# MANUAL

## Power Storage DC 8.0 / 10.0

EN



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PREFACE

Thank you for choosing the RCT Power Storage DC!

You have purchased an innovative, high-quality product with unique features and consistently high efficiency.

RCT Solar Inverters are transformerless, highly flexible and robust. With this device, you will always achieve the highest possible yield from your PV system.



**WARNING**

Solar modules, inverters, cables and other components of the photovoltaic system are electrical devices. During installation, wiring, grid connection, operation, maintenance and service they can cause various hazards.

Please read the documents supplied with the product carefully and follow the instructions and device information to avoid material damage and personal injury.



Keep this manual in a safe place for future reference.

## Declaration of conformity

**RCT Power GmbH** confirms that the Power Storage DC inverter described in this document is in compliance with the essential requirements and provisions of the following European Union directives:

- RED Radio Equipment Directive (RED) 2014/53/EU
- Electromagnetic Compatibility Directive (EMC) 2014/30/EU
- Low Voltage Directive (LVD) 2014/35/EU
- Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive (RoHS2)-2011/65/EU

The detailed declaration of conformity can be found under:

www.rct-power.com

# 1 About this Manual

## 1.1 Validity, purpose and scope of this document and legal regulations

This document is valid for the Power Storage DC models 8.0 and 10.0.

Power Storage DC 8.0 and Power Storage DC 10.0 are referred to as "Inverter", "Hybrid Inverter", "Device" or "Product" unless otherwise stated.

This installation manual provides general instructions for installing, wiring, commissioning and operating the inverter and the battery.

The content of this manual is regularly updated and revised as a part of the continuous product development.

The current document version can be found at: **www.rct-power.com**.

We explicitly reserve the right to make technical changes which improve the device or increase its safety standard. These changes do not require a separate notification. RCT Power GmbH is not liable for damages resulting from the use of this document.

This manual does not supersede existing laws, regulations, rules, standards or conventions.

The warranty conditions are enclosed with the device. No further warranty claims can be derived from this document.

## 1.2 Explanation of Symbols and References

It is important to follow the references in the manual during the installation, operation and maintenance of the Power Inverter. The table below shows the warning signs and symbols used in the manual.

| Symbols and References | Description |
|---|---|
|  DANGER | This symbol indicates a direct imminent danger. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property. |
|  WARNING | This symbol indicates a direct imminent danger of medium risk. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property. |
|  CAUTION | This symbol indicates a direct imminent danger of low risk. If the safety regulations are not observed, it might result in minor or moderate material damage. |
|  NOTICE | This symbol indicates a potentially hazardous situation which, if not avoided, could result in material damage to equipment or property. |
|  | This symbol indicates important information and hints. They will help you to better understand the functionality of the Power Storage DC. |

# 2 Safety Instructions

## 2.1 Personnel and Qualifications



**WARNING**

The inverter and the battery must only be installed, wired, connected, commissioned and serviced by qualified personnel to prevent material damage or personal injury.

Qualified personnel authorised to perform the tasks described in this manual must have the following skills and technical expertise:

- They are trained to install electrical equipment.
- They understand the technical functionality of an inverter
- They are familiar with lithium iron phosphate (LiFeP04) accumulators.
- They have read and understood the documents shipped with the unit.
- They know and use the appropriate tools and equipment to perform the tasks described in the manual.
- They are familiar with all current laws and applicable regulations, standards and directives for electrical equipment.
- They are familiar with the safety requirements and guidelines for electrical equipment.
- They are familiar with occupational health law and safety regulations.
- They know and use appropriate personal protective equipment.

## 2.2 Safety Procedures

The Power Storage DC was developed and tested in strict accordance with international safety regulations.

All safety instructions relating to electrical and electronic equipment must be complied with during installation, operation and maintenance.



**DANGER**

Danger to life or serious injury due to electric shock! High voltages are present in cables and inner parts of the inverter if it is connected to the grid (AC / AC voltage source) or the solar generator (DC / DC voltage source) is exposed to sunlight.

- Qualified personnel must perform any work that involves wiring, connecting or opening the inverter case.
- Important: Both voltage sources (DC / solar generator and AC / grid) must be switched off before any electrical work is carried out on the inverter.
- Turn the DC Switch into the 0 position to disconnect the DC voltage.
- Activate the circuit breaker or remove the fuse to disconnect the mains voltage (AC). Do not reconnect until the work has been completed.
- To disconnect the battery voltage, both voltage sources (DC / solar generator and AC / mains) must be switched off and the battery switch on the master must be set to "0".
- Allow a minimum of 10 minutes for the capacitors to fully discharge and then check the voltage with a suitable measurement device.
- Ensure that other persons stay away from cables and internal components.



**WARNING**

Risk of injury due to electric shock!

Installation, service and maintenance work must only be carried out by a qualified electrician.

- Do not drop the device. Do not expose it to knocks or pressure.
- Only switch on again after all electrical work has been completed.



**CAUTION**

Risk of burns on hot parts of the inverter enclosure.

Parts of the inverter enclosure can become hot during standard operation.

- Use care when touching the enclosure while the inverter is operating.
- Do not cover the Power Storage DC (especially not the top).



**NOTICE**

- All electrical installations must be carried out according to local and national standards and guidelines.
- Contact your local energy supplier or grid operator before connecting the inverter to the grid.
- Ensure that electrically conductive surfaces of the entire PV system are grounded to prevent personal injury.
- A malfunction can impair inverter safety. Do not operate or start the inverter if it shows visible damage or if the displayed error message is unclear.
- The inverter does not contain any parts to be serviced by the owner. Please contact qualified personnel locally for servicing work on the inverter.
- Only use devices and accessories approved by the manufacturer. Do not make any changes to the device. Do not remove the type plate.

# 3 Product Presentation

## 3.1 Intended use

Power Storage DC 8.0 and 10.0 are stationary 3-phase inverters with integrated battery charging unit.

The energy received from the connected solar generator and the battery is converted into grid-compliant AC current and fed into the grid. PV energy can also be charged directly into the battery on the DC side.

**Please note:**
The Power Storage DC is not designed for other use cases or connections to other devices.
Any deployment of the device that is different from the intended use is considered a misuse.
RCT Power GmbH is not liable for damages resulting from misuse of the device.
Any misuse terminates the warranty, guarantee and general legal liability of the manufacturer.

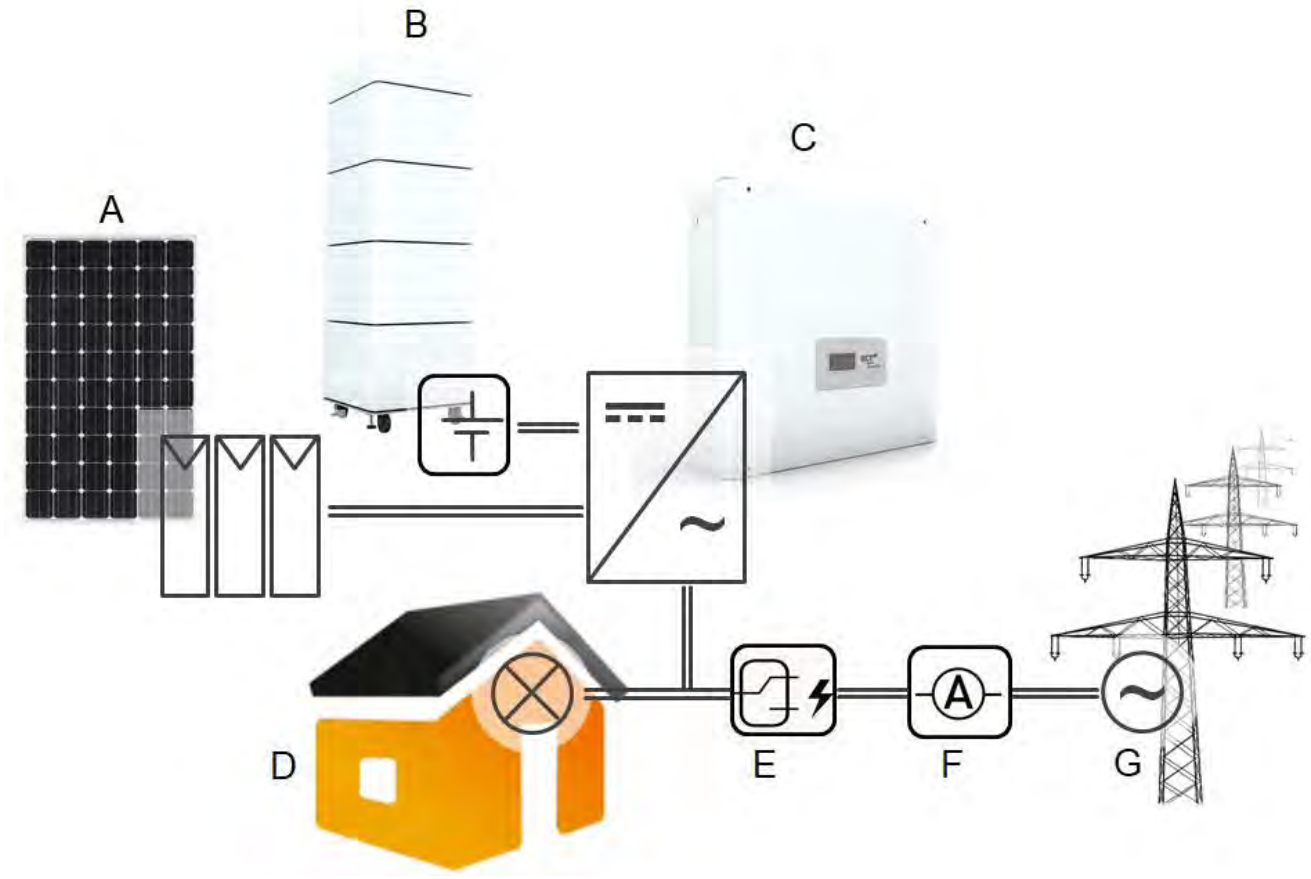



Fig. 3-1 Intended use of the Power Storage DC with the Power Battery in the PV system.

| Pos | Description | Comment |
|---|---|---|
| A | PV Generator | Monocrystalline silicon; polycrystalline silicon and thin film without grounding and protection class II |
| B | Battery | Power Battery 3.8, 5.7, 7.6, 9.6, 11.5 |
| C | Inverter | Power Storage DC 8.0, 10.0 |
| D | Household | Domestic electricity consumers |
| E | Power Switch | Switches to island operation mode in the event of a power failure. |
| F | Power Sensor | Current sensors for AC power measurements |
| G | Public grid | TT, TN-C, TN-S, TN-C-S |

## 3.2 Product specification

### 3.2.1 Scope of supply

Our products are inspected for proper condition before shipment. Despite careful packaging, transport damage can occur. The transport company usually has to take responsibility for this damage.

Please inform the transport company immediately if you notice any damage to the packaging or the Power Storage DC. Your specialist dealer will be happy to assist you if necessary.

Do not install, wire or operate the Power Storage DC if any damage has been detected.

Check the contents of the shipment for completeness according to Fig. 3-2.

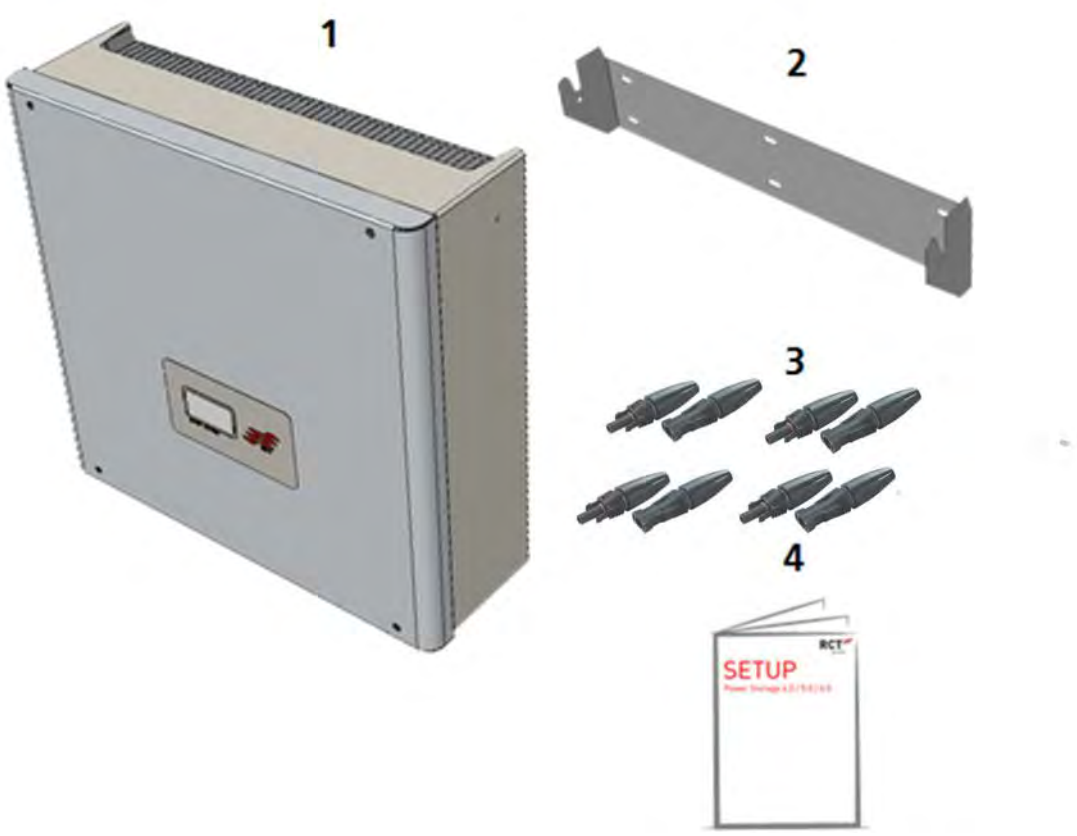



Fig. 3-2 Scope of supply

| Pos. | Description |
|---|---|
| 1 | 1x Power Storage DC |
| 2 | 1x Inverter wall mounting bracket |
| 3 | 4x PV Stick + (Weidmüller) , 4x PV Stick – (Weidmüller) |
| 4 | 1x Setup manual |

### 3.2.2 Component description

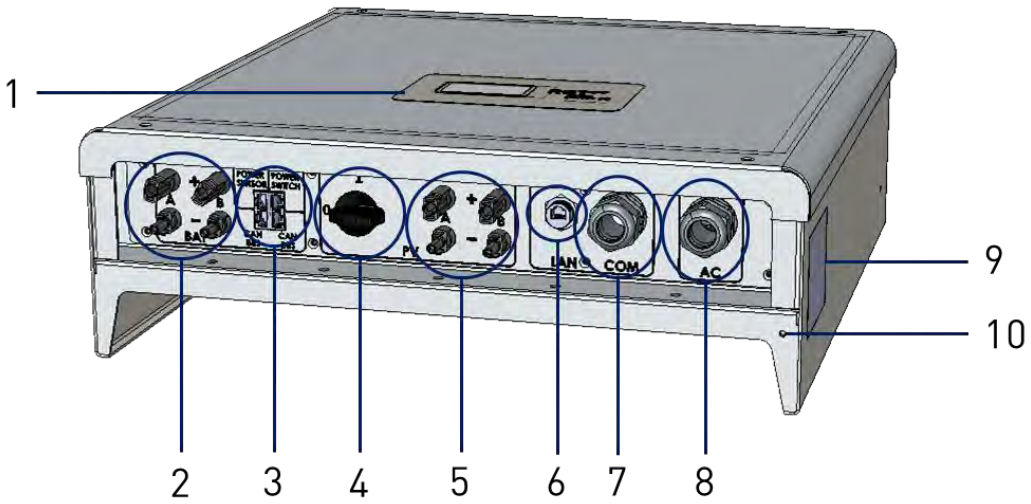



Fig. 3-3 Product specification

| Pos | Description | Comment |
|---|---|---|
| 1 | LCD Operating Display | Displays important Inverter status and operational information (see section 7.3) |
| 2 | Battery connection area | Battery connections (see sections 5.1 to 5.4) |
| 3 | RJ45-CAN bus communication connectors | RJ45-sockets for CAN-bus connection with batteries, Power Sensor and Power Switch |
| 4 | DC load break switch | Normal operation: Switch is in position "1", Turning switch to position "0" shuts down the inverter. |
| 5 | DC connectors | Two separate Solar generator inputs (A & B),<br>Connector Plug Type : Weidmüller WM4 |
| 6 | LAN-RJ45 | RJ45- socket for connection to router (LAN) |
| 7 | Connection area additional communication | Cable entry for the communication connections on the I/O-curcuit board (see sections 5.1 to 5.4) |
| 8 | AC-connection | AC-connection cable entry |
| 9 | Type Plate | Contains technical data, serial number barcode and warning symbols |
| 10 | Additional protective conductor connection | Connection for additional protective conductor (see section 5.6) |

### 3.2.3 Type plate and warning signs

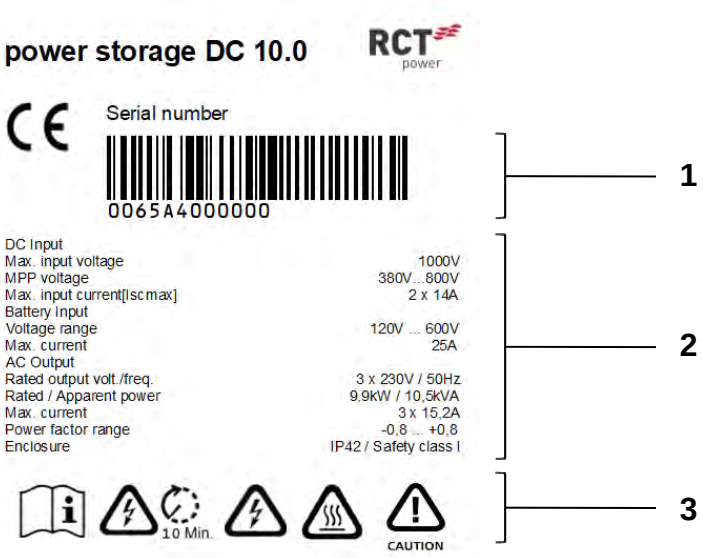


Fig. 3-4 Type plate

| Pos | Description |
|---|---|
| 1 | Serial number |
| 2 | Technical data |
| 3 | Symbols |



This symbol indicates that the user manual must be read and understood before the device is put into operation.




After disconnecting the electrical connections, wait a minimum of 10 minutes before opening the unit.



DC and AC voltage is present in the cables and inner parts of the inverter.



Hot surface! The housing can heat up during operation.




Warning!
High leakage currents. It is essential to establish an earthing connection before connecting to the power supply circuit (AC mains)!

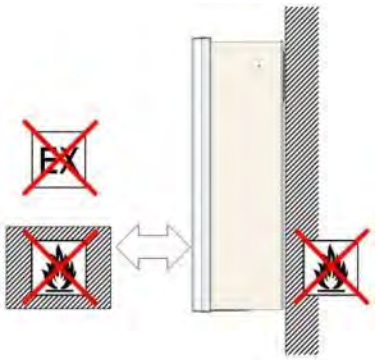
# 4 Mechanical Installation

## 4.1 Select mounting location

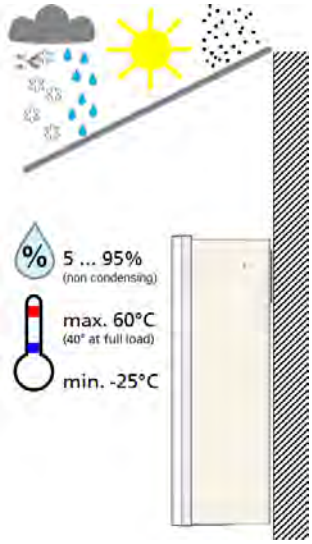
DANGER

Danger to life or serious injury from fire or explosions!

- Do not mount the inverter on a flammable surface.
- No combustible materials must be stored within 3 m of the inverter.
- The inverter must not be installed in areas and rooms subject to explosion hazards.



The mounting surface must be made of flame-retardant material.
Do not install in rooms and area subject to explosion hazards.
Keep away from flammable materials.




The inverter must be protected from dust, snow, rain and direct thermal radiation (e.g. solar radiation, central heating radiators, etc.).

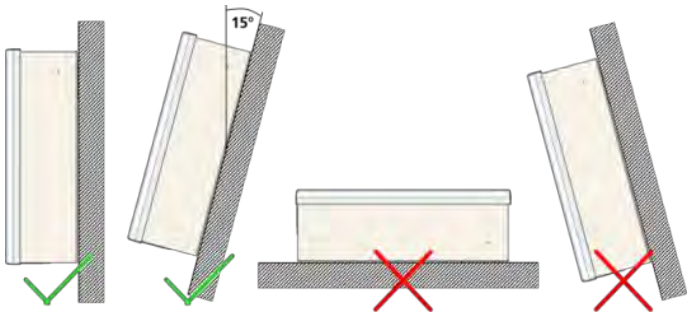
The following requirements must be met:

- Relative humidity 5 ... 85 % (non-condensing).
- Ambient temperature -25 ... 60 °C (40°C at full load).
- Maximum degree of contamination PD 2.

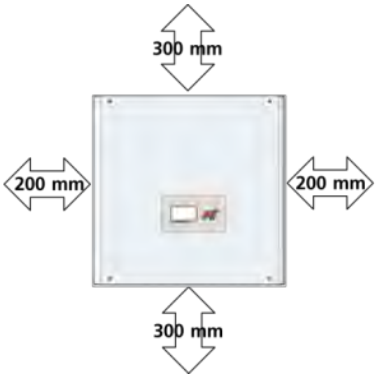



The mounting surface must be solid and able to permanently support the weight of the inverter unit.

The selected location must be accessible easily and safely at all times. Ensure no additional aids (e.g. ladder, scaffolding) are required for access.




Mount the inverter in an upright or slightly backward inclined position.




Required minimum distances to allow sufficient free convection of air for cooling the unit.



To prevent mutual heating, inverters must not be mounted on top of each other.



Installation in a closed cabinet is prohibited.

**NOTICE**

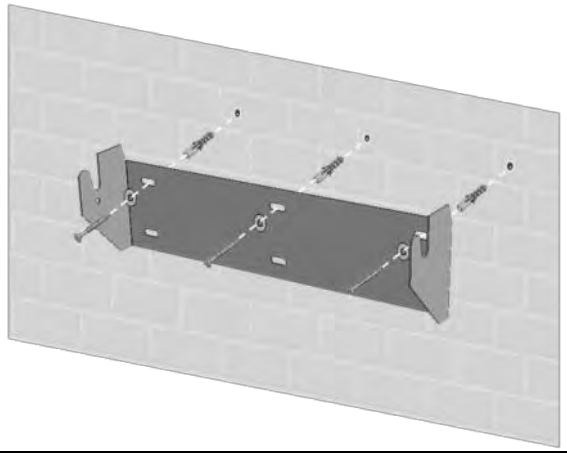
- Ensure sufficient air convection for the inverter. Overheating of the inverter due to poor cooling will result in reduced performance.
- The inverter can produce noise levels of up to 35db during operation. Ensure the inverter is mounted in a way that people cannot be disturbed by the operating noise.

## 4.2 Mounting

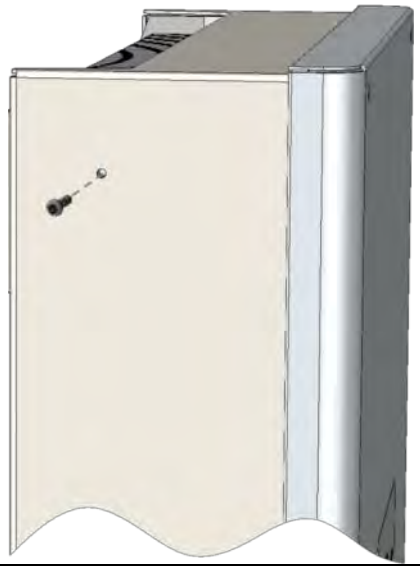
Additional material required (not included in the scope of supply):

- At least 3 to 6 screws with a diameter of 6 to 8 mm.
- Suitable dowels.
- Suitable washers with a minimum outer diameter of 18 mm.

Procedure:



Mount the wall bracket as shown left.
Use at least 3 screws (ø 6-8mm),
3 washers (outside ø min. 18mm)
and the appropriate dowels.



Loosen the inverter's left and right-sided locking screws at the top.

Hook the Power Storage DC with the retaining bolts on both sides into the recesses of the wall mounting bracket.

Tighten the locking screws again to secure the inverter.

Check that the inverter is securely fastened.

# 5 Electrical Installation

## 5.1 Connections overview

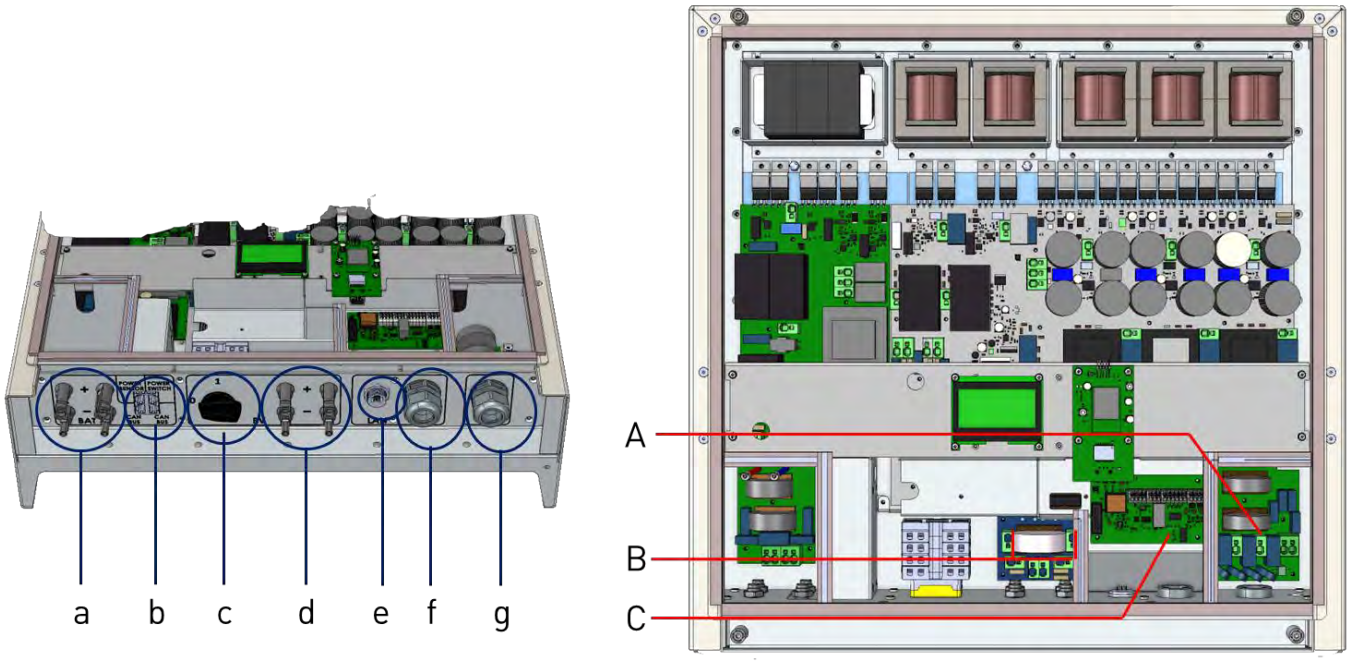



Fig. 5-1 Overview of wiring area and interior connecting components

| Pos | Description | Comment |
|---|---|---|
| a | Battery connection area | Battery connectors, Connector Plug Type : Weidmüller WM4 |
| b | RJ45-CAN bus communication connectors | RJ45-sockets for CAN-bus connection with batteries, Power Sensor and Power Switch |
| c | DC load break switch | Normal operation: Switch is in position "1", Turning switch to position "0" shuts down the inverter when power circuit to battery is interupted. |
| d | DC connectors | Two separate solar generator inputs (A & B), Connector type: Weidmüller WM4. |
| e | LAN-RJ45 | RJ45- socket for connection to router (LAN) |
| f | Connection area additional communication | Cable entry for the communication connections on the I/O-curcuit board (see sections 5.1 to 5.4) |
| g | AC cable gland | AC-connection cable entry |
| A | AC terminal block | AC terminal block with terminals for connecting phases L1, L2, L3, as well as N and PE. |
| B | Terminals for DC parallel connection | Terminals for internal wiring of the DC parallel connection of the PV inputs (see section 5.3). |
| C | Communication circuit board | The communication circuit board has a serial RS485 interface, a multifunction relay, 4 digital inputs for ripple control signals and further digital inputs and outputs (S0) to connect current sensors or displays. |

## 5.2 AC connection

Procedure:

DANGER

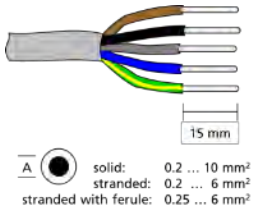
Danger to life or serious injury from electric shock!

- Only qualified personnel must carry out the work described in this section.
- Important: All voltage sources (DC /solar generator, DC /battery and AC /grid) must be disconnected before carrying out any electrical work on the inverter.
- To disconnect the solar generator voltage, turn the DC switch (on the inverter) to the position '0'.
- To disconnect the battery voltage, turn the DC switch (on the Power Battery Master) to the position '0'.
- To disconnect the mains voltage (AC) activate the circuit breaker or remove the fuse. Do not reconnect until the work has been completed.
- Only switch inverter back on after all electrical work has been completed.
- Ensure that other persons stay away from cables and internal components.
- Avoid traction forces on cables and plugs. Avoid sharp edges. Do not exceed the maximum bending radius of the cables.

WARNING

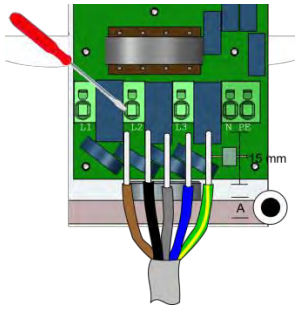
Danger to life or serious injury from electric shock or fire!

- Do not mix up the wires L, N and PE!
- Install an overcurrent protection device (circuit breaker, fuse) of max. 25A.




Required cable:

AWG 24 … 8




Remove the inverter cover and identify the AC terminal block (see Fig. 5-1).

Loosen the cable gland of the AC cable duct. Carefully remove the cable insulation.
Make sure that no wire strand is damaged. Use the designated cable entry provided for the AC cable.

To open the terminals press them down with an insulated screwdriver. Make sure that the connections of L1, L2, L3, N and PE are correctly inserted.

Tighten the cable gland to ensure strain relief for the connected cable.

NOTICE

- Provide an AC disconnector switch. (LS switch 3-pole 6kA B characteristic 25A).
- Ensure that the disconnect device can be easily accessed at all times.
- Install the residual current device (RCD) or (RCCB) Type B required in the country of installation. A residual current circuit breaker (RCCB) type A is sufficient for installations in Germany.

## 5.3 Configuration of the PV inputs

### A) Stand-alone operation Mode

Stand-alone operation mode is preconfigured. In this mode, each DC input (A & B) has an independent MPP tracker.
This is especially beneficial if the properties of the PV-strings, such as module type, number of modules, orientation or shading of the panels are different. Differences in these properties lead to different MPPs of the two PV-strings.

**B) Parallel Mode**

This mode is only used if several strings with the same number of modules are to be connected in parallel and the resulting maximum input current per input exceeds 14 A.

Conditions for parallel mode:

- The total current of all strings connected to the inverter must not exceed 28 A.
- The strings have identical properties (module type, orientation and condition of the modules)

**Example:**

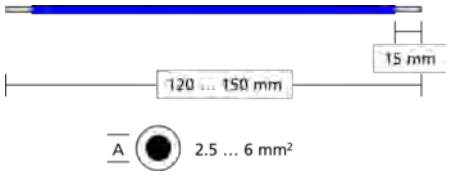
The PV panels are divided into three strings of 9A each. It is nevertheless possible to connect them to the inverter without changing the string configuration. One string is connected to one of the two solar generator inputs. The other two strings are connected in parallel via a Y contact and then connected to the remaining free input.

**Procedure for parallel connection:**

**DANGER**

Danger to life or serious injury from electric shock!

- Only qualified personnel must carry out the work described in this section.
- Important: All voltage sources (DC /solar generator, DC /battery and AC /grid) must be disconnected before carrying out any electrical work on the inverter.
- To disconnect the solar generator voltage, turn the DC switch (on the inverter) to the position '0'.
- To disconnect the battery voltage, turn the DC switch (on the Power Battery Master) to the position '0'.
- To disconnect the mains voltage (AC) activate the circuit breaker or remove the fuse . Do not reconnect until the work has been completed.
- Only switch inverter back on after all electrical work has been completed.
- Ensure that other persons stay away from cables and internal components.




Required cable:

AWG 24 … 10

*Material not included in scope of supply.*



Remove the inverter cover.
Identify the terminals for parallel operation.

Connect terminal X101 with X104.

## 5.4 DC connection

**DANGER**

Danger to life or serious injury from electric shock!

- A high voltage of up to 1000 V is applied to the DC cables while the PV system is exposed to sunlight. Ensure that nobody touches the positive and negative cables at the same time.
- The inverter is transformerless. Therefore, the PV array must not be earthed!
- Avoid traction forces on cables and plugs. Avoid sharp edges. Do not exceed the maximum bending radius of the cables.

NOTICE

- Check the cables for correct polarity.
- Ensure the DC Switch is set to position "0" before connecting the connectors.
- The system voltage must not exceed the maximum input voltage of the inverter (see Type plate). PV modules are suitable for a maximum system voltage according to IEC 61730 Class A.
  Overvoltage will destroy the inverter.
  If necessary, check the string layout to avoid an electrical surge.

- Any type of contamination (dust, moisture, etc.) negatively influences the functionality of the connector system over the intended period of use. It is therefore essential to avoid contamination during the connector assembly and installation.
- The voltage in the DC cables correlates with the intensity of the solar radiation onto the PV array. It is lower in the morning and evening hours or when the PV panels are shaded.

### 5.4.1 DC connector assembly

**Prepare cable conductor :**




Specialist cable for PV applications

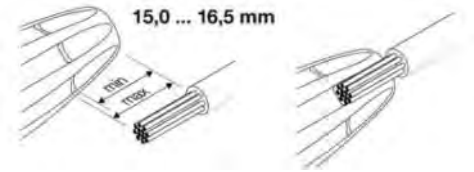
PV Cable

2PfG 1169 / 08.07



Remove the cable insulation carefully.

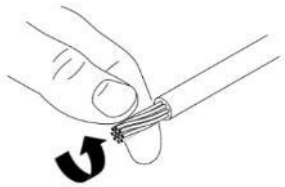
Ensure that no individual strands are damaged.




Check the length of the exposed strands against the plug.

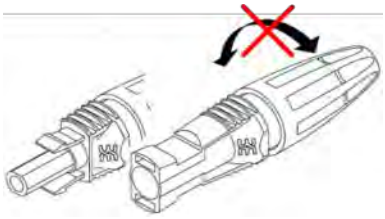
Min. 15mm

Max. 16,5mm

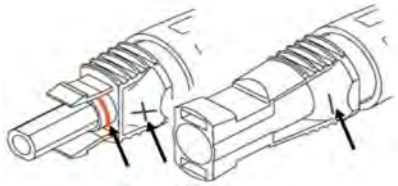


Twist the strands

**Inserting the cable conductor:**

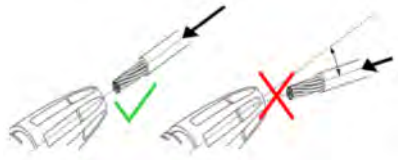


Do not turn connector plug in the screw fitting before strands are wired.

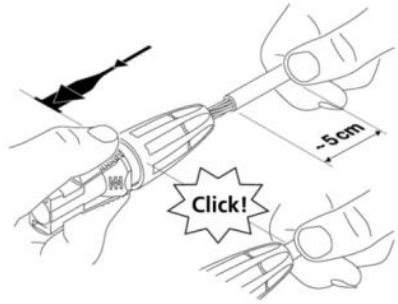


Select the correct connector type.

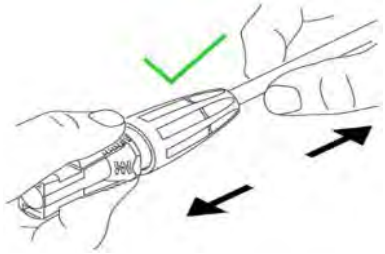
Pay attention to the polarity.



Insert the cable in a straight line into the plug.

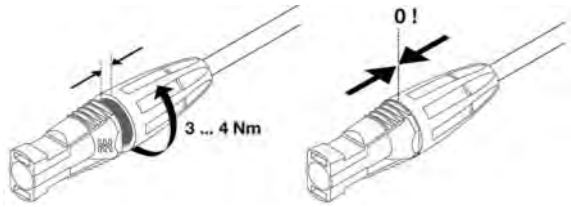



Ensure that the contact snaps into place audibly with a "click".



Check that the connection has snapped in correctly with a slight pull on the cable.

**Conductor cable screw connection:**




Turn connector plug in screw fitting.



Ensure that the DC switch is set to position "0".
Connect the corresponding positive and negative poles to the DC inputs of the inverter.

Do not turn the DC Switch to position "1" until all electrical work has been completed.

### 5.4.2 DC Battery connection

**DANGER**

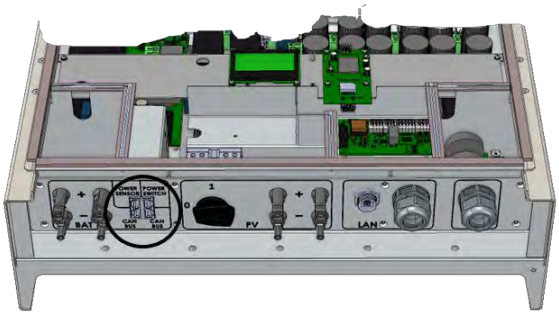
Danger to life or serious injury from electric shock!

- Only the battery systems specified and certified by RCT Power GmbH must be connected! Check the cables for correct polarity.
- Cables must only be connected or disconnected in a voltage-free state.

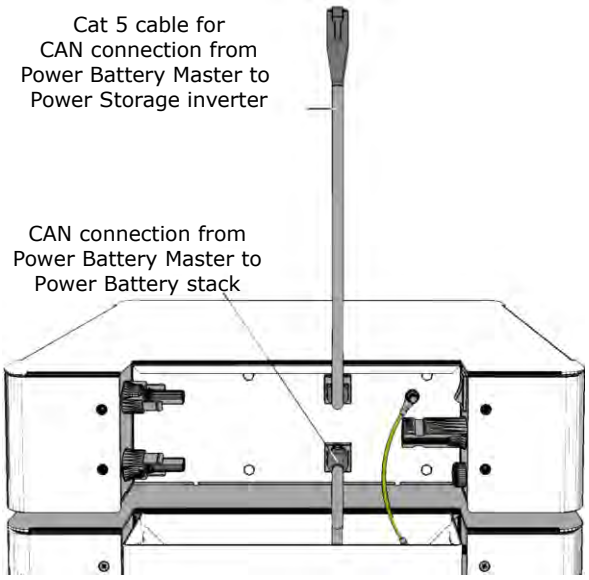
Ensure that the DC load break switch of the inverter is set to "0". The battery ON/OFF switch needs to be set to "0" and AC on the inverter is disconnected by the main switch or by the fuse.

The battery input of the Power Storage DC is then connected to the battery output of the Power Battery Master.

A CAN connection between Power Storage DC and Power Battery Master is required for correct functionality.

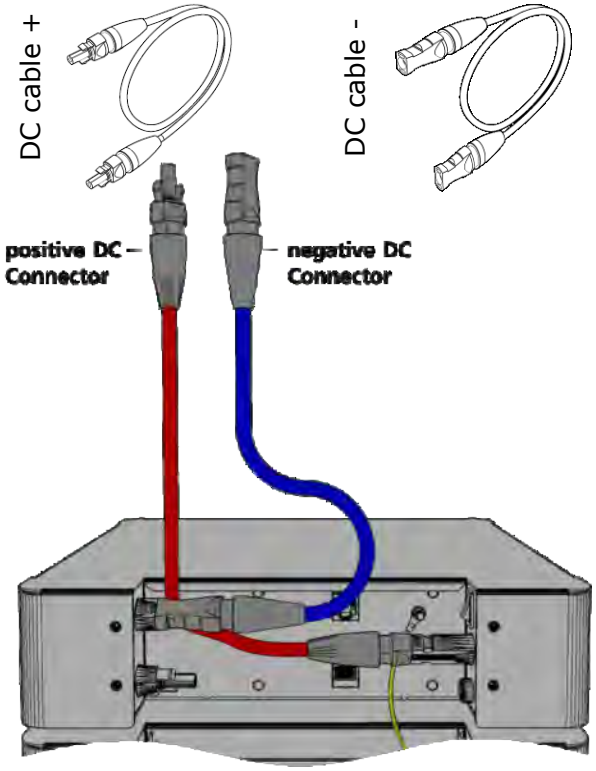


Connect the cable to the RJ45-socket (CAN).






Battery DC input of the Power Storage DC 8.0/10.0.



## 5.5 Disconnecting voltage sources

**DANGER**

Danger to life or serious injury from electric shock!

High voltage is present in the inverter components when the inverter is connected to the mains (AC voltage source) and/or to a PV array exposed to sunlight or is connected to a battery (DC voltage source).

This voltage can cause fatal electric shocks.

- Any work involving wiring, connecting or opening the inverter enclosure must be carried out by qualified personnel.
- Ensure that other persons stay away from cables and internal components.

**WARNING**

Danger to life or serious injury from electric arc!

High voltage is present in the inverter components when the inverter is connected to a solar generator exposed to sunlight or a battery (DC voltage source). This voltage can result in electric arcs if the DC connectors are pulled under load.

Electric arcs can cause severe electric shocks or burns.

**Procedure:**

| Step | Description |
|---|---|
| 1 | Turn the DC load break switch to position "0" (see Fig. 5-1). |
| 2 | Switch off the battery via the ON/OFF switch on the Battery master. Position "0". |
| 3 | Disconnect the inverter from the mains by using the external circuit breaker or the main switch. |
| 4 | Wait a minimum of 10 minutes to allow the capacitors to discharge fully. |
| 5 | Disconnect the DC side (PV and battery):<br>Remove the battery and DC connectors. Squeeze the connector lock together and unplug the connector |
| 6 | Disconnecting the AC side:<br>Remove the inverter cover.<br>Identify the AC terminal block (see Fig. 5-1).<br>Press the terminals down with an insulated screwdriver to open the connections. Pull out the cable ends L1, L2, L3, N and PE.<br>Loosen the cable gland and pull out the AC cable cautiously. |

## 5.6 Additional Protective Conductor Connection

Install an additional protective conductor on the inverter case if required in the country of installation.

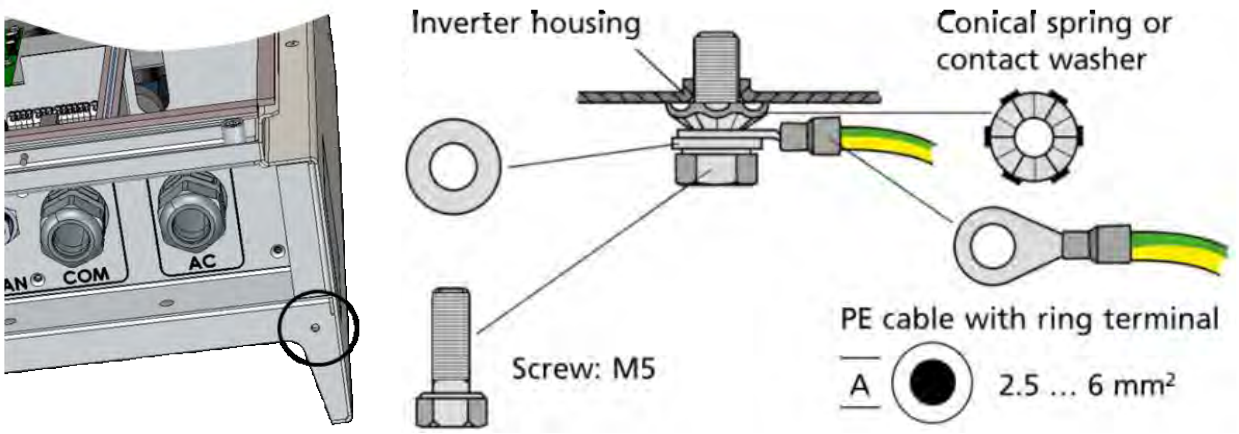



Fig. 5-6 Material not included in scope of supply

**Procedure:**

| |
|---|
| The additional protective conductor connection is located on the lower right side of the inverter enclosure. |
| Assemble the connection as shown in Fig. 5-6. |
| Connect the cable end to the equipotential bonding rail. |

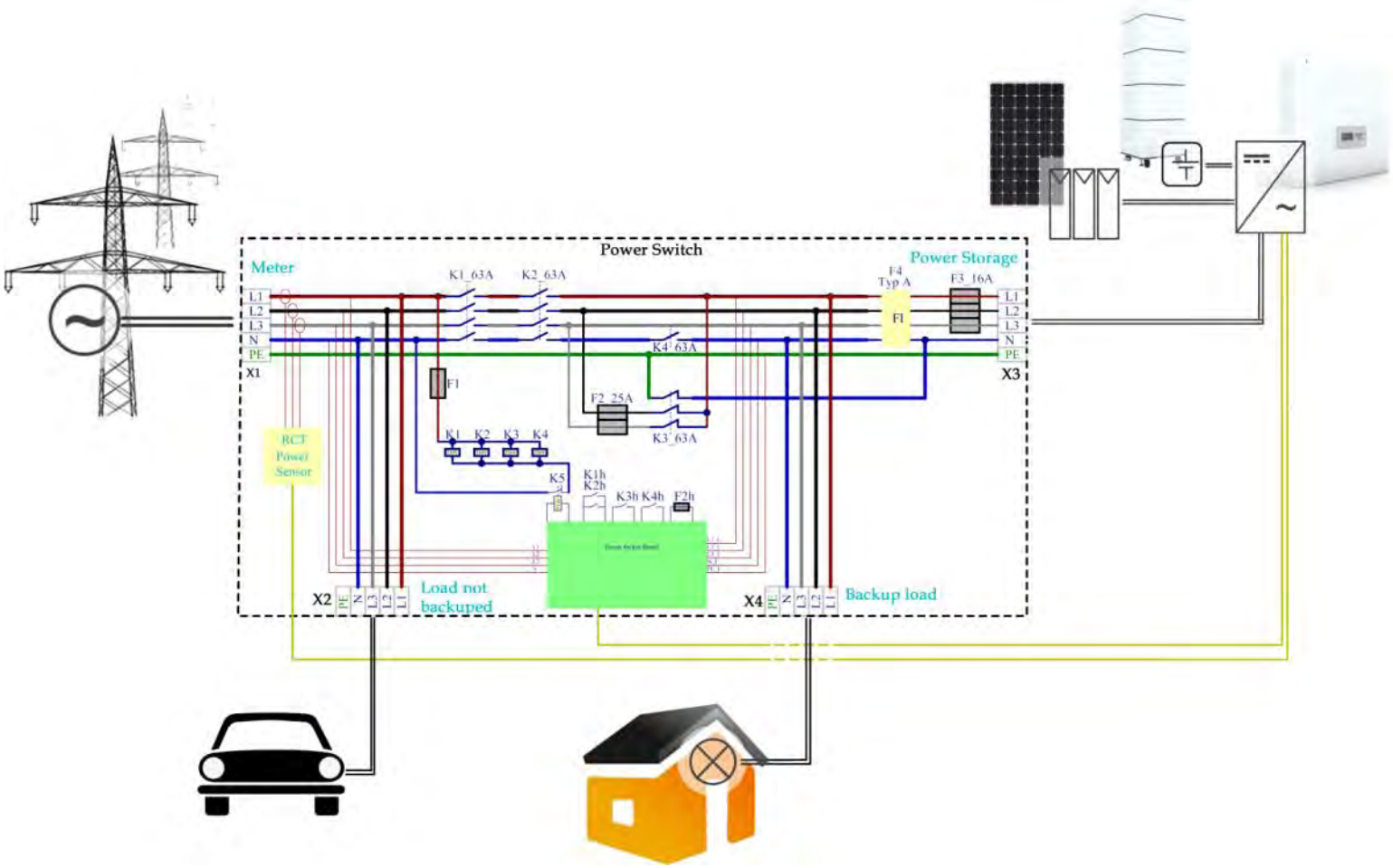
## 5.7 Connection – Power Switch

This section only applies when the RCT Power Switch is used with a battery system.

The RCT Power Switch in conjunction with the battery system ensures that your household loads continue to be supplied in the event of a power failure. The Power switch disconnects the household from the mains and the consumers are then powered by the battery.

When the mains supply is re-established, the Power Switch switches back and reconnects the household to the mains without interruption.

Please Note: RCT Power Switch and the battery system are not an Uninterruptible Power Supply (UPS)! It cannot act as a replacement for dedicated UPS devices that are used to protect vital infrastructure such as servers, medical devices, etc.




Procedure:

Disconnect voltage sources (see section 5.5).

Install the Power Switch in the house junction box or nearby.

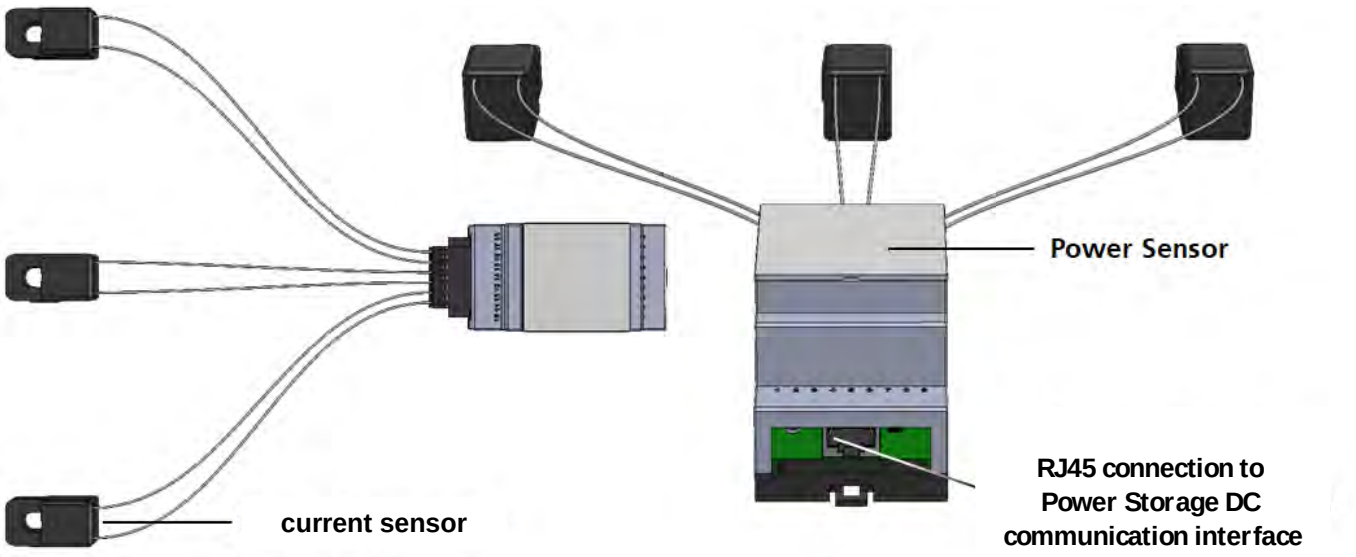
For more information on installing the Power Switch, refer to the Power Switch manual.

## 5.8 Connection – Power Sensor

This section only applies when the RCT Power Sensor is used.

The functionality of the power storage system is based on the measurement of energy flows.

The RCT Power Sensor can easily be installed without disconnecting the cables and allows 3-phase current monitoring.




Put the power sensor in the house junction box.

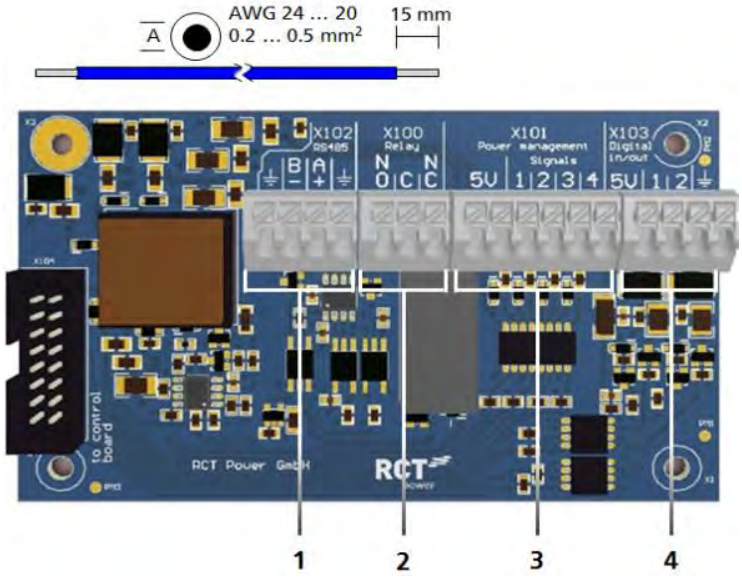
Connect the three current sensors to the phases L1, L2 and L3 in the house junction box. (The sequence and installation direction do not have to be observed).

Connect the power sensor via a patch cable to the inverter‘s corresponding RJ45 port (see Fig, 5-1 b and section 6.3).

For further information on installing the Power Sensor, refer to the Power Sensor manual.

# 6 Communication Ports

## 6.1 I/O circuit board



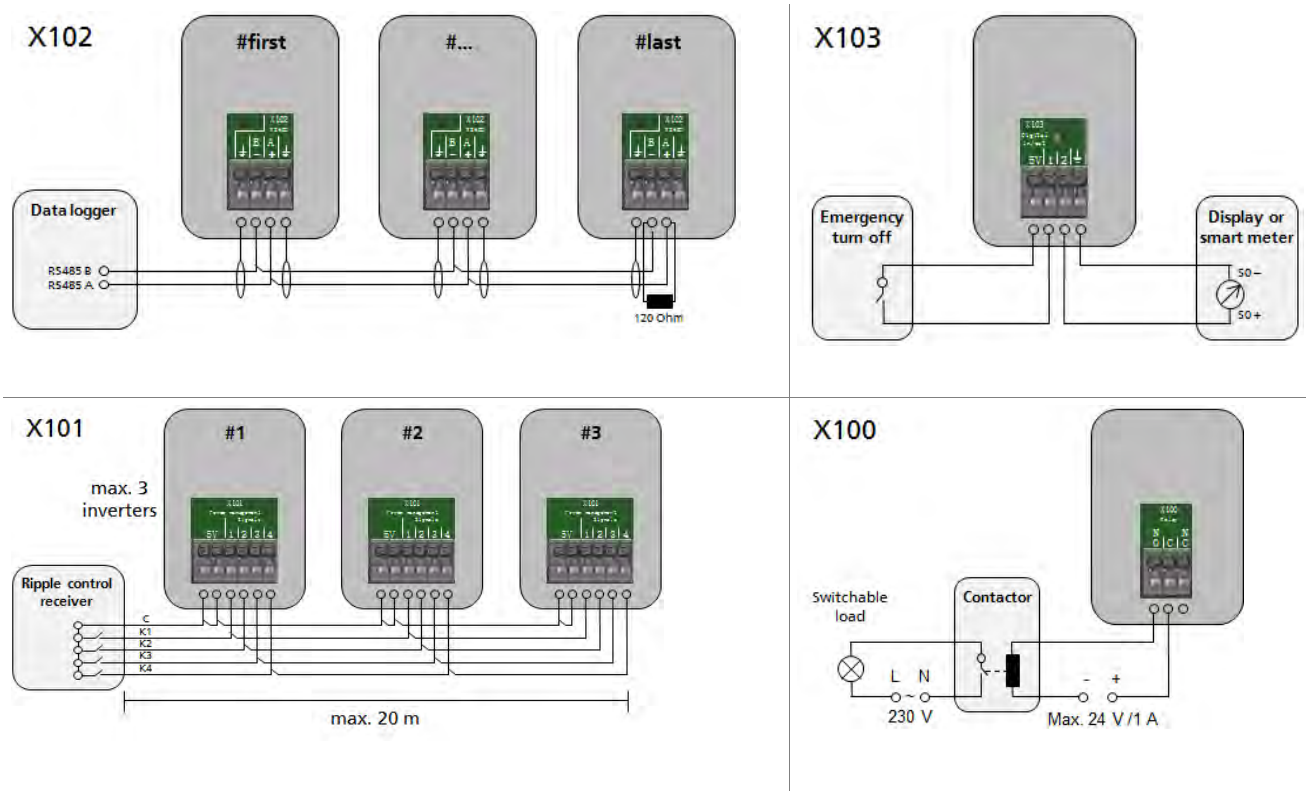

| Pos | Description |
|---|---|
| 1 | X102: Serial RS485 interface. |
| 2 | X100: Multifunction relay, max. 24V, 1A. |
| 3 | X101: Ripple control signals: 4 digital inputs for potential-free relay contacts. |
| 4 | X103: Digital in/outputs (S0 signals), max. input 24V, max. output 5 V, 10 mA. |

Fig. 6-1 I/O circuit board

**Connection of the communication interfaces:**

| Step | Description |
|---|---|
| 1 | Disconnect voltage sources (see section 5.5). |
| 2 | Use the corresponding cable ducts for the supply cables (see Fig. 5-1). |
| 3 | Select the correct interface (see the following section). Press down the spring contact to insert the cable. |

**Wiring the communication ports:**



### 6.1.1 RS485 - X102 Interface

Application:

The serial interface enables the connection of external data loggers or meters.
Select the appropriate RS485 operation mode in the APP configuration:
Connection data logger → “Modbus Slave“
Connection meter → “Modbus Master“

Wiring:

The number of inverters that can be connected to a joint data logger is limited. Refer to the data logger manual for details and specifications.

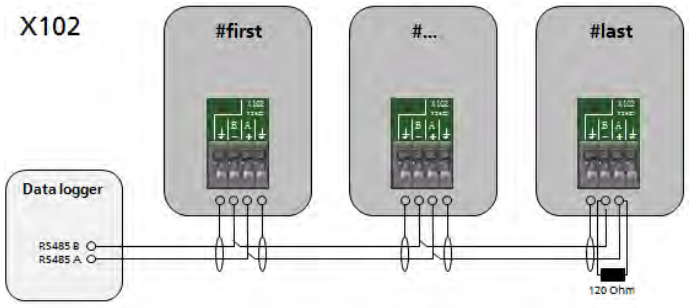



Fig. 6-3 Connection of data logger

### 6.1.2 Multifunction relay X100 Interface

Application:

The multifunction relay can be configured in two ways:

I.1.1 As an alarm relay. In the event of an inverter fault, the alarm signal is connected.

I.1.2 As a load relay. It will be connected above a defined threshold power generated by the inverter and can be used, for example, to control a contactor with an external power supply connecting a household consumer.

Wiring:

A number of signals can be operated in parallel as long as the maximum current of 1 A and 24 V is not exceeded.

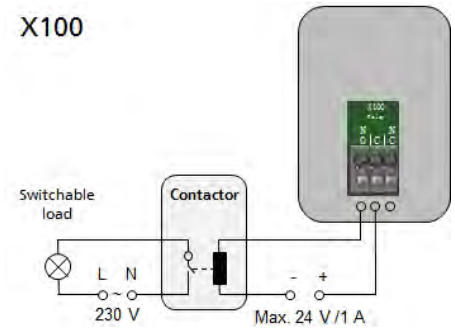



Fig. 6-4 Connection - Contactor and switchable load

### 6.1.3 Ripple control signals X101 Interface

Application:

Four digital inputs are available for potential-free relay contacts connecting one or more inverters to a ripple control receiver.

Wiring:

**NOTICE**

- A maximum of 3 inverters can be connected to each other via X101.
- The total cable length must not exceed 20 m.

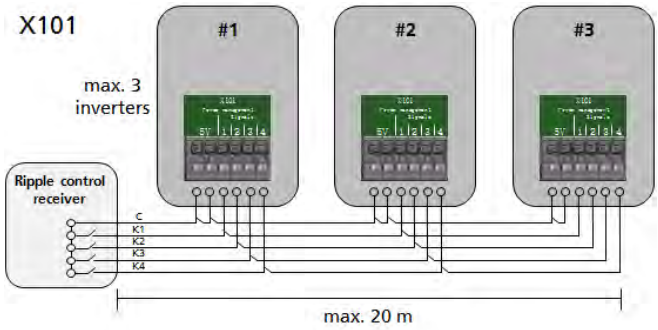



Fig. 6-5 Connection - Ripple control receiver

### 6.1.4 Digital Inputs and Outputs X103 Interface

Application:

I.1.1 Standard use case for input signals is the connection of an electricity meter with S0 output.
I.1.2 Standard use case for an output signal is the connection of a display of feed-in data.
I.1.3 One port can be used for emergency shutdown switches (mandatory in some countries).

Wiring:

Each port of the X103 interface can be configured to receive input or output signals.



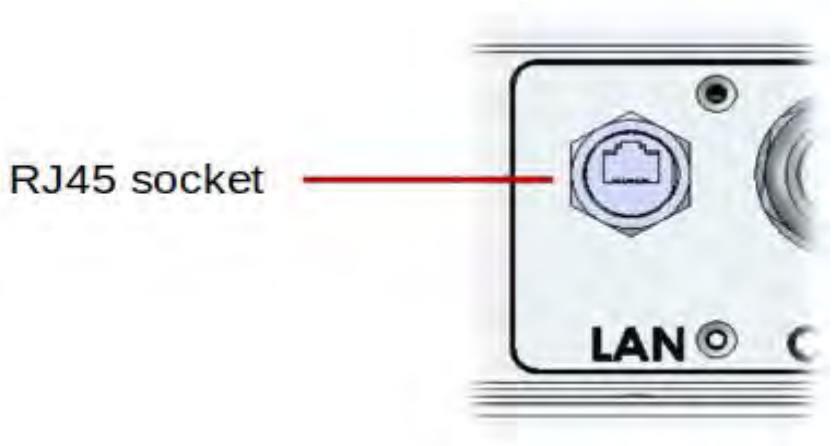

Figure 6-6 X103 interface connected with an emergency shutdown switch and a solar display unit or meter

## 6.2 Connection Ethernet Interface

After the initial commissioning, the Power Storage DC offers the option to communicate via an Ethernet interface in addition to communication over a Wi-Fi network.

Communication over Ethernet requires a network cable of Cat5e or higher standard. The Power Storage DC is connected to the network device (usually a network router) with this cable.

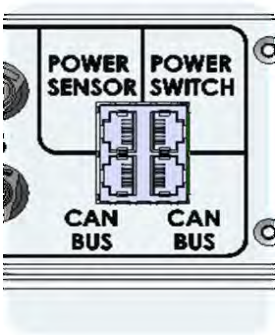
To configure the Ethernet connection, open the RCT Power APP and select the menu item "Network Settings". (see also section 7.1.9)



## 6.3 RJ45 connections for Power Battery, Power Sensor and Power Switch

The inverter communicates with the battery via a Controller Area Network (CAN bus).

If the inverter was optionally supplied with a Power Sensor or Power Switch refer to the devices‘ manuals for more detailed commissioning instructions.



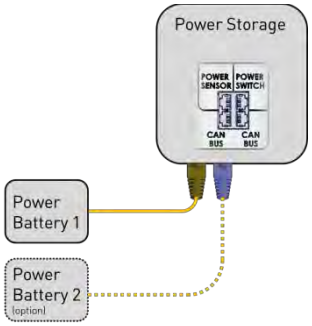

| Description |
|---|
| CAN BUS: Battery communication port.. |
| Power Sensor: Power Sensor communication port. |
| Power Switch: Power Switch communication port. |

Fig. 6-7 Overview of RJ45 connections

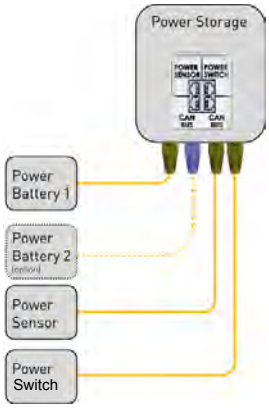
**Connecting the RJ45 interfaces:**

| Step | Description |
|---|---|
| **1** | Disconnect voltage sources (see section 5.5). |
| **2** | Use the corresponding cable ducts for the supply cables |
| **3** | Select the correct interface (see Fig. 6-7 and the following section) and connect the patch cable with the RJ45 socket. |

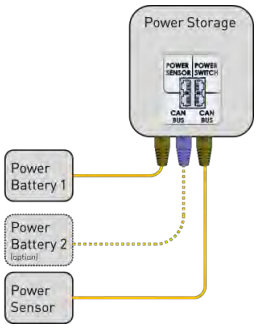
### 6.3.1 Wiring the RJ45 interfaces




Standard communication Power Battery




Additional communication Power Switch and Power Sensor




Additional communication Power Sensor

# 7 Commissioning

## 7.1 Commissioning

**The inverter is equipped with an internal Wi-Fi module.**
**To set up and commission the inverter, you must connect to it via Wi-Fi using the RCT Power APP.**
**This Android operating system based App contains the inverter's central user interface.**
**The App also ensures easy data collection and facilitates troubleshooting.**

**How to get the App → Open the Google Play Store, search for "RCT Power APP" and install.**

**WARNING**

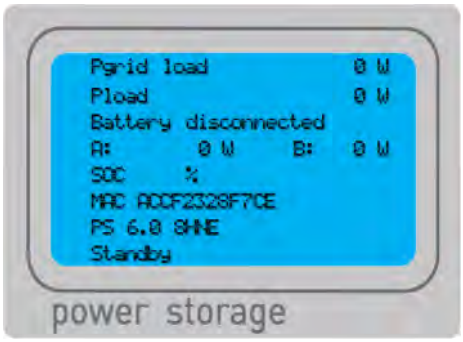
To avoid material damage and personal injury, the Power Inverter must only be installed, wired, connected, commissioned and serviced by qualified personnel.

The following tasks must have been completed before the inverter can be commissioned and operated:

- The Inverter is mounted (see section 4.2).
- The inverter is connected to the public grid (AC) (see section 5.2).
- The PV modules are connected to the inverter (see section 5.4).
- The electrical connections to the battery are established (see section 5.4.2).
- Additional protective conductor connection established if required (see section 5.6).
- Power Switch and/or Power Sensor are connected if available (see section 5. 7 and 5.8).
- The inverter cover is assembled.

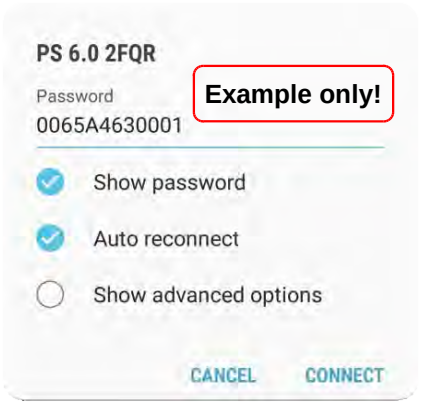
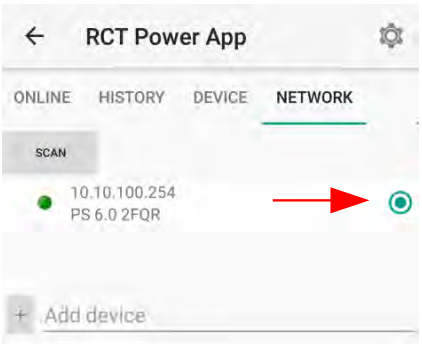
### 7.1.1 Switch on the Inverter

| Step | Description |
|---|---|
| 1 | Switch on the mains connection using the external circuit breaker. |
| 2 | Switch on the solar generator voltage by closing the DC load break switch (switch position "1").<br>If the input voltage is sufficient, the display of the device switches on. |



### 7.1.2 Accessing the inverter

If the inverter is detected or selected by the RCT Power APP the display shows a "*" after the IP address

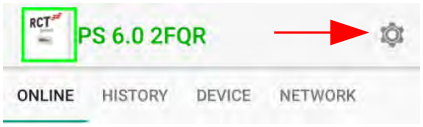
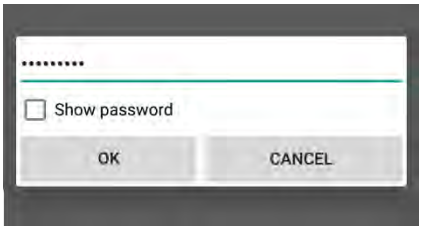
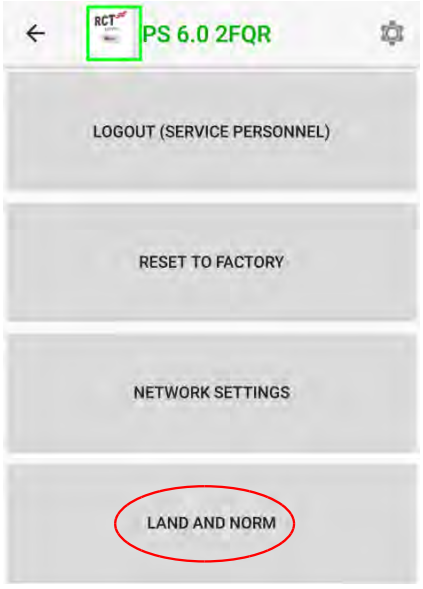
| Step | Description | |
|---|---|---|
| 1 | Activate the Wi-Fi option in the settings menu of your smartphone or tablet. | |
| 2 | Connect to the inverter's wireless network. The network broadcasts its service state ID ( SSID). This ID matches the inverter name shown on the inverter display. (e.g. PS 6.0 2FQR).<br><br>If the inverter is already integrated into an existing Wi-Fi network, connect to this network |  |
| 3 | The first time you connect a mobile device to the inverter's wireless network you are required to authenticate with a password.<br>The password is identical to the serial number of your device (see display or type plate). |  |
| 4 | Launch the "RCT Power APP". |  |
| 5 | Switch to menu item "Network" and press on "Scan" button. | |
| 6 | Select the radio button for "10.10.100.254"<br>(If the device has already been renamed select the new name accordingly). |  |
| 7 | When the connection to an inverter is established, the inverter name is displayed. The RCT Power Icon is framed by a square. |  |

### 7.1.3 Configuring the Inverter

NOTICE

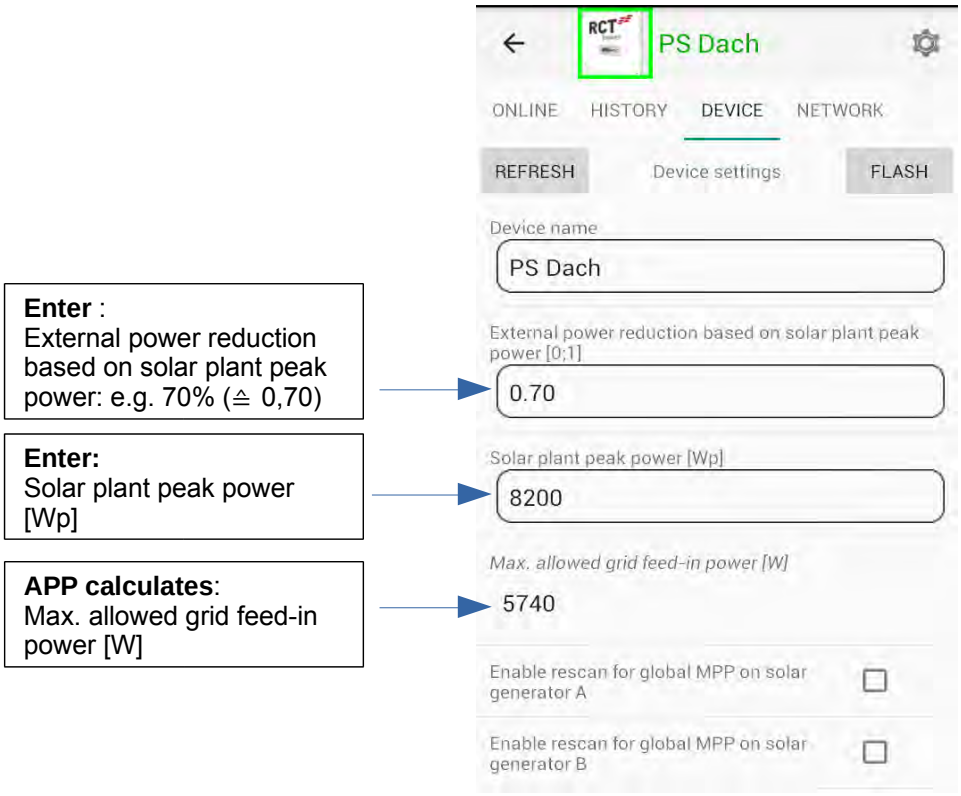
**Please note: The inverter is powered by PV modules.**

**The power supply unit can only be switched on to start and complete the commissioning tasks if the PV array is exposed to sufficient solar radiation.**

| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the inverter (see 7.1.2) | |
| 2 | Press the Settings icon“ ⚙ “. |  |
| 3 | Press on the word “Login“ in the centre of the screen. A Login prompt is displayed.<br>Enter the installer password and press “OK“ to enter the configuration options screen. |  |
| 4 | Select “LAND AND NORM“ from the options. The screen “Land and Parameter Set“ will appear.<br>From the drop down list select the required parameter set. and press the “APPLY“button. |  |
| 5 | The parameters are synchronised and stored. Complete the process by pressing the "FINISH" button.<br>Return to the main menu. |  |

### 7.1.4 Setting Solar plant peak power and External power reduction

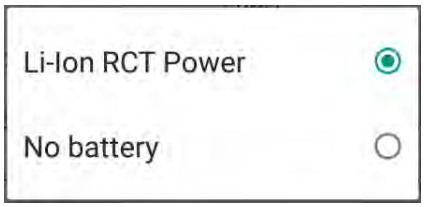
In order to obtain the maximum yield from the solar system, it is possible to configure a dynamic power reduction. There is no additional equipment required for this configuration apart from the Power Sensor.
The feed-in power is measured at the mains connection point and is only capped if the excess power exceeds the set value.

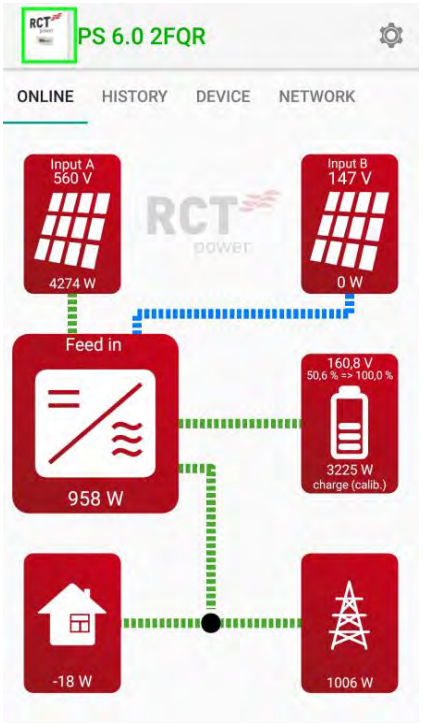
| Step | Description |
|---|---|
| 1 | In the RCT Power APP tap on “DEVICE“ --> “Settings“ --> “Device settings“ |
| 2 | Enter the desired values for<br>“External power reduction based on solar plant peak power [0;1]“ and<br>“Solar plant peak power [Wp].<br>Please ensure that you confirm your entries on the keypad. (Depending on your mobile device this requires a tap on “Enter“ or“OK“).<br><br><br>The input area will briefly turn red before returning to the standard background colour. |

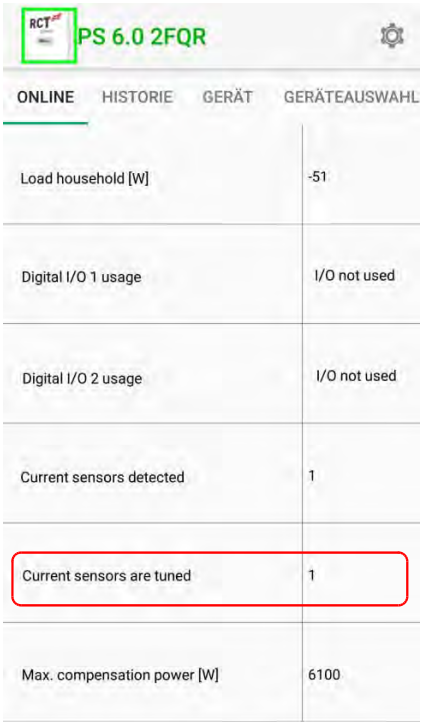
Please note: If your system contains **several devices** you must the enter **peak power** of the **combined system.**

### 7.1.5 Configuring the Battery

| Step | Description |
|---|---|
| 1 | In the main menu go to "DEVICE" and then press "Settings" and "Battery" |
| 2 | Press "Battery type" and select "Li-Ion RCT Power" or the corresponding battery type to be used in your system. |
| 3 | Turn on the battery by setting the battery ON/OFF switch to position "1". |
| 4 | The Inverter checks the battery specifications and then connects to the battery.<br>Current sensors are then being tuned in.<br>The Inverter will then reset and store the settings.<br>Battery calibration will start.<br>This can take several hours. (Power from the mains might be used to assist the calibration in case the PV Power is insufficient.)<br>The system will switch automatically into compensation mode once the calibration has been completed. |
| 5 | Check whether the power sensor has been tuned in.<br>Select "ONLINE" in the App's main menu. Press the „“ symbol,<br>A list will be displayed.<br>The value for<br>"Current sensors are tuned" should be = "1" |

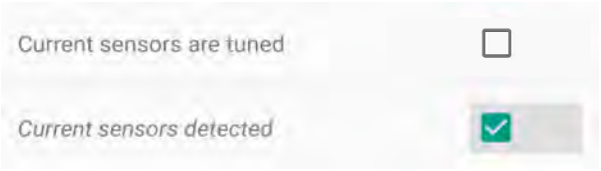
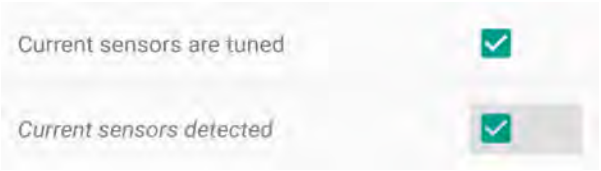


### 7.1.6 Configuring the Power Sensor (during operation)

Re-wiring or other changes to your system might require the Power Sensors to be tuned in again. Below is the procedure:

| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish a connection to the inverter. |  |
| 2 | Follow the following menu path:<br>DEVICE → Settings → Device settings<br>(scroll down on screen) →<br>Power-Sensor tuning (scroll down on screen). | |
| 3 | Unselect<br>"Current sensors are tuned"<br>by removing the tick mark. |  |
| 4 | The device will briefly turn off and attempt to tune in the sensors. The tick mark next to the menu item "Current sensors are tuned" will reappear as soon as the sensors have been detected and the device will then restart. | |
| 5 | After the current sensors have been tuned in Press "FLASH“ button to save the settings permanently.<br>Task completed! |  |

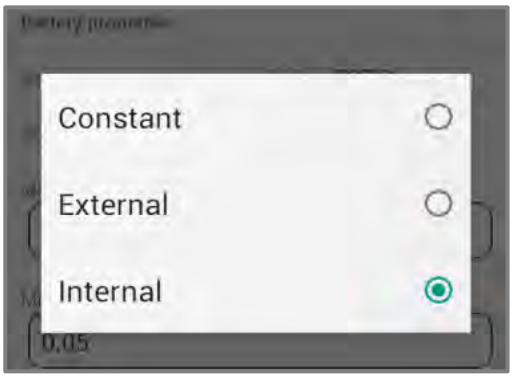
### 7.1.7 Expert Settings Battery

In some instances individual target values may need to be changed in the battery configuration.
Below is the procedure:

Caution: Please do not change the pre-configured values without prior consultation with RCT Power!

| Step | Description |
|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the inverter<br>(see 7.1.2) |
| 2 | Follow the following menu path:<br>DEVICE → Settings → Battery<br>Available settings options: |

- **SOC target selection**

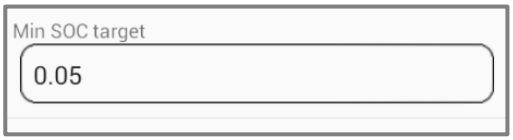



- Internal [recommended]:
  The system determines the Battery SOC target value taking into account the parameters and specifications of the solar system installation.

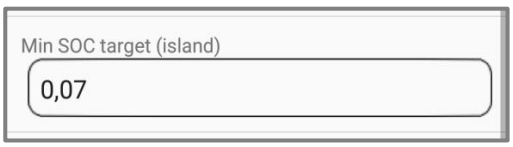
- Constant:
  The battery system attempts to charge the battery to the value set in option "Force SOC target".

External:
An external device provides the SOC target value, e.g. an in-house controller, a weather forecast device etc.

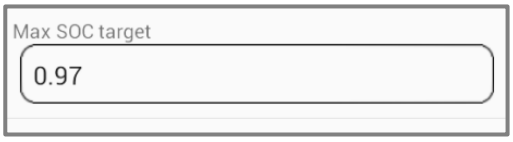
- **Min SOC target**
  Minimum SOC value that can be achieved (0,00 ≙ 0%). Default setting: 0.07.



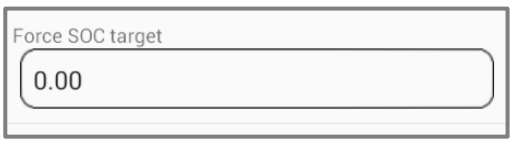

- **Min SOC target (island)**
  Minimum SOC value that can be achieved in island mode (0,00 ≙ 0%). Default setting: 0.07.



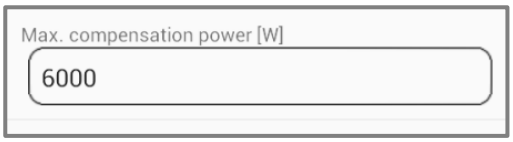

- **Max SOC target**
  Maximum SOC value that can be achieved (1,00 ≙ 100%). Default setting: 0.97



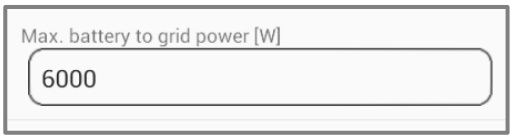

- **Force SOC target**
  SOC target value in setting “Constant“



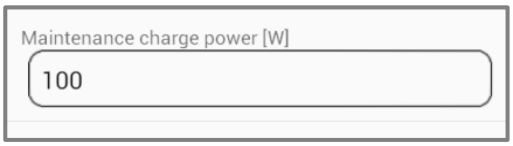
- **Max. compensation power [W]**
  The maximum power that can be taken from the battery for load compensation.



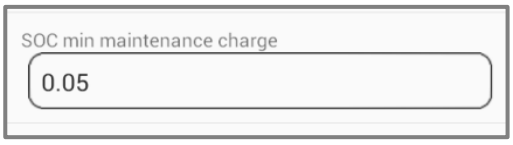

- **Max. battery to grid power [W]**
  The maximum power that can be taken from the battery to feed into the grid.




- **Maintenance charge power [W]**
  The power that is taken from the mains to prevent deep discharge of the battery if the SOC drops below the value set for "SOC min maintenance charge".



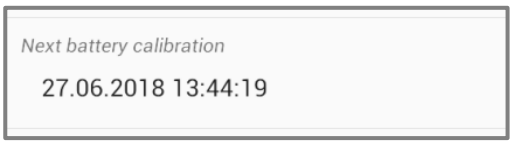

- **SOC min maintenance charge**
  The SOC value of the battery, below which a maintenance charge from the mains is triggered.
  Default setting: 0.05.



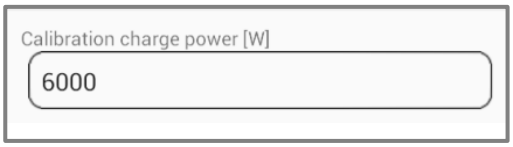

- **Battery calibration interval [days]**
  The period of time after which the next battery calibration is initiated.
  Default setting: 30.




- **Next battery calibration**
  Date of the next standard calibration is displayed.
  Press on the date to select a different date.
  Setting the date to a past date will trigger an immediate calibration.




- **Calibration charge power[W]**
  Maximum power the inverter draws from the grid for calibration if the PV system's power output is too low.



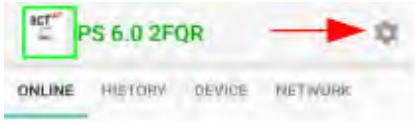
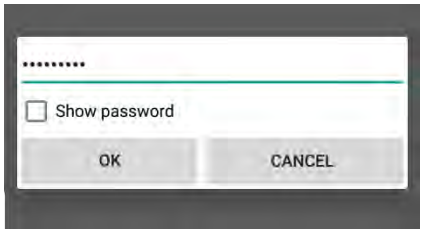
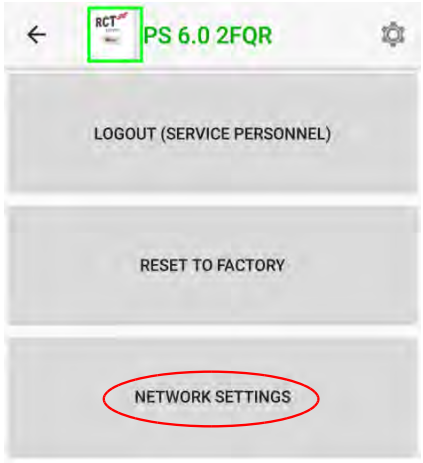

3 Press "FLASH" to save the new settings.

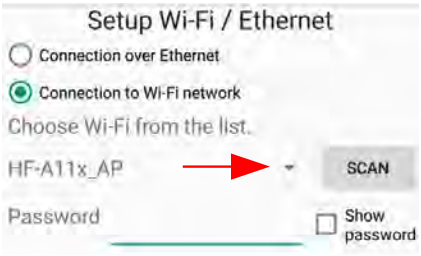
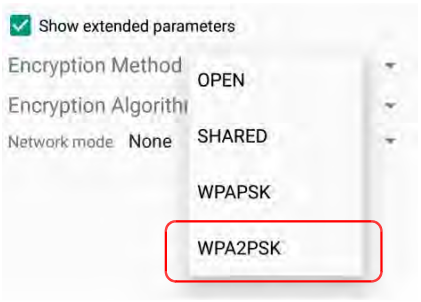
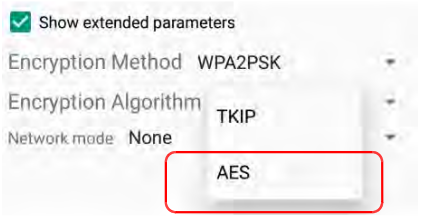
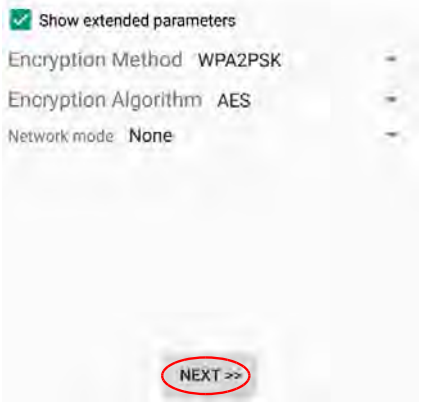
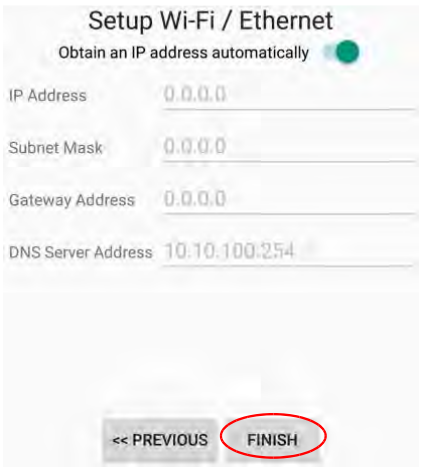
Important: Please note that you must confirm your entries with "OK" or "Done" in your keypad.

The input box will change briefly to red colour before the new value is displayed.

### 7.1.8 Connecting the inverter to a network via a Wi-Fi connection

Procedure to integrate the inverter into a home network via a Wi-Fi connection (Customer or Installer - Login).

| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the inverter (see 7.1.2) | |
| 2 | Press the settings icon “ ⚙ “. |  |
| 3 | A Login prompt is displayed. Enter the password and press “OK“ to enter the configuration options screen. (Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. |  |
| 4 | Press "NETWORK SETTINGS" and wait while the network settings load. |  |
| 5 | Select the radio button "Connection to Wi-Fi network" and press the "SCAN" button. The available Wi-Fi networks will appear in the drop-down list.<br>NOTICE<br>Some Android versions experience difficulties when searching for available Wi-Fi networks. It is a known problem that affects Android versions 6.0 & 6.0.1 and potentially other versions.<br>As a workaround solution open the settings menu of your Android device. Turn on Device Location using Google's location services and run the process again.<br>After the network integration has been completed, you can disable the location services.<br>Important: The Wi-Fi module of the inverter only supports the 2.4 GHz frequency band. |  |

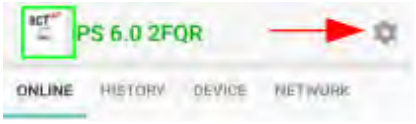
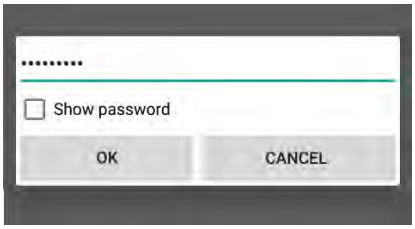
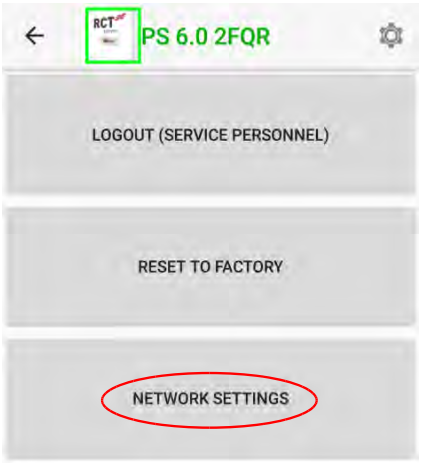
| | | |
|---|---|---|
| 6 | Expand the drop-down list and select the appropriate network. |  |
| 7 | Enter the corresponding Wi-Fi password. |  |
| 8 | Set a tick mark in the "Show extended parameters" box. Drop-down selection lists for the following parameters are available:<br>"Encryption Method" (default: WPA2PSK),<br>"Encryption Algorithm" (default: AES) and<br>"Network Mode" (default: None). | <br> |
| 9 | Press the "NEXT“ button. |  |
| 10 | Set "Obtain an IP address automatically" to "ON" and press the "FINISH" button. |  |

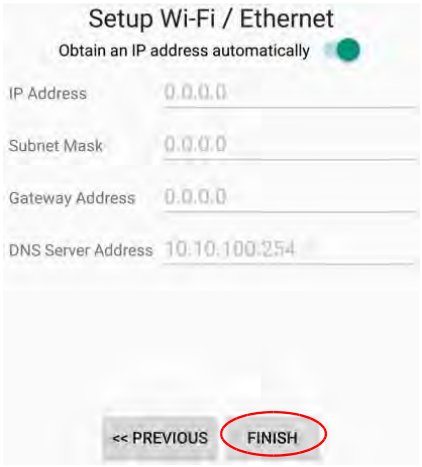
| | | |
|---|---|---|
| 11 | Wait until the new settings are confirmed and then press the "FINISH" button again. |  |
| 12 | Close the RCT Power APP. (this will speed up the process of obtaining the IP address).<br>After a short time, the LCD display of the inverter will show the IP address assigned by your home network. The inverter is now registered in your home network. | |
| 13 | Connect your Android device to your home network. Launch the "RCT Power APP" again.<br>In the "NETWORK" menu press the "SCAN" button.<br>Alternatively, you can enter the assigned IP address under "Add device" at the bottom of the screen and press the "+" symbol.<br>Once the device appears on the device list press the corresponding radio button to select it. | |

### 7.1.9 Connecting the inverter to a network via an Ethernet connection

Procedure to integrate the inverter into a home network via an Ethernet connection (Customer or Installer - Login).

Ensure that a suitable network cable is used to connect the inverter to the home network router. (see 6.2).

| Step | Description | |
|---|---|---|
| 1 | Establish connection to the inverter (see 7.1.2). | |
| 2 | Press the Settings Icon “ ”. |  |
| 3 | A Login prompt is displayed. Enter the password and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. |  |
| 4 | Press "NETWORK SETTINGS" and wait while the network settings load. |  |
| 5 | Select the radio button "Connection over Ethernet" and press the "NEXT" button. |  |

| | | |
|---|---|---|
| 6 | Set "Obtain an IP address automatically" to "ON" and press the "FINISH" button. |  |
| 7 | Wait until the new settings are confirmed and then press the "FINISH" button again. |  |
| 8 | Close the RCT Power APP. (this will speed up the process of obtaining the IP address).<br>After a short time, the LCD display of the inverter will show the IP address assigned by your home network.<br>The inverter is now registered in your home network. | |
| 9 | Connect your Android device to your home network. Launch the "RCT Power APP" again.<br>In the "NETWORK" menu press the "SCAN" button.<br>Alternatively, you can enter the assigned IP address under "Add device" at the bottom of the screen and press the "+" symbol.<br>Once the device appears on the device list press the corresponding radio button to select it. | |

### 7.1.10 Internet based remote access to the inverter

There are three feasible scenarios for remote access to the inverter from the internet. The configuration is explained in the following chapters with the example of the widely used FRITZ!Box router from AVM. Routers from other manufacturers will not support remote access with the MyFritz! account. If remote VPN connections are available will be detailed in their corresponding manuals.

1. Remote access via port forwarding with DynDNS (chapter 7.1.10.1)
2. Remote access via port forwarding with a MyFRITZ! account (chapter 7.1.10.2)
3. Remote access via VPN using DynDNS or a MyFRITZ! account (chapter 7.1.10.3)

Strictly speaking, there are only two different scenarios: remote access via port forwarding or VPN. The MyFRITZ! account ensures, just like DynDNS, the name resolution for access to a private internet connection. These are usually set up with a dynamic IP address resolution by the internet service provider. For a corporate internet connection with a static IP, a MyFRITZ!account or DynDNS are not required. The remote access is established via the known fixed IP address.

There are pros and cons to both methods. Port forwarding is easier to configure. The inverter can be accessed directly from the Internet and poses a potential security risk. Access via VPN (Virtual Private Network) is generally more secure. The connection from a mobile device to the inverter network is encrypted. The configuration of the VPN can, however, be more complex than port forwarding.

#### 7.1.10.1 Remote access via a FRITZ!Box with port forwarding and DynDNS

Remote Access to devices connected to a home network using an internet connection always poses a potential security risk. It requires changes to your network router settings. You may need to contact your internet service provider to have some of the required settings options enabled.

To enable remote access over the Internet, the inverter must be connected via Wi-Fi or LAN to a stable home network with access to the Internet.

One of the following conditions must be met:

- The router supports port forwarding and connects to the internet using a fixed IP address assigned by the Internet Service Provider.

  This is usually only a common set up for corporate internet connections.

  If this condition is met continue to 7).

- The router supports port forwarding and connects to the Internet using a dynamic IP address assigned by the Internet Service Provider. Dynamic Domain Name System entries are enabled.

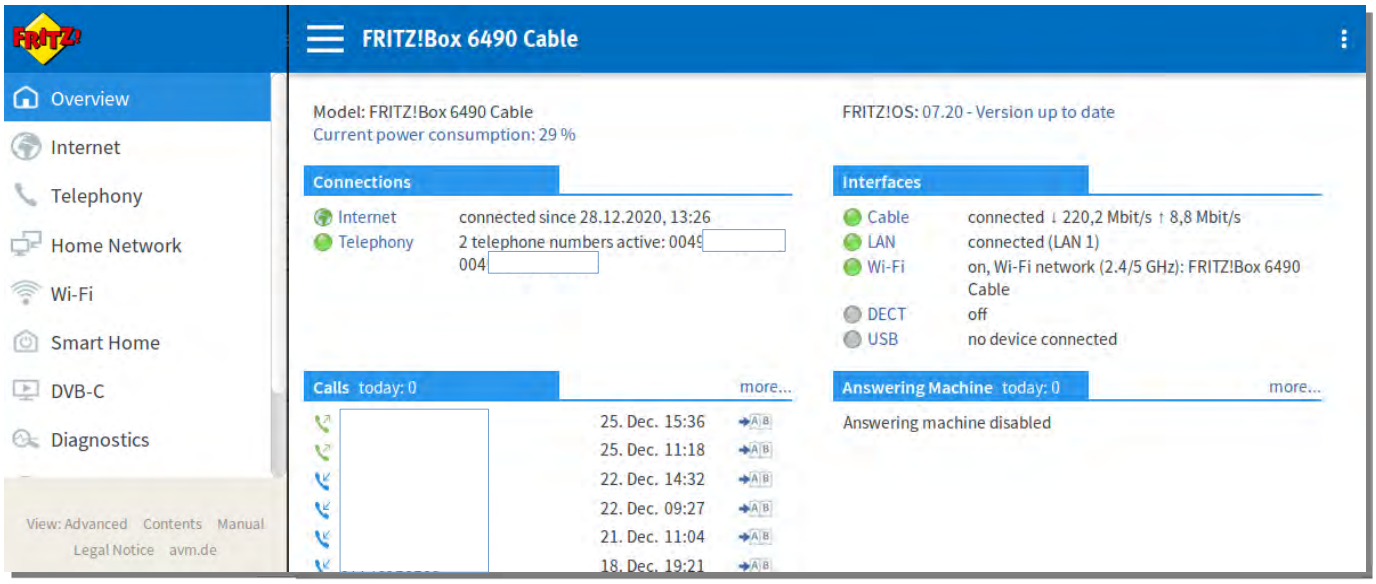
  This is usually a common set up for most private Internet connections.

The following section describes how to set up the remote access via DynDNS using a Fritz!Box router. If you are using a router from a different manufacturer, these instructions may differ.

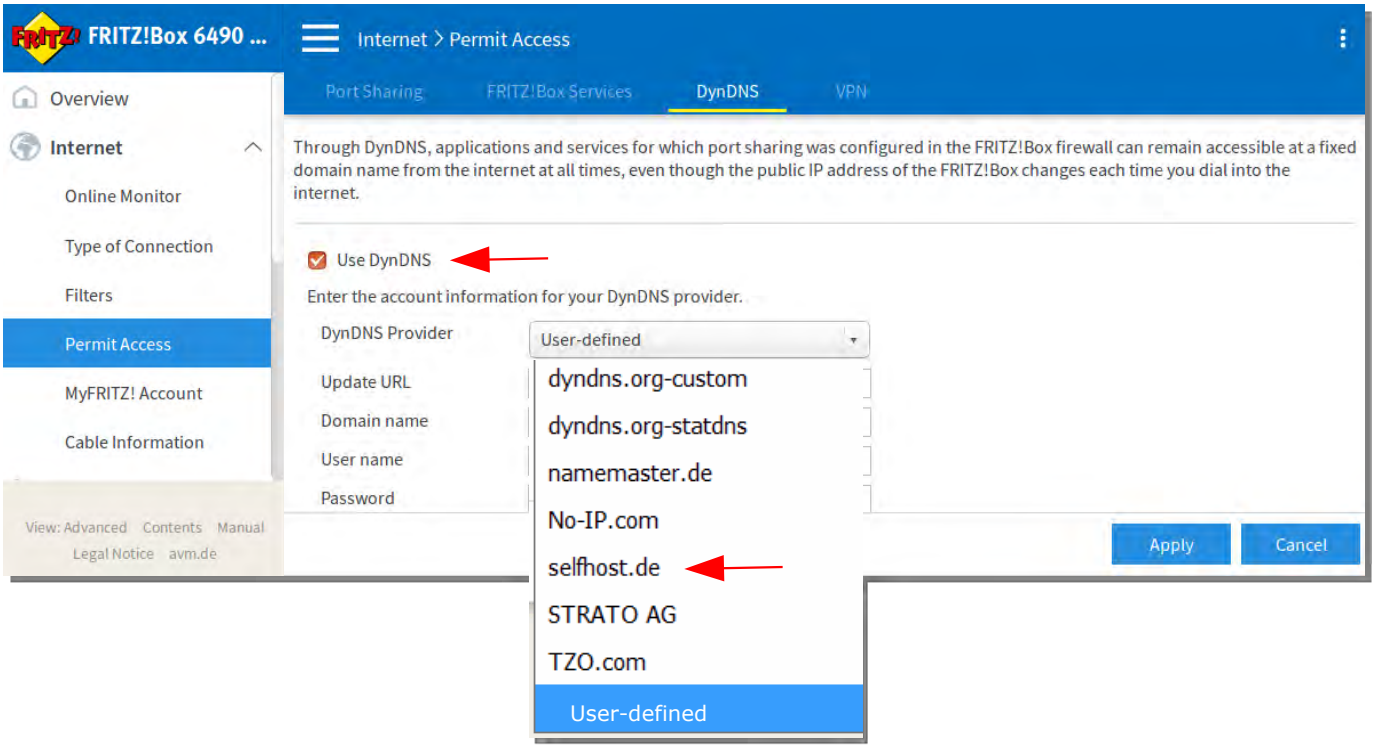
The latest Fritz!OS firmware is Version 07.20. Older firmware might have different configuration menus and Interface layout.

FRITZ!Box is a brand of AVM Computersysteme Vertriebs GmbH

1) Call up the user interface of your Fritz!Box. Enter “fritz.box“ or the IP address of the Fritz!Box into the URL address box (192.168.1.1 or 192.168.178.1 are commonly used addresses).




2) Log in and navigate to “Internet“-→ “Permit Access“ → “DynDNS“. Activate “Use DynDNS“ by setting a tick mark.

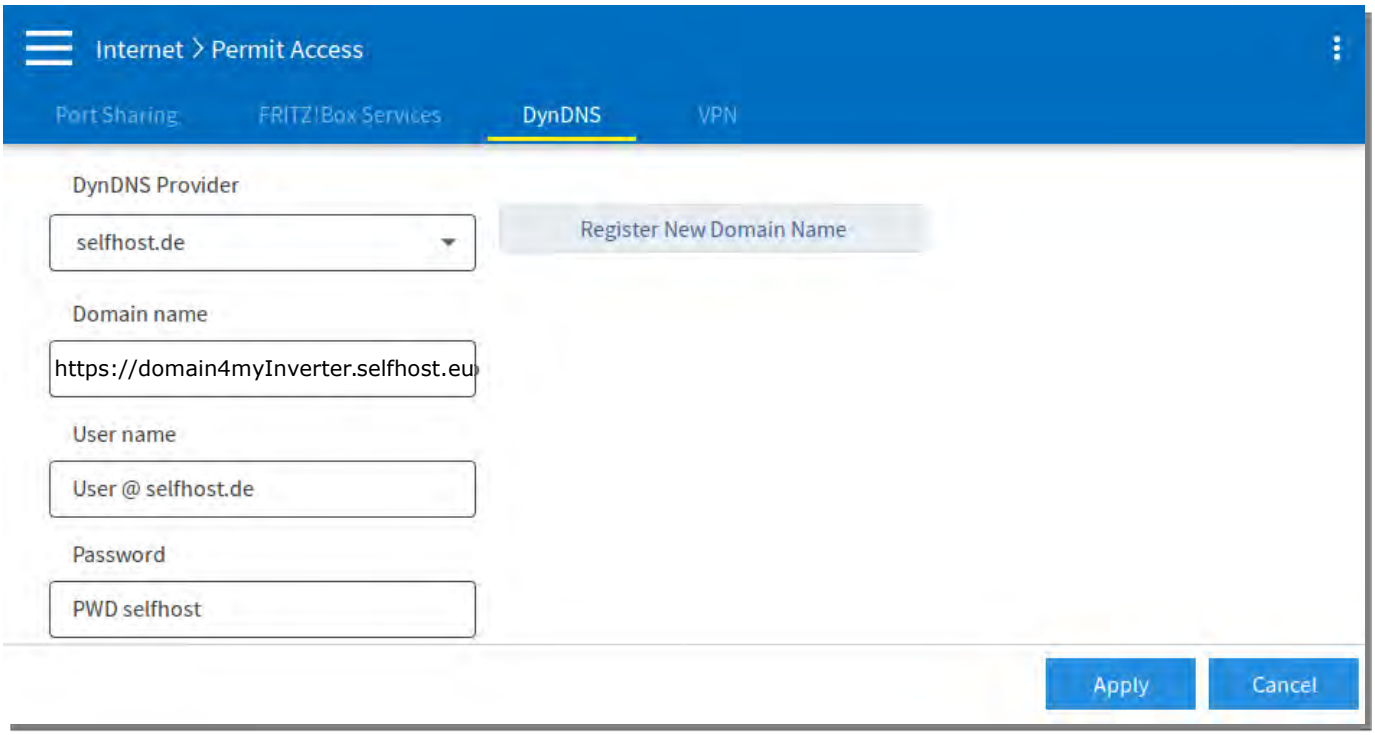



3) Check the drop down list for available DynDNS providers.

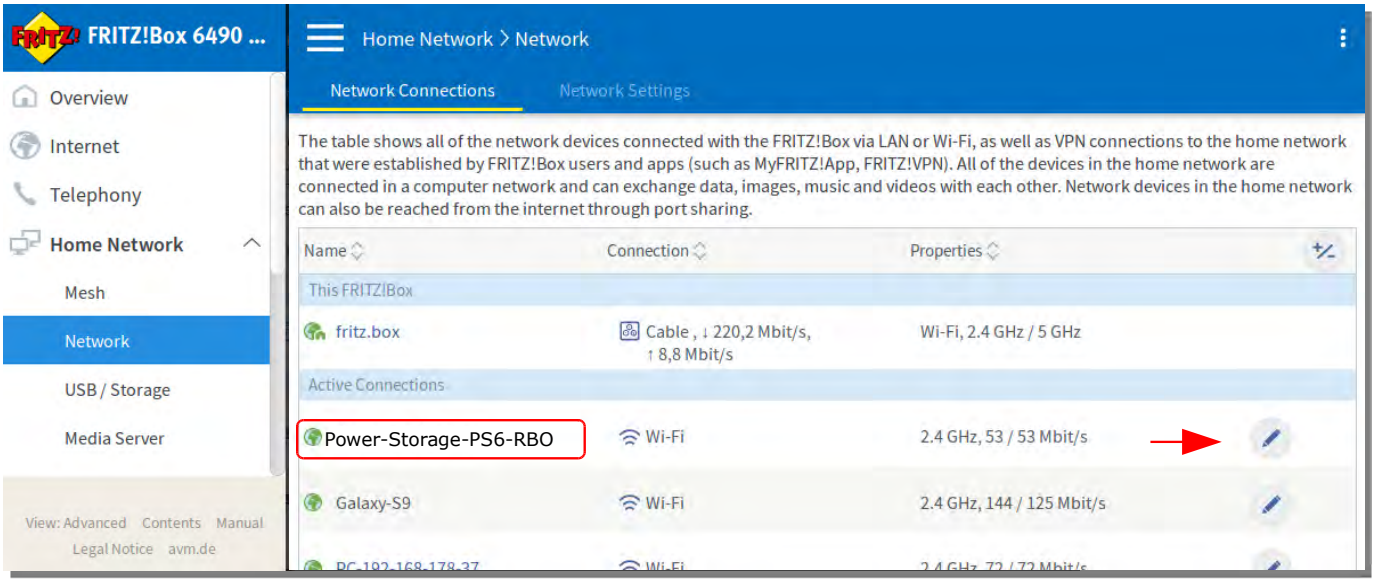
4) For our example we have selected the provider “selfhost.de“. They offer a basic free DynDNS-service

5) After you have decided on the DynDNS provider of your choice you will need to set up a user account with them. After successful registration, a “Dynamic DNS“ can be configured in the router.

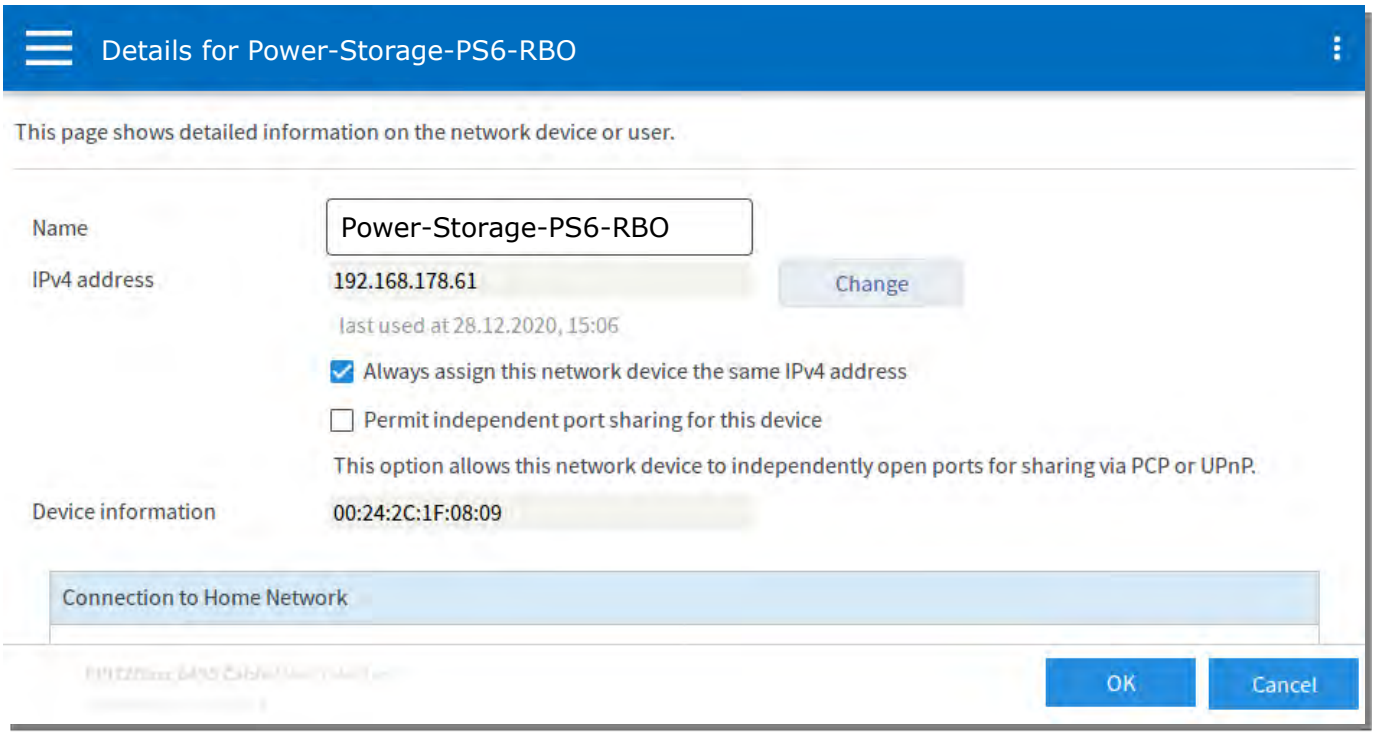
6) Enter the credentials supplied to you by your provider and confirm with a click on “Apply“.



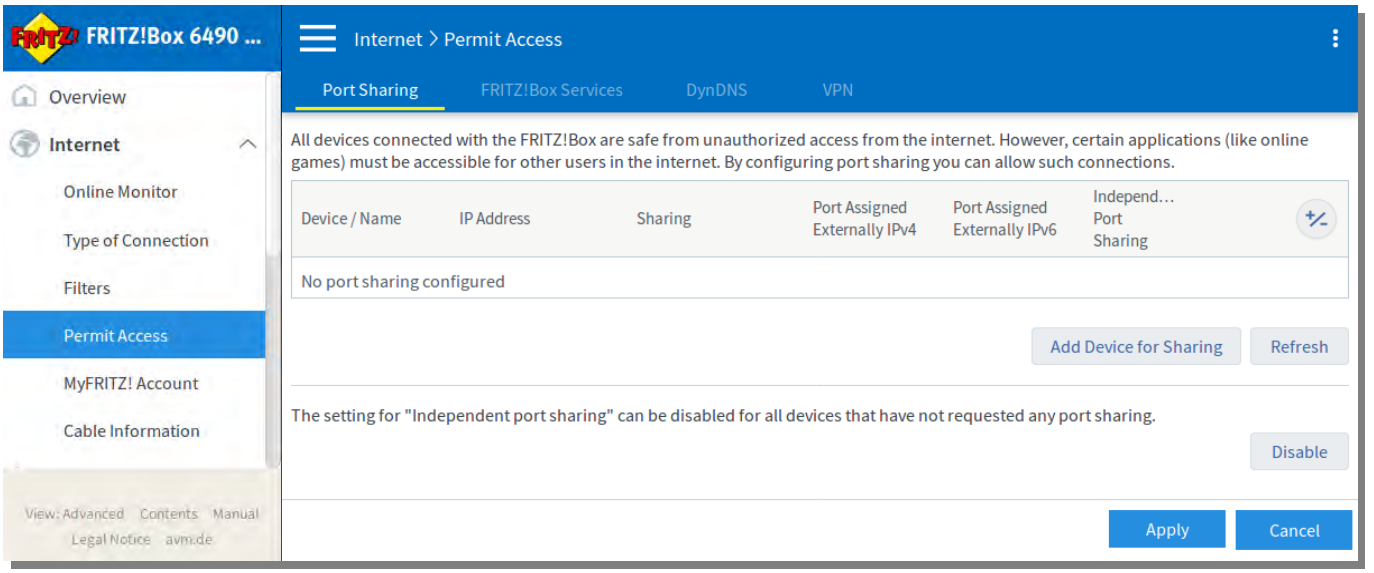

7) Go to “Home Network“ → “Network“-→ and find your inverter in the “Network Connections“ section. Click on the symbol with the pencil to set up a static IP address for your inverter.



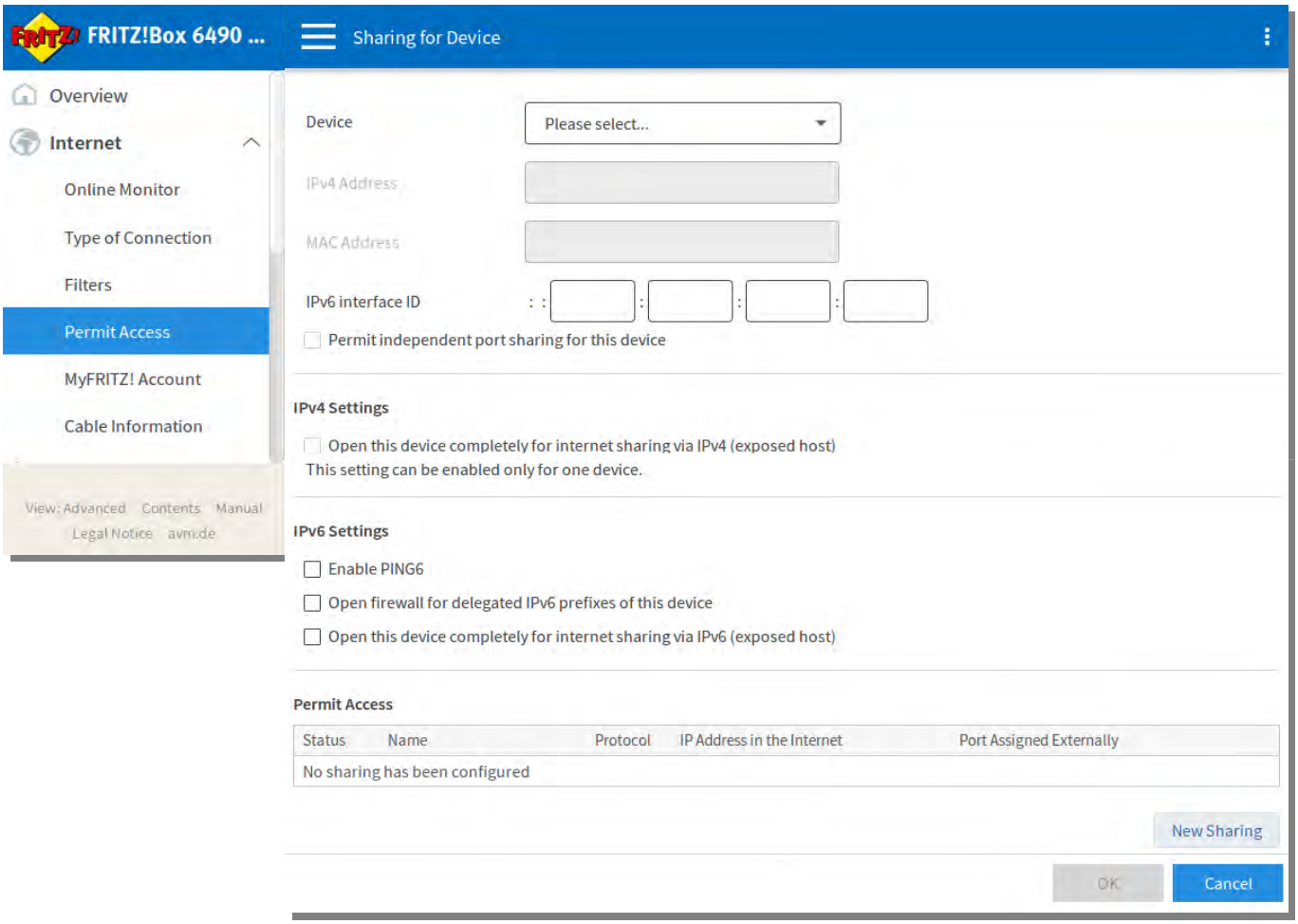
Set a tick mark to activate the “Always assign this Network device the same IPv4 address“setting. Confirm by clicking “OK“.



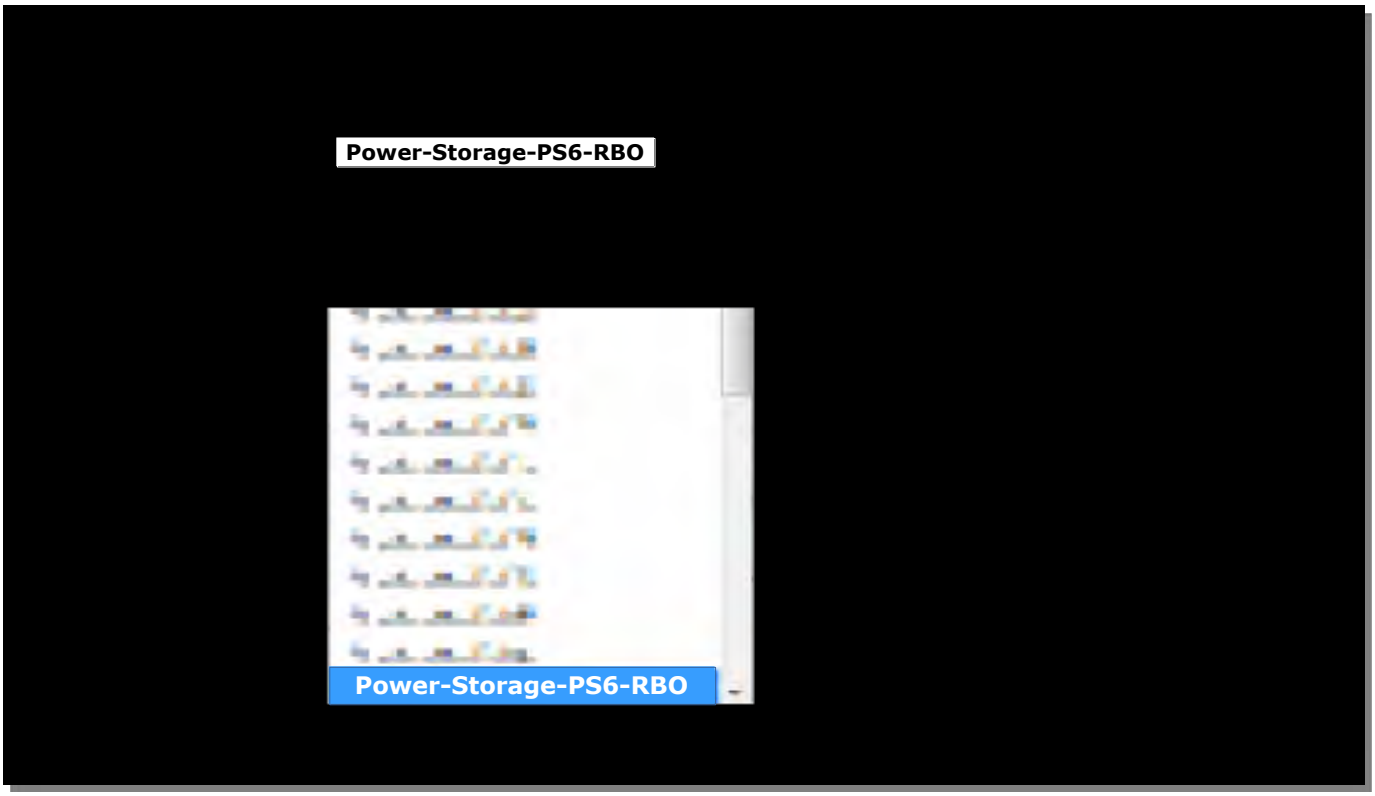

8) Now port sharing has to be activated for the inverter. This is required because the Fritz!Box will be responsible for the port forwarding.
The inverter communicates over Port 8899.
If the router receives requests on Port 8899 it will forward these to the inverter.
The static IP address of the inverter is required for this setup.
Navigate to “Internet“-→ “Permit Access“-→ “Port Sharing“.



9) Click on “ Add Device for Sharing“.

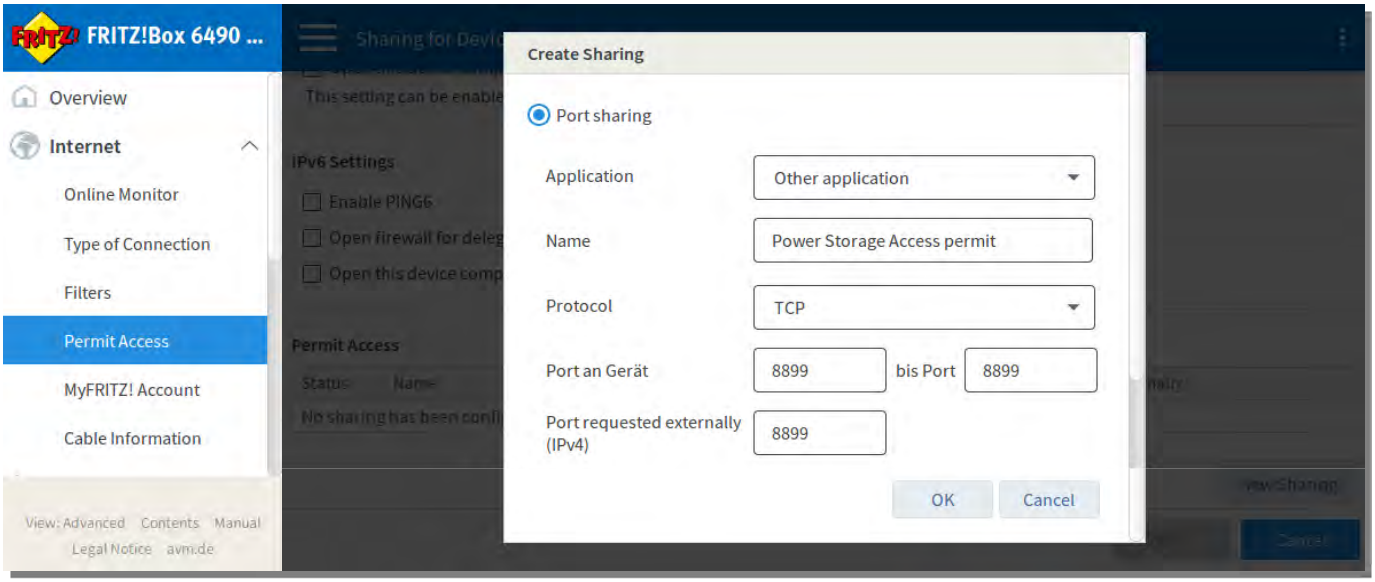



10) Locate your inverter in the “Device“ dropdown list.



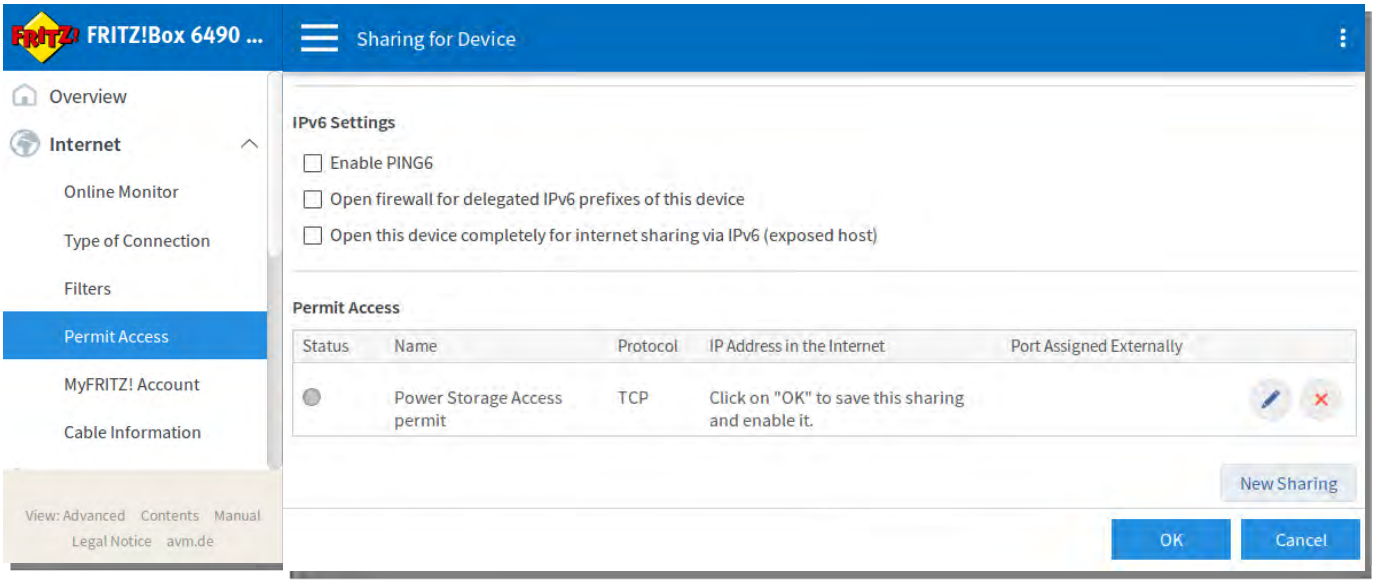
11) Select “New Sharing“ to configure the Port sharing.

Application: Other application
Name: Free choice, just for naming purposes
Protocol: TCP
Port an Gerät: 8899
Port requested externally (IPv4): 8899

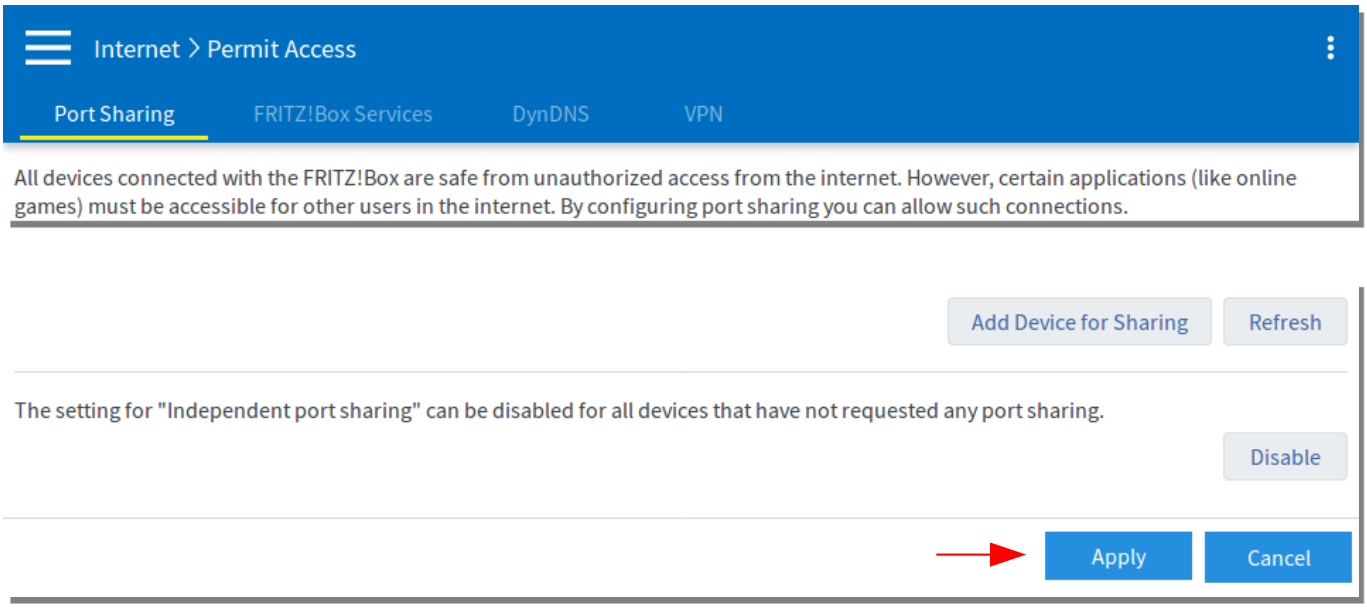



Confirm selection with „“OK“.

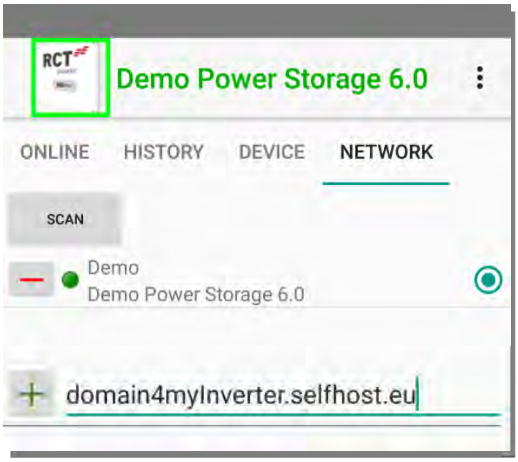
12) Click on “OK“again to save and enable.



13) Click on “Apply“ to confirm the newly configured Port sharing.




14) This completes the installation.
The inverter can now be remotely accessed over an internet connection using the RCT Power App and the DynDNS URL or the static IP address.



#### 7.1.10.2 Remote access via a FRITZ!Box by port forwarding and a MyFRITZ! account

Remote Access to devices connected to a home network using an internet connection always poses a potential security risk.

To enable remote access over the Internet, the inverter must be connected via Wi-Fi or LAN to a stable home network with access to the Internet.

In case you are uncertain that you can configure your router correctly contact the network administrator.

One of the following conditions must be met:

- The router supports port forwarding and connects to the internet using a fixed IP address assigned by the Internet Service Provider.

  This is usually only a common set up for corporate internet connections.

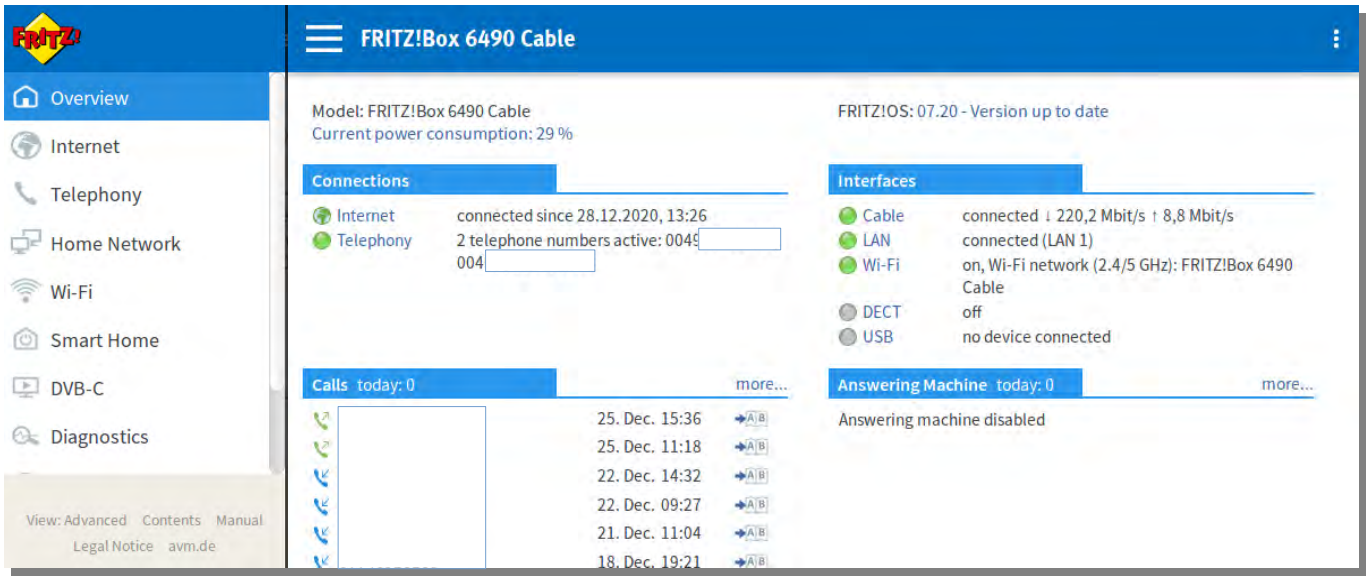
  If this condition is met continue to **11)** .

- The router supports port forwarding and connects to the Internet using a dynamic IP address assigned by the Internet Service Provider. Dynamic Domain Name System entries are enabled.

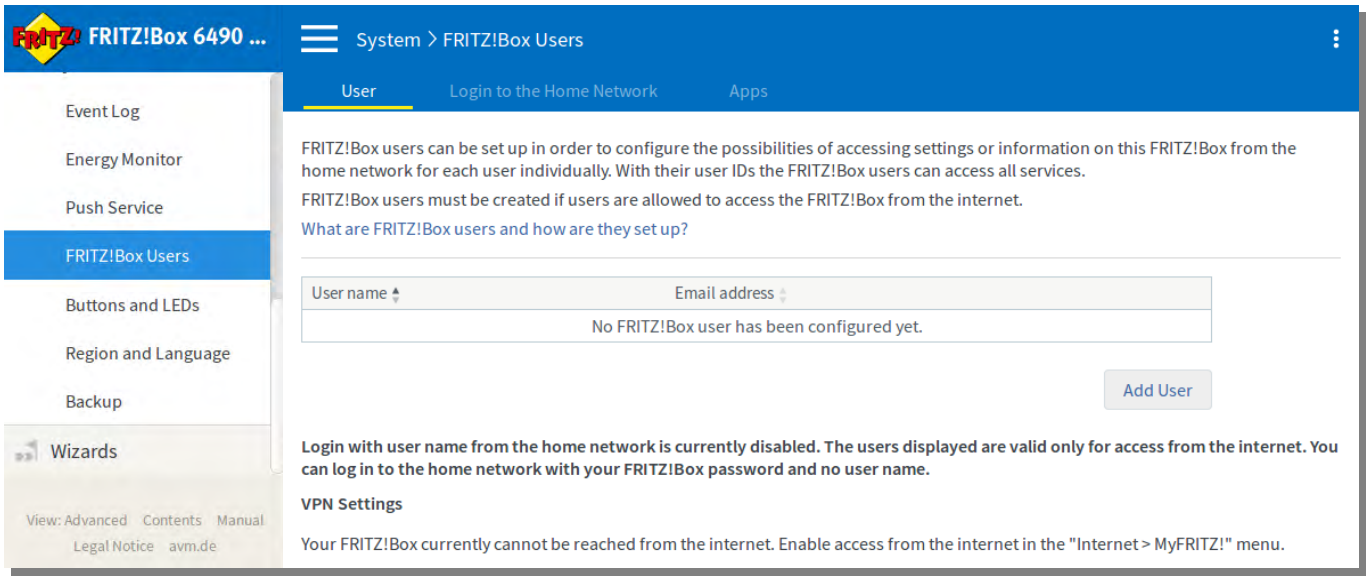
  This is usually a common set up for most private Internet connections.

The following sections describe the configuration for remote access via a FRITZ!Box by port forwarding and a MyFRITZ! Account.

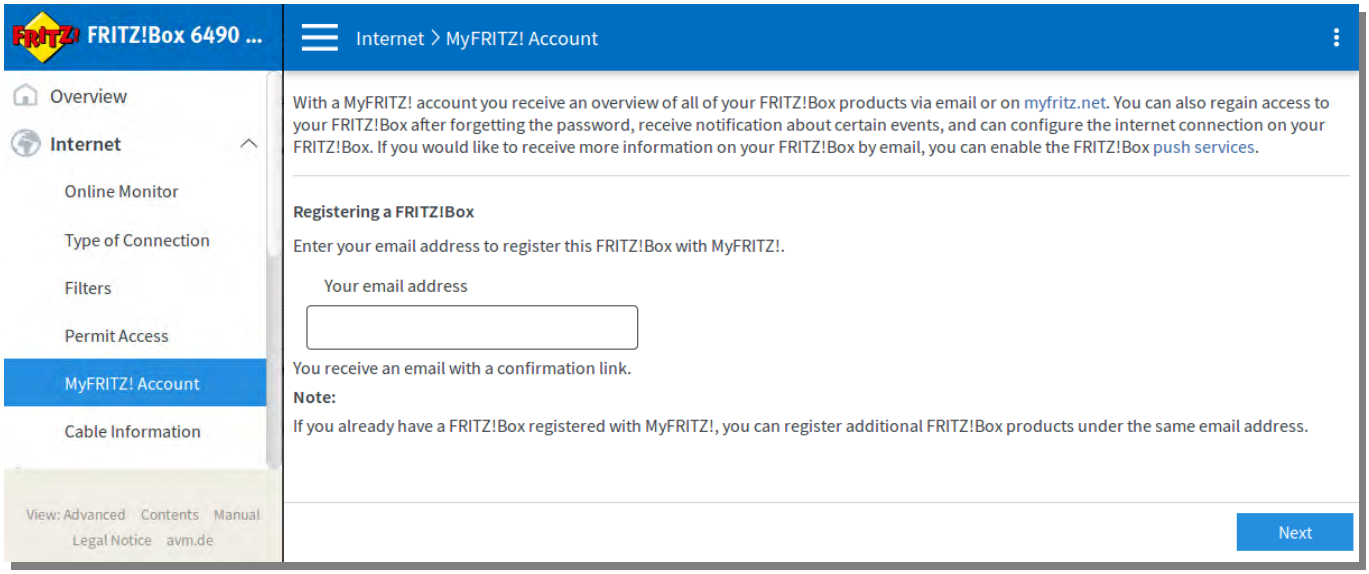
1) Call up the user interface of your Fritz!Box. Enter “fritz.box“ or the IP address of the Fritz!Box into the URL address box (192.168.1.1 or 192.168.178.1 are commonly used addresses).




2) In the router interface navigate to “System“-→ “FRITZ!Box Users“.
Here you can set up a new user by clicking on „“Add User“ or change the details and rights for an existing user.



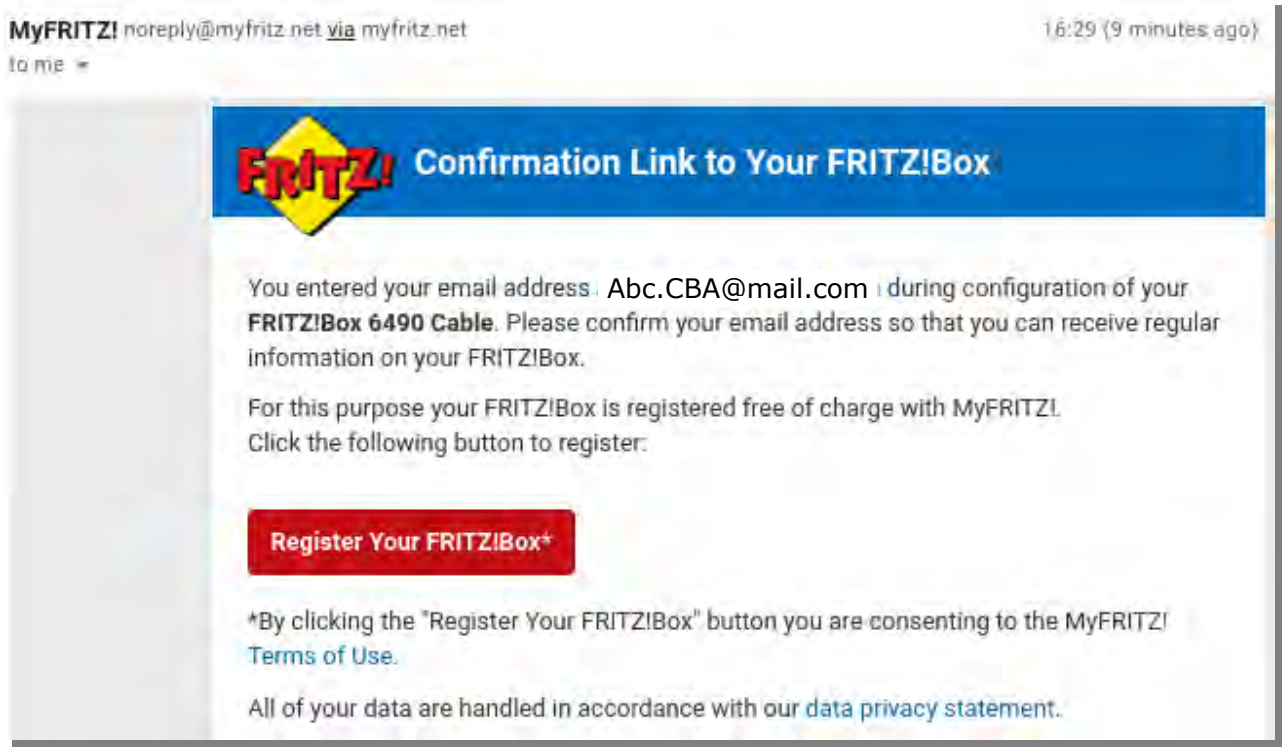
3) Continue to “Internet“-→ “MyFRITZ! Account“.



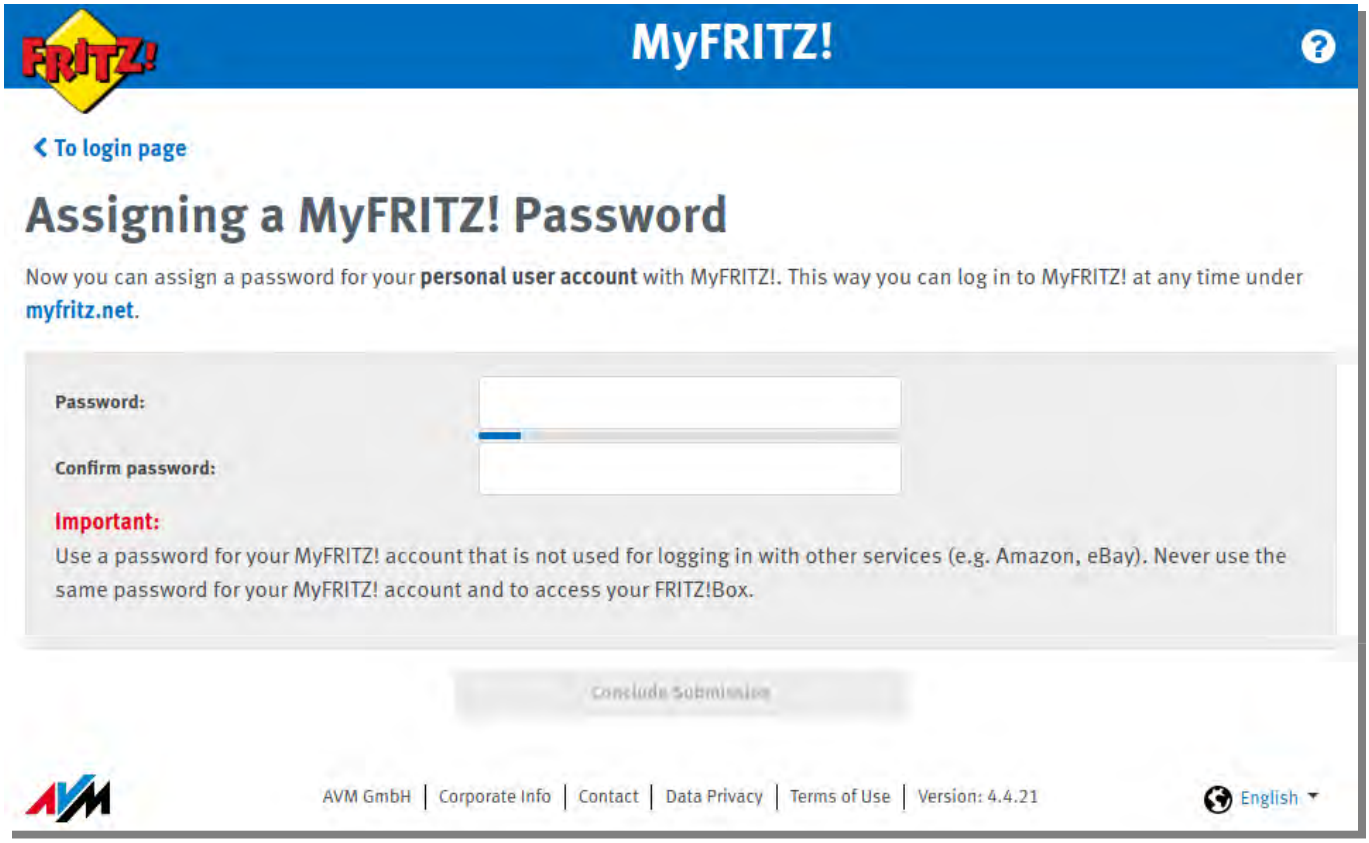

4) Use an existing MyFRITZ! Account or enter an email address to register a MyFritz! Account.

5) Setting up the MyFRITZ! Account.

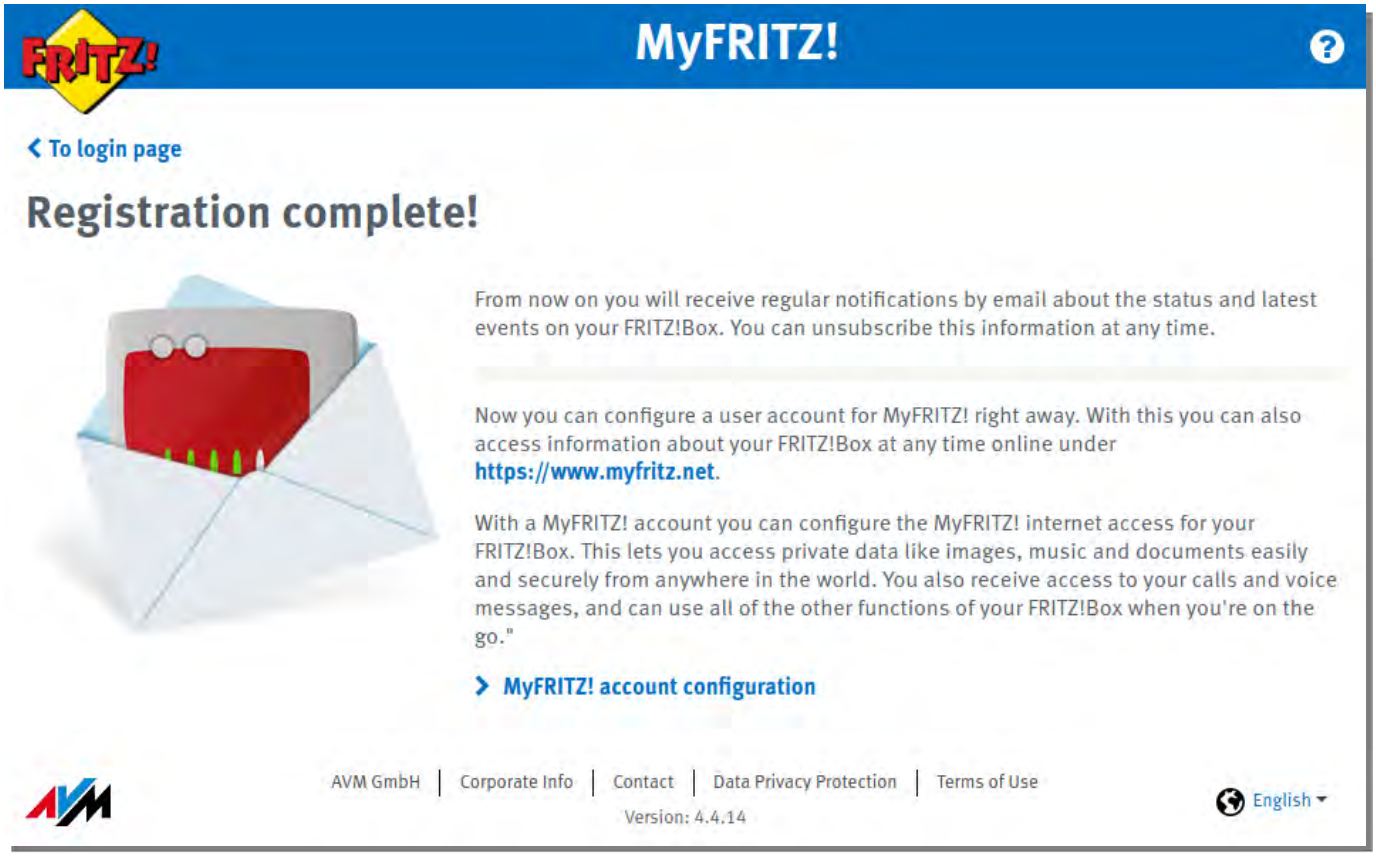
If a new account setup was requested, MyFRITZ! will send a registration conformation email to the address entered in the router interface. Open this note, check the Terms of Use and proceed with the registration by clicking the “Register Your Fritz!Box“ button.



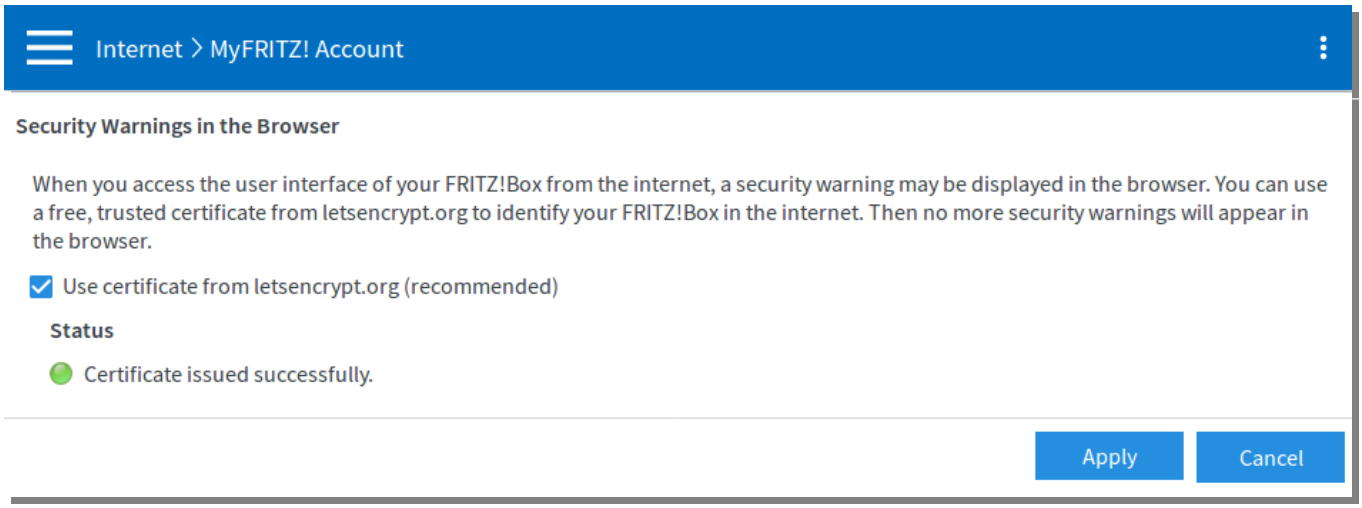
6) This will complete the registration and activate your “MyFRITZ! Account“. You have the option to assign a password during the registration steps.



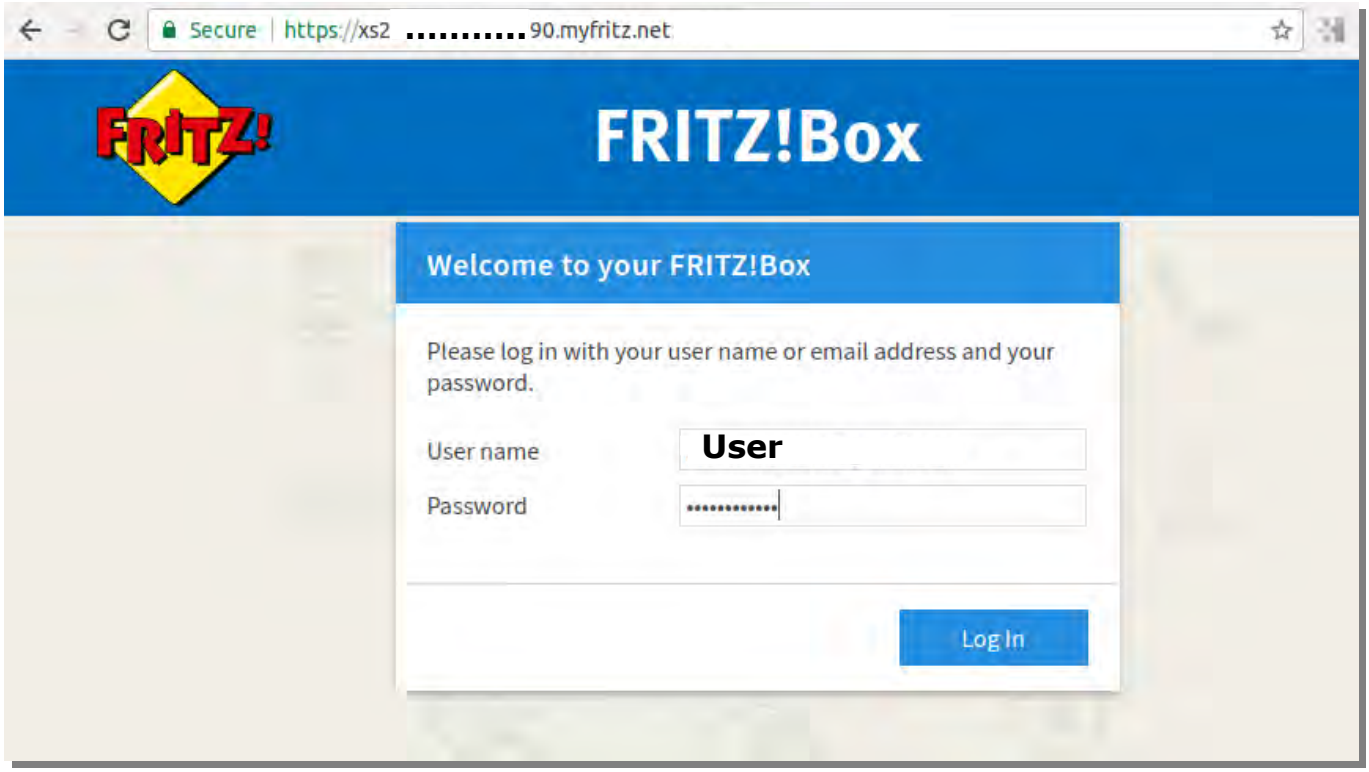

7) You can use your registered email address and password to access your MyFritz! Account in the router user interface or alternatively over https://myfritz.net.



8) If a security warning in the browser indicates that the router has not yet received a trusted certificate you can use the recommended certification from letsencrypt.org as shown below.



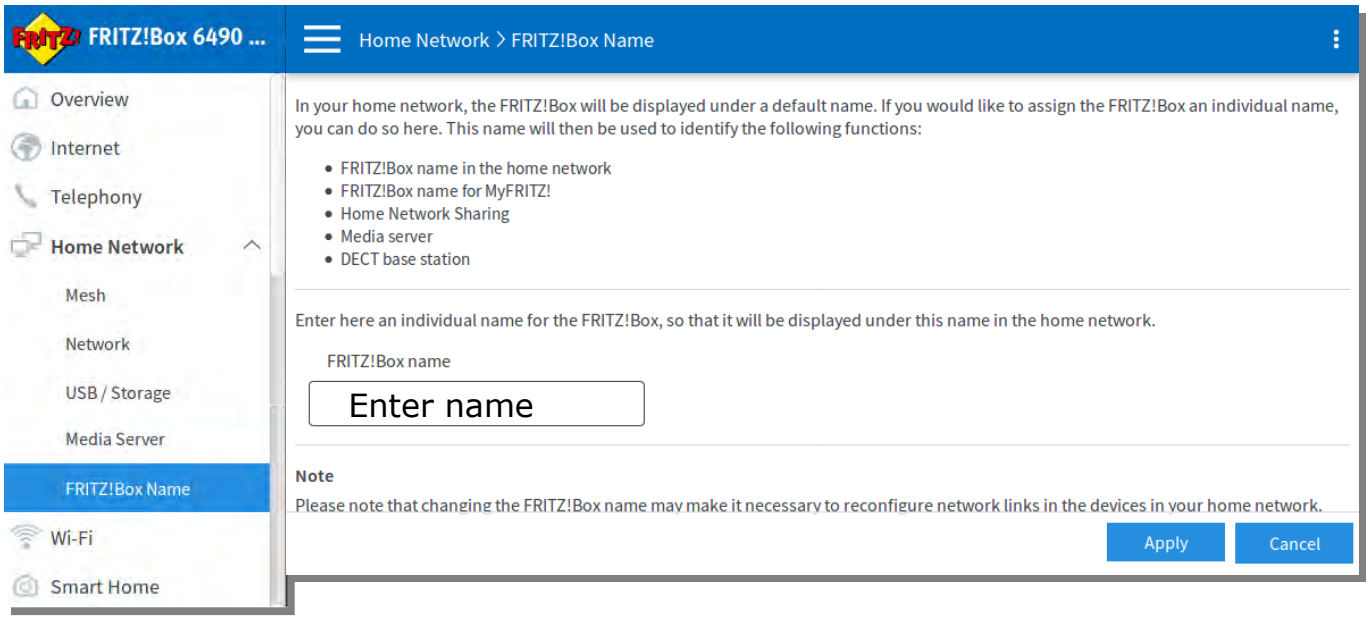

9) Log in to the Fritz!Box with your credentials.




10) Notice : If you do not assign a name to your FRITZ!Box the access URL address will contain a randomly created character string before ".myfritz.net".




You can assign a name to your Fritz!Box to avoid having to use a randomly generated character string.
Navigate to "Home Network"-→ "FRITZ!Box Name" to change this setting.



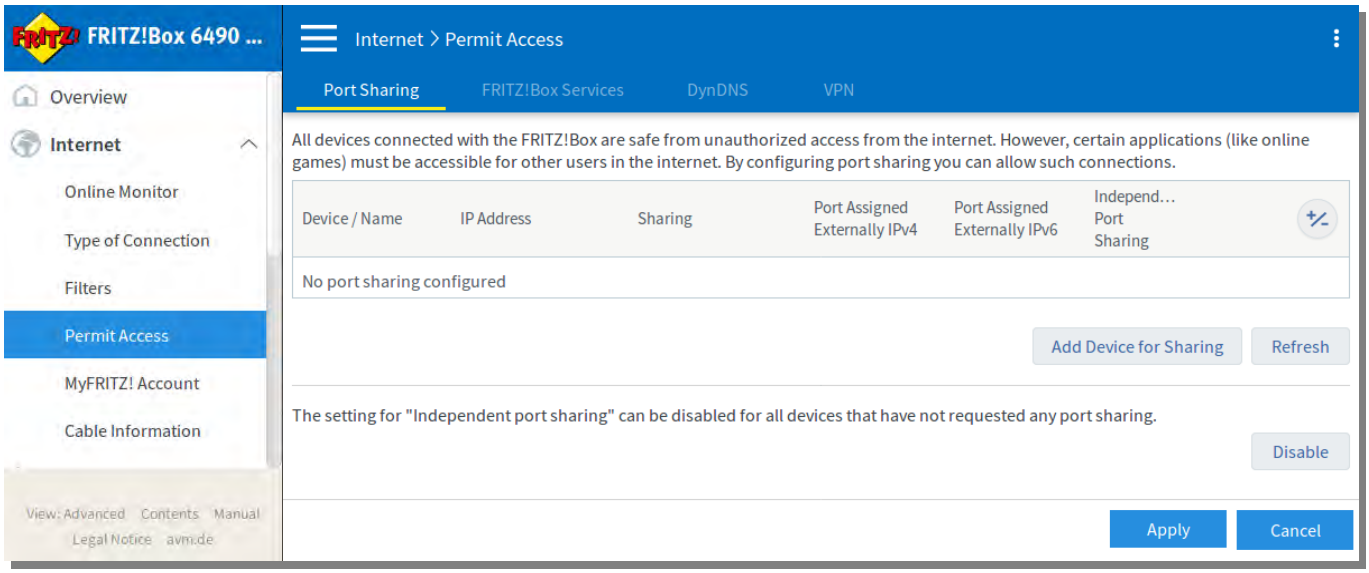

11) Now port sharing has to be activated for the inverter. This is required because the Fritz!Box will be responsible for the port forwarding.

The inverter communicates over Port 8899.

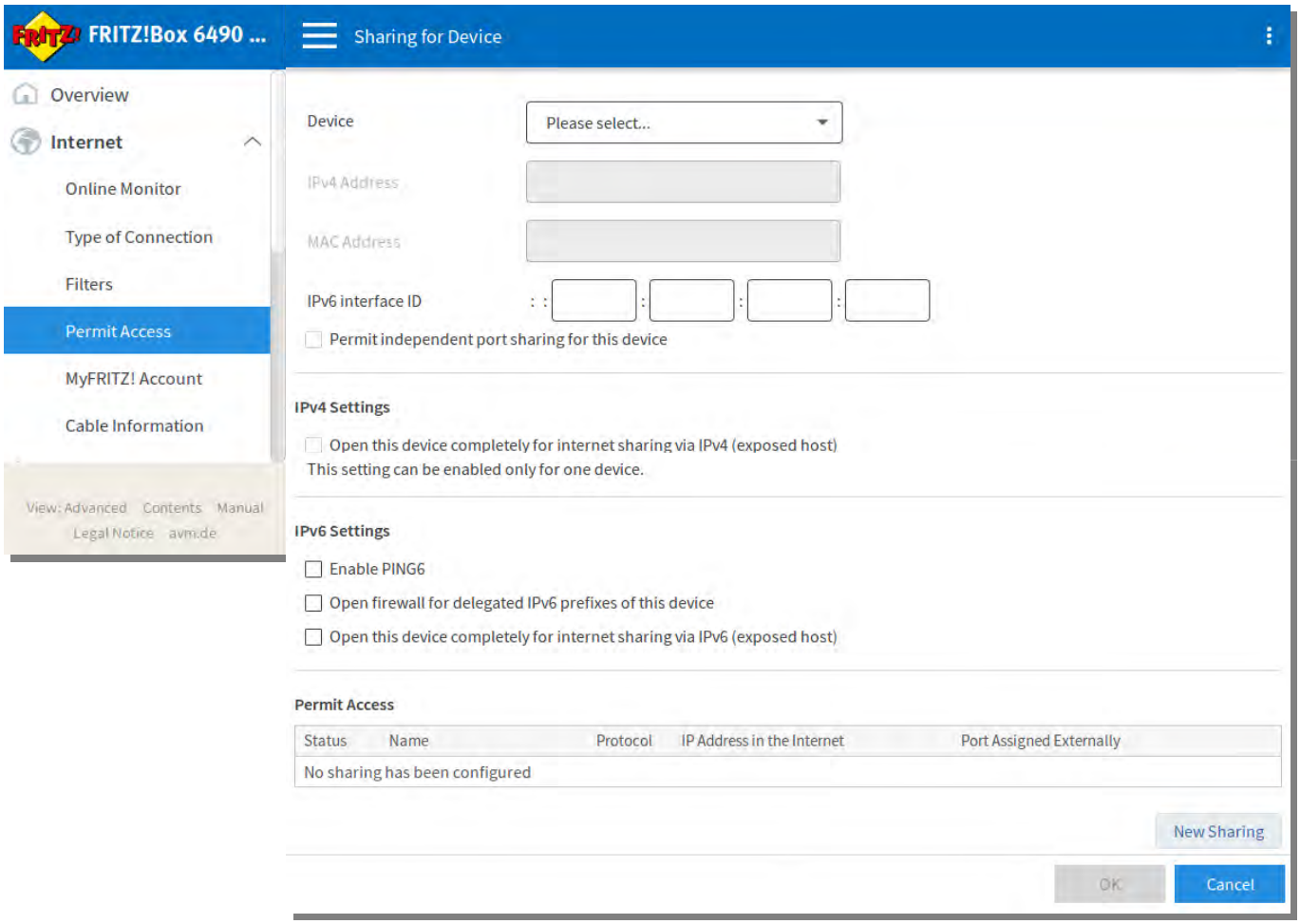
If the router receives requests on Port 8899 it will forward these to the inverter.

The static IP address of the inverter is required for this setup.

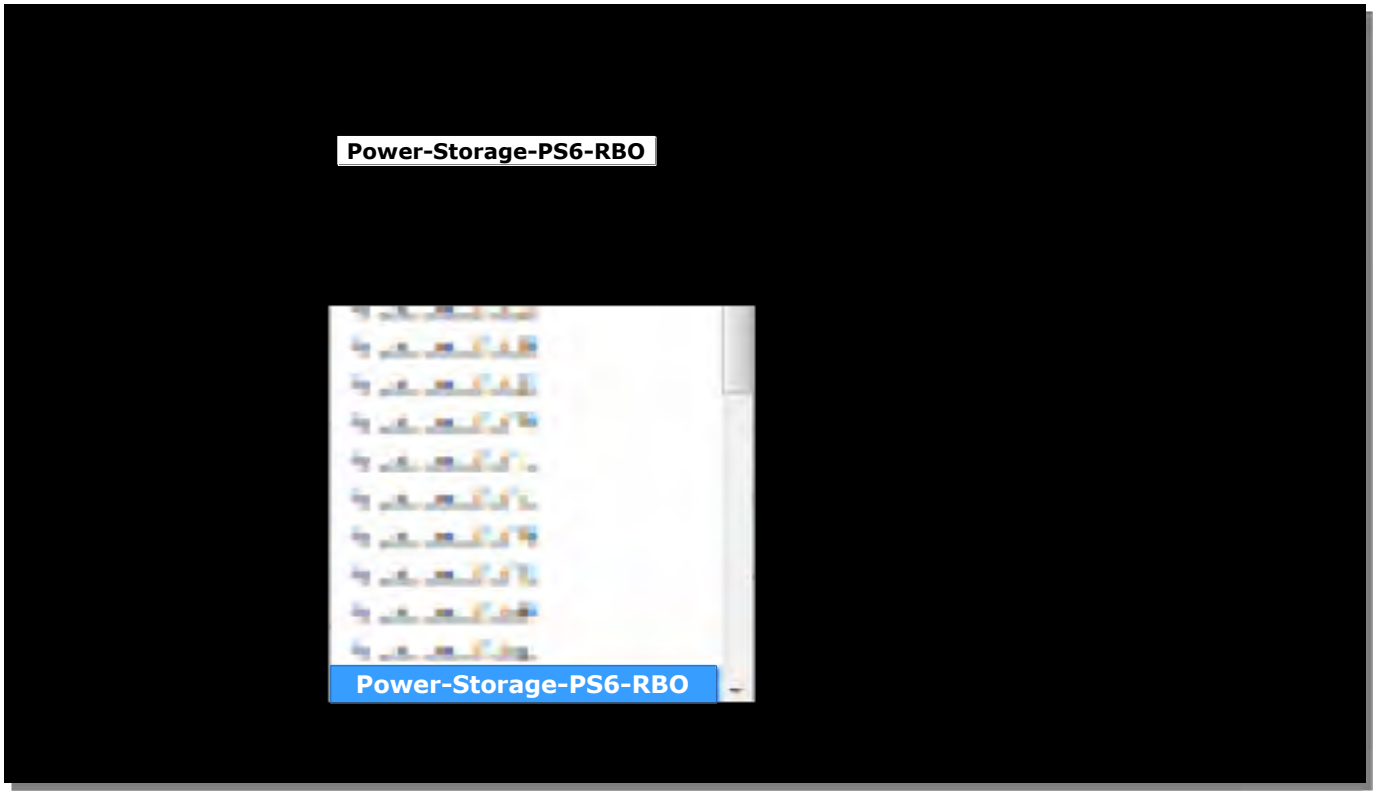
Navigate to “Internet“-→ “Permit Access“-→ “Port Sharing“.



12) Click on “ Add Device for Sharing“.

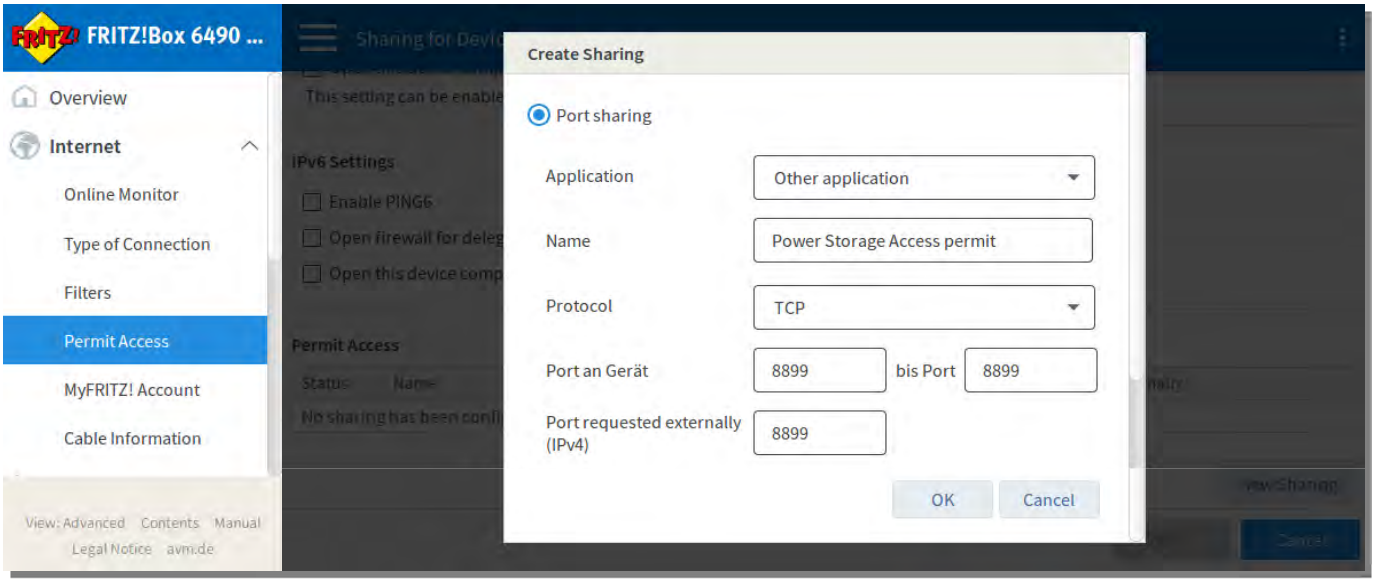



13) Locate your inverter in the “Device“dropdown list.



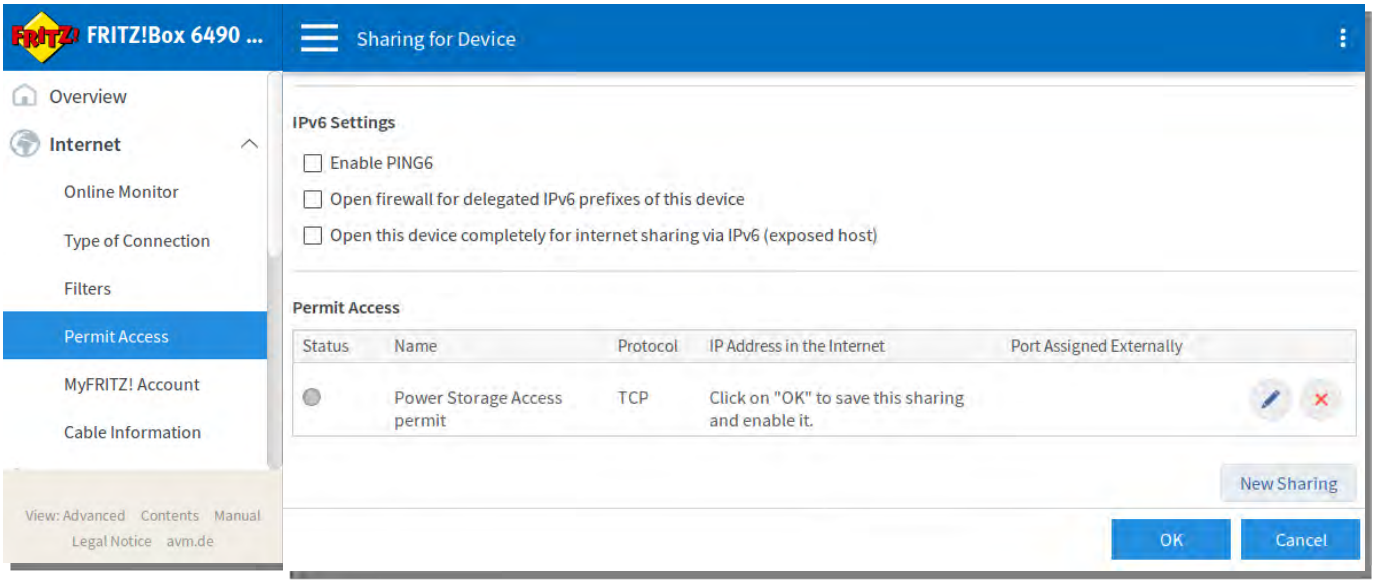
14) Select “New Sharing“ to configure the Port sharing.

Application: Other application
Name: Free choice, just for naming purposes
Protocol: TCP
Port an Gerät: 8899
Port requested externally (IPv4): 8899

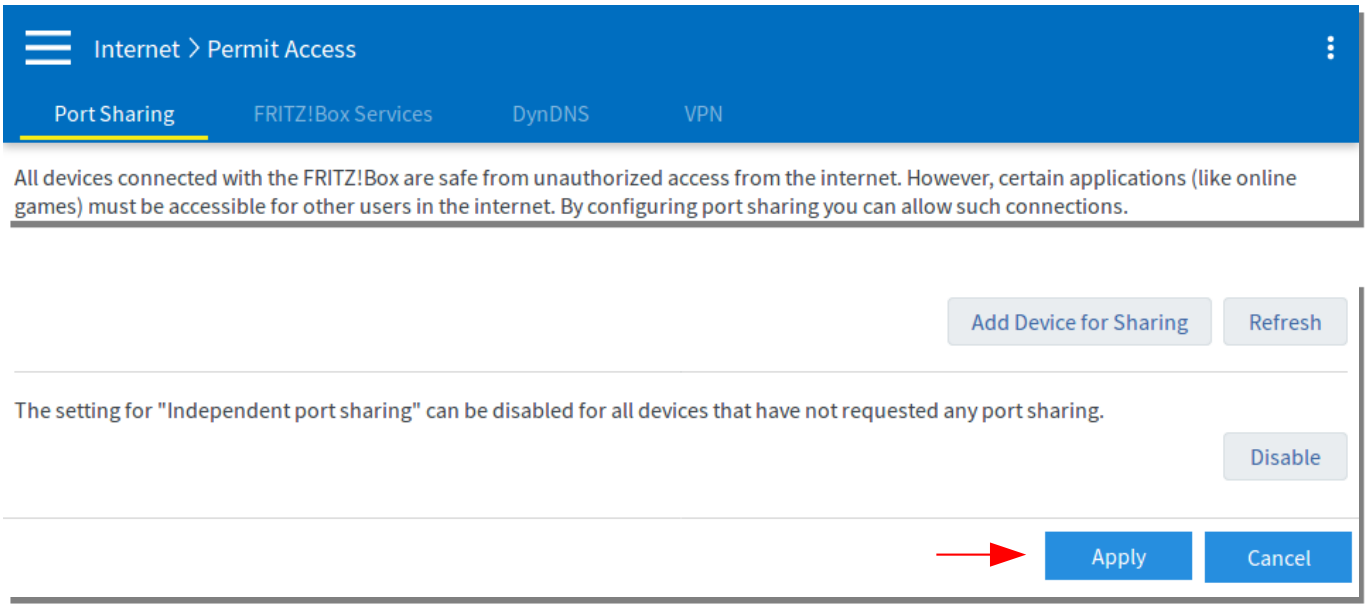



Confirm selection with „“OK“.

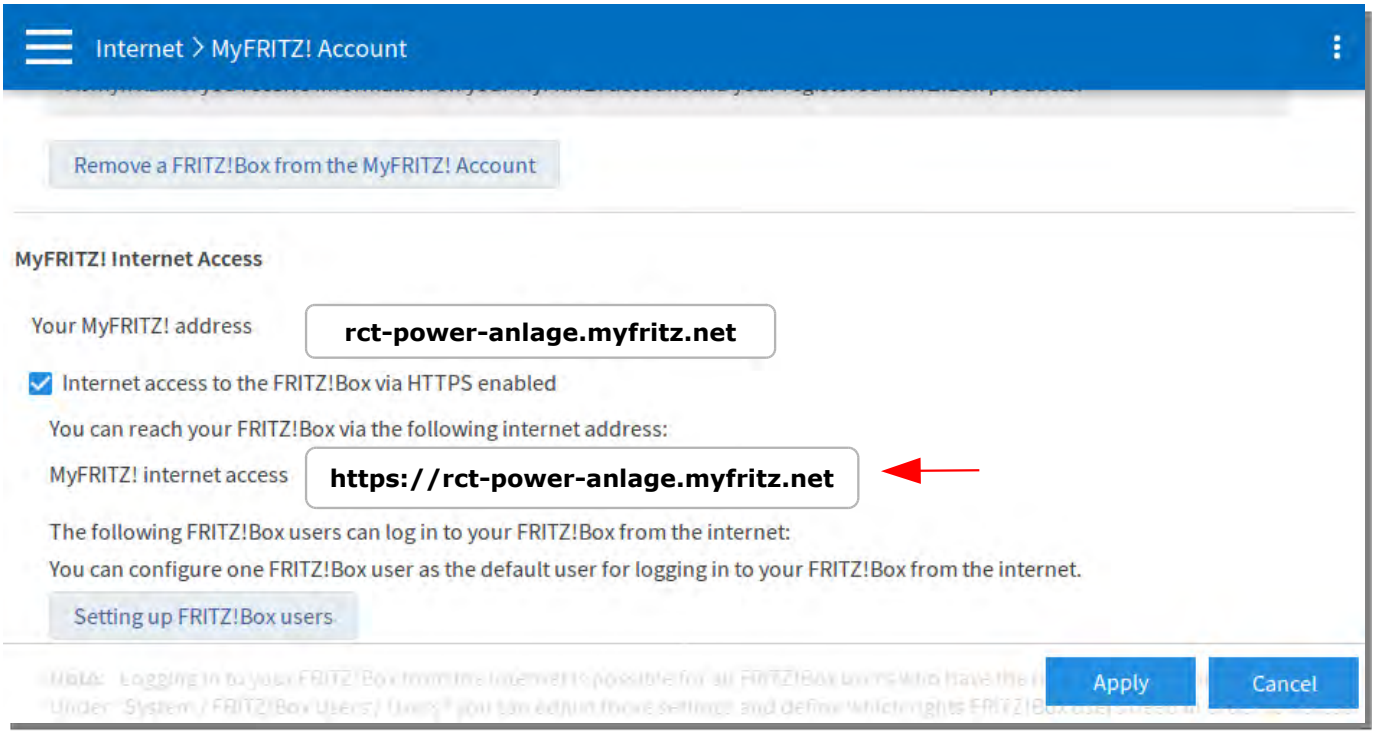
15) Click on “OK“again to save and enable.



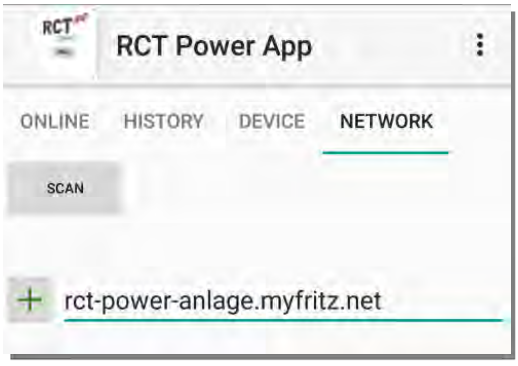
16) Click on “Apply“ to confirm the newly configured Port sharing.




This completes the installation.
The inverter can now be remotely accessed over an internet connection using the RCT Power App.
You can find the URL address under the section “Internet“-→ “MyFRITZ! Account“.




Open the “RCT-Power-App“,go to „“NETWORK“ add the URL address in the “Add device“ section and press on the “+“ sign to connect.



#### 7.1.10.3 Remote access via VPN using DynDNS or a MyFRITZ! account

Remote Access to devices connected to a home network using an internet connection always poses a potential security risk. It requires changes to your network router settings. You may need to contact your internet service provider to have some of the required settings options enabled.

To enable remote access over the Internet, the inverter must be connected via Wi-Fi or LAN to a stable home network with access to the Internet.

One of the following conditions must be met:

- The router supports port forwarding and connects to the internet using a fixed IP address assigned by the Internet Service Provider.

  This is usually only a common set up for corporate internet connections.

  In this case the router can be accessed with the known static IP address.

- The router supports port forwarding and connects to the Internet using a dynamic IP address assigned by the Internet Service Provider. Dynamic Domain Name System entries are enabled.

  This is usually a common set up for most private Internet connections.

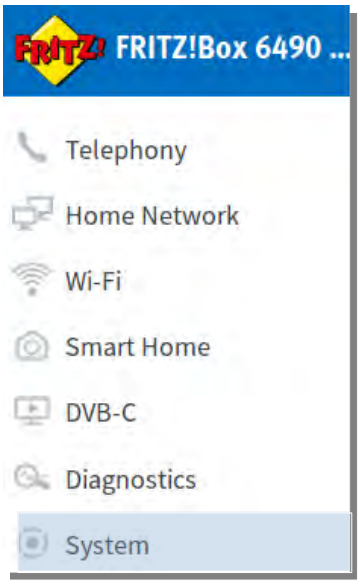
  In this case either a DynDNS (chapter 7.10.1 1-6) or a MyFRITZ! account (chapter 7.10.2 1-10) must be setup and correctly configured.

- Android 4.0 or higher is required on the smartphone or tablet. Most devices that were shipped after 2012 usually ful fill this requirement.

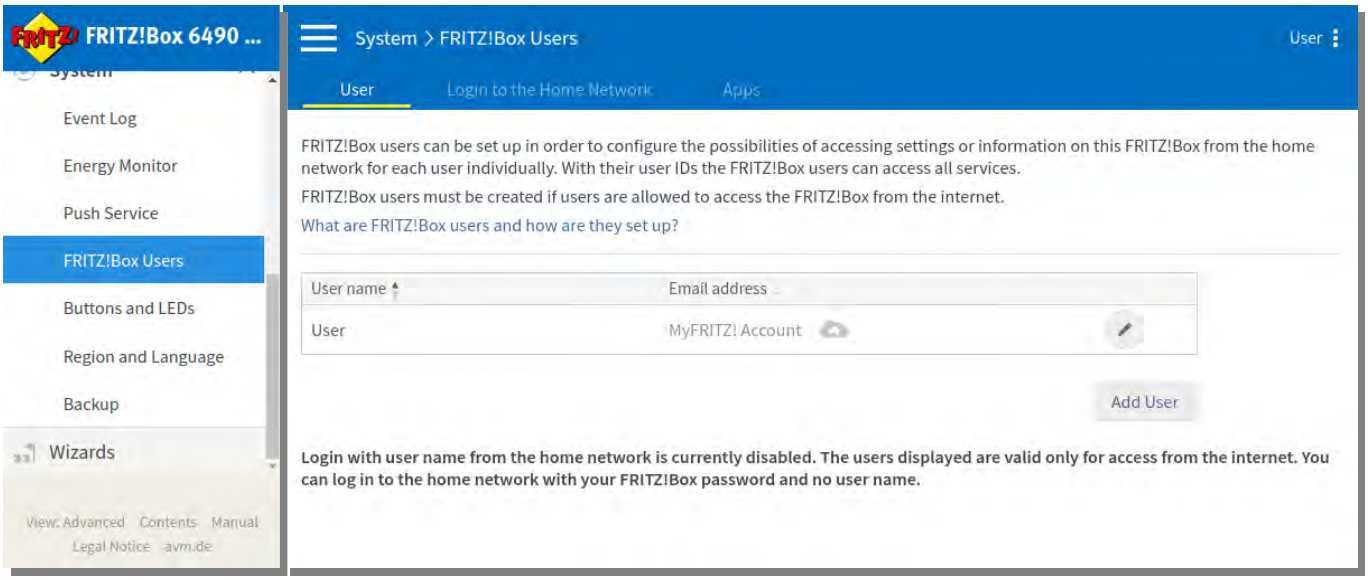
- Remote access only works when the mobile device is connected to a network with a different IP address than the router. e.g. The standard Network of a Fritz!Box is setup under 192.168.178.0.
  The mobile device must be connected to this network to be able to connect to the inverter. It will always be in a different network when connected to a mobile network.

Each separate VPN connection requires a seperate user account in the FRITZ!Box.
A feasible scenario could be to set up one user for the owner and one for service personnel.
The access for service personnel can then be switched on/off independently from the owner access. Configuration steps 1) to 6) have to be repeated corespondingly.

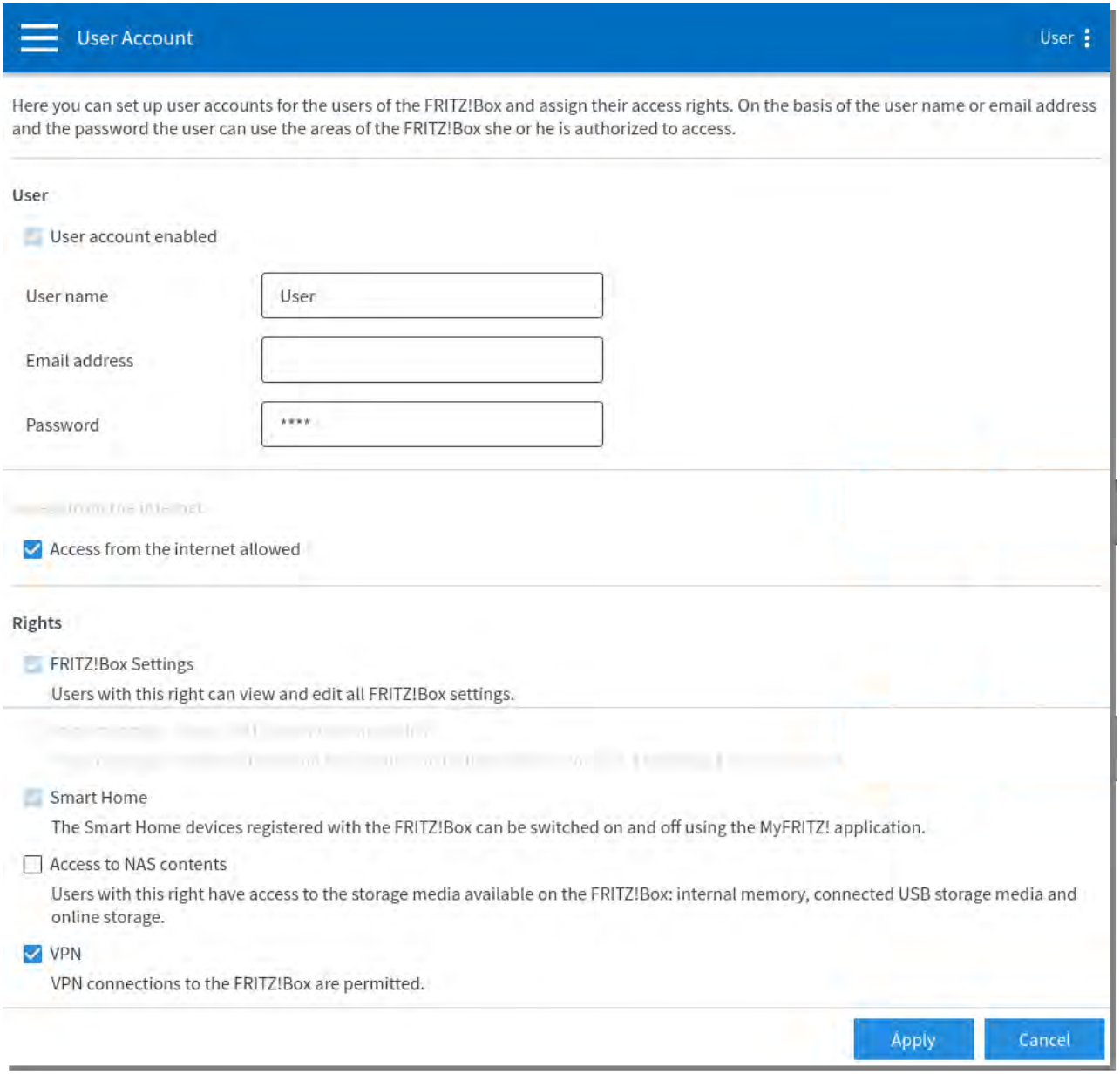
1) In the FRITZ!Box user interface click on "System".




2) Go to "FRITZ!Box User" → “User“.

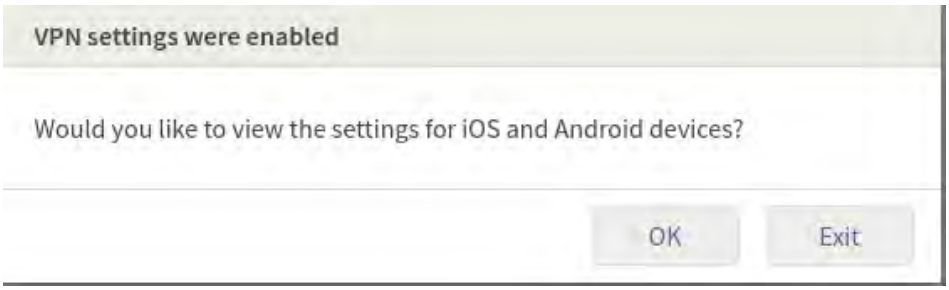


3) Click on the Pencil symbol next to the user for whom the VPN connection to the FRITZ!Box should be enabled. Click on „“Add User“ if apart from the “admin“ account no user has been set up.
Add the necessary credentials in the “User“ section. Take a note of the Password for future reference.
In the „Rights“ section activate "VPN". All other rights should be deactivated. Click on “Apply“.

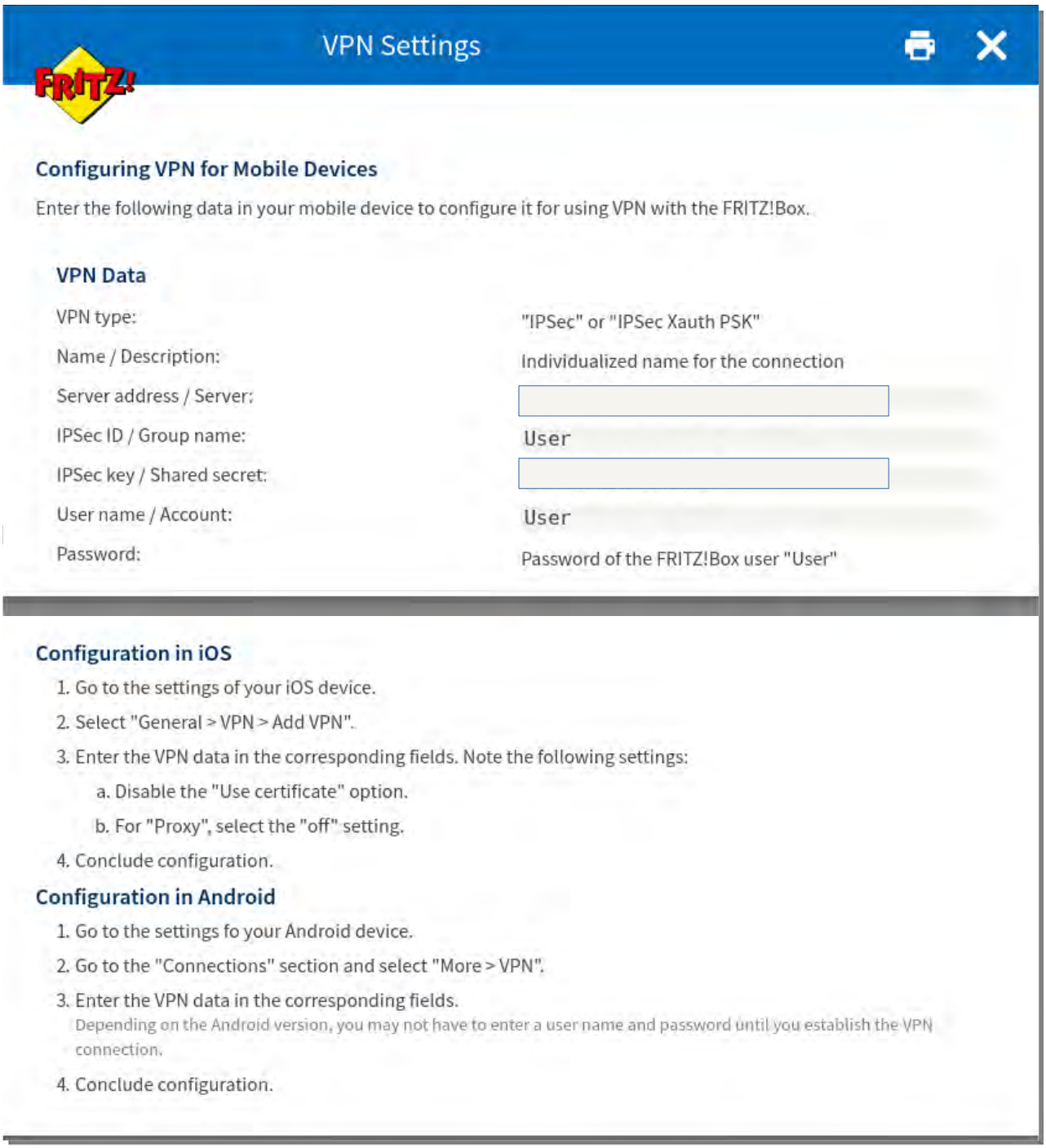



Remote access for individual users can be controlled with the Checkbox “User account enabled “. An example could be a Service user that has been set up for the installer. If required for service work, this user can enabled.

4) To save the settings click on "OK" and if prompted confirm the settings changes at the FRITZ!Box.
A message box will appear “VPN-Settings were enabled“.



5) Click on “OK“ to display the section „“Configuring VPN for Mobile Devices“ which contains a summary of the configuration details and installation instructions for mobile devices.

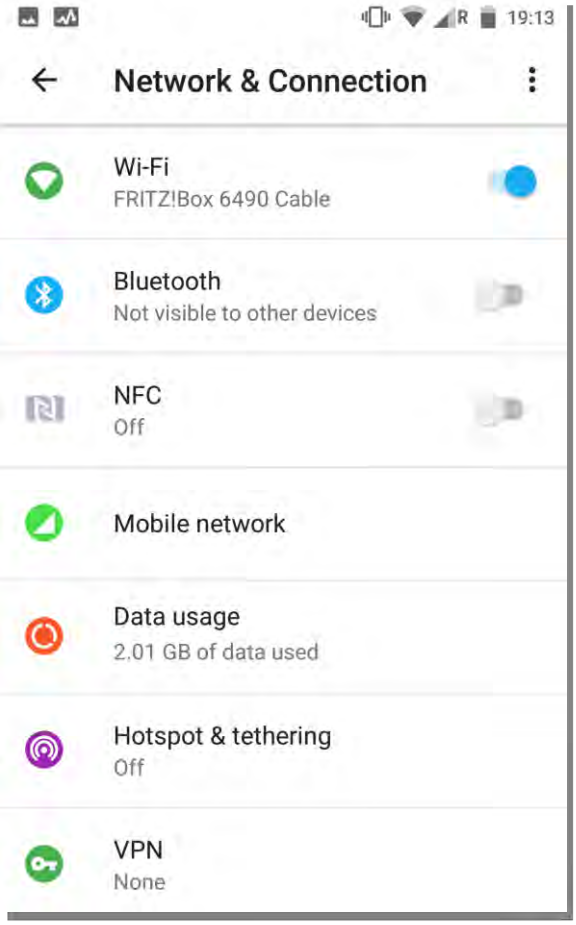



The VPN settings can be called up at any time if changes are required. Go into the User account edit mode and click on“Show VPN Settings“.

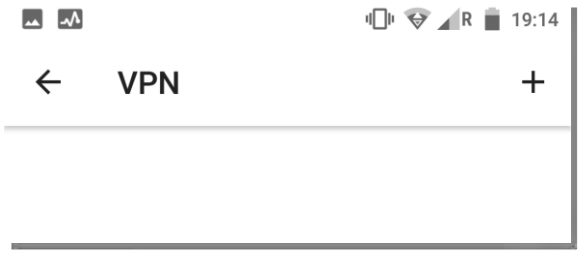



The FRITZ!Box is now configured for VPN access. The next step is to set up the mobile devices. The required settings under Android are explained from section 6) to 10). iOS Users can proceed directly to section 10).

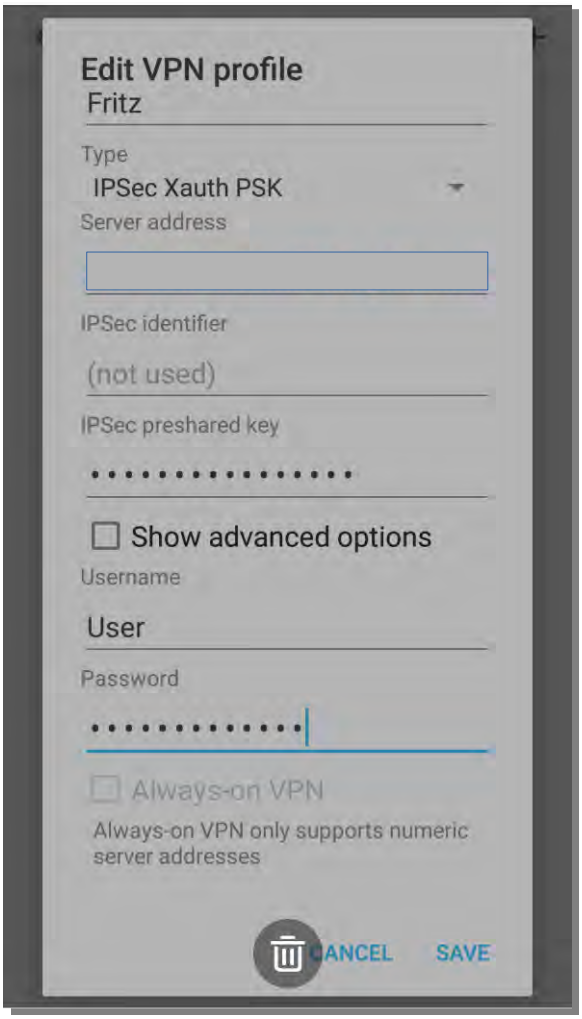
6) The example VPN set up was performed with a device with Android 9.0 (Stock-Version).
In other versions and also depending on the device manufacturer the menu and settings descriptions might differ.
Go to „“Settings“-→ „“Network & Connection“. Tap on „“VPN“ to change these settings.




Press “**+**“ to add a new VPN entry and to open the VPN configuration dialog.



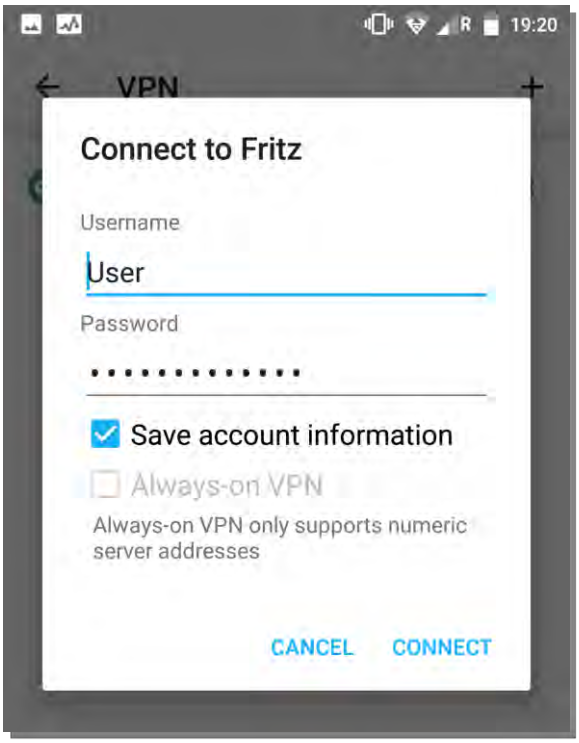
7) Enter the FRITZ!Box VPN Data set in the corresponding VPN configuration dialog fields. → see5).
You have made a note of the password during the user account setup. → see 3)



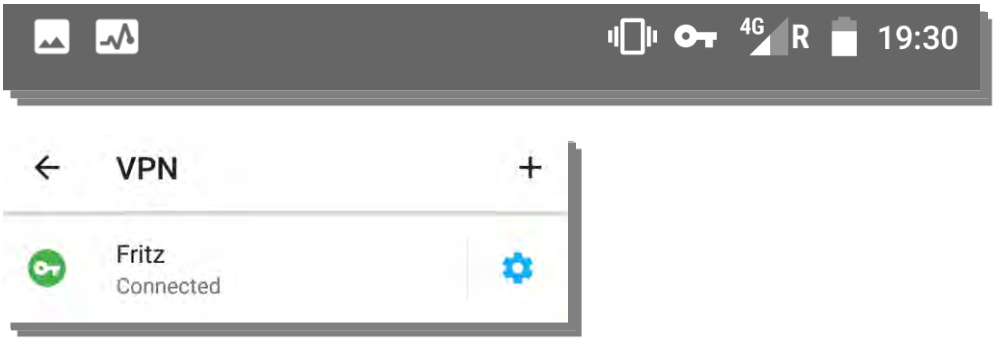

We have named the VPN profile for this example “Fritz“. After you press “SAVE“ the profile will display as an available VPN connection.



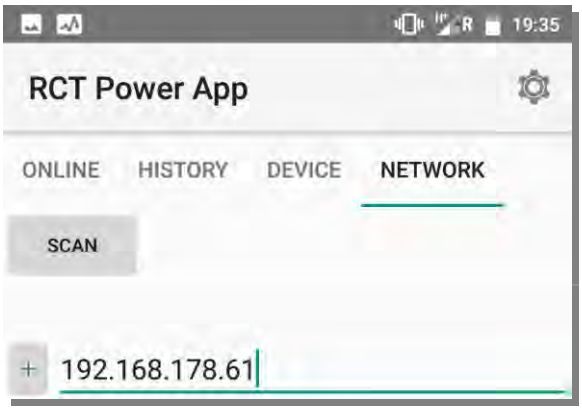
8) If you tap on “Fritz“ the „“Connect to Fritz“ dialog opens. Tap on “CONNECT“ to establish an encrypted connection to the home network.



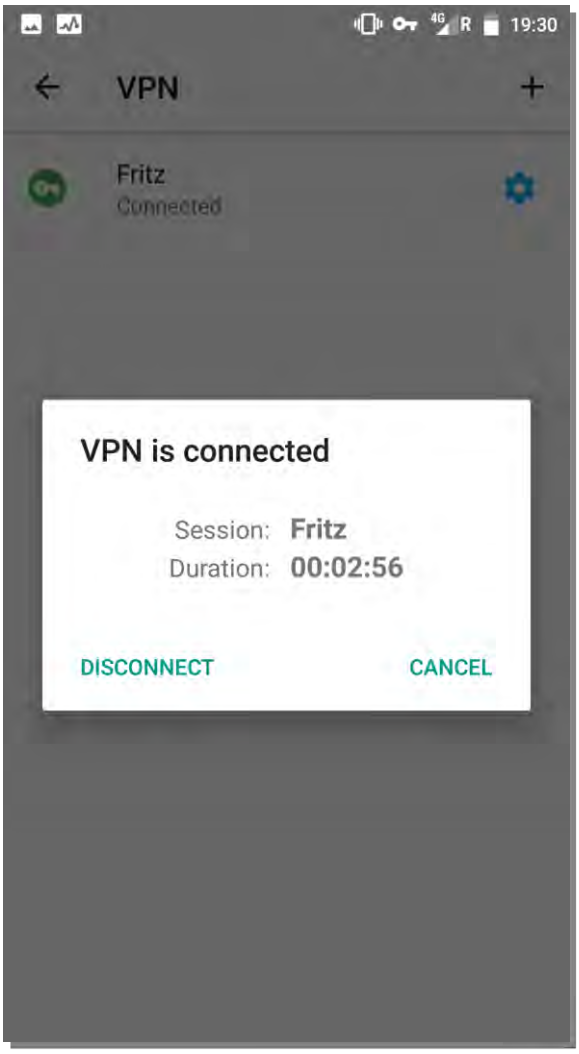

A successful connection to the FRITZ!Box is indicated by a Key symbol in the status bar of the device. The status in the VPN settings section of the mobile device has changed to „“Connected“.




The RCT Power App can now access the inverter with the static IP address previously assigned.
Attention: The complete network traffic of the Smartphone/Smartdevice in this state is processed via the Fritz!Box.

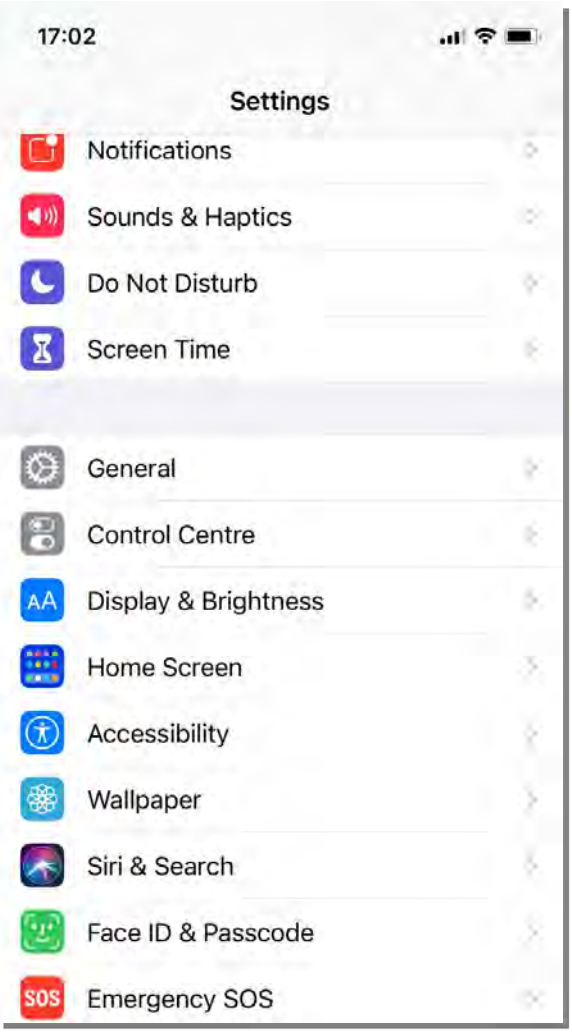


The VPN connection can be terminated by an another tap  on “Fritz“ in the VPN settings.
Tap on „“DISCONNECT“ to end the VPN connection.

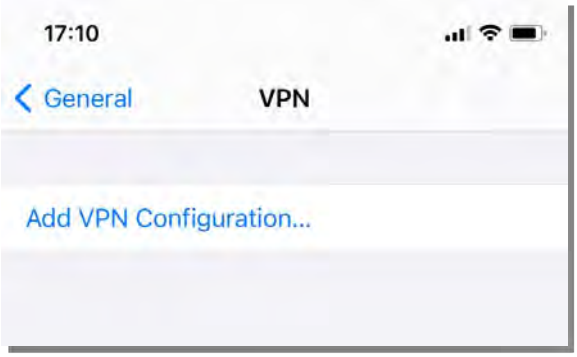



9) Tip: There are several Apps available in the Play Store ( e.g. “VPN Shortcut“) that allow for accessing the VPN connection directly from the homescreen. Using one of these Apps can avoid cumbersome navigation through the settings screens.

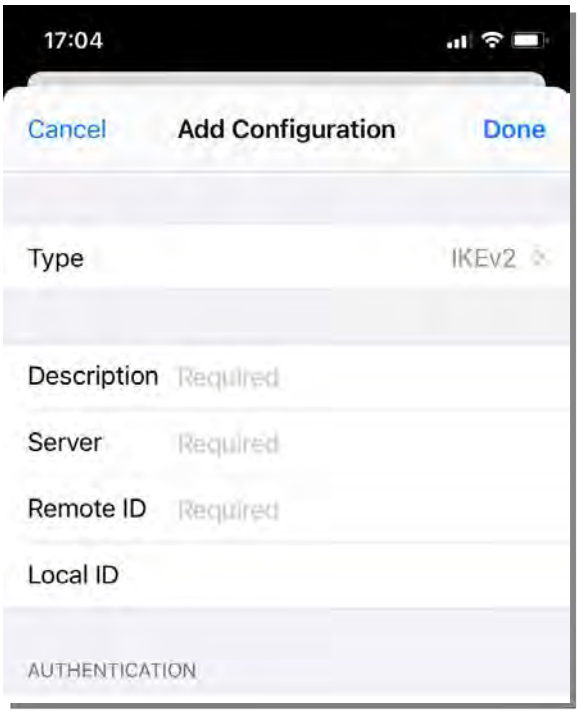
10) These are the steps for the VPN configuration under Apple iOS:
Open “Settings“ in your iOS device.




11) Select "General-→ VPN-→ Add VPN.

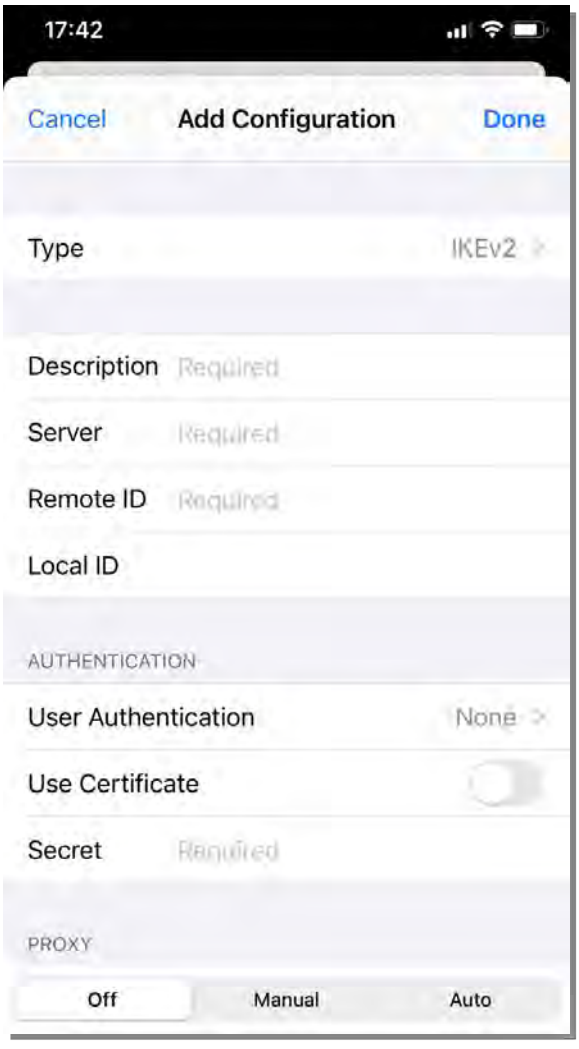


12) Enter the required VPN data in the corresponding fields. Refer to → 5) for details.

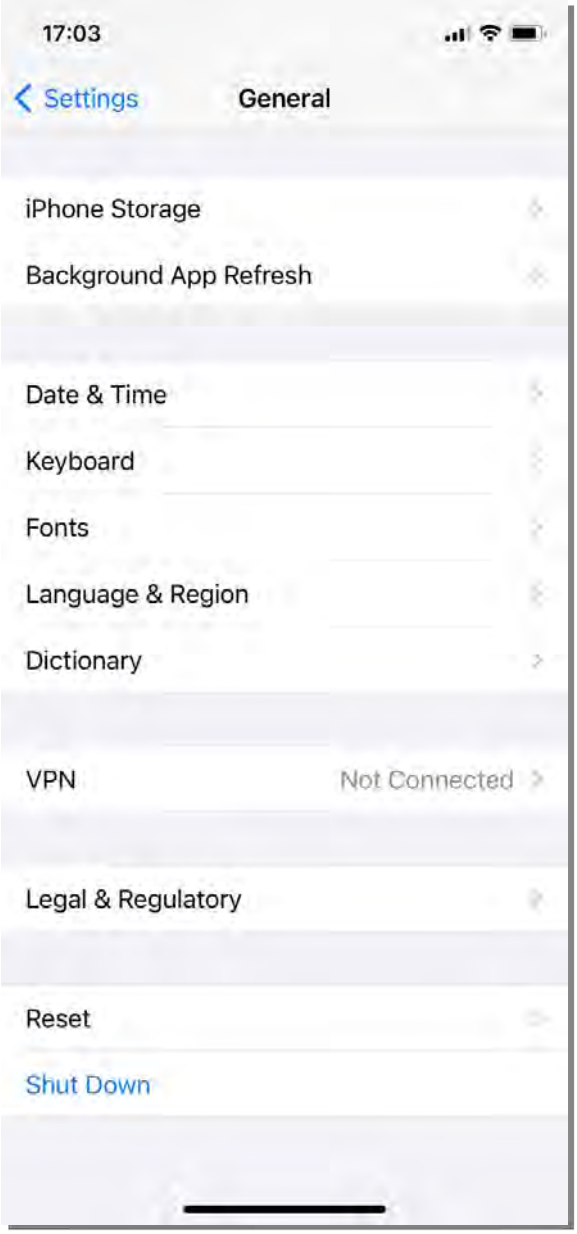



13) Consider these settings:

- Set „“User Authentication“ to “None“.
- Set "Use Certificate " to inactive.
- Set "Proxy" to "Off".



14) Complete the configuration.



## 7.2 RCT Power APP Description

The inverter is equipped with an internal Wi-Fi/LAN module.

To set up and commission the inverter, you must connect to it via Wi-Fi using the Android based RCT Power APP. The App contains the inverter's central user interface.

The App also ensures easy data collection and facilitates troubleshooting.

How to get the App: Open the Google Play Store, search for "RCT Power APP" and install.

The functionality of the RCT Power App is divided into two access areas with separate logins.

Customer Area: Login: ********

Installer Area: Login: please use the installer password

Please note: The Installer Area of the RCT Power APP ( marked in red in section 7.2.1) must only be accessed and operated by qualified personnel!

### 7.2.1 Overview of the RCT Power APP Menu



### 7.2.2 Detailed Description of the RCT Power APP Menu Items

#### 7.2.2.1 Online

"Online" is an interactive overview of all devices in the system with their status and values.
Touching one of the device icons displays more details. The level of details depends on the access area.

#### 7.2.2.2 History

Use this menu to display all the stored system performance data.

##### *7.2.2.2.1 Feed-in Chart*

Graphical display of the system's energy, power and operating data. The user can select the preferred display range (day, week, month, year, total) . A double-click on the chart selects the displayed data set.

##### *7.2.2.2.2 Information*

Errors messages are displayed ordered by date and time of the error's occurrence.

#### 7.2.2.3 Device

Display and setting options for all device-specific parameters. Granted access and administrative rights vary depending on the access area of the RCT Power APP.

##### *7.2.2.3.1 Information*

Inverter specific information, e.g. Control Software version, serial number or the select country-specific norm file.

##### *7.2.2.3.2 Measured values*

Use to display all system measurement information.

###### *7.2.2.3.2.1 AC*

Use to display all AC connection specific readings.

###### *7.2.2.3.2.2 Battery*

Use to display all Battery specific readings.

###### *7.2.2.3.2.3 PV*

Use to display all PV-input specific readings.

###### *7.2.2.3.2.4 Device*

Display of device specific measurement readings.

###### *7.2.2.3.2.5 Energy*

Display of energy readings. Values are ordered by time period and source.

##### *7.2.2.3.3 Settings*

Use to change device and system settings. Granted access and administrative rights vary depending on the access area of the RCT Power APP.

> Changes to settings are only made permanent if they are flashed to the inverter's memory!
> It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

###### *7.2.2.3.3.1 Battery (Installer Area!)*

Use to select the Battery type and to configure the SOC target selection. Minimum and maximum SOC target values, as well as minimum battery discharge voltage and maximum battery charge voltage, can also be configured.

*7.2.2.3.3.1.1 Battery properties (Installer Area!)*

Use to view and retrieve the serial numbers, software versions and parameters of the Power Battery or Power Battery Stacks.

*7.2.2.3.3.2 Interfaces*

Use to configure the interfaces for peripheral devices.

*7.2.2.3.3.2.1 Multifunctional relay*

The multifunction relay can be configured in the operation modes "Load" or "Alarm".
In the mode "Load", the relay switches on when a certain power threshold is reached. Threshold Power and time delay for the switch on/switch action can be configured.
In the mode "Alarm", the relay switches on in the event of an inverter fault. This can be used, e.g. to power on a warning lamp

*7.2.2.3.3.2.2 Digital I/O´s ( Installer Area! )*

Use to configure the Digital I/O interfaces. You can change settings for the external display or configure the interface for pulses from energy meters to control the output power of the inverter. They can also be configured as inputs for emergency stop signals (especially for use in Italy).

*7.2.2.3.3.2.3 RS485*

Use to configure the RS485 interface for connecting a data logger or an electricity meter.

*7.2.2.3.3.2.4 External active power reduction (Installer Area!)*

Use to configure Ripple Control Signal receiver. Pre-configured according German EEG.

*7.2.2.3.3.3 Normative parameters ( Installer Area!)*

Use to view and change the country-specific parameters set up during configuration of the inverter and battery.

*7.2.2.3.3.3.1 AC Level (Installer Area!)*

Use to view and set AC voltage levels and corresponding switch-off times. The default settings correspond with the general mains grid specifications. They can only be changed after consultation with the local utility company.

*7.2.2.3.3.3.2 AFI parameters ( Installer Area!)*

Use to view and configure parameters for the AFI residual current circuit breakers.

*7.2.2.3.3.3.3 DC-component (Installer Area!)*

Use to configure the max. DC components in the feed-in current.

*7.2.2.3.3.3.4 NSM (Installer Area! )*

Use to view and configure normative grid support functions [Cosphi (P), fixed Cosphi, P (f), Q (U) and P (U)]. The default settings correspond with the general mains grid specifications. They can only be changed after consultation with the local utility company.

*7.2.2.3.3.3.5 Switch-on conditions (Installer Area!)*

Use to view and configure the normative switch-on conditions (voltage level, frequency level, test time). The default settings correspond with the general mains grid specifications. They can only be changed after consultation with the local utility company.

*7.2.2.3.3.4 Device settings*

Use to change the settings of inverter and power generating system e.g.

- Device Name
- Date and Time
- Brightness and contrast of the inverter's LCD Display
- Power reducing factor (Installer Area!)
- Activate Power Switch (Installer Area!)
- Activate /deactivate MPP algorithm for shaded strings (Installer Area!)

Please note: The user interface language of the RCT Power APP is automatically set by the language setting of your Android device.

*7.2.2.3.3.4.1 Power Sensor tuning (Installer Area!)*

Use to start and control the integration of the Power Sensors.

*7.2.2.3.3.4.2 Advanced settings (Installer Area!)*

Use to change the advanced settings of the inverter e.g.

- Inverter DC-voltage start value
- Minimum allowed insulation resistance

*7.2.2.3.3.5 Update (some functions only in Installer Area!*

Use to update the software versions of your inverter and the RCT Power Battery.
The first line next to the "UPDATE FROM APP" button shows the actual (available) version and the second your (currently installed) version.
Press the "UPDATE FROM APP" button under the heading "Control Update" to update the inverter software. Press the "UPDATE FROM APP" button under the heading "BMS Update" to update the battery software

Do not close down the RCT Power APP during the update process! If the update fails, try again.
Please note that any update of the inverter software represents a certain risk.
Only update if it is essential to do so.

You can find a detailed description under section 8.8 "Software updates for inverter and battery".

You can also export/import normative parameters (in JSON file format). You might be required to use these parameters if your local utility provider mandates different settings than the default ones.

#### 7.2.2.4 Network

Use this section to monitor a selected inverter with the RCT Power APP. Press the "SCAN" button to search the network for available inverters. Any device within the search range will be listed.
Alternatively, the device can also be added manually by entering the IP address at the bottom of the screen

(press the "+" button to add the device to the list). If the inverter is integrated into an existing external network it is possible to connect remotely using the assigned IP address (see section 7.1.8).
When the connection to an inverter is established, the inverter name is displayed. The RCT Power Icon is framed by a square.The next time you open the app, it will automatically connect you to the last selected device.

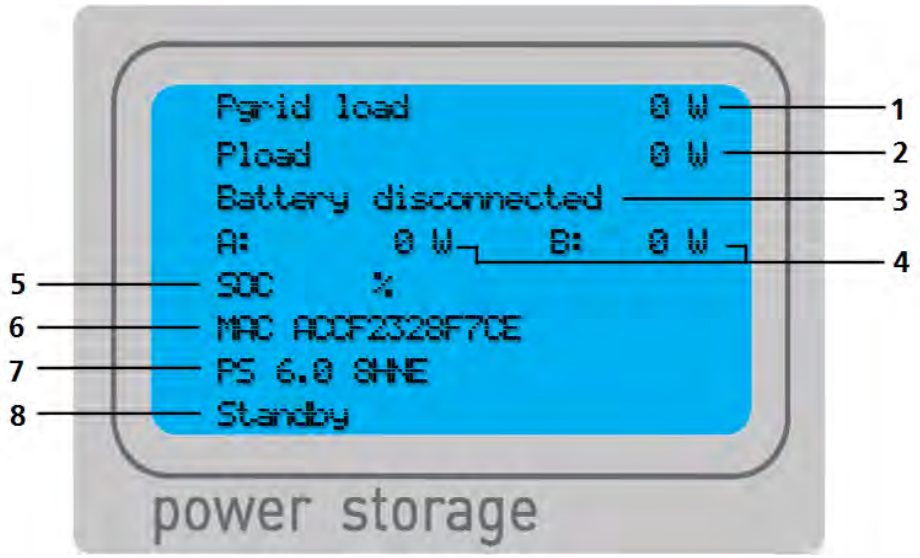
Tap on a device in the list for two seconds to select it.

The selected device can then be deleted from the list by tapping the Recycle Bin icon “ ”.

Grouping of devices: Individual devices in the device selection can be grouped to form a system. Mark the devices you want to group by tapping them for 2s

The " "symbol can be used to group the selected devices into a system or to add them to an existing system.

## 7.3 Display




| Pos. | Description | Comment |
|---|---|---|
| 1 | AC power (grid) | Displays the current power received from or fed into the grid<br>• Pgrid load: Power drawn from the grid.<br>• Pgrid feed: Power feed into the grid. |
| 2 | Household Power | Displays the current household power<br>• Pload: current power consumption household consumers.<br>• Pext. source: generated power from an external source (e.g. an additional solar inverter)/less household power consumption |
| 3 | Battery Power | Displays the current battery power<br>• Pbat: The Battery is passive (inverter and battery are in idle mode).<br>• Pbat charge: The Battery is charging.<br>• Pbat discharge: The Battery is discharging.<br>• Battery disconnected: The Battery is not linked or has no connection.<br>• Battery calibration: The Battery is calibrating (Battery is charging to 100% SOC in order to complete the calibration). |
| 4 | Solar Generators | Solar Generators A and B, Display values alternate between<br>• Voltage<br>• Power<br>• Status:<br>• MPP [Operation at Maximum Power Point]<br>• P_Lim [Solar Generator power is limited]<br>• Fix [Operation in fixed voltage mode]<br>• OFF [Solar Generator not in operation] |
| | | |
| 5 | SOC | Displays the SOC (State Of Charge) of the Battery.<br>Values for both the current state of charge and the target SOC are shown in %. |

| | | |
|---|---|---|
| 6 | Device Information | Display of Device Information. Values alternate between:<br>• IP-address-→ (M= Master, S=Slave)<br>• MAC-address<br>• Serial number<br>• RS485 - address |
| 7 | Device Information | Display of Device Information. Values alternate between:<br>• Date/Time<br>• Norm Parameter<br>• Software Version<br>• Device Name<br>• Configure Wi-Fi (Wi-Fi is being configured) |
| 8 | Device Status | Displays the current device status:<br>• Feed IN [Inverter feeds into the grid]<br>• H/W check [Checking the hardware components]<br>• Initialisation [Initialisation of the system]<br>• Insulation check [Checking the insulation resistance]<br>• Island check [Checking grid status]<br>• Island [Inverter is not connected to the grid]<br>• Island sync<br>[The Inverter is checking the grid quality to switch from island to normal operation mode and connects seamlessly.]<br>• Standby [The Inverter is in standby mode]<br>• Bat passive power<br>[The battery keeps the inverter alive and is not connected to the grid.]<br>• Grid passive power<br>[The Inverter is not connected to a battery and is powered from the mains]<br>• Power check [The Inverter is testing solar power output.]<br>• Relays test [Function test of mains relay]<br>• Start conditions [Grid conditions are checked]<br>• Uzk symmetry [Checking the symmetry of the DC link voltage]<br>• Software X.X.X [Software version used]<br>• Trap XXX [An error has occurred]<br>• Error messages<br>[Detailed info as uggested troubleshooting in section 9] |

## 7.4 Exporting RCT Power APP log data to MS Excel for further processing

**Please note: Some of the data records are not available for all inverter types.**

### 7.4.1 Abbreviations of the individual data records and their definitions

#### 7.4.1.1 Data records "Day"

Recorded are 5-minute averages for the following values:

| | |
|---|---|
| Pdc A [W] , Pdc B [W] | Power of the solar generator inputs A and B |
| Pdc [W] | Power of the solar generator inputs [A+B] summed |
| Udc A [V] , Udc B [V] | Voltage of the solar generator inputs A and B |
| Pac 1 [W] , Pac 2 [W] , Pac 3 [W] | Inverter power of the individual grid-phases |
| Pac [W] | Total inverter power of the grid side |
| Uac 1 [V] , Uac 2 [V] , Uac 3 [V] | Voltage of the individual grid-phases |
| Temp [°C] , Temp2 [°C] | Heat sink temperature inverter, Bat tery converter |
| Temp bat [°C] | Average Bat tery temperature |
| Pbat [W] | Bat tery power [+] corresponds to discharging, [-] corresponds to charging |
| Ubat [V] | Bat tery voltage |
| SOC [%] | Current bat tery charge state |
| SOC targ [%] | Target bat tery charge state |
| Pload [W] | Household consumpt ion |
| Pgrid feed [W] | Grid feed-in power |
| Pgrid load [W] | Grid import power |
| Pgrid [W] | Grid power [+] corresponds to grid import, [-] corresponds to grid export |
| Pext [W] | Power of one or more external inverters |
| Pdc forecast [W] | Expected solar power |
| Pdc max [W] | Maximum solar power over the last 30days |
| Pload forecast [W] | Expected household load |
| Pext forecast [W] | Expected external power |

☐ Pdc A [W] ☐ Pdc B [W] ☐ Pdc [W]
☐ Udc A [V] ☐ Udc B [V] ☐ Pac 1 [W]
☐ Pac 2 [W] ☐ Pac 3 [W] ☐ Pac [W]
☐ Uac 1 [V] ☐ Uac 2 [V] ☐ Uac 3 [V]
☐ Temp [°C] ☐ Temp2 [°C]
☐ Temp bat [°C] ☐ Pbat [W] ☐ Ubat [V]
☐ SOC [%] ☐ SOC targ [%] ☐ Pload [W]
☐ Pgrid feed [W] ☐ Pgrid load [W]
☐ Pgrid [W] ☐ Pext [W]
☐ Pdc forecast [W] ☐ Pdc max [W]
☐ Pload forecast [W] ☐ Pext forecast [W]

Values can be recorded covering a period of up to 90 days.

#### 7.4.1.2 Data records "Week" and "Month"

Recorded are the daily values in the specified period.

| | |
|---|---|
| Edc A [kWh], Edc B [kWh] | Energy of the solar generator inputs A and B |
| Edc [kWh] | Energy of the solar generator inputs [A+B] summed |
| Eac [kWh] | Inverter output energy |
| Eload [kWh] | Household energy comsumption |
| Egrid feed [kWh] | Grid export energy |
| Egrid load [kWh] | Grid import energy |
| Autarky [%] | The autarky describes the share of the electricity consumption that is covered by the photovoltaic storage system either by simultaneous consumption of the generated solar electricity or by discharge of the battery |
| Self-consum [%] | The self-consum describes the share of the generated solar electricity that is either simultaneously consumed or used for battery charging. |
| Eext [kWh] | Energy of one or more external inverters |




Values can be recorded covering a period of up to 11 years.

#### 7.4.1.3 Data records "Year" and "Total"

Recorded are monthly / annual values in the specified period.

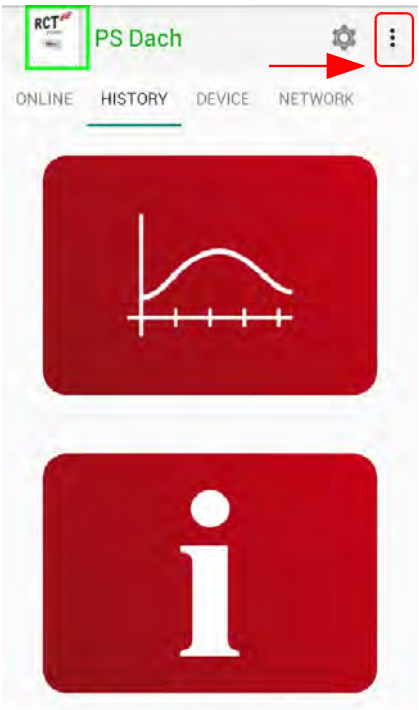
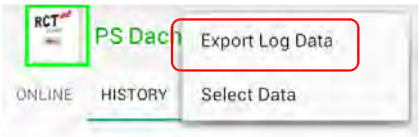
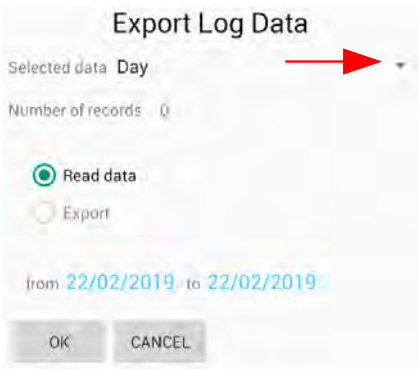
| | |
|---|---|
| Edc A [kWh], Edc B [kWh] | Energy of the solar generator inputs A and B |
| Edc [kWh] | Energy of the solar generator inputs [A+B] summed |
| Eac [kWh] | Inverter output energy |
| Eload [kWh] | Household energy comsumption |
| Egrid feed [kWh] | Grid export energy |
| Egrid load [kWh] | Grid import energy |
| Autarky [%] | The autarky describes the share of the electricity consumption that is covered by the photovoltaic storage system either by simultaneous consumption of the generated solar electricity or by discharge of the battery |
| Self-consum [%] | The self-consum describes the share of the generated solar electricity that is either simultaneously consumed or used for battery charging. |
| Eext [kWh] | Energy of one or more external inverters |

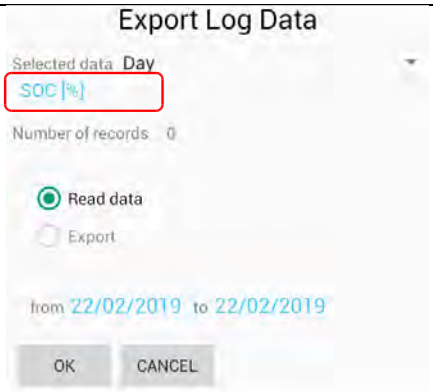


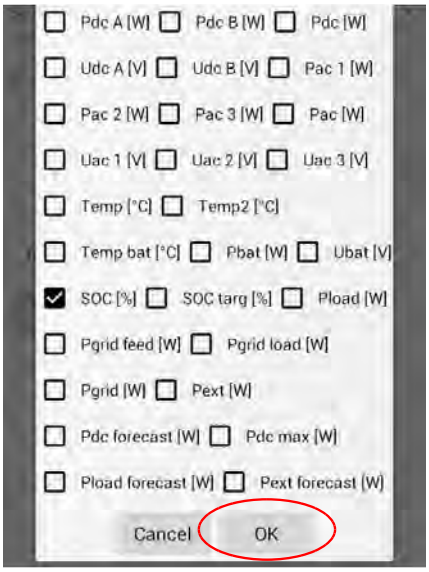

Values can be recorded covering a period of up to 85 years.

### 7.4.2 Exporting Data records

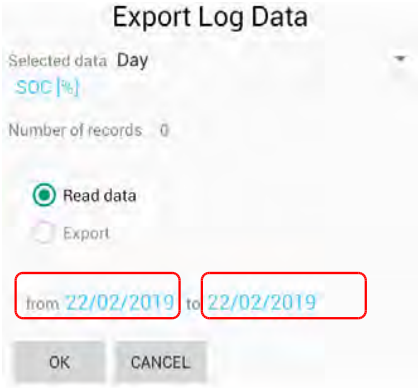
It can be beneficial to export certain records from the inverter's internal data logging system. The export files are in text format. They can easily be imported and manipulated into MS Excel or an equivalent spreadsheet application. The results can be used for accounting purposes with the tax office or to visualise system performance.
Procedure:

| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the inverter. | |
| 2 | Select Menu item “HISTORY“ and press “ ⋮ “. |  |
| 3 | Two options are shown. Select “Export Log Data“. |  |
| 4 | Expand Drop-down list for “Selected data“ and choose the required data type. |  |
| 5 | Touch the area below "Selected data" to select the data you want to export. Confirm with OK". | |

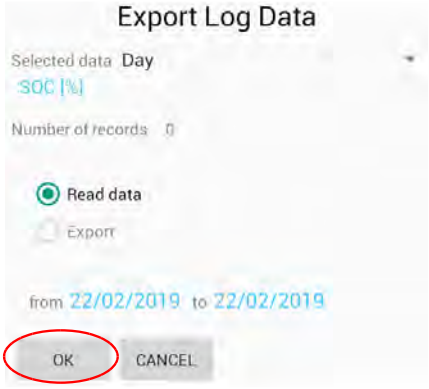



6 Touch the date shown after "from" to select the start date for your data export period.
A calendar date selection window will open.
Tap on the desired date and confirm selection by pressing "OK".
Now touch the date shown after "to" to select the end date for your data export period.
Confirm selection by pressing "OK".

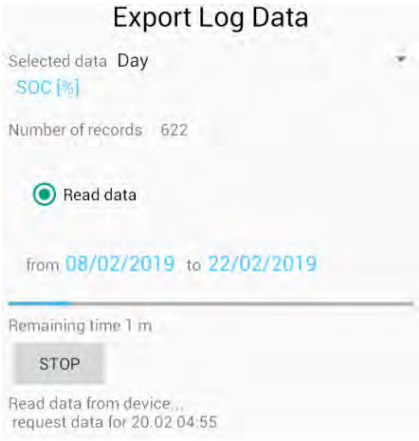



7 Press "OK" to continue.



8 The selected data is now transferred from the inverter's internal data memory to the RCT Power APP.

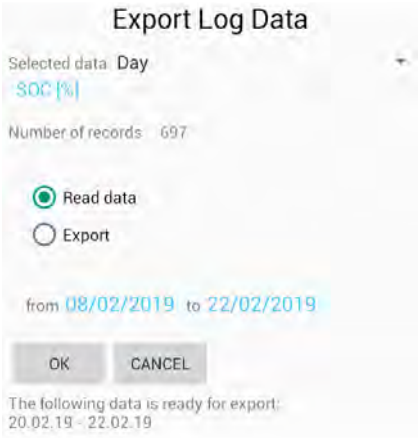
The estimated remaining time for the transfer to complete is displayed below the selected date range.




Please note:

Depending on the amount of data and the time period selected, it may take several hours until the download completes.

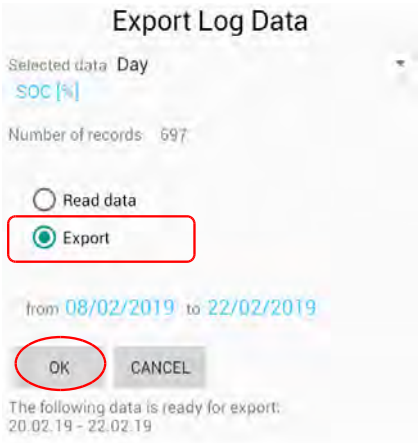
Adapt the selection of data sets and time periods accordingly to reduce the download time.




The data transfer can be cancelled at any time by pressing "STOP".

After successful transmission, the available time period of the log file is displayed.

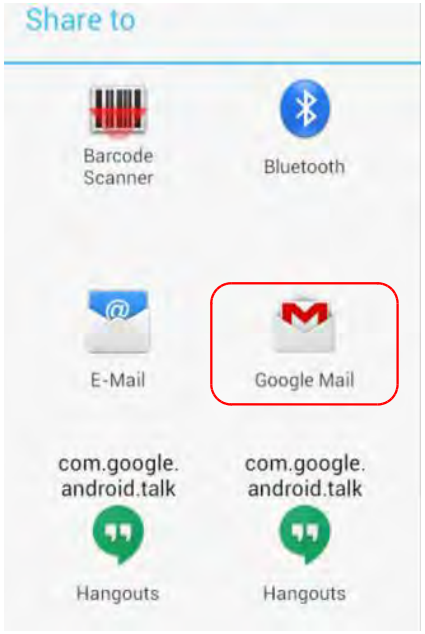
9 To export the data, select radio button "Export" and confirm with "OK".

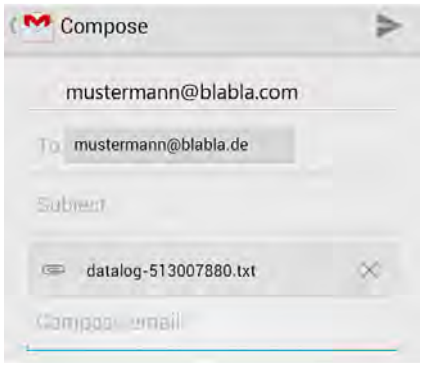


10 A dialogue window similar to the one shown on the right will open.

It is recommended to send the file by e-mail for further processing. Select your preferred e-mail app to send the file to the desired address, which can be your own.

You can also process the file on your Smartphone/Tablet if an adequate application is installed.



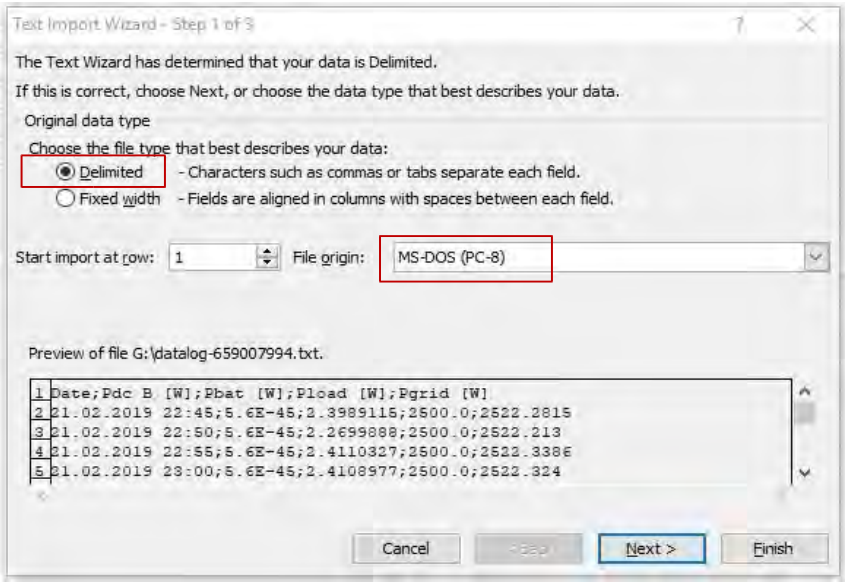




The exported file is a text file which can be processed via the import function of MS Excel or a similar spreadsheet applications.

### 7.4.3 Importing RCT Power APP log data to an MS Excel spreadsheet

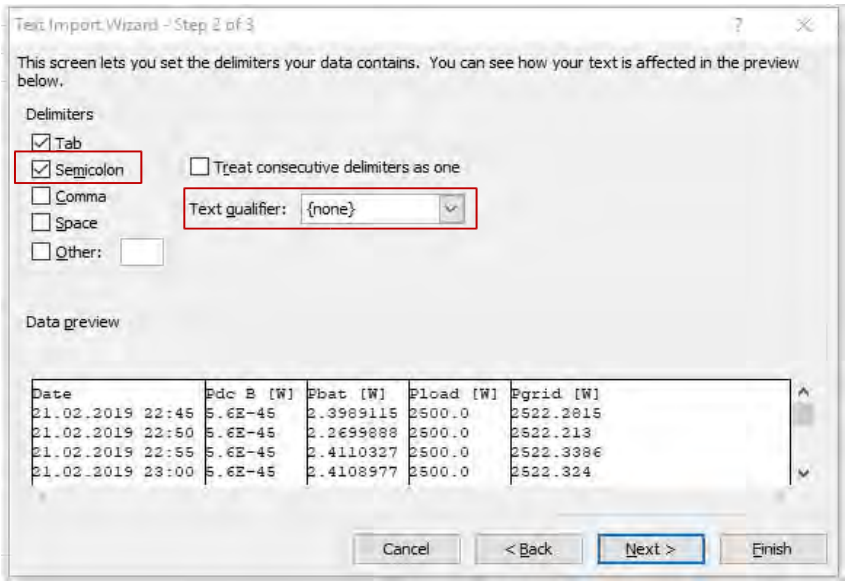
The log data file can be imported into a spreadsheet program. It can be saved, processed or possibly added to a sequential file. (The import procedure is described below using MS Excel for Windows).

1. Open MS Excel, go to File-→ Open... and browse for the text file you want to import.
Once the file has been located select and confirm by clicking Open. The Text Import Wizard will open:

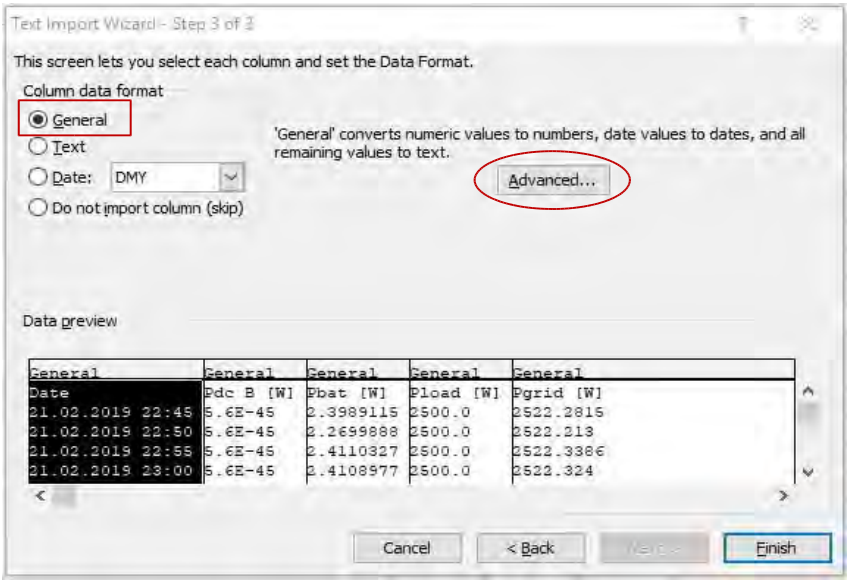



Ensure that the appropriate attributes are selected. For Original Data type: "Delimited"
and for File origin: "MS-DOS (PC-8)".
Continue the wizard by clicking "Next".

2. For Delimiters set the tick mark at "Semicolon" and select "None" for Text qualifier.
Continue the wizard by clicking "Next".



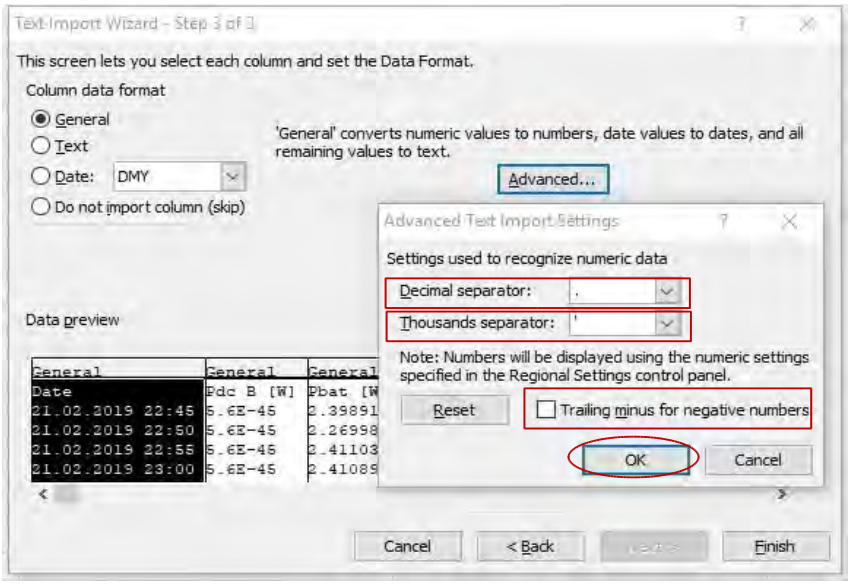
3. Select "General" for the Column data format. Click on "Advanced...." for more options.




4. In the advanced import settings dialogue box select
"." (decimal point) for Decimal separator, and " ' " (inverted comma) for Thousands separator.

Remove the tick mark for "Trailing minus for negative numbers".

Confirm your selections with "OK".




Complete the Text import wizard by clicking on "Finish".

5. Clicking "OK" in the Import data dialog box completes the file import. The imported data can now be further processed in MS Excel.

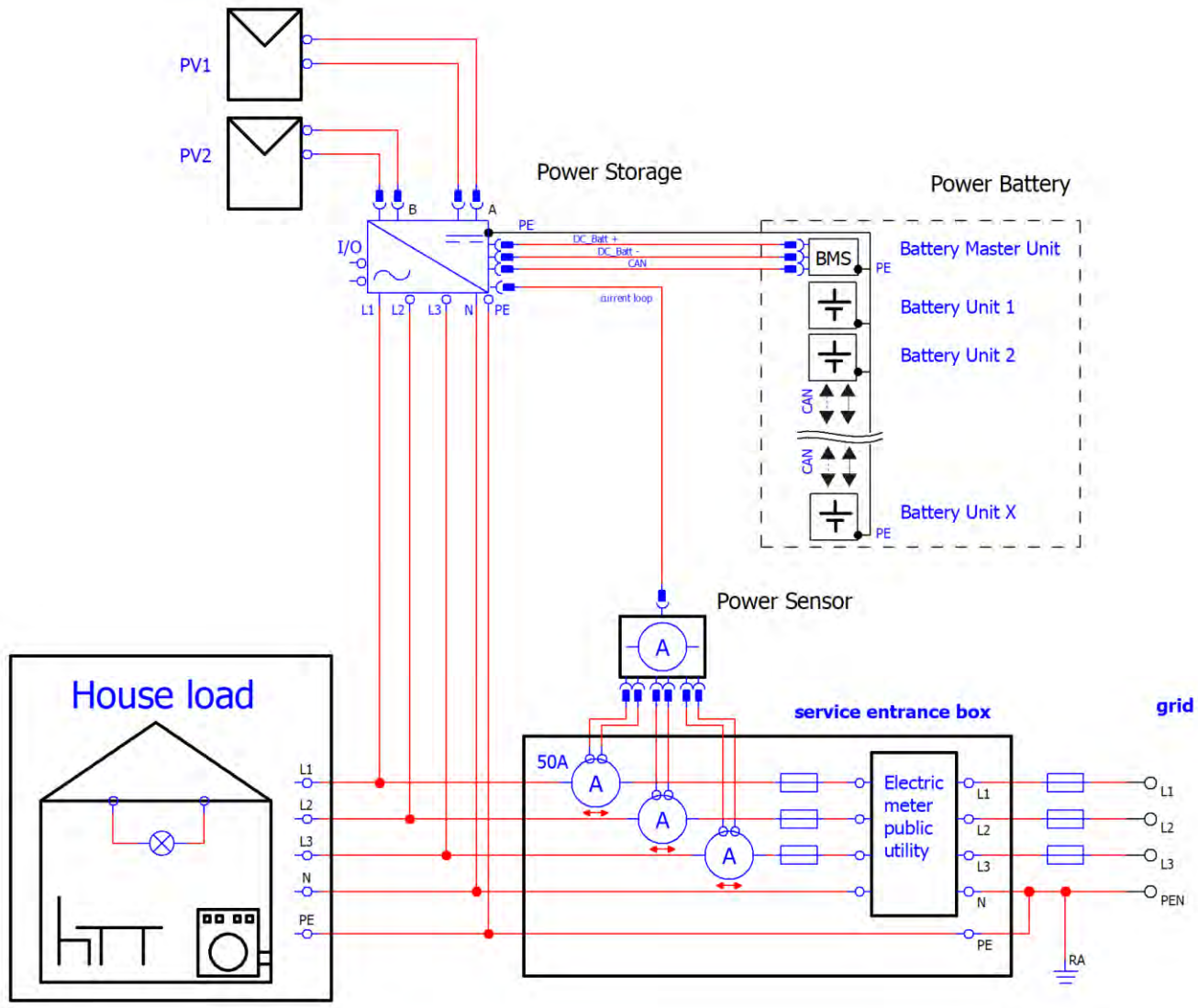
| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Date | Pdc [W] | Pbat [W] | Pload [W] | Pgrid [W] |
| 2 | 18.11.2018 07:45 | 0,21365437 | 97,72832 | 91,06302 | -0,030593067 |
| 3 | 18.11.2018 07:50 | 3,8079643 | 91,143906 | 90,53837 | 0,060736716 |
| 4 | 18.11.2018 07:55 | 10,553242 | 83,53949 | 89,77819 | 0,019051224 |
| 5 | 18.11.2018 08:00 | 18,244768 | 75,15721 | 89,270454 | 0,031608194 |
| 6 | 18.11.2018 08:05 | 26,070415 | 66,96922 | 89,16722 | 0,080382526 |
| 7 | 18.11.2018 08:10 | 37,467262 | 27,67462 | 62,36176 | -0,016673505 |
| 8 | 18.11.2018 08:15 | 49,81549 | -12,687609 | 37,91744 | 2,1012626 |
| 9 | 18.11.2018 08:20 | 47,02951 | 89,459625 | 130,8591 | -0,032817096 |
| 10 | 18.11.2018 08:25 | 53,065266 | 85,37626 | 132,78778 | -0,012080491 |
| 11 | 18.11.2018 08:30 | 58,991386 | 78,23763 | 131,94954 | 0,11306059 |
| 12 | 18.11.2018 08:35 | 66,793564 | 60,71075 | 123,172 | 0,43513948 |
| 13 | 18.11.2018 08:40 | 77,52366 | 71,92865 | 144,19499 | 0,17383236 |
| 14 | 18.11.2018 08:45 | 123,527855 | 54,639656 | 171,9531 | -0,028239995 |
| 15 | 18.11.2018 08:50 | 149,82562 | -23,174372 | 121,30282 | -0,13186973 |
| 16 | 18.11.2018 08:55 | 170,76826 | -76,55818 | 89,274666 | -0,042378634 |
| 17 | 18.11.2018 09:00 | 195,23167 | -101,08598 | 88,513336 | 6,85E-04 |
| 18 | 18.11.2018 09:05 | 222,87146 | -128,19572 | 88,21324 | -0,09301433 |
| 19 | 18.11.2018 09:10 | 251,66664 | -184,02443 | 60,150215 | -0,114060074 |
| 20 | 18.11.2018 09:15 | 284,04523 | -243,73462 | 32,03193 | -0,13071427 |
| 21 | 18.11.2018 09:20 | 319,54752 | -278,62283 | 31,69561 | -0,053357095 |
| 22 | 18.11.2018 09:25 | 359,3892 | -317,04727 | 31,893103 | -0,056800127 |
| 23 | 18.11.2018 09:30 | 398,5271 | -355,3236 | 31,625566 | -0,035470605 |
| 24 | 18.11.2018 09:35 | 435,19864 | -390,66595 | 31,837784 | -0,022697926 |
| 25 | 18.11.2018 09:40 | 475,74054 | -400,4181 | 61,791393 | -0,028479338 |
| 26 | 18.11.2018 09:45 | 517,24774 | -410,9929 | 91,19408 | -0,0920178 |
| 27 | 18.11.2018 09:50 | 558,199 | -451,5428 | 90,45641 | -0,06776172 |
| 28 | 18.11.2018 09:55 | 597,365 | -489,56235 | 90,36973 | -0,22226048 |
| 29 | 18.11.2018 10:00 | 634,774 | -526,17535 | 90,20355 | 0,12750977 |
| 30 | 18.11.2018 10:05 | 674,1743 | -564,2969 | 90,39447 | 0,1329397 |
| 31 | 18.11.2018 10:10 | 712,7969 | -633,09534 | 58,852905 | 0,08523959 |
| 32 | 18.11.2018 10:15 | 752,4447 | -697,7626 | 32,638966 | -0,21614051 |
| 33 | 18.11.2018 10:20 | 787,03265 | -731,6967 | 32,402912 | -0,014511347 |
| 34 | 18.11.2018 10:25 | 825,8585 | -769,42596 | 32,364525 | -0,004061461 |

# 8 Configuration

## 8.1 Power reduction

There are 2 options for power reduction:

- Dynamic power reduction at the house connection point.
- Power reduction using a ripple control receiver.

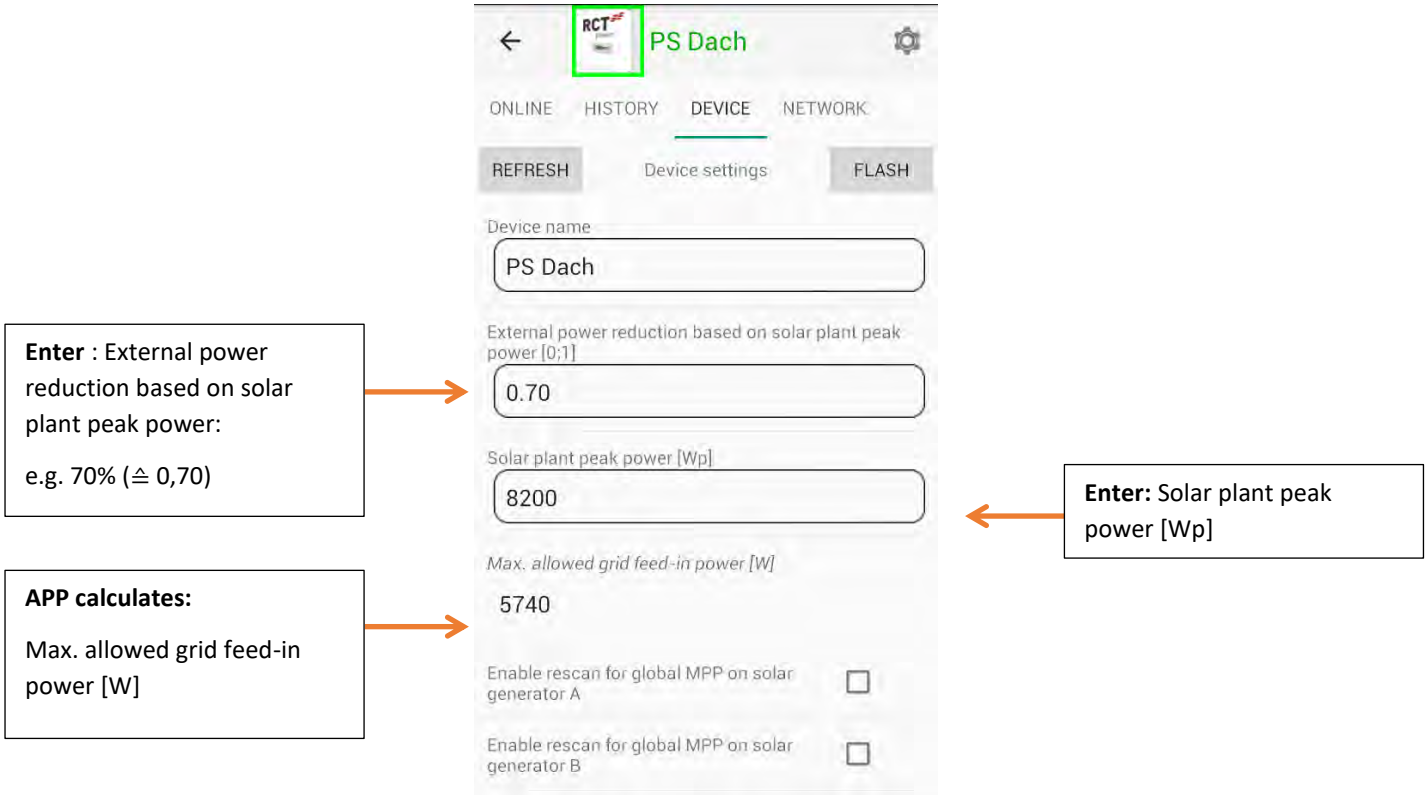


### 8.1.1 Dynamic power reduction at the house connection point

In order to obtain the maximum yield from the solar system, it is possible to configure a dynamic power reduction. There is no additional equipment required for this configuration apart from the Power Sensor. The feed-in power is measured at the mains connection point and is only capped if the excess power exceeds the set value.

**Configuration using the RCT Power APP:**

Launch the "RCT Power APP" and continue to DEVICE --> Settings --> Device settings




Please note: If your system contains **several devices** you must the enter **peak power** of the **combined system.**

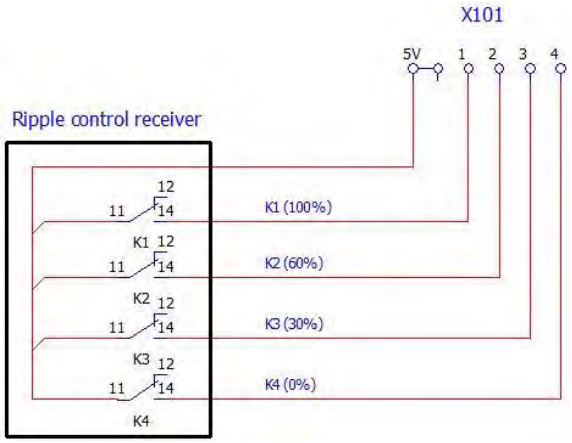
Changes to settings are only saved permanently if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

### 8.1.2 Power reduction using a ripple control receiver

**Commissioning / Wiring:**

Connect the ripple control receiver to terminal X101 on the I/O circuit board.
Recommended cable type: e.g. YR05x0.8WS, YSLY-OZ05x0.5GR




**Configuration using the RCT Power APP:**

Launch the "RCT Power APP" and continue to
DEVICE-→ Settings-→ Interfaces-→ External active power reduction

Actual K4..K1 data: Displays the current status of relays K4...K1 as decimal code (K1 ≙ 2^0)

Delay for new K4...K1 data [s]: Delay in the power reduction when the relay status changes

The device is preconfigured with the following power values:

| K4 | K3 | K2 | K1 | Max. Active Power |
|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 100% |
| 0 | 0 | 1 | 0 | 60% |
| 0 | 1 | 0 | 0 | 30% |
| 1 | 0 | 0 | 0 | 0% |

For further configuration options go to menu
DEVICE-→ Settings-→ Interfaces-→ External active power reduction-→ K4..K1: active power reducing table.

Changes to settings are only made permanent if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

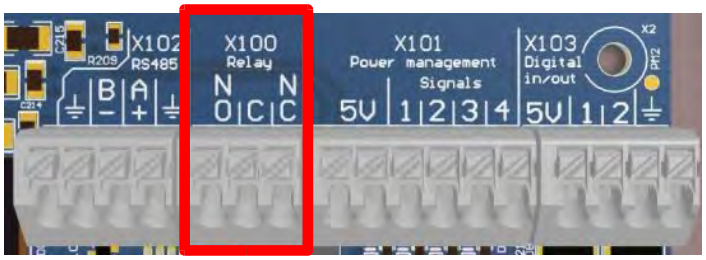
## 8.2 Multifunction Relay

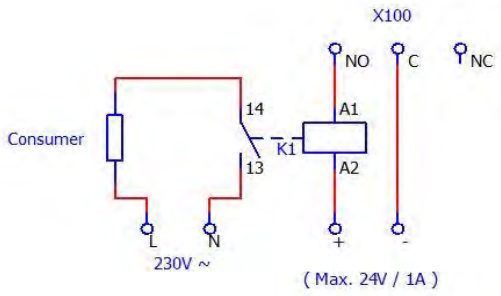
### 8.2.1 Multifunction Relay deployed in "Load" mode

In operational mode "Load", the multifunction relay switches on as soon as a predefined power threshold is reached. This can be used to control a contactor connecting household loads.

**Commissioning / Wiring:**

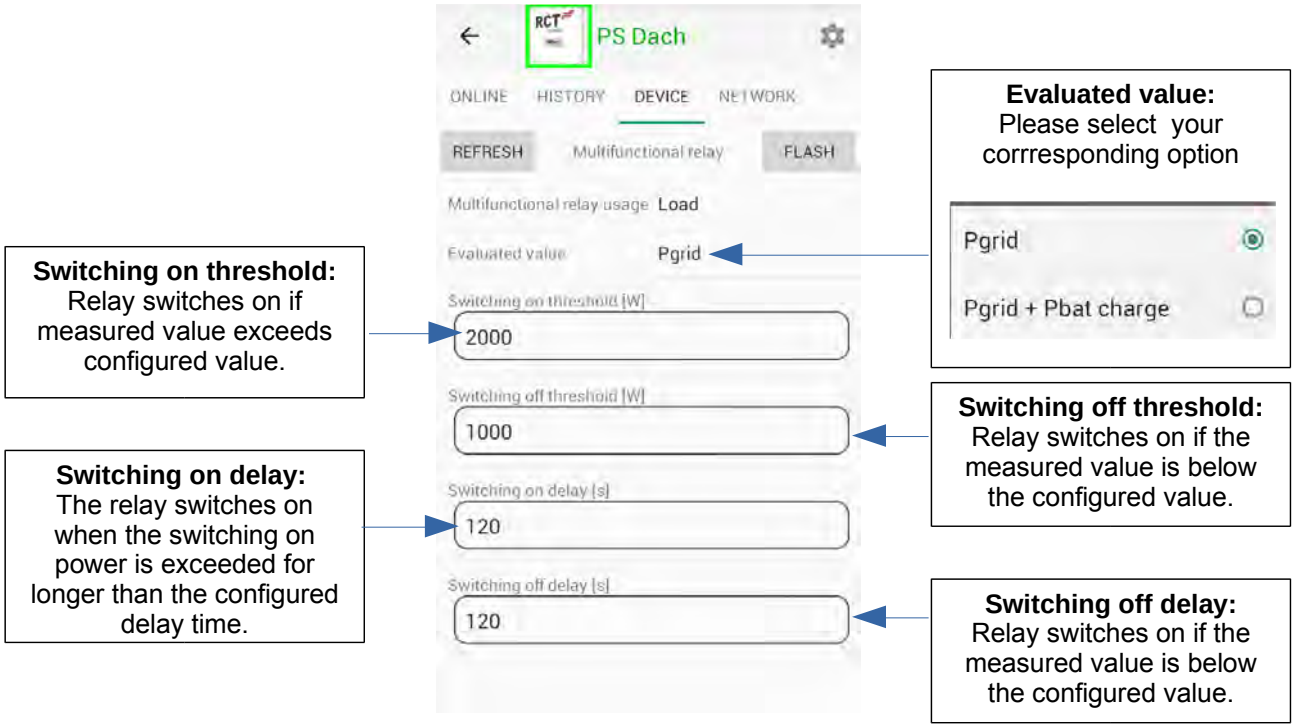
Connect the cables for the power supply (max. 24V/1A) and the contactor to the terminals X100 on the I/O circuit board.




**Configuration using the APP:**

Launch the "RCT Power APP" and continue to
DEVICE-→ Settings-→ Interfaces-→ Multifunctional relay-→ Multifunctional relay usage-→ Load



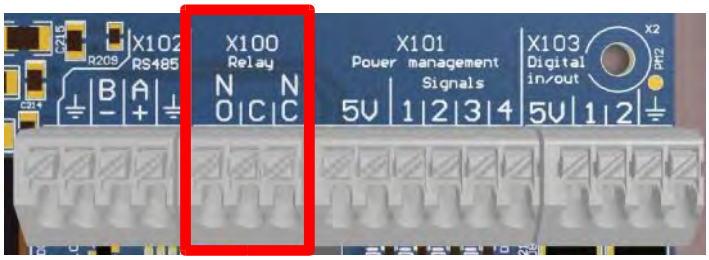

Changes to settings are only made permanent if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

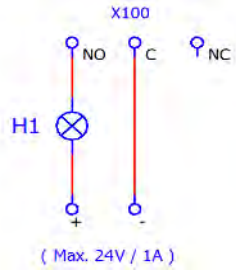
### 8.2.2 Multifunction Relay deployed in "Alarm" mode

In operational mode "Alarm", the multifunction relay switches on when a fault is detected. You can control a signal light to indicate the fault.

**Commissioning / Wiring:**

Connect the cables for the power supply (max. 24V/1A) and the signal lamp to the terminals X100 on the I/O curcuit board.




**Configuration using the APP:**

Launch the "RCT Power APP" and continue to
DEVICE-→ Settings-→ Interfaces-→ Multifunctional relay-→ Multifunctional relay usage-→ Alarm

Changes to settings are only made permanent if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

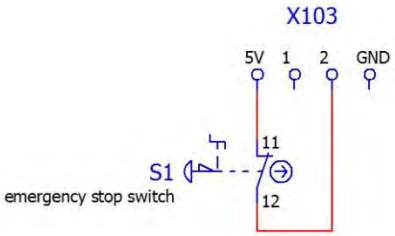
## 8.3 Configuration of the Emergency Stop Switch

Inputs X103 on the I / O board can be used to disable the inverter remotely.

**Commissioning / Wiring:**

Connect the cables of the ripple control receiver to the terminals X103 on the I/O circuit board.




**Configuration using the RCT Power APP:**

Launch the "RCT Power APP" and continue to DEVICE-→ Settings-→ Interfaces-→ Digital I/O's

Under Menu option "Digital I/O 1 usage" select the setting "Input emergency turn off".
Set the tick mark for "Inverted Signal on input I/O 1".
You can also alternatively use Digital I/O 2 for this setting.

Changes to settings are only made permanent if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

## 8.4 Configuration of the External Display

An external display with S0 input can be utilised using the digital I/O connections on the I/O board.

The following four options are available for the external display configuration:

Option 1: Household consumption (Output S0 household power)

Option 2: Grid Feed-in (Output S0 grid power feed-in)

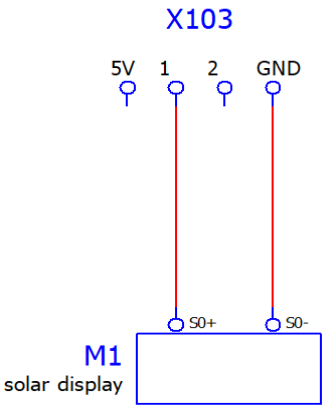
Option 3: Plant power (Output S0 inverter power)

Option 4: AC power single inverter (Output S0 device power)

**Commissioning / Wiring:**

Connect the cables from the S0 input of the display to the terminals X103 on the I/O circuit board.




Please configure the appropriate pulse ratio of the solar display in the RCT Power APP.

The recommended pulse ratio is between 1000 and 5000 pulses / kWh.

**Configuration using the APP**

Launch the "RCT Power APP" and continue to DEVICE-→ Settings-→ Interfaces-→ Digital I/O's

Under Menu option "Digital I/O 1 usage" select the required display option.
Configure the pulse rate according to the recommended specifications of your solar display.
You can also alternatively use Digital I/O 2 for this setting.

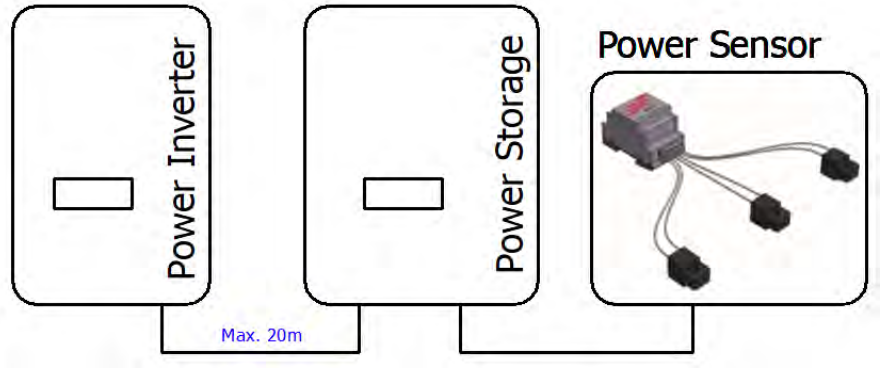
Changes to settings are only made permanent if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

## 8.5 Networking

### 8.5.1 Connecting a Power Storage DC and a Power Inverter to the same network

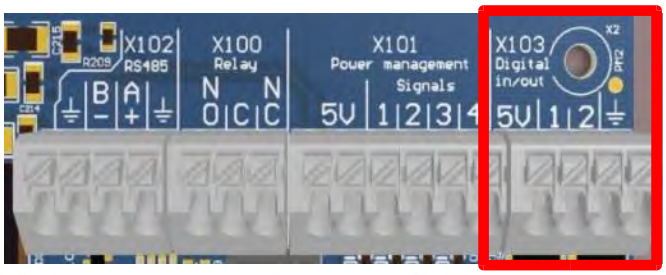
You can use the inverter's integrated the S0 interface to collectively monitor a solar installation with RCT inverters.
Excess power generated by the Power Inverter can be stored in the battery via the Power Storage DC.

If the Power Storage DC is accessed via the RCT Power APP, the generated power of the other inverters is displayed as added-up value.




The total cable length must not exceed 20 m.

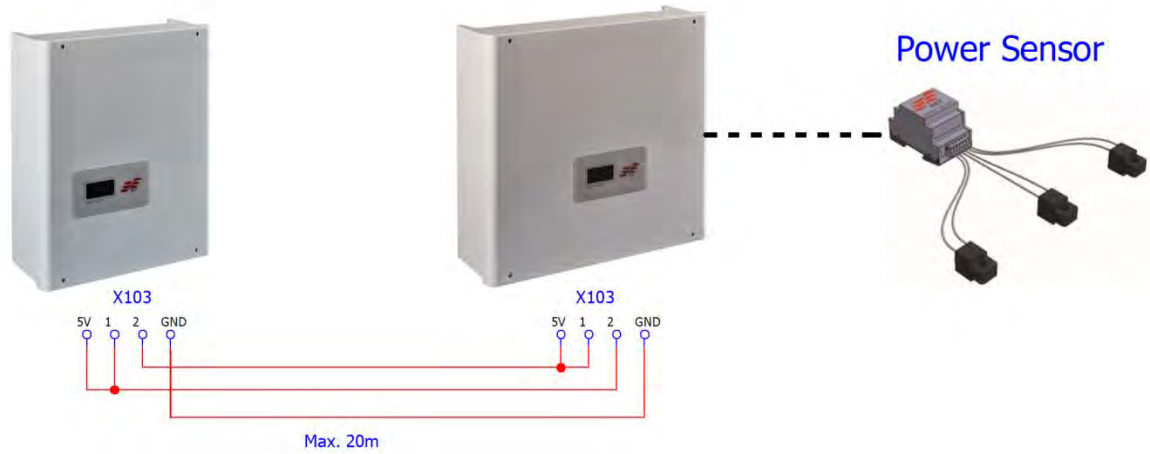
**Commissioning / Wiring:** Use a twisted pair cable to link the inverters together.




| Configuration RCT Power App<br>Digital I/O´s |
|---|
| Digital I/O 1 usage:<br>Input S0 grid power feed-in (10000 imp) |
| Digital I/O 2 usage:<br>Output S0 inverter power (2000 imp) |

| Configuration RCT Power App<br>Digital I/O´s |
|---|
| Digital I/O 1 usage:<br>Input S0 external power (2000 imp) |
| Digital I/O 2 usage:<br>Output S0 grid power feed-in (10000 imp) |

**Power Inverter** **Power Storage DC**



**Configuration using the APP:**

**Power Inverter configuration**

Launch the "RCT Power APP" connect to the Power Inverter and continue to

DEVICE → Settings → Interfaces-→ Digital I/O's → Digital I/O 1 usage-→ Input S0 grid power feed-in
Select "10000" for "Number of impulses per kWh for SO signal on I/O 1" , and continue with

DEVICE-→ Settings-→ Interfaces-→ Digital I/O's → Digital I/O 2 usage-→ Output S0 inverter power
Select "2000" for "Number of impulses per kWh for SO signal on I/O 2"

Press the "FLASH" button to confirm the settings changes!

**Power Storage DC configuration**

Launch the "RCT Power APP" connect to the Power Storage and continue to

DEVICE-→ Settings-→ Interfaces-→ Digital I/O's → Digital I/O 1 usage-→ Input S0 external power
Select "2000" for "Number of impulses per kWh for SO signal on I/O 1" , and continue with

DEVICE-→ Settings-→ Interfaces-→ Digital I/O's-→ Digital I/O 2 usage-→ Output S0 grid power feed-in
Select "10000" for "Number of impulses per kWh for SO signal on I/O 2"

Press the "FLASH" button to confirm the settings changes!

Adjusting Solar plant peak power

If a Power Storage DC is the main device of a PV system but other inverters are also included it is required to adjust the peak power in all devices to the system solar plant peak power.
The value for "External power reduction based on solar plant peak power" must be set for each device.
(70% rule)
The solar plant peak power is the sum of the peak powers of the individual inverters in the system, all of which are measured by the power sensor.

The solar plant peak power can be adjusted under

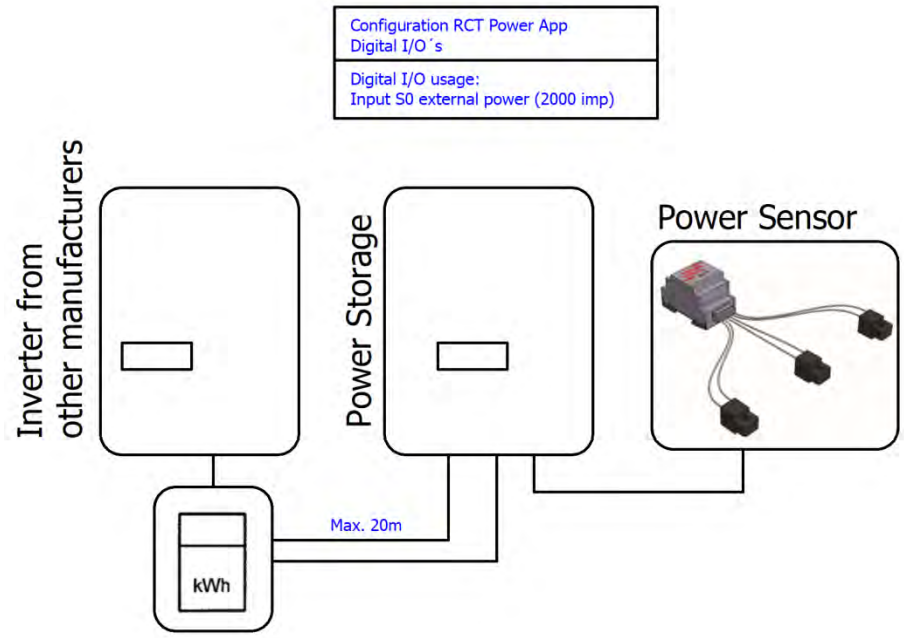
DEVICE-→ Settings-→ Device settings-→ Solar plant peak power
Confirm the updated value by pressing "Done" on the keypad and then update settings by pressing "FLASH".

### 8.5.2 Connecting a Power Storage DC and third-party inverter to the same network

You can use the inverter's integrated the S0 interface to collectively monitor a solar installation with third-party inverters. In the case of a third-party product, an electricity meter with S0 must be installed at the inverter output. This meter is then connected to the S0 interface of the Power Storage DC.

Excess power generated by the third-party inverters can be stored in the battery via the Power Storage DC.

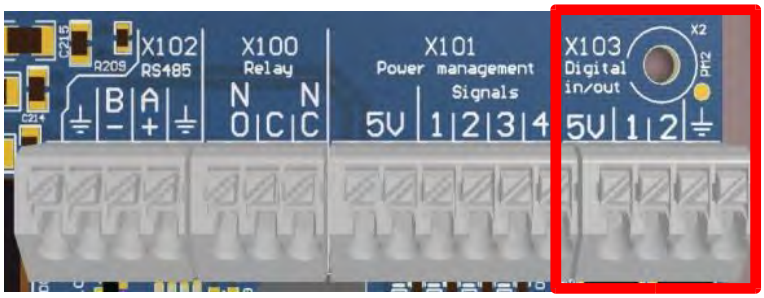
If the Power Storage DC is accessed via the RCT Power APP, the generated power of the third-party inverters is displayed as added-up value.

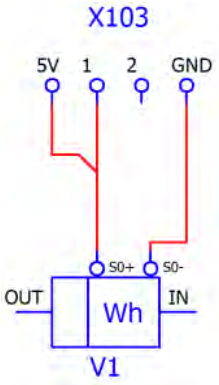


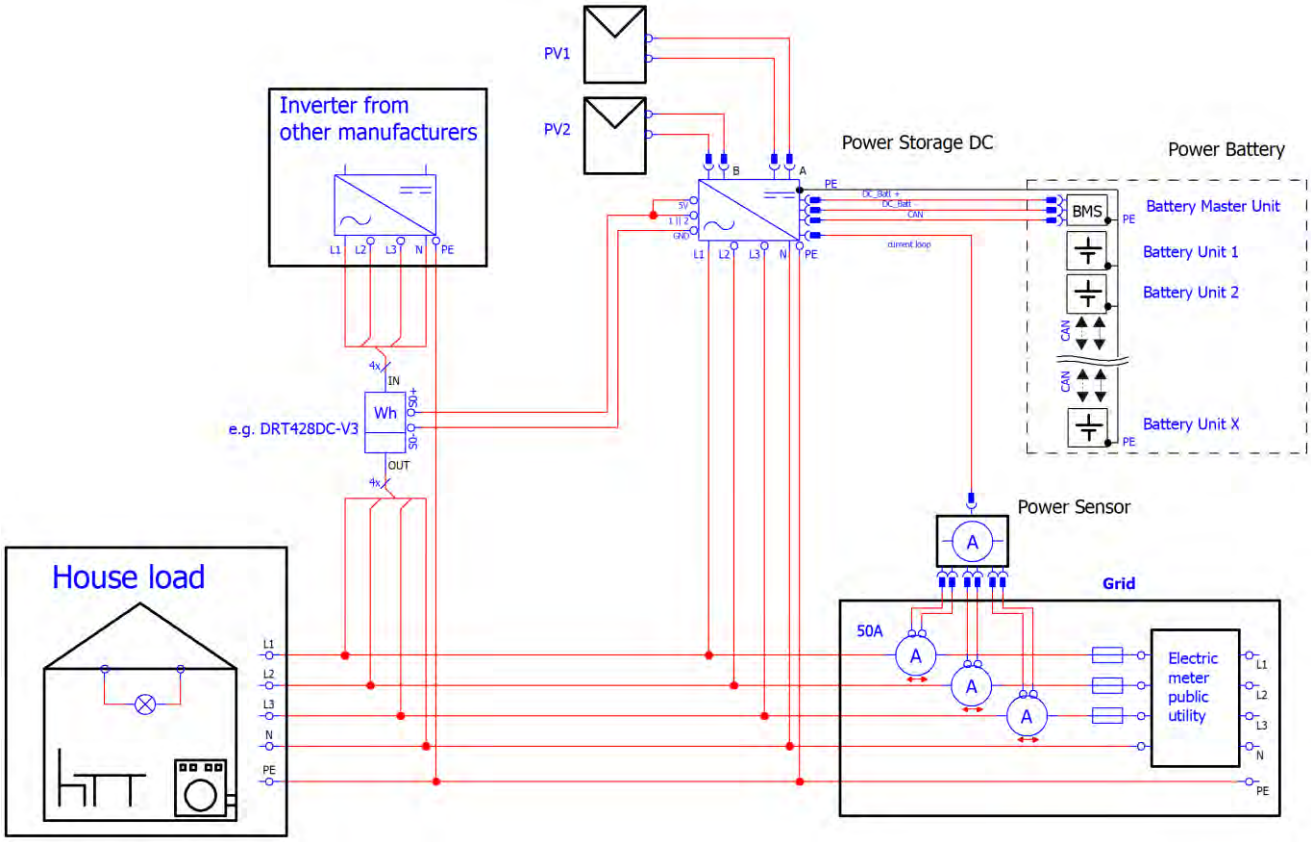

The total cable length must not exceed 20 m.

**Commissioning / Wiring:**

Use a twisted pair cable to link the third-parter inverter.






**Configuration using the APP: Power Storage DC**

Launch the "RCT Power APP" and connect to the Power Storage DC.

DEVICE → Settings → Interfaces → Digital I/O's → Digital I/O 1 usage → Input S0 external power
Select "2000" for "Number of impulses per kWh for SO signal on I/O 1"

Press "Done" on keypad to enter the value. Now press the "FLASH" button to confirm the changes to your settings!

You can also alternatively use Digital I/O 2 for this setting.

**Adjusting Solar plant peak power:**

If a Power Storage DC is the main device of a solar system but the system also includes third-party inverters it is required to adjust the peak power in all devices to the system solar plant peak power.

The solar plant peak power is the sum of the peak powers of the individual inverters in the system, all of which are measured by the power sensor.

The solar plant peak power can be adjusted under:
DEVICE → Settings → Device settings --> Solar plant peak power
Confirm the updated value by pressing "Done" on the keypad and then confirm the settings by pressing "FLASH".

The value for "External power reduction based on solar plant peak power" must be activated and set for the third-party inverter.

### 8.5.3 Connecting multiple RCT Power inverters in a LAN / WLAN network

If there are more than two Power Storage or Power Inverter devices to be linked in one system, connection over the S0 interface is no longer possible..
The devices must be connected over the LAN/WLAN interface using a network switch or a home network router.

The connected devices exchange information over this interface (e.g. house load, grid power, system peak power, power reduction factor, max. permitted feed-in power and SOC target).

Please note: The devices can only be connected to a network if they are integrated into a home network router or a network switch.

For integration into the home network router, please follow the corresponding procedure in the manual.

The integration with a fixed IP address is to be preferred. Configuring the home network router to assigning IP addresses automatically with Dynamic Host Configuration Protocol (DHCP) can lead to a loss of connection and data.

If the devices connect over a network switch, integration with a fixed IP address is mandatory.

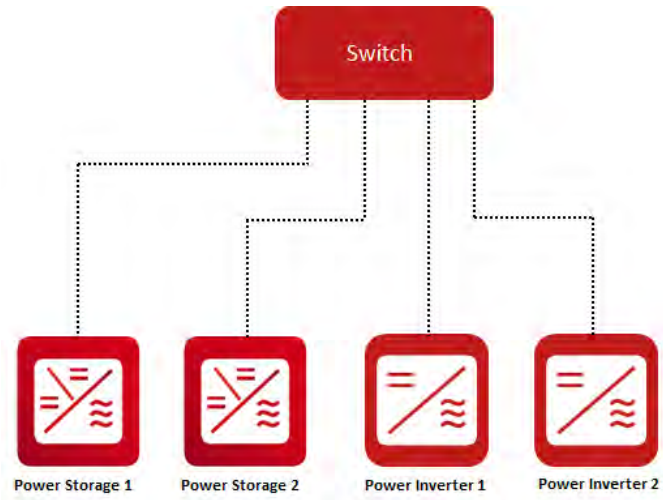



Fig. 1: Device networking via switch [4 clients]

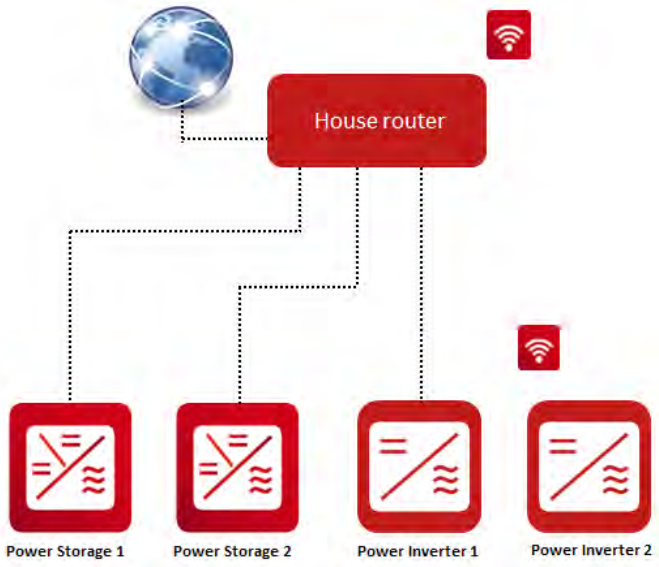



Fig 2: Device networking via router [4 clients]

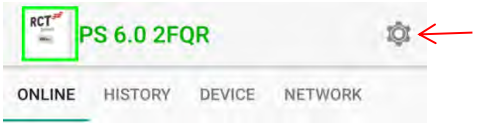
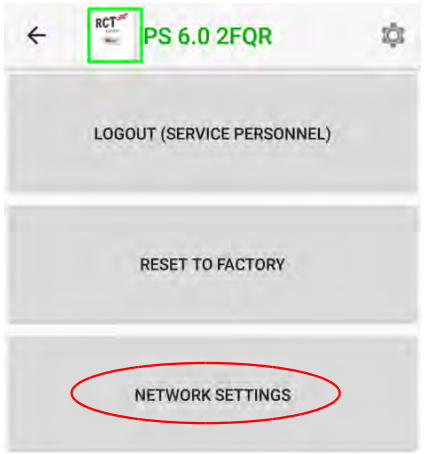
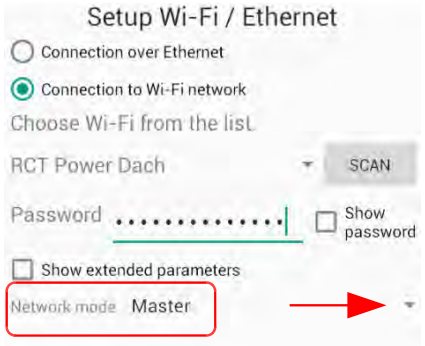
Use the RCT Power APP to integrate multiple devices of RCT Power Storage and RCT Power Inverters into your home network. Integration must be performed for the Master device and all slave devices separately.

The following integration instructions are based on using a fixed IP address and a Wi-Fi connection.

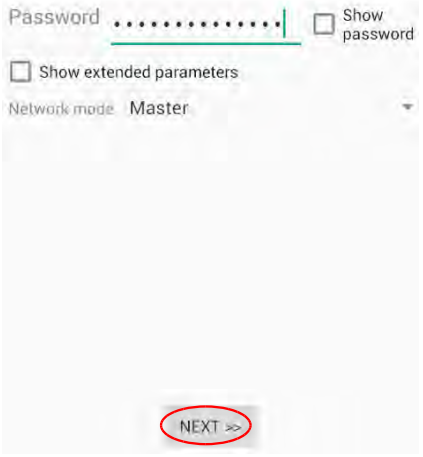
Please note: Software version 4464 or later must be installed for the RCT Power Inverter /RCT Power Storage to ensure that the integration of multiple inverters into the home network is successful.

#### 8.5.3.1 Integration Master device

Please use a Power Storage AC or DC as your master device.

| Step | Description | |
|---|---|---|
| 1 | Launch the "RCT Power APP" and connect to the Power Storage. | |
| 2 | Press the settings icon “ ”. |  |
| 3 | Tap on "LOGIN" Enter the password in the dialogue box and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. | |
| 4 | Press "NETWORK SETTINGS" and wait while the network settings load. | <br> |
| 5 | Expand the selection list for "Network mode" and select "Master". |  |

6 Press "NEXT >>" to continue.




7 Slide button for "Obtain an IP address automatically" to "OFF"position and tap "FINISH".



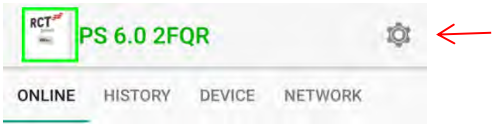
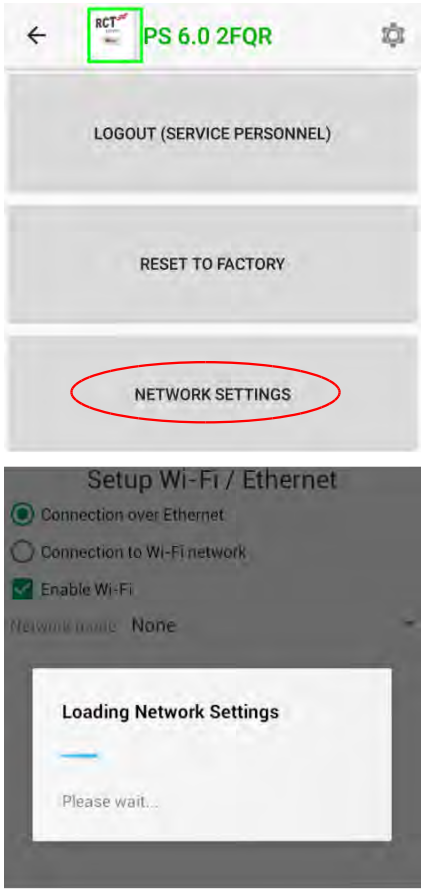

An IP address of 0.0.0.0 usually indicates that a device is not connected to a TCP/IP network. Connect your device to your home network to obtain a valid IP address (see section 7.1.8 and 7.1.9). If you are connecting your device to the home network using a network switch obtain the IP address from the switch.

Take a note of the IP address of the master device. You will need it when you integrate the Slave devices.

Wait until the message "Store changes ...done " appears and press "FINISH" again.



### 8.5.3.2 Integration Slave device

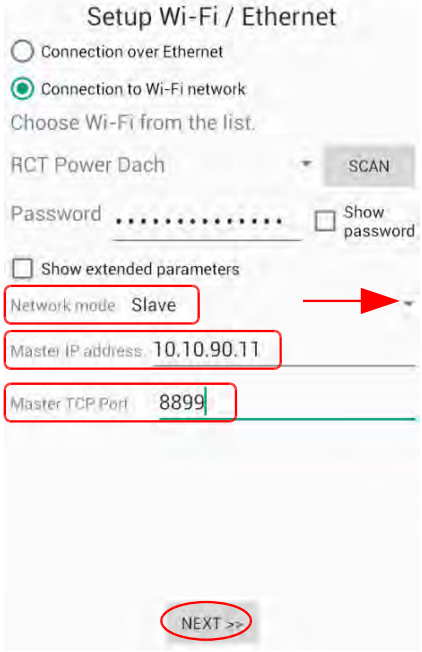
| Step | Description | |
|---|---|---|
| 1 | Launch the "RCT Power APP" and connect to the Power Storage that you want to integrate into the system. | |
| 2 | Press the settings icon “ ”. |  |
| 3 | Tap on "LOGIN" Enter the password in the dialogue box and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. | |
| 4 | Press "NETWORK SETTINGS" and wait while the network settings load. |  |

5 Expand the selection list for "Network mode" and select "Slave".

Add the IP address of the Master device in the field "Master IP address".

The default value for the "Master TCP port" is 8899. It should only be changed if a networking device requires a different setting.

Press "NEXT >>" to continue.




6 Slide button for "Obtain an IP address automatically" to "OFF"position and tap "FINISH".

An IP address of 0.0.0.0 usually indicates that a device is not connected to a TCP/IP network. Connect your device to your home network to obtain a valid IP address (see section 7.1.8 and 7.1.9). If you are connecting your device to the home network using a network switch obtain the IP address from the switch.




Wait until the message "Store changes ...done " appears and press "Finish" again.



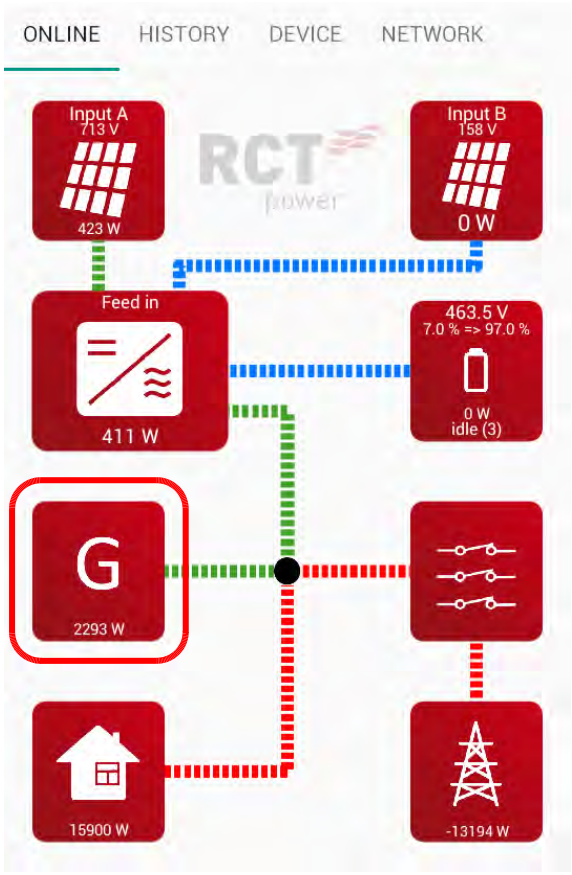

Please use this procedure to integrate all slaves in the system!

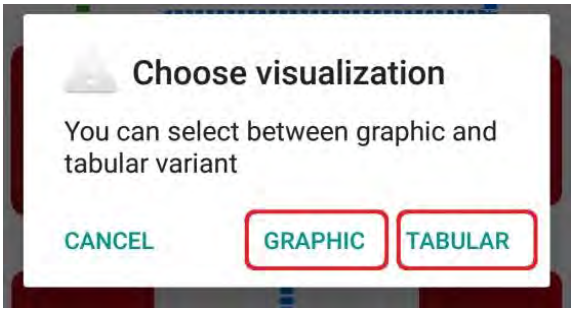
#### 8.5.3.3 System Visualisation

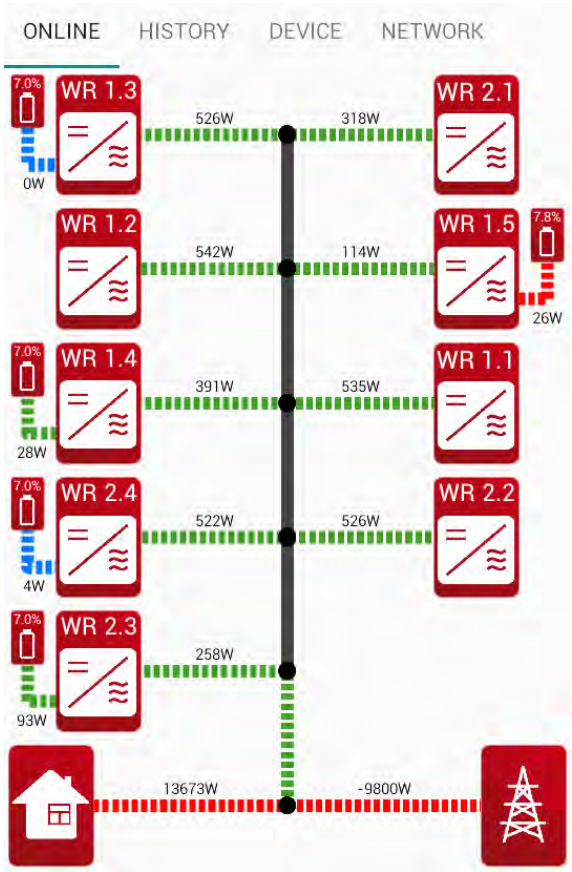
The Master device distributes the parameters house load, network power, system peak power, power reduction factor, max. permitted feed-in power and SOC target in the network.

The required parameters for the system peak power and power reduction factor can only be set in the Master device. The values specified in the Slave devices will be overwritten by the Master device settings.

When the Master device is accessed by the RCT Power APP via the "ONLINE" menu a system visualisation is presented. The Slave devices in the system are grouped under the "G" icon. Tap on the icon to get more detailed information. "GRAPHIC" and "TABULAR" visualisations are available.






Example: System view “GRAPHIC“




Example: System view “TABULAR“

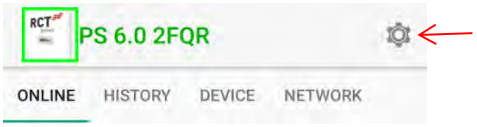
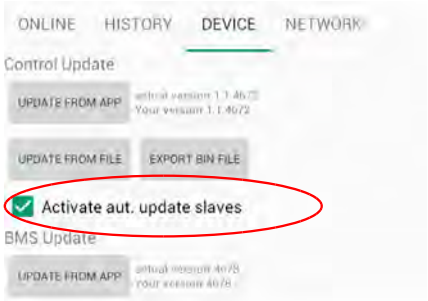
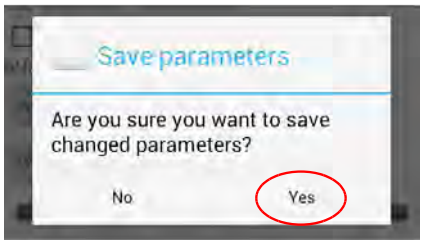
The inverter display indicates if the inverter is used as a Master or a Slave device by adding an additional letter after the IP address. ("S" for Slave and "M" for Master )

#### 8.5.3.4 Firmware update over network connection

The network connection of Master and Slave devices allows for an update of the Control Software for the Master device followed by a subsequent software update of the Slaves devices. This function deactivated by default and requires activation in the RCT Power APP.

Unfortunately, an update of the BMS software over a network is not possible at the moment.

Please note that when you update the software over the network, the master unit must always be updated first. Otherwise, the system may be affected by unforeseeable issues.

| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish a connection to your Master device. | |
| 2 | Press the settings icon “ ⚙ “. |  |
| 3 | Tap on "LOGIN" Enter the password in the dialogue box and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. | |
| 4 | Go to "DEVICE"-→ "Settings"-→ "Update".<br>Under "Control Update" set tick mark for<br>"Activate aut. update slaves". |  |
| 5 | Please confirm the changed parameter with "Yes" in the dialogue box. An update of the Master device Control Software will automatically update the Control Software of all connected Slave device. |  |

If the master device has a more current software version than one of the slaves before the activation of the automatic update parameter, the update process starts immediately. Changed settings cannot be stored. Only one slave at a time can be updated.

## 8.6 Increase battery capacity with additional battery modules (series connection)

During operation of your storage system, it might become apparent that additional consumers might require you to extend the battery capacity. You can add one or more battery modules using the following procedure.



Please perform a software update for both the Power Storage and the Power Battery before each extension of the battery stacks.

**Please ensure that before you expand the battery the "SOC target selection" is set to "Internal".**

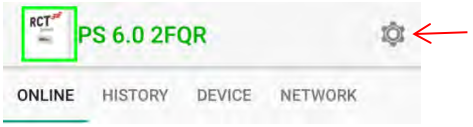
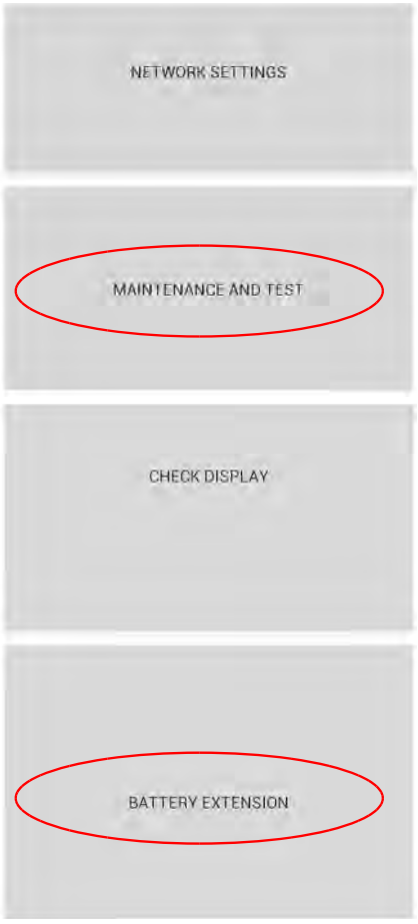
Please note that a maximum of 6 battery modules in total can be added to the RCT Power Storage.

**Extend your system in 3 steps:**

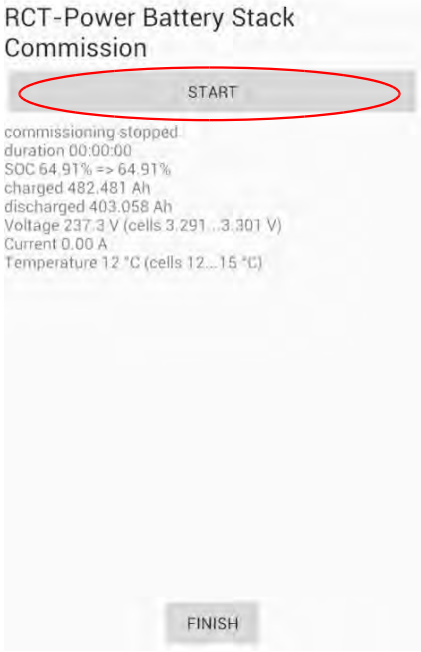

8.6.1 Preparing the existing battery system
8.6.2 Adding additional battery modules
8.6.3 Calibrating the new system

### 8.6.1 Preparing the existing battery system

As a first step, the battery modules are required to be charged to a SOC of 100%. They are then discharged to a SOC of 50%. This ensures that they have a defined SOC value matching the standard delivery SOC of the expansion module(s). The time required for this process step is approx. 2-3 hours, depending on the initial state of charge.
The first step can be started by the end consumer thus avoiding idle time for the installer on site.

| Step | Description | |
|---|---|---|
| 1 | Launch the“RCT Power APP“ and establish connection to the inverter. | |
| 2 | Press the settings icon“ ⚙ “. |  |
| 3 | Tap on "LOGIN" Enter the password in the dialogue box and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“) | |
| 4 | Select "MAINTENANCE AND TEST" and then "BATTERY EXTENSION". |  |

5 The menu item "RCT-Power Battery Stack Commission" will be displayed. Press "START" to start the calibration.




The existing battery stack will now fully charge (SOC of 100%) and then automatically discharge to a SOC of 50%.



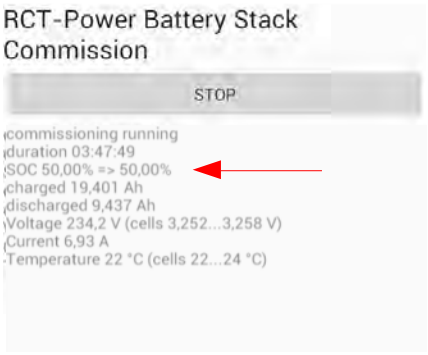

6 After the discharge process has completed the system is held in the state " SOC 50% => 50% ".

The following process steps should be carried out by a qualified technician if possible.

ATTENTION, PLEASE:

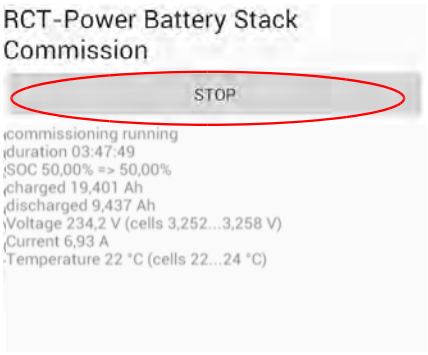
The system automatically switches back into compensation mode after 36 hours.

Ensure that you have either completed the battery extension or have switched off the system.



7 Press "STOP" to return the system to normal compensation mode after the calibration has completed.

Then press "FINISH" to complete the process.




After the system has returned to compensation mode, immediately switch off the battery and inverter.

(DC switch for Power Storage DC/mains fuse for Power Storage AC)



### 8.6.2 Adding additional battery modules

Now additional battery modules can be added to the existing battery stack. (The total maximum number of modules in the stack = 6.)

Connect the new modules to the existing modules as described in the instructions. Ensure battery cable and CAN connectors are correctly wired.

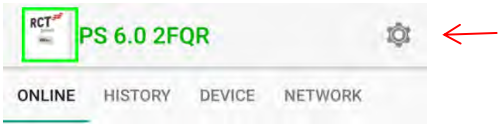
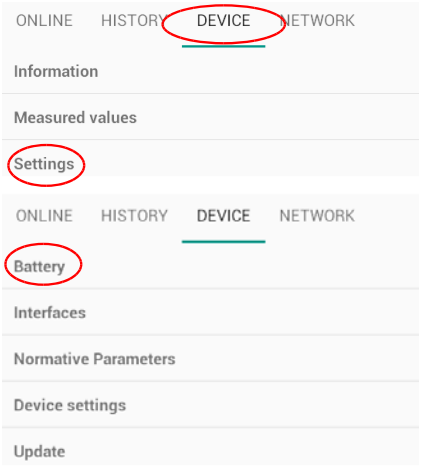
Depending on the mounting location of the inverter it might become necessary to move the inverter's wall mounting brackets upwards.
After the wiring is completed and the new modules are integrated into the existing battery stack, the inverter and the BMS can be switched on again.

The BMS will now automatically update the new modules to the latest software version. This is indicated by the LED lights of the BMS-master device which are flashing alternately between red and green.

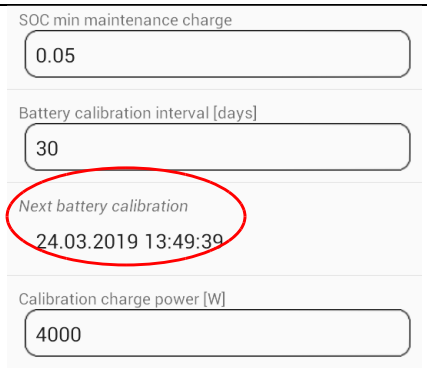
After the software update has been completed, the initialisation process starts (LED colour ="orange"). Once this process is completed, the LED colour changes to "green" and the battery is being connected to the inverter.

### 8.6.3 Calibrating the new system

Continue to complete the extension:

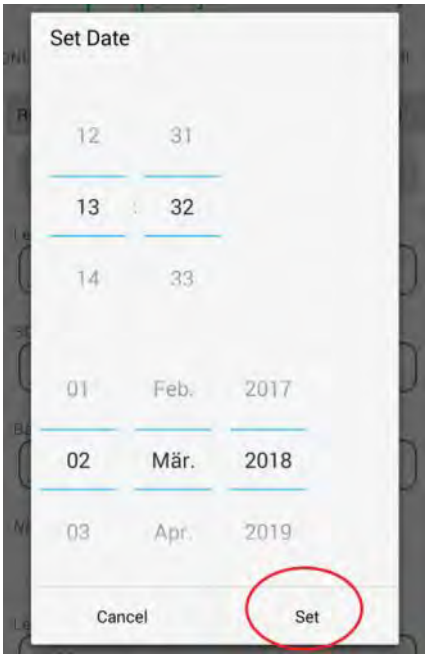
| Step | Description | |
|---|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the inverter. | |
| 2 | Press the settings icon“ ⚙ “. |  |
| 3 | Tap on "LOGIN" Enter the password in the dialogue box and press “OK“ to enter the configuration options screen.<br>(Login Customer Area, password: “********“)<br>Please use the installer password to login as an installer. | |
| 4 | Follow this menu path<br>"DEVICE"-→ "Settings"-→ "Battery" |  |
| 5 | In the Battery menu, scroll down to | |

"Next battery calibration" and tap the date line.



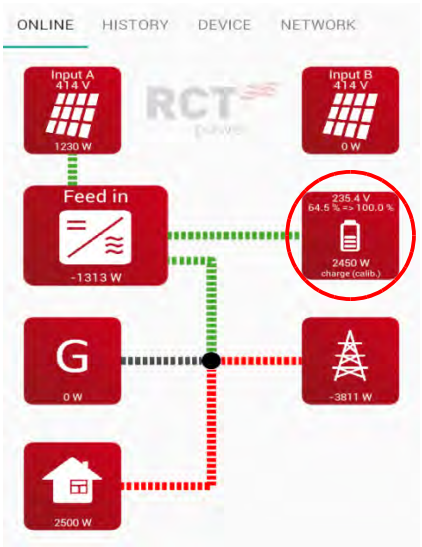

Select a time or date that is in the past and press

"Set" to trigger the calibration.




6 The system will now begin calibration. You can check progress in the RCT Power APP.

In the Menu "ONLINE" check the Battery Icon for the notification message "charge (calib.)" and the SOC target value 100%.




The battery capacity extension is now complete and after a successful calibration run, the system will switch to compensation mode.

## 8.7 Connecting a ModBus meter to the Power Storage DC (with or without radio transmitter module)

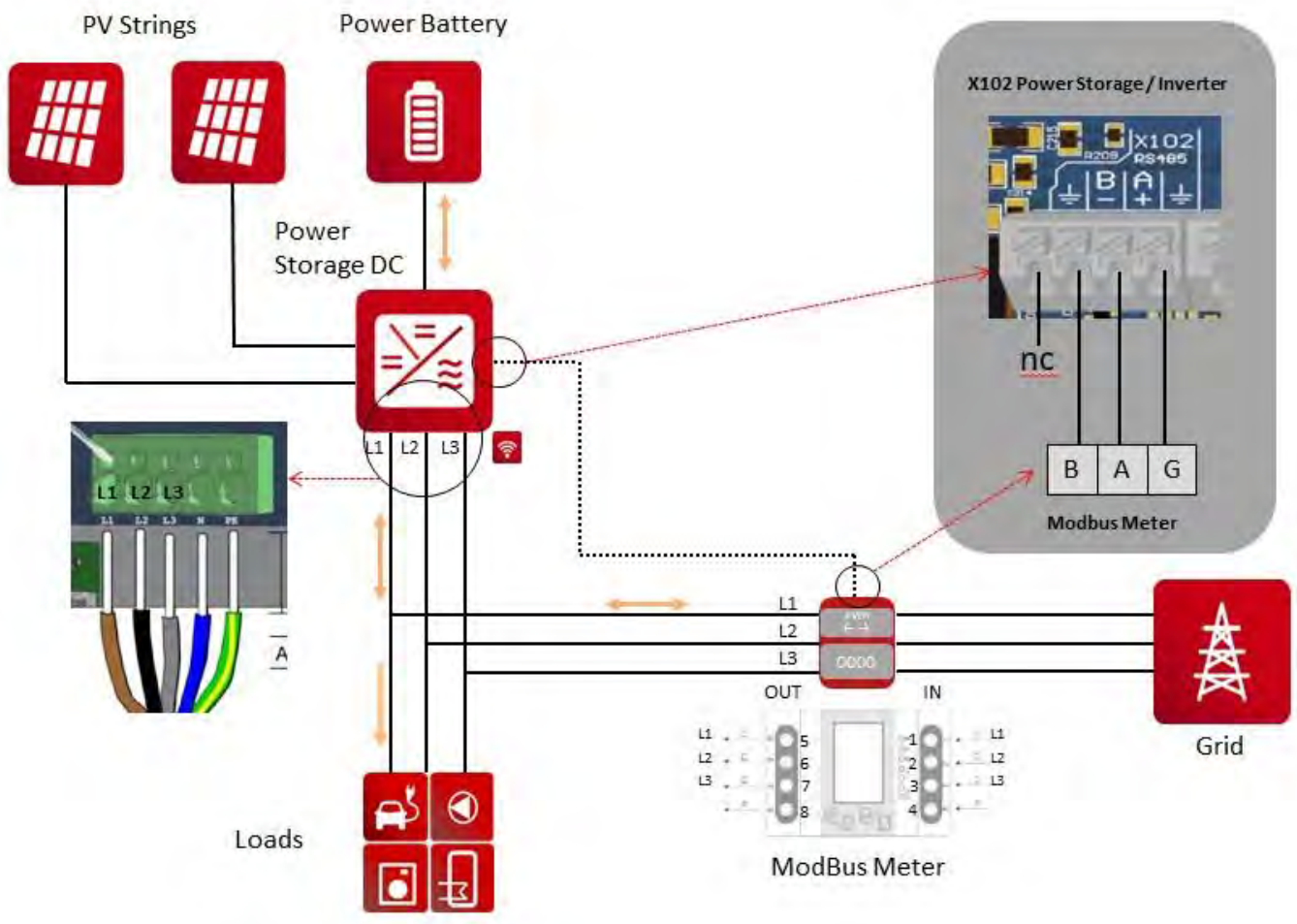
The use of a bidirectional meter with Modbus connection, instead of the Power Sensor, can be beneficial under certain conditions, e.g. bridging of long distances to the house connection point.

Connections over distances of up to 500m are possible. If it is not possible or unpractical to lay cables over this distance a radio transmitter (868 MHz frequency band) can be used instead.

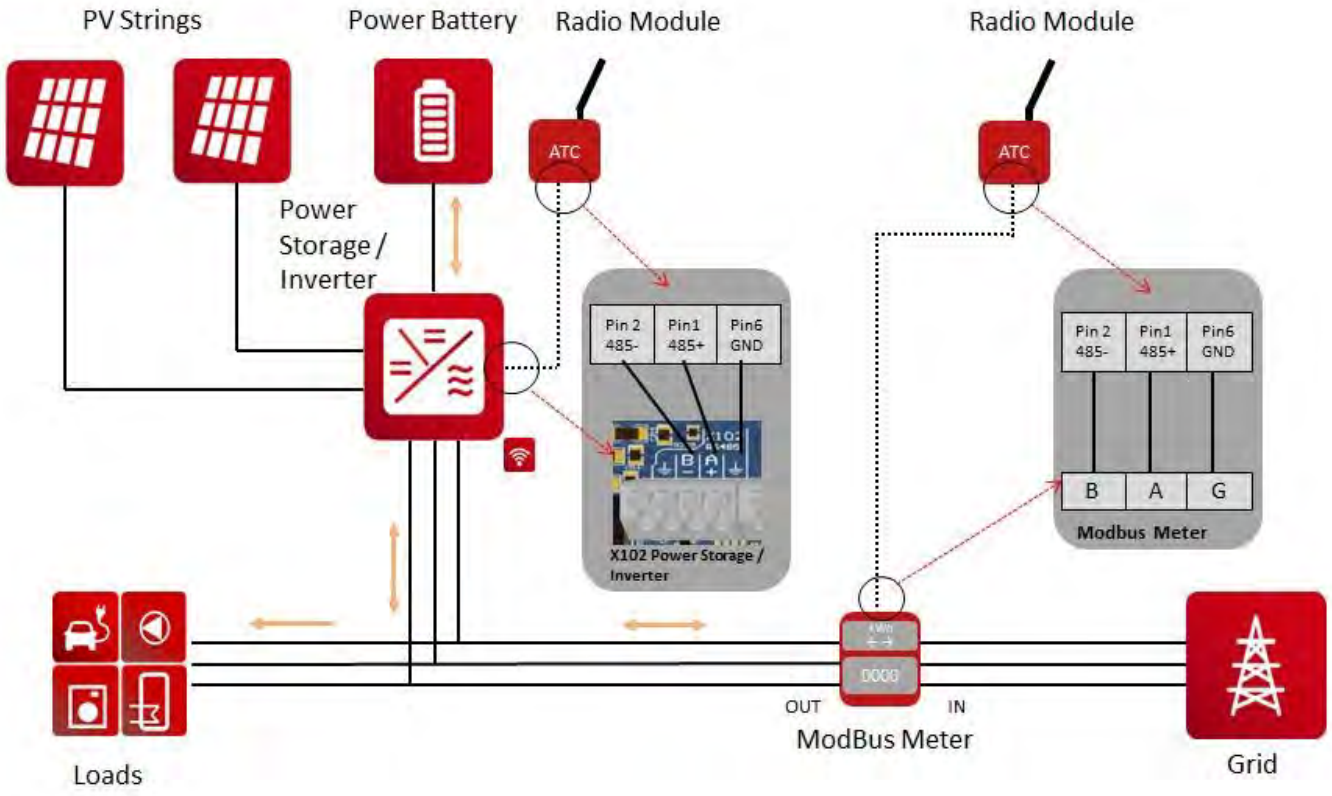
The Power Storage DC is equipped for the connection of the following meter type:

- **SDM630-Modbus-V2** **(Art.Nr. RCTPOWER: 390-0003)**
- **Radio Transmitter ATC-871-S2 (double-Set)** **(Art.Nr. RCTPOWER: 390-0001)**

**Modbus connected meter without radio transmitter module:**



**Modbus connected meter with radio transmitter module:**




Please note: Radio transmission connection requires an auxiliary power supply (plug-in power supply unit included in the scope of supply).

**APP configuration with or without radio module:**

**Please note that the inverter requires at least SW version 4464 to ensure correct functioning.**

Launch the “RCT Power APP“.

Press the Settings icon “ ” Login with installer password → "DEVICE"-→ "Settings" → "Interfaces"-→ "RS485"

Select the option "Modbus Master" under "RS485 working mode" and enter the value "1" under "RS485 address". To confirm and store the settings, press "FLASH".

## 8.8 Software updates for inverter and battery

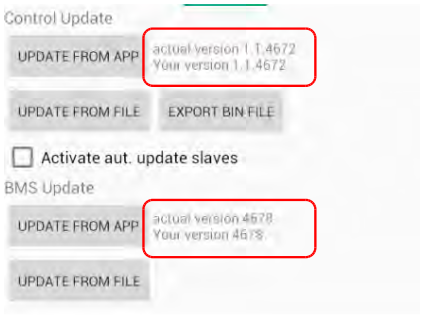
We are continuously working on the improvement and development of our products. Product software is updated and published at irregular intervals. Please use the following procedure to update your device to the latest software version:

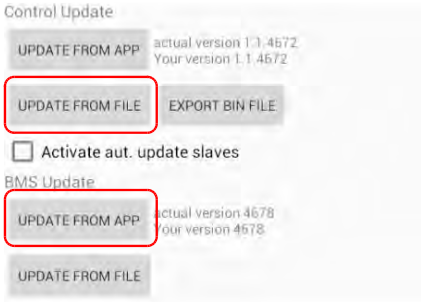
Ensure that the "RCT Power App" is up to date. In "Google Play Store" go to "My apps & games" and check under the tab "Updates" if updates for "RCT Power APP" are available.

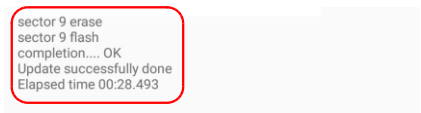
Do not close the RCT Power APP during a software update! In case the update fails, try again. Please note that any update of the inverter software represents a certain risk.

To update the inverter and / or the battery, proceed as follows:

| Step | Description |
|---|---|
| 1 | Launch “RCT Power APP“ and establish connection to the device. |
| 2 | Follow Menu path "DEVICE”-→ "Settings”-→ "Update”. |
| 3 | Update the Inverter software under the header "Control Update" and the battery software under the header "BMS Update".<br>Latest software version available:<br>→ actual version XXXX<br>The software version currently installed on the device:<br>→ your version XXXX<br>If the two version numbers match, the system is up to date.<br>Slaves connected via LAN can automatically receive the latest software version updated for the master. To enable this go to "Control Update" and set tick mark for "Activate aut. update slaves". ( see section 8.5.3.2 for additional information on slave updates) |
| 4 | Before you start with the software update ensure that you have a sufficient DC power of >100W. |
| 5 | To initiate an update press "UPDATE FROM APP".<br>After you have confirmed the safety questions in the dialogue boxes the update will start.<br>Update progress is displayed with a yellow bar.<br>Check that the update has been completed successfully.<br>If the update fails, restart the update, even if the connection to the device is not displayed at the first. Please contact RCT Power if you are still unable to complete the software update.<br>The system software is up to date when the message "Update successfully done" is displayed. |




# 9 Error Messages and Troubleshooting

The inverter displays errors messages on the LCD display and stores them in the internal error memory.

To view the error log launch RCT Power App and go to the “HISTORY” menu. Then press the symbol.

The errors are displayed by type and time of occurrence. Tap the error to show duration and error description.

| Error message | Description | Cause and possible corrective action |
|---|---|---|
| TRAP | General error, causing switch-off of inverter. Occurs always with additional single fault. | Please refer to instructions on additional single fault |
| HW_STOP_UZK | Overvoltage occurred in DC-link. Inverter stops feeding. | DC-link-voltage is out of permissible range. Switch of inverter (DC and AC) for about 15 min. and check PV-voltage. If error still occurs, contact technical hotline |
| U_ZK_UNDERVOLTAGE | Undervoltage occurred in DC-link. Inverter stops feeding. | DC-link-voltage is out of permissible range.<br>Check PV-voltage and ask grid provider about grid stability.<br>If error still occurs, contact technical hotline |
| U_SG_A<br>U_SG_B | Your power storage is approved for a max. open-circuit solar generator voltage of 1000 V.<br>All components are sufficiently dimensioned with a safety factor.<br>If the threshold is exceeded, the Power Storage stops feeding. | Max. allowed DC-voltage was exceeded:<br>Check dimensioning of PV-generator.<br>Reduce the number of modules in series and carry out commissioning again. |
| U_ACC | The battery voltage is outside of the expected range. | Check the parameters and the connection to battery.<br>If error still occurs after reboot, contact technical hotline. |
| THROTTLE_L1_OVERCURRENT<br>THROTTLE_L2_OVERCURRENT<br>THROTTLE_L3_OVERCURRENT | Overcurrent in throttle of phase L1 / L2 /L3 occurred. | Error could be caused by grid interruption or problems with cabling of PV-generator.Please restart inverter.<br>If problem occurs permanent or very often, please contact service. |
| BAT_OVERCURRENT | Your power storage continually monitors charge/discharge current.<br>When the maximum permissible limit exceeded, Power Storage stops charge/discharge. | If the error occurs multiple times, check configuration of battery in APP.<br>If error still occurs after reboot, contact technical hotline. |
| BAT_EMPTY | Your power storage continually monitors battery voltage level.<br>When the minimum permissible limit of battery voltage is dropped below, storage inverter stops discharging. | Battery will be charged, if there is enough power from PV-generator.<br>Check battery connection, if error still occurs, contact technical hotline. |
| BAT_OVERVOLTAGE | Your power storage continually monitors battery voltage level.<br>When the maximum permissible battery voltage limit is exceeded, Power Storage stops charging. | If error occurs for a long period of time, contact technical hotline. |
| UL_UNDER_L1_LV1<br>UL_UNDER_L2_LV1<br>UL_UNDER_L3_LV1 | Your power storage continually monitors voltage level of grid.<br>When the minimum permissible limit of level1 is dropped below, Power Storage stops feeding. | Check grid voltage level and / or ask grid provider about grid stability. |
| UL_UNDER_L1_LV2<br>UL_UNDER_L2_LV2<br>UL_UNDER_L3_LV2 | Your power storage continually monitors voltage level of grid.<br>When the minimum permissible limit of level2 is dropped below, Power Storage stops feeding. | Check grid voltage level and / or ask grid provider about grid stability. |
| UL_OVER_L1_LV1 | Your power storage continually monitors voltage level of grid. | Check grid voltage level and / or ask grid provider about grid stability. |

| | | |
|---|---|---|
| UL_OVER_L2_LV1<br>UL_OVER_L3_LV1 | When the maximum permissible limit of level1 is exceeded, Power Storage stops feeding. | |
| UL_OVER_L1_LV2<br>UL_OVER_L2_LV2<br>UL_OVER_L3_LV2 | Your power storage continually monitors voltage level of grid.<br>When the minimum permissible limit of level2 is exceeded, Power Storage stops feeding | Check grid voltage level and / or ask grid provider about grid stability. |
| GRID_UNDERVOLTAGE_UL1<br>GRID_UNDERVOLTAGE_UL2<br>GRID_UNDERVOLTAGE_UL3 | Your power storage continually monitors voltage level of grid.<br>In case of spikes on the feeding phase the power storage stop feeding and restarts. | Check grid voltage level and phase wiring between L1, L2, L3 and N.<br>Ask grid provider about grid stability. |
| LT_OVERVOLTAGE_L1<br>LT_OVERVOLTAGE_L2<br>LT_OVERVOLTAGE_L3 | Your power storage continually monitors voltage level of grid.<br>When the maximum permissible limit is exceeded for more than 10 minutes, Power Storage stops feeding. | The cable cross section in the AC-supply line could be too small.<br>Your inverter feeds into a spur line, which is insufficiently dimensioned.<br>Check grid voltage level and / or ask grid provider about grid stability. |
| FL_OVER_LV1<br>FL_UNDER_LV1 | Your power storage continually monitors the grid frequency.<br>If this is outside of the permitted level 1, inverter stops feeding. | Ask grid provider about grid stability. |
| FL_OVER_LV2<br>FL_UNDER_LV2 | Your power storage continually monitors the grid frequency.<br>If this is outside of the permitted level 2, inverter stops feeding. | Ask grid provider about grid stability. |
| SW_ON_UMIN_L1<br>SW_ON_UMIN_L2<br>SW_ON_UMIN_L3 | Your power storage continually monitors voltage level of grid before starting to feed in.<br>When the minimum permissible limit is dropped below, Power Storage doesn't start feeding. | Check grid voltage level and / or ask grid provider about grid stability. |
| SW_ON_UMAX_L1<br>SW_ON_UMAX_L2<br>SW_ON_UMAX_L3 | Your power storage continually monitors voltage level of grid before starting to feed in.<br>When the maximum permissible limit is exceeded, Power Storage don't start feeding. | Check grid voltage level and / or ask grid provider about grid stability. |
| SW_ON_FMIN<br>SW_ON_FMAX | Your power storage continually monitors the grid frequency.<br>If this is outside of the permitted level, inverter doesn't start feeding. | Ask grid provider about grid stability. |
| PHASE_POS | Your power storage is equipped with a redundant grid monitoring according to VDE-AR-N 4105:2011-08 and constantly monitors the grid.<br>If phase position between the individual conductors changes, Power Storage stops feeding. | Check phase wiring.<br>Ask grid provider about grid stability. |
| ISO | Before connection to grid, your power storage checks the PV-system for a possible earth fault or insulation fault.<br>If an insulation error is detected, Power Storage don't start feeding. | Check the PV-system for possible insulation faults (e.g. pinched-off DC lines etc.).<br>The measured insulation resistance must be at least 400 kOhms. |
| AFI_30mA<br>AFI_60mA<br>AFI_150mA | Your power storage is equipped with a universally sensitive AFI according to VDE-AR-N 4105:2011-08.<br>This monitoring device has detected a fault | Check your PV-system for possible insulation faults. |

| | | |
|---|---|---|
| AFI_300mA | current.<br>Inverter stops feeding. | |
| IDC<br>IDC_SLOW | Your power storage continually monitors the quality of current fed in.<br>If an increased DC-component in AC-current is detected, inverter stops feeding. | Restart the Power Storage.<br>If the error still occurs, please contact service. |
| CAN_TIMEOUT | CAN communication timeout with battery. | Restart the power storage and reestablish the CAN connection. |
| RELAYS TEST | Before connection to grid, your power storage checks the operation of mains relays. An error was detected during this check. | Restart the Power Storage<br>If the error still occurs, please contact service. |
| EXT_OFF | Your power storage has the possibility to be switched off by a configurable “emergency stop”. This signal is active and inverter stops feeding. | Check “emergency stop” switch to be unlocked.<br>Check configuration of “emergency stop” function in APP. |
| RS485_POWER_SW | Error by RS485 communication with the Power Switch. | Check the RS485 connector fitting.<br>Check the RS485 connector wire ring .<br>If the error still occurs, please contact service. |
| TEMP_SINK1 | Your power storage is designed to feed full power up to an ambient temperature of +40°C.<br>If heatsink temperatures exceed a specific threshold inverter reduces power. | Check ambient temperature of installation, clean the heatsink of inverter.<br>Observe the installation distances specified in manual.<br>Remove possible objects laying on the convection paths of heatsink. |
| TEMP_HIGH | Your power storage is designed to feed full power up to an ambient temperature of +40°C.<br>If heatsink temperature exceeds a specific threshold inverter stops feeding.<br>After the heatsink temperature drops, inverter restarts feeding. | Check ambient temperature of installation.<br>Clean the heatsink of inverter.<br>Observe the installation distances specified in manual.<br>Remove possible objects laying on the convection paths of heatsink. |
| TEMP_BAT | Your power storage is designed to feed full power up to an ambient temperature of +40°C.<br>The charge/discharge current will be reduced.<br>If heatsink temperature exceeds the battery will be disconnected. | Check ambient temperature of installation.<br>Clean the heatsink of inverter.<br>Observe the installation distances specified in manual.<br>Remove possible objects laying on the convection paths of heatsink. |

# 10 Maintenance

This section describes the inverter's routine maintenance work and the suggested time intervals.

| Maintenance Tasks | Method | Maintenance Interval |
|---|---|---|
| System cleaning | Check that the heat sink is free of dust. | Half-yearly or annually depending on environmental conditions |
| System operating status | Check if the inverter is damaged or deformed.<br>Check if the operating noise of the inverter is normal. | Half-yearly |
| Electrical connections | Check that all cables are tight.<br>Check that all cables are intact.<br>Ensure that waterproof caps cover all unused connections.<br>Turn the DC load break switch off and on. | Annually |
| Grounding connection safety | Check that the grounding cables have good contact with their connection points. | Annually |

Important: Before Maintenance and Cleaning tasks are carried out, please ensure that the DC load break switch, the battery unit's on/off switch and the circuit breaker between the inverter and the mains are all switched off.

# 11 Exclusion of Liability

Although the information contained in this manual has been carefully checked for accuracy and completeness, no liability can be assumed for errors or omissions.

RCT Power GmbH reserves the right to change the hardware and software features described in this manual at any time without prior notice.

Warranty or liability claims of any kind are excluded due to one or more of the following reasons:

- Incorrect use or installation of the product.
- Installation or operation of the product in an unsuitable environment.
- The relevant safety regulations during installation and commissioning at the operation site are ignored.
- The product relevant safety notices and instructions contained in the product documentation are ignored.
- By installing or operating the product under insufficient safety and security conditions.
- By modifying the product or by unauthorised software installation.
- A defect in the product caused by the operation of the product or adjacent equipment outside the permitted limits.
- Damage caused by force majeure.

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RCT Power GmbH does not accept any liability for damage caused by incorrect or lost data, due to incorrect operation or malfunction of the inverter, the software, additional devices or personal computers.

# 12 Technical Data

| Power Storage | 8.0 | 10.0 |
|---|---|---|
| Order Number | 110-0003 | 110-0004 |
| **DC-INPUT** | | |
| Max. recommended DC power (South / East-West)* | 10,8 kW / 12 kW | 13,5 kW / 15 kW |
| MPPT | 2 (paralleling possible) | |
| Input per MPPT | 1 | |
| Maximum DC current per MPPT | 14 A ( 28 A in parallel mode) | |
| Rated DC voltage | 700 V | |
| DC Start up voltage / power | 150 V / 40 W | |
| DC voltage range | 140 V ... 1000 V | |
| MPP voltage range | 380 V ... 800 V | |
| Maximum DC voltage | 1000 V | |
| Connector type | Weidmüller PV-Stick (MC4 compatible)<br>* Depending on orientation, inclination and place of installation. | |
| **BATTERY INPUT** | | |
| DC voltage range | 120 V … 600 V | |
| Maximum charge / discharge current | 25 A / 25 A | |
| Connector type | Weidmüller PV-Stick (MC4 compatible) | |
| **AC-OUTPUT (GRID MODE)** | | |
| Rated AC output power | 8000 W | 9900 W |
| Maximum active power | 8000 W | 9900 W |
| Maximum apparent power | 10500 VA | 10500 VA |
| Nominal AC current per phase | 11,6 A | 14,5 A |
| Maximum AC current per phase | 15,2 A | 15,2 A |
| Rated frequency | 50 Hz / 60 Hz | |
| Frequency range | 45 Hz ... 65 Hz | |
| Max. switch-on current | 15,2 A, 0,1ms | |
| Max. fault current (RMS) | 285 mA | |
| Rated AC voltage | 230 V / 400 V (L1, L2, L3, N, PE) | |
| AC voltage range | 180 V ... 290 V | |
| Total harmonic distortion (THD) | < 2% at rated power | |
| Reactive power factor (cos phi) | 1 (adjustable range 0,8 cap….0,8 ind) | |
| Earth fault protection | RCD | |
| DC current injection | < 0,5% In | |
| Required phases, grid connections | 3 (L1, L2, L3, N, PE) | |
| Number of feed-in phases | 3-phase | |
| Type of AC connection | Spring clamps | |
| **PERFORMANCE DATA** | | |
| Stand-by-consumption with discharged Battery storage [2)] | 6 W | |
| Maximum efficiency( PV2AC ) | 98,60% | 98,60% |
| European efficiency ( PV2AC ) | 98,33% | 98,35% |
| Average efficiency PV2AC [1)] | 97,78% | 97,89% |
| Average efficiency PV2Bat [1)] | 98,00% | 98,00% |
| Average efficiency AC2Bat [1)] | 97,33% | 97,44% |
| Average efficiency Bat2AC [1)] | 97,36% | 97,48% |
| Average Dead time / Settling time [2)] | 0,1s / 0,4s | |
| Topology | Transformerless | |

[1)] Average efficiency in combination with a PowerBattery 11.5 and with UmppNenn

[2)] Measurement readings according to efficiency guide for PowerStorage 6.0 and Powerbattery 11.5

## OTHERS

| | |
|---|---|
| PV – DC switch | Integrated |
| DC- / AC-overvoltage category | II / III |
| Data & communication interfaces | Wi-Fi, LAN, RS485, Multifunctional Relay, 4 x digital in, 2 x digital in/out |
| Display | LCD dot matrix 128 x 64 with backlight |
| Cooling | Convection |
| Ingress Protection Code | IP 42 |
| Max. altitude for operation | 2000 m above Mean Sea Level |
| Max. relative humidity | 5 - 85% (non-condensing) |
| Typical noise emission | < 35 dB |
| Ambient temperature range | -25°C … 50°C (40°C at full load) |
| Type of installation | Wall mounting |
| Dimensions (height x width x depth) | 570 x 585 x 200 mm |
| Weight | 32 kg |

## SAFETY / STANDARDS

| | |
|---|---|
| Safety class | 1 |
| Overload behaviour | Working point adjustment |
| Certificates | CE, VDE-AR-N 4105:2018-11, EN 50549<br>More certificates:<br>www.rct-power.com |
| EMC | EN61000-6-2, EN61000-6-3, EN61000-3-2, EN61000-3-3 |
| Safety | EN/IEC62109-1, EN/IEC62109-2 |

## BLOCK DIAGRAM

