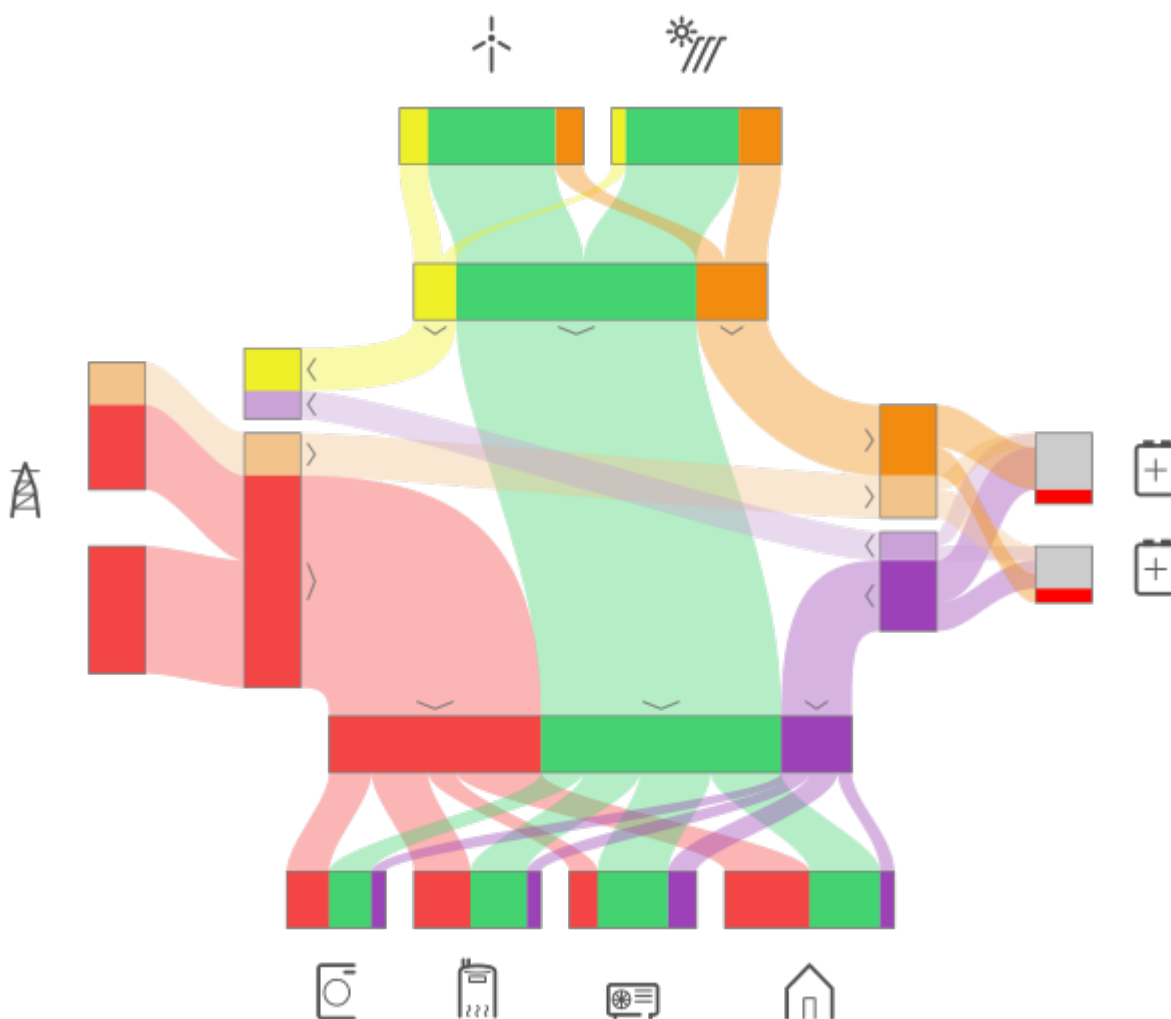


HEMS v1.2.x Introduction

Home Energy Management System (HEMS) is a system for:

- monitoring electricity flows at home (consumption, production, and storage),
- control of key consumers,
- optimizing consumption in terms of reducing consumption and using cheaper energy to ensure the same comfort with lower costs,
- current limiting of consumers to protect main grid fuse,
- managing charging of electric vehicles (EV fleet)



HEMS consists of two parts, one is hardware installed at physical object while second is software to support above listed tasks. Hardware consists of HEMS master controller and units to be connected on it. Units could be divided on input and output:

- from **input**, controller gets measured values e.g. from different sensors (power sensor-PS, temperature) or ON/OFF signals from thermostat, switches, push buttons, while
- on **output**, controller applies result of control algorithm e.g. with power relays switches ON/OFF devices (water heater, washing machine, dryer..) or set charging current for EV on charging station or set charge/discharge current on storage system.

HEMS supports:

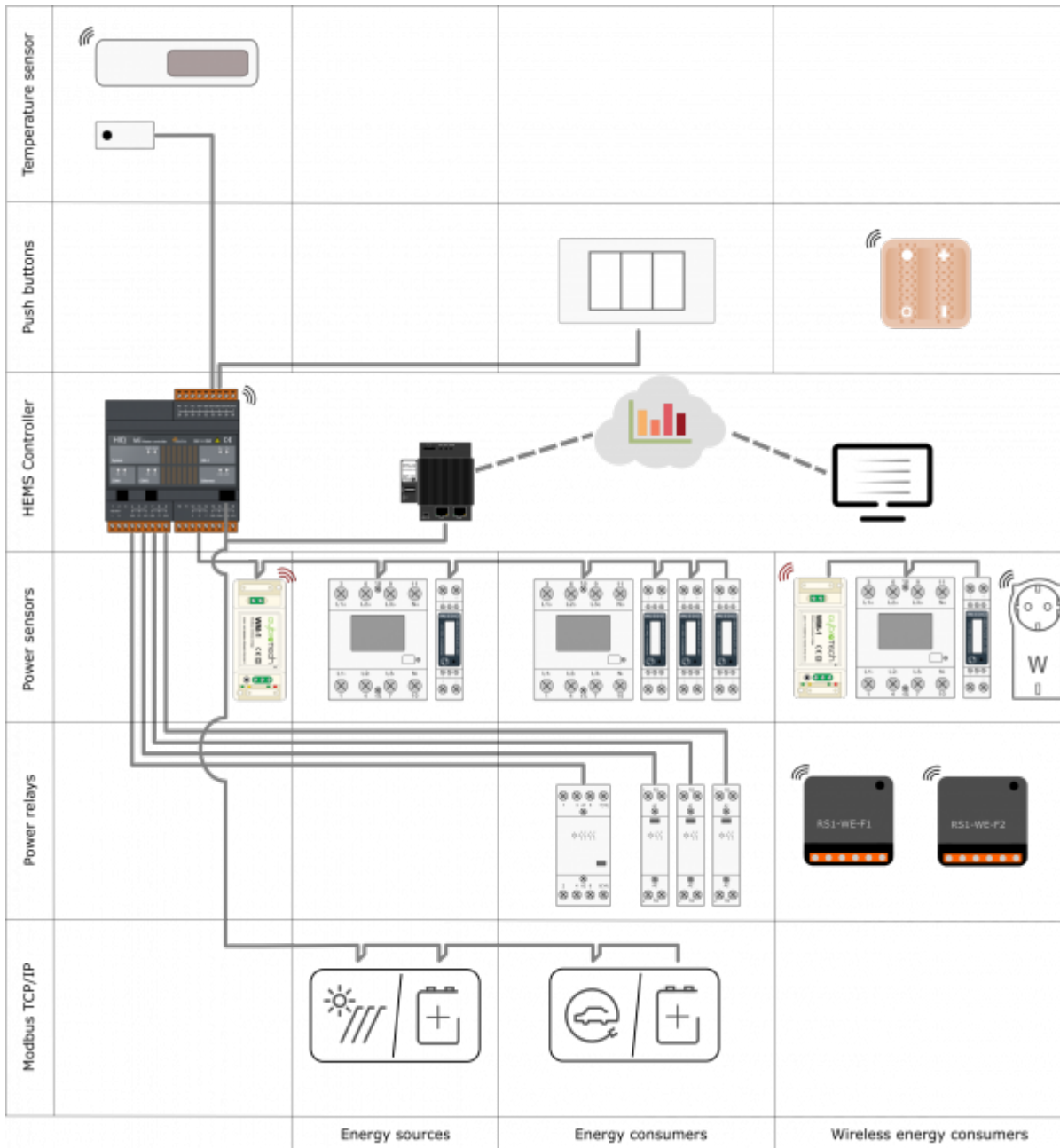
- ✓ 1 grid power sensor
- ✓ up to 3 sensors for local power plants (PV, Wind, Cogeneration, Generator, etc) - as SOURCES
- ✓ up to 2 local storage systems (home battery) - as CONSUMER OR SOURCE
- ✓ up to 8 devices (electrical heating, EV charging station, electrical domestic water heater, washing machine, tumble dryer, ...) as CONSUMERS.

In terms of HEMS terminology there are devices producing energy (PV) named as **sources** and devices consuming energy named **consumers**. For both types, measured electrical characteristic are provided by power meter sensor connected to this device. Consumers could be defined as:

1. Power sensor connected to measured device without capability of control (just measuring),
2. Power sensor connected to measured device with capability of control (HEMS is in charge of controlling a device),
3. Managed device connected to controller without power sensor but with the default set nominal power for device,
4. Managed device connected to controller without power sensor and without set default nominal power.

For connection on cloud HEMS is using IOT linker device.

Below is illustrated HEMS scheme. Connection between controller and units could be **wired** (directly on port, modbus RTU/TCP) or **wireless** (using EnOcean protocol or [wireless modbus to modbus bridge](#)):



where:

- temperature sensor is directly wired ([Digital temperature sensor](#)) or paired ([Wireless temperature sensor](#) and [Wireless temperature and humidity sensor](#)) to the HEMS master controller [MC-230](#). **Note:** only one temperature sensor can be added,
- measurement of electrical power and energy is provided by single-phase ([PM1-E-D](#)) or three-phase ([PM3-I-D](#) and [PM3-E-D](#)) power sensors which are connected directly to HEMS master controller [MC-230](#) or they could be connected wirelessly using WM-1 wireless modbus unit.
- there are also wireless modules [Metering smart plug](#) and [Micro smart plug](#) with integrated power sensor to measure consumption and power of consumer,
- power relays are used for control of managed consumers. They are toggling power supply or enabling signals for the operation of the device. Supported connection is as wired as wireless ([wireless relay switch](#)),
- push button are used for manual control of managed devices, and are directly wired or paired ([Soft remote](#)) to HEMS master controller.



SAFETY INSTRUCTIONS

Use the following safety guidelines to ensure your own personal safety and to protect your equipment and working environment from potential damage.

NOTICE: All applicable local and national codes that regulate the installation and operation of the equipment must be strictly followed.

NOTICE: Installation and electrical connection of the equipment must be carried out by qualified and authorized personnel.

Notices which require special attention are highlighted with following symbols:

-  **WARNING** - which indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.
-  **CAUTION** - which indicates that minor to medium personal injury or property damage can result if proper precautions are not taken.

This product can only function correctly if it is transported, stored, set up and installed correctly, and operated and maintained as recommended according to manufacturer's instructions.



WARNING: Failure to comply with manufacturer's safety and installation instructions or applicable codes and standards can result in damage to equipment or serious injury to personnel.



WARNING: Before installing, servicing or repairing electrical equipment power source must be disconnected.



CAUTION: Don't try to open the device, any interference or change may impact device's properties and significantly affect safety.

- The device must be installed inside electrical enclosure where it cannot endanger people or environment.
- During operation, device must not be exposed to high temperature, high humidity, excessive dust, corrosive gases, vibration or shock.
- All connected wires must comply with manufacturer's specifications.
- For installation use only tools and equipment with non-conducting handles.
- Sufficient ventilation space has to be assured around device for proper operation.
- The manufacturer does not undertake any liability for material or personal damage resulting from use or handling which is not in accordance with the manufacturer's safety instructions.

Master Controller

Advanced Controller



| | | |
|---------------|----------------------------|---|
| Model number: | MC-230-01 | 230 VAC, 11 IO, Enocan, 2 × RS232, RS485, IEX2 terminals |
| | MC-230-02 | 230 VAC, 11 IO, 2 × RS232, RS485, IEX2 terminals |
| | MC-230-03 | 230 VAC, 11 IO, Enocan, 2 × RS232, isolated RS485, IEX2 terminals |
| | MC-230-04 | 230 VAC, 11 IO, 2 × RS232, isolated RS485, IEX2 terminals |
| Mounting: | DIN rail (35mm), 6M, 106mm | |
| Dimensions: | 106x108x58mm | |

Features

- 3 digital inputs
- 4 relay outputs 8 A
- 4 universal inputs/outputs
- Ethernet, USB, IEX-2, 2×RS232, 1×RS485 (optional isolated)
- Enocan gateway (optional)
- 230 VAC or 24 VDC power supply (use only one option!)

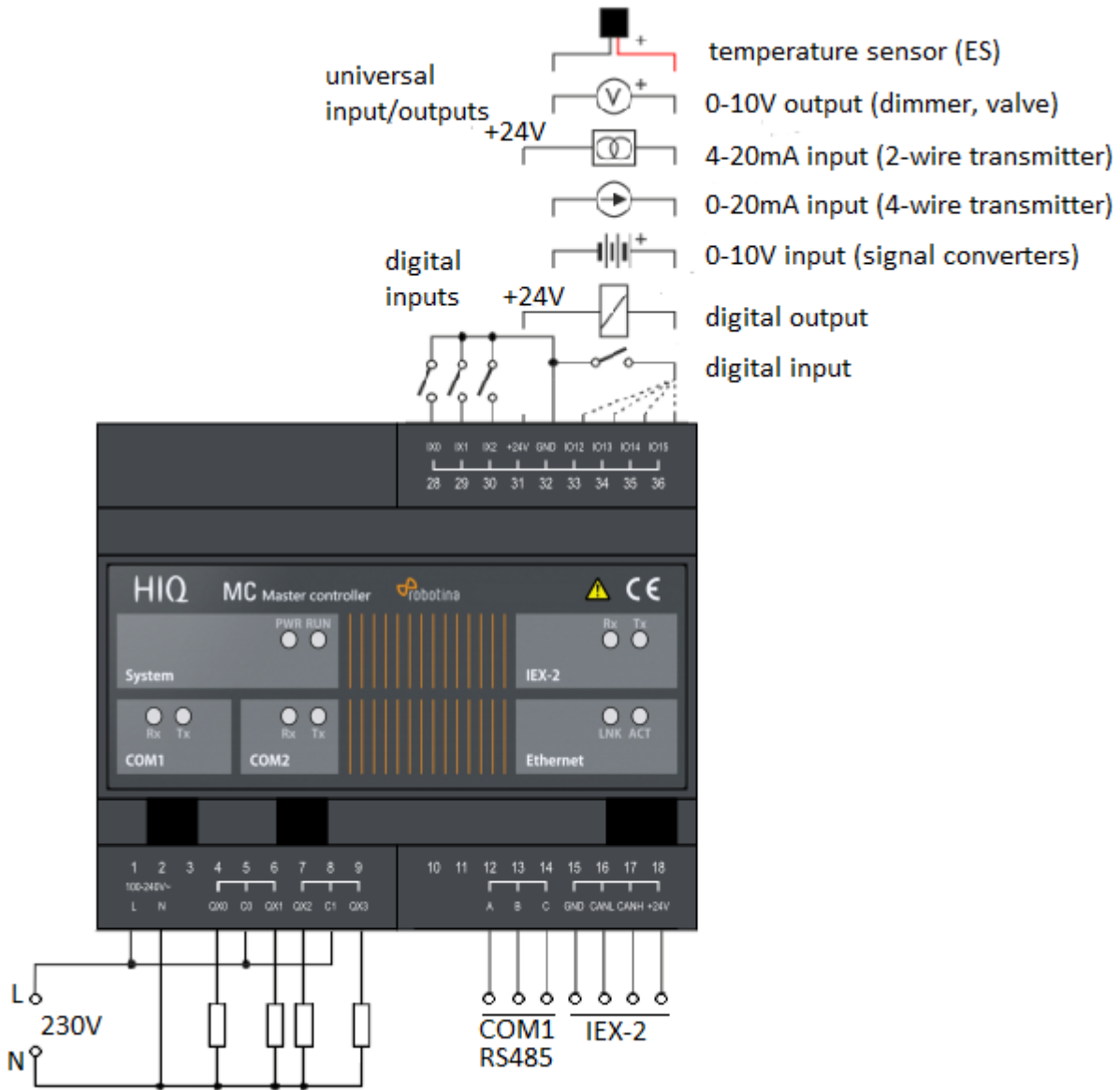
Safety standards

EN 61010-1, EN 61010-2-201, EN 61131-2

Technical specification

| | |
|---|---|
| Relay outputs: | 8A/250VAC resistive, 8A/30VDC resistive |
| Communication: | Ethernet, 2x RS232, 1x RS485, IEX-2 bus |
| Nominal power rating: | 230 VAC or 24 VDC |
| Power consumption: | typ. 1W (no load), 10W max |
| Power output: | 24V 200mA (with 230 VAC power supply) |
| Ingress protection: | IP20 |
| Operating temperature: | 0..50°C |
| Storage temperature: | -20..75°C |
| Relative humidity: | 0..85% n/c |
| Input type(ix00..ix02): | dry contact, internal pull-up 12V 2mA |
| Cable lenght: | 50m |
| COM1 type | RS485 two wire |
| Transmit/receive | automatic switching |
| MAX recommended output power per relay: | |
| - incandescent / halogen 230V | 800 W |
| - halogen 12 V with transformer | 400 W |
| - fluorescent with electronic ballast | 400 W |
| - parallel compensated fluo lamps | 250 W / 30 uF |
| - electric heater | 1400 W |
| Total output power (all relays): | 4000 W |

Terminals



IOT Linker 2 Ethernet Port

Advanced EDGE device. Connects Cybro and MC to HIQ universe



| | |
|--|--|
| Order code without Power Supply: | IOT-L2-2 |
| Order code with AC Power Supply 230VAC/5VDC: | IOT-L2-2-AC |
| Order code with DC Power Supply 24VDC/5VDC: | IOT-L2-DC |
| License for specific IOT linker software: | IOT-C2-xx; xx-version of the software |
| USB wireless modem for IOT linker: | IOT-L2-W |
| Mounting: | DIN rail, wall |
| Dimensions: | 60 x 61 x 26 mm |
| Connection: | LAN Port: connects to Cybro or MC Controller, WAN Port: uplink to HIQ Universe |

- Robust and safe connection of HIQ and 4S systems to HIQ Universe cloud platform.
- Secure access and communication (TLS encryption)
- Local data buffer, no data loss
- User data safety according to GDPR
- Secure remote access to HIQ MC controllers

Technical specifications

| | |
|-----------------|---|
| Power supply: | USB-C, 5V DC |
| Storage: | MicroSD x1 for external storage up to 128GB |
| USB Host: | 1x 2.0 Type-A |
| Network: | 2x 10/100/1000M Ethernet |
| Working temp.: | 0°C to 40°C |
| 4G connection : | USB |
| Software : | IOT linker system software is sold separately on MicroSD card |

Mounting

DIN Rail or Wall



4G LTE USB modem for IOT linker

for IOT-L2-2 and other our IOT linkers

Plug and play USB modem for LTE mobile internet for linker.



Note: SIM card must not have PIN.

Order code :

IOT-L2-W

Wireless Modbus-to-Modbus bridge

Wireless Modbus-to-Modbus bridge



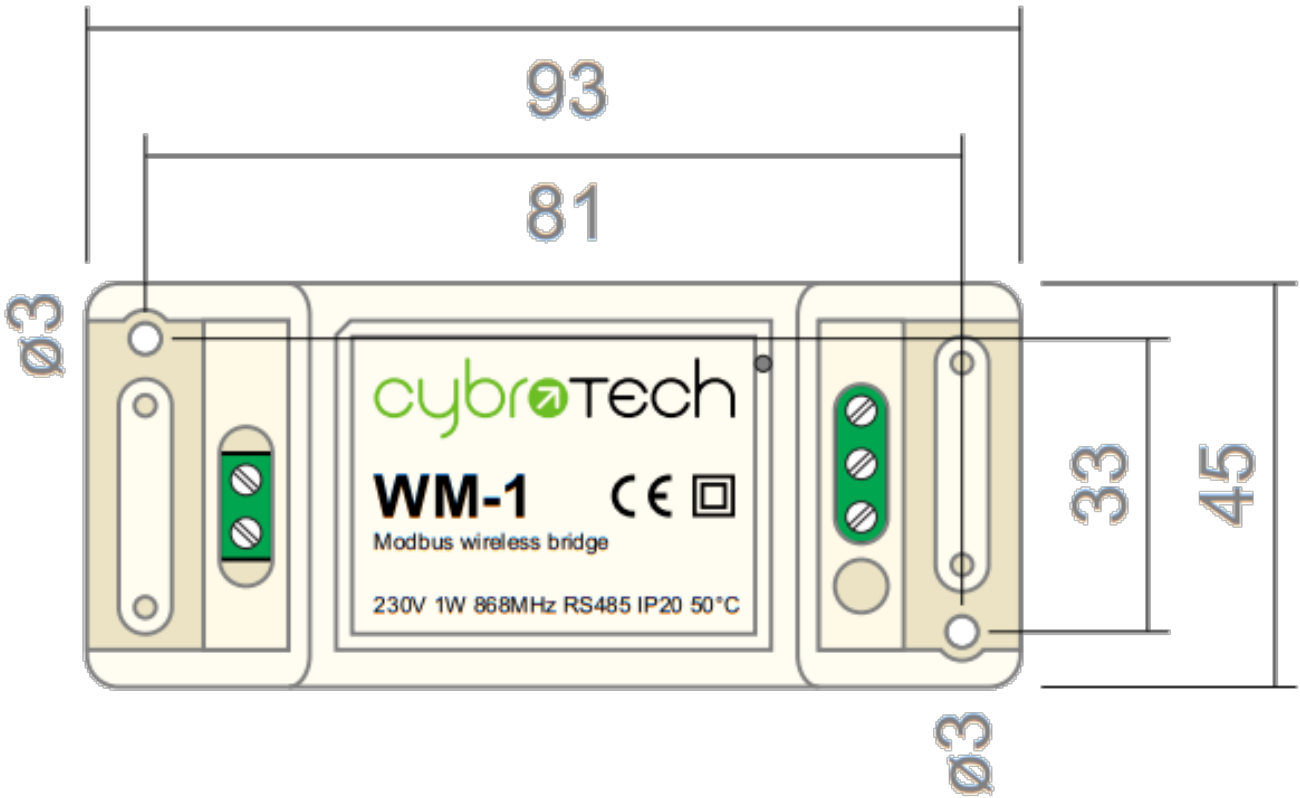
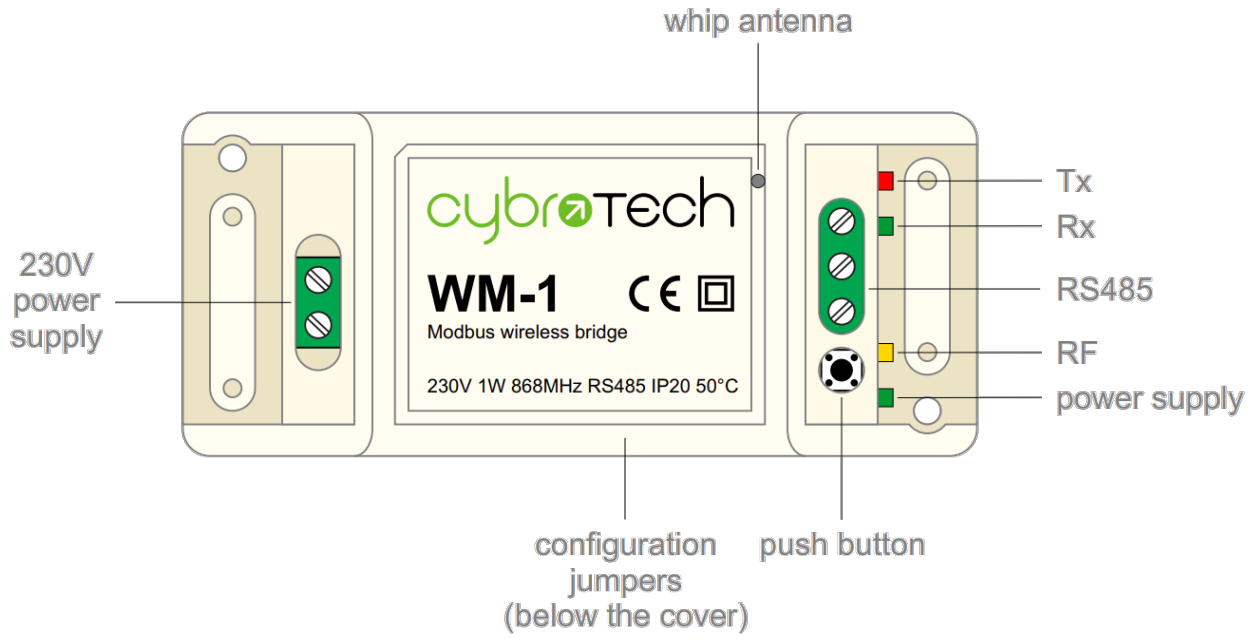
| | |
|---------------|-----------------|
| Model number: | WM-1 |
| Frequency: | ISM 868MHz (EU) |
| Dimensions: | 93x45x27 mm |

Applications

- Replacement for RS485 wiring solution with wireless. Optimal for long range Modbus RTU serial communications with half duplex configuration.

Installation and mounting

- ⚠ Carefully open WM-1 module and configure serial communication with jumpers. (Default configuration is 9600bps, 8N1 with normal timeout)
- ⚠ Place WM-1 module at least 10cm from other objects. Installation is not recommended inside metal cabinets.
- Connect RS485 terminals to WM-1 RS485 terminals
 - A - A
 - B - B
 - C - GND
- Connect to 230V power supply
- Configure radio pairing



Features

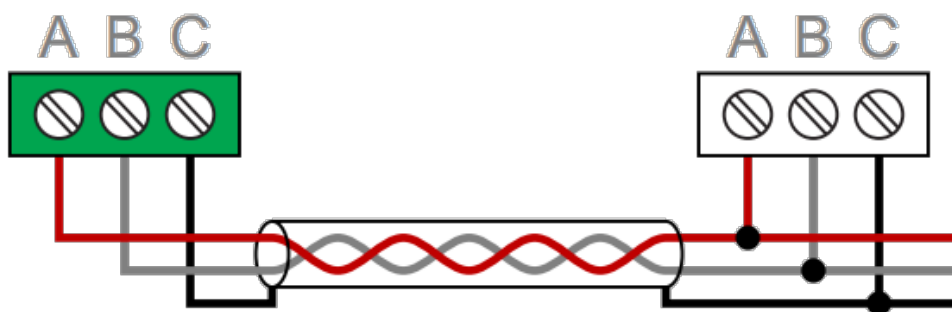
- replacement for RS485 wiring
- Modbus RTU serial protocol
- wired/wireless combinations
- very long range, no hopping
- protected private connection
- multiple slaves per device
- multiple addressable groups

Technical specification

| | |
|------------------------|-------------------|
| Power supply: | 230V, 50/60Hz, 1W |
| Ingress protection: | IP20 |
| Operating temperature: | -20..50°C |
| Storage temperature: | -40..85°C |
| Relative humidity: | 0..85% n/c |

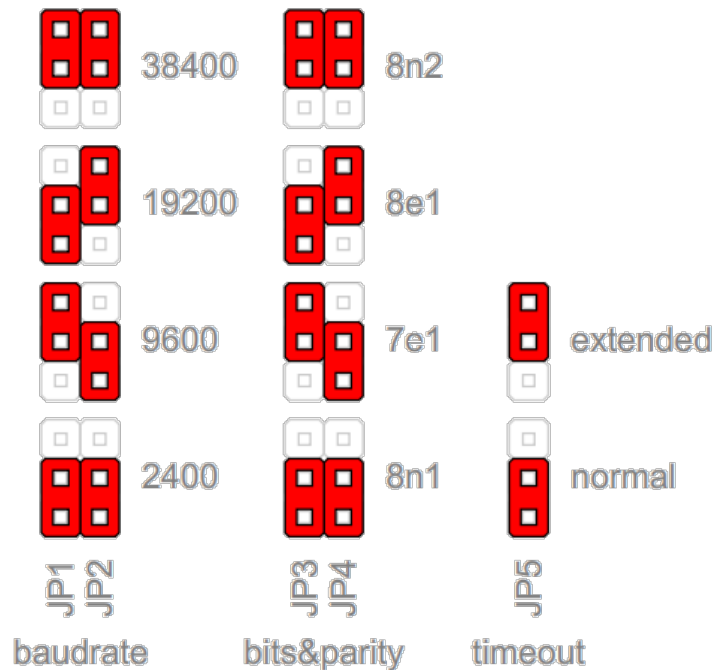
Terminals and wiring

| | | |
|-----------------|----------|-----------|
| To power sensor | A | RS485 bus |
| | B | |
| | C | |
| To power supply | L | 230V AC |
| | N | |
| | | |



Serial configuration and timeout

- Available baudrates 2400, 9600, 19200, 38400 bps
- Data bits and parity 8N1, 7E1, 8E1, 8N2
- ⚠ Max 64 bytes per transmission
- Integrated 240 Ohm termination resistor

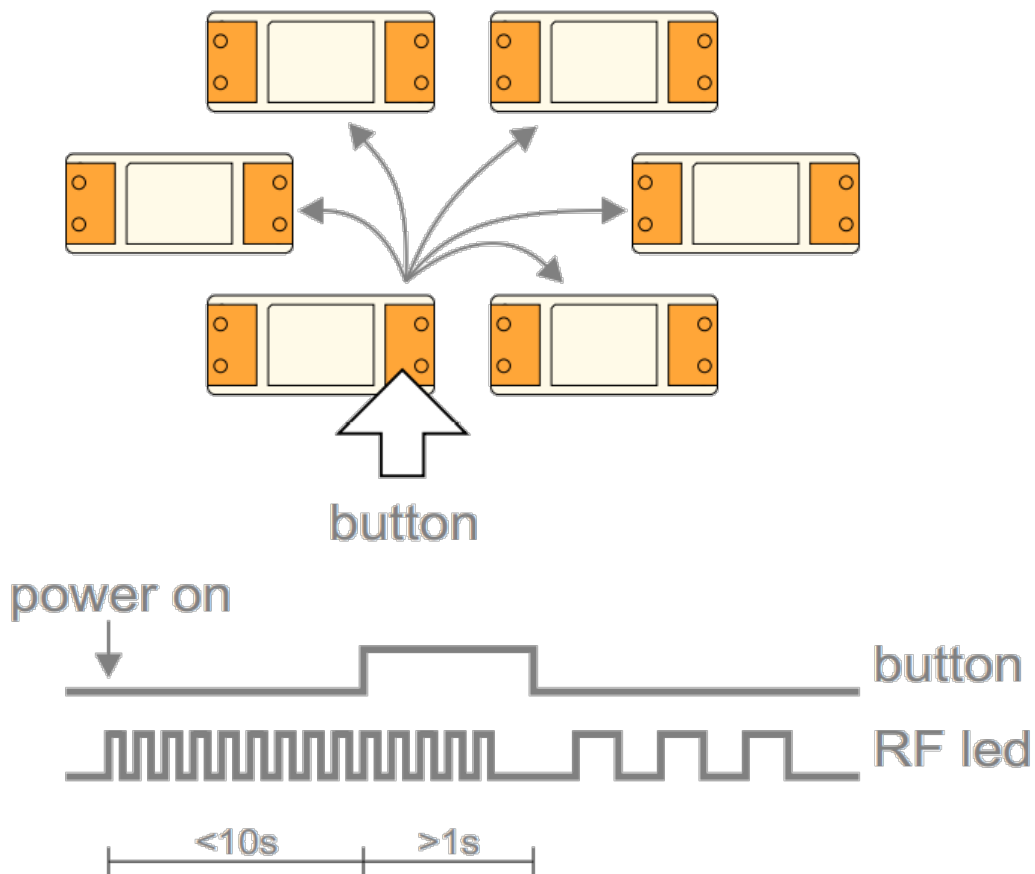


| | normal | extended |
|-------|--------|----------|
| 2400 | 25ms | 200ms |
| 9600 | 10ms | 100ms |
| 19200 | 5ms | 100ms |
| 38400 | 5ms | 100ms |

Radio pairing configuration

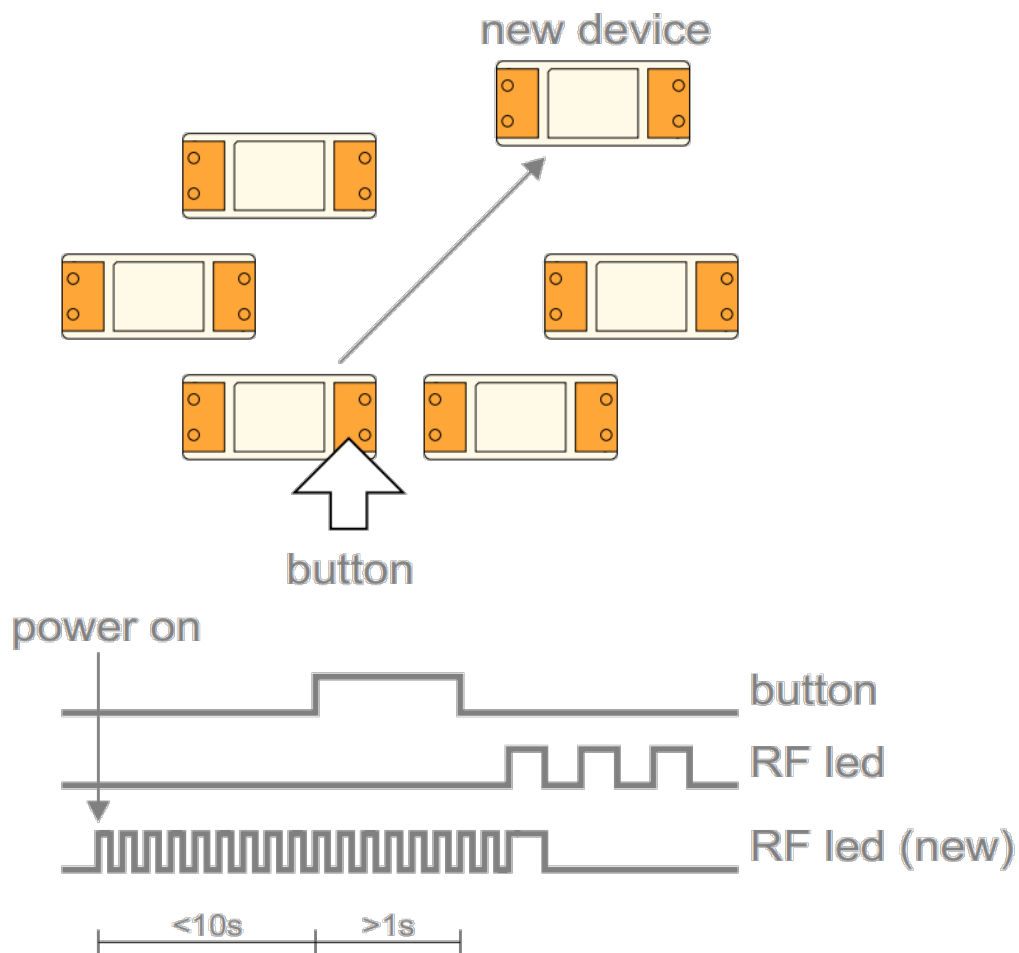
Create new secure group

- * turn on all devices as the same time
- * within 10 seconds, while RF LED is blinking, press and hold button on one of the devices
- * after a second, the new address is randomly generated and sent to all devices. RF LED will blink 3 times to confirm the new address.



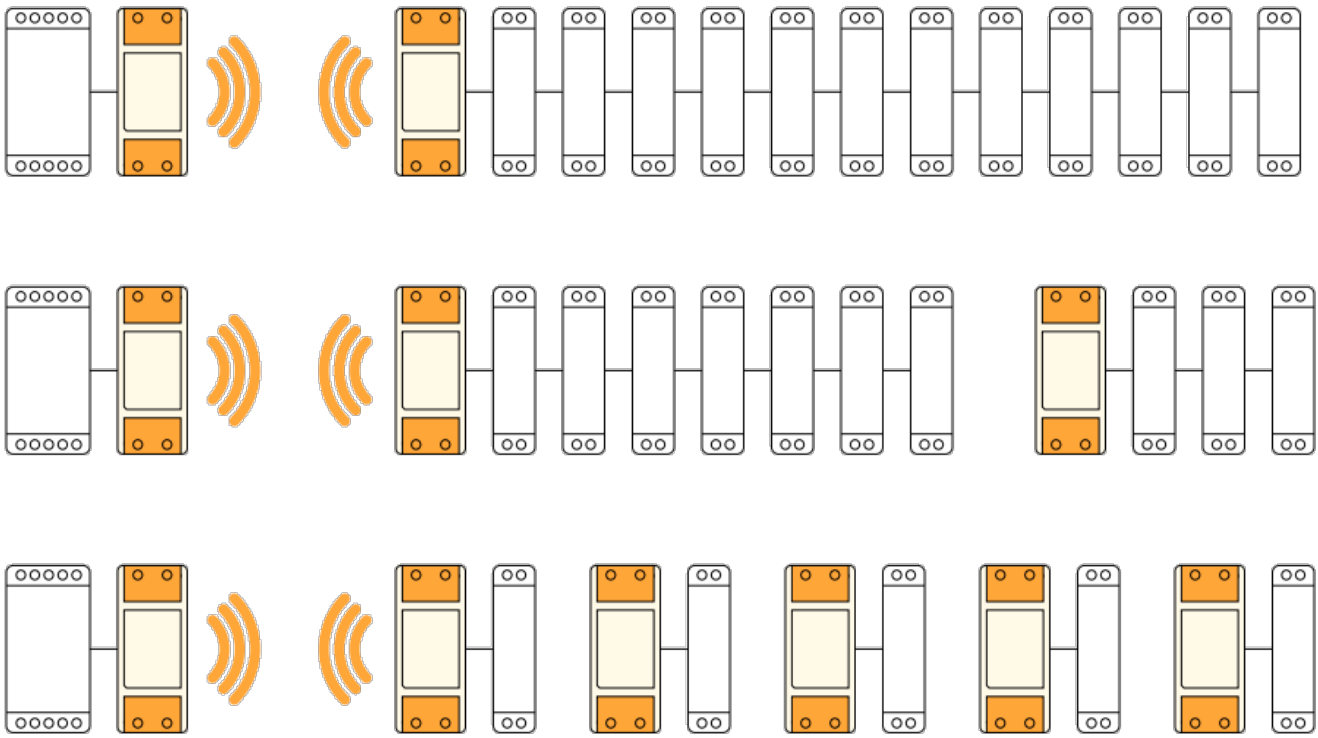
Add new device to the group

- * turn on the device
- * within 10 seconds, press and hold button on one of the existing devices
- * after a second, the existing group address is sent to the new device. RF LED will blink 3 times to confirm the address is sent.



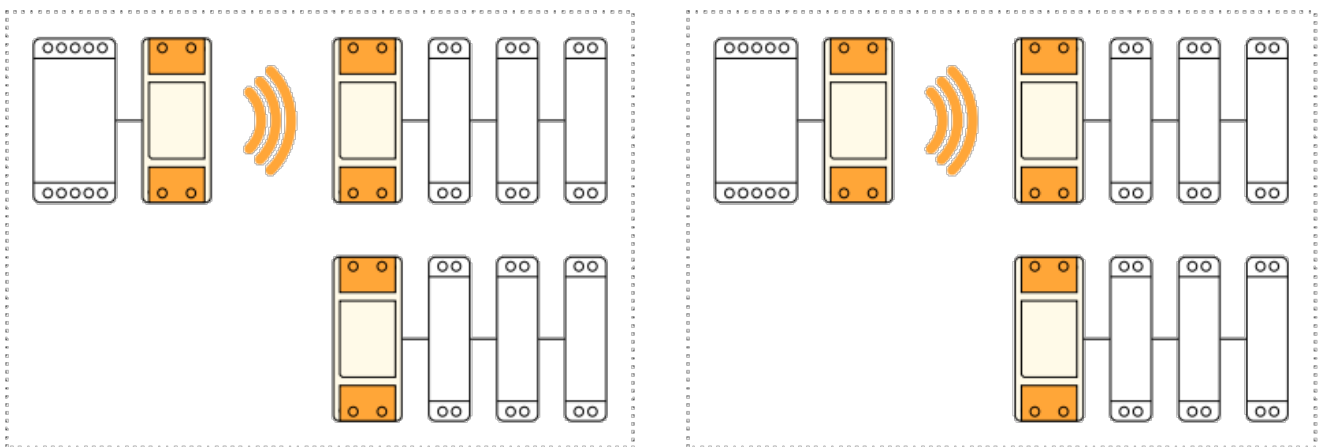
Topology examples

- * Modbus master, connected to 12 slaves using a pair of WM-1 devices
- * Modbus master, connected to 10 slaves, organized in two groups
- * Modbus master, connected to 5 slaves, each one having local WM-1 device



Multiple groups

- * When the system has two or more separate Modbus lines, they should be configured as separate groups.
- * Each group has a single master and one or more slaves.
- * Groups can't talk to each other, but they share the same bandwidth.
- * Two masters may start transmitting at the same time causing collisions.
- * To reduce number of missed messages, keep the traffic low.



Connection check

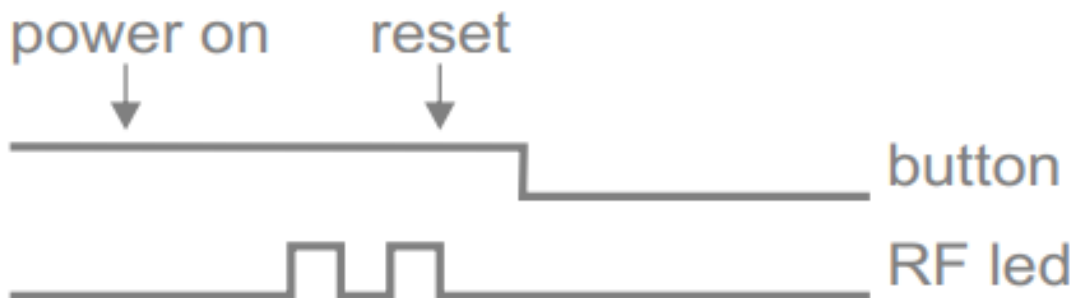
- Press button shortly
- RF LED will blink shortly on each connected device

- Serial interface is unaffected



Factory reset

- Hold button and turn the device ON
- RF led will blink twice. Group address is now reset to default.
- Other devices will not be affected.



Three phase power sensor, CT

3-phase power-sensor, current transformer



| | |
|---|-------------------------------------|
| Model number: | PM3-E-D-CT |
| Connect to: | MC-230 |
| | RS485 power sensor bus A - B |
| Mounting: | DIN rail, 1M, 18 mm |
| Dimensions: | 65 × 72 × 94,5 mm |
| Used for measuring power and energy of | |
| ✓ | single/three-phase energy sources |
| ✓ | single/three-phase energy consumers |

Applications

- Digital multi-function power sensor for single/three phase networks

Features

- DIN rail mounting with 3x 50A (or 1x 50A) current transformer
- Line voltage and THD% (total harmonic distortion) of all phases
- Line Frequency
- Currents, Current demands and current THD% of all phases
- Power, maximum power demand and power factor
- Active energy imported and exported
- Reactive energy imported and exported

General description

The unit measures and displays the characteristics of three phase four wires(3p4w) supplies, including voltage, frequency, current, power, active and reactive energy, imported or exported. Energy is measured in terms of kWh, kVArh. Maximum demand current can be measured over preset periods of up to 60minutes. In order to measure energy, the unit requires voltage and current inputs in addition to the supply required to power the product. The requisite current input(s) are obtained via current transformers (CT). This power sensor can be configured to work with a wide range of CTs with 0.33V

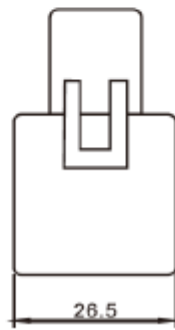
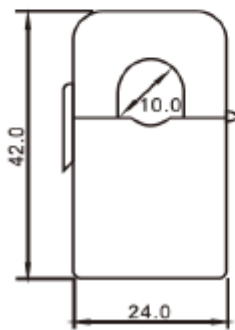
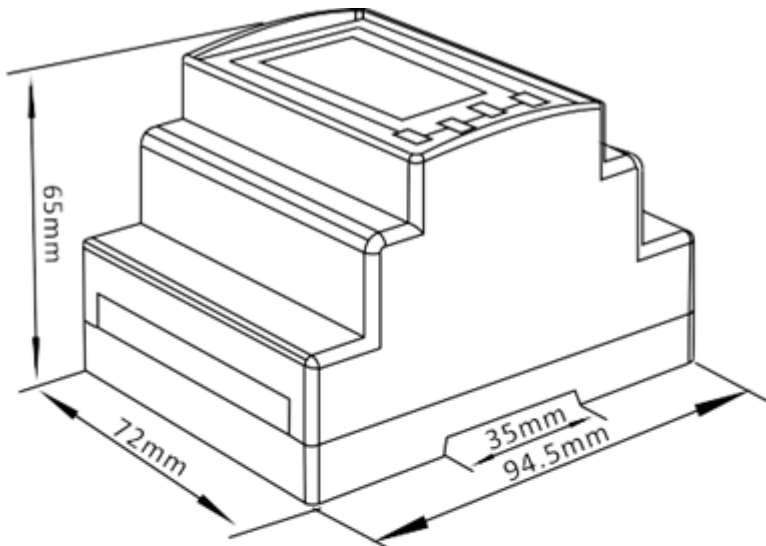
output, giving the unit a wide range of operation. Built-in interfaces provide pulse and RS485 Modbus RTU outputs. Configuration is password protected. This power sensor can be powered from a separate auxiliary (AC or DC) supply. Alternatively, it can be powered from the monitored supply, where appropriate.

Technical specifications

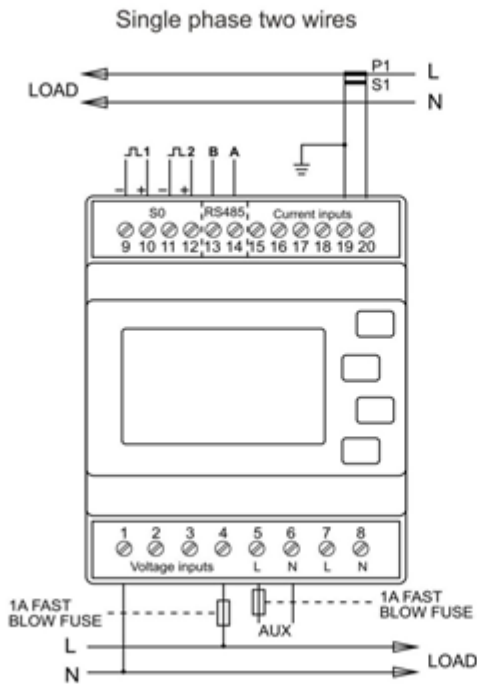
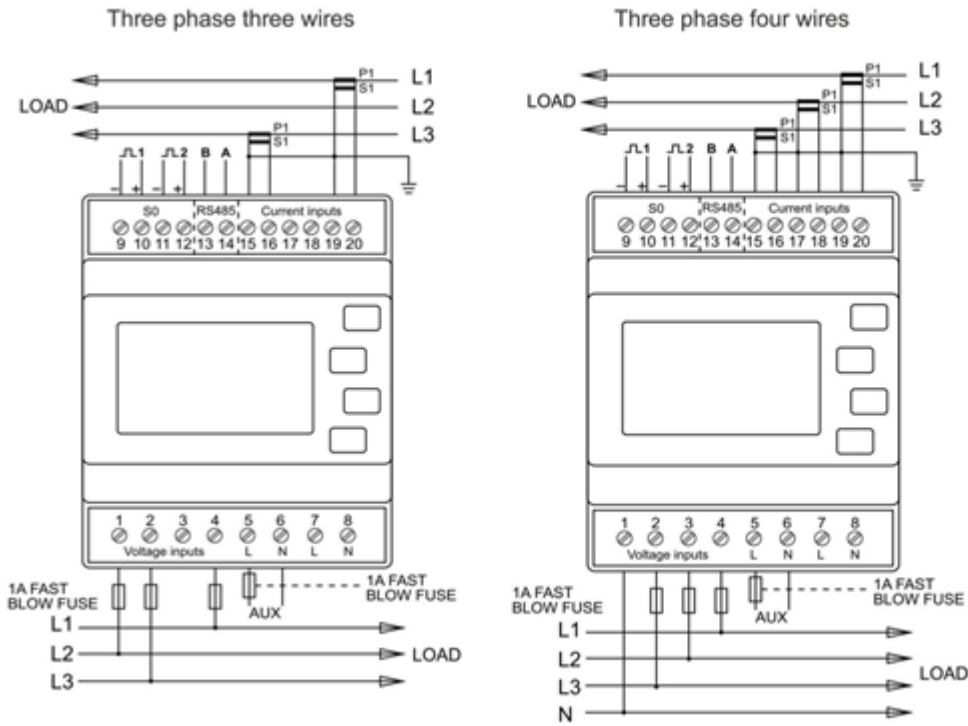
| Technical Data | |
|------------------------------|---|
| Operating Humidity | ≤ 75% |
| Storage Humidity | ≤ 95% |
| Operating Temperature | -25°C - +50°C |
| Storage Temperature | -40°C - +70°C |
| Mounting | DIN rail (DIN 43880) |
| Sealing | IP51 Indoor |
| Auxiliary supply voltage | Nominal ± 1% |
| Auxiliary supply frequency | Nominal ± 1% |
| Frequency | 50Hz or 60Hz(±2%) |
| Power Consumption | ≤ 10W |
| Accuracy | |
| Voltage, Current | 0.5% |
| Frequency | 0.2% of Mid-Frequency |
| Power Factor | 1% of Unity (0.01) |
| Active Power, Apparent Power | ± 1% of Range Maximum |
| Reactive Power | ± 1% of Range Maximum |
| Reactive Energy (Varh) | ± 1% of Range Maximum |
| Active Energy (Wh) | Class 1 IEC 62053-21 |
| Current transformer | |
| Frequency | 50-60 Hz |
| Rated current | 50 A |
| Accuracy | from 20% to 120% of rated current |
| Phase angle | less than 2 degrees at 50% of rated current |
| Insulation voltage | 600 VAC |
| Maximum primary voltage | 5000 VAC (insulated conductor) |
| Dielectric strength | 2.5 kV/1mA/1min |
| Operating temperature | -15 to 60°C |
| Operating humidity | < 85 % |
| Case material | PC/UL94-V0 |
| Bobin | PBT |
| Core | Permalloy |
| Internal structure | Epoxy |
| Leads | UL 1015, Twisted pair, 22 AWG |
| Modbus | |
| Bus Type | RS485 (Semi-Duplex) |
| Protocol | Modbus RTU |
| Baud Rate | 1200/2400/4800/9600bps |
| Address Range | 1-247 |

| | |
|------------------------|---------------|
| Max. Bus Loading | 64pcs |
| Communication Distance | 1000 Meters |
| Parity | EVEN/ODD/NONE |
| Data Bit | 8 |
| Stop Bit | 1 |

Dimensions



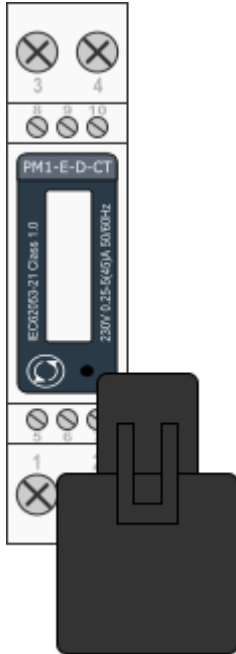
Installation



hiq_pm3-e-d-ct_user_manual_v1.pdf
hiq_pm3-e-d-ct_protocol_v1.6.pdf

Single phase power-sensor, CT

1-phase power-sensor, current transformer



| | |
|---|-------------------------------|
| Model number: | PM1-E-D-CT |
| Connect to: | MC-230 |
| | RS485 power sensor bus A - B |
| Mounting: | DIN rail, 1M, 18 mm |
| Dimensions: | 18 × 62 × 119 mm |
| Used for measuring power and energy of | |
| ✓ | single-phase energy sources |
| ✓ | single-phase energy consumers |

Applications

- Digital multi-function power sensor for single phase networks

Features

- DIN rail mounting with 50A current transformer
- Compact design in a single module 18mm wide
- Seal-able cover(phase and neutral terminals)

General description

The PM1-E-D series is an advanced single phase energy monitoring solution with built-in configuration push button and LCD data displaying, particularly indicated for active energy and other parameters metering and for cost allocation. Housing for DIN-rail mounting, IP51 protection degree.

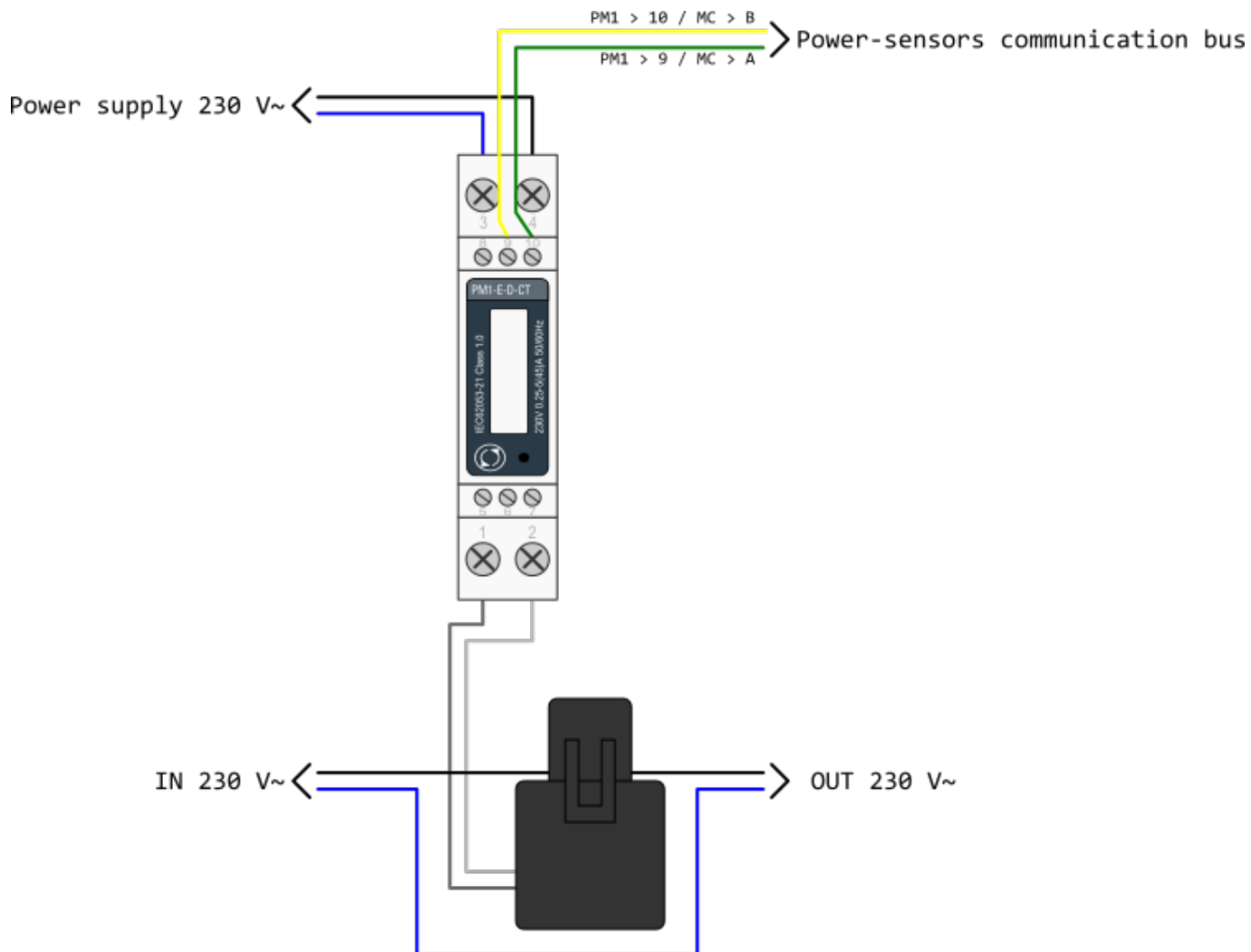
Technical specifications

| Technical Data | |
|--------------------|-------|
| Operating Humidity | ≤ 75% |

| | |
|------------------------------|---|
| Storage Humidity | ≤ 95% |
| Operating Temperature | -20°C - +50°C |
| Storage Temperature | -30°C - +70°C |
| International Standard | IEC 62053-21 |
| Accuracy | Class 1 |
| Mounting | DIN rail (DIN 43880) |
| Sealing | IP51 Indoor |
| Nominal Voltage Input | (Ph+N) 230V AC (176-276V AC) |
| Max Continuous Voltage | 120% of nominal |
| AC Voltage Withstand | 4KV for 1 minute |
| Impulse Voltage Withstand | 6KV-1.2μS |
| Current Input | 0.25-5A(6)A AC RMS |
| Operational Current Range | 0.4% Ib-I _{max} |
| Over current withstand | 20I _{max} for 0.01s |
| Nominal Input Current Burden | 0.5VA |
| Frequency | 50Hz(±10%) |
| Power Consumption | ≤ 2W/10VA/phase |
| Accuracy | |
| Voltage, Current | 0.5% |
| Frequency | 0.2% of Mid-Frequency |
| Power Factor | 1% of Unity (0.01) |
| Active Power, Apparent Power | ≤ 1% of Range Maximum |
| Reactive Power | ≤ 1% of Range Maximum |
| Reactive Energy (Varh) | Class 2 |
| Active Energy (Wh) | Class 1 |
| Current transformer | |
| Frequency | 50-60 Hz |
| Rated current | 50 A |
| Accuracy | from 20% to 120% of rated current |
| Phase angle | less than 2 degrees at 50% of rated current |
| Insulation voltage | 600 VAC |
| Maximum primary voltage | 5000 VAC (insulated conductor) |
| Dielectric strength | 2.5 kV/1mA/1min |
| Operating temperature | -15 to 60°C |
| Operating humidity | < 85 % |
| Case material | PC/UL94-V0 |
| Bobin | PBT |
| Core | Permalloy |
| Internal structure | Epoxy |
| Leads | UL 1015, Twisted pair, 22 AWG |
| Modbus | |
| Bus Type | RS485 (Semi-Duplex) |
| Protocol | Modbus RTU |
| Baud Rate | 1200/2400/4800/9600bps |
| Address Range | 1-247 |
| Max. Bus Loading | 64pcs |

| | |
|------------------------|---------------|
| Communication Distance | 1000 Meters |
| Parity | EVEN/ODD/NONE |
| Data Bit | 8 |
| Stop Bit | 1 |

PM1-E-D-CT Terminals



hiq_pm1-e-d-ct_user_manual_2020_v1.0.pdf
hiq_pm1-e-d-ct_protocol_v1.2.pdf

Smart plug

Enocean wireless smart plug



| | |
|---------------|--|
| Model number: | SCO-WE-F - Schuko (German) SCO-WE-E - Type E (French) |
| Mounting: | In-field; power outlet |
| Dimensions: | 104 × 51 × 36mm |
| Connection: | Wireless Enocean |
| | MC-230-01 |
| | MC-230-03 |
| | MC-24-01 |
| | MC-24-03 |
| | MC-24-06 |

- Smart Actuator
- High power capacity
- Ergonomy

Technical specifications

| | |
|-------------------------|---------------------------------------|
| Power: | 230V AC 50Hz (EU) / 110V AC 60Hz (US) |
| Max switching capacity: | 3.000W (Continuous) |
| | 3.680W (Temporary) on resistive load |
| Self consumption: | < 1W |
| EEP (EnOcean Profile): | EEP D2-01-0A |
| Range: | Up to 30m indoor |
| Wireless repeater: | Yes |
| Dimension: | 104 × 51 × 36mm |

Certifications and standards

Europe

- EN61058-1 :2002+A2 :2008
- NF C 61-314 :2008+A1 :2010 (Type E)
- DIN VDE 0620 -1: 2013 (Schuko)
- DIN VDE 0620 -2-1: 2013 (Schuko)
- EN301489-1 V1.9.2
- EN301489-3 V1.6.1
- EN300220-2 V2.4.1

Smart plug

Enocean wireless smart plug with metering



| | |
|---------------|--|
| Model number: | SCM-WE-F - Schuko (German) SCM-WE-E - Type E (French) |
| Mounting: | In-field; power outlet |
| Dimensions: | 104 × 51 × 36mm |
| Connection: | Wireless Enocean |
| | MC-230-01 |
| | MC-230-03 |
| | MC-24-01 |
| | MC-24-03 |
| | MC-24-06 |

- Smart Actuator
- Metering
- High power capacity

- Ergonomic

Technical specifications

| | |
|-------------------------|---------------------------------------|
| Power: | 230V AC 50Hz (EU) / 110V AC 60Hz (US) |
| Max switching capacity: | 3.000W (Continuous) |
| | 3.680W (Temporary) on resistive load |
| Metering | power [W] and energy [Wh] |
| Self consumption: | < 1W |
| EEP (EnOcean Profile): | EEP D2-01-0A |
| Range: | Up to 30m indoor |
| Wireless repeater: | Yes |
| Dimension: | 104 × 51 × 36mm |

Certifications and standards

Europe

- EN61058-1 :2002+A2 :2008
- NF C 61-314 :2008+A1 :2010 (Type E)
- DIN VDE 0620 -1: 2013 (Schuko)
- DIN VDE 0620 -2-1: 2013 (Schuko)
- EN301489-1 V1.9.2
- EN301489-3 V1.6.1
- EN300220-2 V2.4.1

Micro smart plug

Enocean wireless micro smart plug with metering



| | |
|---------------|--|
| Model number: | SMM-WE-F - Schuko (German) SMM-WE-E - Type E (French) |
| Mounting: | In-field; power outlet |
| Dimensions: | 41 × 73 mm |
| Connection: | Wireless EnOcean MC-230-01 MC-230-03 MC-24-01 MC-24-03 MC-24-06 |

- Smart Actuator
- Metering
- High power capacity
- Ergonomic

Technical specifications

| | |
|-------------------------|---------------------------|
| Power: | 230V AC 50Hz (EU) |
| Max switching capacity: | 1.840 W on resistive load |
| Metering | power [W] and energy [Wh] |
| Self consumption: | < 1W |
| EEP (EnOcean Profile): | EEP D2-01-0E |
| Range: | Up to 30m indoor |
| Wireless repeater: | Yes |
| Dimension: | 41 × 73 mm |

Certifications and standards

Europe

- EN61058-1 :2002+A2 :2008
- NF C 61-314 :2008+A1 :2010 (Type E)
- DIN VDE 0620 -1: 2013 (Schuko)
- DIN VDE 0620 -2-1: 2013 (Schuko)
- EN301489-1 V1.9.2
- EN301489-3 V1.6.1
- EN300220-2 V2.4.1

Temperature and humidity sensor

Enocean wireless temperature and humidity sensor



| | |
|---------------|--|
| Model number: | TSH-WE-W1 |
| Mounting: | In-field; on wall |
| Dimensions: | 80 × 26 × 18 mm |
| Connection: | Wireless Enocean to MC-230-01 |

- No battery
- Wireless
- Easy to mount
- Discreet
- Optional battery

Technical specifications

| | |
|------------------------|-----------------------------|
| Power: | Solar panel |
| - optional: | battery CR1216, 3 years |
| Metering | 0 to 40°C (0.16°resolution) |
| | 0 to 100% RH - Indoor use |
| Self consumption: | < 1W |
| EEP (EnOcean Profile): | EEP - A5-04-01 |
| Range: | Up to 30m indoor |
| Dimension: | 80 × 26 × 18 mm |

Certifications and standards

Europe

- EN 60950-1: 2006+A11:2009
- +A1:2010+A12:2011+A2:2013
- EN301489-3 V1.6.1
- EN 61000-3-2:2013,
- EN 61000-3-3:2013
- EN 300220-2 V3.1.1
- EN 62479:2010

USA

- FCC & IC Rules

Relay Switch

Wireless relay switch, 1 channel



| | |
|---------------|---------------------------|
| Model number: | RS1-WE-F1 |
| Mounting: | In-field; flush box |
| Dimensions: | 40 x 44 x 16.9 mm |
| Connection: | Wireless Enocean |
| | MC-230-01 |
| | MC-230-03 |
| | MC-24-01 |
| | MC-24-03 |
| | MC-24-06 |

- High switching capacity
- Ultra low profile
- Potential-free input
- Remote commissioning

Technical specifications

| | |
|--------------------------|---------------------------------|
| Power supply: | 230 V AC ~ 50 Hz |
| Switching capabilities: | 230 V AC - 10A / 30 V DC - 10 A |
| Consumption: | <1W |
| Maximum output power: | 2,3 kW (resistive load) |
| Radio frequency range: | 868,0 to 868,6 MHz |
| RF power max: | +3dBm |
| Range: | Up to 30m indoor |
| Wireless repeater: | Yes |
| Operational temperature: | 0°C to 40° |
| Protection rating: | IP 2X |
| Pairing: | up to 22 controllers |
| EEP (EnOcean Profile): | D2-01-0F |
| Dimensions : | 40 x 44 x 16.9 mm |

Certifications and standards

Europe

- EN60669-1:1999+A1:02+A2:08
- EN60669-2-1:2004+A1:09+A12:10
- EN300220-2 V3.1.1
- EN301489-01 V2.1.1
- EN301489-03 V2.1.1
- EN62479:2010

rs1-we-f1_user_manual.pdf

Relay Switch

Wireless relay switch, 1 channel



| | |
|---------------|---------------------------|
| Model number: | RS1-WE-F1 |
| Mounting: | In-field; flush box |
| Dimensions: | 40 x 44 x 16.9 mm |
| Connection: | Wireless Enocean |
| | MC-230-01 |
| | MC-230-03 |
| | MC-24-01 |
| | MC-24-03 |
| | MC-24-06 |

- High switching capacity
- Ultra low profile
- Potential-free input
- Remote commissioning

Technical specifications

| | |
|--------------------------|---------------------------------|
| Power supply: | 230 V AC ~ 50 Hz |
| Switching capabilities: | 230 V AC - 10A / 30 V DC - 10 A |
| Consumption: | <1W |
| Maximum output power: | 2,3 kW (resistive load) |
| Radio frequency range: | 868,0 to 868,6 MHz |
| RF power max: | +3dBm |
| Range: | Up to 30m indoor |
| Wireless repeater: | Yes |
| Operational temperature: | 0°C to 40° |
| Protection rating: | IP 2X |
| Pairing: | up to 22 controllers |
| EEP (EnOcean Profile): | D2-01-0F |
| Dimensions : | 40 x 44 x 16.9 mm |

Certifications and standards





Europe

- EN60669-1:1999+A1:02+A2:08
- EN60669-2-1:2004+A1:09+A12:10
- EN300220-2 V3.1.1
- EN301489-01 V2.1.1
- EN301489-03 V2.1.1
- EN62479:2010

rs1-we-f1_user_manual.pdf

Temperature sensor

Digital temperature sensor

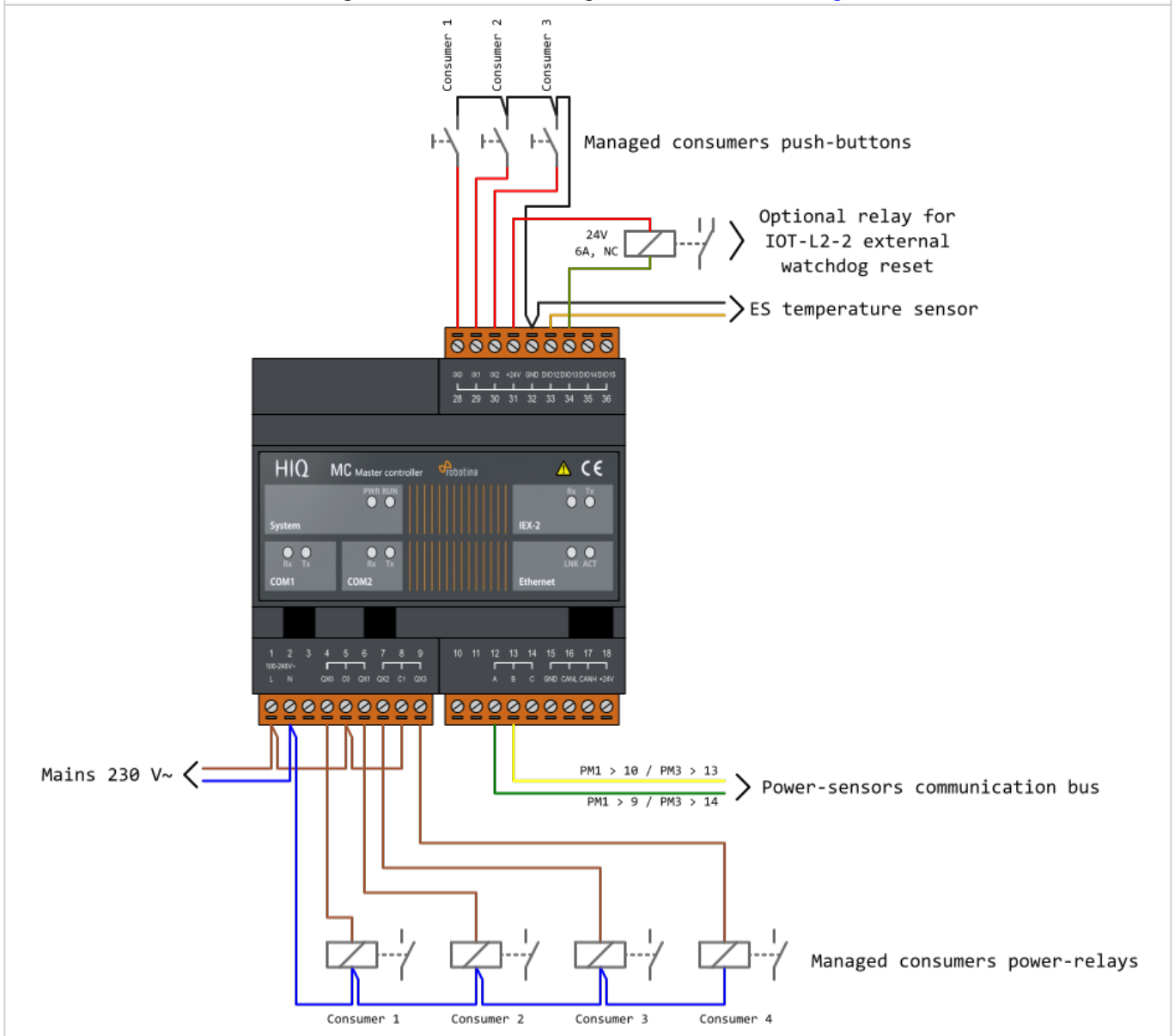
| Technical specifications | |
|-----------------------------|---|
| Operating temperature range | -55°C to +100°C (0°C to +50°C for -W) |
| Measuring error | max. ±2°C (-55°C to +100°C) |
| | max. ±0.5°C (-10°C to +85°C) |
| | typ. ±0.2°C (-10°C to +85°C) |
| Connect to | MC-230 |
| | terminals GND - IO12 |
| | for ES-B connect red and black to GND and yellow to IO12 |
| Order code | |
| ES | heat-shrink tubing, 2m wire |
| |  |
| ES-A | aluminum housing IP 67, 5m wire |
| |  |
| ES-W-OW-WHITE | white plastic housing, terminals |
| ES-W-OW-IVORY | ivory plastic housing, terminals |
| |  |
| ES-B | steel tube housing IP 67, 2m wire |
| |  |

HEMS v1.2.x wiring

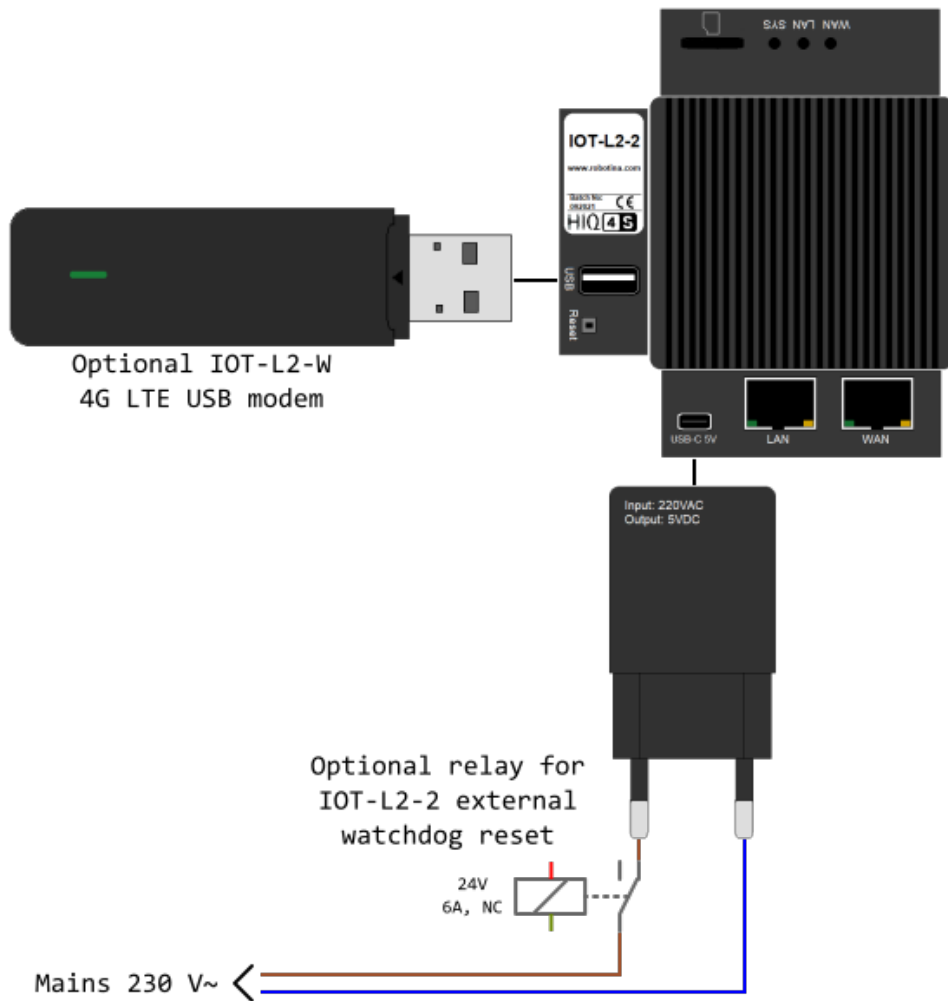
MC-230

Wiring of default configuration.

NOTE: several different configurations can be configured with [HEMS Configurator](#).



IOT-L2-2



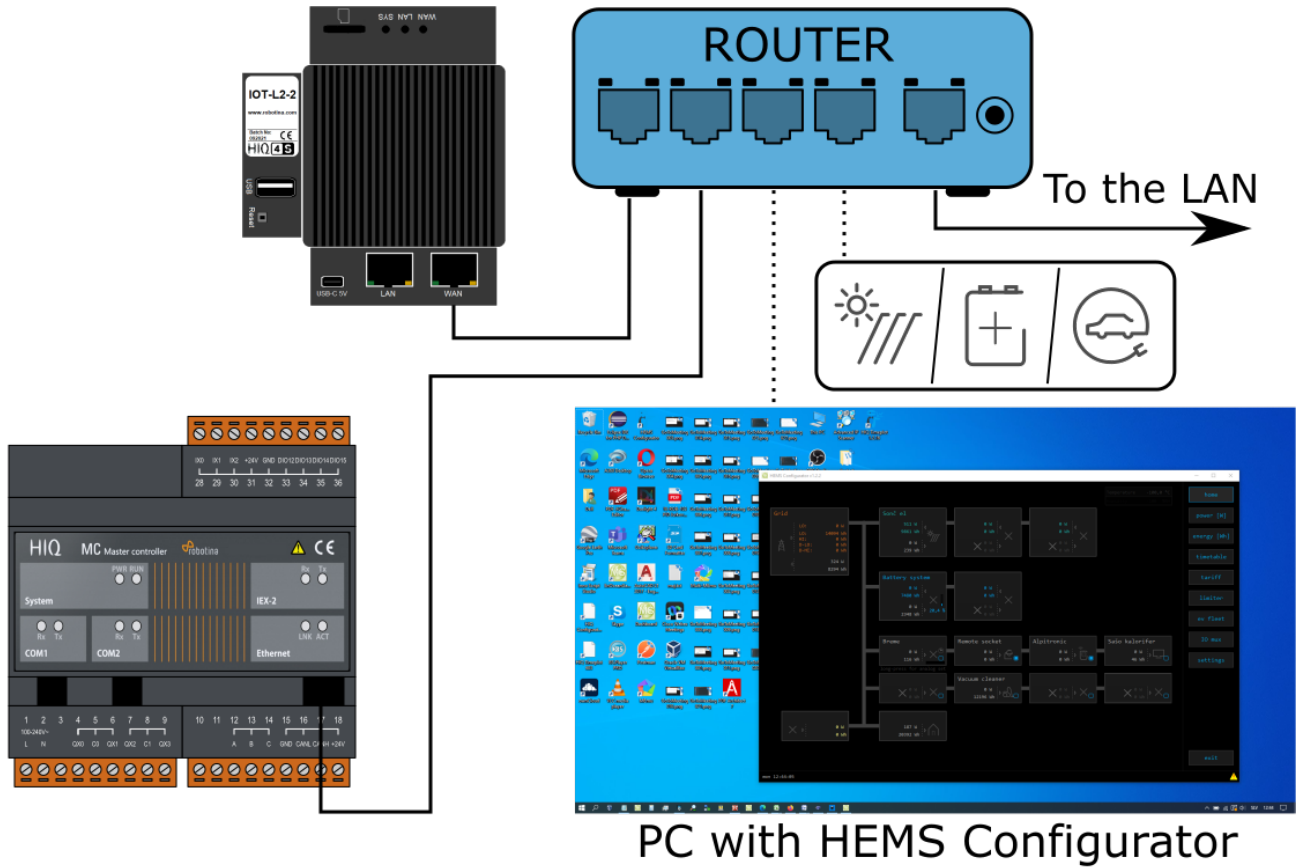
Network (LAN or LTE 4G modem) → MC-230 and IOT-L2-2

Optionally:

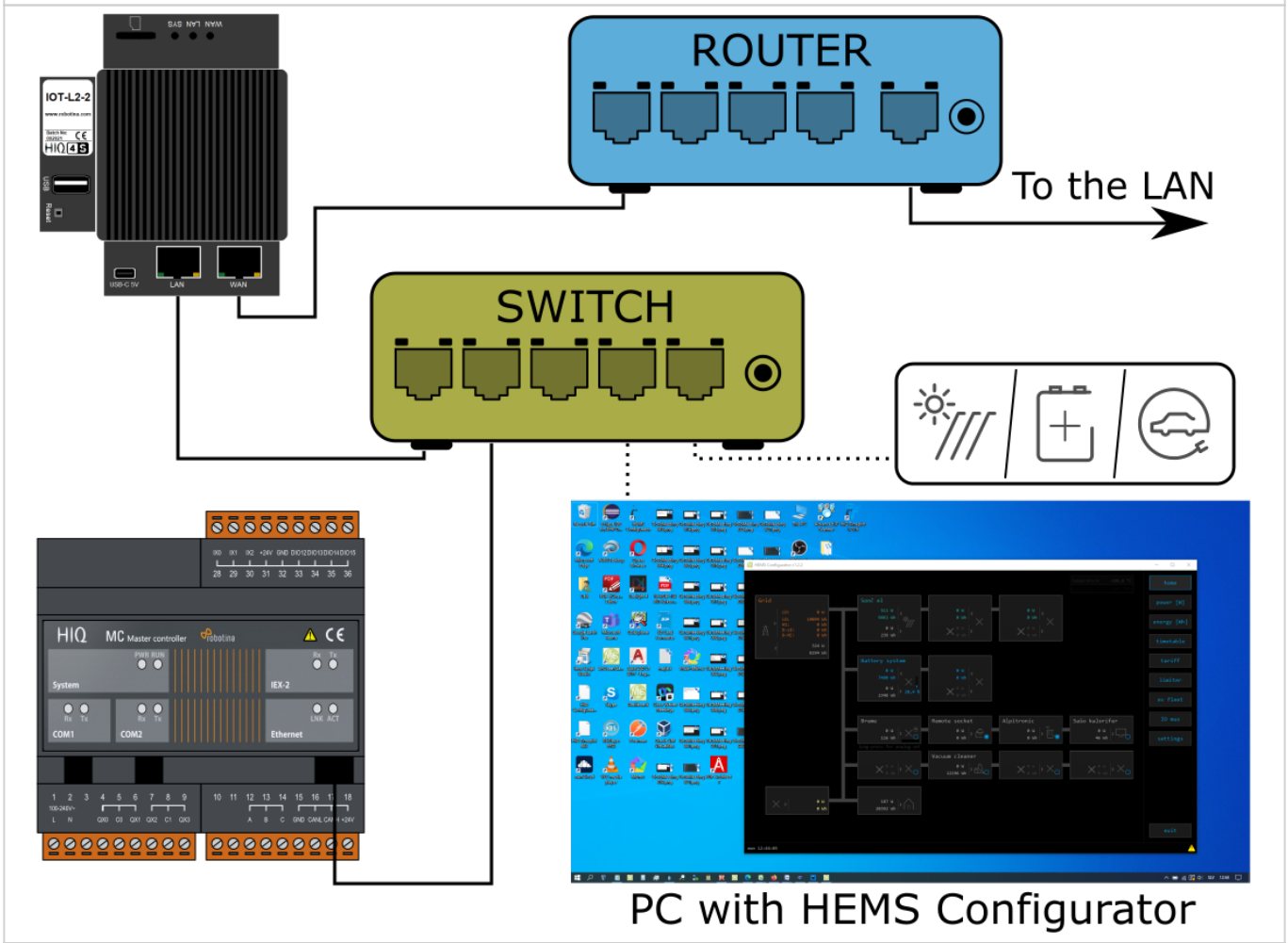
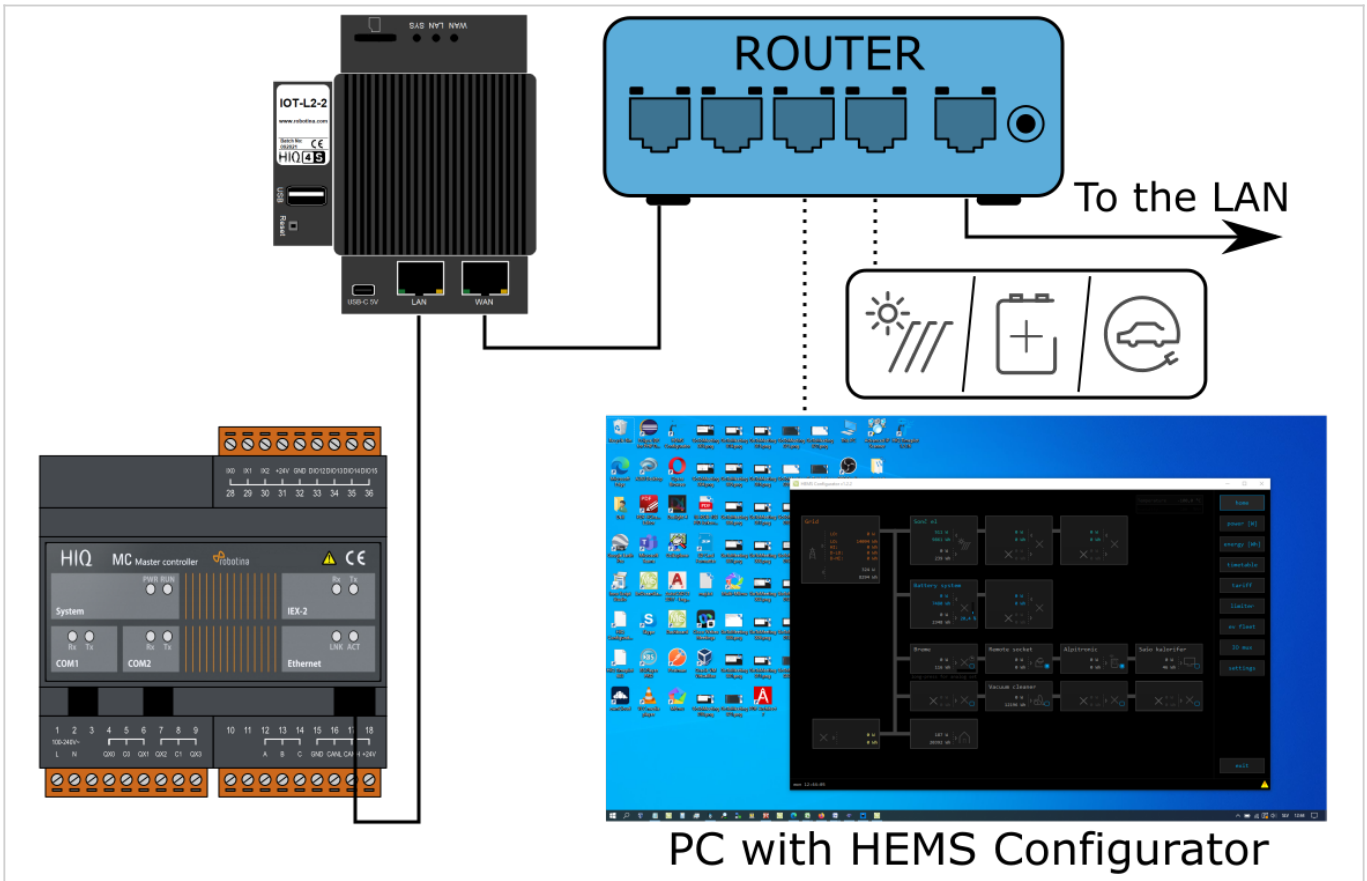
- PC with HEMS configurator
- PV inverter
- Hybrid inverter (battery storage system)
- EV charger

NOTE: When you change network configuration, MC-230 and IOT-L2-2 must be reset.

Default connection to the LAN network:

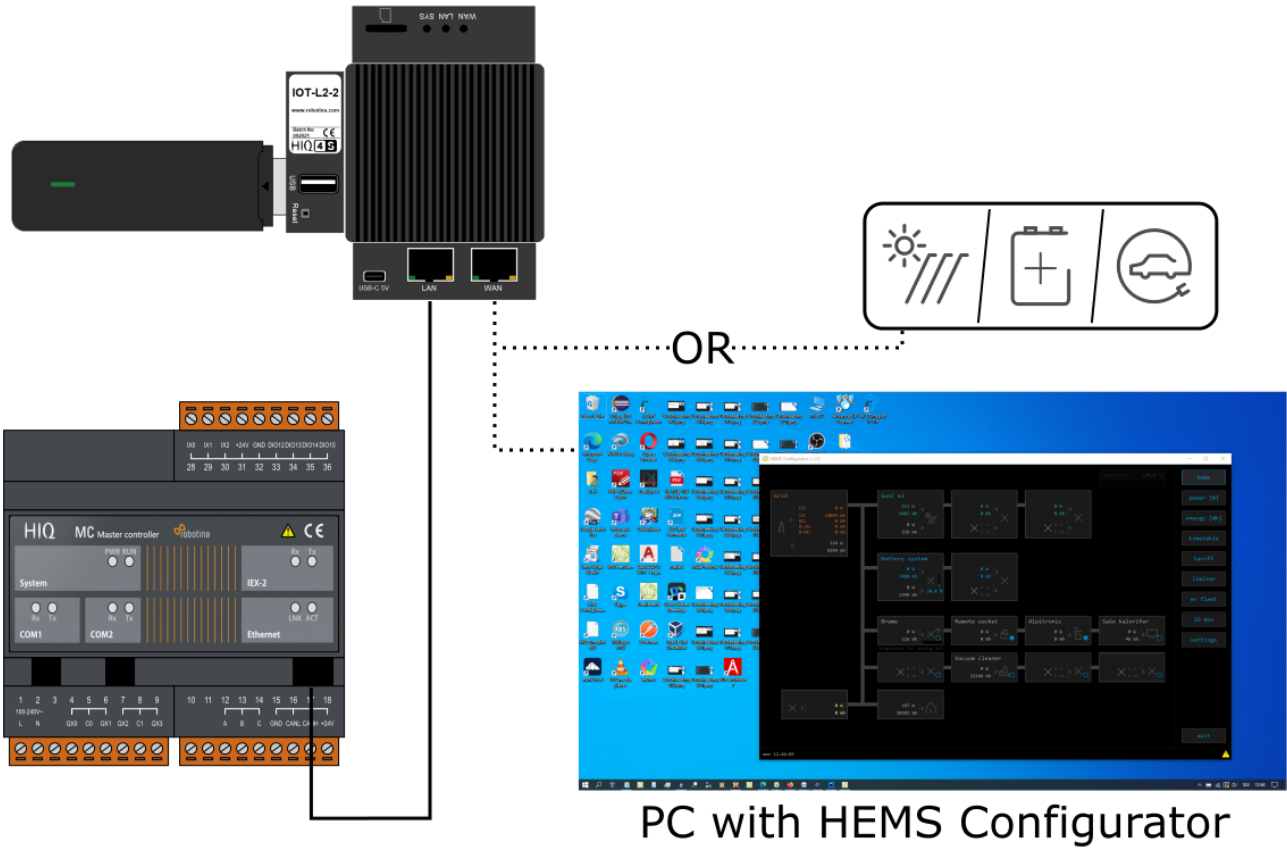


Optional LAN connections:

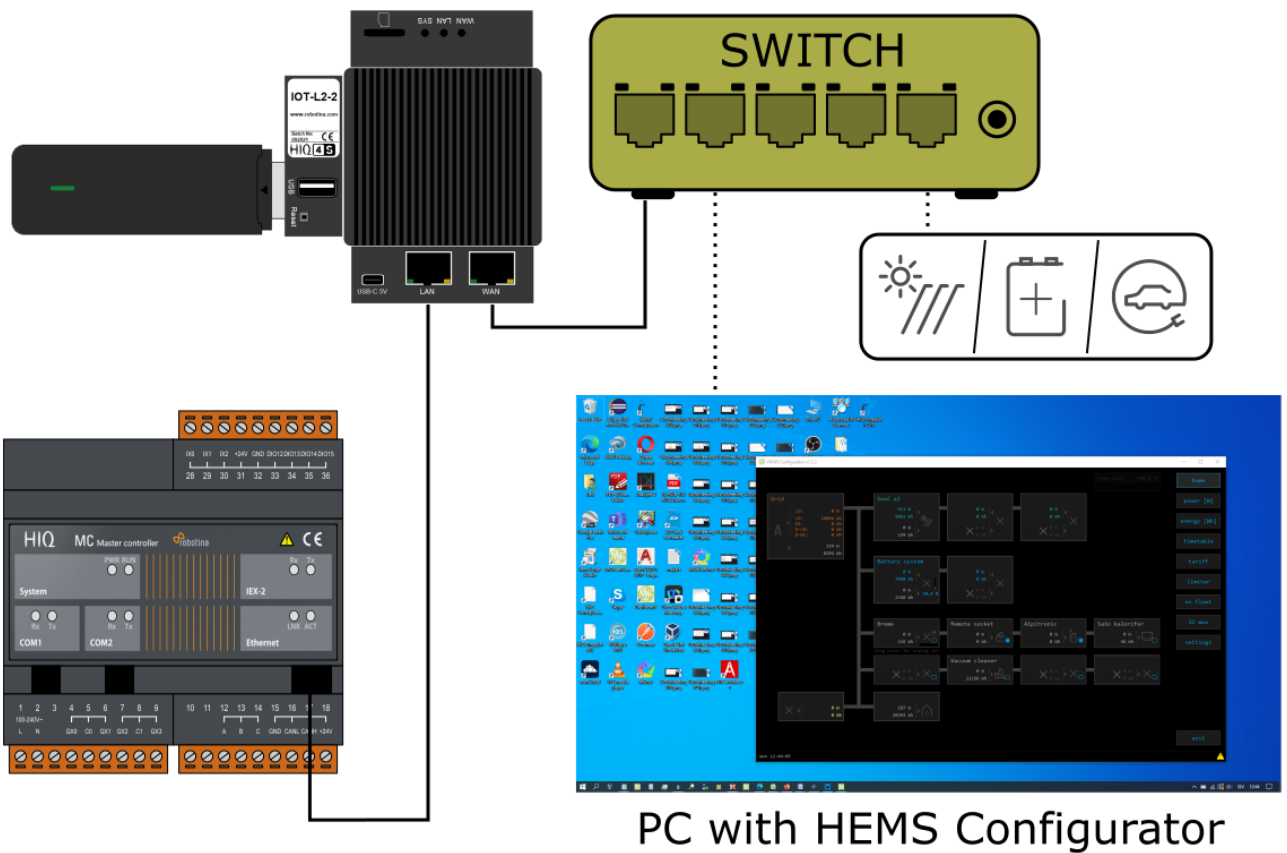


Default connection via LTE 4G modem:

NOTE: All connected devices will have internet access via LTE modem which can result in high costs on your LTE account.

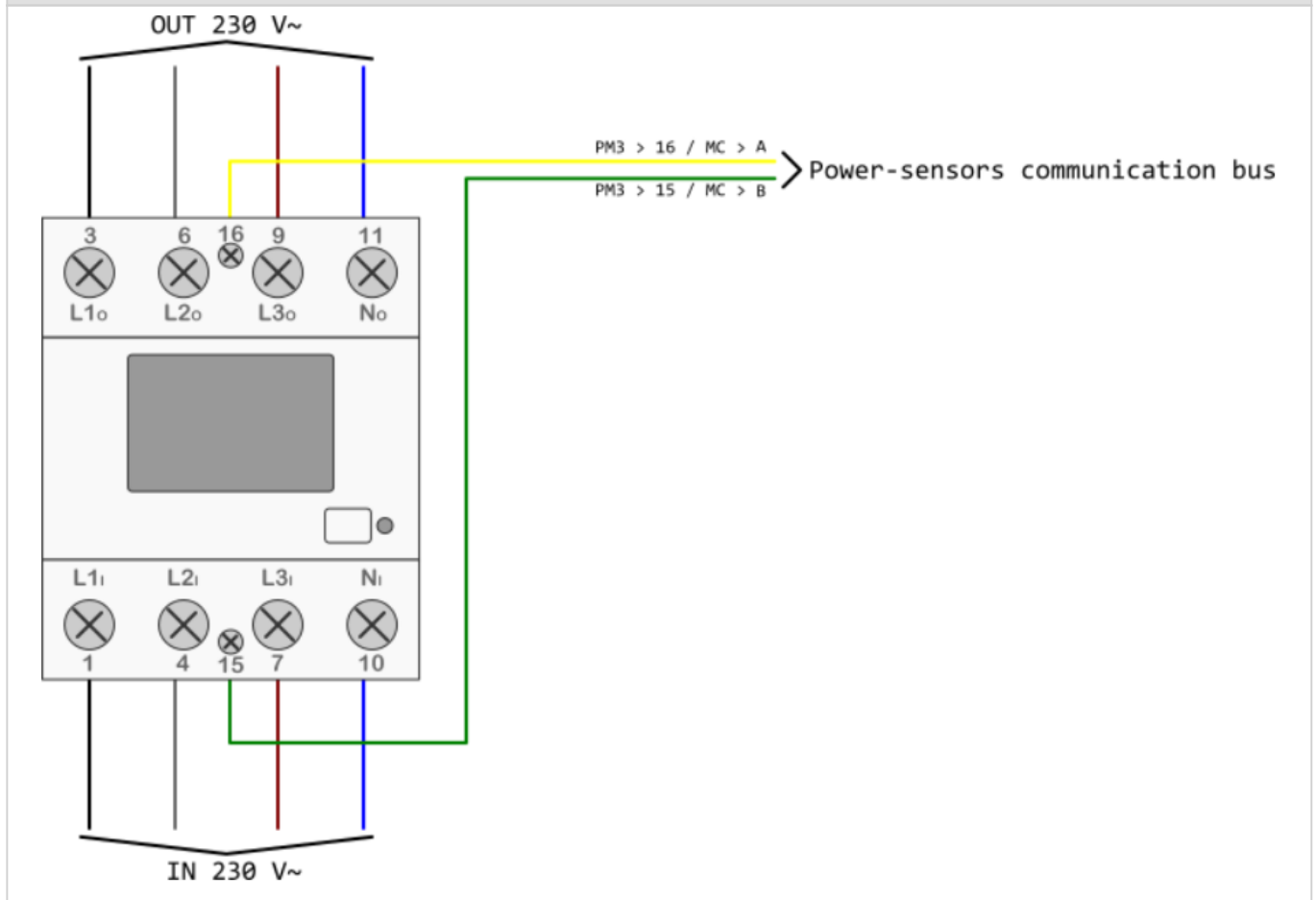


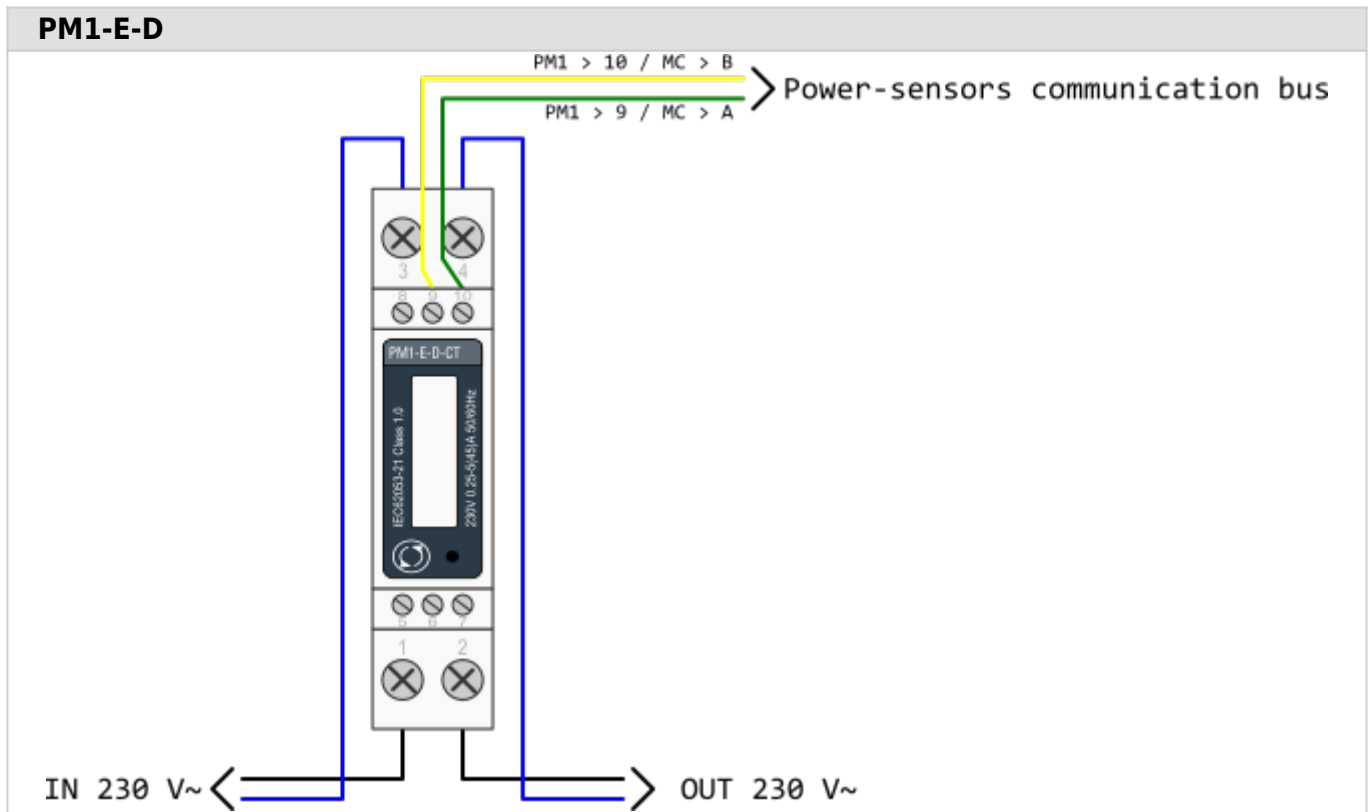
Optional LTE 4G modem connection:



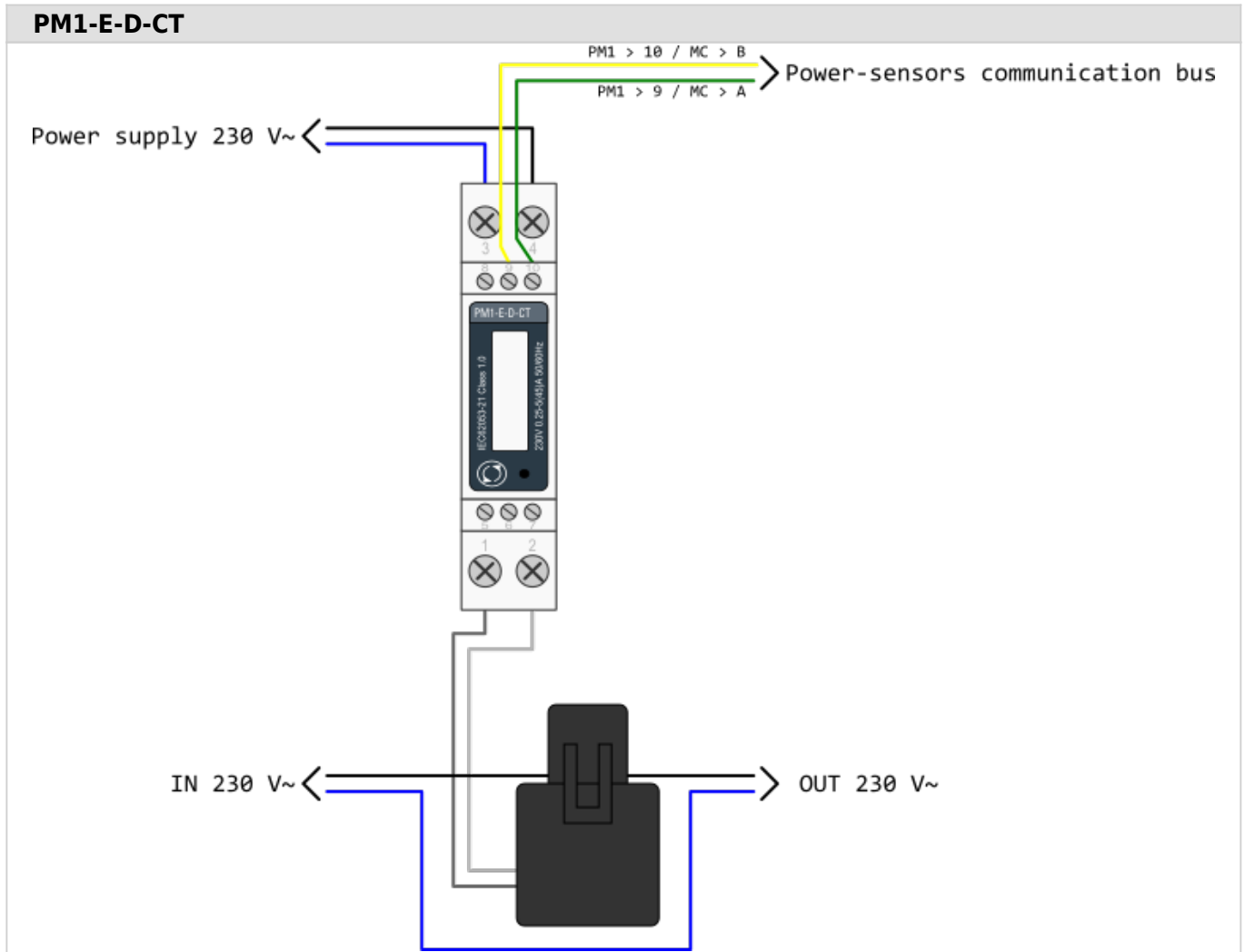
NOTE: Specific network requirements, i.e. static IP address can be configured on the cloud service. Please contact [support](#).

PM3-I-D

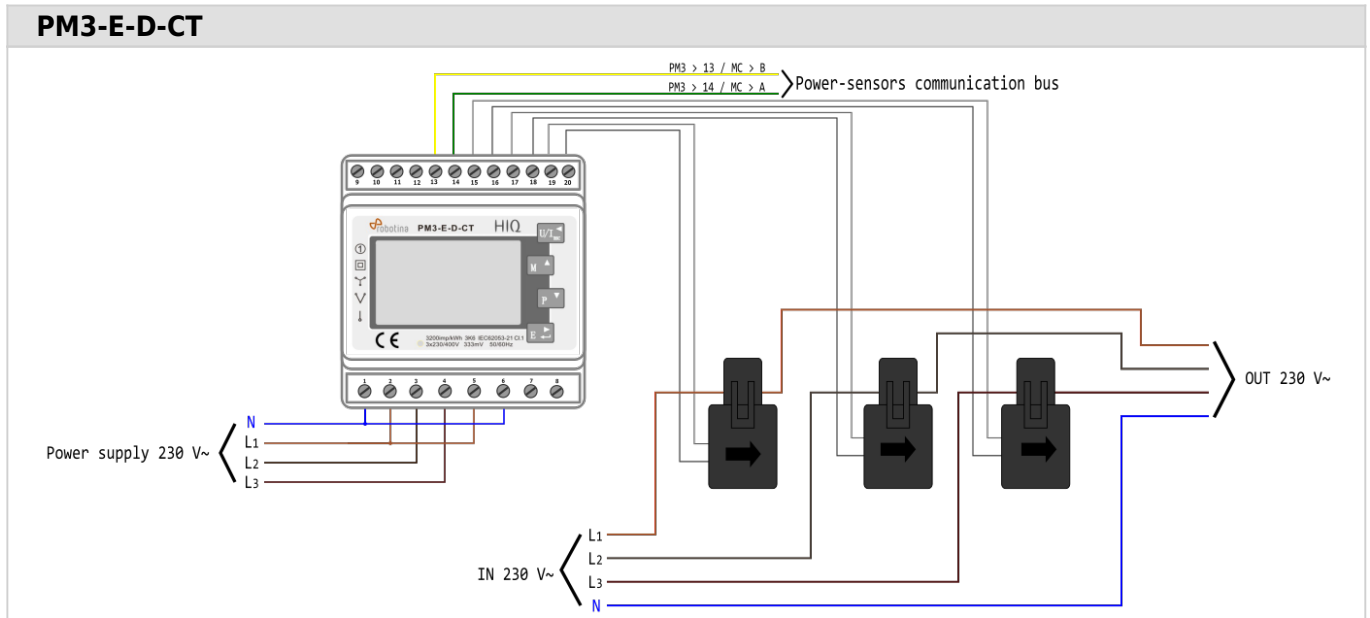




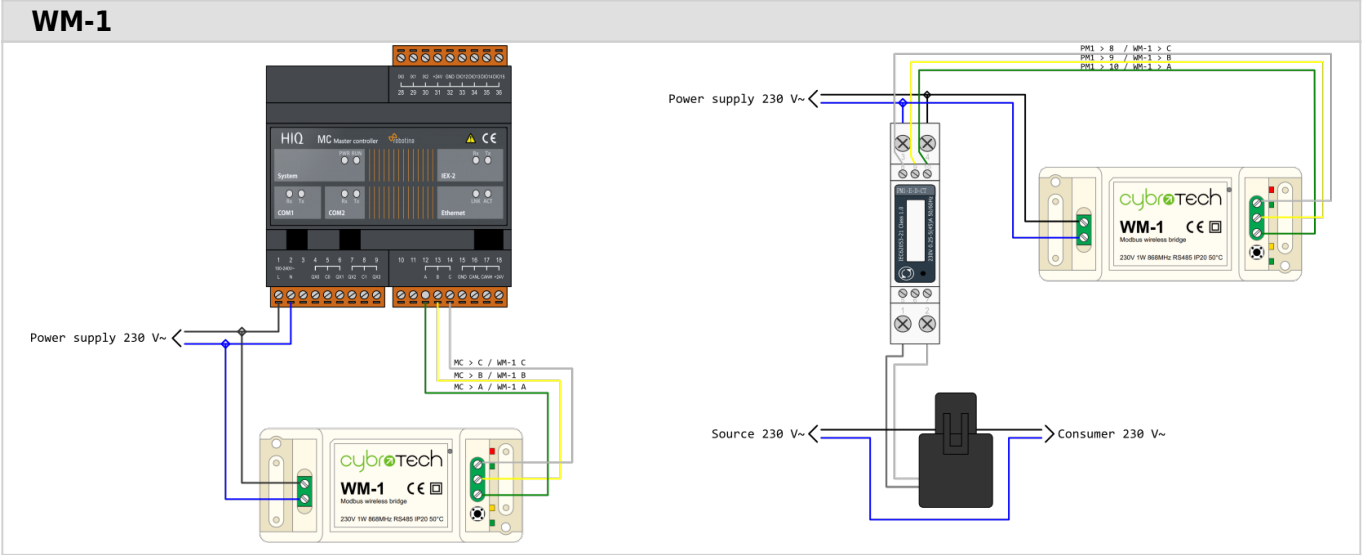
PM1-E-D-CT

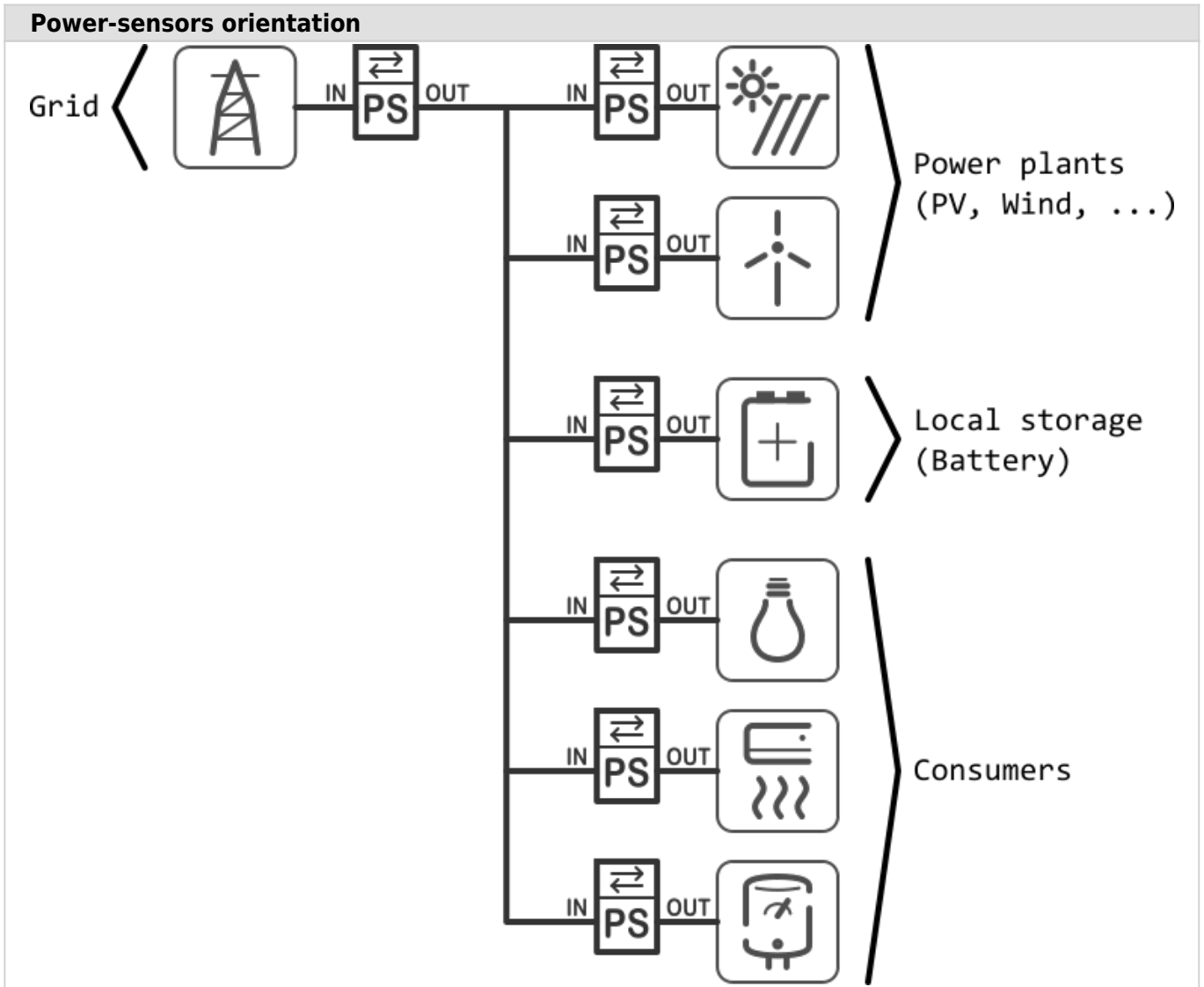


PM3-E-D-CT



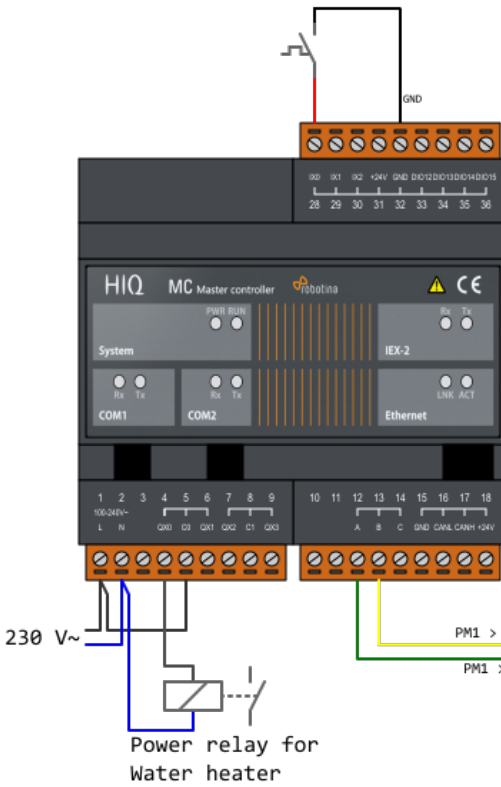
WM-1





Control consumer by external signal

Connect external source to control device, e.g. thermostat signal on IX0 to control temperature by enabling/disabling connected device on QX0.



HEMS configurator

Using HEMS configurator settings page, set Digital 1 for consumer in this case water heater.

| CONSUMERS | icon | output | man.time | P nominal |
|--------------|--------------|-----------|----------|-----------|
| Water heater | Water heater | Digital-1 | 0 min | 2500 W |

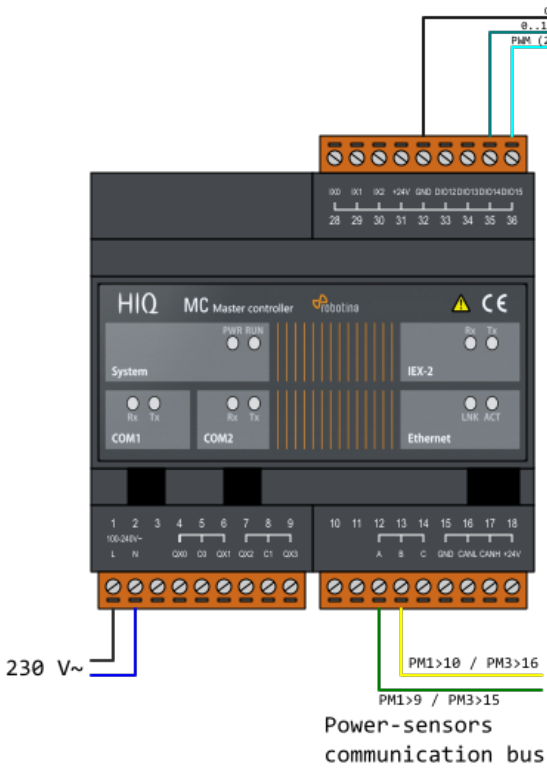
Using HEMS configurator IO mux page, set QX0 to Digital 1 and IX0 to Enable consumer 1:

| | Select input/output type | out mode |
|------|--------------------------|----------|
| QX0 | Digital-1 | normal |
| QX1 | / | normal |
| QX2 | / | normal |
| QX3 | / | normal |
| IO12 | / | normal |
| IO13 | / | normal |
| IO14 | / | normal |
| IO15 | / | normal |
| IX0 | Enable consumer-1 | normal |
| IX1 | / | normal |
| IX2 | / | normal |

PM1 > 10 / PM3 > 16
PM1 > 9 / PM3 > 15 > Power-sensors communication bus

Set analog for consumer 1

Connect analog device to IO14 for analog signal 0-10V or to IO15 for PWM signal (f=1kHz). Analog load is possible to set in configurator for consumer 1 only and reserved outputs are on IO14 & IO15.



HEMS configurator

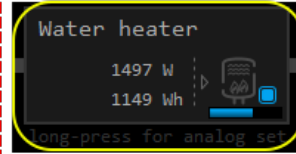
Using HEMS configurator settings page, set Analog for consumer in this case water heater.

| CONSUMERS | icon | output | man.time | P nominal |
|--------------|--------------|--------|----------|-----------|
| Water heater | Water heater | Analog | 0 min | 2500 W |

Using HEMS configurator IO mux page, set IO14 to Analog output 0-10V and IO15 to PWM output

| | Select input/output type | out mode |
|------|--------------------------|----------|
| QX0 | / | normal |
| QX1 | Digital-2 | normal |
| QX2 | Digital-3 | normal |
| QX3 | / | normal |
| IO12 | Digital-6 | normal |
| IO13 | / | normal |
| IO14 | Analog output 0-10V | normal |
| IO15 | PWM output | normal |
| IX0 | Toggle consumer-1 | normal |
| IX1 | Toggle consumer-2 | normal |
| IX2 | Toggle consumer-3 | normal |

On home page, set consumer 1 (water heater) to desired % of power.



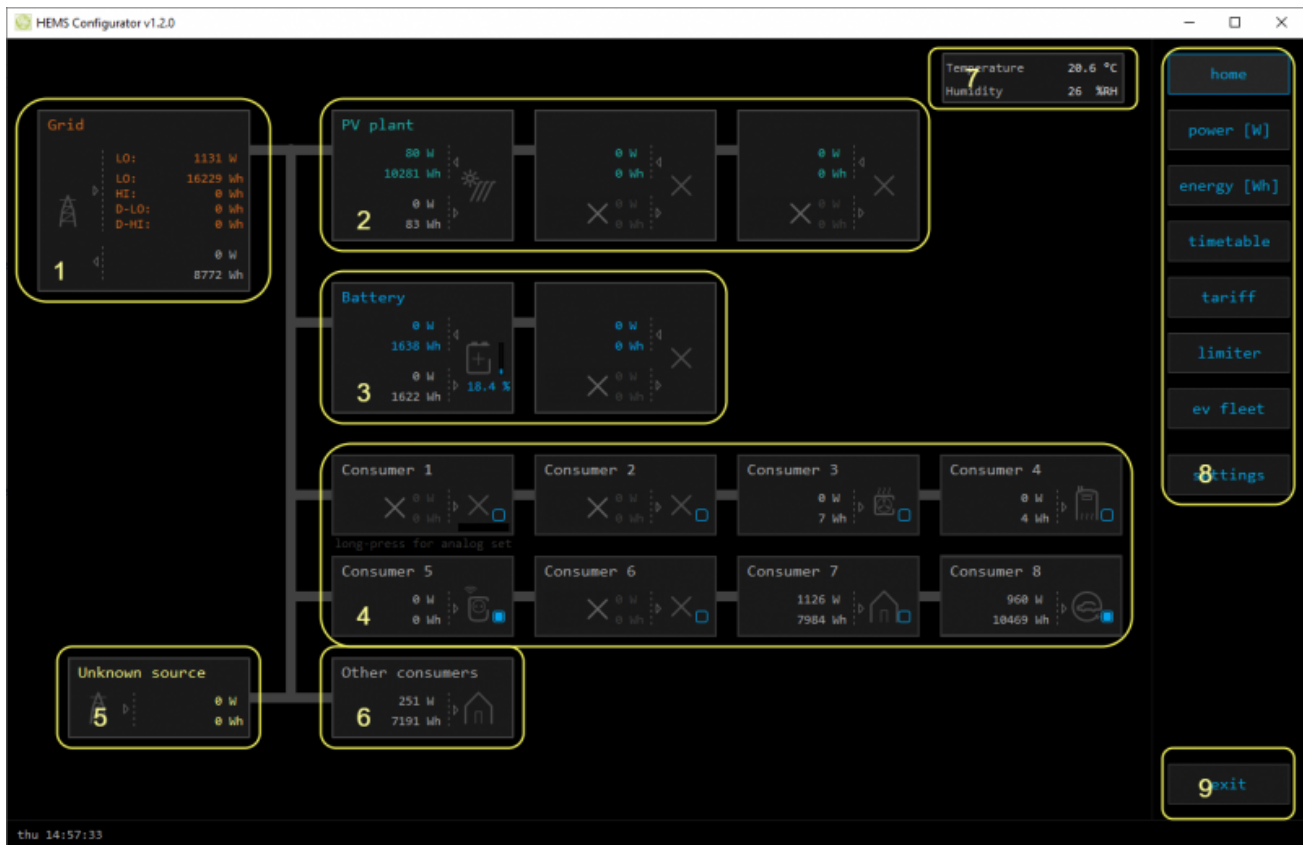
NOTE: analog signal is available for consumer 1 on IO14 and IO15 only.

HEMS v1.2.3 Configurator

Latest version of HEMS Configurator can be found under [download folder](#).

home

Basic system overview.



| 1. Grid | | |
|-----------------------------------|-----------|---|
| > | From grid | Tariff (LO, HI, D-LO, D-HI) and power from grid in W Imported energy by tariff in Wh |
| < | To grid | Power exported to grid in W Exported energy in Wh |
| 2. Plants | | |
| < | Produced | Produced power in W and energy in Wh |
| > | Consumed | Consumed power in W and energy in Wh |
| 3. Storage systems | | |
| < | Sourced | Power in W and energy in Wh sourced from storage (battery) |
| > | Stored | Power in W and energy in Wh stored (to battery) |
| bargraph and %¹ | SOC | Battery State Of Charge |
| 4. Consumers | | |
| > | Consumed | Consumed power in W and energy in Wh |

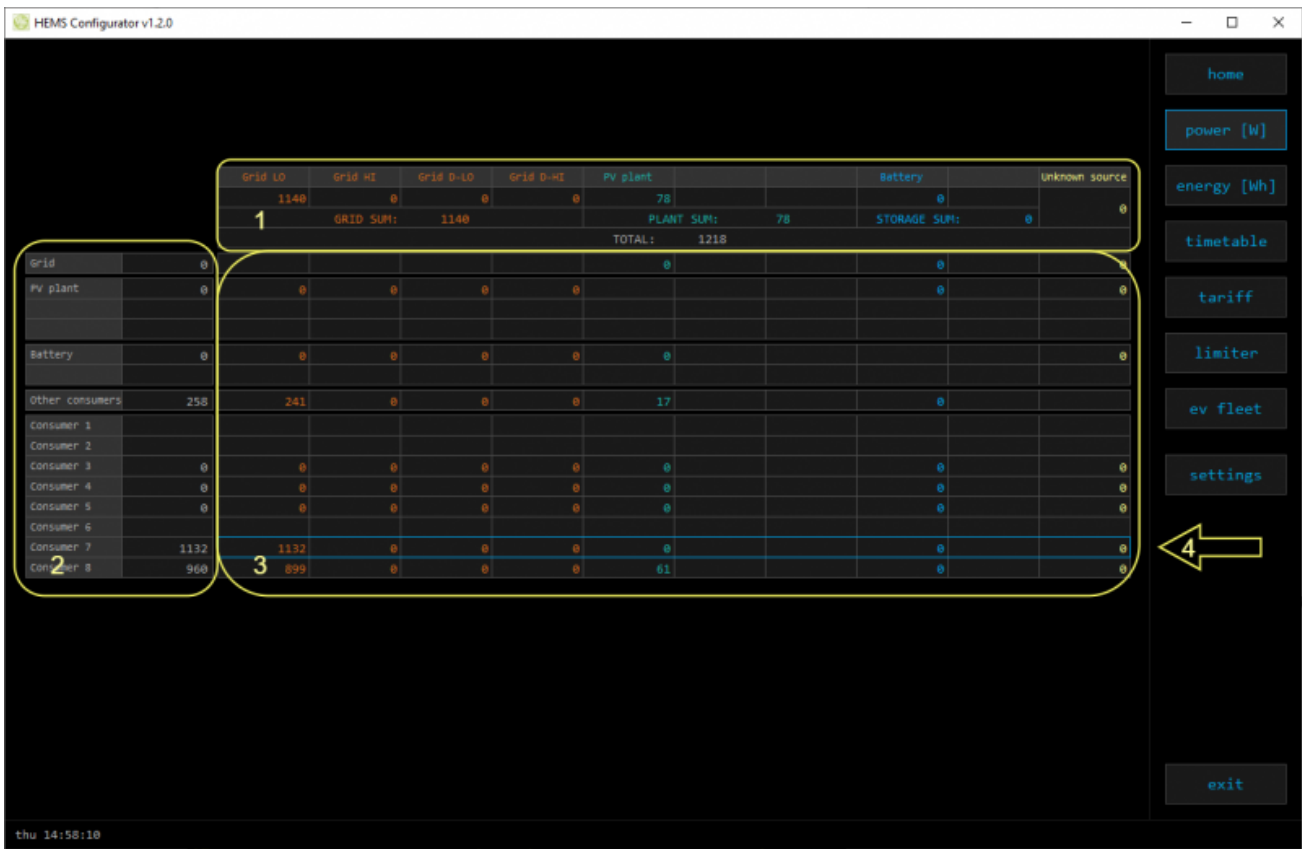
| | | |
|---|-------------|--|
| [] | Status | Output status for managed consumers |
| bargraph² | Analog out | Analog output value |
| click | Toggle | Click in frame toggles managed consumers output |
| long-press² | Set analog | Long press on first consumer pops-up dialog for analog value set |
| 5. Unknown source | | |
| > | Sourced | Power in W and energy in Wh from unknown source |
| ⚠ Accumulate also all differences caused by power-sensor inaccuracy | | |
| 6. Other consumers | | |
| > | Consumed | Consumed power in W and energy in Wh by other (not measured) consumers |
| 7. Temperature and humidity | | |
| | Temperature | Temperature in °C |
| | Humidity | Humidity in % RH |
| 8. Page navigation | | |
| | Home | Home screen |
| | Power [W] | Power screen |
| | Energy [Wh] | Energy screen |
| | Timetable | Timetable screen |
| | Tariff | Tariff screen |
| | Limiter | Limiterscreen |
| | EV fleet | EV fleet screen |
| | IO mux | IO mux screen |
| | Settings | Settings screen |
| 9. Exit | | |
| | Exit | Close application |

¹ only for eStore

² only for first managed consumer

power

Overview of current power distribution by source / consumer.



| |
|---|
| 1. Sourced power |
| Sourced power for each source |
| Sums per source type |
| Total of all sourced power |
| 2. Consumed power |
| Power for each consumer |
| 3. Power distribution |
| Partial distributed power |
| 4. Submeter (Blue outline) |
| Power meter is not part of internal circuit |

HEMS Configurator v1.2.0

| | Grid LO | Grid HI | Grid D-LO | Grid D-HI | PV plant | Battery | Unknown source |
|-----------------|----------------|---------|-----------|-----------|---------------|----------------|----------------|
| | 1140 | 0 | 0 | 0 | 78 | 0 | 0 |
| | GRID SUP: 1140 | | | | PLANT SUP: 78 | STORAGE SUP: 0 | 0 |
| | | | | | TOTAL: 1318 | | |
| 2 | 0 | | | | 0 | 0 | 0 |
| PV plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Battery | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other consumers | 258 | 241 | 0 | 0 | 17 | 0 | 0 |
| Consumer 1 | | | | | | | |
| Consumer 2 | | | | | | | |
| Consumer 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Consumer 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Consumer 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Consumer 6 | | | | | | | |
| Consumer 7 | 1132 | 1132 | 0 | 0 | 0 | 0 | 0 |
| Consumer 8 | 960 | 899 | 0 | 0 | 61 | 0 | 0 |

Navigation buttons: home, power [W], energy [Wh], timetable, tariff, limiter, ev fleet, settings, exit

thu 14:58:10

1. Sourced power distribution

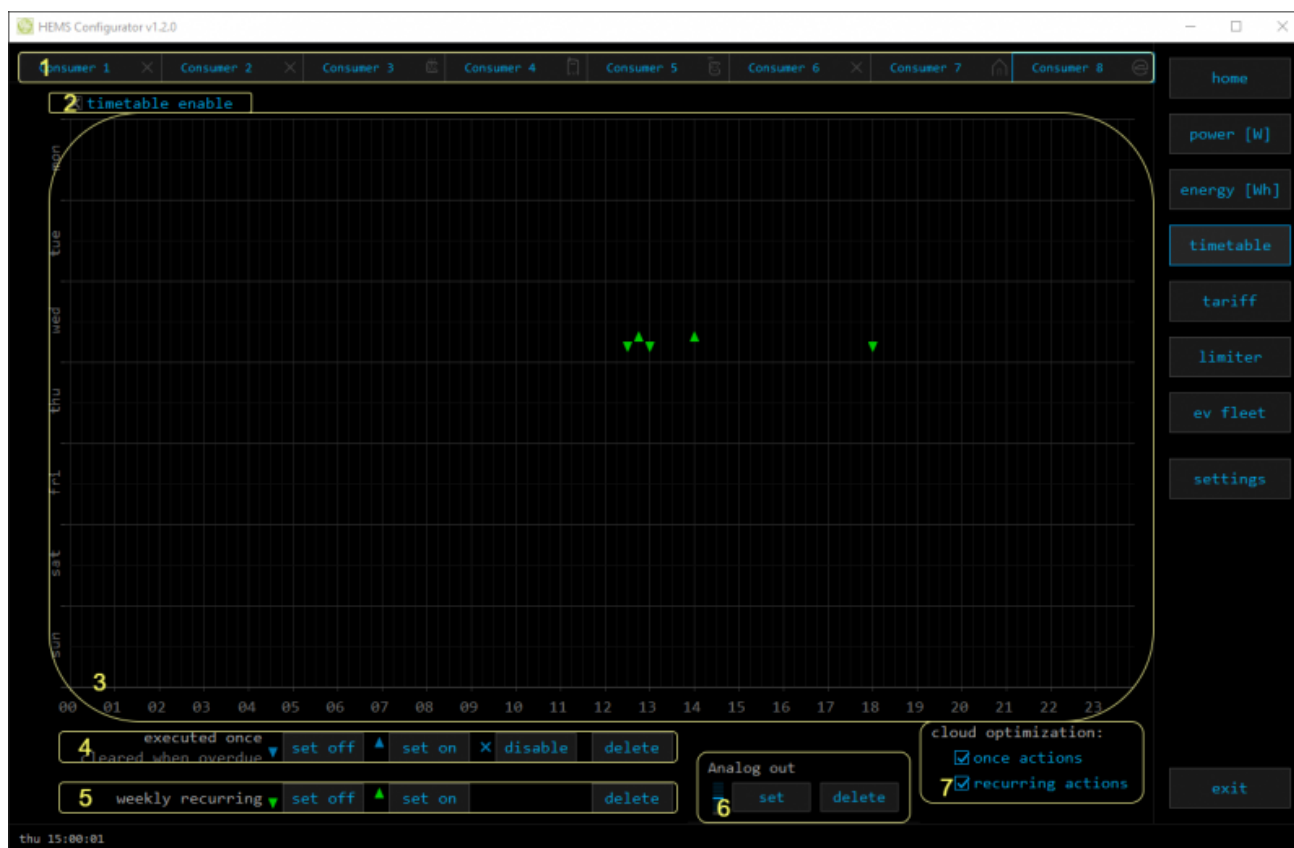
How sourced power is consumed by each consumer

2. Consumed power distribution

Who sources consumed power

timetable

Weekly timetable for managed consumers.



1. Managed load menu

Switch between managed loads

2. Enable checkbox

When un-checked timetable is not executed

3. Events grid

Events displayed in weekly grid (15 min resolution)

Click to select time and set event by clicking buttons below

4. Once actions (top priority timetable actions)

Actions are executed and then automatically cleared.

“Disable” action will just disable recurring action.

5. Recurring actions (low priority actions)

Actions are executed each week.

6. Analog out ¹

Action to set analog output. Analog actions are recurring.

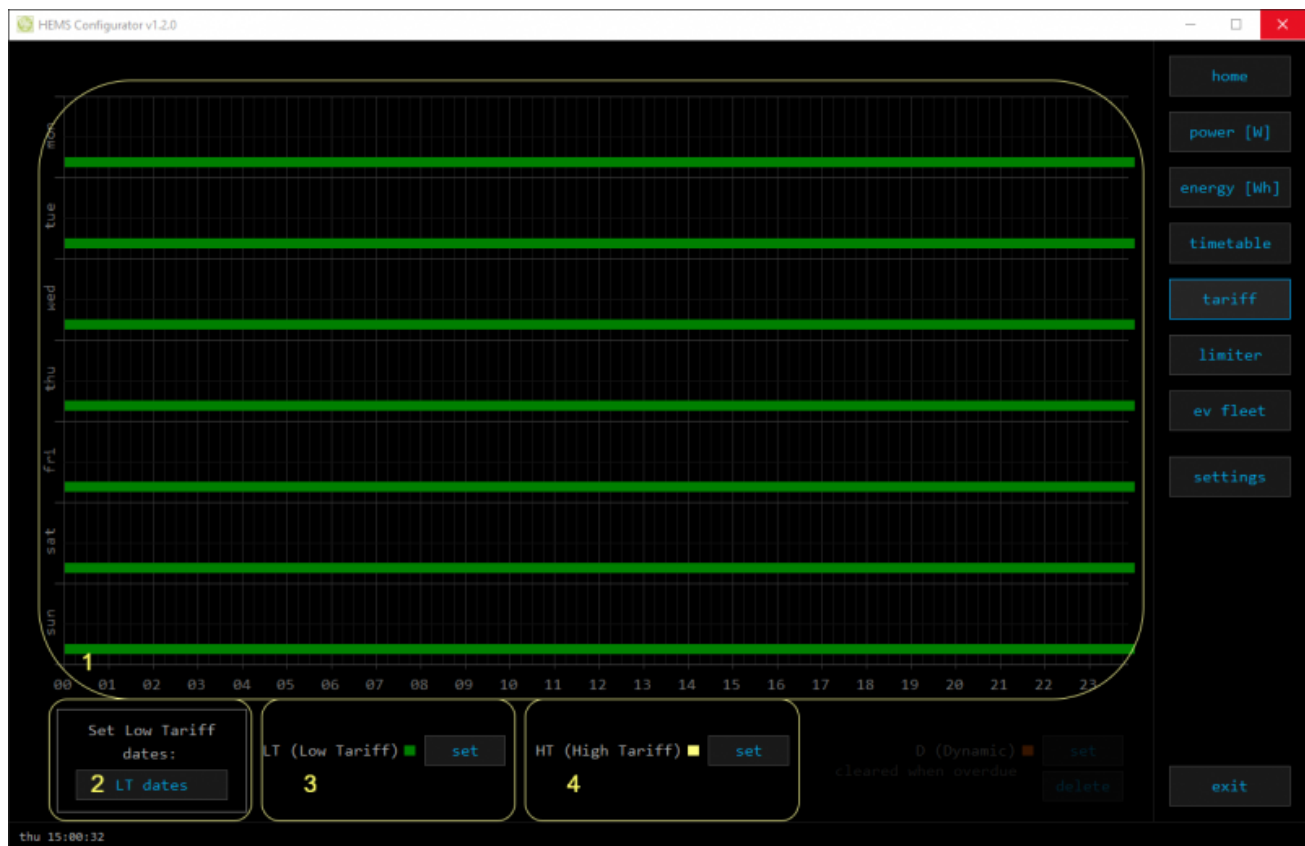
7. Cloud optimization

When enabled (checked) cloud optimization is enabled.

¹ only for Consumer 1

tariff

Weekly tariff timetable for grid energy per tariff distribution.



1. Tariff grid

Graphical weekly timetable with tariffs.

Click to select term, click-and-drag to select multiple terms.

2. Low tariff dates

Set low tariff dates for holidays.

3. Low tariff

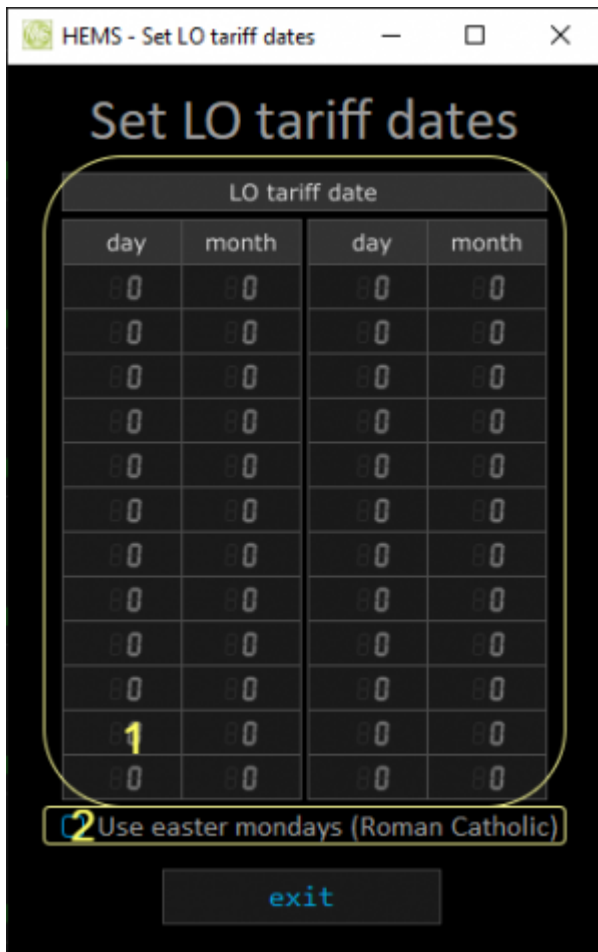
Set low tariff for selected terms.

4. High tariff

Set high tariff for selected terms.

lo tariff dates

Holiday dates when tariff is low



1. Date table

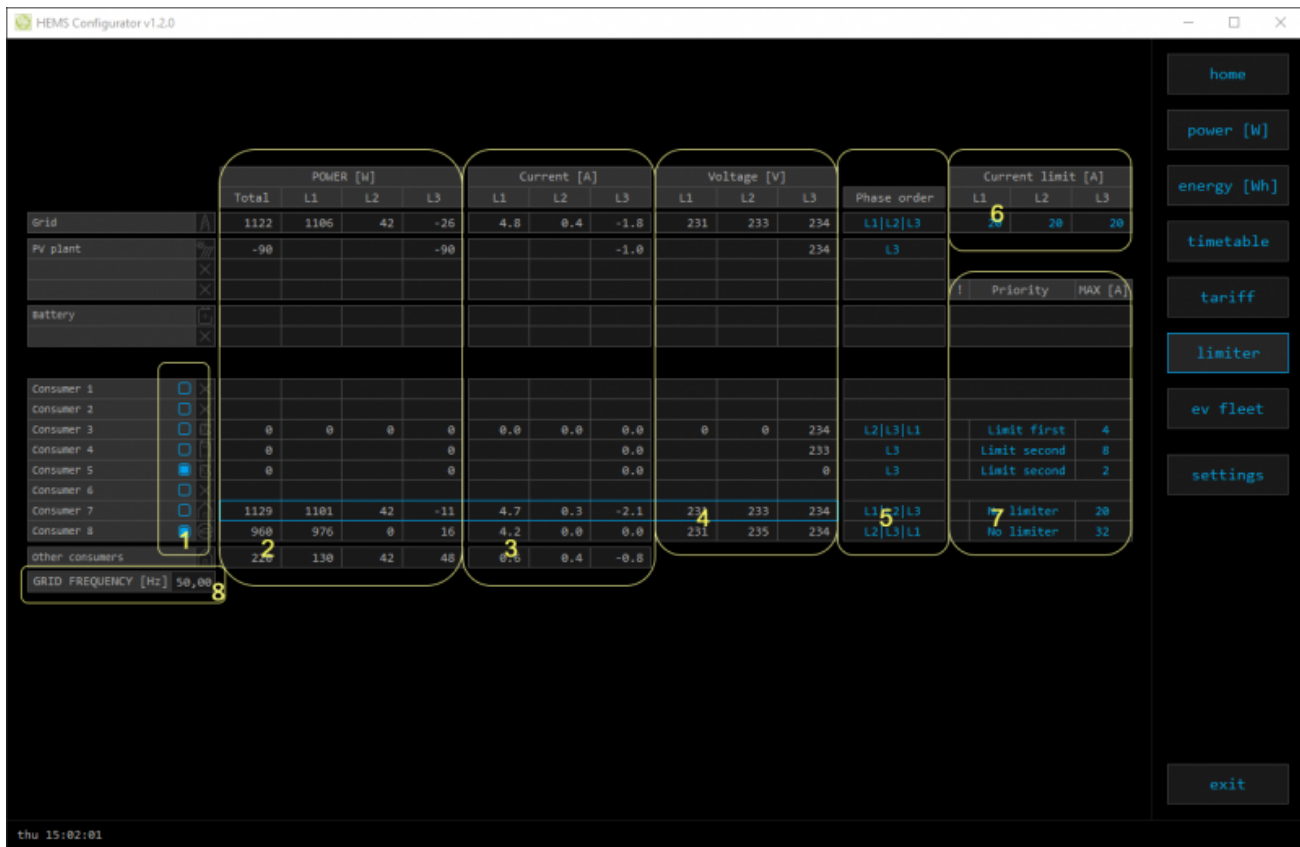
Up to 24 days when tariff is low on holiday



2. Use easter mondays

Use preprogrammed roman-catholic easter monday holidays

limiter

Overview and configuration of limiter



| | |
|--|--|
| 1. Consumer management | |
| Turn consumers on or off | |
| 2. Power | |
| Total power and power for each phase | |
| 3. Current | |
| Current for each phase | |
| 4. Voltage | |
| Voltage for each phase | |
| 5. Phase order | |
| Firstly set correct phase order for grid power sensor and then set for other powers sensors/devices. NOTE: changing grid phase order will NOT apply to phase order of other devices! | |
| 6. Current limit | |
| Current limit threshold for main grid fuse | |
| 7. Status, priority and current setpoint | |
|   | Yellow status when limiter is enabled and active. Green status when enabled and not active |
| Priority | Device priority group (no limiter, limit last, limit second, limit first) |
| Max [A] ¹ | Device expected current draw |
| 8. Grid frequency | |

Grid frequency measured on grid power meter sensor

¹ parameter is dynamically set for all devices, except for the EV charging stations

ev fleet

Overview and configuration of EV charging stations



1. EV charging station management

Turn EV station on or off

2. EV vehicle status

| | |
|--------|-----------------|
| GREY | Stand by |
| RED | Error |
| YELLOW | Charging paused |
| BLUE | Charging |
| GREEN | Charging ended |

3. EV charging station status

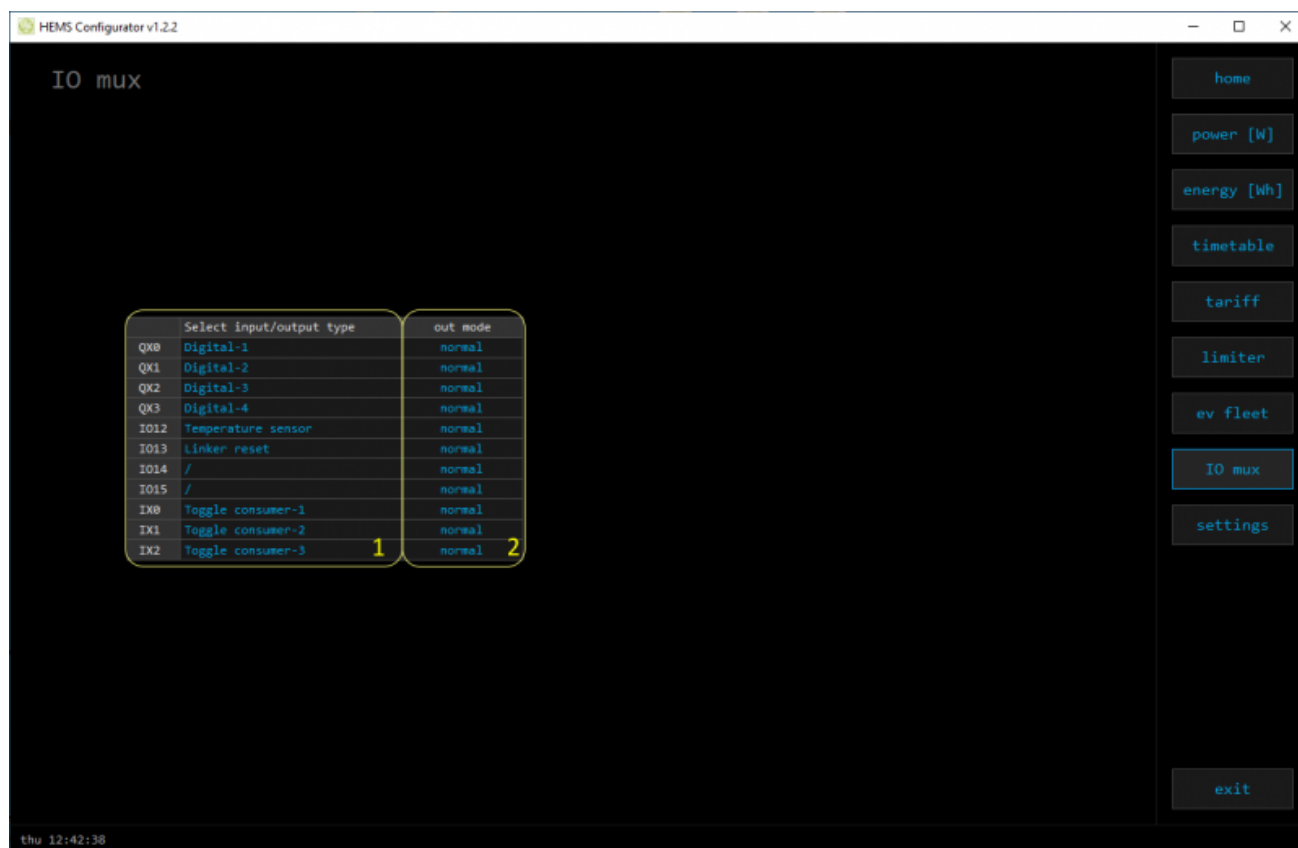
| | |
|-----------------|--------------------------------|
| Status | Status of EV charging station |
| Phase detection | Detection of utilized phases |
| EV [A] | EV charger max allowed current |
| MAX [A] | User set MAX charging current |

3. EV charging session

| | |
|----------|---------------------------|
| Power | Actual power draw |
| Energy | Energy delivered to EV |
| Duration | Session charging duration |

io mux

Overview and configuration of input/output ports IO mux



1. Select input/output type

On the left side there are defined MC controller (MC-230) ports to which could be assigned MC-230 functions (digital, linker reset, router reset, etc).

Default settings are for e.g. QX0 → digital 1 while digital 1 is defined for consumer 1 (settings page). It could be changed in a way to define new function role to QX0 port e.g. for linker reset

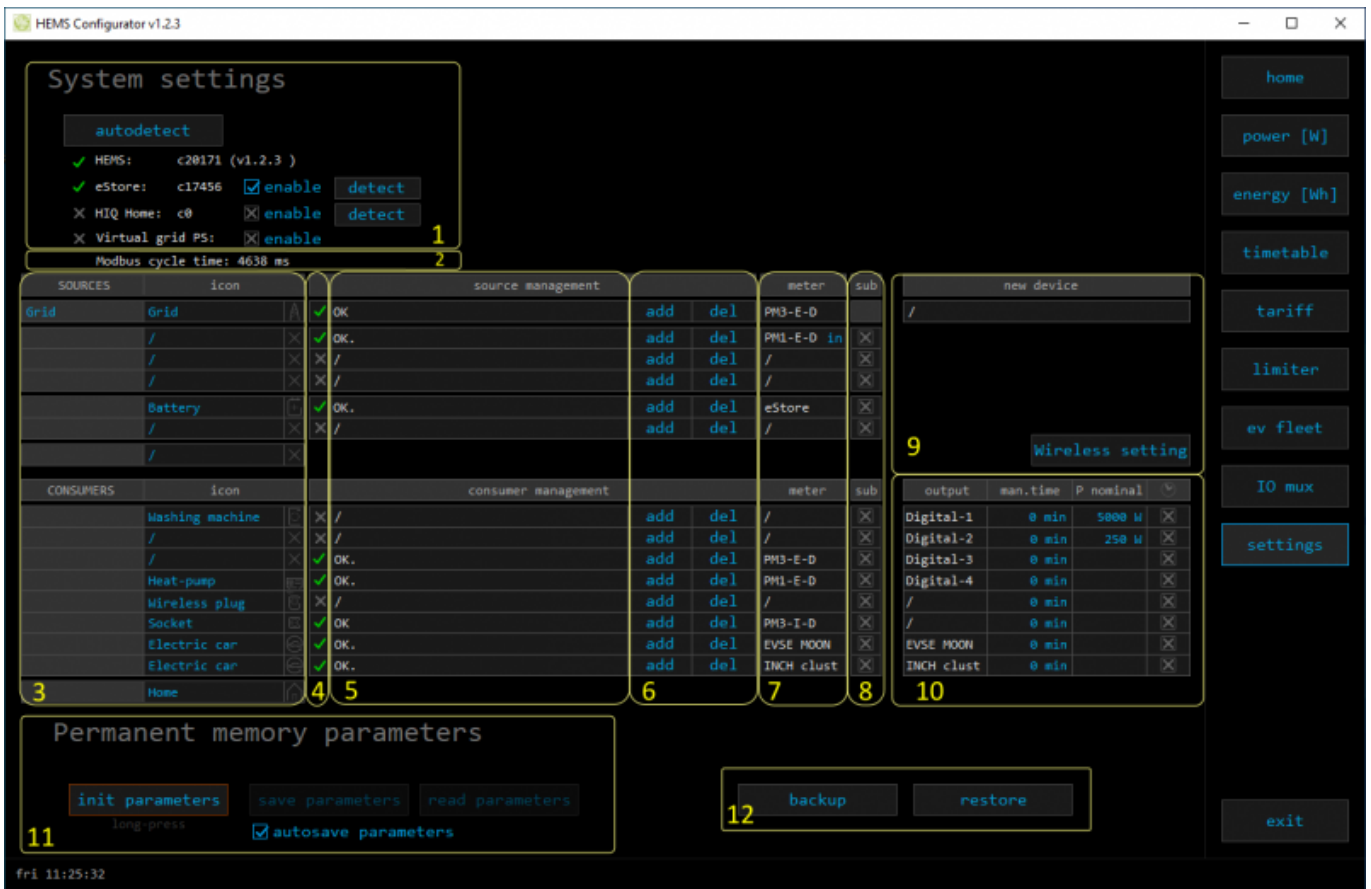
If it is selected Enable consumer at input IX0, IX1 or IX2 it means that dedicated consumer will be managed (ON/OFF) by input signal on IX0, IX1 or IX2. For example, thermostat signal is wired to IX0 port and via IO mux defined "Enable consumer 1" to IX0. While thermostat is active, it is consumer 1 active as well and vice versa.

Limitations: one temperature sensor is allowed, one consumer could be managed by one input only

2. out mode

Managed consumer input/output mode (normal or inverted)

settings



1. System settings

| | | |
|-----------------|------------|---|
| [autodetect] | | Click to find HEMS in local network |
| eStore | c..... | eStore serial number (automatically detected or can be entered manually). |
| | [] enable | When checked HEMS will read Grid, first plant and first Storage directly from eStore (so there is no need to duplicate power-sensor). |
| | [detect] | eStore address is cleared and new eStore can be detected. |
| HIQ Home | c..... | HIQ Home serial number (automatically detected or can be entered manually). |
| | [] enable | When checked HEMS will read Grid power and energy from HIQ Home (so there is no need to duplicate power-sensor). |
| | [detect] | HIQ Home address is cleared so new can be detected. |
| Virtual grid PS | [] enable | Check if system is without main grid power meter. Energy, power and currents are calculated from other power meters. |

2. Modbus cycle time

| | |
|-------------------|---|
| Modbus cycle time | Time in ms for modbus communication to complete reading of all connected devices. |
|-------------------|---|

3. Sources and Consumers settings table

| | |
|---------|-------------|
| SOURCES | Source name |
|---------|-------------|

| | | |
|--|--|--|
| icon | Source icon | |
| 4. Device status | | |
| Status | Status OK, Warning, Error, Detected | |
| 5. Device message | | |
| source and consumer management | Source or consumer power-sensor management | |
| | message | Messages regarding source or consumer power-sensor |
| 6. Device configuration | | |
| Configuration | add | Associate new power-sensor to source or consumer |
| | del | Disassociate power-sensor from source or consumer & configure it as new power-sensor |
| 7. Device type | | |
| meter | Source or consumer power-sensor type | |
| configuration | in/ex | Power plant connection ¹ |
| 8. Submeter option | | |
| sub | Check if this power meter or device is not part of internal circuit. Energy division for this device is ignored and outlined in blue border. | |
| 9. Wireless settings | | |
| new device | Power-sensor configured as new one detected or wireless module configuration ² | |
| Wireless setting | Setting up wireless modules: pairing, adding and delete the wireless modules and setting repeater level | |
| 10. Device output | | |
| output | Select consumer output type | |
| | <<>> | Set repeater level ³ |
| man. time | Managed consumer manual override timer | |
| P nominal | Enter consumer's power in Watts. It is disabled if there is assigned power sensor to this consumer. | |
| clock | Enable timetable | |
| 11. Permanent memory parameters | | |
| [init parameters] | Init all parameters to default values | |
| [save parameters] | Save all parameters to permanent memory | |
| [read parameters] | Read all parameters from permanent memory | |
| [] autosave parameters | Parameters will be automatically saved to permanent memory in 15 minutes after last parameter change | |
| 12. Backup / Restore to PC | | |
| [backup] | Backup all parameters to PC ⁴ | |
| [restore] | Restore all parameters from PC backup ⁴ | |

¹ only for the first power plant

² wireless setting must be enabled

³ only for wireless modules and wireless setting must be enabled

⁴ older versions of backup files may be used. Any unsuccessfully backed or restored parameters will be displayed but operation will end successfully if you use **continue**.

Commissioning

Strictly follow [Safety instructions](#)!

Mounting

Mount the main controller MC-230, IOT-L2-2 linker, PM1-E-D, PM3-E-D and PM3-I-D power sensors, fuses, power relays, and push-buttons to a suitable location.

Wiring

Wire all elements **except** communication with **PM1-E-D** and **PM3-E-D sensors**.

Connect the MC-230 and IOT-L2-2 to the home LAN or use LTE 4G modem.

Configuration

Install and run [HEMS Configurator](#) on your PC.

Go to the “**settings**” page.

With the “**autodetect**” button, the application will locate the controller in the local network.

Enter **names**, select **icons** for all sources and consumers.

Power-sensor adding

Note: adding is supported one by one.

One-phase sensor **PM1-E-D**

- **Connect** communication bus (to only one power-sensor)
- In HEMS Configurator power-sensor should appear as a “new device”
- Press and hold the push-button on the power-sensor until it appears **-Set-** on display
- In HEMS Configurator click on the “ **add**” button next to the source or consumer that the sensor is measuring
- Connect communication bus to the next power-sensor and repeat procedure

Three-phase sensor **PM3-E-D**

- **Connect** communication bus (to only one power-sensor)

- In HEMS Configurator power-sensor should appear as a “new device”
- Click on the “ **add**” button next to the source or consumer that the sensor is measuring
- Connect communication bus to the next power-sensor and repeat procedure

Three-phase sensor PM3-I-D

- Communication bus with the power-sensor should already be connected
- Press and hold the push-button on the sensor until it appears “**CO nF Add**” on display
- In HEMS Configurator counter should appear as a “new device”
- Click on the “**add**” button next to the device that the sensor is measuring

Without grid power sensor

- **Virtual grid PS** is an option if no grid meter is used. Power, current and energy will be calculated from other power sensors.

Power-sensor removing

One-phase sensors PM1-E-D

- Make sure the “new device” is empty
- Press the button on power-sensor until **-Set-** appears on the display
- In HEMS Configurator press “**del**” button next to the sensor
- After a few seconds, the sensor should appear as the “new device”
- If desired, the sensor can be removed or it can be assigned to another device

Three-phase power-sensor

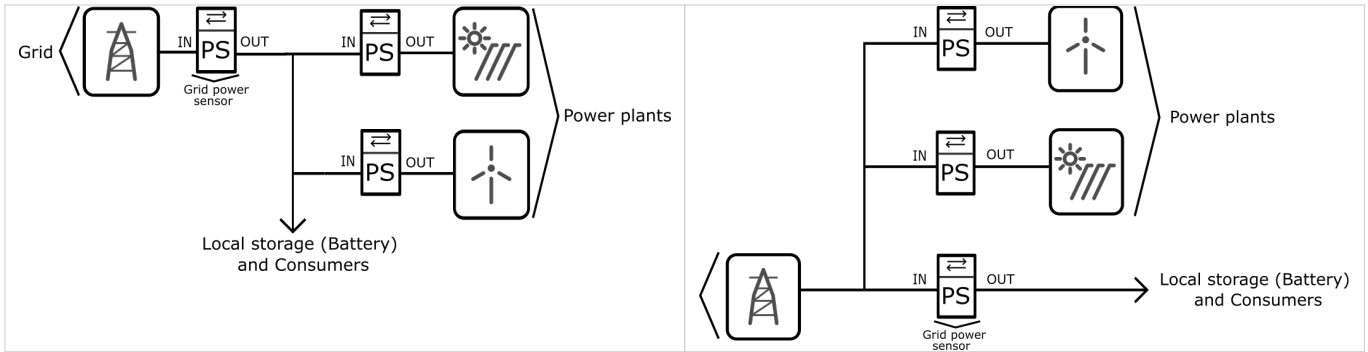
- Make sure the “new device” is empty
- In HEMS Configurator press “**del**” button next to the sensor
- After a few seconds, the sensor should appear as the “new device”
- If desired, the sensor can be removed or it can be assigned to another device

Power plant connection

The power plants can be connected to the grid in two ways:

serial with grid power sensor

parallel with grid power sensor



When configuring the power plant, select

- **in**: serial (**internal**) with grid power sensor
- **ex**: parallel (**external**) with grid power sensor

The power plants are configured as internal by default.

Wireless setting

Enable the wireless setting to add, delete, or set repeater level of wireless modules.

Wireless module adding

Temperature and humidity sensor

- Launch the pairing by the press on the learning button on the back of the device.
- The wireless sensor is added in the HEMS Configurator.

Micro smart plug and Smart plug

- Launch the pairing by the press on the button for 2 seconds until the LED becomes red. Release the button, the LED will then glow in red
- To confirm that the pairing is OK, the LED will blink in green
- In the HEMS Configurator module should appear as a “new device”
- Click on the “ **add** ” button next to the consumer that is connected to the module

Relay switch-1 channel

- Launch the pairing by doing 3 consecutive presses on the relay switch button. The LED blinks red
- To confirm that the pairing is OK, the LED will blink green twice
- The HEMS Configurator module should appear as a “new device”
- Click on the “ **add** ” button next to the consumer that is connected to the module

Relay switch-2 channel

- Launch the pairing by doing 3 consecutive presses on the relay switch button. The LED blinks red
- To confirm that the pairing is OK, the LED will blink green twice
- In the HEMS Configurator the module first channel should appear as a “new device”
- Click on the “ **add**” button next to the consumer that is connected to the modules first channel
- In the HEMS Configurator the module second channel should appear as a “new device”
- Click on the “ **add**” button next to the consumer that is connected to the modules second channel
- Before you pair a new device both channels must be added to the consumers

Wireless module removing

Micro smart plug, smart plug and relay switch-1 channel

- In the HEMS Configurator press “**del**” button next to the consumer connected to the module you want to remove
- After a few seconds the module is removed

Relay switch-2 channel

- In the HEMS Configurator press “**del**” button next to the consumer connected to the channel module you want to remove
- After a few seconds, deleted channel of a module should appear as a “new device”
- We can remove the module by deleting the second channel or the deleted channel can be assigned to another consumer

Setting repeater level

When enabling repeater mode, the wireless module can repeat a message not addressed to him, and increase range by creating network between all wireless devices.

The repeater can be configured to level 0 (off), level 1 (one hop), or level 2 (two hops):

- **Level 0:** gateway — module.
- **Level 1:** gateway — repeater — module.
- **Level 2:** gateway — repeater — repeater — module¹.

By default, the repeater mode is disabled (level 0). If you want to change the repeater mode press icon «» in the **output** in **Consumers settings table**.

¹ Both repeaters must be set to level 2.

Setting device management features

For each consumer we can set:

- **sub**: mark device as a submeter if device is not part of internal network and/or is not connected as intended by default. Energy division for this device will be ignored.
- **man. time**: the time is in minutes for the manual override. It serves to ensure that the user can ensure a minimum validity of the manual switchover.
- **timetable checkbox**: enable or disable the timetable for each device.

Enable power-sensor from compatible systems

HEMS will automatically detect compatible

- battery systems **eStore** and
- home automation systems **HIQ Home**

which are in the same local network.

Only the first system is detected, if there is more than one it is necessary to enter the NAD number of the desired system manually.

if **eStore** is **enabled**, HEMS will read:

- **grid** power-sensor
- power-sensor for the **first PV Plant** and
- power-sensor of the **first storage** system

From the **enabled HIQ Home** system, HEMS will automatically read the **grid** power-sensor.

Internet access

HEMS is connected to the internet via IOT-L2-2 linker.

Digital output

HEMS is supporting up to 8 digital outputs on MC controller (QX0,QX1,QX2,QX3,IO12,IO13,IO14 and IO15). How to set?

- using [HEMS configurator](#) on settings page, define digital output for desired consumer (e.g. Digital-2),
- on IO MUX page assign digital to output port (e.g. IO15 → Digital 2): in this case consumer 2 (Digital-2) is assigned to IO15 port and enables ON/OFF functionality on it.

Note: if it is set **digital** for consumer without assigned power sensor, it is possible to define **P nominal** power instead. It represents fixed power of consumer and while in operating mode HEMS calculates consumed energy.

Analog output

On port IO14 is supported analog output 0-10V, while on IO15 is PWM signal with frequency of 1kHz. Using analog load is possible for consumer 1 only! How to set ([HEMS wiring](#))?

- using [HEMS configurator](#) on settings page, define analog output for consumer 1,
- on IO MUX page define IO14 and/or IO15 port for Analog/PWM output,
- on home screen define analog value 0-100% (long-press) for consumer1 and turn it ON/OFF with short-press.

Note: if it is set **analog** for consumer without assigned power sensor, it is possible to define **P nominal** power instead. It represents fixed power of consumer and while in operating mode HEMS calculates consumed energy.

IO mux

IO mux page within [HEMS configurator](#) allows setting of input/output types for ports on controller:

- e.g. if it is set QX2 → Router reset, it means that when conditions are met (for reset), QX2 port will change state to turn OFF router,
- or if it is set QX2 → Digital-2, it means that digital2 (consumer 2) is assigned to QX2 and enables switching ON/OFF on it,
- for input ports IX0,IX1 and IX2 it is possible to set toggle and enable functionality ([HEMS wiring](#)). it means that dedicated consumer will be directly managed (ON/OFF) by input signal on IX0,IX1 or IX2.

Permanent memory

Saving parameters to the permanent memory, after changing the settings, is necessary since at startup HEMS always reads parameters from the permanent memory.

Backup / restore to PC

HEMS Configurator allows you to backup and restores all parameters to PC.

Phase alignment and limiter settings

Under limiter page set correct phase order to align phases of each device. Set correct main fuse limit [A] to protect the main grid fuse from over current. Check devices that can be managed by limiter and set correct limiter priority. Choose from no limiter, limit last, limit second, limit first. Max expected device current consumption is dynamically calculated and does not need to be set. In case device is an EV charging station, manually set max current for this device.

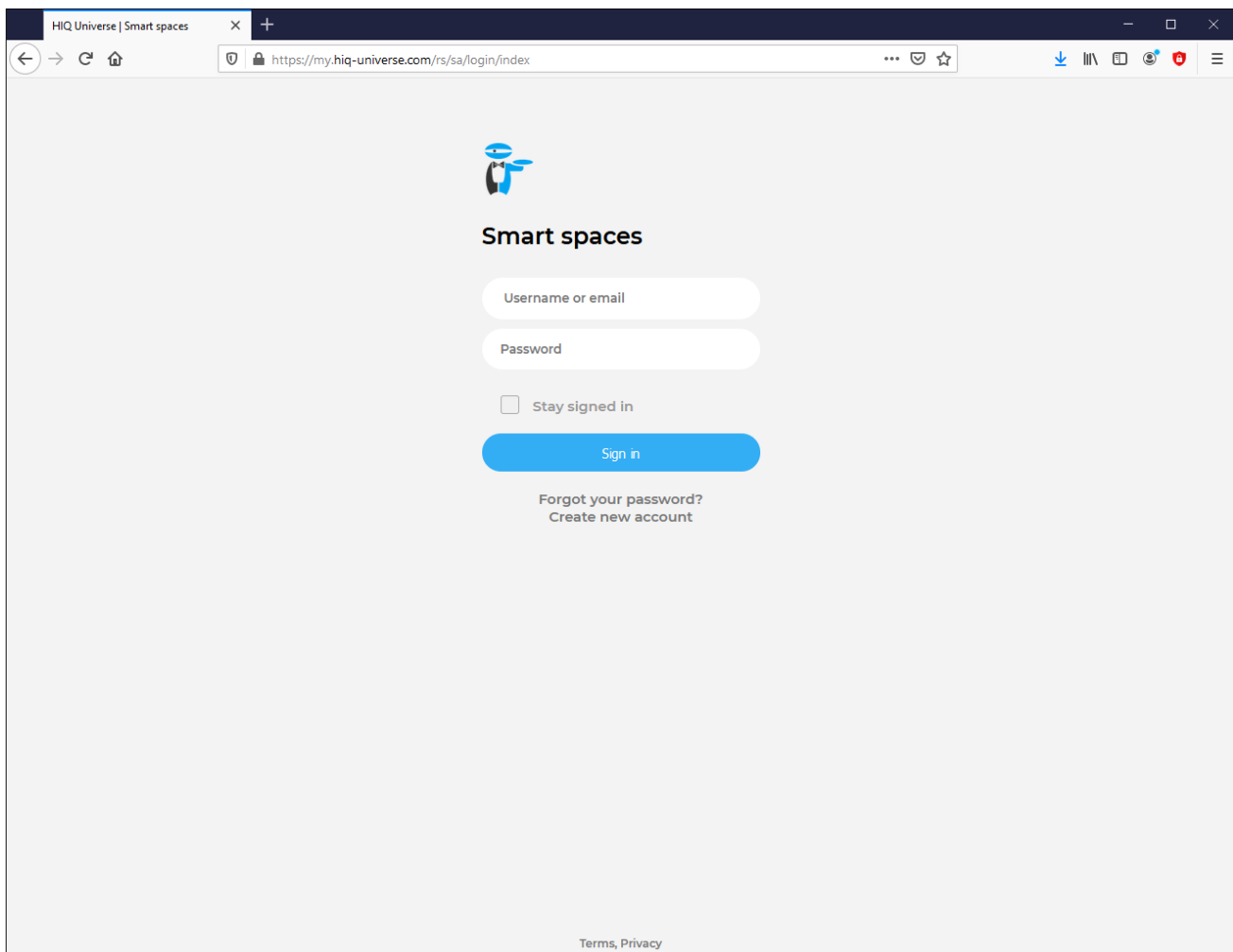
HIQ UNIVERSE

HIQ Universe is a cloud service that enables:

- An overview of current power consumption
- An overview of the history of electrical power and energy consumption and production
- An overview and control of connected devices

Access point: <https://my.hiq-universe.com>

HIQ Universe Log-in



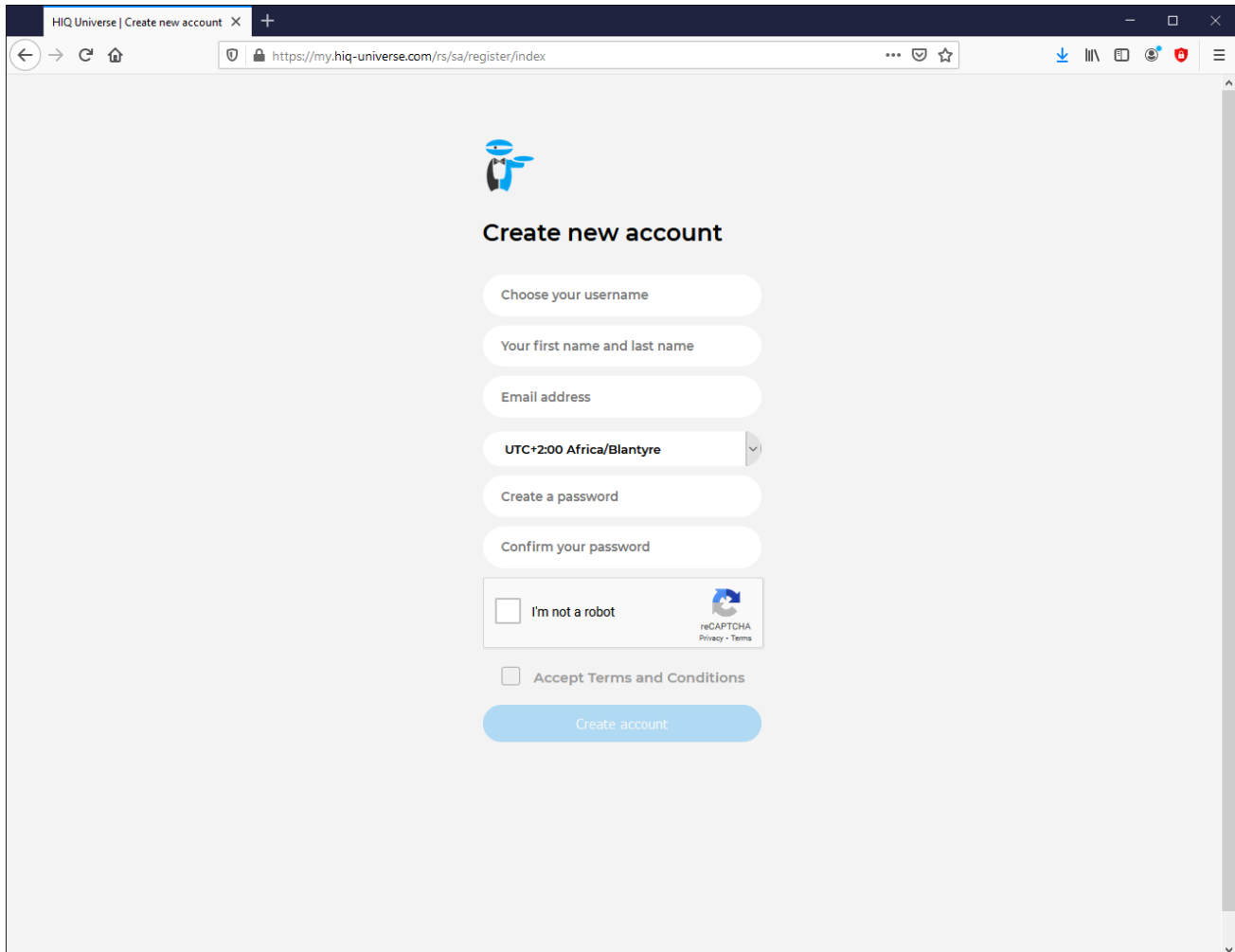
The screenshot shows a web browser window with the URL <https://my.hiq-universe.com/rs/sa/login/index>. The page content includes a logo of a person with a speech bubble, the heading "Smart spaces", and a login form. The form has two input fields: "Username or email" and "Password". Below these is a checkbox labeled "Stay signed in" and a blue "Sign in" button. Underneath the button are two links: "Forgot your password?" and "Create new account". At the bottom of the page, there are links for "Terms, Privacy".

Log in with your username or email and password to see your [HIQ Universe subscription dashboard](#).

To reset forgotten password click on "[Forgot your password?](#)"

To create new account click on "[Create new account](#)".

Create HIQ Universe account



In the appropriate fields, enter:

- **Username**
- **First and Last name**
- **E-mail address**
- **Timezone**
- **Password**

Click on "I'm not a robot"

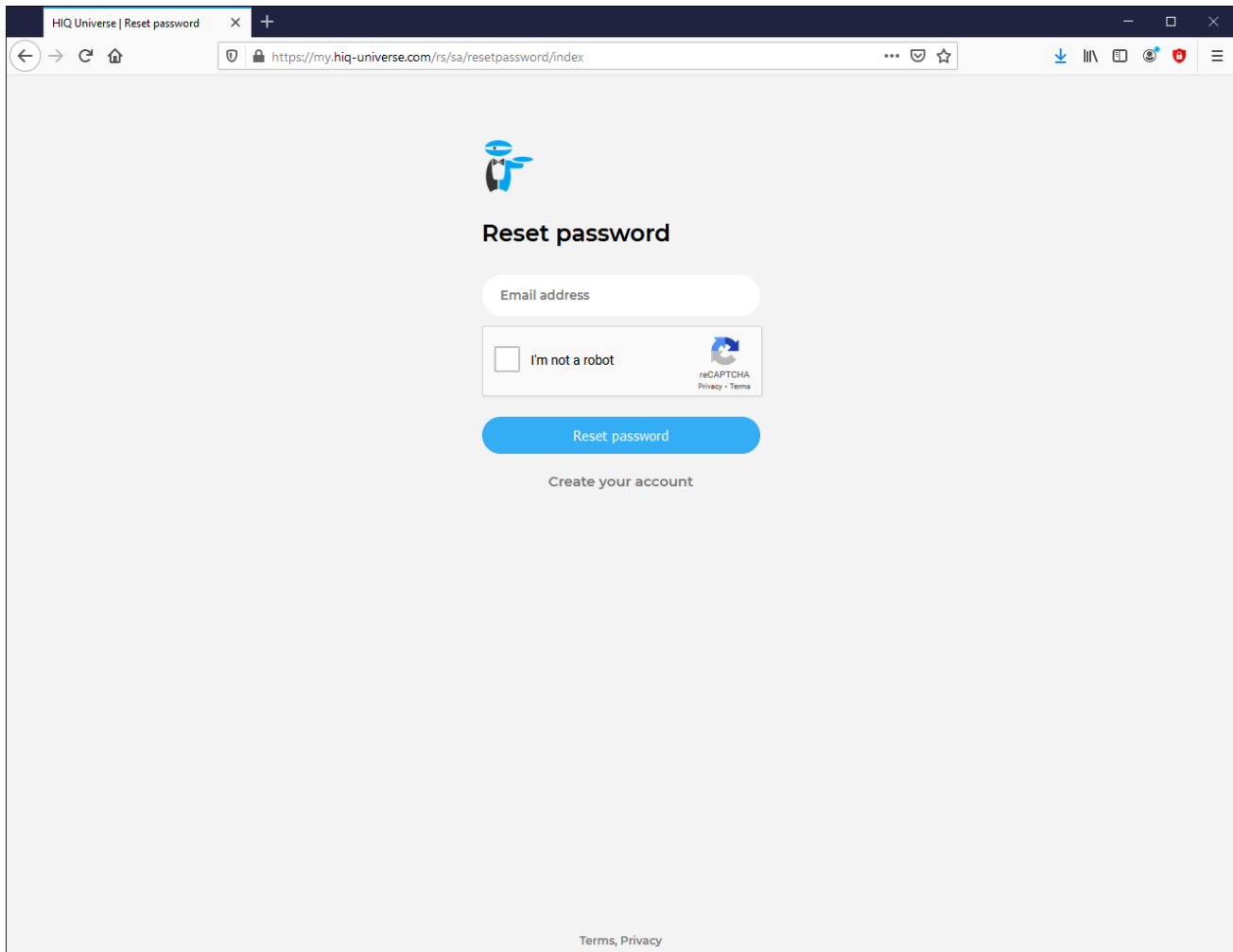
Accept Terms and Conditions.

Click on Create account.

A confirmation link will be sent to your email address.

Proceed to ["HIQ Universe Log-in"](#) screen.

Reset forgotten password



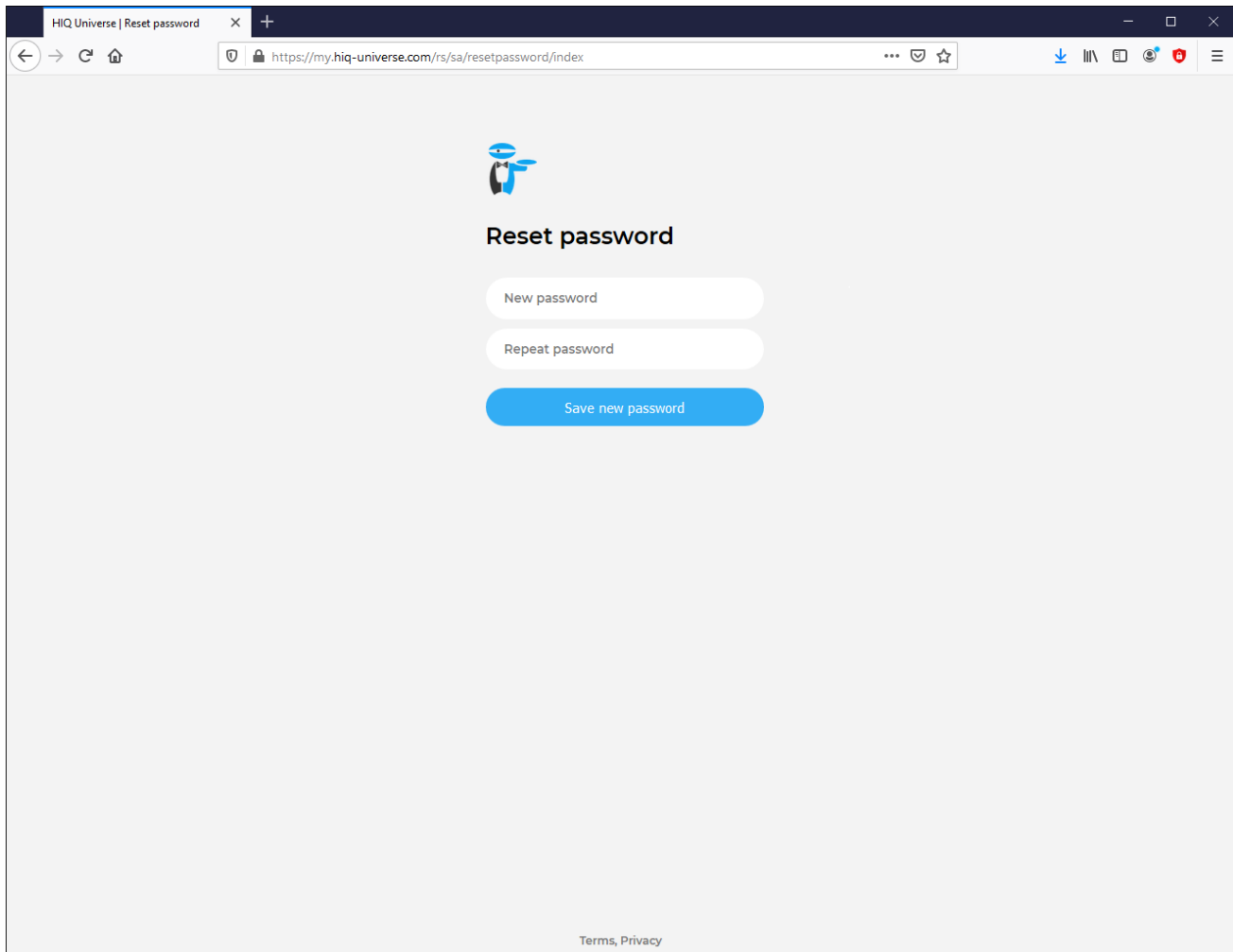
The screenshot shows a web browser window with the address bar displaying "https://my.hiq-universe.com/rs/sa/resetpassword/index". The page title is "HIQ Universe | Reset password". The main content area features a blue robot icon at the top, followed by the heading "Reset password". Below the heading is a white input field labeled "Email address". Underneath the input field is a reCAPTCHA widget with the text "I'm not a robot" and a checkbox. To the right of the checkbox is the reCAPTCHA logo and the text "reCAPTCHA Privacy - Terms". Below the reCAPTCHA widget is a blue button labeled "Reset password". At the bottom of the form area is a link that says "Create your account". At the very bottom of the page, there is a small link for "Terms, Privacy".

In the appropriate field, enter email address.

Click on "I'm not a robot"

Click on "Reset password".

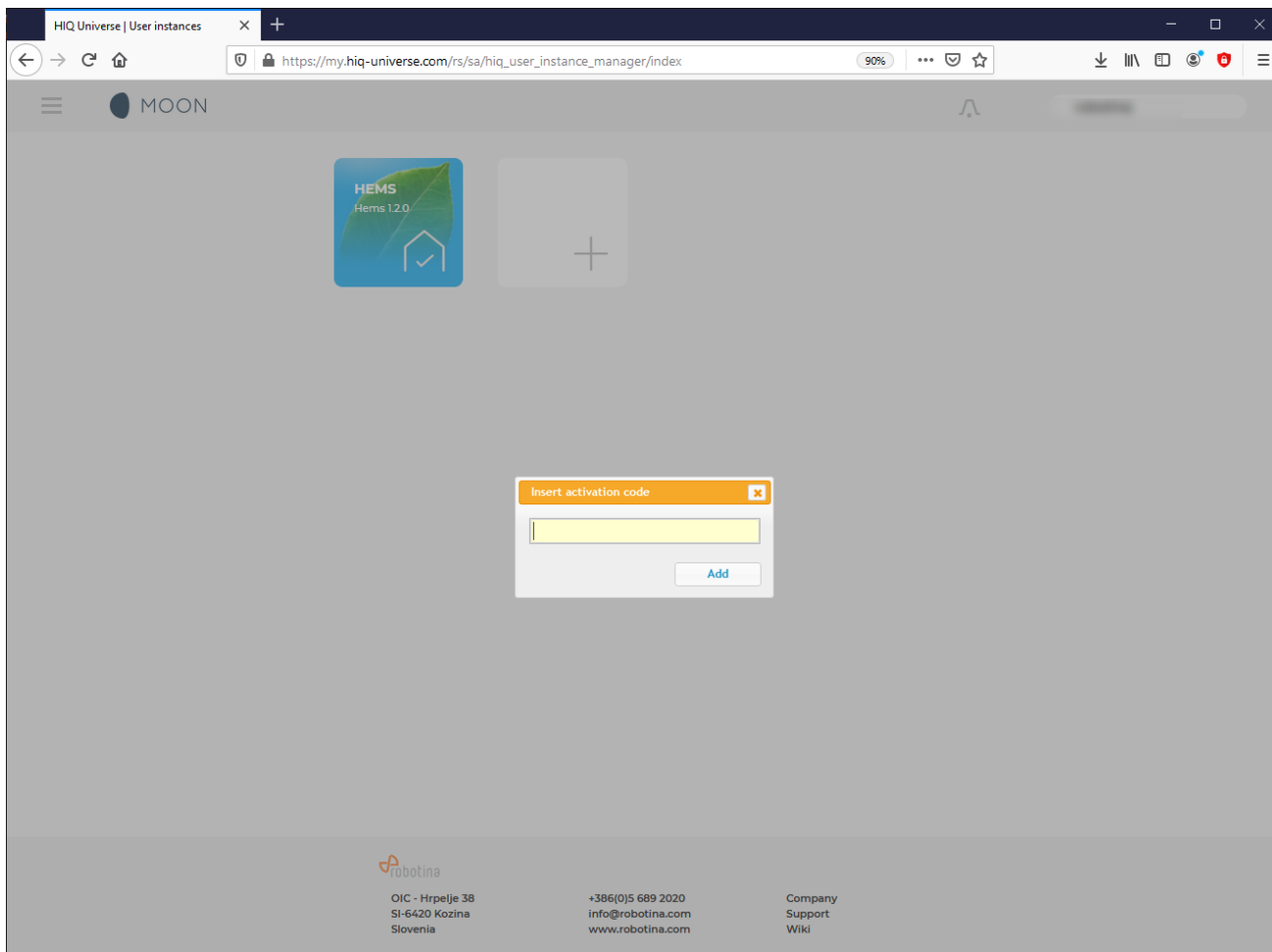
You will receive email with password reset link.

A screenshot of a web browser displaying the "Reset password" page for HIQ Universe. The browser's address bar shows the URL "https://my.hiq-universe.com/rs/sa/resetpassword/index". The page features a blue robot icon at the top center, followed by the heading "Reset password". Below the heading are two input fields: "New password" and "Repeat password". A blue button labeled "Save new password" is positioned below the input fields. At the bottom center of the page, there is a link for "Terms, Privacy".

Enter new password and click on "Save new password".

Proceed to ["HIQ Universe Log-in"](#) screen.

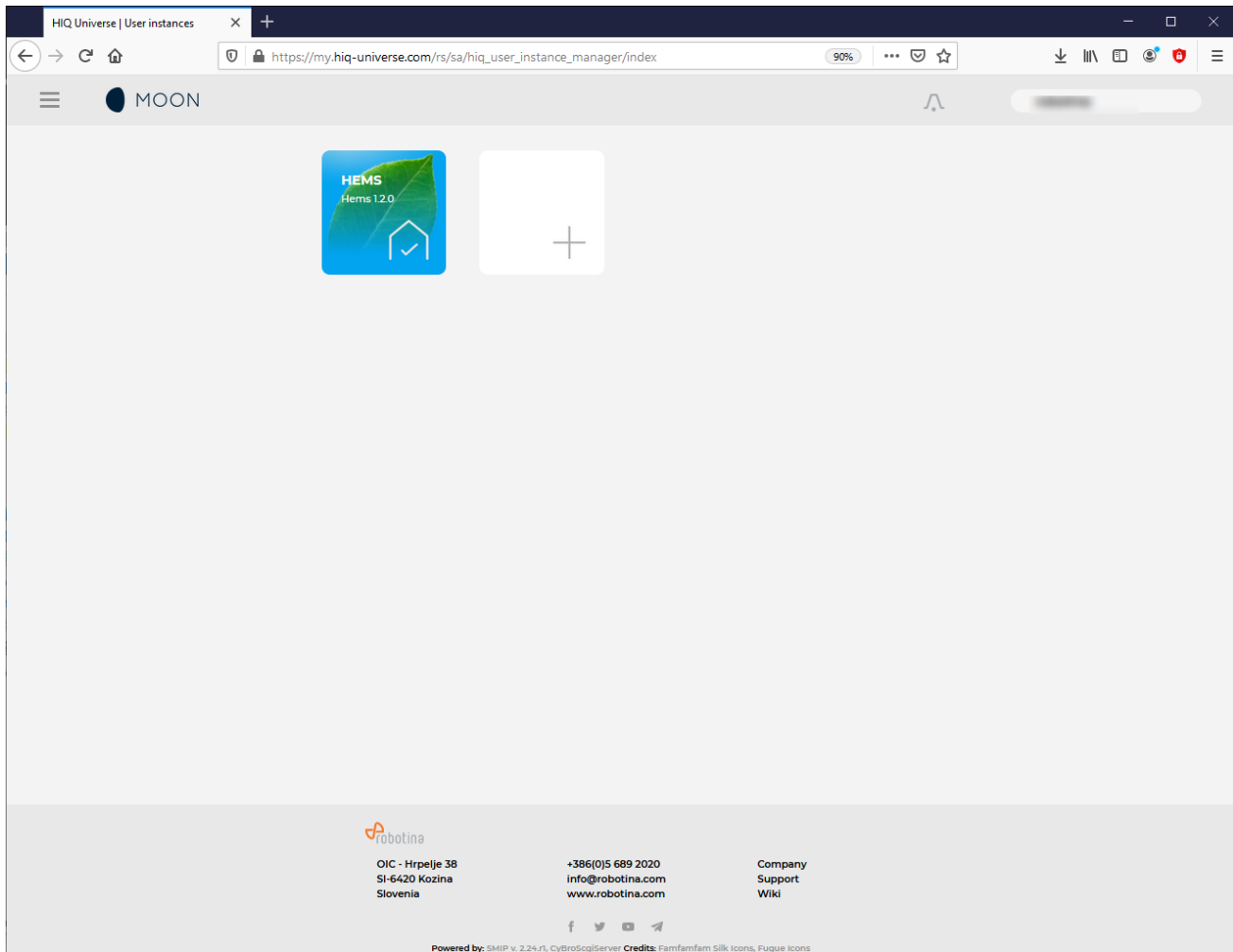
Add HEMS controller



Enter HEMS activation code from “HEMS Quick Set-Up Guide” found in HEMS box.



HIQ Universe subscription dashboard



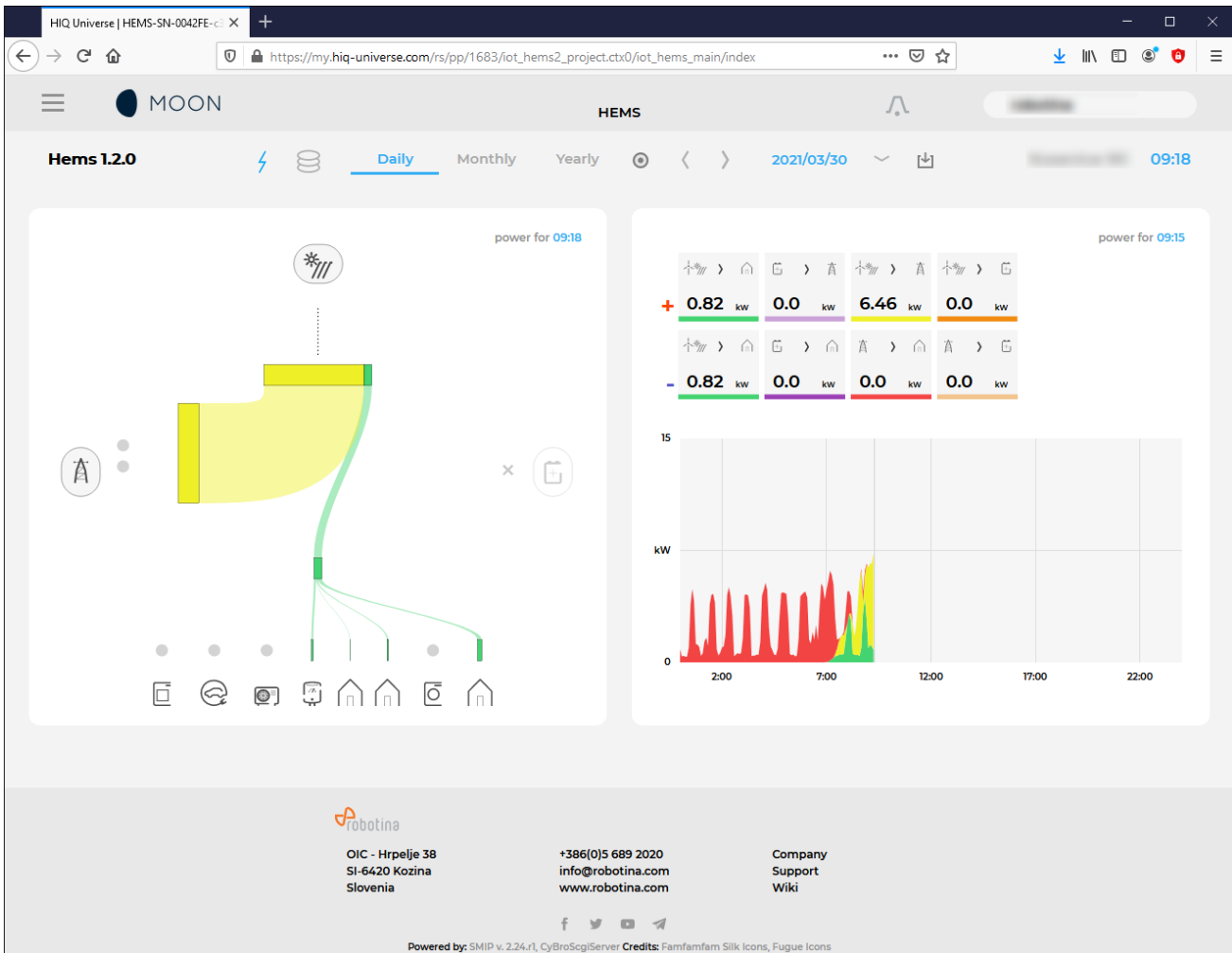
You will see tiles for all your subscribed HIQ Universe devices and services.

Go to [Main HEMS view](#) by clicking on HEMS tile or

add [new HEMS device](#) by clicking on blank tile with + sign.

"[User profile set-up](#)" is invoked by clicking on user name on top right.

Main HEMS view



Main HEMS page consists of 3 sections:

- "Title and view selection row" at the top
- "Power flow chart" on left side
- "Power and energy time-plot" on right

Title and view selection row

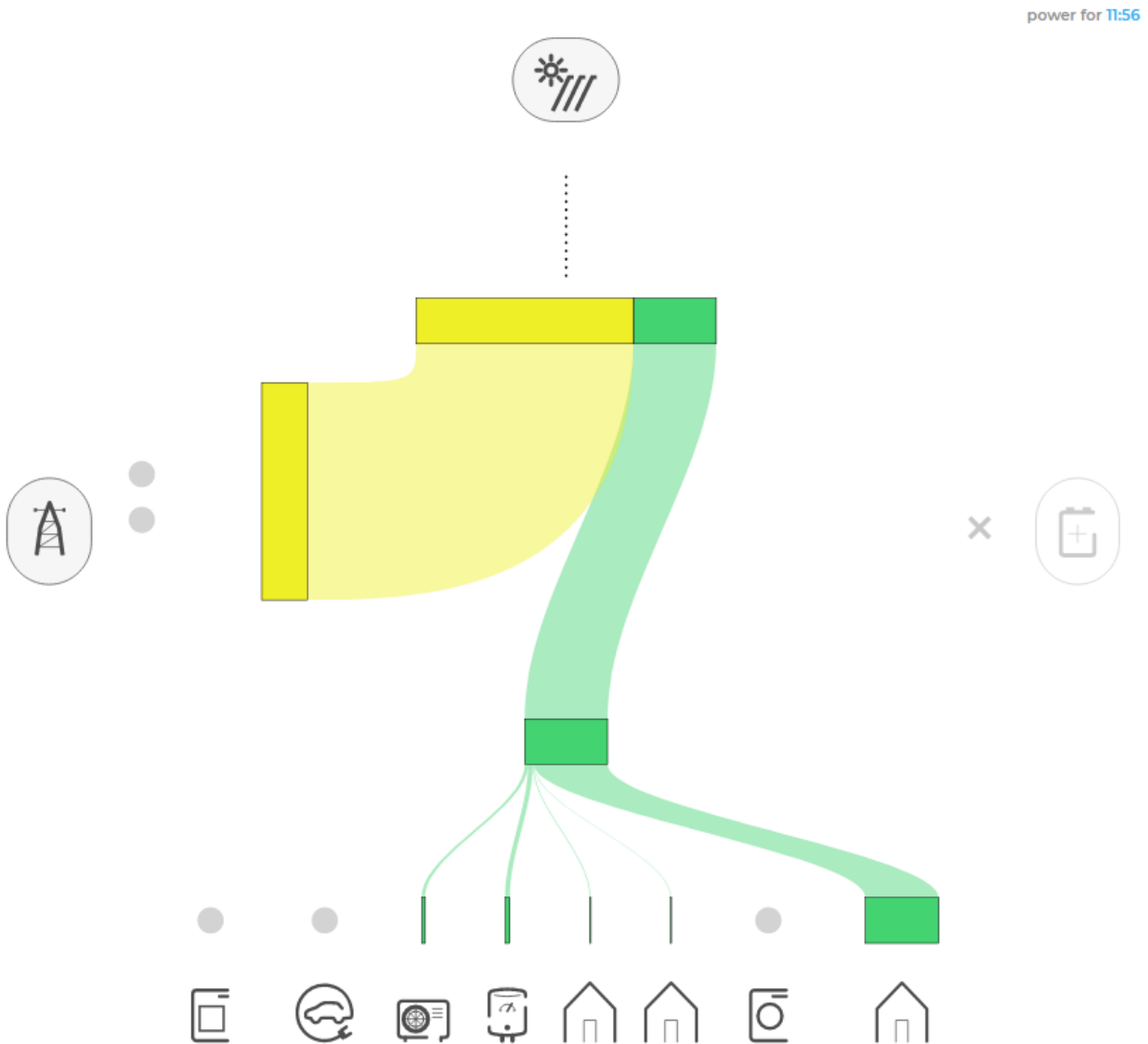


From the left:

- **Application name** → HEMS name
- **Lighting icon** → time-plot displays energy or power
- **Currency icon** → time-plot overlays currency graph
- **Daily** → time-plot displays power
- **Monthly** → time-plot displays energy per day
- **Yearly** → time-plot displays energy par month
- **Target icon** → time-plot go to now
- **<** → time-plot goes to previous term
- **>** → time-plot goes to next term
- **Date** → Select term for time-plot

- **Download icon** → Download “csv” data for displayed time-plot period
- **Location** of HEMS installation
- **Time** at HEMS installation site.

Power flow chart

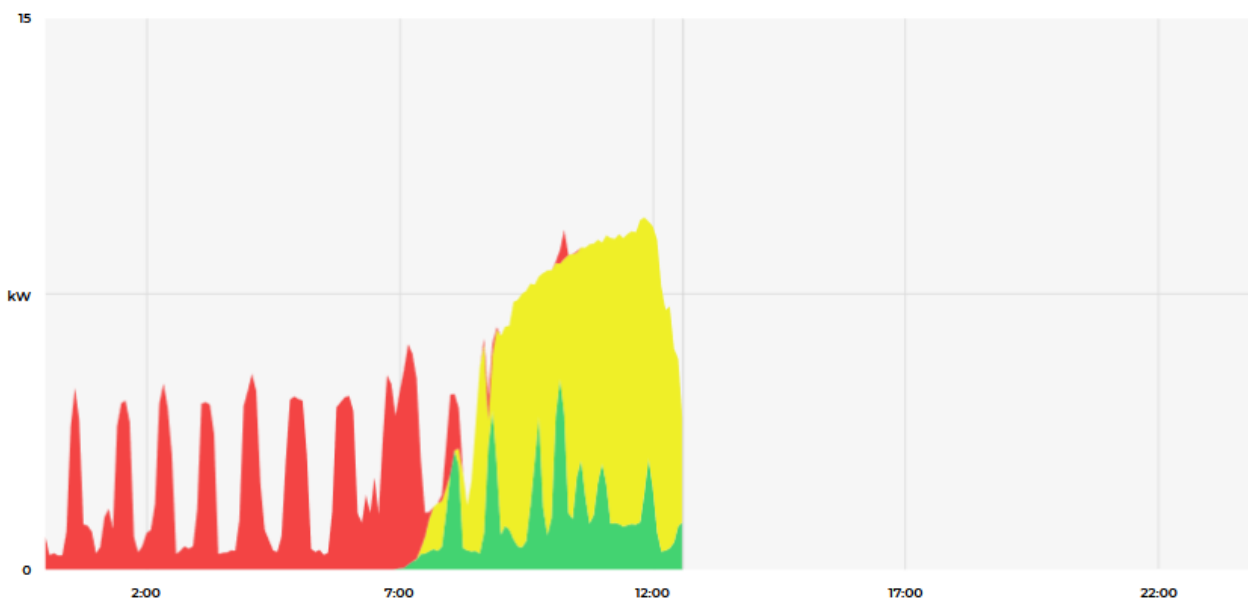
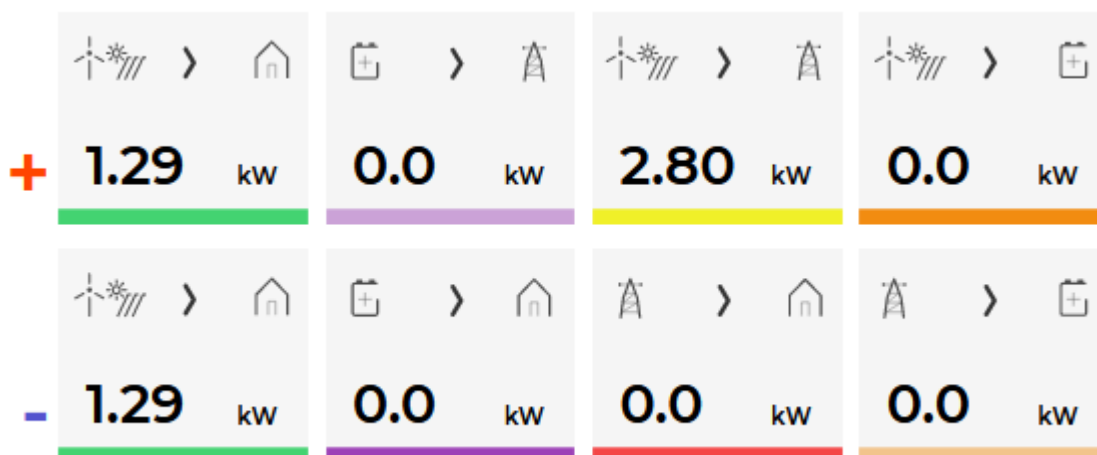


Displays actual power flow with:

- **Power sources** (Local PV, wind, co-generation plants) at top
- **Grid** (divided by tariffs) on left side
- **Storage** (battery) systems on right side and
- **Consumers** on bottom.

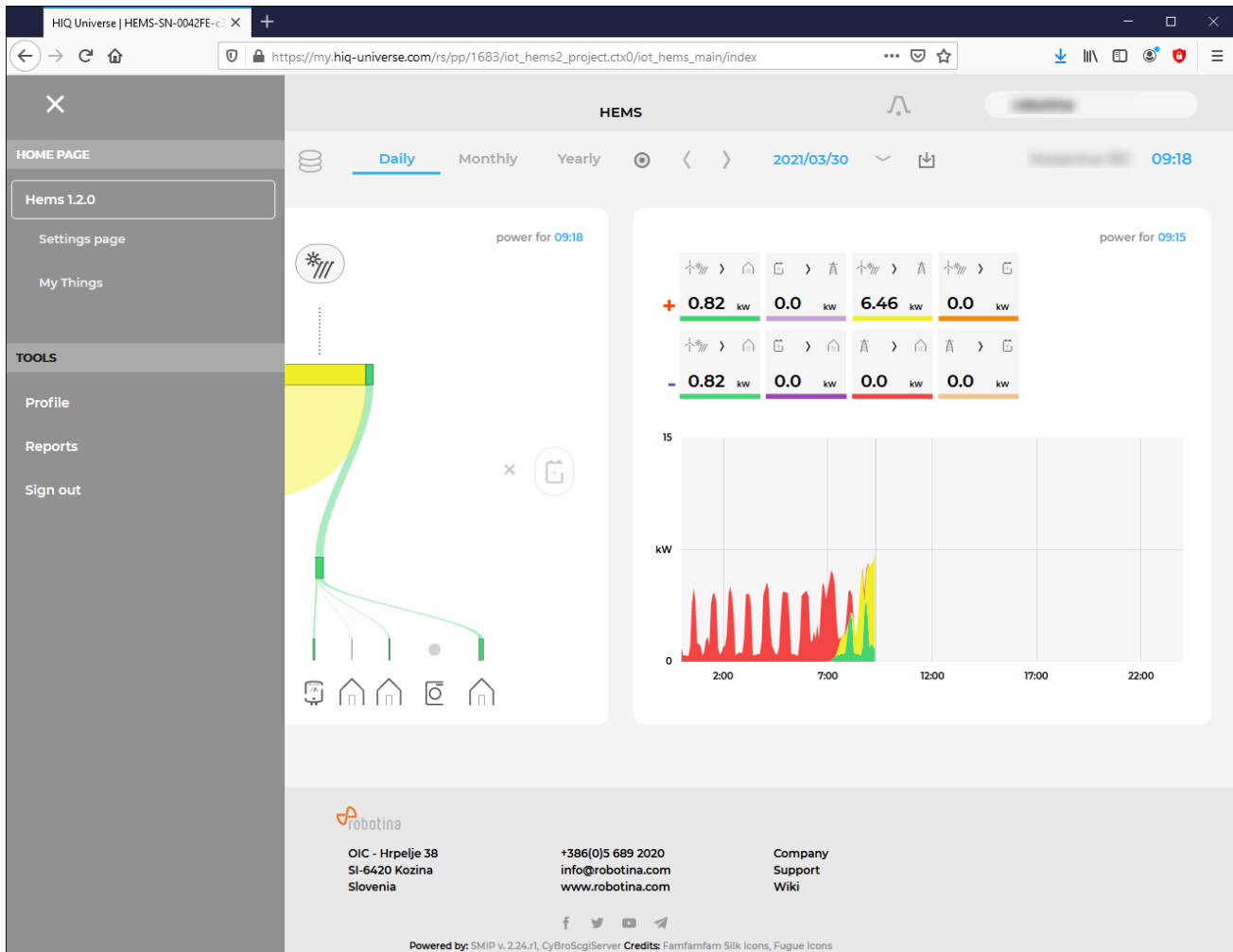
Unused items are soft greyed out with X. Items without actual power are displayed as dots. Clicking on a devices displays current power flow for selected device.

Power and energy time-plot



On bottom is time-plot for selected time period (in title row). By clicking on time plot a term for legend display is selected. Above there is power/energy legend.

Side menu



Side menu is activated by clicking menu icon (three horizontal lines at top-left). Menu items are dynamically created so they can be different for each user. Typical menu items from top:

- **Home page** → section with all your subscribed HIQ Universe devices and services
 - Hems 1.2.0 → "Main HEMS view"
 - Settings page → "HEMS settings"
 - My Things → "My Things"
- **TOOLS** → section with general site tools
 - Profile → "User profile set-up"
 - Reports → "System reports"
 - Sign out → Log off from HIQ Universe

HEMS settings

HIQ Universe | Settings page

https://my.hiq-univers

MOON

Settings page

Device

HEMS-SN-0042FE-c30567-
Dorniz-Wiki

MC serial number ?

Device name

Location

Location name

Location latitude

Location longitude

Time Zone

Energy price

Currency

Low tariff price (€/kWh)

High tariff price (€/kWh)

Feed-in tariff price (€/kWh)

Timeplots range

Electricity

| | |
|--------------------------|-----------------------------------|
| Max daily power (kW) | <input type="text" value="15"/> |
| Max daily energy (kWh) | <input type="text" value="150"/> |
| Max monthly energy (kWh) | <input type="text" value="1000"/> |

Cost

| | |
|-----------------------|----------------------------------|
| Max daily value (€) | <input type="text" value="15"/> |
| Max monthly value (€) | <input type="text" value="150"/> |

[Save settings](#)

Share your device

Owner

Guest account

Guest email address **Remove guest**

[+ Add](#)

[Save guests](#)

Basic settings and info about HEMS.

Sections:

- **Settings:**
 - Device serial number
 - Device name
 - Location name and coordinates, timezone
- **Energy price:** per tariff energy price
- **Timeplots range:** ranges for various timeplots
- **Share your device:** manage device sharing guest accounts

My Things

The screenshot displays the 'My Things' interface within the HIQ Universe platform. The browser address bar shows the URL: https://my.hiq-universe.com/rs/pp/1683/iot_hems2. The interface is organized into several sections:

- Consumers:** A grid of eight cards showing power consumption for different areas:
 - Poraba pritličje: 181 W
 - 1. nadstropje: 27 W
 - Mansarda: 325 W
 - TČ ogrevanje: 0 W
 - TČ sanitarna: 135 W
 - Kuhinja: 0 W
 - Pečica: 0 W
 - Polnilnica: 0 W (with detailed EVSE status: State: Available, Phases: 3 phases, Power: 0 W, EVSE max: 20 A, Max current: 20 A, Last session: 0 h 0 min, Energy: 0 Wh)
- Production and grid:**
 - PV: 7728 W
 - Grid: Voltage L1: 225 V, Voltage L2: 226 V, Voltage L3: 230 V, Frequency: 50.02 Hz, Tariff: LO, Current L1: -11.8 A, Current L2: -11.8 A, Current L3: -11.3 A
- Storage:** A section for monitoring energy storage.
- Sensors:** A section for monitoring various sensors.

My Things GUI could be accessed within the HiQ Universe platform by clicking the My Things item within the main menu. Individual devices are presented as a group of cards, divided on four groups:

- **Consumers**

- Up to 8 consumers
- On/Off control
- Overview of energy and status
 - Settings:
 - Manual override (Minute countdown of manual control until cloud can perform optimizations again)
 - Cloud optimizations with timetable
 - Current limiter with priorities
 - History:

- Power overview
- **Production and grid**
 - Overview of grid and up to 3 other energy sources
- **Storage**
 - Overview of up to 2 battery sources
- **Sensors**
 - Supported for temperature and humidity sensor

Consumers

Polnilnica



State: Available
Phases: 3 phases
Power: 0 W
EVSE max: 20 A
Max current: 20 A
Last session: 0 h 0 min
Energy: 0 Wh

Settings

Manual override:

Smart grid

Cloud optimization:

Smart grid status: Idle

Enabled: from: :
 to: :

Max duration: min

Max request:

Suspend time: min

Current limiter

Limiter priority: min

History

Span: Day | Date: 2021/03/31

Legend:
■ Phase L1: 0 W
■ Phase L2: 0 W
■ Phase L3: 0 W
■ SUM: 0 W

Consumers present devices, that consume electric energy. Within the group of Consumers, the first card present a general consumption of the object - a background consumption. The following items present real controllable devices, such as EV charger, Heat pump, wireless socket, etc. An

example of a device is shown in the following image.

The form of a card of each consumer is composed of the general part, history and settings part.

General part contains:

- **Name** of a device, which can be changed by user.
- **Icon** (button) enables toggling the device operation state (Switch on / Switch off).
- **State** label contain the information of device operation state.
- **Phases** label contain the information of EV utilized phases.
- **Power** label contain the information of device consumption power in watts.
- **EVSE max** label contains EVSE max charging current,
- **Max current** label is user desired max charging current, which can be changed by user.
- **Last session** label contains the information of charging duration and energy.

Settings:

- **Manual override** are minutes after switch on/off button is pressed that the smart-grid service is not allowed to switch on/off the device.
- **Cloud optimization** enables or disables smart grid service.
- **Smart grid status** label shows smart grid operation state with the following states:
- **Enabled** section specify the temporal range between **from** and **to** in the form of *hh:mm*, in which the device is allowed to be switched off from according to the smart-grid service. If **from** is larger than **to**, then temporal range is the opposite. If **from** and **to** are equal, then the smart-grid service is enabled 24 hours a day.
- **Max duration** setting limits the duration of time, the smart-grid service switches off (activates) the device. After smart-grid service activates the device, the device will deactivate (switch back on) after max-duration minutes at the latest.
- **Max request** setting limits the maximum daily activations from the smart-grid service.
- **Suspend time** presents the time in minutes, which has to pass between two activations (between the stop of one activation and start of another).
- **Limiter priority** setting can be no limiter, limit last, limit second and limit first. If DCL is enabled and inactive a green warning icon is displayed on the card. If DCL is active the icon turns yellow and if DCL is disabled there is no icon on the card. Limit first is a group of devices that are dynamically regulated first if the main grid current is over the preset threshold. If main grid current is still over the preset threshold, regulating other groups will follow with limit second and after that with limit last.

History:

- **History** part shows historical consumption of a device. The temporal range can be selected as daily, weekly, monthly or yearly. Daily and weekly range shows power consumption in watts, while monthly and yearly range shows energy consumption in kilowatt-hours. The interface enables time-frame selection and time-frame alignment to current time.

Production and grid

Grid



| | |
|-------------|----------|
| Voltage L1: | 230 V |
| Voltage L2: | 231 V |
| Voltage L3: | 231 V |
| Frequency: | 50.00 Hz |
| Tariff: | LO |
| Current L1: | -11.3 A |
| Current L2: | -11.2 A |
| Current L3: | -7.8 A |

Settings



Current limiter

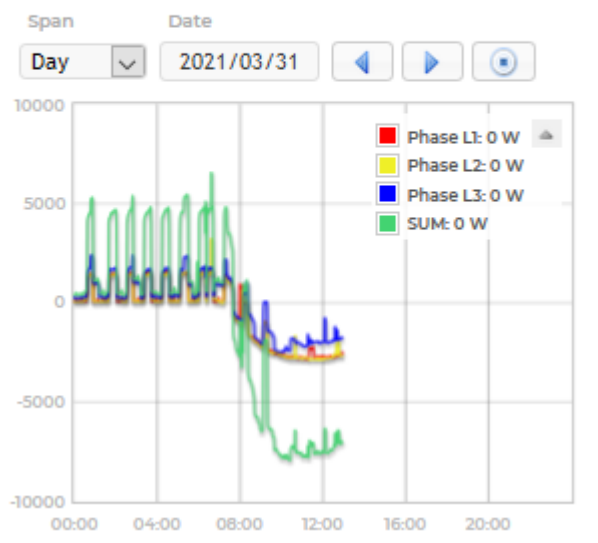
| | | |
|-----------------|---------------------------------|---|
| Max current L1: | <input type="text" value="25"/> | A |
| Max current L2: | <input type="text" value="25"/> | A |
| Max current L3: | <input type="text" value="25"/> | A |

History



Power & Energy

Current



PV elektrarna



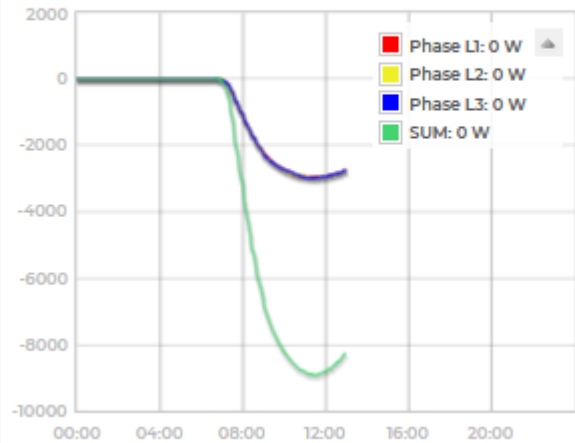
Power:

7961 W

History



Span: Day | Date: 2021/03/31



Producers present devices or systems that produce electrical energy. Example of such devices are solar power plant, wind power plant, diesel generator and others. An example on the following figure shows solar power plant.

General part contains:

- **Name** of a plant, which can be changed by user.
- **Icon** represent the type of producer.
- **Voltage** represents voltage of the grid.
- **Frequency** represents frequency of the grid.
- **Tariff** represents active tariff of the grid.
- **Current** represents current of the grid.

- **Power** label contain the information of device production power in watts.

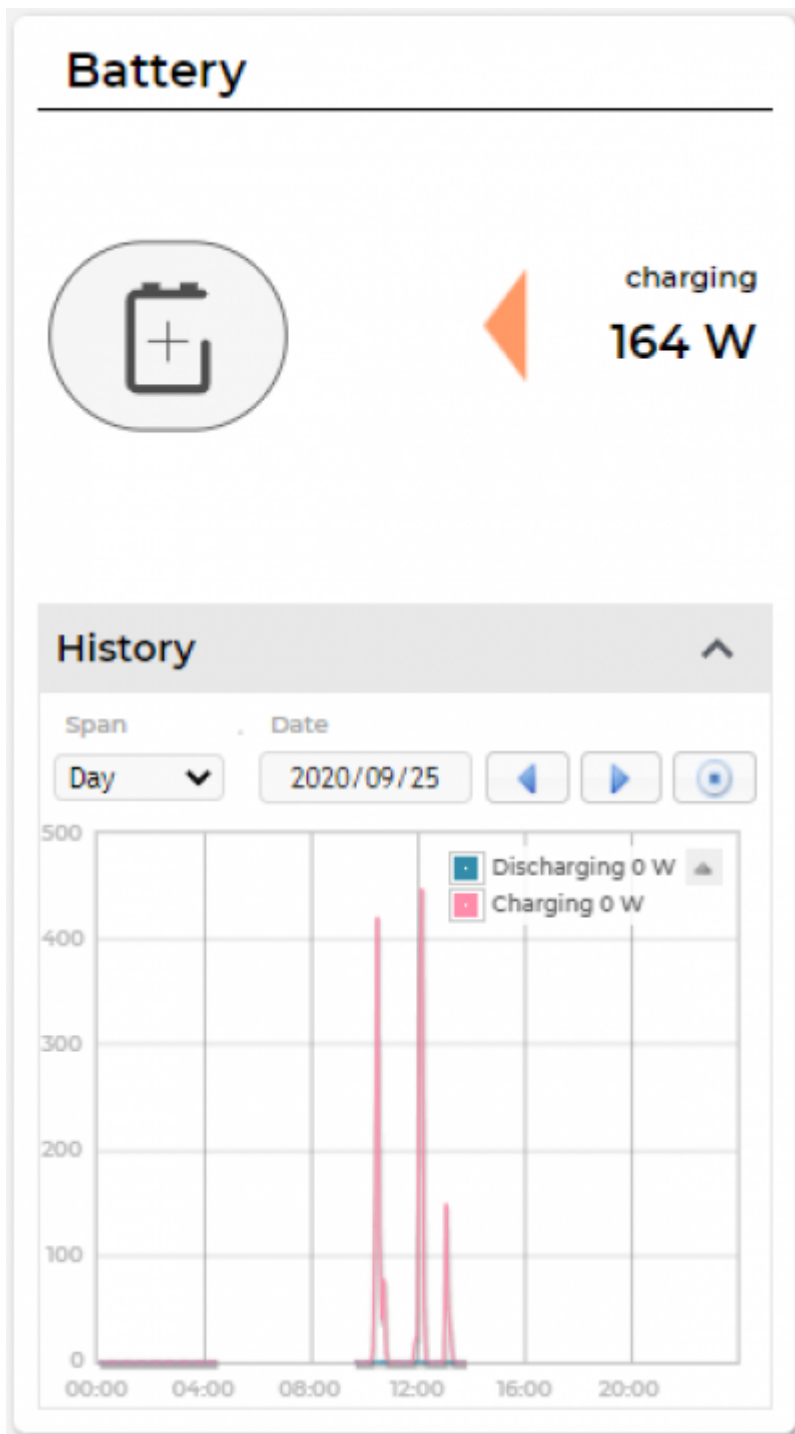
Settings:

- **Dynamic Current Limiter** represents grid current threshold. The DCL will manage devices to keep the current under this threshold. Settings are per phase.

History:

- **History** part shows historical production of a device. The temporal range can be selected as daily, weekly, monthly or yearly. Daily and weekly range shows power production in watts, while monthly and yearly range shows energy production in kilowatt-hours. The interface enables time-frame selection and time-frame alignment to current time. Grid has additional current history.

Storage



Storage present battery as shown in an example figure on the left.

General part contains:

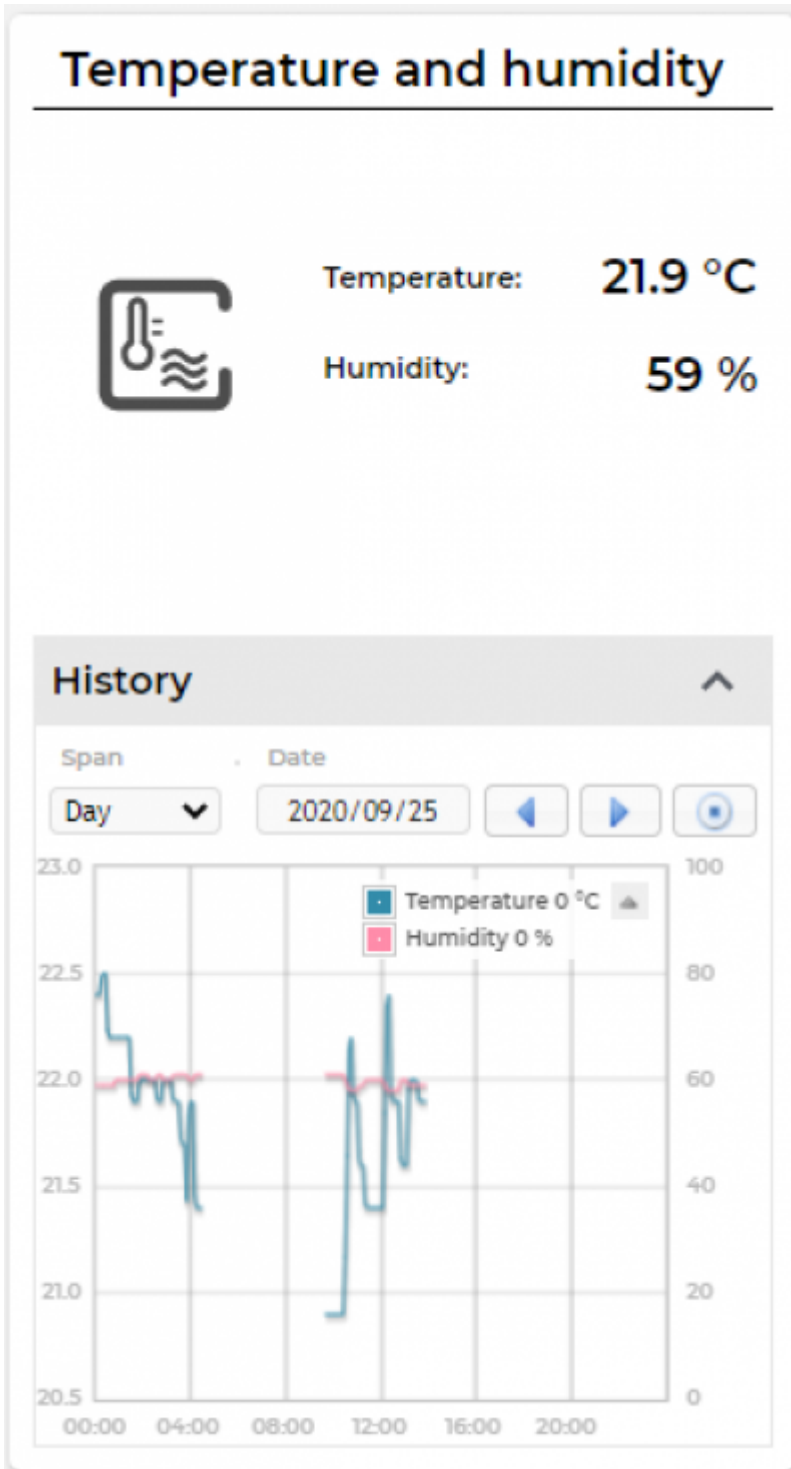
- **Name** of a battery, given by the user.
- **Icon** representing the battery.
- **Power** label contain the information of charging or discharging power in watts.

History:

- **History** part shows historical charging or discharging power of a device. The temporal range can be selected as daily, weekly, monthly or yearly. Daily and weekly range shows

power charging or discharging in watts, while monthly and yearly range shows energy charged or discharged in kilowatt-hours. The interface enables time-frame selection and time-frame alignment to current time.

Sensors



Sensors present devices or systems that measure various quantities, such as temperature, humidity. The left figure represent a combined temperature and humidity sensor.

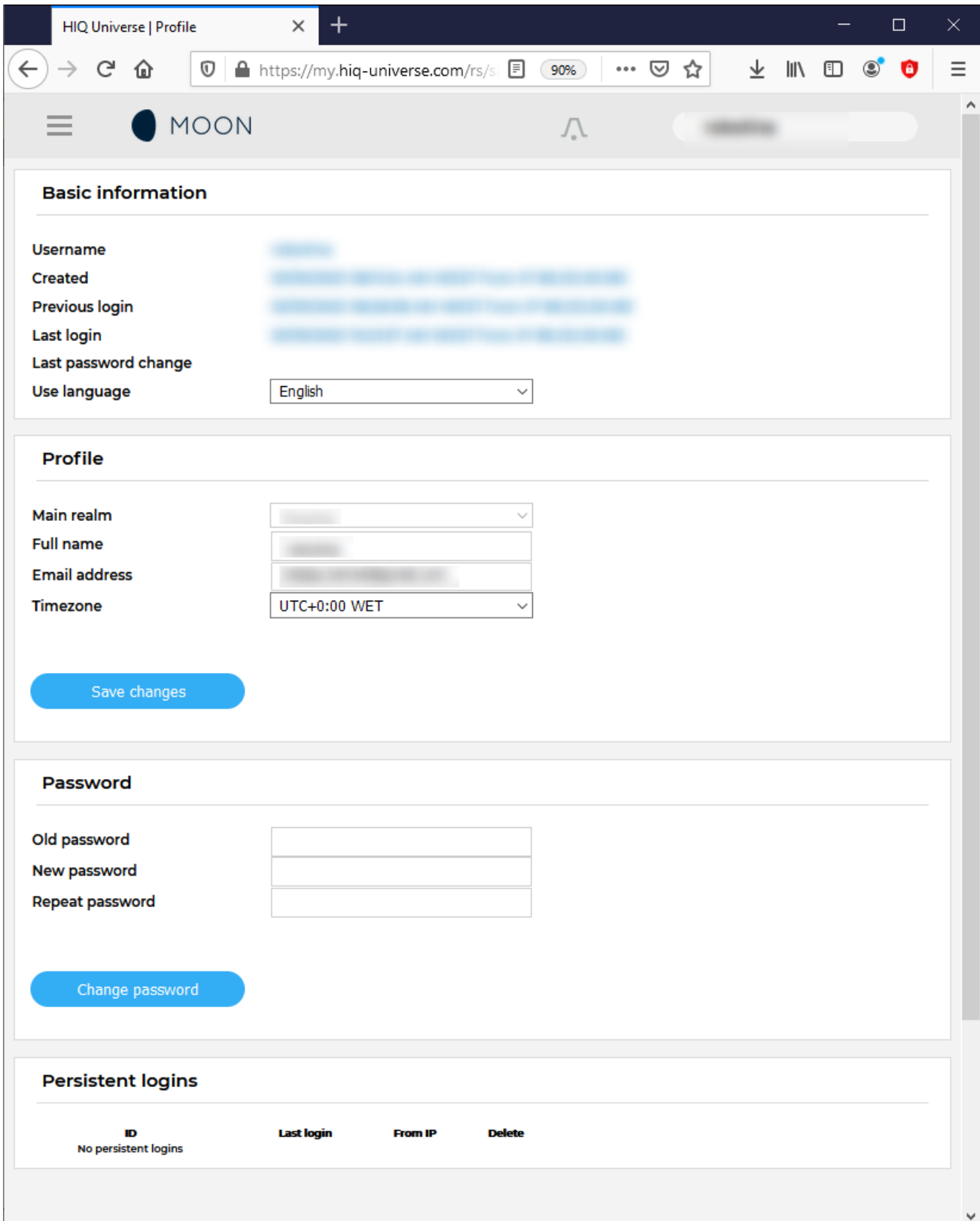
General part contains:

- **Name** of a sensor, which can be changed by user.
- **Icon** represent the type of sensor.
- **Temperature** label contain the information of temperature measurement in °C.
- **Humidity** label contain the information of relative humidity in %.

History:

- **History** part shows historical sensor measurements. The temporal range can be selected as daily, weekly, monthly or yearly. The interface enables time-frame selection and time-frame alignment to current time.

User profile set-up



Basic information section:

- **Username**
- **Created date and IP**
- **Previous and last login date and IP**
- **Last password change date and IP**
- **User language**

Profile section:

- **Main realm display**
- **Full name, email address and timezone edit fields**

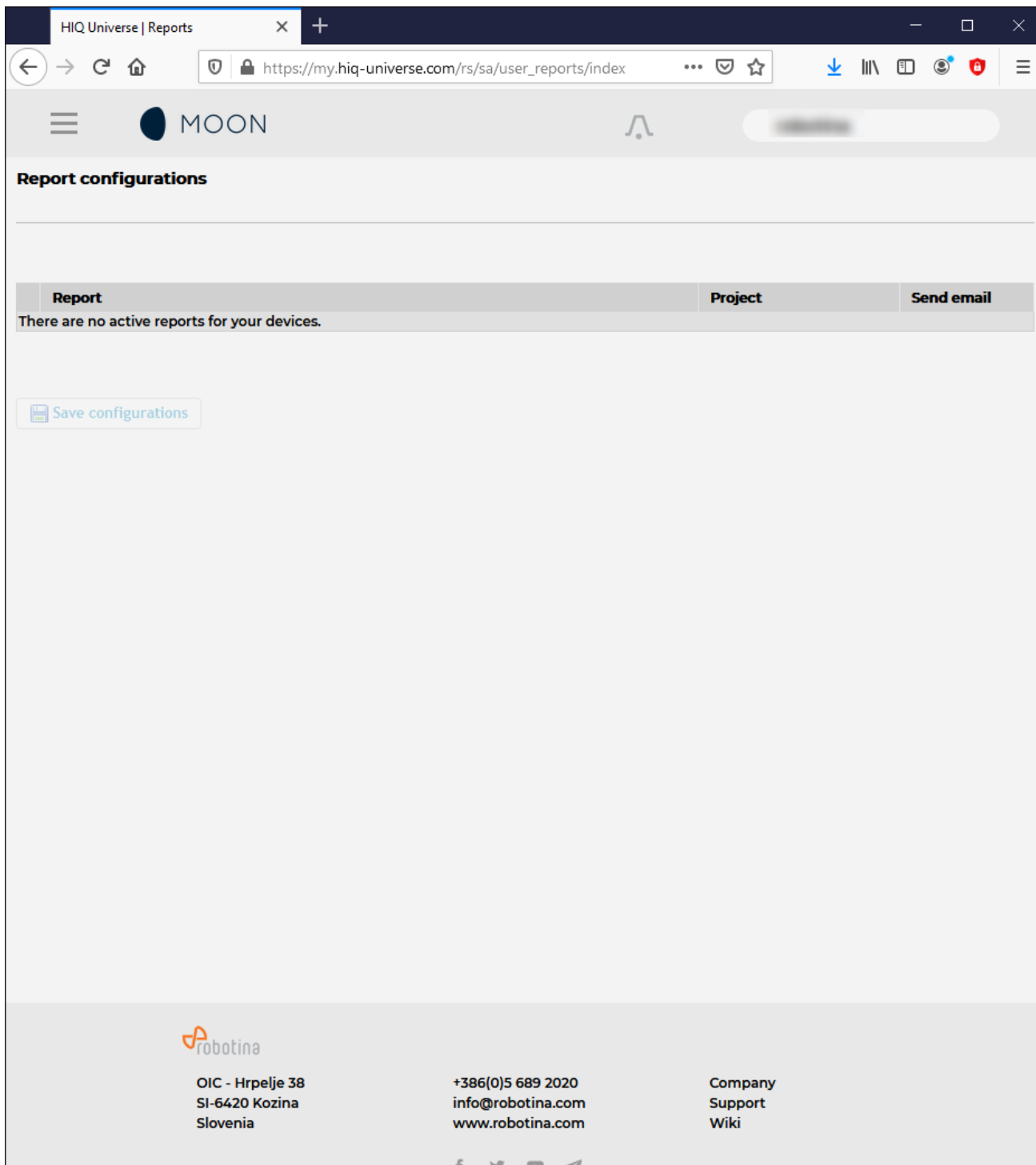
Password:

- **Fields for password changing**

Persistent logins:

- **Data of access from persistent logins**

System Reports



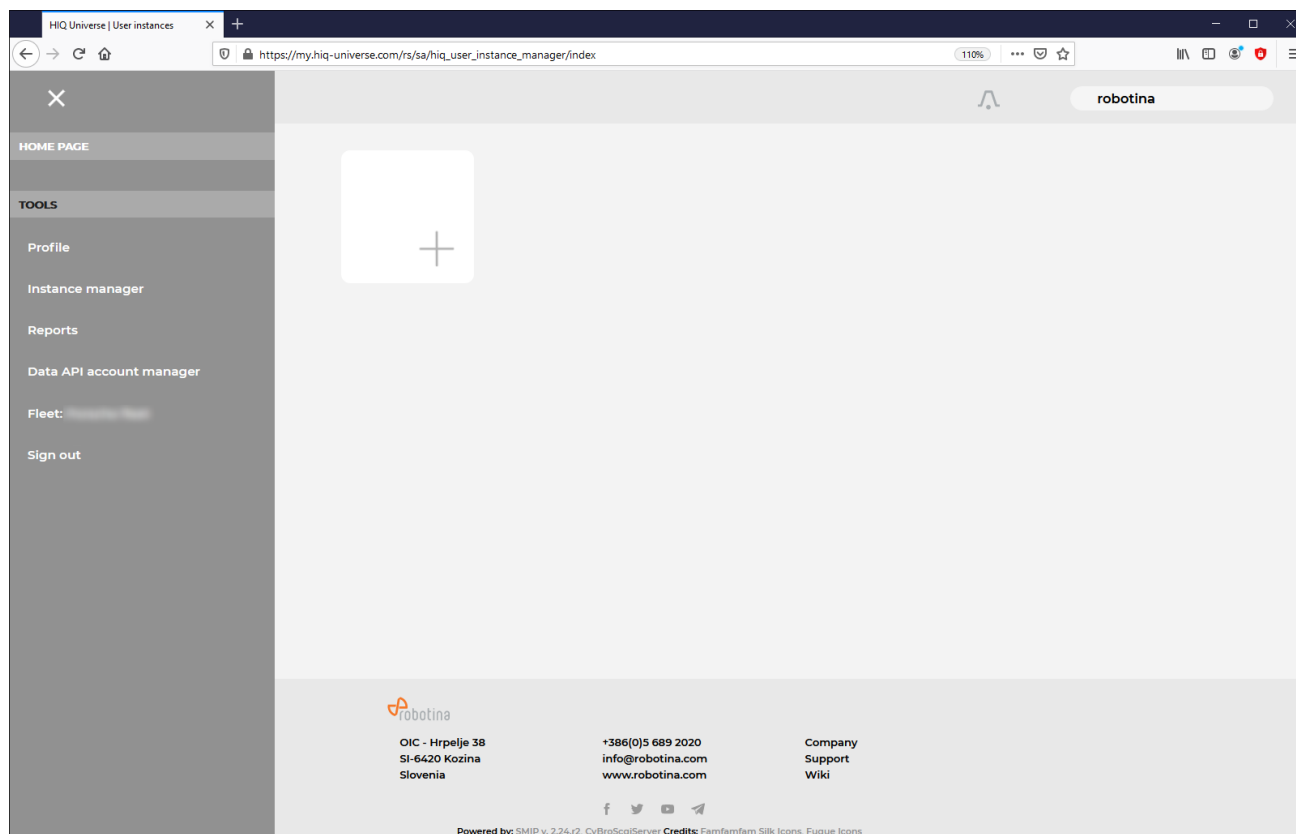
System generated reports can be found here.

HIQ UNIVERSE - Service provider

Accounts with access level of service provider have additional fields available:

- Instance manager
- Data API account manager
- Fleet manager

Side menu



Side menu is activated by clicking menu icon (three horizontal lines at top-left). Menu items are dynamically created so they can be different for each service provider:

- **Home page** → section with all your subscribed HIQ Universe devices and services
- **TOOLS** → section with general site tools
 - Profile
 - Instance manager → ["Overview of installed systems"](#)
 - Reports → Subscription to reports (Depending on the installation).
 - Data API account manager → ["API key management"](#)
 - Fleet manager → ["Aggregation and overview of service providers installed systems"](#)
 - Sign out

Overview of installed systems

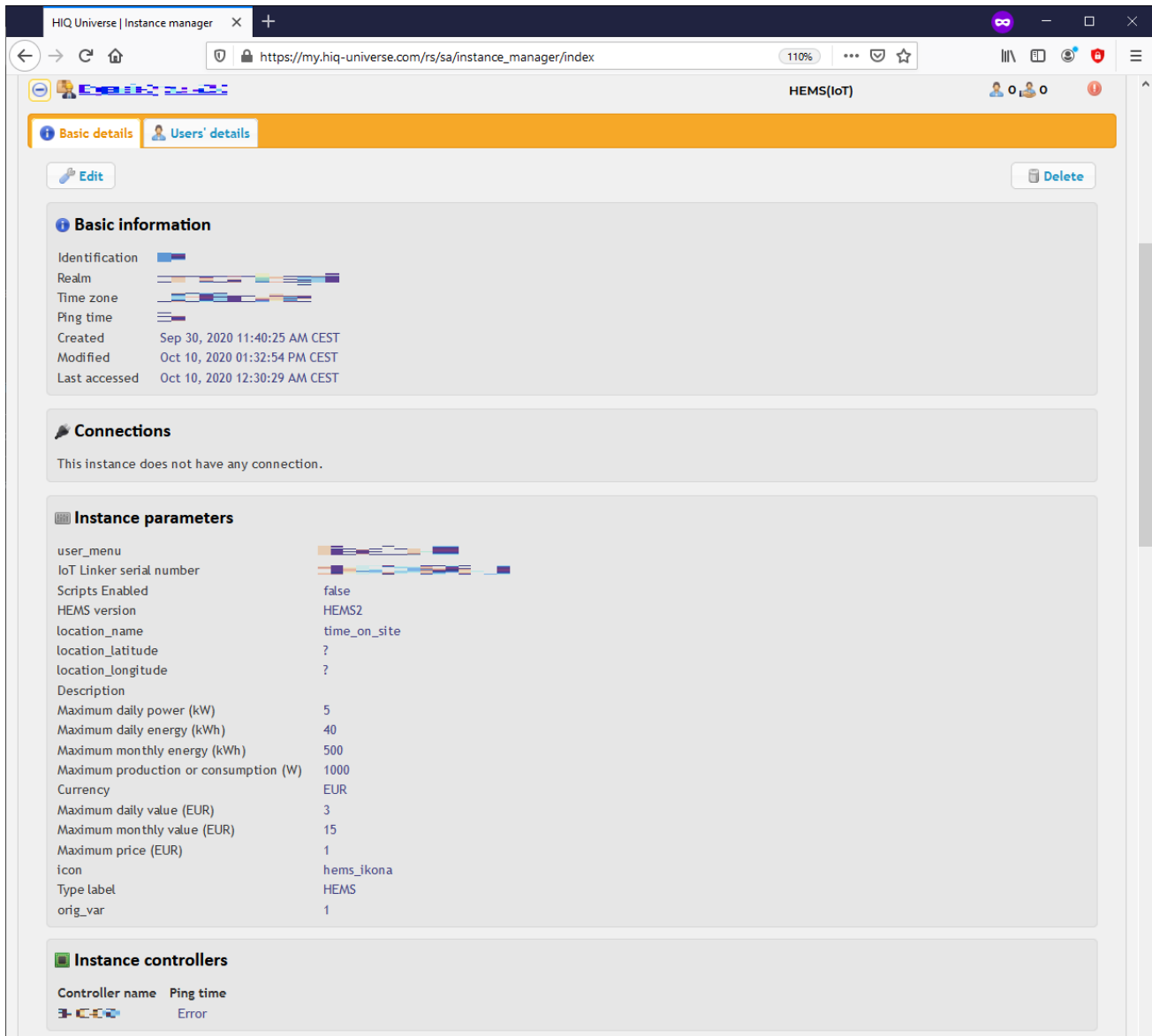
| Title | Type | Users | Status |
|-------|------------------------|-------|--------|
| + | HEMS(IoT) | 0/0 | ✓ |
| + | HEMS(IoT) | 0/0 | ✓ |
| + | HEMS(IoT) | 0/0 | ✓ |
| + | HEMS(IoT) | 0/0 | ✓ |
| + | Dynamic D3 | 0/1 | ! |
| + | Dynamic D3 | 0/1 | ! |
| + | Dynamic D3 | 0/0 | ! |
| + | Flex | 1/0 | ✓ |
| + | Flex | 1/0 | ✓ |
| + | Flex | 1/0 | ✓ |
| + | Dynamic D3 | 1/0 | ✓ |
| + | Flex | 1/0 | ✓ |
| + | HEMS | 0/0 | ! |
| + | Smart Grid | 0/1 | ✓ |
| + | Flex | 1/0 | ✓ |
| + | Flex | 1/0 | ✓ |
| + | Dynamic | 1/0 | ✓ |
| + | HEMS | 0/0 | ! |
| + | Smart Grid | 0/1 | ✓ |
| + | Flex | 1/0 | ! |
| + | HEMS | 0/0 | ! |
| + | Smart Grid | 1/1 | ✓ |
| + | GOFLEX realm aggregate | 0/0 | ✓ |
| + | GOFLEX realm aggregate | 0/0 | ✓ |

Table shows all installed systems by the service provider and their additional info:

- Name
- Type
- Users (nr. of Owners and Guests)
- Status (Online/Offline)

Clicking on the instance name will take you to instance home page as seen by end users. Clicking on the plus sign displays additional instance info:

- **Basic details**
- **User's details**



The screenshot displays the 'Basic details' page for a HEMS instance in the HIQ Universe Instance Manager. The page is titled 'HEMS(IoT)' and includes navigation tabs for 'Basic details' and 'Users' details'. An 'Edit' button is located at the top left, and a 'Delete' button is at the top right. The main content is organized into four sections:

- Basic information:** A table listing system metadata.

| | |
|----------------|-------------------------------|
| Identification | [Progress bar] |
| Realm | [Progress bar] |
| Time zone | [Progress bar] |
| Ping time | [Progress bar] |
| Created | Sep 30, 2020 11:40:25 AM CEST |
| Modified | Oct 10, 2020 01:32:54 PM CEST |
| Last accessed | Oct 10, 2020 12:30:29 AM CEST |
- Connections:** A message stating 'This instance does not have any connection.'
- Instance parameters:** A table listing various configuration parameters.

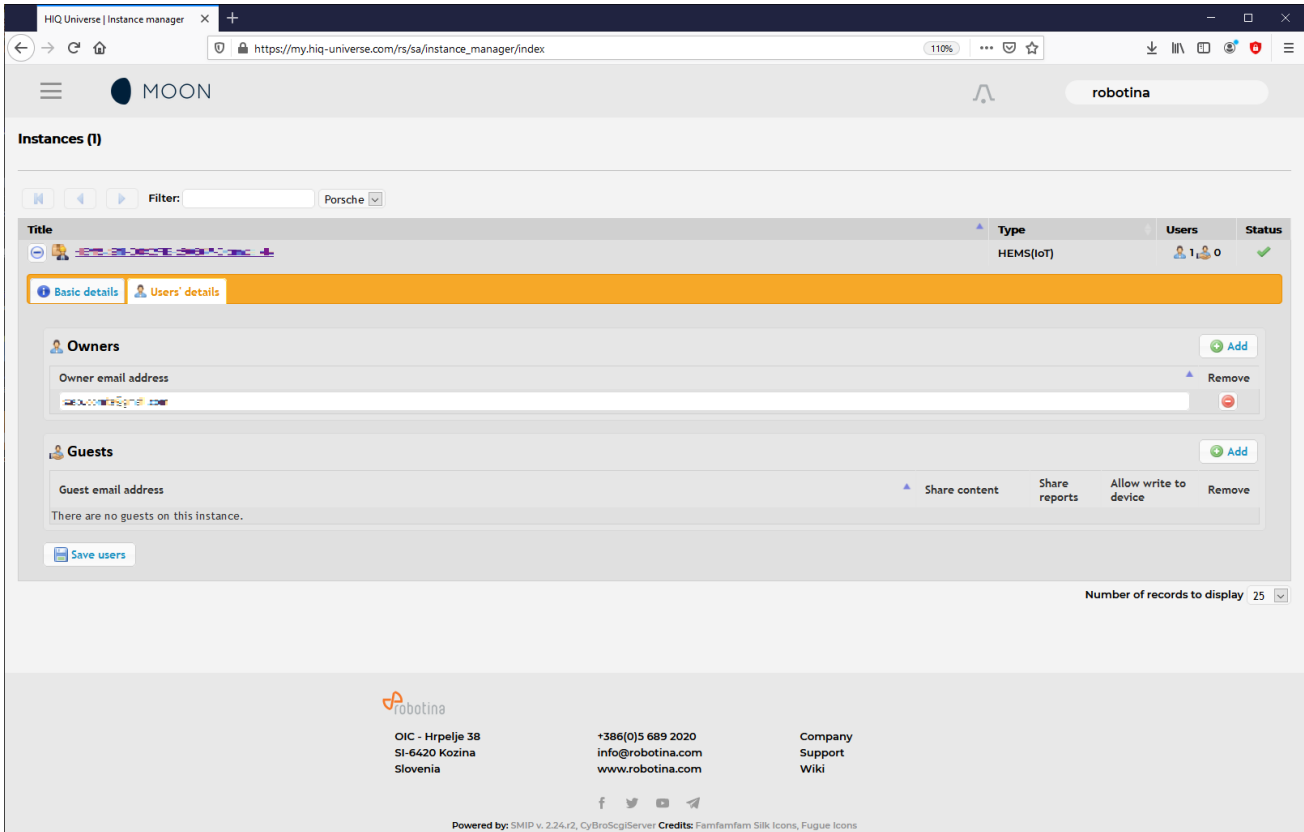
| | |
|---------------------------------------|----------------|
| user_menu | [Progress bar] |
| IoT Linker serial number | [Progress bar] |
| Scripts Enabled | false |
| HEMS version | HEMS2 |
| location_name | time_on_site |
| location_latitude | ? |
| location_longitude | ? |
| Description | |
| Maximum daily power (kW) | 5 |
| Maximum daily energy (kWh) | 40 |
| Maximum monthly energy (kWh) | 500 |
| Maximum production or consumption (W) | 1000 |
| Currency | EUR |
| Maximum daily value (EUR) | 3 |
| Maximum monthly value (EUR) | 15 |
| Maximum price (EUR) | 1 |
| icon | hems_ikona |
| Type label | HEMS |
| orig_var | 1 |
- Instance controllers:** A table showing controller status.

| Controller name | Ping time |
|-----------------|-----------|
| [Icon] | Error |

Basic details displays information about the system. Here you can find:

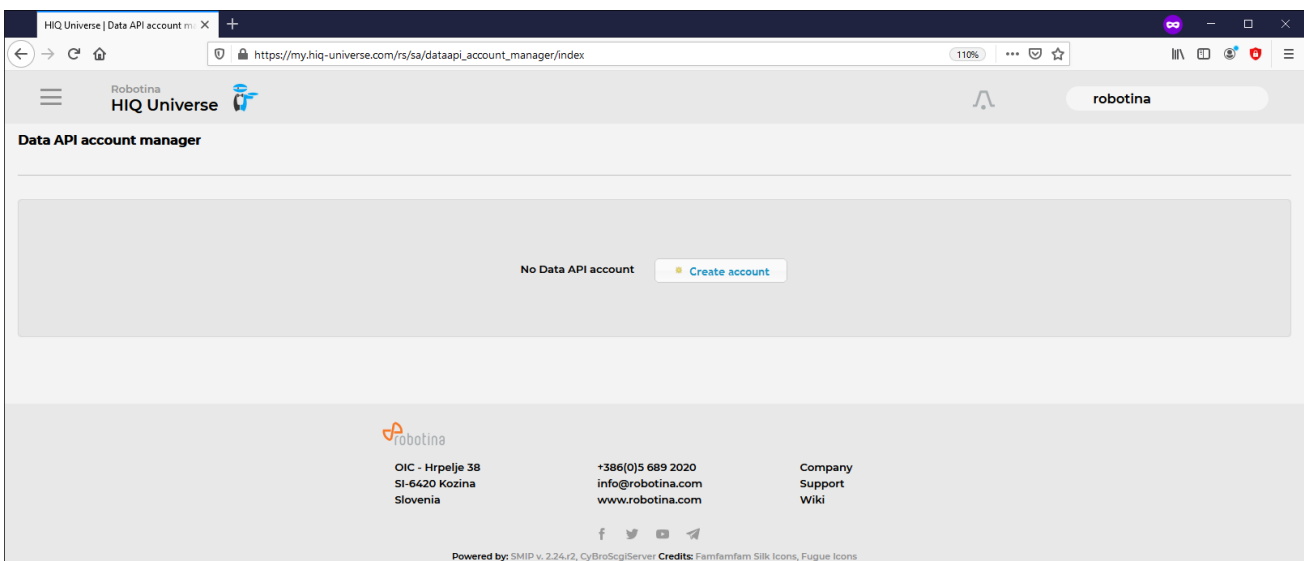
- Basic info
- Connections
- Instance parameters
- Instance controllers

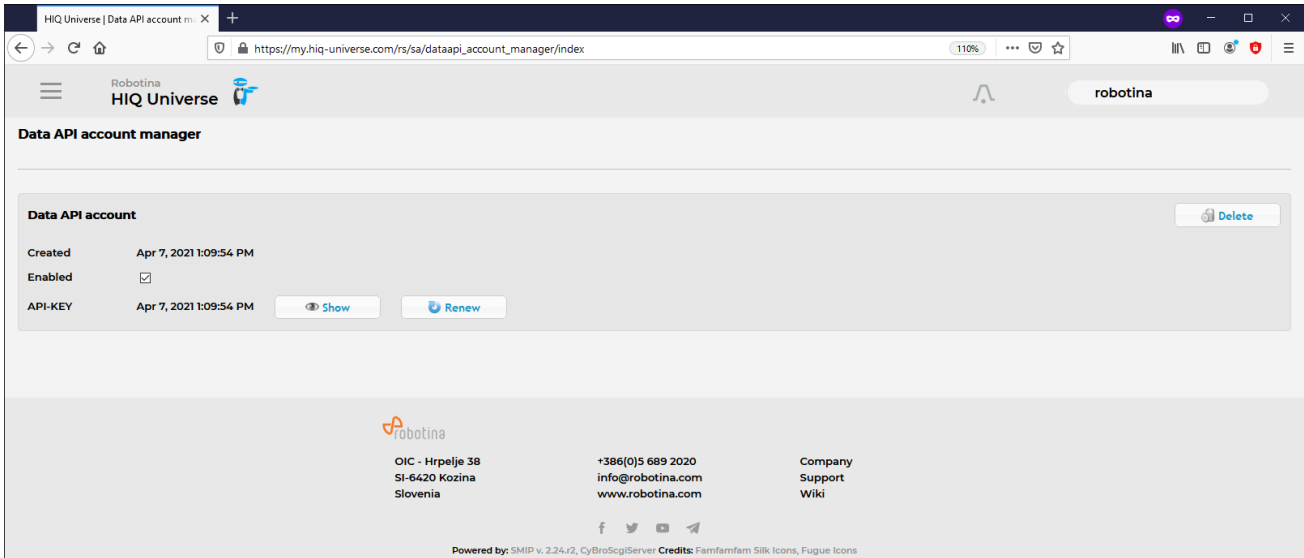
Parameters can also be changed with a click on Edit button.



User's details shows all user that have access to this instance. Owners can be added or removed and have overview, control and settings over this instance. Guest account can be added or removed and will have an overview of an instance. We can select if we want to share reports with guests and to allow writing to the device. Guests can not change the settings.

API key management





An application programming interface key (API key) is a unique identifier used for calling program with an API.

Clicking on Create account will create a new Data API key that can be renewed or deleted.

Aggregation and overview of service providers installed systems

| Instance | SN | Is online | Online status changed | Linker online (last day in seconds) | Last reboot | Linker SW ver | Types version | Init Phase | CPU Temperature | MEM Available | Unpublished messages | at | MC | Last MC online | Prog MC | Documentation | DR Status |
|----------|-----------|-----------|-----------------------|-------------------------------------|---------------------|---------------|---------------|------------|-----------------|---------------|----------------------|---------------------|-------|---------------------|---------|--|-----------|
| | 34400+28C | 1 | 2021-04-07 06:41:28 | 86249 | 2021-04-06 12:34:51 | 10.31 | 1.5 | 4 | 68 | 475 | 0 | 2021-04-07 13:35:25 | 30529 | 2021-04-07 13:40:25 | 11.3 | ["VANILLA":"0005","log4j":"updated"] | 0 |
| | 34400+28E | 0 | 2021-04-01 07:25:48 | 0 | 2021-03-30 12:49:11 | 10.31 | 1.5 | 4 | 58 | 511 | 0 | 2021-04-01 07:39:32 | 30525 | 2021-04-01 07:24:32 | -1-1-1 | ["VANILLA":"0003","SYSUP-0007":"2020-06-05","SYSUP-0015":"2020-06-05","SYSUP-0016":"2020-06-05"] | 0 |
| | 34400+25A | 0 | 2021-04-06 12:44:26 | 44054 | 2021-04-01 09:10:08 | 10.31 | 1.5 | 4 | 62 | 469 | 0 | 2021-04-06 12:10:37 | 30528 | 2021-04-06 12:10:37 | -1-1-1 | ["VANILLA":"0003","SYSUP-0007":"2020-06-05","SYSUP-0015":"2020-06-05","SYSUP-0016":"2020-06-05"] | 0 |
| | 34400+25C | 1 | 2021-04-07 05:50:36 | 86400 | 2021-03-09 17:04:17 | 10.41 | 1.5 | 4 | 59 | 383 | 0 | 2021-04-07 13:34:41 | 30549 | 2021-04-07 13:39:41 | 11.3 | ["VANILLA":"0003","SYSUP-0007":"2020-06-05","SYSUP-0015":"2020-06-05","SYSUP-0016":"2020-06-05"] | 0 |
| | 34400+25E | 1 | 2021-04-07 11:38:06 | 86245 | 2021-04-06 12:15:57 | 10.36 | 1.5 | 4 | 59 | 533 | 0 | 2021-04-07 13:36:27 | 30546 | 2021-04-07 13:41:27 | 11.3 | ["VANILLA":"0003","SYSUP-0007":"2020-06-05","SYSUP-0015":"2020-06-05","SYSUP-0016":"2020-06-05"] | 0 |

Aggregation and overview or so called fleet is a section where all relevant data from installed systems is collected and displayed. This section can vary amongst providers as the interface can be modified to suit the needs of individual service provider.

Download

| | | | |
|--|------------|-------------------|------------------------|
| hems_configurator_v123.exe | v 1.2.3 | HEMS configurator | Windows PC application |
| hems_manual_v123.pdf | 2021-11-19 | HEMS manual | pdf document |