USER'S MANUAL

AZZURRO ZCS

POWER MAGIC

125kW 400Vac

ZUCCHETTI Centro Sistemi

GREEN INNOVATION

Power Magic

400V C&I

Maintenance plan

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General instructions
This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.

Please keep these instructions!
This manual must be considered an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment. The manual must always accompany the equipment, even when it is transferred to another user or plant.

Copyright statement

Technical support
ZCS offers a support and technical consultancy service accessible by sending a request directly from the website https://www.zcsazzurro.com/it/support.
The following toll-free number is available for the Italian territory: 800 72 74 64.

Preface

Overview

The products, services, or features you purchase are subject to the terms and conditions of our commercial contracts. Some or all of the product, service features described in this maintenance manual may not be within the scope of your purchase. This maintenance manual mainly introduces the routine maintenance, fault handling, and component replacement methods of PowerMagic's maiden commercial energy storage system (referred to as the energy storage system). Before maintaining the energy storage system, please carefully read this manual, understand the safety information, and familiarize yourself with the specific maintenance steps of the energy storage system.

Recipients

This maintenance manual is applicable to power station maintenance personnel and electrical technicians with corresponding qualifications. As an important component of the energy storage equipment, you can print the maintenance manual of electronic components into paper according to your needs, and properly keep the paper and electronic documents for easy reference in the future. Whenever anyone operates the equipment, they must operate it in accordance with the requirements of this maintenance manual.

Keep this manual so that it is accessible at all times.

Copyright

Symbols used

This manual provides information for safe operation and uses certain symbols to ensure the safety of personnel and materials, and for efficient use of the equipment during normal operation. It is important to understand this information to avoid accidents and damage to property. Please take note of the following symbols used in this manual.

 **Danger**	**Danger: indicates a hazardous situation which, if not resolved or avoided, could result in serious personal injury or death.**

 **Warning**	**Warning: indicates a hazardous situation which, if not resolved or avoided, could result in serious personal injury or death.**
 **Caution**	**Caution: indicates a hazardous situation which, if not resolved or avoided, could result in minor or moderate personal injury.**
 **Attention**	**Attention: indicates a potentially hazardous situation which, if not resolved or avoided, could result in damage to the system or other property.**
 **Note**	**Note: provides important tips on the correct and optimal operation of the product.**

1. Preliminary safety instructions

 **Note**	If you have problems or questions regarding the reading and understanding of the following information, please contact Zucchetti Centro Sistemi S.p.A. through the appropriate channels.

General information in this chapter

Safety instructions

It mainly highlights the safety instructions to be followed during installation and use of the equipment.

Symbols and icons

Introduces the main safety symbols on the inverter.

1.1. Safety instructions

Before transporting, storing, installing, operating, using, or maintaining this product, please read this maintenance manual first, strictly follow the instructions in the maintenance manual, and adhere to all safety precautions marked on the product and in the manual. The "danger," "warning," "caution," "note," and "explanation" items in the manual do not represent all safety precautions to be observed.

Depending on national and local requirements, permission must be obtained from your local provider before connecting to the electrical grid, making sure that the connections are carried out by a qualified electrician.

Contact the nearest authorised service centre for any repairs or maintenance. Contact your distributor for information on the nearest authorised service centre. DO NOT carry out repairs yourself, as this may result in injury or damage.

Before installing and operating the equipment, the electrical circuit of the strings must be disconnected by opening the string circuit breaker to interrupt the high-voltage DC of the photovoltaic system. Failure to do so could result in serious injury.

The company shall not be liable for any of the following situations or their results:

- Product damage caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, etc
- Product damage caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, etc

- Failure to operate according to the instructions and safety warnings in the product and documents
- Damage caused by transportation conducted by you or third parties you commission
- Damage caused by storage conditions not meeting product requirements
- Damage caused by your or third parties' negligence, intentional acts, gross negligence, improper operation, or reasons not attributable to the company

Qualified personnel

Ensure that the operator has the necessary skills and training to operate the equipment. Personnel responsible for use and maintenance of the equipment must be qualified and capable of performing the activities described, and must also have appropriate knowledge on how to correctly interpret the contents of this manual. For safety reasons, this inverter can only be installed by a qualified electrician with the necessary training and/or skills and knowledge. Zucchetti Centro Sistemi S.p.A. declines all responsibility for damage to property or personal injury caused by incorrect use of the device.

1.1.1 Personal safety

	**Fatal high voltage inside the equipment** **Pay attention to and comply with the warning signs on the equipment**
Danger	**Follow the safety precautions listed in this manual and other related documents of the equipment** **Comply with the relevant protection requirements and precautions of the battery** **There is a risk of electric shock when touching the power supply or terminals connected to it, etc** **Special protective equipment must be used during operation, such as protective clothing, insulated shoes, goggles, helmets, insulated gloves, etc**

Warning	**Be sure to use energy system as required by this manual** **To prevent accidents, please observe the following precautions:** **Place conspicuous warning signs around the energy storage system to prevent accidental closing , causing accidents** **Set up safety warinings tapes near the equipment**

Attention	**When The indicator light of the equipment flashes red, evacuate the scene urgently**

Lifting and transporting, installation and wiring, operation and maintenance of the energy storage system must be performed by professional technicians who comply with local standards. Operators responsible for installing and maintaining equipment must meet the following requirements:

- Must undergo rigorous training to master the correct operation methods, be familiar with the composition and working principles of the energy storage system and its pre- and post-level equipment, understand various safety precautions, and relevant standards of the country/region
- Should have received professional training related to the installation and commissioning of electrical equipment and understand potential dangers and danger levels during equipment installation, operation, and maintenance
- Should have certain knowledge of electronics, electrical wiring, and mechanical principles, and be familiar with electrical and mechanical diagrams
- Should have the ability to respond promptly to dangers or emergencies during installation or commissioning
- Personnel in special scenarios such as electrical operations, working at heights, and operating special equipment must have special operation qualifications required by local national/regional regulations
- Operators of medium-voltage equipment must hold high-voltage electrician operation certificates
- Except for personnel operating the equipment, other personnel should not approach the equipment
- Live operation during installation is strictly prohibited. It is prohibited to install or remove cables live. When the cable cores come into contact with conductors, it may generate arcs, sparks, or fire explosions,

leading to fires or personal injuries

- Improper or incorrect operations with equipment powered on may cause fires, electric shocks, or explosions, resulting in casualties or property losses
- During operations, it is strictly forbidden to wear watches, bracelets, bracelets, rings, necklaces, and other conductive objects to avoid electric shock burns
- Special insulated tools must be used during operations to prevent electric shock injuries or short circuit faults, and the insulation withstand voltage level must meet local legal regulations, standards, and specifications
- Do not disable equipment protection devices and ignore warnings, alerts, and preventive measures in the manual and equipment
- In the event of a fault that may cause personal injury or equipment damage during equipment operation, the operation should be terminated immediately, reported to the person in charge, and effective protection measures should be taken
- Equipment should not be powered on until installation is complete or confirmed by a professional
- Direct contact with or use of other conductors connected to power supply equipment is prohibited, including but not limited to direct contact with other conductors, contact with signal interfaces connected to outdoors, high-altitude operations, outdoor installation, opening doors, etc
- Before operating the equipment, measure the voltage at the contact point to confirm that there is no risk of electric shock
- When the equipment is running, the shell temperature is high, posing a risk of burns, do not touch
- It is strictly prohibited for fingers, components, screws, tools, or boards to come into contact with running fans to avoid injury or damage to the equipment
- In case of fire, evacuate the building or equipment area and press the fire alarm bell or call the fire alarm number. Under no circumstances should you re-enter the burning building or equipment area

1.1.2 Equipment Safety

1.1.2.1 Energy Storage system safety

 **Danger**	**Avoid standing at the cabinet door (including within the opening range of the door) when the energy storage system is malfunctioning.** **It is forbidden to open the cabinet door when the system is running.**

- The layout of the energy storage system installation must meet fire distance or fire wall requirements as specified by local standards, including but not limited to 《GB 51048-2014 Design Code for Electrochemical Energy Storage Station》、《NFPA 855 Standard for the Installation of Stationary Energy Storage Systems》specification requirements.
- The energy storage system should undergo regular fire inspections once a month
- When conducting live inspections of the system, pay attention to the dangerous warning signs on the equipment to avoid standing at the cabinet door
- After replacing the power components of the energy storage system or changing the wiring, manual wiring detection is required to avoid abnormal system operation
- is recommended that users prepare their own cameras to record the detailed process of installing, operating, and maintaining the equipment
- The energy storage system must be equipped with fences, walls, and other protective measures, and erect safety warning signs for isolation to prevent unauthorized personnel from entering during equipment operation, causing personal injury or property loss

1.1.2.2 Battery safety

 **Danger**	**Do not expose the battery to high temperature environments or around heat-generating equipment, such as high temperature sunlight, sources of ignition, transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.** **It is strictly prohibited to disassemble, modify or damage the battery (e.g. inserting**

	foreign objects, extruding with external force, immersing in water or other liquids), which may cause battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion. **It is strictly prohibited to subject the battery to mechanical vibration, dropping, collision, piercing by hard objects and pressure shock, or it may lead to battery damage or fire.** **It is strictly prohibited for the battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.**

For safe use of the product, the technician should carefully read and strictly observe the safety requirements. The Company shall not be liable for product functional abnormality, component damage, personal safety accident, property loss, or other damage caused by the following reasons:

- The batteries are not charged as required, resulting in capacity loss or irreversible damage to the batteries.
- A battery is damaged, falls, or leaks due to improper operations or failure to operate the battery as required.
- The batteries are not powered on in time, which causes damage to the batteries due to over discharge.
- The damage is caused to batteries due to the use of improper equipment for charging and discharging.
- Batteries are frequently over discharged due to improper maintenance, capacity is incorrectly expanded, or the batteries have not been fully charged for a long time.
- Battery operation parameters are incorrectly set.
- Damage is caused to batteries because the battery operating environment does not meet the requirements.
- The customer uses the batteries beyond the scenarios specified in this manual, including but not limited to connect extra loads.
- Batteries are not maintained based on the system manual.
- The product is damaged due to the customer's continued use of batteries beyond the warranty period.
- The product is damaged due to the use of defective or deformed batteries.

- Use batteries provided by the Company with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property loss are caused due to storing or installing batteries with flammable/explosive materials.
- Personal safety accidents and property loss are caused by battery-related operations performed by non-professional personnel, or by not wearing qualified protective equipment during operations.
- The battery is damaged due to eating, drinking, smoking and other behaviors near the battery.
- Batteries are stolen.

1.1.3 Environmental requirements

	**It is strictly prohibited to store flammable or explosive substances in the equipment area.**
Danger	**It is strictly prohibited to place the equipment in an environment of flammable or explosive gases or fumes, and it is prohibited to carry out any operation in such an environment.**
	It is strictly prohibited to place the equipment close to sources of heat or fire, such as pyrotechnics, candles, heaters or other heat-generating devices; heat applied to the equipment may cause damage to the equipment or lead to fire.

- Equipment should be stored in a suitable temperature and humidity environment, in a clean, dry, well-ventilated area, and protected from dust and condensation.
- It is strictly prohibited to install and operate the equipment beyond the range specified in the technical specifications, otherwise the performance and safety of the equipment will be affected.
- It is strictly prohibited to install, use and operate outdoor equipment and cables (including, but not limited to, handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoor area, working at height, outdoor installation, opening doors, etc.) under severe weather conditions such as thunder, lightning, rain, snow, and gusts of wind of more than six degrees.
- It is strictly prohibited to install the equipment in an environment with dust, fumes, volatile gases, corrosive gases, infrared and other radioactive radiation, organic solvents or excessive salt content.
- It is strictly prohibited to install the equipment in an environment with metallic conductive dust, conductive magnetic dust.

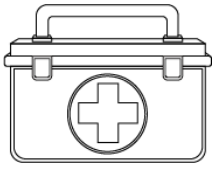
- Installation environment ground is solid, no rubber soil, weak soil or easy to sink and other adverse geological, strictly prohibit the selection of low-lying areas or areas prone to waterlogging, site level should be higher than the highest historical water level in the region.
- If the equipment is installed in a site with heavy vegetation, in addition to routine weeding, the ground underneath the equipment needs to be hardened, e.g., by laying cement, gravel, etc.
- When installing, operating, or maintaining the unit, clean the top of the unit of any standing water, ice, snow, or other debris before opening the door to prevent debris from falling into the interior of the unit.
- When mounting the equipment, make sure that the mounting surface is sturdy and meets the equipment's load-bearing requirements.
- The line holes need to be sealed. The line holes that have been lined are sealed with sealing mud, and the line holes that have not been lined are sealed with the cover of the equipment.
- After installing the equipment, empty packing materials such as cardboard boxes, foam, plastic, cable ties, etc. should be removed from the equipment area.

2. Routine Maintenance

2.1 Preparation before maintenance

 **Attention**	**Safety requirements for operation and maintenance:** **Before connecting or disconnecting cables, the protective switch of the corresponding circuit must be disconnected first** **Place a warning sign prohibiting closure at the disconnected switch** **Use a voltage tester of the corresponding voltage level to check for live electricity and ensure that the equipment is completely de-energized** **If there are energized objects nearby, use insulation boards or insulation tape to cover or wrap them** **Use a grounding wire to reliably connect the circuit to be maintained with the main grounding circuit before operation and maintenance** **After maintenance is completed, remove the grounding wire between the maintenance circuit and the main grounding circuit**

Personal protection tools:

 Safety gloves	 Safety googles	 Dust mask	 Safety shoes
 Reflective vest	 helmet	 Medical kit	 belts

2.2 Power-OFF the energy storage system

2.2.1 Main circuit turn-OFF

During power-off operation, the following should be avoided: the occurrence of load switching or plugging and unplugging of battery isolation switches QB on the AC side molded case circuit breaker QA0 of the PCS, and battery cluster positive and negative bus plugs. Personnel performing the power-off operation need to take insulation protection measures

Step 1

Perform the power-off operation on the human-machine interface first. After the power-off command is issued, if the PCS is connected, the PCS should stop charging and discharging first, and then the battery cluster will automatically perform the power-off operation, and at the same time, the two main relays (KF1 and KF2) and auxiliary power relay (KF4) inside the corresponding high-voltage box should be able to disconnect;

Step 2

Manually disconnect all battery isolation switches QB in the energy storage cabinet and battery cabinet, and turn the handle to the "OFF" position

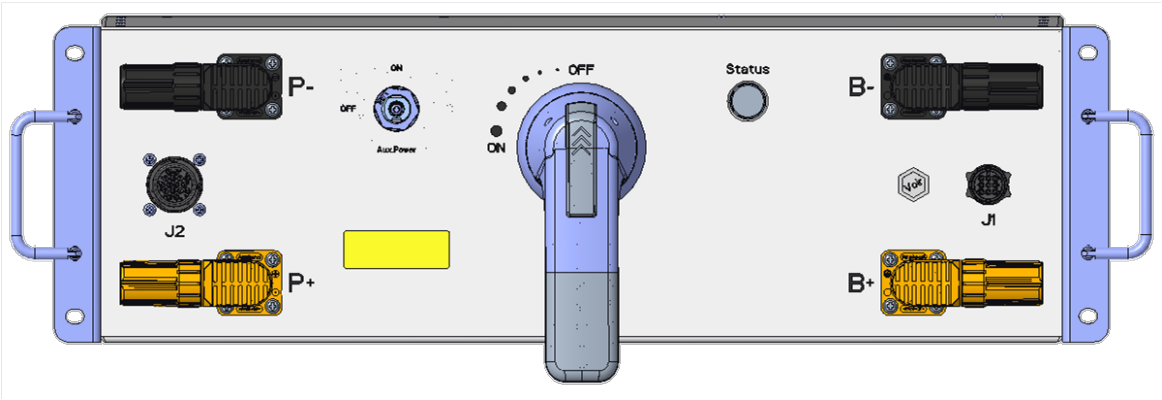


Figure 1 – High voltage battery isolation box (QB disconnected)

Step 3

Wear insulated gloves, pull out the battery packs from the energy storage cabinet and battery cabinet to the plugs of the positive and negative busbars in the high-voltage box

Figure 2 – Position of battery cluster positive and negative plugs

Step 4

Manually trip the PCS AC side molded case circuit breaker QA0 in the equipment compartment of the energy storage cabinet, and turn the circuit breaker handle to the "OFF" position

Step 5

Manually trip the three-phase AC main circuit front-stage switch outside the energy storage cabinet, and the power-off of the main circuit of the commercial energy storage system is completed here

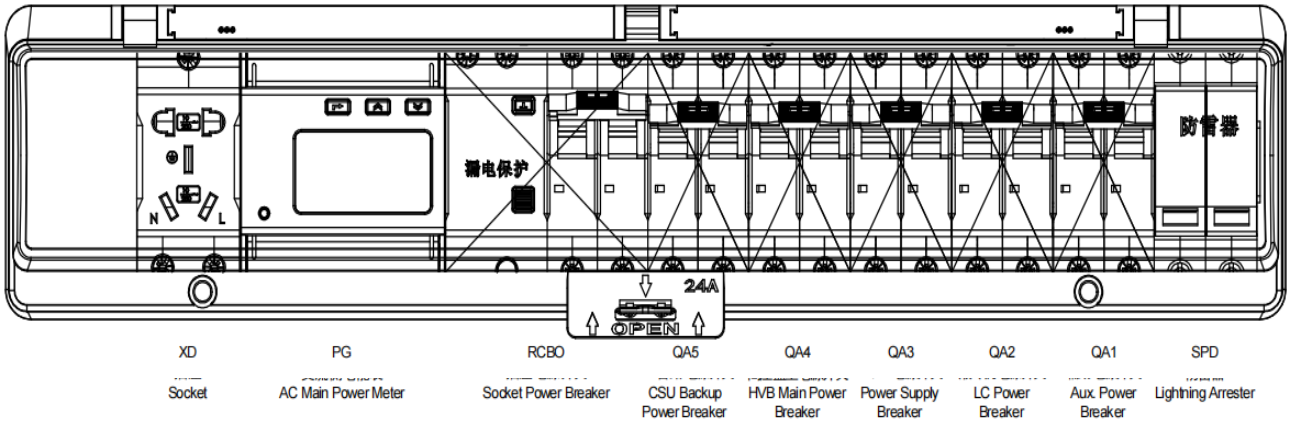


Figure 3 – Position o battery cluster positive and negative plugs

Auxiliary power turn off procedure:

Step 1

Disconnect the circuit breaker QA5 in the auxiliary power box

Step 2

Disconnect the circuit breaker QA4 in the auxiliary power box. At this time, the BCU in all high-voltage boxes and the BMU in all battery packs will be powered off and not working

Step 3

Disconnect the circuit breaker QA3. At this time, the CMU module, fire-fighting system, dehumidifier, water immersion switch, lighting, and other equipment in the cabinet will be powered off and not working

Step 4

Disconnect the circuit breaker QA2. At this time, the liquid cooling unit in the cabinet will be powered off and not working

Step 5

Disconnect the RCBO socket and residual current protection switch (disconnect if there is a closing operation)

Step 6

Disconnect the input switch QA1 of the auxiliary power box

Step 7

Disconnect the single-phase AC front-stage circuit breaker of the auxiliary power box outside the energy storage cabinet, and the auxiliary power off of the commercial energy storage system is completed here

2.3 Routine maintenance

 Warning	**Do not perform maintenance on the battery box in rainy, damp or windy weather. IF unavoidable ZCS shall not be liable for any loss occurred** **Avoid opening the cabinet door when humidity is high during rain, snow or foggy weather and make sure the sealing strips around the door aren't curled when closing the door** **To reduce the risk of electric shock, do not perform any maintenance or repair operations other than those specified in this manual. If necessary, contact First Navigation New Energy service personnel for maintenance and repair**

 Attention	**Accurately fill the check list documents and keep it in order to keep warranty valid**

2.3.1 Daily maintenance

Log-in to the navigation WEB interface to check alarms information.

2.3.2 Work Maintenance (every 6 months)

Follow this check list every 6 months operation.

Item list	Inspection method
Safety function	Check the emergency shutdown button for proper functioning. Simulate shutdown. Check the warning signs on the equipment and other device labels. If they are blurry or damaged, replace them promptly.
Software maintenance	Check the parameters on WEB monitoring system
Internal component inspection	Check the cleanliness of circuit boards and components. Check the temperature and dust of air inlet and outlet vents. If necessary, clean them with a vacuum cleaner. If necessary, replace the air filter. Note! Ventilation of inlet and outlet vents must be checked
Device maintenance	Routine inspection of corrosion on all metal components Check operating parameters (especially voltage and insulation)

2.3.3 Work Maintenance (every 1 year)

Follow this check list every 1 year operation.

Item list	Inspection method
Cabinet (external)	Check if there are any flammable objects on the top of the cabinet Check whether the welding points between the cabinet and the foundation steel plate are firm and whether there is corrosion Check if there is any damage, peeling, oxidation, etc., on the cabinet shell Check if cabinet door locks and other components can be flexibly opened Check if seals and other components are firmly fixed

Cabinet (internal)	Check if there are foreign objects, dust, dirt, and condensation inside the energy storage integrated system
Inlet and outlet vents	Check the temperature and dust of inlet and outlet vents. If necessary, clean them with a vacuum cleaner.
Wiring and cable routing	Start inspection after all internal equipment of the energy storage system is completely powered off! Once any non-compliance is found, correct it immediately. Check if the cable layout is standardized and if there are any short circuits. If anomalies are found, correct them immediately. Check if all cable entry and exit holes of the cabinet are well sealed. Check if there is any water seepage inside the cabinet. Check if power cable connections are loose and tighten them according to the specified torque. Check for damage to power cables and control cables, especially if the insulation on the surface in contact with metal is cut. Check if the insulation wrapping tape of power cable terminal connectors is loose
Grounding and equipotential connection	Check if the grounding connection is correct, and the grounding resistance value shall not be greater than 4Ω. Check if the internal equipotential connections of the energy storage system are correct. Check operating parameters (especially voltage and insulation)
fans	Check the operation status of the fan. Check if the fan is blocked. Check if there is any abnormal noise when the fan is running

2.3.4 Work Maintenance (every 2 years)

Follow this check list every 2 years operation.

Item list	Inspection method
System status	Check the following items, and if they do not meet the requirements, correct them

	immediately: Check if the cabinet and internal equipment are damaged or deformed. Check if there is any abnormal noise from internal equipment during operation. Check if the temperature inside the cabinet is too high. Check if the humidity and dust inside the cabinet are within normal range. If necessary, clean them. Check if the air inlet and outlet of the cabinet are blocked.
Warning signs	Check if there are any foreign objects, dust, dirt, and condensation inside the energy storage system
Inlet and outlet vents	Check if warning signs, labels, and tags are clear and not damaged. If necessary, replace them
Grounding cable shield	Check if the cable shielding layer is in good contact with the insulating sleeve; whether the grounding copper bar is fixed in place
Fuses and Lightning protections	Check if the lightning protection equipment and fuses are properly fastened
Corrosion check	Check if there is oxidation or corrosion inside the outdoor cabinet

3. Alarm Reference

Three levels of alarm are defined based on their severity:

- **Information Alarm**: Device functions normally, but certain informational alarms are triggered due to external factors. Charging and discharging functions are not affected
- **Minor Alarm**: Minor malfunctions occur in some components of the device, resulting in the prohibition of charging or discharging. However, the system remains operational
- **Major Alarm**: Device malfunctions occur, leading to system shutdown and stopping of charging and discharging

3.1 Information Alarms

Section	Alarm info	Alarm reason	Recommendations
Energy storage cabinet environment	Water flood alarm	Water sensor flooding	After stopping charging and discharging, check if the corresponding water immersion sensor is flooded, drain the water, and clean the water immersion sensor.
	Composite sensor alarm	Fire protection composite sensor detection exceeds level 1	After stopping charging and discharging, open the hatch to detect the internal combustible gas concentration. If the concentration is normal, check if the sensor is faulty
	Fire level 1 alarm	Fire system triggers an alarm	Depending on the specific trigger reason for the fire detection, open the hatch after stopping charging and discharging to check.
	Composite sensor communication failure	Communication failure between fire controller and composite sensor	Check if the communication line between the fire controller and composite sensor is properly connected, and if the power supply to the composite sensor is normal.
	Dehumidifier communication failure	Communication failure between CMU and dehumidifier	Check if the communication line between CMU and dehumidifier is properly connected, and if the power supply to the dehumidifier is normal.
	Battery cluster main control version inconsistency	Inconsistent BCU software version inside the battery high-voltage box	It has no impact on system operation. Contact after-sales personnel to refresh the software during regular maintenance.
Liquid cooling unit	Ambient/Return/Outlet temperature sensor malfunction	Damage to or loose connection of ambient/return/ outlet temperature	Liquid cooling unit continues to operate. Charging and discharging can proceed. Contact after-sales promptly during system idle time or regular maintenance for inspection and handling.

		sensor	
	Return/Outlet pressure sensor malfunction	Damage to or loose connection of return/outlet pressure sensor	
	Control box temperature sensor malfunction	1. Poor heat dissipation of the control box; 2. Temperature sensor damage	
	EEPROM malfunction	Mainboard EEPROM inconsistency with actual model or EEPROM damage	
	Clock abnormality	Damage to mainboard clock chip or poor contact	
	Fan 1 alarm	Control box fan stuck or control box fan damaged	
	High outlet pressure alarm	1. System over-fluid compensation or incomplete venting; 2. Outlet pressure sensor malfunction	
	Low return pressure alarm	1. System water shortage; 2. Return pressure sensor malfunction	
	Low/High outlet temperature alarm	1. Outlet and return water temperature sensor temperature drift, loose connection, mixed insertion; 2. Temperature sensor, control board hardware malfunction	1. Check if there is air in the liquid cooling pipeline; 2. Check if the liquid cooling machine pressure parameter settings are reasonable. If unable to resolve, please contact after-sales personnel.
	Exhaust temperature sensor 1 alarm	Exhaust temperature sensor damage or loose connection	Liquid cooling unit continues to operate. Charging and discharging can proceed. Contact after-sales promptly during system idle time or regular maintenance for inspection and handling.
	Suction temperature	Suction temperature	Check whether the fan is blocked, check whether the fan is burned out, and check whether the fan feedback

	sensor 1 alarm	sensor damage or loose connection	circuit is loose.
	Fan 1, 2, 3 malfunction	1. Foreign object stuck in the fan blade; 2. Fan terminal not connected; 3. Fan damaged	
Fire detection alarm	Smoke sensor alarm	Energy storage compartment smoke sensor triggers	After stopping charging and discharging, open the cabinet door to detect if there is obvious smoke inside. If everything is normal, check if the sensor is faulty.
	Temperature sensor alarm	Battery compartment temperature sensor triggers	After stopping charging and discharging, open the hatch to detect if the internal temperature is significantly higher. If everything is normal, check if the sensor is faulty.
	Cluster temperature alarm total indicator	Battery core temperature exceeds alarm threshold	Confirm the specific temperature of the battery core through the monitoring system, then stop charging and discharging.
	Cluster 1 temperature alarm indicator		
	Composite sensor temperature alarm indicator	Composite sensor in the battery compartment detects temperature exceeding the alarm threshold	After stopping charging and discharging, open the hatch to detect if the internal temperature is significantly higher. If everything is normal, check if the sensor is faulty, and if so, replace the component.
	Composite sensor PM2.5 ppm alarm indicator	Composite sensor in the battery compartment detects PM2.5 concentration exceeding the alarm threshold	After stopping charging and discharging, open the hatch to detect if the internal smoke concentration is high. If everything is normal, check if the sensor is faulty.
Fire system self-failure	Fire failure	Fire host self-failure	View the monitoring system, locate the specific failure, and then troubleshoot accordingly.
	Composite sensor communication failure	Communication loss between fire host and composite sensor	Check if the communication line between the fire host and composite sensor is properly connected, and if the power supply to the fire host and composite sensor is normal.
	Pressure sensor high/low alarm	High/low pressure of fire bottle	Contact after-sales personnel to check the status of the bottle group during regular maintenance.
PCS (Power Conversion System)	Over-temperature derating	Temperature too high	System operates at reduced capacity. Check if the corresponding derating reason is normal.
	Bus	DC voltage too	

	overvoltage/undervoltage derating	high/low	
	Bus voltage difference derating	Modulation ratio too low	
	Fan derating prompt	Fan abnormality	
	ISO alarm prompt	Slightly low insulation impedance	Check if there are poor contacts in component connection lines and terminals.
	DC/AC lightning protection alarm	DC/AC lightning protection feedback signal abnormal	Check if the lightning protection module is burned out, and if not, check if the signal line is loose.
	Battery voltage input undervoltage/overvoltage alarm	DC voltage too low/high	Measure the actual DC voltage. If the voltage is within the normal range, check if the connection line is loose.
	Internal/External fan alarm	Internal/External fan speed feedback abnormal	Check the actual fan speed. If the fan is stuck, remove foreign objects. If the fan is found to be damaged, replace it with a new one.
	IGBT temperature alarm	IGBT heatsink temperature too high	Check if the heatsink module is normal, check the inlet and outlet vents and airflow, and check if the fan is abnormal.
Conjunction cabinet (if present)	Monitoring board over-temperature alarm	Temperature exceeds 70 degrees Celsius	Check if the fan is turned on. If not, turn on the fan.
	AC Cabin over-temperature alarm	Temperature exceeds 70 degrees Celsius	
	Monitoring board low-temperature alarm	Temperature below -35 degrees Celsius	Stop charging and discharging and check the sensor status.
	AC Cabin low-temperature alarm	Temperature below -35 degrees Celsius	
	Monitoring board temperature sensor malfunction	Distribution cabinet temperature sensor data abnormality	Check the wiring of the distribution cabinet temperature sensor.
	AC Cabin temperature sensor malfunction	AC Cabin temperature sensor data abnormality	Check the AC Cabin temperature sensor.
	Water immersion alarm	Water immersion sensor immersed in water	After stopping charging and discharging, check if the corresponding water immersion sensor is immersed in water, and perform relevant drainage treatment.

	AC SPD (Surge Protection Device) failure	AC SPD failure	After stopping charging and discharging, check if the AC SPD is faulty.
	Fan 1/2 malfunction	Fan 1/2 status feedback abnormal	After stopping charging and discharging, check if Fan 1/2 is faulty.
	Insulation monitoring device failure	Insulation monitoring device status feedback abnormal	After stopping charging and discharging, check if the insulation monitoring device is faulty.
	Energy storage cabinet failure	Energy storage cabinet status feedback abnormal	After stopping charging and discharging, check if the energy storage cabinet is faulty.
	PCSM1/2/3/4/5/6 AC circuit breaker failure	PCSM1/2/3/4/5/6 AC circuit breaker trip	Check the circuit breaker status after stopping charging and discharging.
	PCSM1/2/3/4/5/6 CAN communication failure	Communication disconnect with module 1/2/3/4/5/6	Check the module status and physical wiring for faults after stopping charging and discharging.
	Metering meter disconnect	Unable to read metering meter data	Check the status and physical wiring of the metering meter after stopping charging and discharging.
	Anti-backflow meter disconnect	Unable to read anti-backflow meter data	Check the status and physical wiring of the anti-backflow meter after stopping charging and discharging.
	Microcomputer device disconnect	Unable to read microcomputer device data	Check the status and physical wiring of the microcomputer device after stopping charging and discharging.
	Dehumidifier disconnect	Unable to read dehumidifier data	Check the status and physical wiring of the dehumidifier after stopping charging and discharging.
	Measurement and control device disconnect	Unable to read measurement and control device data	Check the status and physical wiring of the measurement and control device after stopping charging and discharging.
	Anti-backflow failure	Unable to control grid-connected power	Check the discharge status of other devices in the system.
	SPD1/2 alarm	SPD1/2 status feedback abnormal	Check the SPD1/2 status after stopping charging and discharging.

BMS related alarms:

Section	Alarm info	Alarm reason	Recommendations
BMS system	Supply voltage undervoltage/overvoltage alarm level 1	BMS module supply voltage undervoltage/overvoltage	During system maintenance, check the output voltage of the power supply module inside the high-voltage box.

	Cluster voltage undervoltage alarm level 1	Low battery cluster voltage (5PACK: 648V) (6PACK: 777.6V)	Keep an eye on it, no need for excessive operations, does not affect system operation.
	Cluster voltage overvoltage alarm level 1	High battery cluster voltage (5PACK: 852) (6PACK: 1022.4)	
	Terminal over-temperature alarm level 1	Terminal temperature too high (80°C)	
	Charging overcurrent alarm level 1	Charging current too high (215A)	Check if the PCS end current complies with the system's charging and discharging power commands.
	Discharge overcurrent alarm level 1	Discharge current too high (215A)	
	Insulation low alarm level 1	Insulation impedance too low (1MΩ)	Keep an eye on it, no need for excessive operations, does not affect system operation.
	Single cell voltage overvoltage alarm level 1	Single cell voltage too high (3.55V)	
	Single cell voltage undervoltage alarm level 1	Single cell voltage too low (2.7V)	
	Single cell pressure difference alarm level 1	High pressure difference between single cell voltages within the cluster (400mV)	
	Charging single cell over-temperature alarm level 1	Single cell temperature too high during charging (50°C)	
	Charging single cell under-temperature alarm level 1	Single cell temperature too low during charging (0°C)	
	Discharge single cell over-temperature alarm level 1	Single cell temperature too high during discharge (50°C)	
	Discharge single cell under-temperature alarm level 1	Single cell temperature too low during discharge (0°C)	
	Single cell temperature difference	Large temperature difference	

	alarm level 1	between single cells within the cluster (15°C)	
	Battery pack overvoltage alarm level 1	Battery pack voltage too high (170.4V)	
	Battery pack undervoltage alarm level 1	Battery pack voltage too low (129.6V)	
	Rapid temperature rise alarm	Single cell temperature rise rate >10°C/min	
	BCU and CMU communication failure	CMU loses contact with BCU	Stop for maintenance to check if the CMU and BCU communication lines are properly connected.

3.2 Minor Alarms

BMS related alarms:

Section	Alarm info	Alarm reason	Recommendations
BMS	Cluster voltage undervoltage alarm level 2	Low battery cluster voltage (5PACK: 624V) (6PACK: 748.8V)	Check if the charging power in the forbidden charging state is 0, if the discharge power in the forbidden discharge state is 0, if so, wait for automatic recovery; if not, manually stop the entire system.
	Cluster voltage overvoltage alarm level 2	High battery cluster voltage (5PACK: 864V) (6PACK: 1036.8)	
	Terminal over-temperature alarm level 2	Terminal temperature too high (85°C)	
	Cluster voltage undervoltage alarm level 2	Low battery cluster voltage (5PACK: 624V) (6PACK: 748.8V)	
	Cluster voltage overvoltage alarm level 2	High battery cluster voltage (5PACK: 864V) (6PACK: 1036.8)	
	Terminal over-temperature alarm level 2	Terminal temperature too high (85°C)	
	Charging overcurrent alarm level 2	Charging current too high (230A)	
	Discharge overcurrent alarm level 2	Discharge current too high (230A)	
	Insulation low alarm level 2	Insulation impedance too low (500kΩ)	
	Single cell voltage overvoltage alarm level 2	Single cell voltage too high (3.55V)	
	Single cell voltage undervoltage alarm	Single cell voltage too low (2.7V)	

	level 2		
	Single cell pressure difference alarm level 2	High pressure difference between single cell voltages within the cluster (600mV)	
	Charging single cell over-temperature alarm level 2	Single cell temperature too high during charging (55°C)	
	Charging single cell under-temperature alarm level 2	Single cell temperature too low during charging (-10°C)	
	Discharge single cell over-temperature alarm level 2	Single cell temperature too high during discharge (55°C)	
	Discharge single cell under-temperature alarm level 2	Single cell temperature too low during discharge (-10°C)	
	Single cell temperature difference alarm level 2	Large temperature difference between single cells within the cluster (20°C)	
	Battery pack overvoltage alarm level 2	Battery pack voltage too high (170.4V)	
	Battery pack undervoltage alarm level 2	Battery pack voltage too low (129.6V)	
	Rapid temperature rise alarm	Single cell temperature rise rate >10°C/min	
	BCU and CMU communication failure	CMU loses contact with BCU	Stop for maintenance to check if the CMU and BCU communication lines are properly connected.

3.3 Important Alarms:

Section	Alarm info	Alarm reason	Recommendations
Energy Storage Cabinet Dynamic Environment	Emergency Shutdown	External emergency stop button pressed manually	Confirm whether there is an external emergency fault, restore it after eliminating the external emergency fault.
	Flooding Fault	Water immersion sensors in the battery cabinet are triggered	Check whether the corresponding water immersion sensor location has water ingress, if so, perform drainage.
	Access Control Fault	Corresponding access door of the energy storage cabinet is opened during operation	Check if the energy storage cabinet door is tightly closed.

	Battery Cluster Power-on Failure	Battery cluster power-on unsuccessful	Check for other faults on the monitoring page. If there are other faults, resolve them first. If there are no other faults, contact after-sales personnel for assistance.
	Lightning Protection Fault	Auxiliary power triggers lightning protection signal	Check if the lightning protection module of the auxiliary power input line is damaged.
	External Alarm	External device alarm signal input	Check the source of the external alarm signal (EMS, etc.), confirm if there is a serious external fault.
Liquid cooling unit Liquid cooling unit	Voltage Detection Chip Communication Fault	Mainboard components of the liquid cooling unit are damaged	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Power Supply Undervoltage/Overvoltage Alarm	Input power supply voltage exceeds the unit voltage range (176V ~ 264V): Main control board damaged or Input power supply too high, too low, or unstable	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Use a multimeter to measure voltage at the input of the liquid cooling unit Please contact after-sales support immediately
	Pump Fault	Poor contact of the pump or Pump stuck or damaged or System lacks liquid	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Confirm if the static pressure is normal. If not, please contact after-sales support for replenishment; if yes, please contact after-sales support immediately
	Electric Heating High Temperature Alarm	System lacks water or abnormal operation of water circuit leads to dry burning or Feedback terminal (CN22) not connected	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Confirm if the static pressure and the water inlet and outlet pressures when the pump is running are normal. If not, please contact after-sales support for replenishment; if yes, please contact after-sales support immediately
	Monitoring Communication Alarm	Not connected to upper computer: Main control board damaged or Communication line not properly connected or Communication settings incorrect	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Confirm if the communication line is properly connected. If not, adjust it to correct wiring; if yes, please contact after-sales support immediately
	System Water Shortage Alarm	When the return water pressure ≤0.1 bar continues for 3 seconds: System water shortage or Return water pressure sensor failure or Pipeline valve closed or System leaks	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Confirm 1. whether the pipeline valve is normally open; 2. whether the system is leaking; 3. whether the system is short of water. If not, take appropriate measures; if yes, please contact after-sales support immediately.

	Condensation/Evaporation Pressure Sensor Fault	Sensor damaged or Mainboard damaged	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Evaporation Pressure Too Low	Refrigerant leakage or Electronic expansion valve core jammed, coil not energized or valve head not in place or No flow in the unit water circuit	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Evaporation Pressure Too Low Lock		
	Compressor Exhaust High Temperature	Refrigerant leakage or Electronic expansion valve core jammed, coil not energized or valve head not in place, pipe flattened or Poor heat dissipation (fan stops, reverses or runs slowly during cooling, heat exchanger is too dirty or aged) or Compressor oil shortage or oil diluted and deteriorated or Hardware failure of exhaust sensor or control board	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Compressor Exhaust High Temperature Lock		
	Compressor Drive Lock Alarm	Core components of the liquid cooling unit are damaged or Mainboard damaged	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Compressor Drive communication fault		
	Compressor drive alarm		
	Compressor driver does not match		
	Compressor current is too high		
	EEV low superheat lock alarm	Mainboard damaged or temperature sensor damaged or liquid cooling system faiure	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	EEV drive alarm		
	EEV low superheat alarm		
	Compressor inverter	Cooling fan of electronic box stuck or	The liquid cooling unit cannot operate normally and does not support system charging and

	temperature failure	cooling fan damaged or compressor damaged	discharging. Please contact after-sales support immediately
	Compressor drive module overheated		
	Condensation Pressure Too High Alarm	Fluorine system pipeline blockage or Poor heat dissipation (fan stops, reverses or runs slowly during cooling, heat exchanger is too dirty or aged) or Electronic expansion valve core stuck, coil not energized or valve head not in place or Air or other non-condensing gas in the system (not vacuumed during installation) or Excessive refrigerant charging	The liquid cooling unit cannot operate normally and does not support system charging and discharging. Please contact after-sales support immediately
	Condensation Pressure Too High Lock		
	High Voltage Switch Alarm		
	High Voltage Switch Lock Alarm		
Battery Pack level fire extinguish system	Battery Pack Temperature + CO Alarm (CMU, 1-6 Clusters)	CMU triggers Battery 1-6 Cluster Fire Fighting Secondary Alarm	Battery temperature and combustible gas concentration jointly trigger PACK-level fire fighting. Observe internal temperature data, and conduct further inspection after the temperature data drops. Replace the battery pack and perform cleaning work
	Battery Pack Temperature Too High		
Cabin level fire extinguishing system	Smoke Sensor + Temperature Sensor Alarm in the Same Battery Compartment (CMU, 1-6 Clusters	CMU triggers Fire Fighting Third levelAlarm (Cabin Level Fire Fighting)	Sensors inside the cabin jointly trigger cabin-level fire fighting. Observe internal temperature data or observe from a distance whether there is open fire and dense smoke in the container. Contact the first sailing after-sales and professional firefighters for handling, and open the cabin door for inspection only after a sufficient amount of time has passed
	Smoke Sensor + Compound Temperature Sensor Alarm in the Same Battery Compartment (CMU, 1-6 Clusters)		
	Temperature Sensor Alarm + Compound Sensor CO Alarm in the Same Battery Compartment (CMU, 1-6 Clusters)		
PCS	Grid Overvoltage	Voltage exceeds	If it occurs occasionally, it may be due to a short-

	Grid Undervoltage	operating range	term abnormality in the grid. The energy storage inverter will resume normal operation after detecting normal grid conditions, and no manual intervention is required. If it occurs frequently, please check the grid voltage and frequency to see if they are within the permissible range of the energy storage inverter. If not, please contact customer service for handling. If yes, please check whether the AC side circuit breaker and output cable are properly connected. If the grid voltage and frequency are within the permissible range of the energy storage inverter, and the AC side connection is confirmed to be correct, but the alarm still occurs frequently, after obtaining the consent of the local power utility, please contact customer service to modify the energy storage inverter's grid over/undervoltage protection settings
	Grid Undervoltage	Frequency exceeds operating range	
	Grid Overfrequency		
	Ground Leakage Fault	Ground leakage current too high	If it occurs occasionally, it may be caused by occasional abnormalities in external lines, and the fault will be restored to normal operation after clearing the fault, with no manual intervention required If it occurs frequently or cannot be restored for a long time, please check whether the cable insulation is damaged
	High Impedance Error	High Voltage Transient Error	If the alarm occurs frequently, check whether the grid voltage/frequency is within acceptable range. If yes, check the energy storage inverter's AC circuit breaker and AC wiring. If the grid voltage/frequency is not within acceptable range, AC wiring is correct, but the alarm occurs multiple times, please contact technical support to change the grid over/undervoltage protection values
	Low Impedance Error	Low Voltage Transient Error	
	Islanding Error	Islanding Error	
	Grid Line Voltage Error	Grid Power Failure	
PCU	Grid Current Sampling Error	Grid Current Zero Offset Calibration Error	These are internal faults of the energy storage inverter. Disconnect the energy storage inverter's AC/DC power supply, wait for 5 minutes, then restore power supply, and observe whether the fault is eliminated after the energy storage inverter restarts. If it is not resolved, please contact customer service
	Grid Current DC Component Sampling Error	Grid Current DC Component Sampling Error	
	Grid Voltage Sampling Error (AC Side)	Grid Voltage Zero Offset Calibration Error	
	Leakage Current Sampling Error (AC Side)	Leakage Current Zero Offset Calibration Error (AC Side)	
	Grid Voltage Consistency Error	Inconsistent Grid Voltage Sampling	Disconnect the energy storage inverter's AC/DC power supply, wait for 5 minutes, then restore power supply, and observe whether the fault is eliminated after the energy storage inverter restarts. If it is not resolved, please contact customer service. Check whether there are poor contacts in component connections and
	Auxiliary Power Error	Auxiliary Power Abnormality	
	Inverter Soft Start Failure	AC Voltage Soft Start Failure	

	AC Relay Detection Failure	AC Relay Detection Abnormality	terminals. If there is a fault, repair it promptly
	Insulation Impedance Low	Insulation Impedance Too Low	
	Input Reverse Error	Battery Positive and Negative Connection Reversed	
	Module Temperature Difference Too Large	Large Temperature Difference Between Internal Power Modules	Ensure that the energy storage inverter is installed in a cool and well-ventilated place
	Environment Temperature 1 Protection	Abnormal Environment Temperature	
	Module 1/2/3/4/5/6 Temperature Protection	Abnormal Module Temperature	
	Bus Voltage Imbalance	Large Voltage Difference Between Half-Bus	Internal fault of the energy storage inverter. Close the energy storage inverter, wait for 5 minutes, then open the energy storage inverter, and check whether the fault is resolved. If it is not resolved, please contact customer service
	Bus Undervoltage During Operation	Low Bus Voltage During Operation	If the device is configured correctly, it is due to low battery voltage. After the battery voltage returns to normal level, the energy storage inverter will resume normal operation without manual intervention
	Inverter Bus Voltage Effective Value Software Overvoltage	Excessive Bus Voltage Effective Value	Internal fault of the energy storage inverter. Wait for the fault to be automatically resolved after restarting the energy storage inverter, and check if the problem is solved. If it is not resolved, please contact customer service
	Inverter Bus Voltage Instantaneous Value Software Overvoltage	Excessive Bus Voltage Instantaneous Value	
	Dci Overcurrent Protection	Excessive DC Component	
	Output Instantaneous Current Protection	Excessive Output Current Instantaneous Value	
	Output Effective Value Current Protection	Excessive Output Current Effective Value	
	Inverter Bus Hardware Overvoltage	Excessive Bus Voltage Instantaneous Value	
	AC Output Hardware Overcurrent	Excessive AC Current Instantaneous Value	
	Software Wave-by-Wave Current	Excessive Number of Wave-by-Wave Current	

	Limiting Protection	Limiting	
	Hardware Version Mismatch	Abnormal Hardware Version	Check whether the hardware version matches
Busbar Cabinet (if applicable)	Monitoring Board Overtemperature Protection	Temperature exceeds 75 degrees Celsius	Check if the fan is turned on. If not, please turn on the fan
	AC Cabin Overtemperature Protection	Temperature exceeds 75 degrees Celsius	
	Access Control Alarm	Access control sensor detects door opening	Close the cabinet door
	Grid Switch Position Fault	Grid switch status feedback abnormal	Check whether the grid switch is faulty after the system stops charging and discharging
	Insulation Monitoring Fault	Insulation monitoring feedback abnormal	After the system stops charging and discharging, check whether the ground impedance is abnormal
	Remote REPO Fault	EPO switch pressed	Restore EPO switch
	PCS module model reading error	Module model is not 125KW or 215KW	After the system stops charging and discharging, check whether the module model setting is incorrect
	STS switch position fault	STS switch status feedback abnormal	After the system stops charging and discharging, check the STS switch status
	QF3 fault	QF3 circuit breaker status feedback abnormal	After the system stops charging and discharging, check the QF3 circuit breaker status

BMS related alarms:

Section	Alarm info	Alarm reason	Recommendations
BMS System	Cluster End Voltage Undervoltage Alarm Level 3	Cluster voltage too low (5PACK: 600V) (6PACK: 720V)	Check whether the relays of the DC and AC systems are disconnected through monitoring, and whether the system power is 0; if not, manually send commands or press the emergency stop button to shut down the entire system. Contact after-sales personnel to investigate the cause of overcharge/discharge of the system
	Cluster End Voltage Overvoltage Alarm Level 3	Cluster voltage too high (5PACK: 876V) (6PACK: 1051.2V)	
	Terminal Overtemperature Alarm Level 3	Terminal temperature too high (90°C)	
	Charging Overcurrent Alarm Level 3	Charging current too large (250A)	
	Discharge Overcurrent Alarm Level 3	Discharge current too large (250A)	

	Insulation Too Low Alarm Level 3	Insulation impedance too low (100kΩ)	
	Single Cell Voltage Overvoltage Alarm Level 3	Single cell voltage too high (3.65V)	
	Single Cell Voltage Undervoltage Alarm Level 3	Single cell voltage too low (2.5V)	
	Single Cell Voltage Difference Alarm Level 3	High voltage difference between single cell voltages in the cluster (1000mV)	
	Charging Single Cell Overtemperatur e Alarm Level 3	High temperature of single cell during charging (60°C)	
	Charging Single Cell Undervoltage Alarm Level 3	Low temperature of single cell during charging (-15°C)	
	Discharge Single Cell Overtemperatur e Alarm Level 3	High temperature of single cell during discharge (60°C)	
	Discharge Single Cell Undervoltage Alarm Level 3	Low temperature of single cell during discharge (-15°C)	
	Single Cell Temperature Difference Alarm Level 3	High temperature difference between single cells in the cluster (30°C)	
	Battery Pack Overvoltage Alarm Level 3	Battery pack voltage too high (175.2V)	
	Battery Pack Undervoltage Alarm Level 3	Battery pack voltage too low (120V)	
	BCU Communication Failure with BMU	BCU loses communication with BMU	Maintenance Check whether the BCU is well connected to the communication line with the BMU and whether the BMU is powered normally
	Single Cell Voltage Acquisition Failure	Unable to obtain single cell voltage data	Maintenance Check whether the FPC between the BMU and single cell voltage sampling is intact
	Single Cell Temperature Acquisition Failure	The number of NTC sampling failures is greater than 6, or distributed in different numbers of packs is	Maintenance Check whether the FPC between the BMU and single cell temperature sampling is intact

		greater than 3	
	BCU Serious Fault Status	Circuit breaker IO feedback, external fault signal input	Maintenance Check whether the isolation switch in the high-voltage box is in the OFF state and whether the external fault signal input is high
	Large Difference Between Cluster Voltages	In single-cluster mode and multi-cluster mode, excessive voltage difference between battery cluster (10V) during parallel connection of battery clusters	Maintenance Check the voltage difference between battery clusters. If the fault cannot be eliminated, contact after-sales personnel
	Hall Communication Lost	BCU cannot collect current Hall information	Maintenance Check whether the communication line between the BCU and current Hall in the high-voltage box is normal, and whether the Hall is powered normally
	Normal Power Failure Failure	When sending a normal power failure command, the cluster current is too large	Manual maintenance only. Sending a fault power failure command can make the system de-energized

4. Parts replacement

 **Warning**	**When replacing components, ensure that the energy storage system is powered off first** **Ensure that all high-voltage box isolation switches are disconnected**

4.1 Replace the battery pack

 **Danger**	**The energy storage system must be powered off before replacing battery packs to avoid the risk of electric shock** **Please use specialized protective equipment and insulated tools to prevent electric shock injuries or short circuits** **Smoking or the use of open flames near the battery is prohibited** **Avoid using wet cloths to clean exposed copper busbars or other potentially conductive parts** **Do not use water or any solvent to clean the battery**

 **Attention**	**Before installation, ensure that the battery pack is stored indoors, not exposed to the elements, and meets other storage requirements specified in the user manual** **Before installation, check the status of the battery pack to ensure that there are no abnormalities such as rain exposure, damage, or deformation to the outer packaging** **Do not use a leaking or dropped battery pack** **After unpacking the battery pack, it must be installed within 24 hours. If installation cannot be completed promptly, store the battery in an indoor, dry, non-corrosive gas environment; the energy storage system must be powered on within 24 hours after unpacking the battery pack, and the battery pack must be installed within 72 hours after unpacking** **Avoid installing the battery pack in rainy, snowy, or foggy weather to prevent erosion by water vapor or rainwater**

Note	**Abnormal battery packs within the warranty range are handled and transported by the after-sales service of the company. For battery packs beyond the warranty period, customers should contact local recycling agencies for disposal**

Prerequisites

Fault identification:

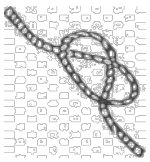
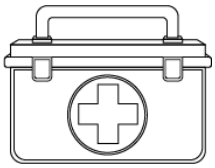
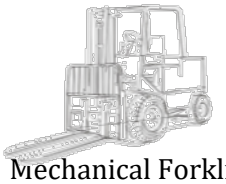
a. Log in to the company's WEB interface to view alarm information.

b. Locate the position of the faulty battery pack based on the alarm information.

c. Refer to the corresponding alarm handling suggestions in the alarm list.

d. Maintenance personnel judge whether battery replacement is required based on the on-site situation

Prepare tools and protective equipment

 Safety gloves	 Safety googles	 Insulated torque socket wrench	 Infrared thermal imager
 Rope	 helmet	 Medical kit	 Mechanical Forklift

The energy storage system is powered off. Refer to Section 2.2 of the maintenance manual for the specific steps to power off the energy storage system.

Battery pack replacement requires ≥4 persons

Operating Procedure:

Step 1: Check Battery Status

Ensure that the entire energy storage system is powered off.

Use an infrared thermal imager to detect the temperature of the battery pack terminal. If the temperature is too high, wait for it to cool down before proceeding to the next step.

After confirming the position of the battery pack to be replaced, affix a repair label (repair labels are stored in the new battery pack wooden box).

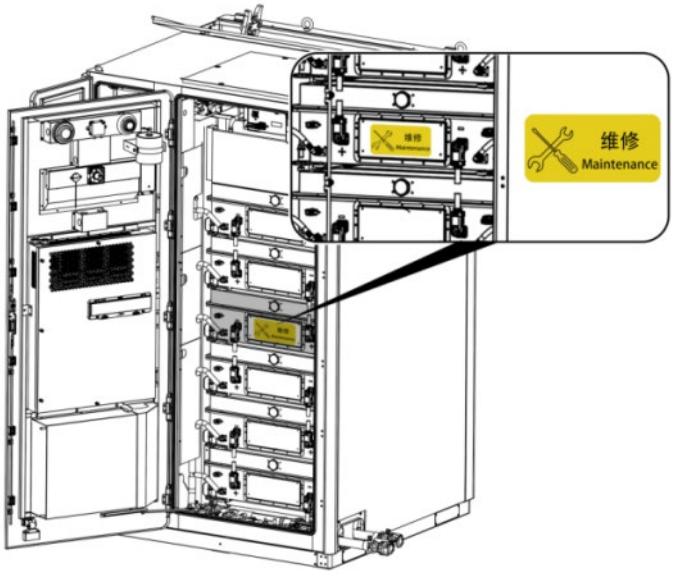


Figure 4 – Example of position of battery faulty battery pack

Step 2: Disconnect the positive and negative terminals and signal terminals of the battery pack requiring maintenance under insulation protection

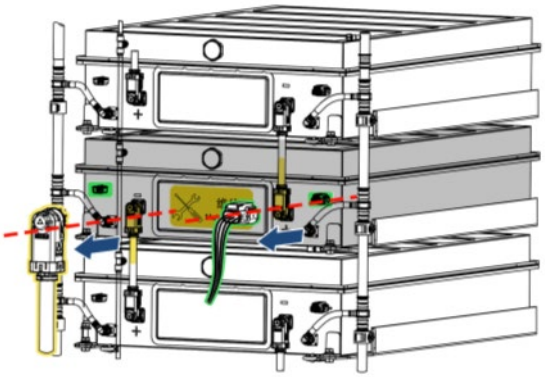


Figure 5 – Disconnection of power plugs

Step 3: Liquid discharge operation

When discharging the cabinet cooling liquid, close the two ball valves at the end of the cabinet that needs to discharge liquid and the adjacent cabinet's pipeline ball valves (the handles of the ball valves should be parallel to the direction of the pipeline).

Connect the diversion pipe (liquid discharge tool) to the small liquid discharge ball valve of the first-level pipeline, secure it firmly, and place the other end of the diversion pipe in the liquid storage tank.

Open the small liquid discharge ball valve of the first-level liquid-cooled pipeline (the handle direction should be parallel to the direction of the pipeline), and use the top-opening exhaust valve of all cabinets that need liquid discharge.

After the liquid has drained completely, close the small ball valve at the bottom of the first-level liquid-cooled pipeline, remove the diversion pipe, and properly dispose of the waste liquid.

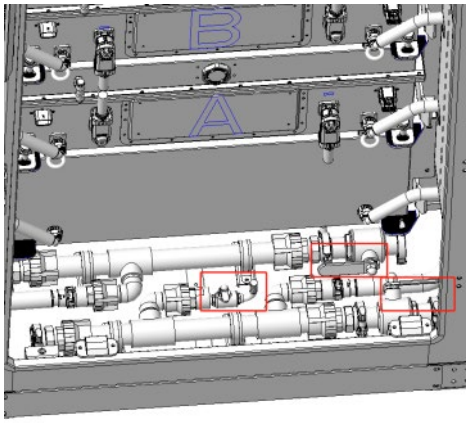


Figure 6 – Primary liquid valves position

Step 4: Disconnect the liquid cooling system pipeline joints and dismantle the upper and lower gas firefighting pipelines

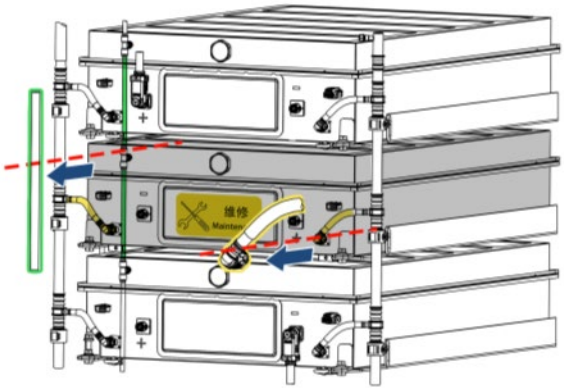


Figure 7 – joints to be disconnected

Step 5: Remove the fixing bolts of the battery pack and dismantle the installation bolts of the upper part of the battery pack to be replaced to avoid scratching

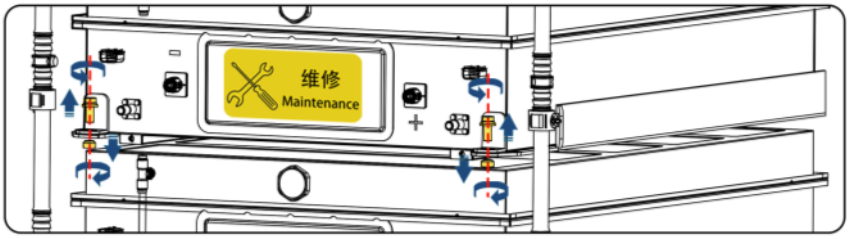


Figure 8 – fixing bolts

Step 6: Screw the M8 lifting ring knob provided with the accessory pack into the corresponding hole of the battery pack

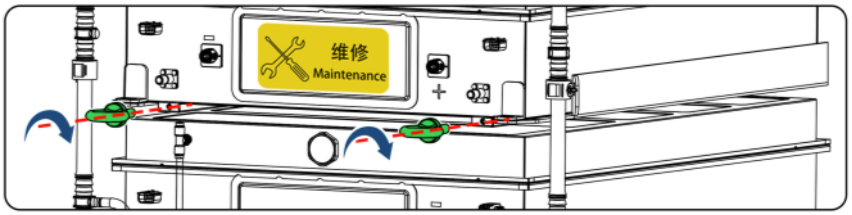


Figure 9 – lifting knobs

Step 7: Raise the forklift to be level with the bottom of the battery pack to be repaired and pass the towing rope through the M8 lifting ring sequentially

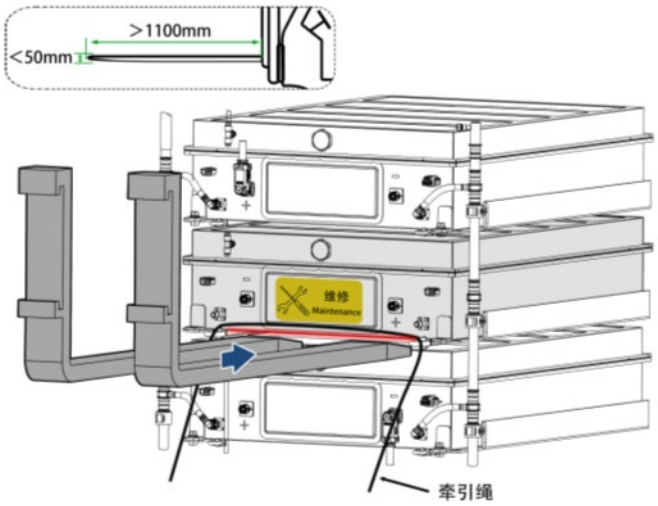


Figure 10 – forklift position

Step 8: Pull the towing rope to completely pull the battery pack onto the forklift mast, and then steadily lower the battery pack to the ground

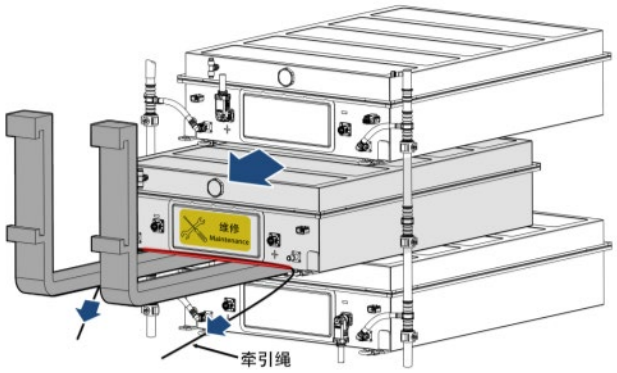


Figure 11 – forklift and rope

Step 9: The dismantled battery pack needs to protect the positive and negative terminals, communication terminals, and fire-fighting three-way joints, and seal the liquid-cooled inlet and outlet holes

⚠ **Warning**	**Ensure that the SOC of the new battery pack is consistent with the SOC mean value of the battery cluster where the replaced battery pack is located:** **When replacing a battery pack in an energy storage cabinet, find the SOC mean value of the other normal battery packs in the battery cluster where the battery pack is located, and charge the new battery pack to the SOC equal to that value** **Install the fully charged battery pack into the battery cluster**

Step 10: Transport the new battery pack to the maintenance area and use a forklift to raise the bottom of the battery pack to be level with the installation guide rail of the energy storage cabinet

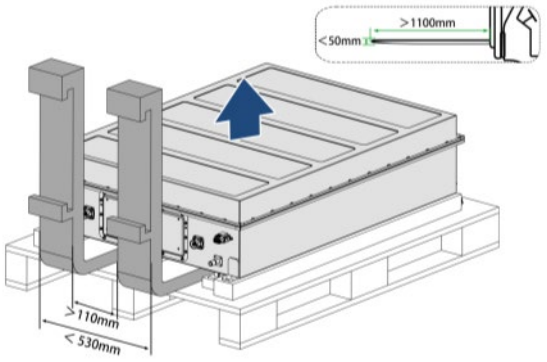


Figure 12 – new battery lifting

Step 11: Push the new battery pack along the guide rail to the bottom rubber pad of the guide rail

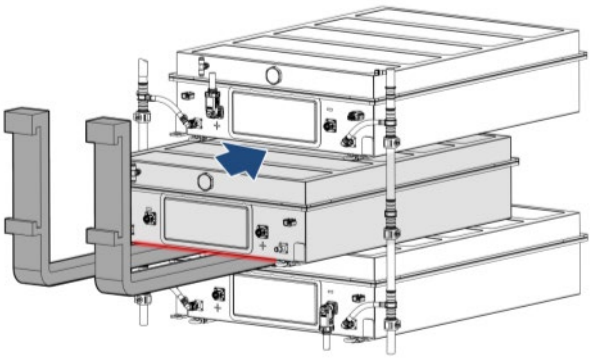


Figure 13 – new battery lifting

Step 12: Re-fix the new battery pack, insert the positive and negative terminals and signal connection terminals, insert the liquid cooling system pipeline joints, and install the upper and lower gas firefighting pipelines

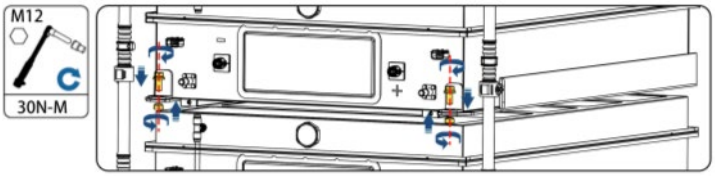


Figure 14 – new battery reassembly

Step 13: Liquid Refilling and Air Removal Operation (Continued)

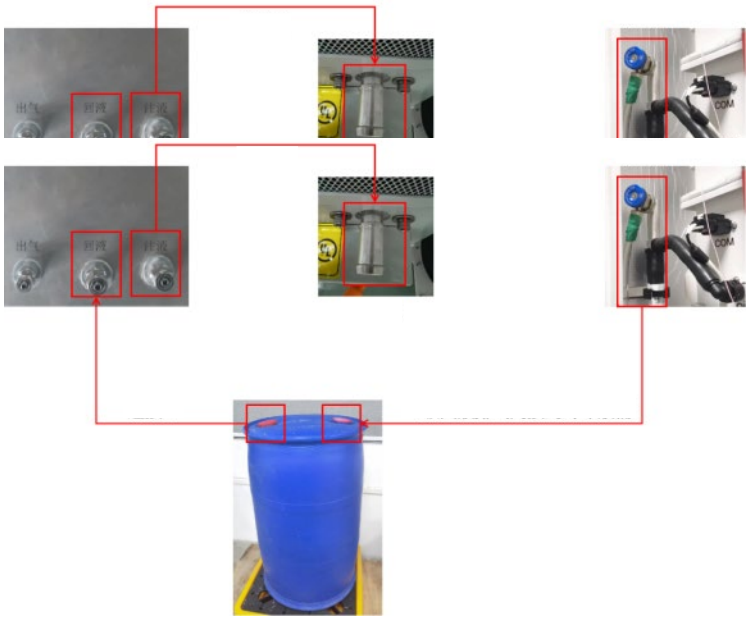


Figure 15 – refill of liquid

a. Connect the filling port tool with the liquid cooling machine filling port and connect the two ends with a 10mm diameter transparent PU hose (connection 1)
b. Connect the return port tool with the cooling liquid water tank, and connect the two ends with a 10mm diameter transparent PU hose (connection 2)
c. Connect the second-level return pipeline air vent valve to the cooling liquid water tank using manual air exhaust tool and transparent PU hose
d. Open the manual air exhaust tool, press the filling button on the tool, and fill the liquid cooling system pipeline with liquid
e. Observe whether there are free bubbles in the return pipe connected to the exhaust port continuously returning to the cooling liquid tank. If after cycling for 5 minutes, use the touchscreen to start the liquid cooling machine pump running in self-circulation mode
f. Observe the state of the cooling liquid in the return pipe. If there are still bubbles in the liquid cooling system pipeline that have not been purged, continue cycling. If there are no bubbles in the liquid cooling system pipeline, it indicates that the circulation degassing of the liquid cooling system pipeline is complete

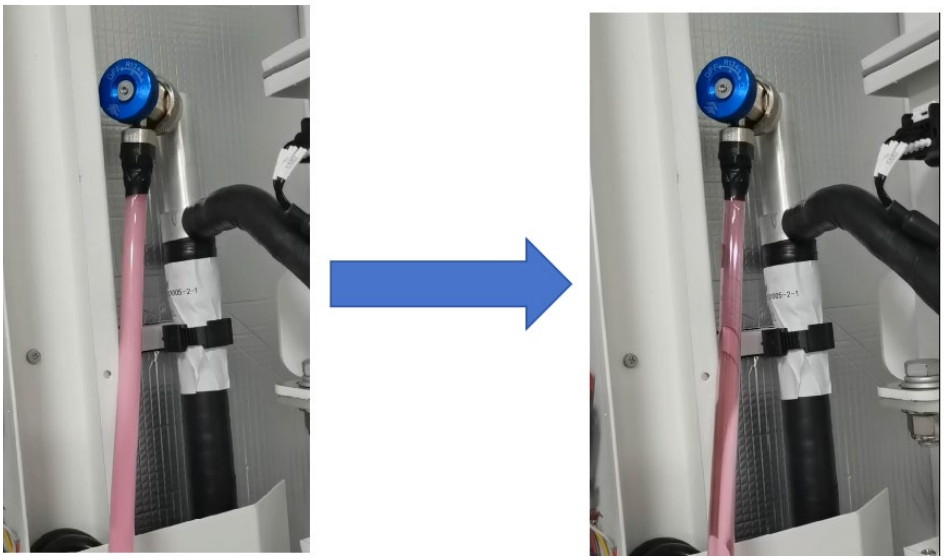


Figure 16 – degassing completions

g. Close the self-circulation, monitor the system's supply and return water pressure, immediately close the liquid cooling machine filling valve, and finally press the filling button on the tool to complete the filling

h. After filling, start the liquid cooling machine in self-circulation mode, stabilize the return water pressure between 1.5-1.8 bar, and it should not continue to decrease. The return water pressure of the liquid cooling system under static conditions should be between 1.6-1.9 bar. If not, continue filling and degassing.

i. After filling and degassing, disconnect all equipment and remove the pipes connected to the tools and the cooling liquid water tank, and then evacuate the equipment with pressure maintained

j.

Post procedures steps

Step 1: Power up the system. Refer to the system power-up section of the energy storage systems user manual

Step 2: Verify the functionality is restored

4.2 Fuses replacement

4.2.1 Main circuit fuses

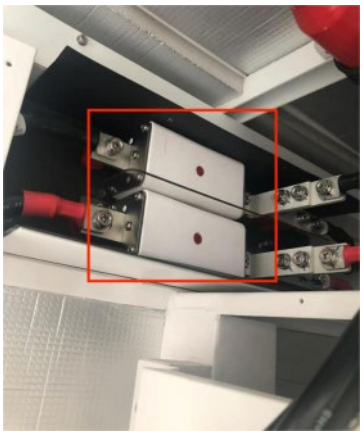


Figure 17 – main circuit fuses

Danger	**The energy storage system must be powered off before replacing fuses to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Safety googles	 Insulated torque socket wrench	 helmet

Operating Procedure:

Step 1

Remove the protective cover above the main circuit fuses

Step 2

Remove the main circuit fuses and connecting wires

Step 3

Replace and reconnect fuses

Step 4

Reinstall protective cover

4.2.2 Battery cluster fuse

Figure 18 – battery cluster fuse

Danger	**The energy storage system must be powered off before replacing fuses to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Safety googles	 Insulated torque socket wrench	 helmet

Operating Procedure:

Step 1

Disconnect the battery pack fuse

Step 2

Remove the protective cover above the fuse

Step 3

Remove the fuse and connecting wires

Step 4

Replace and reconnect fuses

Step 5

Reinstall protective cover

Step 6

Reconnect terminals

4.3 Replacement of Auxiliary power box switches

4.3.1 Auxiliary power switch

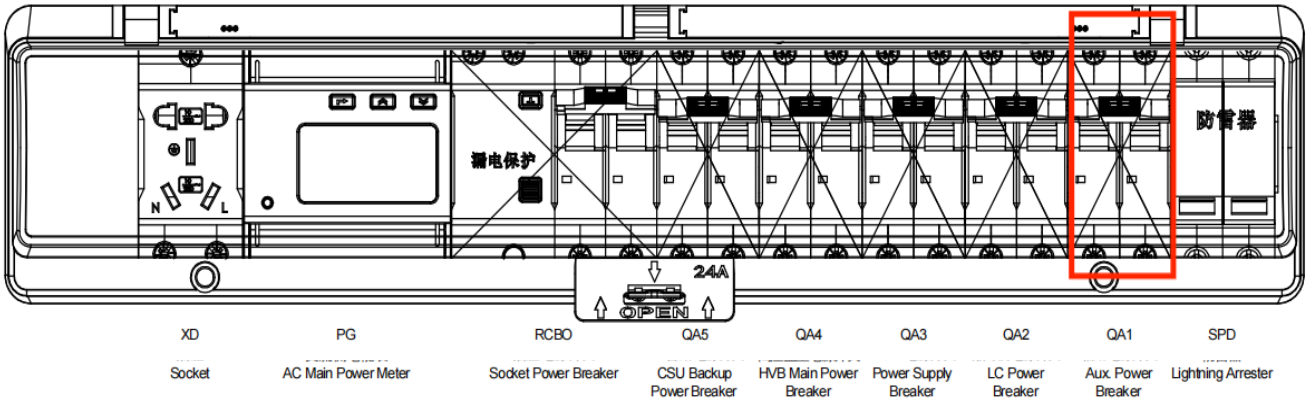


Figure 19 – Auxiliary power switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the auxiliary power switch panel and open the panel

Step 2

Disconnect the cables connected to the auxiliary power switch and label them

Step 3

Remove the faulty auxiliary power switch

Step 4

Install the new auxiliary power switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the auxiliary power switch panel

4.3.2 Liquid cooling system switch

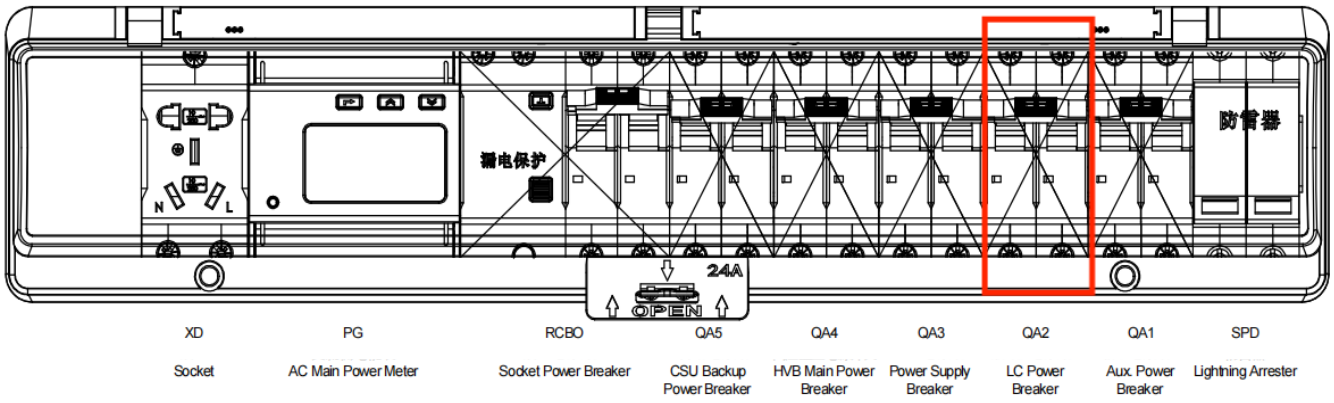


Figure 20 – Liquid cooling system switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the liquid cooling system switch panel and open the panel

Step 2

Disconnect the cables connected to the liquid cooling system switch and label them

Step 3

Remove the faulty liquid cooling system switch

Step 4

Install the new liquid cooling system switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the liquid cooling system switch panel

4.3.3 AC/DC power switch

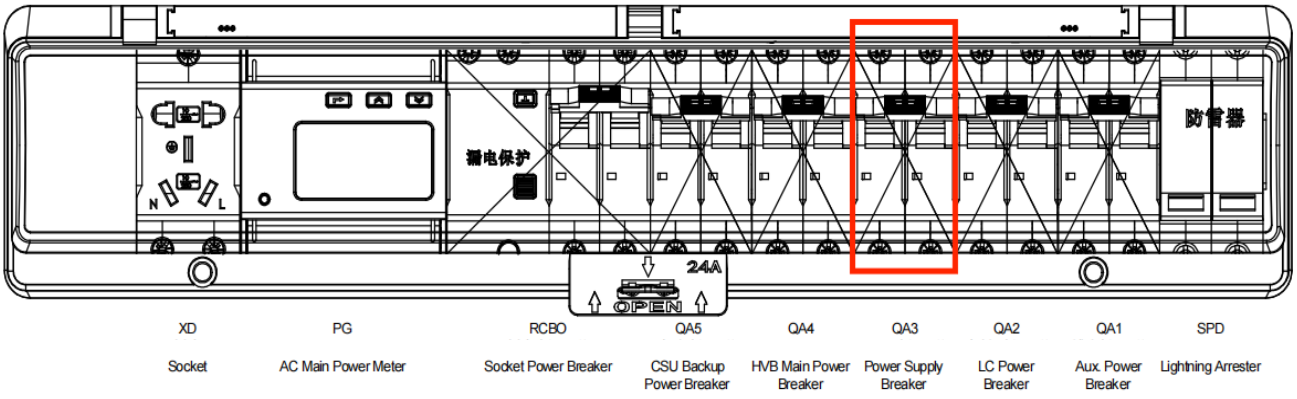


Figure 21 – AC/DC power switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the AC/DC power switch panel and open the panel

Step 2

Disconnect the cables connected to the AC/DC power switch and label them

Step 3

Remove the faulty AC/DC power switch

Step 4

Install the new AC/DC power switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the AC/DC power switch panel

4.3.4 Main power high voltage box switch

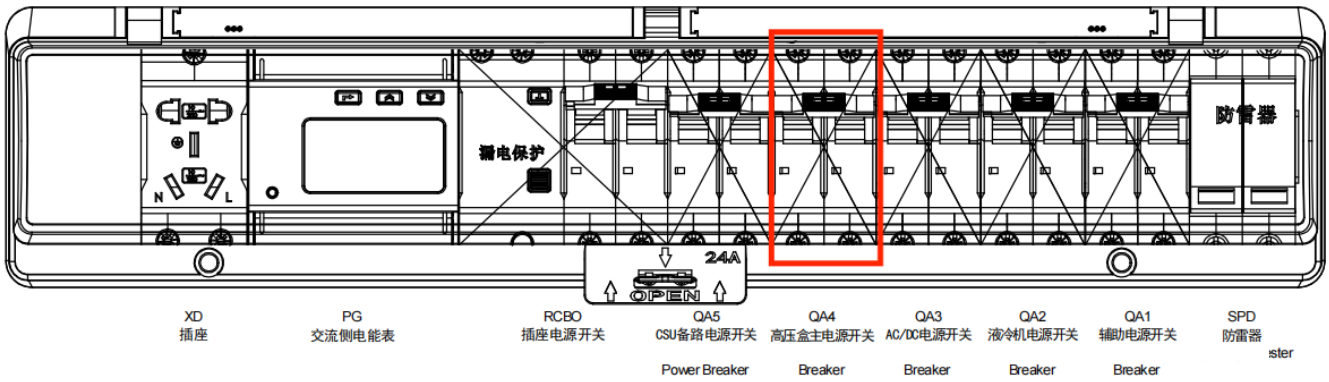


Figure 22 – main power high voltage box switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the main power high voltage box switch panel and open the panel

Step 2

Disconnect the cables connected to the main power high voltage box switch and label them

Step 3

Remove the faulty main power high voltage box switch

Step 4

Install the new main power high voltage box switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the main power high voltage box switch panel

4.3.5 CSU back-up power switch (only for a single energy storage cabinet)

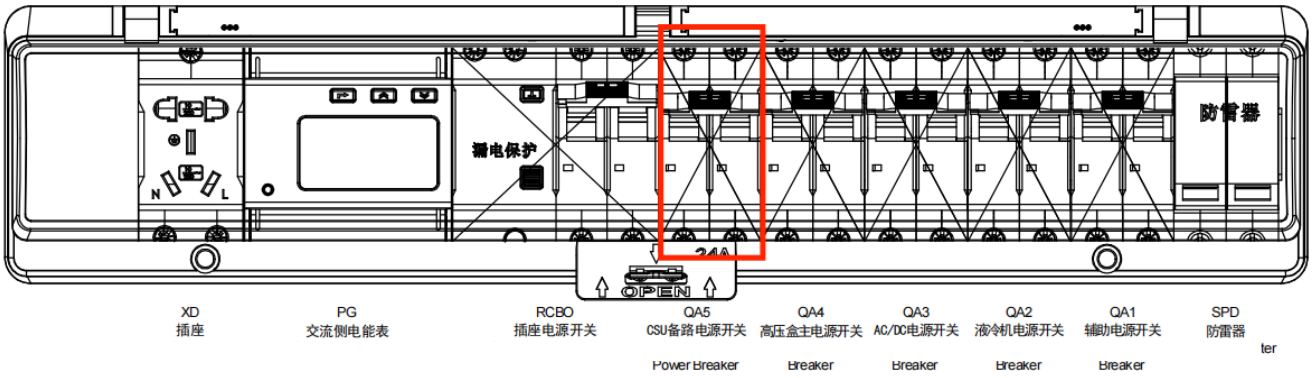


Figure 23 – CSU back-up power switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

*Note: This switch is only configured in scenarios where a single energy storage cabinet is used. In scenarios with two or more cabinets, CSU is not integrated into the cabinets, and CSU backup power switches are not configured

Operating Procedure:

Step 1

Remove the screws of the CSU back-up power switch panel and open the panel

Step 2

Disconnect the cables connected to the CSU back-up power switch and label them

Step 3

Remove the faulty CSU back-up power switch

Step 4

Install the new CSU back-up power switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the CSU back-up power switch panel

4.3.6 Socket power switch

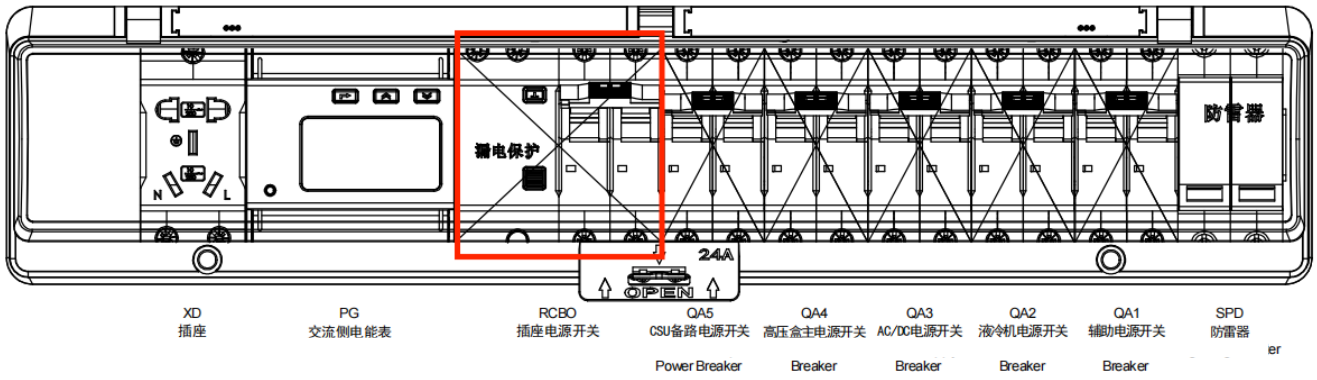


Figure 24 – Socket power switch

Danger	**The energy storage system must be powered off before replacing switches to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the socket power switch panel and open the panel

Step 2

Disconnect the cables connected to the socket power switch and label them

Step 3

Remove the faulty socket power switch

Step 4

Install the new socket power switch

Step 5

Connect the cables according to the labels

Step 6

Reinstall the socket power switch panel

4.4 Lightning arresters

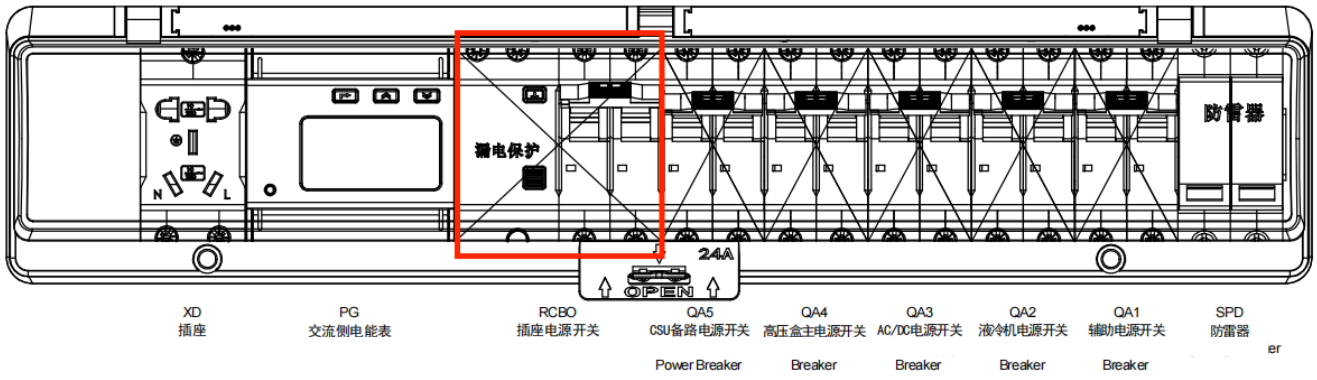


Figure 25 – Lightning arresters

Danger	**The energy storage system must be powered off before replacing lightning arresters to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the screws of the lightning arresters panel and open the panel

Step 2

Disconnect the cables connected to the lightning arresters and label them

Step 3

Remove the faulty lightning arresters

Step 4

Install the new lightning arresters

Step 5

Connect the cables according to the labels

Step 6

Reinstall the lightning arresters panel

4.5 Replacement of AC circuit breaker

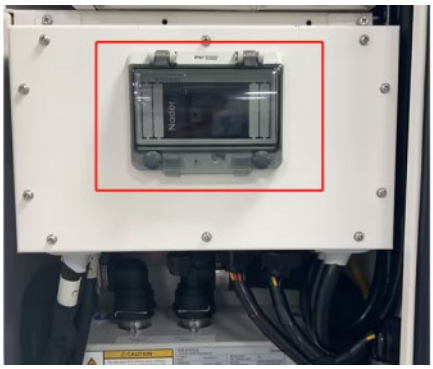


Figure 26 – AC circuit breaker

Danger	**The energy storage system must be powered off before replacing breakers to avoid the risk of electric shock**

Prepare tools and protective equipm

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the AC circuit breaker panel screws and open the panel

Step 2

Remove the copper cables connected to the AC circuit breaker and label them

Step 3

Remove the faulty AC circuit breaker

Step 4

Install the new AC circuit breaker

Step 5

Connect the cables according to the labels

Step 6

Reinstall the AC circuit breaker panel

4.6 Replacement of the LOGO indicator light

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the Logo indicator cover screws from the back of the front door

Step 2

Remove the faulty indicator light disconnecting from cables and label the cables

Step 3

Reconnect the new indicator light according to labelled cables

Step 4

Reinstall the Logo indicator light cover in the back of the front door

4.7 Replacement of the Emergency Stop button

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the emergency stop button cover screws from the back of the front door

Step 2

Remove the faulty emergency stop button disconnecting from cables and label the cables

Step 3

Reconnect the new emergency stop button according to labelled cables

Step 4

Reinstall the emergency stop button cover in the back of the front door

4.8 Replacement of the access switch

Figure 27 – Access switch position

⚠ **Danger**	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipm

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Unplug the terminal of the access control switch and label cables

Step 2

Remove the faulty access control switch

Step 3

Reconnect the new access control switch according to labelled cables

4.9 Replacement of the internal illumination strip

Figure 28 – internal illumination strip

⚠ **Danger**	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Unplug the terminal of the internal illumination strip and label cables

Step 2

Remove the faulty internal illumination strip

Step 3

Reconnect the new internal illumination strip according to labelled cables

4.10 Replacement of the temperature and humidity sensor

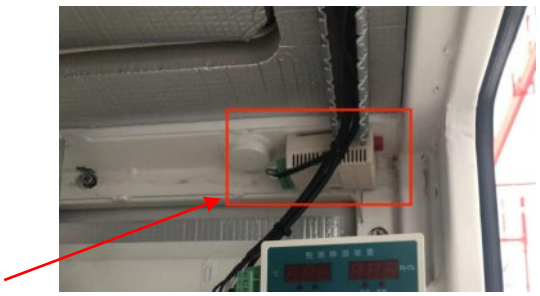


Figure 29 – temperature and humidity sensor

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the dehumidifier first

Step 2

Disconnect the cables from the temperature and humidity sensor and label them

Step 3

Remove the faulty temperature and humidity sensor

Step 4

Install the new temperature and humidity sensor

Step 5

Connect the cables according to the labels

Step 6

Reinstall the dehumidifier

4.11 Replacement of the dehumidifier

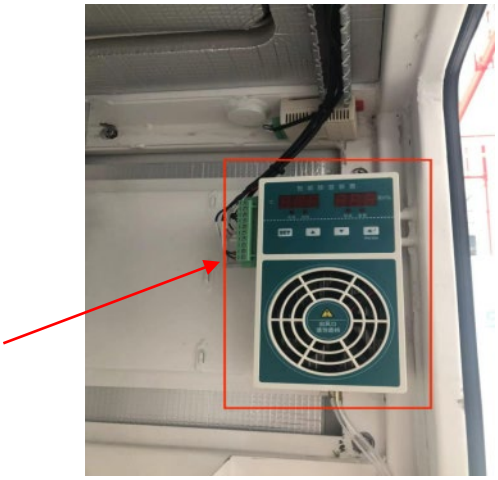


Figure 30 – dehumidifier

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Disconnect the terminals of the dehumidifier connection line

Step 2

Remove the fixing screws of the dehumidifier and drainage pipe, and remove them

Step 3

Install the new dehumidifier and new drainage pipe, tighten the fixing screws

Step 4

Reconnect the dehumidifier connection line terminals, secure the drainage pipe

4.12 Replacement of the exhausts fan

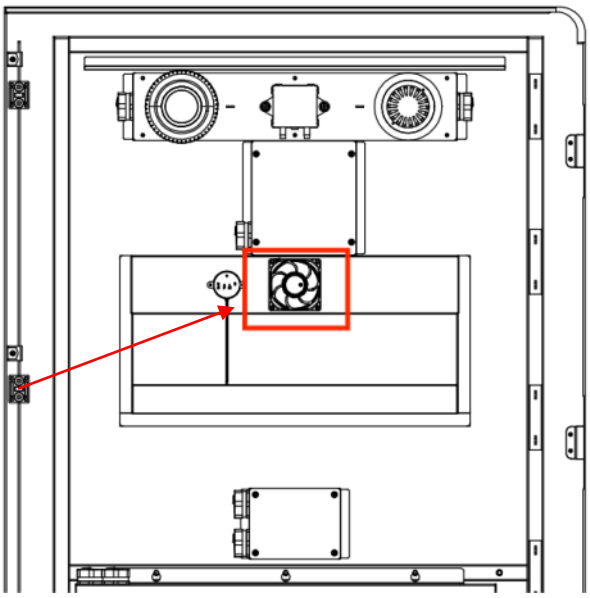


Figure 31 – exhausts fan

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the fan baffle

Step 2

Disconnect the power supply line of the fan

Step 3

Remove the fixing screws of the fan and remove the fan

Step 4

Connect the power supply line of the fan

Step 5

Install the new fan, tighten the fixing screws

Step 6

Secure the fan baffle

Check if the exhausts fan can work normally as follows:

Step 1

Open the auxiliary power module door

Step 2

Trigger the blue test button above the exhaust fan control relay on the front side to force start the exhaust fan

Figure 32 – exausts fan test button

Step 3

Check if there is airflow at the exhaust fan outlet on the energy storage cabinet panel, and if the airflow is normal

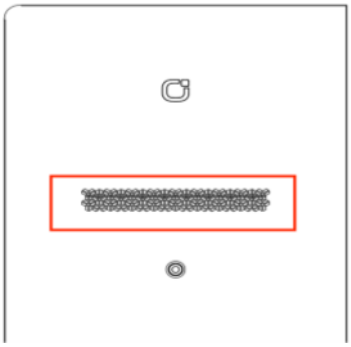


Figure 33 – air outlet

Step 4

If the exhaust fan operates normally, trigger the blue test button above the exhaust fan control relay again to reset the test button and turn off the exhaust fan

Step 5

Close the auxiliary power module door

4.13 Replacement of the water immersion sensor

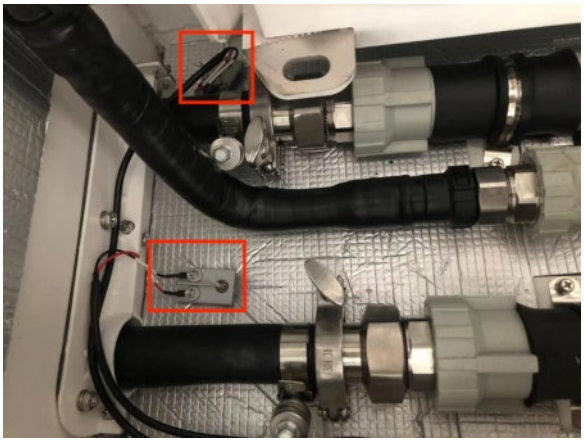


Figure 34 – water immersion sensor

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Disconnect the cables from the water immersion sensor

Step 2

Remove the faulty water immersion sensor

Step 3

Install the new water immersion sensor

Step 4

Connect the cables

4.14 Replacement of switching power supply

Figure 35 – switching power supply

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Disconnect the cables connected to the switching power supply and label them

Step 2

Remove the faulty switching power supply

Step 3

Install the new switching power supply

Step 4

Connect the cables according to the labels

Step 5

Power on the switching power supply, measure the output voltage of the switching power supply with a multimeter, and slowly rotate the adjustment screw on the switching power supply with a screwdriver to adjust the displayed voltage to 24.5V (TB1, TB2, TB3) / 25V (TB4), then release the screwdriver

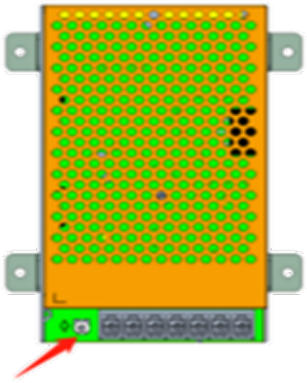


Figure 36 – adjustment screws

4.15 Replacement of the high voltage box

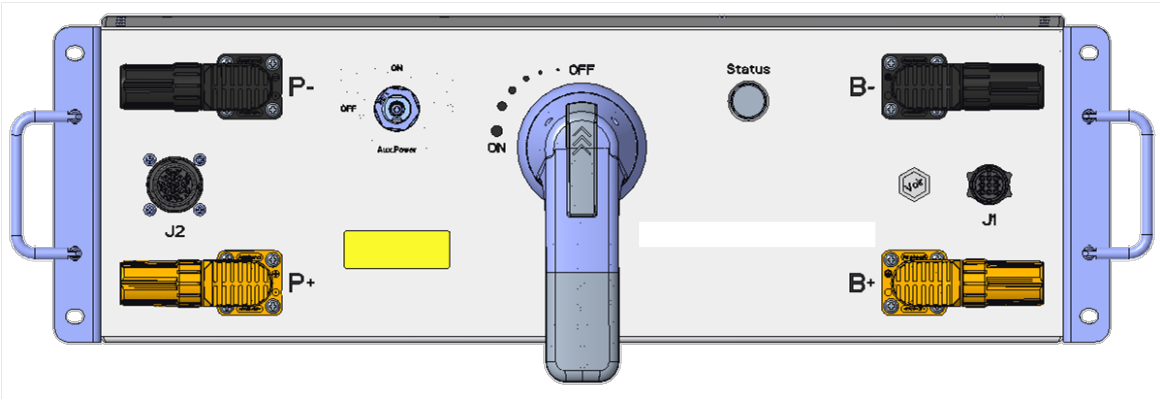


Figure 37 – high voltage box

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Insulated torque socket wrench	 screwdriver	 helmet

Operating Procedure:

Step 1

Disconnect the cables connected to the high-voltage box and label them

Step 2

Remove the fixing screws on both sides of the high-voltage box and the grounding screws

Step 3

Use the handles on both sides of the high-voltage box to pull it out of the slot while supporting the bottom of the high-voltage box with hands, then remove the faulty high-voltage box

Step 4

Install the new high-voltage box into the slot and secure it

Step 5

Connect the cables according to the labels

4.16 Replacement of the temperature sensor

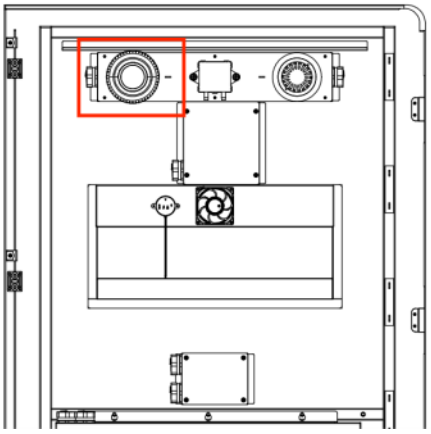


Figure 38 – temperature sensor

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Grasp the temperature sensor with your hand, rotate it counterclockwise by about 10 degrees, and pull it outwards

Step 2

Remove the faulty temperature sensor

Step 3

Install the new temperature sensor

Step 4

Rotate clockwise by about 10 degrees until it is tight

4.17 Replacement of the compound sensor

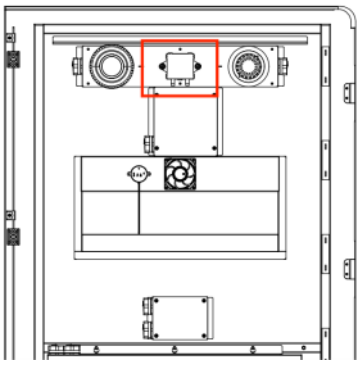


Figure 39 – compound sensor

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the fixing screws and disconnect the cables

Step 2

Remove the faulty compound sensor

Step 3

Install the new compound sensor and connect the cables

Step 4

Secure the screws

4.18 Replacement of the smoke sensor

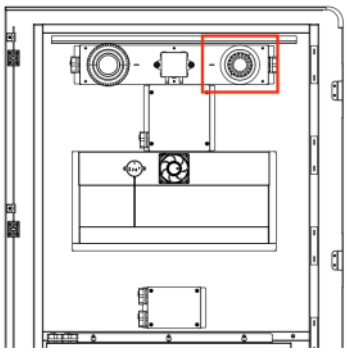


Figure 40 – smoke sensor

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Grasp the smoke sensor with your hand, rotate it counterclockwise by about 10 degrees, and pull it outwards

Step 2

Remove the faulty smoke sensor

Step 3

Install the new smoke sensor

Step 4

Rotate clockwise by about 10 degrees until it is tight

4.19 Replacement of the buzzer

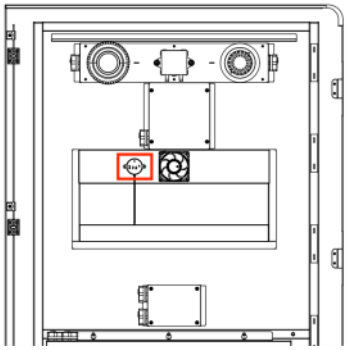


Figure 41 – buzzer

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

			
Safety gloves	Safety googles	screwdriver	helmet

Operating Procedure:

Step 1

Remove the fixing screws of the buzzer cover plate and the buzzer connection line

Step 2

Remove the faulty buzzer

Step 3

Connect the cables and install the new buzzer

Step 4

Secure the screws of the buzzer cover plate

4.20 Replacement of Energy storage inverter (PCS)

Figure 42 – PCS

⚠ **Danger**	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Insulated torque socket wrench	 screwdriver	 helmet

Operating Procedure:

Step 1

Disconnect the connecting cables of the energy storage inverter and label them

Step 2

Remove the door access switch

Step 3

Remove the fixing screws of the energy storage inverter

Step 4

Remove the faulty energy storage inverter

Step 5

Install the new energy storage inverter

Step 6

Connect the cables according to the labels

Step 7

Secure the fixing screws of the energy storage inverter

Step 8

Install the door access switch

4.21 Replacement of the fire extinguisher Cylinder

Figure 43 – Fire extinguisher cylinder access door

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Insulated torque socket wrench	 screwdriver	 keys

Operating Procedure:

Step 1

Remove the solenoid valve and the connecting pipe from the cylinder

Step 2

Remove the fixing screws of the fire extinguisher cylinder

Step 3

Remove the faulty fire extinguisher cylinder

Step 4

Replace it with a new fire extinguisher cylinder

Step 5

Install the solenoid valve and the connecting pipe

Step 6

Secure the screws of the fire extinguisher cylinder

4.22 Replacement of the liquid cooling unit

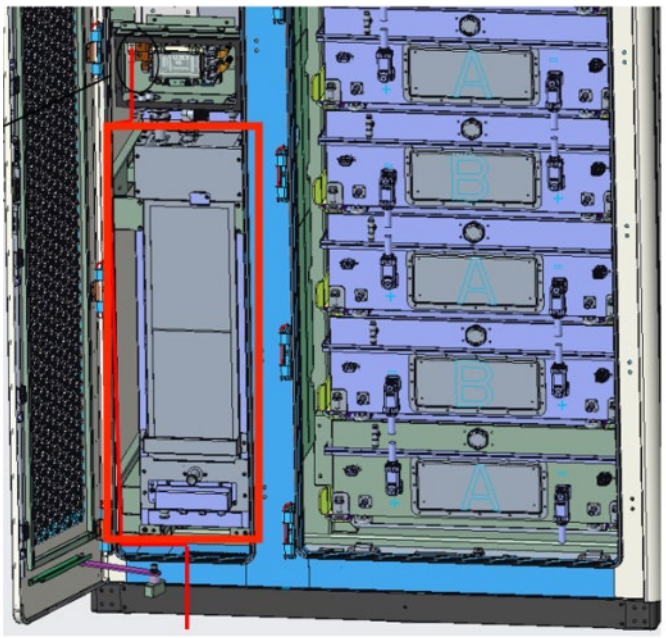


Figure 44 – liquid cooling unit

⚠ **Danger**	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Insulated torque socket wrench	 screwdriver	 Safety googles

Operating Procedure:

Step 1

Install the drainage tool and drain the liquid from the liquid cooling unit

Step 2

Disconnect the cables and piping of the liquid cooling unit

Step 3

Remove the fixing screws of the liquid cooling unit

Step 4

Remove the faulty liquid cooling unit

Step 5

Install the new liquid cooling unit

Step 6

Connect the cables and piping of the liquid cooling unit

Step 7

Secure the fixing screws of the liquid cooling unit

Step 8

Purge any remaining coolant from the liquid cooling piping

Step 9

Perform pressure testing on the liquid cooling unit and primary pipelines

Step 10

After passing the pressure test, perform pressure testing on the liquid cooling unit and secondary pipelines

Step 11

After passing the pressure test, refill the liquid cooling unit with coolant

Step 12

Remove the filling tool

4.23 Replacement of the CSU

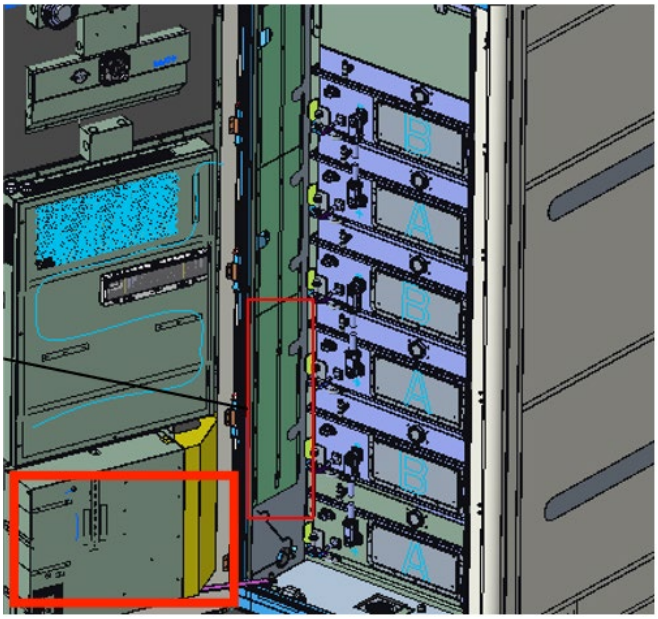


Figure 45 – CSU

Danger	**The energy storage system must be powered off to avoid the risk of electric shock**

Prepare tools and protective equipment

 Safety gloves	 Insulated torque socket wrench	 screwdriver	 Safety googles

Operating Procedure:

Step 1

Remove the screws of the CSU cover plate and open the cover

Step 2

Remove the fixing screws and disconnect the cables of the CSU

Step 3

Remove the faulty CSU

Step 4

Install the new CSU

Step 5

Connect the CSU cables and secure the fixing screws

Step 6

Close the cover plate and secure the screws

5. Emergency handling

When on-site accidents occur, including but not limited to the following listed dangerous situations, please ensure the personal safety of on-site personnel as the first priority and contact our company's after-sales service engineers immediately

Battery falling or strong impact

- If there is an obvious odor, damage, smoke, or fire, evacuate personnel immediately, sound the alarm promptly, and contact professional personnel. Professional personnel should use firefighting facilities to extinguish the fire under the premise of ensuring safety
- If there is no obvious deformation or damage, and no apparent odor, smoke, or fire, operations should be conducted under the premise of ensuring safety:
  - Warehouse: Evacuate personnel, and professional personnel should use mechanical tools to transfer the battery to a spacious and safe place. Contact our company's after-sales service engineer and keep the battery idle for 1 hour while monitoring the battery temperature within ±10°C of room temperature
  - On-site of the energy storage system: Evacuate personnel, close the energy storage system door, and professional personnel should use mechanical tools to transfer the battery to a spacious and safe place. Contact our company's after-sales service engineer and keep the battery idle for 1 hour before

Flood occurring

- Ensure personal safety first, then power off the system
- If any part of the battery is submerged in water, do not touch the battery to avoid electric shock
- Do not use flooded batteries; contact a battery recycling company for disposal

	**Do not open the battery box for maintenance in rainy, humid, or windy weather. If unavoidable, our company shall not be liable for any resulting losses**
Warning	**When it is raining, snowing, or foggy with high humidity, avoid opening the cabinet door. Also, after closing the cabinet door, ensure that the sealing strip around the door is not curled** **To reduce the risk of electric shock, do not perform any maintenance or repair operations beyond what is outlined in this manual. If necessary, contact our company's service personnel for maintenance and repair**

Fire occurring

- In the event of a fire, ensure safety first and then power off the system
- Firefighters should avoid contact with high-voltage components during firefighting to prevent electric shock risks
- When the battery temperature is too high, it may cause battery deformation, damage, and electrolyte overflow, releasing toxic gases. Wear respiratory protection equipment and avoid skin irritation and chemical burns

When the Sound and Light Alarm Is Activated When the device's logo indicator light flashes or the buzzer sounds

- Immediately move away
- Prohibit approaching
- Prohibit opening the door
- Remote power cut-off

Exaust starts occurrence

- Personal protection at the scene: Operators are prohibited from facing the exhaust port
- Post-disaster product maintenance: Contact our company's service engineer for assessment

Fire extinguishing spray occurrence

- Suggestions for on-site operation personnel:

  a. In the event of a fire, evacuate the building or equipment area, press the fire alarm bell, immediately dial the fire alarm number, notify professional firefighters, and provide them with relevant product information, including but not limited to: battery pack type, energy storage system capacity, battery pack location distribution, etc.

  b. Under any circumstances, it is forbidden to re-enter the burning building or equipment area and to open the energy storage system door. The site should be isolated and guarded, and unrelated personnel should be prohibited from approaching.

  c. After dialing the fire alarm number, under the premise of ensuring personal safety, remotely power off the system.

  d. After professional firefighters arrive, provide them with relevant product information, including but not limited to: battery pack type, energy storage system capacity, battery pack location

distribution, user manual, etc.

e. After professional firefighters confirm the fire extinguishing, follow local regulations for handling, and professional personnel should handle it. It is prohibited to open the energy storage system door privately.

f. Post-disaster product maintenance: Contact our company's after-sales engineer for assessment

- Suggestions for firefighting professionals: a. For product information, please refer to the information provided by the operation personnel, including but not limited to: battery pack type, energy storage system capacity, battery pack location distribution, user manual, etc. b. Do not open the energy storage system door until the safety of the internal energy storage system is ensured. c. Follow local firefighting regulations for firefighting operations

6. Cabinet maintenance

6.1 Repair in case of external damages

Inspect the extent of exterior damage and choose the appropriate solution based on the severity.

Solution 1: Surface dirt can be wiped off.

Solution 2: Surface dirt cannot be wiped off.

Solution 3: Primer damage reveals substrate.

⚠ **Attention**	**Check if the protective paint on the shell has peeled off or chipped. If so, repair it promptly** **Every 5 years, the entire exterior should be recoated with specialized protective paint**

Maintenance Procedures for **Solution 1**:

Cleaning Tools

No	Type	Source
1	Rag	Any
2	Water	
3	Alcohol or other non-abrasvive cleaner	

1. Use a cloth (or other scrubbing tool) dampened with water to scrub the dirty surface

2. If water alone cannot clean the surface, use 97% alcohol until the surface cleanliness reaches an acceptable level. (Alternatively, use commonly available non-corrosive cleaning agents

Maintenance Procedures for **Solution 2**:

Cleaning Tools

No	Type	Source
1	Sandpaper	Any
2	Rag	
3	Water	
4	Alcohol	
5	Brush	
6	Color paint specified by manufacturer	

1. Use sandpaper to smooth out the paint surface where there are bumps or scratches

2. Use a cloth dampened with water or 97% alcohol to scrub the damaged areas and remove surface stains

3. After the surface is dry, use a soft brush to touch up the scratched areas with paint, aiming for uniformity

Maintenance Procedures for **Solution 3**:

Cleaning Tools

No	Type	Source
1	Sandpaper	Any
2	Rag	
3	Water	
4	Alcohol	
5	Zinc rich primer	
6	Brush	
7	Color paint specified by manufacturer	

1. Use sandpaper to smooth out the damaged paint areas, removing surface rust and other roughness to achieve smoothness

2. Use a cloth dampened with water or 97% alcohol to scrub the damaged areas and remove surface stains and dust

3. After the surface is dry, spray zinc-rich primer on the exposed substrate for protection. The primer should completely cover the exposed substrate

4. After the primer is dry, use a soft brush to touch up the damaged areas with paint, aiming for uniformity

6.2 Check door locks and hinges

After cleaning, check whether the cabinet's door locks, hinges, etc., can be used normally and are in good condition. If necessary, lubricate the door lock holes, hinges, etc., appropriately

6.3 Check seals

Seals in good condition are an important guarantee to prevent internal cabinet water leakage and should be carefully checked. If damaged, replace them immediately

7. Liquid cooling maintenance

This liquid cooling equipment uses microprocessors and rarely experiences faults. To make the machine work more efficiently, it is recommended to perform maintenance on the following

7.1 Maintenance work (every 6 months)

During inspections, check the following:

- Pipe connection bolt inspection
- Seal inspection (including various valves, metal hoses, threaded/clamp/flange connections, etc.)
- Check for loose pipes and electrical interfaces
- Check for loose pipes and electrical interfaces
- Check the exhaust valve
- Check for damage or aging in the wiring and piping
- Check if there are historical alarms in the liquid cooling system's upper computer
- Confirm and record the above inspection items

7.2 Maintenance work (once a year)

The annual inspection is generally performed when the system is shut down for maintenance. Items that cannot be resolved online during daily operation should be addressed during the annual inspection and maintenance

- Check the cooling system's pipe connection seals and support brackets
- Check the bolt tightness
- Electrical insulation inspection of junction boxes and various electromechanical components
- Grounding resistance check
- Ammeter and voltmeter reading check
- Functional check of various mechanical components
- Manual exhaust valve function check
- Dust removal and cleaning of the liquid cooling unit and junction box
- Tighten the connections of various electrical components
- Test-run the liquid cooling system, ensuring no abnormal noise or alarms during operation, and no unqualified items after completion

8. Fire protection system maintenance

The fire protection system should be inspected and maintained regularly by dedicated personnel who have received specialized training and passed exams. Check and make inspection records according to the specified inspection categories for the gas fire extinguishing system. Any problems found during the inspection should be dealt with promptly

No	Device	Check	Attended result
1	Fire controller	Fire alarm function	Ensure that each controller undergoes at least one fire alarm function check every year
2	Buzzer and status light	Alarm function	Ensure that each on-site buzzer and status indicator light undergoes at least one audible and visual alarm function check every year

Smoke sensors and temperature sensors should be cleaned every 2 years; composite sensors should be zero-calibrated as required, and the gas-sensitive components should be replaced promptly when they reach the service life specified by the manufacturer

Terminal Blocks: Check all terminal blocks of sensors and bases, controllers, manual component buttons, fire hydrant buttons, fire electrical control devices, and other components in the system . Re-fasten the loose terminals; replace the corroded screws, terminal washers, and other wiring components; remove the rusted wire ends, re-connect after tinning

Smoke Sensors: Use professional equipment to clean the sensing components and circuit boards. After cleaning, the sensor response threshold should be calibrated, and it should be within the response threshold range specified in the manufacturer's finished product factory inspection regulations

Temperature Sensors: Use professional equipment to clean the temperature sensing components and circuit boards. After cleaning, the sensor response time should be calibrated, and it should be within the response time range specified in the manufacturer's finished product factory inspection regulations

Composite Sensors: Test the alarm function of standard gas detection composite sensors. When it does not meet the requirements, adjust the alarm threshold or replace the gas-sensitive components as required by the product manual, and then calibrate the sensor alarm threshold to the factory-set value

Products and Fire Electrical Control Devices: Use compressed air, brushes, etc., to remove dust from circuit boards, terminal blocks, etc.; use vacuum cleaners, damp cloths, etc., to remove dust from inside the cabinet. In damp places, desiccants can be placed inside the cabinet. Use a multimeter to measure the supply voltage of the controller's bus loop at the end of the detector or module. When the voltage is less than the specified value in the manual, replace the circuit board or adjust the wiring

Monthly inspections of the fire protection system should meet the following requirements:

- The entire system components, such as fire extinguishing agent storage containers, solenoid valves, connecting pipes, valve driving devices, nozzles, signal feedback devices, etc., should be free of collision deformation and other mechanical damage. The surface should be free of rust, the protective coating should be intact, and the nameplate and sign should be clear. The protective cover, lead seal, and safety signs of manual operation devices should be intact
- The pressure inside the fire extinguishing agent and driving gas storage containers must not be less than 90% of the design storage pressure.

Quarterly comprehensive inspections of the fire protection system should meet the following requirements:

- The types and distribution of combustibles, as well as the openness of protection zones, should meet design requirements
- Equipment between storage devices, fire extinguishing agent conveying pipelines and brackets should not be loose
- The connecting pipes should be free of deformation, cracks, and aging. When necessary, they should be tested or replaced by statutory quality inspection agencies
- Nozzle holes should be unobstructed

When damage or blockage is found in the fire extinguishing agent conveying pipeline, it should be subjected to a tightness test and blow-off according to the provisions of Section E.1 of GB50263-2007 Gas Fire Extinguishing System Construction and Acceptance Specification. Once a year, according to the provisions of Section E.2 of GB50263-2007 Gas Fire Extinguishing System Construction and Acceptance Specification, a simulated start-up test should be conducted for each protection zone.

The maintenance management of steel cylinders should be carried out in accordance with the Cylinder Safety Supervision Regulations, with a service life of 20 years. During use, if any of the following conditions are found, periodic inspections should be carried out in advance:

- Severe corrosion, damage, or doubts about their safety and reliability
- The storage or disuse time exceeds one inspection cycle

9. Other

9.1 Battery packs storage and single battery pack recharge

Incoming Inspection

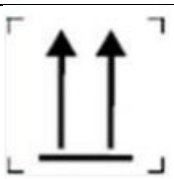
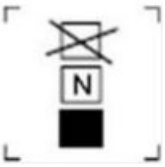
There should be a battery charging label on the outer packaging box of the battery pack. The charging label should indicate the last charging time and the next required charging time for the battery

Figure 46 – Label date indication

Warning	**Battery packs should be stored indoors, away from direct sunlight or rain, in a dry, well-ventilated area. The surrounding environment should be clean, free from significant infrared radiation, organic solvents or corrosive gases, metal conductive dust, etc., and should be kept away from heat sources and open flames** **If a battery pack malfunctions (carbonization, leakage, swelling, water ingress, etc.), it should be promptly transported to a hazardous materials storage room for separate storage, with a distance of no less than 3 meters from surrounding combustibles, and scrapped as soon as possible** **When storing battery packs, they should be placed correctly according to the markings on the packaging box, and it is strictly forbidden to place them upside down, sideways, or at an angle. When stacked, they should meet the stacking requirements on the outer packaging** **When storing battery packs, they should be stored separately to avoid mixing with other equipment and prevent excessive stacking of battery packs. The site must be equipped with fire-fighting facilities that meet the requirements, such as fire sand and fire extinguishers**

Attention	**Battery packs are recommended to be used in a timely manner. For battery packs stored for a long time, regular recharging is required to prevent battery damage**

Packaging symbols

Symbol	Meaning
	Upwards, indicating that the packaging should be stored vertically during transportation and storage
	Fragile items, indicating that fragile items are packed inside the packaging, and care should be taken when handling
	Rain-proof, indicating that the packaging is afraid of rain
	Stacking limit, the N in the figure indicates the maximum number of stacked identical packaging items, subject to the actual illustration

Storage Environment Requirements:

- Ambient temperature: -40°C to +60°C (recommended 20°C to 30°C)
- Relative humidity: 5% RH to 95% RH (recommended around 45% RH)
- Dry, ventilated, and clean
- Avoid contact with corrosive organic solvents, gases, etc
- Avoid direct sunlight
- The distance from heat sources must not be less than two meters
-

The battery storage room must be disconnected from external connections. If the battery panel has indicator lights, the indicator lights should be off

The storage time is calculated from the last charging time indicated on the battery's outer packaging charging label. After the battery is recharged, refresh the last charging time (recommended to record xx year xx month xx day xx hour xx minute) and the next charging time (next charging time = last charging time + charging cycle) on the charging label

The total storage and transportation time of battery packs should not exceed 8 months (calculated from the date of shipment). If it exceeds 8 months, recharging and SOC calibration are required, and at least 50% SOC needs to be supplemented. Failure to recharge as required may affect the performance and service life of the battery

Do not dismantle the outer packaging of the battery. If recharging of the battery is required, it must be carried out by professional personnel according to the requirements, and after recharging, the battery must be put back into the packaging

The warehouse administrator should monthly count the battery storage situation, regularly report the battery inventory situation, and arrange timely recharging for batteries stored for a long time

⚠ **Attention**	**Charging operations must be carried out by professionally trained personnel, wearing insulated gloves and using special insulated tools during operation** **During charging, someone must be on-site to observe and deal with abnormalities in a timely manner** **If the battery swells or emits smoke during charging, charging should be stopped immediately, and the battery should be scrapped**

Supplementary Power Supply Site AC Input Voltage

- Three-phase 260Vac-530Vac, single phase 176Vac-300Vac
- For charging the module, the AC input cable of the warehouse (which needs to meet the requirement of current capacity greater than 30A)

Battery packs stored beyond the expiration date should be reported promptly

When shipping battery packs, follow the first-in-first-out principle

Handle battery packs with care when moving them, and strictly prohibit damaging the batteries

Criteria for Overdue Storage

The storage and transportation time of the battery pack exceeds 8 months (calculated from the date of manufacture)

Recharge the stored battery every 8 months, maximum 3 times. If exceeded, the battery should be scrapped

Preparation of charging equipment

- Multimeter
- Ammeter
- Insulated torque socket wrench
- Charging equipment

Battery Pack Pre-Recharging Inspection

- Before recharging the battery pack, an external inspection is required. Only battery packs that pass the inspection can proceed to the next step of recharging, and defective battery packs should be scrapped
- If the battery pack does not exhibit the following conditions, it is considered to pass the external inspection:
  a. Deformation of the battery pack
  b. Damage to the outer shell of the battery pack
  c. Leakage of the battery pack
- Check whether the accessories supplied with the battery pack are complete according to the packing list provided with the charging equipment

Recharging preconditions

Charging environment temperature: 15°C to 40°C

Charge/Discharge Current (unit A)	Recharging Strategy
≤70A(0.25C)	Discharge first, then recharge to 50% SOC

Charging procedure

Step 1

Use the CAN communication cable (48V) supplied with the charging equipment to connect the communication interface of the charging equipment to the communication port of the battery

Step 2

Use the positive and negative DC input cables supplied with the charging equipment to connect the positive and negative cable interfaces of the charging equipment to the positive and negative terminals of the battery

Step 3

Use the power cable supplied with the charging equipment to connect the AC INPUT port of the charging equipment to the mains

Step 4

Close the AC breaker of the charging equipment

Step 5

Close the DC breaker of the charging equipment

Step 6

Operate the instruments according to the manual of the charging equipment

Step 7

After the charging and discharging are completed, let the fan inside the charging equipment continue to run for about 5 minutes to dissipate the residual heat in the machine. Then, turn off the AC and DC breakers and remove the cables

10. Contacts

If you have any questions about this product, please contact us. Contact number: 800727464

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