

EM-1

Extension Module



USER MANUAL

DOCUMENT EDITION: 1.0

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EM-1

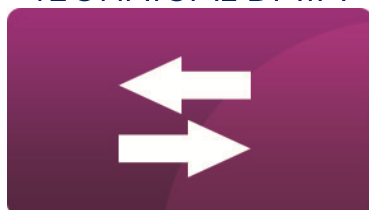
MAIN MENU



SAFETY



TECHNICAL DATA



TRANSMISSION



INSTALLATION



SETTINGS



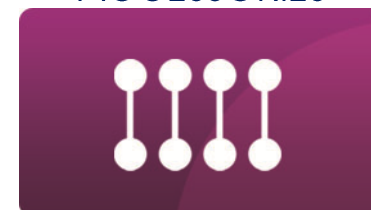
EXPLOITATION



CONSERVATION



ACCESSORIES



DATA COLLECTION



USER SAFETY

Legend of used signs:



After the sign a warning which has the influence on a safety is given.



After the sign a caution information about the use of device is given.

Note: the symbols indicate important information, in order to facilitate familiarization with the instructions. However, this does not exempt the user from compliance with requirements which are not marked with a graphic symbol!



Directive WEEE 2002/96/EG

- Dispose of packaging and the product at the end of the use period in an appropriate recycling point.
- Do not dispose of the product together with household waste.
- Do not burn the product.



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INFORMATIONS

EM-1 module is a device that extends the functionality of MacMAT IV by adding two additional current outputs operating in 4-20 mA current loop and four binary OC type outputs. The EM-1 module can also operate as a standalone device due to the fact it has own table of available parameters available for remote modification using GazModem2 or Modbus transmissions protocols. Data readout and modification can be performed with the use of PC computer or other device equipped with serial RS485 transmission port (i.e. IK-301).

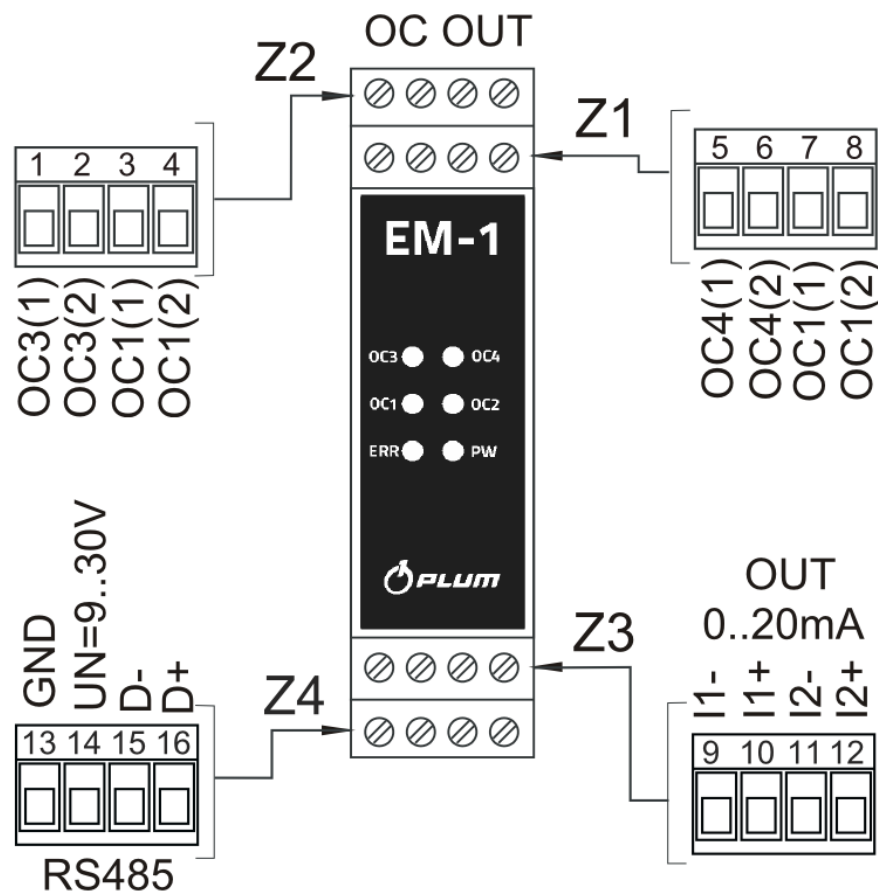


TECHNICAL DATA

Housing, dimensions	Modular, to installation on DIN rail, 99 height x 22,6 width x 122 lenght [mm]
Operating temperature	-25 ÷ 55°C
Housing protection class	IP40
Signaling on front panel	6 LED diodes, State of binary outputs, Transmission, Power supply/State
Current outputs	2 insulated current outputs with operating range 4÷20mA (3,5 mA or 22mA emergency state). Resolution 16 bits, MPE 0,25% terminal Z6 (insulation between channels >500V). These outputs are active without additional power supply in current loop. Max. resistance connected with outputs equal 900Ω.
OC outputs	4 insulated binary relay outputs. terminals Z7, Z8 (insulation between channels >500V).
External supply	9÷30V DC, Power supply from the Z5 terminal or TBUS Z1 terminal
Max. power consumption	9V@300mA, 2,7W 24V@120mA, 2,9W
Transmission RS485	EIA 485, Modbus. Available baud rates 4800, 9600, 19200, 38400, 57600, 115200 kbit/s - 8,N,1



DESCRIPTION CONNECTORS





CONFIGURATION OF TRANSMISSION WITH EM-1 MODULE

Interface is equipped with one serial transmission port operating in standard RS-422 – RS485. Transmission speed can be configured in range from 9600 up to 115200 b/s by modifying parameter **Baudrate** (DP:20). In addition, it is possible to set the detection of the transmission parity by configuring parameter **Parity** (DP:21) and transmission address, parameter **Address** (DP:19). Last 4 digits of the device serial number, when converted to hexadecimal value are the device default transmission address.



TRANSMISSION PROTOCOLS

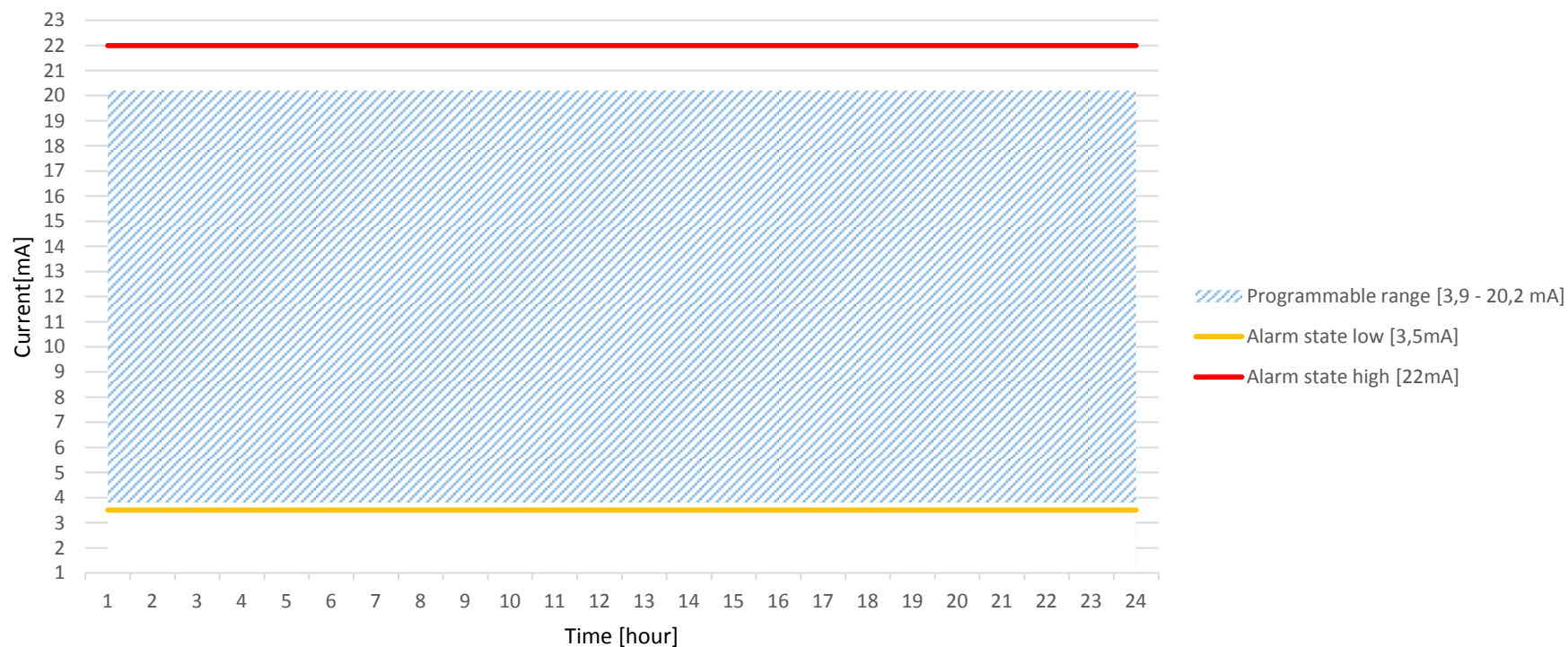
Readout and modification of parameters from EM-1 module DP table is possible with the use of GazModem and Modbus transmission protocols. For proper operation with the use of Modbus protocol it is necessary to set in readout device proper order of bytes (1-2-3-4).



CONFIGURATION OF EM – 1 OUTPUTS

Device is equipped with two current outputs and four binary OC type outputs. Each of this outputs can be configured individually. Parameters **I1** (DP:0) and **I2** (DP:1) are responsible for configuration of currents outputs, while **OC1** (DP:2), **OC2** (DP:3), **OC3** (DP:4) and **OC4** (DP:5) for setup of binary outputs. Range of parameters modification is presented in section table of available parameters.

Operation range of currents outputs





CONFIGURATION OF DEFAULT VALUES FOR MUDULE OUTPUTS

Each time the device is restarted, as a result of a power failure or deliberate isolation by the user, the current outputs and state of OC outputs are set on their default values. User can set default values of currents outputs by modifying parameters **Default I1** (DP:6) and **Default I2**, whereas binary outputs by modifying parameters **Default OC1** (DP:8), **Default OC2** (DP:9), **Default OC3** (DP:10) and **Default OC4** (DP:11).



CONFIGURATION OF ALARM STATE

The alarm state in the device is a situation in which it detects no communication with the control device. According to configuration of EM1 module, lack of transmission during period of time defined as DP table parameter, can cause switching on diode (Err), which informs about error. User by modifying parameter **Rp** (DP:18) can configure readout period which is the time in which device need to detects active transmission at least once. After time configured in parameter Rp since last active transmission LED switches to flashing mode what will least for a period of time equal to $3 \cdot R_p$. After this time the LED is completely turned off until the next valid transmission is detected between the module and the control device.



CONFIGURATION OF CURRENTS OUTPUTS IN ALARM STATE

During alarm state, the values on current outputs can be configured according to the parameters **Conf I1** (DP:16) for current output I1 and **Conf I2** (DP:17) for current output I2. Presented parameters can be set as follows:

- 0 – on output will be set current with value 3,5 mA;
- 1 – on output will be set current with last known value;
- 2 – on output will be set current with value 22 mA;



CONFIGURATION OF CURRENT OUTPUTS CALIBRATION

In order to calculate coefficients A and B for calibration line for the current outputs, following steps needs to be performed:

- 1 Perform measurements during which two different values of current will be set on output (i.e. 4mA and 20mA) and measure the value of current on output in these two points. As a result these points will be obtained:

y1 – current set in point 1;
 x1 – current measured in point 1;
 y2 – current set in point 2;
 x2 – current measured in point 2;



For each current output separate measurement need to be performed.

- 2 Calculate coefficients A and B with the use of following equations:

$$A = \frac{(y2 - y1)}{(x2 - x1)}$$

$$B = \left(\frac{(y2 - y1)}{(x2 - x1)} \right) \times (-x1) + y1$$

- 3 Program calculated coefficients into parameters in DP table. For current output I1 it will be **A1** (DP:12) i **B1** (DP:13), whereas for output I2 respectively **A2** (DP:14) i **B1** (DP:15).



MODIFICATION LOCK

Both reading and modifying of all configurable parameters do not require user authentication. BY configuring parameter **Mod access** (DP:33) user can enable or disable the modification lock on configuration parameters **DP:6 – 21**. By default, every time you restart the device the Mod access parameter is set to 0 - which means that modification lock is active.



TABLE OF ACCESSIBLE PARAMETERS (DP TABLE)

Legend:

- (1) – number of parameter in DP table (DP index);
- (2) – name of parameter;
- (3) – description of parameter, where:
 LOCK-S – parameter is protected by setting of switch in terminal chamber;
 LOCK-MET - parameter is protected by metrological lock (parameter **lock MET**, DP:386).
- (4) – exponent **w**, to obtain final value of parameter multiply read value by 10^w ;
- (5) – unit;
- (6) – additional information:
 M: parameter set by user;
 R: parameter registered in memory with registration period;
 O: value of parameter possible to read;
 additionally type of parameter (**long** – long real, **short** – short real, **dword**, **word**, **byte**, **boolean**, **string**);
- (7) – registers no. in ModBUS RTU protocol.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	I1	Current value at current output I1; Range of programming: 3,9..20,2;	0	mA	MO ^short	5000>5001
1	I2	Current value at current output I2; Range of programming: 3,9..20,2;	0	mA	MO ^short	5002>5003
2	OC1	State of binary output OC1; Range of programming: 0 or 1;	0		MO ^byte	5004
3	OC2	State of binary output OC2; Range of programming: 0 or 1;	0		MO ^byte	5005
4	OC3	State of binary output OC3; Range of programming: 0 or 1;	0		MO ^byte	5006
5	OC4	State of binary output OC4; Range of programming: 0 or 1;	0		MO ^byte	5007
6	Default I1	The default value of current set at the current output I1 after module	0	mA	MO ^short	5008>5009

SETTINGS



		startup; Range of programming: 3,5..22;				
7	Default I2	The default value of current set at the current output I2 after module startup; Range of programming: 3,5..22;	0	mA	MO ^short	5010>5011
8	Default OC1	The default state of binary output OC1 after module startup; Range of programming: 0 or 1;	0		MO ^byte	5012
9	Default OC2	The default state of binary output OC2 after module startup; Range of programming: 0 or 1;	0		MO ^byte	5013
10	Default OC3	The default state of binary output OC3 after module startup; Range of programming: 0 or 1;	0		MO ^byte	5014
11	Default OC4	The default state of binary output OC4 after module startup; Range of programming: 0 or 1;	0		MO ^byte	5015
12	A1	Coefficient A of calibration line for current output I1;	0		MO ^short	5016>5017
13	B1	Coefficient B of calibration line for current output I1;	0		MO ^short	5018>5019
14	A2	Coefficient A of calibration line for current output I2;	0		MO ^short	5020>5021
15	B2	Coefficient B of calibration line for current output I2;	0		MO ^short	5022>5023
16	Conf I1	Configuration of output I1 in alarm state; Range of programing: 0 - 3,5mA; 1- last value of current; 2 - 22mA;	0		MO ^byte	5024
17	Conf I2	Configuration of output I2 in alarm state; Range of programing: 0 - 3,5mA; 1- last value of current; 2 - 22mA;	0		MO ^byte	5025
18	Rp	Readout period of device; Range of programing: 0..1440 where 0 - control disabled;	0	min	MO ^word	5026
19	Address	Transmission address; Range of programming: 1..65534;	0		MO ^word	5027
20	Baudrate	Transmission speed; Range of programming: 9600, 14400, 19200, 38400, 57600, 115200;	0	bps	MO ^dword	5028>5029
21	Parity	Transmission parity control; Range of programming: 0 - None, 1 - Even, 2 - Odd;	0		MO ^byte	5030
22	I1 Bin	Binary value of current at output I1;	0		MO ^dword	5031>5032
23	I2 Bin	Binary value of current at output I2;	0		MO ^dword	5033>5034
24	T	Internal temperature of the device;	0	C	O ^short	5035>5036
25	Tbin	Binary value of the device internal temperature;	0		O ^word	5037
26	VM-24	Value of the supply voltage;	0	V	O ^short	5038>5039
27	ST	Status of the supply voltage;	0		O ^byte	5040
28	Prog ver	Software version;	0		O ^string	5041>...>5052
29	Prog ser	Software revision;	0		O ^string	5053>...>5064

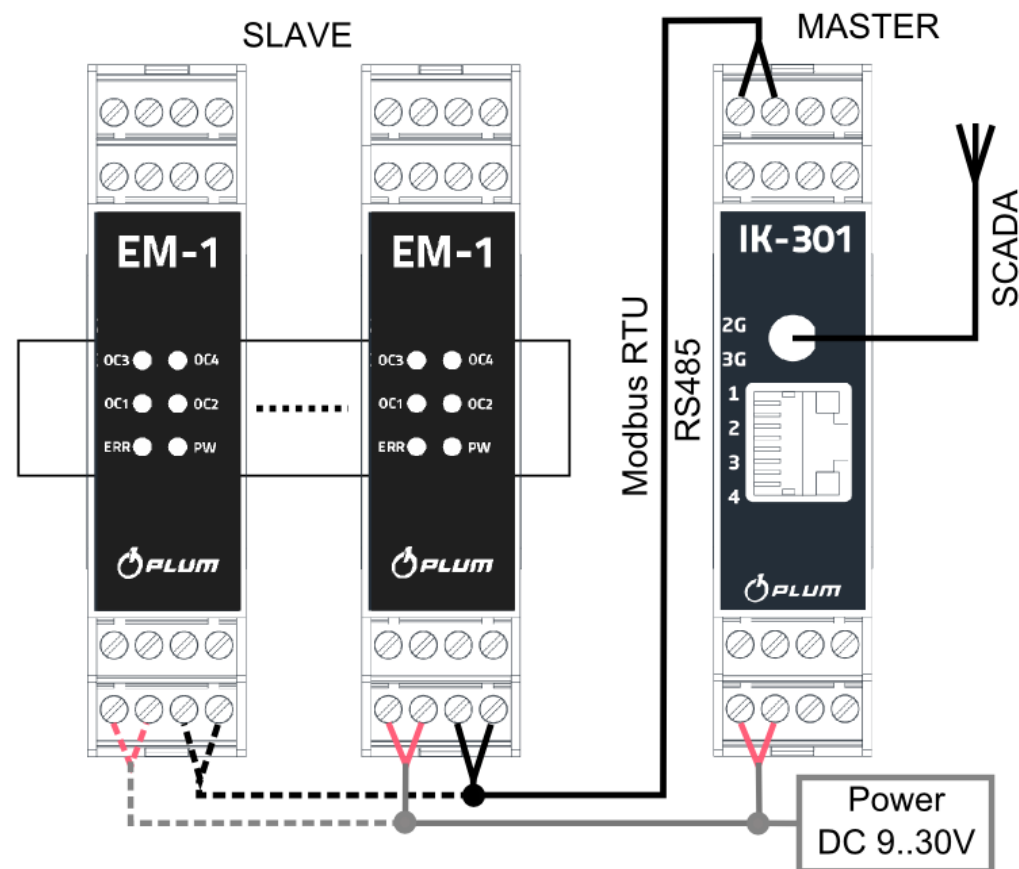
SETTINGS



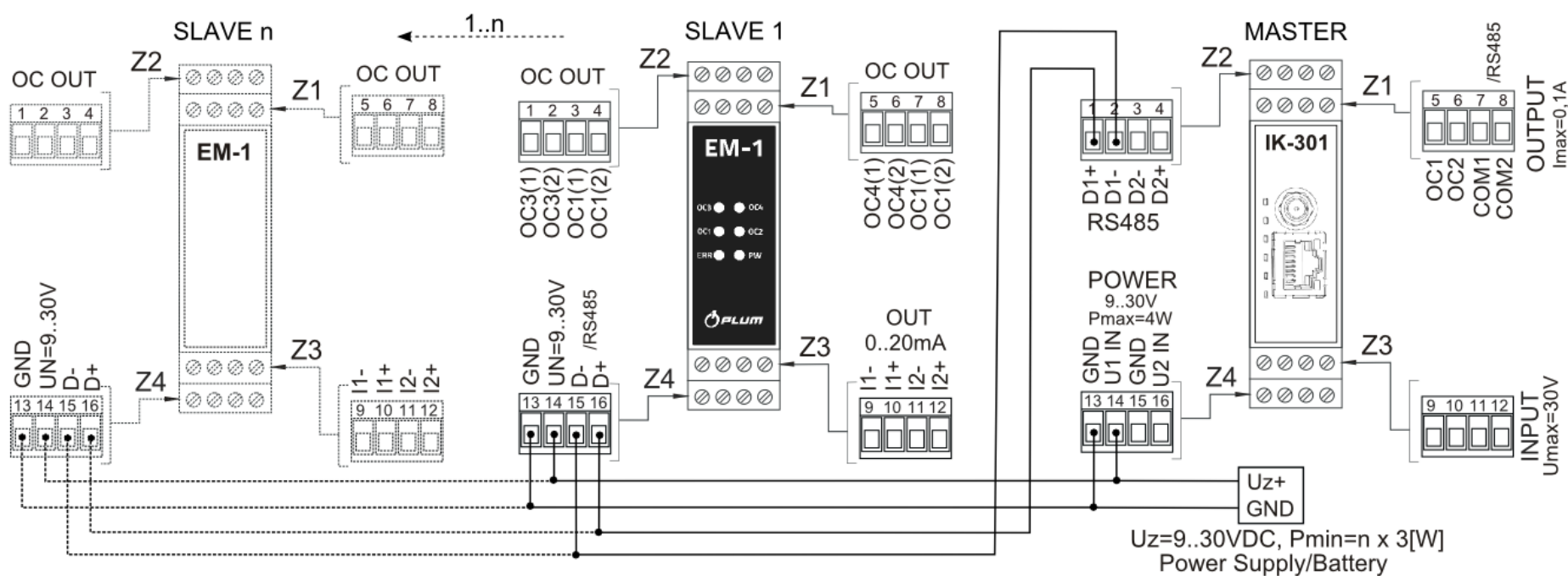
30	DP ver	Version of the DP table;	0		O ^string	5065>...>5076
31	Device	Name of the device;	0		O ^string	5077>...>5088
32	SN	Serial number of the device; Last 4 digits when converted to hexadecimal value are the device default transmission address;	0		O ^string	5089>...>5100
33	Mod access	Modification lock; Range of programing: 0 – lock enabled, 1 – lock disabled;	0		MO ^byte	5101



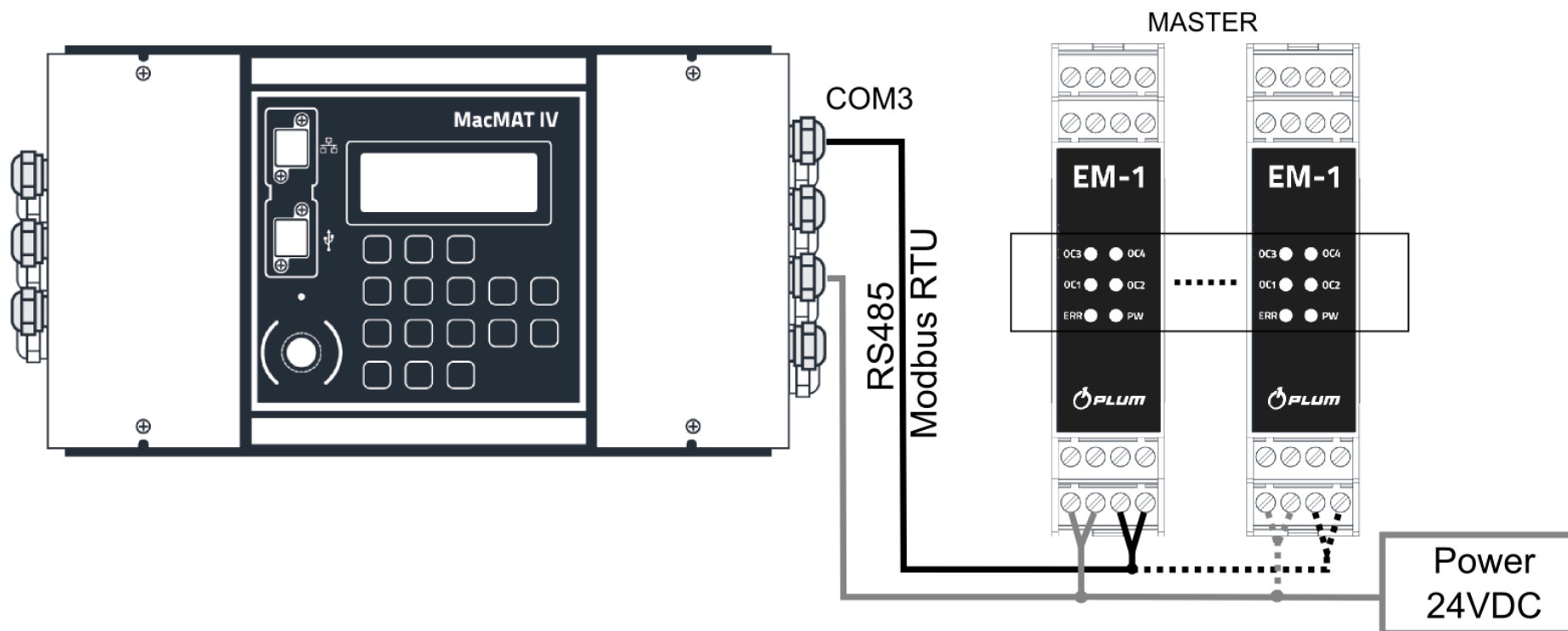
EM-1 CONNECTION TO IK-301 & MacMAT IV

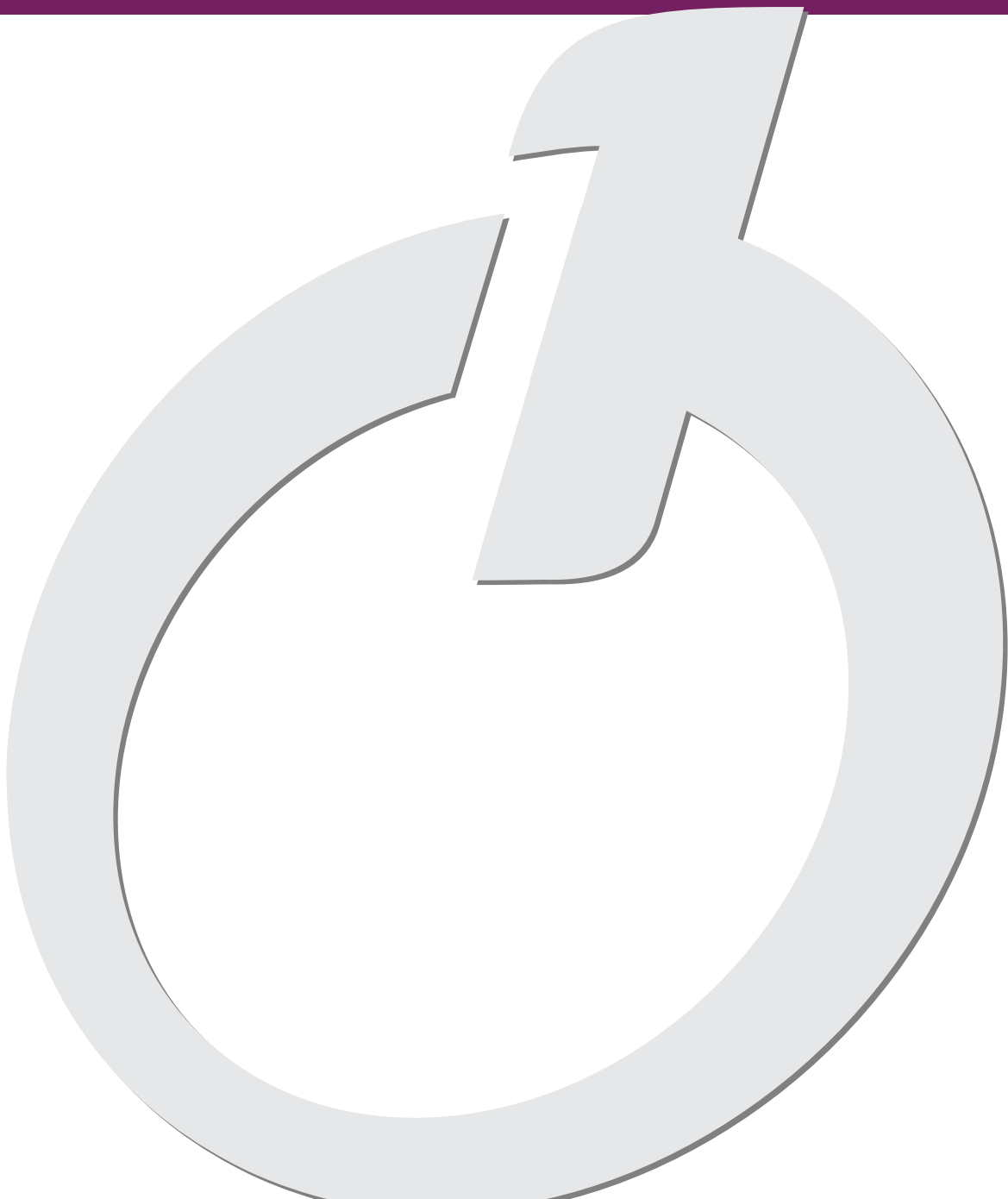


INSTALLATION



INSTALLATION





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