' LED.
If the 4÷ 20 mA sensor is open an error is generated.

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

PIN 15 — ENABLE Input:
If the signal is applied (>10V) then the module is active and the power stage is active in closed loop.

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 12 — 8V reference output (max. 25mA)

PIN 3/4 — PWM output for valve control.

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : 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).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

WARNING! Plugs with freewheeling diodes and LED cannot be used with current controlled power outputs.

They interfere with the current control and they can destroy the output stage.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and the signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN rail should be provided. Transient interference voltages at the terminals are discharged via DIN rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system is controlled in closed loop. The integrated power stage makes it easy to set up the system quickly as it can be connected directly to a pressure valve.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic MS website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

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 OS Windows 7, 8 and 10.

WARNING! In card series 20, the default baud rate to be selected in the software has changed from 9600 baud to 57600 baud.
This can be set in OPTION / SETTINGS / INTERFACE.

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameters setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of parameters and their settings please refer to the Technical Manual *89500 ETM*.

7 - MAIN FEATURES

7.1 - Applications

This module is useful for a variety of pressure control applications. The control is accomplished by a PID controller carefully optimized for this application. Because of the high stability of this controller, the module is recommended for closed loop applications where an open loop control structure is incapable of achieving the desired accuracy.

The output signal (of up to 2.6A) can control a variety of pressure valves, such as pressure relieve valves and pressure control valves and as such no On-Board Electronics are needed.

Examples of such applications can be pressure control with constant pumps, remote controllable servo pumps and/or force & torque control with cylinders and motor drives.

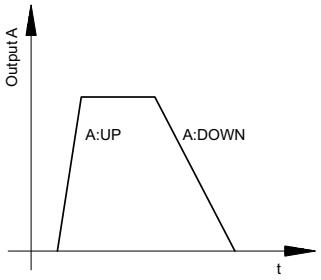
7.2 - Emergency Output (EOUT)

This function is able to set the output at a specific value (degree of valve opening) when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with the programmed ramp. The function can be deactivated.

The output value defined here is stored permanently (independently of the parameter set). The use of this feature should be carefully evaluated according to safety procedures in the system.

7.3 - Command Signal Ramp time (RA)

The parameters for ramp up and ramp down can be set in milliseconds. These values are the amount of time that the command signal will take to follow a step change in the reference signal.



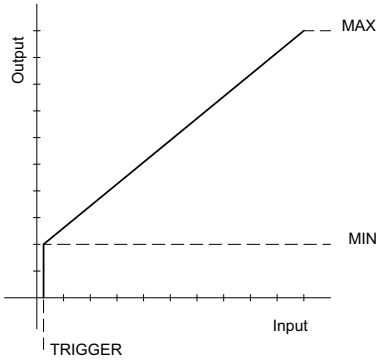
7.4 - PID Controller

The PID controller can be parameterized by modifying the relevant parameters, in order to suppress high-frequency noise and a value is also present in order to control the output by the input signal directly.

7.5 - Adaption of the output signal to the valve characteristics (TRIGGER)

With the MAX value, the maximum output can be easily defined. With the MIN value, the overlap (dead band of the valve) can be compensated. Via the TRIGGER the activation point of the MIN function is set and so a non-sensitive range around the zero-point can be specified.

If the MIN value is set too high, it influences the minimal pressure, which cannot be adjusted any longer. In extreme case this causes to an oscillating at small input values.



7.6 - Sample Time (TS)

The control dynamics can be influenced with the sample time. Changes should only be made by persons who have sufficient knowledge of dynamic systems behavior.

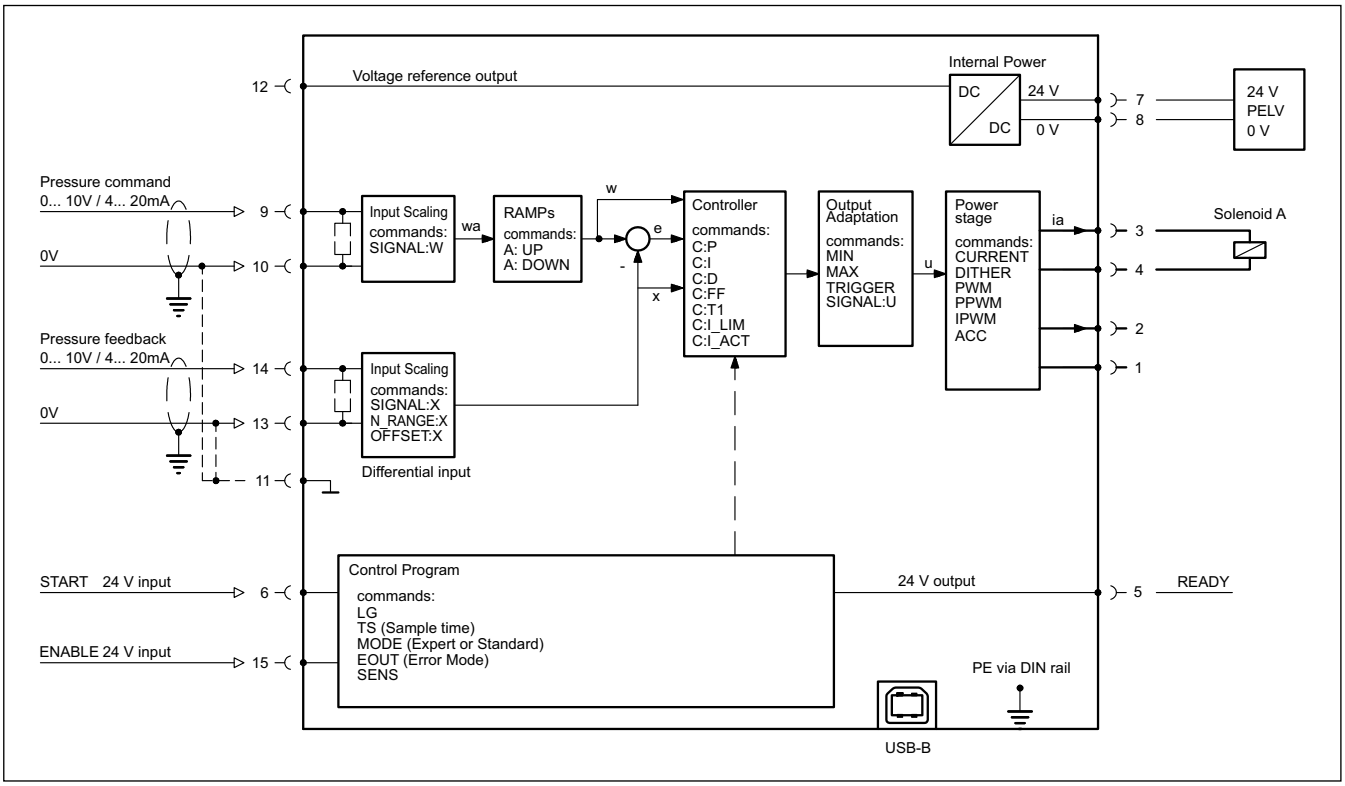
Note that after changing this value all time-dependent parameters must be checked and reset if necessary.

7.7 - Power Amplifier

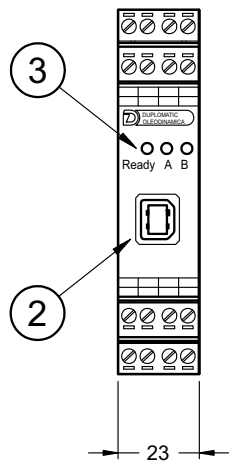
The module comes with an embedded power amplifier that is capable to generate a PWM current signal of up to 2.6A in order to control a pressure valve.

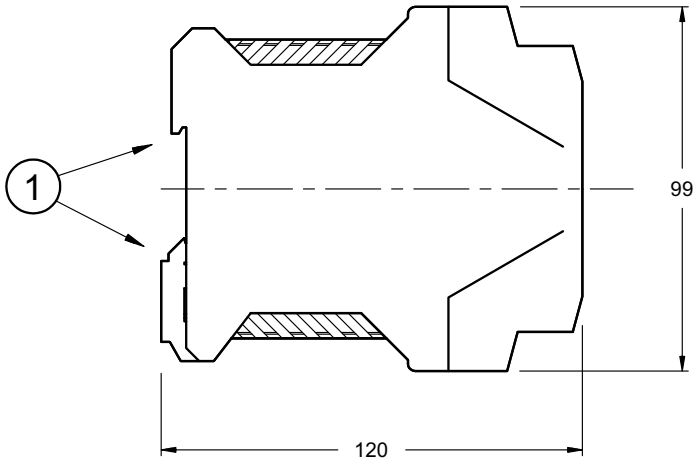
As such the nominal current, dither, frequency and the various parameters of the current loop can be accessed and modified.

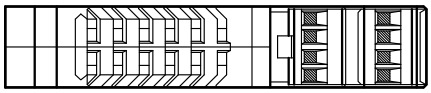
8 - CARD BLOCK DIAGRAM



9 - OVERALL AND MOUNTING DIMENSIONS







1	DIN rail fastening EN 50022
2	USB interface, for setup
3	LEDs for output signals