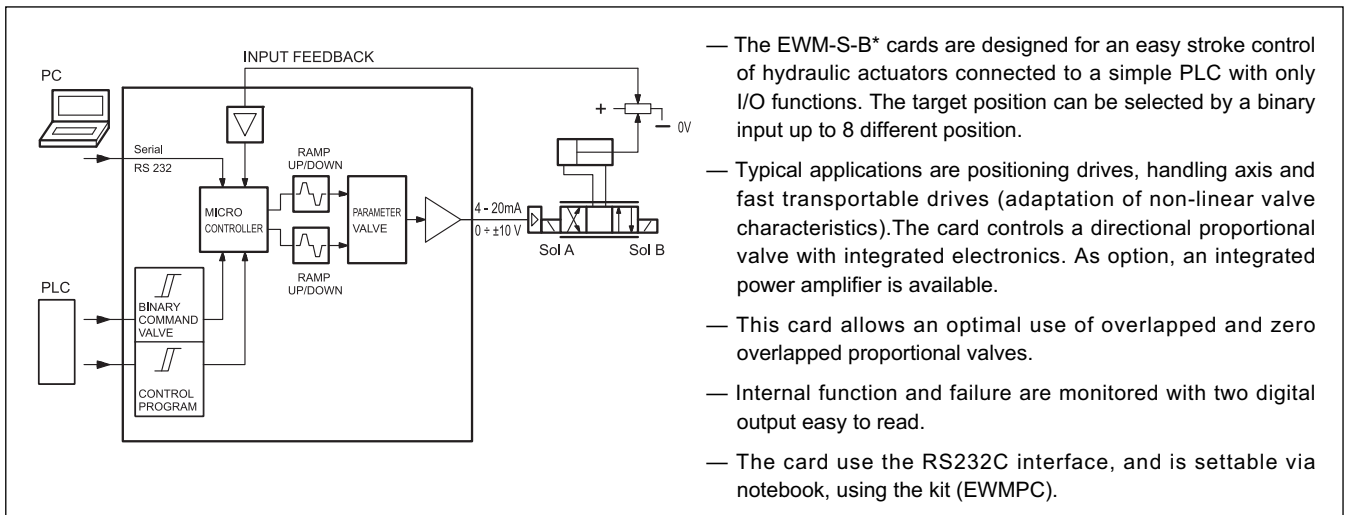


EWM-S-B*

DIGITAL CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS SERIES 10

**RAIL MOUNTING TYPE:
DIN EN 50022**

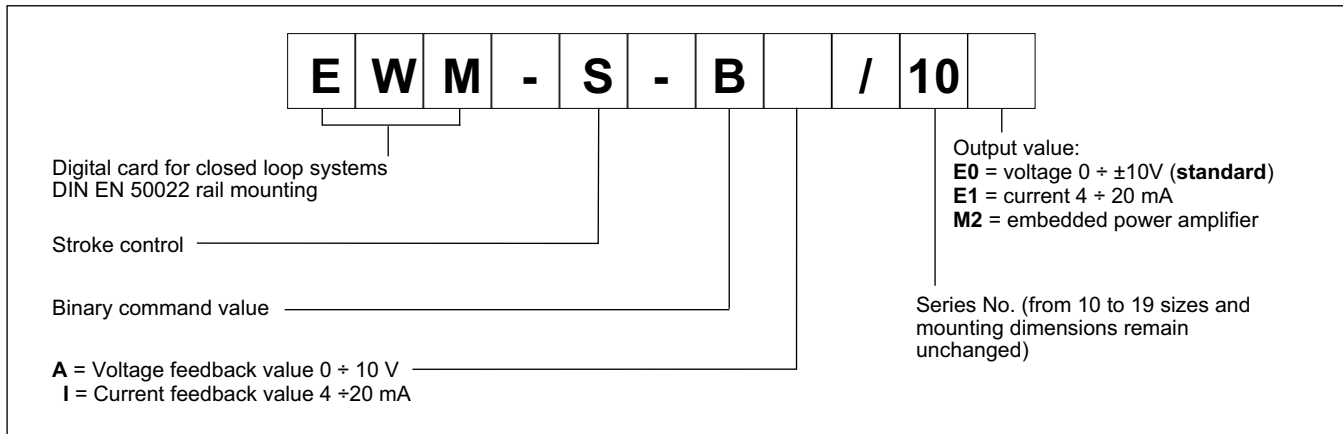
OPERATING PRINCIPLE



TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ± 30 ripple included external fuse 1,0 A (5 A for M2 version)
Current consumption: - E0 and E1 version - M2 version	mA A	100 + sensor power consumption depending from solenoid current. max 5A
Command value		binary command with 3 bit
Feedback value: - BA version - BI version	V mA	0 ± 10 (R ₁ = 90 kΩ) 4 ± 20 (R ₁ = 250 kΩ)
Output values: - E0 version - E1 version - M2 version	V mA A	±10 (max load 5 mA) 4 ± 20 (max load 390 Ω) 1,0 - 1,6 - 2,6
Position accuracy	%	0,01
Interface		RS 232 C
Electromagnetic compatibility (EMC) according to 2004/108/CE		Emissions EN 61000-6-3 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) or 46 on M2 version
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 supports the simple point-to-point positioning with hydraulic drives. Up to eight target positions (with related velocities) can be selected. The deceleration characteristics can be defined with the command CTRL, choosing between linear (LIN) or nearly square root (SQRT1) parameters. See at par.4, Adjustments.

The sampling time of the control loop is 1 ms.

Two operating modes can be selected:

A - stroke depending deceleration, that means the control gain will be adjusted with the parameters D:A and D:B. This is a time-optimal positioning structure with very high stability.

B - NC mode, where the position value is generated from the following error.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

Sequence of the positioning with 3 target position achievable with the EWM-S-B* cards :



S:0 and V:0 - Switching on and placement to parking position.
S:1 and V:1 - Initial positioning in the work cycle
S:2 and V:2 - Second target position
S:3 and V:3 - Return to the first position;
To begin, the external input START (RUN) must be enabled.

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 inductivity 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 the sensors.

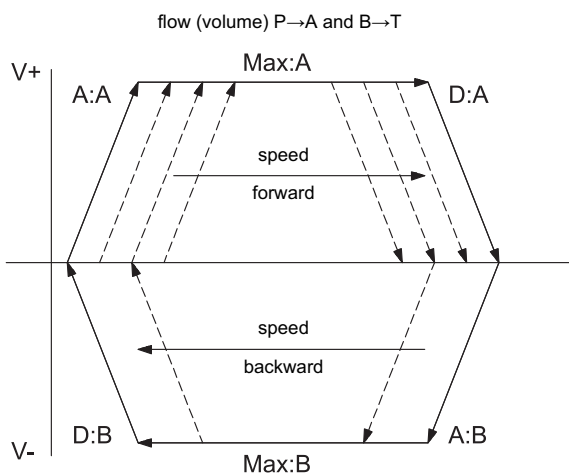
NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

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

2.3 - Digital Input

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





2.4 - Feedback input values

The card accepts analogue feedback input. The feedback value must be $0 \div 10$ V for EWM-S-BA*, and $4 \div 20$ mA for EWM-S-BI* version.

2.5 - Output values

E0 version: output voltage 0 ± 10 V

E1 version: output current $4 \div 20$ mA

M2 version: Embedded power stage configurable via software with a value of 1, 1.6 or 2.6 A.

2.6 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel

Low level <4V High Level > 10 V Max 50 mA with load 200 Ω

3 - LED FUNCTIONS

There are two leds on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready (READY output).

ON - The card is supplied

OFF - No power supply

FLASHING - Failure detected (internal or $4 \dots 20$ mA).
Only if SENS = ON

YELLOW: Signal of the control error monitoring. (STATUS output)

ON - No control error

OFF - Error detected, depending of a parameter error.

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.

STANDARD PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
s:i x	i= 0..7 x= 0..10000	- :0	- 0,01%	Definition of the target positions. The value i is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
vc:i x	i= 0..7 x= 0..10000	- :5000	- 0,01%	Definition of the target speeds. The value i is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
dsel x	x= on off	off	-	Mode of the digital selection inputs. OFF: activation of the target position by a signal change (low to high) of the START input. ON: direct activation by the SELx inputs.
a:i x	i= A B x= 1.. 2000	:A 100 :B 100	ms ms	Acceleration time depending on direction. A indicates analogue output 15 and B indicates analogue output 16. Normally A = flow p-A, B-T and B = flow P-B, A-T.
d:i x	i= A B x= 10.. 10000	:A 2500 :B 2500	0,01% 0,01%	Deceleration stroke depending on direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke will be sufficient.
ctrl x	x= lin sqrt1 sqrt2	sqrt1	-	Selection of the control function: lin = standard linear P-control, (NOTE) sqrt1 = progressive time optimized deceleration curve sqrt2 = sqrt1 with a higher gain in position
vramp x	x= 1.. 2000	50	ms	Ramp time for velocity input.
vmode x	x= on off	off	-	Activation of the NC-generator. The command position is generated by a velocity profile (internal or external preset of v). The axis drives more or less speed controlled.
th x	x= 100.. 60000	5000	ms	Stroke time for 100% velocity and 100% nominal sensor stroke.
hand:i x	i= A B x= -10000.. 10000	:A 3300 :B -3300	0,01% 0,01%	Degree of output signal in manual mode
min:i x	i= A B x= 0.. 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy.
max:i x	i= A B x= 5000.. 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0.. 2000	200	0,01%	Point to activate the deadband compensation (min). Also useful for reduced sensitivity in position with control valves.
inpos x	x= 2.. 2000	200	0,01%	Range for the InPos signal (status output). (NOTE)
offset x	x= -2000.. 2000	0	0,01%	The offset will be added to the command value.
pol x	x= + -	+	-	For changing the output polarity. All A and B adjustments depend on the output polarity. The right polarity should be defined first.
save	-	-	-	Storing the programmed parameter in E ² PROM.
loadback	-	-	-	Reloading the parameter from E ² PROM in working RAM

help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
w, x, xw, u, v	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

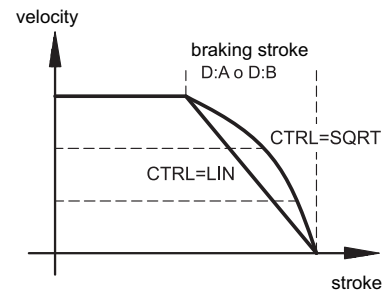
NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half "Inpos" value until setpoint value plus the half "Inpos" value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the CTRL command: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves. If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve. SQRT1: with small control error. control gain corresponds to 30000 / d:i ; SQRT2: control gain corresponds to 50000 / d:i



ADDITIONAL PARAMETERS ON VERSION BI*

Commands	Parameters	Defaults	Unit	Description
ain:i	i= X			Analogue output selection. W and X for the inputs and V = voltage, C = current.
a, b, c, x	a= 0... 10000 b= 0... 10000 c= -10000... 10000 x= V C	: 1000 : 1000 : 0	- - 0,01%	With the parameters a , b and c the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the x -value (x = C) the corresponding input will be switched over to current automatically.

ADDITIONAL PARAMETERS ON VERSION *M2

Command	Parameter	Defaults	Unit	Description
current x	x=0... 2	0	-	Selection of the output current range: 0 = 1,0 A 1 = 1,6 A 2 = 2,6 A
dfreq x	x= 60... 400	120	Hz	Dither frequency
damp1 x	x= 0... 3000	500	0,01%	Dither amplitude. Typical values between 500 and 1200 (good experience were made with 700).
pwm x	x= 100... 7700	2600	Hz	PWM Frequency. PWM Frequencies of ≥ 2000 Hz improve the current loop dynamics. PWM Frequencies in the range of 100... 500 Hz will be used for low dynamic valves with high hysteresis. In this case, DAMPL must be zero.
ppwm x ipwm x	x= 0... 30 x= 1... 500	3 40	- -	PI-compensator for the current controller. Changes should be only done with good experience in optimizing of current loops. In some cases a PWM Frequency of >2500 Hz; PPWM can be increased to 7... 15. ATTENTION: The dither amplitude must be optimized after that.

5 - INSTALLATION

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

It is recommended to use cable sections of 0.75 mm², up to 20 m length and of 1.00 mm² 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).

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

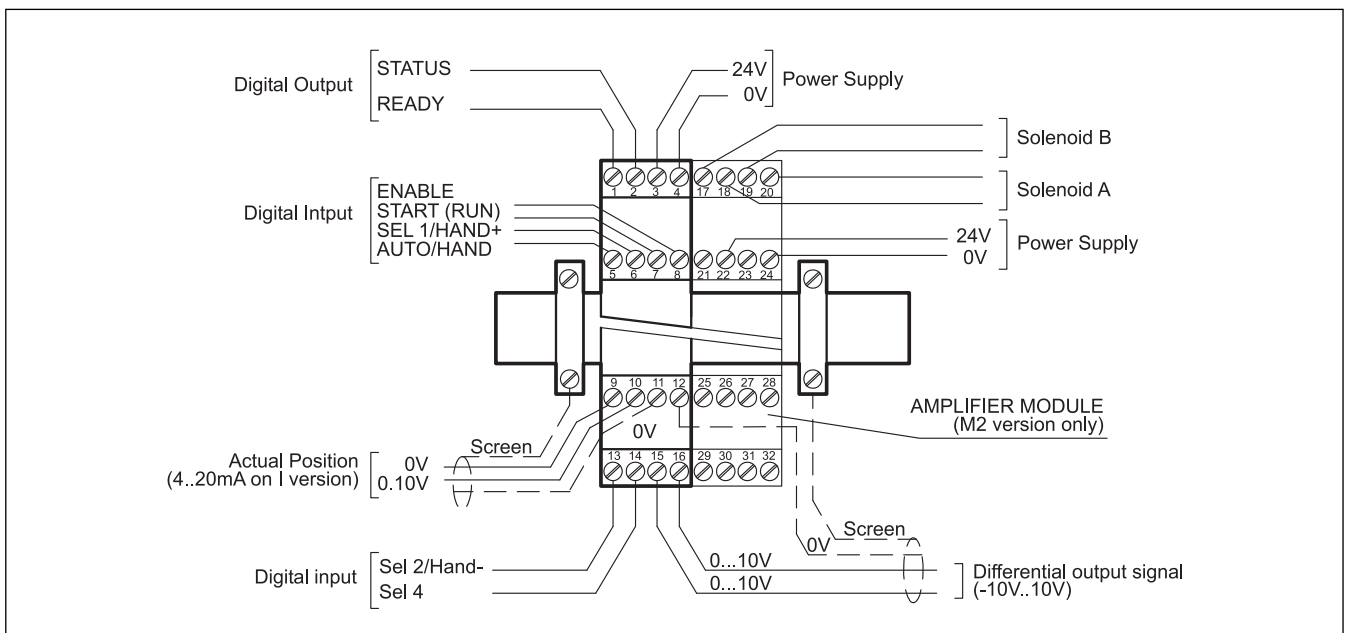
6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit includes a USB cable (2.70 mt length) 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 OF EWM-S-B*



DIGITAL INPUT AND OUTPUT

- PIN 1** READY output.
This output is high when ENABLE is active and there is no sensor error. This output corresponds with the green led.
- PIN 2** STATUS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window.
The output is only active if START = ON.
- PIN 5** AUTO/HAND input
ACTIVATED = automatic mode
DEACTIVATED = hand mode.
- PIN 6** SEL 1/HAND+ input:
SEL 1 = Selection input 1
HAND+ = Hand mode (START = OFF), the axis drives with the programmed speed (parameter HAND:A). After the deactivation the command position is set to the actual position.
- PIN 7** START (RUN) input:
The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke
- PIN 8** 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. Target position is set to actual position and the drive is closed loop controlled.

- PIN 13** SEL 2 / HAND- input:
SEL 2 = Selection input 2
HAND- = (START = OFF), the axis drives with the programmed speed (parameter HAND:B). After the deactivation the command position is set to the actual position.
- PIN 14** SEL 4- input:
Selection input 4 - See schemes in the BINARY TABLE below

Address	0	1	2	3	4	5	6	7
SEL 1	0	1	0	1	0	1	0	1
SEL 2	0	0	1	1	0	0	1	1
SEL 4	0	0	0	0	1	1	1	1

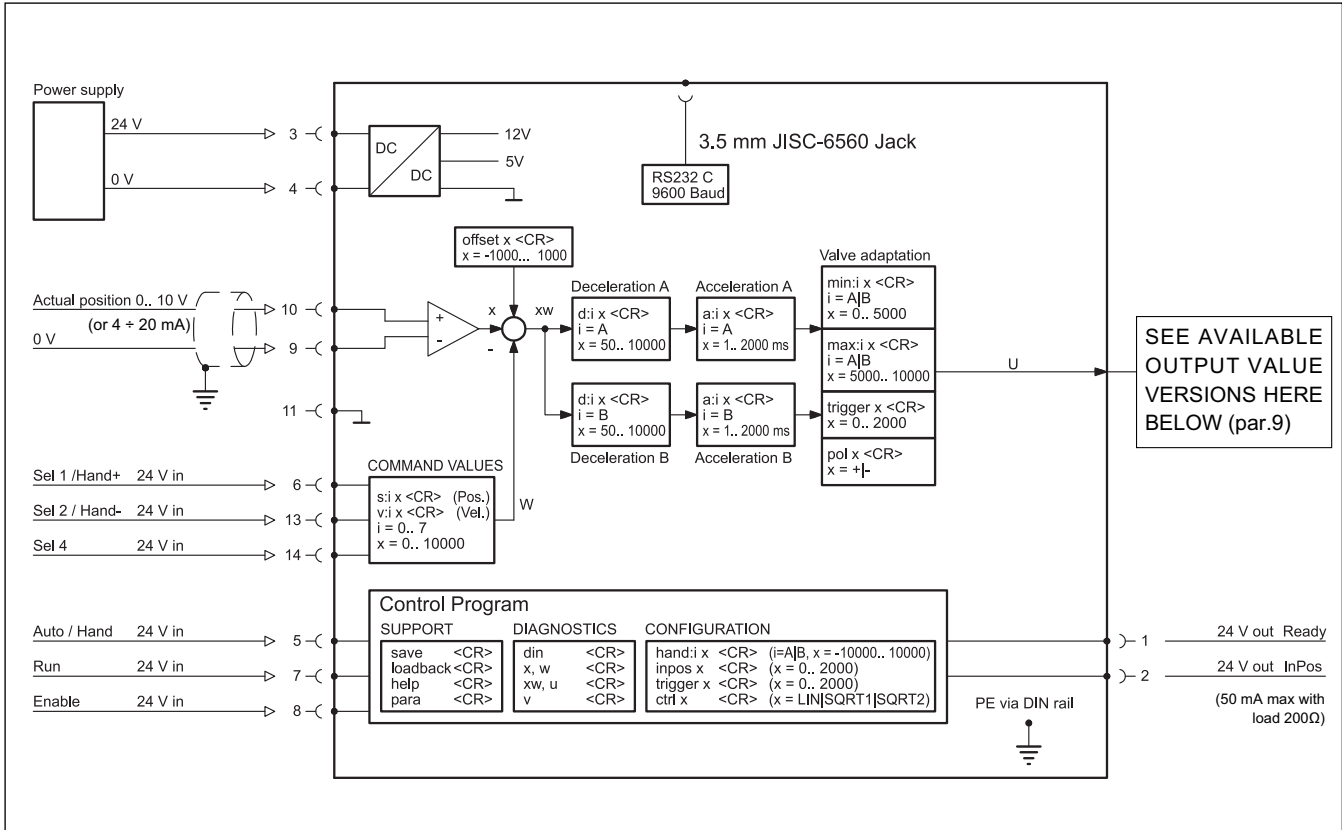
ANALOGUE INPUT

- PIN 9/10** Actual position (feedback) value (X)
range 0 ÷ 100% corresponds to 0 ÷ 10V (or 4 ÷ 20 mA)

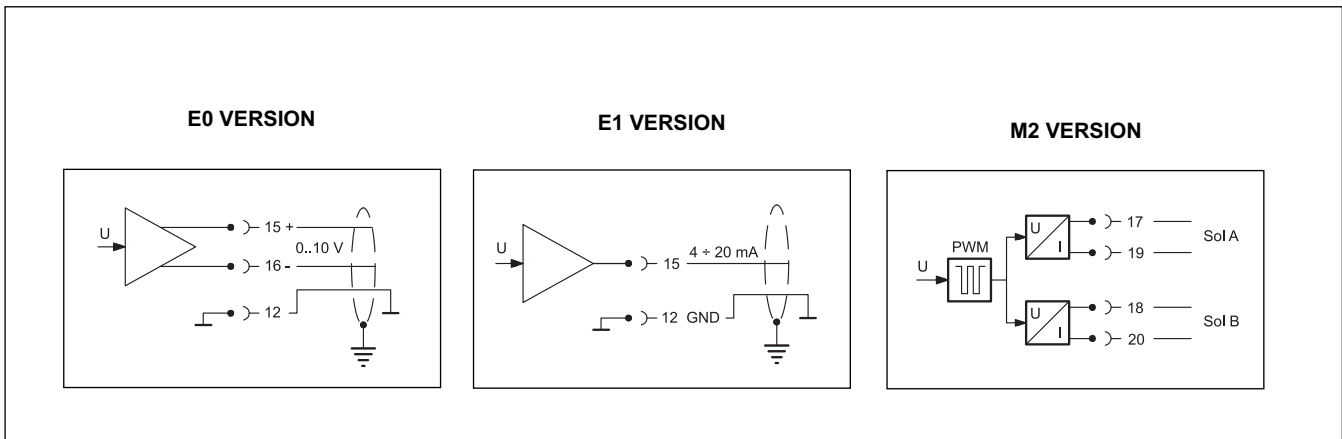
ANALOGUE OUTPUT

- PIN 15/16** Differential output signal (U)
± 100% corresponds to ± 10V differential voltage, optionally (I-version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

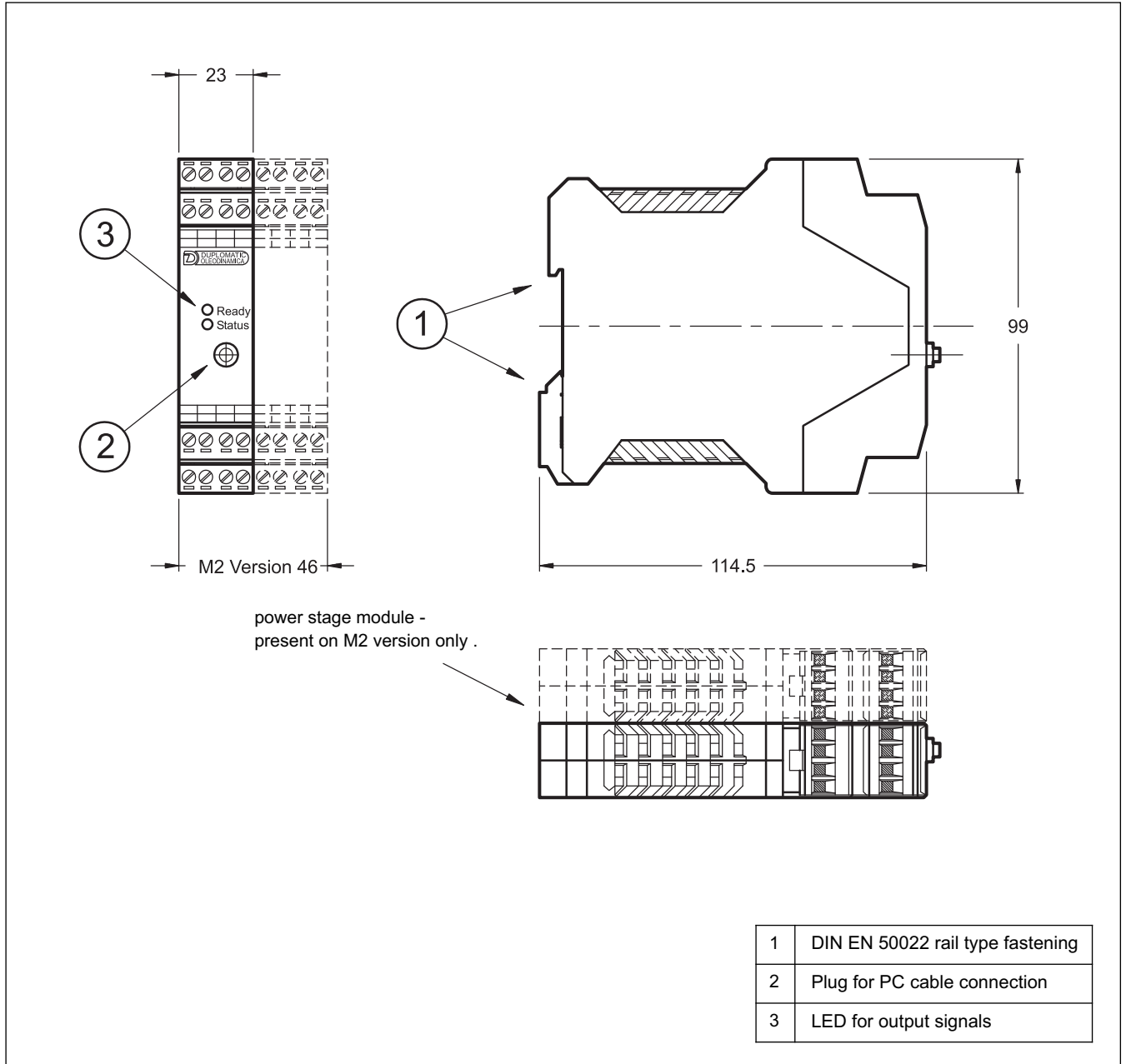
8 - CARD BLOCK DIAGRAM



9 - AVAILABLE OUTPUT VALUE VERSIONS



10 - OVERALL AND MOUNTING DIMENSIONS





EWM-S-B*

SERIES 10



DIPLOMATiC OLEODiNAMiCA S.p.A.

20015 PARABIAGO (MI) • Via M. Re Depaolini 24

Tel. +39 0331.895.111

Fax +39 0331.895.339

www.diplomatic.com • e-mail: sales.exp@diplomatic.com

