BSL NEW ENERGY (HONGKONG) CO., LIMITED

ESS-GRID-P500E

Energy storage converter user manual

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Table of contents

01 Safety Instructions

1.1 Safety Symbols

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. To ensure that users can better use this product and protect personal and property safety, please read the following symbols carefully.

 **DANGER:** Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

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

 **CAUTION:** Indicates a situation with a low risk of 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

 **illustrate:**

This equipment should be used in an environment that meets the design specifications. Otherwise, it may cause equipment failure. The resulting equipment malfunction or component damage, personal safety accidents, property losses, etc. are not within the scope of equipment quality assurance. Local laws, regulations and specifications should be followed when installing, operating and maintaining the equipment. The safety precautions in the manual are only used as a supplement to local laws, regulations and specifications. The company does not assume responsibility for any of the following situations.

1. The installation and use environment exceeds the requirements of relevant international, national and regional standards.

2. Operation not within the conditions of use described in this manual.

3. Unauthorized disassembly, modification of products or modification of software codes.

4. Failure to follow the operating instructions and safety warnings in the product and documentation.

5. Equipment damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, flood, mudslide, etc.).

6. Damage caused by the customer's failure to comply with transportation and installation requirements.

7. Damage caused by storage conditions not meeting the requirements of product documentation.

8. Damage to the hardware or data of the device due to customer negligence, improper operation or intentional damage .

9. System damage caused by a third party or customer , including relocation and installation of the system that does not comply with the requirements of this manual, and damage caused by adjustments, changes or removal of identification marks that do not comply with the requirements of this manual.

10. Defects, failures or damages caused by acts, events, omissions or accidents beyond the reasonable control of the Seller, including power outages or electrical failures, theft, war, riots, civil unrest, terrorism, intentional or malicious damage, etc.

 **Danger:**

The equipment has high voltage. 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 operate in accordance with the regulations:

1. Please check whether the pre-installed cables are connected and fastened. Check whether the device is damaged, such as holes, dents, or other signs of possible internal damage. Check that the internal components of the device are not displaced. It is forbidden to change the structure and installation sequence of the device without authorization.

2. It is forbidden to use water to clean the electrical parts inside the equipment. If liquid is found to have entered the equipment, please press the emergency stop switch immediately and notify the on-site management personnel.

3. It is forbidden to install, connect, maintain and replace with power on. Before touching any conductor surface or terminal, measure the

voltage at the contact point and confirm that the protective ground wire of the equipment or the part to be repaired is reliably grounded to ensure that there is no risk of electric shock.

4. Except for the personnel who operate the equipment, other personnel are not allowed to approach the equipment. Do not power on the equipment before the equipment is installed or confirmed by professionals. When powering on for the first time or operating the main circuit with power on, at least two personnel must be present on site.

illustrate

1. The user's operating behaviors and operating tools during transportation, handling, installation, wiring and maintenance must comply with the laws, regulations and relevant standards of the country and region where the user is located.

2. 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.

3. It is prohibited to reverse engineer, decompile, disassemble, adapt, implant or other derivative operations on the device software. It is not allowed to study the internal implementation of the device, obtain the source code of the device software, steal intellectual property rights, etc. in any way, and it is not allowed to disclose the results of any device software performance test.

1.3 Electrical safety

1.3.1 Wiring requirements

1. Please 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 laid separately. They should not be entangled or crossed.

2. When the wiring is completed or you leave for a short time during the wiring process, you need to immediately seal the cable opening and close the cabinet door to prevent small animals from entering.

3. The cables used in the energy storage system must be firmly connected, well insulated, and meet the specifications. The cable conduit or wire hole must be protected to prevent the cables from being damaged by sharp edges, burrs, etc.

4. After the cable wiring is completed , it is necessary to use cable brackets and cable clamps to securely fix the cables. The cables in the backfill area must be ensured to fit tightly to the ground to prevent deformation or damage caused by the force applied when backfilling the soil.

5. Using cables in high temperature environments may cause aging and damage of the insulation layer. The distance between the cables and the heating device or the periphery of the heat source area should be at least 30mm.

6. To ensure construction safety, all cables should be laid and installed above 0 ° C. When moving cables, especially when working in low temperature environments, they should be handled with care.

1.3.2 Grounding requirements

1. It is forbidden to damage the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that the equipment is reliably grounded.

2. The grounding impedance of the equipment meets the national standard GB 50054 and local electrical standards.

3. It is forbidden to operate the equipment without installing the grounding conductor. 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

1. Before connecting or removing cables, the protection switch of the corresponding circuit must be turned off.

2. Use a multimeter of the corresponding voltage level to check whether it is energized and ensure that the equipment is completely powered off.

3. If there is a charged object nearby, please use an insulating board or insulating tape to cover or wrap it.

4. Use the grounding wire to reliably connect the circuit to be inspected to the grounding circuit before performing operation and maintenance.

illustrate:

1. Before connecting cables, make sure the cable labels are correct.

2. If the device has multiple inputs, all inputs of the device should be disconnected and the device can be operated only after it is completely powered off.

3. After the inspection is completed, remove the grounding wire between the inspection circuit and the grounding circuit.

1.4 Mechanical safety

Notice:

1. When transporting without wooden boxes, the bottom panel must be removed. Handle with care during take-off and landing to avoid impact or vibration.

2. During transportation, the center of gravity of the box should fall between the two forks on the forklift. Long-distance transportation or inversion or tilting is prohibited.

3. When transporting equipment, the large size of the equipment may block the operator's view, so auxiliary personnel need to be arranged to assist.

4. To ensure the safety of drilling outside the equipment, a suitable location should be selected before drilling to ensure that there will be no short circuit or other effects. The equipment should be shielded during the

drilling process to prevent debris from falling into the equipment, and the debris should be cleaned up in time after drilling.

5. When moving equipment by hand, you should be prepared to bear the weight and wear protective gloves, anti-smash shoes and other safety protection equipment.

6. Move the equipment carefully during transportation to avoid collision or drop. Avoid scratching the surface of the equipment and damaging parts or cables.

1.4 Maintenance and replacement

warn:

1. It is forbidden to open the cabinet door in rain, snow, thunder and lightning, dust, fog and other weather conditions.

2. Before removing the components from the cabinet, please make sure that other components on the cabinet are not loose.

3. During equipment maintenance, nearby live parts should be covered with insulating materials.

4. Before the fan is powered off and stops rotating, do not allow any objects to touch the running fan (such as fingers, parts, bolts, etc.).

5. Do not power on the device before troubleshooting.

6. When inspecting the system with power on, pay attention to the danger signs on the equipment and avoid standing at the cabinet door.

7. After powering off all devices except the battery pack, you must wait for 15 minutes to ensure that the device has no power before operating it.

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

9. After completing maintenance and replacement operations, the cabinet door should be locked in time and the key should be properly kept.

0 2 Product Introduction

2.1 Overview of Energy Storage Converter Cabinet

A single ESS-GRID-P500E energy storage converter cabinet adopts a modular design and is mainly composed of the following parts: 4 125kW PCS modules, a 600kW STS module, a 500kVA isolation transformer, an HMI display and control integrated screen, and some protection, control and other electrical components.

2.2 Model Description

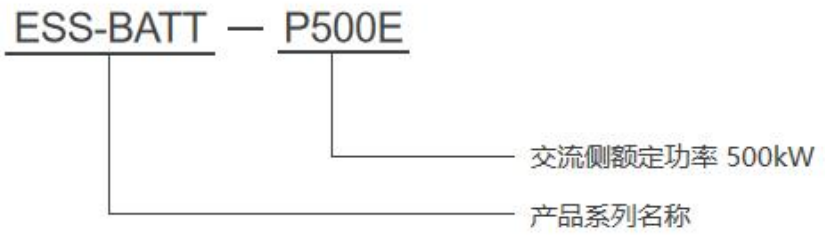


Figure 2.2 Model Description

Note: Isolation transformer and STS on-grid and off-grid switching module are optional components. The rated output power on the AC side can be flexibly configured according to project requirements.

2.3 Product Features

The ESS-GRID series energy storage converter cabinet integrates

modular PCS, HMI display and control system , power distribution system, etc. The modular PCS is used to facilitate maintenance and expansion; the front maintenance is used to reduce the floor space and maintenance channels; it has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency and intelligent management. In common application scenarios, the operation strategies are as follows:

Grid-connected mode:

energy storage converter cabinet is connected to batteries, photovoltaics or other DC sources, and converted into AC power through PCS power modules and connected to the grid . It can achieve: energy storage battery access to achieve peak shaving and valley filling, and arbitrage of electricity price differences.

Off-grid mode:

energy storage converter cabinet is connected to batteries, photovoltaics or other DC sources, and converted into AC power through the PCS power module to power the local load. The default three-phase voltage is 400Vac, 50Hz.

2.4 Product Appearance

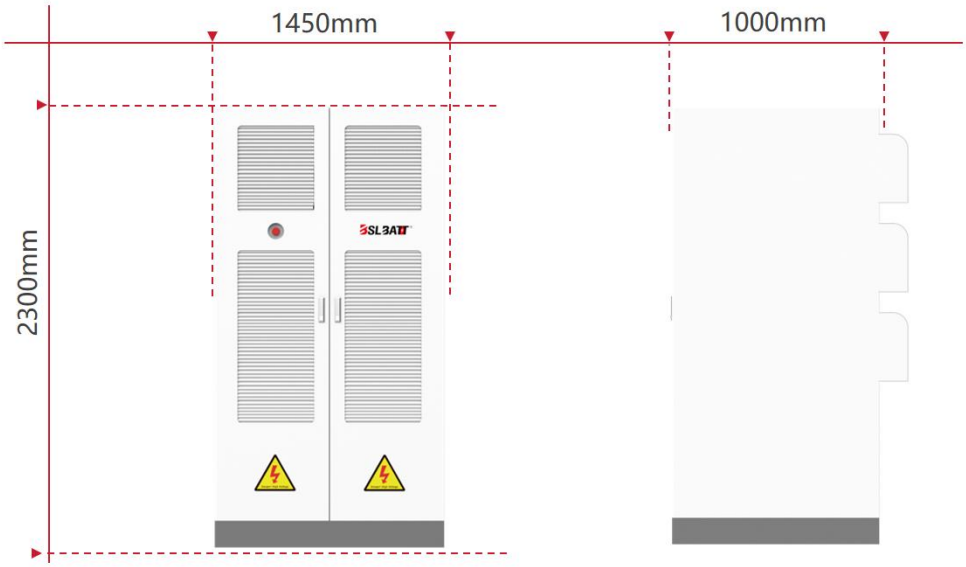


Figure 2.4 Product appearance

Note: According to T/CES 241-2023 "General Technical Specifications for Industrial and Commercial Energy Storage Integrated Cabinets" formulated by the China Electrotechnical Society, the cabinet surface of the ESS-GRID-P500E energy storage converter cabinet adopts anti-corrosion plating or coating to ensure the corrosion resistance of the cabinet. In addition, the cabinet meets the IP54 protection level, which can effectively prevent the intrusion of dust and moisture, and improve the environmental adaptability of the cabinet. The structural strength of the cabinet meets the design requirements in GB/T 5338, ensuring the mechanical strength and stability of the cabinet. At the same time, there are eye-catching safety signs on the surface of the cabinet to remind users to pay attention to safe operation.

2.5 Electrical Schematic Diagram

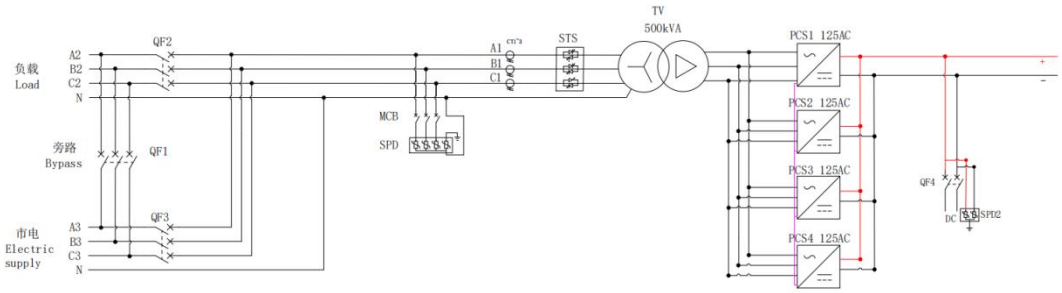


Figure 2.5 Electrical primary diagram

Note: Figure 2.5 is a system solution with on-grid and off-grid functions and an isolation transformer. Different projects have different configurations and slightly different lines. The actual configuration is subject to delivery.

2.6 Product Parameters

ESS-GRID-P500E Energy Storage Converter Technical Parameters

Product Model	P500E	P375E	P250E	P125E
AC side				
Rated grid voltage	400Vac, 3W+PE/3W+N+PE			
Grid voltage range	340Vac ~ 440Vac(adjustable)			
Grid voltage frequency	50/60±5Hz			

Rated AC current	180A*4	180A*3	180A*2	180A*1
Rated Power	500kW	375kW	250kW	125kW
Product Model	**P500E**	**P375E**	**P250E**	**P125E**
Power Factor	-1 ahead ~ +1 behind			
Current harmonics	≤3% (rated power)			
Load side				
Load voltage level	400Vac, 3W+PE/3W+N+PE			
Load voltage frequency	50/60Hz			
Overload capacity	110% long-term operation; 120% 1 minute			
Off-grid output THDu	≤ 2% (linear load)			
DC side				
Input voltage range	625~950V			
Maximum DC current	200A*4	200A*3	200A*2	200A*1
Rated Power	500kW	375kW	250kW	125kW

System Parameters				
show	LCD display and control integrated screen			
Protection level	IP54 (whole cabinet)			
Electrical isolation	With isolation transformer			
Shutdown self-consumption	< 0.1% rated power (excluding transformer)			
Cooling method	Intelligent air cooling			
Altitude	3000m (> 3000m derating)			
noise	Less than 78dB			
Ambient temperature	-25℃~60℃ (derating above 45℃)			
Relative humidity	0~95% (no condensation)			
Product Model	**P500E**	**P375E**	**P250E**	**P125E**
BMS Communication	CAN			
EMS Communications	Ethernet / 485			
Dimensions	1450*1000*2300mm			

W*D*H

Table 2.6

Note: The above are typical configuration parameters of the ESS-GRID series energy storage converter cabinet, which are applicable to models with transformers. For models without transformers, the relevant parameters will be adjusted accordingly based on the removal of the transformer. Please note that the actual supply will strictly follow the provisions of the technical agreement.

Note: The actual parameters are set according to customer requirements before leaving the factory.

2.6 Component Introduction

2.6.1 PCS Energy Storage Converter Power Module

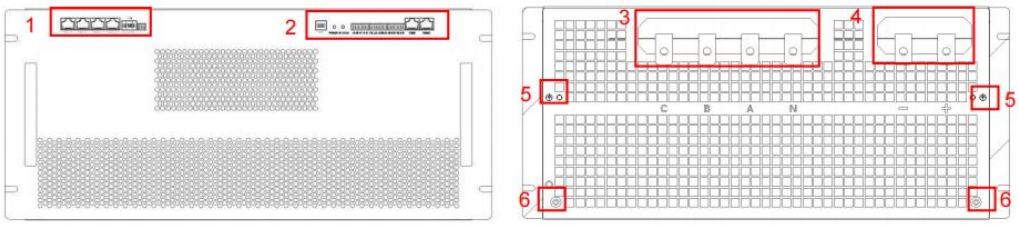
The energy storage converter cabinet adopts a modular solution, and users can configure different numbers of power modules according to project requirements. The parameters of the energy storage converter power module are as follows:

model	BSL-125AC
Rated Power	125kW
Maximum Power	137kW
DC operating	580~1000V (three-phase three-wire) / 670~1000V

voltage range	(three-phase four-wire)
DC side full load voltage range	625~950V (three-phase three-wire) / 670~950V (three-phase four-wire)
Maximum DC current	200A
Rated AC voltage	400Vac , 3W+ PE/3W+N+PE
model	**BSL-125AC**
Rated frequency	50/60Hz , (± 5Hz)
Rated AC current	180A
Overload capacity	110% , normal operation; 120% , 1 minute
Current distortion	< 5% (rated power)
Power factor adjustment range	-1 ahead ~ +1 behind
With unbalanced load capacity	100%
Compatible batteries	Lithium battery / lead acid / photovoltaic module
Charging method	According to BMS instructions / three-stage /MPPT
Working Mode	Constant current, constant power, MPPT , AC voltage source, DC voltage source
Maximum efficiency	98.20%

Dimensions (W*D*H)	520*750*265mm
Weight (approx.)	68kg
Isolation method	Non-isolated
Protection level	IP20
Operating temperature	-25 ℃ ~+60 ℃ (> 45 ℃ derating)
Relative humidity	0~95% (non-condensing)
Cooling method	Intelligent air cooling
noise	< 75dB
Altitude	3000m (> 3000m derating)
Communication interface	CAN

Table 2.6.1



1）并机端口 2）信号端口 3）交流端口 4）直流端口 5）接地端口 6）导向柱
图 1-2 125kW 储能功率模块（正面、背面）

Figure 2.6.1-PCS

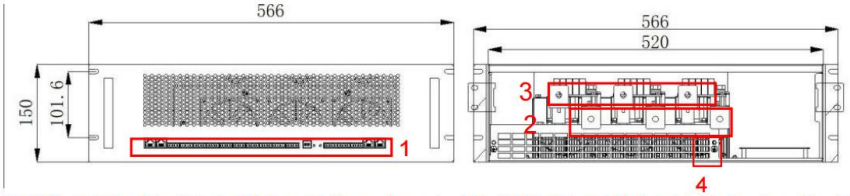
2.6.2 STS on-grid and off-grid switching module

For areas with unstable power grids and frequent power outages, users can configure STS modules according to project requirements and use STS to achieve seamless switching and automatic control of grid connections. The STS module parameters are as follows:

model	BSL -600 STS
Rated Power	600 kW
Maximum Power	660 kW
Rated AC voltage	400Vac , 3W+N
Rated frequency	50/60Hz(± 5Hz)
Rated AC current	866 A
Switching time	<10ms
Maximum efficiency	99%
Dimensions (W*D*H)	483 (excluding mounting ears 444)*600*150mm
Weight (approx .)	35 kg
Protection level	IP2 0
Operating temperature	-25 ℃ ~+60 ℃ (>45 ℃ derating)
model	**BSL -600 STS**
Relative humidity	0~95%(no condensation)
Cooling method	Intelligent air cooling
noise	<70dB
Altitude	3000m (>3000m derating)

Communication interface	CAN

Table 2.6.2



（1）信号端口（2）电网接口（从左至右为 a、b、c）（3）PCS 接口（从左至右为 A、B、C）（4）接地孔

Figure 2.6.2-STS

2.6.3 Three-phase isolation transformer

For off-grid application scenarios, a three-phase isolation transformer is configured to completely disconnect the output and input ends to achieve harmonic filtering and prevent impact current. The isolation transformer module parameters are as follows:

name	Isolation transformer
Rated Power	500 kVA
Insulation class	H
Link Group	Dyn11
Primary input voltage	400V
Primary input current	720 A
name	**Isolation transformer**
Rated frequency	50Hz

Secondary output voltage	400V
Secondary output current	720 A
Overload capacity	110%
Cooling method	Dry self cooling
efficiency	> 97.5%
noise	≤ 65dB

Table 2.6.3

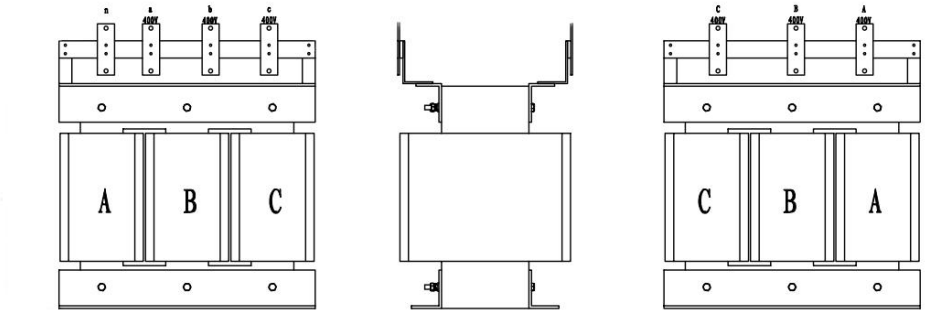


Figure 2.6.3 - Transformer

2.6.4 Air Cooling System

The heat dissipation system of the energy storage inverter cabinet is designed based on the physical principles of air flow and heat exchange, including key components such as S-shaped air inlet shutters, air inlet holes, air outlet hoods and centrifugal cooling fans. The design of the S-shaped

air inlet shutters changes the air flow direction from straight to curved, increases the length of the air flow path and the contact area, effectively filters and reduces the entry of dust particles, and guides the uniform cooling airflow; the air inlet holes are designed according to the heat dissipation requirements to allow cold air to enter the cabinet; the air outlet hood guides the hot air out to prevent hot air circulation; the centrifugal cooling fan generates forced convection through rotating blades, accelerating the discharge of hot air and the intake of cold air. The entire system achieves heat exchange by introducing cold air, enhancing air flow, and exhausting hot air, maintaining the temperature in the cabinet within an appropriate range, and protecting the internal equipment from pollution and damage through filtering devices. As shown below, please refer to the schematic diagram.

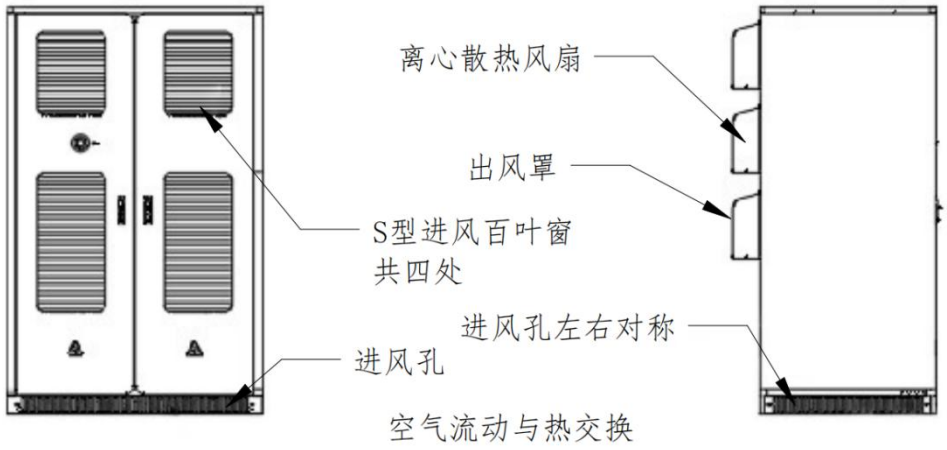
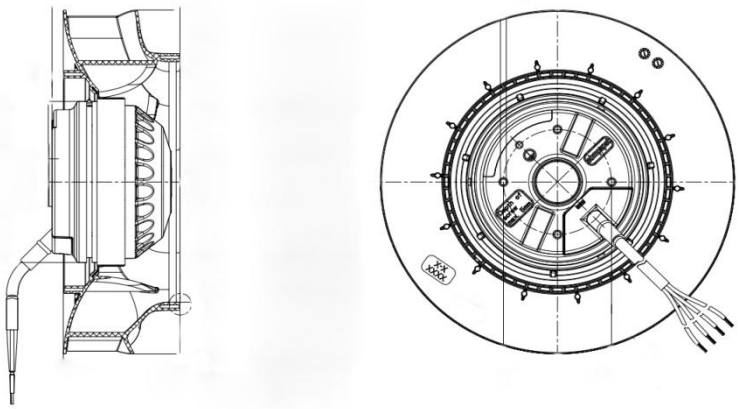


Figure 2.6.4-1- Cooling



system

Figure 2.6.4-2 - Cooling fan

2.6.5 Local Management System

The Microgrid Management System (Lotus-ESS) is an intelligent energy management system independently developed by our company. It is specially designed for microgrid systems and is suitable for energy storage power stations and integrated photovoltaic storage and charging power stations of various capacities.

The system integrates functions such as human-machine interface (HMI), port control and communication, system parameter setting and operation strategy to achieve comprehensive monitoring and management of energy storage systems. Lotus-ESS can not only effectively connect renewable energy systems such as solar power generation and wind power generation to the power grid, but also respond to grid demand on the power generation side, perform peak-frequency regulation and

peak-shaving and valley-filling to assist in grid dispatch and frequency stabilization. On the distribution side, it relieves pressure during peak power consumption and balances excess electricity during off-peak periods through peak-shaving and valley-filling and flexible DC interconnection. In addition, the power consumption side can be used as an uninterruptible power supply and DC source. The product hardware resources and parameters are as follows:

Product Model	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)
Expandable storage	1 USB port , 1 SD card port
Sound alarm	1 controllable buzzer
Program Characterization	1 operation indicator, 1 status indicator, 1 alarm indicator
Abnormal manifestations	1 hardware watchdog timer

Real-time clock	1 set of RTC real-time clock

Table 2.6.3

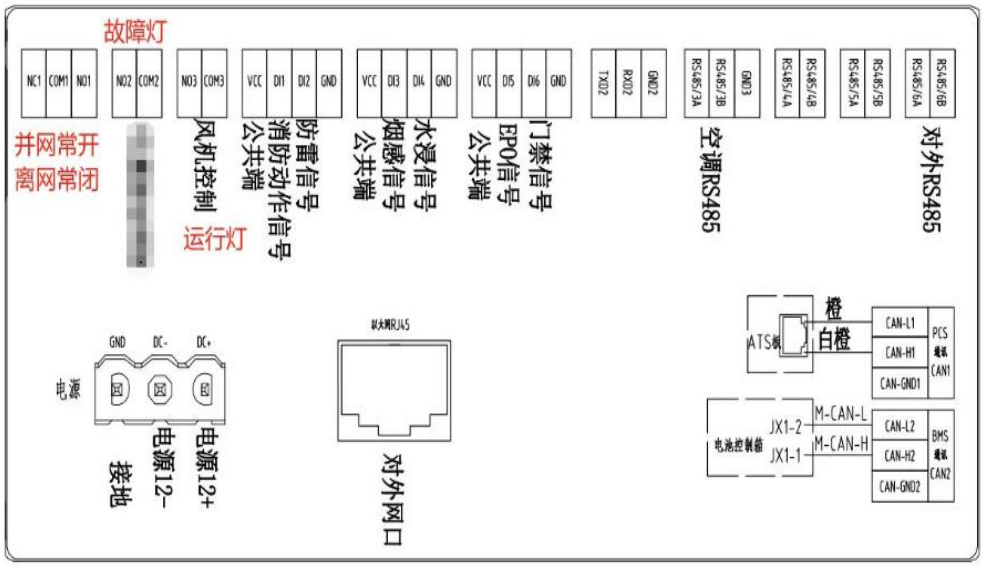


Figure 2.6.3-HMI

2.7 Configuration List

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

name	model	unit	quantity
Cabinet	1450*1000*2300mm	tower	1
AC Power Module	BSL-125AC	tower	4
On-grid and off-grid switching module	BSL-600STS	tower	1
Lightning protection system	20/40kA	set	1

Power distribution system	Micro-break	set	1
Management System	Lotus-ESS	set	1
Isolation transformer	500kVA	tower	1

Table 2.7

03 Installation, transportation and storage

3.1 Packaging and storage

3.1.1 Product packaging

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

parameter	illustrate
model	Product Model
size	Product packaging size
weight	Total weight of product after packaging
Logo	Face up, place with care, center of gravity, etc.

Table 3.1.1

Figure 3.1.1- Packaging diagram

3.1.2 Product Storage

If the product is not transported or installed for use immediately, it must be stored indoors in a location that meets the following conditions:

parameter	Require
Storage temperature (without battery)	-25 ℃ ~+60 ℃
Storage relative humidity	< 95%(no condensation)
altitude	< 3000m

Table 3.1.2

3.2 Transportation and handling

3.2.1 Product Transportation

1. In order to keep the equipment in a better protective state, it is recommended to transport it with packaging;

2. Equipment transportation must be carried out according to the requirements marked on the packaging to prevent personal injury and equipment damage;

3. Railway and air transportation are not recommended for energy storage batteries. Speed limit requirements for land transportation: 80km/h on flat roads and 60km/h on rugged roads. If there is a conflict, please follow local traffic regulations.

3.2.2 Product handling

1. When using a forklift to move the equipment, make sure the forklift has sufficient load capacity and make sure the center of gravity of the equipment falls between the forklift's feet to prevent personal injury and equipment damage;

2. For transportation with batteries, the forklift load-bearing capacity needs to be ≥ 3t; for transportation without batteries, the forklift load-bearing capacity needs to be ≥1.5t;

3. The recommended fork and knife length is ≥ 1.5m, width is 80cm~160cm, and thickness is 25mm~70mm.

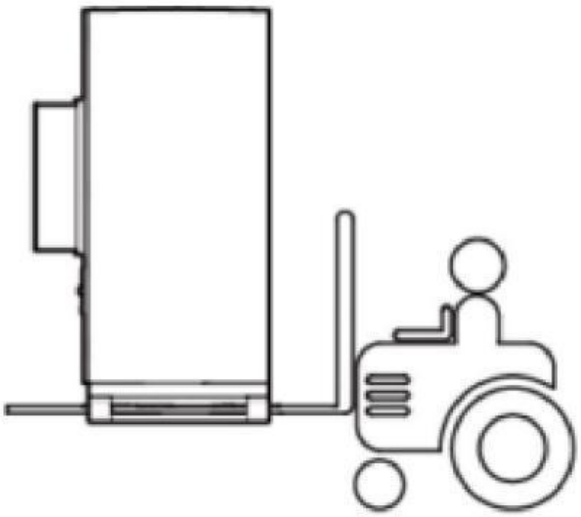


Figure 3.2.2- Schematic diagram of transportation

3.3 Installation Environment

The installation layout of the energy storage system must meet the fire protection distance or firewall requirements specified by local standards, including but not limited to " GB 51048-2014 Design Specifications for Electrochemical Energy Storage 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, not indoor layout. The general requirements for site selection are as follows:

1. The installation location should be higher than the highest historical water level in the area. The distance to the airport, landfill, river bank or dam should be ≥2km.

2. Choose a well-ventilated place. When the equipment is running, do not block the vents and cooling system to prevent high temperature fire. There should be enough installation space to ensure that surrounding equipment will not be affected by the heat generated by the product; the installation location should ensure that there is enough space for external wiring. It should have convenient transportation conditions and reliable fire suppression system equipment.

3. The installation location should be far away from fire sources, and flammable and explosive items should not be placed around the equipment. If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground under the equipment needs to be hardened to prevent weeds from growing.

4. Do not install the energy storage system outdoors in salt-damaged areas to prevent equipment corrosion and fire. Salt-damaged areas refer to areas within 2 km from the coast or affected by sea breeze.

5. The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to prevent unauthorized personnel from entering during equipment operation, which may cause personal injury or property loss.

6. The equipment should be installed in an area away from liquids. It

should not be installed below water pipes, air outlets, or other locations where condensation water is likely to form. It should not be installed below air conditioning outlets, vents, computer room outlet windows, or other locations that are prone to water leakage to prevent liquid from entering the interior and causing a short circuit in the equipment.

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

1. Areas with strong vibration, strong noise sources and strong electromagnetic field interference.

2. Places that generate or have dust, oil smoke, harmful gases, corrosive gases, etc.

3. Places where corrosive, flammable, or explosive items are produced or stored. Areas subject to explosion hazard.

4. Places with existing underground facilities: crowded places, high-rise buildings, underground buildings.

5. Unfavorable geological conditions such as rubber soil, soft soil layers, and ground that is prone to water accumulation and sinking.

6. Within the boundaries of mining subsidence (dislocation) areas. Areas that may be flooded after the dam or embankment fails.

7. Earthquake faults and earthquake zones with a fortification intensity higher than 9 degrees. Areas with direct hazards such as debris flows, landslides, quicksand, and karst caves.

8. Important water supply source sanitary protection areas.

9. Historical relics and historic sites protection areas.

If there is no more suitable site, it is recommended to install a fire wall with a fire resistance of not less than 3h for safety protection, while considering 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 fire wall 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 any damage is found, please keep the evidence and contact the equipment manufacturer.

2. If you are sure that there is no abnormality with the product, please check according to the delivery list to see whether the accessories are complete.

3. Users are required to prepare relevant installation tools before installation.

Serial number	Inspection items	Treatment measures
1	Check whether the fasteners are tightened.	If it is loose, tighten the screws again.
2	Whether the space environment meets the installation size requirements.	If there is insufficient space, it is recommended to redesign and install.
3	Check whether the air duct is unobstructed and free of foreign matter.	If there is any foreign matter, please clean it up. If it is not smooth, eliminate the cause.

Table 3.4-1 Installation inspection

Serial number	name	quantity	Remark
1	Energy storage converter	1 set	Including cabinet key
2	User Manual	1	
3	Certificate	1 serving	

4	Factory inspection report	1 serving
5	Packing List	1 serving

Table 3.4-2 Delivery List

Serial number	Tool Name	legend
1	Insulating gloves	
2	Protective glasses	
3	Insulated shoes	
4	Work clothes	
5	helmet	
6	screwdriver	
7	Wire strippers	
8	Hydraulic pliers	
Serial number	Tool Name	legend

9	Heat Gun	
10	multimeter	
11	Torque wrench	
12	Marking pen	

Table 3.4-3 Installation tool preparation

3.4 Foundation Engineering Installation

In the energy storage inverter installation project, the "GB55003-2021 General Specification for Building and Municipal Foundations" is followed. Site preparation is carried out first, and then basic engineering construction is carried out, including concrete foundation, drainage trough, wire trough construction and guardrail installation, which correspond to foundation construction, drainage system, electrical wiring and enclosure structure facilities respectively.

During construction, all materials, components and equipment must be inspected and accompanied by inspection reports. At the same time, each process shall carry out self-inspection and handover quality inspection. Concealed works must be inspected and documented before concealment. After the basic works are inspected and accepted, the

installation of the energy storage converter cabinet will proceed, involving transportation, positioning, electrical connection and installation of auxiliary equipment. After the entire installation process is completed, the energy storage converter cabinet needs to pass the commissioning test and final acceptance to ensure that the system meets the design requirements and performance standards.

Note: Before installing the energy storage converter cabinet, it is necessary to follow the specific local construction standards.

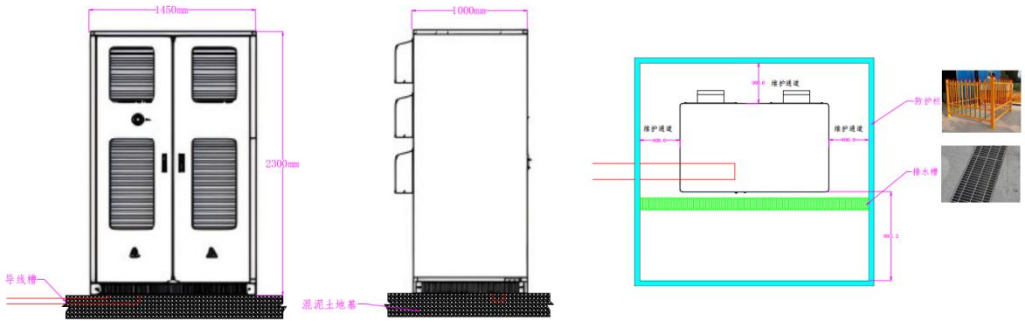


Figure 3.4 Foundation Engineering

3.5 Mechanical Installation

The first step is to make sure that the product is normal and all accessories are complete, and then refer to the following suggestions for mechanical installation:

1. Select the equipment installation location in advance according to the product size, and do a good job of positioning and fixing; the recommended foundation is shown in Figure 3.5-1.

2. Refer to the product weight and select an installation location that has sufficient load-bearing strength;

3. The grounding point is reliable and the grounding resistance is guaranteed to be less than 4Ω.

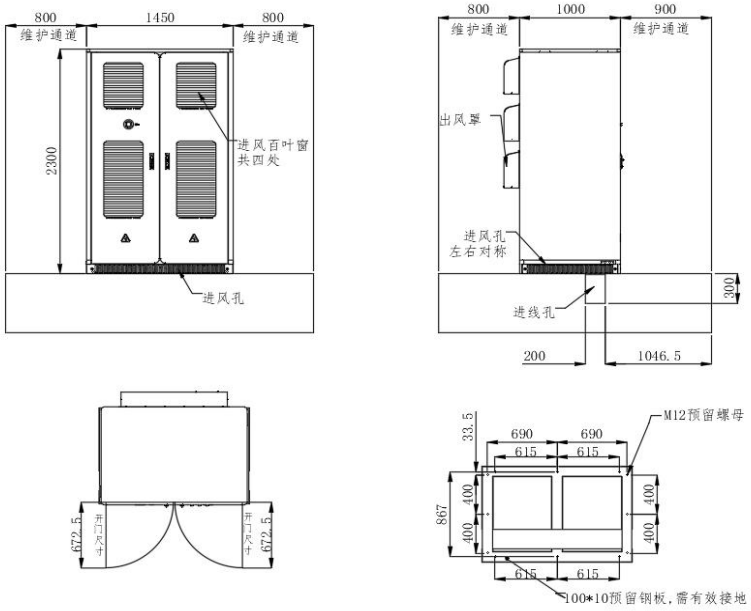


Figure 3.5-1 Installation reference diagram

Note: The actual dimensions of the device are subject to delivery.

The second step is to remove the bottom panel of the equipment after removing the wooden box. Keep the removed panel and screws away and reinstall them after the equipment is in place.

Figure 3.5-2 Schematic diagram of the bottom panel of the equipment

The third step is to use a forklift to place the equipment on the foundation, align the equipment fixing holes with the embedded nuts on the foundation, and tighten them with M16X40 bolts.

Figure 3.5-3 Schematic diagram of bolt tightening at the bottom of the equipment

3.6 Electrical installation

The energy storage converter cabinet adopts an integrated structure, and the wiring between the internal modules has been completed. Only the electrical cables for the AC side and external communication need to be installed on site. According to the product power and cable specifications, a wiring reference is provided as shown in Table 3.6.1. The selection of cable diameter should comply with local cable standards. Factors affecting cable selection include: rated current, cable type, laying method, ambient temperature and maximum acceptable line loss.

Cable diameter comparison table

Model capacity	AC cable	Neutral	Ground	Positive and negative DC cables
100 kW	≥3*50mm²	≥50mm²	≥25mm²	≥2*50mm2
125kW	≥3*70mm²	≥70mm²	≥50mm²	≥2*50mm2
125kW*2	≥ 3 * 70 mm²	≥ 70 mm²	≥ 50 mm²	≥ 2* 50 mm2
125kW*3	≥3*70mm²	≥70mm²	≥50mm²	≥2*50mm2
125kW*4	≥3*70mm²	≥70mm²	≥50mm²	≥2* 50 mm2

Table 3.6.1

Danger: When performing electrical installation, you can refer to the following suggestions:

1. Before wiring, check that all switches in the equipment are in the off state and ensure that the equipment is not powered;

2. Disconnect the power grid switch before wiring to ensure that the cables are not energized;

3. Make sure the phase sequence of the cables is correct. You can add yellow, green, red, and black insulation sheaths or logos to distinguish them to prevent incorrect phase sequence.

4. The connection between the cable terminal and the copper busbar needs to be tightened, and the screw length should be moderate to avoid affecting insulation and tightening;

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

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

7. All AC cables must enter the device through the inlet and outlet holes at the bottom of the device and then be connected to the corresponding phase sequence;

8. After wiring is completed, use fireproof mud to seal the wiring gaps to prevent external insects and rodents from entering and damaging

equipment or cables.

In order to prevent the terminal from loosening due to force, causing poor contact, increased contact resistance, and heat generation, etc., it is necessary to ensure that the bolts tightening the terminal meet the torque requirements listed in Table 3.6.2:

Wiring torque requirement table

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

Table 3.6.2

The inlet and outlet of the energy storage converter cabinet are bottom-in and bottom-out. After removing the switch baffle, as shown in Figure 3.6.3, the A/B/C/N copper busbars at the lower end of the switch are reserved with φ11mm and φ13mm openings for customer wiring, or holes can be opened according to the size required by the customer; the protective ground wire is connected to the PE copper busbar, and the equipment grounding impedance meets the national standard GB 50054 and local electrical standards.

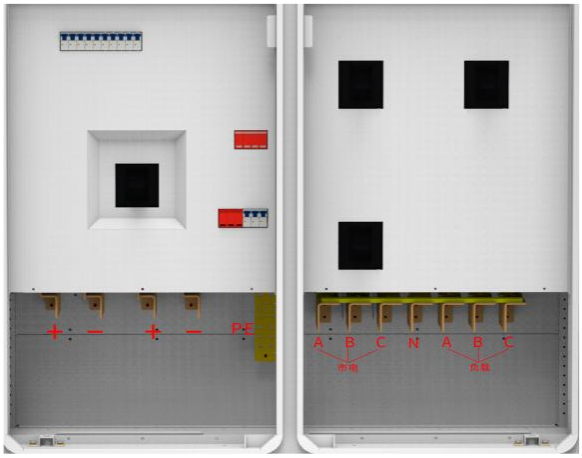
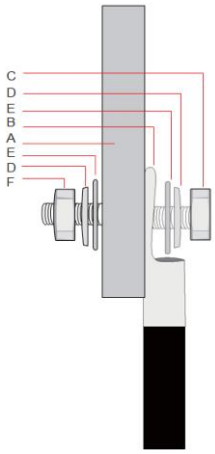


Figure 3.6.3 Wiring diagram

The following is a schematic diagram of the installation of terminals and fixing screws when wiring the system power cables:

The cable and copper bus connection specifications are as follows



序号	名称
A	铜排
B	接线端子
C	螺钉
D	弹垫
E	大平垫
F	螺母

Figure 3.6.4 Terminal block installation

Notice:

1. When using copper core cables or copper clad aluminum cables, please use copper terminal blocks.

2. When using aluminum alloy cables, please use copper-aluminum transition terminals, or aluminum terminals with copper-aluminum transition gaskets.

3.7 Check after installation

After installation, the following items must be checked and measured again to avoid equipment damage and property loss.

Serial number	Inspection items
1	Before measuring, disconnect the battery side and electrical side switches to ensure that the energy storage device is not energized.
2	The positive and negative poles of the system are connected correctly and the AC phase sequence is correct and has been tightened. Measure the resistance between the three phases, which should be in the megohm level. If it is K level or smaller, check the circuit.
3	The external control cables, grounding cables, and communication cables are fastened.
4	The grounding wire resistance is less than 4Ω, and the cable is intact without damage or cracks.
5	Clean the installation area and make sure no tools or foreign objects are left in the installation area.

6	Use fireproof mud to seal the gaps between cables to prevent small animals from entering.

Table 3.7

0 4 Startup and debugging

4.1 Check before power on

1. Check whether the circuit breaker in the energy storage converter cabinet is in the disconnected state;

2. Check whether the connection terminals of all communication and power supply cables are connected reliably;

3. Check whether the communication, power supply wiring harness and power cables of the energy storage converter cabinet are connected correctly;

4. Check whether there are any problems with all communication connections between the modules in the energy storage converter cabinet and the integrated display and control machine.

4.2 Check before starting

Before operating 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 the machine.

1) Appearance inspection:

a. The appearance of the equipment is intact, without damage, rust or paint peeling. If there is paint peeling, please repaint it;

b. Equipment labels must be clearly visible and damaged labels must be replaced in a timely manner.

2) Grounding check:

The box has a grounding point and is grounded securely; the grounding conductor inside the box is reliably connected to the grounding copper bar of the box.

3) Cable inspection:

a. The cable protective layer is intact and has no obvious damage;

b. The terminal is manufactured in accordance with the specifications and the connection is firm and reliable;

c. The labels on both ends of each cable should be clear and unambiguous. The wiring should comply with the principle of separation of strong and weak electricity. A margin should be left at the bends and the cables should not be tightened.

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

4) Copper bar inspection:

The copper bar has no obvious cracks or deformation, the screws at the

overlap are tightened, the markings are not misplaced, and there is no debris on the copper bar.

Component inspection:

The circuit breakers are in the open position; the lightning arrester indicator is green.

Note: Wear insulating gloves when operating.

4.3 Boot steps

The product startup and operation process is as follows:

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

2. Refer to Figure 4.3, close the transformer pre-charging switch, auxiliary power switch, close the QF3 mains switch, complete the transformer soft start, close the QF1 load switch, and close the QF4 DC switch;

3. Click the switch on the HMI touch screen to enable all modules, and click System Start;

4. Set the converter parameters in the "System" -> "Parameter Setting" interface, and select the required operation mode (manual mode, peak shaving and valley filling, backup mode) in the "System" -> "Operation

Mode" interface;

5. Enable all modules on the "Switch" page of the touch screen and click "Inverter On" to complete the startup .

Note: When using the QF2 bypass switch for equipment maintenance, remember to disconnect the QF1 load switch first.

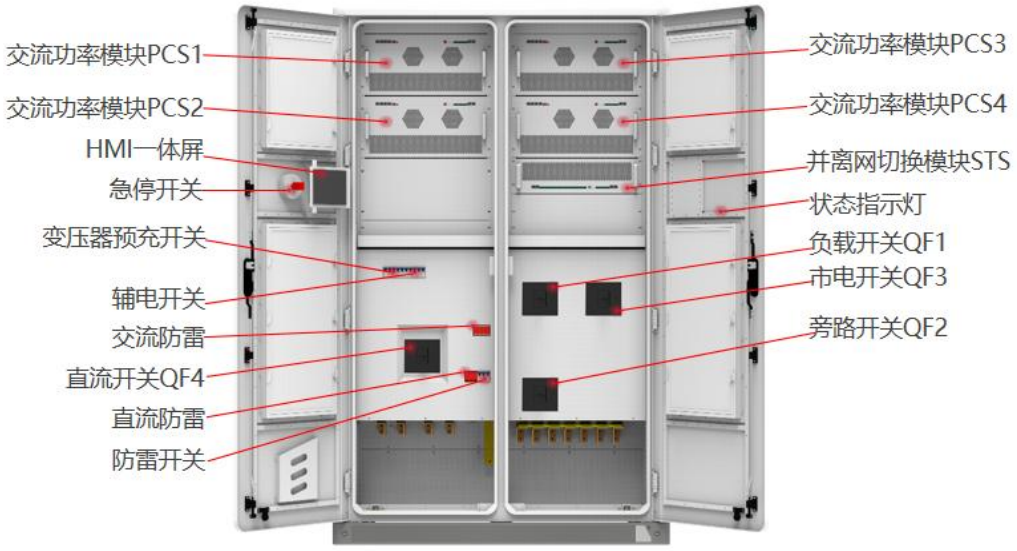


Figure 4.3 Switch position diagram

4.4 Trial operation

After the electrical installation of the equipment is completed, in order to ensure the stable operation of the system, professional electrical technicians are required to power on and set the operating mode and parameters for the first startup:

1. Set the device control mode to "manual mode" and set the active power to 5%;

2. Turn on the air conditioner in "Data" -> "Environmental Monitoring", enable all modules in the "Switch" interface, and click "System On";

3. Observe the parameters of the PCS, battery and air conditioner on the screen during operation. If there is any abnormality, stop the machine for inspection in time;

4. Run for 0.5 hours;

5. Set the active power to -5%. At this time, the battery is charged at 5% of the system's rated power.

6. Observe the parameters of the PCS, battery and air conditioner on the screen during operation. If there is any abnormality, stop the machine for inspection in time;

7. Run for 0.5 hours;

8. After completing the 1-hour trial run without any abnormalities, shut down the system in the "Switch" interface;

9. According to the project background and requirements, you can select local manual power control mode, automatic peak shaving and valley filling mode or backup mode for formal operation. Just click "System Startup" on the system interface.

4.5 Normal shutdown

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

1. Click the touch screen switch interface and click "System Shutdown";

2. Refer to Figure 4.3, disconnect the system transformer pre-charging switch, auxiliary power switch, open QF1 load switch, and open QF4 DC switch;

3. Wait for the bus discharge to end, the touch screen to go out, and the device to shut down.

4.6 Emergency shutdown

When the product fails or an emergency situation requires emergency shutdown, you can perform the following emergency shutdown operations:

1. Press the emergency shutdown button "EPO";

2. Refer to Figure 4.3 and disconnect all auxiliary power switches and AC and DC molded case switches of the system;

3. After confirming that the fault or danger has been eliminated and operation is required, reset the EPO button.

illustrate:

After pressing the "EPO" emergency shutdown button, you need to turn off the AC molded case switch, auxiliary power switch, and DC molded

case switch, and wait for 10 minutes before turning on the machine!

0 5Run and Operation

5.1 Human-machine interface

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 interface displays the system's real-time power, voltage, current, power generation, operating mode, working status and other information.

Figure 5.1 Main page

Each menu expands items:

HMI display and control integrated screen menu table

Serial	Menu	Menu Items	Parameter function

number	Name		
1	Home	none	Display the system's operating status and the current day's charge and discharge curve
2	data	Real-time data	Display of all analog data of converter
		Real-time status	Inverter working status and switch status display

Serial number	Menu Name	Menu Items	Parameter function
2	data	Real-time alerts	Current system alarm information
		Battery data	Battery data display and battery on/off settings
		Environmental Monitoring	Dynamic environment monitoring display and air conditioning parameter setting
3	Record	Historical alarms	Display historical alarm records
		Operation log	Display operation log
		Data Report	Export History
4	system	System Information	Display system information

		Operation Mode	System operation mode settings
		Parameter settings	Converter and battery parameter settings
		Factory settings	Device manufacturer settings
		System Upgrade	System software upgrade
		Communication Settings	Perform communication settings
5	switch	System switch	System startup and shutdown
6	HMI Indicator Lights	HMI left side Indicator Lights	① The first indicator from top to bottom is the power indicator: when the HMI touch screen is powered normally, the green light flashes;
7	HMI Indicator Lights	HMI left side Indicator Lights	② The second indicator from top to bottom is the status indicator: when there is a system fault, the green indicator light is off; when there is no system fault, the green indicator light is always on;

8	HMI Indicator Lights	HMI left side Indicator Lights	③ The third indicator from top to bottom is the fault indicator: when there is a fault in the system, the red indicator flashes; when there is no fault in the system, the red indicator is off (flashing frequency once every 1s)
Serial number	**Menu Name**	**Menu Items**	**Parameter function**
9	System lights	Status Indicator	① When the system is in standby mode and there is a fault, the system light turns red.
10	System lights	Status Indicator	②When the system is running and there is no fault, the system light is green.
11	System lights	Status Indicator	③When the system is running and there is a fault, the system light turns yellow.
12	System lights	Status Indicator	④When the system is in standby mode and there is no fault, the system light will not light up.

5.2 Power on/off operation

1、System start: Refer to Figure 4.3, close the transformer pre-charging switch, auxiliary power switch, close the QF3 mains switch, complete transformer soft start, close the QF1 load switch, and close the QF4 DC switch.

2、Set the converter parameters in the "System" -> "Parameter Setting" interface, select the required operation mode in the "System" -> "Operation Mode" interface, and select the grid-connected and control modes manual, peak shaving and valley filling, and backup mode.

Figure 5.2-1 Operation mode interface

3. Enable all modules on the "Switch" page of the HMI integrated screen (you can also enable some modules as needed), click "System On", and the normal startup time is about 30 seconds, as shown in Figure 5.2-1.

4. Inverter shutdown: When the inverter is running, click "Inverter shutdown", as shown in Figure 5.2-2;

5. Disconnect all AC and DC switches and auxiliary power switches of AC energy storage cabinets, DC photovoltaic cabinets, and battery cabinets.

Figure 5.2-2 Power on/off interface

5.3 Communication Settings

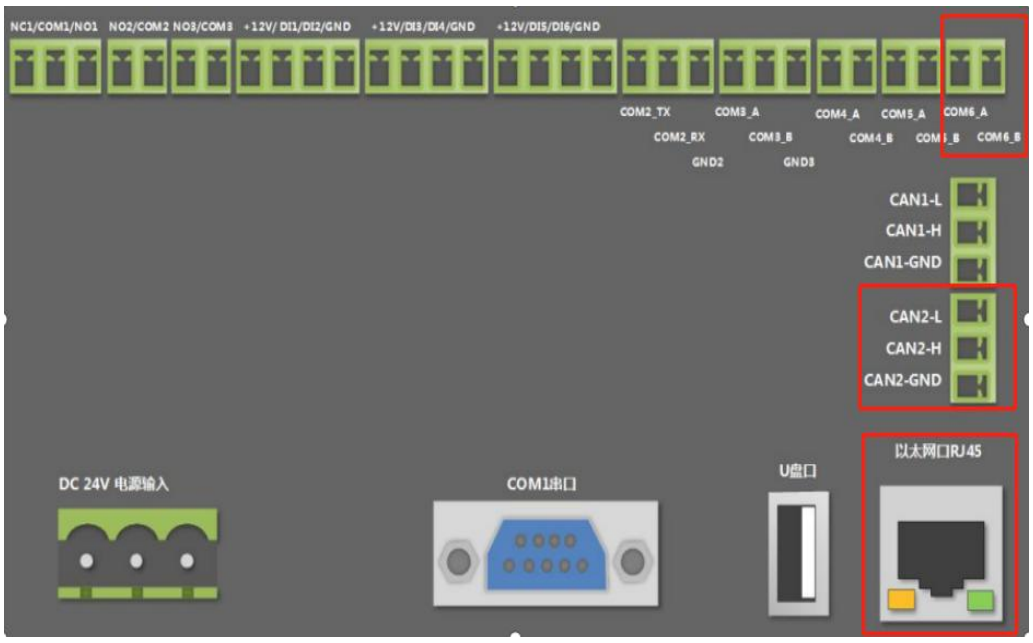


Figure 5.3-1 Communication check

Note: Communication settings refer to the communication protocol settings between the HMI integrated screen and the battery BMS, and between the LCD touch screen and the EMS background.

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

2. Check that the backend EMS communication line has been connected to the terminals COM6_A and COM6_B on the back of the touch screen or to the network port;

3. Click "System" -> "Communication Settings" on the HMI integrated screen to enter the communication settings interface.

4. Battery BMS communication settings: Set the CAN baud rate to 250k bps;

5. Backstage EMS communication setting 1: If RS485 communication is used, set the local address corresponding to the communication panel to 1. If multiple energy storage systems are connected to the backstage slave address, they cannot be repeated;

Figure 5.3-2 Communication settings interface

6. Backstage EMS communication settings 2: If Ethernet communication is used, the energy storage system will be used as the server. The default host 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 to the backstage IP address, they cannot be repeated. After modifying the IP address, click the Set button to configure the IP address.

Figure 5.3-3 Address configuration interface

5.4 Operation mode settings

5.4.1 Introduction to operation mode

The operation modes of the energy storage converter are divided into the following three types:

1. Grid-connected manual mode: In this mode, the energy storage system is connected to the grid, but the start and stop must be manually operated by the user through the LCD touch screen. The user can adjust the active power, reactive power and power factor of charging and discharging in "Parameter Settings".

2. Automatic grid-connected mode: Applicable to peak-shaving and valley-filling scenarios, the system automatically connects to the grid according to the preset charge and discharge power. In the backup mode application, after the battery is charged to the preset SOC, the mains stops charging.

3. Automatic switching mode between on-grid and off-grid: If the grid is powered off in the on-grid state, the converter will automatically switch to the off-grid mode and maintain a 400V/50Hz three-phase AC voltage output; if the grid is restored in the off-grid state, the converter will automatically switch back to the on-grid mode.

illustrate:

a. The on-grid and off-grid switching can be set to scheduled trigger or unscheduled trigger. If it is set to unscheduled trigger, when the mains power is 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 is on, it will automatically switch to on-grid mode. Set to scheduled trigger: When running in on-grid mode, you can manually switch to off-grid mode. Set "on-grid and off-grid" to "off-grid". When running in off-grid mode, you can manually switch to on-grid mode (assuming the mains power exists). Set "on-grid and off-grid" to "on-grid". The setting interface is as follows:

Figure 5.4.1-1 On-grid and off-grid settings interface

b. In the grid-connected mode, the anti-backflow function can be set to disable or enable. If it is set to enable, the energy storage system power will not be fed back to the grid. If it is set to disable, the energy storage system power can flow into the grid. In the system "System" -> "Parameter Settings" -> "Advanced Settings (Password 888888)" -> "MSTS Parameters"

-> "Anti-backflow Enable" setting interface is as follows:

Figure 5.4.1-2 Anti-backflow setting interface

5.4.2 Grid-connected manual mode

1. Click "System" -> "Operation Mode" to enter the page shown in Figure 5.4.2-1.

Figure 5.4.2-1 Grid-connected manual mode setting

2. Set the control mode to "Manual Mode" and set the corresponding active power, power factor, and reactive power on the "Parameter Setting" page. The machine will run according to the set values (positive values are for discharge, negative values are for charging). The power setting interface is shown in Figure 5.4.2-2.

Figure 5.4.2-2 Power setting interface

3. Enter the "Switch" page and "enable" the power modules as needed (it is recommended to enable all). Finally, click "System On" to confirm.

Figure 5.4.2-3 Power on/off interface

5.4.3 Grid-connected automatic mode

Peak shaving and valley filling mode:

1. Click "System" -> "Operation Mode", and click the "Peak Shaving and Valley Filling" button to enter the settings page;

Figure 5.4.3-1 Peak shaving and valley filling operation setting interface

2. Click "Modify" to set the peak-shaving and valley-filling operation

time period and power: set the start and end time, charge and discharge power, and whether to enable in time period 1; click the next item to enter the time period 2 setting, save and exit after completing all time period settings;

Figure 5.4.3-2 Peak shaving and valley filling charging and discharging time setting interface

3. Automatically jump to the following interface and click the Finish button;

Figure 5.4.3-3 Peak shaving and valley filling charging and discharging setting

interface

4. Change the "Control Mode" to "Peak Shaving and Valley Filling";

Figure 5.4.3-4 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 5.4.3-5 Local control operation mode is turned on

Fallback mode:

1. Click "System" -> "Operation Mode", and click the "Backup Mode" button to enter the settings page;

a. When setting AC power charging enable: Allow AC power to charge the battery;

b. Battery charging power: Set the required battery charging power value;

c. When AC power charging is prohibited: AC power is not allowed to charge the battery.

d. 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.

e. Generator charging: When set to prohibited, the generator is not allowed to charge the battery; when set to enabled, the generator is allowed to charge the AC power (provided that the generator is enabled first).

f. Backup power maintenance SOC: When the battery SOC is discharged to the backup power maintenance SOC setting value, the battery will no longer discharge and the load will be provided by the AC power or diesel engine.

Figure 5.4.3-6 Backup mode setting interface 1

3、When the oil generator is running in reverse mode, disconnect the grid switch, close the oil generator switch, and close the load switch;

a. Click "System" -> "Operation Mode" -> "Grid" and set it to generator;

b. Click the "Backup Mode" button to enter the settings page and set the "Generator" to enable;

c. Set “Battery Charging Power” to the required battery charging power value.

Note: After the generator is turned on, it supplies power to the load and charges the battery to the backup power SOC. 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 disconnect the diesel engine switch, close the mains power switch, set the "grid" to mains power, run the backup mode, and execute the backup mode logic. When the mains power charges the battery to the backup power SOC, it will no

longer charge the battery.

3. Change "Control Mode" to "Backup Mode";

Figure 5.4.3-7 Backup mode setting interface 2

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

Figure 5.4.3-8 Automatic control mode operation starts

5.4.4 Automatic switching between on-grid and off-grid

On-grid to off-grid:

When the system is running in the grid-connected state and the grid suddenly loses power, the STS detects the grid power failure, transmits the grid power failure information to the PCS and performs the tripping operation. At the same time, the PCS automatically switches from the grid-connected mode to the off-grid mode after receiving the STS signal. The system can output a stable 400V/50Hz three-phase AC voltage;

Off-grid to grid connection:

When the system is running in an off-grid state and the grid receives power, the STS detects the grid power and transmits the grid power information to the PCS. When the STS tracks the grid phase and amplitude and synchronizes with the off-grid PCS, the PCS notifies the STS to issue a closing command. At the same time, the PCS automatically switches from the off-grid mode to the grid-connected mode, and the system executes the grid-connected strategy.

The specific setting method is as follows:

Manual on-grid and off-grid switching mode:

1. Click "System" -> "Operation Mode" to enter the current page;

2. Select "Scheduled trigger" in "On-grid and off-grid switching" and set it as scheduled trigger;

3. When running in grid-connected mode, you can manually switch to

off-grid mode and set "grid-connected" to "off-grid";

4. When running in off-grid mode, you can manually switch to grid-connected mode (assuming that mains power is available), and set "off-grid" to "grid-connected".

Figure 5.4.4-1 Manual on-grid and off-grid switching mode setting interface

Automatic disconnection mode:

1. Click "System" -> "Operation Mode" to enter the current page, and set "On-grid and Off-grid Switching" to "Unplanned Trigger";

2. When the power grid suddenly loses power during operation in the grid-connected state, 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;

3. When the power grid suddenly receives power while operating in off-grid mode, the energy storage inverter automatically switches from off-grid mode to grid-connected mode.

Figure 5.4.4-2 Automatic on-grid and off-grid switching mode setting interface

5.4.5 Battery parameter settings

1. Click "System" -> "Parameter Settings" to enter the current page;

2. Customers set the upper and lower limits of SOC according to their own needs;

3. It is recommended that the SOC lower limit be set to no less than 5%.

Note: Battery parameters have been set before the system leaves the factory, and it is not recommended to modify them by yourself.

Figure 5.4.5 Battery charge and discharge settings interface

5.4.6 Environmental Monitoring Interface

1. Click "Data" -> "Environmental Monitoring" to enter the following interface;

2. You can view the real-time system environment status, air conditioning parameter settings, and air conditioning on and off on 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 minus the return difference, the air conditioning is turned off. The return difference value is 5°C by default (adjustable from 1 to 10°C).

Heating mode:

When the temperature is lower than the heating point, the air conditioner heating is turned on. When the temperature reaches the heating point plus the return difference, the heating is turned off. The return difference value is 5℃ by default (adjustable from 1 to 10℃).

Figure 5.4.6 Environmental monitoring interface

5.4.7 Data viewing and export

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

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

3. Insert the USB drive, wait for the USB drive to connect, click data export, and wait for the export to complete.

Figure 5.4.7-1 Data report interface

Figure 5.4.7-2 Data export interface

5.4.8 Software Upgrade

Software upgrade includes: integrated screen software, power module DSP software, power module ARM software upgrade. Before upgrading, turn off the system on the "Switch" page of the touch screen, that is, the

software must be upgraded when 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 "UPDATE" to store the burning files;

Figure 5.4.8-1 Create an upgrade software folder

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

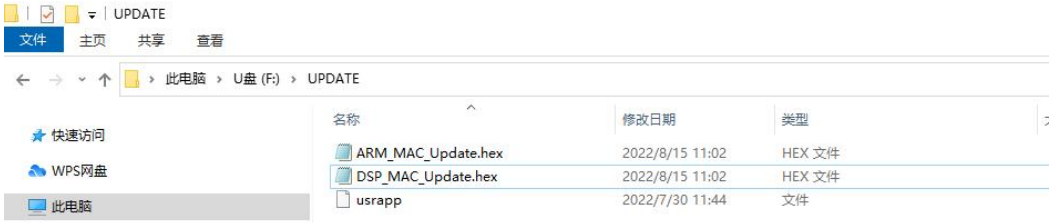


Figure 5.4.8-2 Storing the upgrade software

3. Click "System" -> "System Upgrade", enter the password "888888" to enter the upgrade page;

Figure 5.4.8-3 Password verification

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

5. To upgrade the integrated screen software, click "LCD Upgrade" and wait for about 15 seconds, and then a prompt will appear saying that the upgrade is successful;

Figure 5.4.8-4 Software upgrade and restart interface

6. After the LCD integrated screen software is upgraded, click the "Restart" button to refresh the version and take effect; customers can upgrade the DSP and ARM according to actual conditions, 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 on the "System Upgrade" interface;

8. Click "DSP/ARM Upgrade" and wait for about 5 minutes before the upgrade is successful. The system upgrade is complete.

illustrate:

If the system has multiple modules, it is recommended to upgrade module 1 first, and then upgrade module 2 until all modules are upgraded.

Notice:

1. The upgrade may take some time. Please allow enough time to ensure that the upgrade process is not interrupted.

2. Choose a time when system usage is low to perform the upgrade to reduce disruption to your daily work.

0 6 Alarm and Maintenance

Terminology explanation:

Serial number	the term	explain
1	Fault	The equipment fails and the system stops running
2	Alerts	The output power of the equipment decreases or some functions fail due to external factors, but it does not affect the charging and discharging functions of the system.
3	Normal operation	Refers to the system that works every day
4	Interval operation	Refers to a system that does not run on a fixed monthly basis and cannot be guaranteed to work every day
5	Long time no use	Battery system that has not been started for more than 3 months

6.1 Alarm Processing

Fault alarm processing method table

Alarm/Fault	part	question	Solution
Flooding Fault	Battery compartment	Energy storage cabinet flooded	1. Check whether there is water accumulation inside the cabinet; 2. Confirm whether the distributed energy storage cabinet is leaking and whether the equipment inside the cabinet is intact.
Door sensor Alerts	Battery compartment	Energy storage cabinet door open	1. Check whether the cabinet door is completely closed. 2. Check whether the cable on the door magnetic sensor is disconnected. 3. Check whether the door magnetic sensor is offset.
Fire Fighting Fault	Battery compartment	Battery overheating or fire	1. Immediately press the EPO button and quickly move away from the energy storage cabinet; 2. Continue to observe for 30 minutes at 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.
Alarm/Fault	**part**	**question**	**Solution**
Lightning arrester alarm	Electrical Warehouse	Lightning arrester failure	1. Check whether the signal line of the lightning arrester is loose; 2. Check whether the indicator of the lightning arrester changes color; 3. Replace the AC lightning arrester.
Compressor alarm	air conditioner	1. Loose wiring 2. Compressor damage	1. Disconnect the power switch, open the air conditioner junction box, and check whether the wiring is loose; 2. Observe whether the compressor has obvious damage on the outside and whether there is a burning smell. If so, contact the manufacturer.

Outdoor fan alarm	air conditioner	1. The wiring is loose 2. The fan is damaged	1. Disconnect the power switch, open the air conditioner junction box, and check whether the wiring is loose; 2. Observe whether the fan is obviously damaged or has a burning smell. If so, please contact the service hotline.
Grid overvoltage /undervoltage fault	Power grid/diesel engine	Grid-connected side voltage is abnormal	Check whether the voltage on the grid side is abnormal;
Grid overfrequency /underfrequency fault	Power grid/diesel engine	Grid-connected side frequency is abnormal	Check whether the frequency on the grid-connected side is abnormal;
Island protection failure	Power grid/diesel engine	Grid-connected side voltage is abnormal	Check whether the voltage on the grid side is abnormal;
High/low voltage ride-through alarm	Power grid/diesel engine	Grid-connected side voltage is abnormal	Check whether the voltage on the grid side is abnormal;
Grid voltage unbalance fault	Power grid/diesel engine	Grid-connected side voltage is abnormal	Check whether the voltage on the grid side is abnormal;
Grid phase error	Power grid/diesel generator	The phase sequence on the grid side is wrong	Swap any two cables among ABC
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 abnormality	1. Check if the DC wiring is loose or abnormal; 2. Contact the manufacturer
Busbar half-voltage unbalance fault	Energy Storage Converter	1. Load imbalance 2. Software abnormality	1. Check if 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 whether the internal fan is operating normally; 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

			whether the internal fan is operating normally; 3. Contact the manufacturer
Balance bridge 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 whether the internal fan is operating normally; 3. Contact the manufacturer

Alarm/Fault	part	question	Solution
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 excess	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 rated value	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 communication network cable of the local controller is loose or abnormal;

Parallel/synchronous fault	Energy Storage Converter	Parallel/synchronous signal interruption	1. Check if the parallel cables are loose or abnormal; 2. Check if the parallel settings are abnormal; 3. The hardware circuit is damaged.
Relay open circuit /short circuit fault	Energy Storage Converter	Internal relay abnormality Software abnormality	1. Replace the energy storage converter module 2. Contact the manufacturer to replace the internal panel
Fan 1/2/3 alarm	Energy Storage Converter	Internal fan abnormality	1. Replace the energy storage converter module 2. Contact the manufacturer to replace the internal fan
Leakage current fault	Energy Storage Converter	1. Excessive leakage current 2. Software abnormality	1. Check if the leakage current Hall connection is loose or abnormal; 2. Check if the ground wire is disconnected;
Insulation impedance abnormality fault	Energy storage inverter/battery	Insulation to ground is low, software abnormality	1. Check if the AC and DC cables are damaged or short-circuited to the ground. 2. Check if the battery circuit is damaged or short-circuited to the ground.
Module missing Alerts	Energy Storage Converter	Module to screen Communication interruption	Check whether the communication network cable between modules is loose or abnormal;
Low DC voltage Alerts	Energy Storage Converter	Battery not turned on	Check if the battery is turned on;
Low voltage side one channel Secondary voltage low	Photovoltaic DC Converter	Photovoltaic voltage open circuit voltage is lower than 250V	Use a multimeter to measure the DC voltage of the positive and negative poles of the photovoltaic switch to see if it is greater than 250V.

Table 6.1

Warning: The above warnings and faults are common warnings or faults. If any fault other than that in Table 6.1 occurs, please contact the manufacturer directly.

6.2 System Maintenance

In order to ensure the long-term stable operation of the system, a corresponding maintenance plan needs to be formulated according to different environmental conditions.

1. Maintenance cycle

1. For energy storage systems installed in areas with severe dust, high salt fog or heavy industrial parks, it is recommended that the maintenance cycle be once a month, given the significant impact of environmental factors on the equipment.

2. For energy storage systems in areas with good climate, the impact of environmental factors on the equipment is relatively small, and the maintenance cycle can be appropriately extended to once every 3 months.

2. Inspection Content

Maintenance personnel need to conduct regular inspections according to the contents listed in Table 6.2, mainly including the following aspects:

1. Environmental check: Check the ambient temperature, humidity and dust conditions to ensure that the equipment operates in a suitable environment.

2. Equipment inspection: Check the internal components of the inverter to see if there is any aging phenomenon and discover potential problems in time.

3. Vibration monitoring: monitor the vibration of the equipment during operation to ensure stable operation of the equipment.

4. Troubleshooting: When a problem is found, handle it in a timely manner to ensure the normal operation of the system.

Notice:

1. Maintenance personnel should have relevant professional knowledge and skills to ensure the effectiveness of inspection and maintenance work.

2. According to different environmental conditions, adjust the maintenance cycle and inspection content to ensure stable operation of the equipment.

3. Establish complete maintenance records to facilitate analysis and improvement of maintenance work.

Maintenance Processing Table

Maintenance Object	action	Reference Standards
Cabinet	1. Check the appearance of the whole machine 2. Check the vents 3. Check the door locks	1. No obvious coating peeling, scratches or rust; 2. No obvious signs of water leakage; 3. No dust accumulation in the vents; 4. The door lock is not damaged

fan	1. Check the noise and vibration 2. Check the air hood	1. The fan rotates normally without jamming or abnormal noise. 2. The surface of the air outlet cover is clean and unobstructed.
PCS	1. Check the noise and vibration 2. Check the vents on the front panel 3. Check the contact surface of the rear copper bar	1. The fan on the front panel rotates normally without jamming or abnormal noise. 2. The surface of the vent on the front panel is clean and unblocked. 3. There is no corrosion or discoloration on the copper busbar and contact surface, and no dust accumulation.
STS	1. Check the noise and vibration 2. Check the vents on the front panel 3. Check the contact surface of the rear copper bar	1. The fan on the front panel rotates normally without jamming or abnormal noise. 2. The surface of the vent on the front panel is clean and unblocked. 3. There is no corrosion or discoloration on the copper busbar and contact surface, and no dust accumulation.
transformer	1. Check the appearance	1. The shell is clean, without obvious cracks, deformation, etc.

	2. Insulation test	2. The insulating material has no damage, discoloration or carbonization, and the insulation resistance is within the specified range.
electric	1. Check the lightning arrester 2. Check the circuit breaker and contactor 3. Check the contact surface of the cable copper bar	1. The lightning arrester, circuit breaker and contactor are normal . 2. The screw socket connection wires are not loose or falling off. 3. The copper bus and contact surface are not corroded or discolored, and there is no dust accumulation.

Table 6.2

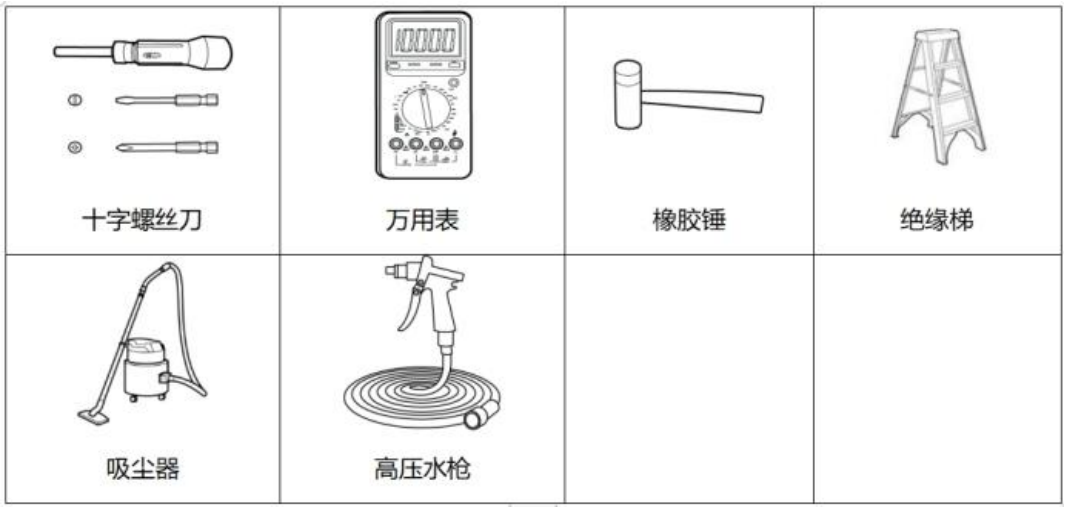
6.3 Cleaning

6.3.1 Preparation before cleaning

Notice:

Please prepare at least the following tools. If you do not have enough tools, maintenance may not be completed. The handles of tools such as Phillips screwdrivers need to be insulated, or insulated tools should be used.

Cleaning tools:



Protective tools:

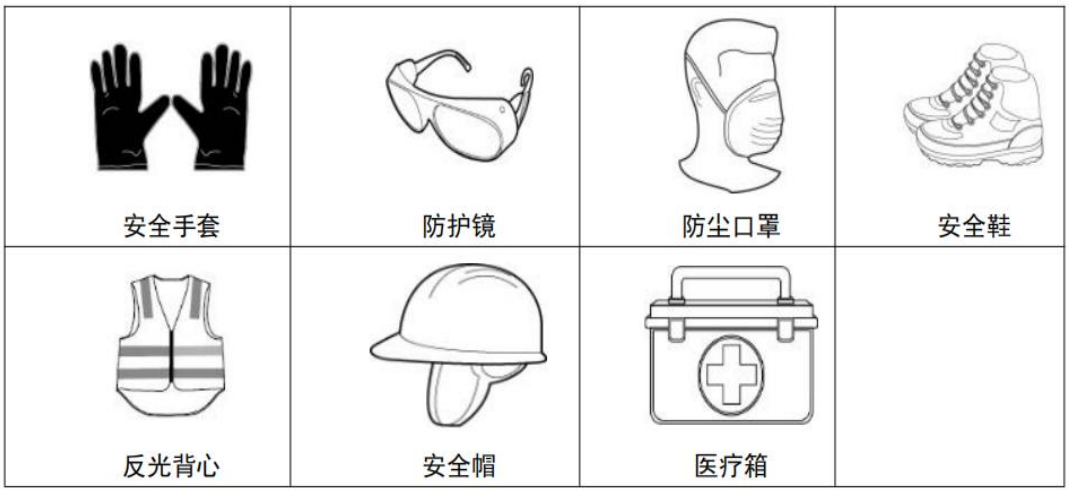


Figure 6.3.1

6.3.2 Cleaning and maintenance

Cleaning maintenance table

category	action	Reference Standards	Is the system powered off?
Cabinet	Clean the vents	1. No dust accumulation in the vents	yes

Cabinet	Cleaning dustproof cotton	1. No insects, rats, snakes or other animals can enter	yes
Cabinet	Flush appearance	1. The dustproof cotton has no obvious discoloration and debris	yes
Air outlet cover	Cleaning fan	1. The surface of the air outlet cover is clean and unobstructed; 2. The fan rotates normally without any jamming or abnormal noise.	yes
power distribution area	Check if there are any foreign objects in the power distribution area	1. The area is clean and free of foreign matter	yes
Note: In dusty areas, it is recommended to clean the filter every time a sandstorm occurs; it is recommended to clean the filter before summer; in other areas, ensure that the filter or condenser is not blocked according to			

actual conditions; the dustproof cotton can be used for up to 2 years. Recommended tools: high-pressure water gun.

Table 6.3.2

6.3.3 Operation steps

Step 1: Power off the system

1. Click "System Shutdown" on the touch screen switch interface;

2. Disconnect the system transformer pre-charging switch, auxiliary power switch, QF3 mains switch, QF1 load switch, QF4 DC switch, etc.;

4. Wait for the discharge to end, the touch screen to turn off, and the device to shut down;

5. Turn off the upper-level distribution switch of the system and hang a "Do Not Close" maintenance sign.

Figure 6.3.3-1

Step 2: Use special tools and keys to open the system cabinet door

Step 3: Disconnect the mains circuit breaker from the upper distribution box and hang a "Do Not Close" inspection sign

Use a multimeter to measure whether the device is still charged. Wait until the device is no longer charged before proceeding to the next step.

Figure 6.3.3-2

Step 4: Open the cabinet door, loosen the buckle of the dustproof cotton frame, remove the dustproof cotton, and place the aluminum alloy frame and dustproof cotton flat in a safe place

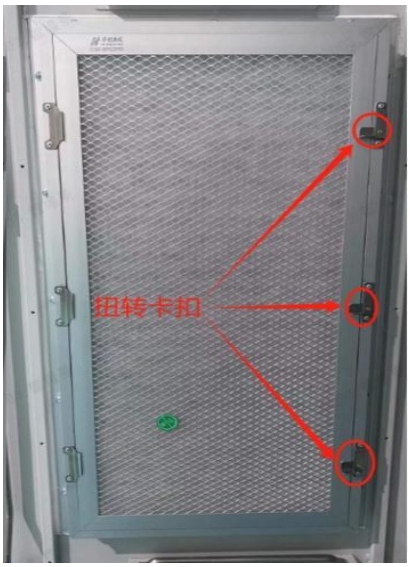


Figure 6.3.3-3

Step 5: Use a high-pressure water gun to rinse the dustproof cotton. If it is too dirty, use a detergent to clean it.

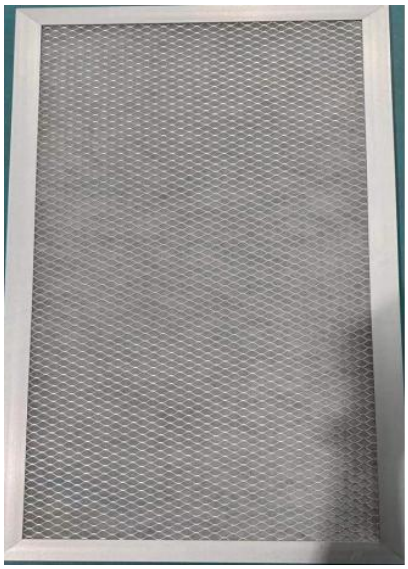


Figure 6.3.3-4

Step 6 Put the cleaned dustproof cotton into the aluminum alloy dustproof cotton frame and dry it, then fix it with a buckle

Step 7 Reboot

6.4 Warranty Service

6.4.1 Warranty Period

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

6.4.2 Warranty Scope

During the warranty period, if the product is caused by quality problems, our company will repair or replace the product for free. Customers should reserve a reasonable response time for our company's repair, and the replaced product will be handled by our company. Customers need to show relevant proof of purchase of the product and ensure that the product trademark is clearly visible, otherwise our company has the right to not provide warranty guarantee.

6.4.3 Disclaimer

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

1. The warranty period has expired;

2. Failure to provide relevant proof of product purchase;

3. Damage caused during transportation, loading and unloading;

4. Damage caused by improper installation, modification or dismantling by unauthorized personnel;

5. Damage caused by operation under abnormal conditions or environment;

6. Machine failure or damage caused by using non-Natong parts or software;

7. Failures caused by force majeure such as fire, earthquake, flood, etc.