



All-in-one integrated residential energy storage system

Products user manual

Product Model: ESS-SAH5B10

Product Name: All-in-one integrated residential energy storage system



Preamble

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Colophon

The latest version in the change history contains all updates made in previous issues.

V1.0 2023-01-11 First issue.

V2.0 2023-02-15 Add functionality and usage of smart meters .
Grounding mounting position adjustment.

V3.0 2023-04-25 Upgrade the inverter, and adjust the accessories package, internal structure, UI display interface, operation logic, product specification, product installation method, smart meter installation.
Add an inverter and inverter signal connection module.

General description

Symbol definition

To ensure personal and property safety/ use of the product for a better practice of users installing the product, this manual clarifies relevant information and uses standard symbols in the industry for emphasis.

The following symbols are used in this product, please read carefully to facilitate better use of this manual.



Danger

Indicates that if not avoided, casualties or serious accidents or injuries will occur. Indicates high risk damage exists.



Caution

Indicates that if not avoided, injury or death will occur or serious accident or injury will occur. Indicates a medium risk level injury exists.



Note

Indicates that if not avoided, minor or moderate injury may result. Indicates that a low-risk injury exists

Abbreviation interpretation

Full text	Abbreviation	Full text	Abbreviation
Flexible printed circuit	FPC	State Of Charge	SOC
Battery management system	BMS	Battery Module	BM
Battery management unit	BMU	Power Conversion System	PCS
Begin of life	BOL	End of life	EOL
Current connection between cells	Bus-bar	Open circuit voltage	OCV
Controller area network	CAN	Switch Gear	S/G

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1. Safety instruction

Danger

- (1) The battery system is a low-voltage system. Installation, use, and operation of the battery system are strictly prohibited under severe weather conditions such as lightning, rain, snow, and strong winds of Force 7 or above.
- (2) Live installation, wiring, maintenance and replacement of parts are prohibited;
Transient contact between a power cable and a conductor may generate electric arcs or sparks, which may cause fire or personal injury.
- (3) Only professional personnel who are familiar with local laws, regulations, and the electrical system, and have professional training and knowledge about this product are allowed to operate the battery system.
- (4) If the electric cabinet or battery case is found with obvious defects, damage, or missing parts, do not use it, and contact professional after-sales personnel.
- (5) Do not remove or modify any part of the battery box or electric cabinet without official authorization of the manufacturer.
- (6) Battery damage may result in electrolyte leakage. If the electrolyte leaks, do not touch the leaked electrolyte or volatile gas.
Take proper precautions and contact the after-sales service center for help immediately.
- (7) Do not place batteries near high temperature, high pressure, or heating devices.
- (8) In case of flood, do not use flooded batteries. Contact your local battery recycler for disposal.
- (9) In case of fire, turn off the power supply of the device as long as it is safe.

Caution

- (1) In case of inhaling the spill, evacuate from the contaminated area and seek immediate medical help.
- (2) In case of eye contact, rinse with water for at least 15 minutes/in case of skin contact, wash contact area thoroughly with soap and water/In case of ingestion, induce vomiting immediately and seek medical attention immediately.
- (3) If replacement or adding of battery needed, please contact the after-sales service center.
Do not remove or install the mobile battery system without authorization.
- (4) Permission from the relevant authorities in your country needed to connect to the grid.
- (5) Do not compile or decompile the device or other derivative work. Do not steal the intellectual property of the device.
- (6) When installing a ground device, connect the cable at first. When removing the device, remove the ground cable at last.
- (7) Do not dispose used batteries as general waste garbage to avoid environmental pollution.
Contact a battery recycling company for disposal. For details, please refer to local laws and regulations.



Note

- (1) Store and transport as required to ensure that the battery system is not damaged during transport and storage.
- (2) Take caution and consideration on the weight when lifting batteries or cabinets.
- (3) Wear gloves when carrying batteries.
- (4) Do not hit, pull, drag, or step on the device, and do not place irrelevant items in any part of the battery module.
- (5) Transportation must be carried out by trained professionals and operation during the process must be documented .
- (6) Ensure that the device is securely placed and not tilted. Tipping the device may cause equipment damage or personal injury.
- (7) Make sure there is a liquid carbon dioxide, Novac1230 or FM-200 fire extinguisher near the device.
- (8) When extinguishing the fire, please use the recommended materials of fire extinguishers,
do not use water or ABC dry powder fire extinguishers; Fire fighters shall wear protective clothing and self-contained breathing apparatus.
- (9) When the ambient temperature exceeds 150°C, the battery may explode.
- (10) When installing and maintaining heavy equipment, use proper tools and take protective measures to avoid scratches on the cabinet.
If the cabinet is scratched, please repair it in time to prevent it from rusting.
- (11) When performing high voltage operations, use special insulated tools.
- (12) The insulation layer may be aged or damaged if cables are used in a high temperature environment.
Keep at least 30mm away from the heating device or heat source area.
- (13) Cables of the same type must be bound together. Cables of different types must be routed at least 30mm apart.
Do not intertwine or cross each other.

2. Product commitment

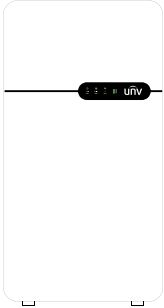



















Our company promises that our products do not have defects caused by improper materials.

3. Packaging, transportation and storage

3.1 Items in pack

The battery system has been rigorously tested and inspected, but may still be damaged during transportation, so please check it carefully.

If any shipping damage or missing is found, report it immediately to the shipper and your local distributor. The battery system packing list is shown in Table 1.

Packing list for the all-in-one machine							Table 1	
 <p>All-in-one X1</p>	 <p>Ground cable X1</p>	 <p>Fixed bracket X2</p>	 <p>Latchkey X1</p>	 <p>Smart meter X1&CT X1</p>	 <p>Meter communication lineX1</p>	 <p>Inverter data moduleX1</p>	 <p>DC connectorX2 pairs</p>	
	 <p>M8 screw X4</p>	 <p>Expansion screw X4 (2spare)</p>	 <p>Spare screw X1</p>	 <p>Spare silicone stoppers X4</p>	 <p>Eye screw X2</p>	 <p>HandleX4</p>		
	 <p>ScrewdriverX1</p>	 <p>2PIN terminal X3</p>	 <p>3PIN terminalX1</p>	 <p>OT terminal X1</p>	 <p>Products user manual X1</p>	 <p>Quick installation manual X1</p>		

3.2 Transportation requirement

- (1) During transportation, place the device in the direction marked on the packing case to avoid damage caused by strong vibration, impact, and heavy weight.
- (2) No loading in open vehicles or cabins during long distance transportation. No mixing with inflammable and explosive materials.
- (3) Handle with care and strictly follow the warning marks on the packing cases in transfer.
- (4) No storing in the open air in transit. Avoid rain, snow or other liquid substances' sprinkling, prolonged sun exposure and mechanical damage in transportation.

3.3 Storage requirement

- (1) The device is packed in a packing case. Place a desiccant in the packing case and seal the packing case.
- (2) If the device is not installed within 3 days after unpacking, it is advised to store the device in the packing box.
- (3) It is recommended to keep the battery power at 25%-60% SOC. A charge and discharge cycle is required every 3 months.
- (4) Storage temperature range: -20°C to 45°C for less than 3 months; Not more than 1 year at 0-35°C.
- (5) Humidity range: 0 to 95% no condensation. Do not install if the battery port is wet and dewy.
- (6) The device must be stored in a cool place, away from direct sunlight and rain, and away from inflammable, explosive, and corrosive materials.

4. Product introduction

This document describes the product introduction, application scenarios, installation, commissioning, maintenance, and technical specifications of the high-voltage energy storage battery system (battery system for short).

4.1 Symbol definition

EU Authorised Representative UNV Technology EUROPE B.V. Room 2945,3rd Floor,Randstad 21-05 G,1314 BD,Almere,Netherlands.



Caution



Caution for electric shock



Caution fire



Surface high temperature



After the power is off, the discharge of components is delayed. Wait for 5 minutes until the device is fully discharged.



Do not place near flammable materials



Do not short-circuit the battery



Do not disconnect or disassemble by non-professionals



Install the product out of reach of children



TUV certification



Recyclable



Please read the instructions carefully before installation and use



LVD/EMC/RE Directive
This product complies with the European Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU and RE Directive 2014/53/EU.



WEEE Directive–2012/19/EU
The product this manual refers to is covered by the Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU and must be disposed of in a responsible manner.



Battery Directive-2013/56/EC
Battery in the product complies with the European Battery Directive 2013/56/EC. For proper recycling, return the battery to your supplier or to a designated collection point.

4.2 icom description

LOAD

Off grid switch

GRID

Grid connection switch

BATT

Battery switch

ON/OFF

Main switch

DEBUG

Debug signal receiving port

BACK-UP

Off-grid port

ON-GRID

On-grid port



Ground port

BATTERY

+

Battery positive

-

Battery negative

PV1

Photovoltaic interface 01

PV2

Photovoltaic interface 02

METER

Smart meter signal receiving port

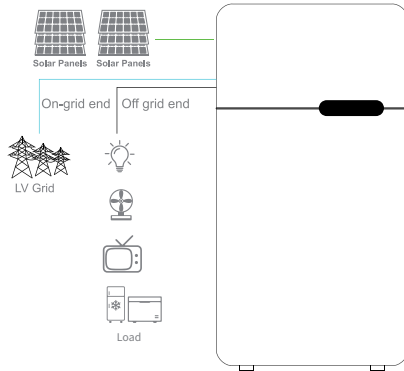
BMS

BMS signal receiving port

CAN/RS485

Standby signal receiving port

4.3 Product Function Introduction



This product is mainly used for home energy storage, together with photovoltaic, load and power grid to form a solar system for energy management.

The energy generated by the photovoltaic system can be used to optimize the electricity consumption structure of the home. The excess energy is used to charge the battery, and the remaining energy is exported to the grid.

When the photovoltaic energy is insufficient to meet the demand for self-use, the battery should be discharged to support the load. If the battery is low, the load will be powered by the grid.

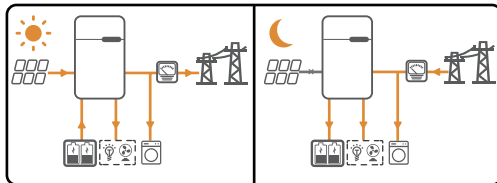
The charge/discharge mode of this product is constant current operation mode (C.C) and constant power mode (C.P).

4.4 Operation mode introduction

Economic mode

- ⚠ Note** (1) Select Economic mode only when it meets the local laws and regulations, e.g., whether the grid is allowed to charge the battery. If not, do not use this mode.
 (2) It is recommended to use economic mode in scenarios when the difference between peak and valley electricity prices is big.

- (1) Day: when the electricity price is in the peak, use the battery to power the load first, and the remaining power can be sold to the grid.
 (2) Night: when the electricity price is in the valley, set the time for the grid to charge the battery.

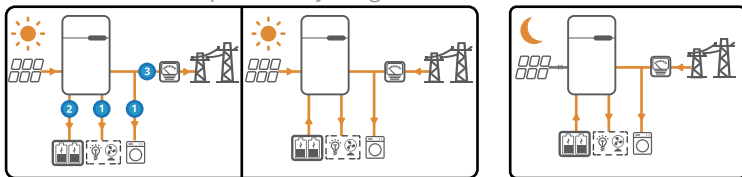


Self consumption mode



- Note** (1) For solar power, consider self consumption mode as priority: the excess power charges the battery in day time; the battery supplies power to the load when there is no solar power generated at night. It improves the self consumption rate and saves electricity costs.
 (2) It is suitable for areas with high electricity prices and little or no solar power generation subsidies.

- (1) Day: when the power generated in the PV system is sufficient, it supplies the household load as priority. And the excess power charges the batteries first. The remaining power will be sold to the grid.
 when the power generated in the PV system is insufficient, use the battery to supply the load first. If the battery power is insufficient, then the load will be powered by the grid.
- (2) Night: If the battery power is sufficient, the load will be powered by the battery. If the battery power is not enough, the load will be powered by the grid.

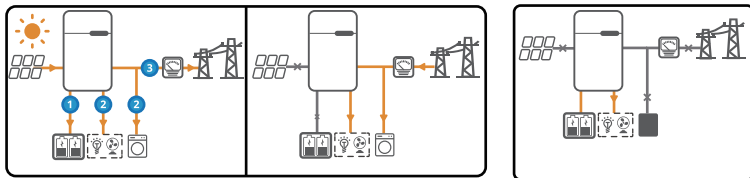


Back-up mode



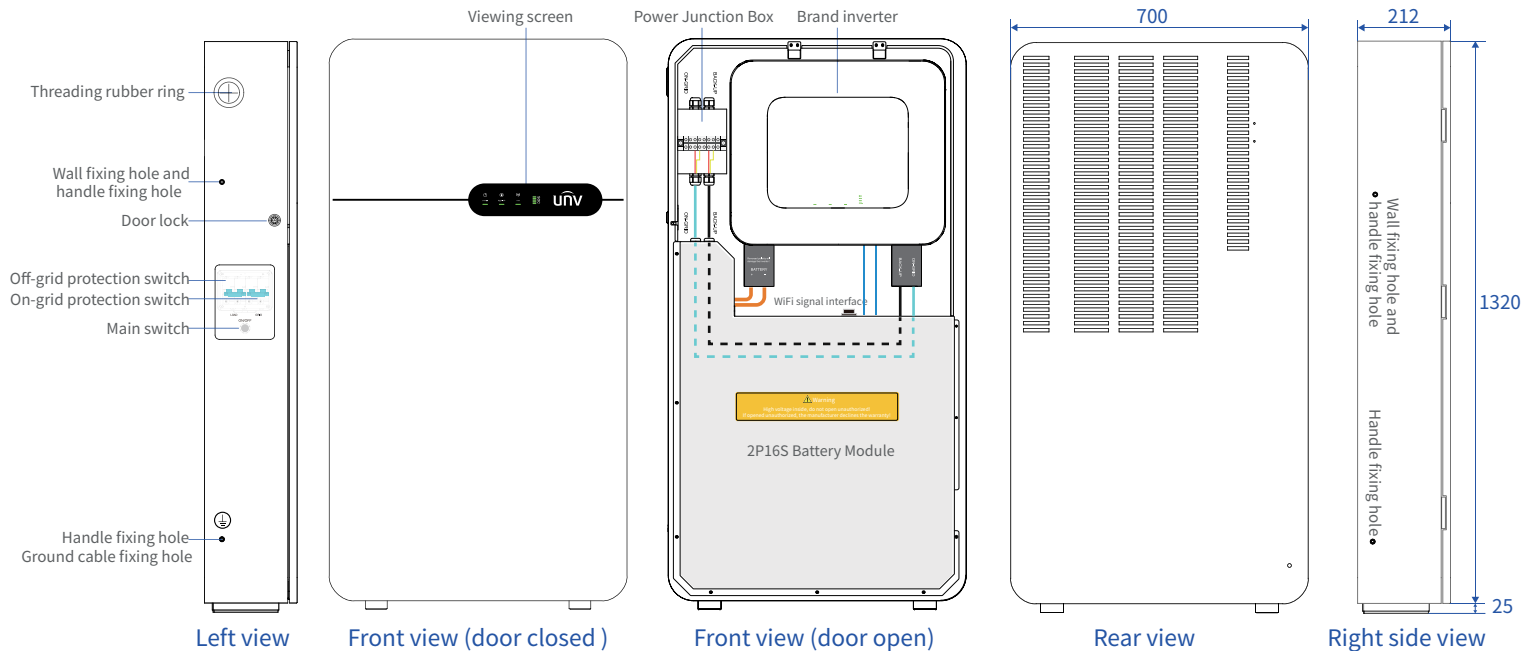
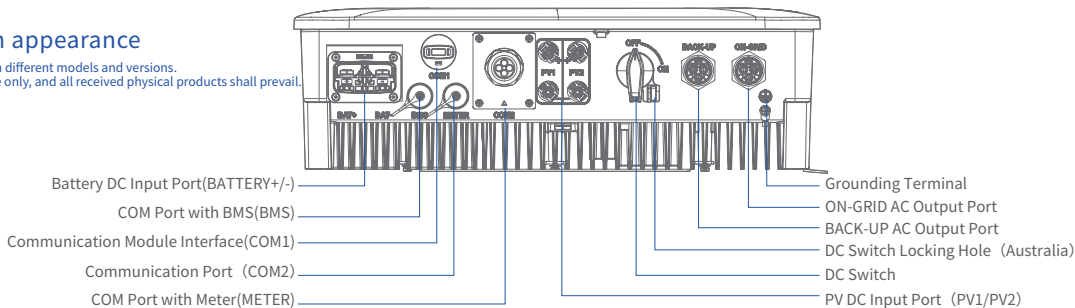
- Note** (1) The back-up mode is mainly applied to the scenario where the grid is unstable and there is an important load. When the grid is disconnected, the inverter turns to off-grid mode to supply power to the load; when the grid is restored, the inverter switches to on-grid mode.
 (2) The battery stops discharging when it reaches SOC. When there is sunlight the next day, the battery starts to supply power to the load after it is charged to a certain power level.

- (1) When the power generated in the PV system is sufficient, it charges the battery as priority. And the excess power charges the load. The remaining power will be sold to the grid.
 (2) When there is no power generated in the PV system:
 · The grid supplies the load when the power grid is normal.
 · The inverter enters off-grid mode and the battery supplies power to the load when the grid is abnormal.

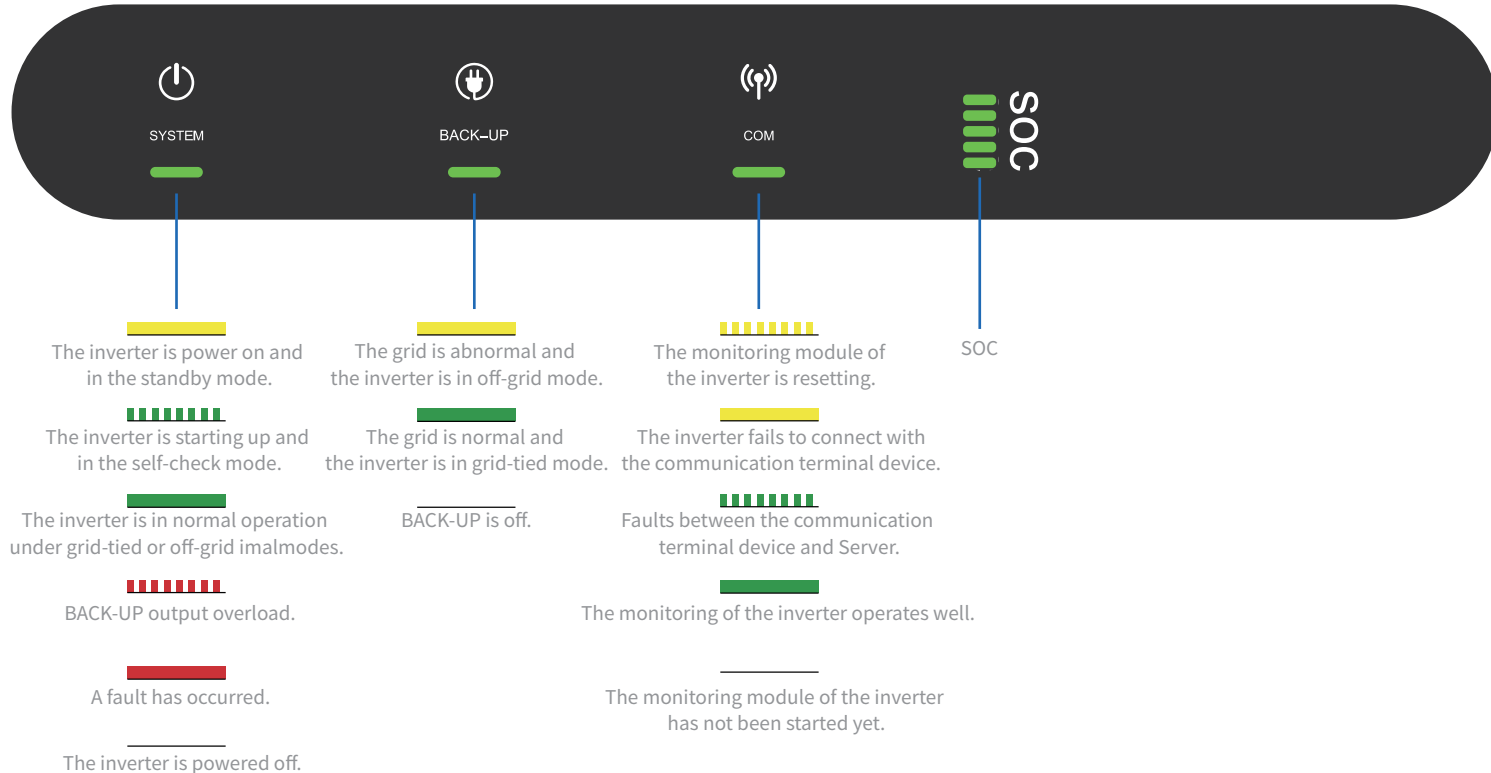


4.5 Battery system appearance

There are slight differences in different models and versions.
The pictures are for reference only, and all received physical products shall prevail.



4.6 UI logic description



4.7 Production specifications

- The depth of discharge (DOD) of a new battery is 100%. All data is measured at a temperature range of 25±3°C and at a C-rate of 0.2C. Available power may vary with different inverters. Rated charge-discharge current and power are affected by temperature and SOC status.
- The inverter also has a self-protection mechanism for derating at high temperature (45°C~50°C).
- Specifications in this document are subject to change without notice. We have made every effort to make this document complete, accurate and up-to-date, and the Company does not assume any responsibility for any loss caused by this document.

Model	ESS-SAH5B10		
General Data			
Dimensions(W*D*H)(mm)	700*212*1320(±5)	Operating Condition	Indoors/outdoors
Weight(kg)	141(±1.5)	OperatingTemperature(°C)	Charge:0°C~55°C; Discharge:-20°C~55°C
Protective Class	I	Cycle life	≥6000times(@25±2°C, 0.5C / 0.5C, 100%DOD, 70%EOL)
IP Rating	IP 65	Certification	IEC62619, IEC61000, IEC63056, IEC62109,RED, UN38.3
Battery Input Data			
Cell type	LFP	Battery Number	IFpP/50/160/120/[2P16S]E/0+50/90
Rated Voltage(V)	d.c.51.2(25°C±2°C)	Standard charging current(A)	100
Rated Energy(kWh)	10.24	Standard discharging current(A)	100
Voltage Range(V)	44.8~57.6	Rated Capacity(Ah)	200
PV String Input Data			
Max. Input Power (W) ^{*1}	9000	Start-up Voltage (V)	58
Max. Input Voltage (V)	600	Norminal DC Input Voltage (V)	360
MPPT Operating Voltage Range (V)	60~550	Number of MPP Trackers	2
Max. Input Current per MPPT(A)	16	Number of Strings per MPPT	1
Max. Short Circuit Current per MPPT (A)	23		
AC Output Data (Back-Up)			
Max. Output Current (A)	27.3	Max.Output Apparent Power (VA)	6000
Nominal Output Voltage (V)	220/230/240	Back-Up Nominal Apparent Power(VA)	6000
Nominal Output Frequency (Hz)	50/60	Output THDv (@Linear Load)	<3%
AC Output Data (On-Grid)			
Max. AC Current Output to Utility Grid (A)	27.3	Max. Apparent Power Output to Utility Grid (VA)	6000*2
Max. AC Current From Utility Grid (A)	43.5	Max. Apparent Power from Utility Grid (VA)	10000
Nominal Output Voltage (V)	220/230/240	Max. Total Harmonic Distortion	<3%
Nominal AC Grid Frequency(HZ)	50/60	Power Factor	~1(Adjustable from 0.8 leading to 0.8 Lagging)
Nominal Apparent Power Output to Utility Grid (VA)	6000*2		

*1: The max power is the actual power of PV.

*2: 4600 for VDE-AR-N4105 & NRS 097-2-1.

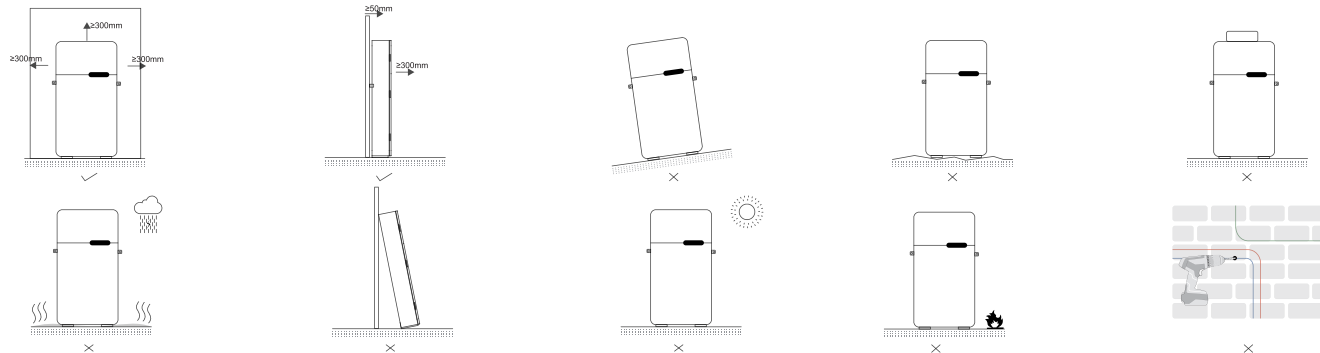
5. Installation

5.1 Installation precautions

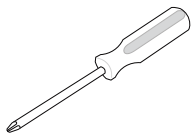
The energy storage battery system is a electrified energy storage device. Non-professionals and improper operation and use may cause serious consequences such as electric shock, combustion and explosion of the battery system.

Only professional personnel are allowed to install and maintain the battery cabinet, and strictly follow the safety regulations when using it. Non-professional personnel are forbidden to install, maintain, and abuse the battery cabinet.

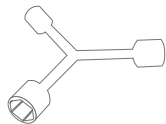
- (1) Before installing a battery cabinet, check whether the electric box, main control box, and related cables are properly connected, including whether the contacts are properly connected to avoid circuit breakers or short circuits.
- (2) Before installing a battery cabinet, check that the grounding device is in good condition.
- (3) When installing a battery cabinet, do not connect the AC L/N pole and DC positive and negative pole of the power supply line reversely or improperly, to avoid short circuit.
- (4) Battery system installation requirements
 - The battery system must be installed on a ground with sufficient bearing capacity and smoothness. If the ground does not have enough support and smoothness, it needs to be strengthened by other means (such as making foundation, adding load-bearing plates, etc.).
 - The battery system must be installed on a wall with sufficient bearing capacity and smoothness. If the wall does not have enough support and smoothness, it needs to be strengthened by other means (such as cement wall, brick wall, etc.).
 - Install the battery system against a wall (50mm space shall be reserved for assembly).
 - Avoid installation near high temperature heat source or low temperature cold source environment (-20~40 is preferable).
 - Do not keep in places containing corrosive gases or liquids.
 - Do not install in areas accessible to children.
 - Do not place inflammable, explosive, or corrosive materials around the device.
 - Do not place anything on the control cabinet.



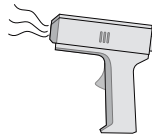
5.2 Installation tools



Cross screwdriver



Socket wrench



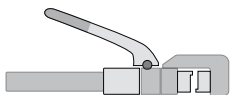
Hot drying gun



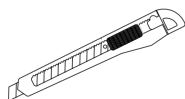
Electric drill



Dust collector



Wire stripping pliers



Snap-off knife



Marker pen



Heat-shrink tube



Lifting rope



Mobile phone or
other Internet-connected device

5.3 Installation protection



Antistatic gloves



Eye mas



Dust mask



Safety shoes

5.4 Operating safety requirements

To install the system safely and effectively,

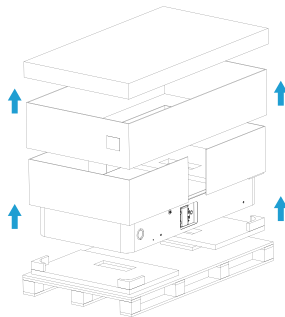
installation personnel must be familiar with the contents and warnings in this document and have qualified professional training.

- (1) This product is a high-voltage device. When operating and maintaining this product, take personal protective measures according to the high-voltage operation regulations. Wear insulated rubber gloves if you need to handle the battery directly.
- (2) For the safety of children, keep out of reach of children.
- (3) When touching the battery system, avoid touching exposed metal parts.
- (4) To prevent static electricity accumulation, maintenance personnel should release static electricity from the human body before operating batteries.
- (5) Do not place tools or metal parts on the top of the control cabinet.
- (6) Do not touch any wiring ports with your hands or other metal objects at any time to avoid electric shock or short circuit.
- (7) Do not step on or sit on the battery system.
- (8) Do not directly short circuit the positive and negative terminals of the battery; otherwise, the battery will leak, heat and crack.
- (9) Do not modify the battery without permission. To prevent danger, a protection system is installed in the battery.
If the protection system is damaged, the charge and discharge may not be controlled, or the charge and discharge current may exceed the set boundary value, resulting in leakage, heating and rupture of the battery.
- (10) Do not overwrite the battery system during charging and discharging. Otherwise, the heat will accumulate, the battery performance will deteriorate, and liquid leaks will occur.

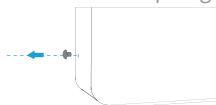
5.5 Product installation

5.5.1 Machine removal and handling

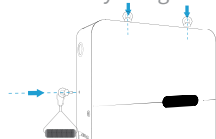
- 01** Take out the product, read the instruction carefully, and check the product.



- 02** Remove the silicone stoppers from the side and top ring holes.



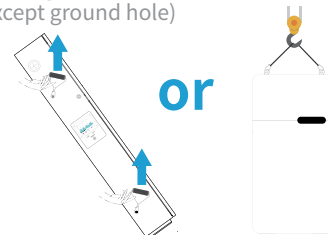
- 03** Install the 4 handles and the two eye rings on the top.




Note

The product is heavy (about 141kg), please take it out carefully, and choose a suitable hoist if necessary. The inner diameter of the eye ring is 16mm; the hoisting rope requires a minimum load-bearing capacity of 1 ton, and the hoisting rope is not allowed to cross, knot or twist during use.

- 04** Use the handles and eye rings on both sides to put the machine into the installation position. After lifting, remove the handles and eye rings, and plug the screw holes with silicone stoppers. (except ground hole)



⚠ Danger Before installation, ensure that all protection switches of the battery system are off , and disconnect all battery and AC power supplies from the fusioncube for at least 5 minutes. Ensure that the battery system is completely isolated to avoid electric shock.

Screw torque recommendation:  M6

Torque: $9.5N \cdot M \pm 10\%$

 M8

Torque: $21.0N \cdot M \pm 10\%$

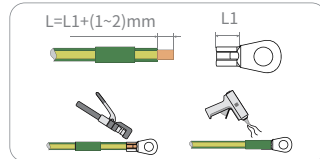


M6

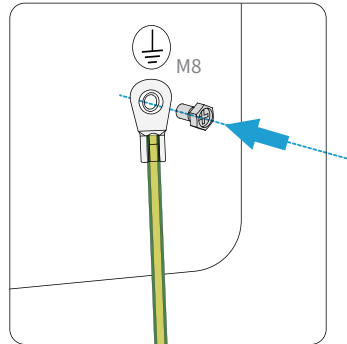
Torque: $9.5N \cdot M \pm 10\%$

5.5.2 Grounding wire assembly

05 Grounding wire assembly



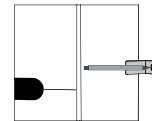
06 Secure the ground terminal to the ground hole with screw (M8).



⚠ Danger The battery system must be installed on walls and floors with sufficient bearing capacity and smoothness.

5.5.3 Machine and wall fixed installation

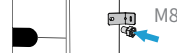
07 Mark the holes with a pen.



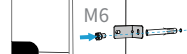
08 Drill holes with electric drill at marked positions. Drill bit diameter: 10mm, depth: 60mm.



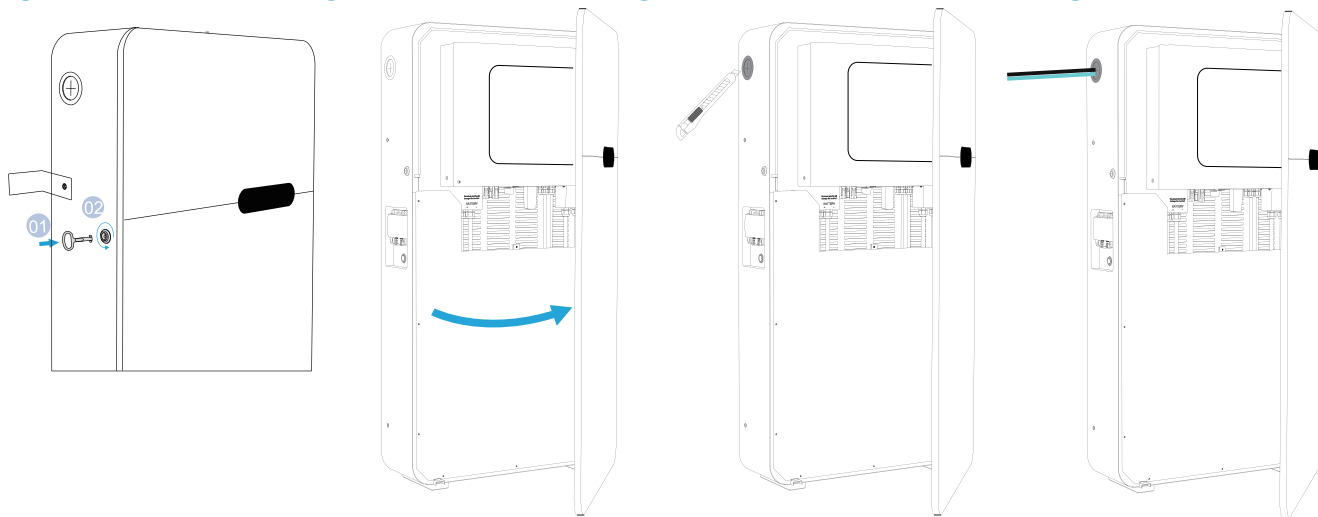
09 Fix the fixing plate and battery system with screws (M8), one on each side, and operate in the same way.



10 Attach it to the wall with expansion screws (M6).

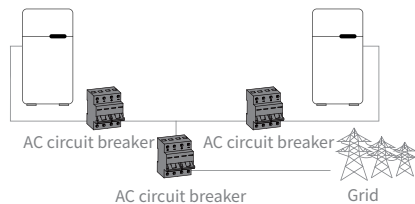


- 11 Use the key to unlock the door. 12 Open the door of the All-in-one. 13 Use a knife to cut the rubber ring along the "+". 14 Cross wire harness through rubber ring.

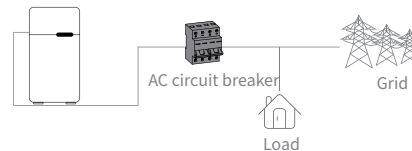


! **Caution** If an electrical short circuit occurs when the AC circuit breaker is not connected to the off-network side, the battery system may be damaged. To isolate the power grid from the inverter when it is connected to the grid, add an external AC circuit breaker (such as DZ47-60 C40) of 40A / 230V.

1. Use split AC circuit breaker for single inverter



2. On the AC side, separate circuit breakers should be connected between the inverter and the grid before the load is connected.

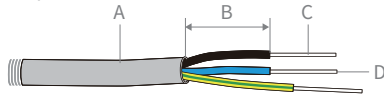


⚠ Danger Connect AC cables to both the grid-connected side and off-grid side. Before connecting AC cables, ensure that the inverter is completely isolated from the DC or AC power supply.

⚠ Caution

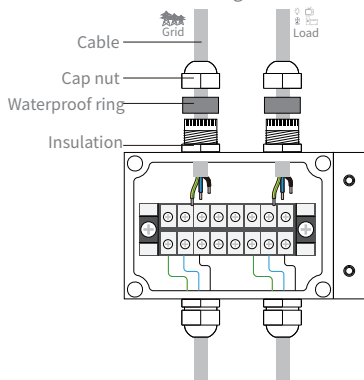
1. The N wire is blue, the L wire is black or brown (brown is preferred), and the PGND cable is yellow-green.
2. The PGND cable of an AC cable should be longer than the N and L cables. Therefore, when an AC cable slips or is removed, the PGND conductor can bear the strain last.

15 Prepare AC cables and terminals based on the right table.

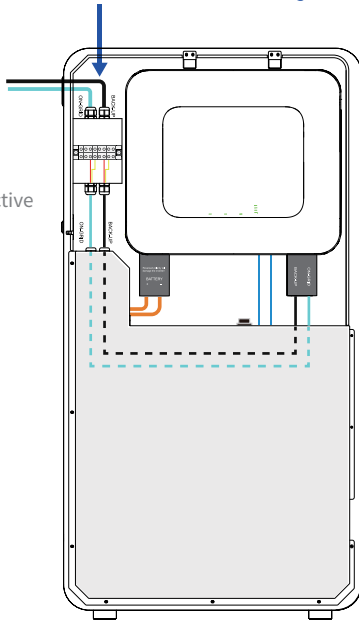


Description	Value
A Outer diameter	13-18 mm
B Strip cable length	20-25 mm
C Length of conductor	7-9 mm
D Conductor cross-sectional area	4-6 mm ²

16 Route the AC cable through the terminal protective cover as shown in the figure.



5.5.4 Installation of wiring box

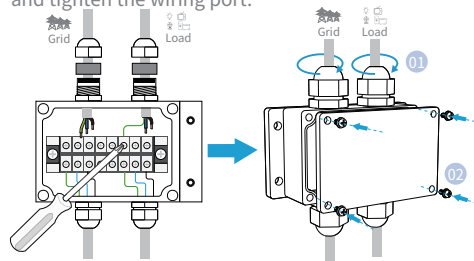


17 Crimp six terminals on the conductor core of the cable.



⚠ Note Do not lock the sheath of the cable into the connector.

18 Connect the assembled AC cables to the AC terminals, tighten the protective cover of the junction box, and tighten the wiring port.



⚠ Note Connect the off-network terminal before connecting the grid-connected terminal, and ensure that it is connected to the correct side.

Special adjustable settings:

Users can use the inverter firmware to set functions such as the hop point, hop time, reconnection time, QU curve, and PU curve. If this special firmware and adjustment method required, please contact after-sales.

5.5.5 Off-grid function Statement

The off-grid output of the battery system has overload capability. The inverter has self-protection derating function in high temperature environment.

(1) For battery systems, a standard PV installation usually requires connecting the inverter to the PV panel and cell.

It is strongly recommended not to use the off-grid function when the system is not connected to a battery.


Any consequences resulting from non-compliance with this statement are not covered by the manufacturer's warranty and liability.

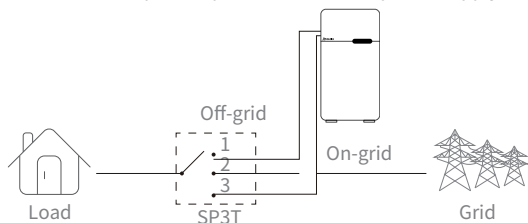
(2) In most cases, the off-network switching time is less than 10ms (considering the minimum UPS condition).

However, some external factors may cause the system fail to enable off-grid mode.

Therefore, users are recommended to be fully informed and follow the following instructions:

- Do not use this function if the load requires a stable power supply to ensure reliable operation.
- Do not connect a load that may exceed the maximum off-network capacity.
- Try to avoid loads that may generate a high starting surge, such as variable frequency air conditioners, high power pumps, etc.
- Due to the condition of the battery itself, battery current may be limited by a number of factors, including but not limited to temperature, weather, etc.

 **Note** For easy maintenance, install an SP3T switch on the off-grid side and the grid-connected side. After installing the SP3T switch, you can adjust the switch to change the load power supply mode, for example, keep the default state, power supply from the grid, or off-grid power supply.



1. The off-grid load is powered by the off-grid side.
2. The off-grid load is isolated.
3. Off-grid loads are powered by the grid side.

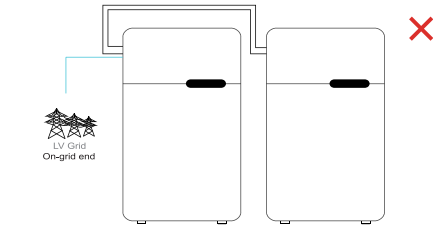
Off-grid overload protection declaration:

When the overload protection is triggered, the inverter restarts itself. If the overload protection is triggered repeatedly, the preparation time for restarting the inverter is longer (one hour at most).

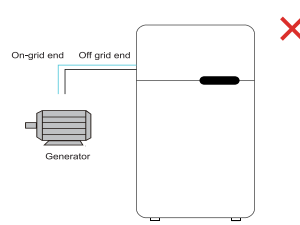
However, you can restart the inverter by reducing the off-grid load power within the maximum limit.

5.5.6 Incorrect installation example

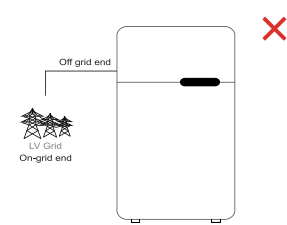
Caution Avoid the following installation methods. Otherwise, the system may be damaged.



Generally speaking, the off-grid side cannot be connected in parallel. If necessary, please contact the after-sales service.



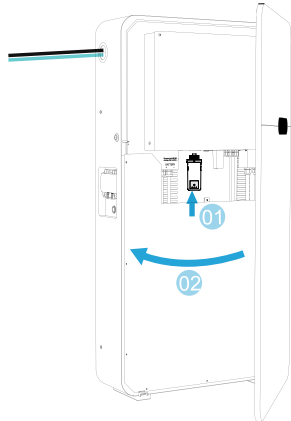
The on-grid or off-grid side cannot be connected to any alternator.



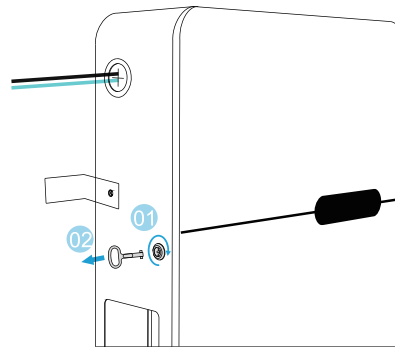
The off-grid side cannot be connected to the power grid.

5.5.7 Installation complete

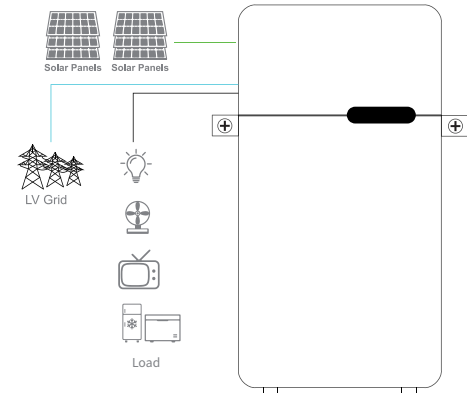
19 Install the WiFi data receiver of the inverter.
Check installation of the wiring harness and close the door.



20 Use a key to close the lock
(keep the key for maintenance).

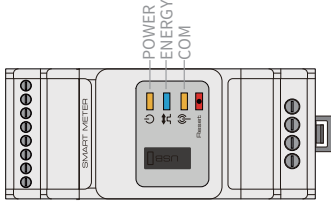


21 The installation is complete and ready for commissioning.



5.6 Smart Meter & CT Connections

A Smart Meter with the CT in product box is compulsory for battery system installation. It can be used to detect the grid voltages and current directions, provide the operating condition of the battery system via RS485 communications. For more detailed information of the Smart Meter.



Smart Meter LED Indications

STATUS	OFF	ON	Blinking
POWER	Not working	Working	/
ENERGY	/	Importing	Exporting
COM	Single blink when data are transferred to the inverter		

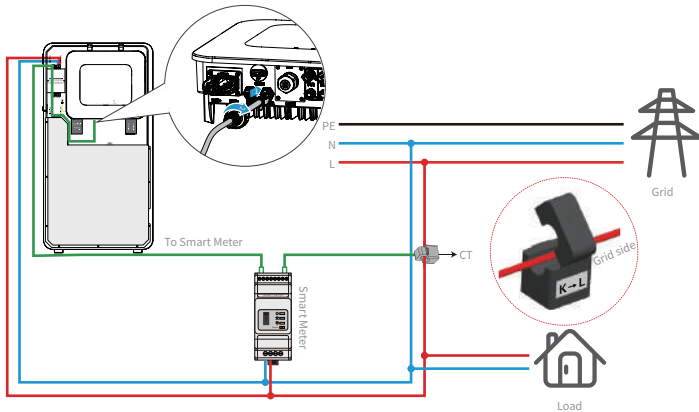
⚠ Danger Make sure the AC cable is totally isolated from AC power before connecting the Smart Meter and CT.

⚠ Note

1. The Smart Meter with CT is already configured ; please do not change any settings on the Smart Meter.
2. One Smart Meter can be used with only one battery system.

⚠ Note

Smart Meter & CT connection diagram



- (1) The energy storage system is equipped with communication cables of 10m (default) long between the Meter and the energy storage system. Please install the meter and CT according to the actual situation.
- (2) The electric meter and CT are shipped with the energy storage system, and parameters have been preset at the factory. Do not modify the parameters of the meter and CT.
- (3) Each energy storage system needs to be connected to a meter separately. Do not connect multiple energy storage systems to the same meter.
- (4) For normal use of the meter and CT, please ensure the following:
 - Please make sure that the CT is connected with the phase line, CT1 is connected to L1, CT2 is connected to L2, and CT3 is connected to L3.
 - Please connect the CT according to the direction of the meter, if it is reversed, it will report a CT reverse fault.
- (5) The battery BMS and Meter communication support the connection of standard RJ45 crystal plugs, and the ports are defined as follows.

Serial number	Colour	BMS function	Smart meter function
1	Orange white	NC	NC
2	Orange	NC	NC
3	Green white	NC	NC
4	Blue	CAN_H	NC
5	Blue white	CAN_L	NC
6	Green	NC	485_A1
7	Brown white	NC	485_B1
8	Brown	NC	485_A1



5.7 Connect the photovoltaic input cable

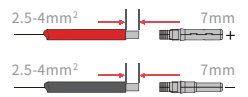
⚠ Danger Ensure that the battery system is completely isolated from all DC and AC power sources for at least 5 minutes before connecting the PV.

Before connecting the PV panel/string to the fusioncube, ensure that the following requirements have been met:

- (1) The total short-circuit current of the PV series shall not exceed the maximum DC current of the inverter.
- (2) To avoid the danger of electric shock, the minimum insulation resistance of the photovoltaic string to the ground must be greater than 19.33kΩ.
- (3) The PV series is not grounded.
- (4) Use the DC connector in the accessory box correctly.

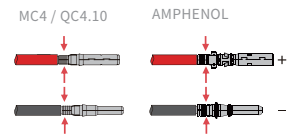
⚠ Note There are MC4 or QC4.10 or Amphenol connector in the accessory box . The following describes the connection methods.

01 Prepare DC input cables and DC connectors.



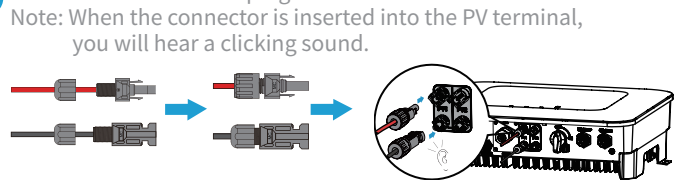
- Note:
- (1) Please use the DC connector in the accessory box.
 - (2) The DC cable specifications are standard 2.5-4mm².

02 Crimp the DC cable.



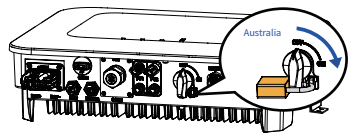
- Note:
- (1) The DC cable must be crimped in place.
 - (2) If amphenol connector is used, do not press it to the limit buckle.
 - (3) A clicking sound will be heard when the crimped wire is inserted into the connector.

03 Screw on the cover and plug the connector into the inverter side.

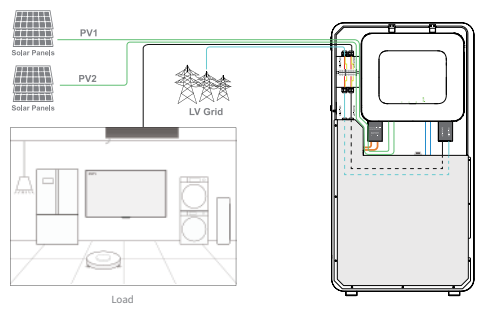


- ⚠** Ensure that the polarity of the PV string is correctly connected; otherwise, the inverter may be damaged.

04 Turn on the photovoltaic switch of the inverter.



05 Turn on the system switch. "SOLAR" is on. The photovoltaic connection is successful.



6. Operational approach

6.1 Check before power-on

When powering on the battery system, do check the following items to prevent system damage.

(1) The installation position is convenient for operation and maintenance.

The installation space is convenient for ventilation and heat dissipation. The installation environment is clean and tidy.

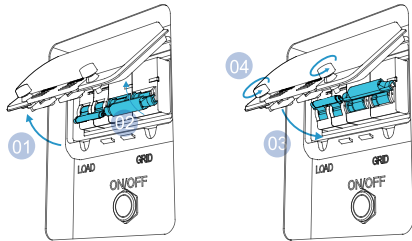
(2) The PGND cable, power cable, communication cable, and terminal resistance are securely connected.


(3) Cables are bundled in proper distribution and without damage.

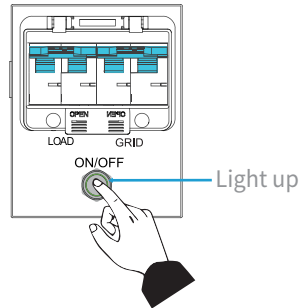
(4) The unused port is blocked.

6.2 System start-up

01 Close all protection switches.



02 Press the main switch (3s) until the key indicator lights up .



03 The indicator light "SYSTEM" turns green, and the battery system start.



04 Set inverter parameters through SolarGo App. Refer to inverter signal connection module for more details.

6.3 System shutdown

When shutting down the battery system, follow the following sequence of steps to prevent damage to the system:

Power-off method 1:

Press the switch button (5s) to make sure that all lights are off.

(It is a process to discharge the capacitor, with the indicator light going off slowly in about 30s)


Power-off method 2:

Turn off all protection switches and make sure all indicators are off.

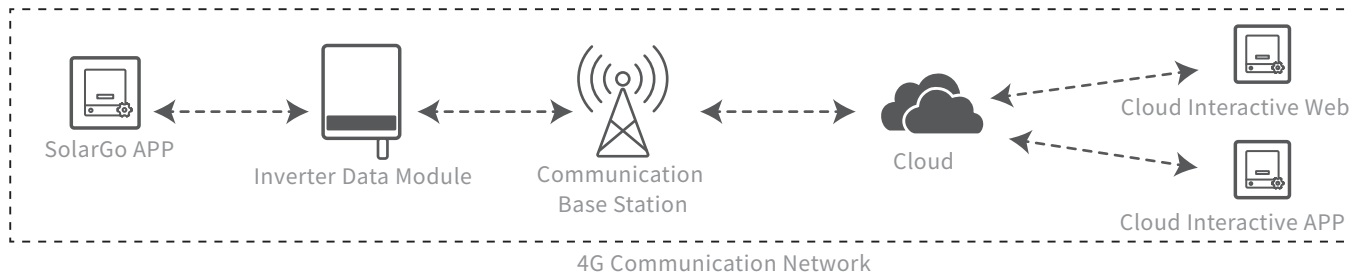
6.4 Inverter signal connection

6.4.1 Technical Parameters

⚠ Note Due to upgrades of product version or other matters, the content of the document will be updated from time to time. Unless there is a special agreement, the content of the document cannot replace the safety precautions of the product label or user manual. All descriptions in this document are for guidance only.

	Model	LS4G Kit-CN
	Input voltage	5V
	Power consumption	<4W
	Dimensions (L*W*D)	96mm*49mm*32mm
	Operating temperature	- 30~ 60°C
	Working humidity	0 ~ 100% RH
	Working altitude	<4000m
	Frequency band	LTE-FDD: B1/B3/B5/B8
		LTE-TDD: B34/B38/B39/B40/B41
		GSM/GPRS: 900/1800
Rate	LTE (Mbps) : 10 (DL) /5 (UL)	
	GPRS (Kbps) : 107 (DL) /85.6 (UL)	
Safe use period (years)	≥25	

6.4.2 Application Scenario

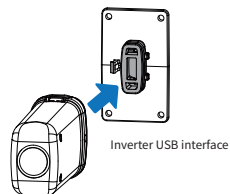


6.4.3 Installation and commissioning

- ⚠ Danger** (1) Make sure the inverter is powered off when installing the inverter data module.
 (2) Please wear anti-static gloves during installation and pay attention to electrostatic protection.

01 Check whether the deliverables are correct.

- (01) Inverter data module*1
- (02) (Optional) 5PIN-USB adapter*1
- (03) (Optional) M3 screws



6.4.4 Power on the device

- (1) Power on the inverter, and the inverter data module is powered on.
 (2) Observe the status of the 4G module and the inverter indicator light.

🔌 4G module: green	📶 4Gmodule: blue	Inverter communication light	Possible fault causes	Troubleshooting solutions
Off	Off	2Flash	The module is not fastened nor powered on.	Fasten the module and power it on.
On	-	-	The module is fastened and powered.	normal status
On	0.2s On, 1.8s Off	2Flash	Under the status of dialing and searching for the network.	normal status
On	1.8s On, 0.2s Off	2Flash	Successful dial.	normal status
On	1.8s On, 0.2s Off	Steady on	Successful cloud connection.	normal status
On	0.125s On, 0.125s Off	Steady on	The inverter communicates with the cloud through the module.	normal status
On	0.2s On, 8s Off	2Flash	The SIM card is not installed or the SIM card is in poor contact.	Insert the SIM card and make sure the SIM card is in good contact.
On	· 1.8s On, 0.2s Off · 0.2s On, 1.8s Off	4Flash	Failed to connect to the cloud due to no traffic.	Please recharge in time and restart the inverter.

- ⚠ Danger** Before replacing the inverter data module, please confirm that the inverter has been powered off and a new inverter data module has been prepared.

- (1) Remove the inverter data module.
- (2) Install a new inverter data module.

6.4.5 Setting Inverter Parameters via SolarGo App

 **Note** For normal operation of the energy storage system, please use the SolarGo APP to set the inverter parameters.

SolarGo App is one smart phone application used to communicate with the inverter via bluetooth, WiFi, 4G or GPRS modules. Commonly used functions:

- (1) Check the operating data, software version, alarms, etc.
- (2) Set grid parameters, communication parameters, etc.
- (3) Maintain the equipment.
- (4) Upgrade the software version of the inverter.

For more details, refer to the SolarGo APP User Manual. Scan the QR code or visit https://en.goodwe.com/Ftp/EN/Downloads/User%20Manual/GW_SolarGo_User%20Manual-EN.pdf to get the user manual.



SolarGo App



SolarGo App User Manual

6.4.6 Monitoring via SEMS Portal

SEMS Portal is an monitoring platform used to communicate with the inverter via WiFi, LAN, 4G or GPRS. Commonly used functions:

- (1) Manage the organization or User information;
- (2) Add and monitor the power plant information;
- (3) Maintain the equipment.



SEMS Portal



SEMS Portal User Manual

7. Maintenance guideline

7.1 Maintenance considerations

- (1) In order to perform system maintenance and maintenance safely and effectively, maintenance personnel must be professionally trained and qualified before they can work.
When performing maintenance work, he staff must comply with the knowledge of safety precautions and use necessary tools and protective equipment.
- (2) When operating and maintaining the system, do not wear metal jewelry such as gold and silver jewelry and watches.
- (3) During maintenance, use insulation tools, wear insulation gloves and shoes.
- (4) After maintenance, clean tools and materials in time. Do not place metal objects and tool parts inside or on the top of the device.
- (5) When connecting and disconnecting system cables, ensure that all switches are off, and protect the positive and negative terminals.
- (6) If system operation and maintenance personnel have any questions about the operation and maintenance of the device, stop the operation and contact the manufacturer. Do not perform any operation without authorization.



It is important to keep in mind that even if the battery cabinet is not running, there is still a dangerous voltage inside the battery cabinet. After turning off the air switches in all battery cases, ensure that the inverter is completely isolated from all DC and AC power sources for at least **5 minutes**. and then check with a voltmeter to ensure that all power supplies are disconnected and in a safe state before maintenance.

7.2 Periodic maintenance

To maintain the efficiency and reliability of the energy storage system, perform the following operations periodically:

- (1) Keep the environment clean to avoid dust or chemical pollution to the battery cabinet.
- (2) Dust removal regularly (once every 6 months) : Clean the system regularly. Before dust removal, cut off the power supply and do not rinse with water.
- (3) Check the wiring terminals of input and output cables regularly (once every 6 months).
Carefully check for loose or foreign objects, severe rust or oxidation on the terminal surface, and measure for good contact.
- (4) Periodically (once every six months) check whether the cables are aged, damaged, and properly insulated.
- (5) Check the working status of the battery cabinet regularly (once every 6 months).
- (6) Waterproof plate: Check whether the waterproof plate for components such as RS485 is replaced every year.

7.3 Diagnosis of common abnormal problems

If the battery cabinet does not work properly after being enabled, do not determine that the battery cabinet is faulty. Find possible causes by referring to Table 7-1. At the same time, check whether the fault is caused by the external environment, for example, the temperature and humidity do not meet the requirements, or the load is overloaded. If the fault persists according to Table 7-1, ask professionals to repair it.

This section contains only some simple troubleshooting procedures. If the answer to the diagnosis is not clear, or the information obtained is not enough to solve the problem, please contact after-sales service for handling.

Serial	Fault or alarm symptom	Possible fault causes	Troubleshooting solution
01	WiFi fault	a.Data stick damage	Replace the data stick
		b.Bad wiring harness contact	Reinsert or replace
02	The battery and PCS communication faulty	a.The cable harness is improperly connected	Check the wiring harness connections
		b.BMS failure	Replace BMS
		c.RJ45 damaged	Replace RJ45
		d.PCS abnormal	Replace the PCS
03	OCCHG	The current charging current of the system is too large	Reduce the power
04	OCDSG	The current discharge current of the system is too large	Reduce the power
05	Discharge high temperature protection	a.Ambient temperature is too high	Discharges are not allowed and the ambient temperature decreases
		b.The temperature of a single cell is abnormal	DSC OFF
		c.The charging and discharging current is too larg	DSC OFF
06	Low temperature discharge protection	The ambient temperature is too low.	Discharges not allowed
07	Charging high temperature protection	a.Ambient temperature is too high	No charging is allowed and the ambient temperature decreases
		b.The temperature of a single cell is abnormal	Stop charging
		c.The charging and discharging current is too large	Reduce charging current
08	Charge low temperature protection	The ambient temperature is too low.	No charging allowed
09	Total voltage low voltage protection	Battery over discharge	Stop discharging and charge immediately
10	Battery volts high	Total voltage is too high	Stop charging
11	Single high voltage protection	Single voltage is too high	Stop charging
12	Single low voltage protection	Battery over discharge	Stop discharging and charge immediately
13	Bonding of relay	Relay damage	Replace the relay
14	NTC abnormal	NTC damage	Replace NTC
15	Insulation supervising	The battery pack is leaking	After break the air-switch , contact customer service
16	BMS internal communication is abnormal	a.The cable harness is improperly connected.	Check the wiring harness connections
		b.BMS failure	Replace BMS
		c.RJ45 damage	Replace RJ45

7.4 Battery protection

A battery will limit charge/discharge for protection purposes under any of the following conditions:

- (1) The battery SOC is lower than 1-DOD (discharge depth).
- (2) Lithium battery BMS limitation. Lithium battery BMS limitation.
- (3) Battery overheat protection.
- (4) The communication of the lithium battery is abnormal.
- (5) The battery voltage is lower than the discharge voltage.

When charge and discharge current limiting protection occurs:

- (1) In grid-connected mode, battery charging and discharging may be abnormal.
- (2) In off-grid mode, the off-grid power supply will be turned off.

Note

- (1) In off-grid mode, if the off-grid power supply is turned off due to low battery, battery SOC, or voltage, all the energy generated on the photovoltaic side will be used to charge the battery until the battery SOC reaches $40\% + (1-DOD)/2$ to activate the off-grid power supply.
- (2) In grid-connected mode and off-grid mode, the battery is protected by DOD (depth of discharge) and discharge voltage over discharge.
- (3) DOD battery Settings prevent the inverter from releasing battery spare power. Once the DOD set value is reached, the load will be powered only by the photovoltaic side or the grid support.

Note

If the battery is charged with little or no charge for several days, the battery may continue to consume its energy to maintain communication with the inverter. If the battery's SOC reaches a certain level, the inverter will cause the SOC to rise. This protection mechanism prevents the battery SOC from dropping to 0%.

7.5 Accident handling

In case of abnormal system and accident, correct and effective measures should be taken to deal with it in time to avoid further damage and expanded loss:

(1) Overheating

When the temperature of a battery string exceeds the upper limit of safe operation, the management system gives a warning and requires user to stop using the battery immediately. In this case, stop using the battery immediately and notify related technicians to conduct a comprehensive check and rectify the fault before continuing using the battery.

(2) Electric leakage

In the process of use, if the system is found to have leakage phenomenon, users must evacuate the relevant personnel immediately, and notify the relevant technical personnel right away on the scene to deal with the problem. Operation may resume only after trouble clearing, and the system is strictly prohibited from working with defect or forced continuation.

(3) Short circuit

In case of system short-circuit caused by various reasons, the relevant personnel must be evacuated immediately, the relevant power supply and electrical equipment should be cut off (if possible), the connection between the battery and the system should be immediately disconnected, and the relevant technical personnel should be immediately notified to repair and troubleshoot the fault. The equipment and devices seriously short-circuited must be comprehensively tested by the manufacturer before it can be decided whether to continue to use.

(4) Impact

If the device is collided, deformed, or impaled by a foreign body for various reasons, disconnect the power cable of the system immediately and notify professional technicians to handle the problem on site. In special cases, only personnel wearing necessary protective equipment can handle the problem on site.

(5) Other accidents

When the device or component needs to be repaired or removed due to other accidents, disconnect the battery circuit first to avoid electric shock. Disassembly should be carried out without short circuit to ensure that there will be no collision, fall, inversion and other secondary damage in the process.

Danger

- (1) If you find any problem that may affect the battery or energy storage inverter system, please contact the after-sales personnel.
Do not disassemble the battery or energy storage inverter without permission.
- (2) If the copper wire inside the conductive wire is found exposed, do not touch, high voltage danger, please contact after-sales personnel, do not disassemble without permission.
- (3) In case of other emergencies, please contact the after-sales personnel in the first time and operate under the guidance of the after-sales personnel, or wait for the on-site operation by the after-sales personnel.

8. After-sales service

The Company provides customers with a full range of technical support and after-sales service. Free warranty service period refer to the contract.

The following conditions are not covered by our free warranty service:

- (1) Failure to operate according to the instructions, which may cause system damage or failure.
- (2) Failure to connect and supply power in accordance with relevant electrical safety codes, or damage or failure caused by poor site environment.
- (3) System damage or failure caused by user's unauthorized modification.
- (4) System damage or failure caused by irresistible natural factors such as typhoon, earthquake, flood, fire, or harsh environment (high temperature, low temperature, high humidity, acid rain, etc.).
- (5) After the occurrence of a fault, the user fails to maintain the initial fault state, handle the fault itself without timely notifying the manufacturer, which results failure to make a practical fault identification.