

**XIONGAN
YINGLI ENERGY TECHNOLOGY
CO., LTD**

**Integrated Battery Energy Storage
System User Manual**

XAYL-DSU-L261

Contents

1. Safety Instructions	4
1.1. Safety Symbols	4
1.2. Safety Instructions	5
1.3. Personal Operation Safety	11
2. Product General Description	12
2.1. Product Appearance	13
2.3. Operating environment	19
2.4. System architecture	20
2.5. Energy storage converter	26
2.6. Auxiliary Control	30
3. Installation instruction	39
3.1. Field installation instruction	39
3.2. Foundation Specifications	39
3.3. Base Mounting Hole Specifications	40
3.4. Foundation Description	41
3.5. Installation Description	41
3.6. Electrical Wiring instructions	44
3.7. Wiring and waterproofing treatment	46
3.8. Other treatment	46
4. Product identification, packaging, transportation and storage instructions	47
4.1. Product identification	47
4.2. Packaging	47
4.3. Transportation	47
4.4. Storage	47
5. Operation instructions	49
5.1. Trial running requirements	49
5.2. System Power-On and Power-Off Procedure	49
5.3. Local Interface Operation Instructions	51
5.4. System running	65
6. Fault Handling and Maintenance Instructions	67
6.1. Battery System Operational Fault Diagnosis and Troubleshooting Procedure	67
6.2. Fault Alarm Handling and Resolution Measures	67
6.3. Emergency Solutions	87
6.4. Maintenance	89
6.5. ANNEX	99
6.6. After-sales	104
7. Notice	105



8. Disclaimer	107
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1. Safety Instructions

To ensure the personal safety and property security of users during the installation of this product, and to guarantee optimal and effective usage, this manual provides relevant information and uses appropriate symbols to highlight critical details.

The following symbols may be used on the product or in this manual to indicate potential hurt to the equipment or personnel. Users must follow the corresponding procedures or practices. Failure to follow the instructions indicated by these symbols may result in partial or complete damage to the equipment and/or related devices, and could even lead to personal injury.

1.1. Safety Symbols

Safety symbols are used to alert operators to safety matters that should be observed during equipment installation, operation, and maintenance. Common symbols are as follows:

Symbols	Definition of Symbols
	DANGER! High-risk level hazard. If not avoided, will result in death or serious injury. Follow manual requirements to prevent serious accidents and fatal injuries.
	This symbol indicates the presence of high voltage inside the machine. Touching may cause electric shock hazard.
	This symbol indicates that improper operation may cause a fire.
	This symbol indicates that it must not be discarded with household waste.
	This symbol indicates that the instruction manual must be read before performing any operation on the product.
	This symbol indicates that the equipment contains AC and DC power terminals. Each power source must be disconnected separately and wait at least 10 minutes before servicing.
	This symbol indicates the Protective Earth (PE) terminal, which must be securely grounded to ensure operator safety.

Tabell-1 Safety Symbol

1.2. Safety Instructions

 **Note, Tip:** Before performing any operation related to power equipment, the operator needs to carefully read the relevant precautions and operating instructions, and strictly follow the safety instructions to avoid accidents. The safety precautions in this manual do not represent all safety matters that should be complied with, but only serve as a supplement to the safety precautions for various operations.

 **Note, Tip:** When installing, operating, and maintaining equipment, operators must operate according to the requirements of the user manual. Power equipment can only be repaired by professional maintenance personnel. Our company is not responsible for any consequences caused by violation of safety operation requirements or violation of safety standards for the design, production, and use of equipment.

 **Note, Tip:** If a situation occurs for which effective handling measures cannot be found in the manual, please contact your supplier for technical support. Any operation method not provided by our company is not recognized.

1.2.1. General Safety Requirements

DANGER

General Safety:

- ◆ Do not install, use, or operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment and cables, plugging outdoor signal interfaces, working at heights, outdoor installation) under severe weather conditions such as lightning, rain, snow, and strong winds.
- ◆ Before touching any conductor surface or terminal, the voltage at the contact point must be measured to ensure there is no risk of electric shock.
- ◆ In the event of a fire, quickly evacuate the building or equipment area and sound the fire alarm bell or call the fire department. Do not re-enter a burning building under any circumstances.
- ◆ Do not prohibit any protective devices.
- ◆ It is strictly forbidden to artificially alter, damage, or obscure the identification and nameplates on the equipment.

- ◆ Hot-line work is strictly prohibited during installation
- ◆ Do not clean electrical parts inside or outside the cabinet with water.。
- ◆ Do not change the structure and installation sequence of the equipments.
- ◆ You must not reverse engineer, decompile, adapt, implant, or otherwise create derivatives of the equipment software. You must not study the internal implementation of the equipment, obtain the source code of the equipment software, steal intellectual property, or disclose any results of the equipment software performance test.

WARNING

Personal Safety:

- ◆ During operation, if personal injury or equipment damage is possible, stop operation immediately, report to the supervisor, and take feasible protective measures.
- ◆ The surface temperature of electrified equipment is relatively high. Do not touch to avoid burns.
- ◆ Do not power on the equipment until the installation process is complete or the equipment has been confirmed by professionals.
- ◆ During installation, operation, and maintenance, special protective equipment such as insulated gloves, goggles, protective clothing, safety helmets, and safety shoes must be worn.
- ◆ Installation, operation, and maintenance must be carried out according to the steps and sequence described in the manual. Do not ignore any warnings, cautions, or precautions in the manual or on the equipment. Replace hazard signs that have become unrecognizable due to long-term use in a timely manner. Do not approach the equipment away from the operator.

NOTICE

- ◆ Used tools should have insulated handles to protect, or use insulated tools.
- ◆ All wiring holes should be sealed. Wiring holes containing wires should be blocked with fireproofing mud.
- ◆ During installation, a torque wrench with a suitable range should be selected, and screws should be tightened according to the torque specified in the manual. Master the correct usage of tools before use to avoid injuring people or damaging equipment.
- ◆ After installation, empty packaging materials such as cartons, foam, plastic, and cable ties should be removed from the equipment area.
- ◆ Paint scratches that occur during equipment transportation and installation should be repaired promptly. Do not expose scratches to the outdoor environment for long periods. Before operation, the equipment should be securely fixed to the floor or other stable object.

1. 2. 2. Mechanical Safety



Lifting:

- ◆ Do not walk under the boom and lifted load when lifting heavy objects.
- ◆ Personnel performing lifting operations must undergo relevant training and pass assessment before conducting lifting operations. Lifting equipment needs to be inspected. Only use complete equipment. Before lifting, ensure the lifting equipment is firmly fixed to load-bearing fixtures or walls. Use special lifting tools for lifting.
- ◆ When manually handling heavy objects, wear protective gloves to avoid injury.
- ◆ During equipment moving, be careful not to scratch the equipment surface or damage parts and cables. The equipment must be handled with care, avoiding collisions, drops, etc., that could cause equipment damage.
- ◆ During lifting, do not drag steel wires and slings, nor impact hard objects.
- ◆ When installing equipment or pulling equipment out of the cabinet, pay attention to unstable or heavy equipment installed on the top of the cabinet to avoid crushing or injury. When lifting heavy objects, be prepared for lifting to avoid crushing or sprains.
- ◆ When using a forklift for handling, the forks must be in the middle position to prevent tipping. Before moving, secure the equipment to the forklift with ropes; movement should be supervised by dedicated personnel.

1.2.3. Electrical Safety

**Lockout-Tagout:**

- ✓ Always follow lockout/tagout procedures before servicing the energy storage cabinet to ensure personnel do not encounter accidents caused by unexpected energization or exposure to harmful energy.
- ✓ To prevent personal injury or even death that may be caused by accidental use, defects, maintenance-related situations, or unauthorized personnel, do not touch any equipment inside the enclosure and keep the cabinet doors closed unless you are authorized personnel and wearing appropriate clothing and shoes that meet PPE requirements. Additionally, ensure all equipment is properly grounded.
- ✓ Isolate the energy storage cabinet's energy equipment and keep it in a locked or off position; only authorized personnel can unlock it when needed. These restrictions cannot be removed without a key or special means such as bolt cutters.

Grounding Requirements:

- ✓ For equipment that must be grounded, the ground wire should be installed first when installing the equipment, and the ground wire should be removed last when dismantling the equipment. Do not damage the grounding conductor.
- ✓ Do not operate the equipment before installing the grounding conductor.
- ✓ The equipment should be permanently connected to the protective earth. Before operating the equipment, check the electrical connections to ensure the equipment is safely grounded. Equipment grounding requirement is $<4\Omega$.

General Requirements:

- ✓ Before making electrical connections, ensure the equipment is intact; otherwise, electric shock or fire may occur. All electrical connections must comply with local electrical standards. Permission must be obtained from the local power department before grid connection.
- ✓ The prepared cables should meet the requirements of local laws and regulations. Special insulated tools must be used for high-voltage work.
- ✓ Do not connect or disconnect power lines while energized. Instantaneous contact between the power line core and conductor can generate arcs or sparks, which may cause fire or personal injury.
- ✓ The power switch must be turned off before connecting or disconnecting power lines.
- ✓ Before connecting the power line, check if the label on the power line is correct.
- ✓ If the equipment has multiple inputs, disconnect all inputs and wait for the equipment to be completely powered off before operating the equipment. If parts are damaged, they must be replaced by professionals to avoid risks.
- ✓ The selection, support, connection, and wiring of cables must comply with local laws, regulations, and standards.

1.2.4. Product Safety Requirements

DANGER

- ◆ Do not short-circuit the positive and negative poles of the product. Otherwise, strong current and high temperature may cause personal injury or fire. During the assembly and connection of the battery system, there should be sufficient safety protection to prevent short circuits.
- ◆ Do not overcharge or over-discharge the product. Otherwise, it may cause overheating of the cells within the module, leading to fire accidents. During product installation and use, multiple overcharge and over-discharge fault protection measures should be implemented in both hardware and software. The positive and negative poles of the product should be connected strictly according to the markings and instructions. Reverse or wrong connection is not allowed.
- ◆ The customer should firmly fix the product on a solid plane. Power lines should be securely tied in the correct position to avoid electricity and sparks generated by friction.
- ◆ During product use, protective measures should be taken to protect the product from mechanical vibration, collision, and pressure impact. Otherwise, internal short circuits may occur in the product, leading to high temperature and fire. The product has potential risks. Appropriate safety measures must be taken during operation and maintenance. Improper operation during safety performance testing may cause cell fire or module thermal runaway.
- ◆ Safety performance tests can only be performed by professionals in specialized laboratories equipped with suitable protective equipment. Otherwise, it may cause serious personal injury and property damage. Failure to comply with the above precautions may lead to different serious accidents.
- ◆ The customer may face the following risks during product use and operation: Operators may be injured by chemicals, electric shock, or arcs during operation. Although the human body's response to DC and AC electricity is different, both DC and AC electricity above 50V can cause serious harm to the human body. Therefore, the customer must adopt a conservative posture during operation to avoid current injury.
- ◆ When operating the product and selecting personal protective equipment, the customer and its employees must consider the above potential risks to prevent accidental short circuits resulting in arcs, explosions, or thermal runaway.

WARNING

- ◆ Do not immerse the product in water. Improper use and storage of the product can cause fire, explosion, and burning risks. Do not disassemble, crush, incinerate, or heat the product. Do not expose the product to fire or high-temperature environments exceeding the range specified in this specification for extended periods, otherwise it may cause a fire. Under any normal operating conditions, the temperature of the cells in the module must not exceed 55° C. If the temperature exceeds 55° C, shut down and stop operating the product.
- ◆ Keep the product out of reach of children. Do not remove the original packaging before use. When disposing of used products, they should be handled promptly according to local recycling or waste regulations.
- ◆ Do not disassemble, dismantle, or repair this product in any way. Do not mix products of different specifications, brands, or batches. If the product emits odor or shows abnormalities such as heating, deformation, discoloration, etc., do not use the product and move it to a safe place.
- ◆ The charging process of the product may stop inappropriately due to errors. If charging stops due to exceeding the allowed charging time, excessive charging voltage, or excessive charging current, this phenomenon is regarded as "inappropriate charging termination". When any of the above phenomena occur, it may mean that the battery system is leaking or some cells are damaged. At this time, the product should be stopped immediately and the supplier should be contacted for inspection and repair.
- ◆ If the product leaks electrolyte or emits odor, move it to a safe place away from fire sources to avoid fire. If electrolyte gets into the eyes, do not rub them. Rinse immediately with clean water and seek medical attention. If electrolyte comes into contact with skin or clothing, rinse immediately with clean water.
- ◆ When the internal resistance of the product in use exceeds 200% of its initial internal resistance or its capacity falls below 70% of the nominal capacity, the customer should discontinue use of the product. Otherwise, Yupont Smart Energy Technology (Jiaxing) Co., Ltd. shall not be liable for any discrepancies in product parameters, quality issues, battery cell failures, or any losses incurred.

1.3. Personal Operation Safety

- ◆ Thoroughly familiarize yourself with the components and working principles of this product, as well as the relevant standards in the country or region where the project is located.
- ◆ Personnel responsible for installing or maintaining the company's equipment must receive comprehensive training, understand all necessary safety precautions, and be capable of correctly performing all operations.
- ◆ Only qualified professionals or trained personnel are permitted to install, operate, and maintain the equipment.
- ◆ Only qualified professionals are allowed to remove safety devices or inspect the equipment.
- ◆ Personnel operating the equipment (including operators, trained personnel, and professionals) must possess special operation qualifications specified by their country, such as for high-voltage work and special equipment operation, and must have received training in professional mechanical and electrical knowledge.
- ◆ Only professionals or authorized personnel are permitted to replace equipment or components (including software).
- ◆ Professionals: Individuals who have received training or have operational experience with the equipment. They are aware of the sources and extent of potential hazards during installation, operation, and maintenance.
- ◆ Trained Personnel: Individuals who have undergone technical training and possess relevant experience. They understand the hazards they may encounter during certain operations and can take protective measures to minimize risks to themselves and others.
- ◆ Operators: Personnel, other than trained personnel and professionals, who may come into contact with the equipment. They understand how the



product works and how to operate it; are knowledgeable about battery operation and handling; are aware of how to address hazards and risks that may arise during the installation and use of electrical equipment; and are familiar with all applicable standard operating instructions, this manual, and all safety information.

2. Product General Description

This product is an industrial and commercial energy storage system designed and manufactured by Yupont Smart Energy Technology (Jiaxing) Co., Ltd. Its main components include an energy storage battery system, liquid cooling system, fire protection system, battery management system (BMS), and necessary auxiliary power distribution systems. The energy storage product has a rated energy capacity of 261.2 kWh and a rated power of 125 kW.

The system utilizes mature, safe, efficient, and long-life high-capacity lithium iron phosphate batteries, combined with a highly intelligent battery management system to ensure operational safety and performance stability. An advanced thermal management design and efficient intelligent control maintain uniform temperature distribution within the cabinet. An independent grounding system enhances operational safety, while an advanced and environmentally friendly preventive fire suppression system eliminates potential hazards proactively. Big data algorithms further enhance the system's safety, reliability, and performance stability.

2.1. Product Appearance

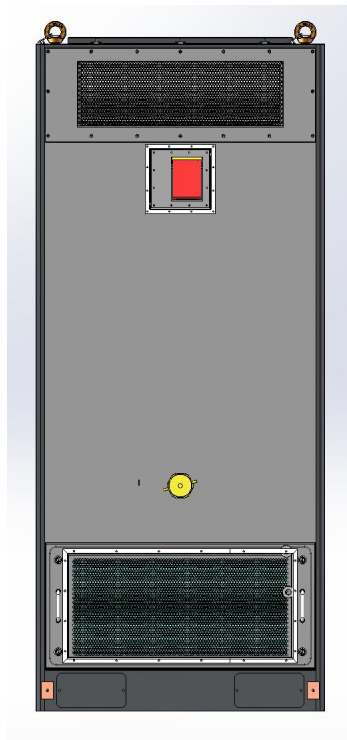


Figure 2-1 Front diagram of the energy storage cabinet

Figure 2-2 Back diagram of the energy storage cabinet

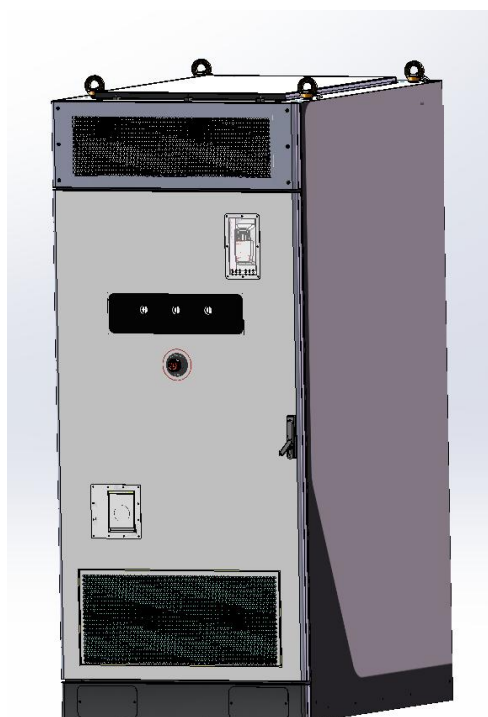


Figure 2-3 Side diagram of the energy storage cabinet

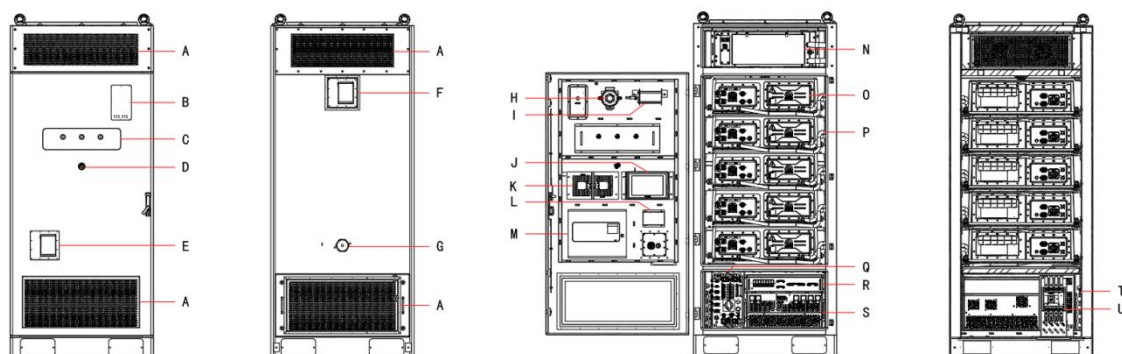


Figure 2-4 Distribution of energy storage cabinet components

NO.	Item	Description	Remark
A	Louver	Air inlet/outlet louver	
B	Sound & Light Alarm	Audible and visual alarm activated upon fire detection	
C	Indicator Lights	POWER/RUN/FAULT	
D	Emergency Stop Button	System emergency stop	
E	Motorized Inlet Louver	Drives inlet/outlet louvers upon detection of combustible gas	
F	Motorized Outlet Louver		
G	Water Fire Fighting Interface	Connects to external water supply via DN65 fitting	
H	Gas Detector	Detects combustible gas (Hz)	
I	Aerosol Fire Extinguishing Device	Releases extinguishing agent upon fire detection	
J	EMS	Energy Management System	
K	Switch	Network management device	
L	Fire Control Box	Fire alarm signal control box	
M	Fire Control Panel	Fire control host	
N	Liquid Cooling Unit	Cools the system via cycling the water	
O	PACK	Energy storage system unit	
P	Liquid Cooling Pipes	Piping for the liquid cooling system	
Q	High-Voltage Box	DC-side management unit	
R	Distribution Box	System power distribution unit	
S	PCS	Power Conversion System	



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Liquid Cooling Container User Manual

T	Surge Arrester	AC-side surge protection device	
U	Circuit Breaker	AC-side switch	

Table 2-1 Component description of liquid cooling cabinet

2.1.1 Distribution box

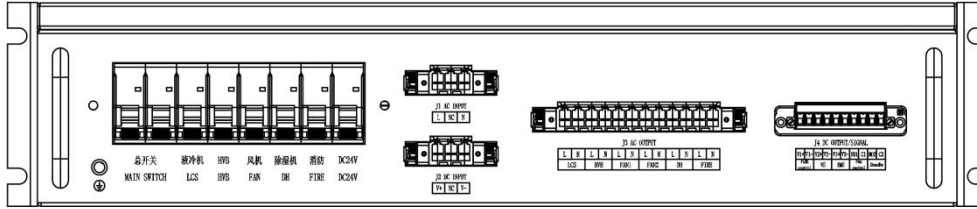


Figure2-5 Panel diagram of distribution box

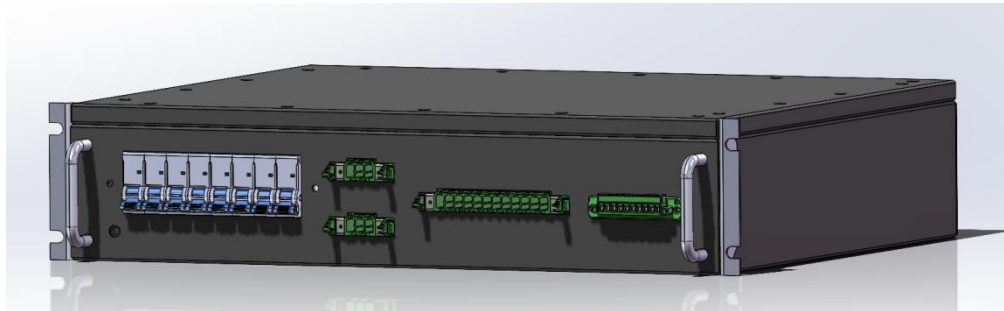


Figure2-6 Structure diagram of distribution box

NO.	Item	Description	Remark
1	MAIN SWITCH	Main power switch for AC distribution	
2	LCS	Power switch for the liquid cooling unit	
3	HVB	Power switch for the high-voltage box	
4	FAN	Power switch for the cooling fan	
5	DH	Power switch for the dehumidifier	
6	FIRE	Power switch for the fire control host	
7	DC24V	DC 24V power output switch	
8	J1 AC INPUT	Terminal block for AC 220V input	
9	J2 DC INPUT	Terminal block for DC 24V input	
10	J3 AC OUTPUT	Terminal block for AC 220V output	
11	J4 DC OUTPUT/SIGNAL	Terminal block for DC 24V and signal output	

Table 2-2 Panel item definition of Distribution Box

2.1.2 High-voltage Box

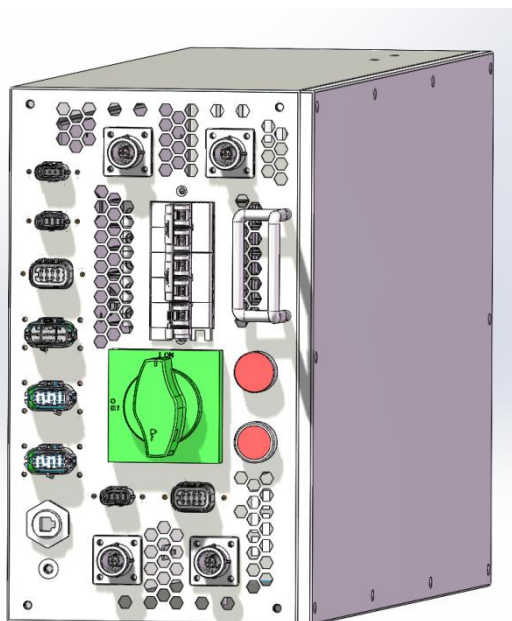
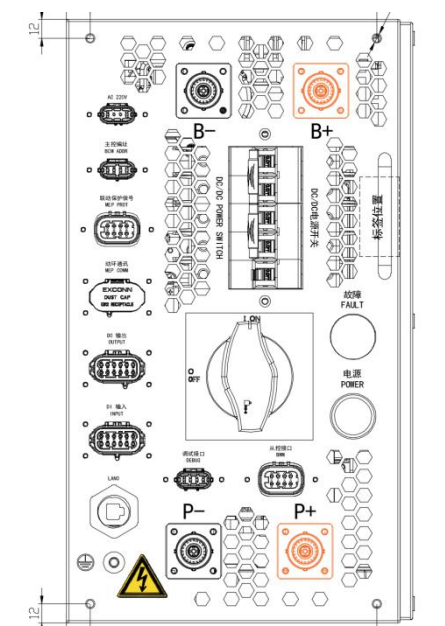


Figure2-6 Panel diagram of High-voltage box Figure2-7 Structure diagram of High-voltage box

NO.	Item	Description	Remark
1	B+	Battery Cluster Input Positive Terminal	
2	B-	Battery Cluster Input Negative Terminal	
3	P+	High-Voltage Box Output Positive Terminal	
4	P-	High-Voltage Box Output Negative Terminal	
5	POWER	BMS Power Switch (Control BMS power on/off)	
6	Circuit Breaker Handle	Manual Control for Battery Cluster High-Voltage Output	
7	DC/DC POWER SWITCH	DC/DC power switch	
8	FAULT	Fault Indicator Light	
9	AC220V	AC Power Input	
10	BCM ADDR	BMS Master Control Programming Interface	
11	MEP PROT	Linked Protection Signal	



		Interface	
12	MEP COMM	Dynamic Environment Monitoring Communication Interface	
13	OUTPUT	Signal Output Interface	
14	INPUT	Signal Input Interface	
15	BMM	BMS Slave Controller Interface	
16	DEBUG	Debugging Interface	
17	LANO	Network Interface	

Table2-3 Definition of High-Voltage Box Panel

2.2. Product model description and main parameters

Product main parameters

NO.	Item	Parameters	Remark
1	Battery Designation	IFpP72/175/208[(1P52S)5S]M/-30+40/90	
2	Battery Type	LFP	
3	Rated Energy(kWh)	261.248	
4	DC Voltage Range(Vdc)	728~936	
5	Nominal DC Voltage(Vdc)	832	
6	Rated AC Power(kW)	125	
7	Rated AC Current(A)	180	
8	Maximun AC Current(A)	198	
9	Rated AC Voltage(Vac)	400(3P+N+PE)	
10	Nominal AC Frequency(Hz)	50/60	
11	Auxiliary AC Voltage(Vac)	230	
12	Auxiliary AC Current(A)	<30	
13	Nominal Auxiliary AC Frequency(Hz)	50/60	
14	Auxiliary Power Supply(kW)	<6	
15	Communication Interface	LAN	
16	Cooling Mode	Liquid cooling	

17	Protective Class	I	Grounding Protection
18	Ingress Protection	IP54	Cabinet Body
19	Ingress Protection	IP67	PACK
20	Enclosure	C4	Corrosion Resistance Grade
21	Operating Temperature(°C)	-30~55	
22	Operating Humidity(%Rh)	5~95	
23	Altitude(m)	≤2000	
24	Dimension(W*D*H mm)	994*1350*2320.5	
25	Weight(kg)	2500(±5%)	

Table 2-4 Product main parameters

2.3. Operating environment

The energy storage cabinet is rated IP54, making it suitable for installation in dry and low-dust outdoor environments. Its design meets the requirements for installation in industrial settings in terms of EMC emission and immunity, as well as noise levels.

To ensure safe and efficient operation of the system, the following requirements must be observed when selecting an installation location:

- ◆ The energy storage cabinet has specific air intake and exhaust requirements. It must be installed in an open area that satisfies these ventilation design criteria. The installation surface must be dry and flat.
- ◆ Accumulation of water on the ground is strictly prohibited. The floor must be level, stable, and capable of fully supporting the weight of the equipment.
- ◆ The allowable ambient temperature range for the installation site is: -30° C to 55° C.
- ◆ The allowable relative humidity range is: 0% to 95% (non-condensing). Sufficient clearance must be maintained in front, behind, on

both sides, and above the equipment to allow for ventilation, heat dissipation, installation, maintenance, and safe evacuation. The equipment grounding resistance must be less than 4Ω . No flammable gases or combustible materials should be present in the installation space

2.4. System architecture

2.4.1. Electrical architecture

There is a total of 1 cluster in the energy storage cabinet, which outputs DC power . The auxiliary AC power distribution part is provided with energy from the outside. The electrical topology is shown in the following :

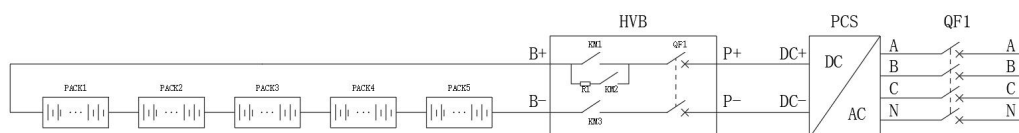


Figure 2-8 Topology diagram of the primary electrical system

2.4.2. Distribution system

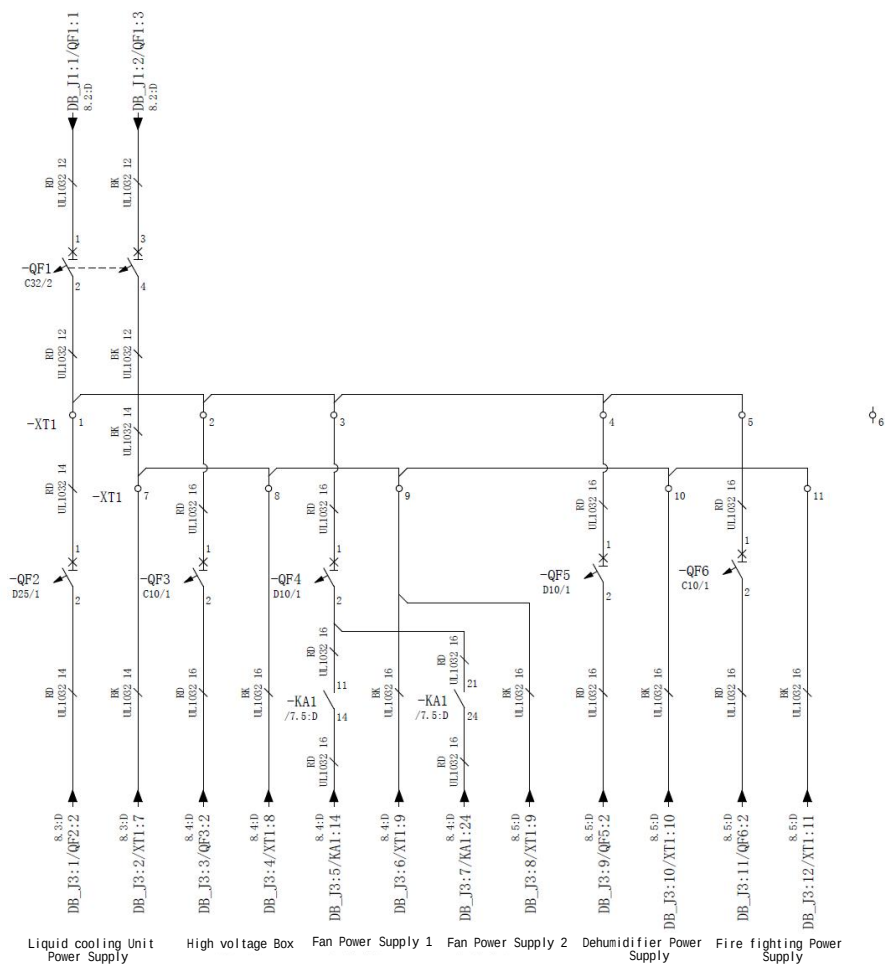


Figure 2-9 AC220V Distribution circuit diagram

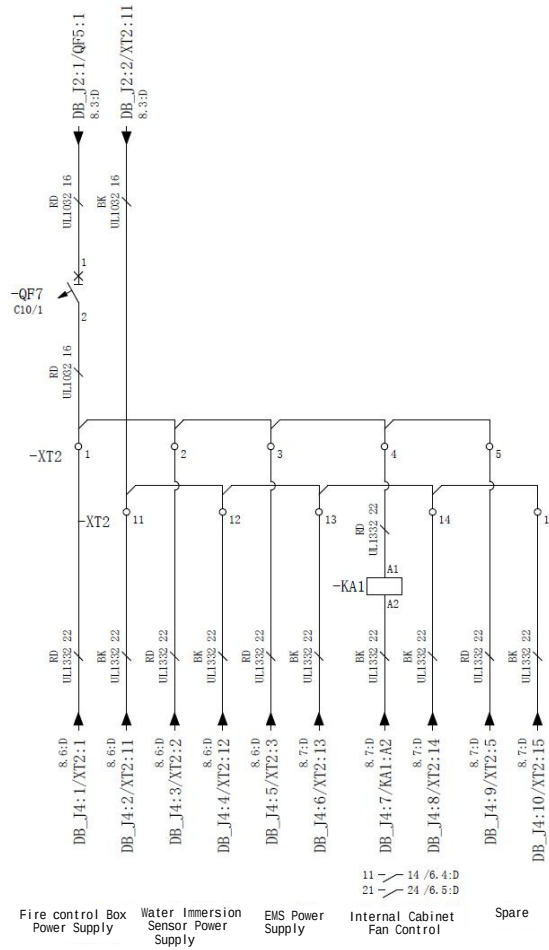


Figure 2-10 DC24V Signal circuit diagram

2.4.3. Battery system

The battery system consists of one standard battery cluster, which is composed of a battery plug-in box, a BMS system, a high-voltage box and a battery rack. The BMS system of the standard battery cluster is divided into two levels, including a acquisition module (installed in the battery plug-in box) and a secondary main control module (installed in the high-voltage box). The battery plug-in box used in the battery cluster is equipped with 52 314Ah lithium iron phosphate cells. A cluster of five battery modules.

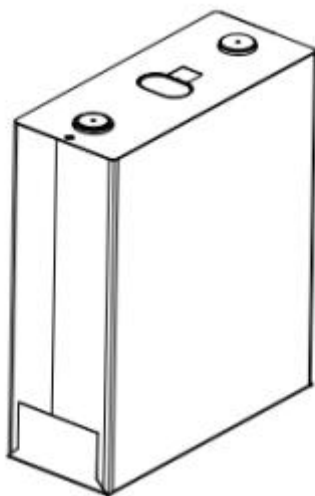


Figure 2-11 Diagram of cell structure

NO.	Item	Parameters	Remark
1	Battery Type	LFP	Square, aluminum shell
2	Nominal Voltage (V)	3.2	
3	Nominal Capacity (Ah)	314	
4	Nominal Charging Current (A)	157	
5	Maximum Charging Current (A)	314	
6	Nominal Discharge Current (A)	157	
7	Maximum Discharge Current (A)	314	
8	Voltage Range (V)	2.5~3.65V	
9	Dimension (W*D*H mm)	$71.7 \pm 0.5 \times 174.7 \pm 0.5 \times 207.11 \pm 0.5$	
10	Weight (kg)	5.6 ± 0.2	
11	Storage Temperature Range (°C)	-20°C~35°C	
12	Operating Temperature Range (°C)	Charge: 0°C~60°C Discharge: -30°C~60°C	
13	Humidity (%)	$RH \leq 95\%$	

Table 2-5 Cell parameters

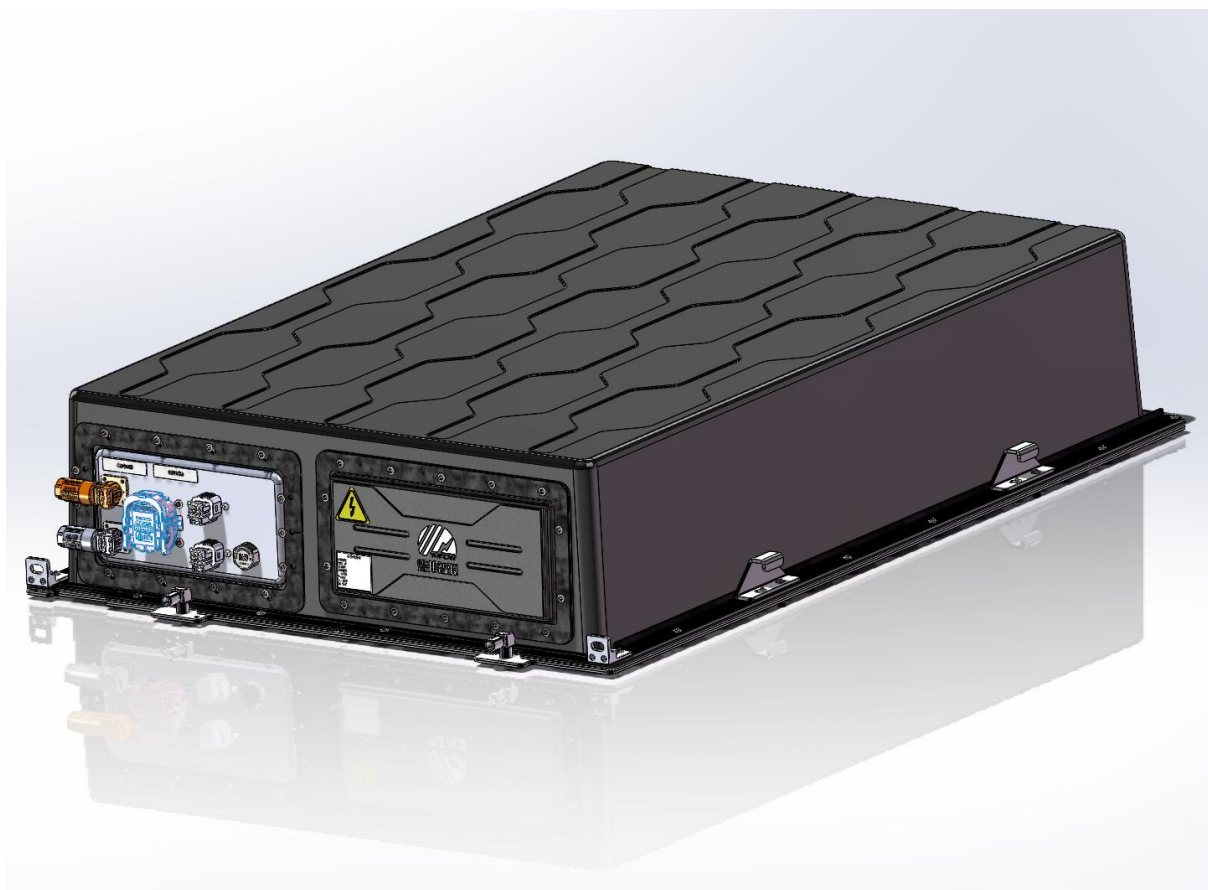


Figure 2-12 PACK structure diagram

NO.	Item		Parameter	Remark
1	Cell parameter	Rated Capacity (Ah)	314	
2	Battery Module	Configuration	1P52S	
		Rated Capacity (Ah)	314	
		Rated Energy (kWh)	52.2496	
		Rated Voltage (V)	166.4	
		Rated Charge/Discharge Rate (C)	0.5C	
		Voltage Range (V)	130~189.8V	
		Operating Voltage Range (V)	145.6~184.6V	



XIONGAN YINGLI ENERGY TECHNOLOGY CO., LTD

Liquid Cooling Container User Manual

NO.	Item		Parameter	Remark
		Weight (kg)	330 ± 10	
		Dimension (W×D×Hmm)	$808 \times 1172 \times 242$	

Table 2-6 Battery module parameters

2.5. Energy storage converter

2.5.1. Product Introduction

The energy storage converter (PCS) is a bidirectional controllable power conversion device that connects the energy storage battery system and the power grid. It enables precise and rapid regulation of voltage, frequency, and power between the grid and the energy storage system, supporting constant-power and constant-current charge/discharge operations, as well as smoothing the output of fluctuating power sources. Not only does the converter meet the conventional requirements of inverting DC to AC like a grid-tied inverter, but it also fulfills the bidirectional power conversion needs inherent to energy storage systems, which involve both charging and discharging. With its capability to both charge and discharge batteries, the PCS is suitable for a wide range of applications including photovoltaic and wind power smoothing, peak shaving and valley filling, and microgrid systems.

2.5.2. Product Theory

The energy storage converter (PCS) enables AC/DC conversion between the power grid and the battery, facilitating bidirectional energy flow. It serves as the primary executive unit and core component of an energy storage system. Equipped with advanced control strategies, the PCS performs functions such as: Charge and discharge management of batteries, Control of charging and discharging power for the battery energy storage system, Operation in both grid-connected and off-grid modes, including seamless transition between these modes. It also provides comprehensive protection features, including: Islanding protection, DC over-voltage protection, AC over-voltage and under-voltage protection, ensuring compliance with the requirements of both grid-connected and off-grid applications.

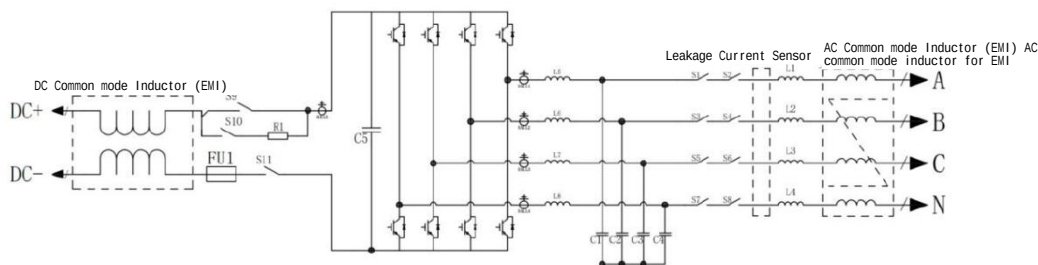


Figure 2-13 Three-Phase Four-Leg Four-Wire Topology Diagram

2.5.3. Product appearance and dimension

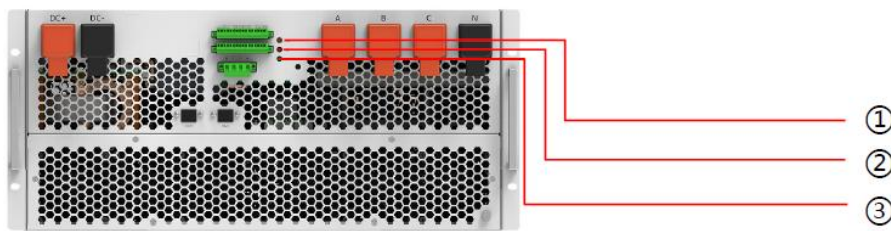


Figure 2-14 PCS appearance

NO.	Description
1	Product appearance
2	External Connection Area with Operation Status Indication

Table 2-7 External Device Introduction

2.5.4. LED Indicators



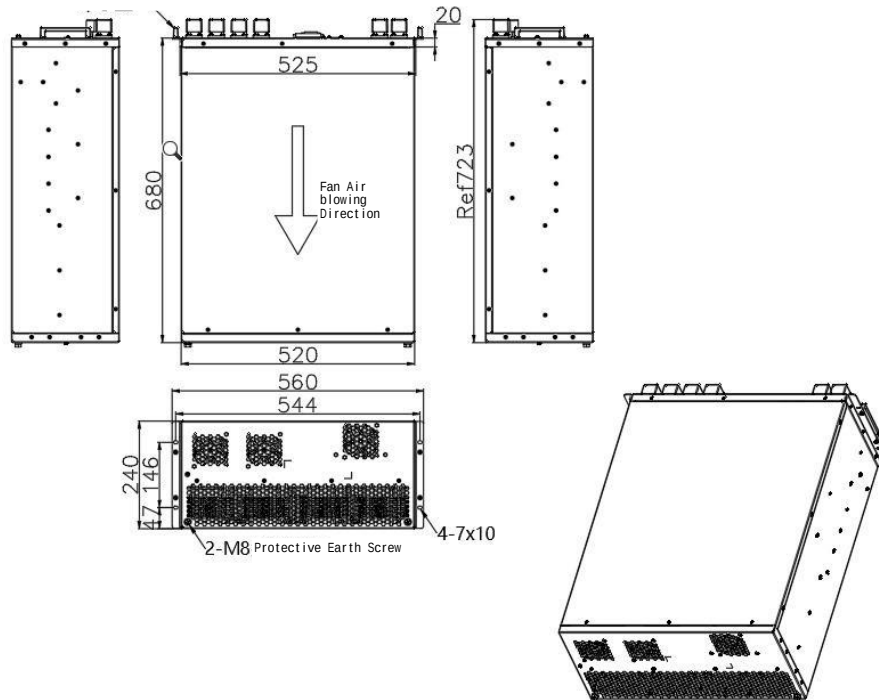
NO.	Item	Indicator definition
1	Yellow LED indicator	Hot-line indicator, his indicator lights up when DC input voltage exceeds 60V
2	Red LED indicator	Alarm Indicator, Lights up when a module fault alarm is triggered
3	Green LED indicator	Work indicator, Steady On (green): Module is operating normally Flashing (green): Module in standby or shutdown state

Table 2-8 Indicator definition

2.5.5. Product demension

The dimensions of the energy storage converter are as follows:

Handle for push/pull assistance only,
non load bearing



2.5.6. Product parameters:

NO.	Item	Parameters	Remark
DC			
1	DC Voltage Range	DC600V~1000V	
2	Full-Load DC Voltage Range	DC630V~950V	
3	Rated DC Current	198A	
4	Rated DC Power	125kW	
On-grid AC			
5	Rated AC Power	125kW	
6	Overload Capability	110% long-term, 120% for 1 min	Ambient temperature $\leq 40^{\circ}\text{C}$
7	Rated Voltage	AC400V	
8	Rated AC Current	180A	
9	Connection Type	3P4W	
10	Grid Voltage Range	400V (-15%~+15%)	
11	Grid Frequency Range	50Hz/60Hz $\pm 2.5\text{Hz}$	
12	THDi	$\leq 3\%$ (full load)	
13	Power Factor	0.99/-1~1	
14	DC Current	$\leq 0.5\%$	

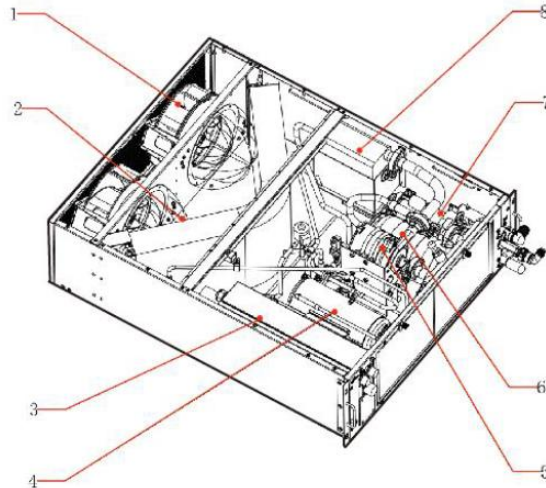
	Component		
15	Charge/Discharge Switch Time	<100ms	
Off-grid AC			
16	Off-Grid AC Voltage	AC400V	
17	AC Voltage Range	AC400V $\pm$ 3%	
18	Off-Grid AC Frequency	50Hz/60Hz	
19	Off-Grid output THDU	$\leq$ 3% (Linear load)	
20	Unbalanced Load Capability	100%	
Other parameters			
21	Maximum Conversion Efficiency	$\geq$ 99%	
22	Ambient Temperature	-30 $^{\circ}$ C $\sim$ 60 $^{\circ}$ C	$\geq$ 50 $^{\circ}$ C derating
23	Relative Humidity	$\leq$ 95%	No condensation
24	Noise	$\leq$ 75dB	
25	IP	20	
26	Altitude	3000 m	$\geq$ 2000m derating
27	Dimension	W520mm $\times$ H240mm $\times$ D680mm	
28	Weight	$\leq$ 70KG	
29	Cooling	Air	
30	Cable & Airflow	One or two times in the front, with the air flowing forward and the air flowing out behind	
31	EMS Communication interface	Ethernet or RS485	

Table 2-9 PCS parameters

2.6. Auxiliary Control

2.6.1. Liquid-cooling system

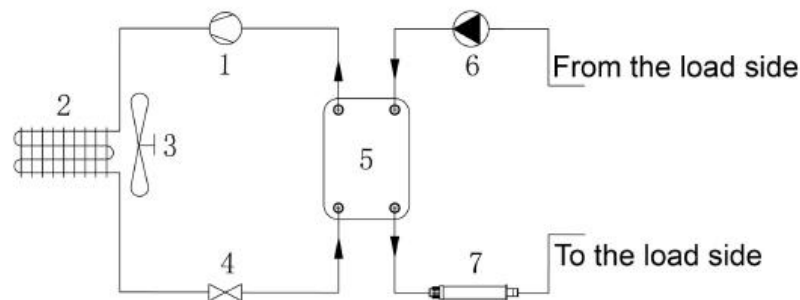
2.6.1.1 Liquid-cooling components



- | | | |
|-----------------------------|-------------------------|-------------------------|
| 1: External circulation fan | 2: Condenser | 3: Electric control box |
| 4: Compressor | 5: Water pump | 6: Expansion tank |
| 7: Electrical heater | 8: Plate heat exchanger | |

Figure 2-15 Structure diagram of liquid-cooling system

2.6.1.2 Schematic diagram of liquid-cooling system



- | | |
|-----------------------------|---------------------------|
| 1: Compressor | 2: Condenser |
| 3: External circulation fan | 4: Throttling element |
| 5: Plate heat exchanger | 6: Circulation water pump |
| 7: Electric heater | |

Figure 2-16 Schematic diagram of liquid-cooling system

NO.	Workflow
1	When the outlet liquid temperature reaches the cooling activation point, the compressor starts to compress the gaseous refrigerant.
2	The control system of the chiller adjusts the speed of the compressor motor based on the liquid outlet temperature or the requirements issued by the upper computer, thereby achieving control over the overall power and liquid outlet temperature of the machine.
3	The condenser condenses the high-temperature refrigerant, which changes from gaseous to liquid state.
4	The external circulation fan discharges the heat released by the refrigerant in the condenser to the outside.
5	The throttling element (electronic expansion valve) throttles and reduces the pressure of the condensed refrigerant.
6	The refrigerant after throttling and pressure reduction enters the plate heat exchanger, absorbs the heat of the coolant flowing through the plate heat exchanger and then evaporates.
7	The cooled coolant is continuously transported to the energy storage battery cabinet by the circulating water pump to cool down the battery pack.

Table 2-10 Liquid-cooling workflow

2.6.1.3 Control logic of liquid-cooling system

Item	Control logic	Description
Cooling	When the cooling demand exceeds 20%, start the cooling	$\text{Cooling demand (\%)} = (\text{Actual control temperature} - \text{cooling set point}) / \text{Cooling sensitivity} * 100\%$
	When the cooling demand is $\leq -80\%$, stop the cooling.	If the cooling set point is 18°C and the cooling sensitivity is 2°C, then the cooling start point is 18.4°C ($18^{\circ}\text{C} + 2^{\circ}\text{C} * 20\% = 18.4^{\circ}\text{C}$). The cooling stop point is 16.4°C ($18^{\circ}\text{C} - 2^{\circ}\text{C} * 80\% = 16.4^{\circ}\text{C}$). When the outlet liquid temperature is adopted as the actual control temperature: When the liquid outlet temperature is $\geq 18.4^{\circ}\text{C}$, the cooling of the unit is turned on.

		When the liquid outlet temperature is $\leq 16.4^{\circ}\text{C}$, the cooling of the unit stops.
Heat ing	When the heating demand exceeds 100%, start the heating	Heating start point (%)=(heating set point - actual control temperature)1 heating sensitivity *100% If the heating set point is 15°C and the heating sensitivity is 3°C , then the heating opening point is 12°C ($15^{\circ}\text{C}-3^{\circ}\text{C}*100\%=12^{\circ}\text{C}$). The heating stop point is 15°C ($15^{\circ}\text{C}-3^{\circ}\text{C}*0\%=15^{\circ}\text{C}$).
	When the heating demand is $\leq 0\%$, stop the heating.	When the outlet liquid temperature is adopted as the actual control temperature: When the liquid outlet temperature is $\leq 12^{\circ}\text{C}$, the unit starts heating. When the liquid outlet temperature exceeds 15°C , the unit stops heating.

Table 2-11 Control logic of liquid-cooling system

2.6.1.3 Liquid-cooling operating modes

Operating Modes	Description
Turn-off	All components are disabled but communication is maintained; connection with the upper-level monitoring system remains active.
Standby	The unit is on standby; the upper-level system can normally obtain and collect data.
self-circulation	The water pump operates at low speed to maintain fluid circulation; cooling/heating is disabled.
Cooling	When cooling is required: cooling is activated; the external circulation fan and compressor run; the internal water pump operates at high speed. When cooling is not required: the external fan and compressor are turned off; the internal water pump runs at low speed.
Heating	When heating is required: the electric heater operates; the internal water pump runs at high speed. When heating is not required: the electric heater is turned off; the internal water pump runs at low speed.
Full-auto	The unit automatically switches between cooling, heating, and self-circulation modes based on actual demand.

Table 2-12 Liquid-cooling operating modes

2.6.1.4 Liquid-cooling Parameters

Parameters		EMW50HFNC1A
Dimension, weight& installation		
Dimension (HxWxD)	mm	245×700×900mm
Weight(excluding coolant)	kg	75
Installation method	/	Drawer
Environment	/	outdoor
Inlet and outlet pipe interface	/	DN20
Environmental protection & performance		
Operating environment	℃	-30~+55
Storage environment	℃	-40~+70
Noise@1m	dB(A)	75
Anti-corrosion	/	C3M
Equipment appearance color	/	outdoor orange RAL7035
IP	/	IPX5
Refrigerant	/	R134a
Coolant	/	50% ethylene glycol water solution
RoHS	/	Yes
Life	Year	10
Air outlet	/	Rear air outlet
Cooling/Heating capacity		
Cooling@L35/W18	kW	5.0
Heating@Tu=10℃	kW	2.0
Outlet water temperature	℃	18
Parameter setting		
The liquid temperature setting range	℃	10~35 (heating point ≤ cooling point)
Default cooling set point	℃	18
Default heating set point	℃	15
Communication protocol	/	RS485/CAN
Cycling water flow		
Rated circulating water flow rate	L/min	46.5L/min
Rated external circulation	kPa	60
Power consumption		



Cooling input power@L35/W18	kW	2.50
Heating input power @Tu=10 °C	kW	2.35
Self-circulation model (single water pump operation) power	kW	0.25
The maximum power consumption	kW	3.60
Power supply system		
Rated working voltage	V, Hz	220~240V 50/60Hz
Supported voltage range	V, Hz	220V $\pm$ 15%, 50/60 $\pm$ 3Hz
Maximum operating current	A	19.2

Table 2-13 Liquid-cooling Parameters

2.6.2. Fire Protection System

The energy storage fire control linkage system can be divided into a gas fire suppression system, a ventilation and exhaust system, and a water sprinkler system. When thermal runaway of batteries leads to the leakage of combustible or toxic gases, the ventilation and exhaust system responds promptly to expel fumes and exchange air. In the event of a fire, the fire suppression system quickly intervenes to perform actions such as detection, alarm, and fire extinguishing. If the fire spreads or reignites and the fire suppression system is unable to control it, the water sprinkler system can be activated for emergency intervention to prevent severe consequences such as deflagration or large-scale fires.

2.6.2.1 Gas Fire Suppression Control System

The gas fire suppression control system consists of the following components:

One (1) gas fire suppression control panel

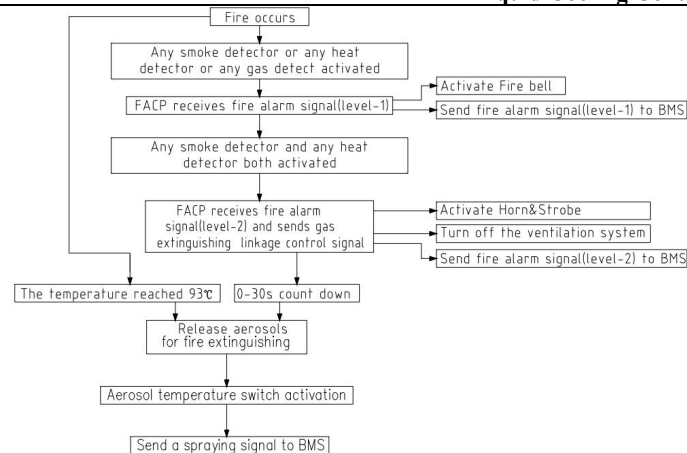
One (1) smoke detector

One (1) heat detector

One (1) audible and visual alarm

One (1) set of aerosol generator units.

The schematic diagram and control logic diagram for the fire alarm and gas suppression system are provided below:



Control Logic Diagram of Automatic Fire Alarm and Gas Fire Suppression System

Tbale 2-13 Schematic and Control Logic Diagram for Fire Alarm and Gas Suppression System

When the system is in automatic mode, the activation of any single device (one smoke detector, one heat detector, or one gas detector) within the industrial and commercial cabinet will cause the fire alarm control panel to receive a Stage 1 fire alarm signal. This triggers the audible and visual alarms and simultaneously transmits the Stage 1 fire alarm signal to the Battery Management System (BMS).

Upon the simultaneous activation of one smoke detector AND one heat detector within the cabinet, the gas suppression control panel receives a Stage 2 fire alarm signal. This activates the audible and visual alarms, sends an interlock signal to shut down the intake and exhaust ventilation equipment, and transmits the Stage 2 fire alarm signal to the BMS. Following the Stage 2 alarm, the gas suppression control panel initiates a 30-second discharge delay sequence for the aerosol suppression system. Once the delay period elapses, the aerosol generator unit is activated to release the extinguishing agent into the protected area. A confirmation signal is simultaneously sent to the BMS.

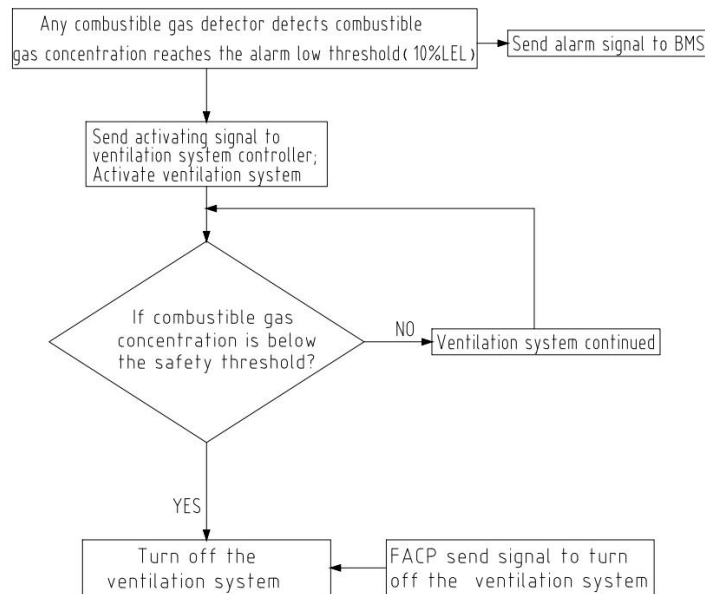
Additionally, as a mechanical backup, the aerosol unit will activate automatically to discharge agent into the protected area and send a feedback signal to the BMS if the temperature inside the cabinet reaches 93°C, irrespective of the control system's status.

2. 6. 2. 2 Ventilation and Exhaust System

The ventilation and exhaust system consists of one (1) hydrogen (H₂) combustible gas detector, one (1) exhaust fan, and one (1) motorized air intake louver. The system is designed with a "supply-in and exhaust-out" configuration. The exhaust fan and the motorized louver

are installed diagonally opposite each other to ensure optimal airflow. The air supply system introduces outside air from the bottom of the energy storage cabinet, while the exhaust system directly extracts and discharges air delivered from the bottom supply, along with air from the upper levels, out of the cabinet.

Schematic and Control Logic Diagram for Ventilation and Exhaust System:



Control logic diagram of the intake and exhaust air systems

Table 2-14 Schematic and Control Logic Diagram for Ventilation and Exhaust System

Automatic Control Strategy: Upon detecting that the gas concentration reaches the first-stage alarm threshold (10% LEL), the combustible gas detector immediately issues a first-stage threshold alarm signal. This signal is transmitted to the Battery Management System (BMS) as a gas alarm and simultaneously to the ventilation system control box as an interlock command to start the ventilation and exhaust system. The ventilation and exhaust system will continue to operate until the gas concentration readings from all monitoring points fall below the first-stage alarm threshold. Once this condition is met, the gas suppression control panel sends an interlock shutdown signal to the ventilation system control box, prompting the system to stop running.

Furthermore, upon receiving a fire suppression interlock signal from the gas suppression control panel, the ventilation system control box must immediately shut down the motorized intake louvers and exhaust fan, irrespective of the current alarm status of the gas detectors.



2. 6. 2. 3 Fire Sprinkler System

This energy storage cabinet employs a flooding-based fire suppression strategy. In the event of a fire, the fire water hose can be connected to the standard quick-connect coupling to supply water into the cabinet. The cabinet base is pre-equipped with a water-based firefighting interface, which is a DN65 standard European threaded connection (provided with a protective cap), ensuring compatibility with European firefighting water connections.

Interlock Logic:

Upon the fire control panel outputting a "Stage 1 Fire Alarm" dry contact signal to the BMS, the system shall shut down. The cabinet's fire control panel shall simultaneously activate the external audible and visual alarm.

Upon the fire control panel outputting a "Stage 2 Fire Alarm" dry contact signal to the BMS, and in accordance with the "de-energize first, suppress second" principle, the EMS shall trip both the DC-side and AC-side breakers within the cabinet, cutting off all power distribution except for the dedicated power supplies to the BMS and EMS. The fire control panel shall initiate the suppression sequence. Following a 30-second delay, the aerosol suppression system is activated to discharge the extinguishing agent. The external audible and visual alarm shall remain activated throughout this process until the aerosol discharge is complete, the backup power is depleted, the emergency stop button on the exterior of the cabinet is pressed, or a remote stop command is issued from the fire control room.

Upon the fire system issuing any fault signal, the system shall shut down. The EMS shall trip both the DC-side and AC-side breakers within the cabinet, cutting off all power distribution except for the BMS and EMS



power supplies. System operation may only resume after the fire system fault signal is cleared and normal status is restored.

3. Installation instruction

3.1. Field installation instruction

Field Selection and Preparation Guidelines:

When selecting an installation field, the following principles must be adhered to as a minimum:

1. The climatic conditions and geological features (e.g., groundwater level) of the proposed site must be thoroughly evaluated to ensure suitability for the energy storage system.
2. The surrounding area must be dry, well-ventilated, and maintain a safe distance from any flammable or explosive materials.
3. The soil at the installation site must possess adequate compactness. A relative compaction of the site soil $\geq 98\%$ is recommended. If the soil is loose, necessary measures must be taken to ensure a stable and secure foundation.

3.2. Foundation Specifications

Foundation Specifications for Energy Storage System Installation

The foundation for the energy storage system must be designed and constructed in advance according to specific standards to meet requirements for mechanical support, cable routing, and future maintenance and inspection. During construction, the following requirements shall be met as a minimum:

1. The bottom of the foundation pit must be thoroughly compacted and leveled.
2. The foundation must provide adequate load-bearing capacity to effectively support the energy storage system.
3. The foundation must elevate the energy storage system to protect its base and interior from rainwater erosion. It is recommended that the foundation height be approximately 300 mm above the surrounding finished grade level.
4. Appropriate drainage measures must be installed, considering local geological conditions.
5. A concrete foundation with sufficient cross-sectional area and height must be constructed. The final height shall be determined by the contractor based on the site-specific soil conditions.

6. Cable routing must be considered during the foundation design and construction.
7. A maintenance platform shall be constructed around the foundation to facilitate future servicing.
8. Sufficient space for cable trenches must be reserved and cable conduits must be pre-embedded during foundation construction, based on the location and dimensions of the cabinet's cable entry and exit points.
9. The specification and quantity of conduit penetration pipes must be determined according to the cable type and the number of incoming/outgoing circuits.
10. All ends of pre-embedded conduits must be temporarily sealed to prevent the ingress of debris; failure to do so will hinder future cable pulling.
11. After all cables are connected, the cable entries, exits, and joints must be sealed with fire-resistant putty or other suitable material to prevent rodent ingress.
12. The entire energy storage cabinet is installed on the foundation. After soil compaction, a C15 concrete blinding layer is laid. The foundation base slab must be reinforced concrete, with the top surface leveled accurately. All embedded parts must be positioned with an elevation tolerance not exceeding ± 3 mm and a positional deviation not exceeding ± 5 mm.
13. Main reinforcement bars shall be of grade HRB335 steel or higher; stirrups shall be of grade HPB300 steel or higher. Columns and ring beams shall be cast using C25 concrete.
14. The number and diameter of conduits for incoming/outgoing cables can be determined based on the user's specific requirements and cable entry/exit locations.
15. The cabinet can be integrated with the foundation by welding to the embedded parts or secured using expansion bolts.
16. The cabinet must be reliably grounded. The grounding grid can be constructed by driving 50x5 hot-dip galvanized steel angle bars into the soil near the foundation to a depth of not less than 2.5 meters. The ground resistance at the cabinet must not exceed 4Ω .

3.3. Base Mounting Hole Specifications

When installing and building the foundation, the issue of the energy storage cabinet's outgoing lines needs to be taken into account. Reserve a trench or an incoming line hole. Please refer to the installation hole positions shown in the following figure.

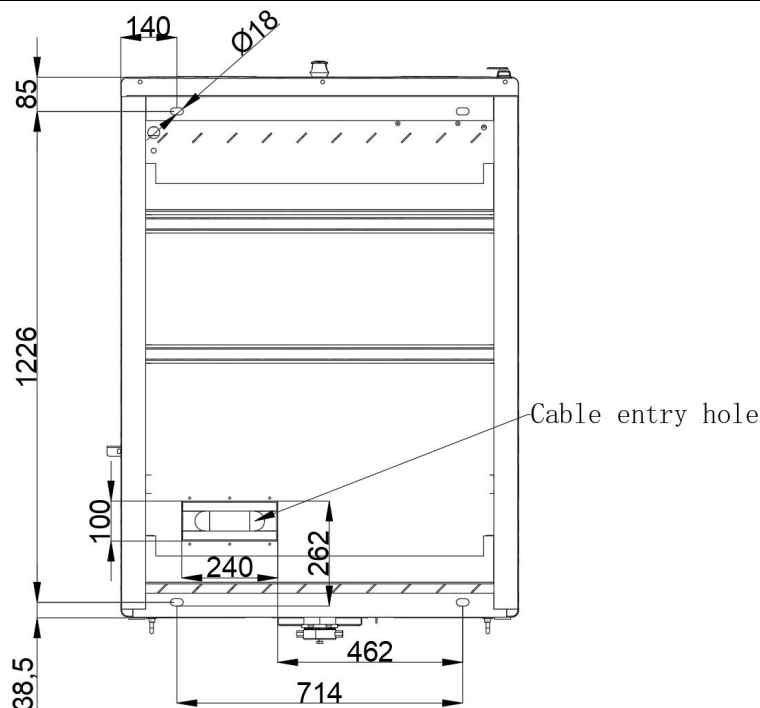


Figure 3-1 Schematic diagram of the energy storage cabinet base

3.4. Foundation Description

The energy storage cabinet adopts the down-entry method, and the foundation needs to be pre-set on site. The following requirements are imposed on the foundation:

- 1) As the energy storage cabinet adopts bottom wiring, the foundation must be designed with necessary dust-proof and rat-proof measures to prevent foreign objects from entering.
- 2) The foundation needs to have necessary waterproof and moisture-proof designs to prevent cable aging and short circuits, which may affect the normal operation of the energy storage cabinet.
- 3) Due to the large power of the energy storage cabinet and the relatively thick cables required, the cross-sectional area of the cables needs to be fully considered during the foundation design.

After confirming that the foundation construction meets the requirements and is dry, solid and level enough, hoist the energy storage cabinet to the designated position. Fix the energy storage cabinet to the foundation using fastening bolts.

3.5. Installation Description

A. Forklift transportation

If the installation site is flat, a forklift can be used to move the energy storage cabinet. The bottom of the energy storage cabinet is equipped with fork holes specially designed for

forklift transportation. If forklift transportation is used, the following requirements should be met:

1. Forklifts should be equipped with sufficient load-bearing capacity (at least 6 tons);
2. The length of the pins should be at least 1800mm.
3. The pins should be inserted into the fork holes at the bottom of the energy storage cabinet (for the position of the fork holes, please refer to the following figure).
4. The transportation, movement and lowering of energy storage cabinets should be slow and steady.
5. The energy storage cabinet can only be placed on a stable surface. The place should have good drainage and no obstacles or bulges.
6. Move the energy storage cabinet through the bottom front fork pocket.
7. Under no circumstances should the energy storage cabinet be moved by inserting the pins into any position other than the fork holes.
8. Before delivery, the sockets of the energy storage cabinet are exposed. It is recommended to seal the sockets with the attached cover plate after on-site installation is completed.

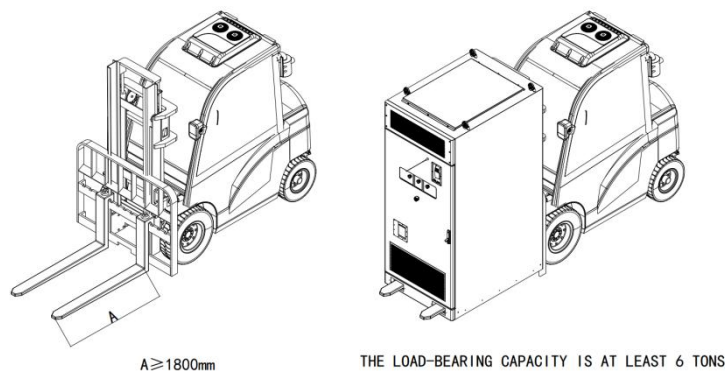


Figure 3-2 Schematic diagram of forklift transportation

B. Lifting and transportation

When lifting the energy storage cabinet, the entire process of lifting the energy storage cabinet must be strictly carried out in accordance with the safety operation procedures of the crane. No one is allowed to stand within a range of 5 to 10 meters in the operation area. In particular, no one is allowed to stand under the lifting boom or the lifted or moving machinery to prevent casualties. In case of adverse weather conditions such as heavy rain, thick fog or

strong wind, lifting work should be stopped. Lifting must at least meet the following requirements:

1. When lifting, it is essential to ensure on-site safety.
2. When conducting hoisting and installation operations, there should be professional personnel on site to direct throughout the process.
3. The strength of the slings used should be sufficient to bear the weight of the energy storage cabinet.
4. Only lifting slings can be used to lift the energy storage cabinets whose packaging has not been removed.
5. The length of the sling can be appropriately adjusted according to the actual requirements on site.
6. During the entire lifting process, it is essential to ensure that the energy storage cabinet remains stable and does not tilt.
7. Take all necessary auxiliary measures to ensure the safe and smooth lifting of the energy storage cabinet.

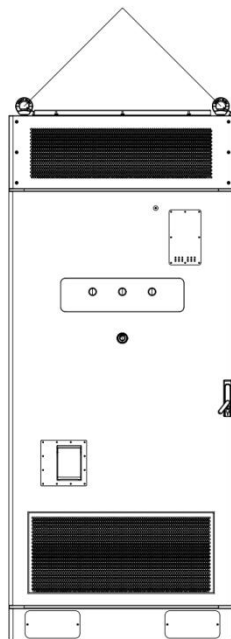


Figure 3-3 Schematic diagram of lifting

3.6. Electrical Wiring instructions

A. Notice

1) Before making electrical connections, check to ensure the integrity and insulation of all cables. If there are any damaged cables, please replace them in time. Poor insulation or damaged cables may cause danger.

2) Before wiring, it is necessary to check the polarity of all input cables to ensure that the polarity or phase sequence of each input is correct.

3) During the electrical installation process, do not pull the cables or wires forcefully to avoid damaging their insulation performance.

4) All cables and wires should ensure a certain amount of bending space.

5) Take necessary auxiliary measures to reduce the stress on the cables or wires.

6) After each step of wiring operation is completed, a careful inspection must be carried out to ensure that the wiring is correct and firm.

7) Accidental contact with live terminals may cause a fatal electric shock hazard!

8) Ensure that the AC/DC switch of the energy storage converter is in the off position and that the terminal blocks are not electrified.

9) When connecting to the power grid, permission from relevant departments must be obtained and all safety instructions and regulations related to the power grid must be followed.

B. Grounding connection

Before the energy storage leaves the factory, the wiring from the main internal electrical equipment to the grounding terminal has all been completed. The connection between the energy storage cabinet and the ground needs to be completed on site. The following operations should be carried out:

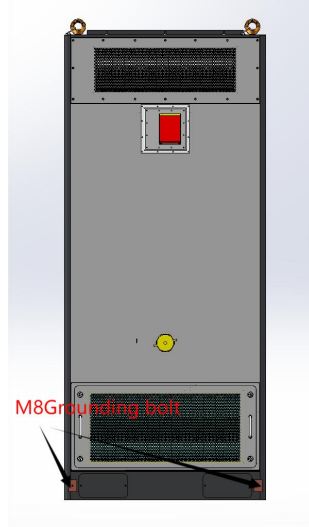


Figure 3-4 Schematic diagram of grounding connection

B. The above Figure shows the location of the external grounding point. Please install the external grounding in combination with the actual situation of the project site and follow the instructions of the staff. After the grounding connection is completed, the grounding resistance must be measured. The grounding resistance value also needs to refer to the relevant standards of the country/region where the project is located.

C. Cable connection

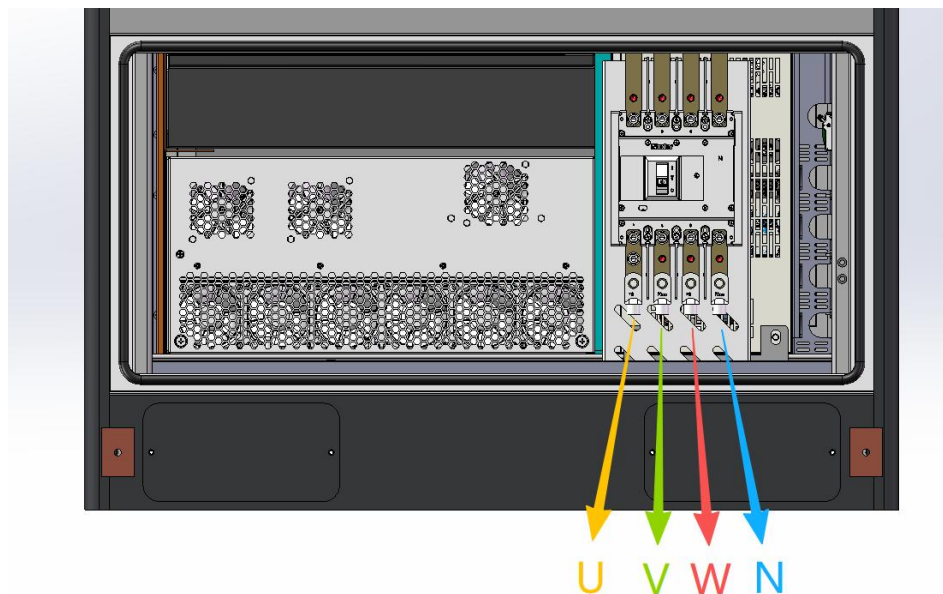


Figure 3-5 Schematic diagram of cable connection

1) Disconnect the upper-level AC circuit breaker and measure with a multimeter to ensure there is no voltage at the terminals.

2) Pass the cable through the bottom entry hole into the interior of the energy storage cabinet.

3) Ensure that the connection sequence of the AC cables is correct.

4) Crimping terminals and wiring. Select the appropriate screw, press the wiring copper nose onto the AC wiring copper bar, and install it in the connection sequence. Tighten the screw with a screwdriver or wrench.

Terminal	Definition	Cable type	Cable specification
Power grid interface	U、V、W、N	Outdoor Multi-Core Copper Cable	$\geq 70\text{mm}^2$

Table 3-1 AC Cable Specification Recommendations

3.7. Wiring and waterproofing treatment

According to the design of the incoming and outgoing line holes of the energy storage cabinet, the cables must be laid in the bottom cable tray of the energy storage cabinet and introduced into the equipment through the incoming and outgoing line holes at the bottom of the cabinet. At the same time, appropriate cables should be selected as required. When wiring, it is necessary to ensure electrical insulation and comply with relevant regulations. Power cables, power supply cables and communication cables should be laid in layers. And when necessary, provide protection and support for the cables to reduce the stress they bear. After confirming that all the wiring is correct and secure. The gaps between the cable entry and exit holes at the bottom of the energy storage cabinet need to be sealed with fireproof putty. At the same time, the entire installation foundation of the energy storage cabinet needs to be treated for waterproofing.

3.8. Other treatment

1) The installation site should be equipped with a drainage system to prevent the bottom of the energy storage cabinet or the equipment inside from being soaked by water during the rainy season or when there is a large amount of precipitation.

2) Please do not plant trees within a close range around the installation site. To prevent strong winds from knocking down branches or falling leaves and blocking the cabinet door or air inlet of the energy storage cabinet.

4. Product identification, packaging, transportation and storage instructions

4.1. Product identification

Product identification shall be carried out in accordance with the standards agreed upon by both the customer and our company. If no agreement has been reached between the two parties, the standards of our company shall apply.

4.2. Packaging

The packaging boxes and their specifications shall be carried out in accordance with the standards agreed upon by both the customer and our company. If no agreement has been reached between the two parties, the standards of our company shall apply.

4.3. Transportation

All the equipment inside the energy storage cabinet has been installed and fixed in the cabinet body before leaving the factory. During transportation, the energy storage cabinet can be lifted and transported as a whole. The transportation of mobile energy storage cabinets needs to meet the following conditions

All the doors of the energy storage cabinet are tightly locked.

2) Select the appropriate crane or lifting tool based on the on-site conditions. The selected tool must have sufficient load-bearing capacity, arm length and rotation radius.

3) If it is necessary to move on slopes, etc., additional traction devices may be required.

4) Remove all obstacles that exist or may exist during the movement, such as trees, cables, etc.

5) The transportation and movement of the energy storage cabinet should be carried out under favorable weather conditions as much as possible.

6) Warning signs or tapes must be set up to prevent non-staff from entering the lifting and transportation area, so as to avoid accidents.

4.4. Storage

If the product is not used immediately, its storage should meet the following requirements:



Keep the outer packaging in good condition. Regular inspections should be carried out. If any damage to the packaging is found, the packaging material must be replaced in a timely manner.

2) After long-term storage, the product must be inspected and tested before use.

3) The short-term storage temperature (within one month) should be maintained at -20 to 50°C, with a relative humidity not exceeding 95%. It should also be protected from fire, heat and moisture, and avoid contact with corrosive elements.

4) The altitude is less than 2,000 meters.

5) When the energy storage cabinet is in use for storage, the battery cabinet should be stored in a state of 40% to 60% charge. If the battery cabinet is not used for a long time, it is recommended to fully charge and discharge it once every three months or so to extend its service life.

5. Operation instructions

5.1. Trial running requirements

Before the equipment is running, please check the following items:

NO.	Checked items	Remark
1	check the integrity and insulation of all cables. If there are any cables with damaged outer skins, please replace them in time	
2	Check the polarity of all input cables to ensure that the polarity or phase sequence of each input is correct. Ensure the connection is safe and reliable, with no loose connections or short circuits in the wiring harness connection	
3	Check whether the grounding of the energy storage cabinet body is completed. After the grounding connection is finished, the grounding resistance must be measured. The grounding resistance value should refer to the relevant standards of the country/region where the project is located	
4	Check that the installation environment of the energy storage cabinet is well-ventilated and can achieve good ventilation and heat dissipation	
5	Check whether the AC circuit breaker switch on the grid side at the back of the cabinet is in the off position	
6	Check whether the AC circuit breaker switch on the grid side at the back of the cabinet is in the off position	
7	Check that the circuit breaker of the high-voltage box is in the open state	
8	Check whether the battery cables of the fire control host are properly connected	
9	Ensure that the voltage and frequency of the AC side grid meet the input requirements of the energy storage converter	

Table4-1 Trial running requirements

5.2. System Power-On and Power-Off Procedure

System Power-On and Power-Off Procedure: After ensuring that the AC switch at the upper level of the energy storage cabinet is turned off and there is no power input into the

energy storage cabinet, use the door lock key provided with the product to open the door panel at the back of the energy storage cabinet, as shown in Figure 4.1. Close the circuit breaker switch QF1 and the lightning protection switch QF2 on the grid side of the energy storage cabinet, reinstall the door panel at the back of the energy storage cabinet, and lock it tightly with the door lock key. Use the AC setting of a multimeter to measure respectively whether the voltage between the ports AN, BN and CN on the upper-level AC switch of the energy storage cabinet is around AC230V. After ensuring there are no errors, close the upper-level AC switch. The external power supply is completed. The operation for the internal power supply of the energy storage cabinet is as follows

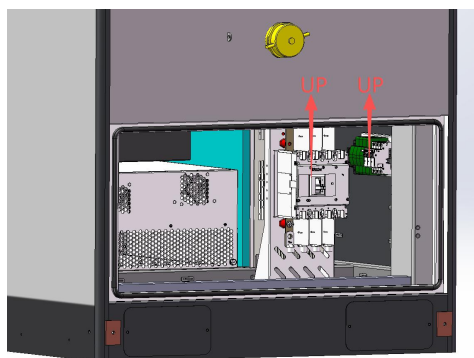


Figure4-1 breaker switch QF1、lightning protection switch QF2

Step 1: Observe whether the green "POWER" indicator light on the front panel of the energy storage cabinet is on. If it is on, it indicates that the external alternating current has been input into the cabinet. Open the front cabinet door, close the high-voltage box circuit breaker, and rotate the circuit breaker handle indicator to "ON".

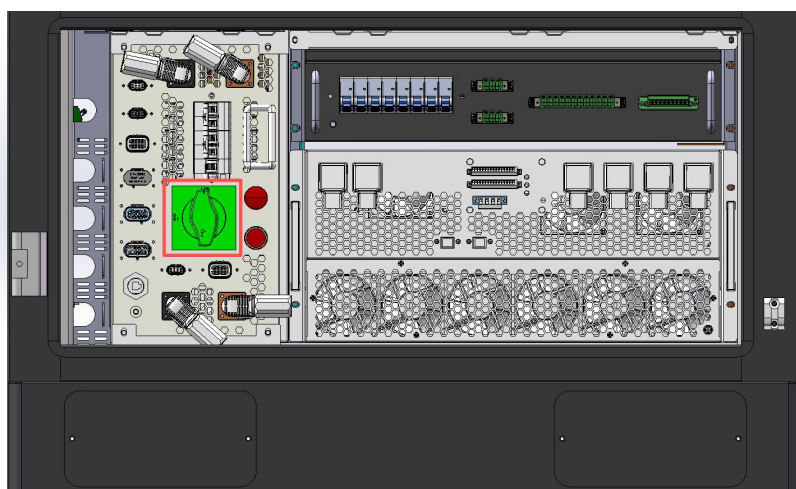


Figure4-2 high-voltage box circuit breaker

Step 2: Close the microcircuit breakers of the distribution box from left to right in sequence and wait for the system to complete the power-on self-check.

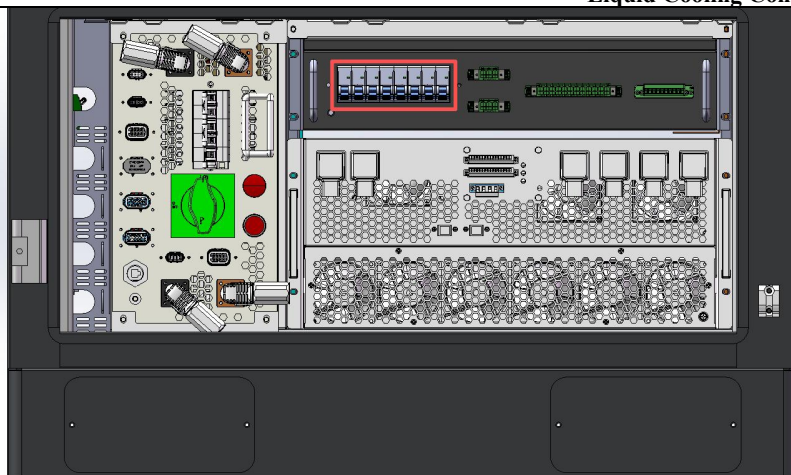


Figure4-3 microcircuit breakers of the distribution box

Step 3: After the system self-checks for no faults, the DC contactor inside the high-voltage box closes, and the green indicator light on the PCS panel flashes. The current working status of the PCS can be determined according to 2.5.4.

At this point, the initial power-on of the system has been completed.

5.3. Local Interface Operation Instructions

5.3.1. Touch Screen Interface

The Single-Line Diagram screen provides a comprehensive overview of the entire energy storage system's electrical architecture, integrating key information such as cell data and alarm status. This centralized view is illustrated in the Single-Line Diagram interface below.

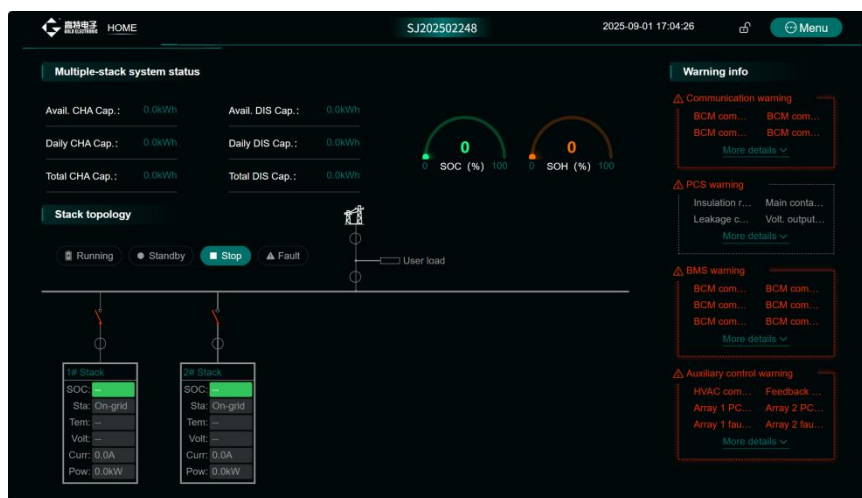


Figure4-9 Touch screen main interface

During operation, the SOC, stack voltage, stack current, stack power, stack status and average temperature of each stack will also be displayed.

5.3.2. Main Control Interface

After entering the main interface, the SOC, power, total voltage, total current, average temperature and other data of the battery stack can be displayed in real time, as shown in Figure 4-8

Click on [Menu/Manipulation/Rack info] in the upper right corner to quickly enter the battery cluster information viewing interface. Click on the alarm status to enter the real-time alarm interface.

At this point, click on [Menu/Manipulation/Stack status] again to switch back to the main interface of the stack. Click on the area of battery capacity/voltage/current information of a certain battery cluster to enter the detailed information interface of that battery cluster.

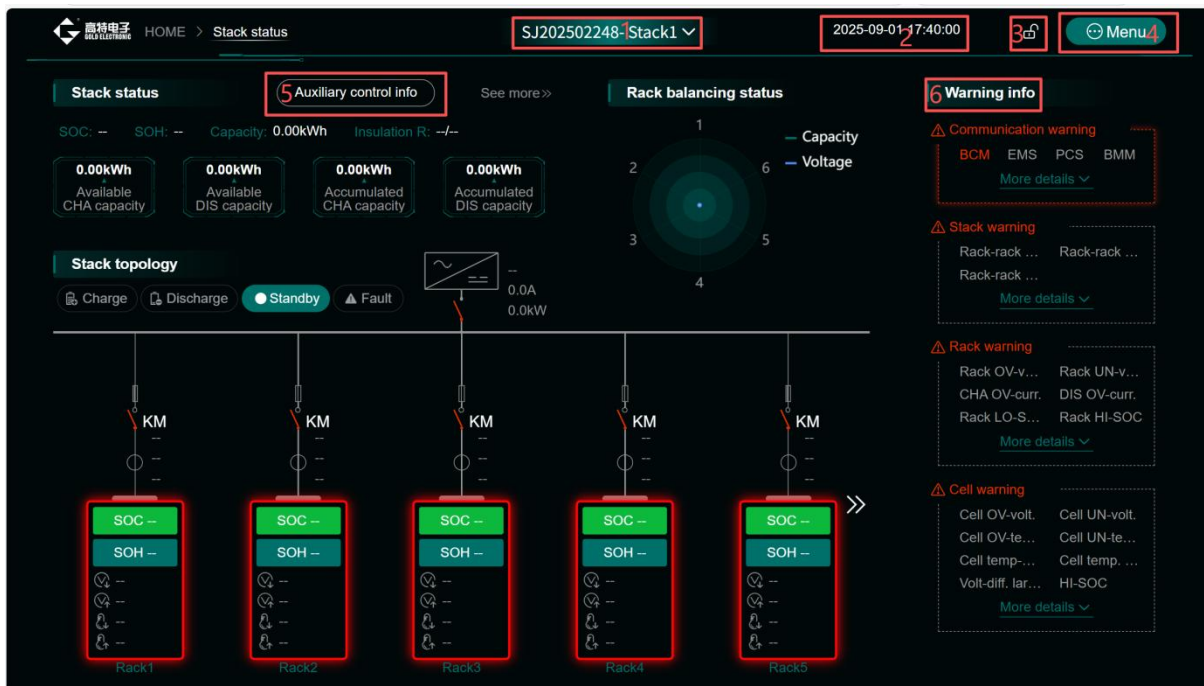


Figure 4-10 Stack1 main interface

1	Battery stack Switching	Click on this area to display a drop-down menu. Select the battery stack name to switch to the operation interface of this battery stack.
2	System Time	Display the system time of BAU
3	Login/Logout	Used for user login and logout. Different users have

		different functional permissions after logging in
4	Battery Stack	Display the alarm information, operation and charging and discharging status of the battery stack, as well as various monitoring numbers 1. Click on [Menu/Manipulation/Rack inf0] in the upper right corner to quickly enter the battery cluster information viewing world 2. Click on the alarm status to enter the real-time alarm interface 3. Click on the charge/voltage/current information area of a certain battery cluster to enter the detailed information interface of that battery cluster 4. Click on the cell voltage/temperature information area under a certain battery cluster to enter the other temperature interface of that battery
5	Auxiliary Control	Display the information of the auxiliary control equipment
6	Alarm	Display the alarm information of Cell, RACK, Stack and Communication

5.3.3. Access the menu bar

In the menu bar, click **【Cell Info】**, select the **【All Cells】** tab to display the cell voltage interface. As shown in the figure below, you can view the number and voltage data of each

cell.

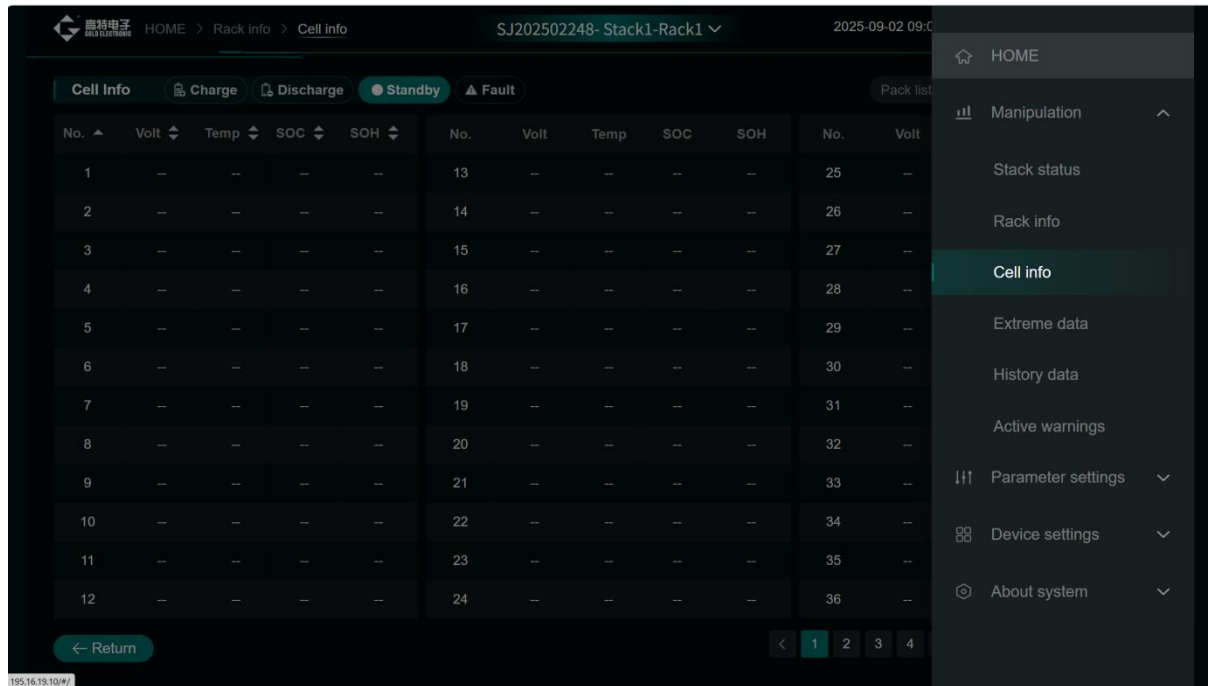


Figure 4-11 Menu interface

5.3.4. Login/Logout

5.3.4.1. User Permission Description

The operable permissions vary when not logged in or when different users log in. For details, please refer to the table below. R: Only data can be viewed. R/W: Data can be viewed and configuration operations can be configured. N: This function is not available

Function		Guest	Operator	Administrator
Home		R	R	R
Battery Cluster	Cluster List	R	R	R
	Details	R	R	R
	Other Temperature	R	R	R
	Cell Voltage	R	R	R
	Cell Temperature	R	R	R
Grid Connection	Power & Environment	R	R	R/W
	Grid Status	R	R/W	R/W
	Grid Settings	R	R/W	R/W
Log	Real-time Alarm	R	R	R
	Historical Alarm	R	R	R
	Storage Management	R/W	R/W	R/W
	Event Log	N	N	N
Settings	Rack Threshold	R	R	R/W
	Cluster Threshold	R	R	R/W
	Cell Threshold	R	R	R/W
	Rack Settings	R	R	R/W
	Cluster Settings	R	R	R/W
	Installation Parameters	N	N	N
Device	Network Configuration	R	R	R/W
	Device Upgrade	N	N	N
	Device Information	N	N	N
	Inspection	N	N	N
	About Us	R	R	R

5.3.4.2.Login

Click on the "Login" button at the top right corner to quickly enter the password login interface. Click on the password and enter "123456" to log in. You can enter the interface to view the alarm information, operation and charging and discharging status of the battery stack, as well as various monitoring data.

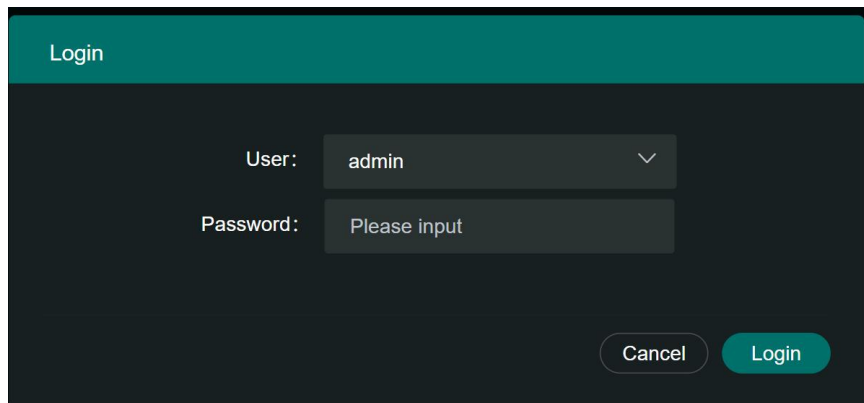


Figure 4-12 Login interface

5.3.4.3. Logout

If there is no operation within 10 minutes, the system will automatically turn off the screen and log out. You can also click on the "Log Out" button in the upper right corner of the main interface to manually log out.

5.3.5. Battery Cluster

5.3.5.1. Check battery cluster list

Click [Stack status] in the menu bar to display the battery cluster list interface, as shown in the following figure. You can view the status of each battery cluster, the highest and lowest voltages of the cluster, SOC, the highest and lowest temperatures of the cluster, and other information.

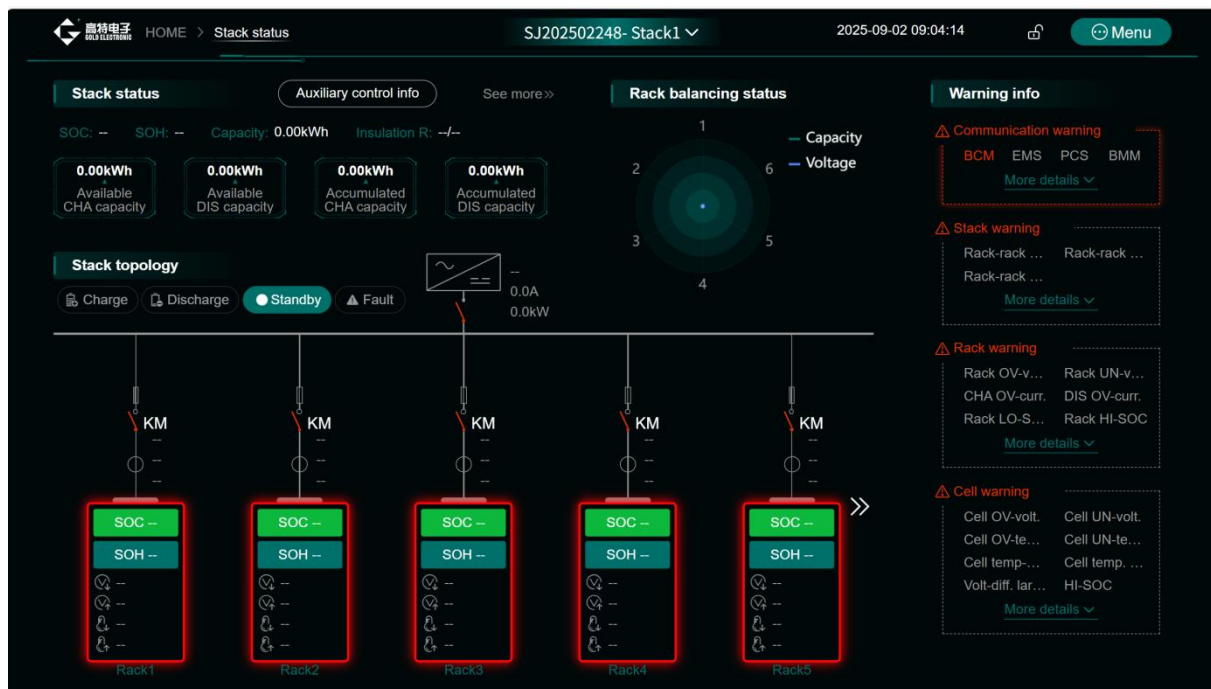
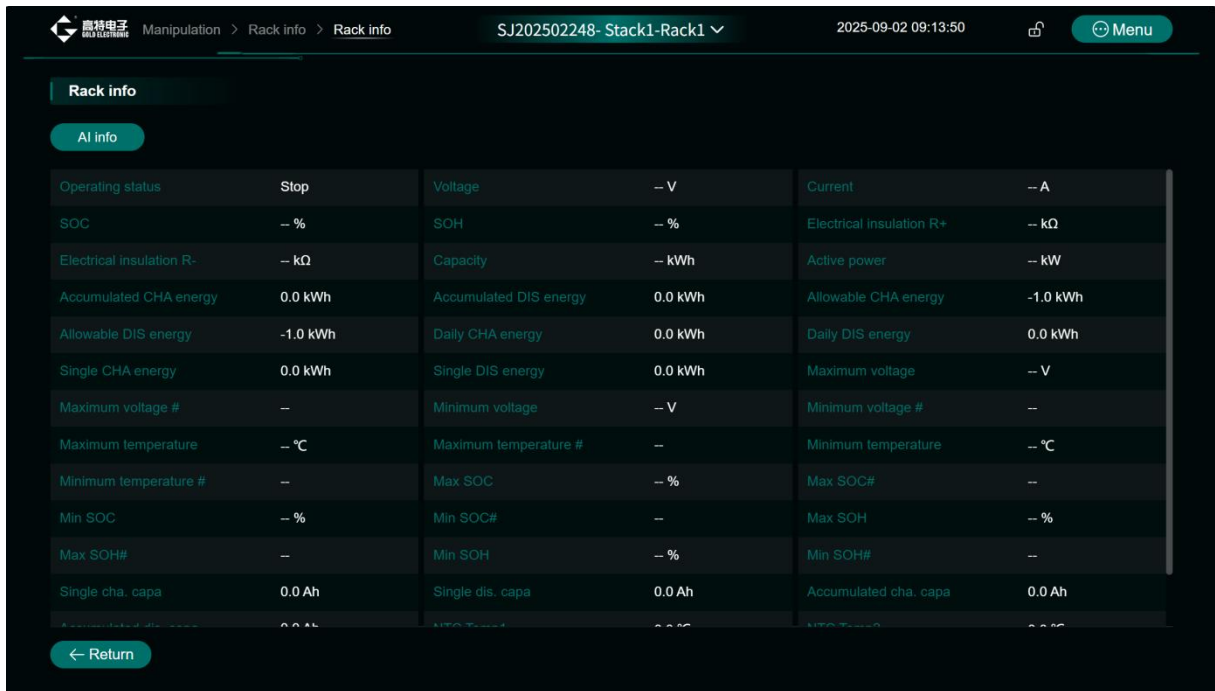


Figure 4-13 Battery cluster list

Click on the "See more" button above to switch and view more information about battery clusters. Click on the icon area of a certain cluster below to enter the detailed information interface of that cluster, where you can view detailed information of the battery cluster, cell voltage, cell temperature and other information.

5.3.5.2. Check detailed information

In the menu bar, click [Rack info], select the [See more] TAB, and the detailed information interface of the battery cluster will be displayed. As shown in the following figure, detailed information such as voltage, temperature, charge and discharge conditions, and insulation of the battery cluster can be viewed.



Rack info		See more	
Operating status	Stop	Voltage	-- V
SOC	-- %	SOH	-- %
Electrical insulation R-	-- kΩ	Capacity	-- kWh
Accumulated CHA energy	0.0 kWh	Accumulated DIS energy	0.0 kWh
Allowable DIS energy	-1.0 kWh	Daily CHA energy	0.0 kWh
Single CHA energy	0.0 kWh	Single DIS energy	0.0 kWh
Maximum voltage #	--	Minimum voltage	-- V
Maximum temperature	-- °C	Maximum temperature #	--
Minimum temperature #	--	Max SOC	-- %
Min SOC	-- %	Min SOC#	--
Max SOH#	--	Min SOH	-- %
Single cha. capa	0.0 Ah	Single dis. capa	0.0 Ah
Accumulated cha. capa	0.0 Ah	Accumulated dis. capa	0.0 Ah

Figure 4-14 Battery cluster detailed information

Click on the project number -Stack-Rack1 above to switch and view detailed information of other battery clusters.

5.3.5.3. Check cell voltage/temperature

Click [Cell info] in the menu bar, select the [All cells] TAB, and the cell data interface will be displayed. As shown in the following figure, you can view other data such as the number and voltage data of each cell.



No.	Volt	Temp	SOC	SOH	No.	Volt	Temp	SOC	SOH	No.	Volt	Temp	SOC	SOH
1	--	--	--	--	13	--	--	--	--	25	--	--	--	--
2	--	--	--	--	14	--	--	--	--	26	--	--	--	--
3	--	--	--	--	15	--	--	--	--	27	--	--	--	--
4	--	--	--	--	16	--	--	--	--	28	--	--	--	--
5	--	--	--	--	17	--	--	--	--	29	--	--	--	--
6	--	--	--	--	18	--	--	--	--	30	--	--	--	--
7	--	--	--	--	19	--	--	--	--	31	--	--	--	--
8	--	--	--	--	20	--	--	--	--	32	--	--	--	--
9	--	--	--	--	21	--	--	--	--	33	--	--	--	--
10	--	--	--	--	22	--	--	--	--	34	--	--	--	--
11	--	--	--	--	23	--	--	--	--	35	--	--	--	--
12	--	--	--	--	24	--	--	--	--	36	--	--	--	--

Figure 4-15 Cell Information

Click on the project number -Stack-Rack1 above to switch and view the cell temperature data of other battery clusters. Click "Cell diagram" to switch the display mode of the cell temperature data.

5.3.6. Auxiliary control

Click [Parameter settings/Auxiliary control] in the menu bar to display the auxiliary control device Settings page, as shown in Figure 4-13.

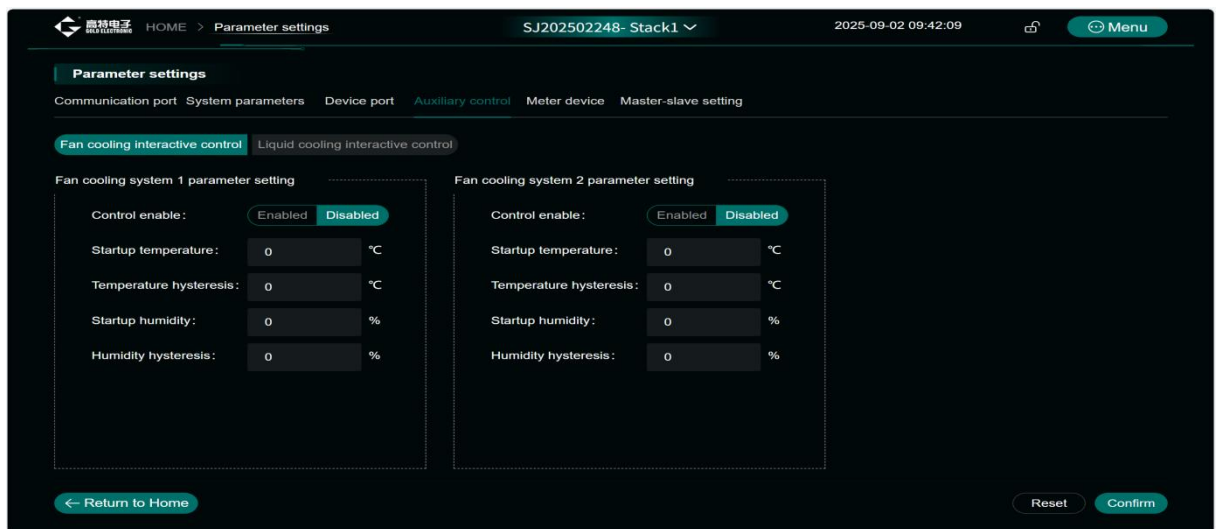


Figure 4-16 Auxiliary control data

Click [HOME/Stack status/Auxiliary control INFO] to view all the monitoring information of this type of device. Click the configuration box in the Settings item. A numeric keypad will pop up. Configure the parameter values. Click [Confirm] to apply the configuration to the current heap.

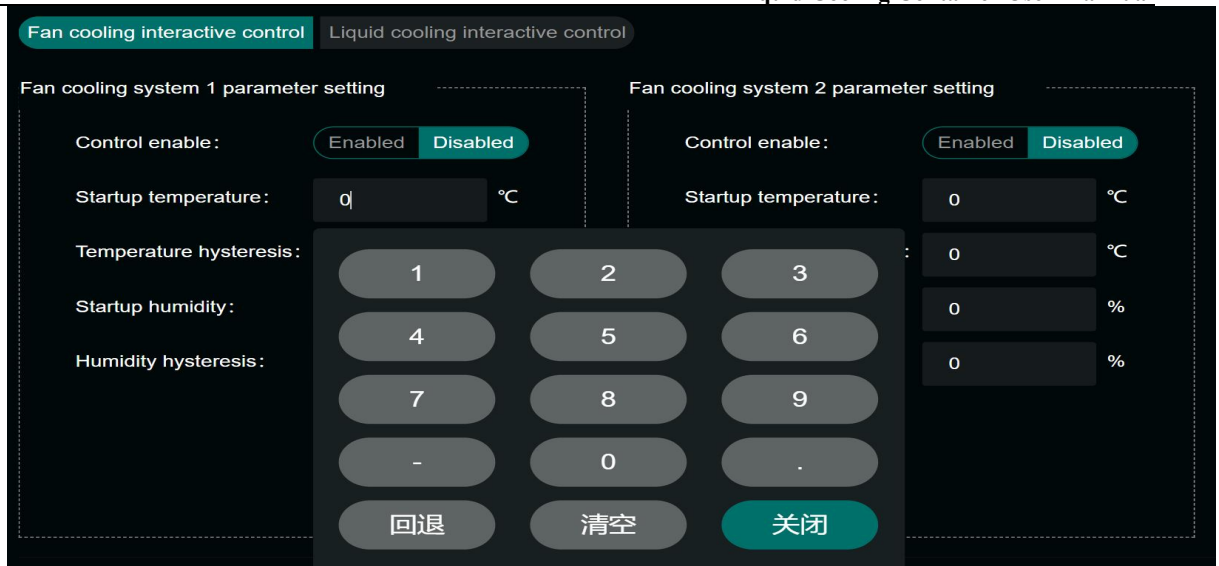


Figure 4-17 Auxiliary Control Device Threshold Settings

5.3.7. Log

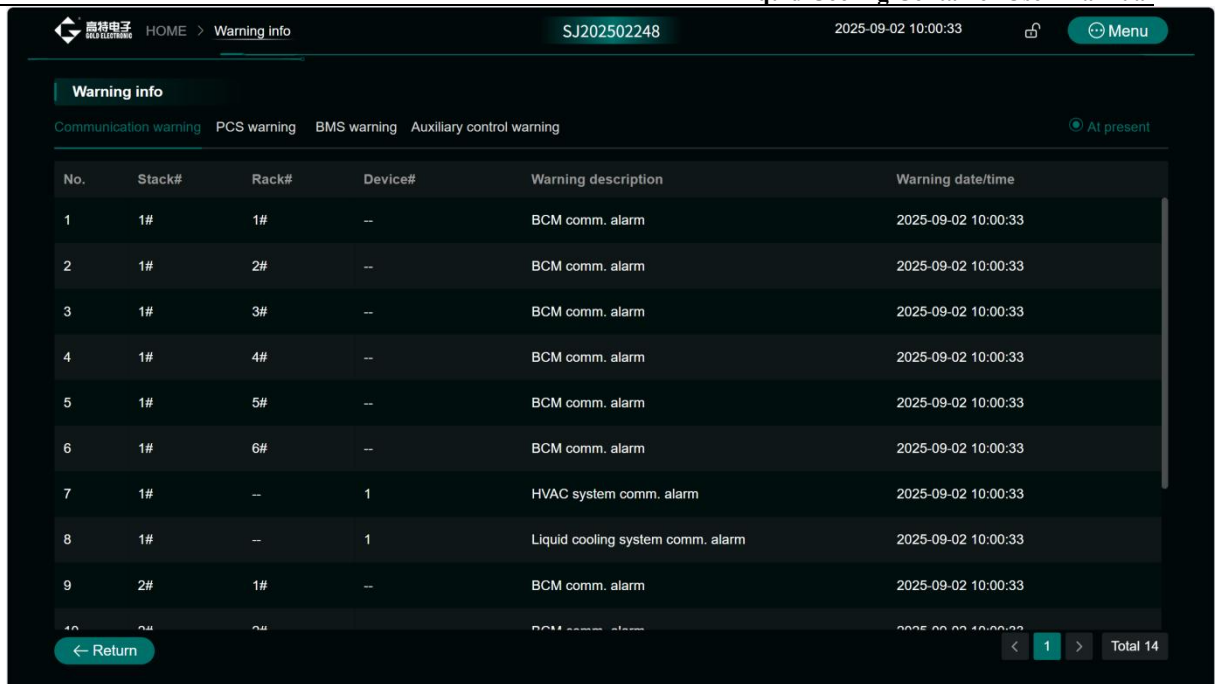
5.3.7.1. Real-time alarm

On the right side of the main interface, the real-time alarm interface is displayed, as shown in Figure 4-17, where the alarm information generated in the system can be viewed in real time.



Figure 4-18 Real-time alarm

Click "More details" to view the specific alarm content, as shown in Figure 4-18.



The screenshot shows the 'Warning info' interface with a table of alarm records. The table has columns for No., Stack#, Rack#, Device#, Warning description, and Warning date/time. The interface also includes a top navigation bar with 'HOME > Warning info', a device ID 'SJ202502248', a timestamp '2025-09-02 10:00:33', and a 'Menu' button. Below the table, there is a 'Return' button and a pagination bar showing '1' and 'Total 14'.

No.	Stack#	Rack#	Device#	Warning description	Warning date/time
1	1#	1#	--	BCM comm. alarm	2025-09-02 10:00:33
2	1#	2#	--	BCM comm. alarm	2025-09-02 10:00:33
3	1#	3#	--	BCM comm. alarm	2025-09-02 10:00:33
4	1#	4#	--	BCM comm. alarm	2025-09-02 10:00:33
5	1#	5#	--	BCM comm. alarm	2025-09-02 10:00:33
6	1#	6#	--	BCM comm. alarm	2025-09-02 10:00:33
7	1#	--	1	HVAC system comm. alarm	2025-09-02 10:00:33
8	1#	--	1	Liquid cooling system comm. alarm	2025-09-02 10:00:33
9	2#	1#	--	BCM comm. alarm	2025-09-02 10:00:33
10	2#	2#	--	BCM comm. alarm	2025-09-02 10:00:33

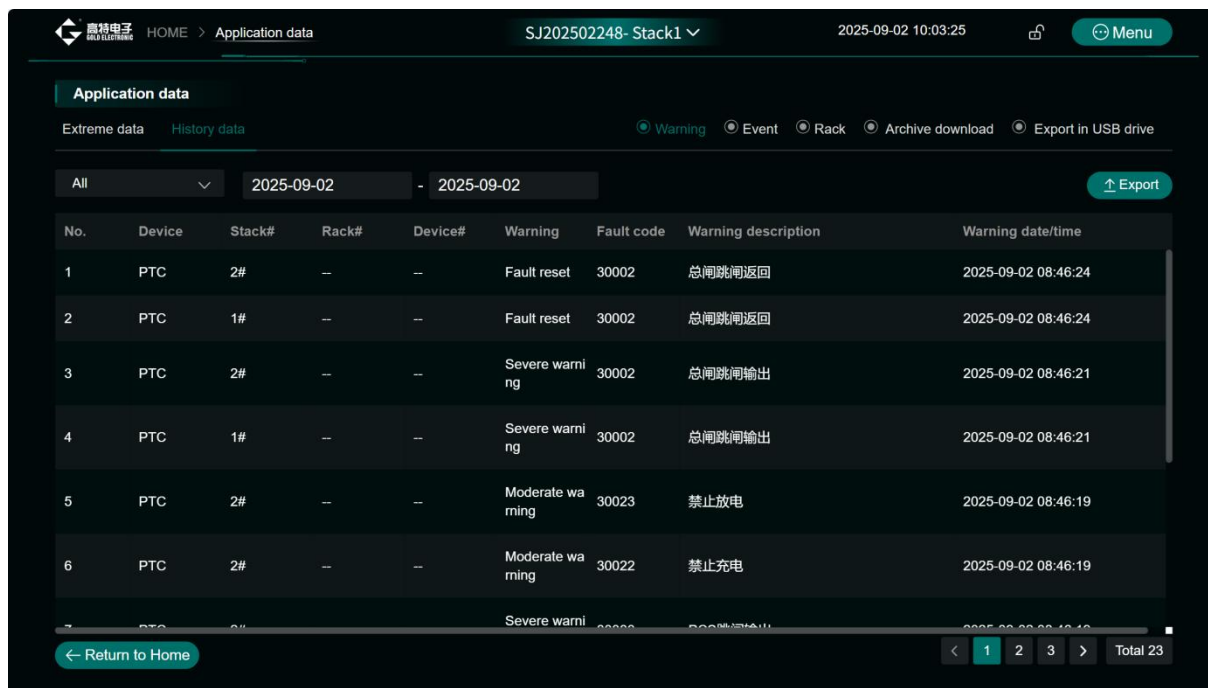
Figure 4-19 Specific alarm information

After the alarm is cleared, click **【Fault Reset】** and confirm to remove the alarm information from the real-time alarm interface. The cleared alarm record can be viewed in the historical alarm interface.

5.3.7.2. History alarm

In the menu bar, click **【Application Data】**, select the **【History Data】** tab to display the historical alarm interface. As shown in Figure 4-18, all historical alarm information can be

viewed.



No.	Device	Stack#	Rack#	Device#	Warning	Fault code	Warning description	Warning date/time
1	PTC	2#	--	--	Fault reset	30002	总闸跳闸返回	2025-09-02 08:46:24
2	PTC	1#	--	--	Fault reset	30002	总闸跳闸返回	2025-09-02 08:46:24
3	PTC	2#	--	--	Severe warning	30002	总闸跳闸输出	2025-09-02 08:46:21
4	PTC	1#	--	--	Severe warning	30002	总闸跳闸输出	2025-09-02 08:46:21
5	PTC	2#	--	--	Moderate warning	30023	禁止放电	2025-09-02 08:46:19
6	PTC	2#	--	--	Moderate warning	30022	禁止充电	2025-09-02 08:46:19

Figure 4-20 History data

Set the start time and end time, click **【Filter】** to view filtered historical alarm information within the specified time period.

5.3.8. Settings

5.3.8.1. Stack settings

In the menu bar, click [Parameter settings], select the [Stack parameter] TAB, and the heap threshold interface will be displayed, as shown in Figure 4-21.

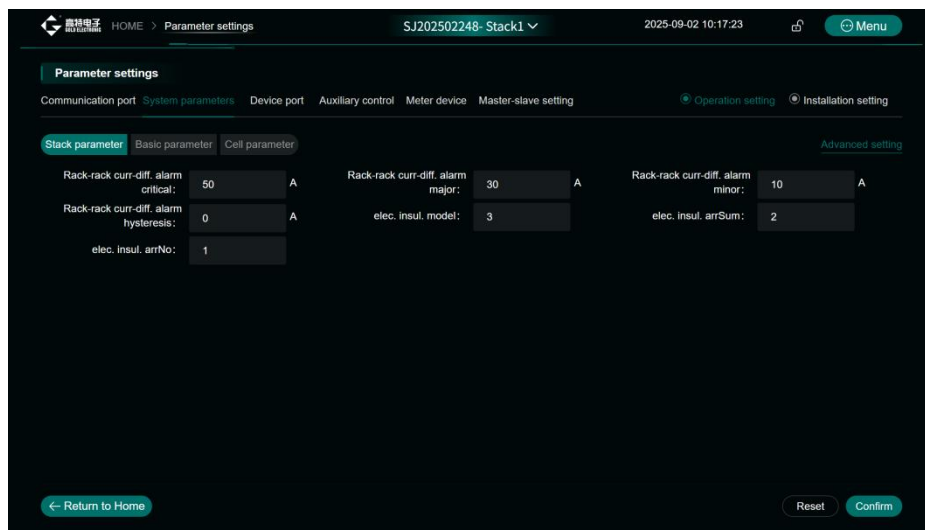


Figure 4-21 Stack settings

Click the configuration box to pop up a numeric keypad. Configure monitoring thresholds for each level, then click **【Confirm】** to apply the settings to the current stack. When the monitored value exceeds the set threshold, the system will generate an alarm message or trigger linked operations.

5.3.8.2. Cluster Threshold Configuration

In the menu bar, click [Parameter settings], select the [Basic parameter] TAB, and the cluster threshold interface will be displayed, as shown in Figure 4-20.

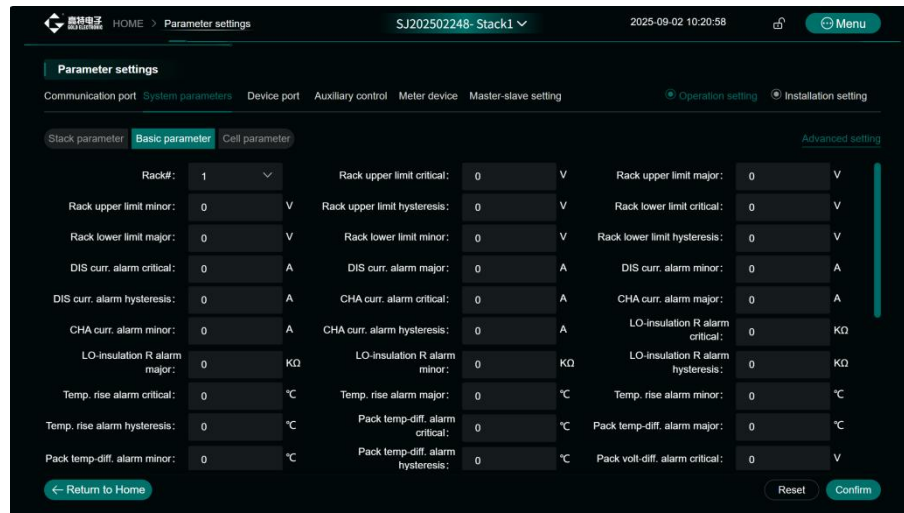


Figure 4-22 Cluster settings

Click the configuration box to pop up a numeric keypad. Configure monitoring thresholds for each level, then click **【Confirm】** to apply the settings to the current stack. When the monitored value exceeds the set threshold, the system will generate an alarm message or trigger linked operations.

5.3.8.3. Cell Thresholds

In the menu bar, click **【Parameter Settings】**, select the **【Cell Parameters】** tab to display the cell thresholds interface, as shown in Figure 4-21.

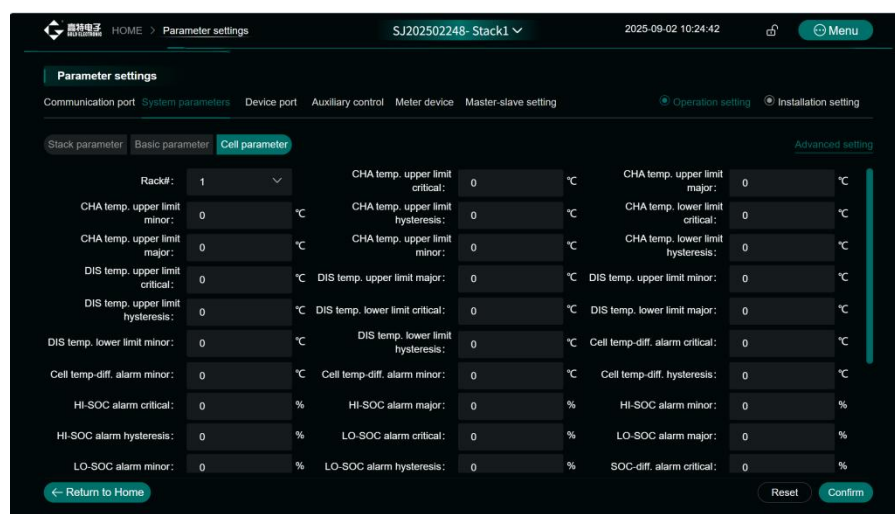


Figure 4-23 Cell thresholds

Click the configuration box to pop up a numeric keypad. Configure monitoring thresholds for each level, then click **【Confirm】** to apply the settings to the current cluster. When the monitored value exceeds the set threshold, the system will generate an alarm message or trigger linked operations.

5.4. System running

Supplement the cooling medium

When the chiller is first connected to the equipment to be cooled, the cooling medium circulation system needs to be filled with cooling medium to ensure the normal operation of the chiller. For the first liquid replenishment of the liquid replenishment device, connect the water supply end of the liquid replenishment pump to the liquid replenishment inlet of the chiller through a pipe, and connect the other end of the liquid replenishment pump to the heat transfer medium container. All connection points should be firmly fixed with clamps. After powering on the power supply of the liquid replenishment pump, carry out liquid replenishment. When the return water pressure reaches 1bar, stop replenishing the liquid and start the self-circulation mode for venting. If the return water pressure drops below 0.8bar after venting, continue replenishing the liquid until it reaches 1bar.

Requirements for cooling medium

When using a water-ethanol mixture for cooling, it is necessary to observe whether there are algae, sediment or corrosion in the chiller. Residues will limit the performance of the chiller. Without water treatment, it will be difficult to achieve a satisfactory situation. The quality of the cooling medium must be monitored regularly and treated to ensure that sedimentation and corrosion can be avoided even under extreme conditions.

The cooling medium must not cause scale sedimentation or loose stratification. This indicates that the cooling medium has low hardness, specifically calcium hardness. Especially when cooling during cyclic operation, the calcium hardness must not be too high. In addition, the cooling medium must not be soft water and erode the material. When the cooling medium is subjected to secondary cooling, the salt content may increase due to the evaporation of a large amount of water. This is because the increase in the concentration of dissolved substances will lead to an improvement in conductivity, making the cooling medium more corrosive. Therefore, not only should an appropriate amount of fresh water be added, but also a portion of the concentrated cooling medium needs to be discharged.

Precautions

During the long-term operation of the chiller, the concentration of the cooling medium may increase, and an increase in the concentration of the cooling medium will lead to a low cooling efficiency of the chiller. Please test the concentration of the cooling medium in the water machine system every three months. If the concentration of the cooling medium is too high, restore the value to the common range by completely replacing the cooling medium. When the cooling medium is water, tap water cannot be used directly; only distilled water or deionized water can be used.

During the long-term operation of the chiller, the cooling medium may accumulate mechanical dirt, high hardness, high chemical dirt content, biological dirt, slime bacteria and algae. Therefore, it is necessary to inspect, purify and maintain the cooling medium in the water machine system every three months. To avoid any destructive impact, the chiller must be reliably grounded before the power is connected. Ethylene glycol is a substance that pollutes groundwater. The operator of the equipment must abide by the relevant national regulations on the protection of groundwater resources and use specially prepared ethylene glycol water solutions.

6. Fault Handling and Maintenance Instructions

6.1. Battery System Operational Fault Diagnosis and Troubleshooting Procedure

- (1) Shut down the unit to temporarily take it out of operation.
- (2) Record the status: Document the observed phenomena at the time of the fault as completely as possible, such as taking photos, videos, screen captures, and saving relevant data.
- (3) Identify the fault type: Refer to the fault information description table below to preliminarily confirm the fault type. Submit the recorded information and confirmation results to the supplier or technical support engineer. User-provided information is critical for repair work.
- (4) Notify the technical engineer and, under their guidance, perform preliminary diagnosis using the methods provided in the table below to further confirm the specific fault type.
- (5) Once the specific fault type is confirmed, contact the engineer for on-site resolution as soon as possible.
- (6) Fault documentation: After troubleshooting, fill out the daily operational fault record form for traceability purposes.

6.2. Fault Alarm Handling and Resolution Measures

Even in the event of a system fault, lethal high voltage may still be present. During maintenance or inspection operations, the following precautions must be observed:

Ensure the system cannot be accidentally re-energized.

Use a multimeter or voltage tester to verify the system is completely de-energized.

Cover adjacent live components near the operational area with insulating materials for isolation.

Throughout the entire maintenance and inspection process, ensure escape routes remain fully unobstructed.

6.2.1. Common Faults Handling

Fault Name	Possible Causes	Solutions
Running Indicator Light Off	Controller frozen, running indicator light damaged	Restart controller, replace running indicator light
Power Indicator Light Off	Power indicator light damaged, no external AC power input	Replace power indicator light, check incoming power supply
AC Circuit Breaker Fails to Close	Emergency stop button pressed, circuit short exists	Check system for faults, reset/restart controller
PCS Panel Indicator Light Off	No DC output from high-voltage box	Troubleshoot battery system faults, reset alarms before re-powering
Equipment Communication Failure	Equipment frozen, poor line connection	Check wiring terminals for disconnection, restart corresponding equipment
High-Voltage Box Contactor Fails to Engage	Fault not reset	Troubleshoot battery system faults, reset alarms before re-powering

Figure5-1 Common Faults Handling

6.2.2. BMS Fault and Alarm Handling and Troubleshooting

NO.	Fault/alarm	Possible Causes	Troubleshooting Solution
1	Running indicator light off	High-voltage relay failure, running indicator light damaged	Replace relay or power indicator light
2	Controller touch screen dark	Poor power wiring harness, controller frozen/damaged	Check power wiring harness, restart/replace controller
3	Precharge relay fails to close	Poor relay wiring connection, relay failure, BMS fault	Check relay wiring, replace relay/troubleshoot BMS
4	Main positive/negative relay fails to close	Poor main relay wiring connection/BMS fault/contact abnormality	Check contactor wiring, replace relay/troubleshoot BMS
5	Internal communication abnormal	Poor internal CAN line connection	Unplug and check CAN connection lines
6	Main positive/negative relay stuck	Main positive/negative relay damaged	Replace main positive/negative relay
7	Cell voltage detection abnormal	Poor voltage detection wiring connection/CCS collection abnormality/cell	Check wiring connection/replace CCS/troubleshoot or replace cell

		abnormality	
8	Cell temperature detection abnormal	Poor temperature detection wiring connection/temperature sensor failure/CCS collection abnormality	Check wiring connection/replace temperature sensor/replace CCS
9	Group voltage detection abnormal	Poor voltage detection wiring connection/BMS collection abnormality	Check voltage detection wiring connection/troubleshoot or replace BMS
10	BMU communication abnormal	Poor communication wiring connection/BMU failure	Check BCU communication wiring/replace faulty BMU
11	Cell overvoltage alarm	Poor balancing/system overcharge	Stop charging, enable standby balancing/stop charge-discharge
12	Cell undervoltage alarm	Poor balancing/system over-discharge	Stop charging, enable standby balancing/stop charge-discharge
13	Cell overtemperature alarm	Individual cell temperature too high/CCS collection abnormality/excessive charge-discharge current	Check liquid cooler operation/replace or troubleshoot CCS/reduce charge-discharge current
14	Cell low temperature alarm	Individual cell temperature too low/CCS collection abnormality/low ambient temperature	Check chiller outlet temperature/troubleshoot CCS/check air conditioner operation
15	Group overvoltage alarm	Cell overcharge/detection abnormality	Stop charge-discharge, contact supplier
16	Group undervoltage alarm	Cell over-discharge/detection abnormality	Stop charge-discharge, contact supplier
17	Charge-discharge overcurrent alarm	System out of control	Stop charge-discharge, contact supplier
18	Excessive cell temperature difference alarm	Uneven cabinet heat dissipation/NTC collection abnormality	Check air conditioner and chiller operation/troubleshoot NTC collection fault
19	Excessive cell voltage difference alarm	Large cell capacity variation/individual cell abnormality/poor cell consistency	Enable balancing/troubleshoot abnormal cells

Table5-2 BMS Fault and Alarm Handling and Troubleshooting

6.2.3. Liquid Cooling Fault Alarm

◆ Alarm Handling

The alarm information of the chiller unit is shown in the table below.

Lock-type alarms require manual clearance by powering off and then restarting the air-cooled chiller unit, while other alarms are automatically cleared when the triggering conditions are no longer met.

Alarm Name	Trigger Condition	Possible Causes	Solutions
High Outlet Water Temperature Alarm	Outlet water temperature exceeds the high-temperature setpoint threshold.	Outlet water temperature sensor failure.	Replace the outlet water temperature sensor.
		Abnormal operation of compressor, electronic expansion valve, internal circulation pump, or external fan.	Inspect the compressor, electronic expansion valve, internal circulation pump, and external fan.
		Load of the equipment being cooled exceeds the designed cooling capacity of the chiller.	Check the load of the equipment being cooled.
		Coolant leakage in the circulation system.	Locate and repair the leak, then replenish the coolant.
Low Outlet Water Temperature Alarm	Outlet water temperature is below the low-temperature setpoint threshold.	Outlet water temperature sensor failure.	Replace the outlet water temperature sensor.
		Malfunction of electric heating element or internal circulation pump.	Inspect the electric heating element and internal circulation pump.
		Heat loss of the equipment being cooled exceeds the designed heating capacity of the chiller.	Check the heat loss of the equipment being cooled.
Outlet Temperature Sensor Failure	Temperature sensor fails to detect outlet water temperature in real time	Loose wiring or damaged cable of the temperature sensor.	Secure the electrical wiring or replace the cable.
		Damaged temperature sensor.	Replace the temperature sensor.
Inlet Temperature Sensor Failure	Temperature sensor fails to detect return water temperature in real time	Loose wiring or damaged cable of the temperature sensor.	Secure the electrical wiring or replace the cable.
		Damaged temperature sensor.	Replace the temperature sensor.
Suction Temperature Sensor Failure	Temperature sensor fails to	Loose wiring or damaged cable of the temperature sensor.	Secure the electrical wiring or replace the cable.



	detect suction temperature in real time	Damaged temperature sensor.	Replace the temperature sensor.
Low Pressure Sensor Failure	Low pressure sensor fails to detect pressure normally	Loose wiring or damaged cable of the low-pressure sensor.	Secure the electrical wiring or replace the cable.
		Damaged low-pressure sensor.	Replace the low-pressure sensor.
Condensation Temperature Sensor Failure	Temperature sensor fails to detect condensation temperature in real time	Loose wiring or damaged cable of the temperature sensor.	Secure the electrical wiring or replace the cable.
		Damaged temperature sensor.	Replace the temperature sensor.
Inverter Communication Fault Alarm	Compressor inverter communication failure	Host computer malfunction.	Check the host computer connection.
		Loose communication wiring or damaged cable of the inverter.	Secure the communication wiring or replace the cable.
Inverter Overcurrent Alarm	Compressor inverter current exceeds overcurrent alarm point	Ground fault or short circuit in inverter output circuit.	Troubleshoot output circuit fault.
		Low voltage.	Adjust voltage to normal range.
		Undersized inverter.	Replace with higher power inverter.
		Motor ground short circuit.	Replace cable or motor.
		Acceleration time too short causing overcurrent.	Increase acceleration time.
		Improper manual torque boost or V/F curve causing overcurrent.	Adjust manual torque boost or V/F curve.
		Starting while motor is rotating causing overcurrent.	Wait for motor to stop before starting.
		Sudden load change during acceleration/deceleration/operation causing overcurrent.	Eliminate sudden load changes.
		Deceleration time too short causing overcurrent.	Increase deceleration time.
Inverter Overtemperature Alarm	Compressor inverter temperature exceeds overtemperature alarm point	Blocked cooling air passage of compressor inverter.	Clear cooling air passage.
		High ambient temperature.	Reduce ambient temperature.
		Damaged fan.	Replace inverter.



		Damaged thermistor.	Replace inverter.
		Damaged inverter module.	Replace inverter.
Other Inverter Fault Alarm	Compressor inverter experiences other faults beyond those listed above	Loose wiring or damaged cable of compressor inverter.	Secure wiring or replace cable.
		Damaged compressor inverter.	Replace compressor inverter.
		Undersized inverter.	Select higher power inverter.
System Low Pressure Alarm	System pressure is below the low-pressure alarm setpoint	Refrigerant leakage	Check for leakage points, repair, and replenish refrigerant.
		Electronic expansion valve malfunction	Replace the electronic expansion valve.
		Severely clogged condenser	Clean the condenser.
CAN Communication Fault Alarm	Communication failure with host computer using CAN protocol	Communication cable damage	Replace the communication cable.
		Incorrect communication port connection	Reconnect the communication lines.
		Mismatched communication baud rate between chiller and host computer	Set the same communication baud rate for the chiller and host computer.
Outlet Pressure Sensor Failure	Outlet pressure sensor fails to detect pressure	Loose or damaged wiring of outlet pressure sensor	Secure or replace the electrical wiring.
Inlet Pressure Sensor Failure	Inlet pressure sensor fails to detect pressure	Loose or damaged wiring of inlet pressure sensor	Secure or replace the electrical wiring.
High Outlet Pressure Alarm	Outlet pressure exceeds high-pressure alarm setpoint	Blockage in water circuit system	Inspect the water circuit system.
		Excessive coolant	Release some coolant to reduce pressure.
Water Replenishment Alarm	Inlet pressure of chiller is below alarm setpoint	Insufficient coolant in chiller	Replenish coolant using the replenishment pump.
AC Overvoltage Alarm	Input power voltage exceeds overvoltage setpoint	Unstable power grid	Check the power grid. If confirmed, recommend installing a voltage stabilizer for the chiller.
AC Undervoltage Alarm	Input power voltage is below undervoltage	Unstable power grid	Check the power grid. If confirmed, recommend installing a voltage



	setpoint		stabilizer for the chiller.
System Low Pressure Lockout Alarm	Three system low pressure alarms occurred within 1 hour	Refrigerant leakage	Check for leakage points, repair, and replenish refrigerant.
		Electronic expansion valve malfunction	Replace the electronic expansion valve.
Inverter Overcurrent Lockout	Three inverter overcurrent alarms occurred within 1 hour	Ground fault or short circuit in inverter output circuit	Troubleshoot the output circuit fault.
		Low voltage	Adjust the voltage to the normal range.
		Undersized inverter	Replace with a higher power inverter.
		Motor ground short circuit	Replace the cable or motor.
		Acceleration time too short causing overcurrent	Increase the acceleration time.
		Improper manual torque boost or V/F curve causing overcurrent	Adjust the manual torque boost or V/F curve.
		Starting while motor is rotating causing overcurrent	Wait for the motor to stop before starting.
		Deceleration time too short causing overcurrent	Increase the deceleration time.
Inverter Overtemperature Lockout	Three inverter overtemperature alarms occurred within 1 hour	Blocked cooling air passage of compressor inverter	Clear the cooling air passage
		High ambient temperature	Reduce the ambient temperature
		Damaged thermistor	Replace the inverter
		Damaged inverter module	Replace the inverter
Inverter Overvoltage Lockout	Three inverter overvoltage alarms occurred within 1 hour	High input voltage	Adjust the voltage to the normal range
		Acceleration time too short causing overvoltage	Increase the acceleration time
		Deceleration time too short causing overvoltage	Increase the deceleration time
Inverter Undervoltage Lockout	Three inverter undervoltage alarms occurred within 1 hour	Momentary power outage	Alarm clears automatically after fault recovery
		Input voltage outside specified range	Adjust the voltage to the normal range
		Abnormal rectifier bridge or buffer resistor	Replace the inverter
		Abnormal driver board	Replace the inverter



XIONGAN YINGLI ENERGY TECHNOLOGY CO., LTD

Liquid Cooling Container User Manual

Other Inverter Fault Lockout	Three other inverter fault alarms occurred within 1 hour	Loose wiring or damaged cable of compressor inverter	Secure wiring or replace cable
		Damaged compressor inverter	Replace the compressor inverter
		Undersized inverter	Select higher power inverter
Abnormal Power Loss	Chiller powers on again after unexpected shutdown without proper turn-off	Improper user operation (direct power cut without shutdown)	No action needed. Alarm clears automatically after few seconds
		Temporary power grid outage	No action needed. Alarm clears automatically after few seconds
Ambient Temperature Sensor Failure	Ambient temperature sensor fails to detect temperature normally	Loose wiring or damaged cable of ambient temperature sensor	Secure wiring or replace cable
		Damaged ambient temperature sensor	Replace ambient temperature sensor
Refrigerat ion System Abnormal	Pressure ratio between high and low pressure sides is too low	Compressor failure	Replace compressor
		Loose wiring or damaged cable of compressor	Secure wiring or replace cable
Low Superheat Protection	System suction superheat is below alarm setpoint	Low coolant flow rate	Replenish coolant
		Excessive refrigerant	Recover some refrigerant
		Electronic expansion valve failure (excessive opening)	Replace electronic expansion valve
		Inaccurate monitoring due to faulty suction temperature sensor or low pressure sensor	Replace suction temperature sensor or low pressure sensor
Inverter Overvoltage Alarm	Compressor inverter voltage exceeds overvoltage alarm setpoint	High input voltage	Adjust voltage to normal range
		Acceleration time too short causing overvoltage	Increase acceleration time
		Deceleration time too short causing overvoltage	Increase deceleration time
Inverter Undervoltage Alarm	Compressor inverter voltage is below undervoltage alarm setpoint	Momentary power outage	Alarm clears automatically after fault recovery
		Input voltage outside specified range	Adjust voltage to normal range
		Abnormal rectifier bridge or buffer resistor	Replace inverter
		Abnormal driver board	Replace inverter

◆ Fault Repair

Common fan failures and repair methods are shown in the following table:

Fault Phenomenon	Possible Causes	Inspection and Repair
External circulation fan not running	Chiller unit not powered on	Check if there is power input to the chiller unit's power supply terminal.
	Lightning strike, circuit breaker tripped	Check if the internal circuit breaker of the chiller unit is closed.
	Abnormal power input (e.g., overvoltage or undervoltage)	Confirm if the chiller unit has corresponding alarms and refer to "Section 7.1 Alarm Handling" for resolution.
	Chiller unit in standby mode	Normal scenario.
	Chiller unit powered on, enters automatic control logic after 30s standby.	
	Fan jammed	Check for foreign objects obstructing the fan.
	Terminals loose	Check if the fan connection terminals are loose.
	Compressor not started	Refer to "Table 7-3 Refrigeration Faults" under "Compressor not started" for handling.
	Control board failure	Replace the control board. For details, refer to "Section 7.3.7 Replacing Electrical Components".
External circulation fan abnormal noise	Fan failure	Replace the fan. For details, refer to "Section 7.3.2 Replacing External Circulation Fan".
	Fan bearing worn out	Replace the fan.
	Fan impeller cracked	Replace the fan.

◆ Cooling system fault

Common Refrigeration System Faults and Repair Methods are shown in the following table:

Fault Phenomenon	Possible Causes	Inspection and Repair
Compressor not starting	Power not turned on (standby mode)	Check main power switch and verify if the unit is powered on via the operation display interface.
	Loose electrical connections	Tighten circuit connectors.
	Open or short circuit	Locate and repair open or short circuit in main power supply.
	Inverter failure	Replace the inverter.
	Control board damaged	Replace the control board. For specific steps, refer to "Section 7.3.7 Replacing Electrical Components".
	Compressor motor failure	Replace the compressor.
Compressor not working	No cooling demand	Check the outlet water temperature and compressor output status on the display interface. Verify if the system is in cooling mode on the operation interface.
	Shutdown delay	The compressor has a minimum shutdown time under normal conditions. If the temperature rises to the startup point during this period, the compressor will still start after the delay.
High exhaust pressure	Condenser clogged	Clean the condenser using compressed air or a vacuum with a brush attachment.
	External circulation fan not running	Refer to "Table 7-2 Fan Faults" under "External circulation fan not running" for handling.

◆ Coolant circulation system fault

The common faults and maintenance methods of the coolant circulation system are shown in the following table:

Fault Phenomenon	Possible Causes	Inspection and Repair
Internal circulation pump not starting	Power not turned on (standby mode)	Check main power switch and verify if the unit is powered on via the operation display interface.
	Loose electrical connections	Tighten circuit connectors.
	Water pump inverter failure	Replace the water pump inverter.
	Pump body failure	Replace the water pump.
Electric heater not working	No heating demand	Check if the outlet water temperature and heating setpoint are properly configured.
	Loose electrical connections	Tighten circuit connectors.



	Electric heater overheating protection	Wait for a period of time and restart the electric heater. Observe if it operates normally.
	Electric heater failure	Replace the electric heater.

6.2.4. PCS Fault and Alarm

Common PCS Faults and Repair Methods are shown in the following table:

Control Software (DSP) Fault Definition

NO.	Fault Name	Physical Significance	Causes and Troubleshooting Methods
1	Hardware Fault_Phase A Hardware Overcurrent	The instantaneous current value of Phase A exceeds the protection threshold set by the hardware circuit.	This fault is currently not in use; the machine will not report this fault.
2	Hardware Fault_Phase B Hardware Overcurrent	The instantaneous current value of Phase B exceeds the protection threshold set by the hardware circuit.	This fault is currently not in use; the machine will not report this fault.
3	Hardware Fault_Phase C Hardware Overcurrent	The instantaneous current value of Phase C exceeds the protection threshold set by the hardware circuit.	This fault is currently not in use; the machine will not report this fault.
4	Hardware Fault_Phase N Hardware Overcurrent	The instantaneous current value of Phase N exceeds the protection threshold set by the hardware circuit.	This fault is currently not in use; the machine will not report this fault.
5	Hardware Fault_Insulation Fault	The resistance between the positive/negative bus and the chassis is lower than the threshold set by the host computer (default: 50K).	With the power off, use a multimeter to measure the resistance between the positive/negative bus and the chassis. If the resistance is less than 100K, check whether the positive/negative terminals are shorted to the chassis. Check whether the correlation coefficients for the positive/negative bus-to-ground voltage in the "Calibration Parameters" are normal.
6	Hardware Fault_Total	If any phase (A, B, C,	This fault is currently



	Drive Fault	N) reports a drive fault, the total drive fault will be reported.	not in use; the machine will not report this fault.
7	Hardware Fault_Phase A Drive Fault	When the Phase A MOSFET is conducting, the driver chip detects that the VCE voltage exceeds the threshold and reports a drive fault.	This fault is currently not in use; the machine will not report this fault.
8	Hardware Fault_Phase B Drive Fault	When the Phase B MOSFET is conducting, the driver chip detects that the VCE voltage exceeds the threshold and reports a drive fault.	This fault is currently not in use; the machine will not report this fault.
9	Hardware Fault_Phase C Drive Fault	When the Phase C MOSFET is conducting, the driver chip detects that the VCE voltage exceeds the threshold and reports a drive fault.	This fault is currently not in use; the machine will not report this fault.
10	Hardware Fault_Phase N Drive Fault	When the Phase N MOSFET is conducting, the driver chip detects that the VCE voltage exceeds the threshold and reports a drive fault.	This fault is currently not in use; the machine will not report this fault.
11	Hardware Fault_Heat Sink Overtemperature Fault	The heat sink temperature exceeds 90 degrees.	1. Check the ambient temperature of the machine and whether the fan is blocked. 2. Check whether the temperature sampling sensor is detached.
12	Hardware Fault_Ambient Overtemperature Fault	The air inlet temperature exceeds 60 degrees.	Check the ambient temperature of the machine and whether the fan is blocked. Check whether the temperature sampling sensor is detached.
13	Software Fault_Phase A Output Overload	Software Fault_Phase A Output Overload	This fault is currently not in use; the machine will not report this fault.
14	Software Fault_Phase A Output Overcurrent	The output current of Phase A exceeds the	This fault is currently not in use; the machine



		overcurrent value.	will not report this fault.
15	Software Fault_Phase B Output Overload	Software Fault_Phase B Output Overload	This fault is currently not in use; the machine will not report this fault.
16	Software Fault_Phase B Output Overcurrent	The output current of Phase B exceeds the overcurrent value.	This fault is currently not in use; the machine will not report this fault.
17	Software Fault_Phase C Output Overload	Software Fault_Phase C Output Overload	This fault is currently not in use; the machine will not report this fault.
18	Software Fault_Phase C Output Overcurrent	The output current of Phase C exceeds the overcurrent value.	This fault is currently not in use; the machine will not report this fault.
19	Software Fault_Phase N Output Overload	Software Fault_Phase N Output Overload	This fault is currently not in use; the machine will not report this fault.
20	Software Fault_Phase N Output Overcurrent	The output current of Phase N exceeds the overcurrent value.	This fault is currently not in use; the machine will not report this fault.
21	Software Fault_AC Overvoltage	The phase voltage of any AC phase exceeds 1.2 times the rated voltage (threshold can be modified via the host computer).	Check if the AC wiring is correct. Measure the voltage of each phase relative to N using a multimeter. Check if the AC overvoltage protection parameters in the "Protection Parameters" section of the host computer are set correctly. Check if the voltage calibration coefficients for each phase in the "Calibration Parameters"



			section of the host computer are correct.
22	Software Fault_AC Undervoltage	The phase voltage of any AC phase falls below 0.85 times the rated voltage (threshold can be modified via the host computer).	Check if the AC wiring is correct. Measure the voltage of each phase relative to N using a multimeter. Check if the AC overvoltage protection parameters in the "Protection Parameters" section of the host computer are set correctly. Check if the voltage calibration coefficients for each phase in the "Calibration Parameters" section of the host computer are correct.
23	Software Fault_THD Exceeded Limit	THD detection starts when phase current exceeds 40A. Phase current THD exceeds 15% (threshold can be modified via the host computer).	Use an oscilloscope to measure if the AC voltage distortion rate is severe. Use an oscilloscope to measure whether the DC voltage is stable during machine operation.
24	Software Fault_AC Phase Loss	The ratio of negative sequence voltage to positive sequence voltage exceeds 0.6.	Check if the AC wiring is correct. Measure the voltage of each phase relative to N using a multimeter. Check if the AC overvoltage protection parameters in the "Protection Parameters" section of the host computer are set correctly. Check if the voltage calibration coefficients for each phase in the



			"Calibration Parameters" section of the host computer are correct.
25	Software Fault_AC Phase Sequence Error	The three-phase AC line sequence is reversed.	Check the AC phase sequence.
26	Software Fault_DC Reverse Connection Fault	The DC positive and negative terminals are connected in reverse.	Check the wiring of the DC positive and negative terminals
27	Software Fault_DC Bus Software Overvoltage	The total voltage of the bus capacitor exceeds 1015V (adjustable range: 850-1020V via the host computer).	Check if the battery voltage exceeds 1000V and whether the battery contactor has tripped. Check if the calibration coefficients for the positive and negative half-bus voltages in the "Calibration Parameters" section of the host computer are correct. Check if the DC bus overvoltage parameters in the "Protection Parameters" section of the host computer are correct.
28	Software Fault_DC Bus Software Undervoltage	The total voltage of the bus capacitor falls below 600V (adjustable range: 600-850V via the host computer).	Check if the battery voltage is below 600V and whether the battery contactor has tripped. Check if the calibration coefficients for the positive and negative half-bus voltages in the "Calibration Parameters" section of the host computer are correct. Check if the DC bus overvoltage parameters in the "Protection Parameters" section of the host computer are correct.
29	Software Fault_AC Overfrequency	The AC current frequency exceeds 50.5Hz (adjustable via the host computer).	Use an oscilloscope or other frequency measurement tool to check if the AC frequency is correct. Check if the overfrequency protection parameters in the



			"Protection Parameters" section of the host computer are set correctly.
30	Software Fault_AC Underfrequency	The AC current frequency falls below 48.5Hz (adjustable via the host computer).	Use an oscilloscope or other frequency measurement tool to check if the AC frequency is correct. Check if the overfrequency protection parameters in the "Protection Parameters" section of the host computer are set correctly.
31	Software Fault_DC Charging Overcurrent	The charging current exceeds 300A (adjustable via the host computer).	Check if the DC voltage drops during operation.
32	Software Fault_DC Discharging Overcurrent	The charging current exceeds 300A (adjustable via the host computer).	Check if the DC voltage drops during operation.
33	Software Fault_DC Main Positive Closing Fault	For high-voltage box models, when the DSP sends a command to open the main positive relay, the relay fails to disengage normally.	Check if the main positive relay is stuck.
34	Software Fault_DC Main Positive Opening Fault	For high-voltage box models, when the DSP sends a command to open the main positive relay, the relay fails to disengage normally.	Check if the main negative relay is stuck.
35	Software Fault_DC Main Negative Closing Fault	For high-voltage box models, when the DSP sends a command to close the main negative relay, the relay fails to engage normally.	Check if the main positive relay is stuck.
36	Software Fault_DC Main Negative Opening Fault	For high-voltage box models, when the DSP sends a command to open the main negative relay, the relay fails to disengage normally.	Check if the main negative relay is stuck.
37	Software Fault_Ferroelectric Parameter Save Error	The stored parameters failed the CRC check.	Re-import the parameters.
38	Software Fault_DC Soft	DC pre-charging timeout.	Check if the DC relay is



	Start Failure		securely engaged. Check if the DC pre-charging resistor is damaged. Check if the DC side voltage is stable.
39	Software Fault_AC-DC Voltage Mismatch	The DC side voltage is less than AC phase voltage * 2.45 + 20V.	Check if the AC voltage is too high or the DC voltage is too low.
40	Software Fault_Grid Islanding Fault	The grid power suddenly fails during operation.	Check the reliability of the grid.
41	Software Fault_Startup Conditions Not Met		
42	Software Fault_Switch Failure During Operation		Temporarily Disabled
43	Software Fault_Startup Timeout		Temporarily Disabled
44	Software Fault_Parameter Configuration Error		Temporarily Disabled
45	Software Fault_Branch Instantaneous Unbalance	Instantaneous current of any branch exceeds 180A	Use an oscilloscope to measure whether there is large-scale fluctuation in AC/DC voltage during operation. Check if the branch calibration coefficients in the host computer's "Calibration Parameters" are correct.
46	Software Fault_Branch RMS Unbalance	Current difference between any two branches in the same phase exceeds 15A	
47	Software Fault_AC Voltage Unbalance	Phase voltage difference in three-phase system exceeds 18% of the average phase voltage	Use a multimeter to measure whether the grid voltage is balanced.
48	Fuse Blown Fault		Temporarily Disabled
49	Fiber Optic Communication Fault		Temporarily Disabled
50		Battery voltage exceeds 1015V (adjustable via host computer)	Check if battery voltage exceeds 1015V. Verify DC overvoltage threshold

	Software Fault_Battery Software Overvoltage		setting in "Protection Parameters" of host computer. Check battery voltage calibration coefficients in "Calibration Parameters" of host computer.
51	Software Fault_Battery Software Undervoltage	Battery voltage below 600V (adjustable via host computer)	Check if battery voltage is below 600V. Verify DC undervoltage threshold setting in "Protection Parameters" of host computer. Check battery voltage calibration coefficients in "Calibration Parameters" of host computer.
52	Software Fault_Bus Voltage Unbalance	RMS voltage difference between positive and negative half-buses exceeds 160V	Use oscilloscope to check for large fluctuations in AC/DC voltage during operation. Verify positive/negative half-bus calibration coefficients in "Calibration Parameters" of host computer.
53	Software Fault_Half-Bus Overvoltage	Temporarily Disabled	
54	Software Fault_PTP Communication Disconnection	Serial communication failure between Arm and DSP	
55	Leakage Current Over-Limit Protection	Leakage current exceeds 1.5A	Check AC/DC grounding insulation reliability.
56	Hardware Fault_Zero Drift Fault	Current zero drift exceeds 15A	If not resolved after reboot, return to factory for repair.
57	Hardware Fault_DC Soft Start Fault	DC precharge timeout	Check DC side positive/negative relays, precharge relay, and DC fuse integrity.
58	Hardware Fault_AC Overcurrent	Instantaneous current of any branch exceeds hardware limit	Check AC/DC voltage stability, wiring correctness, and on/off-grid mode configuration.
59	Software Fault_AC Overcurrent	Instantaneous current of any phase exceeds 330A (adjustable via host computer)	Check AC/DC voltage stability, wiring correctness, and on/off-grid mode configuration.
60	Hardware Fault_Half-	Temporarily Disabled	



	Bus Overvoltage		
61	Hardware Fault_DC Overvoltage	Battery voltage exceeds 1020V	Check if battery voltage is too high.
62	Hardware Fault_AC Soft Start Fault	AC precharge timeout	1. Check AC side voltage sampling accuracy. 2. Check AC filter capacitor voltage sampling correctness.

Communication Software (ARM) Fault Definitions

NO.	Fault Name	Physical Significance	Causes and Troubleshooting Methods
1	ARM_Internal Communication Fault		Internal machine communication issue
2	ARM_EMS Communication Fault		Fault triggered when EMS communication disconnects for 15s after establishment
3	ARM_SPI Fault Recording Communication Fault		Internal machine communication issue
4	ARM_SD Card Fault		SD card damaged or missing
5	ARM_RTC Fault		RTC clock issue
6	ARM_Emergency Stop Input Signal Feedback		"Emergency Stop Input" at PCS housing terminal I1 is closed (normally open by default)
7	ARM_BMS Dry Contact Signal Feedback		"BMS Dry Contact" at PCS housing terminal I2 is closed (normally open by default)
8	ARM_Ingbar STS Switch Thyristor Overtemperature		In PCS grid-connected/off-grid switching scenarios, when STS switch overheats, a DO signal is output to PCS through dry contact at terminal I3 to indicate overtemperature
9	ARM_BMS Communication Fault		Fault triggered when BMS communication disconnects for 15s after establishment
10	ARM_BMS Temperature Abnormal		Check the BMS temperature
11	ARM_BMS Shutdown		Check whether there is a bounce in the message data of BMS



XIONGAN YINGLI ENERGY TECHNOLOGY CO., LTD

Liquid Cooling Container User Manual

12	ARM_BMS Battery Alarm		Check whether there are battery alerts in the message data of the BMS
13	ARM_DCDC Communication Fault		Reserved, currently not in use
14	ARM_Emergency Stop Fault Feedback		Emergency stop fault feedback from EMS or host computer software

6.3. Emergency Solutions

In the event of abnormal sounds, sparks, unusual odors, or other emergencies during equipment operation, to prevent accidents such as electric shock, fire, or explosion, on-site operators shall:

Immediately press the emergency stop switch to halt equipment operation.

1) Disconnect the grid-side AC circuit breaker.

2) Check the control power circuit. If functional, retain control power to facilitate fault diagnosis.

Detailed records of the fault context and consequences must be maintained to support analysis and resolution. No further operation of the equipment is permitted until our after-sales service personnel are contacted for handling. Severe Abnormalities and Accident Handling Measures For battery system abnormalities or accidents, implement correct and effective measures promptly to prevent further damage or loss escalation.

Overheating: Normally, the battery system's cooling mechanism automatically regulates temperature to the optimal range. If the system fails to reach the target temperature within the specified time or exceeds the safe upper limit, the management system will issue a warning and require immediate cessation of use. Stop using the battery immediately and notify technical personnel for comprehensive inspection. Resume use only after troubleshooting.

Leakage: If leakage is detected, evacuate personnel from the energy storage room immediately and notify technical personnel for on-site handling. Do not operate the battery under faulty conditions. Resume use only after repairs.

Over-Discharge: When the battery system is depleted, with overall voltage too low or individual cell voltages below the normal operating range, the management system will issue a warning and require immediate cessation of discharge and initiation of charging. Stop discharging immediately and begin charging. Forced discharge under these conditions may damage battery performance or permanently disable the battery.

Short Circuit: For any battery system short circuit, evacuate personnel from the energy storage room immediately. Cut off relevant power sources and electrical equipment (if possible), disconnect the battery from the system, and notify technical personnel for immediate repairs. Severely short-circuited batteries must not be reused until thoroughly inspected by the manufacturer to determine reparability.

Fire: In case of battery system fire, evacuate personnel immediately and prohibit unauthorized access to the area (due to explosion risks). Only trained personnel using specialized fire extinguishers should attempt suppression. After extinguishing, personnel with proper protective gear must disconnect power lines and fully discharge the battery system (to 0V) using resistors before removal and analysis.

Physical Impact: If the battery system is collided with, deformed, or punctured, disconnect power lines immediately and notify technical personnel. If removal is required, personnel with protective gear must fully discharge the battery before disassembly.

Other Incidents: For other accidents requiring maintenance or removal, disconnect battery lines first, ensure no short circuit risks, and handle the system to avoid collision, falling, or inversion. Refer to the above measures for handling such cases.

6.4. Maintenance

6.4.1. Routine maintenance

To ensure normal operation and heat dissipation of the energy storage cabinet, the dust filter cotton inside the air inlet and outlet louvers requires regular maintenance. The recommended maintenance interval is 3-6 months, adjusted based on regional air pollution levels and operational hours. Do not use hot water or organic solvents (such as gasoline) for cleaning during maintenance.

DANGER

Electrical Hazard! High Voltage!

- ◆ Do not touch any live components of the equipment.
- ◆ Never place flammable materials near the product. The isolation switch is used to manually cut off the high-voltage circuit. Before performing maintenance on the system, the isolation switch must be disconnected. After maintenance is completed, ensure the isolation switch is returned to the ON position.

If the energy storage system remains unused for an long period, it may cause irreversible damage to the batteries. Regular maintenance is essential.

NO.	Item	Frequency	Solutions
1	Normal Use (Daily operation of liquid-cooling cabinet)	12 months	Perform battery maintenance every 12 months to prevent damage. Conduct a system inspection every 12 months.
2	Intermittent Use (Irregular monthly operation frequency, not guaranteed daily))	Monthly	Same requirements as for normal system operation.
3	Long-Term Inactivity (Liquid-cooled cabinet unused for over 3 months)	3 months	Maintain the State of Charge (SOC) between 20% and 50% during storage.
			Disconnect all power-consuming equipment from the system.
			Perform a system inspection every 3 months and retain all maintenance records.
			Conduct battery maintenance every 3 months to prevent degradation or damage.
			Before resuming use, fully charge the



			product at least once to reactivate the battery system and restore optimal performance.
4	Filter Cotton Maintenance	3-6 months	To ensure proper ventilation and heat dissipation in the electrical compartment, it is recommended to remove, clean with water, air dry, and reinstall the filter cotton inside the louvers every 3-6 months. Replace the filter if necessary.
5	Appearance Inspection	1 month	To maintain the product's condition, perform a monthly visual inspection. Address scratches and rust promptly by removing rust and repainting to prevent further corrosion. Contact our after-sales technical support for assistance if needed.
6	Operational Status	Daily	During charging and discharging, check for any abnormal noises from the equipment.

Table5-4 Routine maintenance

Note: The storage State of Charge (SOC) must be maintained within the 20%-50% range. If the customer expects to store the module for more than 1 month but not exceeding 3 months, a charge-discharge cycle must be performed in advance to adjust the SOC to 20%-50%. No liability will be accepted for capacity loss or other damages if the module is stored outside the 20%-50% SOC range or exceeds 3 months without charge-discharge maintenance.

6.4.2. Fire-protection maintenance instructions

(1) Fire Extinguishing System Alarm

All personnel must evacuate immediately when the fire suppression system alarm is activated. After extinguishing, the cabinet door must be opened first for ventilation. Note: Personnel should stay away from the door during ventilation.

(2) Handling of Fire Suppression Components

Fire suppression devices should be kept away from heat sources. During transportation, handle with care and provide protection for the aerosol container position to prevent accidental discharge caused by mechanical impact damage to the internal glass bulb.

(3) Maintenance and Inspection Requirements

Avoid damaging the equipment surface during disassembly/assembly. Unauthorized personnel are prohibited from operating the equipment to prevent accidents. Detailed records must be maintained for all maintenance, inspections, and tests.

NO.	Item	Frequency	Maintenance solutions
1	Aerosol Fire Extinguishing Agent	Every 10 years	Replace
2	Temperature and Smoke Sensors	Every 12 months	Open the cabinet door and check whether the indicators of the temperature and smoke sensors flash every few seconds. If so, they are operating normally.

Table5-5 Fire-protection maintenance instructions

Daily Inspection and Cleaning Requirements:

- 1.Check for faults and alarm records daily.
- 2.Clean the machine using a soft cloth dampened with neutral detergent or window cleaner.
- 3.Do not use highly volatile cleaners or spray cleaning agents directly onto the equipment.

6.4.3.Liquid-cooling maintenance instructions

Routine maintenance is a preventive measure, referring to the periodic inspection and upkeep activities performed by maintenance personnel during normal equipment operation. It aims to promptly detect and eliminate potential alarms and faults within the system. The goal of routine maintenance is to ensure long-term stable operation of equipment. Through routine maintenance:

- 1.Potential alarms during operation can be identified in time, preventing them from escalating and ensuring stable equipment performance.
- 2.Hidden faults can be detected early, eliminating risks at the萌芽 stage and avoiding economic losses and reduced customer satisfaction caused by failures.
- 3.Equipment performance trends can be observed, enabling targeted optimization to improve operational efficiency.

◆ Appearance maintenance

Item	Standard	Cycle	Method	Solutions
Appearance	Clean and dust-free	6 months	Visual inspection	Power off for at least 10 minutes, then



				clean dust and dirt with a brush or soft cloth.
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说明

The above maintenance cycles are suggested values and may be adjusted based on actual planning requirements.

◆ Electrical Control System Maintenance

Item	Standard	Cycle	Method	Solutions
Reliability of Wiring Panel Power Cables and Power Terminals	Electrical cables and terminals are secure without looseness	6 months	visual inspection	After powering off for at least 10 minutes, tighten loose cables with a screwdriver.
	No aging, damage, abnormal heating, or other irregularities in electrical cables	6 months	visual inspection	After powering off for at least 10 minutes, replace the power cable.
	Wiring panel is free of dust	6 months	visual inspection	After powering off for at least

				10 minutes, clean dust thoroughly using a brush.
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Maintenance operations must be performed after power-off. The above maintenance cycles are suggested values and may be adjusted based on actual planning requirements.

◆ Fan Maintenance

Item	Standard	Cycle	Method	Solutions
Fan Operational Reliability	No dust on the fan, and no foreign objects blocking the air vent	6 months	Visual inspection	After powering off for ≥ 10 minutes, clean fan dust with a brush and remove obstructions from vents.
	Fan blades are intact, and the fan rotates smoothly without abnormal noise	6 months	Visual inspection	After powering off for ≥ 10 minutes, check fan for misalignment (tighten if needed) and ensure no cable interference with rotation. Replace the fan immediately if damaged.

◆ 说明

The maintenance cycles provided above are recommended values and may be adjusted according to actual operational plans.

◆ Condenser Maintenance

注意

Condenser fins are sharp. Wear gloves during maintenance operations.

Item	Standard	Cycle	Method	Solutions
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Condenser Cleaning	The condenser is free of dust and foreign object blockages.	6 months	Visual inspection	After powering off for at least 1 minute, clean the condenser using compressed air or a vacuum equipped with a brush attachment.
	The fins show no severe bending or deformation.	6 months	Visual inspection	After powering off for at least 1 minute, perform fin straightening using a fin comb or appropriate tools.



The maintenance intervals provided above are recommended guidelines and may be adjusted based on actual operational requirements.

◆ Expansion Tank Maintenance

Item	Standard	Cycle	Method	Solutions
Working Air Pressure	Maintain pressure between 0.35Bar-0.4Bar	6 months	Tire pressure gauge	After powering off for ≥ 1 minute, recharge the expansion tank with nitrogen.



The maintenance intervals provided are recommended guidelines and may be adjusted based on actual operational plans and requirements.

◆ Coolant Maintenance

Item	Standard	Cycle	Method	Solutions
Coolant	Concentration within specified range pH and electrolyte levels meet requirements Free of contaminants, sediment, and algae	6 months	Coolant tester Visual inspection	After powering off for ≥ 10 minutes, replace the coolant.



It is recommended to conduct sampling tests on the coolant every six months. When the coolant specifications do not meet the requirements, they should be replaced. The testing cycle for coolant with superior stability can be relatively extended. Users can make adjustments based on the actual performance of the coolant.

6.4.4. Maintenance of electrical components

Electrical maintenance shall be performed on the wiring in the battery room and electrical room every six months.

1) Equipment Cleaning

- a) Power off the equipment before cleaning and cover devices with heat dissipation holes;
- b) Use a vacuum cleaner to remove dust and debris - do not use compressed



air to blow onto equipment;

c) After cleaning, check for loose connections and perform repairs if necessary.

2) Wiring Inspection

a) Check cable connections for darkened terminals or signs of contact melting - repair immediately if issues are found;

b) Inspect copper busbars for discoloration - repair immediately if issues are found;

c) Check cables and heat shrink tubing for damage - repair immediately if issues are found.

3) Insulation and Grounding Tests

a) Test system insulation and inspect the insulation condition of equipment and cables - repair immediately if issues are found;

b) Measure grounding resistance to ensure it is within the normal range - repair immediately if issues are found.

4) Power-On Test

a) Check if relays engage with normal sound and operate without abnormal noise - repair immediately if issues are found;

b) Ensure indicators, relays, switching power supplies, and other components light up normally after power-on - repair immediately if issues are found;

c) Use a multimeter to measure whether voltages are within the normal range - repair immediately if issues are found.

6) Auxiliary Electrical Equipment Maintenance

Check the operational status of auxiliary devices such as water leak detectors and lighting fixtures. Replace faulty components according to the spare parts list. Replacement must be performed by qualified personnel. Contact your supplier if necessary.

Periodic maintenance plans shall be developed based on specific equipment, and regular maintenance records shall be completed accordingly.

NO.	Maintenance item	Maintenance Cycle (Recommended)	Maintenance Method
1	Temperature and Humidity Alarm Performance Check	Semi-annually	Visual inspection, cleaning, replacement
2	Liquid Cooler Appearance Cleaning and Contamination Check	6 months	Visual inspection, cleaning, replacement
3	Liquid Cooler Dust Filter, Cable Terminals, etc.	3 months	Check control system wiring panel for dust, cable aging, loose terminals, etc.
4	Liquid Cooler Fan Blades	3 months	Check for abnormal fan noise, foreign objects in vents, etc.
5	Heat Exchanger Dust Cleaning	3 months	Check and clean dust from heat exchanger
6	Coolant Condition Check	3 months	Check coolant concentration, contamination, etc.
7	Water Pump Abnormal Noise, Outlet Pressure Status	6 months	Visual inspection, cleaning, replacement
8	Lightning Protection Device Check (Before thunderstorm season)	Semi-annually	Visual inspection, cleaning, replacement
9	Gas Fire Extinguishing System Check	Semi-annually	Check fixed gas fire suppression system (pressure value within green range)
10	Combustible Gas Alarm Check	Semi-annually	Visual inspection, cleaning, replacement
11	Fire Detector Check	Semi-annually	Check smoke/heat detector alarms and automatic fire alarm system
12	Ground Wire Check and Ground Resistance Test	Semi-annually	Visual inspection, cleaning, replacement
13	Auxiliary Electrical Equipment Working Status	Semi-annually	Visual inspection, cleaning, replacement
14	Power Cable Connection Status	Semi-annually	Visual inspection, cleaning, replacement
15	Insulation Resistance Test	4 years	Check if insulation resistance (high voltage circuit) exceeds 4MΩ (DC)

Table5-8 Maintenance Recommended Form

6.5.ANNEX

- (1) Regular maintenance is essential for product performance and service life. If components need replacement, use genuine parts from the original manufacturer.
- (2) During maintenance, disconnect the power supply to ensure operational safety, unless power is required for specific debugging procedures.
- (3) Before powering off the equipment, confirm that it has completely stopped operating. Never restore power directly while the equipment is running.
- (4) For data and operating programs requiring long-term archiving, back them up first, then shut down the operating system before disconnecting the power.
- (5) After power-off on site, implement a safety lockout to prevent accidental re-energization.

6.5.1. Daily Inspection Items

- (1) Record the ambient temperature and humidity in the battery room daily.
- (2) Assign dedicated personnel to perform daily inspections of the energy storage power station and maintain inspection records. Key daily inspection items are detailed in the list below (including but not limited to).
- (3) Regularly clean the energy storage cabinet system, paying special attention to the air intake and exhaust vents. Use a vacuum cleaner if necessary to ensure unobstructed airflow within the cabinet.
- (4) Ensure no debris is present inside the energy storage cabinet system and that the surrounding area is clear of obstacles to facilitate maintenance.
- (5) Periodically check cable terminals for looseness, severe corrosion, oxidation, or poor contact.
- (6) Regularly inspect cables for aging, damage, or compromised insulation.
- (7) Periodically verify the integrity and functionality of system status and alarm indicators.
- (8) Regularly test the emergency stop switch to ensure rapid system shutdown in case of emergencies.
- (9) Periodically inspect the fire suppression equipment configured for the system to ensure it is in good condition.
- (10) Long-term inactivity: When the battery system remains idle for an extended period, recharge it every 3 months to maintain SOC above 60%.

NO.	Daily Inspection Items	Inspection Ways
1	Operating Environment Check	Check for water stains around the energy storage cabinet and cable trenches. Verify whether the ventilation system is functioning properly. Ensure that air intake and exhaust vents are not blocked.
2	Operating Status	Listen for unusual noises (e.g., indoor smoke alarms, fan activation, relay engagement). Check for abnormal odors inside the cabinet (e.g., burning smell, electrolyte leakage).
3	Fire Detector Status	Monitor for abnormal alarms (e.g., cabinet smoke detectors, fan activation, relay engagement).
4	Operation Indicators	Verify whether the status indicators display the correct operating state.
5	PCS Operation	Confirm whether the power conversion system (PCS) is functioning normally.
6	Fire Protection and Explosion-Proof Ventilation	Ensure emergency alarm devices are in the correct position and check for any activated alarms. Verify whether the ventilation fans are activated.

7	Normal Operating Temperature	Read the internal temperature of the PCS, battery compartment, and other equipment. Observe whether the temperatures are within the normal range.
8	Connector/Terminal Status	Inspect connectors for looseness. Check terminals for severe corrosion or oxidation. Ensure all connections are secure and functioning properly.
9	Lightning Protection	Check whether the surge protective device (SPD) in the energy storage cabinet has failed. If the indicator window turns red, the SPD is faulty and must be replaced immediately. A green indicator indicates normal operation.
10	Cable Inspection	Inspect power and control cables for signs of damage or exposed wiring. If any damage is found, reinforce insulation or replace the cable.
12	Bolt Torque Check	Examine bolts in distribution boxes, PCS, and battery connections for aging or burnt marks. Manually shake the bolts to confirm they are securely tightened.
13	Dust Prevention Check	Clean or replace the air filter pads in the PCS and energy storage cabinet to maintain airflow at the intake vents.
14	Cabinet Cleaning	Inspect the cleanliness of key components inside the PCS, battery compartment, and electrical room. Clean if necessary.
15	Data Storage	Save system operating data and perform checks weekly.

Table 5-9 Daily Inspection Items

6.5.2. Daily Inspection Items:

Energy Storage cabinet daily inspection log				
Energy Storage cabinet NO.		Inspection Date		Inspector:
Items	Inspection Contents	Inspection Status	Problems	Solutions
Battery Room				
Electrical Room				
Fire-protection System				
Liquid cooling system				
Others				

Table 5-10 Routine Inspection Items

6.5.3. Daily Operational Fault Log

[illegible]



Table 5-11 Routine Inspection Items

6.5.4. Regular Maintenance Log

Energy Storage System Regular Maintenance Log					
Date	Maintenance Item	Engineer	Current Maintenance Time	Next Maintenance Time	Remark

Table 5-12 Routine Inspection Items

6. 6. After-sales

Yupont Smart Energy Technology (Jiaxing) Co., Ltd. provides customers with comprehensive technical support and after-sales service.

The free warranty period shall be in accordance with the contract. The following circumstances are not covered by our company's free warranty service:

- (1) Damage to the system or malfunctions resulting from operation not in compliance with the user manual.
- (2) Damage or malfunctions caused by improper wiring or power supply not meeting relevant electrical safety standards, or due to unsuitable on-site environmental conditions.
- (3) Damage or malfunctions resulting from unauthorized modifications by the user.
- (4) Damage or malfunctions caused by force majeure natural disasters such as typhoons, earthquakes, floods, fires, or harsh environmental conditions (high/low temperature, high humidity, acid rain, etc.).
- (5) Failure to maintain the initial fault condition and notify the manufacturer in a timely manner, leading to the inability to conduct a realistic fault analysis.

7. Notice

- (1) Do not immerse the product in water.
- (2) Improper use or storage of the product may pose risks of fire, explosion, or burns. Do not disassemble, crush, incinerate, or heat the product.
- (3) Do not expose the product to fire or prolonged high-temperature environments exceeding the limits specified in this document, as this may cause fire. Under any normal operating conditions, the temperature of the battery cells within the system must not exceed 60° C. If the temperature exceeds 60° C, shut down the product and cease operation.
- (4) Do not disassemble, dismantle, or modify the product in any way without authorization.
- (5) Do not mix products of different specifications, brands, or batches.
- (6) If the product emits unusual odors, overheats, deforms, discolors, or exhibits any other abnormalities, discontinue use and implement appropriate isolation measures.
- (7) Do not short-circuit the positive and negative terminals of the product. High current and temperatures may cause personal injury or fire. During battery system assembly and connection, strictly follow markings and instructions to connect the terminals. Reverse polarity or cross-wiring during charging is prohibited.
- (8) Do not overcharge or over-discharge the product, as this may cause overheating of cells within the battery cluster and lead to fire incidents. Hardware and software multiple fail-safe protections against overcharging and over-discharging must be implemented during installation and use.
- (9) Charging may terminate inappropriately due to exceeding allowed charging time, excessive charging voltage, or excessive charging current. Such events are defined as "improper charging termination." These may indicate leakage or component failure in the battery system. Do not resume charging until the root cause is identified and resolved, as continued charging may cause cell overheating or fire.
- (10) Securely fasten the product on a solid flat surface and properly secure power cables to avoid friction-induced arcing or sparks.
- (11) Do not use plastic materials for electrical connections. Improper electrical connections may cause overheating during operation.

(12) In case of electrolyte leakage, avoid skin or eye contact. If contact occurs, rinse the affected area thoroughly with water and seek medical attention. Do not allow any person or animal to ingest any part of the product.

(13) The product must be protected from mechanical vibration, impact, and pressure during use. Internal short circuits may otherwise occur, leading to high temperatures and fire. The product poses potential hazards; appropriate protective measures must be taken during operation and maintenance. Safety performance tests must only be conducted by professionals equipped with proper protective gear in specialized laboratories, as improper operation may cause fire or explosion. Failure to comply may result in serious personal injury or property damage.

(14) The customer acknowledges the following potential risks during product use and operation: operators may be exposed to chemicals, electric shock, or arc flashes. Although the human body responds differently to DC and AC currents, DC voltages above 50V are as hazardous as AC currents. Conservative practices must be adopted to avoid current-related injuries. The customer and their employees must consider these risks to prevent accidental short circuits, arcing, explosions, or thermal runaway when operating the product or selecting personal protective equipment.

(15) If the internal resistance of the product in use exceeds 200% of its initial value or its capacity falls to 70% or less of the nominal capacity, the customer must discontinue use. Our company shall not be liable for any parameter deviations, quality issues, cell failures, or losses resulting from continued use under such conditions.

8. Disclaimer

(1) Service and Technical Support

Our company provides service and technical support for product installation and usage. If product issues arise from non-compliance with this specification, we may offer technical guidance but do not commit to free replacement services.

(2) Compliance and Liability

The customer must strictly adhere to this specification and ensure all product users do the same. Our company bears no responsibility for parameter deviations, quality issues, malfunctions, or any losses resulting from non-compliance.

(3) Confidentiality Obligation

The customer is obligated to maintain confidentiality regarding the content of this specification and may not disclose it to any third party without authorization. Specific terms are outlined in the separately signed confidentiality agreement.

(4) Prohibition of Unauthorized Modification

Without our prior written consent, the customer, product users, or any related parties are prohibited from integrating, separating, or modifying the product's technical design, or engaging in probing, reverse engineering, or similar activities.

(5) Right to Modify Specifications

We reserve the right to modify product specifications and performance parameters. Customers must confirm the latest product specifications and parameters with us before placing orders.

(6) Compensation for Misuse

If improper use of the product by the customer, users, or any related party causes social impact or damages our reputation, the responsible parties shall compensate for all losses incurred by our company.

(7) Acceptance, Warranty, and Service

Matters related to product acceptance, warranty, after-sales service, and technical support are subject to the commercial agreements between both parties.

(8) Final Interpretation Right

In case of discrepancies between this technical specification and other related documents from our company, we retain the final right of interpretation.