

CM2 Series

C&I All-IN-ONE BATTERY ENERGY STORAGE SYSTEM
USER MANUAL

Preface

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

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

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

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

Guangzhou Sanjing Electric Co., Ltd.

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1.

SAFETY PRECAUTIONS



1.1. About This Document

1.1.1. Overview

This *User Manual* provides introductions and instructions of installing, operating, maintaining, and troubleshooting of SAJ CM2 series commercial & industrial (C&I) all-in-one battery energy storage system (BESS).

Read the user manual carefully before any installation, operation and maintenance and follow the instructions during installation and operation. Always keep this manual available in case of emergency and maintenance purposes.

1.1.2. 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 CM2 energy storage system 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.

1.2. Safety

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

1.2.1. Safety Levels

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

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

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

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

1.2.2. Symbol Explanation

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

	**Attention:** This device shall NOT be disposed of in residential waste.
	**Attention:** This battery module shall NOT be disposed of in residential waste.
	**CAUTION:** Risk of electric shock from energy stored in capacitor. Do not open the cabinet door until 5 minutes after disconnecting all sources of supply.
	**CE Mark** Equipment with the CE mark fulfills the requirements of the Low Voltage Directive and Electro Magnetic Compatibility.
	**RoHS compliant mark** 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** Equipment with the RCM mark is in compliance with AS/NZS 4417.1 & 2 and the EESS.
	**Recyclable**

1.2.3. Safety Instructions

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

DANGER

- Before the operation, the technicians must wear necessary personal protective equipment (PPE) including insulating gloves, insulating shoes, and safety helmet.
- Ensure that the system is powered off prior to any operations.
- Do not touch the surface of the equipment while the housing is wet, otherwise, it might cause electrical shock.
- Do not open the cabinet door or touch the exposed conductive parts (terminals, busbars, or cables) of the CM2 cabinet during operation. Direct contact may result in fatal electric shock.
- To prevent risk of electric shock during installation and maintenance, make sure that the AC connections are disconnected.
- Before opening the cabinet, disconnect the system from the power source; wait for at least five minutes to let the energy storage capacitors discharge completely.
- Do not approach the energy storage cabinet during severe weather conditions such as storms or thunderstorms.
- If the battery packs are defective, broken or damaged, shut down the CM2 system and contact SAJ service for further assistance.
- Do not apply any strong force to the battery.
- Keep inflammable and explosive dangerous items or flames away from the battery.
- Do not soak the battery in water or expose it to moisture or liquids.

WARNING

- Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. SAJ is not responsible for the loss and these warranty claims.
- Do not touch non-insulated parts or cables.
- Be sure that the CM2 cabinet is well grounded to protect properties and persons.

CAUTION

- Only qualified personnel with full knowledge of local safety regulations and local standards on battery can install, maintain, retrieve, and process this product.
- Only use the battery as intended and designed. Do not change any components in the battery.
- Risk of damage due to improper modification.
- Use professional tools when operating on the product.

NOTICE

- During battery installation, install the manual service disconnect (MSD) after all the power cables are securely connected. When disassembling the battery packs, remove the MSD first, and then remove the battery packs.

1.3. Battery safety instructions

1.3.1. General guidelines

CM2 lithium-ion battery energy storage systems (BESS) present a higher risk of fire due to several factors inherent to their chemistry and operation. The electrolyte in battery packs is flammable, toxic, and volatile. Thermal runaway in battery packs can produce flammable gases, along with harmful gases such as carbon monoxide (CO) and hydrogen fluoride (HF).

For the safety and integrity of battery packs, it is essential to follow the guidelines below:

- Do not expose battery packs to high-temperature environments or place them near heat-emitting devices such as direct sunlight, fire sources, transformers, or heaters. Overheating of battery packs can lead to fire or explosion.
- It is strictly prohibited to disassemble, modify, or damage battery packs (such as inserting foreign objects, immersing in water or other liquids), as this can cause leakage, overheating, fire, or explosion of the battery pack. Any attempts to modify battery without the permission from SAJ will void the limit warranty for the battery.

1.3.2. Battery pack fault handling

DANGER
• When there is an electrolyte leak or an unusual odor, never contact with the leaked liquid or gas. Contact professional personnel for handling immediately. • Professional personnel must wear protective equipment such as safety goggles, rubber gloves, a gas mask, and protective clothing to prevent harm caused by the electrolyte spill.

The electrolyte is corrosive, and contact can cause skin irritation and chemical burns. If exposed to the electrolyte, take the following measures immediately:

- **Inhalation**: Evacuate the contaminated area immediately, breathe fresh air; seek medical assistance immediately.
- **Eye contact**: Immediately rinse the eyes with copious amounts of water for at least 30 minutes without rubbing; seek medical help immediately.
- **Skin contact**: Wash the affected area thoroughly with plenty of water and soap; seek medical assistance immediately.
- **Ingestion**: Seek medical help immediately.

1.3.3. Handling of Dropped Battery Packs

When a battery pack has fallen (whether packaged or not), but there is no obvious deformation, damage, unusual odor, smoke, or fire, take the following actions immediately:

- Evacuate the personnel from the area.
- Professional personnel should use mechanical tools to transfer the battery pack to an open and safe location; allow the battery pack to rest for 1 hour while monitoring its temperature to ensure it remains within ±10℃ of room temperature.
- Contact SAJ service engineer.
- If it is at the ESS site, also close the energy storage system door.

If the dropped battery pack exhibits any obvious unusual odor, damage, smoke, or fire:

- Immediately evacuate all personnel from the area.
- Contact professional personnel and call emergency services promptly.
- Under safe conditions, professional personnel should use firefighting equipment to extinguish fires.
- Stop using the battery pack immediately after it has fallen, and contact SAJ service engineer for assessment.

1.4. Emergency handling on-site

When any of the following dangerous incidents occur on-site, prioritize the safety of all personnel present. Ensure the safety of all individuals immediately and then contact SAJ service engineers for further assistance.

1.4.1. Audio-visual fire alarm beeping and flashing

The audio-visual fire alarm beeping and flashing red light indicates a fire safety fault. Take the following actions immediately:

- Evacuate immediately.
- Do not approach the equipment.
- Do not open the cabinet door.
- Cut off the power to the equipment remotely.

1.4.2. Exhaust valve being activated

When the exhaust valve is activated, take the following actions immediately:

- Ensure that no personnel are positioned directly in front of or facing the exhaust valve.
- After the incident, do not attempt to inspect or handle the equipment yourself. Contact SAJ service engineers immediately for professional assessment.

1.4.3. Fire on-site

When a fire occurs on-site, follow strict safety protocols to ensure the safety of all personnel and effective handling of the incident.

Immediate actions:

- Evacuate the building or equipment area immediately.
- Press the fire alarm bell to alert others.
- Dial the emergency services number immediately to notify professional firefighters. Provide them with relevant product information, including but not limited to:
  - Type of battery packs
  - Energy storage system capacity
  - Distribution of battery pack locations
- Under no circumstances should anyone re-enter a burning building or equipment area.
- Do not open the cabinet door.
- Isolate and secure the area, prohibiting unauthorized personnel from approaching.
- After calling the fire department and ensuring personal safety, remotely disconnect the power supply, such as smart container substations, intelligent energy storage controllers, auxiliary power supply devices, combiner box power, and so on.

Upon arrival of professional firefighters:

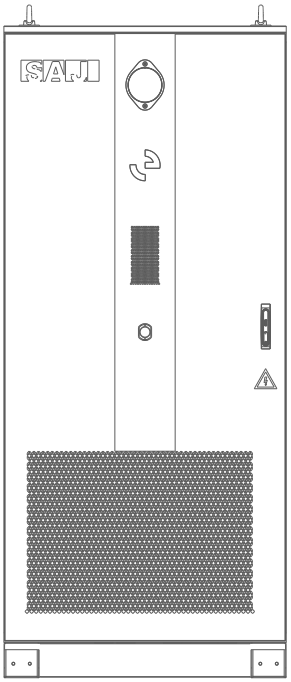
- Supply the firefighters with detailed information about the products, including:
  - Battery pack types
  - Energy storage system capacity
  - Battery pack location distribution
  - User manuals
- Adhere strictly to the instructions provided by the firefighters.

Post-fire incident:

- Wait for professional firefighters to confirm that the fire has been extinguished.
- Follow local regulations and have qualified personnel handle any further actions.
- Do not attempt to open the cabinet door without authorization.
- Contact SAJ service engineers for an assessment of the affected equipment.

Recommendations for professional firefighters:

- Use the information provided by the maintenance staff, which includes:
  - Battery pack types
  - Energy storage system capacity
  - Battery pack location distribution
  - User manuals
- Do not open the cabinet door until its internal safety can be assured.
- Ensure all firefighting operations comply with local fire regulations.



2.

PRODUCT INFORMATION



2.1. System overview

CM2 commercial & industrial (C&I) all-in-one battery energy storage system (BESS) is designed as an all-in-one system that is integrated with battery storage modules and the power conversion system (PCS).

The CM2 BESS also provides the management systems out-of-the-box including battery management system (BMS), energy management system (EMS), temperature control system, fire protection system, and power supply and distribution system. The EMS can manage the storage and release of the electrical energy to fulfil the requirement of industrial and commercial application scenarios.

The following figure shows the scenario where CM2 BESS works with SAJ C6 string inverter to provide maximum PV self-consumption and peak shaving at the grid connection point:

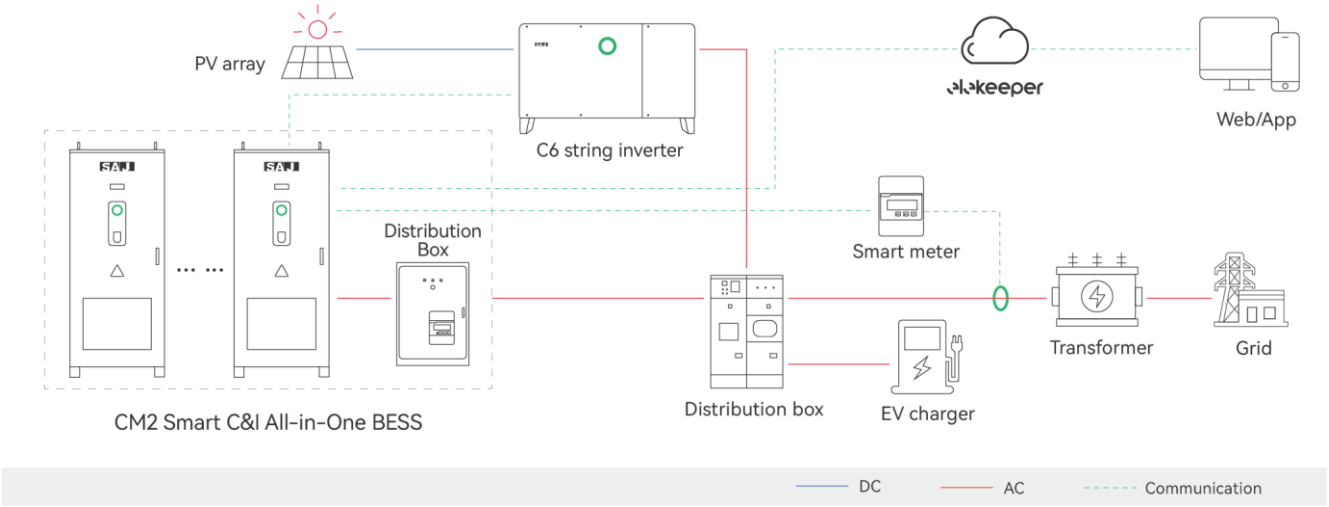


Figure 2.1. System overview of PV-BESS with SAJ inverter

The following figure shows the scenario where CM2 BESS works with third-party string inverter. In this case, an extra smart meter is required between the inverter and CM2:

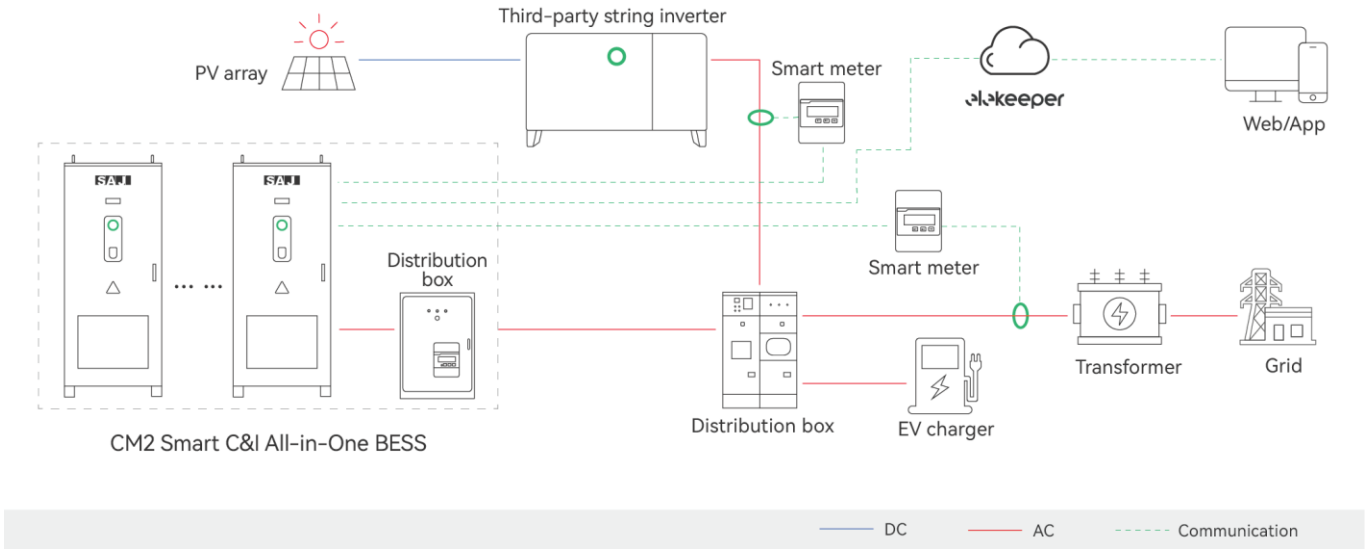


Figure 2.2. System overview of PV-BESS with third-party inverter

The following figure shows the scenario where CM2 BESS works as a storage system to provide peak shaving at the grid connection point through customized charging and discharging schedules:

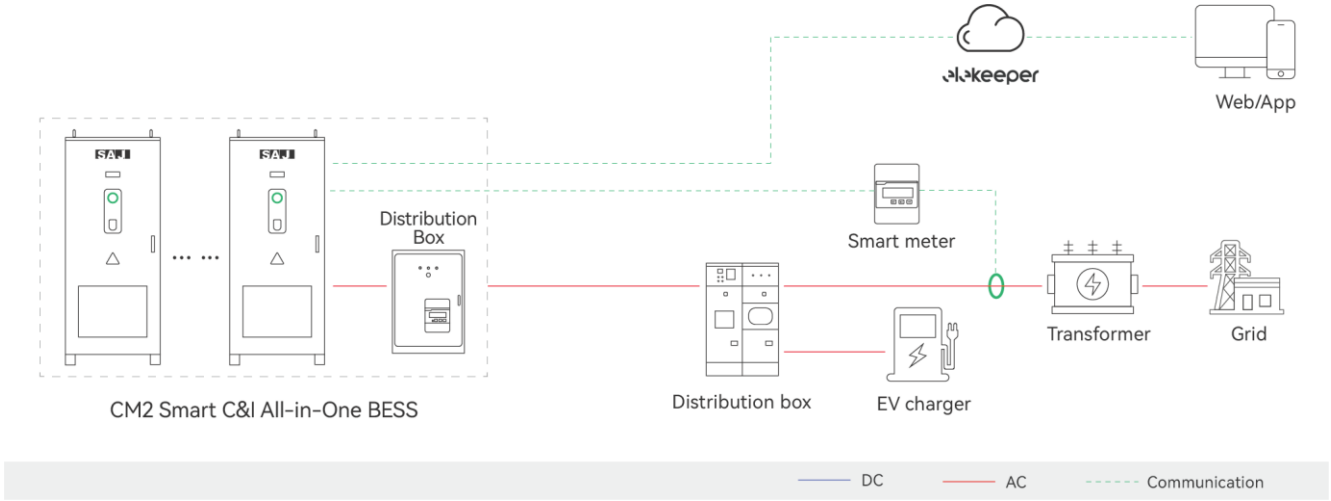


Figure 2.3. System overview of BESS-only

2.2. Product model description

CM2- *X*K- 261

① ② ③

① CM2 represents the product name.

② *X*K stands for the rated power of the CM2 system in kW. For example, 125K means 125 kW.

③ 261 means that the rated energy of the battery system is 261 kWh.

2.3. Main features

The CM2 cabinet can be equipped with the Energy Management System (EMS) that provides various intelligent management functions to optimize power usage, reduce costs, and enhance overall efficiency.

Time-of-Use (TOU) Control Mode

- The system can operate in a preset mode, such as peak shaving, demand control, anti-backflow, and so on. Once a specific mode is selected, the system will remain in that mode without automatic switching.
- Each day can be divided into up to 10 time segments, each with a pre-set control mode.
- The system supports setting different control mode schedules by week (Monday to Sunday) and by month (January to December), and operates according to the predefined schedule, enabling precise management.

Maximum Self-Consumption (AC Coupling)

When a photovoltaic (PV) system is installed at the same grid connection point, the CM2 energy storage system can be combined with the PV system to form an AC-coupled PV-BESS system.

The EMS system monitors real-time power at the grid connection point. When PV generation exceeds the user-side load, it charges the battery storage system; when PV generation is less than the load, it discharges to maximize the use of PV power.

In this mode, anti-backflow and peak shaving control targets can be set to further optimize the power usage.

Virtual Power Plant (VPP) Mode

The CM2 energy storage system can integrate with grid frequency regulation services or power market trading. In this mode, the EMS system needs to integrate with third-party controllers to receive their scheduling and control commands.

Export Limit Control

- Application scenario 1:

For users with PV systems or other generation systems, the export limit control devices should be configured.

The EMS monitors real-time power at the user-side grid connection point, prioritizing power distribution to loads and using excess power to charge the storage system. In cases where generation is insufficient, the storage system automatically supplies power to the load, preventing backflow into the grid.

- Application scenario 2:

When user-side load consumption is lower than the storage system's discharge power, the EMS dynamically adjusts the output power to meet only the load requirements, preventing the storage system from sending power back to the grid.

Peak Shaving

The EMS system monitors the real-time power at the user-side grid connection point to ensure that the user-side grid connection point power does not exceed the maximum allowable input power limit. When the power exceeds the maximum allowable input power:

- If the storage system is on standby or discharging, it starts discharging or increases discharge power to reduce grid-side input power.
- If the storage system is charging, it decreases charging power or stops charging.

2.4. Product appearance

2.4.1. Dimensions

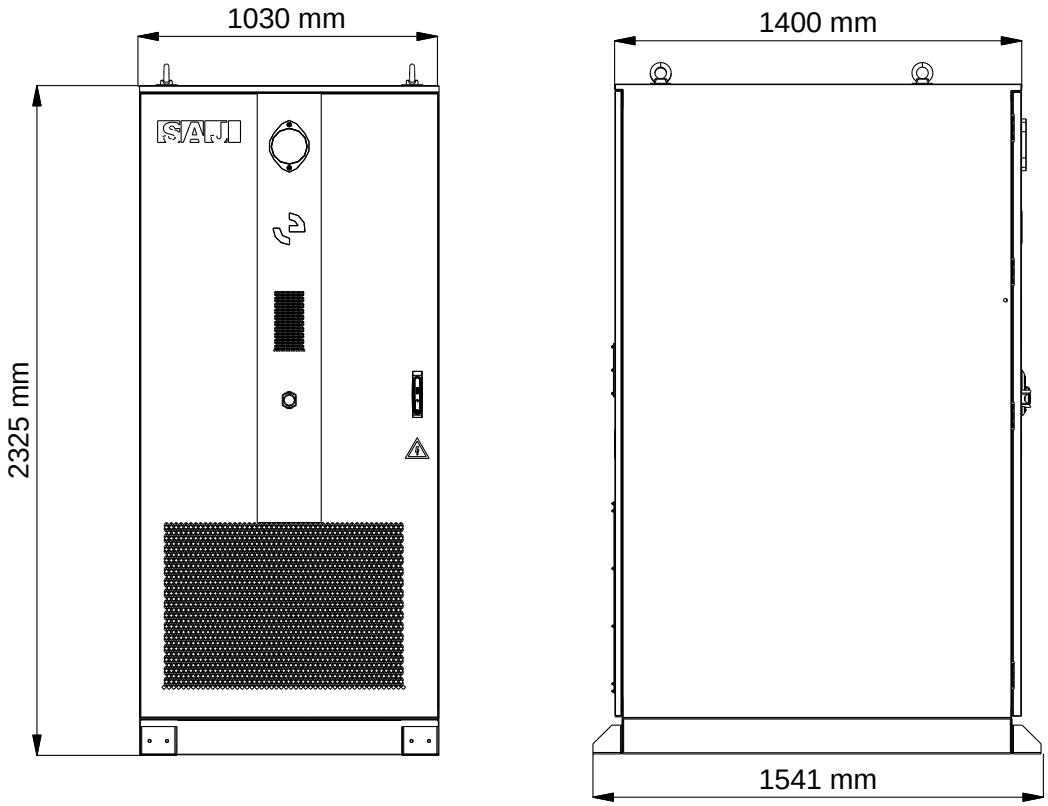


Figure 2.4. Dimensions of CM2 cabinet

2.4.2. Cabinet

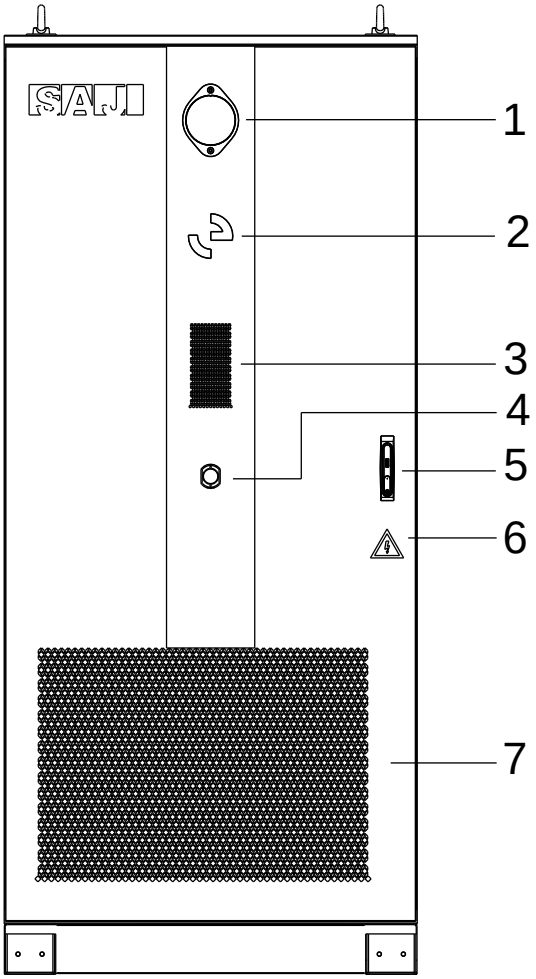


Figure 2.5. Front view

1. Exhaust valve
2. LED indicator

For LED status descriptions, see Table 2.1 "LED indicator description" on page 19.

3. Audio-visual fire alarm
4. Emergency stop of the CM2 system
5. Cabinet lock
6. Warning label
7. Air inlet vent equipped with dust filter

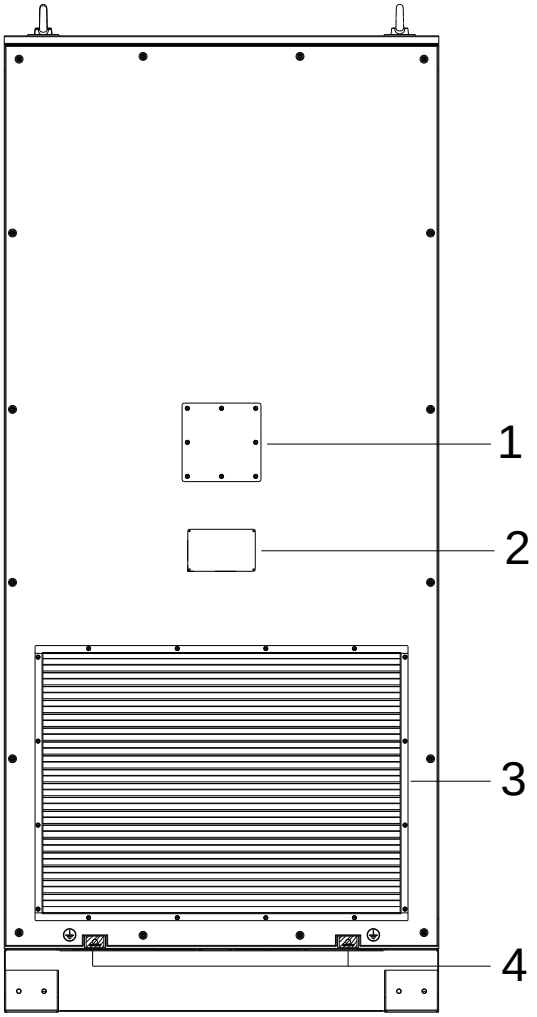
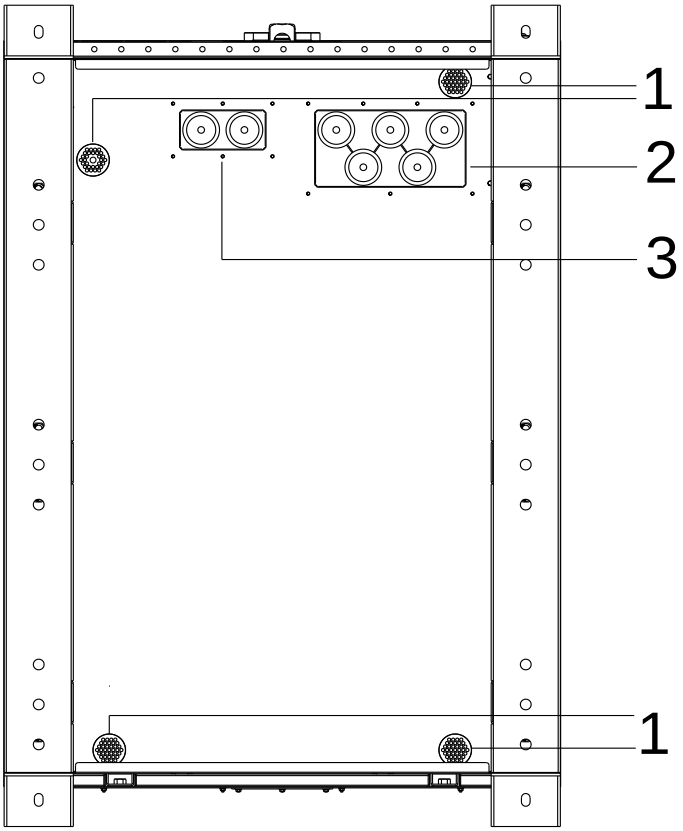


Figure 2.6. Rear view

1. Pre-served port for external fire hose coupling connection
2. Equipment nameplate
3. Air outlet vent
4. Cabinet grounding connection ports



1. Floor drains
2. Threaded cable gland for AC power cables
3. Threaded cable gland for communication cables

Figure 2.7. Bottom view

2.4.3. LED panel

LED Panel	Status		Description
LED light		Solid	The cabinet is working on-grid.
		Breathing	The cabinet is under initialization or at the standby mode.
		Solid	An error has occurred.
		Flashing	Fire alarm error.
		Breathing	The cabinet is upgrading.
		Off	The cabinet is powered off.

Table 2.1. LED indicator description

2.5. Product internal design

2.5.1. PCS electrical interfaces

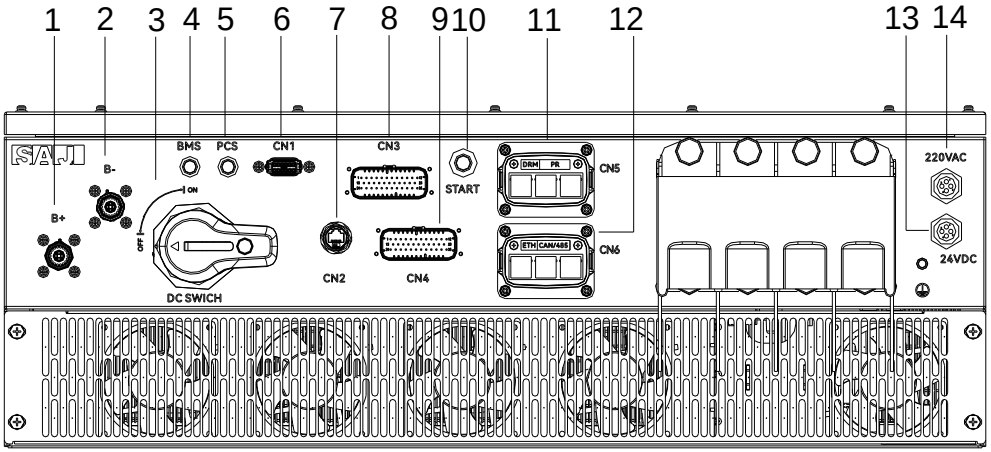


Figure 2.8. PCS electrical interfaces

Callout	Silkscreen	Description
1	B+	The positive port connecting with the fifth (the last) battery module.
2	B–	The negative port connecting with the first battery module.
3	DC SWITCH	The direct current isolator switch of the battery packs. After the switch is turned off, the connection from the battery packs to PCS is turned off.
4	BMS	The status indicator of the battery management system (BMS).
5	PCS	The status indicator of the power conversion system (PCS).
6	CN1	The port for internal communication connection between the BMS and the PCS.
7	CN2	The port for external communication connection between the PCS and the external systems or CM2 cabinets in parallel deployment.
8	CN3	For internal connections.
9	CN4	For internal connections.
10	START	The manual start button of the battery system in off-grid mode. Press the button for about 10 seconds until the PCS indicator lights up to start the battery system.
11	CN5 – DRM, PR	The ports for DRM communication and parallel deployment communication connections.
12	CN6 – ETH, CAN/485	The port for Ethernet, CAN, and RS485 communication connections.
13	24VDC	The 24 V DC power supply port to the EMS unit.
14	220VAC	The port for 220V AC power supply to the liquid cooling system and the dehumidifier. This port connects to the QF2 port of the distribution switch.

Table 2.2. Description of the PCS electrical interfaces

2.5.2. PCS indicator

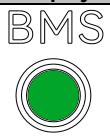
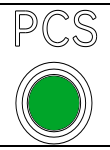
Display	Status	Description
	Solid on	The BMS system is working.
	Slow flashing	The BMS system is at the initializing, waiting, or upgrading status.
	Fast flashing	The BMS system has an error.
	Off	The BMS system is powered off.
	Solid on	The PCS is working.
	Slow flashing	The PCS is at the initializing, waiting, or upgrading status.
	Fast flashing	The PCS has an error.
	Off	The PCS is powered off.

Table 2.3. PCS indicator description

2.5.3. EMS unit (optional)

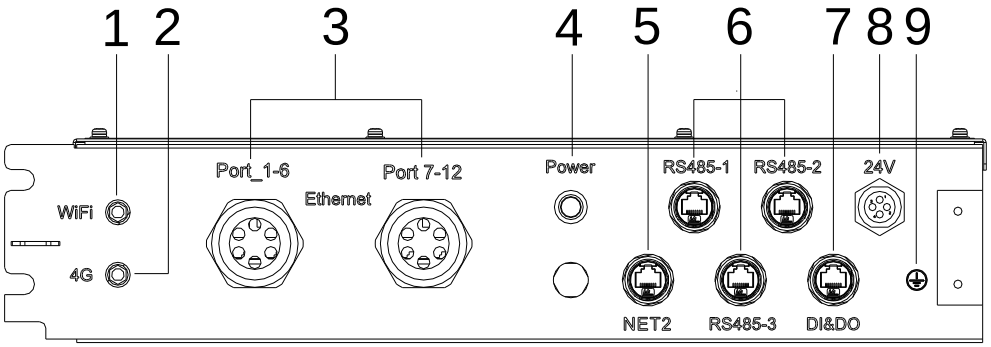
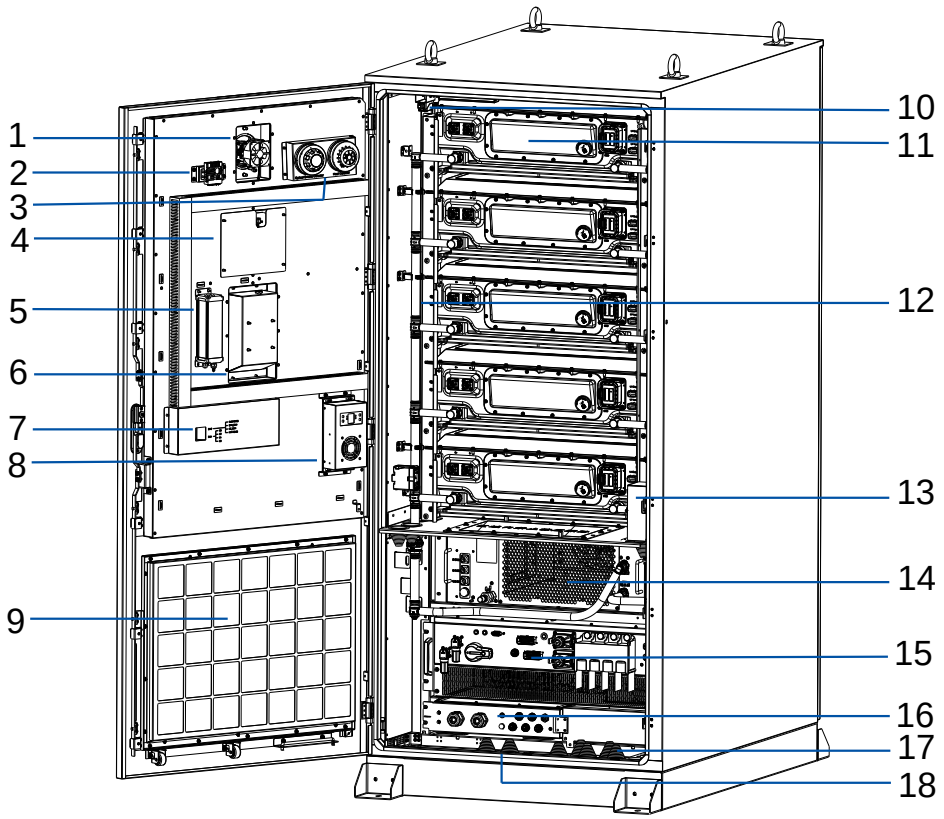


Figure 2.9. EMS unit electrical interfaces

Callout	Silkscreen	Description
1	WiFi	The Wi-Fi (2.4G) connection port for the antenna.
2	4G	The 4G connection port for the antenna.
3	Ethernet Port_1-6; Port 7-12	The ports for Ethernet communication cable connections from each PCS in parallel deployment and for accessing the eSAJ all-in-one local web platform.
4	Power	The status indicator of the EMS unit. • Solid green: The EMS unit is online and working. • Slow flashing (1.5s): The EMS unit is initializing, getting online, or upgrading. • Fast flashing (0.5s): The EMS unit fails to start up. • Off: The power supply is not working.
5	NET2	The port for Ethernet connection to the elekeeper cloud platform.
6	RS485-1, RS485-2, RS485-3	The ports for RS485 communication cable connections. • RS485-1: For grid meter with export limit control function. • RS485-2: For PV meter when third-party inverter is connected. • RS485-3: For SAJ string inverter.
7	DI&DO	The dry input (DI) and dry output (DO) ports. The external devices connecting to this port can be planned according to the actual customer requirement.
8	24V	The 24 V DC power supply port from the PCS.
9	⏚	The EMS grounding which is connected through the metal plate to the cabinet grounding. No additional grounding cable connection is required.

Table 2.4. Description of the EMS unit electrical interfaces

2.5.4. Cabinet interior components



1. Exhaust valve
2. Compound fire detector
3. Optical smoke detector and heat detector
4. LED indicator
5. Aerosol device
6. Audio-visual fire alarm
7. DIP switch
8. Dehumidifier
9. Air inlet vent equipped with dust filter
10. Limit switch
11. Battery modules
12. Liquid cooling pipes
13. Distribution switch ①
14. Liquid cooling system
15. Power conversion system (PCS)
16. Energy management system (EMS) (optional)
17. AC power cable glands
18. Communication cable glands

① The distribution switch includes the QF2 and QF3 switches. QF2 switch controls the power supply to the liquid cooling system and the dehumidifier. QF3 switch controls the connection to the external 220V AC backup power supply for cabinet monitoring and fire detection components.

2.5.5. Battery cluster

CM2 employs a lithium-iron phosphate battery system architecture. Each high-voltage battery cluster consists of standardized and modular battery packs connected in series. The battery cluster is connected to a power conversion system (PCS) to manage the storage and release of the electrical energy.

The battery management system (BMS) continuously monitors the status of each battery pack. If an abnormal status or communication failure is detected in any battery pack, the BMS triggers a corresponding alarm and reports the fault information along with the battery pack number to the energy management system (EMS).

The following figure shows the numbering of the battery packs:

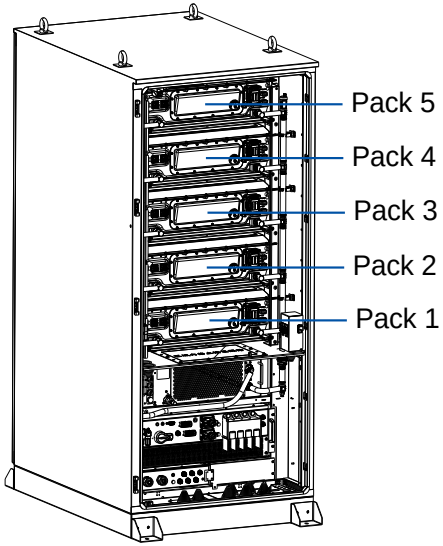


Figure 2.10. Battery pack numbering

Battery pack

The battery packs are composed of cells connected in series. Each battery pack provides functions such as voltage and temperature collection and balance control for each individual cell.

The battery packs are designed using specialized battery management chips, receives control commands through CAN communication, and reports the collected data.

2.5.6. Design of cable entry hole

All the cables between the internal components are connected prior to delivery for installation convenience.

The power cables and communication cables connecting to the external systems can enter through the threaded cable gland on the bottom surface of the cabinet. For details, see Figure 2.7 "Bottom view" on page 19.

2.6. Liquid temperature control system

CM2 BESS employs an advanced variable-frequency liquid cooling unit combined with SAJ intelligent temperature control, offering outstanding energy-saving performance.

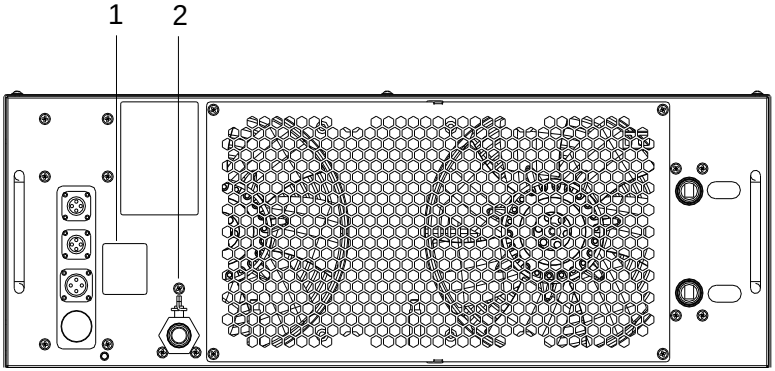


Figure 2.11. Front panel of the liquid temperature control system

Callout	Description
1	The switch of the liquid temperature control system.
2	The coolant filling drain.

Table 2.5. Description of the EMS unit electrical interfaces

Variable-Frequency Liquid Cooling Unit

During system operation, if the battery cell temperature reaches a preset threshold, the liquid cooling unit is activated automatically.

Through water circulation and heat exchange, the liquid cooling system effectively removes heat from the cells and expels it outside the cabinet. This design achieves complete isolation between the cells and the external environment, providing a high protection level and safeguarding internal components from external influences.

Multi-Branch Parallel Water Channels

Inside the battery pack, multi-branch parallel water channels ensure uniform cooling for each cell. This design minimizes temperature differences between cells, extending battery life and enhancing overall performance.

Heating Function under Low-Temperature Conditions

When cell temperatures are low, the liquid cooling unit switches to heating mode and activates its heating power. This maintains the cells within a reasonable temperature range, ensuring continuous optimal working condition.

2.7. Fire detection and suppression systems

The fire safety design of the CM2 energy storage system integrates advanced detection, suppression, and material technologies to ensure rapid response and effective control of potential fire incidents. This comprehensive approach aims to protect personnel, minimize damage, and maintain operational integrity.

Temperature Sensor

The temperature sensor keeps monitoring the temperature inside the cabinet. When individual cell temperatures become abnormal, the Battery Management System (BMS) triggers a warning. The equipment automatically shuts down to prevent further escalation, awaiting manual inspection and troubleshooting.

Smoke Sensor

If the cells lose control and ignite, spreading to the cabinet, the smoke sensor can detect the high concentration of smoke. It issues a fire alarm to alert personnel and initiate emergency procedures.

Compound Fire Detector

The compound fire detector is a critical component that integrates multiple sensors for detecting the CO (carbon monoxide) and VOCs (volatile organic compounds). This multi-sensor integration allows for early and accurate detection of fire-related hazards, providing timely alerts and enabling prompt action.

If a cell enters thermal runaway, the exhaust valve opens, releasing flammable gases into the cabinet. The compound fire detector quickly detects these gases, triggering an immediate alarm.

Meanwhile, the system activates the exhaust system to vent the flammable gases outside the cabinet, reducing the risk of ignition.

Multi-Layered Fire Suppression System

- Aerosol devices are installed inside each battery pack. Upon detecting thermal runaway and ignition, the aerosol activates, filling the entire battery pack with suppressant to extinguish visible flames.
- Additional aerosol devices are installed on the cabinet door. If the fire from the battery pack spreads to the cabinet, the aerosol activates, filling the entire cabinet with suppressant to extinguish visible flames.
- An optional water-based fire suppression system can be configured by connecting external fire hoses, enhancing the system's ability to manage larger fires.

The entire CM2 cabinet is filled with fire-resistant materials capable of withstanding a fire for at least 1 hour. This design provides thermal isolation between faulty and other cabinets, preventing the spread of fire.

3.

TRANSPORTATION AND STORAGE



3.1. Transportation

Warning

- The transportation equipment must be fully prepared and inspected by professional organizations to ensure qualification.
- Ensure that the transportation equipment is not overloaded.
- Do not drill any holes on the product for transportation purpose. Drilling operations on the equipment housings can lead to several critical issues that may affect the integrity and functionality of the device.

NOTICE

- Strictly package the product before vehicle transportation to ensure its safety. For long-distance transport, we recommend utilizing an enclosed container to provide additional protection against environmental factors and potential damage during transit.
- Do not transport this product together with any equipment or items that may affect its performance or cause damage. Ensure that the product is transported separately to maintain its integrity and functionality during transit.

3.1.1. Transportation with package

Forklift

- Ensure that the forklift operator is qualified and experienced in handling heavy loads.
- Use forklift with 3-ton load capacity to move the CM2 cabinet.
- Ensure that the forklift tines are adjusted to a width that can securely and evenly support the load.

  The width should be as wide as necessary to distribute the weight evenly across both forks.
- Do not use a crane to move the cabinet with package.

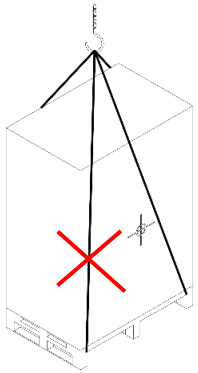


Figure 3.1. No crane

3.1.2. Transportation without package

NOTICE

- Always use wooden pallets under the cabinet when moving to protect the cabinet from damage.
- Always keep the cabinet in a horizontal position during transport. The cabinet should not be laid on its side, inverted, or placed in any orientation other than flat.
- Ensure that the lifting equipment does not contact or rub against the cabinet's surface during crane operations to avoid any damage.

Use a forklift or crane to move the cabinet after unpacking.

Forklift

- Ensure that the forklift tines are adjusted to a width that can securely and evenly support the load.

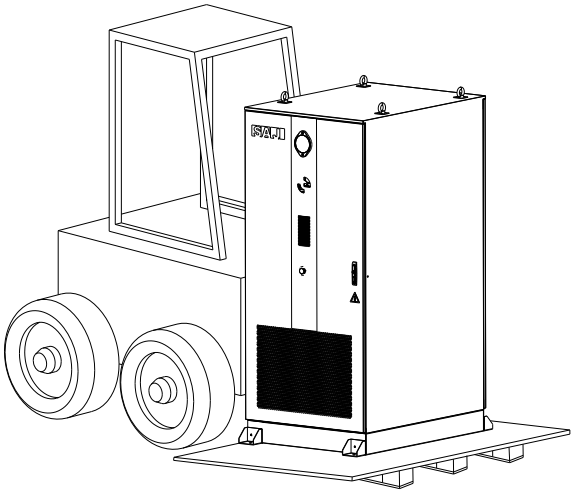


Figure 3.2. Moving with a forklift

Crane

- Select flexible lifting straps or tie-down straps with a minimum individual breaking strength of no less than 3 tons.
- The straps should be threaded through the lifting rings on top of the cabinet and securely fastened to prevent any slippage during lifting.
- Lift and move the cabinet by raising the straps.

NOTICE

- The distance between the lifting hook and the top of the cabinet must be at least 1 meter to ensure sufficient clearance to prevent any accidental contact or damage during lifting operations.
- The tilt angle of the cabinet should be less than 10°.

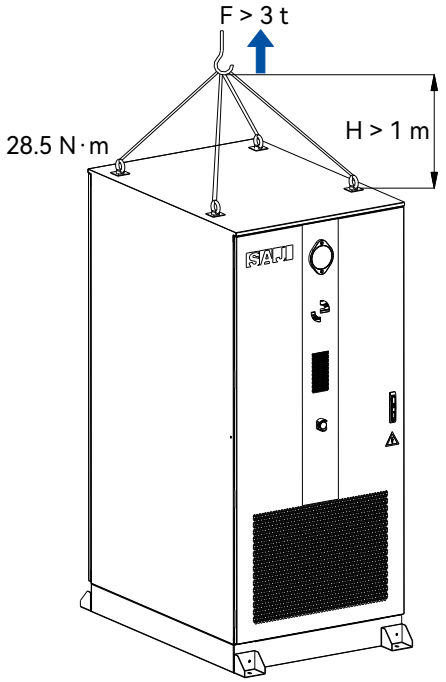
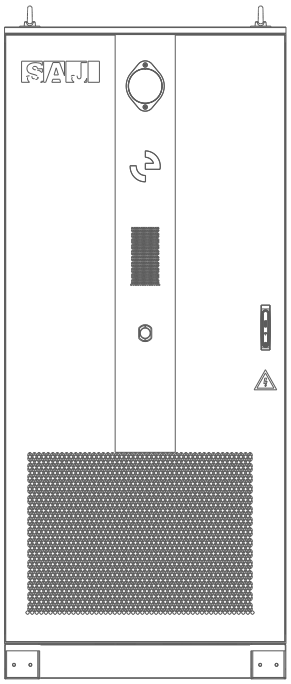


Figure 3.3. Lifting with a crane

3.2. Storage before installation

Store the cabinet after unpacking according to the following guidelines if the installation will be performed after certain period:

- Store the cabinet indoors, such as in a large warehouse or workshop, to prevent condensation inside the cabinet or water immersion at the base during rainy seasons.
- If outdoor storage is unavoidable due to site conditions, raise the base of the cabinet to an appropriate height based on local geological and meteorological conditions to avoid water immersion. Provide heating for internal components if the ambient temperature falls too low.
- The required storage temperature range is -25℃ to +60℃; the relative humidity 0% to 95% with no condensation.
- Place the cabinet on a dry, level, solid surface with sufficient load-bearing capacity and free from vegetation. The ground must be flat without standing water, depressions, or uneven surfaces.
- Ensure that the cabinet doors are securely locked during storage.
- Take effective measures to prevent rainwater, sand, dust, and other contaminants from entering the interior of the cabinet.
- Conduct inspections at least once every two weeks to check that packaging remains intact and undamaged.
- If the storage period exceeds six months, recharge the battery to approximately 40% state of charge (SOC) regularly.



4.

INSTALLATION PREPARATION



4.1. Precautions

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

DANGER

- Danger to life due to potential fire or electricity shock.
- Do not install the CM2 cabinet near any inflammable or explosive items.

NOTICE

- This equipment meets the pollution degree.
- Inappropriate or the harmonized installation environment may jeopardize the life span of the CM2 cabinet.
- Installation directly exposed under intensive sunlight is not recommended.
- The installation site must be well ventilated.

4.2. Determining the installation site

Read the following sections to determine the installation site.

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

4.2.1. Installation environment requirement

It is strongly suggested to install the CM2 cabinet in an outdoor location that is more than 2000 meters from the coast. When selecting the installation location, follow the guidelines below:

- Consult the dealer or SAJ technical support when the distance from the installation location to the coast is between 500 and 2000 meters. Do not install the cabinet within 500 meters from the coast.
- Do not install the cabinet in areas affected by salt damage and pollution which can lead to corrosion of the equipment.
- Do not install the cabinet in areas with moderate or heavy dust pollution, metallic dust pollution, saline-alkali land, corrosive gas pollution, or corrosive rainwater pollution.
- The installation environment must be free of inflammable or explosive materials.
- The equipment must be installed in a place away from any heat source.
- Do not install the device at a place where the temperature changes extremely.
- The height of the equipment from the ground should be considered to prevent the equipment from soaking in water. The specific height is determined by the site environment.
- Avoid exposing the cabinet to direct sunlight as much as possible. Otherwise, the operating temperature may increase by 5℃ to 10℃, causing derating or decreasing of the product life span.

4.2.2. Installation foundation requirement

Follow the guidelines below to construct the foundation for installing the CM2 cabinets:

- Install the CM2 cabinet on a concrete or non-flammable surface. Ensure that the installation surface is level, solid, flat, and has sufficient load-bearing capacity, with no depressions or inclinations.
- Ensure that the bottom of the equipment is higher than the highest historical water level of the area and at least 300 mm higher than the horizon.
- The foundation design must accommodate an equipment weight of at least 2.8 tons.
- If the foundation's load-bearing capacity is insufficient, it must be verified and strengthened.
- On-site earthwork must be properly compacted to support the equipment adequately.
- After the foundation is excavated, do not perform any soaking and agitating process on the foundation. If the process is applied on the foundation, it is necessary to carry out further excavation and backfilling to consolidate the foundation.
- The horizontal error at the contact surface between the equipment foundation and the cabinet should be less than 3 mm.

Reserving space for wiring

Since the CM2 cables are designed to enter through the cabinet bottom, it is necessary to reserve sufficient wiring space for cable outlet at the front or back side of the cabinet when constructing the equipment foundation. After the installation and wiring is completed, all the reserved holes on the equipment foundation and the bottom cable entry holes of the cabinet need to be sealed.

The flatness error of the top surface elevation of the foundation base (column) should not exceed 3 mm. The foundation height can be adjusted according to the equipment and on-site requirements, and it is recommended that the foundation protrudes at least 300 mm above the ground level.

The specific construction plan should be comprehensively considered based on the local installation environment, geological conditions, seismic requirements, and other practical factors.

4.2.3. Installation position requirement

- Install the cabinet vertically. Do not install it backward-tilted, forward-tilted, or horizontally.

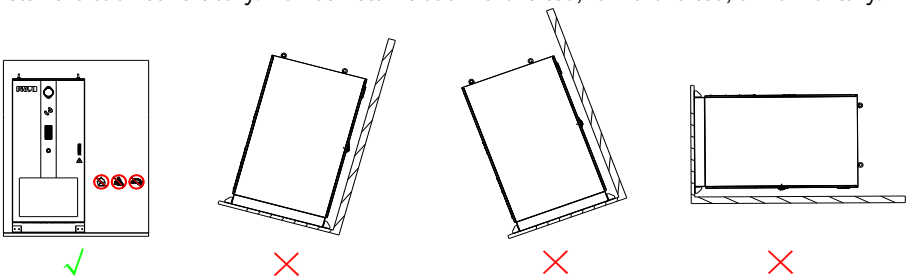


Figure 4.1. Installation position

- Reserve enough space around the CM2 cabinet to ensure proper ventilation. Poor ventilation will affect the working efficiency of the internal electrical components and shorten the product lifespan.

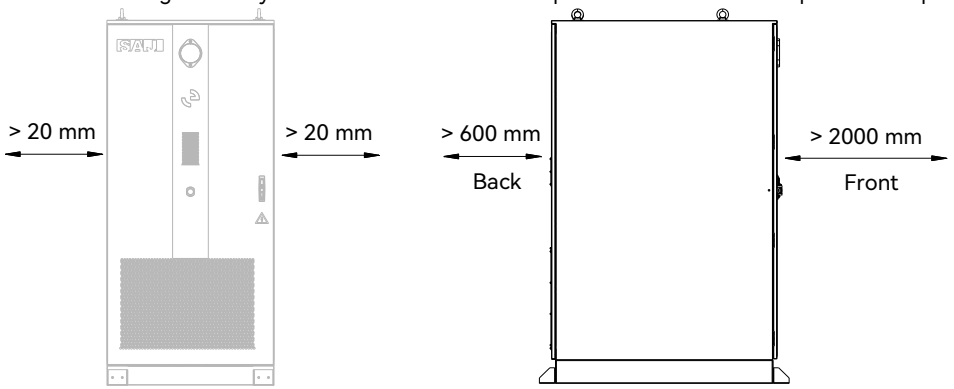


Figure 4.2. Installation space requirement of a single cabinet

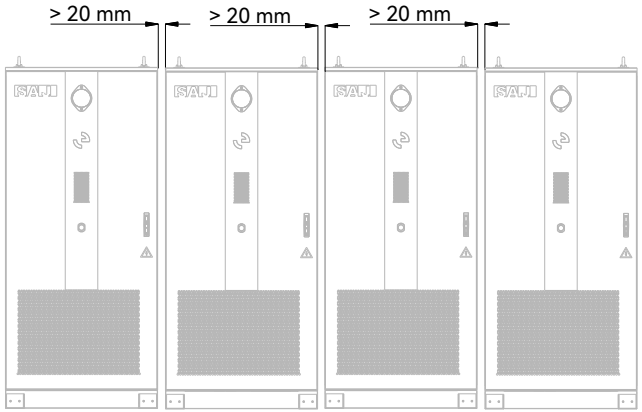
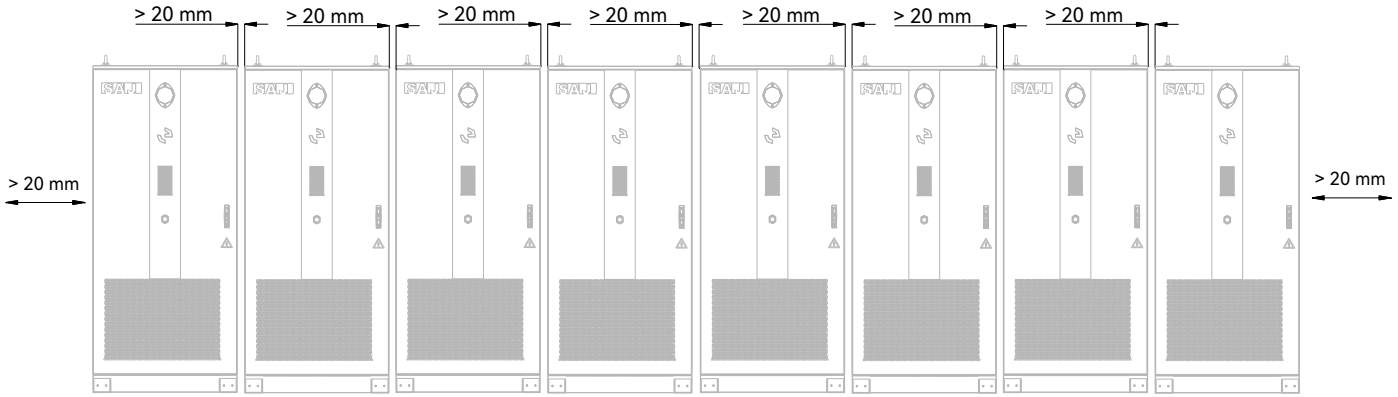


Figure 4.3. Side-by-side space requirement of multiple cabinets

- For less than 8 cabinets, recommend arranging the cabinets in one line as follows:

Front view



Left-side view

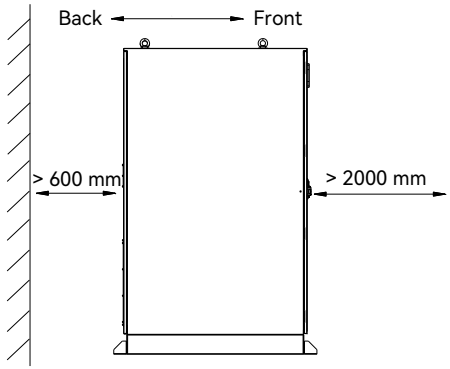


Figure 4.4. Arrangement of 1-8 CM2 cabinets

- For more than 8 cabinets, recommend arranging the cabinets in two lines back-to-back as follows:

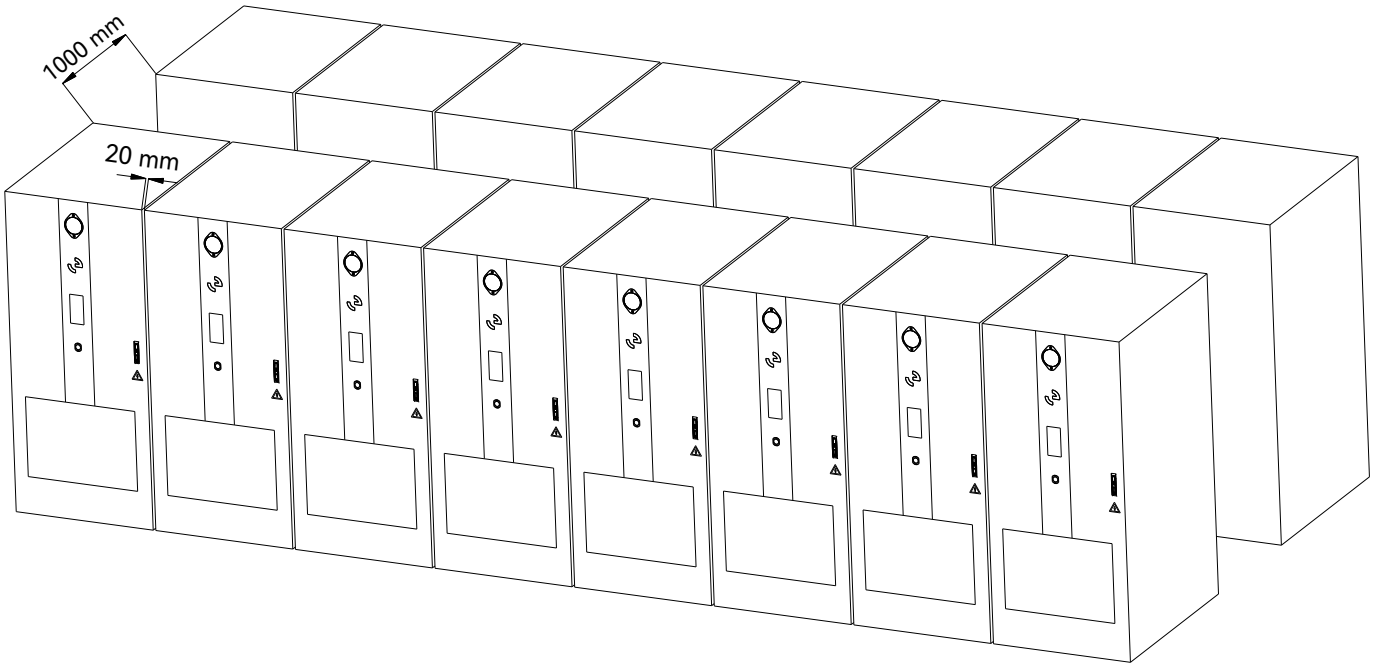


Figure 4.5. Arrangement of 9-20 CM2 cabinets

4.3. Preparing installation tools

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

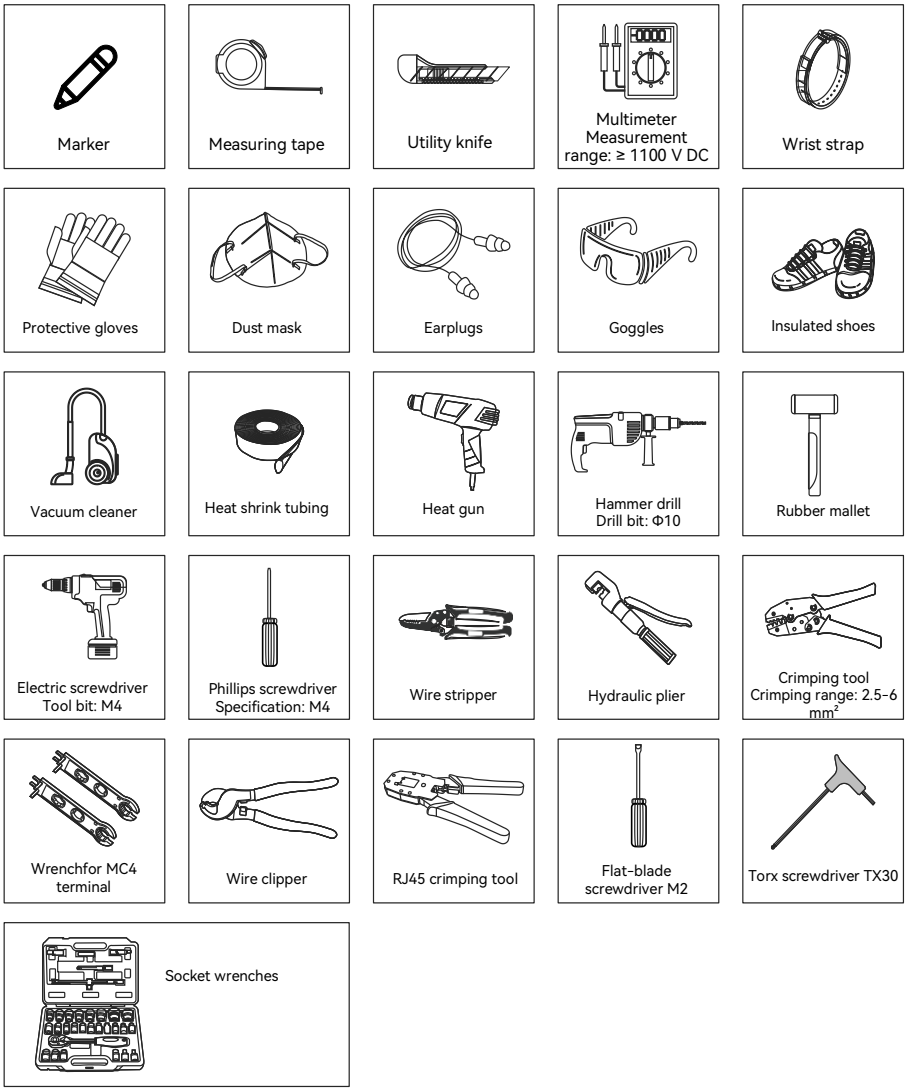


Figure 4.6. Suggested installation tools

4.4. Unpacking

4.4.1. Check the outer packing

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

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

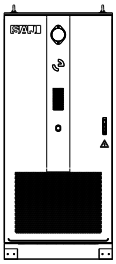
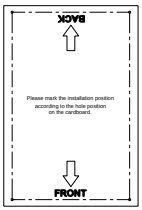
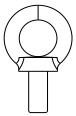
If any serious damage is found or the model is not what you requested, do not unpack the product, and contact your dealer as soon as possible.

4.4.2. Check the package contents

1. Verify that the shipment contains everything that you expect to receive. Contact after sales if there are missing or damaged components.
2. Move the CM2 cabinet to the target installation location with a forklift or crane. Remove the protective base under the cabinet.
3. Place the accessories separately after unpacking to avoid confusion about cable connections.

Contents in your shipment are order-dependent. Not all packages listed below may be in your shipment.

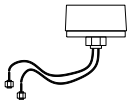
- **CM2 cabinet**

			
CM2 cabinet	Positioning cardboard	M10*20 screw x8	M12*80 expansion bolt x4
			
Eye bolt x4	Protective panel x2	Printed documents	

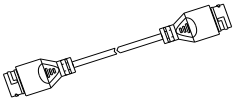
- **EMS unit**



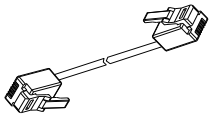
EMS unit *



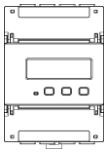
Antenna



24V DC power cable *



Communication cable *



Grid meter



Printed documents *

Note: The optional EMS package only includes the components marked with *. The EMS unit is only equipped with a switch.

4.5. Mount the cabinet

⚠ **CAUTION**
The forklift and crane operators must have valid operation license or certification and follow the operation safety rules.

Before you start

1. Select one of the following options to mount and secure the cabinet:

- Mark and drill the mounting positions with the positioning cardboard, and then move the cabinet to the mounting position. In this case, take the steps in this section first.
- Mark and drill the mounting positions with the support bracket after moving the cabinet to the mounting position. In this case, move the cabinet to the mounting position with a crane first.

2. Make sure that enough space is reserved at the front or back end of the cabinet bottom for the cables and wires passing through.

Step 1. Use the positioning cardboard to mark the four drilling holes for mounting the cabinet.

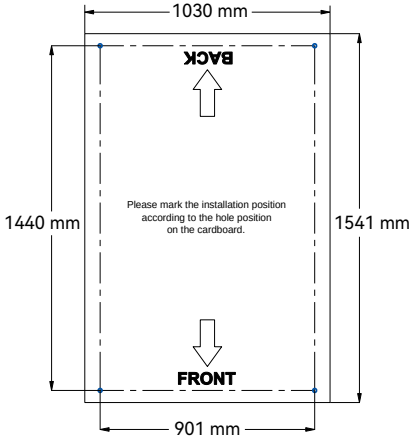


Figure 5.1. Marking drilling positions

Step 2. Drill the four holes on the foundation at the depth of 90-95 mm.

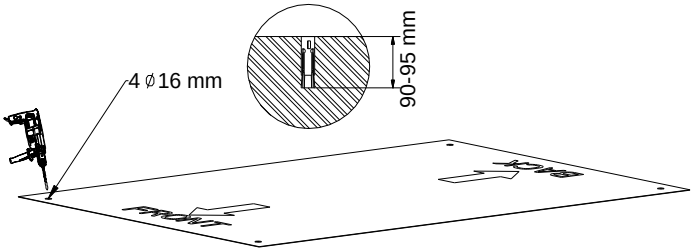


Figure 5.2. Drilling the holes

Step 3. Move the cabinet to the mounting positioning with forklift or crane. For example:

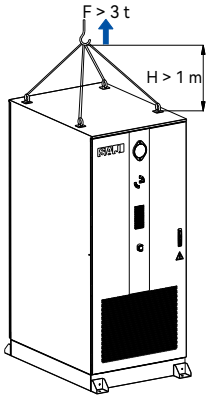


Figure 5.3. Moving the cabinet with crane

5.

ELECTRICAL CONNECTION



5.1. Safety Instructions

Electrical connection must only be operated by professional technicians. Before the operation, the technicians must wear necessary personal protective equipment (PPE) including insulating gloves, insulating shoes, and safety helmet.

DANGER
• Danger to life due to potential fire or electricity shock. • Do not install the cabinet near any inflammable or explosive items. • When it is powered on, the equipment should in conformity with national rules and regulations.

WARNING
Any improper operation during cable connection can cause device damage or personal injury.

5.1.1. Wiring guidelines

- The selection, installation, and routing of cables must comply with local laws, regulations, and standards.
- During the placement of power cables, avoid coiling or twisting. If a power cable is found to be too short, replace it entirely; do not create splices or weld joints within the cable.
- Ensure that all cables are firmly connected, have good insulation, and are appropriately sized for their application.
- Cable trays and pass-through holes should not have sharp edges. Use protective measures at conduit entrances or pass-through holes to prevent damage to cables from sharp edges or burrs.
- Group similar types of cables together and secure them neatly, ensuring they lie flat and straight without damage to the outer jacket. Different types of cables should be laid separately to avoid entanglement or crossing.
- For buried cables, use cable supports and clamps to securely fix them in place. Ensure that backfilled soil around underground cables is compacted to prevent deformation or damage during the backfilling process.
- When external conditions like installation methods or ambient temperatures change, verify the cable selection according to local regulations to ensure parameters like current-carrying capacity.
- To prevent insulation aging or damage due to high temperatures, maintain a minimum distance of 30 mm between cables and heat-generating components or heat source peripheries.

5.1.2. Ground protection

Follow the grounding guidelines below for the equipment which is critical to ensure electrical safety and compliance with local standards:

- The impedance of the equipment's grounding system must meet the requirements specified by local electrical standards.
- The equipment must be permanently connected to a protective ground. Before operating the equipment, always check the electrical connections to ensure that the equipment is reliably grounded.
- It is strictly prohibited to operate the equipment if the grounding conductor has not been installed.
- Do not damage or tamper with the grounding conductor in any way.

5.1.3. AC- and DC-side handling

- Before installing or removing power cables, turn off all switches on both the AC and DC sides to ensure that no electrical flows through the system during the operation.
- Prior to connecting the AC side cables, verify that the phase sequence of the three-phase cables matches the silk-screen markings on the cable connectors.
- If the equipment has multiple input and output paths, disconnect all inputs and outputs before proceeding. After ensuring all power sources are disconnected, wait for at least 5 minutes to allow any residual charge in capacitors or other components to dissipate. Only then should you perform any operations on the equipment.

5.1.4. Electrostatic Discharge (ESD) Protection

⚠ **CAUTION**
• Contact with or improper handling of printed circuit boards or other electrostatic discharge sensitive components can lead to device damage. • Avoid unnecessary contact with circuit boards. • Adhere to ESD protection standards, such as wearing an anti-static wrist strap.

5.2. System connections overview

The following figure shows the cable connections of a single CM2 cabinet:

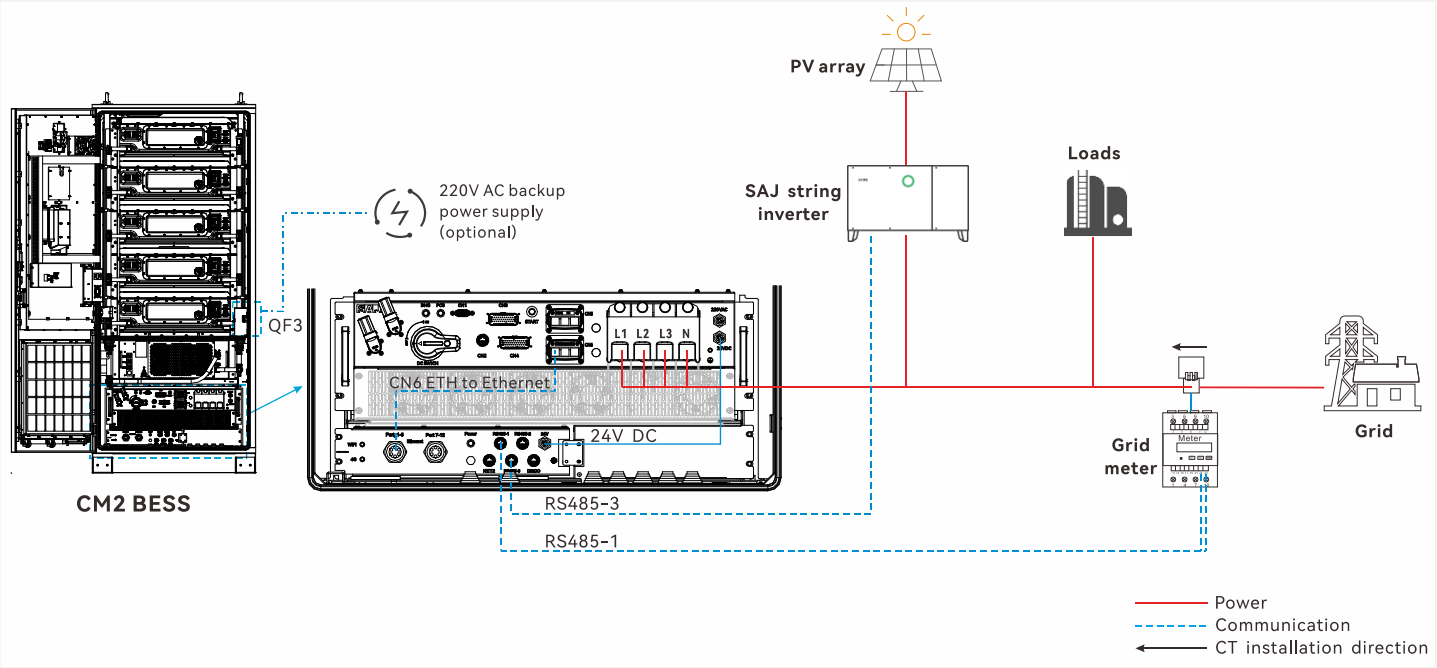


Figure 5.4. Single cabinet connections

The following figure shows the cable connections of multiple CM2 cabinets in parallel. The primary CM2 is equipped with the EMS unit, and the standard CM2 cabinets all connect to the EMS unit on the primary CM2 for system communication.

A maximum of 20 CM2 cabinets can be deployed as one BESS. When 12 or less cabinets are deployed, follow the diagram below for cable connections.

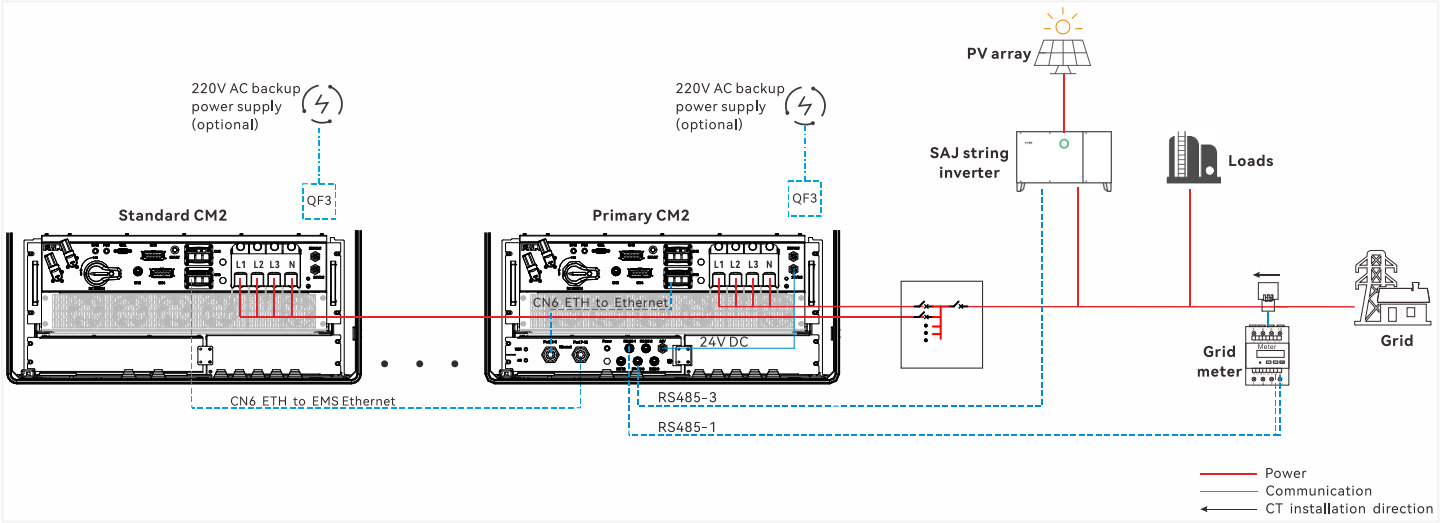


Figure 5.5. Parallel cabinets connections

When more than 12 cabinets are deployed, follow the diagram below for EMS cable connections. In this case, the customer needs to order an optional EMS unit that is equipped with a switch and install it in a standard CM2 cabinet (cabinet 11) as the following example shows.

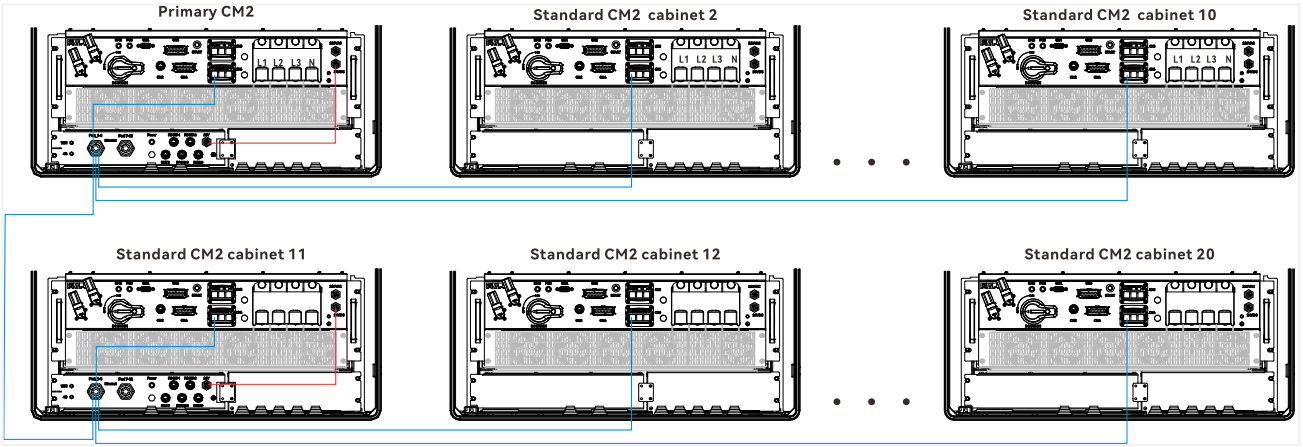


Figure 5.6. EMS cable connection of 20 cabinets

5.3. Check the battery power cable connections

The battery power cables and manual service disconnect (MSD) switches are installed before delivery. Before any electrical connections on site, check that the battery power cables and the MSD switches on each battery pack are securely installed.

5.4. Prepare meters, switch, and cables

- When the third-party string inverters are connected with the CM2 BESS, prepare a PV meter between the inverter and the CM2 cabinet according to the actual requirement of the customer. The PV meter is required to support RS485 communication with the CM2 cabinet.
- The grid meter is delivered in the EMS package. Prepare three current transformers (CT) according to the following specification:

Accuracy class	Secondary-side current (A)
0.5	1 or 5

Table 5.1. Grid meter CT specification

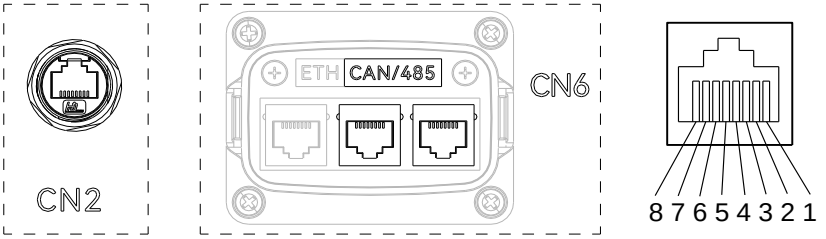
Note: For more details about the grid meter specification and CT requirement, refer to *DTSU666 Smart Power Sensor Quick Guide* that is delivered in the EMS package.

- When it is necessary to deploy over 12 CM2 cabinets as one BESS, order from SAJ an optional EMS that is only equipped with the switch and power supply module for Ethernet communication between the CM2 cabinets.
- Prepare the following cables and connecting terminals according to the recommended specifications. Crimp and assemble the cable ends on the installation site.

Function	Recommended type	Cross-sectional area range (mm^2)		Recommended conductor material	Connecting terminal stud size	Crimping tool
		Range	Recommended			
Grounding cable	Unshielded high voltage cable or other standard outdoor cables	35–120	35	Copper	M12	• 70 mm^2 stripping plier • 70 mm^2 hydraulic crimper
AC L1/L2/L3/N cables		70–240	70	Copper		
AC PE cable		35–120	35			
Ethernet communication cable	CAT 5E outdoor shielded network cable with internal resistance ≤1.50 Ω/10m				Shielded RJ45 connector	Network cable stripping plier and crimper
Communication cable for parallel deployment						
QF3 220V backup power supply	Stranded copper wire for over 300V	1.3–3.3	2.5	Copper	E2508 insulated cord-end terminal	Stripping plier

Table 5.2. Cable specifications

The following table describes the pin definitions of the PCS communication ports:

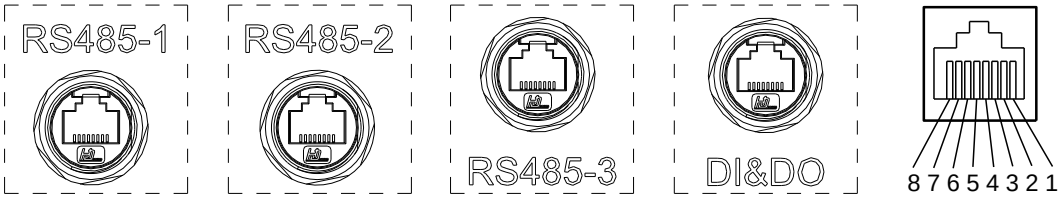


CN2	
1	EXT_MODE_DI2_COM
2	EXT_MODE_DI2
3	RackADDR_DO
4	RackCANH
5	RackCANL
6	Rack_GND
7	Rack_GND
8	RackADDR_DI

CN6 – CAN/485		
1	HMI_RS485_A	HMI_RS485_A
2	HMI_RS485_B	HMI_RS485_B
3	DC_CAN_H	DC_CAN_H
4	DC_CAN_L	DC_CAN_L
5	NC	NC
6	NC	NC
7	NC	NC
8	NC	NC

Table 5.3. Pin definitions of PCS communication ports

The following table describes the pin definitions of the EMS communication ports:



RS485-1	
1	RS485-1A
2	RS485-1B
3	RS485-1G
4	NC
5	NC
6	NC
7	NC
8	NC

RS485-2	
1	RS485-2A
2	RS485-2B
3	RS485-2G
4	NC
5	NC
6	NC
7	NC
8	NC

RS485-3	
1	RS485-3A
2	RS485-3B
3	RS485-3G
4	NC
5	NC
6	NC
7	NC
8	NC

DI/DO	
1	LDI1+
2	LDI1-
3	LDI2+
4	LDI2-
5	DO1
6	DO1
7	DO2
8	DO2

Table 5.4. Pin definitions of EMS communication ports

5.5. Connect the grounding cable

Follow this procedure to connect the grounding cable of each CM2 cabinet.

WARNING
Connect the grounding cable before other electrical connections.

Step 1. Assemble the cables with the terminals as follows:

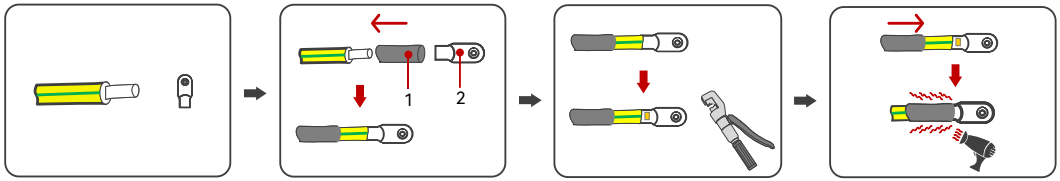


Figure 5.7. Preparing the grounding cable

1. Heat shrink tubing 2. Terminal

Step 2. Secure the grounding cable to one of the grounding ports at the back bottom of the cabinet.

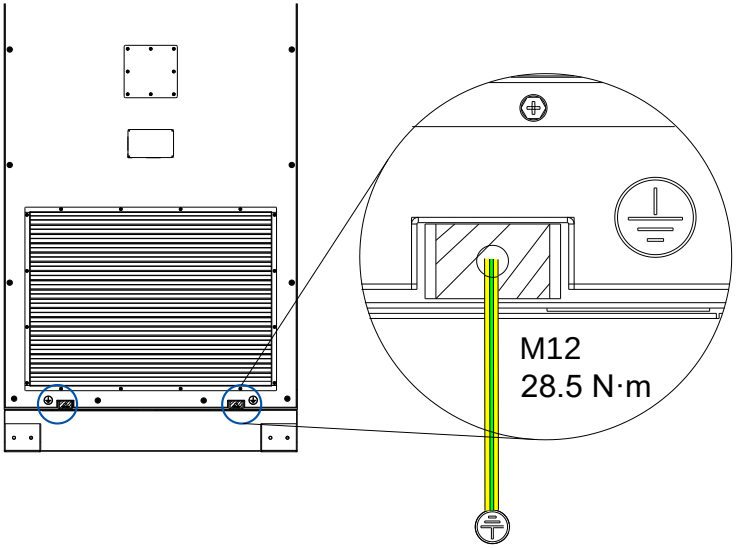


Figure 5.8. Connecting the grounding cable

Step 3. Connect the other cable end to the external earthing bar.

5.6. Connect the EMS unit cables

The EMS unit needs to be installed at the bottom of the CM2 cabinet for both single-cabinet deployment and parallel deployment of multiple CM2 cabinets.

For EMS cable connection diagrams, see section 5.2 "System connections overview" on page 46.

Before you start

- Prepare a 4G nano SIM card for 4G communication with the EMS when 4G communication with the EMS is required.
- Prepare the package contents of the EMS unit.
- Prepare the Ethernet communication cables and connecting terminals according to the recommended specifications. One Ethernet cable is required for each CM2 cabinet to connect to the EMS unit.
- Determine whether to install the antenna on the left or right side of the cabinet depending on the actual installation environment. Point the antenna to an open area to ensure smooth signal reception. Avoid pointing the antenna to the other CM2 cabinets in parallel.

Procedure

Step 1. Remove the left cover and the metal plate from the slot that is reserved for the EMS unit. Keep the six screws and the plate at a proper place.

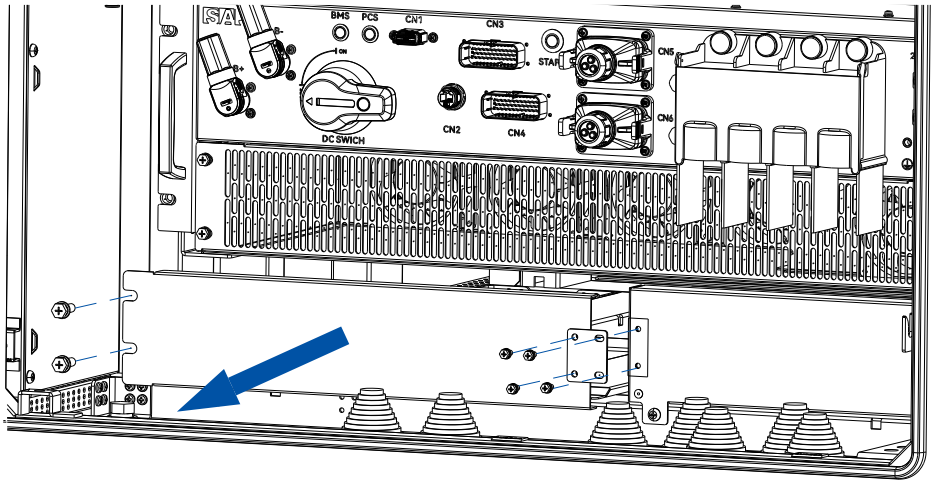


Figure 5.9. Removing the left cover

Step 2. Place the EMS unit on the floor with protective cloth or cover.

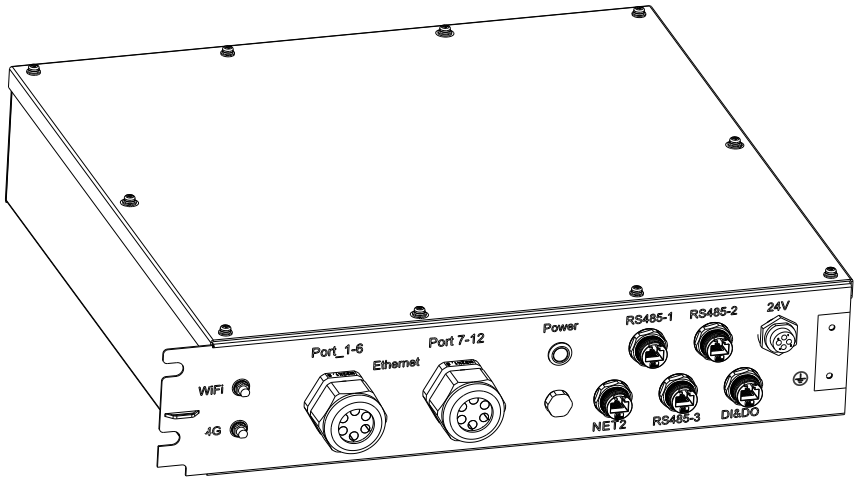


Figure 5.10. Preparing the EMS unit

Step 3. Loosen the 10 M4 screws on top of the EMS unit to remove the upper cover.

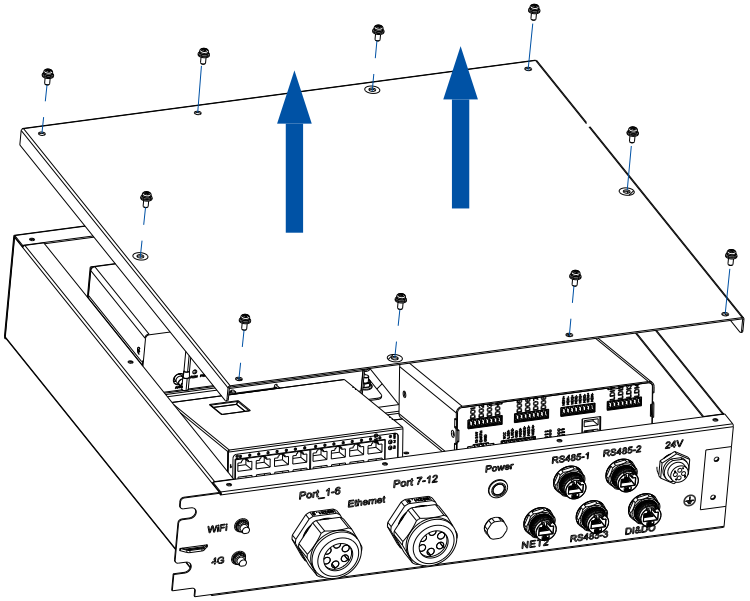


Figure 5.11. Removing the upper cover

Step 4. Insert the 4G nano SIM card into the **Nano-SIM** slot on the eManager module when 4G communication is required. Otherwise, skip this step.

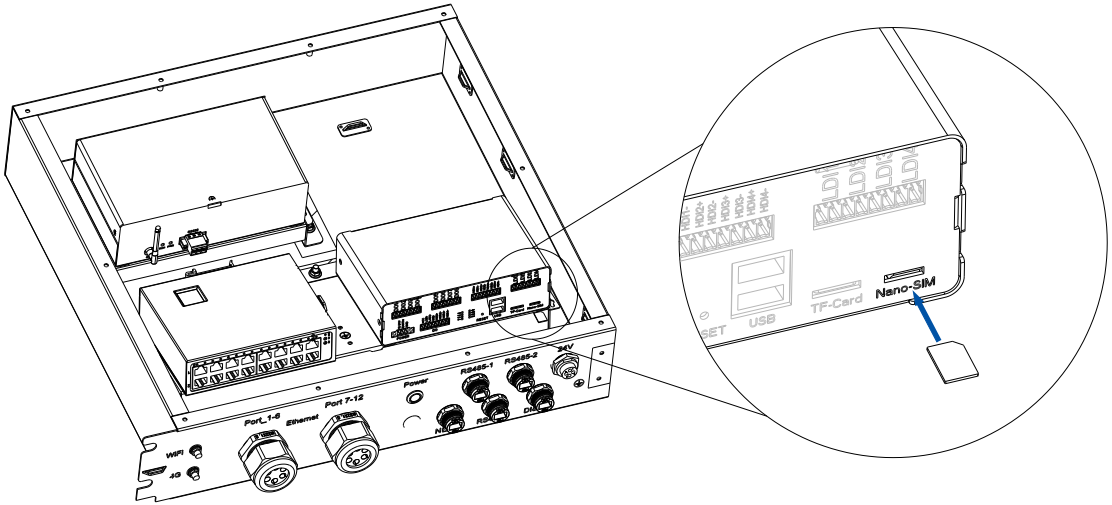


Figure 5.12. Installing the 4G SIM card

Step 5. Connect the Ethernet cables between the EMS unit and each PCS in parallel:

a. Loosen the **Port 1-6** or **Port 7-12** cable gland from the EMS unit; pass the Ethernet cable through the gland, the water-proof nut, and then **Port 1-6** or **Port 7-12**.

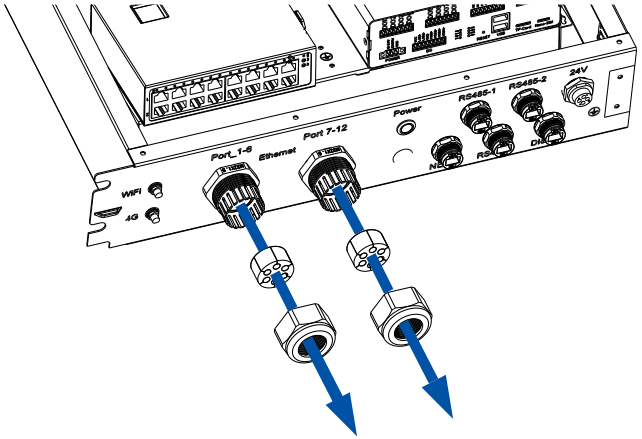


Figure 5.13. Loosening the Ethernet cable gland

b. Insert the RJ45 plugs to the Ethernet ports inside the EMS unit until you hear a “click” sound. Fasten the water-proof nut and the cable gland back to the port.

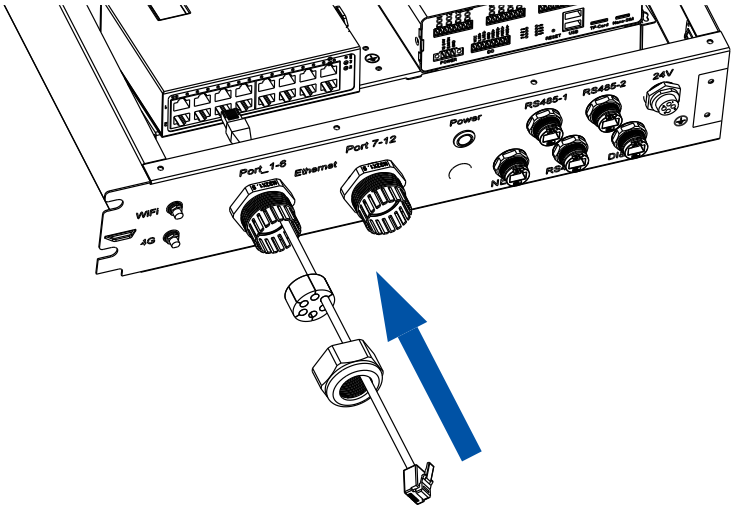


Figure 5.14. Connecting the Ethernet cables to EMS

c. Install the upper cover back to the EMS unit and tighten the 10 M4 screws.

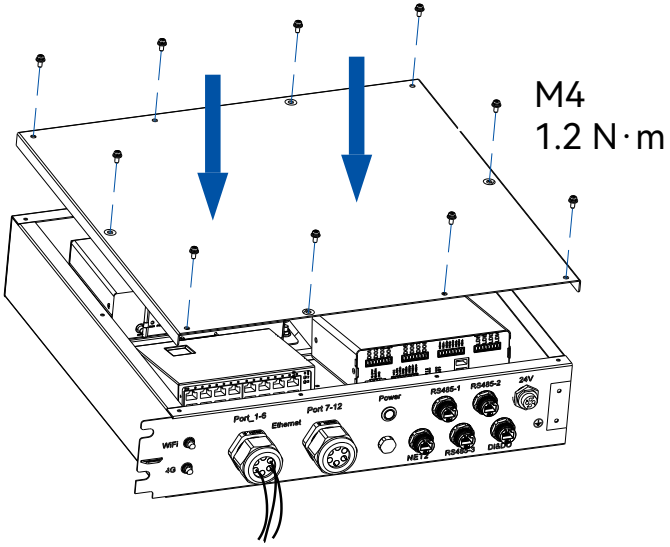


Figure 5.15. Installing the upper cover

d. Insert the EMS unit into the slot and secure the unit with the metal plate and the screws.

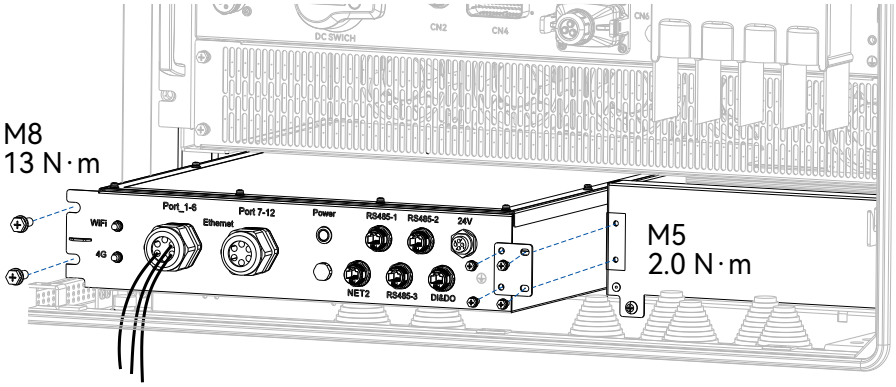


Figure 5.16. Securing the EMS unit

Step 6. Cut the threaded cable gland for communication cables according to the actual number of cables for the other PCS in parallel. Pass the Ethernet cables through the threaded cable gland and then the cabinet bottom entry hole.

- Connect the other cable ends to the **ETH** port of **CN6** of other PCS in parallel or to the optional EMS unit in deployment with over 12 cabinets.
- On the current CM2 cabinet (with EMS unit), connect one of the cables to the **ETH** port of **CN6** on the PCS.

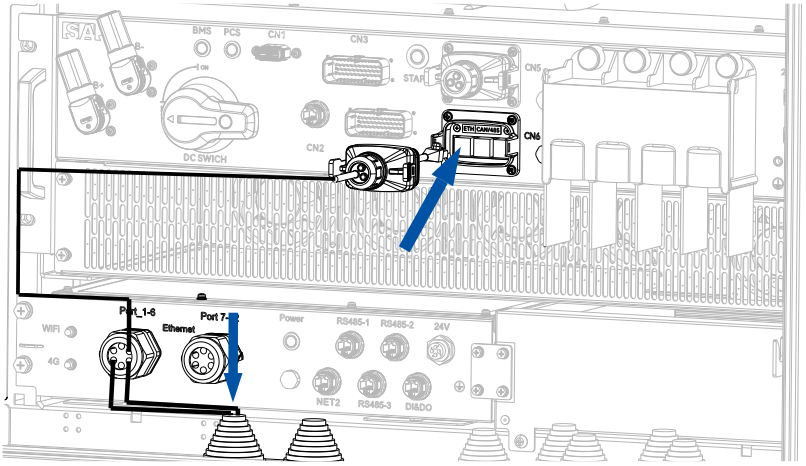


Figure 5.17. Connecting the Ethernet cables to PCS

Step 7. Connect the 24V power cable from the **24V** port on the EMS unit to the **24VDC** port on the PCS.

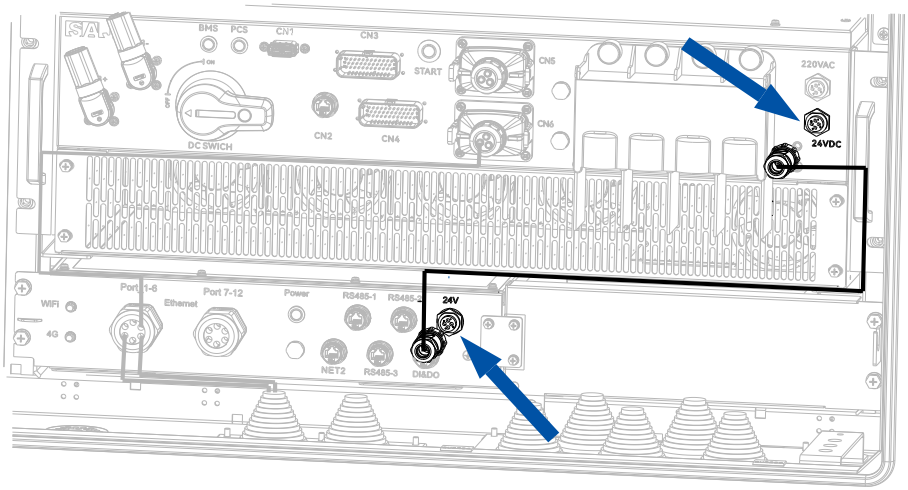


Figure 5.18. Connecting the 24V power cable

Step 8. Take the following steps to connect the antenna:

a. Remove the water-proof plate on top of the antenna entry hole on either the left or right side of the cabinet. For example, install the antenna on the right side as follows:

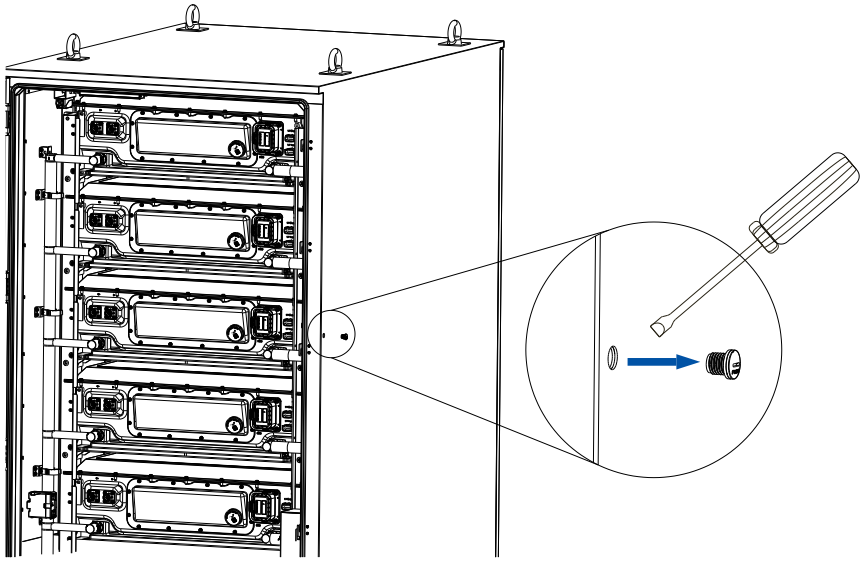


Figure 5.19. Removing the antenna plate

b. Pass the antenna cables from the outer surface of the cabinet, stick the antenna receiver on the outer surface of the entry hole, and fasten the screw nut with a 16 mm wrench.

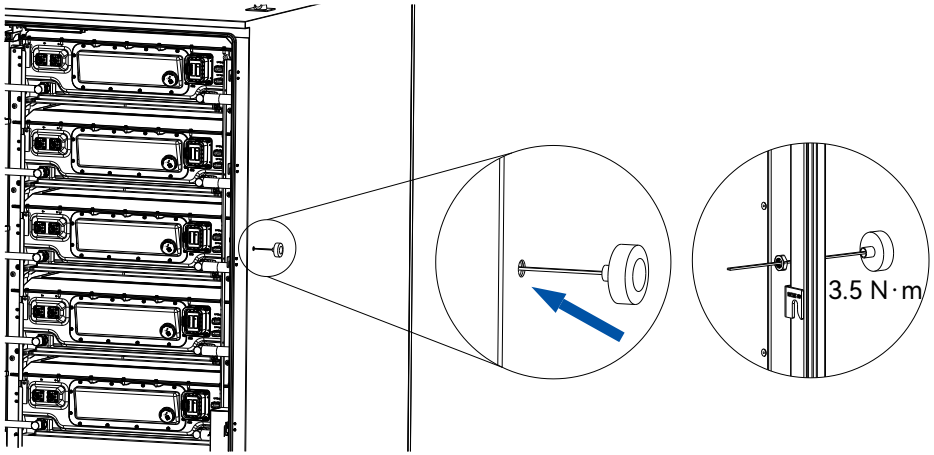


Figure 5.20. Installing the antenna receiver

c. Inside the cabinet, fix the cable along the interior surface of the cabinet. Fasten the 2.4G cable to the **WiFi** port; fasten the 4G cable to the **4G** port with an 8 mm wrench.

Note: The blue dotted line in the diagram below shows the cable routing when the antenna is installed on the left side of the cabinet.

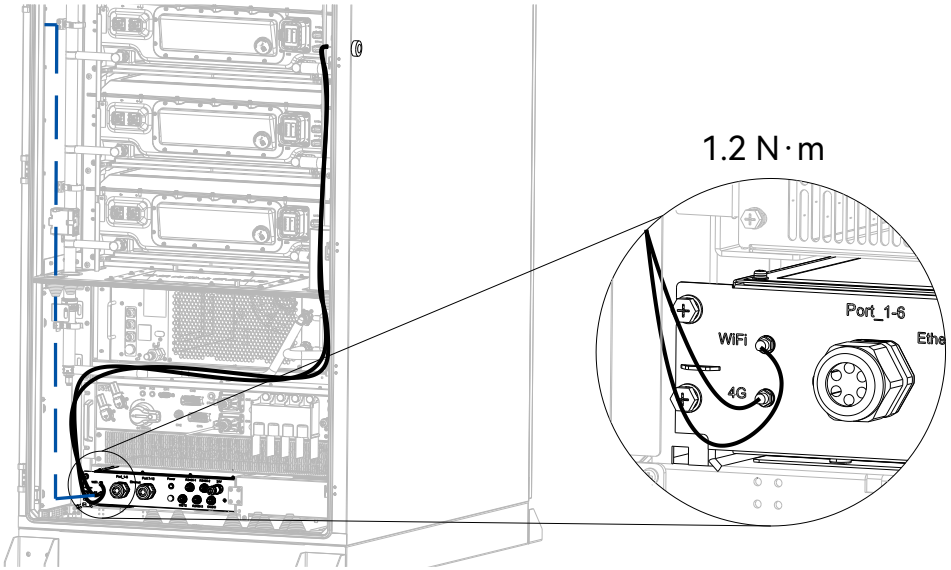


Figure 5.21. Connecting the antenna cables

Step 9. Connect the PV meters.

- When the SAJ string inverter is connected with CM2, connect the inverter RS485 communication port to the **RS485_3** port on the EMS unit.
- When the third-party inverter is connected with CM2, connect the PV meter RS485 communication port to the **RS485_2** port on the EMS unit.

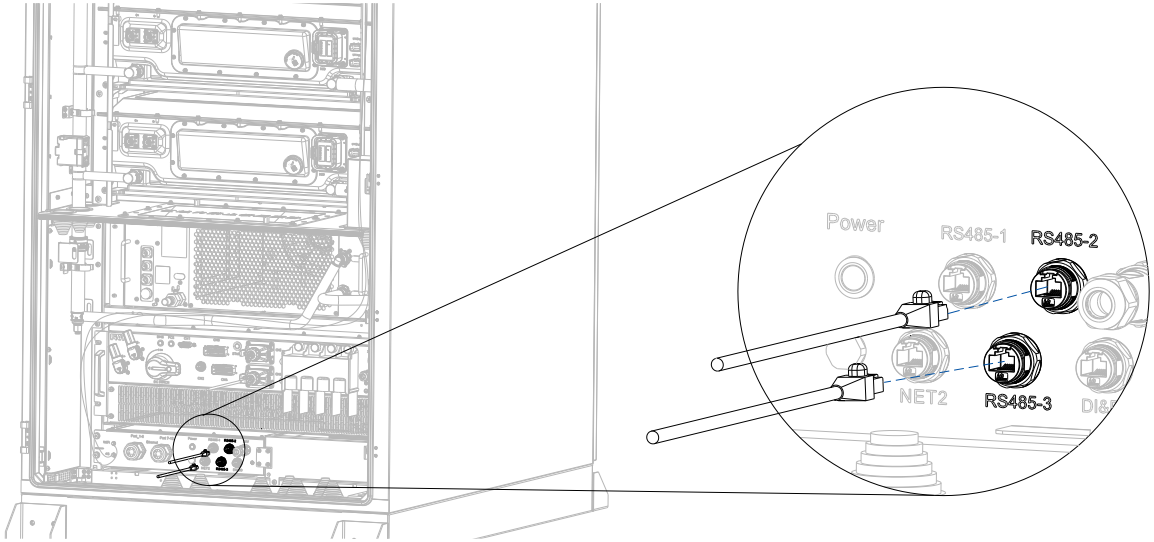


Figure 5.22. Connecting the RS485 cables

5.7. Connect the grid meter

Before you start

Prepare the grid meter that is delivered in the EMS package and the compatible CTs as needed.

For details, see section 5.4 "Prepare meters, switch, and cables" on page 48.

Procedure

Step 1. Follow the diagram below to connect the cables:

- Connect the grid cables to the UA, UB, UC, and UN terminals on the meter.
- Connect the cables of three CTs to terminals 31, 33, 34, 36, 37 and 39 on the meter.

From (CT)	To (meter)
IA*	31
IA	33

From (CT)	To (meter)
IB*	34
IB	36

From (CT)	To (meter)
IC*	37
IC	39

- Connect RS485 to the following pins of **RS485-1** port on the EMS unit:
  - RS485-A: pin 1
  - RS485-B: pin 2

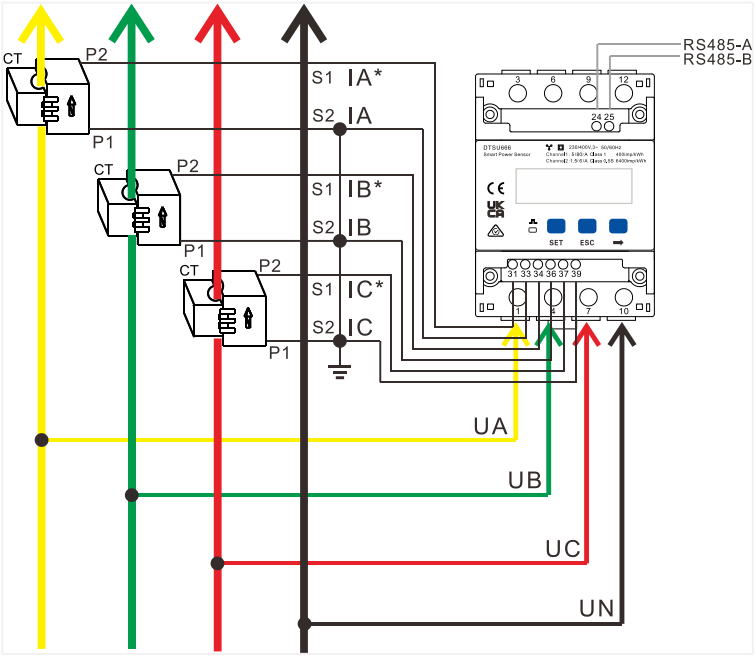
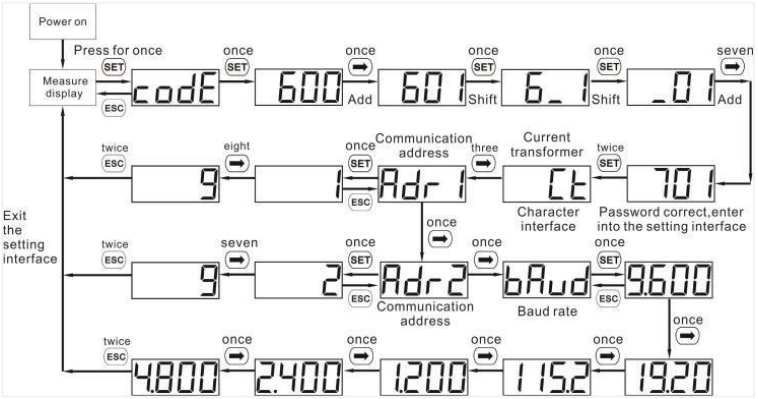


Figure 5.23. Grid meter connection diagram

Step 2. Set the following meter parameters:

Display	Parameter	Value
CE	Current transformer ratio	Set the value according to the actual requirement.
Pt	Potential transformer ratio	
Prot	Communication protocol switchover	**n.1**
Adr 1	Modbus communication address 1	**1**
bAud	Baud rate	**115.2** (115200 bps)
nEt	Wiring mode	• **n.34** (three-phase four-wire) • **n.33** (three-phase three-wire)
SPEC	Channel switchover	**ct** (Transformer connection)

For example, take the following steps to set the communication address to **1**:



a. Power on the meter and enter **Measure display**, and then press **SET** twice to enter the password 701.

b. Press the → button to adjust the value of the first digit. One increment per pressing.

c. Press **SET** once to shift to the second digit and adjust the value in the same way. Set the default password to **701**.

d. When the password is entered correctly, press **SET** twice to enter the port interface and press the → button three times to enter the address page. Then, press **SET** once to start the meter address setting.

e. Press the → button to adjust the value of the address. One increment per pressing. Set the grid meter address to **1**.

f. After all the settings are completed, press **ESC** twice to exit **Measure display** for the meter to start working.

5.8. Connect the AC cables

Before you start

Prepare the L1, L2, L3, N, and PE AC cables and connecting terminals according to the recommended specifications.

Procedure

Step 1. Make sure that the PCS DC switch is at the **OFF** position.

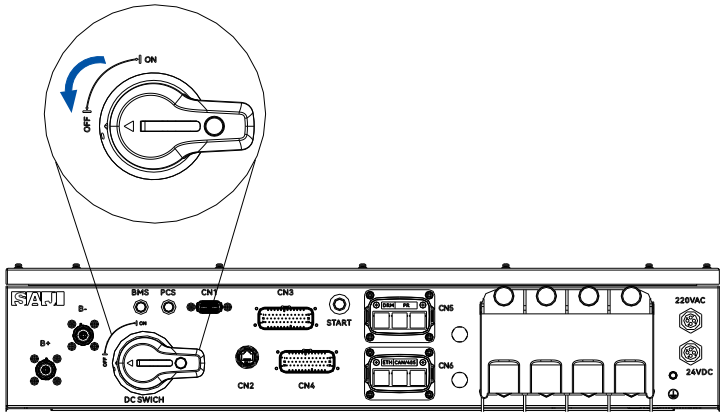


Figure 5.24. Turning off the DC switch

Step 2. Cut the threaded cable gland for AC power cables at the cabinet bottom according to the actual cable diameter. Pass the AC L1, L2, L3, N, and PE cables through the cabinet bottom entry hole; then pass each cable through each threaded cable gland.

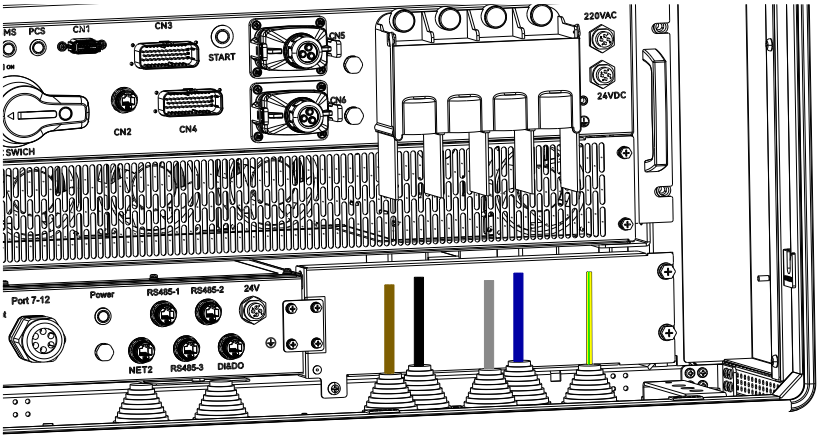


Figure 5.25. Passing the AC cables

Step 3. Assemble the L1, L2, L3, N, and PE AC cable terminals as follows:

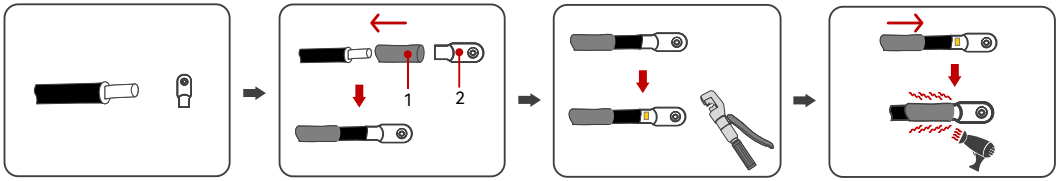


Figure 5.26. Assembling AC cable terminals

1. Heat shrink tubing 2. Terminal

Step 4. Open the plastic protective cover on top of the AC connectors.

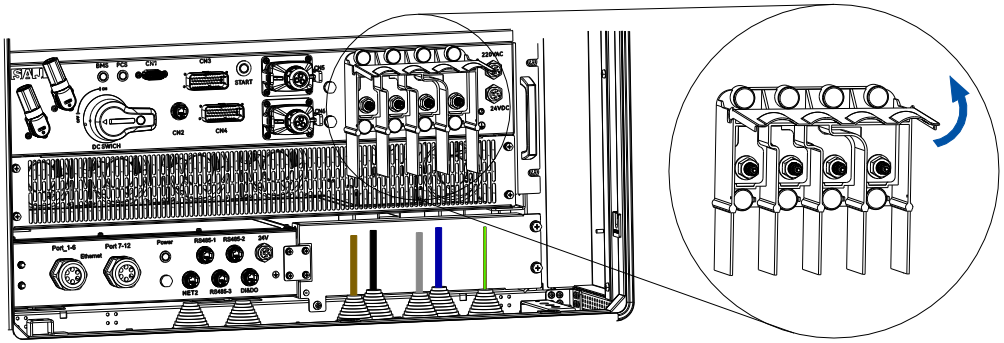


Figure 5.27. Opening the AC terminal cover

Step 5. Loosen the M12 screws on the L1, L2, L3, and N connectors, insert the terminals to the corresponding ports, and secure the terminals with the M12 screws nuts.

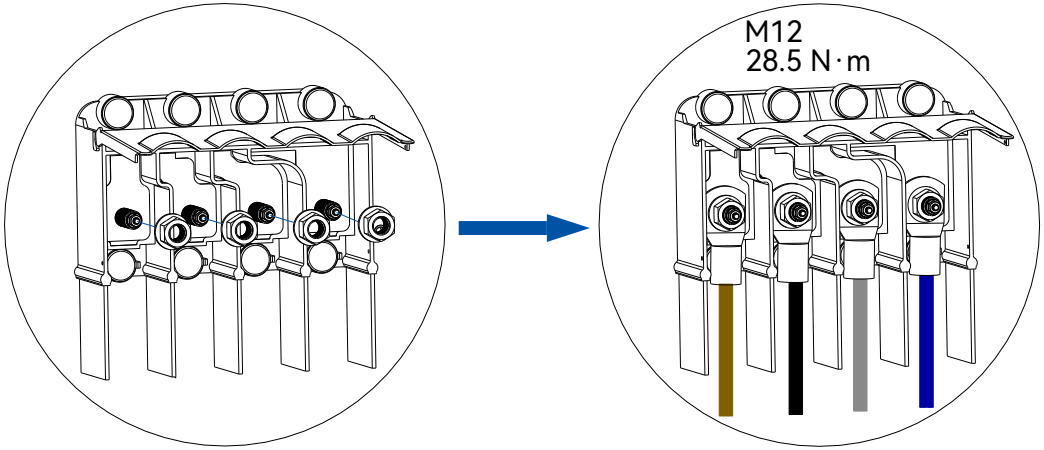


Figure 5.28. Connecting the AC power cables

Step 6. Secure one end of the PE cable to the metal plate on the cabinet bottom with an M12 screw. Connect the other cable end to the external earthing bar.

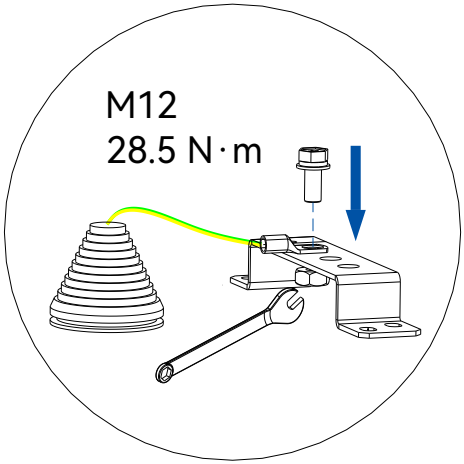


Figure 5.29. Connecting the AC PE cable

Step 7. (Optional) Take the following steps to connect the external 220V backup power supply to **QF3** for cabinet monitoring and fire detection components if necessary.

a. Loosen the three screws at the foot of the QF2 and QF3 switch box. Remove the cover.

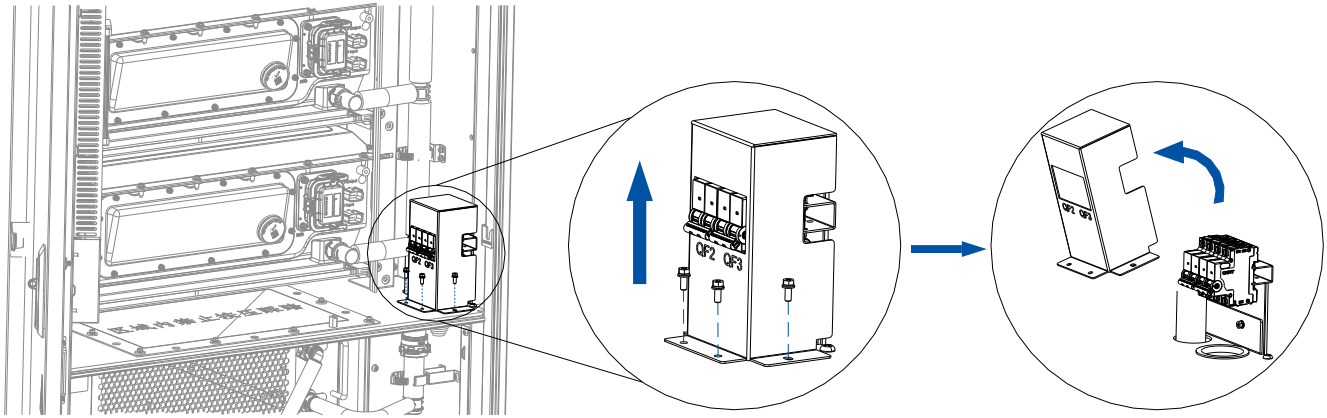


Figure 5.30. Removing the switch cover

b. Pass the two cables through one of the threaded cable glands at the cabinet bottom and secure the two cables to the QF3 ports.

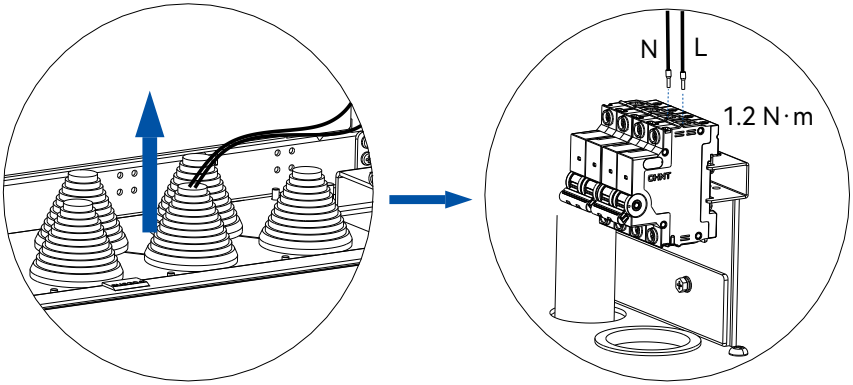


Figure 5.31. Securing the QF3 power supply cables

c. Install the cover back to the QF2/QF3 switch and secure the cover with the three M5 screws.

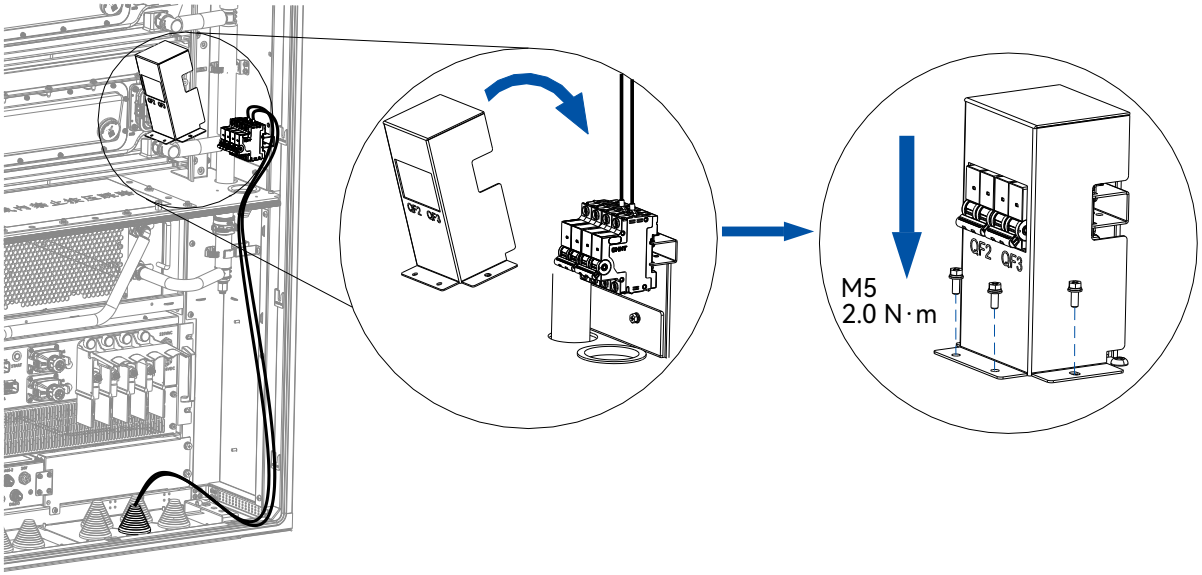


Figure 5.32. Installing the switch cover

5.9. Connect the dehumidifier drainpipe

Connect the dehumidifier drainpipe to an external liquid drainage channel if needed. Avoid draining excessive liquid under the cabinet bottom.

5.10.Secure the cabinet to the ground

Procedure

Step 1. Place the 2 protective panels and 4 support brackets at the bottom of the cabinet.

Skip step 2 and 3 if the drilling positions are already marked with the positioning cardboard.

Step 2. Mark the drilling positions at the bottom of each support bracket, and then remove the support brackets.

Step 3. Drill screw holes at the 4 marked positions at the depth of 90-95 mm.

Step 4. Insert the M12*80 expansion bolts into the foundation using a rubber magnet.

Step 5. Unscrew the M12*80 nuts using a torque wrench.

Step 6. Place the 4 support brackets back into their securing positions, ensuring that the screw holes on their bottoms align with the expansion bolts. Tighten the 3 nuts on each bracket.

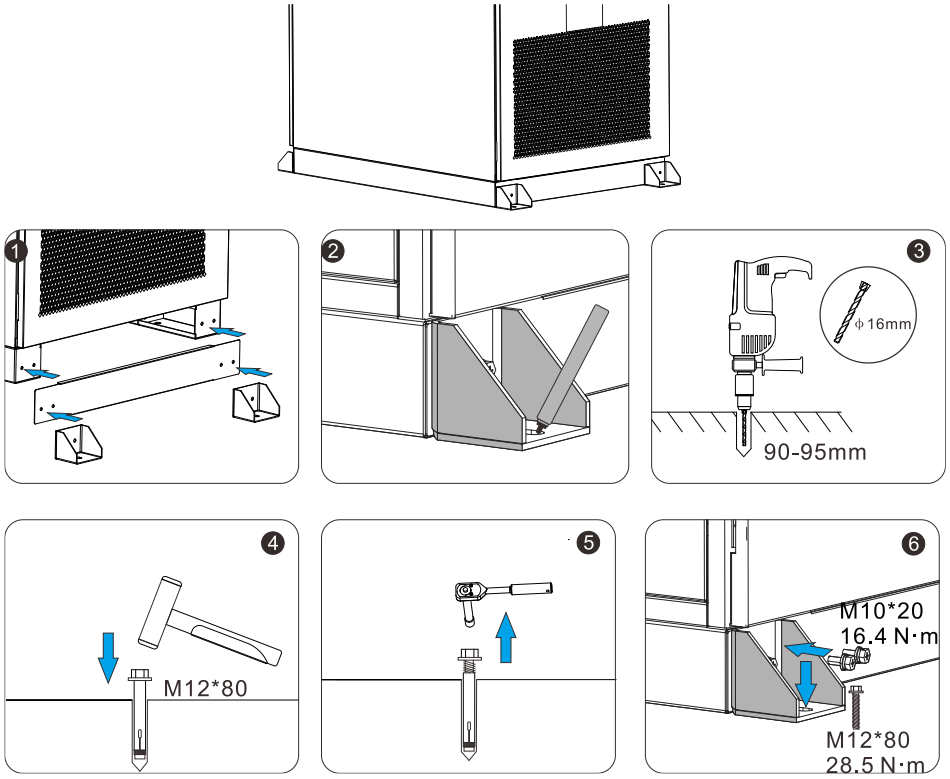
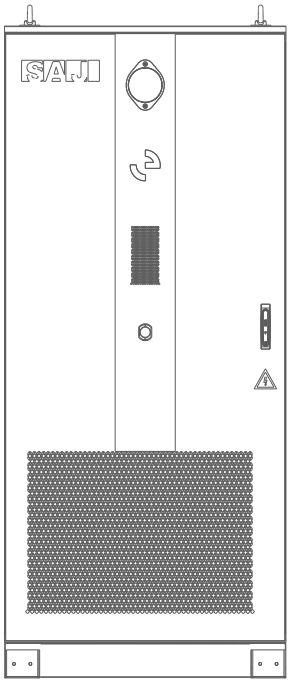


Figure 5.33. Securing the cabinet



6.

STARTUP AND SHUTDOWN

6.1. System check before startup

Before starting up the CM2 cabinet, check that the following items meet the corresponding acceptance criteria:

No.	Item	Acceptance Criteria
1	Equipment appearance	• The equipment appearance is intact with no damage, rust, or paint peeling. Any areas of paint peeling should be repainted. • Equipment labels are clear and visible; any damaged labels should be replaced promptly.
2	Cable appearance	• The cable sheath is intact without obvious damage. • The conduit for cabling is undamaged.
3	Cable connection	• Cable connections match the design specifications. • Terminal fabrication complies with relevant standards, ensuring secure and reliable connections. • Labels at both ends of each cable are clear and consistent in orientation. • Cables are not overly taut, allowing for appropriate slack to prevent stress concentration.
4	Cable routing	• Wiring adheres to the principle of separating strong and weak electrical circuits to avoid electromagnetic interference. • Cables are neatly arranged and aesthetically pleasing. • Cable ties are trimmed evenly, with no sharp edges exposed. • Cable bend radii are within reasonable limits; extra length should be left at bends to prevent tension. • Wiring is straight and smooth, with no crossing cables inside the cabinet.
5	Switch	• The switch for the upstream AC equipment is in the OFF position. • The switch for the high-voltage box is in the OFF position.

Table 6.1. System check before starting up

6.2. Start up the system

Before you start

- Confirm that all auxiliary power and main circuit wiring is completed.
- Measure the voltage and frequency to ensure they meet system requirements.
- Check that the emergency stop switch on the cabinet door is not activated.

Procedure

Step 1. Power on the main circuit:

a) Turn on the switch of the upstream AC equipment.

b) Turn on the AC switch, if configured.

The LED indicator light on the front door of CM2 should light up, indicating successful power-on of the main circuit.

Step 2. Turn the DC switch on the PCS to the **ON** position to power on the DC side connection.

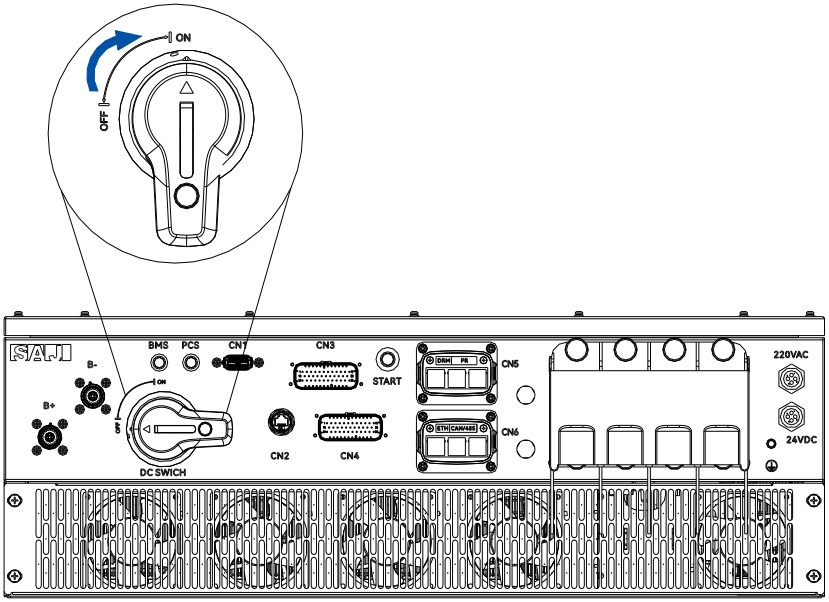


Figure 6.1. Turning on the DC switch

Step 3. Push upward the QF2 micro-circuit breaker to power on the liquid temperature control system and the dehumidifier.

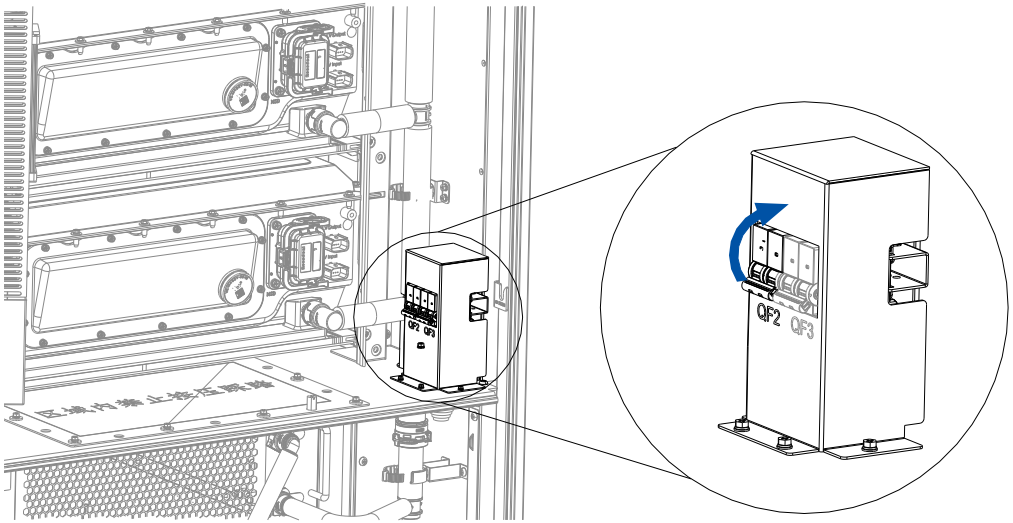


Figure 6.2. Turning on QF2 switch

Step 4. When external 220V AC backup power supply is connected, push upward the QF3 micro-circuit breaker to power on the backup power supply for cabinet monitoring and fire detection components.

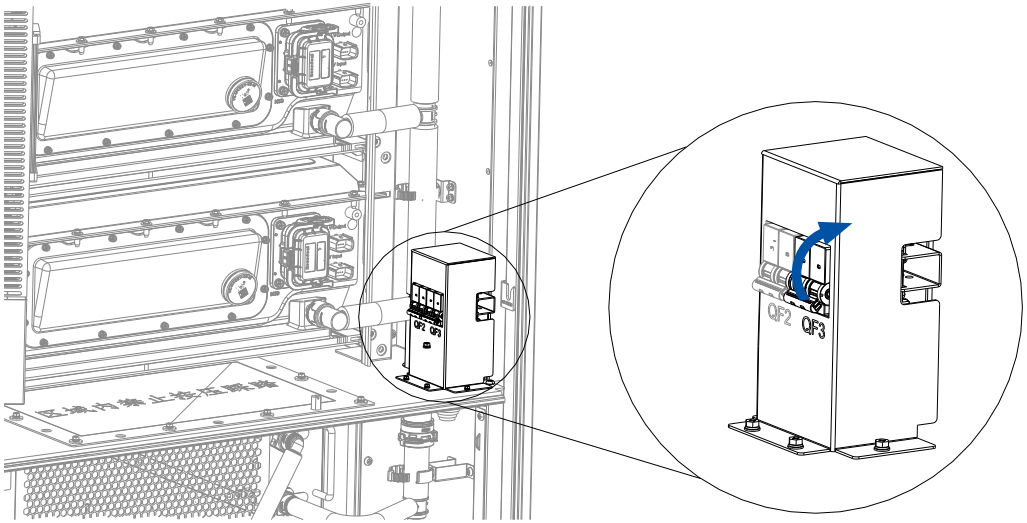


Figure 6.3. Turning on QF3 switch

Step 5. Push forward the air switch on the liquid temperature control system.

Step 6. Continue with the commissioning procedure on the elekeeper App or web platform. For details, see section 7 "Commissioning on App" on page 74.

Step 7. After the CM2 BESS is powered on for 30 minutes, test the temperature of the following terminals with a thermal detector to ensure that the temperature is within proper range:

- PCS AC terminals
- PCS DC terminals
- Battery pack DC terminals
- AC terminals connecting to the external power distribution cabinet.

6.3. Stop the system

Take this procedure to stop the running system.

Step 1. Log in to the elekeeper App or the web platform and stop the CM2 BESS.

Step 2. Press the emergency stop switch on the cabinet door to stop the system.

Step 3. Disconnect the switch of the upstream AC equipment to cut off the CM2 BESS from grid connection.

Step 4. Open the cabinet door. Turn the DC switch on the PCS to the **OFF** position to power off the DC side connection.

Step 5. Turn off the switch on the liquid temperature control system.

Step 6. Pull down the QF3 micro-circuit breaker to power off the connection to the external 220V AC backup power supply.

Step 7. Pull down the QF2 micro-circuit breaker dedicatedly for the liquid temperature control system.

6.4. Shut down the system for maintenance

Take this procedure to shut down the system for maintenance purpose.

Step 1. Follow the steps in section 6.3 "Stop the system".

Step 2. Unplug the **B+** and **B-** power cables on the PCS.

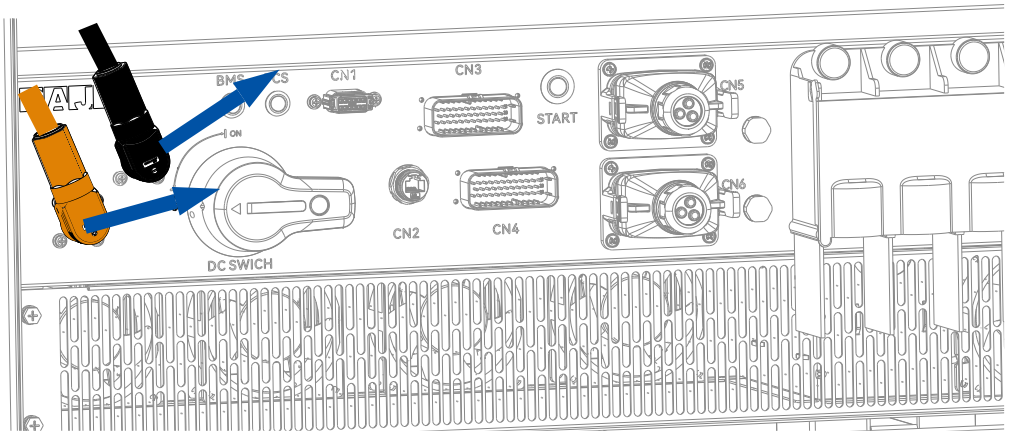


Figure 6.4. Unplugging battery power cables

Step 3. Check that the PCS and BMS indicators are off. After the indicators are off, wait for at least 5 minutes before making any operations.

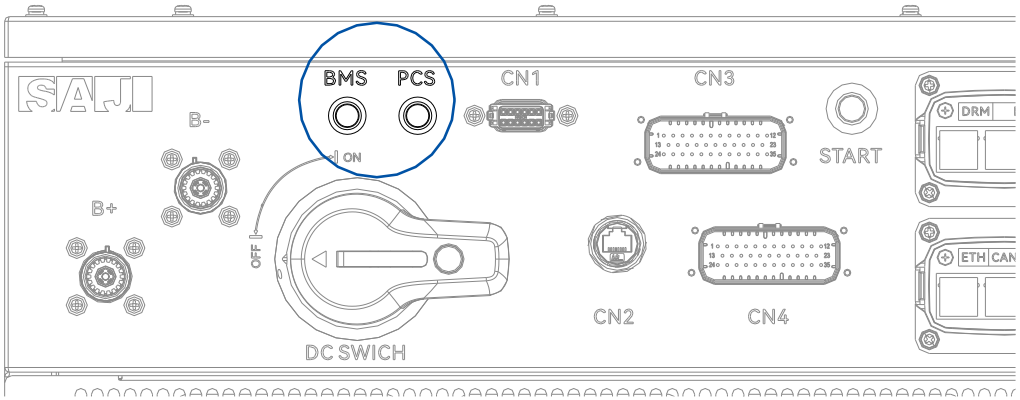


Figure 6.5. Checking PCS and BMS indicators

Step 4. Start the necessary maintenance operations.

7.

COMMISSIONING ON APP



7.1. About the elekeeper App

The elekeeper App can be used for both nearby and remote monitoring.

7.2. Download the App

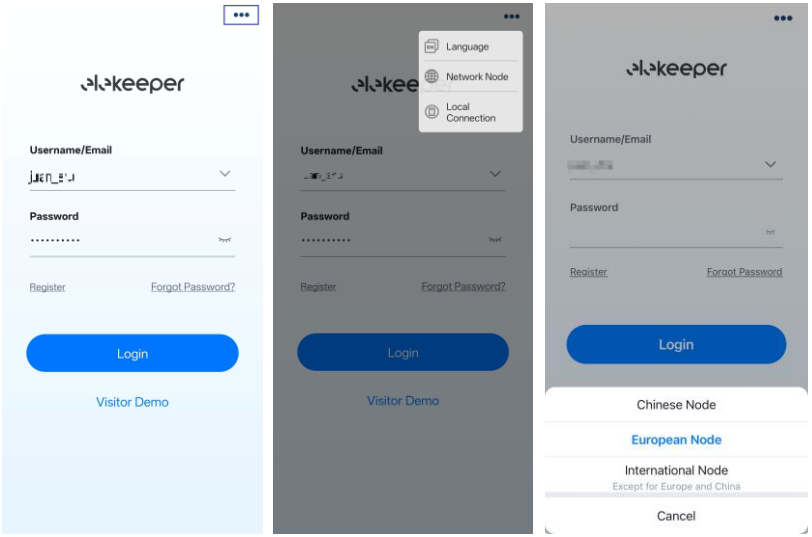
On your mobile phone, search for “elekeeper” in the App store and download the App.

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

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

7.3. Log in to the App

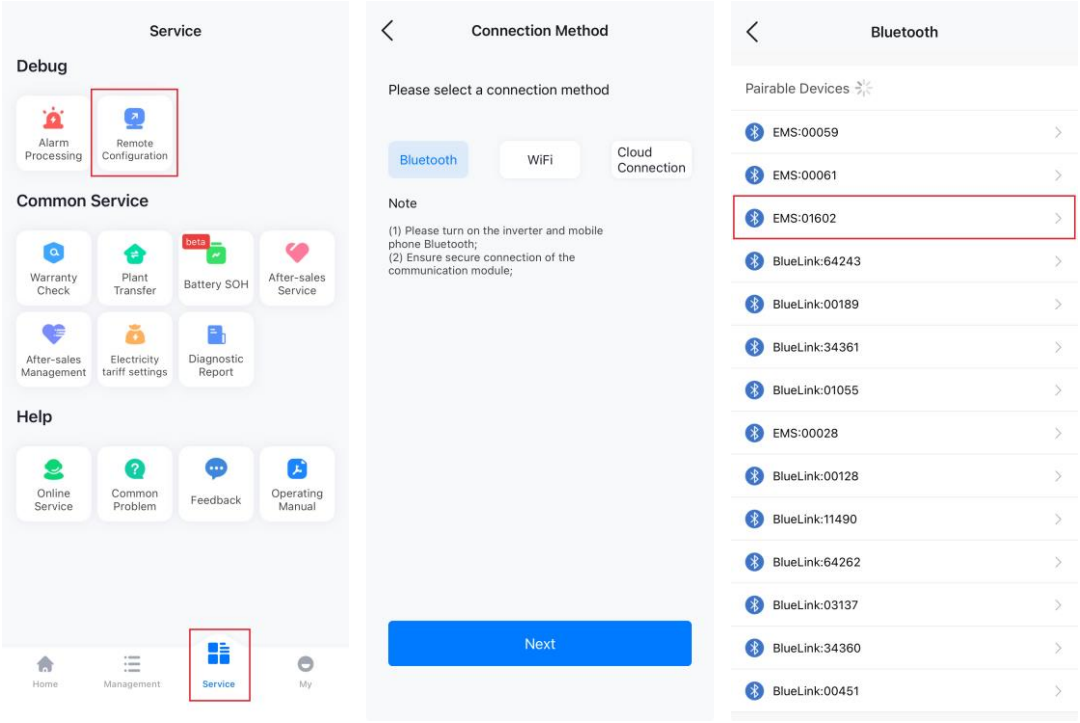
1. Open the App and tap the three-dot icon ••• on the top right corner.
2. Set **Language** to **English** and **Network Node** to **European Node** or **International Node** depending on the installation site of the system.



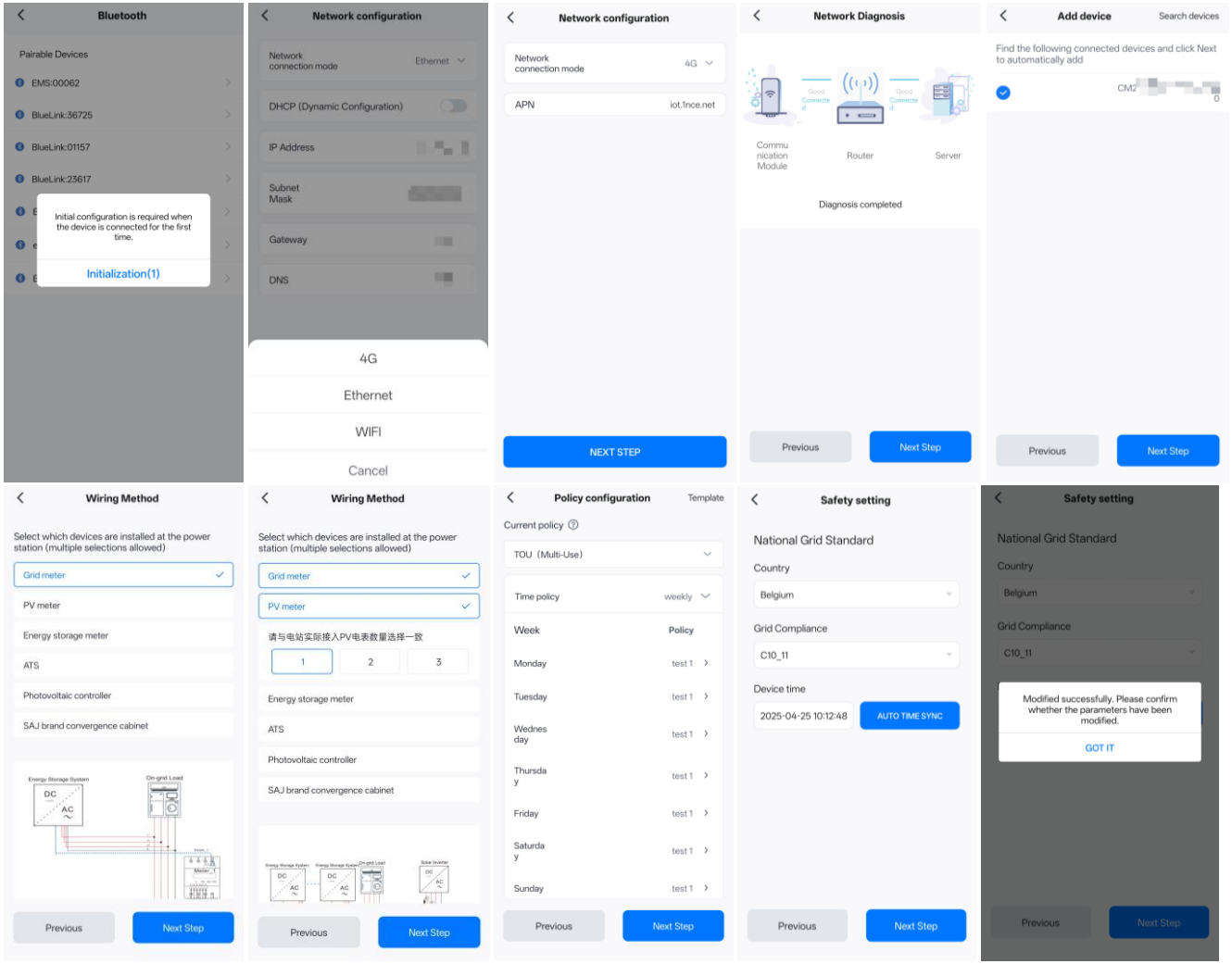
3. If you do not have an account, register first.
   a. Tap **Register**. Choose whether you are an owner, installer, or distributor.
   b. Follow the instructions on the screen to complete the registration.
4. Use the account and password to log in to the App.
5. On the **Service** page, select **Remote Configuration**.
6. Check that Bluetooth is enabled on your mobile phone. Tap **Bluetooth** and then **Next**.

7.4. Complete initialization settings

1. Log in to the App and tap **Service** > **Remote Configuration**.
2. Connect to the EMS communication module through Bluetooth connection. For example, EMS:01602.

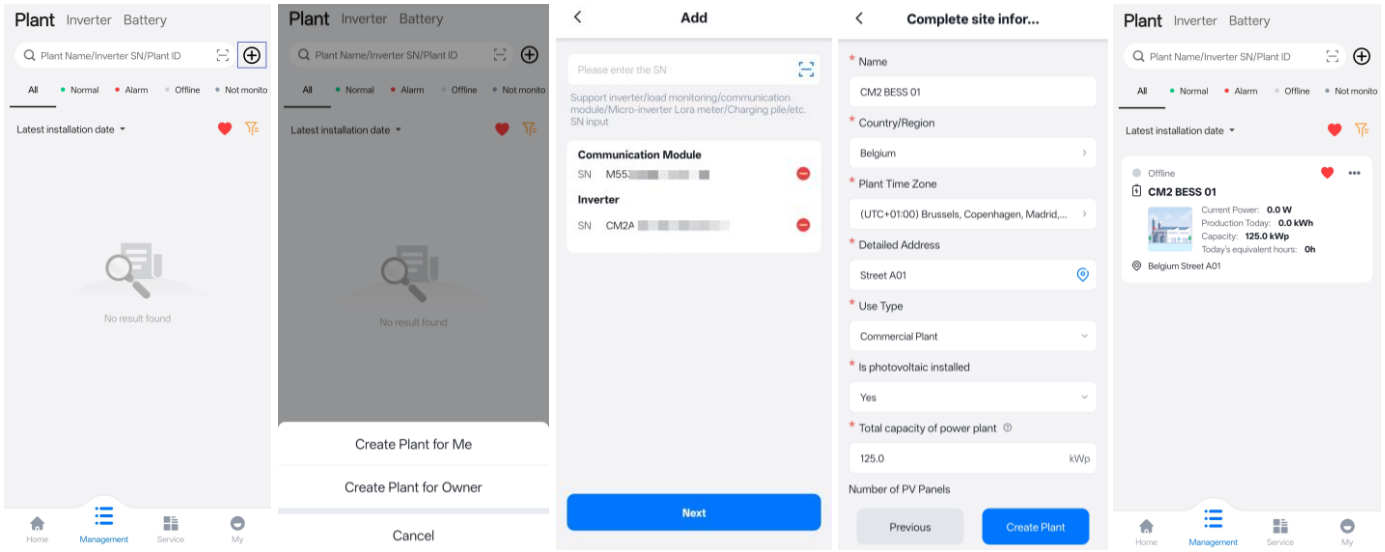


3. Follow the screen to complete the initialization settings.
   - For details about **Policy configuration**, see section 7.8 "Configure the working mode" on page 80.
   - For **Safety setting**, set the following safety parameters according to the regional regulations.
     - **Country**: Select the country where the system is installed.
     - **Grid Compliance**: Select the applicable compliance of the country.
     - Device time: Tap **Auto Time Sync** to synchronize the device time with the time on your mobile phone. The default time is factory-set.



7.5. Create a plant

1. Log in to the App and connect to the EMS unit through Bluetooth connection.
2. On the **Management** page, tap the icon on the upper right corner, and select **Create Plant for Owner**.
3. Register the owner's account or select an existing owner.
4. On the **Create Plant for Owner** page, enter the CM2 serial number and add the device.
5. On the **Complete site information** page, enter the plant information. Tap Create Plant to complete the creation.
6. On the **Management** page, check the new plant as needed.



7.6. Configure the 4G service

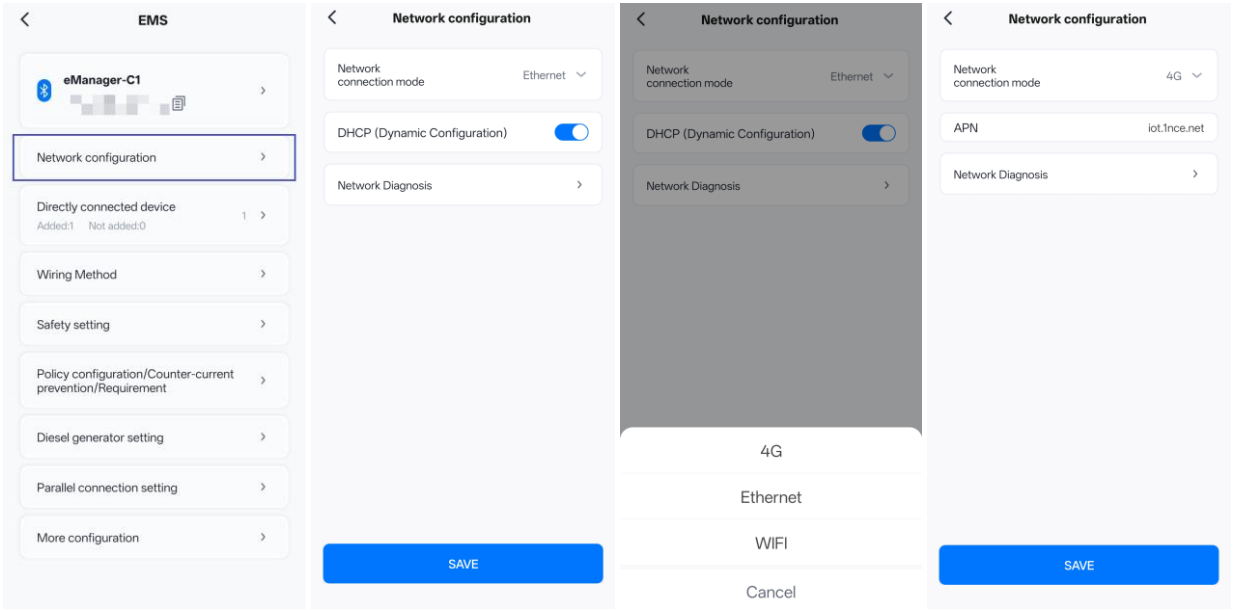
When the 4G service is required for the EMS to connect to the cloud platform, configure the 4G network service on the EMS.

Before you start

Make sure that the 4G SIM card has been installed to the EMS. For detailed instructions, see section 5.6 "Connect the EMS unit cables" on page 51.

Procedure

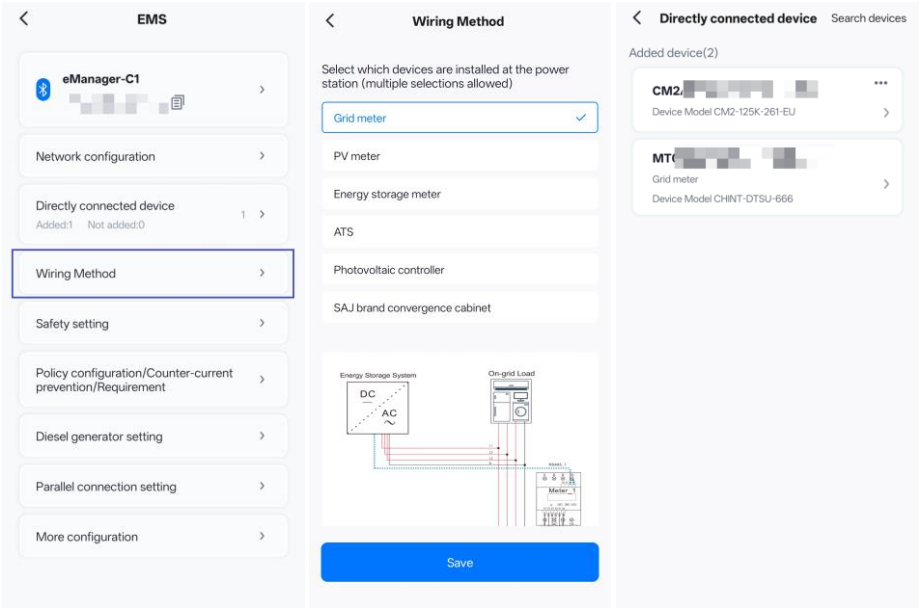
1. Log in to the App and connect to the EMS unit through Bluetooth connection.
2. On the **EMS** page, select **Network configuration**.
3. On the **Network configuration** page, select **Network connection mode**, and select **4G**.
4. Set parameter **APN** to the APN name of the 4G service provider and save the changes.



7.7. Configure meter connection

When the PV or grid meters are installed, configure the meter connection with the EMS.

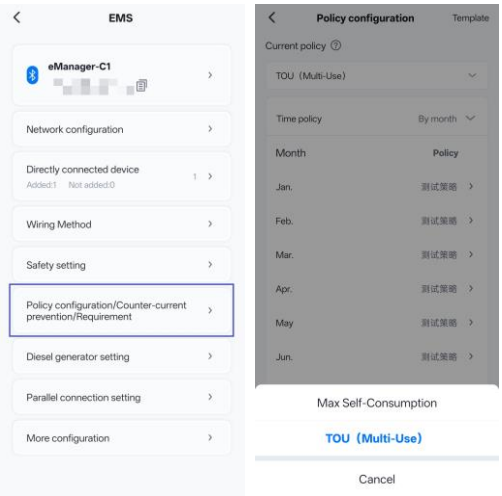
1. Log in to the App and connect to the EMS unit through Bluetooth connection.
2. On the **EMS** page, select **Wiring Method**.
3. On the **Wiring Method** page, select the corresponding meter, and save the changes.
4. On the **Directly connected device** page, check that the selected meter is added under the EMS unit successfully.



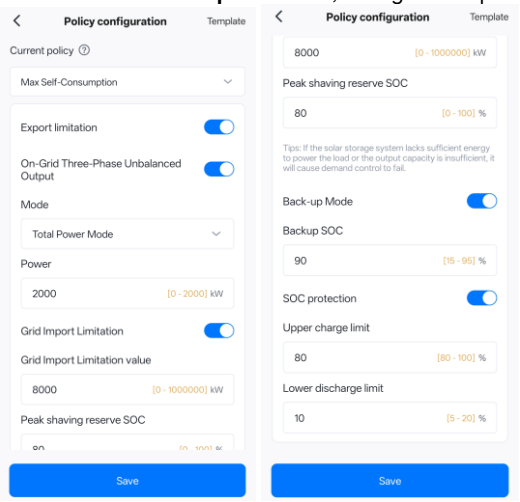
7.8. Configure the working mode

Configure the working mode of the CM2 system according to the actual requirement of the users. Customized policy template can be configured and applied on the App.

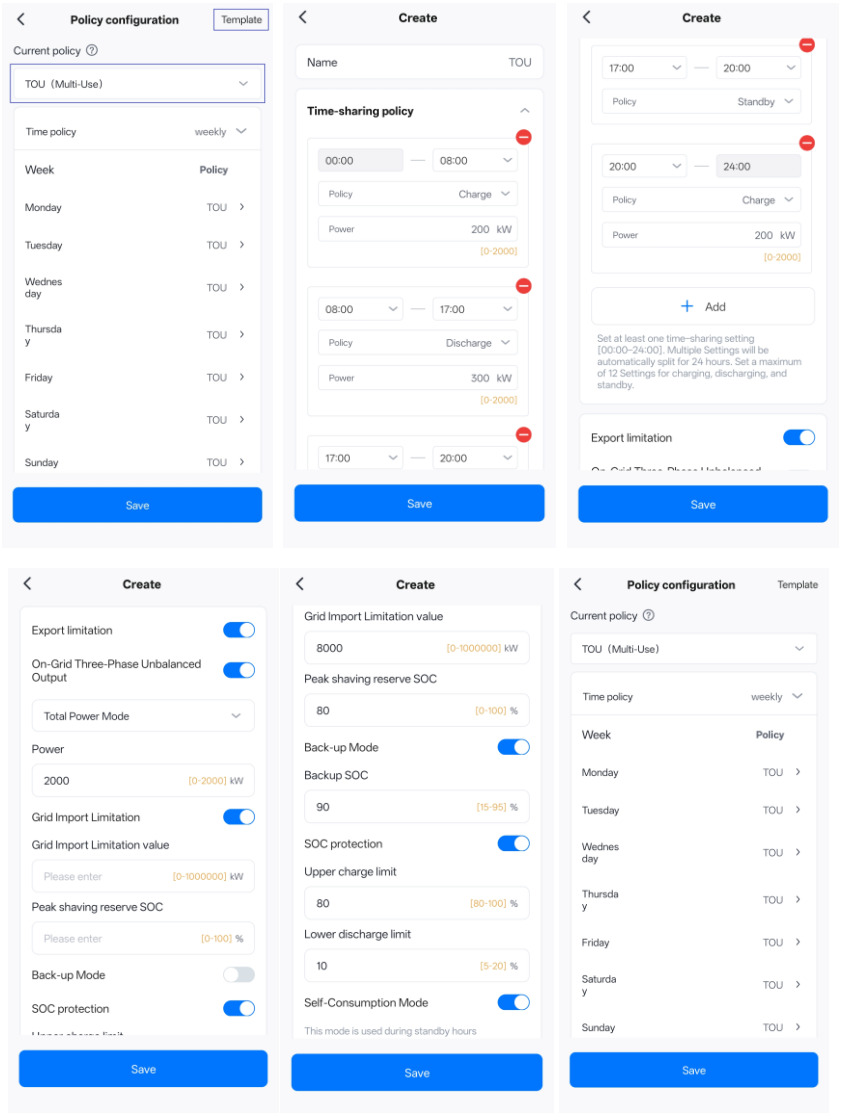
1. Log in to the App and connect to the EMS unit through Bluetooth connection.
2. On the **EMS** page, select **Policy configuration/Counter-current prevention/Requirement**.
3. Select the working mode **Max Self-Consumption** or **TOU (Multi-Use)**.

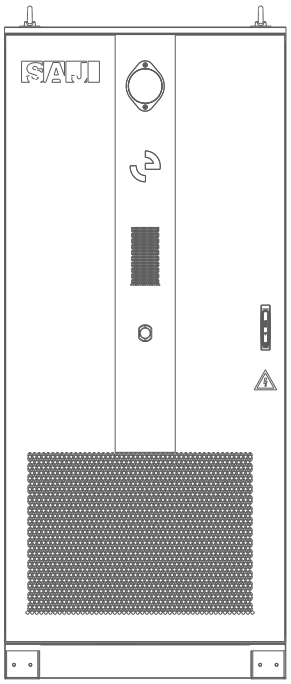


For **Max Self-Consumption** mode, configure the parameters as the following example shows:



For **TOU (Multi-Use)** mode, tap **Template** to create customized working mode for different time-slots. For example, configure the working policy for time periods 00:00-08:00, 08:00-17:00, 17:00-20:00, and 20:00-24:00; and apply the policy for all days on weekly basis:





8.

COMMISSIONING ON WEB



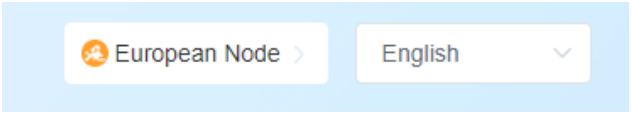
8.1. The elekeeper web platform

The elekeeper web platform is a smart energy management system that monitors the power production and consumption statistics of the CM2 BESS.

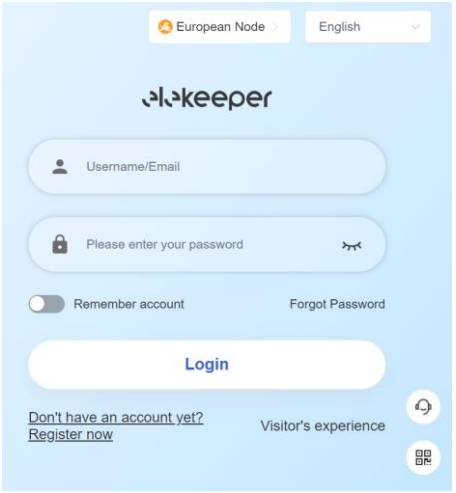
Most of the BESS configurations can be either completed on the elekeeper App or the elekeeper web platform; however, some data can only be viewed on the web platform, such as information about the smart meter and fire protection.

8.2. Log in to the web platform

1. Open https://eop.saj-electric.com/ on the web browser.
2. On the top right corner of the home page, select the node and language as required. For example:



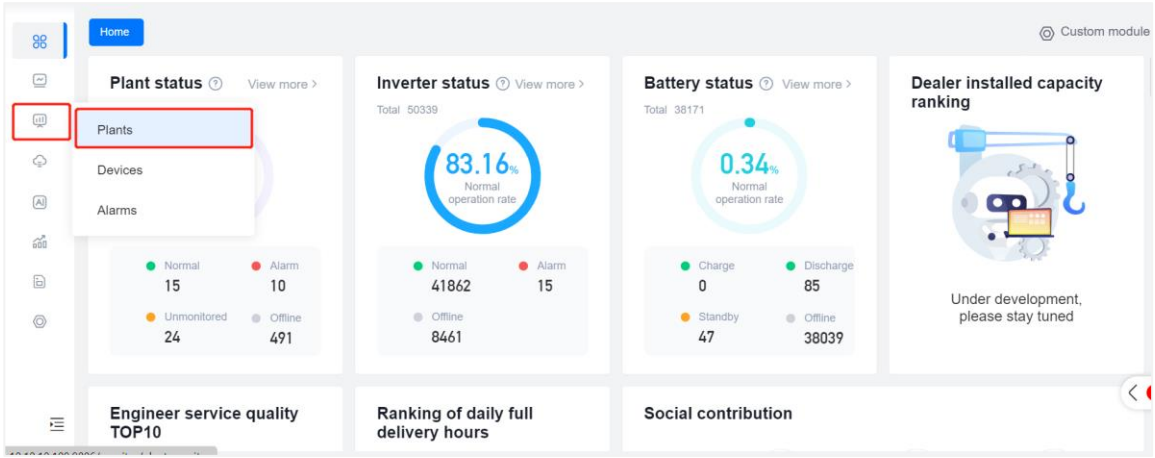
3. For the first-time login, register first.
   a. Tap **Don't have an account yet? Register now**.
   b. Follow the instructions to complete registration.

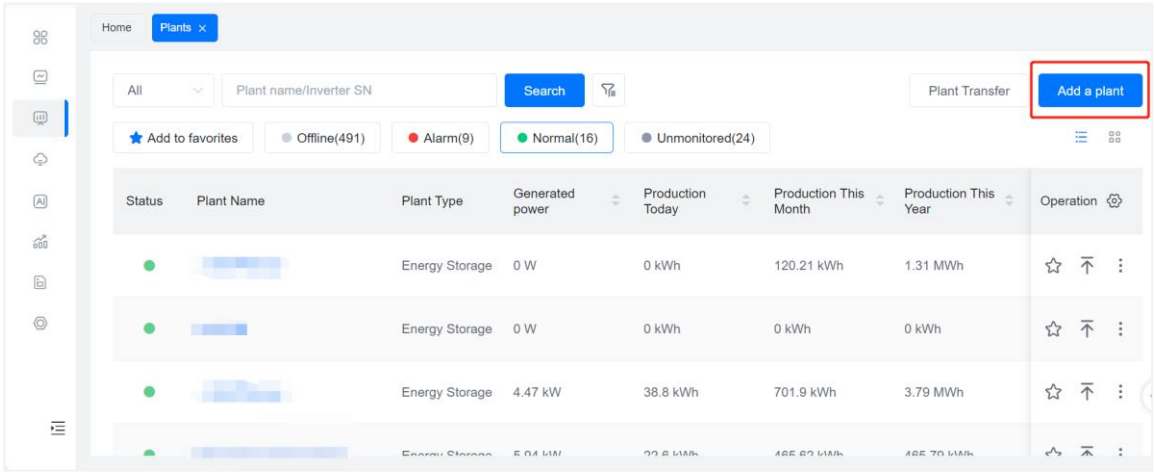


4. Use the account and password to log in to the platform.

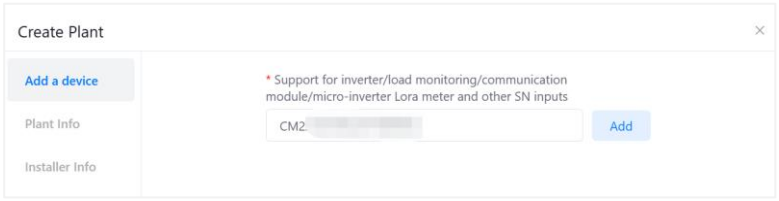
8.3. Create a plant

1. On the **Home** page, select **Plants** on the left navigation pane. Then, select **Add a plant** on the upper right corner.

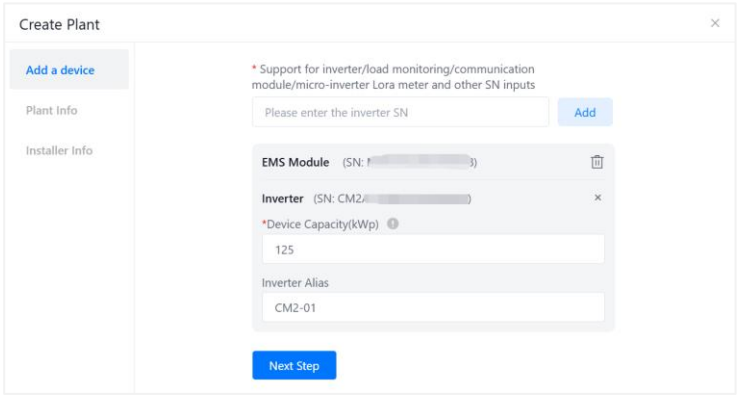




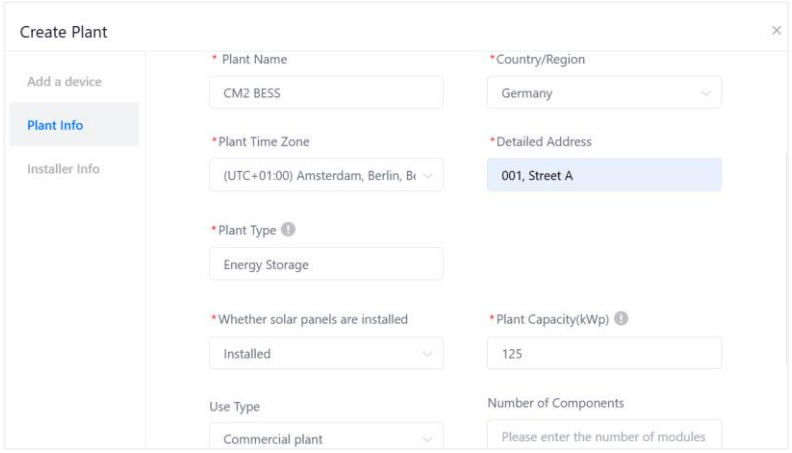
2. On the **Create Plant** page, follow the instructions on the screen.
   a. On the **Add a device** page, enter the device SN and click **Add**.



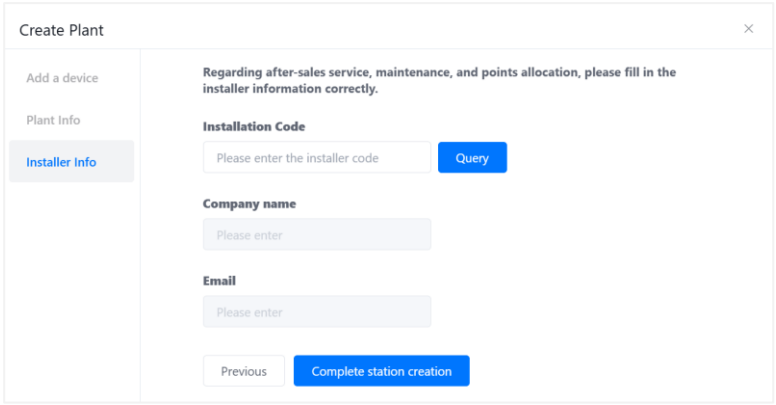
   b. When the EMS module is displayed, confirm the bonding with the CM2 BESS and enter the inverter name.



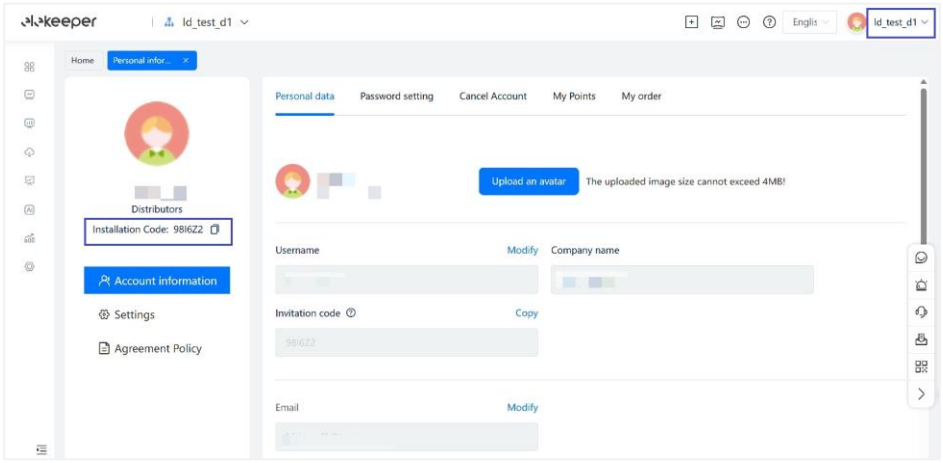
   c. On the **Plant Info** page, enter the plant name and address. Then, configure the plant details, such as type and capacity.



d. On the **Installer Info** page, enter the installation code.



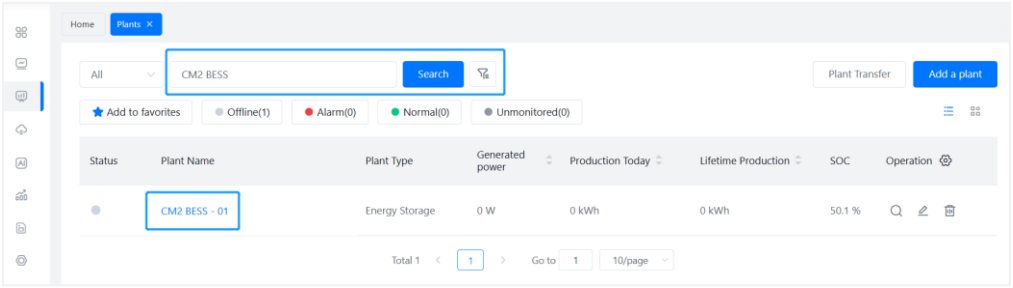
The installation code is only available for the installer role. The code can be found under the **Personal center**. For example: 98I6Z2.



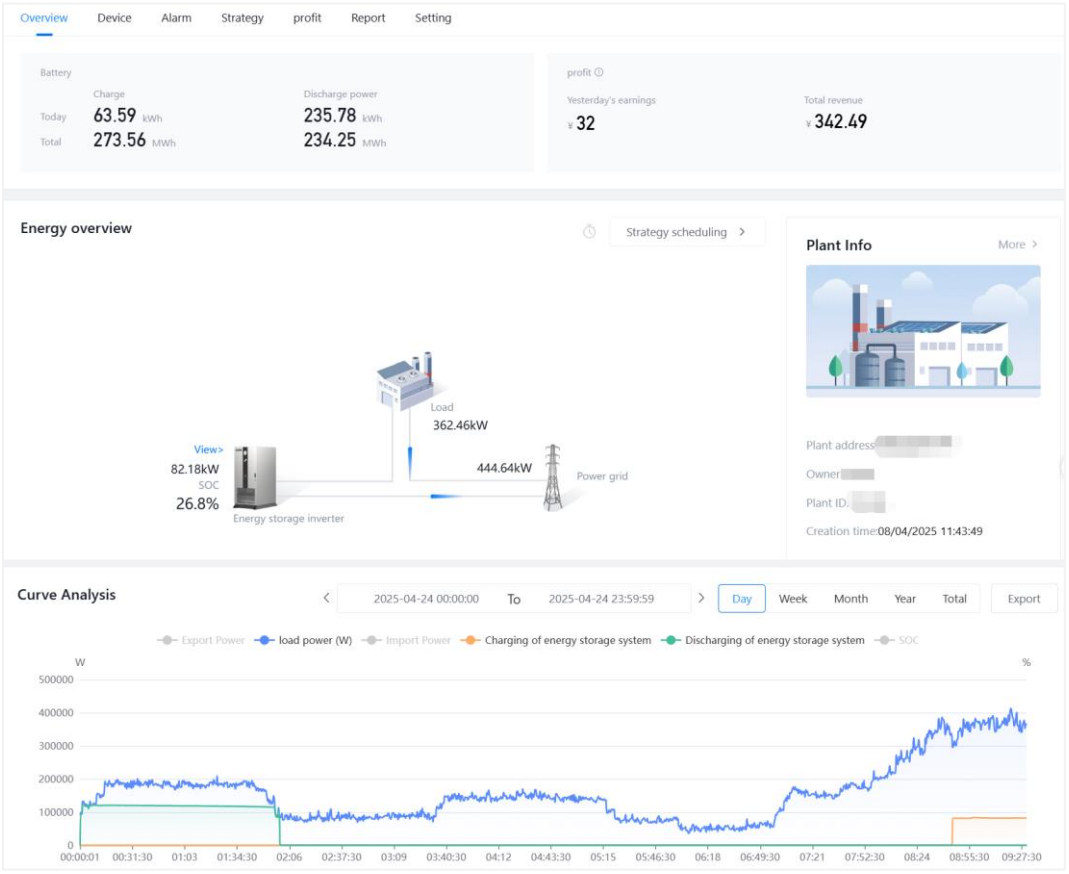
e. Click on **Complete station creation** to finish the creation.

8.4. View the plant statistics

1. On the **Home** page, choose **Plants** on the left navigation pane. Search or filter out the target plant.

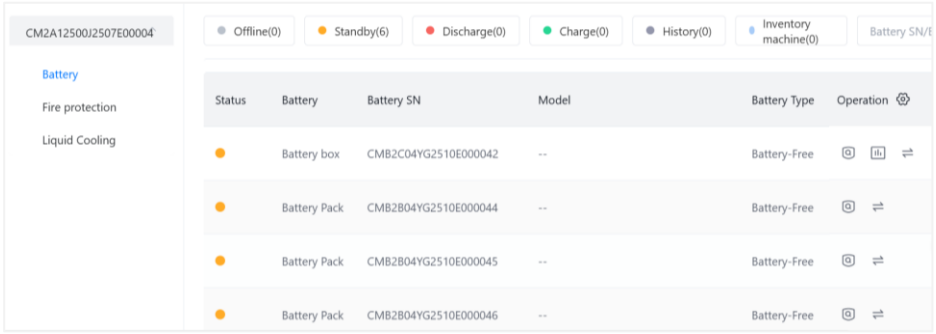


2. Click on the listed plant name to view the plant statistics. For example, CM2 BESS-01.

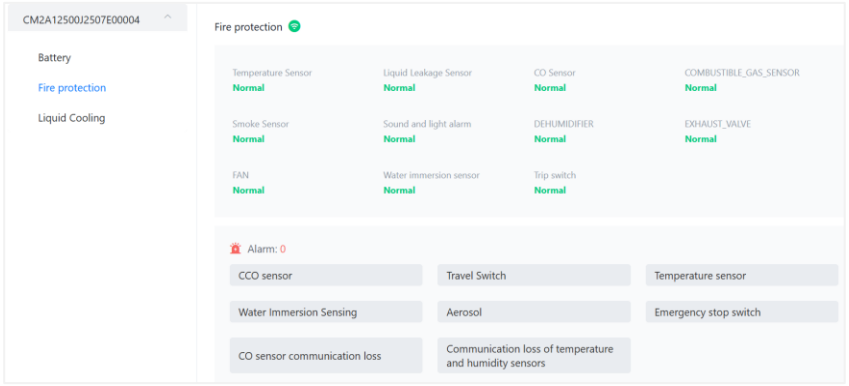


- On the **Overview** page, you can view data like system power production, consumption, battery charging and discharging, and revenue statistics.
  - **Energy overview**: It provides a dynamic connection diagram between PV arrays, grid, loads, and batteries.
  - **Plant Info**: It lists plant address, owner name, capacity, and creation time.
  - **Curve analysis**: You can view the electric energy production and consumption by day, week, month, year, or in total. In addition, you can click on **Export** on the right corner of this area to view the data in Excel format.
  - **Revenue analysis**: You can set the local electricity price. The platform can provide the revenue statistics based on the actual power generation and consumption.
  - **Plant weather**: It shows the current weather in your local area.
  - **Social contribution**: It provides the CO2 emission reduction and standard coal saving statistics and converts the saving to contributions of planted trees.
- On the **Device** page, you can view statistics of the **Battery**, **Fire protection**, and **Liquid Cooling**.

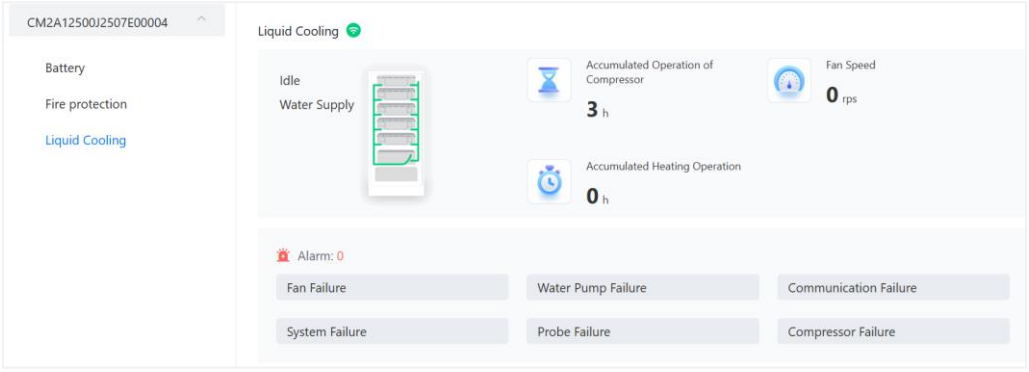
Battery:



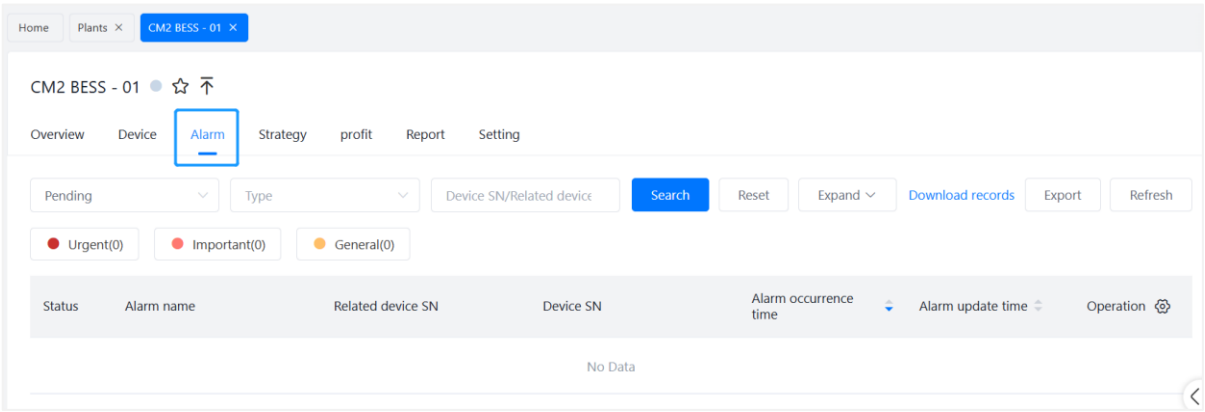
Fire protection:



Liquid cooling:



- On the **Alarm** page, you can view the details of the open and closed alarms.



9.

COMMUNICATION BY LAN



9.1. EMS web platform

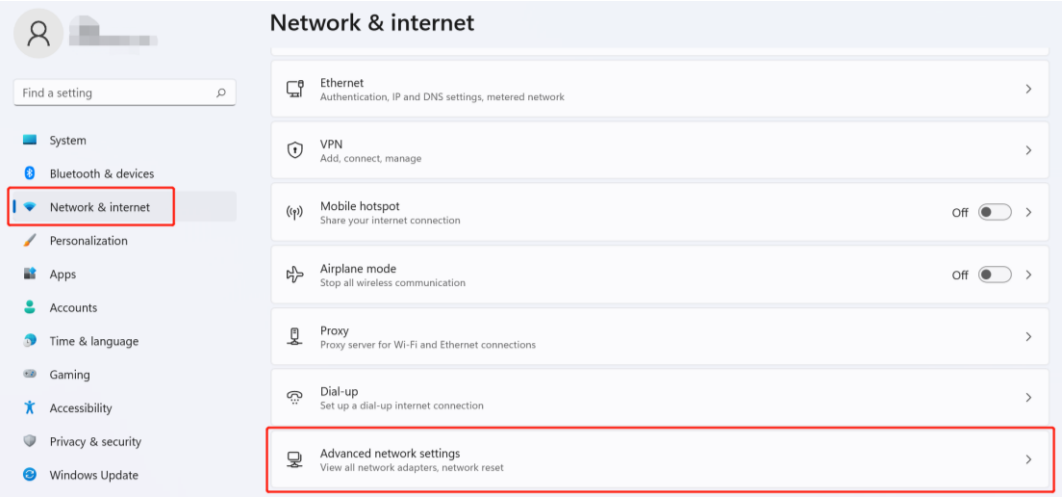
The eSAJ All-In-One Smart EMS is a local web platform that allows the users to view the device, alarm, and strategy of the product. In comparison to the elekeeper web platform, the real-time device data are updated every two seconds.

9.2. Connect the EMS to the computer

1. Prepare an RJ45 network cable.
2. Connect one end of the cable to one of the **Ethernet** ports on the EMS unit depending on which port is available.
3. Connect the other end of the cable to your computer.

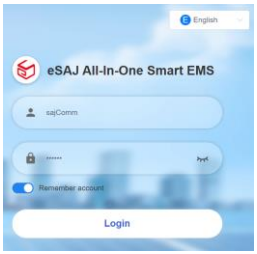
9.3. Log in to the EMS web platform

1. Open your computer, set the IP address, subnet mask, and default gateway.
   a. In **Settings**, select **Network & internet** on the left navigation pane and then select **Advanced network settings** on the right pane.

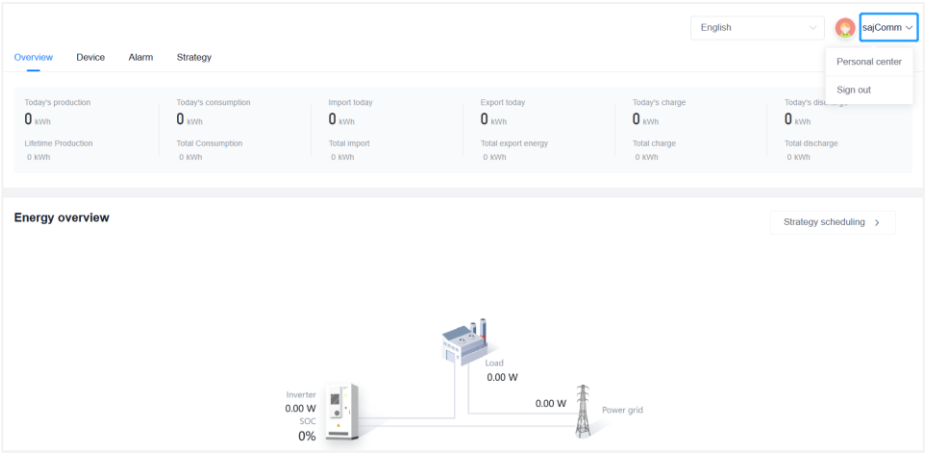


   b. Select the **Ethernet** network. Locate **More adapter options** and click **Edit**.
   c. Configure the manual IP address and subnet mask as follows:
      - IP address: 192.168.1.110
      - Subnet mask: 255.255.255.0

2. Open the IP addresses **192.168.1.136** on the web browser.
3. Use the account **sajComm** and password **080808** to log in.

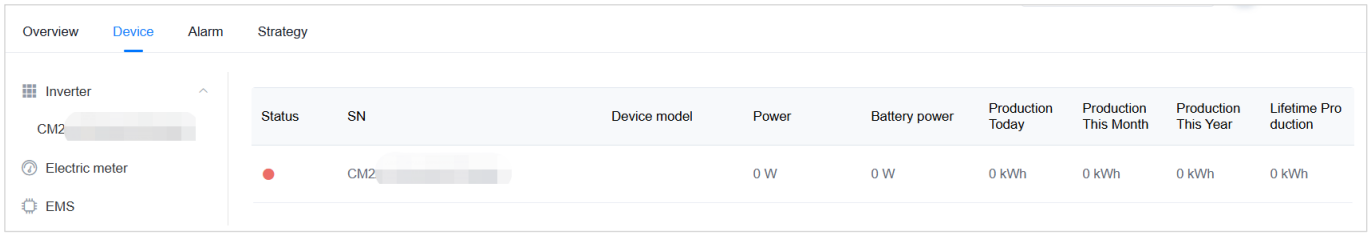


To change the password, enter the account name **sajComm** on the upper right corner and select **Personal center**. Then, follow the instructions on the screen to change password.

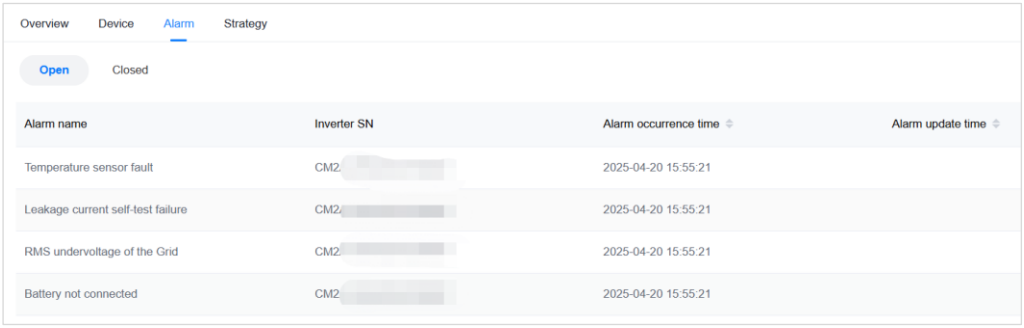


9.4. View the device information

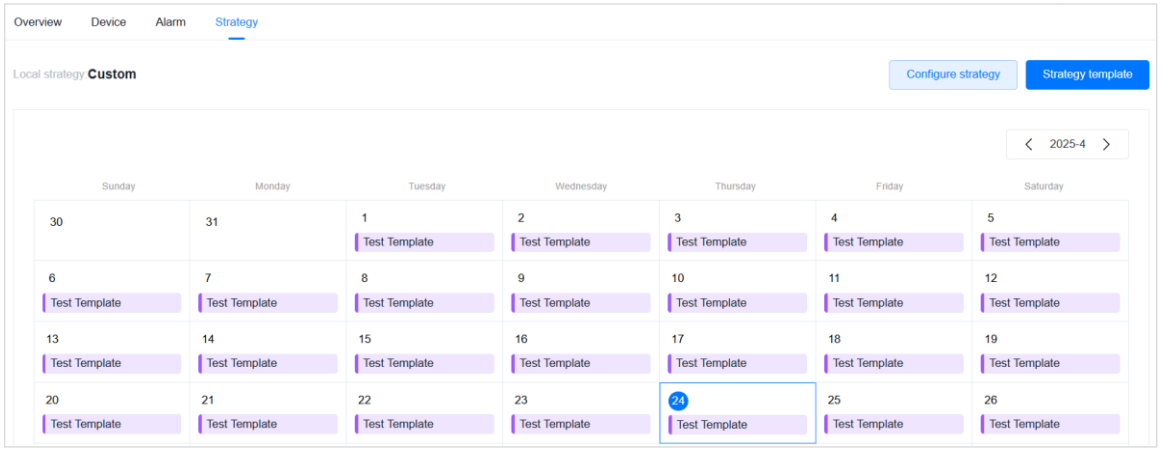
1. To view the device information, open the **Device** tab and select the required device from the list on the left-side.

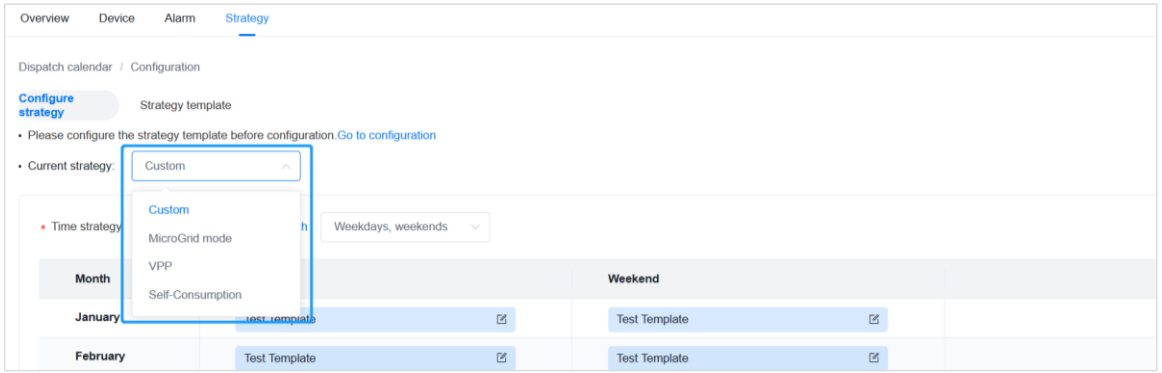


2. To check the reported alarms, open the **Alarm** page to view the active or history alarms.



3. To view the current strategy, open the **Strategy** page. To modify the current strategy, click on **Configure strategy**, and select the proper strategy.





10.

TROUBLESHOOTING

For the errors reported as below, take the suggested troubleshooting actions in the listed order first. If the error is still present after taking the suggested actions or no specific action is suggested, contact the service support for further assistance.

The troubleshooting operations must be performed by authorized technicians.

Error code	Error message	Cause	Troubleshooting actions
1	Instantaneous Overcurrent of Inverter (Software)	Inverter output current exceeds the inverter limit.	1. Detect whether the voltage waveform at the grid connection point is normal; check whether there is a shock load start and stop. 2. Connect the AC switch and restart the inverter.
2	Instantaneous Overvoltage of Busbar (Software)	DC input voltage exceeds the inverter's allowed limit.	1. Check the number of battery packs. 2. Calculate if the open-circuit voltage of the battery pack exceeds the maximum input voltage of the inverter. 3. Close the AC switch and restart the inverter.
3	Overmodulation Fault	Grid voltage is too high or battery voltage is too low.	1. Investigate if the grid voltage is too high. 2. Check the current battery voltage.
4	Instantaneous Imbalance of Bus Voltage	Bus voltage imbalance.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.
7	Instantaneous Overcurrent of Inverter (Hardware)	Inverter output current exceeds the inverter limit.	1. Detect whether the voltage waveform at the grid connection point is normal; check whether there is a shock load start and stop. 2. Close the AC switch and restart the inverter.
8	Instantaneous Overvoltage of Busbar (Hardware)	DC input voltage exceeds the inverter's allowed limit.	1. Check the number of battery packs. 2. Calculate if the open-circuit voltage of the battery pack exceeds the maximum input voltage of the inverter. 3. Close the AC switch and restart the inverter.
9	Half-Bus Hardware Overvoltage	DC input voltage exceeds the inverter's allowed limit.	1. Check the number of battery packs. 2. Calculate if the open-circuit voltage of the battery pack exceeds the maximum input voltage of the inverter. 3. Disconnect the AC/DC switches for 5 minutes. 4. Restart the inverter.
10	Balance Bridge Hardware Overcurrent	Balance bridge current exceeds the inverter limit.	1. Disconnect the AC/DC switches for 5 minutes and reduce the connected loads. 2. Wait for 5 minutes and restart the inverter.
11	Auxiliary Power Supply Failure	Auxiliary power supply failure .	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.

Error code	Error message	Cause	Troubleshooting actions
12	Bus Undervoltage	Bus voltage is lower than the inverter protection limits.	1. Disconnect the AC/DC switches for 5 minutes and reduce the connected loads. 2. Wait for 5 minutes and restart the inverter.
17	Insulation Impedance Fault	Insulation resistance between PCS and ground is below the set value.	1. Disconnect the AC/DC switches for 5 minutes. 2. Check for broken DC cables and broken battery pack surfaces. 3. Check the battery pack for water immersion and power cable connections for condensation. 4. Close the AC switch and restart the inverter.
18	Ground Leakage Current Fault	Ground leakage current is detected in the power station system.	1. Disconnect the AC/DC switches for 5 minutes. 2. Check for broken DC cables and broken battery pack covers. 3. Check the battery pack for water immersion and power cable connections for condensation. 4. Check the AC cables for any damage or water immersion. 5. Close the AC switch and restart the inverter.
19	Neutral to Ground Short Circuit	Short circuit of N line to the ground.	1. Disconnect the AC/DC switches for 5 minutes. 2. Check the AC N cable for any damage or water immersion. 3. Check whether the connection sequence of the AC three-phase cables is correct. 4. Close the AC switch and restart the inverter.
20	Balance Bridge Software Overcurrent	Inductor current in the balance bridge exceeds the range.	1. Disconnect the AC/DC switches for 5 minutes and reduce the connected loads. 2. Wait for 5 minutes and restart the inverter.
21	Excessive DC Component in Grid Connection Current	The DC component of the grid connection current exceeds the limit.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.
22	Temperature Sensor Fault	Temperature sensor is disconnected.	Check if the ambient temperature is too low.
23	Islanding Fault	Grid loss causing islanding effect .	1. Confirm whether there is a power outage and check if the grid connection box switch has tripped. 2. Check if the inverter AC cables are securely connected. 3. Close the AC switch and reconnect to the grid.

Error code	Error message	Cause	Troubleshooting actions
24	Grid Phase Loss	At least one of grid A/B/C phases missing or N-line missing.	1. Disconnect the AC/DC switches for 5 minutes. 2. Check if the AC cable connections are correct. 3. Close the AC switch and restart the inverter.
25	PCS High Temperature	The PCS temperature is too high.	1. Check that enough space is reserved around the cabinet as instructed. 2. Check if the PCS's cooling channels are blocked. 3. Check if the PCS is installed in direct sunlight. 4. Ensure good ventilation in the installation environment.
27	Grid Loss Fault	Inverter cannot detect the grid or grid voltage is too low.	1. Check if the grid voltage is too low. 2. Inspect if the inverter's AC output cables are securely connected. 3. Check if the output AC switch is closed or not. 4. Verify if the inverter's grid compliance is correctly set.
28	Grid Phase Sequence Error	Incorrect grid phase sequence between three-phase electricity.	1. Measure the voltage between each pair of the three-phase lines to ensure that it is normal. 2. Check that the phase sequence is correct. 3. If the voltage and phase sequence are normal, disconnect the AC/DC switches for 5 minutes and restart the inverter.
29	Ground Leakage Self-Check Fault	Leakage current detection sensor fault during inverter startup self-check.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.
33	Grid Overvoltage	Grid voltage exceeds the inverter's allowed range.	1. Check if the grid voltage is too high. 2. Inspect if the inverter's AC output cables are securely connected. 3. Check if the grid connection cables are too thin. 4. Verify if the inverter's grid compliance is correctly set.
34	Inverter Overvoltage	Inverter output voltage exceeds the inverter limit.	1. Check if the inverter output voltage is too high. 2. Inspect if the inverter's AC output cables are securely connected. 3. Check if the grid connection cables are too thin. 4. Verify if the inverter's grid compliance is correctly set.
35	Grid RMS Undervoltage	Grid voltage is below the allowable range of the inverter.	1. Check if the grid voltage is too low. 2. Inspect if the inverter's AC output cables are securely connected. 3. Verify if the inverter's grid compliance is correctly set.

Error code	Error message	Cause	Troubleshooting actions
36	Inverter RMS Undervoltage	Inverter voltage is below the allowable range of the inverter.	1. Check if the inverter voltage is too low. 2. Inspect if the inverter's AC output cables are securely connected. 3. Verify if the inverter's grid compliance is correctly set.
37	Temperature Derating Fault	The temperature inside the PCS is too high.	1. Check that the cabinet and PCS air inlets and outlets are not blocked. 2. Check whether the fan is working properly. 3. Check if the ambient temperature is too high. 4. Check whether the cabinet is under direct sunlight. 5. Check that enough space is reserved around the cabinet as instructed.
38	Inverter RMS Overcurrent	Inverter output current exceeds the inverter limit.	1. Detect whether the voltage waveform at the grid connection point is normal. 2. Check whether the voltage at the grid connection point is too low. 3. Close the AC switch and restart the inverter.
39	Grid Overfrequency	Grid frequency exceeds the upper limit specified by local regulations.	1. Verify if the inverter's grid compliance is correctly set. 2. Detect whether the voltage waveform at the grid connection point is normal. 3. Disconnect the AC/DC switches for 5 minutes. 4. Restart the inverter.
40	Inverter Overfrequency	Inverter frequency exceeds the upper limit specified by local regulations.	
41	Grid Underfrequency	Grid frequency is below the lower limit specified by local regulations.	
42	Inverter Underfrequency	Inverter frequency is below the lower limit specified by local regulations.	1. Verify if the inverter's grid compliance is correctly set. 2. Detect whether the voltage waveform at the grid connection point is normal. 3. Disconnect the AC/DC switches for 5 minutes. 4. Restart the inverter.
43	Battery Overvoltage	Battery voltage is higher than the inverter protection limit.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.
44	Battery Overcurrent	Battery charge is too low or load is too high, causing the battery to be unable to output.	1. Reduce the back-up load. 2. Charge the battery or stop using it.

Error code	Error message	Cause	Troubleshooting actions
45	Battery Undervoltage	Low battery voltage detected during discharge overload.	1. Force charging the battery packs. 2. If failed to charge the battery packs, turn off the PCS DC switch and contact the installer.
46	Inverter Overload	Load connected to the inverter exceeds CM2's maximum output power.	Reduce the connected load.
47	Grid N-Phase Loss	The connection to the grid N line is not working.	1. Disconnect AC/DC switches for 5 minutes. 2. Check whether the AC N cable connection on the PCS is secure; check whether the N line relay at the grid connection point is working properly. 3. Connect the AC/DC switches. 4. Restart the inverter.
48	Abnormal Bus Voltage Difference	The difference between bus voltage and battery voltage exceeds the threshold.	1. Disconnect the AC/DC switches for 5 minutes. 2. Check if battery cables are securely connected. 3. Restart the inverter.
49	Internal Communication Fault of PCS	Lost internal communication within the inverter.	1. Disconnect AC/DC switches for 5 minutes. 2. Restart the inverter.
50	Emergency Stop Fault	Manual activation of the emergency stop switch.	Deactivate the emergency stop switch.
51	Parallel Line Connection Abnormality	Abnormal parallel line connection.	1. Check if the parallel connection cables are properly connected. 2. Close the AC switch and restart the inverter.
52	SPD Fault	The surge protection device (SPD) is broken.	1. Disconnect AC/DC switches for 5 minutes. 2. Check whether the SPD inside the PCS is damaged or not; check whether the SPD indicator shows red. 3. Check whether the SPD signaling wire is connected securely.
53	Secondary Relay Fault	• Relay circuit short-circuit or open-circuit on the secondary grid side; • Relay short-circuit or open-circuit on the host grid side; • Relay short-circuit or open-circuit on the DC side.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.

Error code	Error message	Cause	Troubleshooting actions
54	Synchronization Lock Phase Timeout	Abnormal phase synchronization between parallel inverters.	Check if the parallel connection cables are properly connected.
55	Main Relay Fault	• Relay circuit short-circuit or open-circuit on the host inverter side; • Relay short-circuit or open-circuit on the host inverter side; • Relay short-circuit or open-circuit on the DC side.	1. Disconnect the AC/DC switches for 5 minutes. 2. Restart the inverter.
56	Synchronization Pulse Fault	Carrier synchronization fault.	1. Disconnect the AC side switch for 5 minutes. 2. Check if the carrier synchronization line is correctly connected.
59	Battery Connection Error	• Battery not connected; • Battery cable connections are reversed.	1. Disconnect AC/DC switches for 5 minutes. 2. Check if battery cables are correctly connected.
60	CPLD Series Fault	• Abnormal CPLD version; • CPLD detects driver signal abnormality; • CPLD detects BMS fault signal.	1. Contact technical support to check the CPLD program version. 2. Inspect the BMS faults on the App.
61	Inverter Soft Start Failure	Failure of inverter output soft start.	1. Disconnect AC/DC switches for 5 minutes. 2. Restart the inverter.
62	Model Setting Error	Mismatch between software and hardware model versions.	Check the hardware and software versions and contact technical support for further assistance.
63	Bus Soft Start Failure	Failure of battery pre-charge bus.	1. Disconnect AC/DC switches for 5 minutes. 2. Restart the inverter.
64	Parallel CAN Communication Failure	Failure of parallel CAN communication.	Check the parallel CAN communication wiring for abnormalities.
65	Grid Online Warning	Grid is detected online while in off-grid mode.	1. Disconnect AC/DC switches for 5 minutes. 2. Check whether the grid connection still shows online.
66	Temperature Sensor Warning	Temperature sensor disconnected.	Check if the ambient temperature is too low.

Error code	Error message	Cause	Troubleshooting actions
67	Low Host Temperature	IGBT/cabinet/balance bridge temperature too low.	1. Check if the ambient temperature is too low. 2. If not, disconnect the AC/DC switches for 5 minutes. 3. Restart the inverter.
68	Fan Warning	Fan blades stuck or damaged.	1. Inspect if the external fan (if any) is operating normally. 2. If the fan operates normally but the fault persists, disconnect the AC/DC switches for 5 minutes. 3. Restart the inverter.
69	Overmodulation Warning	Overmodulation coefficient reaches the warning range.	1. Check if the grid voltage is too high. 2. Check if the current battery voltage is too low. 3. Set the device to charging mode to increase the battery voltage or reduce the output power in discharge mode.
70	Derating Warning	System enters a derated power state, triggering an alarm.	1. Check if the equipment temperature is too high. 2. Check if there is a fan warning. 3. Check if there is an overmodulation warning. 4. Check if the system BMS has triggered an alarm.
71	Battery Overvoltage Warning	Battery voltage is too high and exceeds the warning value.	Do not charge at this point.
72	Battery Undervoltage Warning	Battery voltage is too low and falls below the warning value.	Do not discharge at this point.
73	Battery Overcurrent Warning	Battery current exceeds the warning value.	Reduce the power at this point.
81	Internal Communication Fault	Unable to communicate with DSP or DSP response error.	Check the hardware or software versions.
82	BMS Communication Loss Warning	Communication failure with BMS.	Check if the BMS communication cable connections are normal.
83	EMS Communication Loss Warning	Communication failure with EMS.	Check if the EMS communication cable connections are normal and related settings are correct.
90	Memory Fault	Memory read/write fault.	Check if the memory is functioning normally.
91	RTC Fault	RTC clock chip fault.	Check if the clock chip is functioning normally.
97	Internal BMS Communication Loss	Internal communication loss within BMS.	1. Check if the communication cable connections are correct.

Error code	Error message	Cause	Troubleshooting actions
98	Battery Sequence Error	Abnormal communication with battery pack.	2. Verify if the last battery pack has a connector plug.
99	Discharge Overcurrent Protection	The battery discharge current exceeds the set threshold.	Wait for the fault to clear or restart the system.
100	Charge Overcurrent Protection	The battery charge current exceeds the set threshold.	
101	Battery Undervoltage Protection	The battery total voltage falls below the set threshold.	Force charging the battery.
102	Battery Overvoltage Protection	The battery total voltage exceeds the set threshold.	Wait for the fault to clear or restart the system.
103	Cell Undervoltage Protection	The battery cell voltage falls below the set minimum value.	Force charging the battery.
104	Cell Overvoltage Protection	The battery cell voltage exceeds the set threshold.	Wait for the fault to clear or restart the system.
105	BMS Hardware Error	BMS hardware fault.	Contact the installer.
106	Charging Under-temperature Protection	Battery charging below 0℃.	1. Wait for the battery to warm up until the fault clears. 2. Check whether the liquid control system is working properly.
107	Charging Over-temperature Protection	Battery temperature too high during charging.	1. Wait for the battery to cool down until the fault clears. 2. Check whether the liquid control system is working properly.
108	Discharging Under-temperature Protection	Battery temperature too low, which causes the relay to disconnect and stop discharging.	1. Wait for the battery to warm up until the fault clears. 2. Check whether the liquid control system is working properly.
109	Discharging Over-temperature Protection	Battery temperature too high during discharging.	1. Wait for the battery to cool down until the fault clears. 2. Check whether the liquid control system is working properly.
110	BMS Relay Error	• Negative or positive relay stuck; • Negative or positive relay unable to close.	Restart the inverter.

Error code	Error message	Cause	Troubleshooting actions
111	Precharge Error	• Precharge relay damaged; • Precharge resistor open circuit; • BMS damaged.	Restart the inverter.
112	BMS Insulation Error	BMS insulation fault.	1. Check the battery cables for any damage. 2. Check the battery pack covers for any damage. 3. Check the battery pack for any water invasion or condensation. 4. Restart the inverter.
113	BMS Manufacturer Incompatibility	BMS manufacturer mismatch.	Contact the installer.
114	Cell Manufacturer Incompatibility	Inconsistent cell manufacturers of the battery pack.	Contact the installer.
115	Cell Position Incompatibility	Inconsistent cell positions within the battery pack.	Contact the installer.
116	Battery Pack Models or Position Incompatibility	Battery pack model mismatch.	Contact the installer.
117	Circuit Breaker Open	• Battery circuit breaker not closed; • Abnormal auxiliary contacts of the battery circuit breaker.	Close the battery air switch.
118	Excessive Cell Temperature Difference	The temperature difference of the battery cells exceeds the threshold value.	1. Check that the liquid control system is working properly. 2. Check whether the coolant has not been replaced for more than 5 years. 3. Check whether the cabinet is under direct sunlight or near any heat sources. 4. Check whether the cabinet air inlets and outlets are blocked. 5. Restart the inverter.
119	Excessive Cell Voltage Difference (Level 2)	The voltage difference of the battery cells exceeds the threshold value.	1. Check whether the battery packs are over-charged or over-discharged. 2. Restart the inverter.
120	Excessive Cell Voltage Difference (Level 1)		

Error code	Error message	Cause	Troubleshooting actions
121	Cell Over-temperature Protection	• High ambient temperature; • Battery overload.	1. Check that the liquid control system is working properly. 2. Check whether the coolant has not been replaced for more than 5 years. 3. Check whether the cabinet is under direct sunlight or near any heat sources. 4. Check whether the cabinet air inlets and outlets are blocked. 5. If the temperature is normal, let the battery rest for 30 minutes and restart the inverter.
122	Battery Short Circuit Protection	Short circuit between positive and negative terminals of the battery.	Check if the battery cable connections are correct.
123	System Voltage Mismatch	Contact a technician to identify the problem.	Contact the installer.
124	System Locked	Contact a technician to identify the problem.	Contact the installer.
125	FUSE Error Protection	Contact a technician to identify the problem.	Contact the installer.
126	High Voltage Protection on Charging Port	Contact a technician to identify the problem.	Contact the installer.
500	Failure of Water Supply Pump	Failure of water supply pump.	1. Check that the ambient temperature is not too high or too low. 2. Check that the cabinet air inlet and outlet vents are not blocked. 3. Check for proper power supply to the liquid control system. 4. Check that the QF2 switch on the cabinet and the air switch on the liquid control system is not tripped. 5. Power off and restart the liquid control system.
501	Pump Idle Protection	Pump idle protection.	
502	Pump Plugging Failure	Pump plugging failure.	
503	Pump Overcurrent Failure	Pump overcurrent failure.	
504	Pump Under-pressure Failure	Pump under-pressure failure.	
505	Pump Overpressure Failure	Pump overpressure failure.	
506	Pump Phase Loss/Current Sampling Offset/Out-of-step/Precharge Fault	Pump phase loss/current sampling offset/out-of-step/precharge fault	
507	Pump Drive Overheating Protection	Pump drive overheating protection is triggered.	
508	Faulty Water Supply Pressure Sensor	Faulty water supply pressure sensor.	
509	Motherboard IIC Error	Motherboard IIC error.	

Error code	Error message	Cause	Troubleshooting actions
510	Low Return Pressure Fault	Low return pressure fault.	
511	High Water Supply Pressure	High water supply pressure.	
512	Overvoltage Fault	Overvoltage fault.	1. Check that the ambient temperature is not too high or too low. 2. Check that the cabinet air inlet and outlet vents are not blocked. 3. Check for proper power supply to the liquid control system. 4. Check that the QF2 switch on the cabinet and the air switch on the liquid control system is not tripped. 5. Power off and restart the liquid control system.
513	Low Voltage Fault	Undervoltage fault.	
514	System Low Voltage	System low voltage.	
515	Electric Heating Protection	Electric heating protection.	
516	Fan Overload	Fan overload.	
517	System High Voltage Fault	System high voltage failure.	
518	Evaporation Inlet Probe Fault	Evaporation inlet probe failure.	
519	Evaporation Outlet Probe Fault	Evaporative outlet probe failure.	
520	System High Pressure Lockout	System is locked out due to high pressure.	
521	Discharge Pressure Sensor Fault	Exhaust pressure sensor malfunction.	
522	Compressor Converter Communication Error	Communication error of the compressor converter.	
523	Liquid Temperature Probe Fault	Liquid temperature probe failure.	
524	Liquid Return Probe Fault	Liquid return probe failure.	Contact the installer.
525	Environmental Probe Fault	Environmental probe failure.	Contact the installer.
526	High Liquid Outlet Temperature	High liquid temperature at the outlet.	Contact the installer.
527	Return Water Pressure Sensor Fault	Faulty return pressure sensor.	Contact the installer.
528	Communication Timeout between Screen and Mother Board	Communication timeout between screen and motherboard.	Contact the installer.
529	Low Liquid Temperature	Liquid temperature too low.	Contact the installer.

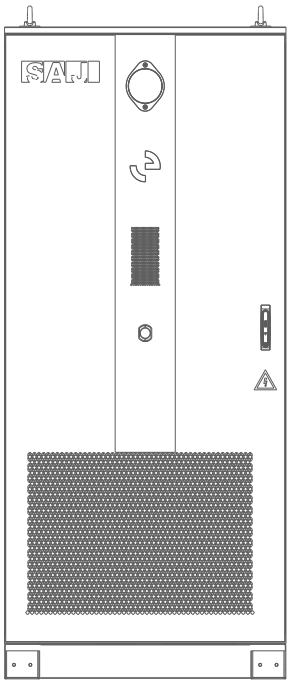
Error code	Error message	Cause	Troubleshooting actions
530	High Water Supply Pressure Warning	Early warning of excessive water supply pressure.	Contact the installer.
531	Power Down Alarm	Power down alarm.	Contact the installer.
532	Board Communication Failure	Board communication failure.	Contact the installer.
533	Compressor Startup Overcurrent	Compressor start-up instantaneous overcurrent.	Contact the installer.
534	Compressor Acceleration Overcurrent	Compressor acceleration overcurrent.	Contact the installer.
535	Compressor Deceleration Overcurrent	Compressor deceleration overcurrent.	Contact the installer.
536	Compressor Overcurrent at Constant Speed	Compressor overcurrent at constant speed.	Contact the installer.
537	Compressor Acceleration Overpressure	Compressor acceleration overpressure.	Contact the installer.
538	Compressor Deceleration Overpressure	Compressor deceleration overpressure.	Contact the installer.
539	Compressor Overpressure at Constant Speed	Compressor overpressure at constant speed.	Contact the installer.
540	Compressor Overpressure at Standby	Compressor overpressure at standby.	Contact the installer.
541	Compressor Under-voltage during Operation	Compressor under-voltage during operation.	Contact the installer.
542	Compressor Output Phase Loss	Compressor output phase loss.	Contact the installer.
543	Compressor Power Device Protection	Compressor power device protection.	Contact the installer.
544	Compressor Overheating	Compressor overheating.	Contact the installer.
545	Compressor Overload	Compressor overload.	Contact the installer.
546	Compressor Detection Press Overload	Compressor detection press overload.	Contact the installer.
547	Compressor Overload	Compressor overload.	Contact the installer.
548	Excessive Compressor Speed	Excessive compressor speed.	Contact the installer.
549	Overcurrent of Compressor D-axis	Overcurrent of compressor D-axis.	Contact the installer.

Error code	Error message	Cause	Troubleshooting actions
550	Overcurrent of Compressor Q-axis	Overcurrent of compressor Q-axis.	Contact the installer.
551	Compressor Parameter Storage Failure	Compressor parameter storage failure.	Contact the installer.
552	Compressor Communication Error	Compressor communication error.	Contact the installer.
553	Compressor Current Detection Fault	Compressor current detection fault.	Contact the installer.
554	Motor Blockage during Compressor Startup	Motor blockage when the compressor starts up.	Contact the installer.
555	Motor Blockage during Compressor Operation	Motor blockage when the compressor is running.	Contact the installer.
556	Compressor Stall Fault	Compressor stall fault.	Contact the installer.
557	Compressor Interruption Overflow 1	Compressor Interruption overflow 1.	Contact the installer.
558	Compressor Interrupt Overflow 2	Compressor Interrupt overflow 2.	Contact the installer.
559	Excessive Rotor Jitter during Compressor Startup	Excessive rotor jitter during compressor startup.	Contact the installer.
560	Excessive Rotor Jitter during Compressor Operation	Excessive rotor jitter during compressor operation.	Contact the installer.
561	PFC Overcurrent	PFC overcurrent.	Contact the installer.
562	PFC Peak Current too Large	PFC peak current too large.	Contact the installer.
563	PFC RMS Current too Large	PFC RMS current too large.	Contact the installer.
564	Fan Start-up Instantaneous Overcurrent	Fan start-up Instantaneous overcurrent.	Contact the installer.
565	Fan Acceleration Overcurrent	Fan acceleration overcurrent.	Contact the installer.
566	Fan Deceleration Overcurrent	Fan deceleration overcurrent.	Contact the installer.
567	Fan Overcurrent at Constant Speed	Fan overcurrent at constant speed.	Contact the installer.

Error code	Error message	Cause	Troubleshooting actions
568	Fan Acceleration Overvoltage	Fan acceleration overvoltage.	Contact the installer.
569	Fan Deceleration Overvoltage	Fan deceleration overvoltage.	Contact the installer.
570	Fan Overvoltage at Constant Speed	Fan overvoltage at constant speed.	Contact the installer.
571	Fan Overvoltage at Standby	Fan overvoltage at standby.	Contact the installer.
572	Fan Undervoltage during Operation	Fan undervoltage during operation.	Contact the installer.
573	Fan Input Phase Loss	Fan Input phase loss.	Contact the installer.
574	Fan Output Phase Loss	Fan output phase loss.	Contact the installer.
575	Fan Power Device Protection	Fan power device protection.	Contact the installer.
576	Fan Overheating	Fan overheating.	Contact the installer.
577	Converter Overload	Converter overload.	Contact the installer.
578	Fan Overload	Fan overload.	Contact the installer.
579	External Fault	Fault of external systems or components.	Contact the installer.
580	Motor Overload	Motor overload.	Contact the installer.
581	Converter Underload	Converter underload.	Contact the installer.
582	Fan Failure	Fan failure.	Contact the installer.
583	Motor Expiration Date	The motor has reached its expiration date.	Contact the installer.
584	Fan Parameter Storage Failure	Fan parameter storage failure.	Contact the installer.
585	Fan Communication Error	Fan communication error.	Contact the installer.
586	Fan Current Detection Fault	Fan current detection fault.	Contact the installer.
587	Poor Self-tuning	Poor self-tuning.	Contact the installer.
588	Fan Analog Input Dropped	Fan analog Input dropped.	Contact the installer.
589	Fan PG Disconnected	Fan PG disconnected.	Contact the installer.
590	Thermistor Open Circuit	Thermistor open circuit.	Contact the installer.
591	Fan Abnormal Shutdown Fault	Fan abnormal shutdown fault.	Contact the installer.

Error code	Error message	Cause	Troubleshooting actions
601	CO Sensor Fault	The CO sensor is faulty.	1. Check whether the sensor is blocked by dust or debris. 2. Check whether the sensor is wired correctly.
602	CO Level-1 Alarm	CO concentration greater than 190 ppm.	1. Turn off the entire energy storage plant, disconnect from the grid, and activate the fire alarm. 2. Observe the cabinet from a distance for smoke and open flames, if any, immediately call the fire alarm and activate the fire emergency program. 3. When the cabinet has no obvious abnormality within 2 hours, restore AC power supply. Monitor the battery cell temperature through remote connection. 4. When the cell temperature is within the normal range, open the cabinet door. Check whether the compound fire detector is working or needs replacement.
603	CO Level-2 Alarm	CO concentration greater than 600 ppm.	
604	VOC Sensor Fault	Volatile organic compounds sensor failure.	1. Check whether the sensor is blocked by dust or debris. 2. Check whether the sensor is wired correctly.
605	VOC Alarm	Excessive concentration of volatile organic compounds.	1. Turn off the entire energy storage plant, disconnect from the grid, and activate the fire alarm. 2. Observe the cabinet from a distance for smoke and open flames, if any, immediately call the fire alarm and activate the fire emergency program. 3. When the cabinet has no obvious abnormality within 2 hours, restore AC power supply. Monitor the battery cell temperature through remote connection. 4. When the cell temperature is within the normal range, open the cabinet door. Check whether the compound fire detector is working or needs replacement.
606	Smoke Sensor Fault	Smoke detection sensor failure.	1. Check whether the sensor is blocked by dust or debris. 2. Check whether the sensor is wired correctly.
607	Smoke Alarm	Excessive smoke concentration.	1. Turn off the entire energy storage plant, disconnect from the grid, and activate the fire alarm. 2. Observe the cabinet from a distance for smoke and open flames, if any, immediately call the fire alarm and activate the fire emergency program.

Error code	Error message	Cause	Troubleshooting actions
			3. When the cabinet has no obvious abnormality within 2 hours, restore AC power supply. Monitor the battery cell temperature through remote connection. 4. When the cell temperature is within the normal range, open the cabinet door. Check whether the compound fire detector is working or needs replacement.
608	Temperature Sensor Fault	Temperature detection sensor failure.	1. Check whether the sensor is blocked by dust or debris. 2. Check whether the sensor is wired correctly.
609	Temperature Alarm	Overheating.	1. Turn off the entire energy storage plant, disconnect from the grid, and activate the fire alarm. 2. Observe the cabinet from a distance for smoke and open flames, if any, immediately call the fire alarm and activate the fire emergency program. 3. When the cabinet has no obvious abnormality within 2 hours, restore AC power supply. Monitor the battery cell temperature through remote connection. 4. When the cell temperature is within the normal range, open the cabinet door. Check whether the compound fire detector is working or needs replacement.
614	System Level-1 Fire Alarm	System level-1 fire alarm.	
615	System Level-2 Fire Alarm	System level-2 fire alarm.	
616	System Stop Fire Alarm	System shutdown fire alarm.	
617	Buzzer Alarm	Fire alarms exist in the system.	
618	Aerosol Triggered Alarm	Cabinet combustion triggered the aerosol.	
619	Exhaust Valve Activated Alarm	High concentration of combustible gases in the cabinet.	
620	Exhaust Fan Activated Alarm	High concentration of combustible gases in the cabinet.	
621	Audio-visual Fire Alarm	The audible and visual fire alarm is triggered.	
622	Flood Alarm	Excessive fluid buildup in the cabinet.	1. Check whether the sensor is blocked by dust or debris. 2. Check whether the sensor is wired correctly. 3. Verify that the sensor is not flooded.
623	Cabinet Door Open	Cabinet door is not closed or open.	1. Check whether the cabinet door is closed and locked properly.
624	Emergency Stop Activated	The emergency stop switch is triggered.	1. Check whether the emergency stop switch is activated unexpectedly.



11.

OPERATION AND MAINTENANCE

11.1. General safety instructions

WARNING

- Danger of high voltage!
- After the system is shut down, wait for at least five minutes to let the energy storage capacitors discharge completely before you open the cabinet door for any maintenance operations.
- Only qualified electrical technicians are allowed to perform the maintenance operations.
- Only perform the maintenance operations in clear and dry weather with no wind or sand. Do not open the cabinet door in weather conditions such as rain, snow, thunderstorms, sandstorms, or heavy fog.
- Do not allow any items (such as fingers, parts, screws, or tools) to contact the fan until it has been powered off and has completely stopped rotating to prevent mechanical injuries.

CAUTION

- Do not leave any screws, washers, and other metal parts inside the cabinet. It can cause short circuits, arc discharges, or other electrical faults, which can lead to serious incidents such as fires or explosions.
- Sand or impact of moisture could damage the electrical components and affect the operating performance of the system.

To ensure the safety and efficiency of maintenance work on the BESS, it is essential to strictly follow these safety operating procedures:

- There must be at least two people or more on-site during maintenance work to assist and respond in emergencies.
- During maintenance, use insulating materials to cover nearby live components to prevent accidental electric shock.
- Do not power on the equipment before completing fault diagnosis to avoid new faults or safety hazards.
- During live inspections, pay attention to warning signs on the equipment and avoid standing near the cabinet door to prevent injuries from unexpected situations.
- For switches that need to be disconnected for maintenance, place a "Do Not Close" warning sign at the switch location to prevent accidental operation.
- After replacing power components or changing wiring in the system, manually start the wiring detection and topology recognition process to ensure normal system operation and avoid abnormalities.
- After completing all maintenance and replacement operations, promptly lock the cabinet door and properly store the keys to ensure the safety of the equipment.

11.1.1. Battery safety instructions

DANGER
A short circuit in a battery pack can generate an instantaneous large current and release a significant amount of energy, which poses serious risks including personal injury and property damage.

When performing maintenance operations on the battery packs:

- Use high-quality electrical (insulating) tape to wrap any exposed cable terminals on the battery pack to prevent accidental contact between conductive parts and reduces the risk of short circuits.
- Avoid allowing any conductive objects such as screws, tools, or metal debris near the battery pack. These items can inadvertently cause a short circuit if they contact exposed terminals or internal components.

11.2. Regular Maintenance

Conduct regular maintenance of the BESS to ensure its long-term stable operation.

The maintenance cycles provided in this section are for reference; actual maintenance cycles should be adjusted based on the specific environmental conditions at the project site. Especially in harsh environments such as desert areas, maintenance cycles should be shortened, and cleaning and anti-corrosion measures should be more frequent.

If the system is installed in a desert area, it is recommended to carefully inspect and thoroughly clean both the inside and the outside of the cabinet after each sandstorm.

NOTICE
• The maintenance cycles in this section are provided as references; actual maintenance cycles should be adjusted based on factors like power station size, site location, and its environmental conditions. • Increase the maintenance frequency in areas with heavy sandstorm or dust.

11.2.1. Maintenance items every three months

Take the following maintenance operations at least once every three months:

Item	Method
Safety functions	• Press the emergency shutdown button to confirm that the system immediately stops all operations and cuts off power. • Check whether all warning signs and labels are clearly visible and not damaged or faded. Replace the signs or labels if necessary.
Cabinet exterior	Any flammable objects on top of the cabinet. Remove them immediately if any.
Cabinet interior	Check for any foreign objects, dust, dirt and frosting inside the cabinet.
Air inlets and outlets	• Check the temperature of the PCS radiator. • Check for dust accumulation on the following components: – The battery control module fan – The PCS radiator If necessary, clean the PCS radiator and the fan with a vacuum cleaner and replace the dust filter inside the cabinet. For instructions on replacing the dust filter, see section 11.4 "Dust filter maintenance" on page 119.
Metal components	• Check all metal components for oxidation or rust. • Measure the system voltage to ensure it remains stable within specified limits. • Check insulation resistance to ensure good insulation and prevent short circuits or leakage accidents.
Liquid cooling system	Check the pressure level of the liquid cooling system. If the pressure level is low, refill the coolant.

Table 11.1. Maintenance items once every three months

11.2.2. Maintenance items every six months

Take the following maintenance operations at least once every six months:

Item	Method
Cabinet exterior	Inspect the cabinet for the following situations. If found, take necessary actions or contact the service engineers: • Inspect the welding points between the cabinet and the base plate for stability and rust. • Inspect the cabinet shell for damage, peeling or oxidation. For repainting instructions, see section 11.6 "Repainting" on page 123. • Check that the cabinet door and locks are working.
Wiring and cable arrangement	⚠ **WARNING** Ensure that all internal equipment in the energy storage cabinet is completely powered off and wait at least 5 minutes for capacitors to fully discharge before starting the inspection work. • Check if all cables are neatly arranged, looking for any short circuits, crossings, or loose connections. Correct any abnormalities immediately and reorganize the cables as needed. • Inspect all entry and exit holes to ensure they are properly sealed to prevent water and dust ingress. • Check the cabinet interior for signs of water leakage, especially at the bottom and near junction boxes. Investigate and take waterproofing measures if leakage is found. • Check power cable connections for looseness and retighten them according to previously specified torque values. • Inspect power and control cables for damage, especially where they contact with the metal surfaces for any cut marks. Replace damaged cables immediately. • Check the insulation wrapping tape on power cable terminals for any detachment or damage. Re-wrap as necessary to ensure proper insulation.
Grounding and equipotential bonding	• Check if the ground connection is correct, ensuring the grounding resistance does not exceed 4 Ω. • Inspect the equipotential bonding inside the cabinet to ensure all metal components are electrically connected correctly.
Switch contactors	Inspect the mechanical operation of auxiliary switches and micro-switches in contactors to ensure smooth operation.

Fan	• Observe if the fans are operating normally, checking for any blockages. • Listening for abnormal noises while the fans are running.
Liquid cooling system	After the system runs for five years, check the pH level of the coolant. Replace the coolant if the pH level is high.
Dust filter	Clean or change the dust filter. For instructions, see section 11.4 "Dust filter maintenance" on page 119.
Screw dropout	Check and clean any dropped screws inside the cabinet. Inspect related areas to see if any additional fixing screws are needed.

Table 11.2. Maintenance items every six months

11.2.3. Maintenance items once a year

Take the following maintenance operations at least once a year:

Item	Method
Cabinet status	Inspect the cabinet for the following situations. If found, take necessary measures or contact the service engineers: • Damage or informality of the cabinet exterior and interior structure. • Abnormal noise during operation. • Cabinet internal temperature is too high. Check the working status of the cooling system in this case. • The humidity and dust level are too high. Follow the instructions in Section 11.5 "Cabinet " on page 122 to clean the cabinet in this case.
Cable shielding grounding	Check the connection between cable shielding and insulating tubes to ensure good contact without looseness or damage. Check the grounding cable connection.
Lightning protection devices and fuses	Inspect the lightning protection devices (such as surge protectors) and fuses for tightness and absence of damage. Replace the devices if necessary.
Corrosion	Inspect the cabinet interior for oxidation or rust, particularly on metal parts and connection points.

Table 11.3. Maintenance items once a year

11.3. Temporary off-grid or standby

When the CM2 system needs to disconnect from the grid or work in standby mode for more than three months, take the following actions first:

- When the grid connection is still available, charge the battery system to at least 40% SOC.
- When the grid connection is not available, turn the PCS DC switch to the **OFF** position. It allows the system to stay at the low-power state to avoid battery over-discharge.

11.4. Dust filter maintenance

Clean or change the dust filter inside the cabinet every six months.

To clean or change the dust filter on the cabinet door:

Step 1. Open the cabinet door and locate the dust filter at the bottom.

Step 2. Loosen the five M5 screws nuts.

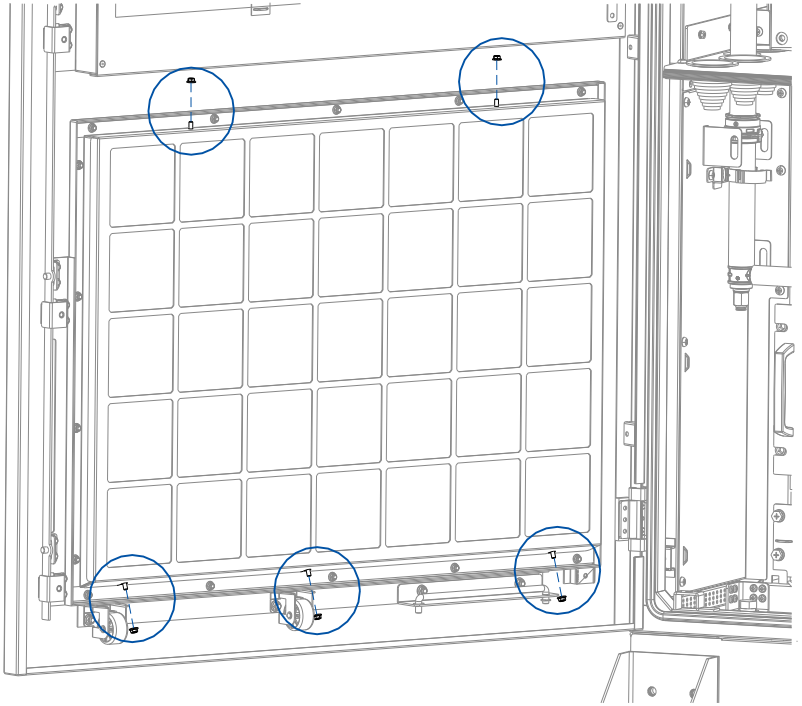


Figure 11.1. Removing the screw nuts

Step 3. Remove the filter cover and the filter.

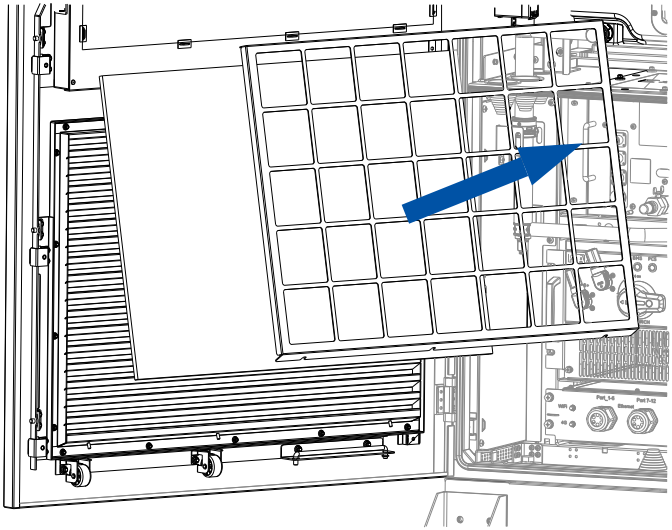


Figure 11.2. Removing the filter cover and filter

Step 4. Clean the filter cover and the filter. If the filter is damaged, replace with a new one.

Step 5. Install the filter and the cover back to the cabinet door. Secure the five M5 screw nuts.

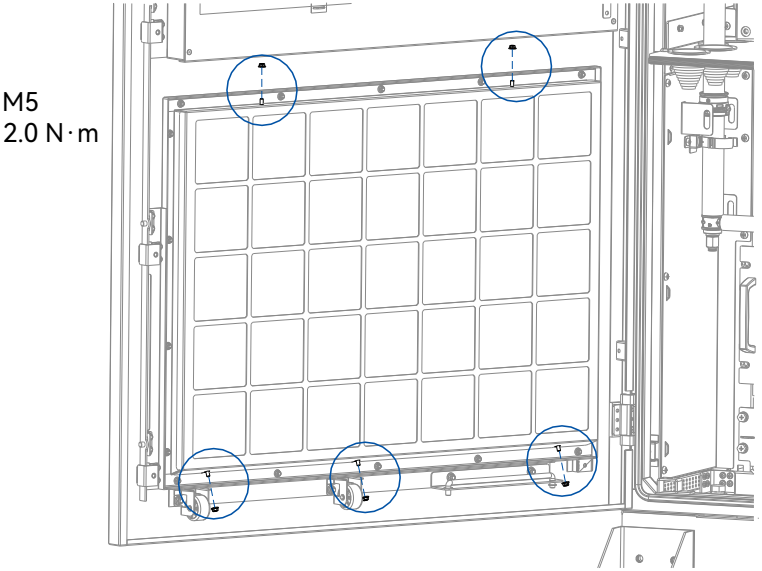


Figure 11.3. Installing the filter and filter cover

To clean or change the dust filter on the back of the cabinet:

Step 1. Locate the dust filter at the bottom of the cabinet back side.

Step 2. Loosen the 16 M5 screws to remove the whole filter.

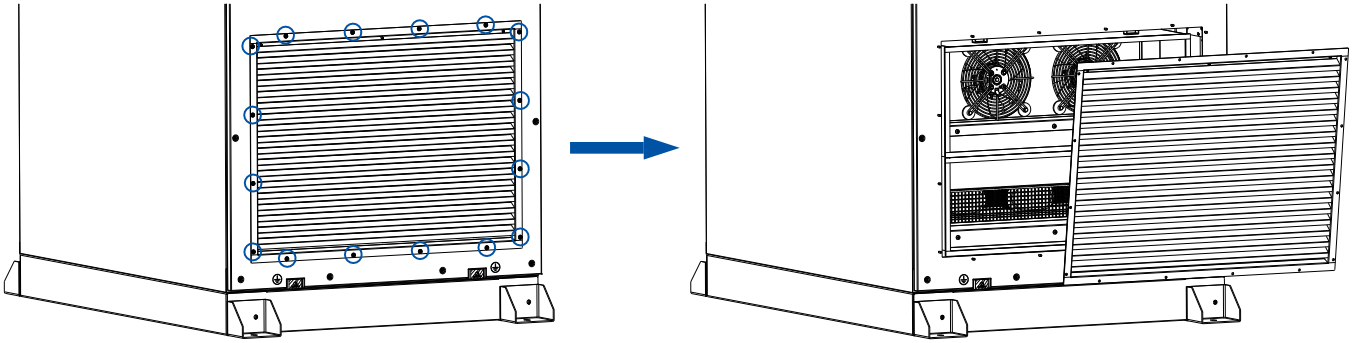


Figure 11.4. Removing the filter

Step 3. Loosen the five M5 screws to separate the filter from the cover.

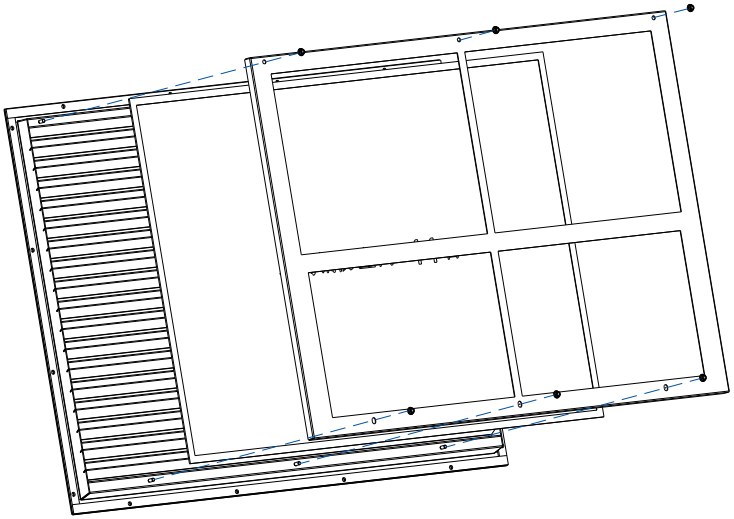


Figure 11.5. Separating the filter from the cover

Step 4. Clean the filter and the filter cover. If the filter is damaged, replace with a new one.

Step 5. Install the filter and the cover back to the cabinet.

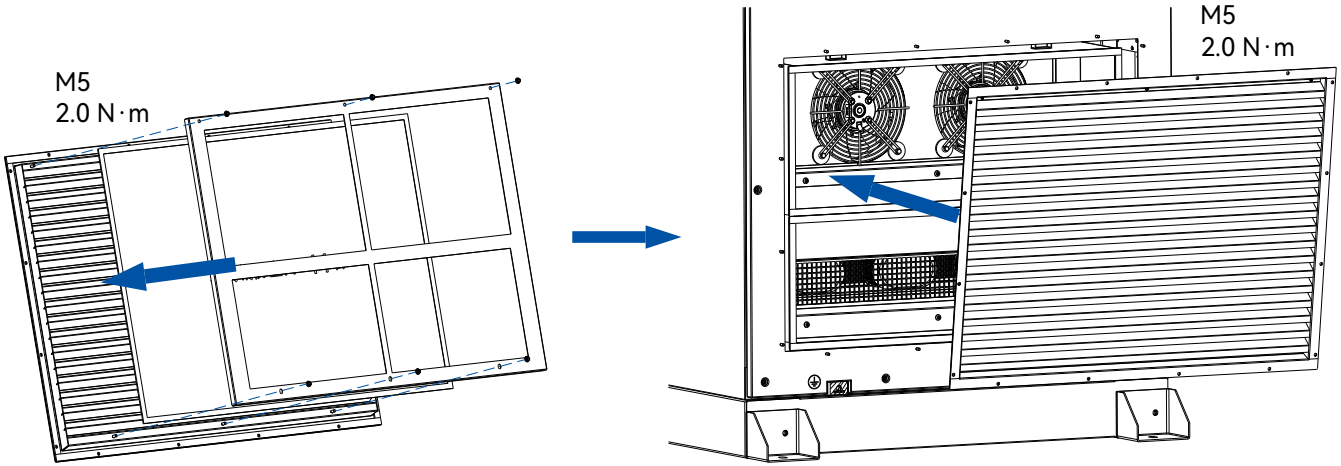


Figure 11.6. Installing the filter

11.5. Cabinet cleaning

To ensure the proper operation and extend the lifespan of the cabinet, follow the guidelines below to clean and maintain the energy storage cabinet regularly.

- Adjust the cleaning schedule based on the weather conditions, geographic location, and other environmental factors surrounding the cabinet.

  For cabinets located in harsh environments like desert areas, shorten the cleaning intervals and increase the frequency.

- Do not use brooms to directly sweep dust inside the storage cabinet as this can stir up dust, causing it to reattach to equipment. It is recommended to use a vacuum cleaner to suction dust without causing secondary pollution.

- Check the foundation area of the storage cabinet for dust accumulation. Use a vacuum cleaner to clean the foundation if necessary.

- After the cleaning work is completed, check if the door locks of the cabinet are functioning properly and in good condition. If necessary, apply lubricating oil to the lock holes and other moving parts of the door lock to ensure smooth operation.

11.6. Repainting

NOTICE
• Regularly inspect the protective paint on the storage cabinet for obvious peeling or cracking. Follow the instructions to repaint the cabinet in different conditions. • Respray the exterior of the whole storage cabinet with special protective paint every five years.

Condition 1: The surface has water stains and dust that can be cleaned with water.

Illustration	Maintenance Procedure
	1. Clean the dirty areas on the surface with a cloth or similar cleaning tool dampened with water.
	2. If the use of water cannot clean the surface, use 97% alcohol to wipe the area until the cleanliness is acceptable. You may also use other non-corrosive cleaners that are locally available.

Condition 2: The surface has traces that cannot be cleaned; the painting is damaged.

Illustration	Maintenance Procedure
	1. Use sandpaper to polish the areas of the surface where the paint is rough or scratched, ensuring the surface becomes smooth.
	2. Use a wet cloth dampened with water or 97% alcohol to clean the surface.
	3. After the surface is dry, use a soft-bristle brush to apply touch-up paint to the scratched areas, ensuring the paint is applied as evenly and consistently as possible.

Condition 3: The primer damage has exposed the substrate of the cabinet.

Illustration	Maintenance Procedure
	1. Use sandpaper to polish the areas of the surface where the paint is rough or scratched, ensuring the surface becomes smooth.
	2. Use a wet cloth dampened with water or 97% alcohol to clean the surface.
	3. After the surface is dry, spray zinc-rich primer onto areas where the substrate is exposed, ensuring that the spray fully covers all bare substrate areas.
	4. After the surface is dry, use a soft-bristle brush to apply touch-up paint to the scratched areas, ensuring the paint is applied as evenly and consistently as possible.

12.

PRODUCT SPECIFICATION

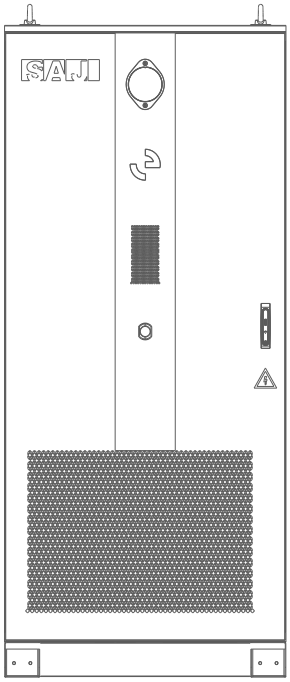
System parameters

Parameter \ Model	CM2-99.9K-261	CM2-125K-261
Battery Parameters		
Cell Type	LFP 3.2V/314Ah	
System Configuration	260S1P	
Rated Energy [kWh]	261	
Rated Battery Voltage [V]	832	
Voltage Range [V]	728-936	
Number of Battery Packs	5	
Depth of Discharge [%]	0-100	
Charge/Discharge Rate [C]	0.5	
Battery Pack Protection Level	IP67	
Battery Cell Cycles	≥8000@70% EOL	
AC Parameters		
Rated Charge/Discharge Power [kW]	99.9	125
Max. Charge/Discharge Power [kW]	99.9	137.5
Max. Charge/Discharge Current [A]	151.7@380V, 144@400V	208.9@380V, 198.5@400V
Icw [kA]	<10, 1s	
Icc [kA]	<10	
Rated AC Voltage [V AC]	380/400, 3L+N+PE	
Rated Frequency [Hz]	50	
Power Factor [cos φ]	> 0.99	
Adjustable Power Factor Range	0i - 1 - 0c	
Total Harmonic Distortion [THDi]	< 3%	
General Parameters		
Topology	Non-isolated	
Ingress Protection Class	IP54 (Cabinet); IP65 (PCS)	
Cooling Type	Liquid cooling (Battery); air forced (PCS)	
Corrosion Protection Level	C4	
Communication	Wi-Fi/Ethernet/RS485	
Operating Temperature Range [℃]	-25℃ to +55℃	
Relative Humidity [%]	0-95, non-condensing	
Maximum Operating Altitude [m]	2000	
Fire Protection	Battery pack-level and cabinet-level aerosols	
Dimension [H*W*D] [mm]	2325*1030*1400	
Weight [kg]	2500	
Warranty [Year]	10	

Model / Parameter	CM2-99.9K-261	CM2-125K-261
Grid Code	CEI-021, CEI-016, EN50549-1, EN50549-2	
Safety Standard and EMC	IEC 62619, IEC 62477-1, IEC 61000-6-2, IEC 61000-6-4, UN 38.3	

Battery pack parameters

Model / Parameter	Y52 2.0
Round Trip Efficiency [%]	>90@0.25C, >88@0.5C
Key Components	52 cells, 1 BMU, 1 aerosol, 1 manual service disconnect (MSD)
Weight [kg]	348±2
Dimension [H*W*D] [mm]	250*779*1136



13.

APPENDIX



13.1. Recycling and Disposal

This device 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.

13.2. Warranty

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

13.3. Contacting Support

Online technical support: Go to https://www.saj-electric.com/services-support-technical to check FAQs or send your message or product enquiry.

Call for assistance: For SAJ support telephone numbers, see https://www.saj-electric.com/locations for your region support details.

Headquarter: Guangzhou Sanjing Electric Co., LTD.

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

Tel: +86 20 6660 8588

E-mail: service@saj-electric.com

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

13.4. Trademark

SAJ is the trademark of Sanjing.

SAJ





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