



EWM-A-PV

WITH PROFINET INTERFACE

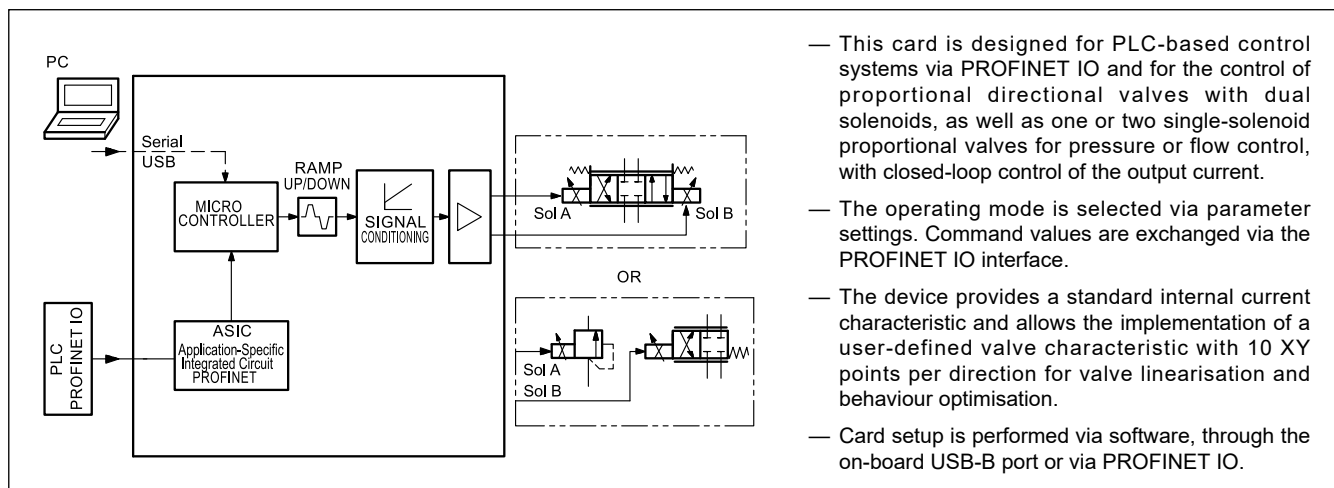
UNIVERSAL AMPLIFIER

FOR PROPORTIONAL VALVES

SERIES 24

RAIL MOUNTING TYPE:
DIN EN 50022

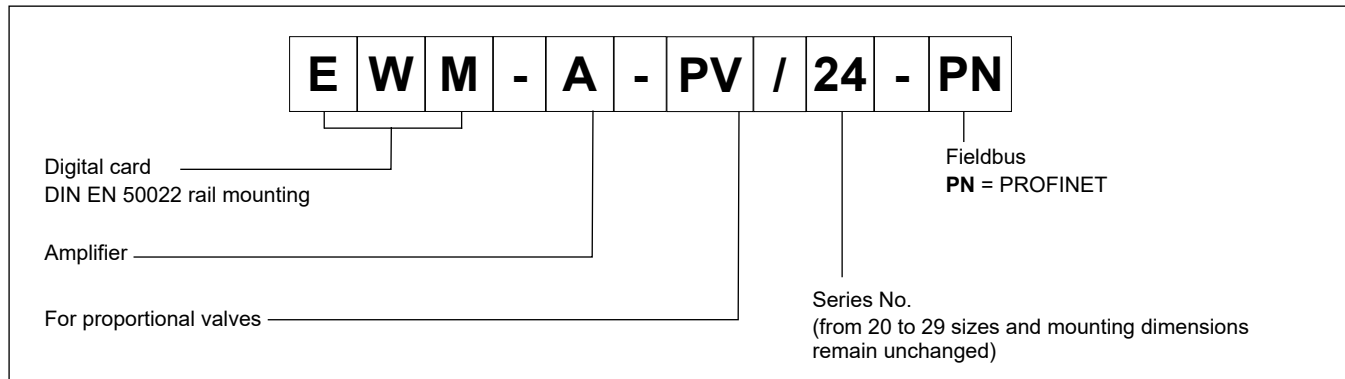
OPERATING PRINCIPLE



TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external	A	3A medium time lag
Current consumption	W	2.5 + power of connected coils
PROFINET IO		data rate 100 Mbit/s - conformance class CC-B
Digital command value (output)	V	OFF: <2V, ON > max Ub; max current 50 mA
Sample time	ms	1
Sample time of solenoid current control	ms	0.125
Output current	mA	500 ÷ 2600
PWM frequency	Hz	61 ÷ 2604 adjustable in prearranged steps
Interface		USB-B 2.0 / fast Ethernet 2x100 Mb/s full duplex
Electromagnetic compatibility (EMC) 2014/30/EU		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 45(w)
Connectors		USB-B - 7x4 poles screw terminals - 2 x RJ45 Ethernet sockets PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP20

1 - IDENTIFICATION CODE



2 - FEATURES

Controller functions

General power amplifier for proportional valves, designed for integration in PLC based control systems via PROFINET IO:

- Control of one proportional directional valve with dual solenoids
- Control of one or two proportional single-solenoid valves for pressure or flow control
- Command and status exchange via PROFINET IO interface
- Closed-loop control of the output current, ensuring stable operation independent of supply voltage and solenoid resistance.
- Parameter setting via software or PROFINET IO, including ramps, dither amplitude and frequency, PWM frequency and current control parameters
- Nominal solenoid current adjustable via software
- Power stage activation via ENABLE signal, combining hardware input and enable via fieldbus

Adaptation of the valve characteristic curve

- Linear output response with optional user-defined characteristic linearization, 10 XY-points per direction.
- Deadband compensation for improved response around the neutral position

Monitoring functions

- Output stage monitoring with detection of cable break and short circuit conditions
- Automatic disabling of the power stage in case of detected faults

Device architecture

- Modular device architecture with two modules
- PROFINET IO communication handled by dedicated hardware (ASIC)
- Control functions executed by a high-performance microcontroller
- Prioritised processing for time-critical control functions

Other characteristics

- GL-certification
- Device configuration and parameter setting via software, through the on-board USB interface or via PROFINET IO

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for operation with a 12 to 30 V DC power supply (typical 24 V) compliant with applicable EMC standards. Inductive loads connected to the same power supply (e.g. relays or proportional valves) must be equipped with suitable overvoltage protection devices (varistors or freewheeling diodes).

A regulated power supply, linear or switching mode, is recommended.

NOTE: The supply voltage applied to the card must not be lower than the rated operating voltage of the solenoids 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 provides a digital input used as ENABLE signal. When ENABLE is active, the power stage is enabled; when deactivated, the power stage is disabled and the output current is switched off.

OFF: <2V, ON >10V. Input resistance 25 kohm.

See the block diagrams for the electric connections.

3.4 - Reference signals

The handling of reference signals depends on the operating mode selected by the FUNCTION parameter.

Once the function is set and parameters are saved, internal signal processing is configured accordingly. Reference and control values are transmitted via PROFINET IO as cyclic process data exchanged between the PLC and the device.

FUNCTION = A-PV: one channel, 2 solenoids
FUNCTION = 2A-PV : two independent channels

3.5 - Output value

The output value is a closed-loop controlled current applied to the proportional valve solenoids. Output range: 500 ÷ 2600 mA.

The output depends on the command value transmitted via PROFINET IO and the related parameter settings.

3.6 - Digital outputs

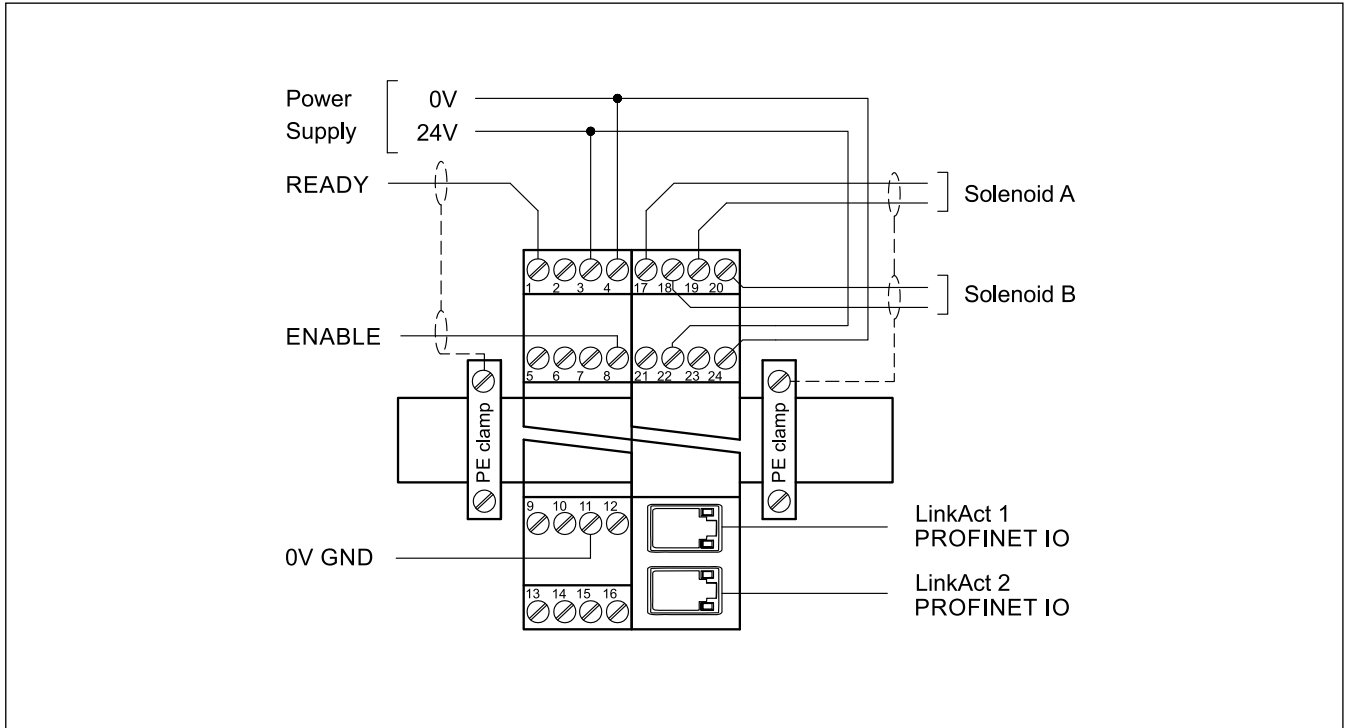
The digital output is a READY signal, indicating that the device is enabled and operating without detected faults.

The READY status is displayed by a green LED on the front panel.

Low level: < 2 V High level: > max V+,
where V+ = power supply (max 50 V).

Status LEDs related to PROFINET IO communication on the fieldbus module are described in detail in the start-up manual.

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

- PIN 1 READY output.
ON: No internal or external errors are detected
OFF: ENABLE (PIN 8) is deactivated or error detected
- PIN 8 ENABLE input
This digital input signal enables the application and activates the power stage

The ENABLE input must be active together with the corresponding fieldbus enable command.
By deactivating the ENABLE input, the power stage is disabled and fault conditions are reset.

POWER OUTPUT

- PIN 17/19 PWM output for solenoid control. Solenoid A (ia)
- PIN 18/20 PWM output for solenoid control. Solenoid B (ib)

5 - INSTALLATION

For power supply and solenoid connections cable cross sections of 0.75 mm² up to 20 m length, and of 1.00 mm² up to 40 m length are recommended.

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 into account for wiring:

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



WARNING! Plugs with free-wheeling diodes and LED indicators cannot be used with current controlled power outputs. They interfere with the current control and can destroy the output stage.

With high frequency EMI inexpensive ferrite elements can be used.

Take into account a separation between the power part (and power cables) and signal part when arranging 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 used. 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 and overall system stability.

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

5.2 - PROFINET IO RT interface (PN version)

PROFINET IO is an Industrial Ethernet communication protocol compliant with IEEE 802.3, operating at a data rate of 100 Mb/s in full-duplex mode, enabling real-time data exchange between PLC and field devices.

Diagnostic LEDs are embedded on each port.

The characteristics of an I/O device are described in a GSDML file. It describes the structure of the cyclic input and output data transferred between the programmable controller and the fieldbus I/O device.

The PROFINET I/O data size must be pre-set to 32 bytes for input and 32 bytes for output.

The .GSDML descriptor file is available for download on our website.

5.3 - Installation guidelines for PN version

PROFINET IO field devices are exclusively connected via switches as network components.

A PROFINET network can have a star, tree, ring or line structure. The transmission media are CAT5 copper cables.

To comply with IP20, RJ45 CAT5 connectors are used in the electrical cabinet, in accordance with EN 50173 or ISO / IEC 11801.

The connection between the components of the PROFINET network is called the PROFINET channel. In most cases, PROFINET channels are built with copper cables according to IEC 61784-5-3 and IEC 24702, maximum length 100 m.

6 - DEVICE SETUP

Card set-up is performed via software connection through the USB port. Device parameters can also be accessed and managed via the PROFINET IO interface, according to the configured operating mode.

6.1 - Software EWM20_SmartManager

The EWM20_SmartManager software can be downloaded from the Duplomatic MS website in the SOFTWARE DOWNLOAD section.

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

Once connected, the software automatically recognises the card model and displays the available parameters, including default values, measuring units and brief descriptions to support correct set-up.

The software is optimised for Microsoft Windows 10 and remains compatible with Windows 7.

6.2 - Parameters table

The parameters table is available in English or German.

The language is set via parameters. Parameter setting can be performed at a standard level, which provides simplified access, or at an expert level, where a larger number of parameters is displayed and can be customised.

The same device parameters available via the setup software can also be accessed and configured via the PROFINET IO interface.

Parameterisation via PROFINET IO can be protected by a password.

For a complete list of parameters and their settings, please refer to the **Technical Manual 89625 ETM**.

7 - MAIN FEATURES

7.1 - Applications

The power amplifier is suitable for applications requiring accurate and dynamic control of proportional valves, where the hydraulic function must be adapted to the operating conditions of the machine.

Configurable ramp functions allow smooth and controlled variation of the output current, reducing pressure peaks and mechanical stress during acceleration and deceleration phases.

The output signal can be adapted to the valve characteristics by means of scaling, deadband compensation and optional characteristic linearization. This allows compensation of valve non-linearities and improvement of repeatability and control accuracy.

The integrated closed-loop current-controlled power stage, delivering up to 2.6 A, ensures stable valve operation independent of supply voltage variations and solenoid resistance.

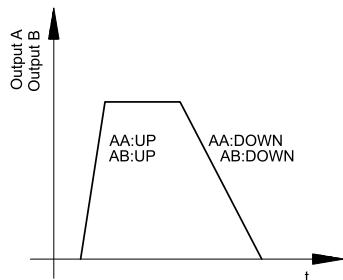
This makes the device suitable for driving a wide range of proportional valves, such as pressure control valves, pressure relief valves, throttle valves and directional control valves without integrated electronics.

7.2 - Ramp function / acceleration time

The ramp up and ramp down parameters are expressed in milliseconds and define the time required for the output current to reach a new value following a step change of the command value.

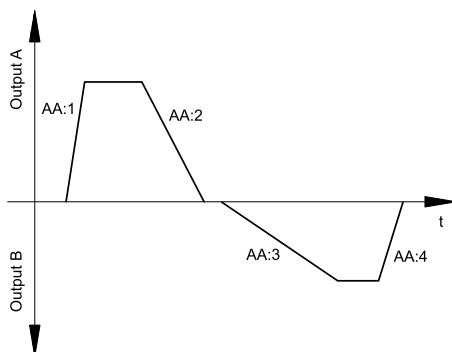
for 2A-PV function

Two quadrant ramp function. The ramp function is adjustable independently for each channel.



for A-PV function

Four quadrants ramp function.



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

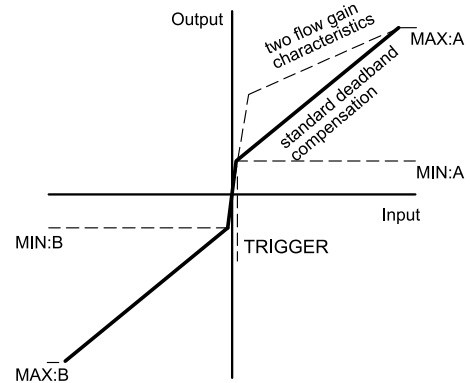
The MAX parameter defines the maximum output current applied to the valve solenoids.

The MIN parameter is used to compensate the valve deadband by introducing a minimum output level, allowing reliable valve activation outside the non-sensitive range.

The TRIGGER parameter defines the activation point of the MIN function and allows the definition of a non-sensitive range around the zero command value. This improves the stability of the valve behaviour in the region around the neutral position.

If the MIN value is set too high, the minimum controllable output may be affected and fine adjustment at low command values may no longer be possible. In extreme cases, this can lead to oscillations at small command values.

The diagram below is valid for the A-PV configuration. For 2A-PV please consider just the 1st quadrant.



7.4 - Linearization (CC, CCA, CCB)

A user-defined signal characteristic can be activated by enabling the CCMODE parameter.

The effect of the user-defined linearization can be evaluated using the process data displayed in the monitor or oscilloscope functions of the EWM20_SmartManager software.

By disabling CCMODE, the user-defined characteristic is deactivated, allowing a quick comparison with the default linear signal behaviour.

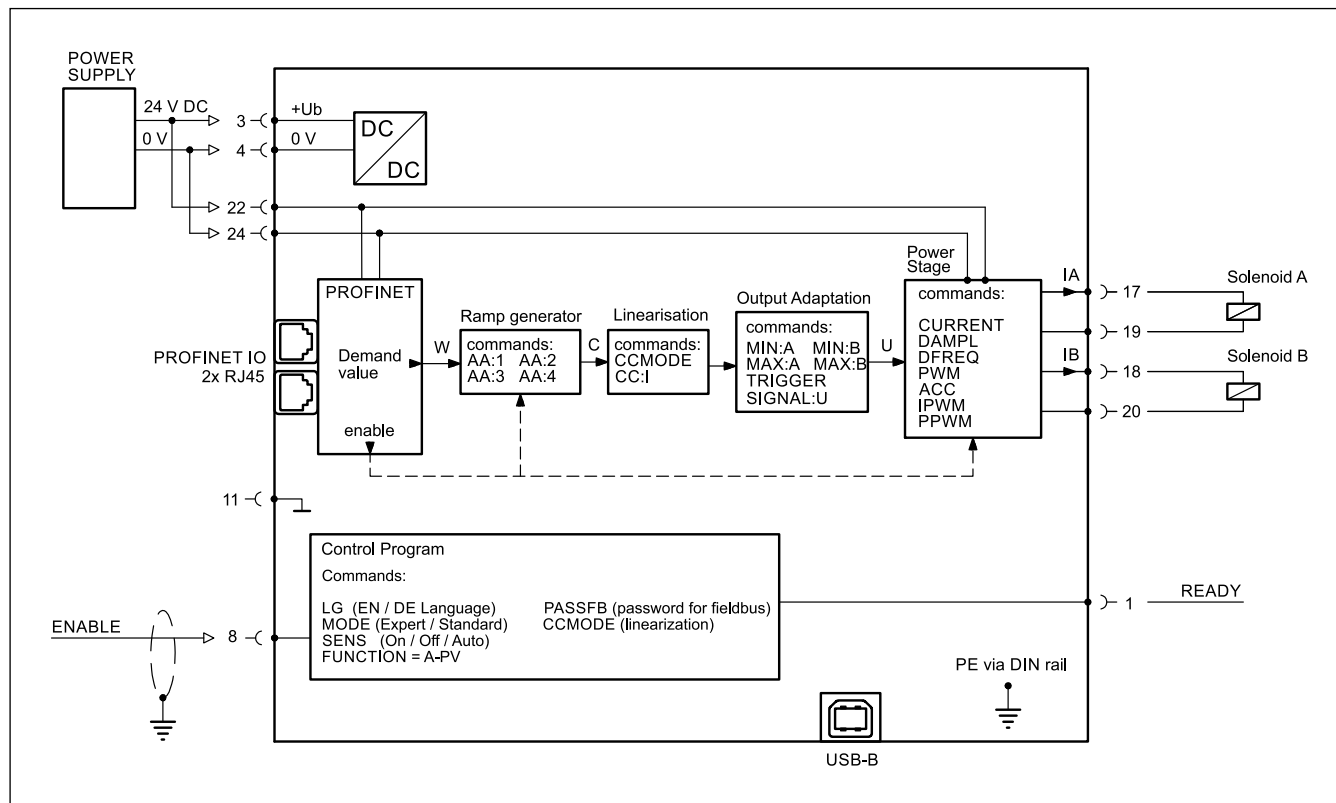
7.5 - Power amplifier

The module integrates a power amplifier with PWM-controlled current output capable of delivering up to 2.6 A to the proportional valve solenoids.

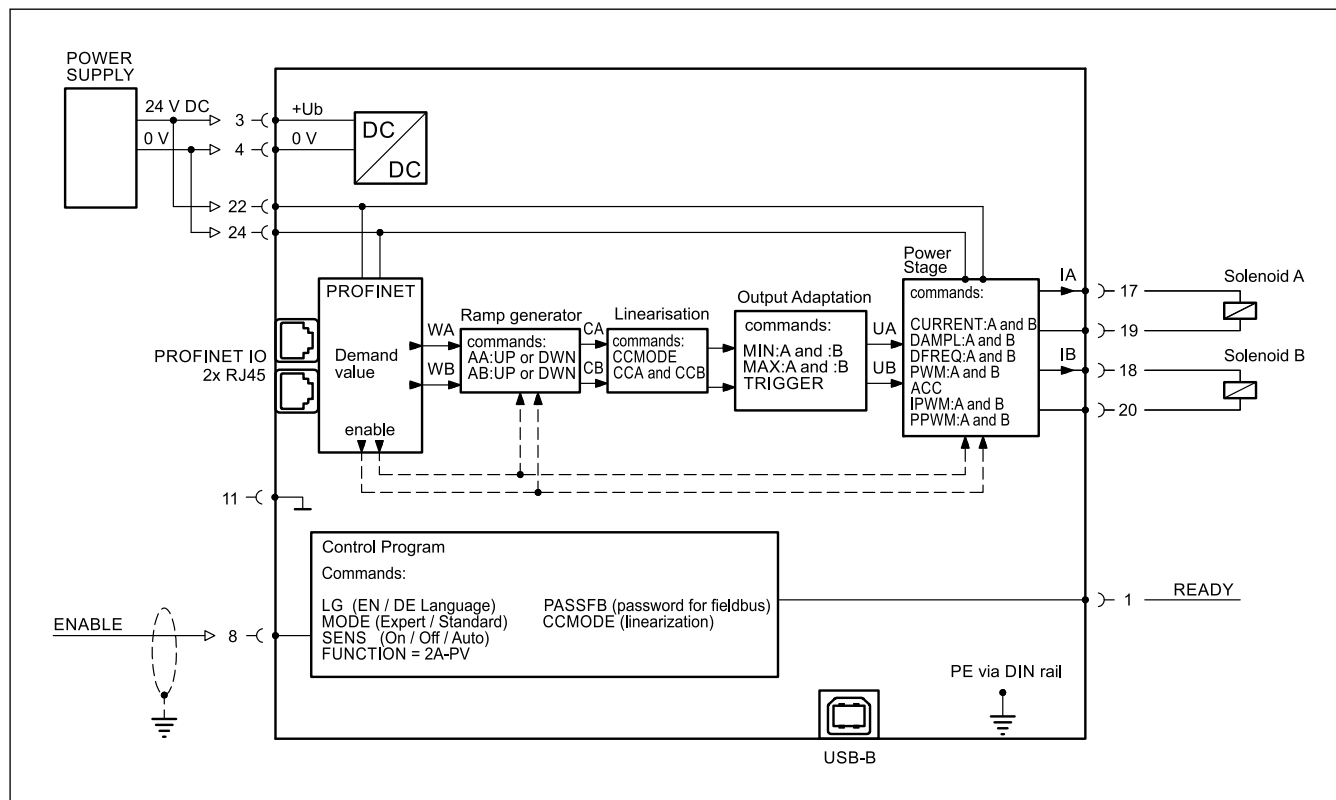
The nominal output current, as well as nominal current, dither settings, PWM frequency and current control parameters can be accessed and adjusted via parameterisation.

8 - CARD BLOCK DIAGRAMS

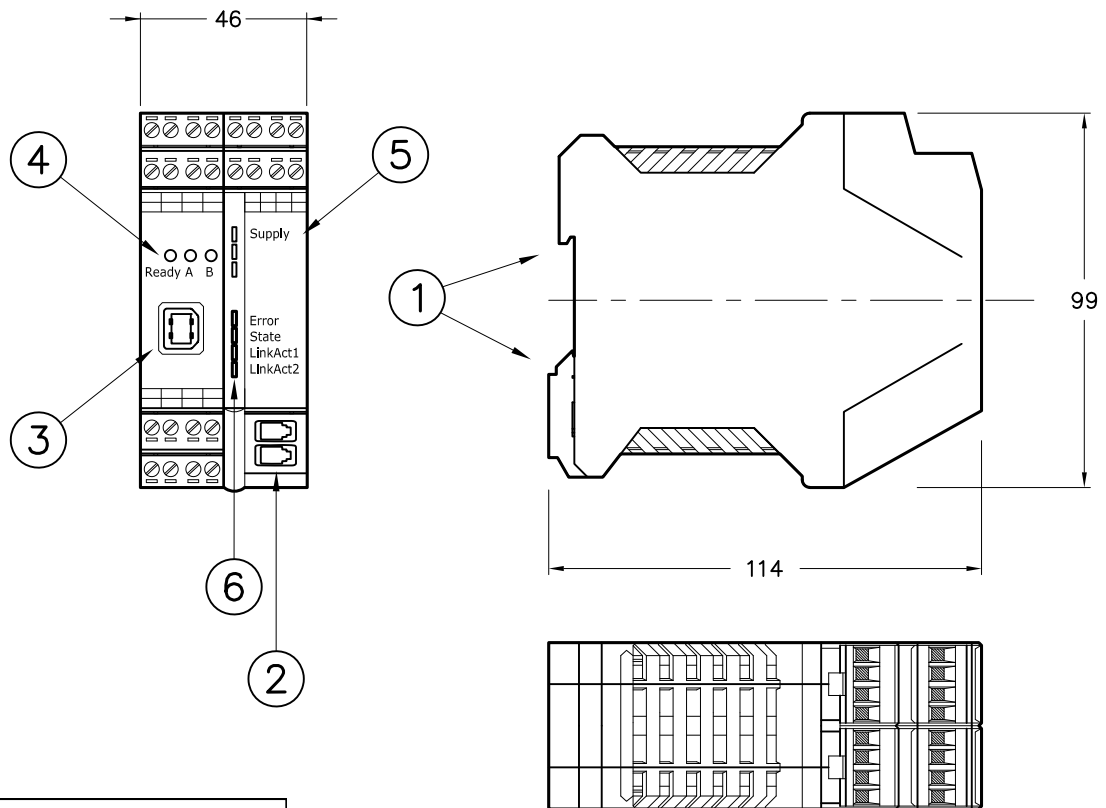
8.1 - A-PV function



8.2 - 2A-PV function



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Fieldbus ports RJ45
3	USB port for PC connection
4	Output signals LED
5	Power stage and fieldbus supply LED
6	Fieldbus status LED



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