MANUAL

Power Inverter 4.0 / 5.0 / 6.0

EN

Copyright

Responsible content editor: RCT Power GmbH

In this user manual, we refer to products and product names that are registered trademarks. This is done for information purposes only and does not constitute a misuse of trademark regulations and laws.

The passages in the user manual referring to these products do not represent the product's original documentation.

About us:

RCT Power GmbH

Line Eid Str. 1

78467 Konstanz, Germany

Phone: +49 (0)7531 996 77-0

Mail: info[at]rct-power.com

Internet: www.rct-power.com

Document number: 01/2019

Table of Contents

Preface

Thank you for choosing the RCT Power Inverter

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 :

- Electromagnetic Compatibility Directive (EMC) 2014/30/EU
- Low Voltage Directive (LVD) 2014/35/EU
- Radio Equipment Directive (RED) 2014/53/EU

The detailed declaration of conformity can be found under :

www.rct-power.com

1 About this Manual

1.1 Validity, Purpose, Scope of this document and Legal Regulations

This document is applies to the Power Inverter models 4.0, 5.0 and 6.0.

Power Inverter 4.0, Power Inverter 5.0 and Power Inverter 6.0 are referred to as "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 Inverter.

2 Safety Instructions

2.1 Personnel and Qualifications

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 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 and safety regulations.
- They know and use appropriate personal protective equipment.

2.2 Safety Procedures

The Power Inverter 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.
- 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 housing.

During standard operation of the inverter, some parts of the inverter's housing can become hot.

- Use care when touching the housing while the inverter is operating.
- Do not cover the Power Inverter (especially not the top).

NOTICE

- All electrical installations must be carried out in accordance with 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 Inverter 4.0, 5.0 und 6.0 are stationary 3-phase inverters..
The energy received from the connected solar generator is converted into grid-compliant AC current and fed into the grid.

Please note:

The Power Inverter 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.

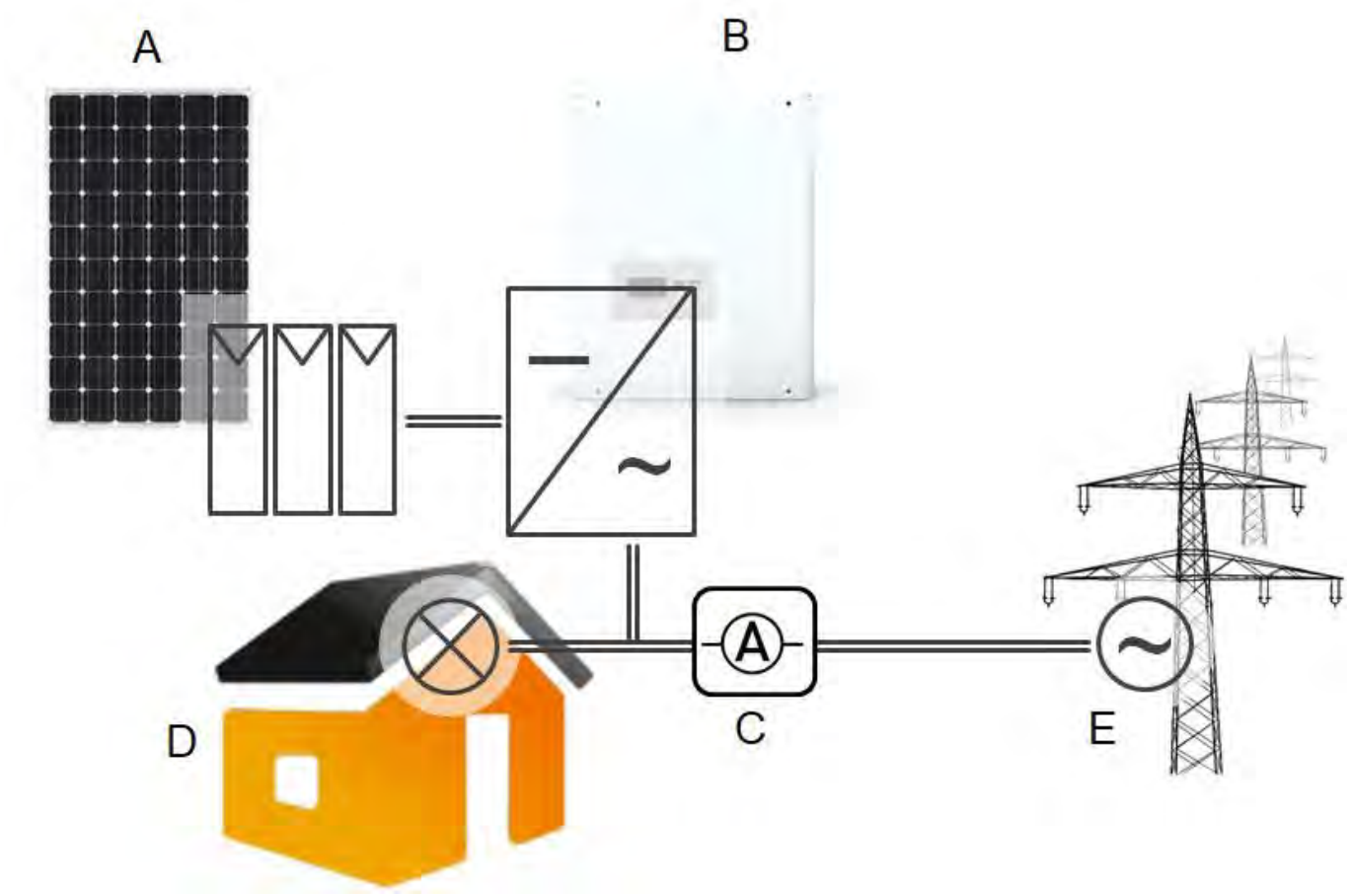


Fig. 3-1 Intended use of the Power Inverter in the PV system.

Pos.	Description	Comment
A	PV Generator	Monocrystalline silicon; polycrystalline silicon and thin film without grounding and protection class II
B	Inverter	Power Inverter 4.0, 5.0, 6.0
C	Meter	Electricity meter to collect AC power measurements
D	Dwelling	Domestic electricity consumers
E	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 Inverter. Your specialist dealer will be happy to assist you if necessary.

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

Check the contents of the shipment for completeness in accordance with Fig. 3-2.

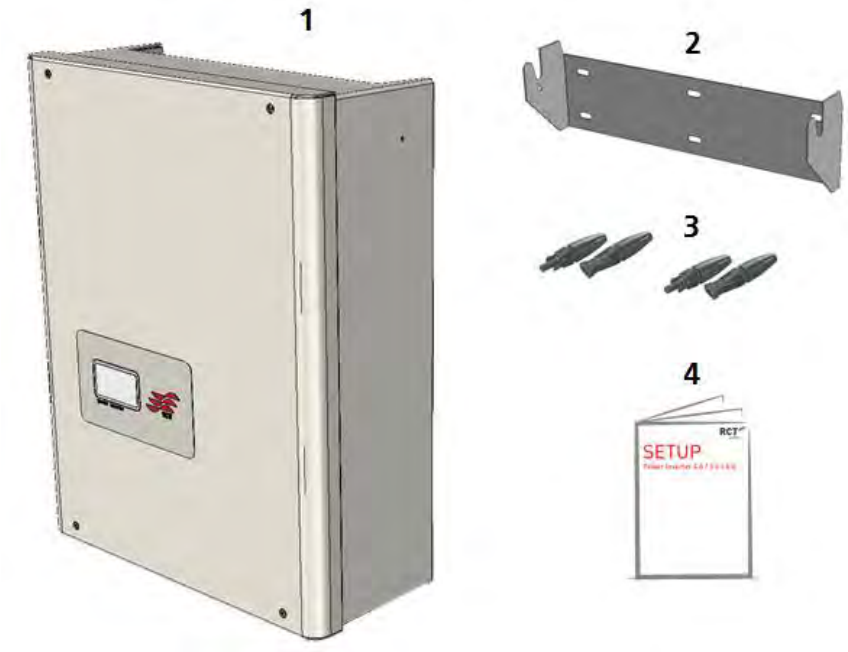


Fig. 3-2 Scope of supply

Pos.	description
1	1x Power Inverter
2	1x Inverter wall mounting bracket
3	2x PV Stick + (Weidmüller) 2x PV Stick – (Weidmüller)
4	1x Setup Manual

3.2.2 Component Description

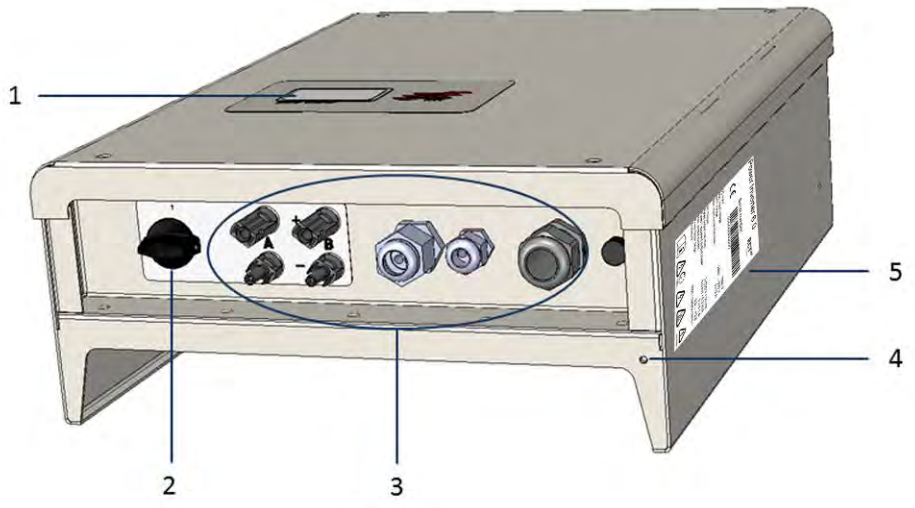


Fig. 3-3 Product specification

Pos.	Component	Description
1	LCD display	Displays important status and operational information of the inverter (see section 7.3)
2	DC load break switch	Normal operation: Switch is in position "1", Turning switch to position "0" shuts down the inverter.
3	Connection area	Connections and cable entries (see sections 5.1 to 5.4)
4	Additional protective conductor connection	Connection for additional protective conductor (see section 5.6)
5	Type Plate	Contains technical data, serial number barcode and warning symbols

3.2.3 Type Plate and Warning Signs

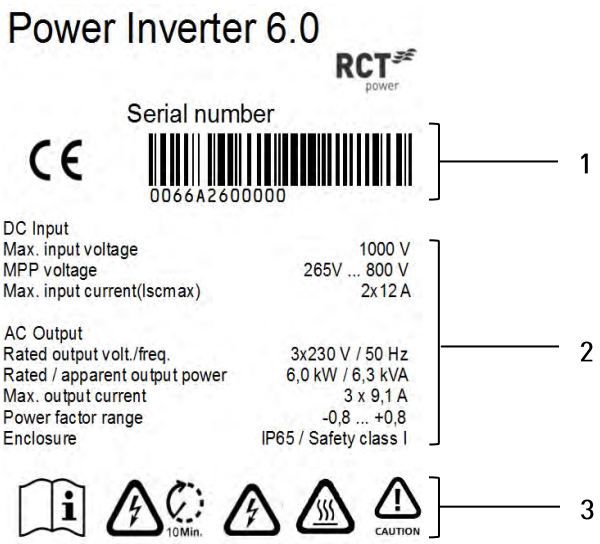


Fig. 3-4 Type plate

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)!

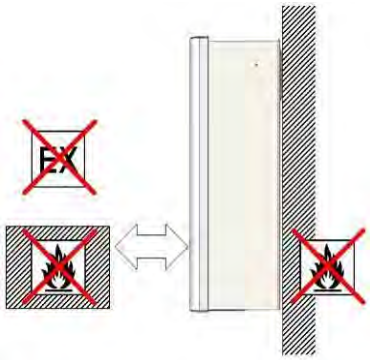
4 Mechanical Installation

4.1 Select mounting location

DANGER

Danger to life or serious injury from fire or explosions!

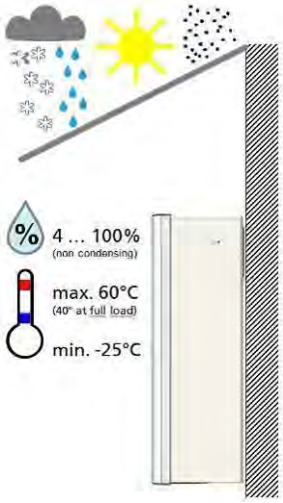
- Do not mount the inverter on a flammable surface.
- No combustible materials must be stored within 3 m of the inverter.
- The inverter must not be installed in areas and rooms subject to explosion hazards.



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.



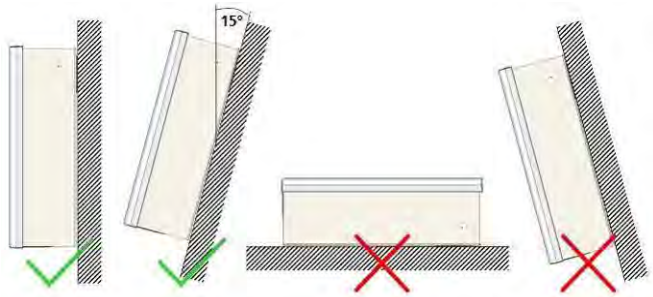
The high degree of protection IP65 allows for both indoor and outdoor roofed installation, however the inverter must be protected from dust, snow, rain and direct thermal radiation (e.g. solar radiation, central heating radiators, etc.).

The following requirements must be met:

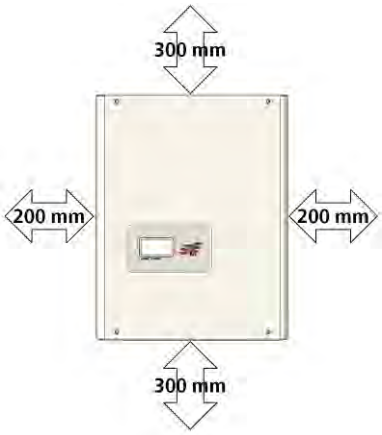
- Relative humidity 4 ... 100 % (non-condensing).
- Ambient temperature -25 ... 60 °C (40°C at full load).
- Maximum degree of contamination PD3.

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

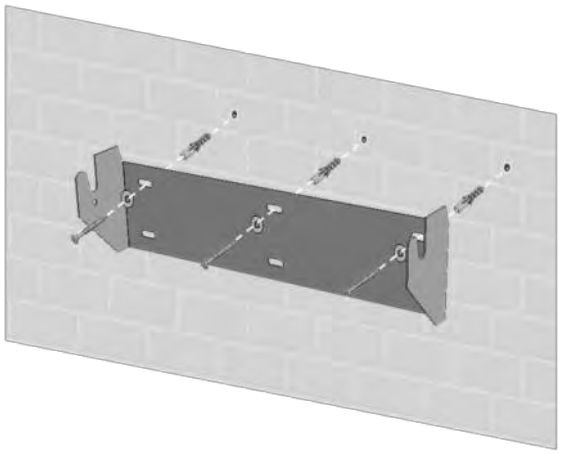
- Ensure sufficient air convection for the inverter. Overheating of the inverter due to poor cooling will result in reduced performance.
- The inverter can produce noise levels of up to 35db during operation. Ensure the inverter is mounted in a way that people cannot be disturbed by the operating noise.

4.2 Mounting

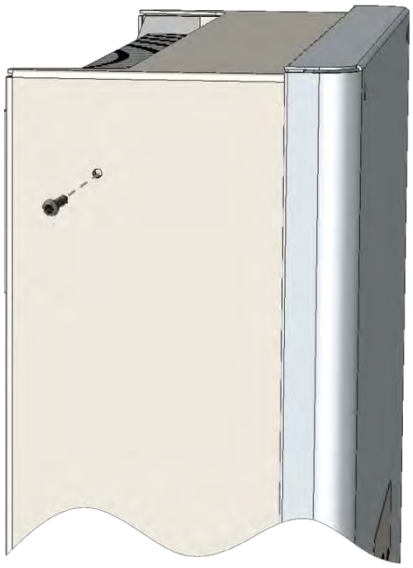
Additional material required (not included in the scope of supply):

- 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 Inverter 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 Overview of the Connections

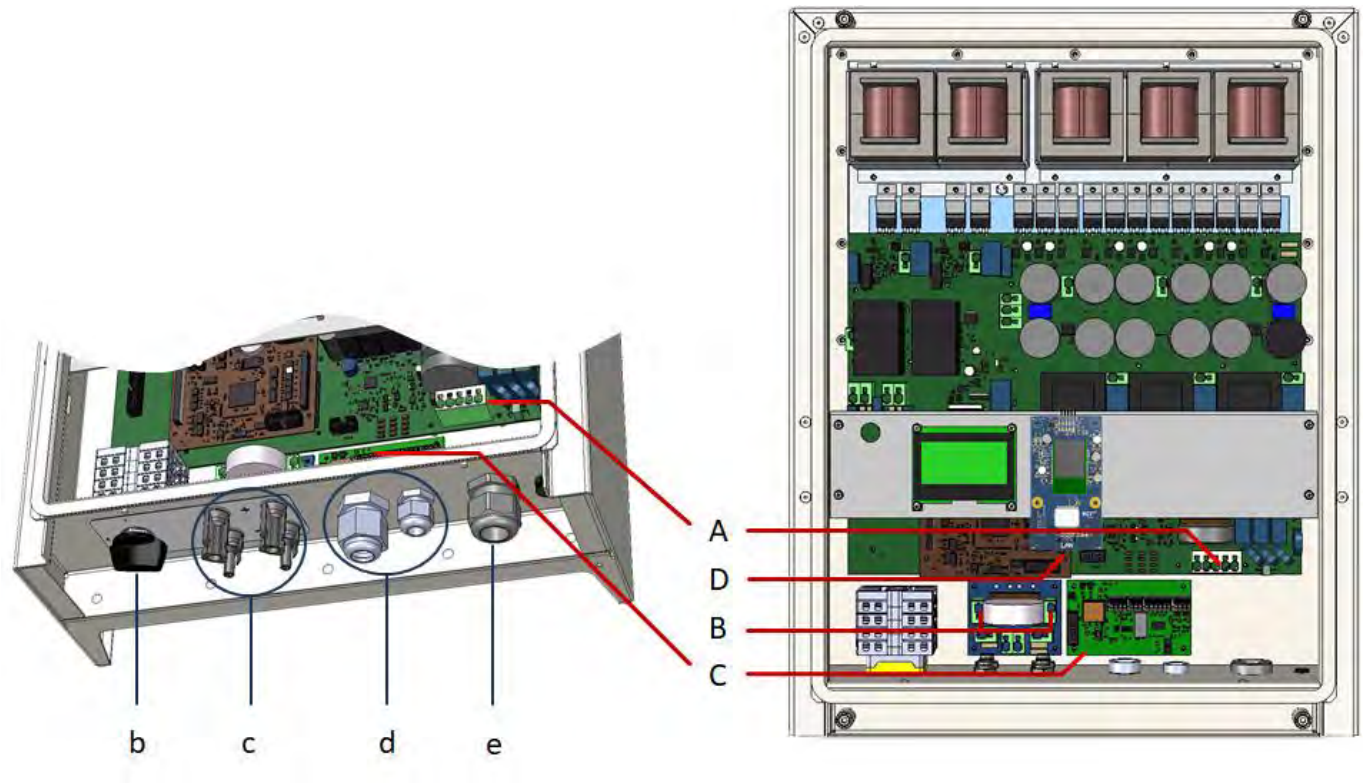


Fig. 5-1 Overview of wiring area and interior connecting components

Pos.	Component	Comment
b	DC load break switch	Normal operation: Switch is in position "1". If the switch is set to position "0", the inverter shuts down when the circuit to the battery is disconnected.
c	DC connectors	Two separate solar generator inputs (A & B), Connector type: Weidmüller WM4.
d	Cable ducts communication interfaces	Cable entries communication interfaces
e	AC cable duct	Cable entry mains power connection (AC)
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 DC parallel connection of the PV inputs (see section 5.3).
C	Communication Board	The communication 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.
D	Ethernet port	RJ45 socket for connection to the Ethernet interface

5.2 AC Connection

Procedure:

DANGER

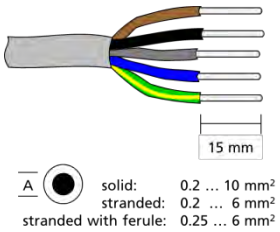
Danger to life or serious injury from electric shock!

- 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 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

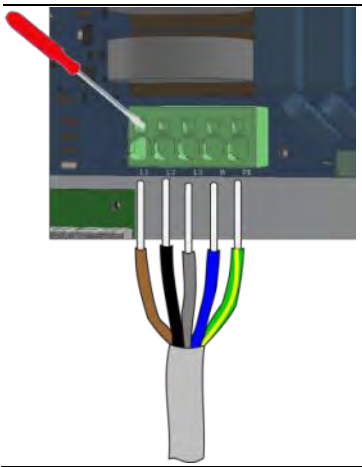
Danger to life or serious injury from electric shock or fire!

- Do not mix up the wires L, N and PE!
- Install an overcurrent protection device (circuit breaker, fuse) of max. 25A.
- Do not connect inverters and loads or more than one inverter, to the same main switch or similar fuse.



Required cable:

AWG 24 ... 8



Install an overcurrent protection device of max. 25A.

Remove the inverter cover and identify the AC terminal block

(see Figure 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 16A).
- Ensure that the disconnect device can be easily accessed at all times.
- Install the residual current device (RCD) required in the country of installation. A residual current circuit breaker (RCCB) type A is required 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 of advantage if the properties of the PV-strings are different such as module type, number of modules, orientation or shading of the panels. 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 resulting maximum input current per input exceeds 12 A.

Conditions for parallel mode:

- The total current of all strings connected to the inverter must not exceed 24 A.
- The strings have identical properties (module type, orientation and condition of the modules)

Example:

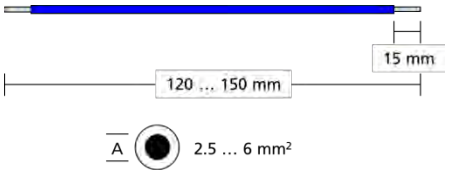
The PV panels are divided into three strings of 8A each. It is nevertheless possible to connect them to the inverter without changing the string configuration. One string is connected to one of the two solar generator inputs. The other two strings are connected in parallel via a Y contact and then connected 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 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 to 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.

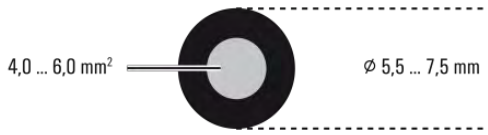
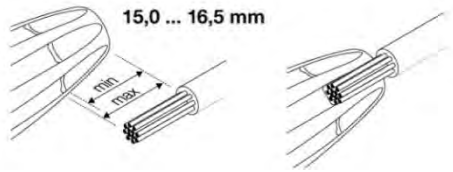
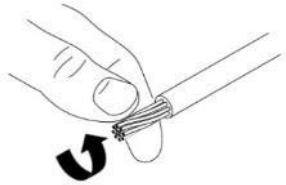
NOTICE

- 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.

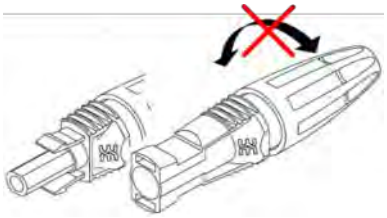
- Any type of contamination (dust, moisture, etc.) negatively influences the functionality of the connector system over the intended period of use. It is therefore essential to avoid contamination during the connector assembly and installation.
- The voltage in the DC cables correlates with the intensity 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

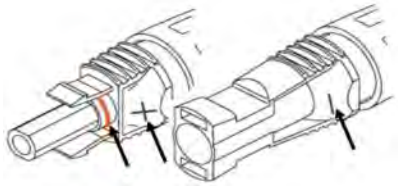
Prepare cable conductor:

	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

Insert of cable conductor:

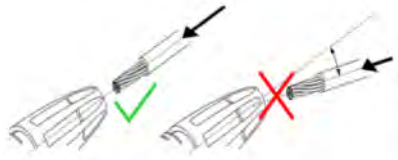


Do not turn connector plug in the screw fitting before strands are wired.

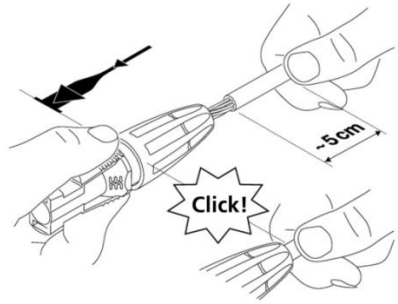


Select the correct connector type.

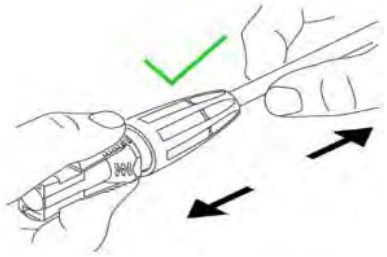
Pay attention to the polarity.



Insert the cable in a straight line into the plug.

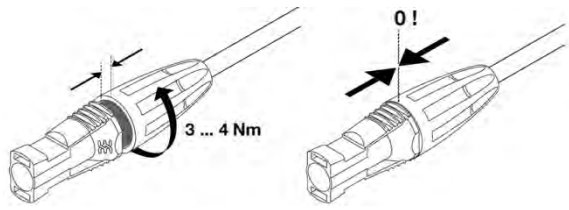


Ensure that the contact snaps into place audibly with a "click".



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.

5.5 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 (DC voltage source).
This voltage can cause fatal electric shocks.

- Any work involving wiring, connecting or opening the inverter housing 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.

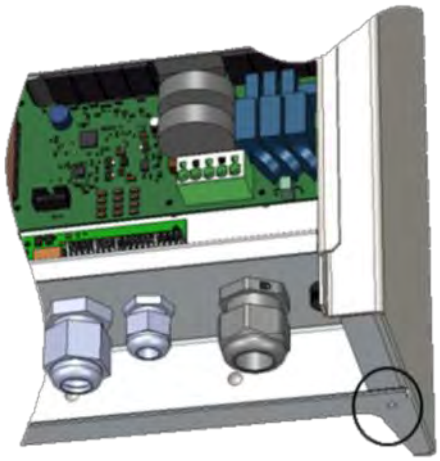
Electric arcs can cause severe electric shocks or burns.

Procedure:

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

5.6 Additional Protective Conductor Connection

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



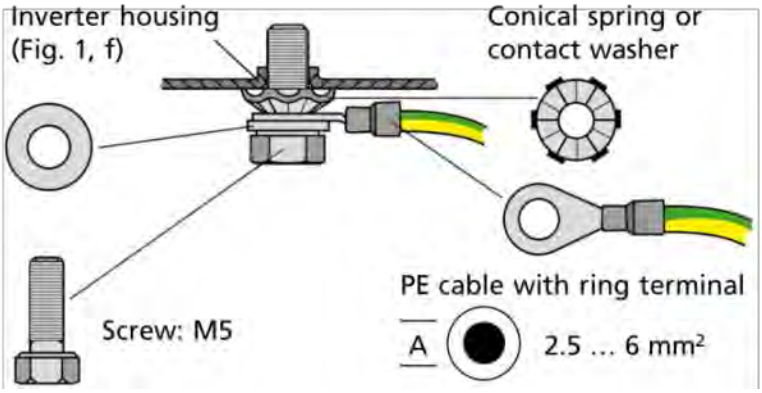


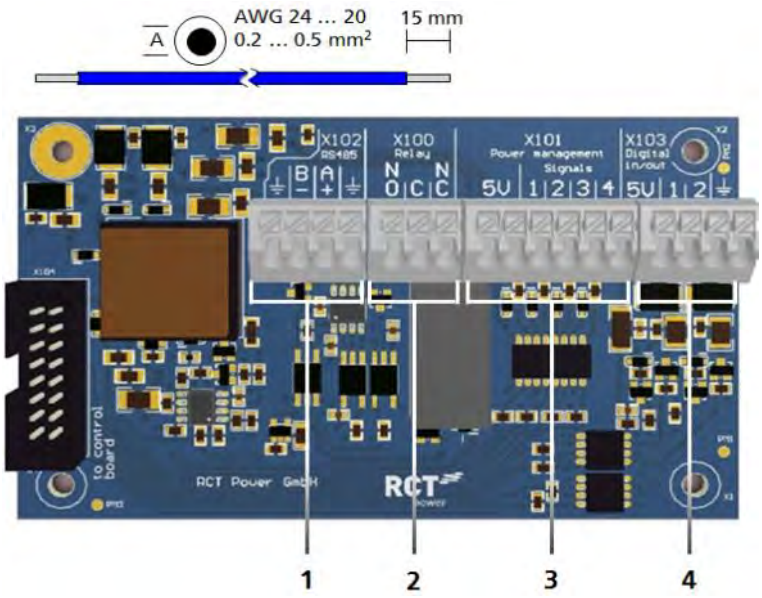
Fig. *5-6 Material not included in scope of supply.*

Procedure:

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

6 Communication Ports

6.1 I/O circuit board



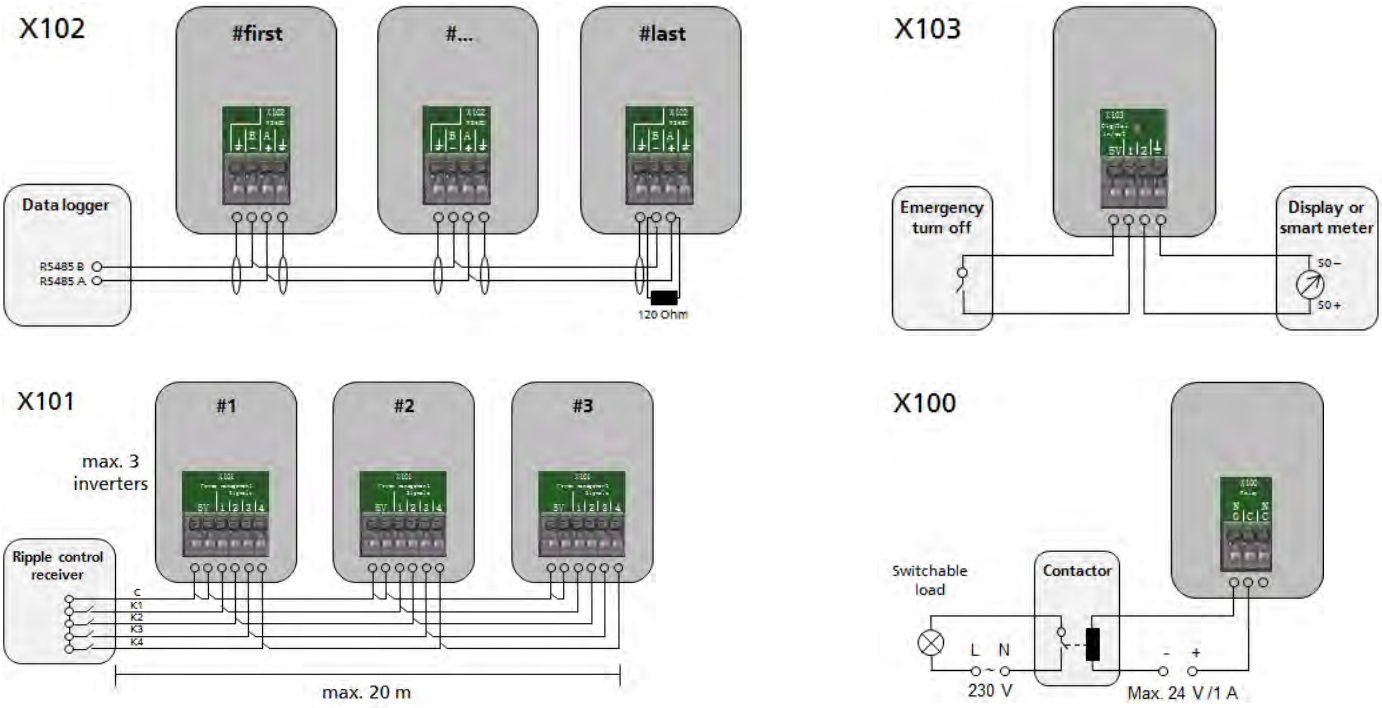
Pos.	Description
1	X102: Serial RS485 interface.
2	X100: Multifunction relay, max. 24V, 1A.
3	X101: Ripple control signals: 4 digital inputs for potential-free relay contacts.
4	X103: Digital in/outputs (S0 signals), max. input 24V, max. output 5 V, 10 mA.

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.

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.

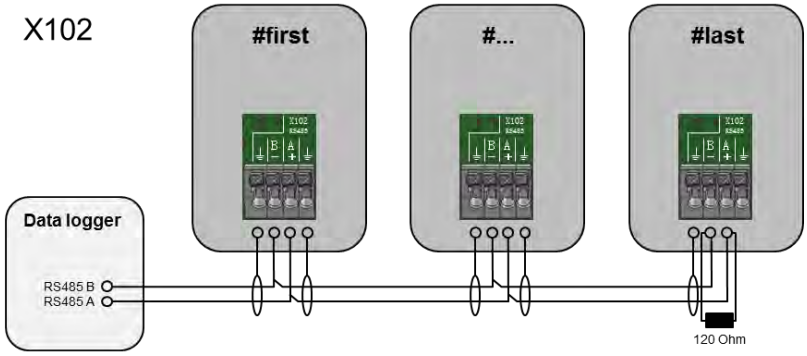


Fig. 6-3 Connection of data logger

6.1.2 Multifunction relay X100 Interface

Application:

The multifunction relay can be configured in two ways:

1. as an alarm relay. In the event of an inverter fault, the alarm signal is connected..
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.

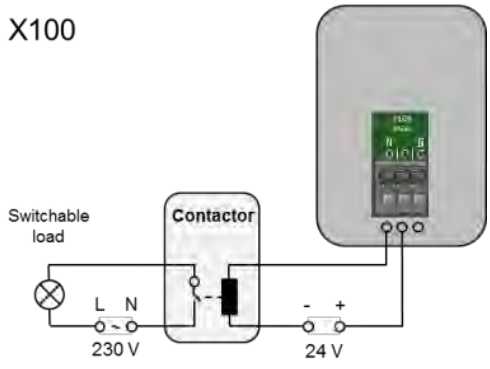


Fig. 6-4 Connection - Contactor and switchable load

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.

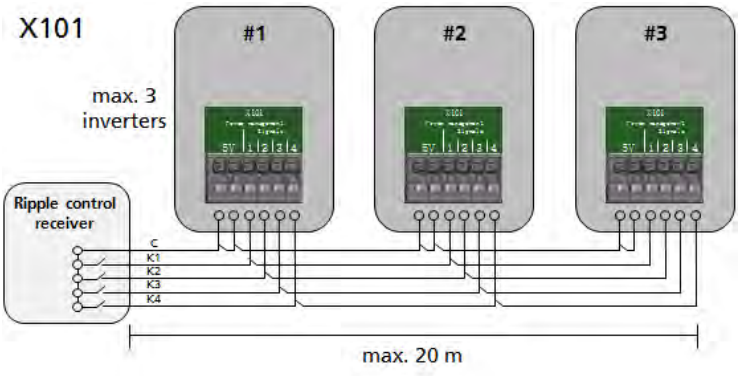


Fig. 6-5 Connection - Ripple control receiver

6.1.4 Digital Inputs and Outputs X103 Interface

Application:

1. Standard use case for input signals is the connection of an electricity meter with S0 output.
2. Standard use case for an output signal is the connection of a display of feed-in data.
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.

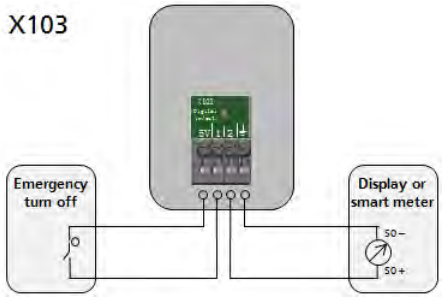


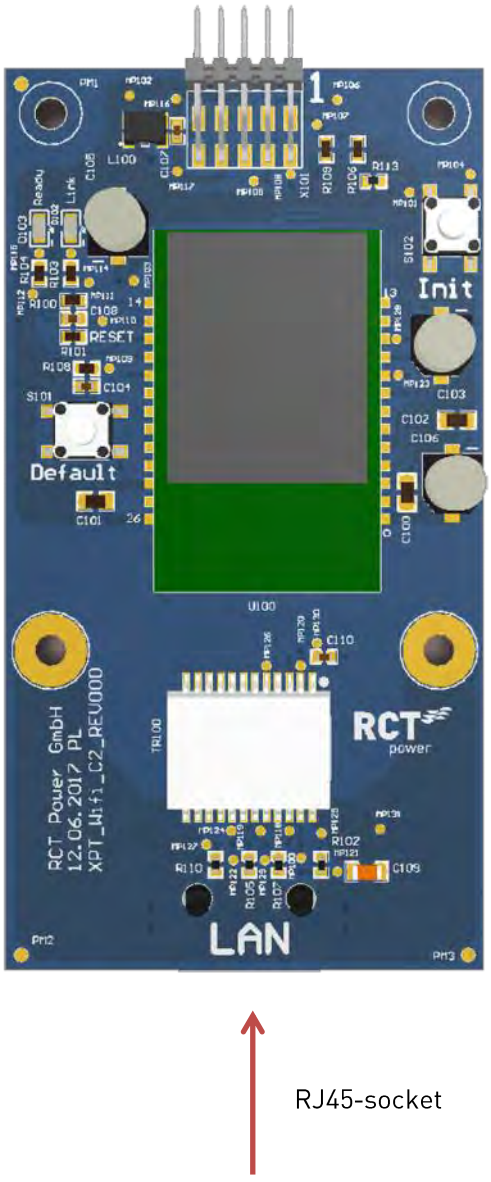
Figure 6-6 X103 interface connected with an emergency shutdown switch and a solar display unit or meter

6.2 Connection Ethernet Interface

After the initial commissioning, the Power Inverter 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".



RJ45-socket

Step	Description
1	Use the corresponding cable ducts for the supply cable (Fig. 5-1, d).
2	Plug the connector into the RJ45 socket and ensure that the correct interface is selected.

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.

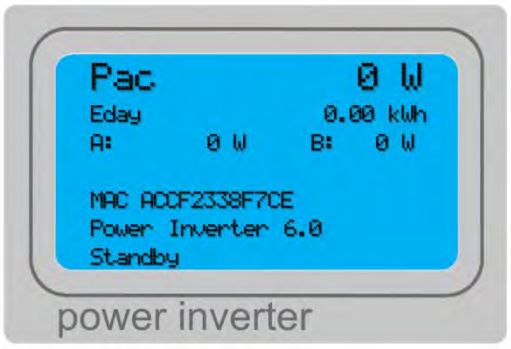
WARNING

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:

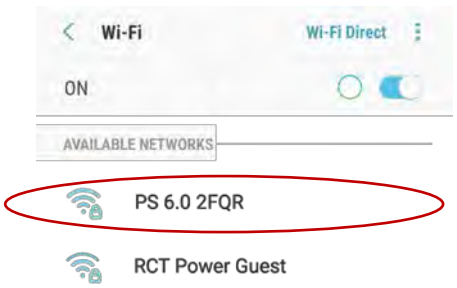
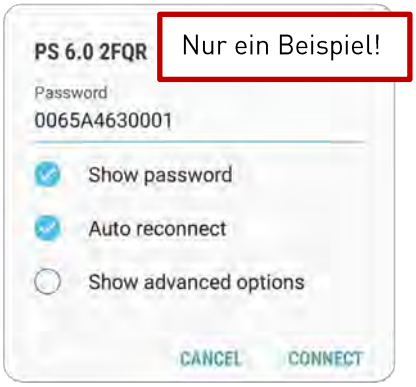
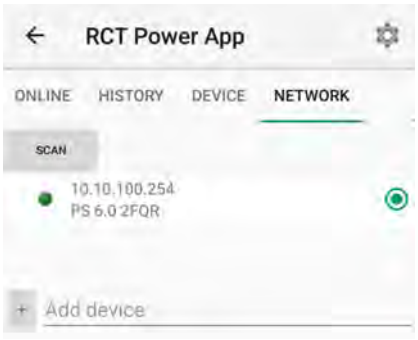
- The Inverter is mounted (see section 4.2).
- The inverter is connected to the public grid (AC). (see section 5.2).
- The PV modules are connected to the inverter.(see section 5.4).
- Additional protective conductor connection established if required. (see section 5.6).
- The inverter cover is assembled.

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"). If the input voltage is sufficient, the display of the device switches on 

7.1.2 Accessing the inverter

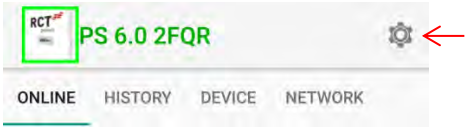
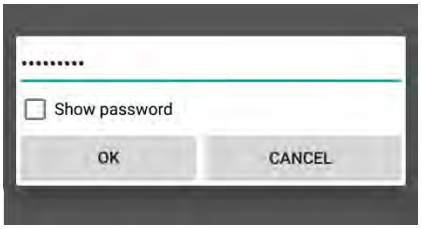
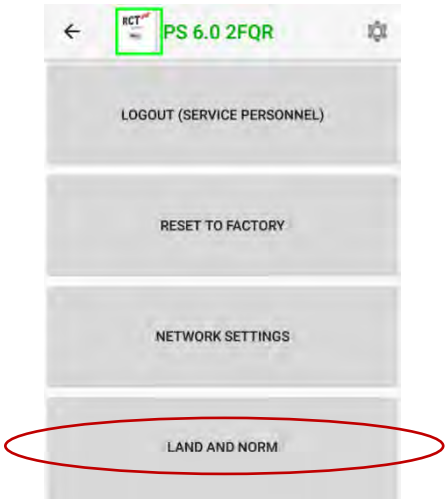
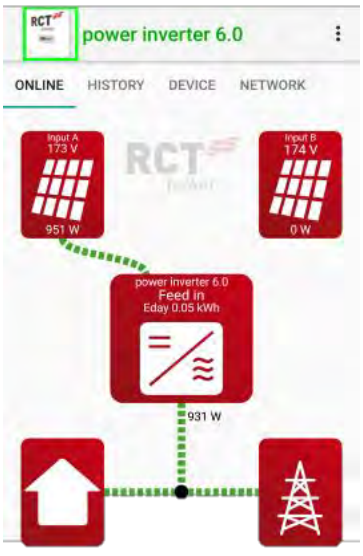
The inverter display will blink temporarily if the inverter is detected or selected by the RCT Power APP.

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). 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. The password is identical to the serial number of your device (see display or nameplate).	
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" (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

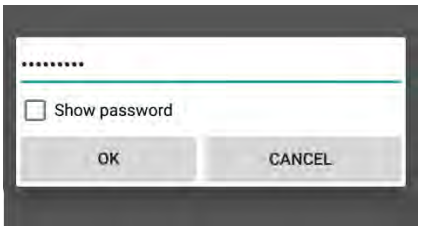
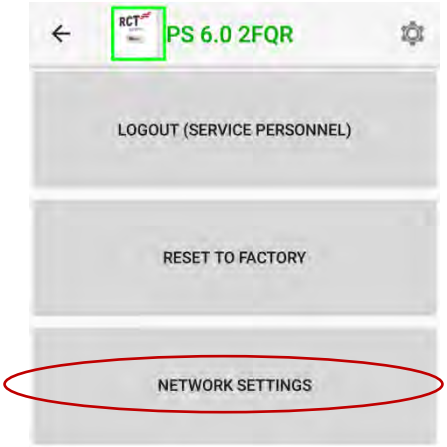
NOTICE

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 Set-up icon" ⚙ "	
3	Press on the word "Login" in the centre of the screen. A Login prompt is displayed. Enter the password and press "OK" to enter the configuration options screen. (default password: "installer")	
4	Select "LAND AND NORM" from the options. The screen "Land and Parameter Set" will appear. 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. Return to the main menu.	
6	The configuration is now complete. After the inverter has checked the specifications, it starts to feed into the grid. To get to the start page, click "back".	

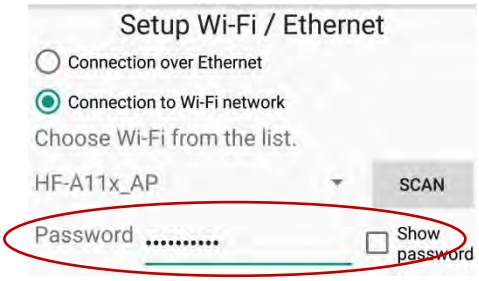
7.1.4 Connecting the inverter to a network via Wi-Fi

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 Set-up Icon" ⚙ ".	
3	A Login prompt is displayed. Enter the password and press "OK" to enter the configuration options screen. (Login Installer Area, password: "installer", Login Customer Area, password: "********")	
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. **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.** NOTICE **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.** **After the network integration has been completed, you can disable the location services.** 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.

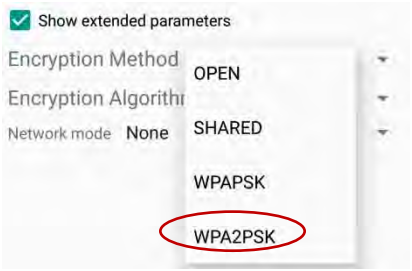


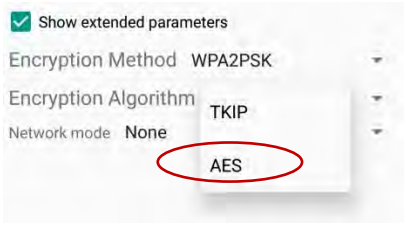
8 Set a tick mark in the "Show extended parameters" box. Drop-down selection lists for the following parameters are available:

"Encryption Method" (default: WPA2PSK),

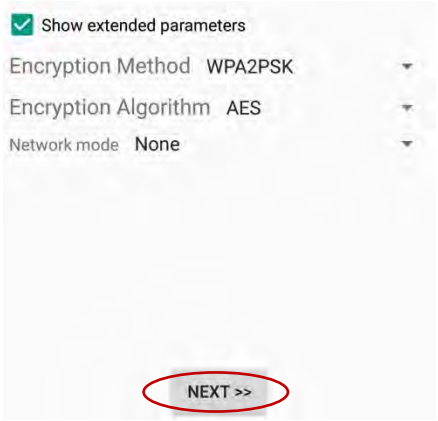
"Encryption Algorithm" (default: AES) and

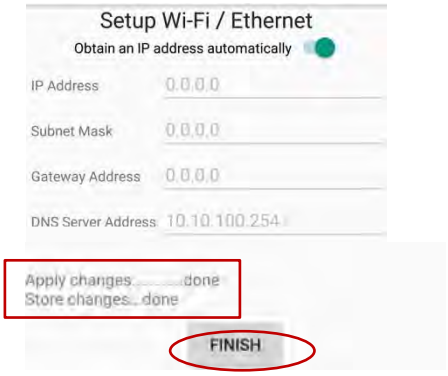
"Network Mode" (default: None).





9 Press the "NEXT" button.

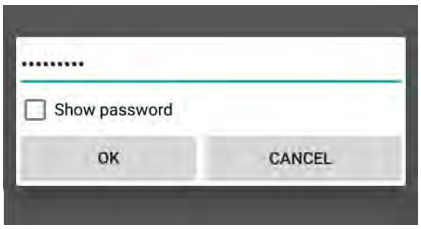
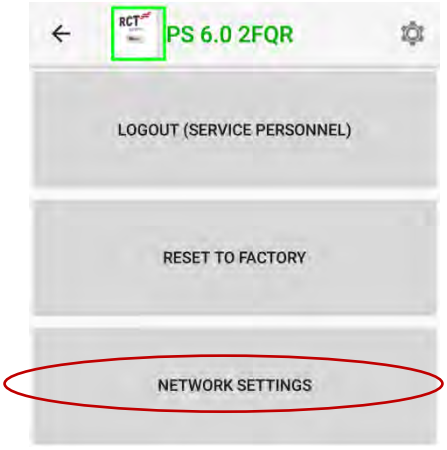
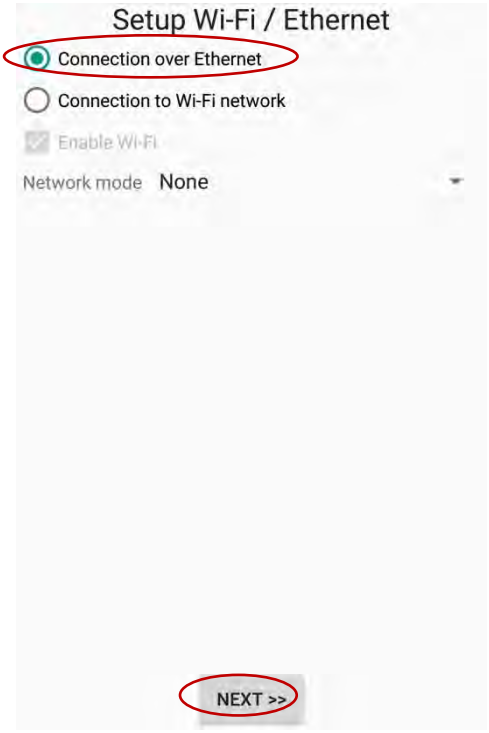


10	Set "Obtain an IP address automatically" to "ON" and press the "FINISH" button.	
11	Wait until the new settings are confirmed and then press the "FINISH" button again.	
12	Close the RCT Power APP. (this will speed up the process of obtaining the IP address). After a short time, the LCD display of 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. In the "NETWORK" menu press the "SCAN" button. Alternatively, you can enter the assigned IP address under "Add device" at the bottom of the screen and press the "+" symbol. Once the device appears on the device list press the corresponding radio button to select it	

7.1.5 Connecting the inverter to a network via the 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 chapter 6.2).

Step	Description	
1	Establish connection to the inverter (see 7.1.2).	
2	Press the Set-up Icon “ ⚙ “.	
3	A Login prompt is displayed. Enter the password and press “OK“ to enter the configuration options screen. (Login Installer Area, password: “installer“, Login Customer Area, password: “********“)	
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). 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.	
9	Connect your Android device to your home network. Launch the "RCT Power APP" again. In the "NETWORK" menu press the "SCAN" button. Alternatively, you can enter the assigned IP address under "Add device" at the bottom of the screen and press the "+" symbol. Once the device appears on the device list press the corresponding radio button to select it.	

7.1.6 Internet based remote access to the inverter

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 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 a common set up for corporate Internet connections.

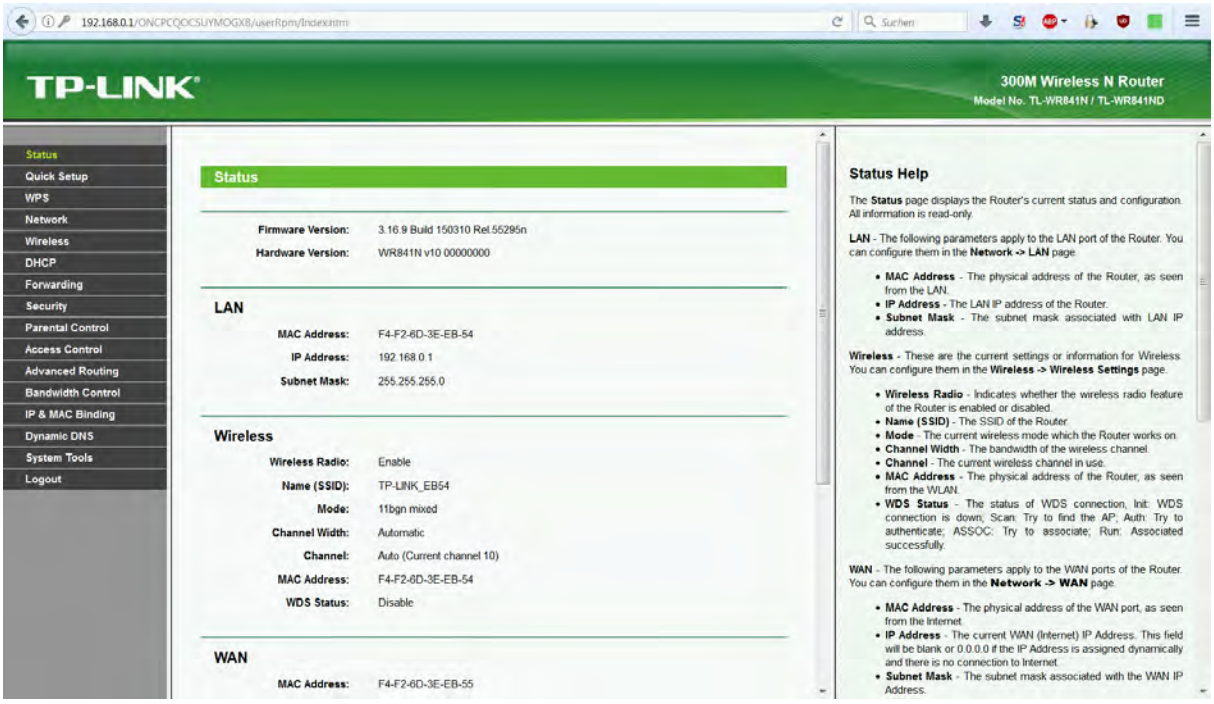
- The router supports port forwarding and connects to the Internet using a dynamic IP address assigned by the Internet Service Provider. Dynamic Domain Name System entries are enabled.

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

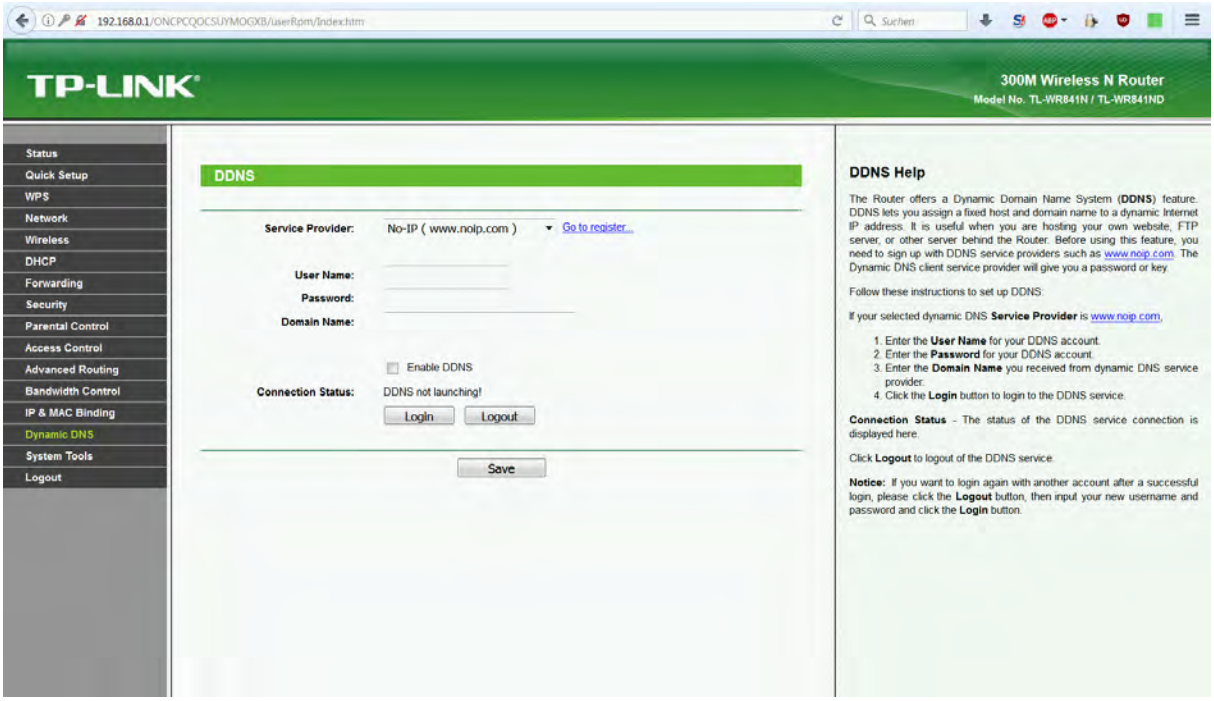
- The router supports the creation of a virtual private network (VPN). You use the VPN internet connection of your device (e.g. Mobile Phone) to access your home network and the inverter.

The following describes how to set up the remote access via DynDNS of a TP-Link router.
Depending on the supplier or manufacturer, this manual may differ.

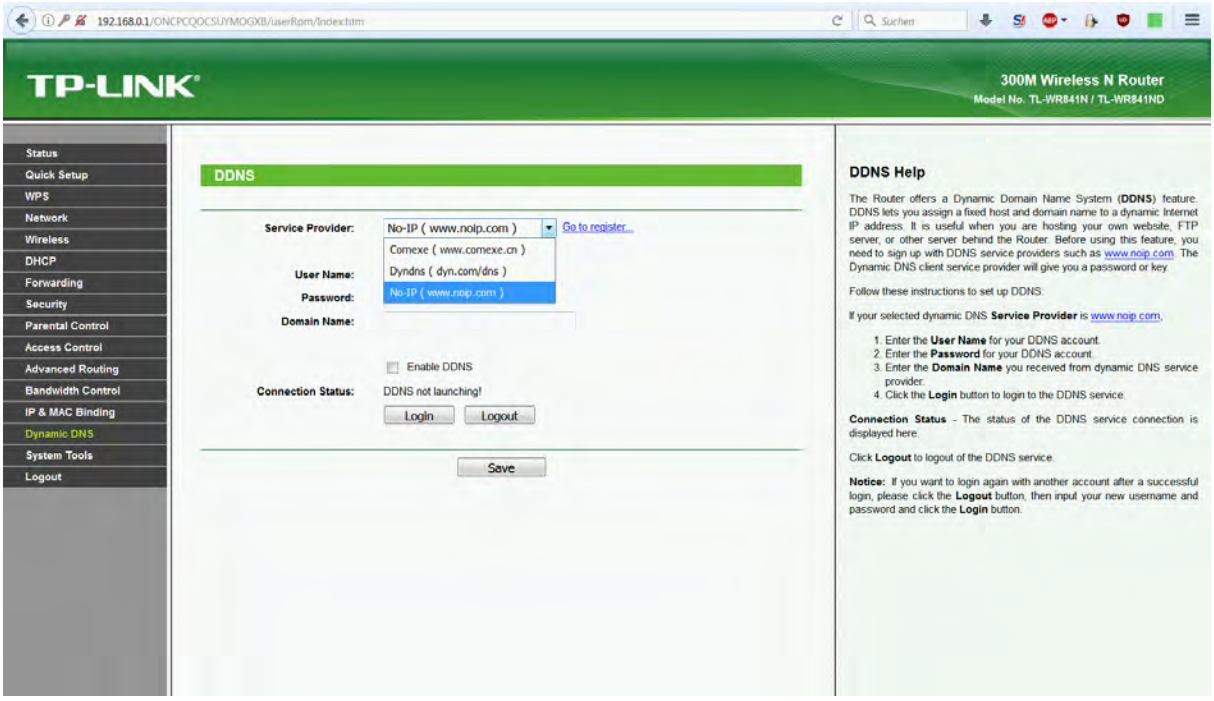
1.) Call the user interface of your TP-Link router. To do this, enter http://192.168.0.1 or http://192.168.1.1 in a browser.



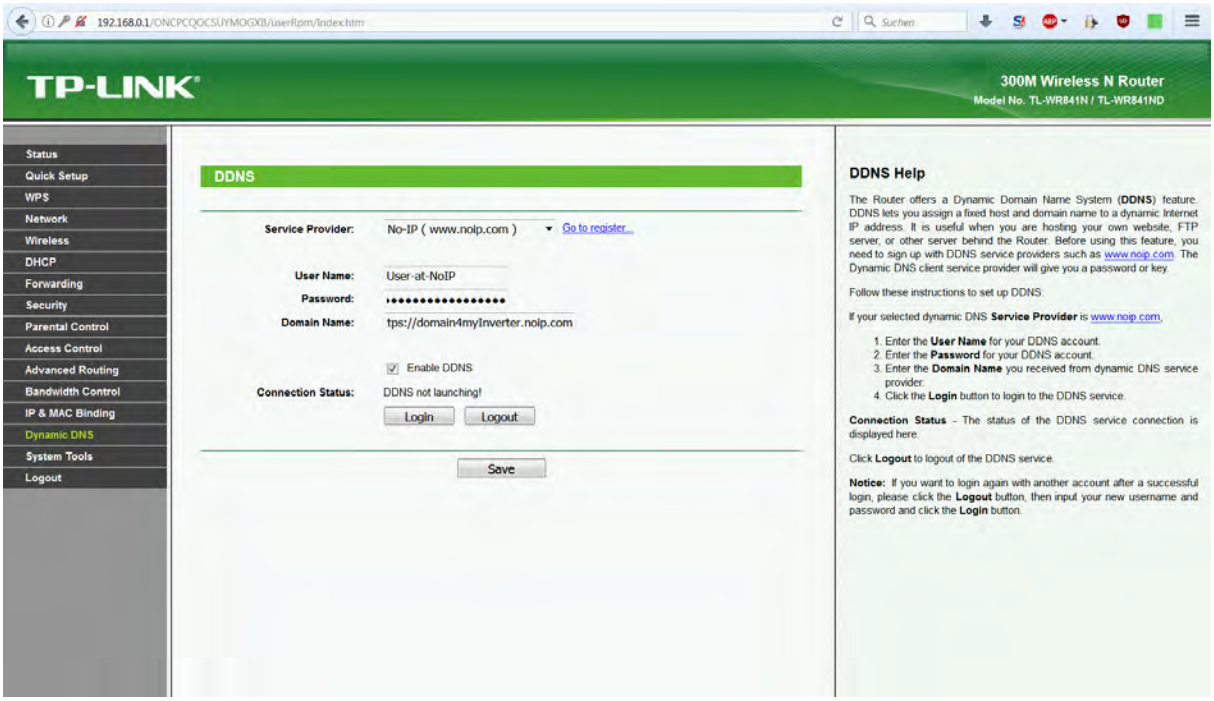
2.) After logging in, switch to the tab “Dynamic DNS”.



3.) Depending on the provider and manufacturer, different DynDNS providers are available. First, look at the available DynDNS providers on the drop-down list.

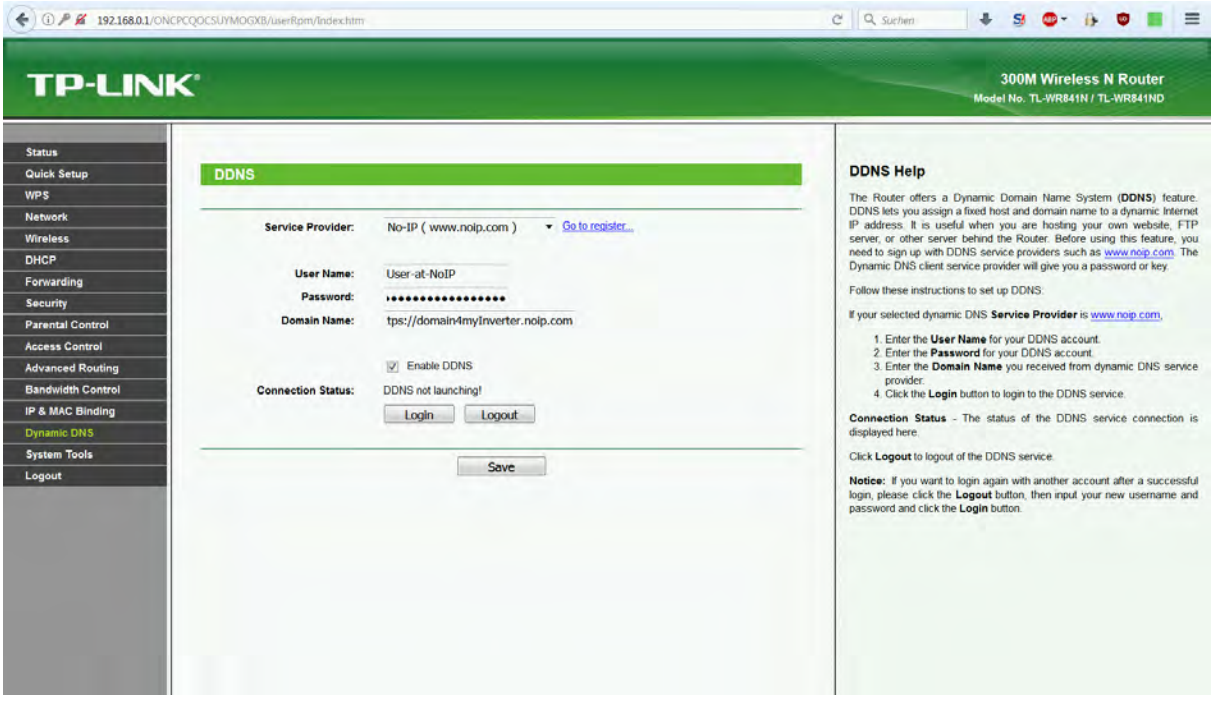


4.) In our example we have selected the provider of “No-IP”, since this also offers a free DynDNS service.

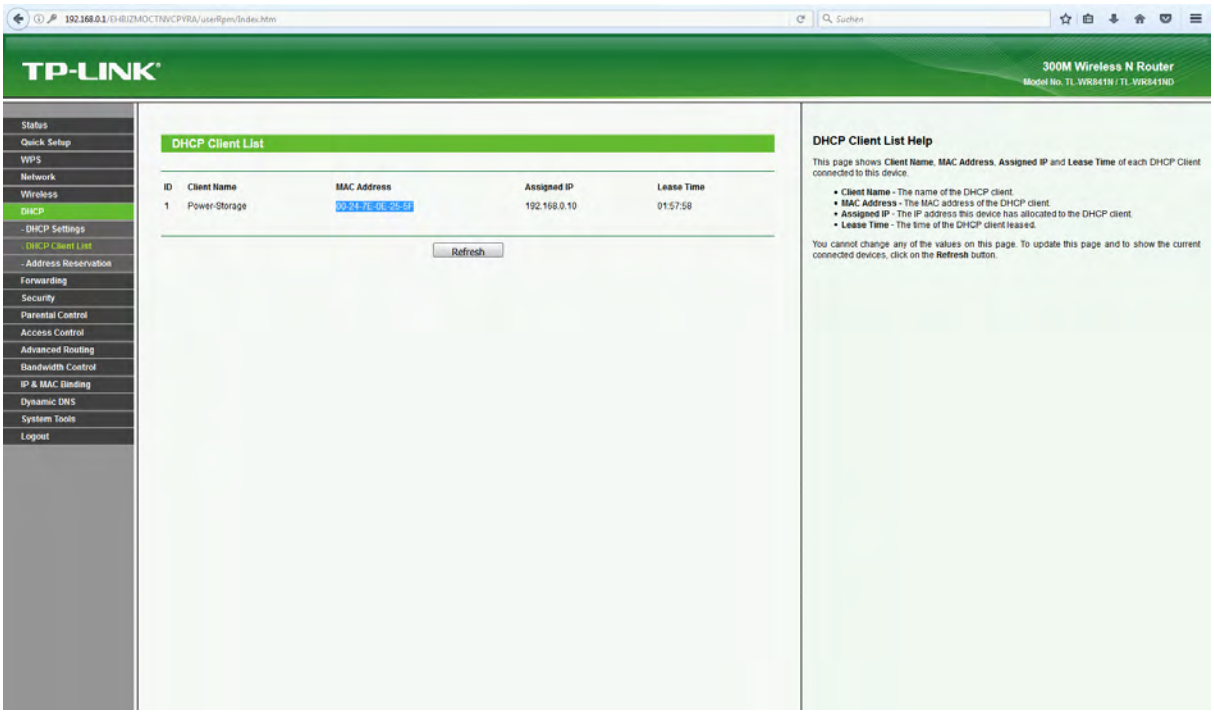


5.) First a DynDNS access of the selected provider has to be created. To do so, you must set up an account with the respective provider.
After successful registration you can create a “Dynamic DNS”.

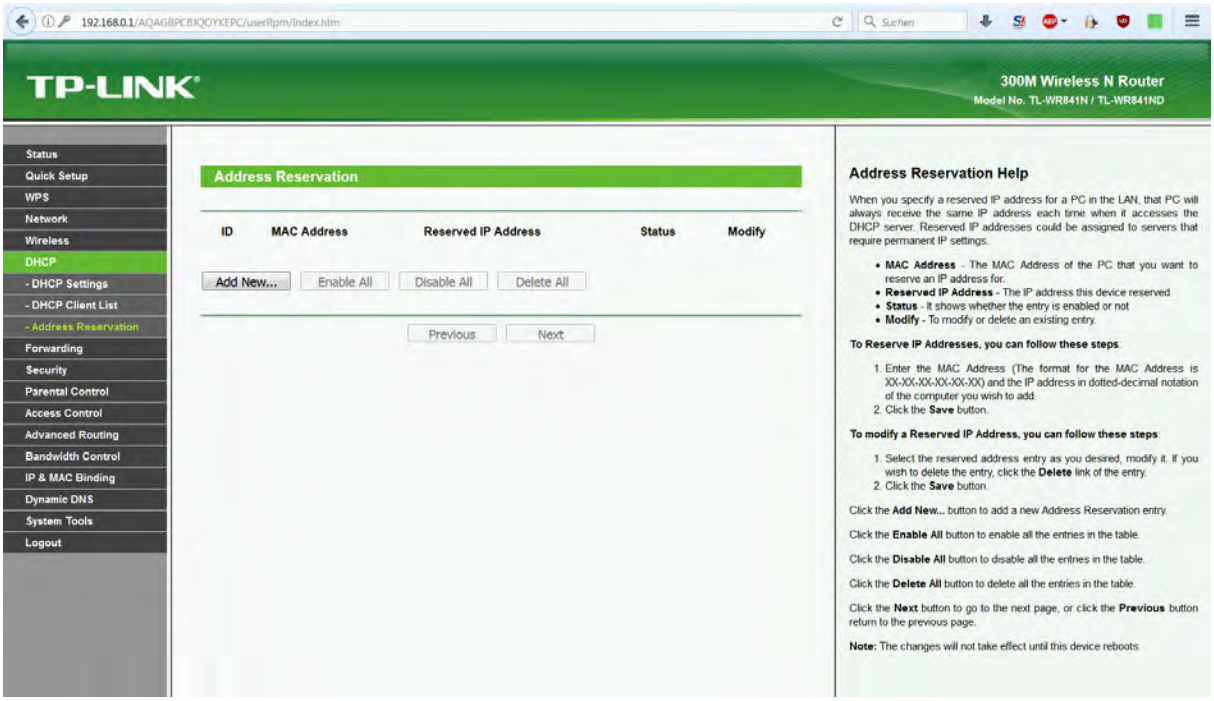
6.) Enter the registration data of the previously created DDNS provider and enable the check box “Enable DDNS” confirm with “Save” and “Login”.



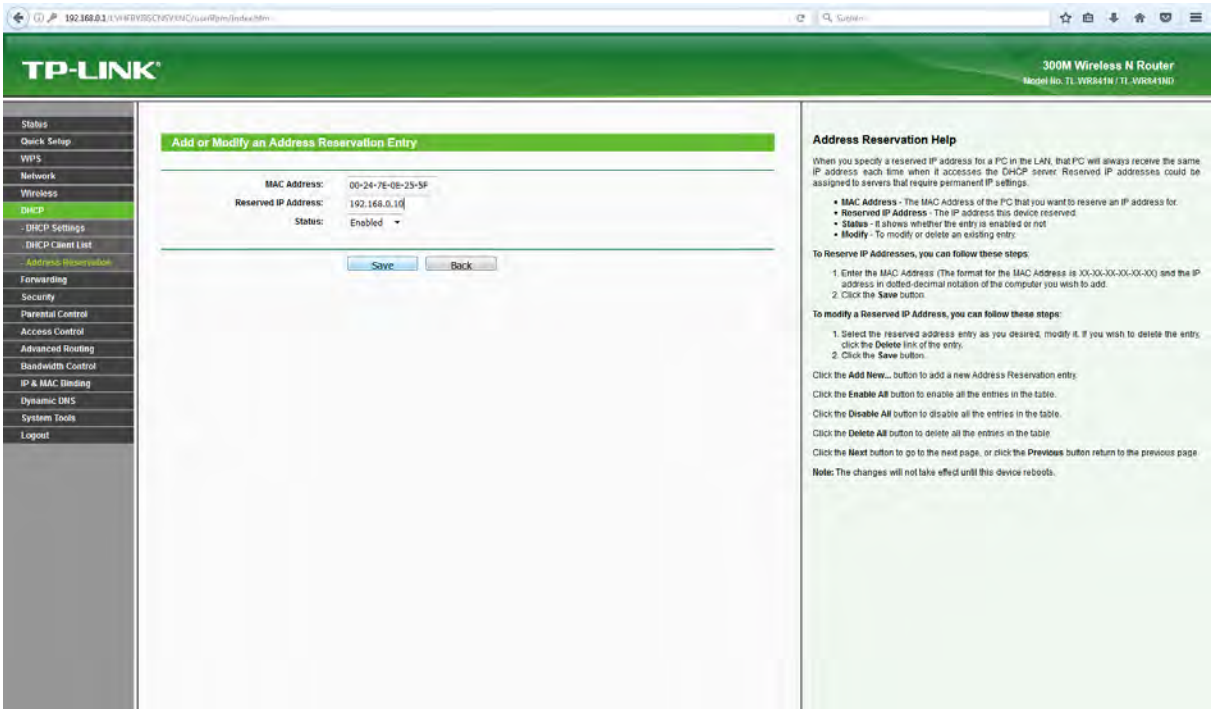
7.) Create a fixed IP address for the inverter, switch to the "DHCP" tab, click on the "DHCP Client List", search for the inverter name and copy the "MAC Address" and the "Assigned IP".



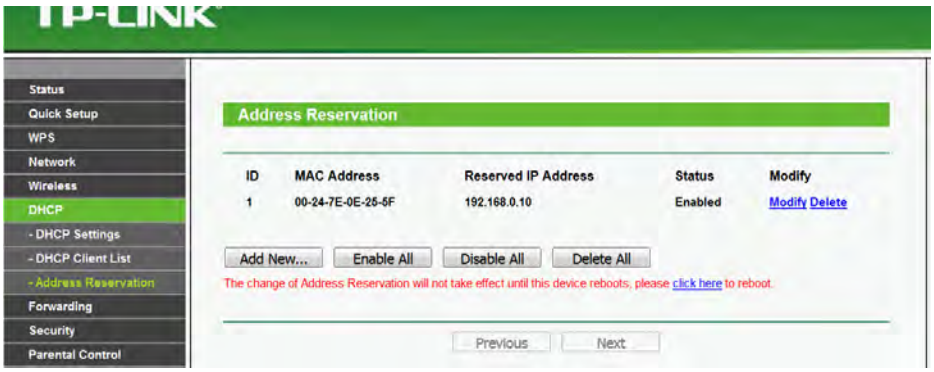
8.) Switch to the "Address Reservation" tab and click "Add New..." .

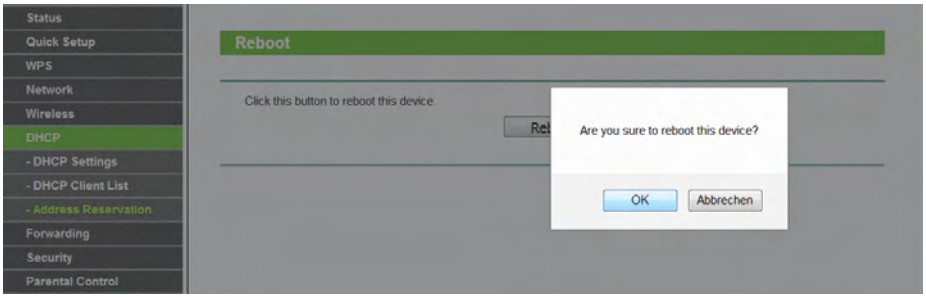


9.) Enter the “MAC Address” and the IP Address (Assigned IP) and confirm with “Save”.



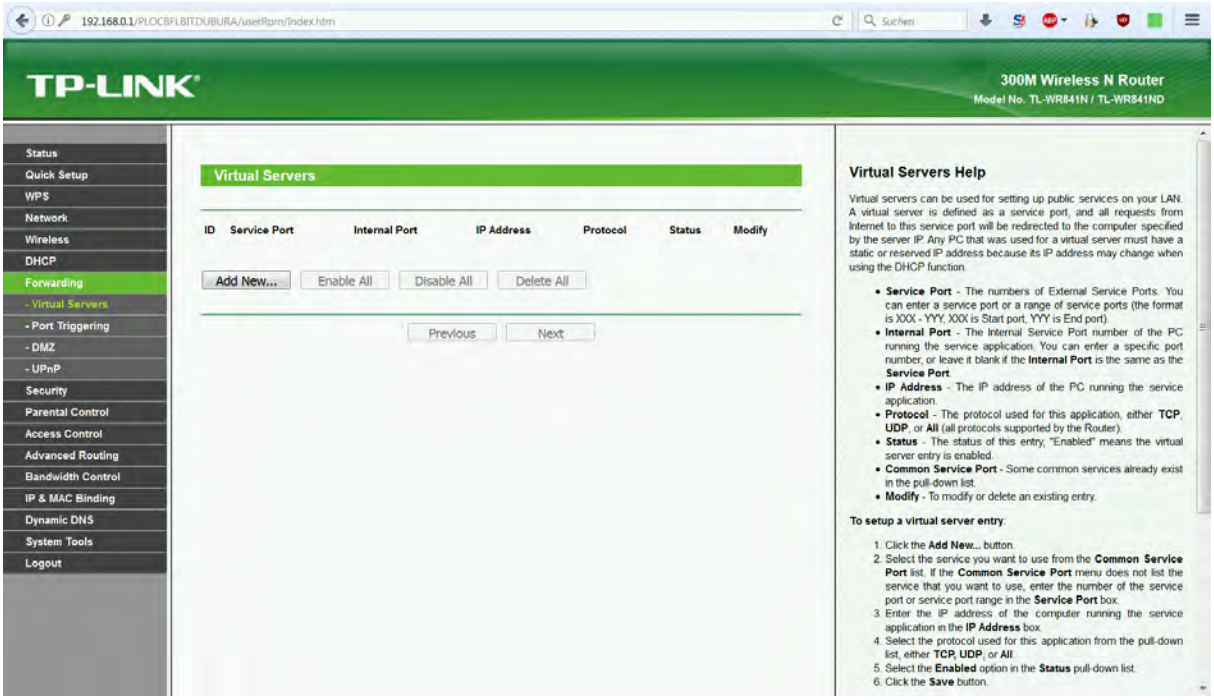
10.) The Router needs to reboot to change the Address, click on “click here”, confirm with “Reboot” and click at last on “OK”.





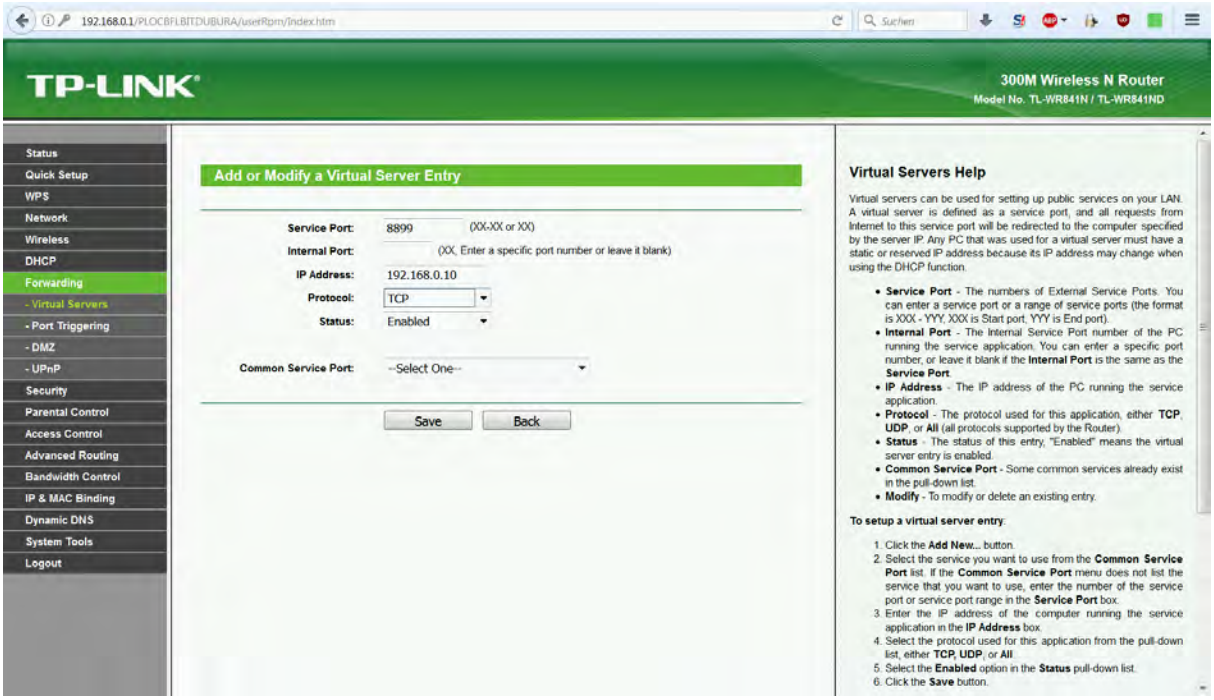
11.) Finally a port release has to be activated. This is necessary, because the TP-Link Router should carry out a port transfer for the inverter.
The communication of the inverter is operated via port 8899. Coming from the Internet requests to port 8899, the router redirects these requests to the inverter.
The (fixed) IP address of the inverter must therefore be specified as the IP address.

Switch to "Forwarding" tab, click on the sub-item "Virtual Servers".



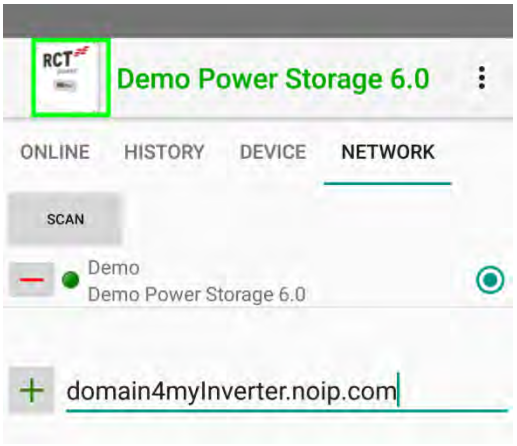
12.) Click on "Add New..."

Service Port: 8899
IP Address: Reserved IP address
Protocol: TCP
Status: Enabled



Confirm with "Save".

13.) The installation is complete. The inverter can be accessed from remote via the RCT Power App by using the DynDNS URL.



7.2 APP Beschreibung

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 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.

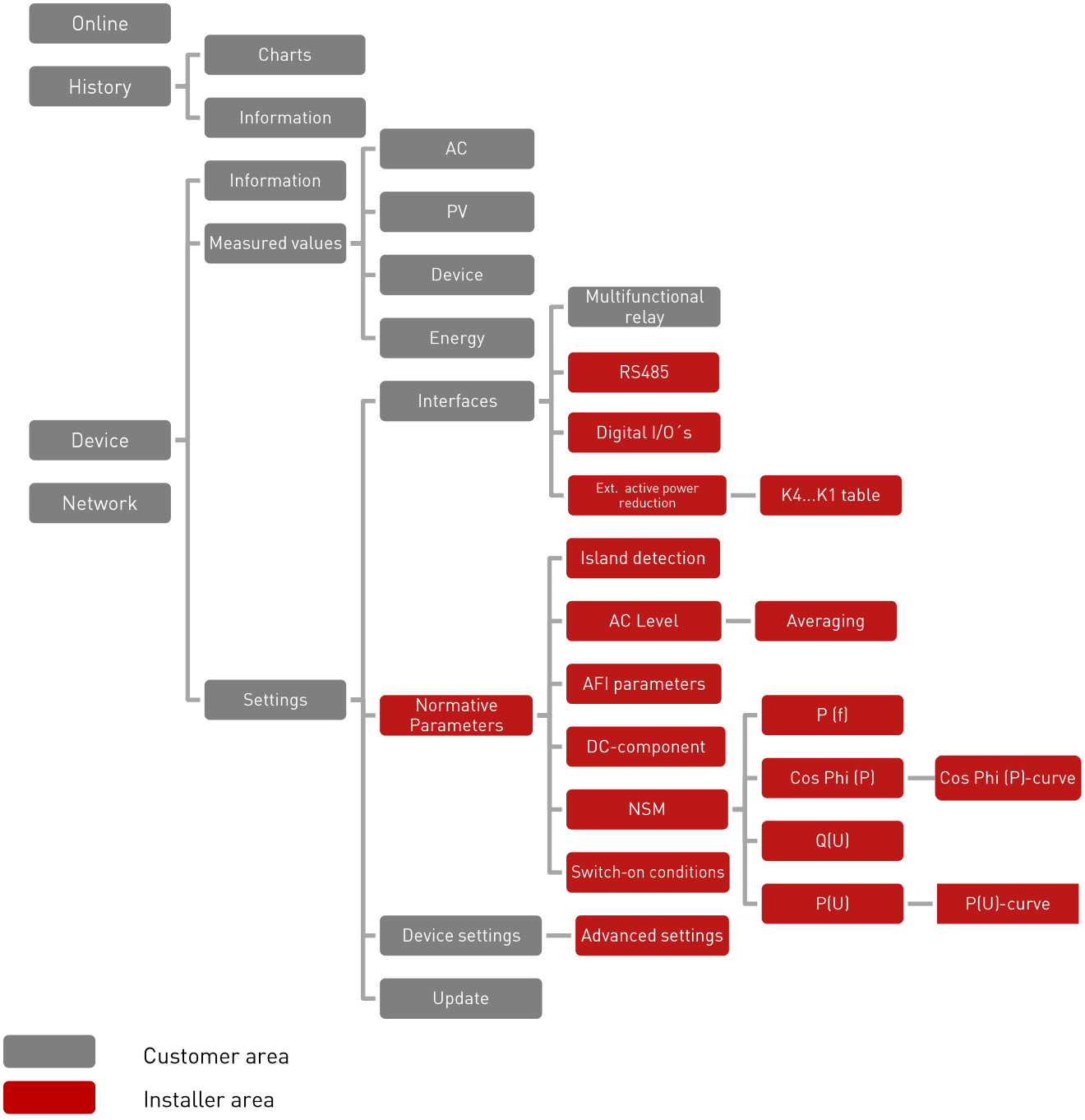
The functionality of the RCT Power App is divided into two access areas with separate logins.

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

Installer Area: Login: installer

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 APP menu



7.2.2 Detailed Description of the 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 PV
Use to display all PV-input specific readings

7.2.2.3.2.3 Gerät
Anzeige der gerätespezifischen Werte

7.2.2.3.2.4 Device
Display of device specific measurement readings.

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.

7.2.2.3.3.1 Interfaces
Use to configure the interfaces for peripheral devices.

7.2.2.3.3.1.1 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

Please note: Changes to settings will only be saved permanently if they are confirmed by pressing the "Flash button. Switching off the inverter will otherwise restore the previous settings.

7.2.2.3.3.1.2 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).

7.2.2.3.3.1.3 RS485

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

7.2.2.3.3.1.4 Ext. Active power reduction (Installer area!)

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

7.2.2.3.3.2 Normative parameters (Installer area!)

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

7.2.2.3.3.2.1 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.

7.2.2.3.3.2.2 AFI parameters (Installer area!)

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

7.2.2.3.3.2.3 DC-component (Installer area!)

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

7.2.2.3.3.2.4 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

7.2.2.3.3.2.5 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.

7.2.2.3.3.3 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 /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.

7.2.2.3.3.3.1 Advanced settings (Installer area!)

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

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

7.2.2.3.3.4 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 8.10 "Software updates for inverter".

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 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]	Display of present power fed into the grid
2	Energy	Generated energy of inverter, values are displayed alternated by - Eday - Emonth - Eyear - Etotal
3	PV Generators	The values of PV generator A and B, are displayed alternated by - Voltage - Power - State - MPP [Operation in Maximum Power Point] - P_Lim [PV power is limited] - Fix [operation in fixed voltage mode] - OFF [PV generator not used]
4	Device Information	Information to device, values are displayed alternated by - IP-adress - MAC-adress - Serial number - RS 485 adress
5	Device Information	Information to device, values are displayed alternated by - Date /time - Norm and parameters - Software version - Device name - Configure Wi-Fi (Wi-Fi is being configured)
6	Device state	Information to current device state - Feed IN [Inverter is feeding in] - H/W check [Checking hardware components] - Initialization [Initilization of system] - Insulation check [Checking insulation resistance] - Island check [Checking grid state] - Standby[Inverter is in Standby mode] - Power check [Inverter is checking solar power] - Relays test [Functional test of grid relays] - Start conditions [Checking grid conditions] - Uzk symmetry [Checking symmetry of DC-link voltage] - Software X.X.X [latest software status] - Trap XXX [Error occured]

7.4 Definitions of log data and exporting to MS Excel for further processing

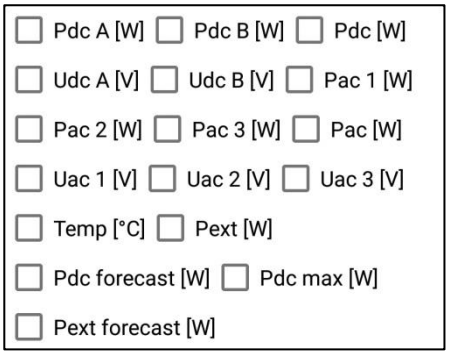
7.4.1 Abbreviations of the individual data records and their definitions

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

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]	Heat sink temperature inverter
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
Pext forecast [W]	Expected external power

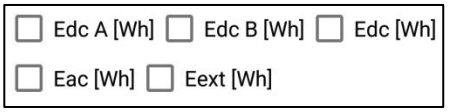


Recorded values can be retained for up to 90 days.

7.4.1.2 Data records „Week“ and „Month“

Recorded are the daily values in the specified period.

Edc A [Wh] , Edc B [Wh]	Energy of the solar generator inputs A and B
Edc [Wh]	Energy of the solar generator inputs [A+B] summed
Eac [Wh]	Inverter output energy
Eext [Wh]	Energy of one or more external inverters

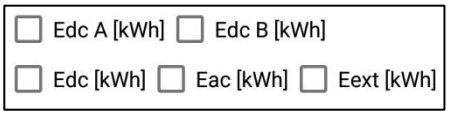


Recorded values can be retained for periods of 11 years

7.4.1.3 Datensätze „Jahr“ und „Gesamt“

Recorded are monthly / annual values in the specified period.

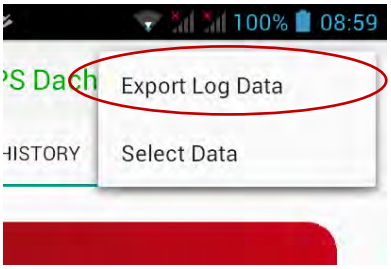
Edc A [kWh] , Edc B [kWh]	Energy of the solar generator inputs A and B
Edc [kWh]	Energy of the solar generator inputs [A+B] summed
Eac [kWh]	Inverter output energy
Eext [kWh]	Energy of one or more external inverters



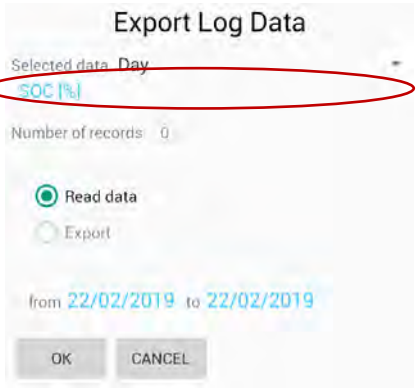
Recorded values can be retained for periods of 85 years.

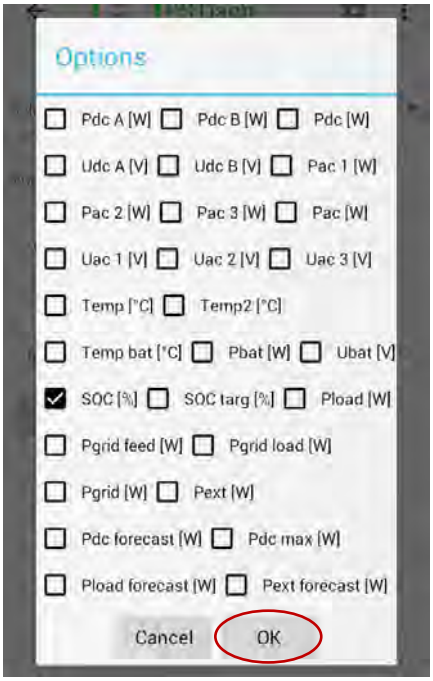
7.4.2 Exporting Data records

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:

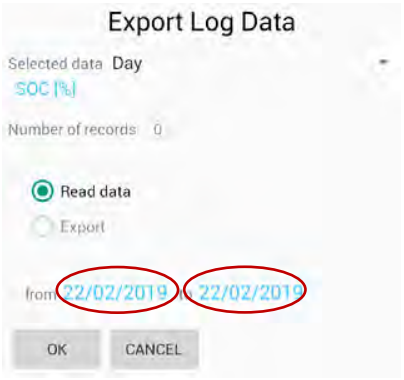
Step	Description	
1	Launch "RCT Power APP" and establish connection to the inverter	
2	Select Menu item "HISTORY" and press" ⋮ ".	
3	Two options are shown.Select "Export Log Data"	
4	Expand Drop-down list for "Selected data" and choose the required data type. Categories are "Day", "Week","Month", "Year" & "Total".	

5 Touch the box below "Selected data" to select the data you want to export. Confirm with OK".

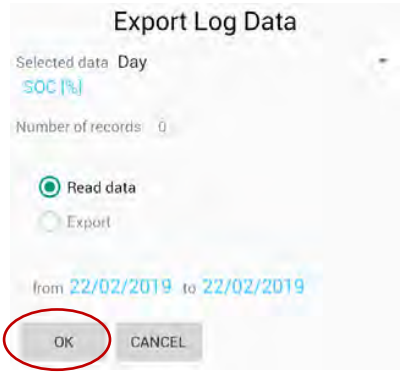




6 Touch the date shown after "from" to select the start date for your data export period. A date selection window will open. Confirm selected date by pressing "Set". Now touch the date shown after "to" to select the end date for your data export period. Confirm selected date by pressing "Set".

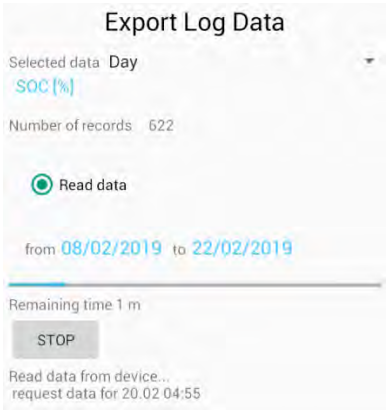


7 Press "OK" to continue.



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

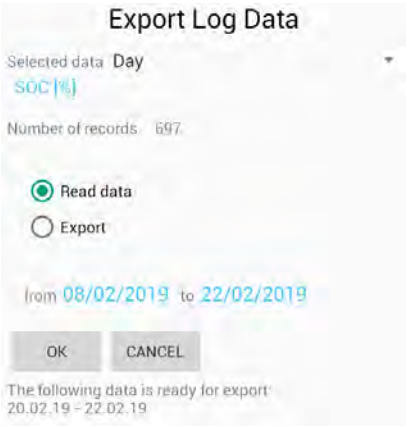
The estimated remaining time for the transfer to complete is displayed below the selected date range



Please note::

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

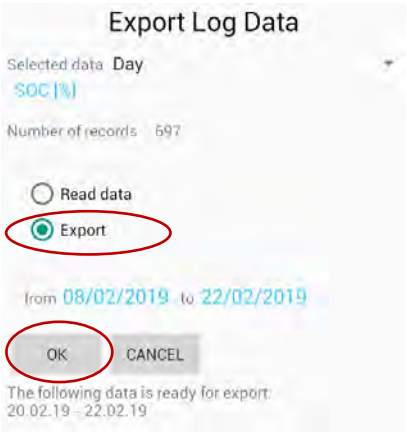
Adapt the selection of data sets and time periods accordingly to reduce the download time.



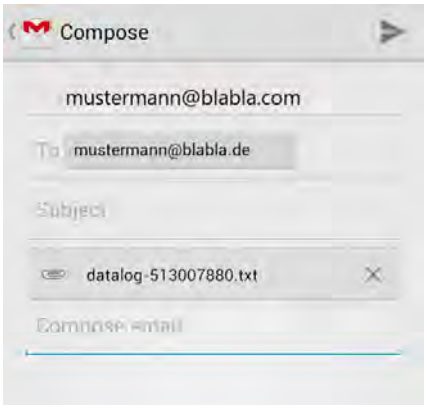
The data transfer can be cancelled at any time by pressing "STOP".

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

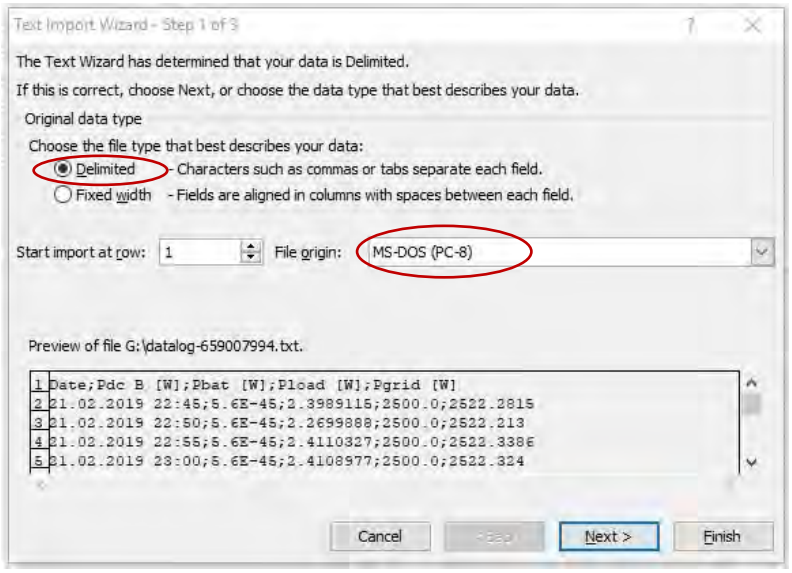


The exported file is a text file which can be processed via the import function of MS Excel or similar spreadsheet applications.

7.4.3 Importing APP log data to an MS Excel spreadsheet

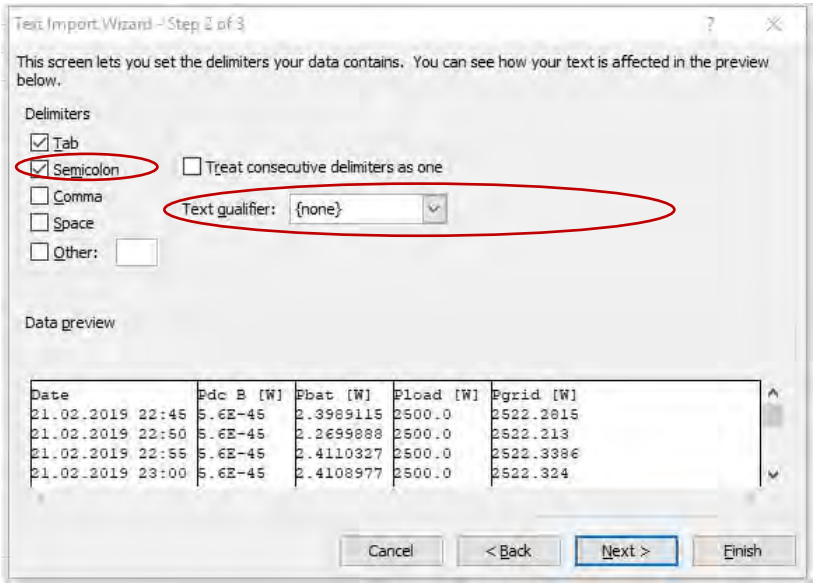
The log data file can be imported into a spreadsheet program. It can be saved, processed or possibly added to a sequential file. (The import procedure is described below using MS Excel for Windows).

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

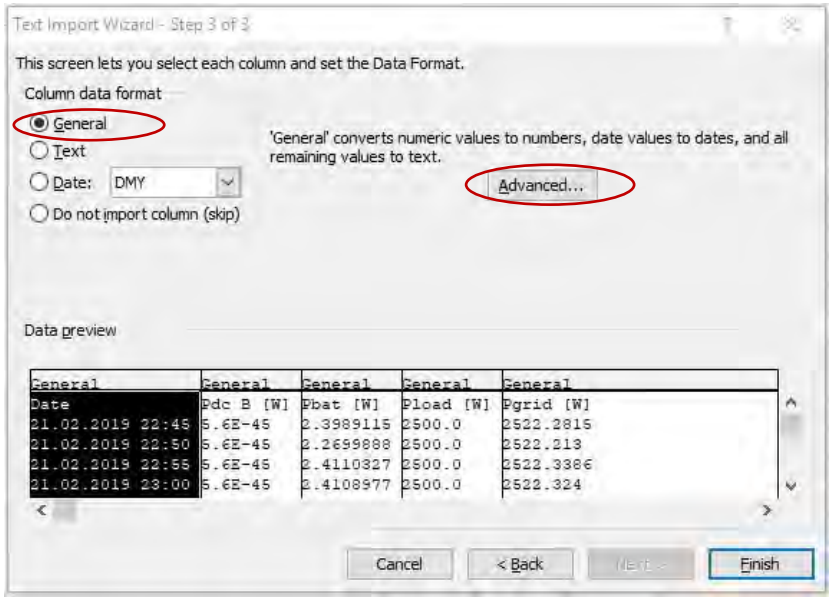


Ensure that the appropriate attributes are selected. For Original Data type: "Delimited" and for File origin: "MS-DOS (PC-8)". Continue the wizard by clicking "Next".

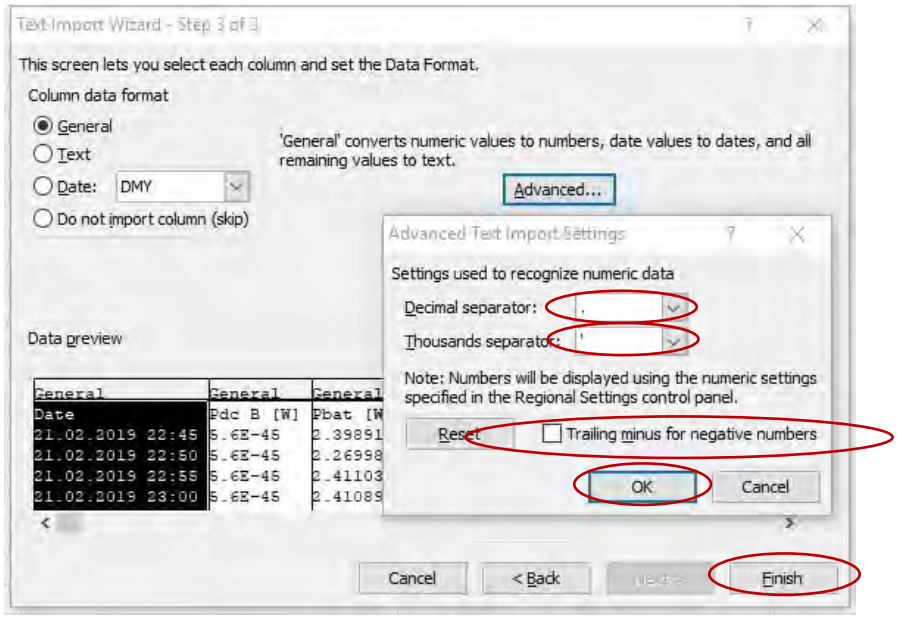
2. For Delimiters set the tick mark at "Semicolon" and select "None" for Text qualifier. Continue the wizard by clicking "Next".



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



4. In the advanced import settings dialogue box select "." as decimal separator, and " ' " as 1'000 separator.
Remove the tick mark for "trailing minus sign for negative numbers".
Confirm your selections with "OK".



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

5. Clicking "OK" 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 3 options for power reduction:

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

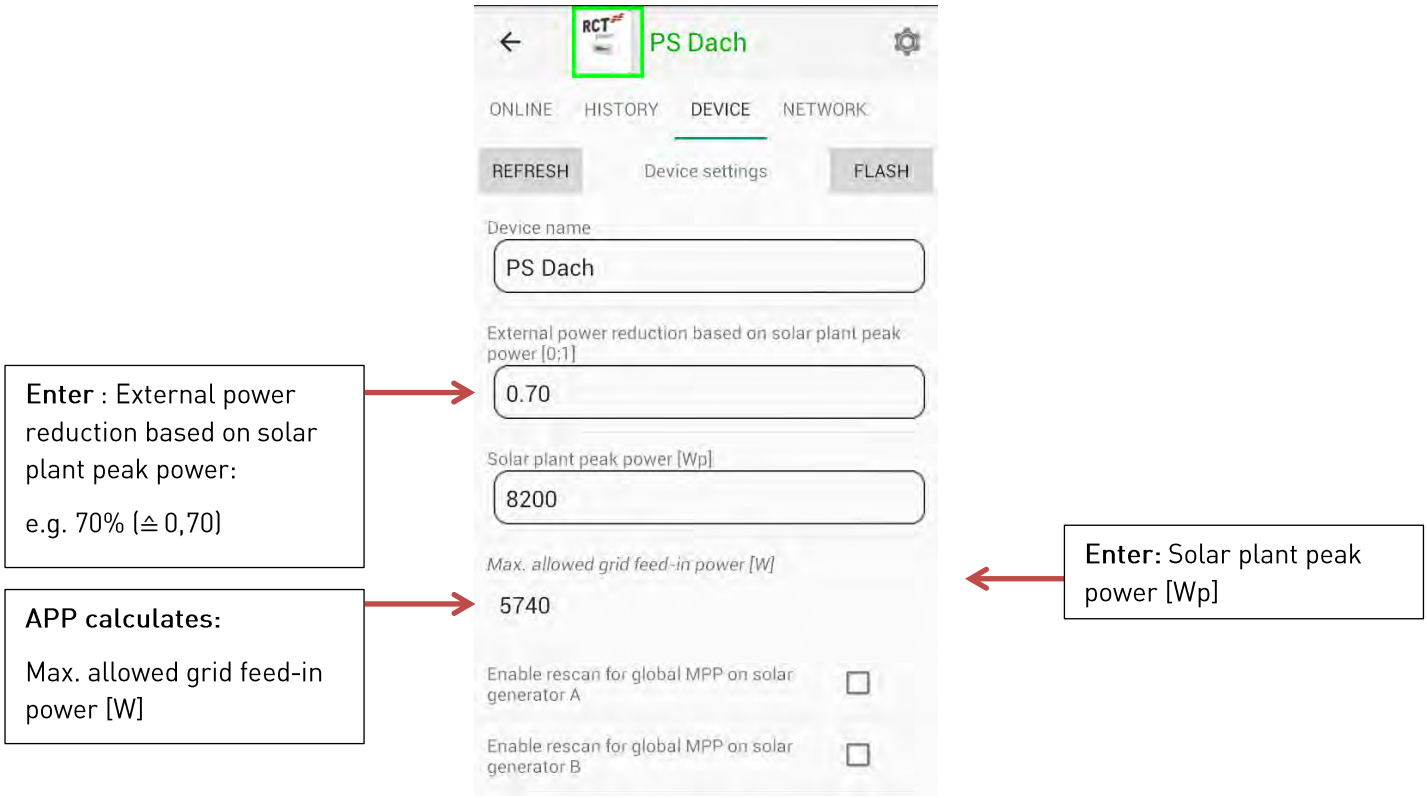
8.1.1 Fixed power reduction

To configure fixed power reduction, there's no additional hardware needed.

App Configuration:

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 Dynamic power reduction with external energy meter

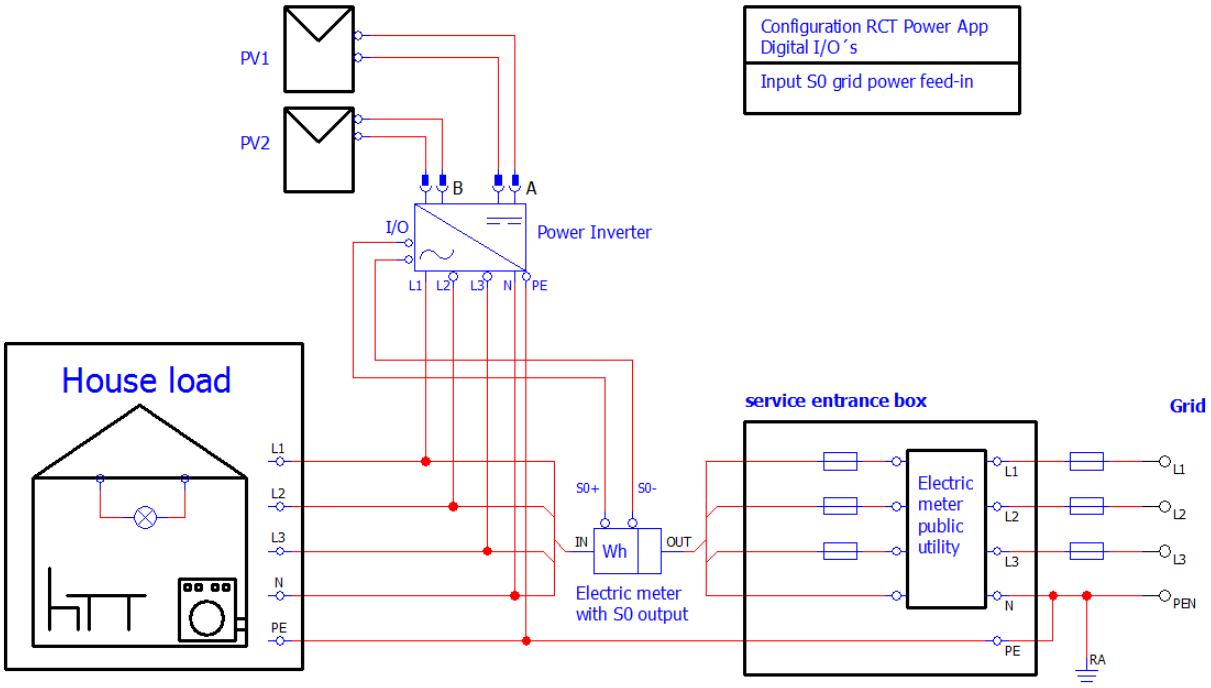
To obtain maximum yield out of solar plant there's the possibility to configure dynamic power reduction.

You can use solar power that exceeds configured power reduction threshold for self-consumption by measuring real power feed in public grid.

For this an external energy meter with S0-interface is needed: p.e. DRT428DC-V3

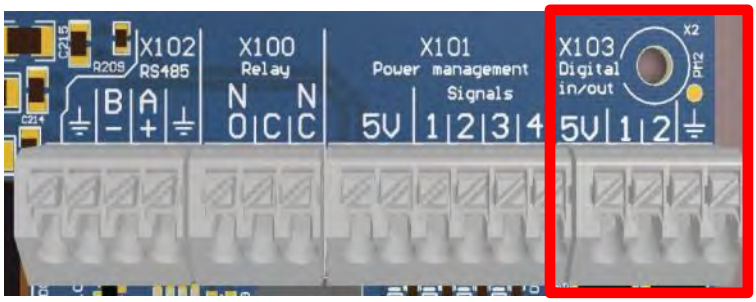
Recommended impulse ratio of energy meter is between 1000 and 2000 impulses/kWh.

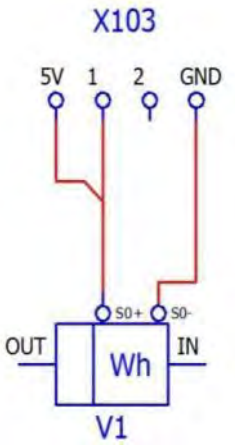
Installation of energy meter:



Commissioning / wiring:

Connect cabling from S0-interface of energy meter to concerning clamps X103 on communication board.

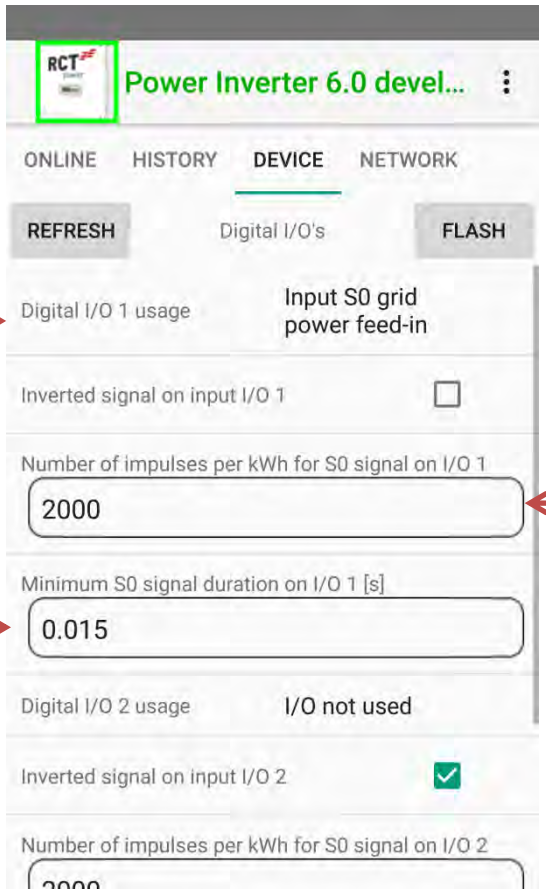




APP configuration:

- Configure power reduction according to "fixed power reduction ratio" (8.1.1.)
- Continue with Device → Settings → Interfaces → Digital I/Os and configure

(Example is for use of Digital I/O 1 and Impulse ratio of 2000).



Use of Digital I/O 1 (X103/1) as Input grid power feed in

Impulse ratio of used energy meter

Pulse length should be minimum 15ms.

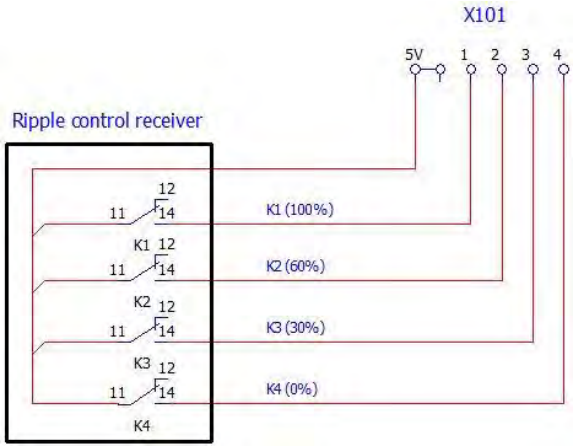
Value should not be modified

Please notify, that the settings are only stored permanent, if they are flashed! Therefore it's necessary to press "Flash" after terminating all settings. Otherwise settings will be resetted after shutdown of inverter.

8.1.3 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 power reduction when the relay statuses change.

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 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.

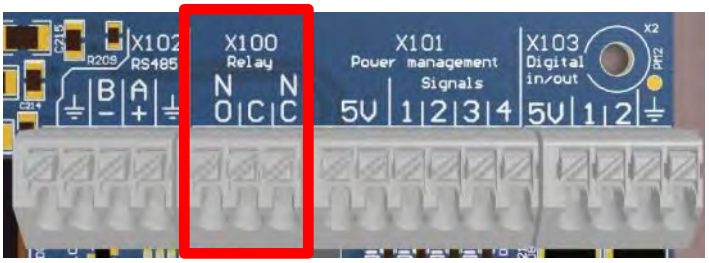
8.2 Multifunctional Relay

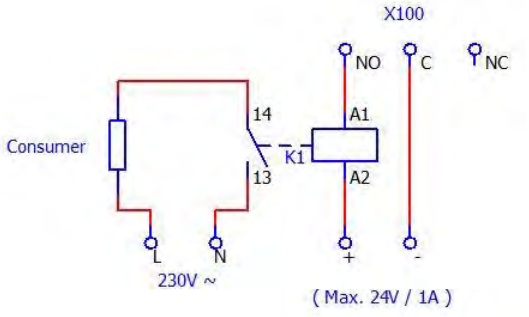
8.2.1 Multifunctional Relay deployed in "Load mode"

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:

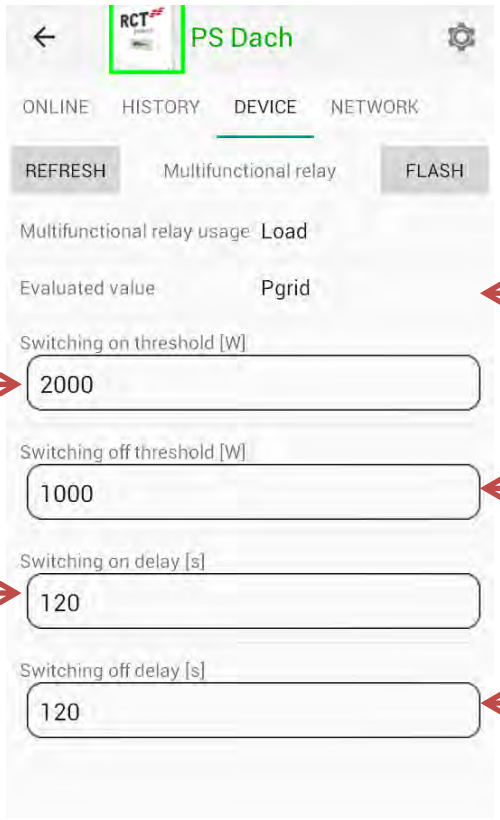
Connect the cables for the power supply (max. 24V/1A) and the contactor to the terminals X100 on the I/O circuit board.





Configuration using the APP:

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



Switching on threshold:

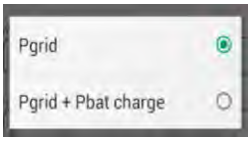
Relay switches on if measured value exceeds configured value.

Switching on delay:

The relay switches on when the switching on power is exceeded for longer than the configured delay time.

Evaluated value

Please select your corrresponding option:



Switching off threshold:

Relay switches on if the measured value is below the configured value.

Switching off delay:

Relay switches on if the measured value is below the configured value.

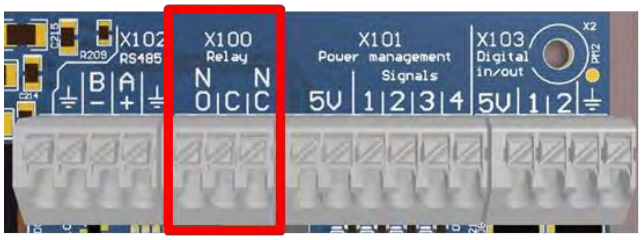
Changes to settings are only saved permanently if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

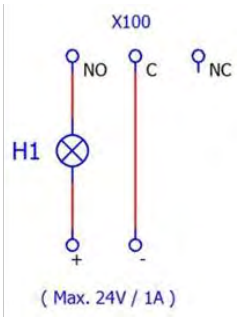
8.2.2 Multifunctional Relay deployed in "Alarm" mode

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 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.

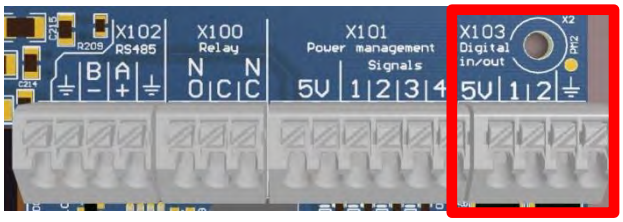
Changes to settings are only saved permanently if they are flashed to the inverter's memory!
It is therefore essential to press "FLASH" to confirm your settings changes. They will otherwise be lost when the inverter is switched off.

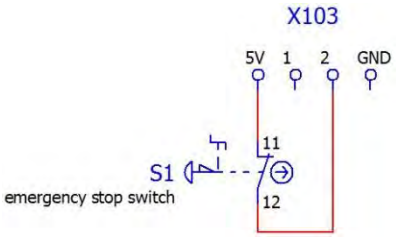
8.3 Configuration of the Emergency Stop Switch

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". Tick the box 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 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.

8.4 Configuration of the External Display

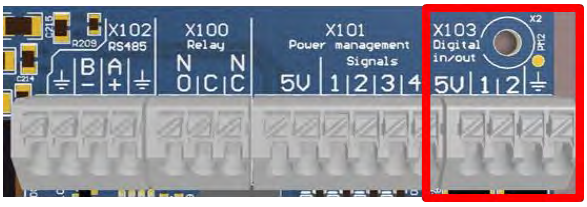
An external display with S0 input can be utilised using the digital I/O connections on the I/O board.

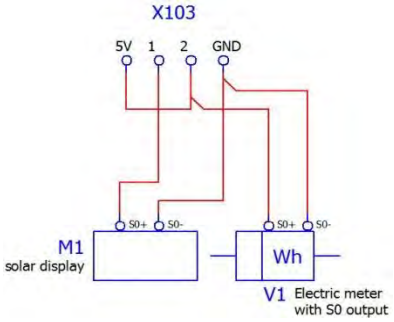
The following four options are available for the external display configuration:

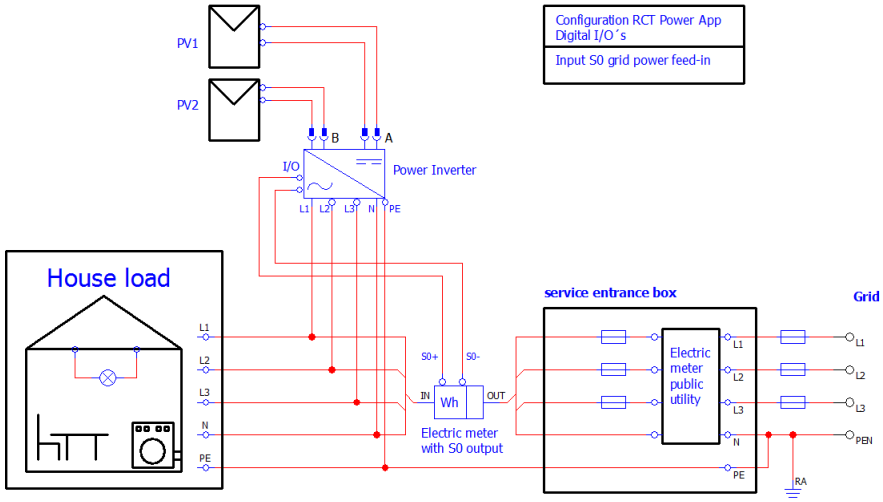
Option 1:	Household consumption	(Output S0 household power) // external meter required!
Option 2:	Grid Feed-in	(Output S0 grid power feed-in) // external meter required!
Option 3:	Plant power	(Output S0 inverter power)
Option 4:	AC power single inverter	(Output S0 device power)

Commissioning / Wiring:

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

8.5 Networking of multiple RCT Power inverters via LAN / WLAN

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

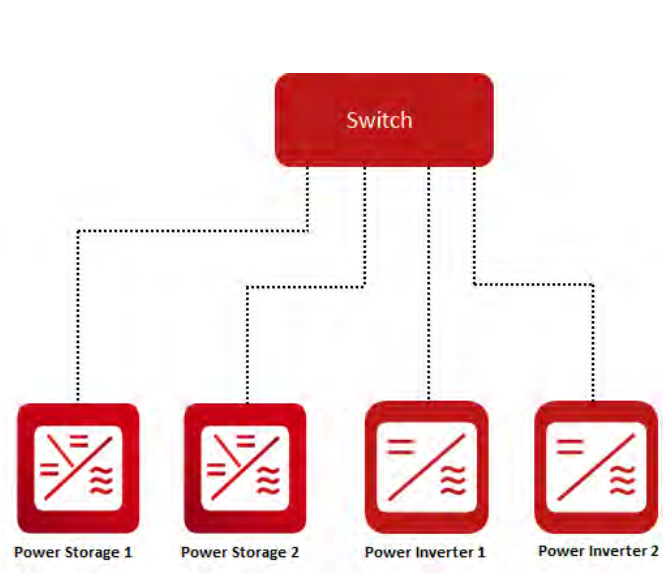


Fig. 1: Device networking via switch [4 clients]

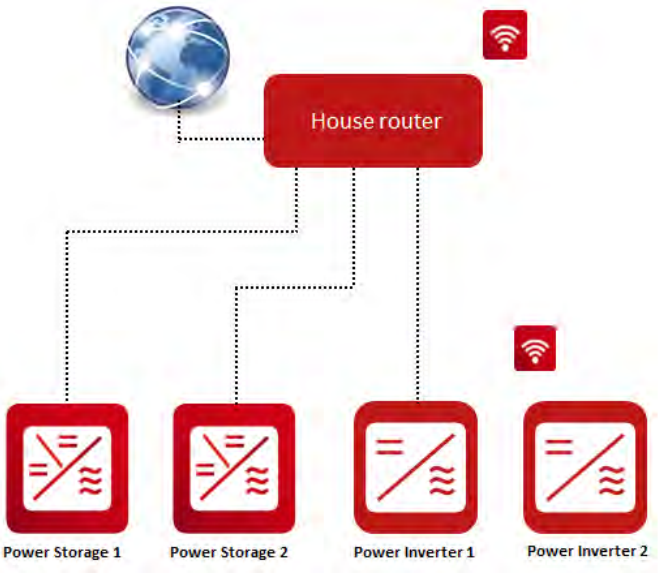


Fig 2: Device networking via router [4 clients]

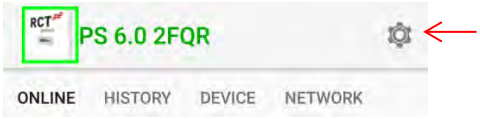
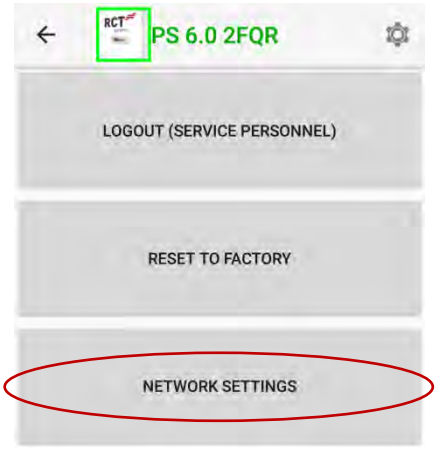
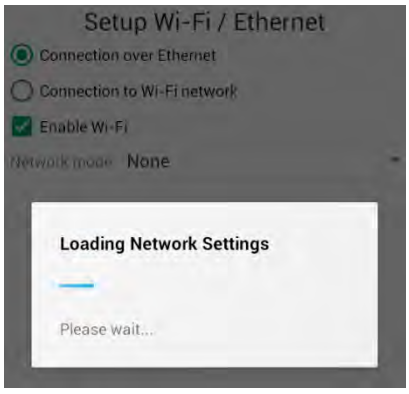
Use the RCT Power APP to integrate multiple devices of RCT Power Storage and RCT Power Inverters into your home network. Integration must be performed for the Master device and all slave devices separately.

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

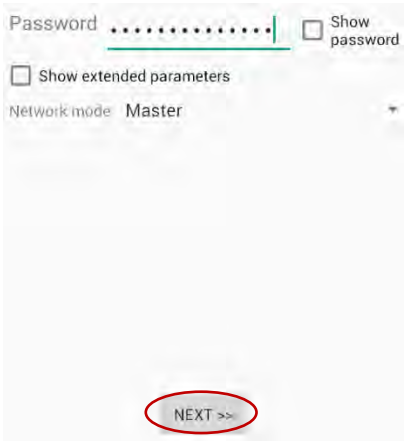
Please note: Software version 4464 or later must be installed for the RCT Power Inverter /RCT Power Storage to ensure that the integration of multiple inverters into the home network is successful.

8.5.1 Integration Master device

Please use the 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 Set-up icon“ ⚙ “.	
3	Tap on "LOGIN".Enter the password in the dialogue box and press “OK“ to enter the configuration options screen. (Login Installer Area, password: “installer“, Login Customer Area, password: “********“)	
4	Press "NETWORK SETTINGS" and wait while the network settings load.	 
5	Expand the selection list for "Network mode" and select "Master".	

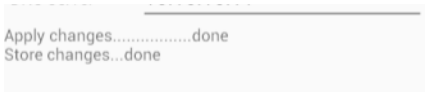
6 Press "NEXT >>" to continue.



7 Set slider button for "Obtain an IP address automatically" to "OFF" and tap "FINISH".

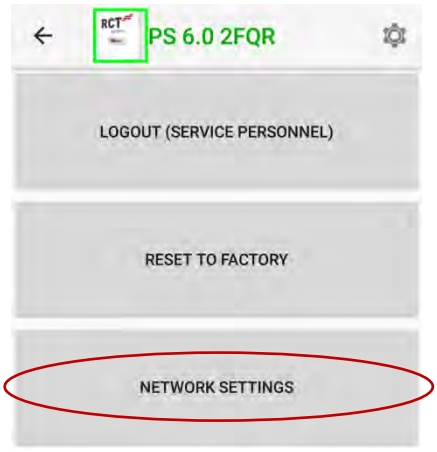
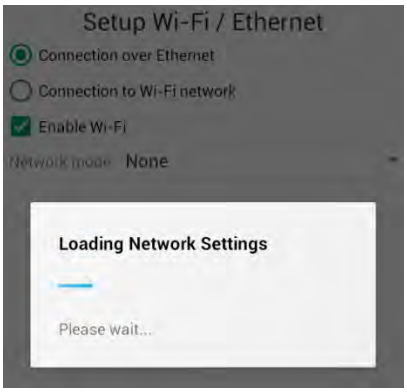
An IP address of 0.0.0.0 usually indicates that a device is not connected to a TCP/IP network. Connect your device to your home network to obtain a valid IP address (see section 7.1.6). If you are connecting your device to the home network using a network switch obtain the IP address from the switch.

Make 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.

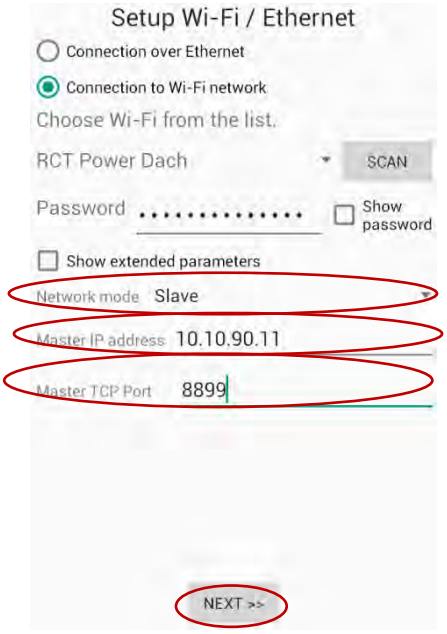
8.5.2 Integration Slave device

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 Set-up icon“ ⚙ “.	
3	Tap on "LOGIN" Login.Enter the password in the dialogue boxand press “OK“ to enter the configuration options screen. (Login Installer Area, password: “installer“, Login Customer Area, password: “********“)	
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 Set slider button for "Obtain an IP address automatically" to "OFF" 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 7.1.6). 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.

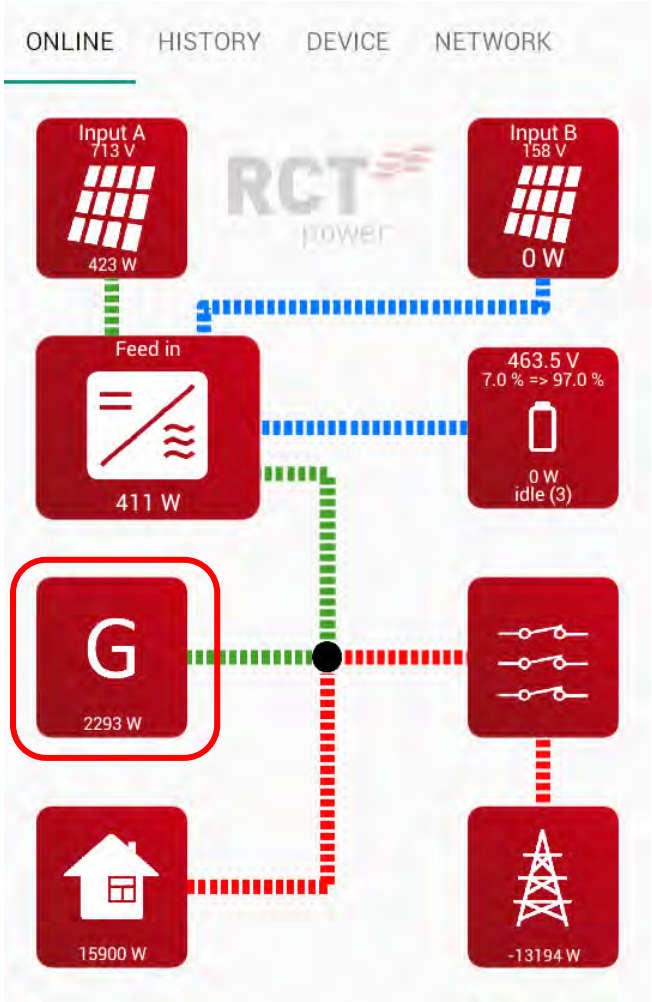
Please use this procedure to integrate all slaves in the system!

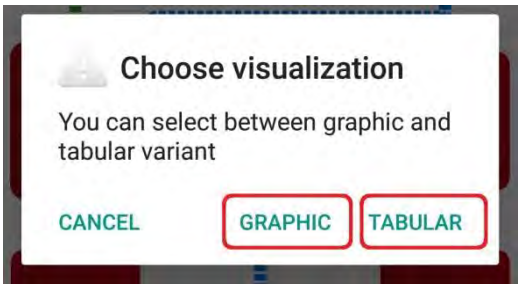
8.5.3 System Visualisation

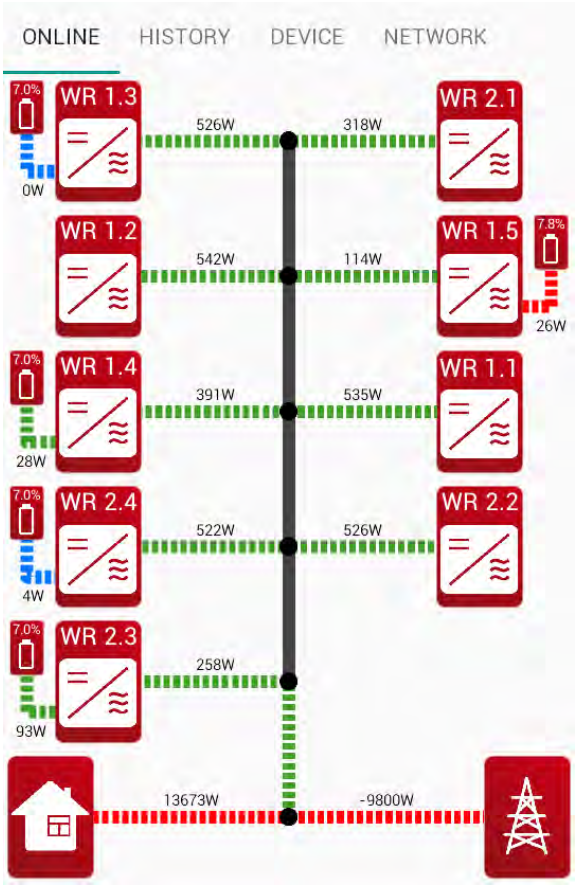
The Master device distributes the parameters house load, network power, system peak power, power reduction factor, max. permitted feed-in power and SOC target in the network.

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.:







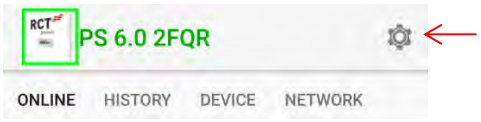
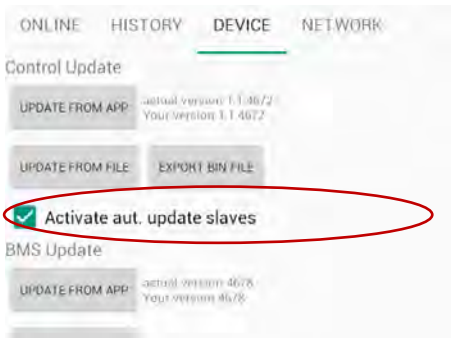
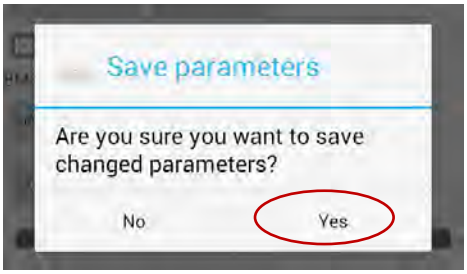
Example: system view "Graphic"

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)

8.5.4 Firmware update via network

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

Step	Description	
1	Launch "RCT Power APP" and establish connection to your Master device.	
2	Press the Set-up icon" ⚙ ".	
3	Tap on "LOGIN" Enter the password in the dialogue box and press "OK" to enter the configuration options screen. (Login Installer Area, password: "installer", Login Customer Area, password: "********")	
4	Go to "DEVICE"→ "Settings" → "Update". Under "Control Update" set tick mark for "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 the 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.

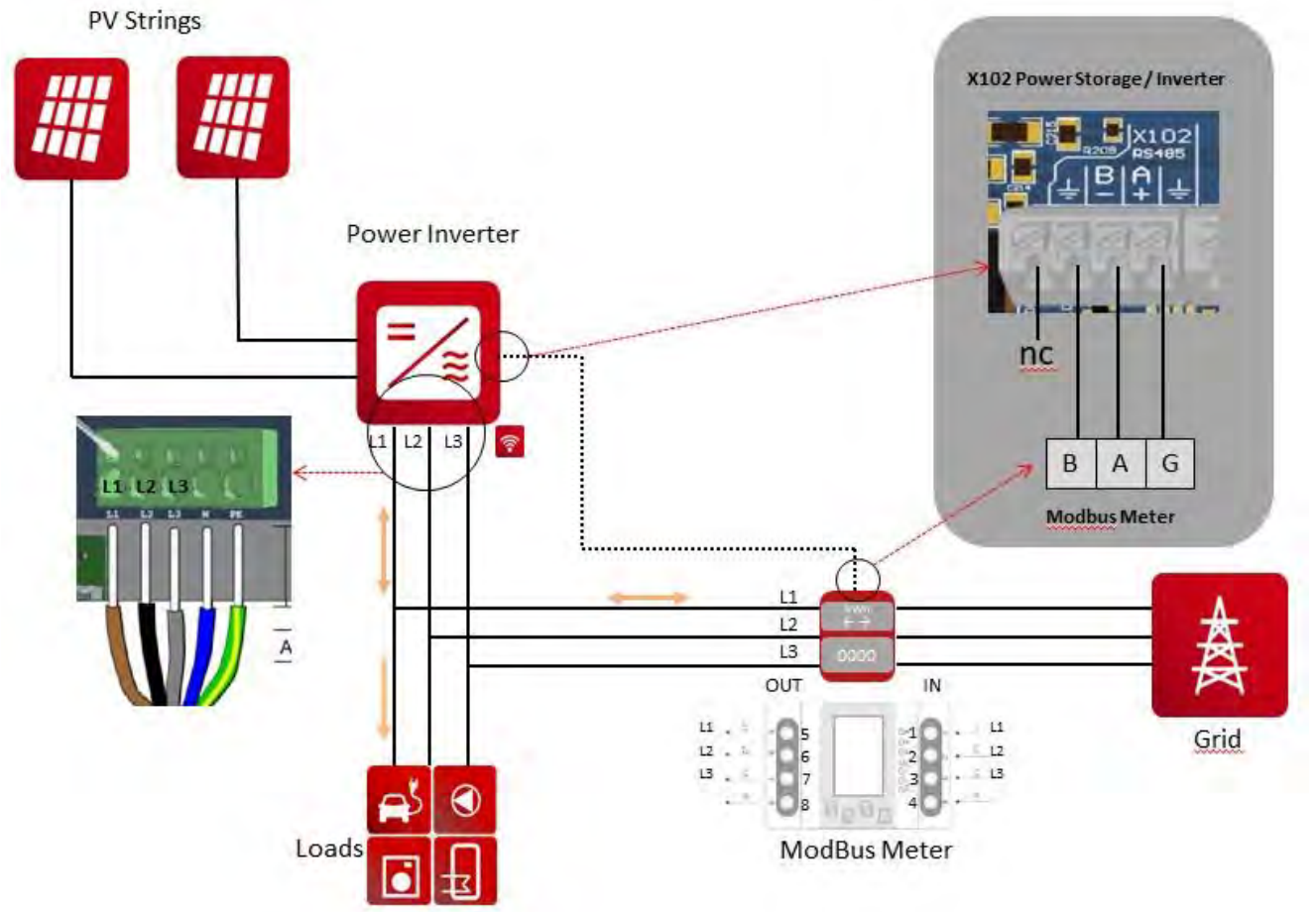
8.6 Connecting a ModBus-meter to the Power Inverter (with or without radio transmitter module)

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

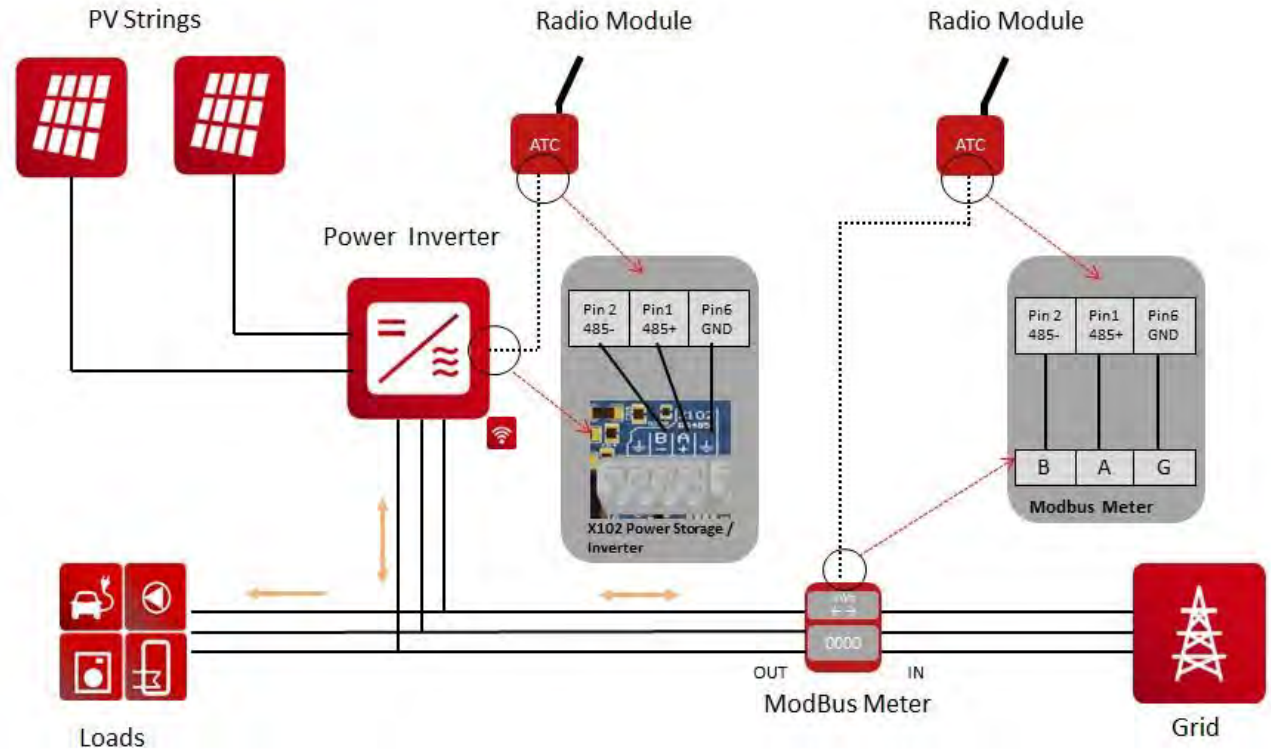
Connections over distances of up to 500m are possible. If it is not possible or unpractical to lay cables over this distance a radio transmitter (868 MHz frequency band) can be used instead.
The Power Storage DC is equipped for the connection of the following meter type:

- SDM630-Modbus-V2 (Art.Nr. RCTPOWER: ZDZ08101AF0)
- Radio Transmitter ATC-871-S2 (2pieces-Set) (Art.Nr. RCTPOWER: ZFM86800AF0)

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).

Configuration Modbus Meter with or without radio transmitter module:

Please note: Software version 4464 or later must be installed for the RCT Power Inverter /RCT Power Storage to ensure that the connection of bidirectional meters is succesful.

Launch the "RCT Power APP".

Press the Set-up icon " " Tap on "LOGIN" Login.

Enter the password in the dialogue box and press "OK" to enter the configuration options screen. (Login Installer Area, password: "installer")

Follow Menu path "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".

8.7 Software update for inverter

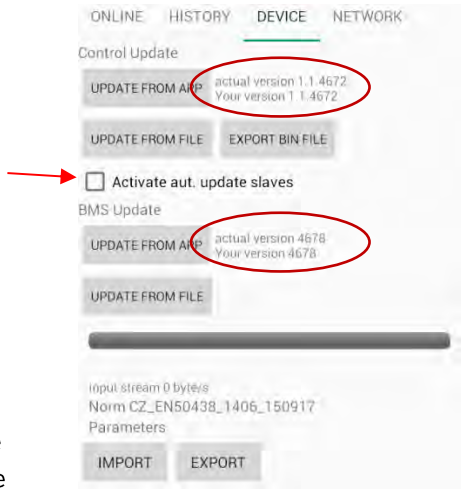
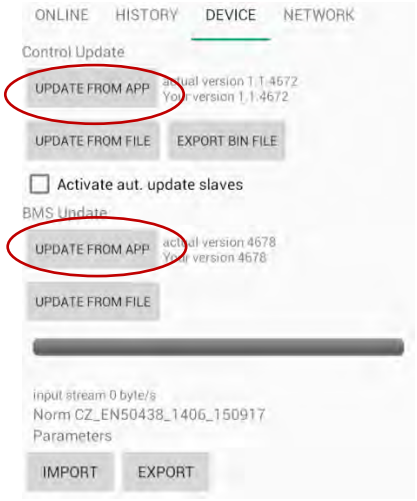
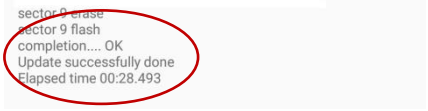
We are continuously working on the improvement and development of our products. Product software is updated and published at irregular intervals. Please use the following procedure to update your device to the latest software version:

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". Latest software version available: → actual version XXXX The software version currently installed on the device: → your version XXXX If the two version numbers match, the system is up to date. 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 8.7.4 for further details)	
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". After you have confirmed the safety questions in the dialogue boxes the update will start. Update progress is displayed with a yellow bar. Check that the update has been completed successfully. 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. 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. Check PV-voltage and ask grid provider about grid stability. If error still occurs, contact technical hotline
U_SG_A U_SG_B	Your power inverter is approved for a max. open-circuit solar generator voltage of 1000 V. All components are sufficiently dimensioned with a safety factor. If the threshold is exceeded, the Power Inverter stops feeding.	Max. allowed DC-voltage was exceeded: Check dimensioning of PV-generator. Reduce the number of modules in series and carry out commissioning again.
THROTTLE_L1_OVERCURRENT THROTTLE_L2_OVERCURRENT 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. If problem occurs permanent or very often, please contact service.
UL_UNDER_L1_LV1 UL_UNDER_L2_LV1 UL_UNDER_L3_LV1	Your power storage continually monitors voltage level of grid. When the minimum permissible limit of level1 is dropped below, Power Inverter stops feeding.	Check grid voltage level and / or ask grid provider about grid stability.
UL_UNDER_L1_LV2 UL_UNDER_L2_LV2 UL_UNDER_L3_LV2	Your power storage continually monitors voltage level of grid. When the minimum permissible limit of level2 is dropped below, Power Inverter stops feeding.	Check grid voltage level and / or ask grid provider about grid stability.
UL_OVER_L1_LV1 UL_OVER_L2_LV1 UL_OVER_L3_LV1	Your power storage continually monitors voltage level of grid. When the maximum permissible limit of level1 is exceeded, Power Inverter stops feeding.	Check grid voltage level and / or ask grid provider about grid stability.
UL_OVER_L1_LV2 UL_OVER_L2_LV2 UL_OVER_L3_LV2	Your power storage continually monitors voltage level of grid. When the minimum permissible limit of level2 is exceeded, Power Inverter stops feeding	Check grid voltage level and / or ask grid provider about grid stability.

GRID_UNDERVOLTAGE_UL1 GRID_UNDERVOLTAGE_UL2 GRID_UNDERVOLTAGE_UL3	Your power Inverter continually monitors voltage level of grid. In case of spikes on the feeding phase the Power Inverter stops feeding and restarts.	Check grid voltage level and phase wiring between L1, L2, L3 and N. Ask grid provider about grid stability.
LT_OVERVOLTAGE_L1 LT_OVERVOLTAGE_L2 LT_OVERVOLTAGE_L3	Your Power Inverter continually monitors voltage level of grid. 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. Your inverter feeds into a spur line, which is insufficiently dimensioned. Check grid voltage level and / or ask grid provider about grid stability.
FL_OVER_LV1 FL_UNDER_LV1	Your Power Inverter continually monitors the grid frequency. If this is outside of the permitted level 1, inverter stops feeding.	Ask grid provider about grid stability.
FL_OVER_LV2 FL_UNDER_LV2	Your Power Inverter continually monitors the grid frequency. If this is outside of the permitted level 2, inverter stops feeding.	Ask grid provider about grid stability.
SW_ON_UMIN_L1 SW_ON_UMIN_L2 SW_ON_UMIN_L3	Your Power Inverter continually monitors voltage level of grid before starting to feed in. 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 SW_ON_UMAX_L2 SW_ON_UMAX_L3	Your Power Inverter continually monitors voltage level of grid before starting to feed in. 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 SW_ON_FMAX	Your Power Inverter continually monitors the grid frequency. If this is outside of the permitted level, inverter doesn't start feeding.	Ask grid provider about grid stability.
PHASE_POS	Your Power Inverter is equipped with a redundant grid monitoring according to VDE-AR-N 4105:2011-08 and constantly monitors the grid. If phase position between the individual conductors changes, Power Storage stops feeding.	Check phase wiring. Ask grid provider about grid stability.
ISO	Before connection to grid, your Power Inverter checks the PV-system for a possible earth fault or insulation fault. If an insulation error is detected, Power Inverter doesn't start feeding.	Check the PV-system for possible insulation faults (e.g. pinched-off DC lines etc.). The measured insulation resistance must be at least 400 kOhms.
AFI_30mA AFI_60mA AFI_150mA AFI_300mA	Your Power Inverter is equipped with a universally sensitive AFI according to VDE-AR-N 4105:2011-08. This monitoring device has detected a fault current. Inverter stops feeding.	Check your PV-system for possible insulation faults.

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. Check if the operating noise of the inverter is normal.	Half-yearly
Electrical connections	Check that all cables are tight. Check that all cables are intact. Ensure that waterproof caps cover all unused connections. 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.

This manual, in whole or in part, may not be reproduced, transmitted, copied or translated into other languages in any form or by any means, without the prior written permission of RCT Power GmbH.
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 Inverter	4.0	5.0	6.0
Order Number	IXP040N1AE0	IXP050N1AE0	IXP060N1AE0
DC-INPUT			
Max. recommended DC power	5000 W	6250 W	7500 W
MPPT	2 (paralleling possible)		
Input per MPPT	1		
Maximum DC-current perMPPT	2 x 12 A (24 A in parallel mode)		
Rated DC voltage	700 V		
DC Start up voltage / power	150 V / 25 W		
DC voltage range	140 V ... 1000 V		
MPP voltage range	200 V ... 800 V	220 V ... 800 V	265 V ... 800 V
Maximum voltage DC	1000 V		
Connector type	Weidmüller PV-Stick (MC4 compatible)		
AC-OUTPUT			
Rated AC output power	4000 W	5000 W	6000 W
Maximum active power	4000 W	5000 W	6000 W
Maximum apparent power	6300 VA	6300 VA	6300 VA
Nominal AC current per phase	5,8 A	7.3 A	8.7 A
Maximum AC current per phase	9,1 A	9.1 A	9.1 A
Rated frequency	50 Hz / 60 Hz		
Frequency range	45 Hz ... 65 Hz		
Max. switch-on current	13 A, 0,1ms		
Max. fault current (RMS)	285 mA		
Rated AC voltage	230V / 400V (L1, L2, L3, N, PE)		
AC voltage range	180V ... 270V		
Total harmonic distortion (THD)	< 2% at rated power		
Reactive power factor (cos phi)	1 (adjustable range 0,8 cap....0,8 ind)		
Anti-islanding operation	Yes		
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		
Grid voltage monitoring	3-phase		
Type of AC connection	Spring clamps		
PERFORMANCE DATA			
Stand-by consumption	< 4.0 W		
Maximum efficiency	98,16%		
European efficiency	97,6%	97,7%	97,9%
Topology	Transformerless		

OTHERS

PV – DC -switch	Integrated
DC overvoltage category	II
AC overvoltage category	III
Data interface	WI-FI, LAN, RS485, Multifunctional dry contact, 4x digital in, 2x digital in/out
Display	LCD dot matrix 128 x 64 with backlight
Cooling	Convection
IP degree of protection	IP 65
Max. operating altitude	2000 m
Max. relative humidity	4 - 100% (non condensing)
Typical noise	< 35 dB
Operating temperature range	-25°C ... 60°C (40°C at full load)
Type of installation	Wall mounting
Dimensions (height x width x depth)	570 x 440 x 200 mm
Weight	22 kg

SAFETY / STANDARDS

Safety class	1
Overload behaviour	Working point adjustment
Certificates	CE, VDE-AR-N 4105:2011-08, EN 50438 Further certificates: 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 DIAGRAMM