50kW/100kWh

Outdoor Cabinet Energy Storage System

STORAGE SINO

User Manual

version record

VERSION	DATE	VERSION UPDATE RECORD	APPROVED
V1.0.0	2023-03-25	FIRST VERSION V1.0.0	ZNEG

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1. Safety Instructions

1.1. Safety symbols explained

When installing, operating and maintaining the equipment, please read this manual first and follow all safety precautions marked on the equipment and in the manual. In order to ensure users can better use this product and protect personal and property safety, please read the symbols used below carefully.

 **DANGER:** Indicates a situation that is potentially hazardous and will result in death or serious injury if not avoided.

 **WARNING:** Indicates a moderately potentially hazardous situation which, if not avoided, could result in death or serious injury.

△ **CAUTION:** Indicates a low level of potential hazard which, if not avoided, may result in moderate or minor injury.

 **Note:** Emphasis and supplementation of content may also provide tips for optimal use of the product.

1.2. General security

 **Description:**

This equipment should be used in an environment that meets the design specifications. Otherwise, equipment failure may occur. The resulting equipment malfunction or component damage, personal safety accidents, property losses, etc. are not covered by the equipment quality guarantee. Local laws, regulations and specifications should be followed when installing, operating and maintaining equipment. The safety precautions in this manual only serve as a supplement to local laws, regulations and specifications. Our company will not be held responsible if any of the following situations occur.

- The installation and use environment exceeds the provisions of relevant international, national and regional standards.
- Do not operate under the usage conditions described in this manual.
- Unauthorized disassembly, modification of products, or modification of software code.

- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environments (force majeure, such as earthquakes, fires, storms, floods, mudslides, etc.).
- Damage caused by the customer's failure to follow transportation and installation requirements.
- Damage caused by storage conditions that do not meet product documentation requirements.
- Damage to the device's hardware or data due to customer negligence, incorrect operation, or intentional damage.
- System damage caused by third parties or customers, including damage caused by relocation and installation of the system that does not comply with the requirements of this manual, as well as damage caused by adjustments, changes or removal of identification signs that do not comply with the requirements of this manual.
- Defects, failures or damage caused by acts, events, omissions or accidents beyond the reasonable control of the Seller, including power outages or electrical failures, theft, war, riots, civil strife, terrorism, intentional or malicious damage, etc.

 **Danger:**

There is a high voltage in the equipment, and improper operation may cause electric shock or fire, resulting in death, serious personal injury or serious property loss. Please follow the operation sequence and safety precautions given in this manual and other related documents , and standardize the operation:

- Check that the pre-installed cables on the device are securely connected. Check the device for damage such as holes, dents, or other signs of possible internal damage. Check that the parts inside the equipment are not displaced, and it is forbidden to change the structure and installation sequence of the equipment without authorization.
- It is forbidden to wash the electrical components inside the equipment with water. When liquid enters the equipment, please press the emergency stop switch immediately and notify the on-site management personnel.

- It is forbidden to perform installation, wiring, maintenance and replacement operations with power on. Before touching any conductor surface or terminal, you should measure the voltage at the contact point and confirm that the protective ground wire of the equipment or parts that need to be repaired is reliably grounded to confirm that there is no risk of electric shock.
- Except for those who operate the equipment, other personnel should not approach the equipment. Do not power on the device before it has been installed or has not been confirmed by professionals. When powering on for the first time or when the main circuit is powered on, at least two people must be on site.

Description

- The user 's operation behavior and operation tools in the process of transportation, handling , installation, wiring and maintenance must meet the laws, regulations and relevant standards of the country and region where they are located .
- During installation, operation, and maintenance, you must first clean up the accumulated water, ice, snow, or other debris on the top of the cabinet before opening the cabinet door to prevent debris from falling into the cabinet.
- Reverse engineering, decompiling, disassembling, adapting, implanting or other derivative operations on device software is prohibited. You may not study the internal implementation of the device, obtain device software source code, steal intellectual property rights, etc. in any way, and you may not disclose any device software performance. The result of the test.

1.3. Electrical Safety

1.3.1. Wiring requirements

- Please select a cable that meets the requirements of local laws and regulations. Cables of the same type should be bundled together, and cables of different types should be laid separately. Intertwining or crossing is prohibited.
- After the wiring is completed or you leave for a short time during the wiring process, you must immediately seal the cable opening and close the cabinet door to prevent small animals from entering.

- The cables used in the energy storage system must be firmly connected, well insulated, and meet the requirements. The position of the cable through the pipe or the hole must be protected to prevent the cable from being damaged by sharp edges and burrs.
- After the cable wiring is completed, cable brackets and cable clamps need to be used for reliable fixation. The cables in the backfilled soil area must be tightly attached to the ground to prevent the cables from being deformed or damaged due to force when the soil is backfilled.
- The use of cables in a high temperature environment may cause aging and damage to the insulation layer. The distance between the cable and the outer periphery of the heating device or heat source area should be at least 30mm.
- To ensure construction safety, all cables should be laid and installed above 0°C. When handling cables, especially when constructing in low-temperature environments, they should be handled with care.

1.3.2. Grounding requirements

- Do not damage the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.
- The grounding impedance of the equipment meets the requirements of the national standard GB 50054 and local electrical standards.
- Do not operate the equipment without a grounding conductor installed. When installing equipment that needs to be grounded, the protective ground wire must be installed first; when dismantling the equipment, the protective ground wire must be removed last.

1.3.3. Maintenance requirements

- Before connecting or removing cables, the protection switch of the corresponding circuit must be disconnected first.
- Use a multimeter with the corresponding voltage level to check whether there is power and make sure the device is completely powered off.

- If there are live objects nearby, please use insulating boards or tapes to shield or wrap them.
- Use a ground wire to reliably connect the circuit to be inspected and the ground circuit before performing operation and maintenance.

Description:

- Before connecting the cable, make sure the cable label is correct before connecting.
- If the device has multiple inputs, all inputs of the device should be disconnected, and the device can only be operated after the device is completely powered off.
- After the inspection is completed, remove the grounding wire between the inspection circuit and the grounding circuit.

1.4. Machinery Safety

△ **Notice:**

- The bottom panel must be removed when forklifting without a wooden box. Take off and land with care, avoid shock or vibration.
- During transportation, the center of gravity of the box should fall in the middle of the two forks on the forklift. Prohibit long-distance transport or inversion, tilting.
- When transporting the equipment, the sight of the operator may be blocked due to the large size of the equipment, so it is necessary to arrange auxiliary personnel to assist in the completion.
- In order to ensure the safety of drilling outside the equipment body, a suitable location should be selected before drilling to ensure that no short circuit will be caused. During the drilling process, the equipment should be covered to prevent debris from falling into the equipment, and the debris should be cleaned in time after drilling.
- When carrying equipment by hand, you should be prepared to bear the load , and you should wear protective gloves, anti-smashing shoes and other safety protection equipment.
- When transporting the equipment, move the equipment carefully to avoid impact or falling . Avoid scratching the surface of the device and damaging components or cables.

1.5. Battery Safety

Description

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

- Failure to charge and accept the battery in time due to customer reasons may result in overdue storage, capacity loss or irreversible damage to the battery.
- Mechanical damage, leakage, rupture, etc. caused by falling due to improper operation or failure to connect the battery as required.
- Customers or third parties may change battery usage scenarios without knowing the company's knowledge. Including but not limited to: connecting additional loads to the battery by yourself, mixing with batteries of other brands, mixing with batteries of different rated capacities, etc.
- Direct damage to the battery caused by the on-site equipment operating environment or external power parameters not meeting the environmental requirements for normal operation. Including the actual operating temperature of the battery being too high or too low, poor power grid conditions and frequent power outages, etc.
- The customer did not correctly set the battery operation and management parameters or improper maintenance caused the battery to frequently over-discharge, the customer expanded the capacity on-site or was unable to fully charge for a long time, etc.
- The customer failed to perform correct maintenance on the battery according to the operating manual of the supporting equipment, including but not limited to: failing to regularly check whether the battery terminal screws were tightened, etc.
- The battery was stolen and lost.
- Batteries that have exceeded the warranty period.

Danger:

- Do not expose the battery to high-temperature environments or heat-generating equipment, such as sunlight, fire, transformers, heaters, etc. Overheating of the battery may cause fire or explosion.

- It is prohibited to disassemble, modify or damage the battery (such as inserting foreign objects, immersing it in water or other liquids, etc.) to avoid battery leakage, overheating, fire or explosion.
- Battery thermal runaway will produce flammable gases, as well as harmful gases such as CO and HF. The accumulation of combustible gas generated after battery thermal runaway poses the risk of deflagration and explosion , which may cause personal injury and property damage .
- When installing and maintaining the battery, you need to wrap the exposed cable terminals on the battery with insulating tape. At the same time, avoid foreign objects (such as conductive objects, screws, liquids, etc.) from entering the battery and causing short circuits.

Warn:

- Batteries must be stored in a separate warehouse and in outer packaging. Avoid mixing with other materials, avoid open storage, and avoid stacking batteries too high.

  Fire-fighting facilities that meet the requirements must be available on site, such as fire sand, fire extinguishers, etc.
- Batteries should avoid impact. When transporting the battery, it should be transported in the direction required by the battery, and inversion and tilting are prohibited.
- Please use the battery within the temperature range specified in this manual. When the ambient temperature of the battery is lower than the lower limit of the working temperature, charging is prohibited to avoid internal short circuit of the battery caused by crystallization during low temperature charging.
- Please dispose of used batteries according to local laws and regulations, and do not dispose of batteries as domestic waste.
- If the time since the last charging of the battery exceeds 8 months, the battery needs to be recharged. If the power is not replenished as required, the performance and service life of the battery may be affected.

Handling measures for abnormal battery

Danger:

- When the electrolyte leaks or there is an abnormal smell, avoid contact with the leaked liquid or gas. Non-professionals should stay away, please contact professionals immediately.
- Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If you come into contact with battery electrolyte, wash the area immediately with plenty of water and soap and seek medical help immediately.
- Do not continue to use the battery after it has been dropped (with or without packaging material) . If there is no obvious deformation or damage in appearance and there is no obvious odor, smoke or fire, under the premise of ensuring safety, transfer the battery to an open and safe place and let it stand for 1 hour before processing, and contact our company's service engineer .
- If a battery has an obvious odor, is damaged, smokes, or catches fire after being dropped, personnel should be evacuated immediately and the police should be called in time . Professionals shall use fire-fighting facilities to extinguish fires while ensuring safety.

1.6. Maintenance and Replacement

△ **Warn**

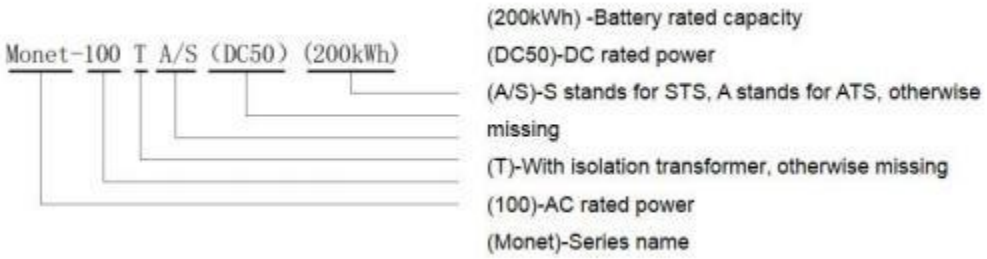
- It is prohibited to open the cabinet door in weather such as rain, snow, lightning, sand, dust, heavy fog, etc.
- Before removing components from the cabinet, make sure that other components on the cabinet are not loose.
- During equipment maintenance, nearby live parts should be covered with insulating material.
- Do not allow any objects to come into contact with the running fan (such as fingers, parts, bolts, etc.) before the fan is powered off and stops rotating.
- Do not power on the device before troubleshooting.
- During live inspection of the system, pay attention to the danger warning signs on the equipment and avoid standing at the cabinet door.
- After powering off equipment other than battery packs, you must wait 15 minutes to ensure that the equipment is out of power before operating the equipment.

- After the power components of the energy storage system are replaced or the wiring is changed, manual wiring inspection is required to avoid abnormal system operation.

After completing maintenance and replacement operations, lock the cabinet door in time and keep the key properly.

2. Product Introduction

2.1. Model Description



Note: The isolation transformer , A/S, and DC power module are optional components , and the rated output power and battery capacity can be flexibly configured according to project requirements.

2.2. Product Features

Monet series outdoor energy storage cabinets integrate energy storage batteries, modular PCS, energy management monitoring system, power distribution system, environmental control system and fire control system, etc. Modular PCS is adopted to facilitate maintenance and capacity expansion. The outdoor cabinet adopts front maintenance, which can reduce floor space and maintenance access. It has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency and intelligent management.

In common application scenarios, the operation strategy of the energy storage system is as follows:

Peak shaving and valley filling: When the time-of-use electricity price is in the valley section: the energy storage cabinet automatically charges and waits after being fully charged; when the time-of-use electricity price is in the peak section: the energy storage cabinet automatically discharges, realizing arbitrage of the electricity price difference and improving the economic benefits of the optical storage and charging system.

Photovoltaic-storage combination: Obtain local load power in real time. Photovoltaic power generation is given priority for self-use and surplus power is stored. If photovoltaic power generation is insufficient to provide local loads, batteries are used first to store power.

2.3. Electrical wiring diagram

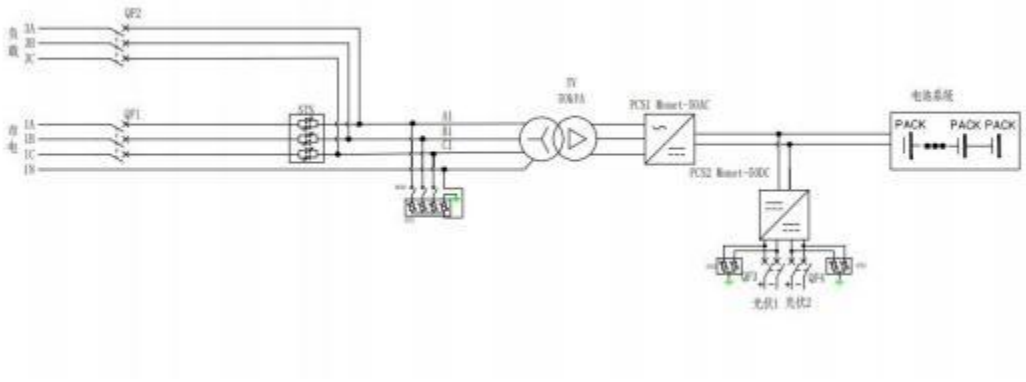


Figure 2.1 Electrical Primary Diagram

Note: Figure 2.1 is a system solution with off-grid, isolation transformer, and photovoltaic input. Different projects have different configurations and slightly different circuits. The actual delivery drawing shall prevail.

2.4. Features

- System productization, integrating energy storage batteries, PCS, energy management monitoring system, power distribution system, environmental control system and fire control system, etc., to fully control the system operating status and risks;
- Configured with a rack-mounted modular PCS, it supports multiple machines in parallel and has good scalability; the number of PCS modules and the total battery power can be selected according to the system capacity requirements of microgrid and other scenarios. The typical configuration is: 100kW/200 kWh .
- The protection level is IP54, which can perfectly cope with various types of outdoor weather;
- The door-mounted embedded integrated air conditioner does not occupy cabinet space, increases the available space of outdoor cabinets, has better top structural integrity and good waterproofing effect;
- The local control panel can realize various functions such as system operation monitoring, energy management strategy formulation, and remote equipment upgrade.

2.5. Product parameters

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

Table 2.1 Parameter table of energy storage system

model	Monet-50TS(DC50)(100kWh)
Battery rated energy storage capacity	100kWh
System rated voltage	844.8V
System voltage range	739.2V~950.4V
Battery Type	Lithium iron phosphate battery (LFP)
Battery pack series and parallel connection	1P * 24S * 9S
Maximum charge and discharge current	1 2 0A
Rated AC power	5 0kW
Rated AC current	72A _
Rated AC voltage	400V, 3W+N+PE/3W+PE
Rated AC frequency	50/60Hz
Current total harmonic distortion rate THDI	<3% (rated power)
power factor	-1 lead~+1 lag
Voltage total harmonic distortion THDU	<3% (linear load)
degree of protection	IP54
protection level	I
isolation method	Transformer isolation
Power consumption during shutdown	< 100W (without transformer)
show	Touch LCD touch screen
Relative humidity	0~95% (no condensation)
noise	Less than 7 8 dB
ambient temperature	-25℃~60℃ (Derating above 45°C)
cooling method	Intelligent air cooling
Altitude	2 000m (over 2 000m derating)
BMSCommunication	CAN
EMS communication	Ethernet/ 485
Dimensions (W*D*H)	1 850 * 1 0 00 * 2300mm
Weight (approx.)	2100kg

△**Note:** The actual parameters have been set before leaving the factory according to customer needs.

2.6. Parts introduction

2.6.1. battery system

Table 2. 2 Battery system parameters

Cell parameters	
Battery Type	Lithium iron phosphate battery (LFP)
Nominal voltage	3.2V
Voltage range	2.8V~3.6V
Nominal capacity	120Ah
Maximum operating temperature range, charging	0~45℃
Maximum operating temperature range, discharge	-10~50℃
Cell series and parallel connection	1P24S
Rated energy	9.216kWh
Nominal voltage	76.8V
Voltage range	60~87.6V
Weight (approx.)	85kg
Overall dimensions (W*D*H)	527*676*202mm
Rated energy storage	100kWh
System rated voltage	844.8V
System voltage range	739.2V~950.4V
Series and parallel mode	1P*24S*11S
Number of electrical boxes included	11
Weight (approx.)	935kg

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 selected by our company has its own BMS system, which is divided into two levels: BMU and BCU.

The BMU is located in the battery box, completes the data collection of the individual cell information inside the battery box, and uploads the data to the BCU. At the same time,

it completes the balancing of the individual cells in the battery box according to the instructions issued by the BCU.

The BCU is located in the main control box and is responsible for the management of the battery cabinet. It accepts detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, performs SOC calculation and correction, and is responsible for the precharge and charge and discharge management of the battery cabinet. The relevant data is uploaded to EMS.

2.6.3. Electrical System

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

Table 2. 3 converter module parameters

Model	Monet -50AC
Rated power	50kW
Maximum power	55kW
DC operating voltage range	600V~950V
DC side full load voltage range	600V~950V
Maximum DC current	92A
Rated AC voltage	400Vac, 3W+N+PE/3W+PE
Rated frequency	50/60Hz, (±5Hz)
Rated AC 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 capability	100%
Compatible battery	Lithium battery/lead acid/photovoltaic module
Charging method	According to BMS instruction/three-stage/MPPT
Operating mode	Constant current, constant power, MPPT, AC voltage source, DC voltage source, VSG
Maximum efficiency	98.2%
Dimensions (W*D*H)	483 (not including mounting lug 440)*600*150mm
Weight (approx.)	35kg
Isolation method	non-isolated
Degree of protection	IP21
Operating temperature	-25°C~+60°C (>45°C derating)
Relative humidity	0~95% (no condensation)
Cooling method	Intelligent air cooling
Noise	<70dB

Altitude	3000m (>3000m derating)
Communication Interface	RS485/CAN (optional)

Photovoltaic storage systems for islands, mountainous areas, border posts and other remote areas or areas with unstable power supply, or new zero-carbon technology parks. Users can configure DC converter power modules according to project requirements to realize a power supply system integrating photovoltaic and energy storage. The parameters of the DC converter power module are as follows:

Table 2. 4 DC converter module parameters

Model	**Monet -50DC**
Rated DC power	50kW
Maximum DC power	55kW
DC working voltage range	200V~1000V
Low voltage side full load voltage range	312V~850V
Maximum current at low voltage side	80A*2
Low voltage side input channels	2 (2 channels can be independent, can be paralleled as 1 channel)
High voltage side full load voltage range	500V~900V
Maximum DC current on high voltage side	110A
High voltage side input channels	1
Compatible battery	Lithium battery/lead acid/photovoltaic module
Operating mode	Constant voltage, constant current, constant power, MPPT
Maximum conversion efficiency	98.8%
Dimensions (W*D*H)	483 (not including mounting lug 444)*600*150mm
Weight (approx.)	25kg
isolation method	non-isolated
degree of protection	IP21
Operating temperature	-25°C~+60°C (>45°C derating)
Relative humidity	0~95% (no condensation)
cooling method	Forced air cooling
noise	<70dB
Altitude	3000m (>3000m derating)
Communication Interface	RS485/CAN (optional)

2.6.4. Environmental control system

The energy storage system is equipped with environmental control units such as smoke detectors, water immersion sensors, door magnetic sensors and fire protection, which can fully control the operating status of the system. Schematic diagram of environmental control system:

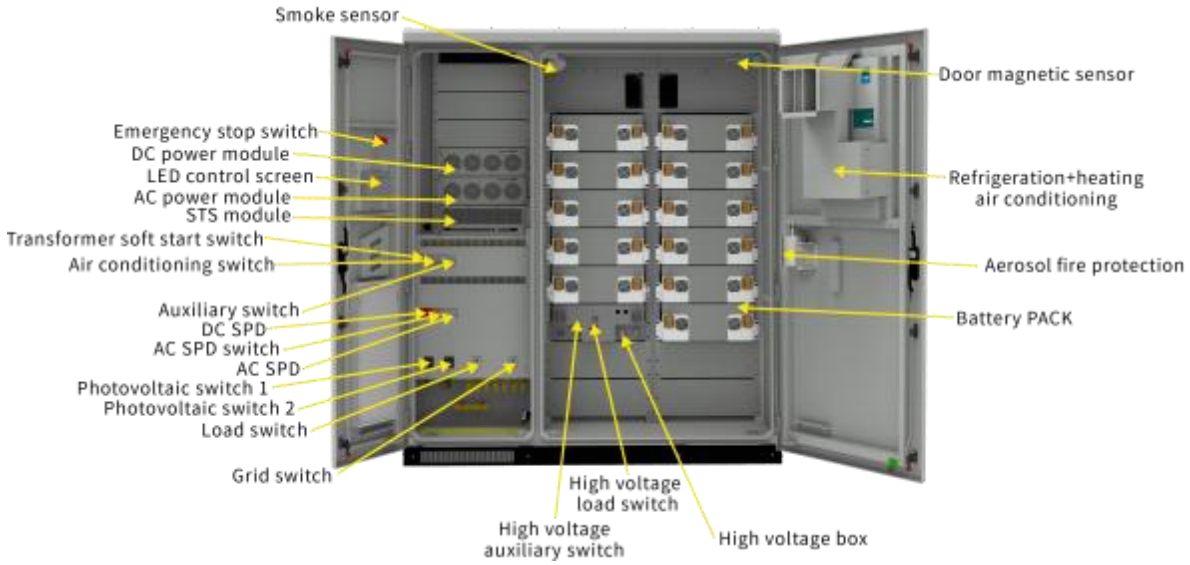


Figure 2.2 Internal structure of the cabinet

2.6.4.1 Precision Air Conditioning Parameters

Table 2.5 Precision Air Conditioning Parameters

Model	AC2000
Electrical parameters	
Rated working voltage	220Vac
Rated cooling current	3.9 A
Maximum operating current	6.5A
Rated operating frequency	50Hz
Dimensions (H*W*D)	746 × 440 × 200mm
Weight	35kg
Degree of protection	IP5 5
Cooling capacity	850W
Heating capacity	1 000W
Air volume	850m³/h
Refrigeration	
Cooling start point	22 ℃ ~ 44 ℃ (can be set)
Hysteresis	Default 6 ℃ (can be set)
Heating	
Heating on point	- 5 ℃ ~ 16 ℃ (can be set)

Hysteresis	Default 10℃ (can be set)
Dehumidification	
Dehumidification start point	50 %~9 9 % (can be set)
Dehumidification stop point	45 %~ 95 % (can be set)
Alarm function	
High temperature alarm in the cabinet	30 ℃ ~ 60 ℃ (can be set)
Low temperature alarm in the cabinet	- 45 ℃ ~ 1 0 ℃ (can be set)
High humidity alarm in the cabinet	0%~ 100% (can be set)
Note: The actual parameters are set before leaving the factory according to customer needs.	

2.6.4.2 Access Switch

The access control switch detects the door opening state of the device.

Table 2. 6 Access control switch parameters

Name	Parameter
Rated voltage	AC-15: 380V DC-13: 220V
rated current	AC-15: 0.79A DC-13: 0.14A
Rated insulation voltage	415V
Rated impulse withstand voltage	2.5kV
operating frequency	Mechanical/Electrical: 20 times/min
use environment	Temperature: -5℃~+40℃ Relative humidity <90% RH (no condensation)

2.6.4.3 Smoke Detectors

Smoke detectors are used to detect the smoke concentration in the current environment.

Table 2.8 Smoke detector parameters

Name	Parameter
Operating Voltage	DC12/24V (allowable range 9V~30V)
Working current	Monitoring status: <1mA@DC12V Fire alarm: <30mA@DC12V
Relay output	Normally open, contact capacity 1A 30VDC
Work instructions	The monitoring status red light flashes about once every 6s Alarm status red light is always on In fault status, the red light flashes continuously about 2 times every 6s
Use environment	Temperature: -10℃~+65℃ Relative humidity <95% RH (no condensation)

2.6.5. Fire Fighting System

The aerosol fire extinguishing device used in the fire fighting system is a new type of environmentally friendly fire fighting product with the world's advanced level. Working principle: When the ambient temperature reaches the starting temperature of the thermal

wire or touches an open flame, the thermal wire will spontaneously ignite and pass 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-sized aerosol fire extinguishing agent is quickly generated and sprayed out to realize rapid fire extinguishing.

Table 2.9 Firefighting aerosol parameters

model	QRR 0.3G/SQ
Technical Parameters	
Drug weight	250g
Equipment weight	2600g
Size	ø127*145mm
Extinguishing time	≤30s
Nozzle temperature	≤200℃
Actual fire extinguishing efficiency	≤100g/m³
Working environment temperature range	-50 ℃ ~ +90 ℃
Relative humidity	≤95%
TH type (thermal line) start mode parameters	
Start temperature	175℃
Expiry date	5 years

2.6.6. Local Management System

Micro-grid management system (Lotus-ES SS) is an intelligent energy management system developed by our company for micro-grid systems .

The product integrates man-machine interface (HMI), port control and communication, system parameters and operation strategy setting functions 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 number	Lotus - ESS
Power input	DC 12V
Output control	3-way isolated output switch
Input control	6-way isolated input switch
Serial communication	2-way isolated RS232, 4-way isolated RS485
Fieldbus	2-way CAN bus interface
Ethernet port	1 10/100M Ethernet port (RJ45)

Extended storage	1 U disk port, 1 SD card port
Audible alarm	1 controllable buzzer
program representation	1 running indicator, 1 status indicator, 1 alarm indicator
Abnormal representation	1 hardware watchdog timer
Real Time Clock	1 set of RTC real-time clock

2.7. Configuration List

In summary, the overall configuration list of the energy storage system under the typical configuration is as follows:

Table 2. Overall configuration list of 12 Monet-50TS (DC50) (100kWh) outdoor cabinet energy storage system

Name	Model	Unit	Quantity	Remark
Battery system	120Ah，100kWh _	set	1	with control box
Energy storage converter	Monet -50AC	tower	1	Modular
Photovoltaic controller	Monet -50 D C	tower	1	Modular
On-grid and off-grid switching	Monet-150STS	tower	1	
Air Conditioning System	AC 2 000 220±15%VAC~50Hz	set	1	Precision Air Conditioning
Fire Fighting System	QRR0 .3G/SQ	set	1	Thermal wire activated type
Auxiliary system	Access control, etc.	set	1	Auxiliary equipment
Management system	Lotus-E SS	set	1	Composed of BMS and EMS

The actual delivery configuration shall prevail.

3. Installation and wiring

3.1. Transport and handling

3.1.1. Product shipping

- In order to keep the equipment in a better protective condition, it is recommended to use packaged transportation;
- Equipment must be transported according to the requirements marked on the packaging to prevent personal injury and equipment damage;
- Recommended to transport energy storage batteries by rail or air. Land transportation speed limit requirements: the speed limit on flat roads is 80km/h, and the speed limit on rough roads is 60km/h. If there is any conflict, please refer to local traffic regulations.

3.1.2. Product handling

- When using a forklift to move, ensure that the forklift has sufficient load capacity, and pay attention to the center of gravity of the equipment falling between the forklift's feet to prevent personal injury and equipment damage;
- For transportation with batteries, the load-bearing capacity of the forklift needs to be ≥ 3t; for transportation without batteries, the load-bearing capacity of the forklift needs to be ≥ 1. 5 t;
- The recommended fork knife length is ≥1.5m, the width is 80cm~160cm, and the thickness is 25cm~70cm.

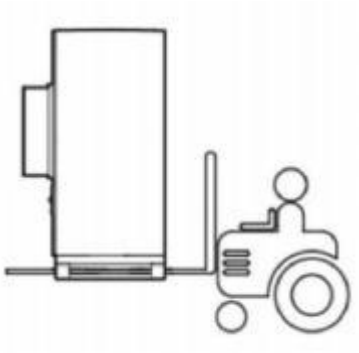


Figure 3.1 Schematic diagram of handling

3.2. Packaging and Storage

3.2.1. Product packaging

In order to keep the product in a better protective state during transportation, it is packed in a specific wooden box. There are the following basic parameters (including but not limited to) on the equipment package, which need to be carefully checked according to project requirements:

Table 3.1 Packaging parameter list

Parameter	Description
Model	Product number
Size	Product size after packaging
Weight	The total weight of the product after packaging
Mark	Face up, handle with care, center of gravity, etc.

3.2.2. Product storage

If the product is not transported or installed and used immediately, the product must be stored indoors, and the storage location must meet the following conditions:

Table 3.2 Product storage condition requirements

Parameter	Require
Storage temperature (without battery)	-25℃~+60℃
Battery	20℃ ~ 30℃
Storage relative humidity	< 95%(no condensation)
Altitude	< 3000m

NOTE: Long term storage of batteries is not recommended. Long-term storage of lithium batteries will cause capacity loss. After lithium batteries are stored 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 (time calculated from shipment). If it exceeds 8 months, it needs to be recharged and SOC calibrated, and it needs to be replenished to at least 50% SOC. If the power is not replenished as required, the performance and service life of the battery may be affected.

3.3. Installation environment requirements

The installation layout of the energy storage system must meet the fire distance or firewall requirements stipulated in local standards, including but not limited to "GB 51048-2014 Design Code for Electrochemical Energy Storage Power Stations" and "NFPA 855 Standard for the Installation of Stationary Energy Storage Systems". The energy storage system is only suitable for outdoor scenarios and requires outdoor layout. It does not support indoor layout. The general requirements for site selection are as follows:

- The water level of the installation location should be higher than the historical highest water level in the area. The distance from the airport, landfill waste disposal site, river bank or dam should be ≥2km.
- Choose a well-ventilated area. When the equipment is running, do not cover the vents and heat dissipation system to prevent fire from high temperature. The installation space is sufficient to ensure that the surrounding equipment will not be affected by the heat generated by the product; the installation location ensures that there is sufficient space for external wiring. It has convenient transportation conditions and reliable fire suppression system equipment.
- The installation location is far away from fire sources. Do not place flammable and explosive items around the equipment. If the equipment is installed in a place with lush vegetation, in addition to routine weeding, it is necessary to harden the ground below the equipment to prevent overgrown weeds.
- Do not install energy storage systems outdoors in salt damage areas to prevent equipment from corroding and causing fires. Salt damage area refers to the area within 2km from the coast or affected by sea breeze.
- The energy storage system must be equipped with protective measures such as fences and walls, and erect safety warning signs for isolation to prevent unauthorized personnel from entering during the operation of the equipment, resulting in personal injury or property damage.

- The equipment should be installed in an area away from liquids. It should not be installed under water pipes, air outlets and other places where condensation is likely to occur. It should not be installed under air-conditioning outlets, vents, machine room outlet windows and other places that are prone to water leakage to prevent liquid from entering the interior and causing short circuits in the equipment.

Description

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

- Strong vibration, strong noise source and strong electromagnetic field interference area.
- Places that generate or contain dust, oil fumes, harmful gases, corrosive gases, etc.
- Places where corrosive, flammable and explosive materials are produced or stored. Within the explosion hazard range.
- Sites with existing underground facilities. Crowded places, high-rise buildings, underground buildings.
- There are bad geological conditions such as rubber soil and weak soil layer, and the ground that is easy to accumulate water and sink.
- Within the boundaries of the mining subsidence (dislocation) area. Areas that may be flooded if a dam or levee breaks.
- Seismic faults and seismic areas with a fortification intensity higher than nine degrees. There are direct hazards such as mudslides, landslides, quicksands, and karst caves.
- Important water supply and sanitary protection areas.
- Historical relics protection area.

If there is no more suitable location, it is recommended to install a firewall with a fire resistance of no less than 3 hours for safety protection, and also consider the space requirements for equipment transportation, installation, maintenance, etc. It is recommended to refer to T/CEC 373-2020: the length and height of the firewall should exceed the outer contour of the energy storage cabinet by 1m each.

3.4. Preparation before installation

1) Before installing the product, check whether the product is intact. If you find any signs of damage, please keep the evidence and contact the company .

2) If there is no abnormality in the product, please check according to the delivery list to see if the accessories are complete.

Table 3.3 Delivery list

serial number	name	quantity	Remark
1	Outdoor Cabinet Energy Storage System	1 set	With door key
2	User Manual	1 copy	
3	Certificate	1 serving	
4	Factory inspection report	1 serving	

3) Users need to prepare relevant installation tools before installation.

Table 3. List of 4 installation tools

Serial number	Name	Quantity	Remark
1	Screwdriver set	1 set	
2	Sleeve	1 set	
3	Multimeter	1 set	
4	Forklift	1 car	
5	Screws, nuts, washers	several	

3.5. Mechanical installation

1) After confirming that there is no abnormality in the product and that all accessories are complete, you can refer to the following suggestions for mechanical installation:

☞ Select the equipment installation location in advance according to the product size, and do positioning and fixation; the recommended foundation is shown in Figure 3.2 .

- Referring to the product weight, the selected installation location needs to have sufficient load-bearing strength;
- The grounding point is reliable and the grounding resistance is guaranteed to be less than 4Ω.

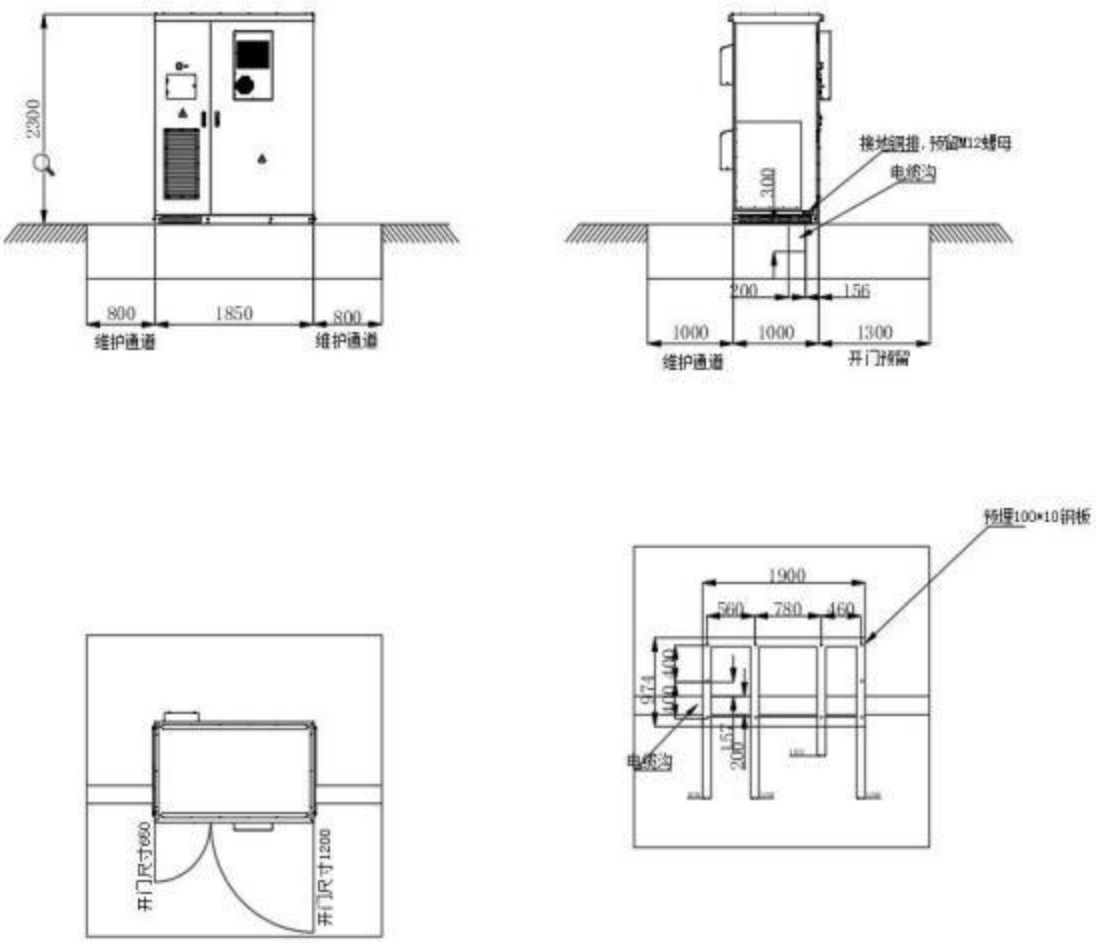


Figure 3. 2 Basic reference drawing (the actual dimensions of the equipment are subject to shipment)

2) After removing the wooden packaging box, first remove the bottom enclosure of the equipment. Put away the removed hoardings and screws and put them back after the equipment is in place .

Figure 3.3 Schematic of the enclosure at the bottom of the equipment

3) Use a forklift to place the equipment on the foundation, align the equipment fixing holes with the foundation embedded nuts, and fasten them with M16X40 bolts.

Figure 3.4 Bolt fastening diagram at the bottom of the equipment

3.6. Electrical Cable Installation

This product adopts an all-in-one structure, and the internal wiring on the DC side has been completed. Only the electrical cable installation on the AC side and external communication is required on site. Natong provides wiring reference as shown in Table 3.5 based on product power and cable specifications. The selection of cable diameter should comply with local cable standards. Factors that influence

cable selection include: rated current, cable type, laying method, ambient temperature and maximum acceptable line loss.

Table 3. 5 cable diameter comparison table

Model capacity	AC cable	Neutral line	Ground wire	Positive and negative DC input (mother level)
50kW	≥3*35mm²	≥35mm²	≥25mm²	Single module ≥70mm2
100kW	≥3*70mm²	≥70mm²	≥50mm²	Single module≥70mm2
150kW	≥3*150mm²	≥150mm²	≥95mm²	Single module≥70mm2

Danger:

When carrying out electrical installation, you can refer to the following suggestions for electrical installation:

（1）Before wiring, check that all the switches in the device are off, and ensure that the device is not charged;

（2）Disconnect the grid switch before wiring to ensure that the cable is not charged;

（3）Make sure that the phase sequence of the cables is correct, you can add yellow, green, red and black insulating sheaths or labels to distinguish them to prevent phase sequence errors;

（4）The connection between the cable terminal and the copper bar must be pressed tightly, and the length of the screw should be moderate, so as not to affect the insulation and fastening;

（5）Communication lines and power cables should be laid separately as much as possible, and the insulation layer of the cables should not be damaged during the laying process;

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

（7）All AC cables need to enter the device through the access hole at the bottom of the device and then connected to the corresponding phase sequence;

（8）After the wiring is completed, use fireproof mud to seal the wiring leaks to prevent external pests from entering and damaging the equipment or cables.

In order to prevent the terminals from loosening due to force, resulting in poor contact, increased contact resistance and heating, etc., ensure that the bolts tightening the terminals meet the torque requirements listed in Table 3.6 :

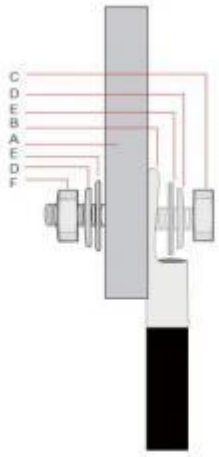
Table 3. 6 Wiring torque requirements

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 way of entering and exiting the energy storage system is bottom entry and bottom exit. After the switch baffle is removed, as shown in Figure 3.5 , the A/B/C/N copper bars at the lower end of the switch reserve openings of φ 11 mm and φ 13 mm Wiring to the customer, or opening holes according to the size required by the customer; the protective ground wire is connected to the PE copper bar, and the grounding impedance of the equipment meets the requirements of the national standard GB 50054 and local electrical standards.

Figure 3.5 Switch terminal

The installation diagram of terminals, fixing screws and other parts used for system power cable wiring is as follows:



Terminal mounting

Serial Number	Name
A	Copper row
B	Terminals
C	Screw
D	Spring pad
E	Large flat pad
F	Screw nut

Name of each component of the terminal

Figure 3.6 Installation of the fixed screws

△ **Note:**

● Using copper terminals when using copper-core or copper-clad aluminum cables.

● Using copper-aluminum transition terminals or aluminum terminals with copper-aluminum transition pads when aluminum cable is used.

3.7. Communication cable installation

When installing external communication cables, pay attention to laying them separately from power cables. It is recommended that the distance between the communication line and the power cable be not less than 300mm when they are laid in parallel. When the communication line must pass through the power cable, try to ensure that the angle between the two cables is 90° to reduce the electromagnetic interference caused by the power cable to the communication line. The communication line should be routed as close as possible to the ground support, such as wire troughs, metal guide rails, etc. If there is no support, it can be basically fixed with cable ties.

The system can use RS485 or Ethernet communication for background communication, and the system communication protocol uses Modbus RTU or TCP; use twisted pair shielded wires or network cables to connect to the location shown below.

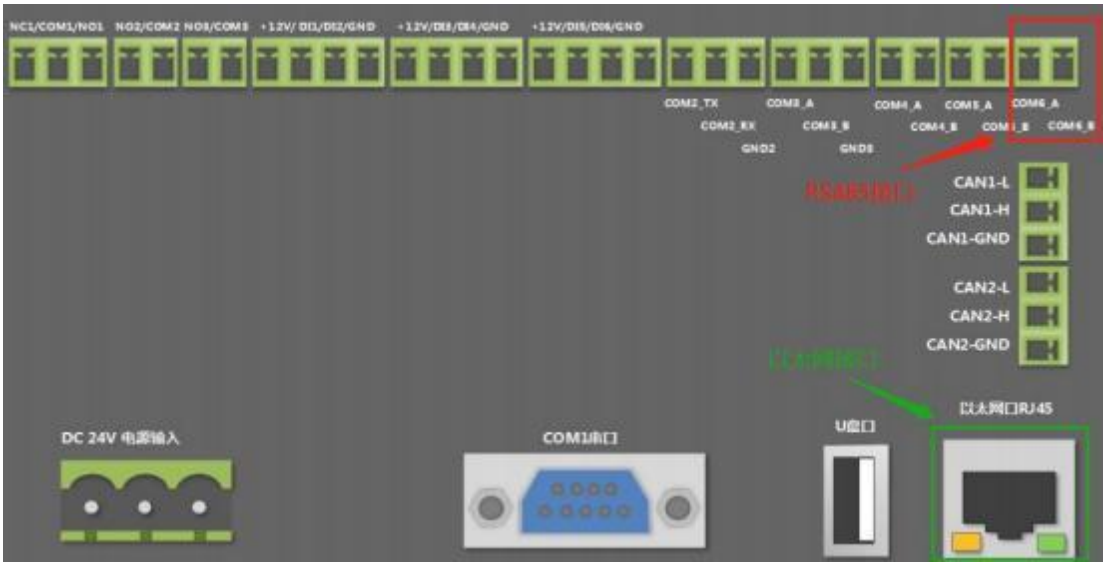


Figure 3.7 Communication cable wiring location diagram

4. Start-up and Debugging

4.1. Check before starting up

Before running the product, please ensure that the product has been installed in accordance with the specifications, and conduct a comprehensive and detailed inspection of the machine to ensure that all indicators meet the requirements before starting it.

1) Visual inspection:

   a、 The appearance of the equipment is in good condition, without damage, rust or paint peeling. If there is paint peeling off, please touch up the paint;

   b、 Equipment labels should be clearly visible, and damaged labels should be replaced in time.

2) Grounding check: The box has a grounding point and is firmly grounded; the grounding conductor in the box is reliably connected to the box grounding copper bar.

3) Cable inspection:

   a、 The cable protective layer is intact and there is no obvious damage;

   b、 The terminals are made in compliance with specifications and the connections are firm and reliable;

   c、 The labels on both ends of each cable must be clear and clear, and the wiring must meet the principle of separation of strong and weak electricity. Leave a margin at the corners and do not tighten them;

   d、 The cable installation bolts have been tightened and the cables are not loose when pulled; the cable holes have been sealed.

4) Inspect the copper bars: there are no obvious cracks or deformations in the copper bars, the screws at the overlap joints are tightened, there is no misalignment of the marking marks, and there are no debris on the copper bars.

5) Component inspection: Refer to Figure 4.1 , the circuit breakers are all in the open position; the lightning arrester indicator is green .

△**Note: For transportation safety, we disconnect one section of the DC copper plate between the battery cluster modules. The entire cluster of batteries is in an open circuit state. The DC copper plate needs to be connected before powering on. Please note that you need to wear insulating gloves for operation and tighten the inner hexagon.**

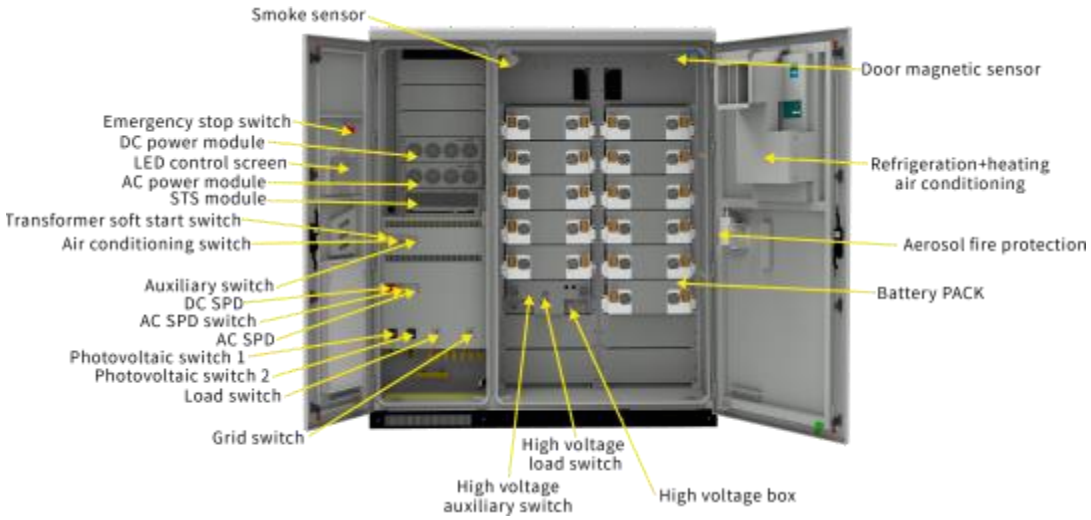


Figure 4.1 Position diagram of power distribution switch

4.2. Boot operation

The operation process of starting and running the product is as follows:

1) Use a multimeter to confirm that the grid voltage is within the predetermined range (400V±10%);

2) Referring to Figure 4.1 , close the transformer soft-start switch MCB1 and auxiliary power switches MCB 2~4 , and close the QF1 AC plastic case switch to complete the transformer soft-start .

3) Wait for the touch screen to start (about 30 seconds) and confirm that the display is normal and there is no fault alarm;

4) Turn on the battery auxiliary power switch and the high-voltage box load switch (rotate to the ON position), and turn on the battery in "Data" - > "Battery Data" .

Close QF 2 load switch, close QF3 photovoltaic switch , close QF4 photovoltaic switch ;

5) Set the converter parameters on the "System" - > "Parameter Settings" interface, and select the required operating mode on the "System" - > "Operation Mode" interface;

6) Enable all modules on the "Switch" page of the touch screen, click "Converter On" to complete the startup.

4.3. Trial run

After the installation of all electrical structures of the equipment meets the start-up conditions, in order to ensure the reliable and stable operation of the energy storage system, the initial operation must be powered on by professional electrical engineering technicians and the operating mode and related parameters should be set according to project requirements:

1) Set the equipment control mode to "manual mode" and set the active power to 5%;

2) in "Data" - > "Environment Monitoring", enable all modules on the "Switch" interface, and click "System On";

3) Observe the parameters of the screen PCS, battery and air conditioner during operation, and stop the machine immediately for detection if there are any abnormalities;

4) Run for 0.5 hours;

5) Set the active power to -5%, at this time the battery is charged at 5% of the rated power of the system,

6) Observe the parameters of PCS, battery and air conditioner on the screen during operation, and stop the machine immediately if there is any abnormality;

7) Run for 0.5 hours;

8) completing the 1- hour trial run without abnormalities, turn off the system on the "Switch" interface;

9) According to the project background and needs, you can choose the local manual power control mode , the automatic peak-shaving and valley-filling mode or the backup mode to be officially put into operation. Just click "System Start" on the system interface.

4.4. Shutdown operation

When the product needs daily maintenance, it needs to be shut down. The normal shutdown operation of the product is as follows:

1) Click on the touch screen switch interface and click "System Shutdown";
2) Referring to Figure 4.1 , disconnect the air conditioning switch MCB2 and auxiliary power switch MCB 3-4 of the system ;
3) Break the main AC circuit breaker;
4) Break off the battery high-voltage control box, battery load switch and auxiliary power switch ;
5) Wait for the busbar discharge to end, the touch screen to turn off, and the device to complete shutdown.

4.5. Emergency shutdown

When a product failure or critical situation requires emergency shutdown, you can perform the following emergency shutdown operations:

1) Press the emergency shutdown button "EPO";
2) Referring to Figure 4.1 , disconnect the system auxiliary power switch MCB 3-4 and the battery auxiliary power supply , and disconnect the high-voltage box voltage battery load switch ;
3) After confirming that the fault or danger is eliminated and operation is required, reset the EPO button.

Description

pressing the "EPO" emergency shutdown, you need to turn off the AC and DC molded case switch, auxiliary power switch, and DC switch of the high voltage box, and you need to wait for 10 minutes before turning it on!

5. Run and Operate

This chapter mainly introduces the LCD touch screen display interface and the corresponding operation control through the human-machine interface. Users can execute various operation commands through the LCD display interface, conveniently browse the parameters and data related to DC, AC and system operation, obtain the current equipment status and real-time alarm information in time, and provide reliable basis for fault diagnosis. In addition, the LCD touch screen can also display system software version information and upgrade each component software through a USB flash drive.

5.1. Human-machine interface introduction

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

Figure 5. 1 Main page

Each menu expansion item:

Serial number	Menu name	Menu item	Parameter function
1	Home page	none	Display the operating status of the system and the charging and discharging curve of the day

2	Data	Real-time data	Display of all analog data of the converter
		real time status	Converter working status and switch status display
		real-time alert	Current system alarm information
		battery data	Battery data display and battery on and off settings
		Environmental monitoring	Dynamic environment monitoring display and air conditioning parameter setting
3	Record	Historical alarms	Display historical alarm records
		operation log	show operation log
		data report	export history
4	System	system message	show system information
		operating mode	System operation mode setting
		parameter settings	Converter and battery parameter settings
		factory setting	Device manufacturer settings
		System Upgrade	System software upgrade
		Communication settings	Make communication settings
5	Switch	System switch	System power on and off

5.2. On/off operation

1、 Turn on the converter: first check the power-on status of the whole machine, refer to Figure 4. 1 Close the transformer soft-start switch MCB1 and auxiliary power switch MCB 2~3 , close the QF1 AC molded case switch, after completing the transformer soft-start, close the battery Auxiliary power switch and load switch (rotate to ON position), close the remaining power distribution AC and DC molded case switch, open the battery in "Data" - > "Battery Data" , observe that there is no fault alarm on the touch screen (it takes about 30 seconds to start the screen) ;

Figure 5.2 Battery on and off interface

2、 Set the converter parameters in the "System" - > "Parameter Settings" interface, select the required operating mode in the "System" - > "Operation Mode" interface , select the grid connection and control mode, manual or peak shaving or valley filling or backup mode etc .;

3、 Click "Switch" to enter the current power on/off interface. After selecting to enable all modules (you can also turn on some modules according to actual needs), click the "System Start" button. The normal startup time is about 2 minutes, as shown in Figure 5.2 .

Figure 5.3 Switch interface

4、 After clicking the "System On" button, if the "Temperature Waiting" appears in the upper right corner of the "Switch" interface, the environment does not meet the system opening conditions. The air conditioner will continue to work until the system opening conditions are met. The "Temperature Waiting" disappears and the system continues to be on.

Figure 5.4 Environment waiting interface

5、 If it is not started successfully, a startup failure prompt interface will pop up, and the cause of the fault can be queried based on the failure; failure: "System fault" "PCS fault" (check in the fault list); "Cannot be discharged" (battery power reaches the SOC lower limit)) "Not Rechargeable" (battery power reaches SOC upper limit value).

Figure 5.5 System startup failure interface

6、 System shutdown: When the system is running, click "System Shutdown" to shut down the system, and then the entire system will stop running. If the temperature and humidity of the system environment are too high (too low), the air conditioner needs to wait for the temperature and humidity to return to the normal range (5~ 35℃) the air conditioner will stop working;

7、 Breaking system auxiliary power switch MCB 2~3 ;

8、 Disconnect battery high voltage control box auxiliary power switch and battery load switch;

9、 Open the main AC and DC circuit breaker.

5.3. Communication settings

Description: Communication settings refer to Communication protocol setting between LCD touch screen and battery BMS , LCD touch screen and EMS background .

1、 Check that the battery B MS communication line has been connected to the terminals CAN2_H and CAN 2_L on the back of the touch screen;

2、 Check that the background EMS communication line has been connected to the terminals COM6_A and COM 6_B on the back of the touch screen or to the network port;

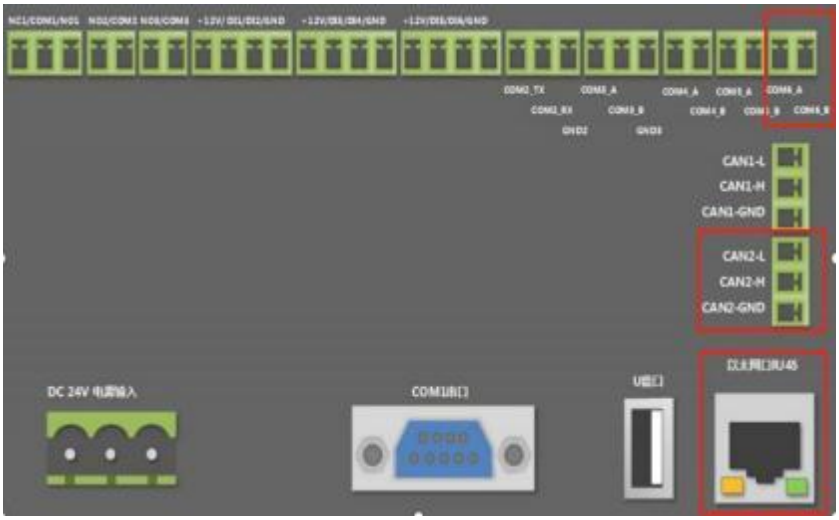


Figure 5.6 Communication wiring inspection

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

Figure 5.7 Communication setting interface

4、 Battery B MS communication settings: Set the CAN baud rate to 250k bps;

5、 Background E MS communication setting 1: If RS485 communication is adopted, set the slave address corresponding to the communication panel to 1. If multiple energy storage systems are connected to the background slave address, the slave address cannot be repeated;

6、 Backend EMS communication setting 2: If Ethernet communication is used, the energy storage system will serve as the server. The default address of the host setting is: 192.168.1.100. Set the local address corresponding to the communication panel to 1 and the server port to 502. If there are multiple The IP address of each energy storage system connected to the backend cannot be repeated. After modifying the IP address, click the Set button to configure the IP address.

Figure 5.8 IP address configuration interface

5.4. Operating mode setting

5.4.1. Mode introduction

The operating modes of the energy system can be divided into three types: manual mode connected to the grid, automatic mode connected to the grid, and automatic switching off the grid .

1、 Grid-connected manual mode: The energy storage system runs in grid-connected mode, but the system startup or shutdown must be manually operated by the user on the LCD touch screen. 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-backflow enablement, photovoltaics are used first. When the photovoltaic power is greater than the load power, the excess power is stored in the battery. When the battery is full, the photovoltaic output power is limited; when the photovoltaic power is less than the load power, the photovoltaic + storage power is used. It can provide joint power supply, and if it is not enough, the

mains power will be supplemented; when there is no light at night, the energy storage power supply will be used first, and when the energy storage power is lower than the set value, the mains power will be supplied.

2、 Automatic grid-connected mode: For peak-shaving and valley-filling application scenarios, the energy storage system automatically connects to the grid and operates based on the preset time-sharing charge and discharge power . For the backup mode application scenario, the photovoltaics give priority to charging the battery, and the load power is provided by the grid. When the battery is charged to the set SOC upper limit, the photovoltaic is turned off, and the battery is discharged to SOC96% and the photovoltaic is turned on. When the photovoltaic power is greater than the load power, the photovoltaic Track the load power; when the photovoltaic power is less than the load power, the photovoltaic + battery jointly supplies power to the load; when the battery SOC value discharges to the standby power maintenance SOC value, the battery stops supplying power to the load, and the photovoltaic + grid jointly supplies power to the load.

3、 Automatic switching between on-grid and off-grid : When the grid suddenly loses power when running in the grid-connected state, the energy storage converter automatically switches from grid-connected to off-grid mode. The system can output a stable 400V/50Hz three-phase AC voltage ; When the power grid suddenly receives power during the grid state , the energy storage converter automatically switches from off- grid to grid - connected mode .

Instructions: a. Scheduled or unplanned trigger can be set for on-off grid switching. If it is set to unplanned trigger: when the utility power is cut off , it will automatically switch to off-grid operation, and the system can output a stable 400V/50Hz three-phase AC voltage ; When the mains power comes in, it automatically switches to grid-connected mode . Set as plan trigger: when running in grid-connected mode, you can manually switch to run in off-grid mode, set "connected and off-grid" to "off-grid", and run in off-grid mode, you can manually switch to run in grid-connected mode (Provided that mains

power exists), set "On-grid and off-grid" to "On-grid". The setting interface is as shown below:

b. In the grid-connected mode, the anti-reverse flow function can be set to be disabled or enabled. If set to enabled: the energy storage system will not supply power back to the grid. Set to prohibited: The power from the energy storage system can flow into the grid. In the system "System" -> "Parameter Settings" -> "Advanced Settings (password 888888) " -> "MSTS Parameters" -> "Anti Backflow Enable" setting interface as shown below:

5.4.2. Grid-connected manual mode

1、 Click "System" - > "Run Mode" to enter the page 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 on the "parameter setting" page, and the machine will run according to the set value (positive value is discharge, negative value is charge) . The power setting interface is shown in Figure 5.10 . The discharge power of this energy storage system has been set to 100% when it leaves the factory, and the customer does not need to change it. Photovoltaic is used first. When the photovoltaic power is greater than the load power, the excess power is stored in the battery. When the battery is full, the photovoltaic output power is limited; when the photovoltaic power is less than the load power, the photovoltaic + energy storage joint power supply is used.

If it is not enough, the mains will be supplemented; no night The lighting gives priority to energy storage for power supply. When the energy storage power is lower than the set value, it is powered by the mains power, and the mains power does not charge the battery.

Figure 5.10 Power setting interface

5.4.3. Grid-connected automatic mode

Peak-shaving and valley-filling mode:

1、 Click "System" - > "Run Mode", click the "Peak Shaving" button to enter the settings page;

Figure 5.11 _ Peak shaving and valley filling operation setting interface

2、 Click "Modify" to set the peak shaving and valley filling operation period and power: set the start and end time, charging and discharging power and whether to enable it in

Period 1; click the next item to enter Period 2 settings, save and exit after completing all period settings;

Figure 5. 12 Peak shaving and valley filling charge and discharge time setting interface

3、 Automatically jump to the following interface, click the Finish button;

Figure 5. 13 Peak shaving and valley filling charging and discharging setting interface

4、 "Control mode" is changed to "peak shaving and valley filling";

Figure 5.14 Peak shaving and valley filling control mode

5、 This is the automatic mode: pause, click "Switch" - > "System On" to complete the local automatic control mode setting.

Figure 5.15 Automatic control operation mode is turned on

Fallback mode:

1、 Click "System" - > "Run Mode", click the " Backup Mode " button to enter the setting page; when setting the mains charging enable: allow the mains to charge the battery; battery charging power: set the required battery charging power value; set When mains charging is prohibited: Mains power is not allowed to charge the battery. Generator: When set to Enable, the generator is allowed to supply power to the load; when set to Disable, the generator is not allowed to supply power to the load. Generator charging: When disabled, the generator is not allowed to charge the battery; when enabled, the generator is allowed to charge the mains (provided the generator is enabled first). Backup power retention SOC: When the battery SOC is discharged to the backup power retention SOC set value, the battery will no longer discharge.

Figure 5.16 Backup mode setting interface

2、 The engine is running in reverse mode, disconnect the power grid switch, close the engine switch, and close the load switch; click "System" -> "Operation Mode" -> "Grid" to set it as generator; click "Backup Mode" button to enter the settings page, set

"Generator" to enable, set "Generator Charging" to enable, and set "Battery Charging Power" to the required battery charging power value. After the generator is turned on, it supplies power to the load and charges the battery to SOC100%. The system will automatically switch to off-grid operation to supply power to the load . When the mains power is restored, you need to manually turn off the oil machine switch, close the mains switch, set the " grid" to mains power, run the backup mode, and execute the backup mode logic.

3、 "Control mode" is changed to " backup mode ";

Figure 5.1 7 backup control mode

4、 This is the automatic mode: pause, click "Switch" - > "System On" to complete the local automatic control mode setting.

Figure 5.1 8 Automatic control operation mode is turned on

5.4.4. Automatic switching between on-grid and off-grid

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. The system can output a stable 400V/50Hz three-phase AC voltage; when running in the

off-grid state, the power grid suddenly receives power . , the energy storage converter automatically switches from off- grid to grid-connected mode . The specific setting method is as follows:

1、 Manual and off-grid switching mode: Click "System" - > "Run Mode" to enter the current page. Select " Plan trigger " in " On-grid and off-grid switching " and set it to plan trigger: when running in grid-connected mode, you can manually switch to running in off-grid mode. Set "On-grid and off-grid" to "off-grid" and run in off-grid mode. In the grid mode, you can manually switch to the grid-connected mode (provided that the mains power is present), and set "On-grid and off-grid" to "On-grid"

Figure 5.19 Manual and off-grid switching mode setting interface

2、 Automatic off-grid mode: Click "System" -> "Operation Mode" to enter the current page, " On-grid switch" is set to "unplanned trigger", set to unplanned trigger: power grid suddenly cuts off when running in grid-connected state When running in the off-grid mode, 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 receives power when running in the off-grid mode , the energy storage converter switches from the off-grid mode to the off-grid mode . The network automatically switches to grid - connected mode.

5.5. Battery parameter settings

1. Click "System" -> "Parameter Settings" to enter the current page; customers can set the upper and lower limits of SOC according to their own needs; it is recommended that the lower limit of SOC be set to no less than 5%.

Figure 5.21 _ Battery charge and discharge setting interface

Note: The battery parameters have been set before the energy storage system leaves the factory. It is not recommended to modify it yourself.

5.6. Data viewing and export

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

Figure 5.22 Data report interface

2、 View the day, month, year and total charge and discharge capacity.

3、 Insert the USB flash drive, wait for the USB flash drive to connect, click Data Export, and wait for the export to complete.

Figure 5.2 3 Data export interface

5.7. Software upgrade

The software upgrade includes: LCD touch screen software, power module DSP software , and power module ARM software. Before upgrading, shut down the system on the "Switch" page of the touch screen, that is, the software must be upgraded while the system is stopped.

1、 First, prepare a USB flash drive and a computer, create a new folder in the USB flash drive, and name it "U PDATE " to store the burning files;

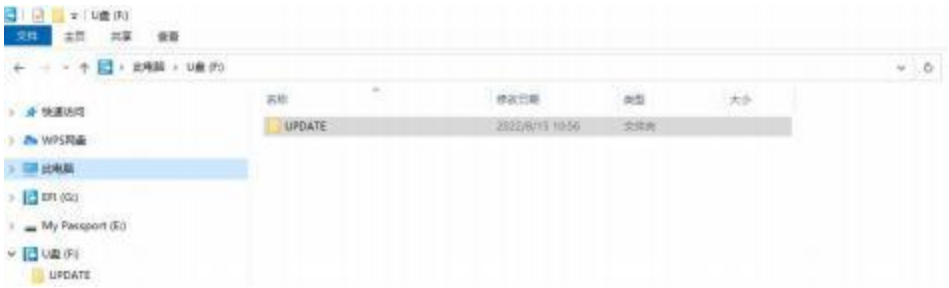


Figure 5.2 4 Create upgrade software folder

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

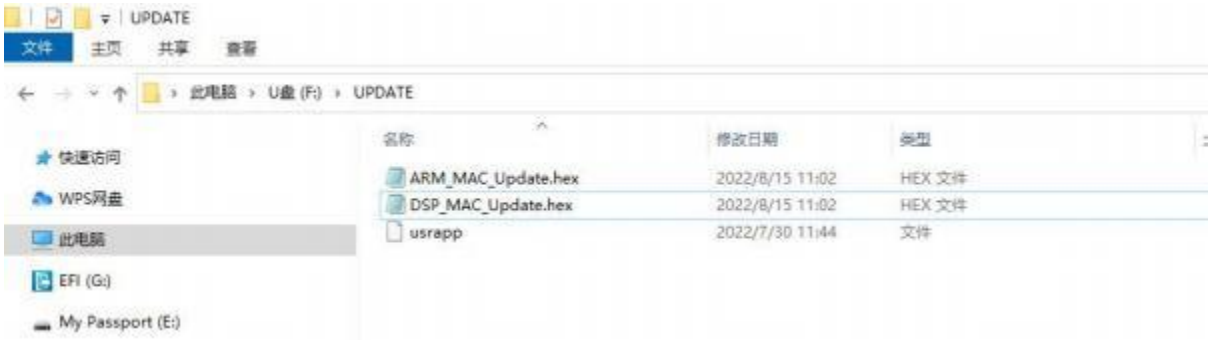


Figure 5.2 5 Store upgrade software

3、 Click "System" -> "System Upgrade", enter the password "888888", and enter the upgrade page;

Figure 5.2 6 Upgrade software password verification

4、 Insert the 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、 To upgrade the L CD touch screen software, click "LCD Upgrade", wait about 15 seconds, and there will be a prompt that the upgrade is successful;

Figure 5.2 7 LCD upgrade software and restart interface

6、 The LCD touch screen software is finished, click the "Restart" button, and the version update will take effect, as shown in Figure 5. 2 4 . Customers can upgrade the DSP and ARM according to the actual situation, and then click "Restart".

7、 To upgrade the power module DSP/ARM, you need to select the module to be upgraded in the module box of the "System Upgrade" interface (when the system has multiple modules, it is recommended to upgrade from module 1 first, and then upgrade in the setting module 2 until the upgrade is completed. all modules);

8、 Click "DSP/ARM upgrade" and wait for about 5 minutes to prompt that the upgrade is successful. Complete system upgrade.

Figure 5.28 DSP/ARM upgrade interface

5.8. Introduction to the environment monitoring interface

Click "Data" -> "Environment Monitoring" to enter the following interface; you can view the system's real-time environmental status, air conditioning parameter settings, and air conditioning on and off in the interface.

Cooling mode: When the temperature is greater than or equal to the set cooling point, the air conditioning is turned on. When the temperature is lower than the cooling point, the air conditioning is turned off. The return difference defaults to 5℃ (adjustable from 1 to 10℃);

Heating mode: When the temperature is lower than the heating point, the air conditioning heating is turned on. When the temperature reaches the heating point plus the return difference value, the heating is turned off. The return difference value defaults to 5℃ (adjustable from 1 to 10℃);

Figure 5.29 Environmental monitoring interface

6. Alarm and Maintenance

The warning levels are defined as follows:

- Failure: The device malfunctions and the system stops functioning (charging/discharging).
- Warning: 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 Fault alarm processing method

Alarm/Fault	Involved parts	problem causes	Solution
Flooding Fault	Battery compartment	Energy storage cabinet soaked in water	1. Check whether there is water in the cabinet; 2. Confirm whether the outdoor cabinet is leaking and whether the equipment inside the cabinet is intact.
Magnetic door alarm	Battery compartment	Energy storage cabinet door opens	1. Check that the cabinet door is fully closed; 2. Check whether the cable on the door magnetic sensor is disconnected; 3. Check whether the position of the door magnetic sensor is offset.
Firefighting Fault	Battery compartment	Battery overheats or catches fire	1. Immediately press the E PO button and quickly move away from the energy storage cabinet; 2. Observation continued for 30 minutes from a safe distance. If there is smoke or fire, please call the fire alarm; if there is no abnormality, manually clear the active alarm and contact the manufacturer.
Lightning protector alarm	Electrical warehouse	Lightning arrester failure	1. Check whether the lightning arrester signal line connection is

			loose; 2. Check whether the indicator of the lightning arrester changes color; 3. Replace the AC lightning protector.
Compressor Alarm	air conditioner	1. Wiring loose 2. Compressor damaged	1. Disconnect the power distribution switch, open the air conditioner junction box, and check whether the wiring is loose; 2. Observe whether the appearance of the compressor is obviously damaged, whether there is a burning smell, if so, contact the manufacturer.
Outdoor fan Alarm	air conditioner	1. Wiring loose 2. Fan damaged	1. Disconnect the power distribution switch, open the air conditioner junction box, and check whether the wiring is loose; 2. Observe whether the fan is obviously damaged, whether there is a burning smell, if so, please contact the service hotline.
Indoor fan Alarm	air conditioner	1. Wiring loose 2. Fan damaged	1. Disconnect the power distribution switch, open the air conditioner junction box, and check whether the wiring is loose; 2. Observe whether the fan is obviously damaged, whether there is a burning smell, if so, please contact the service hotline.
Grid overvoltage/undervoltage Fault	Power Grid/Oil Generator	Abnormal voltage on the grid-connected side	Check whether the grid-connected side voltage is abnormal;
Grid overfrequency/underfrequency Fault	Power Grid/Oil Generator	Frequency abnormality on the grid-connected side	Check whether the grid-connected side frequency is abnormal;
island protection Fault	Power Grid/Oil Generator	Abnormal voltage on the grid-connected side	Check whether the grid-connected side voltage is abnormal;
High/low voltage ride through Alarm	Power Grid/Oil Generator	Abnormal voltage on the grid-connected side	Check whether the grid-connected side voltage is abnormal;

Grid voltage imbalance Fault	Power Grid/Oil Generator	Abnormal voltage on the grid-connected side	Check whether the grid-connected side voltage is abnormal;
Power grid phase error Fault	Power grid/diesel engine	Wrong phase sequence on the grid-connected side	any two of the three wires A and BC
DC voltage high/low Fault	Battery	Abnormal battery voltage	Check whether the DC input voltage is abnormal;
Bus overvoltage Fault	energy storage converter	1. load imbalance 2. software exception	1. Check whether the DC wiring is loose or abnormal; 2. Contact the manufacturer
Unbalanced bus half voltage Fault	energy storage converter	1. unbalanced load 2. Software exception	1. Check whether the load is abnormal; 2. Contact the manufacturer
Over temperature derating Alarm	energy storage converter	Internal temperature is too high	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check that the internal fan is functioning properly; 3. Contact the manufacturer
Power tube over temperature Fault	energy storage converter	Internal temperature is too high	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check that the internal fan is functioning properly; 3. Contact the manufacturer
Balance bridge over temperature Fault	energy storage converter	internal temperature too high	1. Check whether the air inlet and outlet of the electrical compartment are blocked; 2. Check that the internal fan is functioning properly; 3. Contact the manufacturer
DC overcurrent Fault	energy storage converter	DC current excess	1. Check whether there is a short circuit or line damage on the DC side; 2. Replace the energy storage converter module or contact the manufacturer.
balance bridge overcurrent Fault	energy storage converter	Internal current exceeds	1. Check whether the off-grid load is excessive; 2. Replace the energy storage converter module or contact the manufacturer.

Output overload/overcurrent Fault	energy storage converter	AC side power/current excess	1. Check whether the grid voltage is normal; 2. Check whether there is a short circuit or line damage on the DC side; 3. Check whether the off-grid load is excessive; 4. Replace the energy storage converter module or contact the manufacturer.
Wave-by-wave current limiting Fault	energy storage converter	AC side current exceeds the limit	1. Check whether the grid voltage is normal; 2. Check whether the off-grid load is excessive; 3. Replace the energy storage converter module or contact the manufacturer.
communication interruption Fault	Energy storage converter local controller	communication interruption	1. Check whether the communication network cable between modules is loose or abnormal; 2. Check whether the local controller communication network cable is loose or abnormal;
Parallel/synchronization Fault	energy storage converter	Parallel/synchronization Signal interruption	1. Check whether the parallel cables are loose or abnormal; 2. Check whether the parallel machine settings are abnormal; 3. The hardware circuit is damaged.
Relay open/short circuit Fault	energy storage converter	1. Internal relay abnormality 2. Software exception	1. Replacing the Energy Storage Converter Module 2. Contact the manufacturer to replace internal boards
Fan 1/ 2/3 Alarm	energy storage converter	Abnormal internal fan	1. Replacing the Energy Storage Converter Module 2. Contact the factory to replace the internal fan
Leakage current Fault	energy storage converter	1. Leakage current excess 2. software exception	1. Check whether the leakage current Hall wiring is loose or abnormal;

			2. Check if the ground wire is disconnected;
Abnormal insulation resistance Fault	Energy storage converter /battery	1. Low insulation to ground 2. software exception	1. Check whether the AC and DC cables are damaged or short-circuited to ground; 2. Check for broken battery lines or shorts to ground.
module missing alarm	energy storage converter	Module to screen communication interrupted	Check whether the communication network cable between modules is loose or abnormal;
DC voltage is low Alarm	energy storage converter	Battery is not on	Check if the battery is on

Warning: The above alarms and faults are common alarms or faults. If **faults other than those listed in Table 6.1 occur , please contact the manufacturer directly.**

6.2. Routine maintenance

Affected by ambient temperature, humidity, dust, vibration and the aging of internal components of the inverter, some potential problems may occur during the operation of the system. In order to enable the energy storage system to operate stably for a long time, it is necessary to arrange regular inspections by maintenance personnel according to Table 6. 2 , so as to detect and deal with problems in time. It is recommended to maintain quarterly for systems installed in areas with severe sand and dust, high salt fog or heavy industrial parks, and for energy storage systems in areas with good climate and environment, it is recommended to maintain them every six months.

Table 6.2 Routine maintenance work

Maintenance object	Action	Guideline
Cabinet	● Check the appearance of the whole machine ● Check the vents ● Check the condition of the door lock	● No obvious coating peeling, scratches or rust ● No obvious signs of water leakage ● No dust accumulation in vents ● The door lock is not damaged
Air conditioner	● Check for noise and vibration ● Clean the filter	● The fan and compressor rotate normally without any lag or abnormal noise.

		● The filter surface is clean and free of clogging
Energy storage converter	● Check for noise and vibration ● Check front panel vents ● Check the rear copper bar contact surface	● The front panel fan rotates normally without any lag or abnormal noise. ● The surface of the front panel vents is clean and not clogged ● There is no corrosion, discoloration, or dust accumulation on the copper busbars and contact surfaces.
Electric	● Check lightning protector ● Check the cable copper bus contact surface	● Lightning protector is normal ● The screw socket connection line is not loose and falls off ● No corrosion and discoloration of copper bars and contact surfaces, no dust accumulation
Battery pack	● Check for noise and vibration ● Check the contact surface of the cable copper bar	● The fan of the battery pack rotates without stuttering or abnormal noise ● Front panel vent surfaces are clean and unobstructed ● The screw socket connection line is not loose and falls off ● No corrosion and discoloration of copper bars and contact surfaces, no dust accumulation

6.3. Warranty service

6.3.1. Warranty period

In the case of correct use of the product, the warranty period stipulated in the commercial contract shall prevail.

6.3.2. Warranty

During the warranty period of the product, Shenzhen Sinostorage Energy Co., Ltd will repair or replace the product for the customer free of charge if the failure is caused by the quality problem of the product itself. Customers should reserve a reasonable response time for the company's maintenance, and the replaced products will be handled by the company. Customers need to present relevant proof of product purchase and ensure that the product trademark is clearly visible, otherwise the company has the right to not provide warranty guarantee.

6.3.3. Disclaimer

In the following situations, our company has the right not to provide quality assurance, but can still provide paid maintenance services.

- The warranty period has expired;
- Unable to provide proof of product purchase;
- Damage caused during transportation, loading and unloading;
- Damage caused by incorrect installation, modification, or disassembly and repair by unauthorized personnel;
- Damage caused by operation under abnormal usage conditions or environment;
- Machine failure or damage caused by the use of non-Naton components or software;
- Failures caused by force majeure factors such as fire, earthquake, flood, etc