



K A C O 
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KACO blueplanet 3.0 NX1 M2
KACO blueplanet 3.7 NX1 M2
KACO blueplanet 4.0 NX1 M2
KACO blueplanet 5.0 NX1 M2

Quick installation guide

■ English version



Authorized electrician
Important safety instructions

These instructions form part of the product and must be observed. They must also be stored in a place which is always freely accessible.

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1 NX1 Setup app

1.1 App download

The app is available to download on Apple App Store and Google Play Store (currently the app for Android is only available for download on KACO website under the software download section of the NX1 inverters. It will be available in Play Store soon).

The app can be searched by the name “KACO NX1 Setup”. Once installed it will appear as “KacoTool” on the smartphone (Android and iOS). The app is compatible with Android Oreo 8.0 and higher, and with Apple iOS 11 and higher.

2 WLAN Network Configuration

2.1 Authorization

The app will automatically connect to the Wi-Fi Stick hotspot via SSID and password in QR code, so the app needs certain permissions to access the device of smart phone (Android and iOS) as below:

🔄 Access the device of smart phone.

1 Photo and media permission.

2 Location permission.

3 Device information permission.

4 Picture and video permission

5 Location service.

» Proceed with network configuration

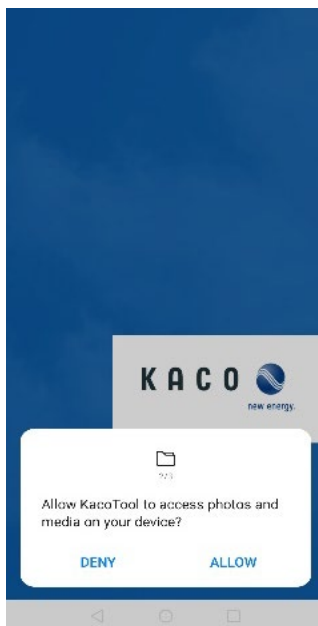


Fig. 1: Photo and media permission

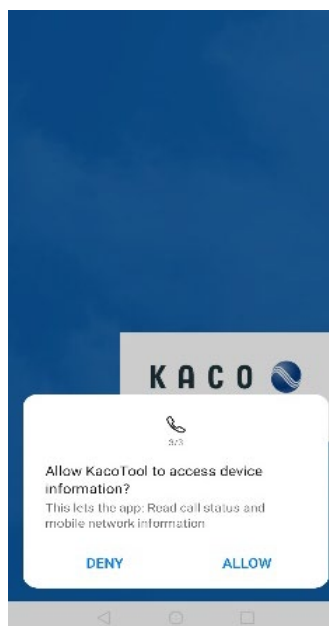


Fig. 2: Device information permission

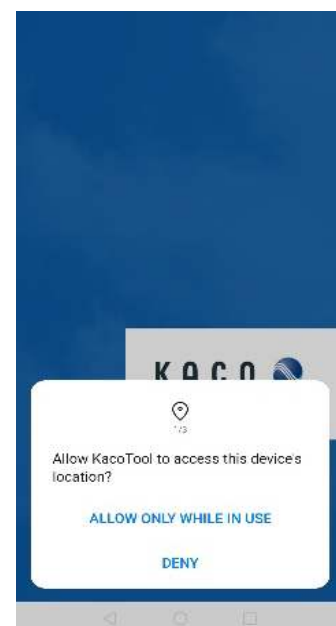


Fig. 3: Location permission

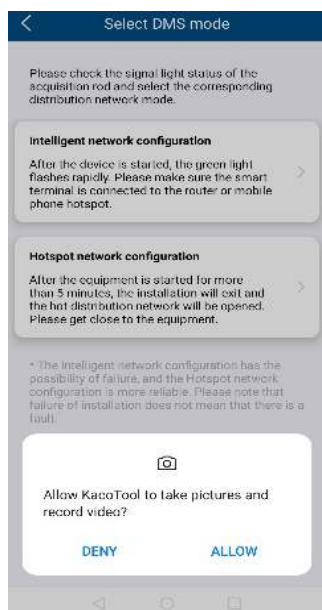


Fig. 4: Pictures and video

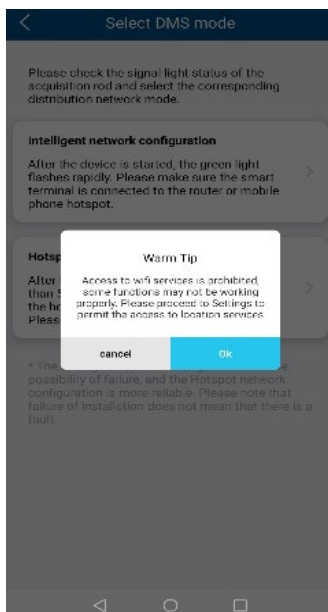


Fig. 5: Location services



NOTE

The permissions are not used to record user's phone data. Please grant these permissions to app.

2.2 Network configuration

Network configuration setting as below:

🔄 Network configuration setting.

- 1 Open the app and click the "INSTALLATION" button (The app will open the phone's camera).
 - 2 Scan the QR code on the Wi-Fi stick. The app will automatically connect to the Wi-Fi stick's hotspot.
 - 3 Click the "Select network" button, choose the Wi-Fi, SSID of the nearby router provides Internet network to Wi-Fi stick. You can also manually enter the router SSID.
 - 4 Fill in the password of SSID selected, click the "Ok" button to start the network configuration.
 - 5 Wait for the result of the network configuration.
- » Proceed with changing to another router, if the router the Wi-Fi stick is connected to does not work.

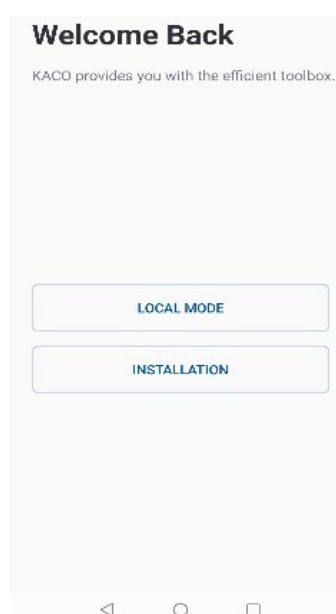


Fig. 6: Home page

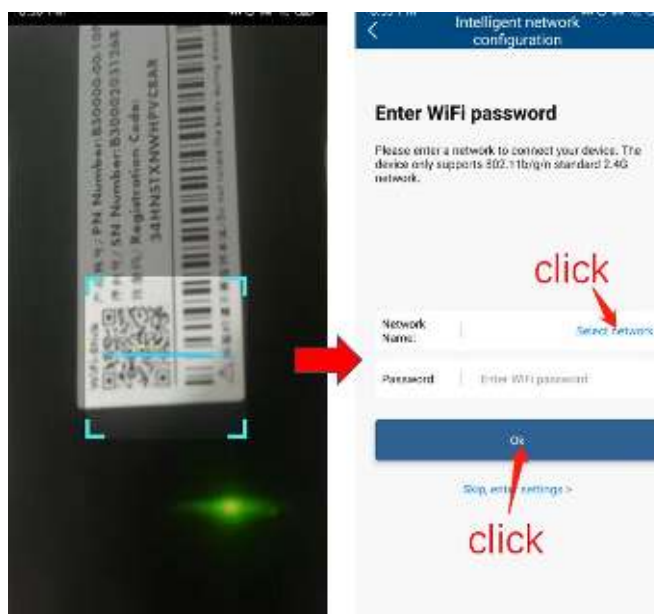


Fig. 7: Scan QR code

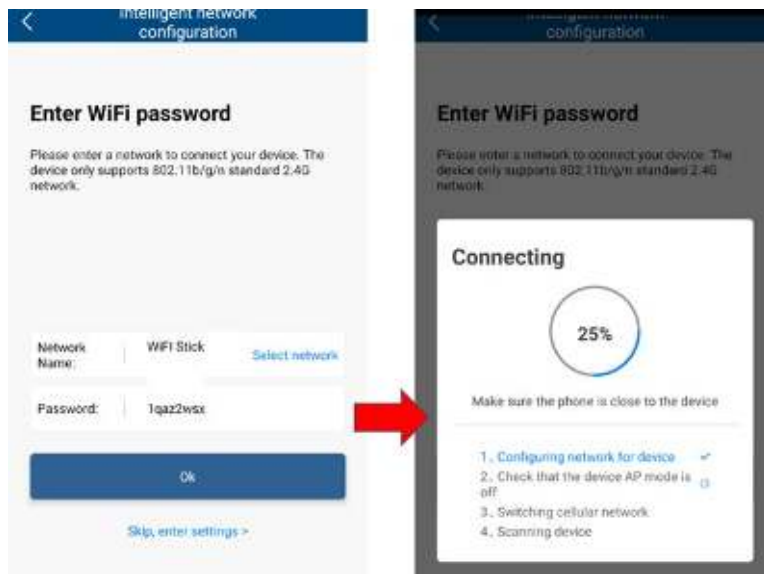


Fig. 8: Network configuration

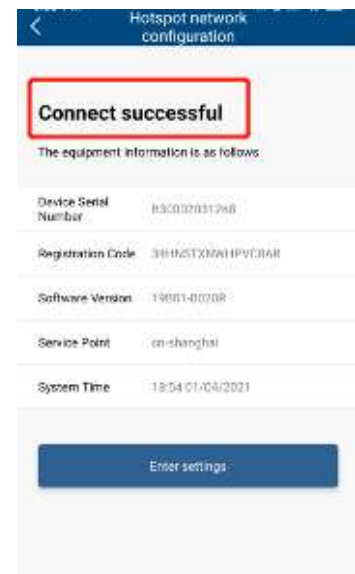


Fig. 9: Successful configuration

NOTE



Frequency band

Before the Network configuration, please prepare a WLAN router that supports 2.4G frequency band. Wi-Fi stick only supports 2.4G frequency band.

Installation position

Please keep the Wi-Fi stick within 10 meters of the router.

SSID and password of router availability

Wi-Fi stick only supports 32 characters SSID and password.

Connection to a different router

If you want the Wi-Fi stick to connect to another router:

🔄 Connect to another router.

- 1 Connect the smart phone to the router via Wi-Fi and open the app, click the "LOCAL MODE" button.
 - 2 Enter the "Monitor Device Details" page and click the "WLAN" option which shows the router connected now.
 - 3 Select the new router within the list and enter the password, click the "Confirm Settings" button in the "Router" page.
- » Proceed with inverter parameter settings.

If the Wi-Fi stick cannot connect to the router the blue LED light doesn't work. You can find the SSID of the Wi-Fi stick's hotspot named as the Wi-Fi stick's serial number in your WLAN list. You can connect to the Wi-Fi stick hotspot using the registration code on the label as the password.

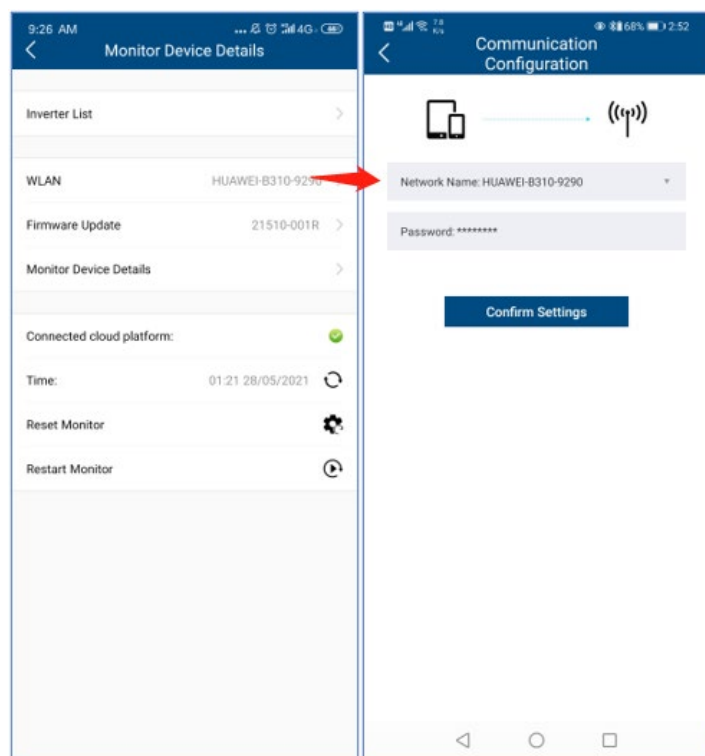


Fig. 10: Changing Wi-Fi network

3 Inverter Parameters Settings

3.1 Connect to Wi-Fi stick

3.1.1 Connect Wi-Fi stick directly through the Wi-Fi stick's hotspot

If you haven't configured the WLAN network to the Wi-Fi stick yet, you can find the Wi-Fi stick's SSID in the WLAN network list of your smart device. If you have configured the WLAN network to the Wi-Fi stick, but the blue LED light of the Wi-Fi stick doesn't work, you can find the Wi-Fi stick's SSID also in the WLAN list of your smart device. The password of the Wi-Fi stick's hotspot is the resist code on the Wi-Fi stick.

🔄 Connect Wi-Fi stick directly through the Wi-Fi stick's hotspot.

1 Open the app and click on "LOCAL MODE".

2 Click the "Scan device" button.

3 Select inverter from list

» Proceed with inverter parameter settings.

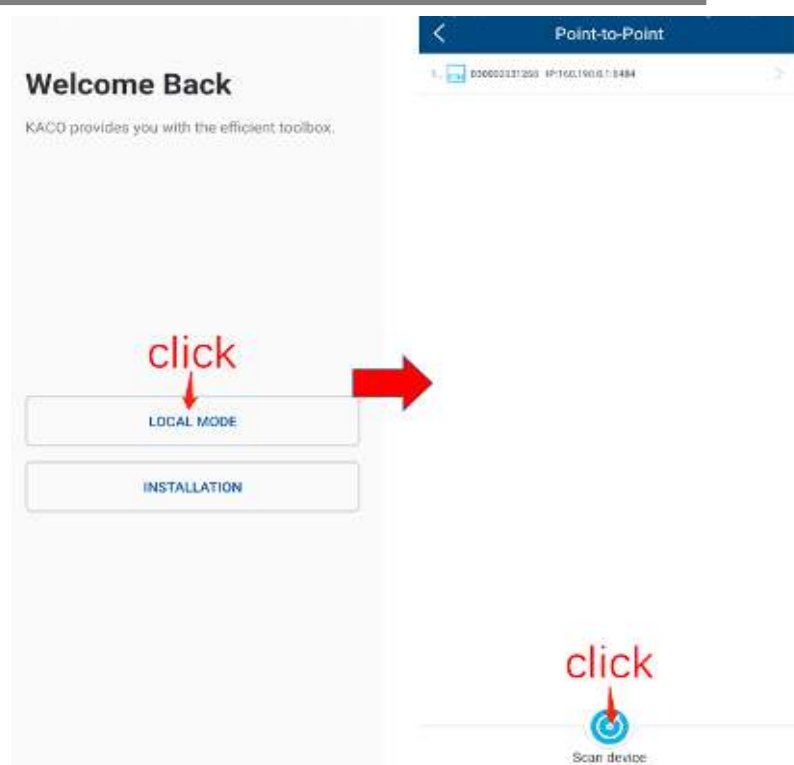


Fig. 11: Connect to Wi-Fi stick

3.1.2 Connect Wi-Fi stick through the router

If you have configured the WLAN network to the Wi-Fi stick and the blue LED light of the Wi-Fi stick works, you need to connect your smart phone to the router.

🔄 Connect Wi-Fi stick through the router.

1 Open the app and click on "LOCAL MODE".

2 Click the "Scan device" button.

3 Select inverter from list

» Proceed with inverter parameter setting.

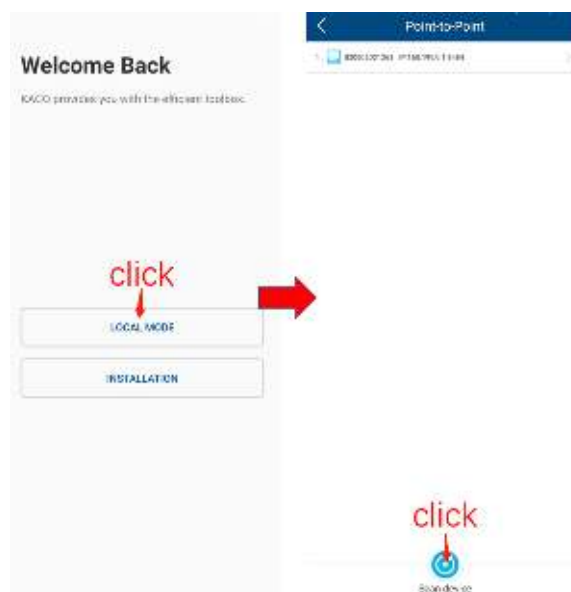


Fig. 12: Connect to Wi-Fi stick

NOTE



Can't find the smart Wi-Fi dongle in your WLAN list?

Sometimes you can't find the smart Wi-Fi dongle in your WLAN list:

- › Check the blue LED light: Blue light indicates a successful connection to the router
- › If the blue LED is not on try to scan again.

3.2 Inverter parameter settings

3.2.1 Connect to inverter

Connect to the Wi-Fi stick with the app.

↻ Enter the "Inverter list".

1. Enter the "Monitor Device Details" page
 2. Click the "Inverter List" item and enter the "Inverter List" page to connect to the inverter.
 3. Click the inverter serial number.
- » Proceed with inverter parameter settings.

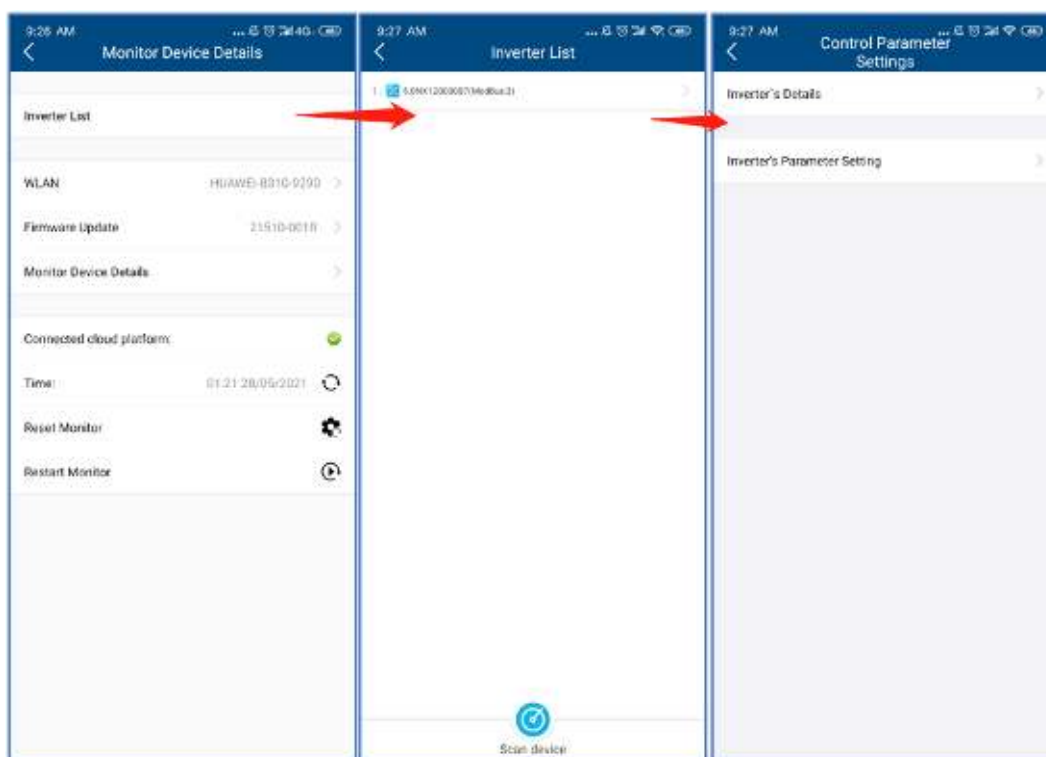


Fig. 13: Connect to inverter

NOTE

Scan device in Inverter List page

Under normal circumstances, you do not need to search for devices.

You might lose your previous inverter list and data due to the following cases:



- › The Wi-Fi stick has no communication with the inverter.
- › You have added a single inverter/multiple inverters to the Wi-Fi stick.
- › You have removed a single inverter/multiple inverters to the Wi-Fi stick.
- › You have replaced a single inverter/multiple inverters to the Wi-Fi stick.

By clicking on “Inverter's Parameter Setting”, you can set the inverter parameters. No passcode is required for the first use of these parameter settings during the initial inverter commissioning. If the inverter parameters need to be changed after the initial commissioning a passcode will be required. The inverter specific passcode can be obtained from KACO Service.

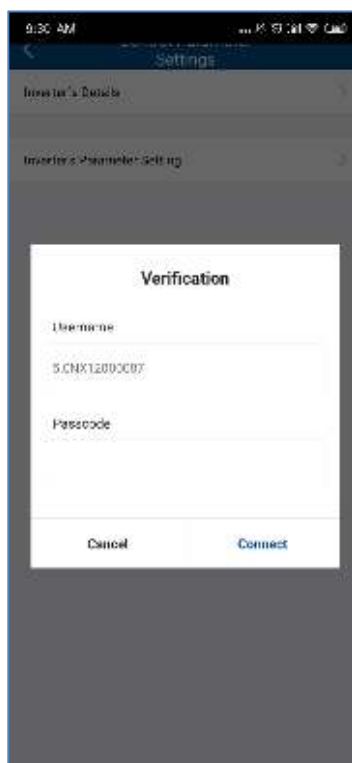


Fig. 14: Inverter passcode

3.2.2 Enabling Inverter functions

All required inverter functions can be activated by enabling them as shown below.

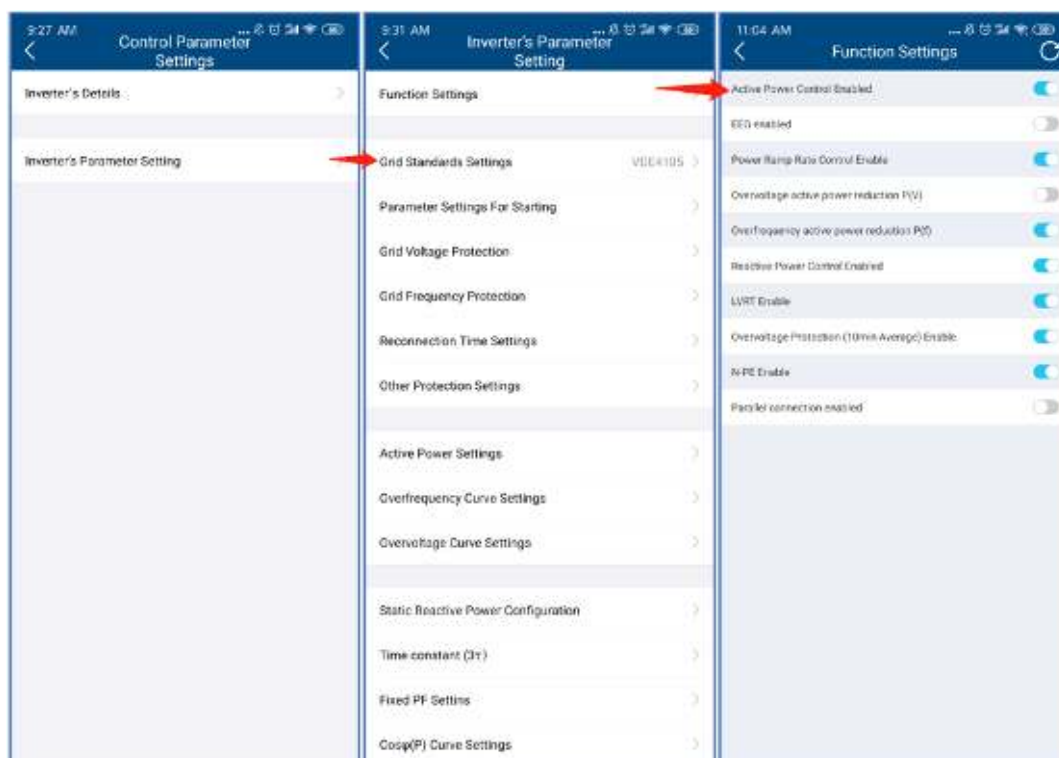


Fig. 16: Inverter function enable/disable

3.2.3 Inverter grid parameter setting: grid standards

The currently selected country standard is displayed on the right side of 'Country standard'.

To select the required local grid code please click on 'Grid Standard Settings'. The next page will display the country standard list. Here you can choose the right grid standard.

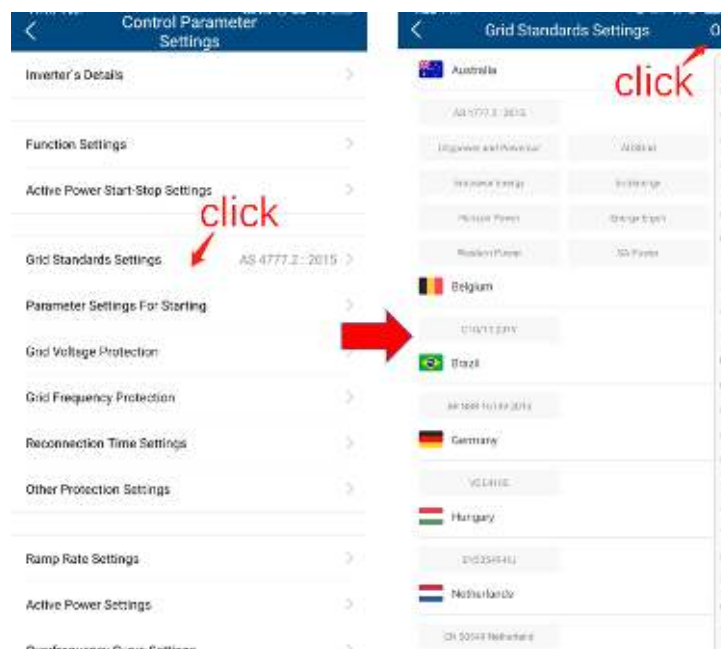


Fig. 17: Grid Standard

3.2.4 Inverter grid parameter setting: power up

Tap 'Parameter Settings For Starting', the next page will display the parameters.

The appropriate voltage range and frequency range for starting can be set according to the requirements of the local grid company.

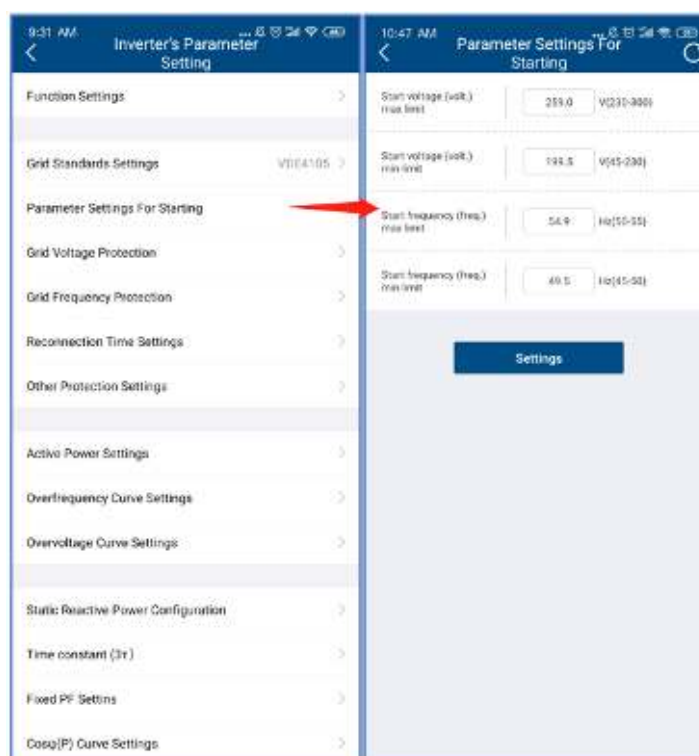


Fig. 18: Parameter settings for starting

3.2.5 Inverter grid parameter setting: voltage protection

Tap 'Grid Voltage Protection', the next page will display the parameters.

There are three threshold levels for the overvoltage and undervoltage protection. The first threshold means the smallest range, and the third threshold means the largest range.

All thresholds need to follow the principles as below:

1. The first maximum threshold \leq The second maximum threshold \leq The third maximum threshold
2. The first minimum threshold \geq The second minimum threshold \geq The third minimum threshold
3. The first threshold tripping time \leq The second threshold tripping time \leq The third threshold tripping time

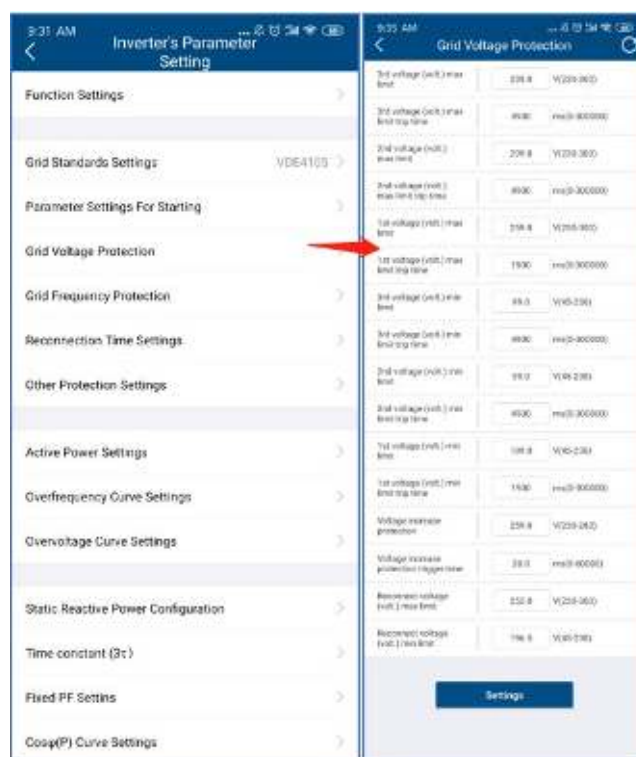


Fig. 19: Grid voltage protection

3.2.6 Inverter grid parameter setting: frequency protection

Tap 'Grid Frequency Protection, the next page will display the parameters.

There are three threshold level for the over-frequency and underfrequency protection. The first threshold means the smallest range, and the third threshold means the largest range.

All thresholds need to follow the principles as below:

1. The first maximum threshold \leq The second maximum threshold \leq The third maximum threshold
2. The first minimum threshold \geq The second minimum threshold \geq The third minimum threshold
3. The first threshold tripping time \leq The second threshold tripping time \leq The third threshold tripping time

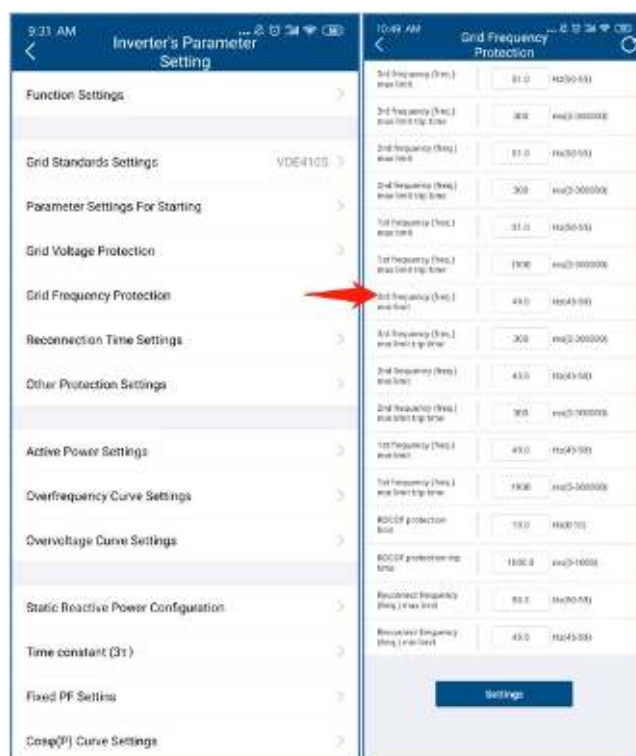


Fig. 20: Grid frequency protection

3.2.7 Inverter grid parameter setting: reconnection time

Tap 'Reconnection Time Settings', the next page will display the parameters.

The observation time during which all the voltage and the frequency values are observed to be within a specified range prior to the inverter connection or reconnection to the grid can be set in this page.

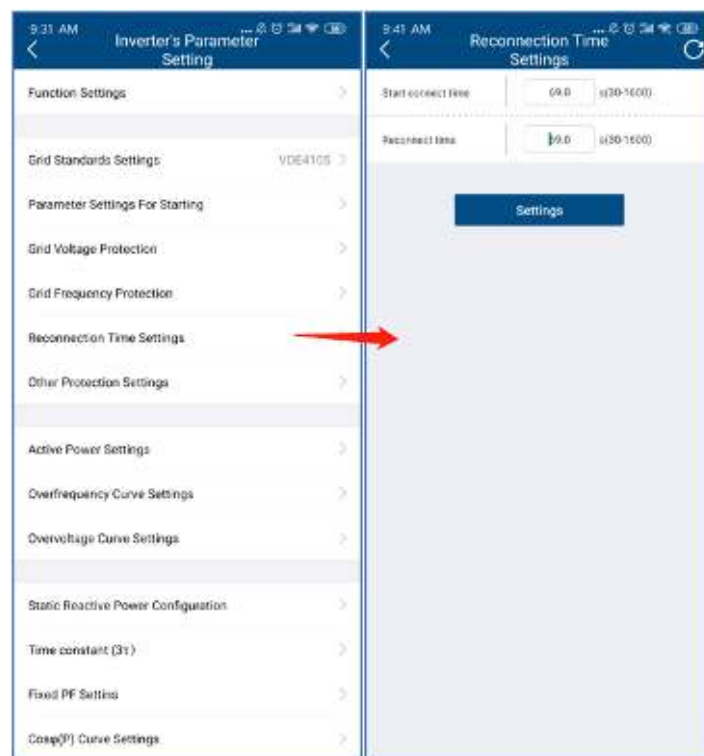


Fig. 21: Reconnection time

3.2.8 Inverter active power setting: power limit

During changing in AC operation and control or changing in energy source operation, the active power generated by the inverter shall not exceed a specified gradient expressed as a percentage of the active nominal power of the inverter per minute. You can set 'Active power gradient for increasing' and 'Active power gradient for reducing' according to the requirement.

The grid company maybe requires reduction of active power on set point. You can set 'Active power limit' according to the requirement.

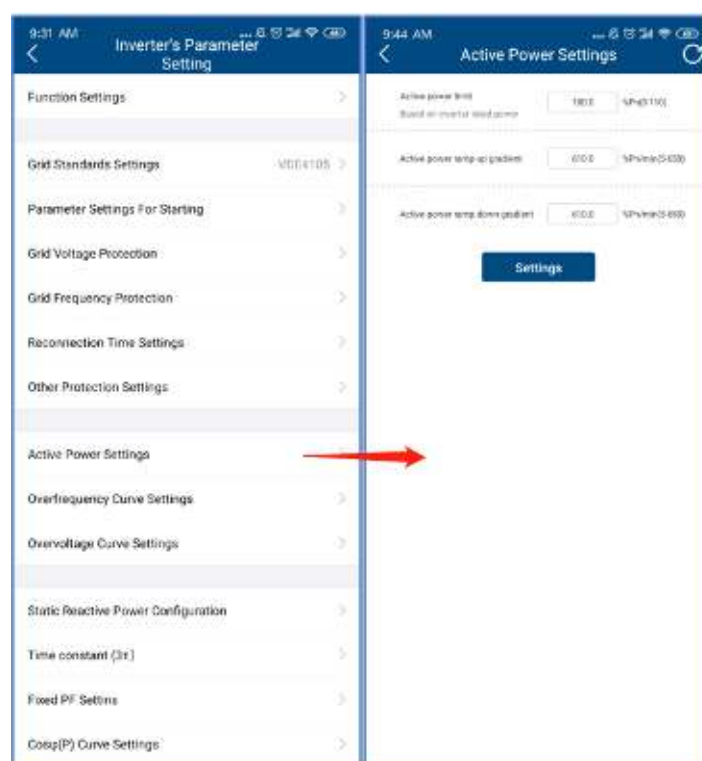


Fig. 22: Power limit

3.2.9 Inverter active power setting: overfrequency curve

The inverter may be capable of activating active power response to overfrequency at a programmable frequency threshold with a programmable droop. There are four available modes.

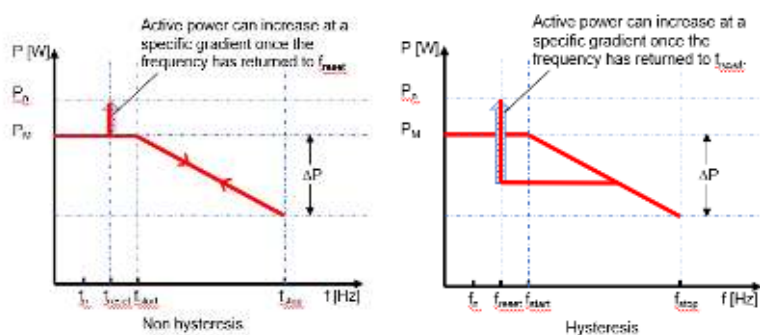
Fix gradient and non-hysteresis: ΔP is the active power as a percentage of P_n , the inverter provide non-hysteresis in the control of active power response to over-frequency.

Fix gradient and hysteresis: ΔP is the active power as a percentage of P_n , the inverter provide hysteresis in the control of active power response to over-frequency.

Variable gradient and non-hysteresis: ΔP is the active power as a percentage of P_M , the inverter provide non-hysteresis in the control of active power response to over-frequency.

Variable gradient and hysteresis: ΔP is the active power as a percentage of P_M , the inverter provide hysteresis in the control of active power response to over-frequency.

The below figure describes the difference between hysteresis and non-hysteresis control



Here,

f_n : Rated frequency

f_{reset} : Reset frequency

f_{start} : Starting frequency

f_{stop} : Stopping frequency

ΔP : Active power in percentage during reducing

Intentional delay time for $P(f)$ is only active for the activation of the function, once the frequency rises above f_{start} and the intentional delay time plus inherent dead time is less than 2s. Once the function is operating, the established control loop is not intentionally delayed.

Min. delay time for active power release is the delay time that the active power can increase after the frequency below f_{reset} .

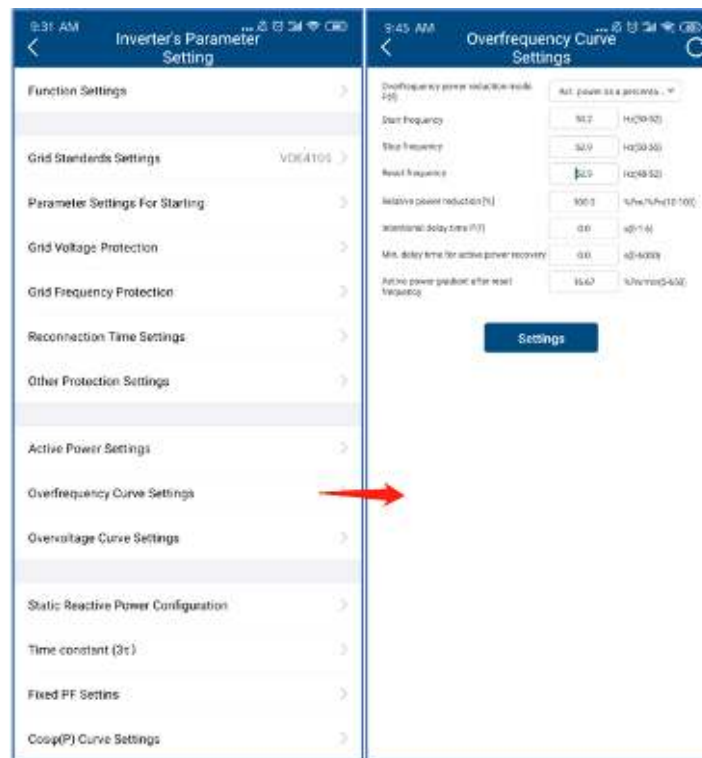


Fig. 23: Overfrequency curve

3.2.10 Inverter active power setting: overvoltage curve

The inverter may be capable of activating active power response to overvoltage at a programmable voltage threshold with a programmable droop. There are five available modes

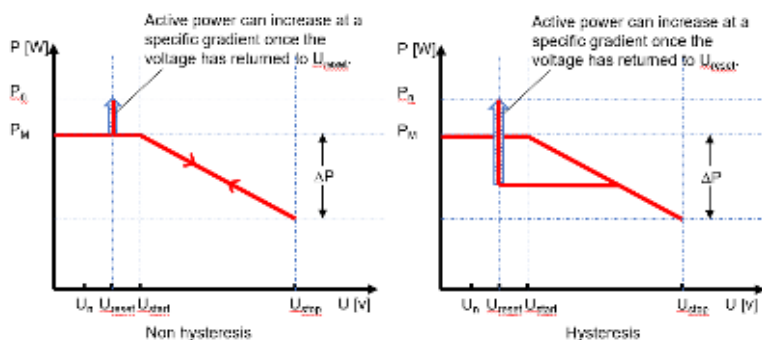
Fix gradient and non-hysteresis: ΔP is the active power as a percentage of P_n , the inverter provide non-hysteresis in the control of active power response to overvoltage.

Fix gradient and hysteresis: ΔP is the active power as a percentage of P_n , the inverter provide hysteresis in the control of active power response to overvoltage.

Variable gradient and non-hysteresis: ΔP is the active power as a percentage of P_M , the inverter provide non-hysteresis in the control of active power response to overvoltage.

Variable gradient and hysteresis: ΔP is the active power as a percentage of P_M , the inverter provide hysteresis in the control of active power response to overvoltage.

The below figure describes the difference between hysteresis and non-hysteresis control.



Here,

f_n : Rated voltage

f_{reset} : Reset voltage

f_{start} : Starting voltage

f_{stop} : Stopping voltage

ΔP : Active power in percentage during reducing

Intentional delay time for $P(f)$ is only active for the activation of the function after the voltage over U_{start} , and the intentional delay time plus inherent dead time shall be less than 2s

Min. delay time for active power release is the delay time that the active power can increase after the voltage below U_{reset} .

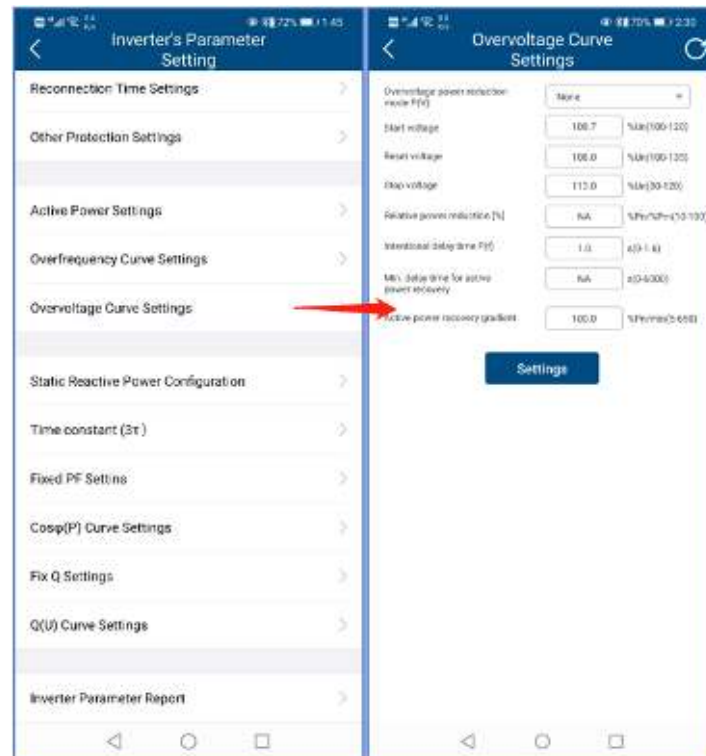
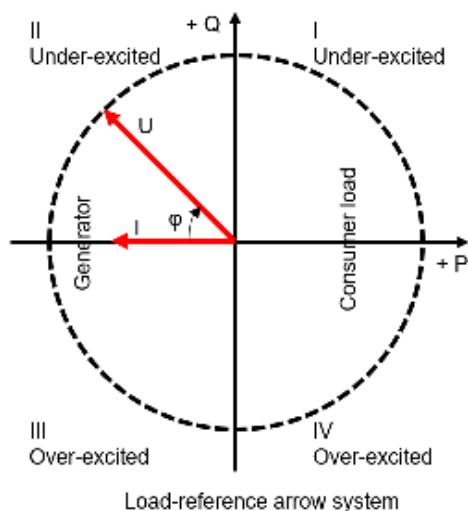


Fig. 24: Over-voltage curve

3.2.11 Inverter reactive power setting: running mode

The inverter may be required to participate to voltage control by means of production and absorption of reactive power. There are seven reactive power control modes. Only one mode may be active at a time.

The inverter acts as a load from the perspective of the grid according to the country standard. This means the inverter operation in Quadrant II (under-excited) or III (over-excited) as below.



Over-excited reactive power also known as Capacitive reactive power or Leading power factor.

Under-excited reactive power also known as Inductive reactive power or Lagging power factor.

Tap 'Reactive power control mode' to choose the mode. The 'Time constant $3(\tau)$ ' should be set first. The reactive power change maybe required to correspond with a first order filter. The 'Time constant $3(\tau)$ ' is three time constant of the filter and is the time until 95% of the nominal value is reached.

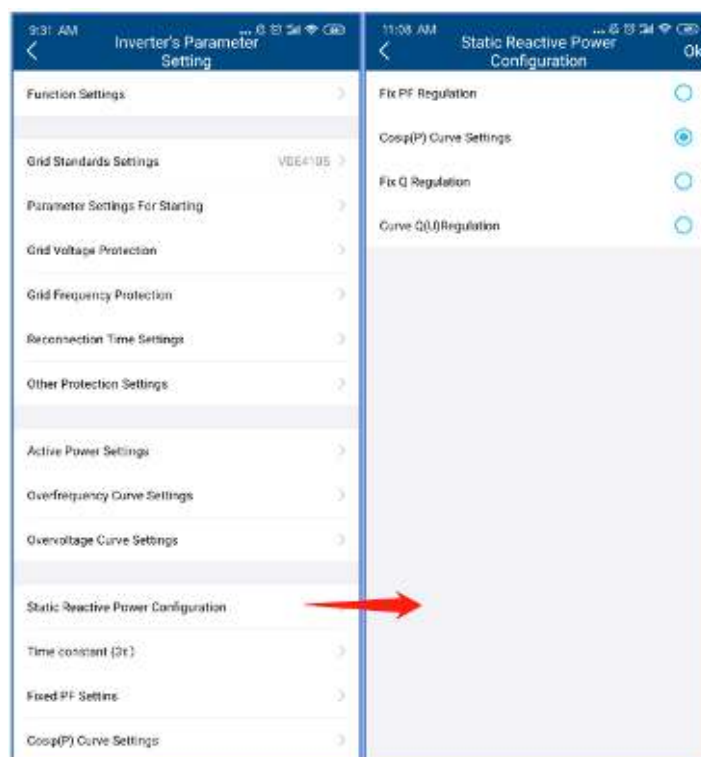


Fig. 25: Reactive running mode

3.2.12 Inverter reactive power setting: fixed power factor

The fixed displacement factor $\cos \phi$ can be set.

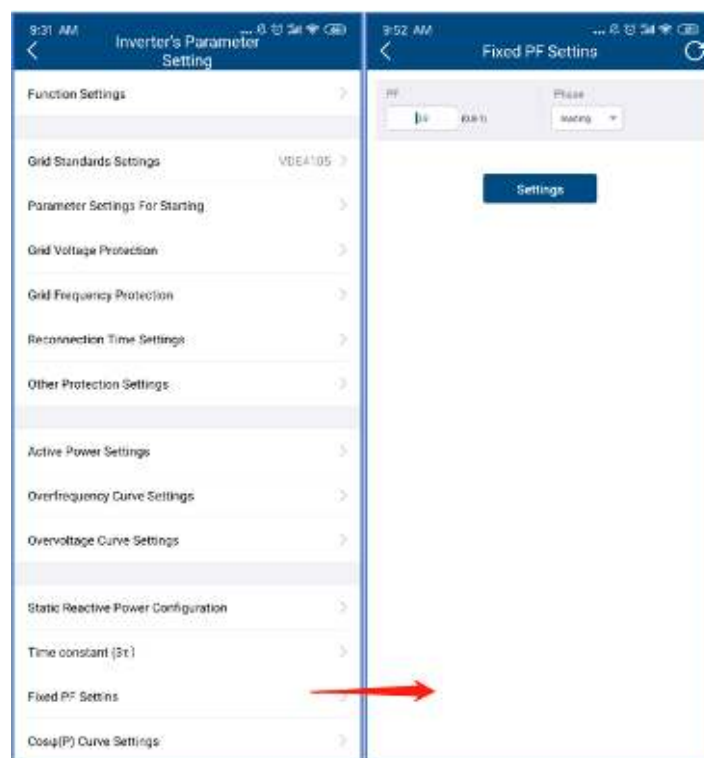
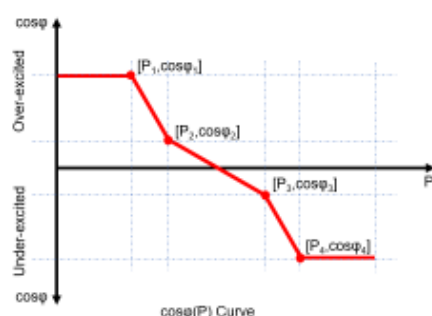


Fig. 26: Fixed power factor

3.2.13 Inverter reactive power setting: $\cos(\Phi) - P$ curve

The power related control mode $\cos \phi (P)$ controls the $\cos \phi$ of the output as a function of the active power output.

There are four coordinate points that are adjustable in the curve as shown in the figure below.



The coordinate points are the active power as a percentage of P_n and the displacement factor $\cos \phi$.

Some grid companies may require two voltage thresholds as a percentage of U_n to activate or deactivate this function. These voltage thresholds are referred to as the 'lock-in' and 'lock-out' voltage.

Activation threshold as a percentage of U_n corresponds to 'lock-in' voltage

Deactivation threshold as a percentage of U_n corresponds to 'lock-out' voltage

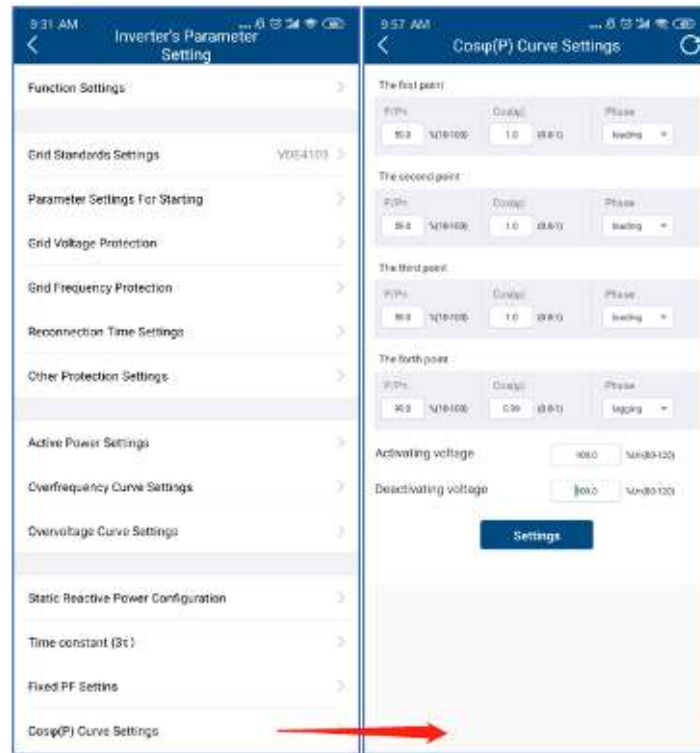


Fig. 27: $\cos \phi$ curve

3.2.14 Inverter reactive power setting: fixed Q

The fixed reactive power as a percentage of P_n can be set.

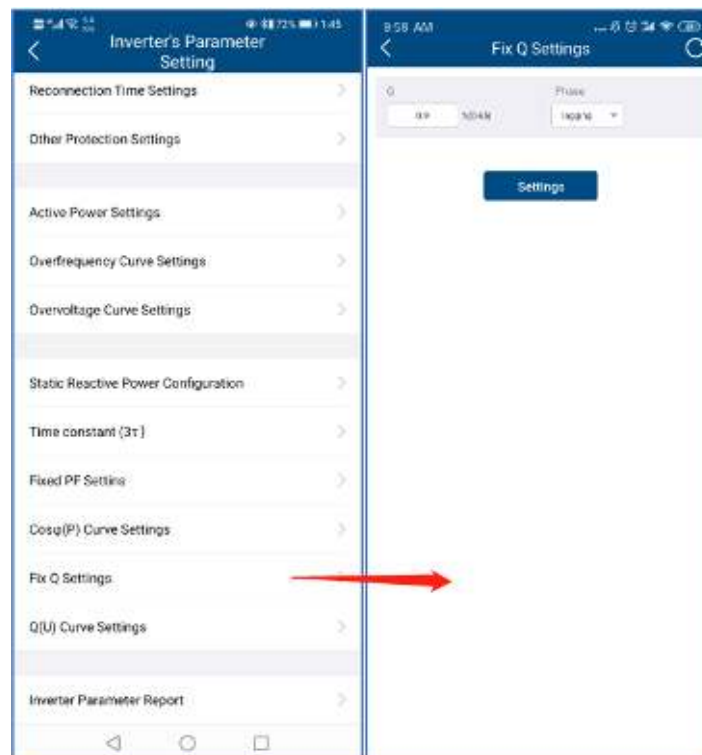
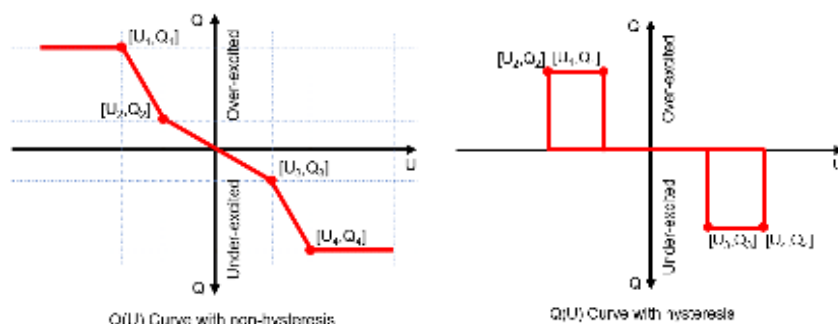


Fig. 28: Fixed Q

3.2.15 Inverter reactive power setting: Q-U curve

The voltage related control mode Q(U) controls the reactive power output as a function of the voltage.

There are four coordinate points that are adjustable in the curve and the difference between non-hysteresis and hysteresis control shown in the figure below.



The coordinate points are the voltage as a percentage of U_n and the reactive power as a percentage of P_n .

Some grid companies may require two active power thresholds as a percentage of P_n to activate or deactivate this function. These active power thresholds are referred to as 'lock-in' and 'lock-out' active power.

Activation threshold as a percentage of P_n corresponds to 'lock-in' active power.

Deactivation threshold as a percentage of P_n corresponds to 'lock-out' active power.

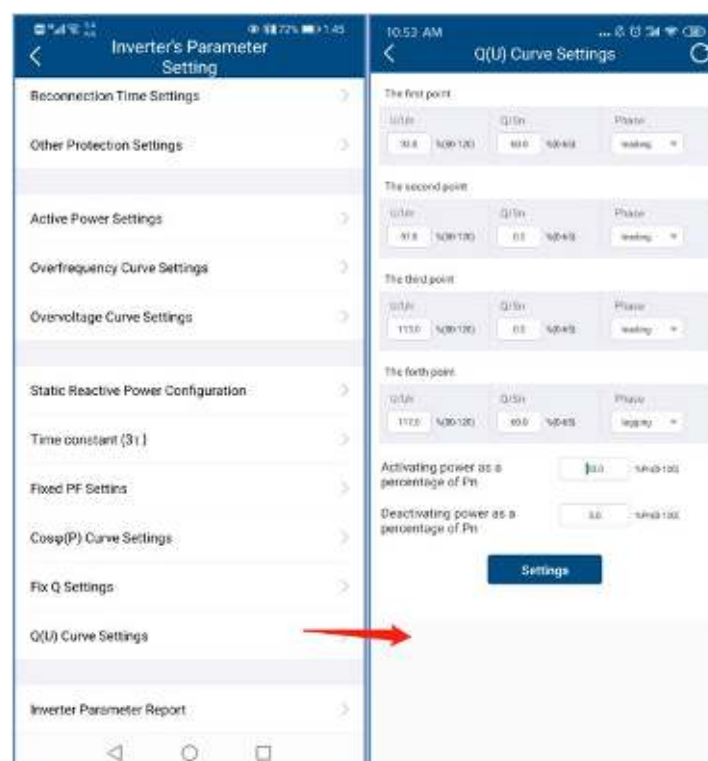


Fig. 29: Q-U curve

3.2.16 Inverter parameter report

Tap 'Inverter Parameter Report', the next page will display the parameter.

🔄 Export inverter parameter in file

- 1 After grid parameter setting, press "Inverter Parameter Report", and the grid parameters will be shown on the page.
- 2 Press "Export PDF", the export file is located as a pdf file in "kaco.report" folder on your smart device.

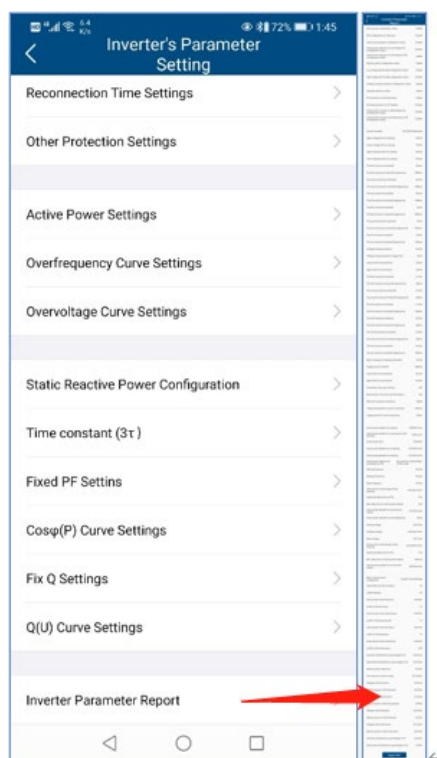


Fig. 30: Parameter report

NOTE



Passcode

Parameter export without the inverter specific passcode is only possible during the first commissioning. If an export is required after the initial commissioning a passcode will be required. The inverter specific passcode can be obtained from KACO Service.

3.3 Inverter real time data

3.3.1 Connect to inverter

Connect to the Wi-Fi stick with the app.

🔄 Enter the “Inverter list”.

1. Enter the “Monitor Device Details” page
2. Click the “Inverter List” item and enter the “Inverter List” page to connect to the inverter.
3. Click the inverter serial number.
» Proceed with inverter real time data.

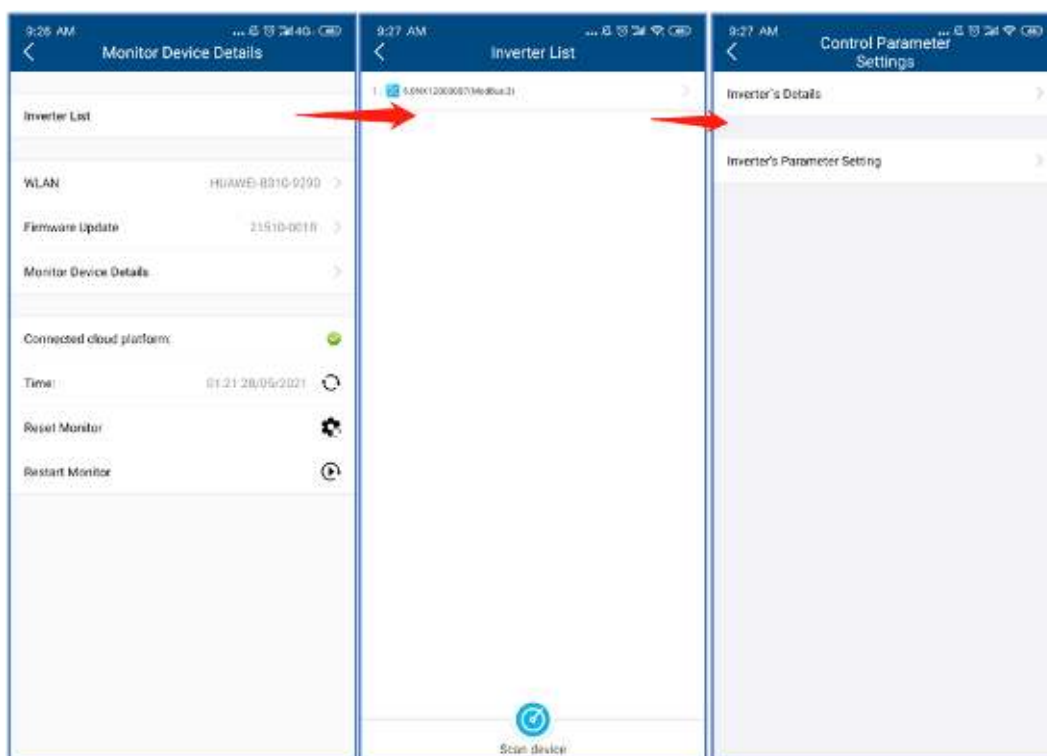


Fig. 13: Connect to inverter

NOTE

Scan device in Inverter List page

Under normal circumstances, you do not need to search for devices.



You might lose your previous inverter list and data due to the following cases:

- › The Wi-Fi stick has no communication with the inverter.
- › You have added a single inverter/multiple inverters to the Wi-Fi stick.
- › You have removed a single inverter/multiple inverters to the Wi-Fi stick.
- › You have replaced a single inverter/multiple inverters to the Wi-Fi stick.

3.3.2 Inverter's details

Click the "Inverter's Details", you can view the real time data from the inverter. The parameters shown on the page are as follows:

Parameter	Description
PV1	Voltage and current of MPPT 1 at DC side
PV2	Voltage and current of MPPT 2 at DC side
U1	Voltage and current at AC side
E-Today	Generation today
E-Total	Cumulative power generation after installation
H-Total	Cumulative running hour after installation
Power	Current power at AC side
Power Factor	Power factor at AC side
Data update time	The sampling time.
Error code	Displays the current error code, if one is present.

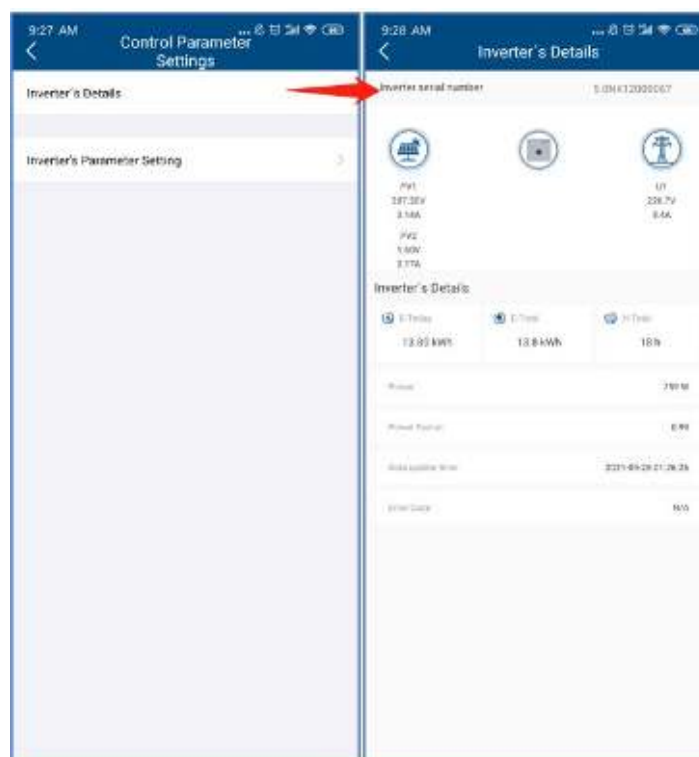


Fig. 15: Inverter real time data

4 Firmware Update

4.1 Wi-Fi stick firmware update

🔄 Wi-Fi stick firmware update.

1. Find Wi-Fi stick in network.
2. Click the “Firmware Update” and Click the “Local upgrade” to find the firmware file (WIFI_STK.bin).
» The whole process takes approximately 5 minutes.

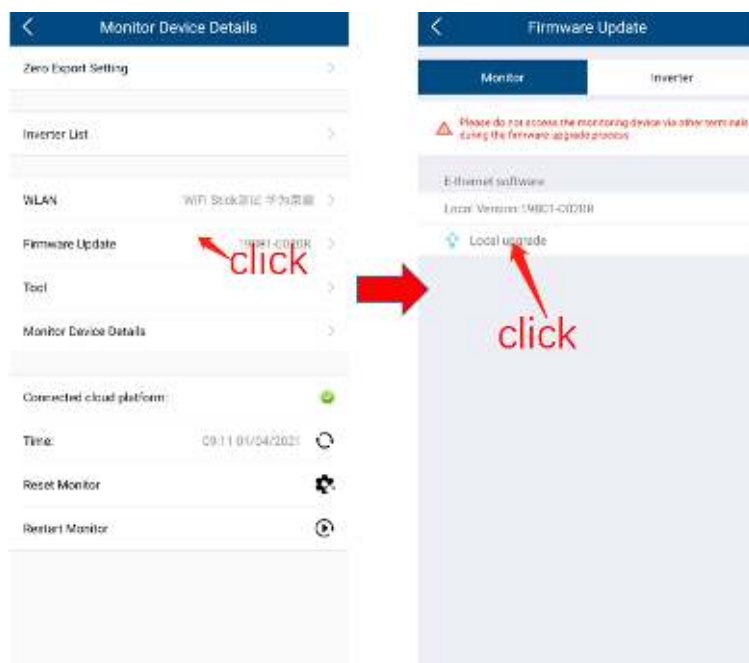


Fig. 31: Wi-Fi stick firmware

4.2 Inverter firmware update

🔄 Inverter firmware update.

1. Connect to the Wi-Fi stick and enter the “Monitor Device Details” page.
2. Click “Firmware Update” and choose the “Inverter” label page.
3. Choose the inverter and choose the firmware path in your smart device.
» The whole process takes about 10 minutes.

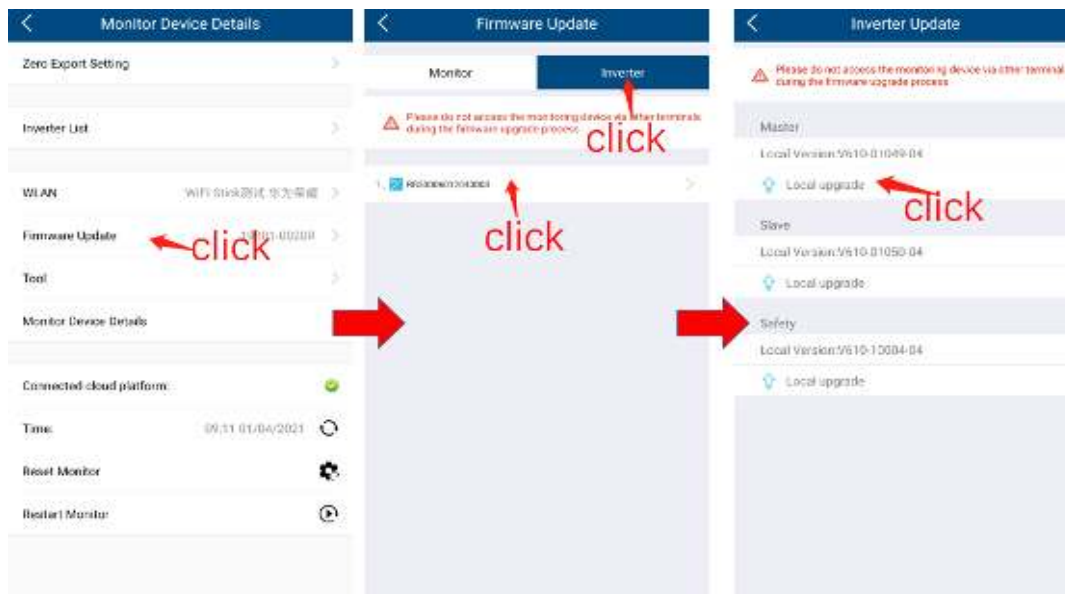


Fig. 32: Inverter firmware



NOTE

The DC power supply must be guaranteed during the upgrade process.

The whole process will take approximately 10 minutes. After 10 minutes, you can check the firmware with the app.

