

# Operating Manual TCM BOX IP XXX-YY

## 1 Introduction

The TCM BOX IP unit in combination with the Innovation Energy cloud allows you to optimise your electricity consumption. The unit contains a semi-direct energy meter with MID certificate, a SIM card with a telemetry module and a GSM antenna for data transmission. Each unit is supplied with a set of 3 current transformers with split core. Once installed, the unit is ready to use and requires no configuration.

### 1.1 Technical parameters

PARAMETER	VALUE
Power	typ. 15 W, <40 W
Supply Voltage	400 V AC $\pm$ 10%
Battery	CR2032
Communication	GSM 850, 900 (2 W), GSM 1800, 1900 (1 W) Modbus RTU
Operating temperature	From -5°C to +50°C
Storage temperature	From -25°C to +70°C
Humidity	<75% RH, non-condensing
Environmental classs	2
Accuracy class	1 / MID (B)
Outputs	Relay
Inputs	Digital, pulse potential-free type OC
Enclosure protection class	IP44
Dimension	191 × 245 × 108 mm
Weight without transformers	1,4 kg
Altitude above sea level	<2000 m above sea level

### 1.2 General description

The unit measures electricity consumption and sends the results to the Innovation Energy cloud. Measurements are transmitted over the GSM network on a private APN. The electricity is measured using an energy meter built into the unit and the current transformers supplied with the unit. The TCM BOX also allows connection of temperature sensors, pulse outputs, control and monitoring of other devices and integration with BMS/HMI systems.

## 2 Installation and start-up

Before connecting the unit, make sure that it has no visible damage and the installation has been carried out in accordance with the recommendations of this manual.

### 2.1 Installation recommendation

The unit should be installed with the multigate grommets facing downwards in a room within the range of the current transformers and with GSM coverage. If GSM coverage is not available, an additional antenna (sold separately) must be used and extended to the location where GSM coverage is available. For wall mounting, use four 4 mm diameter screws/bolts with a minimum length of 45 mm, selected according to the substrate on which the unit is to be mounted. The device has to be installed lower than 2 m above surface, measuring from top of the device. To drill the mounting holes, you can use the drilling template.

#### Caution!

After installation of TCM BOX device to a surface all installation holes needs to be insulated with insulating electrical compound used for junction boxes. Without this done device will loose its guaranteed case protection class.

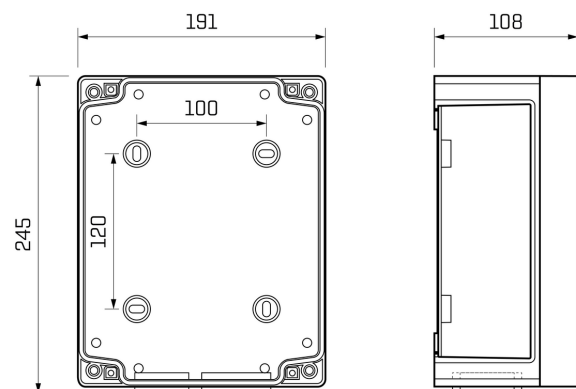


Fig. 1: Dimensions of the device in mm

#### Notes on safety

- Before the first commissioning, read this operating manual carefully.
- Failure to follow the warnings and recommendations may result in electric shock, serious injury or fire.
- All connections and their changes should be made with the power supply disconnected.
- Ensure proper operating conditions in accordance with the technical requirements of the unit. First of all, check the supply voltage and the ambient temperature.
- Failure to connect the unit correctly may result in its damage.
- A poorly fitted unit can come loose from its mounting position and cause a risk of injury/pain.
- Only qualified persons (after reading the manual) are allowed to connect the unit and perform wiring.
- Responsibility for proper installation rests with the installer. Make sure that all country-specific guidelines and standards are met.

**Notes on safety**

- The unit can be installed in a place where only adults are present.
- Responsibility for proper installation lays on person installing the unit. It is required to consider all required norms and laws present in the country in which is device installed.
- Any attempt to make unauthorised changes to the unit or repairs by the user will invalidate the warranty.

**2.2 Connection of the unit**

**2.2.1 Electrical connection**

**Caution!**

The connection of the unit must be carried out by authorised persons. Any installation must be carried out with the power off. The TCM BOX device must be installed in same building as electrical installation that is connected to its inputs. All cables connected to the device has be certified in accordance with IEC 60332 standard.

When leading cables through grommets its required to notify diameter of cable and choose corresponding grommet. Throug each grommet should be put only single cable. When prearring only puncture should be made in grommet but do not cut hole in material covering grommet. Puncture should be smaller than diameter of cable that is put through it. This method is presented image on 2.

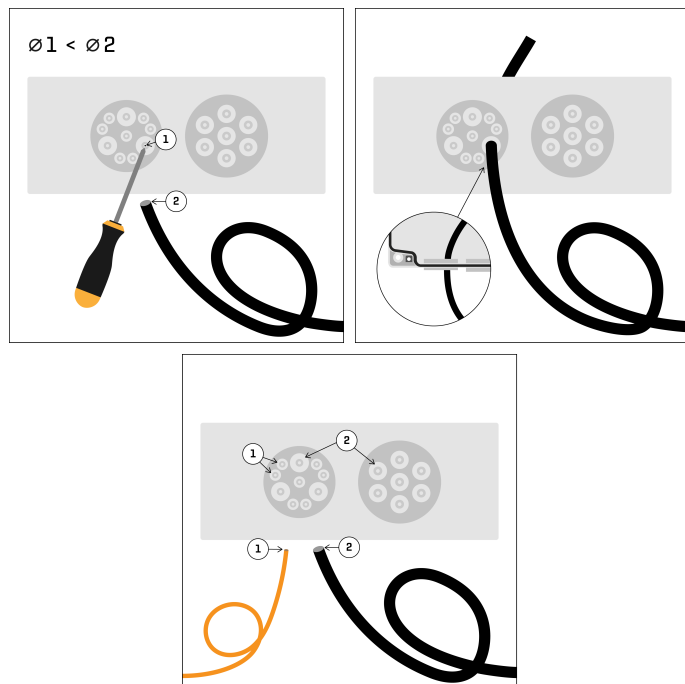


Fig. 2: Leading a cable into device housing

**Caution!**

Leading connections through grommets without proper preparations invalidates enclosure protection class of TCM BOX device.

The electrical connection should be made as shown in Figure 3. The wires feeding the unit should have a cross-section of 0.75-2.50 mm<sup>2</sup>. Transformerts should be mounted in the direction of current flow.

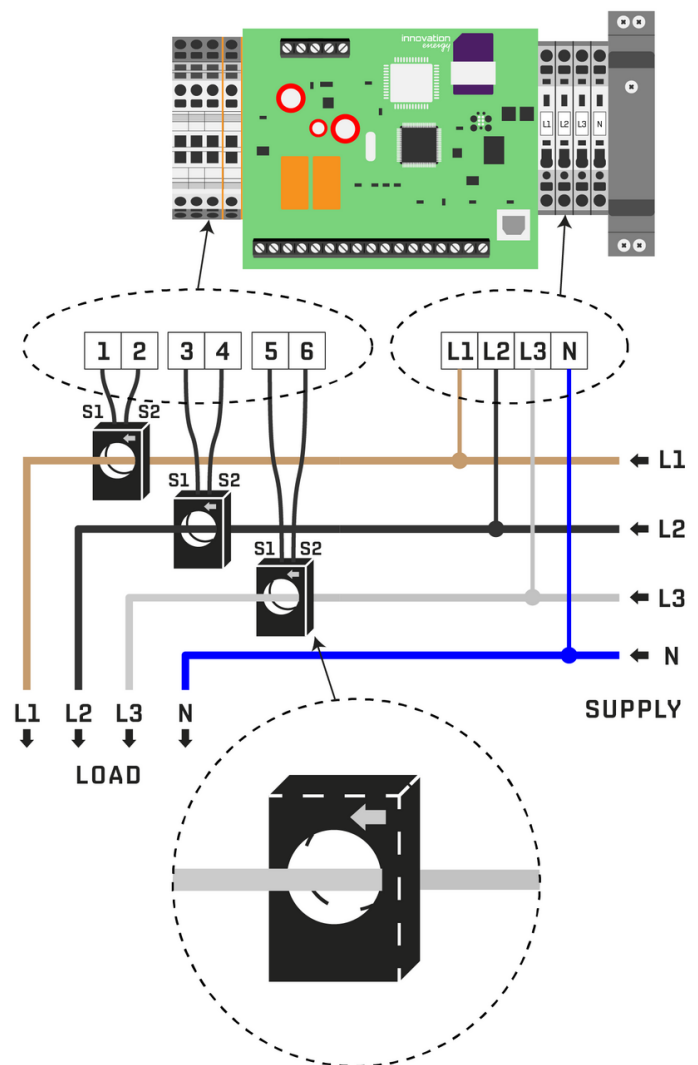


Fig. 3: Electric connection of the unit

### 2.2.2 Connection of additional Modbus devices

TCM BOX allows connection up to 9 additional devices that use Modbus RTU protocol by RS-485 port. For connecting such a device one should use a cable of type YTDY 2x0.5 or similar. Bus ought to be connected the way it's presented on an image 4 using A and B ports. The maximum cable length is about 50 m depending on data transmission rate set or electromagnetic interferences.

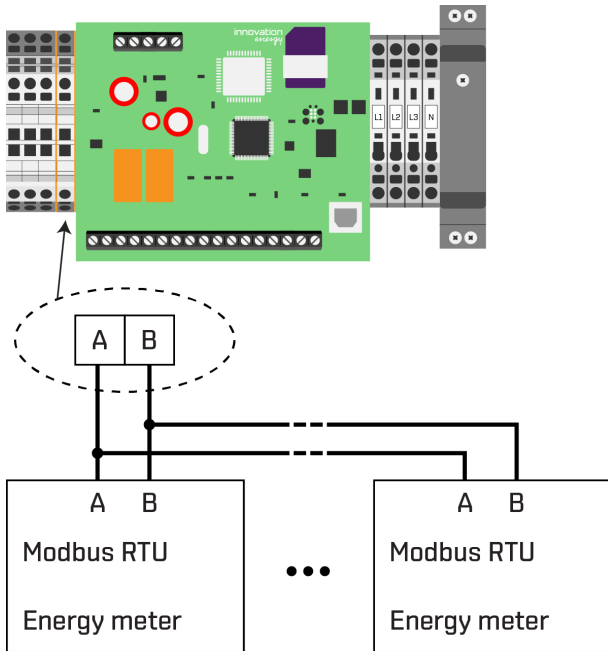


Fig. 4: Connection of additional energy meters

### 2.2.3 Connection of relay outputs

The unit is equipped with two relay outputs Out 1 and Out 2 (SPDT), to which a load with a maximum voltage of 24 V DC and a maximum current of 1 A can be connected. The maximum cable cross-section is 1.5 mm<sup>2</sup>. Out 1 uses connectors 1-3, and Out 2 uses connectors 4-6. An example of a connection is shown in Figure 5. The relay output can be used to connect other relays, contactors or to short-circuit the digital inputs of other devices.

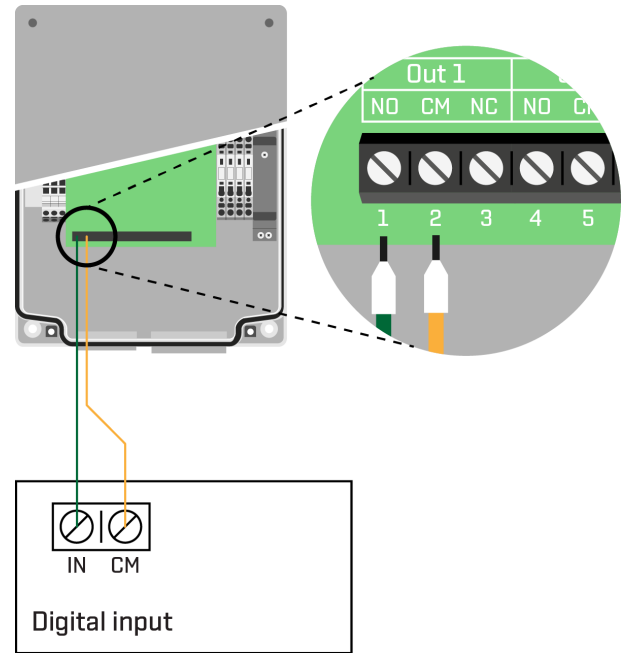


Fig. 5: Connection of relay output

### 2.2.4 Connection of temperature sensors

The unit enables temperature measurement using sensors purchased separately from the unit manufacturer. Sensors should be connected to connectors 7-9. An example of a connection is shown in Figure 6. The unit allows up to 10 sensors to be connected. The maximum cable length for connecting sensors is 60 m. A cable with a cross-section of 0.13-0.50 mm<sup>2</sup> must be used to connect sensors to the unit.

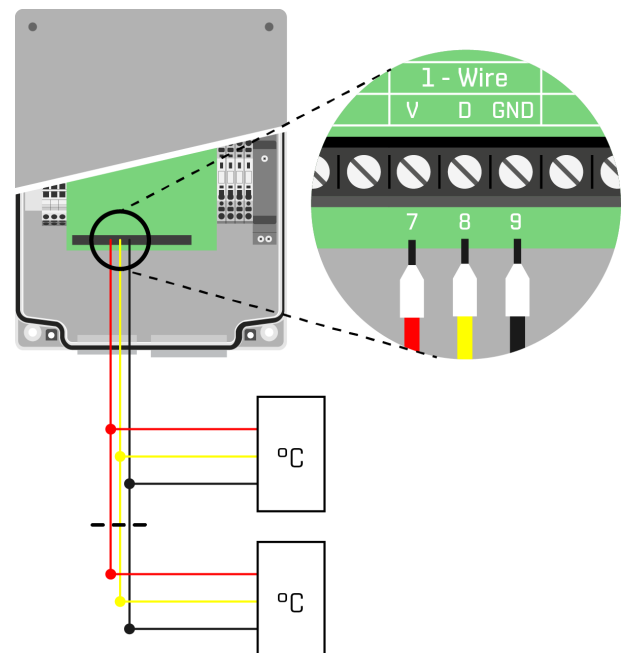


Fig. 6: Connection of temperature sensors

### 2.2.5 Connection of digital inputs

The unit is equipped with two digital inputs In1, In2 that can interact with potential-free outputs. For connection, use cables with a maximum cross-section of  $1.5 \text{ mm}^2$  and connect them to connectors 10-12. The figure 7 shows how to connect a digital input (In 1). Digital inputs can be used to work with devices that have potential-free outputs, e.g. relay outputs. For example, a motion detector, inverter output or air handling unit output can be connected to a digital input.

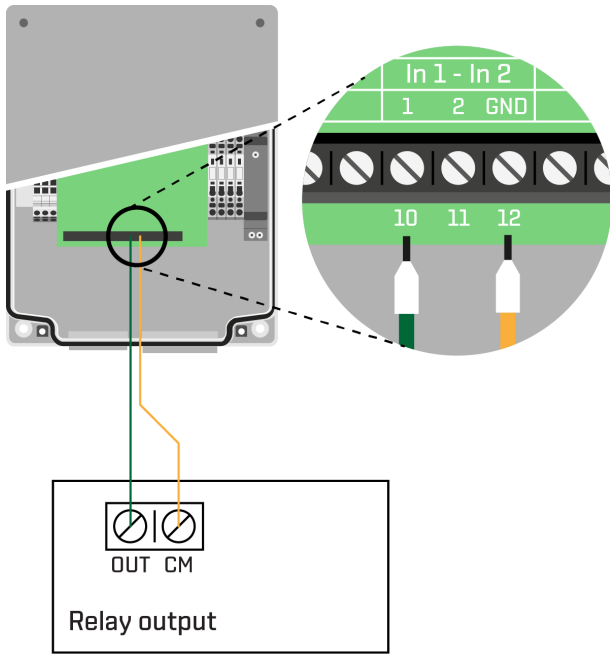


Fig. 7: Connection of digital inputs

### 2.2.6 Connection of a pulse input

The unit allows the calculation of pulses by means of a dedicated Pulse In input. The input operating voltage is 5 V. The input is compatible with the SO pulse output compliant with EN 62053-31 and a potential-free pulse output of the DC type. For connection, use cables with cross-sections of  $0.25\text{--}0.50 \text{ mm}^2$  and a maximum length of 10 meters. Connect the device from which the pulses are to be calculated to connectors 13 (SO+) and 14 (SO-). The figure 8 shows how to connect the pulse count input. The pulse input can be used with utility meters with a pulse output that complies with the above standard.

**Caution!**

Meters, e.g. for gas, must be connected in accordance with current regulations.

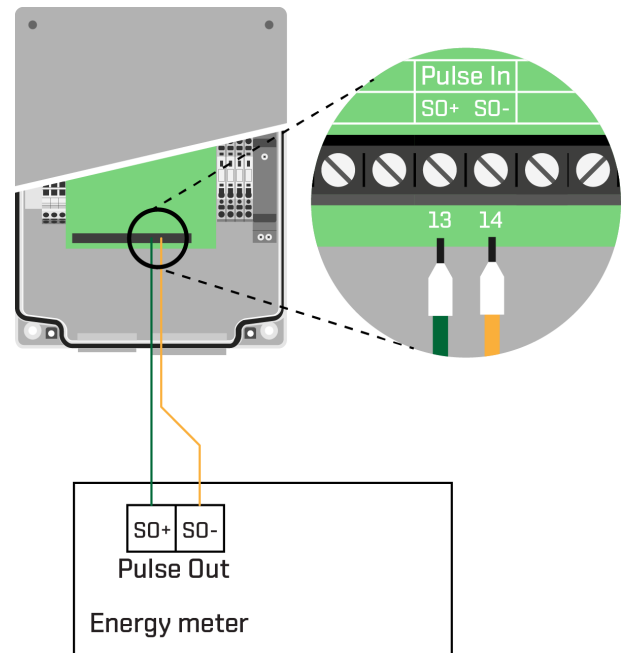


Fig. 8: Connection of pulse input

### 2.2.7 Connection of a BMS

The unit is equipped with an RS-485 interface that communicates with the BMS using the Modbus RTU protocol. Use connectors [Modbus 2] 15-17 for connection. The figure 9 shows how to connect the BMS. The unit makes all the measured values available for reading.

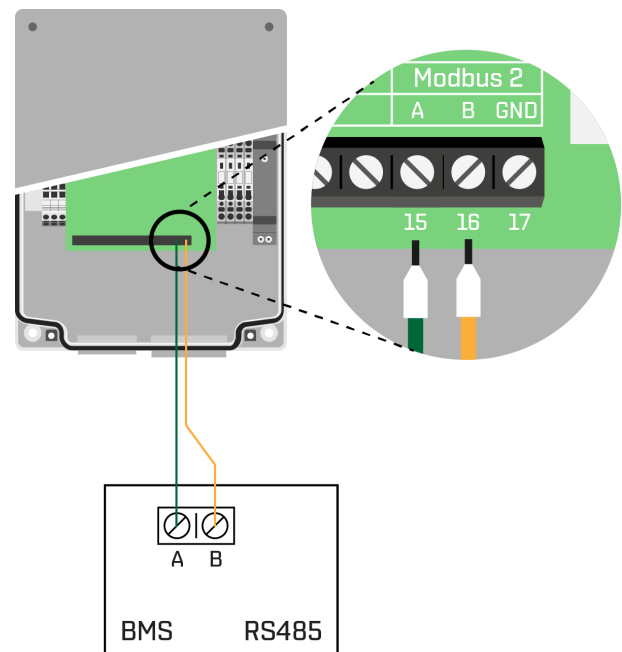


Fig. 9: Connection of a BMS

## 2.3 Other elements

### 2.3.1 USB

The unit is equipped with a USB type B connector for connection to a computer to read the stored data using the TCM Viewer application. USB cable should be not more than 3 meters long.

### 2.3.2 LED

The main board has an LED that flashes at a constant frequency when the power is turned on, and lights up when the unit has started correctly.

### 2.3.3 Battery

#### Caution

Battery replacement must only be carried out by qualified and authorised persons after reading this operating manual. Before starting work, switch off the power supply to the unit and pull up the electric meter. Then replace the battery and reposition the meter on the DIN rail.

#### Caution

Battery has not to be exposed to high temperature, fire, mechanical stress, ie. crushing, cutting, low air pressure. Otherwise it can cause battery leakage of flammable gas or fluid.

The unit contains a CR2032 battery made by VARTA company. No other type of battery can be used. New battery should be transported only in original package. Used battery should be stored without possibility of short-circuiting. When replacing the battery, pay attention to the polarity marked on the battery cage.

### 2.3.4 Fuses

The unit is fitted with four 1A fast-acting fuses (520.617) located in fuse terminals L1, L2, L3 and N. Fuses should be changed only by qualified personnel with authorisation.

### 2.3.5 Used Symbols



Fig. 10: Symbols used in TCM BOX

Symbol	Meaning
1.	Data access in cloud
2.	SIM card included
3.	GSM communication
4.	Data analysis
5.	Temperature measurement enabled

#### Available device versions

Version	Current [A]	Internal transformer diameter [mm]
TCM BOX 1P 150-24	150	24
TCM BOX 1P 200-24	200	24
TCM BOX 1P 250-24	250	24
TCM BOX 1P 200-36	200	36
TCM BOX-1P 250-36	250	36
TCM BOX 1P 300-36	300	36
TCM BOX 1P 400-36	400	36

**Simplified declaration of conformity (UE)**

The device that is mentioned in this manual is in compliance with Directive 2014/53/EU.  
Full declaration of conformity is available on website:

[innovation-energy.co](http://innovation-energy.co)

Scan to find out more.



Technical Issues?

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