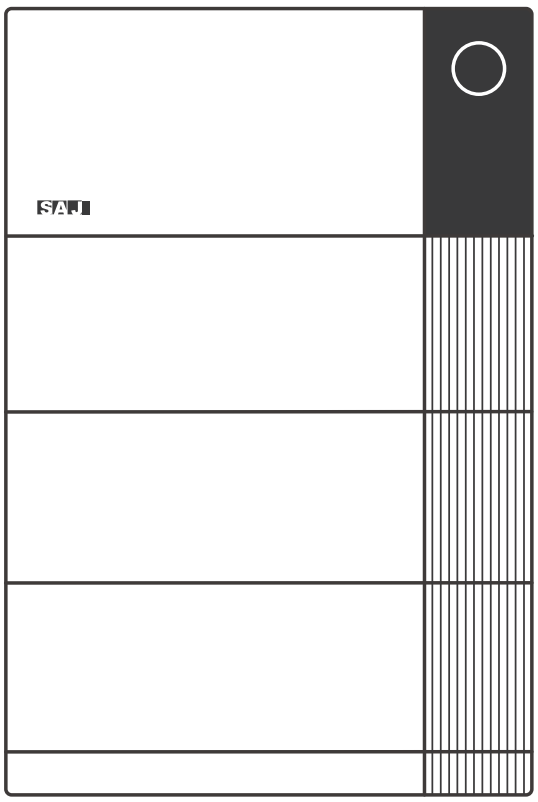
# EK90 series

## All-in-One Energy Storage System

EK90 HS5-(8K-20K)-T3-X

## User Manual



Version 0.1

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## Warranty

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

# About this document

This user manual provides introductions and instructions of operating, maintaining, and troubleshooting the following SAJ product:

- EK90 HS5-(8K-20K)-T3-X

You can find the latest version of this document as eManual at https://www.saj-electric.com/, or scan the QR code below.

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**Note:** Illustrations in this document show only essential details and may differ from the actual product.

**Target Audience**

This document is applicable to the personnel that transport, install, and operate on the product. The personnel are required to have the following qualifications:

- A certain level of expertise in electronics, electrical wiring, and mechanical knowledge in electrical and mechanical schematics.
- Being familiar with the composition and working principles of the product and its upstream and downstream equipment.
- Professional training related to the installation and commissioning of electrical equipment.
- The ability to respond urgently to dangers or emergencies that may arise during installation or commissioning.
- Being familiar with relevant standards and regulations in the country or region where the project is located.
- Being familiar with the contents in this manual.

**Use of the Manual**

Read the user manual carefully before any installation, operation and maintenance and follow the instructions during installation and operation. Always keep the printed manual available for future reference.

**Levels of Warning Messages**

**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, will result in serious injury or moderate injury.

**CAUTION**

Indicates a hazardous situation which, if not avoided, will result in minor or moderate injury.

**NOTICE**

Indicates a situation which, if not avoided, can result in property damage.

## Revision history

| Version | Date | Changes |
| --- | --- | --- |
| V0.1 | 2026-09-02 | Updated the instructions on connecting the manual transfer switch. |
| V0.0 | 2026-07-01 | First version. |

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# 1. Safety instructions

## 1.1. Safety symbols

| Symbol | Description |
|---|---|
|  | **Danger:** Electrical shock hazard<br>This device is directly connected to public grid and thus all work to the system shall only be carried out by qualified personnel. |
|  | **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. |
|  | **Danger:** Risk of electric shock from energy stored in capacitor.<br>Do not open the cabinet door until 5 minutes after disconnecting all sources of supply. |
|  | **Warning:** No open flames<br>Do not place or install near flammable or explosive materials. |
|  | **Caution**<br>Keep the product out of reach of children. |
|  | **Caution:** Check the user manual before service<br>If an error has occurred, refer to the troubleshooting instructions to remedy the error. |
|  | **Caution**<br>This device shall NOT be disposed of in residential waste. |
|  | **Caution**<br>This battery module shall NOT be disposed of in residential waste. |
|  | **CE Mark**<br>Equipment with the CE mark fulfills the requirements of the Low Voltage Directive and Electro Magnetic Compatibility. |
|  | **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. Inverter safety instructions

### Personal Safety

**DANGER**

**Risk of personnel hazard or equipment damage due to improper operations**

Improper operations performed on energized equipment by unqualified personnel may lead to equipment failure or safety hazards.

- Only qualified and trained professionals who are familiar with electrical installation and local codes may install, maintain, or repair the equipment.
- Before any operation, read the safety precautions thoroughly and always follow the standard procedures during operation. Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion.
- Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission. Any unauthorized operation including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property.
- Before any operation, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.
- During operation, do not open the housing or touch electrical terminals.

**WARNING**

**Risk of personal injury due to direct contact with the components or housing**

Direct contact with hazardous moving or hot components during the inverter's operation may lead to personal injury.

- Do not touch a running fan with your hands, components, screws, or any other tools.
- During operation, do not touch heat sink area with bare hands as the inverter surface may become hot.

**CAUTION**

**Risk of equipment damage and personal injury**

If you detect any unusual odors, hear abnormal noises, or notice smoke during operation, immediately shut down the unit and disconnect all power sources.

**NOTICE**

**Risk of equipment malfunction and safety hazards**

Failure to follow proper guidance and neglect of regular monitoring prevents the timely identification and prevention of potential issues.

- Read the entire user manual before installation and keep it at hand for future reference.
- Regularly check the status via the monitoring interface to promptly detect any abnormalities.

### Electrical Safety

**DANGER**

**Risk of high voltage and electric shock**

Before any operation, disconnect the inverter from all AC and DC power sources and wait at least 5 minutes to allow internal capacitors to discharge.

**WARNING**

**Risk of overheat, fire and equipment damage**

Obstructing ventilation or allowing foreign objects to enter the equipment may lead to fire hazards.

- During operation, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects to prevent fire due to high temperature.
- During operation, prevent foreign matter from entering the equipment. Otherwise, equipment short-circuits or damage, load power derating, power failure, or personal injury may occur.
- Do not place any foreign objects or liquid containers on the inverter.

### Environment Requirements

**DANGER**

**Risk of severe electrical shock**

- A lightning strike can induce a sudden and massive power surge, which poses severe hazard to both personnel and equipment.
- Installation, operation, and maintenance is prohibited during thunderstorms.

### Mechanical Safety

**NOTICE**

**Risk of equipment failure or physical injury**

Installing or operating an inverter with pre-existing physical damage compromises safety and functionality.

- Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.
- Before installation, inspect the equipment for any visible damage or signs of transportation damage. If damage is found, do not install or use the equipment.

## 1.3. Battery safety instructions

**DANGER**

**Risk of electric shock, short circuit, or equipment damage**

Performing operations on live / defective equipment or improper grounding connection cause electric shock.

- Do not use the battery or the battery control unit if it is defective, broken or damaged.
- Do not subject the battery to any strong force.
- Keep the power off prior to any operations.
- Make sure that the battery is grounded prior to use.
- Do not pull out any cables or open the battery enclosure when the battery is powered on.
- Maintenance and installation at the battery cell assembly level are not required, and on-site repair or replacement of cell-level components is strictly prohibited. Any such operations shall be carried out by returning the battery module to SAJ or the service provider.

**DANGER**

**Risk of reduced life cycle, fire, or explosion**

Excessive heat or direct exposure to heat sources destabilizes the battery chemistry.

- Do not expose the battery to temperatures more than 50°C.
- Do not place the battery near a heat source, such as direct sunlight, a fireplace.
- Keep inflammable and explosive dangerous items or flames away from the battery.

**DANGER**

**Risk of short circuit, corrosion, internal damage, or malfunction**

Water, moisture, or specific corrosive gases can damage electronics and battery components.

- Do not soak the battery in water or expose it to moisture or liquids.
- Do not use the battery in areas where the ammonia content of the air exceeds 20 ppm.

**WARNING**

**Severe injury, death, equipment damage, system failure, and voided warranty**

Improper handling by unqualified individuals can lead to electrical hazards.

- Only qualified personnel with a thorough understanding of local safety regulations and battery standards may install, maintain, remove, or dispose of this product.
- **SAJ** shall not be held liable for any loss or warranty claims resulting from unauthorized product modifications that could lead to fatal injury, harm to third parties, or impaired equipment performance.
- The battery cannot be disposed of as household refuse. When the service life of the battery reaches its limit, it is not required to return it to the dealer or **SAJ**, but it must be recycled to the special waste lithium battery recycling station in the area.

**⚠ WARNING**

**Risk of fire, explosion, severe burns, equipment destruction**

Short circuit allows high current to flow and generate intense heat.

- To ensure personal and property safety, never short-circuit the positive (+) and negative (-) terminals.
- Connect the batteries in parallel. Do not connect them in series.
- The battery can start only when connected to the inverter. Once disconnected from the inverter, there is no voltage output at the positive and negative terminals. Do not forcibly activate the battery to output voltage by other means.

**⚠ CAUTION**

**System malfunction, accelerated battery degradation, risk of overheating, and potential safety hazards**

Incompatible components or mixed battery types can lead to improper charging/discharging, voltage imbalance, and communication failures.

- Use this battery only with inverters specified as compatible by the manufacturer.
- Do not mix batteries of different models or specifications in a single energy storage system.

**NOTICE**

For optimal performance and safety, use batteries from the same production batch to minimize the risk of operational abnormalities.

## 1.4. Recycling and disposal

**NOTICE**

This product should not be disposed as a residential waste.

Some components inside the equipment can be recycled and reused, while others may pose a pollution risk to the environment. Please contact a locally authorized professional recycling agency for the proper handling of the product and its internal components.

# 2. Product information

## 2.1. Product introduction

### 2.1.1. EK90 product models

#### Model description

Take EK90-HS5-12K-T3-X-IE as an example.

EK90 HS5-12K-T3-X-IE
① ② ③ ④ ⑤

| | |
|---|---|
| ① | The product series. |
| ② | It means the rated power of the system is 12 kW. |
| ③ | It means three phase with 3 MPPT. |
| ④ | It means the rated capacity in kWh of battery packs. |
| ⑤ | It can be blank or IE. IE means the Ireland model. |

#### Product models

| | |
|---|---|
| **System** | EK90 HS5-8K-T3-X[1] |
| | EK90 HS5-10K-T3-X |
| | EK90 HS5-12K-T3-X |
| | EK90 HS5-12K-T3-X-IE |
| | EK90 HS5-15K-T3-X |
| | EK90 HS5-20K-T3-X |
| **Inverter** | EK90 HS5-8K-T3 |
| | EK90 HS5-10K-T3 |
| | EK90 HS5-12K-T3 |
| | EK90 HS5-12K-T3-IE |
| | EK90 HS5-15K-T3 |
| | EK90 HS5-20K-T3 |
| **Battery** | EK90 BU5-6.0-TV |
| | EK90 BU5-7.0-TV |
| | EK90 BU5-9.0-TV |
| **Battery base** | BE5-TV |
| **Wall-mounting bracket** | BT5-TV |

1. The value of x includes 6, 7, 9, 12, 14, 15, 16, 18, 21, 24, 25, 27, 28, 30, 35, 36, 40, 42, 45, 50, and 54.

## 2.1.2. Dimension

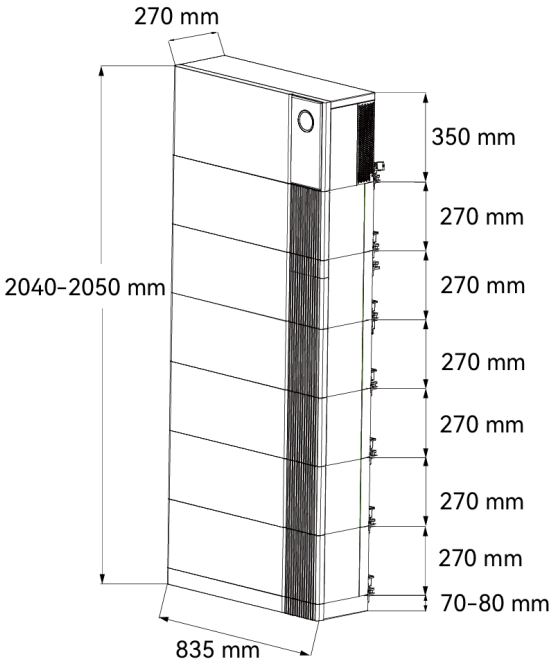
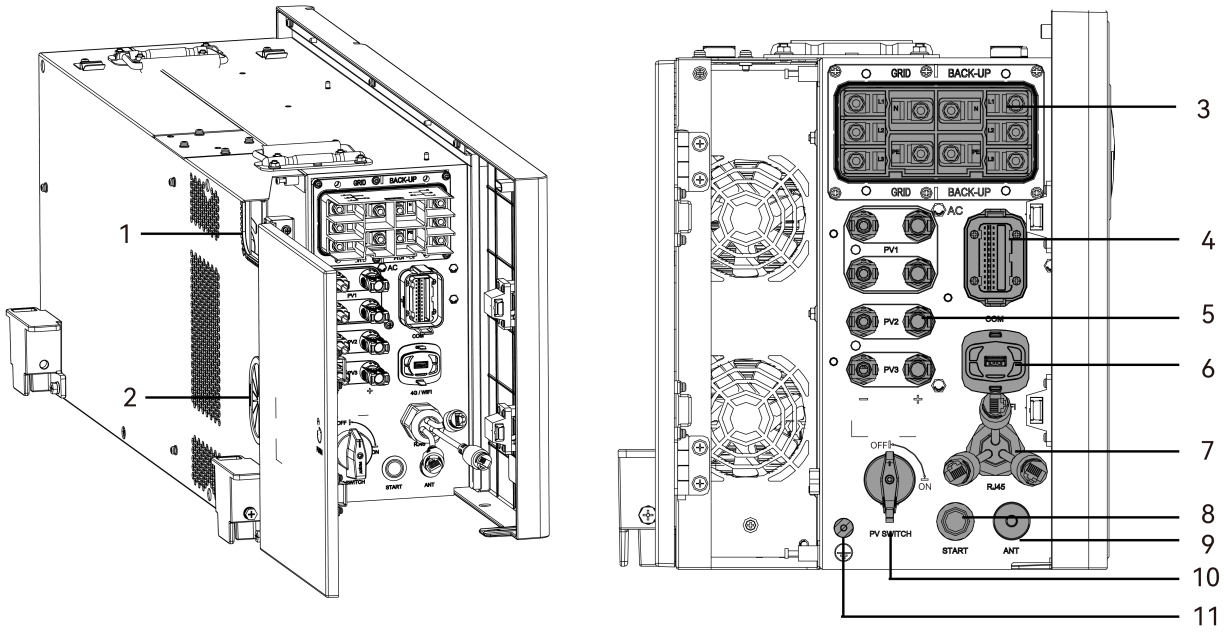



Figure 2.1. Dimensions

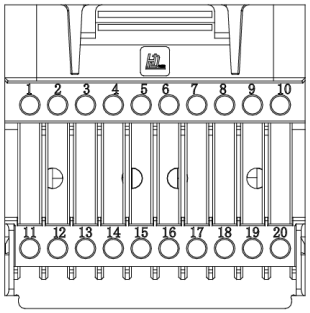
### 2.1.3. Inverter ports and switches




| Callout | Silkscreen | Description |
|---|---|---|
| 1 | / | The cable entry hole 1 for routing AC power cables. |
| 2 | / | The cable entry hole 2 for routing the following cables:<br>. The grounding cable<br>. The DC power cables<br>. The communication cables |
| 3 | **AC**<br>. **GRID**<br>. **BACK-UP** | The connection ports for AC power cables.<br>. **GRID**: for connecting to the public grid.<br>. **BACK-UP**: for connecting to the home backup load. |
| 4 | **COM** | The connection port for communication cables from external devices like DI/DO devices. |
| 5 | **PV1, PV2, PV3** | The negative and positive PV input connection ports. |
| 6 | **4G/WIFI** | The connection port of the eSolar AIO3 Pro and 4G Pro communication modules. |
| 7 | **RJ45** | The RJ45 connection ports for **LAN1**, **LAN2**, and **DRMs** connections as labelled on the ports.<br>**LAN1** and **LAN2** ports are reserved for future use. |
| 8 | **START** | For starting up the energy storage system. |
| 9 | **ANT** | The LoRa antenna connection port. |
| 10 | **PV SWITCH** | The PV switch that controls the connection to the PV array. |

| Callout | Silkscreen | Description |
|---|---|---|
| 11 | | The grounding cable connection port. |

Table 2.1. Inverter electrical ports




| Number | Silkscreen | Description |
|---|---|---|
| 1-6 | / | Reserved for future use. |
| 7 | **DO1+** | Output connection for dry contact device 1. |
| 8 | **DO1-** | Output connection for dry contact device 1. |
| 9 | **DO2+** | Output connection for dry contact device 2. |
| 10 | **DO2-** | Output connection for dry contact device 2. |
| 11 | **PC 485A** | Reserved RS485 connection ports.<br>The RS485 communication can be adjusted with the provided 120 Ω resistor controlled by **SW2** DIP switch. |
| 12 | **PC 485B** | |
| 13 | **Meter 485A** | For RS485 connections with the meter.<br>The RS485 communication can be adjusted with the provided 120 Ω resistor controlled by **SW3** DIP switch. |
| 14 | **Meter 485B** | |
| 15 | **DI1+** | Input connection for dry contact device 1. |
| 16 | **DI1-** | Input connection for dry contact device 1. |
| 17 | **DI2+** | Input connection for dry contact device 2. |
| 18 | **DI2-** | Input connection for dry contact device 2. |
| 19 | **12V** | Port for providing 12V DC power supply to the external device. |
| 20 | **GND** | Port for grounding connection. |

Table 2.2. 20-pin definition for COM port

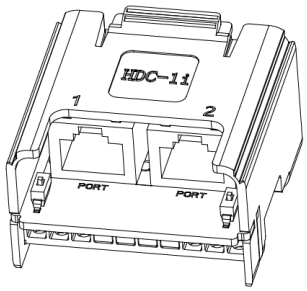


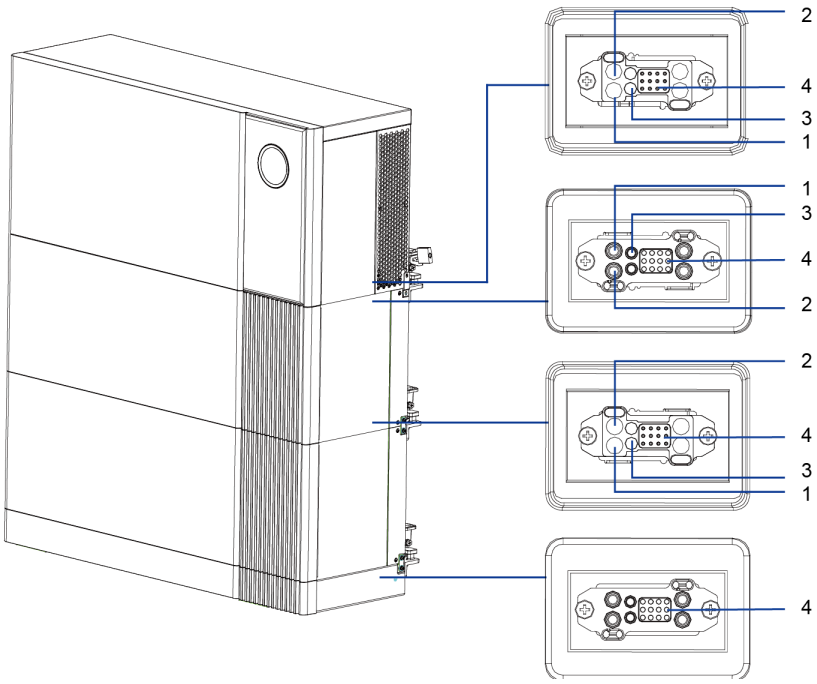

Figure 2.2. RJ45 ports for communication connector

| Number | Silkscreen | Description |
|---|---|---|
| 1 | **PORT CAN** | Reserved port. |

| Number | Silkscreen | Description |
| --- | --- | --- |
| 2 | **DSP CAN** | Reserved port. |

## 2.1.4. Blind-mate connectors

The EK90 system is equipped with blind-mate connectors on the inverter, batteries, and battery base, ensuring quick electrical connection and communication among these components. The following figure shows the positions and ports of the connectors.




| Number | Designation |
|---|---|
| 1 | The positive pole port of the blind-mate connector. |
| 2 | The negative pole port of the blind-mate connector. |
| 3 | The protective earth (PE) port of the blind-mate connector. |
| 4 | The communication ports of the blind-mate connector. |
| Non-labeled ports | Reserved for future use. |

## 2.1.5. LED on the inverter



Figure 2.3. Inverter LED panel

| Display | Color | Status | Description |
|---|---|---|---|
|  | Green | Solid on | The inverter is working properly with grid connection. |
| | | Breath, on 1.5s, off 1.5s | The inverter is in initialization or standby state. |
| | | Breath, on 3s, off 3s | The inverter is working properly off-grid. |
| | | Breath, on 0.5s, off 0.5s | The inverter is working off-grid with SOC lower than 20%. |
| | Red | Solid on | The inverter is faulty. |
| | Yellow | Breath, on 3.5s, off 3.5s | The inverter is upgrading. |
| | Gray | Off | The inverter is powered off. |

Table 2.3. LED light

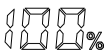
| Display | Color | Status | Description |
|---|---|---|---|
|  | White | *Integer* (example, 50) | Battery state of charge (SOC). For example, 50%. |
| | | -- | The battery communication is lost. |
|  PV | White | Solid on | The PV array is working. |
| | | Off | The PV array is not connected. |
| | Red | Solid on | The PV array is faulty. |
|  BATTERY | White | Solid on | The battery is charging. |
| | | Breath, on 1s, off 1s | The battery is discharging. |
| | | Off | The battery is disconnected or inactive. |
| | Red | Solid on | The battery is faulty. |
|  GRID | White | Solid on | The inverter is working with grid connection. |
| | | Breath, on 3s, off 3s | The inverter is working off-grid. |
| | | Off | No grid is detected. |
| | Red | Solid on | AC connection point is faulty. |
|  COM | White | Solid on | In good communication with the meter, BMS, and cloud. |
| | | Breath, on 1s, off 1s | Lost communication with the meter, BMS, or cloud. |
| | Red | Solid on | Lost communication with all the meter, the BMS, and cloud. |

Table 2.4. LED indicators

## 2.2. Work mode

The EK90 system supports the following working modes:

### AI Mode

The working mode with AI Saving enabled. The system leverages AI-powered intelligent scheduling based on forecasts of PV generation, load demand, and electricity pricing to optimally allocate energy sources and usage, minimizing electricity bills and maximizing grid-export revenue.

### Self-consumption Mode

The self-consumption mode maximizes the use of electricity generated by PV and minimizes the electricity purchased from the grid to reduce costs.

| Period | Working logic |
| --- | --- |
| PV power is sufficient | **[PV→ Loads > Battery > Grid]**<br>Any PV power will first supply the loads,with any surplus being used to charge the battery. Any excess power can then be exported to the grid. |
| PV power is insufficient | **[Battery + Grid → Loads]**<br>Both the battery and the grid power the loads.<br>The battery discharges power to the loads first. Once the battery reaches its minimum SOC, it stops discharging, and the grid supplies power to the loads. |

### Time-of-use Mode

The time-of-use mode allows the users to set the battery charging and discharging time according to the local peak and valley electricity prices.

| Period | Working logic |
| --- | --- |
| Charging period (with lower electricity price) | **[Grid→ Battery]**<br>The battery charges from the grid at a preset charging power until reaching the preset stop-charging SOC (%). |
| Discharging period (with higher electricity price) | [**Battery→ Loads**]<br>The battery discharges to loads at a preset discharging power until reaching the preset stop-discharging SOC (%). |
| Other period | The working logic is the same as self-consumption mode. |

### Back-up Mode

The back-up mode is suitable for areas with frequent power outages. In this mode, the battery capacity is maintained at a relatively high level to ensure that loads work normally when the grid is off. The battery will not be discharged until a grid outage occurs.

| Period | Working logic |
| --- | --- |
| Grid outage occurs | **[PV → Loads > Battery]**<br>The PV power will first supply the loads, with any surplus being used to charge the battery. |

| Period | Working logic |
| --- | --- |
| No grid outage | **[PV → Loads > Battery > Grid]**<br>The PV power will supply the loads first and any surplus will be used to charge the battery. Excess power can then be exported to the grid. |

Table 2.5. With sufficient PV power

| Period | | Working logic |
| --- | --- | --- |
| Battery SOC > preset capacity | Grid outage occurs | **[Battery → Loads]**<br>The battery discharges power to the loads until the battery reaches its minimum SOC. |
| | No grid outage | **[Grid → Loads]**<br>The grid powers the loads. |
| Battery SOC ≤ preset capacity | Grid outage occurs | **[Insufficient PV → Loads]**<br>Only the insufficient PV supplies power to the loads. The battery will not be discharged until its SOC becomes higher than the preset capacity. |
| | No grid outage | **[Grid → Loads]**<br>Only the grid powers the loads. |

Table 2.6. With insufficient PV power

## 2.3. System overview

This section shows the typical integration solutions of system.

### Whole home backup solution

In the whole home backup solution, the system supports integrating with a manual transfer switch that allows the whole home load to connect to and switch between the inverter AC backup output and the public grid. If the grid goes off, the whole home load can be manually switched to the system immediately, and vise versa.

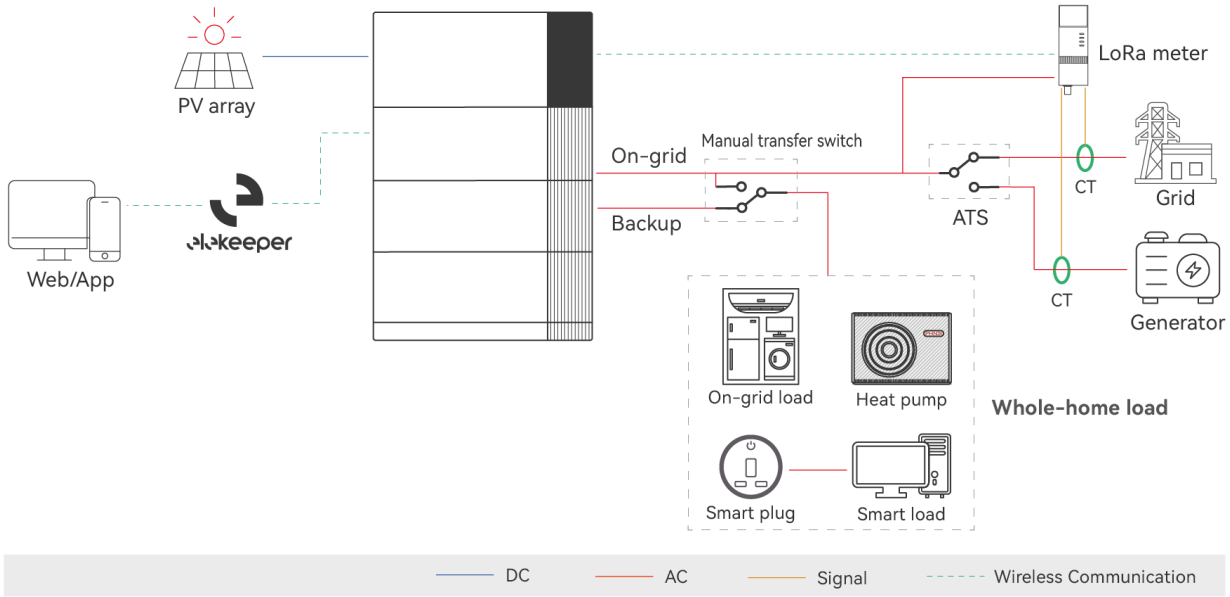



Figure 2.4. Whole home backup solution

| Brand | Specification |
|---|---|
| Lazzen | • Single-phase: NDQ2S-63/1P<br>• Three-phase: NDQ2S-63/3P |

Table 2.7. Manual transfer switch specification

### Partial backup solution

In the partial backup solution, the on-grid load can be connected to the grid AC output of the system, and the off-grid load can be connected to the AC backup output of the system.

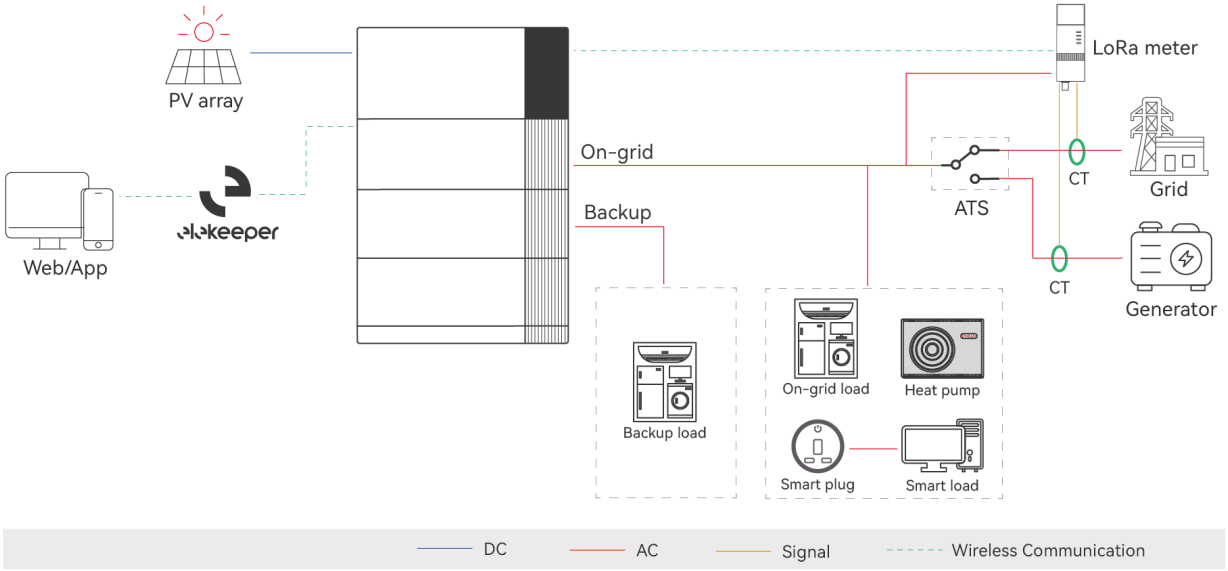



Figure 2.5. Partial Backup Solution

In both solutions, the system provides a dual-channel wireless meter. The meter supports wireless communication with the system at an optimal distance of 150 meters when penetrating walls.

The system also support integrating with wired meter connections through RS485 communication.

# 3. Transportation and storage

## 3.1. Battery transportation and storage

### Transportation

**WARNING**

- The product has passed the UN38.3 test and meets the transportation requirements for dangerous goods, including lithium-ion batteries.
- The transportation service provider must be qualified to transport dangerous goods.
- Before transportation, check that the battery package is intact and that there are no abnormal odour, leakage, smoke or signs of burning. Otherwise, the batteries must not be transported.
- Keep no more than **6** cartons of batteries in one stack.
- Load or unload batteries with caution. Otherwise, the batteries may short circuit or become damaged like leakage or cracking, catch fire or explode.

**NOTICE**

After installing the battery on site, keep the original packaging containing the lithium-ion battery identification. When the battery needs to be returned to the factory for repair, use the original packaging to transport it.

### Storage

**NOTICE**

- The battery remains 50% power when it is sent from the factory.
- The longer the battery is stored, the lower the SOC. If the battery remaining voltage fails to reach the startup voltage requirement, the battery may be damaged.

The battery should be installed within 6 months since delivered from the factory and used with compatible inverters.

Environment requirements for storage within one month:

- Temperature range: -20 ℃ to +45 ℃
- Relative humidity: 5% to 95% RH

Environment requirements for storage within one year:

- Temperature range: 0℃ to 35 ℃
- Relative humidity: < 85% RH

## 3.2. Inverter transportation and storage

**DANGER**

- Observe all safety symbols displayed on the packaging prior to transportation.
- Maintain stable driving conditions throughout transportation to prevent the inverter from colliding or dropping, as internal power components may be damaged, potentially causing short circuits or explosions upon subsequent power-up.
- Ensure that transport vehicles are not overloaded and that weight is distributed evenly.
- Do not drill holes into the product or its housing for any transportation-related purpose. Such modifications can damage the structural integrity and functionality of the device.
- Do not store or transport the equipment in damp, flammable, or explosive environments.

**WARNING**

- When moving the equipment, use the original packaging or dedicated handling tools to avoid muscle strain from lifting heavy objects alone.
- Wear suitable protective gloves when manually handling equipment.
- When lifting the inverter, grip it firmly at the designated handles and support the base. Keep the unit level to avoid dropping.
- Do not unpack the inverter packaging if it is not used immediately.
- Do not store the inverter in areas exposed to direct sunlight, rain, strong electric fields, or high humidity. Such conditions can cause overheating, electrical failure, or corrosion.
- Do not store inverters near chemically corrosive substances or in locations prone to pests or rodents. These can cause irreversible damage to housing and internal components.
- Do not stack heavy objects on top of the inverter enclosure during storage.
- Do not tilt or invert the packaging. Maintain the upright orientation as indicated on the carton to prevent internal displacement or component stress.

**CAUTION**

- Store inverters in a clean, dry, and well-ventilated area to avoid moisture buildup and overheating.
- Promptly replace any packaging materials that have been damaged by insects or rodents.

**NOTICE**

- It is recommended to retain the original packaging for future relocation or return for repair.
- Before long-term storage (exceeding 6 months), ensure the storage environment meets requirements and periodically inspect the packaging integrity. Check for environmental damage, pest intrusion, or packaging degradation.

Storage environment requirements:

- Temperature range: -40 ℃ to +60 ℃
- Relative humidity: 5% to 95% RH
- Corrosion protection level: C4

# 4. Installation

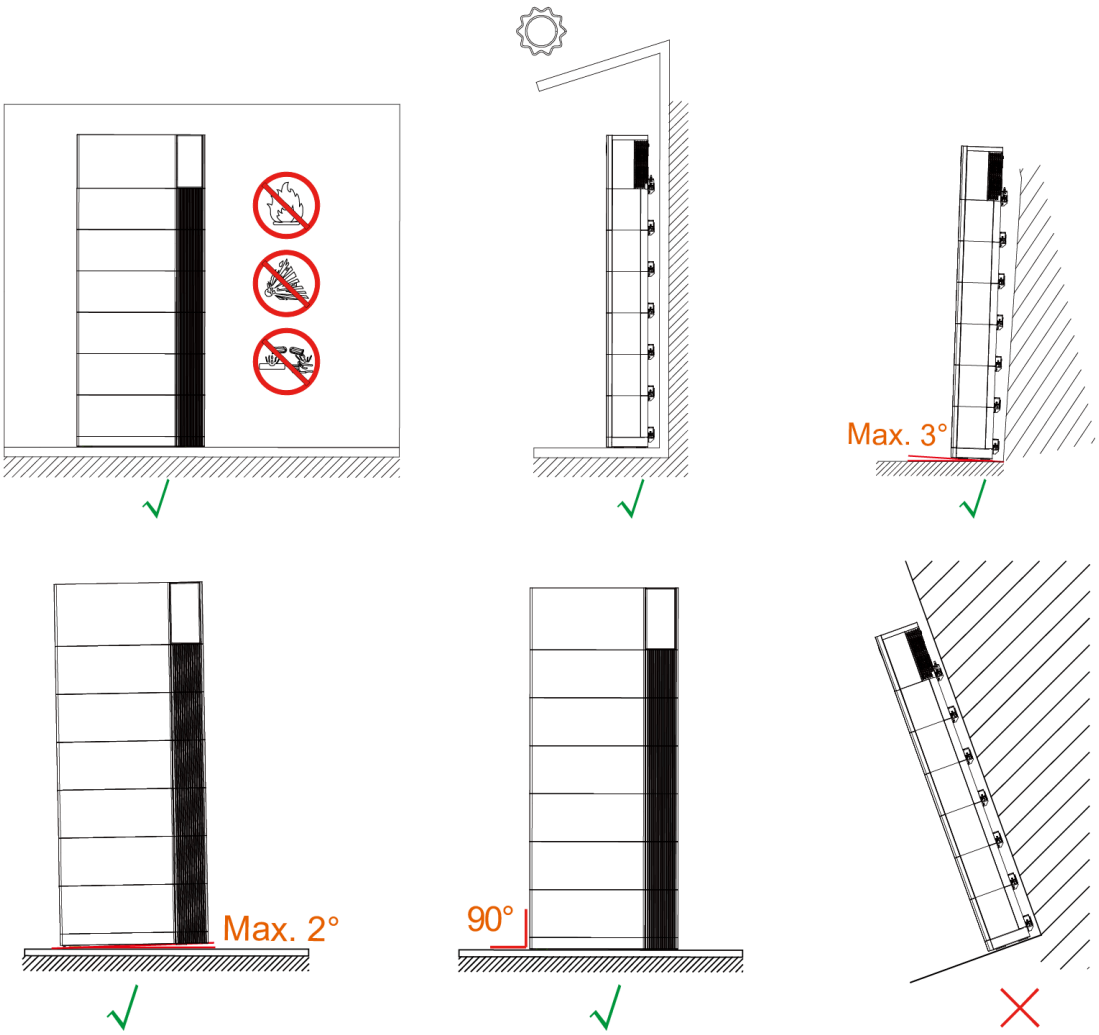
## 4.1. Installation environment requirements

- 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 any heat source.
- Do not install the device at a place where the temperature changes extremely.
- Keep the device away from children.
- Do not install the device in the bedroom, toilet, or bathroom.
- 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.
- For outdoor installation, keep the device away from direct sunlight, rain and snow.
- Ensure the inverter is installed in a well-observed area where the LED display panel can be easily read for real-time status checks.

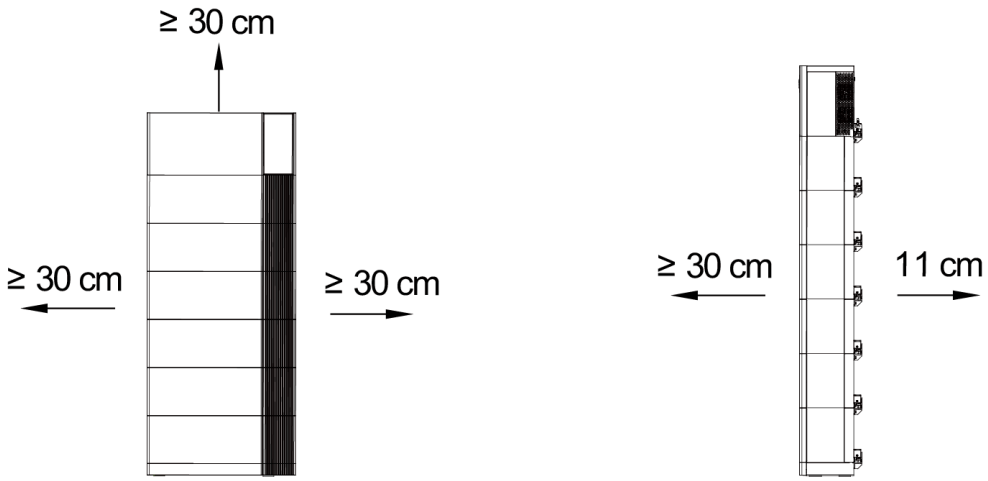


## 4.2. Plan the installation site

Install the product vertically.




Keep enough clearance around the product to ensure proper ventilation.



## 4.3. Installation tools

Installation tools include but are not limited to the following recommended ones. Use other auxiliary tools on site if necessary.

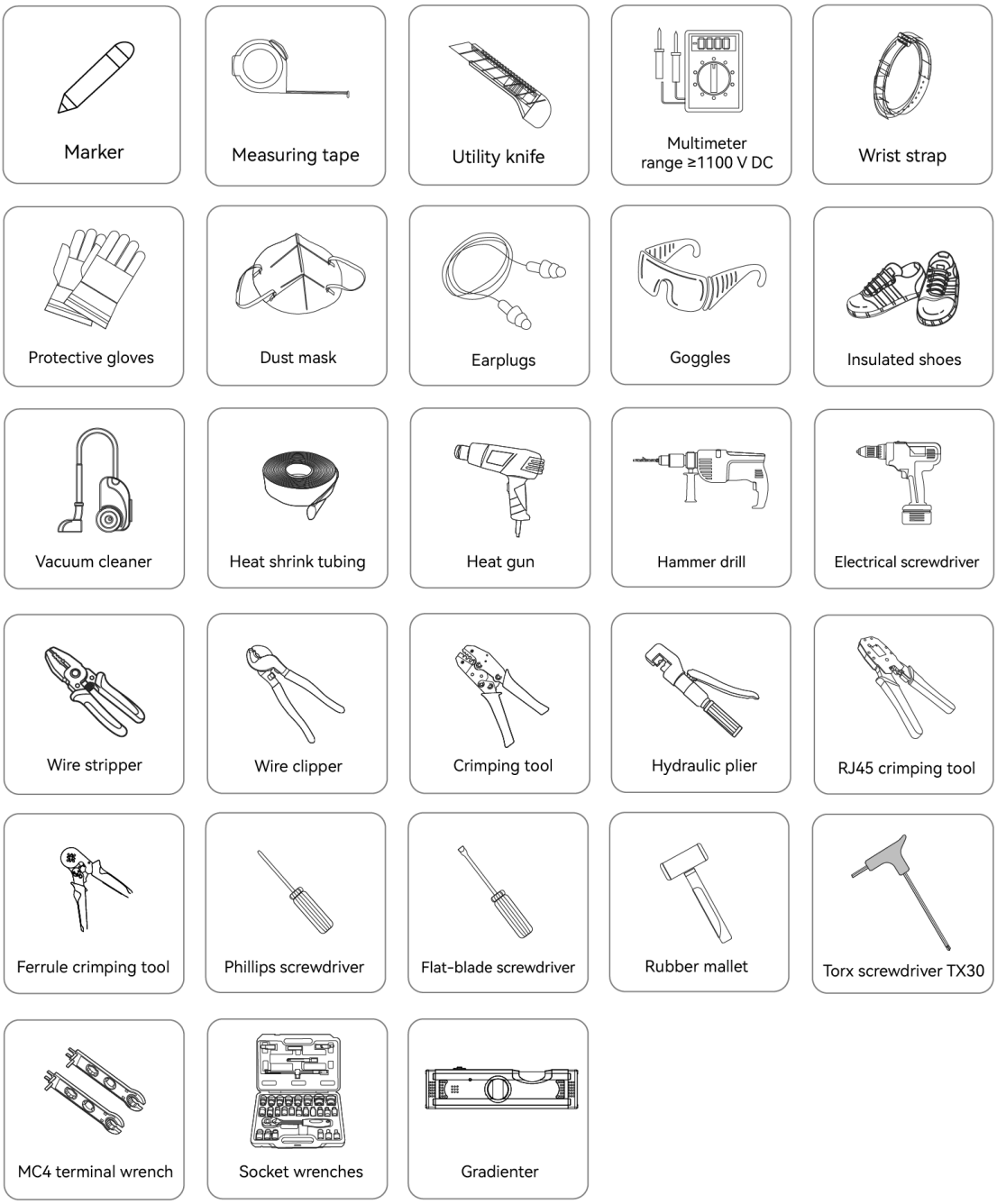
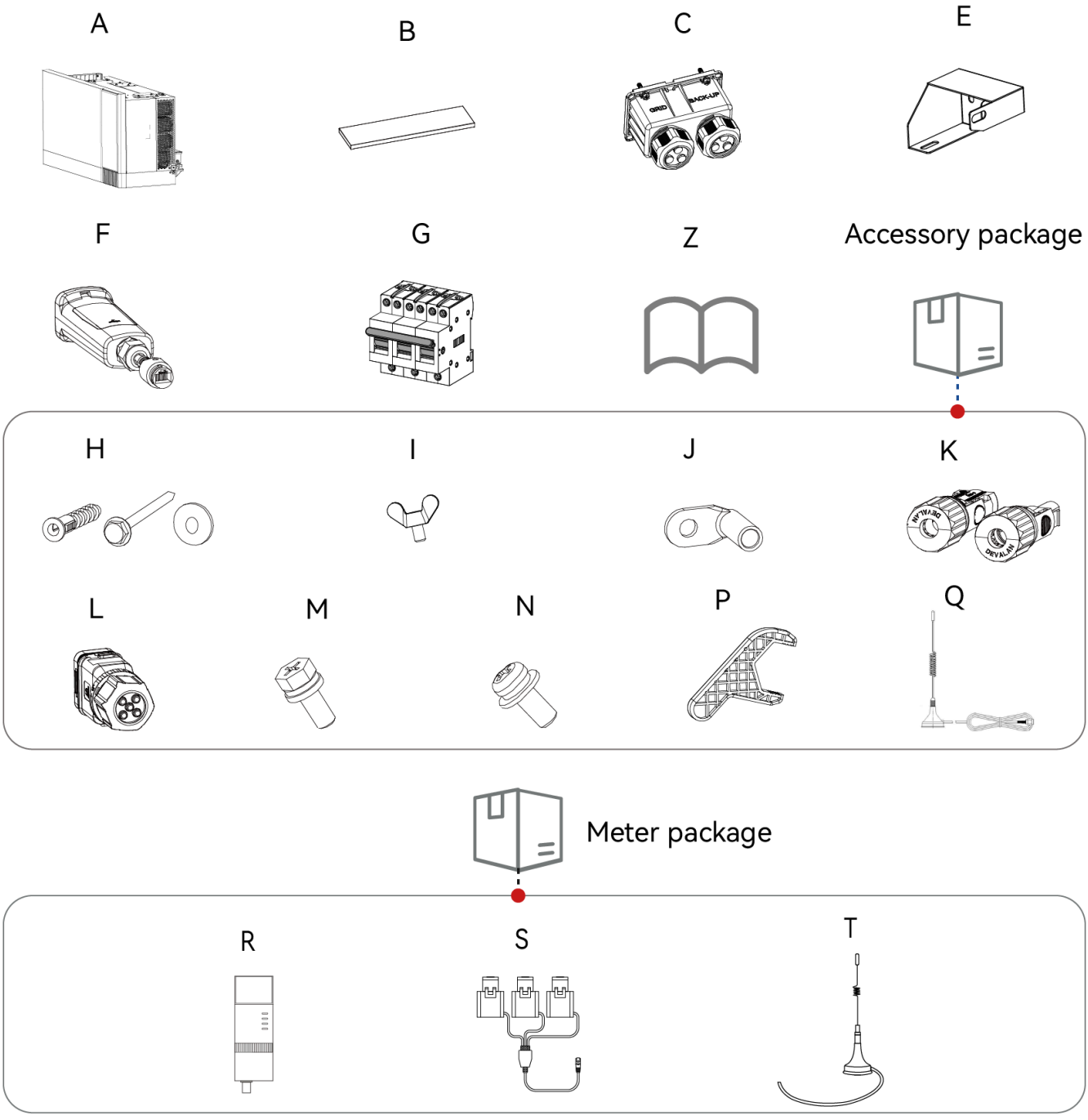



Figure 4.1. Suggested installation tools

## 4.4. Packing list

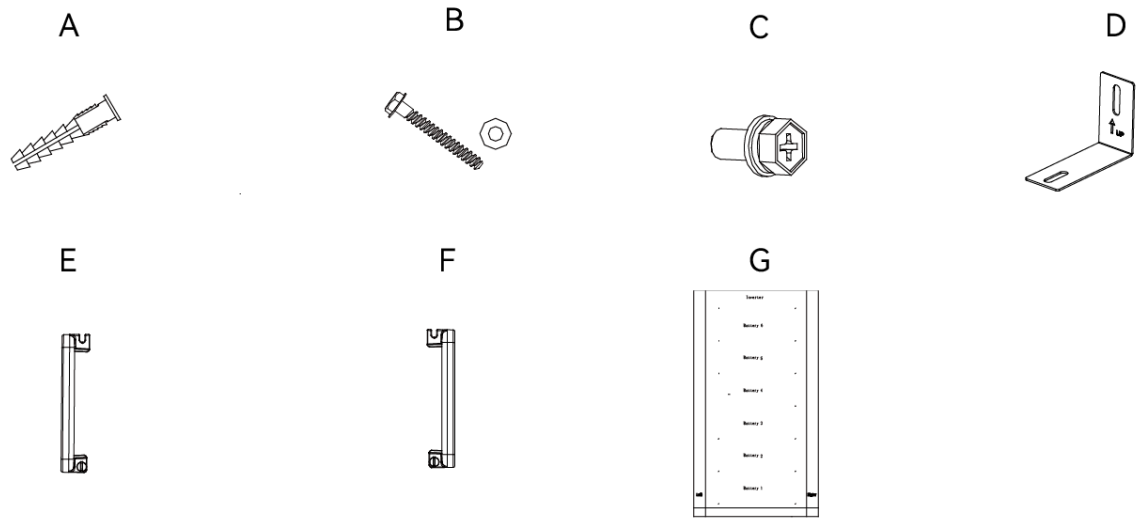
### Inverter




| Number | Quantity | Designation |
|---|---|---|
| A | 1 | Inverter with the battery base |
| B | 1 | Protective cover of inverter |
| C | 1 | AC protective cover |
| E | 1 | Anti-theft bracket |
| F | 1 | Communication module |
| G | 1 | Manual transfer switch |

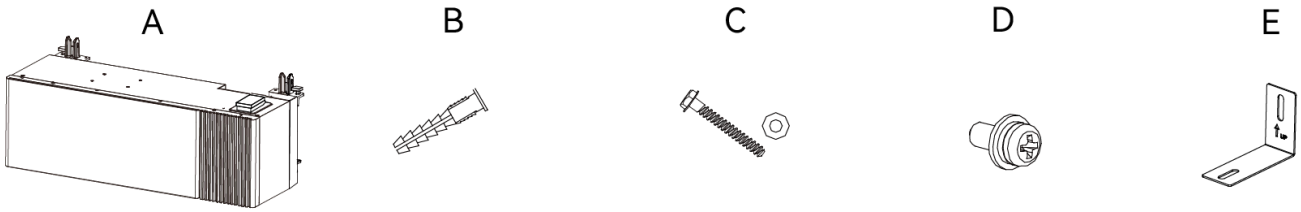
| Number | Quantity | Designation |
|---|---|---|
| H | 1 | Bolts and gaskets for anti-theft bracket |
| I | 1 | Hand-tighten screw |
| J | SC10-5-90: 5<br>SC10-16-5-90: 10 | AC cable terminals:<br>• SC10-5-90: For 6-8 $mm^2$ cables<br>• SC16-5-90: For 10-16 $mm^2$ cables |
| K | 3 or 4 | PV connector. The quantity varies depending on different machine models. |
| L | 1 | 20-pin connector |
| M | 3 | M6*16 screw |
| N | 1 | M4*10 screw. |
| P | 1 | Wrench for securing the AC cover |
| Q | 1 | Antenna to be connected to the inverter. |
| R | 1 | Meter |
| S | 3 | Current transformer (CT) |
| T | 1 | Antenna to be connected to the meter. |
| Z | 1 | Documentation |

The following figure and table show the components for installing the battery base.



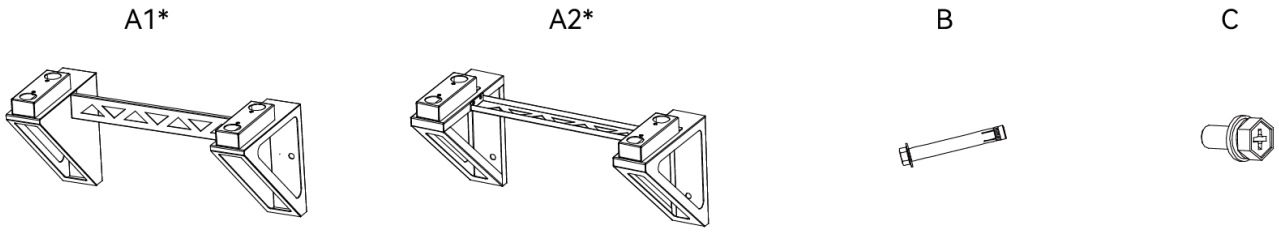

| Number | Quantity | Designation |
|---|---|---|
| A | 2 | M6*80 expansion bolt |
| B | 2 | ST6*50 screw and gasket set |
| C | 2 | M6*16 screw |
| D | 2 | Locking bracket |
| E | 1 | Left handle |
| F | 1 | Right handle |
| G | 1 | Positioning cardboard |

### Battery pack




| Number | Quantity | Designation |
|---|---|---|
| A | 1 | Battery pack |
| B | 2 | M6*80 expansion bolt |
| C | 2 | ST6*50 screw and gasket set |
| D | 4 | M6*16 screw |
| E | 2 | Locking bracket |

### Wall bracket




| Number | Quantity | Designation |
|---|---|---|
| A1/A2 | 1 | Wall bracket. Depending on different shipments, either A1 or A2 is included in this package. Refer to the actual product you received. |
| B | 4 or 6 | M12*100 expansion bolt.<br>• For the wall bracket with 3 installation holes, 6 bolts are provided.<br>• For the wall bracket with 2 installation holes, 4 bolts are provided. |
| C | 2 | M6*16 screw |

## 4.5. Dimension

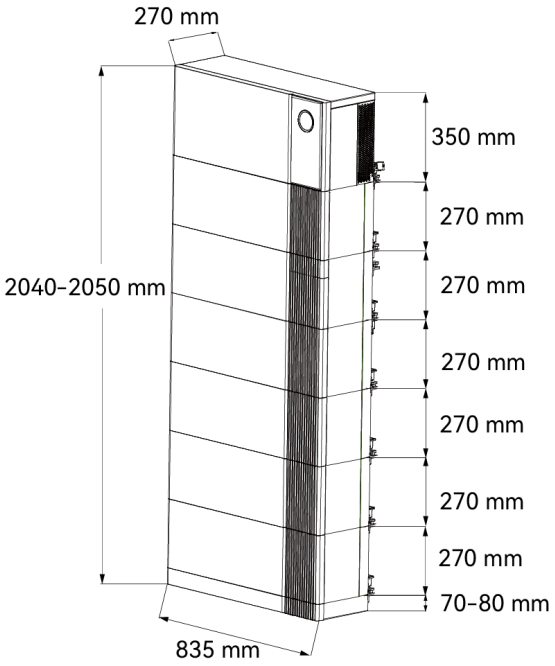
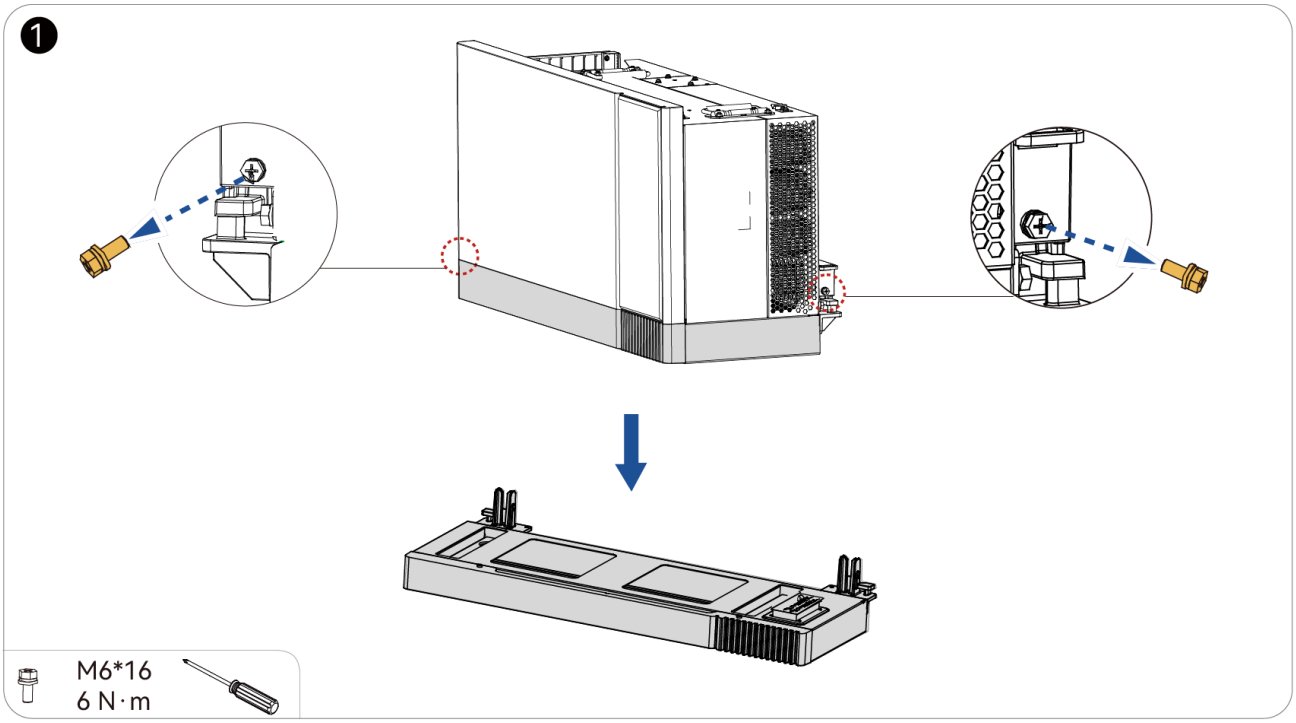
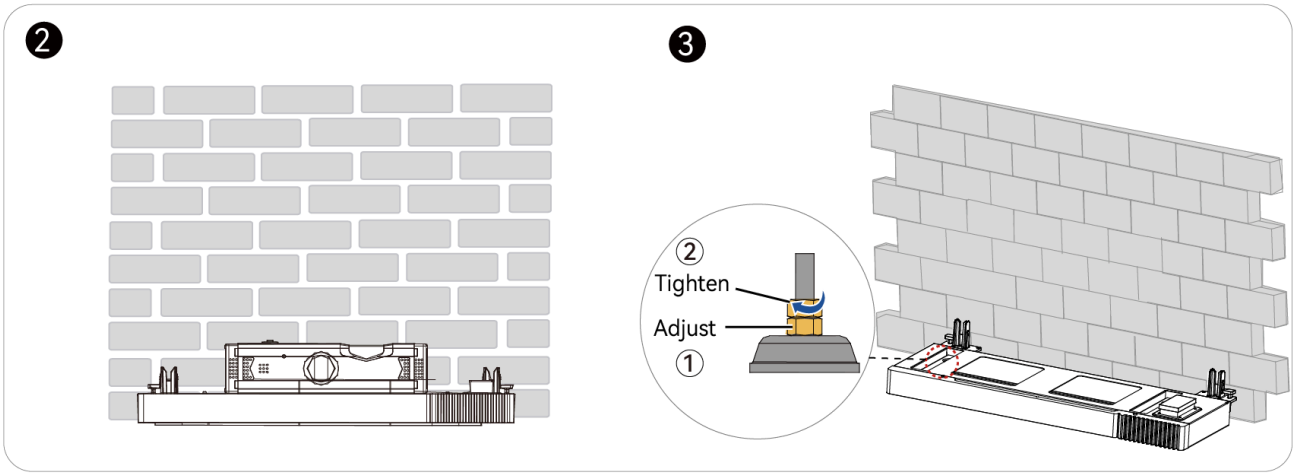


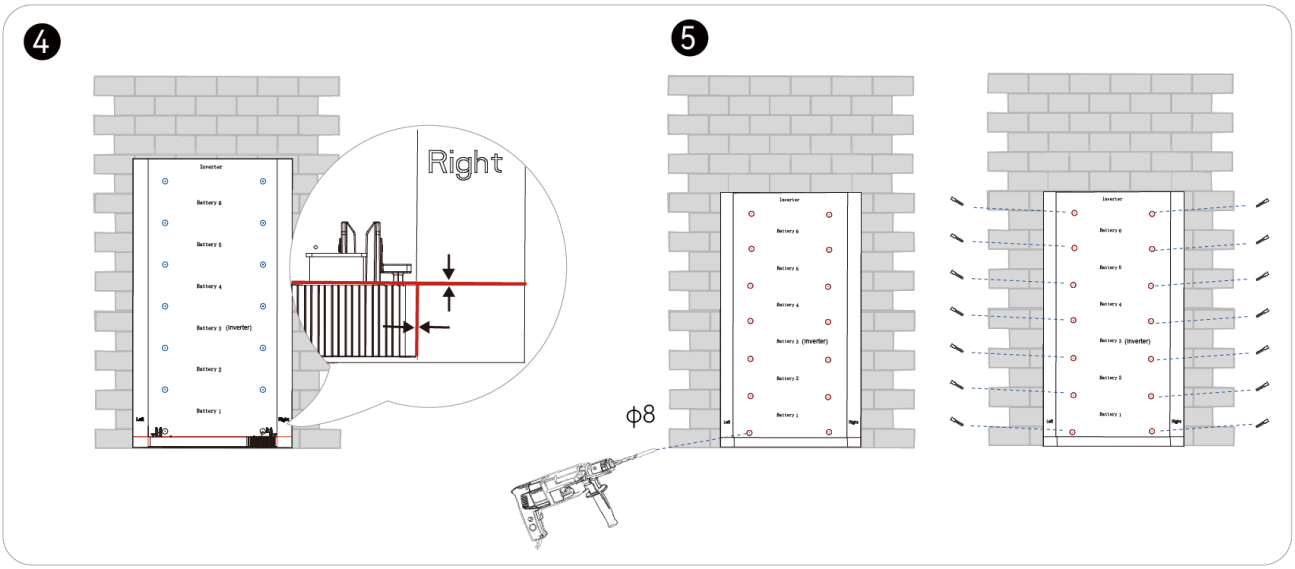

Figure 4.2. Dimensions

## 4.6. Ground mounting

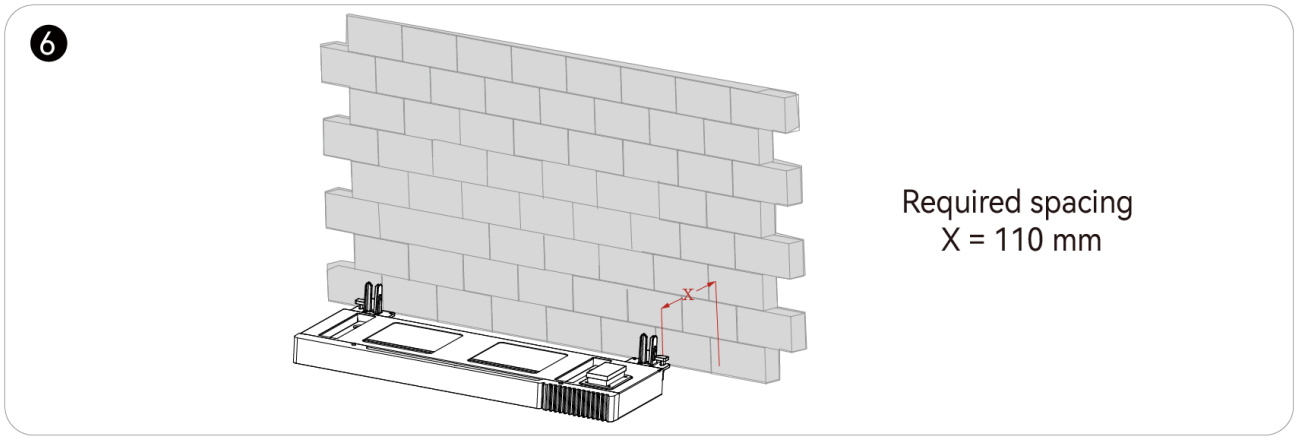
**Note:** For ground mounting, a maximum of 6 batteries is supported.

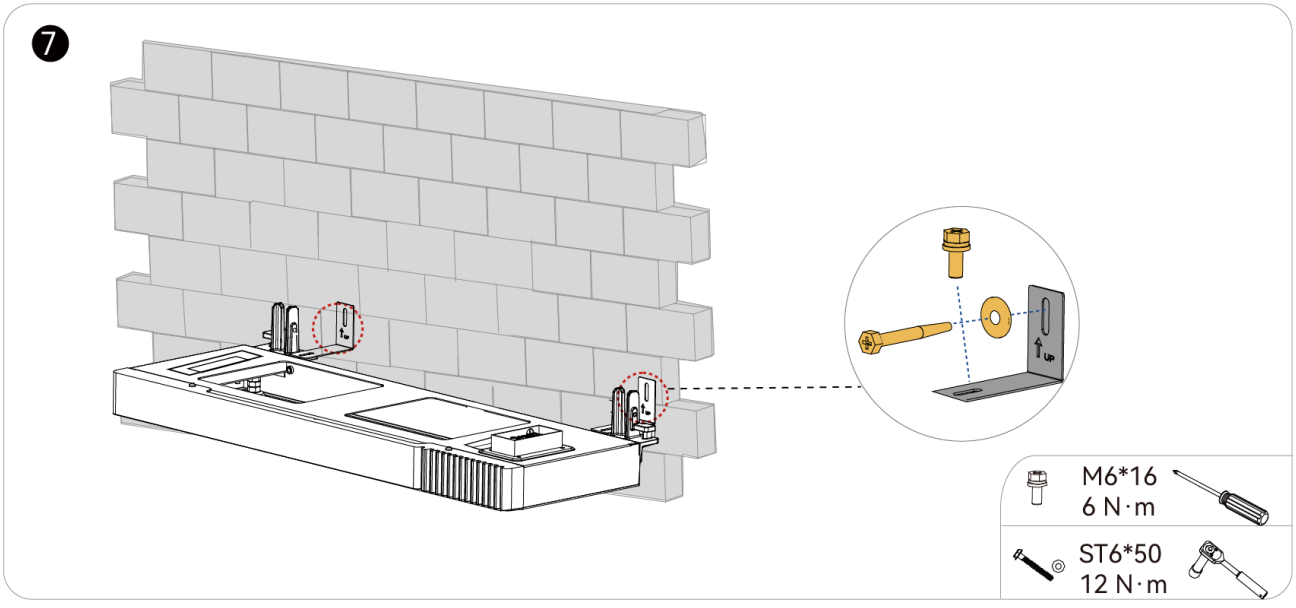


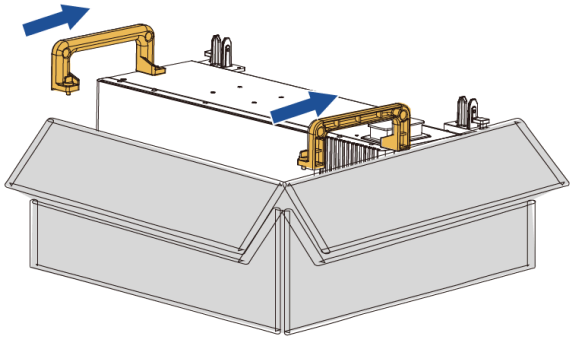



**Note:** Before drilling, put the battery base aside to keep the blind-mate ports dust-free.

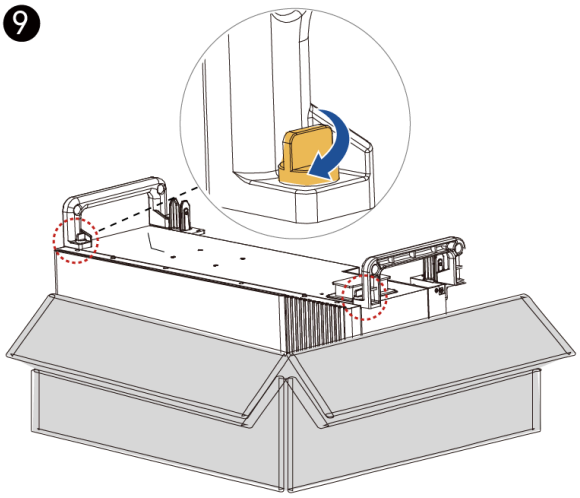


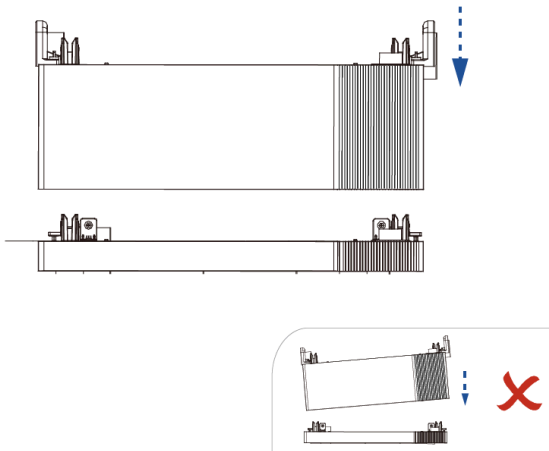
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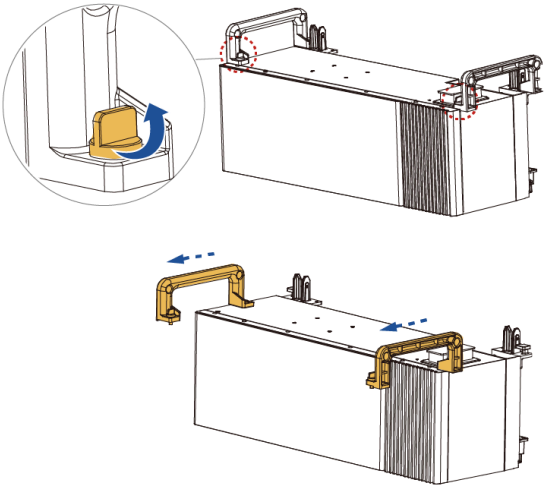
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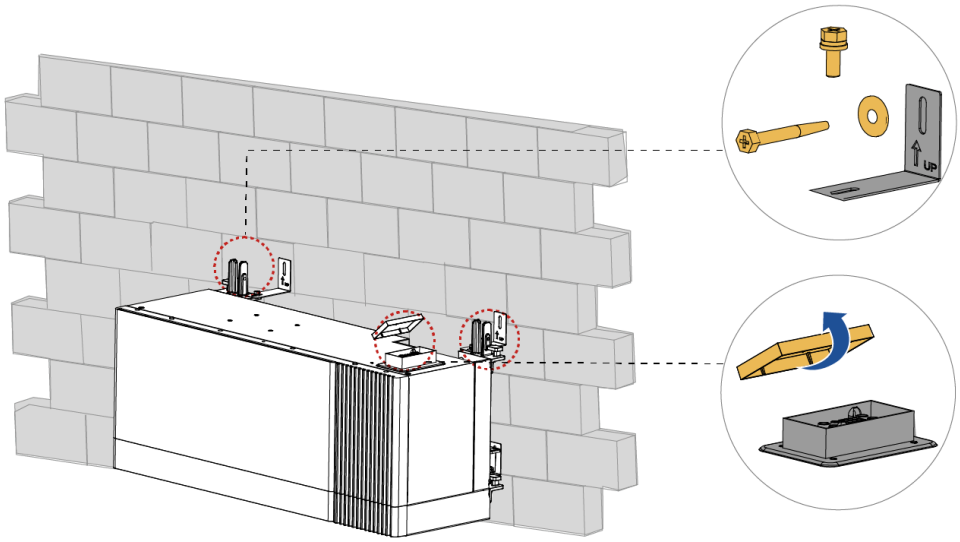
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11



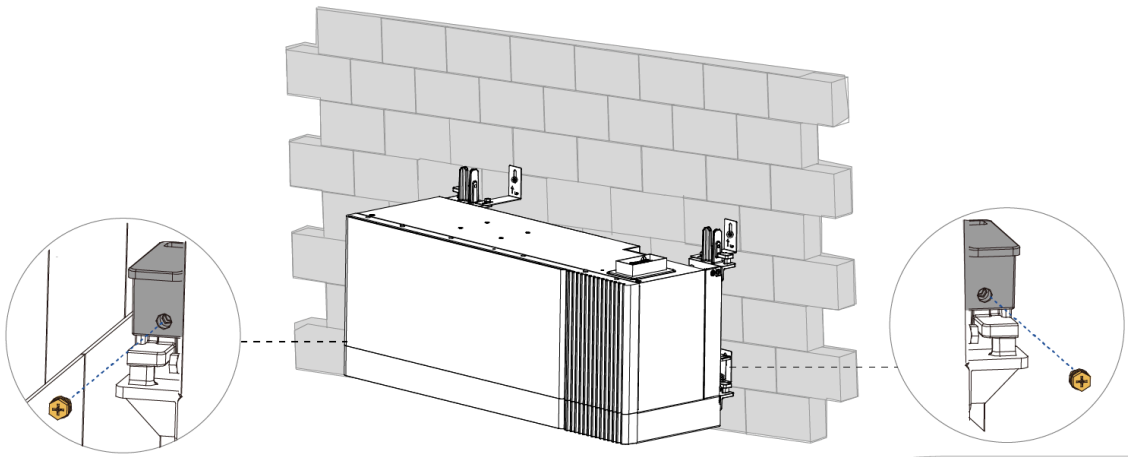
12




M6*16: 6 N·m

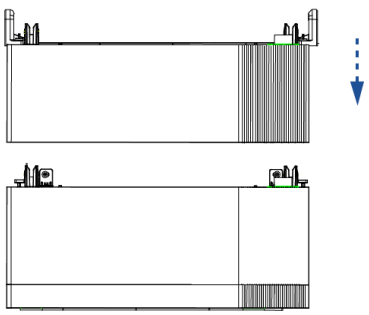
ST6*50: 12 N·m

13



M6*16: 6 N·m

15



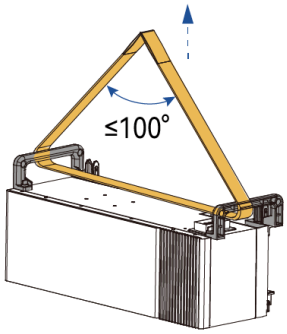
**NOTICE**

The apex angle of the lifting slings should not exceed 100° to ensure safe lifting and transport.

16 Install more batteries by taking the same steps as the first one.

17

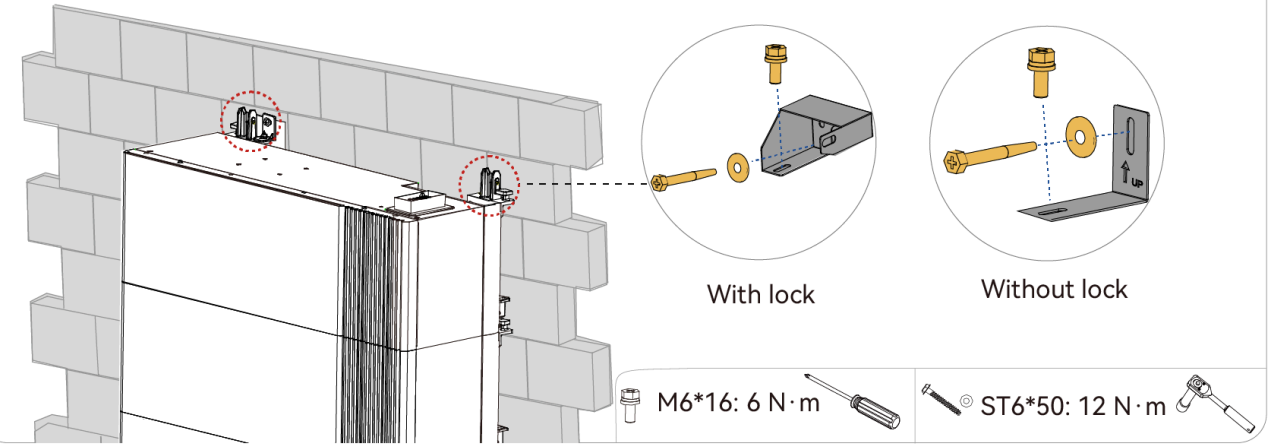
≥4 batteries: recommend using a lifting device.



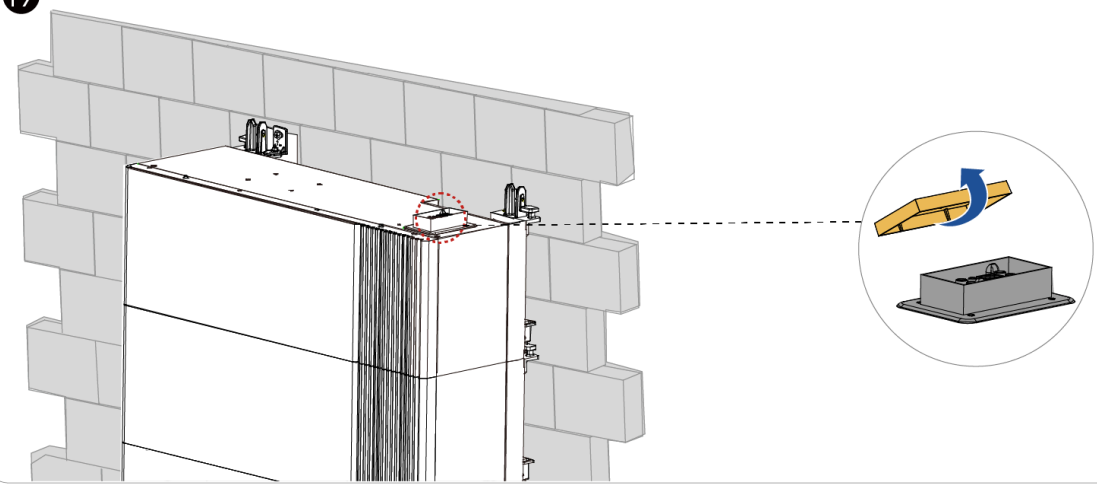

**NOTICE**

The apex angle of the lifting slings should not exceed 100° to ensure safe lifting and transport.

18



19

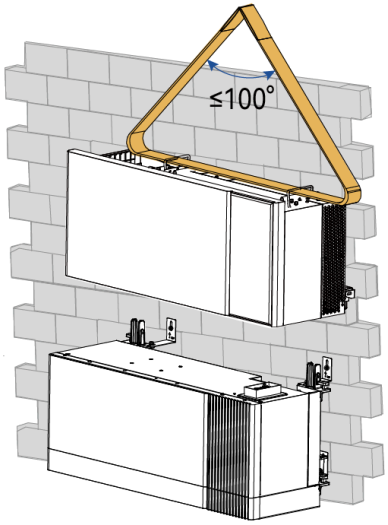


**NOTICE**

The apex angle of the lifting slings should not exceed 100° to ensure safe lifting and transport.

20

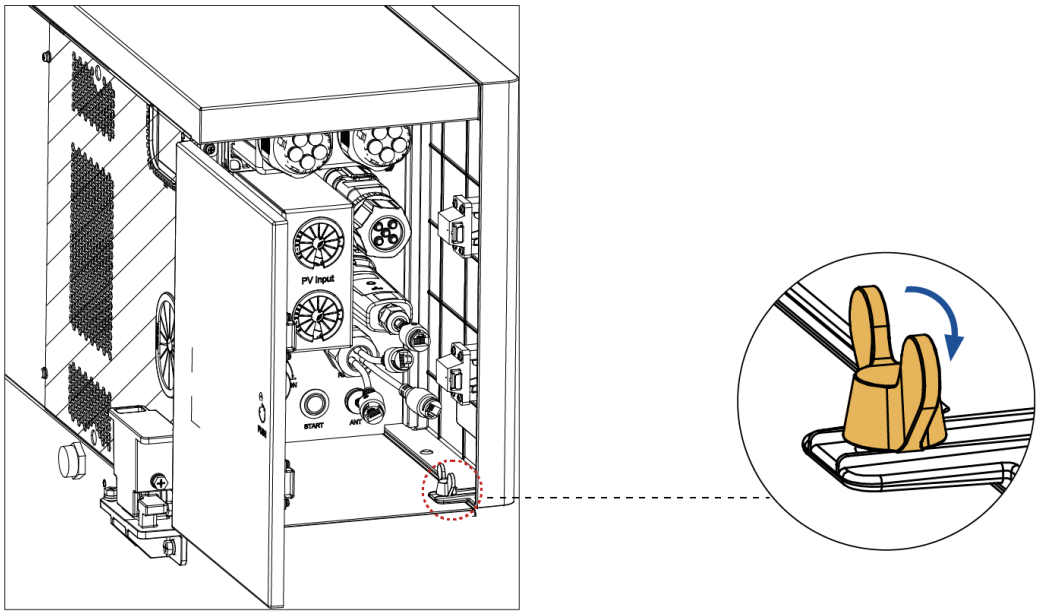
≥4 batteries: recommend using a lifting device.



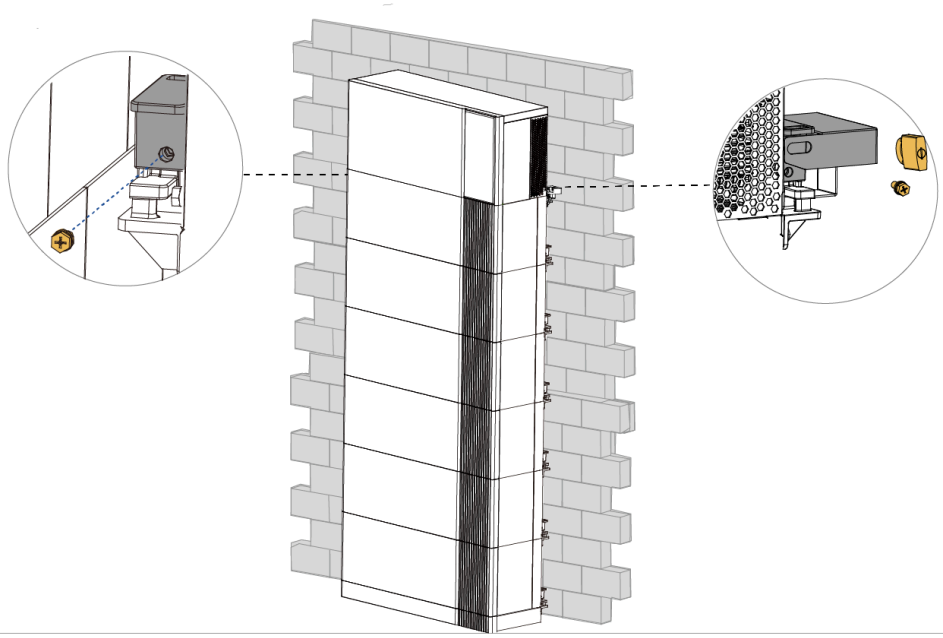

**NOTICE**

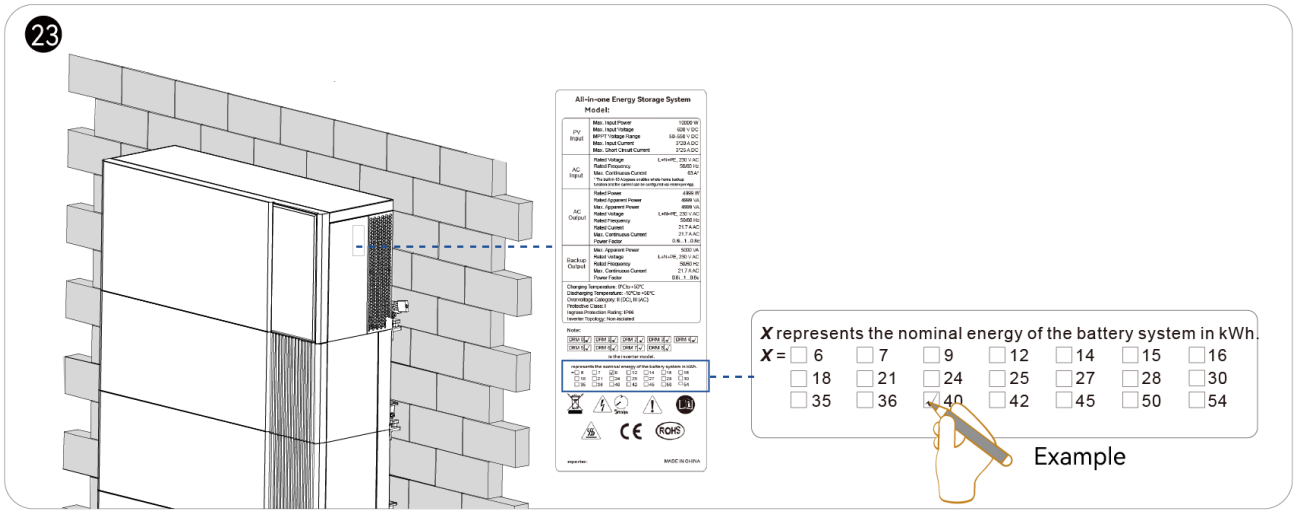
The apex angle of the lifting slings should not exceed 100° to ensure safe lifting and transport.

21




22

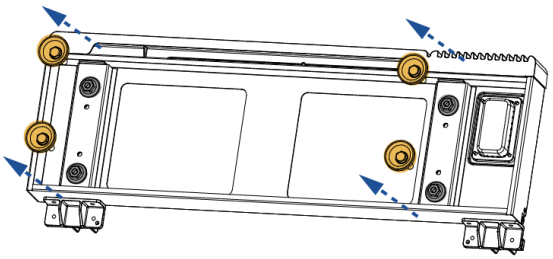



23
All-in-one Energy Storage System
Model:
X represents the nominal energy of the battery system in kWh.
X = 6 7 9 12 14 15 16
18 21 24 25 27 28 30
35 36 40 42 45 50 54
Example

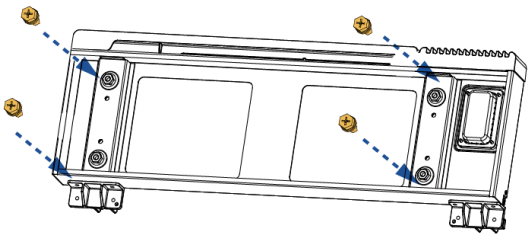
## 4.7. Wall mounting

**Note:** For wall mounting, a maximum of 2 batteries is supported.

❶ Remove the bumper feet.

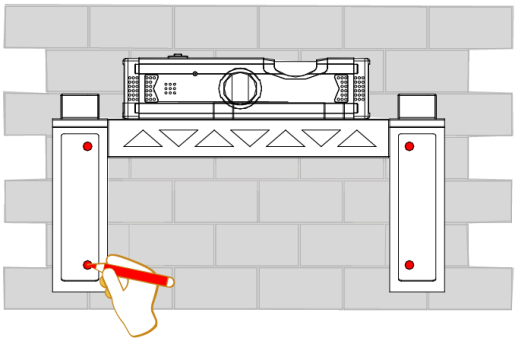


❷

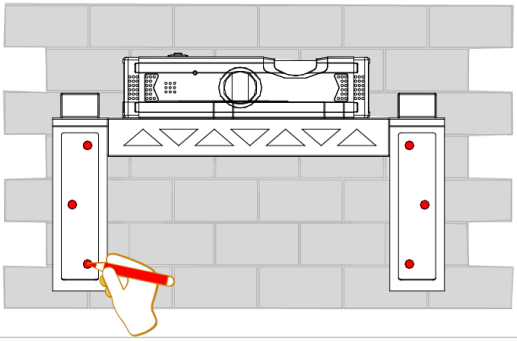



❸

For wall bracket with 2 installation holes

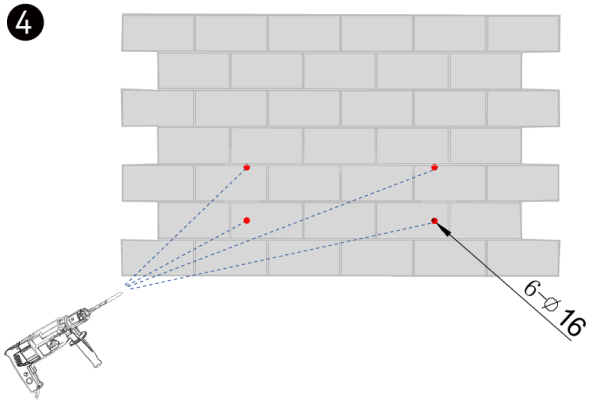


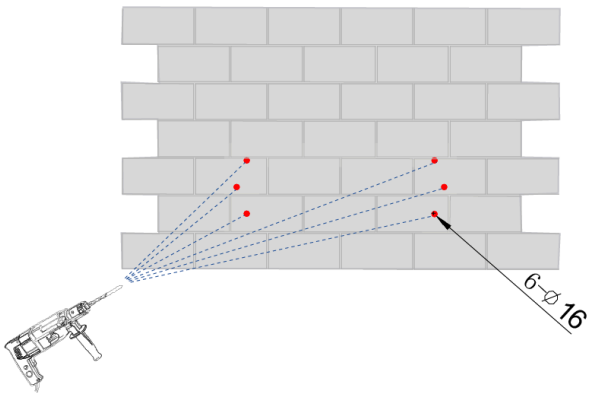
For wall bracket with 3 installation holes



**Note:** The installation height of the wall bracket can be decided according to the actual condition and local regulations of the installation site.

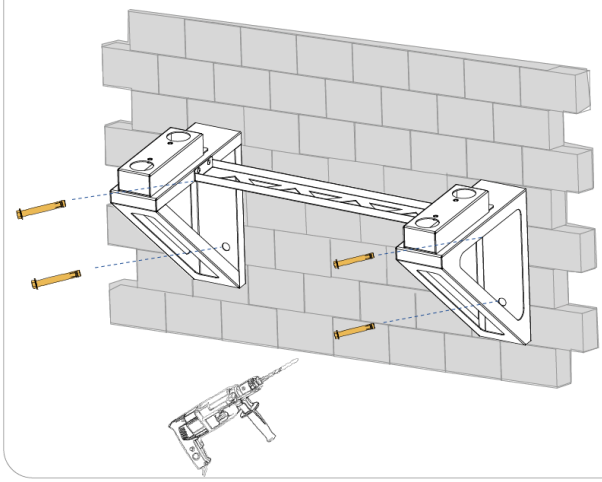
❹



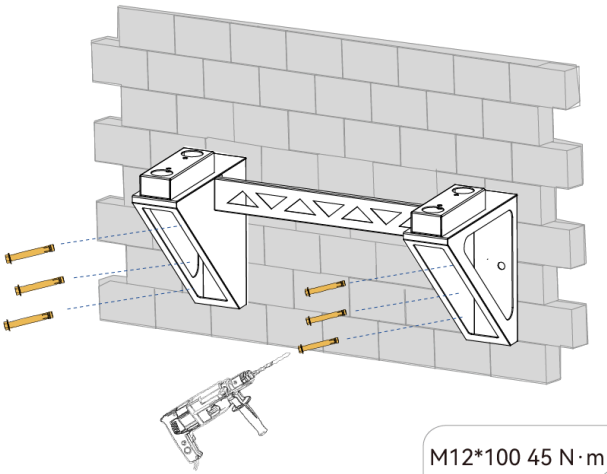



5

For wall bracket with 2 installation holes

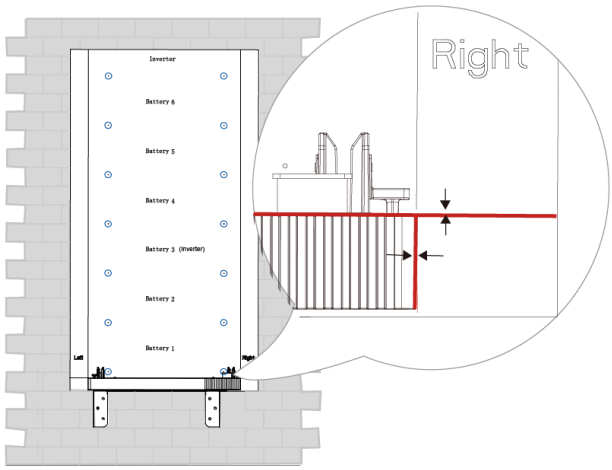


For wall bracket with 3 installation holes

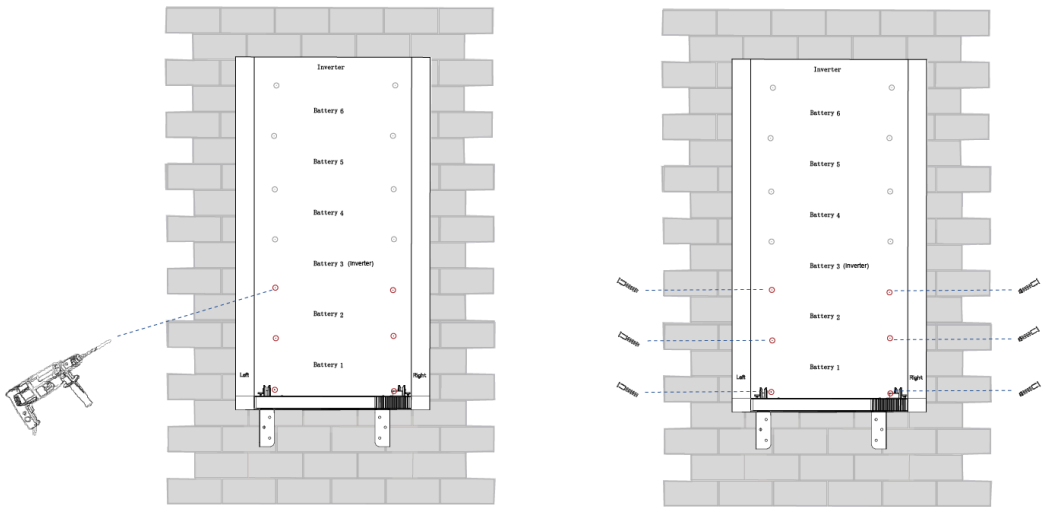


M12*100 45 N·m

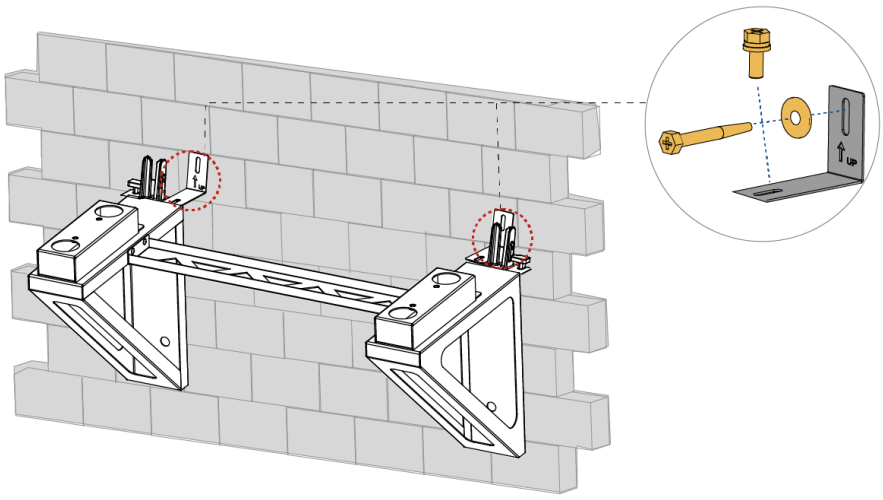
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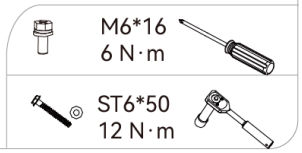



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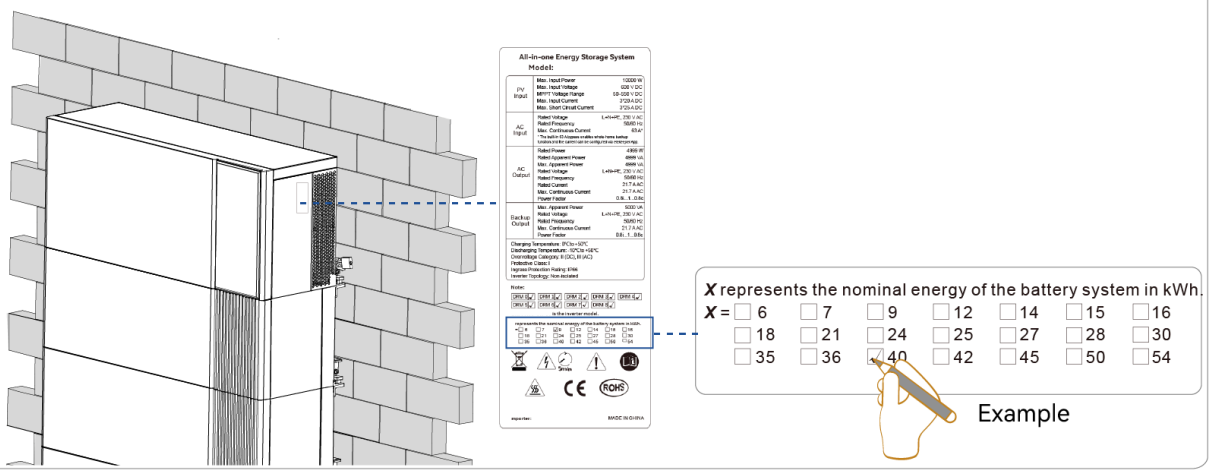
8




9 Install the batteries and inverter by taking the same steps as the ground mounting.

10

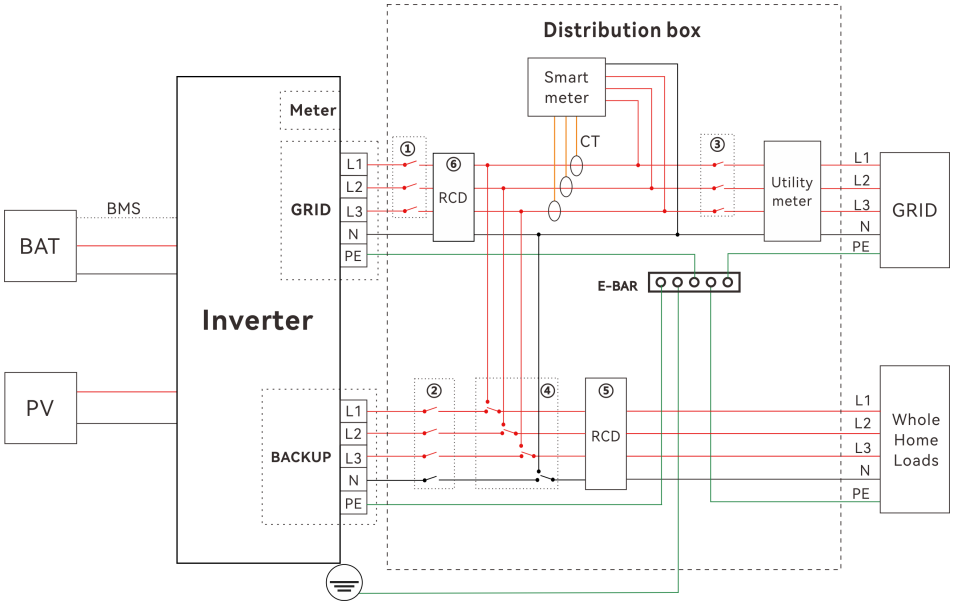


# 5. Electrical connection

## 5.1. Europe

The backup PE line and earthing bar must be grounded properly. Otherwise, the backup function may be inactive during a power outage.

### Whole home backup solution



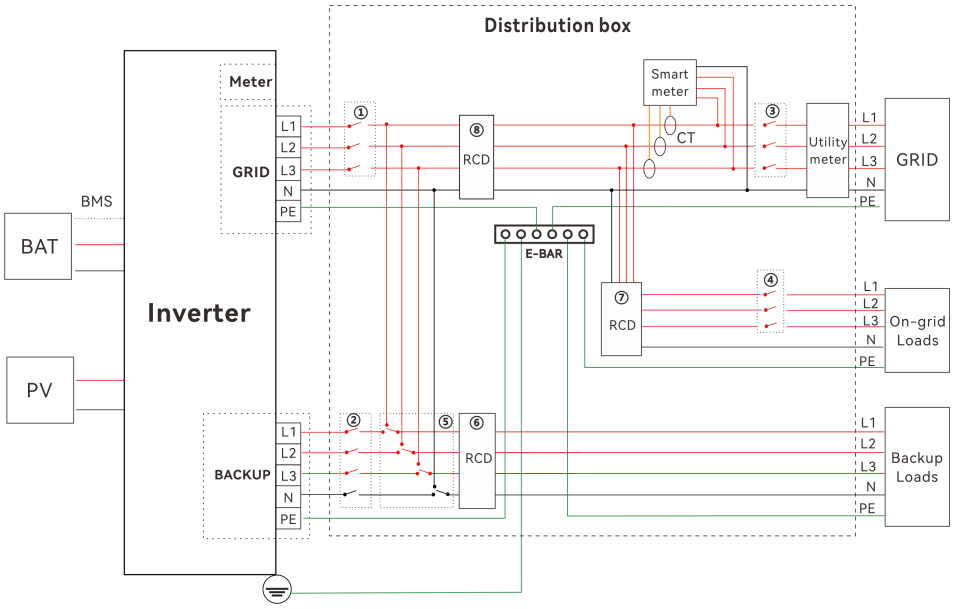

| Product model | ① AC breaker (grid) | ② AC breaker (backup loads) | ③ AC breaker (utility meter) | ④ Manual transfer switch | ⑤⑥ RCD for on-grid/backup loads [1] |
|---|---|---|---|---|---|
| EK90 HS5-8K-T3-X | 63A/400 V | 63A/400 V | Main breaker | 63A/230 V | 30 mA |
| EK90 HS5-10K-T3-X | 63A/400 V | 63A/400 V | Main breaker | 63A/230 V | 30 mA |
| EK90 HS5-12K-T3-X (-IE) | 63A/400 V | 63A/400 V | Main breaker | 63A/230 V | 30 mA |
| EK90 HS5-15K-T3-X | 63A/400 V | 63A/400 V | Main breaker | 63A/230 V | 30 mA |
| EK90 HS5-20K-T3-X | 63A/400 V | 63A/400 V | Main breaker | 63A/230 V | 30 mA |

Table 5.1. Recommended AC breaker and RCD specifications

1. The on-grid RCD is optional since the inverter is integrated with a residential current monitoring unit (RCMU). However, if the external RCD must be installed according to the local regulations, install a type A RCD of action current 30 mA or higher.

**Note:** The values in the above table are recommendations only and can be set to other values based on the actual conditions.

### Partial backup solution



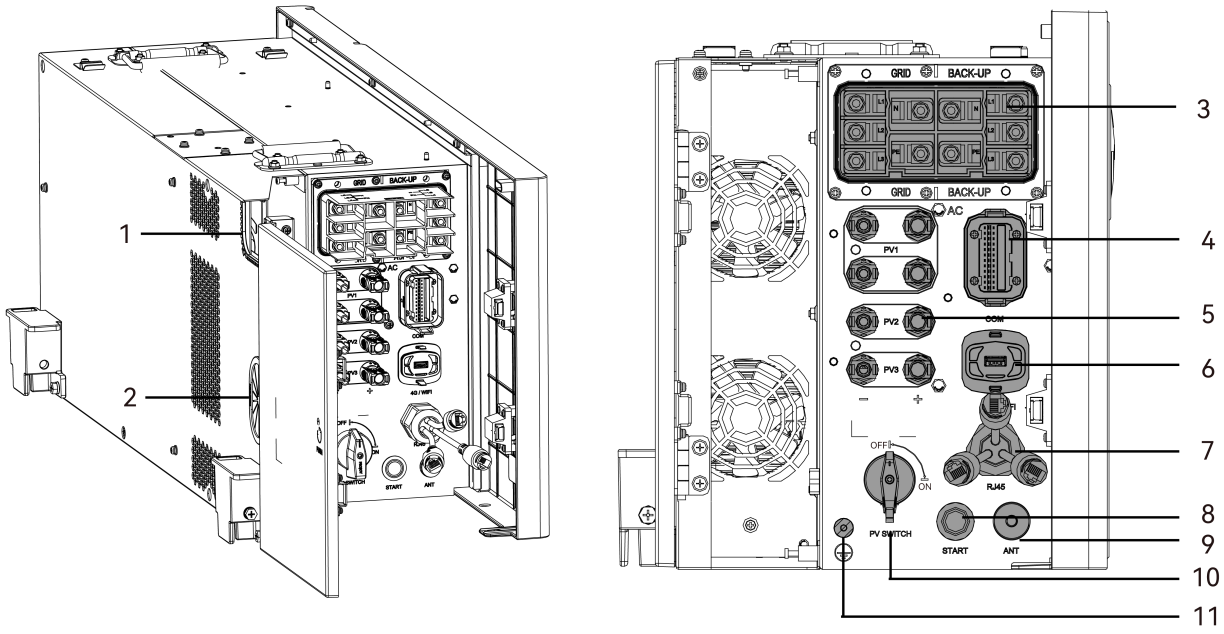

| Product model | ① AC breaker (grid) | ② AC breaker (backup loads) | ③ AC breaker (utility meter) | ④ AC breaker (on-grid loads) | (Optional) ⑤ Manual transfer switch [1] | ⑥⑦ ⑧ RCD for on-grid/ backup loads [2] |
|---|---|---|---|---|---|---|
| EK90 HS5-8K-T3-X | 32 A/400 V | Depend on loads | Main breaker | Depend on loads | Depend on loads | 30 mA |
| EK90 HS5-10K-T3-X | 40 A/400 V | Depend on loads | Main breaker | Depend on loads | Depend on loads | 30 mA |
| EK90 HS5-12K-T3-X (-IE) | 50 A/400 V | Depend on loads | Main breaker | Depend on loads | Depend on loads | 30 mA |
| EK90 HS5-15K-T3-X | 63 A/400 V | Depend on loads | Main breaker | Depend on loads | Depend on loads | 30 mA |
| EK90 HS5-20K-T3-X | 63 A/400 V | Depend on loads | Main breaker | Depend on loads | Depend on loads | 30 mA |

Table 5.2. Recommended AC breaker and RCD specifications

1. For partial backup solution, the manual transfer switch is optional. Install it on demand.
2. The on-grid RCD is optional since the inverter is integrated with a residential current monitoring unit (RCMU). However, if the external RCD must be installed according to the local regulations, install a type A RCD of action current 30 mA or higher.

**Note:** The values in the above table are recommendations only and can be set to other values based on the actual conditions.

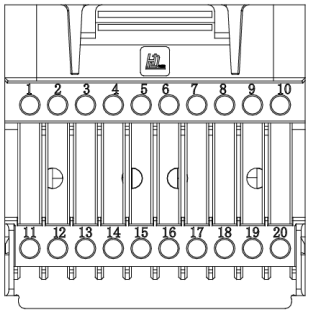
## 5.2. Inverter ports and switches




| Callout | Silkscreen | Description |
|---|---|---|
| 1 | / | The cable entry hole 1 for routing AC power cables. |
| 2 | / | The cable entry hole 2 for routing the following cables:<br>. The grounding cable<br>. The DC power cables<br>. The communication cables |
| 3 | **AC**<br>. **GRID**<br>. **BACK-UP** | The connection ports for AC power cables.<br>. **GRID**: for connecting to the public grid.<br>. **BACK-UP**: for connecting to the home backup load. |
| 4 | **COM** | The connection port for communication cables from external devices like DI/DO devices. |
| 5 | **PV1, PV2, PV3** | The negative and positive PV input connection ports. |
| 6 | **4G/WIFI** | The connection port of the eSolar AIO3 Pro and 4G Pro communication modules. |
| 7 | **RJ45** | The RJ45 connection ports for **LAN1**, **LAN2**, and **DRMs** connections as labelled on the ports.<br>**LAN1** and **LAN2** ports are reserved for future use. |
| 8 | **START** | For starting up the energy storage system. |
| 9 | **ANT** | The LoRa antenna connection port. |
| 10 | **PV SWITCH** | The PV switch that controls the connection to the PV array. |

| Callout | Silkscreen | Description |
|---|---|---|
| 11 |  | The grounding cable connection port. |

Table 5.3. Inverter electrical ports




| Number | Silkscreen | Description |
|---|---|---|
| 1-6 | / | Reserved for future use. |
| 7 | **DO1+** | Output connection for dry contact device 1. |
| 8 | **DO1-** | Output connection for dry contact device 1. |
| 9 | **DO2+** | Output connection for dry contact device 2. |
| 10 | **DO2-** | Output connection for dry contact device 2. |
| 11 | **PC 485A** | Reserved RS485 connection ports.<br>The RS485 communication can be adjusted with the provided 120 Ω resistor controlled by **SW2** DIP switch. |
| 12 | **PC 485B** | |
| 13 | **Meter 485A** | For RS485 connections with the meter.<br>The RS485 communication can be adjusted with the provided 120 Ω resistor controlled by **SW3** DIP switch. |
| 14 | **Meter 485B** | |
| 15 | **DI1+** | Input connection for dry contact device 1. |
| 16 | **DI1-** | Input connection for dry contact device 1. |
| 17 | **DI2+** | Input connection for dry contact device 2. |
| 18 | **DI2-** | Input connection for dry contact device 2. |
| 19 | **12V** | Port for providing 12V DC power supply to the external device. |
| 20 | **GND** | Port for grounding connection. |

Table 5.4. 20-pin definition for COM port

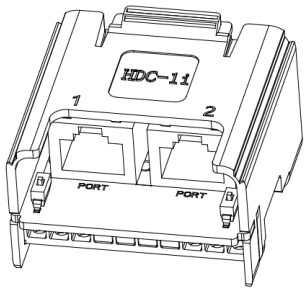



Figure 5.1. RJ45 ports for communication connector

| Number | Silkscreen | Description |
|---|---|---|
| 1 | **PORT CAN** | Reserved port. |

| Number | Silkscreen | Description |
| --- | --- | --- |
| 2 | **DSP CAN** | Reserved port. |

## 5.3. Prepare the cables

### Grounding cable specification

| Cable type | Recommended cross-sectional area range ($mm^2$) |
|---|---|
| Grounding cable | 6 |

### AC grid and backup cable specification

Prepare the following outdoor high-temperature (≥105℃) cables for AC grid and backup load connections:

| Solution | AC grid cable type | Recommended cross-sectional area ($mm^2$) | Recommended conductor material |
|---|---|---|---|
| • Whole home backup<br>• Partial backup | One five-wire cable | 16 | Copper |
| | Five separated cables | 16 | Copper |

Table 5.5. AC grid cable specification

| Solution | AC backup cable type | Cross-sectional area ($mm^2$) | | Recommended conductor material |
|---|---|---|---|---|
| | | Range | Recommended value | |
| Whole home backup | One five-wire cable | 10-16 | 16 | Copper |
| | Five separated cables | / | 16 | Copper |

Table 5.6. AC backup cable specification for whole home backup

| Solution | Model | AC backup cable type | Cross-sectional area range ($mm^2$) | | Recommended conductor material |
|---|---|---|---|---|---|
| | | | Range | Recommended value | |
| Partial backup | • HS5-8K-T3-X<br>• HS5-10K-T3-X<br>• HS5-12K-T3-X<br>• HS5-12K-T3-X-IE | One five-wire cable | 4-6 | 6 | Copper |
| | | Five separated cables | / | 6 | Copper |
| | HS5-15K-T3-X<br>HS5-20K-T3-X | One five-wire cable | 6-8 | 6 | Copper |
| | | Five separated cables | / | 6 | Copper |

Table 5.7. AC backup cable specification for partial backup

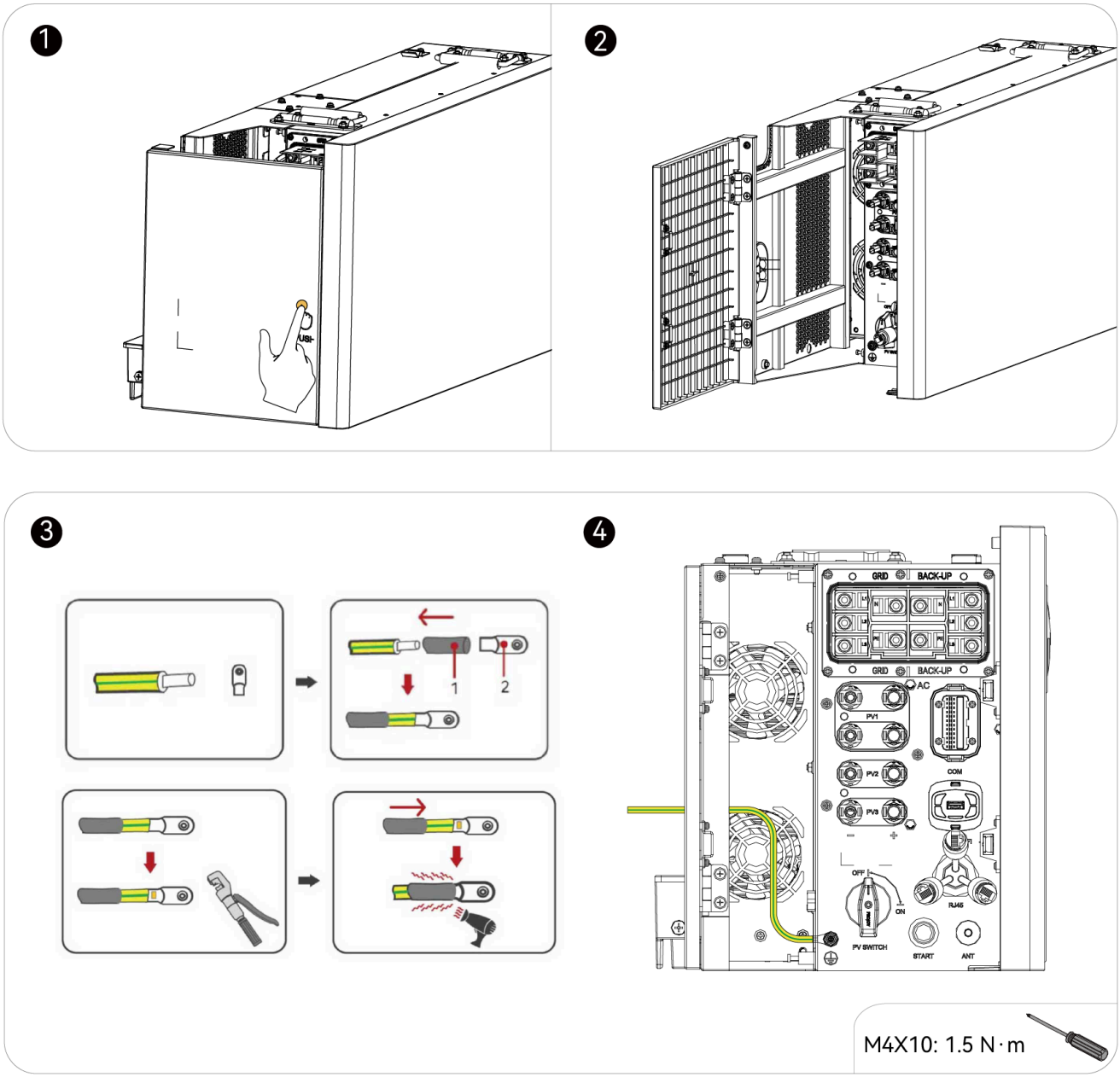
### PV cable specification

| Cross-sectional area range ($mm^2$) | | Recommended conductor material |
|---|---|---|
| Range | Recommended value | |
| 5.0–6.0 | 6.0 | Outdoor copper wire cable, complying with 1000 V DC |

### Communication cable specification

| Terminals | Cable cross-sectional area($mm^2$) | Cable outer diameter (mm) | Insulation off (mm) | |
|---|---|---|---|---|
| | | | External protective layer | Wire insulation |
| 1 - 10 | 0.5 - 0.75 | 4.5 - 6.5 | 55 | 7.5 |
| 11 - 20 | 0.2 - 0.5 | | 33 | 7.5 |

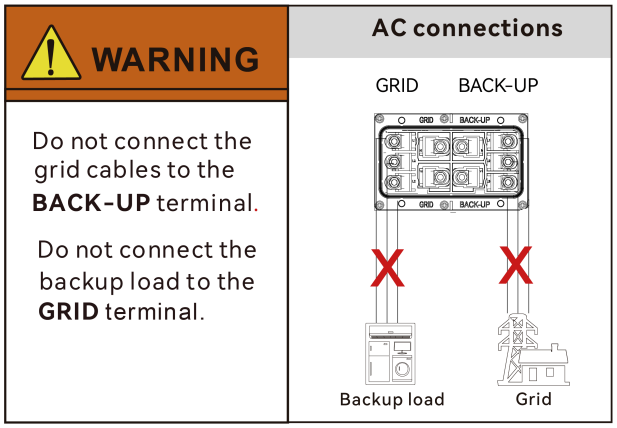
## 5.4. Connect the grounding cable

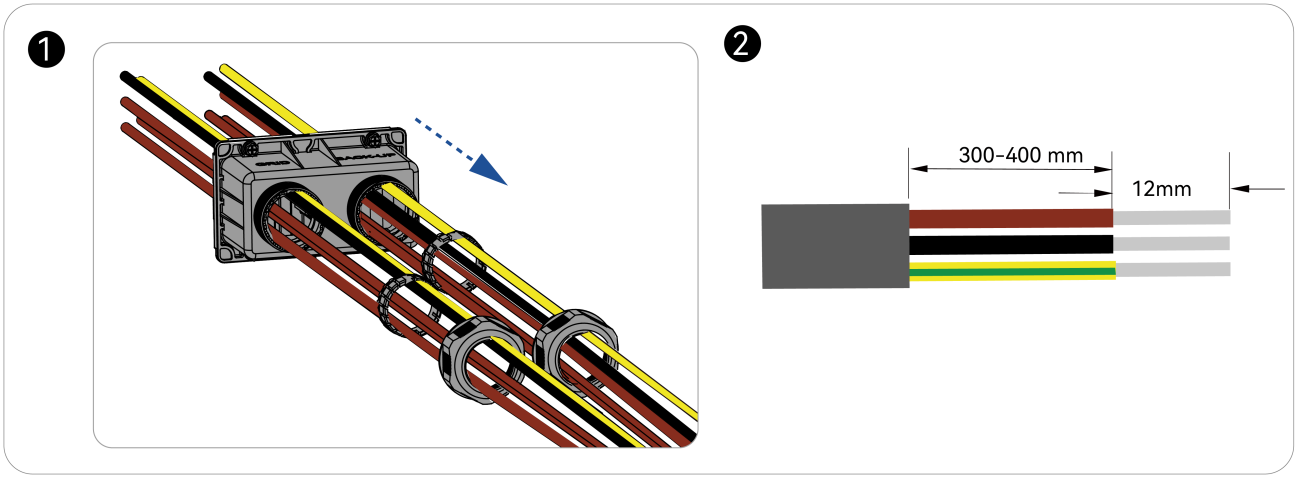


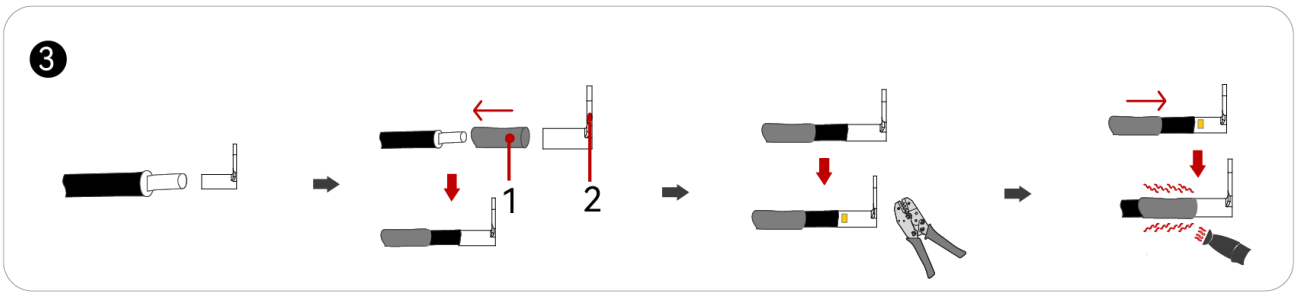
## 5.5. Connect the AC power cables

**NOTICE**

Products are subject to continuous updates. The printed guide may not reflect the latest changes. If there is any inconsistency between the received product and the printed guide, see the latest electronic Quick Guide or User Manual.



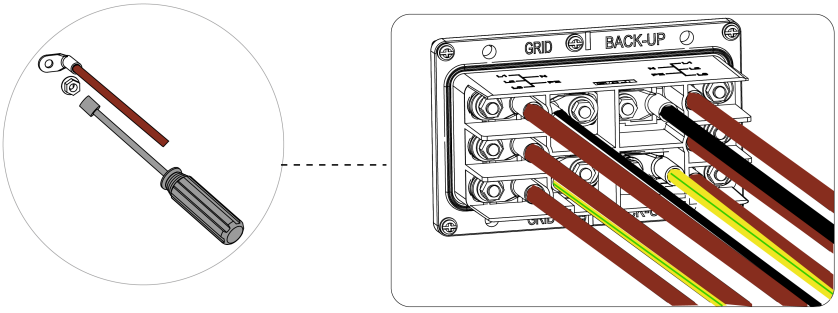



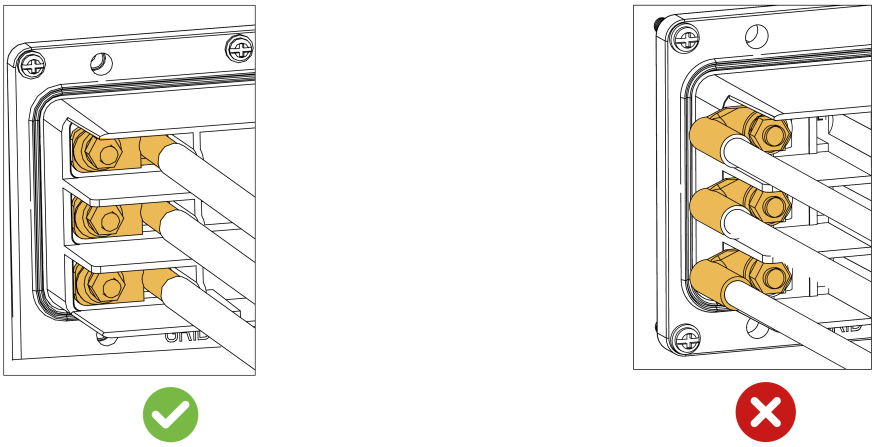

**Note:**

Use cold-pressed terminal crimping plier to crimp the AC cables.

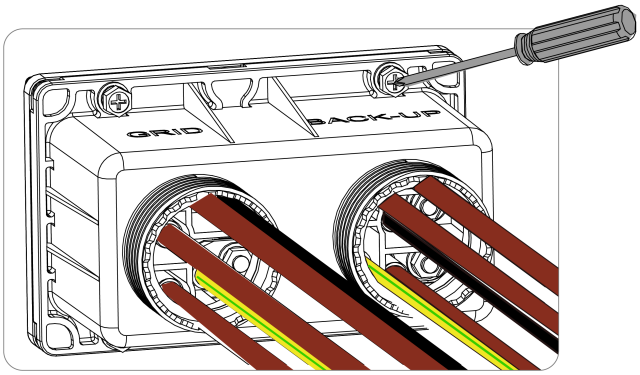
4




M5: 2-3 N·m

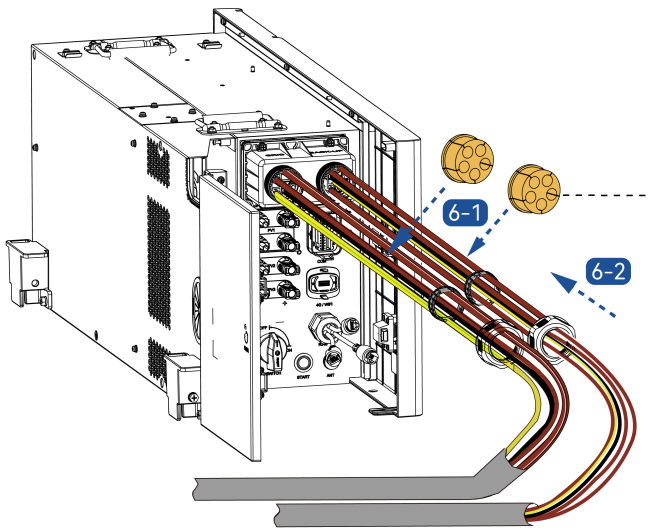


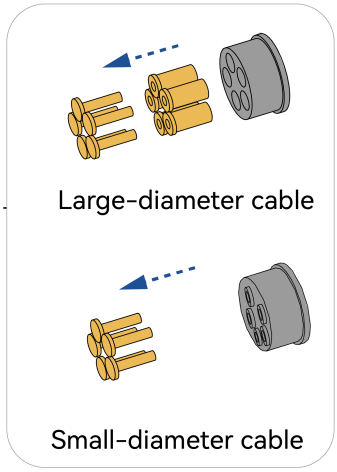
5




M5: 2-3 N·m

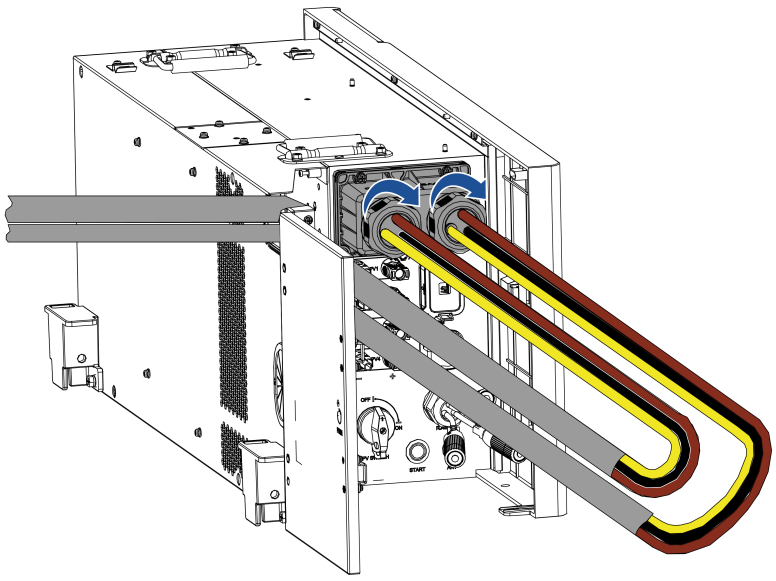
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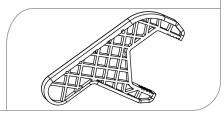



| Rubber type | Cross-sectional area range of cable ($mm^2$) |
|---|---|
| Large-diameter rubber | 10-16 |
| Small-diameter rubber | 4-6 |

7

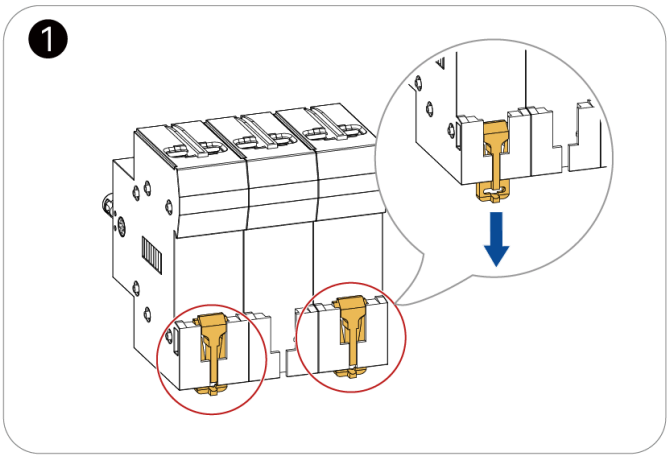


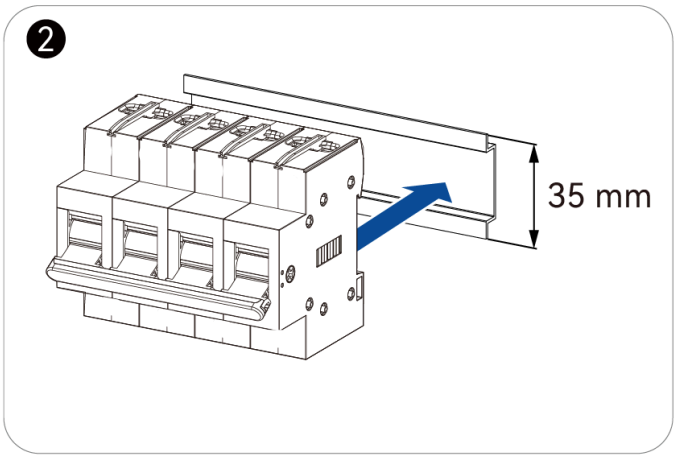


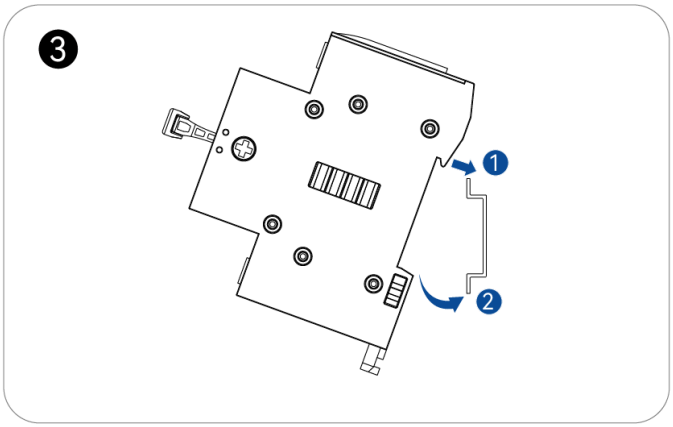
## 5.6. Connect the manual transfer switch (option A)

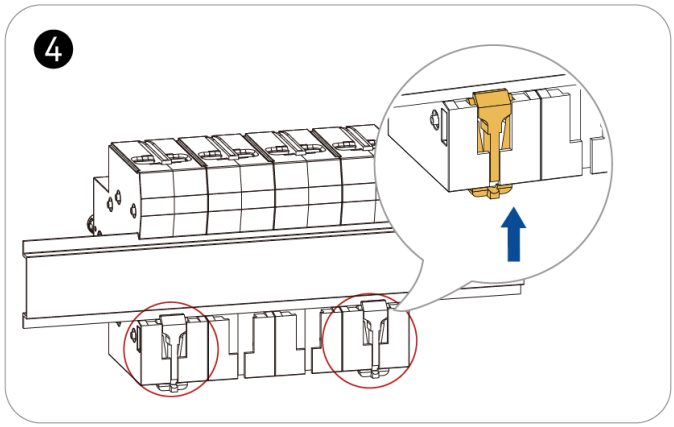
**NOTICE**

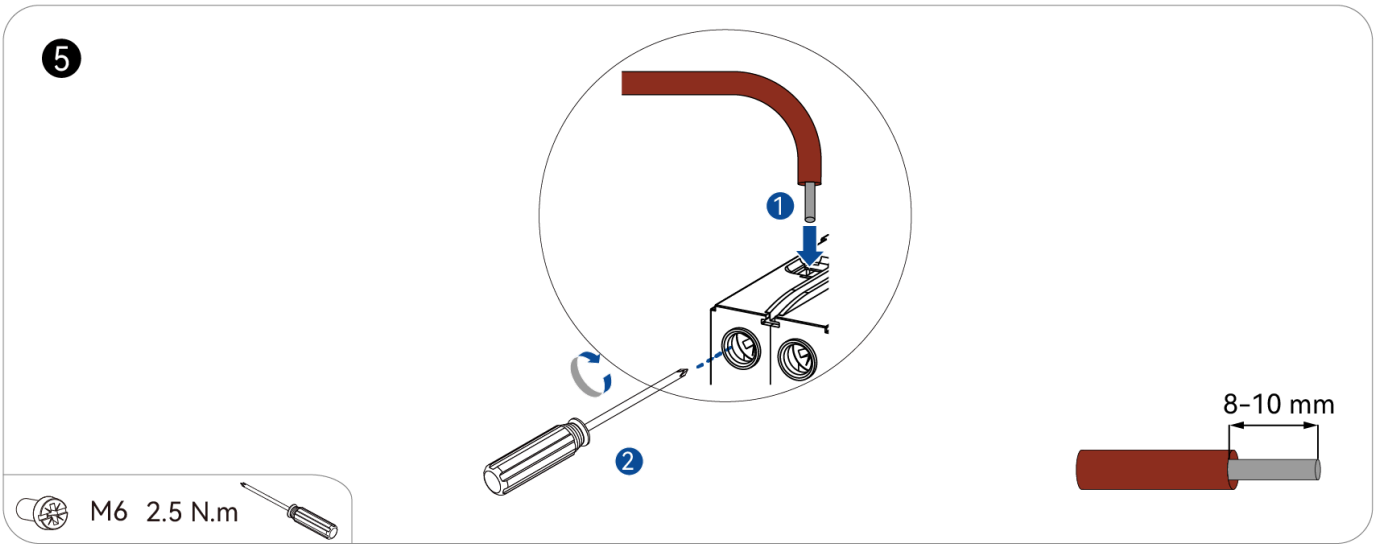
- The illustrations are provided for reference only. The component appearance is subject to the actual product you have received.
- The manual transfer switch may vary depending on the shipments. If the product received differs from the one in the printed document, see the latest electronic User Manual or Quick Guide.

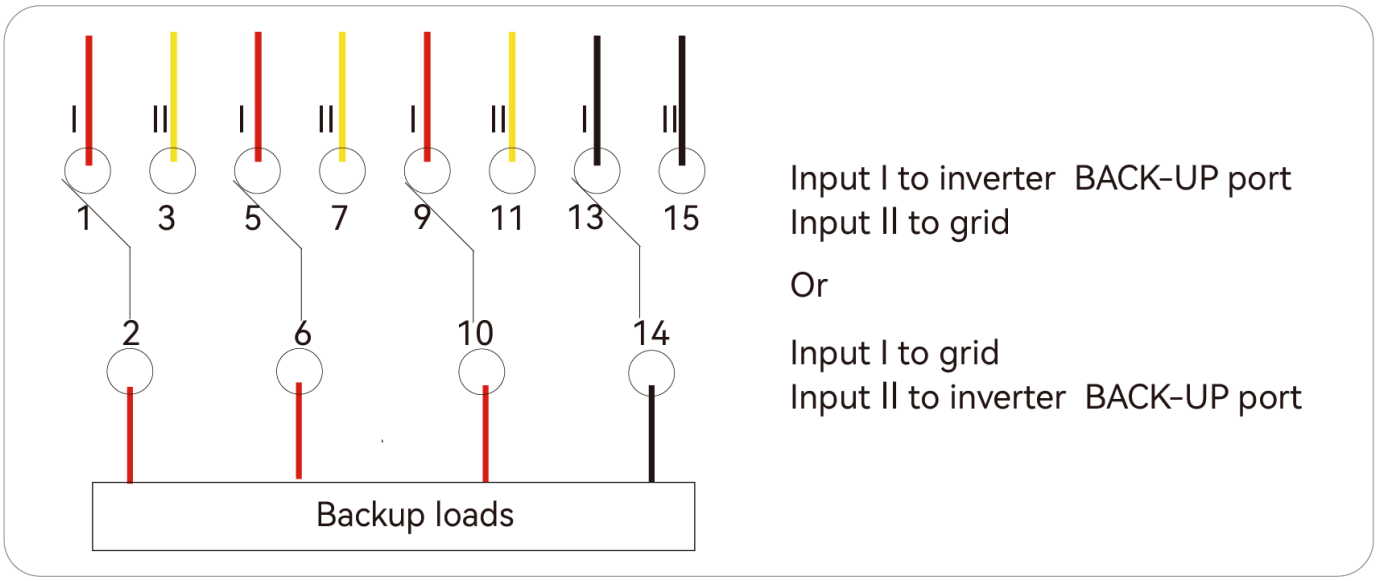


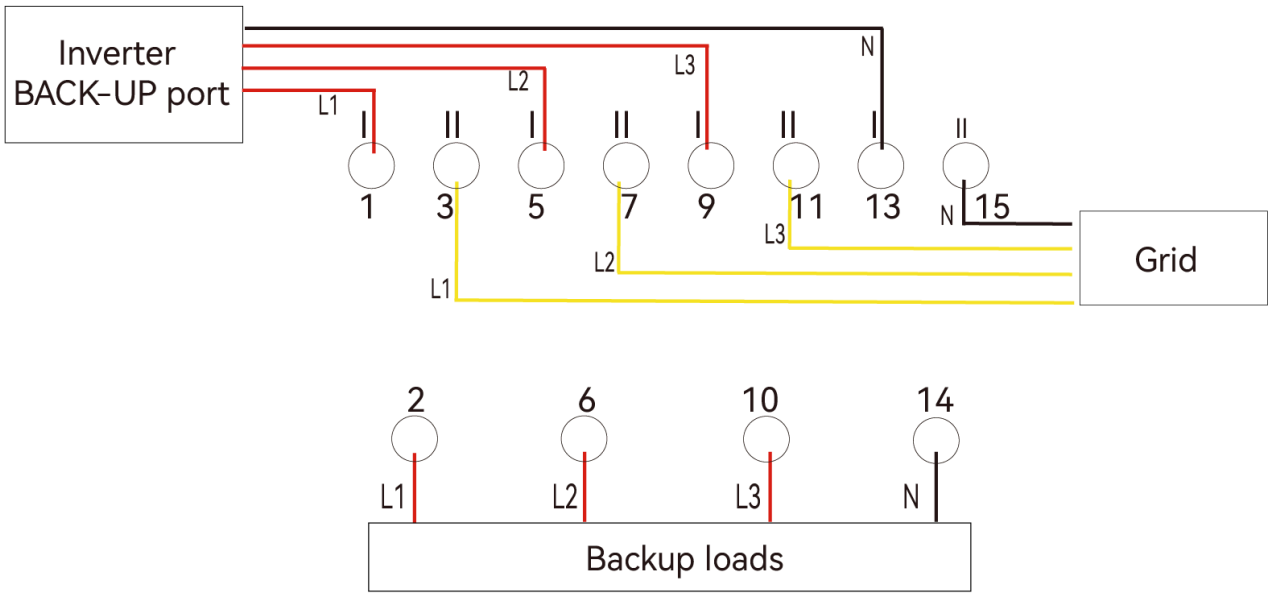






| Terminal Group | Terminal No. | Description |
|---|---|---|
| Input I | 1, 5, 9, 13 | The 1st power input. Connect to the inverter BACK-UP port or the grid. |
| Input II | 3, 7, 11, 15 | The 2nd power input. Connect to the inverter BACK-UP port or the grid. |
| / | 2, 6, 10, 14 | Connect to the backup loads. |

Example

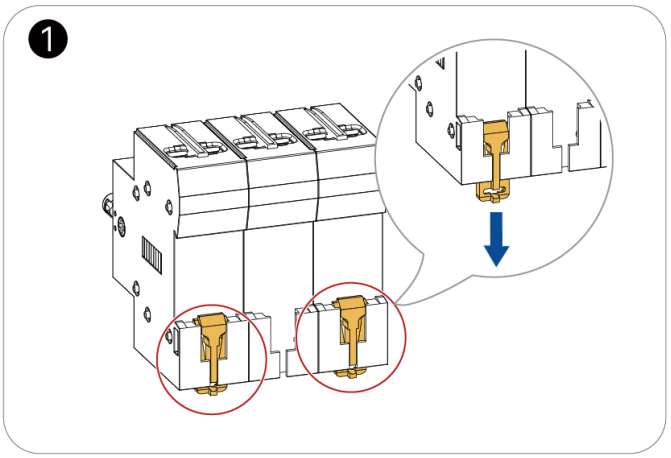

Inverter
BACK-UP port
L1
L2
L3
N
I
II
1
3
5
7
9
11
13
15
N
L3
L2
L1
Grid

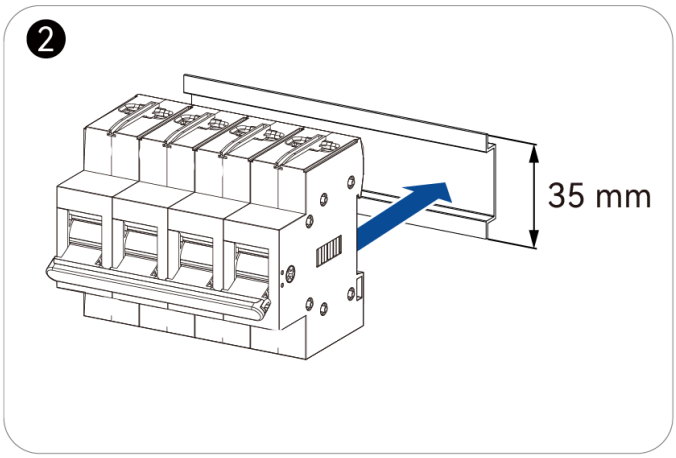

2
6
10
14
L1
L2
L3
N
Backup loads

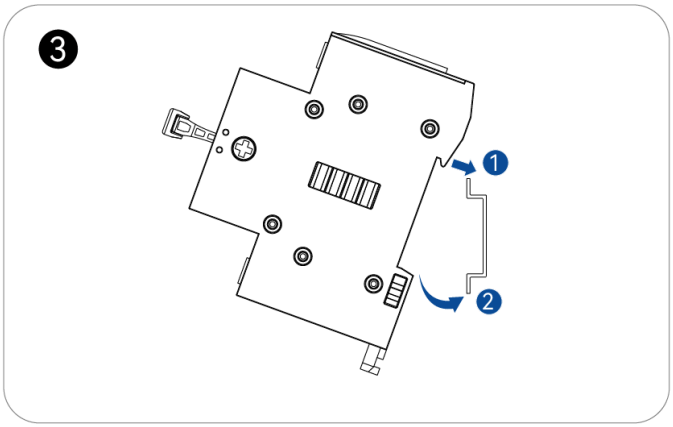
## 5.7. Connect the manual transfer switch (option B)

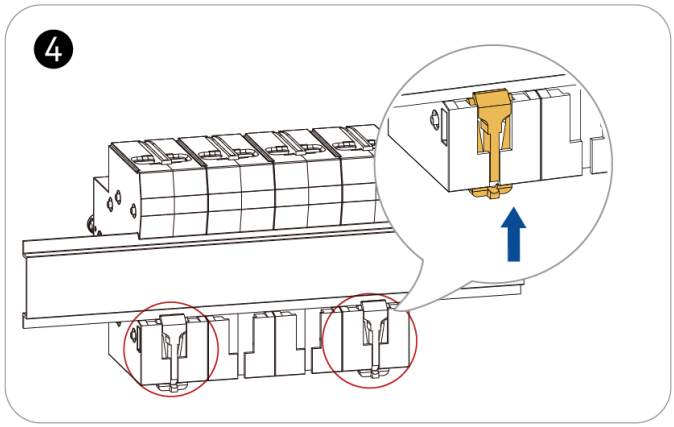
**NOTICE**

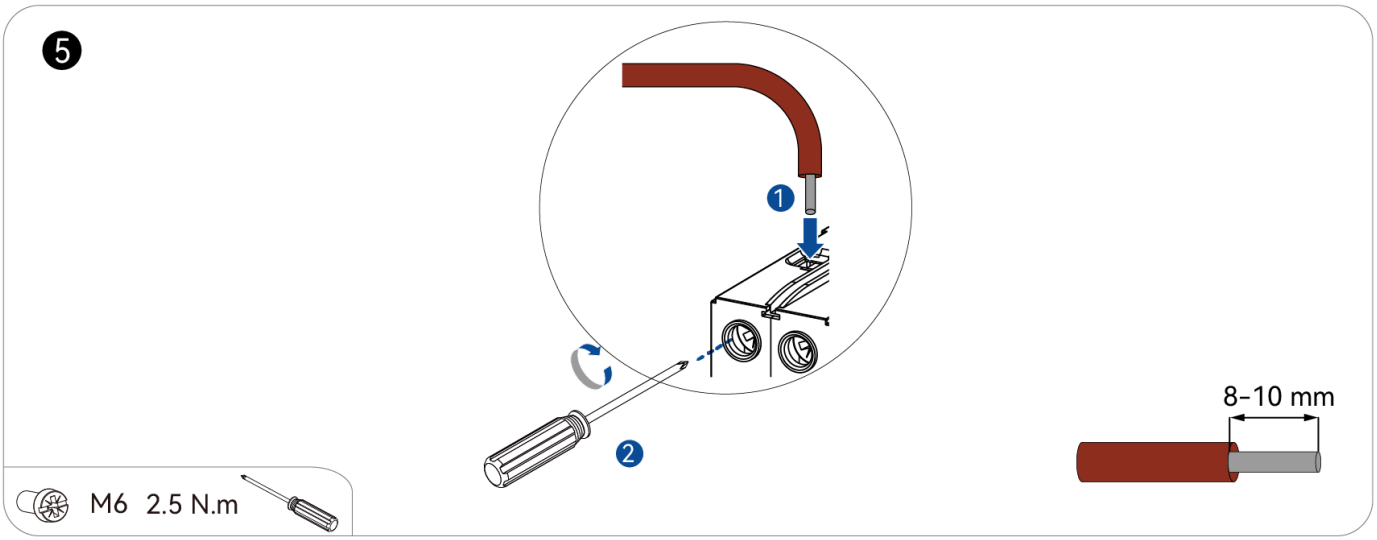
- The illustrations are provided for reference only. The component appearance is subject to the actual product you have received.
- The manual transfer switch may vary depending on the shipments. If the product received differs from the one in the printed document, see the latest electronic User Manual or Quick Guide.

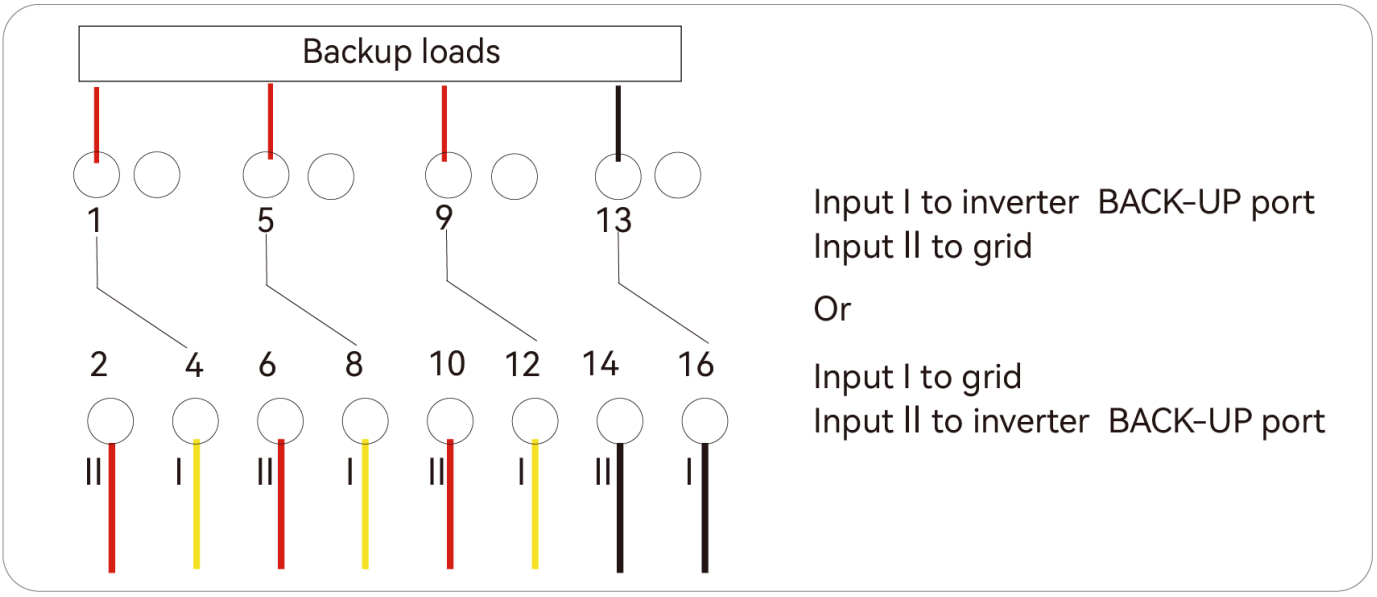


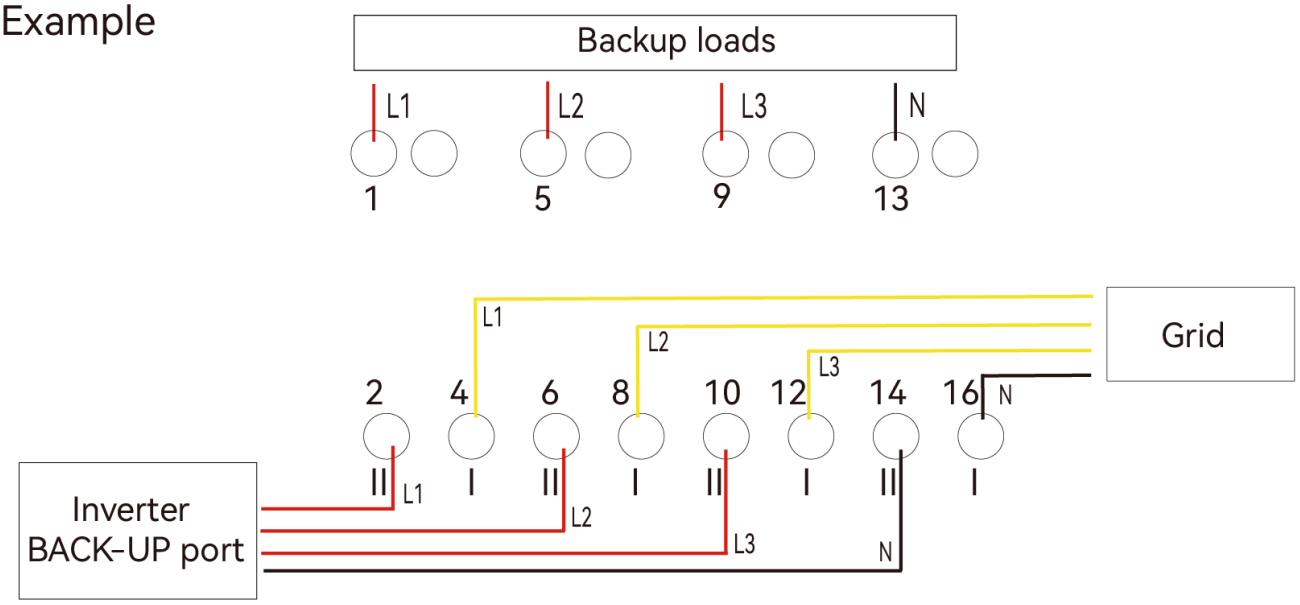





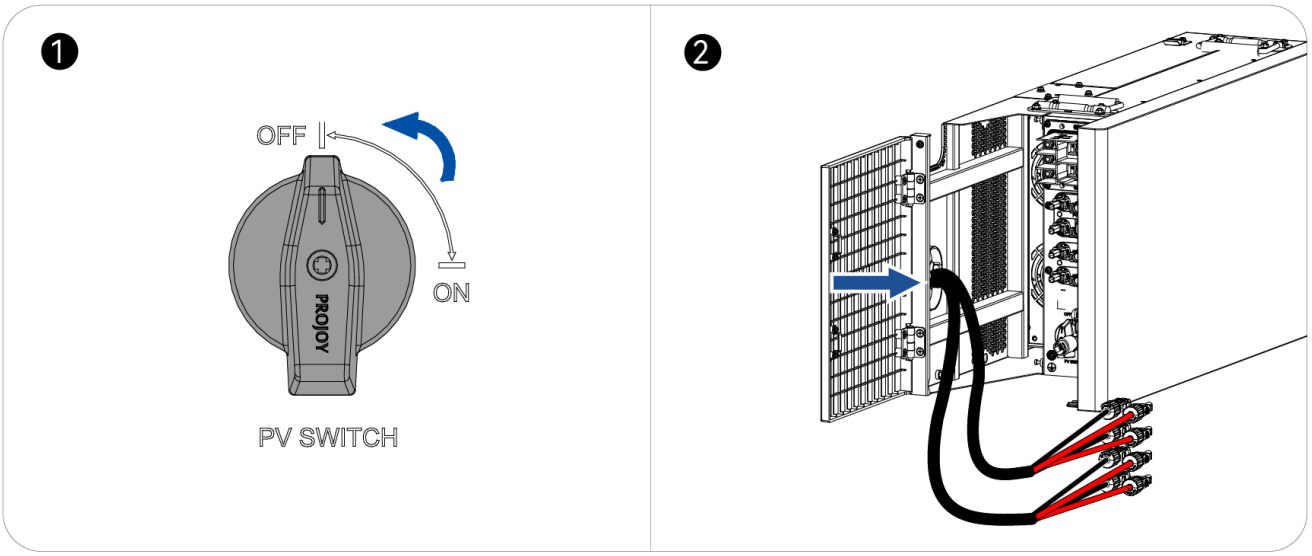

| Terminal Group | Terminal No. | Description |
|---|---|---|
| Input I | 4, 8, 12, 16 | The 1st power input. Connect to the inverter BACK-UP port or the grid. |
| Input II | 2, 6, 10, 14 | The 2nd power input. Connect to the inverter BACK-UP port or the grid. |
| / | 1, 5, 9, 13 | Connect to the backup loads. |

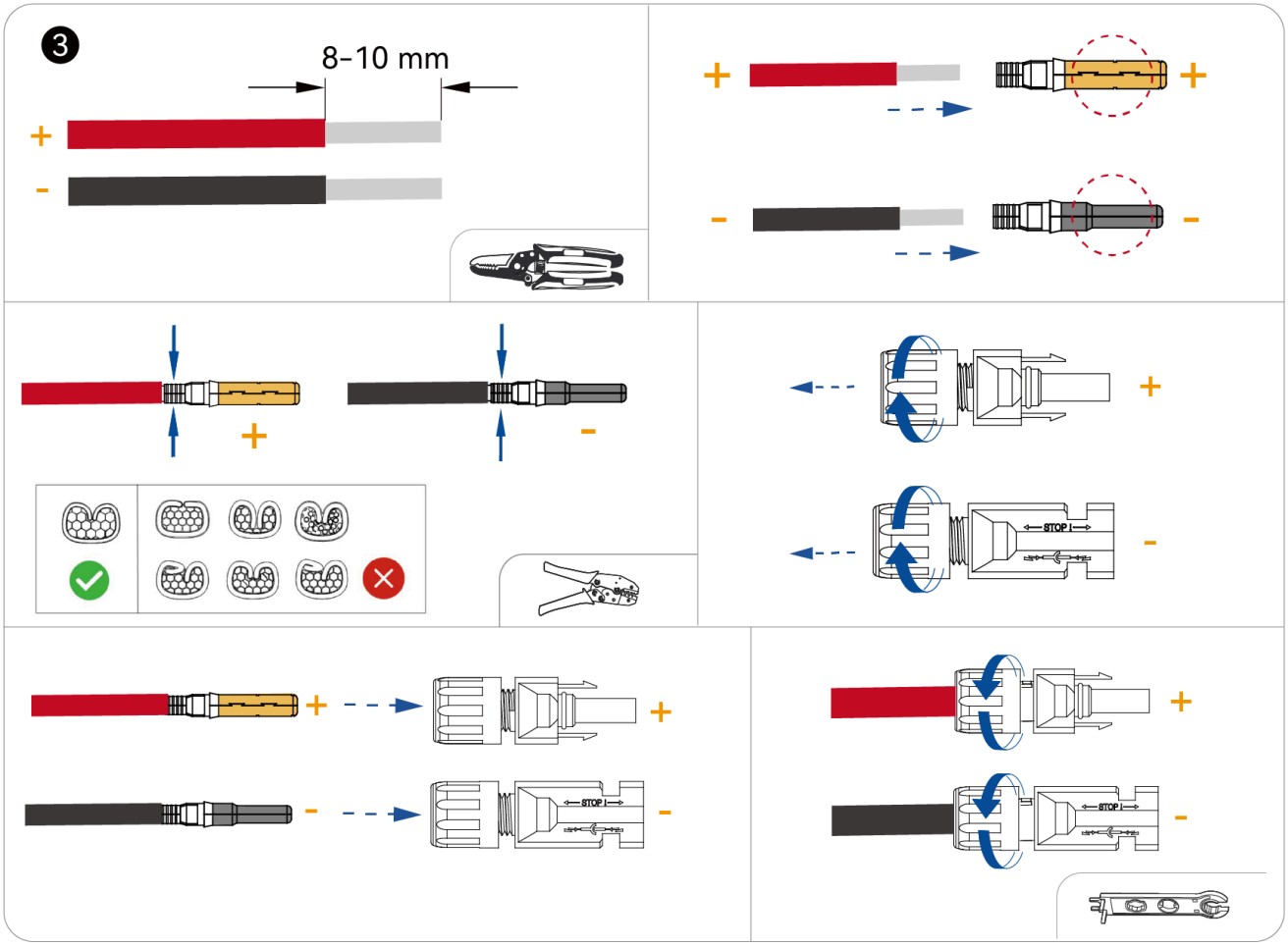
Example


Backup loads
L1
L2
L3
N
1
5
9
13
Grid
L1
L2
L3
N
2
4
6
8
10
12
14
16
Inverter
BACK-UP port
L1
L2
L3
N

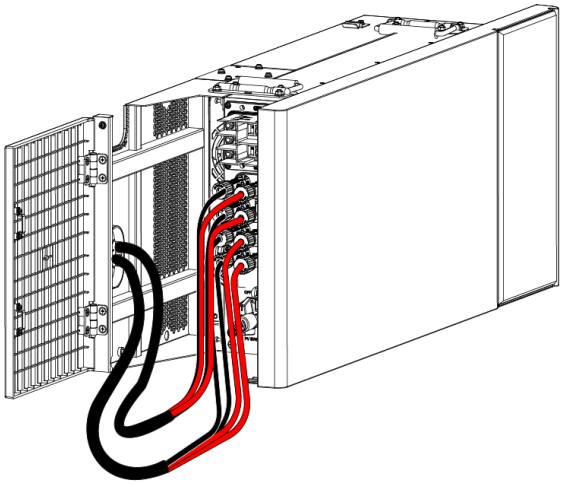
## 5.8. Connect the DC power cables

**Note:** Depending on different models, some ports may be disabled with plugs. Only connect the cables to the available ports.



4

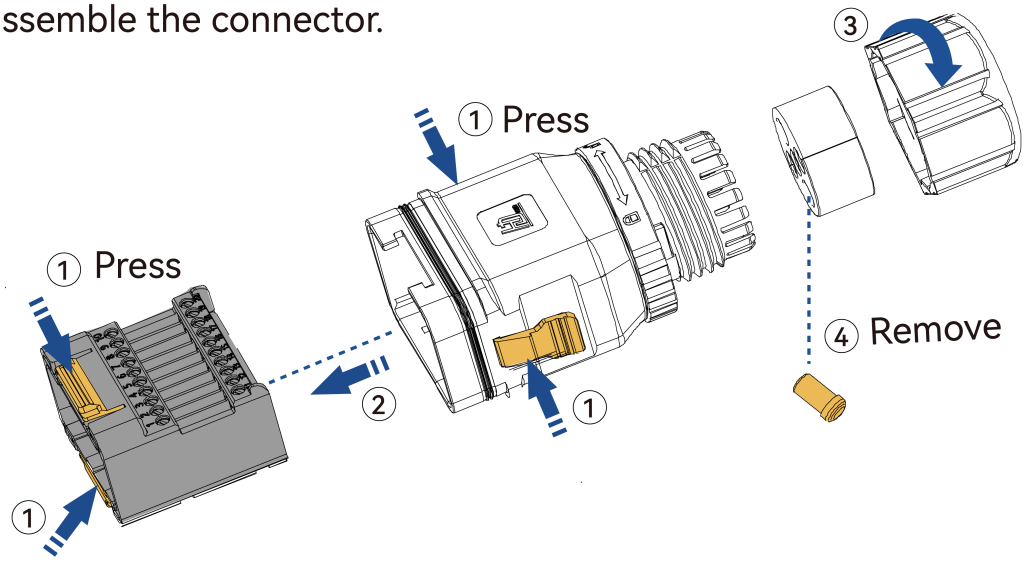


## 5.9. Connect the communication cables to COM port

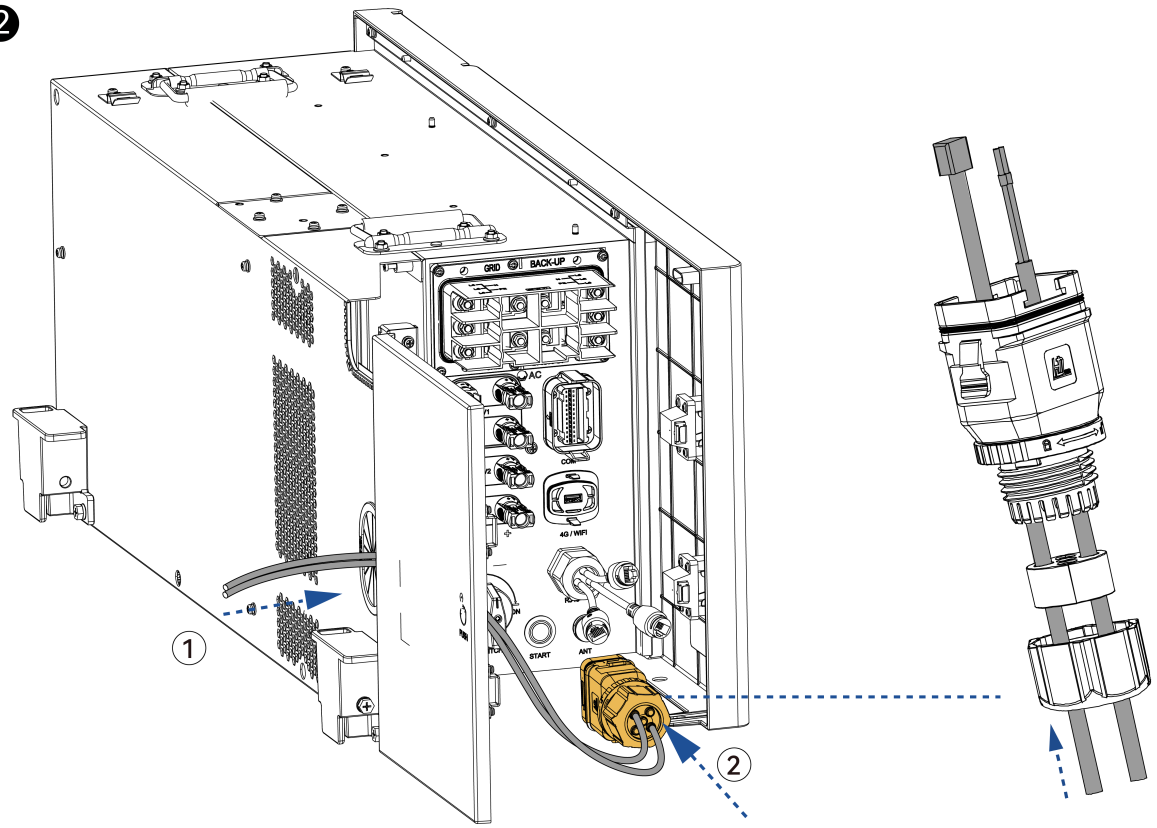
**NOTICE**

Even if no cables are connected, the communication connector must be installed onto the **COM** port. Otherwise, an internal communication loss alarm will be triggered.

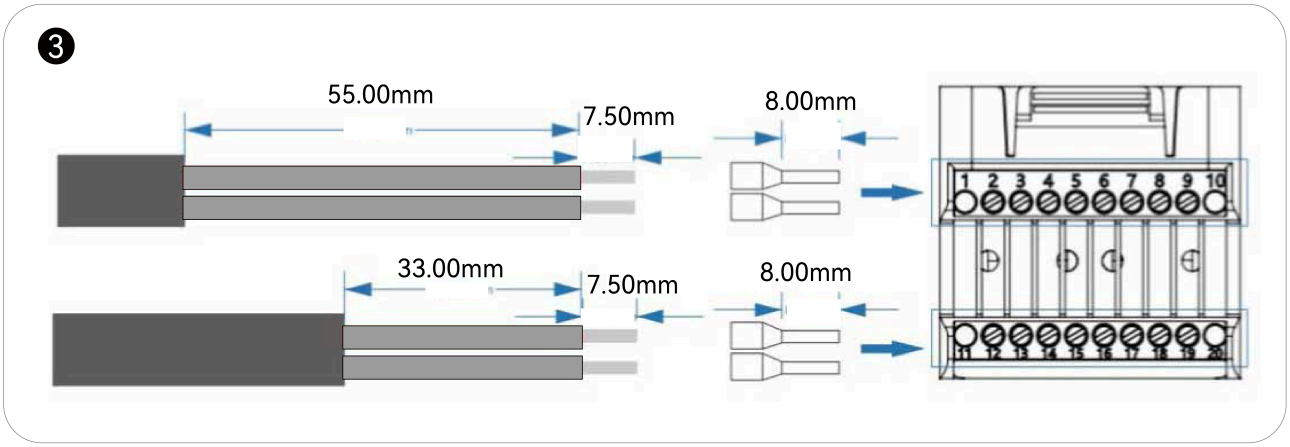
❶ Dissemble the connector.




❷



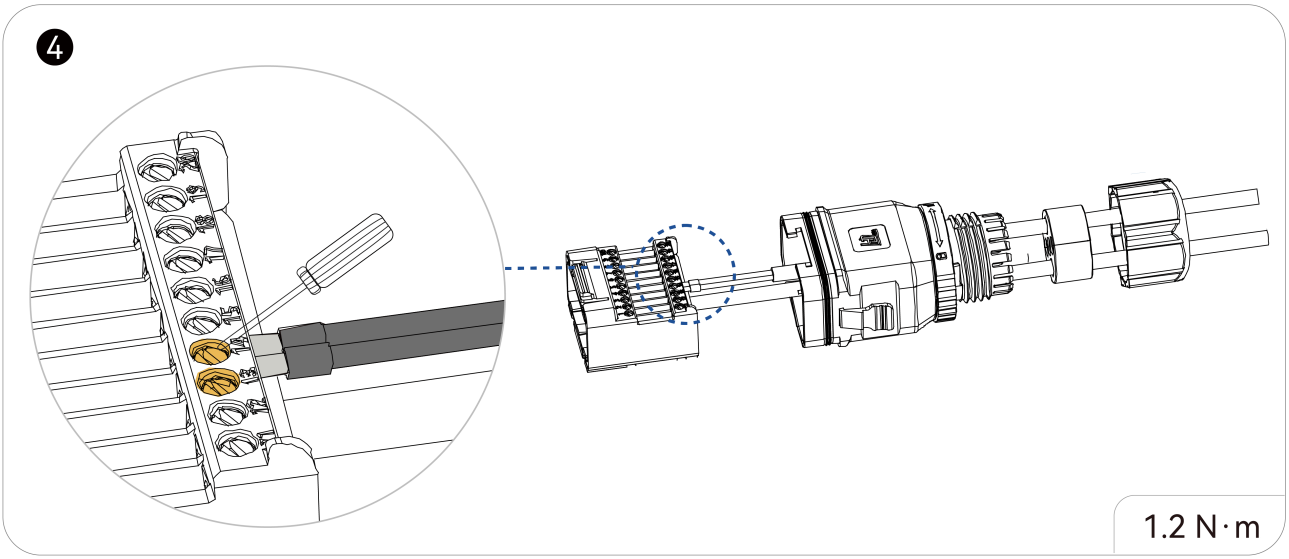
Step 3: Connect and secure the cables to the corresponding terminals based on your needs.



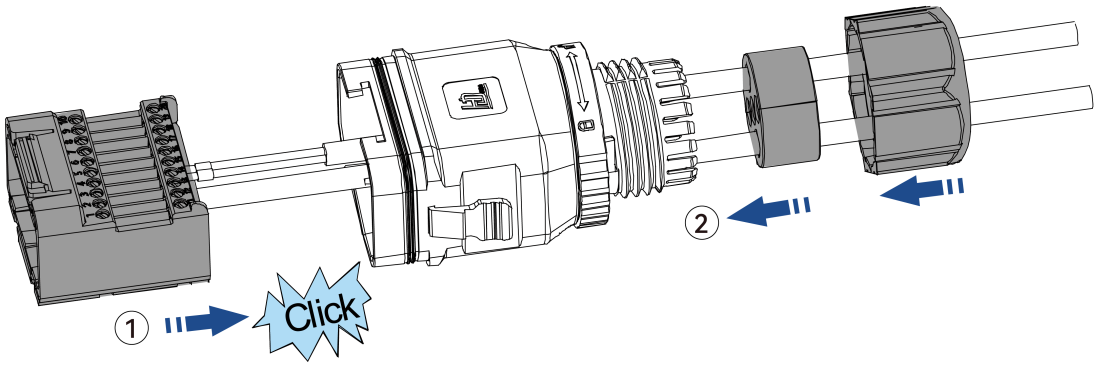

(Optional) Step 4: This step is only required for wired communication between inverter and meter. Connect the cables to terminals **13** (RS485 A) and **14** (RS485 B).

**Note:**

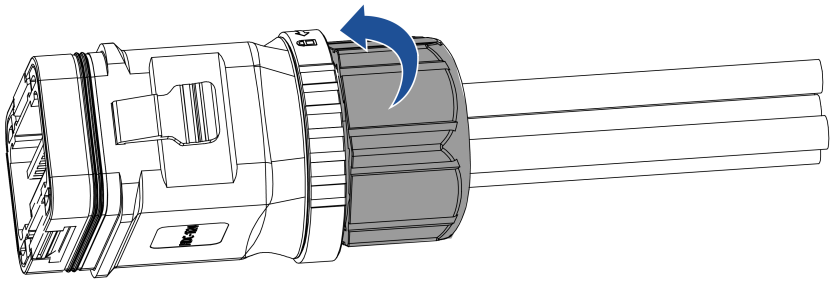
- The inverter is wirelessly pre-paired with the meter at the factory. For wireless communication, no wiring is required at the communication connector. Skip this step and install the antennas instead.
- For any terminal equipped with a 120 Ω resistor, such as METER-A, switch the resistor to **ON** if the cable exceeds 20 meters.



5

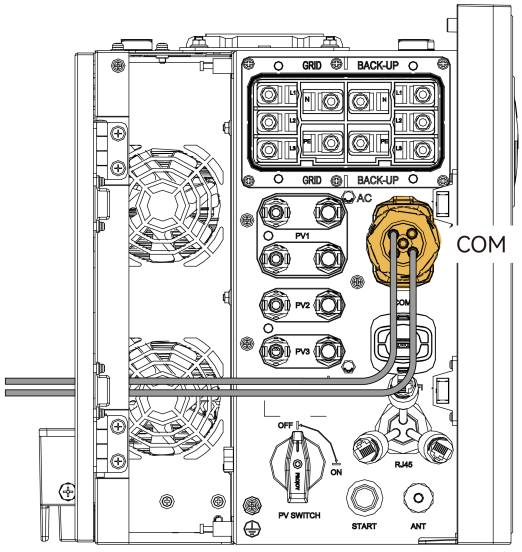



6



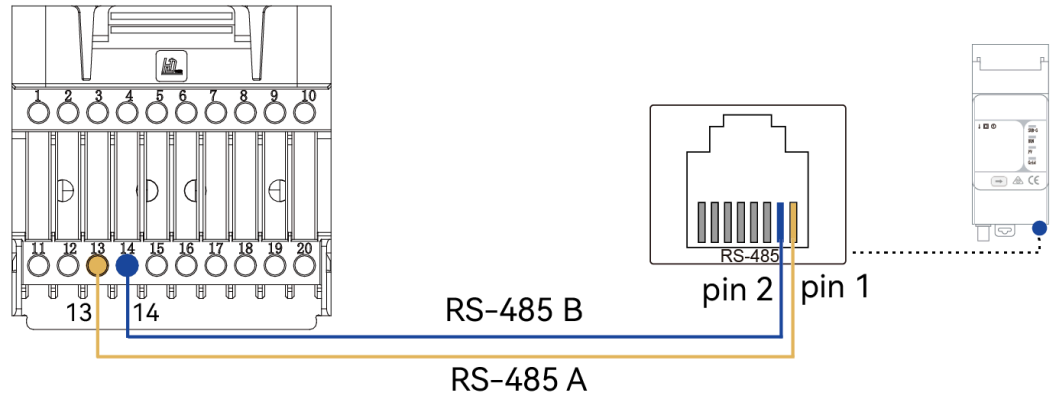
2.5 N·m

7




Step 8: Connect the other end of the cables to external devices, such as the meter.

**Note:** The inverter is wirelessly pre-paired with the meter at the factory. For wireless communication, no wiring is required at the communication connector. Skip this step and install the antennas instead.

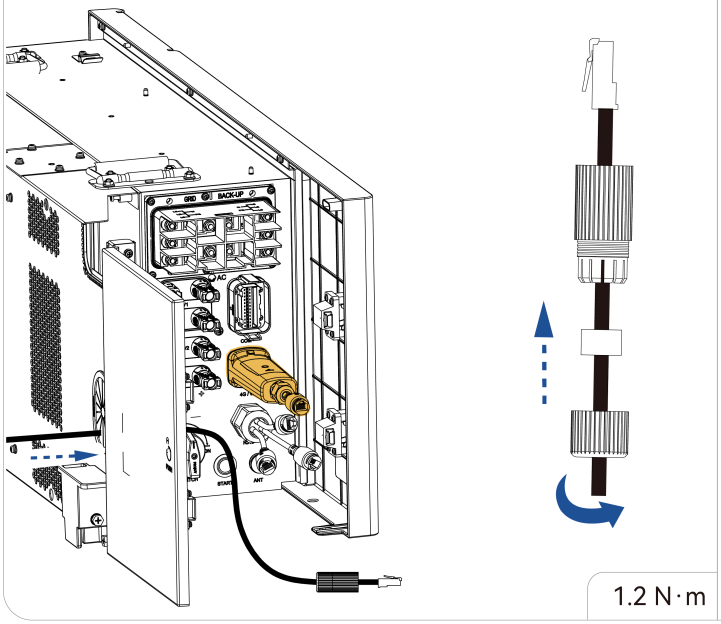


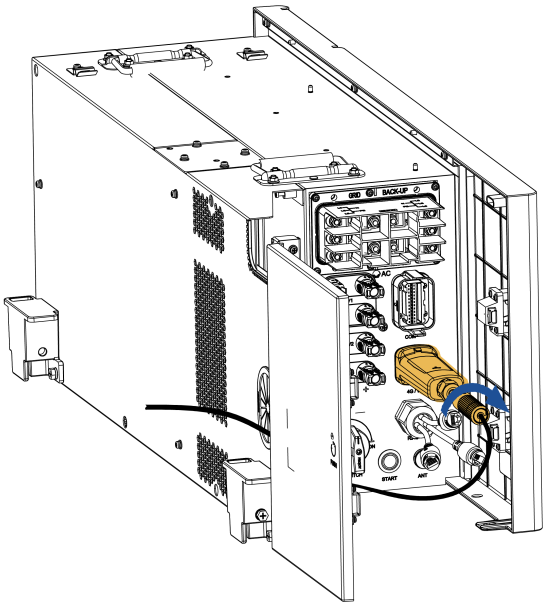

Inverter 20-pin terminal block

Meter RS-485 port

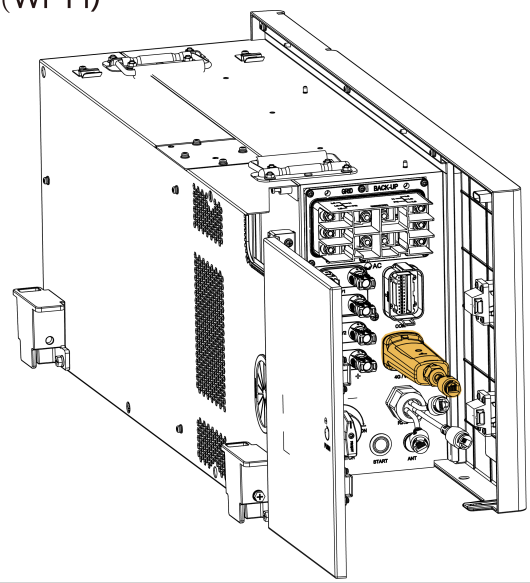
## 5.10. Connect the communication module

eSolar AIO3 Pro module (Ethernet)

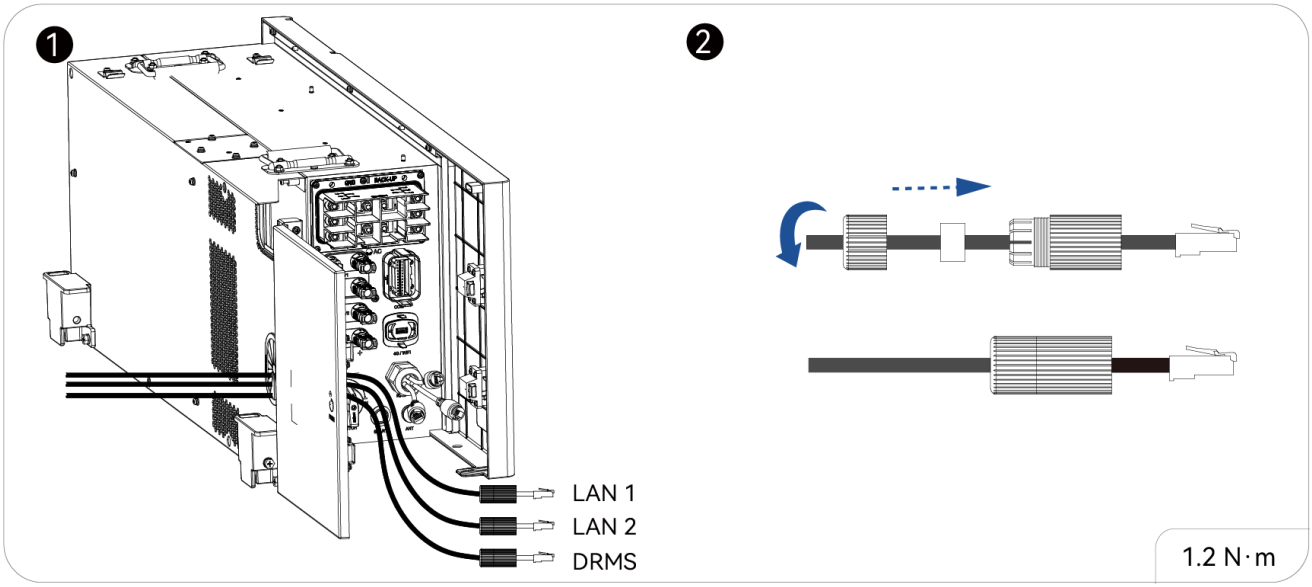


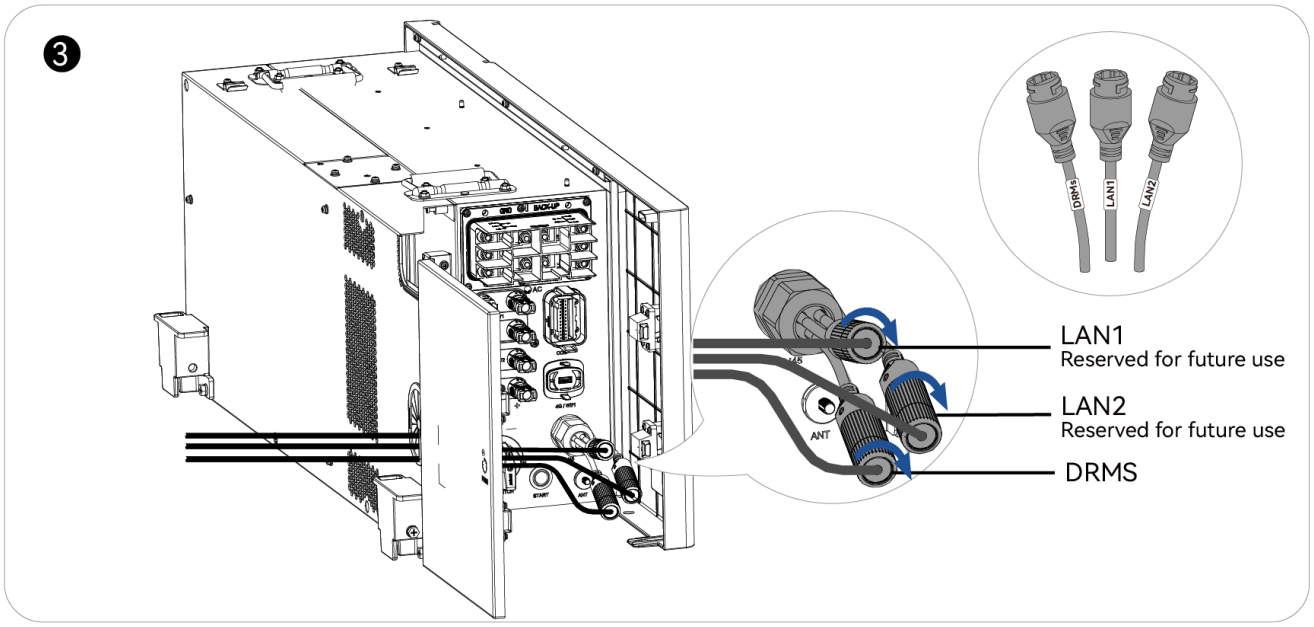



eSolar AIO3 Pro module (Wi-Fi)



## 5.11. Connect the LAN and DRMS cables



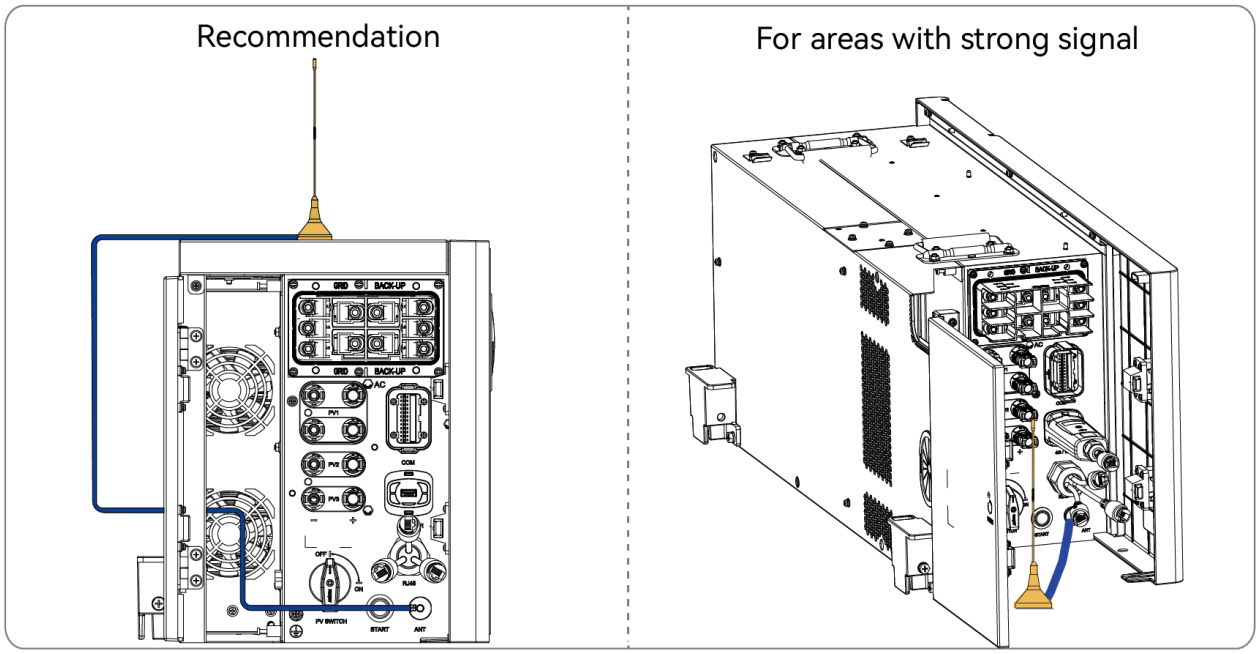
## 5.12. Connect the antenna

This procedure provides the instructions for installing the antennas used to establish wireless communication between the inverter and the meter.

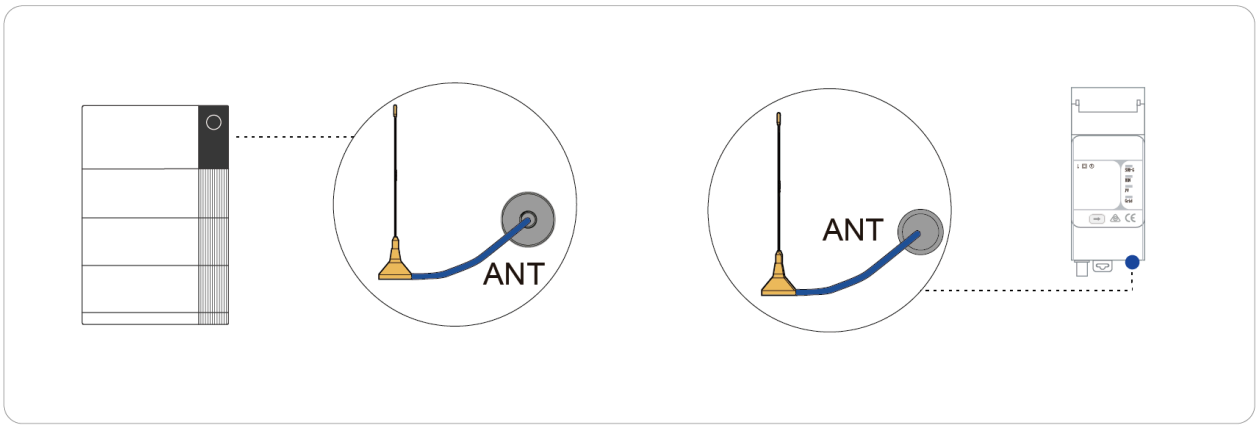
**NOTICE**

- If the RS-485 wired communication is used, skip this step.
- For better signal reception, mount the antenna on top of the inverter and outside the distribution box where the meter is installed. Otherwise, signal loss may occur.
- With the antennas installed, the inverter is pre-paired wireless with the meter included in delivery. If you want to replace or add a meter, pair the meter and inverter through elekeeper app as instructed in the digital User Manual.

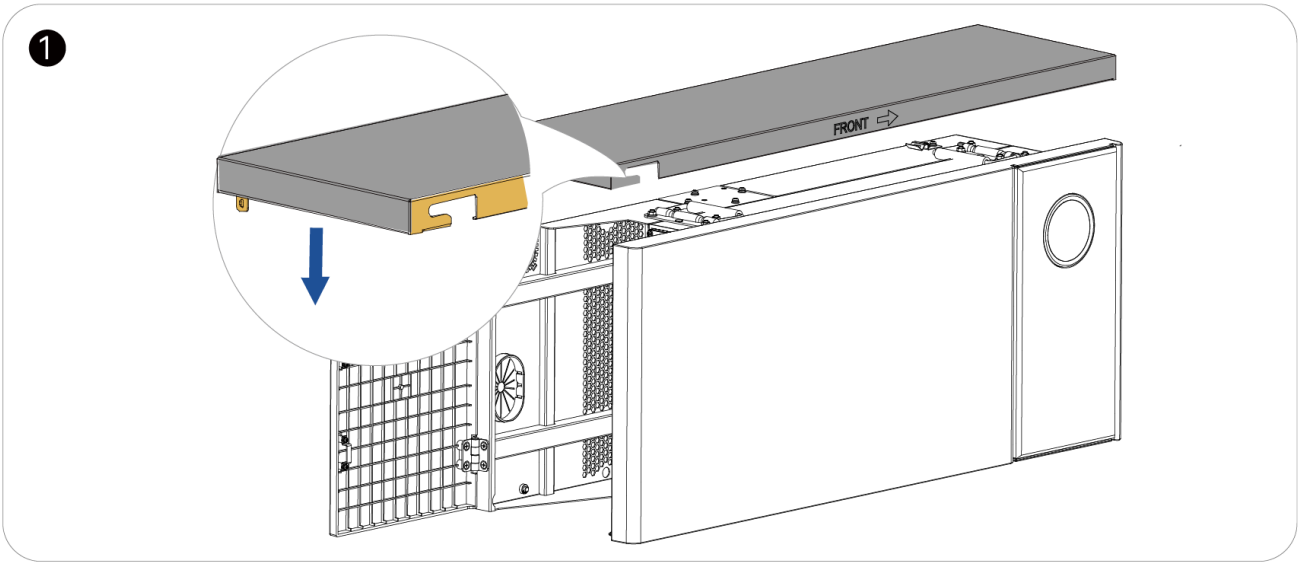
1. Connect the antenna on the inverter.

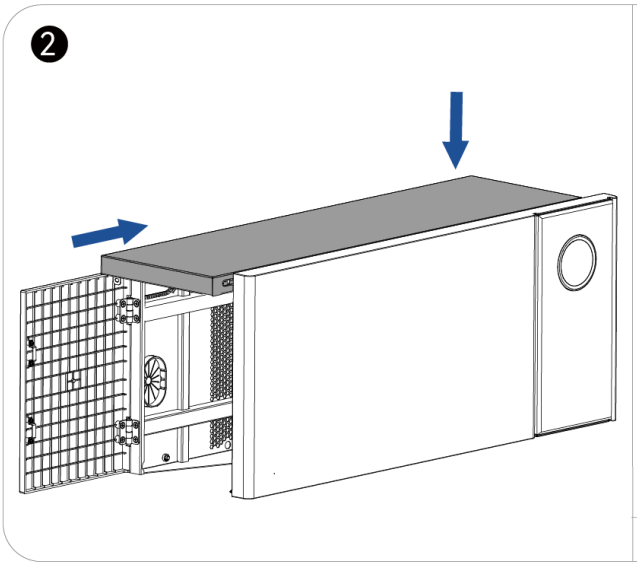


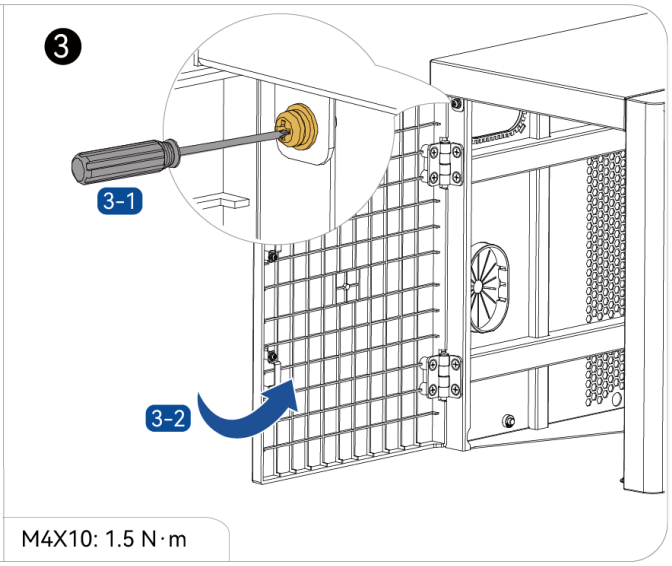

2. Connect the antenna on the meter.



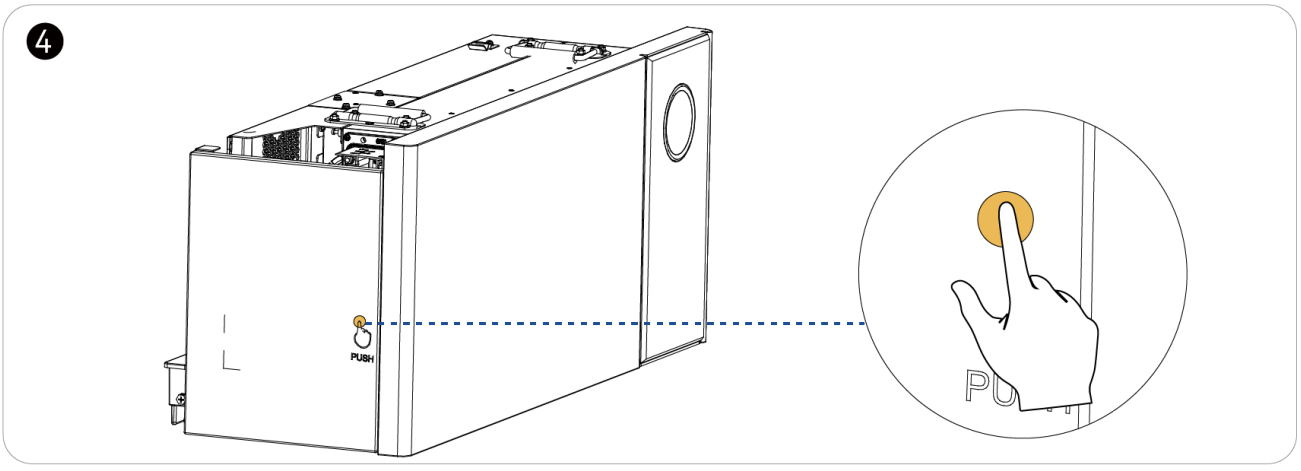
## 5.13. Install the inverter cover




M4X10: 1.5 N·m



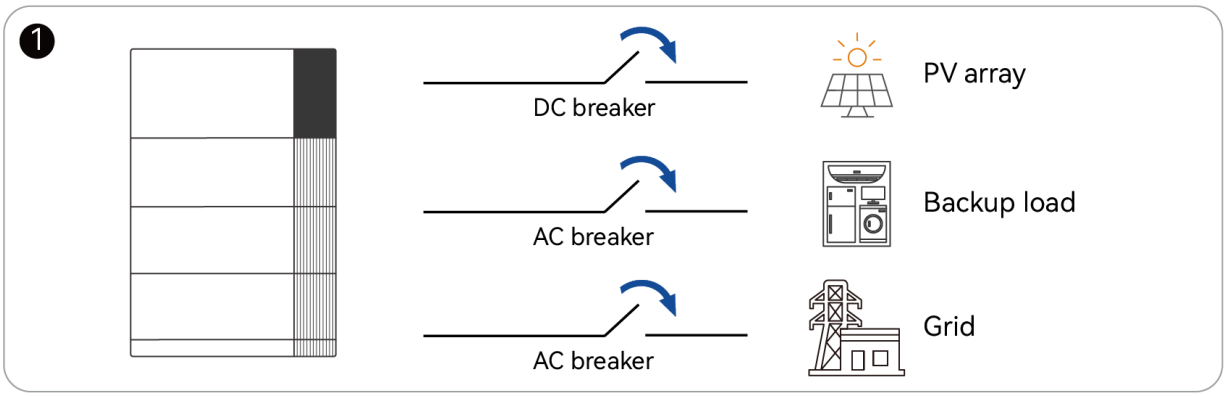
# 6. Start up the system

**Before you begin**

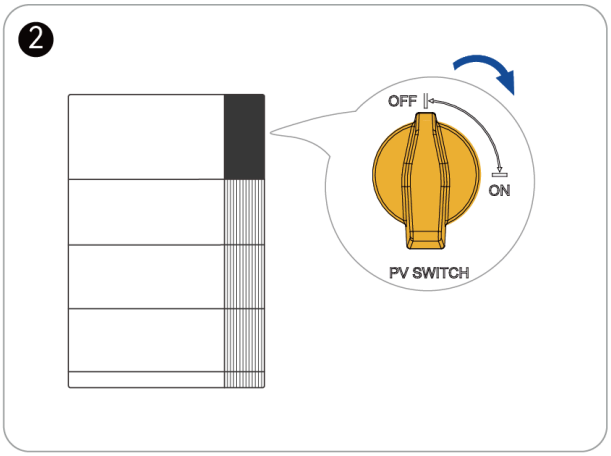
Verify that all the electrical connections are properly wired and secured before starting up the system.

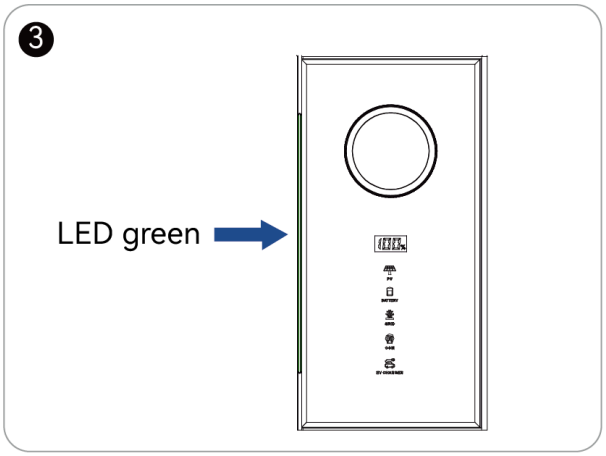
- **Method 1 for starting up the system**

1. Open the AC distribution box, turn on the following circuit breakers in sequence.
   a. The backup loads
   b. The grid




2. On the inverter, turn on the **PV SWITCH** to enable the connection to the PV arrays.
3. Check the LED indicator status on the inverter panel to ensure that the inverter is running properly.



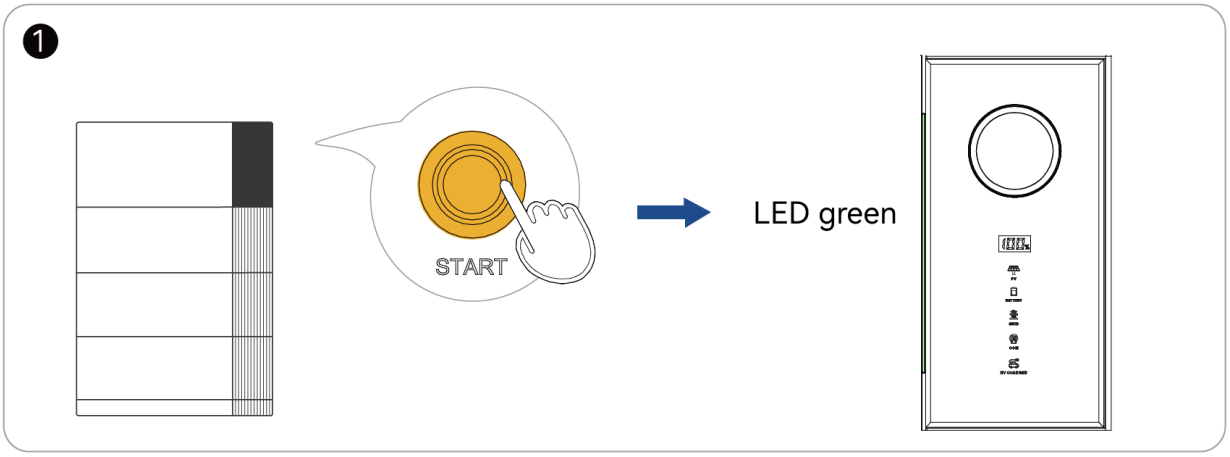




4. Download the elekeeper App and perform the system commissioning.

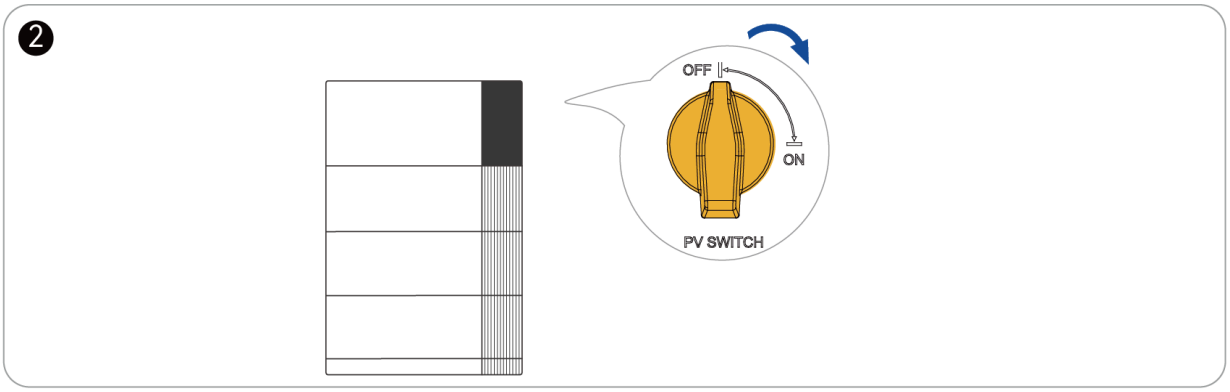



- **Method 2 for starting up the system**

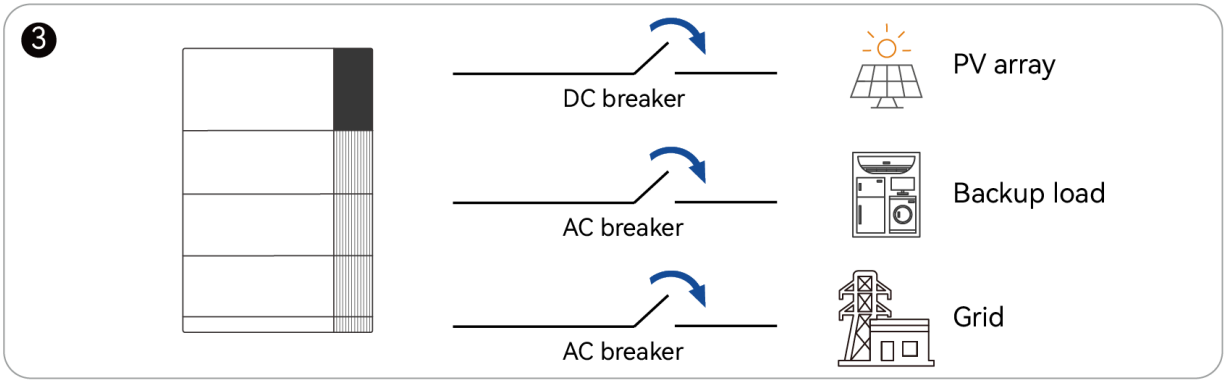
1. On the left side of the inverter, press and hold the **START** button for 5 seconds until the LED indicator on the front panel is on.




2. On the inverter, turn on the **PV SWITCH** to enable the connection to the PV arrays.




3. Open the AC distribution box, turn on the following circuit breakers in sequence.
   a. The backup loads
   b. The grid

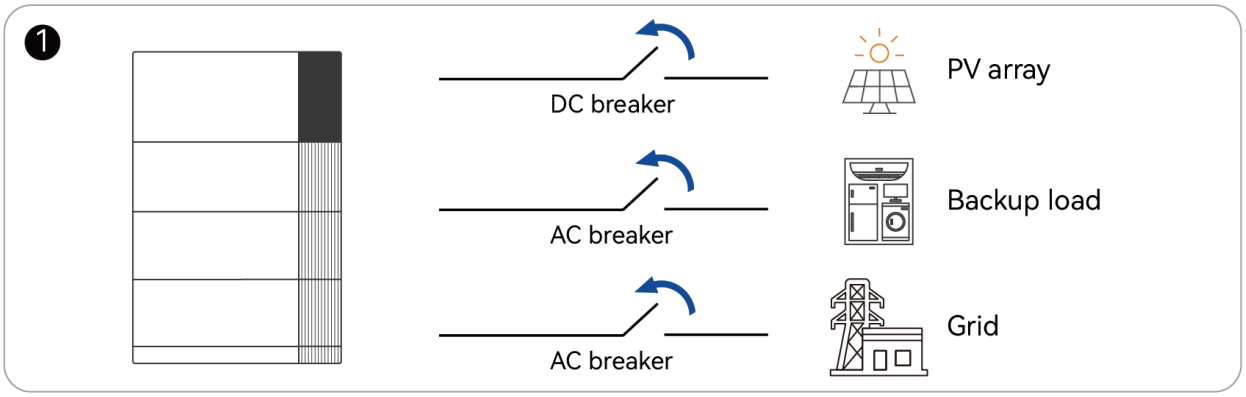


4. Download and elekeeper App and perform the system commissioning.

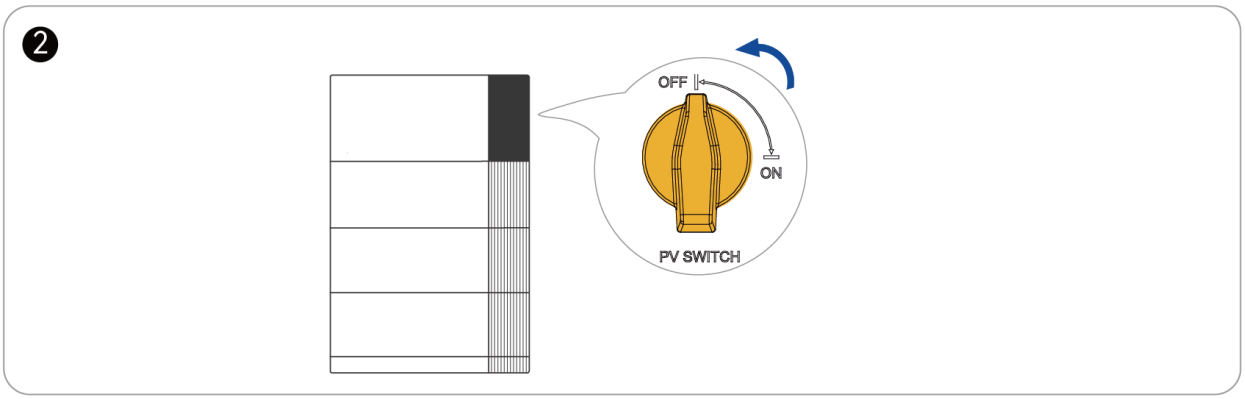


# 7. Shut down the system

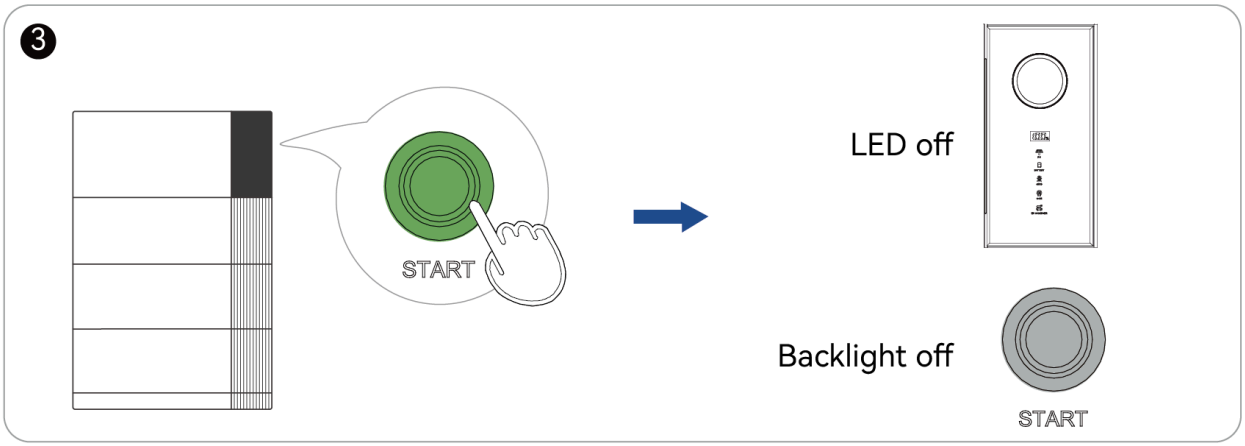
1. Open the AC distribution box, turn off the following circuit breakers:
   a. The backup loads
   b. The grid




2. On the left side of the inverter, turn off the DC switch to disconnect from the PV arrays.




3. On the inverter, press and hold the **START** button for 5 seconds, and then release the button. Wait until both the button backlight and the LED indicator turn off.




**Note:** Once the system is shut down, there is no voltage output at the positive and negative terminals. Do not forcibly activate the system to output voltage by other means.

# 8. Commissioning on App

## 8.1. Download and log in to the elekeeper App

### 8.1.1. About elekeeper

The SAJ elekeeper Application Version 5.0 is an easy-to-use, AI-powered energy management platform designed for homeowners and businesses with full ecosystem autonomous AI control. It gives the Owner full control over their energy - from generation and storage to consumption and selling - through a single App that works on phones, tablets, and computers. The platform provides the following AI-powered modules:

- **AI Care**: provides six-dimensional system diagnosis and 24/7 system protection.
- **AI Saving**: provides AI-powered working strategy adaptation for various scenarios to maximize user revenue.
- **AI Keeper**: provides intelligent functions including full voice autonomous control, user intent recognition, , electricity data analysis, and autonomous task planning.

### 8.1.2. Download the elekeeper App

Search for "elekeeper" in the App store and download the App.

Alternatively, scan the below QR code to download the App.

### 8.1.3. Sign up at the elekeeper App

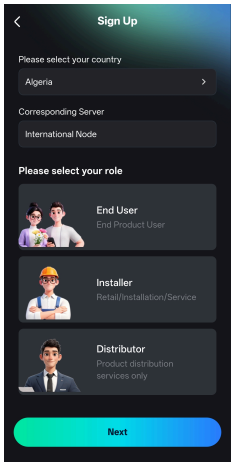
The end user, installer, or distributor can follow this procedure to sign up at the elekeeper App. The installer can also follow this procedure to create an account for the end user.

**Note:** Recommend activating the Location Services on the phone for optimum utilization of the functions.

1. Open the App and tap **Sign Up** on the login page.



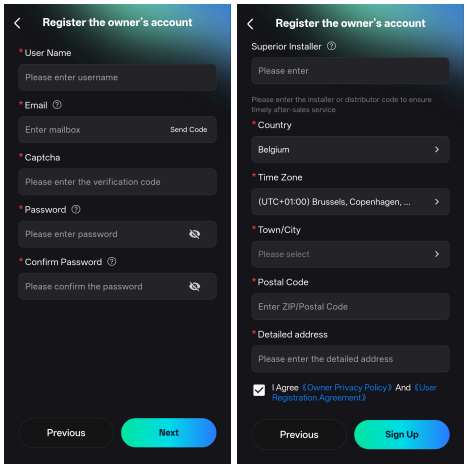

2. Select the country of the installation site and the user role.




| Parameter | Description |
|---|---|
| **Corresponding Server** | The server is set automatically depending on the selected country. |
| **Please select your role** | • **End User**: The owner of the power plant. Select this option when the installer is signing up for the end user.<br>• **Installer**: The installation and retail service providers.<br>• **Distributor**: The distribution service provider. |

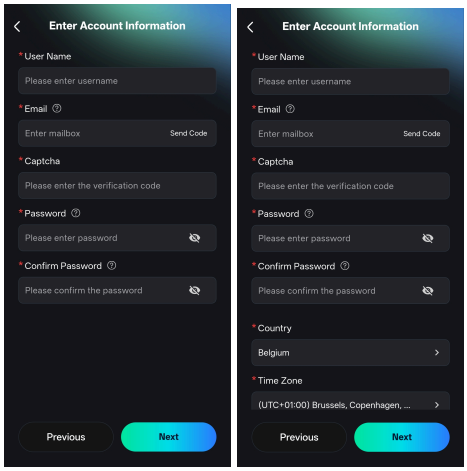
Table 8.1. Signup parameters

3. For the **End User** role, fill in the user information accordingly.

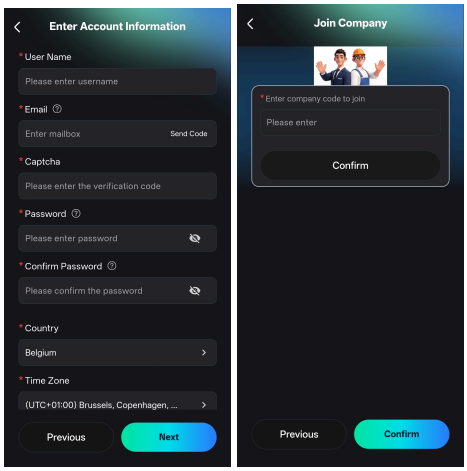



4. For the **Installer** role, either create a company or join an existing company to provide the information accordingly.

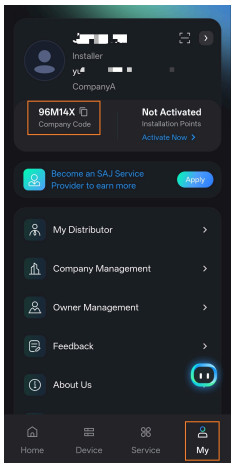
   To create a company:




To join a company:



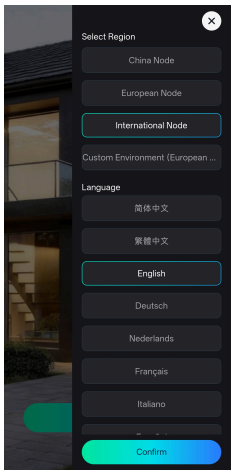

To check an existing user's company code, open page **My**:



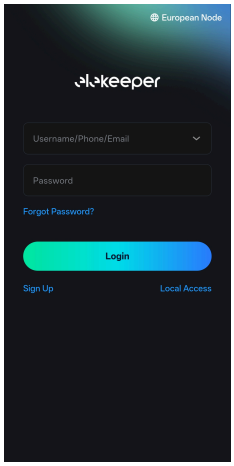

5. For the **Distributor** role, provide similar information as the **Installer** role.

## 8.1.4. Log in to the elekeeper App

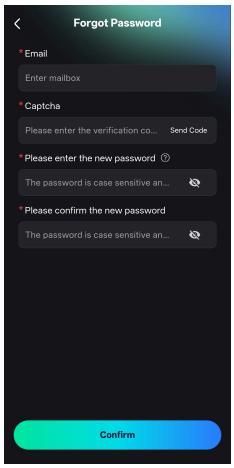
1. Open the App and tap the globe icon on the top right corner.
2. Select the **Region** and **Language** depending on the installation site of the system.




3. Log in with the username, phone number, or email.



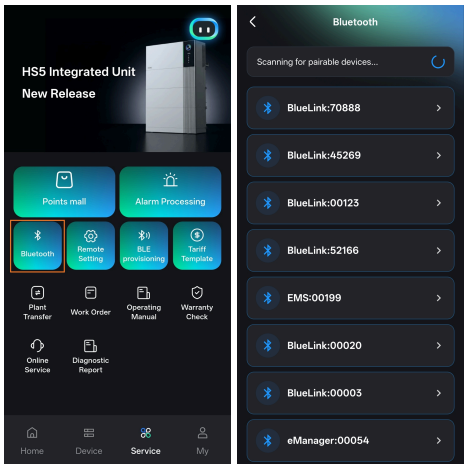

4. (Optional) If you forgot your password, reset your password with email verification.



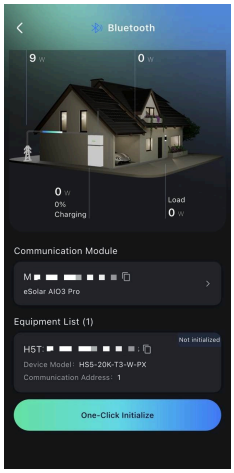
## 8.2. Initialization and installation diagnosis

### 8.2.1. Perform one-click initialization

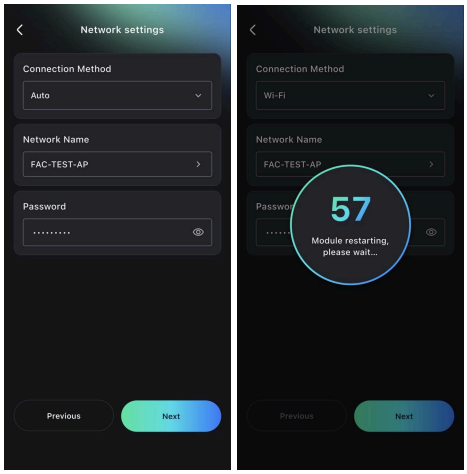
1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. Tap **One-Click Initialize** to start initialization.
   **Example:**



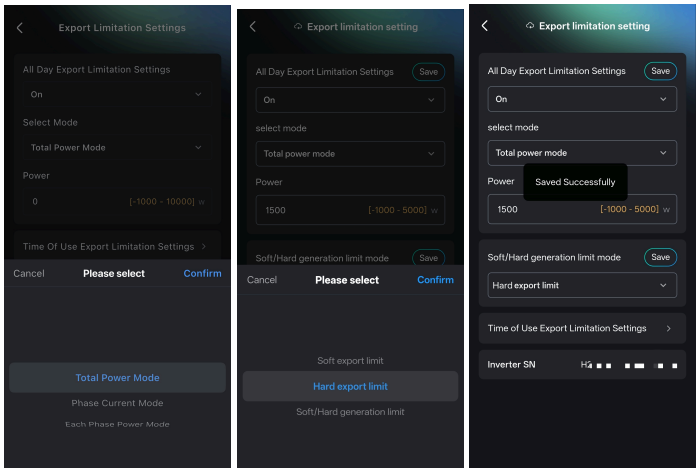

3. Configure the network parameters.
   **Example:**




**Example:**

| Parameter | Description |
|---|---|
| **Connection Method** | The network connection type.<br>. **Auto**<br>. **Wi-Fi**<br>. **Ethernet**: ensure that the Ethernet cable is connected to the router. |
| **Network Name** | The Wi-Fi network to connect to. |
| **Password** | The password for the selected Wi-Fi network. |

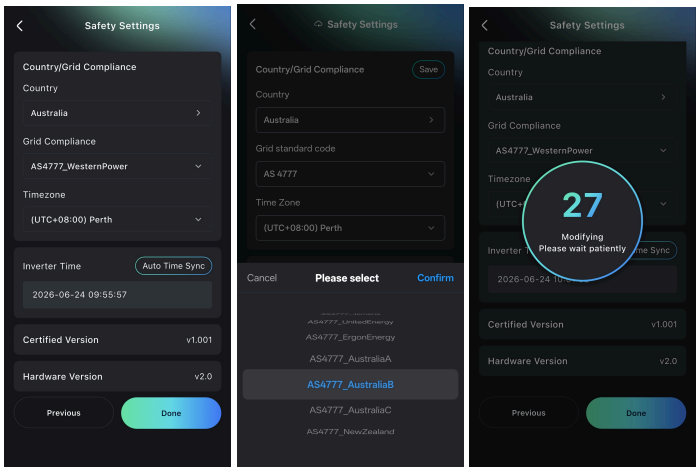
4. Configure the export limitation function.
   The export limitation function controls the maximum power that the inverter exports to the grid.
   **Example:**




| Parameter | Description |
|---|---|
| **All Day Export Limitation Settings** | Enable or disable the export power limitation function that runs continuously throughout the entire day. |

| Parameter | Description |
| --- | --- |
| **Select Mode** | The modes for the export power limitation function.<br>• **Total Power Mode**<br>• **Phase Current Mode**<br>• **Each Phase Power Mode**<br>**Phase Current Mode** and **Each Phase Power Mode** are only applicable for three-phase inverters. |
| **Power** | The export power limit value. |
| **Soft/Hard generation limit mode** | • **Soft export limit**: enable software limit control only, and the export limit is the user-defined power limit value.<br>– In case of communication loss, the inverter exports power within the AC grid output power limit.<br>– In 60 seconds after communication recovery, the export limit is controlled by the user-defined power limit value again.<br>• **Hard export limit**: enable both software and hardware limit controls.<br>– When the export power exceeds the user-defined limit for 5 seconds, the inverter enters standby mode. The inverter restarts automatically in 60 seconds, gradually ramping up its output power.<br>– In case of communication loss for 5 seconds, the inverter stops working.<br>• **Soft/Hard generation limit**: the control mode is similar to **Hard export limit**. Only that the inverter enters standby mode when the export power exceeds the user-defined limit for 15-20 seconds.<br>**Note:** This parameter is only applicable for specific grid code according to local regulations. |
| **Time Of Use Export Limitation Settings** | The time-specific settings that take priority over the **All Day Export Limitation Settings**. The settings can executed once on specific time and date or repeatedly as a loop. |

5. Configure the safety parameters.
**Example:**




| Parameter | Description |
| --- | --- |
| **Country** | The equipment installation location. |

| Parameter | Description |
| --- | --- |
| **Grid Compliance** | Select the grid compliance according to your installation location.<br>Taking Australia as an example, select the specific type of compliance according to the owner's grid configuration.<br>• **AS4777_AustraliaA**: For large interconnected power system.<br>• **AS4777_AustraliaB**: For small interconnected power systems. For example, Western Power.<br>• **AS4777_AustraliaC**: For isolated or remote power systems. For example, Horizon Power and TasNetworks. |
| **Inverter Time** | Tap **Auto Time Sync** to sync the inverter time to the time of the device running the App. |

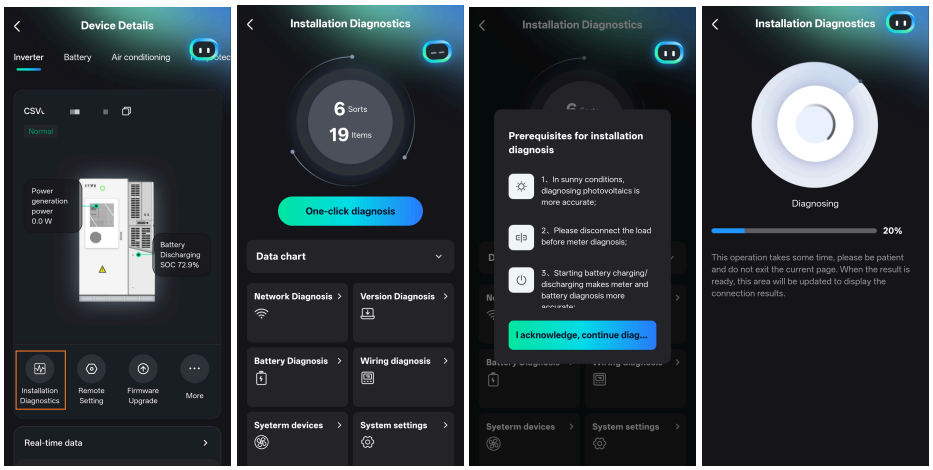
## 8.2.2. Perform installation diagnosis

After the inverter initialization is completed, perform one-click installation diagnosis to verify the installation status of the system, including the network connection, battery settings, wiring status, and so on.

1. On the **Home** page, tap the device name to open the **Device Details** page.
   **Example:**




2. Tap **Installation Diagnostics** to start one-click diagnosis.

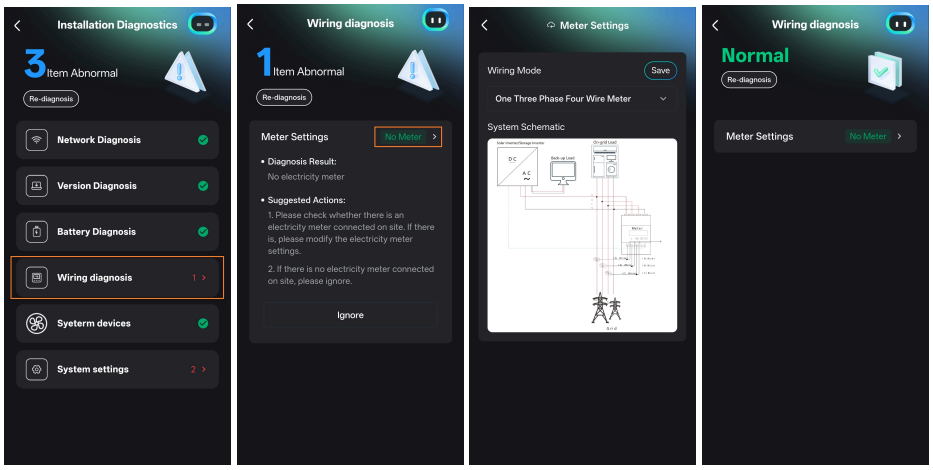



**Note:** If the software versions of the product are too low, follow the prompt-up to upgrade the system version first.

3. Check the faulty diagnostics results and take the suggested actions.
   **Example:**
   a. Tap **Wiring diagnosis** to check the detailed issue and suggested actions.
   b. Tap **No Meter** to change the meter settings where applicable or ignore this issue.

c. Tap **Re-diagnosis** to run the check again.

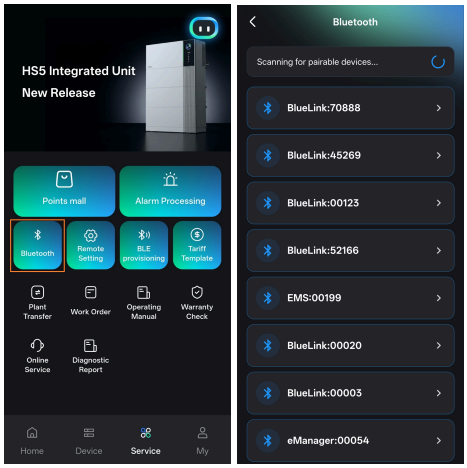
d. Take necessary actions until the issue is resolved.



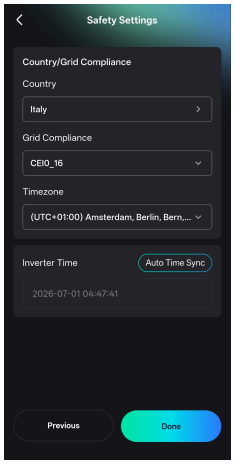
## 8.2.3. Run self-test for grid connection (For Italy)

Italian Standard CEI0-21 requires a self-test function for all inverters that connect to the utility grid. During the self-testing time, the inverter will check the reaction time for over-frequency, under-frequency, over-voltage and under-voltage. The self-test ensures that the inverter can disconnect from the grid when required. If the self-test fails, the inverter cannot feed into the grid.

1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.

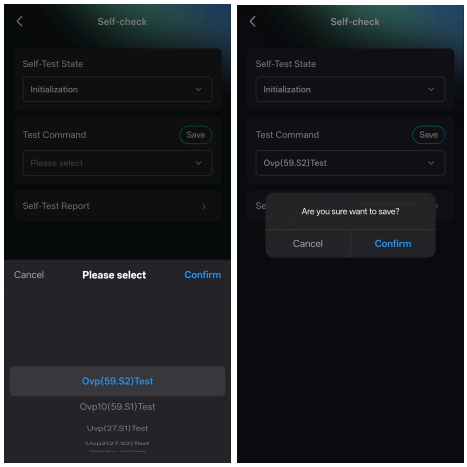



2. On the **Remote Setting** page, tap **Safety Settings** and check whether the grid compliance is set to **Italy** grid codes. Change the settings if needed.

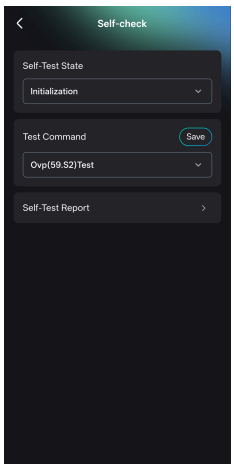



3. On the **Local Connection** page, tap **Self-check**. Choose the self-test items as required, and tap **Save**.

   It takes around 5 minutes to complete each item. After the test item is completed, **Self-Test State** shows **Initialization**.




4. Tap **Self-Test Report** to check the test report. Download the test report if the self-test fails and contact **SAJ** or your inverter supplier.

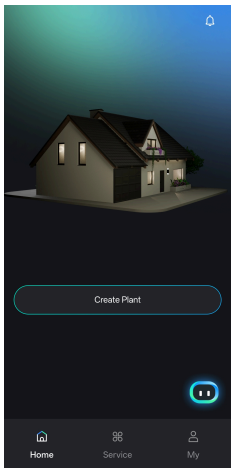



## 8.3. Plant management

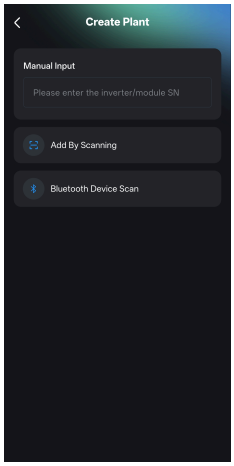
### 8.3.1. Create a power plant

Follow this procedure to create a power plant.

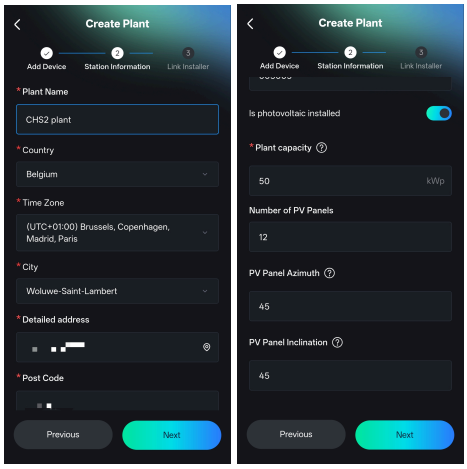
1. On the **Home** page, tap **Create Plant**.




2. Provide the product serial number (SN) to add the devices in the plant.
   - **Manual Input**: Enter the SN of the inverter or the communication module.
   - **Add By Scanning**: Scan the SN.
   - **Bluetooth Device Scan**: Connect to the inverter or communication module through Bluetooth connection.

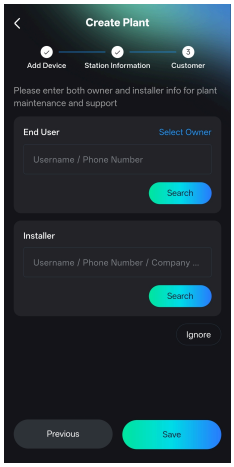



3. Configure the plant details based on the owner's actual information.

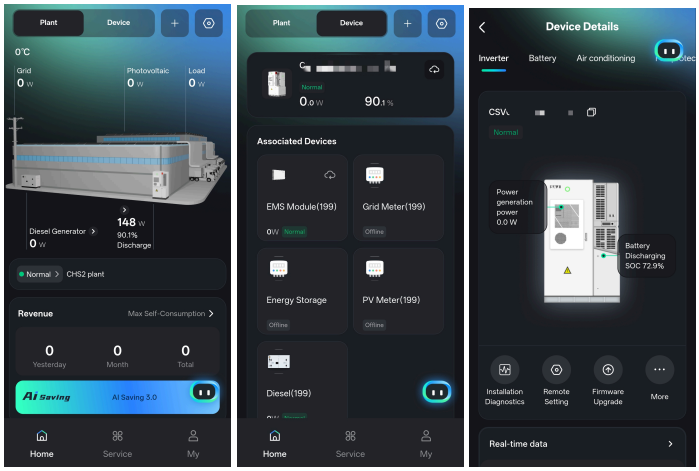



4. Provide the end user and installer information for future maintenance and support purposes.

   The installer company code is created when the installed signs up at the App. For example, 19O67G.



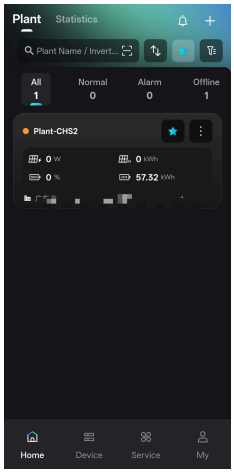

5. After the plant is created successfully, check the plant status as needed.



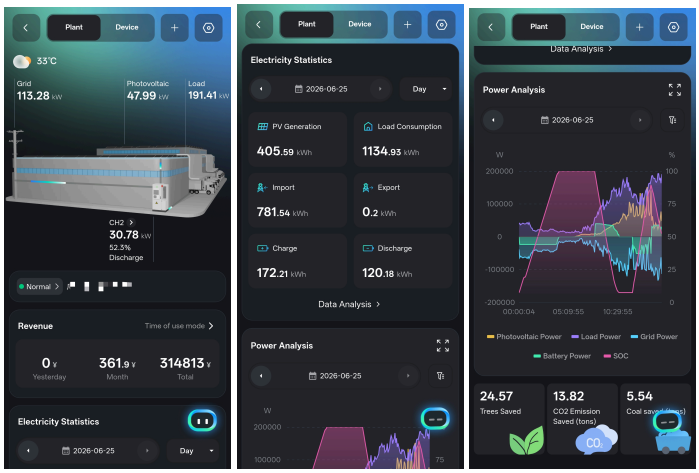
## 8.3.2. View the power plant details

Follow this procedure to check detailed power plant information.

1. On the **Home** page, select and tap the target power plant.
   **Example:**



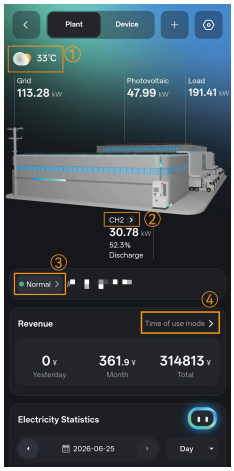

2. Check the following plant information.




| Information | Description |
|---|---|
| Live energy information | • **Grid**: The power that the device is importing from or exporting to the grid.<br>• **Photovoltaic**: The current power generated by the PV array.<br>• **Load**: The overall power consumption by the load.<br>• **Discharge**: The current SOC of the battery system. |
| **Revenue** | The daily, monthly, and total revenue of the power plant. |
| **Electricity Statistics** | The energy statistics of the power plant. Daily, weekly, monthly, yearly, and total statistics are available for detailed data analysis. |
| **Power Analysis** | The power statistics of the power plant. |

Table 8.2. Power plant information

3. Tap each highlighted area for further information or operation.




| Number | Description |
|---|---|
| ① | Tap to check the weather forecast. |
| ② | Tap to open the **Device Details** page for detailed device status and operations like remote settings. |
| ③ | Tap to open the alarm messages list. |
| ④ | Tap to check or modify the working strategy of the device. |

## 8.4. View product information

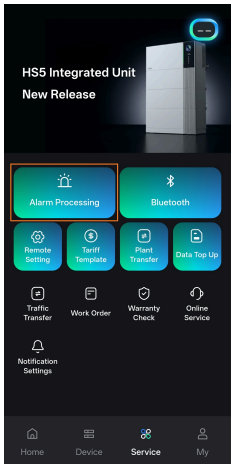
### 8.4.1. Check alarm messages

On the elekeeper App, monitor the system and check the real-time alarm messages.

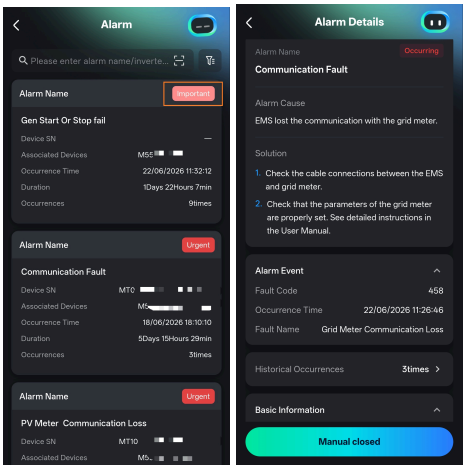
1. Open the alarm message list with one of the options:
   - On the **Home** page, tap the plant status icon in the middle. For example:




   - On the **Service** page, tap **Alarm Processing**.




2. On the **Alarm** page, tap the alarm severity to open the alarm details.

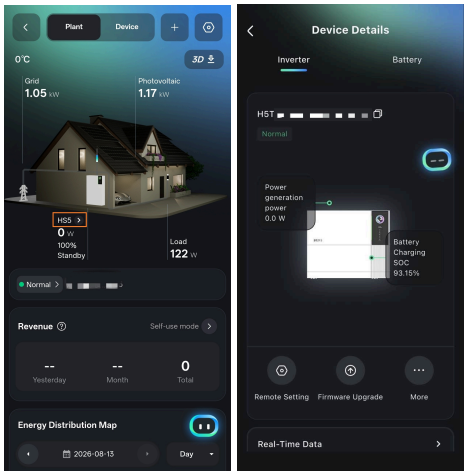



3. Take the suggested troubleshooting actions. Or close the alarm manually if applicable.

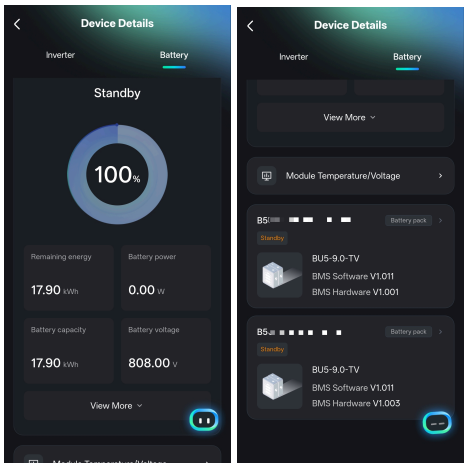
## 8.4.2. Check battery status

The installation engineer or the owner can follow this procedure to check the battery status on the elekeeper App.

1. On the **Home** page, tap the plant to open the plant details page. Then tap the product name to open page **Device Details**.
   **Example:**

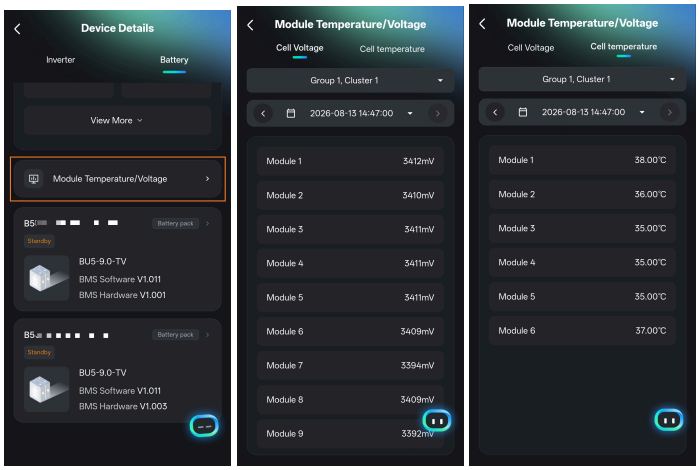



2. Tap page **Battery** to open the battery details page.
   **Example:** View the SoC and remaining energy of the battery system:




3. Check the battery module temperature and voltage as needed.

**Example:**


Device Details
Inverter
Battery
View More
Module Temperature/Voltage
BU5-9.0-TV
BMS Software V1.011
BMS Hardware V1.001
BU5-9.0-TV
BMS Software V1.011
BMS Hardware V1.003
Module Temperature/Voltage
Cell Voltage
Cell temperature
Group 1, Cluster 1
2026-08-13 14:47:00
Module 1 3412mV
Module 2 3410mV
Module 3 3411mV
Module 4 3411mV
Module 5 3411mV
Module 6 3409mV
Module 7 3394mV
Module 8 3409mV
Module 9 3392mV
Module Temperature/Voltage
Cell Voltage
Cell temperature
Group 1, Cluster 1
2026-08-13 14:47:00
Module 1 38.00℃
Module 2 36.00℃
Module 3 35.00℃
Module 4 35.00℃
Module 5 35.00℃
Module 6 37.00℃

## 8.4.3. View the inverter firmware version

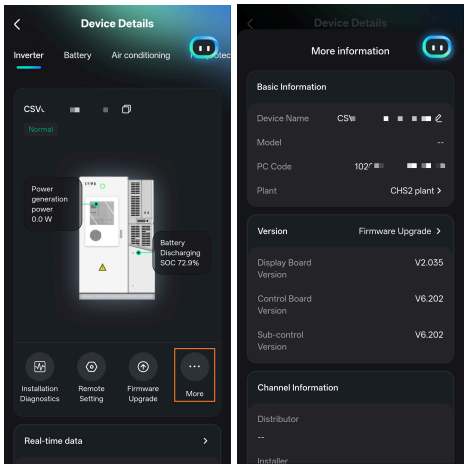
(For Installer role only) Follow this procedure to view the following inverter firmware versions:

- **Display Board Version**: advanced RISC machine (ARM) version
- **Control Board Version**: digital signal processor (DSP) version

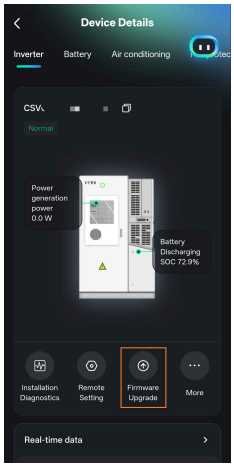
1. On the **Home** page, tap the device name to open the **Device Details** page.
   **Example:**




2. Tap **More**.
   **Example:**



3. On the **Device Details** page, tap **Firmware Upgrade** to upgrade the software versions as needed.



## 8.4.4. View the V-Watt and V-Var settings

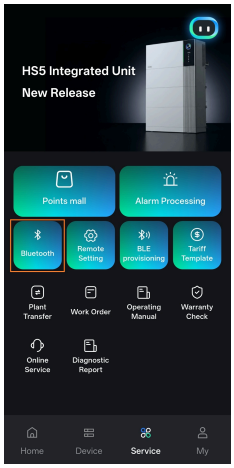
This inverter complies with AS/NZS 4777.2: 2020 for power quality response modes. It meets DNSPs' grid connection rules and requirements for the volt-watt and volt-var settings in different regions.

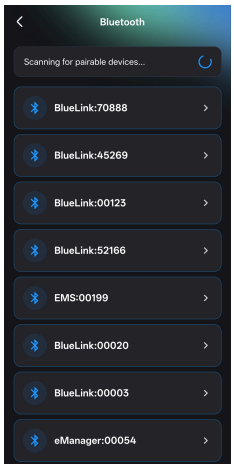
**Note:**

With regard to the power rate limit mode, SAJ product sets the product WGra to 16.67% Pn by default in the following cases according to the requirements of 3.3.5.2 as 4777.2: 2020.

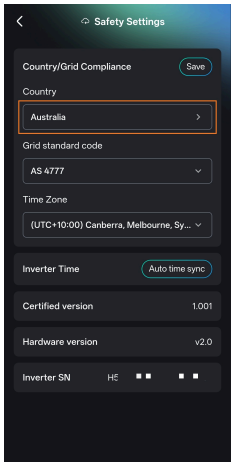
- Soft ramp up after connection.
- Reconnect or soft ramp up/down following a response to frequency disturbance.

1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. On the **Remote Setting** page, tap **Safety Settings** and check whether the grid compliance is set to **Australia** grid codes. Change the settings if needed.



3. On the **Remote Setting** page, select **V-Watt/V-Var** to view the parameter values.

   For **V-Watt** response mode:

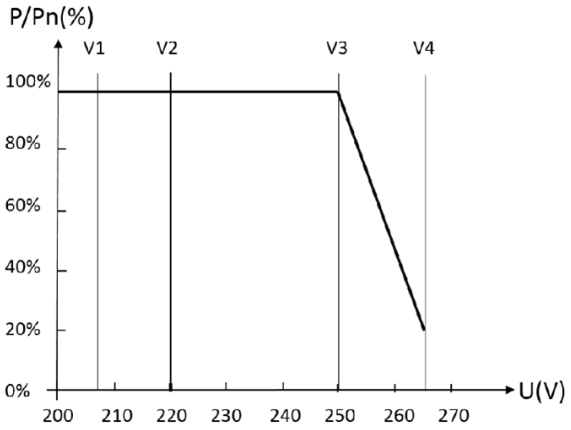
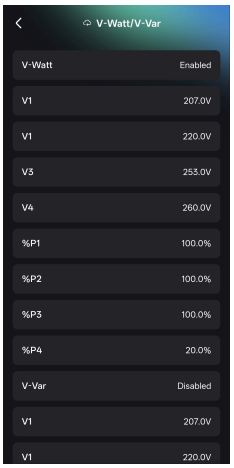



Figure 8.1. **Curve for a Volt-Watt response mode (AS4777 Series)**

Parameters:



For **Volt-Var** control mode:

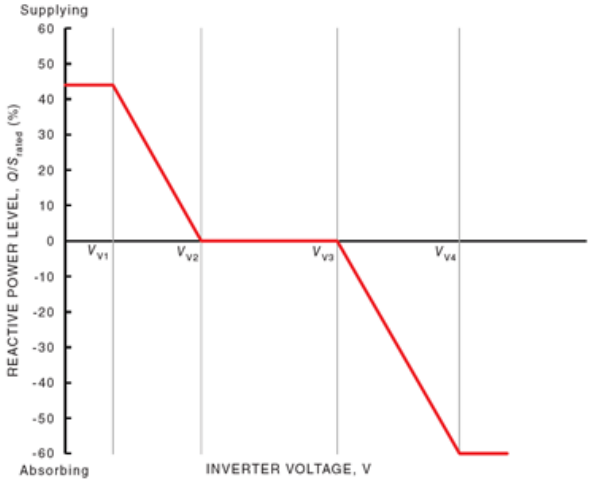
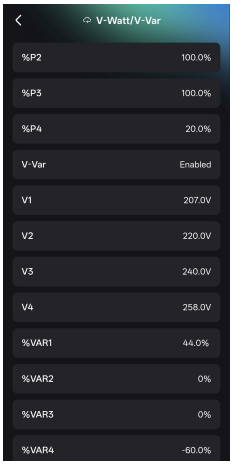



Figure 8.2. **Curve for a Volt-Var control mode (AS4777 Series)**

Parameters:



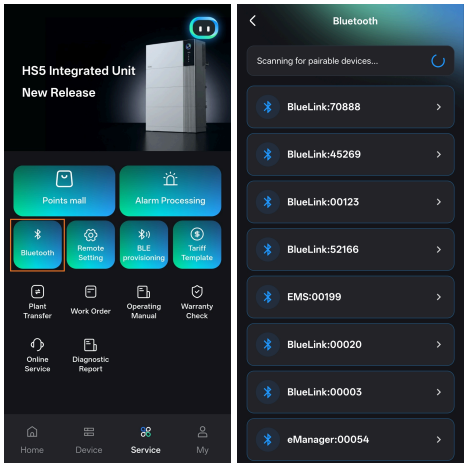
## 8.5. System function configurations

### 8.5.1. Configure working strategy

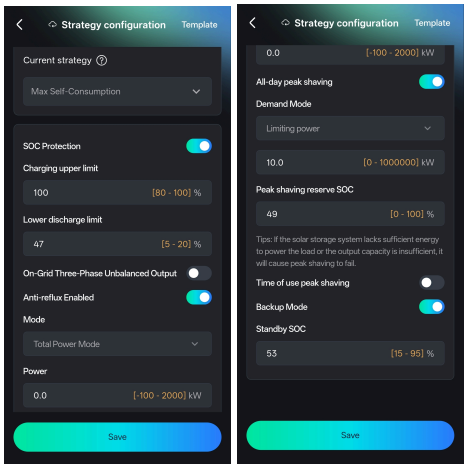
Follow this procedure to configure the device working strategy.

**Note:** The working strategy options and parameters may vary for different devices. Configure the parameters based on the actual App.

1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. Select **Strategy Configuration** or **Working Modes** (depending on the device) to configure the parameters as needed.
3. For mode **Max Self-Consumption**, configure the following parameters:

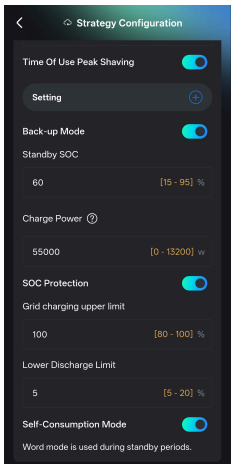



| Parameter | Description |
|---|---|
| **Current strategy** | The active working strategy for the device. |
| **SOC Protection** | Whether to enable battery state of charge (SOC) protection to help prevent excessive charging or discharging. |
| **Charging upper limit** | The maximum battery SOC allowed during charging. Once reached, the battery stops charging. |

| Parameter | Description |
|---|---|
| **Lower discharge limit** | The minimum battery SOC allowed during discharging to protect the battery from over-discharge. Once reached, the battery stops discharging. |
| **On-Grid Three-Phase Unbalanced Output** | Whether to enable three-phase unbalanced output when the system is operating on-grid.<br>This parameter is applicable for three-phase inverters only. |
| **Anti-reflux Enabled** | Enables or disables export limit control function to prevent power from feeding back to the grid. |
| **Mode** | Selects the export limit control mode used by the system. |
| **Power** | The power limit value used in the selected control mode. |
| **All-day peak shaving** | Enables or disables peak shaving throughout the entire day. |
| **Demand Mode** | Selects the demand control method used for peak shaving. |
| **Demand Mode power** | Sets the target power limit used when the selected demand mode requires a power threshold. |
| **Peak shaving reserve SOC** | Sets the battery SOC reserved for peak shaving operation. |
| **Time of use peak shaving** | Enables or disables peak shaving based on configured time periods. |
| **Backup Mode** | Enables or disables backup power operation so the battery can reserve energy for backup loads. |
| **Standby SOC** | Sets the battery SOC to be maintained in standby for backup or reserve purposes. |

Table 8.3. Max Self-Consumption parameters

4. For **Time of Use Peaking Shaving** mode, configure the following parameters:

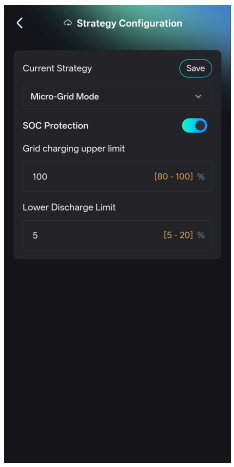



| Parameter | Description |
|---|---|
| **Time Of Use Peak Shaving** | Enables or disables peak shaving based on configured time-of-use periods. |
| **Setting** | The time-of-use setting area where you can add and configure the charging and discharging schedules at configured charging power limit. |
| **Back-up Mode** | Whether to enable the backup power operation so the battery can reserve energy for backup loads. |
| **Standby SOC** | The battery SOC to be maintained in standby for backup or reserve purposes. |
| **Charge Power** | The charging power used when backup mode charging is active. |

| Parameter | Description |
| --- | --- |
| **SOC Protection** | Whether to enable battery state of charge (SOC) protection to help prevent excessive charging or discharging. |
| **Grid charging upper limit** | The maximum battery SOC allowed when charging from the grid. |
| **Lower Discharge Limit** | The minimum battery SOC allowed during discharging to protect the battery from over-discharge. |
| **Self-Consumption Mode** | Whether to enable self-consumption mode during standby periods.<br>• For CHS2 series, enable this option of **Self-Consumption Mode** for the non-charging or non-discharging periods so that the system can work in self-consumption mode when the system is not charging or discharging. If this option is disabled during these periods, the system will be at the bypass status and provides no power to the backup loads. |

Table 8.4. TOU mode parameters

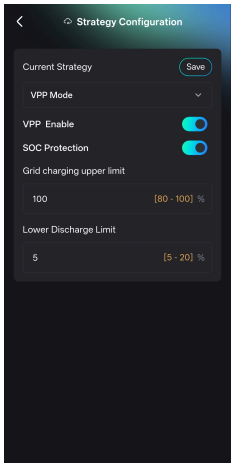
5. For **Micro-Grid Mode**, configure the following parameters:




| Parameter | Description |
| --- | --- |
| **Current Strategy** | The active working strategy for the device. |
| **SOC Protection** | Enables or disables battery SOC protection to help prevent excessive charging or discharging in micro-grid mode. |
| **Grid charging upper limit** | The maximum battery SOC allowed when charging from the grid. |
| **Lower Discharge Limit** | Sets the minimum battery SOC allowed during discharging to protect the battery from over-discharge. |

Table 8.5. Micro-Grid mode parameters

6. For **VPP Mode**, configure the following parameters:



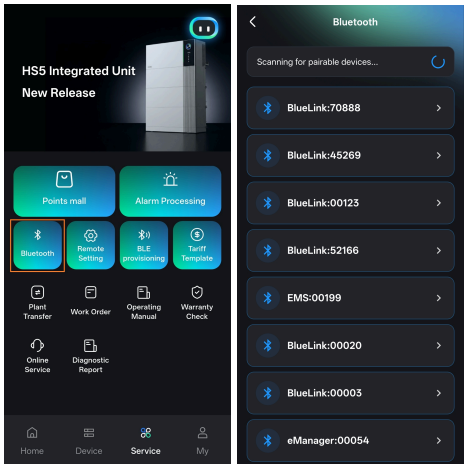

| Parameter | Description |
|---|---|
| **VPP Enable** | Enables or disables VPP mode for the device. |
| **SOC Protection** | Enables or disables battery SOC protection to help prevent excessive charging or discharging in VPP mode. |
| **Grid charging upper limit** | The maximum battery SOC allowed when charging from the grid. |
| **Lower Discharge Limit** | Sets the minimum battery SOC allowed during discharging to protect the battery from over-discharge. |

Table 8.6. VPP mode parameters

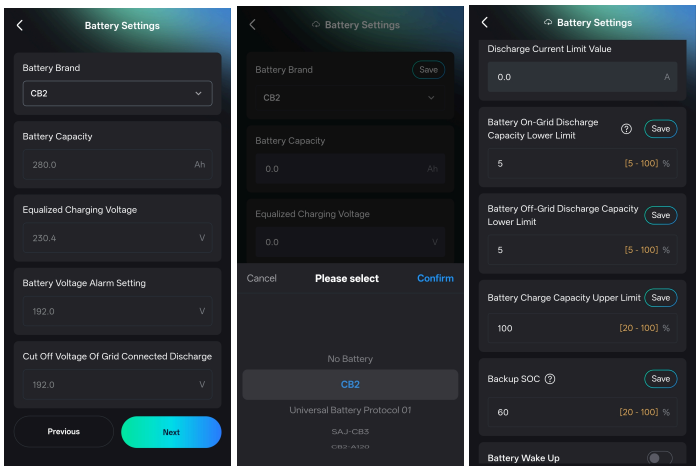
## 8.5.2. Set the battery parameters

The installation technicians can configure the **Battery Settings** during the initialization of the inverter on the elekeeper App or set the parameters after installation through remote connection.

1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. Select **Battery Settings** and configure the parameters as needed.




| Parameter | Description |
|---|---|
| **Battery Brand** | The brand of the battery currently adapted for match the corresponding BMS communication protocol. |
| **Battery Capacity** | The rated ampere-hour capacity (Ah) of the battery pack, used by the system to estimate total energy (kWh) and remaining runtime. |
| **Equalized Charging Voltage** | The maximum charging voltage limit for the battery. When reached, charging stops or switches to constant voltage to prevent overcharging and cell damage. |
| **Battery Voltage Alarm Setting** | The voltage threshold at which a low-voltage alarm is triggered. It reminds the user to monitor battery level. |

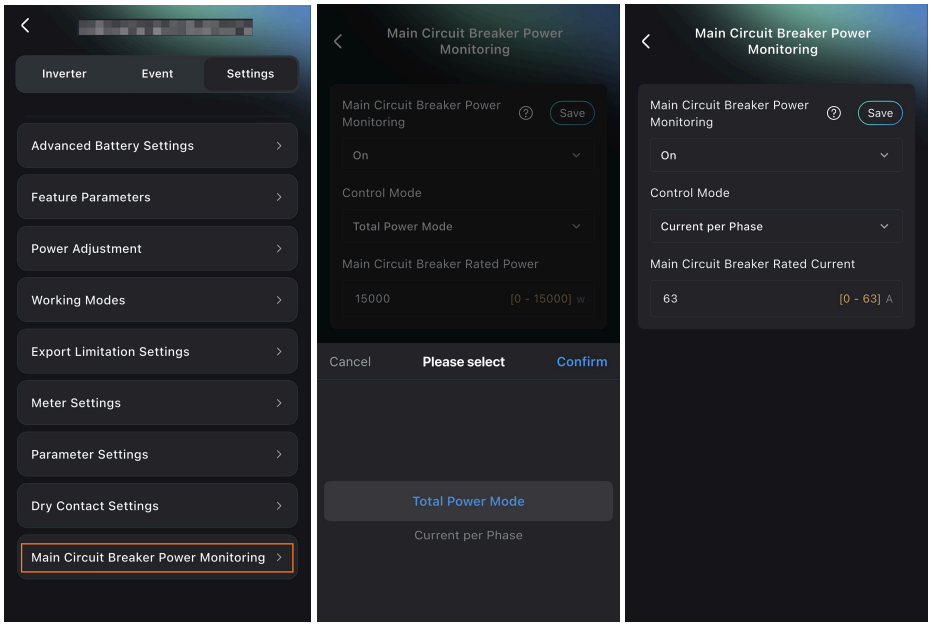
| Parameter | Description |
| --- | --- |
| **Cut Off Voltage Of Grid Connected Discharge** | The voltage at which the battery hard-stops discharging during grid-tied operation and switches to grid power, serving as the final physical protection. |
| **Charge Current Limit Value** | The maximum charging current (A) allowed by the battery. The system limits the input power beyond this current to protect cells from high current stress. |
| **Discharge Current Limit Value** | The maximum discharging current (A) allowed. The load power is limited beyond this current to avoid overcurrent damage to the battery. |
| **Battery On-Grid Discharge Capacity Lower Limit** | The SOC percentage at which discharging stops during grid-tied operation, switching to grid power to reserve energy for unexpected outages. |
| **Battery Off-Grid Discharge Capacity Lower Limit** | The lower SOC percentage (typically lower than the grid-tied value) allowed during off-grid/power outage situations to extend emergency backup duration. |
| **Battery Charge Capacity Upper Limit** | The SOC percentage at which charging stops. Reducing this value can prolong battery life. |
| **Backup SOC** | The target SOC threshold maintained by the system (higher than the grid-tied discharge limit). When SOC falls below this, the system prioritizes PV or grid charging to ensure sufficient backup power. |
| **Battery Wake Up** | A function to force a wake-up voltage or restart communication when the battery enters sleep state due to undervoltage, overtemperature, or BMS protection, allowing reconnection without physical rewiring. |

Table 8.7. Battery parameters

## 8.5.3. Configure main circuit breaker power monitoring

The main circuit breaker power monitoring function dynamically restricts power drawn from and fed to the grid, avoiding over-current tripping of your main circuit breaker.

1. Under the **Settings** tab on the device page, tap **Main Circuit Breaker Power Monitoring**.
2. From the drop down list of **Main Circuit Breaker Power Monitoring**, select **On** to enable this function.
3. Select the power monitoring mode and configure the corresponding parameters.
   **Example:**

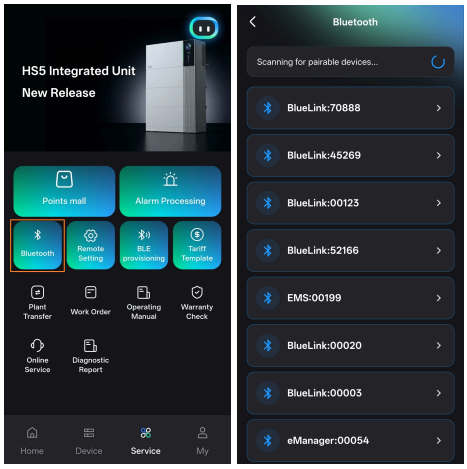



| Mode | Mode description | Steps |
|---|---|---|
| Total Power Mode | The inverter monitors the total import and export power in real time. When it exceeds the configured rated power of the main circuit breaker, the inverter restricts the import and export power to prevent overload tripping. | a. For **Control Mode**, select **Total Power Mode**.<br>b. Configure a value for **Main Circuit Breaker Rated Power**. |
| Current per Phase Mode | The inverter monitors the current of each individual phase in real time. When it exceeds the configured rated current of main circuit breaker, the inverter dynamically restricts import and export power to prevent overload tripping. | a. For **Control Mode**, select **Current per Phase**.<br>b. Configure a value for **Main Circuit Breaker Rated Current**. |

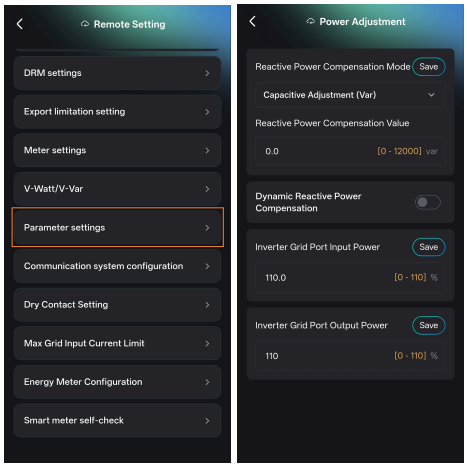
## 8.5.4. Configure power adjustment function

The power adjustment function allows the inverter to regulate and optimize the output power according to grid requirements and operational conditions. This function enables the inverter to adjust active and reactive power dynamically to improve grid stability, comply with local regulations, and enhance energy efficiency.

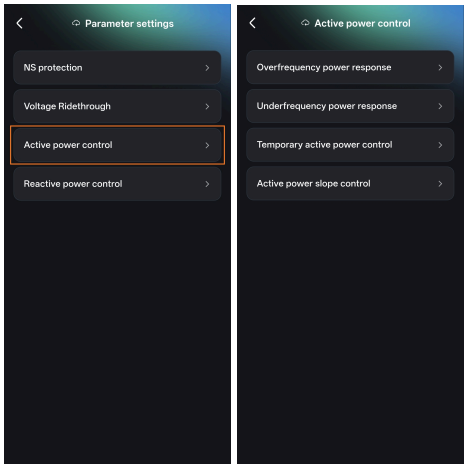
1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. Select **Parameter settings**, and configure the power adjustment parameters as needed.

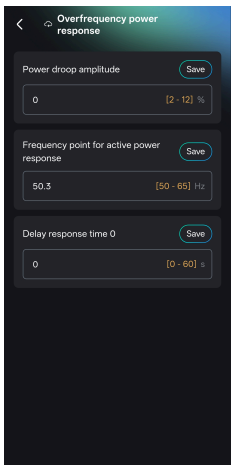


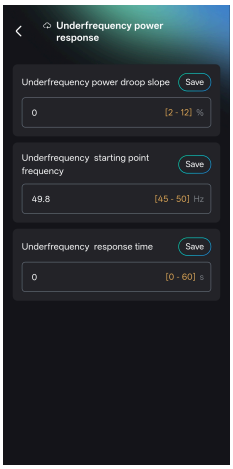
3. For **Active power control**, select the corresponding parameter groups and configure the corresponding parameters as needed:

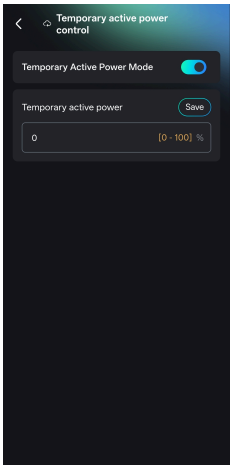


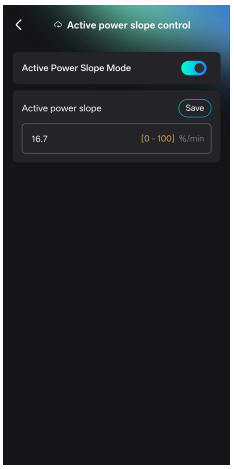




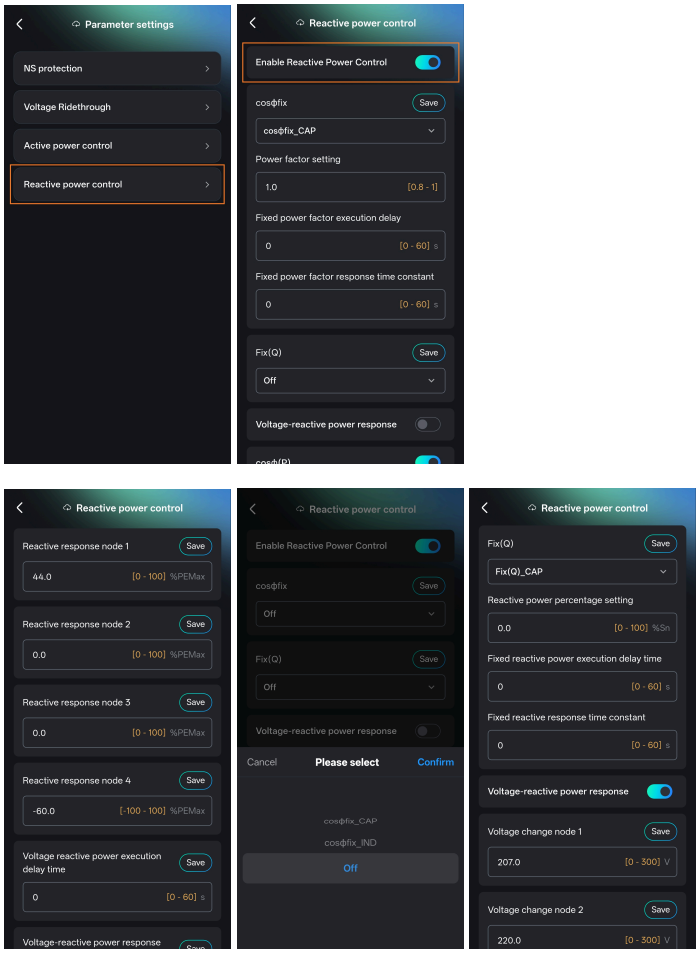


4. For **Reactive power control**, enable the control function first and then configure the corresponding parameters as needed:



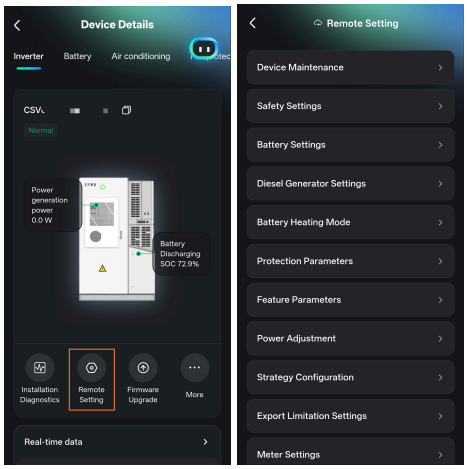
## 8.5.5. Configure the DRM settings

When the **Country** is set to Australia on page **Safety Settings**, set the demand response mode (DRM) according to local regulations as needed.

1. On the **Home** page, tap the device name to open the **Device Details** page.
   **Example:**

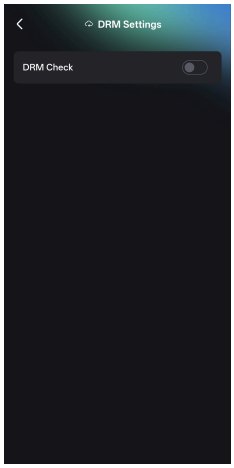



2. On page **Device Details**, tap **Remote Setting** to open the device settings.
   **Example:**




**Note:** The settings menu and parameter list may vary for different devices and user roles.

3. Select **DRM Settings**, and enable the **DRM Check** function.

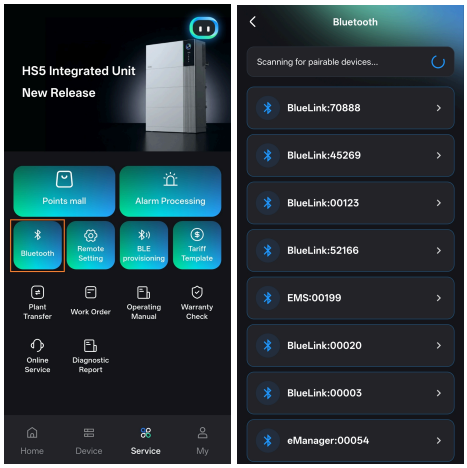


## 8.5.6. Configure G100 function

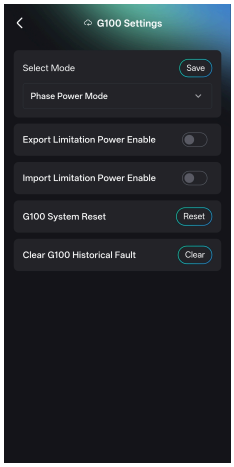
The G100 function is only applicable when the **Country** setting is UK (United Kingdom) on page **Safety Settings**. This function controls the export and import limit at the connection point of the distribution network.

If export and import limit control fails at the connection point, the inverter (or PCS, hereinafter referred as the inverter) will shut down and can only be restarted by resetting the G100 system. If the failure happens four times within 30 days, the inverter will be locked and can only be restored to operation by clearing the fault history.

1. On page **Service**, tap **Bluetooth**. Select the communication module, inverter or EMS according to the last five digits of the serial number (SN).
   **Example:**
   - **BlueLink: 45269** for a communication module or inverter.
   - **EMS: 00199** for EMS units.




2. Select **G100 Settings** to configure the parameters as needed.




| Parameter | Description |
|---|---|
| **Mode** | Whether to control the export and import power limit per total power or per phase power. |
| **Export Limitation Power Enable** | The total power or phase power to be exported to the grid depending on the mode. |
| **Import Limitation Power Enable** | The total power or phase power to be imported from the grid depending on the mode. |

| Parameter | Description |
| --- | --- |
| **G100 System Reset** | To restart the inverter after an export or import limit control failure happens. |
| **Clear G100 Historical Fault** | To manually clear the history of limit control failures for restarting the inverter. |

Table 8.8. G100 settings

# 9. System maintenance

## 9.1. Routine maintenance

To ensure that the system lifespan, perform the suggested routine maintenance operations.

**DANGER**

**Danger of electric shock**

Before operating on the system for cleaning, cable inspection, component maintaining, power off the whole system. Do not open any product cover until 5 minutes after disconnecting all sources of supply.

**Note:**

To purchase the routine maintenance service, contact the installer, distributor, or **SAJ** product support.

### System routine maintenance

| Check item | Check method | Maintenance interval |
|---|---|---|
| **System cleanliness** | Check periodically whether the heat sinks are blocked or dirty. | Once every 6 to 12 months |
| **Cleanness of air intake and exhaust vents** | Check periodically whether there is dust or foreign objects at the air intake and exhaust vents:<br>1. Power off the whole system.<br>2. Remove dust and foreign objects.<br>3. If necessary, remove the baffle plates from the air intake and exhaust vents for cleaning. | Once every 6 to 12 months (or once every 3 to 6 months based on the actual dust conditions in the environment) |
| **Fan** | Check whether the fan generates abnormal noise during operation.<br>Check for and remove any foreign objects from the fan. If the abnormal noise persists, replace the fan. | Once every 6 to 12 months |
| **System running status** | 1. Check whether the inverter is damaged or deformed.<br>2. Check whether the inverter generates abnormal sound during operation.<br>3. Check whether all inverter parameters are correctly set during operation. | Once every 6 months |
| **Electrical connection** | 1. Check whether cables are disconnected or loose.<br>2. Check whether cables are damaged, especially whether the cable sheath that contacts a metal surface is damaged. | 6 months after the first commissioning and once every 6 to 12 months after that |
| **Grounding reliability** | Check whether the PE cable is securely connected. | 6 months after the first commissioning and once every 6 to 12 months after that |
| **Sealing** | Check whether all terminals and ports are properly sealed. | Once a year |

### Battery-specific routine maintenance

| Check item | Check method | Maintenance interval |
|---|---|---|
| **Battery routine maintenance (tool requirement)** | 1. Use only manufacturer-provided professional tools to inspect, test, or service the battery pack.<br>2. Do not disassemble, modify, or perform maintenance on the battery pack without proper training and approved tools. | Applicable to all battery maintenance activities |
| **Battery module appearance** | 1. Check the battery modules for swelling, deformation, cracks, liquid leakage, corrosion, or abnormal odor.<br>2. Check the battery enclosure for damage, deformation, or signs of overheating. | Once every 6 to 12 months |
| **Battery terminal and connection check** | 1. Power off the entire system before performing any checks.<br>2. Inspect all battery terminals and connectors for looseness, oxidation, or signs of overheating.<br>3. Verify that all cable connections are tight and properly torqued to the specified value using manufacturer-approved tools. | 6 months after the first commissioning and once every 6 to 12 months after that |
| **Battery operating status & parameters** | 1. Check the battery pack status such as SOC, voltage, current, and temperature.<br>2. Ensure no cell voltage imbalance, over-temperature, or other alarms are reported.<br>3. Verify the battery communicates normally with the inverter/BMS. | Once every 6 months |
| **Battery ventilation and environment** | 1. Check that the battery compartment and ventilation openings are free of dust, debris, or blockages.<br>2. Ensure the battery is installed in a well-ventilated, cool, and dry environment away from heat sources or direct sunlight. | Once every 6 to 12 months (or once every 3 to 6 months in dusty environments) |

## 9.2. Troubleshooting

For the errors reported as below, contact the service support for further assistance.

The troubleshooting operations must be performed by authorized technicians only.

| Error code | Error message |
|---|---|
| 1 | Master Relay Error |
| 2 | Master EEPROM Error |
| 3 | Master Temperature High Error |
| 4 | Master Temperature Low Error |
| 5 | Master Lost Communication M<->S |
| 6 | Master GFCI Device Error |
| 7 | Master DCI Device Error |
| 8 | Master Current Sensor Error |
| 9 | Master Phase1 Voltage High |
| 10 | Master Phase1 Voltage Low |
| 11 | Master Phase2 Voltage High |
| 12 | Master Phase2 Voltage Low |
| 13 | Master Phase3 Voltage High |
| 14 | Master Phase3 Voltage Low |
| 15 | Master Voltage 10Min High |
| 16 | Master OffGrid Voltage Low |
| 17 | Master Output_Shorter |
| 18 | Master Grid Frequency High |
| 19 | Master Grid Frequency Low |
| 20 | BATInputMode Error |
| 21 | Master Phase1 DCV Error |
| 22 | Master Phase2 DCV Error |
| 23 | Master Phase3 DCV Error |
| 24 | Master No Grid Error |
| 25 | DC ReverseConnect Error |
| 26 | Parallel machine CAN Com Error |
| 27 | Master GFCI Error |
| 28 | Master Phase1 DCI Error |
| 29 | Master Phase2 DCI Error |
| 30 | Master Phase3 DCI Error |
| 31 | Master ISO Error |
| 32 | Master Bus Voltage Balance Error |
| 33 | Master Bus Voltage High |
| 34 | Master Bus Voltage Low |
| 35 | Master Grid Phase Error |
| 36 | Master PV Voltage High Error |
| 37 | Master Islanding Error |
| 38 | Master HW Bus Voltage High |
| 39 | Master HW PV Current High |

| Error code | Error message |
|---|---|
| 40 | Master SelfTestFailed |
| 41 | HW Inv Current High |
| 44 | Master Grid NE Voltage Error |
| 45 | Master Fan1 Error |
| 46 | Master Fan2 Error |
| 47 | Master Fan3 Error |
| 48 | Master Fan4 Error |
| 49 | Lost Communication between DSP and PowerMeter |
| 50 | Lost Communication between M<->S |
| 51 | Lost Communication between inverter and Grid Meter |
| 52 | HMI EEPROM Error |
| 53 | HMI RTC Error |
| 55 | BMS Lost.Conn Warn |
| 56 | CT Device Err |
| 58 | Lost Com.H<->S Err |
| 59 | Lost Communication between inverter and PV Meter |
| 60 | EV_Lost.Conn Warn |
| 78 | Grid Power Emergency Disconnect |
| 81 | Lost Communication D<->C |
| 83 | Master Arc Device Error |
| 84 | Master PV Mode Error |
| 85 | Authority expires |
| 86 | DRM0 Error |
| 87 | Master Arc Error |
| 88 | Master SW PV Current High |
| 89 | Master Battery Voltage High |
| 90 | Master Battery Current High |
| 91 | Master Battery Charge Voltage High |
| 92 | Master Battery OverLoad |
| 93 | Master Battery SoftConnet TimeOut |
| 94 | Master Output OverLoad |
| 95 | Master Battery Open Circuit Error |
| 96 | Master Battery Discharge Voltage Low |
| 97 | BMS Internal Communication Error |
| 98 | Bat Sequence Error |
| 99 | Discharge Over Current Protect |
| 100 | Charge Over Current Protect |
| 101 | Module Under Voltage Protect |
| 102 | Module Over Voltage Protect |
| 103 | Single Cell Under Voltage Protect |
| 104 | Single Cell Over Voltage Protect |
| 105 | BMS Hardware Error |
| 106 | Charge Cell Under Temperature Protect |

| Error code | Error message |
|---|---|
| 107 | Charge Cell Over Temperature Protect |
| 108 | Discharge Cell Under Temperature Protect |
| 109 | Discharge Cell Over Temperature Protect |
| 110 | Relay Error |
| 111 | Pre-charge Error |
| 112 | Insulation Error |
| 113 | BMS supplier Incompatibility |
| 114 | Battery cell supplier Incompatibility |
| 115 | Battery cell Incompatibility |
| 116 | Battery pack models or grades are inconsistent |
| 117 | Circuit Breaker Is Open |
| 118 | Temperature Difference Is Too Wide |
| 119 | Voltage Difference Is Too Wide |
| 120 | Voltage Difference Is Too Wide |
| 121 | BMS Over Temperature Protect |
| 122 | Short Circuit Protect |
| 123 | Total voltage match failed |
| 124 | The system is locked |
| 125 | FUSE error protection |
| 126 | Battery Port Voltage Abnormal Protection |
| 127 | Heating Film Overtemperature Protection |
| 128 | Abnormal Temperature Increases |

# 10. Product specification

## 10.1. EK90 HS5-(8K-20K)-T3-X

| Model | | EK90 HS5-8K-T3-X[1] | EK90 HS5-10K-T3-X | EK90 HS5-12K-T3-X | EK90 HS5-12K-T3-X-IE | EK90 HS5-15K-T3-X | EK90 HS5-20K-T3-X |
|---|---|---|---|---|---|---|---|
| **PV DC Input** | | | | | | | |
| Recommended max. PV power | | 16000 | 20000 | 24000 | 24000 | 30000 | 40000 |
| Max. Input Voltage (V) | | 1000 | | | | | |
| MPPT Voltage Range (V) | | 150-900 | | | | | |
| Start-up Voltage (V) | | 160 | | | | | |
| Nominal DC Input Voltage (V) | | 600 | | | | | |
| Max. Input Current per MPPT (A) | | 20/20/20 | | | | 40/20/20 | |
| Max. Short-circuit Current per MPPT (A) | | 25/25/25 | | | | 50/25/25 | |
| Number of MPP Trackers | | 3 | | | | | |
| No. of Strings per MPP Tracker | | 1+1+1 | | | | 2+1+1 | |
| **Battery DC Input** | | | | | | | |
| Battery Type | | LiFePO4 | | | | | |
| Battery Voltage Range [V] | | 600-900 | | | | | |
| BAT Communication Interface | | CAN | | | | | |
| Max. Battery Quantity per System | | 6 | | | | | |
| **AC Output/Input (On-Grid)** | | | | | | | |
| **AC Output (On-Grid)** | Rated Output Power (W) | 8000 | 9999 | 12000 | 11000 | 15000 | 20000 |
| | Rated Apparent Power (VA) | 8000 | 9999 | 12000 | 11000 | 15000 | 20000 |
| | Max. Apparent Power (VA) | 8800 | 9999 | 13200 | 11000 | 16500 | 22000 |
| | Rated Output Voltage (V) | 3L+N+PE, 230/400 | | | | | |
| | Rated Output Current (A) | 11.6 | 14.5 | 17.4 | 15.9 | 21.7 | 29.0 |
| | Max. Output Current (A) | 12.8 | 14.5 | 19.1 | 15.9 | 23.9 | 31.9 |
| | Adjustable Power Factor | 0.8 leading-0.8 lagging | | | | | |
| **AC Input (On-Grid)** | Rated Input Voltage (V) | 3L+N+PE, 230/400 | | | | | |
| | Max. Input Current (A) | 63[2] | | | | | |

| Model | EK90 HS5-8K-T3-X [1] | EK90 HS5-10K-T3-X | EK90 HS5-12K-T3-X | EK90 HS5-12K-T3-X-IE | EK90 HS5-15K-T3-X | EK90 HS5-20K-T3-X |
|---|---|---|---|---|---|---|
| Rated AC Grid Frequency (Hz) | 50/60 | | | | | |
| Total Current Harmonic Distortion | < 3% | | | | | |
| **AC Output (Backup)** | | | | | | |
| Max. Output Apparent Power (VA) | 8000 | 10000 | 12000 | 12000 | 15000 | 20000 |
| Peak Output Apparent Power (VA 10s) | 16000 | 20000 | 24000 | 24000 | 30000 | 40000 |
| Rated Output Voltage (V) | 3L+N+PE, 230/400 | | | | | |
| Max. Output Current (A) | 11.6 | 14.5 | 17.4 | 17.4 | 21.7 | 29.0 |
| Rated AC Grid Frequency (Hz) | 50/60 | | | | | |
| Adjustable Power Factor | 0.8 leading-0.8 lagging | | | | | |
| Total Current Harmonic Distortion | < 3% | | | | | |
| Switch Time (ms) | ≤10 | | | | | |
| **Efficiency** | | | | | | |
| Euro Efficiency | 97.6% | | | | | |
| Max. Efficiency | 98.2% | | | | | |
| **Protection** | | | | | | |
| Insulation Monitoring | Integrated | | | | | |
| Residual Current Monitoring | Integrated | | | | | |
| DC Reverse Polarity Protection | Integrated | | | | | |
| Anti-islanding Protection | AFD | | | | | |
| AC Short-circuit Protection | Integrated | | | | | |
| AC Overcurrent/Overvoltage Protection | Integrated | | | | | |
| AC Overvoltage Category | III | | | | | |
| DC Overvoltage Category | II | | | | | |
| DVC Class | DVC-A for communication terminals;<br>DVC-C for PV terminals, Battery terminals and all AC terminals | | | | | |
| Icw [kA] | ≤10 kA (<10s) for all terminals | | | | | |
| Icc [kA] | ≤10 kA (<10s) for all terminals | | | | | |
| Current Inrush [A] (Peak value) | 36 for all AC terminals | | | | | |
| Max. AC Fault Current [A] (Peak value) | 95 for all AC terminals | | | | | |
| Max. AC Overcurrent Protection [A] (RMS value) | 63 for all AC terminals | | | | | |
| Max. DC Fault Current [A] (Peak value) | 13.5 for battery terminals | | | | | |

| Model | EK90 HS5-8K-_T3-X [1] | EK90 HS5-10K-T3-X | EK90 HS5-12K-T3-X | EK90 HS5-12K-T3-X-IE | EK90 HS5-15K-T3-X | EK90 HS5-20K-T3-X |
|---|---|---|---|---|---|---|
| Max. DC Overcurrent Protection [A] (RMS value) | 12 for battery terminals | | | | | |
| Feedback Current [A] | 0 | | | | | |
| DC Switch | Integrated | | | | | |
| DC Surge Protection | Type II | | | | | |
| AC Surge Protection | Type II | | | | | |
| AFCI | Integrated | | | | | |
| Inverter Topology | Non-isolation | | | | | |
| Protective Class | I | | | | | |
| **General Data** | | | | | | |
| Dimensions (W / H / D) (mm) | 835 / 690 - 2050 / 270<br>• Inverter: 835 / 350 / 270<br>• Battery pack: 835 / 270 / 270<br>• Battery base: 835 / 70 - 80 / 270 | | | | | |
| Weight (kg) | • Inverter: 44.5<br>• Battery pack:<br>– EK90 BU5-6.0-TV: 60.4<br>– EK90 BU5-7.0-TV: 71.7<br>– EK90 BU5-9.0-TV: 79.2<br>• Battery base: 8 | | | | | |
| Charging/Discharging Temperature Range | -30℃ to +50℃ | | | | | |
| Relative humidity range | 5%-95% Non-condensing | | | | | |
| Corrosion resistance grade | C4 | | | | | |
| Max. Operating Altitude (m) | 3000 | | | | | |
| Cooling | Smart air cooling | | | | | |
| Heating | Heating function for low-temperature operation | | | | | |
| Ingress Protection Rating | IP66 | | | | | |
| Communication | WLAN / Fast Ethernet / RS485 | | | | | |
| Communication Module | eSolar AIO3 Pro / eSolar 4G Pro | | | | | |
| Warranty | Refer to the warranty policy | | | | | |

1. X stands for the battery system configuration. The value of x can be 6, 7, 9, 12, 14, 15, 16, 18, 21, 24, 25, 27, 28, 30, 35, 36, 40, 42, 45, 50, and 54. Each number presents the energy storage capacity for different models. For battery combinations and ratings, refer to the battery combination datasheet.

2. The built-in 63A bypass function enables the whole-house backup power, and the current can be configured on the elekeeper App.

## 10.2. EK90 battery and battery system designations

The following table lists the battery and battery system designations by SAJ battery code.

The SAJ battery code indicates the manufacturer of the battery cell, which is determined by the 6th character of the serial number (SN) code. The SN is located on the power label attached to the battery. For example, in SN code `B5UB4M0Y2552E00002`, the sixth character **M** indicates the manufacturer.

| Battery code | Battery designation | Battery system designation |
|---|---|---|
| M | IFpP74/176/209/[(1P6S)]M/-30+50/95<br>IFpP74/176/209/[(1P7S)]M/-30+50/95<br>IFpP74/176/209/[(1P9S)]M/-30+50/95 | IFpP74/176/209/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |
| N | IFpP73/175/208/[(1P6S)]M/-30+50/95<br>IFpP73/175/208/[(1P7S)]M/-30+50/95<br>IFpP73/175/208/[(1P9S)]M/-30+50/95 | IFpP73/175/208/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/175/208/[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/175/208/[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |
| O | IFpP73/176/208/[(1P6S)]M/-30+50/95<br>IFpP73/176/208/[(1P7S)]M/-30+50/95<br>IFpP73/176/208/[(1P9S)]M/-30+50/95 | IFpP73/176/208/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/176/208/[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/176/208/[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |
| I | IFpP74/176/209/[(1P6S)]M/-30+50/95<br>IFpP74/176/209/[(1P7S)]M/-30+50/95<br>IFpP74/176/209/[(1P9S)]M/-30+50/95 | IFpP74/176/209/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |
| K | IFpP74/176/209/[(1P6S)]M/-30+50/95<br>IFpP74/176/209/[(1P7S)]M/-30+50/95<br>IFpP74/176/209/[(1P9S)]M/-30+50/95 | IFpP74/176/209/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP74/176/209/[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |
| J | IFpP73/175/209/[(1P6S)]M/-30+50/95<br>IFpP73/175/209/[(1P7S)]M/-30+50/95<br>IFpP73/175/209/[(1P9S)]M/-30+50/95 | IFpP73/175/209/[(1P6S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/175/209[(1P7S)YP]M/-30+50/95(Y=1,2,3,4,5,6)<br>IFpP73/175/209[(1P9S)YP]M/-30+50/95(Y=1,2,3,4,5,6) |

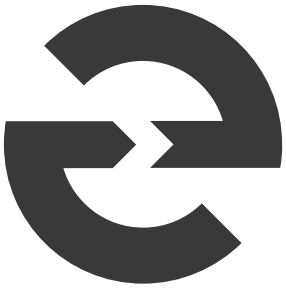
## 10.3. Battery

| Model | EK90 BU5-6.0-TV | EK90 BU5-7.0-TV | EK90 BU5-9.0-TV |
|---|---|---|---|
| **Performance Specification** | | | |
| Battery Type | LiFePO4 | | |
| Cell Capacity (Ah) | 314 | | |
| Cycle Life [1] | 12000 | | |
| Total Energy Capacity (kWh) | 6 | 7 | 9 |
| Usable Energy Capacity (kWh) [2] | 6 | 7 | 9 |
| Depth of Discharge | 100% | | |
| Max. Charging / Discharging Power (W) | 3000 | 3500 | 4600 |
| Rated Voltage (V) | 780 | | |
| Max. Charging / Discharging Current (A) | 7.7 | 9.0 | 11.8 |
| Recommended Charging Method | Charge at constant current of 3.85 A until reaching the maximum voltage of 780 V. | Charge at constant current of 4.5 A until reaching the maximum voltage of 780 V. | Charge at constant current of 5.9 A until reaching the maximum voltage of 780 V. |
| **General Data** | | | |
| Weight (kg) | 60.4 | 71.7 | 79.2 |
| Dimensions (W / H / D) (mm) | 835 / 270 / 270 | | |
| Storage Temperature Range | -10 ℃ to +40℃ | | |

| Model | EK90 BU5-6.0-TV | EK90 BU5-7.0-TV | EK90 BU5-9.0-TV |
|---|---|---|---|
| Charging Temperature Range | EK90: -30℃ to +50℃<br>EK70: 0℃ to +50℃ | | |
| Discharging Temperature Range | EK90: -30℃ to +50℃<br>EK70: -10℃ to +50℃ | | |
| Relative Humidity Range | 5%-95% | | |
| Max. Operating Altitude (m) | 3000 | | |
| Cooling Methods | Natural convection | | |
| Ingress Protection Rating | IP66 | | |
| Installation Method | Ground mounting / Wall mounting | | |
| Number of Modules per Controller (PCS) | 1-6 | | |
| Compatible Inverters | EK90 series | | |

[1] Provided by the battery manufacturer. Test conditions: 25±2℃, 0.5C charge and discharge rate, SOH 60%.

[2] Provided by the battery manufacturer. Test conditions: 100% depth of discharge, 0.2C charge and discharge rate at 25℃, at the beginning of life.



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