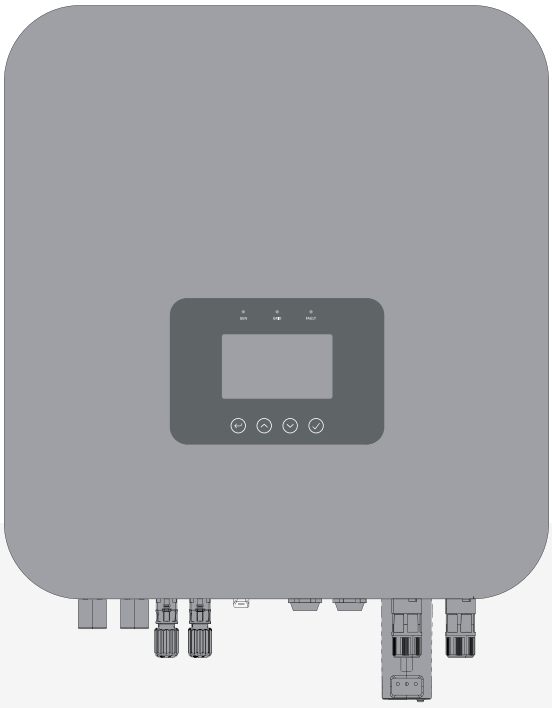
Single Phase Hybrid Solar Inverter

HN3KS-AH2GT / HN3K6S-AH2GT / HN4KS-AH2GT/ HN5KS-AH2GT / HN6KS-AH2GT

User Manual



Contents

Foreword

About Manual

Before operating the inverter, be sure to read this manual and other related documents carefully. All documents must be taken care of and made readily available. Due to changes in product development, the contents of this manual may be updated or revised periodically without prior notice.

Labels in Documentation

Label	Description
DANGER	A high level of potential danger, which, if not avoided, could result in death or serious injury to personnel.
WARNING	A moderate level of potential danger, which, if not avoided, could result in death or serious injury to personnel.
CAUTION	A low level of potential danger, which, if not avoided, could result in moderate or minor injuries to personnel.
NOTICE	Include emphasis and additional information on the content, and may also provide tips or tricks for optimizing product usage.

Labels on Inverter

	CAUTION Do not disconnect under load!
	Danger: High Voltage! Danger: Electrical Hazard!
	Warning: High Temperature! Never touch the enclosure of an operating INVERTER.
	Start maintaining the INVERTER at least 5 minutes after the INVERTER disconnected from all external power supplies.
	Read instructions carefully before performing any operation on the INVERTER.
	Grounding: The system must be firmly grounded for operator safety.

1.Safety Instructions

1.1 General Requirements

During the installation, operation, disassembly, maintenance and scrapping of the product, the relevant local laws and regulations must be strictly observed, as well as the safety instructions in the product manual. The safety precautions in this manual are only supplements to local laws and regulations.

The manufacturer shall not be liable for any violation of local laws, regulations and manuals during inverter installation, operation or maintenance.

The safety instructions in this manual are only supplementary and cannot cover all precautions that should be followed. The operation should be based on the actual situation on the site.

The surface of upper cover has been sprayed with an insulation protective layer.

DANGER

Do not operate products with electricity, including but not limited to handling, installation, wiring, operation, disassembly and maintenance.

WARNING

- It is strictly prohibited to operate products and cables (including but not limited to handling, installing, operating products and cables, supplying power to products, maintaining and working at altitude, etc.) under severe weather conditions such as flood, lightning, rain, snow and strong winds above level 6.
- In case of fire, evacuate from the building or product area immediately and call the fire alarm number. Re-entry into the burning area is strictly prohibited under any circumstances.
- Do not touch the shell when the inverter is running at a high temperature, which may cause burns.

1.2 Unpacking Safety

Fully understand this manual and use the appropriate tools to operate the equipment. Learn the correct way to use the tools before using it to avoid injuring others or damaging the equipment.

When fastening products and terminals, use the specified torque to tighten the screws, otherwise the product may be damaged and the damage caused is not covered by the warranty.

Before opening the outer package of the inverter, please check the outer package for visible damage and check the inverter type number, if there is any abnormal packaging or inverter type does not match the situation, do not open and contact your dealer as soon as possible.

Check all safety labels, warning labels and nameplates on the product.

It is strictly prohibited to alter, damage or block the logo and nameplate on the equipment.

1.3 Storage Safety

If the inverter is not put into use immediately, the following storage conditions should be met.

- The inverter must be stored in the original packing box with built-in desiccant.
- The storage temperature ranges from -25℃ to +60℃ and the storage relative humidity ranges from 0 to 100%.
- If multiple inverters need to be stacked, the number of stacked inverters must not exceed the stacking limit marked on the external container side. At the same time, place it carefully and upright to avoid personal injury or equipment damage.
- Do not store the inverter in direct sunlight, rain and strong electric fields.
- Please store the inverter in a clean, dry place to prevent dust and water vapor erosion.
- The storage period needs to be checked at least every three months. If it is found that moth-eaten rats bite and packaging is damaged, it is necessary to replace the packaging materials in time.
- If the inverter is stored for more than two years, it needs to be inspected and tested by professionals before it can be put into use.

1.4 Carry Safety

CAUTION

- Arrange proper personnel to carry inverters based on the weight of the inverters. The installation personnel must wear protective equipment, such as shoes and gloves.
- When moving inverters, keep them balanced to prevent the inverters from tilting and injuring personnel.
- Placing the inverter directly on hard ground can cause damage to the metal housing, requiring a sponge pad or foam to be laid underneath it.
- Do not use the terminal as a gripper.
- The terminals and interfaces at the bottom of the inverter cannot bear any weight. Do not touch the terminals and interfaces directly with the ground or other supports.

1.5 Installation Safety

CAUTION

- Ensure that the installation environment is well ventilated. Do not place the inverter in an environment that is flammable, explosive, toxic or smoky.
- Before installation, make sure the product does not have any electrical connections. If drilling holes is required during installation, ensure that water and electricity cables in the wall are avoided.
- Improper installation and operation may cause injury.

1.6 Electrical Connection Safety

- All electrical connections must meet national electrical standards.
- It is necessary to obtain permission from the power department of the country/region in order to connect to the grid.
- Cables prepared by customers must comply with local laws and regulations.
- When connecting wires, you must make sure that the positive and negative poles of the wires correspond to the positive and negative poles of the ports.
- Do not intertwine or cross the wires.
- Install the external protective grounding cable first when performing electrical connection and remove the external protective grounding cable last when removing the inverter.
- The insulation layer may age or be damaged when cables are used at high temperatures. Therefore, keep cables away from heat sources at least 30 mm.

DANGER

- Before electrical connection, ensure that the inverter is not damaged and that the inverter and all switches connected to are set to OFF. Otherwise, electric shock or fire may occur.
- Do not install or remove cables when the power is on. This prevents instantaneous arc or spark between the core of the power cable and the conductor, which may cause fire or personal injury.
- Do not damage the ground conductor. Do not operate the product if the grounding conductor is not properly installed. Otherwise, personal injury or product damage may occur.

WARNING

- When performing high voltage operations, use special insulation tools.
- When you need to power off the inverter, disconnect all inputs from the product. Do not perform any operation until the inverter is powered off completely.
- Product damage due to incorrect wiring is not covered by the warranty.

1.7 Operation Safety

When the inverter is powered on for the first time, professionals must set the parameters correctly. Incorrect parameter settings may cause the inverter to be inconsistent with the certification of the country/region, which may affect the normal operation of the inverter.

DANGER

When the product is working properly, please note the following:

- Do not touch the product enclosure and any heat generating parts of the inverter (such as the radiator). Otherwise, there may be a risk of burns.
- It is strictly forbidden to plug and unplug any connector on the inverter.
- Do not touch any wiring terminal of the inverter. Otherwise, there may be a risk of electric shock.
- Do not disassemble any parts of the inverter. Otherwise, there may be a risk of electric shock.
- Do not connect or remove any battery, PV string or any PV module in a string and any AC switch. Otherwise, there may be a risk of electric shock.

1.8 Disassembly Safety

Before removing an inverter, disconnect all electrical connections to the inverter, including load, PV, AC, battery, generator and grounding cable.

If the inverter has more than two rows of AC and DC terminals, remove the outer connector and then the inner connector to prevent mis-operations that may cause personal injury or inverter damage.

DANGER

- After the inverter is shut down, there is still a risk of burning. After the inverter cools down, wear protective gloves before operating the inverter.
- After powering off the inverter for 5 minutes, use a monitoring device to measure the inverter and ensure that there is no voltage or current. Then wear protective equipment to remove the inverter.

1.9 Maintenance Safety

- In order to prevent irrelevant personnel from mis-operations or accidents near the product, please place eye-catching warning signs or set up safety warning belts around the product.
- To avoid the risk of electric shock, do not perform any maintenance operations other than those described in this manual. If necessary, contact your distributor. Otherwise, the loss is not covered by the warranty.
- If the paint on the inverter enclosure falls or rusts, repair it in time. Otherwise, the inverter performance may be affected.
- Do not use cleaning agents to clean the inverter. Otherwise, it may cause damage to the inverter and the resulting loss is not covered by the warranty.
- As the inverter contains no parts that can be maintained, never open the enclosure of the inverter or replace any internal components without authorization. Otherwise, the loss caused is not covered by the warranty.

DANGER

Before performing any maintenance work, power off the inverter. After powering off the inverter for 5 minutes, use a testing device to check that there is no voltage or current. Wear protective equipment and strictly follow the safety precautions listed in this manual and related documents.

1.10 Disposal Safety

When the inverter service life expires, please scrap the inverter according to the relevant local regulations and standards to avoid property damage or casualties.

2.Product Description

2.1 Product Brief Introduction

2.1.1 Function Overview

The inverter is a single-phase hybrid inverter. The inverter is designed to convert the direct current power generated from the PV modules or batteries into grid-compatible AC current and feeds the AC current to the utility grid.

The single-phase hybrid inverter for photovoltaic systems is suitable for both grid-tied and off-grid applications. It can also support the operation of small household loads.

With the integrated Energy Management System (EMS), the inverter can control and optimize the energy flow so as to increase the Self-use of the system.

2.1.2 Appearance

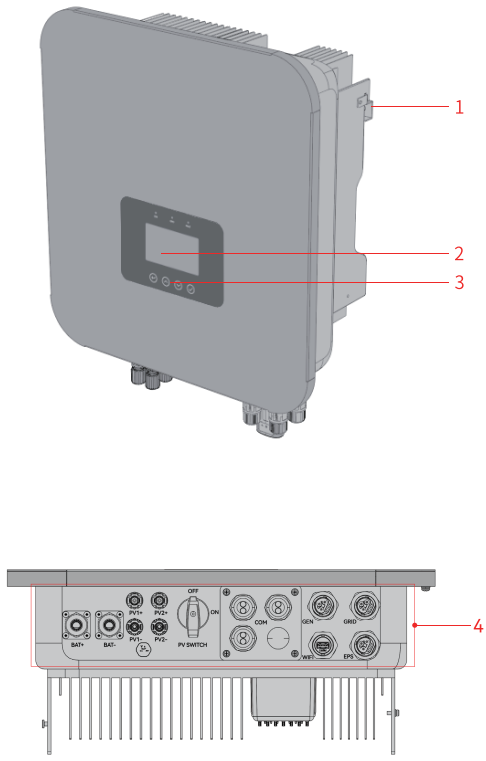


Figure 2.1 Inverter appearance

Table 2.1 Inverter appearance description

No.	Name	Description
1	Mounting-bracket	The inverter can be installed on the wall by mounting-bracket.
2	LED indicator	Indicates the running information.
3	Display and button	Displays the working state and sets the working mode.
4	Connector area	Photovoltaic terminals, battery terminals, AC terminals, generator terminals, load terminals and communication terminals.

2.1.3 Size and Weight

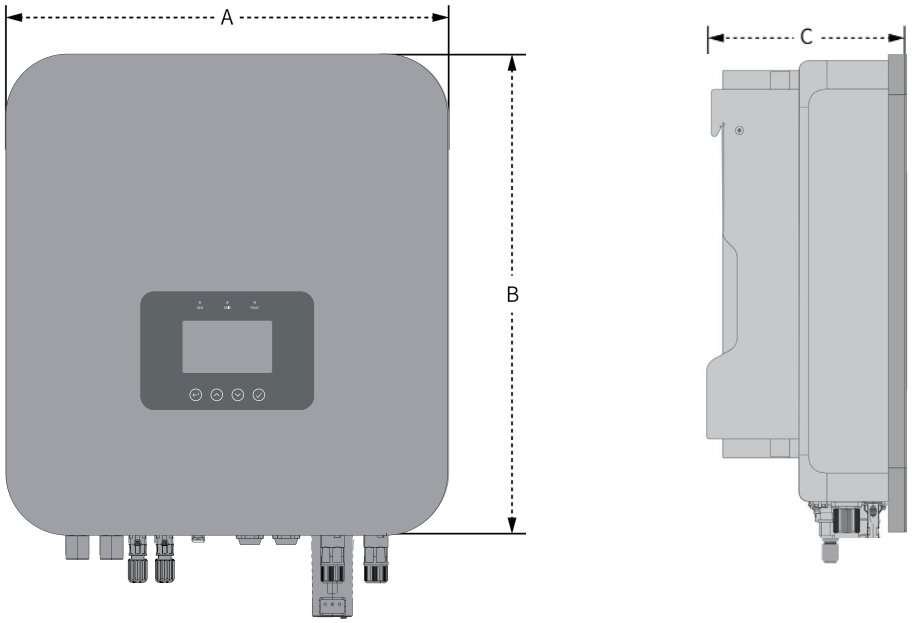


Figure 2.2 Inverter size

The following figure shows the dimensions of the inverter.

Table 2.2 The dimensions of the inverter

Inverter Model	A (mm)	B (mm)	C (mm)	Weight (kg)
HN3KS-AH2GT	485	527	205	23.5
HN3K6S-AH2GT				23.5
HN4KS-AH2GT				23.5
HN5KS-AH2GT				24
HN6KS-AH2GT				24

2.1.4 Supported Power Grid Types

This series inverter supports the following power grid types: TN-S and TT. In the TT power grid, the N-to-PE voltage must be less than 30V.

2.2 LED Indicator

The inverter has three different colors LED indicator to indicate the current running state.

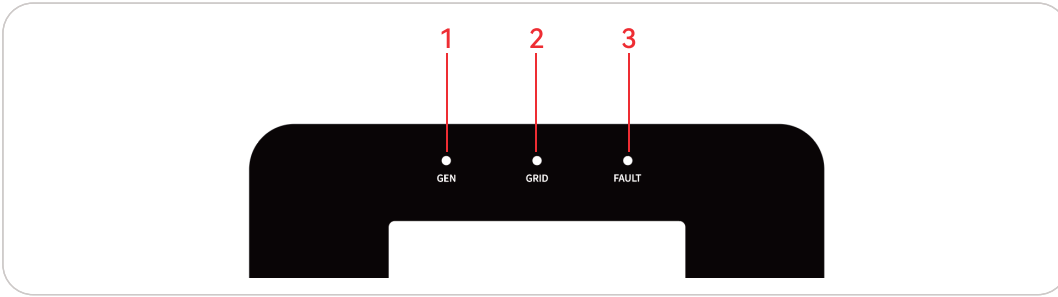


Figure 2.4 LED indicator

Table 2.3 LED indicator explanation

No.	Indicator	Status	Explanation
1	GEN	Blue on	Generator running
		Blinking blue at long intervals	Generator detected
		Off	No generator detected
2	GRID	Green on	Normal work with grid input
		Blinking green at short intervals	Normal work in backup mode without grid input
		Blinking green at long intervals	Normal work in backup mode with grid input (grid fault)
		Off	Inverter off
3	FAULT	Red on	Fault occurred and the inverter shutdown
		Blinking red at long intervals	Alarm reported but the inverter working still
		Off	No fault or alarm

Notice:

Three indicators blinking at short intervals	Updating
Green and blue light breathing mode	Low power mode
Three indicators off	Standby

2.3 Display and Button Description

The inverter has a display screen and four touch buttons used to display running state and set the parameters of the inverter.

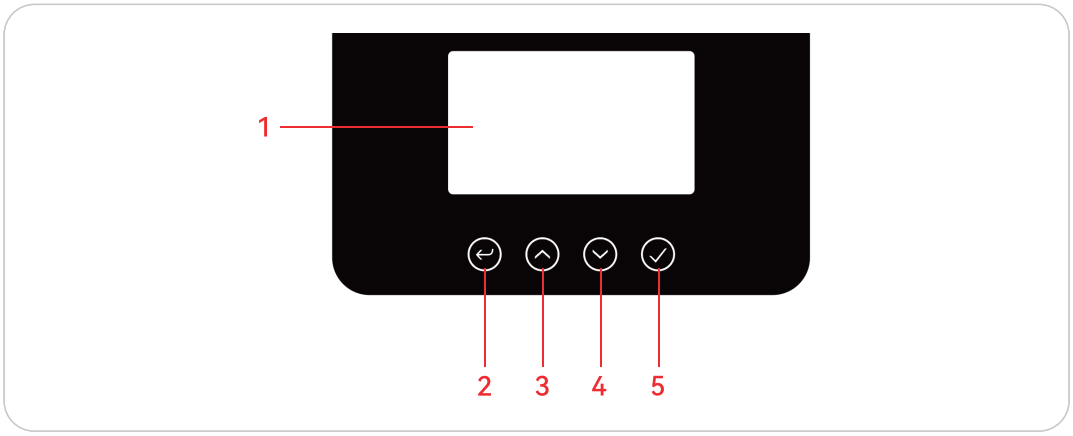


Figure 2.5 Display and button

Table 2.4 Display and button description

NO.	Function button	Describe
1	Screen	Display configured information and running state
2	ESC	Exit/Return to previous menu
3	UP	To go to the previous selection
4	DOWN	To go to the next selection
5	ENTER	OK/Go to next level menu

2.4 Terminal Description

All electrical terminals are located at the bottom of the inverter.

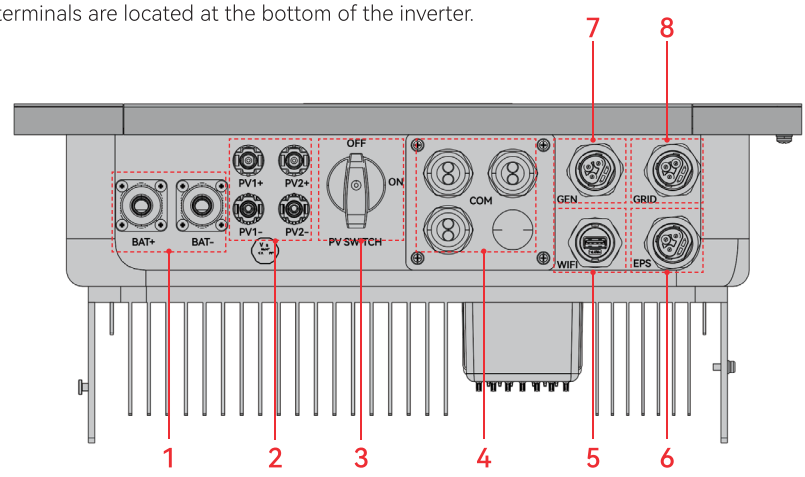


Figure 2.6 Terminal

Table 2.5 Terminal Description

No.	Name	Description	Decisive-Voltage Classification
1	BAT+, BAT-	Connectors for the battery power cables.	DVC-A
2	PV1+, PV1-, PV2+, PV2-	Terminals for PV input.	DVC-C
3	DC SWITCH	Switch on/off the input of the PV.	DVC-C
4	COM	Communication port for BMS, Meter/Grid Current, DRM, AFCI, DRY IO, PARA1, PARA2.	DVC-A
5	WIFI	Communication port to be connected to smart communication stick.	DVC-A
6	EPS	AC terminal for home loads.	DVC-C
7	GEN	Connect the generator power supply.	DVC-C
8	GRID	AC terminal to connect to the grid.	DVC-C

2.5 Multiple Energy-management Strategies

The inverter supports multiple energy management strategies, such as Self-use mode, Peak Shift mode, scheduled charging and discharging mode and backup power mode. Energy management strategies can be set and adjusted through a mobile app and display screen, allowing for the maximization of electricity usage efficiency.

3.Function Description

3.1 Basic Function

The main function of the inverter is to convert the DC power from solar panels or batteries into AC power meeting the requirements of the grid. It achieves this by using a bidirectional converter that allows for charging and discharging of batteries.

Additionally, the inverter is equipped with two maximum power point trackers (MPPT) that track the maximum power point of PV strings with different orientations, tilts or module structures in real-time, maximizing the output power of the solar system.

These functionalities enable the inverter to efficiently utilize the energy from solar panels or batteries and convert it into usable AC power for the grid or for load.

3.2 Protection Function

The inverter is equipped with various protection functions, including AC output short circuit protection, ground insulation resistance monitoring, anti-islanding protection, over-temperature protection, leakage current protection and over-voltage/over-current protection. These protection functions ensure the safe and reliable operation of the inverter and the connected electrical system.

3.2.1 Earth Fault Alarm

If there is a ground fault, the inverter will emit an alarm and indicate a system fault.

3.2.2 Power Derating

Power derating is a method of protecting inverters from device damage due to overheating. Continuous increase in environmental temperature and module temperature can both result in power reduction.

3.2.3 Anti-islanding Protection

Inverters can quickly monitor and disconnect from the grid in the event of grid voltage loss or disconnection. They also emit an alarm signal to avoid safety hazards for the user's equipment and maintenance personnel. The anti-islanding protection response time is less than 1 second, which is lower than the standard requirement of 2 seconds, providing a faster response speed.

3.2.4 Leakage Current Protection

Inverters can detect leakage current in the grid-side circuit. Once the leakage current exceeds the safety range, the inverter will quickly disconnect the circuit and generate an alarm to indicate a system fault, in order to prevent the occurrence of electrical shocks and other hazardous events.

3.3 Battery Management

The inverter is compatible with lithium-ion batteries and lead-acid batteries.

During the communication process between the inverter and the lithium battery, the inverter can accurately assess the State of Charge (SOC) and State of Health (SOH) of the battery by obtaining its status information. This helps improve the performance and reliability of the battery system, resulting in a better user experience and usage efficiency.

For lead-acid batteries, our inverter is designed with a three-stage charging function. Firstly, in the constant current charging stage, the maximum current is used to quickly charge the battery, allowing the voltage to rise rapidly. Once the voltage reaches the constant voltage level, the inverter will maintain a stable voltage state and gradually reduce the current while continuing to charge the battery. Once the battery is fully charged, the inverter will replenish the loss from battery self-discharge with a small current to keep the battery fully charged. Through the three-stage charging function, the inverter can ensure the cycle life of lead-acid batteries and improve their lifespan and performance.

Lead-acid batteries also have battery equalization function. Through battery equalization, it can reverse the accumulation of negative chemical effects such as stratification in the battery, and help remove formed sulfate crystals, thereby improving the battery's lifespan and restoring its health condition.

3.3.1 Charge Management

When the working condition of the inverter meets the corresponding requirements, the solar panels, grid or generator can charge the battery.

The maximum allowable charging current is limited to the smaller value among the following values:

- The maximum charge current of the inverter (Depends on the inverter model).
- The maximum / recommended charge current from the battery manufacturer.

As a result, the battery charge power may not reach the rated power.

3.3.2 Discharge Management

The maximum permissible discharge current is limited to the smaller of the following values:

- Maximum discharge current of the inverter (Depends on the inverter model).
- The maximum/recommended discharge current provided by the battery manufacturer.

As a result, the battery discharge power may not reach the rated power of the inverter.

3.4 Generator Port Management (optional)

Note: Some models in certain regions do not support the Generator and Smart Load feature.

The generator port is a common interface for generator inputs and smart loads outputs.
The generator and smart loads functions are not supported in parallel mode.
The connected generator supports two working mods: 1. manual ignition; 2. automatic ignition. The automatic igintion refers to the generator equiped with ATS device, which can automatically connect and disconnect the generrator. When grid unavailability and low battery capacity occurs, the inverter will automatically access the generator.
After the generator is started, inverter continues to monitor the status of the grid and the battery. If the grid is restored or the battery capacity is sufficient, it immediately disconnects the generator and switches to the grid or battery to supply the loads.
This control improves the reliability and stability of the power system and ensures the normal operation of the load. In addition, through the optimization algorithm, we achieve the best efficiency operation control of the generator, which effectively improves the fuel power generation efficiency and saves fuel consumption.

Smart load control refers to the ability of an inverter to intelligently manage and control the power consumption of connected loads. The smart loads control helps optimize energy usage, reduce costs and improve the overall efficiency and reliability of the power system. Both EPS and smart loads ports can supply power to loads. Regardless of whether the smart loads are connected or not, the inverter prioritizes ensuring that the EPS is continuously powered on. After connecting to the smart loads, the inverter also supplies power to the smart loads.
When the grid is available or the battery capacity is high (The real-time SOC of the battery is greater than or equal to the SOC required for smart load access), the inverter can connect smart loads through the generator port and provide power.
However, if the power supply is insufficient (When the grid is disconnected and the SOC of the battery is less than or equal to the SOC required for smart load exit.), the smart load will be disconnected first automatically to ensure continuous loading of the EPS.

3.4.1 Enabling Generator

Conditions for generator start:
1. When the generator forced start function (Gen Force) is disabled, the following conditions need to be met for the generator to start:
(1) Dry contact connects to inverter and generator; 'Mode' selects to Gen;
(2) The power grid is not available;
(3) When the battery type selects lithium battery, the battery real-time SOC needs to be less than or equal to the generator access SOC ('Gen Trip Soc'-''Access Soc'); when the battery type selects lead-acid battery, the battery voltage needs to be less than or equal to the generator access voltage ('Gen Trip Volt'-''Access Volt');
(4) The inverter is not faulty;
2. When the forced start function is enabled (Gen Force), the generator start needs to meet the following conditions:
(1) Dry contact connects to inverter and generator; 'Mode' selects to Gen;
(2) Grid unavailable;
(3) The inverter is not faulty;

Conditions for generator exit:
1. Generator mode de-selected;
2. Grid is workable;
3. Generator running time reaches the set maximum running time of the generator ('Gen Time Set'-'Max RunTime');
4. Generator failure occurs (over-frequency, under-voltage, continuous overload, start-up failure) ;

5. Inverter failure occurs.

Maximum running time of generator

To avoid overheating after the generator running a long time, users can set the maximum running time of the generator according to the actual situation of the generator, the manual set generator (without ATS) will disconnect the generator relay and the generator will be in no-load state after reaching the maximum running time; the generator configured with ATS will disconnect the generator relay and shut down the generator at the same time after reaching the maximum running time.

Generator Stop time

Generators generally need a certain amount of time to cool down after a long period of operation, so after the generator reaches the stop time, it will judge the access conditions of the generator again to decide whether to start the generator again.

Whether the generator charges the battery

Considering the economic benefits, users can choose to enable or disable the generator to charge the battery function. If the function is enabled, the generator can provide energy to the EPS and the battery after starting. If the function is disabled, the generator can only provide energy to the EPS after starting.

Generator forced start

Considering the very special circumstances, to avoid the problem of battery over-discharge, users can choose whether to open this function. If the function is enabled, the generator start will no longer judge the SOC under lithium battery or battery voltage under lead-acid battery. When the generator's dry contact is enabled, the grid is not available, and the inverter is no fault, generator will be forced to start.

Generator rated power, maximum power setting

Users need to input the rated power and maximum power of the generator according to the actual generator performance of the connected system, and the inverter will judge the generator overload condition according to the minimum value of the two powers setting. Please note that if the actual generator capacity connected to the system is less than the minimum value of both power settings, there is a possibility of damage to the generator.

3.4.2 Enabling Smart Loads

Smart loads access conditions:

1. Gen set 'Mode' selects to Smart Load;
2. The system is running off-grid, the battery type selects lithium battery, and the real-time SOC of the battery needs to be greater than or equal to the SOC of smart load access ('SmartLoad Trip Soc'-'Access Soc'). The battery type selects lead-acid battery, and the voltage of the battery needs to be greater than or equal to the voltage of the smart load access ('SmartLoad Trip Volt'-'Access Volt'). When the system is running on-grid, the smart load access doesn't judge the state of the battery.
3. System is in running state, allowing smart load access;
4. No voltage at the port before smart load access. The condition is to avoid manually turning on the generator in advance.

Smart loads exit conditions:

1. Smart load + EPS load total power trigger overload warning / system overload / battery overcurrent alarm;
2. The system is running off-grid, the battery reaches the smart load exit conditions, that is, when the battery

type selects lithium battery, the battery real-time SOC needs to be less than or equal to the smart load exit SOC; when the battery type selects lead-acid battery, the battery voltage needs to be less than or equal to the smart load exit voltage;

3. System is not in running state;

4. Smart load mode de-selected.

WARNING

1.Generator cannot connect to the grid port. Generator do not supply power to on-grid loads;

2. The capacity of the connected generator needs to be greater than or equal to the maximum power supported by the inverter, otherwise there will be a possibility of damaging the generator;

3. It is prohibited to enable the smart load when connecting the generator, or enable the generator when connecting the smart load, otherwise there will be a possibility of damaging the generator;

4. The maximum running time and stop time of the generator should be set in account of the operating performance of the generator itself, otherwise there will be a possibility of damage to the generator;

5. When accessing the generator with ATS, its communication wire sequence must meet the wiring requirements, otherwise the generator cannot be normally accessed or exited.

3.5 Inverter Operating Mode

3.5.1 Energy Storage System Description

The following figure and table show the application of the inverter in the energy storage system.

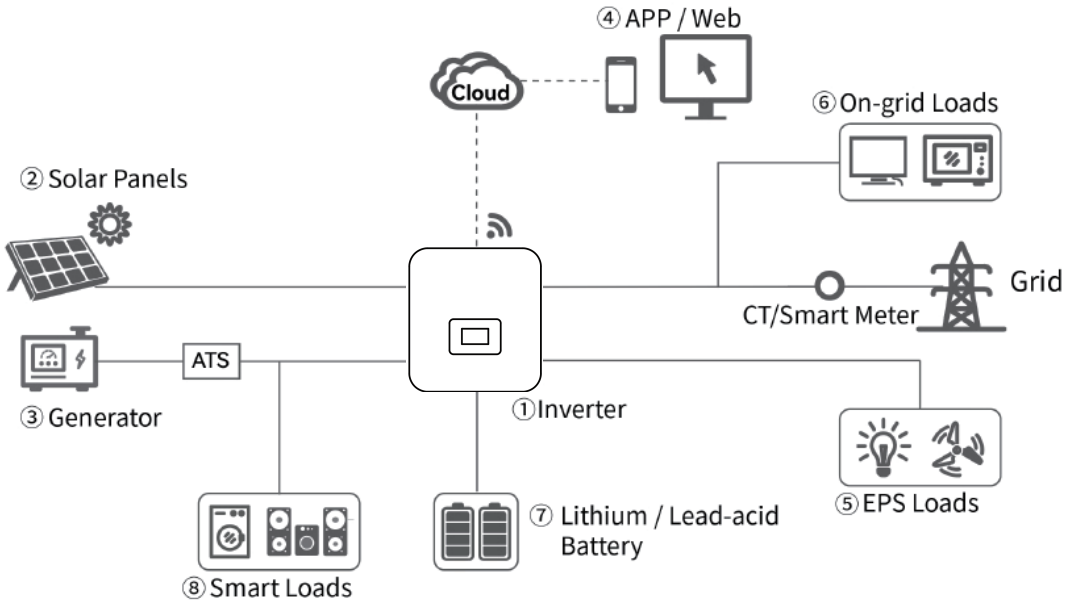


Figure 3.1 Application of inverter

Table 3.1 Components

Item.	Description.	Note.
①	Inverter	Hybrid inverter.
②	Solar panels	Perfectly compatible with most types of solar panels in the market, including the model using 166mm/182mm/210mm solar battery cell.
③	Generator (optional)	Start and shut down the generator automatically based on conditions.
④	APP	Remote real-time monitoring of inverter operating status and data through the APP.
⑤	EPS	Ensure uninterrupted power supply to the important load.
⑥	On-grid Loads	Power supply to on-grid loads.
⑦	Battery (optional)	Lithium-ion batteries or lead-acid batteries.
⑧	Smart Loads (optional)	Power supply to smart loads

3.5.2 Self-use Mode

It is suitable for areas with high electricity prices, PV on-grid electricity subsidies less or no subsidies.

Table 3.2 Self-use mode description

The grid is available	Daytime	A1 (P_{PV}≥P_{Load}) PV can supply power to both the load, battery and grid. The priority of power supply is as follows: ①Load; ②Battery; ③Grid.
		B1 (P_{PV}<P_{Load}) The priority of load supply depends on the amount of battery energy: ①PV and Battery; ②PV, Battery and Grid.
	Evening	C1 The priority of supplying the load is determined based on the amount of energy in the battery: ①Battery; ②Battery and Grid.
The grid is disconnected	Daytime	D1 (P_{PV}≥P_{Load}) PV can supply power to both the load and the battery. The priority of power supply is as follows: ①Load; ②Battery.
		E1 (P_{PV}≤P_{Load}) When the battery energy is sufficient, the battery and PV combined power the load.
		F1 When both the energy from PV and battery are insufficient: 1. If there is a generator: The generator and PV work together to supply power to the load and charge the battery. Once the battery charge is sufficient, the generator will stop operating, battery and PV will continue supplying power to the load. 2. If there is no generator: The PV will only charge the battery.
	Evening	G1 When the battery has sufficient charge, it will power the load.
		H1 When the battery charge is insufficient: 1.If there is a generator: It will power the load and also charge the battery. Once the battery charge is sufficient, the generator will exit and the battery will continue to power the load. 2. If there is no generator: The inverter will be on standby.

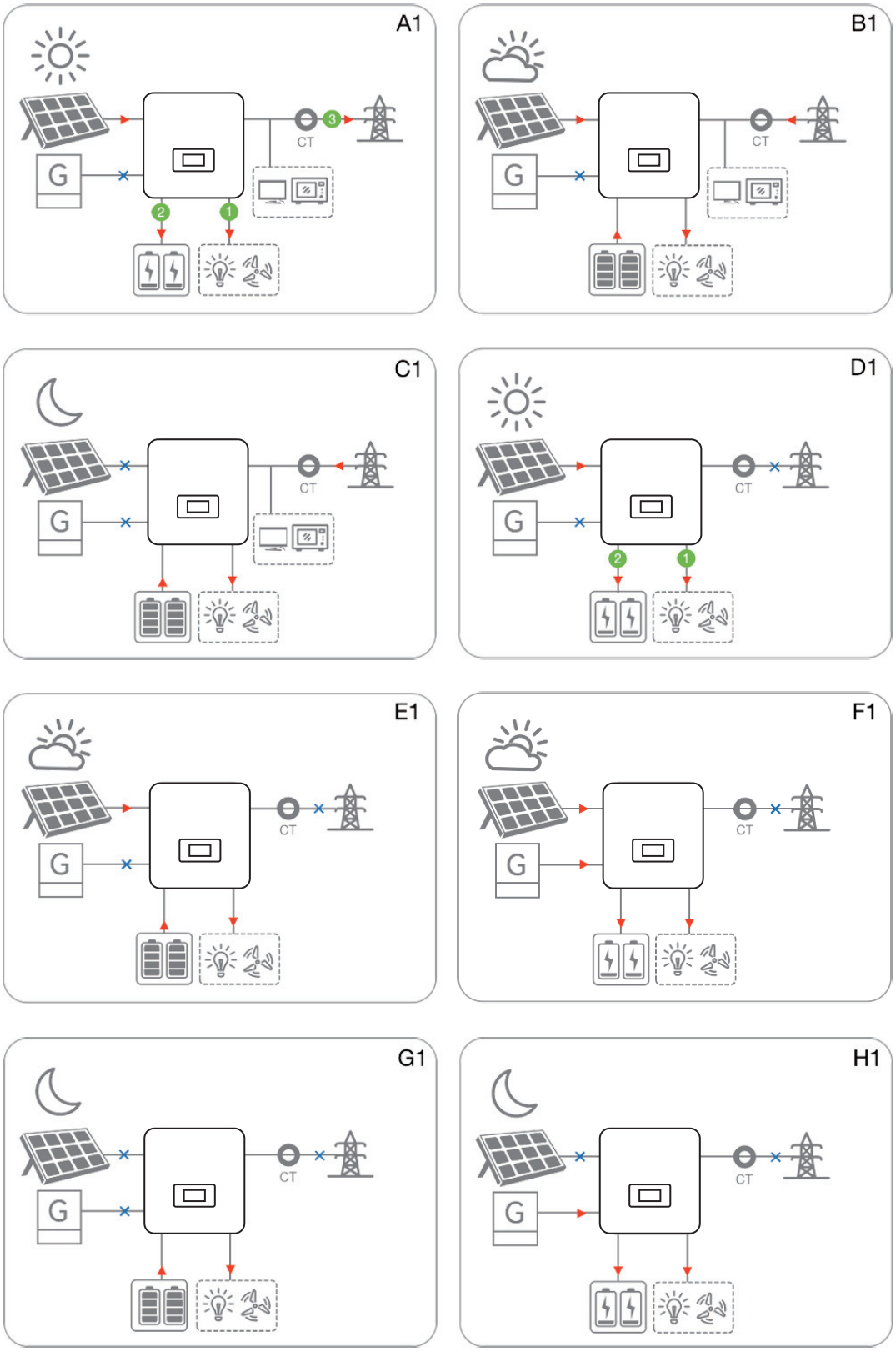


Figure 3.2 Self-use energy flow diagram

3.5.3 Peak Shift Mode

The Peak Shift mode can only be selected if it complies with local laws and regulations, such as allowing the battery to sell electricity to the grid. It is recommended to use the Peak Shift mode in scenarios where there is a significant difference in electricity prices between peak and off-peak periods.

Table 3.3 Peak Shift mode description

The grid is available	Peak	A2 (P_{PV}≥P_{Load}) PV can supply power to both the load, battery and grid. The priority of power supply is as follows: ①Load; ②Grid; ③Battery.
		B2 (P_{PV}<P_{Load}) 1.PV and battery working together to power the load. 2.The extra energy from the battery can be sold to the power grid.
	Valley	C2 (P_{PV}≥P_{Load}) PV can supply power to both the load, battery and grid. The priority of power supply is as follows: ①Load; ②Battery; ③Grid. If the PV energy is not enough to charge the battery, electricity can be drawn from the grid to charge the battery.
		D2 (P_{PV}<P_{Load}) The PV can be combined with the grid to power the load. If the battery is not fully charged at this time, electricity can be drawn from the grid to charge.
	Normal	E2 (P_{PV}≥P_{Load}) PV can supply power to both the load, battery and grid. The priority of power supply is as follows: ①Load; ②Battery; ③Grid. If the photovoltaic energy is insufficient to charge the battery, the power grid will not charge the battery.
		F2 (P_{PV}<P_{Load}) The PV system will work together with the grid to supply the load. The battery cannot charge or discharge.
The grid is disconnected	Daytime	The logic is the same as the Self-use mode: D1, E1, F1.
	Evening	The logic is the same as the Self-use mode: G1, H1.

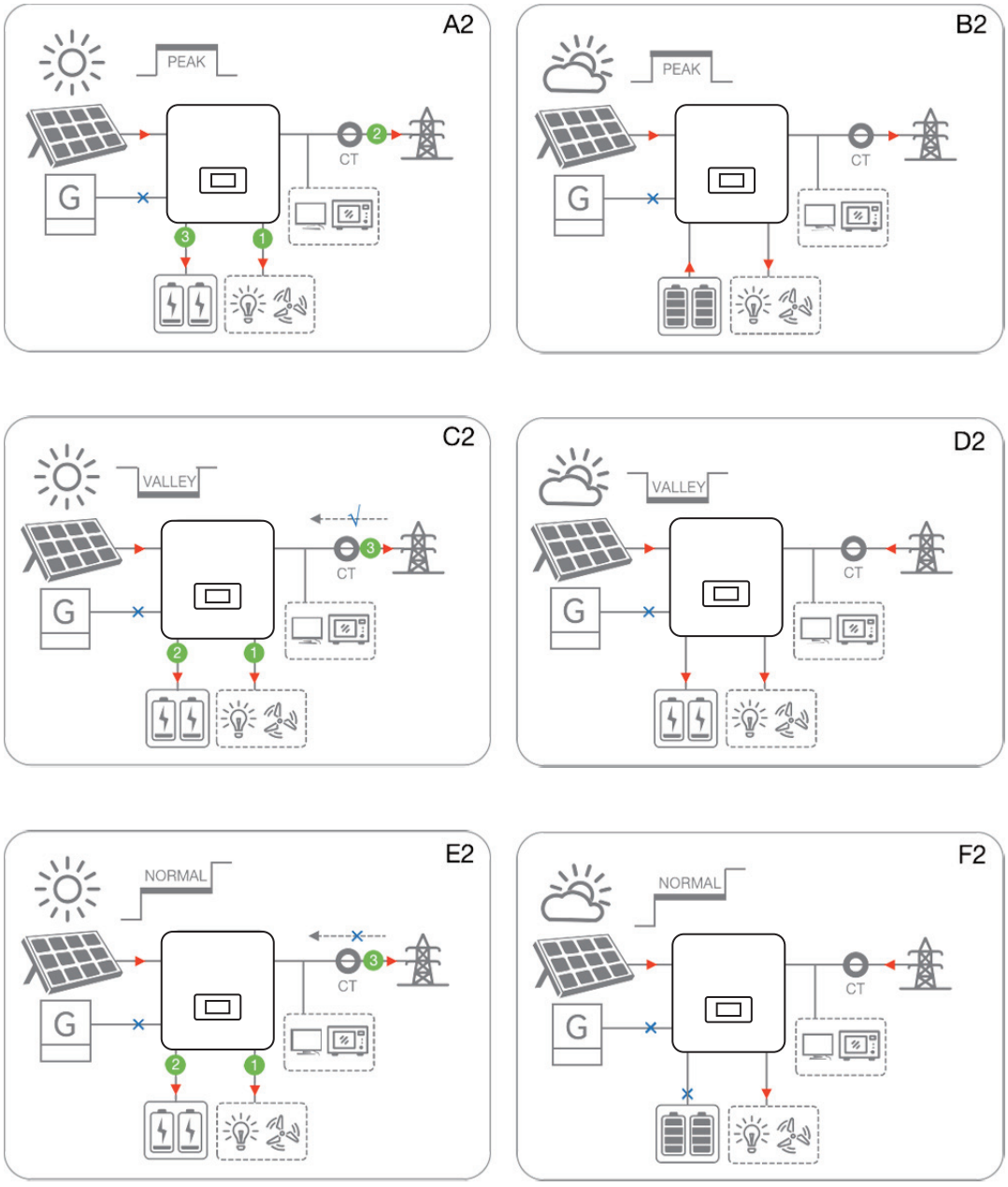


Figure 3.3 Peak Shift mode energy flow diagram

3.5.4 Battery Priority Mode

The battery priority mode is primarily suitable for scenarios where the grid is unstable and there are critical loads. When the grid is available, the system ensures that the battery is fully charged to ensure that the loads can be powered by the battery when the grid is disconnected.

Table 3.4 Battery priority mode description

The grid is available	Daytime	A3 (P_{PV}≥P_{Load}) PV can supply power to both the load, battery and grid. The priority of power supply is as follows: ①Load; ②Battery; ③Grid. If the PV energy is not enough to charge the battery, electricity can be drawn from the grid to charge the battery.
		B3 (P_{PV}<P_{Load}) The PV can be combined with the grid to power the load. If the battery is not fully charged at this time, electricity can be drawn from the grid to charge.
	Evening	C3 The grid can supply the load. If the battery is not full, charge the battery. The battery cannot supply the load.
The grid is disconnected	Daytime	The logic is the same as the Self-use mode: D1, E1, F1.
	Evening	The logic is the same as the Self-use mode: G1, H1.

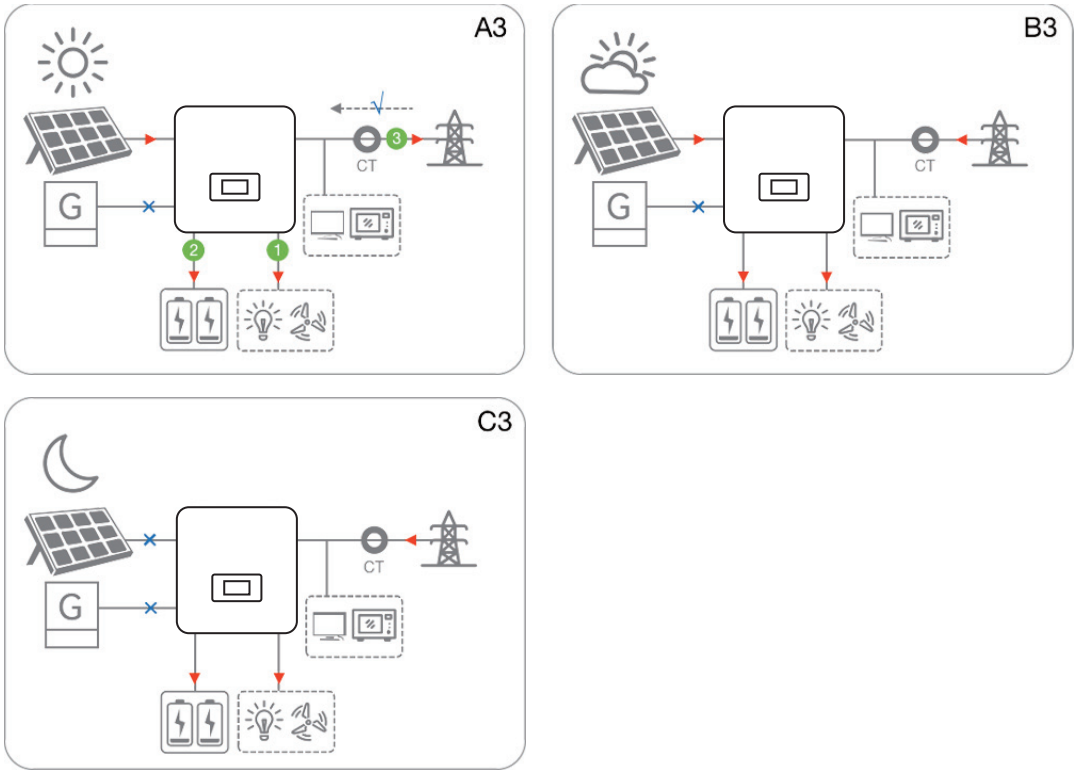


Figure 3.4 Battery Priority mode energy flow diagram

3.5.5 Scheduled Charge and Discharge Mode

Inverter controls the charging and discharging process of the battery based on the user-set schedule. This mode ensures that the battery has sufficient power when the user needs electricity, while avoiding overcharging and over discharging issues that may occur when the battery is in charging or discharging state for a long time. It optimizes the battery usage and extends the battery lifespan.

3.6 Reactive Power Regulation

The inverter can output the corresponding reactive power according to demand, and there are two methods of reactive power control: reactive power control and power factor control.

When selecting reactive power control, the inverter will output the corresponding reactive power according to the reactive power set by the user to meet the power system's requirements for reactive power. With power factor control, the inverter automatically adjusts the reactive power based on the set active power and power factor, in order to meet the desired power factor value of the power system.

The maximum active power that can be set is the rated power corresponding to the inverter model. The maximum reactive power that can be set is ±60% of the rated power. The power factor that can be set ranges from -0.8 to 1 for capacitive loads or from 0.8 to 1 for inductive loads.

Therefore, depending on the actual requirements, choose the appropriate reactive power control method so that the inverter can output the required reactive power for the grid during grid connection and meet the requirements of the power system.

3.7 Communication and Configuration

The inverter possesses various ports for device and system monitoring, including RS485 and WLAN which can configure various parameters for optimal operation. Real-time operational data of the inverter can be obtained through APP.

Inverters can also communicate with batteries to obtain battery status information, enabling monitoring, management and protection of the battery.

Inverters can also replace the Automatic Transfer Switch (ATS) function of a generator by communicating with the generator to achieve automatic start-up and shutdown of the generator.

3.8 PV Control

The PV control section includes PV control modes and PV emergency enablement.

The PV control modes can be divided into independent control and parallel control based on how the PV panels are connected. PV independent control refers to connecting two PV panels separately to two independents PV1 and PV2 input channels. Under PV independent control, each PV panel has its own Maximum Power Point Tracking (MPPT) controller. PV parallel control refers to connecting one PV panel in parallel to both PV1 and PV2 input channels, both PV1 and PV2 channels are connected to the same PV panel, and there is only one MPPT controller for both channels.

PV emergency enable determines whether the inverter can operate off-grid and supply power to the load with only PV input. When PV emergency enable is turned on, even if the grid, battery, and generator are disconnected, the inverter can still utilize the energy from the PV panels to provide power to the load. When PV emergency enable is turned off, even if there is PV input, the inverter cannot operate off-grid and will be in standby mode.

NOTICE

- After enabling PV emergency mode, due to the stability issues of PV energy caused by weather and sunlight, it is recommended to connect low-power loads, such as lighting and TV. It is not recommended to use high-power devices with high requirements for the stability of PV energy, such as desktop computers and air conditioners, to prevent the inverter from shutting down due to PV energy fluctuations, which may result in data loss.
- When using one PV parallel in two PV input ports, you need to set the PV mode to parallel in the PV Set (default is independent).

4.Unpacking

4.1 Check Before Signing

Before unpacking the inverter, check the outer packing for damage, such as holes and cracks and check the inverter model.

If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your dealer as soon as possible.

4.2 Packing List

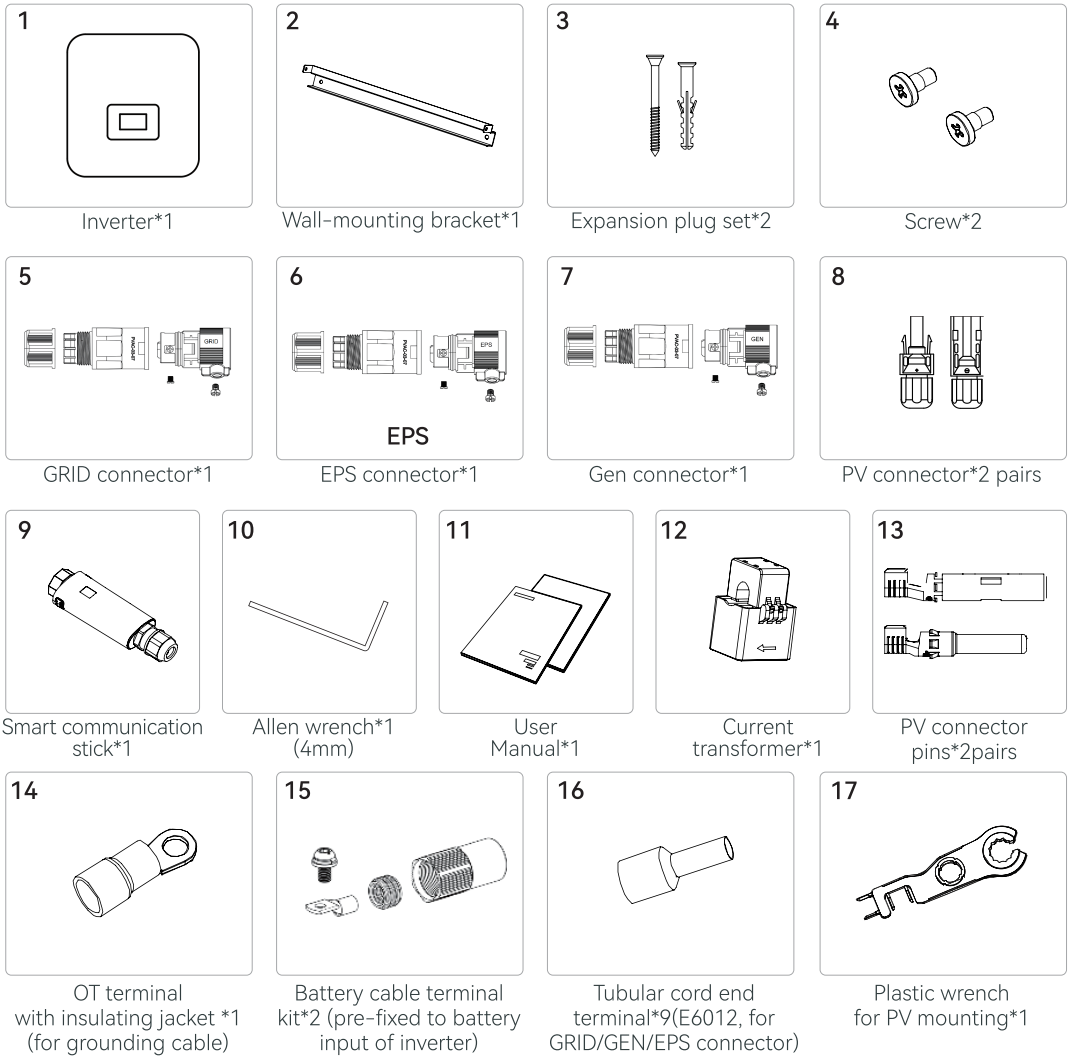


Figure 4.1 Scope of delivery

5.Mechanical Mounting

5.1 Safety During Mounting

DANGER

- Make sure there is no electrical connection before installation.
- Before drilling, avoid the water and electricity wiring in the wall.

WARNING

Comply with all local standards and requirements during mechanical installation.

NOTICE

If drilling is required during installation:

- Wear safety goggles and protective gloves when drilling holes.
- Avoid the product of debris and dust.

5.2 Location Requirements

The proper installation location ensures the safe operation, service life and performance of the inverter to a large extent. The inverter protection level is IP66, which allows it to be installed both indoor and outdoor. The inverter should be installed at a height that makes it easy to view the LED indicator panel and to facilitate electrical connection, operation and maintenance. Do not install in places accessible to children.

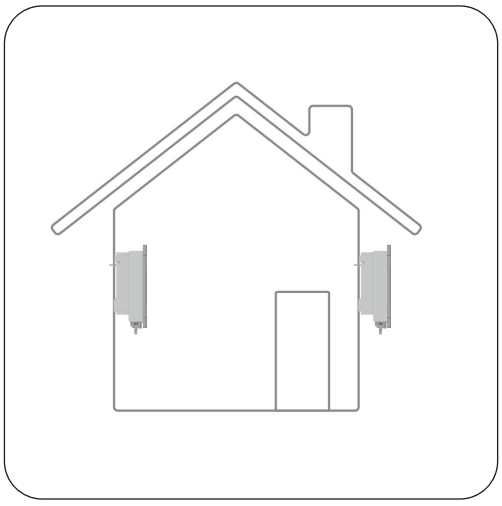


Figure 5.1 Installation location

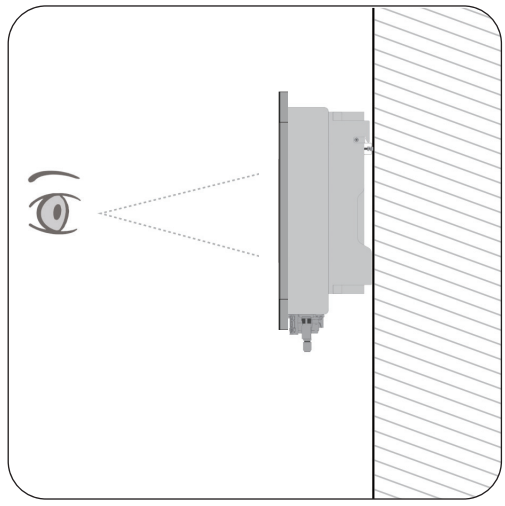


Figure 5.2 Installation height requirements

5.2.1 Environment Requirements

WARNING

Poor installation environment will affect system performance!

- Ensure that the inverter is installed in a well-ventilated place and the heat dissipation system or vent is not blocked.
- Do not install the inverter in an environment with flammable and explosive objects or smoke and strong electric fields.
- The ambient temperature and relative humidity must meet the requirements. Inverter power reduction protection occurs in high-temperature environments. If the inverter is installed in an environment with direct sunlight or temperatures exceeding 40 degrees Celsius, it can lead to a decrease in power output.
- Install the inverter in a sheltered area to avoid direct sunlight and bad weather (e.g., snow, rain, lightning, etc.).

Figure 5.3 Temperature and humidity requirements

5.2.2 Carrier Requirements

The installation structure of the inverter must comply with local/national standards and guidelines. The installation carrier must not be made of flammable materials and must have fire-resistant properties. Please ensure that the installation carrier is sturdy and reliable enough to bear 3 times the weight of the inverter and is suitable for the size of the inverter.

When the inverter is in operation, it may generate vibrations. Therefore, do not install it on carriers with poor sound insulation to avoid causing disturbance to residents in living areas due to the noise generated by the equipment during operation.

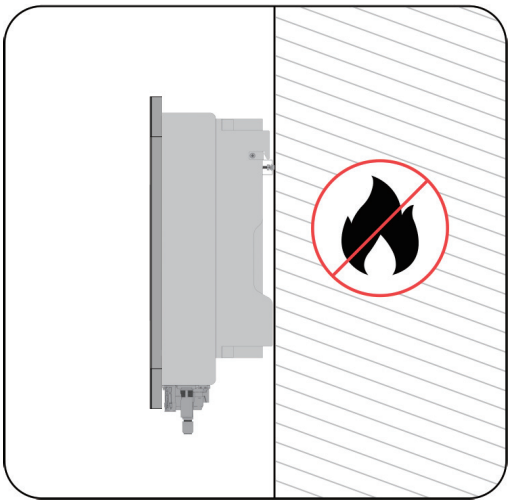


Figure 5.4 Installation carrier requirements

5.2.3 Angle Requirements

The recommended installation angle for inverter is vertical or backward tilt not exceed 15 degrees.

The inverter must not be installed horizontally, rotated, inverted, tilted forward or exceed the backward tilt angle.

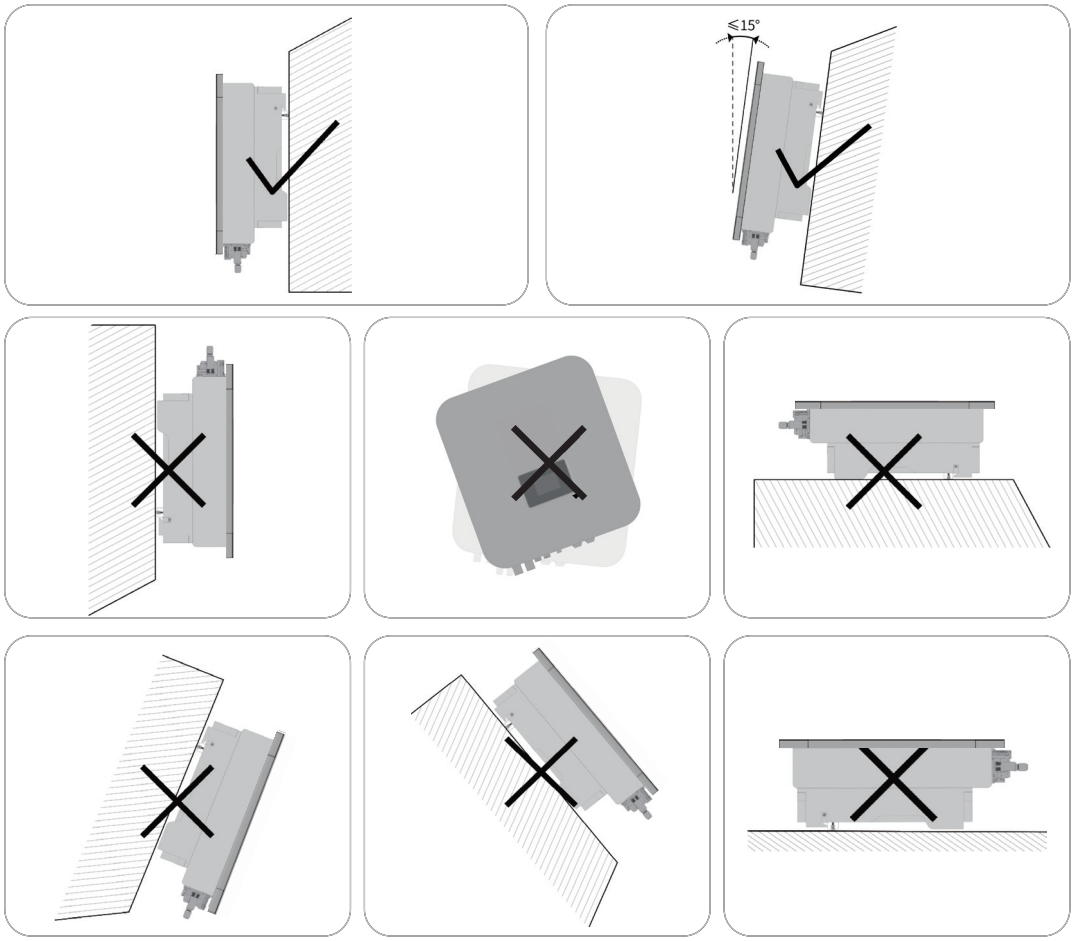


Figure 5.5 Installation angle requirements

5.2.4 Clearance Requirements

Reserve enough clearance around the inverter to ensure sufficient space for heat dissipation.

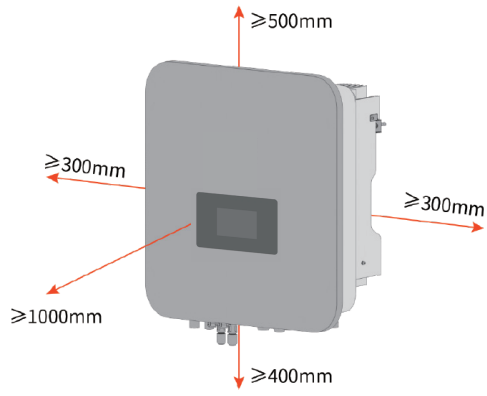


Figure 5.6 Installation space requirements for single inverter

For multiple inverters, recommended as following:

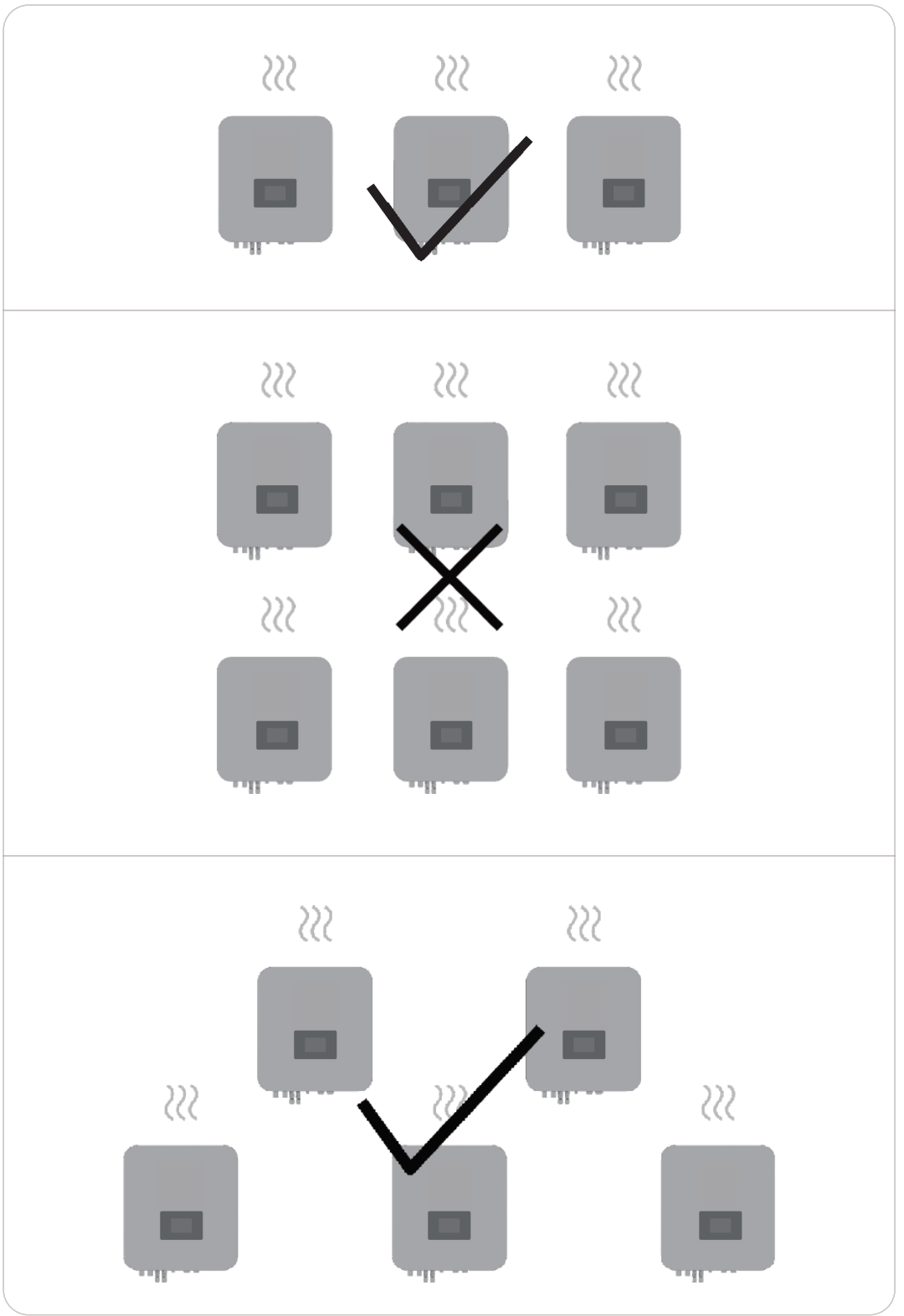


Figure 5.7 Installation space requirements for multiple inverters

5.2.5 Installation Tools

Installation tools include but are not limited to the following recommended ones. Other auxiliary tools can be used if necessary.

Figure 5.8 Installation tools requirements

5.3 Installation

5.3.1 Moving Inverter

CAUTION

- When carrying out transportation, turnover, installation and other operations, it is necessary to comply with the laws, regulations and relevant standards of the country or region.
- Before installation, the inverter should be taken out of the packaging box and transported to the installation site.

5.3.2 Mounting-bracket

The inverter can be installed on a rack or wall by means of mounting-bracket.

Dimensions of the mounting-bracket are as follows.

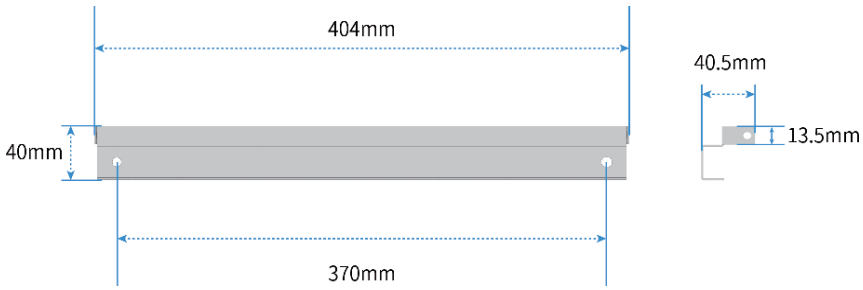


Figure 5.9 Dimensions of the mounting-bracket

Reserve enough space when installing the mounting-bracket to meet the installation space requirements of the inverter.

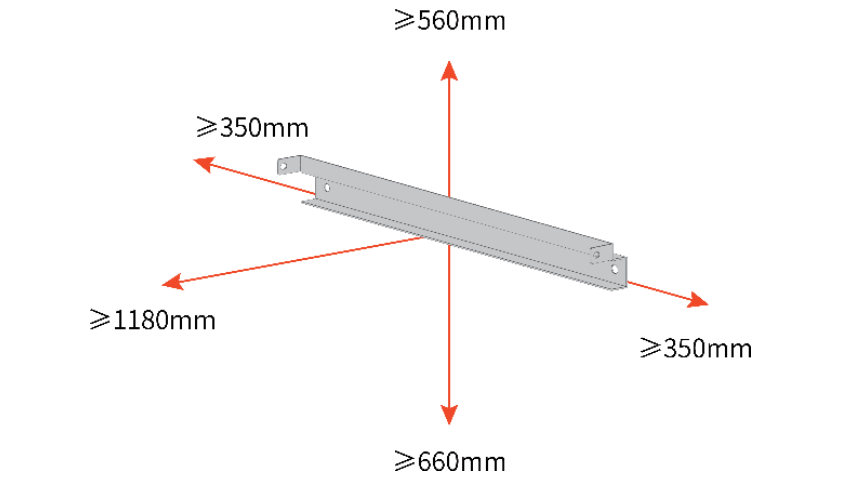


Figure 5.10 Installation space requirements of the mounting-bracket

Inverter is installed on the wall by means of wall-mounting bracket and the expansion plug sets.
The following expansion plug set is recommended for the installation.

(1) Self-tapping screw (M6)

(2) Expansion tube

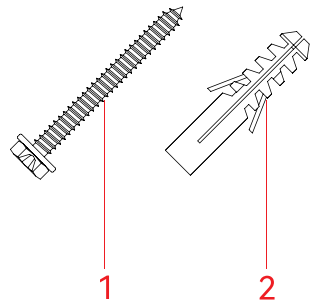
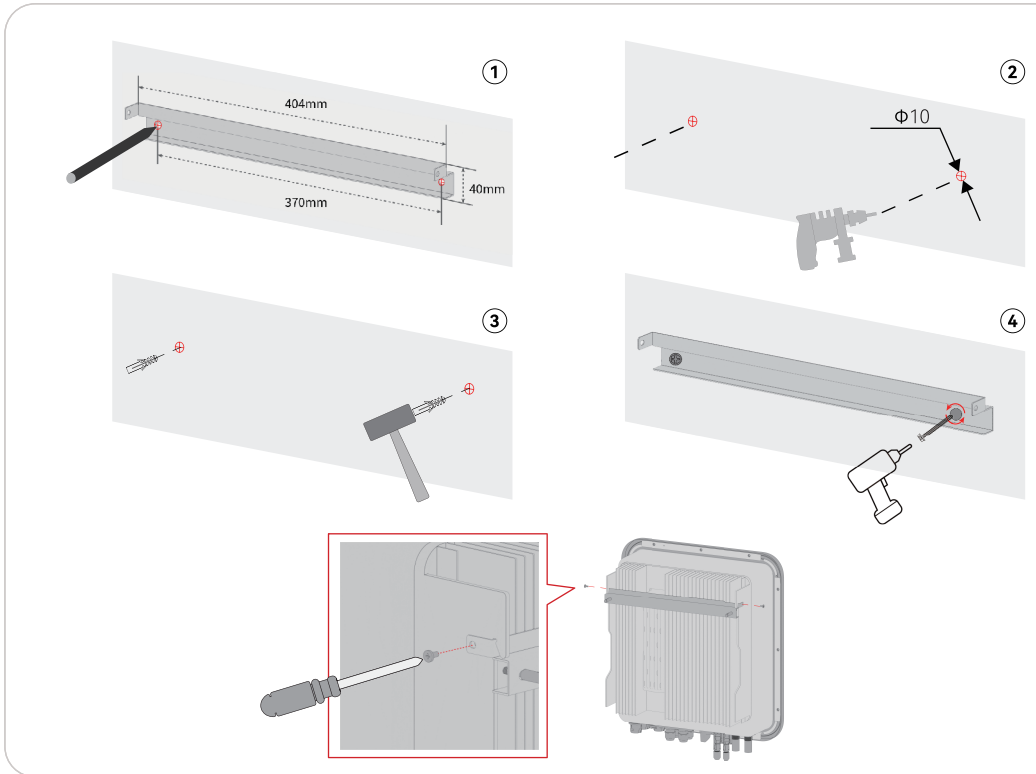


Figure 5.11 Expansion plug set

5.3.3 Installing Inverter

NOTICE

- Ensure that the installation hole positions on the wall are consistent with the mounting bracket and make sure the mounting bracket is placed horizontally.
- The depth of the holes should be about 70 mm.
- Ensure that the installation wall is strong and reliable enough to withstand the weight of 100kg. For example: concrete wall, brick wall, stone wall, etc.



6 Electrical Connection

6.1 Safety Instructions

DANGER

- All operations during the electrical connection process, as well as the specifications of cables and components used, must comply with local laws and regulations.
- Before performing electrical connections, disconnect the inverter and all switches connected to it to ensure that all equipment is powered off. It is strictly prohibited to perform operations while the power is on.
- Before manipulating any cables, be sure to use a measuring device to ensure that the cables are not live or carrying any electrical current.
- Before completing the electrical connection work, do not switch on any circuit breakers or switches.

WARNING

- The grounding conductor must not be damaged and no operation should be performed on the product before installing the grounding conductor. Otherwise, it may cause personal injury or product damage.
- When crimping wire terminals, ensure that the cable conductor is in full contact with the terminal. Do not crimp the cable insulation along with the terminal. Otherwise, it may result in the equipment not functioning properly or the inverter terminal block being damaged due to unreliable connections and subsequent heat generation.
- Incorrect wiring may cause product damage and any damage caused as a result will not be covered by the warranty.
- During electrical connection operations, personnel must wear safety shoes, protective gloves, insulated gloves and other personal protective equipment as required.
- After completing any wiring connection, lightly tug on the cables to ensure a secure connection without any loose or detached wires.

NOTICE

- Only professionals are allowed to perform electrical connection operations.
- The cable colors depicted in this manual are for reference only. Please select cables according to local cable standards.
- All unused terminals must be covered with waterproof caps to prevent them from affecting the product's protection level.
- After completing the wiring, be sure to use fireproofing materials such as fireproof mud to seal the gaps around the inverter's input and output holes if necessary. This will prevent foreign objects or moisture from entering and affecting the long-term normal operation of the inverter.

6.2 Electrical Connection Overview

WARNING

- It is important to install circuit breakers on all input cables to prevent electrical short circuits and potential damage to the inverter.
- Ensure that all output cables are securely connected to the circuit breakers to avoid any malfunction of the inverter.

NOTICE

- If local standard has other requirements for cables, set the cable specification according to the local standard.
- The factors that affect cable selection include rated current, cable type, routing mode, environmental temperature and maximum expected line loss.
- The length of the external cable between the battery and the inverter should be less than 3 meters.
- Type HN6KS-AH2GT can be connected in single phase and must be used with energy storage and balancing devices to ensure that the final installation meets the maximum permissible imbalance (For Belgium ≤5KVA, for Netherlands ≤5.75KVA) as registered by the grid operator.

The electrical connection should be realized as follows:

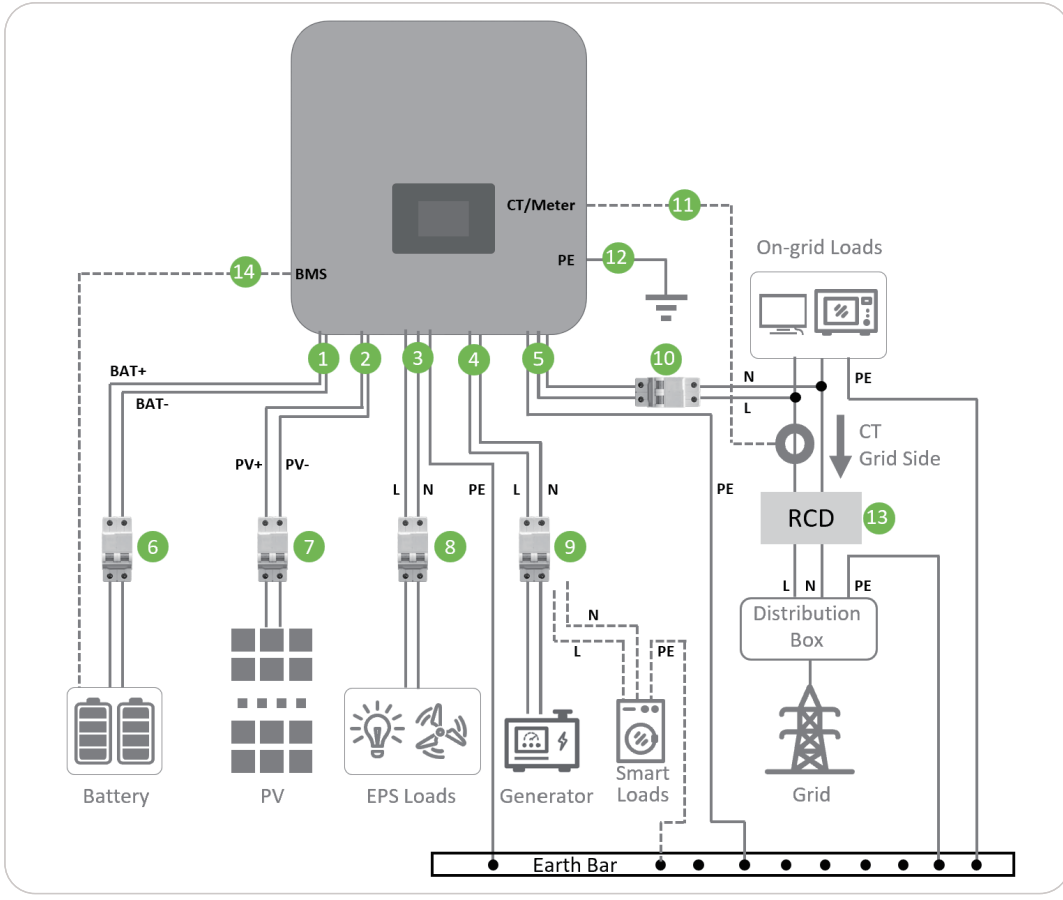


Figure 6.1 Electrical connection

Table 6.1 Cable / Breaker Recommend

No.	Cable/Breaker	Type	Recommended models
1	Battery cable	Complying with 160A standard	25mm² and above
2	PV cable	Common outdoor PV cable in the industry	4mm² and above
3	EPS cable	Outdoor 3-core (L, N and PE) copper wire	6mm² and above
4	GEN cable	Outdoor 2-core (L, N) copper wire	6mm² and above
5	AC cable	Outdoor 3-core (L, N and PE) copper wire	6mm² and above
6	Battery breaker		160A
7	PV breaker		30A
8	EPS breaker		40A
9	Generator breaker		40A
10	On grid breaker		40A
11	CT with cable		
12	Ground cable	Outdoor single-core yellow-green cable	4mm² and above
13	RCD (with breaker)		Breaker: reference to home load RCD: 300mA
14	BMS cable		For lithium battery

6.3 External Protective Grounding Connection

DANGER

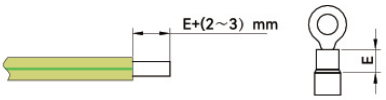
Ensure a reliable connection of the grounding wire to prevent electrical shock hazards.

WARNING

- The external grounding protection point provides a reliable grounding. Do not use inappropriate grounding conductors as it may result in product damage or personal injury.
- If unsure about the grounding connection, please consult a professional for proper guidance.

The external grounding cable is to be prepared by the customer themselves. The grounding cable must be yellow-green color. OT terminals with insulating jacket is in the packing.

1.Remove insulation sleeve a proper length from the head of cables.



2.Use OT terminal crimping tool make cable and terminal crimped tightly.

3.Connect the ground cable with M4 screw.

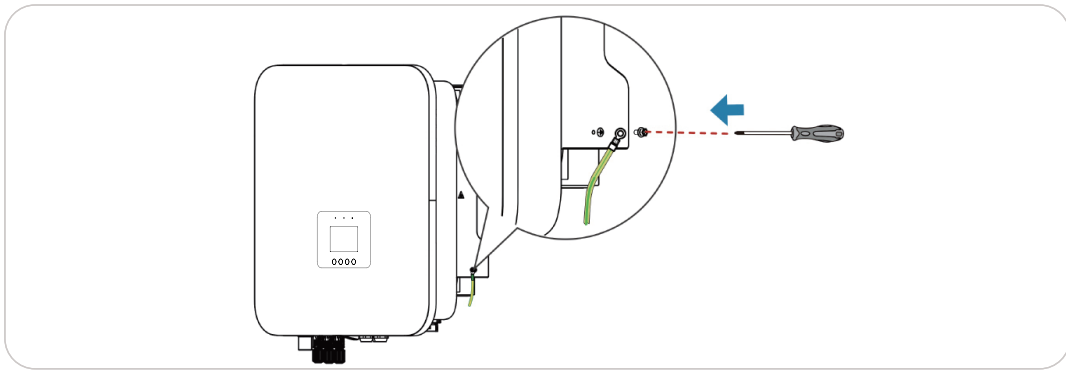


Figure 6.2 Steps for connecting the protective ground wire

6.4 Grid Connection

6.4.1 AC Side Requirements

The inverter can only be connected to the grid with the permission of the loacl power grid department. Before connecting the inverter to the grid, make sure that the grid voltage and frequency meet the requirements, as specified in the 'Technical Data Sheet'. Otherwise, please contact the power company for assistance.
An independent double-pole circuit breaker must be installed on the grid side of the inverter to ensure a safe disconnection between the inverter and the grid (recommended specification is 40A).

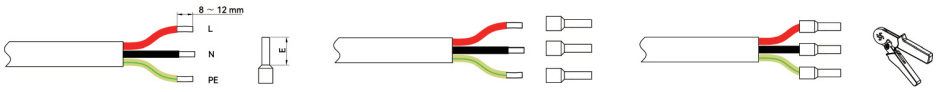
WARNING

- Determine whether an AC circuit breaker with greater overcurrent capacity is required based on actual conditions.
- Do not connect any load between the inverter and the AC circuit breaker.
- Multiple inverters cannot share one AC circuit breaker.

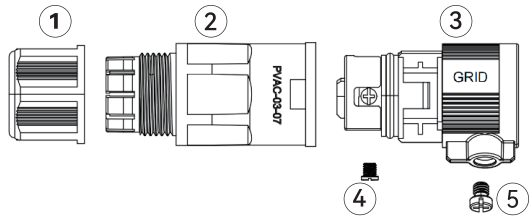
6.4.2 Connecting AC Cable

Switch off the AC circuit breaker and secure it against reconnection.

1. Prepare the power cable as required, the L/N/PE cable color should meet the local regulations. Remove insulation sleeve 8-12mm from the head of cables. Insert the cable into tubular terminal. Use terminal crimping tool make the cable conductor and terminal conductor clamped.

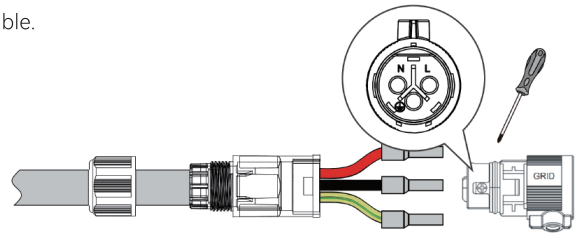


2. Choose the GRID connector (silk printing with 'GRID' on surface). Separate the connectors into 5 parts as shown below.

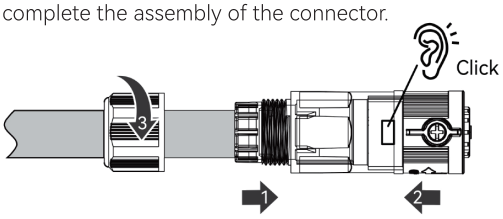


3. Wire the cable through ①→②.

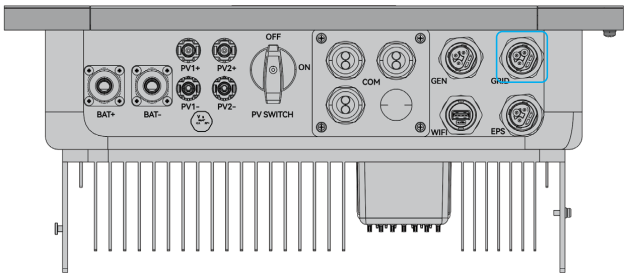
4. Make sure L/N/PE cables go through the socket ③ with the right hole (as shown below). Tighten the bolts ④ on socket ③ on each cable.



5. Put ② and ③ together. If you hear a 'click', two pieces connected well.
6. Screw on the cover ① to complete the assembly of the connector.



7. Insert the GRID connector to GRID port on the inverter. After you hear a 'click', two pieces connected well.
8. Tighten the bolts ⑤ on socket ③.



NOTICE

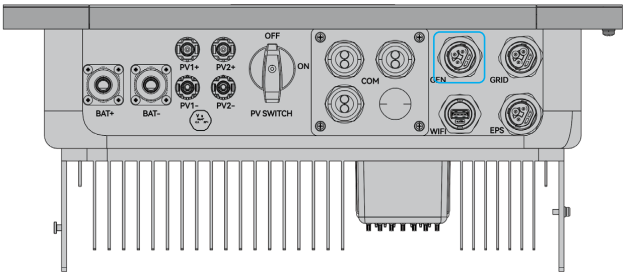
Observe the terminal assignment. Do not connect any phase line to the 'PE' terminal or PE wire to 'N' terminal. Otherwise, unrecoverable damage to the inverter may follow.

6.5 Generator Connection (optional)

The wiring and connection steps for the generator ports are the same as the grid ports. Please refer to section 6.4.2 for the wiring steps for the grid ports and follow the same procedure for the generator ports. The only attention is choosing the GEN connector for generator connection (silk printing with 'GEN' on surface).

Make sure to plug the generator terminals into the corresponding GEN ports on the inverter.

Note: Smart Load power line is also connected to this port. Only one function of Smart Load and Generator can be selected during using.

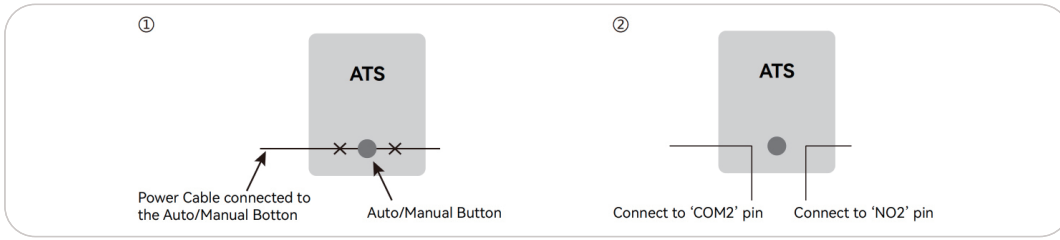


After reaching certain conditions (such as grid disconnection and low battery capacity), the inverter can automatically control the generator to start and stop. To use this feature, communication with the generator is required, and the generator must be capable of communication and have ATS functionality. For detailed communication wiring methods, please refer to section 6.9 and follow the steps provided.

NOTICE

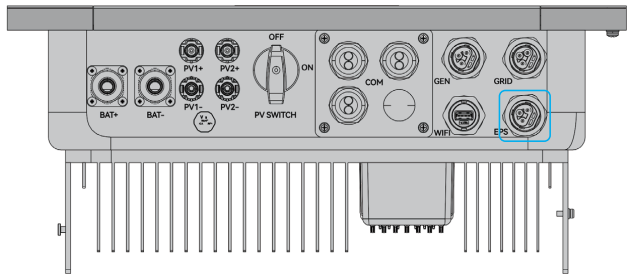
- When connecting a generator to the GEN port, it should ensure that the N and PE cables are shorted between the generator and the inverter.

In order to realize the automatic start/stop control of the generator by the inverter, communication is needed between the ATS of the generator and the inverter. The ATS needs to be connected to the Dry Contact (DRY IO) of the inverter.
The specific connection method is as follows:
Cut off the cables on both sides of the automatic/manual switch of the ATS, and connect one end to the COM2 pin, and the other end to the NO2 pin. Check chapter 6.9 to see the pin definition of DRY IO port.



6.6 EPS Connection

The wiring and connection steps for the EPS ports are the same as the grid ports. Please refer to section 6.4.2 for the wiring steps for the grid ports and follow the same procedure for the load ports. The only attention is choosing the EPS connector for EPS connection (silk printing with 'EPS' on surface).
Make sure to plug the EPS terminals into the corresponding EPS ports on the inverter.



6.7 PV Connection

6.7.1 PV Side Requirements

DANGER

- Exposure to sunlight can generate lethal high voltages in photovoltaic strings, so strictly adhere to the safety precautions listed in the photovoltaic string and related documents.
- Ensure all cables are voltage-free before performing electrical operations.
- If the DC input line is accidentally reversed, first, switch off the circuit breaker. Then, set the 'DC switch' to the 'OFF' position and remove the positive and negative terminals after ensuring there is no voltage. This will correct the polarity of the PV input line on the inverter.
- Please do not switch on any DC switches or AC/DC circuit breakers before completing the electrical connections.

WARNING

- Do not ground the positive or negative terminals of the solar modules, as this can severely damage the inverter.
- Choose high-quality and reliable solar modules. Ensure that the maximum open-circuit voltage and maximum short-circuit current of each photovoltaic string are within the allowable range of the inverter, as specified in the 'Technical Data Sheet' Additionally, the operating voltage should fall within the MPPT voltage range.
- Before connecting the PV terminals to the corresponding ports on the inverter, please first check the polarity of the photovoltaic string to ensure it is correct.
- Do not connect the same PV string to multiple inverters, as this may cause damage to the inverters.
- After connecting the DC cables, use a multimeter to measure the polarity of the DC cables to ensure that the positive and negative terminals are correct and there is no reverse connection. Also, ensure that the voltage is within the allowable range.

NOTICE

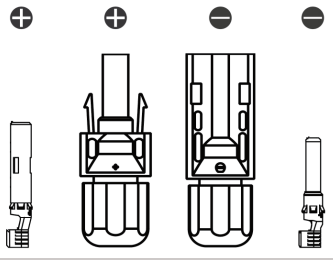
- During the installation of PV strings and inverters, if improper installation or routing of distribution cables leads to a short circuit between the positive or negative terminals of the PV strings and the ground, reverse connection or connection to the wrong ports of the inverter, it may result in equipment damage.
- Any equipment damage caused by such improper installation is not covered by the warranty. It is important to carefully follow the installation guidelines and ensure proper wiring and connection to avoid any potential damage.

6.7.2 Installing PV Cables

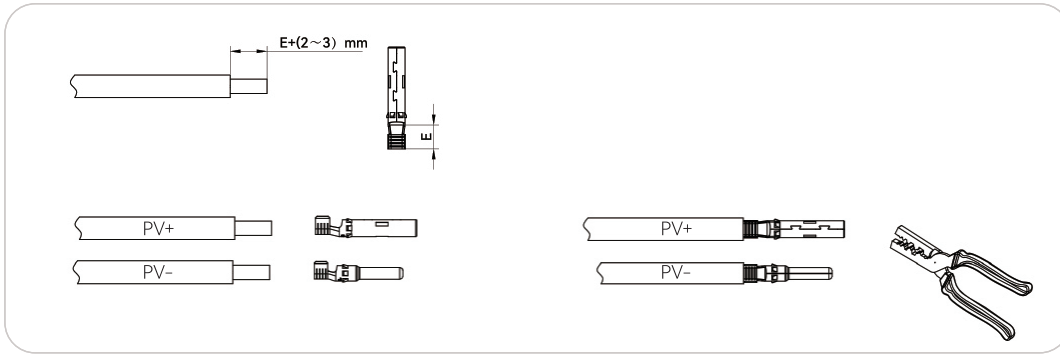
NOTICE

To ensure IP66 protection, please only use the connectors provided with the inverter. Any equipment damage caused by using other incompatible models of positive and negative metal terminals and DC connectors is not covered by the equipment warranty.

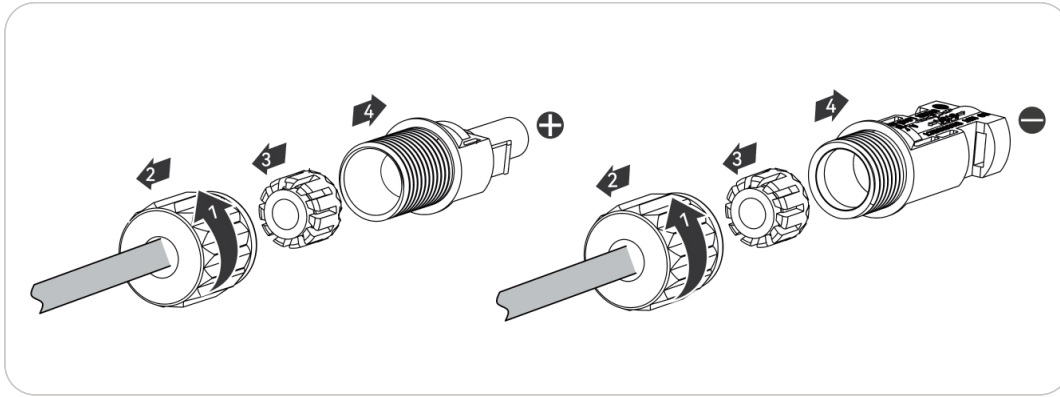
MC4 Cable Coupler and Pin shown as following (The appearance may be slightly different depending on the product batch):



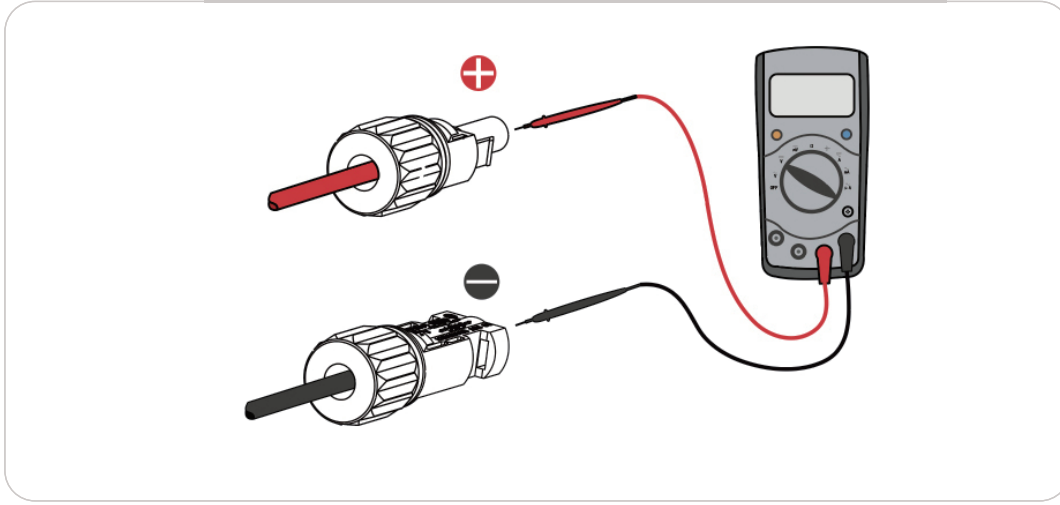
1. Prepare the PV cable as required. The positive cable should be red color or as local regulation. The negative cable should be black color or as local regulation. Remove insulation sleeve for a proper length from the head of cables. Use terminal crimping tool make the cable and terminal connected tightly.



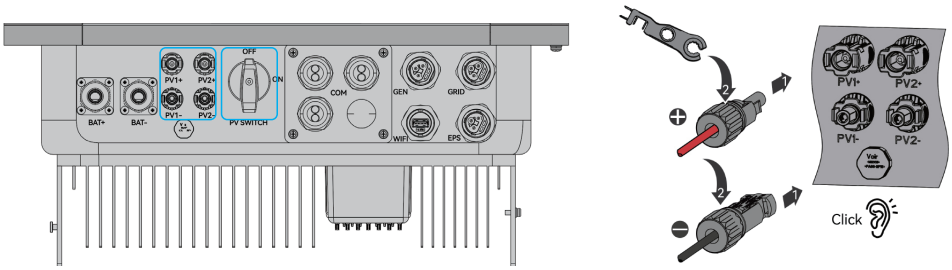
2. Insert the cable into MC4 cable coupler. After hearing a ‘click’, the cable is in the right position.



3. Ensure the PV switch is OFF. Then connect MC4 securely to PV port on the inverter. After hearing a ‘click’, the PV connectors are connected. Use plastic PV wrench to fasten the bolt of PV connector.



4. Ensure the PV switch is OFF. Then connect MC4 securely to PV port on the inverter. After hearing a 'click', the PV connectors are connected well.



6.8 Battery Connection

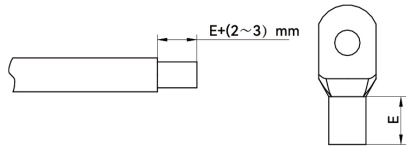
This section mainly describes the cable connections on the inverter side. Refer to the instructions supplied by the battery manufacturer for the connections on the battery side and configuration.

WARNING

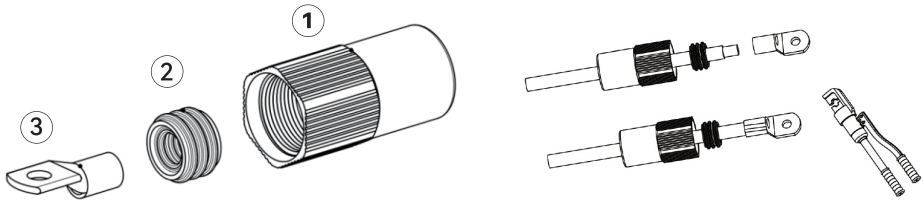
- Only use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, use electrical tape to cover the entire exposed metal surfaces of the available tools except their tips.
- Do not disconnect under load!
- During the installation and operation of the inverter, please ensure that the positive or negative polarities of batteries do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in equipment damage. The damage caused by this is not covered by the warranty.
- When the battery is not in use for a long period of time, please turn off the battery pack switch button to prevent damage to the battery.
- If lead-acid batteries are used, it is necessary to add DC break and DC fuse between the inverter and the lead-acid batteries. Recommended break specification: Voltage ≥ 80V; Current ≥ 125A. Fuse specifications: Voltage ≥ 80V; Current between 150A and 200A.

Follow the steps:

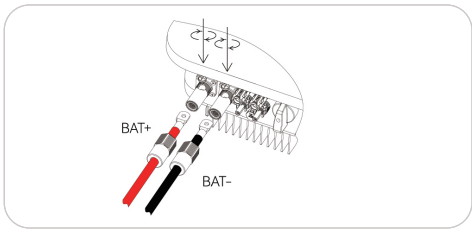
1. Prepare the battery cable as required. The positive cable should be red color or as local regulation. The negative cable should be black color or as local regulation. Remove insulation sleeve for a proper length from the head of cables. Battery cable terminal kit (2 pairs) is pre-fixed to battery input of inverter. Remove kit before connecting.



2. Wire the cable through Battery terminal cap① and waterproof ring②, then use terminal crimping tool make the cable and DT terminal③ connected tightly.



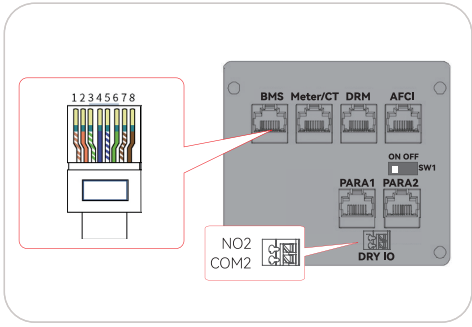
3. Before connecting, check the positive and negative port carefully. Insert the cable into mounting plug of battery port on inverter. Use cross screws to secure DT terminal.
4. Tighten Battery terminal cap① in clockwise direction.



6.9 Communication Cable Connection

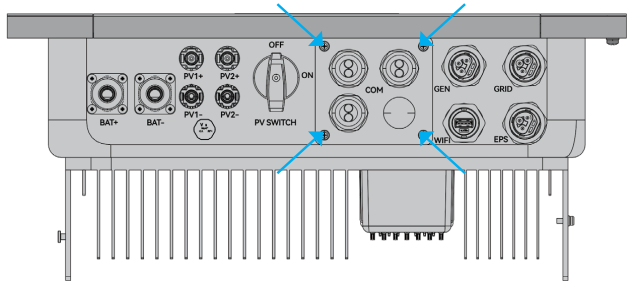
The CAN cable or RS485 cables enables the communication between the inverter and the Li-ion battery. You can choose one of the communication protocols.

The communication port has six slots, each corresponding to a different function. Be careful not to insert it into the wrong slot to avoid communication failure and inverter malfunction. The specific functions corresponding to each slot are as shown in the table below.



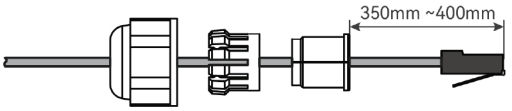
Name	Description	Pin definition			
BMS	BMS Communication for Batteries	1.RS485B 5.CANL	2.RS485A 6.GND	3.GND 7.NC	4.CANH 8.NC
Meter/Grid Current	CT/Meter Communication	1.RS485A 5.CTS-	2.RS485B 6.CTR-	3.CTR+ 7.CTT+	4.CTS+ 8.CTT-
DRM	Grid communication in Australia	1.DRM1 5.+5V	2.DRM2 6.DRM0	3.DRM3 7.GND	4.DRM4 8.GND
AFCI	Arc Fault Detection Communication	1.AFCIRS485A 5.NC	2.AFCIRS485B 6.GND	3.+5V 7.HPRS485A	4.NC 8.HPRS485B
PARA1& PARA2	Parallel communication	1.PARACANH 5.EMSCANL	2.PARACANL 6.NC	3.NC 7.SYN_PARA+	4.EMSCANH 8.SYN_PARA-

1. Remove the screws from the COM port cover.



2. When we connect BMS cable, take one waterproof plug out first. Wire the cable from Cap and sealing ring, then connect the RJ45 terminal to the BMS port. The same connection method is used for other communication cables.

Cable connection diagram:



3. Assemble all the parts. Tighten Cap.

6.10 CT or Electric Meter Connection

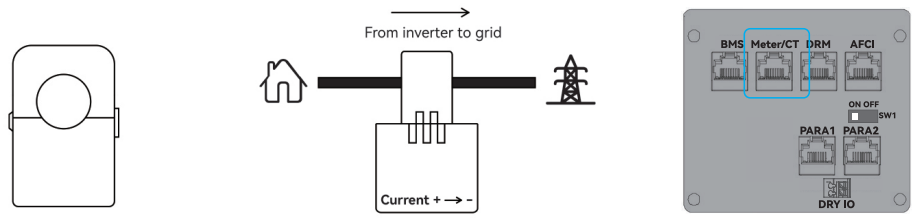
NOTICE

- CT is supplied in the box. If the length of CT cable is longer than 20 meters, we suggest to use electric meter to measuring. The wiring of the electric meter must strictly follow the instructions.
- When connecting CT, it is essential to pay attention to the correct direction. Incorrect direction can lead to abnormal operation of the inverter.
- CT in package can only support system up to 50A.

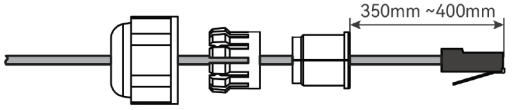
6.10.1 CT Connection

The specific steps for removing and installing the COM port and RJ45 connector are detailed in section 6.9. Please refer to the steps and follow them accordingly.

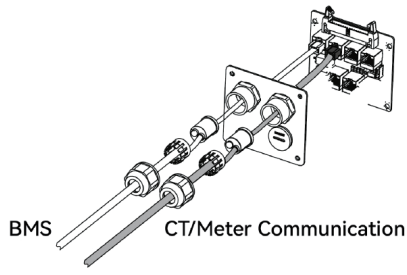
Disassemble the CT and insert the L line (live wire) of the inverter and grid connection into it. It is important to pay attention to the direction of the CT and ensure that the arrow points from the inverter towards the grid. Plug RJ45 connector of CT into Meter/Grid Current port.



Cable connection diagram:



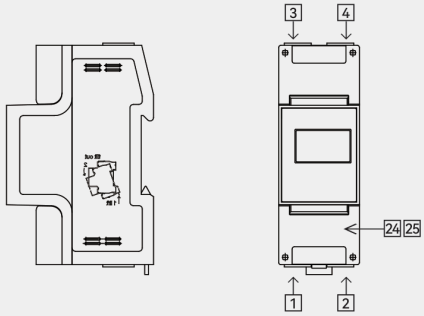
The final assembly is as following for BMS and CT/Meter communication cable.



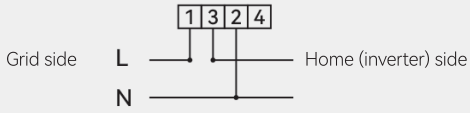
6.10.2 Electric Meter Connection

Take Chint-DDSU666 as an example:

The electric meter is 35mm DIN type. It should be fixed on a rail



The electric meter has 6 connecting terminals. Terminal 1 is for L line input, terminal 3 is for L line output. Terminal 2 is for N line connect.

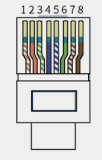


Terminal 24 and 25 is for RS485 communication.

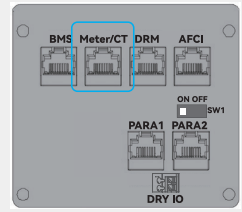
A B

RS485

After connecting L and N line, plug RJ45 connector (cable from terminal 24 and 25) of electric meter into Meter/Grid Current port.



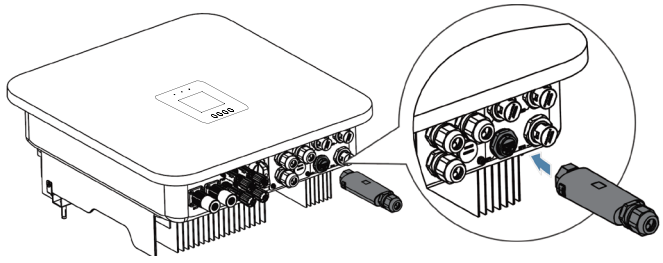
Pin1: RS485A
Pin2: RS484B
Pin3 - Pin8: Cut off



6.11 Smart Communication Stick Connection

The smart communication stick will be included in the package and is used to connect to the cloud platform.

1. Remove the waterproof cap from the WiFi port.
2. Install the stick to WiFi port.
3. Tighten the cap in the clockwise direction.



For detailed information, please refer to Solar APP configuration guide.

7.System Commissioning

7.1 Inspection before Commissioning

Check the following items before starting the inverter:

Table 7.1 Inspection items

No.	Inspection items
1	All equipment has been reliably installed.
2	All DC switches and AC circuit breakers are in the 'OFF' position.
3	The ground cable is properly and reliably connected.
4	The AC cable is properly and reliably connected.
5	The DC cable is properly and reliably connected.
6	The communication cable is properly and reliably connected.
7	Unused ports are sealed.
8	The installation space is proper, and the installation environment is clean and tidy.

7.2 System Power-on

If all of the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

Before turn on the AC switch between the inverter and the grid, you need to use a multimeter AC voltage gear to measure whether the AC voltage is within the allowable range.

Power-on steps:

Step 1: (Optional) If equipped with a battery, please switch on the external DC circuit breaker between the inverter and the battery pack.

Step 2: Switch on the AC circuit breaker between the inverter and the grid.

Step 3: Switch on the external DC circuit breaker between the inverter and the photovoltaic array.

Step 4: (Optional) Power on the battery pack manually if a battery is equipped.

Step 5: Rotate the DC switch of the inverter to 'ON' position.

Step 6: Observe the LED to check the inverter operating status.

If the sun irradiation and grid conditions meet requirements, the inverter will operate normally.

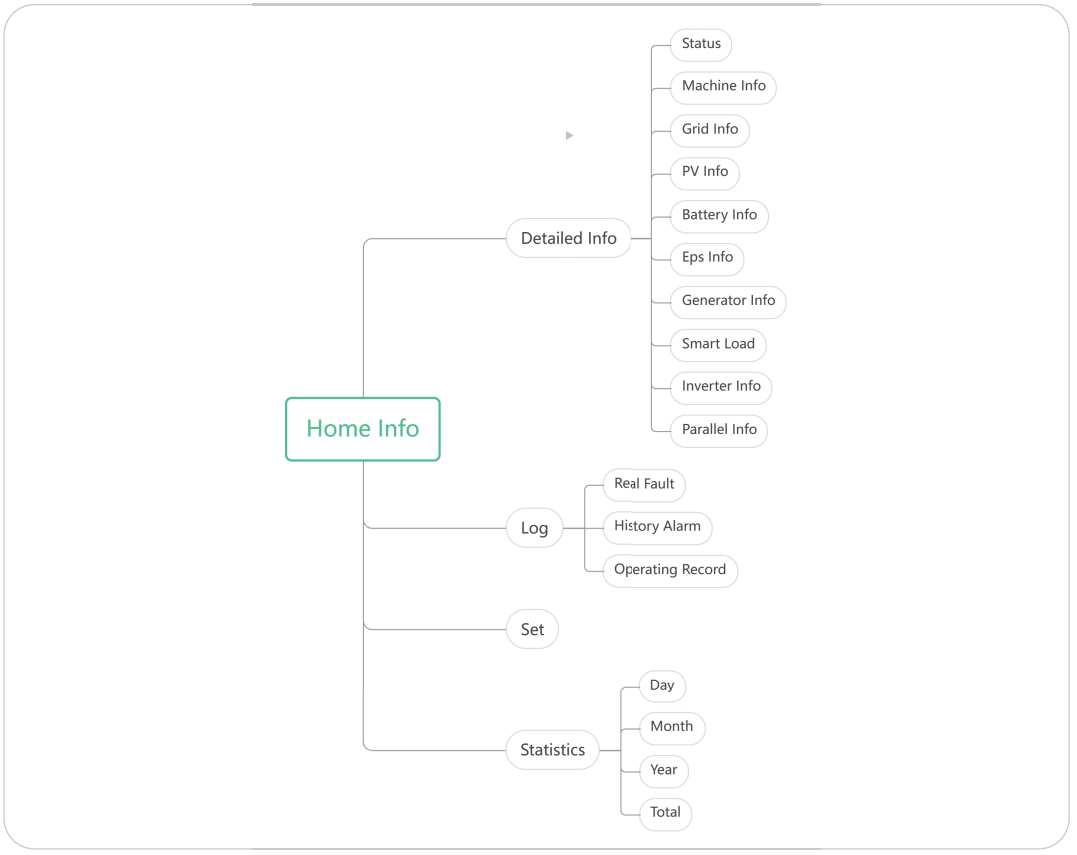
Observe the LED indicator to ensure that the inverter operates normally.

If the indicator light is abnormal, please disconnect all power supplies and reconfirm whether the wiring is normal or not.

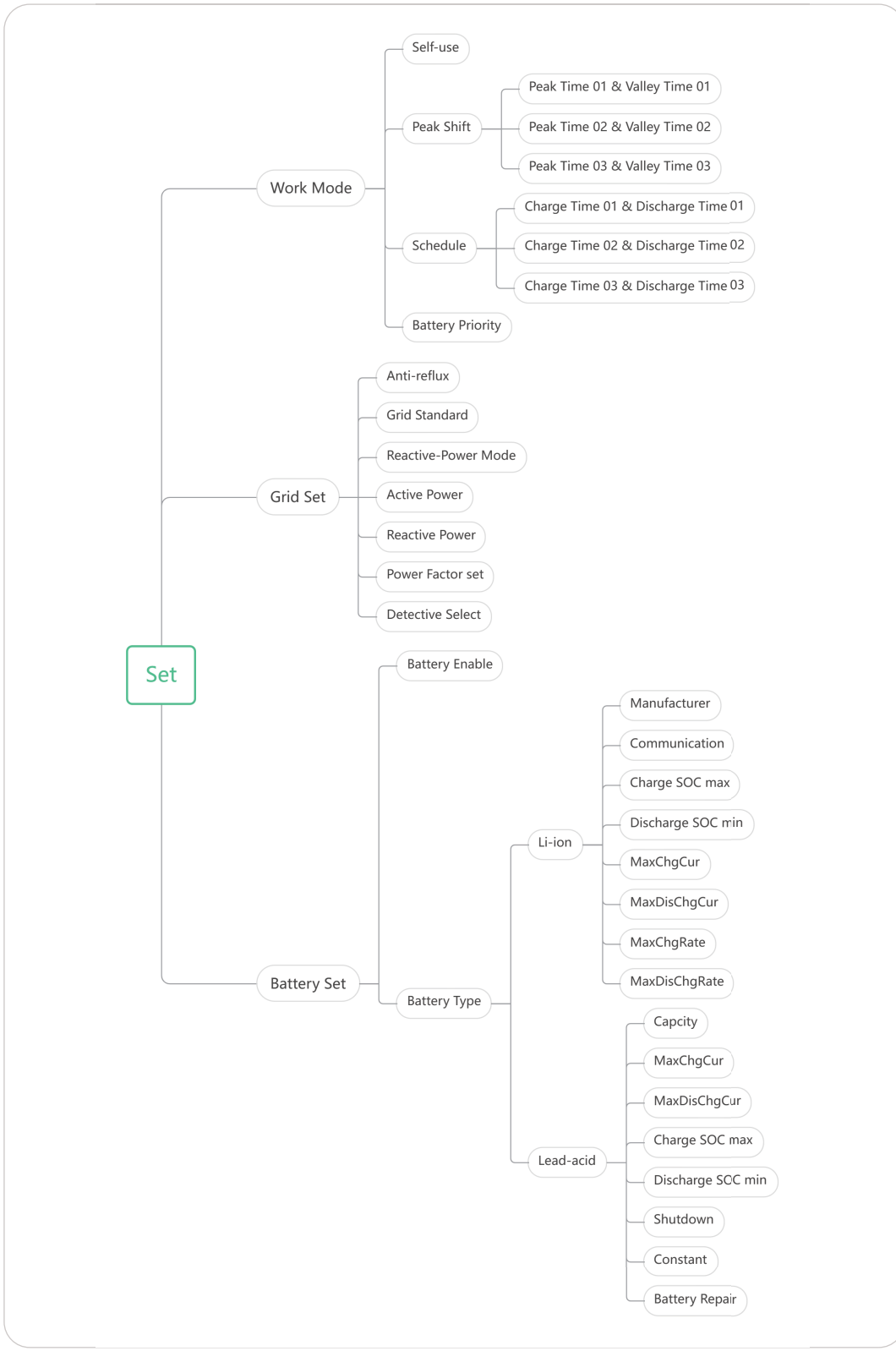
7.3 System Commissioning

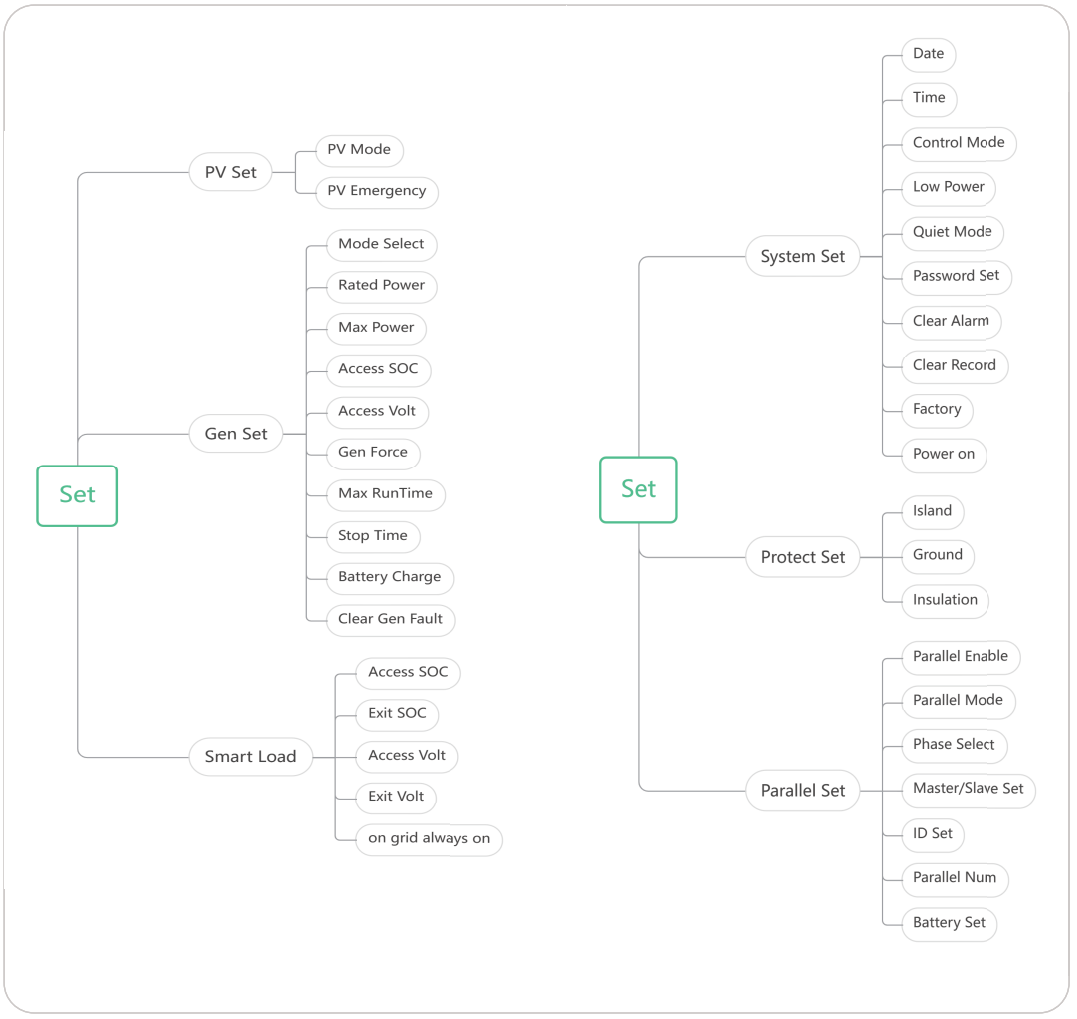
To ensure the proper functioning of the inverter, it is important to perform the parameter settings on the display screen immediately after powering inverter on.

The relationship diagram of the page settings is as follows:



Note: When entering the ‘Set’ page, password is required.



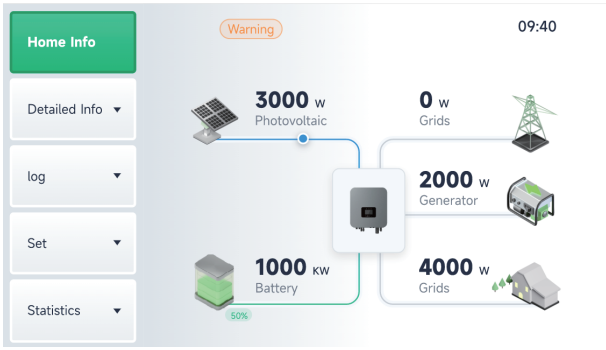
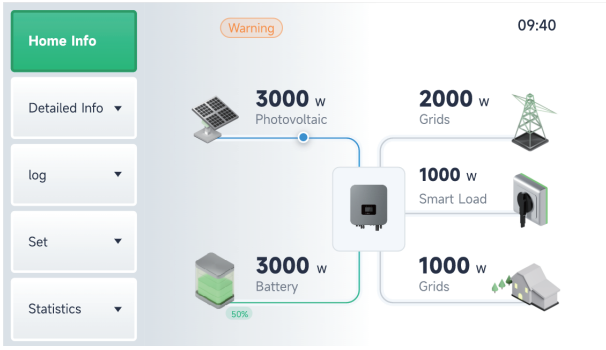


NOTICE

- By using the UP and DOWN buttons, you can move the cursor up and down or flip through pages. Pressing the ENTER button will allow you to enter sub-pages or confirm settings information. Pressing the ESC button will take you back to the previous page.
- When setting parameters, UP represents plus one, and DOWN represents minus one.
- When setting several rows of data, you can follow the steps below to proceed:
  1. Use the UP and DOWN button to navigate to the desired row. Then, press the ENTER button to enter the selected row for setting.
  2. Use the UP and DOWN buttons to increase or decrease the value of the data. And the ENTER button is used to move the cursor.
  3. Once the setting is complete, press the ESC button to bring up the Sure and Cancel page. Pressing ENTER indicates confirmation, while pressing ESC indicates cancellation.

7.3.1 Home Info page

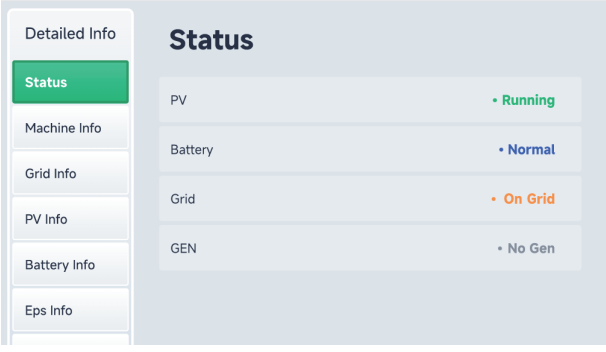
This interface is the default interface of the machine. If there is no screen operation within 3 minutes, the screen will turn off and exit to this interface. You can touch or press a button to light up the screen again.

Interface	Description
 	On the left side of the Home Info is the menu bar, which allows you to select and enter the Home Info, Detail Info, Log, Set and Statistics interfaces respectively. The right side of the Home Info interface is the energy flow diagram of the inverter, which displays PV power (W), grid power (W), battery power (W), load power (W) and power flow direction.

7.3.2 Detail Info Page

Select Detailed Info in the menu bar of the Home Info interface to enter the Detailed Info interface.

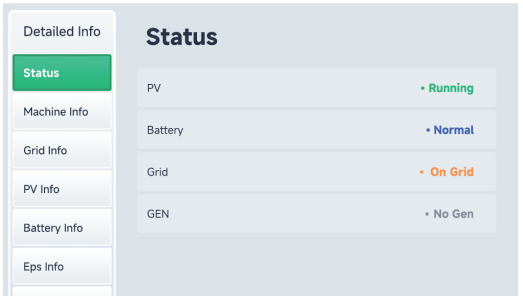
1) Menu

Interface	Description
	On the left side of the Detailed Info interface is the menu bar of the interface, where you can select to enter the Status, Machine Info, Grid Info, PV Info, Battery Info, Eps Info, Gen Info, Smart Load, Inverter Info, and Parallel Info interfaces respectively. Press the Back button or touch Detailed Info in the menu bar to return to the main interface.

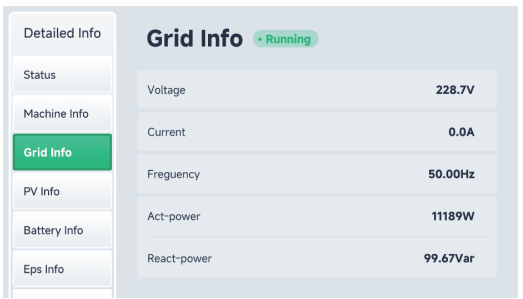
2) Page

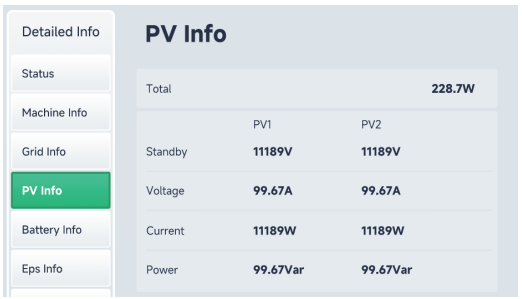
You can view the operating status and real-time data information of the inverter.

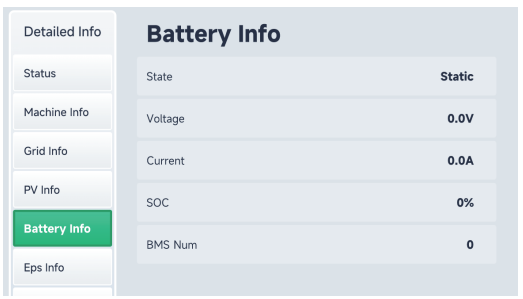
Interface


Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Eps Info
Status
PV • Running
Battery • Normal
Grid • On Grid
GEN • No Gen

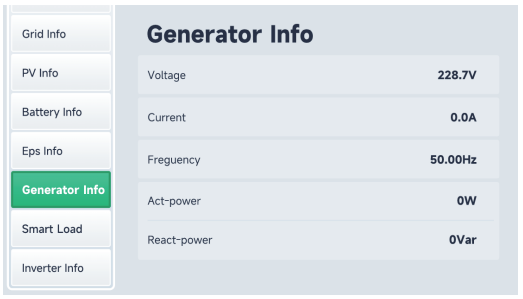

Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Eps Info
Machine Info
Work Mode Peak Shift
Anti-reflex Disable
BMS PYLON
Sys Temp 20°C
Grid Standard European Union

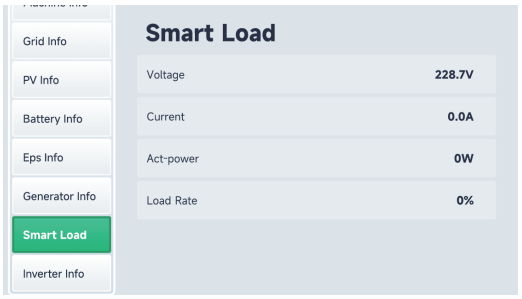

Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Eps Info
Grid Info • Running
Voltage 228.7V
Current 0.0A
Freguency 50.00Hz
Act-power 11189W
React-power 99.67Var

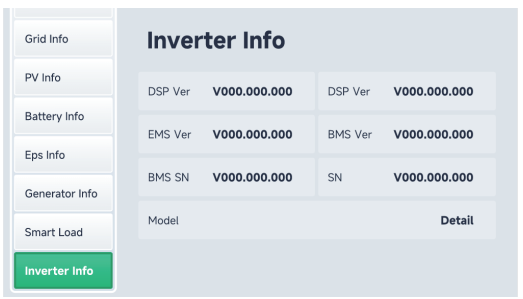

Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Eps Info
PV Info
Total 228.7W
PV1 PV2
Standby 11189V 11189V
Voltage 99.67A 99.67A
Current 11189W 11189W
Power 99.67Var 99.67Var

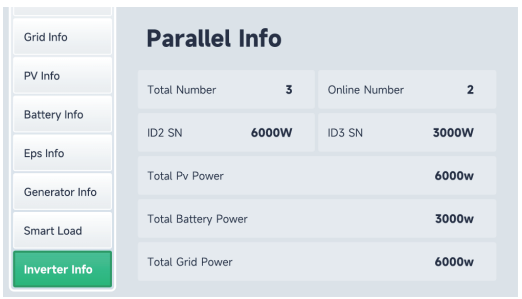

Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Eps Info
Battery Info
State Static
Voltage 0.0V
Current 0.0A
SOC 0%
BMS Num 0


Detailed Info
Status
Machine Info
Grid Info
PV Info
Battery Info
Load Info
EPS Info
Voltage 228.7V
Current 0.0A
Apparent Power 0VA
Loadrate 0%
Grid Load 0W
Total Power 0W

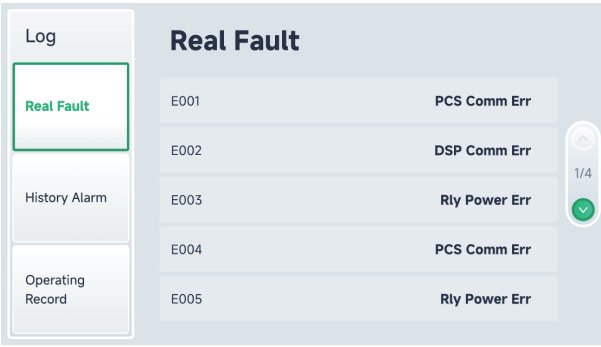

Grid Info
PV Info
Battery Info
Eps Info
Generator Info
Smart Load
Inverter Info
Generator Info
Voltage 228.7V
Current 0.0A
Freguency 50.00Hz
Act-power 0W
React-power 0Var


Grid Info
PV Info
Battery Info
Eps Info
Generator Info
Smart Load
Inverter Info
Smart Load
Voltage 228.7V
Current 0.0A
Act-power 0W
Load Rate 0%


Grid Info
PV Info
Battery Info
Eps Info
Generator Info
Smart Load
Inverter Info
Inverter Info
DSP Ver V000.000.000
DSP Ver V000.000.000
EMS Ver V000.000.000
BMS Ver V000.000.000
BMS SN V000.000.000
SN V000.000.000
Model Detail


Grid Info
PV Info
Battery Info
Eps Info
Generator Info
Smart Load
Inverter Info
Parallel Info
Total Number 3
Online Number 2
ID2 SN 6000W
ID3 SN 3000W
Total Pv Power 6000w
Total Battery Power 3000w
Total Grid Power 6000w

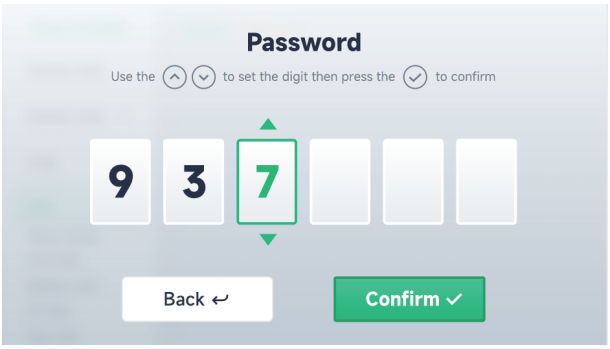
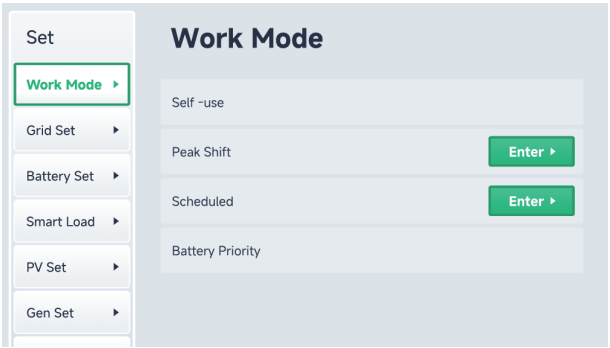
7.3.3 Log Page

Interface	Description
	When a malfunction occurs or you want to view the operation records, you can enter the 3 sub-pages of 'Log' to view the fault information and operation records. Display a total of 20 real-time alarm, including fault code and fault content.
	Display a total of 80 historical alarm, including fault code, fault content, occurrence time and clear time.
	Display a total of 50 operation records, including the operation type, operation time and operation object.

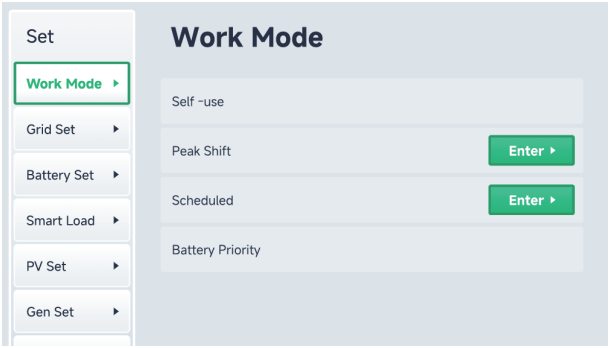
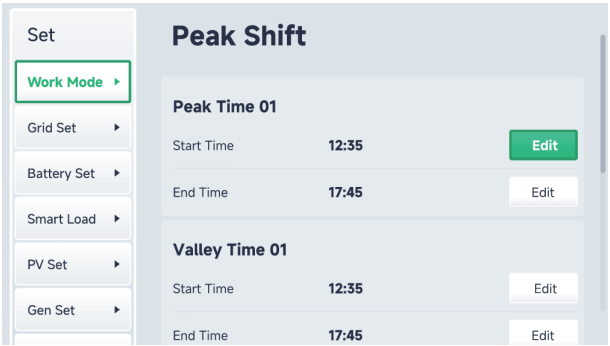
7.3.4 Set Page

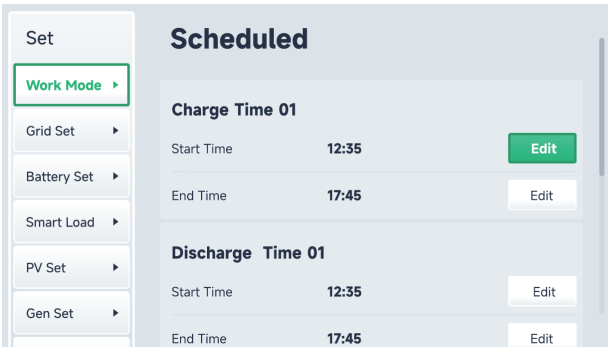
Select Set in the menu bar of the Home Info interface and enter the correct 6-digit password to enter the Set interface.

1) Password & Menu

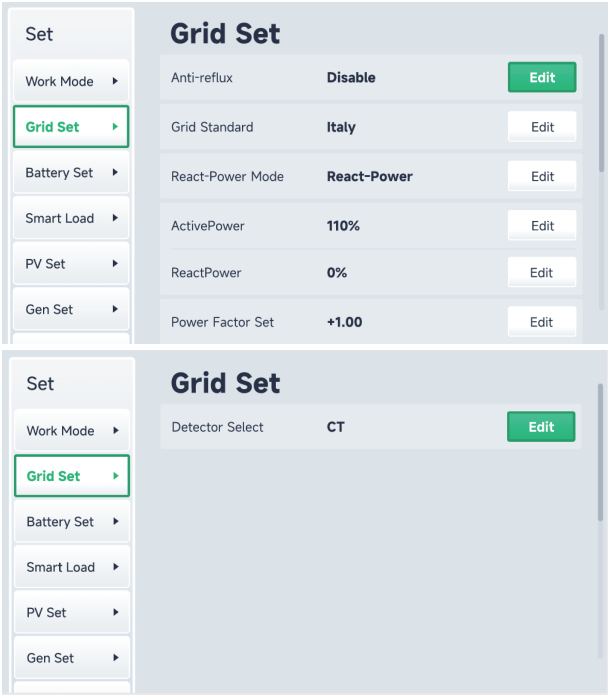
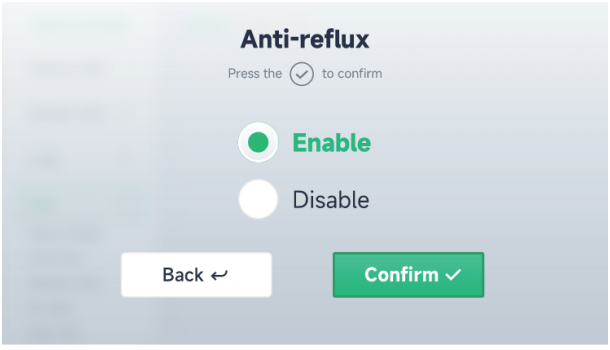
Interface	Description
	Enter the correct 6-digit password and click the Confirm button to enter the Set interface.
	On the left side of the Set interface is the menu bar, where you can select to enter the Work Mode, Grid Set, Battery Set, PV Set, Gen Set, Smart Load, System Set, Protect Set, and Parallel Set interfaces respectively. Press the return button or touch Set in the menu bar to return to the main interface.

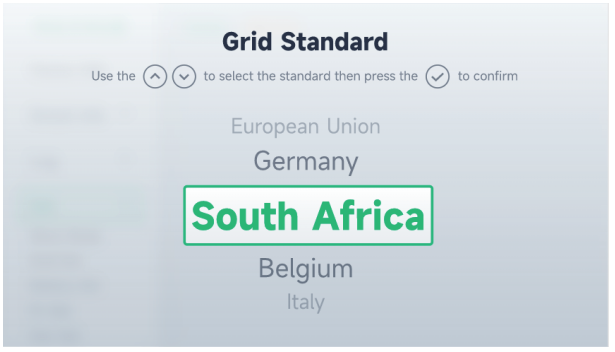
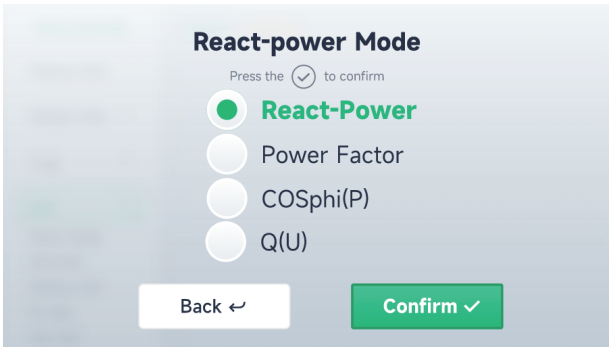
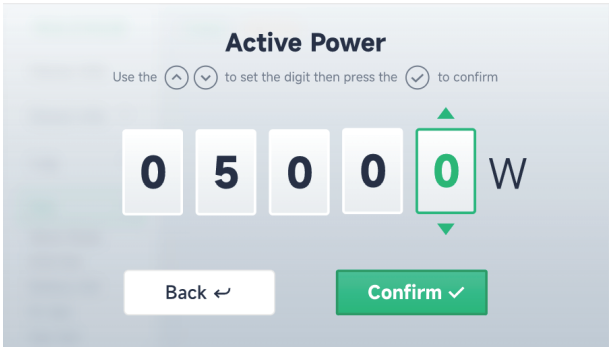
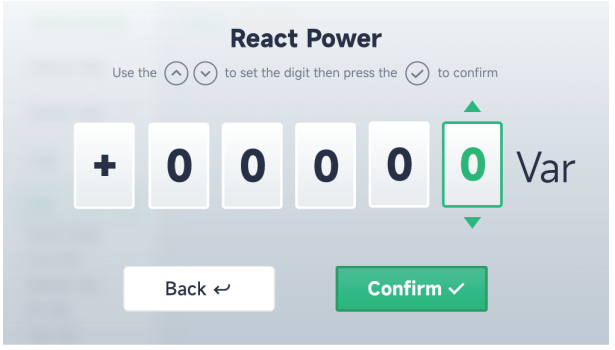
2) Work Mode

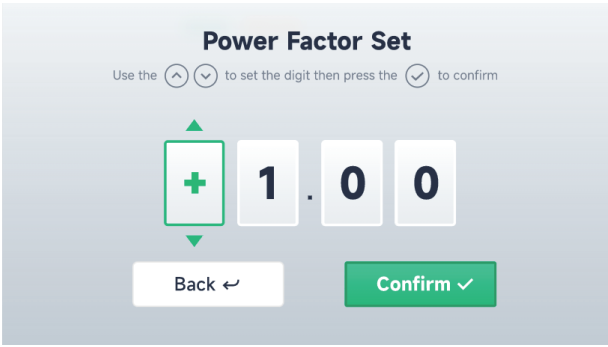
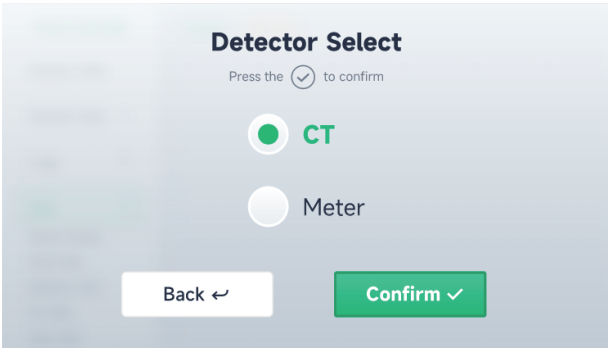
Interface	Description
	The operating modes of the inverter include self use, peak shift, and scheduled charge discharge, and battery priority.
	In the Peak Shift mode, there are a total of six time period that can be set. You can refer to the time slots provided by the local power grid for setting. The pages for the remaining time period have the same content and settings as the 'Peak Time01 & Valley Time01' subpage. The time periods for peak time and valley time should not overlap with each other and should not cross midnight.

	In the scheduled charge and discharge mode, there are also a total of 3 charging time periods and 3 discharging time periods. You can set them according to needs. The remaining time period's settings page and content are the same as 'Charge Time01 & Discharge Time01'. The time periods for charge time and discharge time should not overlap with each other and should not cross midnight.

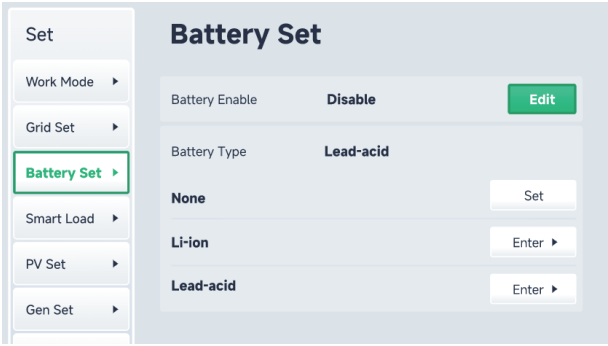
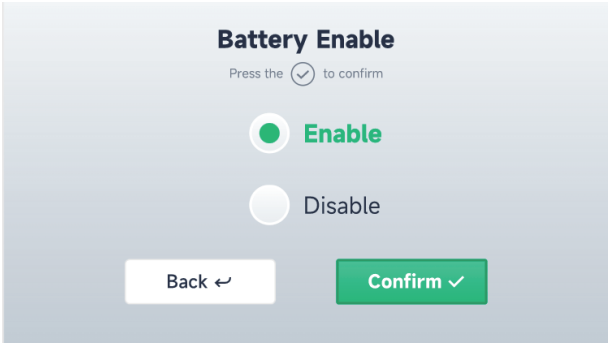
3) Grid Set

Interface	Description
	The grid settings include seven items: anti-reflux control, grid-connection standards, reactive power control, active power setting, reactive power setting, power factor setting and detector selection.
	Once the anti-reflux setting is enabled, the inverter will be unable to feed electricity back into the grid and can only continue to supply power to the load. When anti-reflux setting is disabled, the inverter can operate normally and sell electricity to the grid.

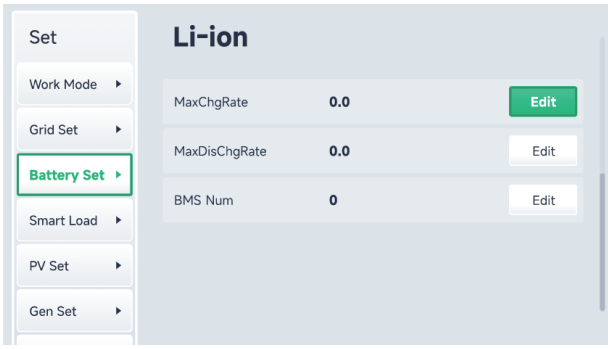
	The inverter supports the grid requirements and standards of the European Union, Germany, South Africa, Belgium, Italy, Netherlands and Spain.
	The inverter supports both reactive power control, power factor control. COSphi(P) and Q(U) are reserved settings.
	Set grid-connected Active power. For a single inverter, the maximum active power setting is the rated power of the inverter. For parallel inverters, the maximum active power setting is the rated power of the inverter multiplied by the number of inverters. The minimum active power is 0.
	Set grid-connected reactive power. For a single inverter, the maximum setting value of reactive power is ±60% of the rated power. In parallel mode, the maximum setting value of reactive power is ±60% of the rated power multiplied by the number of inverters. The minimum reactive power is 0.

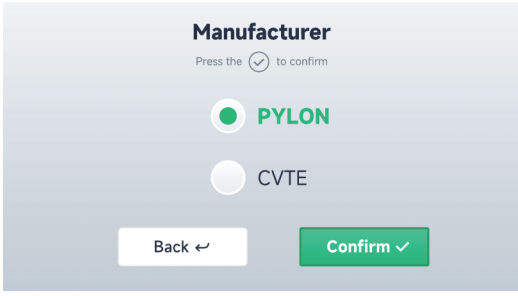
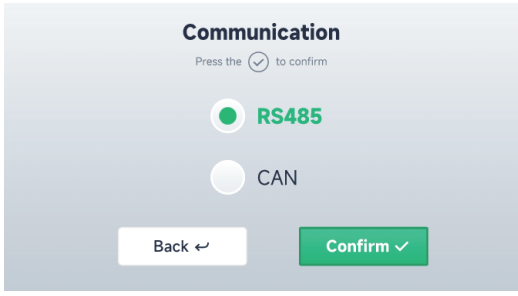
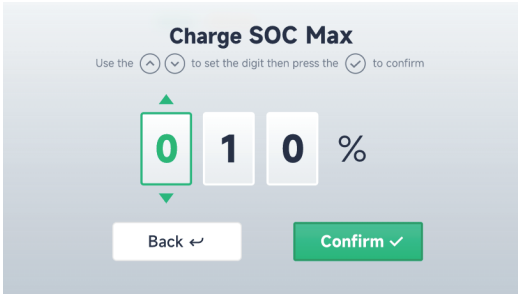
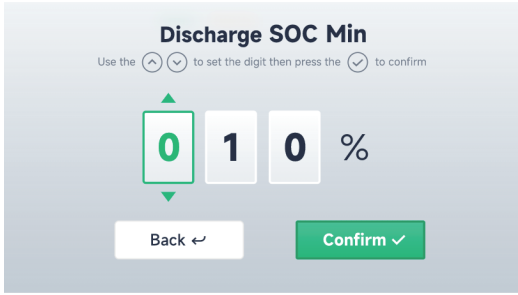
	Set power factor. The power factor can be set within the range of ±0.8 to 1
	Select the corresponding CT or Meter mode based on the actual connected current sampling terminal.

4) Battery Set

Interface	Description
	You can set the battery enable status and select no battery, lithium iron phosphate battery or lead acid battery type on this interface.
	Inverters can operate without batteries. If "enable" is selected, the inverter will operate as battery connected logic.

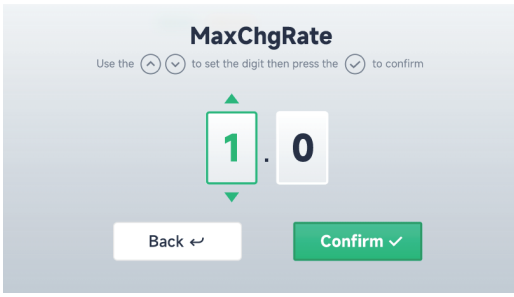
4.1) Li-ion

Interface	Description
 	Parameter setting for lithium battery: manufacturer, communication method, SOC threshold, maximum current, maximum charge and discharge rate.

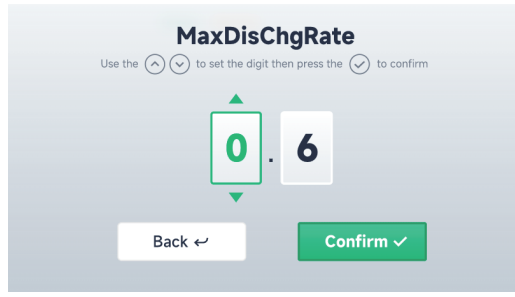
Interface	
 The battery manufacturers that support Pylon and CVTE.	 Choose the corresponding option based on the actual communication method used by the battery.
 Set the maximum charging SOC of the lithium battery. The adjustable range is [0, 100].	 Set the minimum discharge SOC of the lithium battery. The adjustable range is [10, 100].

Set the maximum charging current for lithium batteries. The max adjustable value should not exceed "Max. battery charge/discharge current" found in Technical Data Sheet.

Set the maximum discharge current of the lithium battery. The max adjustable value should not exceed the "Max. battery charge/discharge current" found in Technical Data Sheet.



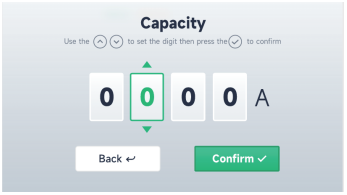
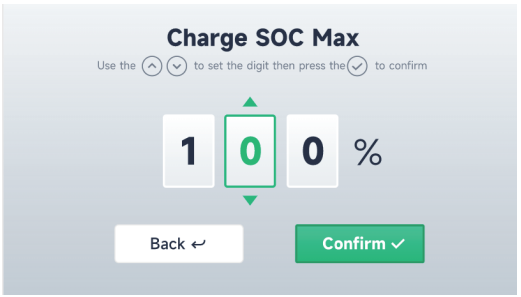
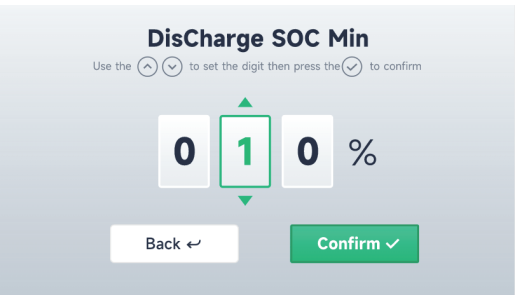
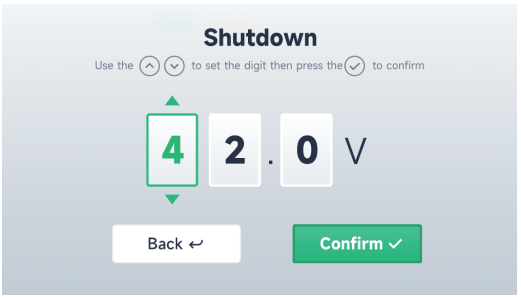
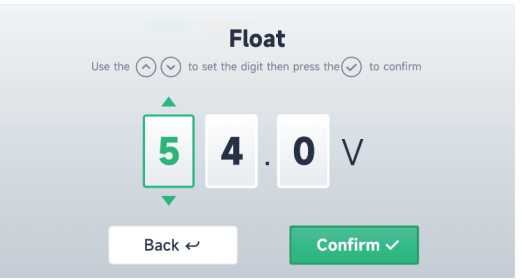
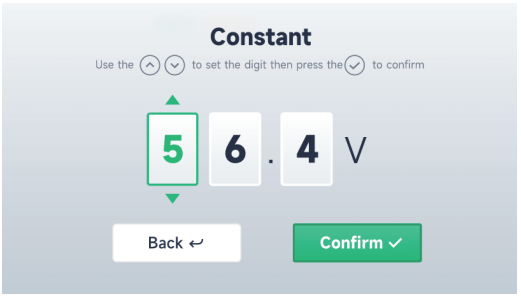
Set the lithium battery charge rate. The adjustable range is [0, 1.0].



Set the lithium battery discharge rate. The adjustable range is [0, 1.0].

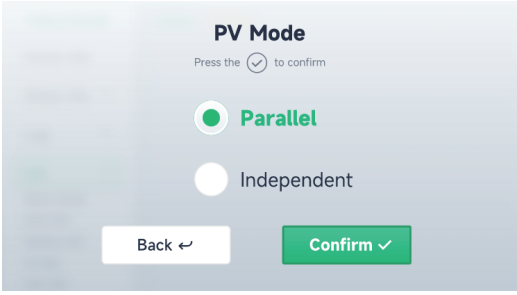
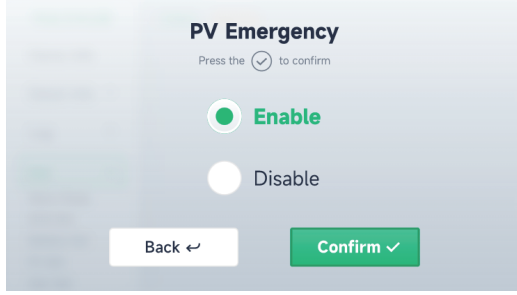
4.2) Lead-acid Battery

Interface	Description
 	For lead-acid batteries, the parameter settings include capacity, maximum current, SOC threshold, and voltage. Battery Repair is reserved setting.

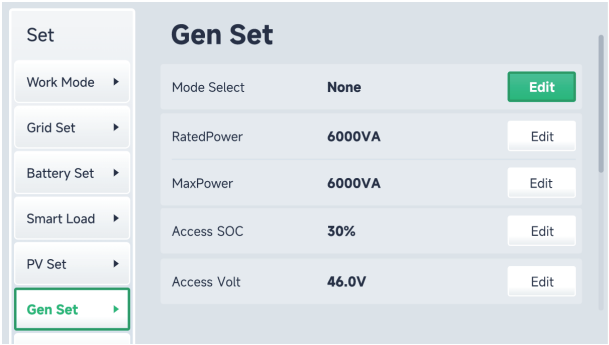
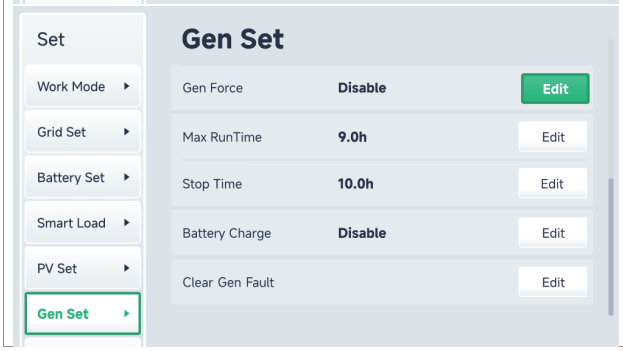
Interface
   Based on the relevant parameters of the actual battery, set the battery capacity, maximum charging current, and discharge current. For Capacity, the adjustable value can not exceed 600Ah * Num (Num = number of inverters in system). For MaxChgCur and MaxDisChgCur, the adjustable value can not exceed 0.3 * Capacity / Num (Num = number of inverters in system), and it can not exceed "Max. battery charge/discharge current" in Technical Data Sheet. Regarding the range of limits for charging and discharging currents, you can refer to the description in Section 3.3 for guidance.
 Set the maximum charge SOC of the lead-acid battery (reserved setting). The adjustable range is [0, 100].
 Set the minimum discharge SOC of the lead-acid battery (reserved setting). The adjustable range is [10, 100].
 Set the lead-acid battery discharge cut-off voltage. The adjustable range is [40, 48].
 Set the float charge voltage for lead-acid batteries. The adjustable range is [50, 56].
 Set the constant voltage charging voltage for lead-acid batteries. The adjustable range is [52, 56.8].

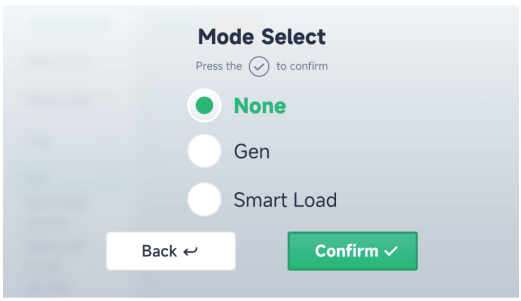
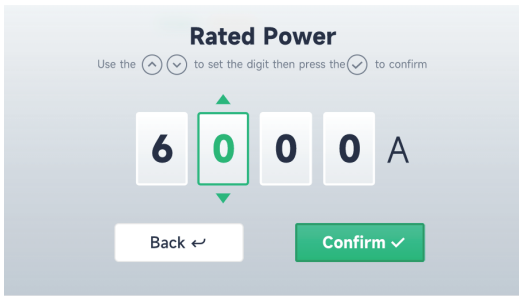
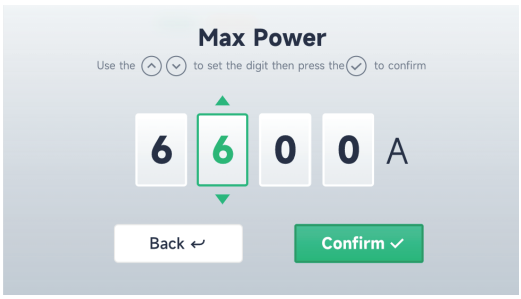
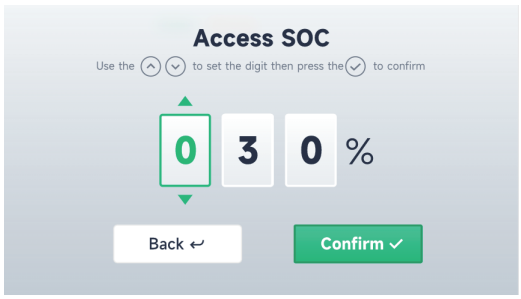
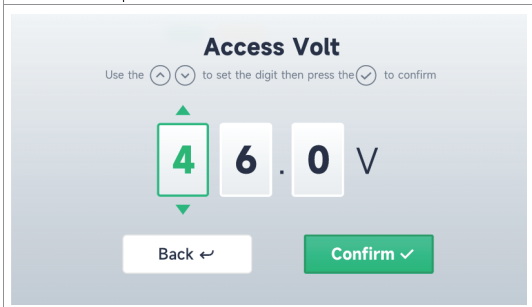
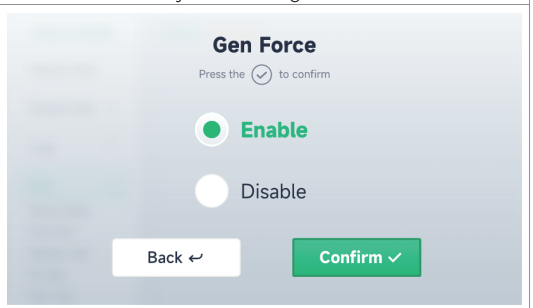
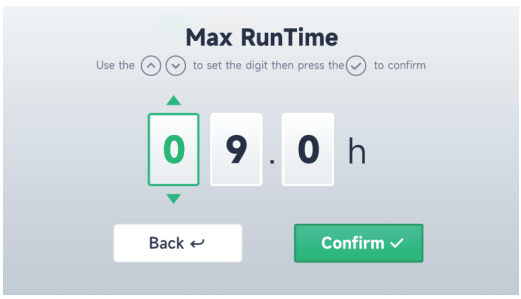
5) PV Set

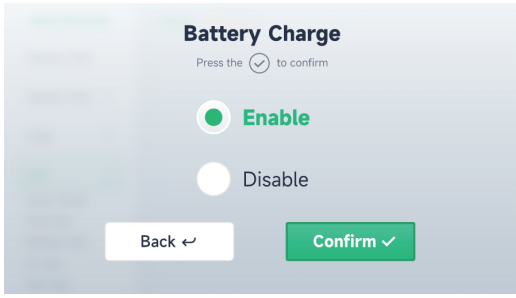
Interface	Description
	Set PV mode and emergency enable. Please refer to Section 3.8 for specific functional descriptions.

Interface	
	
The input types of a photovoltaic system can be divided into two modes: independent and parallel.	Enable and disable of PV emergency enable.

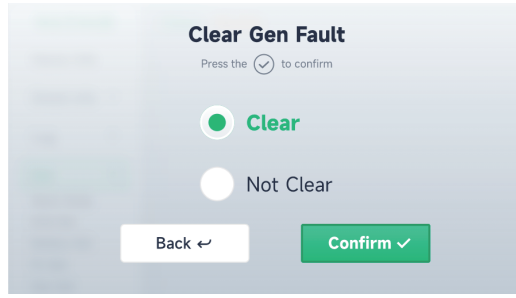
6) Gen Set

Interface	Description
 	Set generator mode, including power output, generator trigger SOC/volt, work mode, stop time, etc. If the generator is failure, it is necessary to repair the generator and manually clear the fault before reconnecting it to the inverter.

Interface	
	
Select function from none, use as generator port, use as smart load port.	Set the rated input power of the generator based on the information provided on the nameplate, ensuring that it does not exceed the maximum power limit for the inverter.
	
Set the maximum input power of the generator based on the information provided on the nameplate, ensuring that it does not exceed the maximum power limit for the inverter.	Set SOC of lithium battery when generator can be accessed. The adjustable range is [0, 100].
	
Set voltage of lead-acid battery when generator can be accessed. The adjustable range is [44, 56.8].	Set the generator forced start function. If the generator does not meet the SOC or voltage access conditions, this option can be used to operate.
	
Set the maximum run time of the generator. The adjustable range is [0, 24.0].	Set the stop time of the generator. The adjustable range is [0, 24.0].

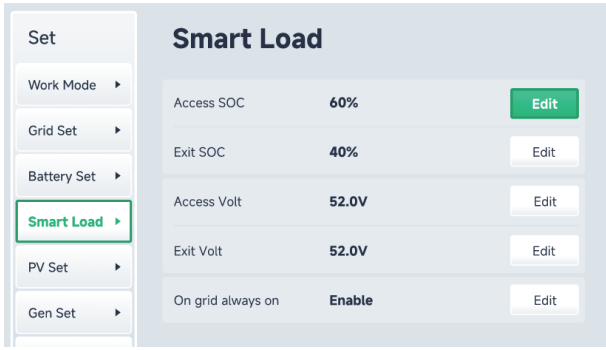


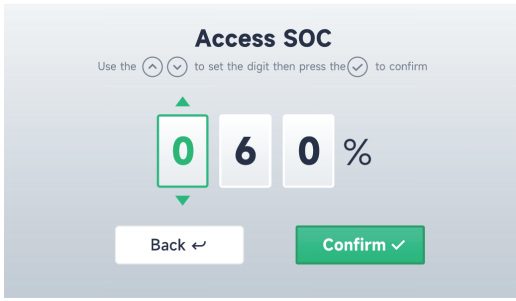
Set whether the generator charges the battery function.

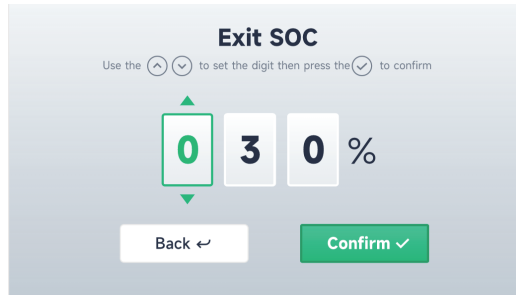


Select to clear the generator fault or not.

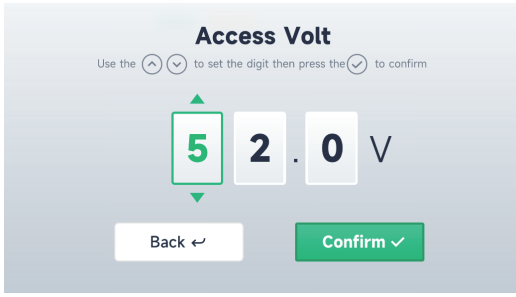
7) Smart Load

Interface	Description
	Set the Smart Load mode, including power output, and Smart Load trigger SOC/Volt.

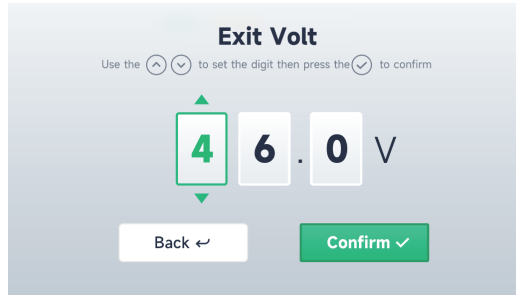
Interface




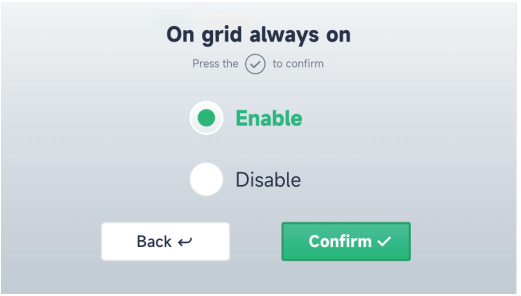
Set the access and exit SOC for smart load in lithium battery mode. The adjustable range is [0, 100].



Set the access voltage for smart load in lead-acid battery mode. The adjustable range is [48, 56.8].

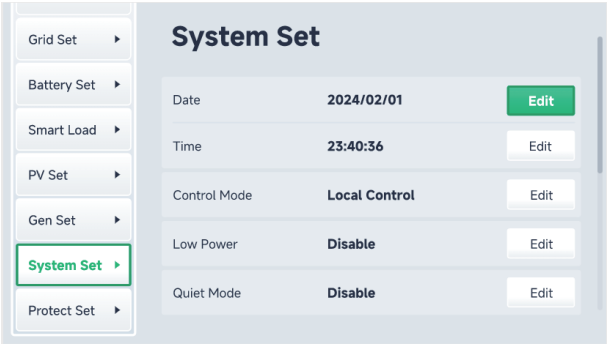
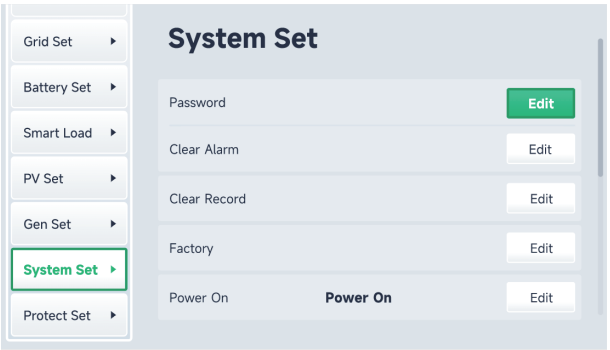


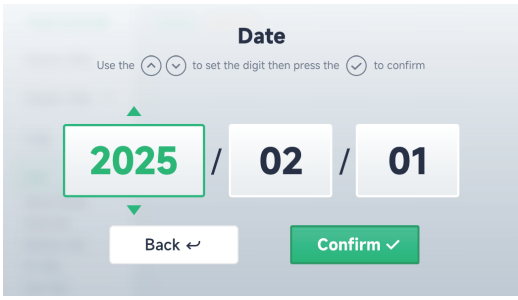
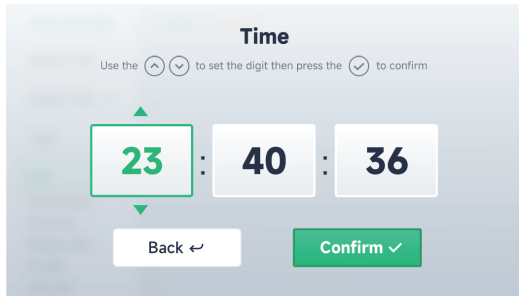
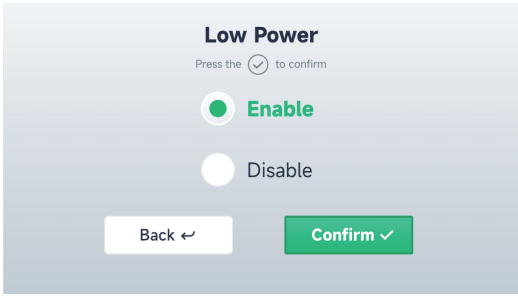
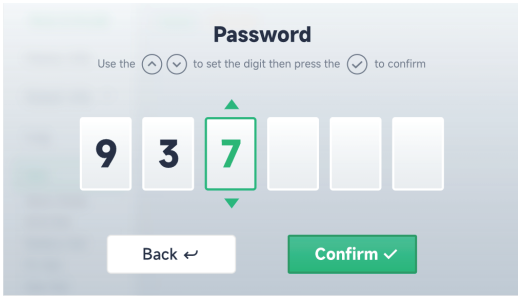
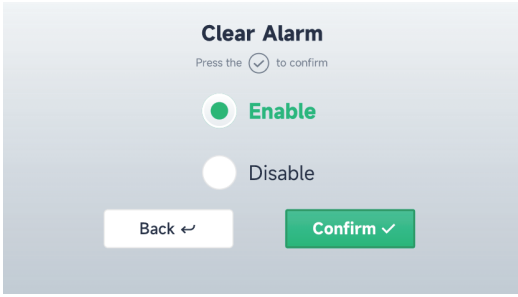
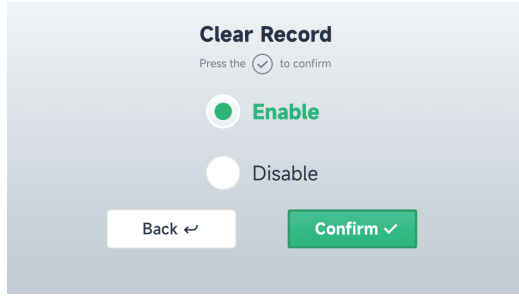
Set the exit voltage for smart load in lead-acid battery mode. The adjustable range is [44, 52.0].

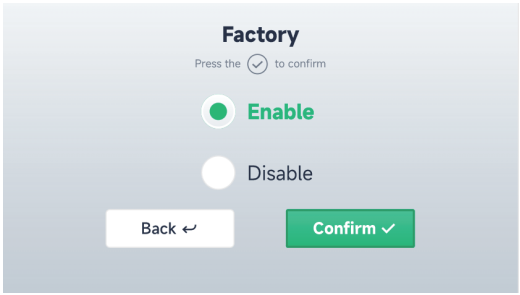


Set whether to enable or disable the On grid always on function of the smart load. When 'On grid always on' is enabled, the smart load will turn on when the grid exists.

8) System Set

Interface	Description
 	System settings include time and password settings. You can also clear faults and logs, restore factory settings, and set low power mode. Control mode, quiet mode and Power On settings are reserved.

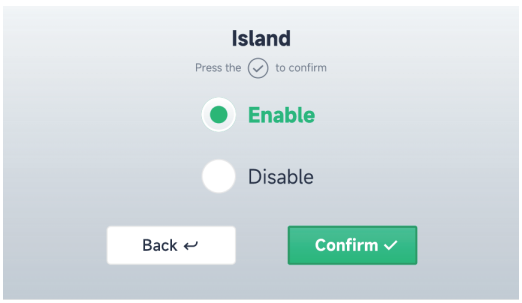
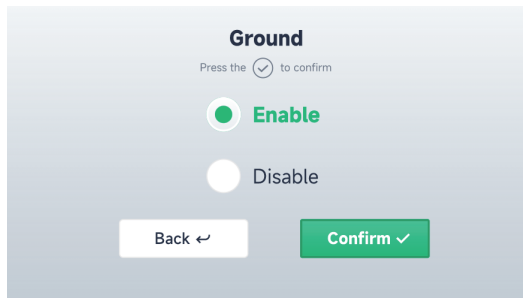
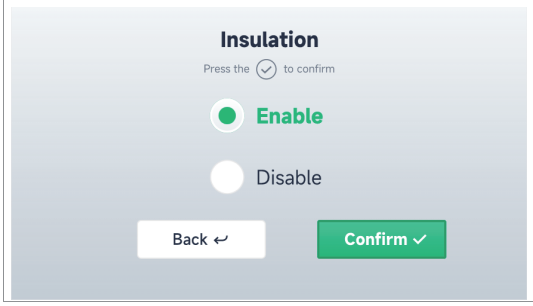
Interface
  Time settings can be adjusted according to the local time.Time settings can be adjusted according to the local time.
 After enabling the low power mode, if the following conditions are met and sustained for 5 minutes, the inverter will enter the low power state: the power grid is available, PV voltages are below 50V, battery current is less than 1A, and the AC side power is less than 500W.After entering the low power consumption state the inverter will go into standby mode, the fan will be turned off, and the indicator light will change to breathing mode.
 The initial password is 000000, and the new password cannot be the same as the old password. After setting all the parameters for the first time, you can set a new password. In the future, only with the correct password can the settings be modified.
 After enabling, all historical fault records will be cleared.	 After enabling, all operation records will be cleared.



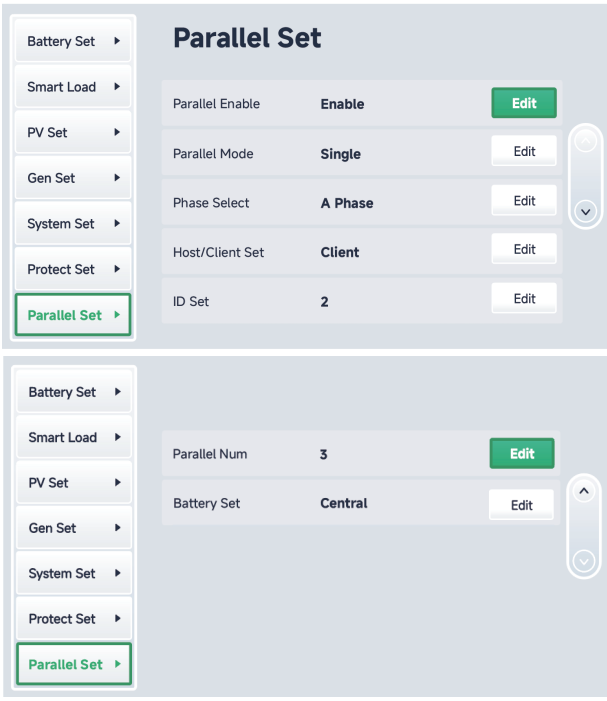
After enabling, the factory settings will be restored.

9) Protect Set

Interface	Description
	Protection function includes island protection. grounding protection and insulation impedance protection. Each protection function can be enabled or disabled.

Interface	
	
	

10) Parallel Set

Interface	Description
	You can use this interface to set the inverter parallel enabling status, host-client status, inverter ID, and parallel quantity. Parallel mode, phase select and battery set are reserved settings. For the detailed configuration, please refer to the section on "Parallel Installation Guide".

7.3.5 Statistics Page

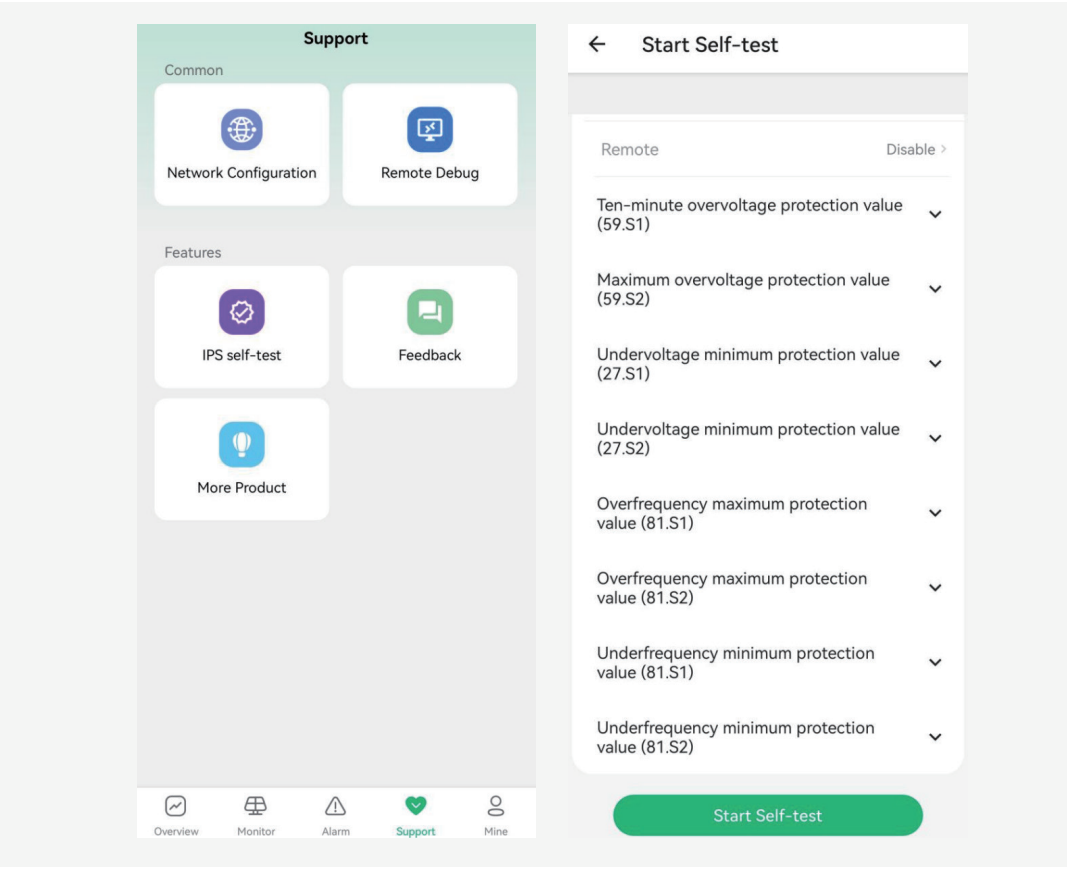
Interface	Description
	Inverters can collect and summarize data for the current day, month, year and overall.
	No matter which statistical information it is, you can view the information about PV, selling electricity purchase electricity, charging, discharging and load. Load information includes EPS and grid load.

7.4 IPS Check (for Italy CEI0-21 Grid Code Only)

The Italy CEI0-21 grid code requires an IPS check for the inverter. During the self-check, the inverter checks the protection threshold and protection time of the 10 min overvoltage (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), minimum underfrequency (81.S1), and minimum underfrequency (81.S2).

Procedure

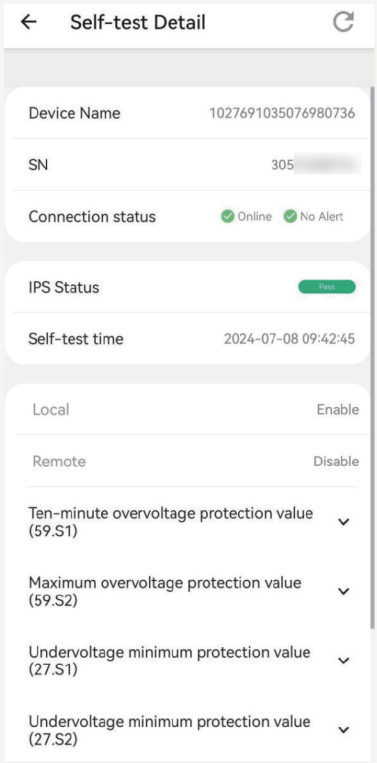
1. Press 'Support' on navi bar at the bottom of the screen. Choose 'IPS self-test' to access the IPS check screen.
2. Tap 'Start Self-test' to start an IPS test.

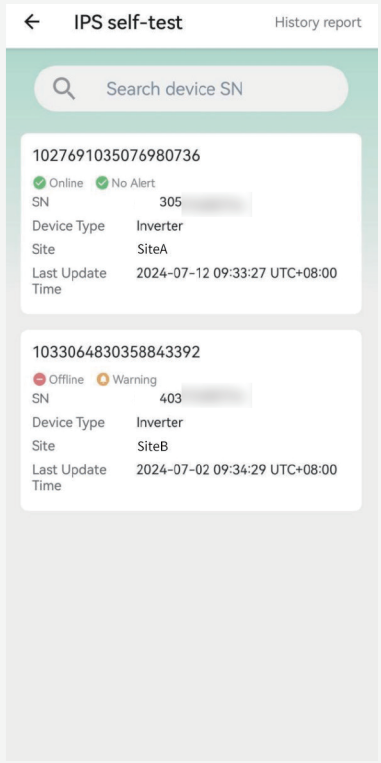


IPS Test Type	Description
Ten-minute overvoltage protection value (59.S1)	The default maximum voltage over 10 min protection threshold is 253 V, and the default protection time threshold is 3s.
Maximum overvoltage protection value (59. S2)	The default overvoltage protection threshold is 264.5 V, and the default protection time threshold is 0.2s.
Undervoltage minimum protection value (27.S1)	The default undervoltage protection threshold is 195.5 V, and the default protection time threshold is 1.5s.
Undervoltage minimum protection value (27.S2)	The default undervoltage protection threshold is 34.5 V, and the default protection time threshold is 0.2s.
Overfrequency maximum protection value (81.S1)	The default overfrequency protection threshold is 50.2 Hz, and the default protection time threshold is 0.1s.

IPS Test Type	Description
Overfrequency maximum protection value (81.S2)	The default overfrequency protection threshold is 51.5 Hz, and the default protection time threshold is 1s.
Underfrequency minimum protection value (81.S1)	The default underfrequency protection threshold is 49.8 Hz, and the default protection time threshold is 0.1s.
Underfrequency minimum protection value (81.S2)	The default underfrequency protection threshold is 47.5 Hz, and the default protection time threshold is 4s.

3. After the IPS test is complete, IPS State is displayed as 'Pass'. Tap 'History report' in the upper right corner of the screen to view the IPS check report.





8 Parallel Installation Guide

WARNING!

- All inverters must be connected to the same batteries and ensure each group of cables from the inverters to the batteries in the same length. The SOC of each battery should be equal before using.

WARNING!

- Do not connect the same PV string to multiple inverters, as this may cause damage to the inverters. Each inverter is separately connected to PV.

WARNING!

- The parallel system only supports the output of single-phase inverter connected to the same phase, and does not support the three-phase mode. The three single-phase inverters can not be connected to the three phases of the grid respectively, otherwise it will lead to parallel fault or inverter damage.

WARNING!

- When wiring, please keep the wire sequence correct. Do not reverse the L and N wire sequence of grid port, and do not reverse the L and N wire sequence of EPS port.
- For the inverters connected in the parallel system, the L line of its EPS port shall be connected together and the N line of its EPS port shall be connected together.

WARNING!

- The length of the parallel communication line shall not exceed 3m, and it must be a network cable with a shielding layer (recommended network cable model: CAT6-FTP)
- Do not use the network cable without shielding layer for parallel communication. Otherwise, the communication will be abnormal and parallel operation also fails.

WARNING!

- Each inverter in the parallel system needs to be connected with an independent WiFi module, and the inverter upgrade needs to be completed with its own WiFi module.
- When upgrading the battery through inverter, it can only be upgraded through the host.

WARNING!

- The EPS cable of parallel inverters shall ensure that the material, cross-sectional area and length of the conductor are consistent.
- The grid cable of parallel inverters shall ensure that the material, cross-sectional area and length of conductor are consistent.
- The battery cable of parallel inverters shall be consistent in material, conductor cross-sectional area and conductor length.

CAUTION!

- To avoid overload, it is best to run the whole system properly before closing the circuit breaker on the load side. If overload occurs frequently, it is recommended to check whether there is an abnormal wiring.

CAUTION!

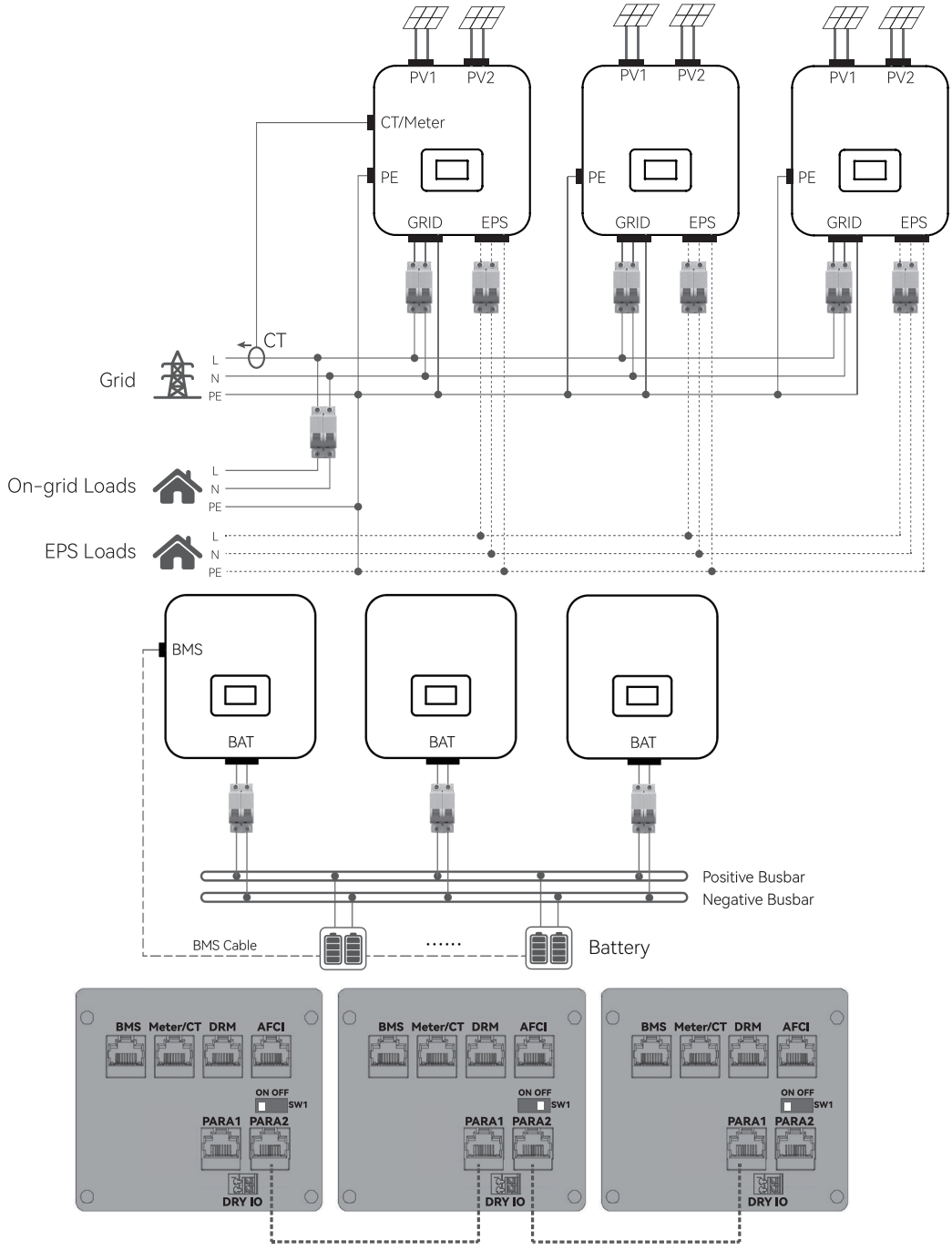
- Conversion time exists in the power supply system. Power supply interruption may occur for key equipment with high power supply requirements.

1. The paralleling system can support paralleling of 3 inverters at most.

2. The maximum bypass-mode current from grid to load is 40A under parallel system.

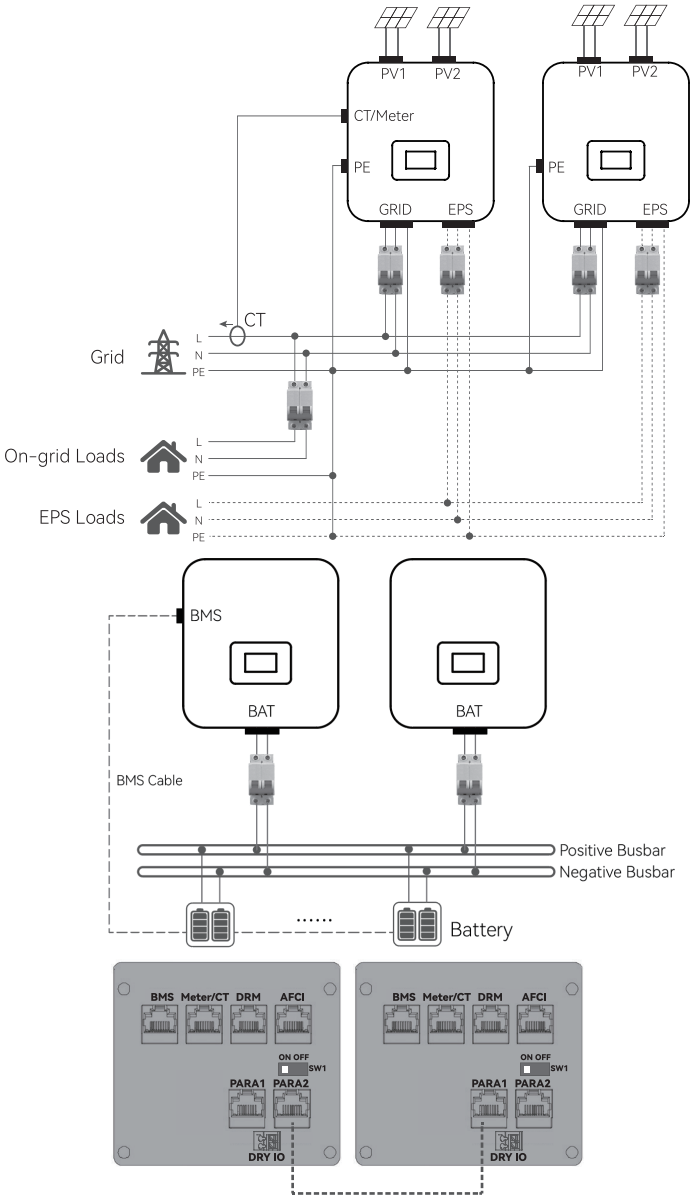
8.1 Parallel Cable Connection

8.1.1 Three inverters in parallel system connection:



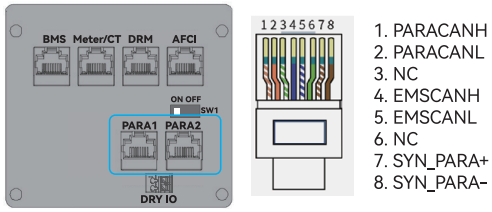
The circuit breaker connected to grid or load shall be of 40A AC type, except the one connected to the On-grid loads. And the circuit breaker connected to the battery shall be of 200A DC type.

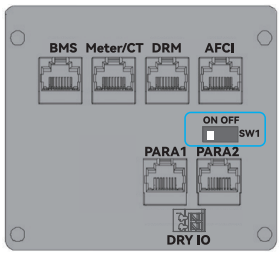
8.1.2 Two inverters in parallel system connection:



The circuit breaker connected to grid or load shall be of 40A AC type, except the one connected to the On-grid loads. And the circuit breaker connected to the battery shall be of 200A DC type.

8.1.3 Parallel Communication port:





·The SW1 switch of the inverter is set to OFF if both PARA1 and PARA2 are connected to the cable.

·The SW1 switch of the inverter is set to ON if only 1 port in PARA1 and PARA2 are connected to the cable.

8.2 System Setting for Parallel

To perform the system setting, please follow these steps:

Step 1. Before using the parallel function, please ensure that all wiring is correct, the communication cable between inverters is connected, all circuit breakers (PV, AC input, AC output, battery circuit breakers) are switch off, and the dial switches (SW1) are setting to right position.

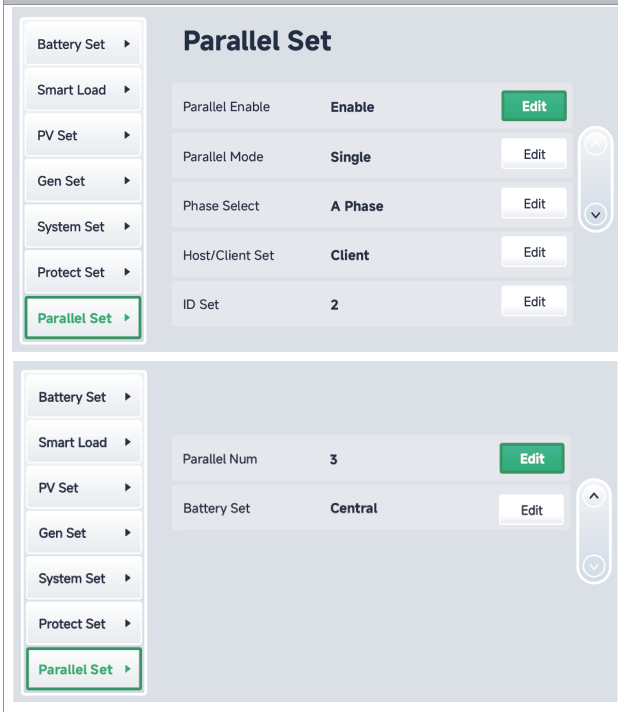
Step 2. Select anyone inverter as the host, and connect CT/Meter and battery communication network cable to the host.

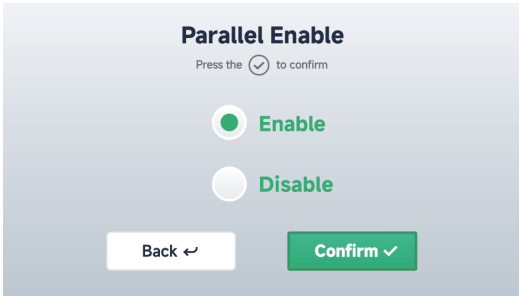
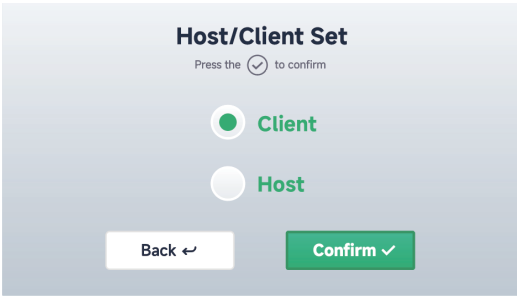
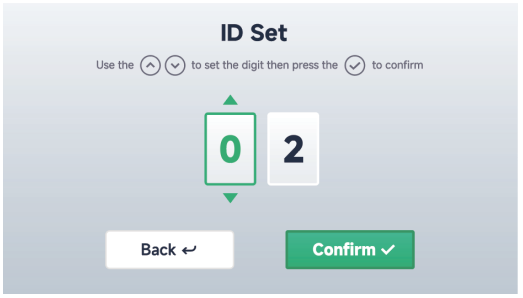
Step 3. Switch on the battery circuit breaker to supply power to the inverter (if the batteries are used in parallel, please ensure that the SOC of each battery is balanced before use).

Step 4. Enter the parallel set interface (set->password->parallel set). The parallel num is set to the number of inverters of the parallel system. Choose the inverter which is connected with CT and BMS to host, and set other inverters to client. The host ID is set to 1. The client ID is set to 2 or 3 (the client ID cannot be repeated).

Step 5. Set the parallel option of all inverters to enable, and wait for the system to start.

Note: In parallel mode, the settings only need to be set in the host. Generator / smart load function is not supported in parallel mode.

Interface	Description
	You can use this interface to set the inverter parallel enabling status, host-client status, inverter ID, and parallel quantity. Parallel mode, phase select and battery set are reserved settings.

Interface	
	
When the inverters need to be paralleled, set the paralleling enable here.	The host and client modes of the inverter can be set.
	
You can set the ID of the inverter. The adjustable range is [1, 3].	The number of parallel connections in the system can be set. The adjustable range is [2, 3].

9 System Decommissioning

9.1 Decommissioning Inverter

WARNING

- Danger of burns!
- Even if the inverter is shut down, it may still be hot and cause burns. Wear protective gloves before operating the inverter after it cools down.

Step 1: Switch off the AC circuit breaker between the inverter and the power grid.
Step 2: Turn the 'DC SWITCH' on the bottom of the inverter to 'OFF'.
Step 3: Switch off the breaker between the inverter and the PV string.
Step 4: Switch off the breaker between the inverter and the battery.
Step 5: (Optional) Switch off the AC circuit breaker between the inverter and the generator.
Step 6: Wait for at least 5 minutes until the internal capacitors are completely discharged.
Step 7: Use a current clamp meter to check the PV DC cables and confirm that there is no current.

9.2 Dismantling Inverter

WARNING

- Before removing the inverter, check that all inputs are disconnected (including AC source, PV, batteries and generator).
- Please do not touch any potentially energized components for at least 5 minutes after disconnecting all inputs to the inverter.
- After the inverter has been disconnected from power for 5 minutes, use a testing device to ensure that all terminals have no voltage or current. Then wear protective equipment before operating the inverter.

Step 1: Decommissioning the Inverter.
Step 2: Disconnect all electrical connections to the inverter, including signal wires, DC input wires, energy storage wires, AC output wires and protective ground. To disconnect all electrical connections of the inverter, follow the reverse steps of '6 Electrical Connections'.
Step 3: Dismantle the inverter referring to '5 Mechanical Mounting' in reverse steps.
Step 4: If necessary, remove the wall-mounting bracket from the wall.
Step 5: If the inverter will be reinstalled in the future, please refer to '1.3 Storage Safety' for a proper conservation.

10 Warning Code and Maintenance

10.1 Fault Diagnosis and Solutions

10.1.1 Troubleshooting

Once the inverter fails, you can view the fault information on the App interface and LCD screen

NOTICE

- Before troubleshooting, it is important to strictly follow the detailed steps in section 9.1 to disconnect the electrical connections and shut down the inverter to avoid any personal injury.
- After troubleshooting and resolving the issue based on the recommended solutions, follow the detailed steps in section 7 to power on and restart the inverter.

Table 10.1 Troubleshooting information

Fault Codes	Fault Explanation	Trigger conditions	Corrective Measures
E005	Output Short	Short circuit on the load side L and N wires.	Please check if there are any issues with the output connection of the inverter, such as a short circuit between positive and negative terminals or reverse connection.
E010	System Overtemperature Protection	Continuous high-power operation or inadequate heat dissipation cause the inverter temperature to rise excessively.	Please check whether the inverter installation position meets installation requirements, the ventilation is good, and the ambient temperature exceeds the upper limit.
E011	System Overload End	The household load power is too high.	Please check if the load power exceeds the rated power of the inverter. If it does, you must turn off some household appliances.
E400	Gen Start Failure	Failure on the generator side causing the generator to fail to start.	1. Check if the generator-related settings on the screen are correct. 2. Check if the communication wiring of the generator is correct. 3. Check if there are any abnormalities with the generator itself.
E602	BMS Communication Error	BMS communication connection failed.	Check if the battery communication cable is connected correctly.
E115	CT Disconnection Error	The CT or Meter is either forgotten to be connected or not properly connected.	Please check if the CT or Meter is connected. If the CT or Meter is already connected, check if the RJ45 connector is inserted into the correct socket position or firmly inserted.
E116	Meter Disconnection Error		

10.1.2 Fault and Alarm Code

The fault and alarm codes of all inverters are detailed in the following table. The inverter you have purchased may only include partial fault information. If you encounter a fault that cannot be identified or resolved, please contact your dealer.

When contacting for service, please gather the following inverter information to help quickly solve your problem:

1. Inverter Information: serial number, software version, fault codes, operating conditions and status before and after the fault, fault occurrence time and frequency.
2. Grid and Battery Conditions: whether the grid can connect to the home load normally, whether the battery operation is normal.
3. Equipment Installation Environment: whether the wiring is correct, whether the inverter is obstructed, etc.

Table 10.2 Fault and alarm code information

Category	Fault Codes and Abbreviations	Fault Explanation
Fault	E000: Bus OVP Fast	Bus Overvoltage Fast Check
	E001: Bus OVP Slow	Bus Overvoltage Slow Check
	E002: Bus UVP	Bus Undervoltage Protection
	E003: Bus Soft Fail	Bus Soft Start Failure
	E005: Output Short	Output Short Circuit
	E006: GFCI leakage 3	GFCI Leakage Fault Level 3
	E007: GFCI leakage 2	GFCI Leakage Fault Level 2
	E008: GFCI leakage 1	GFCI Leakage Fault Level 1
	E010: System OTP	System Over temperature Protection
	E011: Overload Error	System Overload Error
	E013: Client MCU Error	Client MCU Error
	E014: ISO Error	ISO Error
	E015: Board Connect Error	Bus-Board Connection Error
	E016: Ground Protect	Ground Protection
	E020: INV OTP	Inverter Overtemperature Protection
	E021: DCDC OTP	DC Overtemperature Protection
	E022: Grid Rly Error	Grid Relay Error
	E024: GFCI Check Error	GFCI Check Error
	E026: INV Soft Error	Inverter Soft Start Failure
	E027: Parallel Error	Parallel System Error
Alarm	E100: Grid OVP 3	Grid Overvoltage Protection Level 3
	E101: Grid OVP 2	Grid Overvoltage Protection Level 2
	E102: Grid OVP 1	Grid Overvoltage Protection Level 1
	E103: Grid UVP 3	Grid Undervoltage Protection Level 3
	E104: Grid UVP 2	Grid Undervoltage Protection Level 2
	E105: Grid UVP 1	Grid Undervoltage Protection level 1
	E106: Grid OFP Fast	Grid Overfrequency Protection Fast Check
	E107: Grid OFP Slow	Grid Overfrequency Protection Slow Check

Category	Fault Codes and Abbreviations	Fault Explanation
Alarm	E108: Grid UFP Fast	Grid Underfrequency Protection Fast Check
	E109: Grid UFP Slow	Grid Underfrequency Protection Slow Check
	E110: Island Err	Island Error
	E111: Grid Off Fast	Grid Off Fast Check
	E112: PLL Error	Phase-locked Loop Error
	E113: System LN Reverse Connect	System LN reverse connection
	E114: Grid OVP-10Min	Grid Overvoltage Protection For 10 Minutes
	E115: CT Disconnect	CT Disconnection Error
	E116: Meter Disconnect	Meter Disconnect Error
	E117: CT Reverse	CT Reverse Error
	E118: Meter Reverse	Meter Reverse Error
	E136: INV OVP	INV Overvoltage Protection
	E140: Current DC Over	DC Over Current Error
	E150: Parallel CAN Error	Parallel CAN communication error
	E151: Parallel Current Sharing Error	Parallel share current error
	E152: Parallel Version Error	Parallel Version Error
	E153: Parallel Host Error	Parallel Host Error
	E154: Parallel Client Loss	Parallel Client Loss
	E155: Parallel ID Error	Parallel ID Error
	E156: Parallel SYN SIG Error	Parallel Synchronization Signal Error
	E157: Parallel Set Error	Parallel Operation Configuration Error
	E158: Parallel LN REV Error	Parallel Operation LN Reversal error
	E159: Parallel Device Loss	Parallel Equipment Loss error
	E160: Parallel Host SYS Error	Parallel Host System error
	E161: Parallel Host Duplicate	Duplicate Parallel Host Settings
	E162: Parallel Grid RLY Error	Parallel Grid-Side Relay error
	E200: Mid-Bus OVP	Middle-Bus Overvoltage Error
	E203: DC OCP	DC Overcurrent Protection
	E207: Bat OVP	Battery Overvoltage Protection
	E301: PV1 OVP	PV1 Overvoltage Protection
	E302: Differ PV OVP	PV Over Voltage Difference
	E321: PV2 OVP	PV2 Overvoltage Protection

Category	Fault Codes and Abbreviations	Fault Explanation
Alarm	E400: Gen Start Fail	Generator Start Failure
	E401: Gen OVP	Generator Overvoltage Protection
	E402: Gen UVP	Generator Undervoltage Protection
	E403: Gen OFP	Generator Overfrequency Protection
	E404: Gen UFP	Generator Underfrequency Protection
	E405: Gen Loss	Generator Loss
	E406: Gen OverLoad Err	Generator Continuous Overload
	E500: Fan Err	System Fan Error
	E501: Overload	System Overload
	E502: Gen Overload	Generator Overload
	E504: Sys Energy Weak	System Energy Weak Error
	E600: PCS Comm Err	PCS Communication Error
	E602: BMS Comm Err	BMS Communication Error
	E605: Model Err	Model Mismatch Error
	E609: BMS Num Err	BMS Parallel Number Error
	E610: Parallel Phase Duplicate	Parallel Phase Duplicate
	E701: Cell Differ Volt	Cell Different Voltage Alarm
	E702: MOSFET H-Temp	MOSFET High Temperature Alarm
	E703: Cell L-Temp	Cell Low Temperature Alarm
	E704: Cell H-Temp	Cell High Temperature Alarm
	E705: Cell L-Volt	Cell Low Voltage Alarm
	E706: Cell H-Volt	Cell High Voltage Alarm
	E707: Pack L-Volt	Pack Low Voltage Alarm
	E708: Pack H-Volt	Pack High Voltage Alarm
	E709: BMS Inner Comm	BMS Inner Communication Alarm
	E710: BMS H-DischgCurr	BMS High Discharge Current Alarm
	E711: BMS H-ChgCurr	BMS High Charge Current Alarm
	E712: Cell H-Differ-T	Cell High Different Temperature Alarm
	E713: MOSFET OTP Err	MOSFET Overtemperature Protection Error
	E714: Cell UTP Err	Cell Undertemperature Protection Error
	E715: Cell OTP Err	Cell Overtemperature Protection Error
	E716: Cell UVP Err	Cell Undervoltage Protection Error
	E717: Cell OVP Err	Cell Overvoltage Protection Error
	E718: Pack UVP Err	Pack Undervoltage Protection Error
	E719: Pack OVP Err	Pack Overvoltage Protection Error
	E720: BMS Err	BMS Error

Category	Fault Codes and Abbreviations	Fault Explanation
Fault	E721: BMS Dischg OCP	BMS Discharge Overcurrent Protection Error
	E722: BMS Chg OCP	BMS Charge Overcurrent Protection Error
	E730: BMS OVP Err	BMS Overvoltage Protection Error
	E731: BMS UVP Err	BMS Undervoltage Protection Error
	E732: BMS OTP Err	BMS Overtemperature Protection Error
	E733: BMS UTP Err	BMS Undertemperature Protection Error
	E734: BMS Dischg OCP	BMS Discharge Overcurrent Protection Error
	E735: BMS Chg OCP	BMS Charge Overcurrent Protection Error
	E736: BMS Err	BMS Error
	E737: BMS H-Volt	BMS High Voltage Alarm
	E738: BMS L-Volt	BMS Low Voltage Alarm
	E739: BMS H-Temp	BMS High Temperature Alarm
	E740: BMS L-Temp	BMS Low Temperature Alarm
	E741: BMS H-DischgCurr	BMS High Discharge Current Alarm
	E742: BMS H-ChgCurr	BMS High Charge Current Alarm
	E743: BMS Client Loss	BMS Client Loss

10.2 Maintenance

10.2.1 Maintenance Notice

DANGER

- Be sure to use special insulation tools when perform high-voltage operations.
- Before performing any maintenance operations, follow section 8.1 to disconnect the inverter from the power supply.
- Even though the inverter is turned off, it can still be hot and may cause burns. Wait for the inverter to cool down before wearing protective gloves and proceeding with any operations.
- During product maintenance, if there is any unusual odor, smoke or abnormal appearance, it is strictly prohibited to open the product to prevent any harm to personnel. If none of these issues are present, follow the alarm correction measures to repair or restart the inverter.

NOTICE

- To avoid the risk of electric shock, do not perform any other maintenance operations beyond those described in this manual. If necessary, contact your distributor. Otherwise, the losses caused is not covered by the warranty.
- Avoid touching the PCB board or other static-sensitive components to prevent damage to the inverters.

10.2.2 Routine Maintenance

Table 10.3 Routine maintenance requirements

Check Item	Check Method	Maintenance cycle
System running status	Check if the inverter is damaged or deformed. Check if there are any abnormal sounds during the operation of the inverter. When the inverter is running, check if the parameters are correctly set for proper operation.	At least once every six months.
System clean	Check if there is any obstruction or dirt above the heat sink.	Once every six months to a year.
Electrical connection	Check if the cable connections are loose and if there are any significant gaps in the cable entry holes. Inspect the cables for any damage, especially if the copper core of the cables is exposed.	At least once every six months.
Grounding reliability	Check whether the ground cable is properly grounded.	Once every six months to a year.

11. Technical Data Sheet

	Specification	HN3KS-AH2GT	HN3K6S-AH2GT	HN4KS-AH2GT	HN5KS-AH2GT	HN6KS-AH2GT
PV input	Max. PV input power	4500Wp	5500Wp	6000Wp	7500Wp	9000Wp
	Max. PV input voltage	d.c.550V	d.c.550V	d.c.550V	d.c.550V	d.c.550V
	MPPT voltage range	d.c.80-520V	d.c.80-520V	d.c.80-520V	d.c.80-520V	d.c.80-520V
	Max. PV input current	d.c.2×19A	d.c.2×19A	d.c.2×19A	d.c.2×19A	d.c.2×19A
	Min. start-up voltage	d.c.100V	d.c.100V	d.c.100V	d.c.100V	d.c.100V
	Isc PV (absolute maximum)	d.c.2×25A	d.c.2×25A	d.c.2×25A	d.c.2×25A	d.c.2×25A
Battery input	Rated battery voltage	d.c.48V	d.c.48V	d.c.48V	d.c.48V	d.c.48V
	Battery voltage range	Li-ion: d.c. 40~60V Lead-acid: d.c. 40~56.8V	Li-ion: d.c. 40~60V Lead-acid: d.c. 40~56.8V	Li-ion: d.c. 40~60V Lead-acid: d.c. 40~56.8V	Li-ion: d.c. 40~60V Lead-acid: d.c. 40~56.8V	Li-ion: d.c. 40~60V Lead-acid: d.c. 40~56.8V
	Max. battery charge/ discharge current	d.c.80A/80A	d.c.80A/80A	d.c.80A/80A	d.c.120A/120A	d.c.120A/120A
	Battery type	Li-ion/lead-acid	Li-ion/lead-acid	Li-ion/lead-acid	Li-ion/lead-acid	Li-ion/lead-acid

	Specification	HN3KS-AH2GT	HN3K6S-AH2GT	HN4KS-AH2GT	HN5KS-AH2GT	HN6KS-AH2GT
Grid output	Rated grid voltage	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V
	Rated grid frequency	50Hz	50Hz	50Hz	50Hz	50Hz
	Grid input voltage range	a.c. 176- 280V	a.c. 176- 280V	a.c. 176- 280V	a.c. 176- 280V	a.c. 176- 280V
	Rated grid output active power	3000W	3680W	4000W	5000W	6000W
	Rated grid output apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. grid output apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. grid output current	a.c. 13.1A	a.c. 16.0A	a.c. 17.4A	a.c. 21.8A	a.c. 26.1A
Generator input	Rated voltage	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V
	Rated frequency	50Hz	50Hz	50Hz	50Hz	50Hz
	Generator input voltage range	a.c. 176-280V	a.c. 176-280V	a.c. 176-280V	a.c. 176-280V	a.c. 176-280V
	Rated input apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. input apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. input current	a.c. 13.1A	a.c. 16.0A	a.c. 17.4A	a.c. 21.8A	a.c. 26.1A
EPS output	Rated output voltage	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V	a.c. 230V
	Rated output frequency	50Hz	50Hz	50Hz	50Hz	50Hz
	Rated output apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. output apparent power	3000VA	3680VA	4000VA	5000VA	6000VA
	Max. output current	a.c. 13.1A	a.c. 16.0A	a.c. 17.4A	a.c. 21.8A	a.c. 26.1A
General info	Adjustable cos(ϕ)	0.8ind...0.8cap	0.8ind...0.8cap	0.8ind...0.8cap	0.8ind...0.8cap	0.8ind...0.8cap
	Operating temperature range	-25℃...60℃	-25℃...60℃	-25℃...60℃	-25℃...60℃	-25℃...60℃
	Inverter topology	Non-Isolated	Non-Isolated	Non-Isolated	Non-Isolated	Non-Isolated
	Enclosure	IP66	IP66	IP66	IP66	IP66
	Protection class	Class I	Class I	Class I	Class I	Class I
	Overvoltage category	II(PV), III(MAINS)	II(PV), III(MAINS)	II(PV), III(MAINS)	II(PV), III(MAINS)	II(PV), III(MAINS)

Note: The ‘Max. PV input voltage’ refers to the maximum voltage that the inverter's DC input can withstand. If the input voltage exceeds this voltage, it may damage the inverter.