



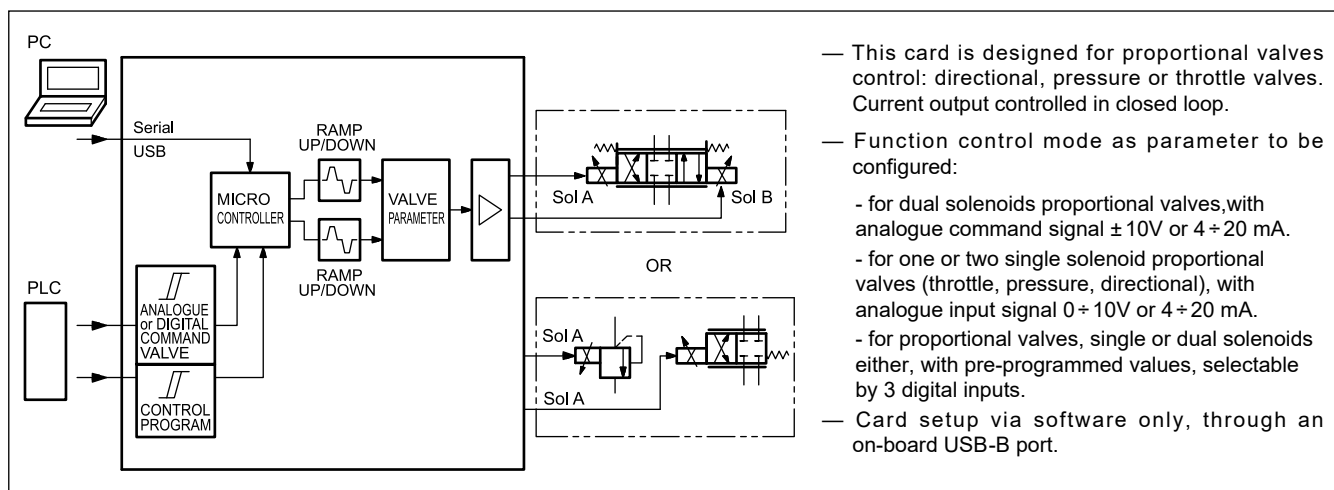
EWM-A-PV

UNIVERSAL AMPLIFIER FOR PROPORTIONAL VALVES

SERIES 20

**RAIL MOUNTING TYPE:
DIN EN 50022**

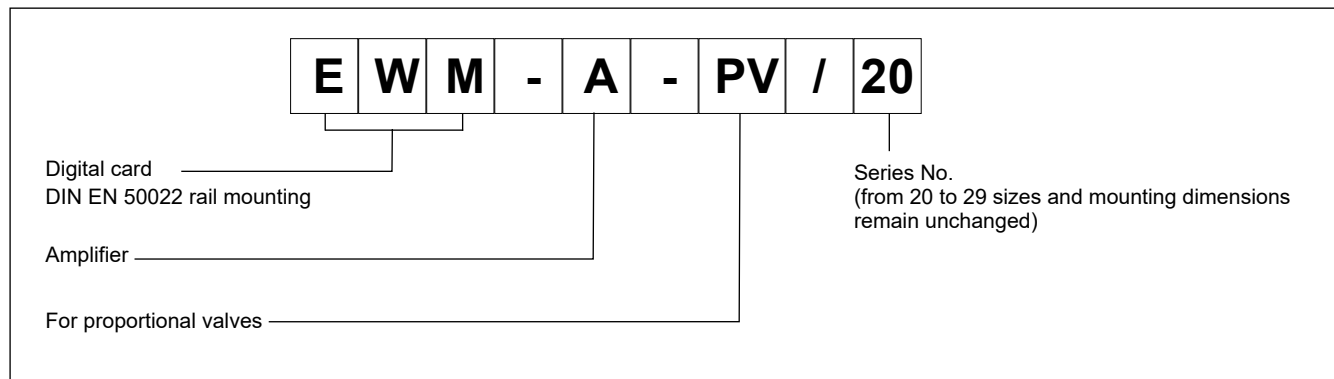
OPERATING PRINCIPLE



TECHNICAL CHARACTERISTICS

Power supply	V DC	12 \div 30 ripple included
Fuse, external	A	3 medium time lag
Current consumption	W	60 depending on type of solenoid, number of operating solenoids
Analogue command values	V mA	± 10 , $0 \div 10$ ($R_I = \min 90$ kohm) $4 \div 20$ ($R_I = 390$ ohm)
Analogue inputs value resolution	%	< 0,01
Digital command values	V	OFF: <2V, ON >10V ($R_I = 25$ kohm)
Sample time of solenoid current control	ms	0.125
Sample time	ms	1
Output current	mA	500 \div 2600
PWM frequency	Hz	61 \div 2604 adjustable in prearranged steps
Interface		USB B type 2.0
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 23(w)
Connector		4x4 poles screw terminals - 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 3 different applications:

- control of one proportional directional valve (2 solenoids) with current controlled by analog input signal
- control of one or two single solenoid proportional valves (throttle, pressure, directional..) with output current controlled by analog input signal
- control of proportional valves (with single or double solenoids either) by three digital input signals to select up to eight pre-programmed command and ramp values
- The output current is closed loop controlled: the current to solenoid is closed loop controlled, so is independent from supply and solenoid resistance.
- Parameters programmable via software: Ramps, Dither frequency and amplitude, PWM frequency and PWM gains
- Free scaling of analogue inputs
- Nominal current selectable stepless via software
- The power stage is controlled by an enable input (ENABLE)

Adaptation of the valve characteristic curve

- Characteristics linearization of current output via 10 XY-points per direction
- Deadband compensation

Monitoring functions

- The output stage is monitored for cable breakdown, is short circuit proof and disables the power stage in case of an error
- Failure monitoring for current analog inputs
- Range monitoring of the input signals (e. g. detecting failures of joystick)

Other characteristics

- GL-certification
- Output value in voltage or current, to be configured via software
- 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 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 accepts digital input. The digital input must have a voltage from 12 to 24 V; OFF: <2V, ON >10V. Input resistance 25 kohm. See the block diagrams for the electric connections.

3.4 - Reference signals

This card is broadly customizable and the command value depends on the function mode selected. (FUNCTION parameter). Once the function has been set and the data saved, the input will be configured automatically

3.4.1 - A-PV function, analogue:

$\pm 10V$ or $4 \div 20$ mA (one channel, 2 solenoids)

3.4.2 - 2A-PV function, analogue:

$0 \div 10V$ or $4 \div 20$ mA (two independent channels)

3.4.3 -D-RL digital, to be pre-parameterized by parameter

8 pre-programmed values (units %), selectable by 3 digital inputs (8 binary targets).

For both single or dual solenoids proportional valve either.

3.5 - Output value

Output value is in current, value range $500 \div 2600$ mA.

All cables which lead outside must be screened.

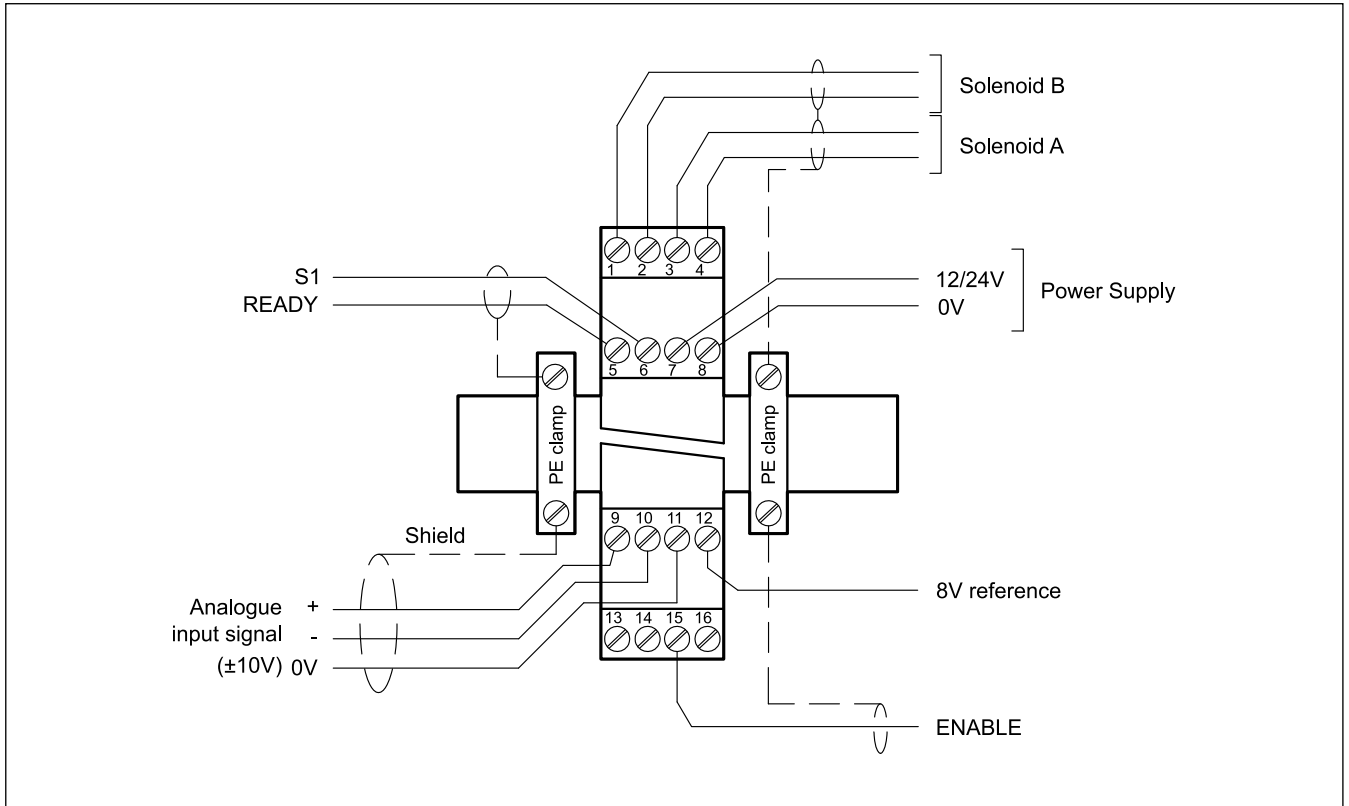
3.6 - Digital outputs

The digital output is READY signal, displayed by the green LED on the front panel.

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

4 - WIRING DIAGRAMS

4.1 - FUNCTION A-PV: analogue signal for dual solenoids directional valve



DIGITAL INPUT AND OUTPUT

PIN	READY output.
5	ON: No internal or external errors are detected OFF: ENABLE (PIN 15) is deactivated or an error is detected
PIN	S1 input:
6	Function dependent on parameter PIN:6 (USCALE/RAMP). OFF: Output current depends on parameter USCALE / ramp function is deactivated. ON: Output current is not scaled by USCALE / ramp function is activated.
PIN	ENABLE input
15	This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. By deactivating this input the errors signals are reset.

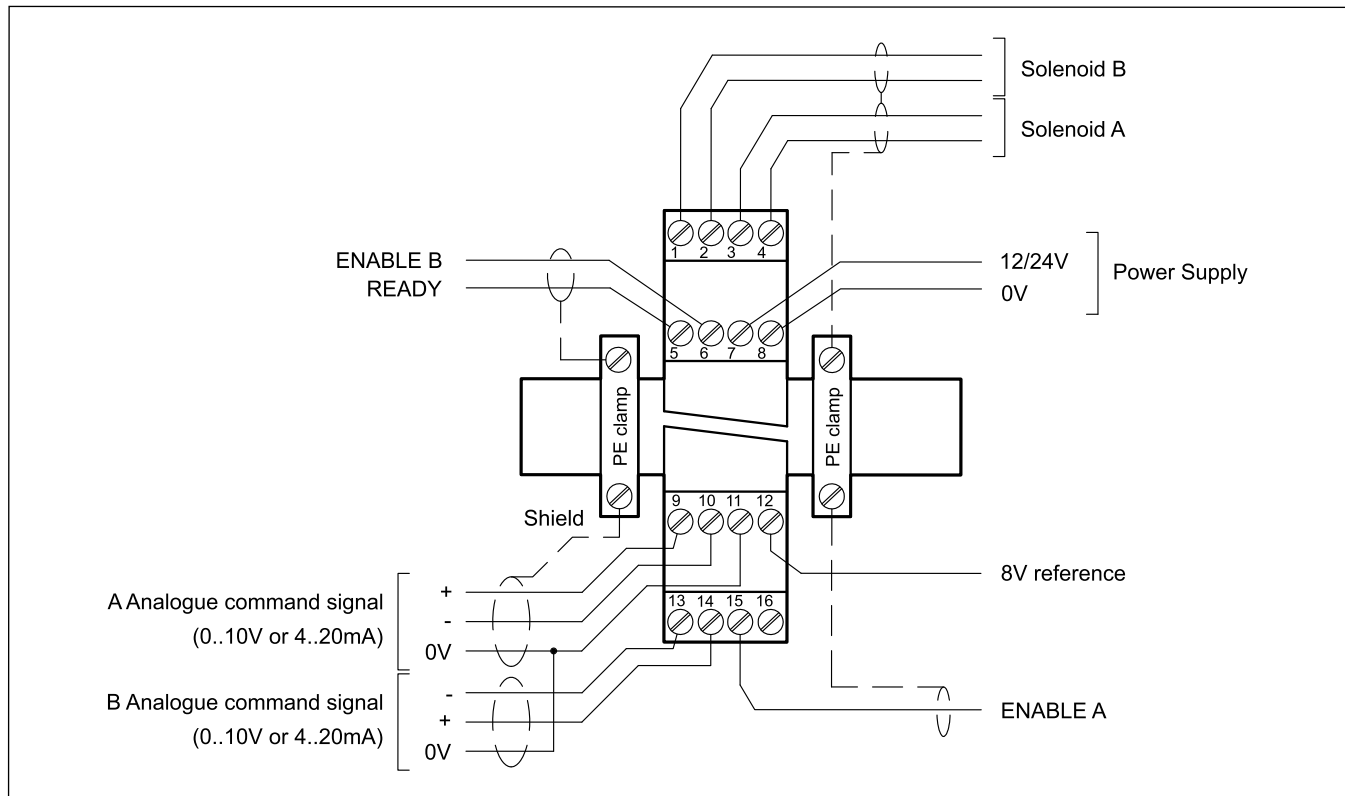
ANALOGUE INPUT

PIN	0V reference for the signal inputs.
11	Warning! PIN 11 and PIN 8 are connected internally
PIN	Command input signal (w)
10/9	range -100...+100% corresponds to $\pm 10V$ or 4 ± 20 mA

POWER OUTPUT

PIN	PWM outputs for solenoid control. Solenoid B
1/2	
PIN	PWM output for valve control.
3/4	
PIN	8V reference output (max. 25mA)
12	

4.2 - FUNCTION 2A-PV: analogue signal, two independent channels, for up to two single solenoid valves



DIGITAL INPUT AND OUTPUT

- PIN 5** READY output.
ON: No internal or external errors are detected.
OFF: Both power stages are deactivated or an error is detected.
This output is visible on the green LED
- PIN 6** ENABLE Input Channel B (dependent on ENABLE_B parameter):
This digital input signal initializes the application.
The output and the READY signal will be activated.
By deactivating error signals are reset.
- PIN 15** ENABLE Input channels A/B or channel A either (dependent on ENABLE_B parameter: if set to OFF, digital input PIN 15 enables both output channels. if ON, the two enable are independent)
This digital input signal initializes the application.
The output and the READY signal will be activated.
By deactivating this input the errors signals are reset.

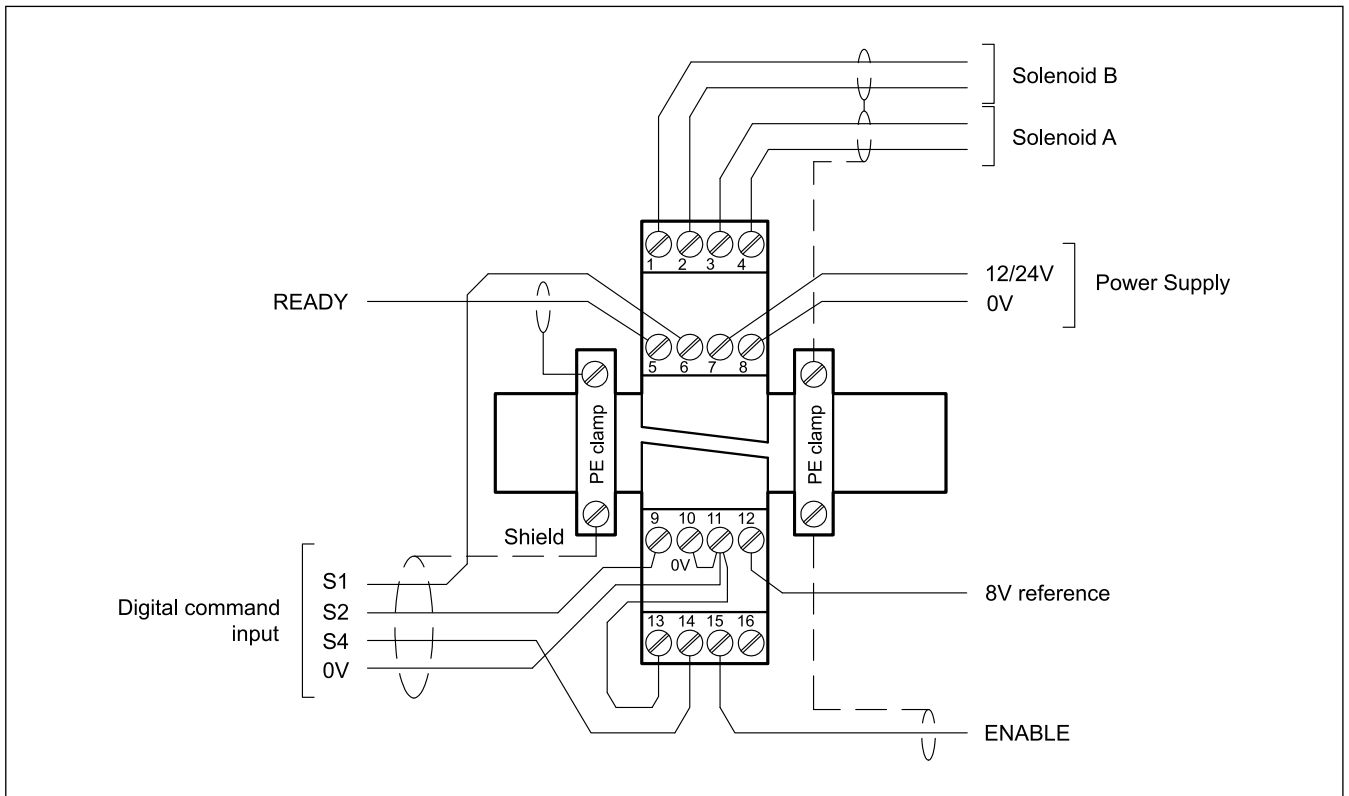
ANALOGUE INPUT

- PIN 11** 0V reference for the signal inputs.
Warning! PIN 11 and PIN 8 are connected internally
- PIN 10/9** Command input signal A (wa)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷ 20 mA
- PIN 13/14** Command input signal B (wb)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷ 20 mA

POWER OUTPUT

- PIN 1/2** PWM outputs for solenoid control. Solenoid B
- PIN 3/4** PWM outputs for solenoid control. Solenoid A
- PIN 12** 8V reference output (max. 25 mA)

4.3 - FUNCTION D-RL: preset digital inputs



DIGITAL INPUT AND OUTPUT

- PIN 5** READY output.
 ON: No internal or external errors are detected
 OFF: ENABLE (PIN 15) is deactivated or an error is detected
- PIN 6** Digital gate inputs for selecting the command value:
PIN 9: S1 **PIN 14:** S2 **PIN 15:** S4
 The whole range of set points can be chosen by binary coding of these inputs. see the table below.

Address	0	1	2	3	4	5	6	7
S1	0	1	0	1	0	1	0	1
S2	0	0	1	1	0	0	1	1
S4	0	0	0	0	1	1	1	1

- PIN 15** ENABLE input
 This digital input signal initializes the application.
 The output and the READY signal will be activated.
 By deactivating this input the errors signals are reset.

POWER OUTPUT

- PIN 1/2** PWM outputs for solenoid control. Solenoid B
- PIN 3/4** PWM output for valve control.
- PIN 12** 8V reference output (max. 25 mA)

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm² up to 20 m length, and of 1.00 mm² 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 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 in account a separation between the power part (and power cables) and 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 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, 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.

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 and 8.

WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable 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 parameter 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 the parameters and their settings please refer to the *Technical Manual 89620 ETM*.

7 - MAIN FEATURES

7.1 - Applications

The power amplifier (D-RL function) is controlled by an enable input and three switch signals. Therefore 8 demand values can be activated binary.

In the event of analogue control (A-PV function) it's possible to preset the directions with two inputs and switch over between rapid and slow speed with the third input.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.

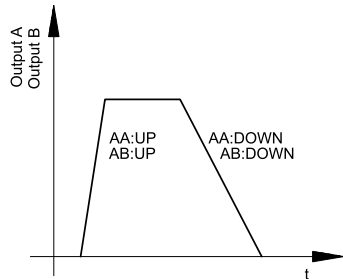
The output signal (of up to 2.6A) can control a variety of valves which need a flexible adaptation of the solenoid control, such as pressure relieve valves and pressure control valves, directional and throttle valves as such no on-board electronics are needed.

7.2 - Ramp function /acceleration time

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.

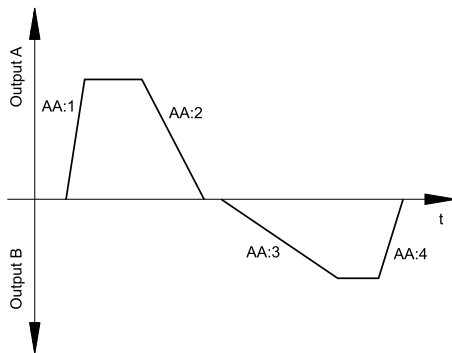
for 2A-PV

Two quadrant ramp function.



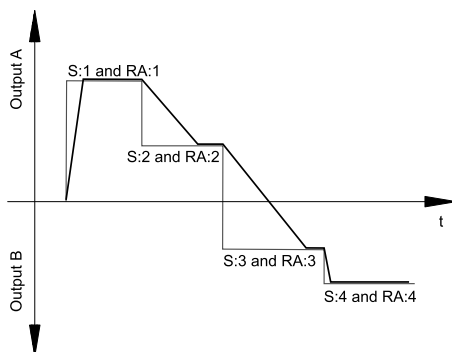
for A-PV

Four quadrants ramp function.



for D-RL

This configuration can take advantage either of the same four quadrant ramp function of A-PV or assign a ramp time for every command value (parameter RMODE)

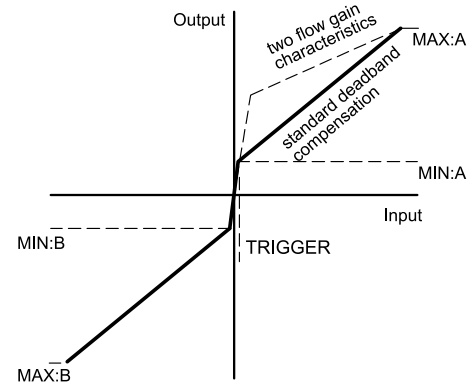


7.3 - Adaption of the output signal to the valve characteristics (TRIGGER)

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.

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



7.4 - Linearization (CCA, CCB, CC)

A user defined signal characteristic can be set by switching on the CCMODE parameter.

The influence of the user defined linearization can be estimated via the process data on the monitor or on the oscilloscope on EWMPC/20 software.

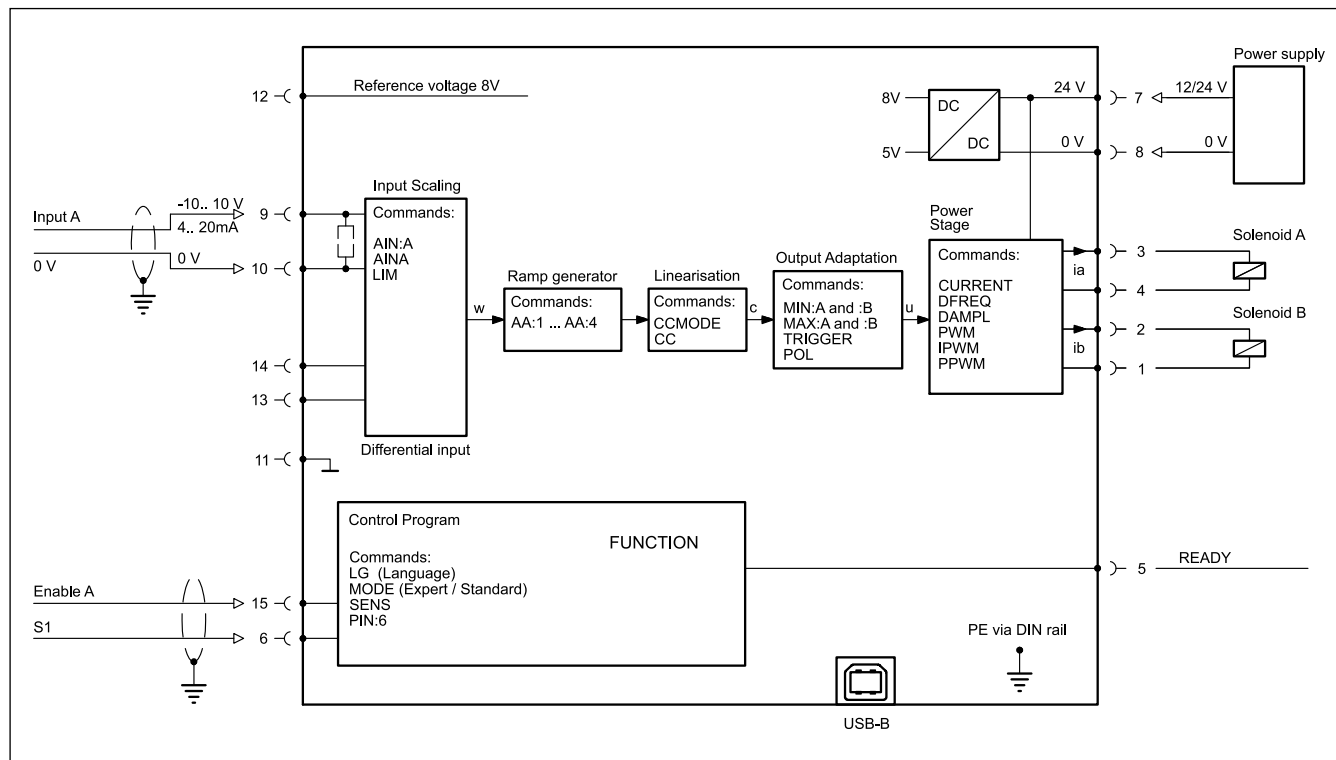
By deactivating CCMODE a simple and quick estimation of the linearization is possible

7.5 - Power Amplifier

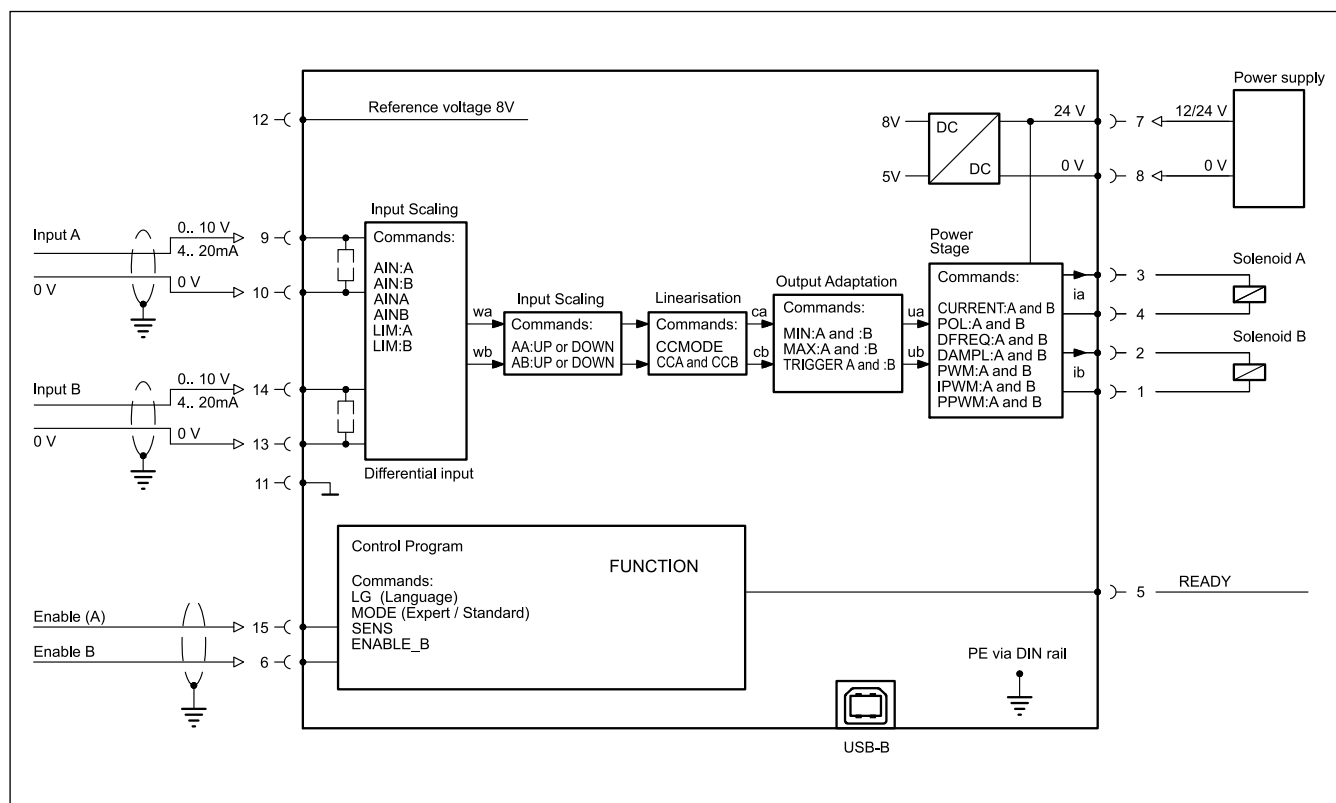
The module comes with an embedded power amplifier that is capable to generating a PWM current signal of up to 2.6A. As such the nominal current, dither, frequency and the various parameters of the current loop can be accessed and modified.

8 - CARD BLOCK DIAGRAMS

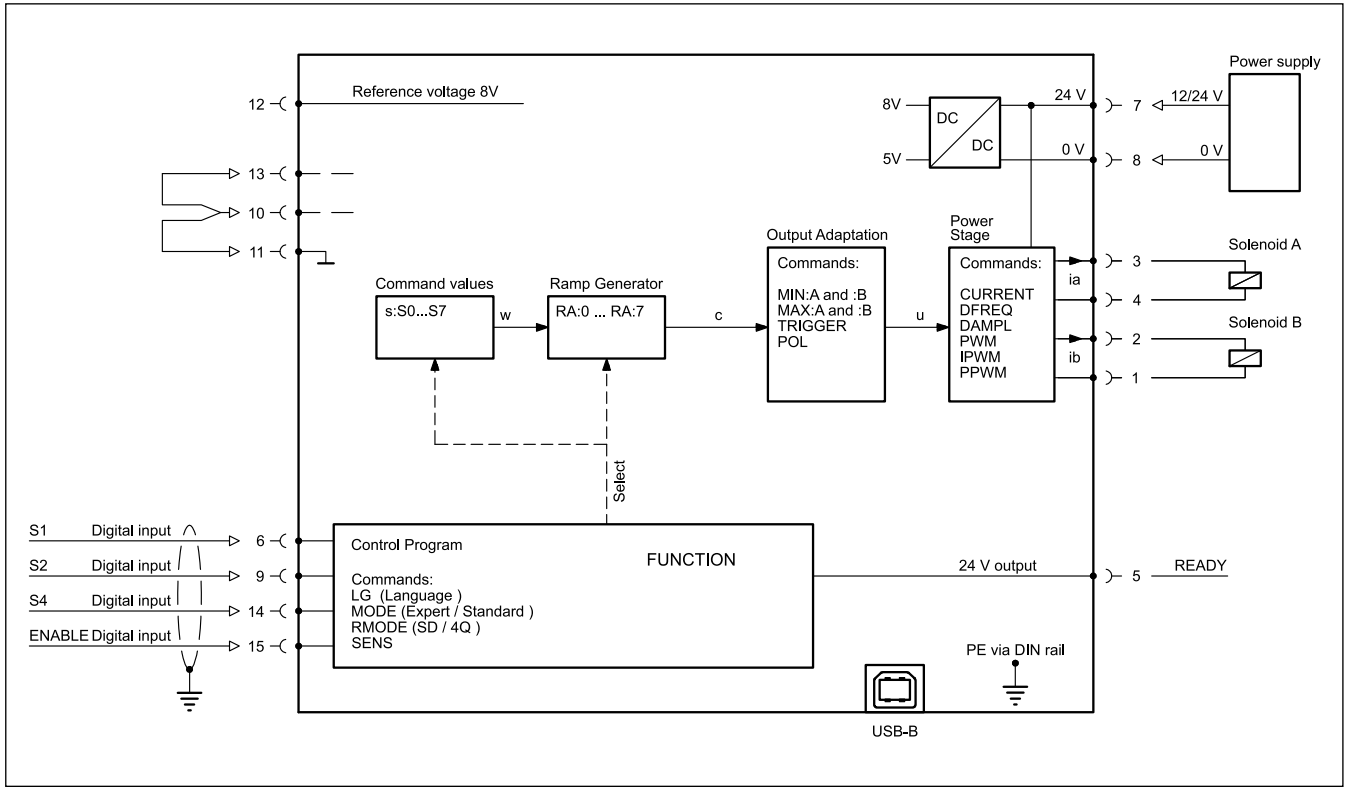
8.1 - function A-PV



8.2 - function 2A-PV



8.3 - function D-RL



9 - OVERALL AND MOUNTING DIMENSIONS

