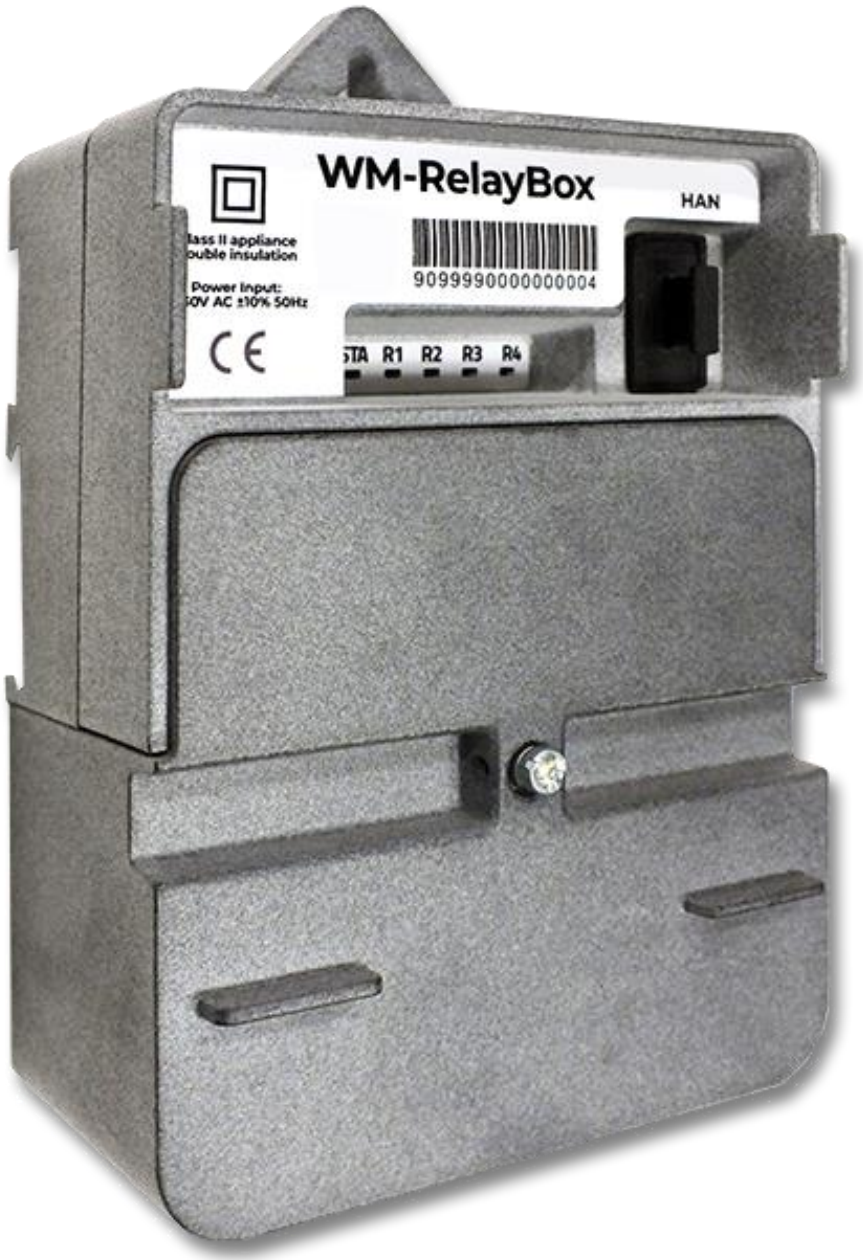
WM-Relay Box®

Installation Guide and User Manual



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Document specifications

This document was made for the **WM-Relay Box®** device and it contains all relevant installation steps of the device.

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Chapter 1. Device installation

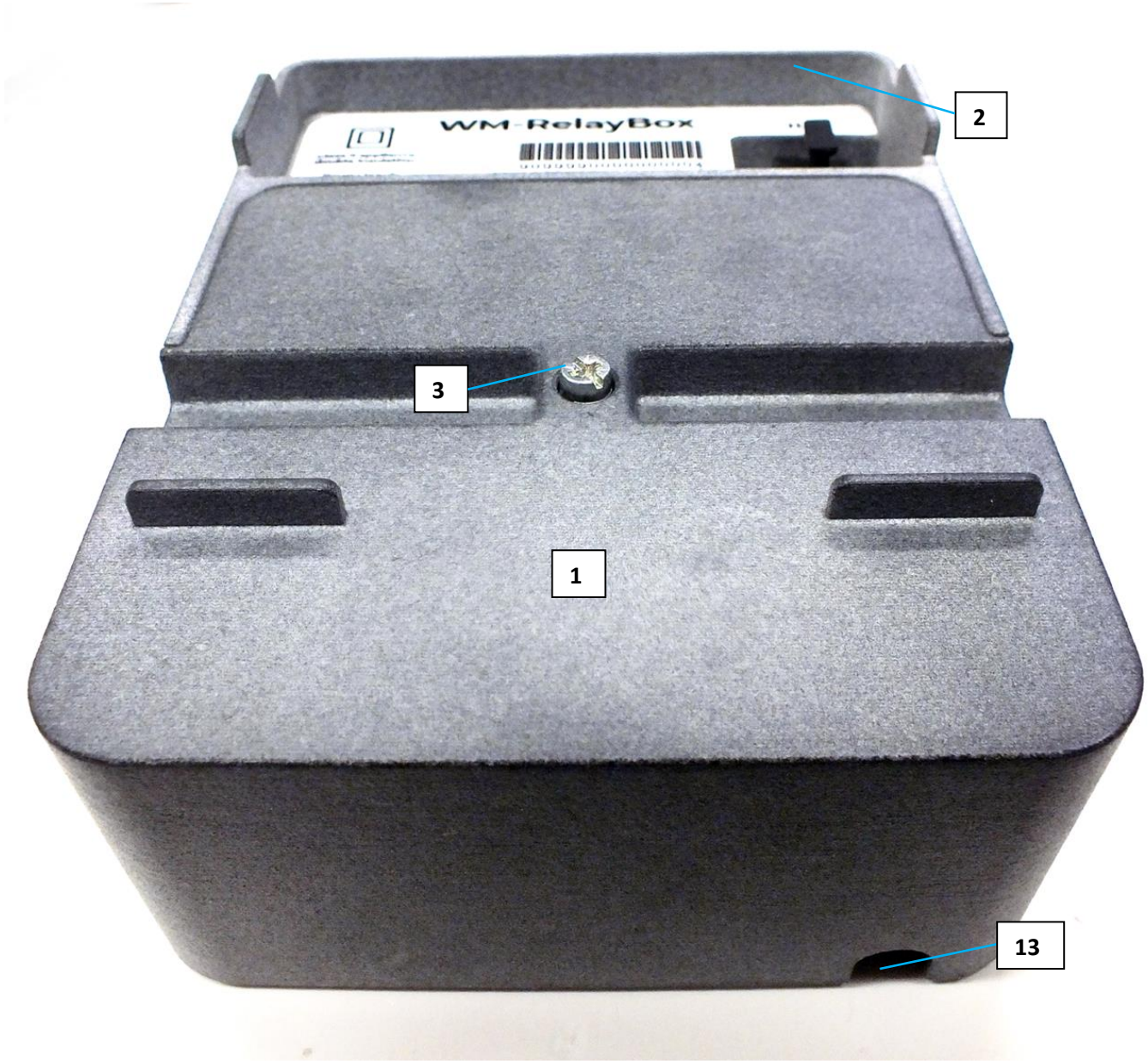
1.1 Device - External view (Top view)

1 – Device terminal cover – protecting the terminal block, and E-Meter port and their cable connections – the cover can be removed by releasing the screw and sliding up the cover

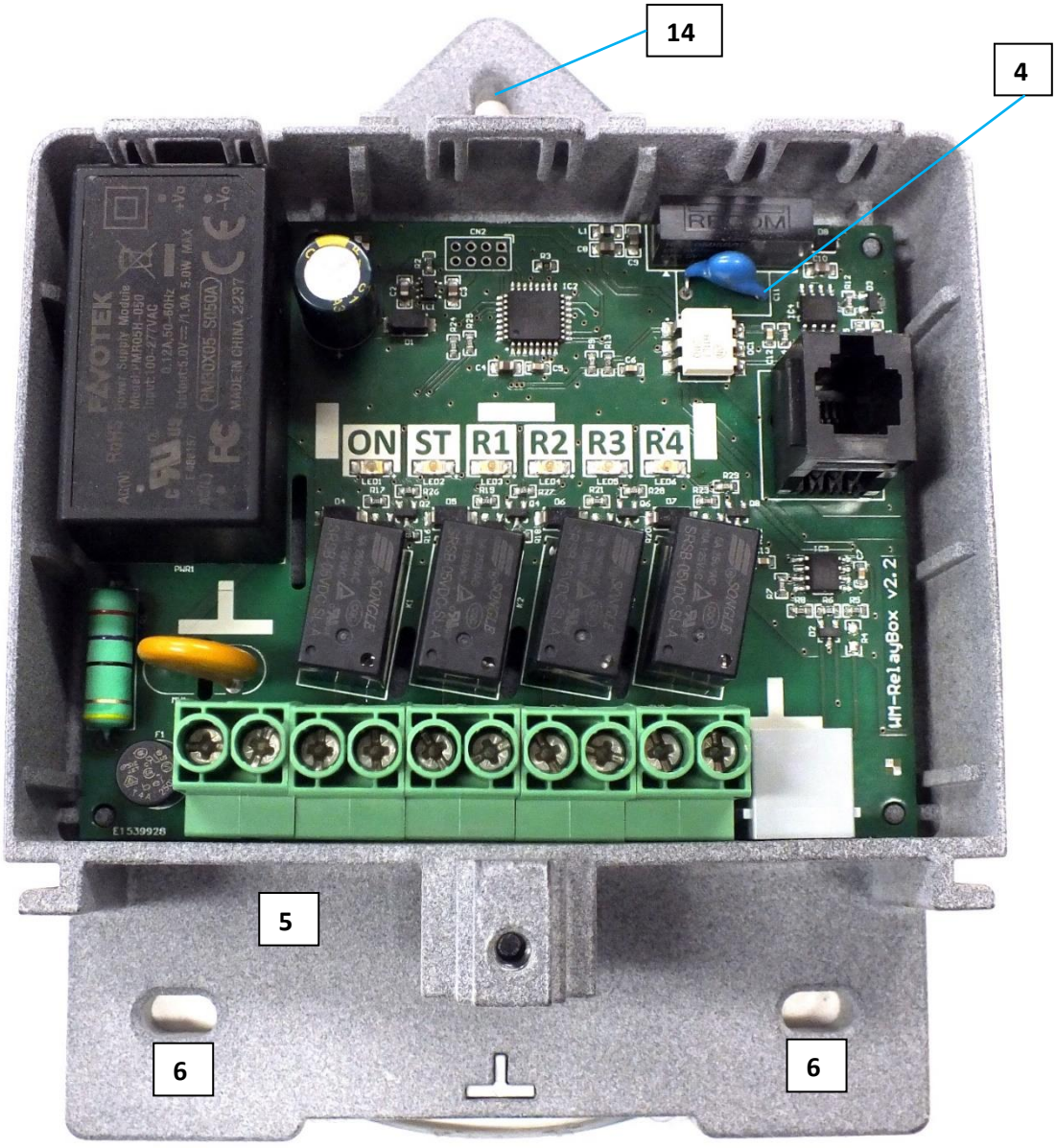
2 – Top cover (upper part, which protects the PCB)

3 – Top cover fastener screw (sealable)

13 – Passage for E-Meter communication (cutout)



1.2 Device – Internal view (under the top cover)

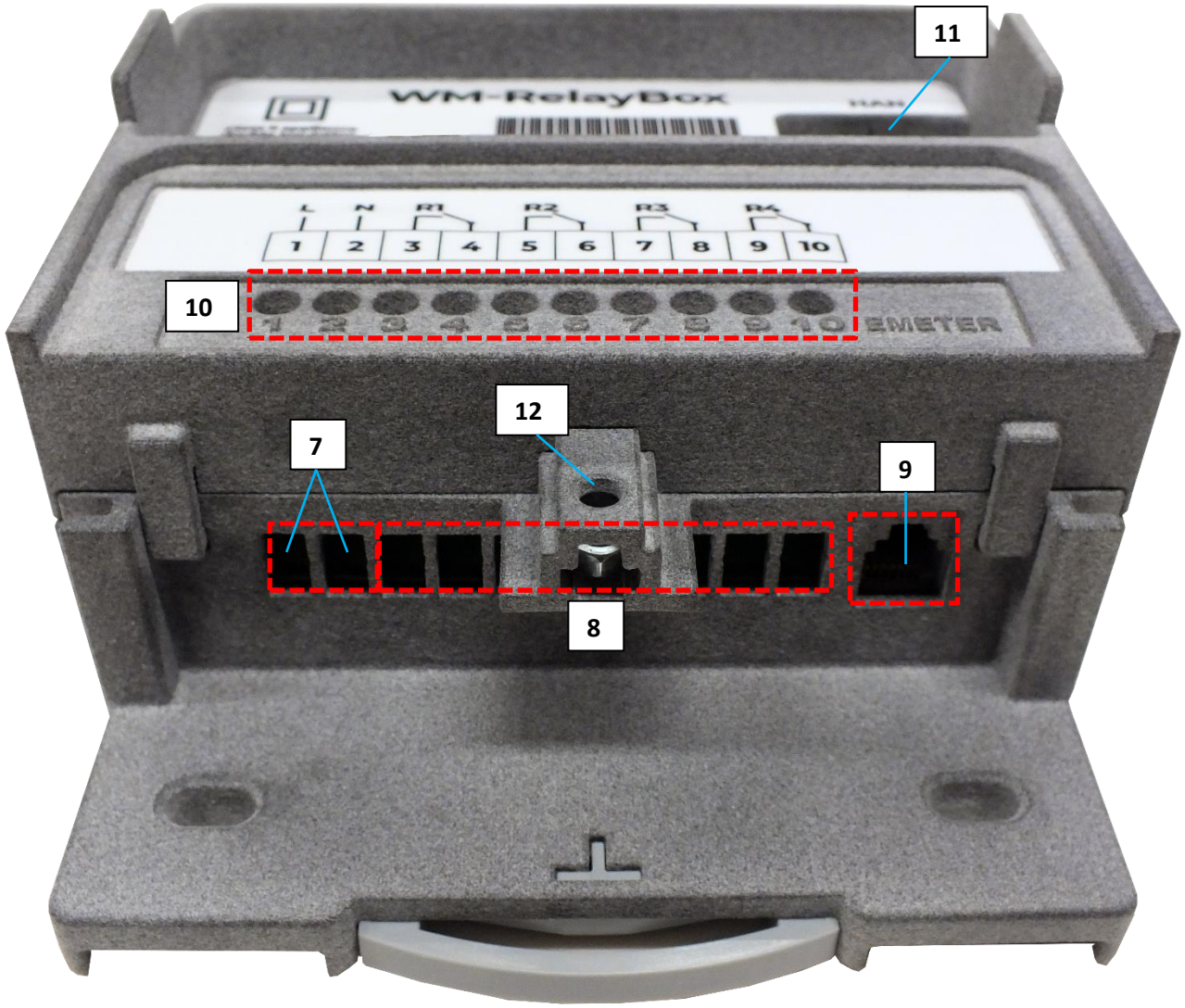


14 – Upper mounting point

4 – PCB (assembled inside of the terminal enclosure)

5 – Base part

6 – Bottom mounting points



7 – Power input (from left-to-right: the first 2-pins on the terminal block for AC wires)

8 – 4pcs Relay connections (4 terminal block pairs, Single-Pole SPST, COM/NC)

9 – E-Meter interface input (RS485, RJ12, 6P6C)

10 – Fixation of the input/output wires on the terminal block (by screws)

11 – HAN / P1 interface output (Customer Interface output, RJ12, 6P6C, 2kV isolated)

12 – Nut for Terminal cover Fastener Screw

15 – Status LEDs

16 – Dust cover of HAN / P1 interface

1.3 Safety declaration

The device must be used and operated according to the related user manual.

The installation can be carrying out only by a responsible, instructed and skilled person by the service team, who has enough experience and knowledge about carrying out the wiring and installing the device.

DO NOT OPEN the internal enclosure of the device!

The users / product using persons are not allowed to open the product enclosure's internal block (also not allowed to access the PCB)!

CAUTION!

It is prohibited to open the device enclosure for anyone during its operation or when the device is under AC power connection!

Always check the LEDs that if these are not having any activity (lighting or blinking), if all LEDs are blank, that means only that the device is currently not under power voltage. Only in this case it is safe to wire or change the connection by an expert / technical team member.

By general the device is using AC mains. ~207-253V AC, 50Hz (230V AC +/-10%, 50Hz), electric shock hazard inside the enclosure! DO NOT open the enclosure and DO NOT touch the PCB. Consumption: Max: 3W

The relays are able to switch max. 5A resistive load, 250VAC.

Its prohibited to touch or modify the wiring or the installation by the user.

It is also prohibited to remove or modify the device PCB. The device and it's parts must not be changed by other items or devices.

Any modification and repairation is not allowed without the permission of the manufacturer. It all causes the loss of product warranty.

The immunity protection of the device enclosure will be effective only in case of under normal usage and operation conditions with unharmed hardware conditions by using the device in the provided enclosure/chassis.

Deliberate damage or occing casualty of the device means the loss of product warranty.

To ensure general safety, please follow the following guideline!

▪ Keep the chassis area clear and dust-free during and after installation.

▪ Keep tools and chassis components away from walk areas.

▪ Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.

▪ Wear safety glasses when working under conditions that might be hazardous to your eyes.

▪ Do not perform any action that creates a hazard to people or makes the equipment unsafe.

Safety with Electricity

Follow this guideline when working on equipment powered by electricity.

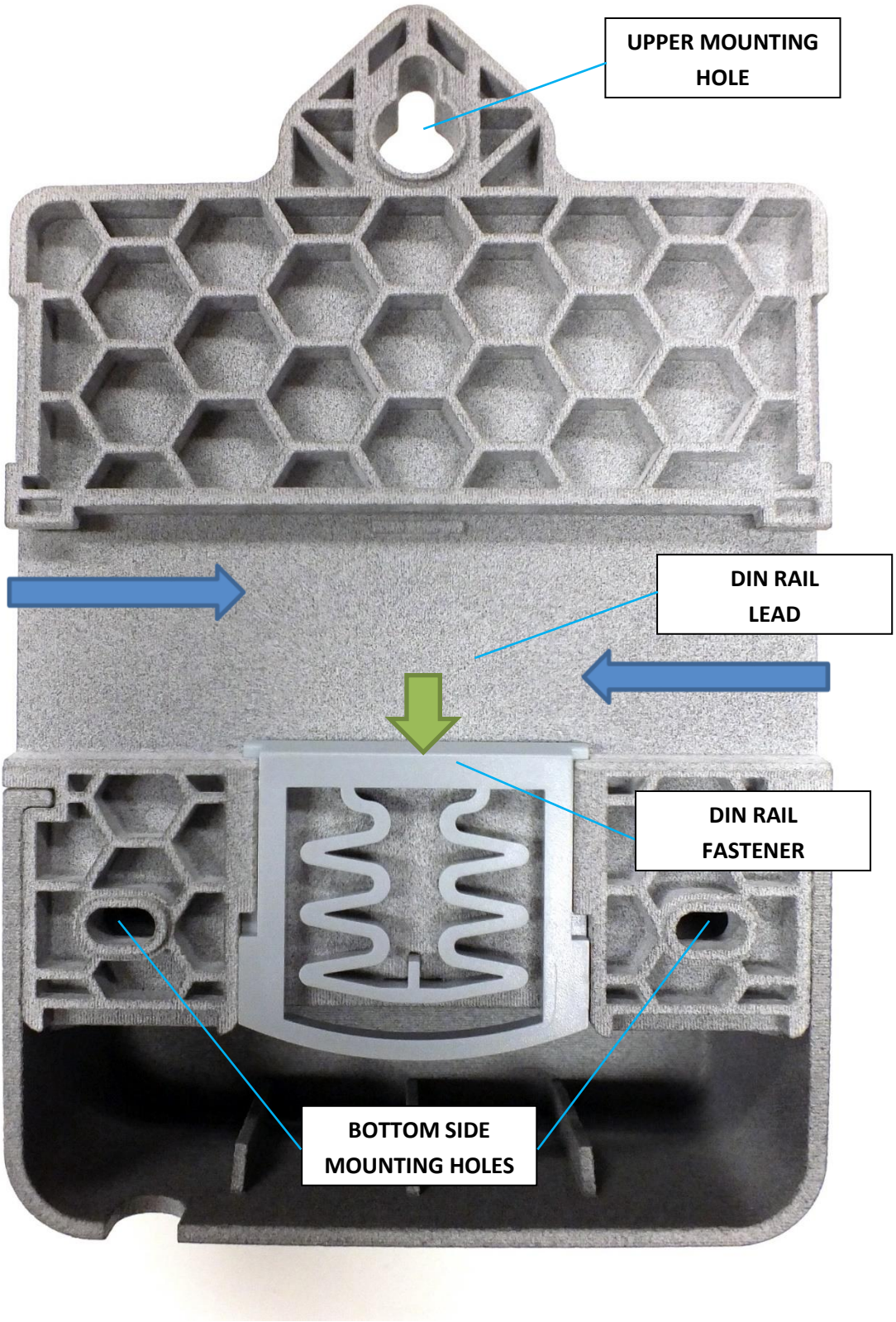
- ▪ Read all the warnings in Safety Warnings.
- ▪ Locate the emergency power-off switch for your installation location.
- ▪ Disconnect all power before:
  - – Installing or removing a chassis / enclosure
  - – Working near power supplies
  - – Wiring power supply cables or connecting relay pairs
- ▪ Do not open the enclosure of the device's internal casing.

1.4 Fastening / mounting the device

The Relay Box enclosure (unit) back side contains two type of fixation modes, which are to be intended to mount:

1. to a 35mm DIN rail (by DIN rail fastener)

2. using a 3-point fixation by screws (Upper mounting hole (14) and Bottom mounting points (6)) – therefore you can also mount the enclosure to wall, place into the street light cabinet box, etc.



1.5 Preparing the device

1. **Make sure that the device is not under power/supply voltage**!

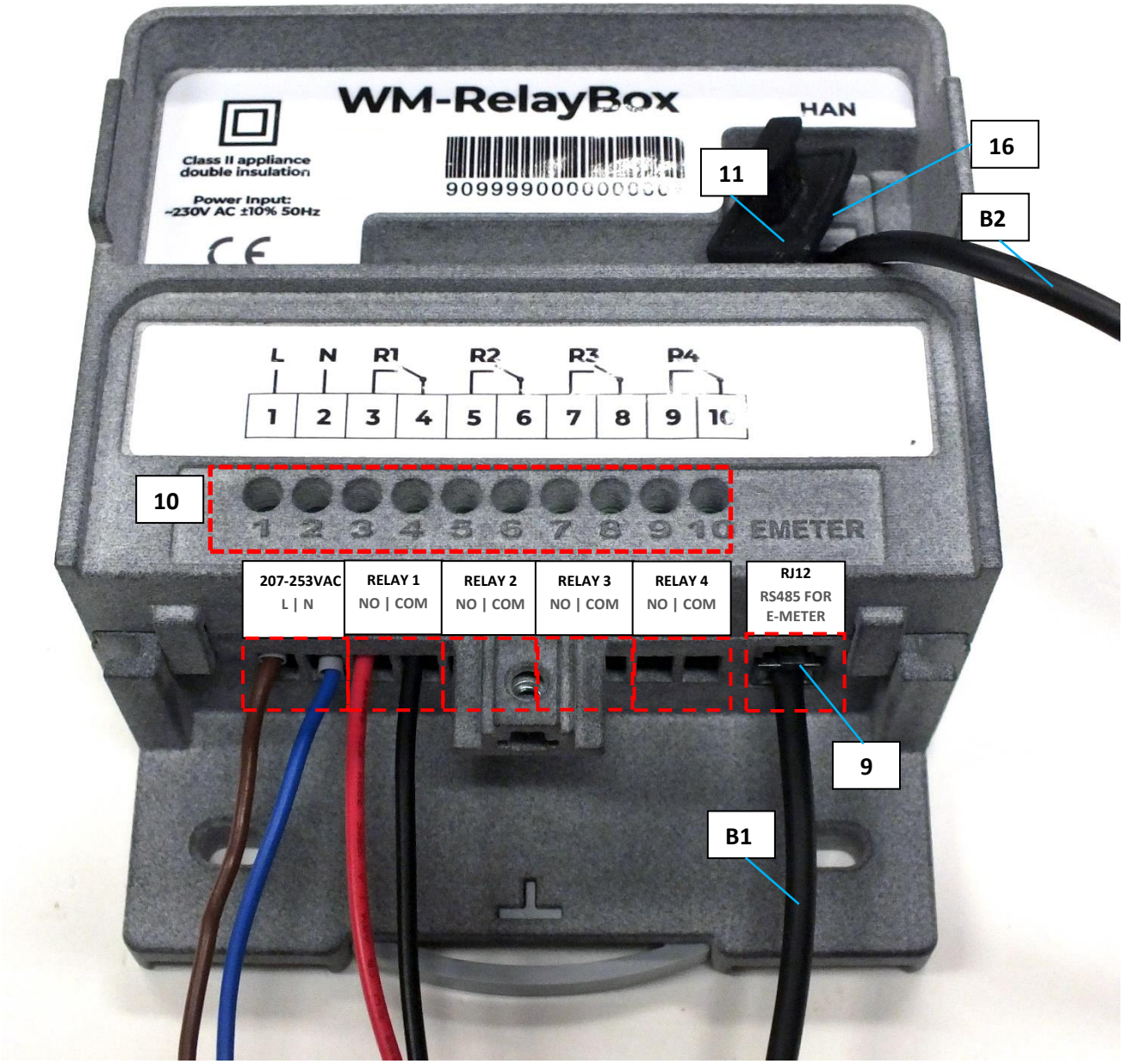
2. Remove the **Terminal cover** (No. 1) by releasing the **Fastener Screw** (No. 3). Use a matching VDE screwdriver for the PZ/S2 type a screw head.

3. Slide up the **Terminal Cover** part (No. 1) carefully from the **Base part** (No. 5), then remove the cover.

   IMPORTANT! DO NOT CONNECT the ~230V AC power source until you did not completed the wiring!

4. Now you can free to connect wires to the **terminal block**. Release the fastener screws (10) of the terminal block inputs and do the wiring.
   Note, that the screw heads are PZ/S1 type, so use a matching VDE screwdriver. After do the wiring, fasten the screws.

5. Then connect RJ12 cable of the smart meter (B1) to the **E-Meter connector** (9).



6. Carry out the wiring according to the wiring diagram on the middle sticker.

7. If you want, connect the **Relay #1** wire pair (NO / COM) to the pins nr. 3, 4. The opposite side of the cable should be connected to the external device, which you want to control / switch by the relay.

8. If you want, connect the **Relay #2** wire pair (NO / COM) to the pins nr. 5, 6. The opposite side of the cable should be connected to the external device, which you want to control / switch by the relay.

9. If you want, connect the **Relay #3** wire pair (NO / COM) to the pins nr. 7, 8. The opposite side of the cable should be connected to the external device, which you want to control / switch by the relay.

10. If you want, connect the **Relay #4** wire pair (NO / COM) to the pins nr. 9, 10. The opposite side of the cable should be connected to the external device, which you want to control / switch by the relay.

11. Place back the **Terminal cover** (No. 1) to the **Base part** (No. 5). Fasten the **fixation screw** (3) and check that the **terminal cover** (1) is closing properly.

12. If the Customer wants to use the external RJ12 **HAN / P1 interface output** (No. 11) then you should remove the **Dust cover** cap (16) from the **HAN** RJ12 socket (11) and you can connect the RJ12 cable (B2) to the port.

13. Plug the **~207-253V AC power voltage** to the AC power wires of the terminal input (wires nr. 1, 2 – pinout: **L** (line), **N** (neutral)) e.g. to an external power source or electricity plug.

14. The WM-RelayBox has a pre-installed embedded system, which starts immediately to operate after adding the power source to the device.

The current operation will be always signed by the status LEDs (No. 15), according to the **LED operation behaviour** description. See Chapter 2.3 – 2.4 for further details.

1.6 Cables

AC power wires: The power cable should be min. 50 cm long, offered to use 2 x 1.5 mm^2, voltage insulation min. 500 V, wires should be signed by colors, the wire endings shoould be sealed.

This will enable the ~207-253V AC power supply connection for the device.
Connector (device side): 2-wires
Pins must be wired for usage (from left-to-right):

- pin #1 : L (line)
- pin #2 : N (neutral)

Relay wire pairs: The wires should be min. 50 cm long, offered to use 2 x 1.5 mm^2, voltage insulation min. 500 V, wires should be signed by colors, the wire endings shoould be sealed.

This will enable the max. 250V AC for 5A resistive load connection for the relays. Separate relay pairs for each relay of the 4 ones.
Connector (device side): 2-wires
Connector pinout (WM-RelayBox side):

- pins no. 3, 4 – Relay #1
- pins no. 5, 6 – Relay #2
- pins no. 7, 8 – Relay #3
- pins no. 9, 10 – Relay #4

RJ12 cables (internal E-meter input connector and external HAN / P1 output connector)

In the physical layer of the RS-485 interface, the following implementation is used for the RJ12 connector.
The relay box uses RJ12 female connectors. The communication cable used to connect the Meter input ←→ WM-RelayBox and between the WM-RelayBox ←→ Customer Interface output, which all using a standard RJ12 male plug on both sides.
The physical design pinout of the RS485 interface is the following.

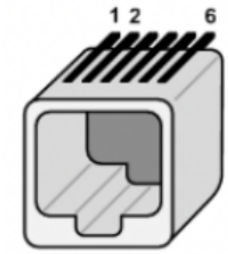


Image 2: RJ12 female

RJ12 female	
Pin	RS 485
1	not connected
2	not connected
3	Data A (+)
4	Date B (-)
5	not connected
6	not connected

The

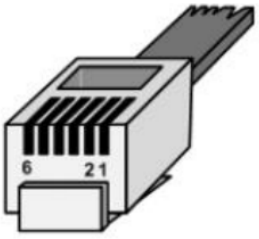


Image 1: RJ12 male

RJ12 interface and Cable pinout

Note, that the RJ12 interfaces (E-Meter input and HAN / P1 output) of the product are orienterd and placed upside down compared to the previous figure.

The RJ12 cable is an 1:1 straight wired cable – all the 6 wires are connected on each end of the cable.

The external HAN / P1 output RJ12 interface has a dust cover cap protects the port against the environmental influences (e.g. falling water drop, falling dust).

1.7 Isolation

The RS485 communication interface to the customer is be galvanically isolated (up to 2kV voltage) from the WM-RelayBox's circuit (PCB).

The RS485 communication interface between the Smart Meter ←→ Relay Box is not galvanically isolated from the WM-RelayBox's circuit (PCB).

1.8 Connection

1.8.1 Smart meter ←→ Relay Box Connection

The data transfer allows only one-way (unidirectional) communication from the meter to the WM-RelayBox (RJ12 e-meter connector input) and one-way communication from the WM-RelayBox to the Customer Interface output connector (isolated, external RJ12).

1.8.2 Smart meter ←→ Relay Box Communication

The device is connected to the intelligent consumption meter via a wired line on the RS-485 bus.

The WM-RelayBox contains four individually switchable relays, which are used to control the connected devices - primarily consumer devices or any other device (to switch on/off).

The WM-RelayBox is communicating and controllable with DLMS/COSEM commands, which are reaching the relay box via one-way unconfirmed communication through the connected consumption meter.

In addition to the commands intended to control the relay box, data intended for the output of the consumption meter are also transmitted via the consumption meter interface.

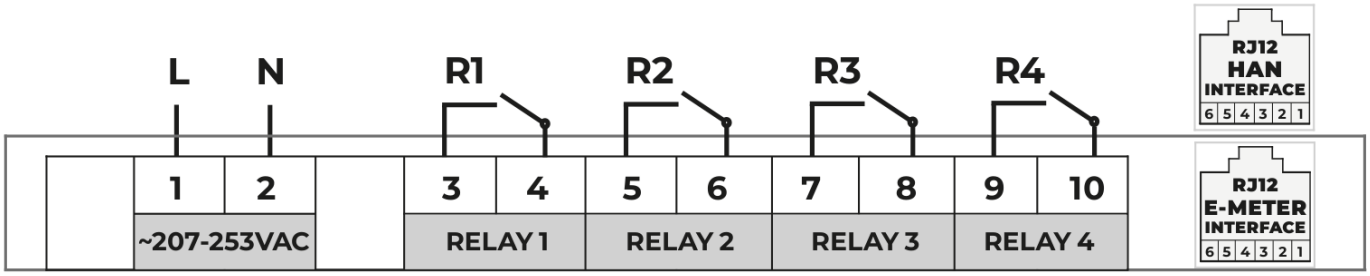
The WM-RelayBox contains a separate isolated and disconnected connector for the consumer output connection.

The purpose of the device is to control the customer's connected equipment.

WM-Relaybox with E-Meter connection to a meter device

WM-Relaybox with HAN / P1 (Customer Interface) connection

1.9 Interface description



Description

L, N: Power supply connector ~207-253V AC, 50Hz (2-pins terminal block), pinout (left to right):

L (Line), N (Neutral)

RELAY 1: for NO, COM wires of the relay (2-wire terminal block), max. switchable: 250V AC, 5A

RELAY 2: for NO, COM wires of the relay (2-wire terminal block), max. switchable: 250V AC, 5A

RELAY 3: for NO, COM wires of the relay (2-wire terminal block), max. switchable: 250V AC, 5A

RELAY 4: for NO, COM wires of the relay (2-wire terminal block), max. switchable: 250V AC, 5A

E-Meter Interface: right beside the terminal block, RS485, RJ12 connector – Input for E-meter connector (6P6C)

HAN Interface: on top of the device, P1 Customer Interface Output (6P6C), RJ12 connector, galvanically isolated voltage

Chapter 2. Operation of the WM-RelayBox

2.1 Introduction

Our device enables the control of connected external devices with relays according to the service provider's requests through the smart meter.
The 4-relay relay switch box is a compact and cost-effective solution for the switch and control of connected devices.
The WM-RelayBox is receiving the unidirectional (one-way) DLMS/COSEM „push" commands and messages of the connected electricity meter to he RJ12 E-meter interface Input. Then it is executing the relay switch requests and sending all data provided by the connected smart meter to the Customer Interface output interface (RJ12, separate and isolated) of the WM-RelayBox.

It's possible to optimize the electricity supply and operation or consumption of external devices in case of closed distribution systems of the areas of usage such as multiple relay control device for electricity meters with additional Customer Interface as industry, smart metering, smart grid, load control and other companies and institutions who want to obtain financial savings and automated control.
Switch a boiler, a pump, pool heating, ventilation system or cooling system, electric car charger or perform the load management of solar panels, etc.

The utility company or service provider can upgrade your electricity metering installations and the electric cabinets with additional control feature by adding our WM-RelayBox.
Extend your Smart Metering Infrastructure with WM-RelayBox for a complete Grid Management.
Protect your investment! No need to change your existing meters.

2.2 Main Features

- Physical inputs:
    - RS485 interface Input (RJ12 connector, 6P6C – for E-meter, protected by terminal cover)
    - Customer Interface (HAN/P1) Output (RJ12, 6P6C, RS485 compatible, galvanically isolated voltage, protected by dust cover)

    - 4pcs relays (single-pole SPST, independent relays with COM/NO switching, to switch max. 250V AC voltage @ 50Hz, up to 5A resistive load)
- Multiple relay control (on/off switching of the connected external devices by each relay)
- Controllable via connected Electricity Meter (RJ12) - unidirectional DLMS / COSEM communication with the connected meter
- Sending all meter data to the separate HAN (RJ12, Customer Interface) connector (DLMS / COSEM unidirectional communication to the Customer Interface output)
- Overvoltage protection according to EN 62052-21
- Configuration at production
- Watchdog

2.3 Starting the device

After adding the AC power supply to the WM-Relaybox, the device will start immediately.
The device is listening on its RS485 bus to the incoming messages/commands of the connected device on RJ12 E-meter port. If it is getting a valid message, the device will execute the incoming command (e.g. relay switching) and forward the message to the HAN interface (RJ12 Customer Interface output).

Simultaneously, the required relay will be switched to ON due to the request. (In case of the switch OFF request, the relay will be switched to OFF).

The LED signals (No. 15) will be always inform you about the current activity.

In case of the removal / disconnection of the AC power source, the relay box will be immediately turning off. After adding the power source again, the relays will be switching to their base-position, which is state OFF (not switched).

2.4 LED signals

PWR (POWER) – The LED active by **red** in case of presence of the ~230V AC voltage. For more details see below.

STA (STATUS) – Status LED, flash briefly once by **red** at startup. If the device will receive a valid message/command on RS485 bus within 5 minutes, it will sign the communication every time by **red** LED flashing.

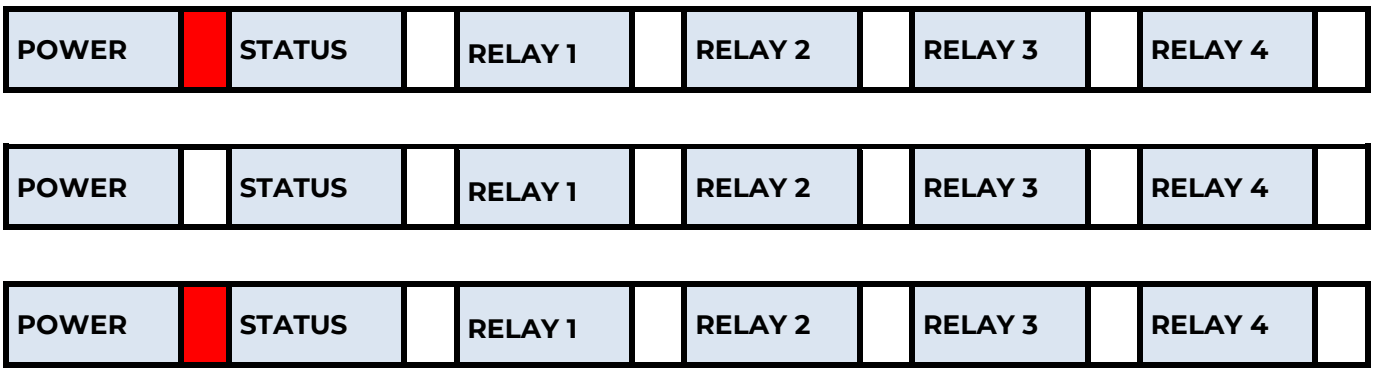
R1..R4 (RELAY #1 .. RELAY #4) – The related LED is active (lighting by **red**), when the current relay will be switched to ON (the current RELAY LED will be also turned on – ligthing continously). In case of OFF status (switched off relay) the LED of the current RELAY LED will be blank.

2.5 LED Operation

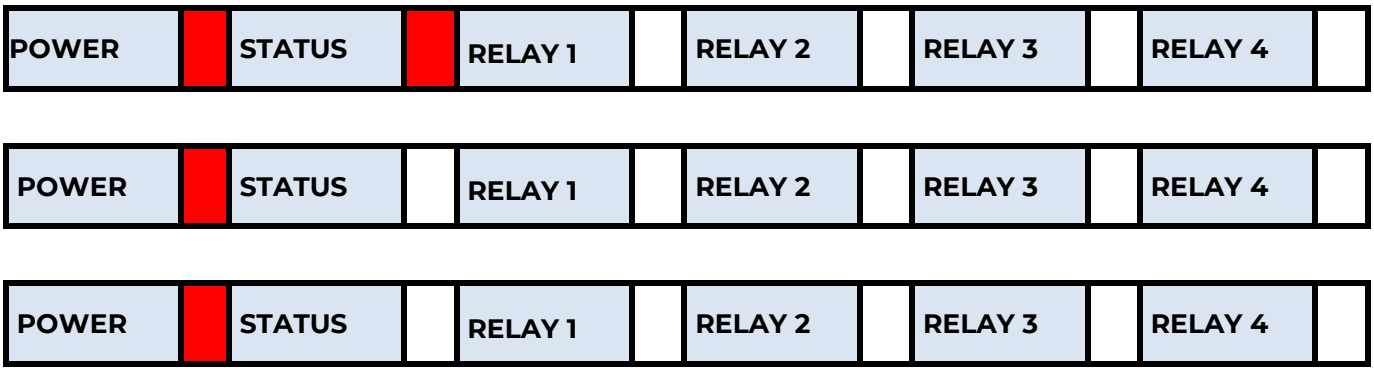
1. At startup, when adding AC power to the device's AC power input, the **STATUS** LED will flash shortly once by **red**.

POWER		STATUS		RELAY 1		RELAY 2		RELAY 3		RELAY 4	

2. Then immediately the **POWER** LED will be start to flashing by **red**. This LED operation behaviour will be valid until the device will receive the first incoming message on RS485 bus.



3. Once, when the device will receive a valid message on RS485 bus, the LEDs will be changing and signing the requested / executed function.
   If the device receives a valid message, the **STATUS** LED will be flashing shortly once by **red**, which signs the message. The **POWER** LED flashing will be changed to continous **red** lighting. If a relay request will be incoming, also see. point nr. 6.



4. Then a 5 minutes counter will be started. If a newer valid request will be incoming within this period, the step nr. 3 will be repeated again. Otherwise it will be continued from step nr. 5.

5. If the 5 minutes counter expired since the last valid message, the behaviour of the **POWER** and **STATUS** LEDs will be replacing each other's previous operation: now the **POWER** LED be changing to flashing **red** further, while the **STATUS** LED will be continously lighting by **red**.

6. If the device receives a relay switch command, the **POWER** LED flashing will be changed to continous **red** lighting. (If the **STATUS** LED was flashing due to the longer inactivity, it will be changed to blank.)
   During this, the WM-RelayBox will be switching the requested relay, and it will be also signed by the turning on the related **RELAY** LED (e.g. **RELAY 1** or **RELAY 2**, etc.) with **red** color.
   E.g. for turning on the **RELAY 2**, the LED operation will be the following:

7. If some relays will be turned off, the related **RELAY** LED(s) will be also turned off (blank).
   E.g. in case of turning of the **RELAY 2**, the LED operation will be the following:

8. If the device will not getting a valid message until 5 minutes, the LED sequence from step nr. 5 will be valid.

9. If the device will get a valid message, this sequence will be repeated from step nr. 3.

10. Meantime, if the AC power source of the device was removed/disconnected the relay box will be turning off within seconds, while all LEDs will be turned to blank.

11. If some relays were turned on before removing the power supply, after adding the power source again, the relays will be switched to their base-position status: switched OFF (so the relay LEDs will be also blank).

Chapter 3. Support

If you have any questions concerning the usage of the device, contact us at the following contact:

E-mail: iotsupport@wmsystems.hu
Phone: +36 20 3331111

Product support can be requisted on our website:
https://www.m2mserver.com/en/support/

Chapter 4. Legal notice

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