

LUNA2000-200KWH-2H1 Smart String ESS

User Manual

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About This Document

Purpose





This document describes the installation, electrical connections, commissioning, and troubleshooting of LUNA2000-200KWH-2H1 Smart String Energy Storage System (also referred to as ESS). Before installing and operating the ESS, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

Intended Audience

This document is intended for plant operating personnel and qualified electricians.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
☐ NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 02 (2023-02-28)

Added [5.2 Clearance Requirements](#).

Added [5.3 Foundation Requirements](#).

Updated [1 Safety Information](#).

Updated [2.3 Appearance](#).

Updated [4 Storage Requirements](#).

Updated [5.1 Site Selection Requirements](#).

Updated [5.4 Forklift Requirements](#).

Updated [8.6 Installing Auxiliary AC Power Cables \(with External Grid Power Supply\)](#).

Updated [8.7 Installing Single-Phase AC Input Power Cables \(Without External Grid Power Supply\)](#).

Updated [14 Technical Specifications](#).

Updated [C Emergency Handling](#).

Issue 01 (2022-10-30)

This issue is used for first office application (FOA).

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1 Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger, Warning, Caution, and Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **The Company shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment should be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. The Company shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

The Company shall not be liable for any of the following circumstances or their consequences:

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.

- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.
- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to the Company.

1.1 Personal Safety

 **DANGER**

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will cause electric arcs, sparks, fire, or explosion, which may result in personal injury.

 **DANGER**

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

 **DANGER**

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

 **DANGER**

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

 **WARNING**

During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.

General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not enter the affected building or equipment area under any circumstances.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
 - Professionals: personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance
 - Trained personnel: personnel who are trained in technology and safety, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Personnel who plan to install or maintain the equipment must receive adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will perform special tasks such as electrical operations, working at heights, and operations of special equipment should possess the required local qualifications.
- Only certified high-voltage electricians are allowed to operate medium-voltage equipment.

- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

 **DANGER**

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

 **DANGER**

Non-standard and improper operations may result in fire or electric shocks.

 **DANGER**

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment damage, load power derating, power failure, or personal injury may occur.

 **WARNING**

For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

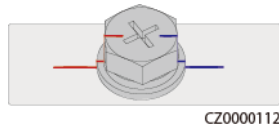
 **CAUTION**

Do not route cables behind the air intake and exhaust vents of the equipment.

General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.
- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.

- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- If any liquid is detected inside the equipment, disconnect the power supply immediately and do not use the equipment.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all of the tools to prevent them from being left inside the equipment.
- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt and the torque error does not exceed 10% of the specified value.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks should cross the edges of the bolts.)



- After the installation is complete, ensure that protective cases, insulation tubes, and other necessary items for all electrical components are in position to avoid electric shocks.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- Before maintaining a downstream electrical device supply or power distribution device, turn off the output switch of its power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- Before fault diagnosis and troubleshooting, take the following safety measures: Disconnect the power supply > Measure the power > Install a ground cable > Hang warning signs and set up fences.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.

- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.
- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protective ground point.
- If high touch current may occur on the equipment, ground the protective ground terminal on the equipment enclosure before connecting the power supply; otherwise, electric shock as a result of touch current may occur.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- If a cable is routed into the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.
- When the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
 - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
 - Cables stored at subzero temperatures must be stored at room temperature for at least 24 hours before they are laid out.

- Do not perform any improper operations, for example, dropping cables directly from a vehicle. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

ESD

NOTICE

The static electricity generated by human bodies may damage the electrostatic-sensitive components on boards, for example, the large-scale integrated (LSI) circuits.

- When touching the equipment and handling boards, modules with exposed circuit boards, or application-specific integrated circuits (ASICs), observe ESD protection regulations and wear ESD clothing and ESD gloves or a well-grounded ESD wrist strap.

Figure 1-1 Wearing an ESD wrist strap



DC15000001

- When holding a board or a module with exposed circuit boards, hold its edge without touching any components. Do not touch the components with bare hands.
- Package boards or modules with ESD packaging materials before storing or transporting them.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

 **DANGER**

Do not store any flammable or explosive materials in the equipment area.

 **DANGER**

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

 **WARNING**

Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

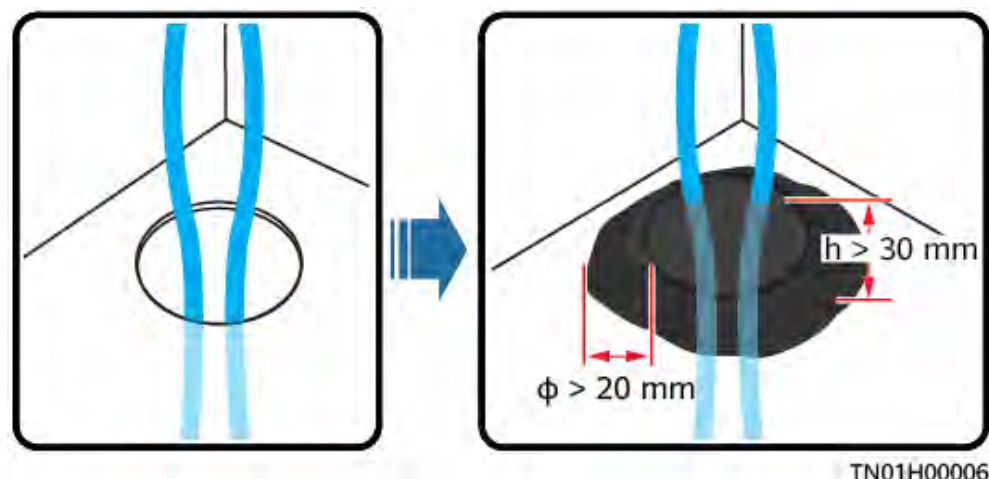
 **WARNING**

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Do not install or run the equipment beyond the technical specifications. Otherwise, its performance and safety will be compromised.
- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive for the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.

- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land or an area prone to water accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel.
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the top of the equipment to prevent foreign objects from falling into the equipment.
- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- All cable holes should be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Mechanical Safety

DANGER

When working at heights, wear a safety helmet and safety harness or waist belt and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.

 **WARNING**

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

 **WARNING**

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

 **WARNING**

When pulling equipment out of a cabinet, be aware of unstable or heavy objects in the cabinet to prevent injury.

 **WARNING**

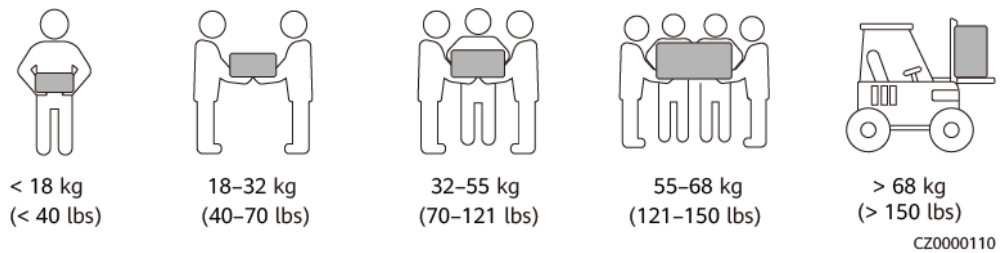
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea or roads in good conditions for transportation as transportation by railway or air is not supported. Avoid tilt or jolt during transportation.

Working at Heights

- Any operations performed 2 meters or higher above the ground should be supervised properly.
- Only trained and qualified personnel are allowed to work at heights.
- Do not work at heights when steel pipes are wet or other risky situations exist. After the preceding conditions no longer exist, the safety owner and

relevant technical personnel need to check the involved equipment. Operators can begin working only after safety is confirmed.

- Set a restricted area and prominent signs for working at heights to warn away irrelevant personnel.
- Set guard rails and warning signs at the edges and openings of the area involving working at heights to prevent falls.
- Do not pile up scaffolding, springboards, or other objects on the ground under the area involving working at heights. Do not allow people to stay or pass under the area involving working at heights.
- Carry operation machines and tools properly to prevent equipment damage or personal injury caused by falling objects.
- Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects should be transported by slings, hanging baskets, highline trolleys, or cranes.
- Do not perform operations on the upper and lower layers at the same time. If unavoidable, install a dedicated protective shelter between the upper and lower layers or take other protective measures. Do not pile up tools or materials on the upper layer.
- Dismantle the scaffolding from top down after finishing the job. Do not dismantle the upper and lower layers at the same time. When removing a part, ensure that other parts will not collapse.
- Ensure that personnel working at heights strictly comply with the safety regulations. The Company is not responsible for any accident caused by violation of the safety regulations on working at heights.
- Do not loiter when working at heights. Do not rest in the area involving working at heights.

Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Do not use single ladders.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the ladder is securely positioned and held firm.



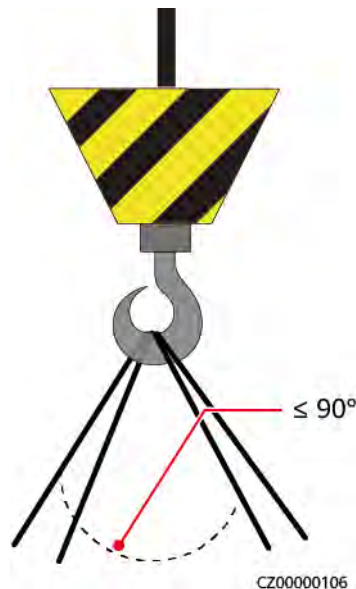
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- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.

- When a step ladder is used, ensure that the pull ropes are secured.

Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed on meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or the hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

1.5 Equipment Safety

1.5.1 ESS Safety

 **DANGER**

Do not open cabinet doors when the system is running.

 **DANGER**

If the ESS is faulty, do not stand within the opening range of the cabinet doors.

 **CAUTION**

Evacuate from the site immediately once the fire alarm horn/strobe is triggered.

NOTICE

Take protection and isolation measures for the ESS, such as installing fences, walls, and safety warning signs to prevent personal injury or property damage caused by unauthorized access during operations.

- When installing the ESS, comply with the fire separation distance or fire wall requirements specified in local standards, including but not limited to *GB 51048-2014 Design Code for Electrochemical Energy Storage Station* and *NFPA 855 Standard for the Installation of Stationary Energy Storage Systems*.
- Check the fire safety of the ESS regularly, at least once a month.
- When inspecting the system with power on, pay attention to the hazard warning signs on the equipment. Do not stand at the battery cabin doors.
- After power components of the ESS are replaced or cable connections are changed, you need to manually start cable connection detection and topology identification to prevent system malfunction.
- It is recommended that you prepare a camera to record the detailed processes of equipment installation, operation, and maintenance.

1.5.2 Battery Safety

 **DANGER**

Do not connect the positive and negative poles of a battery together. Otherwise, the battery may be short-circuited. Battery short circuits can generate high instantaneous current and releases a large amount of energy, which may cause battery leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. To avoid battery short circuits, do not maintain batteries with power on.

 **DANGER**

Do not expose batteries at high temperatures or around heat sources, such as high-temperature sunlight, fire sources, transformers, and heaters. Battery overheating may cause leakage, smoke, flammable gas release, thermal runaway, fire, or explosion.

 **DANGER**

Protect batteries from mechanical vibration, falling, collision, punctures, and strong impact. Otherwise, the batteries may be damaged or catch fire.

 **DANGER**

To avoid leakage, smoke, flammable gas release, thermal runaway, fire, or explosion, do not disassemble, alter, or damage batteries, for example, insert foreign objects into batteries, squeeze batteries, or immerse batteries in water or other liquids.

 **DANGER**

Do not touch battery terminals with other metal objects, which may cause heat or electrolyte leakage.

 **DANGER**

There is a risk of fire or explosion if the model of the battery in use or used for replacement is incorrect. Use a battery of the model recommended by the manufacturer.

 **DANGER**

Battery electrolyte is toxic and volatile. Do not get contact with leaked liquids or inhale gases in the case of battery leakage or abnormal odor. In such cases, stay away from the battery and contact professionals immediately. Professionals must wear safety goggles, rubber gloves, gas masks, and protective clothing, power off the equipment, remove the battery, and contact technical engineers.

 **DANGER**

A battery is an enclosed system and will not release any gases under normal operations. If a battery is improperly treated, for example, burnt, needle-pricked, squeezed, struck by lightning, overcharged, or subject to other adverse conditions that may cause battery thermal runaway, the battery may be damaged or an abnormal chemical reaction may occur inside the battery, resulting in electrolyte leakage or production of gases such as CO and H₂. To prevent fire or device corrosion, ensure that flammable gas is properly exhausted.

 **DANGER**

The gas generated by a burning battery may irritate your eyes, skin, and throat. Take protective measures promptly.

 **WARNING**

Install batteries in a dry area. Do not install them under areas prone to water leakage, such as air conditioner vents, ventilation vents, feeder windows of the equipment room, or water pipes. Ensure that no liquid enters the equipment to prevent faults or short circuits.

 **WARNING**

Before installing and commissioning batteries, prepare fire suppression facilities, such as fire sand and carbon dioxide fire extinguishers, according to construction standards and regulations. Before putting into operation, ensure that fire fighting facilities that comply with local laws and regulations are installed.

 **WARNING**

Before unpacking batteries, ensure that the packing cases are intact and correctly placed according to the labels on the packing cases during their storage and transportation. Do not place a battery upside down or vertically, lay it on one side, or tilt it. Stack the batteries according to the stacking requirements on the packing cases. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

 **WARNING**

After unpacking batteries, place them in the required direction. Do not place a battery upside down or vertically, lay it on one side, tilt it, or stack it. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

 **WARNING**

Tighten the screws on copper bars or cables to the torque specified in this document. Periodically confirm whether the screws are tightened, check for rust, corrosion, or other foreign objects, and clean them up if any. Loose screw connections will result in excessive voltage drops and batteries may catch fire when the current is high.

 **WARNING**

After batteries are discharged, charge them in time to avoid damage due to overdischarge.

Statement

The Company shall not be liable for any damage or other consequences to the batteries it provides due to the following reasons:

- Batteries are damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- Batteries are damaged because the onsite equipment operating environment or external power parameters do not meet the environment requirements for normal operation, for example, the actual operating temperature of batteries is too high or too low, or the power grid is unstable and experiences outages frequently.
- Batteries are damaged, fall, leak, or crack due to improper operations or incorrect connection.
- After being installed and connected to the system, the batteries are not powered on in time due to your reasons, which causes damage to the batteries due to overdischarge.
- Batteries are damaged because they are not accepted in time due to your reasons.
- You set battery operating parameters incorrectly.
- You use batteries of different types together, causing acceleration of capacity attenuation. For example, you use our batteries together with batteries of other vendors or with batteries of different rated capacity.
- You maintain batteries improperly, causing frequent overdischarge; you expand the load capacity without notifying us; or you have not fully charged the batteries for a long time.
- You do not perform battery maintenance based on the operation guide, such as failure to check battery terminals regularly.
- Batteries are damaged because you do not store them in accordance with storage requirements (for example, in an environment that is damp or prone to rain).
- Batteries are not charged as required during storage due to your reasons, resulting in capacity loss or other irreversible damages to the batteries.

- Batteries are damaged due to your or a third party's reasons, for example, relocating or reinstalling the batteries without complying with the Company's requirements.
- You change the battery use scenarios without notifying the Company.
- You connect extra loads to the batteries.
- The battery storage period has exceeded the upper limit.
- The battery warranty period has expired. Do not use a battery whose warranty period has expired, as this poses safety risks.

General Requirements

NOTICE

To ensure battery safety and battery management accuracy, use batteries provided by the Company. The Company is not responsible for any faults of batteries not provided by it.

- Before installing, operating, and maintaining batteries, read the battery manufacturer's instructions and comply with their requirements. The safety precautions specified in this document are highly important and require special attention. For additional safety precautions, see the instructions provided by the battery manufacturer.
- Use batteries within the specified temperature range. When the ambient temperature of the batteries is lower than the allowed range, do not charge the batteries to prevent internal short circuits caused during low-temperature charging.
- Before unpacking batteries, check whether the packaging is intact. Do not use batteries with damaged packaging. If any damage is found, notify the carrier and manufacturer immediately.
- Install batteries within 24 hours after unpacking. If the batteries cannot be installed in time, place them in a dry indoor environment without corrosive gases. Power on the ESS within 24 hours after installation. The process from unpacking batteries to powering on the system must be completed within 72 hours. During routine maintenance, ensure that the power-off time does not exceed 24 hours.
- Do not use a damaged battery (such as damage caused when a battery is dropped, bumped, bulged, or dented on the enclosure), as the damage may cause electrolyte leakage or flammable gas release. In the case of electrolyte leakage or structural deformation, contact the installer or professional O&M personnel immediately to remove or replace the battery. Do not store the damaged battery near other devices or flammable materials and keep it away from non-professionals.
- Before working on a battery, ensure that there is no irritant or scorched smell around the battery.
- When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.

- If batteries are exposed to water accidentally, do not install them. Instead, transport the batteries to a safe isolation point and dispose of them in a timely manner.
- Before installing battery packs, check whether they are abnormal. A battery pack is deemed abnormal when any of the following symptoms occurs:
 - The enclosure of the battery pack is obviously deformed or damaged.
 - The voltage between the positive and negative electrodes of the battery pack is far below the specified range.
- Check whether the positive and negative battery terminals are grounded unexpectedly. If so, disconnect the battery terminals from the ground.
- Do not perform welding or grinding work around batteries to prevent fire caused by electric sparks or arcs.
- If batteries are left unused for a long period of time, store and recharge them according to the battery requirements.
- Do not charge or discharge batteries by using a device that does not comply with local laws and regulations.
- Keep the battery loop disconnected during installation and maintenance.
- Monitor damaged batteries during storage for signs of smoke, flame, electrolyte leakage, or heat.
- If a battery is faulty, its surface temperature may be high. Do not touch the battery to avoid scalds.
- Do not stand on, lean on, or sit on the top of the equipment.
- In backup power scenarios, do not use the batteries for the following situations:
 - Medical devices substantially important to human life
 - Control equipment such as trains and elevators, as this may cause personal injury
 - Computer systems of social and public importance
 - Locations near medical devices
 - Other devices similar to those described above

Short-Circuit Protection

- When installing and maintaining batteries, wrap the exposed cable terminals on the batteries with insulation tape.
- Avoid foreign objects (such as conductive objects, screws, and liquids) from entering a battery, as this may cause short circuits.

Leakage Handling

NOTICE

Electrolyte leakage may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.

Electrolyte is corrosive and can cause irritation and chemical burns. Should you come into direct contact with the battery electrolyte, do as follows:

- Inhalation: Evacuate from contaminated areas, get fresh air immediately, and seek immediate medical attention.
- Eye contact: Immediately wash your eyes with water for at least 15 minutes, do not rub your eyes, and seek immediate medical attention.
- Skin contact: Wash the affected areas immediately with soap and water and seek immediate medical attention.
- Intake: Seek immediate medical attention.

Recycling

- Dispose of waste batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper disposal of batteries may result in environmental pollution or an explosion.
- If a battery leaks or is damaged, contact technical support or a battery recycling company for disposal.
- If batteries are out of service life, contact a battery recycling company for disposal.
- Do not expose waste batteries to high temperatures or direct sunlight.
- Do not place waste batteries in environments with high humidity or corrosive substances.

2 Product Description

2.1 Model Description

This document involves the following product model.

LUNA2000-200KWH-2H1

Figure 2-1 Model number (example)

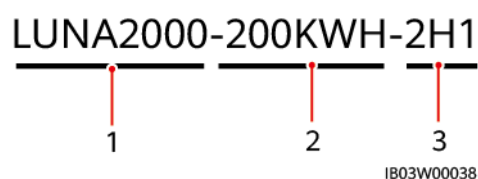


Table 2-1 Model number description

No.	Meaning	Description
1	Product family name	LUNA2000: Smart String Energy Storage System (ESS)
2	Capacity level	200KWH: nominal energy of 193.5 kWh
3	Backup power	2H1: Applies to scenarios where the backup duration is greater than or equal to 2 hour.

2.2 Functions and Features

Function

The ESS consists of power control and lithium battery modules. It stores and releases electricity controlled by the Smart Rack Controller (also referred to as rack controller). The input and output ports of the ESS are high-voltage direct current (HVDC) ports.

- Battery charge: The Smart Power Control System (also referred to as Smart PCS) is connected to the rack controller and send commands to charge batteries.
- Battery discharge: When the grid power is insufficient for the loads, the system controls the batteries to supply power to the loads through the Smart PCS.

Features

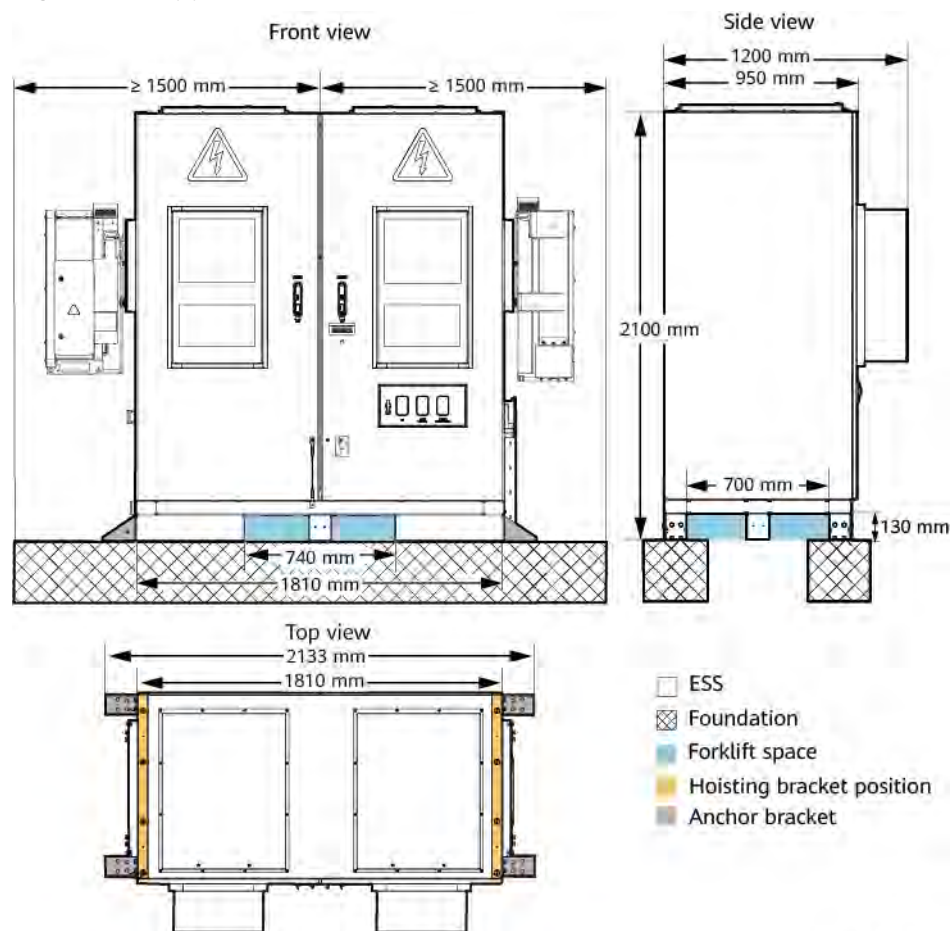
The ESS consists of the power supply and distribution system, monitoring system, environment control system, and fire suppression system. It features safety, reliability, fast deployment, low cost, high energy efficiency, and intelligent management.

Pack-level optimization

1. This design fully leverages the module capacity in the battery racks.
2. Battery packs can be directly replaced by onsite personnel without the need for professional technicians or manual SOC calibration, reducing the replacement time.

2.3 Appearance

Figure 2-2 Appearance and dimensions



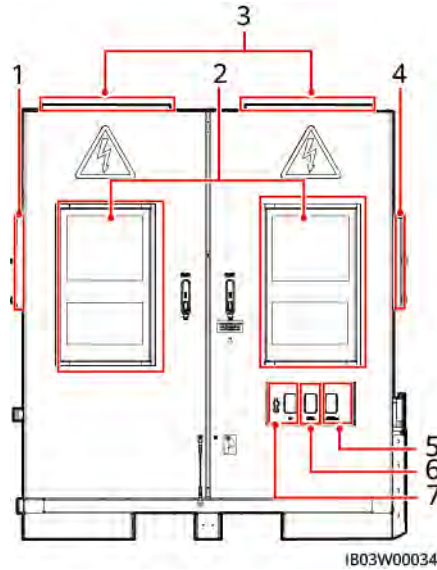
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NOTE

The site foundation must be designed by professional technical personnel such as those from a design institute. The technical personnel can refer to the foundation drawings of the Company. Contact the product manager of the Company to obtain the drawings.

2.4 Components

Figure 2-3 Components (door closed)



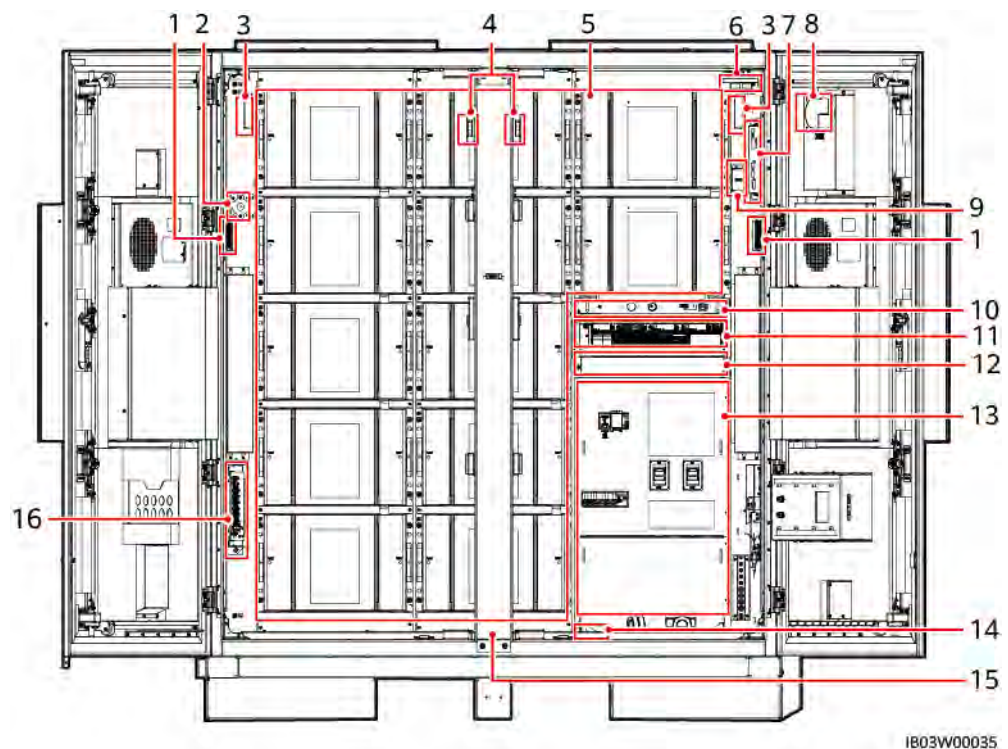
- | | | |
|--|---------------------------|-----------------------------|
| (1) Installation position of the Smart PCS | (2) Air conditioners | (3) Pressure relief windows |
| (4) Installation position of the rack controller | (5) Emergency stop switch | (6) Fire alarm horn/strobe |
| (7) USB port | - | - |

Table 2-2 Component configuration

No.	Item	Maximum Quantity Configured for an ESS	Description
1	Installation position of the Smart PCS	1	Where the Smart PCS is installed.
2	Air conditioner	2	Air conditioners on the ESS cabinet door
3	Pressure relief windows	2	If an explosion occurs inside the equipment, the windows are open to release pressure.

No.	Item	Maximum Quantity Configured for an ESS	Description
4	Installation position of the rack controller	1	Where the rack controller is installed.
5	Emergency stop switch	1	Used for emergency stop of the rack controller.
6	Fire alarm/horn strobe	1	Generates alarms for internal devices when abnormal temperature or smoke occurs.
7	USB port	1	Where a smart USB-WLAN adapter (USB-Adapter2000-C) is installed for local maintenance.

Figure 2-4 Components (door opened)



- (1) Light
- (2) Black start button
- (3) CO sensor
- (4) Door status sensors
- (5) Installation position of battery packs
- (6) Smoke detector

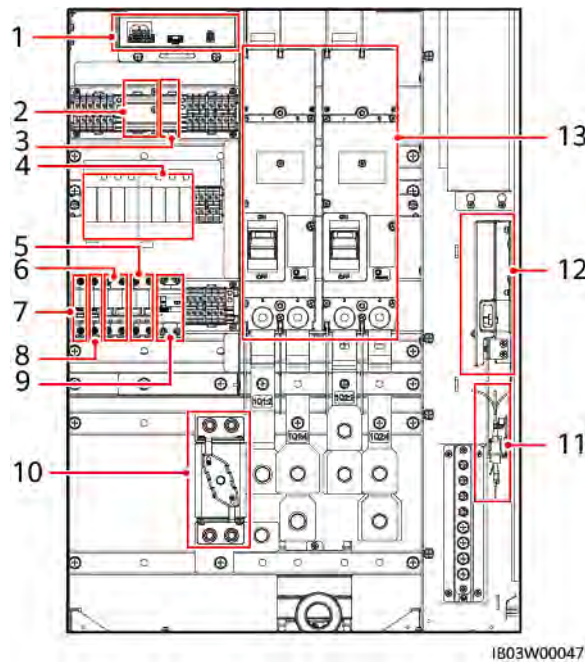
- | | | |
|--|-----------------------------|---|
| (7) Exhaust controller | (8) Exhaust module | (9) T/H sensor |
| (10) Installation position of the rack mounted fire extinguishing system | (11) Embedded power subrack | (12) CMU and installation position of the SmartModule |
| (13) Power distribution area | (14) Water sensor | (15) Adjustable column |
| (16) I/O expansion board | - | - |

Table 2-3 Component configuration

No.	Item	Maximum Quantity Configured for an ESS	Description
1	Light	2	Used for lighting inside the cabinet.
2	Black start button	1	Triggers the ESS black start.
3	CO sensor	2	Checks the concentration of CO in combustible gases.
4	Door status sensor	2	Monitors the door opening and closing status.
5	Battery pack	12	A battery pack is a combination of batteries connected in series and output through a pair of positive and negative terminals. It contains a battery management module. The battery management module consists of the battery management unit (BMU), battery optimization module, and module fan.
6	Smoke detector	1	Photoelectric smoke detector, used for smoke detection.
7	Exhaust controller	1	Works with the CO sensor and exhaust fan to control air exhaust.
8	Exhaust module	1	Exhausts combustible gases from the cabinet.
9	T/H sensor	1	Measures the real-time ambient temperature and humidity in the cabinet.
10	Rack mounted fire extinguishing system	1	Used for fire alarm and automatic fire extinguishing control.

No.	Item	Maximum Quantity Configured for an ESS	Description
11	Embedded power subrack	1	Provides installation positions for components.
	Installation position of the PSU	5	Where the PSU is installed. The PSU converts AC input power into stable DC power.
	SMU11B	1	Collects PSU information and controls PSU output.
12	CMU	1	Converges interfaces, converts protocols, collects and stores data, centrally monitors and maintains devices in the ESS.
	Installation position of the SmartModule	1	Where the SmartModule is installed. The SmartModule aggregates interfaces, converts protocols, and collects data for devices in the ESS, and provides additional ports for the CMU.
13	Power distribution area	-	For details, see Figure 2-5 .
14	Water sensor	1	Detects water based on the resistance change between both electrodes.
15	Adjustable column	1	Used to support the installation of the cabinet door.
16	I/O expansion board	1	Controls and monitors the door status sensor, sensors, and air conditioners in the ESS, connects cables to the fire suppression system, and black starts the system.

Figure 2-5 Components in the power distribution area



- | | | |
|--|--|---|
| (1) 12 V adapter (1TB1) | (2) Installation position of the 220 V maintenance socket (1XD1) | (3) Installation position of the Smart Power Sensor |
| (4) AC surge protective device (SPD) (1FA1 and 1FA2) | (5) UPS switch (5FCB) | (6) AC main switch (1FCB) |
| (7) 12 V adapter switch (1FCB1) | (8) PSU switch (1FCB2) | (9) 220 V maintenance socket switch (1FB1) |
| (10) Fuse (1F1) | (11) Fiber adapter | (12) Fiber management tray |
| (13) DC switches (1Q1 and 1Q2) | - | - |

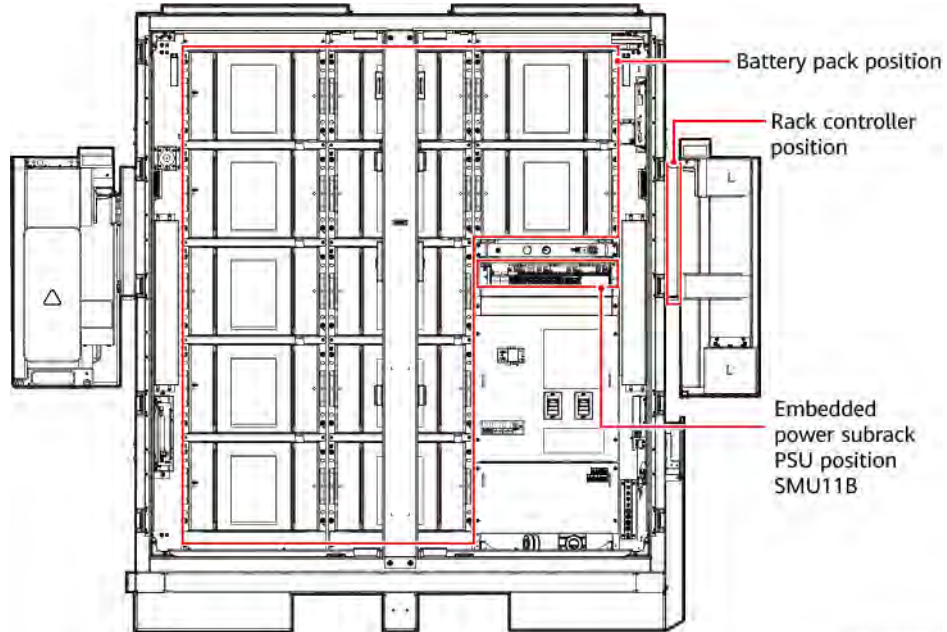
Table 2-4 Component configuration

No.	Item	Maximum Quantity Configured for an ESS	Description
1	12 V adapter	1	Supplies power to components such as the CMU, SmartModule, I/O expansion board, and rack-mounted integrated gas fire extinguisher.
2	(Optional) 220 V maintenance socket	1	Used to obtain power during maintenance.

No.	Item	Maximum Quantity Configured for an ESS	Description
3	(Optional) Smart Power Sensor	1	Measures the voltage and current of the 220 V AC auxiliary power supply.
4	AC SPD	2	Provides AC surge protection.
5	UPS switch	1	Switch of the UPS.
6	AC main switch	1	Main switch for AC power distribution.
7	12 V adapter switch	1	Switch of the 12 V adapter.
8	PSU switch	1	Switch of the PSU.
9	220 V maintenance socket switch	1	Switch of the maintenance socket.
10	Fuse	1	Provides short-circuit protection.
11	Fiber adapter	1	Used to connect optical fibers.
12	Fiber management tray	1	Holds optical fibers.
13	DC switch	2	Used to protect against short circuits and disconnect the DC bus.

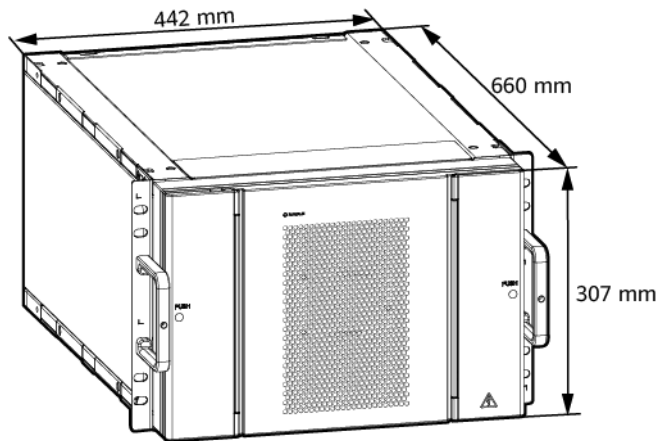
2.4.1 Power Supply and Distribution System

Figure 2-6 Position of the power supply and distribution system



IB03W00041

2.4.1.1 Battery Pack



IB04H00010

Table 2-5 Battery pack technical specifications

Item	Battery Pack (ESM51320AS1)	Battery Pack (ESM57280AS1)
Cell capacity	3.2 V/320 Ah	3.2 V/280 Ah
Cell material	Lithium iron phosphate	Lithium iron phosphate
Combination mode	16S 1P	18S 1P
Rated voltage	51.2 V	57.6 V

Item	Battery Pack (ESM51320AS1)	Battery Pack (ESM57280AS1)
Charge and discharge rate	≤ 1C	≤ 1C
Nominal capacity	16.38 kWh	16.13 kWh
Weight	≤ 140 kg	≤ 140 kg
Dimensions (H x W x D)	307 mm x 442 mm x 660 mm	307 mm x 442 mm x 660 mm
Cooling mode	Air cooling	Air cooling
IP rating	IP20+	IP20+
Storage temperature	0°C to 40°C	0°C to 40°C
Transportation temperature	-40°C to +60°C	-40°C to +60°C
Equalization mode	Passive cell equalization	Passive cell equalization
Communications port	CAN 2.0	CAN 2.0

2.4.1.2 Smart Rack Controller

Figure 2-7 Rack controller

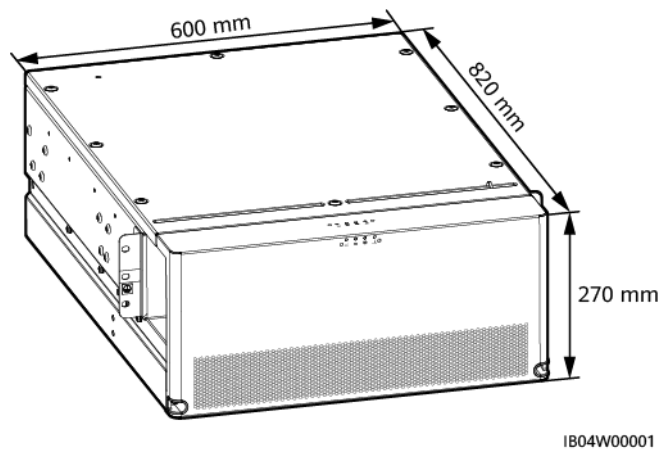


Table 2-6 Efficiency

Item	Rack Controller
Maximum efficiency	≥ 98.5%
Full-load efficiency	≥ 98.5%

Table 2-7 Battery side

Item	Rack Controller
Number of battery racks	1
Rated operating voltage	614.4 V@320 Ah cell 691.2 V@280 Ah cell
Rated operating current of a single battery rack	80 A
Maximum operating current of a single battery rack	95 A
Operating voltage	40–1050 V
Constant power voltage range	655–760 V
Constant current voltage range	560–655 V
Minimum startup voltage	350 V
Rated power of a single battery rack	52 kW
Rated power of a rack controller	104 kW
Operating current of a single battery rack	80 A

Table 2-8 Bus side

Item	Rack Controller
Number of battery racks connected to the bus	2
Maximum DC voltage	1100 V
Rated operating voltage	665 V
Full-load voltage range	595–810 V
Rated operating current of a single battery rack	76.3 A
Maximum operating current of a single battery rack	92 A

Table 2-9 Protection

Item	Rack Controller
Reverse connection protection	Supported

Item	Rack Controller
Surge protection	Supported (bus side)
Insulation resistance detection	Supported
Overtemperature protection	Supported
Overcurrent protection on the battery side	Supported
Short circuit protection on the battery side	Supported
Short circuit protection on the bus side	Supported

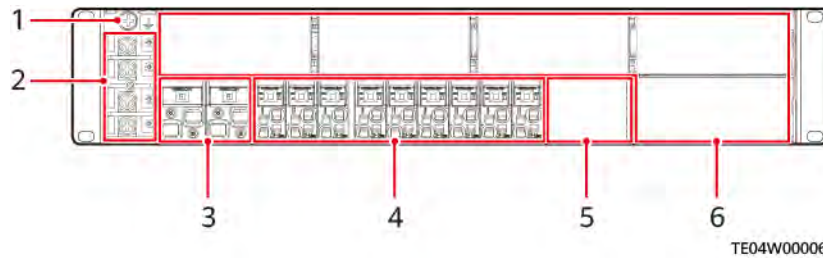
Table 2-10 General specifications

Item	Rack Controller
Parallel mode	Two rack controllers connected in parallel on the battery side and two on the bus side
Power overload	Long-term running at 1.1 times the rated power
Overvoltage category	Bus side DC II
Dimensions (H x W x D)	270 mm x 600 mm x 820 mm
Weight	≤ 90 kg
DC surge protection on the bus side	Type II
Operating temperature range	-30°C to +60°C (The rack controller can be started at -40°C.)
Operating humidity range	0%–100%
Storage temperature	-40°C to +70°C
Storage humidity	5%–95% RH
Cooling mode	Smart air cooling
IP rating	IP66
Maximum operating altitude	4000 m
Input and output terminals	OT terminals
Power response time (from no load to full load)	< 30 ms

Item	Rack Controller
Standby power consumption	7 W in shutdown mode, 48 V external power supply 30 W in shutdown mode, battery power supply, contactor not closed 70 W in standby mode, battery power supply, contactor closed
Environmental protection requirement	RoHS6
Communications port	CAN, RS485, FE

2.4.1.3 Embedded Power Subrack

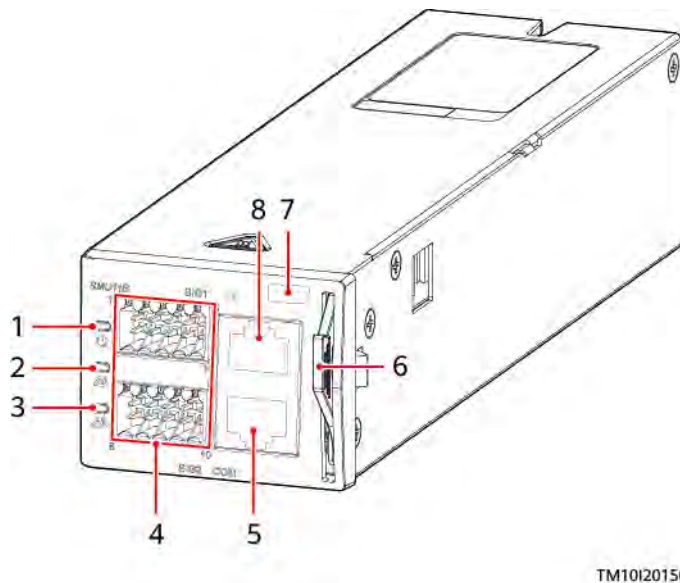
Figure 2-8 Appearance



- (1) Ground screw
- (2) Input terminals
- (3) Battery switches
- (4) Load switches
- (5) Monitoring module (SMU11B)
- (6) PSU installation positions

2.4.1.4 Monitoring Module (SMU11B)

Figure 2-9 SMU11B



TM10I20150

- | | | |
|------------------------|---------------------------|---------------------------|
| (1) Running indicator | (2) Minor alarm indicator | (3) Major alarm indicator |
| (4) Wiring terminals | (5) COM port | (6) Handle |
| (7) Position of the SN | (8) FE port | - |

Table 2-11 Indicator description

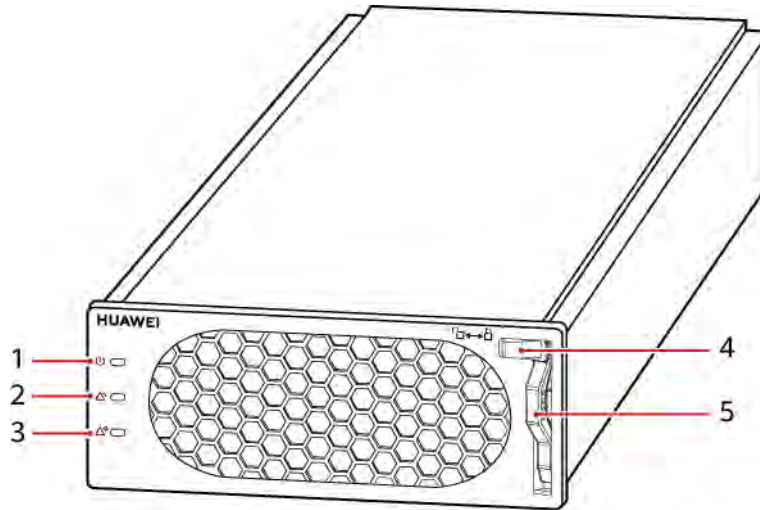
Indicator	Color	Status	Description
Running indicator	Green	Off	The SMU is faulty or has no power input.
		Blinking slowly (0.5 Hz)	The SMU is running properly and communicating with the host properly.
		Blinking fast (4 Hz)	The SMU is running properly but fails to communicate with the host.
Minor alarm indicator	Yellow	Off	No minor alarm or warning is generated.
		Steady on	A minor alarm or warning is generated.
Major alarm indicator	Red	Off	No critical or major alarm is generated.
		Steady on	A critical or major alarm is generated.

2.4.1.5 PSU

The PSU (R4830G) converts AC input power into stable DC power.

Appearance

Figure 2-10 PSU



PR04WC0008

- (1) Power indicator
- (2) Alarm indicator
- (3) Fault indicator
- (4) Locking latch
- (5) Handle
-

Indicators

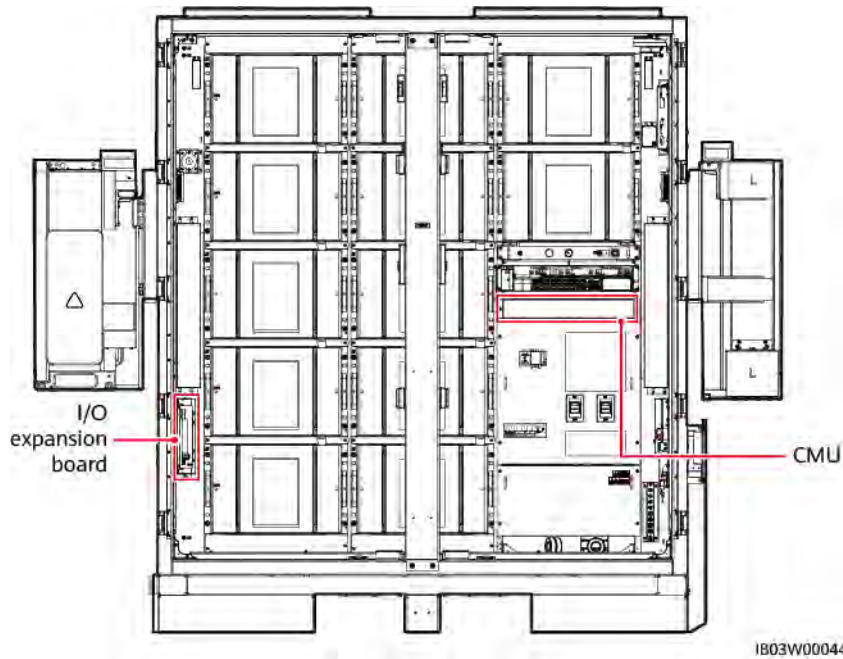
Table 2-12 Indicator description

Indicator	Color	Status	Description
Power indicator	Green	Steady on	The PSU has AC input.
		Off	The PSU has no AC input.
			The PSU is damaged.
		Blinking (0.5 Hz)	Querying is in progress.
		Blinking (4 Hz)	The PSU is loading an application program.
Alarm indicator	Yellow	Off	The PSU has no protection alarm.

Indicator	Color	Status	Description
		Steady on	<ul style="list-style-type: none"> A warning is generated due to ambient overtemperature. A shutdown protection alarm is generated due to ambient overtemperature or undertemperature.
			AC input overvoltage or undervoltage protection is triggered.
		The PSU is hibernating.	
Fault indicator	Red	Blinking (0.5 Hz)	The communication between the PSU and an external device is interrupted.
		Off	The PSU is normal.
		Steady on	The module locks out due to output overvoltage. The PSU has no output due to internal faults.

2.4.2 Monitoring System

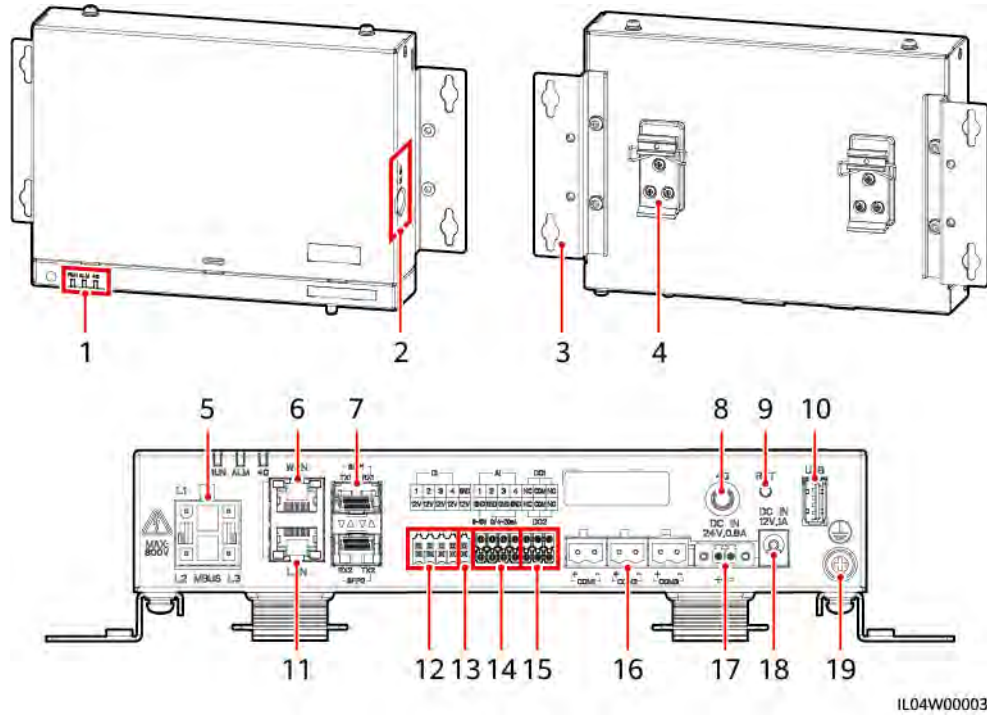
Figure 2-11 Position of the monitoring system



2.4.2.1 CMU

Appearance

Figure 2-12 Appearance





IL04W00003

- | | | |
|------------------------------|--------------------------------|----------------------------|
| (1) LED indicator | (2) SIM card slot | (3) Mounting ear |
| (4) Guide rail clamp | (5) MBUS port (reserved) | (6) GE port (WAN) |
| (7) SFP port | (8) 4G antenna port (reserved) | (9) RST button |
| (10) USB port | (11) GE port (LAN) | (12) DI port |
| (13) 12 V output power port | (14) AI port | (15) DO port |
| (16) COM port | (17) 24 V input power port | (18) 12 V input power port |
| (19) Protective ground point | - | - |

Indicators

Table 2-13 Indicators

Indicator	Status	Description	
Running indicator (RUN) 	Green off	Not powered on	
	Blinking green slowly (on for 1s and then off for 1s)	The communication with the management system is normal.	
	Blinking green fast (on for 0.125s and then off for 0.125s)	The communication with the management system is interrupted.	
Alarm/maintenance indicator (ALM) 	Alarm status	Red off	No system alarm is generated.
		Blinking red slowly (on for 1s and then off for 4s)	The system raises a warning alarm.
		Blinking red fast (on for 0.5s and then off for 0.5s)	The system raises a minor alarm.
		Steady red	The system raises a major alarm.
	Maintenance status	Green off	No local maintenance is in progress.
		Blinking green slowly (on for 1s and then off for 1s)	Local maintenance is in progress.
		Blinking green fast (on for 0.125s and then off for 0.125s)	Local maintenance fails or the connection to the app is to be set up.
		Steady green	Local maintenance succeeded.

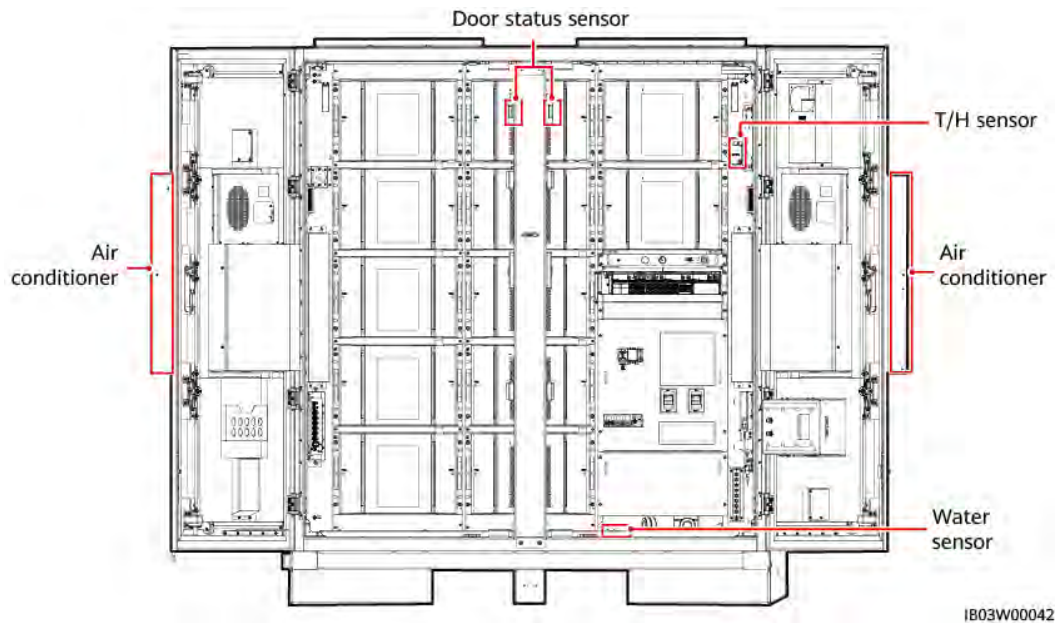
2.4.2.2 I/O Expansion Board

The I/O expansion board controls and monitors the door status sensor, sensors, and air conditioners in the ESS, connects cables to the fire suppression system, and black starts the system.

Item	I/O Expansion Board
Model	ENF1DETC
Operating voltage	220 V AC/12 V DC/24 V DC
Operating Current	≤ 1 A
Operating temperature	-30°C to +55°C
Humidity	≤ 95% RH (non-condensing)
Dimensions (H x W x D)	113.7 mm x 251 mm x 54.5 mm

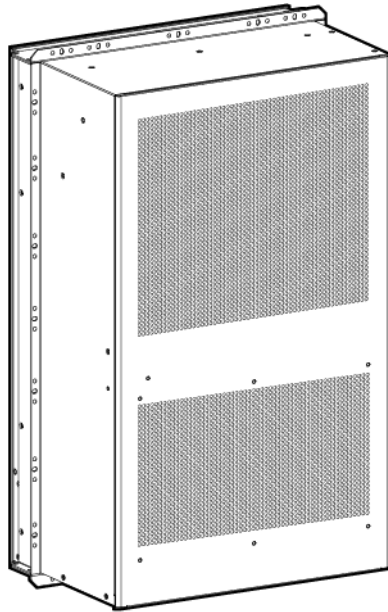
2.4.3 Environment Control System

Figure 2-13 Position of the environment control system



2.4.3.1 Air Conditioner

Figure 2-14 Appearance



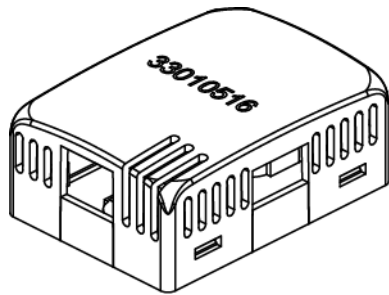
IB04W00015

Item	Air Conditioner
Power specifications	Operating voltage range: -42 V DC to -57 V DC; rated voltage: -48 V DC
Temperature control range	15°C to 35°C
Temperature control precision	±1°C
Sensible cooling capacity (L25/45)	2000 W
Rated power	1050 W
Maximum power	1200 W
Air volume	700 m ³ /h
Heating capacity	1200 W
Dimensions (H x W x D)	746 mm x 446 mm x 300 mm
Weight	70 kg
IP rating	IP55 (between the internal air circulation and the external air circulation)
Operating temperature range	-30°C to 55°C

Item	Air Conditioner
Refrigerant	R134a
Variable-frequency or not	Variable-frequency air conditioner

2.4.3.2 T/H Sensor

Figure 2-15 Appearance



IB04W00024

NOTE

- The appearance of the T/H sensor depends on the actual delivery.
- The T/H sensor belongs to the environment control system and fire suppression system in the ESS.

Table 2-14 T/H sensor technical specifications

Technical Specifications	T/H sensor
Temperature measuring range	-20°C to +80°C
Measurement range and precision	Temperature: -20°C to +80°C, error ≤ ±1°C Humidity: 0% RH to 100% RH, error ≤ ±8% RH
Operating temperature	-20°C to +80°C
Operating voltage	9-16 V DC
Storage temperature	-40°C to +80°C
Signal output	Two RJ45 ports, bidirectional cascading

The T/H sensor uses an RJ45 connector.

Figure 2-16 Pins of an RJ45 connector
RJ45 female connector

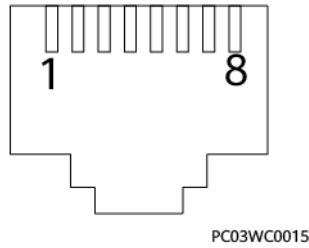
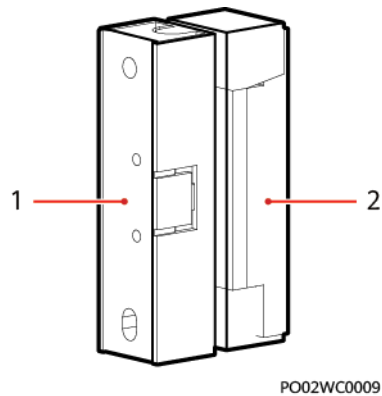


Table 2-15 Pin definitions of an RJ45 connector

Pin	Description
Pin 1 or Pin 4	A
Pin 2 or Pin 5	B
Pin 3	V+
Pin 6	Reserved
Pin 7	Reserved
Pin 8	V-

2.4.3.3 Door Status Sensor

Figure 2-17 Appearance



(1) Switch

(2) Magnet

Technical Specifications	Door Status Sensor
Connection method	Wiring terminals
Rated current	500 mA

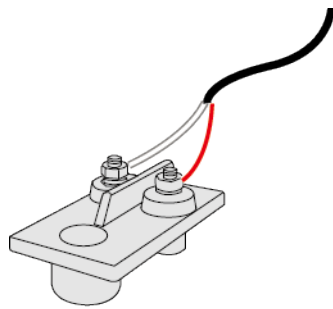
Technical Specifications	Door Status Sensor
Startup distance	25–45 mm
Rated Power	10 W
Securing method	Screw
Hole spacing	40±0.8 mm
Switch voltage	100 V DC (Max)
Contact withstand voltage	150 V DC (Max)
Impedance	0.3 ohms
Switch status	Steady on
Outer material	White acrylonitrile butadiene styrene (ABS) engineering plastic

2.4.3.4 Electrode Water Sensor

The water sensor detects water based on the resistance change between both electrodes.

When the electrodes detect water, they are short-circuited and the CMU reports an alarm.

Figure 2-18 Appearance

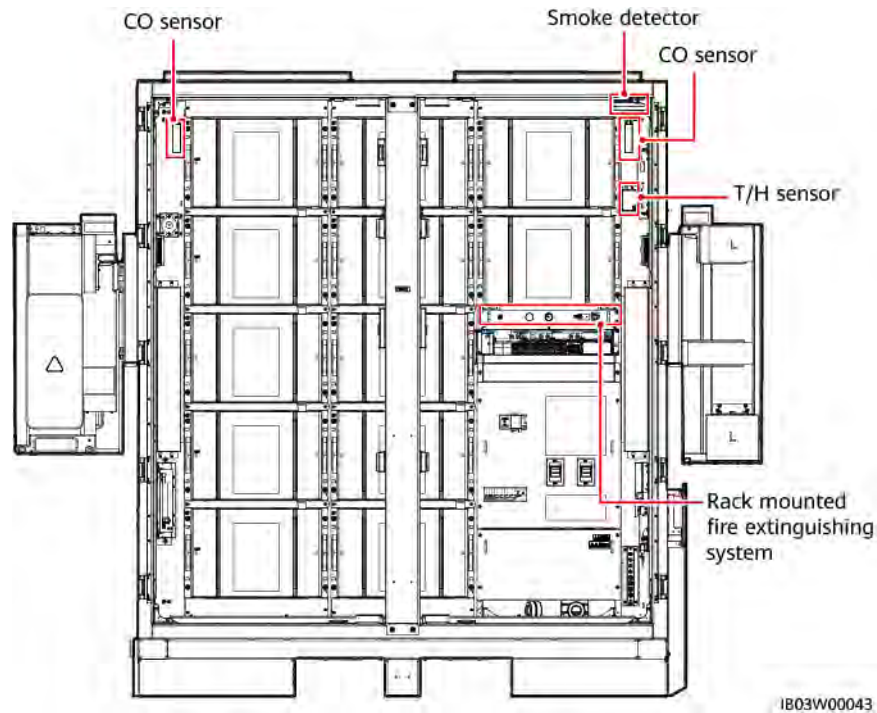


PO01WC0769

Technical Specifications	Electrode Water Sensor
Operating temperature	-40°C to +80°C
Storage temperature	-40°C to +80°C

2.4.4 Fire Suppression System

Figure 2-19 Position of the fire suppression system



2.4.4.1 Rack Mounted Fire Extinguishing System

1. The rack mounted fire extinguishing system is pre-integrated in the cabinet.
2. The extinguishant is perfluorohexanone which features high insulation, environment friendly, and quick fire extinguishing and cooling.

Working Principles

The rack mounted fire extinguishing system adopts the thermo bulb and electric startup mode.

- When the temperature inside the cabinet is higher than the temperature of the thermo bulb for a certain period of time, the thermo bulb breaks to start the fire extinguisher.
- When the external fire suppression system detects a fire, it triggers the electric start signal of the fire extinguishing device and opens the storage device of the extinguishant. The extinguishant is released through the nozzle to cool down and put out the fire.

NOTE

- The thermo bulb can also work normally during electric startup.
- When a fire occurs, the thermo bulb can start the extinguisher even if the electric startup mode fails. This ensures that the fire extinguisher can be started reliably.

Figure 2-20 Front

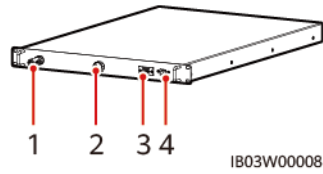
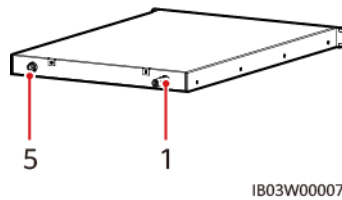


Figure 2-21 Rear



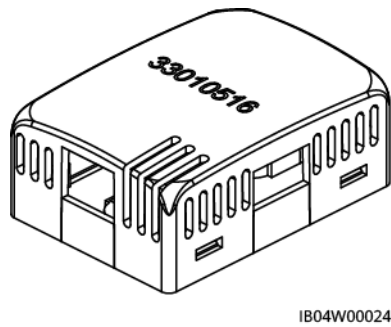
- (1) Thermo bulb (2) Pressure gauge (3) Wiring port (4) Signal for electric startup feedback (5) Extinguishant release nozzle assembly

Table 2-16 Technical specifications

Item		Rack Mounted Fire Extinguishing System
Storage pressure (at 20°C)		1.6 MPa±0.2 MPa
Startup mode (thermo bulb)		Startup at a constant temperature: 79°C±3°C
Startup mode (electric)		12 V external power supply, started by a solenoid valve
Alarming mode		Dry contact signal feedback
Operating environment	Safe operating temperature	-30°C to 55°C
	Transportation temperature	-40°C to 60°C
	Storage temperature	-40°C to 60°C
	Relative humidity	≤ 97% RH (40°C, non-condensing)
Dimensions		≤ 1 U (height) x 700 mm (depth) x 482 mm±1 mm (width)

2.4.4.2 Rack Mounted Fire Extinguishing System

Figure 2-22 Appearance



NOTE

- The appearance of the T/H sensor depends on the actual delivery.
- The T/H sensor belongs to the environment control system and fire suppression system in the ESS.

Table 2-17 T/H sensor technical specifications

Technical Specifications	T/H sensor
Temperature measuring range	-20°C to +80°C
Measurement range and precision	Temperature: -20°C to +80°C, error ≤ ±1°C Humidity: 0% RH to 100% RH, error ≤ ±8% RH
Operating temperature	-20°C to +80°C
Operating voltage	9-16 V DC
Storage temperature	-40°C to +80°C
Signal output	Two RJ45 ports, bidirectional cascading

The T/H sensor uses an RJ45 connector.

Figure 2-23 Pins of an RJ45 connector

RJ45 female connector

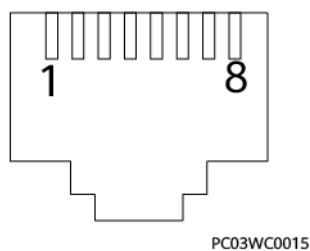


Table 2-18 Pin definitions of an RJ45 connector

Pin	Description
Pin 1 or Pin 4	A
Pin 2 or Pin 5	B
Pin 3	V+
Pin 6	Reserved
Pin 7	Reserved
Pin 8	V-

2.4.4.3 CO Sensor

Figure 2-24 Appearance

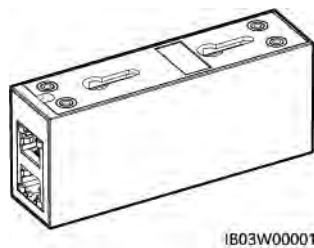


Table 2-19 Technical specifications of the CO sensor

Technical Specifications	CO Sensor
Dimensions (H x W x D)	40 mm x 97 mm x 25 mm
Operating voltage	8–30 V DC
Stability	≤ ±3% FS/year
Precision	≤ ±10% FS
Power consumption	0.12 W
Output signal	RS485
Operating temperature	–25°C to +55°C
Humidity	5%–95% RH (non-condensing)
Resolution	≤ 30 ppm
Response time	≤ 60s
Cabling mode	RJ45 network port
Installation mode	Gourd-shaped mounting hole/nut/magnet

Figure 2-25 Pins of an RJ45 connector
RJ45 female connector

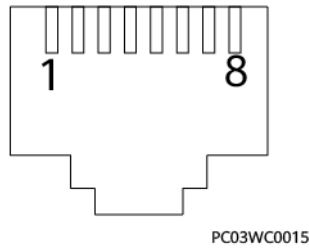


Table 2-20 Pin definitions of an RJ45 connector

Pin	Description
Pin 1 or Pin 4	A
Pin 2 or Pin 5	B
Pin 3	V+
Pin 6	Reserved
Pin 7	Reserved
Pin 8	V-

2.4.4.4 Smoke Detector

The smoke detector can detect the smoke concentration in the environment.

Figure 2-26 Appearance

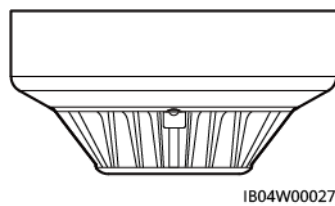


Table 2-21 Indicator description

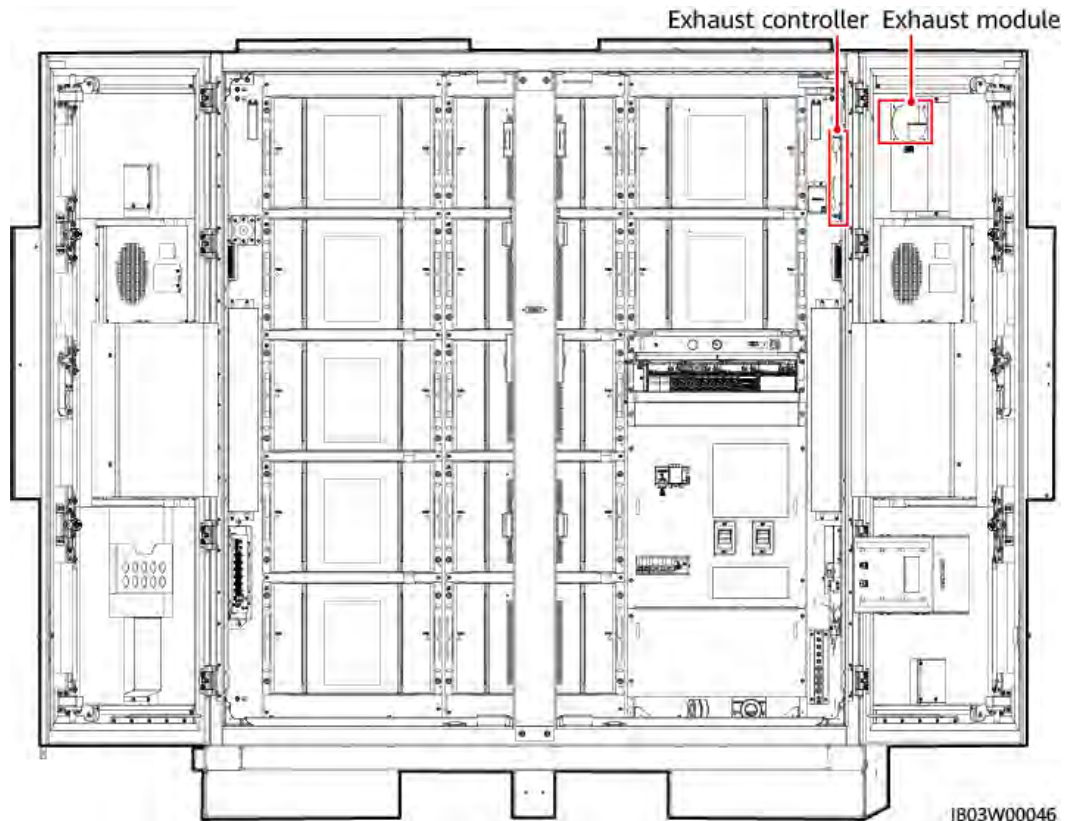
Name	Color	Status	Description
Indicator	Red	Steady on	The detector enters the alarm state.
		Blinking	The detector enters the monitoring state.

Table 2-22 Technical specifications

Item	Smoke Detector
Operating voltage	12 V (9–16 V DC)
Quiescent current	< 8 mA
Alarm current	< 35 mA
Output mode	Relay output
Polarity	None
Output contact capacity	3 A/120 V AC or 3 A/24 V AC
Operating temperature	-20°C to +60°C
Ambient humidity	< 95% RH (non-condensing)

2.4.5 Exhaust System

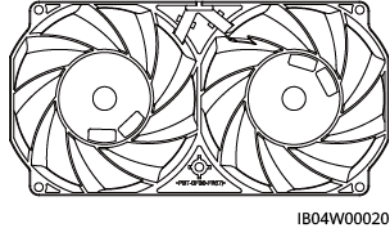
Figure 2-27 Position of the exhaust system



2.4.5.1 Air Exhaust Module

The air exhaust module is the actuator of the active air exhaust system. When the combustible gas is released from the battery, the air exhaust module reduces the concentration of combustible gas in the battery cabin.

Figure 2-28 Appearance

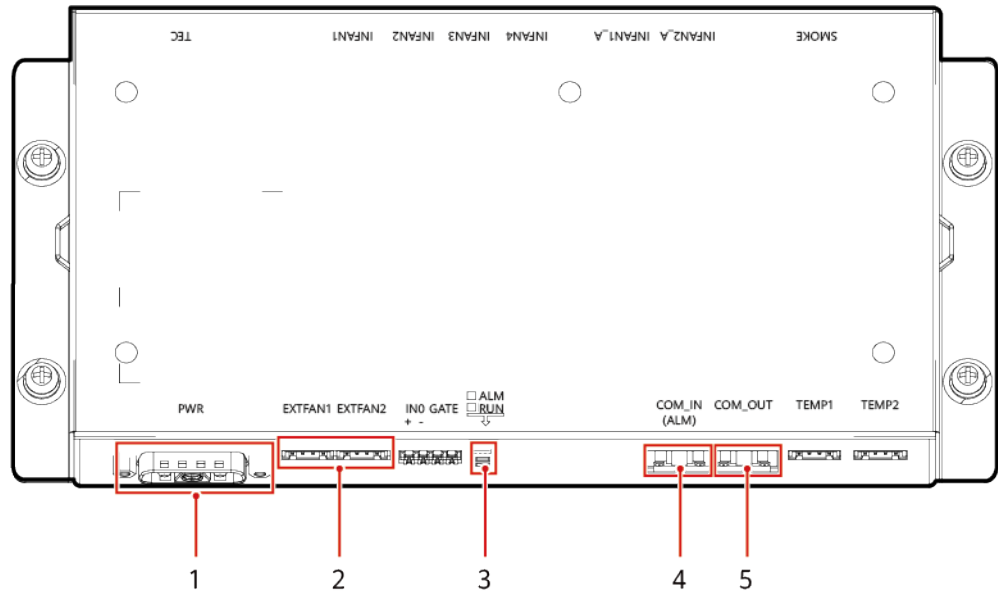


Technical Specifications	Air Exhaust Module
Dimensions (H x W x D)	38 mm x 194 mm x 99 mm
Operating voltage	36-72 V DC
Rated rotating speed	9500±10% RPM
Operating temperature	-25°C to +70°C

2.4.5.2 Air Exhaust Controller

The air exhaust controller TCUE receives commands from the CMU and adjusts the fan speed.

Figure 2-29 Appearance



XW00000209

- (1) Power input port (2) Fan ports (3) Indicators
- (4) Communications port 1 (5) Communications port 2 -

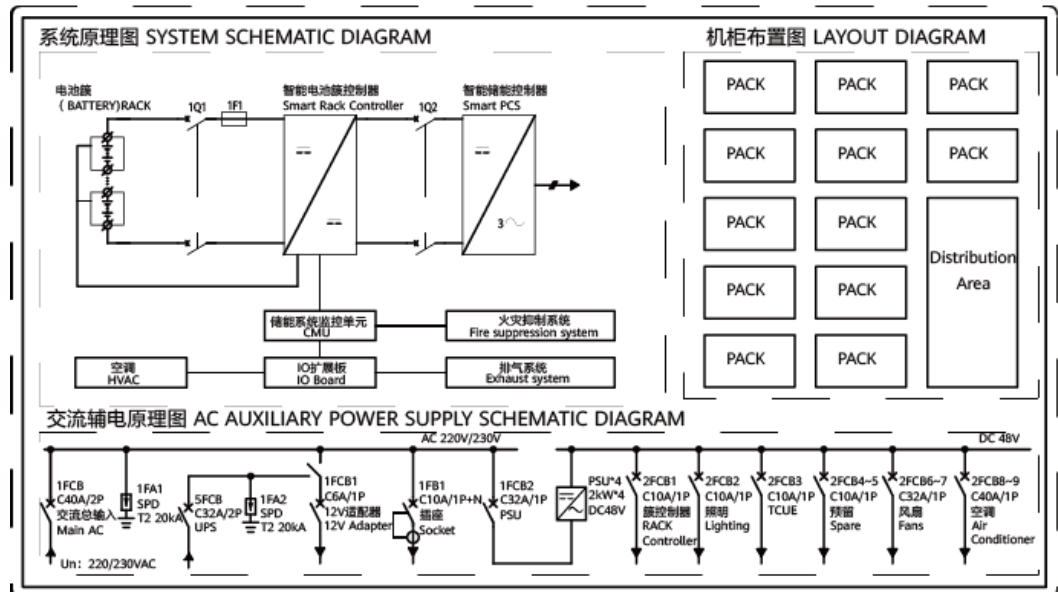
Table 2-23 Indicator description

Silk Screen	Color	Status	Description
RUN	Green	Steady on	Power supply to the board is normal but no program is running.
		Blinking at 0.5 Hz	The system is running properly.
		Blinking at 4 Hz	Serial port communication is interrupted or the board is not registered.
		Off	The system is not powered on.
ALM	Red	Steady on	Power supply to the board is normal but no program is running.
		Blinking at 0.5 Hz	An alarm is generated.
		Off	No alarm is generated.

2.5 Working Principle

2.5.1 Circuit Diagram

Figure 2-30 Circuit diagram



IB03P00004

2.5.2 Device Status

The ESS has six states: running, hibernating, self-checking, faulty, offline, and loading.

Table 2-24 Device status description

Status	Description
Running	The ESS is charging from an external DC source or discharging for external devices.
Hibernating	The ESS stops charging and discharging and shuts down the rack controllers. <ul style="list-style-type: none"> In the running state, if the ESS receives a hibernation command, it enters the hibernation state. In the hibernation state, if the ESS receives a running command, it enters the running state.
Self-checking	The ESS is in progress of a self-check.
Faulty	If a rack controller or battery pack is faulty, the system enters the faulty state.
Offline	A rack controller is disconnected from the CMU.
Loading	After the CMU starts, the system is waiting for battery packs to be connected.

2.6 Typical Application Scenario

Figure 2-31 Electrical connection diagram (components in the dotted box are optional)

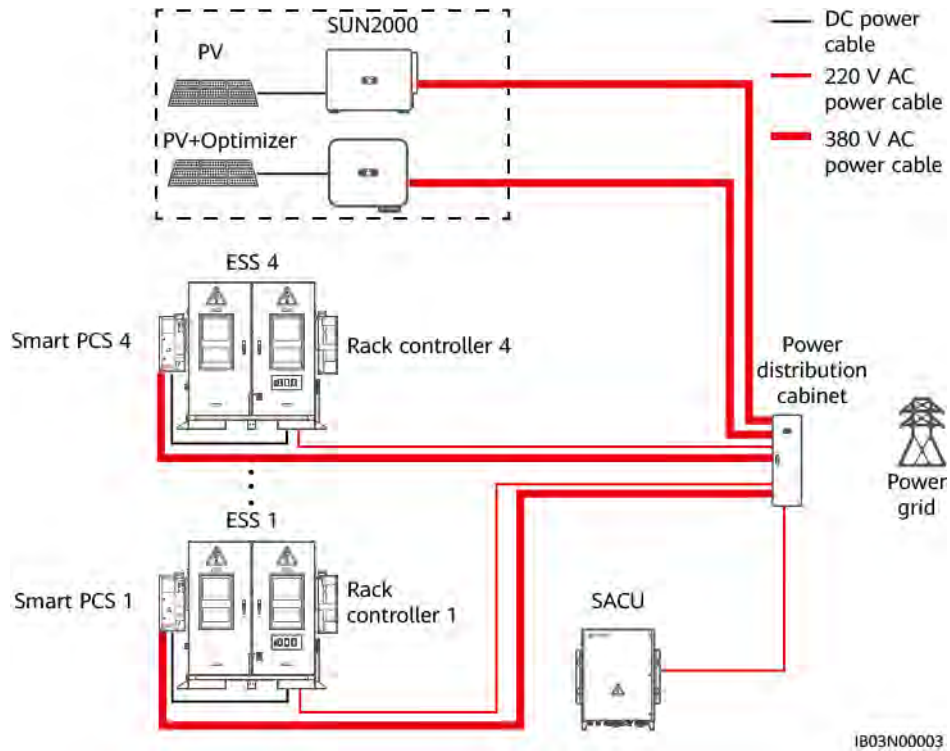
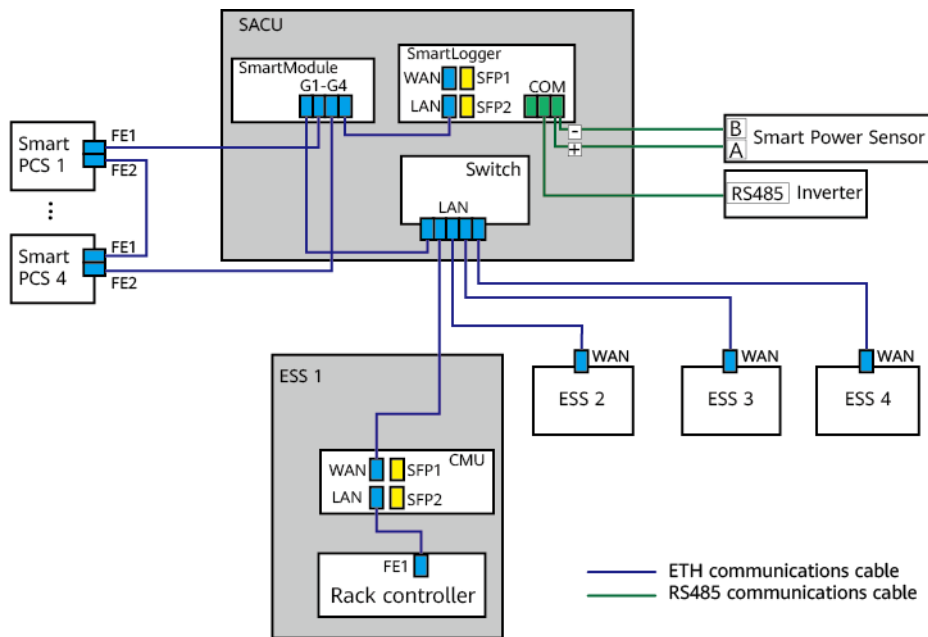


Table 2-25 0.8 MWh/400 kW standard configurations

No.	Item	Recommended Model/ Specifications	Quantity	Source
1	ESS	LUNA2000-200KWH-2H1	4	Purchased from the Company
2	Smart PCS	LUNA2000-100KTL-M1	4	Purchased from the Company
3	Rack controller	-	4	Purchased from the Company
4	SACU	SmartACU2000D-D-00	1	Purchased from the Company

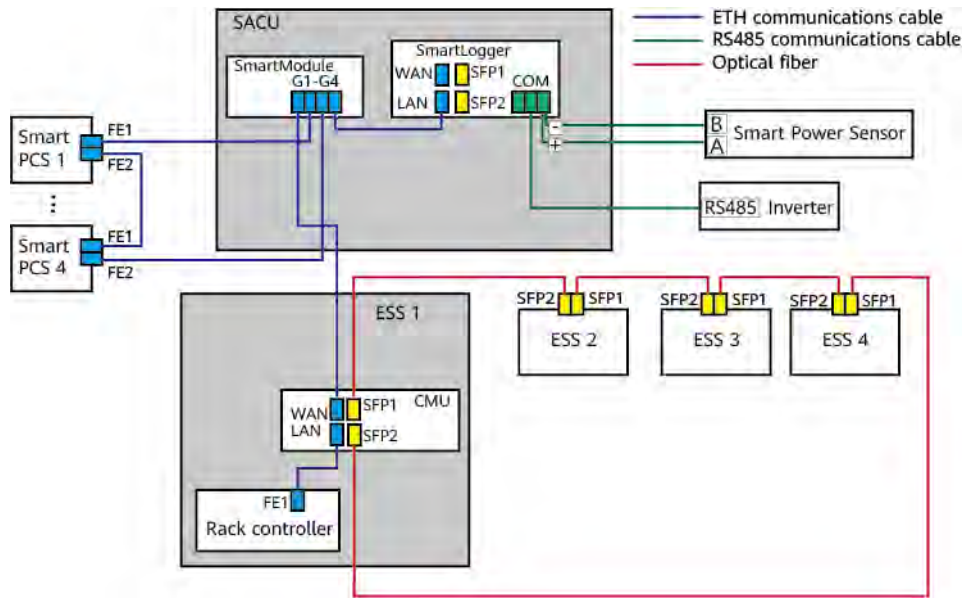
No.	Item	Recommended Model/ Specifications	Quantity	Source
5	Power distribution cabinet	The specifications should comply with the Smart PCS specifications, auxiliary power supply specifications, actual application scenarios, and local laws and regulations.	1	Prepared by the customer
6	Inverter	<ul style="list-style-type: none"> SUN2000-(100KTL, 110KTL, 115KTL)-M2 SUN2000-(20KTL, 29.9KTL, 30KTL, 36KTL, 40KTL)-M3 SUN2000-(50KTL-ZHM3, 50KTL-M3) SUN2000-(20KTL-M3, 33KTL-NH, 40KTL-NH) SUN2000-50KTL-NHM3 SUN2000-(75KTL, 100KTL, 110KTL, 125KTL) series SUN2000-111KTL-NHM0 	Configured based on the capacity requirements	Prepared by the customer

Figure 2-32 Communication networking diagram (FE)



IB03N00001

Figure 2-33 Communication networking diagram (fiber ring network)



3 Transportation Requirements

- Be cautious to prevent injury when moving heavy objects.



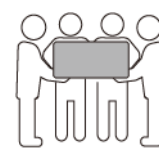
< 18 kg
(< 40 lbs)



18–32 kg
(40–70 lbs)



32–55 kg
(70–121 lbs)



55–68 kg
(121–150 lbs)

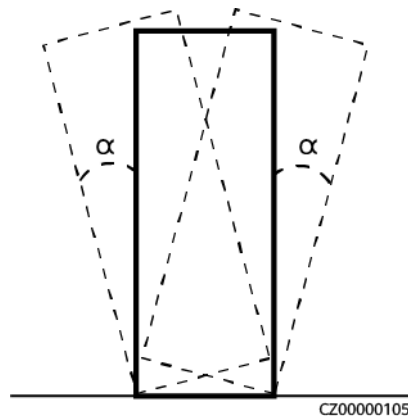


> 68 kg
(> 150 lbs)

CZ0000110

- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.

- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Ensure that tilt angle of the cabinet meets the requirements shown in the figure. The tilt angle α of a cabinet with packaging must be less than or equal to 15° . After the cabinet is unpacked, its tilt angle α must be less than or equal to 10° .



Transportation Requirements

DANGER

Do not load or unload batteries in a rude way. Otherwise, the batteries may be short-circuited or damaged (such as leakage and crack), catch fire, or explode.

WARNING

Do not move a battery by holding its terminals, bolts, or cables. Otherwise, the battery may be damaged.

Move batteries in the required direction. They must not be placed upside down or tilted, and must be protected against falling down, mechanical impact, rains, snows, and falling into water during transportation.

Batteries must be transported separately. Do not transport a cabinet with batteries installed. If the cabinet needs to be transported or moved, remove the batteries first.

- The product passes the certifications of the UN38.3 (UN38.3: section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) and SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of Packaging for Exporting Dangerous Goods). This product belongs to class 9 dangerous goods.
- The batteries can be delivered to the site directly and transported by land and water.

- Comply with the international regulations on the transport of dangerous goods and meet the requirements of the transportation regulatory authorities in the countries of departure, route, and destination.
- Choose sea or roads in good conditions for transportation as transportation by railway or air is not supported. Avoid tilt or jolt during transportation.
- Maritime transport must comply with the *International Maritime Dangerous Goods Code* (IMDG Code).
- Road transport must comply with the *Agreement Concerning the International Carriage of Dangerous Goods by Road* (ADR) or JT/T 617.
- Before transportation, check that the battery package is intact and that there is no abnormal odor, leakage, smoke, or sign of burning. Otherwise, the batteries cannot be transported.
- The packing case must be secured for transportation. Handle the case with care during loading, unloading, and transportation with moisture-proof measures in place.
- Exercise caution when moving batteries to prevent bumping and ensure personal safety.
- Unless otherwise specified, dangerous goods cannot be mixed with goods containing food, medicine, animal feed, or their additives in the same vehicle or container.
- Unless otherwise specified, when dangerous goods packages are loaded in the same vehicle or container as ordinary goods, they should be separated in either of the following ways:
 - Use a spacer that is as high as the packages.
 - Keep a distance of at least 0.8 m around.

4 Storage Requirements

General Requirements

NOTE

- Proof that the product is stored according to the requirements must be available, such as temperature and humidity log data, storage environment photos, and inspection reports.
- Do not store battery packs for extended periods. Long-term storage of lithium batteries may cause capacity loss. Generally, the irreversible capacity loss is 3% to 10% after the lithium batteries are stored at the recommended storage temperature range for 12 months.
- The storage environment must be clean and dry. The product must be protected against rain and water.
- The air must not contain corrosive or flammable gases.
- Do not tilt the product or place it upside down.
- If equipment except battery packs has been stored for more than two years, it must be checked and tested by professionals before use.

4.1 ESS (Excluding Battery Packs) Storage

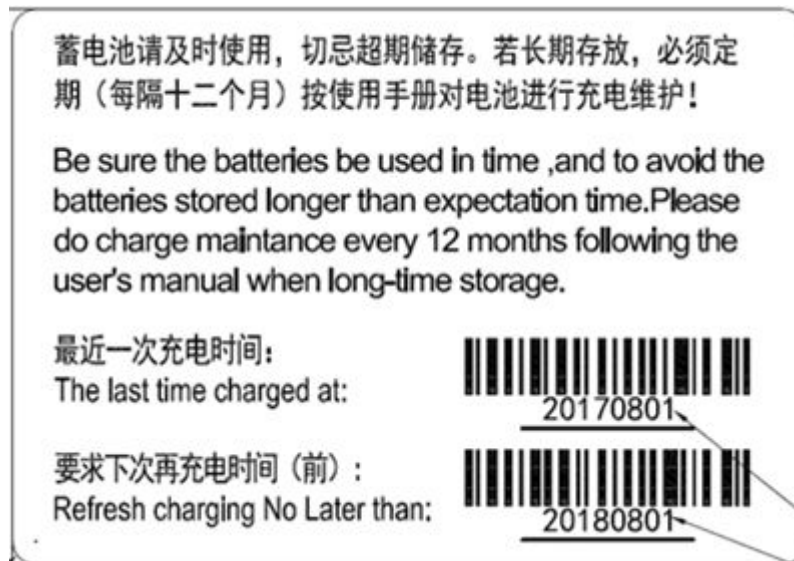
- Do not unpack an ESS if it will be stored for a long time.
- Do not stack the ESSs.
- Ensure that the ground surface is flat (for long-term or temporary storage).
- Close the cabinet door.
- Storage temperature: -40°C to $+60^{\circ}\text{C}$; humidity: 5%–95% RH

4.2 Battery Pack Storage and Single Battery Pack Charge

Material Delivery Check

There must be a battery charge label on the packing case. The charge label must specify the latest charge time and the next charge time.

Figure 4-1 Battery charge label



Storage Requirements





⚠ WARNING

- Ensure that batteries are stored indoors. Install batteries in a dry, clean, and ventilated environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose batteries to sunlight or water and keep them far away from sources of heat and ignition.
- Dispose of bulged, deformed, damaged, or leaking batteries irrespective of how long they have been stored.
- Place batteries correctly according to the signs on the packing case during storage. Do not place batteries upside down, lay them on one side, or tilt them. Stack batteries in accordance with the stacking requirements on the packing cases.
- Store batteries in a separate place. Do not store batteries together with other devices. Do not stack batteries too high. The site must be equipped with qualified fire suppression facilities, such as fire sand and fire extinguishers.

⚠ CAUTION

Batteries should be used soon after being deployed onsite. Batteries that have been stored for an extended period should be charged periodically. Otherwise, they may be damaged.

Table 4-1 Packaging label description

Picture	Description
	<p>This way up: The package should be vertically oriented during transport and storage.</p>
	<p>Fragile: The package contains fragile objects and must be handled with care.</p>
	<p>Keep dry: The package must be kept away from rain.</p>
	<p>Stacking limit by number: The packages should not be vertically stacked beyond the specified number. The actual label may vary.</p>

- The storage environment requirements are as follows:
 - Ambient temperature: -40°C to +60°C (recommended: 20°C to 30°C)
 - Relative humidity: 5%–95% RH (recommended: about 45% RH)
 - Dry, clean, and well-ventilated
 - Away from corrosive organic solvents and gases
 - Away from direct sunlight
 - At least 2 meters away from heat sources
- The batteries in storage must be disconnected from external devices. The indicators (if any) on the batteries must be off.
- The storage duration starts from the latest charge time labeled on the battery package. If a battery is qualified after charge, update the latest charge time (recommended format: YYYY-MM-DD HH:MM) and the next charge time (Next charge time = Latest charge time + Charge interval) on the label.
- The total storage and transportation time of the battery packs cannot exceed eight months (starting from delivery). If it exceeds eight months, charge the batteries and calibrate the SOC to at least 50%. Otherwise, the battery performance and service life may be deteriorated.

- Do not unpack batteries. Batteries should be charged during storage by professionals as required, and they should be put back to their packaging after charge.
- The warehouse keeper should collect battery storage information every month and periodically report the battery inventory information. The batteries in long-term storage should be charged in a timely manner.

 **CAUTION**

- Only trained and qualified personnel are allowed to charge batteries. Wear insulated gloves and use dedicated insulated tools during the operation.
 - Observe onsite during charge and handle any exceptions in a timely manner.
 - If a battery experiences an abnormality such as bulging or smoking during charge, stop charging immediately and dispose of it.
-
- AC mains input voltage requirements for charging:
 - 220 V (three-phase 260–530 V AC or single-phase 176–300 V AC)
 - 110 V (three-phase 130–265 V AC or single-phase 90–175 V AC)
 - AC input power cables used for charging in the warehouse must have a through-current capacity greater than 23 A.
 - If batteries have been stored for longer than allowed, promptly report the event to the person in charge.
 - Ensure that batteries are delivered based on the "first in, first out" rule.
 - Handle batteries with caution to avoid damage.

Conditions for Determining Overdue Storage of Battery Packs

- Do not store batteries for extended periods.
- The total storage and transportation time of the battery packs cannot exceed eight months (starting from delivery). If it exceeds eight months, charge the batteries and calibrate the SOC to at least 50%. Otherwise, the battery performance and service life may be deteriorated.
- If batteries have been stored for longer than allowed, promptly report the event to the person in charge.
- Dispose of deformed, damaged, or leaking batteries directly irrespective of how long they have been stored.
- The storage duration starts from the latest charge time labeled on the battery package. If a battery is qualified after charge, update the latest charge time (recommended format: YYYY-MM-DD HH:MM) and the next charge time (Next charge time = Latest charge time + Charge interval) on the label.
- Charge batteries during storage once every eight months for a maximum of three times. Dispose of batteries if the maximum charge times are exceeded.

Preparing Charging Devices

- Multimeter

- Clamp meter
- Insulated torque socket wrench
- Charger

Inspection Before Charge

1. Before charging a battery, you need to check its appearance. Charge the qualified battery or dispose of the unqualified one.
2. The battery is qualified if it is free from the following symptoms:
 - Deformation
 - Shell damage
 - Leakage
3. Check that the accessories are complete based on the packing list delivered with the charger.

Full Charge Strategy

The charging ambient temperature should range from 15°C to 40°C.

Charge and Discharge Current (Unit: Ampere)	Charging Duration (Excluding Equalization)
20	24 hours (fully discharge the battery and then charge the battery to 50% SOC)
40 ^[1]	12 hours (fully discharge the battery and then charge the battery to 50% SOC)
Note 1: In customized mode, use the AC 220 V/20 A (6 mm ²) power cable delivered with the charger.	

Charging Procedure

 **NOTE**

Prepare the battery qualified for charge.

- Step 1** Connect the communications port on the charger to the COM-2 and 48V-2 ports on the battery using the CAN communications cable (48 V) delivered with the charger.
- Step 2** Connect the positive and negative cable ports on the charger to the positive and negative ports on the battery using the positive and negative DC input power cables delivered with the charger.
- Step 3** Connect the AC INPUT port on the charger to the utility power source using the power cable delivered with the charger.
- Step 4** Turn on the AC circuit breaker of the charger.

- Step 5** Turn on the DC circuit breaker of the charger.
- Step 6** Operate the charger according to its manual.
- Step 7** After the charge and discharge are complete, wait until the fan in the charger keeps running for about 5 minutes to dissipate the residual heat, turn off the AC and DC circuit breakers, and remove the cables.
- End

4.3 Smart Rack Controller Storage

If a Smart Rack Controller will not be used immediately, store it according to the following requirements:

- Do not remove the packaging. Check the packaging regularly (recommended: once every three months). Replace any packing materials that become damaged during storage. If the Smart Rack Controller is unpacked but will not be used immediately, put it back to the original packaging with the desiccant, and seal with tape.
- Storage temperature: -40°C to $+70^{\circ}\text{C}$ (-40°F to $+158^{\circ}\text{F}$); humidity: 5%–95% RH
- Stack Smart Rack Controllers with caution to prevent them from falling over, resulting in personal injury or equipment damage.

5 Site Requirements

5.1 Site Selection Requirements

NOTICE

Refer to the GB 51048 *Design code for electrochemical energy storage station*, NFPA 855 *Standard for the Installation of Stationary Energy Storage Systems*, and local laws and regulations.

The ESS applies only to outdoor scenarios and can only be deployed outdoors. The general requirements for site selection are as follows:

- The site must not be located in a low-lying land. The horizontal level of the installation site must be above the highest water level of that area in history.
- There must be no vegetation, especially flammable plants within 3 m of the ESS and the site to protect the ESS from possible fires.
- The distance between the top of the ESS and flammable materials must be greater than or equal to 2 m.
- For safety purposes, the distance between the ESS and residential buildings must be greater than or equal to 12 m, and the distance between the ESS and densely populated buildings such as schools and hospitals must be greater than 30.5 m. If the safety distance requirement cannot be met, fire walls must be installed between the ESS and the buildings.
- The safety distances between the ESS and production buildings must comply with local fire protection regulations or standards.
 - The ESS located outdoors must be at least 10 ft (3.048 m) away from lot lines, public ways, buildings, combustible materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure.
 - If either of the following conditions is met, the distance between the ESS and the production building can be reduced to 3 ft (0.914 m). In addition, space requirements for equipment transportation, installation, and maintenance must be considered.

- There are 1-hour freestanding fire walls, extending 5 ft (1.5 m) above and extending 5 ft (1.5 m) beyond the physical boundary of the ESS installation.
- Non-combustible exterior walls with no openings or combustible overhangs are provided on the wall adjacent to the ESS and the fire resistance rating of the exterior walls complies with 2-hour fire resistance rating of ASTM E119 or UL 263.
- The ESS and the site should be in an environment free from explosion risks.
- Transportation to the site should be convenient and effective fire suppression facilities should be reliable.

 **NOTE**

- When installing, commissioning, and operating the ESS, ensure that at least two gas fire extinguishers are provided near each unit to ensure fire safety.
- The distance between the exhaust device of an ESS and the heating and ventilation vents, air intake vents of air conditioners, windows, doors, unloading platforms, and fire sources of other buildings or facilities must be greater than 4.6 m.
- Reserve sockets for the water fire suppression system at the ESS site.
- The site area must meet the requirements and there should be space for capacity expansion.
- The ESS should be installed more than 30 m away from the third-party wireless communication facilities.
- The site must be in a well-ventilated place.
- The ESS cannot be installed in salt-affected or polluted areas because this will cause corrosion or even fire. The ESS can be used in the following or better environments:
 - Outdoor environment more than 2000 m away from the coast. You are advised not to use the ESS in an area 500 m to 2 km away from the coast. (If you need to use it, confirm with the vendor or the Company's engineers.) Do not use the ESS in an area less than 500 m away from the coast.
 - More than 1500–3000 m away from heavy pollution sources such as smelteries, coal mines, and thermal power plants
 - More than 1000–2000 m away from medium pollution sources such as chemical, rubber, and electroplating industries
 - More than 500–1000 m away from light pollution sources such as packing houses, tanneries, boiler rooms, slaughterhouses, landfill sites, and sewage treatment plants

 **NOTE**

Reselect the site if the safety distance for a site cannot meet the requirements of relevant national standards.

Do not select the sites that are not recommended by industry standards and regulations, including but not limited to the following areas:

- Areas with sources of strong variation, loud noises, and strong electromagnetic interference
- Areas with dust, oil fumes, harmful gases, corrosive gases, etc.

- Areas with corrosive, flammable, and explosive materials
- Areas with existing underground facilities
- Areas with adverse geological conditions such as rubbery soil and soft soil layer, or prone to waterlogging and land subsidence
- Under a reservoir, water landscape, and water room

 NOTE

- If areas prone to waterlogging cannot be avoided, install water blocking and drainage facilities or raise the ground.
- Cable trenches cannot be used for drainage. Fire retardant sealing should be implemented at cable holes (such as holes through partition walls and floors).
- Areas prone to earthquakes and with seismic fortification intensity higher than 9
- Areas prone to debris flow, landslide, quicksand, karst caves, and other direct hazards
- Areas within the mining land subsidence (dislocation) zone
- Areas within the scope of blasting hazard
- Areas prone to flood due to a dam or levee failure
- Protection areas for important water supply sources
- Protection areas for historic relics
- Populated areas, high-rise buildings, and underground buildings
- Intersections and busy roads of urban main roads

Requirements for flood and waterlogging prevention in site selection:

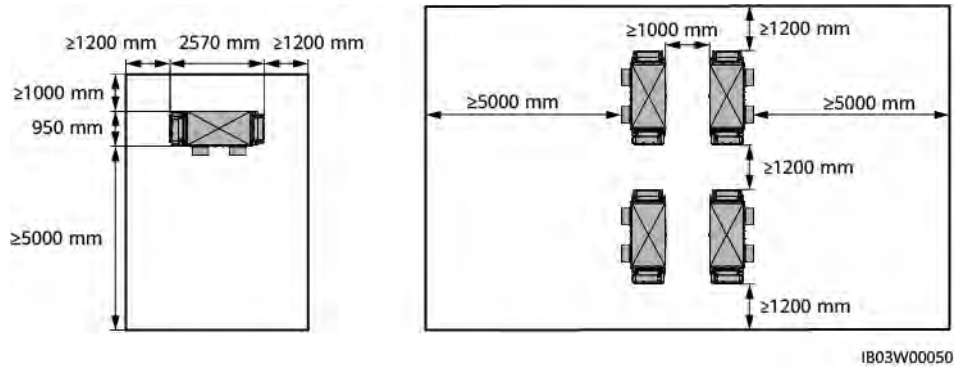
- The site design elevation of a large-scale electrochemical energy storage system (power ≥ 100 MW) should be higher than the flood level with a probability of 1% or the historical highest waterlogging level.
- The site design elevation of a medium- or small-scale electrochemical energy storage system (power < 100 MW) should be higher than the flood level with a probability of 2% or the historical highest waterlogging level.
- If the site design elevation cannot meet the preceding requirements, change the site location or take different flood and waterlogging prevention measures based on the site requirements.
- For energy storage plants prone to wind and waves from rivers, lakes, and seas, the elevation of flood prevention facilities should consider the wind and wave height with a probability of 2% and an additional safety height of 0.5 m.

Security fencing:

It is recommended that physical walls or fences be used for isolation and protection in the energy storage equipment area. The fences should be equipped with a door lock. The fence height should be greater than 2.2 m. Fire walls can be substituted for part or all of the fences, depending on the actual design plans.

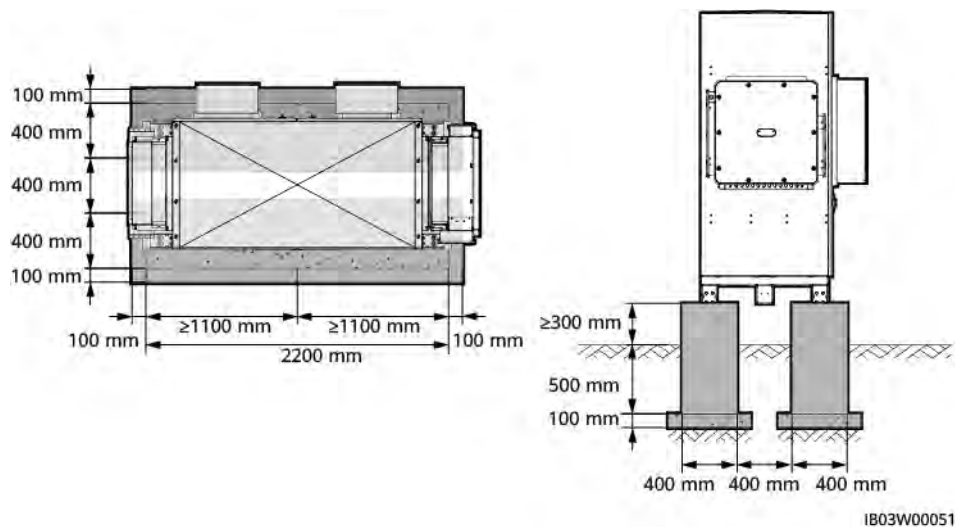
5.2 Clearance Requirements

Figure 5-1 Clearance Requirements



5.3 Foundation Requirements

Figure 5-2 Foundation Requirements



Requirements for foundation design scheme:

- The ESS must be installed on concrete or other non-combustible surfaces. Ensure that the installation surface is horizontal, secure, flat, and has sufficient load-bearing capacity. Subsidence or slope is not allowed.
- The foundation should sustain the total weight of the equipment (2.8 tons). If the load-bearing capacity of the foundation does not meet the requirement, a review is required.
- The bottom of the excavated foundation must be compacted and flat.
- After the foundation is excavated, prevent water from entering the foundation. If water enters the foundation, excavate and refill the affected parts.

- The error of the elevation of the top surface of the foundation (column) should be less than or equal to 3 mm. It is recommended that the foundation be 300 mm higher than the horizontal ground.
- Ensure that the bottom of the equipment is higher than the local highest water level to prevent rain from eroding the ESS base and interior.
- A drainage system must be constructed onsite to prevent the bottom or internal devices of the ESS from being immersed in water in rainy seasons or when a large amount of precipitation occurs.
- Reserve trenches or cable inlets for the ESS during foundation construction.
- The reserved holes on the foundation and the cable inlets at the bottom of the equipment should be sealed.
- The following foundation drawing is for reference only and cannot be used as the final construction drawing. The design specifications of the ESS foundation should be reviewed based on the installation environment, geological features, and seismic resistant requirements of the project site.

5.4 Forklift Requirements

- Do not move the ESS after battery packs are installed.
- Before using a forklift, ensure that the forklift has a load bearing capacity of at least 1 t.
- It is recommended that the length of the tynes be greater than or equal to 1.2 m, the width be 80 cm to 160 cm, and the thickness be 25 cm to 70 cm.

5.5 Hoisting Requirements

- Before hoisting, ensure that the crane and hoisting ropes meet the load-bearing requirements.
- When installing or removing the hoisting equipment, do not drag it on the container to prevent scratches.
- Do not hoist or move the ESS after battery packs are installed.

Stage	Precautions
Before hoisting	Crane hoisting capacity > 1 t, working radius \geq 2 m If the onsite environment does not meet the required working conditions, ask a professional to assess the conditions.
	Only trained and qualified personnel are allowed to perform hoisting operations.
	Check that hoisting tools are complete and in good condition.
	Ensure that the hoisting tools are secured to a load-bearing object or wall.
	The weather condition should be good without wind when the unit needs to be hoisted outdoors.

Stage	Precautions
	Ensure that the crane and steel hoisting ropes provide the required bearing capacity.
	All doors of the equipment are closed and locked.
	Ensure that the steel hoisting ropes are securely connected.
	It is recommended that the container be hoisted from left to right or from right to left.
During hoisting	Do not allow any unauthorized person to enter the hoisting areas and do not stand under the crane arm.
	Ensure that the crane is properly located and avoid long-distance hoisting.
	Keep the container stable and horizontal during hoisting, and ensure that the diagonal gradient of the container is less than or equal to 5 degrees.
	Ensure that the angle between two ropes is less than or equal to 90 degrees.
	Lift and land the container slowly to prevent shock to equipment inside it.
	Remove the ropes after ensuring that the container is placed evenly on the container bases.
	Do not drag steel ropes or lifting appliances. Do not collide with the equipment.
	Secure the unit you have hoisted before hoisting another unit.

6 Unpacking and Acceptance

NOTICE

- To prevent the equipment from falling over, secure it to a pallet truck or forklift using ropes before moving it. Move the equipment with caution to avoid bumping or falling, which may damage the equipment.
 - After placing the equipment in the installation position, unpack it with care to prevent scratches. Keep the equipment stable during unpacking.
 - After unpacking, check whether the fastening components and removable components are loose. If they are loose, notify the carrier and manufacturer immediately.
 - Before unpacking batteries, check whether the packaging is intact. Do not use batteries with damaged packaging. If any damage is found, notify the carrier and manufacturer immediately.
 - If the installation environment is poor, take dustproof and anti-condensation measures (for example, use a dust cover, plastic film, or fabric cloth) after unpacking batteries to prevent condensation and dust buildup, which may corrode the batteries.
-

7 Installation

WARNING

- Ensure that the power circuit breaker is OFF before installing batteries.
 - When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
 - When moving batteries, do not remove protective components such as protective covers or waterproof caps from battery terminals.
 - Do not move or operate under the forklift tynes.
 - You can operate the battery pack installation kit only after the forklift stops moving.
-

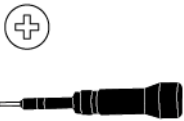

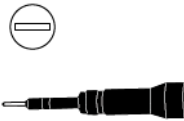
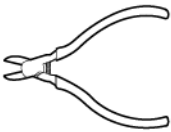
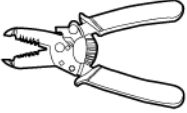



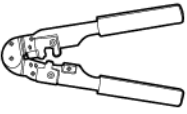
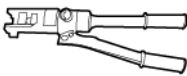


7.1 Installation Preparations

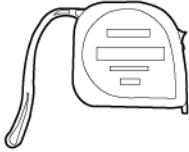


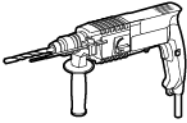









7.1.1 Preparing Tools

NOTE





- The tool pictures are for reference only.
- The tool tables may not list out some tools required onsite. Onsite installation personnel and the customer need to prepare the tools based on the site requirements.

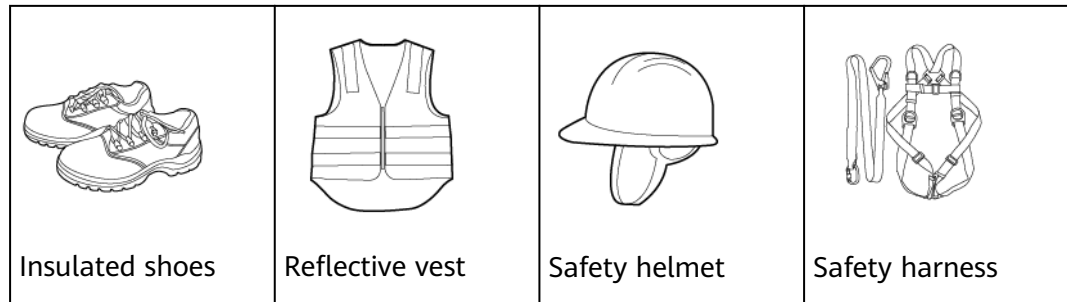
Installation Tools

 <p>Phillips insulated torque screwdriver</p>	 <p>Insulated torque socket wrench (including an extension bar)</p> <ul style="list-style-type: none"> • Socket specifications: 7–19 mm • Socket depth \geq 32 mm • The socket connector matches the torque wrench. • Torque range: 1.2–45 N·m 	 <p>Flat-head insulated torque screwdriver</p>	 <p>Diagonal pliers</p>
 <p>Wire stripper</p>	 <p>Cable cutter</p>	 <p>Rubber mallet</p>	 <p>Utility knife</p>
 <p>RJ45 crimping tool</p>	 <p>Hydraulic pliers</p>	 <p>Multimeter DC voltage measurement range \geq 1500 V DC</p>	 <p>Marker</p>

 Steel measuring tape	 Level	 Vacuum cleaner	 Hammer drill
 Hammer drill bit Ø16 mm	 Heat-shrink tubing	 Heat gun	 Cable tie
 Insulated ladder	 Crane	 Lifting rope Rope length \geq 1845 mm x 4	 Electric forklift
 Pallet truck	-	-	-

Personal Protective Equipment (PPE)

 Insulated gloves	 Protective gloves	 Goggles	 Dust mask
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7.1.2 Pre-installation Check

Checking the Outer Packing

Before unpacking the equipment, check the outer packing for damage, such as holes and cracks, and check the equipment model. If any damage is found or the equipment model is not what you requested, do not unpack the product and contact your dealer as soon as possible.

 **NOTE**

You are advised to remove the outer packing within 24 hours before installing the equipment.

 **WARNING**

If the cabinet is higher than 2 m, take protective measures for working at heights during unpacking.

Checking Deliverables

After unpacking the equipment, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your dealer.

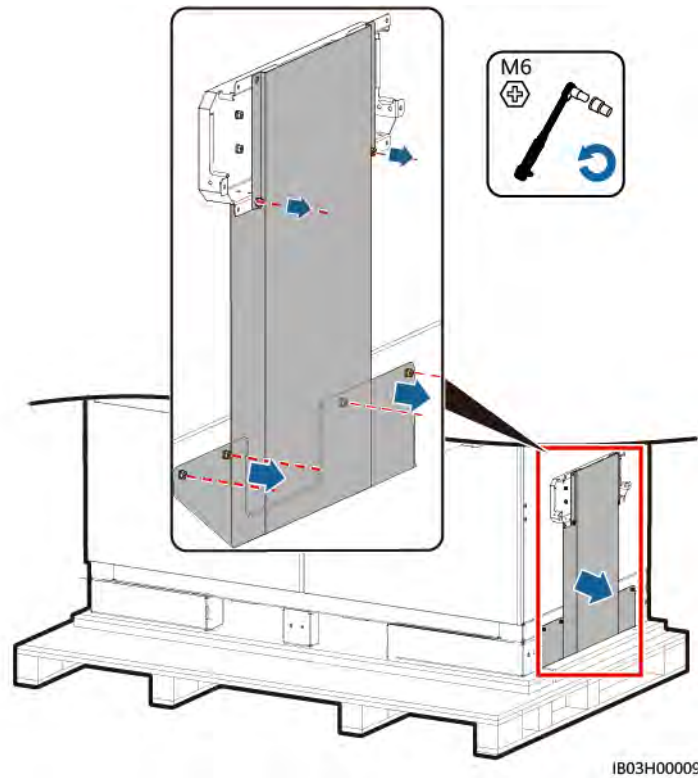
 **NOTE**

For details about the number of accessories delivered with the equipment, see the *Packing List* in the packing case.

7.2 Installing the ESS

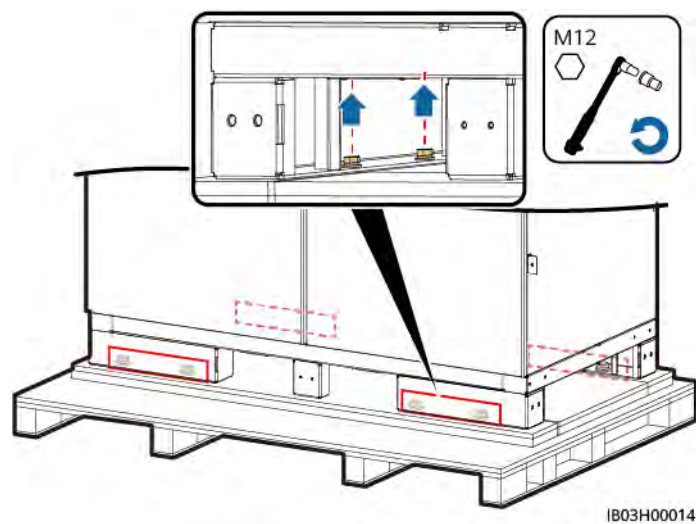
Step 1 Remove the baffle plate from the bottom of the ESS.

Figure 7-1 Removing the bottom baffle



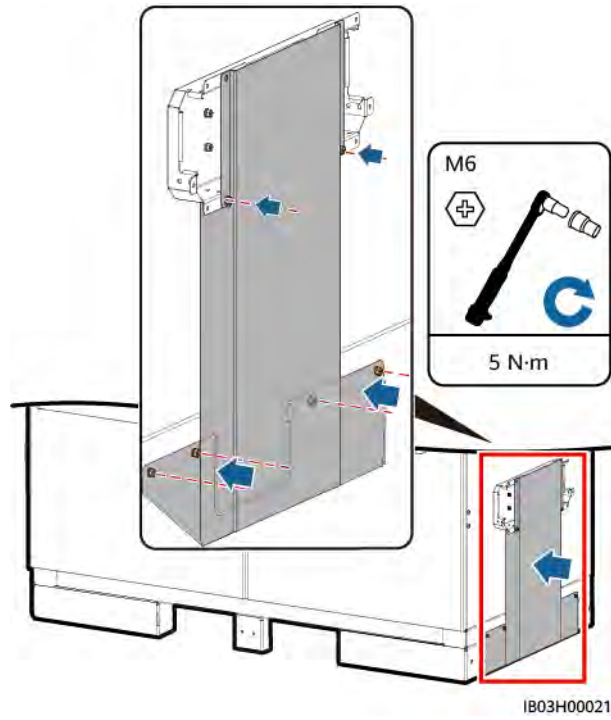
Step 2 Remove the pallets.

Figure 7-2 Removing the pallets



Step 3 Install the baffle plate to the bottom of the ESS.

Figure 7-3 Installing the baffle plate

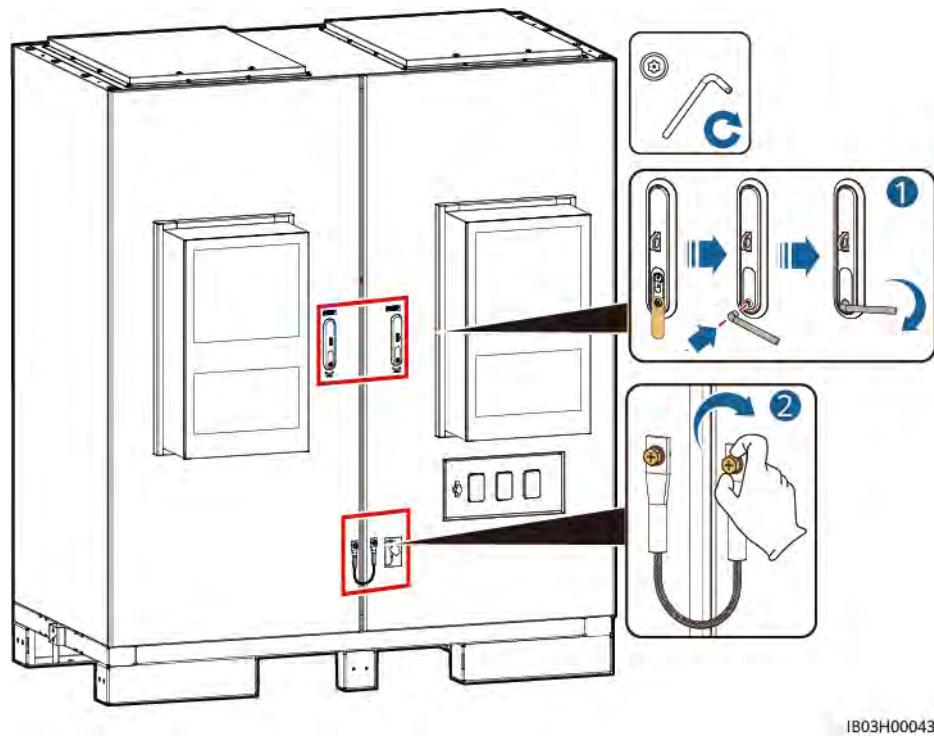


Step 4 Open the cabinet door.

NOTE

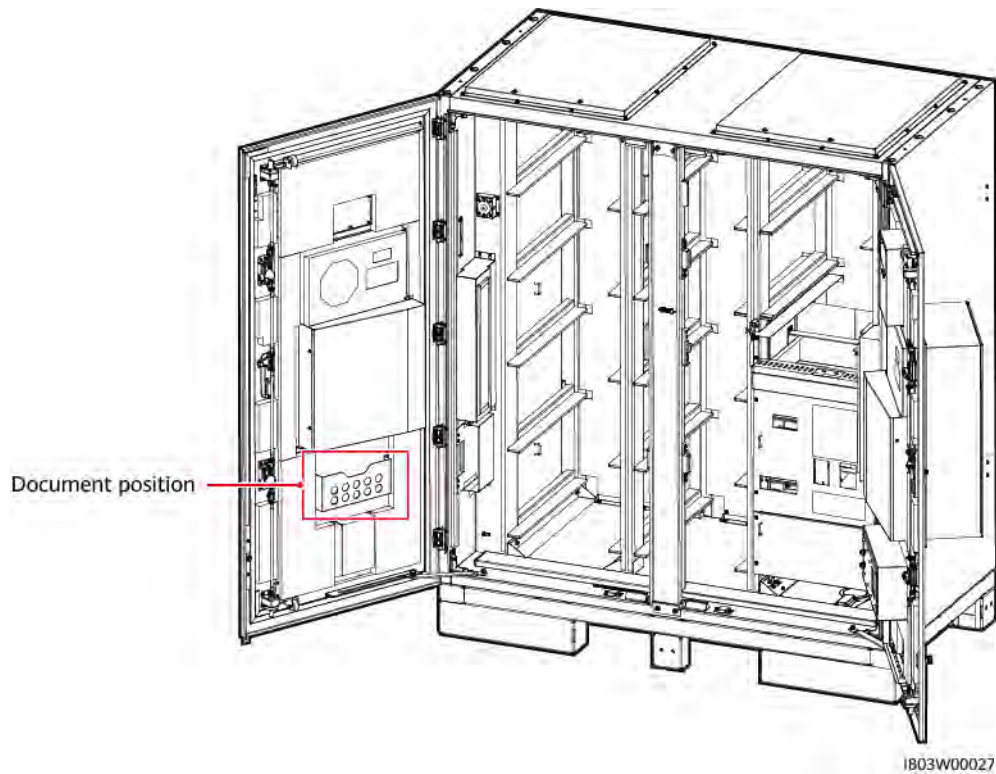
Keep the keys properly after use.

Figure 7-4 Opening the door



Step 5 Take out the delivered documents, such as the packing list.

Figure 7-5 Document position



Step 6 Take out the mounting kits delivered with the product.

NOTE

After opening the door, check the number of deliverables based on the packing list. If any deliverable is missing, contact your dealer immediately.

Table 7-1 List of mounting kits

Hoisting conversion bracket and screw		Anchor bracket, anchor bracket screw, and expansion bolt			Leveling spacer

Step 7 After closing the cabinet door, move the ESS to the specified position.

NOTE

If a forklift cannot be used on the transport route (for example, there is a slope), use a crane to move the ESS.

Figure 7-6 Using a crane

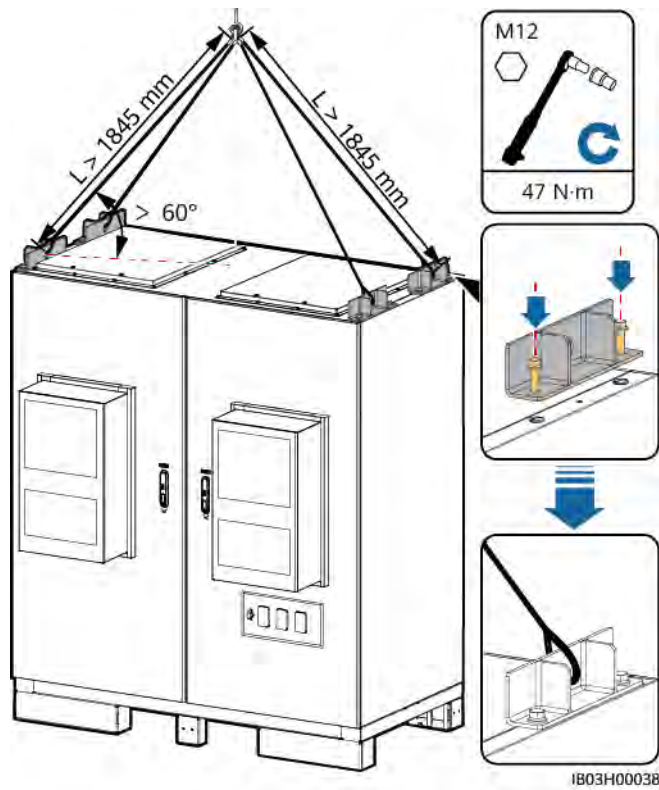
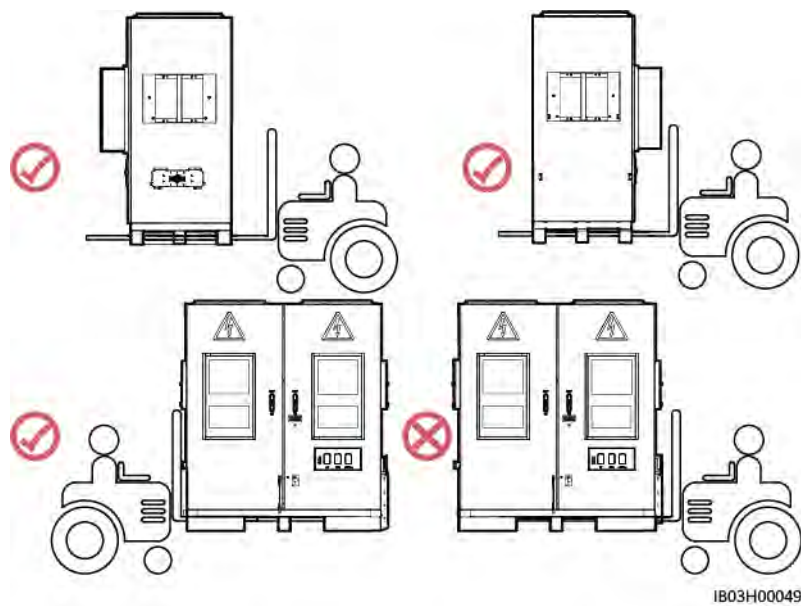


Figure 7-7 Using a forklift

NOTICE

When a forklift is used, bind and secure the ESS based on the site requirements to ensure there is no risk of falling.

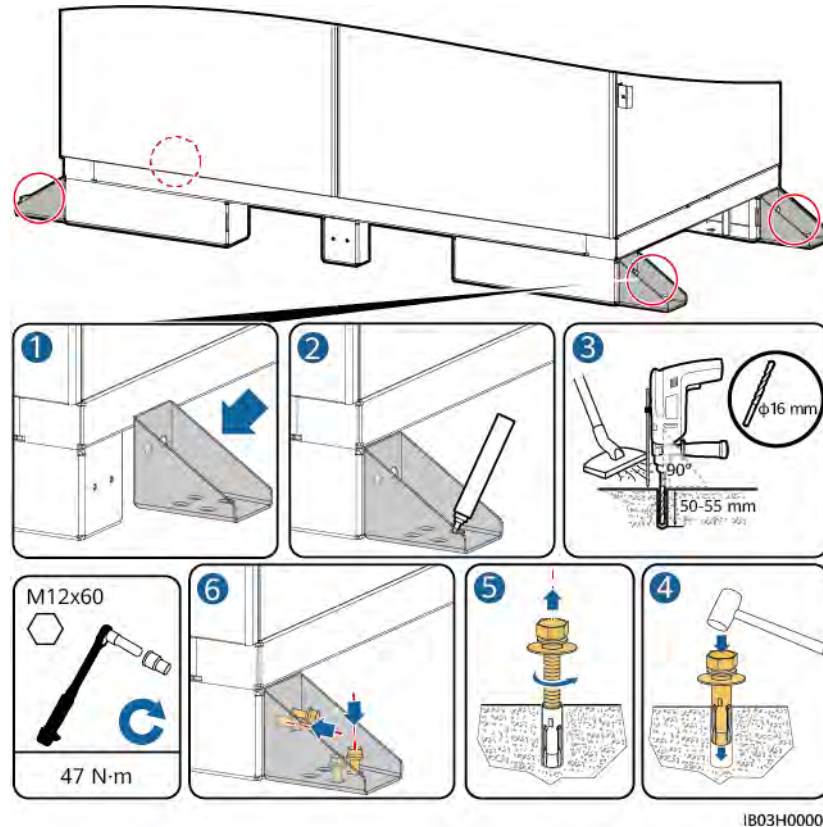


Step 8 Secure the ESS.

 **NOTE**

If the ESS is not positioned stably, use a spacer to level the ESS before securing it.

Figure 7-8 Securing the ESS



----End

7.3 Connecting a Ground Cable for the ESS

 **NOTE**

Ensure that the grounding impedance of the equipment complies with GB 50054 and local electrical standards.

7.3.1 Inside the Cabinet

Prerequisites

For details about how to crimp OT/DT terminals, see [A Crimping an OT or DT Terminal](#).

Name	Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Source
Ground cable	Single-core outdoor copper/ copper-clad aluminum/ aluminum alloy cable	25–50 mm ²	15–17.6 mm	M8 OT/DT terminal	Prepared by the customer

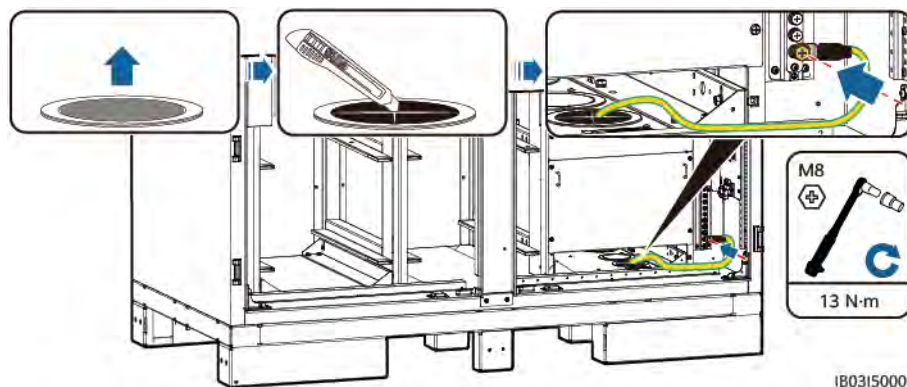
The specifications of the ground cable are subject to this table or calculated according to IEC 60364-5-54.

Procedure

Step 1 Open the ESS cabinet door.

Step 2 Connect the ground cable.

Figure 7-9 Connecting a ground cable



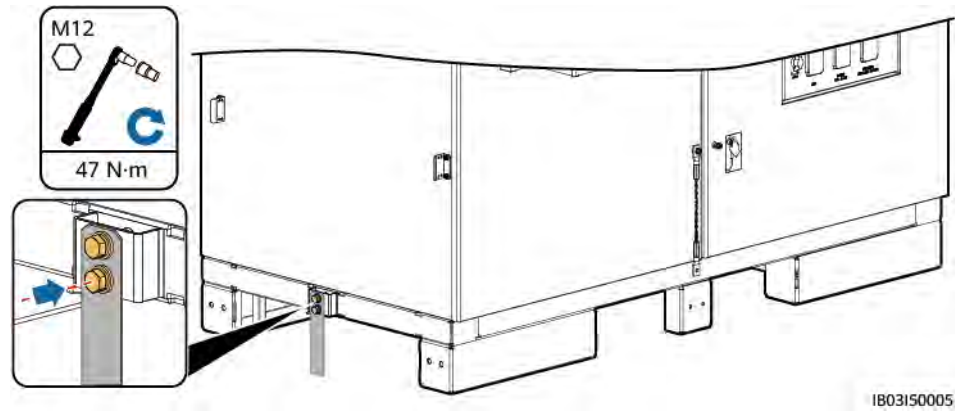
----End

7.3.2 (Optional) Outside the Cabinet

Using a Flat Steel Sheet

The hot-dip zinc-coated flat steel sheet needs to be prepared by the customer (recommended specification: $\geq -40 \times 4$). The specific dimensions depend on the onsite fault current and are subject to the design of the design institute.

Figure 7-10 Connecting a ground flat steel sheet



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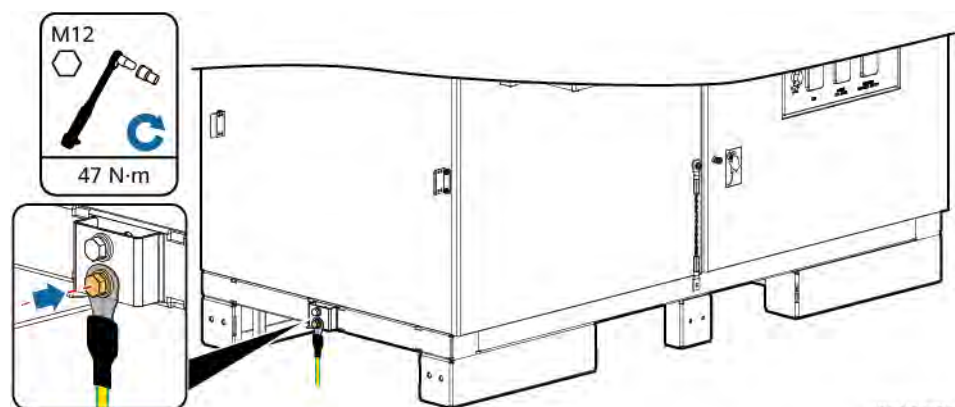
Using a Ground Cable

For details about how to crimp OT/DT terminals, see [A Crimping an OT or DT Terminal](#).

Name	Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Source
Ground cable	Single-core outdoor copper/ copper-clad aluminum/ aluminum alloy cable	25–50 mm ²	15–17.6 mm	M12 OT/DT terminal	Prepared by the customer

The specifications of the ground cable are subject to this table or calculated according to IEC 60364-5-54.

Figure 7-11 Connecting a ground cable



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7.4 Installing Components

Table 7-2 Component installation list

Component	Installation Position	Quantity
Rack mounted fire extinguishing system	Above the power distribution area in the ESS	1
Battery pack	Battery guide rails in the ESS	12
Rack controller	Right side of the ESS	1
Smart PCS	Left side of the ESS	1
(Optional) Maintenance socket	Power distribution area in the ESS	1
(Optional) Smart Power Sensor (DDSU666-H)	Power distribution area in the ESS	1

NOTICE

Before installing components, ensure that the ESS is securely installed.

7.4.1 Installing the Rack Mounted Fire Extinguishing System

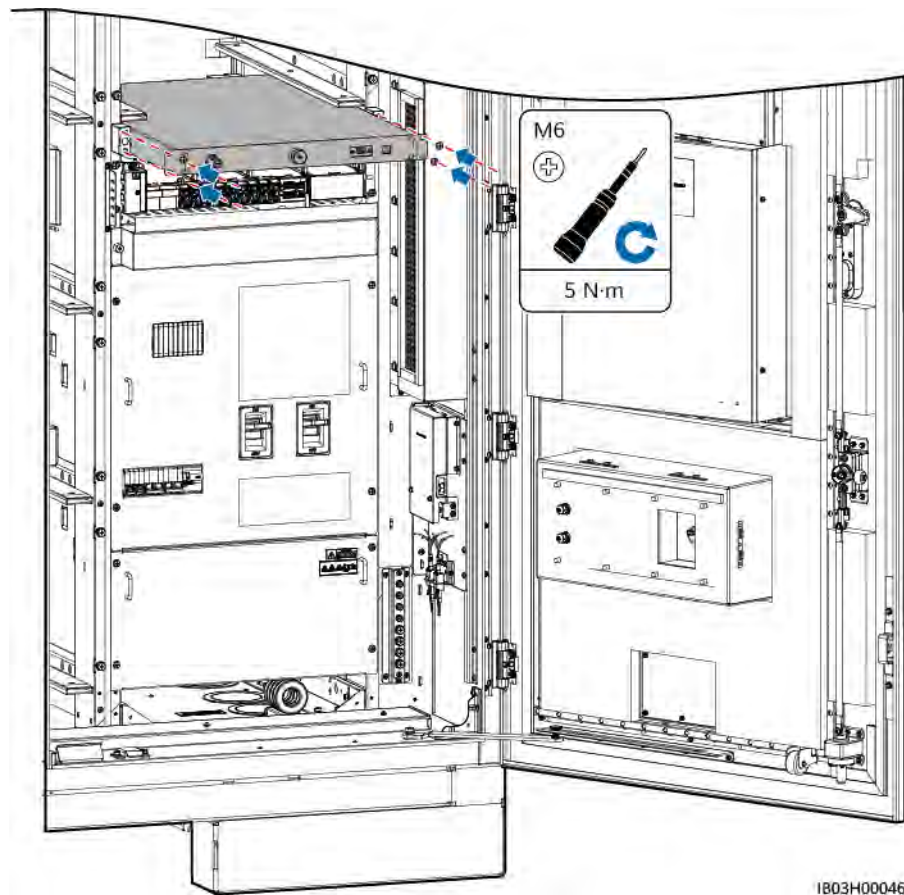
Prerequisites

- Ensure that the rack mounted fire extinguishing system is intact.
- Before installation, read the documents delivered with the rack mounted fire extinguishing system to understand the installation requirements and precautions.

Procedure

Install the rack mounted fire extinguishing system.

Figure 7-12 Installing the component



7.4.2 Installing Battery Packs

Context

- You are advised to use a forklift and battery installation tray kit (installation kit for short) to install battery packs. The installation kit is not delivered with the product and needs to be purchased separately from the Company.
- The appearance of the battery pack installation kit in this document is for reference only.

WARNING

- Ensure that the power circuit breaker is OFF before installing batteries.
 - When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
 - When moving batteries, do not remove protective components such as protective covers or waterproof caps from battery terminals.
 - Do not move or operate under the forklift tynes.
 - You can operate the battery pack installation kit only after the forklift stops moving.
-

CAUTION

- Slowly push or move battery packs to prevent damage and collision.
- To prevent battery packs from falling off, start the pallet truck or forklift after confirming that battery packs are securely bound.

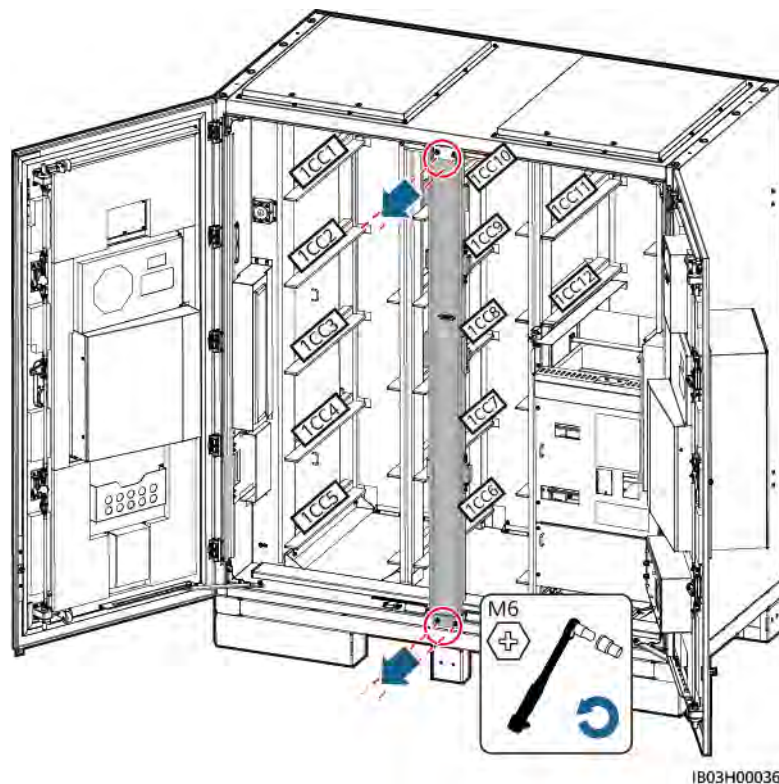
NOTICE

- Before installation, ensure that battery packs are stored indoors and that other storage requirements specified in the user manual are met.
- Before installation, check the status of the battery packs. Do not use the battery packs if the packing cases are exposed to rain, damaged, or deformed, or if the battery packs leak or fall.
- Install battery packs within 24 hours after unpacking. If the battery packs cannot be installed in time, place them in a dry indoor environment without corrosive gases. Power on the ESS within 24 hours after installation. The process from unpacking battery packs to powering on the system must be completed within 72 hours.
- Do not install battery packs on rainy, snowy, or foggy days. Otherwise, the battery packs may be eroded by water vapor or rain.

Procedure

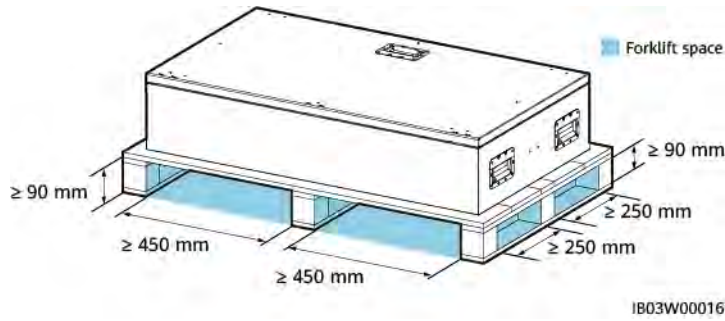
- Step 1** Remove the column in the middle.

Figure 7-13 Removing the column



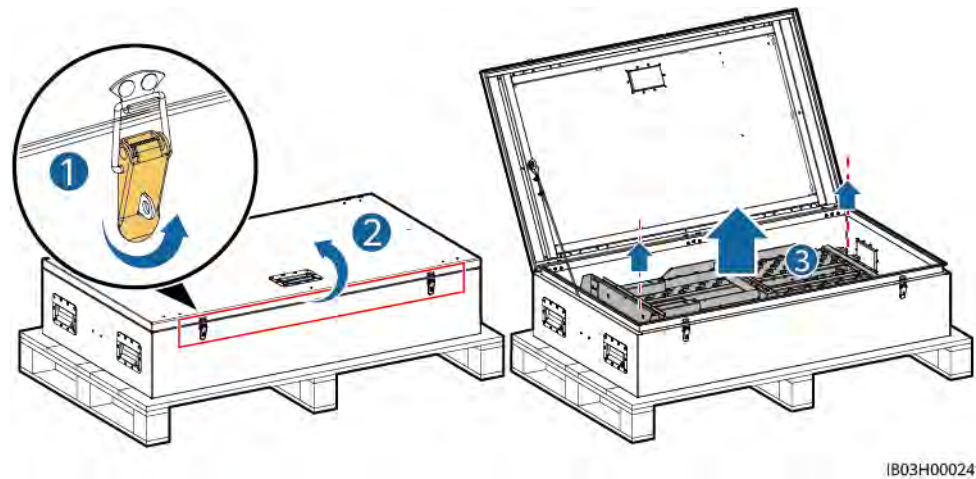
Step 2 Use a forklift to transport the installation kit to the vicinity of the ESS.

Figure 7-14 Forklift space dimensions



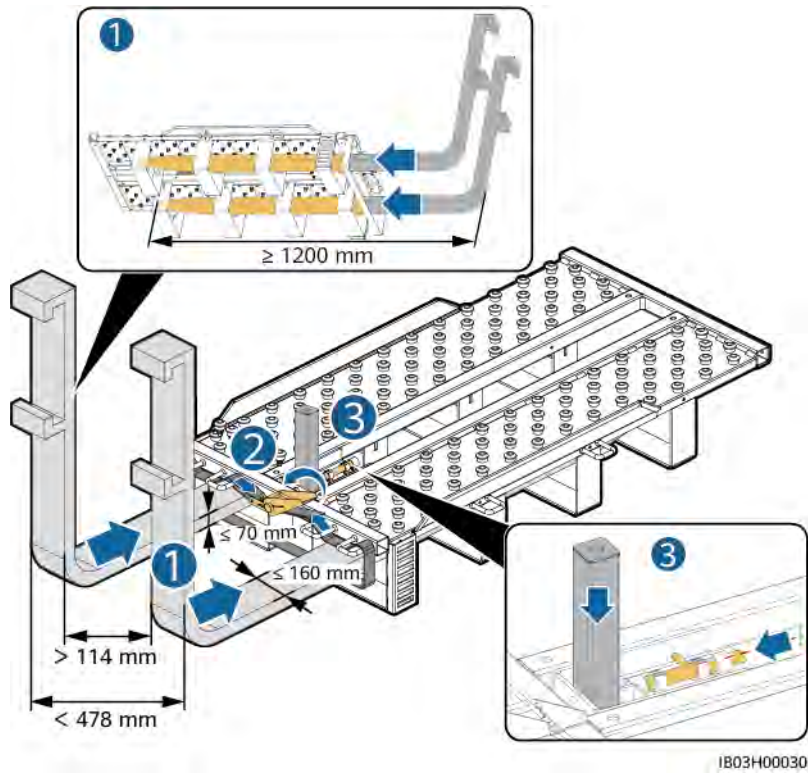
Step 3 Take out the installation kit.

Figure 7-15 Taking out the installation kit



Step 4 Insert, assemble, and secure the installation kit onto the forklift.

Figure 7-16 Assembling the installation kit

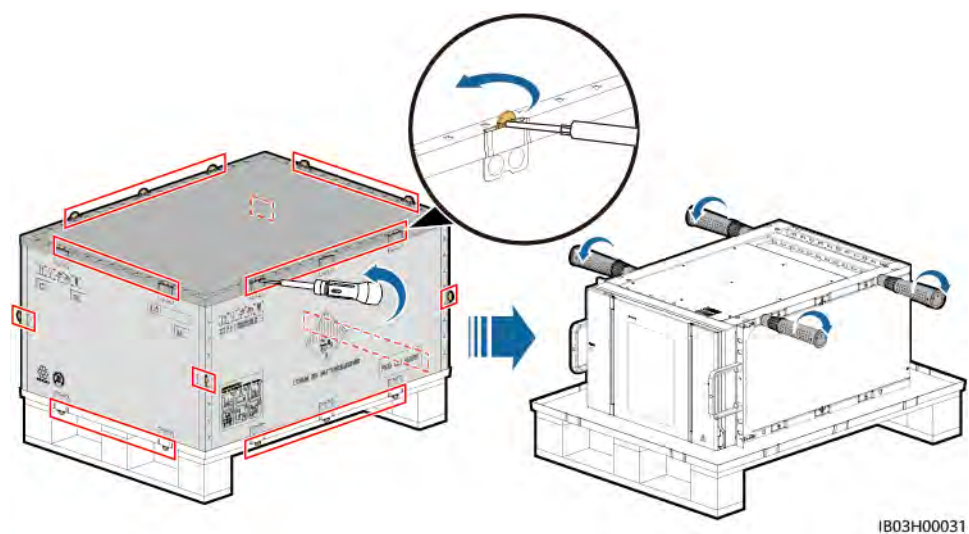


Step 5 Take out a battery pack.

NOTE

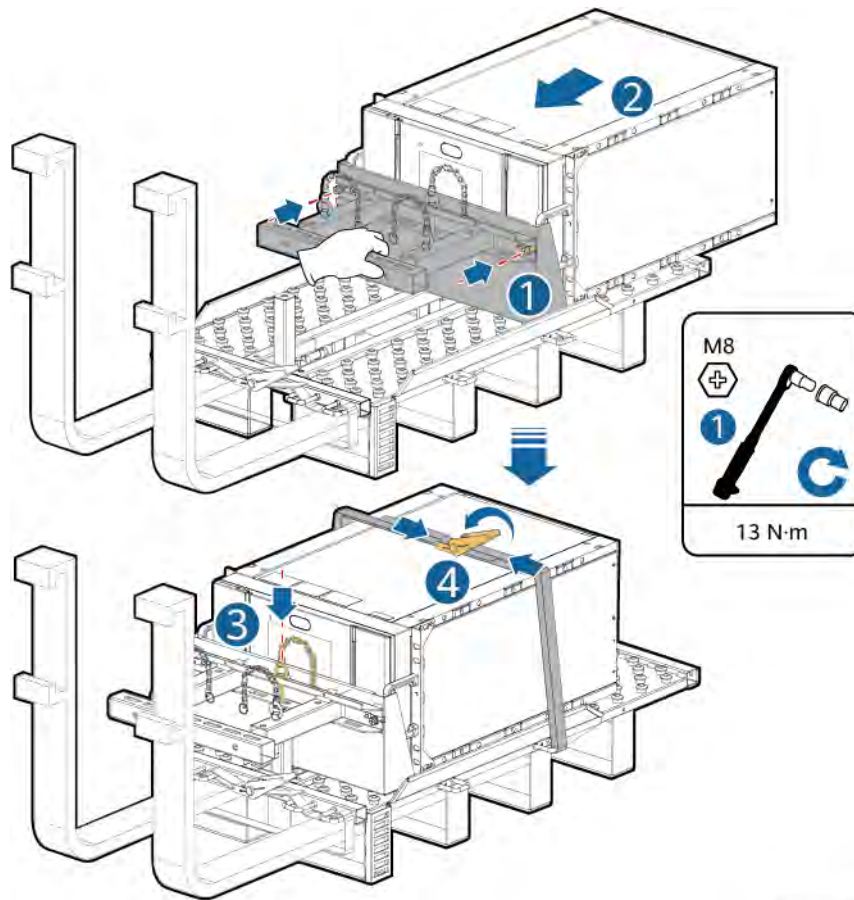
- At least four persons are required to move a battery pack.
- When using the lifting handles, hold the end closer to the device.

Figure 7-17 Taking out the battery pack



Step 6 Install the operating handle on the battery pack, place the battery pack on the installation kit, and secure the battery pack.

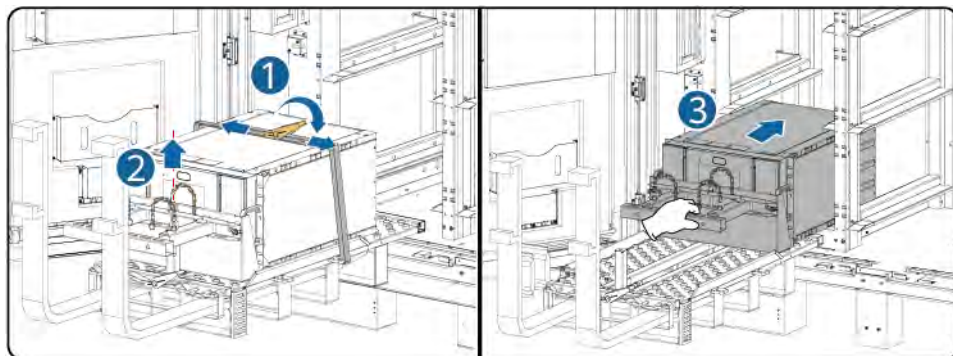
Figure 7-18 Securing the battery pack



IB03H00023

Step 7 Install the battery pack in the ESS.

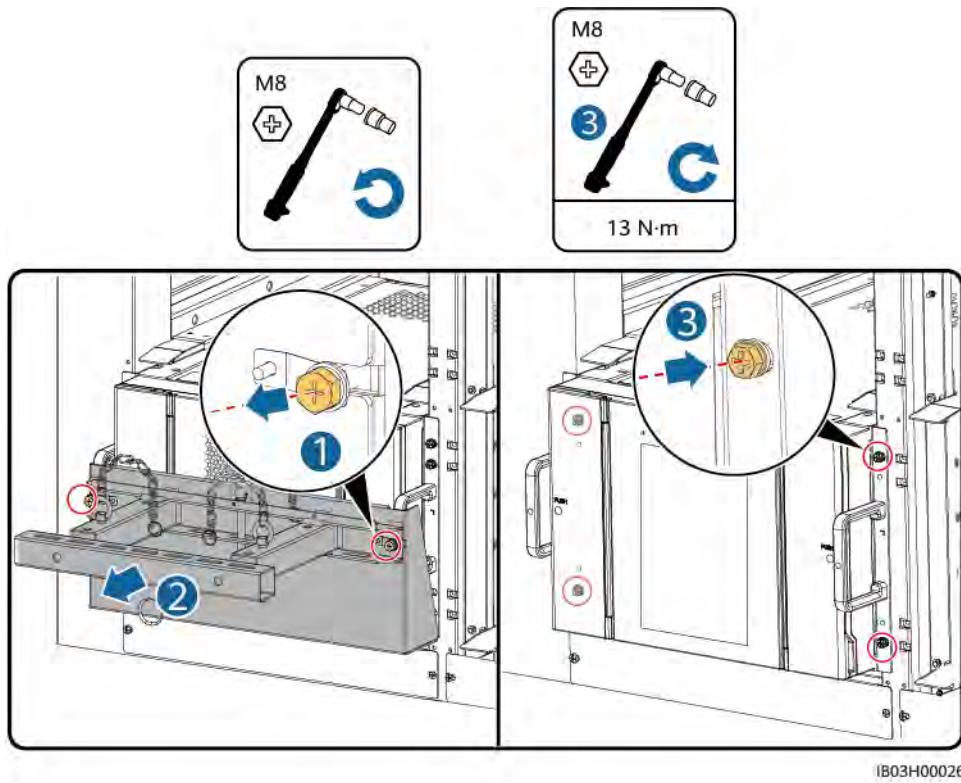
Figure 7-19 Installing the battery pack in the ESS



IB03H00025

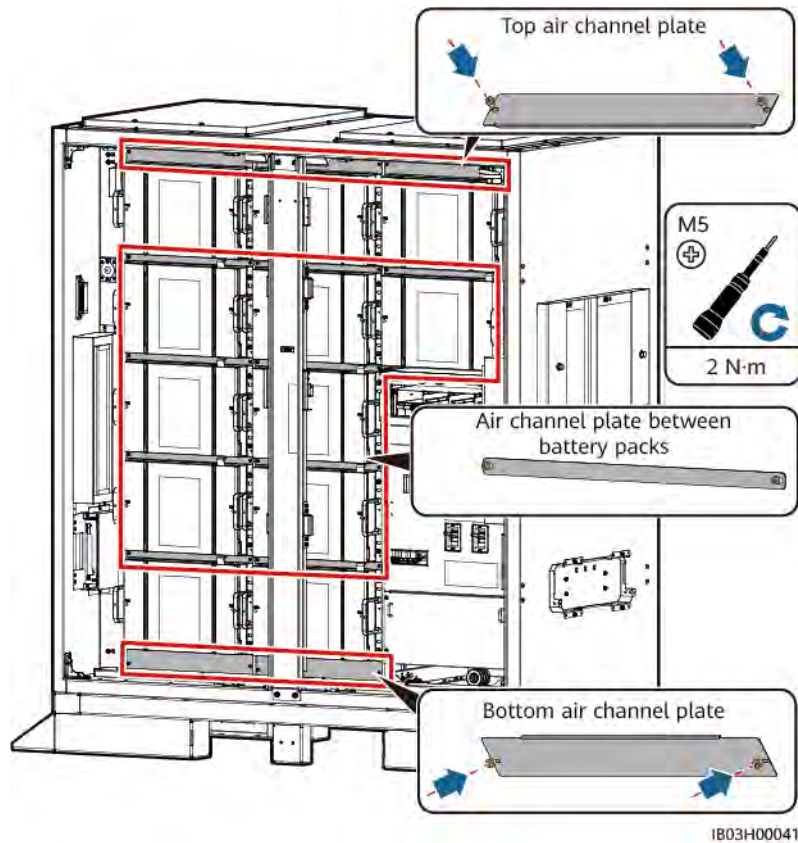
Step 8 Secure the battery pack.

Figure 7-20 Securing the battery pack



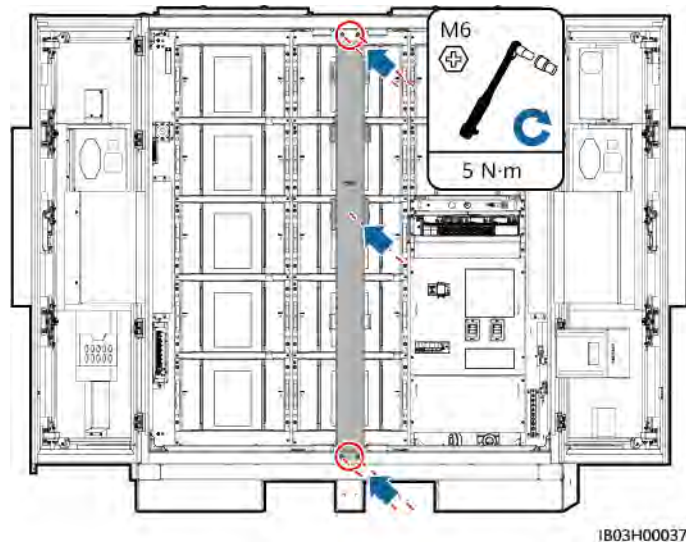
Step 9 Install air channel plates between battery packs based on the label on the air channel plates. The air channel plates are delivered with the container.

Figure 7-21 Installing air channel plates



Step 10 Install the column to the ESS.

Figure 7-22 Installing the column



----End

Follow-up Procedure

After using the installation kit, pack it back to the iron box and place it in a dry indoor place.

7.4.3 Installing the Smart Rack Controller

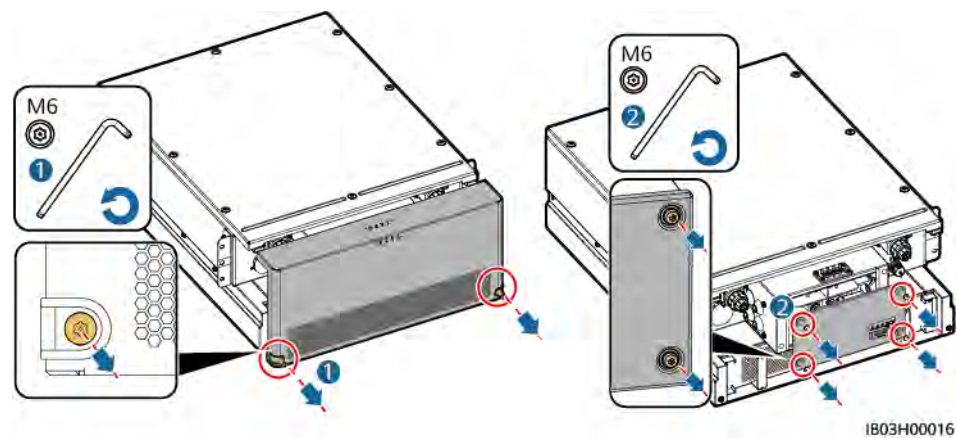
Prerequisites

Unpack and check the rack controller delivered to the site to ensure that it is intact.

Procedure

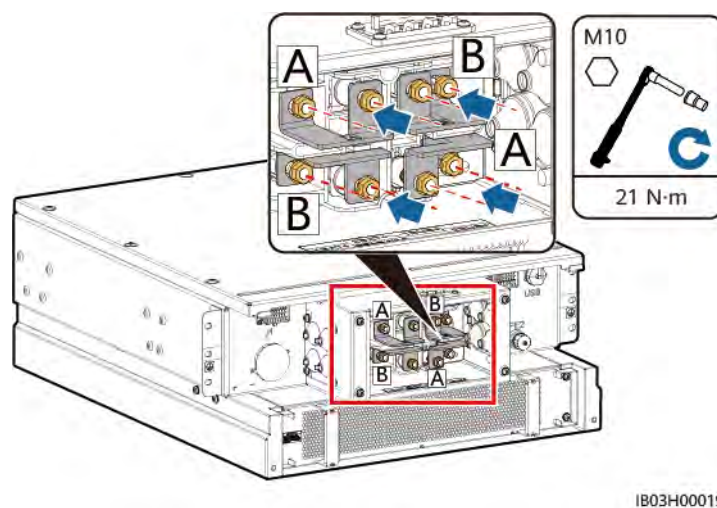
- Step 1** Remove the decorative cover and maintenance compartment cover from the rack controller.

Figure 7-23 Removing covers



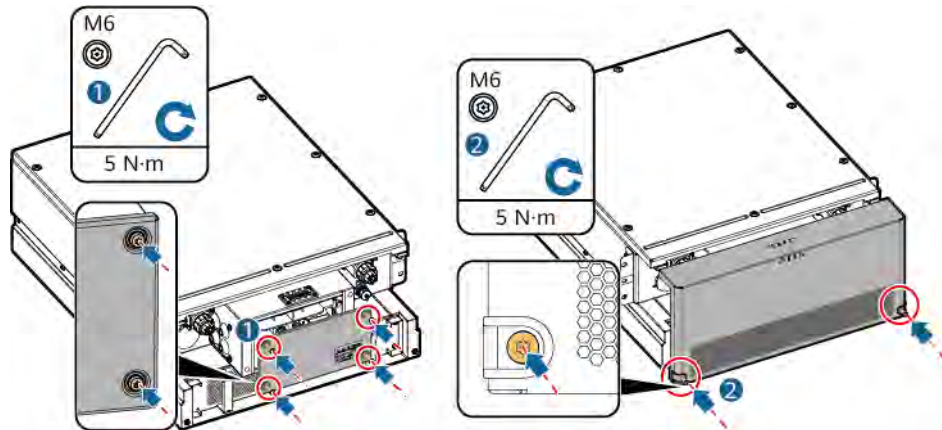
- Step 2** Install short-circuiting copper bars that are delivered with the product.

Figure 7-24 Installing short-circuiting copper bars



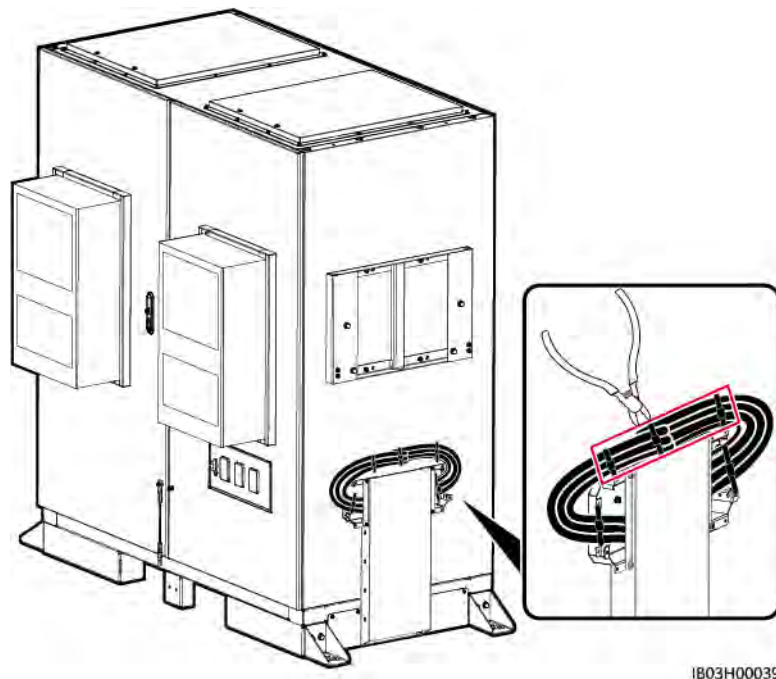
- Step 3** Install the maintenance compartment cover and the decorative cover to the rack controller.

Figure 7-25 Installing covers



Step 4 Remove cables bound on the outside of the ESS.

Figure 7-26 Removing bound cables

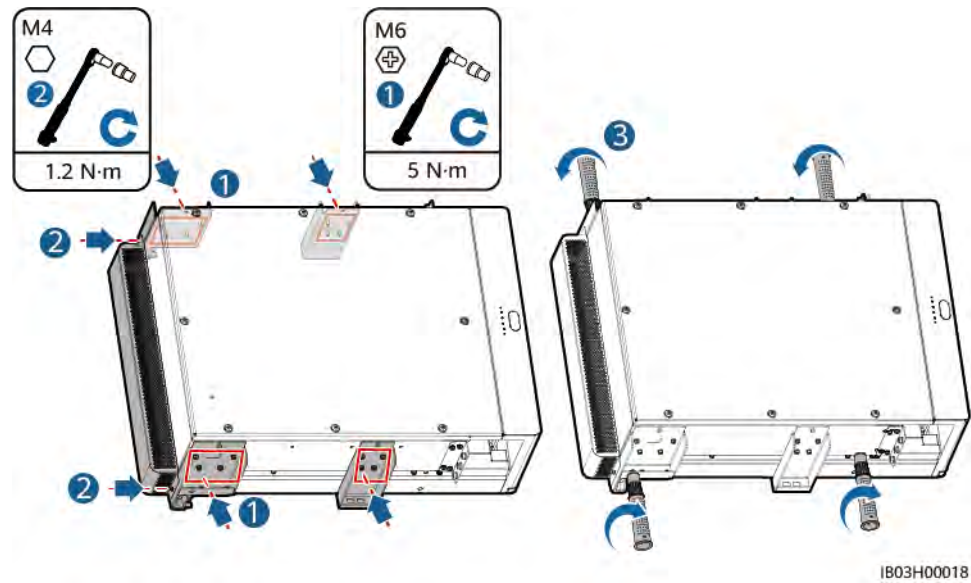


Step 5 Install the upper bracket, lower bracket, rainproof canopy, and lifting handles to the rack controller.

NOTE

- The upper bracket, lower bracket, rainproof canopy, and lifting handles are delivered with the product.
- The screws for securing the upper and lower brackets are preinstalled on the rack controller. Remove the screws before installing the upper and lower brackets.
- The screws for securing the rainproof canopy are preinstalled on the upper bracket. Remove the screws before installing the rainproof canopy.
- When using the lifting handles, hold the handle end closer to the device.

Figure 7-27 Installing mounting kits



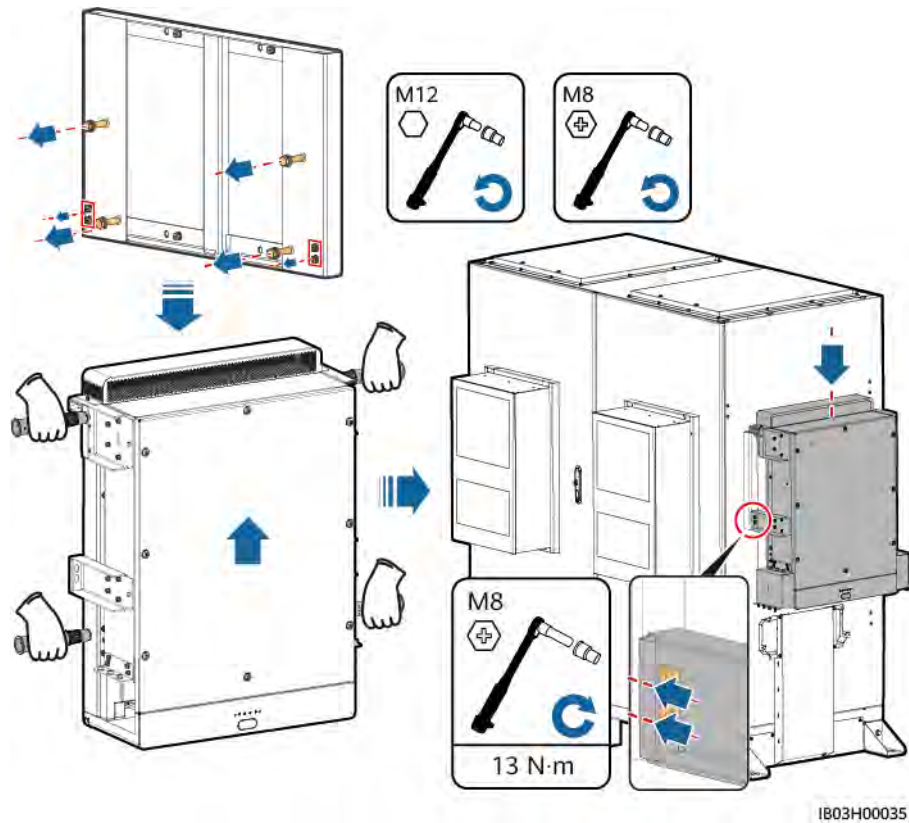
IB03H00018

Step 6 Install the rack controller to the mounting bracket on the ESS.

NOTE

- The M8 screws are used to secure the rack controller. Keep them properly after removing them.
- At least three persons are required to install the rack controller.

Figure 7-28 Installing the Smart Rack Controller



----End

7.4.4 Installing the Smart PCS

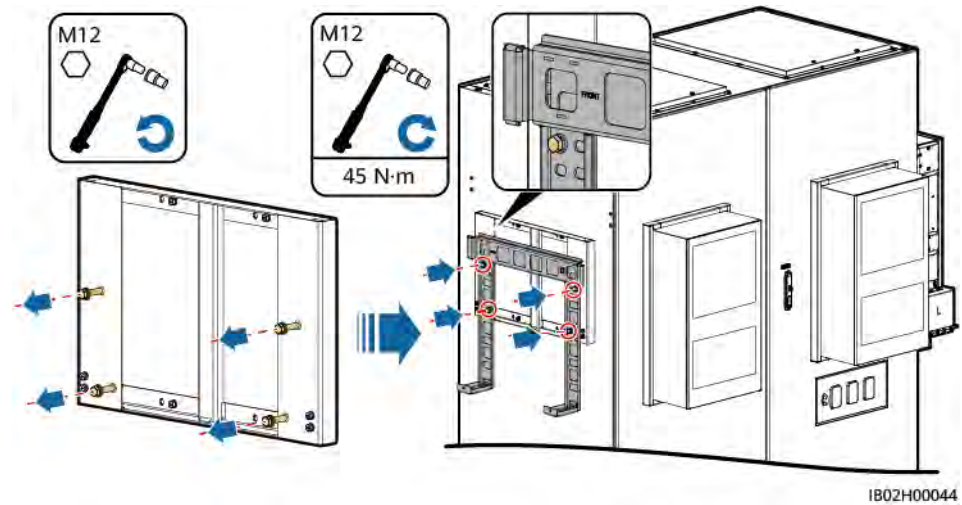
Prerequisites

Unpack and check the Smart PCS delivered to the site to ensure that the Smart PCS is complete and intact.

Procedure

- Step 1** Install the mounting bracket. The mounting bracket is delivered with the Smart PCS.

Figure 7-29 Installing a mounting bracket

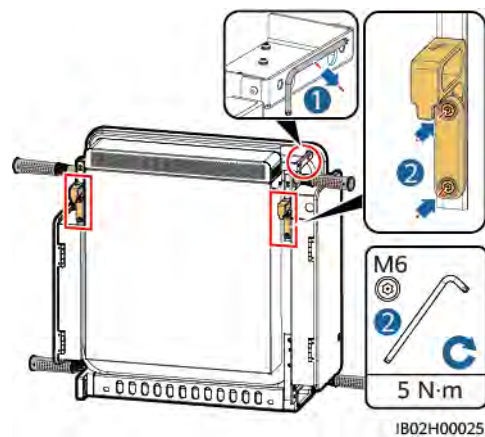


Step 2 Install mounting ears and lifting handles. The mounting ears are delivered with the Smart PCS, and the lifting handles are delivered with the ESS.

NOTE

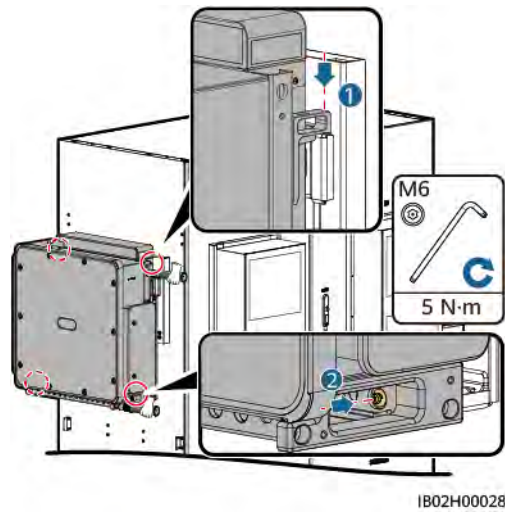
- At least four persons are required to install the Smart PCS.
- When using the lifting handles, hold the handle end closer to the device.

Figure 7-30 Installing mounting ears and lifting handles



Step 3 Secure the Smart PCS.

Figure 7-31 Securing the Smart PCS



----End

7.4.5 (Optional) Installing a Maintenance Socket

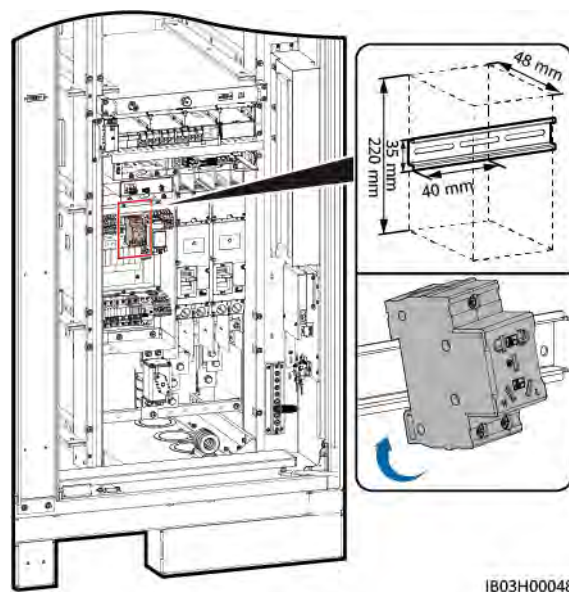
Context

The 220 V socket is prepared by the customer. The actual socket appearance may vary. This section describes only the installation method.

Procedure

- Step 1** Remove the baffle plate in front of the power distribution area.
- Step 2** Install the maintenance socket.

Figure 7-32 Installing the socket



----End

7.4.6 (Optional) Installing a DDSU666-H

Context

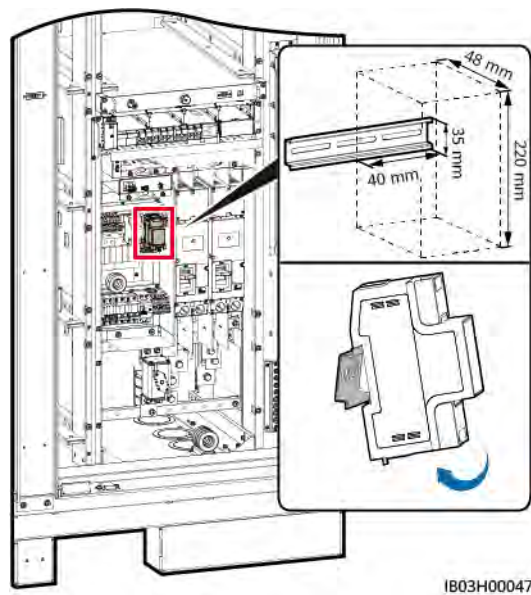
The DDSU666-H meter is purchased from the Company.

Procedure

Step 1 Remove the baffle plate in front of the power distribution area.

Step 2 Install the DDSU666-H.

Figure 7-33 Installing the DDSU666-H



----End

8 Installing Cables

 **DANGER**

Note the polarities when installing batteries. Do not connect the positive and negative poles of a battery or battery string together. Otherwise, the battery may be short-circuited.

 **DANGER**

- Do not smoke or have an open flame around batteries.
 - The site must be equipped with qualified fire suppression facilities, such as fire sand and carbon dioxide fire extinguishers.
 - Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
-

 **WARNING**

Tighten the screws on copper bars or cables to the torque specified in this document. Periodically confirm whether the screws are tightened, check for rust, corrosion, or other foreign objects, and clean them up if any. Loose screw connections will result in excessive voltage drops and batteries may catch fire when the current is high.

 **CAUTION**

- When connecting batteries, ensure that the spring washer is crimped properly for the screw, that the protruding part of the terminal on the cable face outwards, and that the cable is intact.
- Do not connect two or more cables to the positive or negative power port of a battery in parallel.
- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.

 **NOTE**

The cable colors shown in the electrical connection diagrams provided in this section are for reference only. Select cables in accordance with local cable specifications. (Green-and-yellow cables are only used for protective grounding.)

8.1 Preparing Cables

 **NOTE**

The cable diameter must comply with local cable standards. The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.

Name	Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Source
Ground cable for the rack controller	Single-core outdoor copper cable	$\geq 25 \text{ mm}^2$	-	M6 OT/DT terminal	Prepared by the customer
DC power cable	Prefabricated DC power cable (with a corrugated pipe)	-	-	-	Delivered with the product
Auxiliary AC power cable (with external grid power supply)	Two-core (L, N)/Three-core (L, N, PE) outdoor copper/copper-clad aluminum/aluminum alloy cable	6–25 mm^2	12.7–27 mm	Cord end terminal with an insertion depth of 12 mm, M8 OT/DT terminal	Prepared by the customer

Name		Type	Conductor Cross-Sectional Area	Outer Diameter	Terminal	Source
Single-phase AC input power cable (without external grid power supply)		Two-core/ Three-core outdoor copper/copper-clad aluminum/aluminum alloy cable	6–25 mm ²	12.7–27 mm	Pin cord end terminal with an insertion depth of 12 mm	Prepared by the customer
Network cable		CAT 5E outdoor shielded network cable, internal resistance ≤ 1.5 ohms/10 m	-	≤ 9 mm	Shielded RJ45 connector	Prepared by the customer
Optical fiber cable		Four-core or eight-core single-mode armored cable with the transmission wavelength of 1310 nm	-	≤ 18 mm	-	Prepared by the customer
(Optional) Cable to the DDSU666-H	RS485 communications cable	-	-	-	-	Preinstalled before delivery
	Current transformer and cable and power cable	-	-	-	-	Delivered with the product
(Optional) Cable to the maintenance socket	Power cable and ground cable	-	-	-	-	Delivered with the product

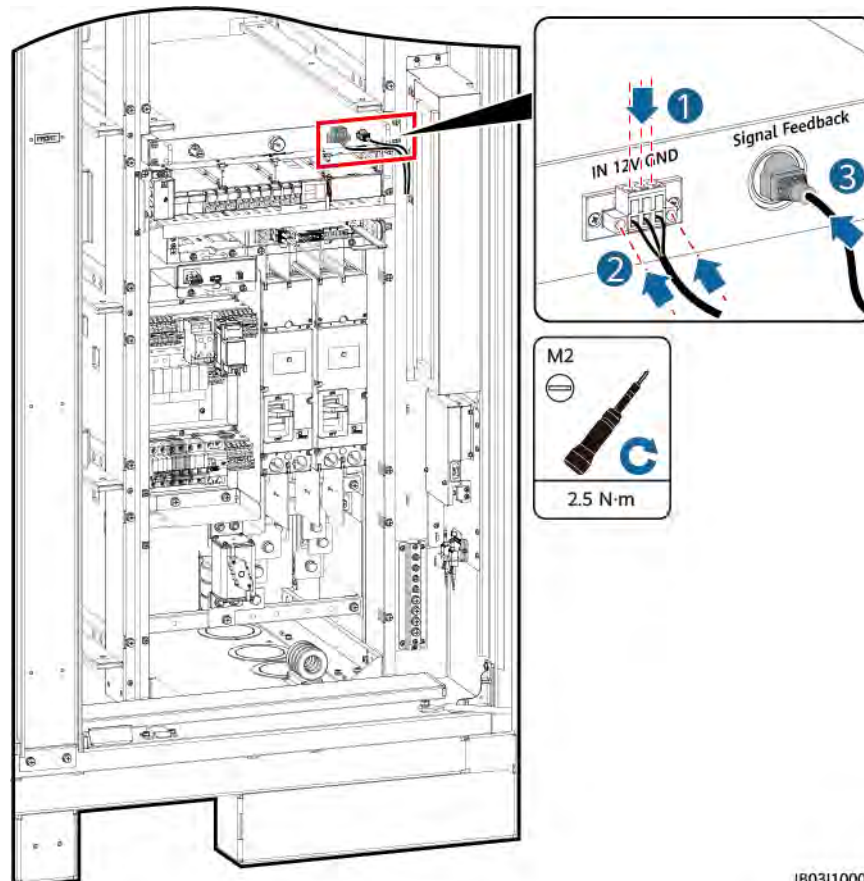
8.2 Installing Cables for the Rack Mounted Fire Extinguishing System

Step 1 Take out the reserved cables and install them to the rack mounted fire extinguishing system.

WARNING

Ensure that the cables are correctly installed. If a fire occurs when cables are not connected or incorrectly connected, the ESS cannot actively extinguish the fire. Ensure that the cables are correctly installed. If a fire occurs when cables are not connected or incorrectly connected, the ESS cannot actively extinguish the fire.

Figure 8-1 Connecting cables



IB03110006

----End

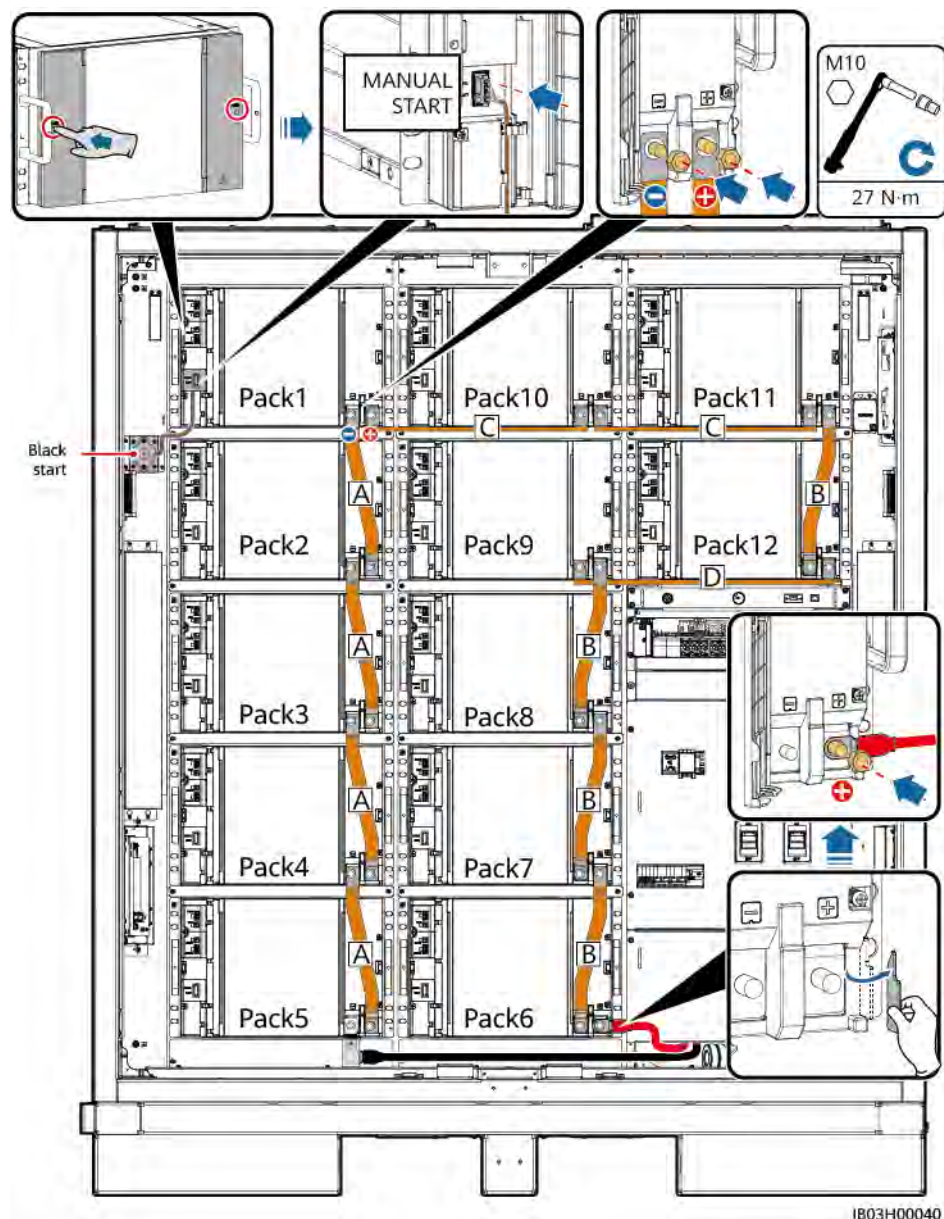
8.3 Installing Battery Pack Cables

Step 1 Install copper bars for battery packs, and connect the battery rack general output power cable and black start cable.

 NOTE

- One end of the battery rack general output power cable and black start cable is preinstalled before delivery.
- There are four types of copper bars delivered with the product: A, B, C, and D.
- Copper bar D must be installed before copper bar B.
- There are two types of M10 nuts for securing copper bars. Select a 15 mm or 16 mm socket based on the site requirements.
- When installing a nut, manually insert the nut into the screw plate, and then use a socket wrench to completely secure the nut in place. This prevents the screw thread from being stuck or stripped due to the deviation of the nut position.

Figure 8-2 Installing copper bars and cables

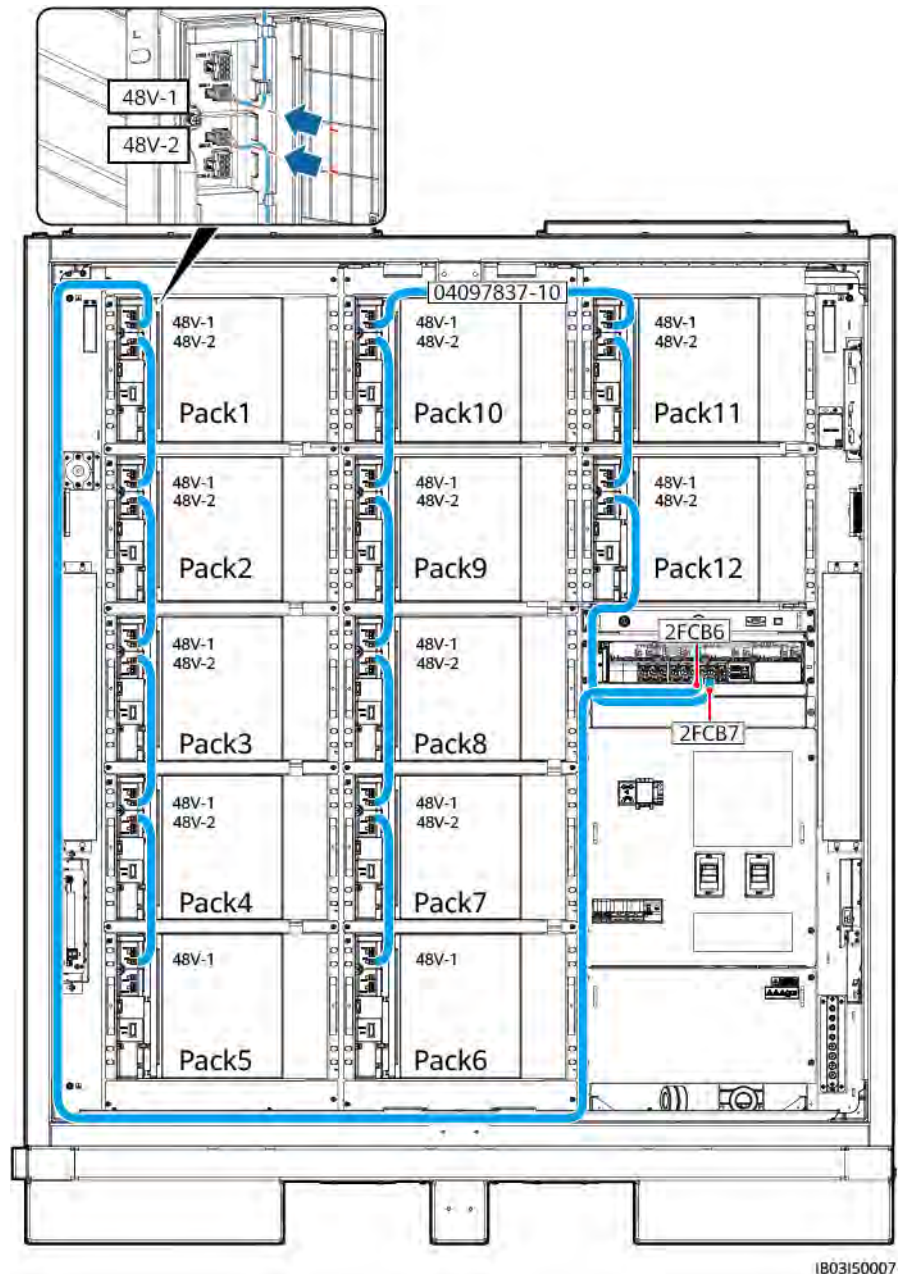


Step 2 Connect 48 V cables to the battery packs.

 NOTE

- Cables to 2FCB6 and 2FCB7 are preinstalled before delivery.
- Other 48 V cables are delivered with the product.
- The cable between Pack10 and Pack11 is 04097837-10, and the other cables are 04097837-07.
- The cable sequence is as follows: 2FCB6-Pack1-2-3-4-5, 2FCB7-Pack12-11-10-9-8-7-6.

Figure 8-3 Connecting 48 V cables to battery packs

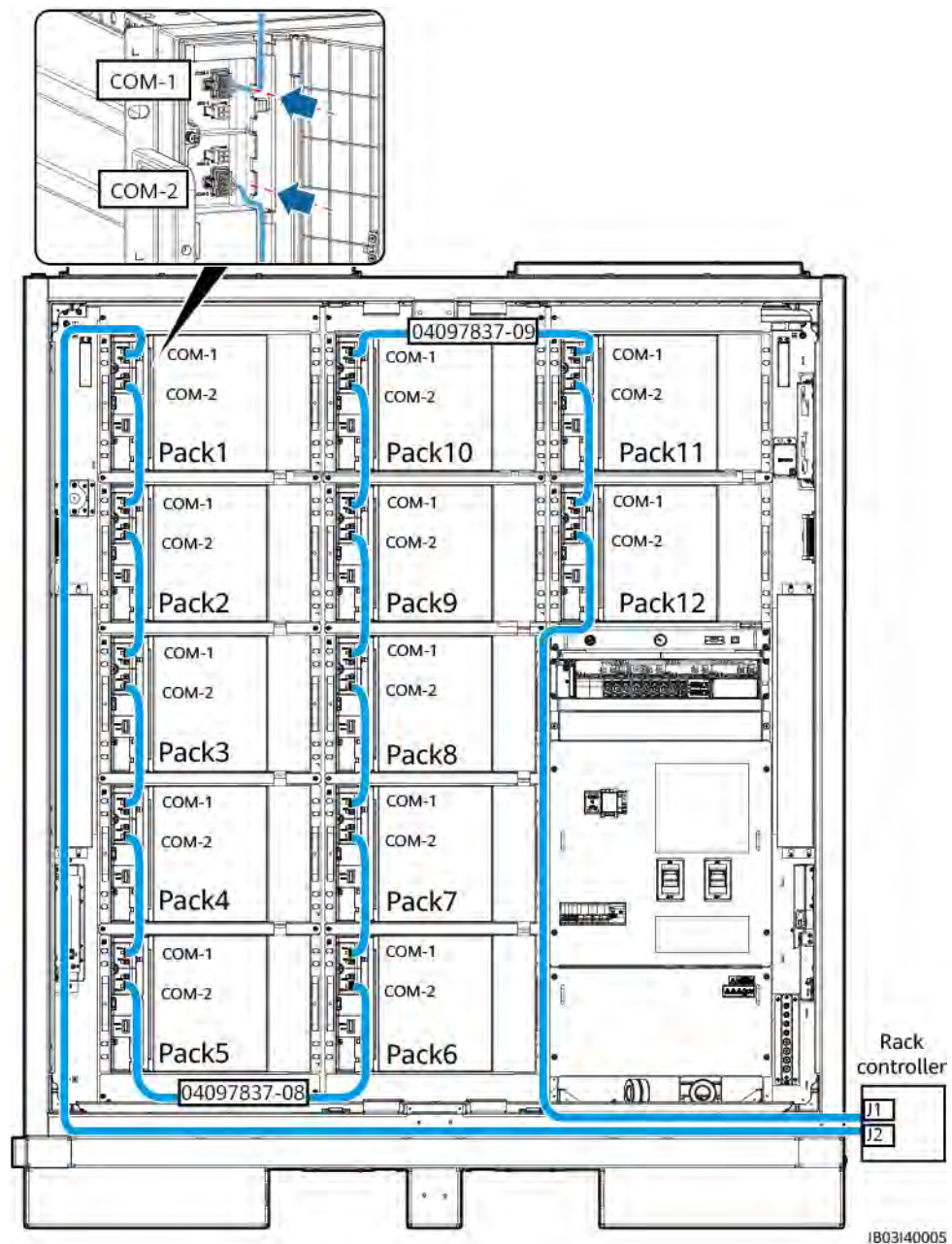


Step 3 Connect cables to the COM ports on the battery packs.

NOTE

- Cables to COM-1 on Pack1 and COM-2 on Pack12 are reserved before delivery. After connecting the cables to the battery packs, bind the cables inside the cabinet. Connect the other ends of the cables after installing the rack controller.
- Other COM port cables are delivered with the product.
- The cable sequence is as follows: Pack1-2-3-4-5-6-7-8-9-10-11-12.
- The cable between Pack5 and Pack6 is 04097837-08, the cable between Pack10 and Pack11 is 04097837-09, and the other cables are 04097837-06.

Figure 8-4 Connecting cables to the COM ports on the battery packs



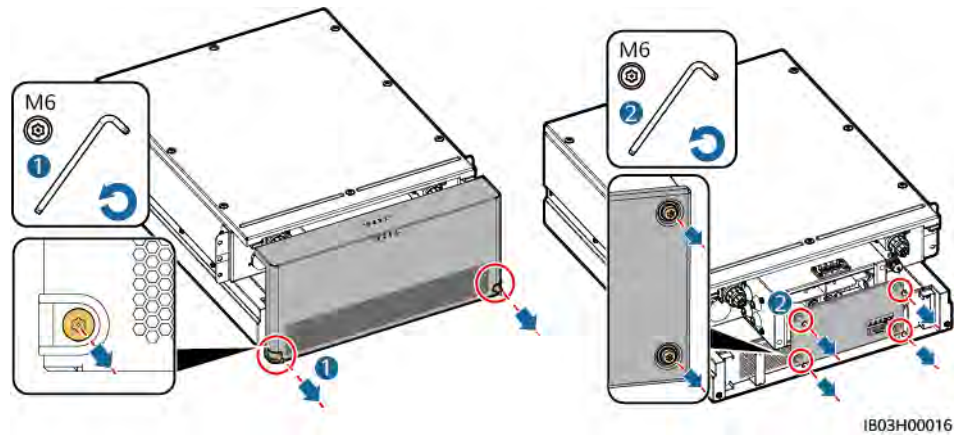
Step 4 Close the terminal covers of the battery packs.

----End

8.4 Installing Rack Controller Cables

Step 1 Remove the decorative cover and maintenance compartment cover from the rack controller.

Figure 8-5 Removing covers

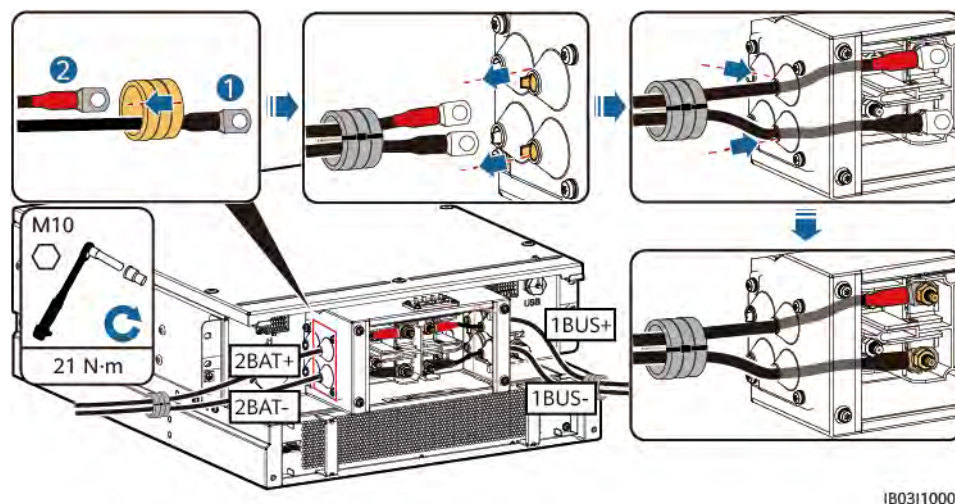


Step 2 Connect the preinstalled cable to the BAT/BUS ports. Magnetic rings are delivered with the product.

NOTICE

- The black magnetic ring is installed on the left side of the rack controller, and the green magnetic ring is installed on the right side of the rack controller.
- Do not remove the cover from an unused pagoda connector.

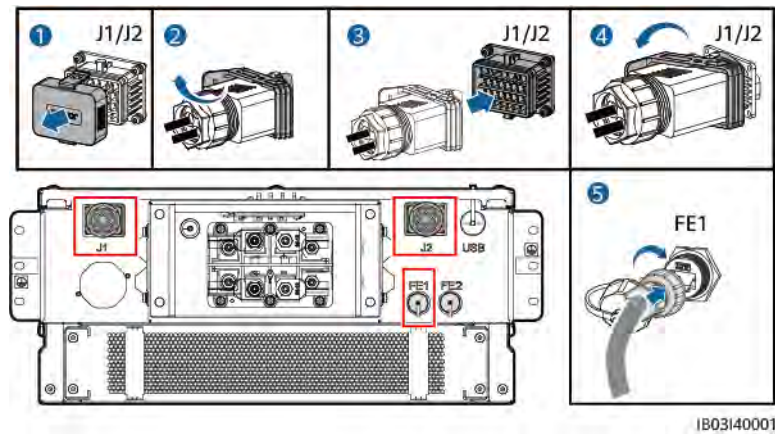
Figure 8-6 Connecting cables



Cable Label	Wiring Terminal
107-1F1:2>TA1:2BAT+	2BAT+
108-1Q2:1>TA1:1BUS+	1BUS+
109-1Q1:4>TA1:2BAT-	2BAT-
111-1Q2:3>TA1:1BUS-	1BUS-

Step 3 Connect the preinstalled cables to J1 (left), J2 (right), and FE1.

Figure 8-7 Connecting cables

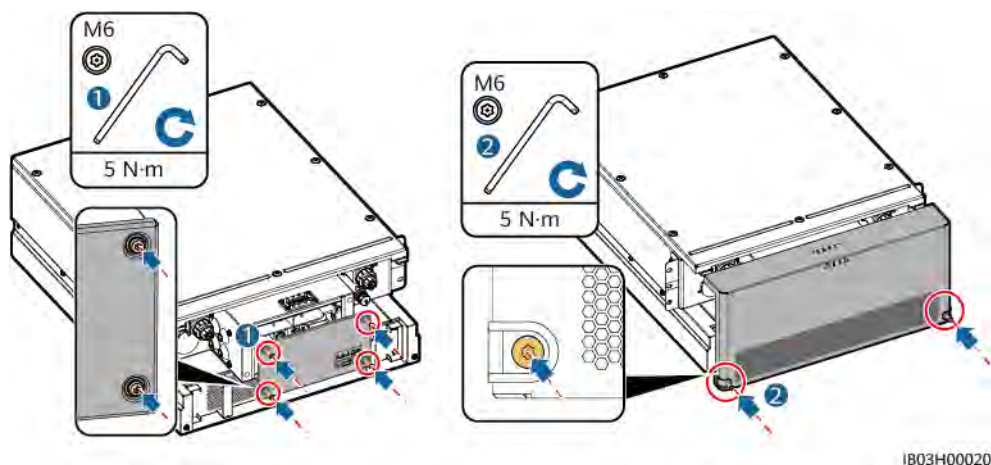


NOTE

- When securing the network cable (shown by (6) in the figure), hold the cable and align it with the FE network port. After the network cable is properly installed, do not release it. Use the other hand to tighten the nut of the RJ45 connector.
- After the network cable is installed, gently pull it down to check that it is properly installed.

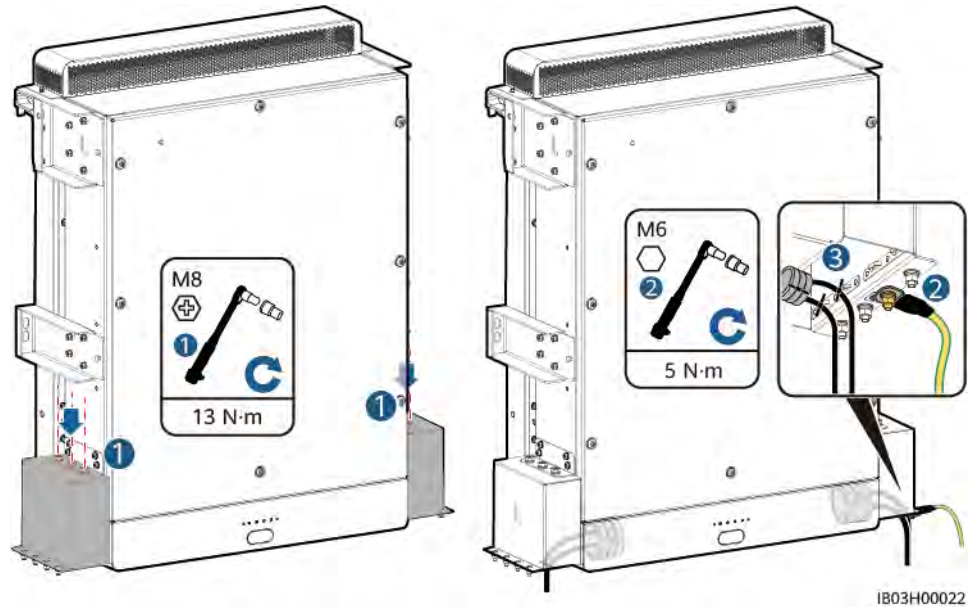
Step 4 Install the maintenance compartment cover and decorative cover of the rack controller, and place the magnetic rings.

Figure 8-8 Installing covers



- Step 5** Install the protective cover delivered with the product, connect a ground cable to the protective cover on the left or right side, and bind the cable.

Figure 8-9 Connecting a ground cable



----End

8.5 Installing DC Power Cables

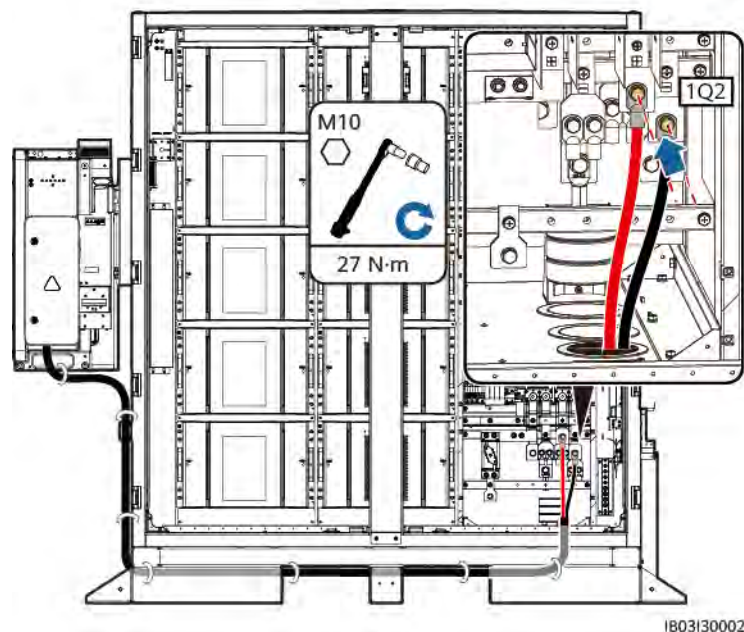
Prerequisites

The DC power cables have been pre-buried.

Procedure

- Step 1** Remove the baffle plate in front of the power distribution area.
- Step 2** Route the DC power cables through the cable hole at the bottom and connect the cables to the DC circuit breaker.

Figure 8-10 Connecting DC power cables



NOTE

- Reserve sufficient length of the cable and add angle steel in the middle of the foundation to support the cable and reduce the stress on the cable.
- For details about how to install other cables for the Smart PCS, see the corresponding quick guide.

----End

8.6 Installing Auxiliary AC Power Cables (with External Grid Power Supply)

Prerequisites

The AC power cables have been pre-buried.

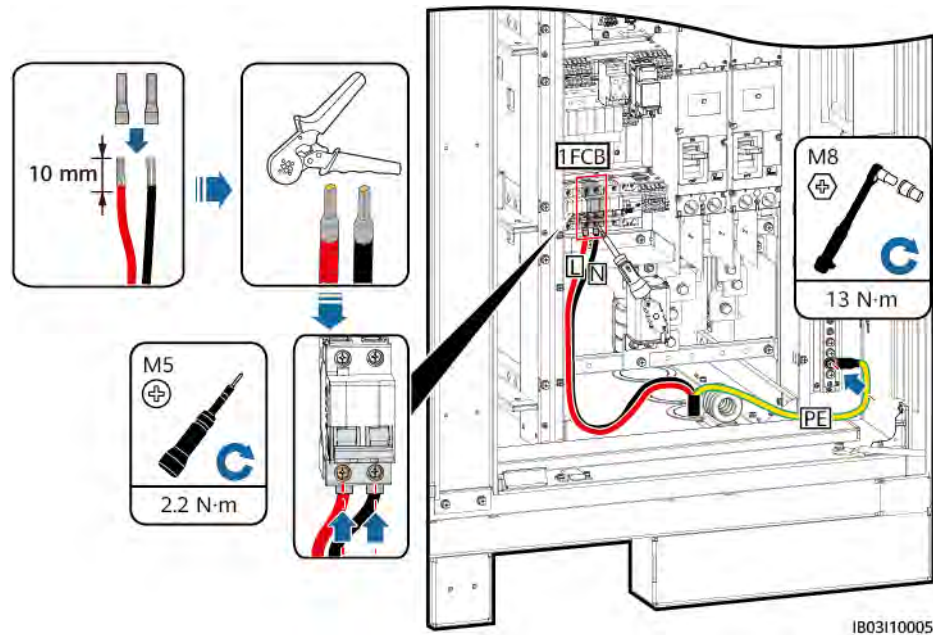
NOTICE

The AC auxiliary power is obtained from the mains or a reliable power supply. Do not directly obtain power from the AC side of renewable energy inverters such as PV inverters and wind power converters.

Procedure

- Step 1** Route the AC power cables through the cable hole at the bottom and connect the cables to the MCB.

Figure 8-11 Connecting AC Power Cables



----End

8.7 Installing Single-Phase AC Input Power Cables (Without External Grid Power Supply)

NOTICE

The AC auxiliary power is obtained from the mains or a reliable power supply. Do not directly obtain power from the AC side of renewable energy inverters such as PV inverters and wind power converters.

NOTE

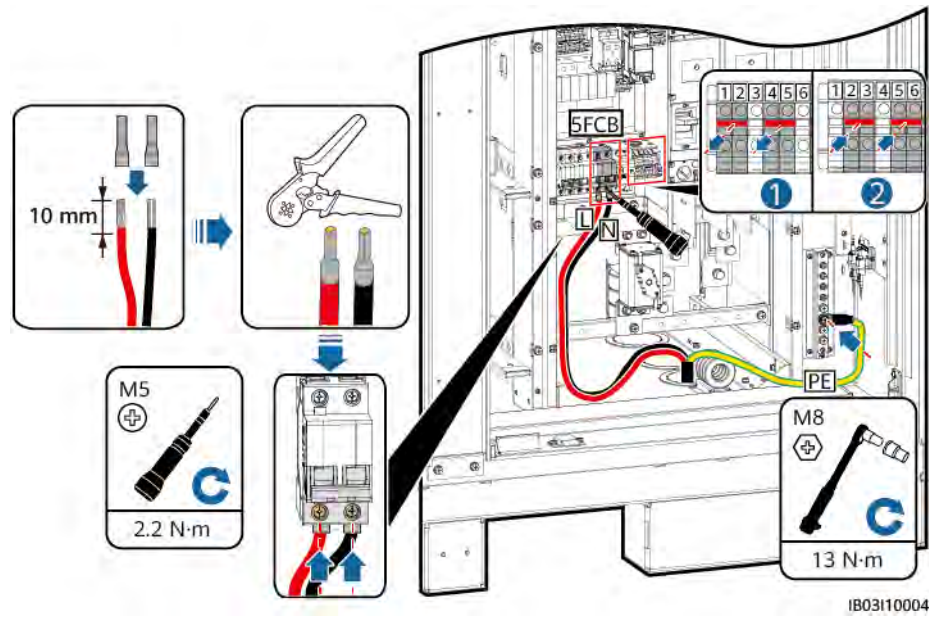
- If a UPS or other reliable backup power supply is used, perform the following steps to connect single-phase AC input power cables.
- Recommended UPS input switch specifications: 230/400 V AC 32 A/2P.

Step 1 Remove the short-circuiting bar from 1-2 and insert it to 2-3 on the XU terminal block.

Step 2 Remove the short-circuiting bar from 4-5 and insert it to 5-6 on the XU terminal block.

Step 3 Connect the cable.

Figure 8-12 Connecting the cable



----End

8.8 Installing Communications Cables

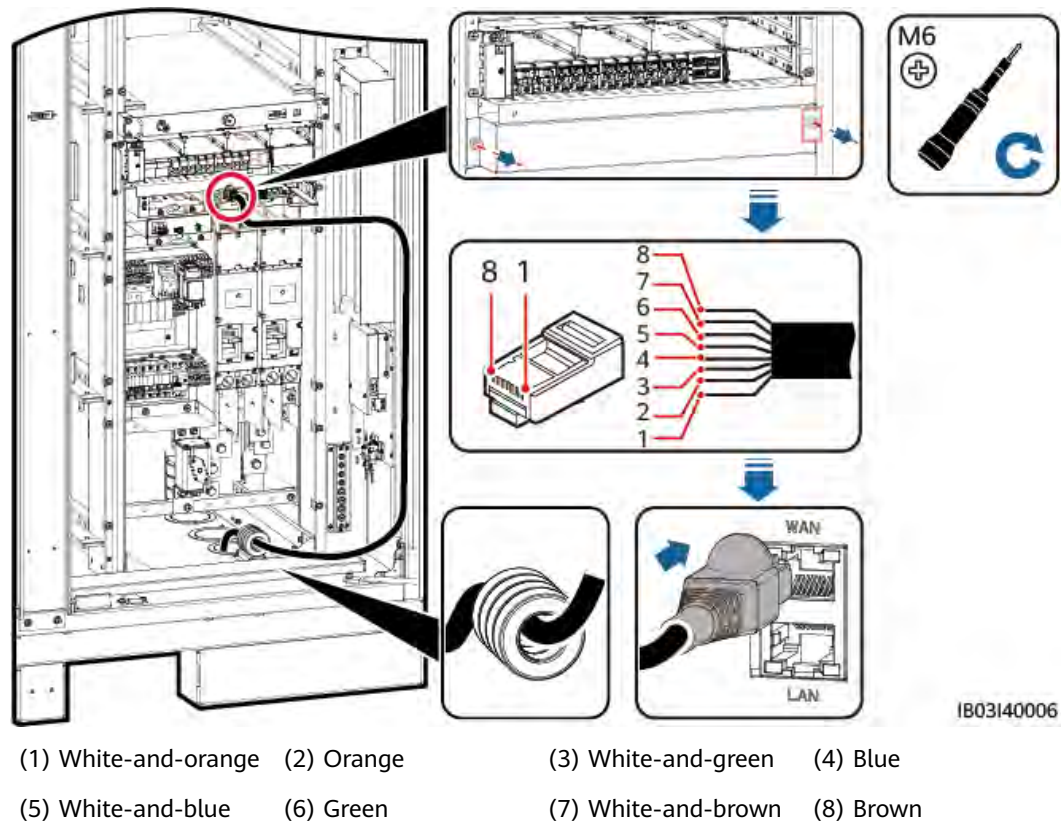
8.8.1 Installing a FE Communications Cable

Step 1 Connect the FE communications cable to the **WAN** port on the CMU.

NOTE

The communications cable needs to be routed through the magnetic ring at the cable hole at the bottom.

Figure 8-13 Connecting a FE communications cable



Step 2 Bind the cables.

----End

8.8.2 Installing Fiber Ring Network Communications Cables

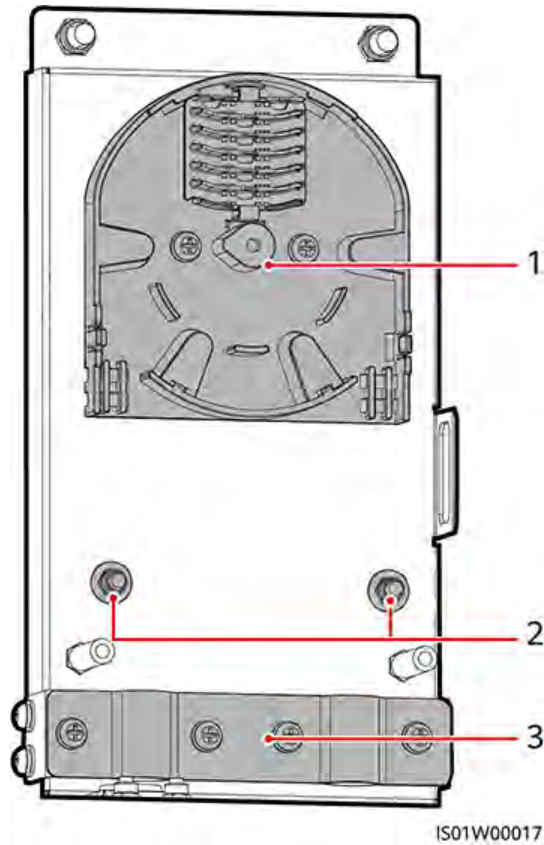
NOTICE

Only professionals are allowed to connect optical fiber cables and splice fibers.

NOTE

In the optical fiber ring topology, two optical fiber cables are required.

Figure 8-14 Access terminal box (ATB) interior



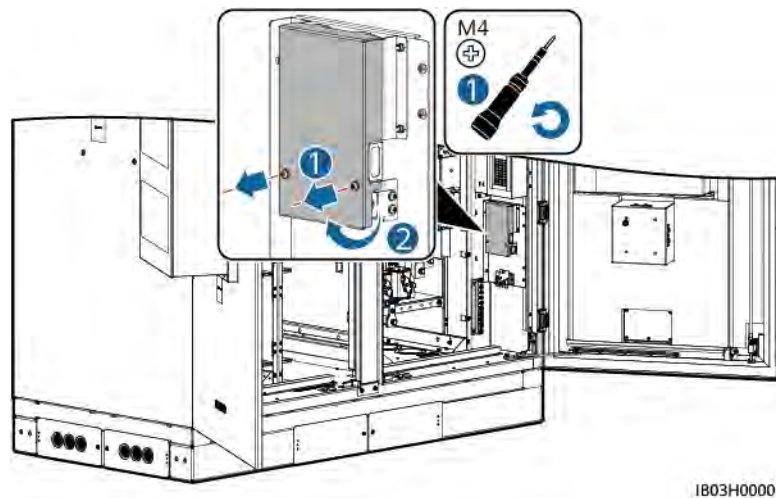
(1) Fiber spool

(2) Fixing points for internal steel wires of optical fiber cables

(3) Cable clip

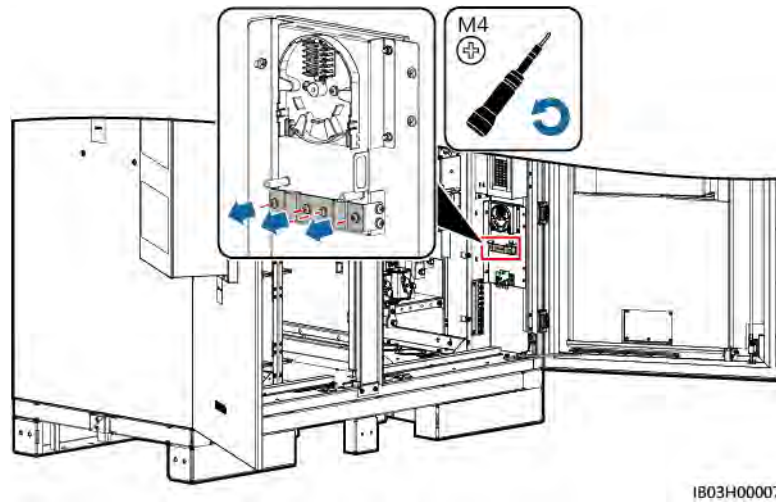
Step 1 Remove the external mechanical parts from the ATB.

Figure 8-15 Removing external mechanical parts



Step 2 Remove the optical fiber cable fastener.

Figure 8-16 Removing a fastener

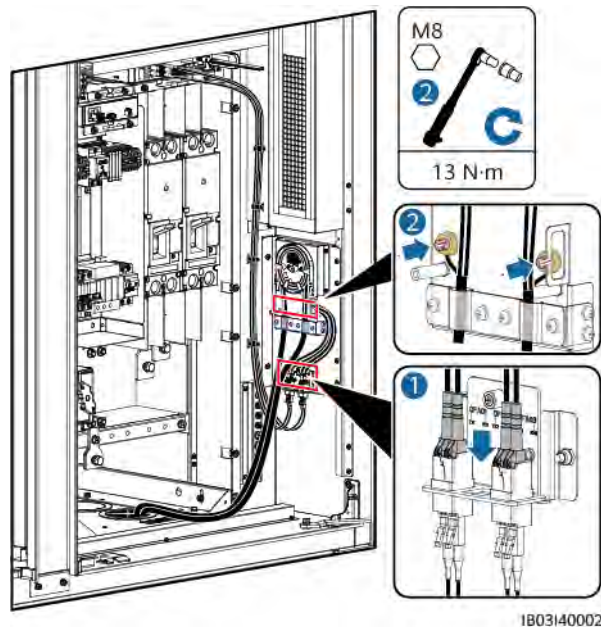


Step 3 Connect one end of the optical jumper to the fiber adapter.

Step 4 Route the other end of the optical jumper through the cable hole on the side of the ATB, and connect the cable to the ATB.

Step 5 Connect the peripheral optical fiber cable to the ATB, splice the optical fiber cable and the optical jumper, and then wind the spliced cable around the fiber spool on the ATB.

Figure 8-17 Connecting optical fiber cables



Step 6 Check that the cables are connected correctly and securely. Then reinstall the optical fiber cable fastener and external mechanical parts.

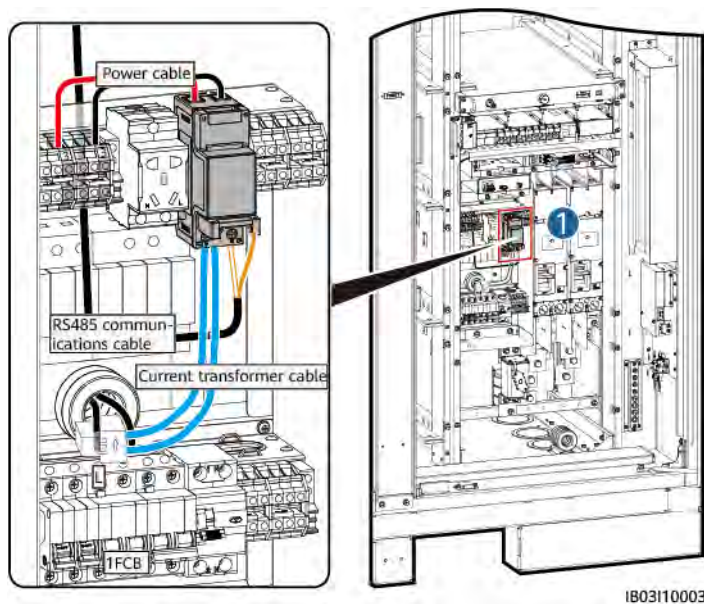
----End

8.9 (Optional) Installing DDSU666-H Cables

Table 8-1 Cable connection

Name	DDSU666-H Side	ESS Side
RS485 communications cable	458A	K1-COM1:+>1PGH1:485A (preinstalled before delivery)
	485B	K1-COM1:->1PGH1:485B (preinstalled before delivery)
Current transformer cable	CT:5 I* (white) CT:6 I (blue)	XT1:1:2>1FCB:1
Power cable	L	XT1:3:1>1PGH1:L
	N	XT2:3:1>1PGH1:N

Figure 8-18 Connecting cables



NOTE

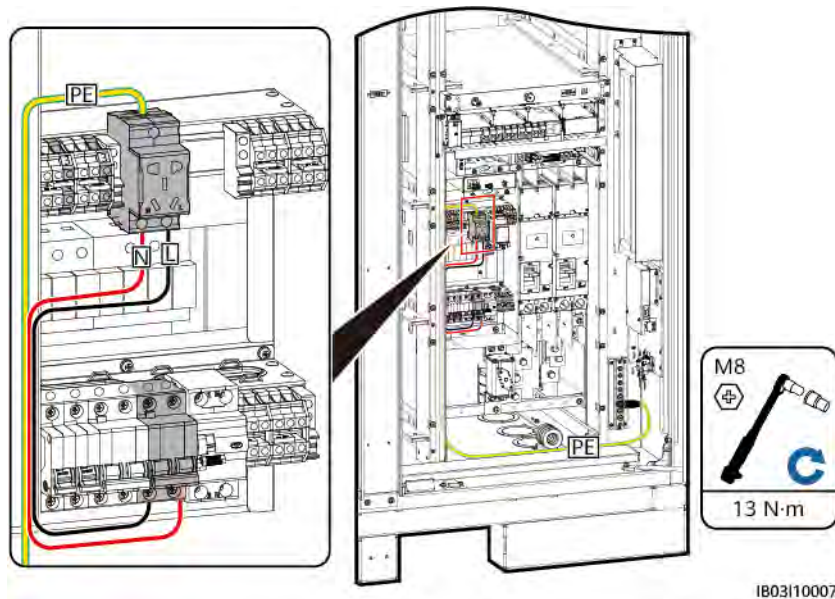
If the ESS is connected to an external UPS, the connection method is the same. However, in this scenario, the DDSU666-H cannot measure the power consumption of the 12 V adapter and there is a maximum error of 0.024 kWh per hour.

8.10 (Optional) Installing Maintenance Socket Cables

NOTE

The actual appearance of the maintenance socket may vary. The figure shows only the installation method.

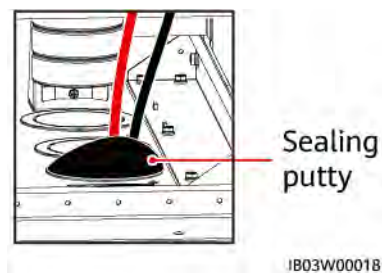
Figure 8-19 Connecting cables



8.11 Sealing Cable Holes

After cables are installed, seal the cable holes using the delivered sealing putty.

Figure 8-20 Sealing putty



9 System Power-On

9.1 Check Before Power-On

9.1.1 General Check

No.	Check Item	Expected Result
1	Appearance	<ul style="list-style-type: none"> The equipment is intact and free from rust or paint flake-off. If paint flakes off, repaint the equipment. The labels on the device are clear. Damaged labels must be replaced.
2	Cable appearance	<ul style="list-style-type: none"> Cable sheathings are properly wrapped and not damaged. Cable hoses are intact.
3	Cable connections	<ul style="list-style-type: none"> Cables are connected in the designed positions. Terminals are prepared as required and securely connected. Labels on both ends of each cable are clear and specific, and attached in the same direction.
4	Cable routing	<ul style="list-style-type: none"> Electrical and ELV cables are routed separately. Cables are neat and tidy. Cable tie joints are evenly cut without burrs. Cables are placed properly and with slack at bending points to avoid stress. Cables are routed neatly without twists or crossovers in the cabinets.
5	Battery pack copper bar	The copper bar is not deformed, and the plastic dip coating is not damaged.

No.	Check Item	Expected Result
6	Switch	<ul style="list-style-type: none"> The DC LV Panel switch is set to OFF. The battery rack switch is set to OFF.

9.1.2 ESS Installation Check

Enclosure

No.	Check Item	Expected Result
1	Installation	<ul style="list-style-type: none"> The installation meets the design requirements. The container is level, and each door opens normally.
2	Appearance	The container surface is free from cracks, dents, and scratches. If the paint flakes off, repaint the device.
3	Grounding	Each container has at least two ground points and is grounded securely with a ground resistance of 0.1 ohm or less.
4	Accessories	The number and positions of external accessories installed meet design requirements.
5	Labels	All labels are correct, clear, and complete.

Interior

No.	Check Item	Expected Result
1	Circuit breaker	The circuit breaker is OFF.
2	Copper bar	The copper bars are not deformed, and there are no foreign objects on the copper bars.
3	Cable	The bolts for installing the cables are tightened and the cables are not loose.
4	Cable hole sealing	Cable holes have been sealed.
5	Battery pack	The battery pack surface is intact.
6	Foreign object	Foreign objects such as tools and remaining materials are cleared.

No.	Check Item	Expected Result
7	Baffle plate for the power distribution area	The baffle plates in the power distribution area are free from cracks, dents, scratches, and looseness.
8	SPD	The SPD indicator is green.
9	Subcomponent (CMU, adapter, and rack mounted fire extinguishing system)	All components are intact.
10	Grounding	The ground conductor is reliably connected to the ground terminal board or copper bar of the container.

9.1.3 Smart PCS Installation Check

Refer to the *LUNA2000-100KTL-M1 Smart Power Control System User Manual*.

Check Item	Expected Result
Installation	The Smart PCS is not deformed or damaged.
	The bottom is securely fixed.
	The Smart PCS is properly installed.
	The clearance around the Smart PCS meets requirements.
Electrical connection	Check that the upstream DC switch and downstream AC switch are OFF .
	All cables are intact and free from any damage or cracks.
	All ground cables are connected securely and reliably.
	All AC power cables are connected correctly and securely, and there is no open circuit or short circuit.
	All DC cables are connected securely in correct polarity, and there is no open circuit or short circuit.
	The communications cables are connected correctly and securely.
Others	The AC maintenance compartment is clean and tidy, without foreign matter.
	The DC maintenance compartment is clean and tidy, without foreign matter.

Check Item	Expected Result
	The AC maintenance compartment door is closed and the screws on the door are tightened.
	The DC maintenance compartment door is closed and the screws on the door are tightened.
	The waterproof plugs on the unused USB and COM ports are secured.

9.1.4 SACU Installation Check

For details, see the [SmartACU2000D Smart Array Controller User Manual \(with No PID Module\)](#).

No.	Expected Result
1	The cabinet and all components are installed properly.
2	All upstream switches for the cabinet and all switches inside the cabinet are OFF.
3	All cables are connected correctly and securely, without exposed metal.
4	Cables are bound neatly, and cable ties are secured evenly and properly in the same direction.
5	Routing for the power cables and signal cables meets the requirements for routing electrical and extra low voltage (ELV) cables and complies with the cable routing plan.
6	The locking caps of the used waterproof connectors are tightened and sealed. Idle waterproof connectors are plugged and the locking caps are tightened.
7	The cabinet interior is clean, without dust, dirt, or foreign matter.
8	The paint on the cabinet exterior is intact. Immediately repaint the part where paint has fallen off to prevent corrosion.

9.2 Installing the PSU

Prerequisites

PSUs are secured inside the ESS during transport and installed onsite.

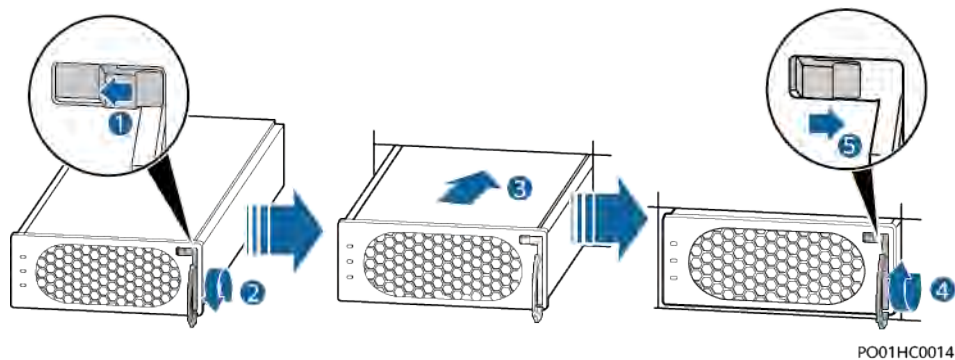
NOTICE

- If a PSU is damaged, contact the local office.
- Do not put your hands into the PSU slot to avoid electric shock.
- In an outdoor scenario, you are advised to power on the PSU within 24 hours after unpacking. If the PSU cannot be powered on in time, place it in a dry indoor environment without corrosive gas.

Procedure

- Step 1** Push the locking latch leftwards.
- Step 2** Pull out the handle.
- Step 3** Gently push the PSU into its slot along the guide rails.
- Step 4** Push the handle upwards.
- Step 5** Push the locking latch rightwards to lock the handle.

Figure 9-1 Installing the PSU



----End

9.3 Power-On Process

⚠ DANGER

Wear insulated gloves and use insulated tools to prevent electric shocks or short circuits.

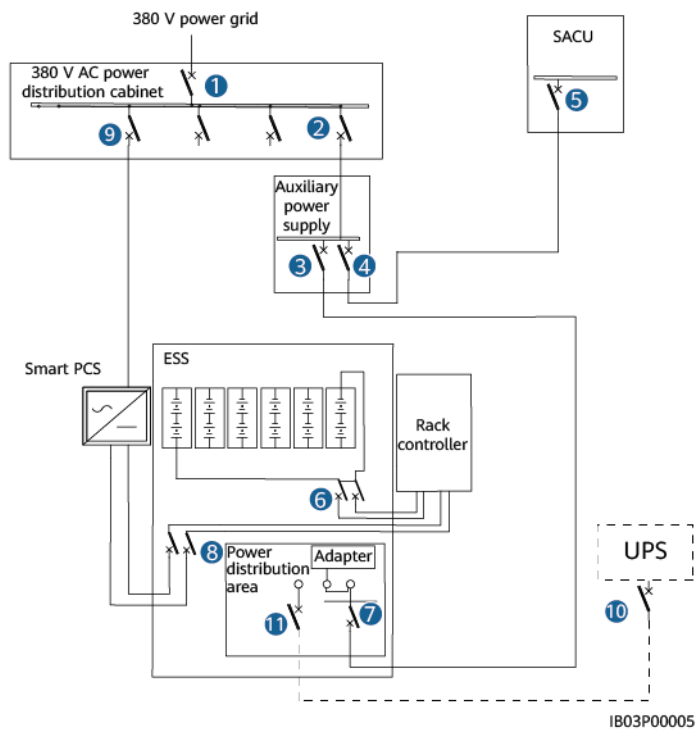
 **CAUTION**

- During the power-on procedure, power off the batteries immediately if any fault is detected. Rectify the fault before proceeding with the procedure.
- Charge batteries if the battery system is powered off for commissioning or batteries are discharged. Otherwise, batteries may be damaged due to overdischarge.
- Battery overdischarge and damage may occur if batteries with low SOC are stored. Batteries should be recharged in a timely manner.

Table 9-1 Procedure

Step	Item		Remarks
1	Powering on the AC power distribution cabinet connected to the grid		As shown by (1) in Figure 9-2
2	Powering on the auxiliary power supply	(Optional) Powering on the UPS	As shown by (10) and (11) in Figure 9-2
		Powering on the 220 V AC auxiliary power supply	As shown by (2), (3), and (4) in Figure 9-2
3	Powering on the SACU		As shown by (5) in Figure 9-2
4	Powering on the ESS	Powering on the DC circuit breakers of battery racks	As shown by (6) in Figure 9-2
5		Powering on the auxiliary power supply (turning on the AC switches and then the DC switches) ^a	As shown by (7) in Figure 9-2
6		Powering on the output DC circuit breakers	As shown by (8) in Figure 9-2
7	Powering on the AC side of the Smart PCS	Powering on the battery side of the AC power distribution cabinet	As shown by (9) in Figure 9-2
<p>Note a: Before turning on the internal switch of the ESS auxiliary power supply, check that the AC auxiliary power supply voltage is within the normal range (220 V±10%).</p>			

Figure 9-2 Power-on process



9.4 Powering on the SACU

Prerequisites

- You have completed the power-on check.
- You have put on proper personal protective equipment (PPE).
- Ensure that the power voltage of the SACU is within the operating voltage range, and the three-phase input voltage is within the operating voltage range of the MBUS CCO.

Procedure

- Step 1** Turn on the single-phase power switch that controls the power supply from the remote transformer station to the SACU.
- Step 2** Turn on the three-phase power switch that controls the power supply from the remote transformer station to the SACU.
 - If the SACU supports the access of one MBUS route, turn on the corresponding three-phase power switch.
 - If the SACU supports the access of two MBUS routes, turn on the corresponding three-phase power switches.
- Step 3** Check that the input voltages of all switches of the SACU are within the operating voltage ranges using a multimeter.
- Step 4** Turn on the **QF03** single-phase input switch in the SACU.
- Step 5** Turn on the three-phase input switch on the SACU.

- If the SACU supports the access of one MBUS route, turn on the FU01 switch.
- If the SACU supports the access of two MBUS routes, turn on the FU01 and FU02 switches.

Step 6 Adjust the support bar, close the cabinet door, and tighten the screws.

 **NOTE**

If a screw used for securing the cabinet door is lost, use the spare security torx screw included in the fitting bag.

----End

9.5 Powering On the Power Supply Loop of the AC Power Distribution Cabinet

Prerequisites

Before power-on, use a multimeter to check that the phase voltage of the AC power distribution cabinet power supply loop is within the normal range (220 V $\pm 10\%$).

Procedure

Step 1 Turn on the switches between the AC power distribution cabinet and the SACU.

Step 2 Turn on the switches between the AC power distribution cabinet and the ESS.

----End

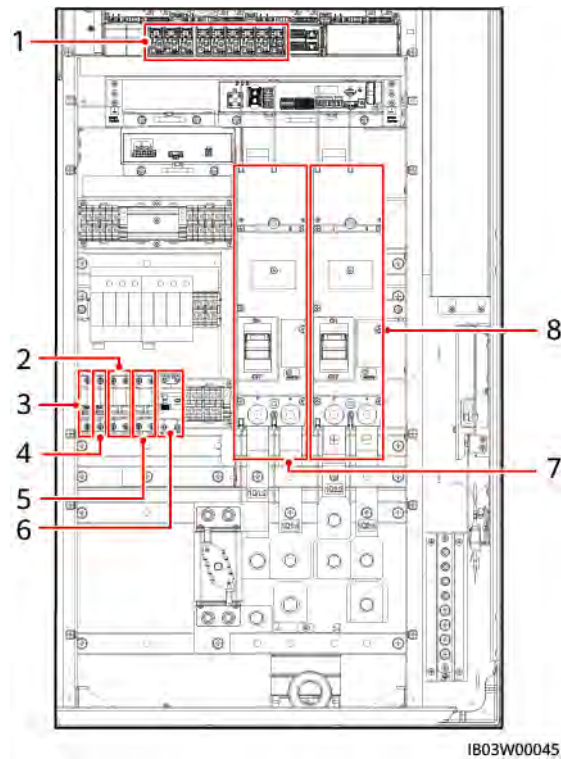
9.6 Powering On the ESS

NOTICE

If the ESS has not been used for six months or longer after being installed, it must be checked and tested by professionals before operation.

Procedure

Figure 9-3 Positions of switches



- | | | |
|---|---|--|
| (1) 48 V DC power distribution switches | (2) AC main switch (1FCB) | (3) 12 V adapter switch (1FCB1) |
| (4) PSU switch (1FCB2) | (5) UPS switch (5FCB) | (6) 220 V maintenance socket switch (1FB1) |
| (7) DC switch (1Q1, on the battery rack side) | (8) DC switch (1Q2, on the Smart PCS DC side) | - |

Step 1 Turn on the DC switch 1Q1. (As shown by 7 in [Figure 9-3](#))

Step 2 Use a multimeter to check whether the AC voltage is within the allowed range (220 V \pm 10%). (As shown by 2 in [Figure 9-3](#))

Step 3 (Optional) Turn on the UPS cable inlet switch 5FCB (as shown by 5 in [Figure 9-3](#)).

Step 4 Turn on the AC main switch 1FCB. (As shown by 2 in [Figure 9-3](#))

Step 5 Turn on all switches in the power distribution system of the ESS.

1. Turn on the 12 V adapter switch 1FCB1. (As shown by 3 in [Figure 9-3](#))
2. Turn on the PSU switch 1FCB2. (As shown by 4 in [Figure 9-3](#))
3. (Optional) Turn on the 220 V maintenance socket switch 1FB1. (As shown by 6 in [Figure 9-3](#))
4. On the embedded power subrack (SK1), turn on the DC/DC switch 2FCB1, DC light power switch 2FCB2, TCUE power switch 2FCB3, fan 1 switch 2FCB6, fan

2 switch 2FCB7, air conditioner 1 switch 2FCB8, and air conditioner 2 switch 2FCB9 in sequence.

 **NOTE**

Use a multimeter to check that the output voltage at position 1 in the preceding figure is $53\text{ V}\pm 5\text{ V}$.

Step 6 Turn on the DC switch 1Q2. (As shown by 8 in **Figure 9-3**)

----End

10 SmartLogger Web-based Deployment

Prerequisites

1. All devices onsite have been commissioned.
2. The system is powered on and alarms are cleared.
3. The commissioning equipment is available onsite.
4. Before the deployment, wait until the air conditioner adjusts the temperature inside the cabinet and the temperature of batteries to the specified temperature range (5°C to 45°C).

10.1 Preparations and WebUI Login

Prerequisites

- The operating system of Windows 7 or later is supported.
- Browser: Chrome 52, Firefox 58, or Internet Explorer 9, or a later version is recommended.

Procedure

- Step 1** Connect the network cable between the network port of the PC and the WAN or LAN port of the SmartLogger.
- Step 2** Set the IP address for the PC on the same network segment as the SmartLogger IP address.

Connected Port	Item	SmartLogger Default Value	Example PC Setting
LAN port	IP address	192.168.8.10	192.168.8.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.8.1	192.168.8.1

Connected Port	Item	SmartLogger Default Value	Example PC Setting
WAN port	IP address	192.168.0.10	192.168.0.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.0.1	192.168.0.1

NOTE

- When the IP address of the WAN port is in the network segment from 192.168.8.1 to 192.168.8.255, set the default gateway to 192.168.8.1 and the IP address of the LAN port to 192.168.3.10. If the connected port is a LAN port, you need to adjust the network configuration of the PC.
- It is recommended that the PC be connected to the LAN port of the SmartLogger or the GE port of the SmartModule. When the PC is connected to the GE port of the SmartModule, adjust the network configuration of the PC to the configuration mode when the PC is connected to the LAN port of the SmartLogger.

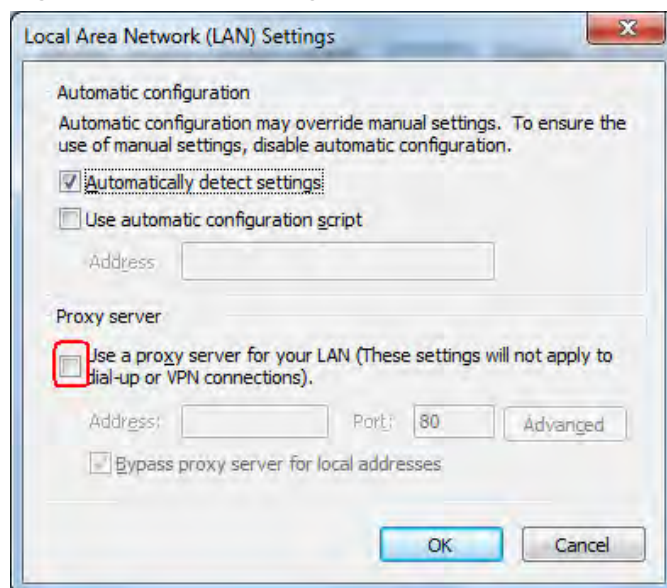
Step 3 Set LAN parameters.

NOTICE

- If the SmartLogger is connected to a local area network (LAN) and a proxy server has been set, you need to cancel the proxy server settings.
- If the SmartLogger is connected to the Internet and the PC is connected to the LAN, do not cancel the proxy server settings.

1. Open Internet Explorer.
2. Choose **Tools > Internet Options**.
3. Click the **Connections** tab and then click **LAN settings**.
4. Clear **Use a proxy server for your LAN**.

Figure 10-1 LAN settings



5. Click **OK**.

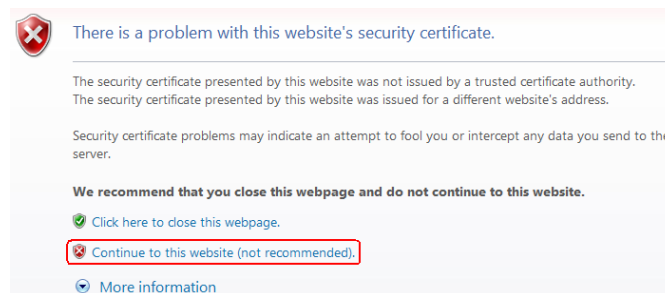
Step 4 Log in to the SmartLogger WebUI.

1. In the address box of a browser, enter `https://XX.XX.XX.XX` (XX.XX.XX.XX is the IP address of the SmartLogger) and press Enter. The login page is displayed. If you log in to the WebUI for the first time, a security risk warning is displayed. Click **Continue to this website** to log in to the WebUI.

 **NOTE**

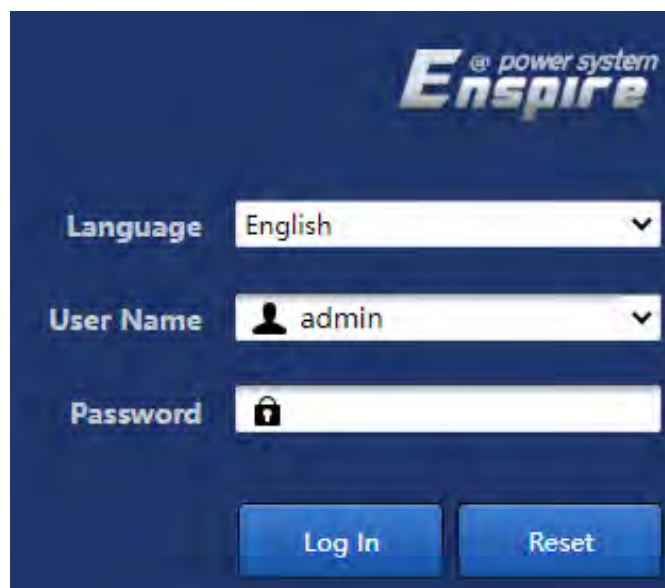
- It is recommended that users use their own certificates. If the certificate is not replaced, the security risk warning will be displayed during each login.
- After logging in to the WebUI, you can import a certificate under **Maintenance > Security Settings > Network Security Certificate**.
- The imported security certificate needs to be bound to the SmartLogger IP address. Otherwise, the security risk warning will still be displayed during login.

Figure 10-2 Security risk warning



2. Specify **Language**, **User Name**, and **Password**, and click **Log In**.

Figure 10-3 Login page (Initial login when the user name is displayed as admin)



NOTE

In this scenario, you need to update the software version to SmartLogger V300R023C00 or later.

Parameter	Description
Language	Set this parameter as required.
User Name	Default value: admin
Password	<ul style="list-style-type: none"> - The initial password is Changeme. - Use the initial password upon first power-on and change it immediately after login. Then, use the new password to log in again.

Figure 10-4 Login page (Initial login when the user name is null)



IL03J00002

NOTE

In this scenario, the software version is SmartLogger V300R023C00 or later.

Parameter	Description
Language	Set this parameter as required.
User Name	Log in as installer.
Password	Set the login password as prompted.

NOTE

- Protect the password by changing it periodically, and keep it secure. If you lose the password, the device must be restored to its factory settings. Huawei will not be held liable for any losses resulting from improper password management.
- You will be locked out for 10 minutes after five failed password attempts in five minutes.
- A dialog box with recent login information is displayed after login. Click **OK**.

----End

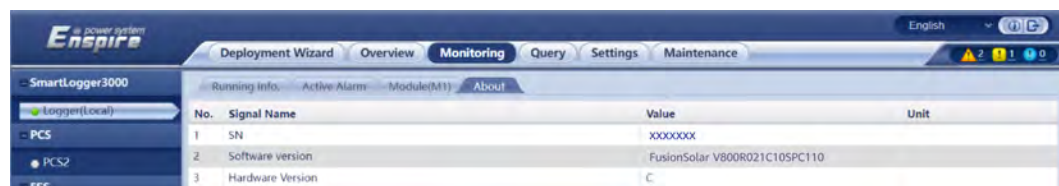
Follow-up Procedure

If any page is blank or a menu cannot be accessed after you log in to the WebUI, clear the cache, refresh the page, or log in again.

10.2 Checking the SmartLogger Software Version

Choose **Monitoring > Logger (Local) > About** and check that the software version is FusionSolar V800R021C10SPC110 or later.

Figure 10-5 Checking the version



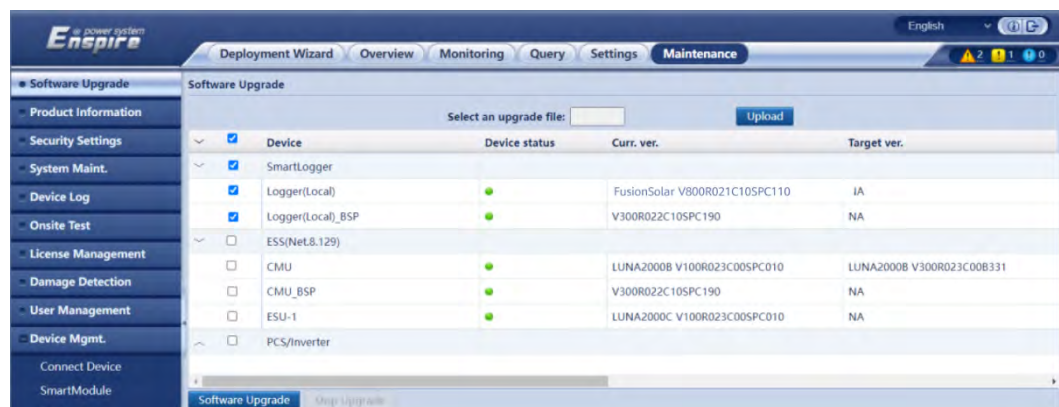
10.3 Upgrading the SmartLogger

NOTE

- If the SmartLogger software version is not FusionSolar V800R021C10SPC110 or later, upgrade the SmartLogger.
- Obtain the SmartLogger upgrade package from the Company.

Step 1 Choose **Maintenance > Software Upgrade**, upload the SmartLogger upgrade package, select the device, and upgrade the SmartLogger.

Figure 10-6 Upgrading the SmartLogger



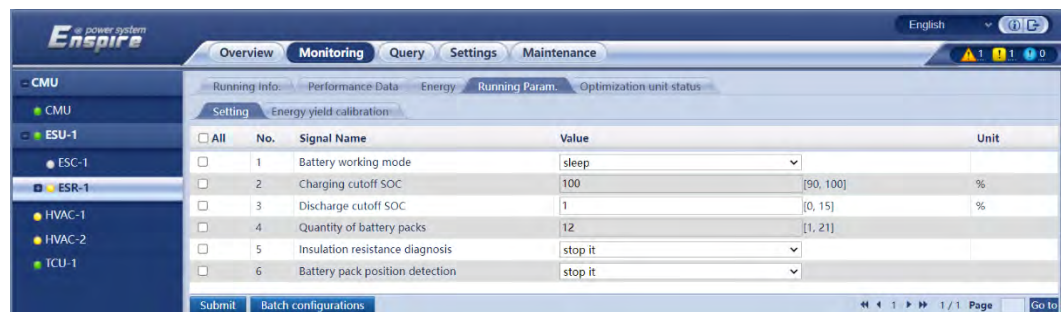
Step 2 After the software upgrade is complete, the SmartLogger automatically restarts. Log in to the SmartLogger WebUI again 2 minutes later.

----End

10.4 Setting Battery Modules

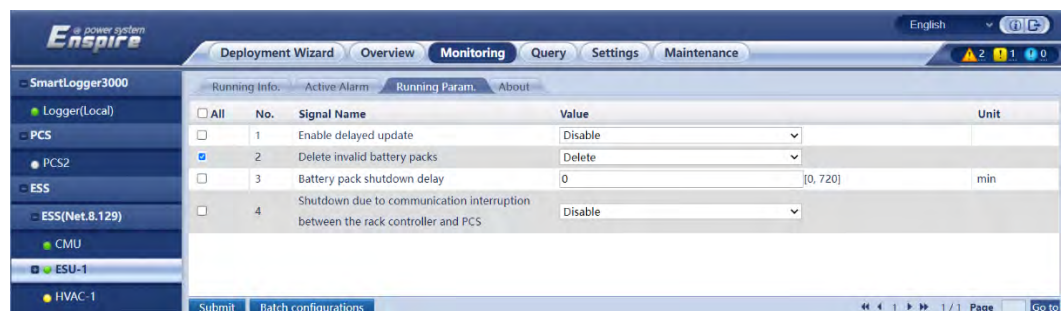
Step 1 Choose **Monitoring > ESR > Running Param. > Setting**, and set **Quantity of battery packs** to 12.

Figure 10-7 Setting the number of battery packs



Step 2 Choose **Monitoring > ESU > Running Param.**, select **Delete invalid battery packs**, and submit the settings.

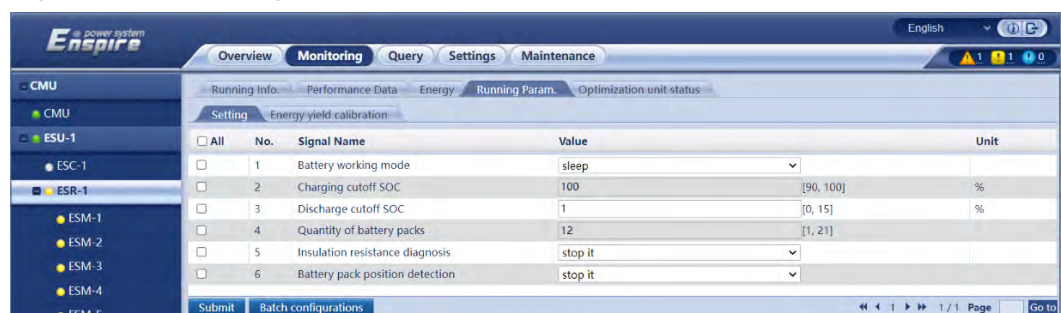
Figure 10-8 Deleting invalid battery packs



Step 3 Choose **Monitoring > ESU > Running Param.**, click  in the upper right corner, and wait for 2 minutes.

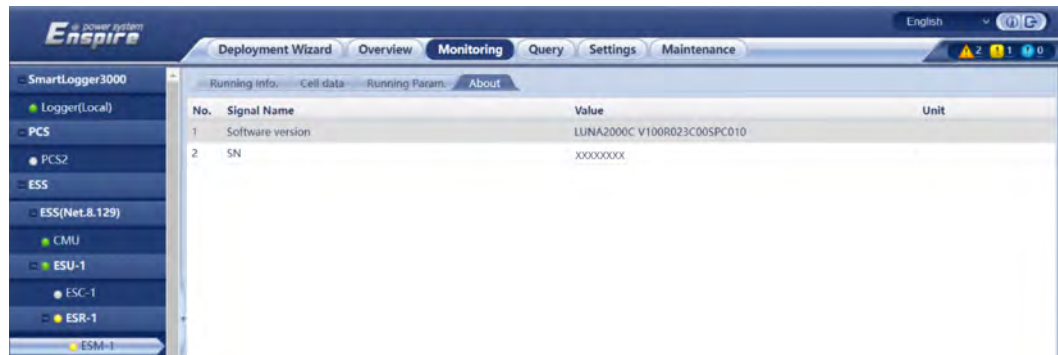
Step 4 Choose **Monitoring > ESR**, click +, and verify that the ESM-1 to ESM-12 status indicators under the ESR are all green or yellow.

Figure 10-9 Checking the status



Step 5 Choose **Monitoring > ESM > About** and check the software versions of ESM-1 to ESM-12.

Figure 10-10 Checking the ESM software version

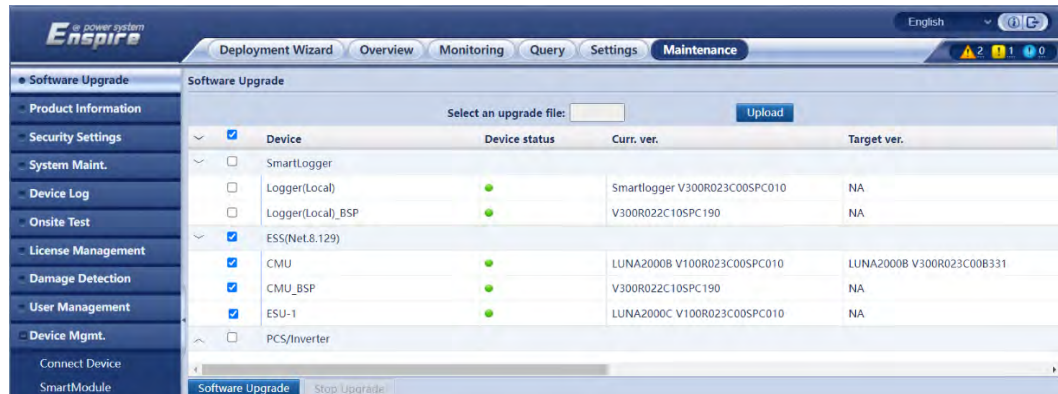


NOTE

- If the software version of ESM-1 to ESM-12 is not FusionSolar V800R021C10SPC110 or later, upgrade the ESU.
- Obtain the upgrade package from the Company.

Step 6 (Optional) Choose **Maintenance > Software Upgrade**, upload the upgrade package, select the device, and upgrade the ESU.

Figure 10-11 Upgrading the ESU



Step 7 Choose **Monitoring > ESU > Running Param.**, click  in the upper right corner, and wait for 2 minutes.

Step 8 Choose **Monitoring > ESM** and check  in the upper right corner to ensure that no major alarm is generated.

----End

10.5 Deployment Wizard

Procedure

Step 1 Log in as **admin** to access the deployment wizard page.

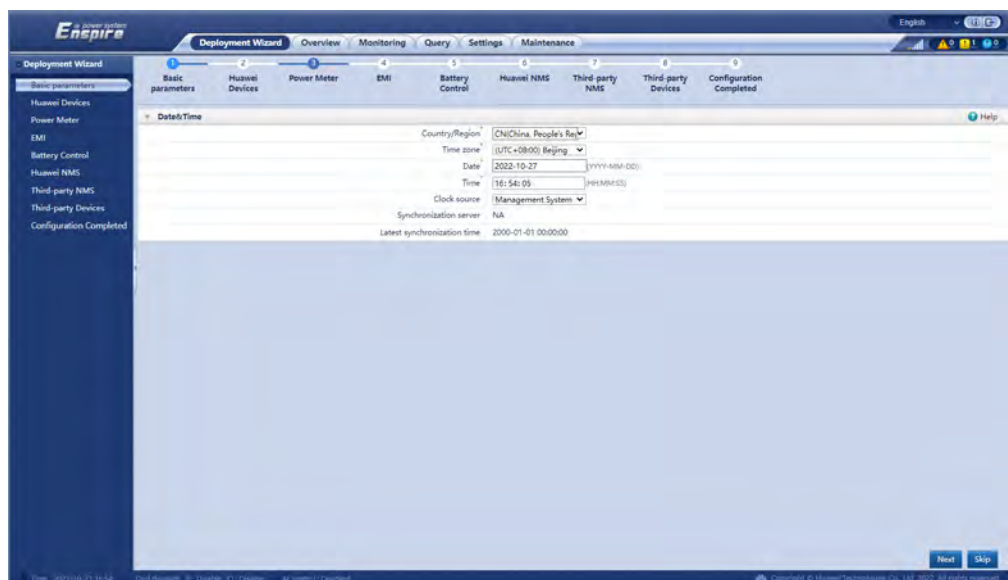
Step 2 Set parameters following the deployment wizard. For details, see **Help** on the page.

 **NOTE**

During parameter setting, click **Previous**, **Next**, or **Skip** as required.

1. Set basic parameters.

Figure 10-12 Setting basic parameters



After setting the parameters, select a communication mode based on the site requirements.

Figure 10-13 Wireless communication (4G/3G/2G)

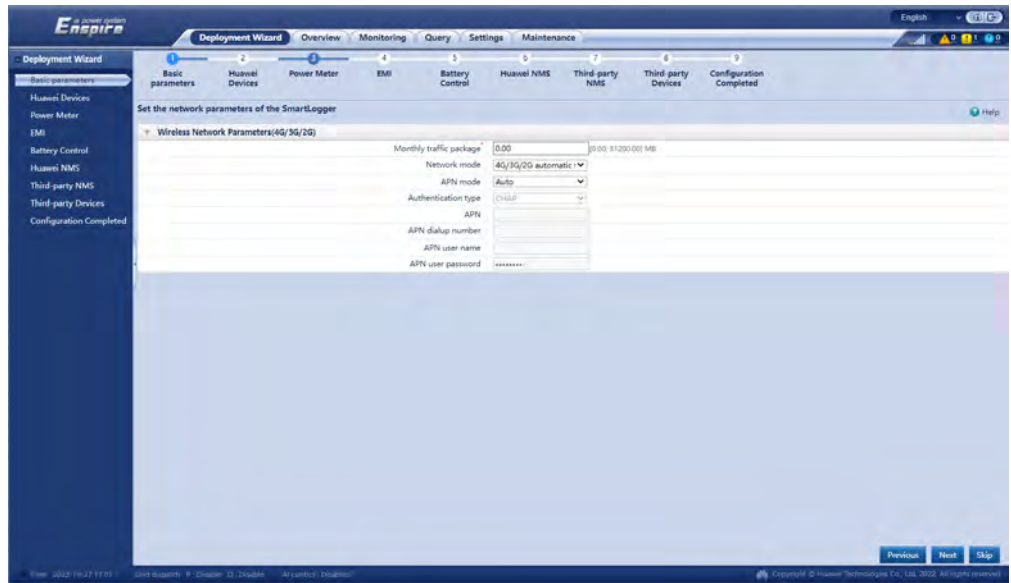
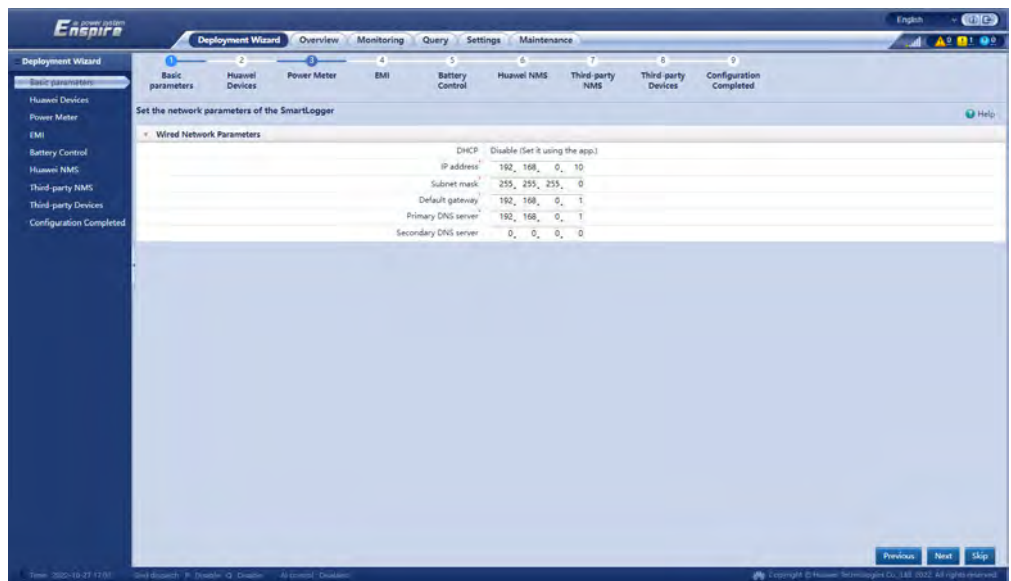
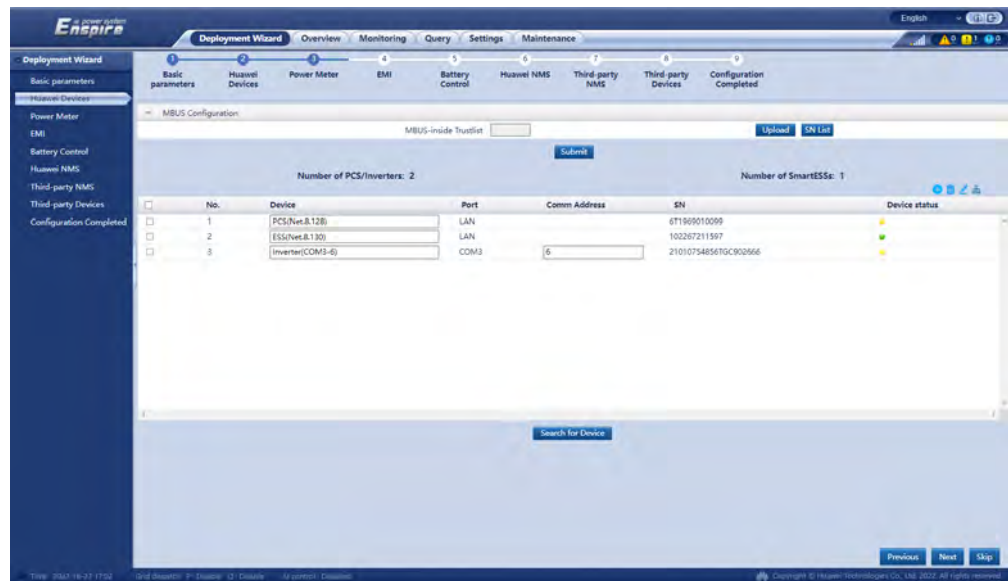


Figure 10-14 ETH communication



2. After Huawei devices are connected, click **Search for Device** to check the cable connections and allocate addresses.

Figure 10-15 Searching for device



 NOTE




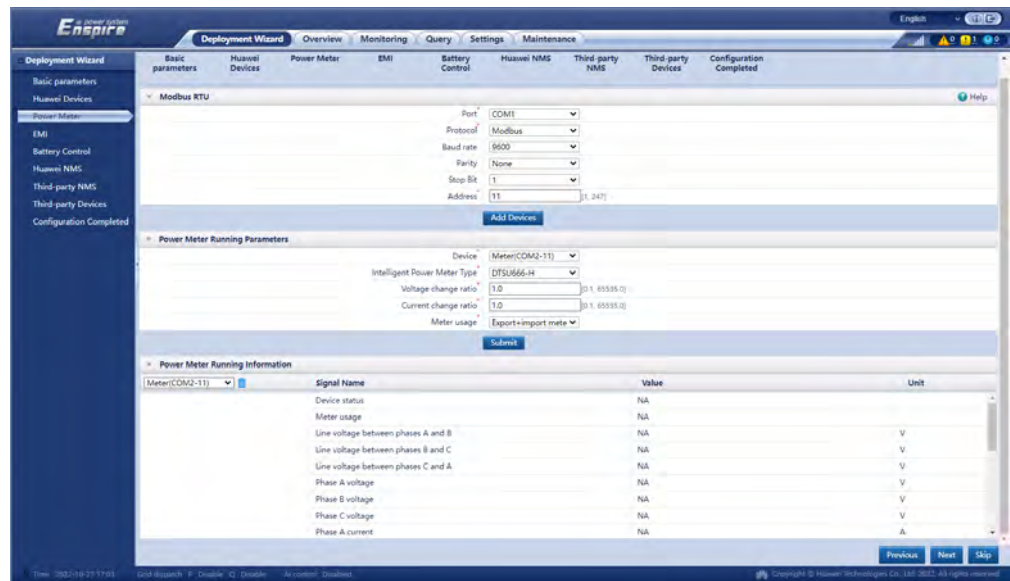
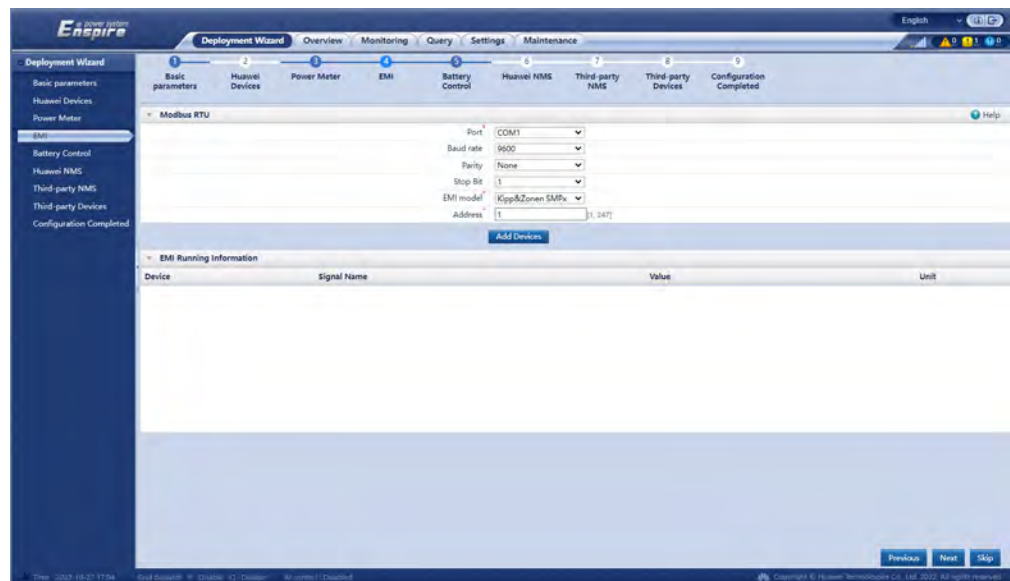
- During the process of **Search for Device**, do not perform upgrade operations (such as upgrading through the app, management system, or WebUI).
 - When you click **Search for Device**, cable connections (DC and AC) will be checked before device search (not applicable to third-party devices), and device addresses will be automatically allocated.
 - After the cable connection check and device search are complete, if a cable connection alarm is generated, you can click the alarm icon  to view the corresponding alarm information.
 - If an alarm is generated when the cable connection check fails, click the alarm icon  to view the alarm cause and handling suggestions. After the fault is rectified, check the cable connection again.
 - After the cable connection check and device search are complete, click  to view the corresponding topology information.
 - After a device is added or deleted, you need to click **Search for Device** again. Otherwise, the system topology will not be updated.
3. Connect to a power meter, and set **Meter usage** to **Export+import meter**.

Figure 10-16 Setting meter parameters



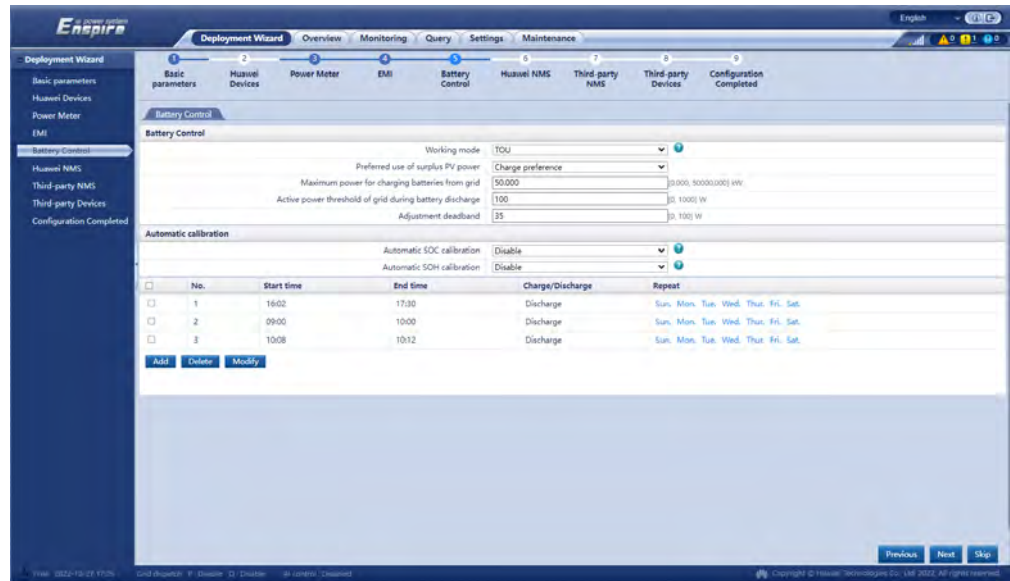
4. Connect to EMIs.

Figure 10-17 Setting EMI parameters



5. Set the battery working mode for battery control.

Figure 10-18 Working modes

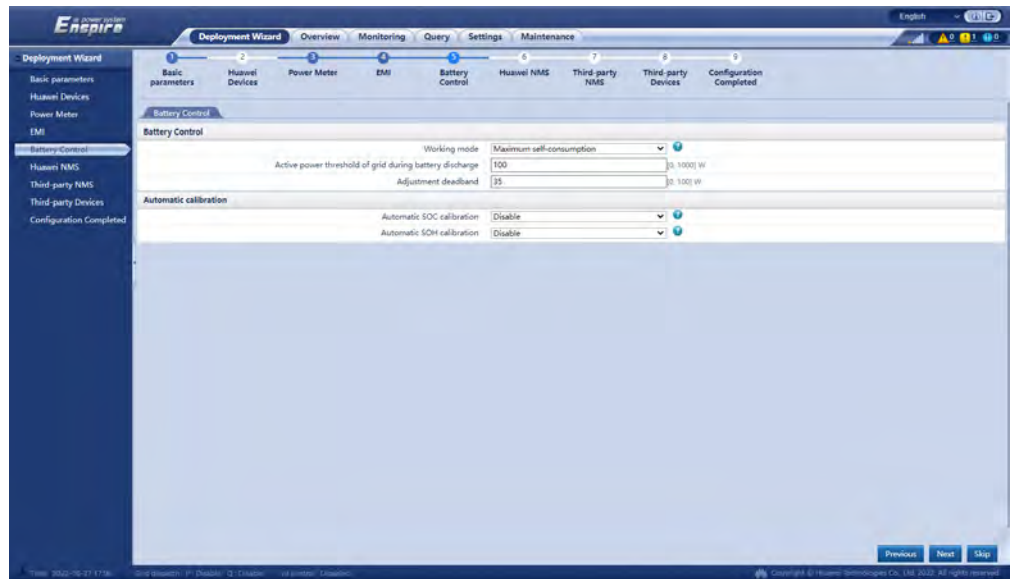


Working mode	Description
No control	SmartLogger directly delivers the external scheduling power limit. No other power scheduling control is performed. The power is automatically controlled by the device.
Maximum self-consumption	<ul style="list-style-type: none"> It is applicable to the PV+ESS system to increase the self-consumption rate of PV power. Excess PV energy is stored in batteries. When PV power is insufficient or no PV power is generated at night, batteries discharge to supply power to the loads, improving the self-consumption rate of the PV system and the self-sufficiency rate, and reducing electricity costs. The SmartLogger performs battery scheduling based on the external scheduling power limit and the preceding policies.

Working mode	Description
TOU	<ul style="list-style-type: none"> - Applies to optical storage systems and pure storage systems with price differences between peak and off-peak hours. - You can manually set the charge and discharge time segments to lower the electricity cost. You need to enable Fed to grid in Battery control. When the electricity price is low at night, the power grid charges the batteries. When the electricity price is high, the batteries discharge to supply power to the loads. - Click Add to set the charge/discharge time. A maximum of 14 time segments are allowed. During the charging period, the power grid charges the batteries, and during the discharging period, the batteries discharge to supply power to the loads. In other time segments that are not set, the ESS does not discharge, and the PV modules and grid supply power to the loads. (In grid-tied/off-grid mode, if the grid fails, the ESS can discharge at any time.) - In some countries, the grid is not allowed to charge batteries. In such case, this mode cannot be used. - The SmartLogger performs battery scheduling based on the external scheduling power limit and the preceding policies.
Scheduled Charge/Discharge	<ul style="list-style-type: none"> - This mode applies to ground power plant scheduling scenarios. - In scheduled discharge, the AC output aims to reach the target value of the scheduled active power: PV power supply is prioritized. If the PV power is insufficient, the batteries supply power to loads; if the PV power is sufficient, the system outputs at the target value and the excess PV power is used to charge the batteries. - In scheduled charge, the AC output aims to reach the target value of the scheduled active power: If the battery power is insufficient or the Smart PCS is limiting power, the system gets power from the grid as much as possible; if the scheduling target is met and the battery has excessive power, the PV power is used to charge the batteries.

- The working mode is set to **Maximum self-consumption**.

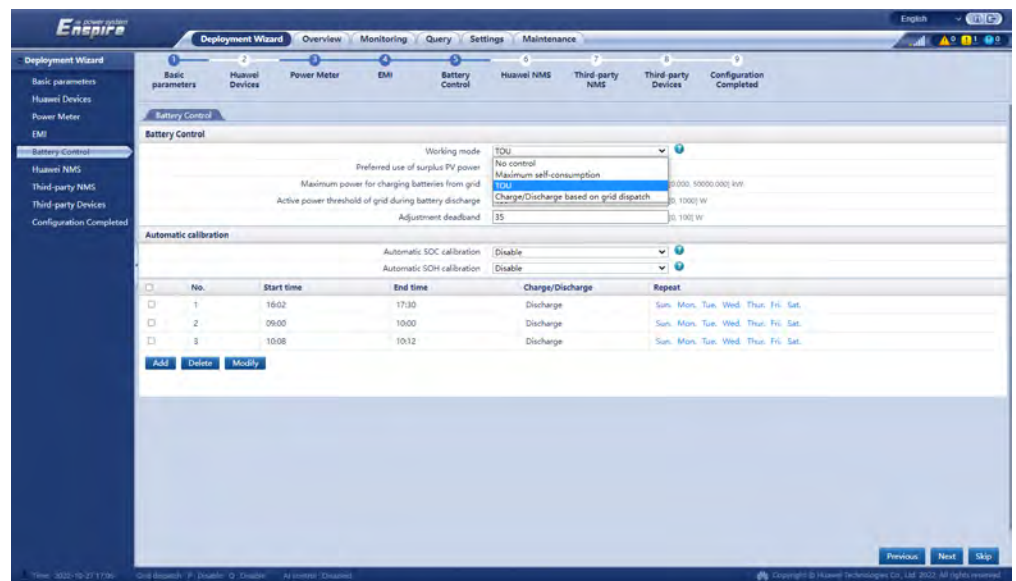
Figure 10-19 Working modes



Parameter	Description
Maximum grid power during battery discharge	Control the maximum target grid power when the grid-connection point has zero power.
Adjustment deadband	Allowed fluctuation of the target grid power for the grid-connection point
Automatic SOC calibration	<ul style="list-style-type: none"> ▪ Enabled: Automatic SOC calibration is enabled. If the total charge and discharge energy reaches the threshold or the calibration function has not been triggered for 30 days, the SOC automatic calibration is performed. The SOC automatic calibration is performed in battery racks. During calibration, the cut-off SOC settings will be ineffective. ▪ Disabled: Automatic SOC calibration is disabled.

- The working mode is set to **TOU**.

Figure 10-20 Working modes

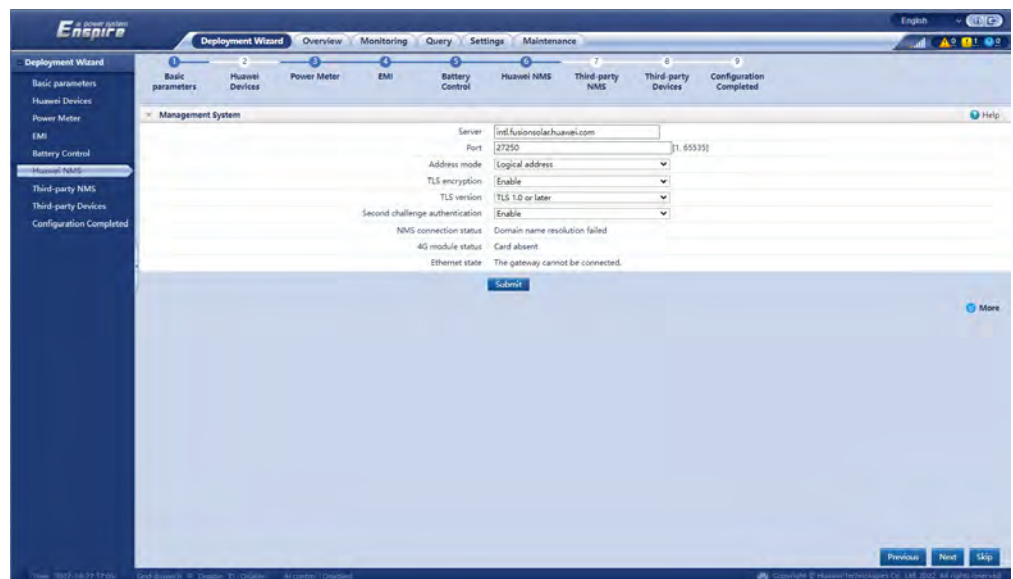


Parameter	Description
Preferred use of surplus PV power	<ul style="list-style-type: none"> ▪ Charge: When the PV energy is greater than the loads, excess PV energy is used to charge the ESS. After the maximum charge power is reached or the ESS is fully charged, the excess PV energy is fed to the grid. ▪ Fed to grid: When the generated PV energy is greater than the loads, the excess PV energy is preferentially fed to the grid. When the maximum output power of the inverter/Smart PCS is reached, the excess energy is used to charge the batteries. This setting is applicable to the scenario where the feed-in tariff (FIT) is higher than the electricity price. The ESS is used only for backup power.
Maximum charge power of grid	Set the maximum power of the grid during battery charging.
Maximum grid power during battery discharge	Control the maximum target grid power when the grid-connection point has zero power.
Adjustment deadband	Allowed fluctuation of the target grid power for the grid-connection point

Parameter	Description
Automatic SOC calibration	<ul style="list-style-type: none"> ▪ Enabled: Automatic SOC calibration is enabled. If the total charge and discharge energy reaches the threshold or the calibration function has not been triggered for 30 days, the SOC automatic calibration is performed. During calibration, the cut-off SOC settings will be ineffective and the response of the charge/discharge power may be impacted temporarily. ▪ Disabled: Automatic SOC calibration is disabled.
Start time	Set the Charge/Discharge time. A maximum of 14 time segments can be set. You can set a cycle by week by clicking the buttons corresponding to Mon. through Sun. in the Repeat box. The buttons are blue by default, indicating selected. After you click it, the button turns gray.
To	
Charge/Discharge	
Repeated	

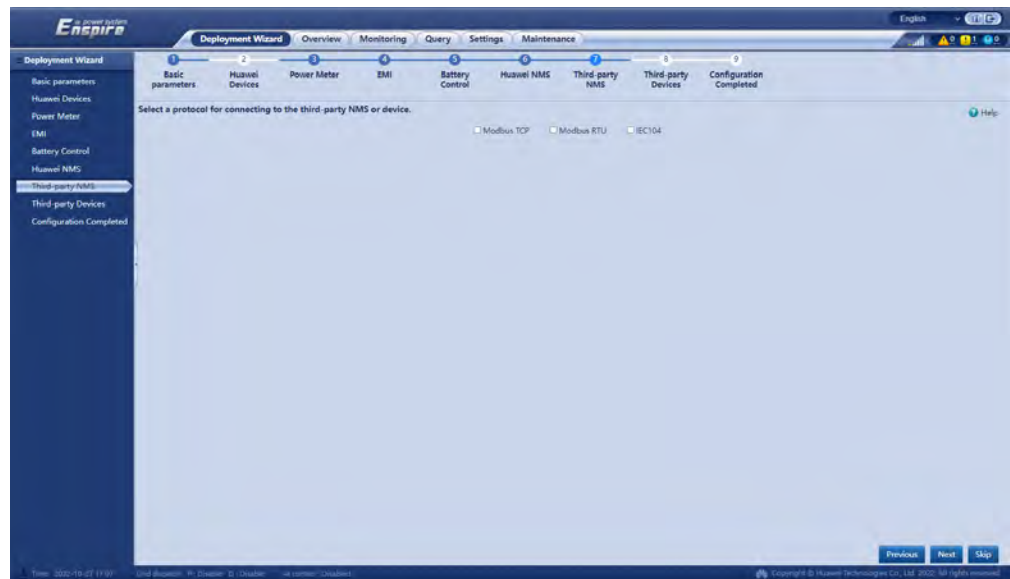
6. Connect to a Huawei network management system (NMS).

Figure 10-21 Huawei NMS



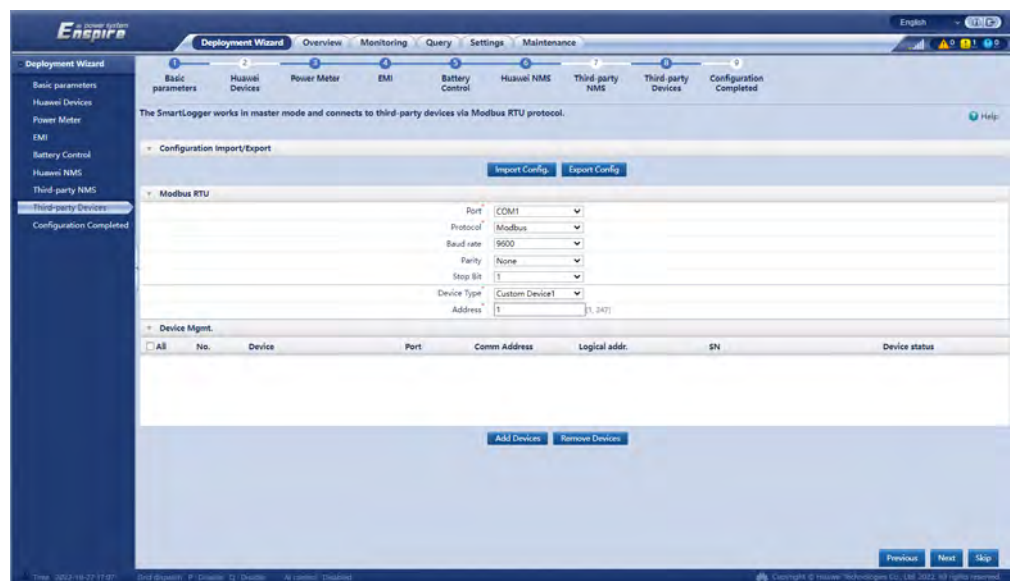
7. Connect to a third-party management system. Select **IEC104**.

Figure 10-22 Third-party management system



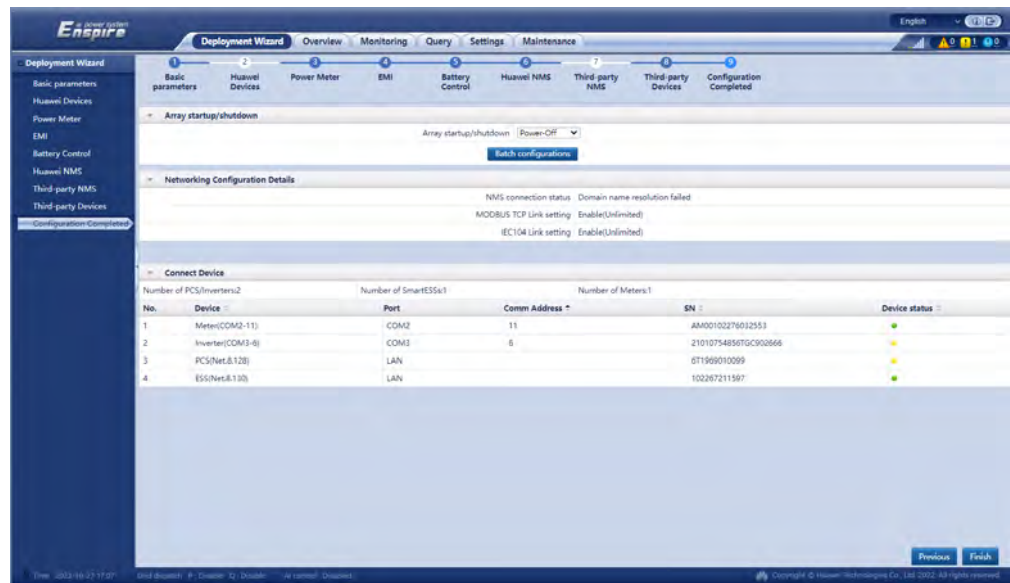
8. Connect to third-party devices.

Figure 10-23 Third-party devices



9. The settings are complete.

Figure 10-24 Settings complete



----End

10.6 (Optional) System Setup

Prerequisites

Start up the system when needed.

Procedure

Step 1 Choose **Maintenance > Connect Device** on the SmartLogger WebUI.


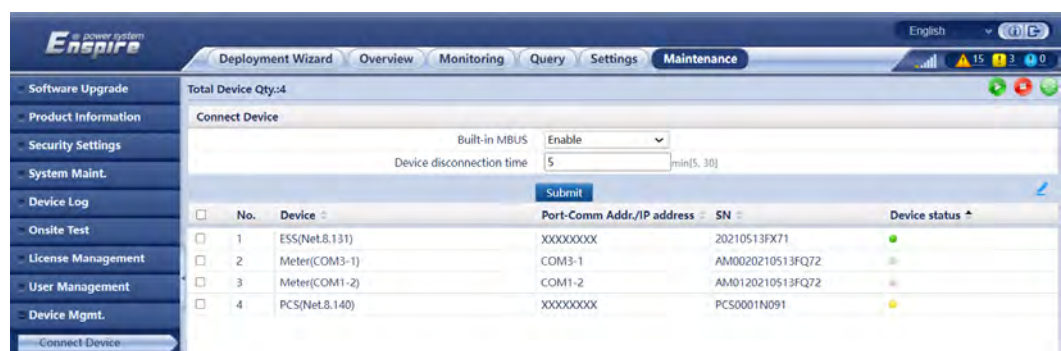
Step 2 Click  in the upper right corner to start devices in batches.

Figure 10-25 System startup



----End

10.7 View Alarm

Step 1 Check whether an alarm is generated on the SmartLogger WebUI or CMU WebUI. If an alarm is generated, handle the alarm by referring to the handling suggestions in the alarm reference section.

 **NOTE**

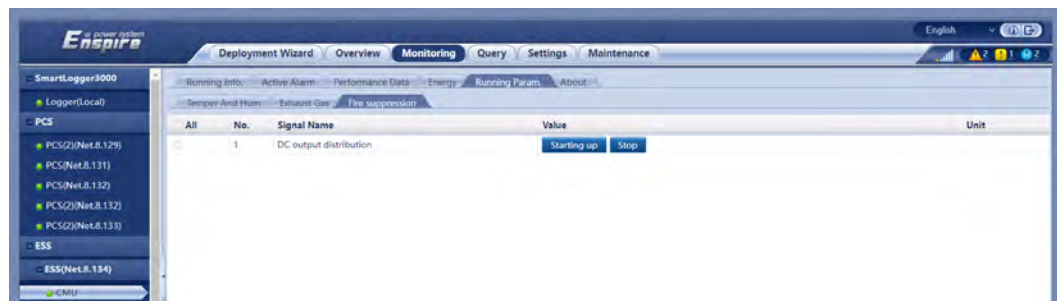
- You are advised to use the SmartLogger WebUI.
- If **Door Status Alarm** is generated, check whether the cabinet door is open. If yes, close the door.
- If **ESU Communication Failure** is generated, check whether communications cables are connected correctly and whether the power supply is normal.

Step 2 Short-circuit the water sensor and check whether a water alarm is generated on the SmartLogger WebUI or CMU WebUI:

- If a water alarm is generated, the water sensor is properly connected. In this case, the water alarm will be cleared after the short circuit is removed.
- If no water alarm is generated, check whether the water sensor cable is connected properly.

After the alarm is cleared, choose **Monitoring > Running Param. > Fire suppression > Starting up** on the SmartLogger WebUI or CMU WebUI.

Figure 10-26 Restoring the power supply



Step 3 Check whether an alarm is generated for the Smart Rack Controller on the SmartLogger WebUI or CMU WebUI. If an alarm is generated, handle the alarm by referring to the handling suggestions in the alarm reference section.

----End

10.8 Setting Capacity Limit

Context

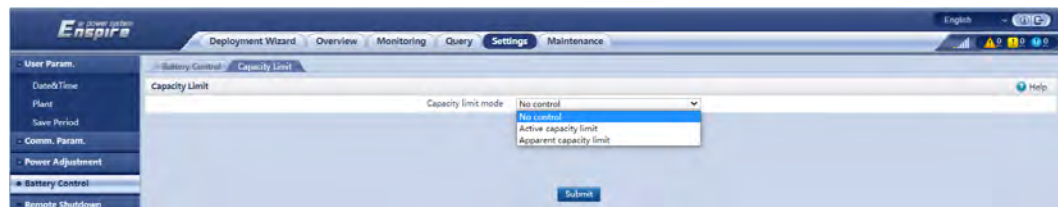
- Peak-valley arbitrage with capacity limit:
When the capacity limit is enabled in **TOU** mode, the charge/discharge time set in the **TOU** window must cover 24 hours of a day. Capacity limitation is not supported in non-charge/discharge time.
- Capacity limit:

- If the capacity limit is met 24 hours a day, the ratio of the ESS/PCS to the load power must be properly set to ensure that the ESS/PCS have sufficient capacity to meet the capacity limit.
- When the ESS is used only for capacity limit, you can set the charge time to 24 hours through the TOU setting. Do not set the discharge time and non-charge/discharge time.
- The overload capability of transformers, power distribution switches, and cables must be greater than the sum of the maximum charge current and maximum load current of the ESS.

Procedure

Step 1 Choose **Settings > Battery Control > Capacity Limit** to set the capacity limit.

Figure 10-27 Setting capacity limit



Parameter	Description
No control	If this parameter is set, the capacity of the grid-connection point is not limited. The inverter and Smart PCS run according to the preset control policy.
Active capacity limit	If this parameter is set, the active power of the grid-connection point for purchasing or feeding power cannot exceed the preset capacity limit.
Apparent capacity limit	If this parameter is set, the apparent power of the grid-connection point for purchasing or feeding power cannot exceed the preset capacity limit.

----End

Active capacity limit

Parameter	Description
Maximum active capacity	Set this parameter according to the charging capacity in the demand contract of the power grid company. Once set, the active power of the grid-connection point for purchasing or feeding power cannot exceed the preset value.

Parameter	Description
PV power limit when electricity meter fails	Specifies the active power limit of the inverter when the feed-in meter communication is abnormal. You can manually change the active power percentage of the inverter as required.
PCS power limit when electricity meter fails	Specifies the active power limit of the PCS when the feed-in meter communication is abnormal. You can manually change the active power percentage of the PCS as required.

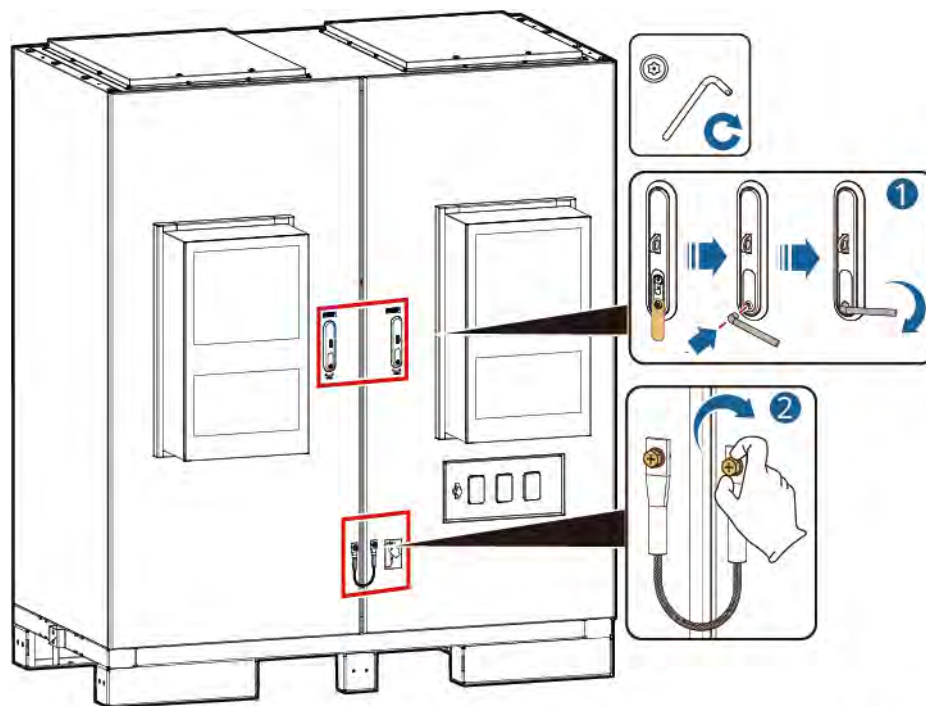
Apparent capacity limit

Parameter	Description
Maximum apparent capacity	Set this parameter according to the charging capacity in the demand contract of the power grid company. Once set, the apparent power of the grid-connection point for purchasing or feeding power cannot exceed the preset value.
PV power limit when electricity meter fails	Specifies the active power limit of the inverter when the feed-in meter communication is abnormal. You can manually change the active power percentage of the inverter as required.
PCS power limit when electricity meter fails	Specifies the active power limit of the PCS when the feed-in meter communication is abnormal. You can manually change the active power percentage of the PCS as required.

11 Closing the Cabinet Door

After the deployment commissioning is complete, close the cabinet door and secure the safety rope.

Figure 11-1 Closing the cabinet door



1803H00043

12 Powering Off the System

12.1 Delivering a Shutdown Command on the SmartLogger

Prerequisites

The system has connected to the grid and is running properly.

Procedure


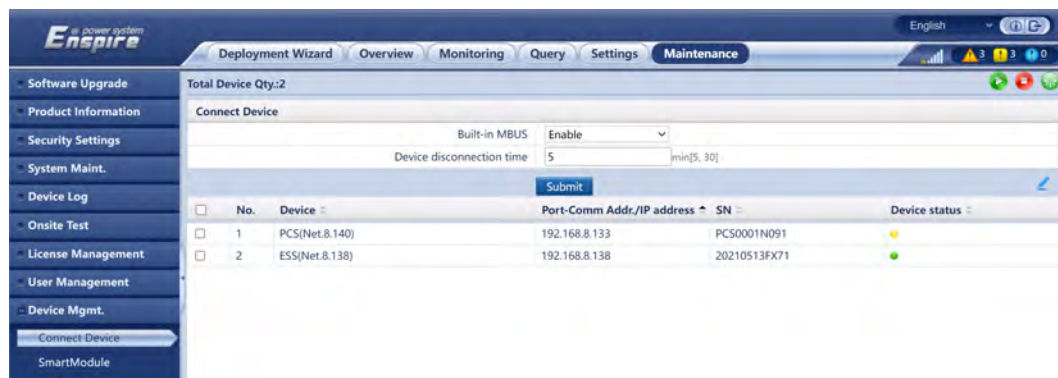
- Step 1** Log in to the SmartLogger WebUI, choose **Maintenance > Connect Device**, and click  to shut down the Smart PCS and Smart Rack Controller.

Figure 12-1 Shutdown command



- Step 2** Choose **Device Monitoring > PCS > Running Info**. Check the device status, active power, and DC voltage to verify that the shutdown is successful.
- Step 3** Choose **Device Monitoring > CMU > Running Info**. Check the rated power and total output voltage of the rectifier to ensure that the shutdown is successful.

Step 4 Choose **Overview > Active Alarms** to view system alarms generated after the shutdown. If any alarm is generated, handle the alarm according to the alarm handling suggestions.

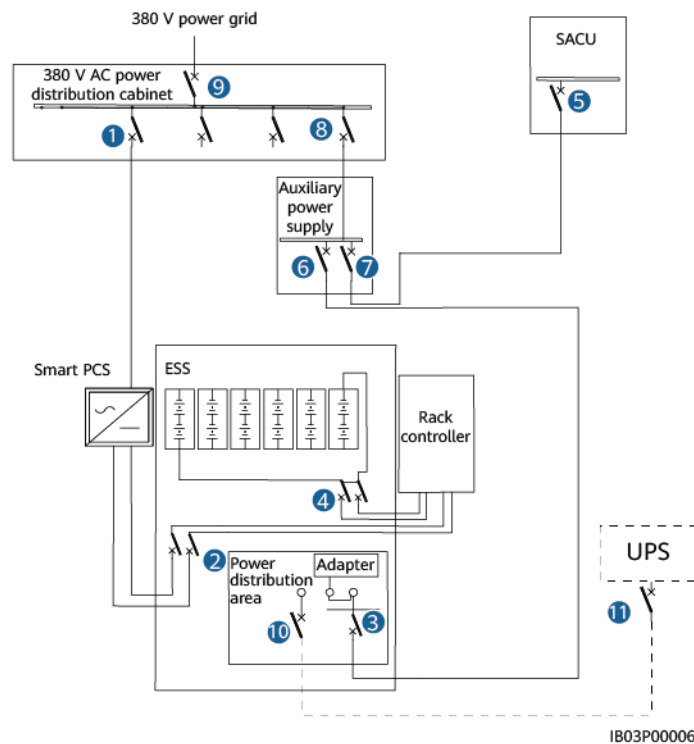
----End

12.2 Power-Off Process

Table 12-1 Power-off procedure

Step	Item		Remarks
1	Powering off the AC side of the Smart PCS	Powering off the battery side of the AC power distribution cabinet	As shown by (1) in Figure 12-2
2	Powering off the ESS	Powering off the output DC circuit breakers	As shown by (2) in Figure 12-2
3		Powering off the auxiliary power supply (turning off the AC switches and then the DC switches)	As shown by (3) in Figure 12-2
4		Powering off the DC circuit breakers of battery racks	As shown by (4) in Figure 12-2
5	Powering off the SACU		As shown by (5) in Figure 12-2
6	Powering off the auxiliary power supply	Powering off the 220 V AC auxiliary power supply	As shown by (6), (7), and (8) in Figure 12-2
7		(Optional) Powering off the UPS	As shown by (10) and (11) in Figure 12-2
8	Powering off the AC power distribution cabinet connected to the grid		As shown by (9) in Figure 12-2

Figure 12-2 Power-off process



12.3 Powering Off ESS Devices

Powering Off the Smart PCS

- Step 1** Wear proper PPE.
- Step 2** Turn off the AC switch between the Smart PCS and the grid.
- Step 3** Open the AC maintenance compartment door, install a support bar, and use a multimeter to measure the voltage between the AC terminal block and the ground. Ensure that the AC side of the Smart PCS is disconnected.
- Step 4** Turn off DC switch 1Q2 in the ESS.
- Step 5** Open the DC maintenance compartment door, install a support bar, and use a multimeter to measure the voltage between the DC terminal blocks. Ensure that the DC side of the Smart PCS is disconnected.

----End

Powering off the ESS

- Step 1** Turn off all switches in the power distribution system of the ESS.
 1. On the embedded power subrack (SK1), turn off the DC/DC switch 2FCB1, DC light power switch 2FCB2, TCUE switch 2FCB3, fan 1 switch 2FCB6, fan 2 switch 2FCB7, air conditioner 1 switch 2FCB8, and air conditioner 2 switch 2FCB9 in sequence.
 2. Turn off switch 1FB1 of the 220 V maintenance socket.

3. Turn off the PSU switch 1FCB2.
4. Turn off the 12 V adapter switch 1FCB1.

Step 2 Turn off the AC main switch 1FCB.

Step 3 (Optional) Turn off the UPS cable inlet switch 5FCB.

Step 4 Turn off the DC switch 1Q1.

----End

12.4 Powering Off the Power Supply Loop of the AC Power Distribution Cabinet

Step 1 Turn off the switches between the AC power distribution cabinet and the ESS.

Step 2 Turn off the switches between the AC power distribution cabinet and the SACU.

----End

13 Alarm Reference

Alarm severities are defined as follows:

- Major alarm: The device disconnects from the grid and stops generating power after a fault occurs.
- Minor: Some components of the device are faulty but the device can still connect to the grid and generate power.
- Warning: The device works properly. The output power decreases or some authorization functions fail due to external factors.

 **NOTE**

[HVAC-No] indicates the number of the air conditioner.

Table 13-1 Alarm List

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3800	Water Alarm	Major	Cause ID = 1 Water is detected in the battery cabin.	1. Check whether there is water in the cabin. If yes, drain the water. 2. Check whether the devices in the cabin are intact and normal. If yes, manually clear the alarm. If not, replace the damaged devices.
			Cause ID = 2 Water is detected in the control unit cabin.	
3801	Door Status Alarm	Major	Cause ID = 1–6 Battery compartment door 1–6 is open. Cause ID = 7 Battery compartment door is open.	1. Check whether the cabin doors are completely closed. If not, close the doors completely. 2. Check whether the cable is disconnected from the door status sensor. If yes, connect the cable correctly. 3. Check whether the door status sensor is displaced. If yes, move it back to the original position.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3802	Fire Alarm	Major	Cause ID = 1 Smoke or overheating is detected in the battery cabin.	<ol style="list-style-type: none"> 1. Remotely monitor the system for 30 minutes to check whether other exceptions (such as abnormal battery voltage, abnormal battery temperature, and abnormal combustible gas concentration) occur. If yes, remotely power off the system. During remote monitoring, do not approach the battery cabin or open the cabin doors. 2. If no exception is found during the remote monitoring, assign trained personnel to the site and observe the system for 30 minutes from a safe distance. If there is smoke or fire, remotely power off the system, evacuate onsite personnel as soon as possible, and call the fire emergency service. 3. If no exception is found during remote monitoring or onsite observation, open the doors of the control unit cabin and check whether the Extinguishant Control Panel generates an alarm. If yes, reset the fire alarm on the Extinguishant Control Panel. If the fire alarm reset fails, contact your technical support. 4. If the fire alarm is reset successfully, manually clear the active alarm remotely. If the alarm clearance fails, close the cabin doors and clear the alarm 20 minutes later. If the alarm persists, contact your technical support.
			Cause ID = 2 A fire has been detected in the battery cabin.	<ol style="list-style-type: none"> 1. Do not open the cabin doors and evacuate onsite personnel. 2. For details, see the "Emergency Handling Plan" section in the maintenance manual. 3. Contact your technical support.
3803	Fire Suppression System Fault	Major	Cause ID = 1 Sensor or controller fault	<ol style="list-style-type: none"> 1. Troubleshoot faults based on the instructions in the fire suppression system user manual. 2. If the fault persists, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3804	AC SPD Fault	Major	Cause ID = 1 The AC SPD is faulty.	<ol style="list-style-type: none"> 1. Check whether the AC SPD signal cable is loose. 2. Check whether the color of the AC SPD indicator changes. 3. Replace the AC SPD.
3805	Air Conditioner Temperature High	Major	Cause ID = 1-13 The return air temperature of [HVAC-No] exceeds the high temperature alarm threshold.	<ol style="list-style-type: none"> 1. If multiple air conditioners report the alarm, shut down the system and contact your technical support. 2. If only one air conditioner reports the alarm, check other alarms reported by the air conditioner and rectify the faults based on the troubleshooting suggestions. If no other alarm is generated, shut down the air conditioner and contact your technical support.
3806	Air Conditioner Temperature Low	Major	Cause ID = 1-13 The return air temperature of [HVAC-No] is below the low temperature alarm threshold.	<ol style="list-style-type: none"> 1. If multiple air conditioners report the alarm, shut down the system and contact your technical support. 2. If only one air conditioner reports the alarm, check other alarms reported by the air conditioner and rectify the faults based on the troubleshooting suggestions. If no other alarm is generated, shut down the air conditioner and contact your technical support.
3807	Air Conditioner Internal Fan Fault	Major	Cause ID = 1-13 <ol style="list-style-type: none"> 1. [HVAC-No] The cable of the fan is loose. 2. The fan is damaged. 	<ol style="list-style-type: none"> 1. Shut down the system at a proper time. 2. Power off the air conditioner, open the enclosure, and check whether the fan cable is loose. If yes, securely connect the cable. Check whether the fan is damaged or burnt. If yes, contact your technical support.
3808	Air Conditioner External Fan Fault	Major	Cause ID = 1-13 <ol style="list-style-type: none"> 1. [HVAC-No] The cable of the fan is loose. 2. The fan is damaged. 	<ol style="list-style-type: none"> 1. Shut down the system at a proper time. 2. Power off the air conditioner, open the enclosure, and check whether the fan cable is loose. If yes, securely connect the cable. Check whether the fan is damaged or burnt. If yes, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3809	Air Conditioner Compressor Fault	Major	Cause ID = 1-13 1. [HVAC-No] The cable of the compressor is loose. 2. The compressor is damaged.	1. Shut down the system at a proper time and take security protection measures. 2. Power off the air conditioner, open the enclosure, and check whether the compressor cable is loose. If yes, securely connect the cable. Check whether the compressor is damaged or burnt. If yes, contact your technical support.
3810	Air Conditioner Return Air Temperature Sensor Fault	Major	Cause ID = 1-13 1. [HVAC-No] The cable of the return air temperature sensor is loose. 2. The sensor is damaged, open-circuited, or short-circuited.	1. Shut down the system at a proper time and take security protection measures. 2. Check whether any cable is loose. 3. Replace the return air temperature sensor.
3811	Air Conditioner Supply Air Temperature Sensor Fault	Major	Cause ID = 1-13 1. [HVAC-No] The cable of the supply air temperature sensor is loose. 2. The sensor is damaged, open-circuited, or short-circuited.	1. Shut down the system at a proper time and take security protection measures. 2. Check whether any cable is loose. 3. Replace the supply air temperature sensor.
3812	Air Conditioner System High Pressure Alarm	Major	Cause ID = 1-13 1. [HVAC-No] The outdoor heat exchanger is blocked or has scale. 2. The outdoor fan is faulty. 3. The air intake or exhaust vent of the outdoor fan is blocked.	1. Check whether the outdoor heat exchanger is blocked by dirt. If yes, clean it using a high-pressure water gun. 2. Check whether the outdoor fan is running properly. If not, replace it. 3. Check whether the air intake or exhaust vent of the outdoor fan is blocked. If yes, clean the air intake or exhaust vent. 4. If the fault persists, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3813	Air Conditioner AC Overvoltage	Major	Cause ID = 1-13 1. The auxiliary power cable is incorrectly connected. 2. [HVAC-No] The main control board is faulty. 3. The overvoltage alarm threshold is improper.	1. Measure the voltage of the air conditioner wiring terminal. If the voltage is approximately 380 V, the auxiliary power cable is incorrectly connected. Disconnect the auxiliary power supply and reconnect the cable correctly. 2. If the voltage is approximately 220 V, contact your technical support.
3814	Air Conditioner AC Undervoltage	Major	Cause ID = 1-13 1. [HVAC-No] The power cable is loose. 2. The model of auxiliary power supply is incorrect. 3. The main control board is faulty. 4. The undervoltage alarm threshold is improper.	1. Measure the voltage of the air conditioner wiring terminal. If the voltage is approximately 110 V or 127 V, the auxiliary power supply does not meet the requirements. Disconnect the auxiliary power supply immediately and replace it with a 380 V power supply. 2. If the voltage is lower than 150 V, check whether the cable is loose. 3. If the voltage is approximately 220 V, contact your technical support.
3816	Air Conditioner Evaporator Temperature Sensor Fault	Minor	Cause ID = 1-13 1. [HVAC-No] The cable of the evaporator temperature sensor is loose. 2. The sensor is damaged, open-circuited, or short-circuited.	1. Shut down the system at a proper time and take security protection measures. 2. Check whether any cable is loose. 3. Replace the evaporator temperature sensor.
3817	Air Conditioner Condenser Temperature Sensor Fault	Minor	Cause ID = 1-13 1. [HVAC-No] The cable is not connected securely or correctly. 2. The sensor is damaged, open-circuited, or short-circuited.	1. Shut down the system at a proper time and take security protection measures. 2. Check whether any cable is loose. 3. Replace the condenser temperature sensor.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3818	Air Conditioner Ambient Temperature Sensor Fault	Minor	Cause ID = 1-13 1. [HVAC-No] The cable is not connected securely or correctly. 2. The sensor is damaged, open-circuited, or short-circuited.	1. Shut down the system at a proper time and take security protection measures. 2. Check whether any cable is loose. 3. Replace the ambient temperature sensor.
3819	Air Conditioner Evaporator Frozen	Minor	Cause ID = 1-13 1. [HVAC-No] The air intake or exhaust of the cabinet is blocked. 2. The indoor fan is faulty. 3. The cooling system cannot be shut down in a timely manner. 4. The evaporator temperature sensor is faulty.	1. Check whether the air intake or exhaust vent is blocked. If yes, clean it. 2. If the fault persists, contact your technical support.
3820	Frequent Air Conditioner System High Pressure Alarm	Major	Cause ID = 1-13 1. [HVAC-No] The condenser is blocked or has scale. 2. The condenser fan is faulty. 3. The external air flow is short-circuited or blocked.	1. Check whether the outdoor heat exchanger is blocked by dirt. If yes, clean it using a high-pressure water gun. 2. Check whether the outdoor fan is running properly. If not, replace it. 3. Check whether the air intake or exhaust vent of the outdoor fan is blocked. If yes, clean the air intake or exhaust vent. 4. If the fault persists, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3821	Air Conditioner DC Overvoltage	Major	Cause ID = 1-13 1. [HVAC-No] The input voltage is higher than the overvoltage threshold. 2. The overvoltage threshold setting is improper. 3. The voltage test device is faulty.	Measure the voltage of the air conditioner power supply, record it, and contact your technical support.
3822	Air Conditioner DC Undervoltage	Major	Cause ID = 1-13 1. [HVAC-No] The input voltage is lower than the undervoltage threshold. 2. The undervoltage threshold setting is improper. 3. The voltage test device is faulty.	Measure the voltage of the air conditioner power supply, record it, and contact your technical support.
3825	UPS Alarm	Major	Cause ID = 1 A UPS alarm has been generated.	Troubleshoot the fault by referring to the alarm troubleshooting section in the UPS user manual.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3826	Combustible Gas Alarm	Major	<p>Cause ID = 1</p> <ol style="list-style-type: none"> 1. The safety valve of the lithium battery is open, and combustible gas is leaked. 2. Lithium battery thermal runaway occurs. 	<ol style="list-style-type: none"> 1. Monitor the ESS remotely for 30 minutes to check whether other exceptions (such as abnormal ambient temperature, battery voltage, battery temperature, and exhaust fan startup) occur. If yes, shut down the ESS. During remote monitoring, do not approach the battery cabin or open the cabin door. 2. If no exception is found during the remote monitoring, send trained personnel to the site and observe the system for 30 minutes from a safe distance. If there is smoke or fire, remotely power off the system, evacuate the onsite personnel as soon as possible, and call the fire emergency number. 3. If no exception is found during remote monitoring and onsite observation, manually clear the alarm. If the alarm clearance fails, contact your technical support.
3827	Ambient Temperature High	Major	<p>Cause ID = 1</p> <p>The ambient temperature in the battery cabin is too high.</p>	<ol style="list-style-type: none"> 1. Check whether the air conditioners in the battery cabin are faulty. 2. Check whether the doors of the battery cabin are completely closed.
3828	Condensation Risk	Minor	<p>Cause ID = 1</p> <p>Condensation risk exists in the battery cabin.</p>	<ol style="list-style-type: none"> 1. This alarm indicates that the cabin needs to be dehumidified. Ensure that the cooling mode is set to automatic. 2. If the alarm persists for more than 30 minutes, check whether the air conditioner in the battery cabin is faulty or the cabin doors are completely closed.
3829	Temperature and Humidity Sensor Malfunction	Minor	<p>Cause ID = 1</p> <p>There are too many faulty temperature and humidity sensors in the battery cabin.</p>	<ol style="list-style-type: none"> 1. Repair the temperature and humidity sensor based on the alarm. 2. On the maintenance screen, check that the temperature and humidity sensor is correctly connected.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3830	Temperature and Humidity Control Malfunction	Major	Cause ID = 1 There are too many faulty air conditioners in the battery cabin.	<ol style="list-style-type: none">1. Troubleshoot the fault based on the corresponding troubleshooting suggestions.2. On the maintenance screen, check that the air conditioner is correctly connected.
3831	The pressure of the fire suppression module is insufficient.	Minor	Cause ID = 1 The pressure of the fire suppression module is insufficient.	Check the fire suppression module and the pressure gauge, and replace the fire suppression module as soon as possible. Otherwise, the system will shut down automatically in three days.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3832	Fire Alarm	Major	<p>Cause ID = 1 Smoke or overheating is detected in the battery cabin.</p> <p>Cause ID = 2 A fire has been detected in the battery cabin.</p>	<p>Cause ID = 1</p> <ol style="list-style-type: none"> 1. Monitor the ESS remotely for 30 minutes to check whether other exceptions (such as abnormal battery voltage, battery temperature, and combustible gas concentration) occur. If yes, shut down the ESS remotely. During remote monitoring, do not approach the battery cabin or open the cabin door. 2. If no exception is found during the remote monitoring, send trained personnel to the site and observe the system for 30 minutes from a safe distance. If there is smoke or fire, remotely power off the system, evacuate the onsite personnel as soon as possible, and call the fire emergency number. 3. If no exception is found during remote monitoring and onsite observation, manually clear the alarm remotely. If the alarm clearance fails, close the cabin doors and clear the alarm 20 minutes later. If the alarm persists, contact your technical support. <p>Cause ID = 2</p> <ol style="list-style-type: none"> 1. Do not open the cabin doors and evacuate onsite personnel. 2. For details, see Emergency Handling Plan in the maintenance manual. 3. Contact your technical support.
3833	Rectifier Fault	Major	<p>Cause ID = 1-6 The rectifier hardware is faulty.</p>	<ol style="list-style-type: none"> 1. Replace rectifier [Number]. 2. If the fault persists after the replacement, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3834	Rectifier Protection	Major	Cause ID = 1-6 1. The AC voltage is abnormal. 2. The ambient temperature is too high.	1. Check whether the AC input voltage is greater than 300 V. If yes, check the power supply. 2. Check whether the air vent of the faulty rectifier [Number] is blocked. If yes, clean the air vent. Check whether there is a heat source near the air vent. If yes, remove the heat source. Check whether the heat dissipation fan is damaged. If yes, replace the rectifier. 3. If the fault persists, contact your technical support.
3835	Rectifier Communication Failure	Major	Cause ID = 1-6 1. The rectifier has been removed. 2. The rectifier is faulty and not working.	1. Turn off the AC input switch of the PSU. 2. Remove the rectifier [Number] and insert it again. 3. If the fault persists, replace the rectifier [Number] or monitoring module. 4. If the fault persists after the replacement, contact your technical support.
3836	Rectifier Power Failure	Major	Cause ID = 1-6 The AC loop is disconnected.	1. Check whether the AC input voltage is less than 80 V. If yes, check the power supply. If not, replace the faulty rectifier [Number]. 2. If the fault persists after the replacement, contact your technical support.
3837	Rectifier Output Overvoltage	Major	Cause ID = 1-6 The PSU locks out due to output overvoltage.	1. Turn off the AC input switch of the PSU. 2. Remove the rectifier [Number] and insert it again. 3. If the fault persists, replace the rectifier [Number] or monitoring module. 4. If the fault persists after the replacement, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3838	T/H Sensor Communication Failure	Minor	Cause ID = 1 T/H sensor-1 communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, connect the cable correctly. 2. Check whether the power supply of the device is normal. If not, contact your technical support.
3839	Air Conditioner Communication Failure	Minor	Cause ID = 1 HVAC-1 communication failed. Cause ID = 2 HVAC-2 communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, reconnect the cable properly. 2. Check whether the power cable of the device is loose. If yes, connect it securely. 3. If the fault persists, contact your technical support.
3840	CO Sensor Communication Failure	Minor	Cause ID = 1 CO sensor-1 communication failed. Cause ID = 2 CO sensor-2 communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, connect the cable correctly. 2. Check whether the power supply of the device is normal. If not, contact your technical support.
3841	H ₂ Sensor Communication Failure	Minor	Cause ID = 1 H ₂ sensor-1 communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, connect the cable correctly. 2. Check whether the power supply of the device is normal. If not, contact your technical support.
3842	ESC Communication Failure	Minor	Cause ID = 1 ESC-1 communication fails.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, reconnect the cable properly. 2. Check whether the power cable of the device is loose. If yes, connect it securely. 3. If the fault persists, contact your technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3843	TCU Communication Failure	Minor	Cause ID = 1 TCU-1 communication failed.	<ol style="list-style-type: none"> 1. Turn off the TCU power switch. 2. Check whether the communication cable is correctly connected to the device. If not, connect the cable correctly. 3. Check whether the power supply of the device is normal. If not, contact your technical support.
3844	SMU Communication Failure	Minor	Cause ID = 1 SMU communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, reconnect the cable properly. 2. Check whether the power cable of the device is loose. If yes, connect it securely. 3. If the fault persists, contact your technical support.
3845	SmartModule Communication Failure	Minor	Cause ID = 1 SmartModule communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, reconnect the cable properly. 2. Check whether the power cable of the device is loose. If yes, connect it securely. 3. Check whether a certificate expiration alarm is displayed in the alarm list. If yes, contact your technical support. 4. If the fault persists, contact your technical support.
3846	CMU Communication Failure	Minor	Cause ID = 1 CMU communication failed.	<ol style="list-style-type: none"> 1. Check whether the communication cable is correctly connected to the device. If not, reconnect the cable properly. 2. Check whether the power cable of the device is loose. If yes, connect it securely. 3. If the fault persists, contact your technical support.


Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3847	Fire Suppression Module Pressure Insufficient	Major	Cause ID = 1 The gas pressure of the fire suppression module is insufficient for more than three days.	Check the fire suppression module and the pressure gauge, and replace the fire suppression module.
3048	T/H Control Mode: Manual	Minor	Cause ID = 1 The temperature and humidity control mode is set to manual.	After the commissioning is complete, set the temperature and humidity control mode to automatic.
3849	Air Exhaust Malfunction	Major	Cause ID = 1 There are too many faulty exhaust fans. Cause ID = 2 There are too many faulty TCUs.	Cause ID = 1 Repair the exhaust fan based on the fault alarm. Cause ID = 2 1. Repair the TCU based on the fault alarm. 2. On the maintenance screen, check that the TCU is correctly connected.
3850	Combustible Gas Detection Malfunction	Major	Cause ID = 1 There are too many faulty combustible gas sensors.	1. Repair the combustible gas sensor based on the fault alarm. 2. On the maintenance screen, check that the combustible gas sensor is correctly connected.
3851	Exhaust Fan Fault	Minor	Cause ID = 1 Exhaust fan-1 is faulty. Cause ID = 2 Exhaust fan-2 is faulty.	1. Check whether the cable is loose. If yes, connect the cable securely. Check whether the fan is damaged or burnt. If yes, replace the fan. 2. Check whether the TCU connected to the exhaust fan works properly. 3. If the fault persists, contact your technical support.
3852	Ambient Temperature Low	Major	Cause ID = 1 The ambient temperature in the battery cabin is too low.	1. Check whether the air conditioners in the battery cabin are faulty. 2. Check whether the doors of the battery cabin are completely closed.


Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
3853	ESC Physical Location Failure	Minor	Cause ID = 1 ESC physical location failed.	<ol style="list-style-type: none"> 1. Check whether the network cables between ESCs are connected properly. 2. Check whether the network cables between the first and last ESCs and the CMU are connected properly. 3. Check whether the RS485 cable between ESC-1 and the CMU is connected properly.
3856	Battery Fault Protection	Major	Cause ID = 1 Some battery packs are severely faulty, causing the system to shut down. Cause ID = 2 The temperature of some battery packs is too low. As a result, charge capacity is not reached due to low temperature protection.	Maintain the battery pack based on the alarm and troubleshooting suggestions.
3857	Memory Abnormal	Minor	Cause ID = 1 <ol style="list-style-type: none"> 1. The storage space is insufficient. 2. The memory is faulty. 	Contact your technical support.


 **NOTE**

If ALM-3833 Rectifier Fault, ALM-3834 Rectifier Protection, ALM-3835 Rectifier Communication Failure, ALM-3836 Rectifier Power Failure, or ALM-3837 Rectifier Output Overvoltage is generated, rectify the fault by referring to the following table.

Table 13-2 PSU indicator status and troubleshooting

Indicator	Color	Status	Description	Suggestion
Power indicator 	Green	Steady on	The PSU has an AC input.	Normal.

Indicator	Color	Status	Description	Suggestion
		Off	The PSU has no AC input.	Check whether the input is normal. If yes, replace the PSU.
			The PSU is damaged.	Replace the PSU.
		Blinking at 0.5 Hz	Querying is in progress.	Normal.
		Blinking at 4 Hz	The PSU is loading the application program.	The PSU automatically recovers after the loading is finished, and no action is required.
Alarm indicator 	Yellow	Off	The PSU does not generate any protection alarm.	Normal.
		Steady on	<ul style="list-style-type: none"> A warning is generated due to ambient overtemperature. A shutdown protection alarm is generated due to ambient overtemperature or undertemperature. 	Check that the air vent is not blocked and the ambient temperature is within the normal range.
			AC input overvoltage or undervoltage protection is triggered.	Check the power grid voltage.

Indicator	Color	Status	Description	Suggestion
			The PSU is hibernating.	Normal.
		Blinking at 0.5 Hz	The communication between the PSU and the monitoring module is interrupted.	Replace the PSU or monitoring module.
Fault indicator 	Red	Off	The PSU is normal.	Normal.
		Steady on	The PSU locks out due to output overvoltage or it is not properly inserted.	Remove the PSU and then insert it 1 minute later.
			The PSU has no output due to an internal fault.	Replace the PSU.

 **NOTE**

- The ESC-No ID is the same as that displayed on the app. The ID is 1 on the left and 2 on the right. A maximum of two ESC-No IDs are supported.
- The ESR-CabinetNo ID is the same as that displayed on the app. The ID is 1 on the left and 2 on the right. A maximum of two ESR-CabinetNo IDs are supported.
- ESM-SlotNo indicates the slot number of the battery pack.

Table 13-3 ESC/BCU common alarms and troubleshooting measures

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3013	Battery Pack Communication of Rack Controller Abnormal	Major	Cause ID = 1 The rack controller failed to communicate with the battery pack.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the communication cable to battery [ESR-CabinetNo ESM-SlotNo] is correct. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
3014	Rack Controller Abnormal	Major	Cause ID = 1-34 A major fault has occurred on the internal circuit of the rack controller.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a hibernation command to the ESR corresponding to the ESC, and turn off the switch on the battery side and the switch on the bus side in sequence, and wait for 5 minutes. 3. Turn on the switch on the battery side and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.
3015	Battery Side Overvoltage on Rack Controller	Major	Cause ID: 1-3 The battery side voltage exceeds the maximum operating voltage of the power module.	<ol style="list-style-type: none"> 1. Check whether a battery pack overvoltage alarm is generated in the rack. If yes, clear the alarm by referring to the alarm handling suggestions. 2. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3016	Battery Side Undervoltage on Rack Controller	Major	Cause ID = 1-3 The batteries are abnormal or not securely connected.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers associated with [ESC-No] and the AC input power switch of the PSU. 2. Issue a hibernation command to all ESRs. 3. Check whether the switch on the battery side is turned on. If not, turn on the switch and issue a running command. 4. If the switch on the battery side is ON, turn off the switch, the switch on the bus side, and the AC input power switch of the PSU. Then wait for 5 minutes. 5. Check the cable connections on the battery side of the power control module by referring to the maintenance manual of the product. 6. After checking that the battery power cable is correctly connected, turn on the AC input power switch of the PSU, the switch on the battery side, and the switch on the bus side in sequence, and issue a running command. 7. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3017	Battery Side Short Circuit on Rack Controller	Major	Cause ID = 1-3 The battery cable is incorrectly connected.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check for voltage at both ends of the battery switch. If no voltage is detected, check whether the cable is short-circuited or grounded. 4. Check the cable connections on the battery side of the power control module by referring to the maintenance manual of the product. 5. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 6. If the alarm persists, contact your dealer or technical support.
3018	Battery Side Reverse Polarity on Rack Controller	Major	Cause ID = 1-3 Battery cables are connected in reverse polarity.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check whether the copper bars and cables on the battery side of the power control module are connected in reverse polarity by referring to the product maintenance manual. 4. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3019	Bus Side Overvoltage on Rack Controller	Major	Cause ID = 1-3 The bus cable is not correctly connected, or the bus voltage exceeds the maximum operating voltage of the power module.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check the cable connections on the bus side of the power control module by referring to the maintenance manual of the product. 4. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
3020	Bus Side Reverse Polarity on Rack Controller	Major	Cause ID = 1-3 The bus is connected in reverse polarity.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check whether the cable between the copper bar on the bus side of the power control module and the DC LV Panel is connected in reverse polarity by referring to the product maintenance manual. 4. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3021	Insulation Resistance of Rack Controller Abnormal	Major	<p>Cause ID = 1-3</p> <ol style="list-style-type: none"> 1. The battery is short-circuited to the ground. 2. The battery is in a humid environment and the insulation between the battery and ground is poor. 	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a hibernation command to the ESR corresponding to the ESC, and turn off the switch on the battery side and the switch on the bus side in sequence, and wait for 5 minutes. 3. Check the ground impedance of the battery output (measured on both the battery side and the bus side). If a short circuit occurs or the insulation is insufficient, rectify the fault. 4. Check whether the PE cable of the system is correctly connected. 5. If the impedance is lower than the specified protection threshold in rainy and cloudy days, set Insulation resistance protection threshold using the mobile app, SmartLogger, or NMS. 6. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and the switch on the bus side in sequence, and issue a running command. 7. If the alarm persists, contact your dealer or technical support.
3022	Rack Controller Temperature High	Minor	<p>Cause ID = 1-9</p> <ol style="list-style-type: none"> 1. The installation position of the battery power control module is not well ventilated. 2. The ambient temperature is too high. 3. The battery power control module is abnormal. 4. The fan of the battery power control module is abnormal. 	<ol style="list-style-type: none"> 1. Check the ventilation of [ESC-No] and whether the ambient temperature of the optimizer exceeds the upper threshold. 2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 3. Check whether the internal or external fan of the rack controller is faulty. 4. If the ventilation and ambient temperature meet requirements, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3023	Battery Terminal Overtemperature on Rack Controller	Major	Cause ID = 1-3 The battery terminal is not securely connected.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check whether the torque of the bolts on the battery side of the power control module meets the requirements by referring to the DCDC replacement section in the maintenance manual of the product. 4. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3024	Bus Terminal Overtemperature on Rack Controller	Major	Cause ID = 1-3 The bus terminal is not securely connected.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers associated with [ESC-No] and the AC input power switch of the PSU. 2. Issue a hibernation command to all ESRs, and turn off the switch on the battery side, the switch on the bus side, and the AC input power switch of the PSU. Then wait for 5 minutes. 3. Check whether the torque of the bolts on the bus side of the power control module meets the requirements by referring to the DCDC replacement section in the maintenance manual of the product. 4. After checking that the battery power cable is correctly connected, turn on the AC input power switch of the PSU, the switch on the battery side, and the switch on the bus side in sequence, and issue a running command. 5. If the alarm persists, contact your dealer or technical support.
3025	Rack Controller Version Mismatch	Minor	Cause ID = 1, 2 The update failed.	<ol style="list-style-type: none"> 1. Version mismatch on [ESC-No]. Please update. 2. If the update fails multiple times, contact your dealer or technical support.
3026	Internal Fan of Rack Controller Fault	Warning	Cause ID = 1, 2 The internal fan is short-circuited, the power supply is insufficient, or the fan is damaged.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Turn on the switch on the battery side and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3033	Communication Failure on Power Control Unit of Rack Controller	Major	Cause ID = 1 The internal communication of the rack controller has failed.	<ol style="list-style-type: none">1. Locate the input and output circuit breakers associated with [ESC-No].2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes.3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command.4. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3034	Rack Controller Cable Connection Abnormal	Major	<p>Cause ID = 1</p> <p>The cable connection between the battery rack and the corresponding power module is incorrect.</p>	<p>If the system is in the array topology identification process, wait until the process is complete or exit the process.</p> <ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the cable connection between battery rack and power module under [ESR-CabinetNo] is correct by referring to the DCDC replacement section in the maintenance manual of the product. 4. Check whether the auxiliary power supply of battery rack [ESR-CabinetNo] is normal and whether the auxiliary power supply switch is turned on by referring to the product maintenance manual. 5. Check that the power cable is securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 6. If the alarm persists, contact your dealer or technical support.
			<p>Cause ID = 2</p> <p>The power-on self-test was terminated due to a system exception.</p>	<ol style="list-style-type: none"> 1. Check other active alarms of the device and rectify the faults based on the alarm handling suggestions. 2. If the alarm persists after the system is reset, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3035	Battery Pack Positions of Rack Controller Abnormal	Major	Cause ID = 1 1. The actual number of battery packs is different from the configured value. 2. The system has not identified the battery pack address. 3. The battery pack has been replaced and the new address has not been identified. 4. Cables of the battery packs are not properly connected.	1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the communications cable between battery packs under [ESR-CabinetNo] are correctly connected and whether the configured number of battery packs matches the actual number by referring to the product maintenance manual. 4. After checking that the battery power cable is correctly connected, turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3040	Incorrect Bus Connection on Rack Controller	Major	Cause ID = 1 The output buses are not connected in parallel in the 1C scenario.	If the system is in the array topology identification process, wait until the process is complete or exit the process. <ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check whether the cable connection to the bus side of the power control module meets the 1C requirement by referring to the quick installation guide. 4. After checking that the battery power cable is correctly connected, turn on the switch on the battery side and then the switch on the bus side, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3042	Rapid Shutdown Cable Connection of Battery Pack Abnormal	Major	Cause ID = 1 The rapid shutdown cabling between battery racks is incorrect.	<p>If the system is in the array topology identification process, wait until the process is complete or exit the process.</p> <ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the rapid shutdown cables between battery racks under [ESR-CabinetNo] are correctly connected by referring to the DCDC replacement section in the maintenance manual of the product. 4. Check that the cables are securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
			Cause ID = 2 The rapid shutdown cabling in the battery rack is incorrect.	If the system is in the array topology identification process, wait until the process is complete or exit the process. 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the rapid shutdown cables in the battery racks under [ESR-CabinetNo] are correctly connected by referring to the product maintenance manual. 4. Check that the power cable is securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
			Cause ID = 3 The power-on self-test was terminated due to a system exception.	1. Check other active alarms of the device and rectify the faults based on the alarm handling suggestions. 2. If the alarm persists after the system is reset, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3052	External DC Auxiliary Power Supply of Rack Controller Fault	Major	Cause ID = 1 1. The DC circuit breaker is OFF. 2. The PSU is faulty.	1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the PSU in the power distribution cabin reports a fault alarm. 4. Check whether the DC circuit breaker is ON. 5. After checking that the PSU is normal, turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence. 6. If the alarm persists, contact your dealer or technical support.
3053	External Fan of Rack Controller Fault	Warning	Cause ID = 1-3 The external fan is short-circuited or damaged, the power supply is insufficient, or the air channel is blocked.	1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Check whether the fan blades are damaged. If yes, clear the foreign matter around the fan, and install a new fan. 4. Turn on the switch on the battery side and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3054	Rack Controller Temperature Abnormal	Warning	Cause ID = 1, 2 The NTC is short-circuited, open-circuited, or not securely connected.	<ol style="list-style-type: none"> 1. Locate the input and output circuit breakers associated with [ESC-No]. 2. Issue a shutdown command, turn off the switch on the battery side and then the switch on the bus side, and wait for 5 minutes. 3. Turn on the switch on the battery side and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.
3056	Emergency Power-Off	Major	Cause ID = 1 The emergency power-off (EPO) button is pressed down.	<ol style="list-style-type: none"> 1. Troubleshoot system faults. 2. After the faults are rectified, pull up the EPO button. 3. Reset all battery racks in sequence.
3057	Version Inconsistent Between Rack Controller and Battery Packs	Warning	Cause ID = 1 <ol style="list-style-type: none"> 1. The versions of the rack controller and battery packs are inconsistent. 2. The update failed. 3. The battery packs have been replaced. 	<ol style="list-style-type: none"> 1. The version of [ESC-No] is inconsistent with that of the battery packs. Although this does not affect the normal running of the system, you are advised to update the entire ESU. 2. If the update failed multiple times, contact your dealer or technical support.
3058	Version Incompatible Between Rack Controller and Battery Packs	Major	Cause ID = 1 <ol style="list-style-type: none"> 1. The versions of the rack controller and battery packs are inconsistent. 2. The update failed. 3. The battery packs have been replaced. 	<ol style="list-style-type: none"> 1. The version of [ESC-No] is incompatible with that of the battery packs. Consequently, the functions are limited, affecting the normal running of the system. Please update the entire ESU. 2. If the update failed multiple times, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3059	Communication Interruption Between the Rack Controller and PCS	Major	<p>Cause ID = 1</p> <ol style="list-style-type: none"> 1. The communications cable between the CMU and SmartLogger is abnormal. 2. The communications cable between the PCS and SmartLogger is abnormal. 	<ol style="list-style-type: none"> 1. Check whether the CMU status indicator on the WebUI indicates that the CMU is offline. If yes, check whether the communications link between the CMU and the SmartLogger is normal. 2. Check whether the PCS status indicator on the WebUI indicates that the PCS is offline. If yes, check whether the power supply to the PCS is normal. If the power supply is normal, issue a shutdown command to the PCS, turn off the circuit breaker on the AC side, and check whether the communication link between the PCS and the SmartLogger is normal. <p>If the link is normal:</p> <ol style="list-style-type: none"> a. Determine the positions of the input and output circuit breakers associated with [ESC-No] and the AC input power switch of the PSU. b. Issue a hibernation command to all ESRs, and turn off the switch on the battery side, the switch on the bus side, and the AC input power switch of the PSU. Then wait for 5 minutes. c. Turn on the AC input power switch of the PSU, the switch on the battery side, and the switch on the bus side in sequence, and issue a running command. d. If the alarm persists, contact your dealer or technical support.
3060	Incompatible ESM	Major	<p>Cause ID = 1</p> <p>The replacement ESM is incompatible with the system.</p>	<ol style="list-style-type: none"> 1. The model of [ESR-CabinetNo ESM-SlotNo] is incompatible with the system. Replace it with an ESM of the original model. 2. If the alarm persists, contact your dealer or technical support.

Table 13-4 BMU common alarms and troubleshooting measures

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3027	Battery Pack Monitoring Board Abnormal	Major	Cause ID = 1–20 A major fault has occurred on the internal circuit of the battery pack monitoring device.	<ol style="list-style-type: none"> 1. The 3027-1 alarm (cell voltage sampling fault) does not affect the running of other battery packs. 2. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 3. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
		Major	Cause ID = 21 The BMU is incompatible with the battery pack.	The BMU is incompatible. Contact your technical support to deliver a replacement of the original model.
3028	Battery Pack Abnormal	Major	Cause ID = 1–8 A major fault has occurred on the battery pack.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch. 3. Contact your dealer or technical support to replace the battery pack.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3029	Battery Pack Locked	Major	Cause ID = 1, 2 The battery pack has triggered the same fault for multiple times.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 24 hours. 3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.
			Cause ID = 3-5 The battery pack has triggered the same fault for multiple times.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3030	Battery Module Fan Fault	Major	Cause ID = 1 1. The fan is short-circuited. 2. The power supply is insufficient. 3. The fan is damaged. 4. The fan is stuck.	1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Replace the fan if it is damaged, clear the foreign matter if there are any, and rectify power supply failure if any. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
3031	Battery Pack Temperature Imbalance	Minor	Cause ID = 1 Temperature imbalance occurs between cells in the battery pack.	1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether an air conditioner or battery pack fan has generated a fault alarm. Rectify the fault based on the alarm handling suggestions. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3032	Battery Pack Overvoltage	Major	Cause ID = 1, 2 The voltage of the battery pack or its cell is too high.	<ol style="list-style-type: none"> 1. The 3032-1 alarm (battery pack overvoltage protection) does not affect the running of other battery packs. 2. Check the alarm module associated with the corresponding ESC. 3. Issue a shutdown command and wait for 5 minutes. 4. If the alarm is cleared, issue a startup command. If the alarm persists for 20 minutes, contact your dealer or technical support.
3036	Optimization Unit of Battery Pack Abnormal	Major	Cause ID = 1-4 A major fault has occurred on the internal circuit of the optimization unit in the battery pack.	<ol style="list-style-type: none"> 1. Determine the position of [ESR-CabinetNo ESM-SlotNo] and the positions of the input and output circuit breakers of the ESC. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3037	Overtemperature on Optimization Unit of Battery Pack	Minor	Cause ID = 1-3 1. The installation position of the battery pack is not well ventilated. 2. The ambient temperature is too high. 3. The battery power control module is abnormal. 4. The optimization unit is abnormal.	1. Determine the position of [ESR-CabinetNo ESM-SlotNo] and the positions of the input and output circuit breakers of the corresponding ESC. 2. Check the ventilation and whether the ambient temperature of the battery exceeds the upper threshold. 3. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 4. If the ventilation and ambient temperature meet requirements, contact your dealer or technical support.
3038	Overtemperature on Optimization Unit Terminal of Battery Pack	Major	Cause ID = 1 The terminal is not securely connected.	1. Determine the position of [ESR-CabinetNo ESM-SlotNo] and the positions of the corresponding input and output circuit breakers. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check the cable connections of the battery pack and optimization unit by referring to the product maintenance manual. 4. Check that the power cable is securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3039	Battery Pack Optimization Unit Version Mismatch	Major	Cause ID = 1, 2 The update failed.	<ol style="list-style-type: none"> 1. The versions of optimization units in [ESR-CabinetNo ESM-SlotNo] do not match. Please update. 2. If the update fails multiple times, contact your dealer or technical support.
3041	Loose Connection of Battery Pack Copper Bar	Major	Cause ID = 1 The copper bar of the battery pack is loosely connected.	<ol style="list-style-type: none"> 1. Determine the position of [ESR-CabinetNo ESM-SlotNo] and the positions of the input and output circuit breakers of the corresponding ESC. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the copper bar connection of battery pack meets the torque requirements by referring to the quick installation guide of the product. 4. Check that the power cable is securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3043	Battery Module SOH Low	Warning	Cause ID = 2 The battery module SOH is too low.	<ol style="list-style-type: none"> 1. Determine the position of [ESR-CabinetNo ESM-SlotNo] and the positions of the input and output circuit breakers of the corresponding ESC. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Replace the battery pack by referring to the product maintenance manual. 4. Check that the power and monitoring cables are securely connected. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
3044	Battery Module Overcurrent	Major	Cause ID = 1 The battery pack has been working beyond the maximum operating current for a long time.	<ol style="list-style-type: none"> 1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3045	Battery Pack Temperature High	Major	Cause ID = 1, 2 1. The installation position of the battery pack is not well ventilated. 2. The air conditioner is not running properly.	1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Check whether the installation position is well ventilated (If not, improve the ventilation and heat dissipation). Check whether the copper bar is securely connected and whether the air conditioner is running properly. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
3046	Battery Pack Temperature Low	Major	Cause ID = 1, 2 The ambient temperature is too low, which triggers charge or discharge protection.	<ol style="list-style-type: none"> 1. The 3046-1 alarm (low temperature protection during battery charge) does not affect the running of other battery packs. 2. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 3. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 4. Check whether the air conditioner is running properly. 5. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 6. If the alarm persists, contact your dealer or technical support.
3047	Battery Pack Undervoltage	Major	Cause ID = 1, 2 <ol style="list-style-type: none"> 1. The voltage of the battery pack or its cell is too low. 2. The battery pack has been stored for a long period of time. 3. The battery pack has been idle for a long time after grid connection. 	<ol style="list-style-type: none"> 1. The 3047-1 (battery pack undervoltage protection) and 3047-2 (cell undervoltage protection) alarms do not affect the running of other battery packs. 2. Connect to the power grid and charge batteries in 48 hours. 3. If the alarm persists after the battery has been charged for one hour, contact your dealer or technical support.

Alarm ID	Alarm Name	Severity	Possible Cause	Suggestion
			Cause ID = 4 1. The voltage of the battery pack or its cell is too low. 2. The battery pack has been stored for a long period of time. 3. The battery pack has been idle for a long time after grid connection.	1. Determine the positions of the input and output circuit breakers of the ESC corresponding to [ESR-CabinetNo ESM-SlotNo]. 2. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 3. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 4. If the alarm persists, contact your dealer or technical support.
3048	ESM Auxiliary Power Supply Fault	Warning	Cause ID = 1 The black start auxiliary power supply relay control is faulty.	1. System running is not affected. 2. Locate the input and output circuit breakers associated with [ESC-No]. 3. Issue a shutdown command, turn off the switch on the battery side, the switch on the bus side, and the AC power supply switch, and wait for 5 minutes. 4. Turn on the AC power supply switch, the switch on the battery side, and the switch on the bus side in sequence, and issue a startup command. 5. If the alarm persists, contact your dealer or technical support.
			Cause ID = 2 The black start button is faulty.	
			Cause ID = 3 The black start auxiliary power supply cannot be powered-off properly.	
			Cause ID = 4 The black start function cannot be enabled.	
			Cause ID = 5 The primary and secondary sources disabling function is faulty.	
3055	Undertemperature on Optimization Unit of Battery Pack	Major	Cause ID = 1 The ambient temperature is excessively low.	1. Check whether the air conditioner is running properly. 2. If the alarm persists, contact your dealer or technical support.

14 Technical Specifications

Single-cabinet rack controller configuration	One rack controller
Single-cabinet battery configuration	12S1P
Single-cabinet battery rated capacity	193.5 kWh
Charge and discharge rate	≤ 0.5C
Intra-cabinet equalization mode	Battery pack-level active equalization
Cabinet dimensions (H x W x D)	2135 mm x 1810 mm x 1200 mm
Cabinet dimensions (including rack controller and Smart PCS, H x W x D)	2135 mm x 2570 mm x 1200 mm
Net weight (including battery packs)	≤ 2950 kg
Net weight (excluding battery packs)	≤ 1070 kg
IP rating	IP55
Operating temperature range	-30°C to +55°C
Storage temperature range	-40°C to +60°C
Operating humidity range	0%–100% (non-condensing)
DC surge protection	Type II
Maximum operating altitude	4000 m
Battery temperature control mode	Industrial air conditioning
Fire extinguishing system	1 U fire suppression module (perfluorohexanone)
Auxiliary power supply	176V AC to 264V AC, ≤ 4.2 kVA

System communications port	Ethernet/Optical fiber
System communications protocol	Modbus TCP
Environmental protection requirements	RoHS6

A Crimping an OT or DT Terminal

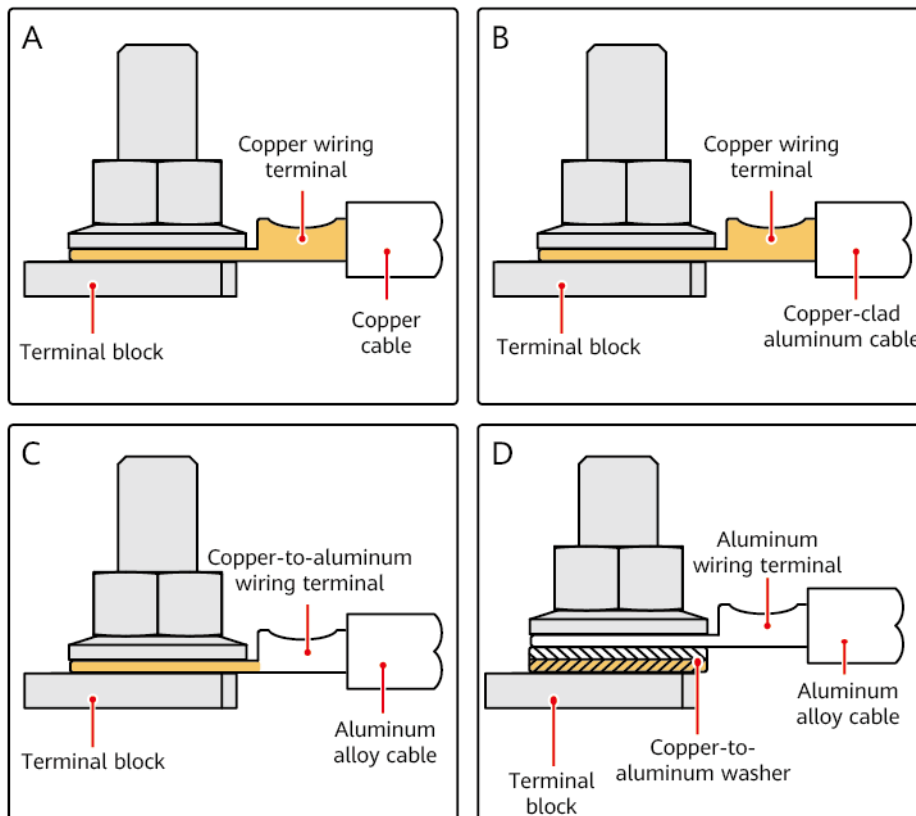
Requirements for OT/DT Terminals

- If a copper cable is used, use copper wiring terminals.
- If a copper-clad aluminum cable is used, use copper wiring terminals.
- If an aluminum alloy cable is used, use copper-to-aluminum wiring terminals, or aluminum wiring terminals with copper-to-aluminum washers.

NOTICE

- Do not connect aluminum wiring terminals to the terminal block. Otherwise electrochemical corrosion may occur, affecting the reliability of cable connections.
 - Comply with the IEC 61238-1 requirements when using copper-to-aluminum wiring terminals, or aluminum wiring terminals with copper-to-aluminum washers.
 - Ensure that the aluminum side of the washer contacts the aluminum wiring terminal, and the copper side contacts the terminal block.
-

Figure A-1 Requirements for OT/DT terminals

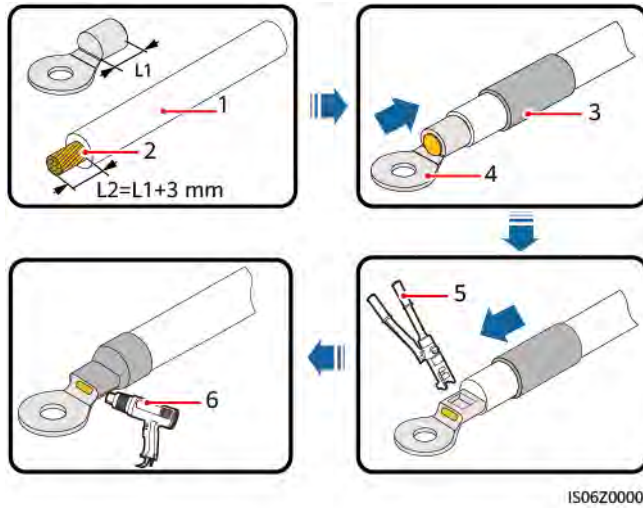


Crimping an OT or DT Terminal

NOTICE

- Avoid damaging the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT or DT terminal has been crimped must wrap around the core wires completely. The core wires must be in close contact with the OT or DT terminal closely.
- Wrap the wire crimping area with heat-shrink tubing or insulation tape. The heat-shrink tubing is used in this section as an example.
- Use a heat gun carefully to avoid heat damage to the equipment.

Figure A-2 Crimping an OT terminal



IS06200001

(1) Cable

(2) Core

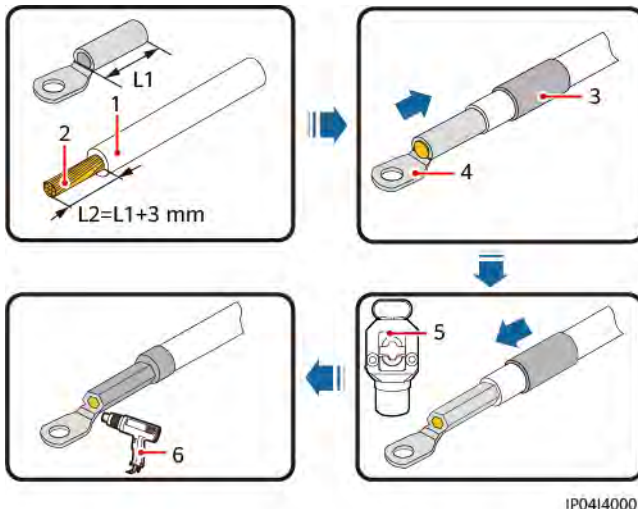
(3) Heat-shrink tubing

(4) OT terminal

(5) Hydraulic pliers

(6) Heat gun

Figure A-3 Crimping a DT terminal



IP04140001

(1) Cable

(2) Core

(3) Heat-shrink tubing

(4) DT terminal

(5) Hydraulic pliers

(6) Heat gun

B Repainting the Equipment

Prerequisites

- Do not repaint the equipment under poor weather conditions, such as rain, snow, strong winds, and sandstorms, when there is no shelter outdoors.
- You have prepared the paint according to the color palette included with the equipment.

Repainting Description

The equipment should be intact. If the paint peels, repaint the area.

 **NOTE**

Check the damaged area and prepare the appropriate tools and materials.

Table A-1 Repainting description

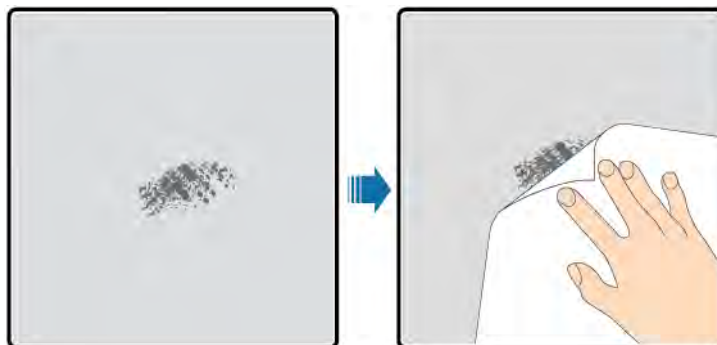
Paint Damage	Tools and Materials	Procedure	Description
Slight scratch (steel base material is intact)	Spray paint or paint, fine sandpaper, anhydrous alcohol, cotton cloth, and brush (required for repainting a small area) or paint gun (required for repainting a large area)	Steps 1, 2, 4, and 5	<ol style="list-style-type: none"> 1. For the color of the finish coat (acrylic acid paint), see the included color palette and the Pantona number. 2. For a few smudges, scratches, or rust, manual paint spraying or brushing is recommended. 3. For many scratches or
Smudges and rust that cannot be removed			

Paint Damage	Tools and Materials	Procedure	Description
Deep scratch (primer damaged, steel base material exposed)	Spray paint or paint, zinc-rich primer, fine sandpaper, anhydrous alcohol, cotton cloth, and brush (required for repainting a small area) or paint gun (required for repainting a large area)	Steps 1, 2, 3, 4, and 5	large-area smudges and rust, use a paint gun to spray paint the area. 4. The paint coating should be thin and even. The surface should be smooth. There must not be any paint drops on the coating.
Logo and pattern damage	If a logo or pattern has been damaged, obtain the logo size and color number and contact a local advertisement coating supplier to formulate a repair solution based on the logo size, color, and damage.		5. Leave the repainted area for about 30 minutes before performing any further operation.
Dent	<ol style="list-style-type: none"> If a dent is less than 100 mm² in area and 3 mm in depth, fill the dent with Poly-Putty base and then perform the same operations as those for fixing deep scratches. If a dent is greater than 100 mm² in area or greater than 3 mm in depth, contact the local supplier for an appropriate repainting solution. 		

Procedure

Step 1 Gently polish the damaged areas using fine sandpaper to remove smudges or rust.

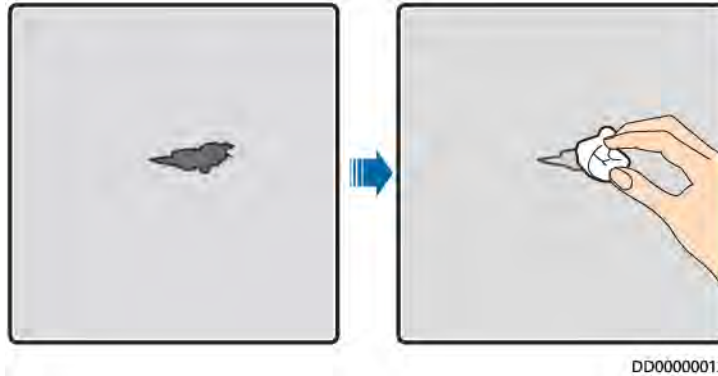
Figure B-1 Polishing a damaged area using sandpaper



DM97000001

- Step 2** Dip a piece of cotton cloth into anhydrous alcohol and wipe the polished or damaged area to remove dirt or dust. Then wipe off the alcohol with a clean and dry cotton cloth.

Figure B-2 Wiping a polished or damaged area using anhydrous alcohol



- Step 3** Paint zinc-rich primer on the damaged coat.

NOTICE

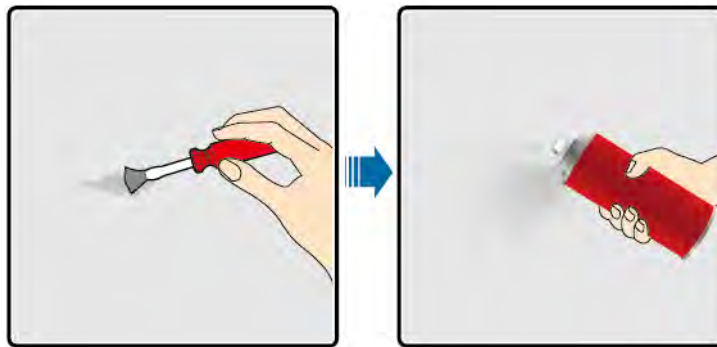
- If the base material is exposed, apply epoxy zinc-rich primer, wait until the paint has dried, and then apply an acrylic acid top coating.
- Select an epoxy zinc-rich primer or acrylic acid top coating with the same color as that of the equipment's surface coating.

- Step 4** Apply paint evenly to the damaged area based on the damage degree until all damage traces are no longer visible.

NOTICE

- Ensure that the painting is thin, even, and smooth. There must not be any paint drops on the coating.
 - In the case that an equipment pattern has different colors, to prevent undamaged areas and those with different colors as the damaged area from being polluted during repainting, cover such areas using white paper and adhesive tape before repairing paint.
-

Figure B-3 Repainting a damaged area



DD0000013

Step 5 Wait for 30 minutes and check whether the painting meets the requirements.

NOTE

- The color of the repainted area must be consistent with that of the surrounding area. Use a colorimeter to measure the color difference (ΔE), which should be less than or equal to 3. If a colorimeter is unavailable, ensure that there is no visible edge between the repainted area and the surrounding area. The paint should also be free of bulges, scratches, peeling, or cracks.
- If you choose to spray paint, it is recommended that you spray paint three times before checking the result. If the color does not meet the requirements, paint more times until the painting meets the requirements.

----End

Paint Supply Information

Table B-1 Painting requirements

Item	Specification
Primer thickness	60 μm
Intermediate coat thickness	120 μm
Top coat thickness	60 μm
Primer type	Epoxy zinc rich paint
Intermediate coat type	Zinc-rich paint
Color number of the top coat	Obtain the color number based on the color palette included with the equipment.

NOTE

The following paint model list provided by Huawei is subject to change and for reference only. The price of paint and technical services are subject to local pricing.

Supplier	Location	Paint Model
Hempel	Equipment surface painting	Zinc-rich primer for pretreatment: HEMPADUR ZINC (shopprimer) 1536C/19830 Zinc-rich primer for the entire container: HEMPADUR ZINC (on line) 1536C/19830 Intermediate coat: HEMPADUR FAST DRY 15560/12170 Top coat: HEMPATHANE 55210/17630 (RAL9003)
	Logo painting	Red: HEMPATHANE 55210/57200 (RAL3020) Black: HEMPATHANE 55210-19990 (RAL9005)
CMP	Equipment surface painting	Zinc-rich primer for pretreatment: EPICON ZINC SC B-2 M (SHOP PRIMER) Zinc-rich primer for the entire container: EPICON ZINC SC B-2 M (ON LINE ZINC) Intermediate coat: EPICON SC PRIMER GREY CSC-9107 Top coat: UNYMARINE SC FINISH WHITE CSC-9205 (RAL-9003)
	Logo painting	Red: UNYMARINE SC MARKING RAL-3020 Black: UNYMARINE SC MARKING RAL-9005

C Emergency Handling

If an accident (including but not limited to the following) occurs on the site, ensure the safety of onsite personnel first and contact the Company's service engineers.

Battery Falling or Strong Impact

- If a battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals can use fire extinguishing facilities to extinguish the fire under safety protection.
- If the appearance is not deformed or damaged, and there is no obvious abnormal odor, smoke, or fire, ensure safety and perform the following operations:
 - Warehouse: Evacuate personnel, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour and ensure that the battery temperature is within the room temperature range (tolerance: $\pm 10^{\circ}\text{C}$) before handling.
 - ESS onsite: Evacuate personnel, close the doors of the ESS, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour before handling.

Flood

- Power off the system if it is safe to do so.
- If any part of the batteries is submerged in water, do not touch the batteries to avoid electric shock.
- Do not use batteries that have been soaked in water. Contact a battery recycling company for disposal.

Fire

 DANGER

- If a fire occurs, power off the system if it is safe to do so.
 - Extinguish the fire with carbon dioxide, FM-200 or ABC dry powder fire extinguishers.
 - Ask firefighters to avoid contact with high-voltage components during fire fighting to prevent the risk of electric shock.
 - Overheating may cause batteries to deform, become faulty, and leak corrosive electrolyte or toxic gas. Keep away from the batteries to avoid skin irritation and chemical burns.
-

Fire Alarm Horn/Strobe

When the alarm indicator on the equipment blinks or buzzes:

- Stay away immediately.
- Do not approach.
- Do not open the door.
- Remotely cut off the power supply.

Gas Exhaust

- Onsite personal protection: Do not directly face the exhaust vents.
- Post-disaster product maintenance: Contact the Company's service engineers for evaluation.

Extinguishant Release or Fire

- Suggestions for onsite O&M personnel:
 - a. When a fire occurs, evacuate from the building or equipment area, press the fire alarm bell, and immediately call the fire emergency service. Notify the professional firefighters and provide them with relevant product information, including but not limited to battery pack types, ESS capacity, and battery pack location and distribution.
 - b. Do not enter the affected building or equipment area under any circumstances, and do not open the doors of the ESS. Isolate and monitor the site. Keep irrelevant personnel away from the site.
 - c. After calling the fire emergency service, remotely power off the system (such as the Smart Transformer Station, Smart PCS, auxiliary power supply devices, and combiner box power supply) while ensuring your own safety.
 - d. After professional firefighters arrive, provide relevant product information, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
 - e. After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the doors of the ESS without permission.

- f. Post-disaster product maintenance: Contact the Company's service engineers for evaluation.
- Suggestions for professional firefighters:
 - a. For product information, see the information provided by O&M personnel, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
 - b. Do not open the doors of the ESS before it is deemed safe by professionals.
 - c. Follow local fire fighting regulations.

D How Do I Recycle Used Batteries?

NOTICE

- The Company does not recycle batteries. Contact local recycling agencies to handle batteries.
 - If there are no such agencies in your area, you can contact the nearest foreign recycling agencies.
-

Step 1 Contact the nearest recycling agency.

Step 2 Recycling agencies assess the costs.

Step 3 Recycling agencies carry out recycling, which can be done in two ways:

- Onsite recycling: Recycling agencies can visit your sites to recycle lithium batteries, but the price depends on actual conditions such as the distance and transportation expenses.
- Centralized recycling: You can collect all lithium batteries to be recycled in one place for the recycling agencies to handle.

 **NOTE**

You need to cover the related transportation expenses.

Step 4 Recycling companies handle recycling. The recycled lithium batteries are at the disposal of the recycling companies.

----End

E CMU Commissioning

E.1 Operations on the CMU WebUI

E.1.1 CMU WebUI Operations

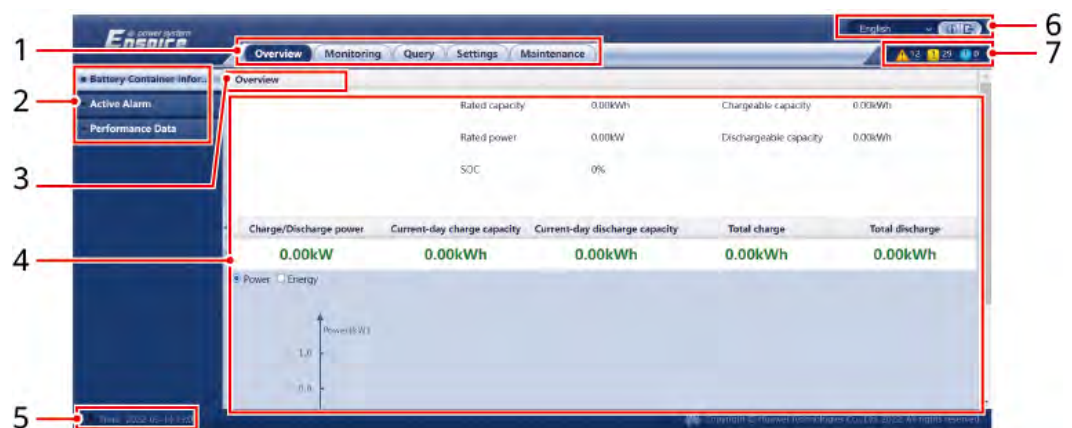
E.1.1.1 Introduction to WebUI

NOTICE

- The web software version corresponding to the WebUI screenshots in this document is LUNA2000C V100R023C00. The screenshots are for reference only.
- The parameter names, value ranges, and default values are subject to change. The actual display may vary.













E.1.1.2 WebUI Layout





Figure E-1 WebUI layout



No.	Function	Description
1	First-level menu	Choose the corresponding first-level menu before you perform any operation over the WebUI.
2	Second-level menu	Under the first-level menu, choose the device to be queried or the parameter to be set under the second-level menu.
3	Third-level menu	After choosing a second-level menu, choose a third-level menu to access the query or setting page.
4	Details page	Displays details of the queried information or parameter setting.
5	System time	Displays the current system time.
6	Display language	Selects the display language or chooses to log out.
7	Alarm icon	Displays the severities and number of active system alarms. You can click a number to access the alarm page.

E.1.1.3 Icon Description

Icon	Description	Icon	Description
	Click the About icon to query the WebUI version information.		Click the Drop-down icon to choose a parameter or time.
	Click the Exit icon to log out.		Alarms are classified into major, minor, and warning ones. Click the Alarm icon to query an alarm.
	Click the Increase/Decrease icon to adjust time.		Click the Start icon to start the device.
	The Select icon indicates that a parameter is selected.		Click the Stop icon to shut down the device.
	The Select icon indicates that a parameter is not selected. Click the icon to select a parameter.		Click the Reset icon to reset the device.
	Hide icon and Display icon		The CMU is in Running state.

Icon	Description	Icon	Description
	<ul style="list-style-type: none"> The device is in Disconnection state. When the device is in Disconnection state, its parameters cannot be set. 		The CMU is in Loading state.
	The CMU is in Initializing, Power-off, Idle or other state in which the device is not feeding power into the grid.		Ascending order or descending order icon. Click the icon to sort parameters in ascending or descending order for the corresponding column.

E.1.1.4 WebUI Menus

Table E-1 WebUI menus

Main Menu	Second-Level Menu	Third-Level Menu	Function
Overview	ESS information	-	Queries ESS information.
	Active Alarm	-	Queries active alarms.
	Performance Data	-	Queries or exports performance data.
Monitoring	CMU	Running Info.	Queries the running information.
		Active Alarm	Queries active alarms.
		Running Param.	Set running parameters.
		Module(M1)	Queries the expansion module.
		IO Board	Queries the IO Board information.
		About	Queries the version and communication information.
Query	Alarm History	-	Query historical alarms.
	Operation Log	-	Queries operation logs.
	Export Data	-	Exports historical alarms, energy yield, operation logs, and power grid scheduling data.

Main Menu	Second-Level Menu	Third-Level Menu	Function
Settings	User parameters	Date&Time	Sets the date and time.
	Comm. Param.	Wireless Network	<ul style="list-style-type: none"> • Sets parameters for the built-in WLAN. • Sets mobile data (4G/3G/2G) parameters.
		Wired Network	Sets wired network parameters.
		RS485	Sets RS485 parameters.
		Modbus TCP	Sets Modbus TCP parameters.
	Other parameters	-	-
Maintenance	Software Upgrade	-	Upgrades the CMU software.
	Product Information	-	Queries product information.
	Security Settings	-	<ul style="list-style-type: none"> • Changes the user password. • Sets the automatic logout time. • Upload a network security certificate. • Updates the key. • Sets the lockout duration and number of times an account is locked upon login failure. • Sets the certificate alarm time. • Uploads a SmartModule security certificate. • Enables or disables communication using an expired SmartModule certificate.
	System Maint.	-	<ul style="list-style-type: none"> • Resets the system. • Restore factory settings. • Clears data. • Exports all configuration files. • Imports all configuration files. • Clears cache.
	Device Log	-	Exports device logs.
	Onsite Test	-	Battery racks charge/discharge test.
	User Management	-	Add, modify or delete a user.

Main Menu	Second-Level Menu	Third-Level Menu	Function
	Device Mgmt.	Connect Device	<ul style="list-style-type: none"> Adds or removes a device. Imports or exports configurations.
		SmartModule	<ul style="list-style-type: none"> Removes the SmartModule. Sets the authentication password.
		Clear Alarm	Clears device alarms.

E.1.2 Maintenance Operations

E.1.2.1 Preparations and WebUI Login

Prerequisites

- The operating system of Windows 7 or later is supported.
- Browser: Chrome 52, Firefox 58, or Internet Explorer 9, or a later version is recommended.

Procedure

Step 1 Connect the network cable between the network port of the PC and the WAN or LAN port of the CMU.

Step 2 Set the IP address for the PC on the same network segment as the CMU IP address.

- When the CMU is connected to the SACU

Connected Port	Item	CMU Default Value	Example PC Setting
LAN port	IP address	192.168.8.10	192.168.8.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.8.1	192.168.8.1
WAN port	IP address	192.168.0.10	192.168.0.11
	Subnet mask	255.255.255.0	255.255.255.0
	Default gateway	192.168.0.1	192.168.0.1

- When the CMU is not connected to the SACU

SACU LAN Port IP Address	CMU WAN Port IP Address	CMU LAN Port IP Address
192.168.8.10	192.168.8.XXX	192.168.3.10
XXX.XXX.XXX.XXX ^a	XXX.XXX.XXX.XXX ^a	192.168.8.10

Note a: When you set the IP address of the SACU LAN port, the IP address of the CMU WAN port changes with the IP address of the SACU LAN port. You can view the IP address on the SACU WebUI or SUN2000 app.

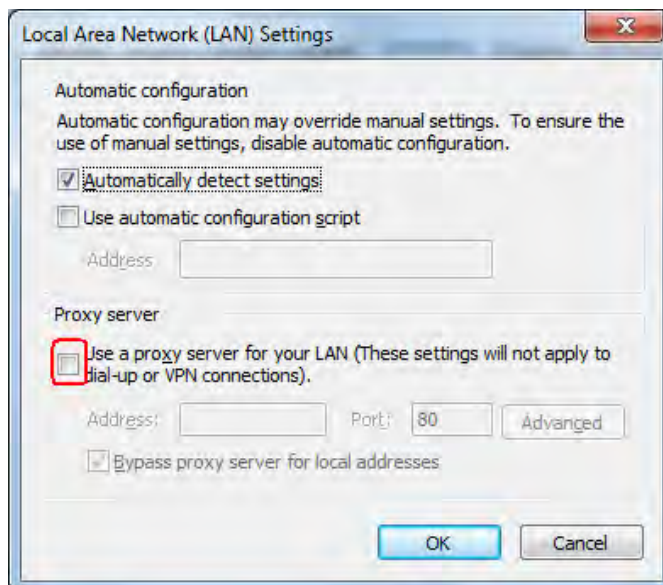
Step 3 Set LAN parameters.

NOTICE

- If the CMU is connected to a local area network (LAN) and a proxy server has been set, you need to cancel the proxy server settings.
- If the CMU is connected to the Internet and the PC is connected to the LAN, do not cancel the proxy server settings.

1. Open Internet Explorer.
2. Choose **Tools > Internet Options**.
3. Click the **Connections** tab and then click **LAN settings**.
4. Clear **Use a proxy server for your LAN**.

Figure E-2 LAN settings



5. Click **OK**.

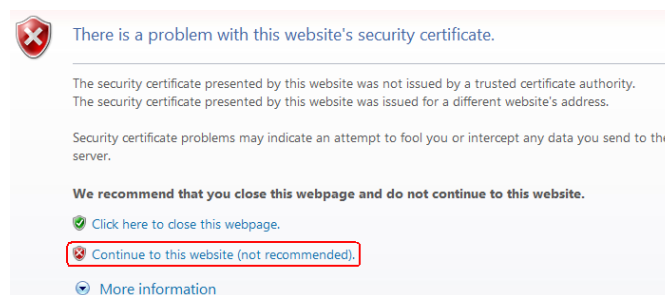
Step 4 Log in to the CMU WebUI.

1. In the address box of a browser, enter `https://XX.XX.XX.XX` (XX.XX.XX.XX is the IP address of the CMU) and press Enter. The login page is displayed. If you log in to the WebUI for the first time, a security risk warning is displayed. Click **Continue to this website** to log in to the WebUI.

 **NOTE**

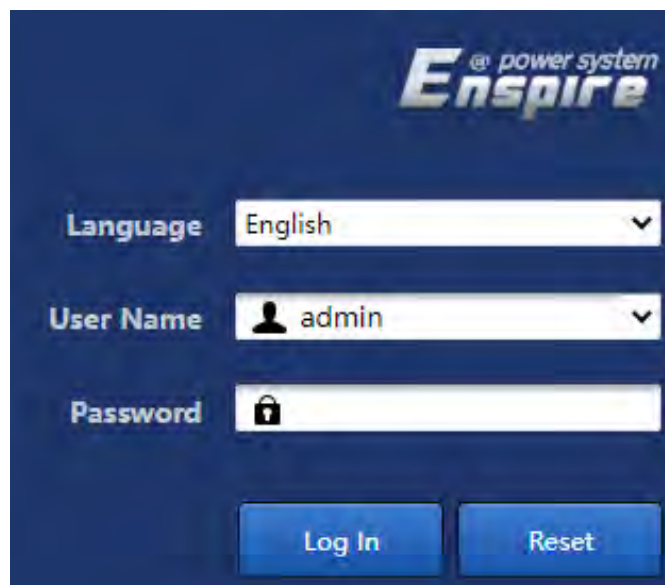
- It is recommended that users use their own certificates. If the certificate is not replaced, the security risk warning will be displayed during each login.
- After logging in to the WebUI, you can import a certificate under **Maintenance > Security Settings > Network Security Certificate**.
- The imported security certificate needs to be bound to the CMU IP address. Otherwise, the security risk warning will still be displayed during login.

Figure E-3 Security risk warning



2. Specify **Language**, **User Name**, and **Password**, and click **Log In**.

Figure E-4 Login page (Initial login when the user name is displayed as admin)



 **NOTE**

In this scenario, you need to update the software version to LUNA2000C V100R023C00 or later.

Parameter	Description
Language	Set this parameter as required.
User Name	Default value: admin
Password	<ul style="list-style-type: none"> - The initial password is Changeme1234. - Use the initial password upon first power-on and change it immediately after login. Then, use the new password to log in again.

 **NOTE**

Updating the CMU to LUNA2000C V100R023C00 or later:

- Method 1: Log in as admin using your new password.
- Method 2: Log in as installer using your app login password (the initial password is 00000a).

Figure E-5 Login page (Initial login when the user name is null)



IL03J00002

 **NOTE**

In this scenario, the software version is LUNA2000C V100R023C00 or later.

Parameter	Description
Language	Set this parameter as required.
User Name	Log in as installer.
Password	Set the login password as prompted.

NOTE

- Protect the password by changing it periodically, and keep it secure. If you lose the password, the device must be restored to its factory settings. Huawei will not be held liable for any losses resulting from improper password management.
- You will be locked out for 10 minutes after five failed password attempts in five minutes.
- A dialog box with recent login information is displayed after login. Click **OK**.

----End

Follow-up Procedure

If any page is blank or a menu cannot be accessed after you log in to the WebUI, clear the cache, refresh the page, or log in again.

E.1.2.2 Upgrading the Software Version

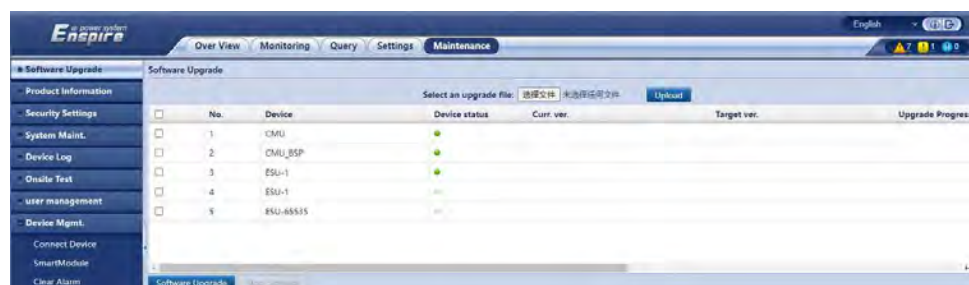
Prerequisites

- Before upgrade, check whether an ESU alarm is generated. If yes, clear the alarm by referring to the alarm handling suggestions and then perform the upgrade.
- Before upgrade, ensure that the SOC of the battery rack is greater than 30%. Otherwise, the delayed upgrade function may be triggered (only software is loaded without performing the upgrade).

Procedure

Step 1 Upgrade the software.

Figure E-6 Software upgrade



----End

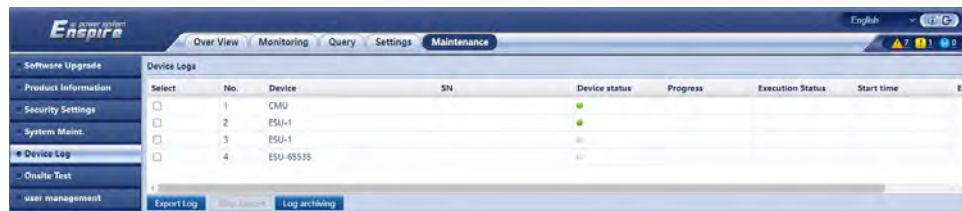
NOTE

- The **Stop Upgrade** function applies only to the devices waiting to be upgraded.
- If the system displays a message indicating that the loading is successful instead of the upgrade, the delayed upgrade function is triggered. The system automatically performs the upgrade when the conditions are met.
- If the upgrade fails, contact Huawei technical support.

E.1.2.3 Exporting Device Logs

Step 1 Access the device log page.

Figure E-7 Exporting logs



Step 2 Select the device whose logs are to be exported and click **Export Log**.

NOTE

Logs can be exported for a maximum of six devices of the same type at a time.

Step 3 Observe the progress bar and wait until the log export is complete.

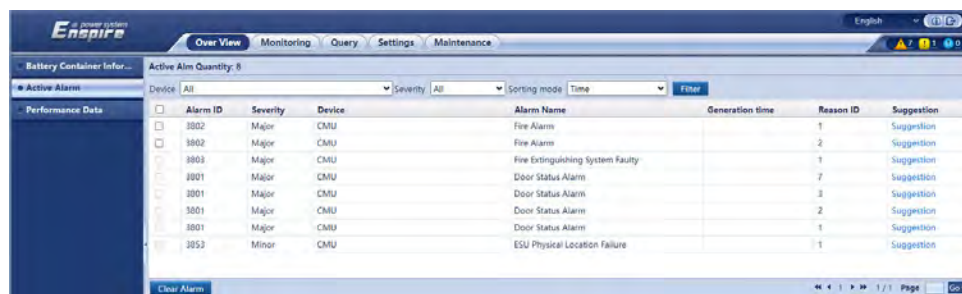
Step 4 After the export is successful, click **Log archiving** to save the logs.

----End

E.1.2.4 Checking Alarms

Step 1 Choose **Overview > Active Alarm**.

Figure E-8 Checking alarms



----End

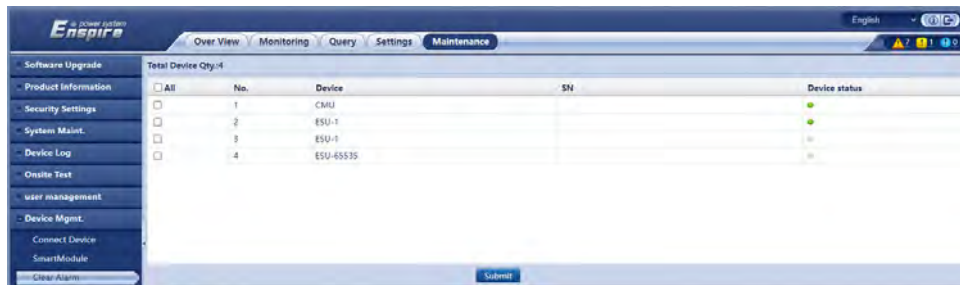
E.1.2.5 Clearing Alarms

You can clear all active and historical alarms for the selected device and re-collect alarm data.

Procedure

Step 1 Choose **Maintenance > Device Mgmt. > Clear Alarm**.

Figure E-9 Clearing alarms



Step 2 Select the name of the device whose alarms are to be cleared, click **Submit**, and choose **All**, **Locally synchronized alarms**, or **Alarms stored on devices** to clear alarms.

----End

 **NOTE**

If alarms are cleared for the CMU, you must reset alarms on the management system. Otherwise, the SmartLogger cannot obtain the alarm information collected by the CMU after the alarms are cleared.

E.2 App Operations

E.2.1 Downloading and Installing the App

SUN2000 app: Access Huawei AppGallery and search for **SUN2000**, or scan the following QR code (or directly visit <https://appgallery.cloud.huawei.com/appdl/C10279542>) to download and install the app.

QR code:



E.2.2 Logging In to the App

Prerequisites

- The CMU has been powered on.

- The WLAN function has been enabled on your phone.
- Keep the mobile phone within 5 m of the CMU. Otherwise, the communication signal quality between the app and the CMU will be affected.

Procedure

Step 1 Press and hold the **RST** button for 1s to 3s to power on the CMU's built-in WLAN module.

NOTE

- If the **ALM** indicator blinks green quickly for 2 minutes and other indicators are off, the WLAN module is powered on.
- If the WLAN module is not connected to the app, the WLAN module is automatically powered off after being powered on for 4 hours.

Step 2 In the SUN2000 app, select a connection mode.

NOTE

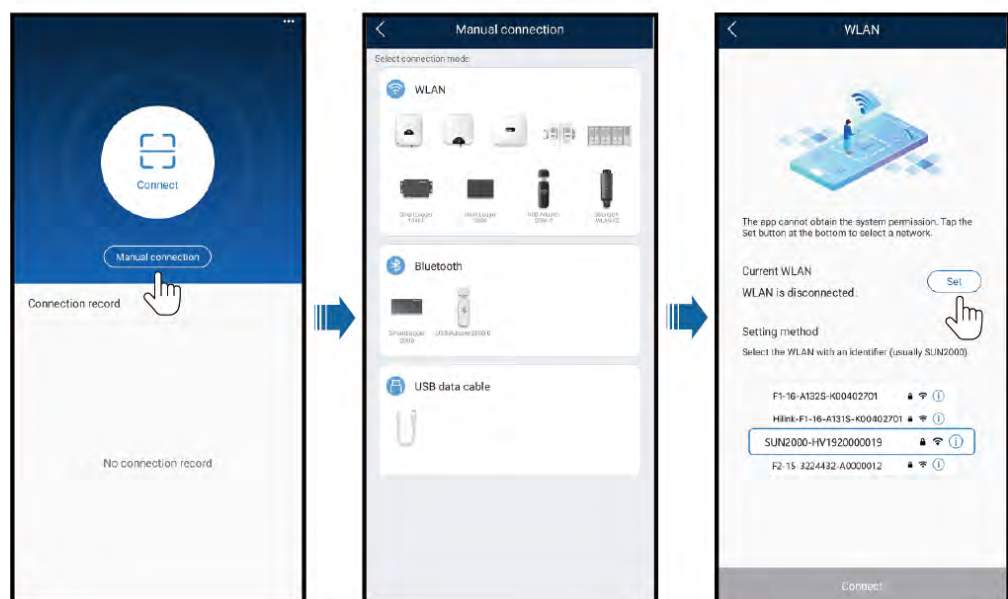
- The screenshots in this section correspond to the SUN2000 app 6.22.10.117 (Android).
- Use the initial password for the first login and change it immediately after login. To ensure account security, protect the password by changing it periodically, and keep it secure. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, devices cannot be accessed. In these cases, the Company shall not be liable for any loss caused to the plant.

1. Tap **Manual connection** and select a product icon.

NOTE

- The CMU has a built-in WLAN module. The initial name of the WLAN hotspot is **SN of the Monitor-CMU**, and the initial password is **Changeme**.
- If **Changeme** cannot be used for the first login, obtain the initial password from the QR code on the CMU.

Figure E-10 Manual connection



2. Tap **Connect** and scan the QR code on the CMU.

 **NOTE**

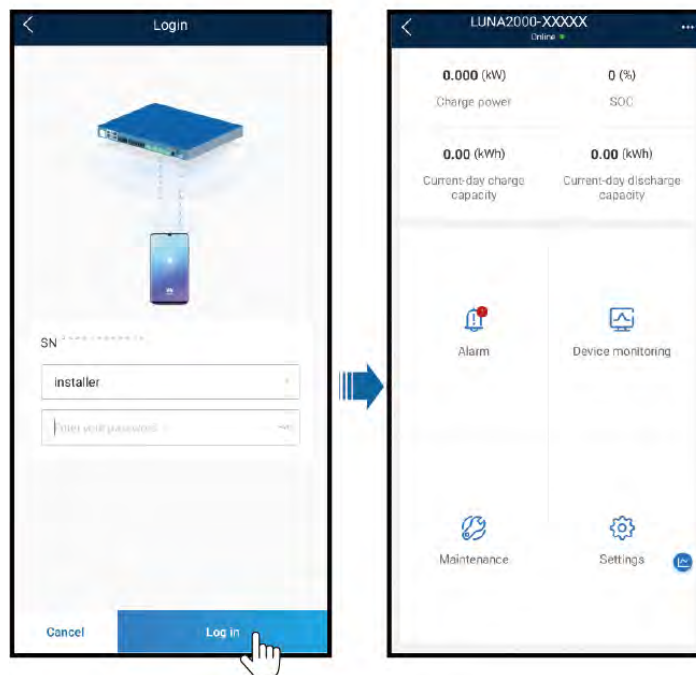
Products delivered earlier do not support connection by scanning the QR code. If you cannot connect to the product by scanning the QR code, manually connect the product.

- Step 3** Select the login user and enter the login password. The main menu screen is displayed.

NOTICE

- When you log in to the system for the first time, set the login password. To ensure account security, protect the password by changing it periodically, and keep it secure. Your password might be stolen or cracked if it is left unchanged for extended periods. If a password is lost, devices cannot be accessed. In these cases, the Company shall not be liable for any loss caused to the plant.
- For the same username, the password for logging in to the app is the same as that for logging in to the CMU WebUI.
- You will be locked out for 10 minutes after five failed password attempts in 5 minutes.

Figure E-11 Login




----End

E.2.3 Change Password

Changing the WLAN Hotspot Password of a Device

Log in to the app, choose **Settings** > **Communication settings** > **Device WLAN**, and change the WLAN hotspot password of the device.

Changing the Login Password of a User

After logging in to the app, tap  in the upper right corner of the screen, and choose **Change password** to change the login password.

F Contact Information

If you have any questions about this product, please contact us.

Table F-1 Customer Service Contact Information

Country	Email	Tel
China	solarservice@huawei.com	400-822-9999
Japan	Japan_ESC@ms.huawei.com	0120258367
Romania	eu_inverter_support@huawei.com	800400897/+40312291238

G Acronyms and Abbreviations

A

AI	analog input
APP	application

B

BMU	battery monitoring unit
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C

CAN	control area network
CMU	central monitoring unit
COM	cluster communication port

E

EPO	emergency power-off
ESC	smart rack controller
ESM	battery pack
ESR	battery rack

ESU energy storage unit

D

DC direct current

DO digital output

F

FE fast Ethernet

G

GE gigabit Ethernet

I

IO input & output

L

LAN local area network

LED light-emitting diode

M

MBUS monitoring bus

N

NTC negative temperature
coefficient

P

PID	potential induced degradation
PSU	power supply unit
R	
RST	reset
S	
SACU	smart array controller
SFP	small form-factor pluggable
SIM	subscriber identity module
SMU	site monitoring unit
SN	serial number
SOC	state of capacity
SOH	state of health
T	
TCU	temperature control unit
TCUE	temperature control unit C
TOU	time-of-use price
U	
UPS	uninterruptible power system
USB	universal serial bus

W

WAN

wide area network