MOTOMA®

Power into the Future

USER MANUAL

PV-ESS Integration M50-100

Document version：3.0

Release date：2024-11

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INTRODUCTION

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About this manual

(1) Applicable Products

This user manual primarily introduces the transportation and storage, mechanical installation, electrical connection, commissioning and decommissioning, fault handling, and maintenance methods for the PV-ESS Integration (hereinafter referred to as: M50-100). This manual is applicable only to the PV-ESS Integration developed by MOTOMA.

Product name：PV-ESS Integration，

Model number： M50-100。

(2) Intended Readers

This manual is intended for personnel involved in the installation, operation,

maintenance, and other related tasks of this product. Readers should possess certain electrical and related professional knowledge and qualifications. All installation operations must and can only be performed by professional technical personnel. Professional technicians must meet the following requirements:

• Undergo specialized training and receive qualification recognition.

• Read this manual thoroughly and understand the relevant safety matters of operation.

• Be familiar with local standards and safety regulations of the electrical system.

(3)Symbols Used

To ensure the personal and property safety of users when using the product and to use it more efficiently and correctly, relevant information is provided in the manual, highlighted with the use of symbols. The symbols possibly used in this manual are listed below. Please read them carefully to better understand and use this manual.

Symbol	Symbol Meanings
 DANGER	Used to warn of emergency danger situations. If not avoided, this could lead to death or serious personal injury.
 WARNING	Used to warn of potential hazardous situations. If not avoided, this could possibly lead to death or serious personal injury.
 CAUTION	Used to warn of potential hazardous situations. If not avoided, this could lead to moderate or minor personal injury.
 NOTE	Used to convey equipment or environmental safety warning information. If not avoided, this could lead to equipment damage, data loss, reduced equipment performance, or other unforeseeable outcomes.

1 Safety Instruction

1.1 General Safety Precautions

Before transporting, storing, installing, operating, using, and maintaining the equipment, please read this manual thoroughly, operate strictly according to the manual, and follow all safety precautions identified on the equipment and in the manual. The "instructions," "notes," "cautions," "warnings," and "dangers" in the manual do not represent all the safety matters to be observed; they supplement all safety precautions. You must also comply with relevant international, national, or regional standards, as well as industry practices. MOTOMA assumes no liability for any violations of general safety operation requirements or violations of safety standards in design, production, and use of the equipment. The equipment should be used in an environment that meets design specifications. Otherwise, equipment failure may occur, leading to abnormal equipment function or component damage, which is not covered by the quality assurance; likewise, MOTOMA bears no liability for personal injury or property damage that may result. When transporting, storing, installing, operating, using, and maintaining the equipment, comply with local laws, regulations, and standards. The safety precautions in the manual are supplementary to local laws, regulations, and standards. **MOTOMA is not responsible for the following situations or their consequences:**

1) Installation and usage environments that do not comply with relevant international, national, or regional standards.
2) Operation outside the conditions described in this manual.
3) Unauthorized disassembly, alteration of the product, or modification of software codes.
4) Operation not in accordance with the product and documentation instructions and safety warnings.
5) Equipment damage caused by abnormal natural events (earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, force majeure).
6) Transport damage caused by you or your appointed third party.
7) Damage due to storage conditions not meeting product documentation requirements.
8) Negligence, improper operation, or deliberate damage by you or a third party, resulting in hardware or data damage to the equipment.

9) System damage caused by you or a third party, including relocation and installation of systems not in accordance with this manual, and damage caused by unauthorized adjustments, changes, or removal of identification marks.

10) Defects, malfunctions, or damage caused by acts, events, negligence, or accidents beyond the seller's reasonable control, including power outages or electrical faults, theft, war, unrest, internal strife, terrorism, intentional or malicious damage, etc.


NOTE

Reverse engineering, decompiling, disassembling, dismantling, adapting, implanting, or other derivative operations on the equipment software are prohibited. It is forbidden to study the internal implementation of the equipment, obtain the equipment software source code, steal intellectual property, etc., and to disclose any performance tests of the equipment software.

1.2 Personal Safety


DANGER

1) Strictly prohibit live operation during installation. Live installation and removal of cables can generate arcs, sparks, or cause fires and explosions, leading to fires or personal injury.
2) Fire, electric shock, or explosion can occur during equipment operation due to non-standard or incorrect operation, resulting in personal injury or property loss.
3) Do not wear conductive objects like watches, bracelets, rings, necklaces during work to avoid electric shock burns.
4) Use specialized insulated tools during work to avoid electric shock injuries or short circuits. The insulation voltage level must meet local laws, regulations, standards, and specifications.

WARNING	Use specialized protective equipment, such as protective clothing, insulated shoes, safety goggles, safety helmets, insulated gloves, etc., during work.

1.3 Personnel Requirements

Operations such as lifting and transporting, installation and wiring, and operation and maintenance of the equipment must be carried out by professional electrical technicians who meet local specifications. Operators should wear protective gear that meets local safety requirements.

Fig 1.3-1 Personnel Dress Requirements

Operators must meet the following requirements:

1) Do not wear conductive items like watches, bracelets, rings, necklaces during installation, operation, and maintenance to avoid electric shock burns.
2) Comply with the laws, regulations, and relevant standards of the country or region during transportation, transshipment, installation, wiring, and maintenance.
3) Be familiar with the composition and working principles of the entire energy storage system and operate according to the manual.
4) Have received professional training related to the installation and trial operation of electrical equipment, possess certain knowledge in electronics, electrical wiring, and mechanics, and be familiar with electrical and mechanical schematics.
5) Have the ability to respond to emergencies or sudden situations that may occur during installation or trial operation.

1.4 Electrical Safety

1) Ensure that the equipment is undamaged before making electrical connections, as damage may cause electric shock or fire.
2) Non-standard or incorrect operations may lead to accidents such as fire or electric shock.
3) Prevent foreign objects from entering the equipment during operation, as this may cause short circuits or damage to the equipment, reduction in load supply, power drop, and personal injury.

Equipment requiring grounding must have the protective earth wire installed first during installation; it must be the last to be removed during disassembly.

Do not allow cables to pass through equipment air inlets and outlets.

1.5 General Requirements

1) Installation, operation, and maintenance must be carried out according to the steps in the manual. Do not modify, add, or change the equipment without authorization, and do not change the installation order.
2) Grid connection operation requires permission from the electrical department of the country or region. Follow power station safety specifications, such as the operation ticket and work ticket systems.
3) Set up temporary fences or warning ropes in the work area and hang "No Entry" signs. Non-workers are strictly forbidden from entering.
4) Before installing or removing power cables, disconnect the equipment itself and its upstream and downstream switches.

5) If liquid enters the equipment, immediately turn off the power and do not continue to use it.
6) Before operating the equipment, carefully check that the tools used meet the requirements and are logged; after operation, count and collect the tools to prevent them from being left inside the equipment.
7) Before installing power cables, confirm that the cable labels are correct and that the cable terminals have been insulated.
8) When installing the equipment, use a torque tool of the appropriate range to tighten the screws. When tightening with a wrench, ensure that the wrench is not skewed, and the torque value deviation does not exceed the specified 10%.
9) After installation, ensure that all electrical components, protective covers, insulation tubes, and other devices are in place to avoid the risk of electric shock.
10) If the equipment has multiple inputs, disconnect all inputs and wait for the equipment to be completely powered down before operating.
11) When maintaining downstream electrical or distribution equipment, disconnect the corresponding output switch of the power supply equipment.
12) When maintaining equipment, hang a "Do Not Close" sign on the upstream and downstream switches or circuit breakers and post warning signs to prevent accidental connection.
13) Faults must be fully resolved before re-powering. When diagnosing and troubleshooting faults, the following safety measures must be completed if power off is necessary: power off > test for electricity > install grounding wire > hang signs and set up barriers.
14) Regularly check the equipment terminal screws, confirm they are tightened and not loose. If cables are damaged, they must be replaced by professional personnel to avoid risks.
15) Do not tamper with, damage, or cover up labels and nameplates on the equipment, and timely replace labels that have become unclear due to long-term use.
16) Do not use water, alcohol, or oil solvents to clean the internal and external electrical components of the equipment.

1.6 Grounding Requirements

1) The equipment grounding impedance should meet local electrical standards.

2) Equipment must be permanently connected to the protective ground. Before operating the equipment, check its electrical connections to ensure reliable grounding.
3) Do not operate equipment without installing a grounding conductor.
4) Do not damage the grounding conductor.
5) For equipment using three-core sockets, ensure that the ground terminal in the three-core socket is connected to the protective ground.
6) If it is a large contact current device, before connecting the input power, the protective ground terminal of the equipment chassis must be grounded first to prevent contact current from causing electric shock to the human body.

1.7 Wiring Requirements

1) The selection, installation, and routing of cables must comply with local laws, regulations, and standards.
2) During the laying of power cables, avoid twisting or coiling. If the power cable is not long enough, replace it with a new one; do not make joints or welds in the power cable.
3) All cables must be securely connected, well insulated, and of the appropriate specification.
4) Cable ducts and through holes should have no sharp edges, and protective measures should be in place where cables pass through to prevent damage by sharp edges or burrs.
5) If cables enter the cabinet from the top, they should be bent in a U-shape outside the cabinet before entering.
6) Cables of the same type should be bundled together, neatly and without damage to the outer sheath; cables of different types should be laid at least 30mm apart and should not be intertwined or crossed.
7) Seal cable entries with sealing putty immediately after wiring or when leaving the wiring process to prevent moisture and small animals from entering.
8) Buried cables should be reliably fixed using cable supports and cable clamps, and cables in the backfill soil area should be closely fitted to the ground to prevent deformation or damage during backfilling.
9) When external conditions, such as installation methods or environmental temperatures, change, it is necessary to refer to IEC-60364-5-52 or local regulations and standards to

verify cable selection, such as whether the current carrying capacity meets requirements.

10) Using cables in high-temperature environments may lead to aging and damage of the insulation layer. The distance between cables and heat-generating devices or heat source areas should be at least 30mm.
11) At low temperatures, severe impacts or vibrations can cause the plastic sheath of the cable to become brittle and crack.
12) To ensure construction safety, the following requirements should be followed: All cables should be laid and installed at temperatures above 0℃. When handling cables, especially in low-temperature environments, they should be handled gently. If the storage temperature of the cable is below 0℃, the cable must be stored in a room-temperature environment for more than 24 hours before laying.
13) Unconventional operations, such as pushing cables directly off a vehicle, are prohibited to avoid damage to the cables, which can lead to decreased performance, affecting current carrying capacity and temperature rise.

1.8 Anti-static Requirements

NOTE	Human-generated static electricity can damage static-sensitive components on circuit boards, such as BMU boards. 1）Wear anti-static gloves before touching the equipment or handling circuit boards. 2）When holding a circuit board, hold it by the edges without components and avoid touching the components with your hands. 3）Circuit boards that have been removed should be wrapped in anti-static materials for storage or transportation.

1.9 Environmental Requirements

DANGER	1) It is strictly forbidden to place the equipment in environments with flammable or explosive gases or smoke, and any operation in such environments is prohibited. 2) Do not store flammable or explosive materials in the vicinity of the equipment. 3）Keep the equipment away from heat sources or fire sources,

such as fireworks, candles, heaters, or other heating devices, as this may cause equipment damage or fire.

1) Install the equipment away from liquids and not under locations prone to condensation, such as water pipes or air vents; it should also not be installed under air conditioning vents, ventilation openings, or windows in machine rooms where water leakage is likely, to prevent liquids from entering the equipment and causing faults or short circuits.

2) Do not block the ventilation ports or cooling system of the equipment during operation, and do not cover it with other items, to prevent overheating and fire.

1) The storage environment for the equipment should have suitable temperature and humidity, be clean, dry, well-ventilated, and free from dust and condensation.
2) Do not install or operate the equipment beyond the specified technical parameters, as this may affect the performance and safety of the equipment.
3) Do not install, use, or operate outdoor equipment or cables in severe weather conditions such as thunderstorms, rain, snow, high winds of level 6 or above (including but not limited to moving equipment, operating equipment and cables, plugging and unplugging outdoor signal interfaces, working at heights, outdoor installations, opening doors, etc.).
4) Do not install equipment in environments with dust, smoke, volatile gases, corrosive gases, infrared radiation, organic solvents, or high salt content.
5) Do not install equipment in environments with conductive metallic dust or magnetic dust.
6) Do not install equipment in areas prone to mold, mildew, or other microorganisms.
7) Avoid installing equipment in areas with strong vibrations, loud noise sources, and strong electromagnetic interference.
8) The installation site should comply with local laws, regulations, and relevant standards.
9) Ensure the installation surface is solid and not composed of materials like rubber soil, weak soil, or prone to sinking.
10) Avoid low-lying areas or areas prone to water accumulation.
11) The site's elevation should be above the highest historical water level of the area.
12) If the equipment is installed in areas with lush vegetation, in addition to routine weeding, the ground below the equipment should be hardened, such as by laying cement or stones.

13) Before installing, operating, or maintaining the equipment, clear any accumulated water, ice, snow, or other debris from the top. Open the door only after ensuring that no debris will fall into the equipment.

14) Seal all cable entry points. Use sealing clay for cable entry points that are in use and use the provided covers for those not in use. The correct sealing method is shown in the figure below.

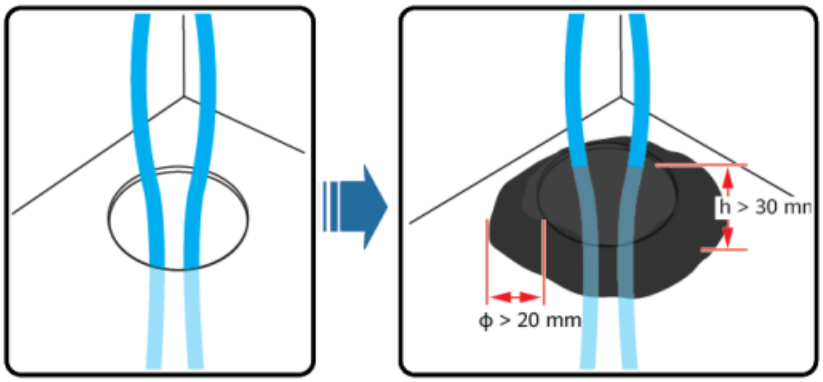


Figure 1.9-1 Standard for Sealing Cable Entry Points

1.10 Mechanical Safety

DANGER

High-altitude work requires wearing safety helmets, safety belts, or lanyards, securely attached to firm structural components. Do not hang on unstable moving objects or metal with sharp edges to prevent accidents due to hook slippage and falls.

1) Tools should be complete and professionally inspected for quality. Do not use tools with damage, those that fail inspection, or are beyond their inspection validity. Ensure tools are secure and not overloaded.

WARNING

2) Before installing the equipment in the cabinet, ensure the cabinet is properly fixed to prevent tilting or collapsing due to an unstable center of gravity, which could injure installers or damage the equipment.

3) When removing equipment from the cabinet, be careful with potentially unstable or heavy equipment inside the cabinet to avoid crushing or impact injuries.

4) Drilling holes in the equipment is strictly prohibited. Drilling can damage the equipment's seal, electromagnetic shielding, internal components, and cables. Metal filings generated from drilling can cause short circuits on circuit boards.

1.11 General Requirements

1) Paint scratches that occur during the transportation and installation of equipment must be repaired promptly, and it is strictly forbidden for the scratched areas to remain exposed for an extended period.
2) Welding, cutting, or any other operations involving electrical arcs on the equipment are prohibited without the assessment and approval of our company.
3) Installation of other equipment on top of the equipment is prohibited without the evaluation and authorization of our company.
4) When working in the space above the equipment, additional protection must be added to the top of the equipment to prevent damage to the equipment.
5) Please use the correct tools and be familiar with their proper usage.

1.12 Safe Handling of Heavy Objects

1) When handling heavy objects, select appropriate handling tools and ensure an adequate number of personnel coordinate their efforts based on the weight of the cargo to ensure safe handling. The recommended methods for handling goods by our company are shown in the diagram below.

Figure 1.12-1 Schematic Diagram of Different Methods for Handling Goods of Varying Weights.

2) When manually handling equipment, wear protective gloves and anti-crush shoes, and use other safety protective gear as required.
3) During the equipment handling process, take precautions to avoid scratching the equipment surface or damaging components and cables.
4) When using a forklift for handling, ensure that the forklift forks are positioned in the middle to prevent tipping. Before moving, secure the equipment to the forklift using ropes and assign personnel to oversee the process.
5) Exercise caution when moving equipment to prevent collisions or falls.
6) Choose sea transport or well-maintained roads for transportation; rail and air transport are not supported. During transportation, minimize vibrations and tilting as much as possible.
7) The tilting angle of the equipment cabinet must adhere to the requirements shown in the diagram, with a tilt angle of $\alpha \leq 10°$ when packaged and $\alpha \leq 5°$ after unpacking.

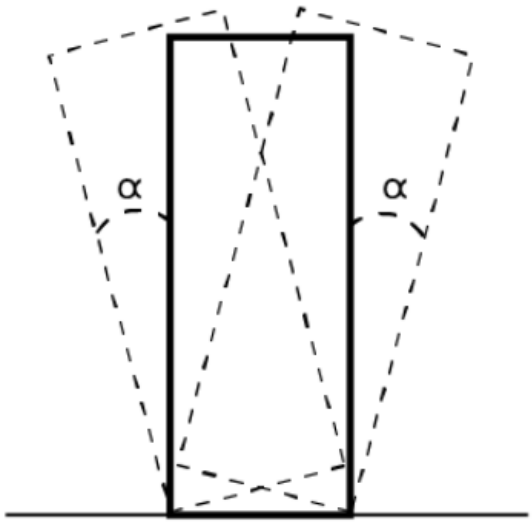


Figure 1.12-2 Schematic Diagram of Allowable Tilting Angles for Cabinet

1.13 High Altitude Safety

1) Any operation conducted at a height of more than 2 meters above ground level is considered a high-altitude operation and requires the presence of a safety supervisor.
2) Individuals must undergo relevant training and obtain the necessary qualifications before engaging in high-altitude operations.
3) High-altitude operations should be halted in the event of rain or other hazardous conditions. After such conditions pass, the safety officer and technical personnel must inspect all operation equipment to ensure safety before resuming work.
4) In high-altitude work areas, dangerous prohibited zones must be marked and clearly identified, and access by unauthorized personnel must be strictly prohibited.
5) Guardrails and signs must be installed at openings and holes in high-altitude work areas to prevent accidental falls.
6) Below the work area in high-altitude operations, it is strictly forbidden to store scaffolding, planks, or other objects. Ground personnel are prohibited from staying or passing directly beneath the high-altitude work area.

7) Ensure that tools and equipment are properly secured to prevent damage to equipment or injury to personnel due to falling objects.
8) It is strictly prohibited for personnel working at heights to throw objects from a high elevation to the ground or vice versa. Instead, use hoists, baskets, elevated platforms, or cranes for transporting objects.
9) Whenever possible, avoid simultaneous operations on upper and lower levels. If unavoidable, dedicated protective shelters or other measures must be implemented between upper and lower levels, and upper levels must strictly avoid stacking tools and materials.
10) When dismantling scaffolding upon completion of work, it must be done in a step-by-step manner from top to bottom, and simultaneous dismantling of upper and lower levels must be strictly prohibited to prevent collapse.
11) Personnel engaged in high-altitude work must strictly adhere to high-altitude safety regulations, and the company assumes no responsibility for accidents resulting from violations of high-altitude safety operation rules.
12) Playfulness and resting are strictly prohibited during high-altitude work.

1.14 Climbing Safety

1) When there is a possibility of electrical operations at heights, wooden ladders or insulated ladders should be used.
2) Platforms with protective barriers should be prioritized for climbing operations, and single-pole ladders should be prohibited.
3) Before using a ladder, ensure that it is in good condition, capable of bearing the

weight, and strictly avoid overloading.

4) The ladder must be placed on a stable surface, and there must be someone to hold the ladder during use.

Figure 1.14-1 Schematic Diagram of Personnel Assisting on a Ladder

5) Maintain a stable posture while climbing, ensuring that your body's center of gravity does not deviate from the ladder edge to reduce the risk and ensure safety.

6) Secure the rope firmly when using an extension ladder.

1.15 Lifting Safety

1) Personnel involved in lifting operations must undergo relevant training and be qualified before commencing work.

2) The lifting area must be demarcated with temporary warning signs or barriers.

3) The foundation for lifting must meet the load-bearing requirements of the crane.

4) Before lifting, ensure that lifting tools are securely fixed to a fixed object or wall that meets the weight-bearing standards.

5) During lifting, walking beneath the lifting arm or load is strictly prohibited.

6) Dragging steel cables or lifting gear and using hard objects to strike are prohibited during lifting.

7) During lifting, ensure that the angle between the two cables does not exceed 90°, as shown in the following diagram.

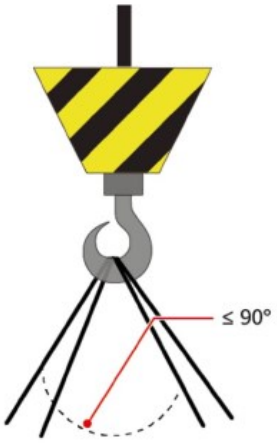


Figure 1.15-1 Schematic Diagram of Cable Angle during Lifting Operations

1.16 Drilling Safety

1) Prior approval from the customer or contractor is required before drilling.
2) When drilling, wear safety protective equipment such as protective goggles and gloves.
3) Avoid pre-embedded pipelines or cables during drilling to prevent short circuits or other hazards.
4) During drilling, protect the equipment from debris and promptly clean up after drilling to prevent debris from entering the equipment.

1.17 Equipment Safety

(1) ESS Safety

This product specification is only applicable to M50-100 optical storage integrated intelligent distributed energy storage products developed by Shenzhen Motoma Power Co.,Ltd.

DANGER	1) Opening the cabinet doors is prohibited during system operation. 2) Avoid standing near the cabinet doors, including within their opening range, during an ESS fault.
NOTE	ESS must have protective measures such as fences or walls, along with erected safety warning signs for isolation, to prevent unauthorized personnel from entering during operation and causing personal injury or property damage.

1) The installation layout of the ESS must comply with local standards for fire safety distances or firewalls, including but not limited to the "GB51048-2014 Electrochemical Energy Storage Station Design Specification" and the "NFPA 855 Standard for the Installation of Stationary ESS."
2) ESS should undergo regular fire safety inspections, at least once a month.
3) During live inspections of the system, pay attention to danger warning signs on the equipment and avoid standing at the cabinet doors.
4) After replacing power components of the ESS or changing connections, manual initiation of connection testing and topology recognition is required to prevent abnormal system operation.
5) It is recommended that users have their own recording devices to document the detailed process of installing, operating, and maintaining the equipment.

(2) Battery Safety

1) Short-circuiting the positive and negative terminals of the battery is strictly prohibited, as it can cause a short circuit. A battery short circuit can instantly generate a large current and release a significant amount of energy, leading to battery leakage, smoking, release of combustible gases, thermal runaway, fire, or explosion. To prevent battery short circuiting, maintenance with the battery charged is not allowed.
2) Do not expose the battery to high-temperature environments or near heating devices such as intense sunlight, fire sources, transformers, heaters, etc. Overheating of the battery can cause leakage, smoking, release of combustible gases, thermal runaway, fire, or explosion.
3) The battery must not be subjected to mechanical vibrations, falls, collisions, puncturing by sharp objects, or pressure impacts, as these could damage the battery or cause fires.
4) Dismantling, modifying, or damaging the battery (such as inserting foreign objects, external pressure, immersion in water or other liquids) is strictly forbidden, to avoid causing battery leakage, smoking, release of combustible gases, thermal runaway, fire, or explosion.
5) Contact of battery terminals with other metal objects is prohibited as it may cause heating or electrolyte leakage.


DANGER

6) Using or replacing batteries with incorrect models poses a risk of fire or explosion. Please use batteries of the specified model recommended by the manufacturer.
7) Battery electrolyte is toxic and volatile. In case of electrolyte leakage or abnormal odors, avoid contact with the leaked liquid or gases. Non-professionals should not approach and must contact professionals immediately. Professionals should wear protective goggles, rubber gloves, gas masks, protective clothing, etc., turn off the equipment promptly, remove the leaking batteries, and contact a technical engineer for handling.

8) The battery is a sealed system and under normal operating conditions, no gases are released. However, in extreme misuse scenarios such as burning, puncturing, compression, lightning strike, overcharging, or other conditions that might cause thermal runaway, the battery could be damaged or undergo abnormal chemical reactions internally, potentially leading to electrolyte leakage or the production of gases like CO or H2. Ensure proper venting measures for combustible gases on-site to prevent combustion or equipment corrosion.

9) Gases produced by burning batteries can irritate the eyes, skin, and throat. Take appropriate precautions.

1) Batteries should be installed away from areas prone to liquid intrusion, such as air conditioning vents, ventilation openings, windows in machine rooms, water pipes, etc., to prevent liquids from entering the equipment and causing failures or short circuits.
2) When installing and commissioning batteries, adhere to construction standards and equip with fire safety facilities, such as fire sand, CO2 fire extinguishers, etc. Before operation, ensure the availability of fire safety facilities compliant with local laws and standards.
3) Before unpacking batteries for storage and transport, ensure that the outer packaging is intact and correctly placed according to the packaging box labels, strictly prohibiting upside-down, sideways, vertical, inclined placement, and stacking in compliance with the stacking requirements on the packaging, to avoid any impacts or falls that could damage or scrap the batteries.

4) After unpacking, place batteries in the specified direction, strictly forbidding upside-down, sideways, vertical, inclined, or stacked placement, to avoid any impacts or falls that could damage or scrap the batteries.

5) Tighten the copper busbars or cable terminal screws as specified in the manual, regularly check for tightness, rust, corrosion, or other foreign objects, and clean them. Otherwise, loose screws can cause excessive connection voltage drop, and high currents can cause excessive heating, burning the battery.

6) After battery discharge, charge the battery promptly to prevent damage due to over-discharge.

Disclaimer: MOTOMA is not responsible for damage to batteries provided by the company due to the following reasons:

1) Battery damage caused by earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, or force majeure.
2) Direct damage to batteries due to on-site equipment operating environments or external electrical parameters not meeting the requirements for normal operation, including but not limited to actual operating temperatures of batteries being too high or too low, unstable electrical grid conditions, frequent power outages, etc.
3) Battery damage, falls, leaks, ruptures, etc., due to improper operation or failure to connect the batteries as required.
4) Battery damage caused by over-discharge due to failure to power up the batteries promptly after on-site installation and system connection.
5) Battery damage due to failure to accept delivery promptly.
6) Incorrect setting of battery operation management parameters.
7) Mixing batteries provided by the company with other batteries, causing accelerated capacity degradation, including but not limited to: mixing with batteries of other brands or different rated capacities.
8) Frequent over-discharge of batteries due to improper maintenance, on-site capacity expansion, or long-term inability to fully charge.
9) Failure to properly maintain and care for batteries according to the operating manual of the accompanying equipment, including but not limited to: not regularly checking whether battery terminal screws are tightened.
10) Battery damage due to storage not in accordance with requirements (such as storing in humid or rain-prone environments).
11) Battery damage due to failure to charge promptly, causing over-storage and resulting in capacity loss or irreversible damage.

12) Battery damage caused by you or a third party, including but not limited to: unauthorized relocation or installation of batteries against the company's requirements.
13) Changing the battery usage scenario without notifying the company.
14) Connecting additional loads to the battery on your own.
15) Exceeding the maximum storage period of the battery.
16) Exceeding the warranty period of the battery.

(3) General Requirements

This product specification is only applicable to M50-100 optical storage integrated intelligent distributed energy storage products developed by Shenzhen Motoma Power Co.,Ltd.


DANGER

1) Do not expose batteries to high-temperature environments or near heating devices, such as sunlight, fire sources, transformers, heaters, etc. Overheating of batteries may cause fires or explosions.
2) Dismantling, modifying, or damaging batteries (such as inserting foreign objects, immersing in water or other liquids) is strictly prohibited, to avoid causing battery leakage, overheating, fire, or explosion.
3) Lithium-ion battery ESS have a high fire risk. Consider the following safety risks before working on batteries.
4) Battery electrolyte is flammable, toxic, and volatile.
5) Thermal runaway of batteries can produce combustible gases and harmful gases such as CO and HF.
6) Accumulation of combustible gases produced after thermal runaway of batteries poses a risk of deflagration and explosion. ESS must be installed and unloaded in accordance with the laws and industry standards of the region. Rough handling can cause short circuits or damage to batteries inside the cabinet, potentially leading to battery leakage, rupture, explosion, or fire.

1) Batteries must be stored in a separate warehouse, in their external packaging, to avoid mixing with other materials, open-air storage, and excessive stacking. The site must

have fire safety facilities that meet requirements, such as fire sand, fire extinguishers, etc.

2) Do not disassemble the external packaging of batteries under normal circumstances. If recharging of batteries is required, it must be done by professionals according to requirements. After recharging, the batteries should be repackaged.
3) After unpacking batteries for outdoor use, it is recommended to power them up within 24 hours. If timely powering up is not possible, store the batteries indoors, in a dry environment free from corrosive gases.
4) Batteries should be placed according to the anti-inversion labels or tags on the packaging boxes, to avoid leakage from long-term inverted storage.
5) Batteries should be protected from impacts.
6) When handling batteries, carry them in the direction required by the battery, prohibiting inversion or tilting.
7) Use batteries within the temperature range specified in this manual. When the environmental temperature of the battery is below the lower limit of the working temperature, do not charge to avoid internal short circuits due to crystallization at low temperatures.
8) Dispose of waste batteries according to local laws and regulations, and do not treat batteries as household waste. Improper disposal of batteries can lead to environmental pollution.
9) Do not use damaged batteries (batteries with dents or other damage to the casing). Damaged batteries may release flammable gases, and should not be stored near undamaged products.
10) The storage location for damaged batteries should not contain flammable materials, and non-professionals should not approach.
11) During the storage of damaged batteries, monitor them to ensure there are no signs of smoke, flame, electrolyte leakage, or heating.
12) If the battery pack is accidentally drenched, do not continue with the installation. Transport it to a safe isolation point and promptly apply for spare part replacement.
13) Ensure no direct sunlight or rain exposure, dry and well-ventilated environment, clean surroundings, and absence of excessive infrared radiation, organic solvents, or corrosive gases.

(4) Recharging Requirements

1) If it has been more than 6 months since the last charge, the battery needs to be recharged. Failure to recharge as required may affect the battery's performance and lifespan.
2) Consult a MOTOMA service engineer for the production completion time of the battery pack.
3) Before installing the battery pack, check for any abnormalities. Abnormalities in the battery pack include significant deformation or damage to the outer shell, total positive to total negative voltage being approximately 0V, or impedance from the positive or negative ears to the ground being less than 50kΩ.

(5) Battery Installation Requirements

1) Please use the specified model of the battery. Using non-specified models may result in battery damage.
2) Before installing the battery, check that the packaging is intact. Do not use batteries with damaged packaging.
3) Batteries should be placed horizontally and secured.
4) During the installation of batteries, do not place installation tools or miscellaneous items on the batteries.
5) Pay attention to the positive and negative terminals during the installation process, and avoid short-circuiting the battery's terminals.
6) During installation, use a torque wrench to ensure terminal connections are tightened and regularly check for looseness.

(6) Battery Short Circuit Protection

Short circuits in batteries can produce a large current instantaneously and release a significant amount of energy, potentially causing personal injury and property loss.

1) When installing or maintaining batteries, use insulating tape to wrap exposed cable terminals on the battery.
2) Avoid foreign objects (such as conductive objects, screws, liquids, etc.) entering the

battery and causing a short circuit.

(7) Hazard and Toxicity Description

1) Hazard: Contact of battery terminals with other metals may cause heating or electrolyte leakage. The electrolyte is flammable; if it leaks, immediately move the battery away from the fire.
2) Toxicity: Vapors produced by burning batteries may irritate the eyes, skin, and throat.

(8) Battery Anomaly Handling Measures

1) In case of electrolyte leakage or abnormal odors, avoid contact with the leaked liquid or gas. Non-professionals should not approach, and professional personnel should be contacted immediately. Professionals should wear protective goggles, rubber gloves, gas masks, protective clothing, etc., to prevent harm caused by electrolyte spillage.
2) The electrolyte is corrosive and can cause skin irritation and chemical burns upon contact. If contact with battery electrolyte occurs, take the following measures:
3) Inhalation: Evacuate the contaminated area, inhale fresh air immediately, and seek medical help.
4) Eye Contact: Immediately rinse eyes with plenty of water for at least 15 minutes without rubbing, and seek medical help.
5) Skin Contact: Immediately wash the contact area with plenty of water and soap, and seek medical help.
6) Ingestion: Seek medical help immediately.

(9) In Case of Battery Drop

1) After a battery drop (with or without packaging), if there are no obvious deformations or damages and no obvious odors, smoke, or fire, proceed with caution.
2) In a warehouse: Evacuate personnel, use mechanical tools by professionals to transport the battery to a safe open space, and contact a MOTOMA service engineer. Leave the

battery stationary for 1 hour and monitor the temperature within ±10°C of room temperature before handling.

3) At the ESS site: Evacuate personnel, close the ESS door, use mechanical tools by professionals to transport the battery to a safe open space, and contact a MOTOMA service engineer. Leave the battery stationary for 1 hour before handling.
4) If a battery drop results in obvious odors, damage, smoke, or fire, immediately evacuate personnel, contact professionals, report the incident, and extinguish the fire with fire-fighting equipment by professionals ensuring safety.
5) After a battery has fallen, it is prohibited to continue use. Please contact our company's service engineer for assessment.

(10) Maintenance and Replacement

1) Before removing components from the cabinet, please ensure that other components on the cabinet are not loose or pose safety hazards.
2) When performing maintenance on the ESS, there must be two or more personnel present at the site.
3) During equipment maintenance, insulated materials should be used to cover nearby energized components.
4) Opening the cabinet is prohibited during adverse weather conditions such as rain, snow, lightning, sandstorms, heavy fog, etc.
5) Before the fans are powered off or stopped, it is prohibited to touch the running fans with fingers, components, screws, tools, or circuit boards.
6) Do not power on the equipment before troubleshooting.
7) When conducting live inspections of the system, pay attention to the danger warning signs on the equipment and avoid standing at the energy storage cabinet door.
8) After de-energizing equipment other than battery packs, wait for 15 minutes to ensure that the equipment is completely de-energized before performing any operations on the equipment.
9) Switches that need to be disconnected for maintenance must have conspicuous labels affixed to them.
10) After replacing power components or making wiring changes to the ESS, manual wire detection and topology recognition must be initiated to prevent abnormal system operation.
11) After completing maintenance and replacement procedures, promptly lock the battery cabinet door and securely store the key.

2 Product Introduction

2.1 Product Definition

PV-ESS Integration (refer to as M50-100)) is a novel ESS that combines photovoltaic, power generation, load management, and energy storage. It goes beyond simple modular stacking, ensuring reliable and efficient electricity consumption for users while contributing to stable power supply for local public grids and enhancing overall power quality. Additionally, it aids in reducing the need for grid expansion and alleviating hardware investments in local power supply systems.

The product system adopts a modular design, with individual modules for Power Conversion System (Hybrid Inverter), photovoltaic capacity, energy storage capacity, energy management system (EMS), fire protection system, air conditioning insulation system, and combustible gas emission system. This modular approach allows each component to operate optimally, leveraging their respective advantages.

The Power Conversion System (Hybrid Inverter) provides a stable and reliable power source for loads. Using advanced technology, it integrates solar power, grid electricity, and energy storage batteries to supply power to loads.

Photovoltaic (PV) collects solar energy and transmits it to the user through Hybrid Inverter. From a long-term perspective, it provides users with reliable clean energy while saving the electricity costs of users.

Energy storage batteries provide users with a continuous and reliable power source, particularly in situations requiring uninterrupted power supply. They also help in smoothing peak power demand and reducing overall power consumption.

The energy management system (EMS), employing advanced smart algorithms, optimizes the sources of electricity for users, enhancing the economic efficiency of power consumption and ensuring reliable power supply.

The fire protection system ensures the safety of the product itself and can be integrated with the user's fire protection system for a comprehensive fire protection solution.

The air conditioning insulation system precisely controls battery temperature, extending battery lifespan and enhancing battery power supply.

The combustible gas emission system releases gases produced during battery charging and discharging outside, reducing gas concentration inside and minimizing the risk of combustion and explosion.

Through a well-designed configuration of Power Conversion System (Hybrid Inverter) , photovoltaic capacity and energy storage capacity, the system can operate in grid connection (leveraging peak and off-peak electricity price differentials) and off-grid (in areas with unreliable or no grid power) status.

2.2 System Composition

This product is a smart micro grid system that intelligently regulates the distribution of multiple sources and loads. The overall design is housed in a comprehensive cabinet containing up to 9 battery packs, a high-voltage box, BMS, EMS, air conditioning system, fire protection system, and one 50 kW Hybrid Inverter.

Figure 2.2-1 PV-ESS Integration M50-100

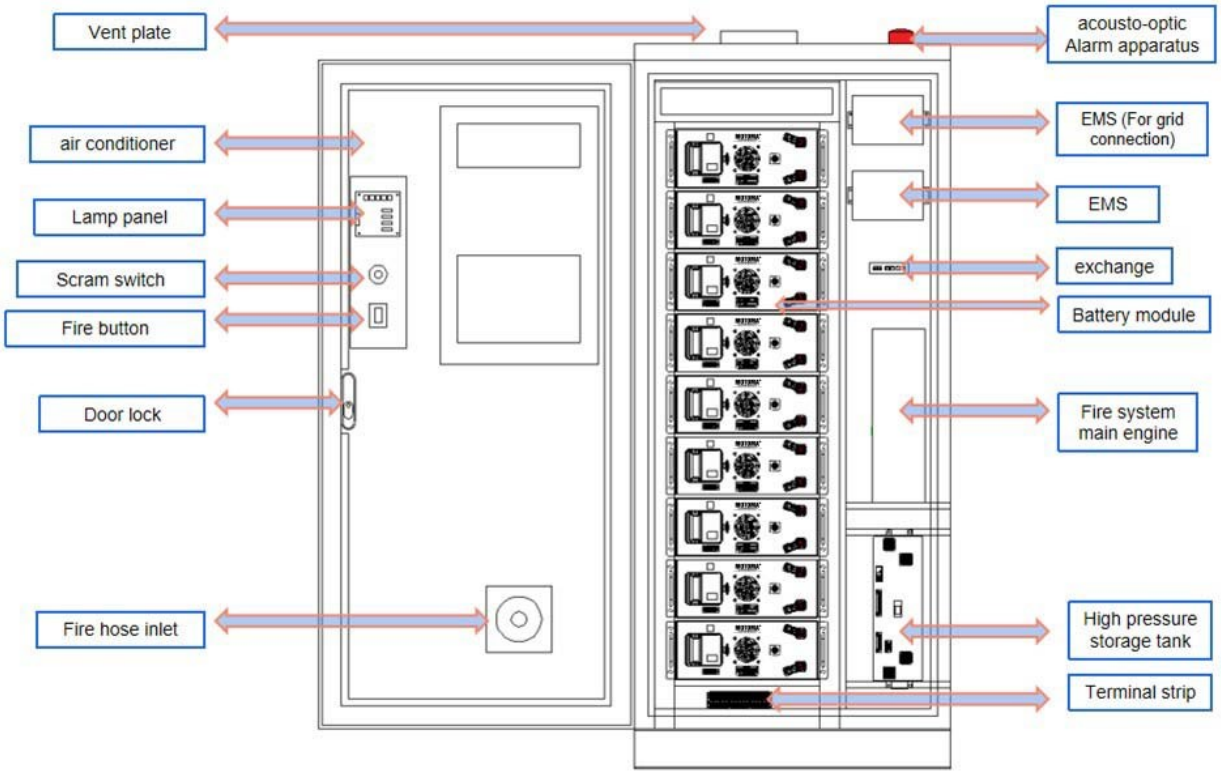


Figure 2.1-2 PV-ESS Integration M50-100 Internal Layout Diagram one

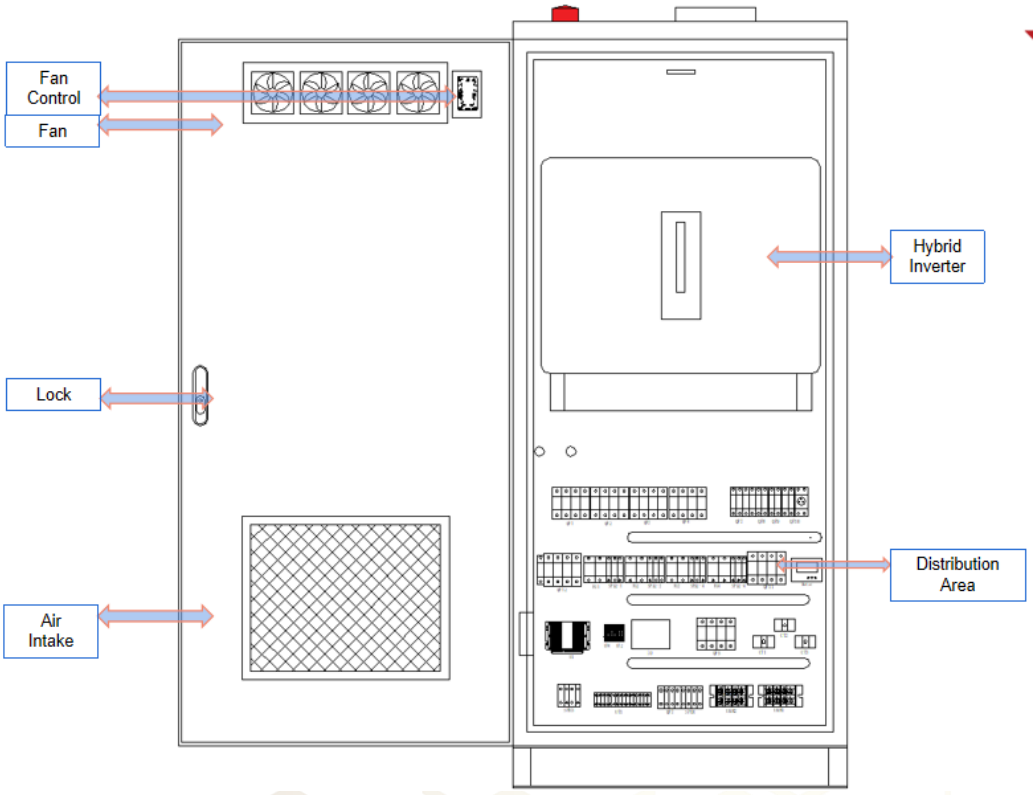


Figure 2.2-3 Internal layout of PV&ESS All-in-one Cabinet

2.3 Battery PACK

The Battery PACK is composed of 24 cells, each with a capacity of 150Ah, along with one fan, one BMU, and structural and electrical components for cell support. The PACK integrates a temperature-controlled air duct, a dedicated channel for combustible gas emission, among other features. The rated capacity of the battery PACK is 11.52 kWh.

Table 2.3-1 Detailed parameters of Battery PACK

No.	Parameters	Product specification	Condition
1	Series and parallel connection modes	1P24S	
2	Rated capacity	11.52kWh	@25℃±2℃, 0.5Ccharge/discharge
3	Rated voltage	76.8V	3.2V*24S
4	Maximum charging voltage	86.4V	3.6V*24S
5	Minimum discharge voltage	67.2V	2.8 V*24S
6	Charge-discharge rate	≤0.5C	
7	Normal operating temperature range (charging)	0~50℃	
8	Normal operating temperature range (discharging)	-20~50℃	
9	Storage temperature range	Within 3 months：0~35℃ Within 1 month：-20~45℃	

10	Optimal storage temperature	25℃	
11	Operating humidity range	5%~95% RH	
12	Altitude	≤2000m	
13	External dimensions	L*W*H（mm） (857.5±2*428±2*176±2)	
14	Weight	87.8±2kg	

Product Dimensional Diagram:

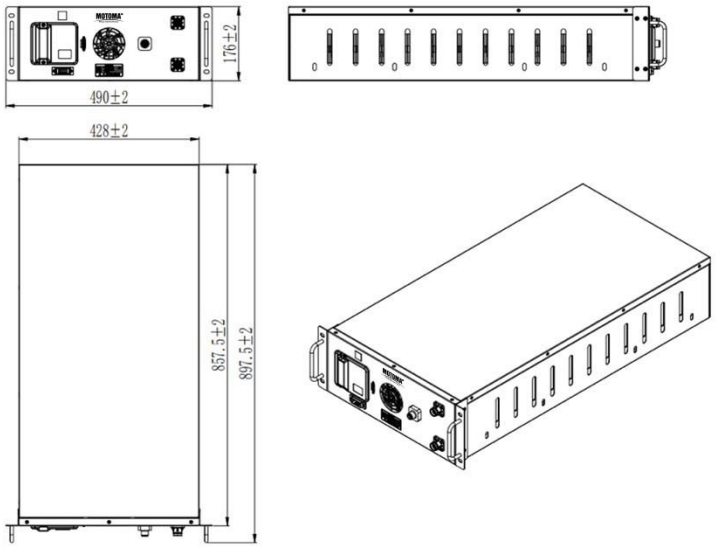


Figure 2.3-1 Battery Pack External Dimension Diagram

When the battery module needs to be stored for an extended period, charge the battery module to a battery level between 15% and 40%. Perform a standard charging and discharging current cycle at least once a month, and activate with a low current (0.1C) every three months.

Environment requirements: temperature 0 ° C ~35 ° C, relative humidity ≤60%, atmospheric pressure 86kPa~106kPa, placed in a dry, ventilated place, avoid contact with

corrosive substances, away from fire and heat sources.

After packaging, the battery module should be transported to prevent severe vibration, impact, or compression during transportation, and protect against exposure to sunlight and rain. Various transportation methods, such as automobiles, trains, ships, and aircraft, can be used.

2.4 High-voltage Tank

The high-voltage tank is the control part of the entire battery pack, responsible for main circuit interruption control and safe management of the charging and discharging processes of the battery clusters to ensure the safe, reliable, and stable operation of the battery. Its interior mainly consists of pre-charge resistor, fuse, circuit breaker, DC contactor, and shell, among other components. The specifications of the high-voltage box are shown in the table below.

Table 2.4-1 Parameters of the High-voltage Tank

No.	Item	Parameters	Remarks
1	Maximum voltage[Vdc]	1000	
3	Rated current[A]	200	
4	Maximum current[A]	250	
5	Temperature range[℃]	-25 ~ +55	
6	Humidity range	0 ~ 95%RH	No

			condensing
7	Communication mode	CAN	
8	Communication protocol	CAN2.0B	
9	Altitude[m]	<3000	>2000m derate
10	Ingress protection	IP20	
11	Weight[kg]	20± 3	

2.5 BMS - Battery Management System

The BMS system of this product adopts a dual-level architecture, primarily designed for real-time monitoring of the battery pack. It can detect individual cell voltage, total voltage, current, temperature, etc., making real-time judgments about the battery's operational status. It uploads battery pack status information and alarm messages, and when necessary, cuts off the battery pack circuit output for protection.

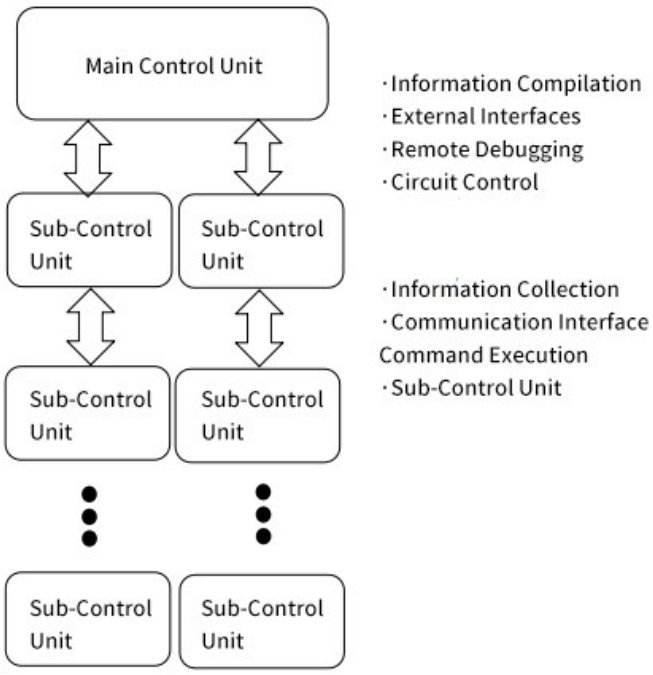


Figure 2.5-1 BMS Dual-Level Architecture Diagram

(1) Cooperative Control Management Unit Overview - Battery Management Unit (BMU)

The BMU is a vital component of the Energy Storage Battery Management System (BMS), playing a decisive role in the safe application and lifespan extension of the energy storage battery pack during collective use. The BMU accurately collects voltage and temperature data from individual cells, enabling real-time monitoring of battery status. Additionally, the BMU features temperature information monitoring, passive cell balancing management, module fan control, and other functions.

(2) Functions and Characteristics of Cooperative Control Unit

1) Battery single-cell voltage function with high accuracy and fast data acquisition, applicable to various battery types, compatible with lithium iron phosphate, lithium manganese oxide, lithium titanium oxide, and ternary batteries.

2) Temperature sampling function: High-precision and reliable data acquisition, supporting sampling of 24 series single-cell batteries and up to 28 external temperature channels.
3) Balancing: Passive balancing with a maximum balancing current of 80mA.
4) isoSPI communication: From-control unit samples information through isoSPI communication and uploads it to the main control, with automatic address allocation. Up to 30 from-control units can be daisy-chained on a single isoSPI communication line, requiring confirmation with technical personnel if exceeding this quantity.
5) 485 communication function: Implements DIO input-output control, applicable for functions like program upgrades.
6) 1 high-side output: Maximum sustained output of 1A for a single high-side switch with internal status detection for hardware self-check.
7) GPIO output and input: 2 open-drain I/O outputs, supporting PWM waves, and two I/O inputs.
8) Rich self-diagnostic functions, meeting functional safety certification requirements.
9) All materials conform to UL-94V0 flame retardancy.
10) Complies with 1500V safety regulations, supporting UL certification for systems exceeding 1500V.

(3) Main Control Management Unit Overview - (BCU)

The main control unit is the control core of the battery management system, detecting battery single-cell voltage, temperature, etc., through communication with the from-control unit. It monitors external characteristics parameters such as total battery pack voltage, charge-discharge current, ground insulation resistance, estimates and monitors internal battery status (capacity, SOC, SOH, etc.) based on appropriate algorithms. On this basis, it manages battery pack charge-discharge, thermal management, insulation detection, single-cell balancing, and fault alarms. It can exchange data with Hybrid Inverter, EMS, human-machine interfaces, etc., through a communication bus and communicate with the BMU through a daisy chain.

(4) Functions and Characteristics of Main Control Unit

1) High-reliability design: Software, hardware, and structural design follow relevant professional standards.
2) High safety: Comprehensive protection functions with multiple redundant protection measures for battery protection under various limit and unexpected conditions.
3) Strong anti-interference ability: Designed considering the high-power and complex wiring electromagnetic environment of ESS. All component selections meet high reliability requirements, and input-output interfaces and communication interfaces use effective isolation and filtering to meet the harsh electromagnetic environment of practical applications.
4) Precise signal acquisition and SOC estimation: Uses internationally renowned high-precision sampling chips, combines strengths from various SOC algorithms in the industry, and features smart learning to ensure accuracy in signal acquisition and SOC estimation.
5) Rich external interfaces: Abundant digital, analog, and communication interfaces, meeting the interface requirements of various projects.
6) Broad expandability: Adopts a daisy chain architecture, and the from-control units can be flexibly configured between 1 and 20 based on the number of battery series.
7) Flexible configuration upgrade, the product can be flexibly configured using upper computer software based on different application requirements, and rapid program upgrades can be achieved through the CAN communication port.
8) All materials conform to UL-94V0 flame retardancy.
9) Rich self-diagnostic functions, meeting functional safety certification requirements.

2.6 EMS - Energy Management System

The Energy Management System (EMS) is the energy dispatching and management center of the PV storage system. Through real-time communication with the BMS (Battery Management System), PV storage inverter, circuit energy meter, manageable load devices, and peripheral devices (air conditioning, fire protection), it collects critical data from all

communication substations. Through data collection, processing, analysis, internal program logic operation, it controls the orderly and robust operation of the ESS. The EMS used in this product possesses powerful data processing capabilities, is compatible with multiple communication protocols, can quickly interface with BMS and Hybrid Inverter available on the market, and supports remote servicing. The specific parameters are shown in the table below.

Table 2.6-1 EMS Parameters

No.	Item	Technical specification
1	Mobile communication	Support China Mobile, China Unicom, China Telecom 4G/3G/2G full Netcom communication module
2	Ethernet interface	Total 2 channels, 10M/100M, standard RJ45 interface
3	RS485 interface	Total 4 channels, electrical isolation, voltage 2500Vrms, 12Pin Phoenix terminal interface
4	CAN bus interface	Total 2 channels, electrical isolation, voltage 2500Vrms, Phoenix terminal interface
5	RS232 interface	Total 1 channel, electrical isolation, 1500Vdc, DB9 female debugging interface
6	USB interface	A total of 1 channel, HOST or OTG (can be selected by dip), Type-A interface, used for USB flash drive read and write or firmware upgrade burning
7	DO signal interface	4 channels, passive signal output, maximum voltage: 30Vdc, maximum current: 3A, relay electrical isolation, voltage 4000Vrms

8	DI signal interface	4 channels, passive switching signal input, electrical isolation, voltage 4000Vrms
9	Operating power source	12±3V/24±3V, maximum current 3A, standard 5.08mm pitch Phoenix terminals
10	Dimension	215× 150× 44（mm）(not including mounting ears)
11	Operating environment temperature	-30～+70℃
12	Storage and transportation environment temperature	-40～+85℃
13	Operating relative humidity	20%～90% no condensing
14	Storage and transportation relative humidity	20%～90% no condensing
15	Altitude	<2000m
16	Mounting mode	The chassis is equipped with mounting ears on both sides, supporting wall-mounted and modular installations.

2.7 Fire Suppression System

This product employs a set of perfluorohexane extinguishing agent with a fire suppression

accuracy at the chamber level. It reserves a PACK-level fire interface, and users can opt for PACK-level fire suppression (if not specified, the default is chamber level). The configuration of the fire suppression system equipment is as follows:

Table 2.7-1 Specifications of the Fire Suppression System for this Product

No.	Equipment	Model	Qty.
1	5kg main assembly of fire control device	EVFH-F-5/2.5 W ZE	1set
2	Solenoid valve		1
3	Quick-insert hose	Ø8 PA	3.5m
4	Composite detector	ZEKB0600	1
5	Safety fence	GS8590-EX.3	1
6	Nozzle	External thread G 3/8	1
7	Sound and light alarm	RF1500A	1
8	Alarm start switch		1

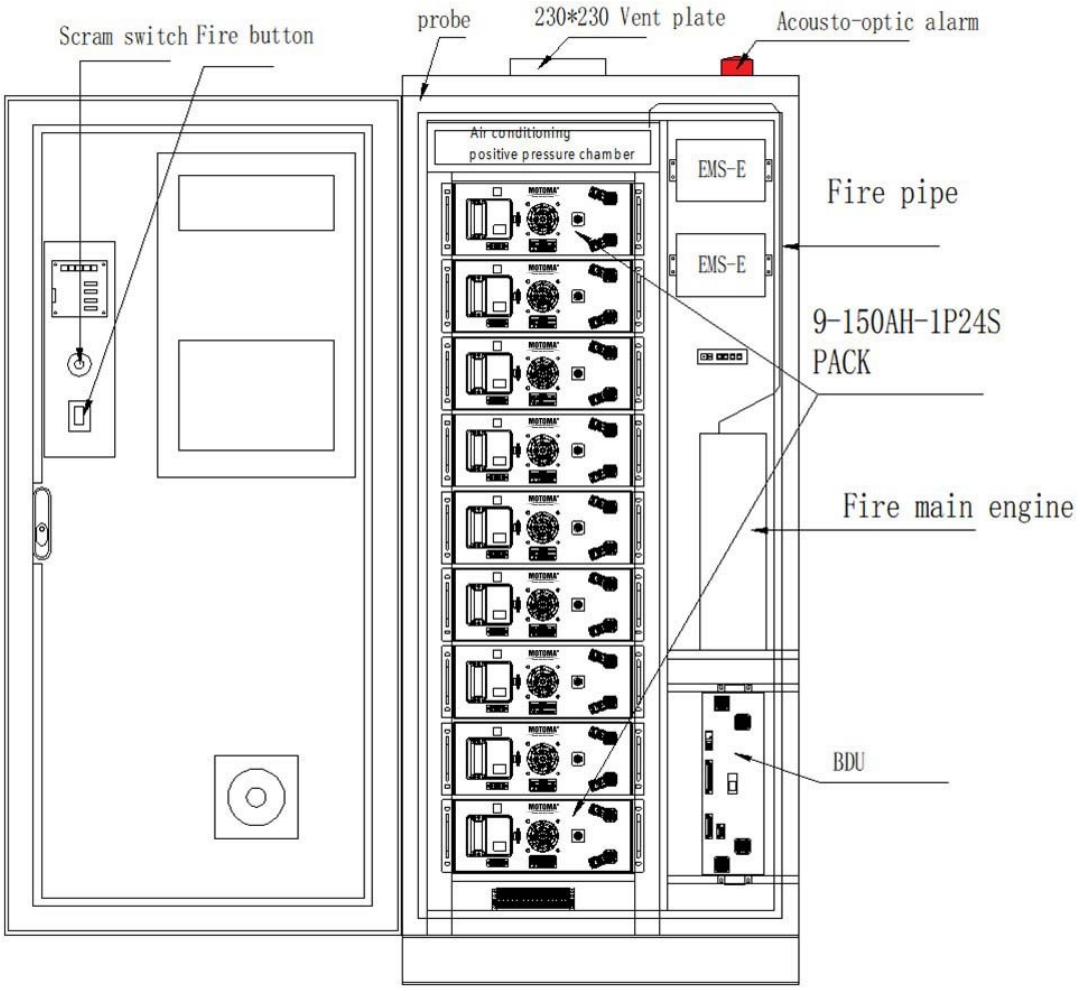


Figure 2.7-1 Fire Suppression System Layout Diagram

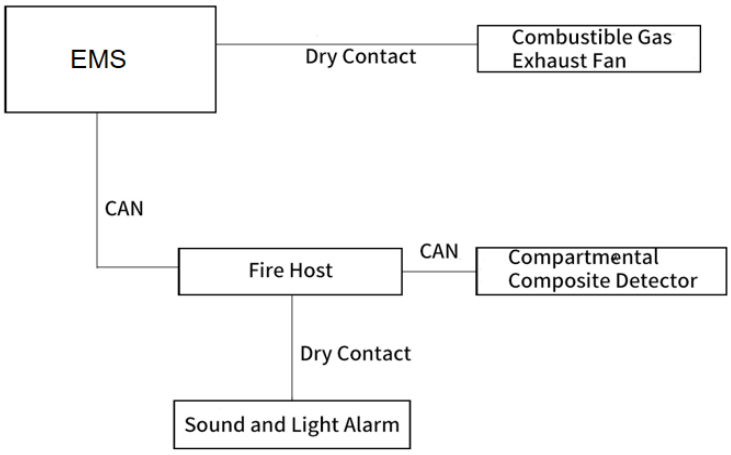


Figure 2.7-2 Communication Topology of the Fire Suppression System

2.8 Hybrid inverter

The hybrid inverter used in this product is a three-phase and off-grid energy storage inverter, which is suitable for the energy management for photovoltaic, battery, power grid.

The electricity from the photovoltaic panels is used for load electricity, and excess electricity can be stored in the battery. When the battery is fully charged, the excess power can be transmitted to the public grid.

When the electricity generated by the photovoltaic is not enough to meet the load demand of user, the battery will discharge to the load. If there is not enough energy stored in the battery, grid will power the load through the system.

The inverter used in this product is an inverter without isolation transformer, and there is no isolation between DC input and AC output.

Table 2.8-1 Hybrid inverter Parameters

Category	Technical specification	Technical parameter
PV input parameter	Maximum input power	50kW
	MPPT voltage range/rated voltage	200-850V/620V
	Starting voltage	200V
	Maximum input current	30A

	Maximum short-circuit current	40A
	MPPT number	4
	Number of MPPT input strings per channel	2
Battery parameter	Operating voltage range	200-800V
	Maximum charge/discharge current	100A
	Maximum charge/discharge power	50kW
	Battery type	Li-ion/Lead-acid
Grid-connected output parameters	Rated output power	50kW
	Maximum apparent power	50kVA
	Rated output voltage	400V，3L/N/PE
	Rated frequency	50Hz/60Hz
	Maximum output current	75A
Off-grid output parameters	Rated voltage	400V，3L/N/PE
	Rated frequency	50Hz/60Hz
	Rated output current	75A
	Rated output power	50kW
	Maximum apparent output power	50kVA
	Off-grid switching time	<20ms
Efficiency	Maximum efficiency	98.40%

	European efficiency	97.50%
Protection	Ac overcurrent protection	Be equipped with
	Earth fault protection	Be equipped with
	Power network monitoring and protection	Be equipped with
	Residual current detection protection	Be equipped with
	Over/under voltage protection	Be equipped with
	ISO protection	Be equipped with
	DC injection monitoring	Be equipped with
	Feedback current monitoring	Be equipped with
	Island protection	Be equipped with
	Load protection	Be equipped with
	Overheat protection	Be equipped with
	Operating temperature range	-25℃~+50℃（>45℃ derate)
	Working altitude	<4000m（>2000m derate)
	Noise index	<40dB
	Topological structure	Transformerless isolation
	Cooling mode	Integrated fan
	Class of protection	IP54
	Relative humidity range	5~90%

	DC connector type	Quick plug terminal
	AC connector type	Terminal
	Man-machine interaction mode	LCD
	Cloud communication	RS485（4G/GPRS could choose）
	BMS communication mode	CAN
	Electric meter communication mode	RS485
	Installation mode	Wall hanging/floor
	Electricity consumption at night	<10W
	Dimension（W*D*H）	800×620×300mm
	Weight	72kg

2.9 Multi-Unit Parallel Solution

This product supports a multi-unit parallel solution, with a maximum support of 3 cabinets in parallel. Customers can choose the number of cabinets according to their actual needs. In a multi-unit parallel configuration, customers need to purchase a mains input distribution box, an EPS load output distribution box, and a general load output distribution box. The mains input distribution box distributes mains power to each cabinet; the EPS load distribution box consolidates the EPS load output of multiple cabinets, then distributes it to various loads; the general load distribution box consolidates the general

load output of multiple cabinets, then distributes it to various loads.

2.10 Electrical Schematic Diagram

The inverter used in this product is a three-phase and off-grid energy storage inverter, which is suitable for the energy management of photovoltaic, battery, load and power grid.

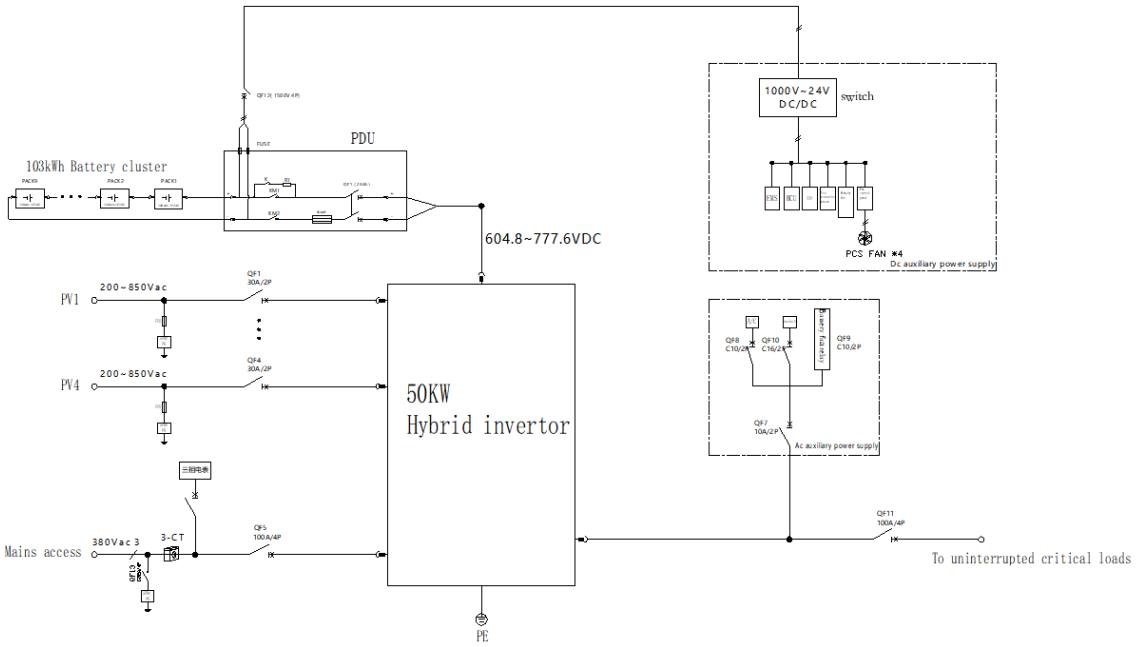


Figure 2.9-1 Electrical schematic diagram of single product

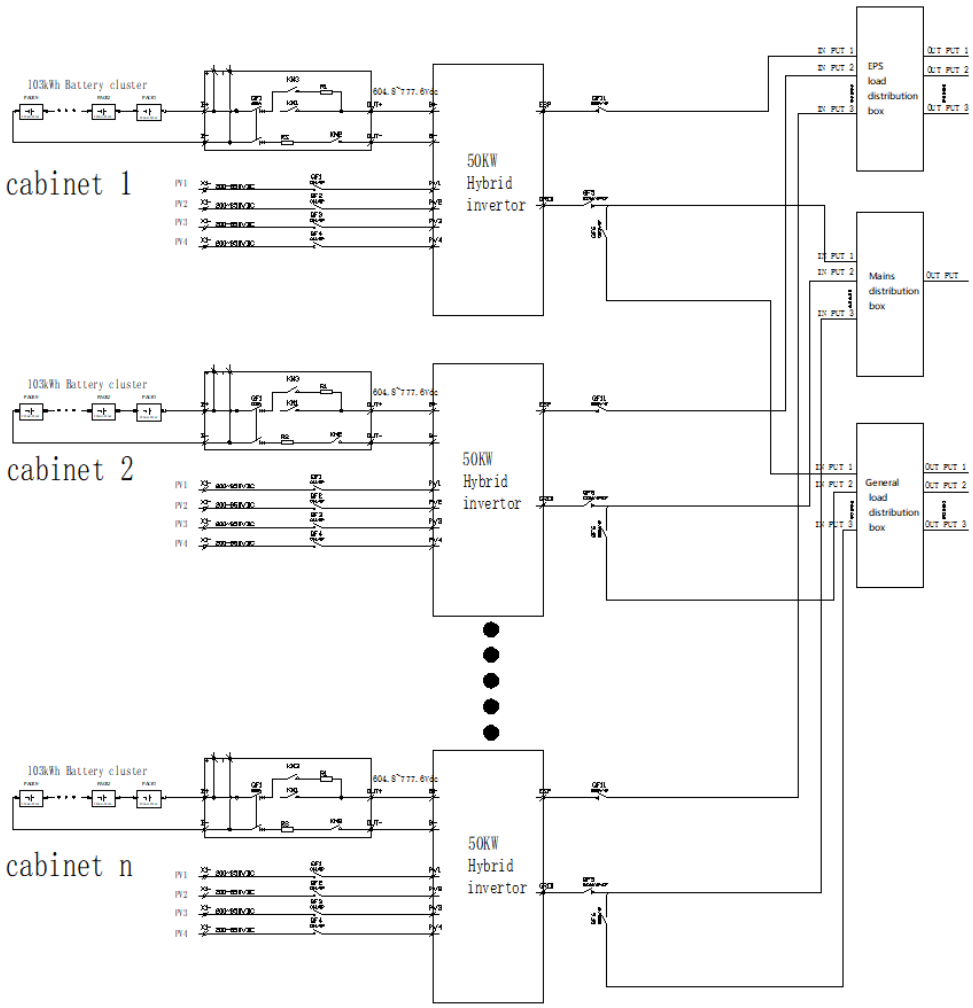


Figure 2.9-2 Electrical schematics of multi-machine parallel products

2.11 Communication Topology

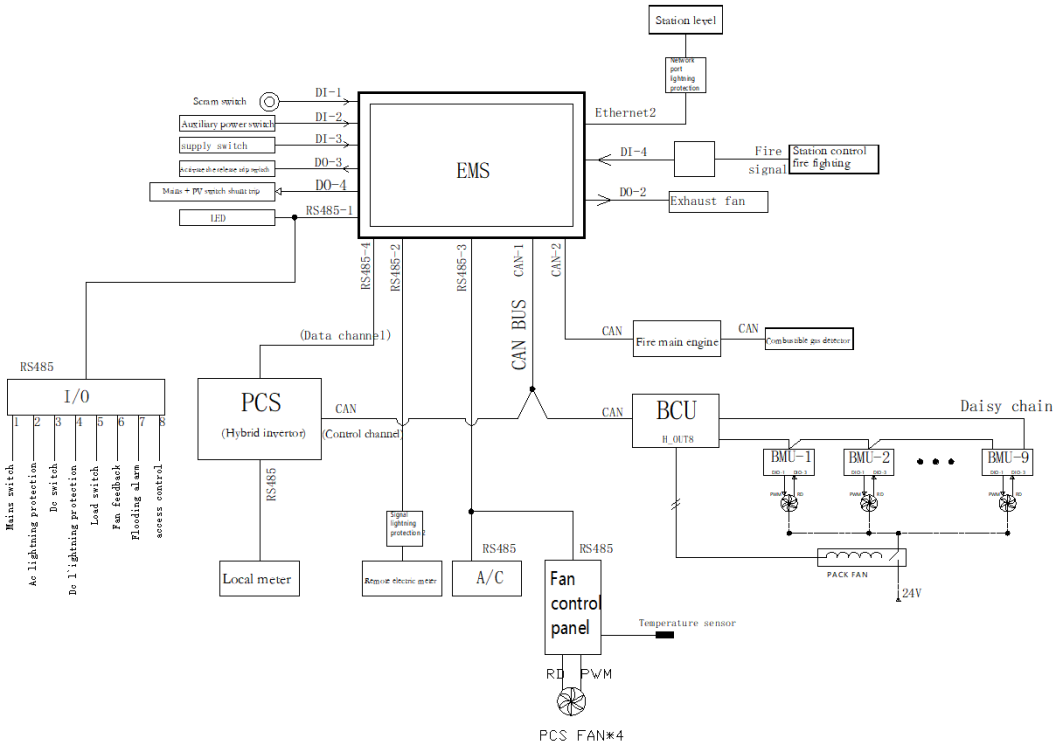


Figure 2.10-1 Communication topology of single products

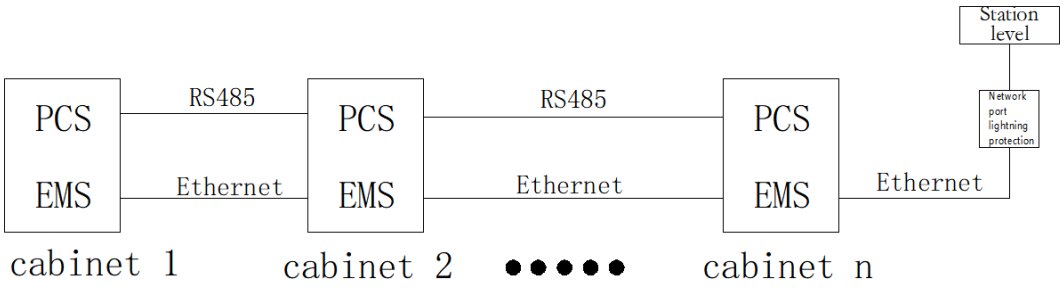


Figure 2.10-2 Multi-machine parallel (grid-connected mode) product communication topology

2.12 Specifications

Table 2.12-1 Specifications for PV-ESS Integration

Product Model	M50-100
Photovoltaic parameter	
Maximum input power	50kW
Starting voltage	200V
PV rated voltage	620Vdc

MPPT Operating voltage range	200-850Vdc
MPPT Number	4
Number of single MPPT input channels	2
Maximum input current (per MPPT)	30A*4
Maximum short circuit current (per MPPT)	40A*4
DC side energy storage parameters	
Nominal energy	103kWh
Nominal voltage	690Vdc
Battery voltage range	605~777 Vdc
Rated charge/discharge current	75A
Maximum charge/discharge current	90A
AC parameter	
Rated output power	50kW
Rated input power	50kW
Maximum output current	75A
Rated voltage (input and output)	3L/N/PE；400V
Off-grid switching time	<20ms
Grid frequency	50Hz/60Hz
Voltage total harmonic distortion	<3%@Rated power & linear load
Mechanical parameter	
Weight	Net weight1500kg、Gross weight with packaging1570kg
Overall dimension	960×1650×2245（W×D×Hmm）
Package size	1030×1720×2400（W×D×Hmm）
Communication mode	RS485，Ethernet，4G
Environmental parameter	
Operating temperature	-20℃～50℃（Derating above 45 ° C）
Storage temperature	-20℃～45℃
Relative humidity	5～95%，No condensation

Altitude	3000m（Derating above 2000 meters）
Class of protection	IP54

3 Product transportation and installation

3.1 Product transportation and storage requirements

This product meets the requirements of vehicle, ship and other transportation. The shipping box must be firm and the outside of the box should conform to the national standard

There should be signs such as "Handle with care" and "moisture-proof". Before packing the product, ensure that the remaining battery power is about 40%-50%, and turn off all switches to check whether the components are firmly installed. Due to the external environment (such as temperature, transportation, storage, etc.), the product specifications are subject to the specific factory date. Avoid: direct rain, snow or falling into water, falling or mechanical impact during transportation.

Do not transport batteries if they leak or bulge. Contact a battery recycling company for handling.

3.2 Installation Environment Requirements

NOTE	The site selection must meet the requirements of GB 51048 Design Code for Electrochemical Energy Storage Power Station, NFPA 855 Standard for the Installation of Stationary ESS and local regulations.

Energy storage systems are only suitable for outdoor scenarios and require outdoor deployment; indoor placement is not supported. The site selection criteria are generally as follows:

1) The installation location should not be in low-lying areas, and the horizontal plane of the installation should be higher than the historical highest water level in that area.

2) The distance from airports, buried waste disposal sites, riverbanks, or dams should be ≥2000m.
3) Choose an open area, ensuring that there are no obstacles within a 10m radius around the site.
4) Maintain a distance of at least 50m from residential areas to avoid noise pollution, stay away from sources of ignition, and prohibit children from entering.
5) Have convenient transportation conditions and a reliable fire suppression system.
6) Meet the immediate space requirements and leave space for expansion based on the needs of the entire lifecycle.
7) Select a well-ventilated location, and do not block ventilation openings or heat dissipation systems during equipment operation to prevent overheating and fire.
8) Installing energy storage systems in areas prone to salt damage can lead to corrosion and potential fire hazards. Do not install energy storage systems outdoors in areas prone to salt damage. Salt-prone areas refer to regions within 2000m of the coastline or areas influenced by sea winds. The extent of the impact of sea winds varies based on meteorological conditions (such as typhoons, seasonal winds) or topography (presence of embankments, hills).

NOTE

1) When the safety clearance at the selected site fails to meet the relevant national standards, it is advisable to reconsider the site selection.
2) If no more suitable site is available, it is recommended to install a fire wall with a fire resistance rating of not less than 3 hours according to DBJT 15-81-2022 "Technical Code for Fire Resistance Design of Building Concrete Structures." The thickness of the fire wall should be ≥200mm, as shown in the table below. Simultaneously, considerations should be given to the requirements of equipment transportation, installation, maintenance, and other spaces.
3) It is recommended to refer to T/CEC 373-2020: The length and height of the fire wall should extend beyond the outline of the prefabricated container by 1 meter each. Also, refer to NFPA 855-2020 "Standard for the Installation of Stationary Energy Storage Systems": When there is an independent fire wall with a 1-hour fire resistance rating, the clearance is allowed to be reduced to 914mm.

Table 3.1-1 Minimum Values of Wall Thickness and Cover Thickness for Longitudinal Reinforcement

Fire Resistance Limit (min)	Wall Thickness (mm) / Cover Thickness of Longitudinal Reinforcement (mm)			
	u=0.35		u=0.7	
	One-sided Fire Exposure	Two-sided Fire Exposure	One-sided Fire Exposure	Two-sided Fire Exposure
60	140/15	140/15	140/15	140/15
90	140/15	140/15	140/20	170/20
120	150/20	160/20	160/30	220/30
180	180/35	200/40	210/45	270/50

Note: u is the ratio of combined axial pressure to the normal temperature axial bearing capacity at the point where the force is applied to the wall.

Site selection should avoid areas not recommended by industry standards and regulations, including but not limited to the following locations, regions, and places:

1) Areas with strong vibration, strong noise sources, and strong electromagnetic field interference.
2) Places with dust, oil smoke, harmful gases, corrosive gases, etc.
3) Places for production or storage of corrosive, flammable, or explosive materials.
4) Areas with existing underground facilities.
5) Areas with poor geological conditions such as rubber soil, soft soil layers, prone to water accumulation, and sinking ground.
6) Areas with seismic faults and earthquake intensities greater than nine degrees.
7) Areas directly threatened by mudslides, landslides, quicksand, and sinkholes.
8) Within the boundaries of mining subsidence (faulting) zones.
9) Within the blast danger zone.
10) Areas that may be submerged after dam or dike failure.
11) Important sanitary protection zones for water supply sources.
12) Historical and cultural heritage protection zones.

13) Crowded places, high-rise buildings, and underground structures.

3.3 Installation Space Requirements

To ensure the normal maintenance of equipment inside the cabinet and facilitate the normal movement of tools, it is recommended to reserve sufficient space around the cabinet installation location. The minimum size of the reserved space should not be less than the minimum size shown in the figures below:

1) For a single cabinet, reserve a minimum installation spacing of ≥1500mm on the side with the door open and ≥1000mm on the side without the door open. For multiple cabinets, consider the later maintenance of battery packs, and the minimum reserved space should not be less than the minimum size shown in the figures below.
2) A maintenance aisle with a net width of ≥1000mm should be set around the cabinet or on one side.
3) It is recommended to use a fence to isolate and protect the equipment area, with a height of 1.5m.
4) The spacing design above only considers installation and operation requirements. The final spacing must meet local fire requirements.
5)

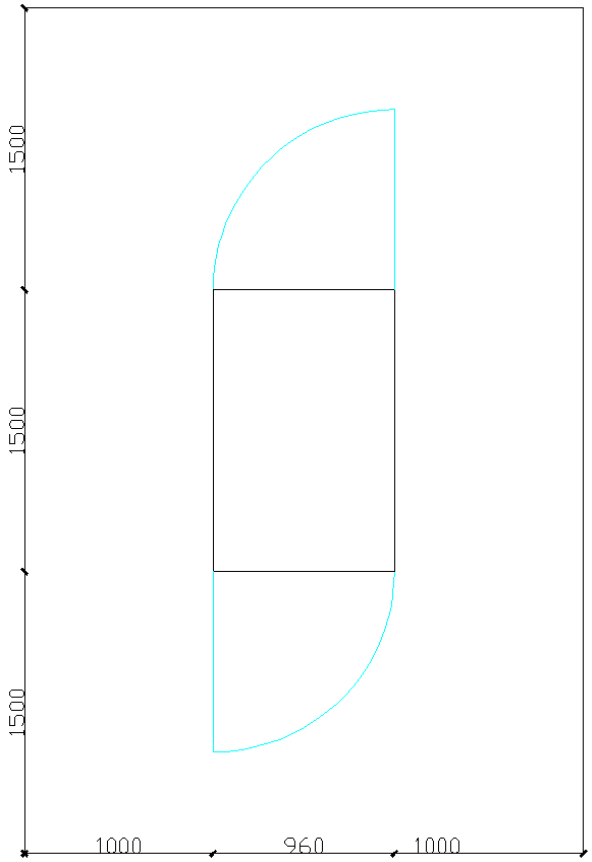


Figure 3.2-1 Schematic Diagram of Single Cabinet Installation Space Requirements（unit: mm）

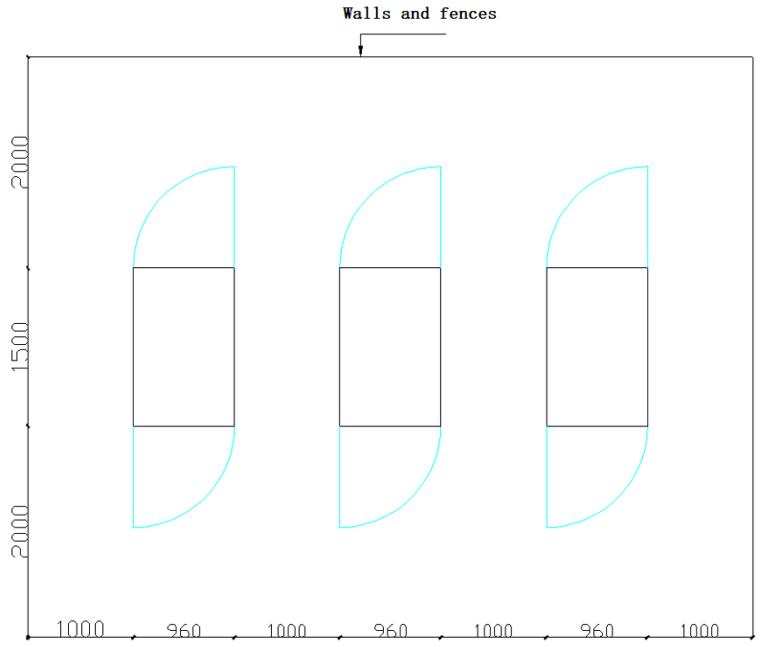


Figure 3.2-2: Schematic Diagram of Multiple Cabinets Installed in Parallel Space Requirements

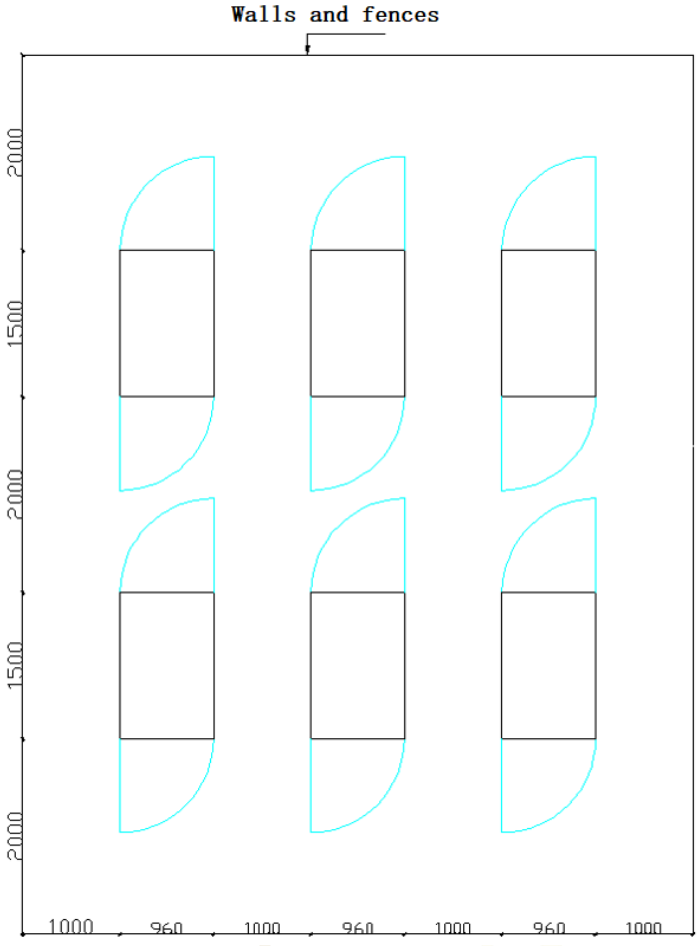


Figure 3.2-3: Schematic Diagram of Multiple Cabinets Arranged in Double Rows Back-to-Back Installation Space Requirements

3.4 Cabinet Installation

 WARNING	The cabinet is relatively heavy, and before constructing the foundation, the conditions of the installation site (mainly referring to geological conditions and environmental climate conditions, etc.) should be carefully examined. Only on this basis can the design and construction of the foundation be started.

The storage location of the cabinet needs to be prepared by a professional construction team in advance. Sufficient space should be left around it for installation and maintenance. If the power lines run through the bottom cable trench, foundation preparation should be done in advance to meet the requirements of lightning protection, waterproofing, rodent prevention, and ventilation. The foundation for cabinet installation must be designed and constructed according to certain standards to meet the requirements of mechanical support, cable routing, and later maintenance and inspection. The following requirements must be met during foundation construction:

1) The soil at the cabinet installation site needs to have a certain degree of compactness. It is recommended that the relative compaction of the soil at the installation site is ≥ 98%. If the soil is loose, measures must be taken to ensure the stability of the foundation.
2) The bottom of the cabinet foundation pit must be compacted and filled to provide sufficient and effective support for the cabinet.
3) The cabinet foundation should be constructed according to the foundation drawing provided by the supplier or the foundation drawing confirmed by our company. The surface tolerance of the foundation should be ±5mm.
4) Elevate the base of the cabinet to prevent rainwater from eroding the base and interior of the battery cabinet.
5) The cross-sectional area and height of the foundation should meet the requirements.

6) Drainage measures should be built according to local geological conditions.
7) Build a sufficiently sized and high-quality cement foundation. The height of the foundation should be determined by the construction party based on the site geology.
8) Consider cable routing during foundation construction.
9) Construct a maintenance platform around the foundation for convenient maintenance in the future.
10) Based on the location and size of cable entry and exit points inside the cabinet, sufficient space should be reserved for AC/DC cable trays during foundation construction, and cable conduits should be embedded in advance.
11) Determine the specifications and quantity of sleeve pipes based on the cable model and the number of incoming and outgoing lines.
12) Build a drainage system to prevent the cabinet base or internal equipment from being immersed in water during heavy rainfall or abundant precipitation.
13) Both ends of all embedded pipes should be temporarily sealed to prevent impurities from entering; otherwise, it will be inconvenient for later wiring.
14) After connecting all cables, seal the cable entry and exit points and joints with fire-resistant mud or other suitable materials to prevent rodents from entering.

The recommended cabinet installation foundation is shown in the below:

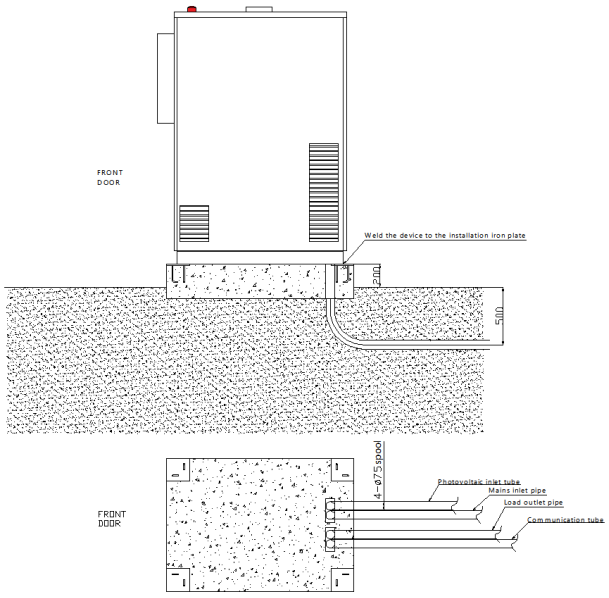
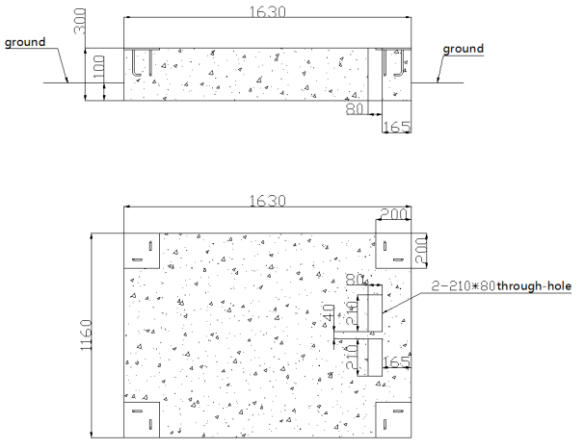


Figure 3.3-1 Equipment foundation drawing (unit: mm)



Basics

Figure 3.3-2 Equipment foundation drawing (unit: mm)

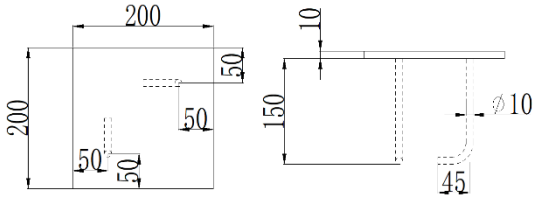


Figure 3.3-3 Equipment foundation drawing (unit: mm)

Basic manufacturing instructions

1) The site is compacted and smooth

2) Cement base material C25

3) The part below the foundation ground shall not be less than 100mm

4) Before cementing, bury wire pipe (4*ø75mm) with a depth greater than 500mm

5) When the cement is poured, the installation iron plate should be embedded according to the dimensions of the drawing

6) Pay attention to the position and size of pre-opening holes when cement is poured

7) After the cement pouring, the equipment should be maintained for more than 7 days before installation

Mounting plate instructions

) The mounting iron plate is Q235

2) Iron plate size 200*200*10mm

3) Weld two ø10 steel bars to the bottom of the iron plate, as shown in the figure above

3.5 Photovoltaic panel installation

User must inquire professionals to install the photovoltaic panel according to the user manual. Please pay attention to the following during installation:

1) When photovoltaic panels are exposed to sunlight, they generate electricity and can cause fatal voltages and electric shocks.

2) The inverter is a multi-power system, and the operator must wear appropriate personal protective equipment: safety helmet, insulated wire and gloves etc.

3) The operator must use measuring equipment to ensure that there is no voltage in the cable before touching the output cable of the photovoltaic panel.

4) It is strictly prohibited to install photovoltaic modules in rainy, snowy and windy weather conditions.

5) It is strictly prohibited to handle photovoltaic modules by one person, it must be carried by two people, and it should be handled lightly to avoid large vibration of the components, so as not to cause hidden cracks of photovoltaic modules.

6) Photovoltaic modules of the same size and specifications can be connected in series.

7) Do not use when the photovoltaic module is damaged.

8) The unpacked battery components at the construction site should be placed face up and flat, and the bottom should be padded with wooden pallets and panel packaging materials. It is strictly prohibited to put them upright, tilted or suspended.

9) It is strictly prohibited to expose the back of the component directly to sunlight.

10) During the construction process, it is strictly prohibited to step on the panels, to avoid the barbaric construction behavior of component installation to the maximum extent, the design unit should fully consider the reserved channel for component installation, and should not blindly affect the high quality of the construction of the power station in order to pursue the installed capacity.

11) It is strictly prohibited to squeeze or use sharp objects to knock, collide, scratch any part of the photovoltaic module.

12) Do not place or touch the installation tool on the photovoltaic module at will.

13) Do not touch the metal parts of the photovoltaic module.

14) It is strictly prohibited to connect the positive and negative plugs of the same photovoltaic module connection line.

15) It is strictly prohibited to lift the component by lifting the junction box or connecting piece.

The assembly of photovoltaic modules and accessories should be prepared with the following tools:

1) The fasteners of the photovoltaic module bracket must meet the requirements of national standards, and the hot-dip galvanized parts are used to ensure their life and anti-corrosion fastening purposes. The number, specifications, models and varieties of bolts, nuts, flat washers and spring washers should be complete, with good performance and meet the design requirements. After each bolt is tightened, the length of the exposed part of the bolt should be 2/3 of the diameter of the bolt.

2) Tools: socket wrench, open wrench, box wrench, hex wrench, level, north pointer, steel measuring tape, torque wrench, wire rope, horizontal pipe, horse stool, step ladder, etc. must meet the requirements of engineering construction and quality inspection.

Wiring between components shall meet the following requirements:

1) The number and path of photovoltaic module connections should meet the design requirements;

2) The indirect plug-in of the photovoltaic module should be firmly connected;

3) The connection between the external cable and the plug-in should be tin lined;

4) The open circuit voltage and short circuit current of the photovoltaic module string should be tested after the series connection of the photovoltaic module;

5) The connection lines between photovoltaic modules can be fixed by brackets, and fixed, and should be neat and beautiful;

6) The positive and negative of the same group of photovoltaic modules or photovoltaic modules should not be short-circuited;

7) Do not touch the metal parts of the photovoltaic module string;

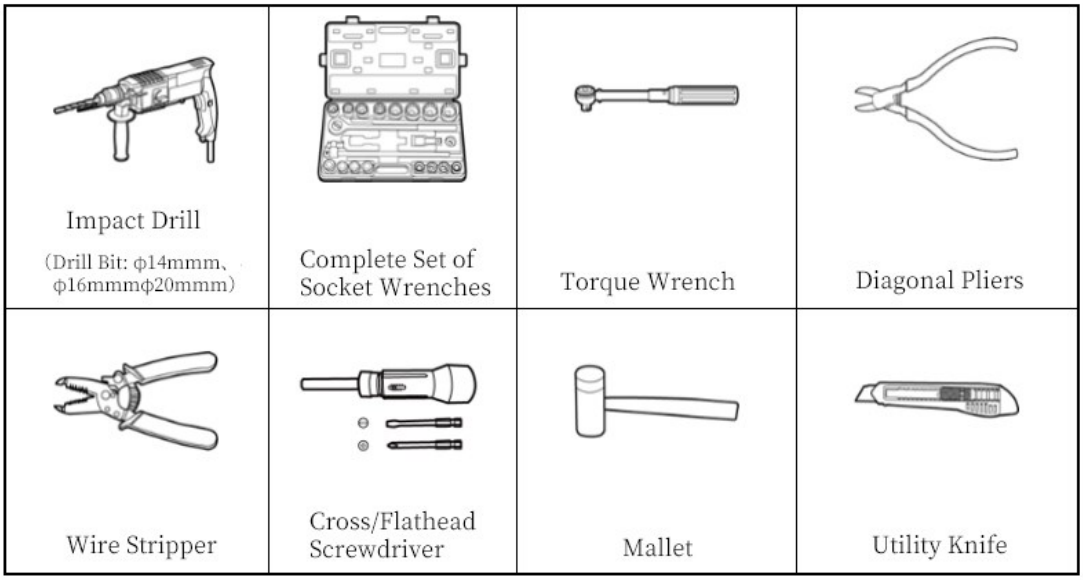
8) It is strictly prohibited to connect photovoltaic modules in the rain.

3.6 Pre-Installation Inspection

(1) Tool Preparation

Before installing equipment, the tools needed, including installation tools and personal protective tools, must be prepared, as shown below.

NOTE	The tools used, including socket wrenches, torque wrenches, screwdrivers, and other handles, need to undergo insulation protection treatment or be used with insulated tools.



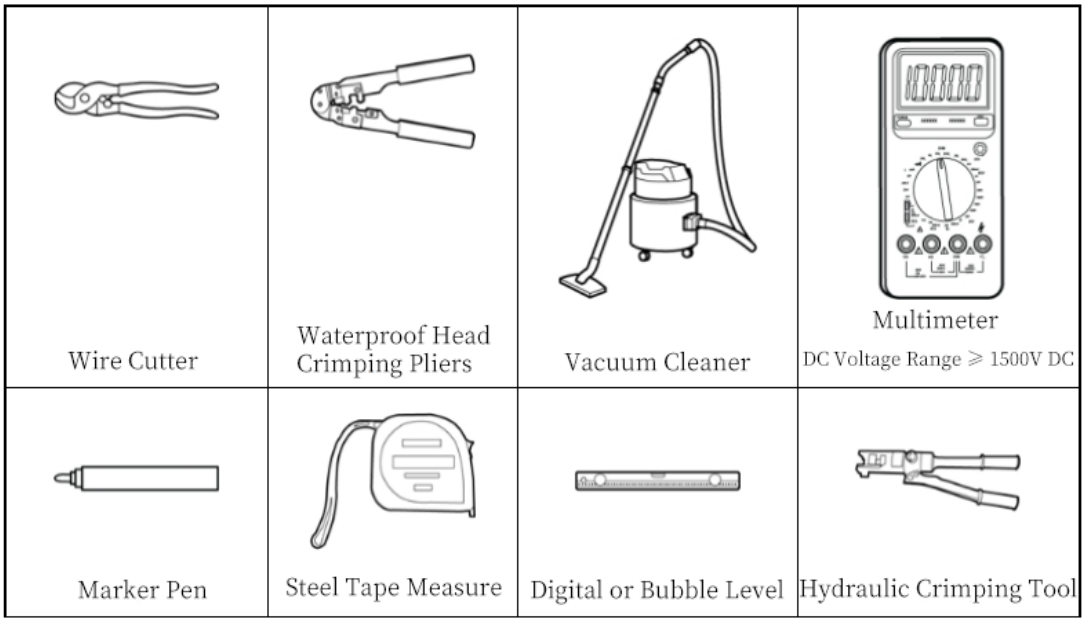


Figure 3.5-1 Common Installation Tools Schematic

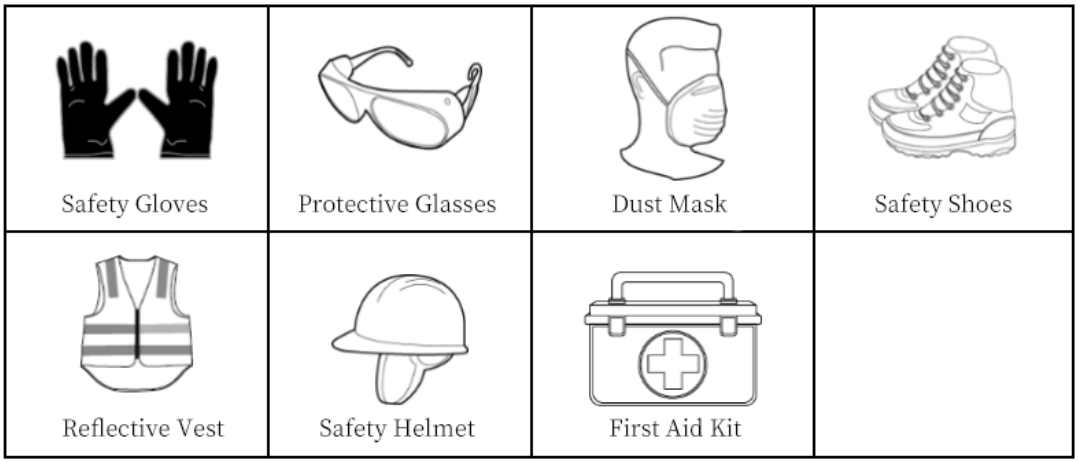


Figure3.5-2 Personal Protective Equipment Schematic

(2) Installation Environment Inspection

Inspect according to site requirements, and proceed with the installation only if the requirements are met. The company will not be responsible for any losses caused by forced installation that does not meet the requirements.

NOTE

Marking the Safety Zone: Use red construction markings to circle the safety area. Clear obstacles within the safety zone, and prominently display construction and safety warning signs.

4.Electrical Connection

4.1 Overview of Electrical Connection

The inverter used in this product integrates the functions of energy storage and photovoltaic grid-connected connection. This product provides mains access port, photovoltaic DC input port, ground cable connection and communication line connection port when multiple machines are in parallel. The system application diagram is shown below.

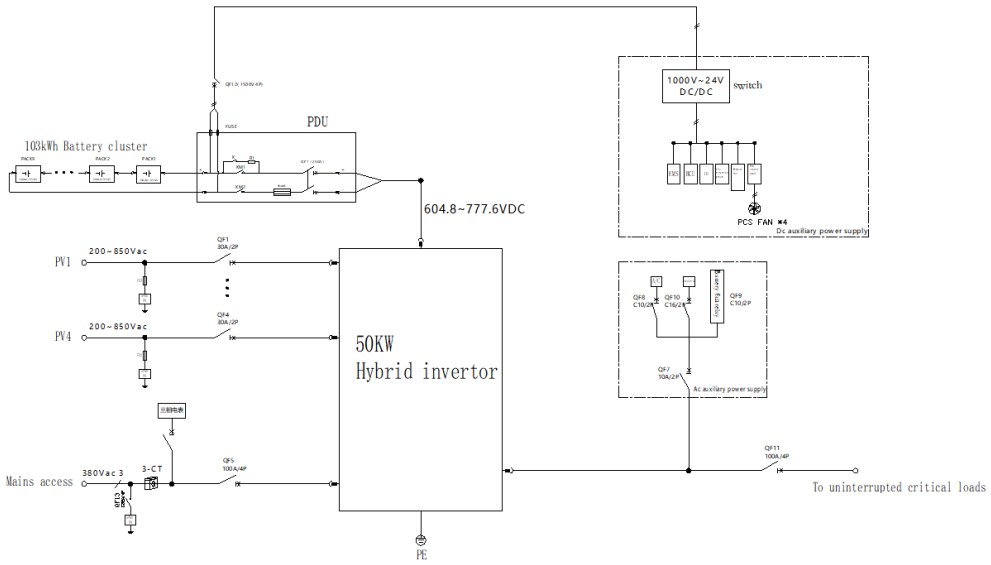


Figure4.1-1 Electrical Main Wiring Diagram

4.2 Grounding Wire Connection

WARNING

Prohibit the installation of fuses, switches, etc., on the protective ground wire.

NOTE

Grounding complies with local electrical safety regulations.

The product cabinet is equipped with one grounding point. After the cabinet is installed, install the grounding lead wire. It is recommended to use 16-35mm² single-core outdoor copper core yellow-green wire, with DT/OT terminals. Secure one end of the yellow-green wire tightly to the cabinet grounding bus with an M6 screw, and connect the other end to the grounding angle iron. The grounding angle iron is recommended to be an ∠50×5×2500mm hot-dip galvanized grounding iron. Before connecting, drive the grounding iron vertically into the ground. The cabinet requires no less than one grounding point. The grounding schematic is shown in the figure below:

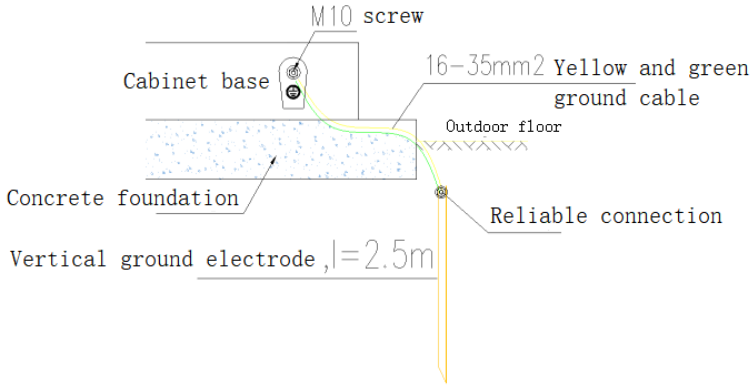


Figure 4.2-1 Cabinet grounding diagram

4.3 AC Line Connection

NOTE

1) When connecting AC lines, ensure that the cables are not damaged or broken, and ensure that the N line connection is reliable to avoid damage to AC equipment within the system.
2) After connecting AC lines, ensure that the terminals are fully aligned and in good contact, and the AC input lines are vertical.

This product offers both general load and critical load interfaces to meet the needs of different load requirements. Loads can be connected below the QF11 switch. Before wiring, it is important to disconnect the AC circuit breakers QF5 and QF11. The utility power input terminals are located on the right terminal bar of the distribution panel. It is recommended to use 25mm² copper core cables for both utility and load lines, or recalculate based on the ambient temperature at the installation site, cable cooling conditions, and cable length. For more details, please refer to the figure below.

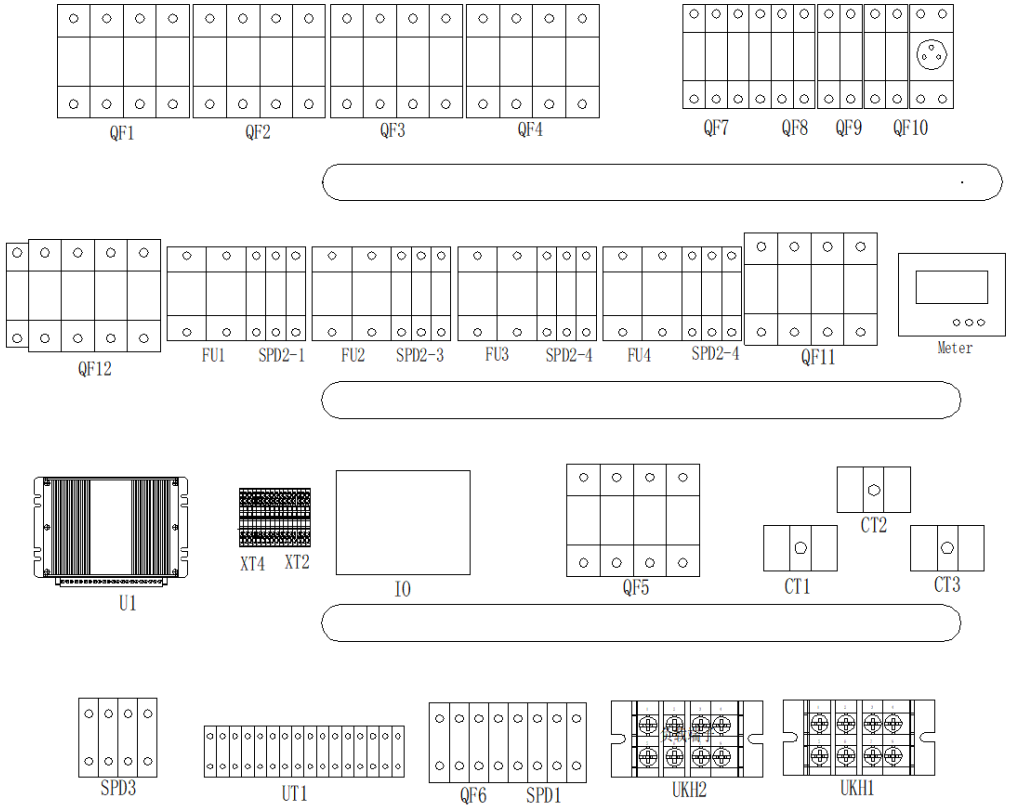


Figure 4.3-1 Distribution Panel Layout Diagram

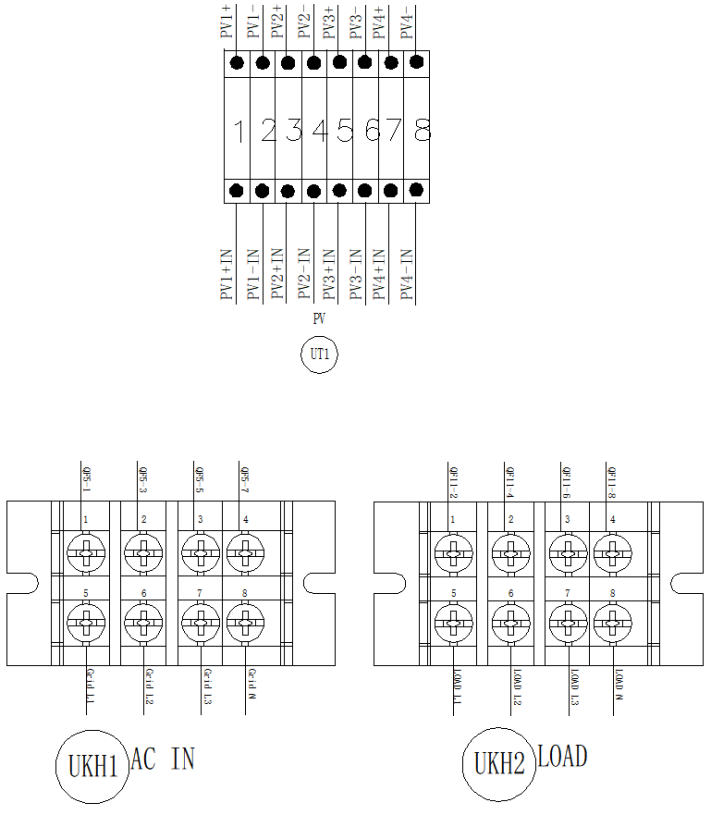


Figure 4.3-2 Distribution Panel Terminal Row Definition Diagram

4.4 Photovoltaic power generation access

 DANGER	1) Once the photovoltaic array is exposed to sunlight, it will produce deadly high pressure, when the inverter is connected to the photovoltaic, please ensure that the photovoltaic array is well insulated. 2) Ensure that the maximum voltage of each PV string is always less than 850 V. 3) Each input of the inverter operates independently, and each has an independent MPPT, so the photovoltaic group structure of each photovoltaic input can be different from that of another photovoltaic input, including panel type, number of cells, inclination etc.

Before photovoltaic power generation is connected, the following points should be noted:

1) In order to make full use of the input power of the photovoltaic panel, the photovoltaic series of the same way should be consistent, including the same model, the same number of panels, the same inclination, the same azimuth.

2) Before wiring, pay attention to disconnect the circuit breaker on the front panel of the DC distribution box.

3) Before wiring, it should be noted that the positive and negative terminals should not be reversed.

The PV access point of this product is located at terminals 1-8 of the UT1 terminal block on the left side of the power distribution panel. It can provide four PV connections. Note the correct sequence of cable connections. The photovoltaic input line is recommended to use 4-6mm² photovoltaic cables.

 NOTE	In grid-connected mode, when the user's load power is less than the battery discharge or photovoltaic power generation power of the product, if no counter-current measures are taken, the excess power of the product will be reverted to the public power grid, which may cause

instability or even collapse of the power grid system.
Therefore, this product needs counter-current protection.

4.5 Anti-backflow Meter Connection

The principle of anti-backflow is as follows: the user's normal line power flows from the public power grid to the user. When the user load power is less than the discharge power of the battery or the photovoltaic power generation power of this product, the user's line power flows from the user to the public power grid, which is called reverse power. During the discharge process of this product, due to fluctuations in load power, changes in electricity usage, and other reasons, energy backflow may also occur. The anti-backflow solution can effectively avoid this problem and ensure the safe and efficient operation of the energy storage system. Based on the specific usage scenarios of this product, this manual recommends several anti-backflow solutions:

(1) Anti-backflow measures for a single transformer

When this product is connected to the low-voltage 400VAC side of the user's transformer, the energy storage system charges directly from the low-voltage busbar during charging and supplies power to the load directly through the low-voltage busbar during discharge. The sum of the charging power of the energy storage system and the load power must not exceed the corresponding transformer capacity or maximum demand value during charging, and the energy storage system is not allowed to discharge to the corresponding high-voltage side of the transformer during discharge. The schematic diagram is shown in Figure 4.5-1

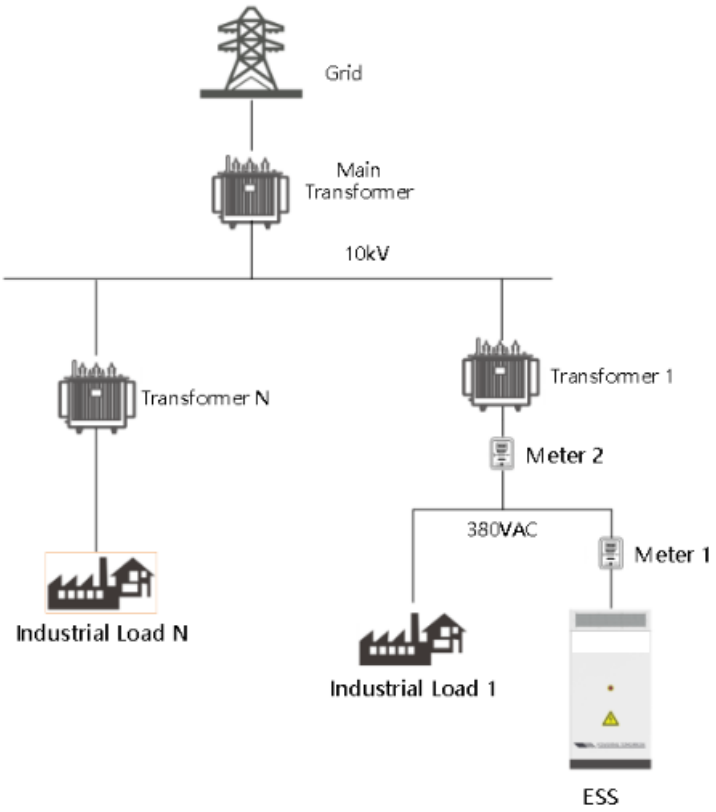


Figure 4.5-1 Schematic Diagram of The Product Connected to a Single Transformer

Anti-backflow system configuration scheme:

① Use Meter 1 (included in this product) on the energy storage system side for bidirectional metering of energy storage system charging and discharging; ② Add Meter 2 on the low-voltage side of Transformer 1 for anti-backflow and overload metering detection; ③ When Meter 2 detects current flowing to Transformer 1, Meter 2 will feedback the detected grid access point data to the EMS (Energy Management System) of this product. The EMS responds quickly to dynamically adjust the output power of the inverter, thereby achieving zero power grid access. ④ If there are many types of loads and frequent fluctuations, for more accurate metering and control, a separate metering meter can also be added on the load side, and the energy storage discharge power can be adjusted in real-time based on the power of the load side meter.

2) Anti-backflow measures on the low-voltage side of multiple transformers

Some users' 10kV busbars are connected to multiple transformers with different capacities. If this product is installed under one of the transformers, during certain periods, the discharge of this product can be sent to the 10kV busbar of the corresponding transformer and then sent to the loads under other transformers for use. However, the energy storage

system is not allowed to discharge to the high-voltage side of the main transformer. This situation is more common in some larger industrial parks, where the capacities of transformers in the park vary. The energy storage system is often only connected to the transformer with relatively large electricity loads. When the electricity consumption under this transformer is low, the energy storage system can boost the voltage to the 10kV busbar through this transformer and then step down through other transformers in the park to supply electricity to the loads under this transformer. The schematic diagram is shown in Figure4.5-2:

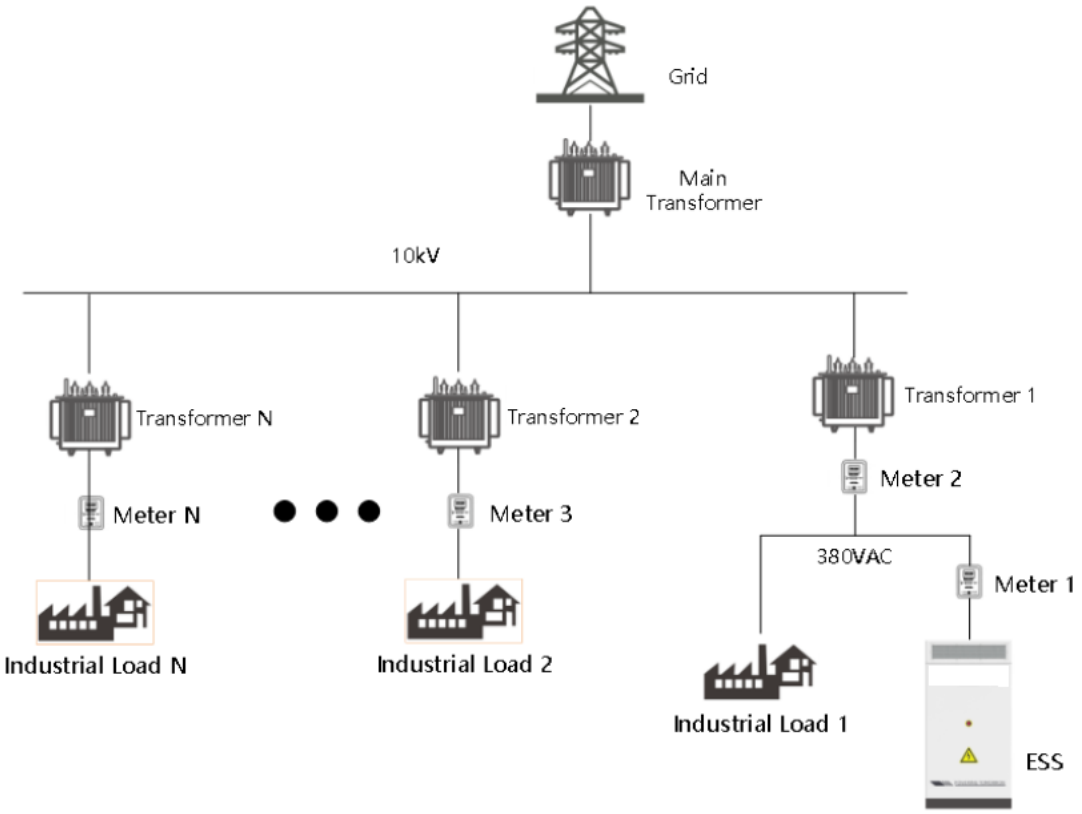


Figure 4.5-2 Schematic Diagram of Multiple Transformer Park Connection for This Product - Part One

System Configuration Scheme:

1) Use Meter 1 (included with this product) on the energy storage system side for bidirectional metering of energy storage system charging and discharging.
2) Add Meter 2 on the low-voltage side of Transformer 1 for overload protection of this transformer.
3) Add meters to other transformers.
4) Meters 2 to N calculate the sum for anti-backflow purposes.

Note:

1) If multiple subsystems are connected to the low-voltage side of different transformers, they can all refer to the connection method shown for Transformer 1 in the diagram.
2) This scheme involves the addition of multiple meters, which may pose difficulties in construction due to issues such as wiring and control 485 communication line length.

（2）Anti-backflow measures on the high-voltage side of multiple transformers

To address the issues identified in scheme 2, anti-backflow measures can be implemented on the high-voltage side of the park. The schematic diagram is shown in Figure 4.5-3:

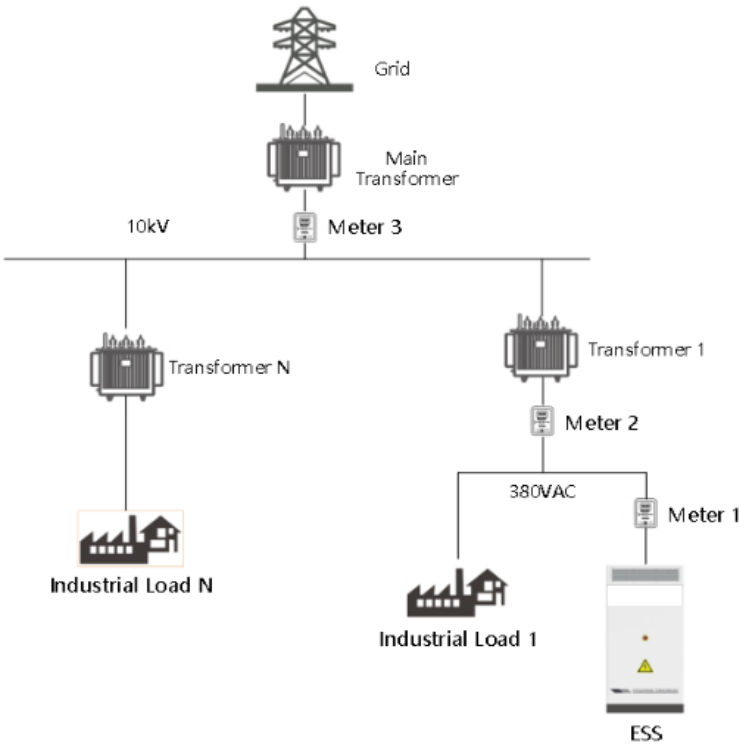


Figure 4.5-3 Schematic Diagram of Multiple Transformer Park Connection for this Product - Part Two

System Configuration Scheme:

1) Use Meter 1 (included with this product) on the energy storage system side for bidirectional metering of energy storage system charging and discharging.

2) Add Meter 2 on the low-voltage side of Transformer 1 for overload protection of this transformer.
3) Add high-voltage Meter 3 on the primary transformer's 10kV side for high-voltage anti-backflow detection.
4) Meter 3 should be connected on the high-voltage side, which may require a significant power-off area for wiring and specialized personnel for installation. Additionally, PT (potential transformer) configuration is required.

Due to the large difference in electricity consumption between different users, it is difficult to unify the anti-countercurrent detection meter of this product. Its supporting transformer and the RS485 communication line between the meter and this product need to be purchased by the customer. The electric meter is recommended to use Ankore DTSD1352 or Yada DTSD3366D multifunctional electric meter. It is recommended to use the port type 0.66-K current transformer. The transformer for the high voltage side countercurrent prevention scheme should be selected according to the user's power distribution device.

3) This product anti-countercurrent wiring mode

After installing the anti-current meter and transformer, the customer needs to use an RS485 cable to lead the meter signal to the cabinet of this product for communication with the EMS. The customer can connect the cabinet end of the RS485 cable to the signal lightning protection terminal at the bottom, where 485+ is connected to terminal 3 and 485- is connected to terminal 4. Signal lightning protection is below IO.

4.6 Multi-Unit Parallel Connection

1) AC access

If multiple cabinets are used, the AC mains of each cabinet are connected. For details about how to connect load lines, see 4.3 Connecting a Single Cabinet. When multiple cabinets are installed in the same place, a single mains distribution box can be used. The power distribution box imports one power supply from the customer's low-voltage distribution network and distributes it to each optical storage cabinet. Customers can also set the general load distribution box and EPS load distribution box according to their own needs, in order to better distribute power.

2) Photovoltaic access

For details, see 4.4 Connecting a Single Cabinet.

3) Communication line wiring

When multiple Hybrid Inverter are connected in parallel, the Hybrid Inverter of each cabinet must be connected in series through RS485 communication, and the EMS must be connected in series through Ethernet communication. The RS485 communication of the Hybrid Inverter is connected to the PARA communication wiring terminal of the Hybrid Inverter. The Ethernet RJ45 cable of the EMS is connected to the lightning protection lower end of the network port in the electrical cabin of the optical storage cabinet.

No.	Color	Meter Side	Battery Side
1	Orange & White	/	RS485_A3
2	Orange	/	RS485_B3
3	Green & White	RS485_B2	/
4	Blue	/	CANH_B
5	Blue & White	/	CANL_B
6	Green	RS485_A2	/
7	Brown & White	RS485_B2	/
8	Brown	RS485_A2	/

Figure 4.6-1 Hybrid Inverter Communication terminal definition diagram

5 System power-on

5.1 Pre-Power-On Inspection

1）The energy storage system can only be put into operation after confirmation by a qualified professional.

2）For energy storage systems that have been out of service for a long time, a comprehensive and meticulous inspection of the equipment must be conducted before powering on. The system can only be powered on after ensuring that all indicators meet the requirements

1）Check if the wiring is correct.

2）The protective covers inside the equipment are securely installed.

3）The emergency stop button is in the released state.

4）Check to ensure there are no grounding faults.

5）Use a multimeter to measure the AC and DC side voltages to ensure they meet the startup conditions and there is no risk of overvoltage.

6）Check to ensure no tools or parts are left inside the equipment.

7）The energy storage system can only be put into operation after confirmation by a qualified professional.

8）For energy storage systems that have been out of service for a long time, a comprehensive and meticulous inspection of the equipment must be conducted before powering on. The system can only be powered on after ensuring that all indicators meet the requirements

5.2 ESS Power On

If there is a tripping phenomenon of the circuit breaker during the power-on process, pause to close other circuit breakers. Immediately check whether the downstream load of the tripped circuit breaker has a short circuit.

1）Check and confirm that the AC lightning arrester is normal, and the AC lightning arrester circuit breaker is closed.

2）Close the mains power switch QF5.

3）Close the auxiliary power supply switch QF7.

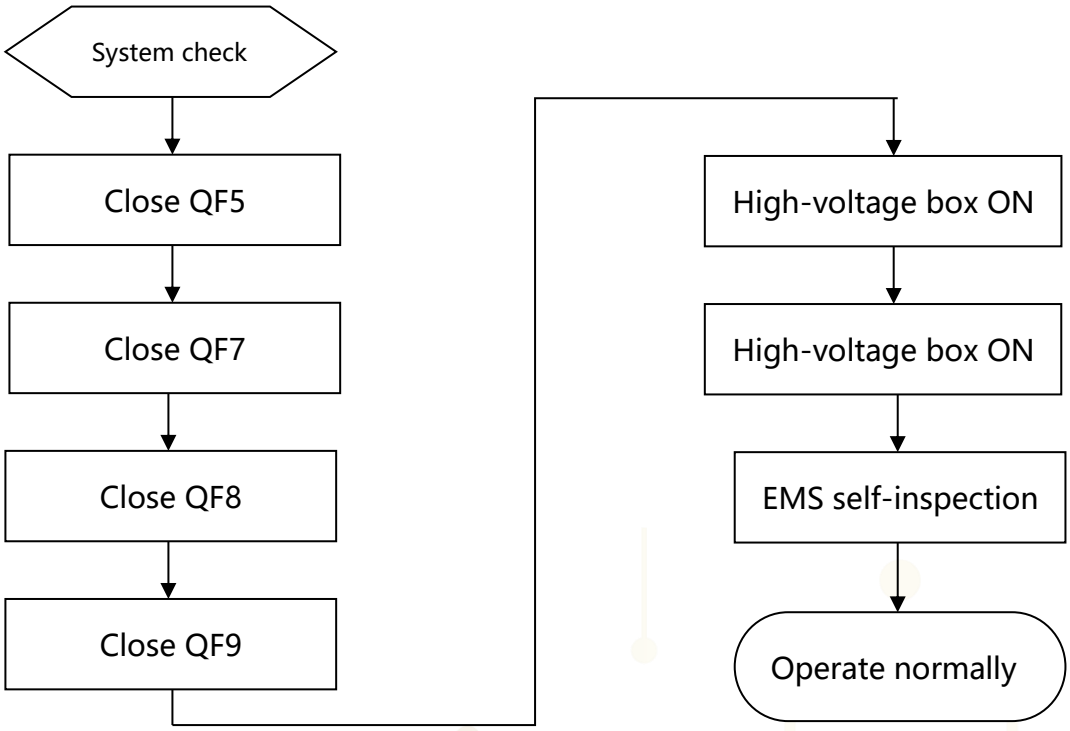
4）Close the auxiliary power supply switch QF8.

5）Close the fan power supply switch QF9.

6）Turn the handle of the DC circuit breaker in the high-voltage box to ON, and close the circuit breaker.

7）Close the 24V switch power supply switch QF12.

8）Control the BMS main contactor to close through EMS operation. Wait for about 5 seconds, observe that the BMS main contactor status is closed, indicating that the operation is successful



5.3 Photovoltaic system powered on

1) Check and confirm that the DC lightning protection device is normal and the DC lightning protection fuse is closed.

2) Check and confirm whether the PV DC lines are properly connected and whether the MC4 terminals are connected.

3) Check and confirm whether the positive and negative terminals of each PV DC line are correctly connected.

4) Close DC switch QF1, QF2, QF3, QF4.

6 The Use of Cloud Platforms

This product supports the operation and maintenance management of cloud platforms, which are based on energy digitalization technologies such as the Internet of Things, big data analysis, and cloud computing. It constructs a cloud-edge collaborative system to achieve device perception, intelligent diagnosis, and collaborative control. It realizes remote monitoring/unmanned attendance of commercial and industrial energy storage sites, providing users with efficient and secure smart operation and maintenance services.

6.1 User Login

（1）Account Information

Please contact your installer or our service staff to obtain an account.

(1) Login

The login address of the energy management cloud platform can be obtained by contacting the relevant service staff of commercial and industrial storage. Enter your account and password on the login page, then click "Login" to access the platform.

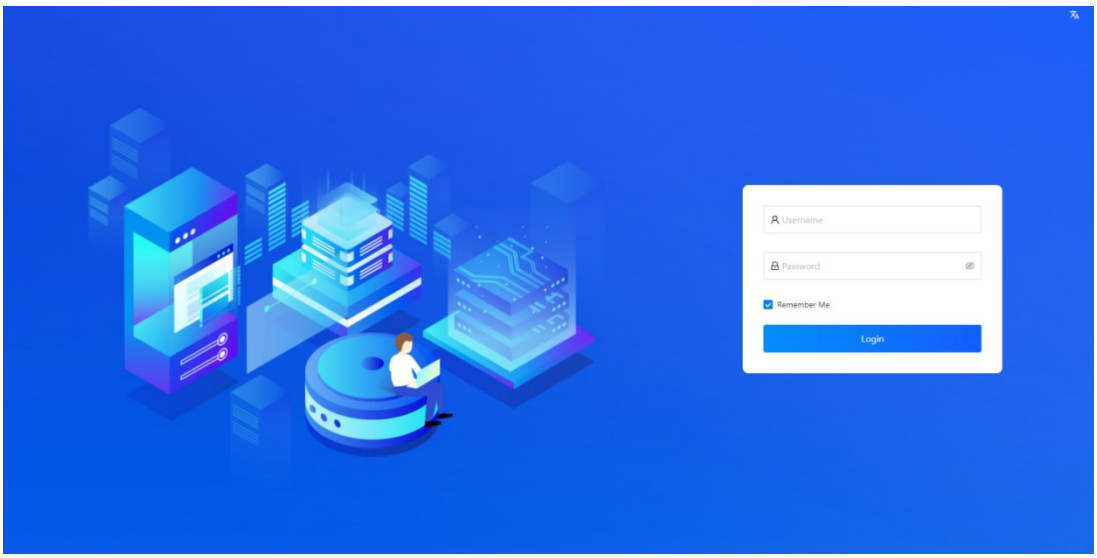


Figure 6.1-1 Cloud Platform Login Display Interface

(2) Multi-language Switching**

Language switching can be done in the upper right corner of the login page.

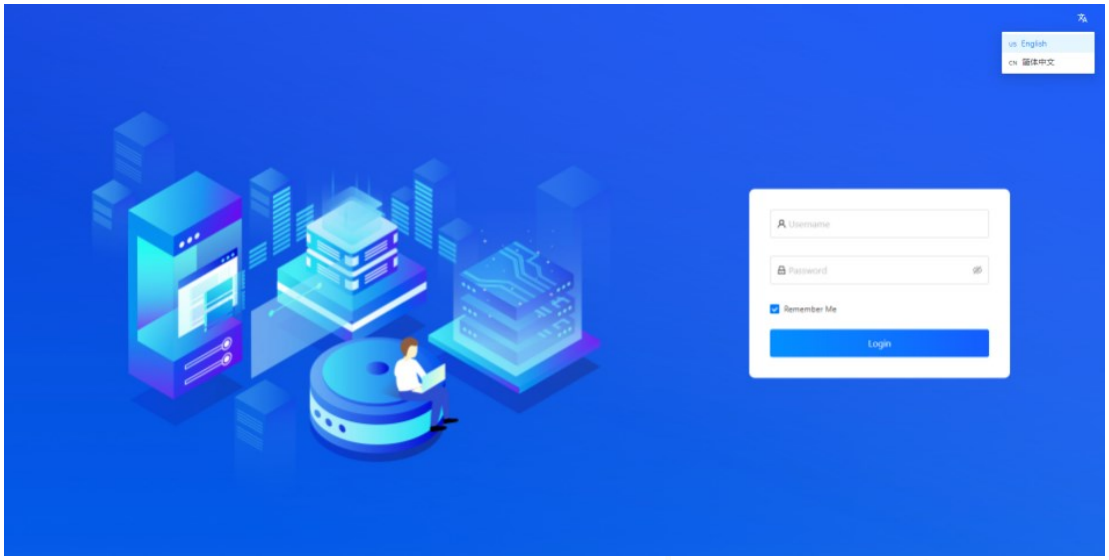


Figure 6.1-2 Cloud Platform Language Switching Display Interface

(3) Logout

Log in to the management platform - click on the avatar icon in the upper right corner, then click the "Logout" button to exit the system.

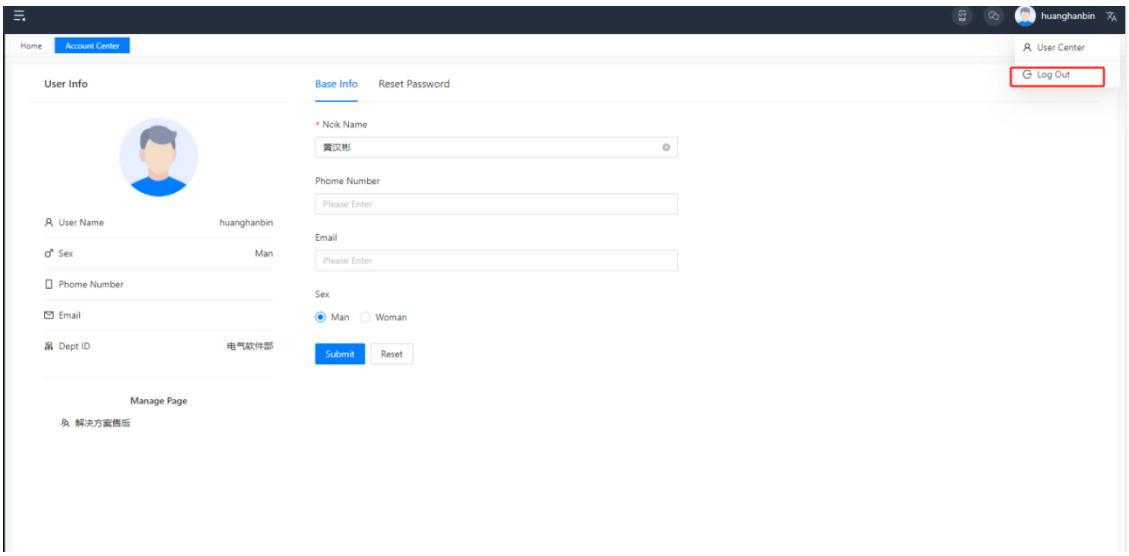


Figure 6.1-3 Cloud Platform Logout Display Interface

(4) Login Account Viewing and Password Reset

Log in to the management platform - click on the icon in the upper right corner, then click the "Personal Center" button to enter the basic information page, where you can modify the login account's avatar, user nickname, mobile phone number, user email, gender, and other basic information, as shown in the figure below:

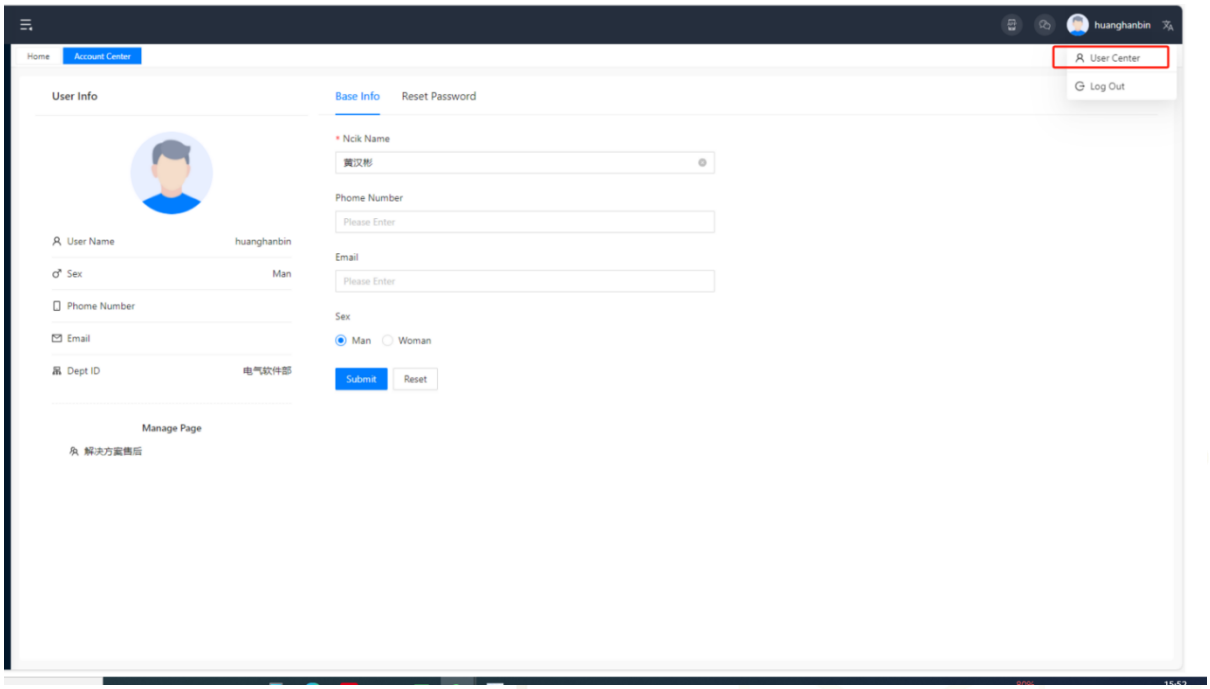


Figure 6.1-4 Cloud Platform Personal Center Display Interface

Log in to the management platform - click on the icon in the upper right corner, then click the "Personal Center" button to enter the password reset page, where you can modify the password information again, as shown in the figure below:

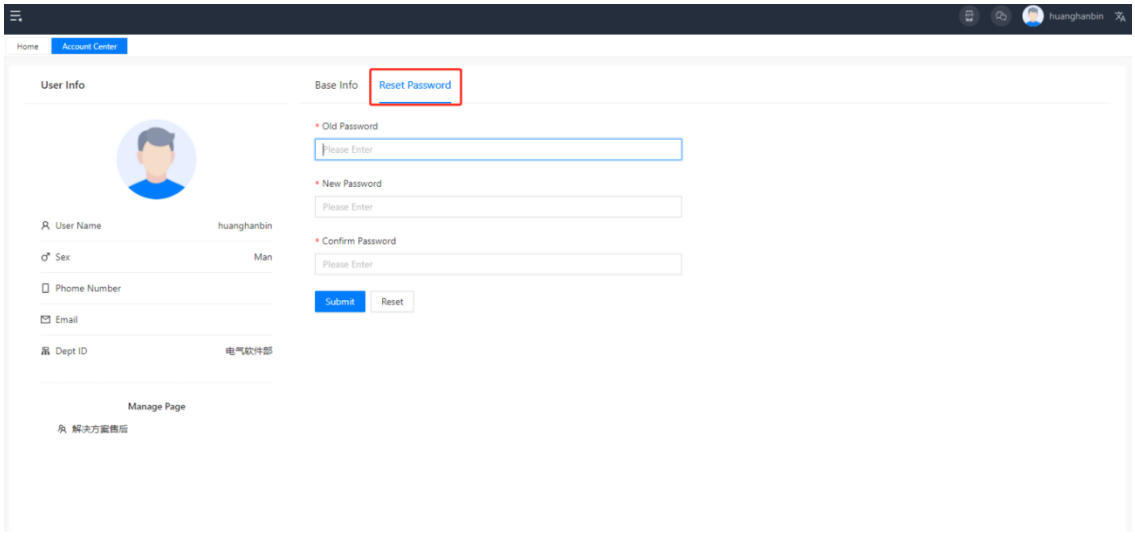


Figure 6.1-5 Cloud Platform Password Modification Display Interface

6.2 Site Management

Owners can use conditional filtering to manage their site lists, view the main information of the sites, edit the basic information of the sites, configure operational parameters, and view the operation logs of the sites.

(1)Site List

Query conditions: Site name, creation time, region.

List display: Site name, site code, site type, creation time, delivery time, site location, construction status, installer, operator, last operation time.

Site operations: Edit (edit site basic information), Site Configuration (site operational parameter configuration).

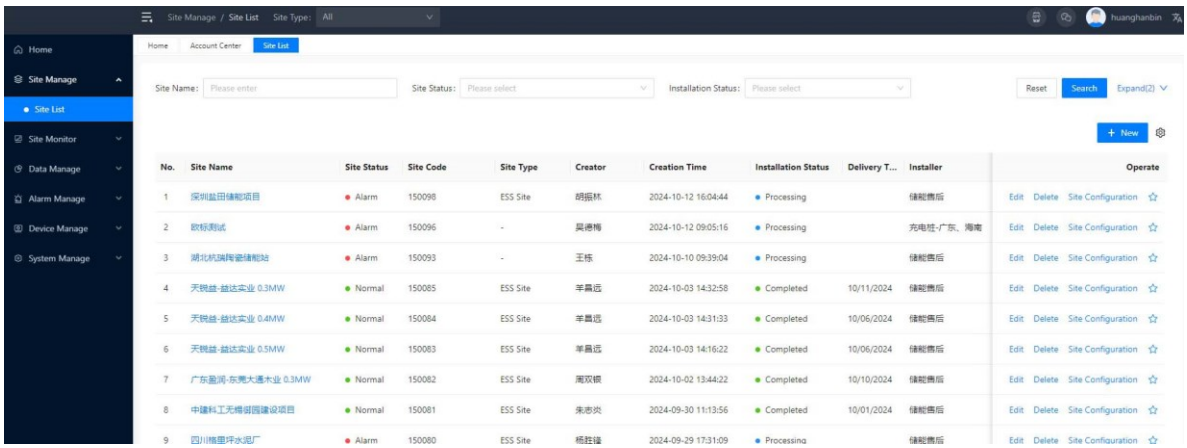


Figure 6.2-1 Cloud Platform Site List Display Interface

(2)Edit Site

Click the "Edit" button in the operation column of the site list, and you can set the basic information such as the city grid voltage level, transformer capacity, site location, photovoltaic capacity, energy storage capacity, and charging pile rated total power on the pop-up page. You can upload site photos and site logos for display.

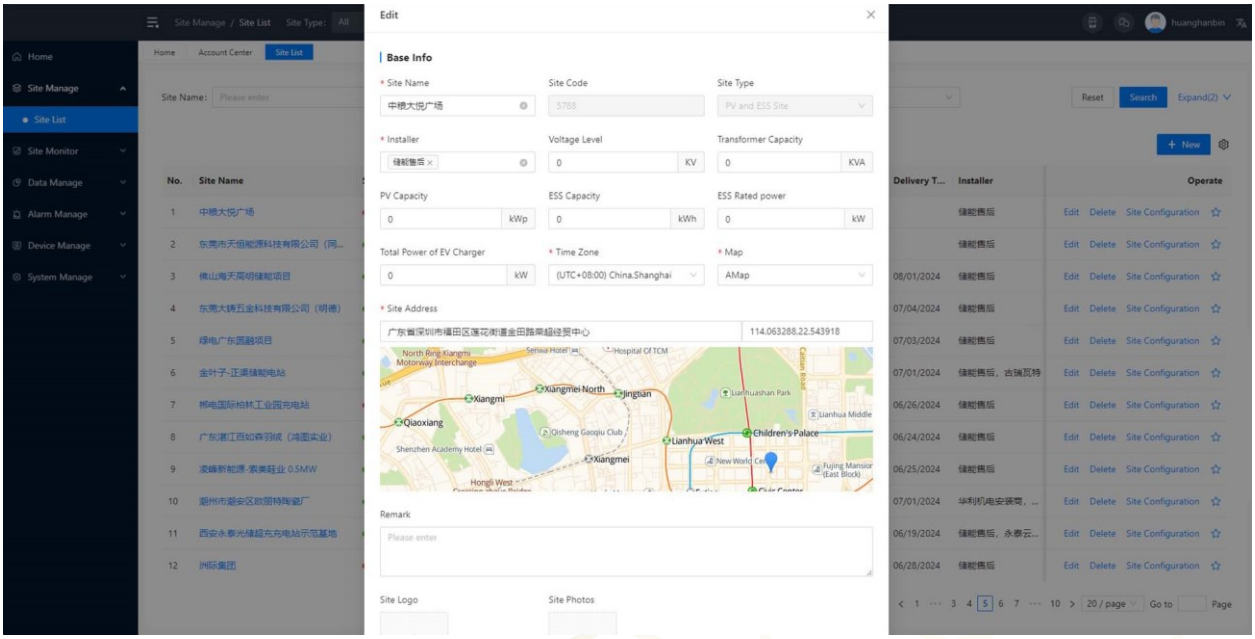


Figure 6.2-2 Cloud Platform Edit Site Display Interface

(3)Site Configuration

Click the "Site Configuration" button in the site list to jump to the "Site Configuration" page, which includes six sub-pages: Basic Information, Device Management, System Parameter Settings, Operation Management, Electricity Price

Management, and Configuration Log. This allows users to modify some statistical collection points during the site operation and adjust the rules of benefits according to their needs.

(4)Basic Information

On the current page, you can view the delivery status and basic information of the current site, which helps to understand the overview of the current site.

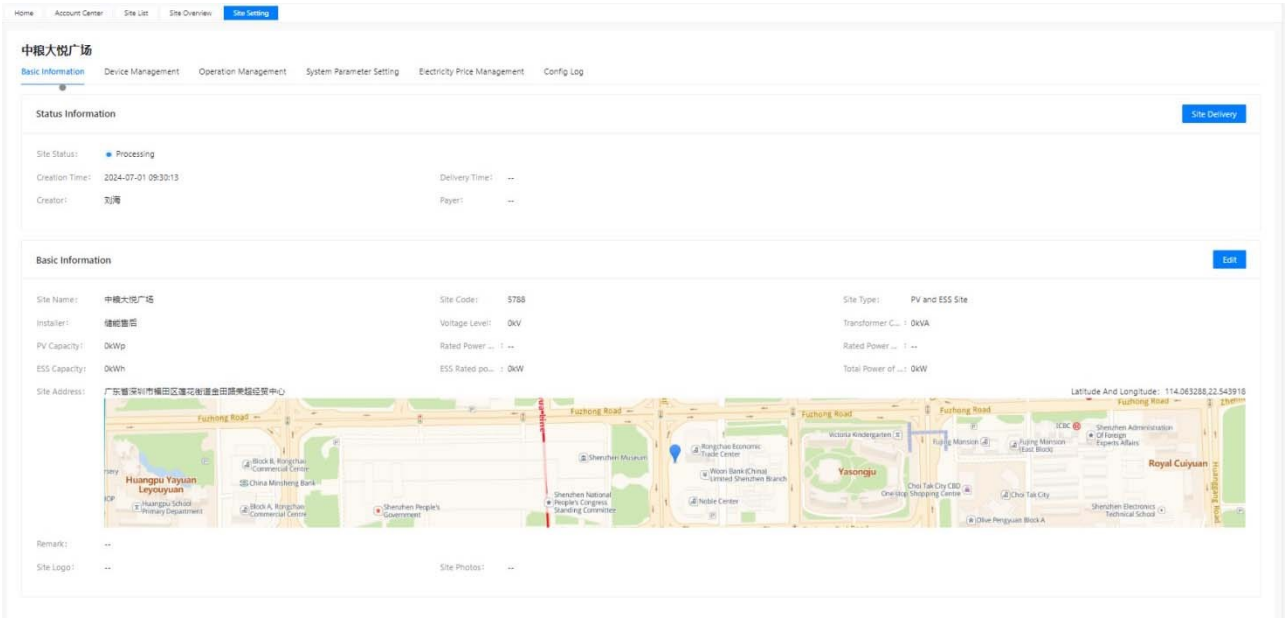


Figure 6.2-3 Cloud Platform Site Information Display Interface

(5)Device Management

This page displays all the device information under the site, allowing you to conveniently monitor the device operation information and view related configuration information.

Query conditions: Product type, device name, device serial number, add time, communication status.

List display: Device name, device code, device serial number, product model, product type, site affiliation, add time, online time, communication status.

Click the device name to display the device details page, where you can view the real-time data, historical information, alarm information, and sub-module data of the selected device. The page displayed after clicking the device is consistent with the device management function introduction.

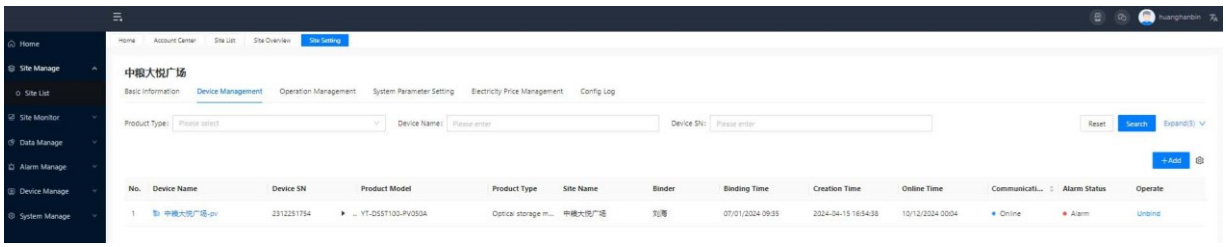


Figure 6.2-4 Cloud Platform Site Device Management Display Interface

(6)Operation Management

Monitoring settings: Users can view the configuration of the site's collection point parameters on the current page. This configuration will affect the summary data display on the site overview page. Failure to configure properly will affect the accuracy of the data display.

City power monitoring: Configure the site's city power electricity usage and real-time power data source.

Other loads: Configure the site's load electricity usage and real-time power data source.

Photovoltaic monitoring: Configure the site's photovoltaic power generation.

Energy storage monitoring: Configure the site's energy storage charge volume, site's energy storage discharge volume, and real-time power data source.

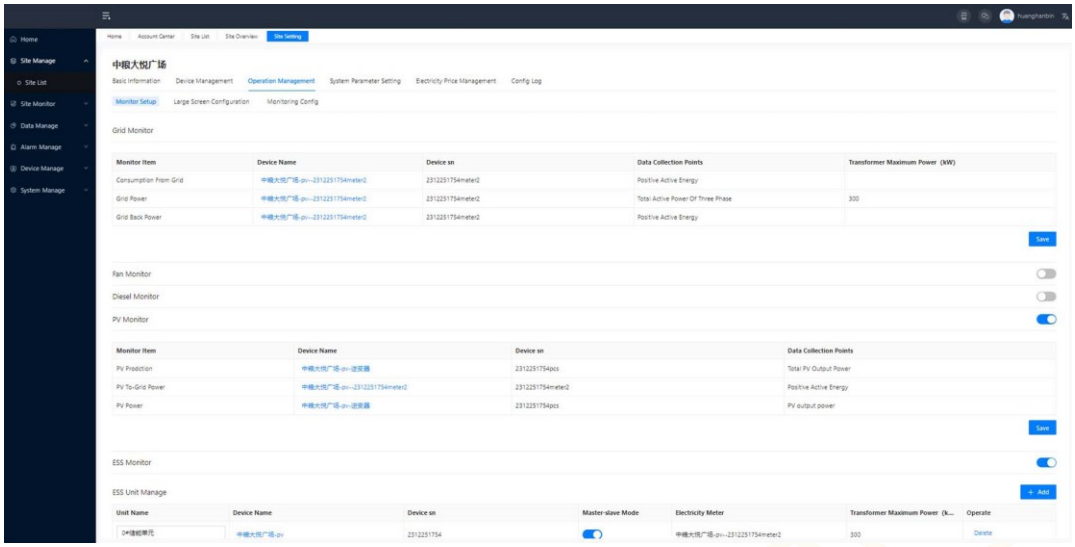


Figure 6.2-5 Cloud Platform Site Operation Management Display Interface

(7)Operation Parameter Settings

You can set the duration for saving historical data, and users can choose according to their needs.

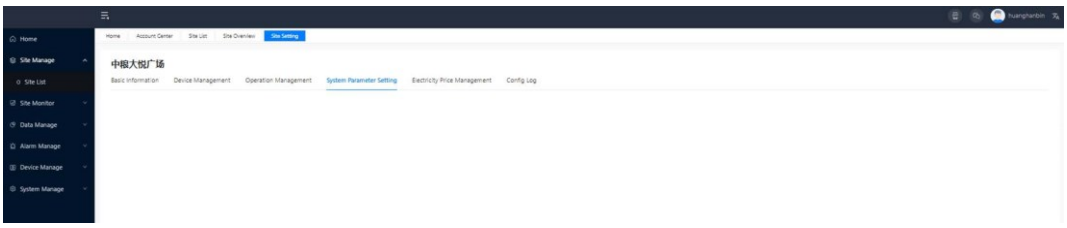


Figure 6.2-6 Cloud Platform Site Operation Parameter Settings Interface

(8)Electricity Price Management

City grid electricity price settings: Users can flexibly create multiple electricity price rules according to the charging standards of the power supply bureau. Each rule can configure multiple effective dates, set uniform peak, flat, and valley electricity prices for these date ranges, and set the peak, flat, and valley time periods within the date range, with a maximum of ten segments.

Rule name: Define the name of the electricity price rule. There should be no date conflicts between different rules.

Effective date: Select the effective date of the electricity price, which can add multiple discontinuous time periods. There should be no overlapping dates between different rules.

Power factor assessment: The standard for the power supply bureau to assess the power factor for industrial electricity.

Basic electricity charge type: Demand electricity charge (charged according to the maximum demand), capacity electricity charge (charged according to the maximum capacity).

Peak, flat, and valley electricity prices: Enter the corresponding peak, flat, and valley period electricity prices for the region.

Time period: Set the corresponding peak, flat, and valley periods according to the regional electricity price periods.

Photovoltaic grid connection electricity price settings: Users can flexibly create multiple electricity price rules according to the charging standards of the power supply bureau. Each rule can configure multiple effective dates and set a certain period's grid connection electricity price for these date ranges, with a maximum of ten segments.

Rule name: Define the name of the electricity price rule. There should be no date conflicts between different rules.

Effective date: Select the effective date of the electricity price, which can add

multiple discontinuous time periods. There should be no overlapping dates between different rules.

Grid connection electricity price: Enter the corresponding peak, flat, and valley period electricity prices for the region.

Time period: Set the corresponding period according to the regional electricity price period.

New electricity price example:

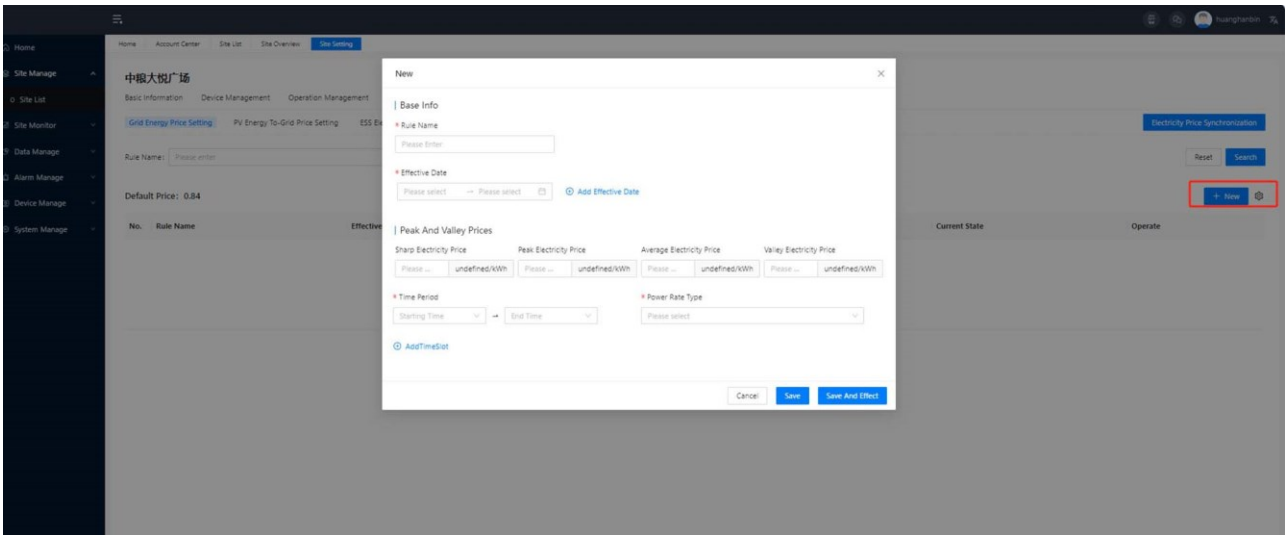


Figure 6.2-7 Cloud Platform Site Electricity Price Management Display Interface

Click "View Details" in the list to view the configured electricity price details.

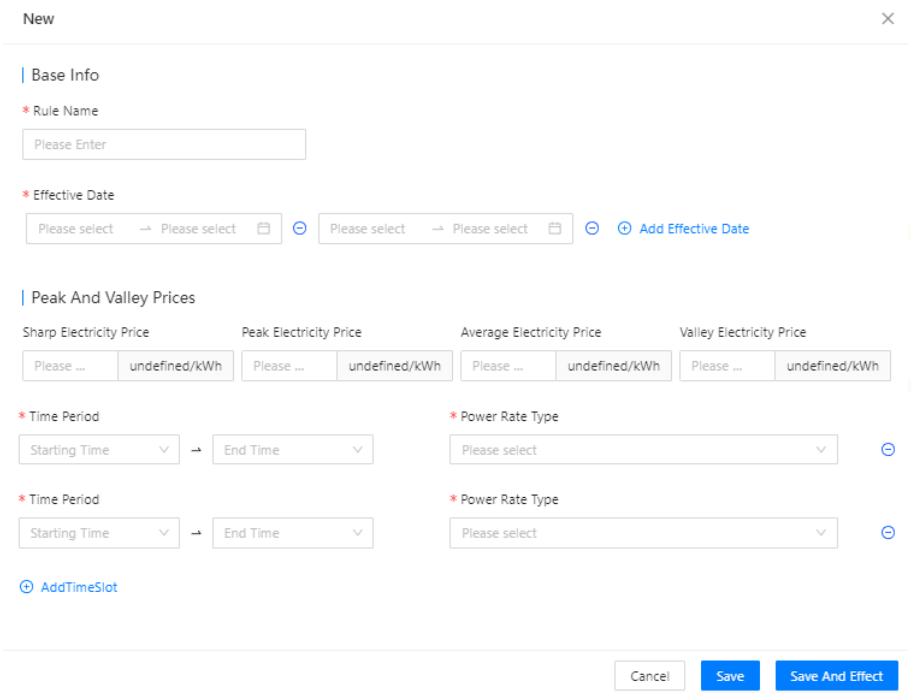


Figure 6.2-8 Cloud Platform Site Electricity Price Details Display Interface

(9)Configuration Log

The current page displays the historical data of user settings for the site, recording all operations on the site, including site permission configuration, electricity price configuration records, site information modifications, which facilitates the daily maintenance and traceability of operations by maintenance personnel.

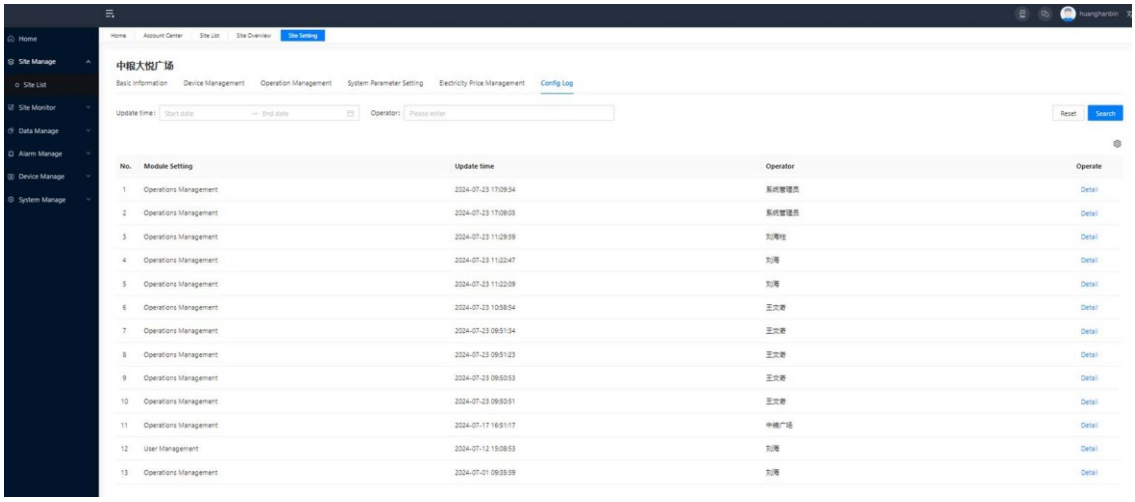


Figure 6.2-9 Cloud Platform Site Configuration Log Display Interface

Click "View Details" to see the detailed log and parameters of the operation, which is convenient for analysis and comparison.

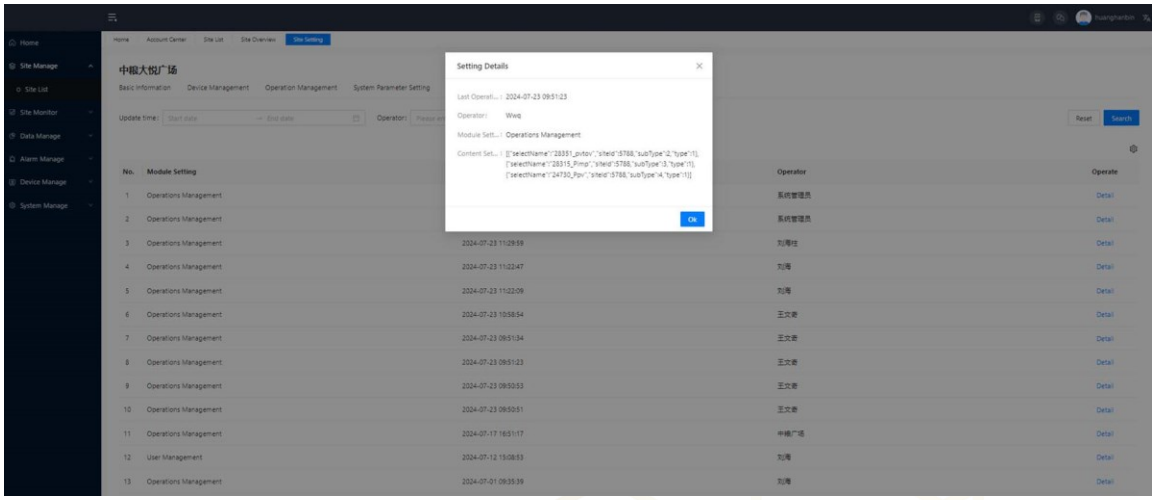


Figure 6.2-10 Cloud Platform Site Log Parameter Display Interface

6.3 Site Monitoring

(1) Site Overview

On the current page, users can view the basic information of the site, main module information, emission reduction statistics, real-time energy flow diagram, multi-dimensional revenue statistics, real-time power, and cumulative electricity statistics for specific time periods. This provides a comprehensive, intuitive, and real-time overview of the site's energy status and equipment operation, facilitating users to grasp the overall operation of the site and the corresponding revenue information in real-time

Table 6.3-1 Site Display Information Statistics Table

Feature Point	**Description**
Basic Information	Site name, geographical location, site status, photovoltaic total capacity, energy storage total capacity, delivery time, site picture.
Site Operation Data Display	Main operating parameter information of the operating data of energy storage batteries, energy storage systems, city electricity, photovoltaics, and loads.
Energy Flow Diagram	Displays the energy flow and real-time operating power of the current power station's city electricity, energy storage, photovoltaics, and loads, as well as the operating status of the equipment.
Revenue Display	Displays energy storage benefits, energy storage charging electricity costs, and energy storage discharge income according to four dimensions: day, month, year, and cumulative.
Emission Reduction Statistics	The amount of energy storage discharge is equivalent to energy saving and emission reduction, reducing the waste of electricity resources, equivalent to reducing the CO_2 emissions produced by the combustion of fossil fuels, equivalent to planting trees for the Earth.
Real-time Power Display	Displays the real-time operating power of the site's city electricity, energy storage system, photovoltaics, and other loads, and historical power curve data can be queried by selecting a date.
Electricity Statistics Data	Electricity information of city electricity, energy storage charge, energy storage discharge, photovoltaic generation, and other load electricity usage data, and

	historical daily, monthly, and annual electricity data can be queried by selecting a date.

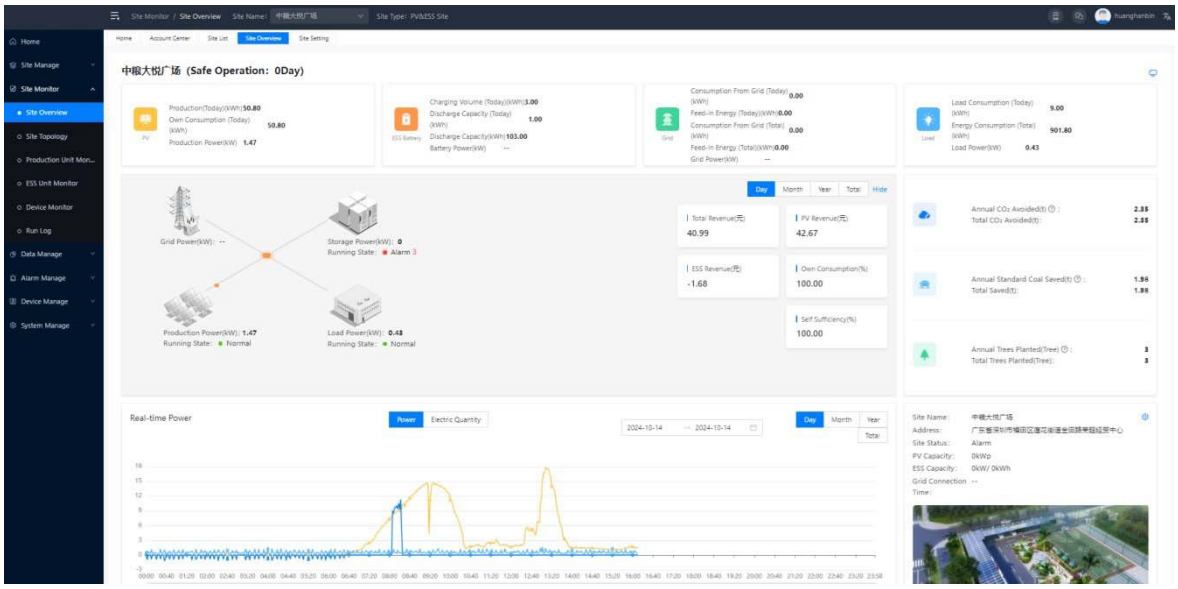


Figure 6.3-1 Cloud Platform Site Overview Display Interface

(2) Power Generation Unit Monitoring

On the current page, users can view the statistical information of the site-level photovoltaic power generation, including the number of power generation units in operation, the number of units not in operation, the number of generation strings, and the self-use ratio.

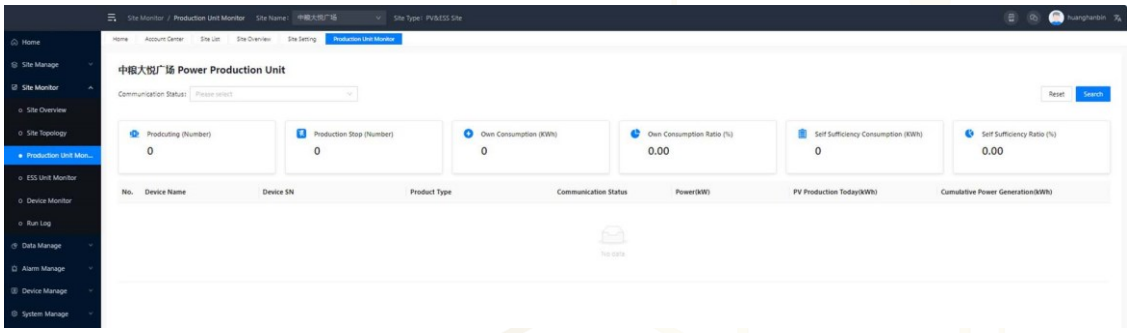


Figure 6.3-2 Cloud Platform Power Generation Unit Display Interface

(3) Energy Storage Unit Monitoring**

1) Single Machine Energy Storage Unit Monitoring

On the current page, users can view the statistical information of the site-level energy storage unit, including rated capacity, today's system charge, today's system discharge, cumulative charge, cumulative discharge, daily revenue, and cumulative revenue information.

It is also possible to view the overview data of different energy storage cabinets by switching tables.

Physical structure diagram of the equipment and the operating status of each component: liquid cooling unit, dehumidifier, cabinet door, EMS, battery stack, battery module, battery cell, Hybrid Inverter operating status, and by clicking "More," you can view the detailed information of the corresponding energy storage equipment's sub-devices.

The daily operating power curve of the energy storage unit, positive values for discharge, and negative values for charging. Historical daily charge and discharge power curves can be queried by selecting a historical date.

The charge and discharge trend of the energy storage unit, and you can query the daily charge and discharge volume of the current month and the monthly charge and discharge volume of the current year by month/year dimension.

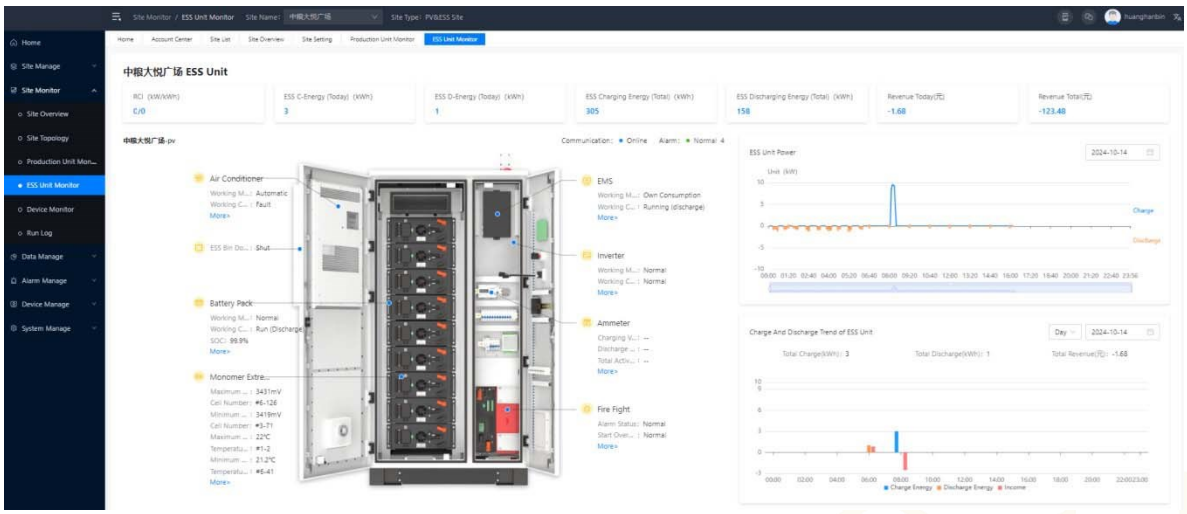


Figure 6.3-3 Cloud Platform Single Machine Energy Storage Unit Display Interface

2) Parallel Machine Energy Storage Unit Monitoring

When the energy storage equipment at the site uses parallel machine communication, all the energy storage cabinet information of the current parallel machine system will be summarized and displayed, and the information of a single

energy storage cabinet can also be viewed and displayed.

Display the operating data of the energy storage unit such as rated capacity, today's system charge, today's system discharge, cumulative charge, cumulative discharge, daily revenue, and cumulative revenue. Display the current group's host and group information, and when the number of master and slave devices is more than two, you can view the main information of the current device by switching the left and right arrows: SOC, SOH, current voltage, current current, current power, and other information. Display the overall energy storage unit power and charge and discharge trend of the current parallel group.

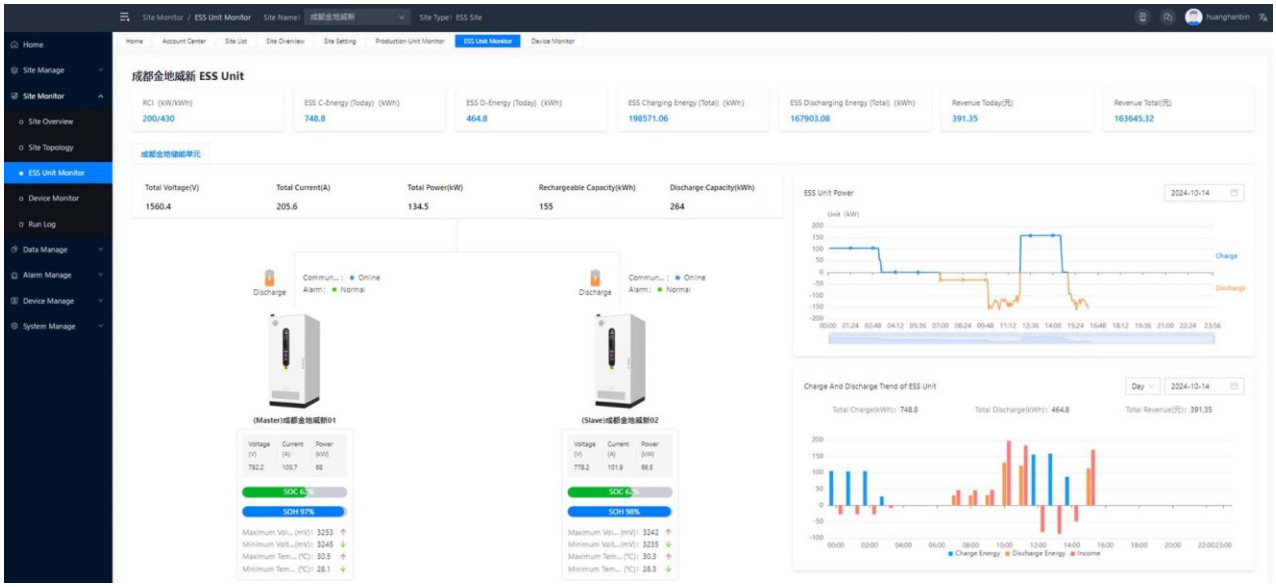


Figure 6.3-4 Cloud Platform Parallel Machine Energy Storage Unit Display Interface One

Click on the icon of a host or slave machine to switch to the device overview page of the clicked device, and you can switch the information of each device by clicking the arrows. When you click the back button on the overview page, you return to the master-slave topology page. The overall energy storage unit power and charge and discharge trend of the current parallel machine are displayed on the right.

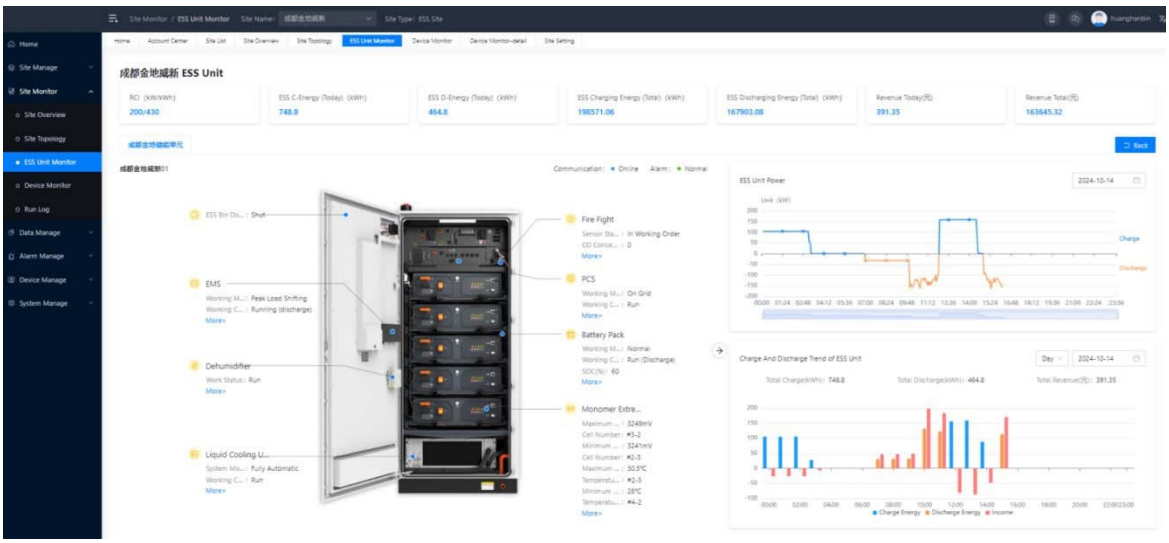


Figure 6.3-5 Cloud Platform Parallel Machine Energy Storage Unit Display Interface Two

(4) Equipment Monitoring

The equipment at the commercial and industrial energy storage site is comprehensively monitored in three categories: EMS, energy storage inverter, and other equipment.

EMS: Display the basic information of the equipment, the site it belongs to, communication status, alarm status, and system mode.

Energy Storage Inverter: Display the basic information of the equipment, the communication status of the site it belongs to, alarm status, working status, rated power, and current power.

Other Equipment: Display the basic information of the equipment, the communication status of the site it belongs to, and alarm status.

You can click on the equipment name to jump to the equipment details page and view the real-time data of the selected equipment. The refresh frequency is determined by the equipment's report frequency.

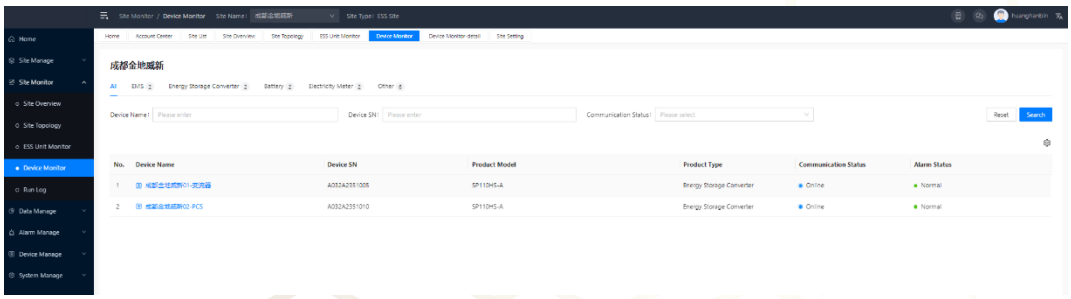


Figure 6.3-6 Cloud Platform Equipment Monitoring Display Interface

The real-time data display of EMS, and the real-time data of other equipment are

similar to the equipment details.

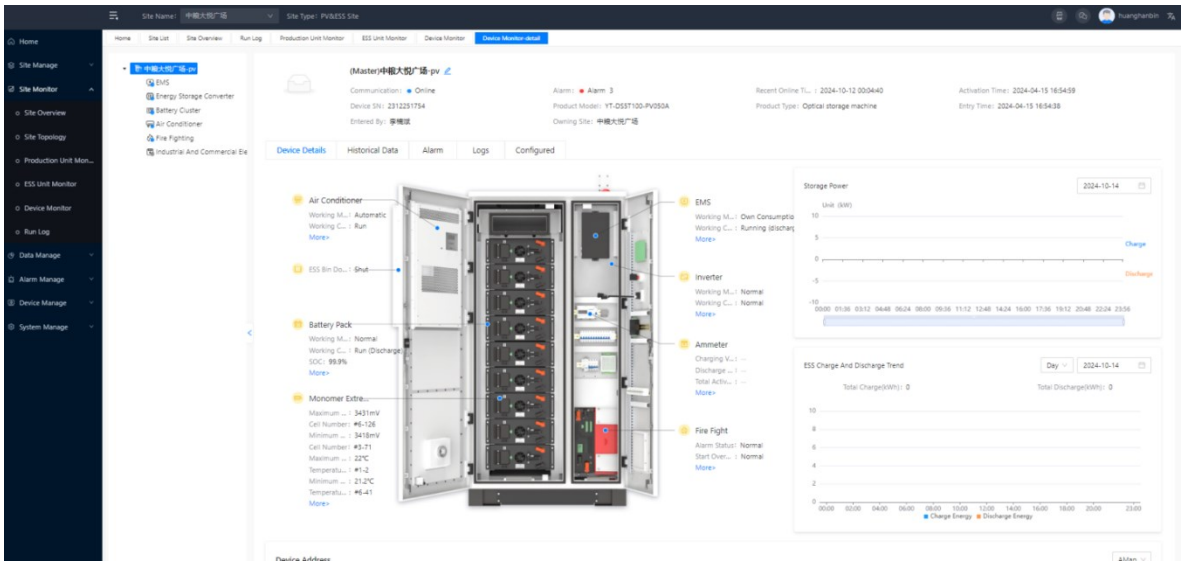


Figure 6.3-7 Cloud Platform EMS Monitoring Display Interface

(5) Operation Log

During the operation of the equipment, when the state of the equipment changes, the system will record the time of the equipment state change, the previous and current values of the change facilitate the traceability of the equipment operation state, and the command issuance to the equipment will also be recorded in the log for easy traceability of the issuance record.

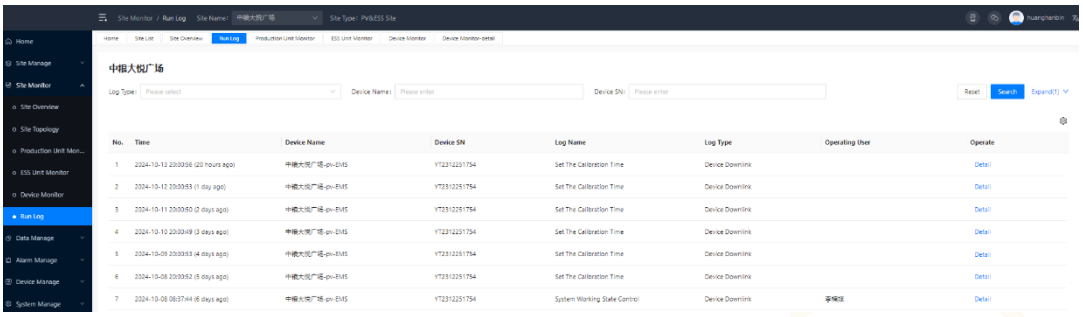


Figure 6.3-8 Cloud Platform Operation Log Display Interface On

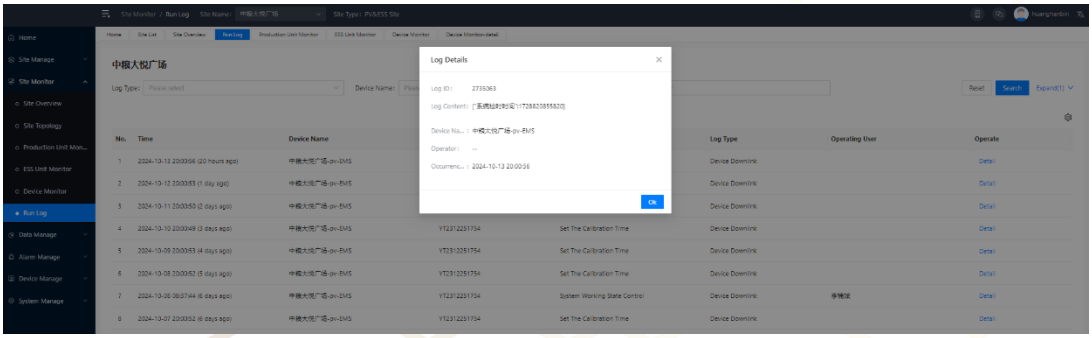


Figure 6.3-9 Cloud Platform Operation Log Display Interface Two

(6) Data Management

1) Data Report

Users can select any site and classify and summarize the operation data of all equipment under the current site, such as electricity, revenue, and electricity costs. Support site reports, city electricity reports, energy storage reports, and other load reports. The statistical dimension supports daily (hourly data statistics), monthly (daily data statistics), annual (monthly data statistics), and lifecycle (annual data statistics). The related reports support the export function.

2) Site Report:

Statistics on city electricity usage, city electricity costs, energy storage charge, energy storage discharge, energy storage charging costs, energy storage discharge income, energy storage benefits (energy storage discharge income - energy storage charging costs), other load electricity usage, and other load electricity costs.

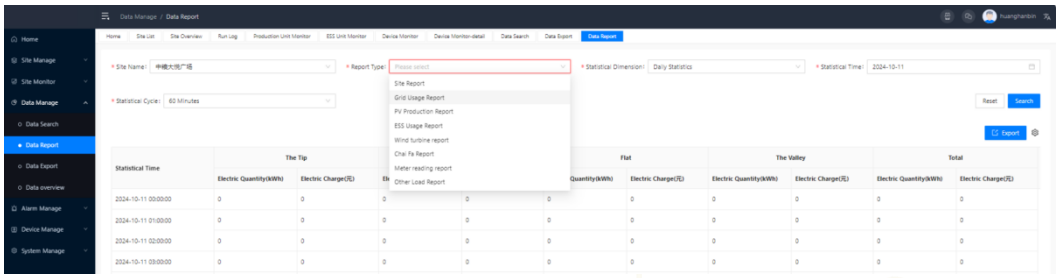


Figure 6.3-10 Cloud Platform Site Report Display Interface

3) City Electricity Report:

Statistics on city electricity peak period electricity usage, electricity costs; peak period electricity usage, electricity costs; normal period electricity usage, electricity costs; valley period electricity usage, electricity costs; total electricity usage, total electricity costs.

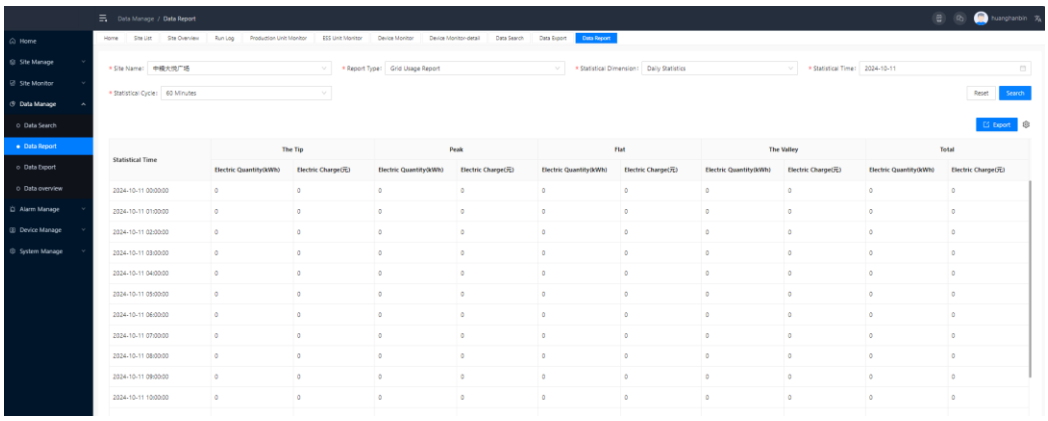


Figure 6.3-11 Cloud Platform City Electricity Report Display Interface

4) Energy Storage Report:

Statistics on the charge and costs of energy storage during peak, flat, and valley periods, as well as total charge and costs.

Statistics on the discharge and income of energy storage during peak, flat, and valley periods, as well as total discharge and income.

Statistics on the total benefits of energy storage (total discharge income - total charging costs).

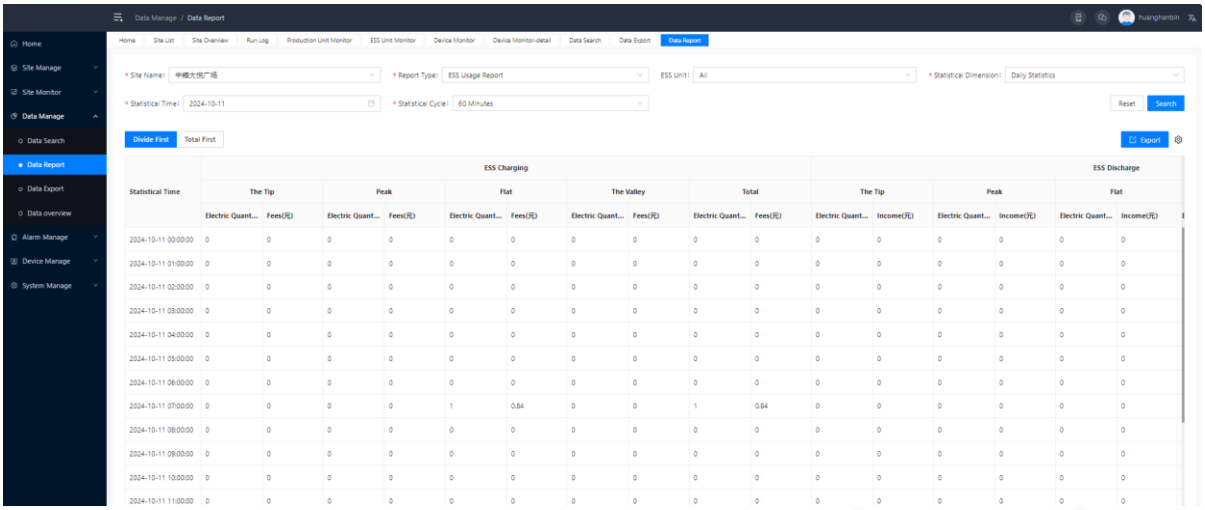


Figure 6.3-12 Cloud Platform Energy Storage Report Display Interface

5) Other Load Report:

Statistics on the electricity usage and electricity costs of other loads during peak, peak, flat, and valley periods, as well as total electricity usage and costs.

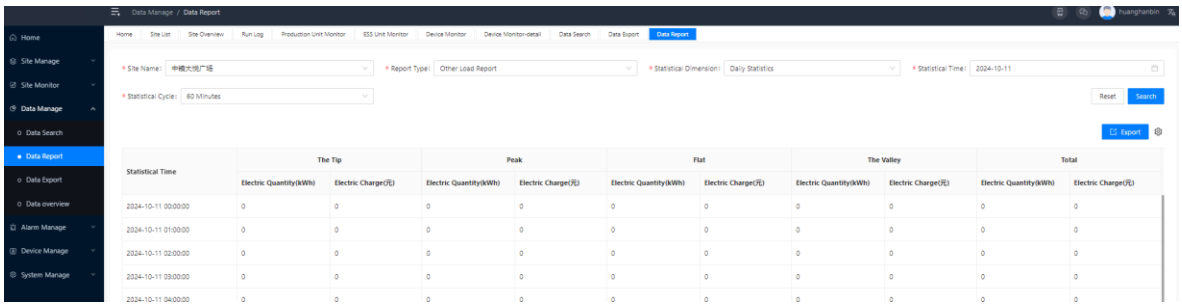


Figure 6.3-13 Cloud Platform Other Load Report Display Interface

(7) Data Inquiry

After users select a site, they can inquire about the historical trend data of a certain device's collection point under the current site and support the export of the inquiry results.

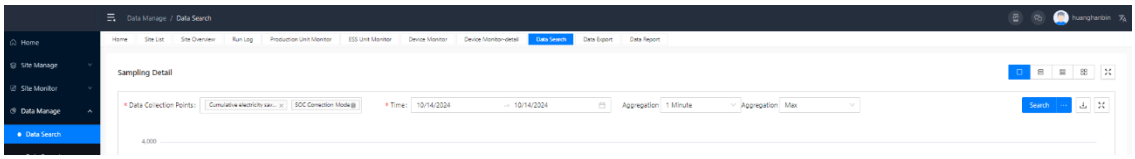


Figure 6.3-14 Cloud Platform Data Inquiry Display Interface One

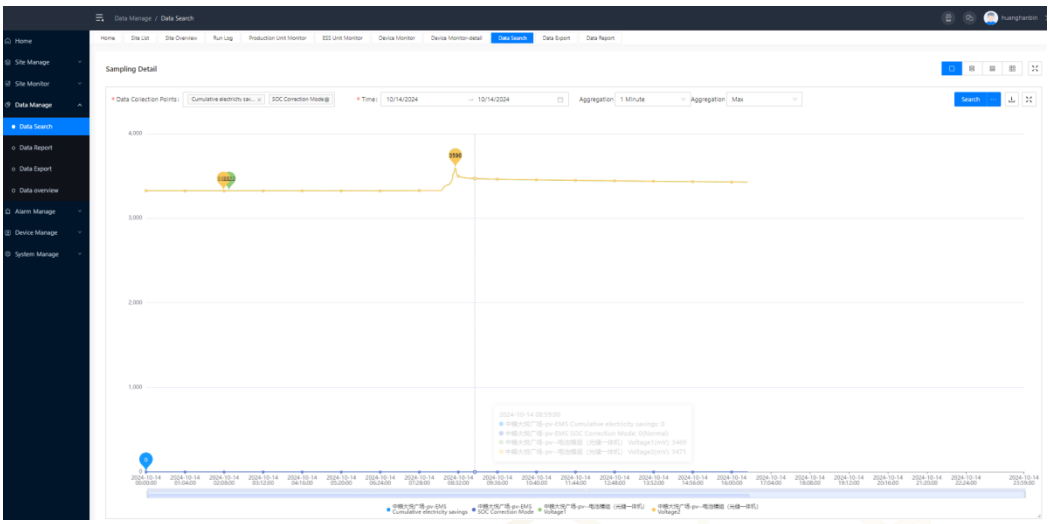


Figure 6.3-15 Cloud Platform Data Inquiry Display Interface Two

6.4 Alarm Management

(1) Current Alarms

Users can inquire about the real-time alarm information of a certain site or all sites

through alarm levels, alarm statuses, and other inquiry conditions. This provides users with timely and comprehensive equipment alarm information, helping users to discover and solve problems in a timely manner, ensuring the reliability and stability of the equipment.

Alarm levels are divided into urgent, important, minor, and提示, and alarm statuses are divided into alarms in progress and alarms cleared.

Alarms in progress are displayed in the current alarms, and after the alarm is restored, they are transferred to the historical alarms at 24:00 on the same day.

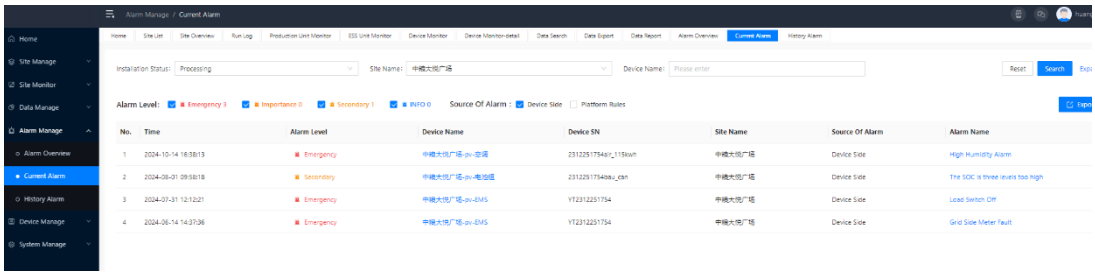


Figure 6.4-1 Cloud Platform Current Alarm Display Interface

Click on the alarm information to pop up and display the detailed alarm information.

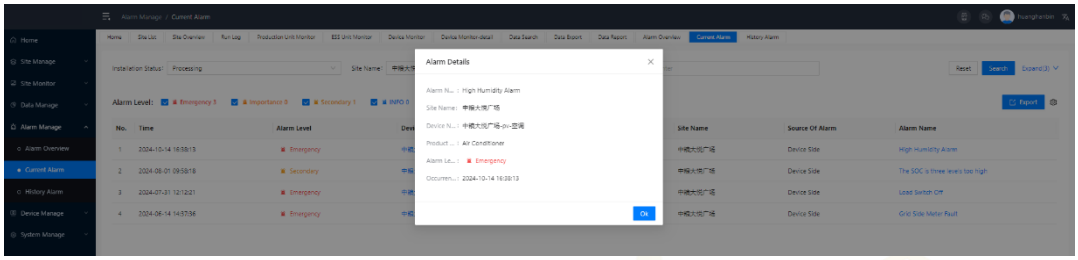


Figure 6.4-2 Cloud platform alarm information display page

(2) Historical alarm

Alarm record saving and tracing provides users with comprehensive and convenient historical alarm management services, which helps users review past alarms, analyze device history, and better control various alarm problems during the device life cycle. Displays all cleared alarms. The alarms can be manually or automatically Cleared.

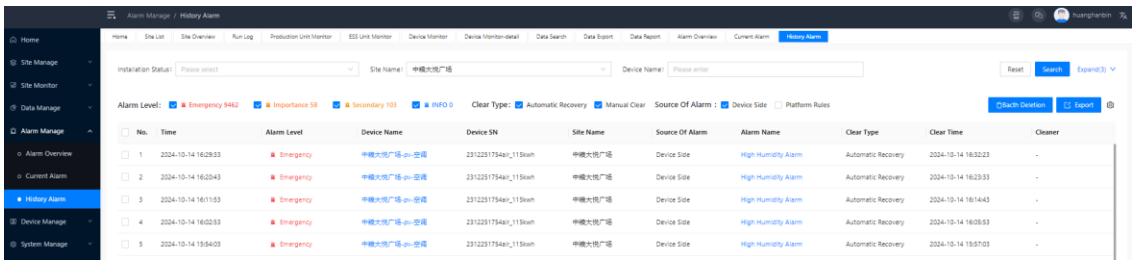


Figure 6.4-3 Cloud platform historical alarm display page

Click Alarm information to display the alarm details

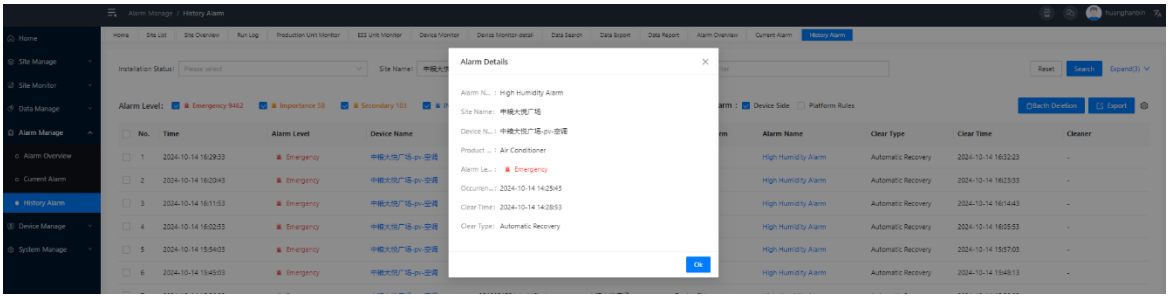


Figure 6.4-4 Cloud platform historical alarm display page

6.5 Device Management

(1) Device List

Users can search for devices at their sites by site name, product type, device name, device serial number, communication status, and other search criteria, making it convenient for users to view the operating status and lifecycle of the equipment.

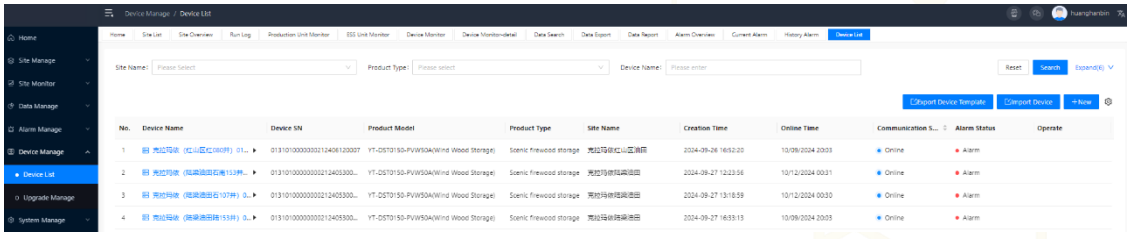


Figure 6.5-1 Cloud Platform Device List Display Interface

(2) Device Details

After clicking on the device name, users can enter the device details page. The device details are dedicated to real-time monitoring, control, and management of

various device units in the energy storage main device. Through this module, users can easily monitor the operating status of the equipment, implement remote control, conduct data analysis, and monitor the equipment.

The device details include five modules: Device Details, Historical Data, Alarms, Logs, and Configuration. Historical Data, Alarms, and Logs are common modules, and all device details have these module functions.

(3) Historical Data

Users can query the historical data generated by the operation of the device and its subordinate sub-devices, and can also select different data points of different sub-devices for inquiry. The results of the data inquiry can be exported.

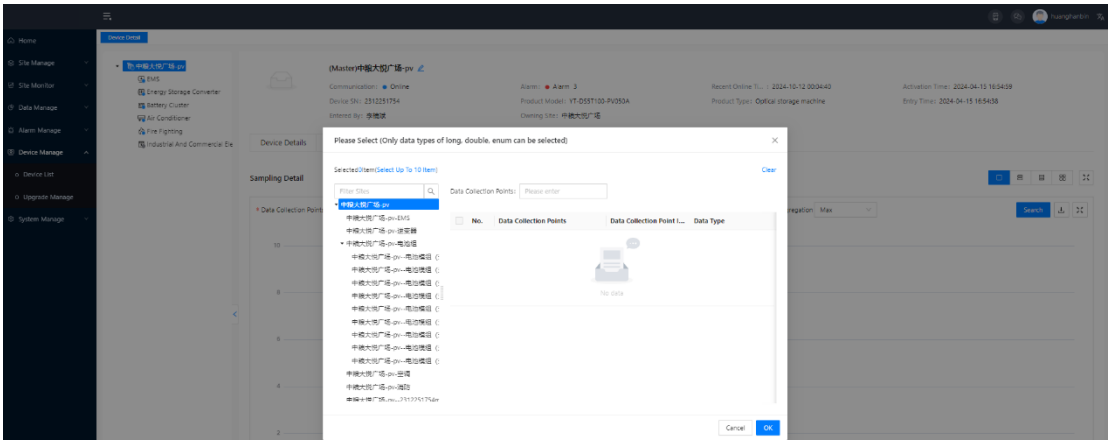


Figure 6.5-2 Cloud Platform Historical Data Display Interface One

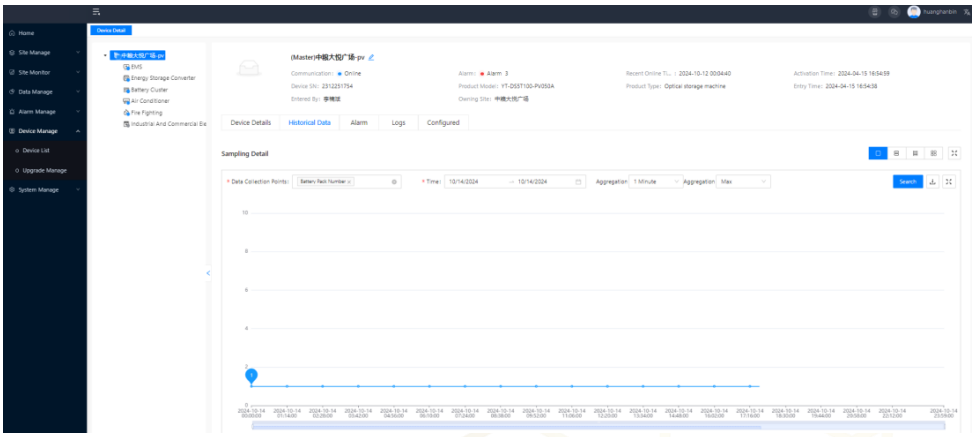


Figure 6.5-3 Cloud Platform Historical Data Display Interface Two

(4) Alarms:

Through real-time monitoring, various alarm methods, four alarm levels, and alarm details, users are provided with timely and comprehensive equipment alarm

information to help users discover and solve problems in a timely manner, ensuring the reliability and stability of the equipment.

Alarm levels are divided into Critical, Urgent, Minor, and Notification; alarms that are in an alarmed state are displayed in the Current Alarms, and after the alarm is restored, they are transferred to the Historical Alarms at 24:00 on the same day.

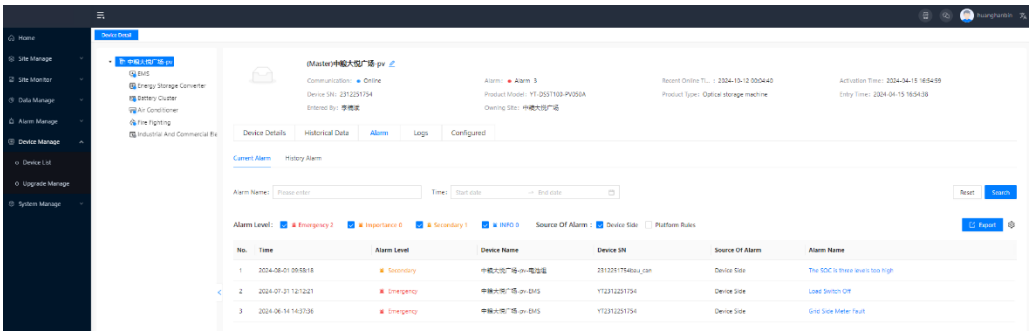


Figure 6.5-4 Cloud Platform Device Alarm Display Interface

Click on the alarm information to pop up and display detailed alarm information.

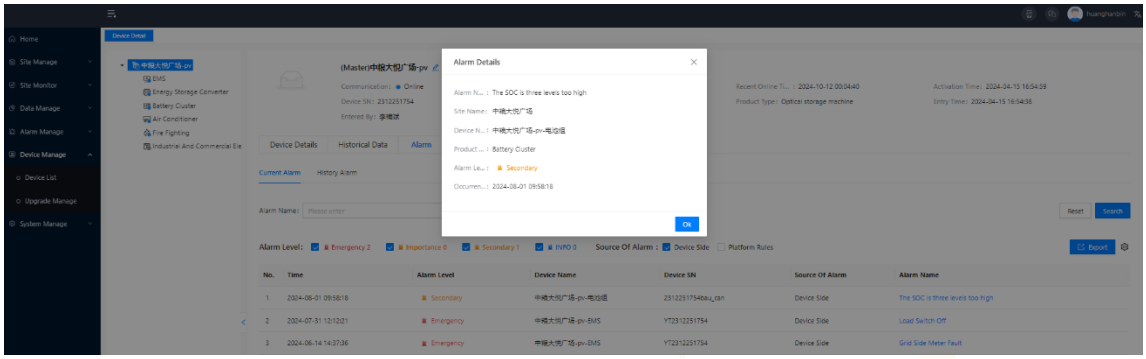


Figure 6.5-5 Cloud Platform Device Alarm Information Display Interface

(5) Logs:

During the operation of the equipment, when the state of the equipment changes, the system will record the time of the equipment state change, the previous and current values of the change facilitate the traceability of the equipment operation state, and the command issuance to the equipment will also be recorded in the log for easy traceability of the issuance record.

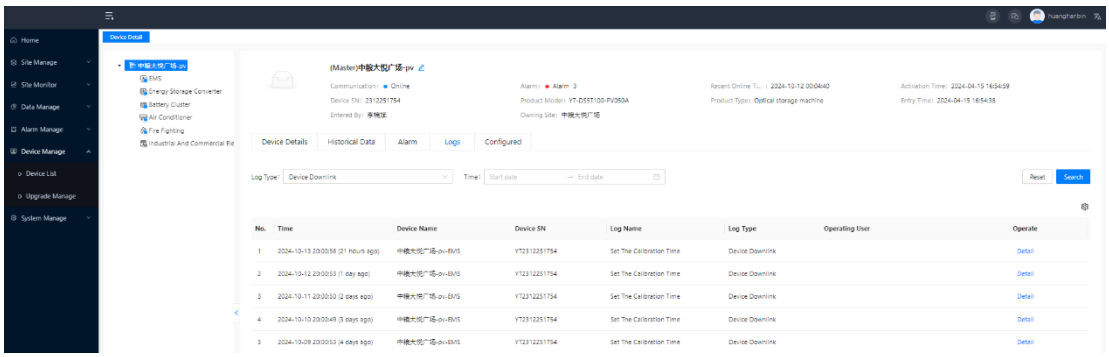


Figure 6.5-6 Cloud Platform Operation Log Display Interface

Click to view details and view the specific content of the log.

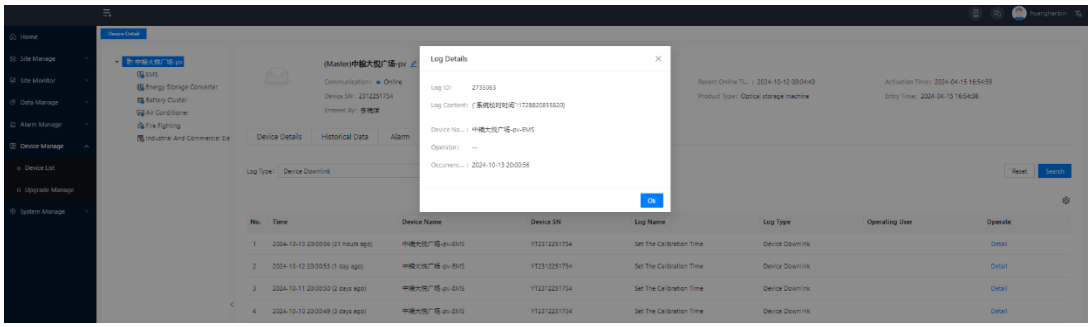


Figure 6.5-7 Cloud Platform Operation Log Content Display Interface

(6) Integrated Energy Storage Cabinet

Device Details:

Display the basic information and operating status of the energy storage cabinet.

Display the physical structure diagram of the equipment and the operating status of each component: cabinet door, EMS, battery pack, cell information, inverter, air conditioning main operating information, and by clicking "More," you can view the detailed information of the corresponding energy storage equipment's sub-devices.

Display the operating power of the energy storage unit, positive values for discharge, and negative values for charging. You can select a historical date to query the charge and discharge power curve of that day.

On the left side of the device details, display the device tree, showing the list of devices and their sub-devices, and click to switch and view different devices.

Display the single-line electrical diagram.

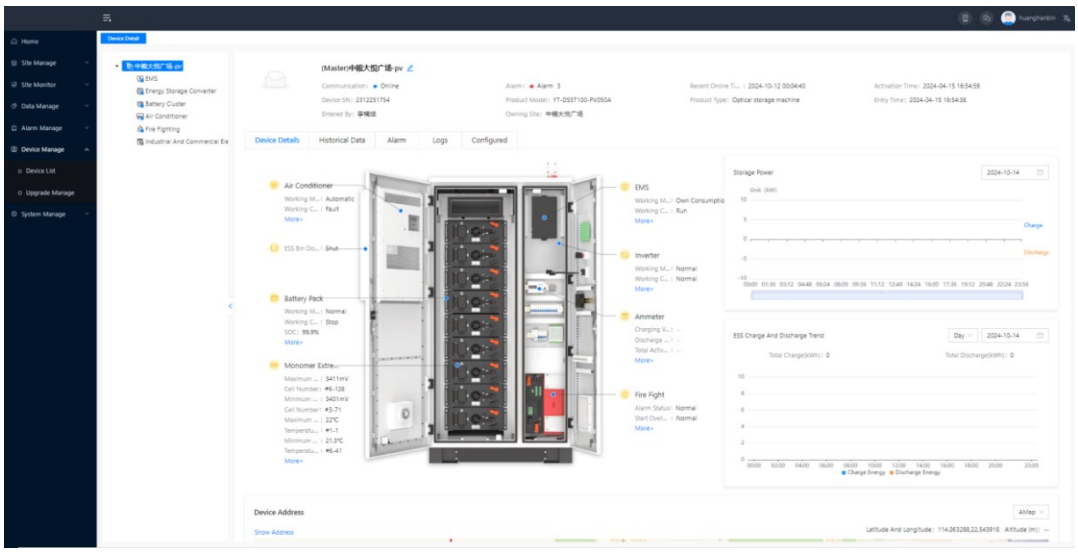


Figure 6.5-8 Cloud Platform Integrated Energy Storage Cabinet Display Interface

(7) Energy Storage EMS

1) Device Details - Operating Data

Display the basic information, status information, system charging cost statistics, system discharging revenue statistics, emission reduction, and other information of the EMS device.

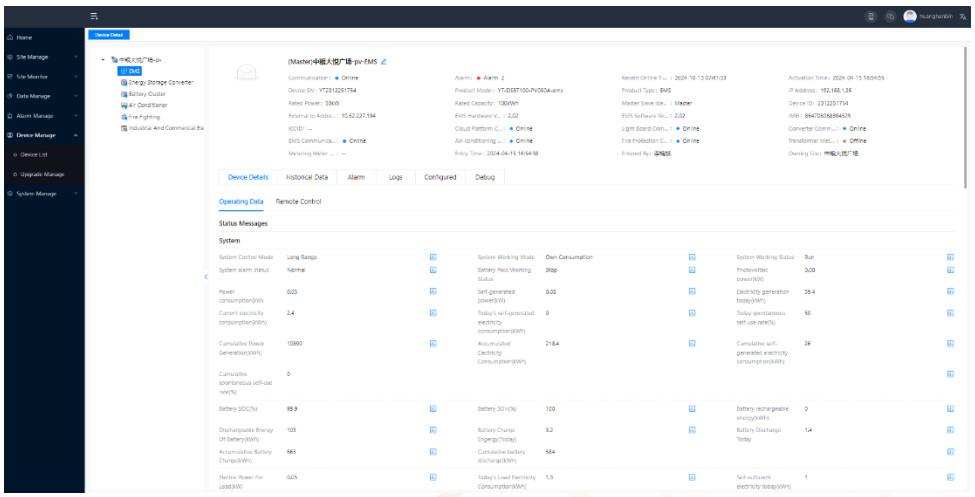


Figure 6.5-9 Cloud Platform EMS Information Display Interface

Click on the data point next to the collection point to view the historical data trend of that data point, and you can select a historical time period to view the trend of the collection point within that time period.

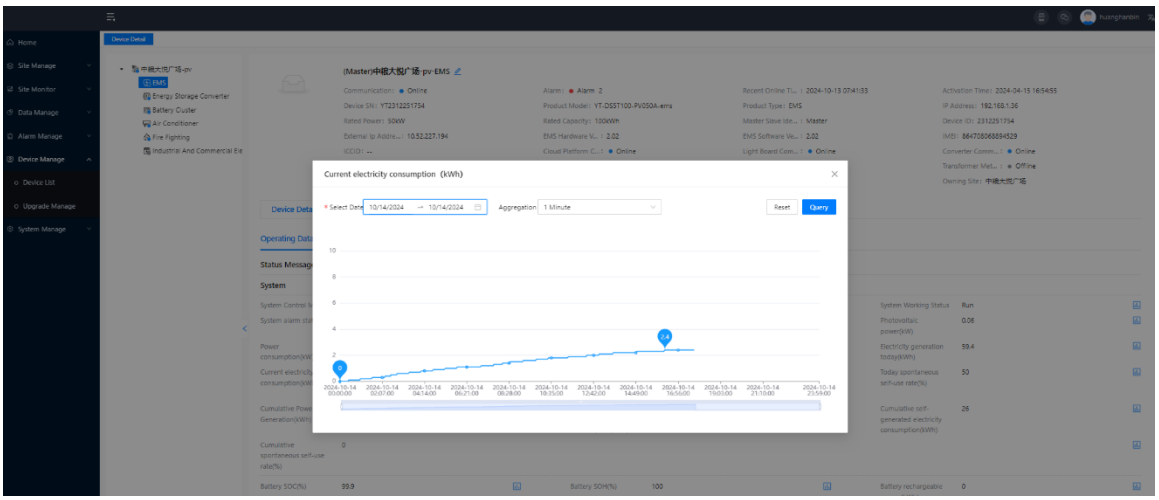


Figure 6.5-10 Cloud Platform Historical Data Display Interface

2) Device Details - Remote Control:

For details on related control commands, see Appendix B.2.

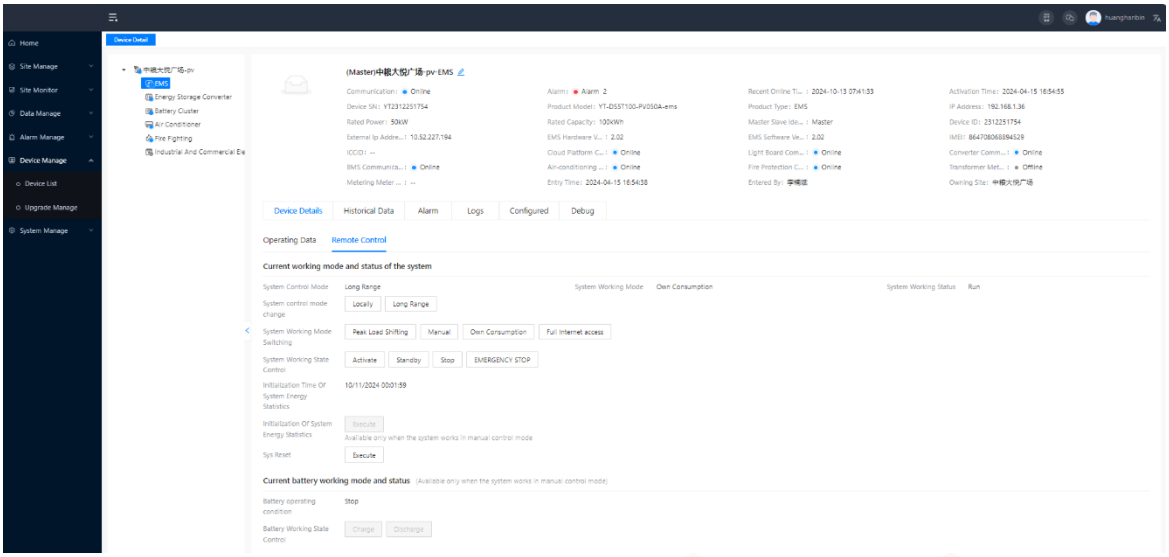


Figure 6.5-11 Cloud Platform Remote Control Display Interface

3) Configuration - Energy Management

Peak Shaving and Valley Filling Mode Settings: You can set up to ten time periods for charging and discharging period cycles, charging and discharging modes, charging and discharging power, as well as the highest and lowest SOC throughout the entire mode process.

Manual Mode Settings: Set the maximum manual charging power and maximum discharging power.

Peak, Flat, and Valley Period Settings: Issue peak, flat, and valley electricity prices for four periods to the equipment, and set up to ten time periods for peak, flat, and valley modes for the equipment.

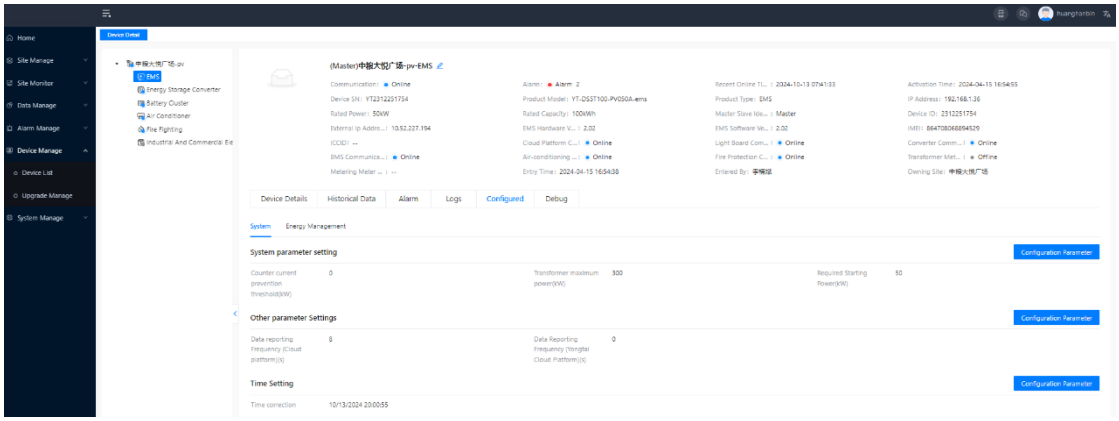


Figure 6.5-12 Cloud Platform Energy Management Settings Display Interface

(8) Energy Storage Inverter

Device details display the status information of the energy storage inverter, status information, AC side information, DC side information, photovoltaic information, temperature information, and electricity meter information.

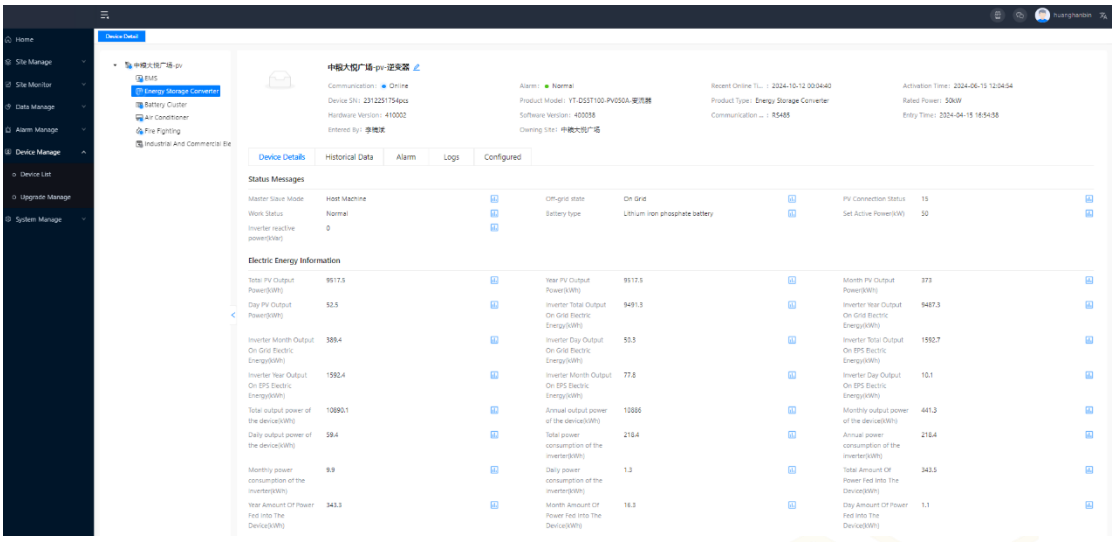


Figure 6.5-13 Cloud Platform Energy Storage Inverter Display Interface

(9) Energy Storage Battery Pack

Device details display the status information of the battery pack (remote measurement), status information (cell extreme values), status information (remote signaling), status information (fans), and cell extreme value information.

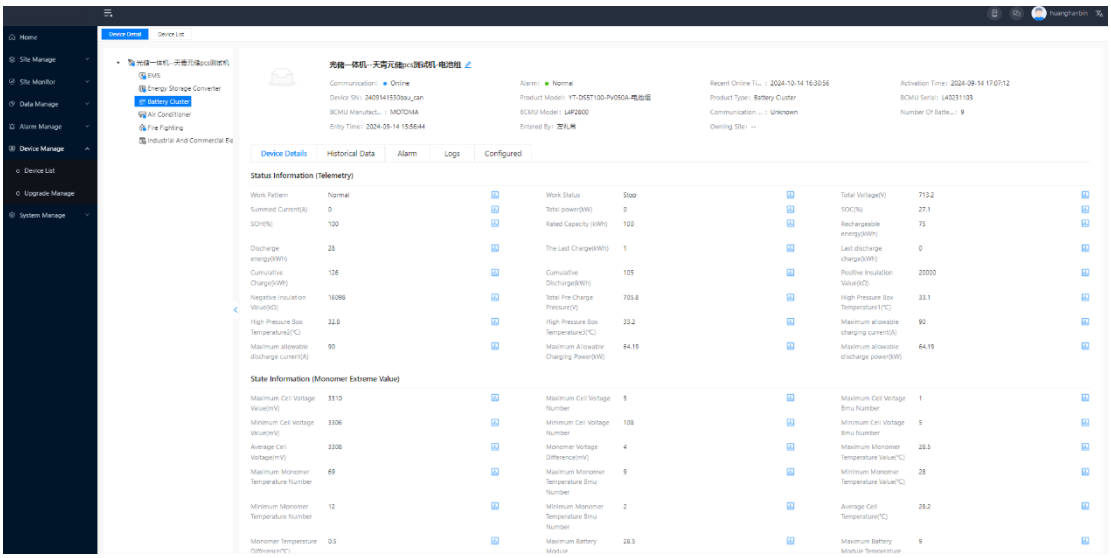


Figure 6.5-14 Cloud Platform Energy Storage Battery Pack Display Interface

(10) Energy Storage Air Conditioning

Device details display the status information when the energy storage air conditioning is operating.

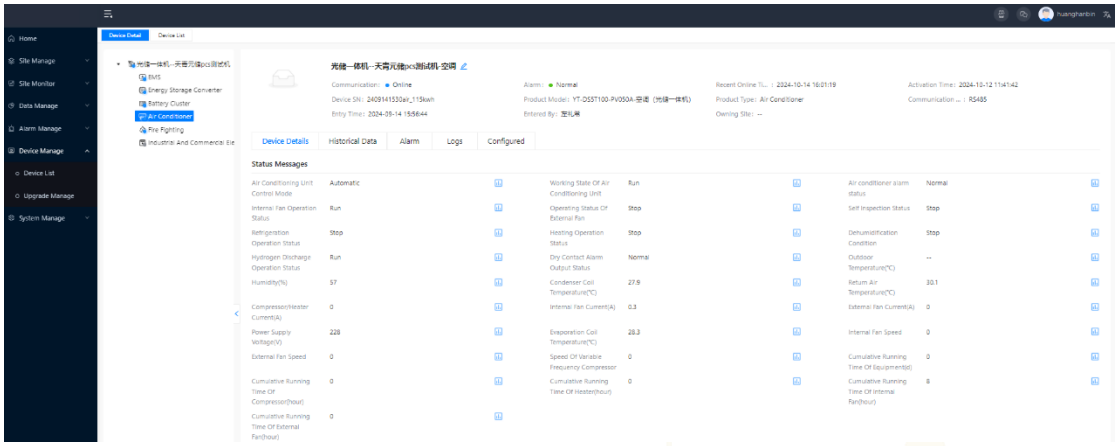


Figure 6.5-15 Cloud Platform Air Conditioning Information Display Interface

(11) Energy Storage Fire Protection

Display the main status information of the air-cooled fire protection

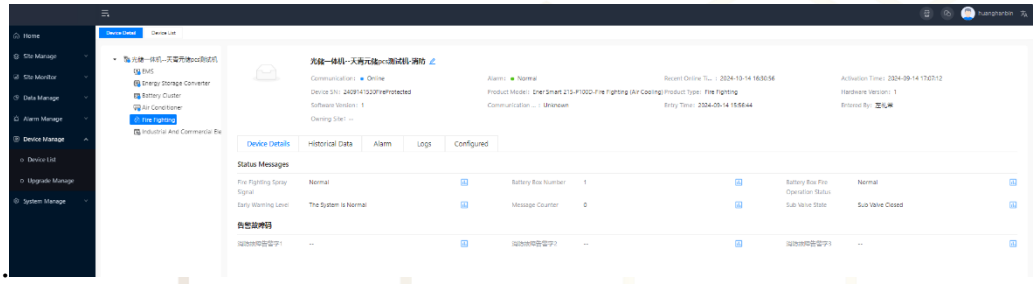


Figure 6.5-16 Cloud Platform Fire Protection Information Display Interface

(12) Grid-Side Electricity Meter

Device details display the real-time data of the electricity meter operation: three-phase current, three-phase voltage, three-phase active power, three-phase reactive power, three-phase apparent power, three-phase cumulative electricity, frequency, and three-phase power factor.

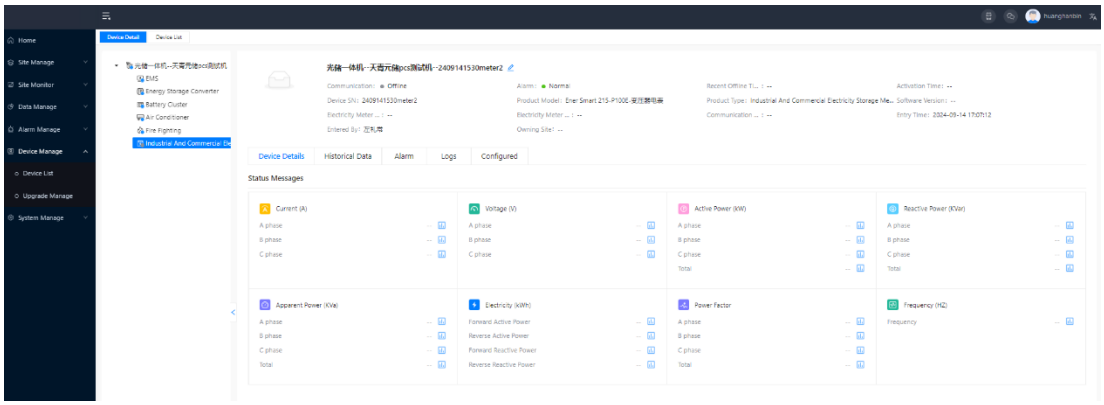


Figure 6.5-17 Cloud Platform Electricity Meter Information Display Interface

6.6 Upgrade Management

Users can select the product to be upgraded through upgrade tasks, product types, and product models.

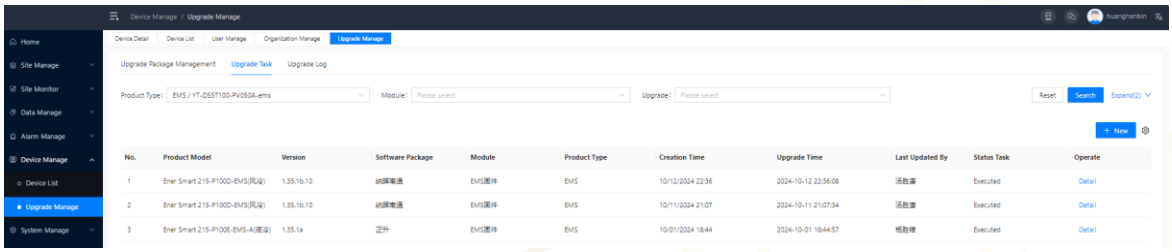


Figure 6.6-1 Upgrade Management Display Interface

7 System Maintenance

7.1 Pre-Maintenance Notices

1) Do not open the battery cabinet for maintenance in rainy, damp, or windy weather. If unavoidable, any resulting damages will not be the responsibility of this company.
2) Avoid opening the cabinet door during rainy, snowy, or foggy conditions with high humidity. After closing the cabinet door, ensure that the sealing strip around the door is not curled.
3) To minimize the risk of electric shock, refrain from performing any maintenance or repair operations beyond those specified in this manual. If necessary, contact MOTOMA customer service personnel for maintenance and repairs.

7.2 Maintenance Work Conducted Every Two Years

No.	Item	Inspection method
1	System Status and Cleaning	Please inspect the following items, and promptly rectify any discrepancies found: 1) Examine the battery cabinet and internal devices for damage or deformation. 2) Check for abnormal noises during the operation of internal devices. 3) Monitor whether the temperature inside the battery cabinet exceeds acceptable levels. 4) Verify that the humidity and grime levels inside the battery cabinet are within normal ranges. If necessary, cleaning is required.

		5) Ensure that the air inlet and outlet of the battery cabinet are not obstructed.
2	Warning Signs	Examine warning signs and labels for clarity and absence of damage. Replace if necessary.
3	Grounding of Cable Shielding	Inspect the proper contact between the cable shielding layer and insulation sleeves; confirm the secure fixation of the grounding copper bus.
4	Lightning Protection Devices and Fuses	Verify the secure fastening of lightning protection devices and fuses.
5	Corrosion Status	Examine the internal conditions of outdoor cabinets for oxidation or rust.

7.3 Maintenance Work Conducted Every Year

No.	Item	Inspection method
1	External Inspection of the Cabinet	Check the following items, and promptly rectify any discrepancies found: 1) Check for flammable objects on top of the battery cabinet. 2) Inspect the welding points between the battery cabinet and the foundation steel plate for stability and signs of rust. 3) Examine the battery cabinet casing for damages, peeling paint, oxidation, or any other issues. 4) Verify the flexibility of cabinet door locks and hinges. 5) Ensure that seals and gaskets are securely in place.
2	Internal Inspection of the Cabinet	Check the interior of the ESS cabinet for foreign objects, dust, dirt, and condensation.

3	Inlet and Outlet Vents	Check air conditioner temperature and dust accumulation. If necessary, use a vacuum cleaner to clean the air conditioner.
4	Wiring and Cable Layout	The inspection should commence only after completely disconnecting power to the internal devices of the ESS cabinet. If discrepancies are found during inspection, rectify them immediately: 1) Check if the cable layout is compliant and free from short circuits. Correct any anomalies promptly. 2) Verify the proper sealing of all cable entry and exit points on the battery cabinet. 3) Check for water leakage inside the battery cabinet. 4) Inspect power cable connections for looseness and tighten according to specified torque. 5) Examine power and control cables for damage, especially any signs of cuts where they contact metal surfaces. 6) Ensure that insulation wrapping on power cable connection terminals is intact.
5	Grounding and Equipotential Connections	1) Verify the correctness of grounding connections, and the grounding resistance should not exceed 4Ω. 2) Check the correctness of equipotential connections inside the ESS cabinet.
6	Fans	1) Check the operational status of the fans. 2) Ensure that the fans are not obstructed. 3) Examine for any abnormal noise during fan operation.
7	Screws	Check for the presence of dropped screws or any other issues inside the battery cabinet.

7.4 Maintenance Work Conducted Every Six Months to One Year

No.	Item	Inspection method
1	Safety Functions	1) Verify the emergency shutdown button's stopping functionality. 2) Simulate a shutdown. 3) Inspect the equipment for warning signs and other labels. If any are found to be blurred or damaged, replace them promptly.
2	Internal Component Inspection	1) Inspect the cleanliness of circuit boards and components. 2) Check the air conditioning temperature and dust accumulation. If necessary, use a vacuum cleaner to clean the air conditioning modules. 3) If needed, replace the air filter. Caution! Ensure proper ventilation of the air conditioning intake. Otherwise, if the air conditioning cannot effectively cool, it may malfunction due to overheating.
3	Device Maintenance	1) Perform routine checks for corrosion on all metal components (every six months). 2) Conduct annual inspections of relays (auxiliary switches and micro-switches) to ensure their mechanical operation is sound. 3) Check operational parameters, especially voltage and insulation parameters.

8 Alarm&Fault Reference

8.1 EMS Alarms/Faults

The following is the EMS alarm/fault list.

Table 8.1-1 EMS Alarm/Fault List

No.	Alarm name	Fault cause	Handling suggestion
1	BMS communication disconnected	1. The BMS is not powered on. 2. The communication cable harness is loose.	1. Check whether the power supply to the BMS is normal. 2. Check whether the wiring harness is loose and damaged.
2	The Hybrid Inverter communication disconnected	1. The Hybrid Inverter is not powered on. 2. The communication cable harness is loose.	1. Check whether the Hybrid Inverter power supply is normal; 2. Check whether the wiring harness is loose and damaged.
3	Meter communication disconnected	1. The meter is not powered on. 2. The communication cable harness is loose.	1. Check whether the power supply of the meter is normal; 2. Check whether the wiring harness is loose and damaged.

4	Air conditioning communication lost	1. The air conditioner is powered off. 2. The communication cable harness is loose.	1. Check whether the power supply to the air conditioner is normal. 2. Check whether the wiring harness is loose and damaged.
5	Fire signal alarm	1. There is smoke or partial overheat in the battery cabinet. 2. The battery cabinet is on fire.	1. Remotely monitor the device for 30 minutes and check whether other anomalies exist, such as abnormal temperature, battery voltage, battery temperature, and hydrogen concentration. If yes, shut down the remote system. During remote monitoring, do not go near the battery cabinet and do not open the cabinet door. 2. If there is no abnormality in the remote monitoring, arrange security trained personnel to go to the site and observe the situation at a safe distance for 30 minutes. If there is smoke or fire, please shut down the remote system, stay away from the scene as soon as possible, and call the fire alarm phone. 3. If the remote monitoring and on-site observation are not abnormal, open the battery cabinet door and observe whether the perfluorooacetone is sprayed. If yes, contact the service hotline.

6	Electrical emergency stop signal alarm	The emergency stop button of the battery cabinet door is pressed or damaged.	1. Manually press the emergency stop button to reset. 2. Replace the emergency stop button if the emergency stop button is damaged.

8.2 BMS Alarms/Faults

The following is the BMS alarm/fault list.

Table 8.2-1 BMS Alarm/Fault List

No.	Alarm Name	Cause of Malfunction	Suggested Action
1	Pack Fan Failure	1. Insufficient power supply. 2. Fan damage or blocked by foreign objects.	1. Check if the fan's 220V power supply is reliably connected. 2. Inspect the fan blades for damage, remove any foreign objects around the fan, check for power supply anomalies, and then reinstall the fan.
2	BMU Hardware Failure	BMU damage	1. Restart the BMU by cycling the power on and off. 2. Reseat the BMU. 3. If the above steps do not resolve the issue, replace the BMU.
3	BCMU Hardware Failure	BCMU damage	1. Restart the BCMU by cycling the power on and off. 2. Reseat the BCMU. 3. If the above steps do not resolve the issue, replace the BCMU.
4	Contactor Sticking Fault	1. Contactor damage	1. Replace the contactor. 2. Correct the wiring.

		2. Incorrect wiring of contactor feedback contacts	
5	BMU Communication Failure	Loose communication plug	Replace the communication cable assembly.
6	Current Sensor Failure	1. Loose shunt sampler wires 2. Shunt damage or reversed connection 3. Damaged sampling module	1. Secure the shunt sampler signal wires. 2. Measure the shunt for normal operation and signal output. If unresolved, replace the shunt. 3. Replace the BCMU.
7	NTC Failure	Sampling异常	Restart/Disassemble/Replace the BMU.
8	Emergency Stop Signal Alarm	The emergency stop button on the battery cabinet door is pressed or damaged.	1. Reset the manually pressed emergency stop button. 2. If the emergency stop button is damaged, replace it.
9	Water Immersion Signal Alarm	The battery cabinet is flooded, or the water immersion sensor is damaged.	1. Check for water accumulation inside the battery cabinet and drain it thoroughly. 2. Ensure the water immersion sensor inside the battery cabinet is intact. Replace damaged devices if necessary; if intact, manually clear the alarm.
10	Fire Signal Alarm	Smoke, localized overheating, or fire in the battery cabinet.	1. Remotely monitor for 30 minutes for any abnormalities (e.g., temperature, battery voltage, battery temperature, combustible gas concentration). If any, shut down the remote system. Do not approach or open the cabinet during monitoring.

			2. If no other abnormalities are detected, arrange for trained personnel to observe from a safe distance for 30 minutes. If smoke or fire is observed, shut down the system remotely, evacuate, and call the fire department. 3. If no abnormalities are detected remotely or on-site, open the cabinet to check for the release of perfluoropolyether. If released, contact the service hotline; if not, replace the perfluoropolyether module for a fault.
11	AC Surge Arrestor Failure	AC surge arrestor failure	1. Check if the AC surge arrestor signal wire is loose. 2. Check if the indicator on the AC surge arrestor has changed color. 3. Replace the AC surge arrestor.
12	Total Voltage Over voltage III/II/I Alarm	Battery total voltage exceeds III/II/I alarm threshold	Rest for over 30 minutes or discharge to return normal.
13	Total Voltage Under voltage III/II/I Alarm	Battery total voltage is below III/II/I alarm threshold	Rest for over 30 minutes or charge to return normal.
14	Cell Over voltage III/II/I Alarm	Individual battery cell voltage exceeds III/II/I alarm threshold	Rest for over 30 minutes or discharge to return normal.
15	Cell Undervoltage III/II/I Alarm	Individual battery cell voltage is below III/II/I alarm threshold	Rest for over 30 minutes or charge to return normal.

16	Discharge Current Too High III/II/I Alarm	Excessive dispatch power	Issue reasonable dispatch power.
17	Charging Current Too High III/II/I Alarm	Excessive dispatch power	Issue reasonable dispatch power.
18	Discharge Battery Overtemperature III/II/I Alarm	1. Loose cooling fan plug. 2. Cooling fan failure 3. Air conditioning coolant failure 4. Air conditioning cooling system not activated.	1. Reseat the fan plug. 2. Power the fan separately to check operation. 3. Replace the coolant. 4. Check the cooling system.
19	Discharge Battery Undertemperature III/II/I Alarm	Air conditioning heating system not activated	Check the heating system.
20	Charging Battery Overtemperature III/II/I Alarm	1. Loose cooling fan plug 2. Cooling fan failure 3. Air conditioning coolant failure 4. Air conditioning cooling system not activated.	1. Reseat the fan plug. 2. Power the fan separately to check operation. 3. Replace the coolant. 4. Check the cooling system.
21	Charging Battery Undertemperature III/II/I Alarm	Air conditioning heating system not activated	Check the heating system.

22	Insulation Resistance Too Low III/II/I Alarm	1. Dampness/excessive dust 2. Ground short circuit 3. Poor power line contact	1. Dehumidify and clean. 2. Measure system insulation with an instrument. 3. Check power line connections.
23	High Temperature Alarm for HV Junction Box Connector	Fan failure in the distribution box, abnormal 220V supply.	Check if the fan power supply is normal or replace the fan.
24	Cell Voltage Difference III/II/I Alarm	Voltage difference between battery clusters exceeds 30V	Charge and discharge individual clusters to equalize total cluster voltage.
25	Cell Temperature Difference III/II/I Alarm	1. Loose cooling fan plug 2. Cooling fan failure 3. Air conditioning coolant failure 4. Air conditioning cooling system not activated.	1. Reseat the fan plug. 2. Power the fan separately to check operation. 3. Replace the coolant. 4. Check the cooling system.
26	Low SOC III/II/I Alarm	Battery SOC is below III/II/I alarm threshold	Rest for over 30 minutes or charge to return normal.

8.3 Hybrid Inverter Alarms/Faults

Refer to the Hybrid Inverter user manual's alarm/fault list for troubleshooting.

8.4 Air Conditioning Alarms/Faults

The following is the air conditioning alarm/fault list.

Table 8.4-1 Air Conditioning Alarm/Fault List

No.	Alarm Name	Cause of Malfunction	Suggested Action
1	Return Air Temperature Sensor Failure Alarm	1. Loose wiring of the return air temperature sensor. 2. Sensor damage, open circuit, or short circuit.	1. Please shut down the system at an appropriate time and take safety precautions. 2. Check for loose wiring. 3. Replace the return air temperature sensor.
2	Return Air Humidity Sensor Failure Alarm	1. Loose wiring of the return air humidity sensor. 2. Sensor damage, open circuit, or short circuit.	1. Please shut down the system at an appropriate time and take safety precautions. 2. Check for loose wiring. 3. Replace the return air humidity sensor.
3	Supply Air Temperature Sensor Failure Alarm	1. Loose wiring of the supply air temperature sensor. 2. Sensor damage, open circuit, or short circuit.	1. Please shut down the system at an appropriate time and take safety precautions. 2. Check for loose wiring. 3. Replace the supply air temperature sensor.
4	High Temperature Alarm	The unit has been operating continuously for more than 10 minutes, and the return air temperature is higher than the high-temperature alarm set point.	1. Check the air conditioning parameter "High Temperature Alarm Set Point" to ensure it is set reasonably. 2. If the parameter is set correctly, please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down the air conditioner and contact the service hotline.

5	Low Temperature Alarm	The unit has been operating continuously for more than 10 minutes, and the return air temperature is lower than the low-temperature alarm set point.	1. Check the air conditioning parameter "Low Temperature Alarm Set Point" to ensure it is set reasonably. 2. If the parameter is set correctly, please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down the air conditioner and contact the service hotline.
6	High Humidity Alarm	The unit has been operating continuously for more than 10 minutes, and the return air humidity is higher than the high humidity alarm set point.	1. Check the air conditioning parameter "High Humidity Alarm Set Point" to ensure it is set reasonably. 2. If the parameter is set correctly, please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down the air conditioner and contact the service hotline.
7	Low Humidity Alarm	The unit has been operating continuously for more than 10 minutes, and the return air humidity is lower than the low humidity alarm set point.	1. Check the air conditioning parameter "Low Humidity Alarm Set Point" to ensure it is set reasonably. 2. If the parameter is set correctly, please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down

			the air conditioner and contact the service hotline.
8	High Pressure Alarm	1. High-pressure switch is disconnected. 2. High-pressure wiring is loose.	1. Check if all system valves are fully open. 2. Check if the condenser is dirty or blocked, and clean the condenser if necessary. 3. Check if the condenser fan is operating normally. 4. Check if the high-pressure wiring is connected properly.
9	High Pressure Lock Alarm	1. Three high-pressure alarms or condenser high-temperature alarms occur within 1 hour. 2. High-pressure alarm or condenser high-temperature alarm persists for 10 minutes without being cleared.	1. Check if all system valves are fully open. 2. Check if the condenser is dirty or blocked, and clean the condenser if necessary. 3. Check if the condenser fan is operating normally. 4. Check if the high-pressure wiring is connected properly.
10	Low Pressure Alarm	1. Low-pressure switch is disconnected. 2. Low-pressure wiring is loose.	1. Check if all system valves are fully open. 2. Check if the system refrigerant is insufficient or leaking. 3. Check if the low-pressure wiring is connected properly.
11	Low Pressure Lock Alarm	1. Three low-pressure alarms or evaporator low-temperature alarms occur within 1 hour. 2. Low-pressure alarm or evaporator low-temperature alarm	1. Check if all system valves are fully open. 2. Check if the system refrigerant is insufficient or leaking. 3. Check if the low-pressure wiring is connected properly.

		persists for 10 minutes without being cleared.	
12	Condenser Temperature Sensor Failure Alarm	1. Wiring is not stable or incorrect. 2. Sensor damage, open circuit, or short circuit.	1. Please shut down the system at an appropriate time and take safety precautions. 2. Check for loose wiring. 3. Replace the condenser temperature sensor.
13	Evaporator Temperature Sensor Failure Alarm	1. Evaporator temperature sensor wiring is loose. 2. Sensor damage, open circuit, or short circuit.	1. Please shut down the system at an appropriate time and take safety precautions. 2. Check for loose wiring. 3. Replace the evaporator temperature sensor.
14	Condenser High Temperature Alarm	The condenser temperature is higher than the condenser high-temperature alarm set point.	Please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down the air conditioner and contact the service hotline.
15	Evaporator Low Temperature Alarm	The evaporator temperature is lower than the evaporator low-temperature alarm set point.	Please check other related alarms for this air conditioner and perform maintenance according to the corresponding repair suggestions. If there are no other related alarms, please shut down the air conditioner and contact the service hotline.

9 Appendix

A.How to Touch Up Paint

A.1 Prerequisites

1) In outdoor, unobstructed conditions, it is strictly forbidden to touch up paint in harsh weather such as rain, snow, strong winds, sandstorms, etc.
2) Prepare paint that meets the requirements based on the color chart provided at the time of shipment.

A.2 Paint Touch-Up Instructions

The equipment's appearance should be kept intact. If there is paint peeling, touch up immediately.

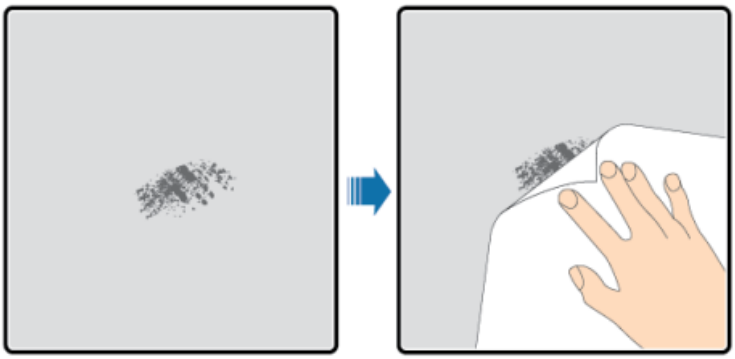
[Table 1: Paint Touch-up Instructions]

Degree of Paint Damage	Tools and materials	Operation steps	Description
Light scratches (not exposing the steel substrate)	Spray paint or paint, brush (for small area touch-ups), fine sandpaper, anhydrous ethanol, cotton cloth, spray gun (for large area touch-ups);	Refer to B.3 steps 1+2+4+5 for operation.	The topcoat (acrylic paint) color should reference the color chart provided at the time of shipment, including the Pantone number indicated on the chart. For minor scratches and small stains or rust, it is recommended to use hand spray paint or brush. For major scratches and large areas of stains or rust, use an oil paint spray gun for application. The paint film should be as thin and even as possible, avoiding a droplet-like appearance and maintaining a smooth surface. After touch-up, subsequent operations can be carried out
Stains and rust that cannot be wiped off			
Deep scratches (primer damaged, exposing	Spray paint or paint, zinc-rich primer, brush (for small area touch-ups), fine	Refer to B.3 steps 1+2+4+5 for operation.	

the steel substrate)	sandpaper, anhydrous ethanol, cotton cloth, spray gun (for large area touch-ups).		approximately 30 minutes after allowing the paint surface to settle.
Damage to logos and patterns	For damaged logos and patterns, provide the logo's dimensions and color codes. Seek a local advertising spray supplier to develop a repair plan based on logo size, color, and the extent of damage, and then execute the repair.		
Impact dents	If the impact area is smaller than 100mm² and the depth is less than 3mm, use unsaturated polyester resin putty (Poly-Putty base) (atomic gray) to fill the area. After filling, follow the procedure for repairing deep scratches. If the impact area is larger than 100mm² or the depth is greater than 3mm, seek a local supplier to provide a customized repair plan based on the specific situation.		

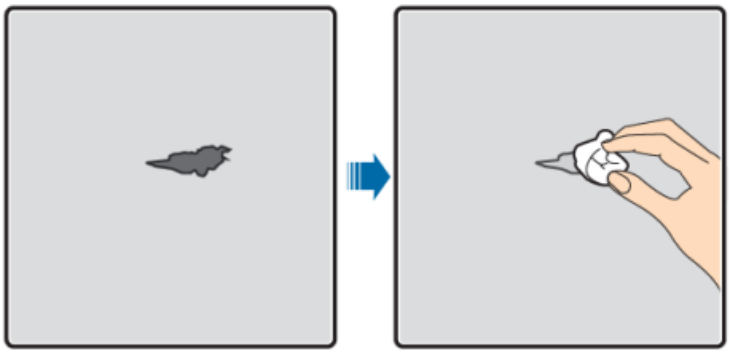
A.3 Operation Steps:

Step 1: Gently sand the damaged area with fine sandpaper to remove dirt or rust.



[Image 4: Sanding the damaged coating with fine sandpaper]

Step 2: Dampen a cotton cloth with anhydrous ethanol, wipe the sanded or repair area to remove surface dirt and dust, then dry with a clean cotton cloth.



[Image 5: Treating the damaged coating with anhydrous ethanol]

Step 3: Use a brush or spray gun to apply zinc-rich primer to the damaged coating.

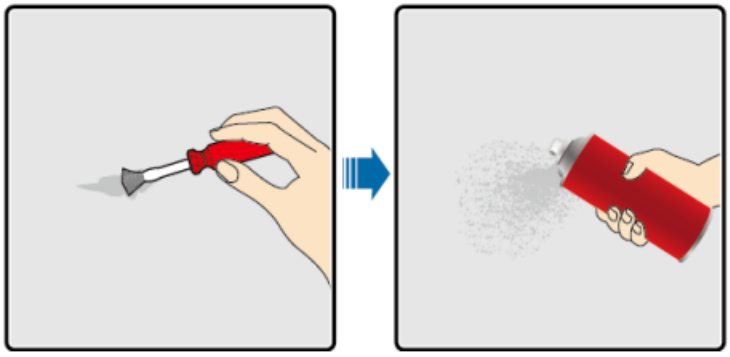
NOTE

1) If the repair area has exposed the substrate, apply epoxy zinc-rich primer first until the paint is dry and the substrate is not exposed, then apply acrylic topcoat.
2) Choose epoxy zinc-rich primer or acrylic topcoat based on the color of the equipment surface coating.

Step 4: Depending on the degree of paint damage, choose one of the methods—self-spraying, brushing, or using a spray gun—to evenly touch up the damaged coating until no traces of damage are visible.

NOTE

1) Pay attention to keeping the painted film as thin and even as possible, without forming droplets, to maintain a smooth surface.
2) For equipment with different colored patterns, before touching up, cover other colored areas with tape and white paper to avoid contamination during the touch-up process.



[Image 6: Touching up the damaged coating on the equipment]

Step 5: After painting, let it sit for about 30 minutes, then observe whether the repaired area meets the requirements.

NOTE

1)The repaired area should match the color of the surrounding areas, with a color difference (ΔE) of ≤3 when measured with a colorimeter. If a colorimeter is not available, ensure there is no obvious edge between the repainted area and its surrounding areas. The paint should not have protrusions, scratches, peeling, or cracks.

2)If using spray paint, it is recommended to apply three coats and then observe if it meets the requirements. If not, repeat the spray painting until the requirements are met.

B EMS System Parameter Description

B.1 Data Monitoring Information

System Parameter Description

System-Related Parameters Table

Parameter	Unit	Description	Calculation Formula	Remarks
Today's System Charging	kWh	The cumulative electricity charged into the energy storage system from 00:00 today to the current moment.	Initialized to the default value of 0kWh at 00:00:00 every day, and starts to accumulate the charging quantity of the energy storage system for today (including the work loss of auxiliary power supply, etc.).	
Today's System Discharging	kWh	The cumulative electricity discharged by the energy storage system from 00:00 today to the current moment.	Initialized to the default value of 0kWh at 00:00:00 every day, and starts to accumulate the discharging quantity of the energy storage system for today (including the work loss of auxiliary power supply, etc.).	
Cumulative System Charging	kWh	The total charging quantity of the energy storage system from the last system energy statistics initialization to the current moment.	From the last operation of "System Energy Statistics Initialization" (the corresponding timestamp can be viewed next to the operation button in the upper computer software), until the total charging quantity of the energy	

			storage system is accumulated.	
Cumulative System Discharging	kWh	The total discharging quantity of the energy storage system from the last system energy statistics initialization to the current moment.	From the last operation of "System Energy Statistics Initialization" (the corresponding timestamp can be viewed next to the operation button in the upper computer software), until the total discharging quantity of the energy storage system is accumulated.	
Available Charging Energy	kWh	The remaining electricity that can be charged into the energy storage system as of the current moment.		
Available Discharging Energy	kWh	The remaining electricity that can be discharged from the energy storage system as of the current moment.		
System Charging	kWh	The quantity of electricity charged by the energy storage system during the statistical period.	Day: The quantity of electricity charged by the energy storage system daily; Month: The total sum of daily charging quantities of the energy storage system within the	

			statistical month; Year: The total sum of monthly charging quantities of the energy storage system within the statistical year.	
System Discharging	kWh	The quantity of electricity discharged by the energy storage system during the statistical period.	Day: The quantity of electricity discharged by the energy storage system daily; Month: The total sum of daily discharging quantities of the energy storage system within the statistical month; Year: The total sum of monthly discharging quantities of the energy storage system within the statistical year.	
First Charging	kWh	The cumulative quantity of electricity charged for the first time of the day at the current moment.	The cumulative quantity of electricity charged for the first time of the day, with a default starting value of 0kWh each day, and no further accumulation after the first charging stops.	
First Discharging	kWh	The cumulative quantity of electricity discharged for the first time of the	The cumulative quantity of electricity discharged for the first time of the day, with a default starting	

		day at the current moment.	value of 0kWh each day, and no further accumulation after the first discharging stops.	
Second Charging	kWh	The cumulative quantity of electricity charged for the second time of the day at the current moment.	The cumulative quantity of electricity charged for the second time of the day, with a default starting value of 0kWh each day, starting to accumulate from the second charging, and no further accumulation after the second charging stops.	
Second Discharging	kWh	The cumulative quantity of electricity discharged for the second time of the day at the current moment.	The cumulative quantity of electricity discharged for the second time of the day, with a default starting value of 0kWh each day, starting to accumulate from the second discharging, and no further accumulation after the second charging stops.	
System Total Active Power	kW	The total active power of the system during charging or discharging at the current moment.	The total active power of the system during charging or discharging at the current moment (sum of three-phase active	

			power on the AC side). Discharging is positive, charging is negative.	
System Total Reactive Power	kvar	The total reactive power of the system during charging or discharging at the current moment.	The total reactive power of the system during charging or discharging at the current moment (sum of three-phase reactive power on the AC side). Discharging is positive, charging is negative.	
System Total Apparent Power	kVA	The total apparent power of the system during charging or discharging at the current moment.	The total apparent power of the system during charging or discharging at the current moment (sum of three-phase apparent power on the AC side).	
System Set Active Power	kW	The set active power value for the system's current charging or discharging.	Charging is a negative value, discharging is a positive value.	
System Set Reactive Power	var	The set reactive power value for the system's current charging or discharging.	Charging is a negative value, discharging is a positive value.	
Charging/Discharging Power	kW	The active power of the energy storage system during charging or	The active power of the energy storage system (AC side) during charging or discharging at the	

		discharging at the current moment.	current moment. Discharging is positive, charging is negative.	

2)Battery-Related Parameters

Battery-Related Parameters

Parameter	Unit	Description	Calculation Formula	Remarks
Today's Charging	kWh	The cumulative quantity of electricity charged into the energy storage battery from 00:00 today to the current moment.	Initialized to the default value of 0kWh at 00:00:00 every day, and starts to accumulate the charging quantity of the energy storage battery for today.	
Today's Discharging	kWh	The cumulative quantity of electricity discharged by the energy storage battery from 00:00 today to the current moment.	Initialized to the default value of 0kWh at 00:00:00 every day, and starts to accumulate the discharging quantity of the energy storage battery for today.	
Available Discharging Energy	kWh	The remaining electricity that can be discharged from the energy storage battery as of the current moment.		
Available Charging Energy	kWh	The remaining electricity that can be charged into the energy storage battery as of the current moment.		
Energy Storage	kW	The active power of the energy storage battery during	The active power of the energy storage battery during charging or	

Battery Power		charging or discharging at the current moment.	discharging at the current moment. Discharging is positive, charging is negative.	
Battery SOC	%	The capacity value of the energy storage battery at the current moment.	Calculated and uploaded by the system BMS.	
Battery SOH	%	The health status value of the energy storage battery at the current moment.	Calculated and uploaded by the system BMS.	
Battery Total Voltage	V	The total voltage value of the energy storage battery at the current moment.		
Battery Total Current	A	The total current value of the energy storage battery at the current moment.		
Battery Total Power	kW	The total power value of the energy storage battery at the current moment.		
Highest Cell Voltage	mV	The highest cell voltage value of the energy storage battery at the current moment.		
Lowest Cell Voltage	mV	The lowest cell voltage value of the energy storage battery at the current moment.		
Average Cell Voltage	mV	The average cell voltage value of the energy storage battery at the current moment.		

Cell Voltage Difference	mV	The maximum cell voltage difference of the energy storage battery at the current moment.	"Highest Cell Voltage" - "Lowest Cell Voltage"	
Highest Cell Temperature	℃	The highest cell temperature value of the energy storage battery at the current moment.		
Lowest Cell Temperature	℃	The lowest cell temperature value of the energy storage battery at the current moment.		
Average Cell Temperature	℃	The average cell temperature value of the energy storage battery at the current moment.		
Cell Temperature Difference	℃	The maximum cell temperature difference of the energy storage battery at the current moment.	"Highest Cell Temperature" - "Lowest Cell Temperature"	

3) Load and other related parameters

Load and other related parameters

Parameter	**Unit**	**Description**	**Calculation Formula**	**Remarks**
Load Active Power	kW	The current active power value of the load.		
Cumulative Load Electricity Consumption	kWh	The total electricity consumption of the system load since the last system	From the last "System Energy Statistics Initialization"	

		energy statistics initialization.	operation (the corresponding timestamp can be viewed next to the operation button in the upper computer software), as of the current total electricity consumption of the energy storage system load after accumulation.	
Load Electricity Consumption Power	kWh	The current electricity consumption power of the energy storage system's load.		
Grid-Side Electricity Meter Active Power	kW	The current active power value read from the grid-side electricity meter.		
Grid-Side Electricity Meter Current Forward Total Active Energy	kWh	The current forward total active energy read from the grid-side electricity meter at the current moment.		
Grid-Side Electricity Meter Current Reverse Total Active Energy	kWh	The current reverse total active energy read from the grid-side electricity meter at the current moment.		

B.2 Configuration Parameter Information

1) System Configuration Parameter Description

System Configuration - System Parameter Configuration Description

Name	Description	Remarks
Anti-islanding Threshold	Sets the power threshold for the energy storage device to activate anti-islanding. When the minimum power consumption on the grid side is less than this threshold, and if the energy storage system is discharging, it will reduce the discharge output power of the energy storage system according to the preset strategy until the energy discharge output power is 0kW.	
Transformer Maximum Load (kW)	The active power of the maximum load of the grid-side transformer.	
Demand Start Power (kW)	Sets the minimum demand power for the energy storage system to start.	
Data Upload Frequency (Cloud Platform)	Sets the time interval for the energy storage system to upload data to the user's cloud platform, in seconds (s), with a time interval settable between 1s~30s.	
Data Upload Frequency (MOTOMA Cloud Platform)	Sets the time interval for the energy storage system to upload data to the MOTOMA Cloud Platform, in seconds (s), with a time interval settable between 1s~30s.	
Time Synchronization	Sets the system time of the energy storage system, supporting reading the current system time and writing the synchronized system time.	

2) Energy Management Parameter Configuration

Peak Shaving and Valley Filling Mode Parameter Configuration Description

Name	Description	Remarks
Maximum SOC (%)	Sets the maximum capacity allowed for charging in peak shaving and valley	

	filling mode. Charging stops when this capacity is reached.	
Minimum SOC (%)	Sets the minimum capacity allowed for charging in peak shaving and valley filling mode. Discharging stops when this capacity is reached.	
Charging/Discharging Power Mode	Sets the value acquisition method for the system's charging/discharging power: Maximum Power: Charges/discharges at the maximum power allowed by the current device; Fixed Power: Charges/discharges at the set fixed power.	
Time Period Setting	Sets the daily working time periods for peak shaving and valley filling, including the start and end times of each period, as well as the charging/discharging working mode and corresponding power; time periods are in 24-hour hh:mm format.	

Backup Mode Parameter Setting Description

Name	**Description**	**Remarks**
Charging Power (kW)	Sets the maximum charging power allowed in backup mode.	
Discharging Power (kW)	Sets the maximum discharging power allowed in backup mode.	
Maximum SOC (%)	Sets the maximum capacity allowed for charging in backup mode. Charging stops when this capacity is reached.	
Minimum SOC (%)	Sets the minimum capacity allowed for charging in backup mode. Discharging stops when this capacity is reached.	

Manual Mode Parameter Setting Description

Name	Description	Remarks
Charging Power Setting (kW)	Sets the current charging power of the system in manual mode.	
Discharging Power Setting (kW)	Sets the current discharging power of the system in backup mode.	

Peak, Valley, Flat, and Off-Peak Electricity Price Parameter Setting Description

Name	Description	Remarks
Electricity Price Setting (kW)	Sets the electricity prices, with "Peak Price," "Shoulder Price," "Flat Price," and "Valley Price" for setting.	
Feed-in Electricity Price Setting (kW)	Sets the feed-in electricity prices, with "Peak Price," "Shoulder Price," "Flat Price," and "Valley Price" for setting.	
Time Period Setting	Sets the peak and valley electricity price types for each daily period and whether to enable them; can set the start and end times of each period, as well as the corresponding electricity price types; time periods are in 24-hour hh:mm format.	

Energy Storage Work Mode and Parameter Description

Work Mode	Mode Description
Peak Shaving and Valley Filling Mode	The energy storage system operates according to the preset daily peak shaving and valley filling time periods, following the preset charging/discharging working modes and power. Up to 10 time periods can be set daily, in 24-hour hh:mm format. Each period can set start and end times, as well as charging/discharging working modes and corresponding power.
Backup Mode	The energy storage system, in backup mode, operates within the preset maximum and minimum SOC range. When the minimum SOC is reached, it charges at the

	set charging power, and when the maximum SOC is reached, it discharges at the set power.
Manual Mode	The energy storage system, in manual mode, charges or discharges according to the manually set charging and discharging powers. The settings for peak shaving and valley filling and backup mode are overridden.

3) Energy Storage System Control Function Description

Energy Storage Operation Control Function Description

Operation Item	**Description**	**Remarks**
System Control Mode Switching	Sets the current control mode operation of the energy storage system, supporting two modes: "Local" or "Remote." Selecting "Remote" sets the energy storage system to be controlled by a remote cloud or mobile APP, allowing control of the energy storage system via the cloud or mobile APP. The energy storage system defaults to remote mode at the factory and can be configured via the upper computer software.	
System Work Mode Switching	Sets the current operating work mode of the energy storage system, supporting three work modes: "Peak Shaving and Valley Filling," "Backup," and "Manual Control." Selecting "Peak Shaving and Valley Filling" mode, the system operates according to the preset charging/discharging modes and power in the energy management preset peak shaving and valley filling time periods. Selecting "Backup"	

	mode, the system operates according to the preset backup mode parameters in energy management.	
System Work Status Switching	Sets the current operating work status of the energy storage system, supporting four work statuses: "Start," "Standby," "Stop," and "Emergency Stop." Selecting the "Start" button, the energy storage system starts and operates according to the preset work mode. Selecting the "Standby" button, the energy storage system stops charging/discharging and enters a "Standby" work status, with the Hybrid Inverter shut down and the BMS main contactor closed. Selecting the "Stop" button, the energy storage system stops charging/discharging and enters a "Stop" work status, with the Hybrid Inverter shut down and the BMS main contactor open. Selecting the "Emergency Stop" button, the energy storage system stops charging/discharging and immediately outputs an emergency stop control command to each functional module of the energy storage system via communication, immediately stopping charging/discharging, and outputs an emergency stop DO dry contact signal, entering an "Emergency Stop" work status.	
System Energy Statistics Initialization	Sets the energy storage system's energy statistics to reset to 0. This operation will clear all previous energy statistics data and start energy	

	statistics after initialization. This initialization operation only initializes the internal energy statistics data of the energy storage system and cannot initialize the read values of the electricity meters on the grid side and inverter side. The energy storage system's energy statistics record the current electricity meter reading as the starting data and start counting the energy of the energy storage system's operation thereafter.	
System Reset	Sets the operation to reset the energy storage system. This operation will first reset the fault of the energy storage system's Hybrid Inverter in a preset sequence.	