

YiLiNK



V1.0

100kW/215kWh Industrial and Commercial Energy Storage User Manual

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CONTENTS

Chapter 1 Safety Instructio	1
1.1 Foreword	1
1.2 Safety Precaution	2
1.3 Use Precautions	3
Chapter 2 Safety Instructio	4
2.1 System Survey	4
2.2 Energy Storage System Specifications	6
2.3 Main Components of the System	7
Chapter 3 Machine Installation Instructio.....	9
3.1 Label Instructions	9
3.2 Safety Instructions	10
3.3 Safety Warning Operation	10
3.4 Machine Label Protection	10
3.5 Electricity Safety Matters	11
3.6 Environmental Space Requirements	11
3.7 Live Test Specifications.....	12
3.8 Maintenance or Inspection Specification	12
3.9 Machine Installation Guidance	13
3.10 Machine Installation Guidance	15
3.11 Delivery	15
3.12 Installation Site Requirements	18
3.13 Cable Requirements	19
3.14 Wiring Specifications	20
3.15 AC Side Wiring	22
3.16 System Grounding	22

Chapter 1: Safety Instructions

1.1 Foreword

Firstly, we appreciate you for using the energy storage series products of our company, this manual will introduce the relative information of the outdoor industrial and commercial integrated energy storage cabinet (100KW/215KWh) product (hereinafter referred to as 'energy storage cabinet').

The energy storage cabinet system adopts the 'All-in-One' design method, is embedded with the electricity cabin and battery cabin, and the integration of PCS, BMS, and EMS. The liquid cooling system and fire fighting system are also equipped.

This manual mainly provides the contents of product information, installation and usage instructionm fault information and daily maintenance of the energy storage cabinet, etc., not all information of the energy storage system is included. To ensure the correct installation and use of the energy storage cabinet, and to ensure its superior performance, it is necessary to carefully read this user manual and follow the precautions in the manual before handling, installing, operating, and maintaining the energy storage cabinet.

Warranty Statement:

Under normal use, if the product malfunctions or is damaged, our company provides warranty services during the warranty period. During the warranty period, appropriate repair fees will be charged for product damage caused by the following circumstances.

- Product damage caused by failure to operate the product in accordance with the provisions of the manual.
- Product damage caused by fire, flood, and abnormal voltage.
- Product damage caused by using this product for abnormal functions.
- Product damage caused by exceeding the specified usage range of the product.
- Secondary damage to products caused by force majeure factors (natural disasters, earthquakes, lightning strikes).

Please keep this manual safe for future reference. Our company reserves the right to continuously improve our products and update the content of this manual without prior notice. The physical and data deviation caused by product update, please refer to the physical product.

Chapter 4 Hardware Operation Instructions23

4.1 Component Layout Introduction23

4.2 EMS Interface Instructions25

Chapter 5 Operation Instruction of Web Cloud Platform33

5.1 Operation Instruction of Web Cloud Platform33

Chapter 6 Maintenance and Troubleshooting36

6.1 Daily Maintenance36

6.2 Fault Schedule36

1.2 Safety Precaution

When operating the battery system, it is necessary to strictly follow safety precautions and relevant operating procedures. Any incorrect operating methods may cause personal injury and equipment damage. When using the battery system, ensure that you have read this manual to prevent electric shock and burns, and ensure the integrity of the equipment. In addition, when operating the equipment, ensure compliance with the contents of the safety signs and labels of the product.

Note : This product is live equipment, please use it carefully!

The safety of personnel is fully considered in the design of the battery system. Like other live equipment, the operation must comply with some safety matters.

- 01** The operation and maintenance personnel must be specially trained and obtain the qualification certificate for the operation and use of electrical equipment, and should carefully read this user manual.
- 02** The safety barriers must be installed and should be marked with electric hazard.
- 03** During maintenance, it is necessary to follow the operating procedures, such as wearing insulated gloves, insulated shoes, and safety glasses. Other supervisors must be present during operation.
- 04** Wearing watch, bracelet, bangle, ring, and other conductive objects are prohibited during operation.
- 05** Never touch the battery system with wet hands.
- 06** Please do not open the product cover without authorization, there is a danger of electric shock.
- 07** The maintenance of the battery pack must be maintained by professional personnel, and it is strictly prohibited to disassemble the system by non-professional personnel: when proceeding with use or maintenance operation, it is strictly prohibited to wear or damage the internal and external wiring of the battery pack in case of danger.
- 08** When proceeding operations, special tools must be used, and the tools must be insulated.
- 09** Before the installation and removal of the power cables, the relevant power switch must be disconnected.

- 10** Before connecting the cable, it is necessary to confirm the cable and its identification, and connect it only after it matches the actual installation situation.
- 11** When using the power battery pack, do not exceed its usage environment range, otherwise it may cause abnormal conditions.
- 12** Placing flammable materials next to the battery system is prohibited.

This manual will also mention relevant safety precautions in other chapters, which must be followed to prevent personnel injury and equipment damage.

1.3 Use Precautions

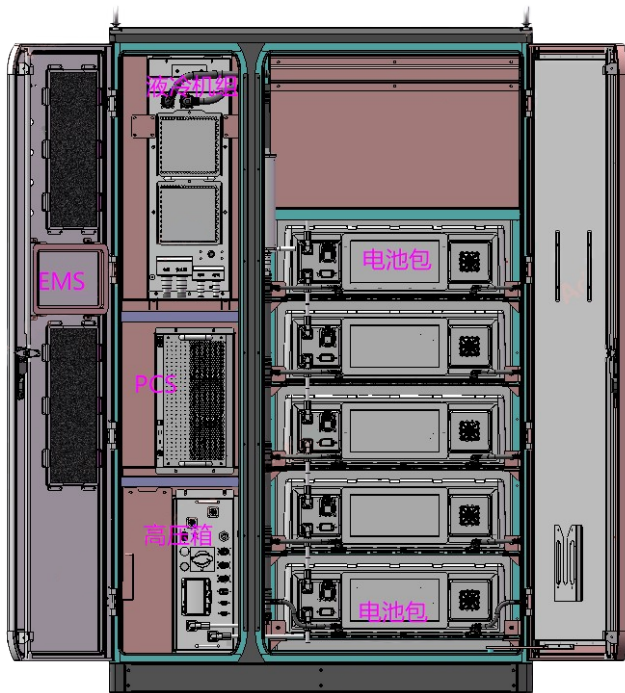
- 01** The usage environment should meet the technical requirements of the product.
- 02** During installation, it is necessary to strictly follow the installation steps outlined in this manual.
- 03** The operators and users of the product must be electrical equipment operators and users who have undergone professional training.
- 04** The product will inevitably accumulate dust and various impurities during use, and it must be regularly cleaned and maintained.
- 05** After a period of operation, the product needs to be maintained and cleaned up to avoid losses.
- 06** The system of recording the operation status of the equipment and application maintaining should be formed.
- 07** During operation, users should monitor the load operation at any time and stop the machine in a timely manner if it is abnormal.
- 08** Ensure good indoor ventilation and maintain ambient temperature within the range of 10-30℃ .
- 09** Be very careful when handling or measuring internal components, and be careful not to short circuit the instrument leads or contact other terminals: Maintenance processed by users is limited to recording the fault phenomenon, and if necessary, further repairs should be handed over to our company for processing.

Chapter 2: Safety Instructions

2.1 System Survey

The system is mainly composed of battery system, BMS management system, PCS, hydraulic-cooling unit, control relay, and other units. During the charging and discharging process of the battery pack, the battery management system collects real-time battery cell voltage, temperature parameters, current and other parameters, and analyzes and records them. When abnormal conditions such as over-voltage, under-voltage, over-temperature, and over-current of the battery are detected, the battery management system alarms, and if necessary, cuts off the charging and discharging circuit to protect the battery pack. The energy storage system has the advantages as below:

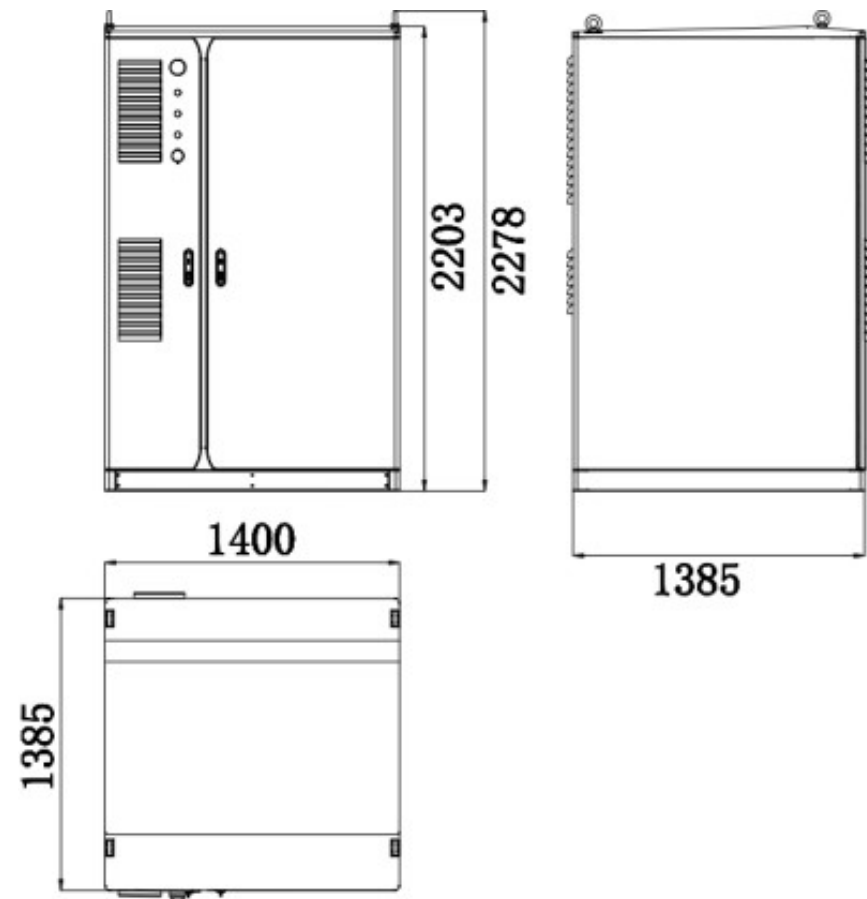
- The energy storage cabinet system has standardized and compact design, strong mobility, and is not limited by region. The system can easily and quickly allocate energy storage equipment in different spaces, different time, different power requirements, and different application scenarios to achieve resource integration and full utilization.
- The energy storage cabinet system has the characteristics of perfect function, advanced equipment, easy control, convenient maintenance, and beautiful appearance, so as to adapt to the new situation of power system, communication, industry and commerce, emergency rescue and military and other places as emergency standby power supply. At the same time, it can also be used for power grid peak shaving and valley filling, dynamic capacity increase, power quality management, and other application scenarios.



2.2 Energy Storage System Specifications

Grid connection parameters	
Grid type	3L+N
Nominal power	100kW
Nominal voltage	380V
Voltage range of grid	320V~460V
Nominal current	144A
Maximum conversion efficiency	≥97%
Overload capacity	110% Long term
Nominal frequency	50Hz
Grid frequency range	50Hz±2.5Hz
Total harmonic distortion rate of power grid	≤3%
three-phase unbalance	100%
Power factor	0.99
Battery parameter	
Battery type	Lithium ion Phosphate
Nominal energy	280Ah
Nominal voltage	215.04kWh
Operation voltage range	600V~864V
Composition method	1P240S
Rate	≤0.5C
Parameter system	
Cooling system	Industrial-level hydraulic cooling
Firefighting system	Perfluorohexanone fire fighting
Operation environment temperature	-20℃ ~50℃
Noise	≤60dB
Protection level	IP54 (Outdoor)
Altitude	≤3000m
Dimension	1460mm*1400mm*2203mm(L*W*H)
Weight	2.5±0.1 Ton

The external dimension diagram of the energy storage cabinet system is shown in Figure 2



2.3 Energy Storage System Specifications

Table 2 Main Components

No.	Item	Unit	Quantity
1	Battery PACK box	PCS	5
2	PDU high-voltage box	PCS	1
3	PCS Power Conversion System	PCS	1
4	EMS Energy Management System	set	1
5	Firefighting system	set	1
6	Hydraulic-cooling unit	PCS	1

2.3.1 Battery PACK box

The battery PACK box uses lithium iron phosphate battery cells with an initial capacity of 3.2V / 280Ah, 48 cells in series to form a PACK, and 5 PACKs to form a 768V / 280Ah / 215kWh battery system. The configuration is as follows:

Table 3 Battery system configuration table

Category		Single cell Quantity	Battery Capacity	Nominal voltage (V)	Maximum voltage (V)	Minimum voltage (V)	Nominal energy (kWh)
Logic single cell	1P	1	280	3.2	3.6	2.6	0.896
Battery module	1P48S	48	280	153.6	175.2	124.8	43.008
Battery system	1P240S	240	280	716.8	875	624	215.04

2.3.2 PDU Control box

Table 4 List of key components

No.	Item	Unit	Quantity
1	DC Contactor	PCS	2
2	DC Circuit breaker	PCS	1
3	Air-break switch	PCS	2
4	Prefilled resistance	PCS	1
5	Fuse	PCS	1
6	BMS Master control module	PCS	1
7	Current sensor	PCS	1

2.3.3 MPPT Parameters

Nominal Power	50kW	Dimensions (W * D * H) mm	400*500*88
High Voltage Side Current	Max.80A	Working Temperature	-20℃ ~55℃ (derating above 45℃)
Output Voltage Range	DC300V~DC1000V	Storage Temperature	-40℃ ~70℃ (without battery)
Low Voltage Side Current	Max.100A	Relative Humidity	0% RH~95% RH, non condensing
Input Voltage Range	DC0V~DC900V	IP Level	IP20
Maximum Efficiency	≥99%	Working Altitude	2000m; 2000m~4000m Derated Use
Parallel Quantity	16	Cooling Method	Air cooling, intelligent fan speed regulation
Communication Methods	RS485/Modbus RTU	Weight	17.5kg

2.3.4 PCS Power Conversion System

PCS parameter name		Parameter
DC side parameter	Maximum DC voltage	950V
	Minimum DC voltage	615V
	DC operation voltage range	615~950V
	DC side maximum current	170A
AC grid connection parameter	Nominal charge/discharge power	105kW
	Maximum charge/discharge power	115kW
	Nominal charge/discharge current	136A
	Nominal grid voltage	400V
	Allowable grid voltage range	300~440V
	Nominal grid frequency	50Hz/60Hz
	Total harmonic distortion rate of current	<3%(Under nominal power)
	Power factor	>0.99
AC off-grid parameter	Power factor range	-1~1
	Nominal output voltage	230/400V
	Voltage deviation	±2%
	Total harmonic distortion of voltage	<3%(Linear load)

Chapter 3: Machine Installation Instructions

3.1 Label Instructions

In order to ensure the personal and property safety of users when using this product, and to better use this product, relevant information is provided in the manual and highlighted with

	Indicates a highly potential danger that, if not avoided, could result in death or serious injury to personnel.
Distress	
	Indicates a moderate potential danger, if not avoided, could result in death or serious injury to personnel.
Warning	
	Indicates a low potential danger that, if not avoided, may result in moderate or mild injury to personnel.
Caution	
	Indicates potential risks that, if not avoided, may cause the equipment to malfunction or malfunction.
Be careful	

appropriate symbols. The following lists the symbol prompts that may be used in this manual. Readers are advised to read them carefully.

Please always pay attention to the danger warning signs on the body, which include:

Identification symbol	Identification description
	This symbol indicates that there is high voltage inside the body, touching may cause a risk of electric shock.
	This symbol indicates that the temperature here is higher than the acceptable range for the human body. Please do not touch it arbitrarily to avoid personal injury.
	This symbol indicates that this is protective grounding (PE) end, and needs to be firmly grounded to ensure the safety of operators.

3.2 Safety Instructions

- Only professional electricians or personnel with professional qualifications can carry out various operations on this product.
- Operators should be fully familiar with the structure and working principle of the entire energy storage system.
- Operators should be fully familiar with this manual.
- Operators should be fully familiar with the relevant standards of the country/region where the project is located.

 Warning	It is strictly prohibited to perform maintenance or repair operations while the equipment is live! When maintaining or repairing equipment, At least two personnel must be present on site. The device has been safely disconnected, and wait for 15 minutes for discharge before maintenance or repair operations can be carried out.
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3.3 Safety Warning Operation

To prevent unrelated personnel from approaching and causing accidents during the installation, daily maintenance, and maintenance of energy storage systems. Please comply with the following:

- Set up clear signs at the front and rear switches of the energy storage system to prevent accidental closing of the switches.
- Set up warning signs or safety warning tapes near the operating area.
- After maintenance or repair operations are completed, be sure to remove the cabinet door key and keep it properly.

3.4 Machine Label Protection

- The warning signs on the body of the energy storage system and inside the cabinet contain important information for safe operation of the energy storage system. It is strictly prohibited to tear or damage the signs artificially!
- There is a nameplate installed on the right side of the front door of the energy storage system, which contains important parameter information related to the product. It is strictly prohibited to tear or damage the signs artificially!
- If the body identification is damaged or blurred, please be sure to contact our company.

 Caution	Please ensure that the body identification is always clear and readable. Once the body identification is damaged or blurred, it must be replaced immediately.
---	--

3.5 Electricity Safety Matters

 Distress	There is a fatal high voltage inside the product! Do not touch the terminals or conductors connected to the power grid circuit. Pay attention to all instructions or safety instructions regarding connection to the power grid, and follow the warning signs on the product. Comply with the safety precautions listed in this manual and other relevant documents of this equipment.
--	--

 Distress	Damaged equipment or system malfunctions may cause electric shock or fire! Preliminary visual inspection of the equipment before operation for any damage or other hazards. Check if other external devices or circuit connections are safe and confirm that the equipment is in a safe state before the operation can be proceeded.
--	--

 Distress	There is a fatal high voltage between the positive and negative terminals of the energy storage battery pack connected to the energy storage system! When maintaining equipment, ensure that the connection between the energy storage system battery packs is completely disconnected.
--	---

 Caution	Static sensitive components on circuit boards or other areas may be damaged due to improper operation or contact by operators. Please avoid unnecessary contact with the circuit board.
---	--

3.6 Environmental Space Requirements

To ensure that staff can quickly evacuate the scene in the event of an accident, please comply with the following:

- Do not place flammable or explosive materials around the energy storage system.
- It is strictly prohibited to pile up debris in the escape passage or occupy the escape passage in any form. Do not use the energy storage system in damp environments beyond the specified limits!



Caution

It is highly possible to damage the energy storage system in a humid environment! To ensure the normal use of various functions of the energy storage system, please comply with: **When the air humidity is above 95%, do not open the cabinet door** to avoid maintenance or repair of the energy storage system in rainy or humid weather conditions.

3.7 Live Test Specifications



Distress

There is high voltage in the equipment, and accidental contact may cause a fatal electric shock hazard. Therefore, when conducting live measurements, it is necessary to: Take protective measures (such as wearing insulated gloves, insulated shoes, etc.). At least two personnel must be present on site to ensure personal safety.

When conducting electrical connections, trial runs, and other operations on the energy storage system, it is necessary to use relevant electrical measurement equipment to ensure that the electrical parameters meet the requirements.



Warning

Select high-quality measurement equipment that meets on-site requirements in terms of range and usable conditions. Ensure that the connection and use of measuring equipment are correct and standardized, so as not to cause arc and other dangers.

3.8 Maintenance or Inspection Specifications

When performing maintenance or repair operations on equipment, the following points should be noted:

- Set up maintenance signs and ensure that the energy storage system will not be accidentally re-powered on.
- Use a multimeter to ensure that the internal discharge of the energy storage system has been completed.
- Ensure that the equipment is well grounded.
- Live parts must be covered with insulation material.
- After the energy storage system is shut down and the AC/DC power supply is disconnected, at least 15 minutes is needed before opening the front door to the energy storage system.
- Perform maintenance or repair operations.
- Throughout the maintenance and repair process, it is necessary to ensure that the escape routes are completely unobstructed.

3.9 Machine Installation Guidance

3.9.1 Precautions before installation

- The installation of this series of energy storage systems must be carried out by at least two qualified personnel simultaneously, and all electrical installations must comply with local electrical installation standards.
- During installation, do not touch any other parts inside the chassis except for the wiring terminals.
- Safety signs must be set up at all upstream switches indicating 'under construction, don't close'.

3.9.2 Precautions before installation

After the product packaging is opened, the following items must be inspected, as shown in the table below.

No.	Inspection item	Confirmation
1	There is no damage, scratches, dents, etc. on the appearance.	☐
2	The purchased optional accessories of the products are complete.	☐
3	The nameplate information is consistent with the ordered product model.	☐
4	The warning label is free from damage, scratches, blurriness, and other phenomena.	☐

3.9.3 Precautions for unboxing

- It is not allowed to remove the package when the energy storage cabinet is being stored, and it can only be removed during installation.
- When receiving goods from transportation company, it is essential to carefully inspect the products, compare them with the supply list, and verify each received item. If the goods are missing or damaged, the transportation company should be notified immediately upon discovery.
- Before opening the box, please check whether the outer packaging of the product is intact, and whether there is any damage, moisture, deformation, etc.
- Please open the packaging in hierarchical order and do not forcefully tap.
- When opening the box, please check the surface of the product and its accessories for any damage, rust, scratches, missing items, etc.

3.9.4 Storage precautions

- When storing, try to package the product in its original packaging method, and maintain the temperature between -30℃ and+60℃ .
- The equipment must be placed in a clean and dry space, avoiding splashing, rain, humidity, high temperature, or outdoor exposure to sunlight.
- There are no harmful gases, flammable, explosive products, or corrosive chemicals in the storage space.
- Long term storage must be covered or appropriate measures taken to ensure that the product is not contaminated or affected by the environment.
Avoid mechanical impact, heavy pressure, strong electric and magnetic field effects.
- Avoid direct sunlight, keep a distance of ≥ 2m from the heat source, elevate the packaging box to a height of ≥ 20cm from the ground, and keep a distance of ≥ 50cm from walls, windows, or air inlets.



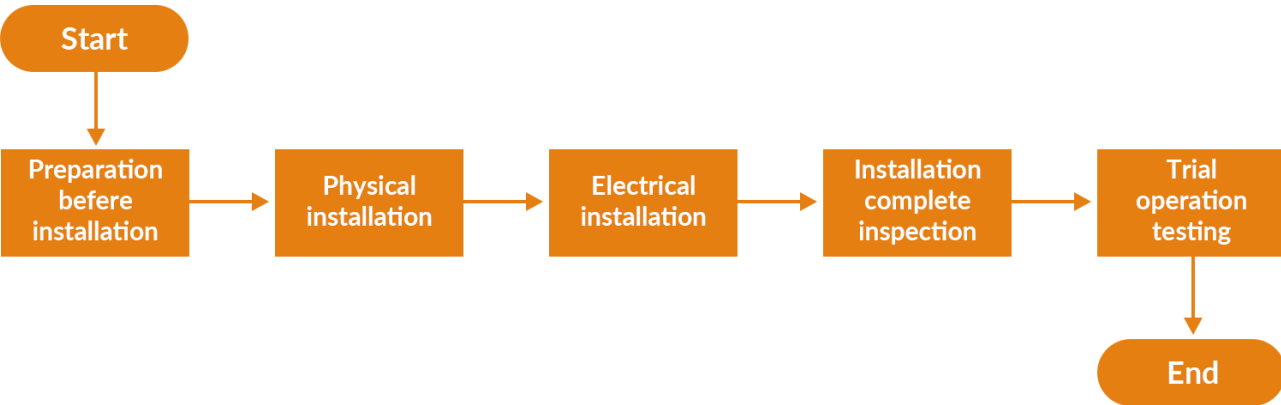
Caution

Under the above specified conditions, products stored for more than 3-6 months must be recharged once.

Under the above specified conditions, products stored for more than 0.5 to 1 year must be re inspected and can only be used after passing the inspection.

3.9.3 Storage precautions

The installation procedure of the energy storage system is as follows:



Installation flow chart

3.10 Machine Installation Guidance

Packaging inspection, before installation, it is necessary to check whether the equipment is damaged. If any transportation damage is found, please contact the transportation company or our company and provide photos of the damaged area. Check the delivery list according to the packing list inside the packaging box to ensure that all delivered accessories are all in readiness and complete.

Table 5 Delivery checklist

Item	Quantity
Energy storage system	1 pcs
Key	5 pcs
Certificate of conformity	1 pcs
Product user manual	1 pcs
Delivery Inspection Report	1 pcs

3.11 Transportation

3.11.1 Transportation description

- To ensure that the energy storage system is in a good protective state, packaged transportation should be used as much as possible.
- When using forklifts or cranes for transportation, it is necessary to pay attention to the weight of the energy storage system, ensure that the transportation equipment has sufficient bearing capacity, and reasonably arrange the support or lifting points.
- The outer packaging of the energy storage system is marked with detailed product parameters and transportation requirements. Please transport according to the signs on the packaging.

3.11.2 Line-haul

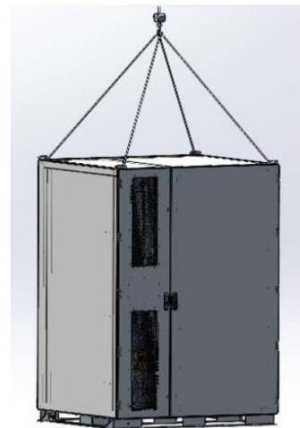
- Please strictly package the product before transporting it by vehicle. Closed boxes must be used for long-distance transportation.
- It is strictly prohibited to mix this product with equipment or articles that may affect or damage this product.

3.11.3 Short-haul

Short-distance transportation methods are mainly divided into two types, forklift handling and lifting handling, as follows



Forklift handling schematic diagram



Lifting handling schematic diagram

Note:

When forking the cabinet, the spacing between forks should be adjusted as needed to balance the load on both forks and not tilt. Slowly increase the height of the fork arm, and the height of the fork arm should not be too high.

Forklift transportation:

- Forklifts of over 3 tons is necessary.
- A trial fork is required, and if it is not suitable, the forklift foot position needs to be adjusted. After the trial fork is suitable, lift the equipment and transport it to the appropriate position. During transportation, the center of gravity of the box should be placed between the two forks of the forklift.
- During the transportation process, the inclination angle of the equipment should be less than 10°, and the undulating height should be as low as possible.
- Hydraulic vehicles are prohibited from being transported over long distances or on sloping roads, as this may damage the hydraulic vehicle.
- Take-off and landing should be taken lightly to avoid impact or vibration. When the forklift falls, it is necessary to pay attention not to press to the foot.
- When moving, the left and right sides need someone to support, pay attention to the ground leveling.
- Considering that the equipment is relatively high and may obstruct the driver's line of sight, it is recommended to arrange personnel to guide the driver according to the situation.

- When transporting without packaging, be sure to remove the lower bumper before proceeding with transportation.

Hoisting transportation :

- Note : A single sling or binding should be able to withstand a weight of not less than 3t. Please use flexible slings or straps.
- Carry out trial lifting, confirm that the belt can bear the weight of the equipment, and the lifting is not inclined.
- The hook position should be at the center of gravity.
- After lifting, the cabinet tilt angle should not exceed 10°.
- Before handling, it is necessary to confirm that the front door lock of the cabinet has been locked, so as not to open suddenly during the handling process and cause injury.
- Take-off and landing should be taken lightly to avoid impact or vibration.
- When the equipment is transported, it must be carried with a wooden plank, which is only allowed to be placed flat, and inverted or side-to-side handling is not allowed.
- When hoisting with a crane, the rope cannot touch the module.
- The lifting lug of the equipment is tied with a strap, and the hook should be at least 1 m away from the top of the cabinet.



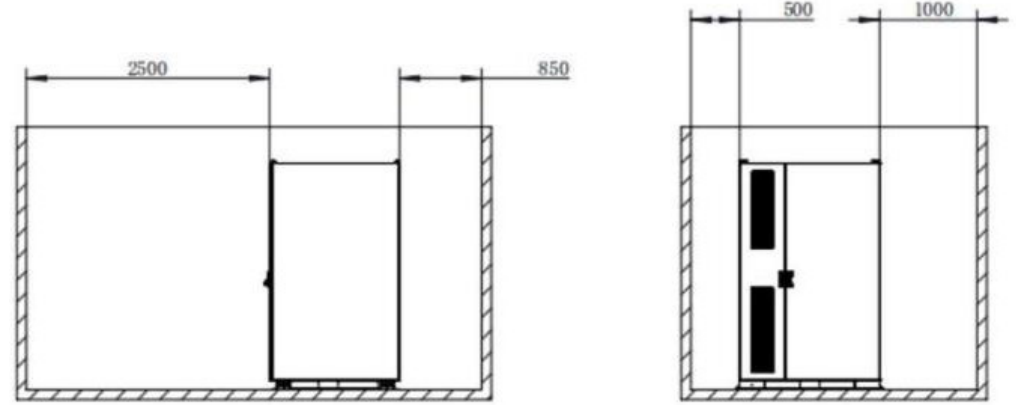
Safety warning

In the installation operation, ignoring the following safety tips may lead to equipment damage, personal injury or serious casualties. Please strictly abide by the following safety tips

- Installation must be carried out correctly by professionals under the condition of following all warning prompts.
- Before the installation operation, ensure that the mechanical strength of the installation position is sufficient to support the weight of the equipment, otherwise it will cause mechanical danger.
- Please do not wear loose clothes or wear accessories when carrying out installation work, otherwise there may be a risk of electric shock!

3.12 Installation Site Requirements

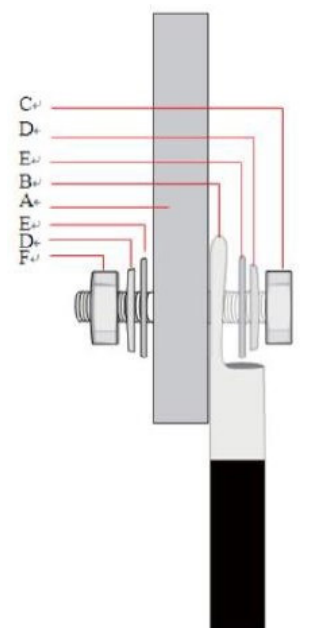
Item	Specified requirements
Installation site requirements	A good ventilation environment must be maintained. The air inlet and outlet must be professionally treated for rain, wind, sand, and dust prevention. Ensure that there are no trees around the installation location to prevent strong winds from knocking down branches or falling leaves from blocking product doors or air intakes. Necessary fire, water, and rodent prevention measures are necessary. Keep away from areas where toxic and harmful gases are concentrated, and keep away from flammable, explosive, and corrosive materials.
Foundation requirements	The installation surface must be flat and dry, and there must be no accumulated water on the ground. Ensure that the ground level does not shake and can bear the weight of the equipment. Specific requirements for the foundation: A: The equipment must be installed on concrete or other non combustible surfaces, ensuring that the installation plane is horizontal, firm, and flat, with sufficient load-bearing capacity, and no dents or tilts are allowed. B: When constructing the foundation, it is necessary to consider the issue of equipment outlet, reserve trenches or inlet holes, and refer to the following diagram for the installation hole map (unit: mm). C: During construction, it should be ensured that the bottom of the equipment is above the highest historical water level in the local area. D: The equipment (including height, embedded parts, threading pipes, etc.) should be adjusted in combination with the process and on-site. E: The height of the equipment foundation top mark can be adjusted according to the actual needs of the equipment and the site. F: The equipment foundation is configured based on the total weight of the equipment not exceeding 2.8t. When the weight of the equipment exceeds the design, it needs to be rechecked. G: If installed on hard ground, it is recommended to use bolt connection method, and the connection points should be adjusted according to the actual situation on site. The preset trench on site has the following requirements: A: Due to the bottom inlet of the equipment, the trench must have necessary dust and rodent proof design to prevent foreign objects from entering. B: Necessary waterproof and moisture-proof design is required in the trench to prevent cable aging and short circuit, which may affect the normal operation of the equipment. C: Due to the high power of the equipment and the need for thicker cables, the cross-sectional area of the cables needs to be fully considered in the design of the trench.

Space requirements	Sufficient space must be left in the front, back, left, right, and above of the equipment for heat dissipation, maintenance, and escape. The installation space requirements for a single equipment are shown in the following diagram: 
Altitude	000m, after >2000m, it needs to be reduced in capacity for use (non-standard treatment for high-altitude models).
Temperature	-30 ℃ ~+60 ℃ , overload of 110% below +45 ℃ can operate for a long time, and derating operation above +50 ℃ .
Relative humidity	0%~100% Do not open the door when the air humidity is 95 %. Avoid opening the cabinet door, maintenance or repair operations under rainy or wet weather conditions.
Installation	After the product installation position is positioned, it is fixed with an expansion screw according to the following diagram, and the four corner positions of the product should be fixed with OB18 * 38mm screw locks.

3.13 Cable Requirements

Installation diagram of terminals and fixing screws used in cable wiring: Table 6 Item names of wiring terminals.

No.	Item
A	Copper busbar
B	Connecting terminal
C	Screws
D	Washer
E	Large flat cushion
F	Nuts



3.14 Wiring Specifications

When laying cables, communication cables and power cables need to be laid separately. The DC circuit and AC circuit need to be laid separately, and the distance between different cables should be greater than 300mm.

When the control cable must pass through the power cable, it is necessary to ensure that the angle between the two types of cables is as close as possible to 90 degrees. The recommended minimum spatial distance between parallel shielded data cables and power cables and their corresponding on-site relationship.

Table 7 correspondence between signal cable and power cable wiring spacing on site.

Parallel line length (m)	Minimum spatial distance (m)
200	0.3
300	0.5
500	1.2

In order to prevent the copper nose of the wiring from loosening under force, causing poor contact, or increasing contact resistance leading to heating or even fire, it is necessary to ensure that the wiring terminals are securely fastened.

The screws meet the torque requirements listed in the table below:

Table 7 wiring space between signal cable and power cable

Screw size	M4	M5	M6	M8	M10	M12	M14	M16
Torque (N*m)	2	3.2	7	16	34	46	58	68

The protection of cables includes communication cables and power cables, and the protection methods are as follows:

Protection of communication cables: Due to the thin size of communication cables, they are easily pulled apart or detached from the wiring terminals during construction. Therefore, it is recommended to connect the power circuit first, and try to use cable trays when connecting. If there are no cable trays, use zip ties to tighten them. When routing, avoid heating elements and strong electric field circuit cables. Protection of power cables: Therefore, during installation and connection, it is necessary to avoid scratching or damaging the insulation skin of the cables, as this may cause short circuits. The power cables must also be properly fixed.

Connection requirements:

- The connection point has tight outgoing lines, low contact resistance, and good stability.
- The electrical wiring color must be executed according to the standard wiring color, and the wire diameter size must meet the electricity consumption.

- Connect the wires correctly according to the diagram. The electrical wiring should be firm and good, and the wiring should be arranged in bundles or laid horizontally in a regular manner. It should be neat, beautiful, and clear.
- When the movable and fixed parts of the wire are connected separately at both ends, such as the connection across the door, multiple strands of copper wire must be used, and sufficient length margin must be reserved to avoid mechanical damage to the wire due to excessive tension caused by bending. The wire harness must be fixed with wire clamps at the terminal outlet position.
- The wires and electrical components should be securely and reliably connected by bolts, plugs, welding, or crimping. All connectors with multiple flexible wires should be crimped with cold pressed joints. When connecting with screws, the direction of the bending line should be consistent with the direction of the screw's advance.
- The wiring harness laying must be reasonable, not to hinder the replacement or maintenance of electrical appliances, not to allow the wire to go between the two terminals, and not to cover the line label.
- The strong and weak electric circuits should not use the same cable, and should be arranged in bundles separately.
- When using shielded cables, one end of the shielding layer should be grounded.
- When the line is connected, the line numbers at both ends of the same wire must be consistent with the drawings. The line number must be printed on the special bushing by computer. The selected bushing must directly match the thickness of the guide line. The length of the line number tube should be consistent, the handwriting is clear, and the number arrangement direction is consistent. Such as horizontal set, the number from left to right.
- The installation position, method and scheme of components of the same batch of products should be as consistent as possible. Attention should be paid to protecting the integrity of components during assembly.
- Confirm the cable A phase, B phase, C phase, N phase, and do a good job of identification, communication line to confirm the A / B line sequence.



Safety warning

- Professional personnel are required for installation operations, and the installation process must strictly follow the instructions in the user manual.
- Before installation, all switches of the internal and external front stages must be disconnected, and wait for 15 minutes to confirm that they are all in a dead state.
- Warning signs must be left at the disconnected position to prevent re-energization during installation.
- Necessary grounding and short-circuit connections are required.
- Live parts need to be treated as necessary and isolated with insulation materials to avoid injury to personnel.

3.15 AC Side Wiring

The energy storage system adopts a 3-phase 4-wire system (A/B/C/N) wiring. Open the control cabinet door and disassemble the lower right corner panel. The incoming line A/B/C on the grid side is connected to the lower port of the grid switch, as shown in the following figure. The screw hole used for the incoming line terminal on the grid side is M8, and the diameter of the AC connection cable is not less than 70mm².



AC access wiring diagram

3.16 System Grounding

The grounding copper bar in the energy storage system needs to be reliably connected by grounding cable. The grounding copper bar has been reliably connected to the shell of the energy storage system in the cabinet.

When connecting, the grounding copper bar needs to be connected to the equipotential bonding device of the installation site or the electrical control room. The resistance should not be higher than 4Ω, and the diameter of the grounding cable should not be less than 16 mm².

Chapter 4: Hardware Operation Instructions

4.1 Component Layout Introduction

The system is mainly composed of battery system, PCS energy storage converter, display screen, EMS energy management system, AC meter, industrial air conditioning, grid-connected switch, perfluorohexanone fire protection system and so on.

4.1.1 Power up inspection

Before powering up, please check the power plug, signal plug and liquid cooling pipe joint one by one without loosening, MSD is correctly connected, and the mains is correctly connected. The detailed inspection items are as follows :

No.	Content	Confirmation
1	Check whether there is condensation on the device (water film or water droplets on the surface). If so, the cabinet fan must be turned on for ventilation until the phenomenon disappears. Check the pipe connections to ensure there are no leaks.	☐
2	Measure whether the voltage on the incoming line side is within the specified range and confirm that there is no phase loss, short circuit or other faults.	☐
3	Power input terminals (A, B, C, N) must be correctly and firmly connected.	☐
4	The equipment must be reliably grounded.	☐
5	Each control signal communication cable are correctly connected.	☐
6	The wiring terminals are all complete and undamaged, and have been insulated.	☐
7	Inside or outside, there are no wire ends, metal chips, and other foreign matters that can cause signal cables, or power cables to short circuit.	☐

4.1.2 Start-up steps

Check before starting up : Please confirm that the power plug, signal plug, liquid cooling pipe joint are correctly connected with MSD without loosening; the mobile energy storage system is correctly connected to the main power supply. After being familiar with the above switching components and checking them correctly, the system is started according to the following steps:

Power on process:

① Power on AC side → ② Close → ③ Close → After the display and control screen is turned on, turn on the central control switch and reset the fault.

4.1.3 Shutdown steps



Safety warning

- Before shutting down, it is necessary to confirm that the device is idle before shutting down.
- Follow these steps to shut down:
Turn off the central control switch of the display and control screen → ③ disconnect → ② disconnect → ① turn off the AC side power after turning off the automatic mode



4.2 EMS Interface Instructions

4.2.1 Main interface

After the system starts up normally, enter the main interface of the system. In the main interface, the functions of multi-stack system status, stack system topology diagram, meter information curve, and alarm information of each system can be queried. As the following figure



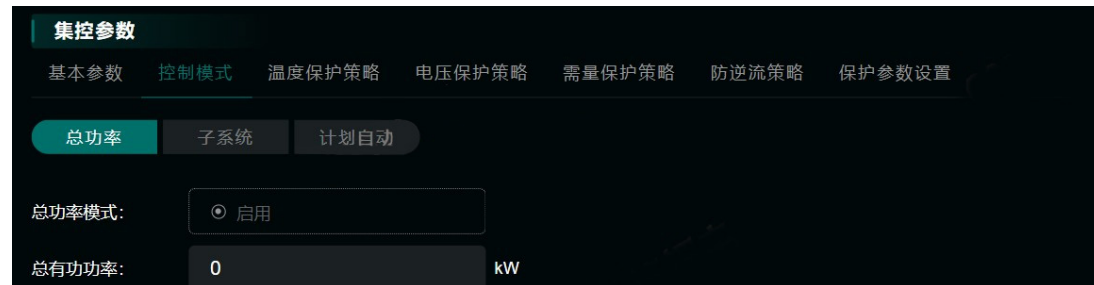
4.2.2 Multi-stack system state

After the system starts up normally, enter the main interface of the system. In the main interface, the functions of multi-stack system status, stack system topology diagram, meter information curve, and alarm information of each system can be queried. As the following figure following figure



4.2.2.1 Control mode

The total power mode is set to enable and stop the total power mode, and the system equally allocates PCS power control. As the following figure

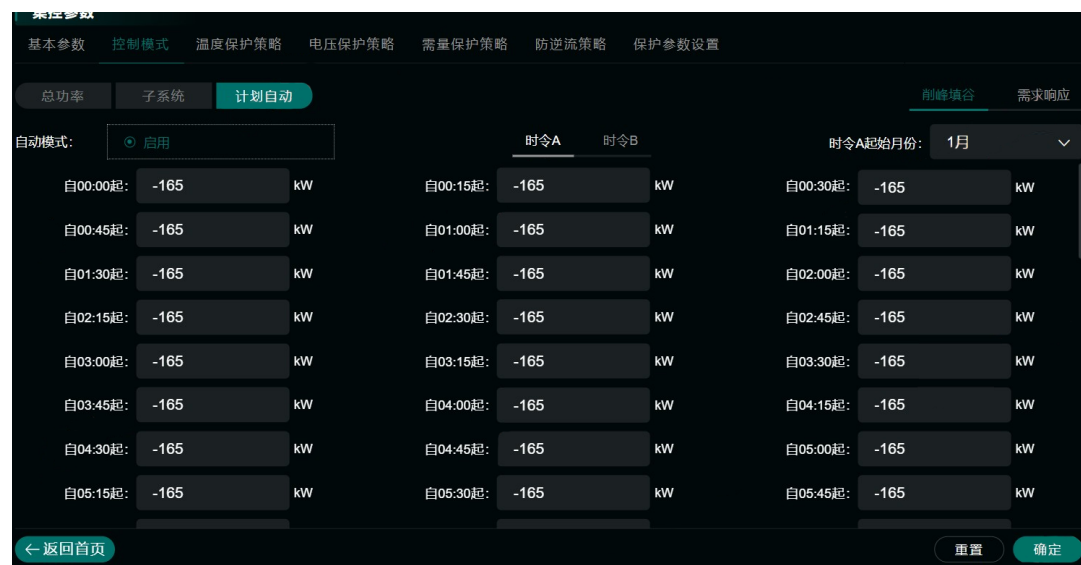


Subsystem mode can be set to start and stop the system, and the active power of each subsystem can be set separately. After confirming the selected subsystem, subsystem mode control can be carried out. As the following figure



Planned automatic mode, divided into two modes: seasonal mode and curve mode, can be set to start and stop in automatic mode.

Seasonal mode allows you to add 24-hour power curve control of PCS in different seasonal periods in different months. For example, the starting month of season A is March, and the starting month of season B is September. From March to August, the power is set according to season A, as shown below



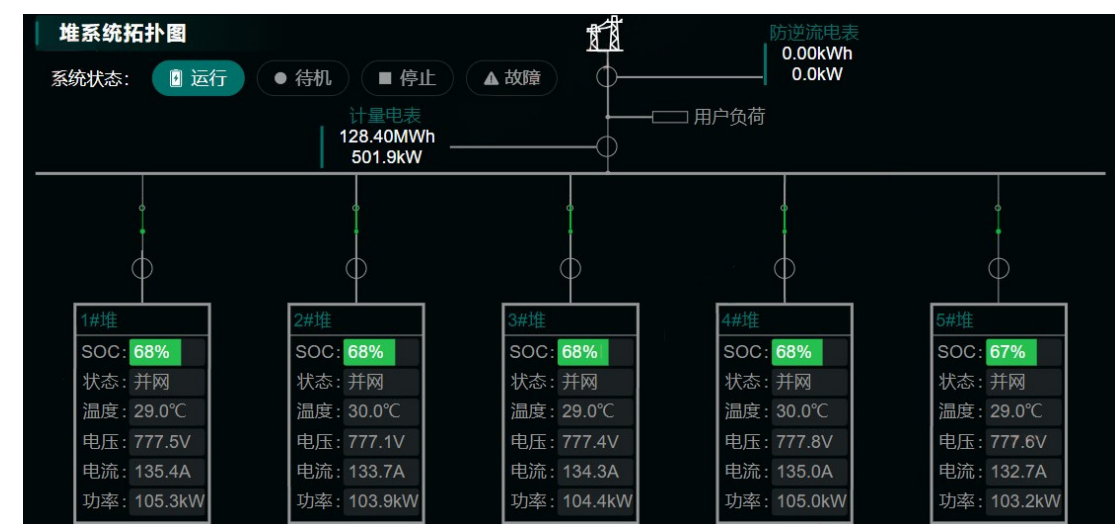
Curve control, set power curve control according to season B from September to February. Curve mode, set the curve mode to enable, you can set multiple time periods, set according to the active power and reactive power within the time period, and select Start, confirm and enable this mode.

As the following figure



4.2.3 Topology diagram of the stack system

- Display system status: Display system charging, discharging and standby status.
- Metering meter: Click and enter "Metering meter" on the main page of the EMS management system to view data such as meter voltage, current, active and reactive power, and system statistics.
- Anti-backflow meter: Click and enter "Anti-backflow meter" on the main page of the EMS management system to view the anti-backflow meter voltage, current, active and reactive power, and system statistical power data.
- Stack data: Click on the data frame diagram of each stack to view the detailed parameters of each corresponding stack.



4.2.3.1 Metering meter



4.2.3.2 Anti-reverse current meter

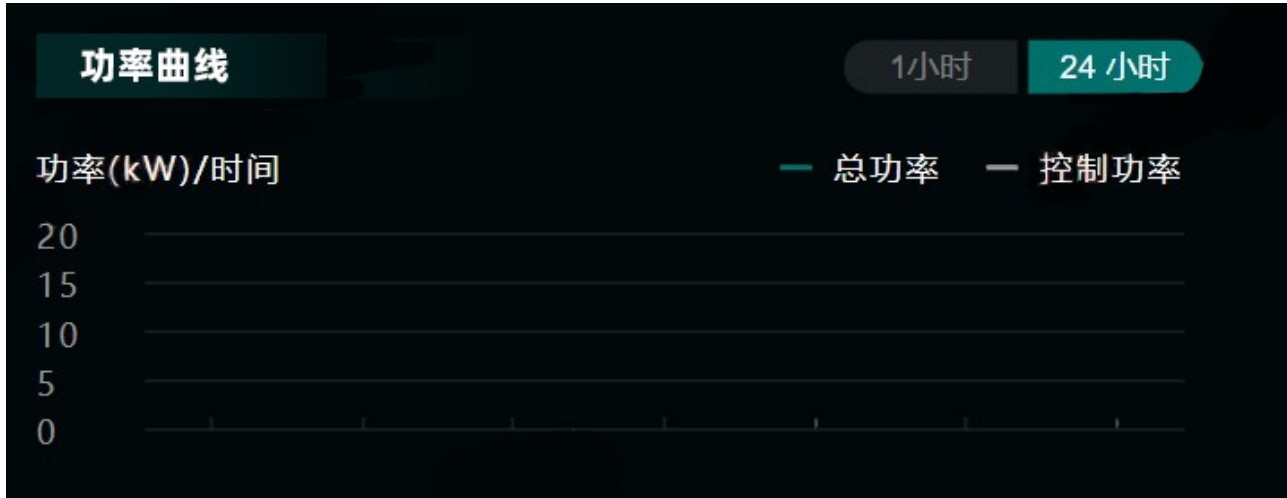


4.2.3.3 Stack data



4.2.4 Power curve

The curve graphs of total power and control power are divided into two time periods to display data: 1 hour and 24 hours.



4.2.5 Warning information

- Communication status alarm: If the communication of any PCS, BMS, fire protection, or liquid cooling equipment in the system is disconnected, a red alarm will be displayed in the alarm information bar.
- PCS alarm: When any of PCS warning occurs, the information bar will display a red alarm.
- BMS alarm: When any of BMS warning occurs, the information bar will display a red alarm.
- Environmental control alarm: When any warning of firefighting, air-conditioning, temperature and humidity meter, and DI collection occurs, the information bar will display a red alarm.



4.2.5.1 Communication status warning

告警信息					
通讯状态告警	PCS告警	BMS告警	环控告警	当前告警	
序号	堆号	簇号	设备号	告警描述	告警时间
暂无数据					

4.2.5.2 PCS warning

告警信息					
通讯状态告警	PCS告警	BMS告警	环控告警	当前告警	
序号	堆号	簇号	设备号	告警描述	告警时间
暂无数据					

4.2.5.3 BMS warning

告警信息					
通讯状态告警	PCS告警	BMS告警	环控告警	当前告警	
序号	堆号	簇号	设备号	告警描述	告警时间
1	1#	1#	--	充电单体过温 (轻度)	2024-01-15 13:25:46
2	1#	1#	--	放电单体过温 (轻度)	2024-01-15 13:25:46

4.2.5.4 Environmental control warning

告警信息					
通讯状态告警	PCS告警	BMS告警	环控告警	当前告警	
序号	堆号	簇号	设备号	告警描述	告警时间
1	1#	--	1	A相逆向	2024-01-15 13:26:16
2	1#	--	1	B相逆向	2024-01-15 13:26:16
3	1#	--	1	C相逆向	2024-01-15 13:26:16

4.2.6 More Operations

All parameters set in the parameter settings are power-off retention parameters. After restarting, there is no need to set them again, just set them once. The parameters of the mobile energy storage system have been set before leaving the factory. If you need to adjust them, please contact customer service engineers for assistance.



Chapter 5: Operation Instruction of Web Cloud Platform

5.1 Operation Instruction of Web Cloud Platform

Based on the industrial gateway + SaaS cloud platform, creating a set of commercial energy storage management solution. This solution aims to provide supporting cloud services for customers' energy storage cabinet hardware products.

5.1.2 Multi-site overview



5.1.2.1 New energy data large screen



5.1.3 Centralized control management

Centralized control platform: Use the battery cabinet as a perspective to view the status and real-time data of all battery cabinets.



- Real-time status data: The status and alarms of a single battery cabinet can be viewed, and various sensor data access and alarms such as fire protection, smoke detectors, and water immersion are supported.
- System topology: You can view detailed data and alarms of a single battery cabinet, including charge and discharge capacity, revenue, power, etc.
- Power analysis: Energy storage and load power curves can be drawn for data analysis.
- Charge and discharge curve: charge and discharge power curve can be drawn for data analysis.
- Income indicator statistics: Statistics of today's income, accumulated income, etc., and the income curve can be drawn.
- Charge and discharge power statistics: Statistics of today's charge, today's discharge, cumulative charge, cumulative discharge, etc., and a power curve can be drawn.



5.1.3.1

Energy storage system centralized control platform battery cluster information



5.1.3.1 Energy storage system centralized control income statistical information



Chapter 6: Maintenance and Troubleshooting

6.1 Daily maintenance

During each on-site maintenance, the energy storage integrated cabinet should be functionally inspected, which mainly includes:

- Check the connecting cable.
- Check the operation status of the energy storage all-in-one cabinet.
- Check the operating mode switching of the integrated energy storage cabinet.
- Check the indicator light display status of the integrated energy storage cabinet.
- Check the status of the dust filter. If there is serious dust accumulation, replace the dust filter.

6.2 Fault Schedule

The mobile energy storage integrated cabinet has a complete fault protection function. Once a fault occurs, it will automatically stop and the user can read relevant fault information through EMS.

Users can use the prompt information in the following table to conduct a preliminary self-check on the fault, observe the fault phenomenon, analyze the cause, and try to solve it. Please note that when self checking for faults, do not unpack the energy storage integrated cabinet. If the problem cannot be solved, please contact the sales channel or Xinrui Energy.

There are two types of fault reset methods: automatic reset and manual reset:

- Automatic reset fault: After this type of fault occurs, the energy storage integrated cabinet will automatically reset the fault after a certain period of time. If the fault condition is eliminated, it will exit the fault state; If the fault condition still exists, the fault will be reported again.
- Manual reset fault: After this type of fault occurs, after troubleshooting and eliminating the fault conditions, it is necessary to manually reset the energy storage cabinet through EMS to exit the fault state.

This table is the fault schedule

No.	Fault content	Reset method	Processing method
1	ESS1010 PCS1 Communication fault	Automatic reset	If it cannot be automatically reset, it may be that the communication line is broken or the interference is too serious.
2	ESS1020 BMS Communication fault	Automatic reset	
3	ESS1030 meter 1 communication fault	Automatic reset	
4	ESS1040 Air-conditioner communication fault	Automatic reset	
5	ESS1050 STS Communication fault	Automatic reset	

6	ESS1060 Main circuit breaker opening failure	/	The circuit breaker is damaged or the circuit breaker contact feedback signal is disconnected.
7	ESS1061 Main circuit breaker closing failure	/	
8	ESS1090 Emergency stop	/	Press the emergency stop button and release the emergency stop button to reset.
9	ESS1091 Flood alarm	/	Flooding occurs.
10	ESS1092 Firefighting alarm	/	Fire outbreaks.
11	ESS2000 PCS1-Grid not powered on	Automatic reset	The external grid switch is not closed. Close the external grid switch.
12	ESS2001 PCS1-Grid over voltage	Automatic reset	The input voltage on the AC side is too high. Check whether the grid voltage is normal.
13	ESS2002 PCS1-Grid voltage low	Automatic reset	The input voltage on the AC side is too high. Check whether the grid voltage is normal.
14	ESS2003 PCS1-Grid over frequency	Automatic reset	The input voltage frequency on the AC side is too high. Check whether the grid voltage is normal.
15	ESS2004 PCS1-Grid frequency low	Automatic reset	The AC side input voltage frequency is too low. Check whether the grid voltage is normal.
16	ESS2005 PCS1-Power grid phase sequence error	Automatic reset	The AC side input voltage phase sequence is reversed. Adjust the AC side input voltage phase sequence.
17	ESS2006 PCS1-Power grid phase loss	Automatic reset	The single-phase input voltage on the AC side is too low. Check whether the grid voltage is normal.
18	ESS2007 PCS1-Grid voltage imbalance	Automatic reset	The voltage difference between the input phases on the AC side is too high. Check whether the grid voltage is normal.
19	ESS2008 PCS1-Grid off-grid state	Automatic reset	The input voltage on the AC side fluctuates. Check whether the power grid is disconnected.
20	ESS2009 PCS1-High voltage ride through protection	Automatic reset	/
21	ESS2010 PCS1-Low voltage ride through protection	Automatic reset	/
22	ESS2033 PCS1 - Busbar over voltage	Automatic reset	The grid voltage is too high, check the grid voltage is normal.
23	ESS2034 PCS1-Busbar voltage low	Automatic reset	The AC side is seriously overloaded. Check whether the phase-to-phase insulation on the AC side is normal.
24	ESS2042 PCS1-Abnormal detection of battery voltage polarity reverse connection	Automatic reset	The positive and negative pole voltage of the DC side is reversed, check whether the positive and negative pole wiring of the DC side is correct.
25	ESS2043 PCS1-Battery over voltage	Automatic reset	The DC side input voltage is too high. Check whether the DC input voltage is normal.
26	ESS2044 PCS1-Battery voltage low	Automatic reset	The DC side input voltage is too low. Check whether the DC input voltage is normal.
27	ESS2045 PCS1-Battery over current	Automatic reset	AC side overload, reduce load operation.
28	ESS2048 PCS1-Module over current	Automatic reset	AC side overload, reduce load operation.
29	ESS2049 PCS1-Grid side leakage current is too large	Automatic reset	AC ground short circuit, please contact the manufacturer.

No.	Fault content	Reset method	Processing method
30	ESS1010 PCS1 Communication fault	Automatic reset	Overload operation, fan failure, please contact the manufacturer.
31	ESS1020 BMS Communication fault	Automatic rese	Overload operation, reduced load operation.
32	ESS1030 meter 1 communication fault	Automatic rese	Overload operation, reduced load operation.
33	ESS1040 Air-conditioner communication fault	Automatic rese	Overload operation, fan failure, please contact the manufacturer.
34	ESS2066 PCS1-Internal fan failure	Automatic rese	Internal fan stalls, please contact the manufacturer.
35	ESS2067 PCS1-External fan failure	Automatic rese	External fan stalls, please contact the manufacturer.
36	ESS2068 PCS1-Emergency shutdown	Automatic rese	Emergency stop switch disconnected, reset the emergency stop switch.
37	ESS2070 PCS1 - DC-to-ground insulation impedance failure	Automatic rese	DC ground insulation impedance is abnormal, please contact the manufacturer.
38	ESS2072 PCS1-Internal environment over temperature	Automatic rese	Internal fan abnormal, please contact the manufacturer.
39	ESS2074 PCS1-AC to ground insulation fault	Automatic rese	/
40	ESS2080 PCS1-BMS fault	Automatic rese	/
41	ESS2081 PCS1-Charging termination	Automatic rese	/
42	ESS2082 PCS1-Discharging termination	Automatic rese	/
43	ESS3016 BMS-High discharge temperature-level II alarm	Automatic rese	Discharging period, battery over temperature, stop discharging and wait for the temperature decrease.
44	ESS3017 BMS-Low discharge temperature-level II alarm	Automatic rese	Discharging period, battery temperature low, stop discharging, wait for the temperature increase, and re-start the system.
45	ESS3021 BMS-SOC low-Level II alarm	Automatic rese	SOC Low, generally don't shutdown.
46	ESS3022 BMS-SOC high-Level II alarm	Automatic rese	SOC High, generally don't shutdown.
47	ESS3024 BMS-charging current large-Level II alarm	Automatic rese	Charging current large, appropriately reduce the charging power.
48	ESS3028 BMS-Total voltage high-Level II alarm	Automatic rese	Battery voltage high, shutdown the system, recover after being placed still.
49	ESS3029 BMS-Total voltage low-Level II alarm	Automatic rese	Battery voltage low, need to be charged in time.
50	ESS3030 BMS-Charging temperature high-Level II alarm	Automatic rese	Charging period, battery over temperature, decrease charging power.
51	ESS3031 BMS-charging temperature low-Level II alarm	Automatic rese	Charging period, battery temperature low, stop charging, wait for the temperature increase, and re-start the system.

52	ESS3032 BMS-discharging temperature high-Level III alarm	Automatic reset	Battery over temperature in discharging, decrease discharging power.
53	ESS3033 BMS-discharging temperature low-Level III alarm	Automatic rese	Battery temperature low in discharging, stop discharging, wait for the temperature increase, and re-start the system.
54	ESS3037 BMS-SOC low-Level III alarm	Automatic rese	SOC Low, generally don't shutdown.
55	ESS3038 BMS-SOC high-Level III alarm	Automatic rese	SOC High, generally don't shutdown.
56	ESS3040 BMS-Large charging current-Level III alarm	Automatic rese	Charging current large, appropriately reduce the charging power.
57	ESS3044 BMS-Total voltage high-Level III alarm	Automatic rese	Battery voltage high, shutdown the system, recover after being placed still.
58	ESS3045 BMS-Total voltage low-Level III alarm	Automatic rese	Battery voltage low, need to be charged in time.
59	ESS3046 BMS-Charging temperature high-Level III alarm	Automatic rese	Charging period, battery over temperature, decrease charging power.
60	ESS3047 BMS-charging temperature low-level III alarm	Automatic rese	Charging period, battery temperature low, stop charging, wait for the temperature increase, and re-start the system.
61	ESS3049 BMS-Abnormal communication to master control	Automatic rese	BMS internal malfunction, please contact the manufacturer
62	ESS3050 BMS-Communication to EMS failure	Automatic rese	Communication failure between BMS and EMS, check communication circuit.
63	ESS3052 BMS-PCS Communication timeout	Automatic rese	Communication failure between BMS and PCS, check communication circuit.
64	SS3053 BMS-Display screen communication failure	Automatic rese	Communication failure between BMS and touch screen, check communication circuit.
65	ESS3057 BMS - Fire alarm	/	Fire outbreaks.
66	ESS3061 BMS - Fan Fault	/	BMS internal cooling fan failure.
67	ESS3072 BMS-Emergency shutdown	/	Press the emergency stop button and release the emergency stop button to reset.
68	ESS3076 BMS-Extreme high single cell voltage	Automatic rese	Externe high single cell voltage of the battery, shutdown and place still.
69	ESS3077 BMS-Extreme low single cell voltage	Automatic rese	Single cell voltage of the battery too low, contact the manufacturer.
70	ESS3078 BMS-Temperature extremely high	Automatic rese	Single cell temperature of the battery too high, shutdown and place still.

The above fault list only lists some common faults. When the energy storage integrated cabinet reports the above faults, it is recommended to initially check the faults described in the list. If the problem can still not be solved, or the failure is not listed in the list, please contact the customer service engineer.



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