BSL New Energy Technology Co., Ltd

ESS-GRID Cabinet

User Manual

Commercial and Industrial Energy Storage Cabinet

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Catalog

01 Safety Instructions

1.1 Description of safety symbols

When installing, operating and maintaining the equipment, please read this manual first and follow the identification of the equipment and all safety precautions in the manual. In order to ensure that users can better use this product and protect personal and property safety, please read the following symbolic tips carefully.

Danger: Indicates a situation with a high potential danger, which will lead to death or serious injury if not avoided.

Warning: Indicates moderate potential hazard if a situation that could result in death or serious injury is not avoided.

Caution: Indicates a low potential danger, which may lead to moderate or mild injury to people if failed to be avoided.

Description: The emphasis and supplementation of the content may also provide tips for optimal use of the product.

1.2 General safety

Description:

This equipment should be used in an environment that meets the requirements of design specifications, otherwise it may cause equipment failure, resulting in abnormal equipment function or component damage, personal safety accidents, property losses, etc. are not within the scope of equipment quality assurance. Local laws, regulations and specifications shall be observed when installing, operating and maintaining the equipment. The safety precautions in the manual are intended only to supplement local laws, regulations and norms. The Company shall not be liable in the event of any of the following circumstances.

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

2. Do not run under the conditions of use described in this manual.

3. Disassemble, change the product or modify the software code without authorization.

4. Failure to operate according to the operating instructions and safety warnings in the product and documents.

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

6. Damage caused by the customers failure to comply with transportation and installation requirements.

7. Damage caused by storage conditions that do not meet the requirements of product documentation.

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

9. System damage caused by third-party or customer reasons, including damage caused by relocation and installation of systems that do not meet the requirements of this manual, and adjustment, change or removal of identification signs that do not meet the requirements of this manual.

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

Danger:

There is a high voltage in the equipment, and irregular operation may cause electric shock or fire, resulting in death, serious personal injury or serious

property damage. Please follow the operation sequence and safety precautions given in this manual and other relevant documents, and specify the operation:

1. Please check that the pre-installed cable connection of the equipment is fastened. Check the equipment for damage, such as holes, depressions, or other signs of possible internal damage. Check that the components inside the equipment are not displaced, and it is forbidden to change the structure and installation sequence of the equipment without authorization.

2. It is forbidden to clean electrical parts inside the equipment with water. When liquid is found to enter the equipment, please press the emergency stop switch immediately and notify the site management personnel.

3. Live installation, wiring, maintenance and replacement are prohibited. Before contacting any conductor surface or terminal, the voltage at the contact point should be measured, and at the same time, it should be confirmed that the protective ground wire of the equipment or parts requiring maintenance is reliably grounded, and there is no risk of electric shock.

4. Except for those operating the equipment, other personnel should not approach the equipment. Please do not power on the equipment if the equipment has not been installed or confirmed by a professional. At least two personnel must be guaranteed at the site during the first power-up or live operation of the main circuit.

Description

1. The users operating behavior and operating tools during transportation, handling, installation, wiring and maintenance must meet the laws, regulations and relevant standards of the country and region where they are located.

2. During installation, operation, and maintenance, it is necessary to clean the accumulated water, ice, snow or other debris on the top of the cabinet first, and then open the cabinet door to prevent the debris from falling into the cabinet.

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

1.3 Electrical safety

1.3. 1 Cabling Requirements

1. Please select a cable that meets the requirements of local laws and regulations. Cables of the same kind should be tied together, and cables of different kinds should be laid separately, and it is forbidden to entangle or cross-lay with each other.

2. If the wiring is completed or you leave for a short time during the wiring process, you need to immediately block the cable port 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 have specifications that meet the requirements. The position of the cable pipe or hole must be protected to prevent the cable 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 for reliable fixation. The cables in the backfilled soil area should be tightly fitted to the ground to prevent the cables from being deformed or damaged by stress during backfilling soil.

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

6. In order to ensure the safety of construction, all cables should be laid and installed above 0 ℃. When handling cables, especially when working in a low-temperature environment, they should be handled carefully.

1.3. 2 Grounding requirements

1. It is forbidden to destroy the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, the electrical connections 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 when the grounding conductor is not installed. When installing the 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 finally.

1.3. 3 Maintenance requirements

1. Before connecting or removing the cable, the protection switch of the corresponding circuit must be disconnected.

2. Use a multimeter with the corresponding voltage level to check whether it is live and ensure that the equipment has been completely powered off.

3. If there is a live body nearby, please use an insulating board or insulating tape to shield or wrap it.

4. After reliably connecting the circuit to be repaired with the grounding circuit using the grounding wire, carry out operation and maintenance.

Description:

1. Before connecting the cable, you must confirm that the cable label is correctly marked before connecting.

2. 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 down.

3. After the maintenance is completed, disassemble the grounding wire between the maintenance circuit and the grounding circuit.

1.4 Mechanical safety

Note:

1. When forking without a wooden box, the bottom coaming must be removed. Takeoff and landing need to be handled gently to avoid impact or vibration.

2. During transportation, the center of gravity of the box should fall between the two forks on the forklift. It is forbidden to carry it over a long distance or to invert or tilt it.

3. When transporting the equipment, the sight of the operator may be obscured due to the large size of the equipment, so auxiliary personnel need to be arranged to assist in completing it.

4. In order to ensure the safety of drilling outside the equipment body, a suitable location should be selected before drilling to ensure that short circuit and other effects will not be caused. During the drilling process, the equipment should be shielded to prevent debris from falling into the equipment, and the debris should be cleaned in time after drilling.

5. When carrying equipment by hand, you should be prepared for load-bearing, and wear protective gloves, anti-smashing shoes and other safety protective equipment.

6. Move the equipment carefully during equipment handling to avoid impact or falling. Avoid scratching equipment surfaces, damaging parts or cables.

1.5 Battery safety

Description

The Company is not responsible for damage to the batteries supplied by the Company for the following reasons:

1. Failure to charge and accept the battery in time due to customer reasons, resulting in expired storage, capacity loss or irreversible damage, etc.

2. Mechanical damage, leakage, rupture, etc. caused by drop due to improper operation or failure to connect the battery as required.

3. Customers or third parties do not know the company and change the battery usage scenario on their own. Including but not limited to: connecting

additional loads to the battery by yourself, mixing with other brands of batteries, mixing with batteries of different rated capacities, etc.

4. Direct damage to the battery caused by the field equipment operating environment or external power parameters that cannot meet the environmental requirements of normal operation. Including the actual operating temperature of the battery being too high or too low, the power grid is in bad condition and frequent power outages, etc.

5. The customer fails to set the battery operation management parameters correctly or maintains them improperly, resulting in frequent battery over-discharge, customer on-site capacity expansion or long-term inability to fully charge, etc.

6. The customer fails to properly maintain the battery according to the supporting equipment operation manual, including but not limited to: failing to regularly check whether the battery terminal screws are tightened, etc.

7. The battery was stolen and lost.

8. Batteries that have exceeded the warranty period.

Danger:

1. Do not expose the battery to high temperature environments or around heating equipment, such as sunlight, fire sources, transformers, heaters, etc. Overheating of the battery may cause fire and explosion.

2. It is forbidden to disassemble, modify or destroy the battery (such as inserting foreign objects, immersing it in water or other liquids, etc.) to avoid causing battery leakage, overheating, fire or explosion.

3. Battery thermal runaway will produce combustible gases, as well as harmful gases such as CO and HF. The accumulation of combustible gas generated after the thermal runaway of the battery poses the risk of deflagration and explosion, which may cause personal injury and property damage.

4. When installing and maintaining the battery, the exposed cable terminals on the battery need to be wrapped with insulating tape. At the same time, avoid foreign objects (such as conductive objects, screws, liquids, etc.) entering the battery and causing short circuits.

Warning:

1. Batteries must be stored in a separate warehouse and in outer packaging to avoid mixed storage with other materials, avoid open storage, and avoid battery stacking too high. The site must be equipped with fire-fighting facilities that meet the requirements, such as fire-fighting sand, fire extinguishers, etc.

2. The battery should avoid impact. When handling the battery, it should be carried in the direction required by the battery, and it is forbidden to invert or tilt it.

3. 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 operating temperature, charging is prohibited to avoid internal short circuit of the battery caused by crystallization due to low-temperature charging.

4. Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as domestic garbage.

5. If the battery has been charged for more than 8 months, the battery needs to be recharged. If the battery is not recharged as required, the performance and service life of the battery may be affected.

Battery abnormality handling measures

Danger:

1. When electrolyte leaks or has an abnormal smell, avoid contact with the leaked liquid or gas. Please do not approach non-professionals, please contact professionals immediately.

2. The electrolyte is corrosive, and contact may cause skin irritation and chemical burns. In case of contact with battery electrolyte, the contact area needs to be cleaned immediately with plenty of water and soap, and medical help is sought immediately.

3. After the battery is dropped (regardless of whether it is packaged or not), it is forbidden to continue to use it. If the appearance is not obviously deformed or damaged, and there is no obvious odor, smoke or fire, transfer the battery to

an open and safe place for 1 hour before processing on the premise of ensuring safety, and contact our service engineer.

4. When there is obvious peculiar smell, damage, smoke or fire after the battery falls, people 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

Warning:

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

2. Before taking out the parts from the cabinet, please confirm that other parts on the cabinet are not loose.

3. During equipment maintenance, insulating materials should be used to cover nearby live parts.

4. Before the fan is powered off and stops rotating, any items are prohibited from touching the running fan (such as fingers, parts, bolts, etc.).

5. Do not power on the equipment before troubleshooting.

6. During live inspection of the system, you should pay attention to the danger warning signs on the equipment and avoid standing at the cabinet door.

7. Equipment other than the battery pack must wait 15 minutes after powering down to ensure that the equipment is out of power before operating the equipment.

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 the related operations of maintenance and replacement, the cabinet door should be locked in time and the key should be properly kept.

02 Product Introduction

2.1 Overview of energy storage system

A single 241kWh industrial and commercial energy storage battery integrated cabinet is an energy storage unit, which consists of 15 battery packs and a high-voltage box, as well as a 125kW PCS, two 50kW DC, a 150kW STS, a 100kVA transformer, etc. Each Pack is composed of 16 battery cells connected in series, and the rated capacity of the battery cells is 314Ah, the high-voltage box contains the battery cluster management unit and some protection, control and other electrical components, which are used to manage and protect the operating status of the entire battery cluster. The integrated cabinet adopts a separate design of the battery compartment and the electrical compartment, which is convenient to install and maintain.

2.2 Model description

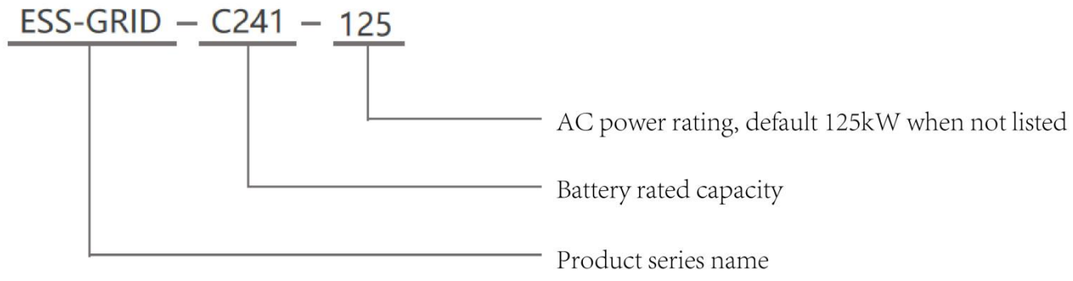


Figure 2.2-Model Description

Note: Isolation transformer, STS parallel off-grid switching, and DC power module are optional components. The rated output power and battery

capacity can be flexibly configured according to project needs.

2.3 Product functions

The integrated energy storage cabinet integrates energy storage battery, modular STS, modular PCS, modular DC/DC converter, energy management monitoring system, power distribution system, environmental control system and fire control system, etc. The modular PCS is adopted to facilitate maintenance and expansion. The industrial and commercial storage integrated cabinet adopts pre-maintenance, which can reduce the floor space and maintenance channels. It has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency and intelligent management.

Under common application scenarios, the operation strategies of energy storage systems are as follows:

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

2.Combination of photovoltaic and storage: real-time acquisition of local load power, priority of photovoltaic power generation for self-use, and storage of surplus power; if the photovoltaic power generation is insufficient to provide local load, batteries will be preferred to store power.

2.4 Product features

1. System productization, integrating energy storage batteries, modular PCS, modular STS, modular DC/DC converters, energy management monitoring systems, power distribution systems, environmental control systems and fire control systems, etc., to fully control the system operation status and risks;

2. Equipped with rack-mounted modular PCS, which supports multi-machine parallel connection and has good scalability; the number of PCS modules and total battery power can be selected according to the system capacity requirements of microgrid and other scenarios. Typical configurations are: 125kW/200 kWh, 125kW/215 kWh, 125kW/225 kWh, and 125kW/241kWh.

3. Protection level IP54, which can perfectly cope with various types of outdoor weather;

4. The door-mounted embedded integrated air conditioner is adopted, which does not occupy cabinet space, increases the available space of outdoor cabinets, has better structural integrity at the top and good waterproof effect;

5. The local control panel can realize diversified functions such as system operation monitoring, energy management strategy formulation, and remote equipment upgrade.

2.5 C241 Product Appearance

Figure 2.5-Product Appearance

2.6 Communication topology diagram

Industrial and commercial energy storage communication topology (integrated cabinet)

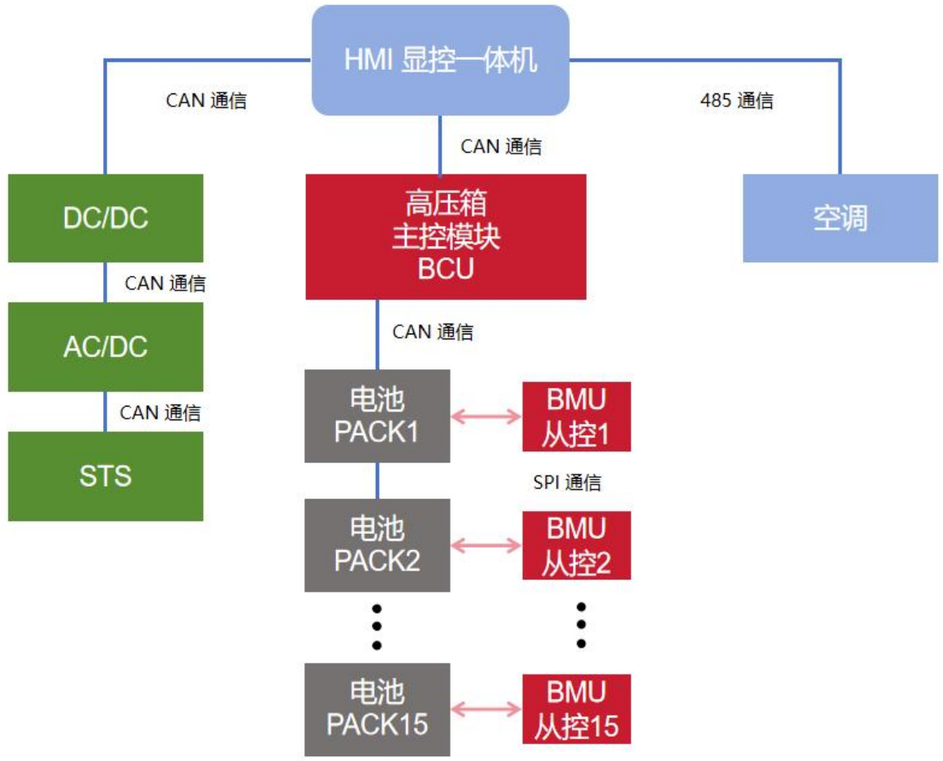


Figure 2.6-Communication topology diagram

Note: Figure 2.6 shows the system solution with battery management system and energy management system. Different projects have different configurations and slightly different communications. Actual shipments shall prevail.

2.7 Electrical wiring diagram

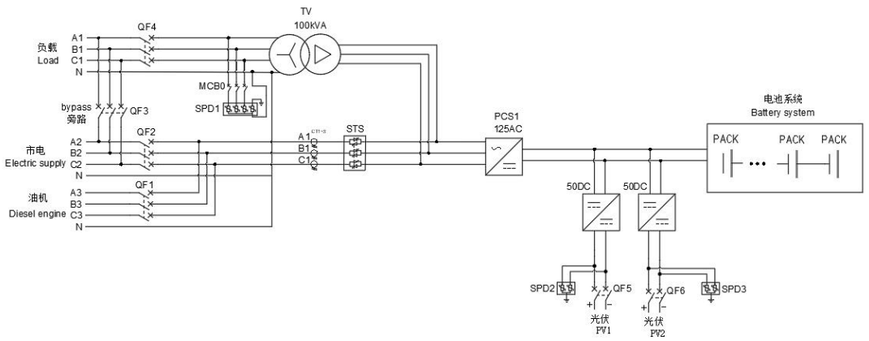


Figure 2.7-Electrical primary diagram

Note: Figure 2.1 shows the system solution with off-grid, isolation transformer, and photovoltaic input. Different projects have different configurations and slightly different lines. Actual shipments shall prevail.

2.8 Product parameters

C241 industrial and commercial energy storage battery integrated cabinet technical parameter table

Serial No.	Project	Parameter	Remark
	Battery parameters		
1	Battery Type	LFP	Lithium iron phosphate
2	Battery cell specifications	3.2 V/314Ah	
3	System grouping method	1P * 16S * 15S	
4	Rated energy	241kWh	
5	Rated voltage	768V	
6	System voltage range	672V-864V	
7	Maximum charge and discharge current	157A	
19	Cooling method	Intelligent air cooling	
	AC side parameters		
20	Rated AC power	125kW	PCS
21	Maximum AC power	137kW	PCS
22	Rated AC current	181A	PCS
23	Maximum AC current	199A	PCS
24	Rated AC voltage	400Vac	PCS
25	Wiring mode	3W + PE/3W + N + PE	PCS
26	Rated AC frequency	50/60 ± 5 Hz	PCS
27	Current total harmonic distortion rate	< 5% (rated power)	THDI
28	Total harmonic distortion rate of voltage	< 3% (linear load)	THDU
29	Power factor	-1 lead ~ +1 lag	
30	Cooling method	Intelligent air cooling	
	DC side parameters		
31	DC side voltage range	625 ~ 950V (three-phase three-wire)/670 ~ 950V (three-phase four-wire)	PCS
32	DC side maximum current	200A	PCS
33	Photovoltaic power rating	100kW	DC/DC
34	Photovoltaic DC voltage range	312 ~ 500V	Low pressure side
Serial No.	**Project**	**Parameter**	**Remark**
35	Photovoltaic maximum current	160 * 2A	
	System parameters		
36	Level of protection	IP54	
37	Level of protection	I	
38	Isolation method	Transformer isolation: 100kVA	
39	Power consumption during shutdown	< 100W	No transformer included
40	Show	Touch LCD touch screen	
41	Relative humidity	0~95%	No

			condensation
42	Noise	Less than 78dB	
43	Ambient temperature	-25℃~60℃	Derating above 45 ℃
44	Cooling method	Intelligent air cooling	
45	Altitude above sea level	2000m (over 2000m derating)	
46	BMS Communications	CAN	
47	EMS Newsletter	Ethernet/485	
48	Size (W * D * H)	1850 * 1100 * 2300mm	
49	Weight (including battery approx)	3090kg	

Table 2.8

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

Figure 2.8

2.9 Component Introduction

2.9. 1 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 comes with a 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 single cell information inside the battery box, uploads the data to the BCU, and at the same time completes the balancing between the single 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 the detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, calculates and corrects the SOC, is responsible for the pre-charging and standby and charging and discharging management of the battery cabinet, and uploads relevant data to EMS.

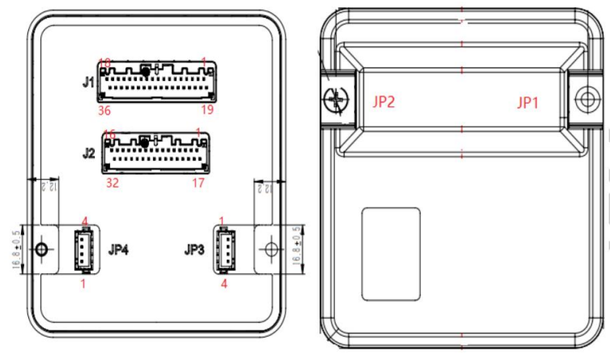


Figure 2.9. 1-1 BMU

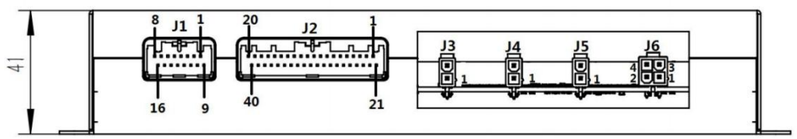


Figure 2.9. 1-2 BCU

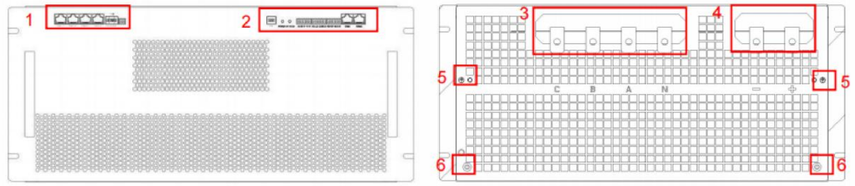
2.9. 2 Electrical system

2.9. 2.1 Energy storage converter power (PCS) module

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

Model	BSL-125AC
Rated power	125kW
Maximum power	137kW
DC operating voltage range	580 ~ 1000V (three-phase three-wire)/670 ~ 1000V (three-phase four-wire)
Model	**BSL-125AC**
DC side full load voltage range	625 ~ 950V (three-phase three-wire)/670 ~ 950V (three-phase four-wire)
Maximum direct current	200A
Rated AC voltage	400Vac, 3W + PE/3W + N + PE
Rated frequency	50/60 Hz, (± 5 Hz)
Rated AC current	180A
Overload capacity	110%, normal operation; 120%, 1 minute
Current distortion	< 5% (rated power)
Power factor adjustment range	-1 lead ~ +1 lag
With unbalanced load capacity	100%
Adapt battery	Lithium battery/lead acid/photovoltaic module
Charging method	According to BMS instruction/three-stage/MPPT
Working mode	Constant current, constant power, MPPT, AC voltage source, DC voltage source
Maximum efficiency	98.20%
Size (W * D * H)	520 * 750 * 265mm
Weight (approx.)	68kg
Isolation method	Non-isolated
Level of protection	IP20
Operating Temperature	-25 ℃ ~ + 60 ℃ (> 45 ℃ derating)
Relative humidity	0 ~ 95% (non-condensation)
Cooling method	Intelligent air cooling
Model	**BSL-125AC**
Noise	< 75dB
Altitude above sea level	3000m (> 3000m derating)
Communication interface	CAN

Table 2.9. 2.1



1. Parallel port 2.Signal port 3.AC port 4. DC port 5.Ground port 6.Guide post
Figure 1-2 125kW Energy Storage Power Module (Front, Rear)

Figure 2.9. 2.1-PCS

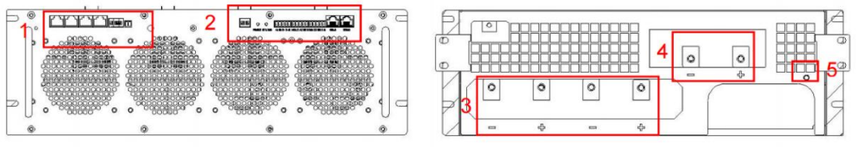
2.9. 2.2 DC Converter Power (DC/DC) Module

Optical storage systems for islands, mountainous areas, border posts and other remote areas or areas with unstable power supply, or newly built zero-carbon science and technology parks. Users can configure DC converter power modules according to project needs to charge batteries through DC coupling to realize an integrated power supply system of photovoltaics and energy storage. The DC converter power module parameters are as follows:

Model	BSL-50DC
Rated DC power	50kW
Maximum DC power	55kW
Model	**BSL-50DC**
DC operating voltage range	200V ~ 950V
Full load voltage range on low voltage side	345V ~ 900 V

Maximum current on low voltage side	80A * 2
Number of input circuits on low voltage side	2 (2 channels can be independent, 1 channel can be connected in parallel)
High voltage side full load voltage range	500V ~ 950 V
Maximum DC current on high voltage side	110A
Number of input circuits on high voltage side	1
Working mode	Constant voltage, constant current, constant power, MPPT
Maximum conversion efficiency	98.80%
Size (W * D * H)	483 (excluding mounting ear 444) * 600 * 150mm
Weight (approx.)	30 kg
Isolation method	Non-isolated
Level of protection	IP20
Operating Temperature	-25 ℃ ~ + 60 ℃ (> 45 ℃ derating)
Relative humidity	0 ~ 95% (non-condensation)
Cooling method	Forced air cooling
Noise	< 70dB
Altitude above sea level	3000m (> 3000m derating)
Communication interface	RS485/CAN (optional)

Table 2.9. 2.2



(1) Parallel Interface (2)Signal port (3)Low voltage side interface (4) High voltage side interface (5) Grounding port

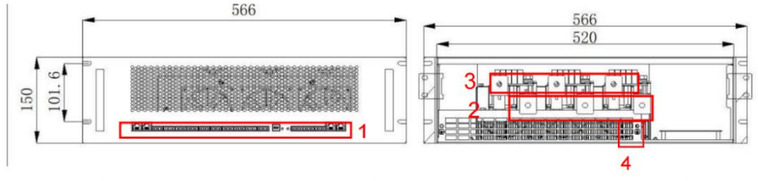
Figure 2.9. 2.2-DC

2.9. 2.3 STS and off-grid switching module

For areas where the power grid is unstable and power is often cut off, users can configure STS modules according to project needs, and realize functions such as seamless switching and automatic control off-grid through STS. The STS module parameters are as follows:

Model	BSL-150STS
Rated power	150kW
Maximum power	165kW
Rated AC voltage	400Vac, 3W + N
Rated frequency	50/60 Hz (± 5 Hz)
Rated AC current	216A
Switching time	< 10ms
Maximum efficiency	99%
Dimensions (W * D * H)	483 (excluding mounting ear 444) * 600 * 150mm
Weight (approx.)	25kg
Model	**BSL-150STS**
Level of protection	IP20
Operating Temperature	-25 °C °C ~ + 60 °C (> 45 °C derating)
Relative humidity	0-95% (non-condensation)
Cooling method	Intelligent air cooling
Noise	< 70dB
Altitude above sea level	3000m (> 3000m derating)
Communication interface	CAN

Table 2.9. 2.3



(1) Signal port (2) Grid connector (a, b, c from left to right) (3) PCS connector (A, B, C from left to right) (4) Ground hole

Figure 2.9. 2.3-STS

2.9. 2.4 Three-phase isolation transformer

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

Model	MTFI-3100A
Rated power	100kVA
Model	**MTFI-3100A**
Size (W * D * H)	600 * 410 * 670mm
Insulation grade	H
Connection group	Dyn11
Primary side input voltage	400V
Primary side input current	144A
Rated frequency	50Hz
Secondary side output voltage	400V
Secondary side output current	144A
Overload capacity	110%
Cooling method	Dry self-cooling
Efficiency	> 97.5%
Noise	≤ 65 dB

Table 2.9. 2.4

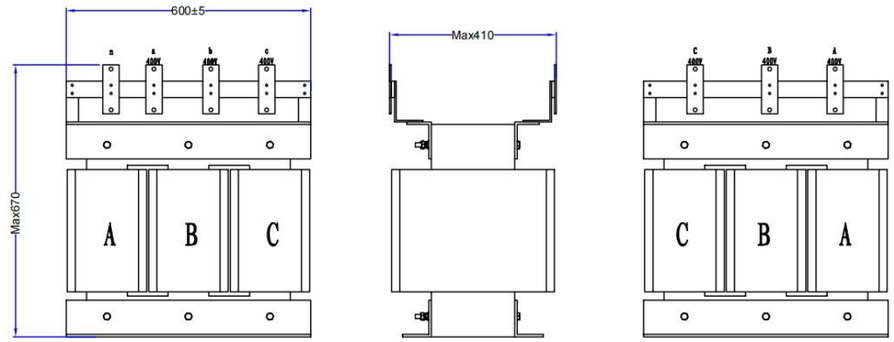


Figure 2.9. 2.4-Transformers

2.9. 3 Environmental monitoring system

2.9. 3.1 Air-cooled air conditioners

How it works:

① Refrigeration: When the temperature in the cabinet is higher than the refrigeration set point plus the refrigeration deviation, start refrigeration; Stop cooling when the cabinet temperature falls below the cooling set point.

② Heating: When the temperature in the cabinet is lower than the heating set point, start heating; When the cabinet temperature is higher than the heating set point plus the heating deviation, the heating is stopped.

③ Dehumidification: When the humidity in the cabinet is greater than the dehumidification opening humidity (default 80%, range 50 ~ 99%), and the temperature in the cabinet is lower than the dehumidification opening temperature (default 25 ℃, range 20 ~ 40 ℃), turn on electric heating dehumidification; When the temperature in the cabinet rises to the dehumidification stop temperature (default 30 ℃, range 25 ~ 50 ℃), or the humidity falls back to the dehumidification stop humidity (default 75%, range 50 ~ 99%), stop heating.

Model	AC3000P
Electrical parameters	

Rated current	5A
Rated operating frequency	50Hz
Size (H * W * D)	1350 × 550 × 250mm
Weight	63kg
Level of protection	IP54
Model	**AC3000P**
Refrigeration capacity	3000W
Heating capacity	2000W
Air volume	850 m ³/h
Noise	< 70dB
Refrigeration	
Refrigeration opening point	Default 25 ℃ (setting range: 16 ~ 38)
Cooling deviation	Default 6 ℃ (setting range: 1 ~ 10)
Heating	
Heating opening point	Default 5 ℃ (setting range: 5 ~ 26)
Heating deviation	Default 10 ℃ (setting range: 1 ~ 10)
Dehumidification	
Dehumidification opening temperature	Default 25 ℃ (setting range: 20 ~ 40)
Dehumidification stop temperature	Default 30 ℃ (setting range: 25 ~ 45)
Dehumidification on humidity	Default 80% (setting range: 50 ~ 99)
Dehumidification stop humidity	Default 75% (setting range: 45 ~ 95)
Alarm function	
High temperature alarm in cabinet	30 ℃ ~ 60 ℃ (settable)
Low temperature alarm in cabinet	-45 ℃ ~ 10 ℃ (settable)
High humidity alarm in cabinet	0% ~ 100% (settable)
Note: Actual parameters are set according to customer requirements before leaving the factory.	

Table 2.9. 3.1

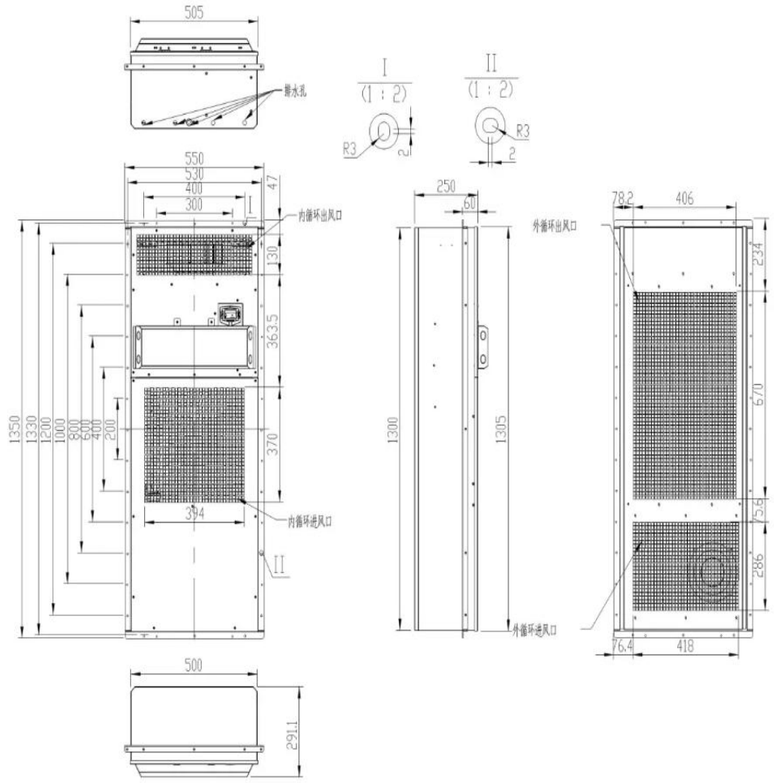


Figure 2.9. 3.1-Air-cooled air conditioners

2.9. 3.2 Access control switches

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

Name	Parameter
Rated load	5A/250VAC
Name	**Parameter**
Operating speed	5mm-50cm/s
Operating frequency	Machinery; 120 times/min Electrical: 30 times/min
Insulation resistance	100mΩ or more

Contact resistance	25mΩ initial value
Dielectric withstand voltage	Disconnected 1000VAC 1500VAC between terminals
Vibration	Misoperation 10-55Hz complex amplitude
Shock	Durability 1000 m/s ² Misoperation 300m/s ³
Longevity	Electrical: More than 100,000 times Mechanical: More than 1,000,000 times
Level of protection	IP65
Use Temperature	-20~+60℃
Use humidity	<85%

Table 2.9. 3.2

Note:

1. Do not disassemble the access control switch by yourself to avoid more serious damage or safety risks.

2. Do not carry out abnormal forced door closing or door opening.

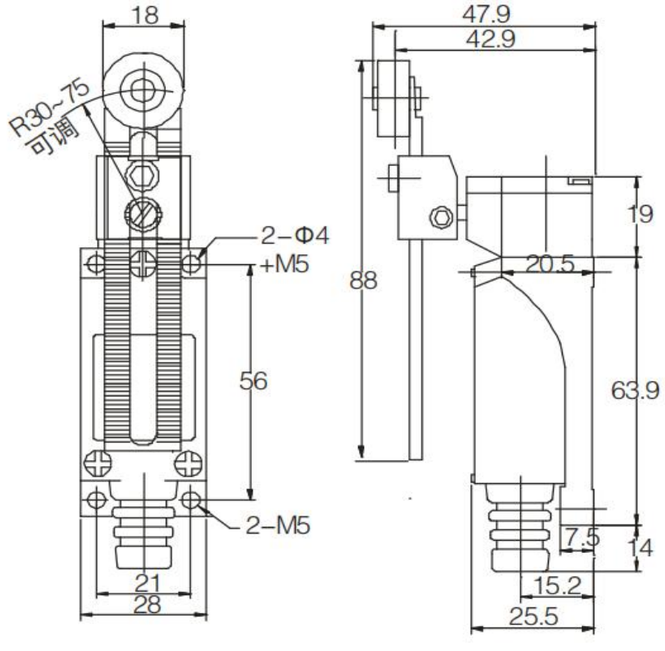


Figure 2.9. 3.2-Access Control

2.9. 3.3 Temperature and smoke detectors

Smoke detectors and temperature detectors are used to detect the smoke concentration and temperature of the current environment respectively.

Name	Parameter
Operating voltage	DC12/24V (allowable range 9V ~ 28 V)
Operating current	Quiescent current: ≦ 0. 6 mA Alarm current : 10 mA ≦ I ≦ 50 mA
Indicator light	It flashes during monitoring, and the alarm often lights up
Operating Temperature	-10℃ ~ +55℃
Name	**Parameter**
Relative humidity	≤ 95% RH (non-condensation)
Smoke sensitivity	0.2 ~ 0.3 dB/m (smoke detector)
Alarm temperature level	A2R (temperature detector)
Level of protection	IP32
Overall dimensions	φ 100 × 43 mm
Relay contact output capacity	Normally open, 1A @ 30VDC
Weight	120g
Shell material and color	ABS, white
Terminal block material	Copper nickel plated, stainless steel

Table 2.9. 3.3

Figure 2.9. 3.3-Temperature Smoke Detector

2.9. 4 Fire protection system

The aerosol fire extinguishing device used in the fire protection system is a new type of environmentally friendly fire protection product with the world's advanced level. Working principle: When a fire occurs, after the fire extinguishing device receives the electric start signal or the open flame ignites the thermal wire, the electric trigger or thermal wire burns and activates the aerosol generating agent in the fire extinguishing device. The aerosol generating agent decomposes the chemical coolant through the heat released by the oxidation-reduction reaction, so that the aerosol generating agent and coolant can participate in the fire extinguishing together.

Model	QRR0.3G/S
Start mode	Hot start (optional electric start, or hot start with electric start)
Passive switching feedback signal	Passive switching signal "normally open on standby, normally closed after starting (started after greater than 80 ℃)"
Protect space	≤ 3 m ³
Weight of medicament	300g
Equipment Weight	860 ± 30 g
Spray time	≤ 14s
Overall dimensions	46 * 68.5 * 255mm
Nozzle temperature	Distance spout ≤ 200 ℃ at 5mm
Ejection lag time	≤ 5s
Actual extinguishing efficiency	100g/m ³ ~ 130g/m ³
Operating environment temperature range	-50℃~+90℃
Operating environment temperature range	160℃~+180℃
Expiration date of use	10 years

Table 2.9. 4

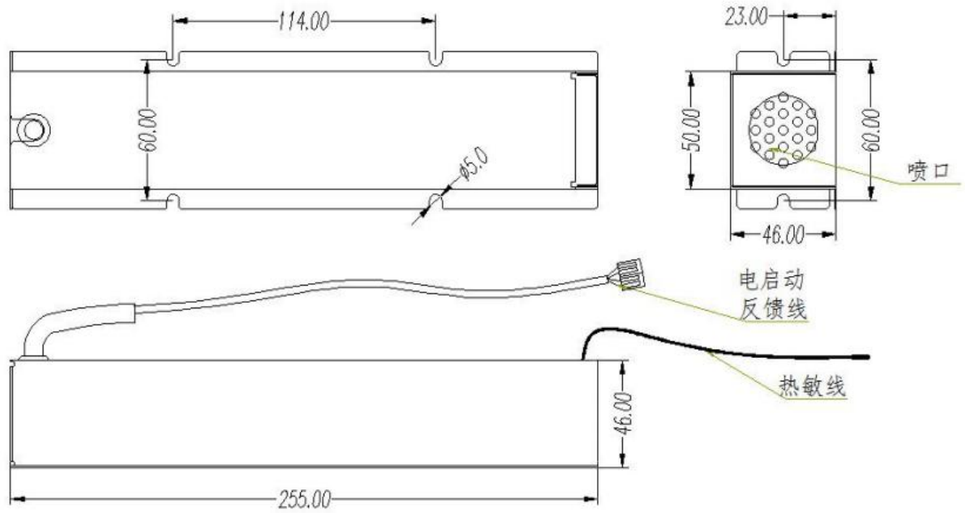


Figure 2.9. 4-Fire fighting installations

2.9. 5 Local management system

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

The product integrates human configuration screen (HMI), port control and communication, system parameter and operation strategy setting functions to realize the monitoring and management of energy storage systems. Product hardware resources and parameters are as follows:

Product model	Lotus-ESS
Power input	DC 12V
Output control	3-way isolated output switching value
Product model	**Lotus-ESS**
Input control	6-way isolated input switching value
Serial communication	2-way isolation RS232, 4-way isolation RS485
Fieldbus	2-way CAN bus interface

Ethernet port	1 channel 10/100 M Ethernet port (RJ45)
Extended storage	1 U disk port, 1 SD card port
Acoustic alarm	1 controllable buzzer
Program Characterization	1 Operation Indicator, 1 Status Indicator, 1 Alarm Indicator
Anomaly characterization	1 hardware watchdog timer
Real time clock	1 set of RTC real-time clocks

Table 2.9. 5

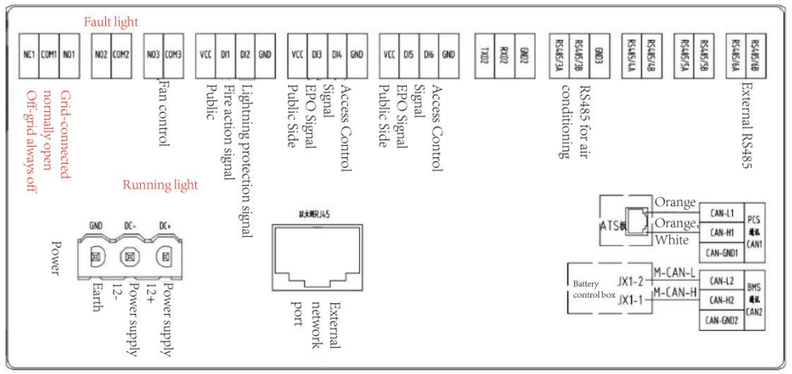


Figure 2.9. 5-HMI

2.10 Configuration Checklist

ESS-GRID C241 Overall Configuration Checklist

Name	Model	Unit	Quantity	Remark
Battery system	314Ah, 241kWh	Set	1	With control box
Energy storage converter	BSL-125AC	Unit	1	Modularity
DC converter Power module	BSL-50DC	Unit	2	Modularity
STS and off-grid Switching module	BSL-150STS	Unit	1	Modularity
Air conditioning system	AC3000P 220 ± 15% VAC ~ 50Hz	Set	1	Intelligent air cooling
Fire protection system	QRR0.3G/S	Set	1	Thermo-sensitive wire
Three-phase isolation Transformer	MTFI-3100A	Unit	1	Dyn11
Auxiliary system	Access control, power distribution, etc.;	Set	1	Auxiliary Supporting equipment
Management System	Lotus-ESS	Set	1	By BMS and EMS Composition

Table 2.10

Note: The actual supply configuration shall prevail.

03 Installation, Transportation and Storage

3.1 Packaging and storage

3.1. 1 Product packaging

In order to make the products in a better protective state during transportation, specific wooden boxes are used for packaging. The following basic parameters (including but not limited to) are included on the equipment packaging, which need to be carefully checked according to the project requirements:

Parameter	Description
Model	Product model
Dimensions	Dimensions after product packaging

Weight	Total weight of product after packaging
Identification	Face up, handle carefully, position of center of gravity, etc

Table 3.1. 1

Figure 3.1. 1-Schematic diagram of packaging

3.1. 2 Product storage

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

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

Table 3.1. 2

3.2 Transportation and handling

3.2. 1 Product shipping

1. In order to keep the equipment in a better protective state, it is recommended to use packaged transportation;

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

3. Energy storage batteries are not recommended for railway or air transportation. Speed limit requirements for land transportation: 80km/h on smooth roads and 60km/h on rugged roads. If there is any conflict, please refer to local traffic regulations.

3.2. 2 Product handling

1. When using a forklift to move, ensure that the forklift has sufficient load capacity, and pay attention to the fact that the center of gravity of the equipment should fall between the feet of the forklift to prevent personal injury and equipment damage;

2. With battery transfer, the load-bearing capacity of the forklift needs to be ≥ 3 t; Without battery transfer, the load-bearing capacity of forklift needs to be ≥ 1. 5t;

3. It is recommended that the length of the fork knife is ≥ 1. 5m, the width is 80cm ~ 160cm, and the thickness is 25mm ~ 70mm.

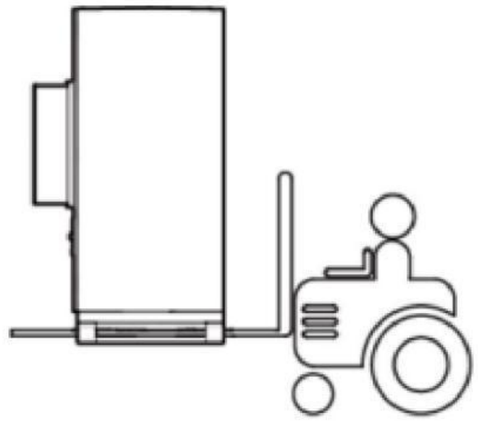


Figure 3.2. 2-Handling Schematic

3.3 Installation environment

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

1. The horizontal level of the installation location should be higher than the highest water level in the history of the area. The distance from airports, landfills, river banks or dams should be ≥ 2km.

2. Choose a well-ventilated place. Do not block the air vents and heat dissipation system while the equipment is running to prevent high-temperature fire. 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.

3. The installation location is far away from the fire source, and does not place flammable or explosive items around the equipment. If the equipment is installed in a site with lush vegetation, in addition to routine weeding, the ground below the equipment needs to be hardened to prevent overgrowth of weeds.

4. Do not install energy storage systems outdoors in salt-damaged areas to prevent the equipment from being corroded and causing fires. Salt-damaged areas refer to areas within 2km of 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 the operation of the equipment, resulting in personal injury or property loss.

6. The equipment should be installed in an area far away from liquid, and should not be installed below positions such as water pipes and air outlets that are prone to condensation; It should not be installed under air-conditioning ports, vents, outlet windows of computer rooms and other positions that are prone to water leakage to prevent liquid from entering the inside and causing short circuit of equipment.

Description

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

1. Strong vibration, strong noise sources and strong electromagnetic field interference areas.

2. Places that produce or have dust, oil fume, harmful gases, corrosive gases, etc.

3. Places where corrosive, flammable and explosive materials are produced or stored. Within blasting hazard range.

4. Places with existing underground facilities. Crowded places, high-rise buildings and underground buildings.

5. There are unfavorable geological conditions such as rubber soil and soft soil layers, and the ground that is easy to accumulate water and sink.

6. Within the boundaries of mining subsidence (dislocation) area. An area that is likely to be flooded after a dam or levee breaks.

7. Earthquake areas with earthquake faults and fortification intensity higher than nine degrees. Sections with direct hazards such as debris flow, landslide, quicksand and karst caves.

8. Important water supply water source sanitary protection zone.

9. Historical relics and historical sites protection areas.

If there is no more suitable site selection, it is recommended to install a firewall with a fire resistance of not less than 3h for safety protection, and at the same time 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.

3.4 Preparation before installation

1. Before installing the product, check whether the product is intact. If you find any damage marks, please keep the evidence and contact the equipment manufacturer.

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

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

Serial No.	Inspection Items	Treatment measures
1	Whether the fasteners are tightened.	If there is any looseness, tighten the screw again.
2	Whether the space environment meets the installation dimension requirements.	If there is insufficient space, it is recommended to redesign and reinstall.
3	Whether the air duct is smooth and free of foreign matter.	If there is any foreign matter, please clean it. If it is not smooth, eliminate the cause.

Table 3.4-1 Installation checks

Serial No.	Name	Quantity	Remark
1	Optical and storage integrated outdoor energy storage cabinet	1 set	Cabinet door key included
2	User Manual	1 book	
3	Certificate of conformity	1 serving	
4	Factory inspection report	1 serving	
5	Packing list	1 serving	

Table 3.4-2 Delivery List

Serial No.	Tool Name	Legend
1	Insulating gloves	
2	Protective glasses	
3	Insulated shoes	
Serial No.	**Tool Name**	**Legend**
4	Work clothes	
5	Safety helmet	
6	Screwdriver	
7	Wire stripping pliers	
8	Hydraulic clamp	
9	Heat gun	
10	Multimeter	
11	Torque wrench	
12	Marker pen	

Table 3.4-3 Preparation of Installation Tools

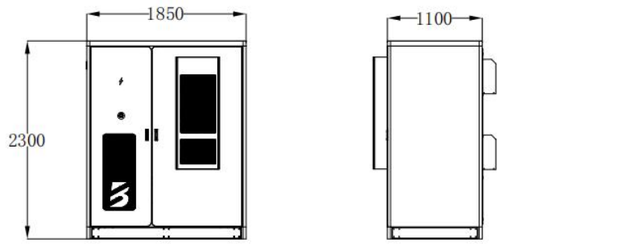
3.5 Mechanical installation

In the first step, after confirming that there is no abnormality in the product and all accessories are complete, you can refer to the following suggestions for mechanical installation:

1. Select the equipment installation position in advance according to the product size, and position and fix it well; the suggested basis is shown in Figure 3.5-1.

2. Referring to the weight of the product, the selected installation location needs to have sufficient load-bearing strength;

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



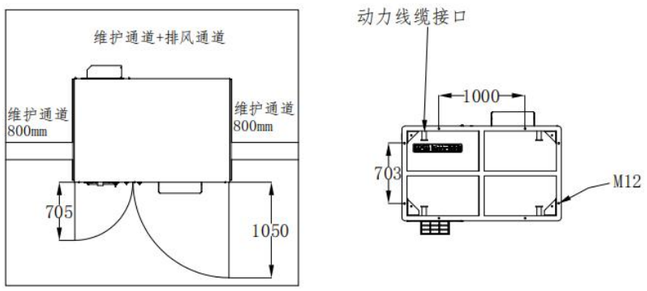


Figure 3.5-1 Foundation Reference Drawing

Note: The actual dimensions of the equipment are subject to shipment.

The second step is to remove the bottom coaming of the equipment after removing the packing wooden box. Put away the removed coaming and screws, and install the equipment back after it is in place.

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

In the third step, use a forklift truck to place the equipment on the foundation, align the fixing hole of the equipment with the embedded nut of the foundation, and fasten it with M16X40 bolts.

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

3.6 Electrical installation

The internal wiring of the energy storage battery integrated cabinet has been completed before leaving the factory. Users only need to connect the cabinet cables and external wiring.

3.6. 1 C241 integrated cabinet interface description

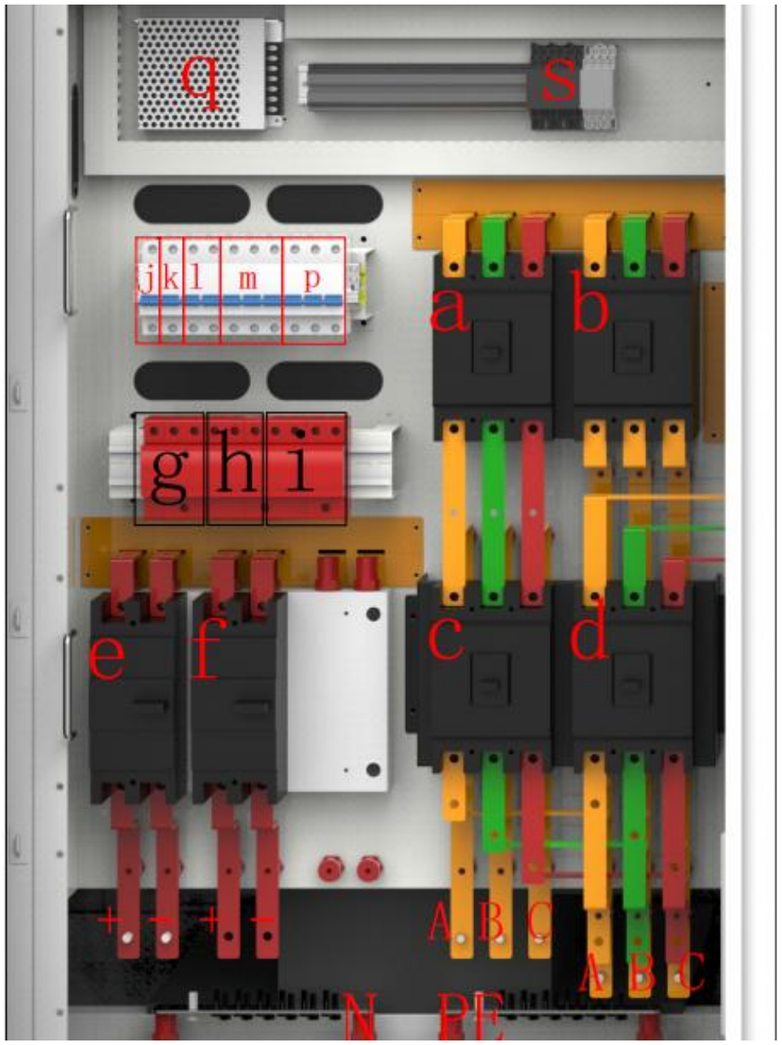


Figure 3.6. 1-1 Electrical side reference diagram

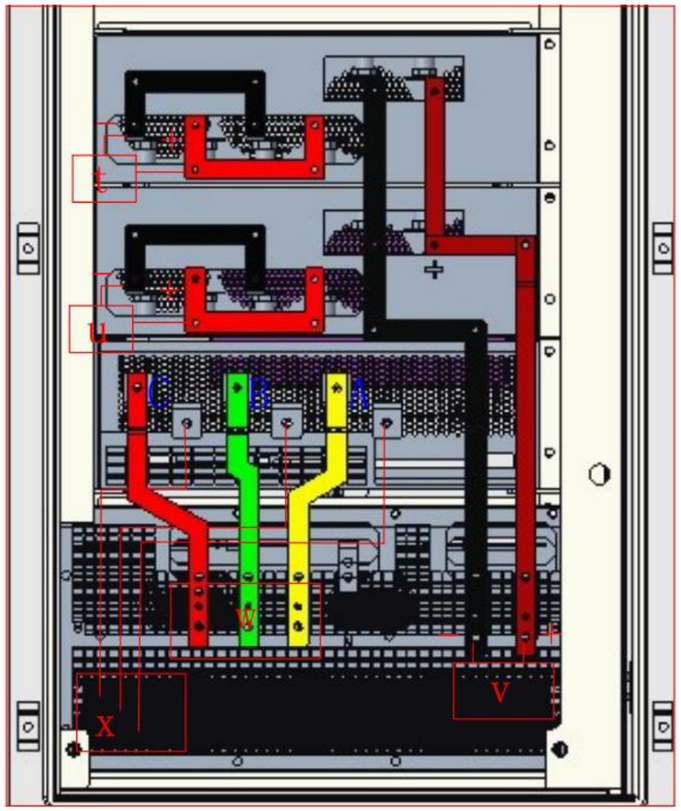


Figure 3.6. 1-2 Electrical side reference diagram

Serial No.	Symbol	Name	Remark
1	a	Main side circuit breaker-QF2	AC (1000V, 250A)
2	b	Diesel side circuit breaker-QF1	AC (1000V, 250A)
3	c	Bypass side circuit breaker-QF3	AC (1000V, 250A)
4	d	Load Side Circuit Breaker-QF4	AC (1000V, 250A)
5	e	Photovoltaic side circuit breaker-QF5	Direct current (250A, DC24V)
Serial No.	**Symbol**	**Name**	**Remark**
6	f	Photovoltaic side circuit breaker-QF6	Direct current (250A, DC25V)
7	g	DC side lightning protection-SPD2	DC (1000V, 20kA)
8	h	DC side lightning protection-SPD3	DC (1000V, 20kA)
9	i	AC Side Lightning Protection-SPD1	AC (750V, 20kA)
10	j	Auxiliary Power Switch-MCB6	AC 400V/6A (1P)
11	k	Fan Switch-MCB5	AC 400V/6A (1P)
12	l	Air-cooled air conditioner switch-MCB4	AC 400V/32A (2P)
13	m	Transformer soft start switch-MCB3	AC 400V/32A (3P)
14	p	AC side lightning protection switch-MCB1	AC 400V/63A (3P)
15	q	Auxiliary power supply	AC-DC 24V Switching Power Supply
16	s	Intermediate relay	DC (24V)
18	u	BSL-50DC Module-PV Side Interface	
19	v	PCS Module-Battery Side Interface	Docking battery high voltage box
20	w	STS Module-Grid Side Interface	Docking mains circuit breaker
21	x	PCS Module-Transformer Side Interface	Secondary side of docking transformer
22	N	Total zero row	Neutral line
23	PE	Common ground row	Yellow and green ground wire

Table 3.6. 1 Interface Description Table

3.6. 2 C241 Electrical Cable Installation

The C241 product adopts an all-in-one structure, and the internal wiring of the DC side has been completed. Only the electrical cables of the AC side and external communication need to be installed on site. Provide wiring reference as shown in Table 3.6. 2-1 according to product power and cable specifications. The selection of cable diameter shall comply with local cable standards. The factors affecting cable selection are: rated current, cable type, laying method,

ambient temperature and maximum acceptable line loss.

Model Capacity	AC cable	Zero line	Ground wire	Positive and negative DC input (female stage)
50kW	≥ 3 * 35 mm ²	≥ 35 mm ²	≥ 25 mm ²	≥ 2 * 35mm2
100kW	≥ 3 * 70 mm ²	≥ 70 mm ²	≥ 50 mm ²	≥ 2 * 70mm2
150kW	≥ 3 * 95 mm ²	≥ 95 mm ²	≥ 95 mm ²	≥ 2 * 95mm2

Figure 3.6. 2-1 Comparison table of cable diameters

Hazard: When performing electrical installation, you can refer to the following recommendations for electrical installation:

1. Before wiring, check that all switches in the equipment are disconnected to ensure that the equipment is not powered;

2. Disconnect the power grid switch before wiring to ensure that the cable is unpowered;

3. Make sure that the phase sequence of the cable is correct. You can add yellow, green, red and black insulating sheaths or signs to distinguish them to prevent phase sequence errors;

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

5. Lay communication lines and power cables separately as much as possible, and ensure that the cable insulation layer is not 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 equipment through the entrance and exit holes at the bottom of the equipment and then connect to the corresponding phase sequence;

8. After the wiring is completed, use fireproof mud to seal the wiring leakage to prevent external insects and rats from entering and damaging the equipment or cables.

In order to prevent contact resistance from increasing and heating caused by poor contact caused by loosening of the terminal by force, ensure that the bolts fastening the terminal meet the torque requirements listed in Table 3.6. 2-2:

Screw Dimensions	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. 2-2 Requirements for wiring torque

The inlet and outlet wiring mode of the energy storage system is lower in and lower out. After removing the switch baffle, as shown in Figure 3.6. 2-3, the A/B/C/N copper bar at the lower end of the switch is reserved with φ11mm and φ13mm openings for customer wiring, or opening holes according to the size required by customers; the protective ground wire is connected to the PE copper bar, and the grounding impedance of the equipment meets the requirements of national standard GB 50054 and local electrical standards.

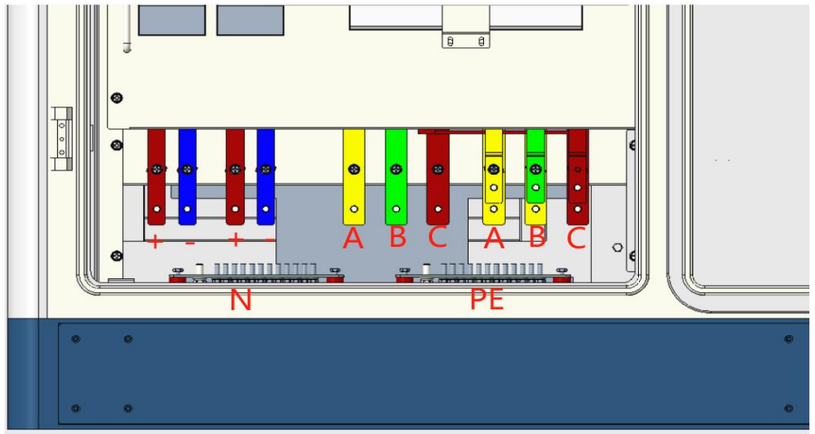
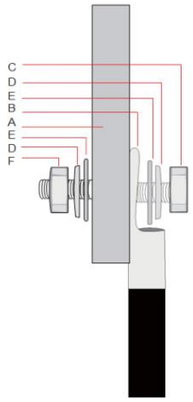


Figure 3.6. 2-3 Wiring diagram

The following is a schematic diagram of the installation of terminals, fixing screws and other parts when wiring the system power cable:

The connection specification between cable and copper bar is shown in the following figure.



序号	名称
A	Copper row
B	Terminal block
C	Screws
D	Spring washers
E	Large flat washers
F	Nuts

Figure 3.6. 2-4 Terminal Block Installation

Note:

1. When using copper core cables or copper-clad aluminum cables, please use copper terminals.

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

3.6. 3 Inspection after equipment wiring

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

Serial No.	Inspection Items
1	Before measuring, disconnect the battery side and electrical side switches to ensure that the energy storage equipment is not charged.
Serial No.	**Inspection Items**
2	The positive and negative connections between the battery and the energy storage equipment, the AC phase sequence is correct and has been tightened. Measure the resistance between the three phases, which should be megohm level. If it is K level or less, check the circuit.
3	The external control cable, ground cable and communication cable have been tightened.
4	The resistance of the grounding wire is less than 0.1 Ω, and the cable is intact without damage or cracks.
5	Clean the installation area, and there are no tools or foreign objects missing in the installation area.
6	Fireproof mud seals cable gaps to prevent small animals from entering.

3.7 C241 Diversified Collocation

The first type is the two-machine parallel configuration of the C241 energy storage system.

The C241 industrial and commercial storage all-in-one machine has a parallel function. By connecting two C241 industrial and commercial storage all-in-one machines in parallel, the power output of the entire system can be effectively improved.

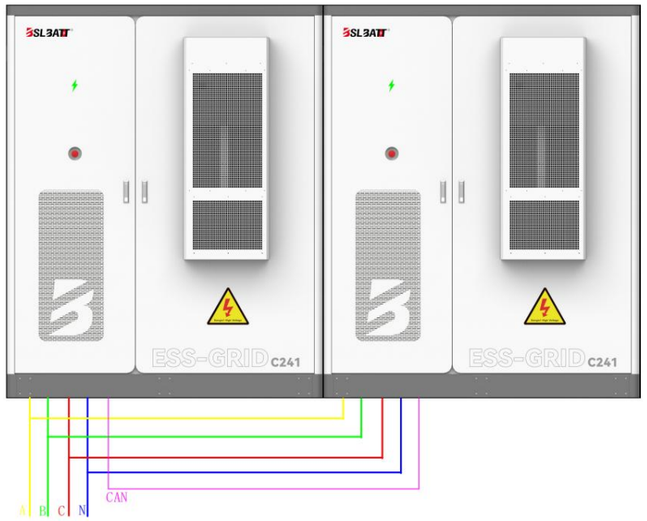


Figure 3.7-1 Schematic diagram of two machines connected in parallel

Note: Two machines are configured in parallel

1. Ensure that the models, specifications and status of the two C241 industrial and commercial storage integrated machines are consistent to ensure the system stability and power improvement effect after parallel connection.

2. Before making parallel connection, please carefully read and follow the parallel operation guide in the product manual to ensure that the connection is correct.

3. Parallel operation should be carried out by professionals to ensure the safety and reliability of electrical connections and avoid equipment damage or safety accidents caused by improper operation.

4. After parallel connection, the system needs to be comprehensively inspected to ensure that all components are operating normally and the power output meets expectations.

The second type is C241 energy storage system-multi-battery capacity expansion.

The C241 industrial and commercial storage all-in-one machine has the ability to connect multiple machines in parallel with the 241C battery cabinet.

This configuration can effectively increase the capacity of the entire energy storage system. According to the specific needs of users, the number of 241C battery cabinets connected in parallel can be selected, up to 10 units can be connected in parallel to increase the total capacity of the system.

This design follows the standards of "T/CES 241-2023 General Technical Specifications for Integrated Industrial and Commercial Energy Storage Cabinets", ensuring the technical performance and safety performance of the system. The parallel design is not only flexible, but also takes into account safety, allowing the energy storage cabinet to operate reliably in different industrial and commercial scenarios to meet diverse energy storage needs.

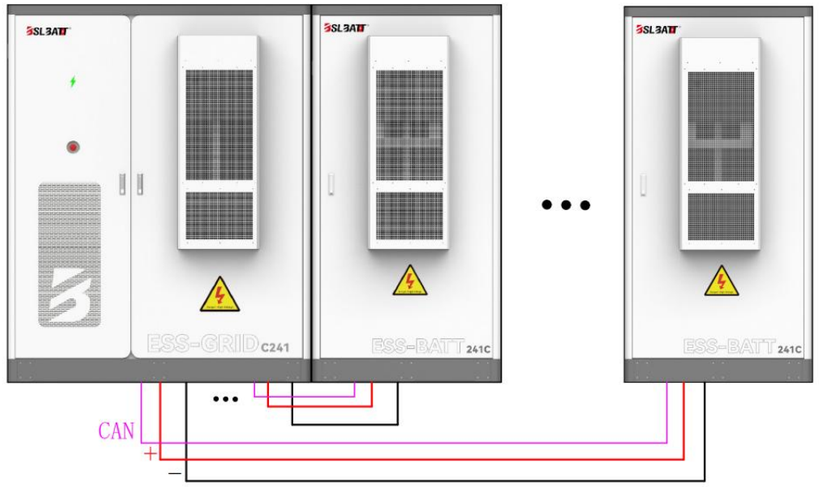


Figure 3.7-1 Schematic diagram of multi-battery capacity expansion

Note: Multi-battery capacity expansion

1. When selecting the number of 241C battery cabinets connected in parallel, reasonable configuration should be made according to actual energy storage needs to avoid waste of resources caused by excessive expansion.

2. When installing battery cabinets, please ensure that the spacing between battery cabinets meets the requirements of "T/CES 241-2023 General Technical Specifications for Integrated Industrial and Commercial Energy Storage Cabinets" to ensure ventilation and heat dissipation effects.

3. When connecting battery cabinets in parallel, pay attention to the

electrical connection of battery cabinets to ensure good contact and no risk of short circuit.

4. Regularly check the operating status of the parallel battery cabinet, troubleshoot in time, and ensure the safe and stable operation of the system.

5. Before capacity expansion operation, please ensure that the energy storage system is in a power-off state to avoid electric shock accidents.

04 Startup and Debugging

4.1 Inspection before power-on

1. Check whether the circuit breaker in the electrical cabin of the energy storage battery integrated cabinet is disconnected;

2. Check whether the series power cables between the battery packs and between the battery packs and the high-voltage box are reliably connected;

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

4. Check whether the communication, power supply wiring harness and power cables on the high-voltage box panel are connected correctly;

5. Check whether there are any problems with all communication connections between the module in the energy storage battery integrated cabinet and the display and control integrated machine.

4.2 Pre-start inspection

Before running the product, please ensure that the product has been installed according to 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) Visual inspection:

A. The appearance of the equipment is intact, without damage, rust and paint peeling. If the paint peels off, please touch up the paint;

b. The equipment label is clearly visible, and the damaged label should be replaced in time.

2) Grounding inspection:

The box body is equipped with a grounding point, and the grounding is firm; The grounding conductor in the box is reliably connected to the grounding copper bar of the box body.

3) Cable inspection:

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

b. The terminal manufacturing conforms to the specifications, and the connection is firm and reliable;

c. The labels at both ends of each cable are clear and clear, the wiring meets the principle of separation of strong and weak current, and a margin is left at the corner and shall not be tightened;

d. The cable installation bolts have been tightened, and the cable is not loose when pulled; The plugging of the cable through hole has been completed.

4) Copper bar inspection:

There are no obvious cracks or deformations in the copper bar, the screws at the overlapping joints are tightened, the scribing marks are not misaligned, and there is no debris on the copper bar.

5) Component inspection:

The circuit breakers are all in the open position; The lightning protector indicator is marked in green.

Note: For the sake of transportation safety, we disconnect the DC cable of the battery module. The whole cluster of batteries is in an open circuit state. Before powering on, you need to connect the DC cable. Note that you need to wear insulating gloves to operate. When you insert the connector, you hear a "stuck" sound, indicating that it has been inserted in place.

4.3 Boot steps

The operation process of product startup 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 soft start switch MCB3, the air conditioning switch MCB4 and the auxiliary power switch MCB6, close the QF2 mains switch to complete the soft start of the transformer

4. Close the battery auxiliary power switch and the high-voltage box load switch (rotate to the ON position), close the QF4 load switch, and close the QF5 ~ 6 photovoltaic switches (if there is no photovoltaic, there is no need to turn ON it).

5. 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;

6. Enable all modules on the "Switch" page of the HMI integrated screen, and click "Converter Turn on" to complete the boot.

Figure 4.3 Switch Position Diagram

Note: When the equipment uses the QF1 oil engine switch, remember to disconnect the QF2 mains switch first; When using the QF3 bypass switch for equipment maintenance, remember to disconnect the QF4 load switch first.

4.4 Trial Running

After the equipment has completed all electrical structure installation and met the startup 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 set the operation mode and related parameters according to the project requirements:

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

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

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

4. Run for 0.5 hours;

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

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

7. Run for 0.5 hours;

8. After completing the 1-hour trial operation without abnormality, turn off the system at the "switch" interface;

9. According to the project background and needs, you can select the local manual power control mode, automatic peak shaving and valley filling mode or backup mode to officially put it into operation, and click "System Start" 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 air conditioning switch MCB4, the auxiliary power switch MCB6 and the battery auxiliary power switch of the system;

3. Break QF1 oil engine switch, QF2 mains switch, QF3 bypass switch, QF4 load switch, QF5~6 photovoltaic switch;

4. Break the DC load switch of the battery high-voltage control box;

5. Wait for the bus discharge to end, the touch screen to go out, and the equipment to be shut down.

4.6 Emergency shutdown

When the product fails or critical conditions require emergency shutdown, the following emergency shutdown operations can be performed:

1. Press the emergency shutdown button "EPO";

2. Refer to Figure 4.3, disconnect the auxiliary power switches MCB4~5 of the system and the auxiliary power supply of the battery, and disconnect the DC switch of the high-voltage box;

3. After confirming that the fault or danger is resolved and needs to be run, reset the EPO button.

Description:

After pressing "EPO" for emergency shutdown, you need to turn off the QF1 oil engine switch, QF2 mains switch, QF5~6 photovoltaic switch, auxiliary power switch MCB4, and high-voltage box DC switch. After waiting for the HMI touch screen to be powered down, you need to wait for 10 minutes before it can be turned on!

05 Operation 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 page interface displays the real-time power, voltage, current, power generation, operation mode, working status and other information of the system.

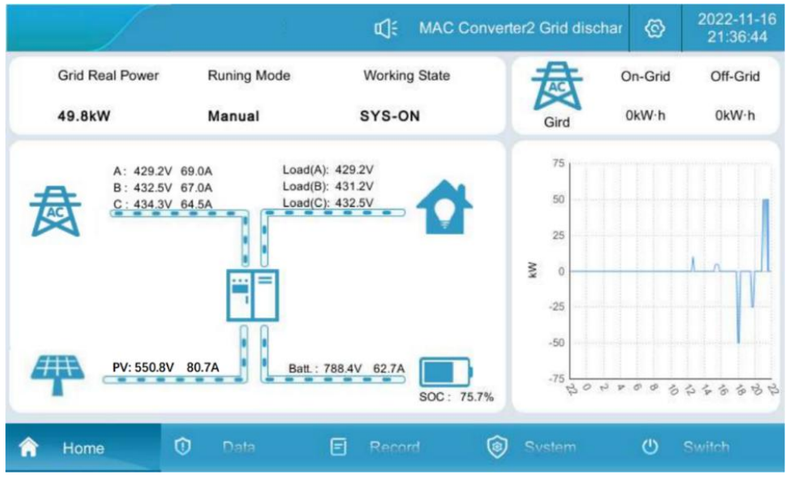


Figure 5.1 Main page

Each menu expansion item:

HMI display and control integrated screen menu table

Serial No.	Menu name	Menu Items	Parametric function
1	Homepage	Without	Display the running status of the system and the charge and discharge curve of the day
Serial No.	Menu name	Menu Items	Parametric function

		Real-time data	Display of all analog data of converter
		Real-time status	Converter working status and switch status display
2	Data	Real-time alarm	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
		Historical warning	Display historical alarm records
3	Record	Operation Log	Display operation log
		Data report	Export history
		System Information	Display system information
		Mode of operation	System Operation Mode Settings
		Parameter settings	Converter and battery parameter settings
4	SYSTEM	Manufacturer setting	Equipment manufacturer settings
		System Upgrade	System software upgrade
		Communicatio n settings	Make communication settings
5	Switch	System switch	System power-on and power-off
6	HMI Indicator light	HMI left Indicator light	① The first one from top to bottom is the power indicator light: when the HMI touch screen is powered normally, the green light flashes;
7	HMI Indicator light	HMI left Indicator light	② The second one from top to bottom is the status indicator light: when the system is faulty, the green indicator light does not light up; When there is no fault in the system, the green indicator light is always on;
8	HMI Indicator light	HMI left Indicator light	③ The third one from top to bottom is the fault indicator light: when the system is faulty, the red indicator light flashes; When there is no fault in the system, the red indicator light does not light up (flashing frequency once every 1s)
9	System lamp	Status indication	① When the system is in standby mode and there is a fault, the system light turns on red.
10	System lamp	Status indication	② When the system is running and there is no fault, the system light will turn on green
11	System lamp	Status indication	③ When the system is running and there is a fault, the system light will turn on yellow
12	System lamp	Status indication	④ When the system is in standby and there is no fault, the system light does not light up.

Serial No.	Menu name	Menu Items	Parametric function

5.2 Switch-off operation

1. System start: First, check the power-on status of the whole machine. Refer to Figure 4.1 to close the transformer soft start switch MCB3 and the auxiliary power switch MCB6, and close the QF2 mains switch to complete the soft start of the transformer.

2. Close the QF4 load switch and close the QF5~6 photovoltaic switch. (Note: When the QF1 oil engine switch is used for the equipment, remember to disconnect the QF2 mains switch first; when the QF3 bypass switch is used for equipment maintenance, remember to disconnect the QF4 load switch first);

3. It takes about 30 seconds for the screen to start.

4. 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 connection and control mode manual, peak shaving and valley filling and backup mode.

5. Enable all modules on the "Switch" page of the HMI integrated screen (some modules can also be turned on according to actual needs), click "System

Turn on", and the normal turning on time is about 30 seconds, as shown in Figure 5.2-1.

6. Converter off: When the converter is running, click "Converter Off", as shown in Figure 5.2-2;

7. Break the converter auxiliary electrical switches MCB4~5

8. Open QF2 mains switch, open QF4 load switch, and QF5~6 photovoltaic switch.

Figure 5.2-1 Operation Mode Interface

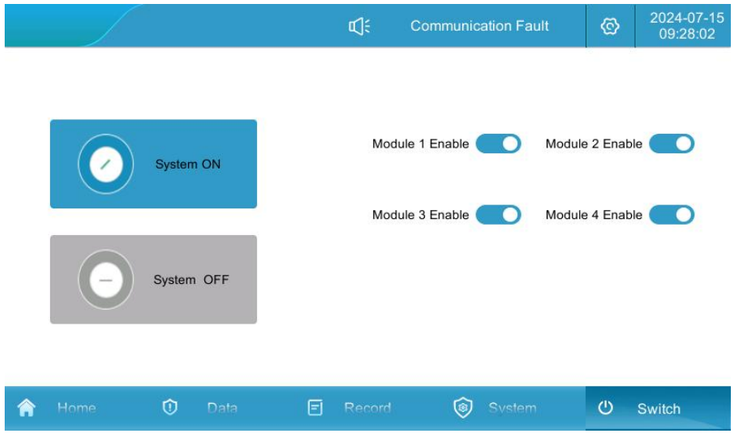


Figure 5.2-2 On-off interface

5.3 Communication settings

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

1. Check that the battery BMS communication cable has been connected to the terminals CAN2 _ H and CAN2 _ L on the back of the touch screen;

2. Check that the background EMS communication cable has been connected to the terminals COM6 _ A and COM6 _ B on the back of the touch screen or to the network port;

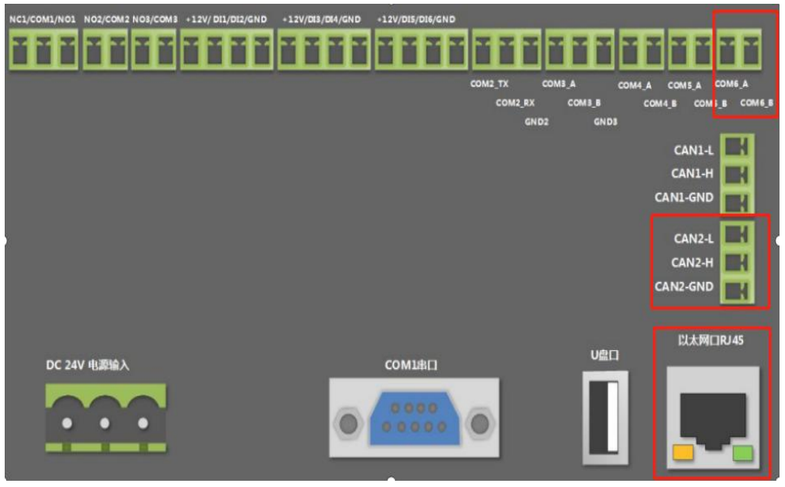


Figure 5.3-1 Communication Check

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. Background EMS communication settings 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 background, the slave addresses cannot be repeated;

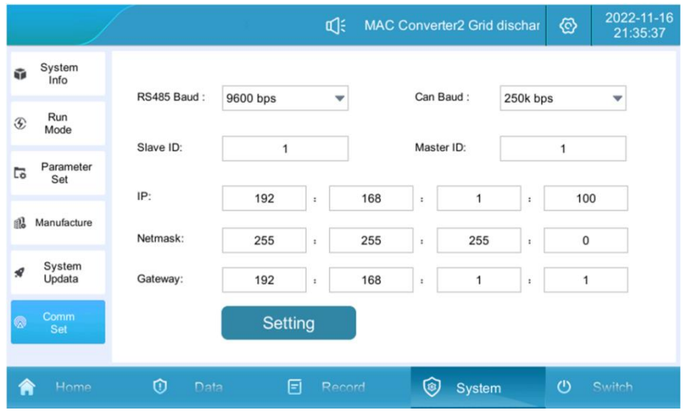


Figure 5.3-2 Communication setting interface

6. Background EMS communication settings 2: If Ethernet communication is used, the energy storage system is used as the server. The default address of the host is set to: 192.168. 1.100. The local address corresponding to the communication panel is set to 1, and the server port is 502. If multiple The IP addresses connected to the background of energy storage systems cannot be repeated. After modifying the IP address, click the Settings button to configure the IP address.

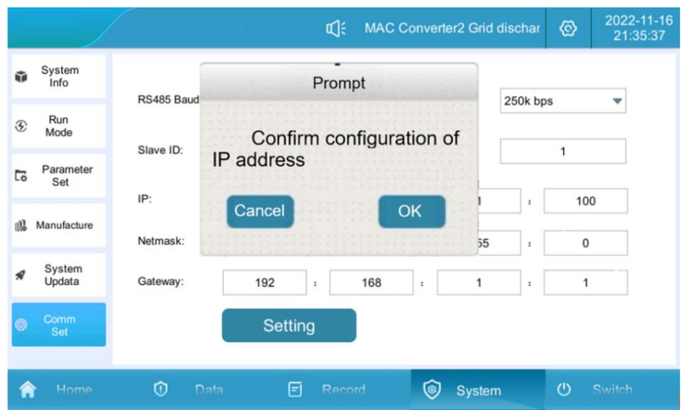


Figure 5.3-3 Address configuration interface

5.4 Operation Mode Settings

5.4. 1 Introduction to operation mode

The operation modes of industrial and commercial storage cabinets can be divided into three types: grid-connected manual mode, grid-connected automatic mode, and off-grid automatic switching.

1. Grid-connected manual mode: The energy storage system runs in grid-connected mode, but the HMI integrated screen must be manually operated by the user when the system starts or stops. The charging and discharging active power, reactive power, and power factor of the energy storage system can be set in "Parameter Settings". When the photovoltaic power is greater than the load power, the excess power is stored in the battery, and the photovoltaic output power is limited after the battery is full; when the photovoltaic power is less than the load power, the combined power supply of photovoltaic + energy storage will be supplied. If it is not enough, the main power will supplement it; when there is no light at night, energy storage is preferentially used for power supply. When the energy storage capacity is lower than the set value, it will be supplied by mains power.

2. Automatic grid-connected mode: For peak shaving and valley filling application scenarios, the energy storage system is automatically connected to the grid based on the preset time-sharing charging and discharging power. For the backup mode application scenario, the photovoltaic gives priority to charging the battery, and the load power is provided by the power grid. When the battery is charged to 100% of the set SOC upper limit, the photovoltaic is shut down, and the battery SOC is discharged to 96%. When the photovoltaic power is greater than the load power, the photovoltaic tracks the load power. When the photovoltaic power is less than the load power, the photovoltaic + battery jointly supplies power to the load.

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

Note: a. Switching between on-grid and off-grid can be set as planned or unplanned trigger, set as unplanned trigger: when the utility power is disconnected, the system will automatically switch to off-grid operation, and the system can output stable three-phase AC voltage of 400V/50Hz; when the

utility power comes back to the power supply, the system will automatically switch to grid-connected mode operation. Setting as schedule trigger: running in grid-connected mode can be manually switched to off-grid mode operation, set the “and off-grid” to “off-grid”, running in off-grid mode can be manually switched to grid-connected mode operation (provided that utility exists), set the “and off-grid” to “off-grid”, set the “and off-grid” to “off-grid”, and set the “and off-grid” to “off-grid”. Set “Off-grid” to “On-grid”. The setting interface is shown below:

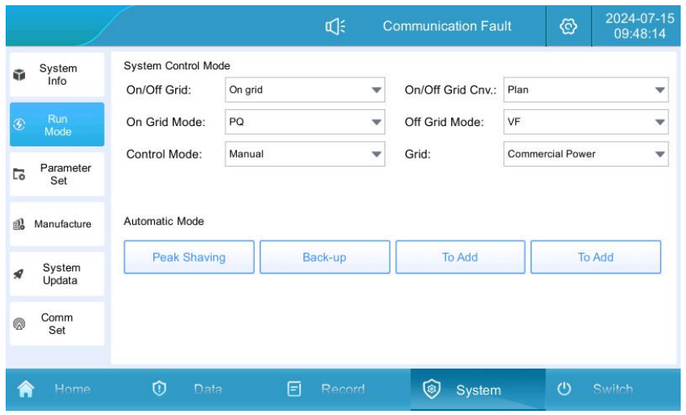


Figure 5.4. 1-1 and off-grid setup interface

b. In the grid-connected mode, the anti-backflow function can be disabled or enabled. Set to enable: the electricity of the energy storage system will not be reversely supplied to the grid. Set to Forbidden: Electricity 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 is as shown below:

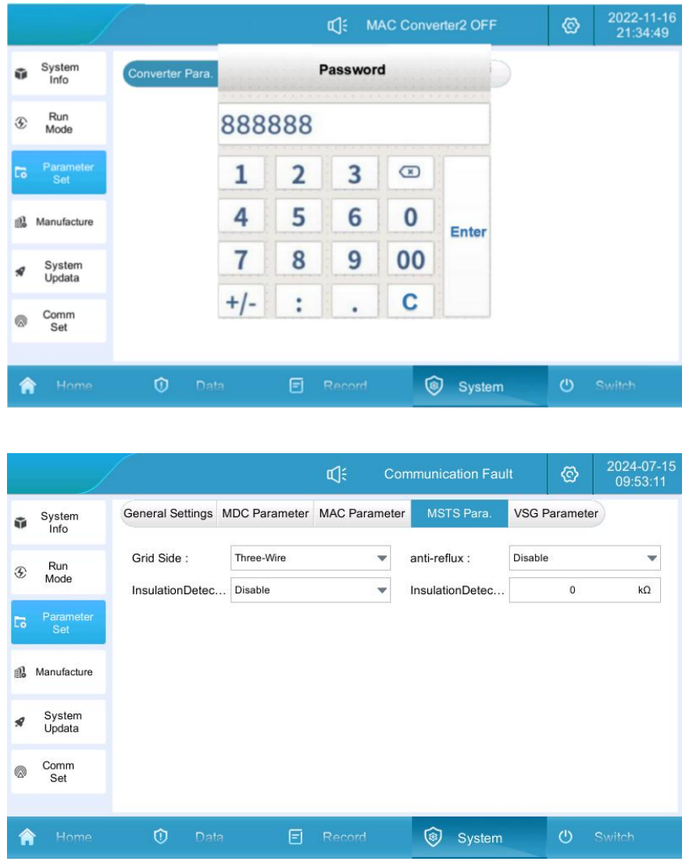


Figure 5.4.2-1 Anti-backflow setting interface

5.4. 2 Grid-connected manual mode

1. Click "System"-> "Operation Mode" mode to enter the page of Figure 5.4. 2-1.

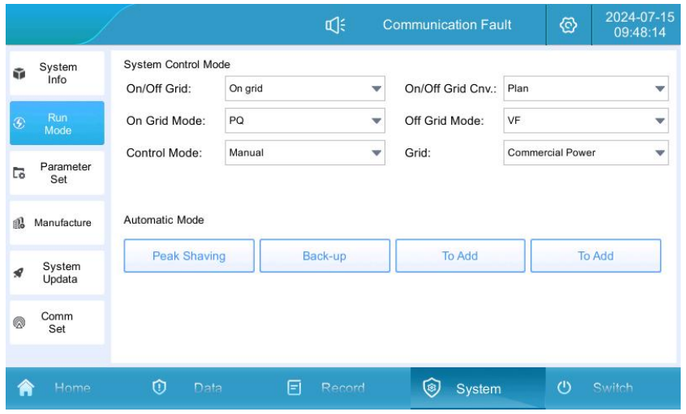


Figure 5.4. 2-1 Grid Connected Manual Mode Settings

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 runs according to the set value (positive value is discharge, negative value is charging). The power setting interface is shown in Figure 5.4. 2-2.

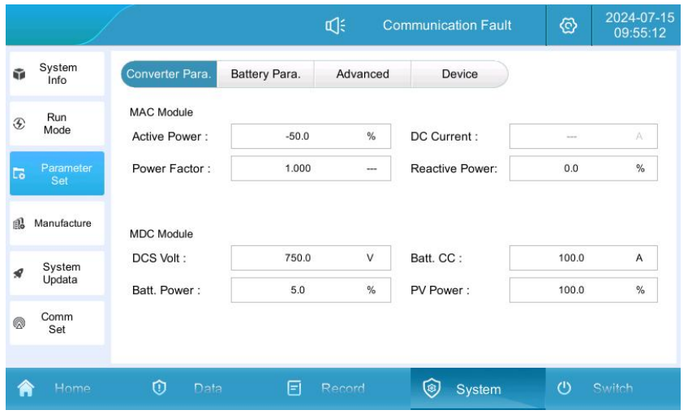


Figure 5.4. 2-2 Power Setting Interface

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

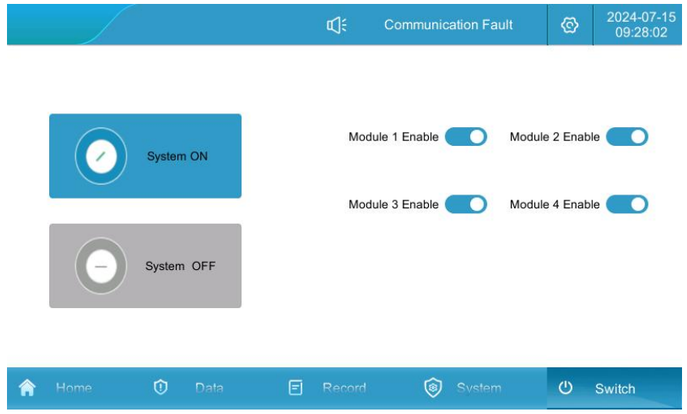


Figure 5.4. 2-3 On-off interface

5.4. 3 Automatic grid connection 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;

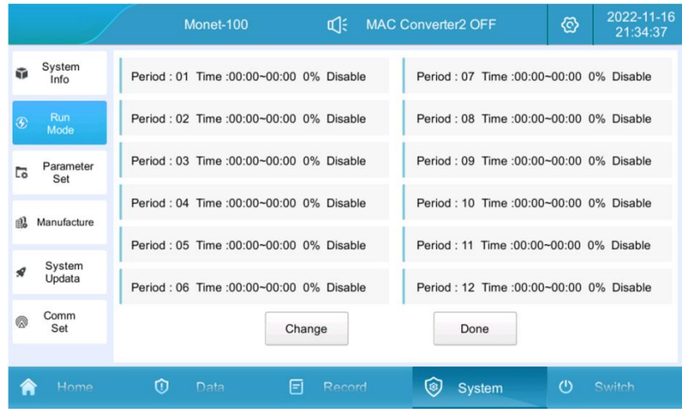


Figure 5.4. 3-1 Peak shaving and valley filling operation setting interface

2. Click "Modify" to set the peak shaving and valley filling operation period and power: set the start and end time, charging and discharging power and whether it is enabled in period 1; click the next item to enter the period 2 settings, save and exit after completing all period settings;

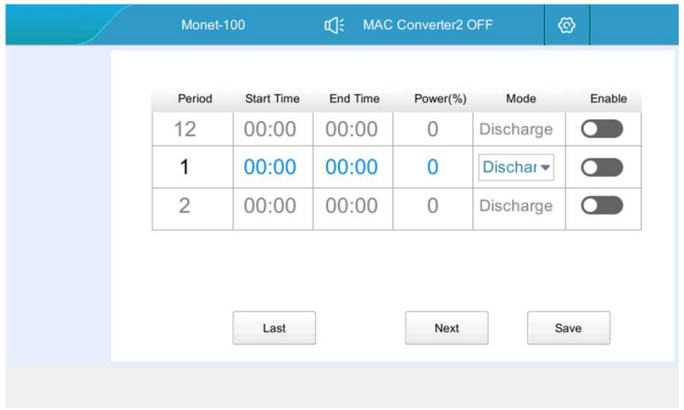


Figure 5.4. 3-2 Peak shaving and valley filling charge and discharge time setting interface

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

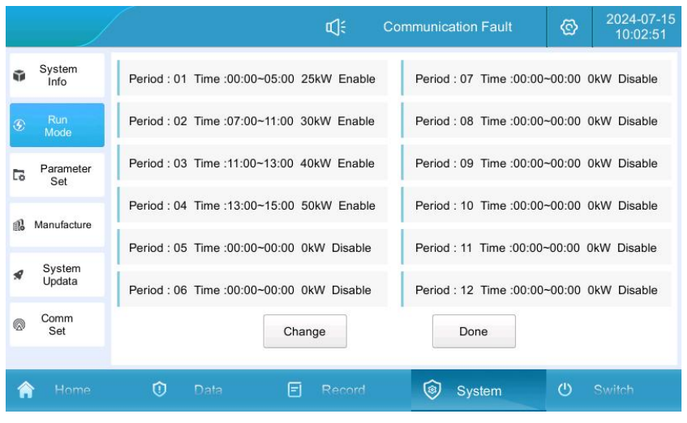


Figure 5.4. 3-3 Peak shaving and valley filling charge and discharge setting interface

4. "Control mode" is modified to "peak shaving and valley filling";

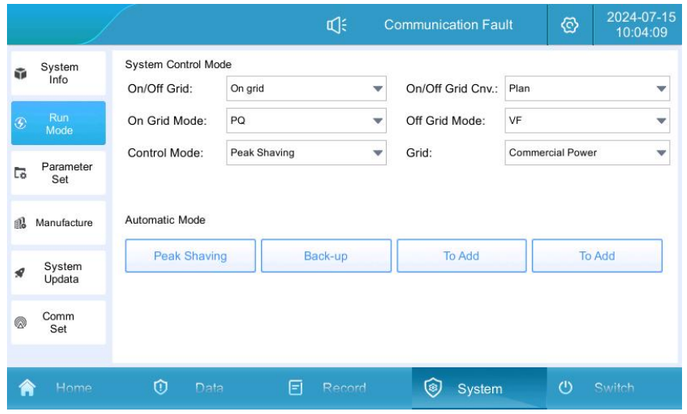


Figure 5.4. 3-4 Peak shaving and valley filling control mode

5. At this time, it is automatic mode: pause, click "Switch"-> "System On" to complete the local automatic control mode setting.

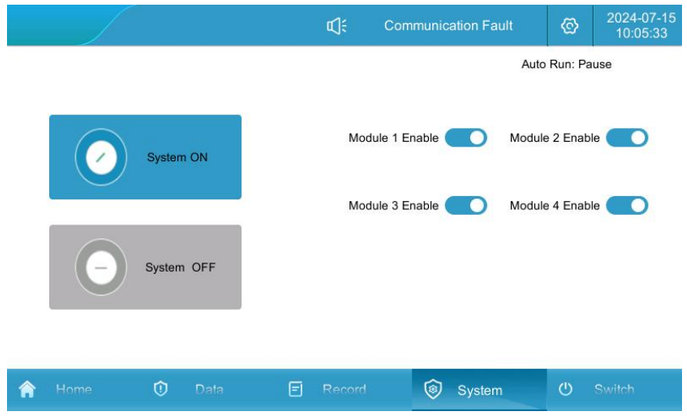


Figure 5.4. 3-5 Local control operation mode on

Fallback mode:

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

a. When setting mains charging enabled: allowing the mains to charge the battery;

b. Battery charging power: setting the required battery charging power

value;

c. When setting the mains charging prohibition: the mains 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 forbidden is set, the generator is not allowed to charge the battery; When set to enabled, the generator is allowed to charge the mains (provided the generator is enabled first).

f. Standby power holding SOC: When the battery SOC is discharged to the set value of standby power holding SOC, the battery is no longer discharged, and the load is provided by mains power or oil engine.

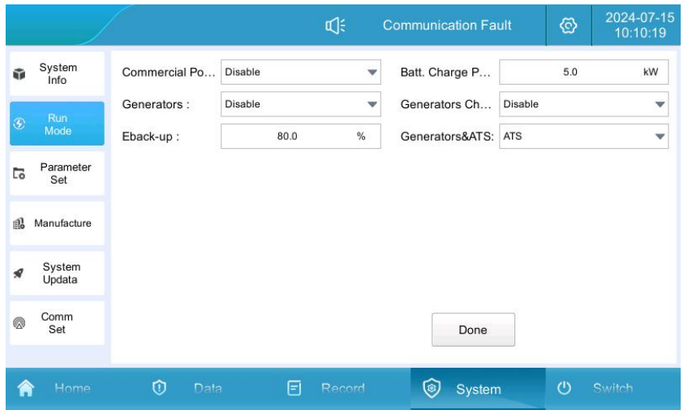


Figure 5.4. 3-6 Backup Mode Setting Interface 1

2. When the oil engine is running in reverse mode, disconnect the power grid switch, close the oil engine switch, and close the load switch;

a. Click "System"-> "Operation Mode"-> "Power Grid" to set it as the generator;

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

c. Set "Battery Charging Power" to the power value required for battery charging.

Note: After the generator is turned on, the generator supplies power to the load, and at the same time charges the battery to the standby power maintaining SOC. The system will automatically switch to off-grid operation to supply power to the load. When the mains power is restored, it is necessary to manually disconnect the oil engine switch, close the mains switch, set the "power grid" to mains power, run the backup mode, execute the backup mode logic, and no longer charge the battery when the mains charges the battery to the backup SOC.

3. Modify "control mode" to "backup mode";

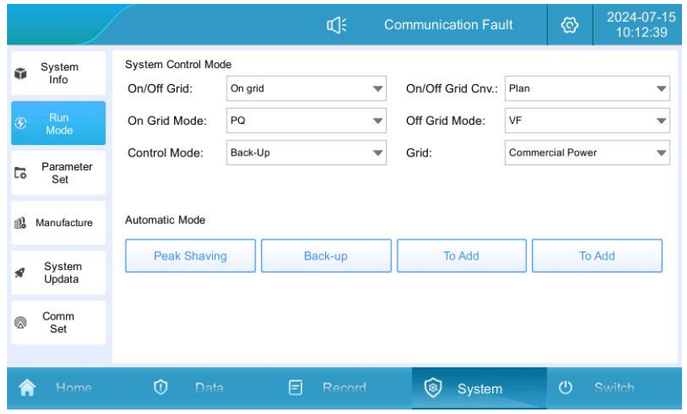


Figure 5.4. 3-7 Backup Mode Setting Interface 2

4. At this time, it is automatic mode: pause, click "Switch"-> "System On" to complete the local automatic control mode setting.

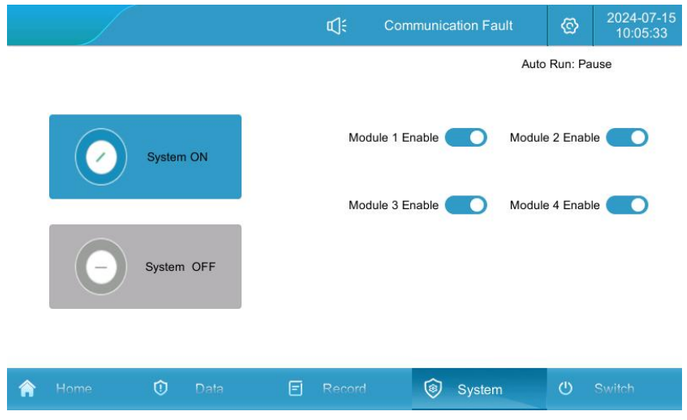


Figure 5.4. 3-8 Start of Automatic Control Mode Operation

5.4. 4 Automatic off-grid switching

Grid-connected to off-grid:

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

Off-grid to grid-connected:

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

The specific setting method is as follows:

Manual and off-grid switching mode:

1、Click "System"-> "Run Mode" to enter the current page;

2、Select "Planned Trigger" in "Parallel Off-Grid Switching" and set it as Planned Trigger;

3、When running in grid-connected mode, you can manually switch to off-grid mode and set "off-grid" to "off-grid";

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

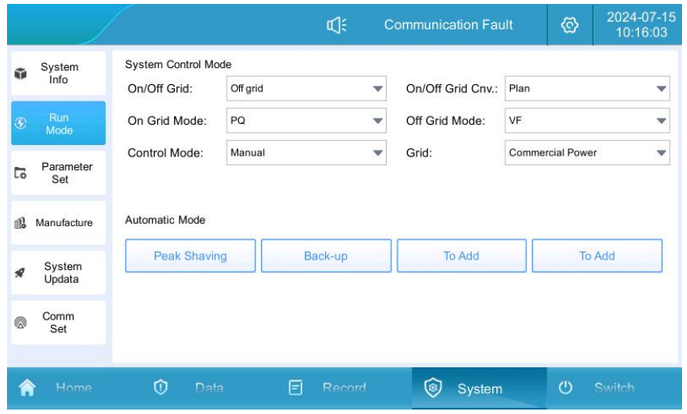


Figure 5.4. 4-1 Manual and off-grid switching mode setting interface

Automatic off-grid mode:

1、Click "System"-> "Operation Mode" to enter the current page, "and set off-grid switch" to "Unplanned Trigger";

2、When the power grid suddenly loses power while operating 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 comes in the off-grid mode, the energy storage converter automatically switches from off-grid to grid-connected mode.

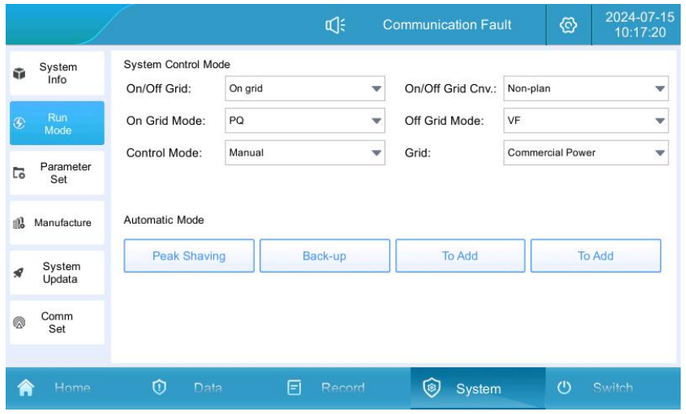


Figure 5.4. 4-2 Automatic and off-grid switching mode setting interface

5.4. 5 Battery parameter settings

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

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

3. It is recommended that the lower limit setting value of SOC should not be less than 5%.

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

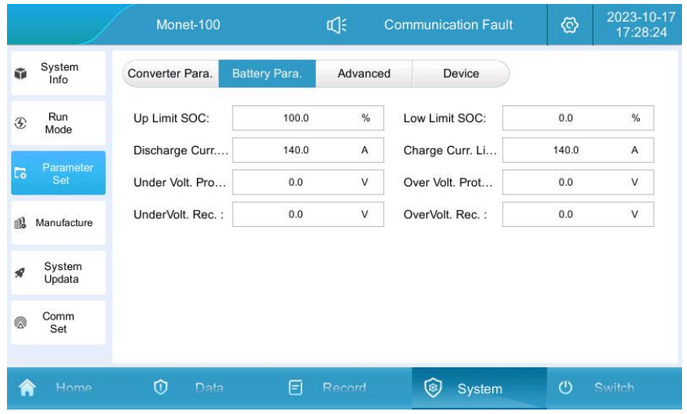


Figure 5.4. 5 Battery charge and discharge setting interface

5.4. 6 Environmental monitoring interface

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

2. You can view the real-time environmental status of the system, 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 conditioner cooling is turned on, and when the temperature is lower than the cooling point and the return difference is reduced, the air conditioner cooling is turned off. The return difference is 5 ℃ by default (adjustable from 1 to 10 ℃);

Heating mode:

When the temperature is lower than the heating point, the air conditioner heating is turned on, and when the temperature reaches the heating point, the heating is turned off. The default difference is 5 °C (adjustable from 1 to 10 °C);

Figure 5.4. 6 Environmental Monitoring Interface

5.4. 7 Data viewing and exporting

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

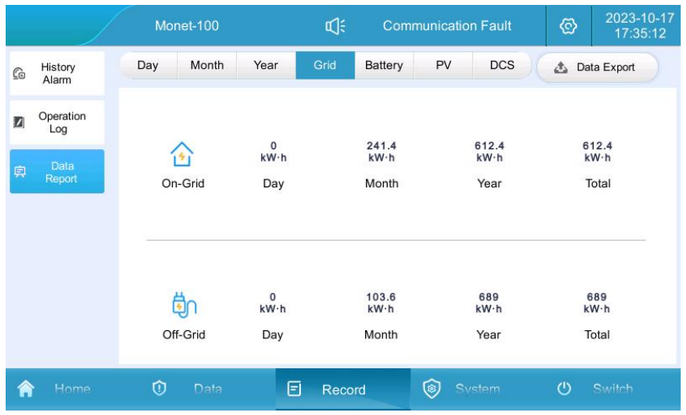


Figure 5.4. 7-1 Data report interface

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

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

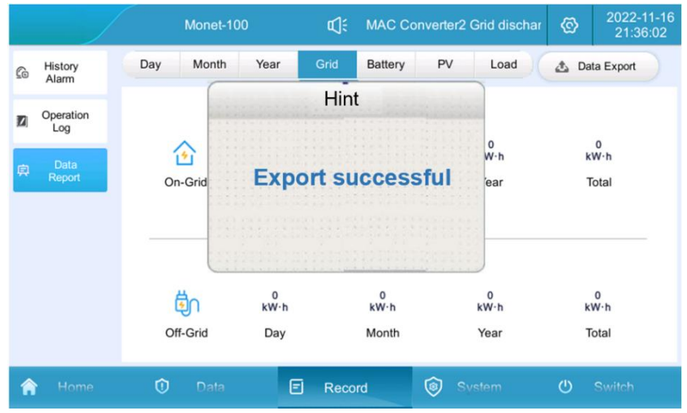


Figure 5.4. 7-2 Data export interface

5.4. 8 Software Upgrade

The software upgrade includes three software upgrades: integrated screen software, power module DSP software and power module ARM software. Turn off the system on the touch screen "Switch" page before upgrading, that is, the software must be upgraded while the system is stopped running.

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 burned files;

Figure 5.4. 8-1 Creating an upgrade software folder

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

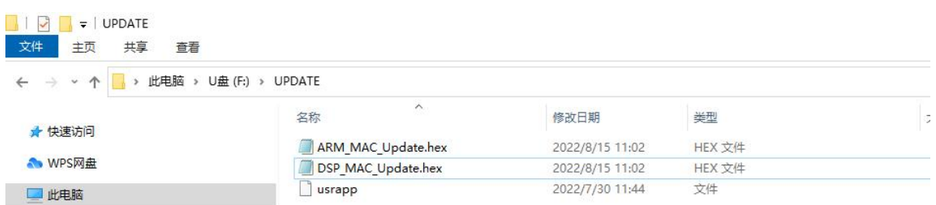


Figure 5.4. 8-2 Storing Upgrade Software

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

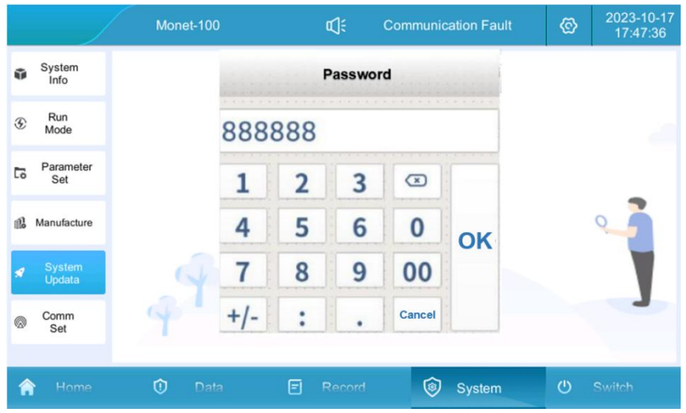


Figure 5.4. 8-3 Password Verification

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

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

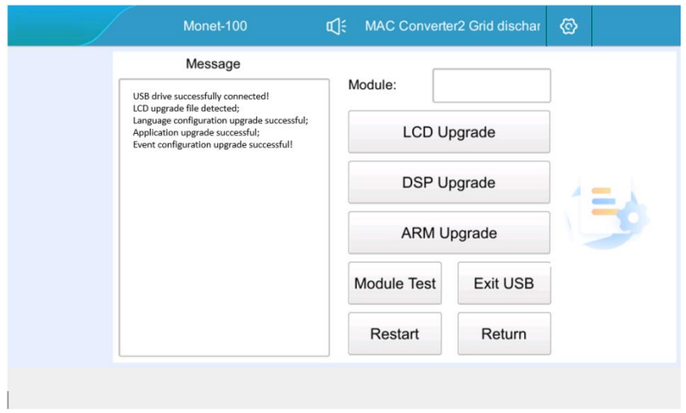


Figure 5.4. 8-4 Upgrade software and restart interface

6. After the LCD integrated screen software is upgraded, click the "Restart" button, and the version refresh will take effect; customers can click "Restart" after completing the upgrade of DSP and ARM according to the actual situation.

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;

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

Description:

When the system has multiple modules, it is recommended to upgrade from Module 1 first, and then upgrade in Setting Module 2 after completion until all modules are upgraded.

Note:

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

2. Choose a time when the system usage rate is low to upgrade to reduce the interference to daily work.

06 Alarm and Maintenance

Term explanation:

Serial No.	Terminology	Explain
1	Malfunction	Equipment fails and the system stops running
2	Alarm	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 run	Refers to a system whose monthly operation frequency is not fixed and it cannot be guaranteed to work every day
5	Use it for a long time	Battery system that has not been started for more than 3 months

6.1 Alarm handling

Alarm/Fault	Component	Questions	Treatment method
Water immersion Malfunction	Battery compartment	Energy storage cabinet flooding	1. Check whether there is any water accumulation inside the cabinet; 2. Confirm whether the distributed energy storage cabinet is leaking and whether the equipment in the cabinet is intact.
Door magnetic Alarm	Battery compartment	Energy storage cabinet door opens	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 position of the door magnetic sensor is offset.
Firefighting Malfunction	Battery compartment	Battery overheating or fire	1. Press the EPO button immediately and quickly move away from the energy storage cabinet; 2. Continue to observe at a safe distance for 30 minutes. If there is smoke or fire, please call the fire alarm; If there is no abnormality, manually clear the activity alarm and contact the manufacturer.

Alarm/Fault	Component	Questions	Treatment method
Lightning protector alarm	Electrical warehouse	Lightning protector failure	1. Check whether the signal wire connection of lightning protector is loose; 2. Check whether the lightning protector indicator is discolored; 3. Replace the AC lightning protector.
Compressor alarm	Air conditioner	1. Loose wiring 2. Compressor damage	1. Disconnect the distribution switch, open the air conditioning junction box, and check whether the wiring is loose; 2. Observe whether the appearance of the compressor is obviously damaged and whether there is a burning smell. If so, contact the manufacturer.
Outdoor fan alarm	Air conditioner	1. Loose wiring 2.Fan damage	1. Disconnect the distribution switch, open the air conditioning junction box, and check whether the wiring is loose; 2. Observe whether the fan is obviously damaged and whether there is a burning smell. If so, please contact the service hotline.
Grid overvoltage/ undervoltage fault	Power grid/oil engine	Voltage abnormality on grid-connected side	Check whether the voltage on the grid-connected side is abnormal;
Power grid over-frequency/under-frequency fault	Power grid/oil engine	Frequency abnormality on grid-connected side	Check whether the frequency on the grid-connected side is abnormal;
Island protection failure	Power grid/oil engine	Voltage abnormality on grid-connected side	Check whether the voltage on the grid-connected side is abnormal;
High/low voltage ride-through alarm	Power grid/oil engine	Voltage abnormality on grid-connected side	Check whether the voltage on the grid-connected side is abnormal;

Grid voltage imbalance fault	Power grid/oil engine	Voltage abnormality on grid-connected side	Check whether the voltage on the grid-connected side is abnormal;
Power grid staggered phase	Power grid/diesel engine	Wrong phase sequence connection on grid-connected side	Switch any two cables in the ABC three wires
DC voltage high/low fault	Battery	Battery voltage abnormality	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
Busbar half voltage unbalance fault	Energy storage converter	1. Load imbalance 2. Software exception	1. Check whether the load is abnormal; 2. Contact the manufacturer
Overtemperature derating alarm	Energy storage converter	Internal temperature is too high	1. Check whether the air inlet and outlet of the electrical warehouse are blocked; 2. Check whether the internal fan is running normally; 3. Contact the manufacturer
Power tube Overtemperature fault	Energy storage converter	Internal temperature is too high	1. Check whether the air inlet and outlet of the electrical warehouse are blocked; 2. Check whether the internal fan is running normally; 3. Contact the manufacturer
Balance bridge Overtemperature fault	Energy storage converter	Internal temperature is too high	1. Check whether the air inlet and outlet of the electrical warehouse are blocked; 2. Check whether the internal fan is

running normally;
3. Contact the manufacturer

Alarm/Fault	Component	Questions	Treatment method
DC overcurrent fault	Energy storage converter	DC current excess	1. Check whether there is 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 excess	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 failure	Energy storage converter local controller	Communication interruption	1. Check whether the communication network cable between modules is loose and abnormal; 2. Check whether the communication network cable of the local controller is loose and abnormal;

Parallel/synchronous failure	Energy storage converter	Parallel/Sync Signal Interrupt	1. Check whether the parallel cable is loose or abnormal; 2. Check whether the parallel settings are abnormal; 3. The hardware circuit is damaged.
Relay Open/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 panels
Fan 1/2 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. Leakage current excess 2. Software exception	1. Check whether the leakage current Hall wiring is loose or abnormal; 2. Check whether the grounding wire is disconnected;
Abnormal insulation impedance fault	Energy storage converter/battery	Low insulation to ground software abnormality	1. Check whether the AC and DC cables are damaged or short-circuited to the ground; 2. Check whether the battery circuit is damaged or short-circuited to the ground.
Module missing Alarm	Energy storage converter	Module to screen Communication interruption	Check whether the communication network cable between the modules is loose and abnormal;
DC voltage low Alarm	Energy storage converter	Battery not on	Check if the battery is on;
Low voltage side one way Low secondary voltage	Photovoltaic DC converter	Photovoltaic voltage Open circuit voltage less than 250V	Use a multimeter to measure whether the positive and negative DC voltages of the photovoltaic switch are greater than 250V.

Table 6.1

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

6.2 System maintenance

Before performing maintenance and overhaul operations on the energy storage system, operators must follow the following safety steps:

1. Disconnect the DC circuit breaker switch on the high-voltage box panel and ensure that it is OFF.

2. Check the fire-fighting facilities to ensure that they are in normal working condition.

After the maintenance and overhaul operation is completed, the operator shall ensure that:

1. The DC circuit breaker switch is in the ON state.

2. Fire-fighting facilities continue to maintain normal working conditions.

This energy storage system product has a high level of protection and is suitable for outdoor environments. However, long-term operation in harsh environments may lead to aging of energy storage equipment or damage to internal equipment. In order to extend the service life and improve the performance of the equipment, it is recommended to regularly perform the following maintenance inspections on the energy storage equipment: Replace aging or damaged parts. Moreover, due to factors such as ambient temperature, humidity, dust, vibration and aging of internal components of the inverter, the system may have potential problems during operation. In order to ensure the long-term stable operation of the energy storage system, maintenance personnel should conduct regular inspections in accordance with the provisions of Table 6.2 to discover problems and deal with them in a timely manner. Specific maintenance cycle recommendations are as follows:

1. Systems installed in industrial parks with severe dust, high salt spray or heavy industrial parks are recommended to be maintained once a month.

2. In areas with a good climate environment, it is recommended that the energy storage system be maintained every 3 months.

Maintaining Objects	Action	Reference Standard
Cabinet	1. Check the appearance of the whole machine 2. Check the vent 3. Check the door lock	1. No obvious coating peeling, scratches or rust; 2. There is no obvious trace of water leakage; 3. There is no dust accumulation in the vent; 4. The door lock is not damaged
Air conditioner	1. Check noise and vibration 2. Clean the filter	1. The fan and compressor rotate normally without jamming or abnormal noise 2. The surface of the filter screen is clean and there is no clogging
Firefighting	1. Check the appearance 2. Check the wiring harness	1. Firm wiring and no pollutants
PCS	1. Check the noise and vibration 2. Check the front panel vent 3. Check the contact surface of the rear copper bar	1. The front panel fan rotates normally, without jamming or abnormal noise. 2. The surface of the front panel vent is clean and there is no clogging. 3. There is no corrosion or discoloration of the copper bar and contact surface, and there is no dust accumulation
STS	1. Check the noise and vibration 2. Check the front panel vent 3. Check the contact surface of the rear copper bar	1. The front panel fan rotates normally, without jamming or abnormal noise. 2. The surface of the front panel vent is clean and there is no clogging. 3. There is no corrosion or discoloration of the copper bar and contact surface, and there is no dust accumulation
DC/DC	1. Check the noise and vibration 2. Check the front panel vent 3. Check the contact surface of the rear copper bar	1. The front panel fan rotates normally, without jamming or abnormal noise. 2. The surface of the front panel vent is clean and there is no clogging. 3. There is no corrosion or discoloration of the copper bar and contact surface, and there is no dust accumulation
Transformer	1. Check the appearance 2. Insulation detection	1. The shell is clean, without obvious cracks, deformation, etc. 2. The insulating material is not damaged, discolored or carbonized, and the insulation resistance is within the specified range.
Electrical	1. Check the lightning protector 2. Check the circuit breaker and contactor 3. Check the contact surface of the cable copper bar	1. The lightning protector, circuit breaker, and contactor are normal 2. The screw and socket connecting wires are not loose and falling off 3. The copper bars and contact surfaces are not corroded and discolored, and there is no dust accumulation
Battery pack	1. Check the noise and vibration 2. Check the contact surface of the cable copper bar	1. There is no lag or abnormal noise when the battery pack fan rotates 2. The surface of the front panel vent is clean and there is no clogging 3. The screw socket connecting wires are not loose and falling off 4. There is no corrosion and discoloration of the copper bar and contact surface, and there is no dust accumulation

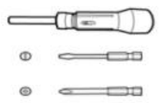
Table 6.2

6.3 Dust cleaning treatment

6.3. 1 Preparation before dust cleaning

Note:

Please prepare at least the following tools. If there are not enough tools, there may be a possibility that the maintenance cannot be completed; the tools used, Phillips screwdrivers and other handles need to be insulated and protected, or insulated tools should be used.

 Cross screwdriver	 Multimeter	 Rubber hammer	 Insulated ladder
 Vacuum cleaner	 High pressure water gun		

 Safety gloves	 Protective goggles	 Dust mask	 Safety shoes
 Reflective Vest	 Safety helmet	 Medical kit	

6.3. 2 Dust cleaning and maintenance

Category	Action	Reference Standard	Whether the system is powered down
Cabinet	Clean the vent	1. There is no dust accumulation in the vent	Yes
Cabinet	Cleaning dustproof cotton	1. No insects, rats, snakes and other animals enter	Yes
Cabinet	Rinse Appearance	1. The dustproof cotton has no obvious discoloration and debris	Yes
Air conditioner	Clean the radiator	1. The surface of the radiator is clean and free of clogging; 2. The fan rotates normally without jamming or abnormal noise	Yes
Distribution Region	Check whether there are foreign objects in the power distribution area	1. The area is clean and free of foreign matter	Yes
Note: It is recommended to clean every sandstorm in dusty areas; It is recommended to clean it once before entering the summer season; In other areas, according to the actual situation, ensure that the filter or condenser is not clogged; Dust-proof cotton has a maximum age of 2 years. Recommended Tool: High Pressure Water Gun.			

Table 6.3. 2

6.3. 3 Operational procedures

Step 1: Power down and shut down the system

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

2. Break the system auxiliary power switches MCB4~5 and the battery auxiliary power switch;

Break QF1 oil engine switch, QF2 mains switch, open QF4 load switch, QF5~6 photovoltaic switch;

3. Break the DC load switch of the battery high-voltage control box;

4. Wait for the bus discharge to end, the touch screen to go out, and the

equipment to be shut down;

5. Turn off the power distribution switch at the upper level of the energy storage equipment and hang the "No Closing" maintenance sign.

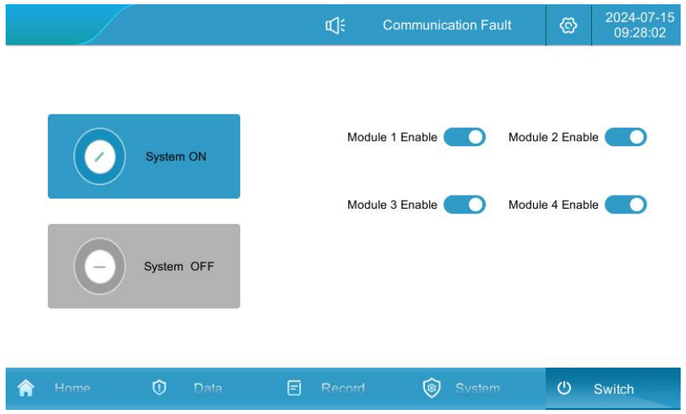


Figure 6.3. 3-1

Step 2: Use a special tool and key to open the system cabinet door

Step 3: Disconnect the circuit breaker of the upper distribution box of the main circuit breaker and hang the "No Closing" maintenance sign.

Use a multimeter to measure whether the inside of the equipment is still charged, and wait until the equipment is no longer charged before proceeding to the next operation;

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 the dustproof cotton flat in the safe placement area.

Figure 6.3. 3-3

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

Figure 6.3. 3-4

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

Step 7: Restart.

6.4 Warranty Services

6.4. 1 Warranty period

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

6.4. 2 Warranty Coverage

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

6.4. 3 Disclaimer

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

1. The warranty period has exceeded;

2. Cannot provide relevant certificates of product purchase;

3. Damage caused during transportation, loading and unloading;

4. Damage caused by incorrect installation, modification or dismantling and repair by unauthorized personnel;

5. Damage caused by operation under abnormal usage conditions or environments;

6. Machine failure or damage caused by the use of non-Naton components or software;

7. Failures caused by irresistible factors such as fire, earthquake and flood.