Powermaster Series Energy Storage Cabinets

USER'S MANUAL

Ver 1.0

March 2024

This manual is applicable to Powermaster Series Energy Storage Cabinets.

CONTENTS

1. Safety notice

1.1. Safety symbol specification

When installing, operating, and maintaining the device, read this manual and follow the labels on the device and all safety precautions in this manual. Users can better use this product to ensure personal and property safety. Please read the following symbols carefully.

 Danger: Indicates a situation with a high level of risk that, if not avoided, will result in death or serious injury.

 Warning: Indicates a hazard with a medium level of risk that could result in death or serious injury if not avoided.

 Attention: Indicates a hazard with a low level of risk that, if not avoided, could result in moderate or minor injury.

 Instructions :Emphasis and additions to the content may also provide tips for optimizing the use of the product.

1.2. Universal security

 **Instructions:**

The device must be used in an environment that meets the design specifications. Otherwise, the device may be faulty, and the resulting abnormal functions, component damage, personal accidents, and property losses are not covered by the quality guarantee. When installing, operating, and maintaining the device, comply with local laws, regulations, and regulations. The safety precautions in this manual are only supplements to local laws, regulations and regulations. The company is not responsible for any of the following situations.

- Installation and use of the environment beyond the relevant international, national, regional

standards.

- Do not operate under the conditions of use described in this manual.
- Disassemble or change the product or modify the software code without authorization.
- Do not follow the instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, flood, debris flow, etc.).
- Damage caused by customer's failure to comply with shipping and installation requirements.
- Damage caused by storage conditions that do not meet product documentation requirements.
- Damage to the hardware or data of the equipment due to customer's negligence, incorrect operation or intentional damage.
- System damage caused by third parties or customers, including damage caused by relocation and installation of systems that do not comply with the requirements of this manual, as well as adjustments, changes or removal of identification marks that do not comply with the requirements of this manual.
- Defects, malfunctions or damages caused by acts, events, omissions or accidents outside the reasonable control of Seller, including power outages or electrical failures, theft, war, riots, civil unrest, terrorism, intentional or malicious damage, etc.

Danger:

The device has a high voltage. Improper operation may cause electric shock or fire, resulting in death, serious personal injury, or serious property damage. Please follow the operation order and safety precautions in this manual and other related documents, and operate properly:

- Check that the pre-installed cables are securely connected. Inspect the equipment for damage, such as holes, dents, or other possible internal damage the signs. Check that the components inside the device are not shifted, and do not change the structure and installation sequence of the device without authorization.
- Do not use water to clean the electrical components inside the device. If liquid is found to enter the equipment, press the emergency stop switch immediately and notify the field management personnel.
- Do not install, connect cables, maintain, or replace devices on the power line. Before touching any conductor surface or terminal, measure the voltage at the contact point and ensure that the PGND cable of the device or component to be repaired is reliably grounded.
- Do not approach the device except for the personnel who operate the device. Do not power on the device before it is installed or confirmed by professional personnel. Ensure that at least two personnel are on site when the main circuit is powered on for the first time.

Instructions:

- The operations and tools used during transportation, relocation, installation, cable connection, and maintenance must meet the requirements of the country and place where you are located District laws and regulations and related standard requirements.
- When installing, operating, and maintaining the cabinet, clean up the water, snow, ice, or other debris on the top of the cabinet before opening the door to prevent debris from falling into the cabinet.
- It is forbidden to reverse engineer, decompilate, disassemble, adapt, implant or other derivative operations on the device software. It is forbidden to research the internal

implementation of the device in any way, obtain the source code of the device software, steal intellectual property rights, etc., and it is forbidden to disclose the results of any device software performance test.

1.3. Electrical safety

1.3.1. Wiring requirement

- Select cables that comply with local laws and regulations. Cables of the same type should be bundled together, and cables of different types should be routed separately. Do not intertwine or cross cables.
- When the cable connection is complete or the cable is left for a short time during the wiring process, plug the cable port immediately and close the cabinet door to prevent small animals from entering.
- Cables used in the energy storage system must be securely connected, properly insulated, and meet specifications. Protect the pipe and cable holes from sharp edges and burrs.
- After cables are connected, use cable supports and cable clips to secure cables. Ensure that cables in the backfilling area are tightly connected to the ground to prevent deformation or damage caused by force during backfilling.
- If cables are used in high temperature environments, the insulation layer may be aged or damaged. The distance between the cables and the heating devices or the heat source area must be at least 30mm.
- To ensure construction safety, all cables should be laid and installed above 0 ° C. Handle cables with caution, especially in a low-temperature environment.

1.3.2. Grounding requirement

- Do not damage the ground conductor. The grounding body of the device must be permanently connected to the protective grounding network. Before operating the device, check the

electrical connections of the device to ensure that the device is reliably grounded.

- The grounding impedance of the device meets the requirements of the national standard GB 50054 and local electrical standards.
- Do not operate the device without a ground conductor installed. When installing a device that needs to be grounded, install the PGND cable first. When removing a device, remove the PGND cable at the end.

1.3.3. Maintenance requirement

- Before connecting or removing a cable, turn off the protection switch of the corresponding loop.
- Use a multimeter of the corresponding voltage level to check whether the device is powered on and ensure that the device is completely powered off.
- If there are live bodies nearby, use insulation boards or tape to cover or wrap them.
- After the loop to be repaired is securely connected to the grounding loop using a ground cable, perform operation and maintenance.

Instructions:

- Before connecting a cable, ensure that the label on the cable is correct.
- If the device has multiple inputs, disconnect all inputs and perform operations on the device only after the device is powered off.
- After the overhaul is complete, remove the grounding cable between the overhaul loop and the grounding loop.

1.4. Safety of machinery

Attention:

- The bottom coaming must be removed when transported without wooden case.
- Take off and land gently to avoid shock or vibration.
- During transportation, the center of gravity of the box should be placed in the middle of the two forks on the forklift. Do not carry, invert or tilt over long distances.

- When transporting the equipment, it may be due to the large size of the equipment to cover the line of sight of the operator, and it is necessary to arrange auxiliary personnel to assist.
- To ensure the safety of drilling outside the device, select a proper position before drilling to ensure that short circuit is not affected. Cover the equipment during drilling to prevent debris from falling into the equipment, and clean the debris immediately after drilling.
- When carrying equipment by hand, prepare for bearing load and wear protective equipment such as protective gloves and anti-smashing shoes.
- Move the device carefully to avoid impact or falling. Avoid scratching device surfaces, damaging components, or damaging cables.

1.5. Battery safety

Instructions:

The Company is not responsible for the damage caused by the batteries provided by the company due to the following reasons:

- Due to customer reasons, the battery is not charged in time, acceptance, resulting in extended storage, capacity loss or irreversible damage.
- Drop mechanical damage, leakage, rupture, etc. caused by improper operation or failure to connect the battery as required.
- The customer or a third party will change the battery usage scenario without knowing the company. Including but not limited to: connecting extra load to the battery itself, mixing with other brands of batteries, mixing with batteries of different rated capacities, etc.
- The battery is directly damaged because the device operating environment or external power parameters cannot meet the environmental requirements for normal operation. The actual operating temperature of the battery is too high or too low, and the power grid is in bad condition.

- Battery operating and management parameters are incorrectly set or improperly maintained, resulting in frequent over discharge of batteries, onsite capacity expansion, or long-term failure to be fully charged.
- The customer does not properly maintain the battery according to the operation manual of the supporting equipment, including but not limited to: does not regularly check whether the battery terminal screws are tightened.
- The battery was stolen and lost.
- Batteries that are out of warranty.

Danger:

- Do not expose the battery to high temperatures or heat-generating devices, such as sunlight, fire sources, transformers, and heaters. Overheating of the battery may cause fire or explosion.
- Do not disassemble, modify or destroy the battery (such as inserting foreign matter, immersion in water or other liquids), so as not to cause battery leakage, overheating, fire or explosion.
- The thermal runaway of the battery will produce flammable gases, as well as harmful gases such as CO and HF. The accumulation of combustible gas after the battery thermal runaway may cause deflagration and explosion, which may cause personal injury and property damage.
- When installing and maintaining batteries, wrap exposed cable terminals on batteries with insulation tape. At the same time, avoid foreign bodies (such as conductive objects, screws, liquids, etc.) entering the battery and causing short circuit.

Warning:

- Batteries must be stored in a separate warehouse and in outer packaging. Do not mix with other materials, do not store in the open air, and do not stack batteries too high. The site must be equipped with the required fire fighting facilities, such as fire sand, fire extinguisher, etc.
- Batteries should avoid collisions. When moving batteries, move them in the required direction. Do not invert or tilt them.
- Use the battery within the temperature range specified in this manual. When the ambient

temperature of the battery is lower than the operating temperature limit, it is prohibited to charge the battery to avoid internal short circuit caused by crystallization due to low temperature charging.

- Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as domestic waste.
- If the battery has been charged for more than 8 months, recharge the battery. If the batteries are not powered on as required, the performance and service life of the batteries may be affected.

1.6. Measures for handling battery exceptions

Danger

- When electrolyte leakage or abnormal odor occurs, contact with the leaking liquid or gas should be avoided. Non-professional personnel should not approach, please contact professional personnel immediately.
- The electrolyte is corrosive and contact may cause skin irritation and chemical burns. If you come into contact with battery electrolyte, wash the contact area immediately with plenty of water and soap, and seek medical help immediately.
- After the battery drops (whether with or without packaging materials), do not continue to use. If the battery is not deformed or damaged and there is no obvious odor, smoke, or fire, transfer the battery to an open and safe place for one hour and contact our service engineers for further processing.
- When the battery has obvious odor, damage, smoke, and fire, the personnel should be evacuated immediately and the alarm should be reported in time. Fire fighting facilities are used by professional personnel to ensure safety.

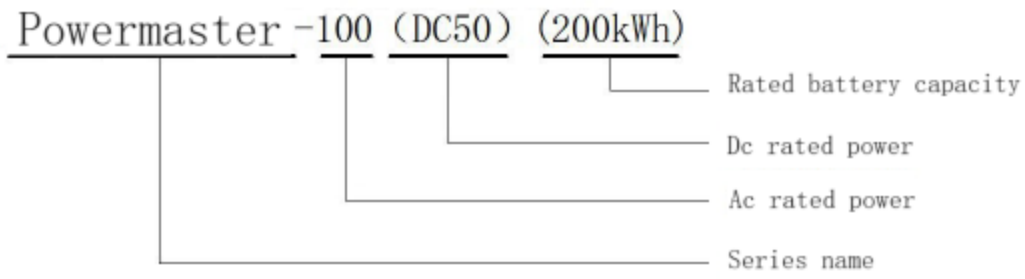
1.7. Maintenance and replacement

Warning

- It is forbidden to open the cabinet door in rain, snow, thunder, dust, fog and other weather.
- Before taking out a component from the cabinet, ensure that other components are secure.
- During equipment maintenance, use insulation to cover nearby live parts.
- Do not touch any objects (such as fingers, parts, and bolts) before the fan is powered off and stops running.
- Do not power on the device before troubleshooting.
- When the system is on line, pay attention to the danger warning label on the device and avoid standing near the cabinet door.
- After powering off all devices except battery packs, wait 15 minutes and ensure that the devices are powered off before performing any operations on them.
- After the power components of the energy storage system are replaced or cable connections are changed, you need to manually check cable connections to avoid system exceptions.
- After completing maintenance and replacement operations, lock the cabinet door and keep the key properly.

2. Product introduction

2.1. Type description



Instructions: The rated output power and battery capacity can be flexibly configured according to project requirements.

2.2. Product function

Powermaster series outdoor energy storage cabinet integrates energy storage battery, modular PCS, energy management monitoring system, power distribution system, environmental control system and fire control system. The use of modular PCS, easy to maintain and expand, outdoor cabinet before the use of maintenance, can reduce the footprint and maintenance channels, with safe and reliable, rapid deployment, low cost, high energy efficiency and intelligent management.

In common application scenarios, the running strategies of the energy storage system are as follows:

- Peak cutting and valley filling: When the TOU price is in the valley segment, the energy storage cabinet automatically charges and stands by after full; When the TOU price is in the peak segment, the energy storage cabinet automatically discharges, realizes the price difference arbitrage, and improves the economic benefit of the optical storage and charging system.
- Light storage joint: real-time access to local load power, photovoltaic power generation

priority self-use, surplus power storage; When photovoltaic power is insufficient to provide local loads, battery storage is preferred.

2.3. Electrical circuit diagram

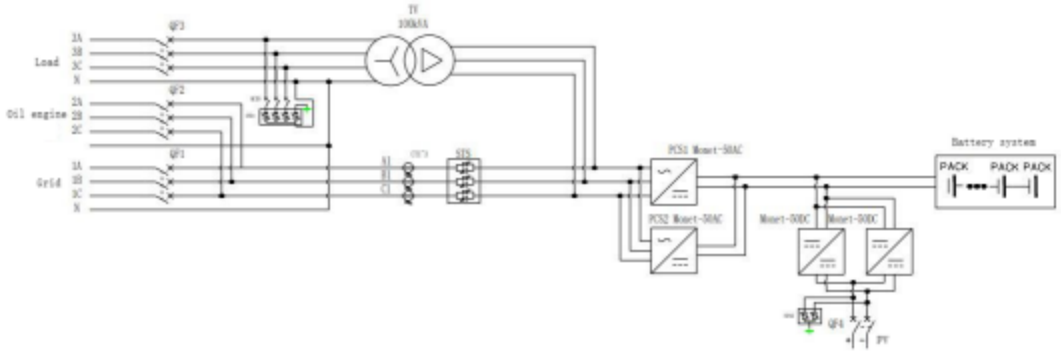


图 2.1 Electrical primary diagram

Instructions: Figure 2.1 shows the system scheme with parallel off-grid, with isolation transformer and photovoltaic input. Different projects have different configurations and slightly different lines. The actual delivery drawings shall prevail.

2.4. Product characteristics

- System productization, integrated energy storage battery, PCS, energy management monitoring system, power distribution system, environmental control system and fire control System, etc., fully control the operating status and risks of the system;
- Configure rack-type modular PCS, support multi-machine parallel, good scalability; The number of PCS modules and the total battery capacity can be configured based on the system capacity requirements in the micro-grid scenario. The typical configuration is 100kW/200kWh;
- Protection level IP54, can perfectly cope with all types of outdoor weather;
- Door mounted integrated air conditioning, does not occupy the cabinet space, improve the available space of outdoor cabinet, the top structure integrity is better, good waterproof effect;

- Local control panel can realize the system operation monitoring, energy management strategy formulation, equipment remote upgrade and other diversified functions.

2.5. Product parameters

The following are typical configuration parameters of the Powermaster series outdoor cabinet energy storage system. The actual supply is subject to the technical agreement.

Table 2.1 Parameters of energy storage system

Model	**Powermaster-100(DC100)(215kWh)**
Rated battery energy storage capacity	215kWh
System rated voltage	768V
System voltage range	672V~864V
Battery type	LiFePO (LFP)
Battery string in series parallel mode	1P*20S*12S
Maximum charge and discharge current	140A
Rated AC power	100kW
Rated alternating current	144A
Rated AC voltage	400V, 3W+N+PE/3W+PE
Rated ac frequency	50/60Hz
Total harmonic distortion rate of current (THDI)	<5% (rated power)
Power factor	-1 lead ~+1 lag
Total harmonic distortion rate of voltage (THDU)	<3% (linear load)
Class of protection	IP54
Protection class	I
Isolation mode	Transformer isolation
Shutdown power consumption	< 100W(without transformer)

Reveal	Touch LCD touch screen
Relative humidity	0~95%(no condensation)
Noise	< 70dB
Ambient temperature	-25℃~60℃ (Derated above 45℃)
Cooling mode	Intelligent air cooling
Altitude	2000m(Derated over 2000m)
BMS communication	CAN
EMS communication	Ethernet / 485
Dimension (W*D*H)	1850*1250*2150mm
Weight (approx)	2900kg

Attention: The actual parameters have been set before delivery according to customer requirements.

2.6. Component introduction

2.6.1. Battery system

Table 2.2 Battery system parameters

Cell parameter	
Battery type	LiFePO (LFP)
Reference voltage	3.2V
Voltage range	2.8V~3.6V
Nominal capacity	280Ah
Maximum charging temperature range	0~50℃
Maximum discharging temperature range,	-10~50℃
Cell series parallel mode	1P20S
Rated energy	17.92kWh
Nominal voltage	64V
Voltage range	56V~72V
Weight (approx)	135kg
Overall dimension (W*D*H)	460*940*230mm
Rated energy storage	215kWh
System rated voltage	768V
System voltage range	672V~864V
Series-parallel system	1P*20S*12S
Number of electric boxes included	12
Weight (approx)	1620kg

2.6.2. Battery management system

The energy storage management system consists of a battery management system (BMS) and an energy management system (EMS). The battery we choose comes with a BMS system, which is

divided into two levels: BMU and BCU.

The BMU collects data about battery cells in the battery box and sends the data to the BCU. The BMU balances battery cells in the battery box according to instructions from the BCU.

The BCU is located in the main control box and manages the battery cabinet. It receives detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, performs SOC calculation and correction, manages the pre-charging and charging of the battery cabinet, and uploads the related data to the EMS.

2.6.3. Electrical system

The outdoor cabinet energy storage system adopts a modular scheme, and users can configure different number of power modules according to the project requirements. The power module parameters of the energy storage converter are as follows:

Table 2.3 Converter module parameters

Model	**Powermaster-50AC**
Rated power	50kW
Maximum power	55kW
Dc operating voltage range	500V~900V
Dc side full load voltage range	500V~900V
Maximum direct current	110A
Rated AC voltage,	400Vac，3W+PE
Rated frequency	50/60Hz（±5Hz）
Rated alternating current	72A
Overload capacity	110%, normal operation; 120%, 1 minute;
Current distortion	<5% (rated power)
Power factor adjustment range	-1 lead ~+1 lag
With unbalanced load capacity	100%

Adaptive battery	Lithium/lead-acid/photovoltaic modules
Charging mode	According to BMS instruction/three-stage /MPPT
Working mode	Constant current, constant power, MPPT, AC voltage source, DC voltage source,VSG
Maximum efficiency	98.2%
Dimension (W*D*H)	483 (excluding mounting ear 444) *600*150mm
Weight (approx)	35kg
Isolation mode	non-isolated
Class of protection	IP21
Operating temperature	-25℃~+60℃(>45℃ derated)
Relative humidity	0~95%0~95% (non-condensation)
Cooling mode	Intelligent air cooling
Noise	< 70dB
Altitude	3000m (>3000m Derated)
Communication interface	RS485/CAN (optional)

Light storage systems for islands, mountains, border posts and other remote areas or areas with unstable power supply, or new zero-carbon science and technology parks. The user can configure the DC converter power module according to the project requirements to realize the integrated power supply system of photovoltaic and energy storage. Dc converter power module parameters are as follows:

Table 2.4 DC converter module parameters

Model	Powermaster-50DC
Rated DC power	50kW
Maximum DC power	55kW
Dc operating voltage range	200V~1000V
Low voltage side full load voltage range	312V~850V
The maximum current on the low voltage side	80A*2
Input routes on the low pressure side	2(can be 2 independent, can be parallel to 1)
High voltage side full load voltage range	500V~900V
Maximum DC current on the high voltage side	110A
Number of input routes on the high voltage side	1
Adaptive battery	Lithium/lead-acid/photovoltaic modules
Working mode	Constant voltage, constant current, constant power,MPPT
Maximum conversion efficiency	98.8%
Size (W*D*H)	483 (excluding mounting ear 444)*600*150mm
Weight (approx)	25kg
Isolation mode	non-isolated
Class of protection	IP21
Operating temperature	-25° C ~+60 ° C (>45 ° C derated)
Relative humidity	0~95% (non-condensation)
Cooling mode	Forced air cooling
Noise	＜70dB
Altitude	3000m (>3000m Derated)
Communication interface	3000m (>3000m Derated)

2.6.4. Environmental control system

The energy storage system is equipped with environmental control units such as smoke detector, water sensor, door status sensor and fire protection, which can fully control the system running status. Environmental control system diagram:

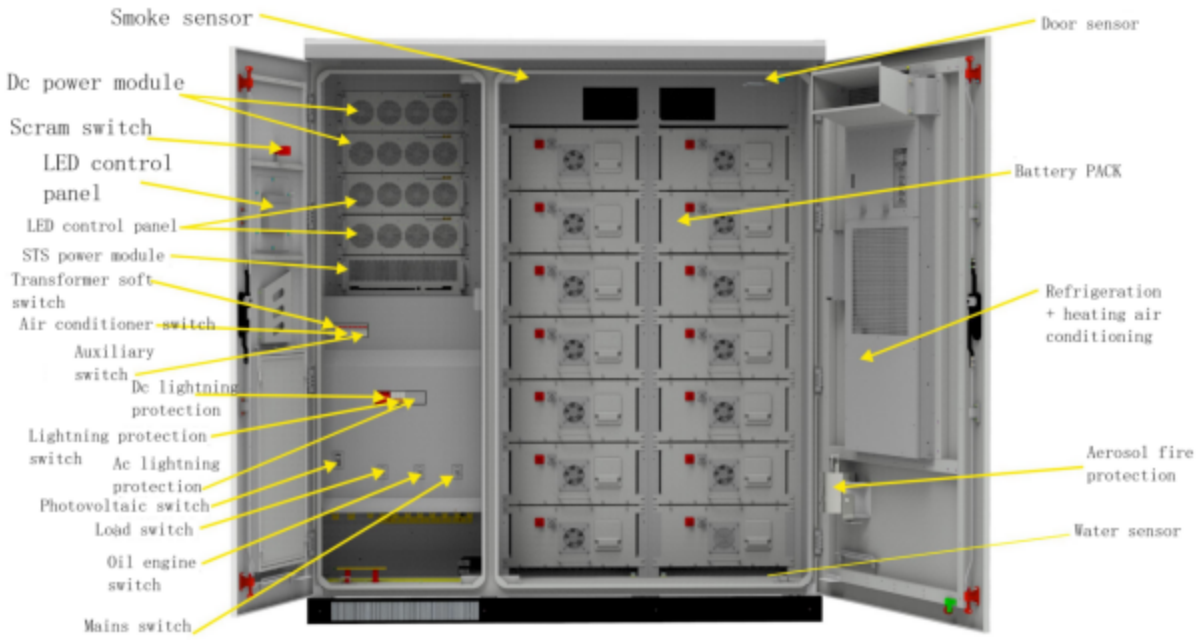


Figure 2.2 Cabinet internal structure

Precision air conditioning parameters

Dehumidification stop point	45% ~ 95%(Configurable)
Alarm function	
A high temperature alarm is generated in the cabinet	30 ° C to 60 ° C (Optional)
The cabinet low temperature alarm is generated	-45°C~10°C (Optional)
High humidity inside the cabinet alarm	0%~100% (configurable)
Note: The actual parameters are set before delivery according to customer requirements.	

- **Access control switch**

The door opening status of the access control switch detection equipment:

Table 2.6 Access switch parameters

name	argument
Rated voltage	AC-15：380V DC-13：220V
Rated current	AC-15：0.79A DC-13：0.14A
Rated insulation voltage	415V
Rated impact resistancepressure	2.5kV
Operating frequency	Mechanical/electrical: 20 cycles/min
Use environment	Temperature: -5℃~+40℃ Relative humidity < 90%RH (no condensation)

- **Water detection device**

Water detection device detects whether the energy storage system is leaking:

Table 2.7 Water sensor parameters

Name	Argument
Operating voltage	DC12V (allowed range 10V~15V)
Working current	≤0.1A
Detection channel	1-channel, 2-core leaking cable
Response time	<2s
Relay output	Normally open, contact capacity 1A 30VDC
Use environment	Temperature: -10℃~+65℃ Relative humidity <95%RH (no condensation)

- **Smoke detector**

A smoke detector is used to detect the concentration of smoke in the current environment.

Table 2.8 Smoke detector parameters

Name	Argument
Operating voltage	DC12/24V (allowed range 9V-30V)
Working current	Monitoring status: <1mA@DC12VFire alarm: <30mA@DC12V
Relay output	Normally open, contact capacity 1A 30VDC
Work instruction	Monitoring Status The red light blinks 1 every 6sSecondary alarm status The red light is steady on fault status The red light blinks twice every 6s
Use environment	Temperature: -10°C~+65°C Relative humidity < 95%RH (no condensation)

2.6.5. Fire protection system

The aerosol fire extinguishing device used in the fire fighting system is a new type of environmental protection fire fighting product with world advanced level. Working principle: When the ambient temperature reaches the starting temperature of the thermal wire or contact with an open flame, the thermal wire spontaneously combusts and is transmitted to the aerosol series Fire extinguishing device. After the aerosol fire extinguishing device receives the start signal, the internal fire extinguishing agent is activated, and the nano-type aerosol fire extinguishing agent is quickly generated and emitted to achieve rapid fire extinguishing.

Table 2.9 Parameters of fire aerosol

Model number	**QRR250**
Technical parameter	
Reagent weight	250g
Equipment weight	2600g
Dimension	ø127*145mm
Extinguishing time	≤30s
Nozzle temperature	≤200℃
Actual extinguishing efficiency	≤100g/m^3
Operating ambient temperature range	-40℃~+70℃
Relative humidity	≤95%
TH type (thermal wire) boot mode parameters	
Starting temperature	175℃
Useful life	5 years

2.6.6. Local management system

Microgrid Management System (Lotus-ESS) is an intelligent energy management system developed by our company for microgrid systems, which is mainly used in the application of various capacities of energy storage power stations and optical storage and charge integrated power stations.

The product integrates the functions of HMI, port control and communication, system parameters and operation strategy setting to realize the monitoring and management of the energy storage

system. Product hardware resources and parameters are as follows:

Table 2.10 Local controller parameters

Product model	Lotus- ESS
Power input	DC 12V
Output control	3 isolated output switches
Input control	6 Isolated input switch quantity
Serial communication	Two channels isolate RS232 and four channels isolate RS485
Fieldbus	Two CAN bus interfaces
Ethernet port	1 10/100M Ethernet port (RJ45)
Extended storage	One USB flash drive port, one SD bayonet
Audible alarm	1 controllable buzzer port
Program characterization	1 running indicator,1 status indicator,1 alarm indicator
Anomaly characterization	+1 hardware watchdog timer
Real time clock	1 Group RTC real-time clock

2.7. Configuration list

To sum up, the overall configuration list of the energy storage system under typical configuration is as follows:

Table 2.12 Powermaster Energy Storage Cabinets Overall configuration list

Name	Model	unit	quantity	remark
Battery system	280Ah，215kWh	Set	1	Tape control box
Energy storage converter	Powermaster-50AC	PCS	2	modularization
Photovoltaic controller	Powermaster-50DC	PCS	2	modularization
And off-grid switching	Powermaster-150STS	PCS	1	modularization
Air conditioning system	AC3000 220± 15%VAC~50Hz	Set	1	Precision air conditioner
Fire protection system	QRR0.25GW/S-THF	Set	1	Thermal wire startEjector type
Auxiliary system	Access control	Set	1	Auxiliary equipment
Management system	Lotus-ESS	Set	1	It consists of BMS and EMS

The actual supply configuration shall prevail.

3. Installation and wiring

3.1. Transport and handling

3.1.1. Product transportation

- In order to make the equipment in a better protection state, it is recommended to use packaging transport;
- Transport the equipment according to the requirements on the package to prevent personal injury and equipment damage;
- Energy storage batteries are not recommended for rail transportation or air transportation. The speed limit for land transportation is 80km/h on flat roads and 60km/h on rugged roads. If there is any conflict, please refer to the local traffic regulations.

3.1.2. Product handling

- Ensure that the forklift has sufficient load and that the center of gravity of the device rests between the feet of the forklift to prevent personal injury and equipment damage;
- With battery transfer, forklift bearing capacity needs 23t; Without battery transfer, forklift load capacity needs 21.5t;
- Recommended fork length ≥ 1.5m, width 80cm~160cm, thickness 25cm~70cm.

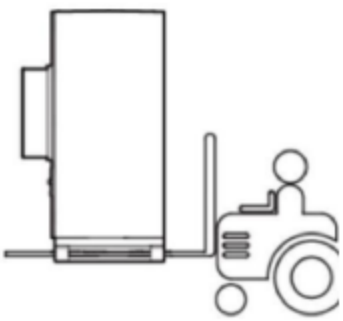


Figure 3.1 Transport diagram

3.2. Packing and storage

3.2.1. Packing and storage

In order to make the product in a better state of protection during transportation, special wooden cases are used to pack. There are the following basic parameters (including but not limited to) on the equipment packaging, which need to be carefully checked according to the project requirements:

Table 3.1 Packaging parameters table

parameter	Instructions
Model number	Product model
Dimension	Product packaging size
Weight	Total product weight after packaging
Identification	Face up, handle with care, center of gravity, etc

3.2.2. Product storage

If the product is not immediately shipped or installed for use, the product must be stored indoors, in a storage place and meet the following conditions:

Table 3.2 Requirements for product storage conditions

Argument	Demand
Storage temperature(Battery not included)	-25℃~+60℃
Battery	20℃ ~ 30℃
Keep relatively wet country	95%(no condensation)
Altitude	< 3000m

Look out： Long-term battery storage is not recommended. Lithium battery long-term storage will have capacity loss, lithium battery storage at the recommended storage temperature

for 12 months, the general irreversible capacity loss is 3% to 10%. The total storage and transportation time of the battery pack shall not exceed 8 months (calculated from the time of delivery). More than 8 months need to be replenished and SOC calibration, at least need to replenish 50% SOC. If the batteries are not powered on as required, the performance and service life of the batteries may be affected.

3.3. Installation environment requirements

The installation layout of the energy storage system must meet the fire distance or firewall requirements specified in local standards. Including but not limited to《GB51048-2014 Design Code for Electrochemical Energy Storage Power Station》,《NFPA 855 Standard for the Installation of Stationary Energy Storage Systems》. The energy storage system applies only to outdoor scenarios and requires outdoor layout. Indoor layout is not supported. The general requirements for site selection are as follows:

- The water level of the installation position should be higher than the highest water level in the history of the area. The distance from airport, landfill, river bank or dam should be ≥2km.
- Choose a well-ventilated area. When the device is running, do not block the vents and heat dissipation system to prevent high temperature fire. Adequate installation space to ensure that the surrounding equipment will not be affected by the heat generated by the product; Installation position Ensure that external cable space is sufficient. With convenient transportation conditions, reliable fire suppression system equipment.
- Keep the installation location away from fire sources. Do not place flammable or explosive materials around the device. If the equipment is installed in a place with dense vegetation, in addition to routine weeding, the ground under the equipment needs to be hardened to prevent weeds.
- Do not install the energy storage system outdoors in salt-affected areas to prevent corrosion and fire. Salt-affected areas are those within 2km of the coast or affected by sea breezes.
- Protective measures such as fences and fences must be set up for the energy storage system,

and safety warning labels must be erected for isolation to prevent unauthorized personnel from entering the device during operation, which may cause personal injury or property damage.

- Install the device in an area away from liquid. Do not install the device under the water pipe or air outlet where condensate is likely to occur. Do not install it under the air conditioner port, air vent, or cable window of the equipment room to prevent liquid from entering the inside and causing short circuit.

Instructions

When the safety distance of the site cannot meet the requirements of relevant national standards, it is recommended to relocate the site. Site selection should avoid scenarios that are not recommended by industry standards and regulations, including but not limited to the following locations, regions, and venues:

- Strong vibration, strong noise source and strong electromagnetic field interference area.
- Producing or having dust, oil fumes, harmful gases, corrosive gases, etc.
- A place where corrosive, flammable or explosive materials are produced or stored.
- Within the explosive hazard range.
- Places with existing underground facilities. Crowded places, high-rise buildings, underground buildings.
- There are bad geological conditions such as rubber soil, soft soil layer, easy to collect water and easy to sink the ground.
- Within the limits of mining subsidence zones. An area likely to be flooded if a dam or levee breaks.
- Earthquake fault and fortification intensity greater than 9 degrees earthquake area.
- There are debris flow, landslide, quicksand, karst caves and other direct hazards.
- Important water source sanitation protection area.
- Protected area of historical relics and monuments.

If there is no more suitable site, it is recommended to install a fireproof firewall of no less than 3h for security protection, and consider the space requirements of equipment transportation, installation, and maintenance. For details, see T/CEC 373-2020. The length and height of the firewall must be 1m higher than that of the energy storage cabinet.

Preparation before installation

- Before installing the product, check whether the product is intact. If you find any traces of damage, please keep evidence and contact us.
- If there is no abnormality in the product, please check the delivery list to see if the parts are complete.

Table 3.3 Delivery list

Serial number	name	quantity	remark
1	Outdoor cabinet energy storage system	1 set	Cabinet door key included
2	User manual	1 copy	
3	Certificate of conformity	1 part	
4	Factory inspection report	1 part	

- Before installation, you need to prepare installation tools.

Table 3.4 Installation tool list

Serial number	name	quantity	remark
1	Screwdriver set	1 set	
2	Sleeve	1 set	
3	Multimeter	1 set	
4	Forklift	1 pce	
5	Screws, nuts, gaskets	several	

3.4. Mechanical installation

After confirming that the product is normal and all accessories are complete, you can refer to the following suggestions for mechanical installation:

- Select the installation position of the equipment in advance according to the product size, and do a good job of positioning and fixing; The recommended basis is shown in Figure 3.2;
- With reference to the weight of the product, the selected installation position needs to have sufficient bearing strength;
- Ensure that the ground point is reliable and the grounding resistance is less than 4Ω.

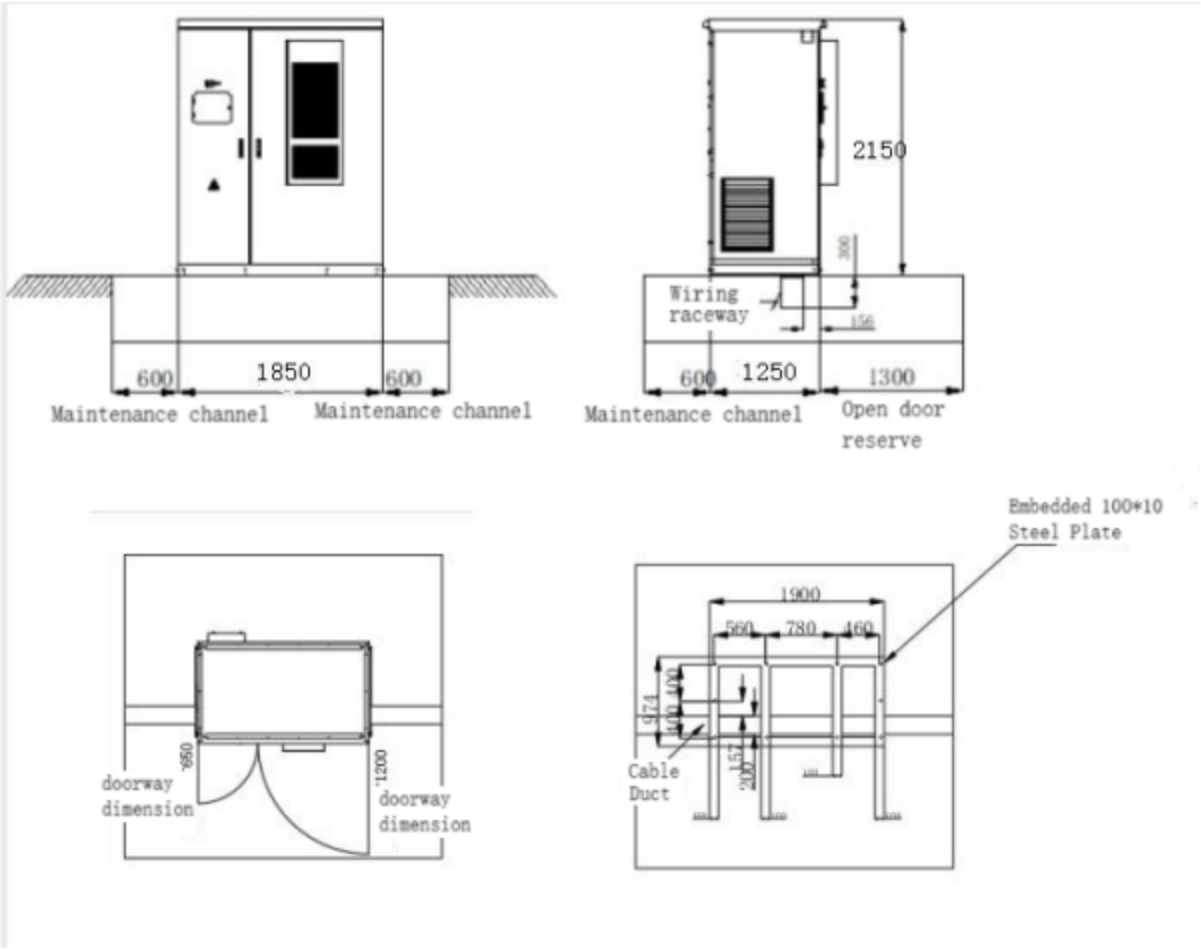


Figure 3.2 Basic reference drawing

(The actual dimensions of the equipment shall be subject to shipment.)

- Remove the sealing plates at the bottom of the device after removing the wooden cases. Put away the removed sealing plates and screws, and reinstall the devices after they are in place.

Figure 3.3 Schematic diagram of the sealing plate at the bottom of the device.

- Use a forklift truck to place the device on the foundation, align the device fixing holes with the embedded nuts, and secure the device using M16X40 bolts.

3.5. Electrical cable installation

This product uses the fusioncube architecture. The DC side has been connected internally. You only need to install electrical cables for the AC side and external communication onsite. Naton provides the wiring reference in Table 3.5 according to the product power and cable specifications. The cable diameter must meet the local cable standards. Factors affecting cable selection include rated current, cable type, laying mode, ambient temperature, and maximum acceptable line loss.

Table 3.5 Cable diameters Table

Model capacity	Ac cable	Zero line	Ground wire	Positive and negative DC inputs(female)
50kW	≥3*35mm^2	≥35mm^2	≥25mm^2	Monotypic soil≥ 70mm2
100kW	≥3*70mm^2	≥70mm^2	≥50mm^2	Monotypic soil≥ 70mm2
150kW	≥3*150mm^2	≥150mm^2	≥95mm^2	Monotypic soil≥ 70mm2

Danger:

For electrical installation, refer to the following suggestions:

1. Before wiring, check that all switches in the device are off, and ensure that the device is not powered on;
2. Before connecting the cable, turn off the power grid switch and ensure that the cable is not

live;

3. To ensure that the phase sequence of the cable is correct, you can add yellow, green, red and black insulation jackets or labels to distinguish them to prevent phase sequence errors;

4. The connection between the cable terminal and the copper bar should be pressed tightly, and the screw length should be moderate to avoid affecting insulation and fastening;

5. Lay communication cables and power cables separately, and ensure that the insulation layer is not damaged during the laying process;

6. The ground cable must be reliably connected to the ground copper bar, and the cross-sectional area of the cable must meet design requirements;

7. All AC cables enter the device through the hole at the bottom of the device and connect to the corresponding phase sequence;

8. After cable connections are complete, use fireproof mud to seal cable leaks to prevent external pests from entering and damaging devices or cables;

9. To prevent the contact resistance from increasing and heating due to the loose force of the terminal, ensure that the bolts fastening the terminal meet the torque requirements listed in Table 3.6:

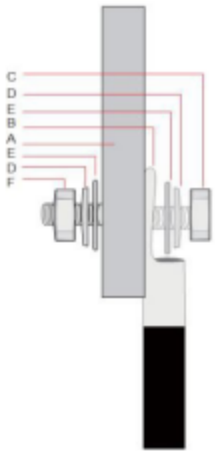
Table 3.6 Cable torque requirements

Screw size	M4	M5	M6	M8	M10	M12	M14	M16
Torque (N*m)	1.8~2.4	4~4.8	7~8	22~29	44~58	76~102	121~162	189~252

The inlet and outlet cables of the energy storage system are bottom-in and bottom out. After the switch baffle is removed, as shown in Figure 3.5, φ11mm and φ13mm holes are reserved for the A/B/C/N copper bar at the lower end of the switch for connecting cables to the customer, or the holes are cut according to the customer's requirements. The PGND cable is connected to the PE copper bar, and the grounding impedance of the device meets the requirements of the national standard GB 50054 and local electrical standards.

Figure 3.5 Switch terminal

The following shows how to install terminals and screws for power cable connection:



Terminal mounting

Serial	Name
A	Copper bar
B	Terminal
C	Screws
D	Spring washer
E	Large flat pad
F	Nut

the component of the wiring terminal

Screws are installed

Attention

1.If copper core cables or copper-clad aluminum cables are used, use copper wiring terminals.

2.When aluminum alloy cables are used, use copper and aluminum transition terminals, or aluminum transition terminals with copper and aluminum transition gaskets.

3.6. Communication cable installation

When installing external communication cables, lay them separately from power cables. The distance between the communication cable and the power cable should be at least 300mm. When the communication cable must pass through a power cable, ensure that the Angle between the two cables is 90 degrees to reduce electromagnetic interference caused by the power cable. The communication cable should be as close to the ground as possible to support the cable, such as wire trough, metal guide rail, etc. If there is no support, you can use cable ties to basically fix it.

The system can use RS485 or Ethernet communication mode for background communication, and the system communication protocol uses Modbus RTU or TCP. The system uses twisted-pair shielded cables or network cables to connect to the position in the following figure.

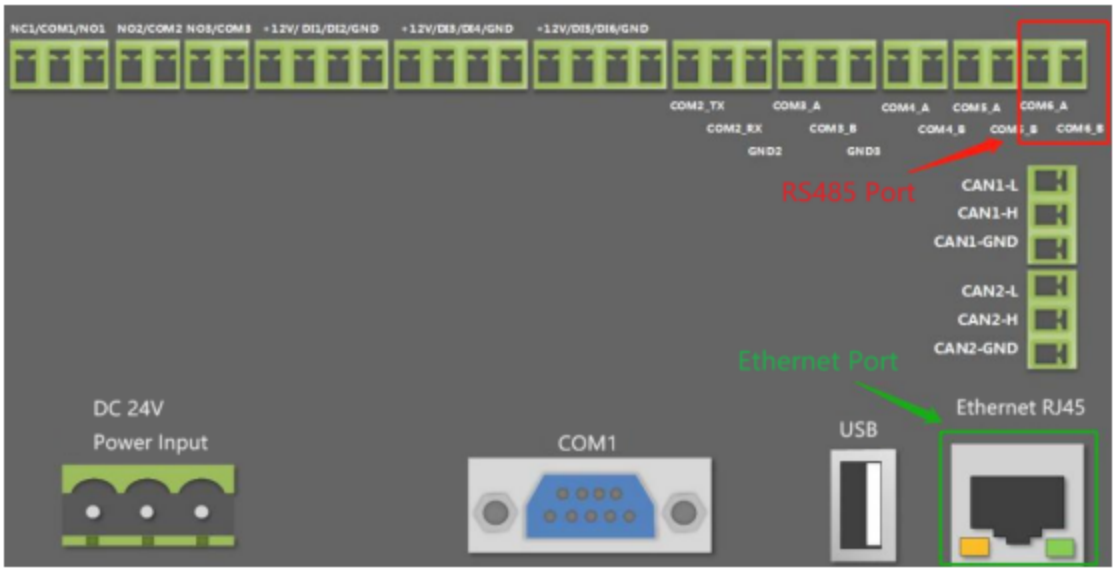


Figure 3.7 Communication cable layout diagram

4. Power on and commissioning

4.1. Check before starting

Before the operation of the product, please ensure that the product has been installed in accordance with the specifications, and carry out a comprehensive and detailed inspection of the machine to ensure that the indicators are in line with the requirements before starting.

- **Appearance inspection:**

1. Equipment appearance intact, no damage, no rust and no paint. If the paint is off, repair the paint;

2. The device label is clearly visible. Replace the damaged label in time.

- Grounding check: the box has a ground point and is firmly grounded; The ground conductor in the box is securely connected to the ground copper bar in the box.
- Cable check:

1. Cable protection layer wrapped intact without obvious damage;

2. The terminal is made in accordance with the specification, and the connection is firm and reliable;

3. The labels on both ends of each cable are clear and clear. The cables meet the principle of separating strong and weak electricity;

4. Cable mounting bolts are secured, and cables are securely pulled. The cable holes have been plugged.

- Check the copper bar: The copper bar has no obvious cracks or deformation, the screws at the joints are fastened, the marking marks are not misplaced, and there is no debris on the copper bar.
- Component inspection: Refer to Figure 4.1, circuit breakers are in the opening position.
- The surge arrester indicator is green.

Figure 4.1 Distribution switch position diagram

4.2. Power-on operation

The product boot operation process is as follows:

- Use a multimeter to confirm that the power grid voltage is within the predetermined range (400V±10%);
- Refer to Figure 4.1, closing transformer soft switch MCB1 and auxiliary switch MCB3, closing QF1 AC plastic-case switch to complete the transformer soft starting;
- Wait for the touch screen to start (about 30 seconds) to confirm that the display is normal and there is no fault alarm;
- Turn ON the battery auxiliary switch and the battery load switch of the high voltage box (rotate to the ON position), and turn on the battery in "Data" -> "Battery Data". Closing QF2 oil switch, closing QF3 load switch, closing QF4 photovoltaic switch;
- On the "System "->" Parameter Setting "interface, set the converter parameters. On the" System "->" Operating Mode" interface, select the required operating mode;

- Enable all modules on the "Switch" page of the touch screen, and click "Converter on" to complete the startup.

4.3. Trial run

After all electrical structures of the device are installed and startup conditions are met, to ensure reliable and stable operation of the energy storage system, professional electrical engineers must power on the system for the first time and set the operation mode and related parameters according to project requirements:

- Set the device control mode to "manual mode" and set the active power to 5%;
- Choose "Data" > "Environment Monitoring" to start the air conditioner, enable all modules on the "Switch" screen, and tap "System On";
- Observe screen PCS, battery and air conditioning parameters during operation, and stop detection in time if there is an anomaly;
- The active power is set to -5%, and the battery is charged at 5% of the rated power of the system;
- Observe screen PCS, battery and air conditioning parameters during operation, and stop detection in time if there is an anomaly;
- Run for 0.5 hours;
- After the one-hour trial run is complete, shut down the system on the Switch screen.
- You can choose the local manual power control mode, automatic peaking and valley filling mode or backup mode according to the project background and requirements, and then click "System Power on" on the system interface.

4.4. Shutdown operation

When the product needs routine maintenance, it needs to be shut down. The normal

shutdown operation of the product is as follows:

- Click the touch screen switch interface and click "System shutdown";
- Refer to Figure 4.1, break the air conditioning switch MCB2, auxiliary switch MCB3 and battery auxiliary power switch;
- Break the main AC circuit breaker;
- Break the battery load switch and auxiliary switch of the high voltage control box;
- Wait until the busbar discharge ends, the touch screen is off, and the device is shut down.

4.5. Scram Shutdown

When the product fails or an emergency shutdown is required, the following emergency shutdown operations can be performed:

- Press the emergency shutdown button "EPO";
- Refer to Figure 4.1, disconnect the system auxiliary electrical switch MCB2-3 and the battery auxiliary power supply, and disconnect the battery load switch of the high voltage box;
- Reset the EPO button after confirming that the fault or danger is rectified and needs to run.

Instructions

After pressing "EPO" for emergency shutdown, you need to turn off the AC/DC plastic-case switch, auxiliary power switch, and battery load switch of the high voltage box, and wait 10 minutes before turning on!

5. Operation

This section describes the LCD touch screen display interface and the corresponding operation control through the man-machine interface. You can run various operation commands on the LCD to view DC, AC, and system running parameters and data, and obtain the current device status and real-time alarm information in a timely manner, providing a reliable basis for fault diagnosis. In addition, the LCD touch screen can also display the system software version information and upgrade the software of each component through the U disk.

5.1. Man-machine interface introduction

After the system is powered on, the LCD touchscreen displays the startup screen. 30 seconds later, the startup screen disappears, and the Home screen is displayed. As shown in Figure 5.1, the main page interface displays system real-time power, voltage, current, power generation, operating mode, working status and other information.

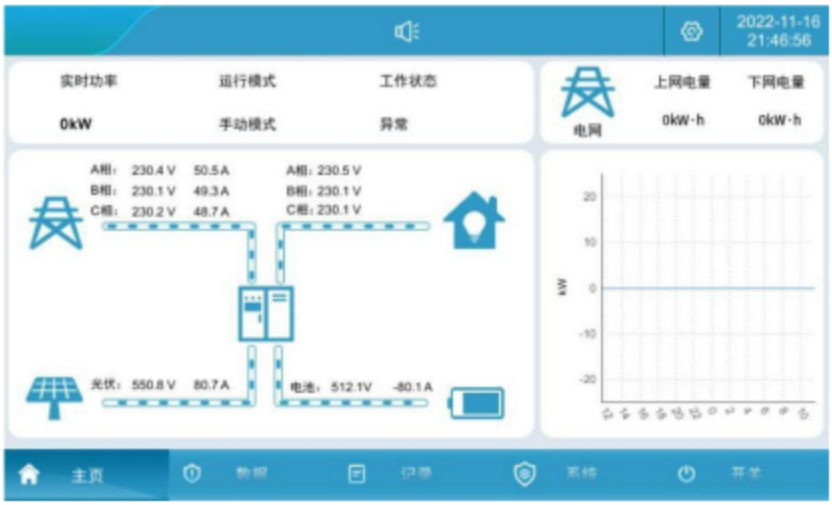


Figure 5.1 Main page

Menu expansion items:

NO.	Menu	Menu item	Parameter function
1	Home page	No	Display the operating status of the system and the charge and discharge curve of the day
2	Data	Real-time data	Converter all analog data display
		Real-time state	Converter working state and switch state display
		Real-time alarm	Current system alarm information
		Battery data	Battery data display and battery on/off Settings
		Environmental monitoring	Dynamic ring monitoring display and air conditioning parameter setting
3	Records	Historical alarm	Historical alarm records are displayed
		Operating master	Display operation log
		Data report	Export history
4	System	System information	Display system information
		Operation mode	Set the system running mode
		Parameter	Converter and battery parameter setting

		setting	
		Manufacturer setting	Equipment manufacturer Settings
		System upgrade port	System software upgrade
		Communication setup	Set up communication
5	Switch	System switch	System power on and off

5.2. On-off operation

1. Switch ON the converter: First check the power on of the whole machine, refer to Figure 4.1 to close the transformer soft start switch MCB1 and auxiliary switch MCB3, and close the QF1 AC plastic case switch. After completing the transformer soft start, close the battery auxiliary switch and the battery load switch (rotate to the ON position), and close the remaining distribution AC-DC plastic case switch. "Battery Data" battery on, observe the touch screen no fault alarm (screen startup takes about 30 seconds);

Figure 5.2 Battery on/off screen

2. Set the converter parameters in the "System "->" Parameter setting "interface, select the required operation mode in the" System "-> "Operation mode" interface, select grid-connected and control mode manual or peak cutting and valley filling or backup mode;

3. Click "Switch" to enter the current on-off interface, select enable all modules (you can also turn on some modules as required, the number of modules depends on the actual shipment), click "System on" button, the normal start time is about 2 minutes, as shown in Figure 5.2.

Figure 5.3 Switch on/off screen

4. After clicking the "System On" button, if the temperature wait appears in the upper right corner of the "Switch" interface, the environment does not meet the conditions for the system to start, the air conditioner will continue to work until the conditions for the system to start are met, and the "temperature wait" disappears and the system continues to start.

Figure 5.4 Environment waiting page

5. If the startup fails, a startup failure message is displayed, and you can query the fault cause according to the failure. Failure: "System failure" "PCS failure" (search the fault list); "Non-discharge" (battery power reaches SOC lower limit) "Non-rechargeable" (battery power reaches SOC upper limit).

Figure 5.5 System startup failure page

6. System shutdown: When the system is in operation, click "System shutdown" to shut down the system, and then the entire system will stop running. If the ambient temperature and humidity of the system are too high (too low), the air conditioner will stop working only after the temperature and humidity return to the normal range (5~35℃);

7. Break off the system auxiliary electrical switch MCB3;

8. break the battery high voltage control box auxiliary switch and battery load switch;

9. Break the main AC/DC circuit breaker.

5.3. Communication setup

Instructions: Communication setting refers to the setting of the communication protocol between the LCD touch screen and the battery BMS, and between the LCD touch screen and the EMS background.

1. Check that the battery BMS communication cable is connected to terminals CAN2_H and CAN2_L on the back of the touch screen;

2. Check that the background EMS communication cable is connected to COM6_A, COM6_B or network port on the back of the touch screen;

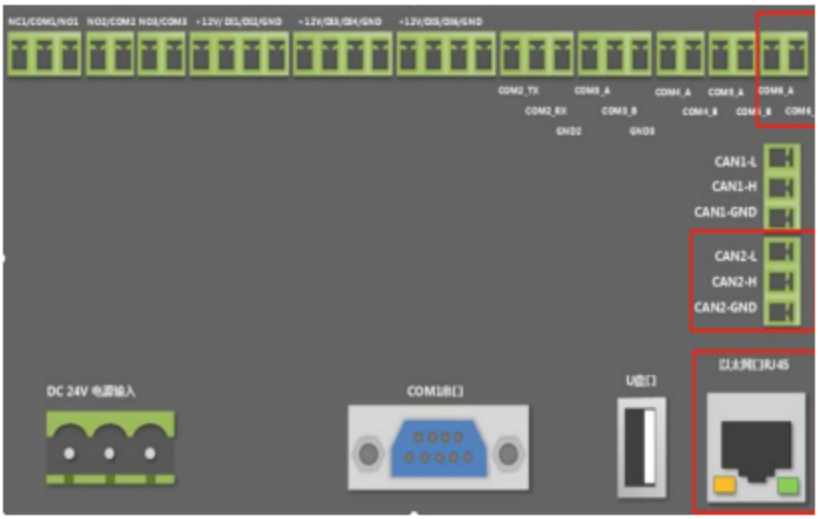


Figure 5.6 Checking communication cables

3. Click the LCD touch screen "System" -> "Communication Settings" to enter the communication Settings interface.

Figure 5.7 Communication setting interface

4. Battery BMS communication Settings: set the CAN baud rate to 250k bps;

5. Background EMS communication set 1: if RS485 communication is used, set the corresponding

6. local secondary address of the communication panel to 1, if multiple energy storage systems

7. access the background secondary address cannot be repeated;

8. Background EMS communication Settings 2: If Ethernet communication is used, the energy storage system as the server, the host set the default address is:192.168.1.100, set the local address corresponding to the communication panel to 1, and the server port to 502, if multiple energy storage systems are connected The background IP address must be unique. After changing the IP address, click the Set button to set the IP address.

Figure 5.8 IP Address configuration interface

5.4. Run mode setting

5.4.1. Mode introduction

The operation mode of the energy storage system can be divided into three types: grid-connected manual mode, grid-connected automatic mode, and off-grid automatic switching.

1. Grid-connected manual mode: The energy storage system runs in grid-connected mode, but the LCD touch screen must be manually operated by the user to start or stop the system. The charging and discharging active power, reactive power, and power factor of the energy storage system can be set in Parameter Settings. After the discharge power is set to 100% anti-countercurrent enable, photovoltaic priority is used, when the photovoltaic power is greater than

the load power, excess power is stored in the battery, and the photovoltaic output power is limited after the battery is full; When the photovoltaic power is less than the load power, photovoltaic + energy storage combined power supply, if not enough, the mains supply; When there is no light at night, the energy storage power supply is preferred. When the energy storage power is lower than the set value, the utility power supply is used.

2. Grid-connected automatic mode: For peak cutting and valley filling application scenarios, the energy storage system automatically connects to the grid according to the pre-set time-sharing charge and discharge power. For the backup mode application scenario, the PV gives priority to battery charging, and the load power is provided by the power grid. When the battery is charged to the set SOC upper limit, the PV shuts down, and the battery discharges to SOc96% of the PV starts up. When the PV power is greater than the load power, the PV tracks the load power. When the PV power is less than the load power, the PV and battery jointly supply power to the load. When the soc value of the battery is discharged to the standby power to maintain the SOc value, the battery stops supplying power to the load, and the PV and grid jointly supply power to the load.

3. Off-grid automatic switching: When the power grid suddenly loses power when running in the grid-connected state, the energy storage converter automatically switches from grid-connected to off-grid mode, and the system can output a stable 400V/50Hz three-phase AC voltage. When the power grid suddenly calls, the energy storage converter automatically switches from off-grid to grid-connected mode.

Instructions:

1. a. Off-grid switching can be set planned trigger or non-planned trigger, set to non-planned trigger: when the mains power failure, automatically switch to off-grid operation, the system can output stable 400V/50Hz three-phase AC voltage; When the mains calls, it automatically switches to the grid-connected mode. Set as scheduled trigger: When running in grid-connected mode, you can manually switch to off-grid mode, set "Off-grid" to "off-grid", when running in off-grid mode, you can manually switch to "grid connected mode" (the premise is that the mains exists), and set "off-

grid" to "grid connected". The setting interface is as follows:

2. B.In grid-connected mode, the anti-reverse function can be disabled or enabled. Set to Enable: The energy storage system will not be reverse-supplied to the grid. Set to Disable: The energy storage system can flow into the power grid. Choose "System" > "Parameter Settings" > "Advanced Settings (Password 888888)" > "MSTS Parameter" > "Anti-Counter-current Enable". The following figure shows the setting page:

5.4.2. Grid-connected manual mode

1. Click "System "->" Operation Mode "to enter the page as shown in Figure 5.9

Figure 5.9 Grid-connected manual mode setting

2. Set the control mode to "Manual mode", set the corresponding active power, power factor, and reactive power rate on the "Parameter Setting" page, and the machine runs according to the set values (positive values are discharge, negative values are charging). Figure 5.10 shows the power setting interface.

Figure 5.10 Power setting interface

5.4.3. Grid-connected automatic mode

Peak cutting and valley filling mode:

1. Click "System" >" Operation mode ", click "peak cutting and valley filling" button to enter the setting page;

Figure 5.11 Operation setting interface of peak clipping and valley filling

2. Click "Modify" to set the peak clipping and valley filling operation period and power: set the start and end time, charge and discharge power, and whether to enable it in period 1: click the next item to enter the setting of period 2, save and exit after completing all period Settings;

Figure 5.12 Setting interface of charge and discharge time for peak clipping and valley filling

3. Automatically jump to the following interface, click the finish button;

Figure 5.13 Charge and discharge setting interface of peak clipping and valley filling

4. Change the "control mode" to "Peak cutting and valley filling";

Figure 5.14 Control mode of peak cutting and valley filling

5. Automatic mode: pause, click "Switch" -> "System on" to complete the local automatic control mode setting.

Figure 5.15 Automatic control operation mode opened

Backup mode Mode:

1. Click "System" -> "Operation Mode", click "backup mode" button to enter the setting page; If the mains charging function is enabled, the mains is allowed to charge the battery. Battery charging power: Set the required battery charging power value; If the mains charging is disabled: The mains does not charge the battery. Generator: When enabled, the generator is allowed to supply power to the load. When set to Disable, power cannot be supplied to the generator to the load. Generator charging: When the setting is disabled, the generator is not allowed to charge the battery; When set to enable, the generator is allowed to charge the mains (provided the generator is enabled first). Stand-by SOC: The battery does not discharge when the battery is discharged until the stand-by SOC is set.

Figure 5.16 Backup mode setting interface

2. Change "Control Mode" to "Backup mode"

Figure 5.17 Backup control mode

3. Automatic mode: pause, click "Switch" -> "System on" to complete the local automatic control mode setting.

Figure 5.18 Automatic control operation mode opened

5.4.4. And off-grid automatic switching

In the grid-connected state, when the power grid suddenly loses power, the energy storage converter automatically switches from grid-connected to off-grid mode, and the system can output a stable 400V/50Hz three-phase AC voltage. When the power grid suddenly calls, the energy storage converter automatically switches from off-grid to grid-connected mode. The specific setting method is as follows:

1. Switch mode manually and off-network: click "System "->" Running Mode" to enter the current page. Select "Plan Trigger" in "Off-grid Switch" and set it to "planned trigger" : When running in grid-connected mode, you can manually switch to off-grid mode, set "off-grid" to "off-grid ", when running in off-grid mode, you can manually switch to grid connected mode (the premise is that the mains exists), set" off-grid "to" grid connected"

Figure 5.19 Manual and off-network switching mode setting interface

2. Automatic off-grid mode: click "System "->" Operation Mode "to enter the current page," and off-grid switch "set to" non-planned trigger ", set to non-planned trigger: When the power grid suddenly loses power, the energy storage converter automatically switches from the grid-connected mode to the off-grid mode, and the system can output a stable 400V/50Hz three-phase AC voltage. When the power grid suddenly calls when running in off-grid mode, the energy storage converter automatically switches from off-grid to grid-connected mode.

Figure 5.20

5.5. Battery parameter setting

Click "System" -> "Parameter Setting" to enter the current page; Customers set SOC upper and lower limits according to their own needs; You are advised to set the SOC lower limit to at least 5%.

Figure 5.21 Battery charge and discharge setting screen

Attention: Battery parameters have been set before delivery of the energy storage system. You are not advised to change battery parameters.

5.6. Data viewing and export

1. Click "Record" -> "Data Report" to enter the current page.

Figure 5.22 Data report interface

2. Check the day, month, year and total charge and discharge.

3. Insert the USB flash drive, wait for the USB flash drive connection, click data export, wait for the export is complete.

Figure 5.23 Data export interface

5.7. Software upgrade

Software upgrade includes: LCD touch screen software, power module DSP software, power module ARM software three kinds of software upgrade.Before the upgrade, shut down the system on the Switch page of the touch screen. That is, upgrade the software when the system stops running.

1. First of all, prepare a U disk, a computer, a new folder in the U disk, named "UPDATE" for storing burned files;

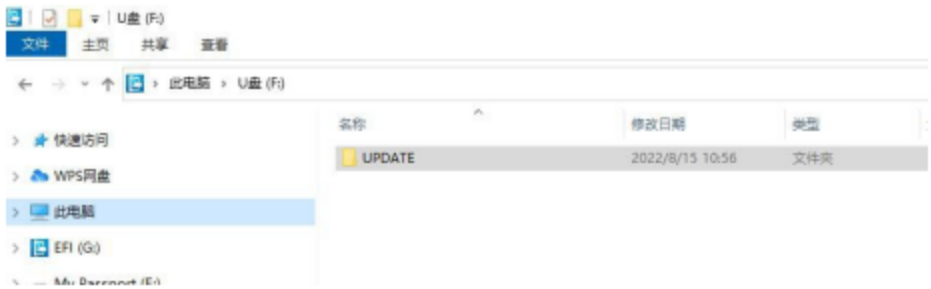


Figure 5.24 Creating the upgrade software folder

2. Copy the DSP, LCD and ARM firmware required for system upgrade to the UPDATE folder;

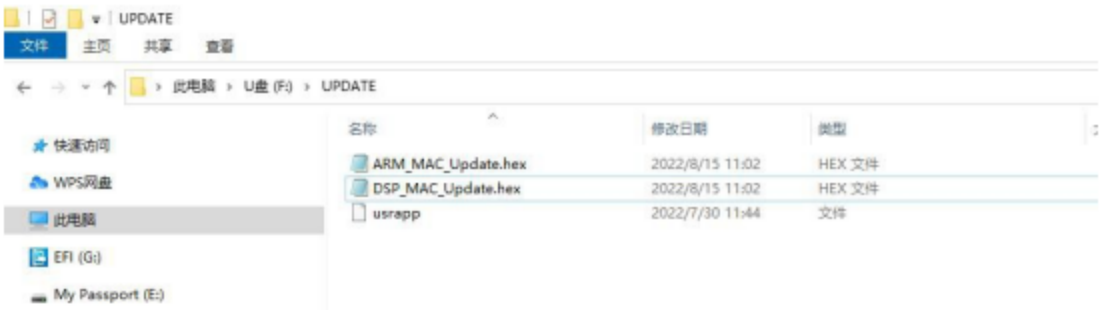


Figure 5.25 Saving the upgrade software

3. Click "System" →> "System Upgrade" and enter the password "888888" to enter the upgrade page;

Figure 5.26 Password verification for upgrading software

4. Insert a USB flash drive on the back of the touch screen. The interface shows that the USB Flash drive is connected and the upgrade file is detected.

5. Upgrade the LCD touch screen software, click "LCD upgrade ", wait about 15 seconds, there will be a prompt upgrade success;

Figure 5.27 LCD Upgrade software and restart screen

6. After the LCD touch screen software is finished, click the "Restart" button to refresh the version, as shown in Figure 5.24. Customers can upgrade DSP and ARM according to the actual

situation, and then click "restart".

7. To upgrade the power module DSP/ARM, select the module to be upgraded in the module box on the System Upgrade interface. (If the system has multiple modules, it is recommended to upgrade module 1 first, and then upgrade module 2 until all modules are upgraded.);

8. Click "DSP/ARM Upgrade" and wait about 5 minutes for a message indicating that the upgrade succeeds. The system upgrade is complete.

Figure 5.28 DSP/ARM upgrade interface

5.8. Environment monitoring interface

Click "Data" -> "Environment Monitoring" to enter the following interface; You can view the real-time system environment status, air conditioner parameter Settings, and air conditioner on/off on the screen.

Cooling mode: When the temperature is greater than or equal to the set cooling point, the air conditioner starts cooling. When the temperature is lower than the cooling point, the air conditioner turns off cooling. The default return difference is 5 ° C (adjustable from 1 ° C to 10 ° C).

Heating mode: The air conditioner turns on when the temperature is lower than the heating hot spot, and turns off when the temperature reaches the heating hot spot. The return difference is 5 ° C

(adjustable from 1 ° C to 10 ° C) by default.

Figure 5.29 Environment Monitoring page

6. Alarm and maintenance

Alarm severities are defined as follows:

- Failure: The equipment fails and the system stops running (charging/discharging).

Alarm: The output power of the device decreases or some functions fail due to external factors, but the charging and discharging functions of the system are not affected.

6.1. Alarm handling

Table 6.1 Troubleshooting methods for fault alarms

Alarm/Fault	Component involved	Cause of the problem	Treatment method
Flooding fault	Battery holder	The storage tank is flooded	Check whether there is standing water inside the cabinet. Confirm whether the outdoor cabinet is leaking and whether the equipment in the cabinet is intact.
Door status sensor alarm	Battery holder	The energy storage cabinet door opens	Check that the cabinet door is completely closed. Check whether the cable on the door status sensor is disconnected. Check whether the position of the door status sensor is offset.
Fire failure	Battery holder	Battery overheats or catches fire	Immediately press the EPO button and move away from the storage cabinet. Stay at a safe distance for 30 minutes. If there is smoke, fire phenomenon, please call the fire alarm telephone; If

			no, manually clear the active alarm and contact the vendor.
The surge arrester alarms	Electrical bin	The surge arrester is faulty	Check whether the signal cable of the SPD is loosely connected. Check whether the lightning arrester indicator is discolored; Replace the AC surge arrester.
Compressor alarm	Air conditioner	Cables are loose. The compressor is damaged	Turn off the power distribution switch, open the junction box of the air conditioner, and check whether the cables are loose.Observe whether there is obvious damage to the appearance of the compressor, whether there is a burning taste,If so, contact the manufacturer.
Outdoor fan alarm	Air conditioner	Cables are loose and the fan is damaged	Turn off the power distribution switch, open the junction box of the air conditioner, and check whether the cables are loose.Observe whether there is obvious damage to the fan, whether there is a burning taste, if so,Please contact the service hotline.
Indoor fan alarm	Air conditioner	Cables are loose and the fan is damaged	Turn off the power distribution switch, open the junction box of the air conditioner, and check whether the

			cables are loose.Observe whether there is obvious damage to the fan, whether there is a burning taste, if so,Please contact the service hotline.
Power grid over voltage or under voltage fault	Power grid/oil machine	The voltage on the grid-connected side is abnormal	Check whether the grid-connected side voltage is abnormal;
Power grid over frequency/under frequency fault	Power Grid /Oil engine	The frequency on the grid-connected side is abnormal	Check whether the frequency of grid-connected side is abnormal;
Island protection fault	Power grid/oil machine	The voltage on the grid-connected side is abnormal	Check whether the grid-connected side voltage is abnormal;
High/low voltage crossing Give an alarm	Grid /oil generator	Grid side voltage abnormal	Check whether the grid-connected side voltage is abnormal;
The power grid voltage is unbalanced breakdown	Power grid/oil machine	The voltage on the grid-connected side is abnormal	Check whether the grid-connected side voltage is abnormal;
Grid	Grid/diesel	The phase	Switch any two cables in ABC wire

misphase	engine	sequence on the grid-connected side is incorrect	

Alarm/Fault	Component involved	Cause of the problem	Treatment method
High DC voltage low breakdown	Battery	Abnormal battery voltage	Check whether the DC input voltage is abnormal;
Bus over voltage breakdown	Energy storage converter device	1.The load is unbalanced 2. The software is abnormal	1. Check whether the DC cable is loose or abnormal. 2. Contact the manufacturer
The bus bar is half unevenequilibrium breakdown	Energy storage converter device	1. The load is unbalanced 2.The software is abnormal	1. Check whether the load is abnormal. 2. Contact the manufacturer
Over temperature drop The fore head Suep	Energy storage converter device	Excessive internal temperature	Check whether the inlet and outlet of the electrical warehouse are blocked; Check whether the internal fan works properly. 3. Contact the manufacturer
Power tube over temperature breakdown	Energy storage converter device	Excessive internal temperature	Check whether the inlet and outlet of the electrical warehouse are blocked; Check whether internal fans work properly. Contacting the Manufacturer
The balance bridge over temperature fault	Energy storage converter	Excessive internal temperature	Check whether the inlet and outlet of the electrical warehouse are blocked; Check whether the internal fan works properly. Contact the manufacturer
Dc over current breakdown	Energy storage converter device	Excess dc current	Compatible Check whether there is short circuit or line damage on the DC side 2 Replace the energy storage converter or contact the manufacturer.
Balancebridge over flow breakdown	Energy storage converter	Excess of internal current	Check whether the off-network load is excessive. 2. Replace the energy storage converter module or contact the manufacturer.

Output overload /Over current fault	Energy storage converter	Ac side power Excess current	Check whether the power grid voltage is normal; Check whether there is a short circuit on the DC side or the line is damaged. Check whether the off-network load is excessive. Replace the energy storage converter module or contact the manufacturer.
Wave by wave limit flow Therefore,disabled	Energy storage converter device	The current on the AC side is excessive	Check whether the power grid voltage is normal; Check whether the off-network load is excessive. 3. Replace the energy storage converter module or contact the manufacturer.
Communication interruption fault	Energy storage converter Local control device	Communication interruption	1. Check whether the communication network cables between modules are loose. 2. Check whether the network cable of the local controller is loose.
Weaver /synchronous the fault	Energy storage converter device	Weaver letter/synchronization no interruption	Loose, check whether the weaver cable or exception; Check whether weaver set exception; Hardware circuit damage.
Relay open /Short circuit it disabled	Energy storage convert	The internal relayIs abnormal Software exception	Replace energy storage converter module Contact manufacturer to replace the internal panel
Fan 1/2/3 alarm	Energy storage convert	Internal fan abnormal	Replace energy storage converter module . Contact the manufacturer to replace the internal fan
Leakage current The fault	Energy storage converter device	Leakage current excess Software, abnormal	Check whether leakage current hole loose connection or exception; Check the ground wire is broken;
Insulation resistance abnormal The fault	Energy storage converter Implement/battery	The insulation on the low side Software, abnormal	Check whether the ac/dc cable is damaged, or to ground short circuit; Check whether cell lines of short circuit or being damaged.

Module is missing The alarm	Energy storage converter device	To screen communication interrupt module	Loose, check module communication cables between abnormal;
Low dc The alarm	Energy storage converter device	Battery is not open	Check whether the battery is open

Warning: The above alarm and fault for common alarm or malfunction，If a fault other than Table 6.1 occurs，Please contact the manufacturer directly.

6.2. Routine maintenance

Influenced by environmental temperature, humidity, dust, vibration and the influence of inverter internal components ageing, system in running process there may be some potential problems. To make the energy storage system can long-term and stable run, need according to table 6.2, regular visit to arrange maintenance personnel, find and handle problems in a timely manner. Installed on the dust serious, high salt fog or heavy industry park system suggest quarterly maintenance time, gas condition good regional energy storage system maintenance once every six months are recommended.

table 6.2 Routine maintenance work

Maintenance oflike	**Action**	**The reference standard**
Enclosure	Check the engine appearance Check the vents check the door lock	No obvious disbonding, scratch or rust. No obvious leak traces Vent dust accumulation The door lock is no damage
Air conditioner	Check the noise and vibration Clean the filter	Fan, compressor rotation is normal, no caton and sound Mesh surface clean, no jam

Energy storage converter device	Check the noise and vibration Check the front panel vents Check the backend copper platoon interface	The front panel fan rotation is normal, no caton, sound Air vents on the front panel surface clean, no jam Copper platoon and contact no corrosion discoloration, no dust accumulation
Electricity	Check the lightning protection device Check the cable copper platoon interface	Lightning protection device is normal Loose screw socket connections without loss Copper platoon, and contact surfaces without corrosion discoloration, without dust accumulation
Battery pack	Check the noise and vibration Check the cable copper platoon interface	Battery pack fan rotation without caton, sound Air vents on the front panel surface clean, no jam Loose screw socket connections without loss Copper bar and contact surface without corrosion discoloration, no dust accumulation

6.3. The warranty service

6.3.1. Warranty period

In the case of the correct use of the product, the business the warranty period of the contract shall prevail.

6.3.2. The warranty scope

Product during the warranty period, any belongs to the product itself quality problem caused by fault, CYG ET CO., LTD. For free maintenance or replacement product for the customer. Customers should be the company set aside a reasonable response time of maintenance, replacement of products handled by our company. Need to show proof of purchase of products related, and to ensure that the product brand is clearly visible, otherwise, the company shall have the right to not be warranty guarantee.

Disclaimer

Appear the following situation, the company shall have the right not to quality assurance, but still can provide paid maintenance services.

- Has more than warranty period;
- Can't provide the product purchase related certificate;
- In the process of transportation, loading and unloading damage;
- Incorrect installation, modification, or the damage is repairing by unauthorized personnel;
- Running under abnormal conditions of use or the environment, cause damage;
- Use a natong machine malfunction or damage caused by component or software;
- Due to irresistible factors such as fire, earthquake, flood caused by the fault.