

PowerMount-5.0MWh

User Manual

Revision History

Revision history depicts the changes that were implemented in the user manual. The most current publication contains all the changes made in the previous in the versions.

This version is the first official release.

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Overview

This manual offers comprehensive information on the product profile, use cases, installation and commissioning, system maintenance, and technical specifications of the PowerMount-5.0mwh.

Intended Readers

This document is intended for:

- Sales Engineers
- System Engineers
- Technical Support Engineers
- End Users (Note: End users are prohibited from performing operations specified in the manual that must be carried out by licensed technicians.)

Meaning of Symbols

To ensure personal and property safety during installation and enhance user experience, this manual explains the meaning of standard industry symbols. This manual includes the following types of warnings. Please read carefully before installation.

Danger

Failure to follow these instructions may result in death or serious injury, indicating a high level of risk.

Warning

Failure to follow these instructions may result in death or serious injury, indicating a moderate level of risk.

Caution

Failure to follow these instructions may result in death or serious injury, indicating a low level of risk.

Note

This instruction is supplementary to the key information in the manual.
It does not pertain to personal injury, equipment damage, or environmental harm.

Meaning of Warning Signs



Caution! Risk of electric shock



Keep away from flammable materials



Danger



Do not short circuit the battery



Be careful of fire



Do not install or disassemble unless performed by qualified personnel



High surface temperature



Install the product in a location that is out of the reach of children



After a power failure, there is a delay in discharging the components. Please wait 20 minutes until the equipment is fully discharged.



Do not discard this product. It should be sent to a designated recycling facility.



Do not dispose of this product with household waste.



Recyclable



Read these instructions carefully before installing or operating the product



CE compliance

Definition of Abbreviation

Short Name	Full Name	Short Name	Full Name
FPC	Flexible Printed Circuit	SOC	State Of Charge
BMS	Battery Management System	BM	Battery Module
BMU	Battery Management Unit	PCS	Power Conversion System
BOL	Begin Of Life	EOL	End Of Life
Bus-bar	Current Connection Between Cells	OCV	Open Circuit Voltage
CAN	Controller Area Network	S/G	Switch Gear
SOH	State of Health	DOD	Depth of discharge
MSD	Manual Service Disconnect	ESD	Electrostatic Discharge
ACB	Air Circuit Breaker	LEL	Lower Explosive Limit

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1 Safety Notice

Statement

- Please read this manual carefully and follow the procedures and instructions provided, including any safety signs or precautions displayed on the equipment or outlined in this manual. These guidelines must be adhered to prior to transportation, storage, installation, operation, and O&M (Operation & Maintenance).
- The terms "Equipment" and "Product" in this manual refer to products, software, components, spare parts, or services related to the contracted product.
- "The company" mentioned in this manual refers to the manufacturer or producer of the equipment, as well as any salespersons or service providers. "User" refers to any individual who handles, stores, installs, operates, uses, or maintains the equipment.
- The terms "Danger," "Warning," "Caution," and "Attention" in this manual do not encompass all necessary safety instructions that should be observed. Users are expected to comply with industry best practices, along with relevant codes and standards applicable in their jurisdiction.
- The company will not be responsible for any loss resulting from the violation of safety instructions during the design, production, or use of the equipment.
- Use the equipment only in environments that meet the specified design requirements. Failure to do so may result in malfunctions, system faults, or damage to components or parts, which are not covered under the equipment's quality guarantee.
- Operating the equipment in environments that do not meet the design specifications may result in personal injury or property damage, for which the company assumes no liability. All operations, including transportation, storage, installation, operation, and maintenance, must comply with applicable laws, regulations, standards, and specifications.
- Do not reverse engineer, decompile, disassemble, modify, or tamper with the equipment's software. Studying the internal logic of the equipment, obtaining its source code, or infringing upon intellectual property rights is not permitted. It is prohibited to disclose the results of any equipment software performance tests.

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

- Damage to equipment caused by force majeure, such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, and similar events.
- Failure to operate the equipment in accordance with the conditions specified in the product manual.
- Failure to follow the operational and safety instructions outlined in this manual.
- Unauthorized disassembly, modification, or changes to the product or its software code; or damage caused by improper storage of the product in violation of this manual.
- Installation or operation of the equipment in environments that contradict relevant codes and standards, or where unqualified personnel install or run the equipment.
- Materials and tools used by the user to operate or maintain the product must meet the requirements of local laws, regulations, and related standards. The company is not liable for damage caused during transportation by a third-party freight forwarder commissioned by the user.
- Damage caused by negligence, fault, vandalism, improper operation by the user or third party, or factors unrelated to the company will not be the company's responsibility.

1.1 Personal Safety

Danger

- Ensure that the power is turned off during installation. Do not install, disassemble, or connect the equipment while the power is on. Live-line installation may produce electric arcs, sparks, flames, or explosions, potentially leading to fire or personal injury.
- When the equipment is electrified, operate it correctly and safely. Failure to do so may result in fire, electric shock, or explosion, causing injury or property damage. It is strictly forbidden to wear conductive accessories, including watches, bracelets, bangles, rings, or necklaces during operation, to prevent electric shock.
- During operation, use specialized protective equipment, such as protective clothing, insulating shoes, goggles, safety helmets, and insulating gloves. Additionally, use dedicated insulation tools to avoid electric shock or short circuits.
- The insulation resistance level and withstand voltage must comply with local laws, regulations, standards, and specifications.

Warning

- Do not disable equipment protection devices. Always follow the warnings, cautions, and precautions provided in the manual and on the equipment.
- During operation, if any fault is detected that may cause personal injury or equipment damage, stop the operation immediately, report the incident to the person in charge, and implement appropriate protective measures.
- Do not power on the equipment before it is installed and confirmed by technicians.
- Do not touch the power supply equipment directly or with conductive materials, such as damp objects.
- Before touching any conductor surface or terminal, measure the voltage at the contact point to confirm that there is no risk of electric shock.
- During operation, the casing or enclosure can become hot and cause burns. Avoid touching it..
- In case of fire, evacuate the building or the area where the equipment is located and activate the fire alarm or report the fire immediately. Re-entry into the area of a burning building or near the equipment is strictly prohibited under any circumstances.

Requirements for Installers:

The personnel responsible for the installation and maintenance of the equipment must be properly trained and demonstrate proficiency in correct operation. They must also understand safety precautions and comply with local standards and regulations of the jurisdiction.

Professional: A trained, experienced technician proficient in the principles and structure of the equipment, who understands the potential hazards and risks during installation, operation, and maintenance.

Trained person: A trained and experienced technician aware of potential hazards during operation and capable of minimizing risks to themselves and others.

1.2 Electrical Safety

Danger

- Before making electrical connections, ensure that the equipment is not damaged. Otherwise it may cause electric shock or fire. Improper or incorrect operation may cause accidents, such as fire or electric shock.
- During operation, prevent foreign objects from entering the equipment. Otherwise, short circuits, equipment damage, reduced load power, power failure, or personal injury may occur. When installing the equipment, connect the protective ground (PGND) cable first. When removing the equipment, disconnect the PGND cable last.
- During operation, the casing or enclosure may become hot, posing a risk of burns. Do not touch it.

Danger

- In case of fire, evacuate the building or the area where the equipment is located and activate the fire alarm or report the fire immediately. Re-entry into the area of a burning building or near the equipment is strictly prohibited under any circumstances.

Warning

- Approval from the national or regional electricity authority is required for grid connection and operation.
- Before installing or removing the power cable, ensure the equipment is turned off and both front and rear switches are disconnected.
- Before operating the equipment, ensure that the tools meet the required specifications and are logged appropriately. After operation, verify that no tools have been left inside the equipment.
- Before installing the power cable, check that the cable label is correct and that the cable terminal is properly insulated.
- Ensure accurate torque wrench settings for secure fastening. Ensure that torque wrenches fasten screws squarely, and the torque error should not exceed 10%. Tighten the screws with both red and blue torque verification marks for double-checking.
- After installation, ensure that all electrical components, protective shells, insulating sleeves, and other devices are in place to prevent the risk of electric shock.
- If the equipment has multiple inputs, disconnect all inputs and only operate the equipment once it is fully powered off.
- Before maintaining loads or power distribution devices, turn off the output switch on the power supply equipment.
- During maintenance, hang “Do not close” signs on switches or circuit breakers and post warning signs to prevent accidental reconnections. The equipment can only be re-energized after troubleshooting is completed.
- If power must be cut off for maintenance, follow these safety measures: Power off > Check the electrical safety > Install the ground cable > Hang warning signs and set up barriers.
- Non-professionals are prohibited from opening the internal components of the equipment.
- Regularly check the equipment connection terminals, ensuring that the screws are securely tightened.
- Regularly inspect the equipment cables for damage. Any damaged cable must be replaced by qualified technicians.
- Do not use solvents like water, alcohol, or oil to clean electrical components inside or outside the equipment.

1.3 Battery Protection

Danger

High Voltage Inside! DANGER: Electric Shock! Batteries inside the equipment will produce high voltage when connected. Accidental contact may result in electric shock or life-threatening risks.

During installation, maintenance, and overhaul, make sure:

- All batteries have been disconnected for at least 20 minutes.
- Set clear and visible warning signs at the disconnection points to prevent accidental reconnection

Danger

- Do not short circuit the positive and negative terminals of the battery, as this will cause a short circuit. A short circuit in the battery can result in a high current and release a large amount of energy, causing the battery to leak, produce smoke, release flammable gases, or suffer from thermal runaway, fire, or explosion.
- It is strictly prohibited to perform maintenance on the battery while power is on. Doing so can cause a short circuit.
- Do not expose the battery to high temperatures or place it near heating sources, such as direct sunlight, fire, transformers, or heaters. (An overheating battery may cause leakage, smoke, release of flammable gases, thermal runaway, fire, or explosion.)
- Do not touch battery terminals with metal objects, as this may cause heating or electrolyte leakage.
- Only use batteries recommended by the manufacturer through authorized channels. Incorrect use or replacement of batteries may lead to fire or explosion.
- The battery is a closed system and will not release gases under normal operation. In extreme cases, such as being burnt, pinched, squeezed, struck by lightning, overcharged, or subjected to other severe conditions, the battery may suffer thermal runaway. Damage or abnormal chemical reactions may occur, resulting in electrolyte leakage or the release of gases such as CO and H₂. To avoid burning or corroding equipment, ensure that flammable gases are properly vented.
- Non-professionals are advised to stay away in case of battery accidents, as the electrolyte is toxic and volatile. Please contact a professional immediately for assistance.
- When a battery leaks, professionals should wear goggles, rubber gloves, gas masks, protective clothing, and other necessary safety gear. They should promptly de-energize the equipment and safely remove the leaking battery. At the same time, contact a technical engineer or the after-sales department for further handling.

Warning

- Before storage, transportation, and unpacking, ensure that the outer package is intact and that the battery is placed correctly according to the markings on the packaging. Do not place the battery upside down, sideways, vertically, or at an angle. Stack the battery according to the stacking requirements on the outer package to prevent the battery from falling or being damaged.
- Install batteries in areas far from liquids. Do not install the batteries in areas prone to water leakage, such as near air conditioning outlets, vents, windows in machine rooms, water pipes, etc. Ensure no liquid enters the equipment to prevent system failure or short circuits.
- Tighten the fastening screws of the copper bar or cable according to the torque specifications in the manual, and regularly check that they are properly tightened. Inspect for any rust, corrosion, or other anomalies. Failure to properly connect screws can lead to excessive voltage drop or, in extreme cases, may ignite the battery if the current is high.
- After the battery is discharged, recharge it promptly to avoid damage from over-discharge.

1.4 Ground Fault Protection

Danger

- When the energy storage system (ESS) experiences a ground fault or improper grounding, components that are normally non-live may generate lethal high voltage. Accidental touch might be lethal.
- Before operation, ensure the system is properly grounded, take appropriate protective measures, and comply with applicable codes and standards in the jurisdiction.

1.5 Live-line Measurement

Danger

The ESS contains high voltage. Accidental contact may result in lethal electric shock. During live-line measurement, follow these guidelines:

- Take protective measures, such as wearing insulating gloves or rubber-soled shoes.
- Ensure the person performing live-line measurements is accompanied by at least one technician.

1.6 Use of Measuring Instruments

Danger

Electrical measuring instruments must be used to ensure the electrical parameters of connections and commissioning meet design standards.

- The range and working conditions of the instruments should meet the necessary requirements.
- Ensure proper and correct connection and usage of measuring equipment to avoid arcing.
- Take protective measures (such as wearing insulating gloves or rubber shoes) and ensure the person performing live-line measurement is accompanied by at least one technician.

1.7 Complete Power-down Procedure

Any operation on the ESS can only be performed when the ESS and its internal devices are completely powered off.

Warning

- Ensure devices that are powered off remain disconnected to prevent accidental re-energization.
- Ensure proper grounding.
- Use a multi-meter to confirm that the ESS is completely powered off.
- Use a multi-meter to ensure that the internal devices of the ESS are completely powered off.
- Ensure that escape routes are always unimpeded during operation.
- Use insulating materials to cover parts that are near live components.
- Wait at least 20 minutes after the ESS has fully stopped before beginning any operations.

1.8 Electric Arc Protection

Warning

Strictly follow the principles outlined in this manual when operating the product to ensure both equipment and personal safety. Improper operation may result in electric arcs, fire, or explosions.

The following are considered improper operations: Always keep in mind that accidents must be handled by professionals. Improper handling of accidents may worsen the situation and lead to more severe failures.

- Do not plug or unplug DC high-voltage fuses while the power is on.
- Avoid touching wiring bars, terminals, or other internal parts of the machine that may potentially be live.
- Do not allow metal parts, such as screws, to fall into the power module.
- Do not touch the uninsulated end of a potentially live cable.
- Ensure that the power cable is properly connected and not loose.
- Avoid incorrect operations by unqualified or untrained personnel.

Warning

Before operating the equipment, assess whether there is an electric arc risk in the working area. If there is an electric arc risk,

- follow these steps: Operators must be adequately trained.
- Identify areas with potential electric shock hazards as soon as possible.
- Wear the necessary protective clothing before working in areas where electric shock risks may exist.

1.9 Protection Against ESD

Warning

Improper handling of printed circuit boards or other electrostatic-sensitive components can cause equipment damage.

- Avoid unnecessary contacts among the circuit boards.
- Comply with ESD prevention regulations, such as wearing an ESD bracelet.

1.10 Protection Against Sand, Dust, and Moisture

Warning

Do not open the ESS cabinet door during severe weather conditions, such as sandstorms, thunderstorms, strong winds, hail, or when the relative humidity exceeds 95%. After the harsh weather subsides, promptly clean and resume activities near the site.

1.11 Enclosure Warning Sign Protection

Warning

The warning signs on the product and internal electrical equipment contain critical safety information. Do not tear or damage them!

- Ensure that the system's warning signs remain legible at all times.
- Replace any damaged or unclear warning signs immediately.

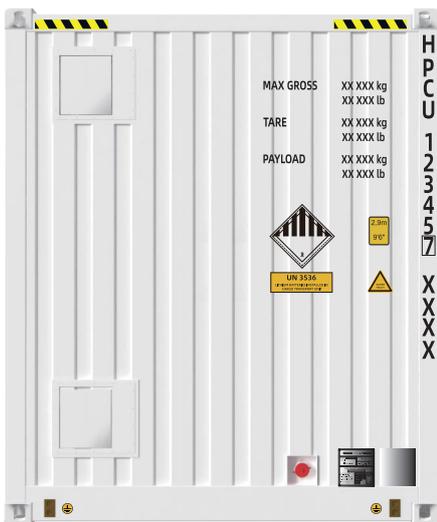
2 Product Commitment

The company guarantees that the products are free from defects caused by improper materials.

3 Packaging, Transportation & Storage

3.1 Packaging and Transportation

This product is packaged in a 20HQ standard container. The container's corner fittings are designed according to 20ft container standards, and the outer packaging fully complies with sea and land transportation regulations. It can be delivered directly to the site without additional packaging.



The integrated energy storage system has been thoroughly tested and inspected, but it may still incur damage during transportation, so please inspect the product carefully.

In case of any damage or missing parts after transportation, report the issue to the transporter and your local distributor immediately. (Note: Minor collisions during transportation are expected. Slight paint peeling and minor collisions are normal and can be repaired after receiving the goods.)



Transport the container by lifting only. Forklifts are prohibited from transporting the containers. Forklifts are prohibited from transporting the containers.

3.2 Transportation Requirements

The 20HQ standard container is designed to meet the requirements of the International Maritime Dangerous Goods Code (IMDG Code) for sea transportation and ADR or JT/T 617 for land transportation. It can be delivered directly to the site.



UN3536 CLASS

- Special English Name for Transportation: LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT Lithium-ion batteries or lithium metal batteries
- International Maritime Dangerous Goods (IMDG) Code, Edition 39-18, mandatory from January 1, 2020.



Securing at four corners



ADR or JT/T 617 Transportation requirements

Land transportation must comply with the standards and management practices of local container truck transportation. Clarify the rights, obligations, and responsibilities of the carrier, shipper, and other relevant parties. Ensure the proper maintenance of transportation order and protect the legitimate rights and interests of all parties involved in the transportation contract. Strictly follow relevant international and national laws, regulations, and the Rules for Automobile Cargo Transportation.

- **Compliance with Containerized Energy Storage Transportation Standards (Sea and Land)**
 - Compliance with Containerized Energy Storage Transportation Standards (Sea and Land)
 - The containerized energy storage system, battery pack, and battery cluster must have UN 38.3 reports, respectively.
 - The MSDS, classification, and identification report of hazardous characteristics, along with the certificate of cargo transportation conditions, must be provided.
 - The container must have the International Convention for Safe Containers (C.S.C.) Approval Certificate and the stress analysis report issued by the classification society.
 - Compliant with UN 3536.
- **Label Requirements**
 - The lithium battery inside the containerized energy storage system is not subject to identification or labeling requirements.
 - The identification labels on the front and sides of the containerized energy storage system must display Class 9 labels, UN 3536 numbers, etc.
- **Transportation Precautions**
 - Ensure that the State of Charge (SOC) remains at 40-50% during the transportation of energy storage containers, and take proper insulation measures.
 - The battery pack, liquid chiller unit, fire extinguishing system, and A/C system must be securely fixed to the internal structure of the container to prevent impact or significant load movement during transportation.
 - Comply with local road weight limits.
 - The container enclosure size is the same as a 20HQ container. The trailer for container enclosure transportation must be appropriate for the size of the container enclosure. The container enclosure must not be suspended in the air outside the trailer.
 - To prevent damage to the customized container due to overspeed or sudden jolts, ensure that the speed does not exceed 70 km/h on good roads such as expressways and 30 km/h on unpaved roads like dirt roads.
 - Pay attention to the protection of the container enclosure when securing it to the trailer. Do not use wire ropes or other dirty binding materials that may come into contact with the container enclosure. Use thick cardboard or packing cotton to pad any contact areas with the container enclosure to prevent paint damage.
 - After the container arrives at the customer's site, the receiver should inspect the container for any damage. Regardless of the extent of the damage, make a note on the equipment delivery receipt and send a photo of the damage to the company.

3.3 Lifting and Handling

3.3.1 Lifting Precautions

Danger

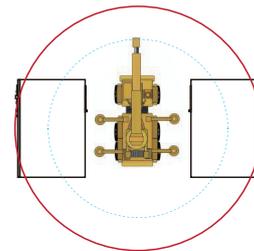
- Do not lift the integrated energy storage system using the bottom slot.
- During lifting and transportation, adhere to all safety operation standards and regulations specific to the jurisdiction where the project is located.
- The company will not be liable for any personal injury or property damage resulting from violations of relevant requirements or other safety regulations.

Warning

- Strictly follow the crane's safe operating procedures when lifting the integrated energy storage system.
- Maintain a safe distance of 5m to 10m from the lifting operation area, particularly avoiding standing under the lifting arm or near the lifted or moved equipment, to prevent accidents.
- In the event of bad weather conditions, such as heavy rain, fog, or strong winds, stop the lifting operation immediately and take appropriate protective measures on site.
- When lifting the integrated energy storage system, adhere to the following requirements:
 - Ensure that all personnel maintain a safe distance and follow proper lifting procedures.
 - Ensure professionals supervise the lifting and installation process.
 - The strength of the slings used should be capable of bearing the weight of the integrated energy storage system.
 - All sling joints must be safe and reliable, and all slings connected with corner fittings should be of equal length.
 - The length of the slings should be properly adjusted according to the actual site requirements.
 - The integrated energy storage system must remain stable and should not skew throughout the lifting process.
 - Use the four lifting rings of the integrated energy storage system to lift the system.
 - Take all necessary auxiliary measures to ensure the safe and smooth lifting of the integrated energy storage system.

Danger

- The blue dotted circle in the schematic diagram of crane operation for lifting the integrated energy storage system indicates the crane's operational range.
- During crane operation, it is strictly forbidden to stand within the solid circle.



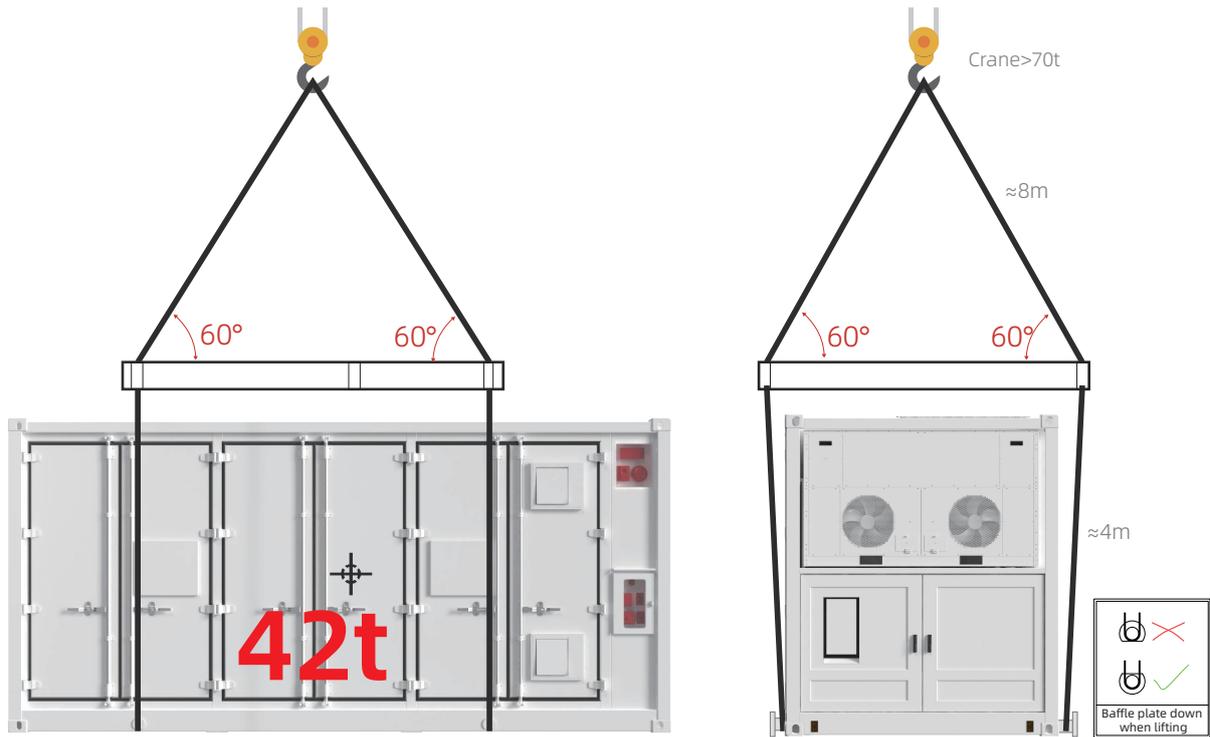
3.3.2 Lifting Operation

During the lifting of the integrated energy storage system, each operation must follow these requirements:

- Lift the integrated energy storage system vertically. During lifting, do not drag the system on the ground, on top of the lower cabinet, or push it across any surface.
- Pause the lifting at 300mm above the supporting surface to check the connection between the lifting equipment and the integrated energy storage system. Continue lifting only after confirming that the connection is secure.
- The integrated energy storage system must be placed gently and stably. It is strictly prohibited to swing the system outside of the vertical landing area during placement.
- The site where the integrated energy storage system is placed should be solid, flat, with good drainage, and free of obstacles or protrusions.
- The integrated energy storage system must be secured using the four bottom corner fittings at the site.
- Due to site limitations, use non-vertical force to lift the system through the four lifting rings of the integrated energy storage system.

3.3.3 Lifting Requirements

- The stacking height of the container enclosure must comply with the identification requirements. The frame and main structure must not be altered without authorization.
- The ground or fixed point where the container enclosure is installed must be level and firm.
- The foundation must be suitable for the container enclosure, including but not limited to load-bearing capacity, size, installation point, and foundation flatness.
- **Recommended Lifting Scheme**
 - 01. Before lifting, confirm there are no obstacles around the area. Lift the system slowly and steadily to ensure safety.
 - 02. When installing the lifting wire rope, avoid scratching the painted surface of the container.
 - 03. Ensure the crane and wire rope are selected based on the exact weight of the container to guarantee safe and efficient lifting.



Lifting from the bottom (recommended)



Lifting from the top

(Since the product is too heavy, lifting from the top is not recommended unless there are special requirements)

3.4 Storage Safety Management

3.4.1 Container Storage Safety Management

- For packing and unpacking dangerous goods, storage guidelines specific to such goods must be strictly followed. The specifications, quantities, and packaging labels of goods entering and leaving the warehouse must be thoroughly checked and inspected. Goods with discrepancies in documentation or materials must not be warehoused or moved in/out.
- The stacking of dangerous goods must comply with relevant regulations. Dangerous goods stored in the same warehouse must meet isolation requirements.
- The sub-packaging, repackaging, unpacking, and open-case inspection of dangerous goods must be conducted in a designated safe area outside the warehouse.
- After operations, the storage area and warehouse must be inspected to ensure safety before leaving.
- The containers used for storing dangerous goods must be cleaned by qualified personnel or certified units.

3.4.2 Battery Storage Safety Management

- The storage environment must comply with local regulations and standard requirements.
- In case of faults (such as carbonization, leakage, expansion, water ingress, etc.), batteries must be promptly transferred to a designated dangerous goods warehouse for separate storage. Maintain a distance of at least 3 meters from surrounding combustibles, and the faulty batteries should be scrapped as soon as possible.
- During storage, batteries must be placed correctly according to the markings on the packing boxes. Do not place batteries upside down, sideways, or at an angle. Batteries must meet the stacking requirements outlined on the outer packaging for safe storage.
- Store batteries separately, avoiding mixing them with other equipment or stacking them too high. When a large number of batteries are stored on site, ensure that firefighting facilities such as fire extinguishers and sand buckets are available and meet safety requirements.
- The ambient air must be free from corrosive or flammable gases.
- Storage Environment Requirements:
 - a.Ambient temperature: -10°C to 55°C, with a recommended storage temperature of 0°C to 30°C (for up to 6 months).
 - b.Relative humidity: 5% RH to 95% RH.
 - c.Store in a dry, well-ventilated, and clean environment.
 - d.Avoid contact with corrosive organic solvents, gases, or other harmful substances.
 - e.Avoid direct sunlight exposure.
 - f.Maintain a distance of at least 2 meters from heat sources and ensure minimal infrared radiation exposure.
 - g.Ensure that the environment is free from metallic conductive dust and similar contaminants.
- During storage, it is essential to maintain proper documentation of temperature and humidity logs, storage environment photos, and inspection reports to ensure compliance with product storage requirements.
- Before storage, the battery must be disconnected from the power supply, and the circuit breaker must remain in the open state.
- The warehouse manager should conduct monthly inventory checks of the stored batteries, report the inventory regularly, and schedule recharging for batteries that have been stored for nearly:15 months (-10°C to 25°C),9 months (25°C to 35°C),or 6 months (35°C to 55°C).
- For batteries stored beyond their recommended period, they can only be used after inspection and testing by qualified professionals.
- When removing stored batteries, the principle of first-in, first-out must be followed.
- After the production test, batteries should be charged to a minimum of 50% SOC before being stored.

Warning

- Visual inspection must be conducted before recharging the battery. Only qualified batteries can be recharged; unqualified batteries must be scrapped. If a battery shows deformation, case damage, or electrolyte leakage, it can be visually deemed unfit for use.
- If the battery shows no signs of deformation, case damage, or electrolyte leakage, it can be deemed qualified upon visual inspection.

3.4.3 Conditions Defining Extended Storage

- If a battery shows deformation, damage, or leakage, it will be scrapped immediately, regardless of the storage duration.
- The storage time is calculated from the last charging date, which is indicated on the recharging label attached to the outer package of the battery. After each qualified recharge, update the latest charging date and the next scheduled charging time on the recharging label.
- The next charging time equals the latest charging date plus the recharging interval. The maximum allowable storage period and the number of recharges are limited to 3 years or 3 charging cycles (it is recommended to recharge at least once every 6 months). If the maximum allowable period or the number of recharges is exceeded, the battery must be scrapped. Capacity loss is expected in long-term storage of lithium batteries.
- The capacity loss occurs during long-term storage of lithium batteries. After lithium batteries are stored at the recommended storage temperature for 12 months, the irreversible capacity loss is generally between 3% and 10%.
- If the customer conducts a discharge test acceptance according to the specifications, the batteries may not pass if the capacity after storage is less than 100% of the rated capacity.

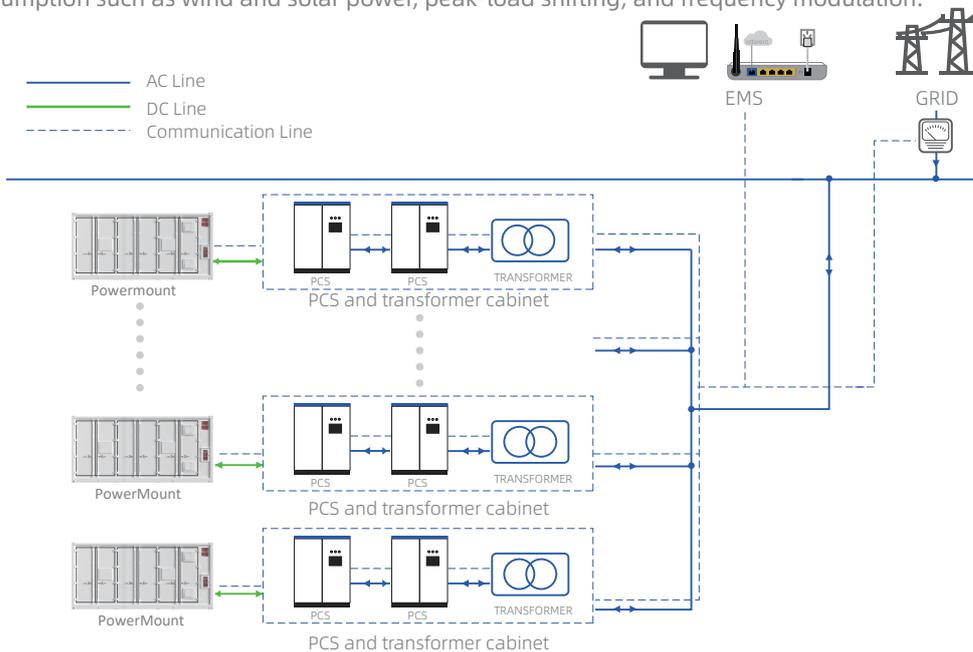
Warning

If the SOC drops to 0% or the system turns off automatically, recharge within 7 days. For permanent battery faults caused by failure to recharge after overdue storage due to customer reasons, the Company will not provide corresponding warranty services.

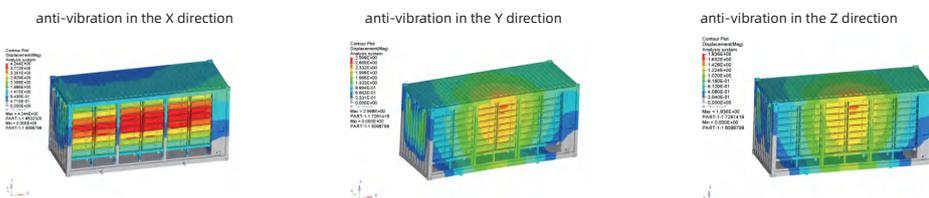
4 Product

4.1 Introduction

- The 20-foot liquid-cooled containerized energy storage system integrates the battery system, battery management system, fire suppression system, thermal management system, and power distribution and control system. The container features an independent power supply system, temperature control system, heat insulation system, flame retardant system, fire alarm system, firefighting system, and other automatic control and safety assurance systems. It is characterized by high energy density and high reliability.
- The system can reduce battery clusters to meet the demand for lower capacity.
- The 20-foot liquid-cooled container is primarily used for energy storage at the utility level. It is used for new energy consumption such as wind and solar power, peak-load shifting, and frequency modulation.



- The product is preferred for its compact design and operational versatility. The energy storage container, weighing approximately 42 metric tons, requires suitable lifting equipment at ports. It is engineered for seamless loading onto cargo ships or transportation by road, rail, and sea.
- The container system is robust and durable, ensuring safety during transport,



- The container is designed to be corrosion-resistant, fireproof, waterproof, dust-proof (sand-resistant), shockproof, UV-resistant, and theft-resistant. It ensures structural integrity for up to 25 years without failure from exposure to corrosion, fire, water, dust, or ultraviolet rays. It requires repainting every 5 years to maintain optimal protection and appearance.
- Fireproof features: The shell structure, thermal insulation materials, and interior and exterior decorative materials are flame retardant, offering enhanced safety and durability.
- The container has an overall Ingress Protection . Sealing strips are installed at the points where the container door panels connect with the exterior. These prevent the ingress of dust or rain during sandstorms or heavy rainfall, ensuring that no water accumulates, seeps, or leaks on the top, sides, or bottom of the container.

4.2 Product Specifications

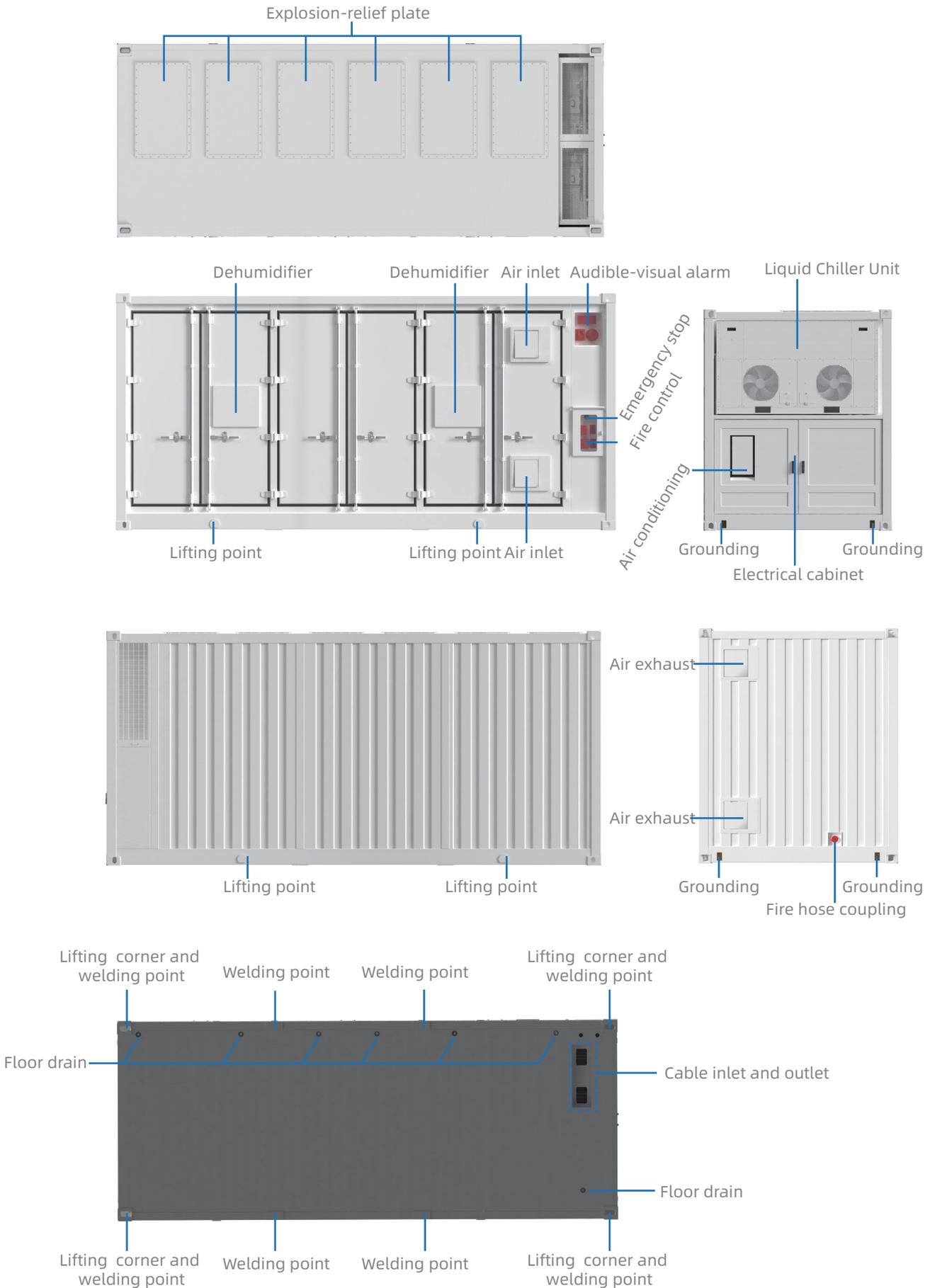
At a 100% depth of discharge for the new battery, all data were measured within a temperature range of $25 \pm 2^\circ\text{C}$ under 0.5P charge and discharge conditions. The rated charge and discharge current, as well as power, are influenced by both the temperature and the SOC.

Product model	PowerMount-5.0mwh (0.25P、US)	PowerMount-5.0mwh (0.5P、US)
Battery parameters		
Cell chemistry	LFP	
Rated energy (kWh)	5015.96kWh	
Rated voltage of battery (V)	1331.2VDC	
Battery voltage range (V)	1164.8~1500VDC	
P-rate	0.25P	0.5P
AC auxiliary power		
Voltage (Vac)	480VAC(US)	
Rated frequency	50/60Hz	
Auxiliary power output	36kW	
Phase	3L+N+PE	
Other parameters		
Mass (t)	≈41.5	
Dimensions (W * D * H) (mm)	6058*2438*2896mm	
Maximum system efficiency	0.25P 94%	0.5P 93%
Cycle life	8000@25°C,0.5C/0.5C,90%DOD, 70%EOL	
Cooling system	Liquid cooled	
Maximum working altitude(m)	≤2000m	
Allowable operating temperature (°C)	-30 ~ +55°C	
Allowable relative humidity	0%-95%, RH	
IP rating	IP55/IP54/Type 3R(US)	
Protection class	Class I	
Corrosion class	C4/C5	
Communication interface	Ethernet/RS485/CAN	
Communication protocol	Modbus TCP / Modbus RTU / CAN 2.0/IEC61850/IEC104	
Fire suppression system	Cabinet-level fire suppression options include aerosol systems, Novec 1230, and an optional absence of both, along with water-based fire suppression (sprinkler systems).	
Short circuit protection	Yes	
Lightning protection	Yes	
Overcharge/overdischarge protection	Yes	
Overtemperature protection	Yes	
Fire detection	Yes	
Codes and standards compliance	IEC62619/IEC63056、IEC62477、IEC61000、UL9540A、UL9540、 UL1973、NFPA68、NFPA69、UN38.3、UN536、FCC	

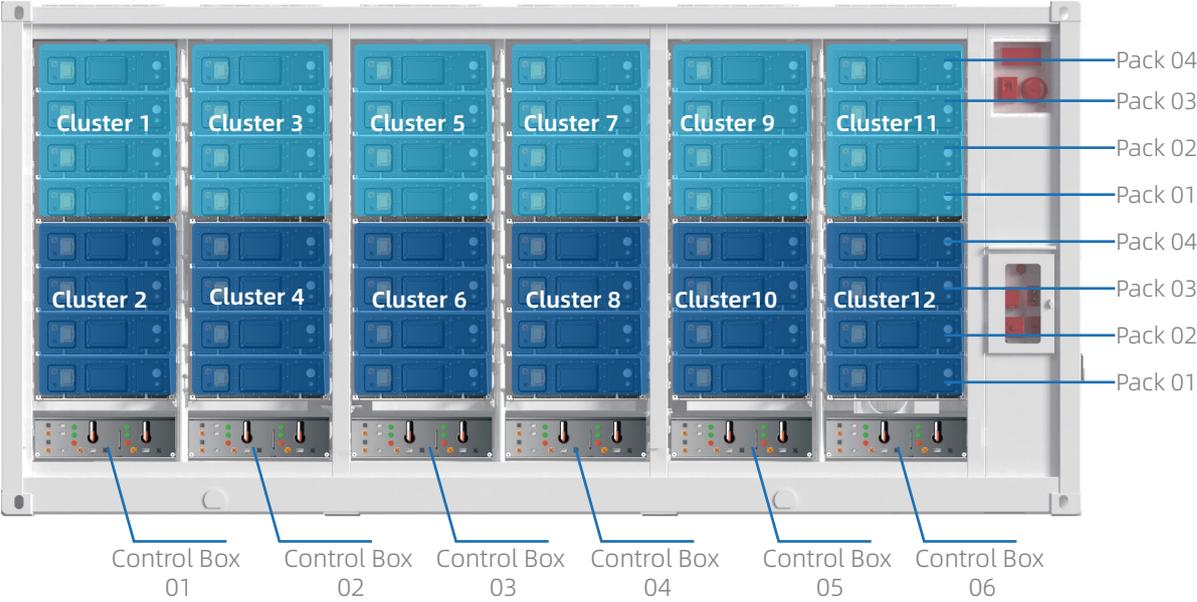
Product model	PowerMount-5.0mwh (0.25P、EU)	PowerMount-5.0mwh (0.5P、EU)
Battery parameters		
Cell chemistry	LFP	
Rated energy (kWh)	5015.96kWh	
Rated voltage of battery (V)	1331.2VDC	
Battery voltage range (V)	1164.8~1500VDC	
P-rate	0.25P	0.5P
AC auxiliary power		
Voltage (Vac)	400VAC(EU)	
Rated frequency	50/60Hz	
Auxiliary power output	36kW	
Phase	3L+N+PE	
Other parameters		
Mass (t)	≈41.5	
Dimensions (W * D * H) (mm)	6058*2438*2896mm	
Maximum system efficiency	0.25P 94%	0.5P 93%
Cycle life	8000@25°C,0.5C/0.5C,90%DOD, 70%EOL	
Cooling system	Liquid cooled	
Maximum working altitude(m)	≤2000m	
Allowable operating temperature (°C)	-30 ~ +55°C	
Allowable relative humidity	0%-95%, RH	
IP rating	IP55/IP54/Type 3R(US)	
Protection class	Class I	
Corrosion class	C4/C5	
Communication interface	Ethernet/RS485/CAN	
Communication protocol	Modbus TCP / Modbus RTU / CAN 2.0/IEC61850/IEC104	
Fire suppression system	Cabinet-level fire suppression options include aerosol systems, Novec 1230, and an optional absence of both, along with water-based fire suppression (sprinkler systems).	
Short circuit protection	Yes	
Lightning protection	Yes	
Overcharge/overdischarge protection	Yes	
Overtemperature protection	Yes	
Fire detection	Yes	
Codes and standards compliance	IEC62619/IEC63056、IEC62477、IEC61000、UL9540A、UL9540、 UL1973、NFPA68、NFPA69、UN38.3、UN536、FCC	

4.3 Container System

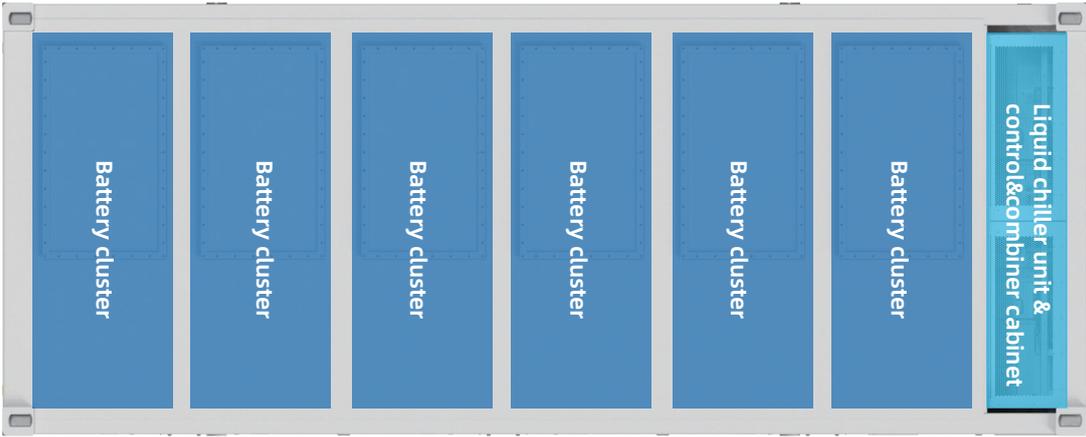
4.3.1 External layout of the container



4.3.2 Internal layout of the container



Front View



Top View

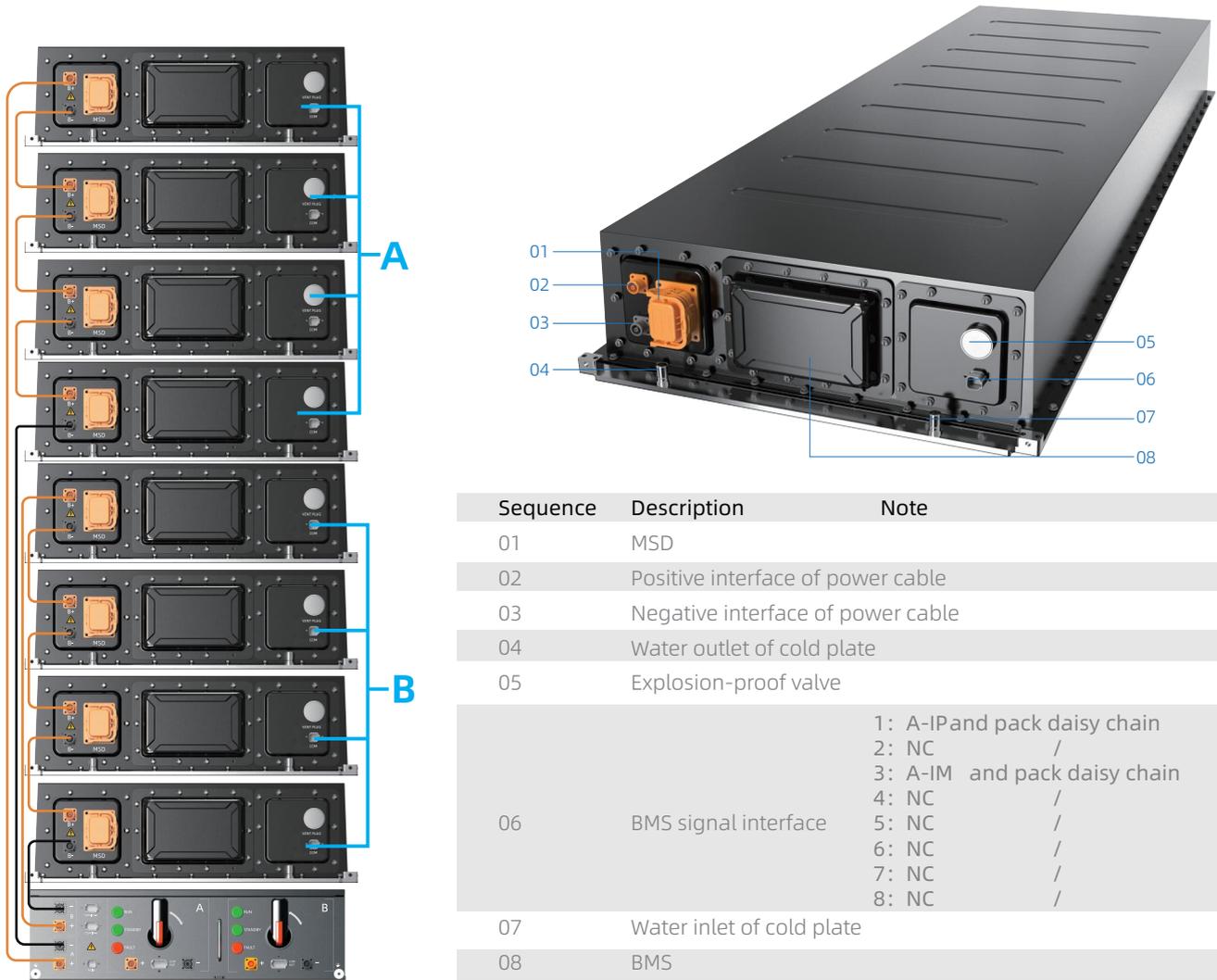


Right View

4.4 Battery cluster system

4.4.1 Liquid-cooled battery

- The battery pack uses liquid-cooled finned brazed cooling plates, providing enhanced flexibility and efficient heat exchange.
- The safety system addresses three key areas: explosion-proof, thermal runaway prevention, and anti-expansion. The battery cells feature a heat-insulating, high-temperature resistant elastic protective layer that blocks heat transfer during thermal runaway and prevents diffusion. The elastic layer also absorbs expansion forces generated during operation, extending the battery's lifespan.
- An explosion relief valve is incorporated to rapidly discharge gas, balance internal pressure, and prevent damage from high pressure within the battery box.



Single cluster (2 clusters in total) diagram

Sequence	Description	Note
01	MSD	
02	Positive interface of power cable	
03	Negative interface of power cable	
04	Water outlet of cold plate	
05	Explosion-proof valve	
06	BMS signal interface	1: A-IP and pack daisy chain 2: NC / 3: A-IM and pack daisy chain 4: NC / 5: NC / 6: NC / 7: NC / 8: NC /
07	Water inlet of cold plate	
08	BMS	

Pack technical parameters

Item	Parameters
Configuration	1P104S
Key component	iccs
Rated capacity	314Ah
Rated energy	104.499kWh
Rated Power	52.249kW
Rated voltage	332.8VDC
Voltage range	291.2-379.6VDC (cell: 2.8~3.65V)
P-rate	0.5P (Compatible with 0.25P)
Working temperature	-30-55°C
Weight	672±15kg
Dimensions(W*D*H)	790±2*2199.5±3*237±2mm
IP rating	IP67

4.5 Control and Combiner Cabinet

4.4.2 Control Box

- Each high-voltage control box is responsible for managing and safeguarding the two clusters it is connected to.
- The high-voltage box is equipped with a Battery Cluster Management Unit (BCU), fuse, precharge resistor, Hall element, and other components. These elements aggregate operational data from both clusters, measure charge and discharge currents, and provide protection against short circuits and over-current conditions.
- It has functions such as high voltage detection and circulation control.. All wiring is designed to facilitate easy installation .



No.	Description	Note
01	Cluster A Signal Interface	1: A-IP and pack daisy chain communication 2: NC / 3: A-IM and pack daisy chain communication 4: NC / 5: NC / 6: NC / 7: NC / 8: NC /
02	Cluster A positive electrode	
03	Cluster B negative electrode	
04	Cluster B signal interface	1: A-IP and pack daisy chain communication 2: NC / 3: A-IM and pack daisy chain communication 4: NC / 5: NC / 6: NC / 7: NC / 8: NC /
05	Cluster B positive electrode	
06	Cluster B negative electrode	
07	AC220V auxiliary power port	1: L 2: N 3: PE 4: NC 5: NC 6: NC AC power supply
08	Cluster A battery operation indicator	<ul style="list-style-type: none"> ● RUN Illuminates green during normal operation of the batteries of Cluster A but remains off in other conditions. ● Standby Illuminates green when the batteries of Cluster A are in a standby state, meaning they are neither charging nor discharging. ● Fault Illuminates red when a fault occurs at the cluster level but remains off in other conditions

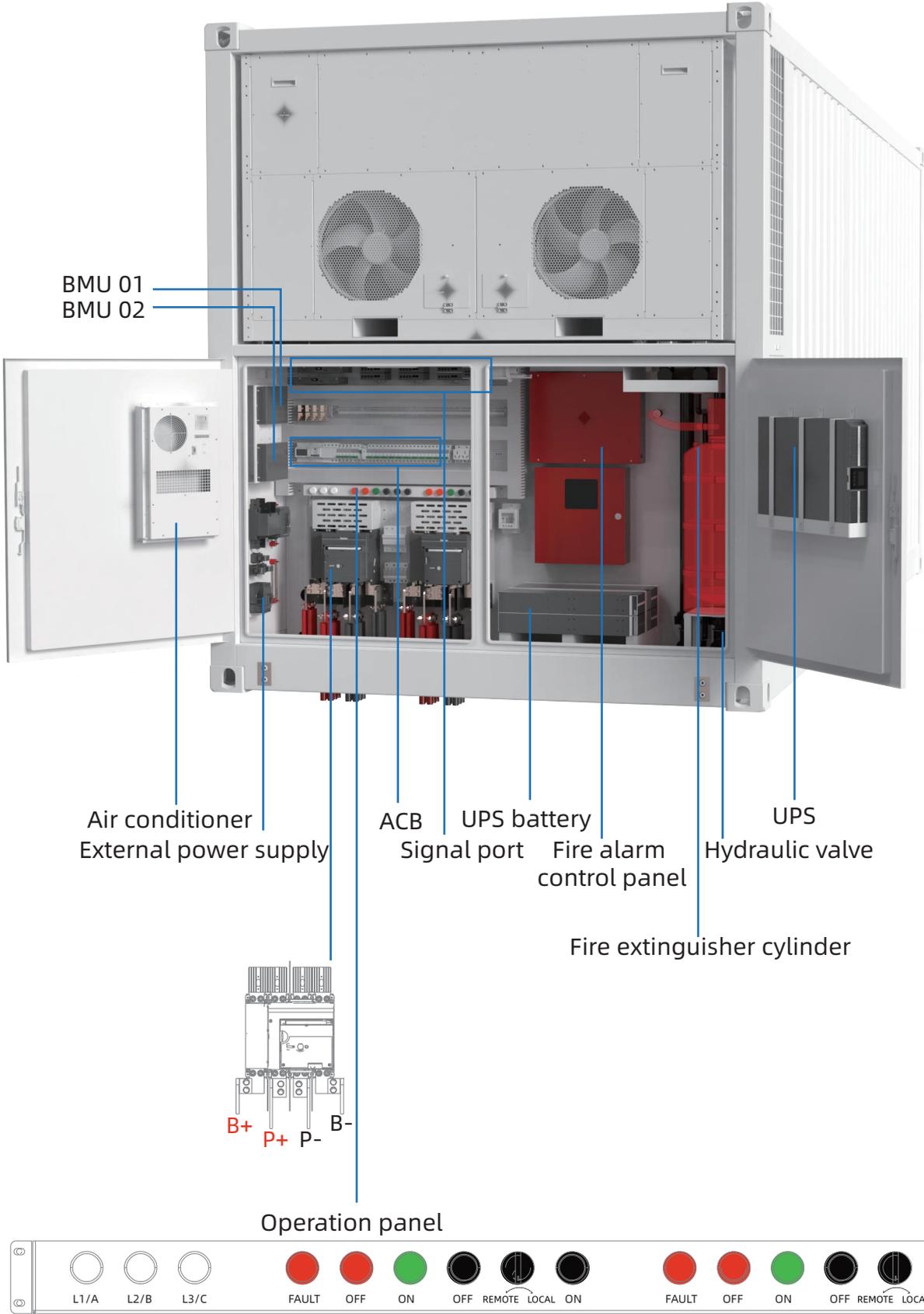
09	Positive output terminal of cluster A	
10	Cluster A battery circuit breaker	
11	Cluster A battery signal output interface	1: CAN1H (Intranet) for Debugging and Firmware Upgrade 2: CAN1L (Intranet) for Debugging and Firmware Upgrade 3: CAN2H (External Network) for Communication with Load or BAU 4: CAN2L (External Network) for Communication with Load or BAU 5: 24V + Reserved Power Supply Port 6: 24V- Reserved Power Supply Port 7: 485-1A Reserved Communication Port 8: 485-1B Reserved Communication Port 9: 485-2A Reserved Communication Port 10: 485-2B Reserved communication port 11: DI1 High Level Detection 12: DO1 High Level Output
12	Cluster A battery output negative electrode	
13	Cluster B battery operation indicator	<ul style="list-style-type: none"> ● RUN Illuminates green during normal operation of the batteries of Cluster A but remains off in other conditions. ● Standby Illuminates green when the batteries of Cluster A are in a standby state, meaning they are neither charging nor discharging. ● Fault Illuminates red when a fault occurs at the cluster level but remains off in other conditions
14	Cluster B battery output positive electrode	
15	Cluster B battery circuit breaker	
16	Cluster B battery signal output interface	1: CAN1H (Intranet) for Debugging and Firmware Upgrade 2: CAN1L (Intranet) for Debugging and Firmware Upgrade 3: CAN2H (External Network) for Communication with Load or BAU 4: CAN2L (External Network) for Communication with Load or BAU 5: 24V + Reserved Power Supply Port 6: 24V- Reserved Power Supply Port 7: 485-1A Reserved Communication Port 8: 485-1B Reserved Communication Port 9: 485-2A Reserved Communication Port 10: 485-2B Reserved communication port 11: DI1 High Level Detection 12: DO1 High Level Output
17	Cluster B battery output positive electrode	
18	Grounding	

PDU technical parameters

Item	Parameters	Item	Parameters
Weigh	≤50kg	IP rating	IP65
Dimensions (W * D * H)	790±2*796±2*230±2mm		

4.4.2 Control and Combiner Cabinet

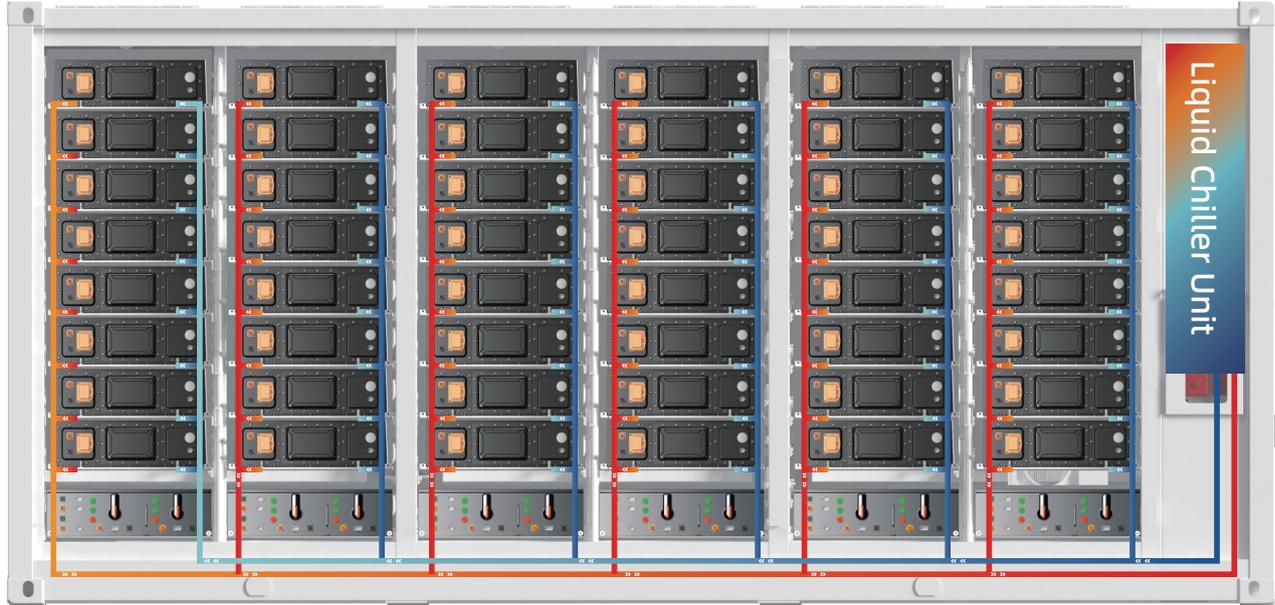
The power distribution system is used to assist power distribution and control power distribution equipment to ensure the normal operation of the whole system. It provides auxiliary power supply for different systems such as battery system, fire suppression system, lighting system, communication system, air conditioner, liquid chiller unit, socket, and dehumidifier.



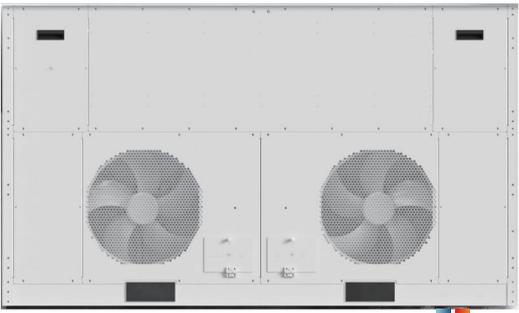
4.6 Thermal Management System

The product features a liquid cooling design that offers faster and better heat transfer, ensuring efficient cooling. Due to the high specific heat capacity of the liquid, it maintains a minimal temperature change even after absorbing significant heat, resulting in a small temperature differential. Unlike air cooling, liquid cooling is less affected by altitude and atmospheric pressure, maintaining high cooling efficiency.

This design reduces system energy consumption by 20% and extends battery service life by 10%, significantly lowering the overall energy consumption ratio.



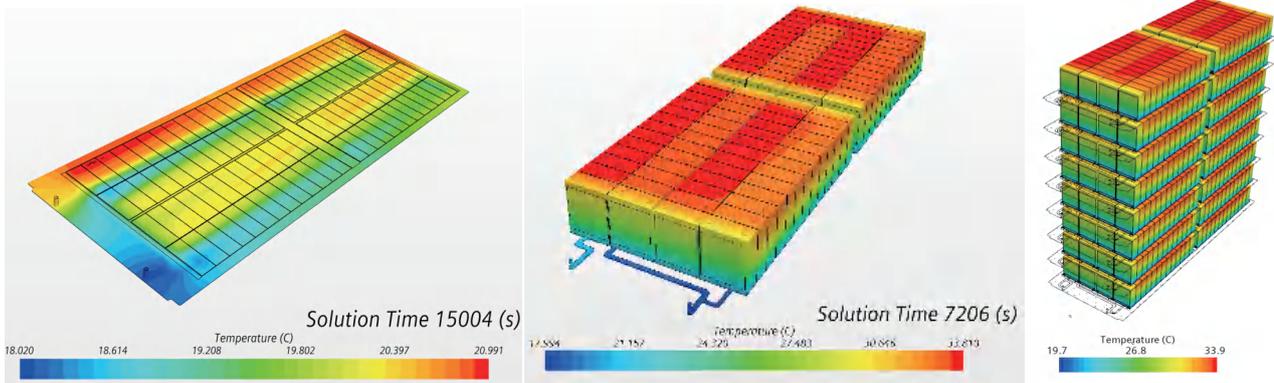
Parameters of liquid chiller

Liquid Chiller Unit	Item	Parameter
 <p data-bbox="494 1713 670 1758">Water outlet</p>	Rated cooling capacity(kW)	60 (ambient temperature: 45 °C, outlet water temperature: 20 °C)
	Rated heating capacity(kW)	16
	Power supply voltage(V)	480V (323~552V)
	Frequency(Hz)	50/60
	Number of phases/feeder cables	3L + N + PE
	Rated refrigeration current(A)	43
	Maximum operating current(A)	60
	Rated heating current(A)	26
	Refrigerant type	513a
	Injection quantity(oz)	113~2
	High pressure(psig/MPa)	319 (2.2)
	Low pressure(psig/MPa)	217 (1.5)
	Operating temperature (°C)	-30~55
	Coolant temperature (°C)	5-35 (cooling); < 50 (heating)
	Flow (50% ethylene glycol solution)	500L/Min(@ 150kPa battery side voltage drop)
	Altitude (m)	0~4000
	Protection level	IP67 (for electrical components)
	Noise dB (A)	≤ 75 (JB/T 4330)
Length * Thickness * Height (mm)	2100* 550* 1230	
Panel thickness(mm)	2.5	
Anti-corrosion measures (Coating/Coating)	C5M	

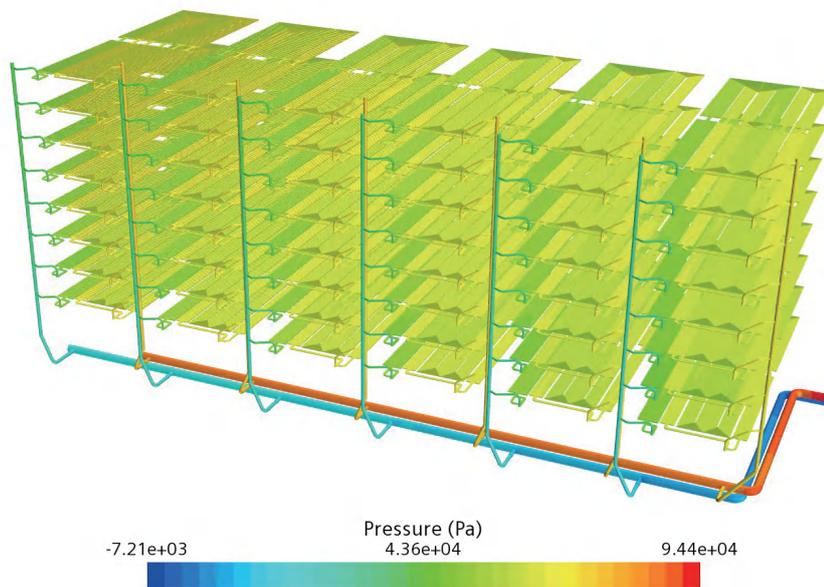
Temperature Control Effect

The following data is based on simulations and test results and is provided for reference purposes only. The Company does not guarantee the accuracy of the data. Actual performance may vary due to external variables such as environmental conditions and other uncertain factors, and as such, there may be deviations from these results.

0.5 P charging for 2 hours and 30 minutes (stationary), followed by 0.5 P discharging for 2 hours.



The temperature variation at the cluster level of the battery is less than 2.6°C. The maximum temperature recorded for the battery cell is 34.03°C, with a temperature difference of 2.9°C within the cluster.



The airflow in the container system remains consistent, ensuring that the cluster-level deviation is maintained at less than 10%.

4.7 Fire Suppression System

I. Design basis:

1. NFPA-855 "Installation Standard for Stationary Energy Storage Systems";
2. NFPA-70 "National Electrical Code";
3. NFPA-72 "National Fire Alarm Code";
4. NFPA-2010 "Fixed Aerosol Fire Extinguishing System";
5. NFPA-69 "Explosion-proof System Standard"
6. NFPA-68 "Deflagration Ventilation Standard"; 2. System

II. Composition

(1) Automatic fire alarm and aerosol fire extinguishing system

The fire alarm system includes a range of components, such as smoke detectors, temperature detectors, an alarm bell, sound and light alarm indicators, deflation indicator lights, an emergency start button, an emergency stop button, and a no-release switch (available in the United States), among others.

Battery Compartment: Two smoke detectors, two temperature detectors, and an electrically activated aerosol fire extinguishing device are installed. **Electrical Cabin:** A temperature-controlled aerosol fire extinguishing device is installed.

When both the smoke sensor and temperature sensor in the battery compartment are activated simultaneously, the gas fire extinguishing controller initiates a secondary fire alarm. After a 30-second delay, the aerosol fire suppression system in the battery compartment is automatically activated.

When the temperature in the electrical cabin reaches 93°C, the aerosol fire suppression system is automatically activated. A spray signal is sent to the gas fire extinguishing controller, triggering the deflation indicator light as part of the suppression process.

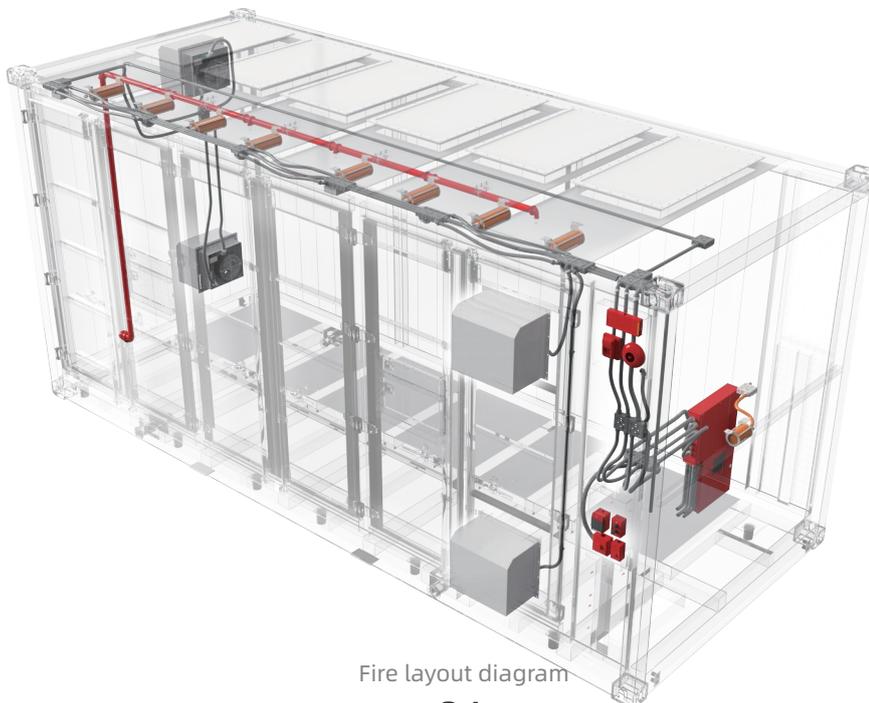
(2) **Combustible Gas Exhaust System:** Components include 2 hydrogen gas detectors, 1 explosion-proof exhaust fan, an air inlet, and a fan control button.

(3) Explosion Venting System:

The container is equipped with 6 explosion venting plates on the top. These plates are designed to open at 0.1 bar (0.01 MPa), providing a total venting area of no less than 3.8 square meters.

(4) Fire Sprinkler System:

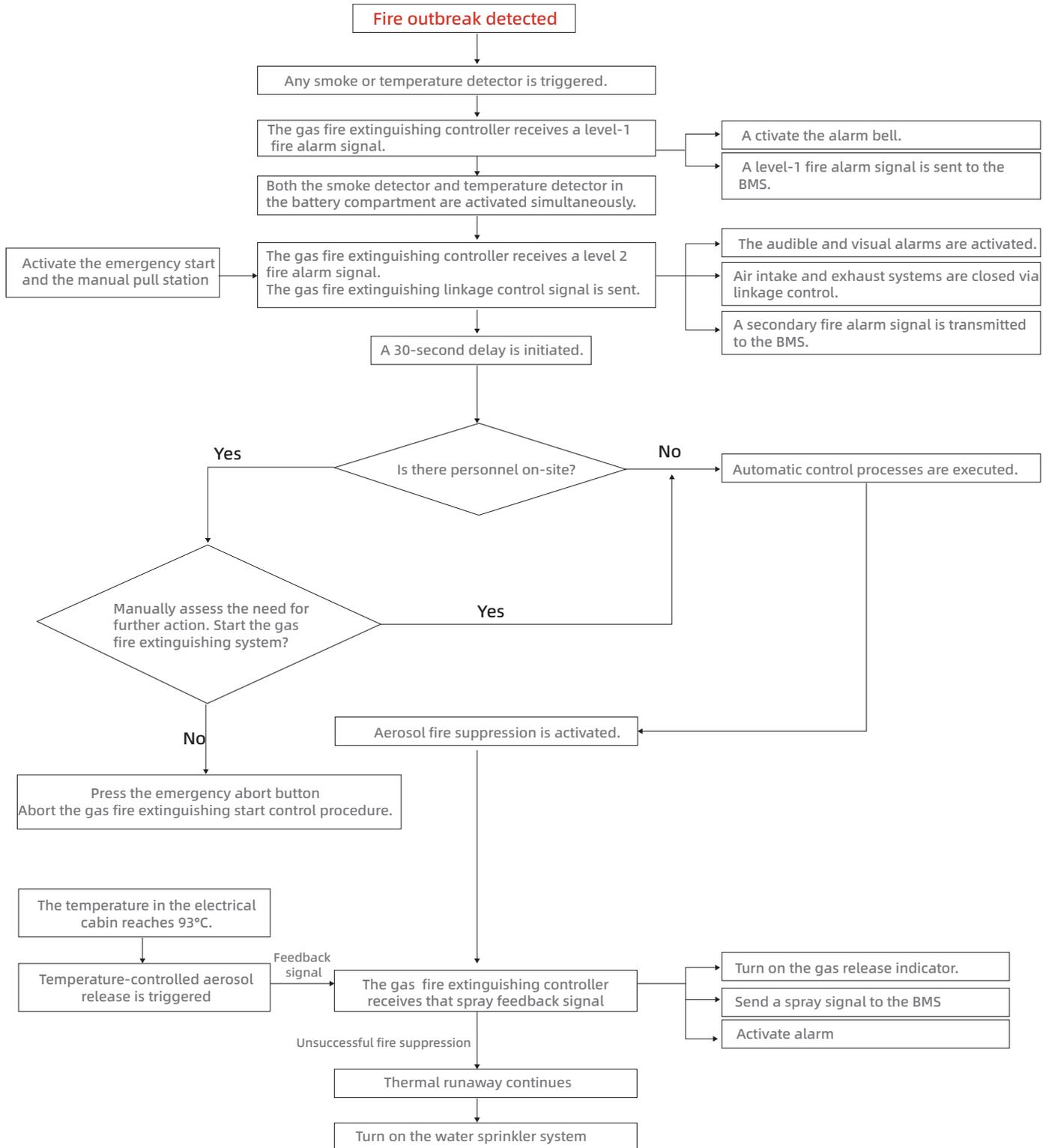
The system comprises a water supply interface, pipeline, and 5 open sprinklers.



Fire layout diagram

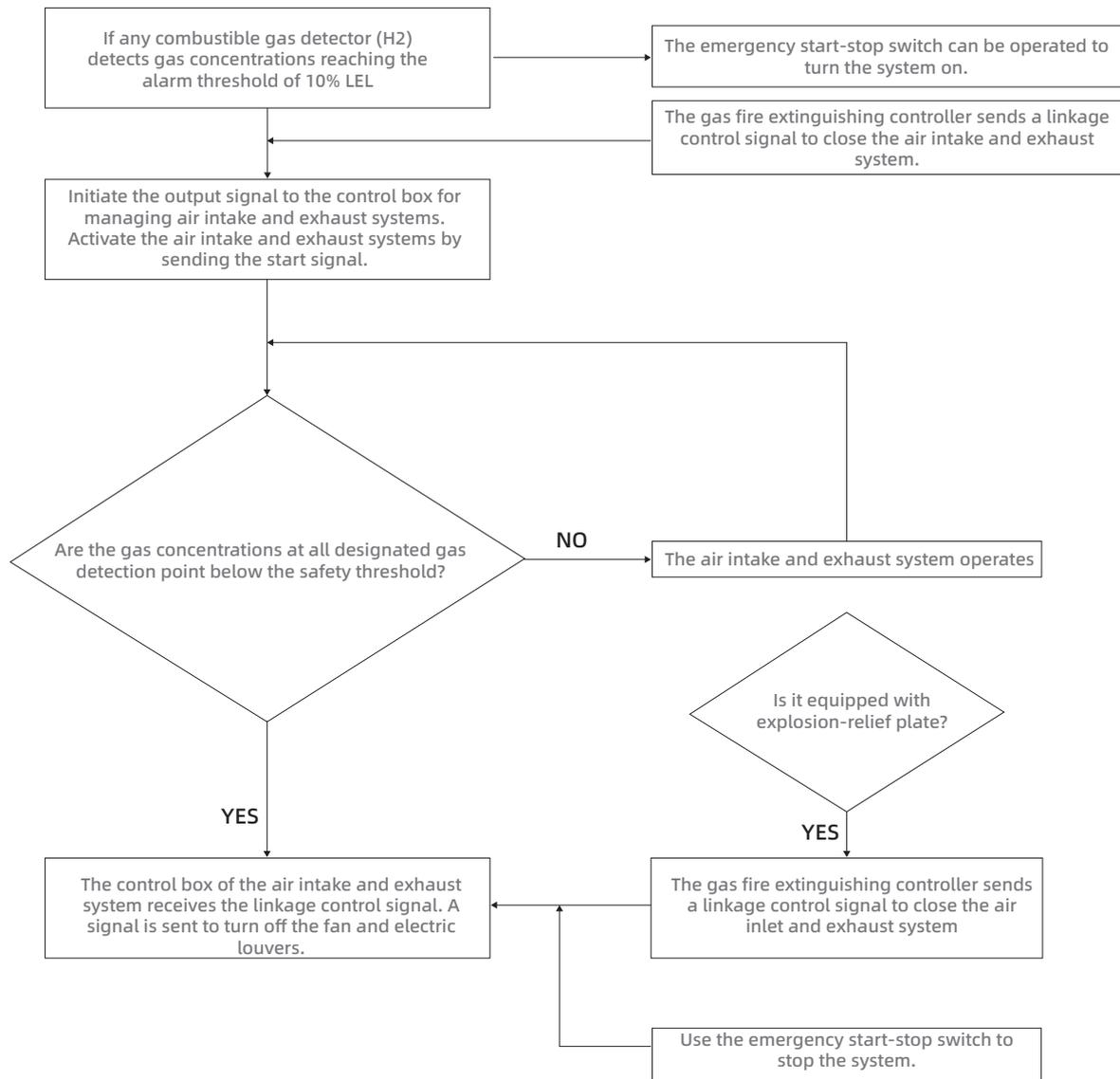
Battery Compartment Fire Suppression Logic

When the temperature in the electrical cabin reaches 93°C, the aerosol fire suppression system is automatically activated. A spray signal is sent to the gas fire extinguishing controller, triggering the deflation indicator light as part of the suppression process.

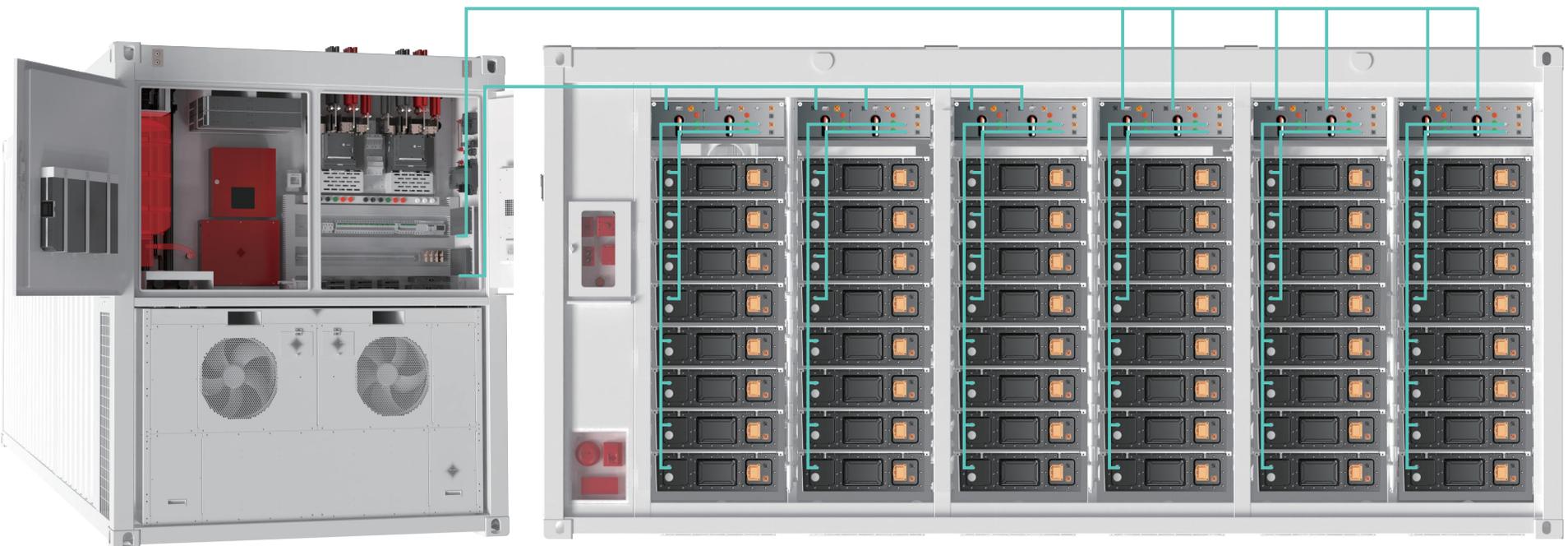


Combustible Exhaust System Logic

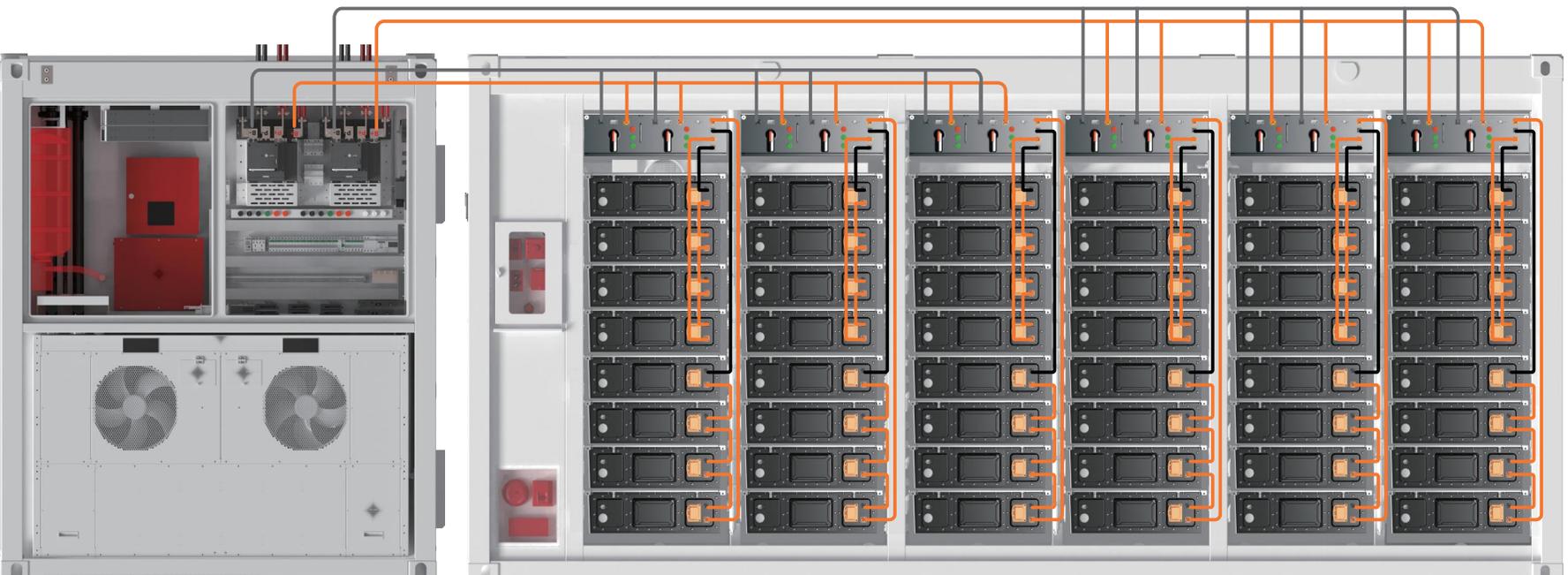
Set up combustible exhaust system, including combustible gas detector, exhaust device, air inlet device, etc. Comply with the NFPA 69 Explosion Protection System Standard to prevent explosions by reducing the concentration of combustible gases within the protected area.



4.8 Signal Cable Connection Diagram



4.9 Power Cable Connection Diagram



5 Foundation Construction

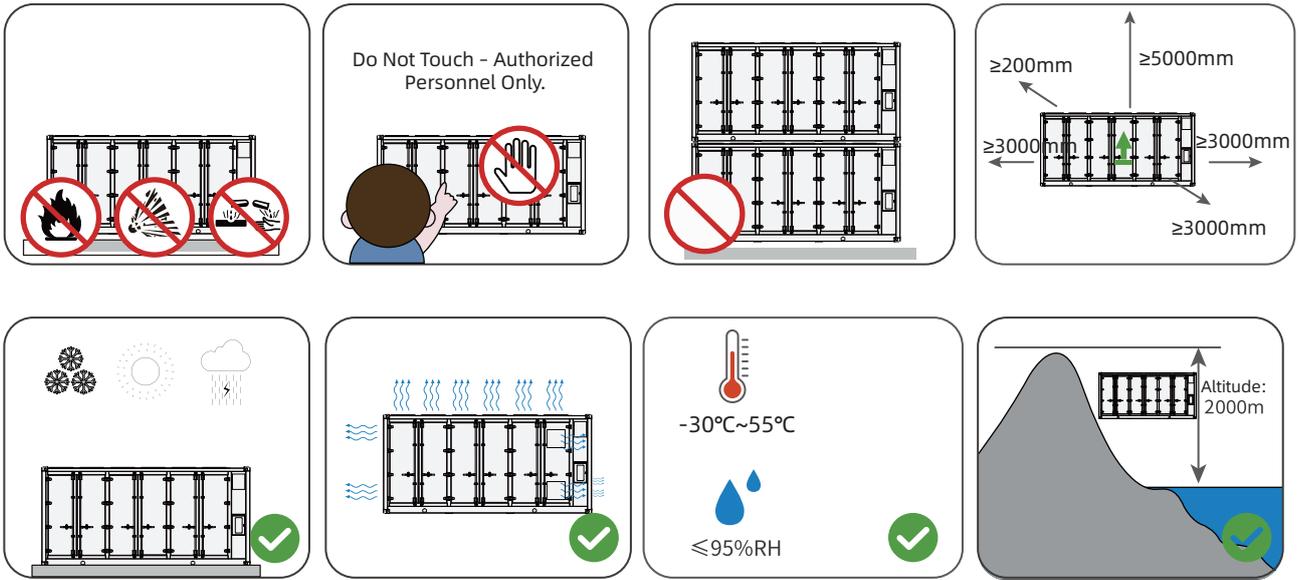
5.1 Select Installation Location

Basic requirements

- The energy storage system has Waterproof and dustproof protection and is suitable for outdoor installation. However, it should not be placed in areas with prolonged high humidity.
- The system generates noise during operation, so it's recommended to install it away from residential areas.
- Ensure the installation site is free from corrosive or flammable gases.

Installation Environment Requirements

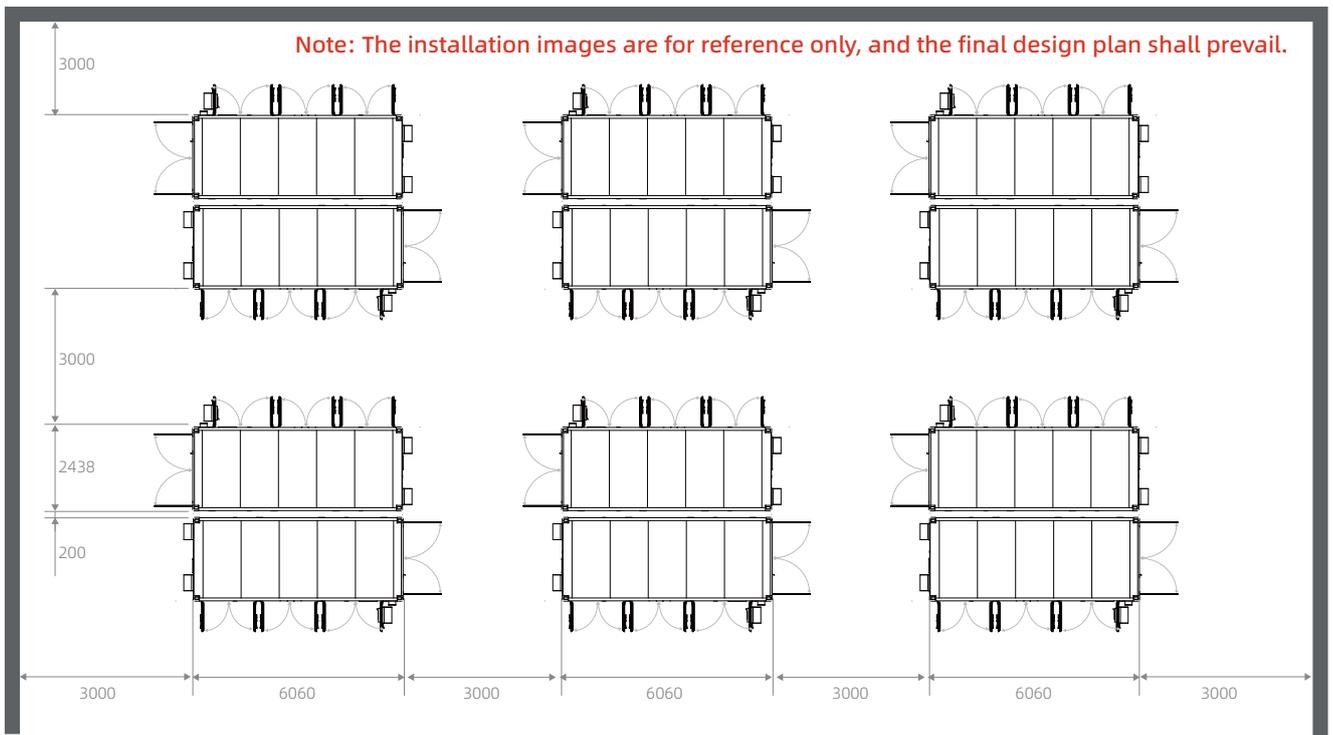
- Do not install or operate the energy storage system beyond the specified technical limits, as this may compromise safety and performance.
- Site selection must adhere to local laws, regulations, and standards. The system should be installed and maintained by professionals, ensuring strict compliance with safety regulations.
- The energy storage system must be installed on flat ground with adequate load-bearing capacity, avoiding unfavorable geology (e.g., rubber soil, soft soil, subsidence). If the ground is unstable, additional support or foundations should be constructed.
- Avoid low-lying areas prone to water or snow accumulation. The installation site must be above the highest recorded water level.
- Snow accumulation above the system's base must be cleared immediately to prevent water from damaging the system.
- The system should not be installed in flood-prone areas; it should be elevated to prevent rainwater erosion.
- In vegetated areas, ensure land is hardened (cement or gravel) for installation.
- Reserve sufficient space for door openings and ventilation during installation.
- The energy storage system must be installed in an area with good ventilation and large airflow. Regularly clean the air inlet and outlet to prevent blockage by sand.
- Do not place any items within the installation range of the energy storage system.
- During installation, operation, and maintenance, clean any accumulated water, ice, snow, or debris from the top before opening the system to prevent materials from entering.
- The system should not be placed in environments containing corrosive gases or liquids, dust, smoke, volatile gases, infrared radiation, organic solvents, or excessive salt content.
- Keep flammable, explosive, corrosive, or hazardous items away from the energy storage system.
- Avoid installing the system in environments with conductive or magnetic dust.
- Do not install the system in areas prone to mold, fungi, or microorganisms.
- The system should not be installed in areas with strong vibrations, high noise levels, or electromagnetic interference.
- It is strictly forbidden to install energy storage systems in sites accessible to children.
- It is strictly forbidden to install energy storage systems in areas where animals can break into.
- Avoid installing the system near high-temperature heat sources or in low-temperature environments. The preferred temperature range is -20°C to 45°C, with a humidity range of 0% to 95% RH (no condensation) and altitudes below 2000 meters.
- For installations in special conditions, consult with the manufacturer in advance and obtain a written agreement. The company reserves the right to refuse repair services for machine damage caused by improper installation environments.



5.2 Recommended Installation Distance

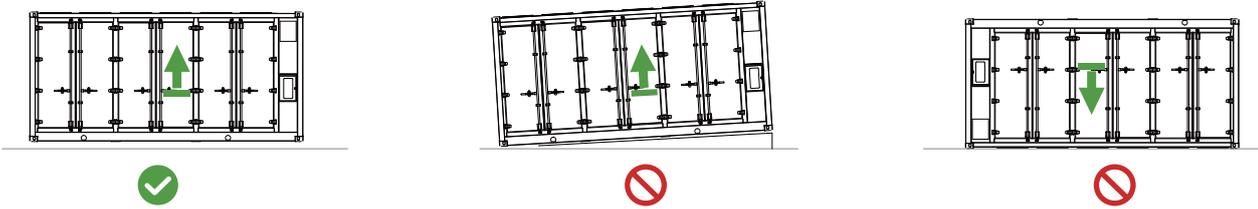
When installing the product, ensure sufficient distance from walls and other equipment to meet the requirements for maintenance access, fire escape routes, and proper ventilation. This section shows the minimum space requirements for a non-containerized energy storage system. It is recommended to select a larger area to ensure the cabinet operates reliably and efficiently.

Note: The installation images are for reference only, and the final design plan should take precedence.



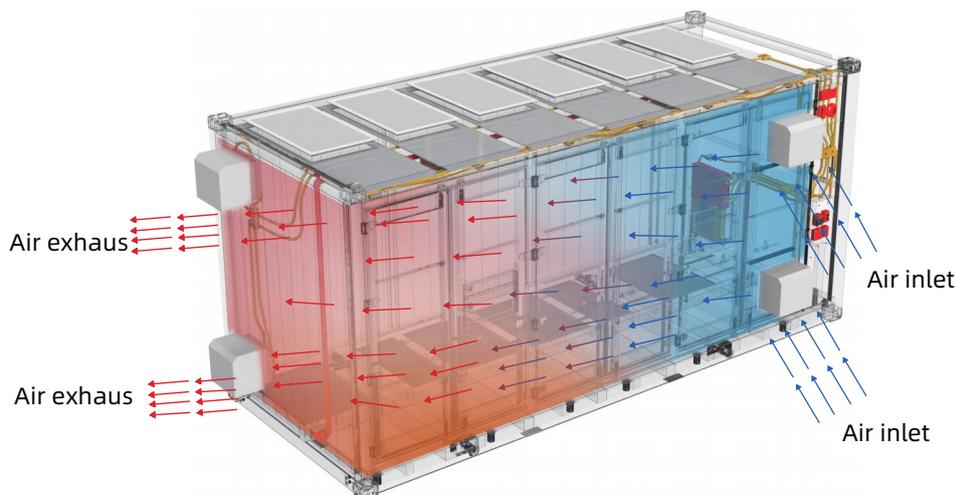
5.3 Recommended Installation Angle

Ensure that the equipment is installed horizontally and must not be tilted, positioned sideways, or upside down.



5.4 Ventilation Direction

- The energy storage system generates significant heat during operation. If the equipment temperature becomes too high, its electrical performance will degrade, or it may sustain damage. When choosing the installation site, consider how heat will dissipate to maintain optimal performance and prevent equipment damage.
- To meet the ventilation requirements of the energy storage system, the installation environment should meet the following conditions:
 - The energy storage system must be installed in an area with good ventilation and large airflow.
 - The air inlet should provide sufficient fresh air circulation.
 - Regularly clean the air inlet and outlet to prevent blockage by sand or other debris.



5.5 Foundation Construction Requirements

The integrated energy storage system is relatively heavy. Before laying the foundation, various conditions of the installation site (primarily including geological conditions, environmental factors, and climate conditions) must be thoroughly inspected. Only after completing these inspections should the foundation's design and construction commence.

Installation conditions

Working Temperature Range: -30 ~ 55 °C

Storage temperature: -20 ~ 45 °C

Relative humidity: 0 ~ 95% RH, no condensation

Altitude : ≤ 2000m

Verticality : No vibration and vertical inclination not exceeding 5 °

Pollution Level : II

Site Environment : The surrounding environment must be dry, well-ventilated, and located far from flammable and explosive areas.

The soil at the installation site must have a sufficient degree of compactness. The relative soil compactness at the installation site should be $\geq 98\%$. If the soil is loose, measures must be taken to stabilize the foundation.

Installation is not allowed in environments with metal conductive dust.

Foundation construction

Poor foundation construction may cause difficulties with equipment placement, door functionality, and the overall operation of the integrated energy storage system. Thus, the foundation must meet specific standards for mechanical support, cable routing, maintenance, and overhaul needs.

Basic Foundation Requirements:

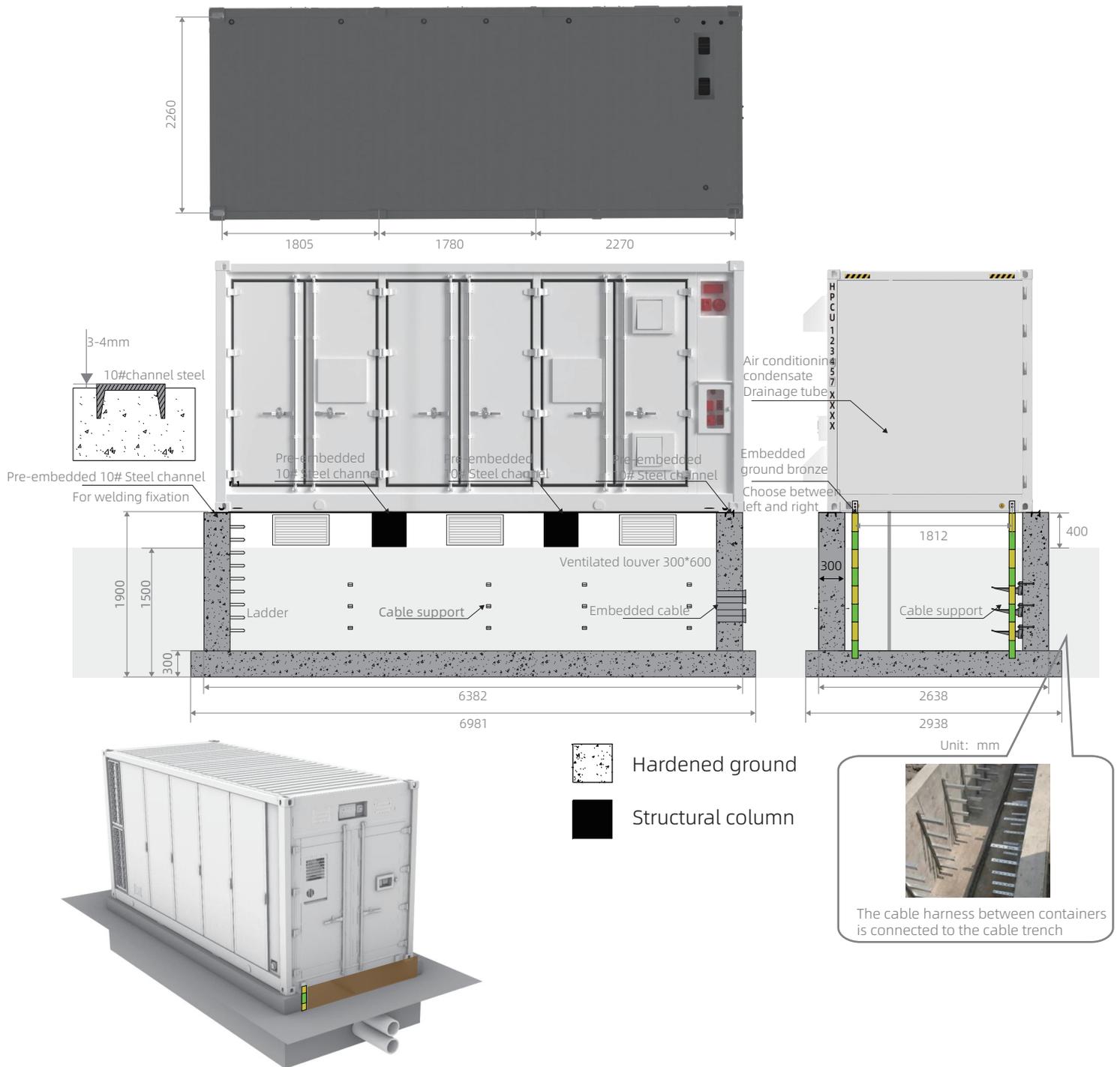
- The excavation base for the foundation pits must be properly tamped and filled. 1) .It is recommended to use pebbles to compact the foundation base to prevent settling.
- The foundation must provide adequate load-bearing support for the integrated energy storage system.
- Raise the integrated system to prevent rainwater from eroding the base and interior components. The foundation should be 300-450 mm above the horizontal ground level of the installation site.
- Appropriate drainage measures must be included, based on local geological conditions.
- A cement foundation with a sufficient cross-sectional area and height is required. The container's installation height should exceed the historical maximum water level (at least once in a century). The foundation height should be determined according to site geology and construction needs.
- Cable routing should be considered during foundation construction. Excavated muck must be removed promptly to prevent interference with the installation process.
- A maintenance platform should be installed around the foundation for easier access during future maintenance.
- Based on the location and size of cable entry and exit points for the battery outdoor cabinet, ensure enough space for the AC/DC side cable tray and pre-embedded cable guide during foundation construction.
- Determine the specifications and quantity of perforated tubes according to the cable model and the number of incoming and outgoing lines.
- Temporarily seal both ends of all embedded tubes to prevent impurities from entering, ensuring easier wiring later.
- Once the cables are connected, seal the cable inlets, outlets, and joints with refractory mud or other suitable material to prevent rodents from entering.
- Install pre-embedded grounding units in accordance with relevant standards in the project's location.

Other Protective Measures

- Install a drainage system at the installation site to prevent equipment at the bottom of the integrated energy storage system or within the cabinet from being submerged during heavy rain or precipitation.
- Avoid planting trees near the installation site to prevent future complications, so as to prevent strong winds from blowing branches or leaves that may block cabinet doors or air inlets and outlets of the energy storage system.

5.5.1 Proposed Foundation Construction Scheme 01

Note: The installation images are for reference only, and the final design scheme shall prevail.



Foundation Construction Guidelines:

1. Embed 10# channel steel into the concrete foundation, with a protrusion of 3-5 mm above the ground surface.
2. The foundation must be level, smooth, and capable of evenly bearing the weight of the battery cabinet (approximately 38 tons).
3. Seal the inner wall and foundation platform of the cable chamber with M10 mortar, applying a 10 mm thick, smooth layer.
4. Ensure the bottom surface of the cable chamber is slightly inclined to create a drainage channel, preventing water accumulation.
5. Introduce 012 round steel or 30X4 flat steel into the grounding grid from the top of the HV and LV foundations on both sides, ensuring grounding resistance meets the requirements of the local electric power department.
6. Equip cable trenches with cable brackets to support the installation.
7. This diagram is a schematic representation of the foundation layout for positioning the battery cabinet and is for reference purposes only. The specific foundation treatment should be determined based on a comprehensive evaluation of site conditions.
8. The size and position of the louver can be selected and adjusted according to customer requirements.
9. The minimum fire separation distance between prefabricated battery cabinets must be at least 3 meters. If firewalls are used, there is no limit on the fire separation distance. Firewalls should extend at least 1 meter beyond the outer contour of the prefabricated cabinets.
10. After installation, the base must be sealed to prevent animal access.

5.5.2 Proposed Foundation Construction Scheme 02

Note: The installation illustration is for reference only. The specific design scheme may vary depending on actual conditions.



Hardened ground

Unit: mm



Structural column



Foundation Construction Guidelines:

1. The hardened ground base should be level, smooth, and capable of evenly bearing the weight of the battery cabinet.
2. The structural column must be made of concrete grade C30 or higher.
3. Conduits for wiring should be reserved within the hardened ground, and the quantity and direction should be based on the onsite wiring routes.
4. The $\Phi 12$ round steel or 30x4 flat steel in the grounding grid should be introduced into the top of both the HV and LV foundations, with grounding resistance meeting the local electric power department's requirements.
5. This diagram is a schematic representation of the foundation layout for positioning the battery cabinet and is for reference purposes only. The specific foundation treatment should be based on a comprehensive evaluation of site conditions.
6. The minimum fire separation distance between prefabricated battery cabinets must be at least 3 meters. If firewalls are used, there is no limit on the fire separation distance. Firewalls should extend at least 1 meter beyond the outer contour of the prefabricated cabinets.
7. The height difference between columns should not exceed 5 mm. Otherwise, the container door will be obstructed from opening.

6 Installation

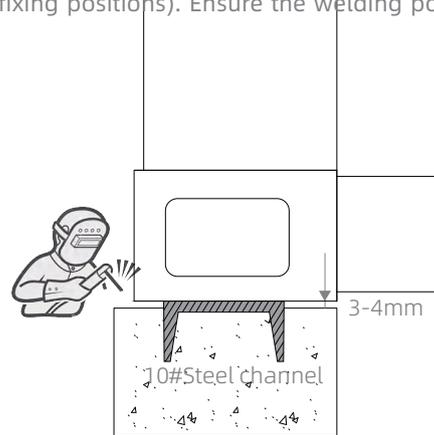
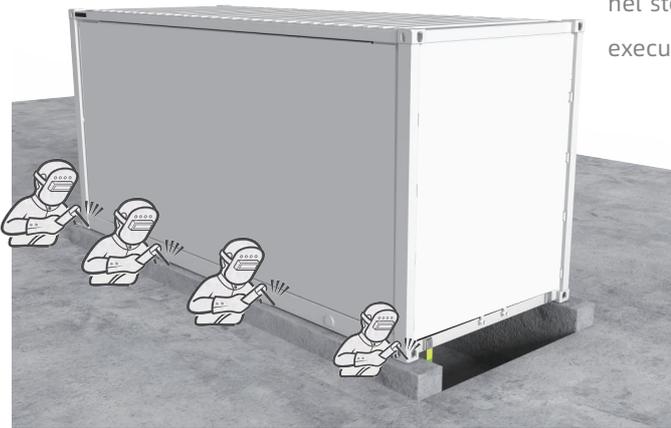
6.1 Container Fixing Scheme

Note: The installation images are for reference only, and the final design scheme shall prevail.

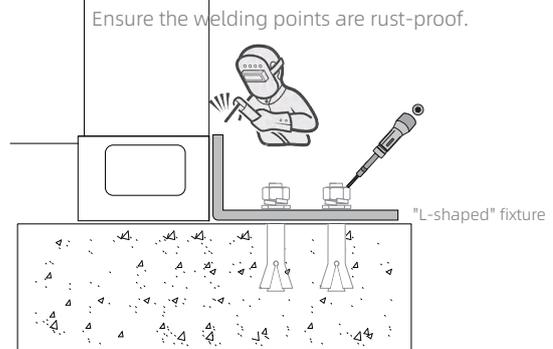
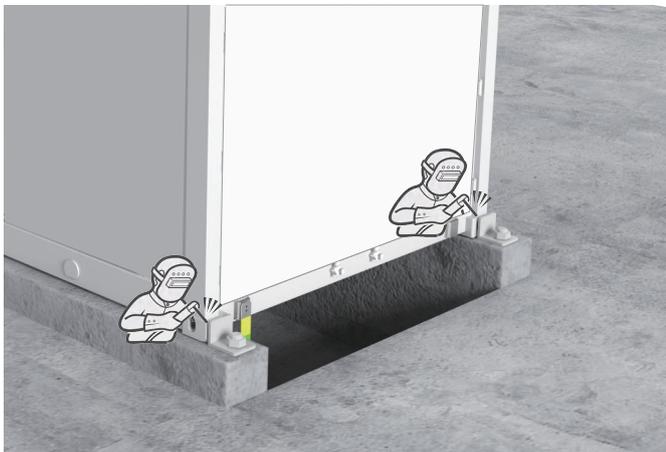
Due to the large weight and size of the container, fixation is generally not required. However, containers have relatively high installation foundation requirements. The bottom of the container must be placed on a concrete foundation with sufficient strength and flatness, meeting the requirements of GB 50204-2015 (Code for Acceptance of Constructional Quality of Concrete Structures).

When the container is installed, the four corner fittings and bottom beams must provide sufficient support area and bearing capacity .

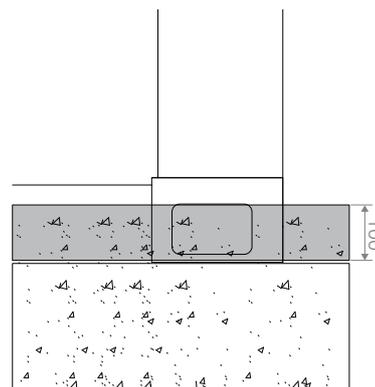
Scheme 01 The container is directly welded with the embedded channel steel (8 fixing positions). Ensure the welding points are properly executed.



Scheme 02 "L-shaped" fixing plates (fixed at four corners) are used, with one end welded to the container and the other end fixed by expansion screws.



Scheme 03 Cement irrigation is applied for fixation. Note: Cement is corrosive and may affect the service life of the container to some extent.



6.2 Installation of Waterproof Cover

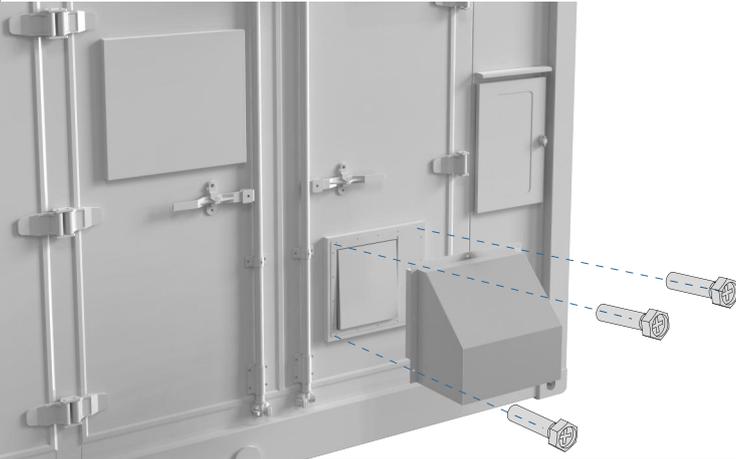
Instruction

Weatherproof fan cover: To shield fans from rain.

Fastening Hardware: Use Stainless Steel Outer Hex Flat Head Bolt M5 * 25.

Adhesive Application: Apply Light Gray Silbond 196 adhesive (300ml/bottle) as needed.

- 01 Remove fittings and screws, and securely fix the components.



- 02 Contact the outer contour with glue to ensure waterproof requirements.



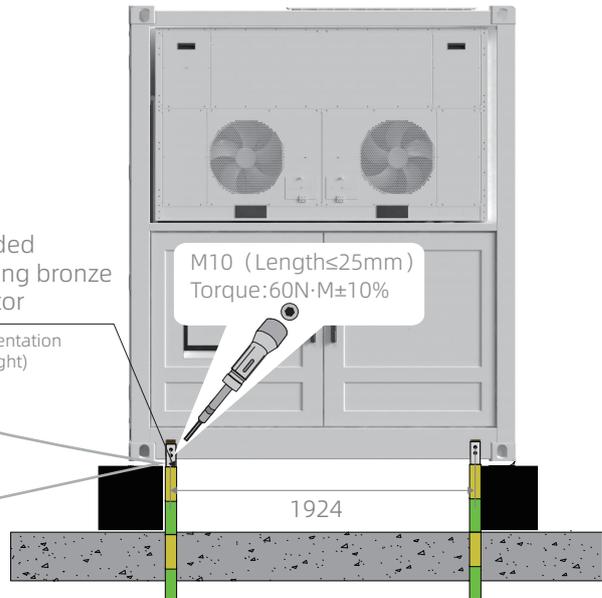
6.3 Grounding Scheme



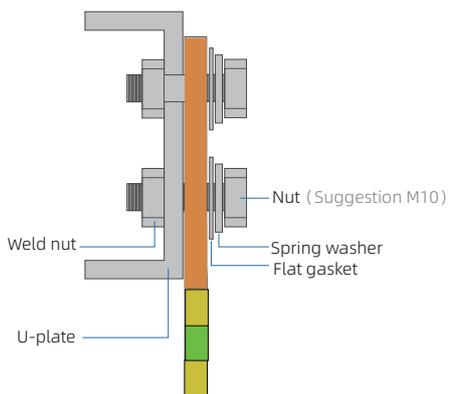
Embedded grounding bronze connector

Select Orientation (Left or Right)

M10 (Length ≤ 25mm)
Torque: 60N·M ± 10%



Warning



- The container provides users with at least 2 grounding points with a bolted connection of grounding bars to realize reliable grounding of non-functional conductive conductors through the container. The effective cross-sectional area of the grounding system shall not be less than 250 mm².
- The grounding connection between the equipment and the ground electrode must be reliably fixed.
- To ensure the system's safe and reliable operation, the grounding impedance of the user-provided grounding point should be ≤ 4 Ω, and the connection impedance should be ≤ 0.1 Ω.
- Whether the grounding part is welded or screwed,
- rust-proof treatment must be applied after installation to ensure long-term durability.

Instruction

In areas with high soil resistivity, to achieve low grounding resistance, a grounding grid composed of multiple grounding bodies in parallel is often required.

For large-scale PV power stations, significant amounts of steel materials are necessary to achieve a large grounding area, making it challenging to meet the grounding resistance requirements.

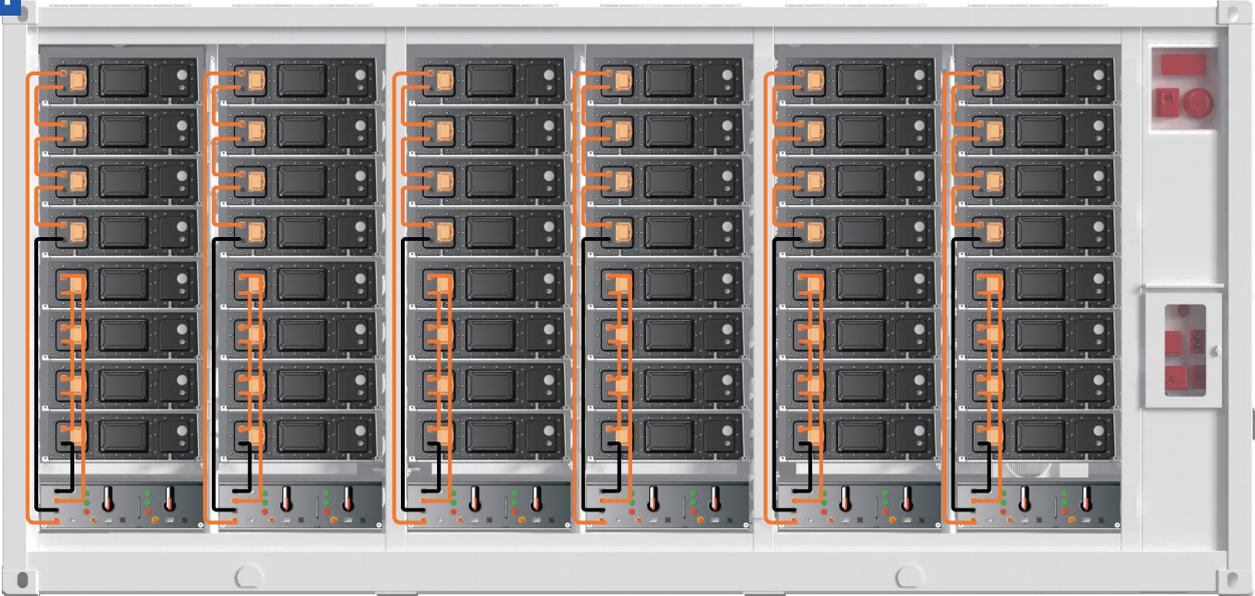
If necessary, the resistivity of soil near the grounding body can be reduced to decrease grounding resistance.

6.4 Installation of Battery MSD

⚠ Instruction

- The internal cable connection between the batteries in the energy storage integrated cabinet is completed. The connection shown in the figure is schematic only.
- For safe transportation, the MSD on the battery pack (PACK) of the energy storage system is not installed beforehand.

01 Verify that the PDU and the power plug for each cluster are properly connected.



02 Insert the MSD into each battery pack.



03 Insert the battery pack into MSD from top to bottom.

MSD Installation Method

a. . Open the handle and insert the MSD angle and listen for a "click" sound to confirm proper installation.



b. Pull the handle to a 90°.



c. Compress the CPA to ensure that it is locked. (Compression Pin Actuator)



MSD Disassembly Method

a. Open the CPA to unlock.



b. Pull the handle to 60°.



c. Press the secondary button and pull the handle to 90°.



d) Lift to open.



6.5 Schematic Diagram of External Wiring of Container

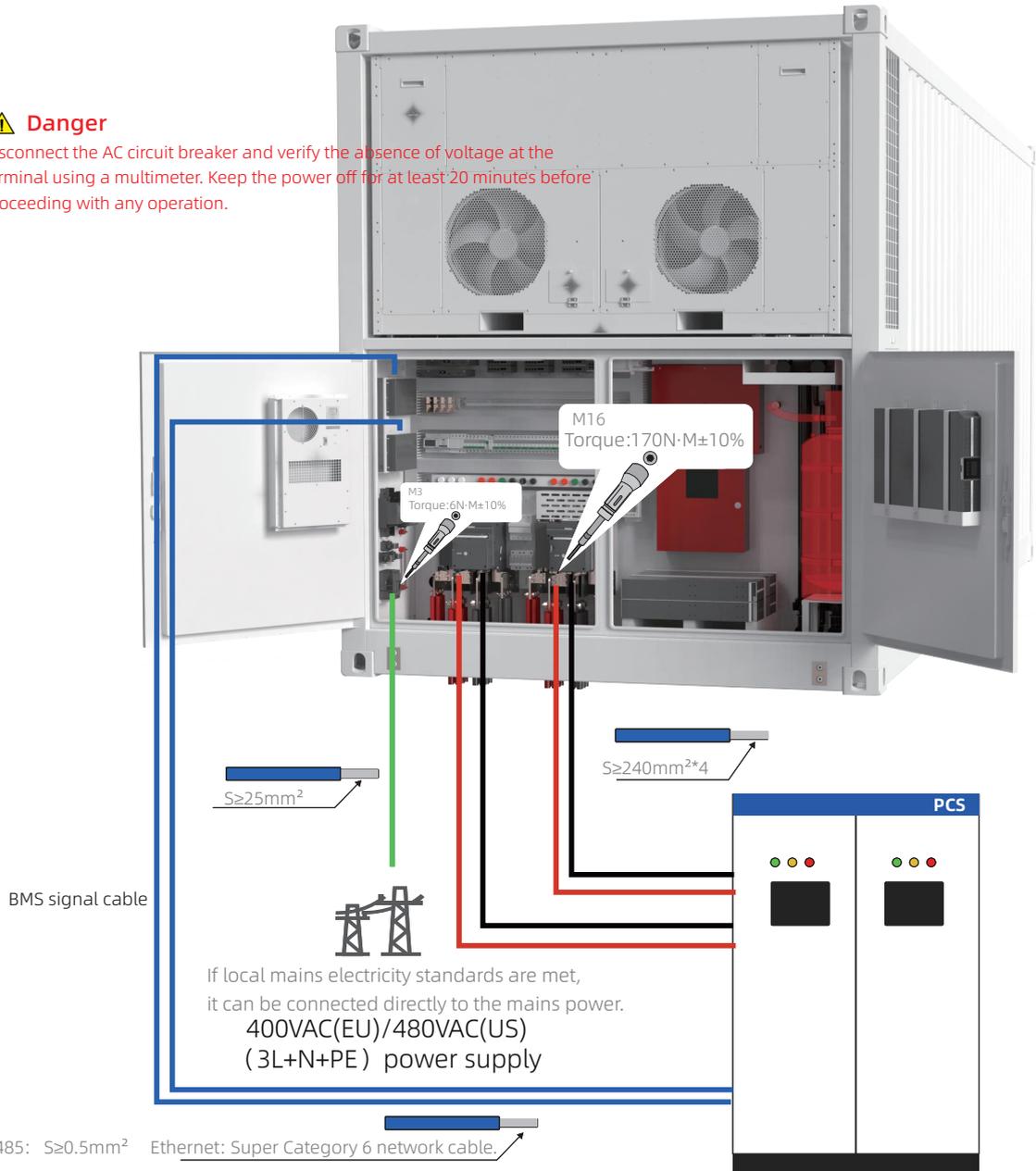
⚠ Danger

- Ensure that the AC/DC switch of the energy storage converter is off, and ensure that the wiring terminal is not charged.
- When connecting the AC power grid, disconnect the upstream AC circuit breaker and ensure that there is no voltage at the contact terminals.
- Connection to the grid may only be made with the approval of the utility grid and following all relevant safety instructions.
- The AC output must be properly grounded inside the equipment.
- DC and AC circuits are isolated from the enclosure. System connections need to be made by installation personnel if it is required by applicable national electrical codes.



⚠ Danger

Disconnect the AC circuit breaker and verify the absence of voltage at the terminal using a multimeter. Keep the power off for at least 20 minutes before proceeding with any operation.

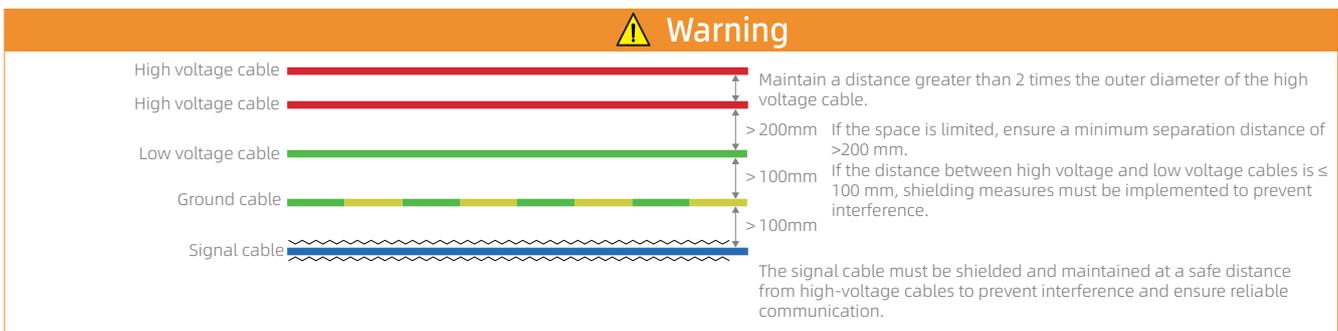


⚠ Warning

- The length of the wiring screw should be carefully selected, ensuring it is just slightly exposed beyond the copper bar mounting hole. Overlong screws may compromise insulation and potentially cause a short circuit.
- Inspect for any heat-shrinkable tubes clamped at the connection between the wiring copper nose and the copper bar. If any tubes are clamped, remove them promptly, as they may lead to poor contact or equipment damage.

6.6 Wiring and Waterproof Treatment

- For equipment requiring upper wiring, overhead wiring should be employed. If underfloor wiring is necessary, cables must be laid in covered trenches. All electrical connections must follow principles of safety, reliability, and standardization.
- It is strictly prohibited to coil or twist power cables during installation. If a power line is too short, it must be fully replaced. No joints or welding points are allowed in the power lines.
- When high voltage (HV) cables and low voltage (LV) cables are placed side by side, the spacing between them must be greater than 200 mm. Additionally, the spacing between HV cables must exceed twice the diameter of the HV cables to ensure proper heat dissipation.
- Cables must be routed through the designed inlet and outlet holes of the integrated energy storage system. They should be laid beneath the system and led into the equipment through designated holes at the base of the cabinet. Appropriate cables must be selected based on the specific requirements of each piece of equipment within the integrated energy storage system.
- Terminals, contacts, and any exposed parts of the wiring should be fully insulated.
- Once all wiring has been confirmed to be correct and secure, the gaps in cable inlets and outlet holes on the outdoor battery cabinet should be sealed with fire-resistant materials such as bricks or fireproof mud. The installation foundation of the integrated energy storage system requires comprehensive waterproof treatment.
- When strong and weak current cables are laid in the same channel, shielding measures should be implemented.
- If external conditions, such as the laying method or ambient temperature, change, IEC-60364-5-52 or applicable local regulations and cable selection specifications must be consulted to ensure the current-carrying capacity meets the requirements.
- Cables in high-temperature environments may experience insulation degradation, leading to aging and damage. The minimum distance between cables and heating devices or heat sources should be at least 30 mm.
- In low-temperature environments, severe impact and vibration may cause the plastic sheath of cables to crack. To ensure construction safety, the following requirements shall be followed:
 - All cables should be laid and installed at temperatures above 0°C to ensure safety during construction. When handling cables, particularly during construction in low-temperature conditions, they must be treated with extra care.
 - If the storage temperature of the cable is below 0°C, it should be moved to room temperature and stored for more than 24 hours before laying.
 - Non-standard practices, such as pushing cables directly off the vehicle, are strictly prohibited. This is to prevent damage that could degrade the cable's performance, potentially affecting its current-carrying capacity and causing temperature rise.



6.7 Complete Electrical Connections

Caution

After completing all electrical connections, ensure that the wiring has been thoroughly and carefully inspected.

- Verify that all cables are properly connected. Confirm that all connections are secure and correctly fastened.
- Protect the inlet and outlet holes of the integrated energy storage system by filling cable gaps with fireproof materials such as fireproof mud.
- If a waterproof terminal is used, ensure that it is correctly tightened to maintain the seal. Seal any unused terminals to prevent environmental exposure.
- Reinstall all protective netting firmly.
- Apply waterproofing to the foundation at the bottom of the external cabinet of the integrated energy storage system.

7 Commissioning and Trial Operation

7.1 Check Before Startup

 **Danger**

- Only qualified professional technicians are authorized to operate and service the equipment.
- This product is primarily used in environments with strong industrial electrical systems. During operation, since the equipment contains live parts, unauthorized removal of covers, improper use, mishandling, or lack of maintenance can result in serious injury or property damage.
- The user is responsible for commissioning the equipment in compliance with technical regulations established by the local governing body or region.
- All safety instructions in this manual must be thoroughly read and strictly followed. Ensure that the equipment is properly grounded.
- All adjacent live parts should be covered or isolated to prevent electrical hazards.
- If the safety device on the current branch trips, it indicates a potential fault and the current has likely been cut off. To minimize the risk of fire or electric shock, all conductive parts and other components must be inspected, and any damaged parts must be promptly replaced. Once the safety device has tripped, it is essential to identify and resolve the "cause of disconnection" before resetting the system.

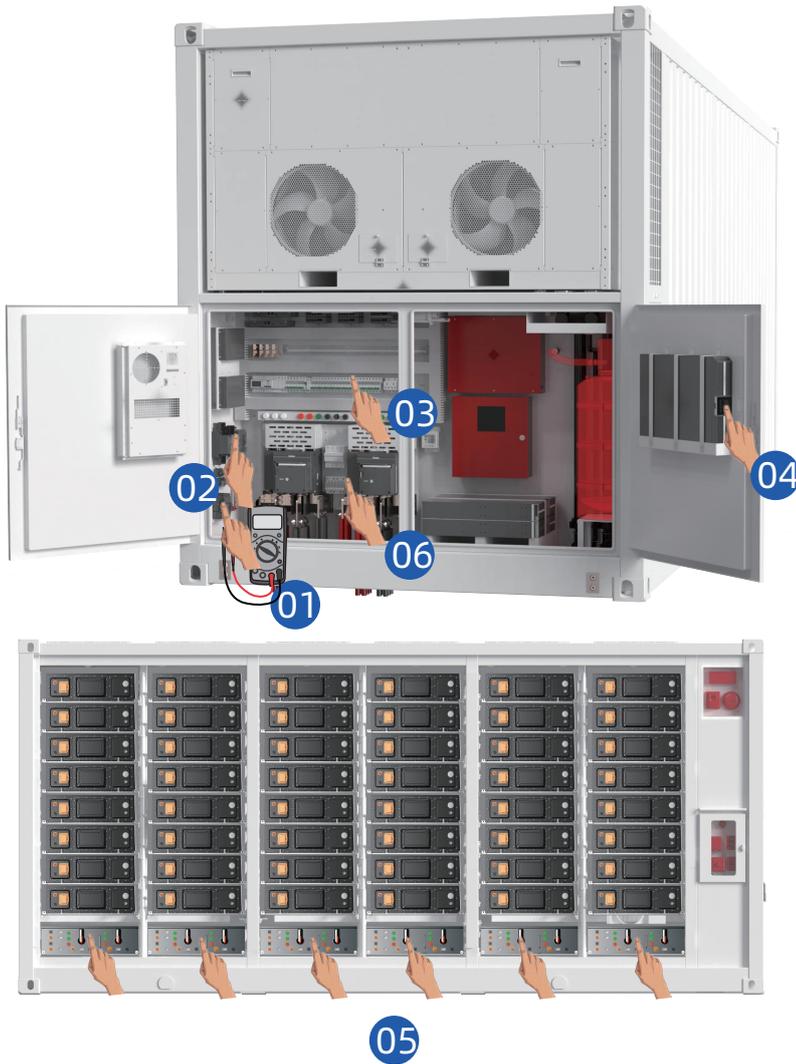
Pre-Commissioning Checklist

Before starting the commissioning process, to prevent damage to the equipment and avoid property loss, the following checks and measurements must be completed:

Serial No.	Inspection Project	Completion
Check installation		
	• Before taking measurements, disconnect the switches on both the battery and grid sides to ensure the converter's DC and AC sides are not energized.	<input type="checkbox"/>
	• Verify the positive and negative connections between the battery and the converter. Ensure the AC phase sequence is correct and securely tightened. Measure the resistance between the three phases, which should be at the megohm level. If the reading is at a 1-K level or lower, inspect the circuit for potential issues.	<input type="checkbox"/>
	• Confirm that the external control cable, ground cable, and communication cable are all securely tightened.	<input type="checkbox"/>
	• Ensure the resistance of the grounding wire is less than 0.1Ω , that the cable is free of damage or cracks, and that the filter screen for the vent is intact.	<input type="checkbox"/>
	• Clean the installation area thoroughly, ensuring no tools or foreign objects are left behind.	<input type="checkbox"/>
	• For approved installation and operation environments, refer to the installation environment requirements and site specifications to ensure proper airflow and avoid thermal circulation issues.	<input type="checkbox"/>
	• Ensure the energy storage system is securely fixed to the site.	<input type="checkbox"/>

Serial No.	Inspection Project	Completion
Check cable connections		
• Inspect the connecting cables for any signs of damage. If damage is found, replace the cable immediately.		<input type="checkbox"/>
• Verify the cable connections by referring to the system wiring diagram. If any abnormality is detected, make the necessary adjustments without delay.		<input type="checkbox"/>
• Ensure that all cables are securely connected. If any loose connections are found, tighten them immediately.		<input type="checkbox"/>
• Confirm that the PE equipotential connection is properly established. The PE ground terminal on the AC side should be connected to the equipotential connection point in the electrical control room and properly grounded.		<input type="checkbox"/>
Check the energy storage switch		
• Ensure that the AC circuit breaker and DC load switch are in the open position.		<input type="checkbox"/>
• Inspect the emergency stop button to confirm it is released and functioning properly.		<input type="checkbox"/>
• Verify that all electrical switches and buttons of the energy storage converter, along with its front and rear stages, operate smoothly and meet specification requirements.		<input type="checkbox"/>
Check the battery pack		
• Measure the DC side voltage and confirm that it does not exceed the maximum allowable input for the converter.		<input type="checkbox"/>
• Ensure the positive and negative connections are correct.		<input type="checkbox"/>
• Verify that the open circuit voltage of the battery pack meets the specified requirements.		<input type="checkbox"/>
Check grid-side voltage		
• Measure the frequency on the AC grid side and ensure it does not exceed the allowable grid frequency range for the AC side of the converter.		<input type="checkbox"/>
• Check the three sets of line voltages (L1-L2, L1-L3, L2-L3) and phase voltages (L1-N, L2-N, L3-N) on the AC grid side.		<input type="checkbox"/>
• Confirm that the measured values remain within the allowable grid voltage range and that the three phases are balanced.		<input type="checkbox"/>

7.2 Power-up Sequence and Operation



- 01 Use a multimeter to measure the input voltage. Once the readings are verified and correct, turn on the input power switch. Ensure that the L1, L2, and L3 indicator lights are on.
- 02 Turn on the power supply switch of the liquid chiller unit.
- 03 Turn on all input power switches in turn.
- 04 Turn on the UPS and the miniature circuit breaker switch.
- 05 Close the cluster-level circuit breakers one by one. The "standby indicator" (yellow) will light up if the equipment is functioning correctly.
- 06 Close the isolating switch in the combiner cabinet, and then close the PCS DC side circuit breaker.
- 07 Confirm the communication of the energy storage system at the PCS or BAU terminal. When the terminal indicates that the device is normal, proceed. Charging and discharging operations can be performed. During charging and discharging actions, the "running indicator light" (green) will turn on.
- 08 The "fault indicator light" (red) will illuminate if there is a critical failure of the energy storage equipment.
- 09 Please refer to the PCS User Manual for related operation of the PCS.

7.3 Power-down Sequence and Operation

Shutting Down the Energy Storage System for Maintenance:

- 01 First, reduce the output power on the PCS side to 0 kW. Disconnect the circuit breaker on the PCS DC side.
- 02 Proceed by disconnecting the cluster-level circuit breakers one by one.
- 03 Disconnect the isolation switch in the DC combiner cabinet.
- 04 Disconnect the auxiliary control power to prevent unintended system behavior.

⚠ Danger



In the case of an emergency shutdown, press the emergency stop button directly.

8 Maintenance Guide

8.1 Precautions for Maintenance

- **Scope of Application**

This guideline applies to the Operation and Maintenance (O&M) management of the energy storage system. The procedures include fundamental requirements for O&M management, station requirements, personnel qualifications, service protocols, safety procedures, emergency handling, record-keeping, and O&M evaluations and improvements.

O&M Management Requirements

01.The O&M management of the energy storage system must comply with all applicable national laws, regulations, and relevant industry standards.

02.A robust management system and well-defined safety protocols must be in place for the effective O&M of the energy storage system.

03.Responsibilities must be clearly assigned to specific personnel, and the workflow and responsibilities for each role should be detailed in the operating procedures.

- **Equipment Requirements**

01.The infrastructure for equipment must meet the required national or industry standards and be fully operational. The use, maintenance, and overall management of the equipment should be carried out only by qualified personnel.

02.O&M staff must perform regular inspections on a weekly, monthly, quarterly, and annual basis to ensure the system is functioning properly as per the established patrol inspection schedule.

03.The equipment's internal and external environments must be kept clean and free of corrosion, with no stains on any surface of the charging components.

04.The surrounding area of the electrical facilities must be free from flammable or explosive materials, pollutants, and any corrosive agents that could interfere with the system.

- **Personnel Requirements**

General Requirements

01.The system must be operated and maintained by special personnel, and the number of persons responsible for operation and maintenance in each station shall not be less than 2.

02.O&M personnel must receive work safety education and job skills training and take up their posts after passing the examination.

03.O&M personnel must operate according to the operation procedures and job specifications.

04.O&M personnel must be responsible for their work, fulfill service commitments, and use civilized and standardized language.

Requirements for Post Responsibilities

01.O&M personnel must have a comprehensive understanding of the working principles of power supply and energy storage systems, including common troubleshooting, maintenance methods, emergency treatments, and safety knowledge.

02.O&M personnel must also be familiar with national rules and regulations concerning work safety and electrical safety, and be knowledgeable in accident emergency response protocols.

Post skill requirement

01. O&M personnel must master the working principle of power supply and energy storage systems, common troubleshooting methods, maintenance methods for energy storage facilities, emergency treatment methods, and safety knowledge.

02. O&M personnel must understand the relevant national rules and regulations on work safety, and master electrical safety knowledge, and accident emergency treatment methods.

• Service Requirements

Status Monitoring

01.O&M personnel must consistently monitor the operational status of energy storage facilities within the power station. This includes formulating preventive measures to mitigate potential issues and addressing existing problems in a timely manner.

02.O&M personnel should collect, analyze, and review operational data from the client on a weekly, monthly, quarterly, and annual basis. Preventive maintenance plans should be developed based on the results of this data analysis.

Periodic Patrol Inspection and Maintenance

01.Weekly, monthly, quarterly, and annual equipment inspections must be conducted to ensure the optimal performance and service life of the facilities.

02.Written records of these inspections must be compiled, documented, and made available monthly for review.

03.If any of these periodic inspections will impact the operation of the power station, O&M personnel must issue an advance notice and communicate this to the working group.

Spare Parts and Tools Management

01.O&M personnel should efficiently manage spare parts and tools, maintaining accurate inventory records and ensuring their correct usage.

02.The procurement and requisition process for equipment spare parts must be meticulously documented, and any false requisition is strictly prohibited.

Danger

- Open the DC isolation switch of the PCS and ensure that the battery is fully disconnected from the PCS.
- Disconnect the circuit breaker in the PDU, the connection between the HV box and the battery box, and isolate the energy storage system.
- Ensure that the energy storage system is properly grounded and isolated from all DC and AC power supplies for at least 20 minutes. Verify with a voltmeter before proceeding with maintenance.
- Ensure that all power supplies are disconnected and in a safe state before performing any maintenance tasks.
- **Always keep in mind that even if the battery cabinet is not in operation, there are still dangerous voltages inside the battery cabinet.**

8.2 Scheduled Maintenance

Warning

- O&M personnel must manage spare parts and tools effectively, maintaining an accurate inventory and ensuring the proper use of these items.
- The maintenance periods outlined in this section are for reference purposes only. The actual maintenance intervals should be determined based on the specific conditions of the project environment. If the AIO energy storage system operates in challenging conditions, such as desert environments, the maintenance period should be shortened accordingly. In such cases, internal and external cleaning, as well as corrosion and rust prevention measures, should be conducted more frequently.
- For systems installed in desert areas, it is recommended to thoroughly inspect and clean both the inside and outside of the energy storage system following each sandstorm.
- Before beginning any inspection work, ensure that the internal components of the energy storage system are completely powered off. During the inspection, if any nonconformities are identified, they must be corrected immediately.

Safety Management

Organization and Personnel

01.The O&M management system must establish a dedicated safety management structure, assigning full-time or part-time safety officers, and specifying the responsible personnel for each process.

02.O&M personnel must adhere to post-specific safety operation guidelines, remain within designated work areas, and are strictly prohibited from operating mechanical or electrical equipment unrelated to their duties.

03.O&M personnel must wear appropriate work attire, including insulated footwear and safety protective gear, as required during operational activities.

04.O&M personnel must address or report any potential safety hazards identified during patrol inspections or troubleshooting activities in a timely manner.

Equipment

01.O&M personnel must ensure the electrical safety of the equipment at all times.

02.Faulty equipment must be replaced promptly by O&M personnel, and it is strictly prohibited to use defective equipment for operation.

03.The power supply must be fully disconnected before performing any equipment maintenance.

04.Safety management personnel are required to inspect all safety signage during weekly, monthly, quarterly, and annual inspections. Any signs that are deformed, damaged, or faded must be repaired or replaced promptly.

Patrol Inspection

01.Safety management personnel should conduct irregular inspections to identify any illegal operations, rectify them, and address or report potential safety hazards immediately.

Fire Safety

01.Fire safety management must adhere to all relevant laws, regulations, and standards.

02.Firefighting equipment and facilities must be configured according to legal requirements. All firefighting facilities must be complete, valid, and equipped with clear and visible signs.

03.Fire safety inspections must be conducted monthly, and all firefighting facilities should be maintained by designated personnel. The fire extinguishing and monitoring systems must be kept in optimal condition.

04.Fire training and emergency drills are required twice a year. Safety management personnel must be thoroughly trained in firefighting and familiar with the location, functionality, and proper use of firefighting equipment.

05.All emergency exits must remain clear and unobstructed to allow for timely evacuation in case of fire.

Management of Tools and Instruments

- O&M personnel must effectively manage the spare parts and tools of the power station, ensuring proper inventory control and usage.
- The procurement and requisition of spare parts must be properly recorded, and any false requisition is strictly prohibited.
- The O&M team must be provided with the necessary tools and instruments for their daily activities, including safety protection and maintenance tasks, to ensure the smooth implementation of inspections, maintenance, and repairs..

List of Tools and Instruments	Maintenance Tools		
Safety helmet dust	Toolkit screwdriver	Multi-meter Test pen	Insulation resistance tester/
Mask insulating	Electrician's pliers	Infrared thermometer	megameter Electrician's knife
Gloves safety gloves	Wrench	Digital hygrometer HV	Electrical insulation tape Flashlight
Insulated shoes	Needle pliers	Electroscope	Ladder truck
(safety shoes))			Charging and discharging device

Record

- O&M personnel must document the entire operation and maintenance (O&M) process, including fault handling records, periodic inspection and maintenance logs, spare parts replacement records, and more.
- The original data of all O&M activities must be preserved. Records must be timely, accurate, truthful, and complete.
- All paper records should be converted to electronic files, with a minimum retention period of 3 years for original paper records, and 5 years for electronic records.

Monthly Maintenance

Fire Safety Maintenance	01. Inspect and record the status of the gas fire extinguishing system and storage room on-site.
	02. Check all system components such as the fire extinguishing agent container, valves, piping, safety devices, nozzles, feedback systems, and pressure reducers to ensure they are free from damage or deformation.
	03. Ensure the pressure of the fire extinguishing agent and driving gas container is at least 90% of the design storage pressure.

Quarterly Maintenance

Energy Storage System Inspection	01. Visually examine the system for any signs of damage, deformation, or rust.
	02. Listen for any abnormal sounds during the energy storage process.
	03. Observe system parameters during operation through theBAU.
	04. Use thermal imaging to detect potential overheating of the system.
	05. Check for any electrolyte leakage outside the battery box.
	06. Ensure proper ventilation, ambient temperature, humidity, dust control, and that other environmental conditions around the energy storage equipment meet the required specifications.
Air duct cleaning	01. Inspect the air ducts for dust accumulation.
	02. Listen for any abnormal vibration noises when the fan is running. Use appropriate tools for cleaning the system components.
	03. Use appropriate cleaning tools.

Quarterly Maintenance

Fire Safety Maintenance	<p>01.Ensure that the type and distribution of combustibles and the opening of the protection area comply with design requirements.</p> <p>02.Inspect the fire extinguishing agent delivery pipes, supports, and hangers in the storage device room to ensure they are securely fixed and show no signs of looseness.</p> <p>03.Check the fire extinguishing agent pipes for any signs of deformation, cracks, or aging. If necessary, send the connecting pipes to a certified quality inspection agency for testing or replacement.</p> <p>04.Ensure the nozzles are free from blockages.</p> <p>05.In the event of a damaged or blocked fire extinguishing agent delivery pipe, perform a tightness test followed by a system purge to ensure functionality.</p>
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Inspection of battery appearance and structure	<p>01. Visually inspect the shell to ensure it is clean; if any stains are present, wipe them off and ensure the battery is well-ventilated and dry.</p> <p>02. Check the battery's appearance and shell for any signs of leakage or deformation. If any issues are detected, replace the battery promptly.</p> <p>03.Verify and measure the ambient temperature, ensuring it falls within the normal range according to the recorded data.</p>
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Perform voltage and internal resistance (conductance) measurements:)	<p>For voltage measurement, use a multimeter or DC voltmeter to measure the voltage at the battery terminal and the total voltage of the battery pack. Record and evaluate the results.</p> <p>For internal resistance (conductance) measurement, use an internal resistance or conductivity meter to measure the internal resistances of the battery cells. Compare the results with the reference data.</p> <p>For batteries with high internal resistance, it is recommended to focus on the following checks:</p> <p>01.Ensure the battery is functioning as expected and operating correctly.</p> <p>02.Confirm the battery voltage and temperature are within the specified range set by the manufacturer.</p> <p>03.Check if the battery has been overcharged or undercharged for extended periods, which can impact its performance.</p> <p>04.Verify whether the battery's operating life has exceeded the manufacturer's recommended life span.</p>
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Inspection of battery connection parts	<p>01.Make sure that all connections to the battery are properly fastened, with no loose bolts or overheating at connection points</p>
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Every Six Months Maintenance

Air conditioning	<p>01.Inspect the power and communication lines of the cabinet air conditioning unit to ensure they are functioning normally.</p> <p>02.Check whether the air conditioner operates correctly and whether there is a significant temperature difference between the air inlet and outlet when the refrigeration system is engaged.</p> <p>03.Check if the fan and compressor are operating normally without any abnormal noises or vibrations during system operation.</p> <p>04.Inspect the mechanical structure for any damage or deformation.</p> <p>05.Ensure the internal and external circulation air inlets and outlets of the air conditioner, as well as the mesh screen at the air inlet and outlet, are not blocked.</p> <p>06.Verify that the air conditioning refrigeration functions correctly and that the internal temperature of the integrated energy storage system meets the required parameters.</p>
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Every Six Months Maintenance

Circuit connection	<p>01. Inspect all electrical connections for signs of looseness or poor contact.</p> <p>02. Check for any damage or scratches on cable insulation or metal surfaces in contact with cables.</p> <p>03. Inspect the insulating bandage on all terminals to ensure it is intact and has not fallen off.</p> <p>04. Inspect all screw locations thoroughly to identify any signs of overheating, such as discoloration or physical damage.</p> <p>05. Examine the wiring copper bars and screws for any noticeable changes in color, which could indicate overheating, corrosion, or other potential issues requiring attention.</p>
Inspection of Door Locks and Hinges	<p>01. After cleaning, ensure that the door locks and hinges of the integrated energy storage system are functional and in good condition. Lubricate the door lock holes and hinges if necessary to maintain smooth operation.</p>
Inspection of Sealing Strips	<p>01. A properly maintained sealing strip is essential to prevent water ingress into the integrated energy storage system. Carefully inspect the sealing strip for any signs of damage and replace it immediately if required.</p>
Fan Maintenance	<p>Inspect the coolant levels for the fan system every six months to ensure optimal cooling performance. When the return fluid pressure drops below 0.8 Bar, coolant should be injected using a fluid infusion pump to restore proper pressure.</p> <p>01. Remove the maintenance panel located at the front of the liquid chiller unit and ensure the ball valve behind the drain outlet is closed.</p> <p>02. Open the automatic exhaust valve or hand valve positioned at the highest point of the connecting pipe.</p> <p>03. Connect the liquid outlet of the fluid infusion pump to the fluid infusion port of the liquid chiller unit using a pipe. Simultaneously, connect the liquid inlet to an external liquid storage tank.</p> <p>04. Power the fluid infusion pump by connecting the power cord to the appropriate terminal of the liquid chiller unit.</p> <p>05. Activate the fluid infusion pump to initiate the coolant injection process.</p> <p>06. Monitor the return pressure until it stabilizes between 0.8 and 1 Bar to ensure the proper fill level is achieved.</p> <p>07. After injection, close the automatic exhaust valve or hand valve, then close the ball valve behind the fluid infusion port. Disconnect the pump and reattach the maintenance panel.</p>
Device Maintenance	<p>01. Conduct regular inspections of all metal components for signs of corrosion.</p> <p>02. Annually inspect contactors (including auxiliary switches and microswitches) to ensure they are mechanically operational.</p> <p>03. Review operating parameters, focusing on voltage and insulation.</p> <p>04. Inspect all circuit breakers for any failures or damage.</p> <p>05. Check which the circuit breaker or load switch is damaged.</p> <p>06. Clean circuit boards and components as needed.</p> <p>07. Monitor the temperature and dust levels of the radiator, and clean the heat release module using a vacuum cleaner or replace the filter screen if necessary.</p>
Safety Function Maintenance and Inspection	<p>01. Verify the emergency stop button and LCD stop functions.</p> <p>02. Simulate a system shutdown to ensure proper functionality.</p> <p>03. Inspect warning signs and equipment labels on the machine body. Replace them if they are blurry or damaged.</p>

Annual Maintenance

Fire Safety	01. Conduct a simulated start-up test. If possible, perform a simulated jet test on the gas fire extinguishing system.
Grounding: Inspect the grounding of the cable shield layer for safety.	01. Check if the cable shielding layer is properly connected and in good contact with the insulation tube. Ensure the ground copper bar is properly secured.
Lightning protection equipment and fuse	01. Verify that the surge protection device and fuses are securely in place.
Cabinet exterior	<p>01. Check for any loose screws within the energy storage system.</p> <p>02. Inspect the system for oxidation or rust, particularly inside the energy storage unit.</p> <p>03. Test the security door, main door, and battery hatch of the storage container to ensure they open smoothly.</p> <p>04. Confirm the internal and external environments of the energy storage container are clean, organized, and free from</p> <p>05. Inspect both the exterior and interior of the energy storage container for signs of corrosion or parts that may have fallen off.</p> <p>06. Confirm the energy storage container is properly grounded.</p> <p>07. Verify that the safety warning label on the container remains intact.</p> <p>08. Ensure the battery cabinet and control cabinet within the container are securely fixed.</p> <p>09. Check that the cable is properly sealed at both the inlet and outlet of the device.</p> <p>10. Inspect the open trench of the cable to prevent any potential damage. Confirm that the support structure is grounded correctly and that heat dissipation in the trench is functioning well.</p>
Cabinet interior	<p>01. Check for any foreign objects, dust, dirt, or condensate inside the energy storage system.</p> <p>02. Ensure the inlet and outlet of the energy storage system are clean and free from obstructions. Check the temperature of the heat sink and inspect it for dust accumulation. If necessary, use a vacuum cleaner to clean the cooling module or other parts.</p>
Wiring and Cable Layout	<p>01. Verify the cable layout is in accordance with standards and that no short circuits are present. If any anomalies are detected, address and correct them immediately.</p> <p>02. Check that all inlet and outlet cable holes of the energy storage system are properly sealed.</p> <p>03. Inspect for water seepage inside the energy storage system.</p> <p>04. Ensure the power cable connections are secure and tightened according to the specified torque values.</p> <p>05. Check the power cable and control cable for any signs of damage, particularly if the cable insulation is in contact with metal surfaces.</p> <p>06. Confirm that the insulation wrapping tape around the wiring terminals is intact.</p> <p>07. Verify the ground connection is accurate, and ensure the grounding resistance does not exceed 1 ohm.</p> <p>08. Confirm that the equal potential connection within the energy storage system is properly established.</p>

8.3 System Cleaning

Cleaning the surroundings and interior of the integrated energy storage system is a crucial aspect of regular maintenance. Environmental factors such as temperature, humidity, and dust, along with internal equipment vibrations, can cause dust to accumulate inside the system. This can obstruct air inlets and outlets or enter the equipment itself, potentially causing malfunctions, reducing the equipment's lifespan, or impacting power generation.

Regular inspections and cleaning during normal operation are essential to maintaining a stable operating environment and ensuring the longevity of internal components.

Cleaning Cycle

The cleaning schedule for the integrated energy storage system should be established based on the operational environment, including climatic conditions, to maintain both external and internal cleanliness. In harsh environments, such as desert areas, cleaning intervals should be shortened accordingly to prevent excessive accumulation of dust and debris.

Internal Cleaning of the Energy Storage System

For dust inside the integrated energy storage system, avoid using a broom as it may stir up dust. Instead, vacuum cleaners are recommended for effective dust removal. Users should periodically inspect the foundation for cleanliness.

Cleaning the foundation with a vacuum cleaner is recommended if needed.

It is important to regularly check the ventilation of the air inlet. A clogged or blocked air inlet could lead to overheating

Warning

- If the module is not adequately cooled.
- The suggested maintenance cycles are provided as general guidelines. However, actual maintenance schedules should be determined in combination with the specific installation environment and conditions. Factors such as the scale of the power station, location, site environment, and other factors will influence the maintenance periods.
- In windy or dusty environments, it is strongly advised to shorten the maintenance cycle and increase maintenance frequency to prevent issues caused by environmental factors.

8.4 Battery Maintenance

Warning

- The battery is potentially dangerous, so appropriate protective measures must be taken during operation and maintenance.
- Incorrect operation can result in serious personal injury and property damage.
- Operators must handle the batteries using the correct tools and wear protective gear.
- Battery maintenance should be performed only by professionals who are familiar with battery technology and have undergone proper safety training.

The recommended maintenance periods are based on the specific installation environment of the product. These should be adjusted according to the actual operating conditions. Maintenance intervals may vary depending on the scale of the power station, installation location, and site environment.

Inspection Content	Inspection Method
Function check	<ul style="list-style-type: none"> ▪ DC Contactor Operation: Send ON/OFF instructions during the shutdown state to verify normal operation. ▪ 24V Output Voltage: Measure to ensure it is within the specified range. ▪ BC Operation Record Check: Review records to ensure that the current, voltage, and temperature are within the acceptable service range.
Ambient temperature and humidity inspection	<p>Ambient Temperature Record Check: Verify if the temperature is within the prescribed range for proper operation.</p> <ul style="list-style-type: none"> • Ambient Humidity Record Check: Ensure the humidity is within the acceptable application range.
Switch box (if applicable) and battery module box	<p>Critical Checks: Immediately correct any issues that do not meet the following requirements:</p> <ul style="list-style-type: none"> • Check if any flammable objects are placed on top of the battery cluster. • Inspect the fixing points between the battery cluster and the foundation steel plate for firmness and any signs of corrosion. • Inspect the box for any visible damage, paint peeling, or signs of oxidation. • Check for foreign matters, dust, dirt, or condensed water inside the battery cluster.
Grounding connection	<p>Ensure the grounding connection is correct, and the grounding resistance value is not greater than 4 ohms.</p>
Wiring and cable arrangement	<ul style="list-style-type: none"> ▪ Check for foreign matters, dust, dirt, or condensed water inside the battery cluster. The wiring and cable arrangement should be inspected after the internal equipment of the battery cluster is completely powered off. During the inspection, if any non-conformance is found, correct it immediately. ▪ Ensure that the cable arrangement is standardized and check for the presence of any short circuits. Immediately correct any anomalies. ▪ Verify that all inlet and outlet holes of the battery container are well sealed. ▪ Check for water seepage inside the battery container (BC). ▪ Inspect whether the power cable and copper bar connections are loose, and then tighten them according to the previously specified torque. ▪ Check the power cable and communication cable for any damage.
Screws	<p>Check for screws falling off or signs of corrosion inside the battery cluster.</p>

Equipment Maintenance

01. Recommended ambient temperature of operation: 0°C to 45°C. Temperature control range during charging and discharging: Maintain between 15°C and 30°C, with a preferred temperature of 25°C.
02. High-rate charging and discharging of the battery clusters is prohibited. Continuous charging and discharging currents of a single cluster should not exceed the rated current.
03. If the battery energy storage system is left unused for a long time, it should be charged and discharged every six months to maintain the system's SOC between 30% to 40%. After recharging, ensure the SOC of all packs is consistent.
04. Before using the system that has been unused for a long time, fully charge it at least once to restore the battery's performance to its optimal state.
05. Regularly (once a day), check whether the voltage, temperature, and other monitoring data from the upper computer are normal, and ensure there are no abnormal alarms in the alarm panel.
06. Regularly (once a month), check whether the battery energy storage system status and alarm indicators are in good condition and whether they function properly.
07. Regularly (once a month), check whether the emergency stop switch of the battery energy storage system works to ensure a quick system stop under emergency situations.
08. Regularly (once a month), check the firefighting system to ensure that it is in good condition and within its validity period.
09. Regularly (once every six months), check whether the fastening bolts of the HV cables and connecting bars of the battery energy storage system are loose, whether the contact is good, and whether the surface of the terminals is severely corroded or oxidized.
10. Regularly (once every six months), check whether the positive and negative HV protective covers of the pack are aging, damaged, or missing.
11. Regularly (once every six months), check cables for looseness, aging, damage, and breakage, as well as for good insulation.
12. Regularly (every six months) check the battery cabinet for any irritating odors or signs of burning in the HV connection parts.
13. Regularly (once a year), inspect the air ducts of the cooling system for blockages. Clean the system, focusing on the air inlets and outlets of the fan, and use a vacuum cleaner if necessary to ensure smooth air circulation within the cabinet. Ensure that the power supply is disconnected before performing dust removal; under no circumstances should the system be rinsed with water.
14. Different types of battery modules must not be used in series or parallel configurations.
15. Battery packs should never be interchanged with one another.

8.5 Liquid-Cooling System Maintenance

The recommended maintenance periods are based on the specific installation environment of the product. These should be adjusted according to the actual operating conditions. Maintenance intervals may vary depending on the scale of the power station, installation location, and site environment. In environments that are particularly windy or dusty, the maintenance cycle should be shortened, and maintenance frequency should be increased to maintain system integrity.

Item	Maintenance content	Inspection Method	Maintenance tool
Fan	Check the fan blades for normal rotation and damaged blades. If yes, replace the fan.	01. The fan blades shall rotate smoothly without abnormal noise; 02. The fan blades shall be free of damage. Note: At least half a year. Damage inspection is not mandatory.	Screwdriver
Water pump	01. Inspect the water pump's heat dissipation inlet hole. If more than 5% is blocked or dirty, clean it with a brush. 02. Visually check the water pump body (excluding pipeline connections) for signs of leakage or dripping (except for normal condensate water). If leakage is found, replace the sealing ring of the water pump.	.Note: Maintenance should be performed at least once every six months. Damage inspection is optional, but the following checks should be conducted: 01. The water pump should operate smoothly, without generating abnormal noise. 02. The pump body should not show signs of liquid leakage, except for normal condensate water.	Brush
Water system	Check the Human-Machine Interface (HMI) of the liquid chiller for any warning messages.	Monitor for alarms such as "low liquid level in the water tank" and replenish the fluid immediately when such alarms are received.	Straight screwdriver, cross screwdriver, water pump, water pipe, clamp

Replacement of Coolant

Replacement object	Replacement standard	Replacement Cycle	Tools Required
Coolant	1.If there are visible impurities in the anti-freeze coolant, 2.or the color of the coolant has significantly darkened, replacement is necessary.	5~6 years or 10 years	Water pumps, hoses, hose clamp, flat-head screwdriver Note: Contact technical support at Dunext for further assistance if needed.

Personal Protective Equipment(PPE)

Always wear nationally-recognized PPE when handling coolant. Recommended PPE includes:



Insulated gloves



Goggles



Dust mask



Insulated shoes

Disposal Considerations

Coolant: Dispose of the used coolant according to local environmental regulations. Never dispose of it irresponsibly.

Residual Waste: Ensure that waste is classified and recycled where possible. Waste that complies with relevant regulations can be either burned or reused.

Unpolluted Containers: Containers that have not been contaminated can be recycled according to local recycling regulations.

Contaminated Containers: Containers that cannot be thoroughly cleaned and decontaminated must be treated as hazardous waste and disposed of according to proper disposal guidelines.

Emergency Treatment for Leakage

To handle coolant leakage in a technical environment, the following measures are recommended:

- Contact trained professionals right away and evacuate non-essential personnel from the area.
- Cut off the source of leakage as soon as possible to prevent the coolant from entering areas such as sewers, drainage systems, and natural water bodies.
- Use appropriate protective equipment to avoid direct contact with the leaked coolant while managing the spill.
- For major leaks: Construct barriers or pits to contain the fluid and use pumps to transfer the leaked coolant to a secure container. For minor leaks: Absorb the coolant using materials like clay or sand, and store the absorbed material in a sealed container for proper disposal.

First Aid Measures

Inhalation: Evacuate the affected individual to an area with fresh air, ensuring they are breathing smoothly. If necessary, administer oxygen therapy for dyspnea. Perform artificial respiration if breathing stops, and seek immediate medical advice.

Skin Contact: Remove any contaminated clothing and thoroughly wash the affected area with running water. Seek medical attention if necessary. **Eye Contact:** Rinse eyes with clean water or saline for at least 15 minutes. Seek medical advice afterward.

Ingestion: Seek medical assistance immediately. Do not induce vomiting unless directed by medical personnel.

Emergency Procedures: If medical help is not immediately available, transport the affected individual, along with any labels and container information, to the nearest emergency medical facility. Do not give food or drink to an unconscious patient.

8.6 Fault Troubleshooting

Danger

- In faulty conditions, the energy storage system may still contain hazardous high voltage. Only qualified technicians (those who have undergone professional training in equipment troubleshooting) are authorized to perform the procedures outlined in this section. Ensure all troubleshooting operations adhere strictly to the instructions provided in this manual.
- Follow all safety operation specifications during troubleshooting procedures.

- In case of an issue, such as the energy storage system failing to charge/discharge properly, abnormal changes, fire risks, or air conditioning malfunctions, check the following:
 - Verify that the BAU end displays the correct fault information related to the energy storage system.
 - Ensure that the BAU is operating correctly.
 - Check if communication between the energy storage system and BAU is functioning as expected.
 - Check if the power supply and communication of the firefighting system are functioning normally.
 - Check if the air conditioning power supply or communication is normal.
 - For alarm faults and resolution methods (for any additional faults), please promptly contact after-sales support personnel for assistance.

System Troubleshooting and Emergency Plan

Fault cause analysis and tracking

01.O&M personnel should investigate the fault cause and determine if the fault is significant and urgent (e.g., fire alarms, insulation failures, BMS tripping, or overcurrent protection failures). O&M personnel should promptly visit the site to address the issue. If immediate resolution is not possible, assign personnel from nearby units to verify the safety of the energy storage power station.

02.After arriving at the site and performing an inspection, restart the PCS following the resolution of general faults. For unresolved issues, promptly contact the O&M engineer for further assistance.

03.If the issue cannot be resolved through remote assistance, we will dispatch relevant personnel to the site as quickly as possible.

04.Emergency Fault Handling: When the system operates abnormally, the background data and SOE (Sequence of Events) records must be checked to identify the fault. Determine if it is a BMS, PCS (Power Conversion System), or EMS (Energy Management System) fault. For BMS faults, follow these standard troubleshooting procedures:

No.	Fault type	Handling method
01	Fault type: Identify the fault type (e.g., voltage, temperature, differential pressure) that does not critically impact system operation.	01.These are pre-alarms generated during system operation and can be acknowledged without affecting the operational policies. However, consistent monitoring is recommended.
02	Troubleshooting scheme for failure to close the protection contactor at the battery pack end when there are tertiary system alarms, such as overvoltage and undervoltage.	01. Modify the tertiary protection parameter values through the human-machine interface to temporarily restore the system to normal. Reset the protection parameters to their default values once the battery pack is charged or discharged back to the normal range.
03	The system fails to operate normally	First, accurately locate the fault. 01.Check the background monitor to confirm which battery system fails. 02.Review the alarm record on the human-machine interface display screen in the container or the background BMS alarm record.

No.	Fault type	Handling method
04	Troubleshooting scheme for CMU communication	01.Check if the power supply of cluster 1 HV box is normal. 02.Check if the RS485 connection cable on the HV box terminal block for communication with PCS is securely connected.
05	Troubleshooting scheme for BCU communication	01.Check if the power supply and the indicator light of the HV box are normal. 02.Check if the wiring harness connection on the HV box terminal block is secure and if the screws are tightly locked.
06	Troubleshooting scheme for CMU communication	01.Check if the power supply of cluster 1 HV box is normal. 02.Check if the RS485 connection cable on the HV box terminal block for communication with PCS is securely connected.
07	Troubleshooting scheme for communication between BMS and communication network	Troubleshooting scheme for communication between BMS and communication network 01. Check if the power supply to the IEC61850 protocol converter in the BMS cabinet is functioning normally. 02.Ensure the connection between the BMS and the protocol converter COM port is stable. 03.Verify if the data light on the protocol converter COM port is flashing correctly. 04.Check if the network cable connection at the protocol converter LAN port is secure. 05.Confirm that the LAN port data light is flashing normally.
08	Troubleshooting scheme for abnormal power supply of the BMS	01.Check if the power supply of the distribution box is normal and if the UPS system is functioning correctly. 02.Verify that the isolation transformer is operating correctly.
09	Troubleshooting scheme for grid connection of the battery cluster	01.Check for any alarms that might interfere with the grid connection strategy for the battery cluster. 02.Compare the total voltage of the battery cluster experiencing grid connection failure with other clusters, and if there is a significant difference, perform equalizing charge and discharge treatment.
10	Troubleshooting scheme for successful grid connection of the battery pack with no charging or discharging current in a cluster	1. Check if the main circuit isolation switch is closed and if the fuse inside the HV box is damaged.

Battery system faults and solutions

No.	Fault type	Solutions
01	Large voltage difference between battery cells	Maintain and charge the battery first. If the battery voltage difference is still too large, contact the manufacturer to replace the battery.
02	The battery PACK temperature is too high	Stop charging and discharging.Wait until the temperature returns to normal before resuming charging and discharging.
03	Insulation fault	Stop charging and discharging the system for maintenance.
04	The internal resistance of the battery is too large	First maintain and charge. If the battery voltage difference is still too large, contact the manufacturer to replace the battery.
05	The battery capacity difference is too large	First, maintain and charge the battery. If the voltage difference between the battery cells remains too large, contact the manufacturer to replace the battery.
06	Battery short circuit	Contact the manufacturer to replace the battery.
07	Excessive capacity attenuation	Contact the manufacturer to replace the battery.
08	Circuit breaker broken	Replace the fuse (refer to the picture below)

BMS faults and solutions

No.	Fault type	Handling method
01	BMS fails to operate normally after being powered on	Record the occurrence, power off and restart the system, and report the issue to the manufacturer for further diagnostics.
02	No data on the touch screen of the combiner cabinet	Verify if the combiner cabinet is connected to the BMS network cable and check if the IP address configuration of the battery stack is correct.
03	Abnormal sampling voltage of battery cell	Remove the battery module and check if the equalization fuse is blown. Replace the CMU board to verify if the issue resolves. Refer to the figure below for disassembly and reassembly instructions.
04	CMU disequilibrium	Remove the battery module and check if the sampling fuse is blown. Replace the CMU board to verify if the issue resolves. Refer to the figure below for disassembly and reassembly instructions.
05	The touch screen shows the total voltage is normal, but there is no current or the current is low during charging and discharging.	Check whether the contact resistance of the cluster circuit increases, whether the battery module is not pushed tightly, whether the contacts of the combiner cabinet circuit breaker are damaged, whether the internal resistance of the battery module increases, and whether the voltage is normal.

Replace the Fuse and CMU

01.First, obtain authorization from the battery system manufacturer. Unauthorized operation may cause equipment damage and void the warranty. T

02.he operator must bear the cost of any losses incurred due to unauthorized operations. Ensure operators are professionally trained, and the equipment is fully powered down before proceeding. Turn off the system power supply and ensure a gradual step-by-step power shutdown.

03.Dismantle power cables, communication cables, liquid cooling pipes, etc.

04.Open the front cover of the power battery pack.Replace the CMU, as shown in the figure below.

05.Remove the CMU and replace the damaged fuse, as shown in the figure below.

06.After replacement, check the output voltage of the battery pack. Restore the upper cover of the battery pack after confirming the voltage is correct.

07.Restore the power cables, communication cables, and liquid-cooling pipes.

Firefighting system faults and solutions

Type of issue	Symptom	Solution
Fire alarm display	01. Fire alarm graphic display 02. No response in audible and visual alarm test	If the audible-visual alarm interface is loose, disconnect and reconnect it.
The fault indicator light is yellow	01. Communication fault of fire alarm control unit 02. Fire alarm control unit UPS feeding 03. Other faults	01. In case of a communication fault in the fire alarm control panel, verify that the network cable is securely connected. 02. Power on the fire alarm control panel to initiate charging. 03. For any other faults, contact the service hotline.
Fire alarm control unit	01. System startup failure 02. UPS fails to supply power normally	01. The DIP switch is set to download mode. Set the DIP switch to start mode. 02. The backup power switch is not closed. Check and close the backup power switch.
Emergency start-stop switch	01. Manual/automatic operation cannot be switched	The system works abnormally. Call the service hotline.

Fan system faults and solutions

Type of issue	Symptom	Solutions
Inner circulation fan not working	01. Equipment not powered on and struck by lightning, causing the circuit breaker to trip 02. Power input of the air conditioner is abnormal (overvoltage, under-voltage, or phase loss) 03. The equipment is in standby state 04. The fan is stuck 05. The terminal is loose	01. Check whether the power input at the equipment's end is energized. 02. Ensure the circuit breaker inside the equipment is properly closed. 03. Use RS485 communication to connect the display and verify if any alarms have been triggered, then correct the issues. After powering on the equipment, it will enter automatic control mode following a 30-second standby period. 04. Inspect if the fan is obstructed by foreign objects. 05. Check if the fan's terminal connection is loose.
The external circulation fan does not run	01. The compressor is not started 02. The fan is stuck 03. The terminal is loose	01. External fan will not start until the compressor starts 02. Check for any foreign objects blocking the fan. 03. Verify the fan terminal for loose connections.
Fan abnormal sound	01. The fan bearing is worn 02. Fan abnormal sound due to blade scratching other objects	01. Replace the fan. 02. Check for interference between cables and fan blades.

Cooling system faults and solutions

Type of issue	Symptom	Solutions
Compressor fails to start	01. It is not powered on (in standby state) 02. Circuit connection is loose 03. Compressor motor is burnt out	01. Check the main power switch and the operation display interface to verify if the compressor is started. 02. Tighten the circuit connector. 03. Inspect the motor and replace it immediately if faulty.
The compressor does not work	01. There is no need for cooling 02. Shutdown delay	01. Check the indoor return air temperature display and the compressor output status on the operation interface. 02. The compressor has the shortest shutdown time under normal conditions. If the temperature rises to the starting point again during this period, the compressor will restart after a delay.
High exhaust pressure	01. The condenser is blocked by dirt 02. The external circulation fan does not work	Clean the condenser.

Replacement of Electronic and Electrical Components

- Ensure the replacement components are identical in model and manufacturer as originally supplied in the integrated energy storage system. If the model identification is unclear, contact the supplier for verification.
- If using alternative components from different manufacturers or models from the same manufacturer, ensure prior approval and analysis from the supplier before installation. Failure to comply may result in liabilities including personal injuries, equipment damage, or other property losses, for which the company is not responsible.
- All procedures outlined in this section must be strictly followed for the replacement of components. The company is not responsible for any loss caused by incorrect or unauthorized replacement of components.
- Only qualified and professional technicians are authorized to perform the component replacement as per the instructions in this section.

Maintenance of Fire Suppression Device

- Always comply with the fire protection regulations and standards applicable to the country/region where the system is installed. Regular inspections and maintenance of the firefighting equipment must be carried out to ensure that all functional indicators are within normal parameters.
- The system employs an advanced fire extinguishing device with a tube body constructed from special molecular materials, containing clean extinguishing agents. When the tube body is exposed to heat, it ruptures, forming a natural nozzle that releases the extinguishing agent, effectively suppressing the fire.
- The tube body is highly sensitive to heat and responds quickly to fire. Upon heating, the fire suppression system immediately releases the extinguishing agent to control the fire in a timely manner.

Danger

Caution: Risk of suffocation. During fire suppression, a large volume of gas is released. Avoid proximity to the integrated energy storage system during this time to ensure safety.

8.7 Accident Handling

The emergency plan must be carried out under the unified command of the O&M Center and implemented by O&M personnel. During this period, seamless communication must be maintained.

Emergency measures outlined in the plan should be enforced by O&M personnel to ensure their effectiveness.

Training and drills for the emergency plan must be conducted for all staff every six months, with improvements based on any issues identified during the drills.

In case of any abnormalities or accidents in the system, prompt and effective measures should be taken to prevent further damage and losses.

● Overheating

If the battery pack temperature exceeds the upper limit for safe operation, the management system will issue a warning and require an immediate cessation of use. In this situation, immediately cease use and notify the relevant technicians to perform a thorough inspection. Resume operation only after troubleshooting has been completed and the issue is fully resolved.

● Electric leakage

If electric leakage is detected during system operation, all personnel must be evacuated immediately, and relevant technicians should be notified to handle the situation. The system should only resume operation after troubleshooting and confirming that the issue has been fully resolved. Operating the system with defects or under forcible conditions is strictly prohibited.

● Short circuit

In the event of a short circuit caused by any reason, immediately evacuate all relevant personnel. Cut off power supplies and electrical equipment if possible. Disconnect the battery from the system and promptly notify technicians to conduct maintenance and troubleshooting. The equipment and devices must be thoroughly inspected and tested by the manufacturer following a serious short-circuit fault to determine whether they are fit for continued use.

● Collision

If the equipment is impacted, deformed, or punctured due to external factors, immediately disconnect the system's power and notify professional technicians for on-site evaluation and handling. In special situations, personnel equipped with the necessary protective gear should address the issue on-site before any disassembly.

● Fires

Step 1: Evacuate personnel to a safe area, establish an isolation zone, and contact emergency services if required. Step 2: If personal safety is assured, proceed with the following actions:

01.If the wiring harness is smoking or on fire, use a carbon dioxide or dry powder extinguisher to put out the fire.

02.If the energy storage battery ignites, extinguish the fire from a safe distance using a high-pressure water gun.

03.In case of inhaling dense smoke, evacuate the area immediately and seek medical advice as soon as possible. Step 3: Notify the system manufacturer for further guidance and instructions on how to handle the situation.

● Flooding

Step 1: Immediately evacuate on-site personnel to a safe area, regardless of whether the system is powered on. Clearly mark safe isolation zones.

Step 2: Notify the system supplier and arrange for service intervention once the water subsides.

Step 3: Do not restart the system until the manufacturer has conducted a safety assessment and approved the system for use.

● Server downtime

During server downtime, O&M personnel must promptly ensure that the system's operational status is safe. Contact the maintenance engineer of the server manufacturer to determine the recovery time frame. If the server is not operational within one hour, report the issue to the responsible personnel for further discussion and confirmation.

● Power failure of power supply system

When the power supply system of the power station fails, the O&M personnel must quickly arrive at the site to disconnect the equipment power supply switch and press the PCS emergency stop button. Simultaneously, they should contact the responsible electrical personnel to confirm the cause of the power failure and estimate the time to restore power, then report to the leadership. After power is restored, re-energization must be carried out according to procedure, and the proper functioning of the equipment must be confirmed.

● Electric shock

In the event of an electric shock, O&M personnel must prioritize self-safety, cut off the facility's power supply, assess the condition of the shock victim, make emergency calls, and administer first aid if necessary. All handling and first aid must strictly adhere to the specified protocols to avoid further injury to the victim, ensuring no secondary harm is caused during rescue efforts.

● Other accidents

If repairs or removal of equipment/components are necessary due to accidents, first disconnect the battery circuit to avoid electric shock. When dismantling, ensure no short circuits occur, and handle the equipment carefully to prevent any secondary damage, such as collisions, falls, or inversions during the process.

Danger

- If any issue that might affect the battery energy storage system is identified, contact after-sales personnel and do not disassemble without proper authorization.
- Do not touch any exposed copper wire inside conductive wiring due to the high voltage risk. Contact after-sales personnel for further instructions. Unauthorized disassembly is prohibited.
- In the event of other emergencies, contact after-sales personnel immediately, and either follow their guidance remotely or wait for them to operate on-site.

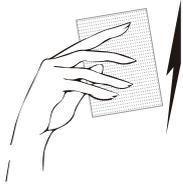
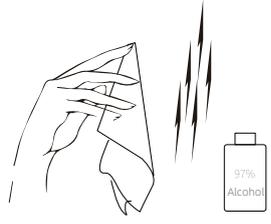
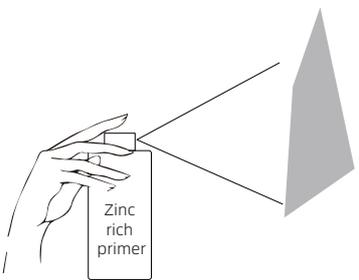
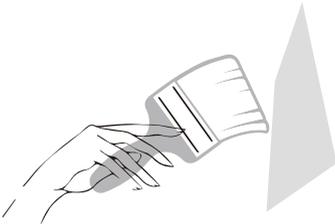
8.8 Paint Restoration Procedures

Check the integrated energy storage system for appearance damage:

Surface dirt caused by water stains or dust can be cleaned.

- Use a wet cloth or other appropriate cleaning tools to scrub the affected areas.
- If the stain cannot be removed with clean water, scrub with 97% alcohol or a non-corrosive detergent until the surface is acceptably clean.

If the topcoat is damaged and traces cannot be cleaned,

<p>01 use abrasive paper to smooth fuzzy or scratched areas of the surface paint.</p> 	<p>02 Scrub the damaged area using a rag dipped in water or 97% alcohol to effectively remove surface stains.</p> 
<p>03 After the surface dries, spray a zinc-rich primer onto the exposed base material for protection. Ensure the spraying completely covers the exposed substrate.</p> 	<p>04 Once the surface is dry, use a soft brush to touch up any paint scratches. The paint should be applied uniformly to maintain a consistent finish.</p>  <p>Color number RAL7035</p>

Warning

- Ensure that the protective paint applied to the shell of the integrated energy storage system is intact. If the paint has peeled off, repair it promptly.
- This product requires regular maintenance. It is recommended to repaint the external surface of the integrated energy storage system with specialized protective paint every five years.

8.9 Battery Recycling

The Company does not recycle batteries. Dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste.

Improper battery disposal may result in environmental pollution or explosion risks.

If there is no local recycling agency, it is recommended that customers contact the nearest national recycling agency for proper disposal.

Warning

- In case of battery leakage or damage, contact technical support or a certified battery recycling company for scrapping. When the battery reaches the end of its service life, contact a battery recycling company for disposal.
- Avoid exposing used batteries to high temperatures or direct sunlight. Ensure that waste batteries are not exposed to high humidity or corrosive environments.
- Secondary use of faulty batteries is prohibited. Battery recycling companies should be contacted immediately to prevent environmental pollution.

Recovery process:

Step 1: Contact the nearest recycling agency.

Step 2: The recycling agency assesses the cost of recycling.

Step 3: Recycling agencies carry out recycling in two ways:

On-site recycling: The recycling agencies can visit your site to recycle the batteries. However, the cost will be assessed based on factors such as transportation distance.

Centralized recycling: You may collect all lithium batteries at a centralized location for the recycling agency to handle.

9 After-sales Service

The company provides comprehensive technical support and after-sales service to customers.

Please refer to your contract for details regarding the free warranty service period.

The following situations are not covered by our free warranty service:

- Damage or system faults caused by failure to operate the system according to the Operation Manual.
- Faults resulting from failure to comply with electrical safety regulations or operating in poor site conditions.
- Damage caused by unauthorized modifications to the system by users.
- Damage or system faults caused by force majeure, such as natural disasters (e.g., typhoons, earthquakes, floods, fire), or extreme environmental conditions (e.g., high/low temperatures, high humidity, acid rain, etc.).
- If the user does not maintain the initial fault status or fails to notify the manufacturer in a timely manner, and attempts to handle the fault independently, causing the failure to identify the actual causes of the fault.

If you have any questions about this product, please contact us. To serve you faster and better, kindly provide the following information:

(1) Equipment model

(2) Equipment serial number (SN code)

(3) Fault code/name

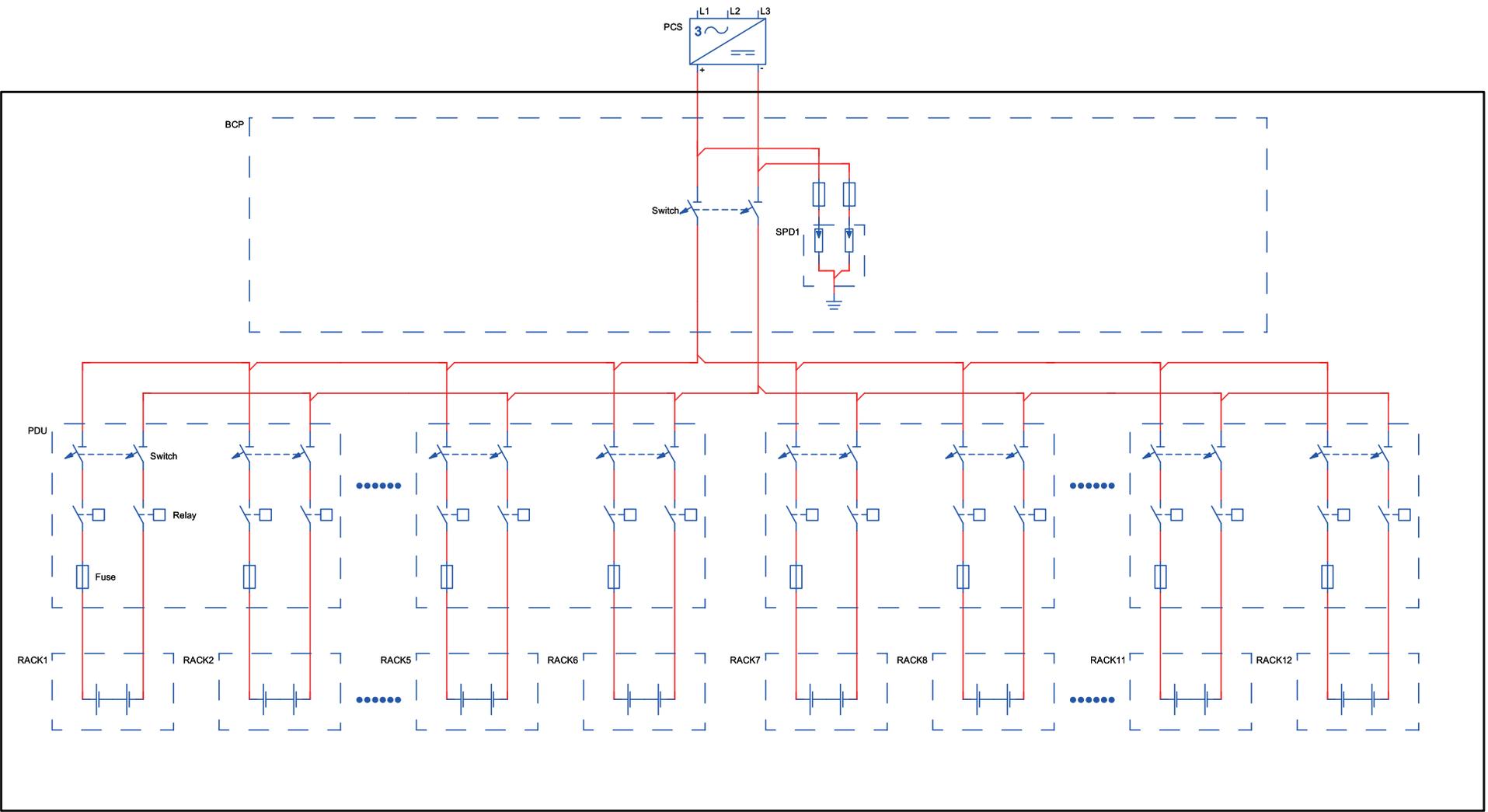
(4) Brief description of fault phenomenon

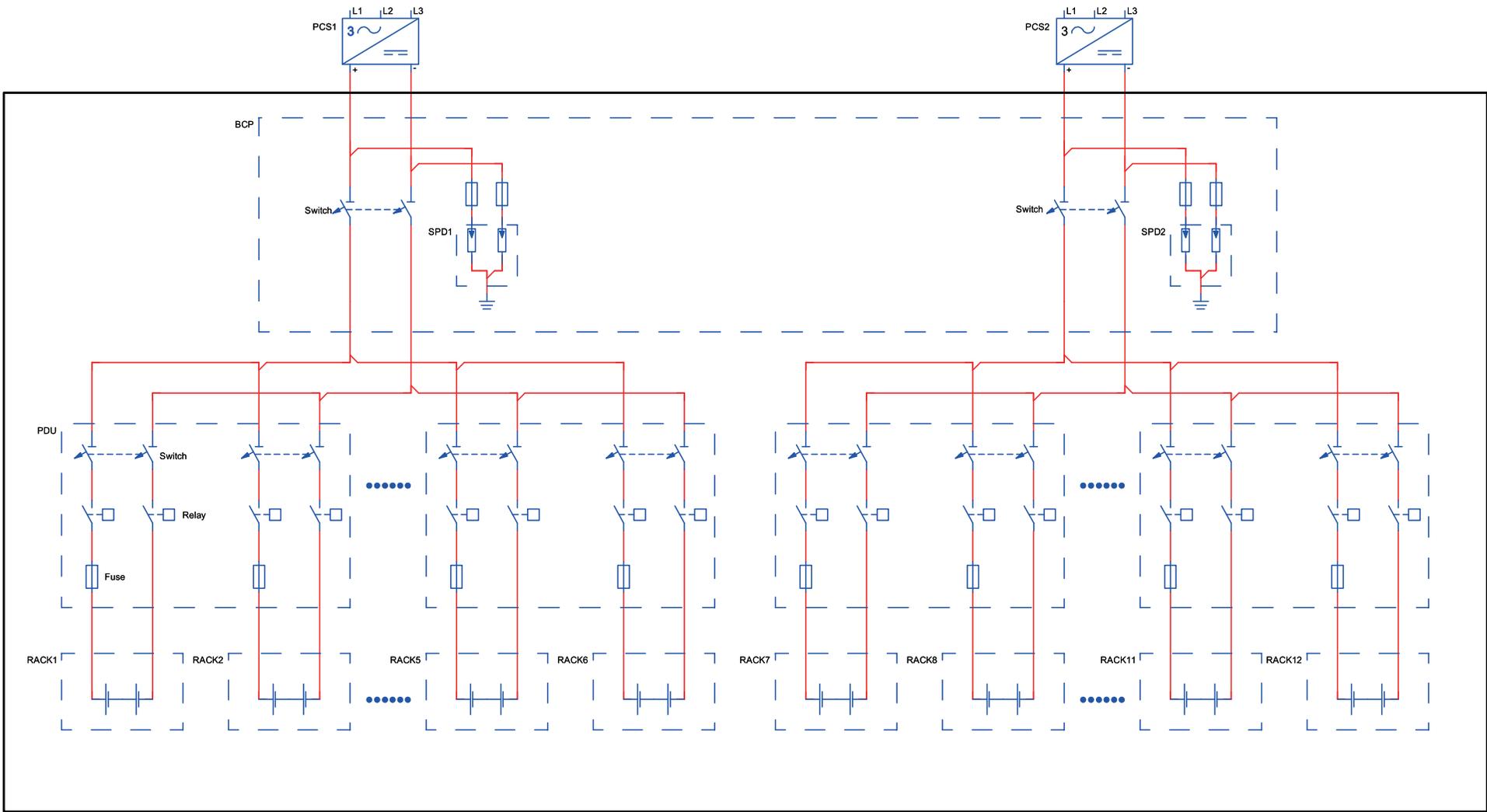
(5) Equipment installation address

(6) Contact information

PN:11-380-00984-00

ANNEX 01 Schematic Diagram (single frame circuit breaker)





ANNEX 02 Schematic Diagram (Dual circuit breakers)



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