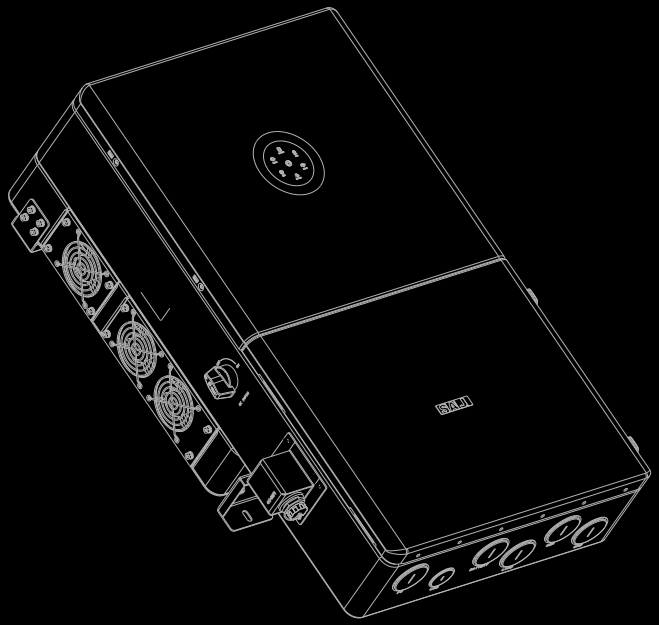


# H2

## HYBRID SOLAR INVERTER
## USER MANUAL

H2-(5K-7.6K)-LS3-US

H2-(9.6K-11.4K)-LS4-US

# Preface

Thank you for choosing SAJ products. We are pleased to provide you first-class products and exceptional service.

This manual provides information about installation, operation, maintenance, troubleshooting and safety. Please follow the instructions of this manual so that we can ensure delivery of our professional guidance and whole-hearted service.

Customer-orientation is our forever commitment. We hope this document proves to be of great assistance in your journey for a cleaner and greener world.

We make constant improvements on the products and their documentation. This manual is subject to change without notice; these changes will be incorporated in new editions of the publication. To access the latest documentation, visit the SAJ website at https://www.saj-electric.com/

Guangzhou Sanjing Electric Co., Ltd.

# TABLE OF **CONTENTS**

# 1.

# SAFETY PRECAUTIONS

# 1.1. About this document

## 1.1.1. Overview

This *User Manual* provides introductions and instructions of installing, operating, maintaining, and troubleshooting of the SAJ products H2-(5K-7.6K)-LS3-US and H2-(9.6K-11.4K)-LS4-US. For details, refer to the model types listed in section 2.2 "Models".

Read the user manual carefully before any installation, operation and maintenance and follow the instructions during installation and operation. Keep this manual all time available in case of emergency.

Failure to follow any of the instructions or warnings in this document can result in device damage, potentially rendering it inoperable; or even causes electrical shock, serious injury, or death. SAJ shall take no responsibility for any personal injuries or property damage caused by improper use.

## 1.1.2. Target audience

This document is applicable to:

- Installers
- Users

The qualified and trained installers must have knowledge and experience in:

- Installing electrical equipment. Applying all applicable installation codes.
- Analyzing and reducing the hazards involved in performing electrical work.
- Installing and configuring batteries.
- Selecting and using Personal Protective Equipment (PPE).

# 1.2. Safety

**CAUTION:**

**ONLY qualified and trained electricians who have read and fully understood all safety regulations contained in this manual can install, maintain, and repair the equipment. Access to the equipment is by the use of a tool, lock and key, or other means of security.**

## 1.2.1. Safety levels

| ⚠ DANGER |
| --- |
| Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |

| ⚠ WARNING |
| --- |
| Indicates a hazardous situation which, if not avoided, can result in death or serious injury or moderate injury. |

| ⚠ CAUTION |
| --- |
| Indicates a hazardous condition which, if not avoided, can result in minor or moderate injury. |

| ! NOTICE |
| --- |
| Indicates a situation that can result in potential damage, if not avoided. |

## 1.2.2. Symbol explanation

| Symbol | Description |
| --- | --- |
|  | **Danger:** Electrical shock hazard<br>This device is directly connected to public grid, thus all work to the battery shall only be carried out by qualified personnel. |
|  | **WARNING:** No open flames<br>Do not place or install near flammable or explosive materials. |
|  | **Danger:** Hot surface<br>The components inside the battery will release a lot of heat during operation. Do not touch metal plate housing during operating. |
|  | **Attention:** Install the product out of reach of children. |
|  | **Attention:** Check the user manual before service.<br>If an error has occurred, refer to the troubleshooting chapter to remedy the error. |
|  | **Attention:** This device shall NOT be disposed of in residential waste. |
|  | **Attention:** This battery module shall NOT be disposed of in residential waste. |

| | |
|---|---|
|   | **CAUTION:** Risk of electric shock from energy stored in capacitor. Do not remove cover until 5 minutes after disconnecting all sources of supply |
|  | **CE mark**<br>Equipment with the CE mark fulfills the requirements of the Low Voltage Directive and Electro Magnetic Compatibility. |
|   | ETL mark<br>The ETL Mark is proof of product compliance to North American safety standards. |
|   | **RoHS compliant mark**<br>Equipment with the RoHS mark does not exceed the allowable amounts of the restricted substances defined in Restriction of Hazardous Substances in Electrical and Electronic Equipment. |
|  | **RCM compliant mark**<br>Equipment with the RCM mark is in compliance with AS/NZS 4417.1 & 2 and the EESS. |
|  | **Recyclable** |

## 1.2.3. Safety instructions

For safety, be sure to read all the safety instructions carefully prior to any works, and please observe the appropriate rules and regulations of the country or region where you installed all-in-one energy storage system.

**DANGER**

- Risk of fatal personnel injuries due to electrical shock and high voltage.
- Do not touch the operating component of the inverter; it might result in burning or death.
- To prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are disconnected prior to work.
- Do not touch the surface of the inverter while the housing is wet, otherwise, it might cause electrical shock.
- Do not stay close to the inverter while there are severe weather conditions including storm, lightning, etc.
- Before opening the housing, the SAJ inverter must be disconnected from the grid and PV generator; you must wait for at least five minutes to let the energy storage capacitors completely discharge after disconnecting from power source.
- Please keep the power off prior to any operations.

**WARNING**

- Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. SAJ is not responsible for the loss and these warranty claims.
- Do not touch non-insulated parts or cables.
- For personal and property safety, do not short-circuit the positive (+) and negative (-) electrode terminals.
- Disconnect the PV array from the inverter by using an external disconnection device. If no external disconnection device is available, wait until no more DC power is applied to the inverter.
- Disconnect the AC circuit breaker, or keep it disconnect if it is tripped, and secure it against reconnection.
- The SAJ inverter must only be operated with the PV generator. Do not connect any other source of energy to the SAJ inverter.
- Be sure that the PV generator and inverter are well grounded in order to protect properties and persons.

**CAUTION**

- ·The inverter will become hot during operation. Please do not touch the heat sink or peripheral surface during or shortly after operation.
- ·Risk of damage due to improper modifications.

**NOTICE**

- Moving or reinstall the inverter to another location might void the warranty without prior written permission from SAJ.

## 1.3. Safe handling

- Only qualified electricians who have read and fully understood all safety regulations in this manual can install, maintain, and repair the inverter.
- When the inverter is working, do not touch the internal components or cables to avoid electric shock.
- When the inverter is working, do not plug in or out the cables.
- Make sure the AC input voltage and current are compatible with the rated voltage and current of the inverter; otherwise, components might be damaged, or the device cannot work properly.

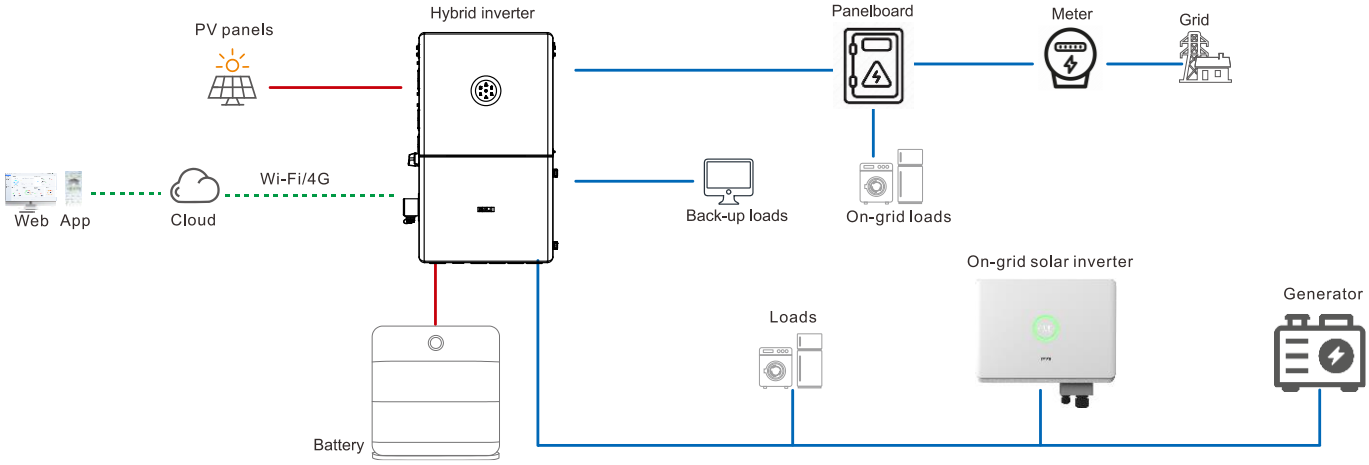
# 2.

# PRODUCT INFORMATION

# 2.1. General introduction

The H2 series low-voltage inverter is a transformer-less hybrid solar inverter, which is a key component of a complete energy storage system.

The inverter provides the maximum power point tracking (MPPT), battery charging/discharging circuit and full-bridge inverting circuit. It converts the solar power to grid-compliant AC power for home loads and exports extra power to the grid. The solar power can also be stored into the battery for later use when 天 the grid is down or during peak hours of high electricity rates.




When power outage occurs, the inverter transfers the critical loads to battery power immediately and seamlessly without supply interruption to the critical loads.

# 2.2. Models

## 2.2.1. Product models

The H2 series low-voltage inverter includes the following models:

- H2-5K-LS3-US
- H2-7.6K-LS3-US
- H2-9.6K-LS4-US
- H2-11.4K-LS4-US

### 2.2.2. Model description

**H2 - *x*K - LS3 - US**

**H2 - *x*K - LS4 - US**

**H2:** inverter series

***x*K**: rated power of the inverter. For example, 5K indicates the rated power of the inverter is 5 kW.

***LS3***: Low voltage with 3 MPPT

***LS4***: Low voltage with 4 MPPT

**US**: This model is applicable to the United States.

## 2.3. Dimension

Dimension (H*W*D): 810*470*247 mm (31.89*18.504*9.724 inch)

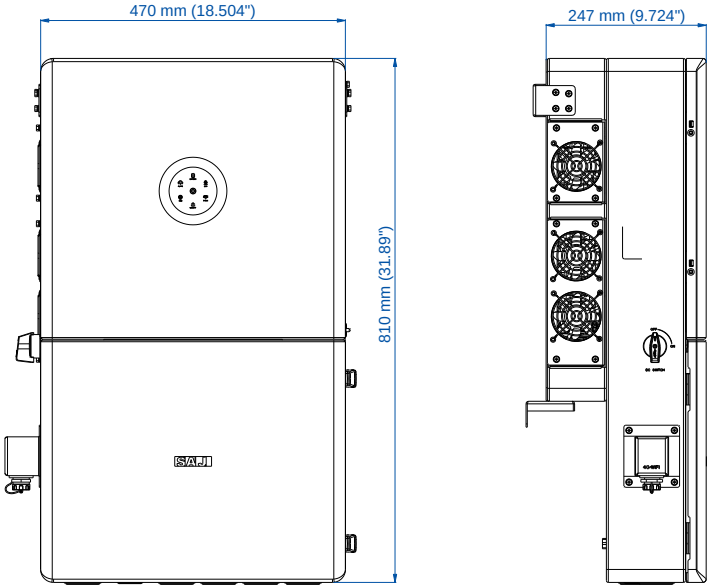



Figure 2.1. Inverter dimension

## 2.4. Knockout holes, switch, and button

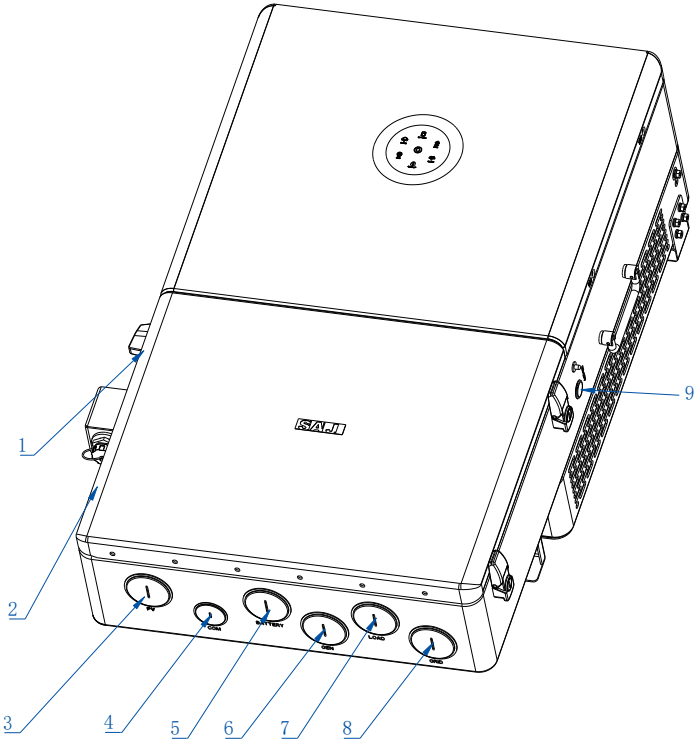



Figure 2.2. Knockout holes, switch, and button

| Callout | Silkscreen | Description |
|---|---|---|
| 1 | DC Switch | DC switch |
| 2 | 4G/WIFI | For connecting the communication module |
| 3 | PV | For connecting the PV cables |
| 4 | COM | For connecting the communication cables |
| 5 | BATTERY | For connecting the battery cables |
| 6 | GEN | For connecting the generator cables |
| 7 | LOAD | For connecting the load cables |
| 8 | GRID | For connecting the grid cable |
| 9 | ON/OFF | Start button. Press this button to start or shut down the inverter. |

Table 2.1. Description of the knockout holes, switch, and button

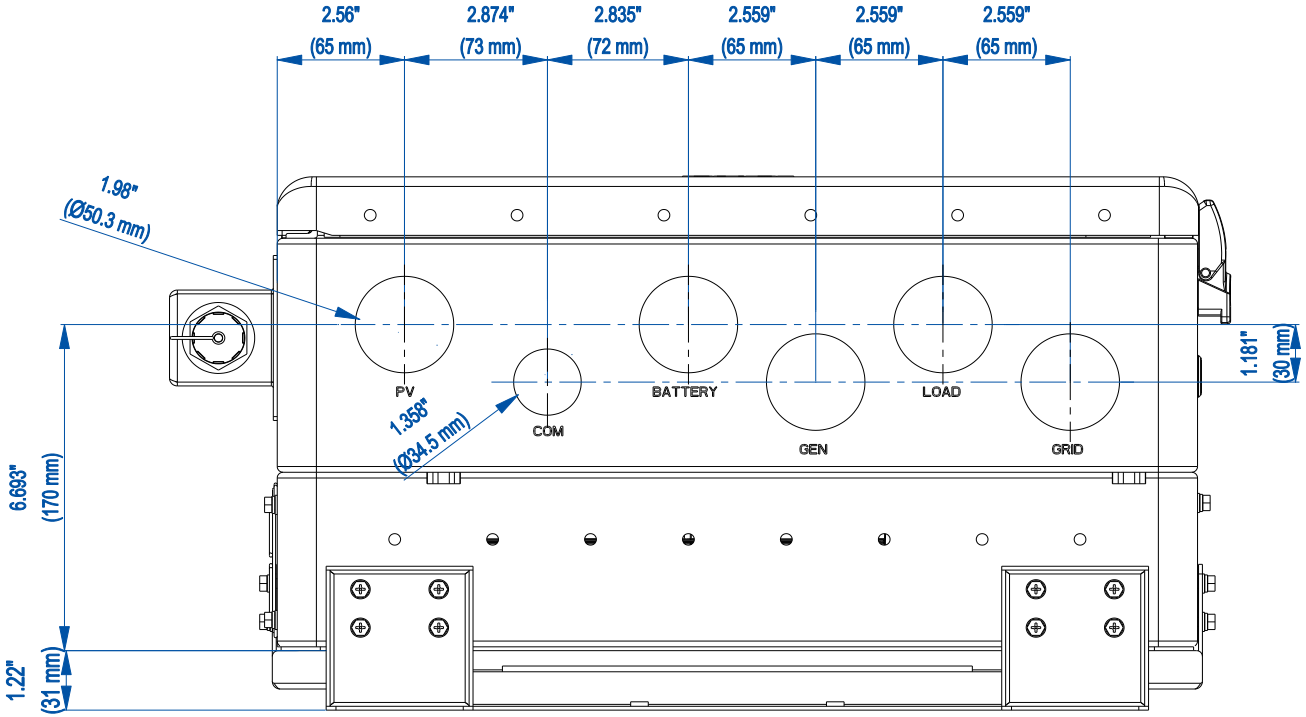



Figure 2.3. Dimension of knockout holes

| Knockout hole | Dimension | Knockout hole | Dimension |
|---|---|---|---|
| PV | ϕ50.3 mm (ϕ1.98") | COM | ϕ34.5mm (ϕ1.358") |
| BATTERY | ϕ50.3 mm (ϕ1.98") | GEN | ϕ50.3 mm (ϕ1.98") |
| LOAD | ϕ50.3 mm (ϕ1.98") | GRID | ϕ50.3 mm (ϕ1.98") |

Table 2.2. Dimension of knockout holes

## 2.5. Electrical terminals in the junction box

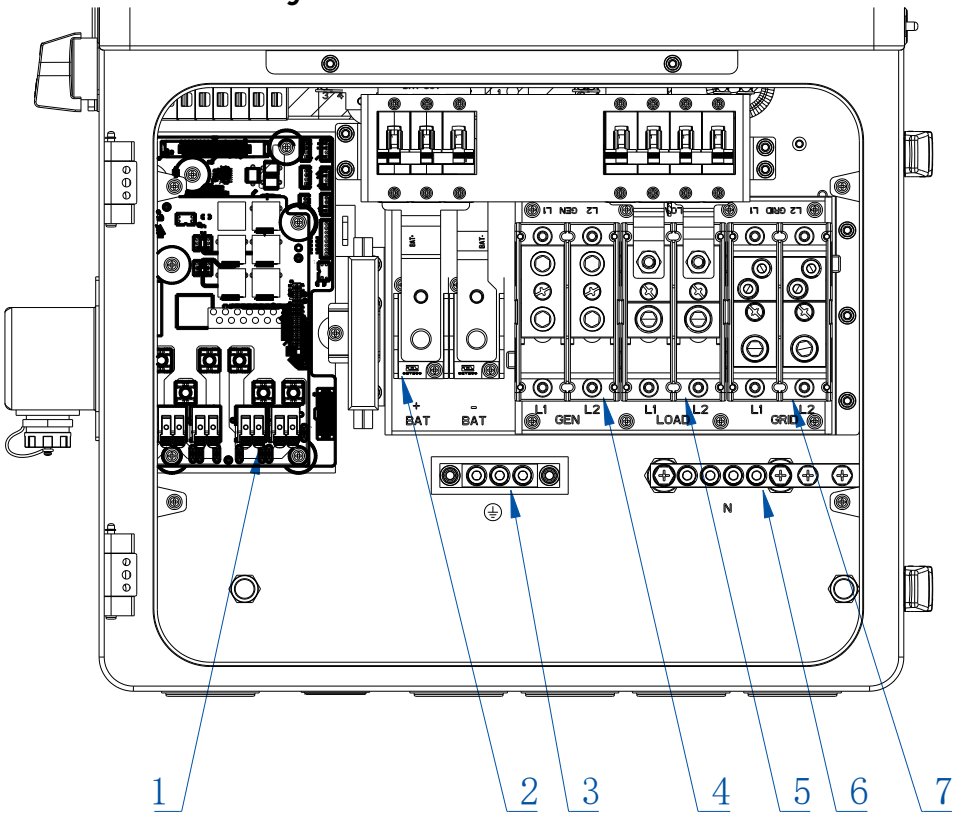



Figure 2.4. Electrical terminals in the junction box

| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | PV1–PV4 | 2 | BAT (BAT+ and BAT-) |
| 3 | PE | 4 | GEN |
| 5 | LOAD (L1 and L2) | 6 | N |
| 7 | GRID (L1 and L2) | / | / |

Table 2.3. Description of electrical terminals

## 2.6. LED indicators

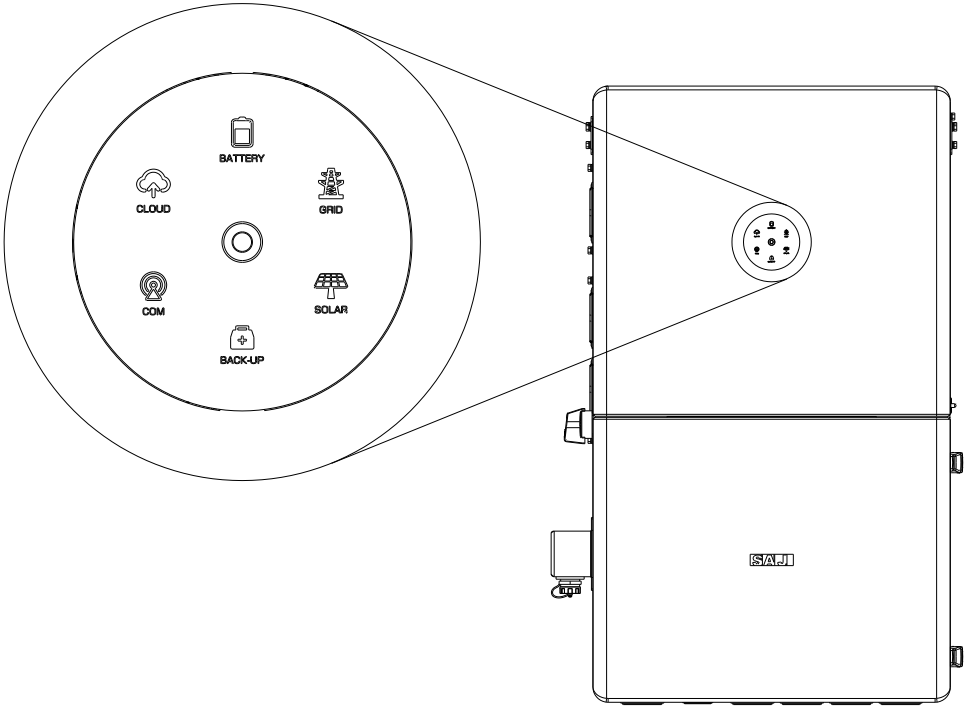



Figure 2.5. LED indicators

| LED indicator | Status | Description |
|---|---|---|
| | Off | The inverter is powered off. |
| | Breathing 6s | The inverter is in initialization or standby state. |
| | Solid on | The inverter is working properly. |
| | Breathing 6s | The inverter is upgrading. |
| | Solid on | The inverter is not working properly. |
| System | Solid on | The battery is importing electricity from the grid. |
| | On 1s, off 1s | The battery is exporting electricity to the grid. |

| | | |
|---|---|---|
| | On 1s, off 3s | No electricity is imported from or exported to the grid. |
| | Off | The inverter is disconnected from the grid. |
|  Battery | Solid on | The battery is in discharging status. |
| | On 1s, off 1s | The battery is in charging status. |
| | Off | The battery is disconnected or inactive. |
|  Grid | Solid on | The grid is connected and working properly. |
| | On 1s, off 1s | The inverter is trying to connect to the grid. |
| | On 1s, off 3s | The grid is not working properly. |
| | Off | No grid is detected. |
|  PV | Solid on | The PV array is working properly. |
| | On 1s, off 1s | The PV array is not working properly. |
| | Off | The PV array is not working. |
|  Backup | Solid on | The AC-side load is working properly. |
| | On 1s, off 1s | The AC-side load is overloaded. |
| | Off | The AC-side load is disconnected or off. |
|  Communication | Solid on | In good communication with both the meter and BMS. |
| | On 1s, off 1s | In good communication with the meter but lost communication with the BMS. |
| | On 1s, off 3s | In good communication with the BMS but lost communication with the meter. |
| | Off | Lost communication with the meter and the BMS. |
|  Cloud | Solid on | The inverter is connected to the cloud. |
| | On 1s, off 1s | The inverter is trying to connect to the cloud. |
| | Off | The inverter is disconnected from the cloud. |

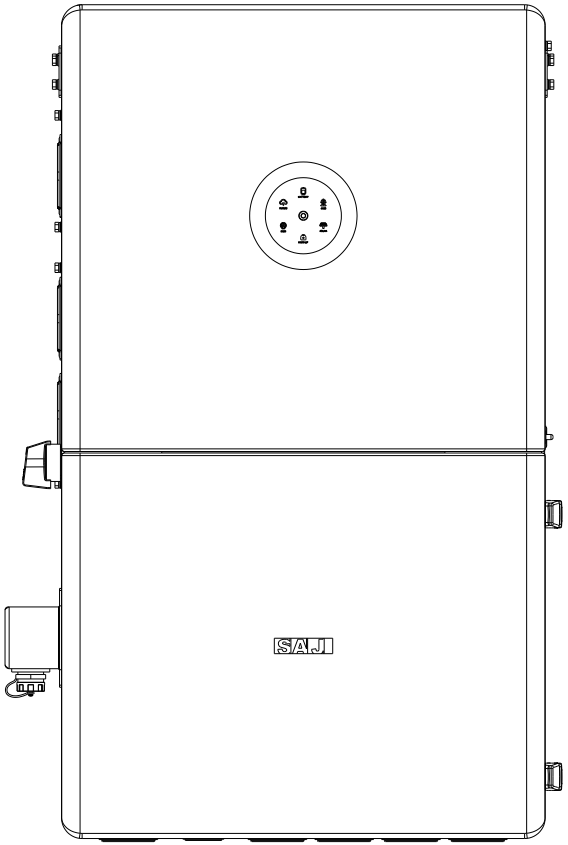
Table 2.2. Description of the LED indicator status

# 2.7. Datasheet

| Model | H2-5K-LS3-US | H2-7.6K-LS3-US | H2-9.6K-LS4-US | H2-11.4K-LS4-US |
|---|---|---|---|---|
| **PV String Input** | | | | |
| Max. PV array power [Wp]@STC | 7500 | 11400 | 14400 | 17100 |
| Max. DC voltage[V] | 600 | | | |
| MPPT voltage range[V] | 90–510 | | | |
| Nominal DC voltage[V] | 380 | | | |
| Start voltage [V] | 100 | | | |
| Min. input voltage [V] | 80 | | | |
| Max. input current[A] | 16/16/16 | | 16/16/16/16 | |
| Max. short current [A] | 19.2/19.2/19.2 | | 19.2/19.2/19.2/19.2 | |
| Quantity of strings per MPPT | 1/1/1 | | 1/1/1/1 | |
| Quantity of MPPT | 3 | | 4 | |
| DC switch | Integrated | | | |
| **Battery Port Connection** | | | | |
| Battery type | Lead-acid battery/Lithium battery | | | |
| Voltage range [V] | 40–60 | | | |
| Start voltage [V] | 42 | | | |
| Max. charging/discharging current [A] | 152 | | 228 | |
| **AC Output [On-grid]** | | | | |
| Rated AC power [W]@208 V AC | 4330 | 6580 | 8320 | 9880 |
| Rated AC power [W]@240 V AC | 5000 | 7600 | 9600 | 11400 |
| Rated AC current [A]@208/240 V AC | 20.8 | 31.7 | 40 | 47.5 |
| Rated AC voltage and range | L1/L2/N/PE, 120 V AC (split-phase), 208 V AC (2/3 phase)<br>L1/L2/PE: 240 V AC<br>● 120 V: 106–132 V<br>● 240 V: 211–264 V<br>● 208 V: 183–229 V | | | |

| Model | H2-5K-LS3-US | H2-7.6K-LS3-US | H2-9.6K-LS4-US | H2-11.4K-LS4-US |
|---|---|---|---|---|
| Rated output frequency and range [Hz] | ● 50 Hz: 47–53<br>● 60 Hz: 57–63 | | | |
| Power factor [cos Φ] | 0.8 leading–0.8 lagging | | | |
| Total harmonic distortion [THDi] | < 3% | | | |
| **AC Output [Back-up Mode]** | | | | |
| Rated AC power [W]@208 V AC | 4330 | 6580 | 8320 | 9880 |
| Rated apparent power [VA]@240 V AC | 5000 | 7600 | 9600 | 11400 |
| Rated AC current [A]@208/240 V AC | 20.8 | 31.7 | 40 | 47.5 |
| Peak output power [VA, 1 min] | 6000 | 8360 | 10560 | 12540 |
| Peak output power [VA, 10s] | 7500 | 11400 | 14400 | 17100 |
| Rated output voltage [V] | 120 / 208 / 240 | | | |
| Rated output frequency and range [Hz] | ● 50 Hz: 45–55<br>● 60 Hz: 55–65 | | | |
| Output THDV (@liner load) | < 3% | | | |
| Switching time | < 10 ms | | | |
| **AC Input [GEN]** | | | | |
| Maximum continuous input power@240V | 5000 | 7600 | 9600 | 11400 |
| Rated voltage [V] | 120 / 208 / 240 | | | |
| Rated current [A] | 20.8 | 31.7 | 40 | 47.5 |
| **Efficiency** | | | | |
| Maximum efficiency | 97.20% | | | |
| CEC efficiency | 96.50% | | | |
| AC-Bat maximum efficiency | 94.20% | | | |
| **Protection &Features** | | | | |
| Overvoltage protection | Integrated | | | |
| ISO monitoring | Integrated | | | |
| DC component monitoring | Integrated | | | |
| Monitoring of ground fault current | Integrated | | | |

| Model | H2-5K-LS3-US | H2-7.6K-LS3-US | H2-9.6K-LS4-US | H2-11.4K-LS4-US |
|---|---|---|---|---|
| Grid monitoring | Integrated | | | |
| AC output short circuit protection | Integrated | | | |
| AC grounding detection | Integrated | | | |
| DC surge protection | Type II | | | |
| AC surge protection | Type II | | | |
| Island protection monitoring | Integrated | | | |
| AFCI | Integrated | | | |
| RSD | Integrated | | | |
| **Interface** | | | | |
| Display | LED/App (via Bluetooth) | | | |
| Communication port | RS485/Wi-Fi/CAN | | | |
| Communication | Wi-Fi/4G (optional) | | | |
| Load Monitor | 24 hours | | | |
| **General Data** | | | | |
| Topology type | Transformer-less (DC-AC) | | | |
| Standby power consumption [W] | < 35 | | | |
| Operating temperature range | -40℃ to +60℃ (-40℉ to 140℉)<br>[Load shedding operation above 45℃] | | | |
| Cooling method | Air fan cooling | | | |
| Relative humidity | 0%-100% RH, no condensation | | | |
| Altitude | < 2000 m | | | |
| Noise [dBA] | < 50 | | | |
| Ingress protection | NEMA 4X | | | |
| Mounting | Wall mounting | | | |
| Dimension [H x W x D] | 810*470*247 mm (31.89*18.504*9.724 inch) | | | |
| Weight | 48 kg (105.82 lb) | | | |
| Warranty [year] | 10 years | | | |
| Applicable standard | UL 1741 and 1741SB; IEEE1547 and 1547.1; UL1699B, UL1998; CSA STD. C22.2 No.107.1, FCC, Part15, Class B, Rule21, HE CO 14H | | | |


SAJ

# 3.

# TRANSPORTATION AND STORAGE

## 3.1. Transportation

- The transportation service provider must be qualified to transport dangerous goods.
- Keep less than 4 cartons of inverter in one stack.

## 3.2. Storage

- Store it in a dry and ventilated environment and keep it away from heat sources.
- Keep the inverter in an environment with storage temperature at -40 ° C to +60 ° C (-40℉ to 140℉), humidity 5% to 95% RH.

# 4.

# INSTALLATION

## 4.1. Precautions

For safety, be sure to read all the safety instructions carefully prior to any works and observe the appropriate rules and regulations of the country or region where you installed the energy storage system.

**DANGER**

- Dangerous to life due to potential fire or electricity shock.
- Do not install the inverter near any inflammable or explosive items.

**NOTICE**

- This equipment meets the pollution degree.
- Inappropriate or the harmonized installation environment may jeopardize the life span of the inverter.
- Installation directly exposed under intensive sunlight is not recommended.
- The installation site must be well ventilated.

## 4.2. Check the system topology diagram

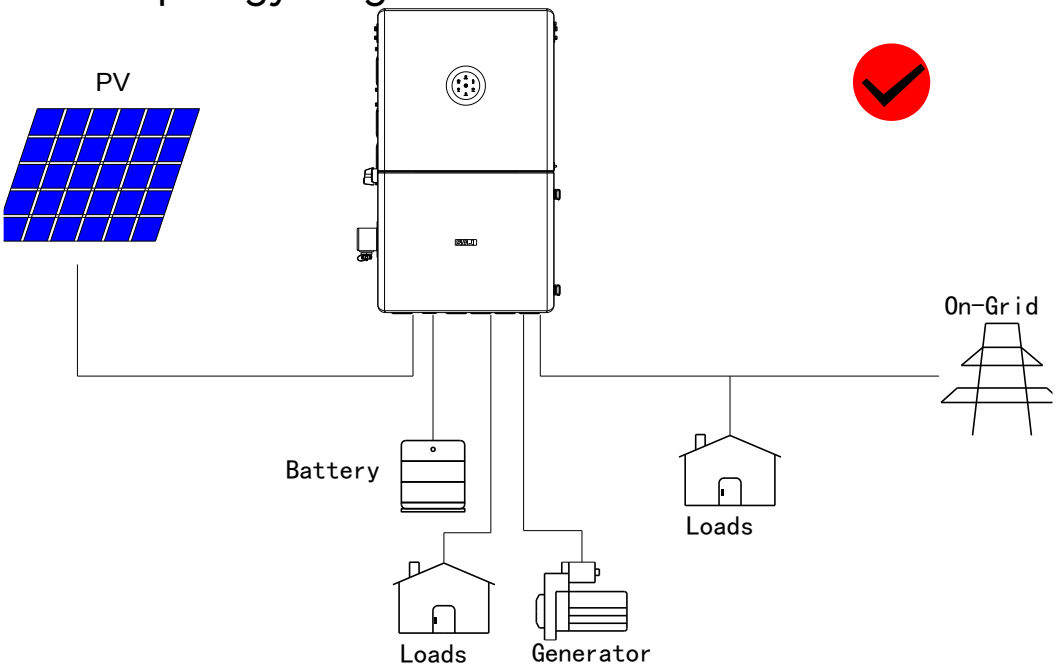



Figure 4.1. Correct system topology diagrams

The following installation examples should be avoided. Any damage caused will not be covered by the warranty policy.

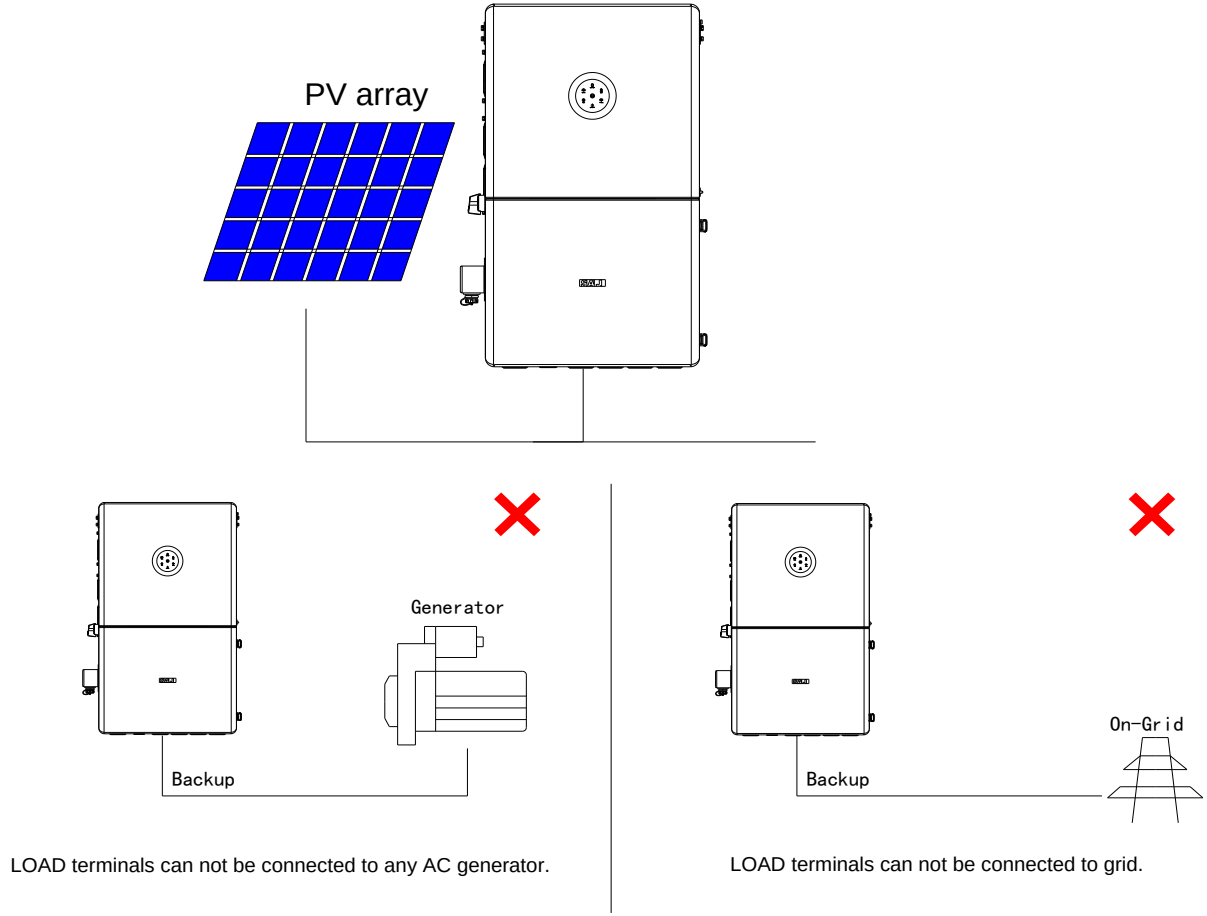



Figure 4.2. Incorrect system topology diagrams

# 4.3. Determine the installation site

Read the following sections to cautiously determine the installation site.

The safety regulations vary in different countries and regions. Follow local safety regulations.

## 4.3.1. Installation environment requirements

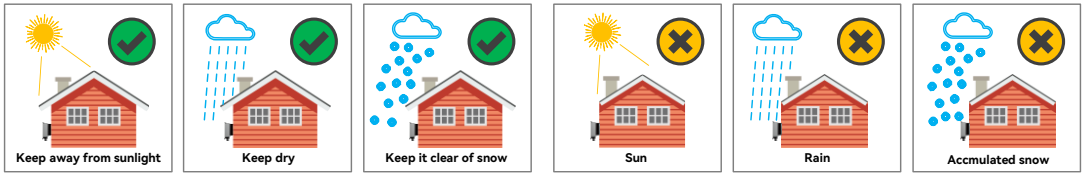



Figure 4.3. Installation location

- Do not expose the device to direct solar irradiation as this could cause power derating due to overheating.
- The installation environment must be free of inflammable or explosive materials.
- The device must be installed in a place away from heat sources.
- Do not install the device at a place where the temperature changes extremely.
- Keep the device away from children.
- Do not install the device at daily working or living arears, including but not limited to the following areas: bedroom, lounge, living room, study, toilet, bathroom, theater, and attic.
- When installing the device at the garage, keep it away from the driveway.
- Keep the device from water sources such as taps, sewer pipes and sprinklers to prevent water seepage.
- It is recommended that the device be installed in an area where its status can be easily checked and maintained in case of failure or emergency.

## 4.3.2. Installation location requirements

- The device employs natural convection cooling, and it can be installed indoor or outdoor.
  - Indoor requirement: The battery connected to the device CANNOT be installed in the habitable rooms.
  - Outdoor requirement: The height of the device from the ground should be considered to prevent the device from soaking in water. The specific height is determined by the site environment.

- Install the device vertically. Do not install it forward-tilted, horizontally or upside down. The maximum allowable backward-tilted angle is 15 degrees.

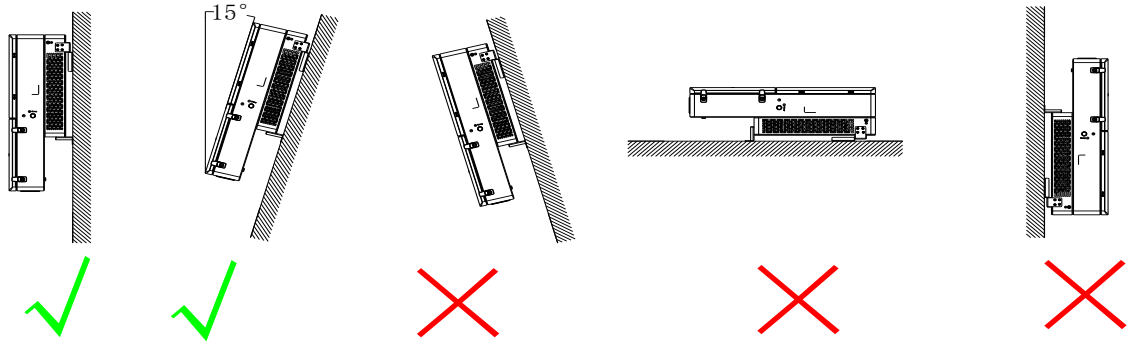



Figure 4.4. Installation limitations

- Choose a solid and smooth wall to ensure that the inverter can be installed securely on the wall. Make sure that the wall can bear the weight of the inverter and accessories.
- Reserve enough clearance around the inverter to ensure a good air circulation at the installation area, especially when multiple inverters need to be installed in the same area.

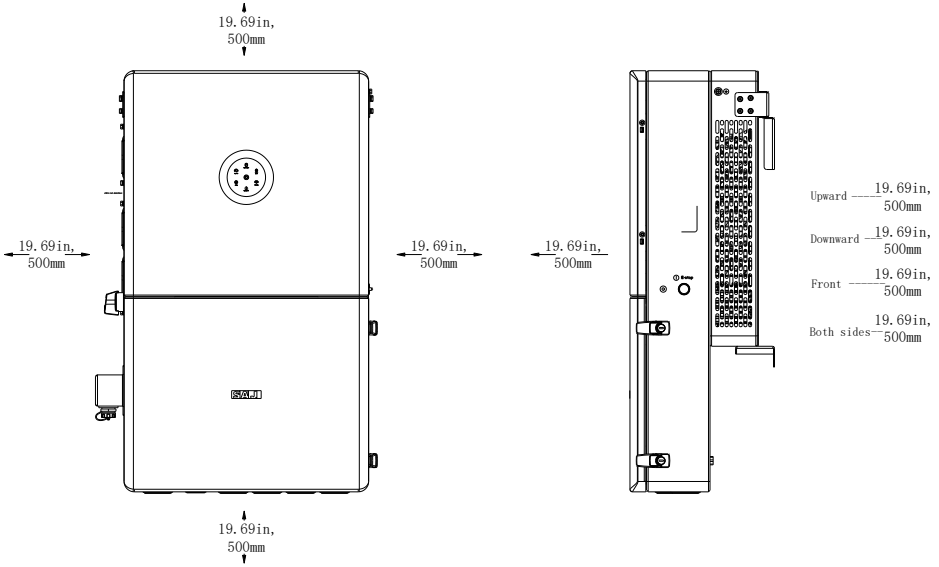



Figure 4.5. Installation clearance

# 4.4. Prepare installation tools

The tools illustrations are for your reference. Installation tools include but are not limited to the following recommended ones. Use other auxiliary tools based on site requirements.

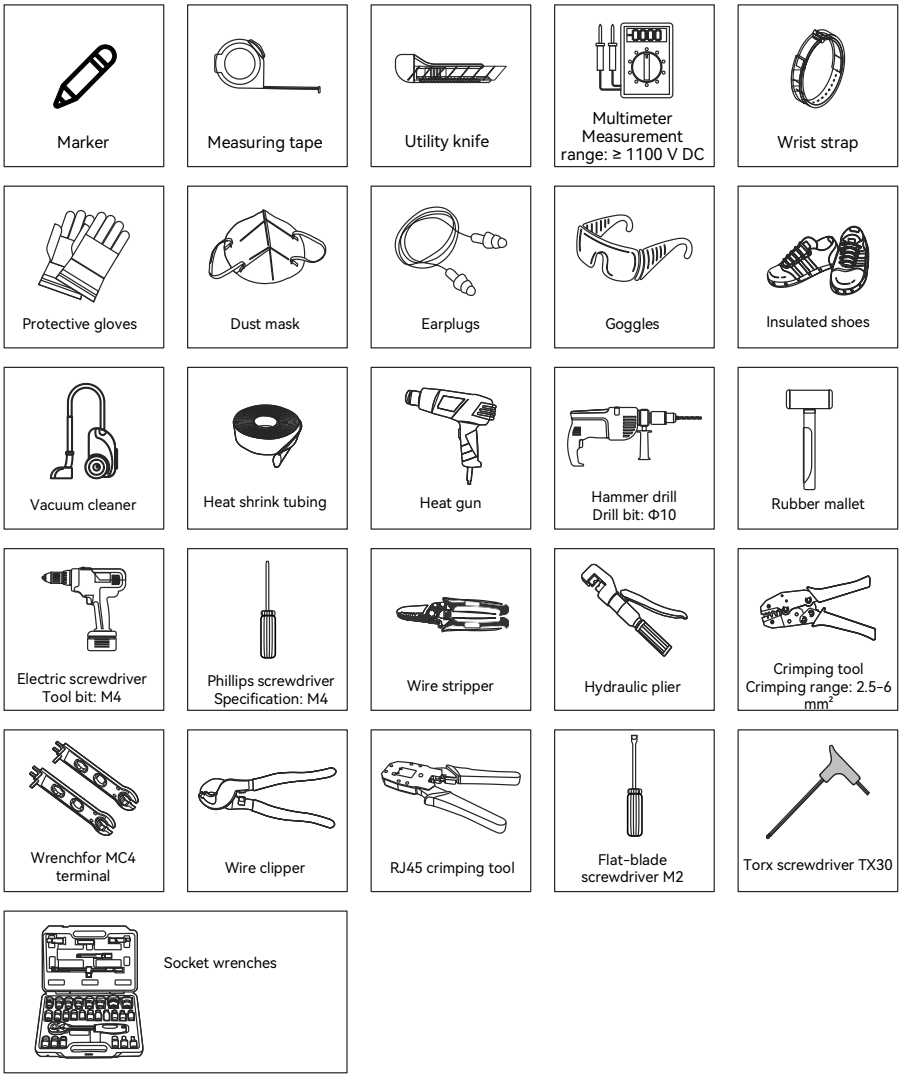



Figure 4.6. Suggested installation tools

# 4.5. Unpacking

## 4.5.1. Check the outer packing

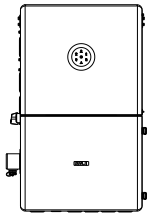
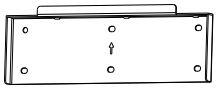
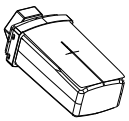
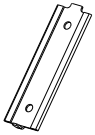
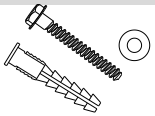
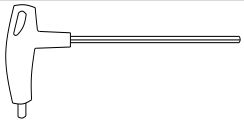
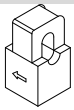
Although SAJ's products have thoroughly tested and checked before delivery, there is possibility that the products may suffer damages during transportation.

1. Check the outer packing package for any damage, such as holes and cracks.
2. Check the equipment model.

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

## 4.5.2. Check the package contents

1. Verify that the shipment contains everything that you expected to receive. Contact after-sales if there are missing or damaged components.
2. Place the connectors separately after unpacking to avoid confusion for connection of cables.

| | | | |
|---|---|---|---|
|  |  |  |  |
| Inverter | Mounting plate | Communication module | Flathead tool |
|  |  |  |  |
| Key x4 | Allen wrench | M6*50 screw x8<br>Expansion tube x8 | Hex wrench |
|  |  | | |
| Current transformer x2 | Printed documents | | |

# 4.6. Install the inverter

**Before you start**

Make sure that the wall can bear the weight of the inverter and accessories.

**Procedure**

Step 1. Use a positioning jig to mark eight holes on the wall according to the following figure. Then, drill eight holes on the wall.

Alternatively, you can place the mounting plate onto the wall and mark upper six holes and place the inverter onto the wall to mark the bottom two holes.

**Notes:**

- Reserve enough distance at the inverter bottom for installing the metal cable conduits.
- The upper six holes are reserved for installing the upper mounting plate while the bottom two holes are for the bottom locking brackets of the inverter.

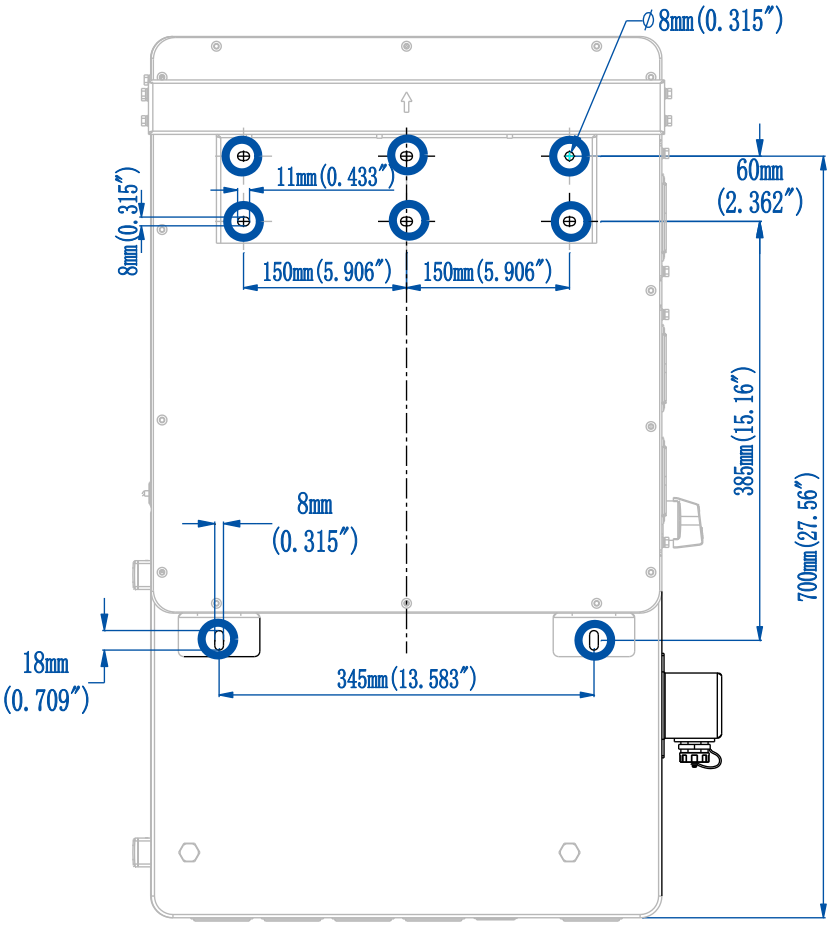



Figure 4.7. Eight holes for installing the mounting bracket

Step 2. Use six M6*50 screws to secure the mounting plate to the wall.

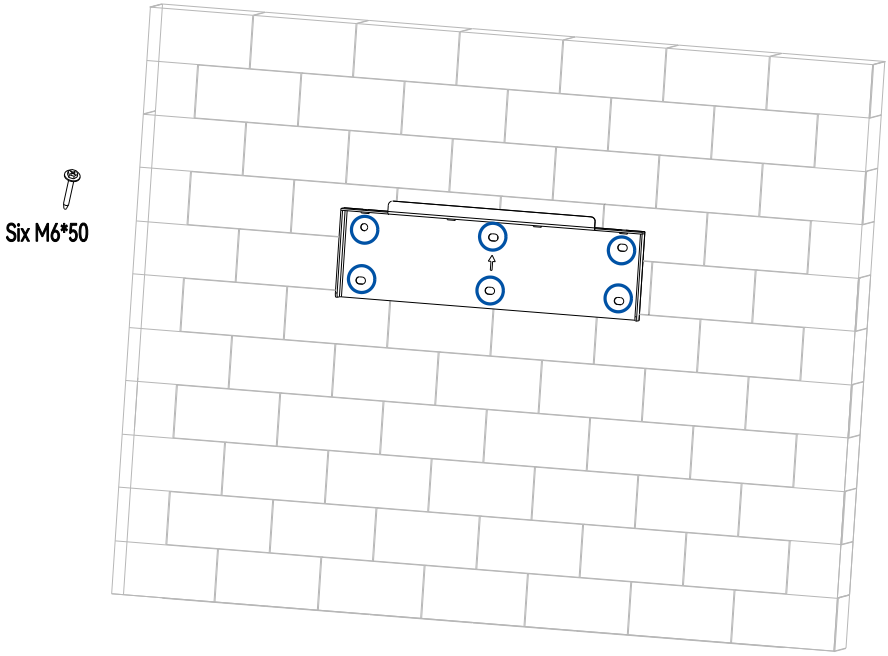



Figure 4.8. Inserting eight expansion tubes into the holes

Step 3. Mount the inverter onto the mounting plate. Insert two M6*50 screws (1.2-1.5 N·m) on each bottom side of the inverter to secure it to the wall.

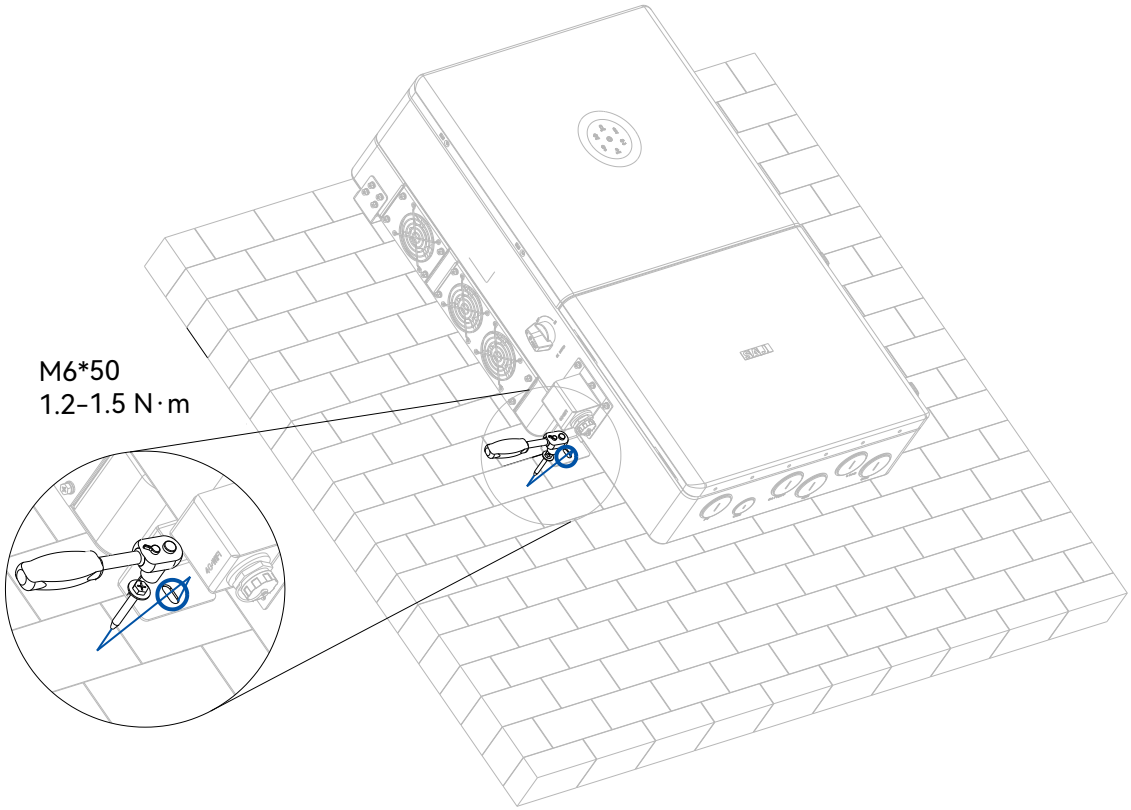
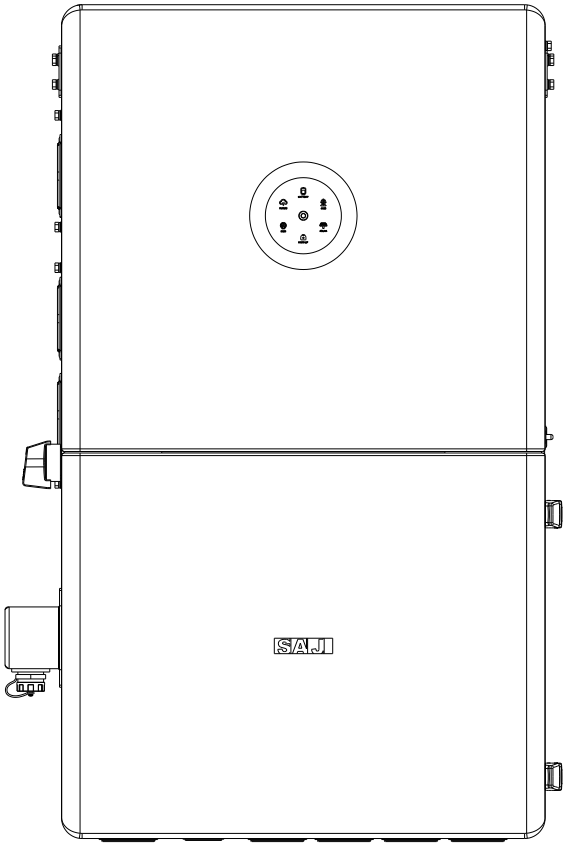



Figure 4.9. Securing the bottom locking brackets

Step 4. If required, install metal conduits to the knockout holes at the bottom of the inverter.

## 4.7. Install the battery

For details, refer to the battery user manual.


SAJ

# 5.

# ELECTRICAL CONNECTION

## 5.1. Safety instructions

Electrical connection must only be operated on by professional technicians. Operators must be aware that the inverter is a bi-power supply equipment. Before connection, necessary protective equipment must be employed by technicians including insulating gloves, insulating shoes, and safety helmet.

| DANGER |
| --- |
| • Dangerous to life due to potential fire or electricity shock.<br>• Do not install the inverter near any inflammable or explosive items.<br>• Dangerous to life due to potential fire or electricity shock.<br>• When it is powered on, the equipment should in conformity with national rules and regulations.<br>• The direct connection between the inverter and high voltage power systems must be operated by qualified technicians in accordance with local and national power grid standards and regulations. |

| WARNING |
| --- |
| • The PV arrays will produce a DC voltage when exposed to sunlight. |

| NOTICE |
| --- |
| • Any improper operation during cable connection can cause device damage or personal injury.<br>• Electrical connection should in conformity with proper stipulations, such as stipulations for cross-sectional area of conductors, fuses, and ground protection.<br>• The overvoltage category of the DC input port is II and that of the AC output port is III. |

## 5.2. Connect the grounding cable

**About this task**

This additional grounding cable must be connected before other electrical connection.

The cable needs to be prepared by the user. It is recommended to use a cable with a 6 $mm^2$ conductor cross-sectional area.

**Note**: The inverter cannot be used with functionally earthed PV Arrays.

**Procedure**

Step 1. Assemble the cable and OT/DT terminal.

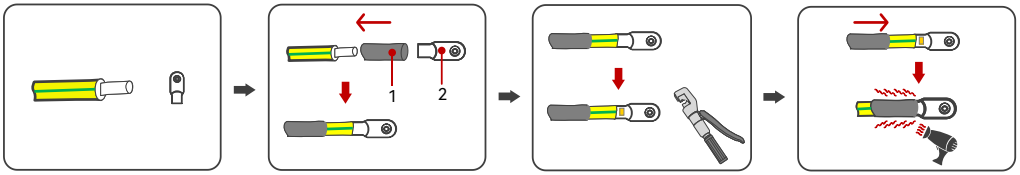



Figure 5.1. Preparing the grounding cable

| | | | |
|---|---|---|---|
| 1 | Heat shrink tube | 2 | OT/DT terminal |

Step 2. Loosen the screw and connect the grounding cable.

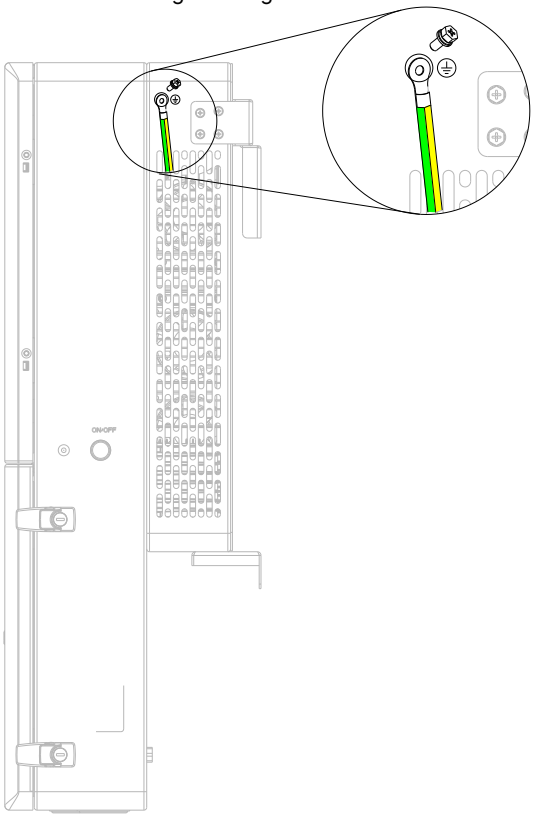


Figure 5.2. Connecting the grounding cable

## 5.3. Open the junction box of the inverter

Step 1. Use the provided key to open the two locks on the right side of the inverter. Then, lift the cover leftwards.

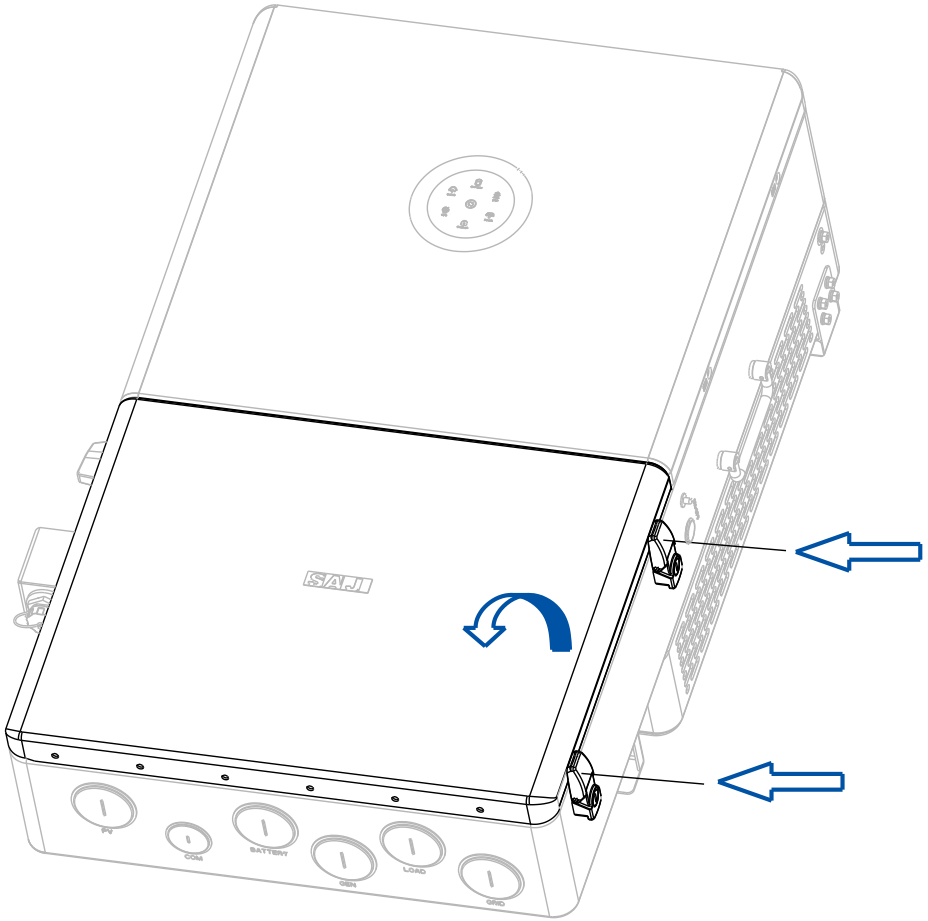


Figure 5.3. Opening the junction box

Step 2. Loosen the four screws to unlock the internal plate. Lift the plate outwards.

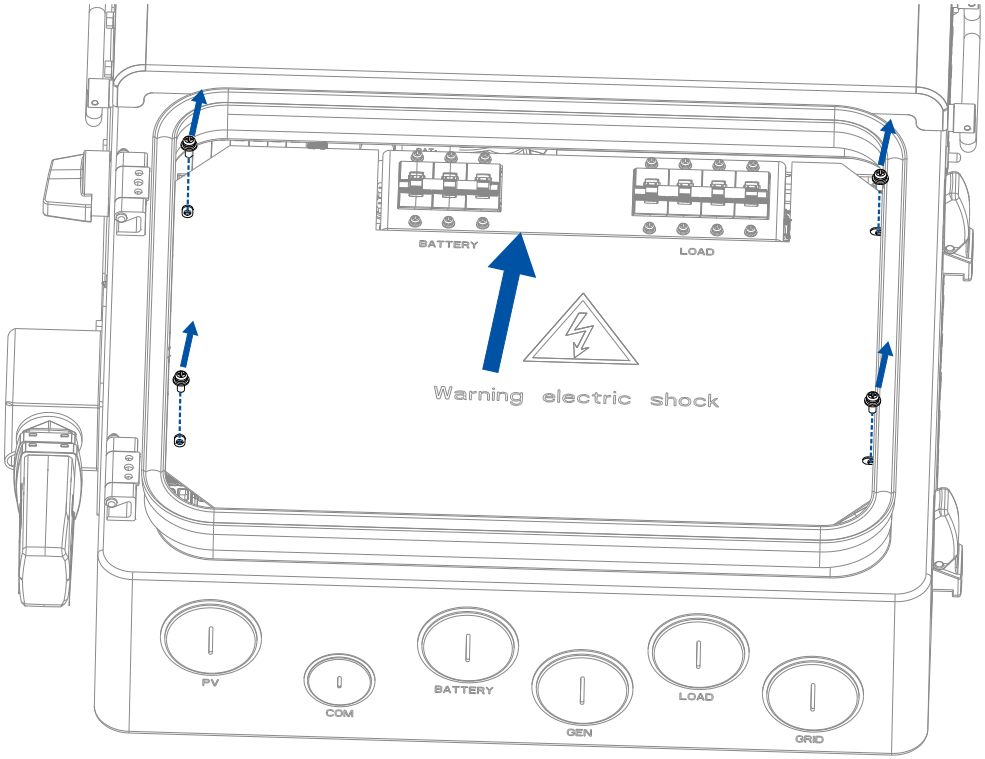



Figure 5.4. Removing the internal plate

# 5.4. Assemble the AC-side electrical connection

**About this task**

For safety operation and regulation compliance, it is required to install a circuit breaker between the grid and the inverter.

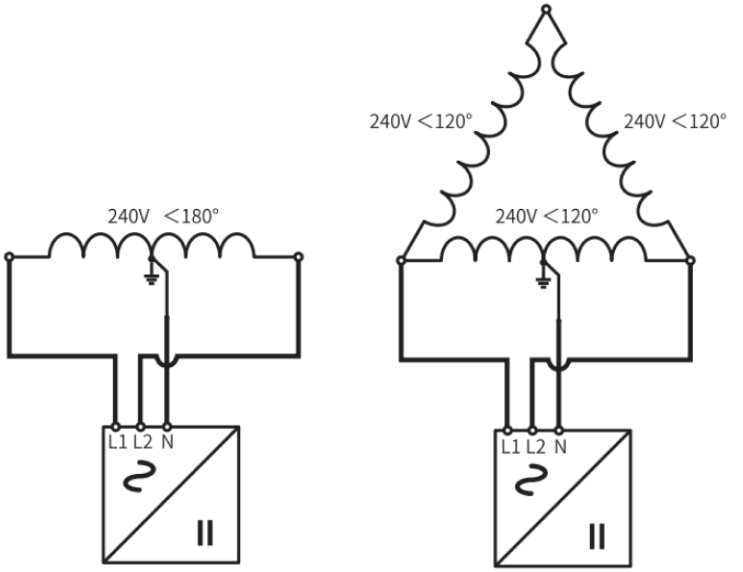



Figure 5.5. AC grid

Choose the breaker and cables according to the following table.

**Note:** If the inverter is installed far away from the grid connection point, select a larger cable size to ensure that the voltage drop from the grid connection point to the inverter is within 2% of the grid voltage.

| Inverter Model | AC Breaker | Cables Size |
|---|---|---|
| H2-5K-LS3-US | 45 A | 10 AWG |
| H2-7.6K-LS3-US | 70 A | 8 AWG |
| H2-9.6K-LS4-US | 85 A | 6 AWG |
| H2-12K-LS4-US | 100 A | 6 AWG |

Table 5.1. Recommended cables and AC breakers

| ⚠ WARNING |
| --- |
| • Risk of personal injury due to electric shock!<br>• Ensure that the equipment is powered off before performing wiring operations.<br>• Improper wiring of AC conductors will result in risk of electrical failure or equipment damage. Please ensure that all connections are made correctly in accordance with the instructions in this document and in accordance with local wiring codes and regulations before applying power to the unit. |

**Procedure**

Step 1. Strip off the insulation on the cable ends. (20-mm/0.79-inch length for LOAD and GRID cables; 10-mm/0.39-inch length for GEN cables)

If needed, you can install a terminal on the cable end, as shown below:

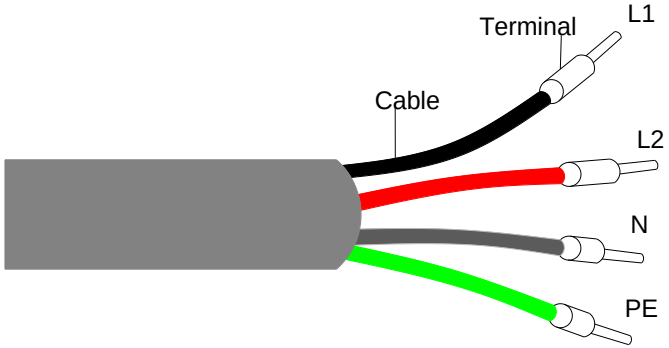



Figure 5.6. Installing terminals on the cable ends

Step 2. Use a flathead tool to remove the knockout hole fillers. (Inserting into the hole and anti-clock rotation)

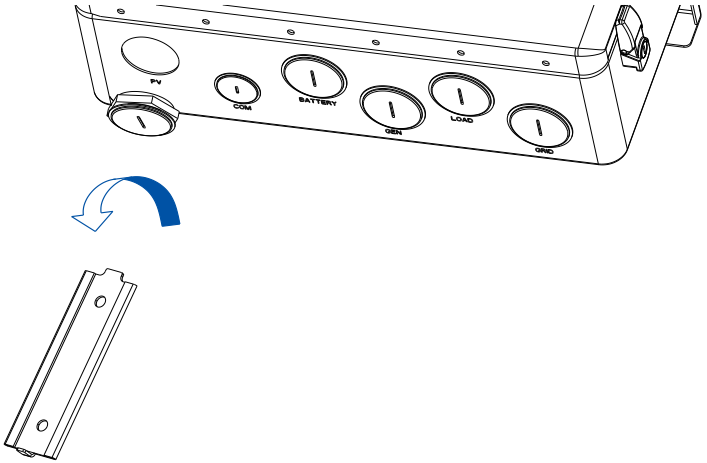



Figure 5.7. Removing the knockout hole fillers

Step 3. According to the silkscreens, insert the grid cables through the corresponding knockout hole and insert them to corresponding terminals L1, L2, L3, N, and PE. Then, use a standard torque to tighten the screws on the terminals to secure the cable connection.

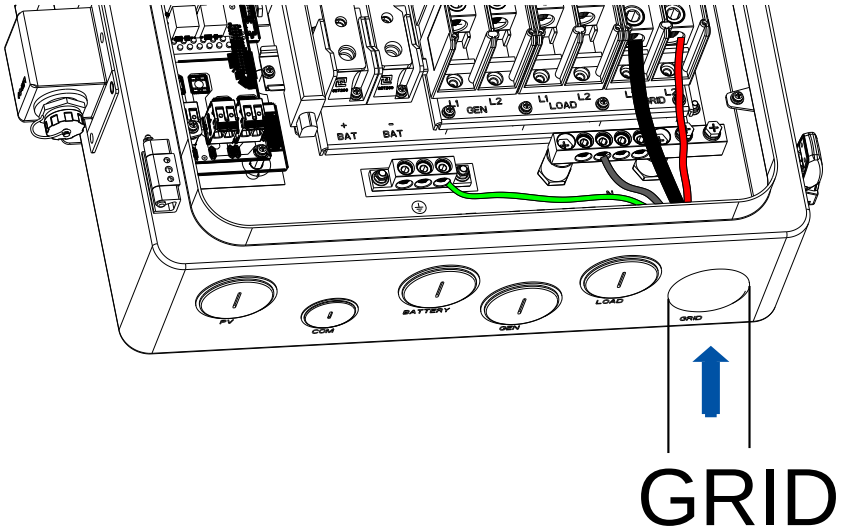



Figure 5.8. Connecting the grid cables

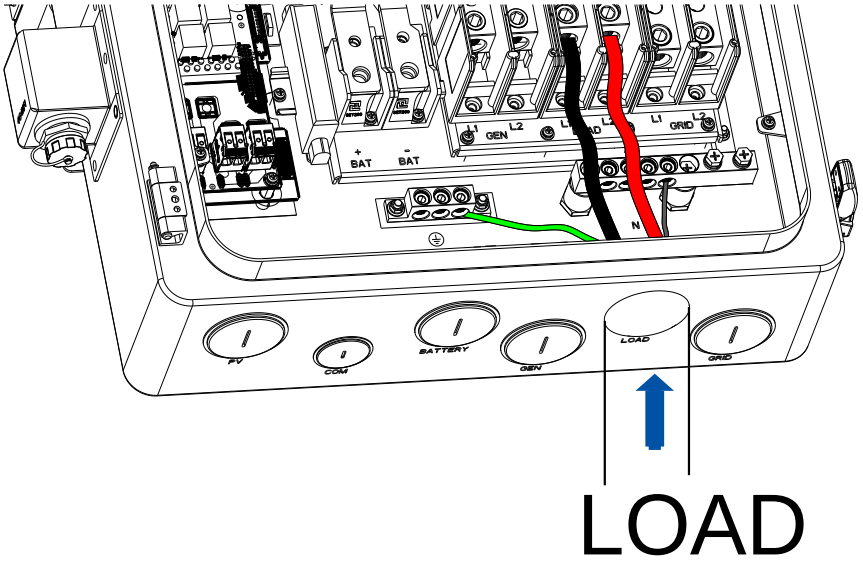



Figure 5.9. Connecting the load cables

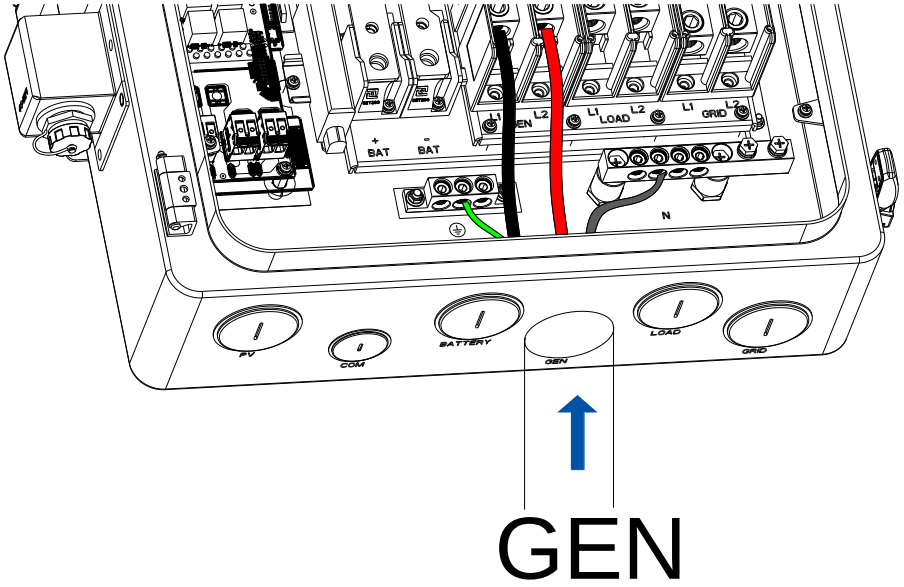



Figure 5.10. Connecting the generator cables

# 5.5. Connect the battery to the Inverter

**About this task**

For battery details, refer to battery product documentation.

**CAUTION:** Do NOT connect the positive port to the negative port on one battery. This will short-circuit this battery, causing serious battery damage.

**Procedure**

Step 1. Strip off the insulation (20-mm/0.79-inch length) on the cable ends.


| Cable | Recommended cable | Recommended torque |
|---|---|---|
| BAT+, BAT- | 2/0 AWG | 80 LB-IN (9. N·m) |

Install an M10 bronze terminal on the cable end, as shown below:

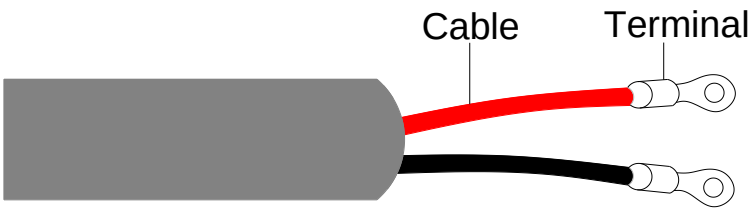



Figure 5.11. Putting terminals on the cable ends

Step 2. Insert the cables through the BATTERY knockout hole and connect them to the battery terminals in the junction box.

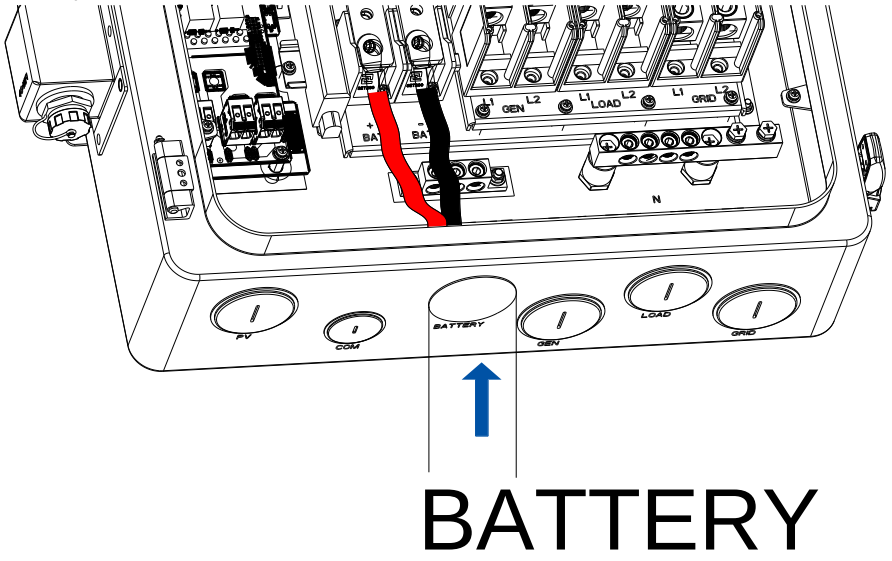



Figure 5.12. Connecting the battery cables

## 5.6. Assemble the PV-side electrical connection

Step 1. Strip off the insulation (20-mm/0.79-inch length) of the cable ends. User cable ferrules if the cable is of multi-strand type.


| Cable | Recommended cable |
|---|---|
| PV+, PV- | 12 AWG |

**NOTICE**

- Connect the positive connector to the positive side of the solar panels and connect the negative connector to the negative side of the solar side. Be sure to connect them in the right position.

If needed, you can install a terminal on the cable end, as shown below:

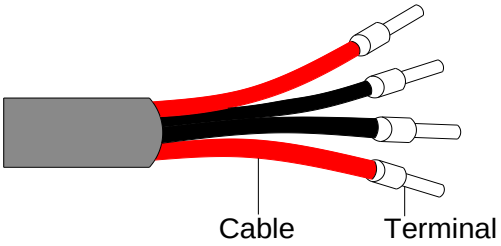



Figure 5.13. Putting terminals on the cable ends

Step 2. Ensure that the DC switch on the left side of the inverter is in OFF position.

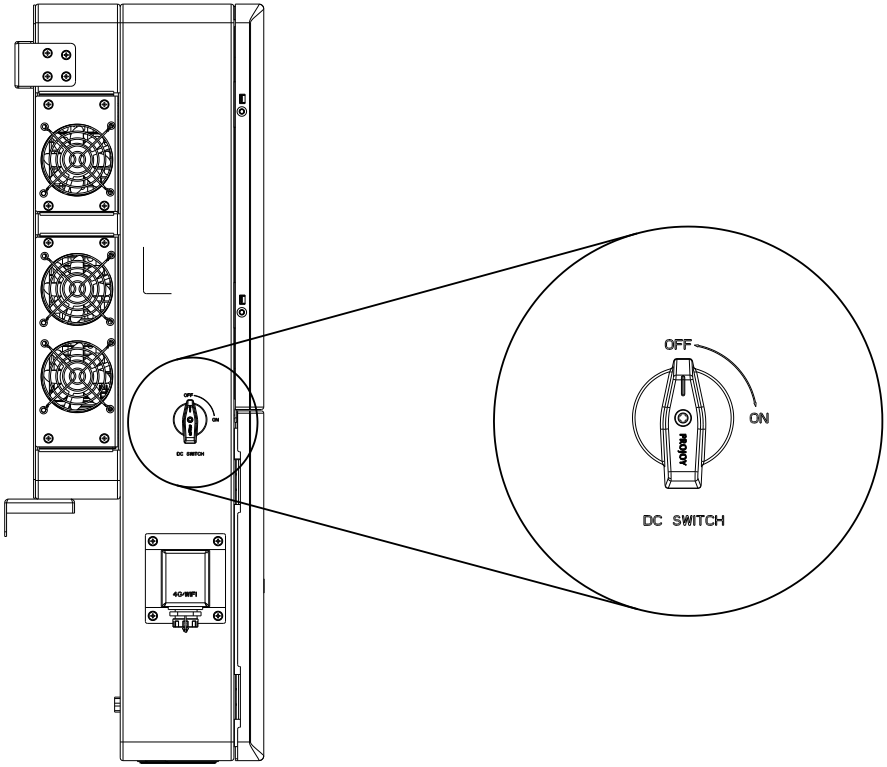



Figure 5.14. DC switch in OFF position

Step 3. Insert the PV cables through the PV knockout hole and connect them to the PV terminals in the junction box.

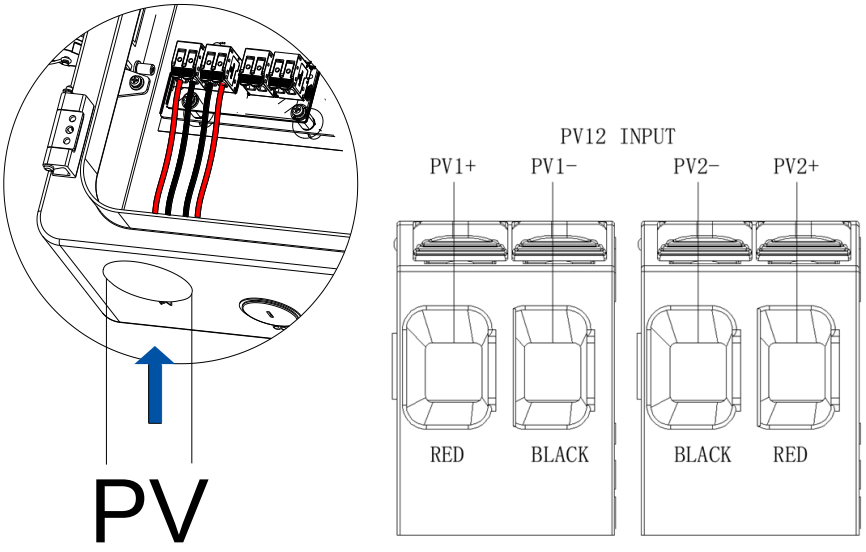



Figure 5.15. Connecting the cables to PV1 and PV2

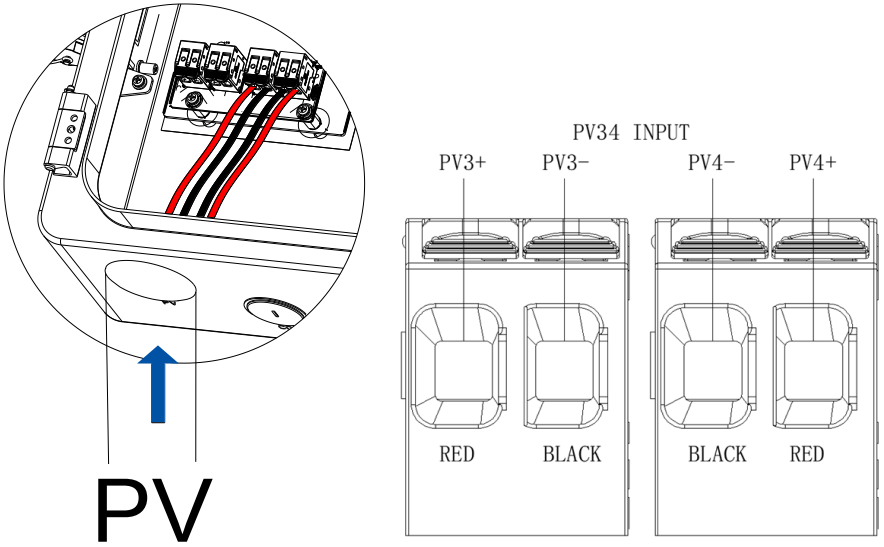


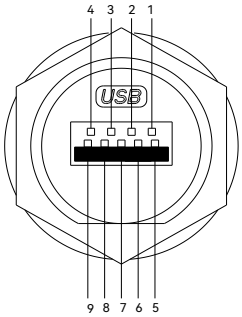

Figure 5.16. Connecting the cables to PV3 and PV4

# 5.7. Assemble the communication connection

## 5.7.1. Install the communication module

**About this task**

An RS232 USB communication port is provided at the bottom of the junction box. This port is used to connect the communication module, such as a Wi-Fi or AIO3 module.




| Pin | Description |
|---|---|
| 1 | GND: Ground wire |
| 2 | 485A: 485 communication pin A |
| 3 | 485B: 485 communication pin B |
| 4 | CANL: Low speed CAN signal |
| 5 | +5V: Power supply |
| 6 | 232RX: Send data |
| 7 | 232TX: Receive data |
| 8 | CANH: High speed CAN signal |
| 9 | NULL: Null |

**Procedure**

Step 1. On the left side of the inverter, remove the cover from the 4G/WIFI port.

Step 2. Insert the communication module into the 4G/WIFI port. Secure the module by rotating the nut.

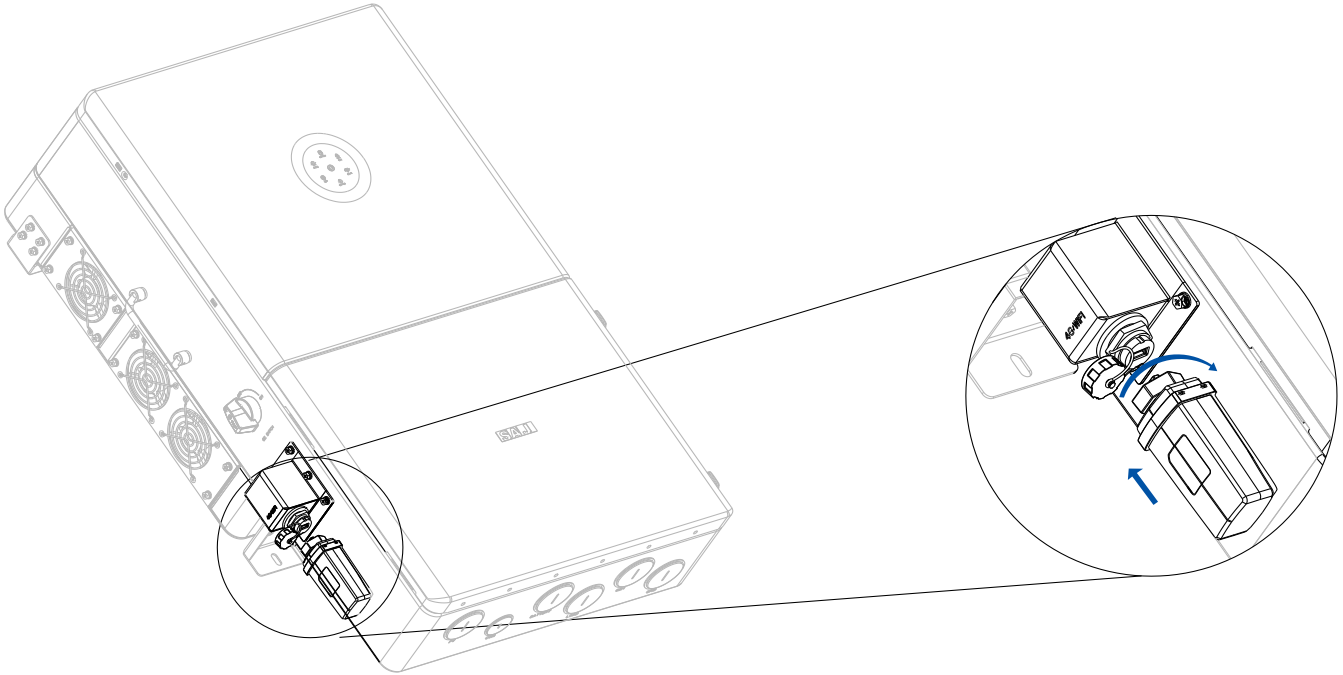


Figure 5.17. Connecting the communication module

## 5.7.2. Connect the communication cable

Connect one end of the network cable to the communication port on the BMS.

Insert the other end of the network cable through the BATTERY knockout hole of the inverter and connect it to the BMS_CAN port.

| BMS_CAN | |
|---|---|
| 1 | NC |
| 2 | NC |
| 3 | NC |
| 4 | CANH |
| 5 | CANL |
| 6 | NC |
| 7 | NC |
| 8 | NC |

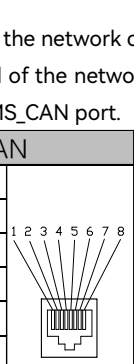



Figure 5.18. Pin definitions of the BMS_CAN port

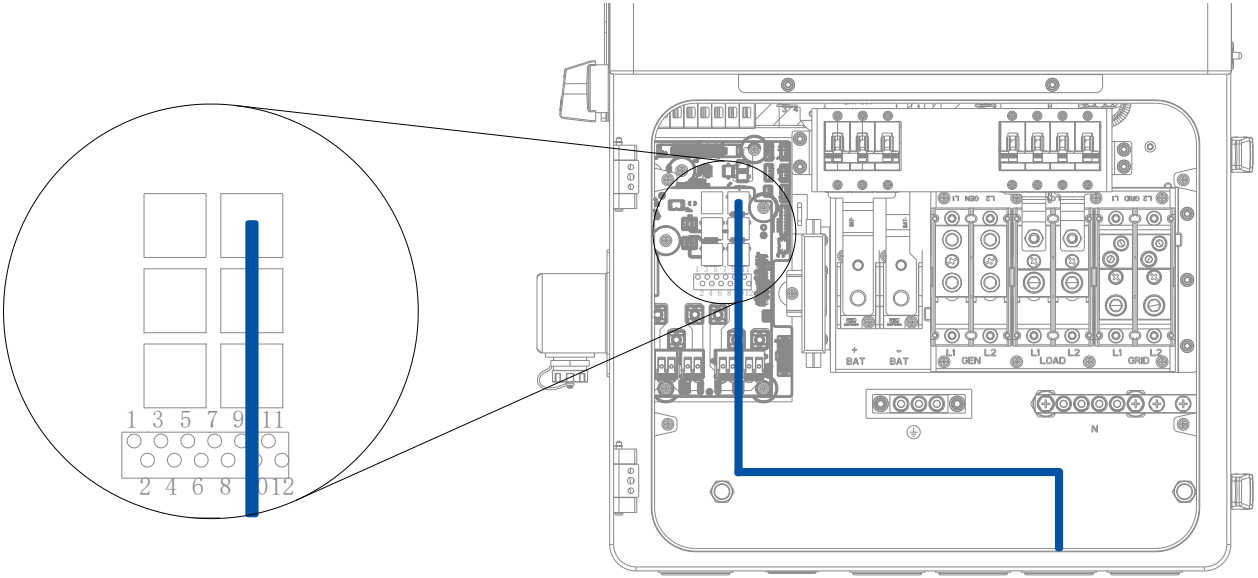



Figure 5.19. Connect the cable to the BMS_CAN port

# 5.8. Connect the CTs

Connect the CT wires to pin 1, 2, 3, and 4 on the CN89 terminal in the junction box of the inverter.

| From the CT | | To the CN89 terminal pins in the inverter |
|---|---|---|
| CT GRID-L1 | Blue wire | 1 |
| | White wire | 2 |
| CT GRID-L2 | Red wire | 3 |
| | Black wire | 4 |

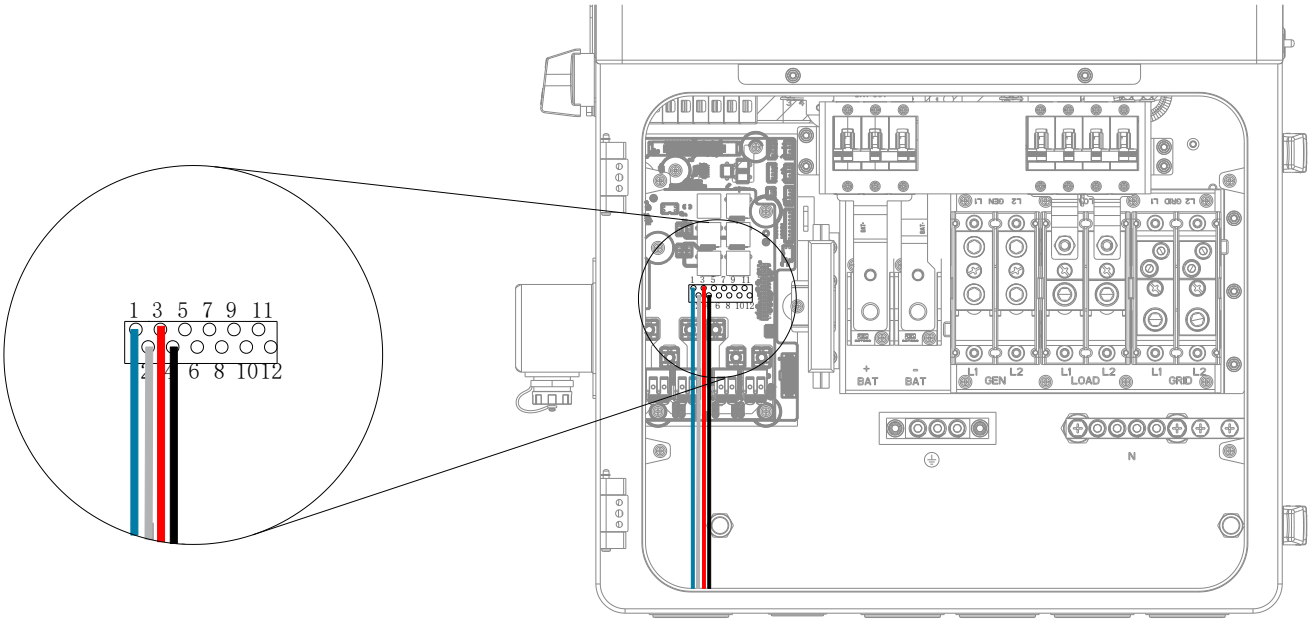



Figure 5.20. CT connection

# 5.9. Install an external rapid shutdown switch

**About this task**

According to local safety regulations, an external rapid shutdown switch is required in case of emergency. After the switch is turned off, the system stops working immediately.

**Procedure**

Connect the wires of the external rapid shutdown switch to pins 11 and 12 on the CN89 terminal in the junction box of the inverter.

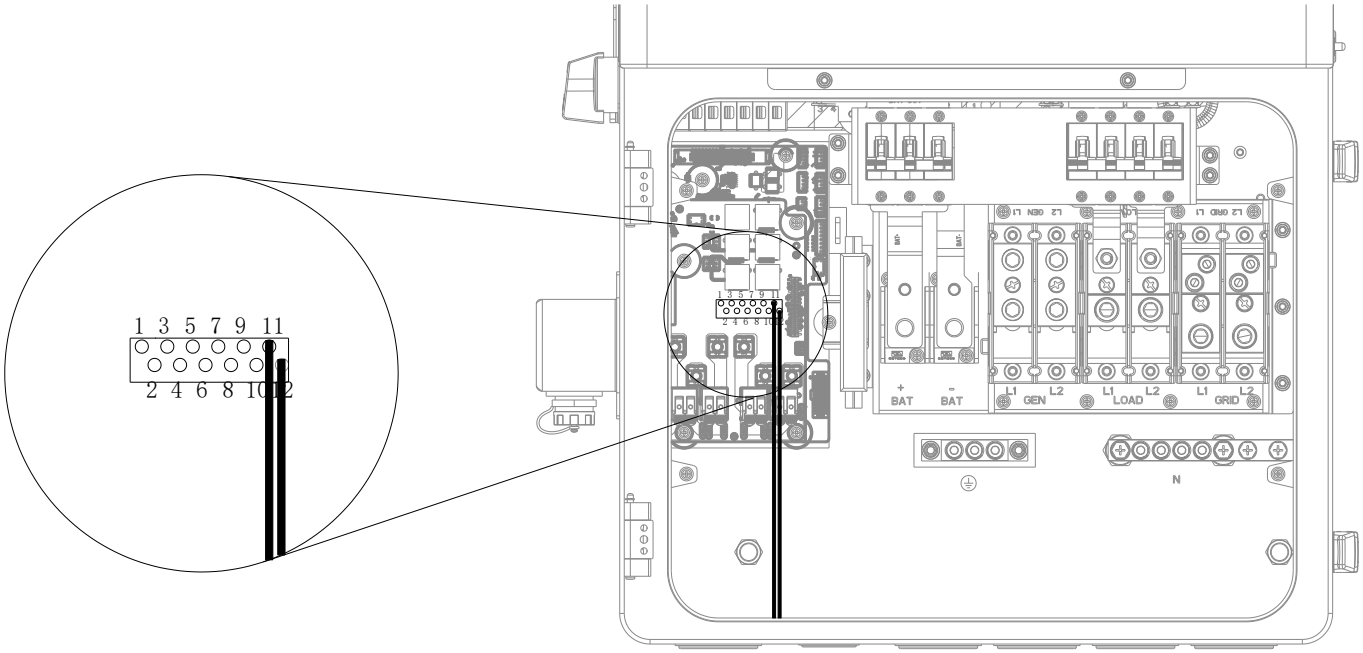



Figure 5.21. Connection of the external rapid shutdown switch

# 5.10. Close the junction box of the inverter

Step 1. Align the holes on the internal plate with the holes in the junction box. Push the plate downwards. Tighten four screws to lock the plate.

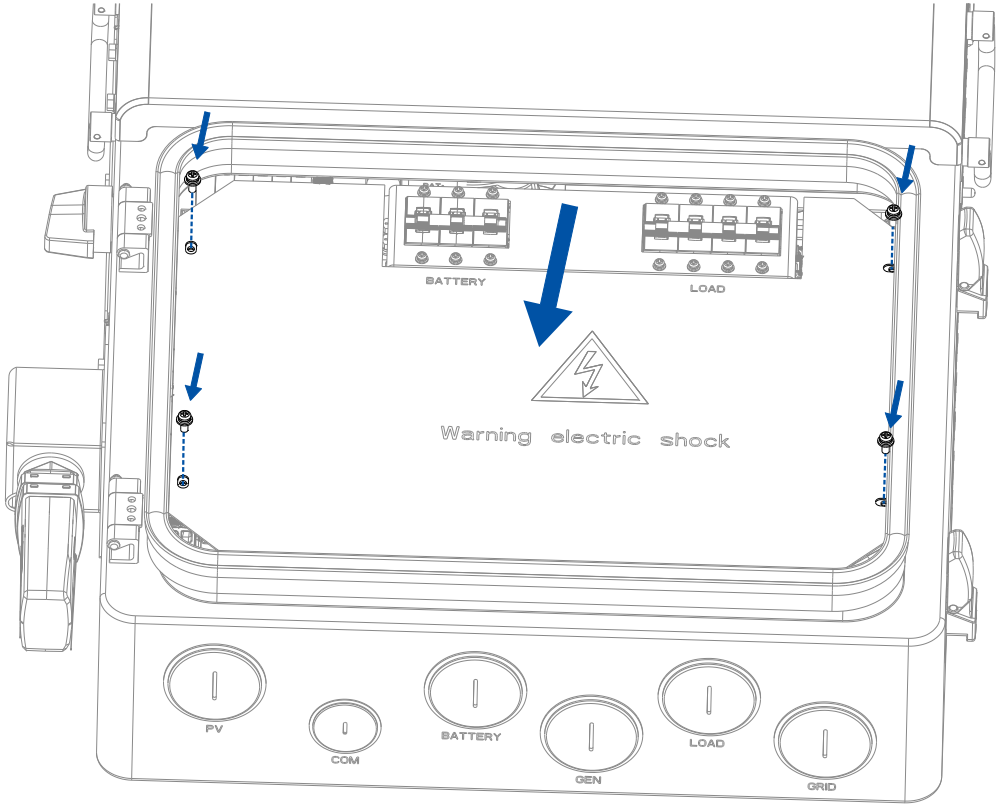



Figure 5.22. Installing the internal plate

Step 2. Close the cover. Lock the cover back on the right side of the inverter. Keep the key to a safe place.

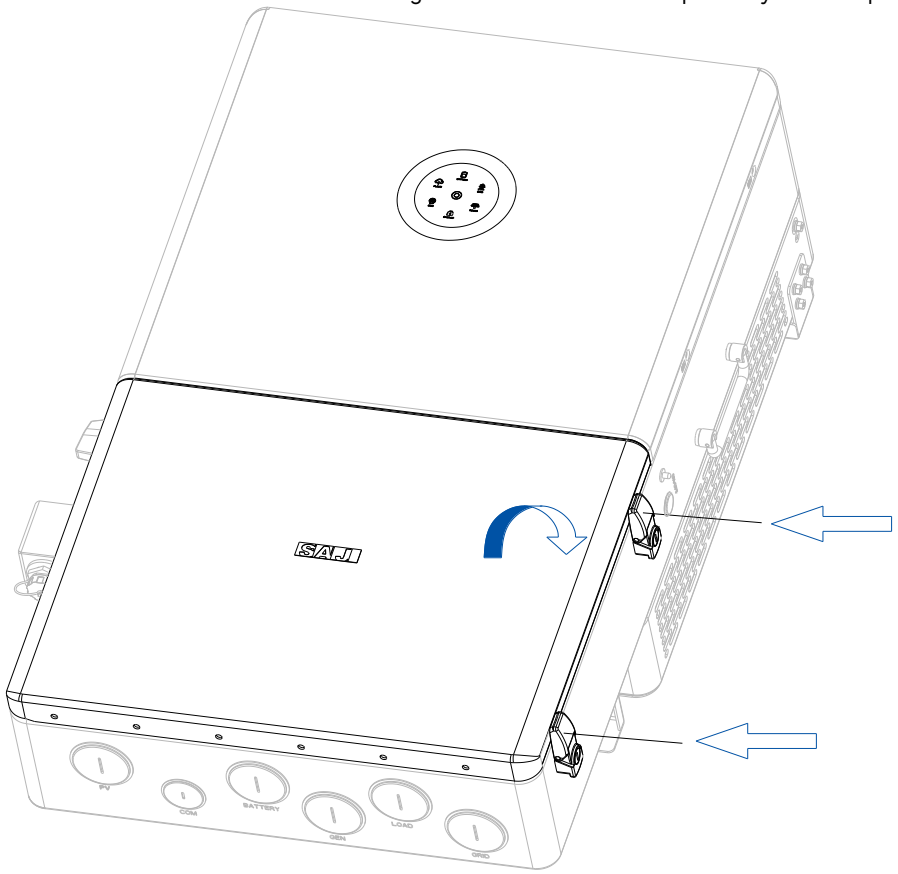
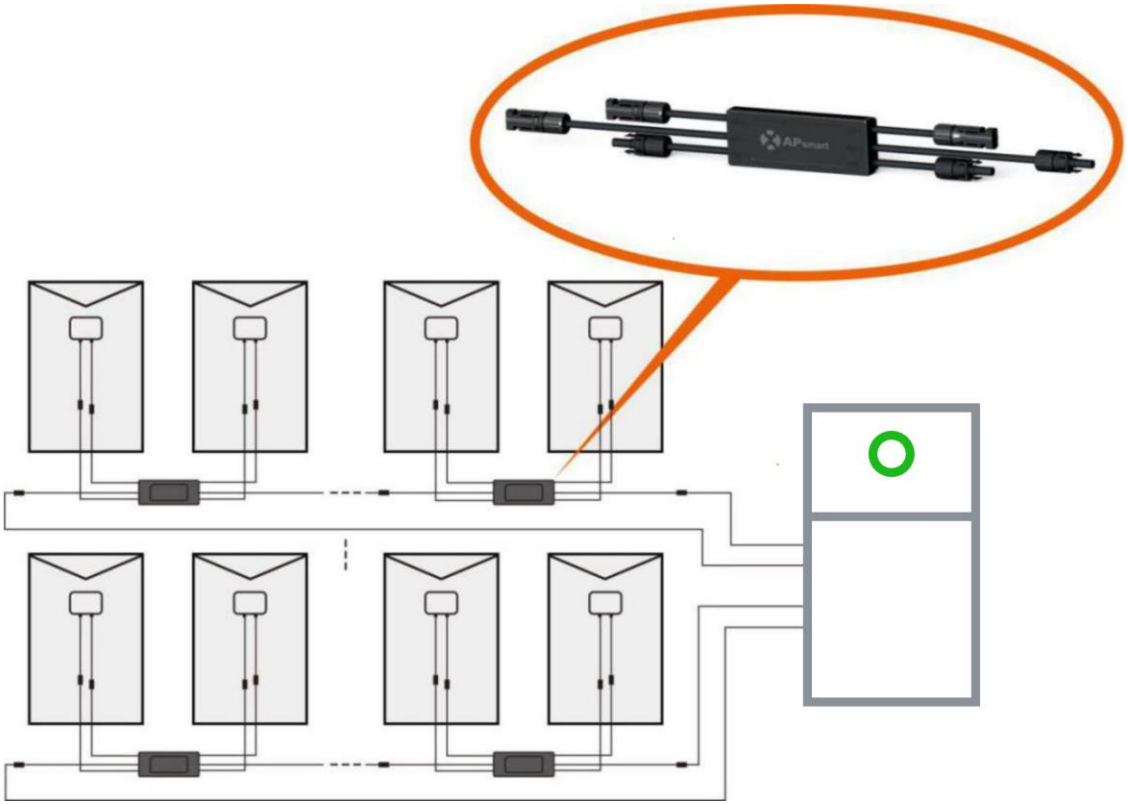



Figure 5.23. Closing the cover of the junction box

# 5.11.Install an RSD (optional)

The SAJ inverter provides RSD protection with a built-in transmitter (Transmitter-PLC-1P). To enable RSD protection, use an APsmart RSD-D model to connect to PV panels. For more details about the cable connections, refer to the RSD-D manual.



## 5.12. Connect the smart meter

To buy a smart meter, contact SAJ for more details. By using a SAJ-recommended smart meter, many functions can be implemented, such as the export limitation function.

Connect the smart meter by referring to section 5.13.2 “Connection topology diagrams”.

# 5.13.System connection overview

## 5.13.1. Connection structure

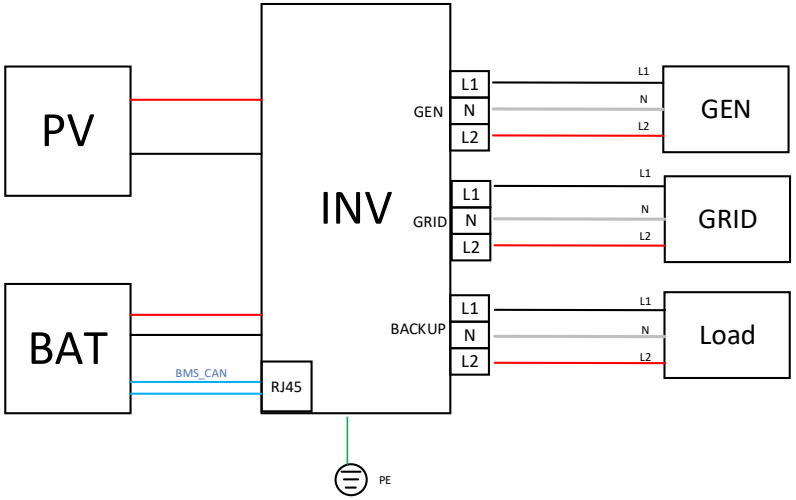



Figure 5.24. With a generator

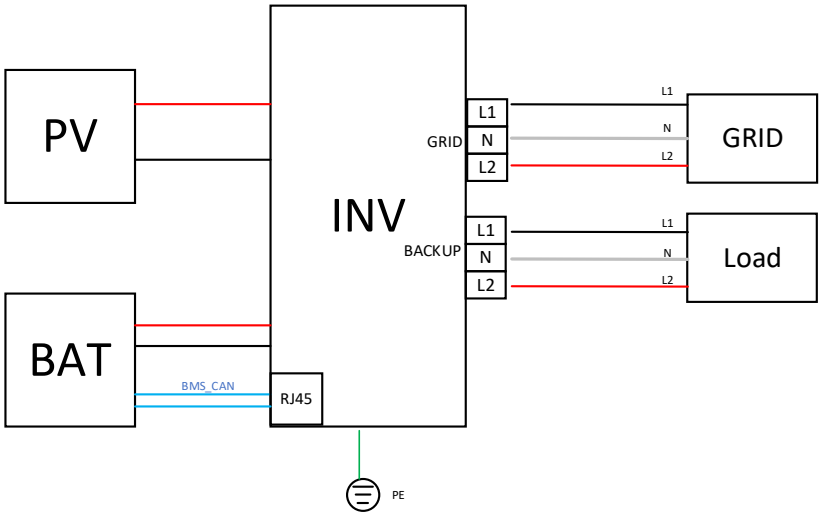



Figure 5.25. Without a generator

## 5.13.2. Connection topology diagrams

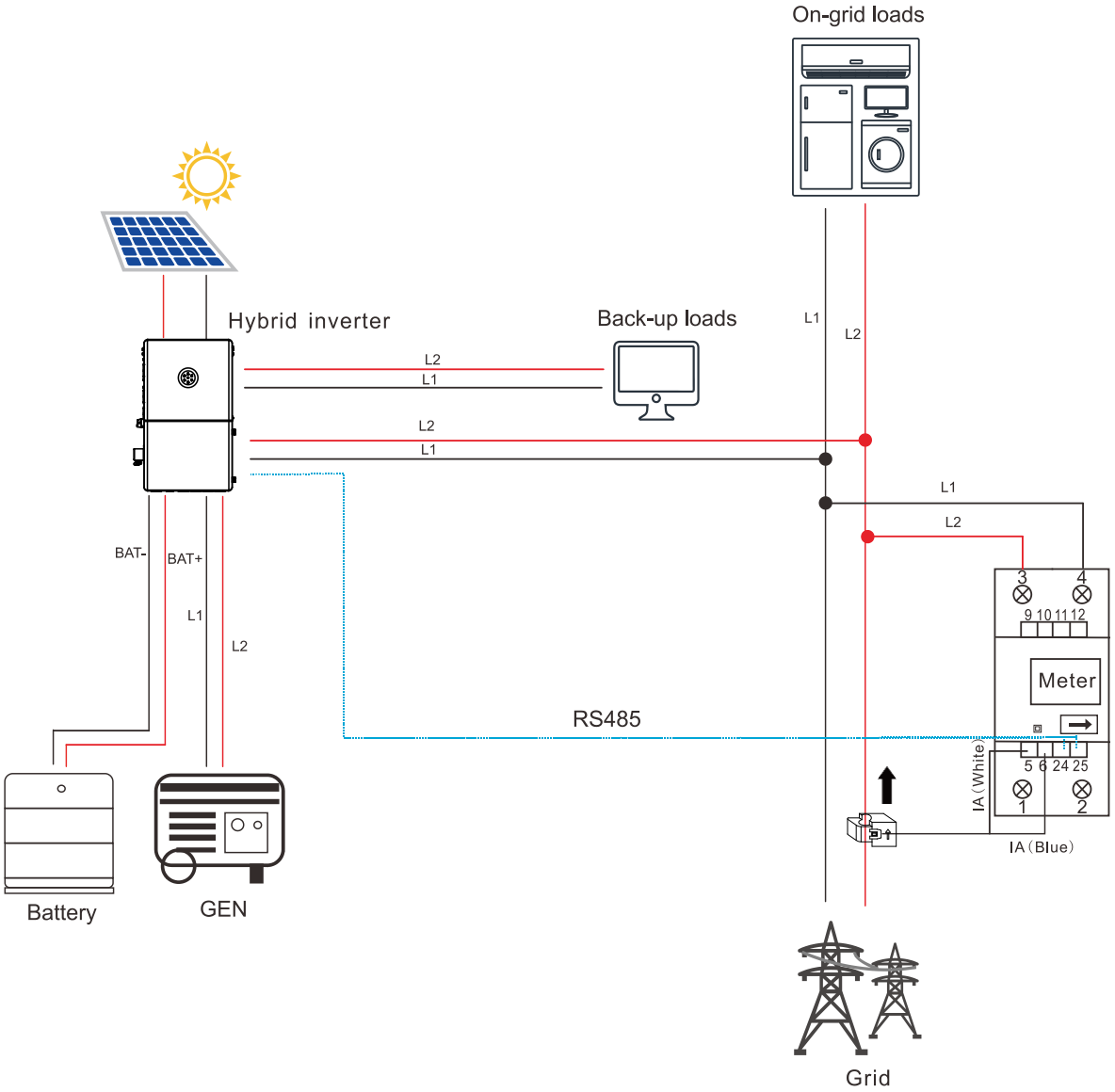



Figure 5.26. Single-phase

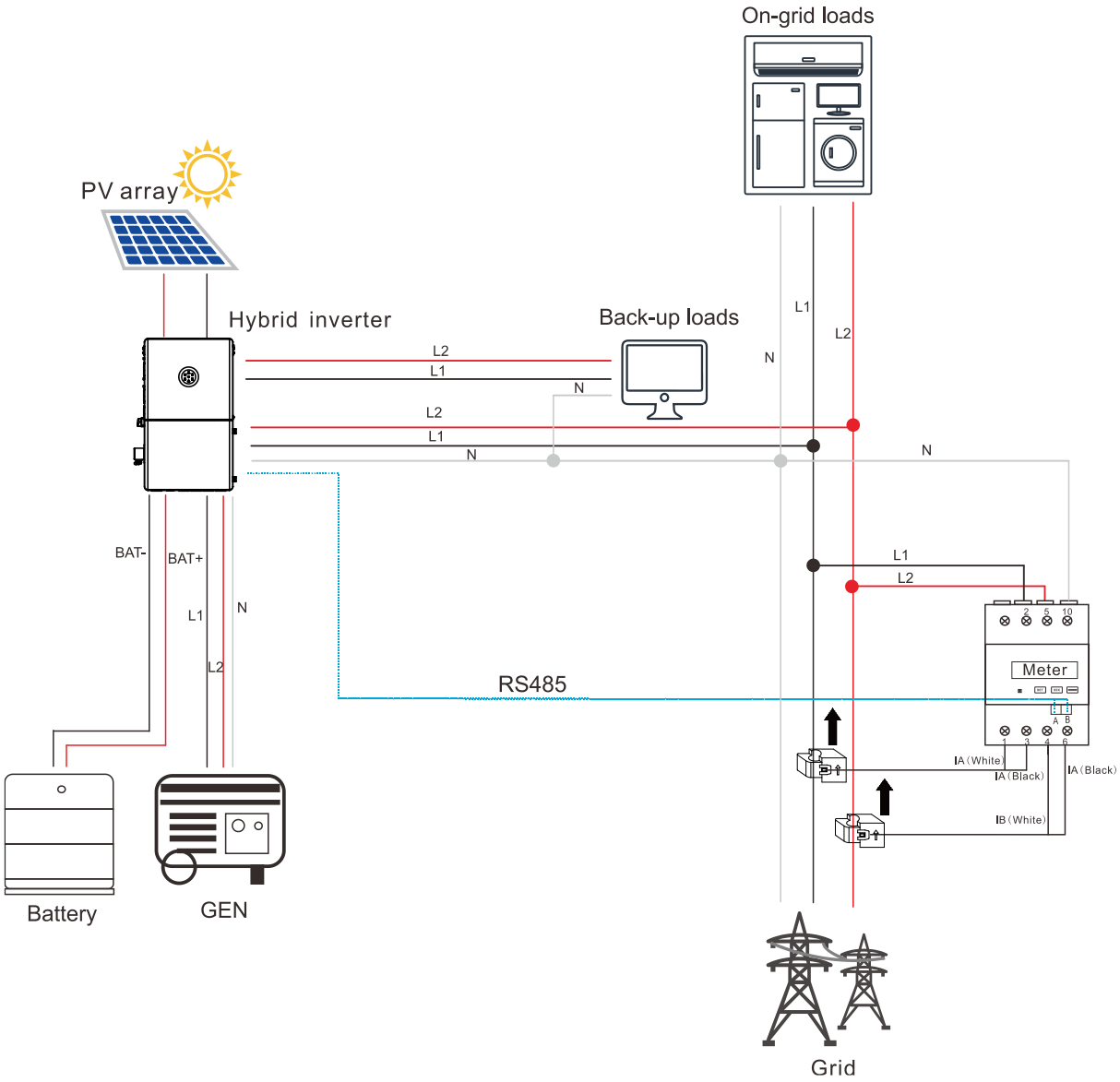



Figure 5.27. Split-phase

# 6.

# STARTUP AND SHUTDOWN

# 6.1. Startup

Step 1. Open the junction box. Turn on the following breakers by pushing their handles upwards:

a. Load breaker (optional, only when loads are connected)

b. Battery breaker

Step 2. Open the breaker on the grid side.

Step 3. Turn on DC SWITCH on the left side of the inverter.

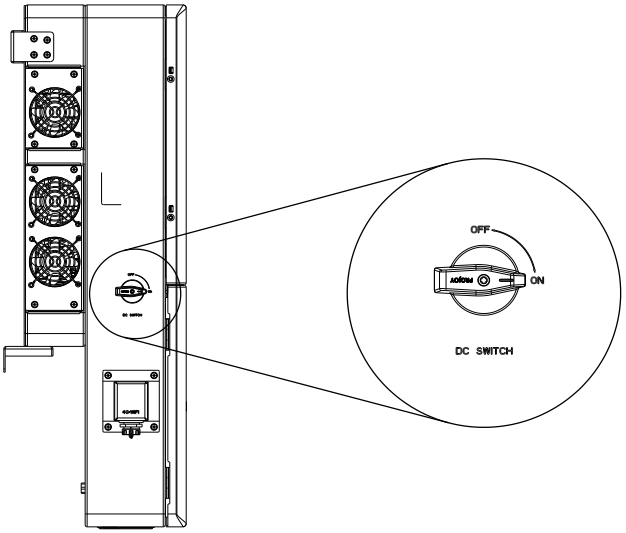



Figure 6.1.DC switch on the left side of the inverter

Step 4. Turn on the battery switch on the battery. For details, refer to the battery user manual.

Step 5. Press the ON/OFF button on the right side of the inverter.

Step 6. Check the LED indicator status on the inverter panel to ensure that the inverter is running properly. For details, refer to section 2.6 “LED indicators”.

# 6.2. Shutdown

Step 1. Press the ON/OFF button on the right side of the inverter so that the button bounces back.

Step 2. Turn off DC SWITCH.

Step 3. Turn off the battery switch and load switch.

Step 4. Turn off the breaker on the grid side.

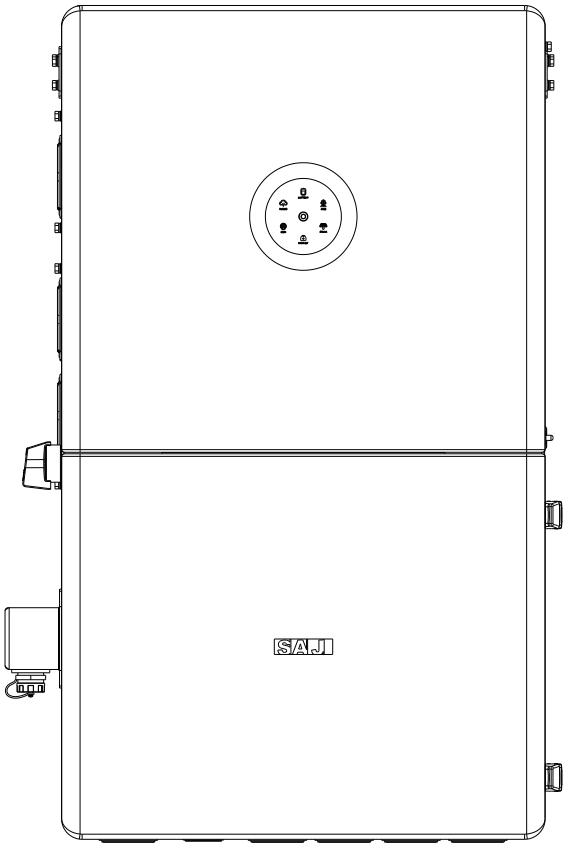
## 6.3. Emergency shutdown

If there is an emergency, press the ON/OFF button on the right side of the inverter to shut down the system immediately.

When the button is bounced, the system is shut down.

## 6.4. Restart after emergency shutdown

After the emergency is subsided, press the ON/OFF button to restart the system.


SAJ

# 7.

# COMMISSIONING

# 7.1. Download the App

The Elekeeper App can be used for both nearby and remote monitoring. Depending on the communication module used, it supports Bluetooth/4G or Bluetooth/Wi-Fi to communicate with your energy storage system (ESS).

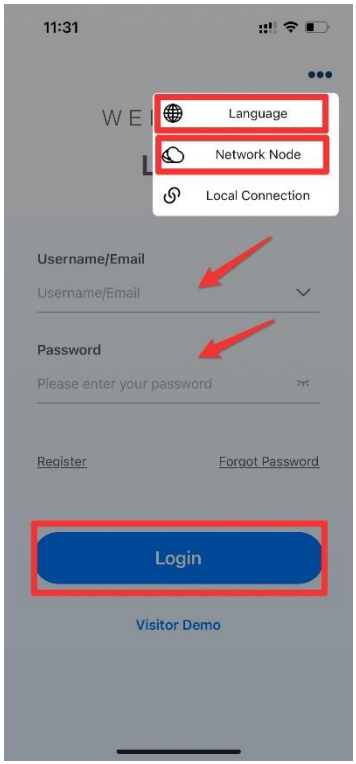
On your mobile phone, search for “Elekeeper” in the App store and download the App.

# 7.2. Log in to the App

**Note:** The detailed operations on the App might vary, depending on the version you are using.

If you have an account, log in to the App directly:

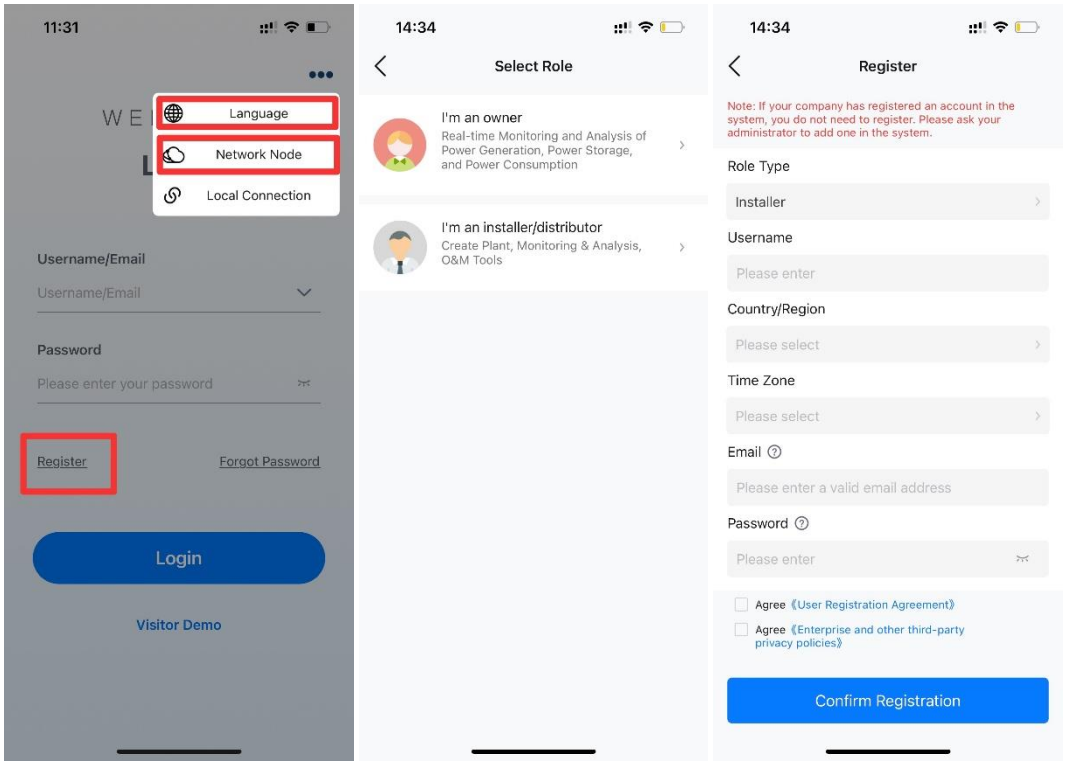
1. Tap the three-dot icon ••• on the top right corner. Choose the language and network node based on your needs.
2. Log in to the App by using the account and the password.



To apply for a new account, perform as follows:

1. Tap the three-dot icon ••• on the top right corner. Choose the language and network node based on your needs.
2. Tap Register. Choose whether you are an owner or an installer or distributor.
3. Follow the instructions on the screen to complete the registration.
4. Log in to the App by using the new account and the password.

   Example (for installer):



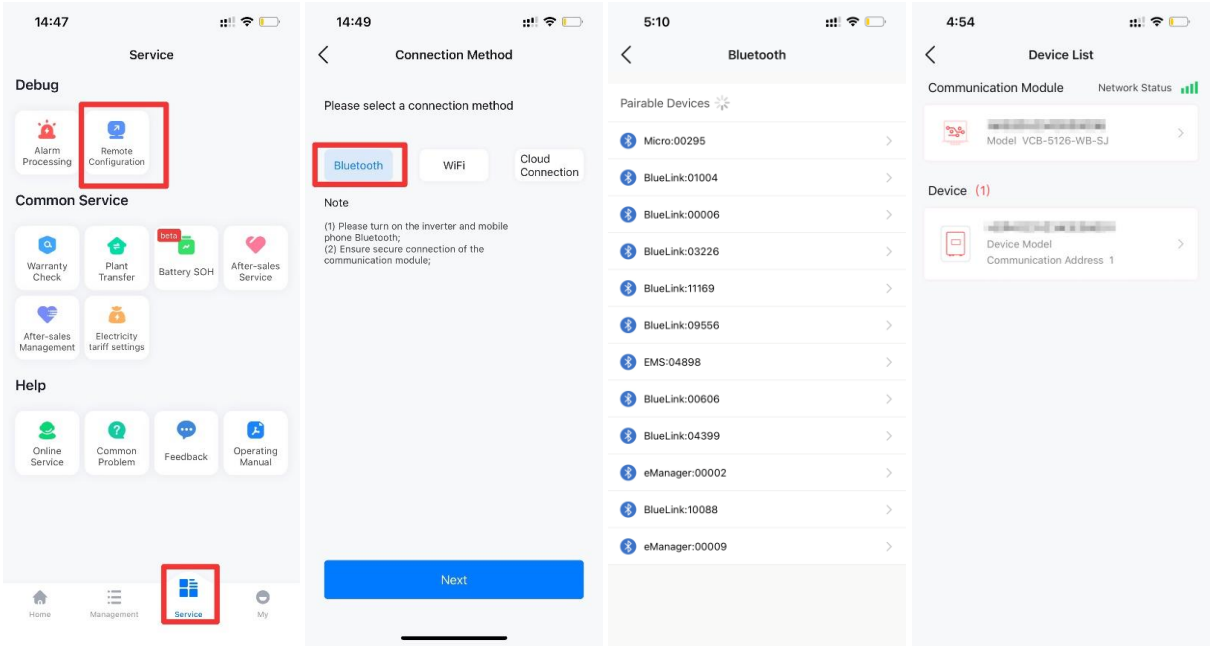
## 7.3. Perform the initialization settings

**Prerequisite**

The Bluetooth function on your mobile phone is enabled.

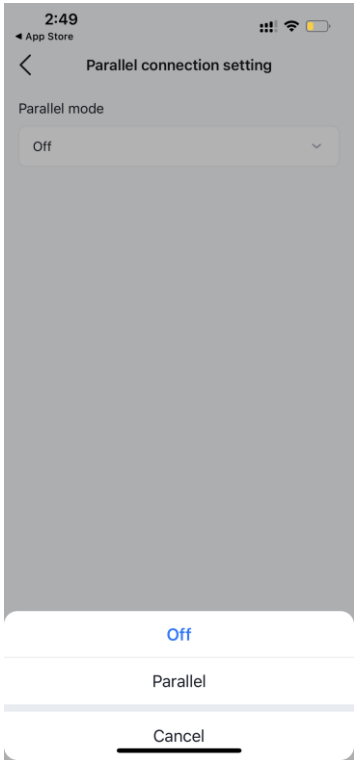
**Procedure**

1. On the **Service** interface, select **Remote Configuration**. Tap **Bluetooth** and then **Next**. Tap your inverter according to the serial number (SN) of the communication module.



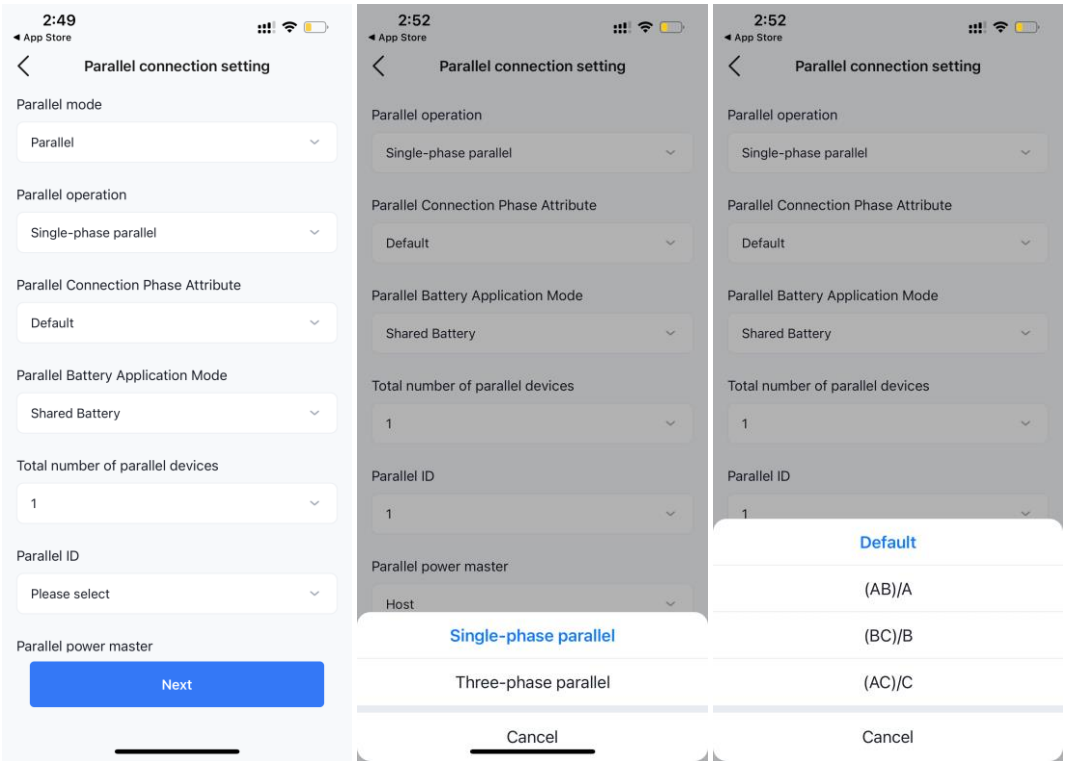
2. Complete the initialization settings by following the instructions on the screen.
   a. Parallel connection settings

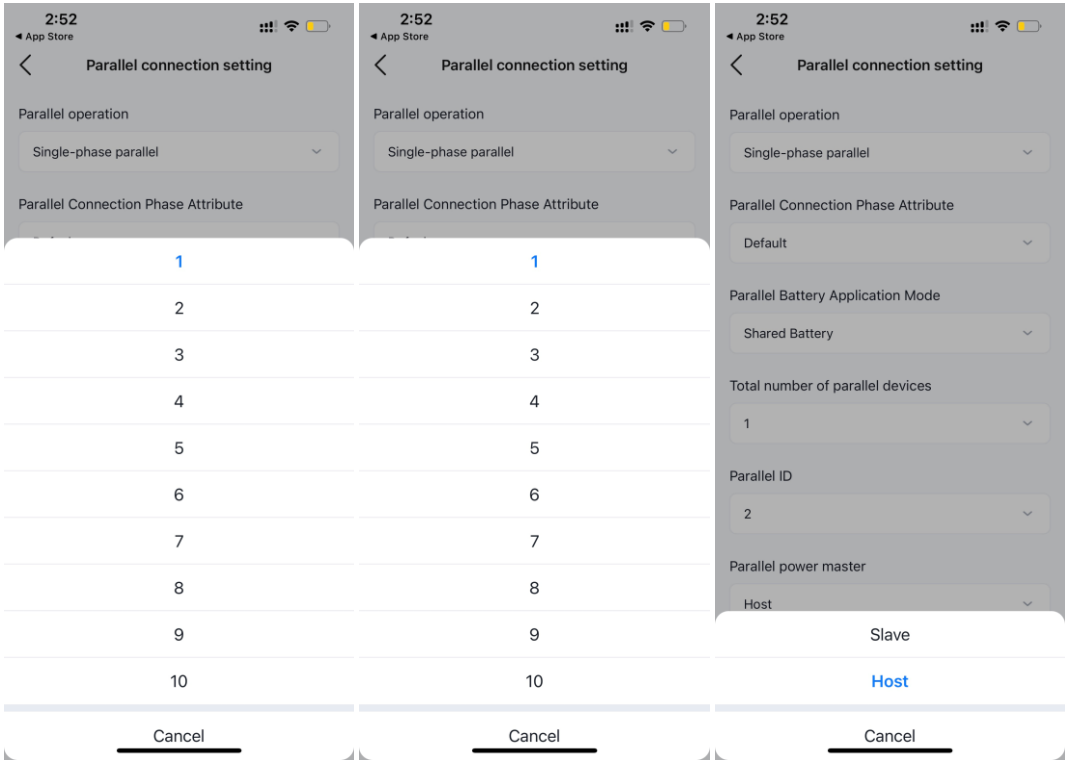
      Example:



If you have selected **Parallel**, set the parallel connection parameters per you needs.

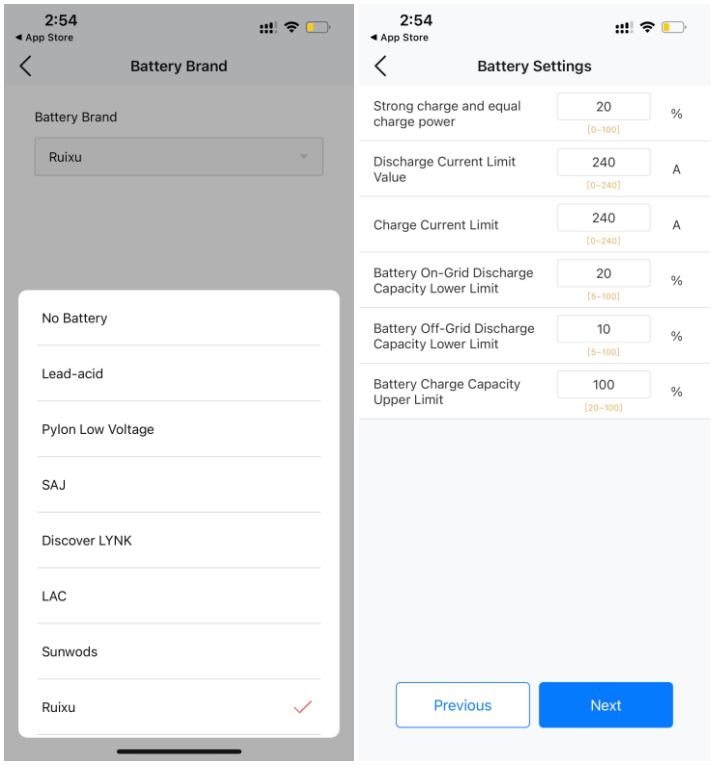
Examples:




2:52
App Store
Parallel connection setting
Parallel operation
Single-phase parallel
Parallel Connection Phase Attribute
1
2
3
4
5
6
7
8
9
10
Cancel
2:52
App Store
Parallel connection setting
Parallel operation
Single-phase parallel
Parallel Connection Phase Attribute
1
2
3
4
5
6
7
8
9
10
Cancel
2:52
App Store
Parallel connection setting
Parallel operation
Single-phase parallel
Parallel Connection Phase Attribute
Default
Parallel Battery Application Mode
Shared Battery
Total number of parallel devices
1
Parallel ID
2
Parallel power master
Host
Slave
Host
Cancel

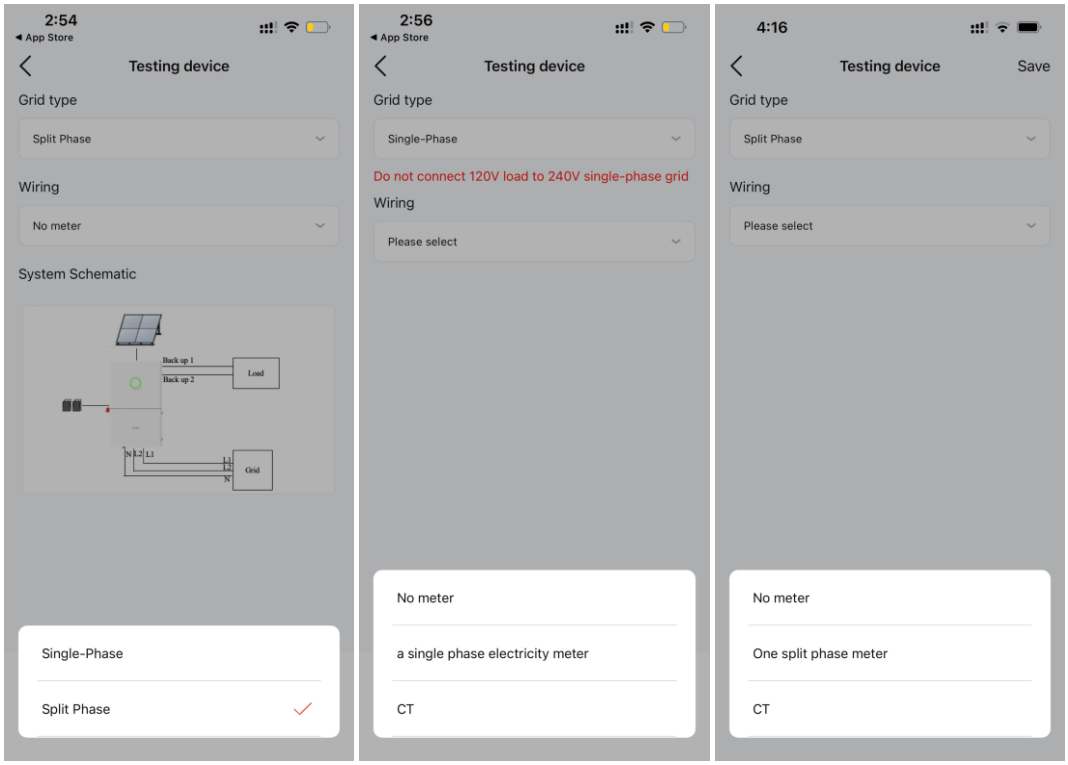
b. Battery brand and settings

Example:

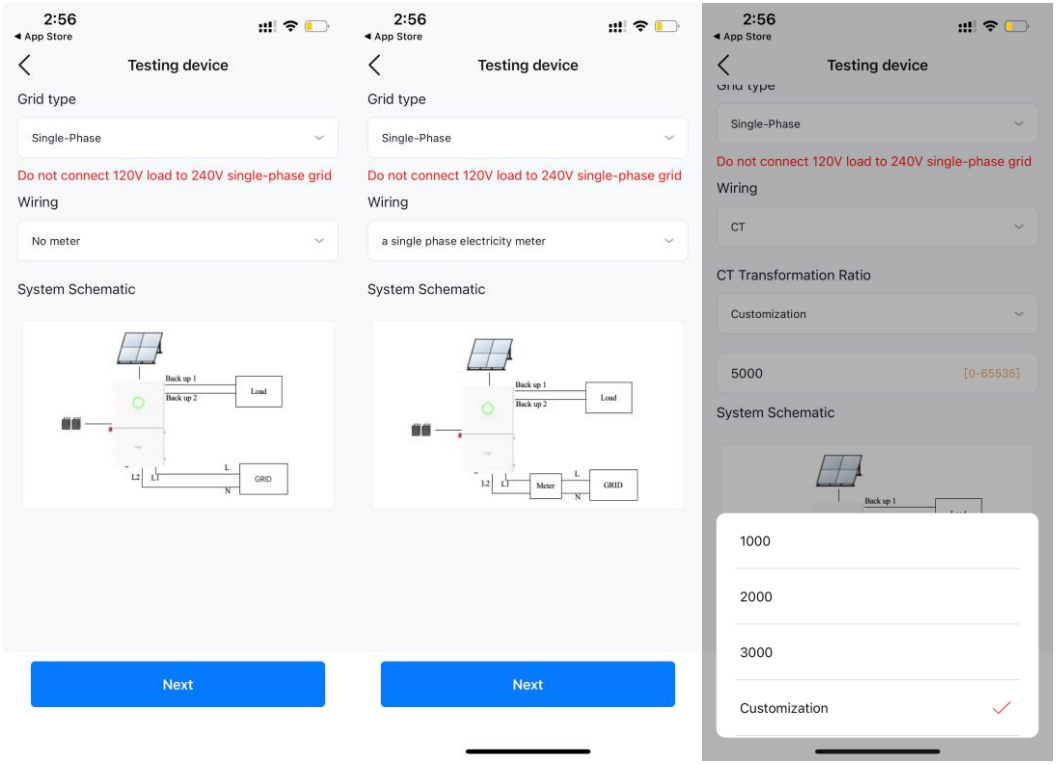


c. Meter and system schematic

Examples:

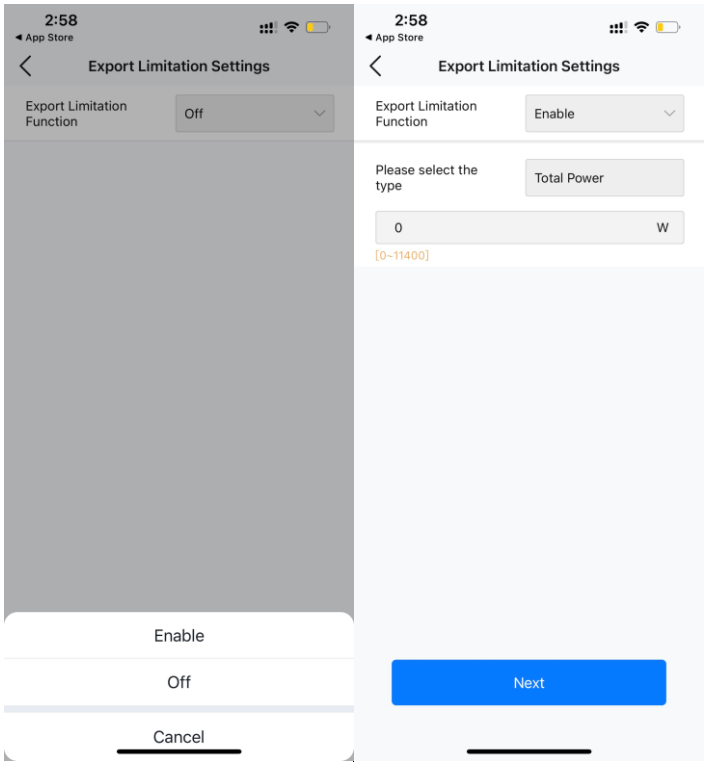


If you have set **Wiring** to **CT**, you need to set **CT Transformation Ratio**.



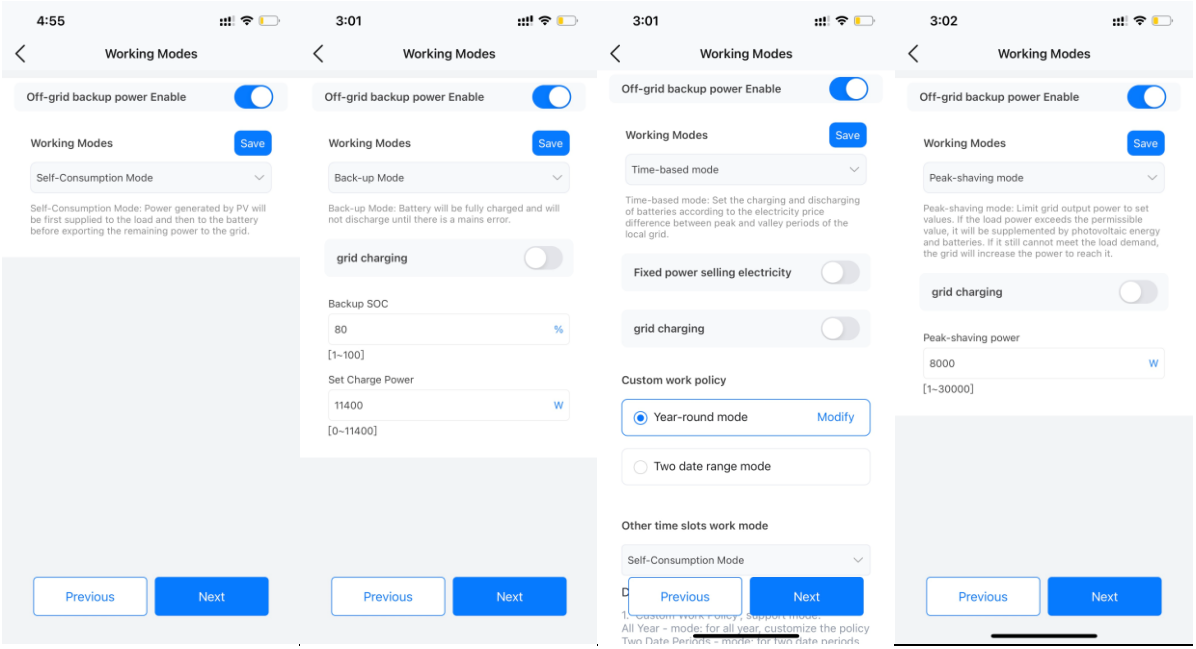
d. Export limitation settings

Example:



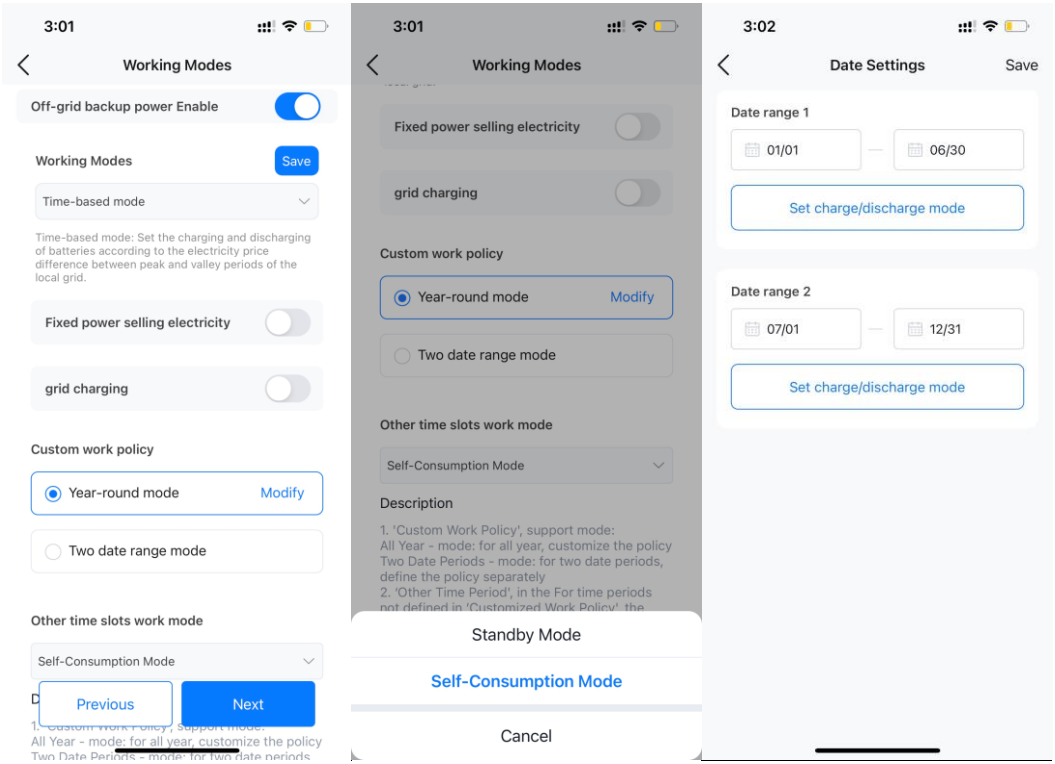
e. Working mode

**Self-Consumption Mode**, **Back-up Mode**, **Time-based mode**, and **Peak-shaving mode**



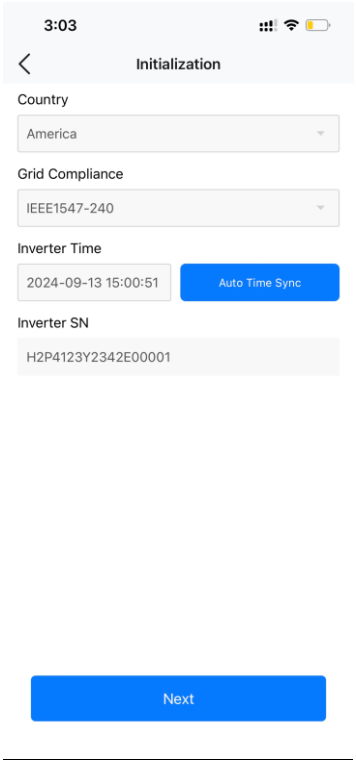
In **Time-based mode**, set **Other time slots work mode**.

In addition, if you have set **Custom work policy** to **Two date range mode**, configure **Date Settings**.



f. Country and grid compliance

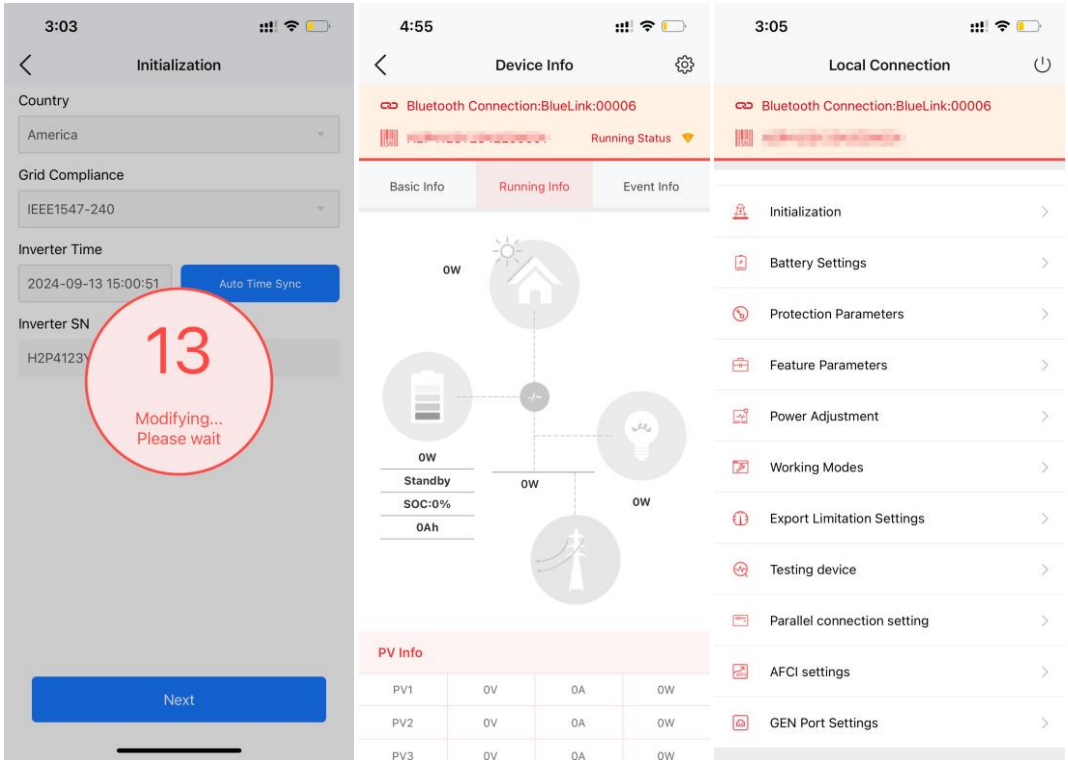
Example:



g. Initialization completion

After the initialization is completed, you can view the detailed device information on the displayed **Device Info** page.

Tap the setting icon on the top right corner to enter the **Local Connection** page.



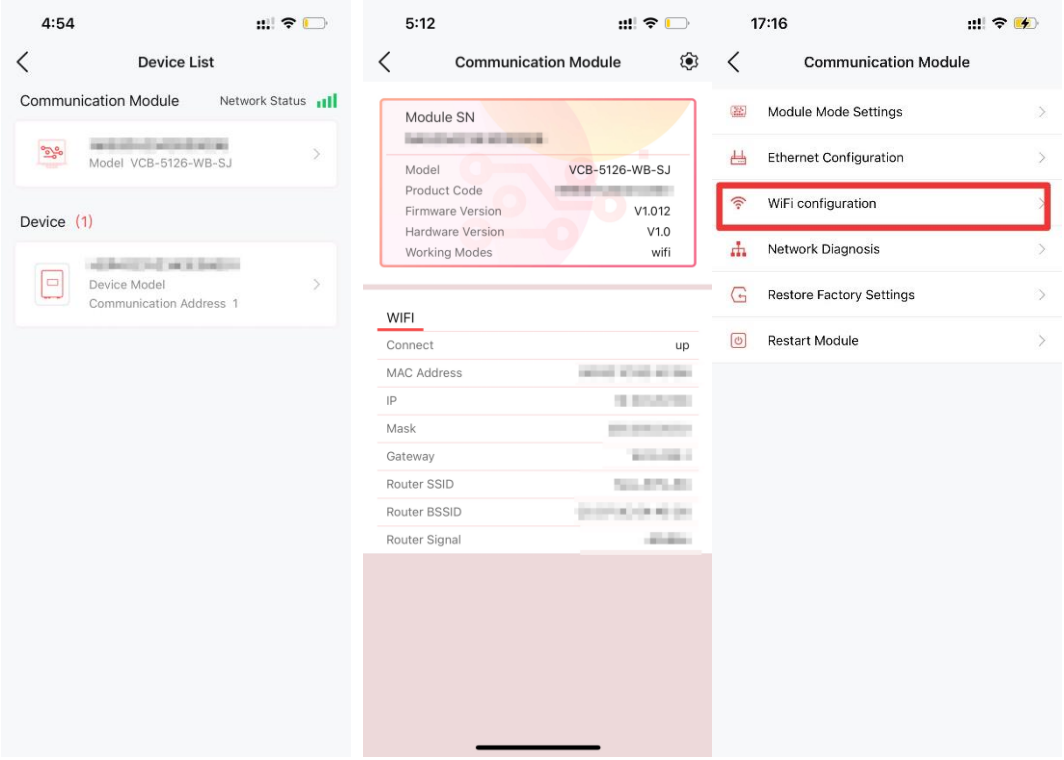
# 7.4. Configure the communication module

**About this task**

If you want to remotely monitor the energy storage system and view the device statistics (for example, when you are away from home), connect the communication module installed on the inverter to the network.

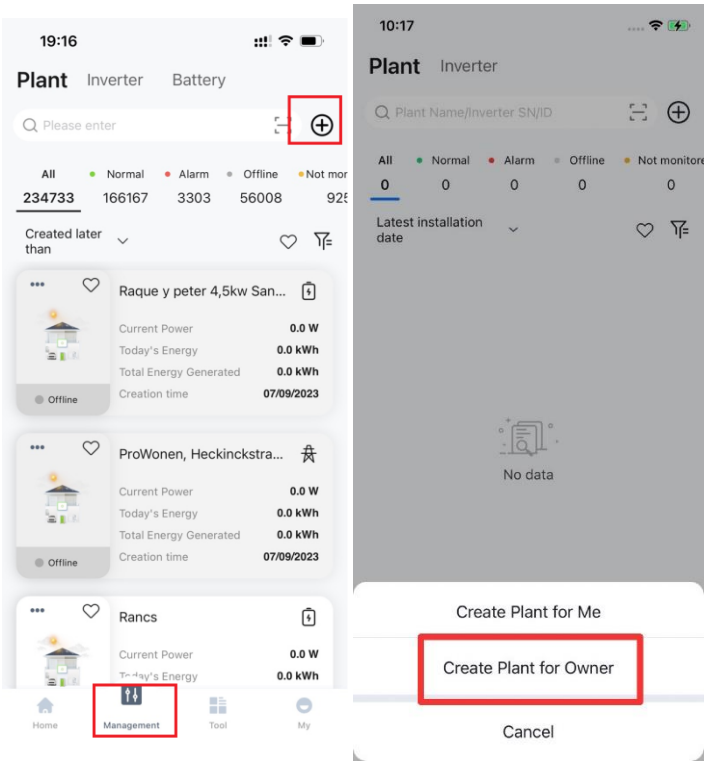
**Procedure**

1. On the **Device List** page, select your communication module according to its SN.
2. Tap the setting icon on the upper right corner.
3. Select **WiFi Configuration** and set the communication module to connect to your home network.

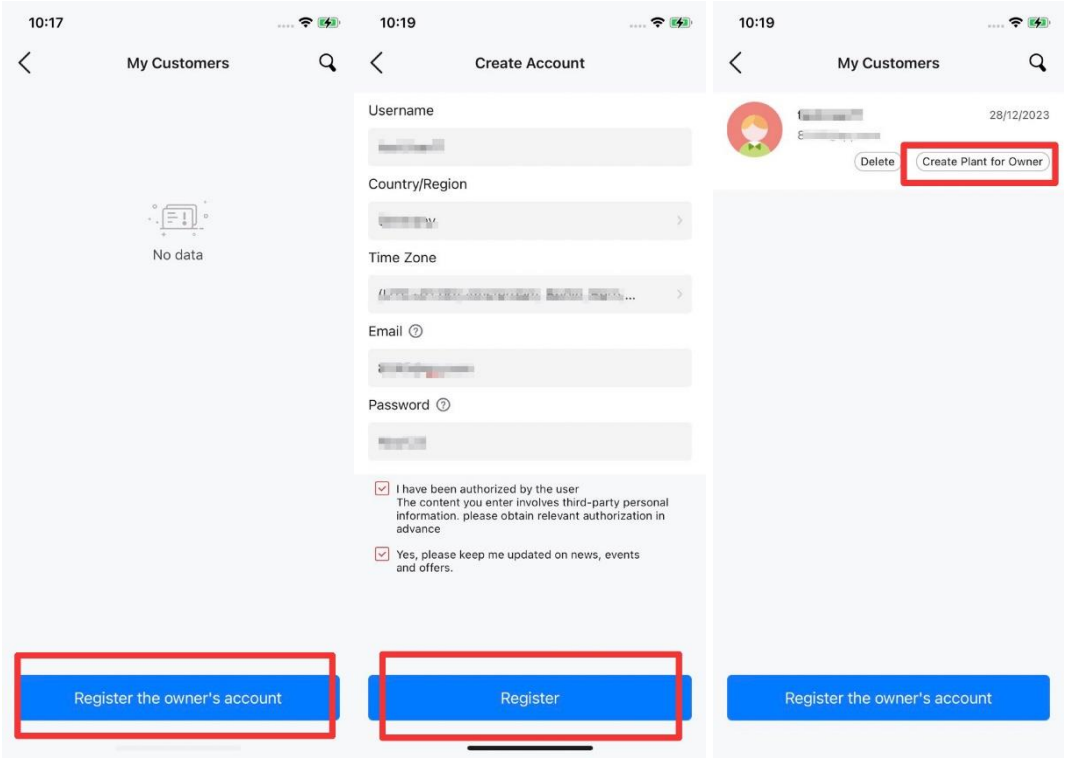


## 7.5. Create a plant

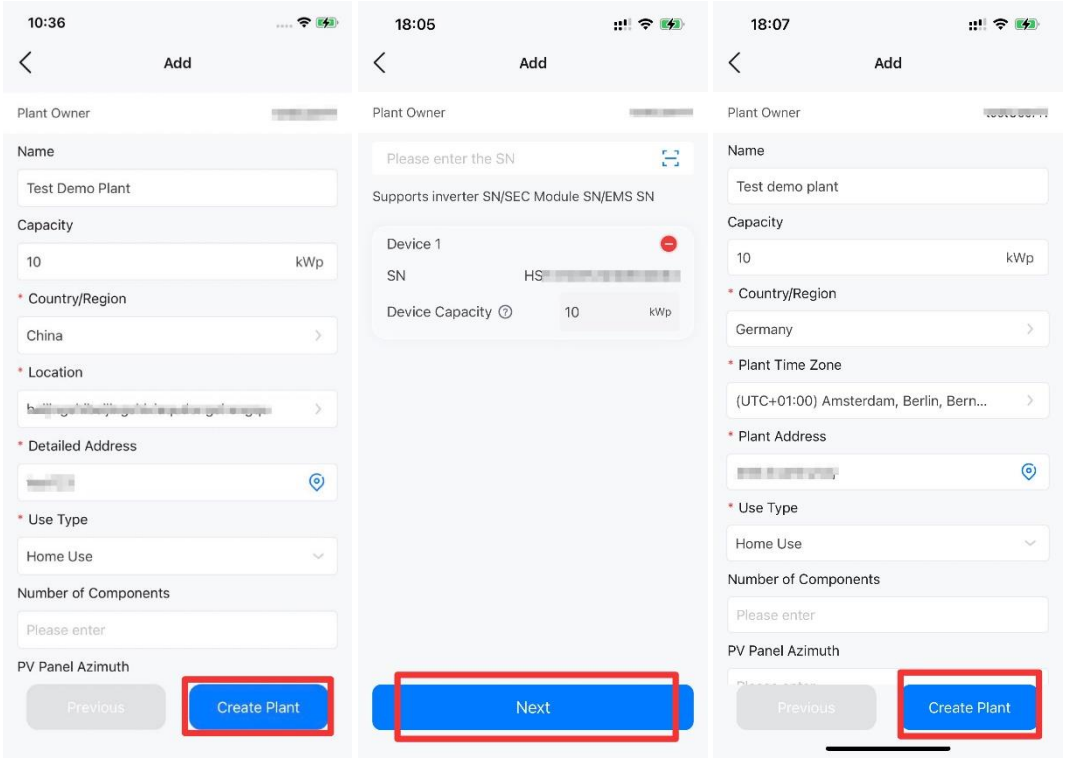
1. On the **Management** page, tap the ⊕ icon on the top right corner. Select **Create Plant for Owner**.

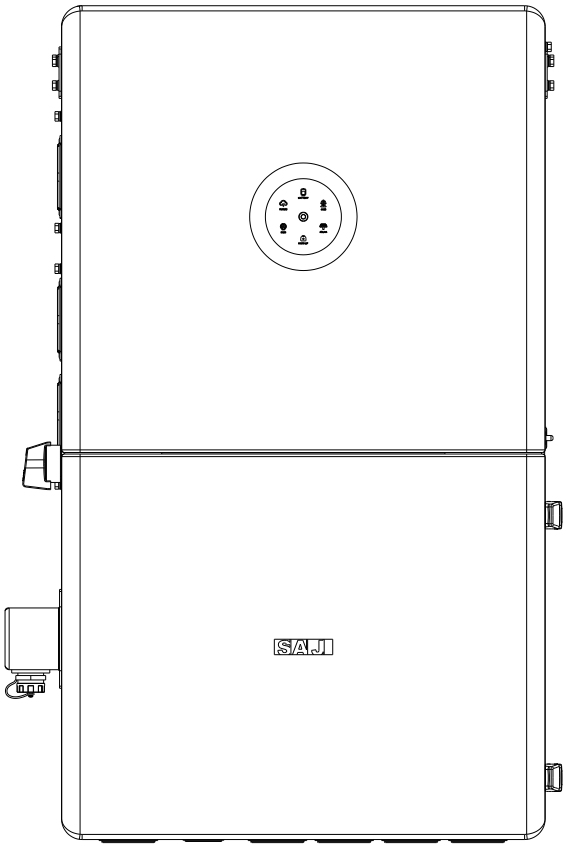


2. Apply for an account for the end user.



3. Configure the plant details.

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# 8.

# TROUBLESHOOTING

For any errors reported as below, contact the after-sales for service support. The operations and maintenance must be performed by authorized technicians.

| Error message | Description |
|---|---|
| Master Bus Voltage High | The DC input voltage exceeds the allowed input limit of the inverter. |
| Master HW Bus Voltage High | The DC input voltage exceeds the allowed input limit of the inverter. |
| Master Bus Voltage Low | The bus voltage of the inverter is too low. |
| Master PV Voltage High | The DC input voltage of the inverter is too high. |
| Slaver Adc Sample Error | The inverter sampling circuit is faulty. |
| Master Adc Sample Error | The inverter sampling circuit is faulty. |
| Consistent Adc Adc Sample Error | The inverter sampling circuit is faulty. |
| Master Pv Input Error | PV reverse connection or sensor abnormality. |
| Frequency Config Error | The center frequency of the safety configuration does not match the real frequency of the power grid. |
| Master HW PV Current High | 1. The positive and negative poles of the string are reversely connected.<br>2. Internal damage to the inverter. |
| Master SW PV Current High | 1. The positive and negative poles of the string are reversely connected.<br>2. Internal damage to the inverter. |
| Master HW Inv Current High | 1. The positive and negative poles of the string are reversely connected.<br>2. Internal damage to the inverter. |
| Master SW Inv Current High | The grid-side output current exceeds the inverter limit. |
| Master HW BAT Current High | The grid-side output current exceeds the inverter limit. |
| Master SW BAT Current High | The battery charging and discharging current exceeds the inverter limit. |
| Master HW BLC Current High | The battery charging and discharging current exceeds the inverter limit. |
| Master SW BLC Current High | The operating current of the balancing bridge exceeds the inverter limit. |
| Master Grid NE Voltage Error | Live line grounding occurs on the grid side |
| Master Arc Device Error | Arc equipment failure. |
| Master Arc Error | DC arcing caused by DC short circuit or poor terminal contact. |
| Arc Permanent Err | Permanent arc error |
| Master Battery Voltage Error | 1. Bad battery connection. |

| Error message | Description |
|---|---|
| | 2. Lithium battery is turned off. |
| Gen Output OverLoad | The load connected to the generator output is greater than the maximum output power. |
| Battery Open Circuit | Inverter cannot detect battery voltage. |
| Master Battery Discharge Voltage Low | Low voltage detected during battery discharge and overload. |
| Lost Communication between M<->H | Internal communication of the inverter is lost. |
| Lost Communication between M<->S | Internal communication of the inverter is lost. |
| Lost Communication between S<->H | Internal communication of the inverter is lost. |
| Master Grid Rly Errot | 1. A live wire grounding occurs on the power grid side.<br>2. The grid voltage is too low.<br>3. The inverter relay circuit is faulty. |
| Master Inv Rly Errot | 1. A live wire grounding occurs on the power grid side.<br>2. The grid voltage is too low.<br>3. The inverter relay circuit is faulty. |
| Master Temperature High Error | Inverter temperature is too high. |
| Master Temperature Low Error | Inverter temperature is too low. |
| GFCI Device Error | Inverter leakage current detection equipment fails. |
| Grid Voltage High | The grid voltage is higher than the inverter safety regulations allow. |
| Grid Voltage 10Min High | The grid voltage is higher than the inverter safety regulations allow. |
| Grid Voltage Low | The grid voltage is lower than the allowable range of the inverter safety regulations. |
| EpsPort Voltgae Error | Before leaving the grid, detect abnormal voltage at the off-grid port. |
| Master Grid Frequency High | The grid frequency is higher than the upper limit specified by the local power grid. |
| Master Grid Frequency Low | The grid frequency is lower than the lower limit specified by the local power grid. |
| Output OverLoad | The load connected to the back-up end is greater than the maximum output |

| Error message | Description |
|---|---|
| | power of the inverter. |
| Output Volt DCV High | The DC component of the AC output exceeds the limit range. |
| Output Current Dci High | The DC component of the AC output exceeds the limit range. |
| Master No Grid Error | The inverter cannot detect the grid voltage. |
| Master BMS com Lost | BMS does not start normally. |
| Gen Rly Errot | 1. Diesel engine sampling circuit abnormality.<br>2. Diesel engine relay failure. |
| GFCI Error | A ground leakage current fault was detected in the power station system. |
| ISO Error | The insulation resistance between the string and the ground is less than the set value. |
| Bus Voltage Imbalance | Bus voltage imbalance. |
| Lost Communication between H<->M | Internal communication of the inverter is lost. |
| Lost Communication between H<->S | Internal communication of the inverter is lost. |
| HMI EEPROM Error | memory failure. |
| Lost Communication between Master and Meter | Abnormal communication between inverter and meter. |
| Lost Communication between inverter and SEC | Communication abnormality between inverter and load monitoring module. |
| HMI RTC Error | RTC failure |
| BMS Device Error | Battery abnormality |
| BMS Lost.Conn | BMS does not start normally. |
| CT Device Err | CT equipment failure |
| AFCI Lost Com.Err | AFCI board communication interrupted. |
| Master FAN Error | Master FAN Error |
| Master Bat Midbus Error | Battery voltage is too high or too low |

# 9.

# APPENDIX

## 9.1. Recycling and disposal

This device should not be disposed as a residential waste.

An inverter that has reached the end of its operation life is not required to be returned to your dealer; instead, it must be disposed by an approved collection and recycling facility in your area.

## 9.2. Warranty

Check the product warranty conditions and terms on the SAJ website: https://www.saj-electric.com/

## 9.3. Contacting support

**GUANGZHOU SANJING ELECTRIC CO., LTD**

Address: SAJ Innovation Park, No.9, Lizhishan Road, Guangzhou Science City, Guangdong, P.R.China.

Postcode: 510663

Website: https://www.saj-electric.com/

**Technical Support & Service**

Tel: +86 20 6660 8588

Fax: +86 20 6660 8589

E-mail: service@saj-electric.com

**Sales**

Tel: 86-20-66608618/66608619/66608588/66600086

Fax: 020-66608589

E-mail: info@saj-electric.com

## 9.4. Trademark

SAJ is the trademark of SanJing.

**GUANGZHOU SANJING ELECTRIC CO., LTD**

**Tel:** 86-20-66608588 **Fax**: 86-20-66608589 **Web:** www.saj-electric.com
**Add:** SAJ Innovation Park, No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong, P.R.China

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