



iStoragE3 Series
Energy Storage System
User Manual

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XIAMEN KEHUA DIGITAL ENERGY TECH CO., LTD.

Address:	Room 208-38, Hengye Building, No. 100 Xiangxing Road, Torch High-tech Zone (Xiang'an) Industrial Zone, Xiamen, China
Website:	www.kehua.com
E-mail:	service@kehua.com
Customer Service Telephone:	400-808-9986
Tel:	0592-5160516
Fax:	0592-5162166

Foreword

Summaries

Thank you for choosing the iStoragE3 series energy storage system (hereinafter referred to as iStoragE3)!

This document gives a description of the iStoragE3 series energy storage system, including the features, performance, appearance, structure, working principles, installation, operation and maintenance. etc.

Please save the manual after reading, in order to consult in the future.

 **NOTE**

The figures in this manual are just for reference, for details please see the actual product.

Suitable Model

- Inverter
 - iStoragE3 5K
 - iStoragE3 6K
 - iStoragE3 8K
 - iStoragE3 10K
 - iStoragE3 12K
- Battery pack
 - iStoragE B5-S2

 **NOTE**

The iStoragE3 series energy storage system consists of inverter and battery.

Symbol Conventions

The manual quotes the safety symbols, these symbols used to prompt users to comply with safety matters during installation, operation and maintenance. Safety symbol meaning as follows.

Symbol	Description
 DANGER	Alerts you to a high risk hazard that will, if not avoided, result in serious injury or death.
 WARNING	Alerts you to a medium low risk hazard that could, if not avoided, result in moderate or minor injury.
 CAUTION	Alerts you to a low risk hazard that could, if not avoided, result in minor injury.
	Anti-static prompting.
	Be care electric shock prompting.
 TIP	Provides a tip that may help you solve a problem or save time.
 NOTE	Provides additional information to emphasize or supplement important points in the main text.

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1 Safety Description

This chapter mainly introduces the safety announcements. Prior to performing any work on the device, please read the user manual carefully, follow the operation and installation instructions and observe all danger, warning and safety information.

1.1 Safety Announcements



Before operation, please read the announcements and operation instructions in this section carefully to avoid accident.

The promptings in the user manual, such as "Danger", "Warning", "Caution", etc. don't include all safety announcements. They are just only the supplement of safety announcements when operation.



Any device damage caused by violating the general safety operation requirements or safety standards of design, production, and usage will be out of Kehua's guarantee range.

1.1.1 Use Announcements



There is no operational part inside the inverter. Please do not open the crust of the inverter by yourself, or it may cause electric shock. The inverter damage caused by illegal operation is out of the guarantee range.

 **DANGER**

Don't touch terminals or conductors that connected with grid to avoid lethal risk!

 **DANGER**

Damaged device or device fault may cause electric shock or fire!

- Before operation, please check if the inverter is damaged or has other danger.
 - Check if the external device or circuit connection is safe.
-

 **DANGER**

Before checking or maintenance, if the DC side and AC side is power down just now, it is necessary to wait for 5 minutes to ensure the inner device is completely discharged, and then the operation can be performed.

 **DANGER**

The surface temperature of the inverter may reach to 80°C. During running, please don't touch the surface to avoid scald.

 **CAUTION**

No liquid or other objects are allowed to enter iStoragE3, or, it may cause iStoragE3 series energy storage system damage.

 **CAUTION**

In case fire, please use dry power fire extinguisher. If using liquid fire extinguisher, it may cause electric shock.

1.1.2 Inverter Symbol Illustration

Table1-1 Inverter symbol illustration

Symbol	Illustration
	<p>Beware of a danger zone</p> <p>This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.</p>
	<p>Beware of electrical voltage</p> <p>The product operates at high voltages.</p>
	<p>WEEE designation</p> <p>Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.</p>
	<p>Observe the documentation.</p>
	<p>CE marking</p> <p>The product complies with the requirements of the applicable EU directives.</p>
	<p>Danger to life due to high voltages in the inverter, observe a waiting time of 5 minutes.</p> <p>High voltages that can cause lethal electric shocks are present in the live components of the inverter.</p> <p>Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.</p>
	<p>Beware of hot surface</p> <p>The product can get hot during operation.</p>

1.1.3 Protection for PV Array

When install PV array in daytime, it necessary to cover the PV array by light-proof material, or the PV array will generate high voltage under sunshine. If touching PV array accidently, it may cause electric shock or human injury!

 **DANGER**

There exists dangerous voltage between the positive and negative of PV array!

When installing the device, make sure that the connection between inverter and PV array has been disconnected completely. And set warning mark in the disconnected position to avoid reconnecting.

1.1.4 ESD Protection

 **CAUTION**

To prevent human electrostatic damaging sensitive components (such as circuit board), make sure that you wear a anti-static wrist strap before touching sensitive components, and the other end is well grounded.

1.1.5 Grounding Requirements

 **WARNING**

High leakage risk! The inverter must be grounded before wiring. The grounding terminal must be connected to ground, or, there will be the risk of electric shock when touching the inverter.

- When installing, the inverter must be grounded first. When dismantling, the grounding wire must be removed at last.
- Don't damage the grounding conductor.
- The device must be connected to protection grounding permanently.
- Before operation, check the electrical connection to ensure the inverter is grounded reliably.

1.1.6 Moisture-proof Protection

 **CAUTION**

Moisture incursion may cause the inverter damage!

Observe the following items to ensure the inverter works normally.

- When the air humidity is more than 95%, don't open the door of the inverter.
- In the wet or damp weather, don't open the door of the inverter to maintain or repair.

1.1.7 Safety Warning Label Setting

In order to avoid accident for unwanted person gets close to the inverter or makes improper operation, observe the following requirements while installing, maintaining or repairing.

- Set warning marks where the switches are to avoid switching them on improperly.
- Set warning signs or safety warning belt in the operation area, which is to avoid human injury or device damage.
- When the port of battery pack and inverter are not in use, please don't remove the corresponding waterproof cover.

1.1.8 Electrical Connection

Electrical connection must be performed according to the description in the user manual and the electrical schematic diagram.



The configuration of PV string, grid level, grid frequency, etc. must meet the technical requirements of inverter.

Grid-tied generation should be allowed by the local power supply department and the related operation should be performed by professionals.

All electrical connection must meet the related country and district standard.

1.1.9 Measurement Under Operation



There exists high voltage in the device. If touching device accidentally, it may cause electric shock. So, when perform measurement under operation, it must take protection measure (such as wear insulated gloves, etc.)

The measuring device must meet the following requirements:

- The range and operation requirements of measuring device meet the site requirements.
-

- The connections for measuring device should be correct and standard to avoid arcing.

1.2 Safety Precaution for Battery Pack

1.2.1 General Safety Precautions

- Overvoltage or wrong wiring can damage the battery pack and cause deflagration, which can be extremely dangerous.
- All types of breakdown of the battery may lead to a leakage of electrolyte or flammable gas.
- Battery pack is not user serviceable. High voltage is present in the device.
- Read the label with Warning Symbols and Precautions, which is on the right side of the battery pack.
- Do not connect any AC conductors or PV conductors which should be only connected to the inverter directly to the battery pack.
- Do not charge or discharge the damaged battery.
- Do not damage the battery pack in such ways as dropping, deforming, impacting, cutting or penetrating with a sharp object. It may cause a leakage of electrolyte or fire.
- Keep the battery away from the fire source..

1.2.2 Response to Emergency Situations

The battery pack consists of multiple batteries to form a high-voltage system, if it fails, there is a high-voltage risk. Kehua company cannot guarantee the absolute safety of the battery pack, so you need to pay attention to the following matters:

- If a user happens to be exposed to internal materials of the battery cell due to damage on the outer casing, the following actions are recommended.
 - Inhalation: Leave the contaminated area immediately and seek medical attention.
 - Eye contact: Rinse eyes with running water for 15 minutes and seek medical attention.
 - Contact with skin: Wash the contacted area with soap thoroughly and seek medical attention.
 - Ingestion: Induce vomiting and seek medical attention.
- If a fire breaks out in the place where the battery pack is installed, perform the following countermeasures.
 - Fire extinguishing media

Respirator is not required during normal operations. Use FM-200 or CO₂ extinguisher for battery fire. Use an ABC fire extinguisher, if the fire is not from battery and not spread to it yet.

– Fire fighting instructions

If fire occurs when charging batteries, if it is safe to do so, disconnect the battery pack circuit switch to shut off the power to charge.

If the battery pack is not on fire yet, extinguish the fire before the battery pack catches fire.

If the battery pack is on fire, do not try to extinguish but evacuate people immediately.

– Effective ways to deal with accidents

On land: Place damaged battery into a segregated place and call local fire department or service engineer.

In water: Stay out of the water and don't touch anything if any part of the battery, inverter, or wiring is submerged. Do not use submerged battery again and contact the service engineer.

1.3 Requirements for Operator



The operation and wiring for iStoragE3 series energy storage system should be performed by qualified person, which is to ensure that the electrical connection meets the related standards.

The professional technician must meet the following requirements:

- Be trained strictly and understand all safety announcements and master correct operations.
- Fully familiar with the structure and working principle of the whole system.
- Know well about the related standards of local country and district.

2 Overview

This chapter mainly introduces the device features, appearance, operating mode, etc.

2.1 Product Intro

With iStoragE3 series energy storage system, it is possible to effectively manage energy in users' home day and night. This energy storage system provides a complete energy solution with multiple working modes which meet different application scenarios. It will bring independence and economy for energy use.

iStoragE3 series inverter needs to be used with matched battery packs. Based on actual needs, 1 inverter can be used with 1~8 battery packs together, as shown in Figure2-2.

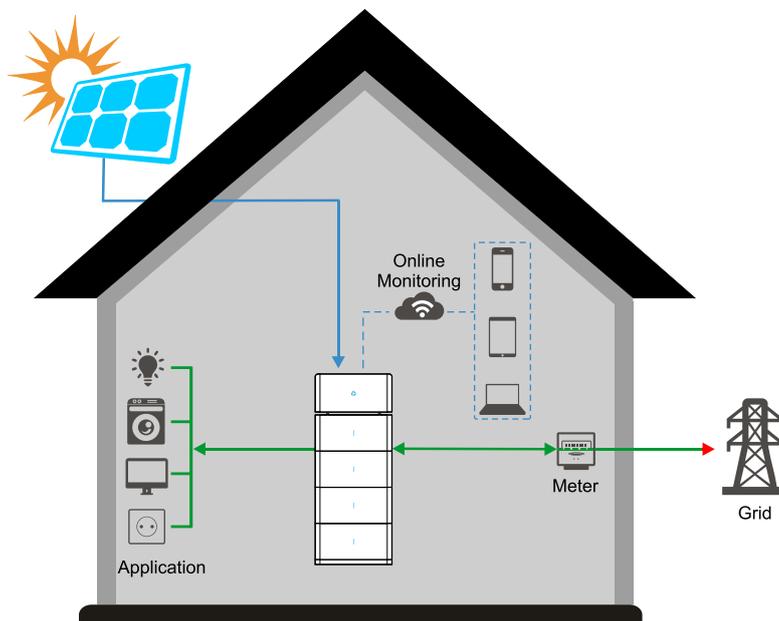


Figure2-1 Energy storage system

NOTE

The more battery pack configured, the more energy stored, and the more time backed up.
When the matched battery packs more than 4, the battery packs needs to installed as 2 piles.

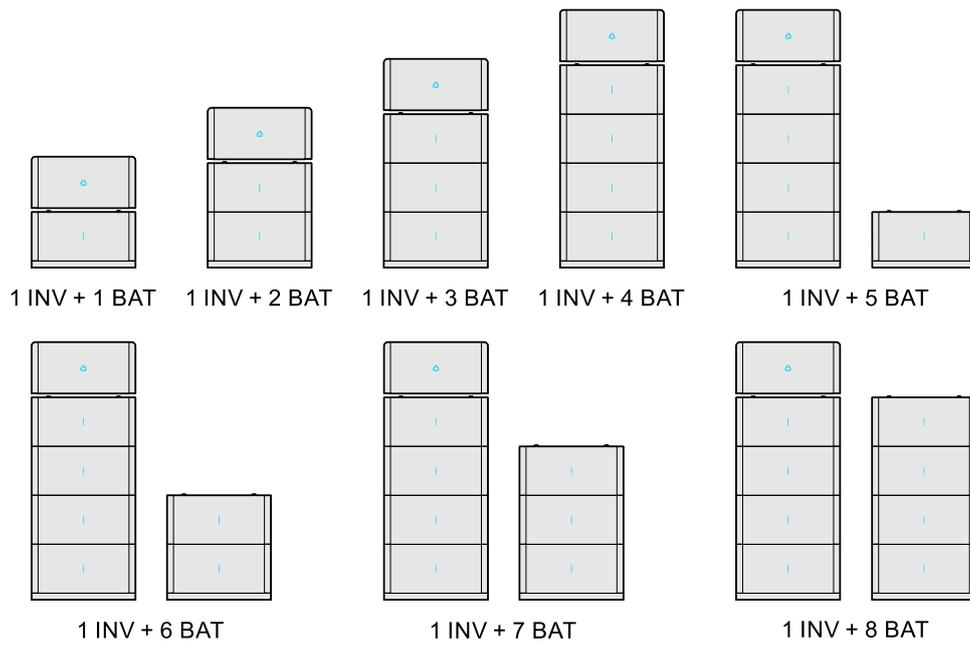


Figure2-2 Configuration diagram

2.1.1 Model Meaning

Inverter

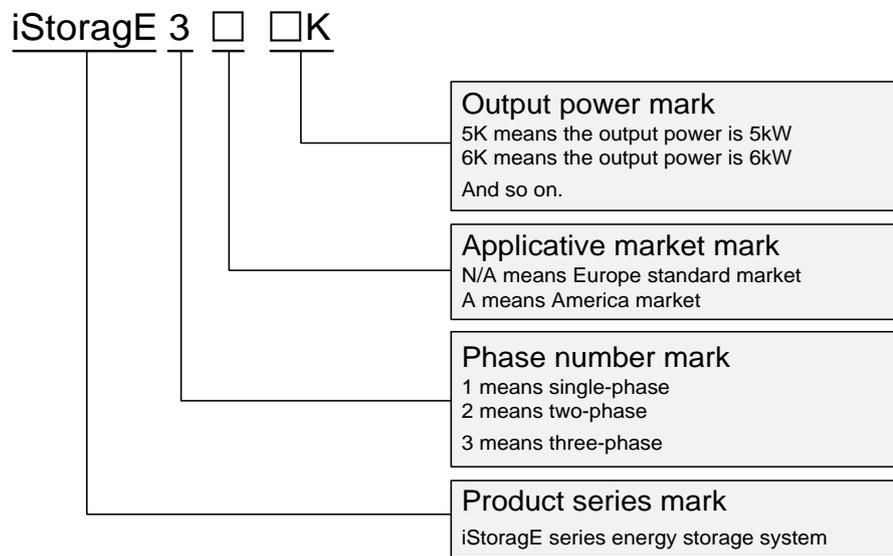


Figure2-3 Model meaning of inverter

Battery pack

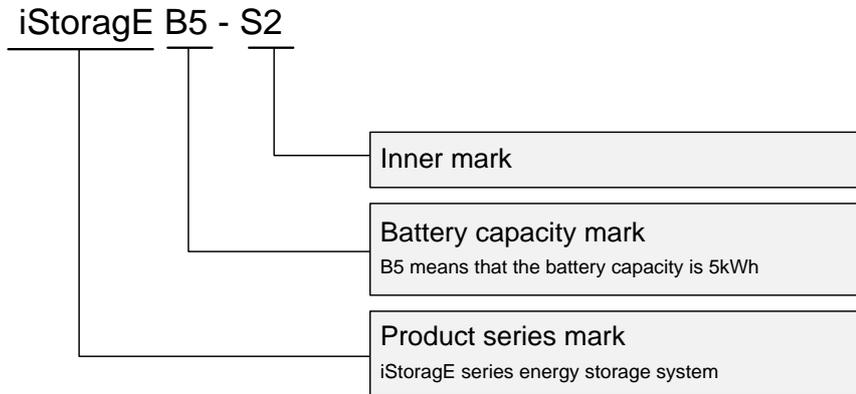


Figure2-4 Model meaning of battery pack

2.1.2 Working Mode

Backup mode

iStoragE3 product can work as an energy backup unit in order to provide uninterrupted blackout protection when the grid goes down.

- Grid is available

	BAT is full	BAT is not full	BAT is empty
PV>load	Rest PV power to grid.	PV charge the BAT.	
PV<load	PV+grid power support the load.	PV+grid power support the load and charge the BAT.	
PV is not available	Grid power support the load.	Grid power support the load and charge the BAT.	

- Grid is not available, transfer to off-grid mode

Self consumption mode

iStoragE3 series product provides energy to loads in priority, then excess PV energy to battery. When PV power is insufficient or no PV power, battery discharge to load.

- Grid is available

	BAT is full	BAT is not full	BAT is empty
PV>load	Rest PV power to grid.	PV charge the BAT.	
PV<load or PV is not available.	BAT discharge.		PV+grid or grid power support the load, BAT stand by.

- Grid is not available, transfer to off-grid mode

Time of use mode

iStoragE3 product can meet the maximum energy utilization rate and users' income. According to peak-valley electricity price and users' electricity demand.

- Grid is available

	BAT is full	BAT is not full	BAT is empty
PV>load	Rest PV power to grid.	PV charge the BAT	
PV<load or PV is not available.	BAT discharge.		PV+grid or grid power support the load, BAT stand by.

- Grid is not available, transfer to off-grid mode

Energy scheduling mode

iStoragE3 series product provides charge and discharge time settings for customers, so they can pre-charge when the price of power is low, and save the energy for use when grid power prices are high.

- Grid is available

	BAT is full	BAT is not full	BAT is empty
PV>load	Rest PV power to grid.	PV charge the BAT.	
PV<load or PV is not available.	BAT discharge.		PV+grid or grid power support the load, BAT stand by.

- Grid is not available, transfer to off-grid mode

External control mode

iStoragE3 series product can realize the remote scheduling of inverter control, and energy management optimization strategy through API interface.

External control mode and other modes above can be selected simultaneously. The other mode will run in out of schedule time.

Off-grid mode

iStoragE3 series product can be operated in a completely off-grid mode where no grid power is available.

	BAT is full	BAT is not full	BAT is empty
PV>load	PV power limited to load.	PV charge the BAT.	
PV<load or PV is not available.	BAT discharge.		Equipment auto power-off.



NOTE

The above modes are only functional definitions, and the setting items may not have corresponding items.

2.2 Appearance

2.2.1 Inverter

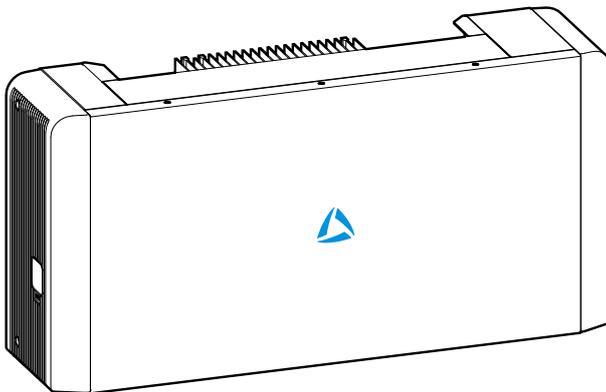


Figure2-5 Appearance of inverter

Table2-1 LED illustration of inverter

LED display	Status	Illustration
	Blue	ON: the system works normally.
	Red and Blue Flicker alternately	ON: minor alarm.
	Blue Flicker	Inverter standby or shut down.
	Red Flicker	Inverter standby or shut down, minor alarm.
	Red	ON: inverter fault.
	OFF	Inverter power off.

2.2.2 Battery Pack

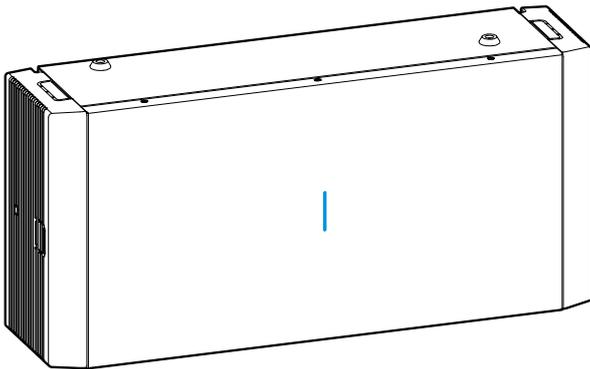


Figure2-6 Appearance of battery pack

Table2-2 LED illustration of battery pack

LED display	Status	Illustration
	Blue	ON: the battery works normally.
	Red and Blue Flicker alternately	ON: minor alarm.
	Blue Flicker	Battery standby or shut down.
	Red Flicker	Battery standby or shut down, minor alarm.

LED display	Status	Illustration
	Red	ON: battery fault.
	OFF	Battery power off.

2.3 Structure Layout

2.3.1 Inverter

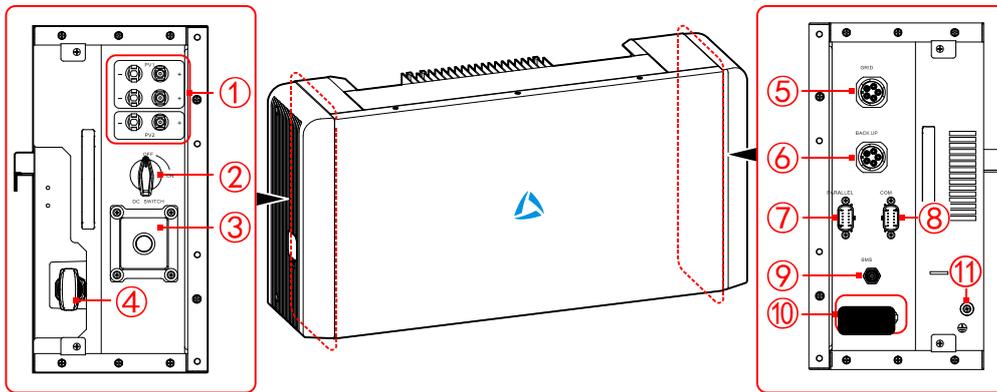


Figure2-7 Structure layout of inverter

Table2-3 Structure layout illustration of inverter

No.	Mark	Name	No.	Mark	Name
①	PV +/-	PV input port	⑦	PARALLEL	Parallel port
②	DC SWITCH	DC switch	⑧	COM	External communication port
③	RSD	RSD button	⑨	BMS	Battery communication port
④	WIFI/4G	WIFI/4G port	⑩	BAT +/-	Battery pack connection port
⑤	GRID	Grid connection port	⑪		External grounding terminal
⑥	BACK UP	Load connection port	-	-	-

DC switch

DC switch (as shown in of Figure2-7 ②) is the connection switch between inverter and PV array.

- During installation and wiring, the DC switch must be OFF.
- Before maintenance, the DC switch must be OFF, and 5 minutes after the indicator is off, the maintenance can be done.



When maintenance or wiring, the DC switch must be disconnected.

COM communication port

The pin definition of COM communication port (as shown in Figure2-8) is shown in Table2-4.

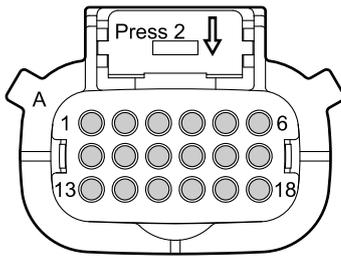


Figure2-8 COM port diagram

Table2-4 Pin definition of COM port

Pin	Definition	Pin	Definition
1	RSD485-B	10	Upper-computer 485-A 16 DRM
2	RSD485-A	11	Upper-computer 485-B
3	Meter 485-A	12	DRM IN1-5 (Only for Australia)
4	Meter 485-B	13	DRM IN2-6 (Only for Australia)
5	Reserved	14	DRM IN3-7 (Only for Australia)
6	Reserved	15	DRM IN4-8 (Only for Australia)
7	RSD power supply 12V_ISO	16	DRM REF GEN 0 (Only for Australia)

Pin	Definition	Pin	Definition
8	RSD power supply 0V_ISO	17	DRM COM/LOAD (Only for Australia)
9	Reserved	18	DRM MC (Only for Australia)

2.3.2 Battery Pack

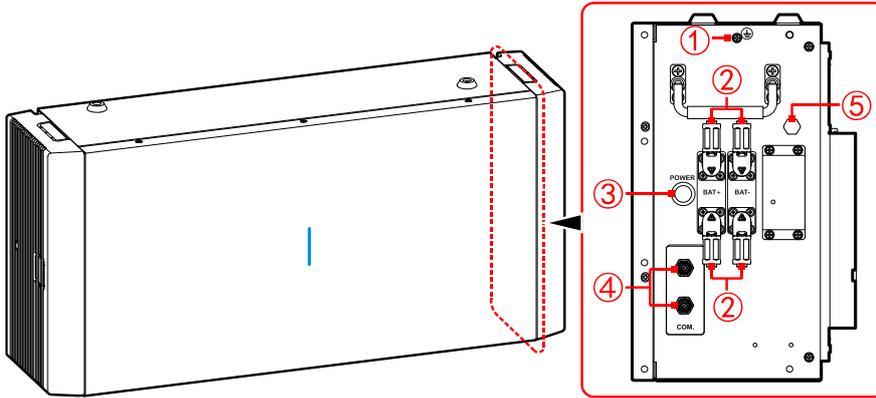


Figure2-9 Structure layout of battery pack

Table2-5 Structure layout illustration of battery pack

No.	Mark	Name	No.	Mark	Name
①	⊕	Grounding terminal	④	COM.	Battery communication port
②	BAT +/-	Battery connection port	⑤	-	Breather valve
③	POWER	Battery ON/OFF button	-	-	-

2.4 Size

The size of the inverter and battery pack is as shown in Figure2-10, Figure2-11.

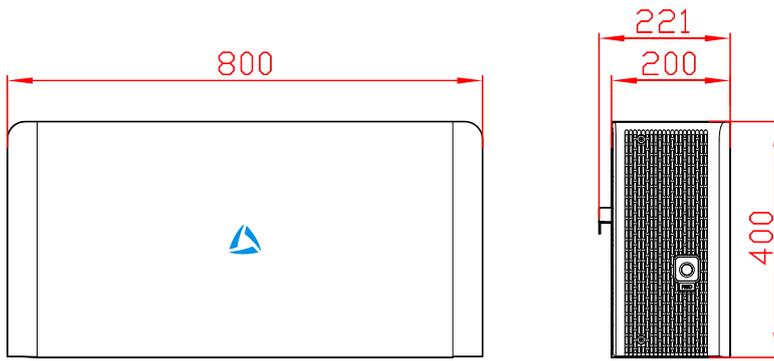


Figure2-10 Size of inverter (Unit: mm)

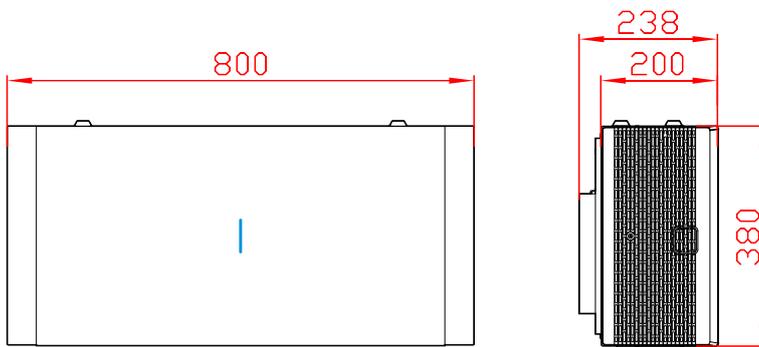


Figure2-11 Size of battery pack (Unit: mm)

2.5 Heat Dissipation Illustration

The inverter adopts bottom air inlet and top air outlet, as shown in Figure2-12. The battery pack adopts bottom and left side inlet and top air outlet, as shown in Figure2-13. For normal use of the device, avoid any sundries block the air inlet & outlet holes.

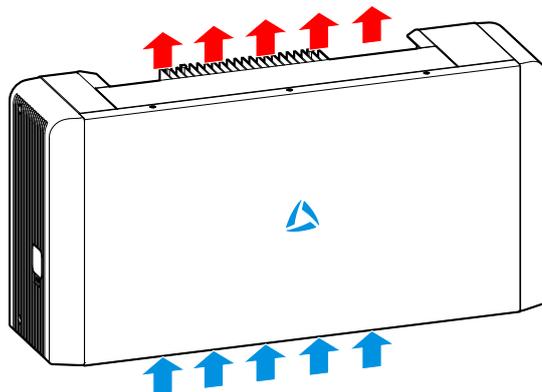


Figure2-12 Heat dissipation diagram of inverter

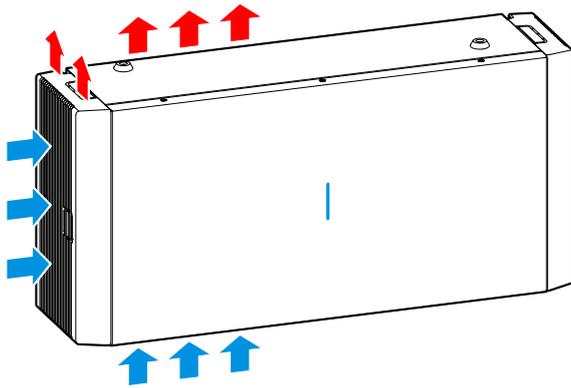


Figure2-13 Heat dissipation diagram of battery pack

2.6 Application Scenarios

The iStoragE3 series energy storage system can be applied in DC-coupled system, AC-coupled system and fully off-grid system, as shown in Figure2-14, Figure2-15 and Figure2-16.

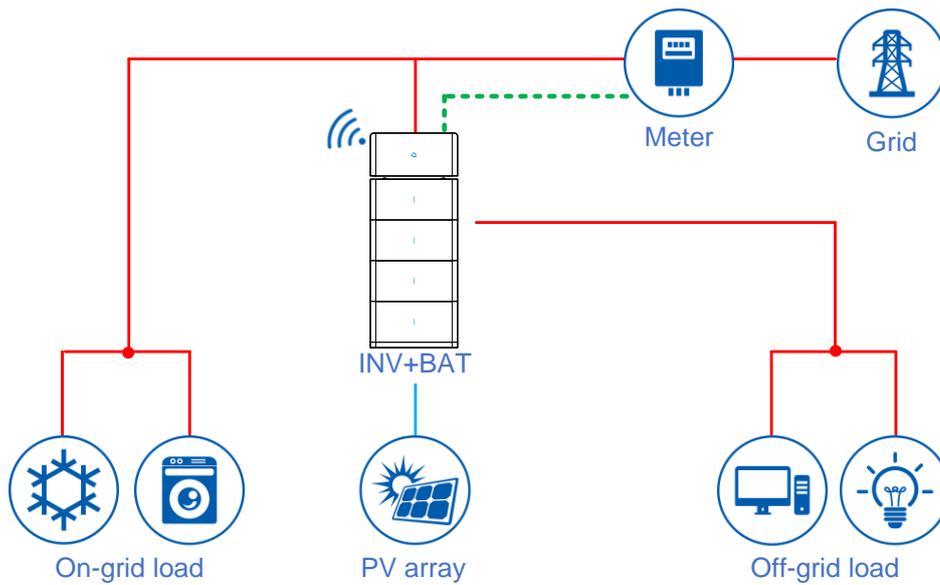


Figure2-14 DC-coupled system

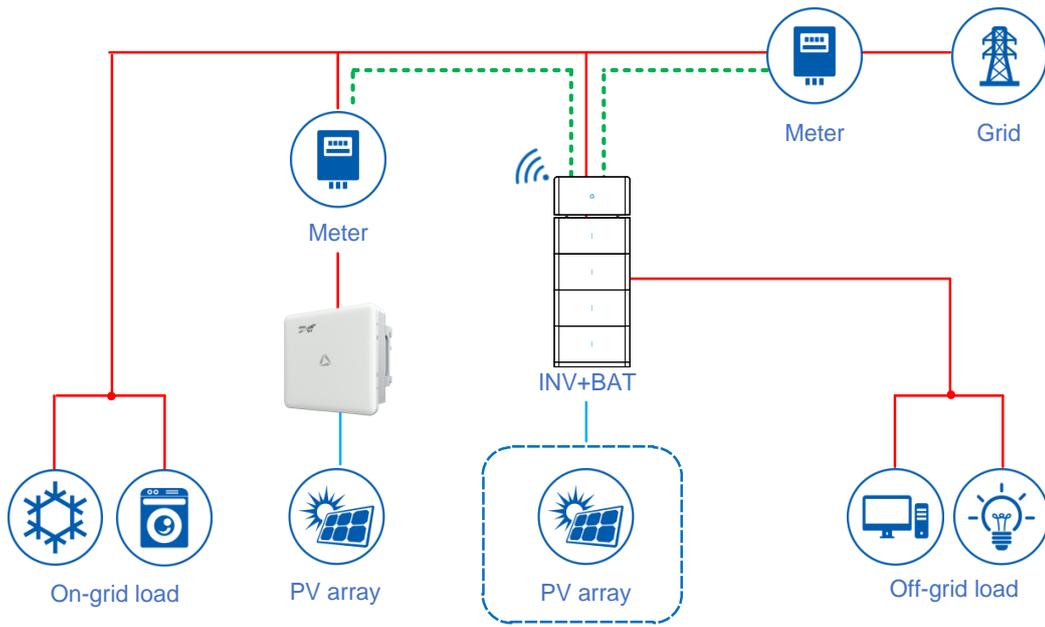


Figure2-15 AC-coupled system

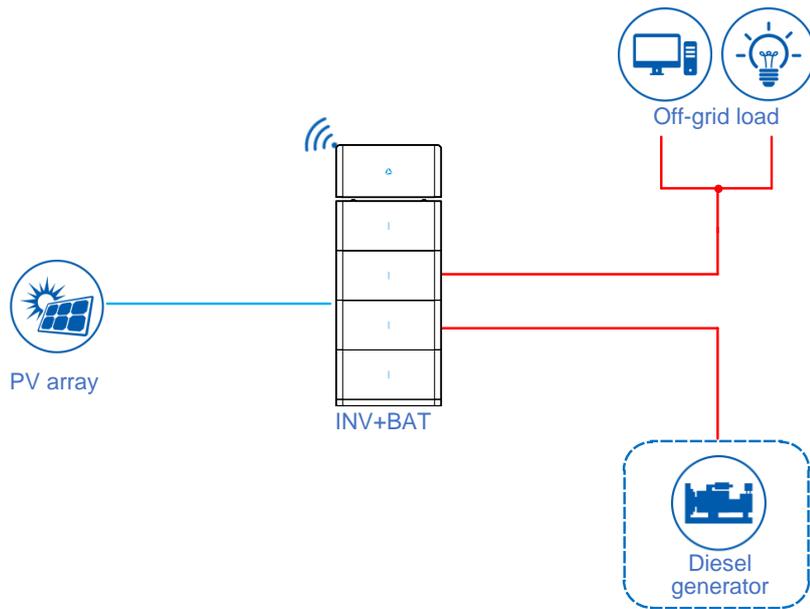


Figure2-16 Fully off-grid system

3 Installation

This chapter introduces the installation of the device, including installation process, installation preparation, transportation and unpacking, installation procedure, electrical connection and checking, etc.

3.1 Installation Process

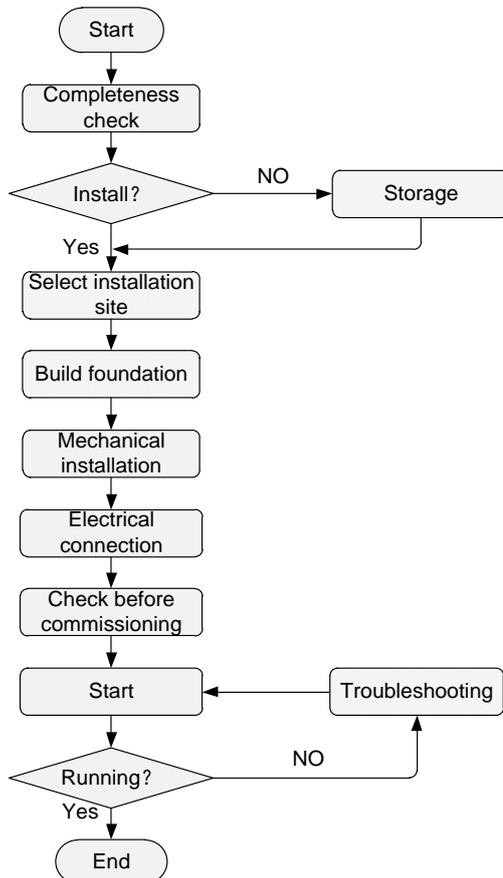
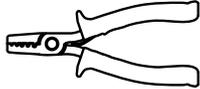
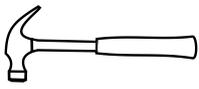
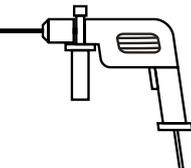
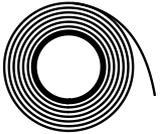
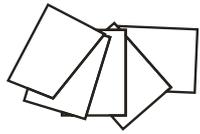
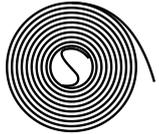
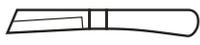
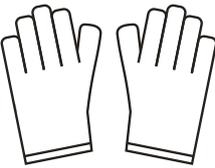
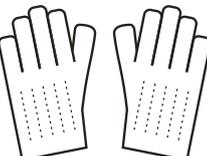
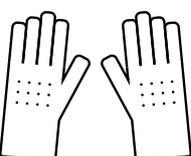
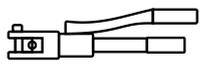
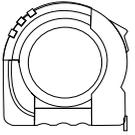


Figure3-1 Installation process

3.2 Installation Preparation

3.2.1 Tools

Tools			
			
Clamp meter	Multi-meter	Label paper	Phillips screwdriver
			
COAX crimping tool	Diagonal pliers	Wire stripper	Claw hammer
			
Hammer drill	Insulation tape	Cotton cloth	Brush
			
Heat shrink tubing	Heat gun	Electrician's knife	Protective gloves
			
ESD gloves	Insulated gloves	Hydraulic pliers	Cable tie
			
Tape	Levelling instrument	Goggles	Torque wrench

CAUTION

- The tools in above table are for reference only, actual tools can be adjusted according to the site condition.
- The installation tools must be insulated to avoid electric shock.

3.2.2 Installation Environment

The used environment may effect the service life and reliability of the device. So, the work environment should meet the following requirements.

- The installed place should within the specification (operating temperature:-20°C~50°C, relative humidity: 0%-100%).
- The installed place should be without vibration or not easy impacted.
- The installed place should be without dust, corrosive material, salty or flammable gas.
- The installed place should be without flammable or explosive materials.
- Do not install the iStoragE3 in the closed place or with poor ventilation. Ensure that there has sufficient fresh-air supply around the device.
- The installed wall or supporter should be with enough bearing capacity.

NOTE

For stably running and long service life, we suggest to install the iStoragE3 series energy storage system in the place where has no directly sunshine, rain or snow. It is good if the installed place with shelter, as shown in Figure3-2

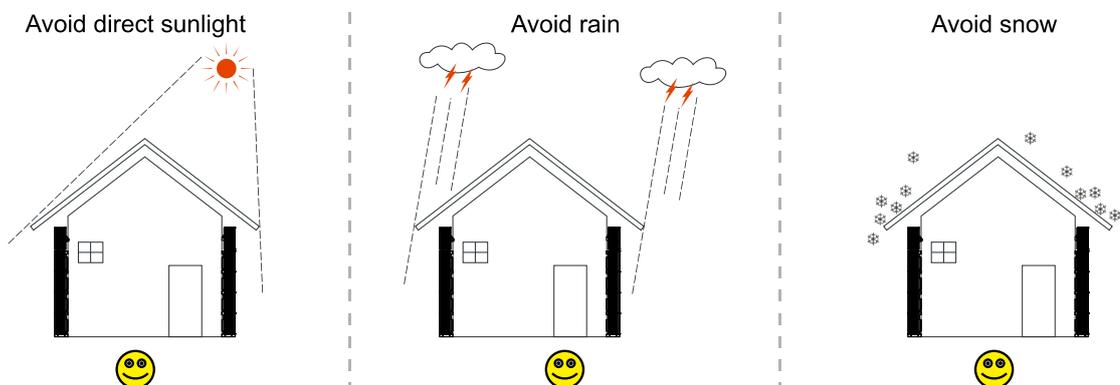


Figure3-2 Recommended installation environment

3.2.3 Installation Space

Keep at least 500mm from the left and right side of the device to other objects, keep at least 300mm from the top of the device to ceiling and keep at least 300mm from front of the device to other objects, which is good for heat dissipation or maintenance, as shown in Figure3-3.

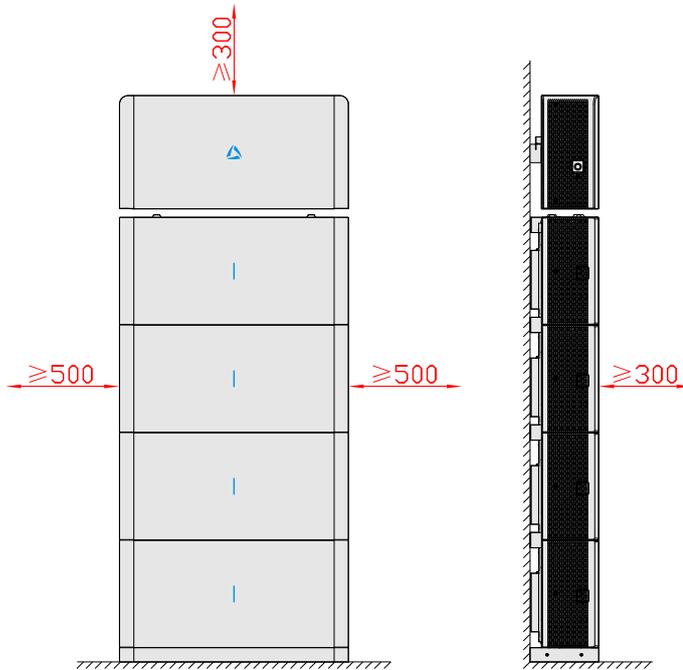


Figure3-3 Installation space (unit: mm)

NOTE

- The installation space of iStoragE3 series energy storage system is the same. In above figure, we take 1 INV + 4 BAT as an example to illustrate.
- If the battery packs are installed in 2 piles, the installation space between the 2 piles battery pack should be meet the requirement in Figure3-3.

3.3 Transportation and Unpacking

3.3.1 Transportation

The device should be transported by trained professional.



During transporting, please take care and avoid impacting or dropping.

DO NOT reverse place the battery pack.

3.3.2 Unpacking and Checking

 **NOTE**

Select the unpacking site in advance. In principle, the unpacking site should be as close to the installation site as possible.

The device has been tested and checked strictly, but it still may be damaged during transporting, so, please check it carefully.

- Inspect the device's appearance, if any shipping damage is found, report it to the carrier and your local dealer immediately.
- Check if the types of the accessories are complete and correct. If there is any discrepancy, take notes and contact Kehua company or local office immediately.

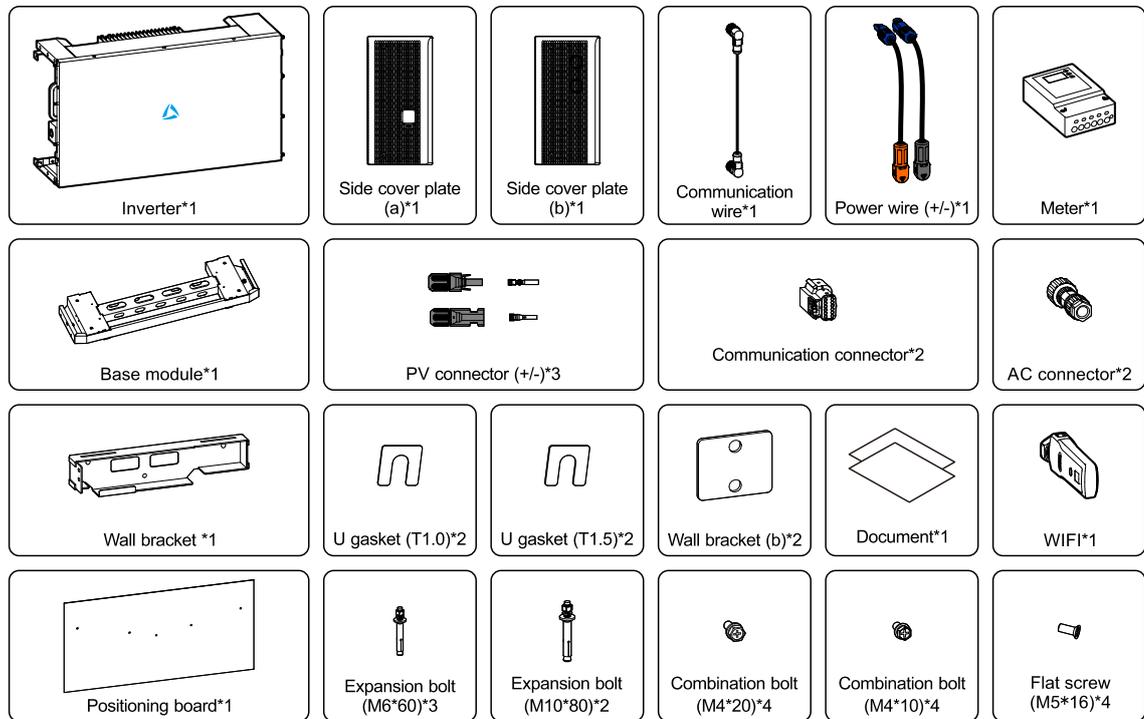


Figure3-4 Packing list of inverter

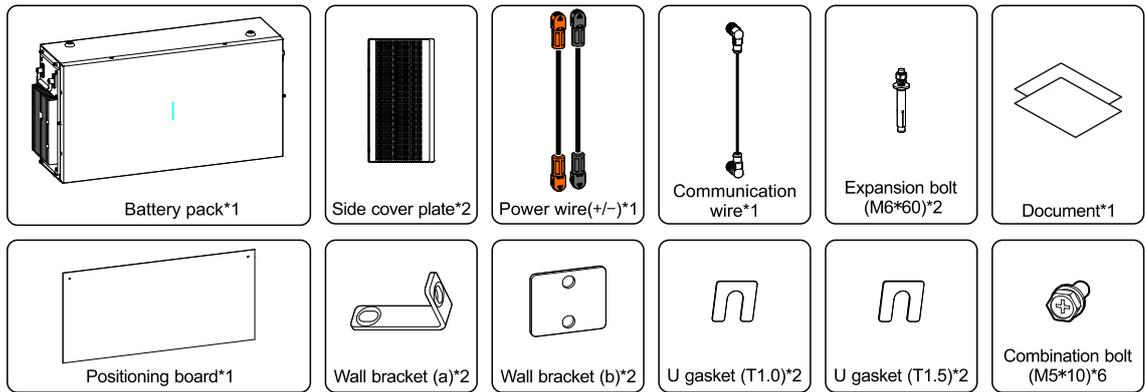


Figure3-5 Packing list of battery pack

NOTE

The meter is optional, it is provided according to the contract.

CAUTION

If the iStoragE3 series energy storage system needs to be stored for a long time after unpacking, it is necessary to pack the device by original package and save properly.

If the battery pack needs to be stored for a long time, it is necessary to charge the battery every half a year.

3.4 Mechanical Installation

The installation carrier for iStoragE3 should be with a certain structural strength, such as cast-in-place reinforced concrete walls or brick structure walls, etc. For other special walls, corresponding strengthening measures should be taken according to the actual situation.

WARNING

The battery is very heavy, so it needs to transported and installed by proper auxiliary tools. There is a risk of injury if the battery pack is not handled properly during transporting.

! CAUTION

Keep the installed place far away from the tube of water, electricity or gas, which is to avoid affect the installation.

! CAUTION

When installing, please wear safety gloves and safety shoes.

Step 1 Install the base.

1. Mark the installation holes on the floor on the basis of the position board, as shown in Figure3-6.

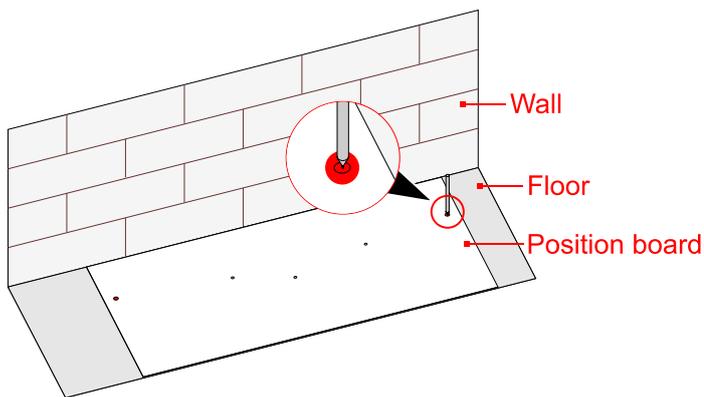


Figure3-6 Mark the installation holes of base

2. Drill holes and install the expansion bolts M10, as shown in Figure3-7.

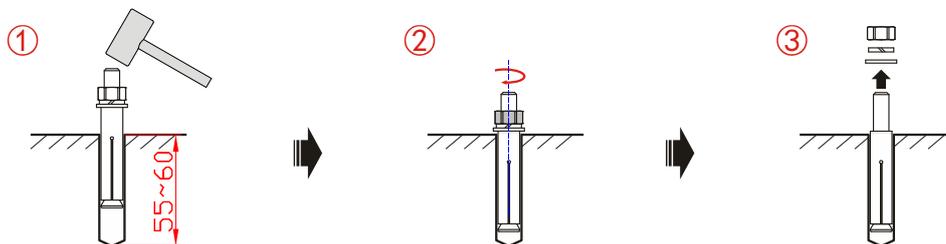


Figure3-7 Install the expansion bolt (unit: mm)

! CAUTION

During drilling, please wear safety goggles and a dust mask to prevent dust from entering your eyes.
After drilling, please clean the scrap in the installation holes, and then perform the installation.

3. Fix the base module to the installed floor, as shown in Figure3-8.

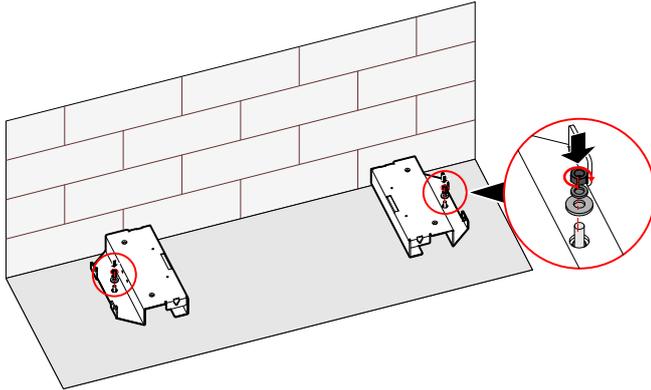


Figure3-8 Fasten the base module

! CAUTION

Ensure that the installed floor is flat and horizontal. If not, please use gasket to make the floor horizontal.

4. Assemble the beam to the base module, as shown in Figure3-9.

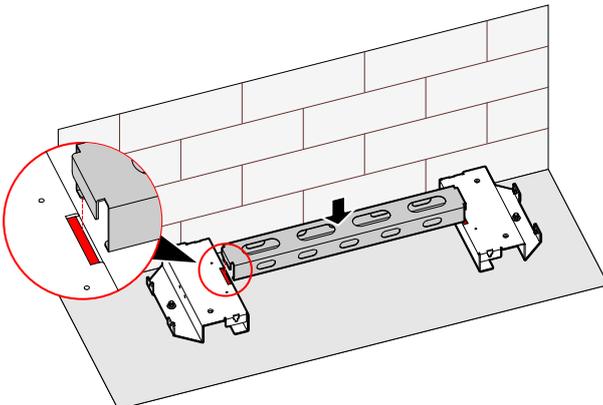


Figure3-9 Assemble the beam

5. Lead the cover plate into the base module and fix it with screws, as shown in Figure3-10, Figure3-11.

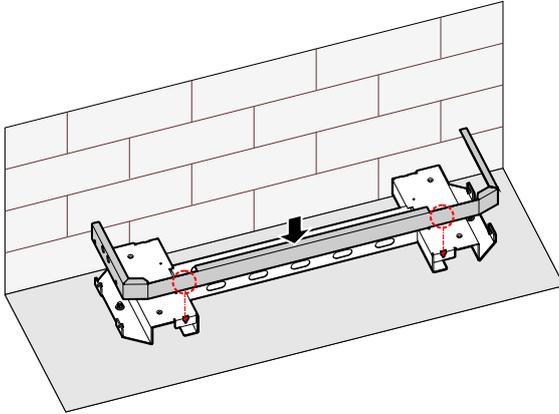


Figure3-10 Install the cover plate

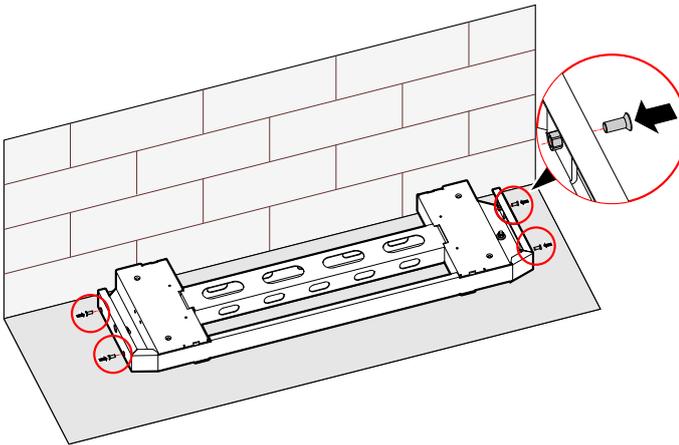


Figure3-11 Fasten the cover plate

 **NOTE**

If the device is installed on the low-lying position and may have the risk of soaking by rain, we suggest selecting the support to lift the device to avoid damage for the device. The installation of support is as follows.

1. Assemble the support and base by screws M5, as shown in Figure3-12.

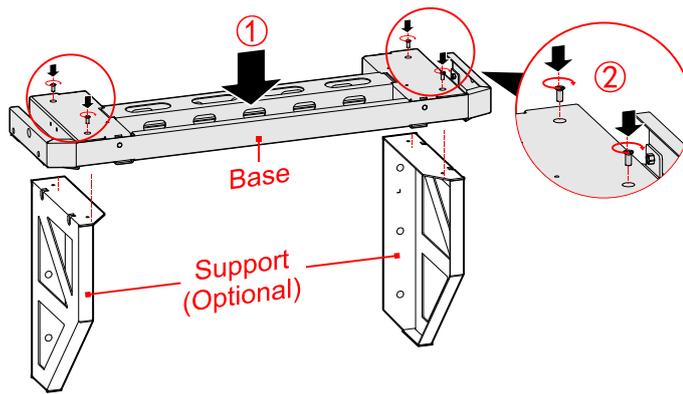


Figure3-12 Assemble the support and base

2. Mark the installation holes, as shown in Figure3-13.

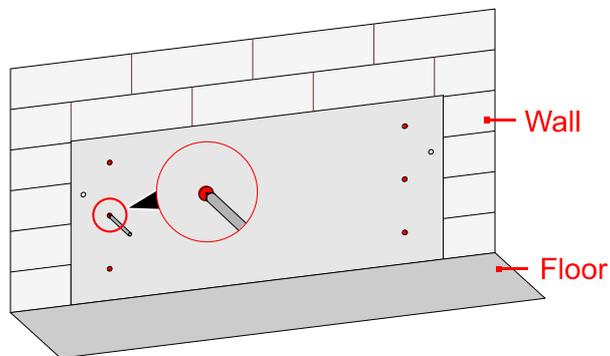


Figure3-13 Mark the installation holes

3. Drill holes and install the expansion bolts M6, as shown in Figure3-14.

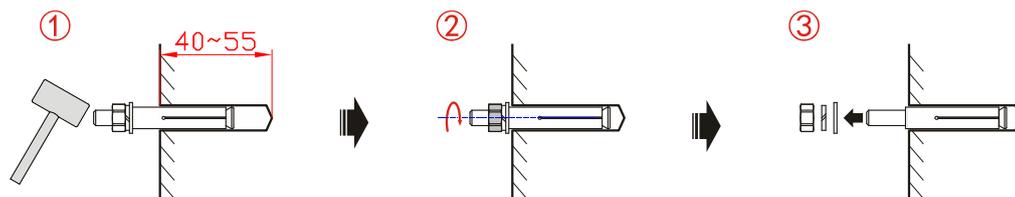


Figure3-14 Install the expansion bolt (unit: mm)

CAUTION

During drilling, please wear safety goggles and a dust mask to prevent dust from entering your eyes.
After drilling, please clean the scrap in the installation holes, and then perform the installation.

4. Fix the assembled base, as shown in Figure3-15.

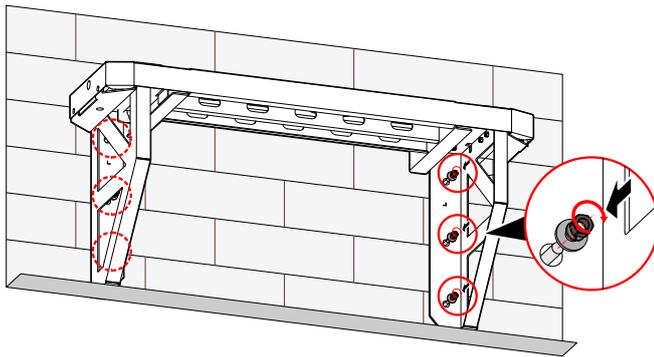


Figure3-15 Fix the assembled base

Step 2 Mark the installation holes of battery packs and inverter, as shown in Figure3-16~Figure3-18.

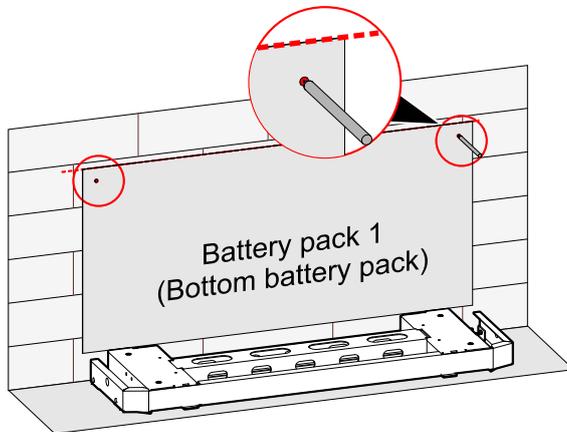


Figure3-16 Mark the installation holes of bottom battery pack

NOTE

The installation holes of base with support is the same as that of standard configured base, in above figure, we take standard configured base as an example to illustrate.

For easy location of battery pack 2, 3, 4 and inverter, after marking the installation holes, it is necessary to draw a line at the top of the position board, as the red dotted line shown in Figure3-16, Figure3-17.

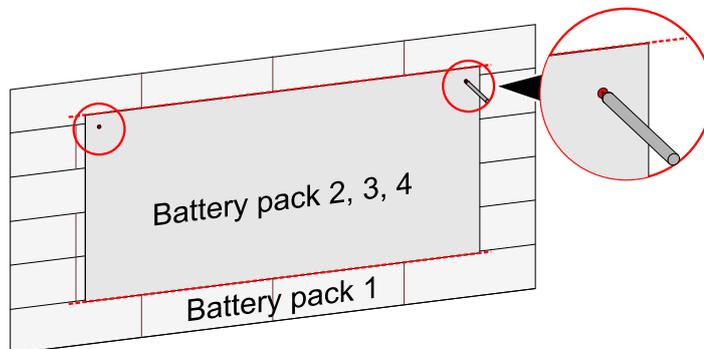


Figure3-17 Mark the installation holes of other battery packs

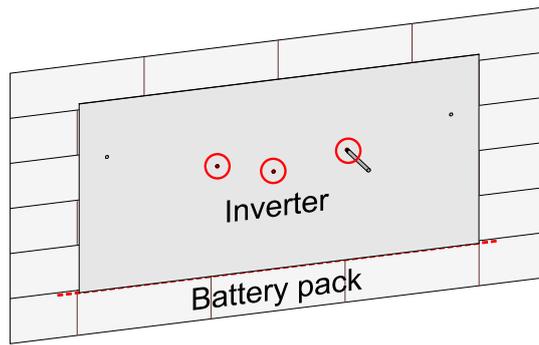


Figure3-18 Mark the installation holes of inverter

Step 3 Drill holes and install the expansion bolts M6, as shown in Figure3-19.

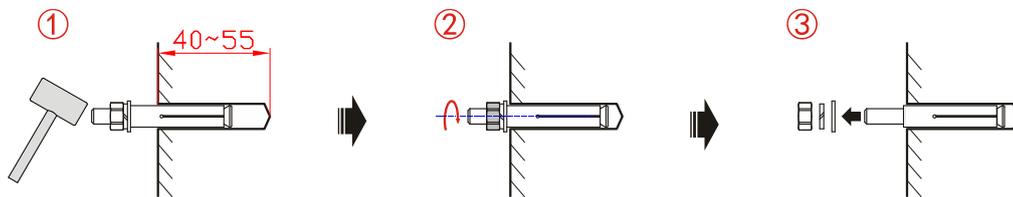


Figure3-19 Install the expansion bolts (unit: mm)

⚠ CAUTION

During drilling, please wear safety goggles and a dust mask to prevent dust from entering your eyes.

After drilling, please clean the scrap in the installation holes, and then perform the installation.

Step 4 Install battery packs.

1. Fix the bottom battery pack with base by wall bracket (b), as shown in Figure3-20.

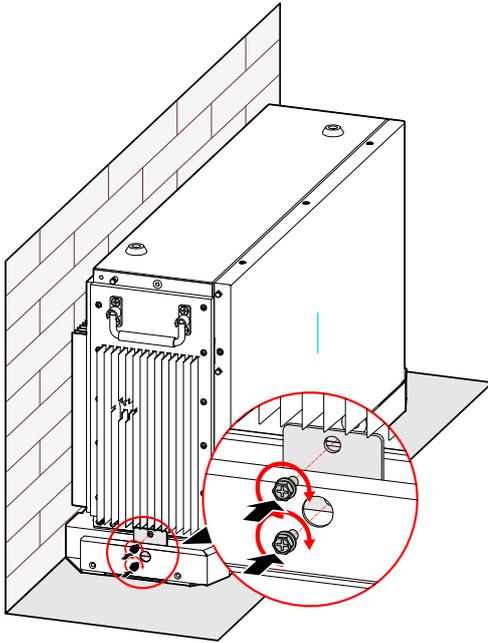


Figure3-20 Fix the bottom battery pack with base

2. Fix the wall bracket (a) of bottom battery pack, as shown in Figure3-21.

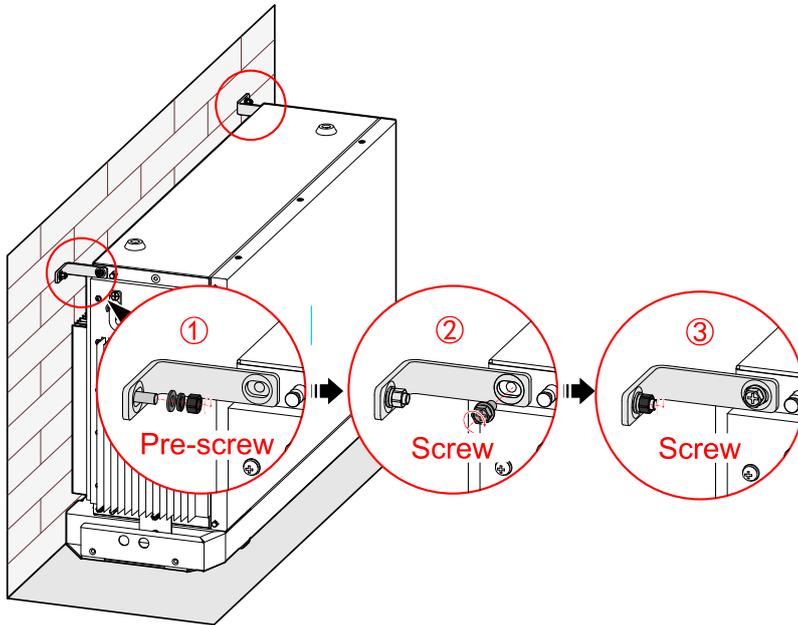


Figure3-21 Fix the wall bracket (a)

3. Place the battery pack onto the lower battery pack, as shown in Figure3-22.

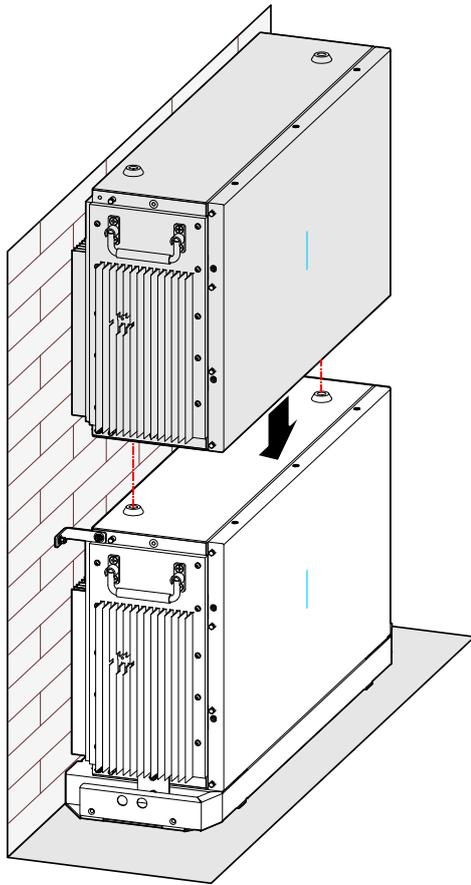


Figure3-22 Place the battery pack

 **CAUTION**

While placing the battery pack, the bottom limit holes of the upper battery pack should match the screw on the top of the below battery pack.

4. Fix the battery pack, as shown in Figure3-23.

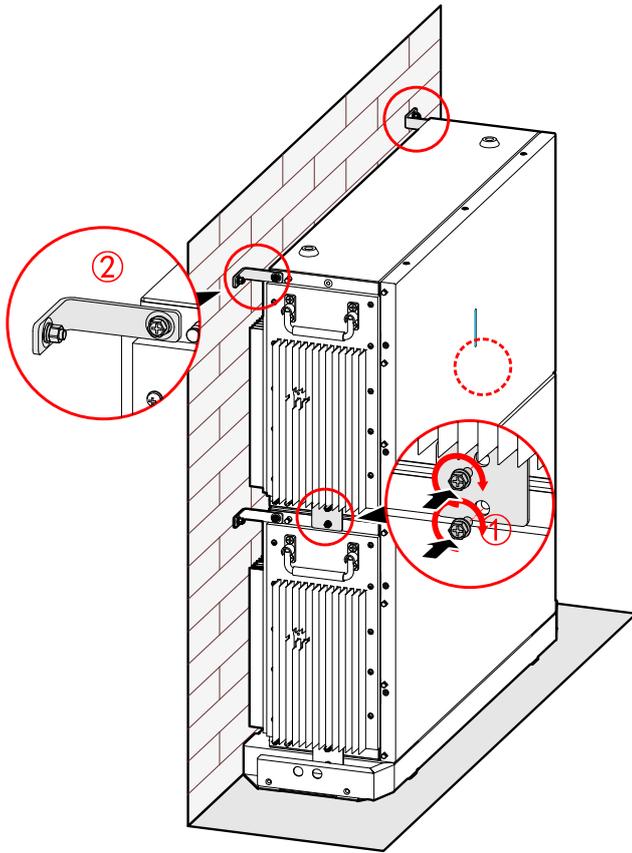


Figure3-23 Fix the battery pack

 **NOTE**

The installation of adjacent battery pack is the same, in above figure, we take the installation of 2 battery pack as example to illustrate.

If the quantity of battery pack >4 ,. It needs to be installed in 2 piles, the other pile of battery packs should be placed at the right of the inverter. The installation method is the same.

Step 5 Install the inverter.

1. Fix the wall-mounted bracket, as shown in Figure3-24.

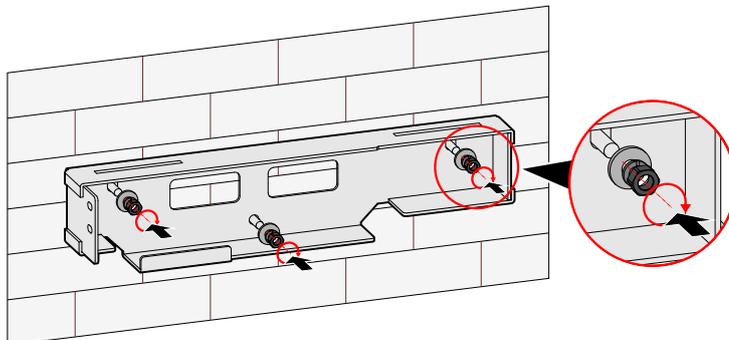


Figure3-24 Fix the wall-mounted bracket

2. Hang the inverter to wall-mounted bracket, as shown in Figure3-25.

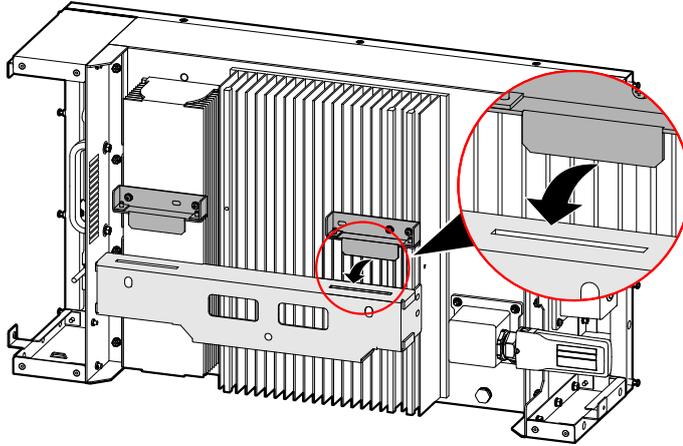


Figure3-25 Hang the inverter to wall-mounted bracket

3. Fix the inverter, as shown in Figure3-26.

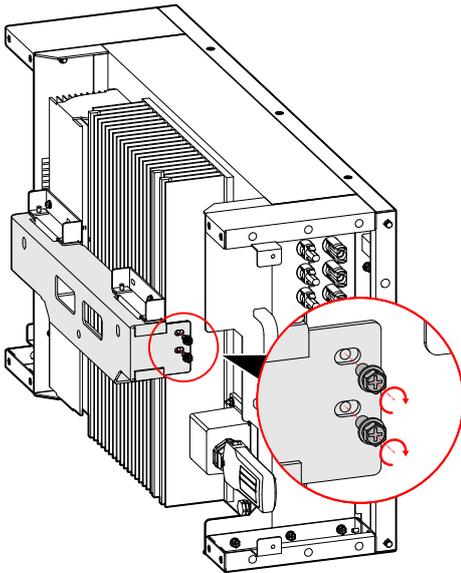


Figure3-26 Fix the inverter

- Step 6 Connect the wires of the inverter and battery packs, as shown in Figure3-27.

⚠ CAUTION

- While connecting the inner wires of system, it is necessary to make the handle on the battery pack vertical to the side, and lead the battery +/- and BMS communication wires go through the handle, and then connect them.
- The inner wiring of system must use the configured battery wires.
- During wiring, ensure that the connection of battery+ and battery - are all right.
- The wires of battery +/- and grounding should be separated from the communication wire.

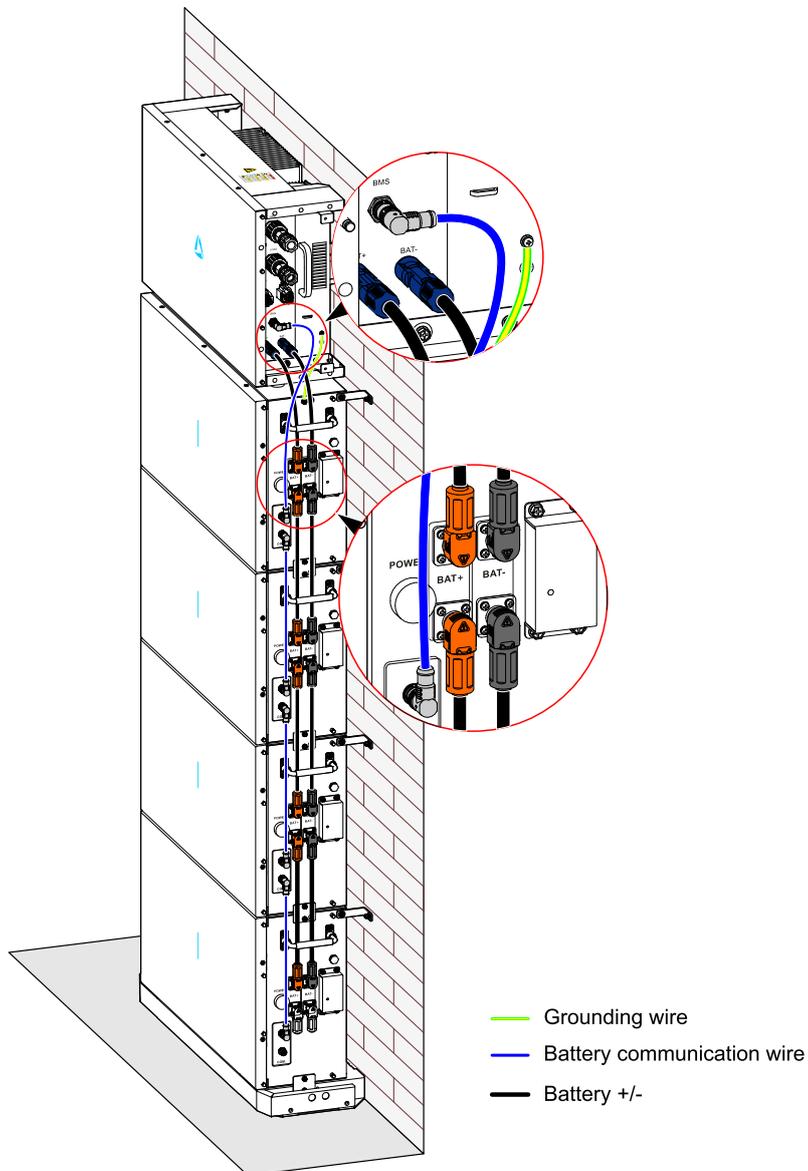


Figure3-27 Inner connection diagram

 **NOTE**

- Only the grounding wire of top battery pack needs to be connected to the grounding terminal of inverter, the grounding of other battery packs is connected by the wall bracket (b).
- In above figure, we take 1 inverter + 4 battery packs as an example to illustrate. The wiring of other configuration is the same.

 **CAUTION**

The battery terminals that not connected should be blocked by original covers.

----End

3.5 Electrical Connection

3.5.1 Wire Specification

The recommended wire specification is as shown in Table3-1.

Table3-1 Recommended wire specification

Item	Cross-sectional area (mm ²)
Battery power cable	6~10
Battery communication cable	0.12 ~0.2 (AWG26~AWG24)
PV power cable	4
Signal cable	0.12~0.2 (AWG26~AWG24)
AC power cable	4~6
PE cable	4~10

3.5.2 External Grounding Connection

The external grounding terminal of inverter is as shown in ⑪ of Figure2-7.

! WARNING

The external grounding wire cannot replace the PE wire of AC terminal, they all must be connected with ground reliably.

- Step 1 Strip the insulation layer of grounding wire for about 7mm, insert the wire into OT terminal and crimp them by crimping tool, the as shown in Figure3-28.

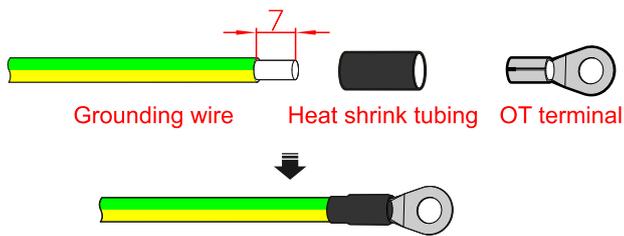


Figure3-28 Stripping diagram of external grounding wire (unit: mm)

- Step 2 Connect the wires of the inverter, as shown in Figure3-29 .

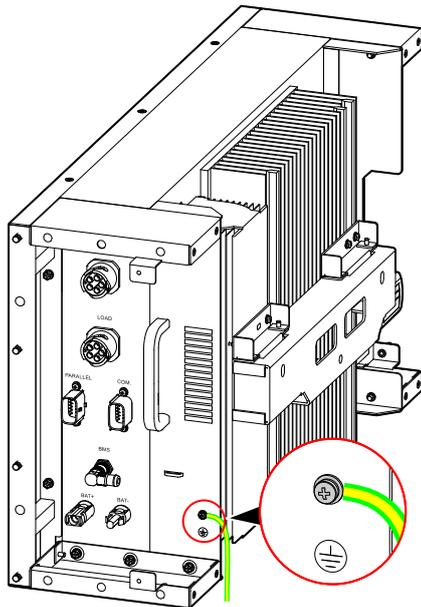


Figure3-29 Inverter external grounding connection

CAUTION

- The grounding of the inverter and the lightning rod of the building that inverter installed cannot be the same, the two need to be separated (as shown in Figure3-30), or, lightning stroke will damage the inverter.
- The grounding of the inverter should be directly connected to the grounding system, and the impedance should be less than 20mΩ.

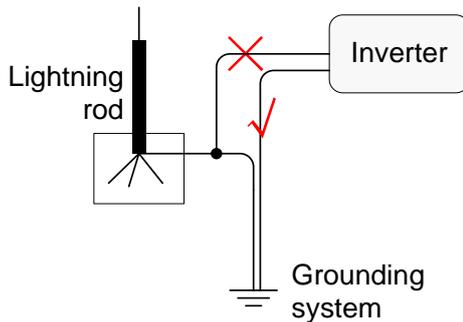


Figure3-30 Grounding diagram of inverter

----End

3.5.3 DC Input (PV) Connection

CAUTION

- When installation, please use the equipped DC terminals to avoid inverter damage.
- It is recommended to use independent switch for each PV input, and before connecting, the switches must be off. We suggest to use the special DC switch (rated voltage is 1000V, rated current is more than 20A).
- Switch off the DC switch of inverter and external DC switches before connecting the PV array.
- Ensure that the connection between PV array and the inverter at positive pole and negative pole is correctly.
- The DC input voltage should be less than the max. input voltage of the inverter.
- It's forbidden to connect the grounding wire with positive pole or negative pole of PV array, or it will lead to inverter damage.

Use the equipped PV connector and metal terminal to connect the PV input. The PV connector includes positive connector and negative connector, they match the corresponding positive metal terminal and negative terminal, corresponding procedure as follows.

Step 1 Ensure that the DC switch on the inverter and external DC switches are all OFF.

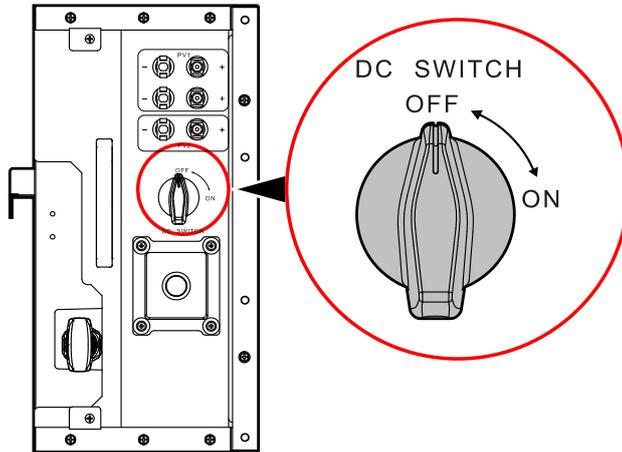


Figure3-31 Inverter's DC switch OFF status

Step 2 Strip the insulation layer of positive wire and negative wire for about 7mm, as shown in Figure3-32.



Figure3-32 Stripping diagram of DC input (unit: mm)

NOTE

It is better to use different color for the positive and negative of PV input. It is recommended to use red wire as the positive wire, use black wire as negative wire to avoid wrong connection. If using the wires of other color, please confirm the corresponding connection relationship.

Step 3 Unscrew the lock nut of positive and negative connection, lead the positive and negative wires go through corresponding lock nut, and then insert the positive wire and negative wire into the positive metal terminal and negative metal terminal respectively. Crimp the metal terminals firmly by crimping pliers, as shown in Figure3-33.

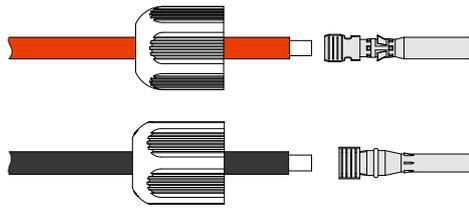


Figure3-33 Crimp the metal terminal

Step 4 Insert the positive wire and negative wire into corresponding insulation crust respectively. If there has a click sound, it means that the wire have been inserted properly, as shown in Figure3-34.

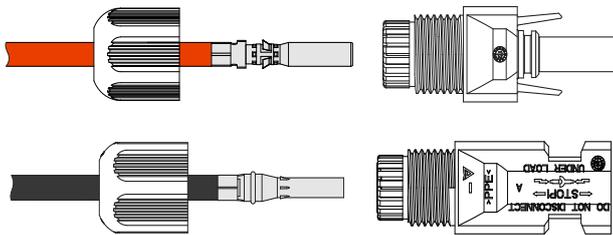


Figure3-34 Fasten the metal terminal

Step 5 Tighten the sealing nuts of positive connector and negative connector to the corresponding insulation crusts respectively, as shown in Figure3-35.

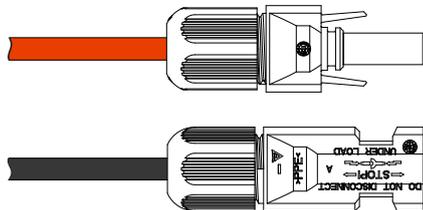


Figure3-35 Tighten the sealing nuts

Step 6 Measure the voltage and check if the positive and negative is connected properly and if the voltage within the input range of the inverter.



Measure the voltage of PV string < 1000V

Figure3-36 Measure the PV voltage

- Step 7 Insert the positive connector and negative connector to the MPPT+ and MPPT– terminals (as shown in Figure3-37) and tighten them. If there has a click sound, it means that the connector have been inserted properly.

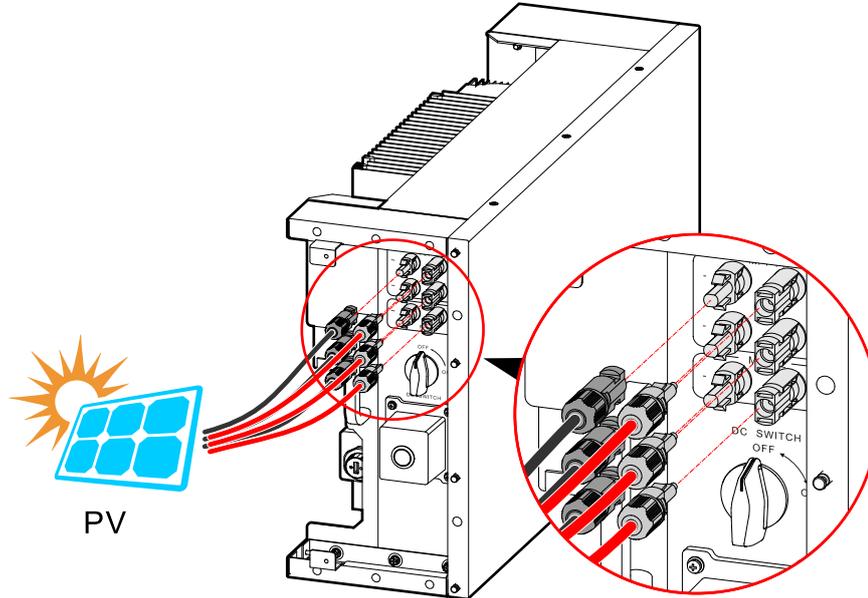


Figure3-37 Connect the PV connector

CAUTION

If there are 2 routes of PV input, please connect the first and third group PV connectors to improve the use rate of PV energy.

----End

3.5.4 Grid Connection

CAUTION

It's forbidden that several inverters shares an AC switch.

It's forbidden to connect load between inverter and grid switch.

To ensure the inverter can be disconnected with load safely, we suggest equipping independent dipolar switch for each inverter to protect the inverter.

Table3-2 Recommended AC breaker specification

Model	AC input specification (GRID)	AC output specification (LOAD)
iStoragE3 5K	16A	16A
iStoragE3 6K	20A	20A
iStoragE3 8K	25A	25A
iStoragE3 10K	32A	32A
iStoragE3 12K	32A	32A

⚠ CAUTION

During wiring, please pay attention to distinguish the live wire, neutral wire and grounding wire of grid side.

Step 1 Ensure that the external grid switch is OFF.

NOTE

- If the grid connection adopts multi-core wires, the wiring must go through the side panel. So, it is necessary to knock-off the wiring hole of grid on the decoration panel, as shown in Figure3-38.
- If the grid connection adopts the single-core wires, the wiring can go through side or back. When wiring from side, the wiring holes also needs to be knock off, as shown in Figure3-38.

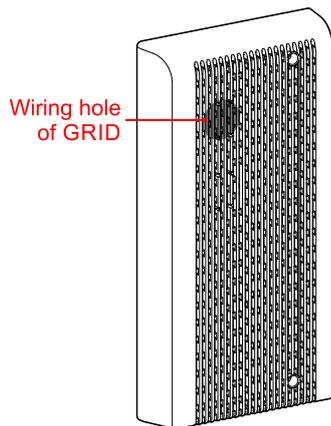


Figure3-38 Knock down hole of GRID

Step 2 Prepare grid connector, as shown in Figure3-39.

 **NOTE**

- If adopt side wiring, it is necessary to lead the grid wire go through the side wiring hole and then crimp the wires.
- In following figure, we take multi-core wire as an example to illustrate.

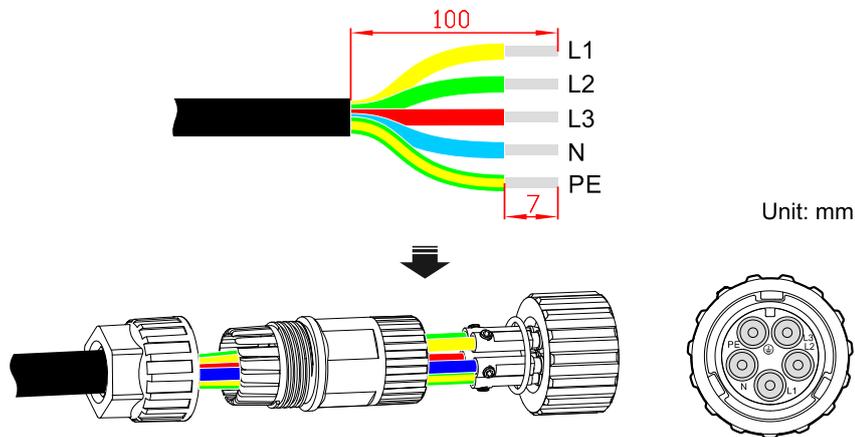


Figure3-39 Connect the AC connector

 **NOTE**

It is better to use different color for grid cables. While connecting, please confirm the corresponding connection relationship.

Step 3 Insert the AC connector to the GRID port, as shown in Figure3-40.

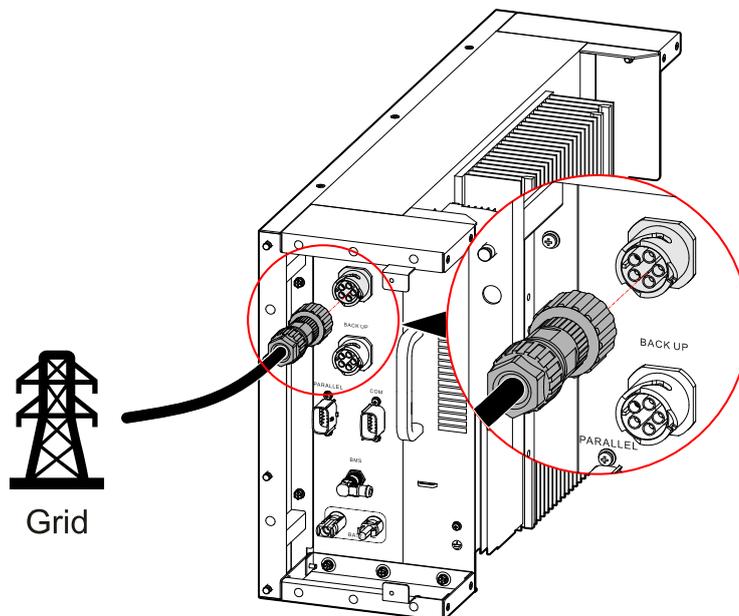


Figure3-40 Connect the grid

----End

3.5.5 Load Connection

CAUTION

During wiring, please pay attention to distinguish the live wire, neutral wire and grounding wire of load side.

Step 1 Ensure that the external load switch is OFF.

NOTE

- If the grid connection adopts multi-core wires, the wiring must go through the side panel. So, it is necessary to knock-off the wiring hole of grid on the decoration panel, as shown in Figure3-41.
- If the grid connection adopts the single-core wires, the wiring can go through side or back. When wiring from side, the wiring holes also needs to be knock off, as shown in Figure3-41.

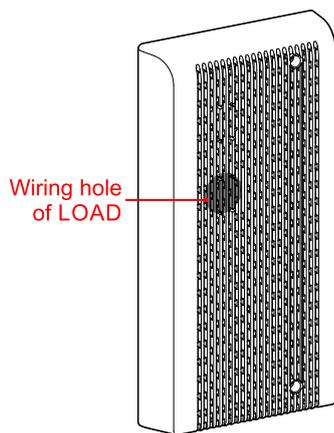


Figure3-41 Knock down hole of LOAD

Step 2 Prepare load connector, as shown in Figure3-42.

NOTE

- If adopt side wiring, it is necessary to lead the grid wire go through the side wiring hole and then crimp the wires.
- In following figure, we take multi-core wire as an example to illustrate.

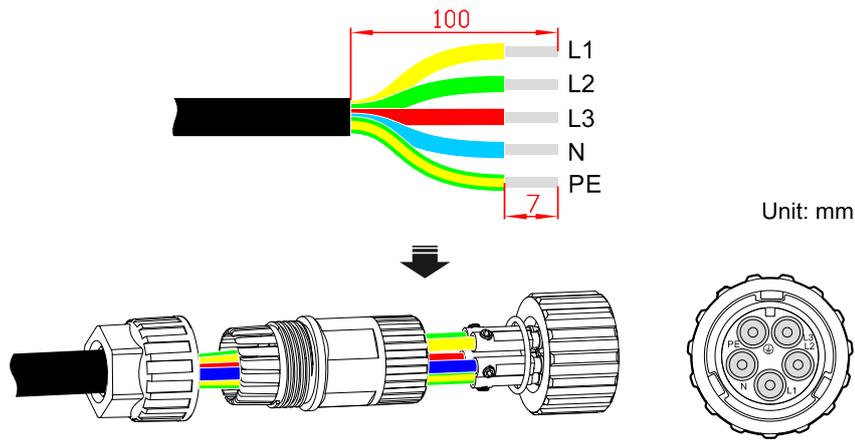


Figure3-42 Connect the AC connector

NOTE

It is better to use different color for grid cables. While connecting, please confirm the corresponding connection relationship.

Step 3 Insert the AC connector to the BACK UP port, as shown in Figure3-43.

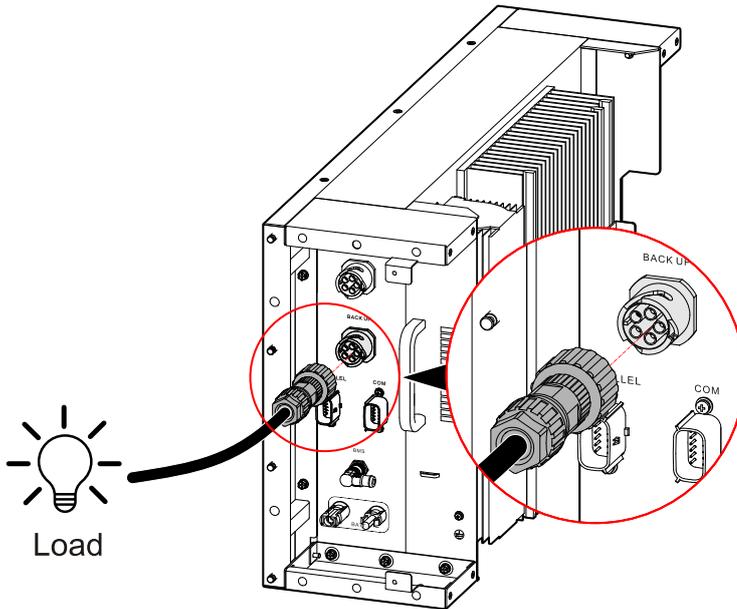


Figure3-43 Connect the load

----End

3.5.6 WIFI/4G Connection

 **NOTE**

WIFI and 4G is alternative. it is configured according to user's actual needs.

When the inverter equips WIFI/4G, install it to the WIFI/4G port (as shown in Figure3-44) to monitor on the internet. The monitor way is as shown in Figure3-44.

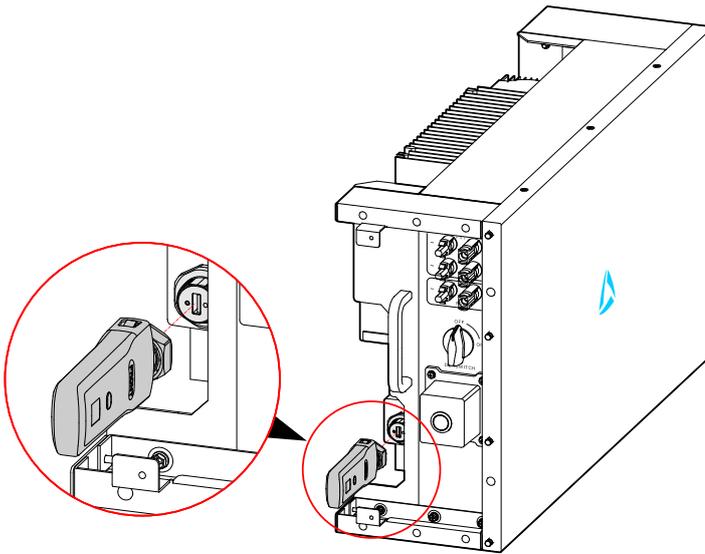


Figure3-44 WIFI communication connection

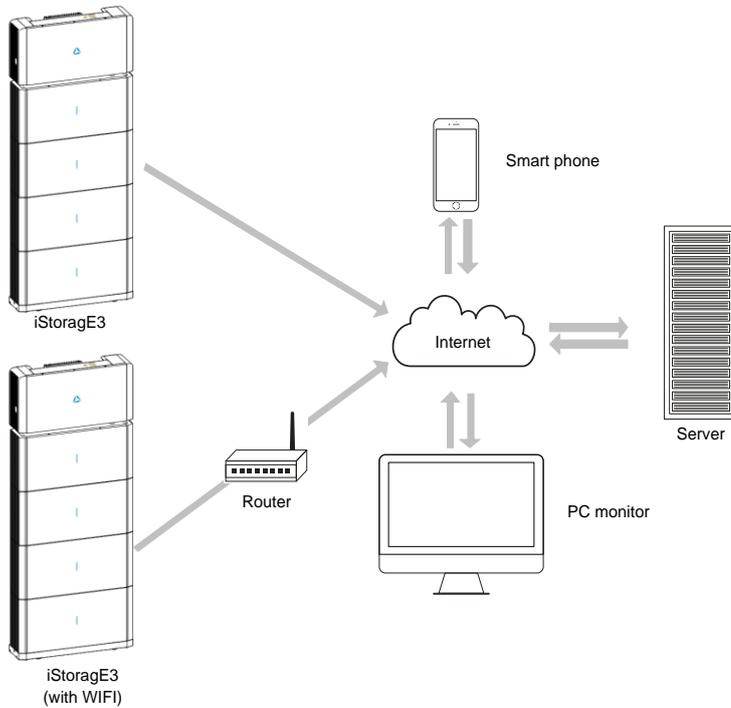


Figure3-45 Communication way

**NOTE**

For the use of WIFI/4G, please see the built-in user manual in the packaging of WIFI.

3.5.7 Communication Connection

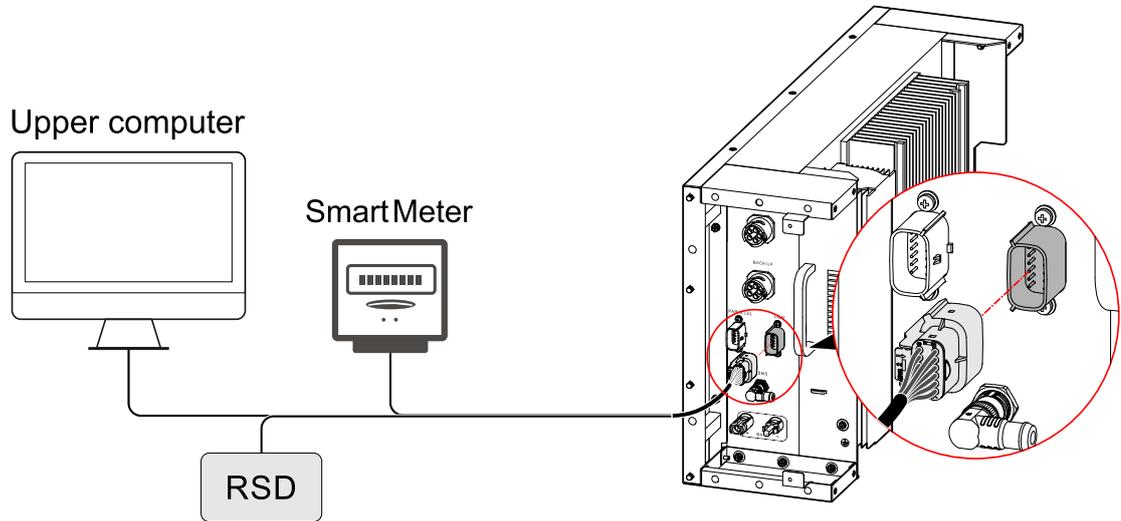


Figure3-46 COM communication connection

Meter port

Meter communication port is used to communicate with smart meter to achieve zero-export.

**NOTE**

For the actual wiring of the smart meter, see the diagram on the right side of the meter.

**CAUTION**

CT direction is: inverter → grid, please connected properly!

Smart meter setting


CAUTION

- If the meter used in the grid side of iStoragE3 product, address is set to A-001.
- If the meter used in the PV inverter grid side, address is set to A-002.
- When there is a PV inverter in the user's home, it is recommended to install the smart meter in the grid output side of the PV inverter to ensure the accuracy of grid electricity statistics, and the address is set to A-002. As shown in Figure3-47.

When using the zero-export function, the following setting is required:

1. Set the "Zero-export function" enable in " Basic parameter setting".
2. Set the "Zero-export control power" in "Basic parameter setting" according to the actual use (the setting value of zero-export control power is percentage, it is corrected by rated power. For example, when the rated power of the inverter is 5kW, if the zero-export power set to 30%, the set zero-export control power is 1. 5kW).

The pin illustration of smart meter is as shown in Table3-3.

Table3-3 Pin illustration of smart meter (three- phase)

Pin	Illustration
3	Connect to phase-L of GRID port in the inverter and L1 of grid output.
6	Connect to L2 of grid output.
9	Connect to L3 of grid output.
10	Connect to phase-N of GRID port in the inverter and N of grid output.
13	Connect to I+ port of current transformer of grid output L1.
14	Connect to I- port of current transformer of grid output L1.
16	Connect to I+ port of current transformer of grid output L2.
17	Connect to I- port of current transformer of grid output L2.
19	Connect to I+ port of current transformer of grid output L3.
21	Connect to I- port of current transformer of grid output L3.

Pin	Illustration
24	RS485: A. Connect to RJ45's pin6 of communication port in the inverter.
25	RS485: B. Connect to RJ45's pin5 of communication port in the inverter.

The setting of the smart meter address is as shown in Figure3-47.

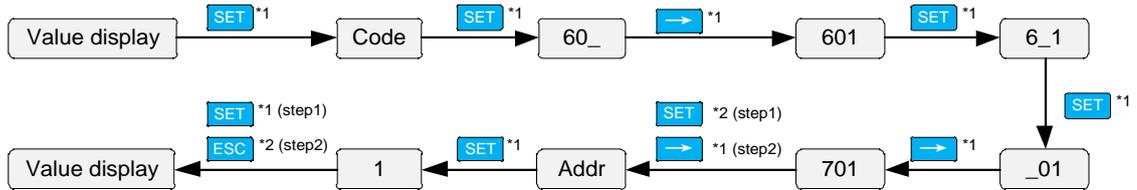


Figure3-47 The setting of the smart meter address (three- phase)

3.6 Installation Side Cover Plates

Step 1 Knock off the right wiring holes (as shown in Figure3-48) of battery packs.

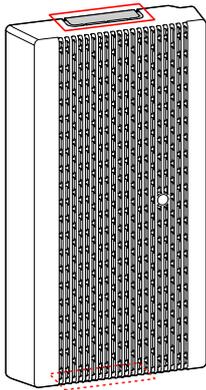


Figure3-48 Wiring holes diagram of battery pack

Step 2 Fix the side cover plates, as shown in Figure3-49.



While fixing the cover plates, it is necessary to lead the corresponding wires go through the groove of cover plate and fasten them to avoid extruding for the wires and even cause damage for the wires and affect the normal use.

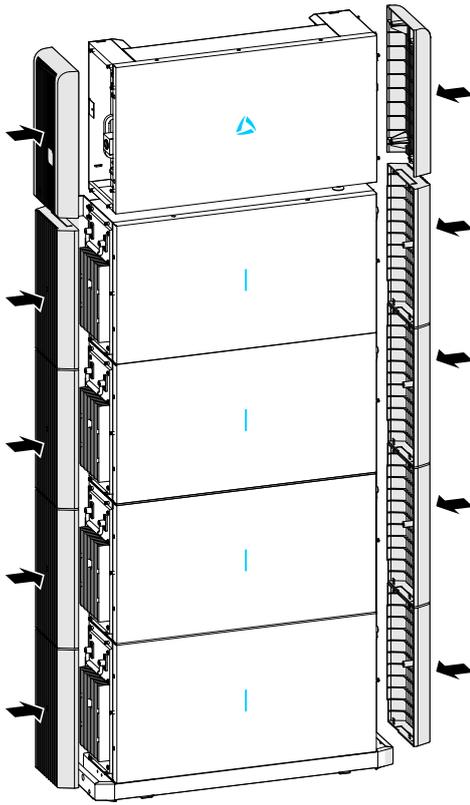


Figure3-49 Fix the wiring cover plate



NOTE

In above figure, we take 1 inverter + 4 battery packs as an example to illustrate, other configuration is the same.

----End

3.7 Check the Installation

After installation, check the following items:

- Check if the connection of DC input, AC output and communication wire are right.
- Check if the iStoragE3 is installed firmly.
- Check if all the wiring is tightened.

4 APP Operation

This chapter is mainly introduces the operation of APP.

4.1 First Startup

Step 1 Login the following website to download the APP and do WIFI configuration.

- Download APP

APPSTORE: <https://apps.apple.com/cn/app/wisesolar-plus/id1510470362>



GOOGLE PLAY: <https://play.google.com/store/apps/details?id=com.kehua.wisesolarpro>



- WIFI configuration

Operation guide: <https://energy.kehua.com/quickStart>



Step 2 After registering and logging in, you can view the main page, as shown in Figure4-1.



Figure4-1 Home interface

Step 3 Click the plant to enter the "Plant details" interface, as shown in Figure4-2.

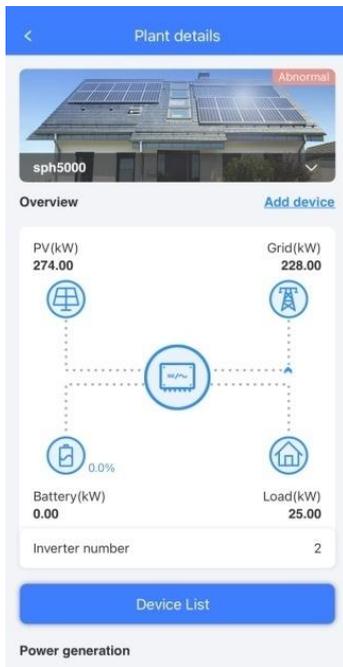


Figure4-2 Plant details interface

Step 4 Click the "Device List" button to enter the device list interface, as shown in Figure4-3.



Figure4-3 Device list

----End

4.2 Inverter Information Query

Step 1 Click corresponding SN to view the device status information.

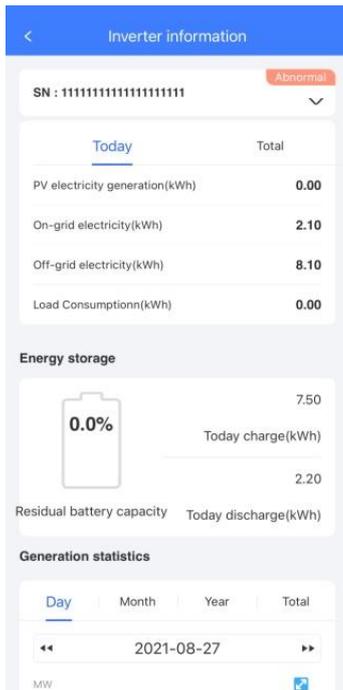


Figure4-4 Inverter information interface

Step 2 Pull-down the interface and click the "More" button to see more information, such as PV information, BAT information, INV information and Grid information.



Figure4-5 Inverter information interface

----End

4.2.1 Running Information

PV information

In the PV information item, you can view PV voltage, PV current and PV power, etc. as shown in Figure4-6.



The screenshot shows a mobile application interface for 'Inverter information'. It features a blue header with a back arrow and the title 'Inverter information'. Below the header is a section titled 'Running Information' which contains a sub-section 'PV information'. This sub-section lists various PV-related metrics in a table format.

PV information	
Day PV energy(kWh)	0
Month PV energy(kWh)	0
Year PV energy(kWh)	0
Total PV power(kW)	0
Total PV energy(kWh)	193.1
PV1 voltage(V)	0.3
PV1 current(A)	0
PV1 power(W)	0
PV2 voltage(V)	0
PV2 current(A)	0
PV2 power(W)	0

Figure4-6 PV information

Battery information

In the "Battery information" item, you can view battery voltage, battery current, etc. as shown in Figure4-7.

The screenshot shows a mobile application interface for 'Inverter information'. At the top, there is a blue header with a back arrow and the text 'Inverter information'. Below the header, the section 'Running Information' is displayed. Underneath, there is a sub-section titled 'Battery information' which contains a list of battery-related metrics and their values.

Battery information	
Battery voltage(V)	0
Battery current(A)	0
Battery power(kW)	0
Battery day charged(kWh)	0
Battery day discharged(kWh)	0
Battery month charged(kWh)	0
Battery month discharged(kWh)	0
Battery year charged(kWh)	0
Battery year discharged(kWh)	0
Battery SOC(%)	97.6
Max. cell voltage(V)	3.335
Min. cell voltage(V)	3.333
BMS battery voltage(V)	266.6
BMS battery current(A)	0
BMS charge limit current(A)	31.9

Figure4-7 Battery information

Inverter information

In the inverter information item, you can view the inverter voltage, inverter current, etc. as shown in Figure4-8.

The screenshot shows the same 'Inverter information' app screen. It displays two sub-sections: 'Device information' and 'Inverter information'. 'Device information' includes heat sink and internal temperatures. 'Inverter information' includes energy generation and consumption statistics, as well as current and voltage readings for the grid and load.

Device information	
Heat sink temperature(°C)	43.1
Internal temperature(°C)	40.8

Inverter information	
Total grid-tied energy(kWh)	5.5
Total grid-tied consumed(kWh)	8.1
Total load consumed(kWh)	0
Day grid-tied generated(kWh)	3.1
Day consumed(kWh)	8.1
Load day consumed(kWh)	0
Grid current(V)	227.3
Grid side load voltage(V)	227.3
Inverter current(A)	1.2
Grid voltage(A)	1.1
Grid side load current(A)	0
Load voltage(V)	228.8

Figure4-8 Inverter information

Grid information

In the running information item, you can view grid voltage, grid current, grid-tied power, etc. as shown in Figure4-9.



The screenshot shows a mobile application interface titled 'Inverter Information'. Under the 'Running Information' section, there is a list of 15 parameters and their corresponding values:

Load voltage(V)	228.8
Load current(A)	0.9
Grid-tied apparent power(VA)	229
Grid-tied active power(W)	229
Grid-tied reactive power(Var)	12
Grid side load apparent power(W)	0
Grid side load active power(Var)	0
Grid side load reactive power(VA)	0
Load voltage sample adjustment value(VA)	29
Load reactive power(W)	-26
Load apparent power(Var)	-14
PF	0.99
Grid frequency(Hz)	49.9
Output frequency(Hz)	49.9
Voltage DC component(mV)	-27.3
Current DC component(mA)	-1.3

Figure4-9 Grid information

- Query software version

In the running information item, you can query the currently running software version in "Control software 1 version" and "Control software 2 version" of "Device information".



Figure4-10 Device information

- Query/Select standard type

In the "Basic parameter setting" item of "Control" page, in the "Standard type" query or select national standard, such as Austrilia Region A, B, C, Newzealand.



Figure4-11 Basic parameter setting

- Fixed power factor mode and reactive power mode setting.

In the "Reactive power mode" of "Basic parameter setting" item, if it is set to "Scheduling by SI", reactive power mode is enabled, and if it is set to "Scheduling by PF", fixed power factor mode is enabled.



Figure4-12 Reactive power mode

- Set Generation/Export limit control – Hard limit control.

In the "Other setting" item, you can enable Generation/Export limit control– Hard limit control.

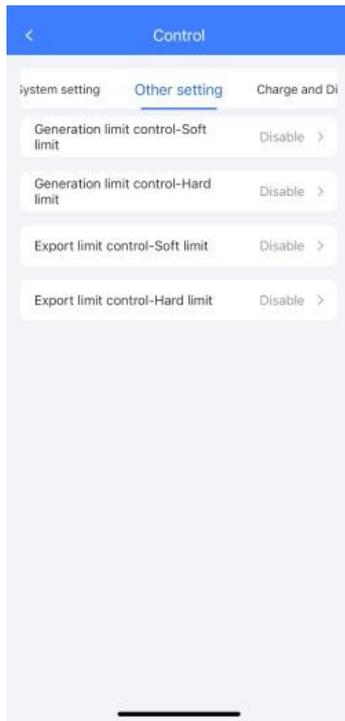


Figure4-13 Hard limit control

- Set "Volt-watt response mode".

In the "Grid related setting" item, select "Linear" in "P-V mode" to enable Volt-watt response mode, Volt-watt response mode is for charging of multiple mode inverter with energy storage.

- Set " Volt-var response mode".

In the "Grid related setting" item, select "Enable" in "Q-V mode" to enable "Volt-var response mode".

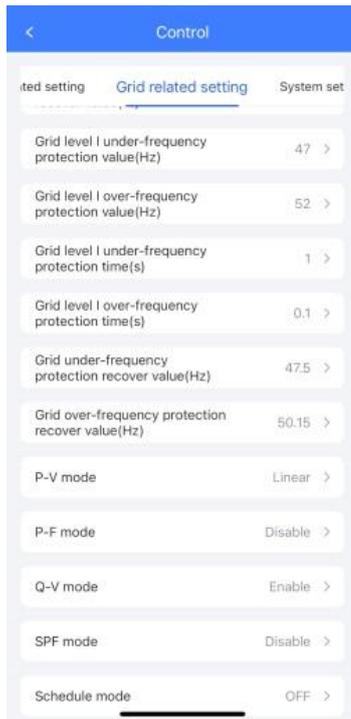


Figure4-14 P-V mode

- Password authentication required for setting changes.

Password authentication is required when modifying parameters, the password is login password.



Figure4-15 Password authentication

4.2.2 Status Information

In the "Status information" item, you can view battery information and device information, as shown in Figure4-16.



Figure4-16 Status information

4.3 Control Interface

Click the "Control" button in the inverter information interface to enter the control interface, as shown in Figure4-17.



Figure4-17 Inverter information

The control interface contains basic parameter setting, system setting, battery setting, grid setting, charge & discharge setting, etc.

4.3.1 Basic Parameter Setting

Basic parameter setting contains ON/OFF setting, mode setting and BMS communication setting.



Figure4-18 Basic parameter setting

Mode can be set to: time of use mode, backup mode, self consumption mode, energy scheduling mode and external control mode.

Time of use mode

- Step 1 Choose "Disable" in "External control mode".
- Step 2 Choose "Time of use" in "Work mode".
- Step 3 Set the corresponding time period.

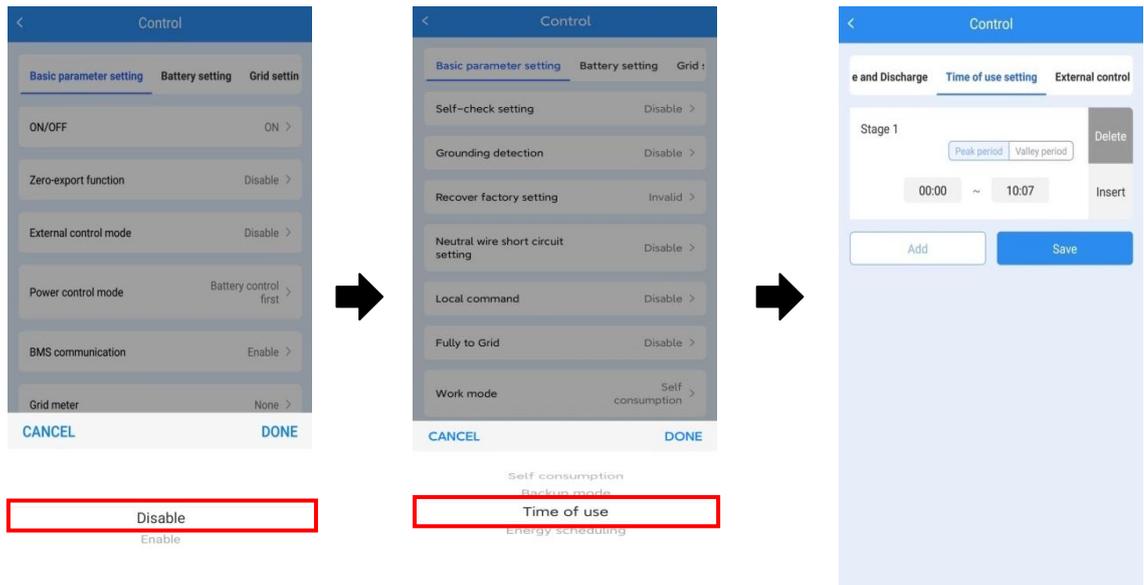


Figure4-19 Time of use mode

----End

Backup mode

Step 1 Choose "Disable" in "External control mode".

Step 2 Choose "Backup mode" in "Work mode".

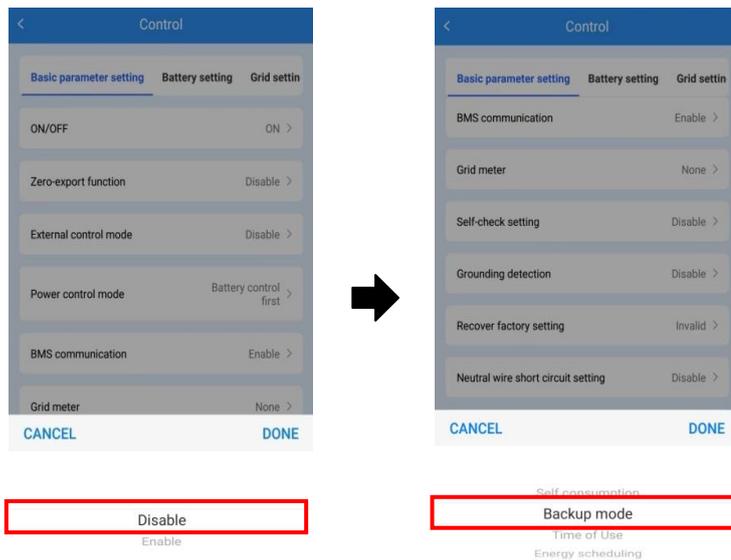


Figure4-20 Backup mode

Self consumption mode

Step 1 Choose "Disable" in "External control mode".

Step 2 Choose "Self consumption" in "Work mode".

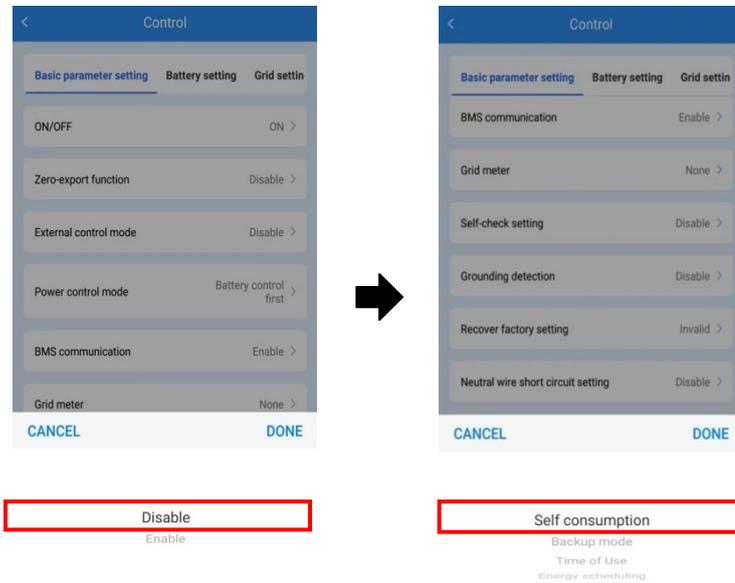


Figure4-21 Self consumption mode

Energy scheduling mode

Step 1 Choose "Disable" in "External control mode".

Step 2 Choose "Energy scheduling" in "Work mode".

Step 3 Set the corresponding time period.

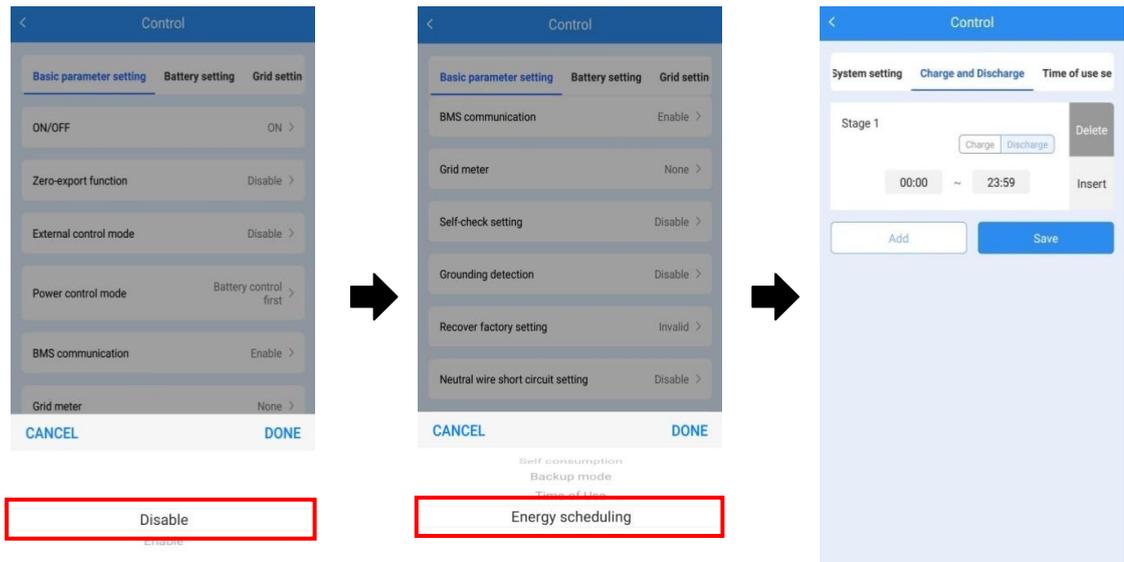


Figure4-22 Energy scheduling mode

----End

External control mode

- Step 1 Choose "Enable" in "External control mode".
- Step 2 Choose "Battery control first" or "Grid control first".
- Step 3 Set the corresponding time period.

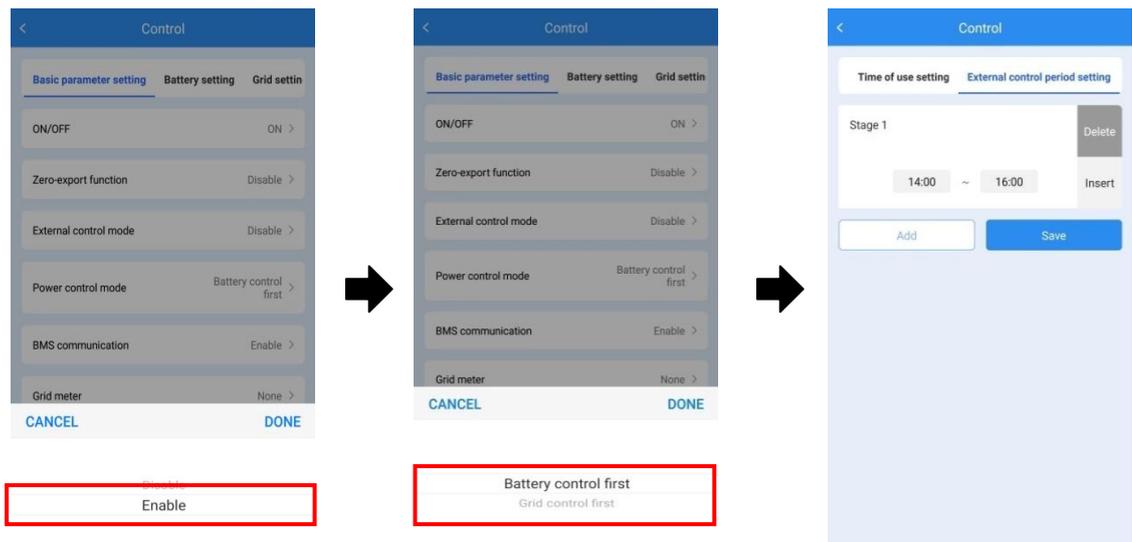


Figure4-23 External control mode

----End

Battery Backup Power Setting

In grid-tied mode, the setting can prevent inverter from releasing the backup power of battery pack. Once the SOC value of battery reaches the set value, the load is powered only by PV side or grid.

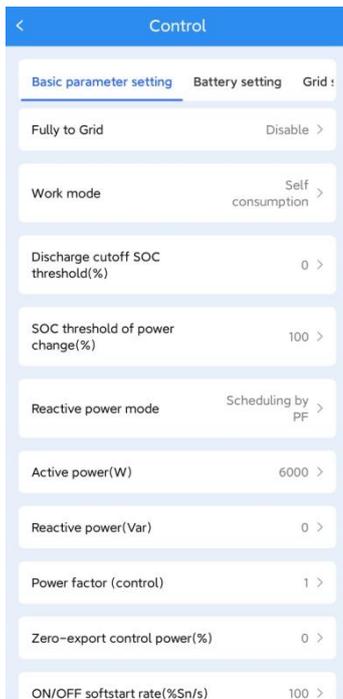


Figure4-24 Battery backup power setting

4.3.2 System Setting

In the system setting item, you can set system time.

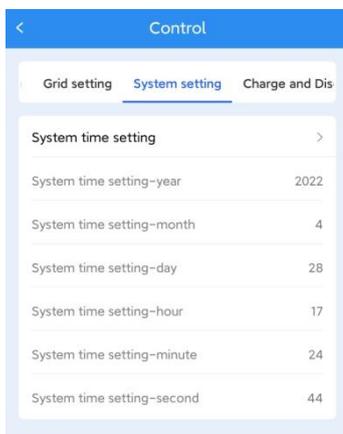


Figure4-25 System setting

4.3.3 Battery Setting

In the battery setting item, you can set battery charge and discharge power.

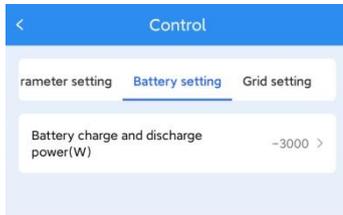


Figure4-26 Battery setting

4.3.4 Grid Setting

In the grid setting item, you can set grid mode including P-V mode, Q-V mode, SPF mode and schedule mode. As shown in Figure4-27.



Figure4-27 Grid setting

5 Startup and Shutdown

This chapter introduces how to start and shut down the device.

5.1 Startup

Step 1 Turn on the external load switch.

Step 2 Turn on external grid switch.



After closing the grid switch, iStoragE3 series energy storage system will be started automatically.

Step 3 Turn on the DC switch on the inverter and external PV switch.

----End



NOTE

For the first installation, the battery needs to be fully charged and then discharged to 60% SOC once at least.

5.2 CEI Self-Check

 **NOTE**

iStoragE3 has the CEI self-check function, which is required only in Italy. Other countries do not need to operate.

Self-check function can only be operated in the local APP mode. The specific operation steps are as follows.

Step 1 Open the APP, if it shows the login interface, please exit and perform as below.

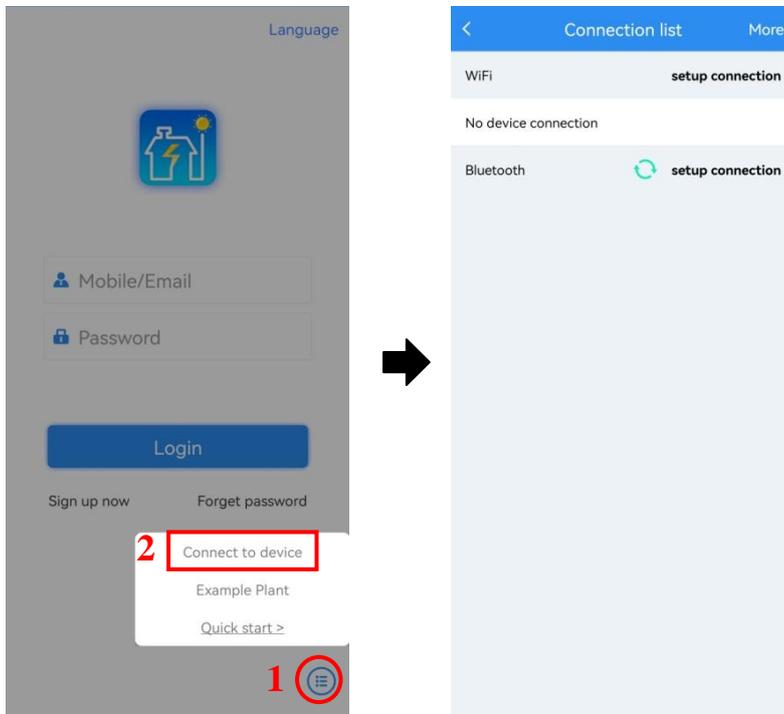


Figure5-1 Connect to device

Step 2 The mobile phone needs to be connected to the WIFI of the device (the picture below are example, the WIFI password is 12345678), refresh and then it will show the device.

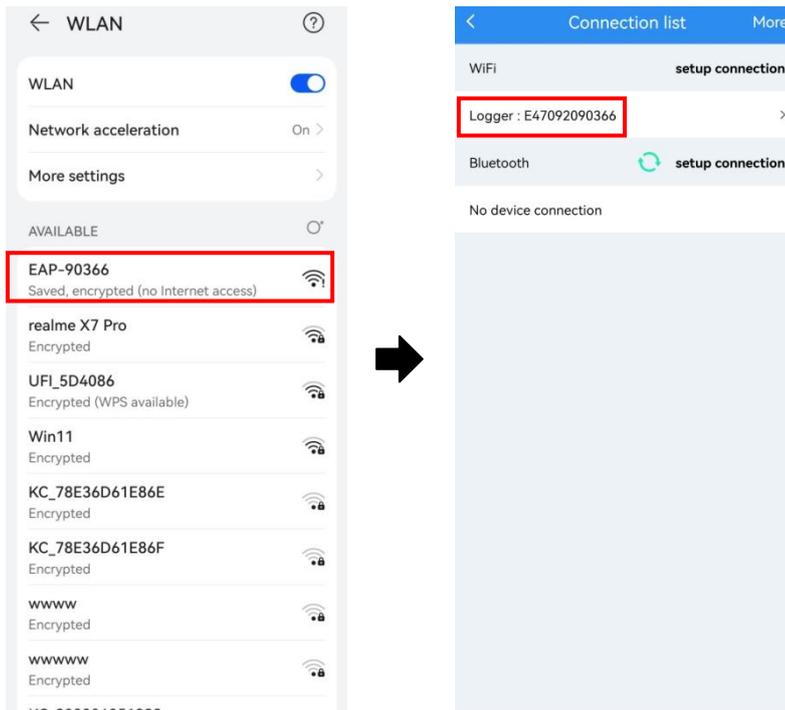


Figure5-2 Connect to WLAN

Step 3 Click "View device" in the logger interface, and then click "Customer".

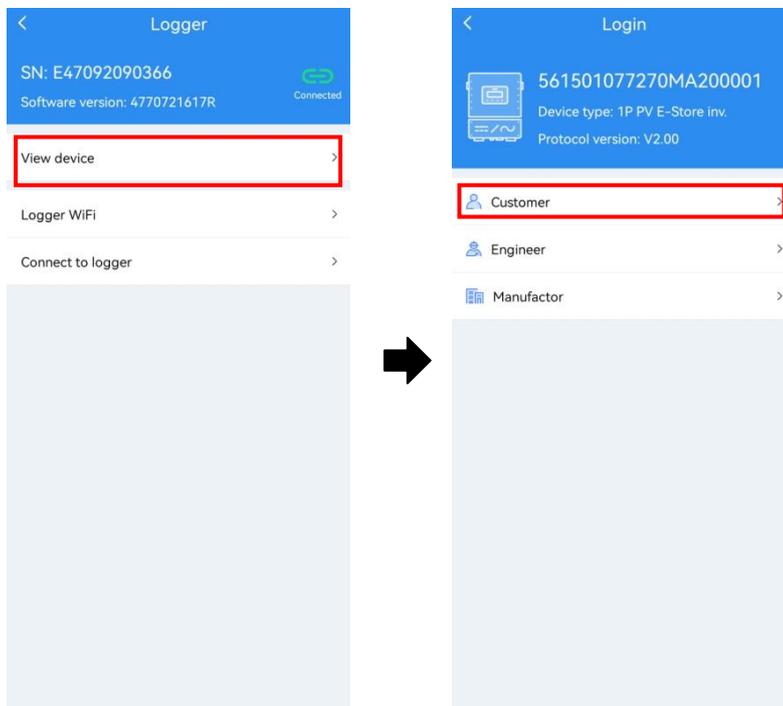


Figure5-3 Enter the customer interface

Step 4 Click "Start" in the monitor interface and click "Done" in the popup. Then the device starts self check.

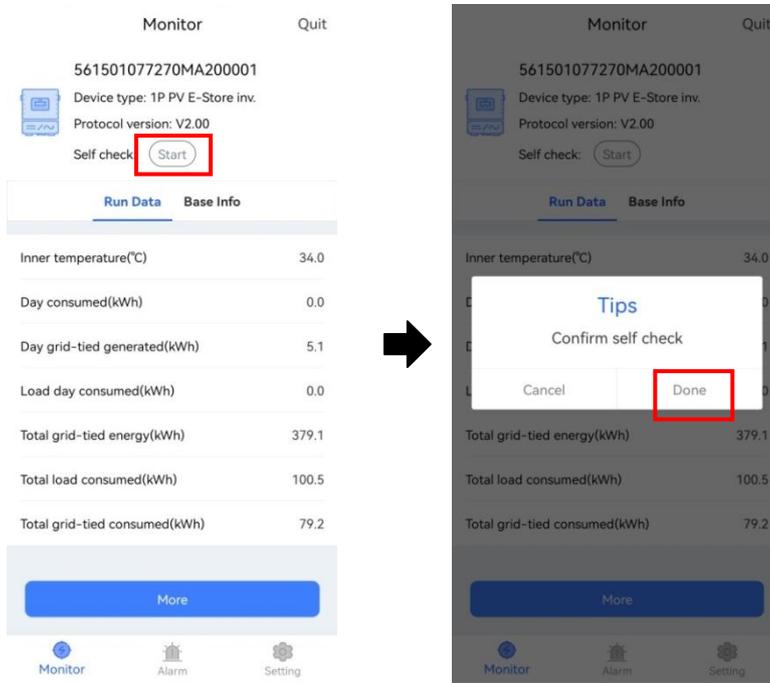


Figure5-4 Start the self check function

Step 5 Click "More" in the "Monitor" interface to view the self check info.

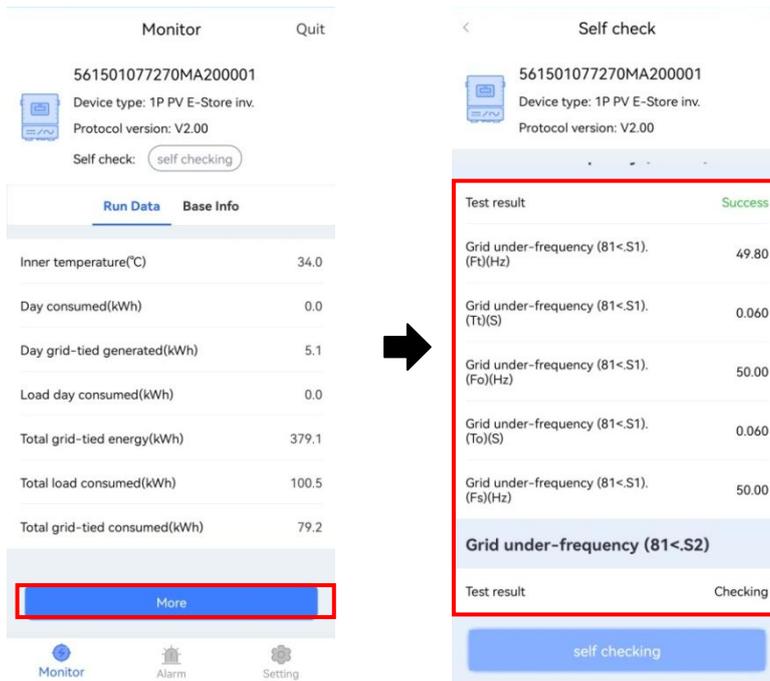


Figure5-5 View test results

----End

5.3 Shutdown

Step 1 Powering off the inverter on the APP.

Step 2 Switch off the external PV switch and grid switch, and wait for the inverter indicator light off.

Step 3 If iStoragE3 needs to power outage for long time, long press the POWER button of battery packs until the battery indicator light off.

----End

6 Maintenance and Troubleshooting

This chapter mainly introduces the maintenance and troubleshooting for device.

6.1 Maintenance

The iStoragE3 series energy storage system needn't to be maintained regularly, but the sundries or dust may influence the heat dissipation performance, so, use soft brush to clean the inverter. If the LED indicator is too dirty to view, use a wet cloth to clean them.



During running, do not touch the inverter. The temperature of some parts on the inverter is too high, and may cause scald injury. After shut down the inverter and wait until it cooling down, then do the maintenance and clean.



Do not clean the inverter with any solvent, abrasive material or corrosive material.

Normally, the inverter and battery pack need no maintenance or calibration. However, in order to maintain the accuracy of the SOC, it is recommended to perform a full charge calibration for SOC (charge the battery until the charging power is 0) on the battery at regular intervals (such as two weeks).

Disconnect the inverter and battery pack from all power sources before cleaning. Clean the cover and display with a soft cloth.

To ensure that the inverter and battery pack can operate properly in the long term, we suggest to perform routine maintenance on it as described in this chapter.

Table6-1 Maintenance checklist

Check Item	Acceptance Criteria	Maintenance Interval
Product cleanliness	The heat sink of the inverter are free from obstacles or dust.	Semiannually or once per year
Product visible damage	The inverter and battery pack are not damaged or deformed.	Semiannually
Product running status	<ol style="list-style-type: none"> 1. The inverter and battery pack operate with no abnormal sound. 2. All parameters of the inverter and battery pack are correctly set. Perform this check when the inverter and battery pack is running. 	Semiannually
Electrical connection	<ol style="list-style-type: none"> 1. Cables are securely connected. 2. Cables are intact and in particular, the cable jackets touching the metallic surface are not scratched. 3. Unused PV input terminals, unused communication ports of the inverter, power and COM terminals of the battery pack are locked by watertight caps if the product is mounted outdoor. 	The first maintenance is needed 6 months after the initial commissioning. And then make it semiannually or once per year.

6.2 Troubleshooting

iStoragE3 is designed on the basis of the grid-tied operation standards and meets the requirements of safety and EMC. Before provided to client, iStoragE3 has been experienced for several rigorous tests to ensure reliable and optimizing operation.

If some faults occur, the indicators will show fault. Under the circumstances, iStoragE3 may stop power generation. The troubleshooting is as shown in Table6-2, Table6-3.

Table6-2 Inverter troubleshooting

Check item	Fault description	Solution
Grid over-voltage	Grid voltage exceeds the allowable range.	<ol style="list-style-type: none"> 1. Check whether the grid is normal. 2. Check whether the wiring of grid is normal. 3. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Grid under-voltage	Grid voltage exceeds the allowable range.	<ol style="list-style-type: none"> 1. Check whether the grid is normal. 2. Check whether the wiring of grid is normal. 3. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Grid over-frequency	Grid frequency exceeds the allowable range.	<ol style="list-style-type: none"> 1. Check whether the grid is normal. 2. Check whether the wiring of grid is normal. 3. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Grid under-frequency	Grid frequency exceeds the allowable range.	<ol style="list-style-type: none"> 1. Check whether the grid is normal. 2. Check whether the wiring of grid is normal. 3. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Sync phase abnormal	Phase lock abnormal	<ol style="list-style-type: none"> 1. Check whether the grid is normal. 2. Check whether the wiring of grid is normal. 3. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Short-circuit protection	When off-grid, the output side is short-circuited	<ol style="list-style-type: none"> 1. Measure the output side impedance by multimeter. If the impedance is small, please check whether the wiring of grid is right. 2. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Overload protection	Load is too heavy.	<ol style="list-style-type: none"> 1. Check whether the load exceeds the rated power. 2. Restart the inverter to see if the fault still

Check item	Fault description	Solution
		exists. If it still exists, contact service.
Inverter over-current	The current of inverter software exceeds the allowable value	<ol style="list-style-type: none"> 1. Check whether the off-grid output is overload, short circuited or has impact load. 2. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Inverter voltage abnormal	Output voltage abnormal	Check whether voltage and load of grid is abnormal.
Inverter voltage DC component abnormal	When off-grid, voltage DC component abnormal.	Restart the inverter to see if the fault still exists. If it still exists, contact service.
Inverter current DC component abnormal	When grid-tied, current DC component abnormal.	Restart the inverter to see if the fault still exists. If it still exists, contact service.
Overload alarm	The load is too large.	<ol style="list-style-type: none"> 1. Check whether the load exceeds the rated power. 2. Restart the inverter to see if the fault still exists. If it still exists, contact service.
Bus over-voltage	Bus voltage is too high.	<ol style="list-style-type: none"> 1. Check whether the input voltage of PV1, PV2, PV3 exceed 930V. 2. If the item 1 is OK, restart the inverter to see if the fault still exists. If it still exists, contact service.
Insulation impedance abnormal	The impedance on DC side to ground is too low.	<ol style="list-style-type: none"> 1. If the fault occurs when power on in the morning, it may be caused by wet weather. 2. Use a multimeter to measure the impedance of the ground to the housing. If the impedance is not close to 0, it is connection problem between the ground wire and the housing. 3. Measure the impedance of ground to PV1+/PV2+/ PV3+/PV- by multimeter. If the impedance is less than 36kΩ, check whether the

Check item	Fault description	Solution
		<p>connection of each port is correct.</p> <p>4. Confirm to install the device according to the user manual.</p> <p>5. Restart the inverter to see if the fault still exists. If it still exists, contact customer service.</p>
Residual current abnormal	Residual current exceeds allowable range.	<p>Restart the inverter to see if the fault still exists. If it still exists, contact customer service.</p>
Inner over-temperature	Ambient temperature is too high.	<p>1. Try to lower the ambient temperature.</p> <p>2. Make sure that the inverter is installed according to the user manual and there is no block around the inverter.</p> <p>3. After the inverter is powered off and waiting for 30 minutes, then restart it. If the fault still exists, contact service.</p>
Inverter IGBT over-temperature	The temperature of heat sink on the inverter is too high	<p>1. Try to lower the ambient temperature.</p> <p>2. Make sure that the inverter is installed according to the user manual and there is no block around the inverter.</p> <p>3. After the inverter is powered off and waiting for 30 minutes, then restart it. If the fault still exists, contact service.</p>
PV IGBT over-temperature	The temperature of PV side is too high	<p>1. Try to lower the ambient temperature.</p> <p>2. Make sure that the inverter is installed according to the user manual and there is no block around the inverter.</p> <p>3. After the inverter is powered off and waiting for 30 minutes, then restart it. If the fault still exists, contact service.</p>
Heat sink over-temperature	Temperature is too high and reaches the	<p>1. Check whether the environment temperature is too high, try to lower the ambient temperature.</p>

Check item	Fault description	Solution
alarm	rated drop point.	<p>2. Make sure that the inverter is installed according to the manual and there is no block around the inverter.</p> <p>3. After the inverter is powered off and waiting for 30 minutes, then restart it. If the fault still exists, contact service.</p>
Fan abnormal	Fan abnormal	<p>1. Check whether the fan is blocked.</p> <p>2. Restart the inverter to see if the fault still exists. If it still exists, contact customer service.</p>
RSD abnormal	RSD abnormal	<p>1. Confirm whether the RSD button is pressed.</p> <p>2. Restart the inverter to see if the fault still exists. If it still exists, contact customer service.</p>
Remote communication abnormal	Cannot communicate with upper computer.	<p>1. Confirm whether the baud rate and address is correct.</p> <p>2. Confirm if the wire from the device to PC is normal.</p>
Inner abnormal	The inner of the inverter is abnormal	<p>1. Confirm whether the inner of the inverter is abnormal on the basic of the related fault info.</p> <p>2. Restart the inverter to see if the fault still exists. If it still exists, contact customer service.</p>
Battery pack n communication abnormal (CAN)	The CAN communication with battery pack n is abnormal	Check whether the communication wire between inverter and battery pack n is loose or dropped out.
Battery pack n communication abnormal (RS485)	The RS485 communication with battery pack n is abnormal	Check whether the communication wire between inverter and battery pack n is loose or dropped out.
HMI communication abnormal (CAN)	Inner CAN communication is	Restart the inverter to see if the fault still exists. If it still exists, contact customer service.

Check item	Fault description	Solution
	abnormal	
HMI communication abnormal (RS485)	Inner RS485 communication is abnormal	Restart the inverter to see if the fault still exists. If it still exists, contact customer service.
Battery pack n inner communication abnormal (CAN)	The CAN communication with battery pack n is abnormal	Check whether the communication wire between inverter and battery pack n is loose or dropped out.
PVn polarity reverse connected	The positive and negative of PVn input is reversed.	Check whether the wiring of PVn is reversed.
PVn over-voltage	The voltage of PVn exceeds the allowable value.	Check the voltage of PVn, if the voltage exceeds 1030V d.c., please decrease the PV string quantity.
PVn over-current	The current of PVn exceeds the allowable value.	1. Try to lower PV power. 2. Restart the inverter to see if the fault still exists. If it still exists, contact customer service.
PVn arc abnormal	The arc of PVn abnormal.	Restart the inverter to see if the fault still exists. If it still exists, contact customer service.

Table6-3 Battery error description

Check item	Fault description	Solution
Battery over-voltage	Battery over-voltage	1. Battery discharge. 2. Check the error, if the problem is not be solved yet, please call the service center.
Cell over-voltage	Cell battery over-voltage	1. Battery discharge. 2. Check the error, if the problem is not be solved yet, please call the service center.

Check item	Fault description	Solution
Battery under-voltage	Battery under-voltage	<ol style="list-style-type: none"> 1. Charging the battery. 2. Check the error, if the problem is not be solved yet, please call the service center.
Cell under-voltage	Cell under-voltage	<ol style="list-style-type: none"> 1. Charging the battery. 2. Check the error, if the problem is not be solved yet, please call the service center.
Battery disconnected	Battery disconnected	<ol style="list-style-type: none"> 1. Check battery wiring. 2. Check the error, if the problem is not be solved yet, please call the service center.
Cell temperature difference is too large	Cell battery temperature difference is too large	Wait for 30 minutes after power off. If the problem is not resolved, call for service.
Cell voltage difference is too large	Cell battery voltage difference is too large	Call for service immediately.
Cell charge over-temperature	Cell battery charge temperature is too high	<ol style="list-style-type: none"> 1. Confirm if the ambient temperature is too high, try to lower ambient temperature. 2. Wait for 30 minutes after power off. If the problem is not resolved, call for service.
Cell charge under-temperature	Cell Battery charge temperature is too low	<ol style="list-style-type: none"> 1. Confirm if ambient temperature is too low, try to increase ambient temperature. 2. Wait for 30 minutes after power off. If the problem is not resolved, call for service.
Cell discharge over-temperature	Cell battery discharge temperature is too high	<ol style="list-style-type: none"> 1. Confirm if ambient temperature is too high, try to reduce ambient temperature. 2. Wait for 30 minutes after power off. If the problem is not resolved, call for service.

Check item	Fault description	Solution
Cell discharge under-temperature	Cell battery discharge temperature is too low	<ol style="list-style-type: none"> 1. Confirm if ambient temperature is too low, try to increase ambient temperature. 2. Wait for 30 minutes after power off. If the problem is not resolved, call for service.
Battery temperature rise rate alarm	Battery temperature rises too fast	<ol style="list-style-type: none"> 1. Confirm if ambient temperature is too high, try to reduce ambient temperature. 2. Confirm if there are obstructions around battery. 3. Wait for 30 minutes after power off. If the problem is not resolved, call for service.
SOC is too low	SOC is too low	Charging the battery.
SOH is too low	SOH is too low	Charging the battery.
Intermediate bus over-voltage	Intermediate bus over-voltage	Please call for service.
Intermediate bus under-voltage	Intermediate bus under-voltage	<ol style="list-style-type: none"> 1. Check battery wiring. 2. Charging the battery. 3. Check the error, if the problem is not be solved yet, please call the service center.
Output over-voltage	Output over-voltage	<ol style="list-style-type: none"> 1. Check if the PV component input voltage of inverter is too high; 2. Check if the problem is solved after power off; 3. Check the error after restart the inverter, if the problem is not be solved yet, please call the service center.
Battery over-current	Battery over-current	<ol style="list-style-type: none"> 1. Check if battery voltage is normal; 2. Disconnect battery output load, check if the problem is be solved; 3. Check the error after restart the inverter, if the

Check item	Fault description	Solution
		problem is not be solved yet, please call the service center.
Output over-current	Output over-current	<ol style="list-style-type: none"> 1. Wait for a while, check if the fault is recovery. 2. Check the fault, if the problem is not be solved yet, please call for service.
Battery sampling difference	Battery sampling difference	<ol style="list-style-type: none"> 1. Wait for a while, check if the fault is recovery. 2. Check the fault, if the problem is not be solved yet, please call for service.
Battery insulation impedance alarm	Battery insulation impedance alarm	<ol style="list-style-type: none"> 1. If fault occurs when device power on in the morning, it may be caused by the wet weather. 2. Test impedance of ground to device by multimeter, if the impedance is not close to 0, there is a problem with the device wiring and ground wiring. 3. Test impedance of ground to BAT+/BAT- by multimeter. If the impedance is less than insulation impedance protection value, check if each port wiring is correct. 4. Install the device according to manual. 5. Check the fault, if the problem is not resolved, call for service.
Battery insulation impedance protection	Battery insulation impedance protection	<ol style="list-style-type: none"> 1. If fault occurs when device power on in the morning, it may be caused by the wet weather. 2. Test impedance of ground to device by multimeter, if the impedance is not close to 0, there is a problem with the device wiring and ground wiring. 3. Test impedance of ground to BAT+/BAT- by multimeter, if the impedance is less than insulation impedance protection value, check if each port wiring is correct.

Check item	Fault description	Solution
		<ol style="list-style-type: none"> 4. Install the device according to manual. 5. Check the fault after restart battery, if the problem is not resolved, call for service.
EPO	Emergency power off	<ol style="list-style-type: none"> 1. Confirm EPO button status. 2. Restart battery, if the problem is not resolved, call for service.
Fan alarm	Fan abnormal	<ol style="list-style-type: none"> 1. Check if the fan is blocked. 2. Check the fault, if the problem is not resolved, call for service.
Transformer temperature abnormal	Transformer temperature is too high	Wait for 30 minutes after power off. If the problem is not resolved, call for service.
Output over-load	Output over-load	<ol style="list-style-type: none"> 1. Check for overload. 2. Check the fault, if the problem is not resolved, call for service.
Heat sink over-temperature	Heat sink over-temperature, reach the derating point	<ol style="list-style-type: none"> 1. Check the temperature, if the temperature is too high, try to reduce the ambient temperature. 2. Make sure to install the device according to manual and there are no obstructions around device. 3. Wait for 30minutes after the system power off, restart the device, if the problem is not resolved, call for service.
Ambient over-temperature	Ambient over-temperature, reach the derating point	<ol style="list-style-type: none"> 1. Check the temperature, if the temperature is too high, try to reduce the ambient temperature. 2. Make sure to install the device according to manual and there are no obstructions around device. 3. Wait for 30minutes after the system power off, restart the device, if the problem is not resolved, call for service.

Check item	Fault description	Solution
Internal abnormal	Host internal abnormal	<ol style="list-style-type: none"> 1. Check if the inner battery module is abnormal according to related information. 2. Restart the inverter, if the problem is not resolved, call for service, please call for service.
Monitor CAN communication fault	Monitor CAN communication fault	<ol style="list-style-type: none"> 1. Check if the wiring is correct. 2. If the problem is not resolved, call for service.
Monitor 485 communication fault	Monitor 485 communication fault	<ol style="list-style-type: none"> 1. Check if the wiring is correct. 2. If the problem is not resolved, call for service.
Address conflict	Device address repeat	<ol style="list-style-type: none"> 1. Check if the address is repeated. 2. Set the address according to S/N. 3. If the problem is not resolved, call for service.


CAUTION

If the inverter has any alarm information mentioned in Table6-2. Please shut down the inverter (refer to 5. 2 Shutdown), 5 minutes later, restart the inverter (refer to 5. 1 Startup). If the alarm status is not removed, please contact our local dealer or service centre. Before contacting us, please prepare the following information.

1. Inverter S/N.
2. Distributor/ dealer of the inverter (if has).
3. The date of grid-tied power generation.
4. Problem description.
5. Your detail contact information.

7 Package, Transportation and Storage

This chapter introduces the package, transportation and storage of device.

7.1 Package

The device is packaged by carton. When packaging, pay attention to the placing direction requirements. On the side of the carton, there has warning icons, including keep dry, handle with care, up, stacking layer limit, etc. On the other side of the carton, it prints the device model, etc. On the front side of the carton, there is the logo of Kehua company and device name.

7.2 Transportation

During transporting, pay attention to the warnings on the carton. DO NOT make the device impact severely. To avoid damaging the device, place the device strictly according to the placement direction. DO NOT carry the device with the objects that is inflammable, explosive, or corrosive. DO NOT put the device in the open-air while midway transshipment. Leaching or mechanical damage by rain, snow or liquid objects is prohibited.

7.3 Storage

During storage, place the device strictly according to the direction that showed on the carton. Keep at least 20cm from the bottom of the carton to floor and keep at least 50cm from the carton to wall, heat source, cold source, windows or air inlet. The poisonous gas, inflammable or explosive or corrosive chemical objects are prohibited. Besides, strong mechanical shaking, impact or strong magnetic field is also prohibited. The storage temperature of inverter is -40°C - 70°C .

During battery storage, please follow the four points below:

1. Wrap the positive and negative connector with insulating material to ensure that no metal parts are exposed to outside to avoid short circuit.

2. Battery storage temperature requirement: short-term (with one month) storage in a clean and ventilated room at $-20^{\circ}\text{C}\sim 45^{\circ}\text{C}$, long-term (within one year) in a clean and ventilated room at $0^{\circ}\text{C}\sim 35^{\circ}\text{C}$ and the relative humidity of environment is $55\pm 20\%$.
3. During battery storage, (SOC capacity state) should be kept above 30%. In order to prevent over discharge during long-term storage (more than three months), it should be charged regularly to ensure SOC is 30%~50%. It is recommended that the storage time after receiving the goods should not exceed half a year.
4. A battery that has been shelved for a long time needs to be charged and discharged regularly, It is recommended to perform a standard charge and discharge cycle every 3 months in the initial stage. After storing or transporting the device beyond the work temperature, keep the device aside and make its temperature return to normal range for more than 4h before installation.

A Technical Specifications

A.1 Inverter

Item \ Model	iStoragE3 5K	iStoragE3 6K	iStoragE3 8K	iStoragE3 10K	iStoragE3 12K
PV input					
Max. input power (W)	9000	9000	18000	18000	18000
Max. input voltage (V d.c.)	1000				
MPPT voltage range (V d.c.)	150~900				
Max. PV input current (A d.c.)	16/16		27/16		
MPPT voltage range with full-load (V d.c.)	450~750				
Startup voltage (V d.c.)	180				
MPPT number	2				
Per MPPT string number	1/1		2/1		
Max. PV short-circuit current (A d.c.)	20/20		34/20		
Grid input					
Rated input power (VA)	10000	12000	16000	18000	18000
Max. apparent power (VA)	10000	12000	16000	18000	18000
Rated voltage (V a.c.)	380/400, 3W+N+PE				
Rated input current (A a.c.)	15.2	18.3	24.3	26	26

Item	Model	iStoragE3	iStoragE3	iStoragE3	iStoragE3	iStoragE3
		5K	6K	8K	10K	12K
Max. continuous input current (A a.c.)		15.2	18.3	24.3	26	26
Rated grid frequency (Hz)		50/60				
Grid output						
Rated output power (VA)		5K	6K	8K	10K	12K
Max. apparent power (VA)		5.5K	6.6K	8.8K	11K	12K
Rated grid voltage (V a.c.)		380/400, 3W+N+PE				
Grid voltage range (V a.c.)		323~418/340~440				
Grid type		Three phase				
Rated output current (A a.c.)		7.2	8.7	11.6	14.5	17.4
Max. continuous output current (A a.c.)		7.9	9.6	12.8	16	17.4
Max. output over current protection (A a.c.)		42				
Max. output fault current (A a.c.)		42				
Rated grid frequency (Hz)		50/60				
Grid frequency range (Hz)		45~55/55~65				
Power factor (rated power)		>0.99				
Power factor range		0.8 ahead~0.8 lag (0.8* rated power)				
THDi		<3% (rated power) <5% (load is 50%, rated power)				
Backup output						
Rated output power (VA)		5K	6K	8K	10K	12K

Item	Model	iStorageE3	iStorageE3	iStorageE3	iStorageE3	iStorageE3
		5K	6K	8K	10K	12K
Max. apparent power (VA)		10K	12K	16K	18K	18K
Rated voltage (V a.c.)	380/400, 3W+N+PE					
Rated output current (A a.c.)		7.2	8.7	11.6	14.5	17.4
Max. continuous output current (A a.c.)		7.9	9.6	12.7	15.9	17.4
Max. output over current protection (A a.c.)	42					
Protection & Safety						
DC reverse connection protection	Yes					
Anti-island	Yes					
Zero-export	Yes					
AC short-circuit protection	Yes					
Leakage current protection (RCD)	Yes					
DC switch	Optional					
PV fault detect	Yes					
Input DC impedance monitor	Yes					
Surge protection	TYPE II					
Basic parameter						
Size (W×H×D) (mm)	800×400×200					
Weight (kg)	27					
Installation	Wall-mounting					
Insulation	No transformer					

Item	Model	iStoragE3	iStoragE3	iStoragE3	iStoragE3	iStoragE3
		5K	6K	8K	10K	12K
Ingress protection	IP65					
Self consumption at night	<10W					
Operating temperature range (°C)	-20~50 (Auto derating above 35 °C)					
Relative humidity	0~100%					
Cooling	Natural					
Operating altitude (m)	2000 (>2000m derating)					
Noise (typical) (db (A))	<35@ 1m					
Display	LED+APP					
Communication	RS485 /WIFI/ 4G/ Sunspec /RSD /DRM (Australia)					
AC terminal	OT: Grid (max.10mm ⌀) Backup (max.6mm ⌀)					
PV DC terminal	MC4 (max.6 mm ⌀)					
BAT terminal	MC4 (max.10 mm ⌀)					

- Specifications are subject to change without prior notice.
- The external communication circuit of rechargeable Lithium-ion battery pack need to be considered reinforced insulation with power circuit, the reinforced insulation of clearance and creepage should be considered with system voltage and impulse in the system.

A.2 Battery Pack

Item	Model
BAT input	
Rated DC Power (VA)	4000
Max. input voltage (V d.c.)	1000
Input voltage range (V d.c.)	650~900

Item \ Model	iStoragEB5-S2
Voltage range with full load (V d.c.)	650-800
Max. charge current (A d.c.)	6.15
Max. discharge current (A d.c.)	6.15/7.38 (10s)
BAT pack capacity(kWh)	5~40
Basic parameter	
Size (W×H×D) (mm)	800*380*200
Weight (kg)	55kg
Installation	Wall-mounting
Ingress protection	IP65
Operating temperature range (°C)	-20~50 (If the temperature higher than 45°C or lower than -20°C, the inverter needs to decrease rated power to use.)
Relative humidity	0~100%
Cooling	Natural
Operating altitude (m)	2000 (>2000m derating)
Noise emission (typical)	<25db(A)@1m
Display	LED
Communication	RS485, CAN
BAT terminal	MC4 (max.10mm \varnothing)

- Specifications are subject to change without prior notice.

B Acronyms and Abbreviations

A

AC Alternating Current

AWG American Wire Gauge

C

CE Conformance Européenne

D

DC Direct Current

I

IEC International Electrotechnical Commission

L

LED Light-emitting Diode

M

MPPT Maximum Power Point Tracking

P**PE** Protective Earthing**PV** Photovoltaic**R****RS485** Recommend Standard485**T****THDi** Total Distortion of the input current waveform



XIAMEN KEHUA DIGITAL ENERGY TECH CO., LTD.

ADD: Room 208-38, Hengye Building, No. 100 Xiangxing Road, Torch
High-tech Zone (Xiang'an) Industrial Zone, Xiamen, China (361000)
TEL: 0592-5160516 (8 lines)
FAX: 0592-5162166
[Http://www.kehua.com](http://www.kehua.com)



Technical Support

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