



BSL NEW ENERGY TECHNOLOGY CO., LTD

User Manual

ESS-GRID C109

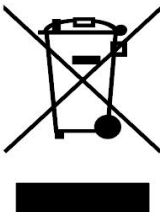
Copy Right @BSL New Energy Technology Co., LTD

Notice:

The products, services, etc. you purchase shall be subject to the commercial contracts and terms of Guangdong BSL New Energy Technology Co., Ltd. All or part of the products and services described in this document may not be within the scope of your purchase or use. Unless otherwise specified in the contract, Best New Energy makes no express or implied representations or warranties regarding the contents of this document.

Due to product version upgrades or other reasons, the content of this document will be updated from time to time. Unless otherwise agreed, this document is only used as a guide, and all statements, information and suggestions in this document do not constitute any express or implied warranty.

Identification Instructions

	Please read the endorsed documentation carefully before using the product.
	When the user maintains and repairs, disconnect the power and wait five minutes before working to prevent a stored charge.
	Danger. Risk of electric shock!
RoHS COMPLIANT	Hazardous Substance Labeling
	Flammability risk
	Keep the battery away from open flame or ignition sources.
	Recycling
	The danger of high voltages. Danger to life due to high voltages in the energy storage system
	This marking indicates that this product should not be disposed with other household wastes

Version History

[illegible]

Catalogue

01 Safety Instructions	1
1.1 Safety symbol description	1
1.2 General safety	1
1.3 Electrical safety	2
1.3.1 Wiring requirements	2
1.3.2 Grounding requirements	3
1.3.3 Maintenance requirements	3
1.4 Mechanical safety	4
1.5 Battery safety	4
1.6 Maintenance and replacement	6
02 Product Introduction	7
2.1 Overview of Energy Storage System	7
2.2 Product Description	7
2.3 Product Application	7
2.4 Product appearance	10
2.5 Communication Topology Diagram	10
2.6 Electrical Circuit Diagram	10
2.7 Product Parameters	11
2.8 Component Introduction	13
2.8.1 Battery pack	13
2.8.2 High voltage control box	14
2.8.3 Battery Management System	16
2.8.4 Energy Storage Converter Power (PCS) Module	16
2.8.5 DC/DC converter power module	18
2.8.6 ON/Off grid switching module STS	19
2.8.7 Temperature Control System	20

2.8.8 Thermal runaway suppression system	21
2.8.9 Access control switch	23
2.8.10 Local management system	24
2.9 Configuration List	25

03 Transportation and storage26

3.1 Packaging and Storage	26
3.1.1 Product packaging	26
3.1.2 Product storage	26
3.2 Transportation and Handling	27
3.2.1 Product Transportation	27
3.2.2 Product handling	27
3.3 Installation environment	28
3.4 Space Preparation	30
3.5 Foundation preparation	31
3.6 Pre-installation preparation	32
3.7 Basic installation	34
3.8 Mechanical Installation	35
3.8.1 Electrical connection	36
3.8.2 Check the equipment after wiring	45

04 Startup and Debugging 46

4.1 Pre-power Check	46
4.2 Check before Startup	46
4.3 Power-on Procedure	47
4.4 Trial Run	48
4.5 Normal Shutdown	48
4.6 Emergency Stop Shutdown	49

05 Operation and Handling 50

5.1 Human-Machine Interface	50
5.2 Power on/off Operation	52
5.3 Communication Settings	53
5.4 Operation Mode Setting	54
5.4.1 Introduction to Operation Mode	54
5.4.2 Grid ON Manual Mode	56
5.4.3 Grid connected automatic mode	57
5.4.4 Automatic off grid switching	60
5.4.5 Battery parameter settings	61
5.4.6 Data Viewing and Exporting	62
5.4.7 Software Upgrade	63
06 Alarm and Maintenance	65
6.1 Alarm Handling	65
6.2 System Maintenance	68
6.3 Dust removal treatment	70
6.3.1 Preparation before dust cleaning	70
6.3.2 Dust cleaning and Maintenance	71
6.3.3 Operating steps	71
6.4 Warranty service	73
6.4.1 Warranty period	73
6.4.2 Warranty Coverage	73
6.4.3 Disclaimer	74
Appendix	75
Emergency Handling	75

01 Safety Instructions

1.1 Safety symbol description

When installing, operating, and maintaining equipment, please read this manual first and follow all safety precautions indicated on the equipment and in the manual. **To ensure that users can better use this product and protect personal and property safety, please read the symbol prompts used below carefully.**



Danger: Indicates a highly potential danger that, if not avoided, could result in death or serious injury.



Warning: Indicates moderate potential danger if not avoided, which may result in death or serious injury to personnel.



Note: Indicates a low potential danger, and failure to avoid it may result in moderate or mild injury to personnel.



Illustration: Emphasizing and supplementing content may also provide tips for optimizing product usage.

1.2 General safety



Illustration:

This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment failure, resulting in abnormal equipment functions or component damage, personal safety accidents, property damage, etc., which are not within the scope of equipment quality assurance. Local laws, regulations, and standards should be followed when installing, operating, and maintaining equipment. The safety precautions in the manual are only supplementary to local laws, regulations, and norms. When any of the following situations occur, our company shall not be held responsible.

1. The installation and usage environment exceeds the provisions of relevant international, national, and regional standards.
2. Do not operate under the usage conditions described in this manual.
3. Unauthorized disassembly, alteration of products, or modification of software code.
4. Not following the operating instructions and safety warnings in the product and documentation.
5. Equipment damage caused by abnormal natural environments (force majeure such as earthquakes, fires, storms, floods, mudslides, etc.).
6. Damage caused by the customer's failure to comply with transportation and installation requirements.
7. Damage caused by storage conditions not meeting product documentation requirements.
8. Due to customer negligence, incorrect operation, or intentional damage, the hardware or data of the device is damaged.

9. System damage caused by third-party or customer reasons, including relocation and installation of systems that do not comply with the requirements of this manual, as well as damage caused by adjustments, changes, or removal of identification marks that do not comply with the requirements of this manual.

10. Defects, malfunctions or damages caused by actions, events, negligence or accidents beyond the reasonable control of the seller, including power outages or electrical failures, theft, war, riots, internal strife, terrorism, intentional or malicious damage, etc.



Danger:

The equipment has high voltage, and improper operation may result in electric shock or fire, leading to death, serious personal injury, or significant property damage. Please follow the operating sequence and safety precautions provided in this manual and other relevant documents, and operate in a standardized manner:

1. Please check if the pre-installed cables on the device are securely connected. Check if the equipment is damaged, such as holes, dents, or other signs of possible internal damage. Check that there is no displacement of the internal components of the equipment, and prohibit unauthorized changes to the structure, installation sequence, etc. of the equipment.
2. Do not use water to clean the electrical components inside the equipment. When liquid is found to have entered the interior of the equipment, please immediately press the emergency stop switch and notify the on-site management personnel.
3. Installation, wiring, maintenance, and replacement operations with electricity are prohibited. Before coming into contact with any conductor surface or terminal, the voltage at the contact point should be measured, and it should be confirmed that the protective grounding wire of the equipment or components that require maintenance is reliably grounded, and there is no risk of electric shock.
4. Do not approach the equipment except for personnel operating it. Do not power on the device until it has been installed or confirmed by a professional. At least two personnel must be present on site during the first power on or live operation of the main circuit.



Illustration:

1. The user's operational behavior and tools during transportation, handling, installation, wiring, and maintenance must comply with the laws, regulations, and relevant standards of the country or region where they are located.
2. During installation, operation, and maintenance, it is necessary to first clean the accumulated water, ice, snow, or other debris on the top of the cabinet before opening the cabinet door to prevent debris from falling into the cabinet.
3. Reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations of device software are prohibited. It is not allowed to study the internal implementation of the device, obtain the source code of the device software, steal intellectual property, or disclose the results of any device software performance testing in any way.

1.3 Electrical safety

1.3.1 Wiring requirements

1. Please select cables that comply with local laws and regulations. Cables of the same type should be tied together, and cables of different types should be laid separately. It is forbidden to wrap or cross lay them with each other.
2. If the wiring is completed or briefly left during the wiring process, the cable port should be immediately sealed, the cabinet door should be closed, and small animals should be avoided from entering.
3. The cables used in energy storage systems must be securely connected, well insulated, and meet the required specifications. The position of cable conduit or wire 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 attached to the ground to prevent deformation or damage caused by stress during backfilling.
5. The use of cables in high-temperature environments may cause aging and damage to 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. To ensure construction safety, all cables should be laid and installed at temperatures above 0 °C. When handling cables, especially in low-temperature environments, they should be handled with care.

1.3.2 Grounding requirements

1. Do not damage the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, the electrical connections of the equipment should be checked to ensure that it is reliably grounded.
2. The grounding impedance of the equipment meets the requirements of the national standard GB 50054 and local electrical standards.
3. It is prohibited to operate the equipment without installing a grounding conductor. When installing equipment that requires grounding, protective grounding wires must be installed first; When dismantling equipment, the protective grounding wire must be removed last.

1.3.3 Maintenance requirements

1. Before connecting or removing cables, the protective switch of the corresponding circuit must be disconnected first.
2. Use a multimeter with the corresponding voltage level to check if the device is live and ensure that it has been completely powered off.
3. If there are live objects nearby, please use insulation boards or tapes to cover or wrap them.
4. After reliably connecting the circuit to be repaired to the grounding circuit using a grounding wire, carry out operation and maintenance.



Illustration:

1. Before connecting the cable, it is necessary to confirm that the cable label identification is correct before making the connection.
2. If the device has multiple inputs, all inputs should be disconnected and the device can only be operated after it is completely powered off.

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

1.4 Mechanical safety



Note:

1. When transporting without wooden crates, the bottom fence must be removed. Take off and land with care to avoid impact or vibration.
2. During transportation, the center of gravity of the box should fall between the two forks on the forklift. Long distance handling, inversion, and tilting are prohibited.
3. When transporting equipment, it may be necessary to arrange auxiliary personnel to assist due to the large size of the equipment blocking the operator's line of sight.
4. To ensure the safety of drilling outside the equipment body, a suitable location should be selected before drilling to ensure that it will not cause short circuits or other impacts. During the drilling process, the equipment should be covered to prevent debris from falling into the interior of the equipment, and debris should be cleaned up promptly after drilling.
5. When handling equipment by hand, preparation should be made for bearing weight, and safety protective equipment such as protective gloves and anti smashing shoes should be worn.
6. Be careful when moving equipment during transportation to avoid impact or falling. Avoid scratching the surface of the equipment, damaging components or cables.

1.5 Battery safety



Illustration:

We are not responsible for any damage caused to the batteries provided by our company due to the following reasons:

1. Due to customer reasons, the battery was not charged and inspected in a timely manner, resulting in expired storage, capacity loss, or irreversible damage.
2. Mechanical damage, leakage, rupture, etc. caused by improper operation or failure to connect the battery as required.
3. Customers or third parties who are not aware of our company may change the battery usage scenario on their own. Including but not limited to: connecting additional loads to the battery by oneself, mixing with other brands of batteries, mixing with batteries of different rated capacities, etc.
4. Direct damage to the battery caused by the inability of on-site equipment operating environment or external power parameters to meet the environmental requirements for normal operation. Including the actual operating temperature of the battery being too high or too low, severe power grid conditions, frequent power outages, etc.
5. The customer has not set the battery operation management parameters correctly or maintained them improperly, resulting in frequent overdischarging of the battery, on-site expansion by the customer, or long-term inability to fully charge.
6. The customer did not perform proper maintenance on the battery according to the operating manual of the supporting equipment, including but not limited to: not regularly checking whether the battery terminal screws are tightened, etc.
7. The battery was stolen and lost.

8. Batteries that have exceeded their warranty period.



Danger:

1. Do not expose the battery to high temperature environments or heat generating devices such as sunlight, fire sources, transformers, heaters, etc. Overheating of batteries may cause fires and explosions.
2. Do not disassemble, modify or damage the battery (such as inserting foreign objects, immersing in water or other liquids, etc.) to avoid battery leakage, overheating, fire or explosion.
3. Thermal runaway of batteries can produce flammable gases, as well as harmful gases such as CO and HF. The accumulation of combustible gases generated after thermal runaway of batteries poses a risk of explosion and explosion, which may cause personal injury and property damage.
4. When installing and maintaining the battery, it is necessary to wrap the exposed cable terminals on the battery with insulating tape. At the same time, avoid foreign objects (such as conductive objects, screws, liquids, etc.) from entering the interior of the battery and causing a short circuit.



Warning:

1. Batteries must be stored in a separate warehouse and in their outer packaging, avoiding mixing with other materials, storing outdoors, and stacking batteries too high. The site must have fire-fighting facilities that meet the requirements, such as fire sand, fire extinguishers, etc.
2. Batteries should be avoided from impact. When handling batteries, they should be carried in the direction required by the battery, and inversion or tilting are prohibited.
3. Please use the battery within the temperature range specified in this manual. When the ambient temperature of the battery is below the lower limit of the operating temperature, charging is prohibited to avoid crystallization caused by low-temperature charging and internal short circuit of the battery.
4. Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as household waste.
5. If the battery has been charged for more than 8 months, it needs to be recharged. If not recharged as required, it may affect the performance and service life of the battery.

Measures for handling battery abnormalities



Danger:

1. When electrolyte leakage or abnormal odor occurs, contact with the leaked liquid or gas should be avoided. Non professionals are not allowed to approach, please contact professionals immediately for assistance.
2. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If in contact with battery electrolyte, immediately clean the contact area with plenty of water and soap, and seek medical help immediately.
3. After the battery drops (with or without packaging), it is prohibited to continue using it. If there is no obvious deformation or damage to the appearance and there is no obvious

odor, smoke, or fire, transfer the battery to an open and safe place for 1 hour before processing, and contact our service engineer, while ensuring safety.

4. When there is a noticeable odor, damage, smoking, or fire after the battery drops, personnel should be evacuated immediately and the alarm should be reported in a timely manner. Professional personnel use fire-fighting equipment to extinguish fires while ensuring safety.

1.6 Maintenance and replacement



Warning:

1. If the device malfunctions, please contact your dealer promptly for assistance.
2. Before carrying out maintenance work, please power off the equipment first, and then follow the instructions on the delayed discharge label to wait for the corresponding time to ensure that the equipment has been powered off before operating it.
3. During the maintenance process, please try to avoid unrelated personnel entering the maintenance site, and temporary warning signs or fences must be erected for isolation.
4. Unauthorized personnel are not allowed to open the cabinet door, otherwise there is a risk of electric shock, and the resulting malfunction is not covered by the warranty.
5. It is prohibited to open the cabinet door in weather conditions such as rain, snow, lightning, dust, and heavy fog.
6. Before removing the components from the cabinet, please confirm that other components on the cabinet are not loose.
7. Operation and maintenance personnel as well as professional technicians should receive sufficient training on safe use and equipment maintenance, and should operate with sufficient preventive measures and personal protective equipment.
8. During equipment maintenance, insulation materials should be used to cover nearby live parts.
9. Before the fan is powered off or stopped rotating, it is forbidden for any object to come into contact with the running fan (such as fingers, components, bolts, etc.).
10. The equipment can only be powered on again after the fault has been resolved, otherwise it may cause the fault to expand or damage the equipment.
11. When conducting live inspection of the system, Note should be paid to the danger warning signs on the equipment to avoid standing at the cabinet door.
12. After the replacement of power components or wiring changes in the energy storage system, manual wiring inspection is required to avoid abnormal system operation.
13. When replacing the battery, please replace it with the same type of battery module.
14. After the maintenance operation is completed, it should be checked immediately to ensure that no tools or other components are missing in the equipment.
15. After completing maintenance and replacement operations, the cabinet door should be locked in a timely manner and the key should be properly kept.

02 Product Introduction

2.1 Overview of Energy Storage System

The standard energy storage integrated cabinet in the ESS-Grid Cabinet Series consists of 14 battery packs, 1 high voltage box, 150kW PCS, 150kW DC, 150kW STS, etc. Each pack is composed of 18 battery cells connected in series, with a rated capacity of 135Ah. The high voltage control box includes a battery cluster management unit BCU and some electrical components for protection and protection of the entire battery cluster operation status. The integrated cabinet adopts a separate design of battery compartment and electrical compartment, making installation and maintenance very convenient.

2.2 Product Description

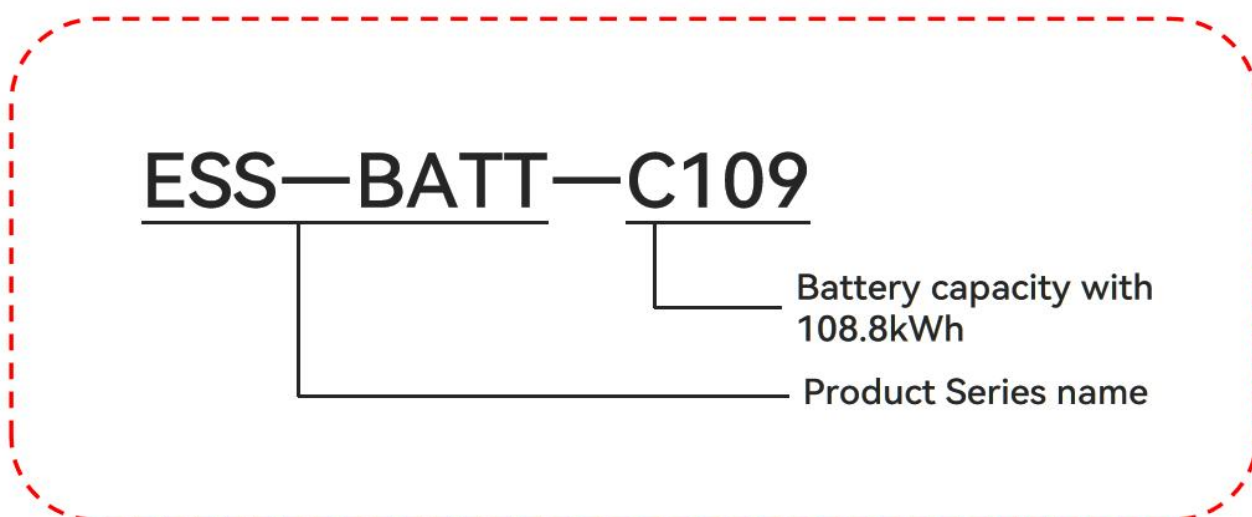


Figure 2.2



Illustration:

Isolation transformer, STS and off grid switching, and DC power module are optional components. The rated output power and battery capacity can be flexibly configured according to project requirements.

2.3 Product Application

The integrated energy storage cabinet includes energy storage batteries, modular STS, modular PCS, modular DC/DC converters, energy management monitoring systems, power distribution systems, environmental control systems, and fire control systems. Adopting modular PCS for easy maintenance and expansion, the industrial and commercial storage integrated cabinet adopts front maintenance, which can reduce the footprint and maintenance channels, and has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency, and intelligent management.

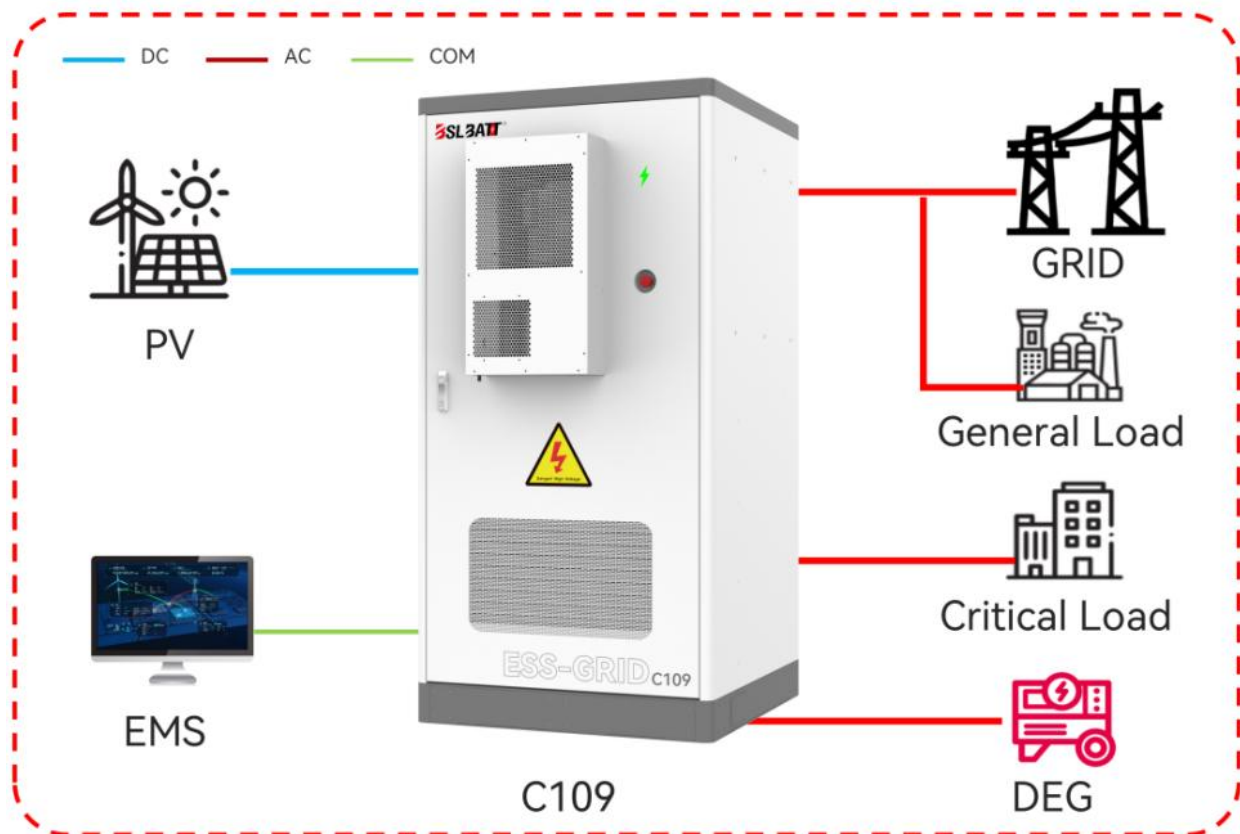


Figure 2.3-1

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

1. Peak shaving and valley filling: When the time of use electricity price is in the valley section, the energy storage cabinet will automatically charge and standby after being fully charged; When the time of use electricity price is in the peak period: the energy storage cabinet automatically discharges, realizing the arbitrage of electricity price difference and improving the economic benefits of the photovoltaic storage and charging system.
2. Photovoltaic Energy Storage Union: Real time acquisition of local load power, priority given to photovoltaic power generation for self use, and surplus electricity storage; If the photovoltaic power generation is insufficient to provide local load, priority should be given to using batteries to store electricity.

Four machine parallel configuration: The industrial and commercial storage integrated machine has a parallel function, which can connect up to four industrial and commercial storage integrated machines of the same model in parallel, effectively improving the power output of the entire system.

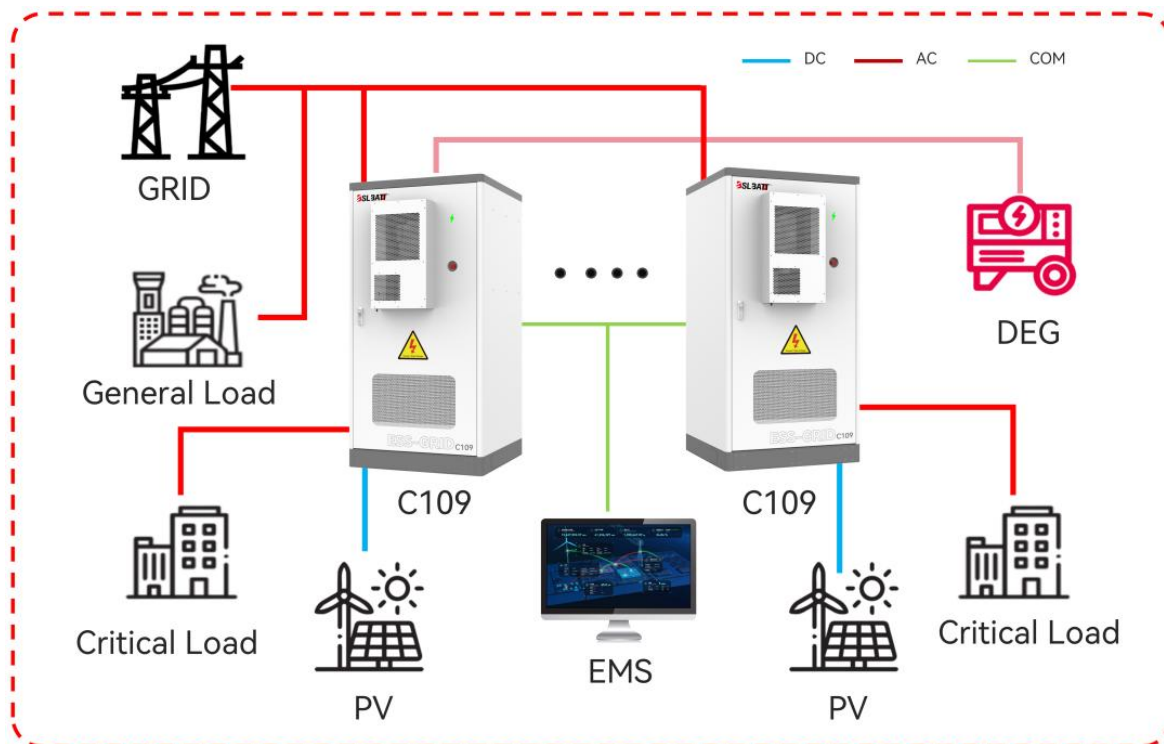


Figure2.3-2

Multi battery expansion: The industrial and commercial storage integrated machine has the ability to achieve multi cluster parallel connection with similar battery cabinets, which can effectively improve the capacity of the entire energy storage system. According to the specific needs of users, the number of parallel DC battery cabinets can be selected, and up to 2 more can be clustered together to increase the total capacity of the system.

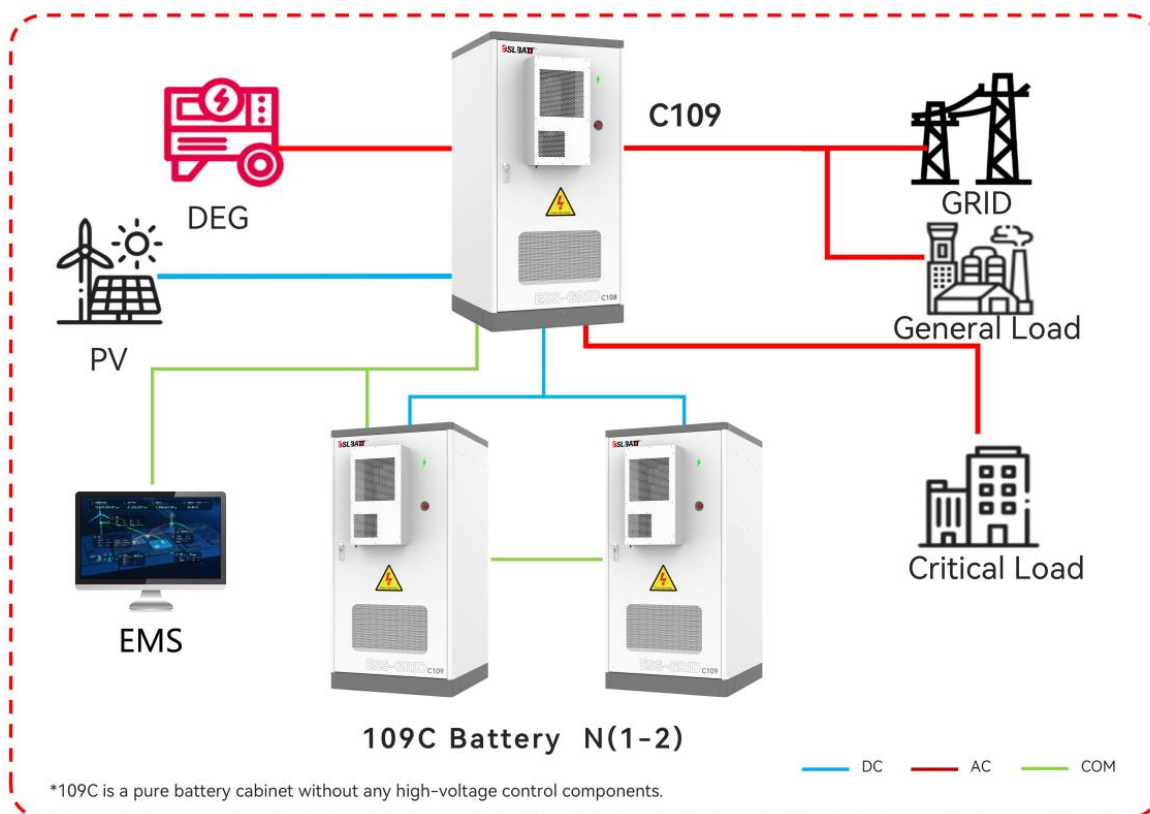


Figure2.3-3

2.4 Product appearance

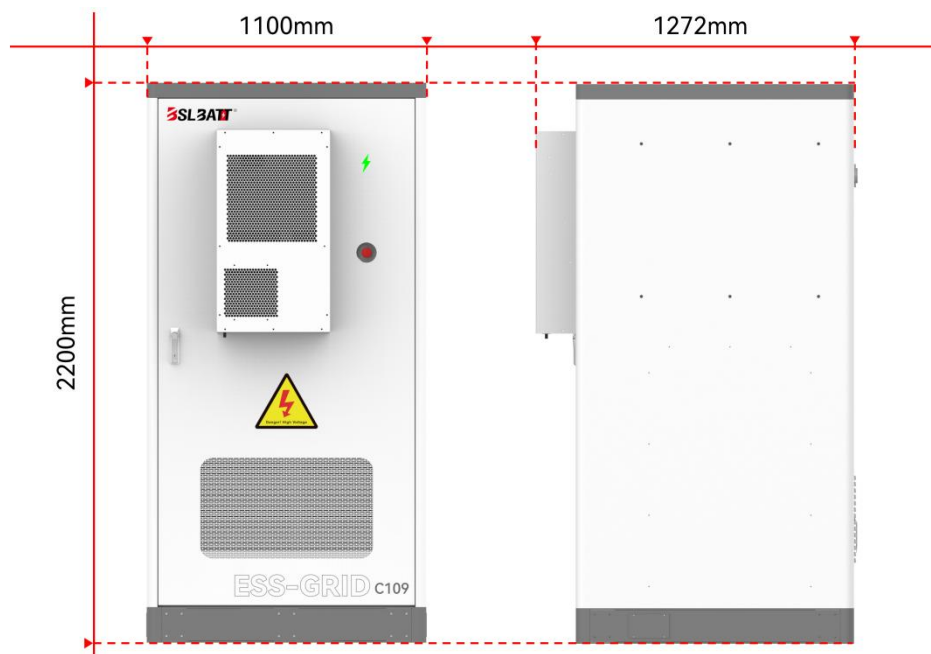


Figure2.4

2.5 Communication Topology Diagram

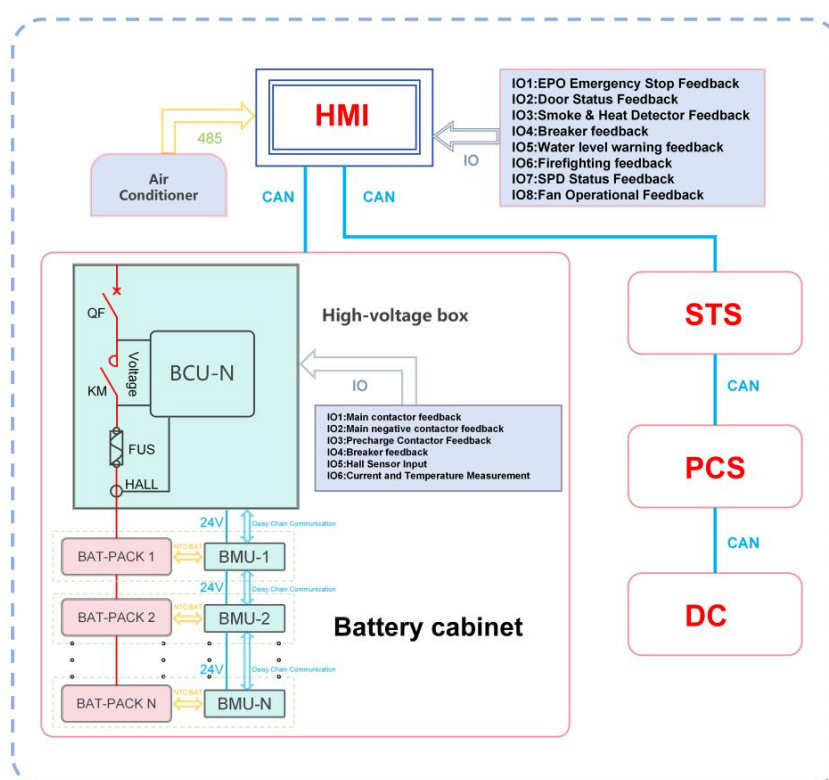


Figure2.5



Illustration: Different project configurations have slight differences in communication, and the actual shipment shall prevail.

2.6 Electrical Circuit Diagram

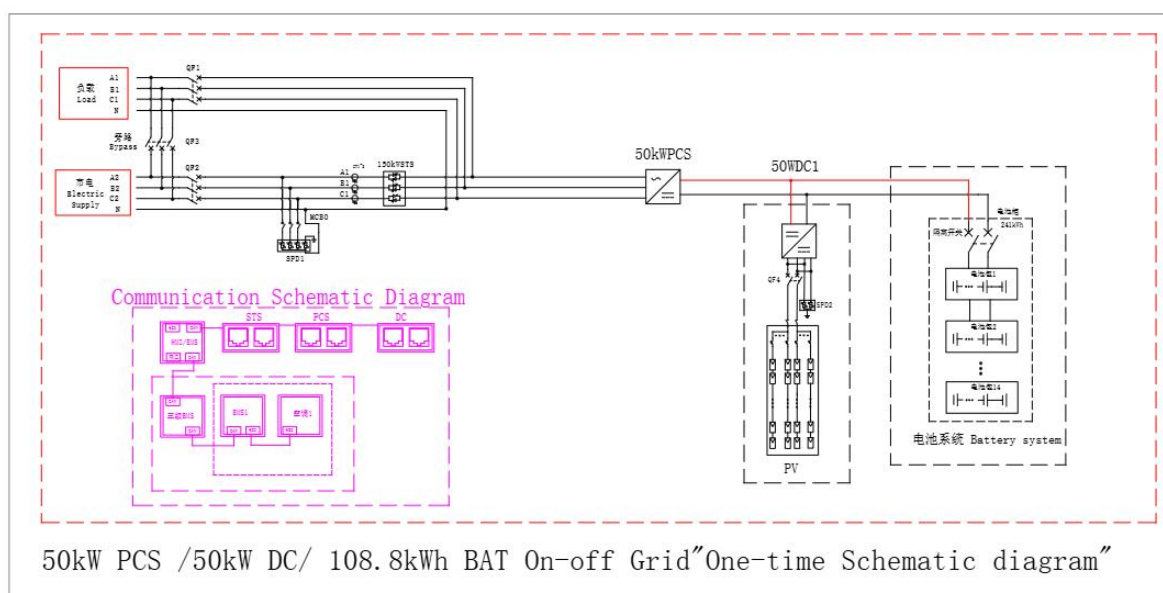


Figure2.6



Illustration: Figure 2.6 shows the C109 system solution with off grid and photovoltaic input. Different project configurations and lines may vary slightly, and the actual shipment shall prevail.

2.7 Product Parameters

ESS-GRID Cabinet series Parameter

Model	ESS-GRID C109
System Parameter	50kW/108kWh
Cooling Method	Air-cooled
Battery Parameters	
Battery Type	Lithium Iron Phosphate Battery (LFP)
Series-parallel connection	1P*18S*14S
Rated capacity	135Ah
Rated capacity	108.86kWh
Rated voltage	806.4V
Operating voltage range	705.6V~907.2V
System voltage range	730.8V~882V
Rated Charge/Discharge Current	45A (1/3C)
Charge temp.	0~55℃
Discharge temp.	-20~55℃
PV Parameters	
Max. PV Input Voltage	900V

Max. PV Power	55kW
MPPT Quantity	1
Max. Input Current	160A/80A+80A
MPPT Voltage Range	250-620V
MPPT Full Load Open Circuit VoltageRange(Recommended)	345V-620V
AC Parameters	
Rated AC Power	50kW
Nominal AC Current Rating	72A
Max. AC Current Rating	79A
Rated AC Voltage	400Vac/230Vac ,3W+N+PE /3W+PE
DC Side Voltage Range	6000~1000V (3P3W) / 680~1000V (3P4W)
DC Side Full Load Voltage Range	625~950V (3P3W) / 680~950V (3P4W)
Rated Frequency	50Hz/60Hz(± 5 Hz)
Power Factor Adjustable Range	1 Ahead ~ +1 Behind
Total Current Harmonic Distortion	THDI<3%(RatedPower)
General Parameters	
Protection Level	IP55
Fire Protection System	Aerosol/Perfluorohexa none/Heptafluoropropane
Isolation Method	Non-isolated(Optional Transformer)
Operating Temperature	-25°C~55°C (>45°C Derating)
Relative humidity	0~95% ((no condensation)
Altitude	≤ 3000 m(>3000m Derating)
Communication Protocol	RS485/ CAN2.0 / Ethernet/ Dry contact
Dimensions (W*D*H)	1100*1272*2200mm (± 5 mm)
Weight	1540kg $\pm 3\%$

Table2.7-1



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

2.8 Component Introduction

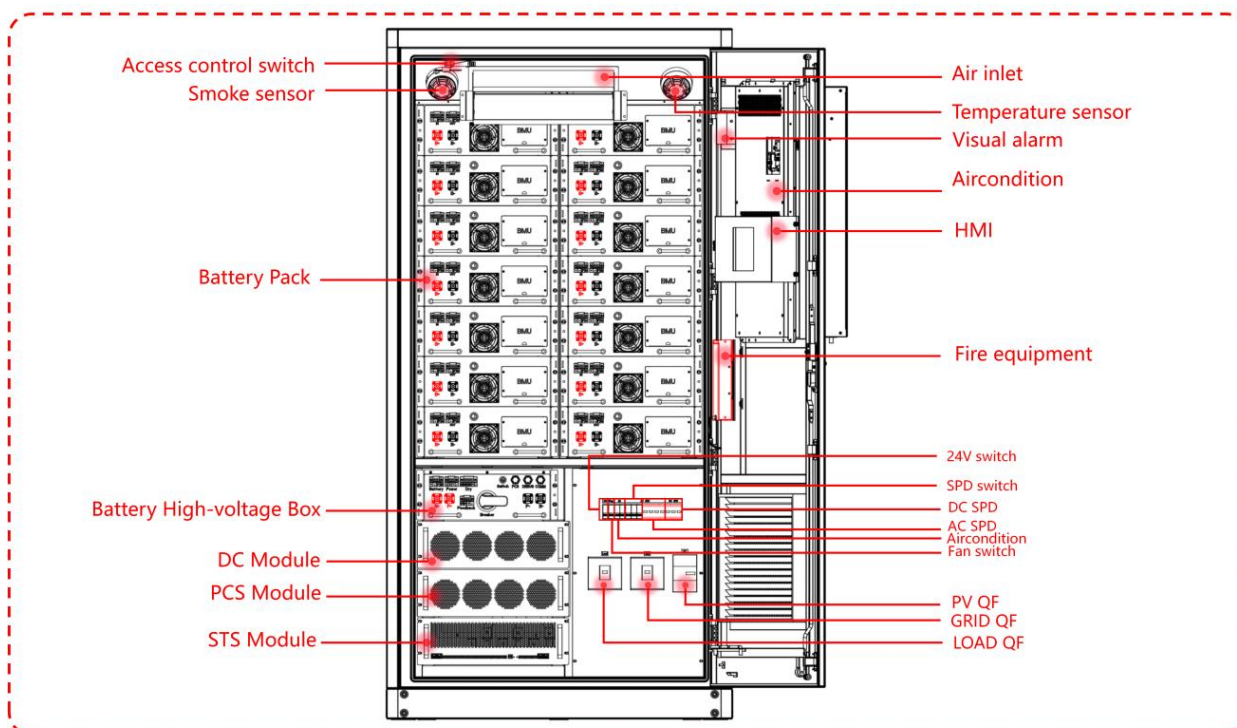
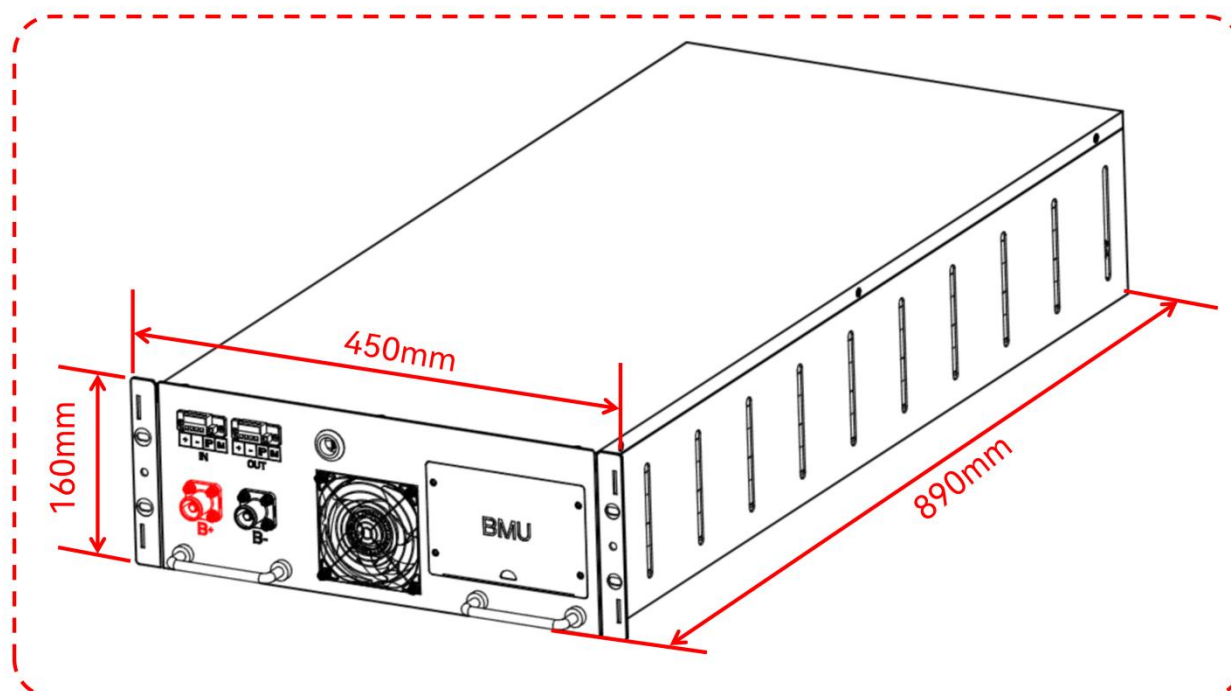


Figure 2.8

2.8.1 Battery pack



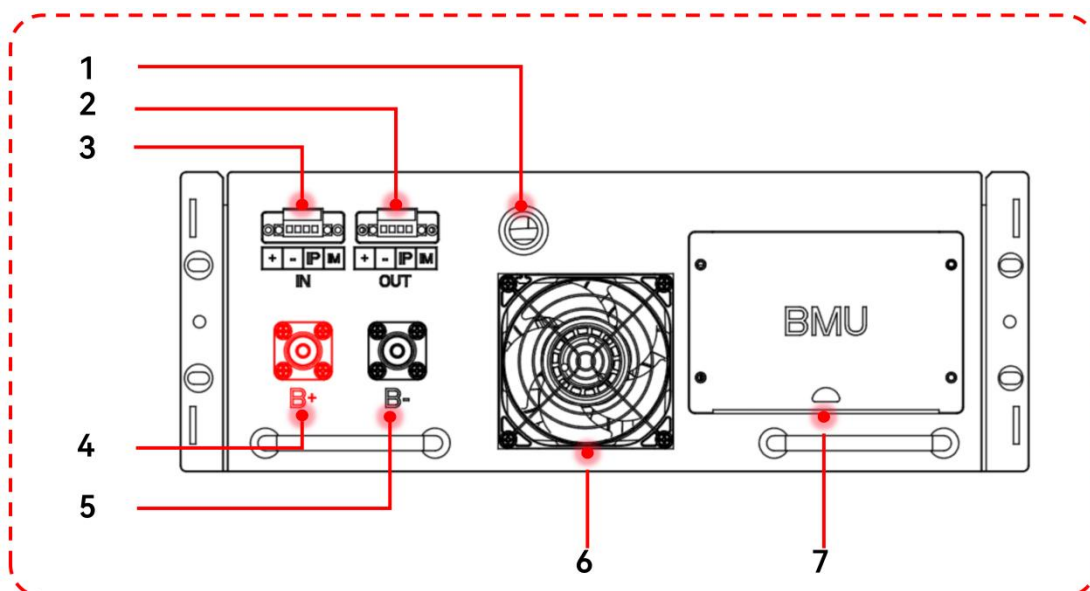
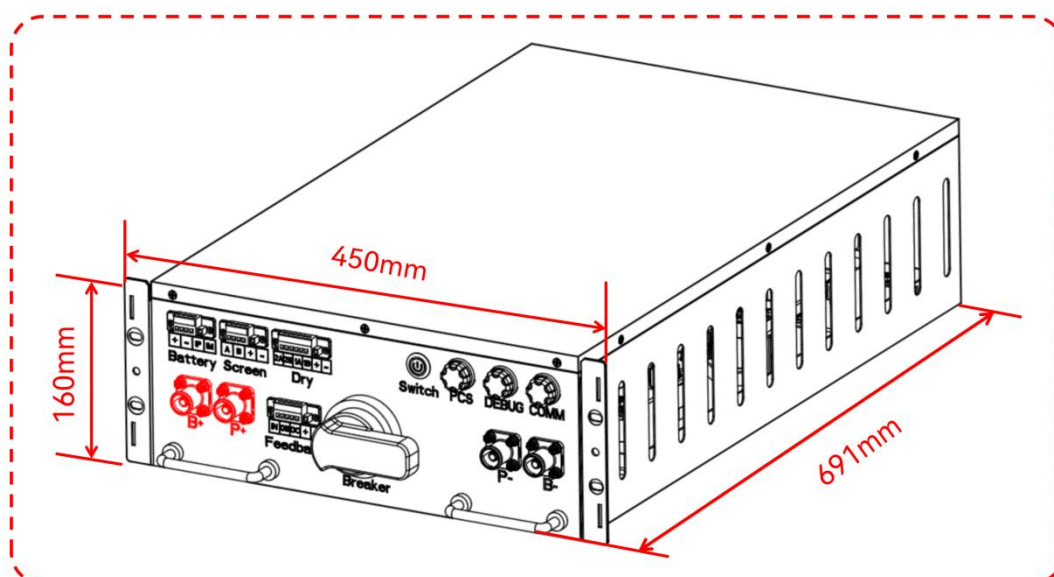


Figure 2.8.1

NO.	Model name	Descriptions
1	Fan power port	Used to power the internal fan of the battery box
2	Communication output	Used for BMU communication information collection
3	Communication input	Used for BMU communication information collection
4	Negative output	Connect the negative terminal
5	Positive output	Connect the positive terminal
6	Cooling fan	Cool the battery to reduce the chance of thermal runaway.
7	BMU	Battery Management Unit

Table 2.8.1

2.8.2 High voltage control box



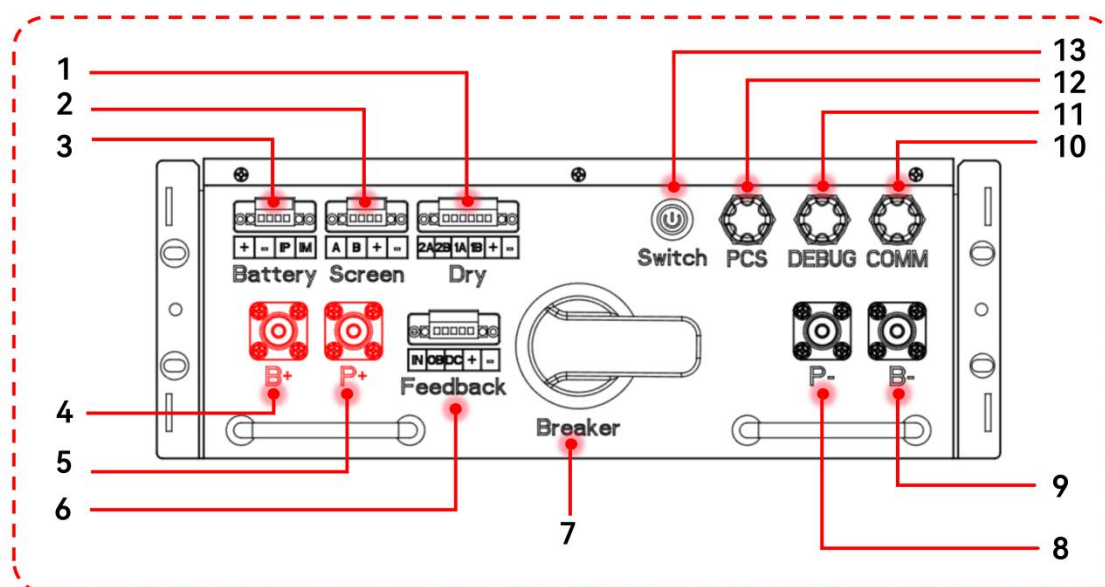


Figure 2.8.2

NO.	Model name	Descriptions
1	Dry contact	Connectivity status of the control circuit
2	24V power output	External power supply or communication interface for the display screen
3	Battery contact	Battery pack communication master control,connecting to each battery pack to check status.
4	Battery positive connection port	Connect the positive terminal
5	System positive output port	Connect the external positive DC cable, which can be connected to the positive terminal of the inverter.
6	Feedback contact	For signal reception and conversion between equipment during parallel operation
7	Isolating circuit breaker	Control the on and off of the high-voltage circuit of the battery.
8	System negative output port	Connect the external negative DC cable to the inverter's negative terminal.
9	Battery negative connection port	Connect the negative terminal
10	COMM	Address confirmation for parallel connection with another battery system
11	Debugging	communicating with the computer, monitoring and upgrading the battery.
12	PCS	PCS communication connection
13	Switch	Control the "on/off" of the low-voltage circuit ifor battery system

Table 2.8.2

2.8.3 Battery Management System

The energy storage management system consists of a battery management system (BMS) and an energy management system (EMS). The battery we have chosen comes with a BMS system, which is divided into two levels: BMU and BCU.

The BMU is located inside the battery box and completes the data collection of individual cell information inside the battery box. It uploads the data to the BCU and balances the individual cells inside the battery box according to the instructions issued by the BCU.

BCU is located in the main control box and is responsible for the management of the battery cabinet. It receives detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, performs SOC calculation and correction, is responsible for pre charging and waiting for charging and discharging management of the battery cabinet, and uploads relevant data to EMS.

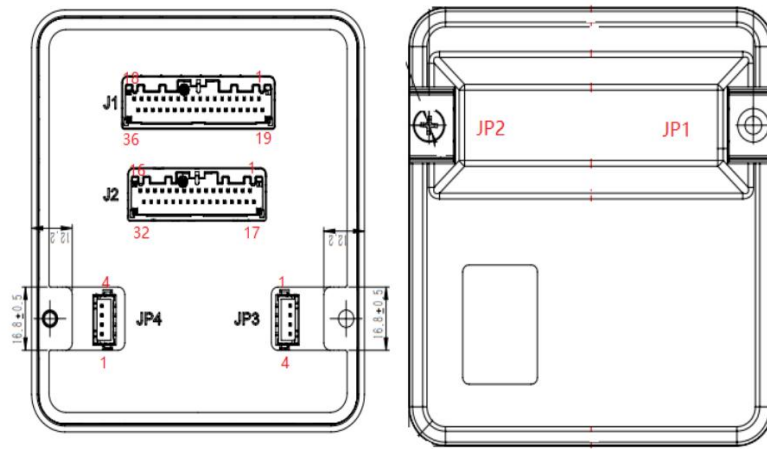


Figure2.8.3-1 BMU

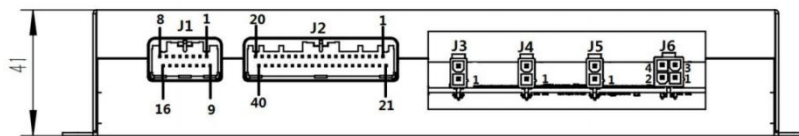
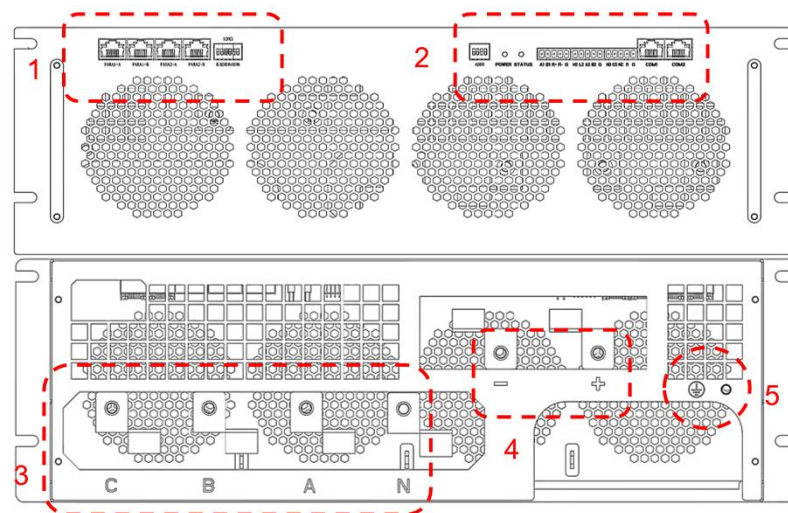


Figure2.8.3-2 BCU

2.8.4 Energy Storage Converter Power (PCS) Module



- (1) Parallel port (2) Comm port (3) AC port (4) DC port (5) Grounding port

Figure 2.8.4



Illustration:

In parallel ports, the "A" and "B" interfaces of PARA1 (module parallel interface) are connected in parallel without priority distinction between the two. All internal PCS modules must ensure that the parallel interfaces are properly connected, otherwise system abnormalities may occur during operation.

NO.	Name
1	PARA1-A
2	PARA1-B
3	PARA2-A
4	PARA2-B
5	R1, R2, R3, R4, R5, R6
6	N/A

Table 2.8.4-1 Parallel Connection Port Table

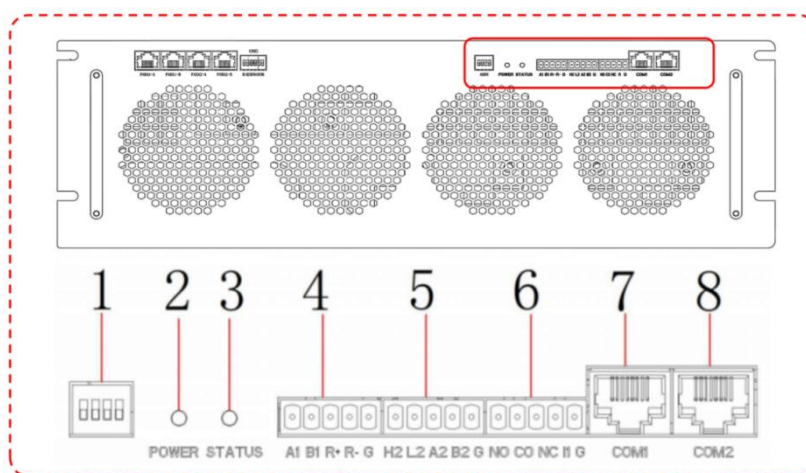


Figure 2.8.4 Signal Port Interface Diagram



Illustration:

1. The COM1 and COM2 signal ports are connected in parallel as external communication interfaces for the PCS module.

When multiple modules are running in parallel, each module must be assigned a unique hardware address. If two modules have the same address, it will cause address conflicts, making it difficult to correctly identify parallel units and affecting the normal operation of the system.

NO.	Name	Description
1	ADDR	DIP switch address
2	POWER	Power indicator (Red)
3	STATUS	Status indicator (Green)
4	RJ45	485 Communication Interface 1
5	N/A	N/A
6	N/A	N/A
7	COM1	PCS CAN & RS485 communication port
8	COM2	PCS CAN & RS485 communication port

Table 2.9.4-2 Signal Port Interface Table

2.8.5 DC/DC converter power module

For islands, mountainous areas, border outposts, and other remote regions or areas with unstable power supply, or for the construction of zero carbon technology parks with photovoltaic storage systems. Users can configure the DC converter power module according to project requirements, and charge the battery through DC coupling to achieve an integrated power supply system of photovoltaic and energy storage.

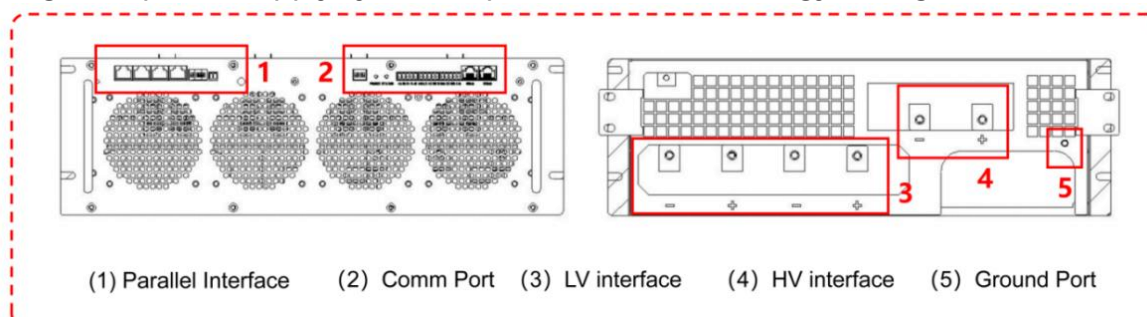


Figure2.8.5-1

NO.	Name
1	PARA1-A
2	PARA1-B
3	PARA2-A
4	PARA2-B
5	R1.R2.R3.R4.R5.R6

Table2.8.5-1

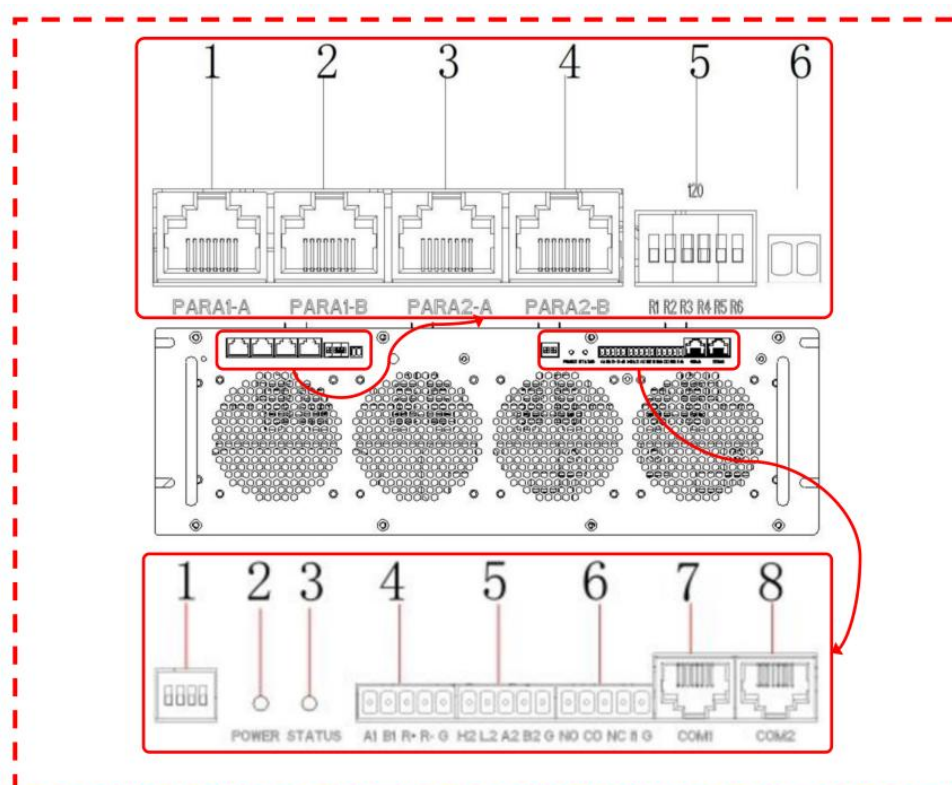


Figure2.8.5-2

NO.	Name
1	Dial address
2	Power Indicator (Red)
3	Status Indicator (Green)
4	485 communication interface 1
5	485 communication interface 2
6	I/O interface
7	RJ45 Port 1 (CAN Communication port)
8	RJ45 Port 2 (CAN Communication port)

Table2.8.5-2

2.8.6 ON/Off grid switching module STS

For areas with unstable power grids and frequent power outages, users can configure STS modules according to project requirements to achieve seamless switching and automatic control of on/off grid operations through STS.

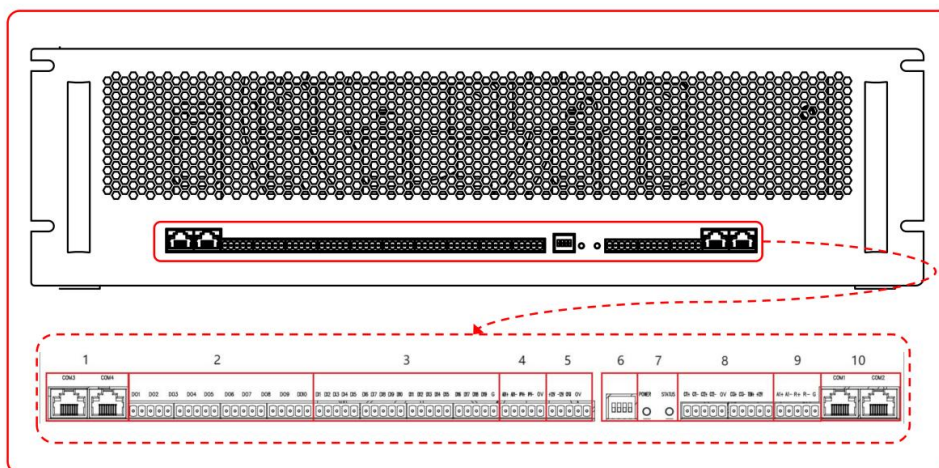


Figure 2.8.6

NO.	Name
1	Parallel Port
2	Output Digital Signals (DO1-DO10)
3	Input Digital Signals (DI1-DI19)
4	Empty
5	Empty
6	DIP Switch
7	Indicator Light
8	Current Sampling Interface
9	Empty
10	RJ45 Interface (CAN Communication Interface)

Table 2.8.6

2.8.7 Temperature Control System

Industrial grade air conditioning

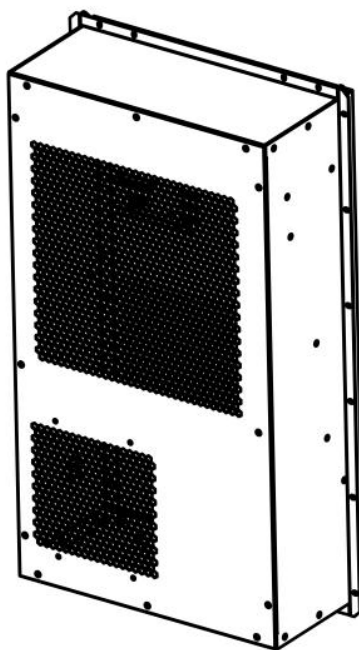


Figure 2.8.7

Air conditioning parameter table	
Name	Outdoor Cabinet Air Conditioner
Model	HDC020AS
Mounting Method	Semi-embedded Mounting
Power Supply	220VAC±15% 50Hz/60Hz
Cooling Capacity	2000W@L35/L35
Power Consumption	870W@L35/L35
Heating Capacity	1200W@L35/L55
Power Consumption	1090W@L35/L55
Internal Airflow	820 m³/h
Working Temperature Range	-40°C~+55°C
IP Grade	IP55
Net Weight	38kg
Refrigerant	R134a
Dimensions	833x483x216(mm,HxWxD)

Table 2.8.7

2.8.8 Thermal runaway suppression system

Temperature and smoke detector

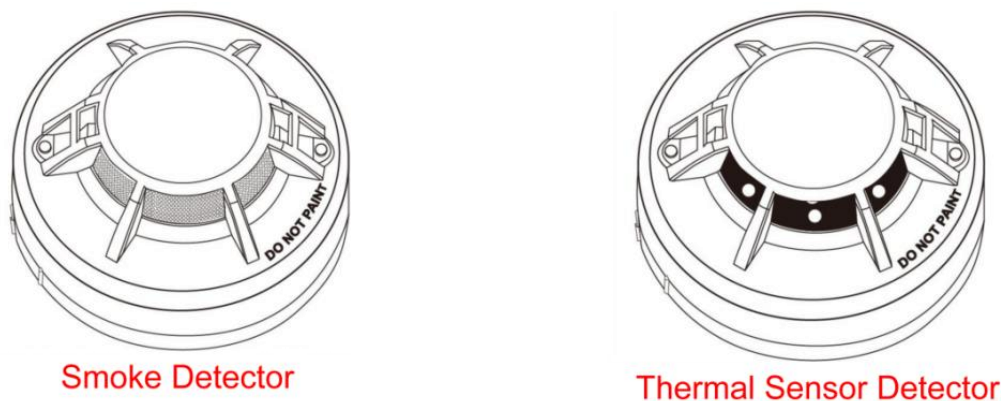


Figure 2.8.8-1

Technical Specifications of Temperature&Smoke Detector	
Operation voltage	9~28V DC
Operation current	Static current<60uA
Alarm current	10mA≤I≤50mA
indicator	Flashes during monitoring and stays on constantly when alarming.
Operating temperature	-10°C~+55°C
Relative humidity	<95%RH(Without condensation)
Smoke sensitivity	0.4dB/m
Alarm temperature level	A2R

Table 2.8.8-1

Fire protection system

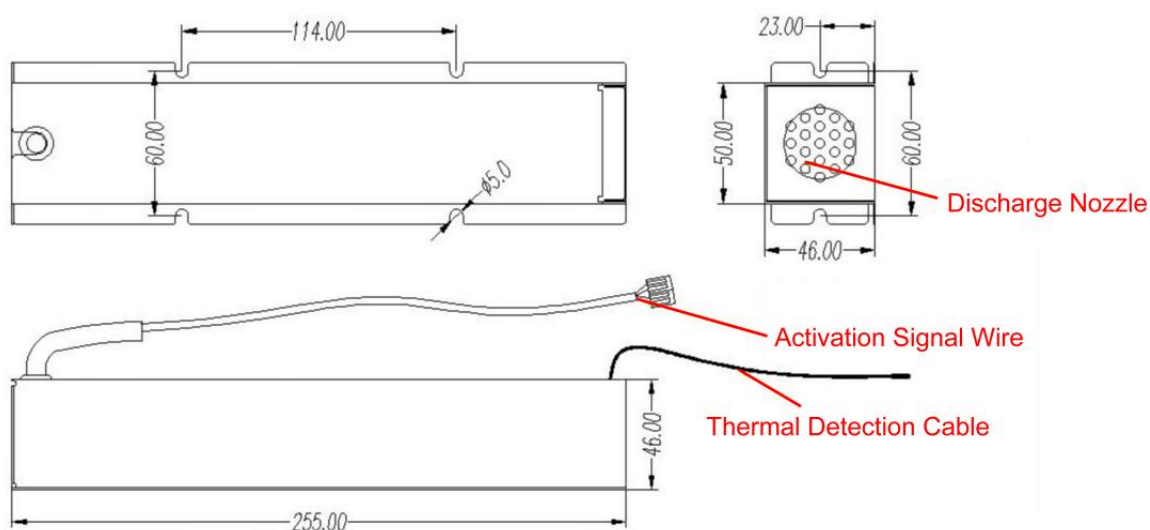


Figure2.8.8-2

Fire Equipment Parameter Table	
Service life	10 years
Startup method	hot start and electric start
Cold Cranking Temperature	160°C→180°C
Ambient Operating Temperature	-50°C→+90°C
Mandatory Safety Clearance	≤ 3 m ³
Total Aerosol Emission Mass	300g±2%
Spray delay time	≤5s
Nozzle temperature	5mm away from the nozzle≤200°C
Passive switch feedback signal	normally open in standby mode, normally closed after startup (starts after exceeding 80°C)
Equipment weight	860g

Table 2.8.8-2

Pressure Relief Valve

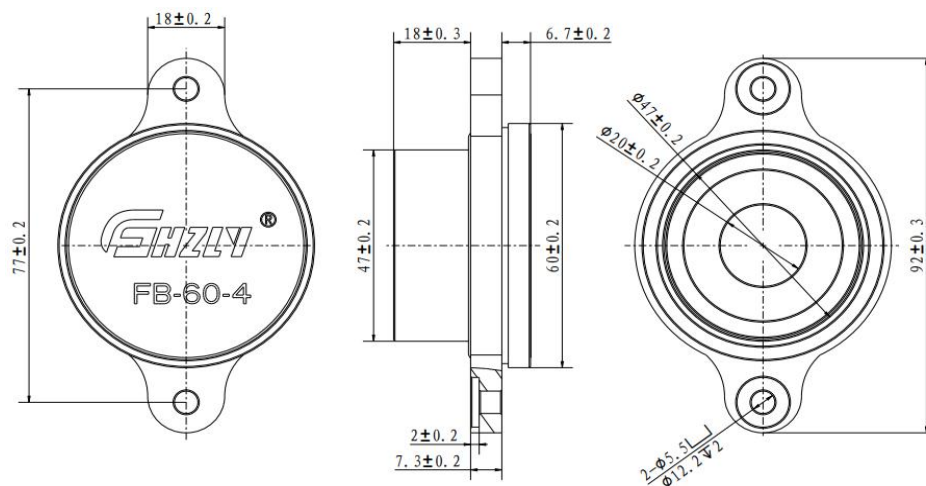


Figure 2.8.8-3

Pressure Relief System Technical Parameter	
IP Protection Rating	IP68
Air Permeability Rate	>900ml/min(air pressure 1.5kPa)
Burst Pressure	4±1kPa
Environmental Compliance	Rohs2.0
Flame Retardant Class	UL94-VO
Temperature Resistance	300g±2%
Discharge Lag Time	-40~125°C

Table 2.8.8-3



Illustration:

1. Balance the pressure difference inside and outside the battery cabinet. Under normal operation, the product will not experience seal failure due to the pressure difference exceeding its tolerance when the external environment changes (temperature and altitude changes).
2. When the battery pack experiences abnormal conditions, the product can quickly release pressure.

2.8.9 Access control switch

Door opening status of access control switch detection equipment.

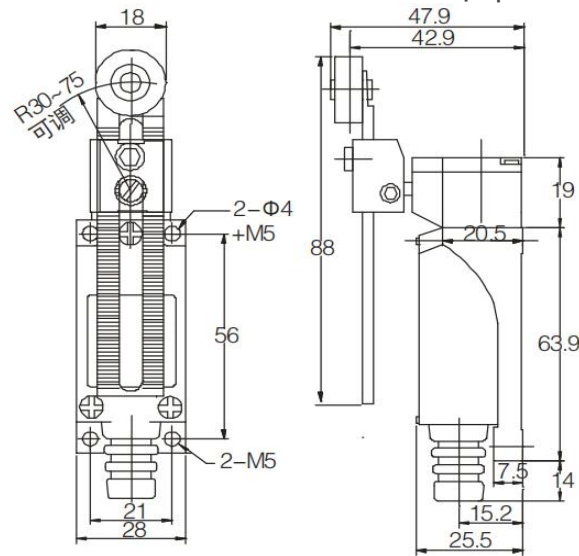


Figure2.8.9

Model	MTFI-3125A
Rated Load	5A/250VAC
Operating Speed	5mm-50cm/s
Operating Frequency	Mechanical: 120 times/min Electrical: 30 times/min
Insulation Resistance	Above 100mΩ
Contact Resistance	Initial value 25mΩ
Dielectric Withstand Voltage	Non-connected: 1000VAC Between terminals: 1500VAC
Vibration	Malfunction: 10-55Hz double amplitude
Shock	Durability: 1000m/s ² Malfunction: 300m/s ³
Service Life	Electrical: 100,000 times and above Mechanical: 1,000,000 times and above
Protection Class	IP65
Operating Temperature	-20~+60°C
Operating Humidity	<85%

Table2.8.9

 Note:

1. Do not disassemble the access control switch by yourself to avoid more serious damage or safety risks.
2. Do not forcefully close or open doors abnormally.

2.8.10 Local management system

Lotus ESS is an intelligent energy management system developed by our company for micro-grid systems, mainly used in various capacity energy storage power stations and integrated photovoltaic storage and charging power stations.

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

Product Model	Lotus - ESS
Power Input	DC 12V
Output Control	3 isolated output switching signals
Input Control	6 isolated input switching signals
Serial Communication	2 isolated RS232 ports, 4 isolated RS485 ports
Fieldbus	2 CAN bus interfaces
Ethernet Port	1 10/100M Ethernet port (RJ45)
Expanded Storage	1 USB port, 1 SD card slot
Audio Alarm	1 controllable buzzer
Program Characterization	1 running indicator light, 1 status indicator light, 1 alarm indicator light
Abnormality Characterization	1 hardware watchdog timer
Real-Time Clock	1 set of RTC real-time clock

Table2.8.10

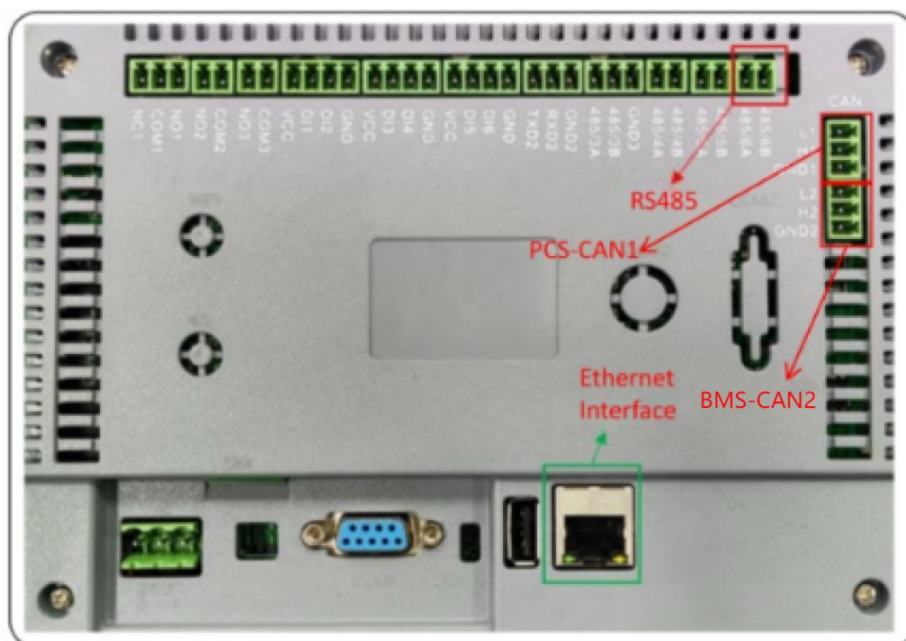




Figure2.8.10-HMI

2.9 Configuration List

ESS-GRID C109 Configuration List

Name	Model	Unit	QTY	Remarks
Battery system	135Ah, 109kWh	PCS	1	With control box
PCS	BSL-50AC	PCS	1	modularization
DC -DC Converter	BSL-50DC	PCS	1	modularization
STS	BSL-150STS	PCS	1	modularization
Air Conditioner	HDC020AS	SET	1	Smart Air Cooling
Fire Protection System	QRR0.3G/S	SET	1	Thermal wire Startup type
Auxiliary System	Access control, power distribution, temperature and smoke detectors, cables, etc	SET	1	self-contained complete
Management System	Lotus-ESS	SET	1	self-contained complete



Note: The actual supply configuration shall prevail.

03 Transportation and storage

3.1 Packaging and Storage

3.1.1 Product packaging

To ensure that the product is in good protective condition during transportation, specific wooden boxes are used for packaging. The equipment packaging has the following basic parameters (including but not limited to), which need to be carefully checked according to project requirements:

Parameter	Description
Model	Product model
Dimensions	Dimensions of the product after packaging
Weight	Dimensions of the product after packaging
Markings	Keep upright, Handle with care, Position of center of gravity, etc.

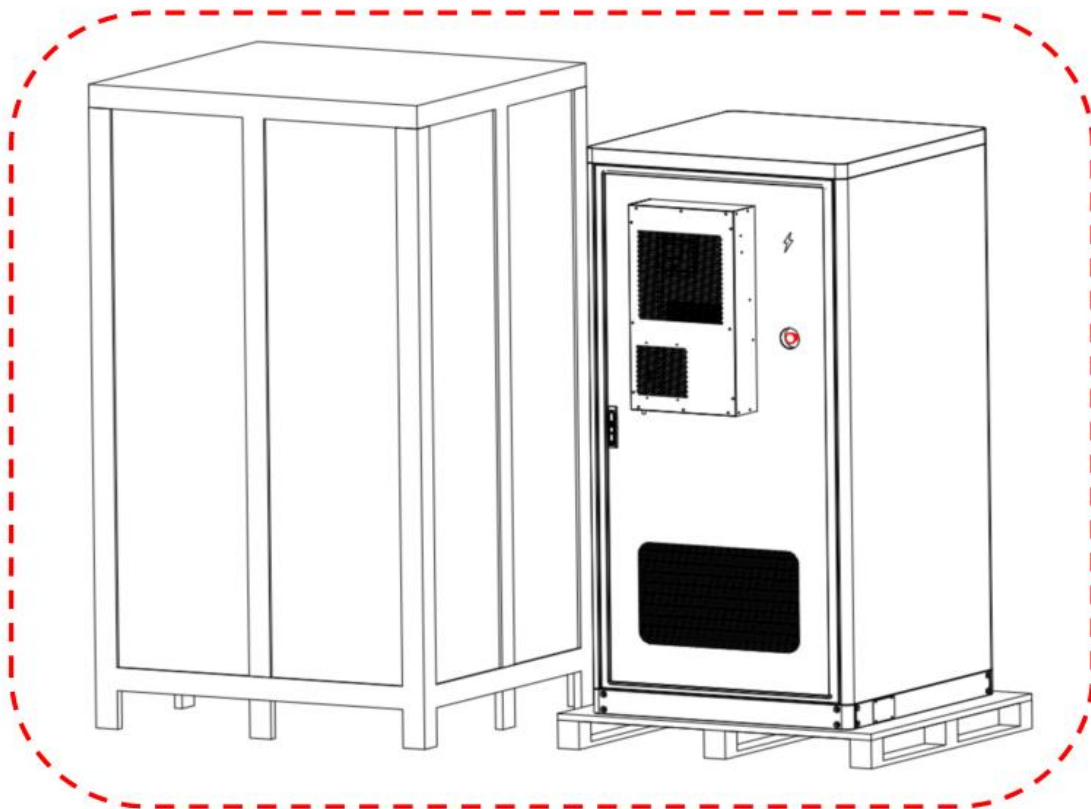


Figure 3.1.1-Packaging Diagram



Note: The actual supply configuration shall prevail.

3.1.2 Product storage

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

Parameter	Requirements
Storage temperature (excluding battery)	-25°C~+60°C
Battery	20°C ~ 30°C
Storage relative humidity	< 95% (no condensation)
Altitude	< 2000m

Table3.1.2

When storing low battery, it is necessary to recharge according to the maximum time interval allowed by the SOC when the battery is fully discharged. Failure to recharge beyond the maximum time interval may result in battery damage due to over discharging.

SOC at the time of power-off prior to storage	Max. recharging interval
SOC=50%	8 months
30%≤SOC<50%	4 months
5%≤SOC<30%	20 days
SOC<5%	48 hours

Table3.1.3



Note: The operation of replenishing electricity must be carried out by professionals who have received skill training, and insulated gloves and specialized insulated tools must be worn during the operation.

During the process of replenishing electricity, someone must be present on site to observe and promptly handle any abnormalities.

During the process of recharging, if the battery experiences abnormalities such as swelling or smoking, it should be immediately stopped from charging and scrapped.

3.2 Transportation and Handling

3.2.1 Product Transportation

1. To ensure that the equipment is in good protective condition, it is recommended to use packaged transportation;
2. Equipment transportation should be carried out according to the labeling requirements on the packaging to prevent personal injury and equipment damage;
3. Energy storage batteries are not recommended for railway or air transportation. Land transportation speed limit requirements: flat roads have a speed limit of 80km/h, and rugged roads have a speed limit of 60km/h. In case of any conflict, please refer to local traffic regulations.

3.2.2 Product handling

1. Ensure that the forklift has sufficient load capacity when moving, and note that the center of gravity of the equipment should be placed between the forklift feet to prevent personal injury and equipment damage;
2. When transporting with batteries, the forklift's load-bearing capacity needs to be $\geq 3t$; when transporting without batteries, the forklift's load-bearing capacity needs to be $\geq 1.5t$;

3. Recommended fork length $\geq 1.5\text{m}$, width 80cm~160cm, thickness 25mm~70mm.

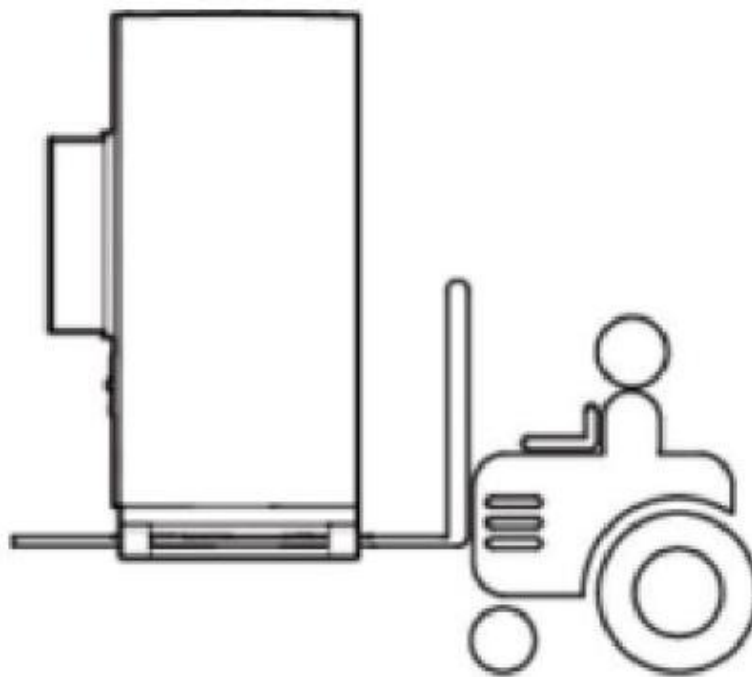


Figure3.2.2-Transportation diagram

3.3 Installation environment

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

1. The installation location should be above the historical highest water level in the area. The distance from the airport, landfill, riverbank or dam should be $\geq 2\text{km}$.
2. Choose a place with good ventilation. When the device is running, do not cover the ventilation openings and cooling system to prevent high temperature fires. Adequate installation space to ensure that surrounding equipment is not affected by the heat generated by the product; Ensure sufficient external wiring space in the installation location. Having convenient transportation conditions and reliable fire suppression system equipment.
3. The installation location should be away from fire sources, and flammable and explosive materials should not be placed around the equipment. If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground below the equipment needs to be hardened to prevent overgrown weeds.
4. Do not install energy storage systems outdoors in salt affected areas to prevent equipment from corroding and causing fires. Salt damaged areas refer to areas within 2km of the coast or affected by sea winds.
5. The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to prevent unauthorized

personnel from entering during equipment operation, which may cause personal injury or property damage.

6. The equipment should be installed in an area far away from liquids and should not be installed below water pipes, air outlets, or other locations that are prone to condensation; It should not be installed below air conditioning vents, ventilation openings, computer room outlet windows, and other locations that are prone to water leakage, to prevent liquids from entering the interior and causing equipment short circuits.



Illustration

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

1. Strong vibration, strong noise sources, and strong electromagnetic field interference areas.
2. Places that generate or have dust, oil fumes, harmful gases, corrosive gases, etc.
3. Places where corrosive, flammable, and explosive materials are produced or stored. Within the hazardous range of blasting.
4. Places with existing underground facilities. Densely populated areas, high-rise buildings, and underground structures.
5. There are unfavorable geological conditions such as rubber soil and weak soil layers, which are prone to water accumulation and sinking on the ground.
6. Within the boundary of the mining subsidence (displacement) zone. The area that may be submerged after a dam or embankment collapses.
7. Earthquake faults and seismic areas with a fortification intensity higher than nine degrees. Areas with direct hazards such as mudslides, landslides, quicksand, and caves.
8. Important water source hygiene protection zone.
9. Historical relics and historic sites protection area.

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

3.4 Space Preparation

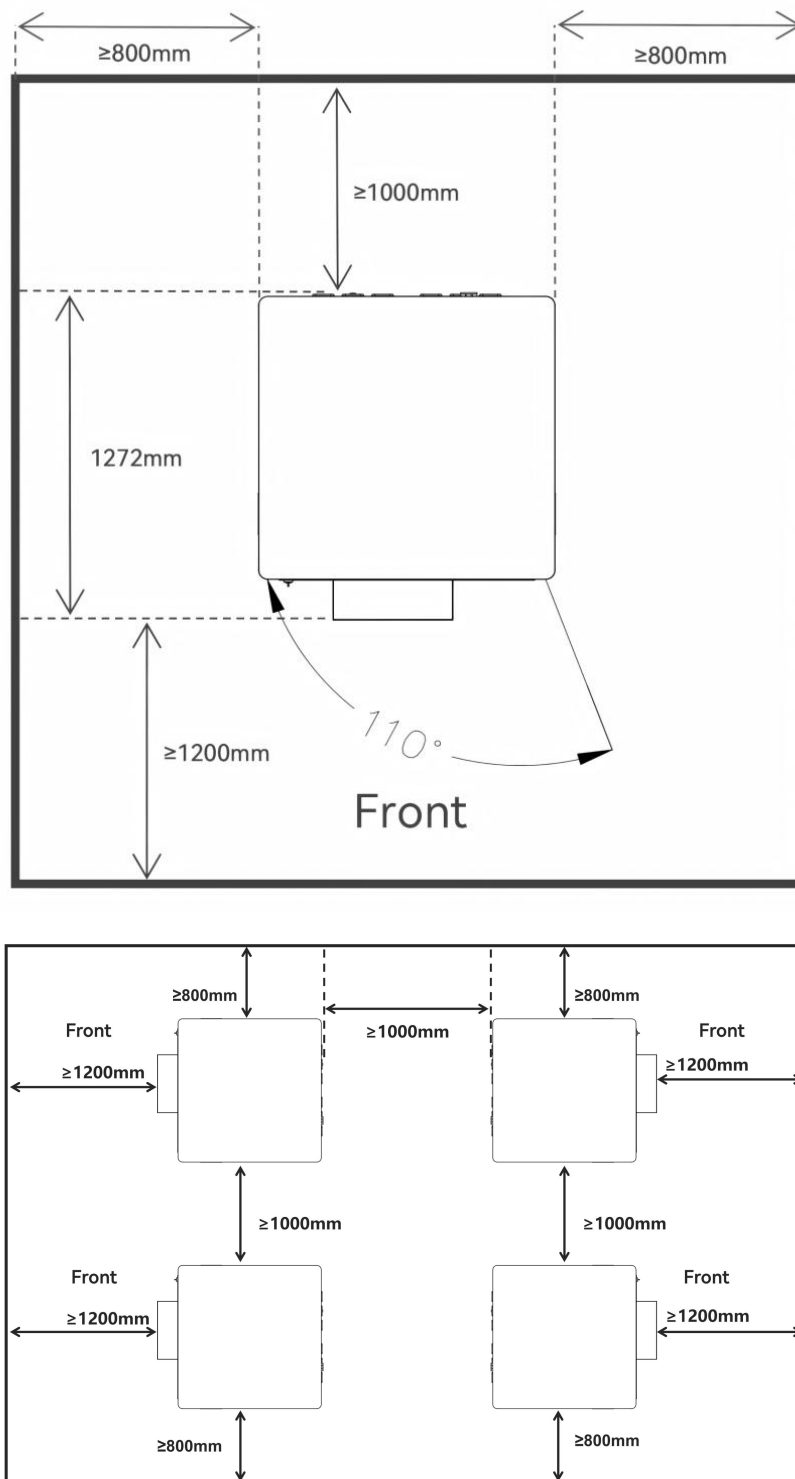


Figure 3.4-2



Illustration: The recommended "Spatial Layout Diagram" in the above figure refers to the "GB 51048-2014 Design Code for Electrochemical Energy Storage Power Stations", and the safety distance setting should be based on the actual local implementation standards.

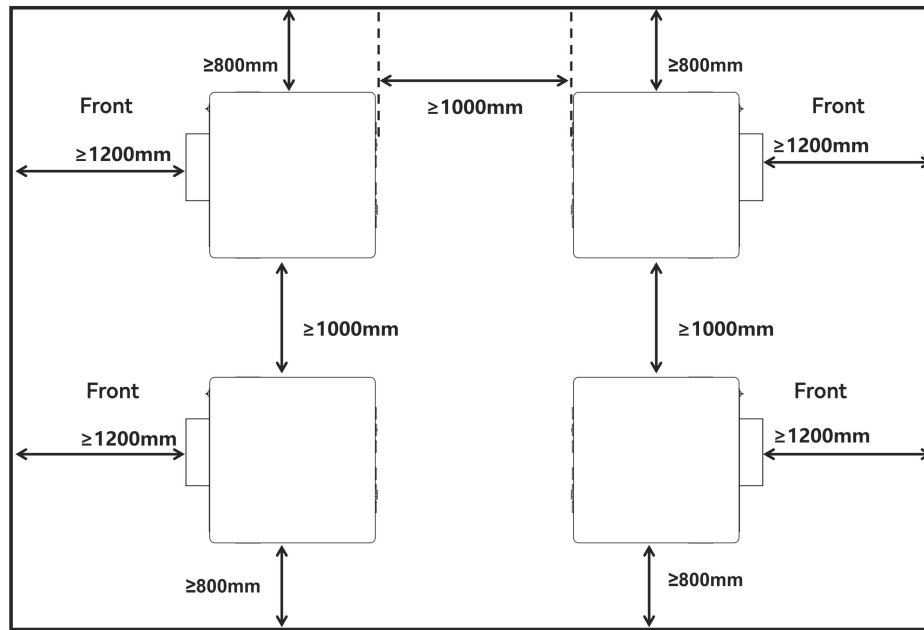


Figure 3.4-3



Illustration: The above figure shows the minimum space requirement.

3.5 Foundation preparation

Foundation reference diagram

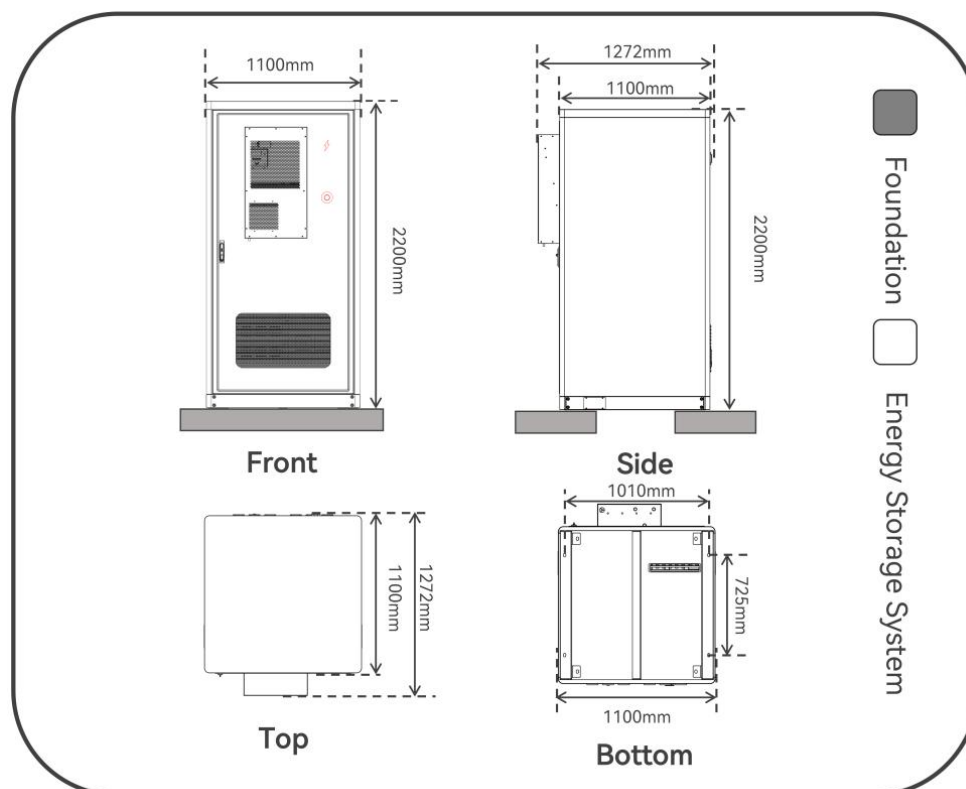


Figure 3.5



Illustration: The above diagram cannot be used as the final construction drawing and is for reference only.

Foundation design requirements:

1. The foundation must be higher than the local historical highest water level and at least 300mm above the horizontal ground level;
2. Construct drainage facilities in accordance with local geological and municipal drainage requirements to ensure that there is no accumulation of water at the equipment foundation; The foundation construction should meet the local historical maximum rainfall drainage requirements, and the discharged water needs to be treated in accordance with local laws and regulations;
3. The energy storage system must be installed on concrete or other non combustible surfaces; The installation plane must be horizontal, firm, and flat, with sufficient load-bearing capacity, and no dents or tilts are allowed;
4. The foundation is configured based on the total weight of the equipment. When the bearing capacity of the foundation is not met, it needs to be reviewed; The bottom of the foundation pit must be compacted and filled; It is strictly prohibited to disturb the foundation by soaking in water after excavation. If it is disturbed by soaking in water, excavation should continue and replacement should be carried out;
5. When constructing the foundation, it is necessary to consider the issue of cable outgoing lines for the energy storage system and reserve trenches or entry holes; The reserved holes in the foundation and the bottom inlet holes should be sealed;



Illustration: The survey, design, and construction plan for the on-site foundation must be led by a qualified design institute or professional technical personnel, and strictly follow local regulations, industry standards, and the actual situation of the project for review and confirmation.

3.6 Pre-installation preparation

1. Before installing the product, it is necessary to check whether the product is intact and undamaged. If any signs of damage are found, please keep evidence and contact the equipment manufacturer.
2. If the product is confirmed to be normal, please check according to the delivery list to see if the accessories are complete.
3. Users need to prepare relevant installation tools before installation.

NO.	Inspection Item	Handling Measure
1	Whether the fasteners are tightened	If loose, retighten the screws
2	Whether the space environment meets the installation dimension requirements	If the space is insufficient, it is recommended to redesign before installation
3	Whether the air duct is unobstructed and free of foreign objects	If there are foreign objects, please clean them; if it is not unobstructed, eliminate the cause

Table3.6-1 Pre-installation checklist

NO.	Name	QTY	Remarks
1	Industrial, commercial and storage integrated outdoor cabinet	1SET	Including cabinet door key
2	User Manual	1BOOK	
3	Certificate of Conformity	1PCS	
4	Delivery Inspection Report	1PCS	
5	Packing List	1PCS	

Table3.6-2 Delivery List

Assistance Tool Table

NO.	Tool Name	Legend
1	Insulating gloves	
2	Safety goggles	
3	Insulating shoes	
4	Work clothes	
5	Safety helmet	
6	Screwdriver	
7	Wire stripper	
8	Hydraulic clamp	
9	Heat gun	
10	Multimeter	
11	Torque wrench	
12	Marker pen	

Table3.6-3

3.7 Basic installation

The first step is to refer to the following suggestions for mechanical installation after confirming that the product is normal and all accessories are complete:

1. Select the installation position of the equipment in advance according to the product size, and ensure proper positioning and fixation; The suggested foundation is shown in Figure 3.7-1.
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, ensuring that the grounding resistance is less than $4\ \Omega$.

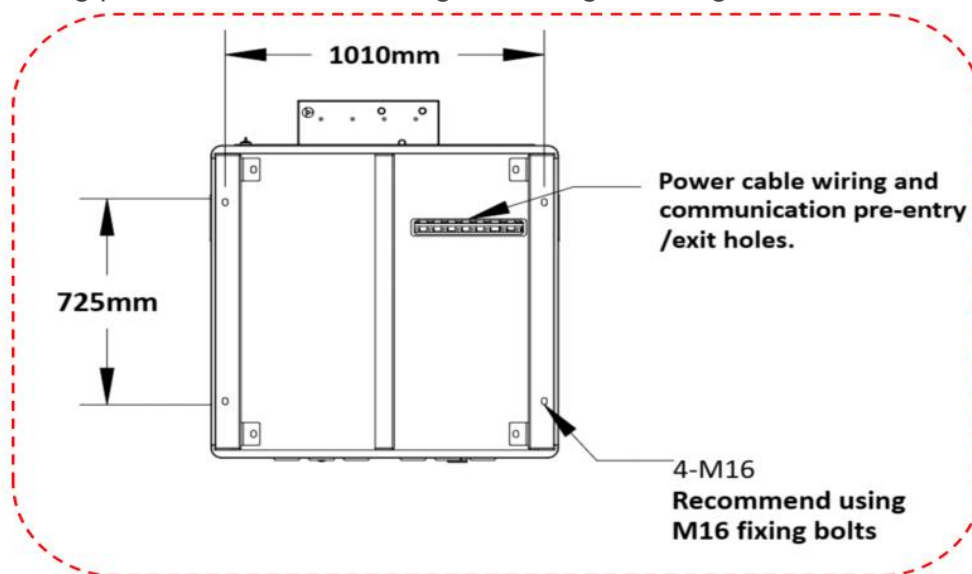


Figure 3.7-1 Basic reference diagram



Note: The actual external dimensions of the equipment shall be subject to shipment. Step two, remove the wooden packaging box and first remove the bottom enclosure of the equipment. Put away the removed fence and screws, and reinstall them after the equipment is in place.

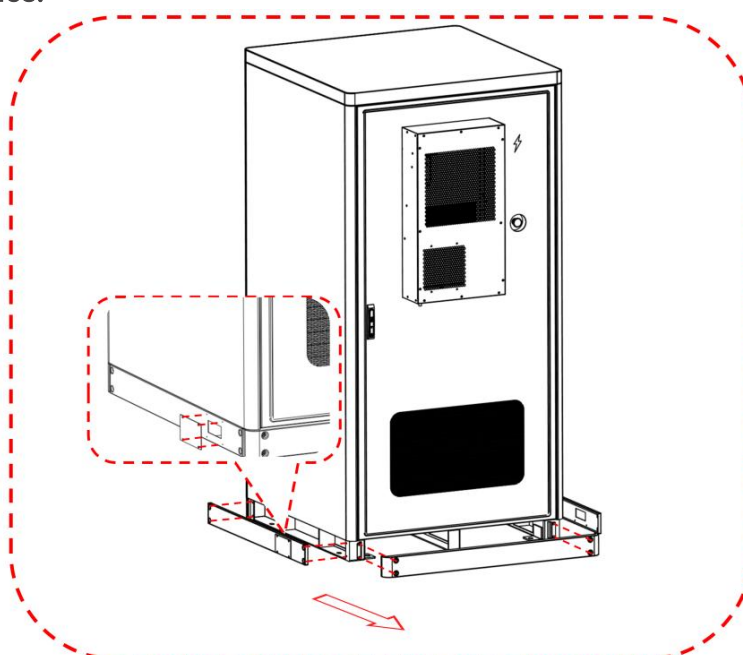


Figure 3.7-2 Diagram of the bottom enclosure of the equipment

Step three, use a forklift to position the equipment on the foundation, align the equipment fixing holes with the foundation embedded nuts, and tighten them with M16 bolts.

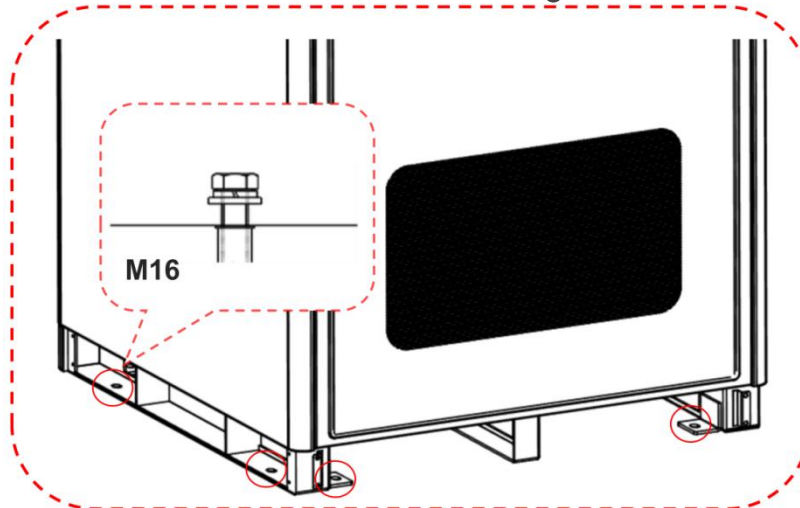


Figure 3.7-3 Diagram of tightening bolts at the bottom of the equipment

3.8 Mechanical Installation



Note:

When installing battery packs, it is recommended to use forklifts or other auxiliary installation tools. Transporting battery packs requires the cooperation of 4 or more people. During the process, handle with care and avoid any collisions. Personal safety should be taken seriously, and protective components on battery terminals should not be removed during transportation.

The installation of the battery pack should be fixed in a bottom-up order. Forklifts should also be installed in the order of the battery pack to prevent the risk of tipping due to a high center of gravity. The battery pack installation operation can only be carried out after the forklift has completely stopped running, and personnel are strictly prohibited from standing or reaching into any part of their body below the installation area.

Step 1, install the battery pack

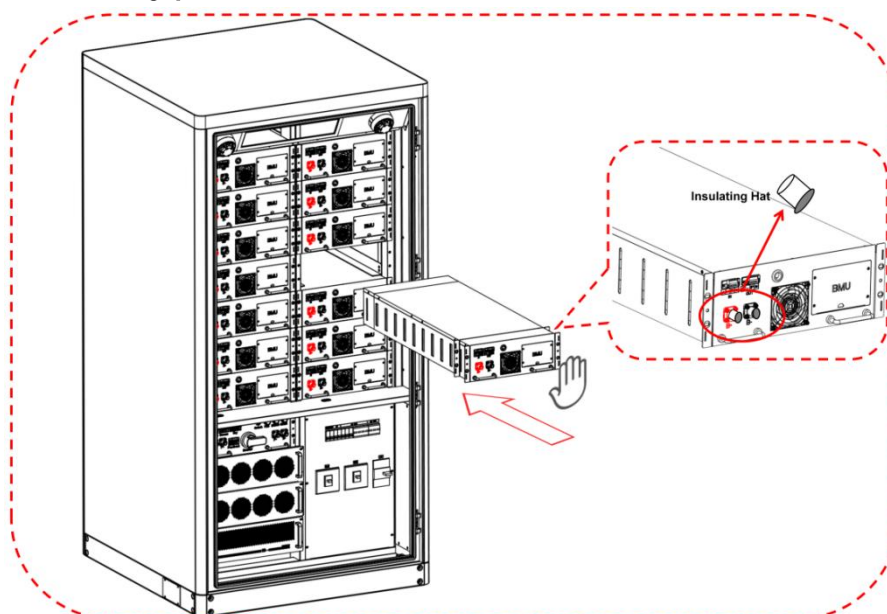


Figure 3.8-1

Step 2, fix the battery pack

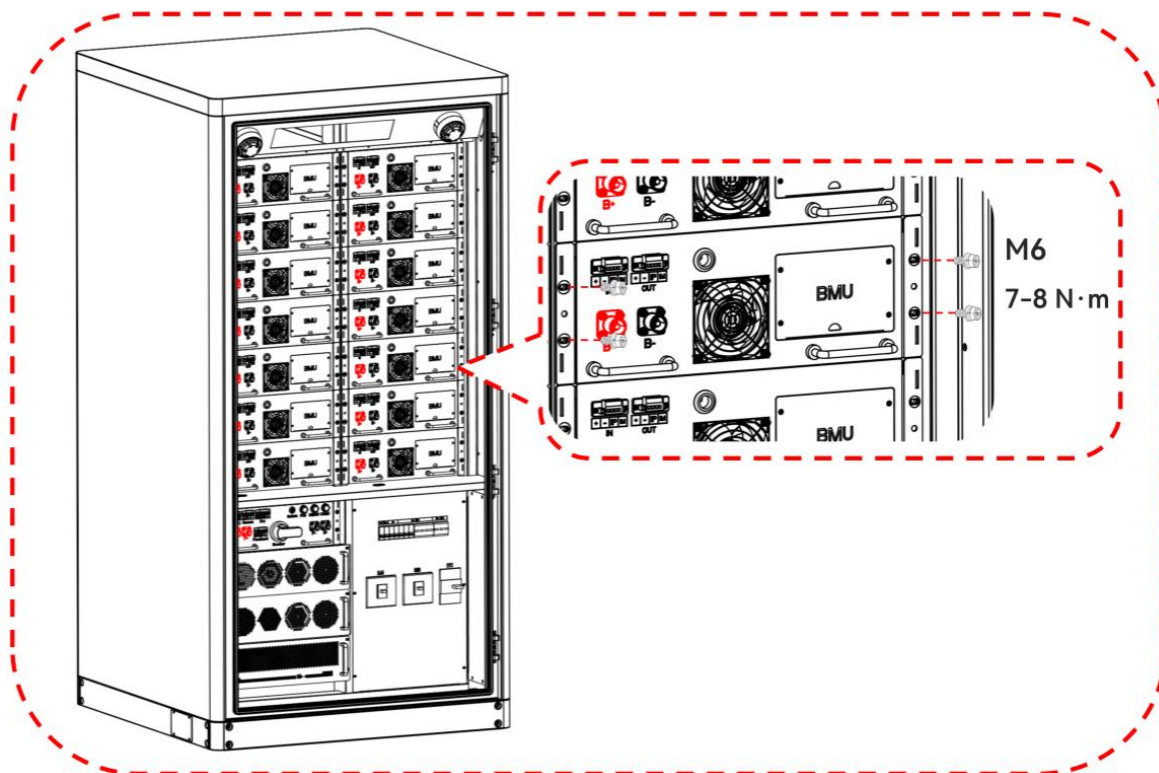


Figure 3.8-2



Illustration: Unless there are special requirements for the project, the installation and fixation of the battery pack inside the cabinet have been completed before leaving the factory;

3.8.1 Electrical connection



Danger:

1. Note the positive and negative poles during the connection process. It is strictly prohibited to short-circuit the positive and negative poles of the battery pack;
2. Smoking or using open flames near batteries is prohibited;
3. There must be fire-fighting facilities on site that meet the requirements, such as fire sand, fire extinguishers, etc;
4. Please use specialized protective equipment and insulation tools to avoid electric shock injuries or short circuit faults;



Note: When connecting the battery pack securely, ensure that the cables are not damaged;

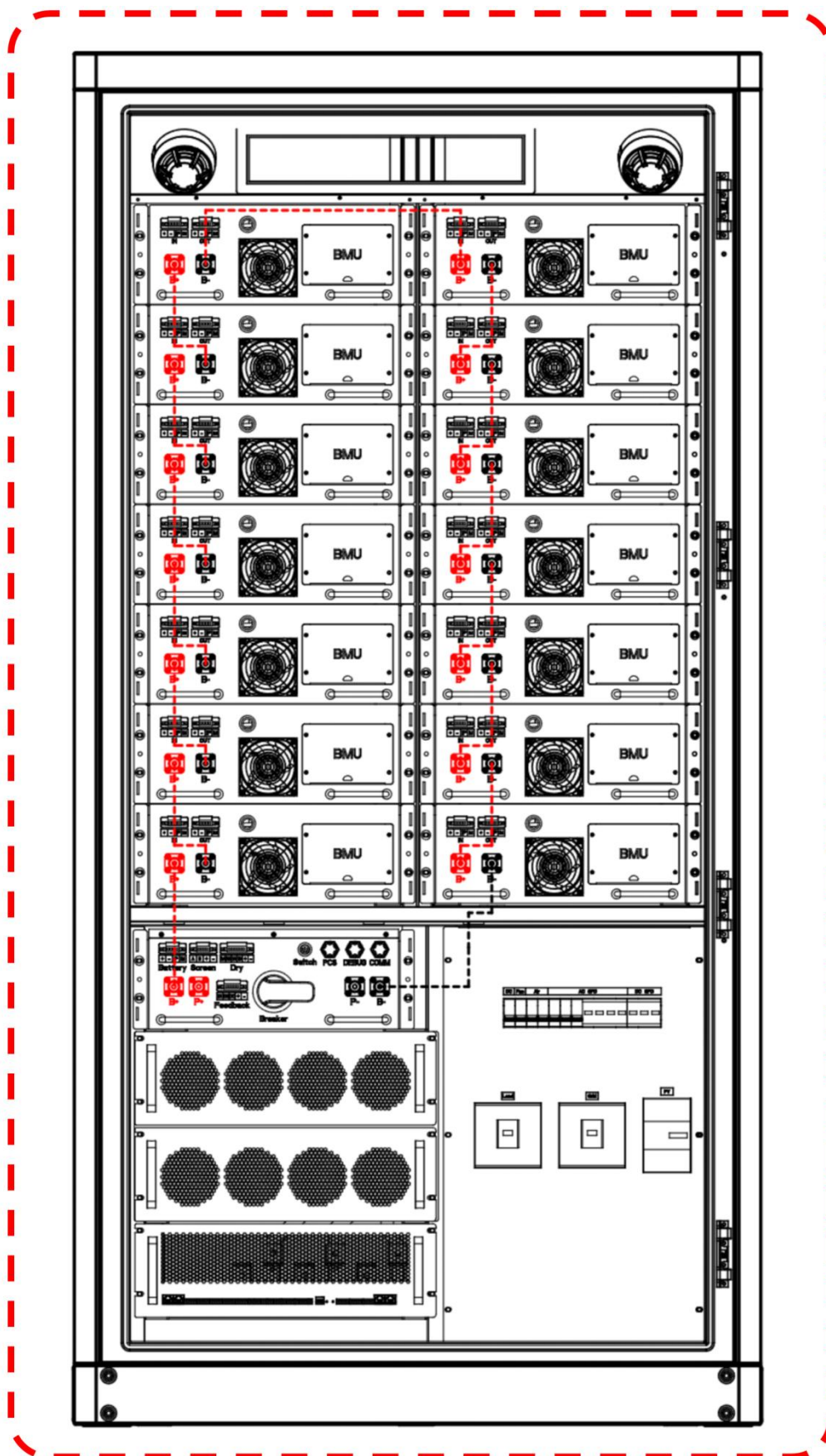


Figure 3.8.1-2



Illustration: Unless there are special requirements for the project, the connections inside the battery cluster in the cabinet have been completed before leaving the factory;

Step 3, Connect PCS to High Voltage Control Box



Note:

The PCS module has been pre installed in the electrical compartment of the cabinet, and the DC side cable connection of PCS has been completed before leaving the factory, with the other end connected to the high-voltage control box in the battery compartment;

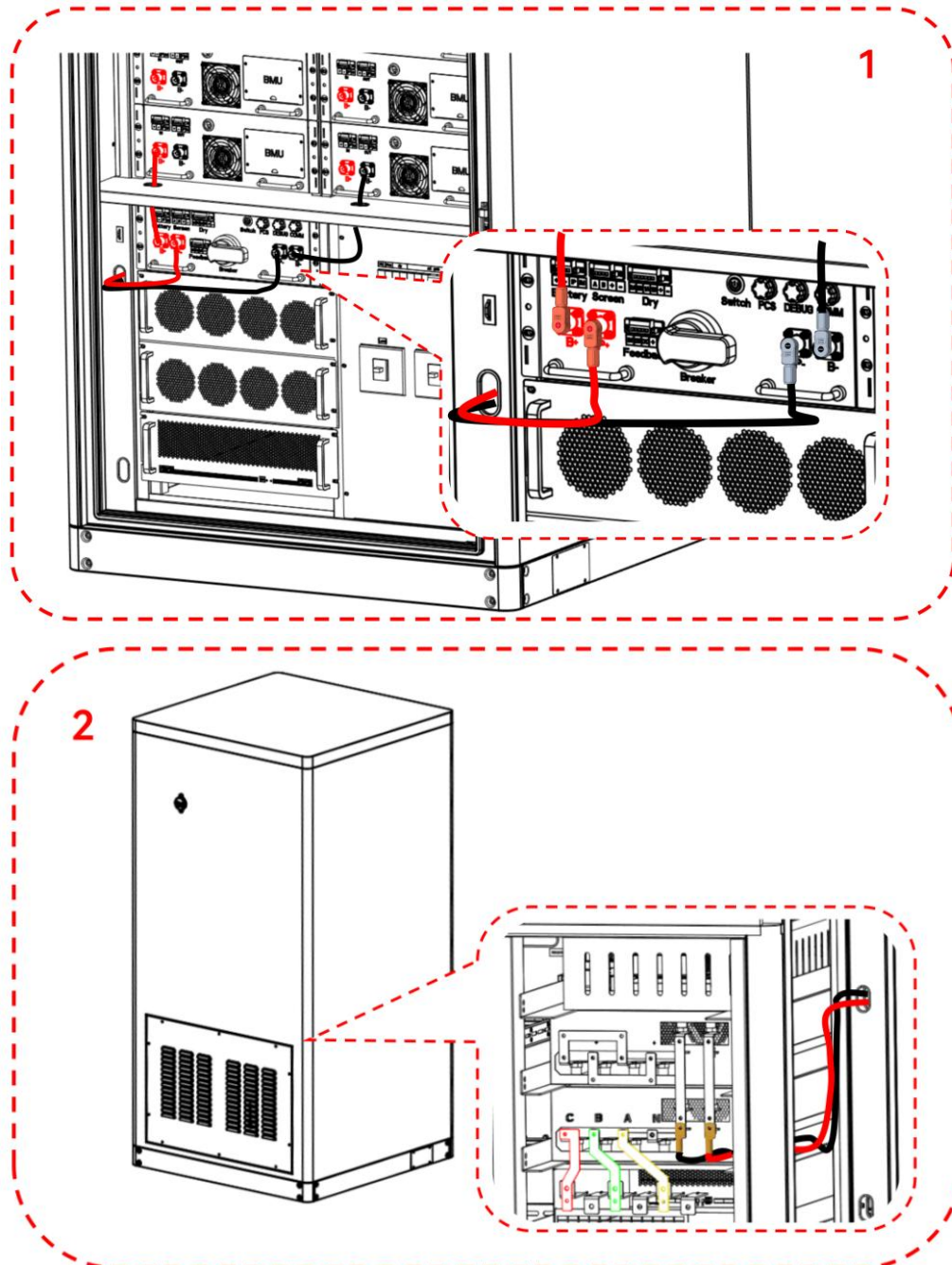


Figure 3.8.1-3



Illustration:

When the PCS DC side cable in the electrical compartment is not connected to the high-voltage control box in the battery compartment, insulation tape must be used to double wrap the exposed terminals for protection, ensuring air isolation and avoiding contact with the metal parts of the cabinet, while the system is completely powered off;

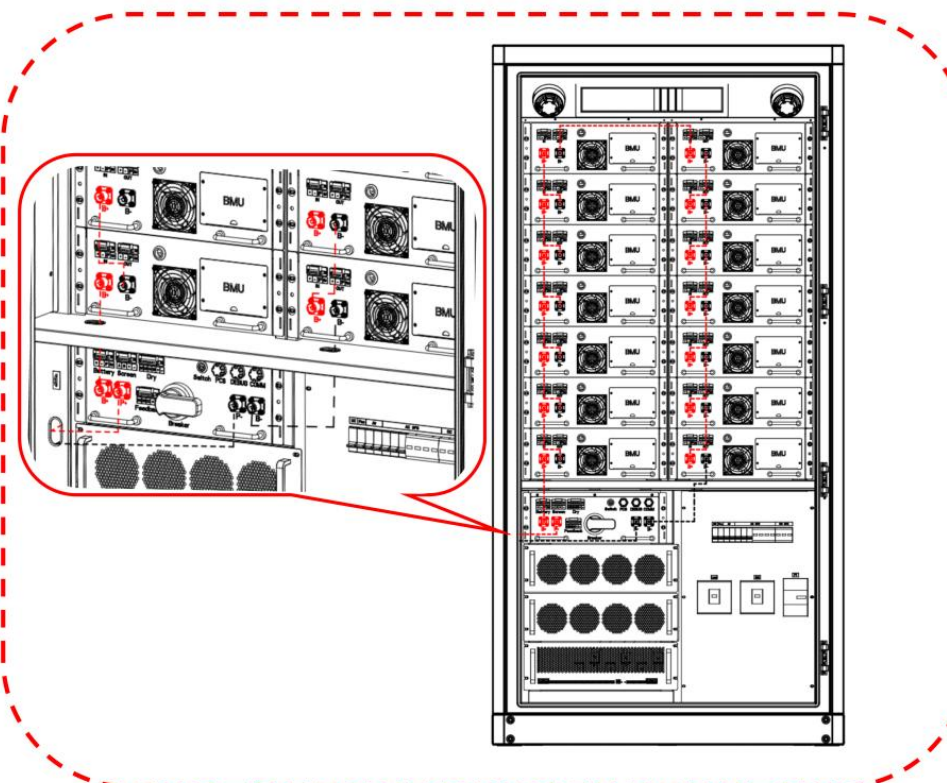
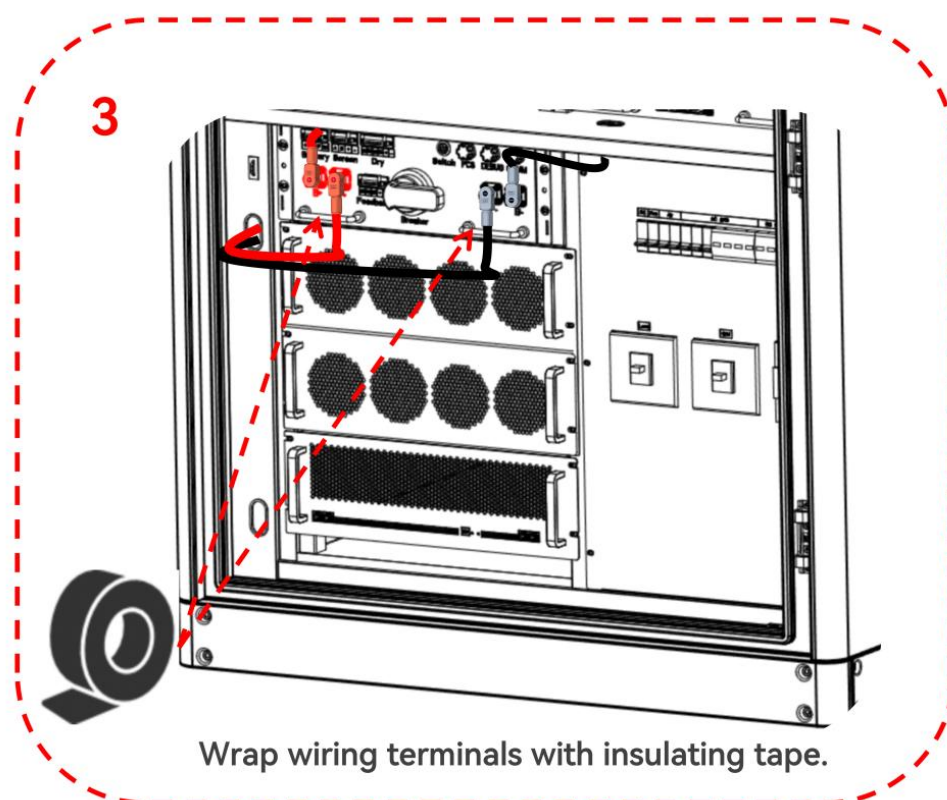


Figure 3.8.1-4



Note: Please ensure that cables can only be connected in the event of a power outage.



Illustration: Unless there are special requirements for the project, the connections on the control box inside the cabinet have been completed before leaving the factory;

Step 4: External Connection of the System

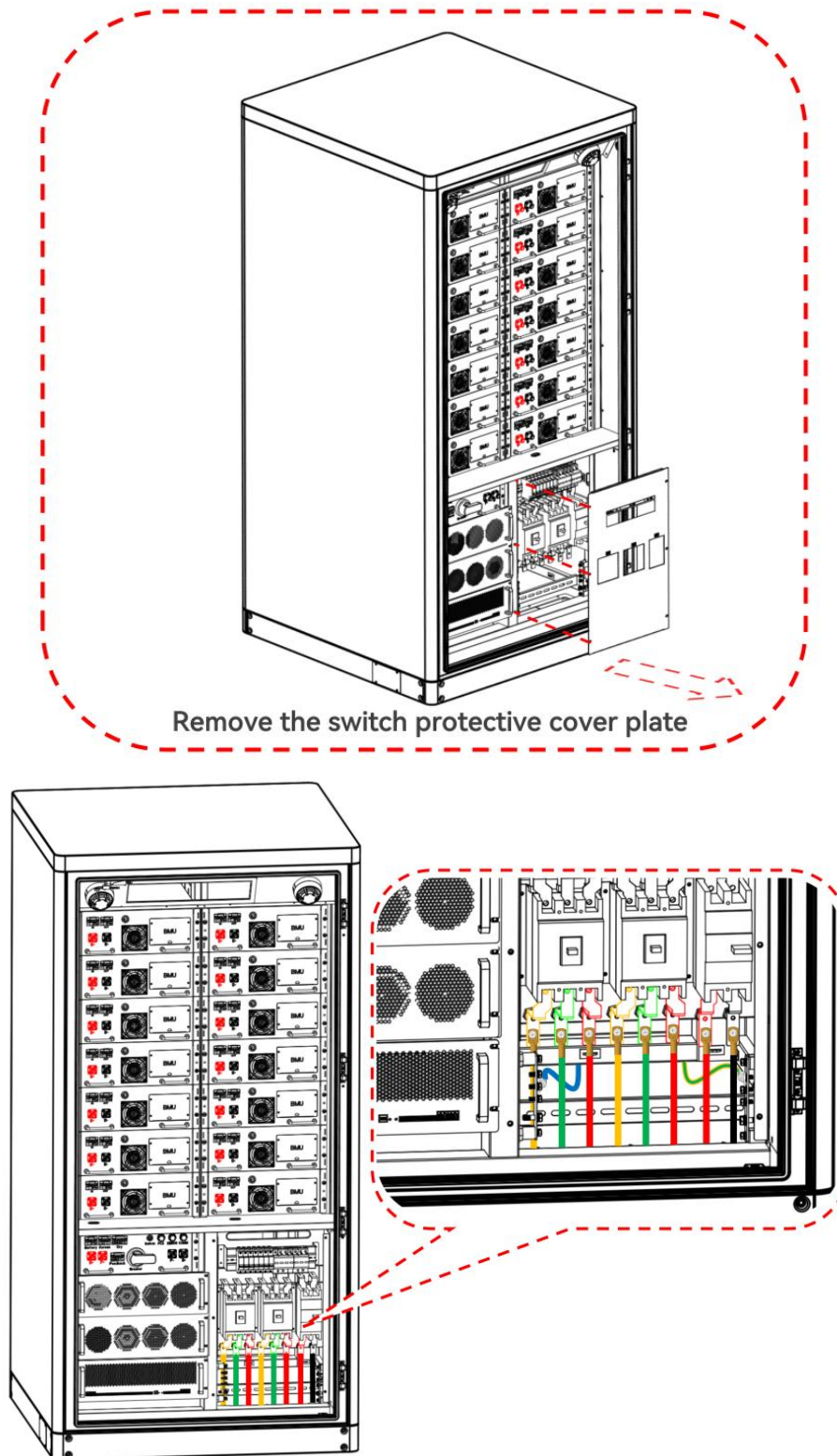


Figure 3.8.1-5

The C109 product adopts an integrated machine structure, and the internal wiring of the DC side has been completed. On site, only electrical cable installation is required for the AC side and external communication. Provide wiring reference as shown in Table 3.8.1-1 based on product power and cable specifications. The selection of cable diameter should comply with local cable standards. The factors that affect cable selection include rated current, cable type, laying method, ambient temperature, and maximum acceptable line loss.

Model Capacity	AC Cable	Neutral Line	Ground Line	Positive and Negative DC Input (Battery Side)
50kW	$\geq 3 \times 25\text{mm}^2$	$\geq 25\text{mm}^2$	$\geq 16\text{mm}^2$	$\geq 2 \times 50\text{mm}^2$
100kW	$\geq 3 \times 50\text{mm}^2$	$\geq 50\text{mm}^2$	$\geq 25\text{mm}^2$	$\geq 2 \times 50\text{mm}^2$
125kW	$\geq 3 \times 70\text{mm}^2$	$\geq 70\text{mm}^2$	$\geq 50\text{mm}^2$	$\geq 2 \times 50\text{mm}^2$

Table 3.8.1-1 Comparison Table of Cable Diameter



Danger: When carrying out electrical installation, the following suggestions can be referred to for electrical installation:

1. Before wiring, check that all switches inside the equipment are in the disconnected state to ensure that the equipment is not energized;
2. Before wiring, disconnect the power grid switch to ensure that the cables are not live;
3. To ensure the correct phase sequence of the cable, different colored insulation sheaths or labels such as yellow, green, red, and black can be added to distinguish and prevent phase sequence errors;
4. The connection between the cable terminal and the copper busbar needs to be tightened, and the length of the screws should be selected appropriately to avoid affecting insulation and fastening;
5. Communication cables and power cables should be laid separately as much as possible, ensuring that the insulation layer of the cables is not damaged during the laying process;
6. The grounding cable must be reliably connected to the grounding copper bar, and the cross-sectional area of the cable must meet the design requirements;
7. All communication cables must enter the equipment through the bottom inlet and outlet holes and be connected to the corresponding phase sequence;
8. After the wiring is completed, use fireproof mud to seal the gaps in the wiring to prevent external insects and rodents from entering and damaging the equipment or cables.

In order to prevent the loosening of the terminal block under stress, which may cause poor contact and increase contact resistance and heat generation, it is necessary to ensure that the bolts used to tighten the terminal block meet the torque requirements listed in Table 3.8.1-2:

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

Table 3.8.1-2 Wiring torque requirements

The input and output methods of the energy storage system are bottom in and bottom out. After removing the switch baffle, as shown in Figure 3.8.1-6, the A/B/C/N copper bars at the bottom of the switch are reserved with holes of diameter 11mm and 13mm for customers to wire, or holes can be made according to customer requirements for size; The protective grounding wire is connected to the PE copper busbar, and the grounding

impedance of the equipment meets the requirements of the national standard GB 50054 and local electrical standards.

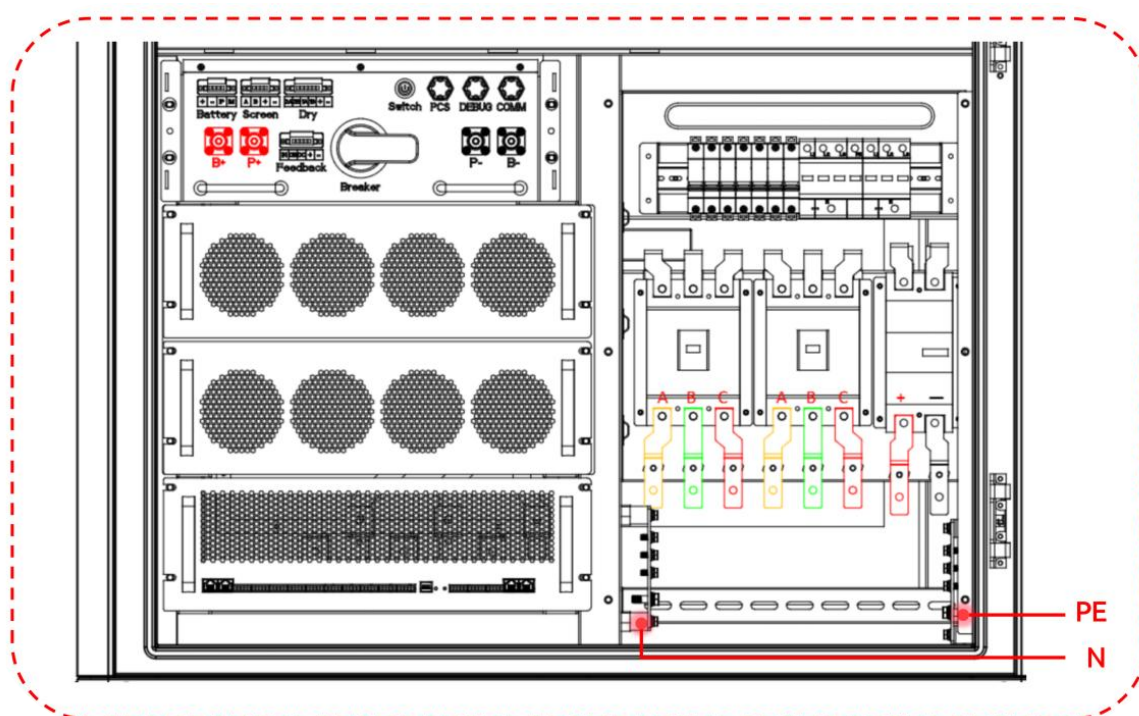


Figure 3.8.1-6Wiring diagram

The following is a schematic diagram illustrating the installation of components such as terminals and fixing screws during the wiring of system power cables:

The connection specifications between cables and copper bars are shown in the following figure

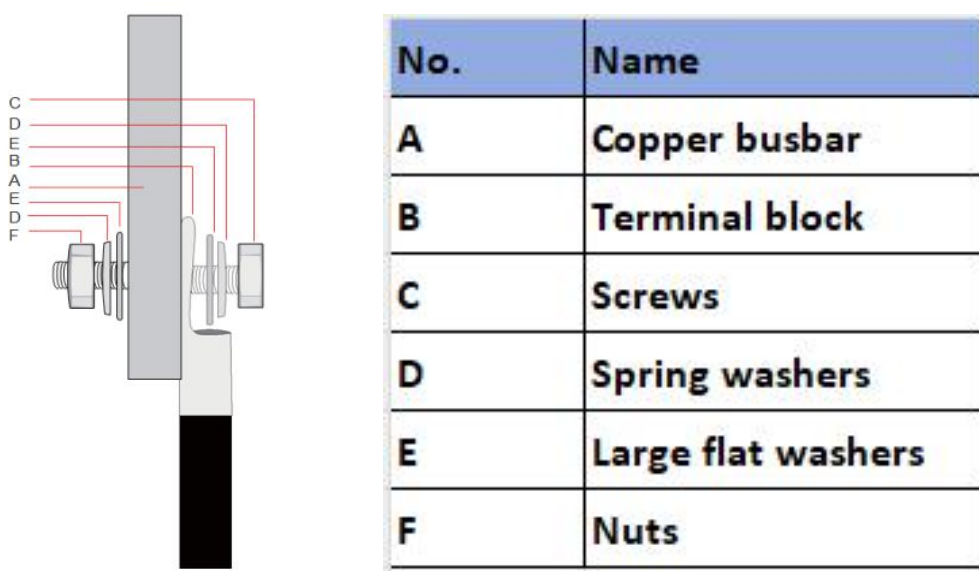


Figure 3.8.1-7Installation of wiring terminals



Note:

1. When using copper core cables or copper-clad aluminum cables, please use copper terminal blocks.
2. When using aluminum alloy cables, please use copper aluminum transition terminal blocks or aluminum terminal blocks with copper aluminum transition washers.

Step 5: Connect the communication cable

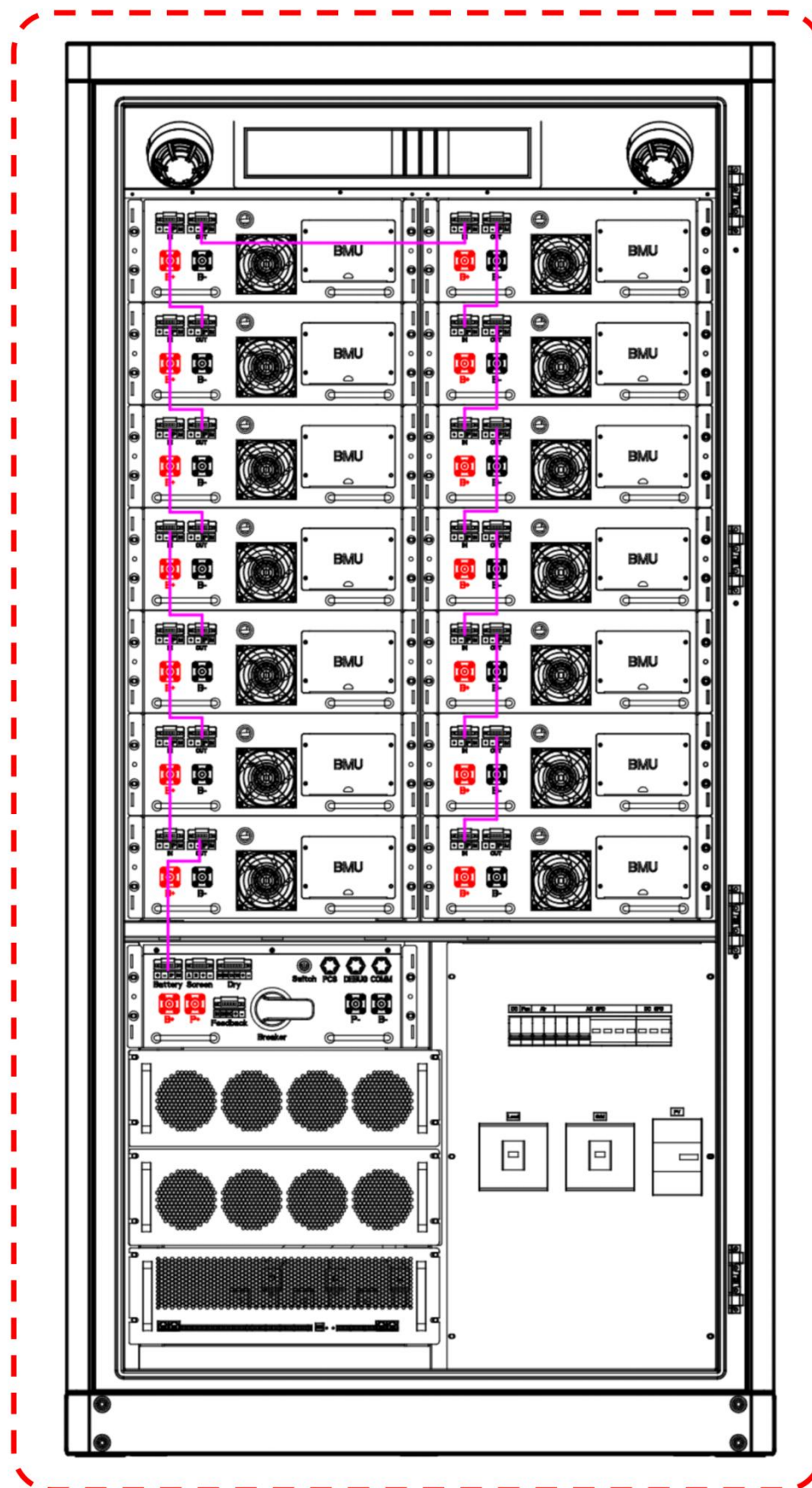


Figure 3.8.1-8

3.8.2 Check the equipment after wiring

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

NO.	Inspection Items
1	Before measurement, disconnect the switches on the battery side and electrical side to ensure the energy storage equipment is not energized.
2	The positive and negative connections between the battery and the energy storage equipment, as well as the AC phase sequence, are correct and properly tightened. Measure the resistance between the three phases, which should be at the megaohm level. If it is at the k level or lower, the line must be inspected.
3	The external control cables, grounding wires, and communication cables are properly tightened.
4	The grounding wire resistance is less than 4Ω , and the cables are in good condition with no damage or cracks.
5	Clean the installation area to ensure no tools or foreign objects are left in the area.
6	Seal the cable gaps with fire clay to prevent small animals from entering.

Table3.8.2

04 Startup and Debugging

4.1 Pre-power Check

1. Check if the circuit breaker inside the energy storage converter cabinet is in the disconnected state;
2. Check whether the connection terminals of all communication and power cables are reliably connected;
3. Check whether the communication, power supply harness, and power cables of the energy storage converter cabinet are connected correctly;
4. Check if there are any communication connections between the modules inside the energy storage converter cabinet and the integrated display and control machine.

4.2 Check before Startup

Before running the product, please ensure that it 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 up.

1) Appearance inspection:

- a. The appearance of the equipment is intact, without damage, rust, or paint peeling. If there is paint peeling, please perform touch up operation;
- b. The equipment labels are clear and visible, and damaged labels should be replaced in a timely manner.

2) Grounding inspection:

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

3) Cable inspection:

- a. The cable protection layer is wrapped intact without obvious damage;
- b. The terminal production meets the specifications and the connection is firm and reliable;
- c. The labels at both ends of each cable are clear and distinct, and the routing follows the principle of separating strong and weak electricity. Leave a margin at the turning point and do not tighten it;
- d. The cable installation bolts have been tightened and there is no looseness when pulling the cable; The sealing of cable conduit holes has been completed.

4) Copper bar inspection:

The copper bar has no obvious cracks or deformations, the screws at the overlap are tightened, the markings are not misplaced, and there are no debris on the copper bar.

5) Component inspection:

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



Note:

1. Insulated gloves are required for operation.

For transportation safety, we disconnect one section of the battery module's DC cable, leaving the entire cluster of batteries in an open circuit state. Before powering on, we need to connect the DC cable and insert it into the connector. If you hear a "card" sound, it means it has been inserted into place.

4.3 Power-on Procedure

The product startup operation process is as follows:

1. Use a multimeter to confirm that the grid voltage is within the predetermined range ($400V \pm 10\%$);
2. Refer to Figure 4.3 for the soft start switch of the closing transformer Air conditioning switch Auxiliary power switch, close QF2 Grid switch, complete transformer soft start.
4. Close the auxiliary power switch of the battery and the load switch of the high-voltage box (rotate to the ON position), close the QF1 load switch, and close the QF3 photovoltaic switch (if there is no photovoltaic, it does not need to be turned on).
5. Set the inverter parameters in the "System" -> "Parameter Settings" interface, and select the desired operating mode (manual mode, peak shaving and valley filling, backup mode) in the "System" -> "Operating Mode" interface;
6. Enable all modules on the "switch" page of the HMI integrated screen, click "inverter on" to complete the startup.

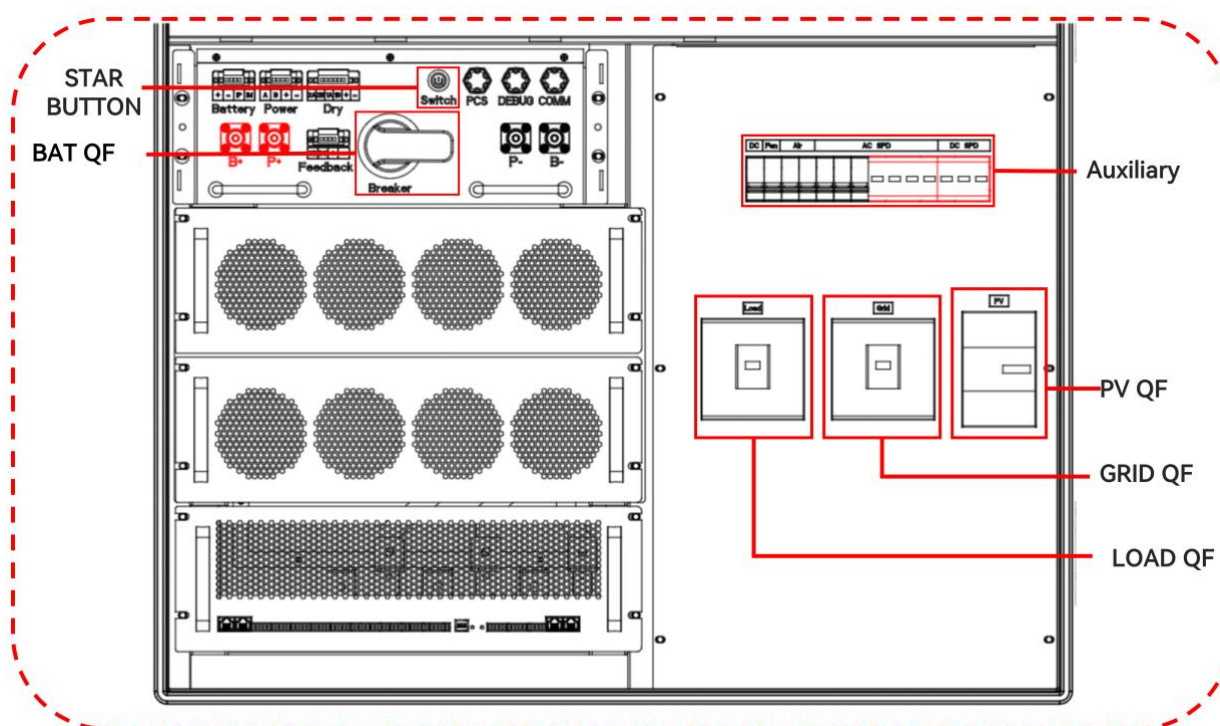


Figure4.3 Switch Position Figure

4.4 Trial Run

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

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

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

Step 3: Observe the parameters of the screen PCS, battery, and air conditioning during operation. If there are any abnormalities, stop the machine for testing in a timely manner;

Step 4: Run for 0.5 hours;

Step 5: Set the active power to -5%, and charge the battery at 5% of the system's rated power,

Step 6: Observe the parameters of the screen PCS, battery, and air conditioning during operation. If there are any abnormalities, stop the machine for testing in a timely manner;

Step 7: Run for 0.5 hours;

Step 8: After completing a 1-hour trial run without any abnormalities, turn off the system on the "switch" interface;

Step 9: You can choose the local manual power control mode based on the project background and requirements. The automatic peak shaving and valley filling mode or backup mode has been officially put into operation. Click "System Power On" on the system interface.

4.5 Normal Shutdown

When the product requires daily maintenance and shutdown operation. The normal shutdown operation of the product is as follows:

Step 1: Click on the touch screen switch interface and select "System Shutdown";

Step 2: Refer to Figure 4.3 and disconnect the system air conditioning switch Auxiliary power switch and battery auxiliary power switch;

Step 3: Disconnect the QF1 Load switch QF2Grid switch QF3 photovoltaic switch;

Step 4: Disconnect the DC load switch of the high-voltage control box of the battery;

Step 5: Wait for the busbar discharge to end, the touch screen to turn off, and the device to complete shutdown.

4.6 Emergency Stop Shutdown

When the product malfunctions or needs to be shut down urgently in a critical situation, the following emergency shutdown operations can be performed:

Step 1: Press the emergency shutdown button "EPO";

Step 2: Refer to Figure 4.6 to disconnect all auxiliary power switches of the system AC/DC plastic shell switch Battery DC load switch;

Step 3: After confirming that the fault or Danger has been resolved and needs to be run, reset the EPO button.

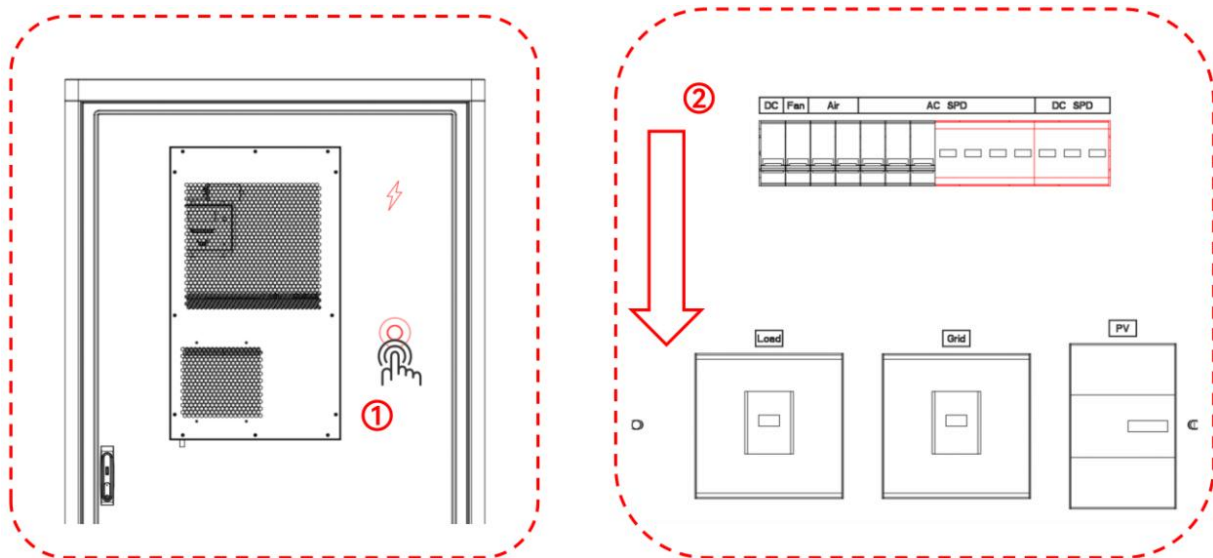


Figure4.6 Emergency stop shutdown



Illustration: After pressing the "EPO" emergency shutdown button, the QF1Load switch needs to be turned on QF2Grid switch QF3 photovoltaic switch Auxiliary power switch The DC switches of the high-voltage box are all turned off. Wait for 10 minutes after the HMI touch screen is powered off before turning it on!

05 Operation and Handling

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 homepage interface displays the real-time power of the system Voltage. electric current. Electricity generation Operating mode Work status and other related information.

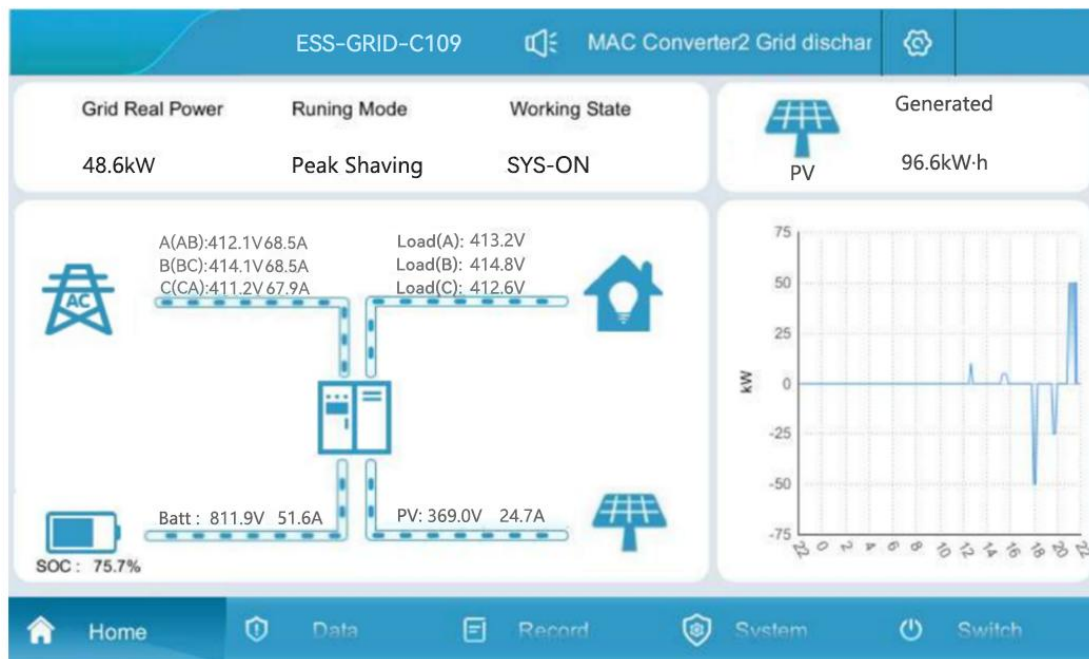


Figure5.1 Homepage

Expand each menu item:

HMI display and control integrated screen menu Table

NO.	Name	Content	Function
1	Homepage	None	Display the operating status of the system and the daily charging and discharging curve Figure
2-1	Data	real-time data	Display of all analog data of the inverter
2-2	Data	Real-time status	Inverter working status and switch status display
2-3	Data	Real-time alerts	Current system alarm information
2-4	Data	Battery data	Battery data display and battery on/off settings

2-5	Data	environmental monitoring	Dynamic environmental monitoring display and air conditioning parameter settings
3-1	Record	Historical Alarms	Display historical alarm records
3-2	Record	Operation log	Display operation logs
3-3	Record	Data Report Table	Export History
4-1	System	System Information	Display system information
4-2	System	operation mode	System operation mode setting
4-3	System	Parameter Settings	Converter and battery parameter settings
4-4	System	Factory Settings	Equipment manufacturer settings
4-5	System	System upgrade	System software upgrade
4-6	System	Communication Settings	Set up communication settings
5	Switch	System switch	System startup and shutdown
6-1	HMI	left side HMI	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;
6-2	indicator light	indicator light	
7-1	HMI	left side HMI	② The second one from top to bottom is the status indicator light: when the system has a fault, the green indicator light does not light up; When the system has no faults, the green indicator light is always on;
7-2	indicator light	indicator light	
8-1	HMI	left side HMI	③ The third one from top to bottom is the fault indicator light: when the system has a fault, the red indicator light flashes; When the system has no faults, the red indicator light does not light up (flashing frequency once every 1 second)
8-2	indicator light	indicator light	
9	System lights	Status indicator	① When the system is in standby mode and there is a fault, the system light will turn red.
10	System lights	Status indicator	② When the system is running and there are no faults, the system light will turn green
11	System lights	Status indicator	③ When the system is running and there is a fault, the system light will turn yellow
12	System lights	Status indicator	④ When the system is in standby mode and there are no faults, the system light does not turn on.

Table5.1

5.2 Power on/off Operation

1. System startup: First, check the power on status of the entire machine. Refer to Figure 4.3 to close the transformer soft start switch and auxiliary power switch. Close the QF2 Grid switch to complete the transformer soft start.
2. Close QF1 load switch Close the QF3 photovoltaic switch.
3. The screen startup takes about 30 seconds.
4. Set the inverter parameters in the "System" ->"Parameter Settings" interface, select the desired operating mode in the "System" ->"Operating Mode" interface, and choose the grid connection and control mode manually Peak shaving, 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 as needed), click "system on", and the normal startup time is about 30 seconds, as shown in Figure 5.2-1.
6. Inverter shutdown: When the inverter is running, click "Inverter shutdown", as shown in Figure 5.2-2;
7. Disconnect the auxiliary power switch of the inverter
8. Open the QF1 load switch QF2 Grid switch QF3 photovoltaic switch.

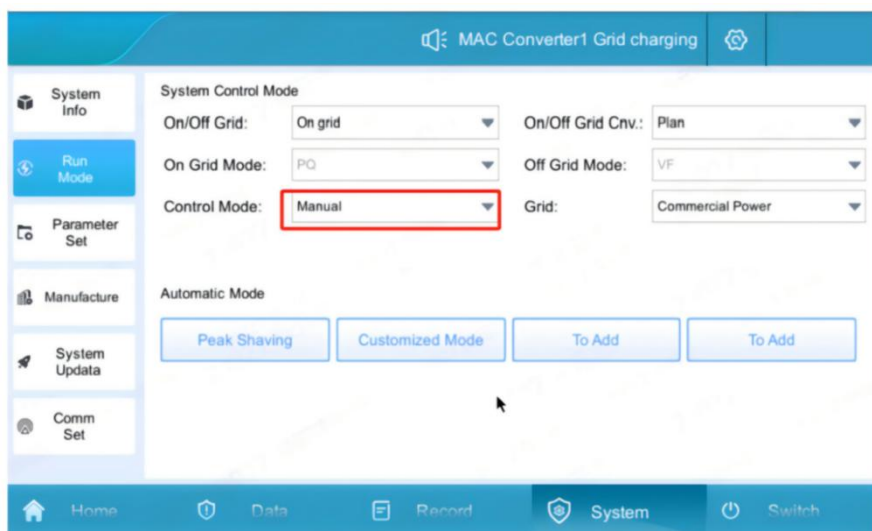


Figure5.2-1 Operation mode interface

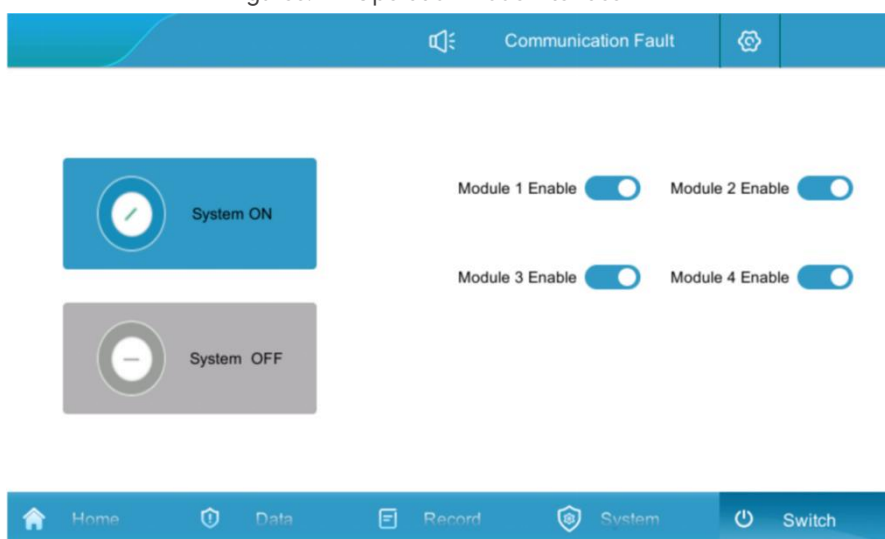


Figure5.2-2 Power on/off interface

5.3 Communication Settings

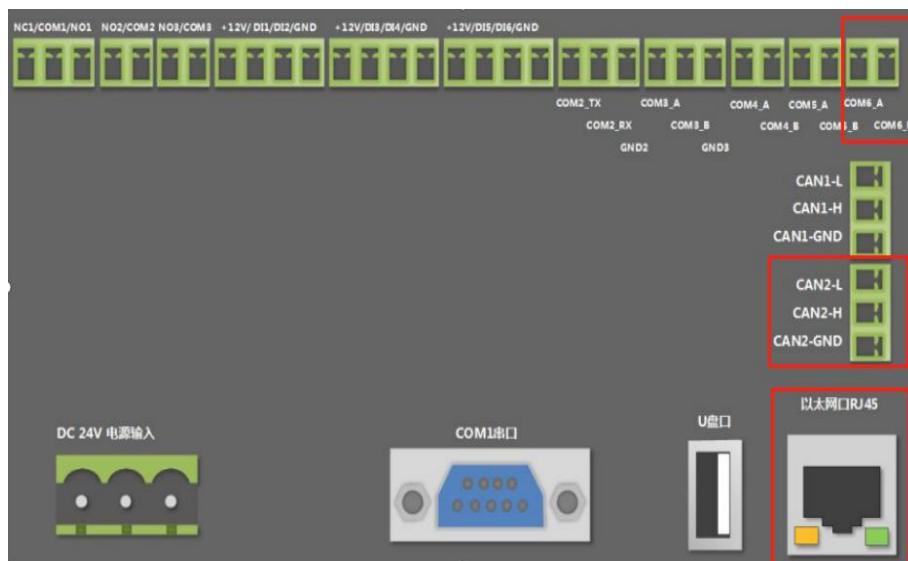


Figure5.3-1 Communication check



Illustration: Communication settings refer to the communication protocol settings between the HMI integrated screen and the battery BMS. LCD touch screen and EMS backend.

1. Check that the BMS communication cable of the battery has been connected to the CAN_2H.CAN_2L terminal on the back of the touch screen;
2. Check that the backend EMS communication cable has been connected to the back terminal COM6.A.COM6_S of the touch screen or to the network port position;
3. Click on the HMI integrated screen "System" ->"Communication Settings" to enter the communication settings interface.
4. Battery BMS communication settings: Set the CAN baud rate to 250k bps;
5. Background EMS communication setting 1: If RS485 communication is used, set the local address corresponding to the communication panel to 1. If multiple energy storage systems are connected to the background, the address cannot be duplicated;

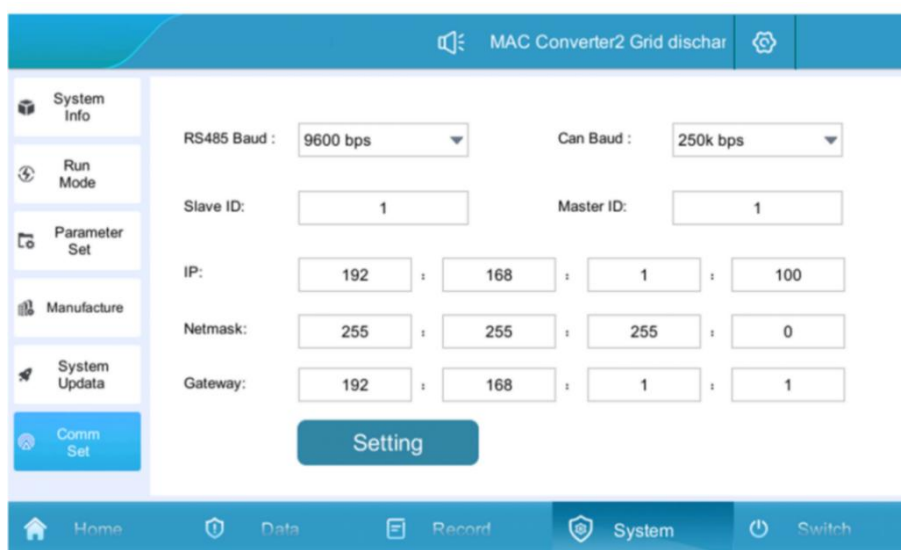


Figure5.3-2 Communication settings interface

6. Backend EMS communication settings 2: If Ethernet communication is used, the energy storage system will use the local machine as the server, and the default address for the host will be 192.168.1.100. The corresponding local address for the communication panel will be set to 1, and the server port will be set to 502. If multiple energy storage systems are connected to the backend IP address, the IP address cannot be duplicated. After modifying the IP address, click the settings button to configure the IP address.

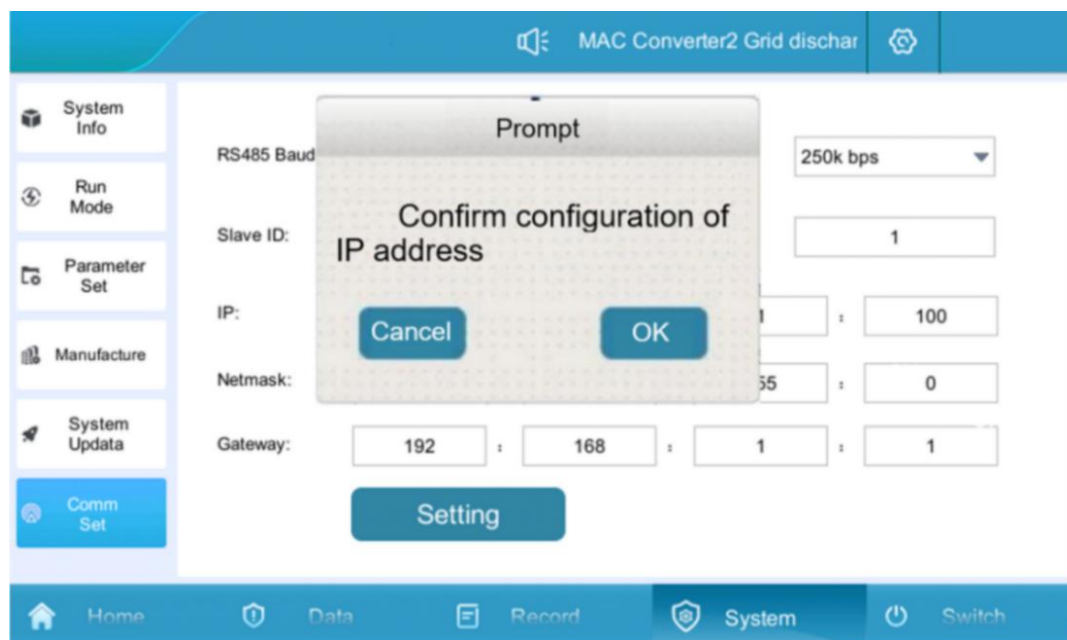


Figure5.3-3 Address configuration interface

5.4 Operation Mode Setting

5.4.1 Introduction to Operation Mode

The operating modes of energy storage inverters are divided into the following three types:

1. Grid connected manual mode: In this mode, the energy storage system is connected to the grid for operation, but startup and shutdown require manual operation by the user through the LCD touch screen. The user can adjust the active power of charging and discharging in "parameter setting" Reactive power and power factor.
2. Grid connected automatic mode: suitable for peak shaving and valley filling scenarios, the system automatically connects to the grid according to the preset charging and discharging power. In the backup mode application, after the battery is charged to the preset SOC, the mains power stops charging.
3. Off grid automatic switching mode: In the grid connected state, if the power grid is cut off, the inverter automatically switches to off grid mode, maintaining 400V/50Hz three-phase AC voltage output; If the power grid is restored in an off grid state, the inverter will automatically switch back to grid connected mode.

Illustration:

- a. Off grid switching can be set to scheduled or unplanned triggering. When the mains power is cut off, it automatically switches to off grid operation, and the system can output a stable 400V/50Hz three-phase AC voltage; When the mains power comes in, it

automatically switches to grid connected mode for operation. Set as plan trigger: When running in grid connected mode, it can be manually switched to off grid mode. Set "off grid" to "off grid", and when running in off grid mode, it can be manually switched to grid connected mode (assuming mains power exists). Set "off grid" to "grid connected". The setting interface is shown in the following figure:

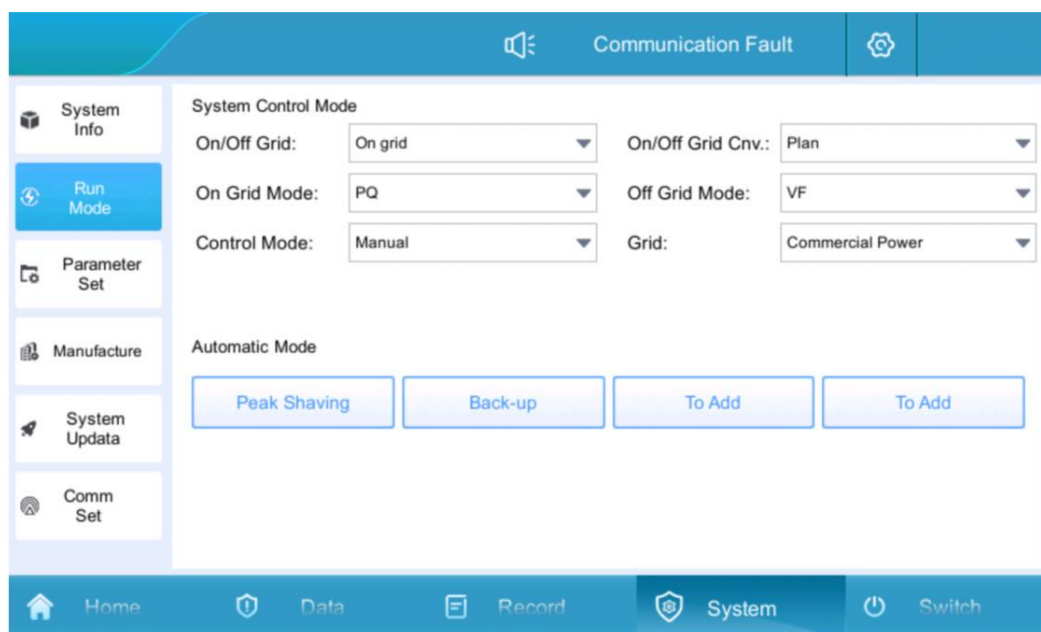


Figure 5.4.1-1 Off grid setting interface

b. In grid connected mode, the anti backflow function can be set to disable or enable, and set to enable: the energy storage system will not reverse power supply to the grid. Set as prohibited: The electricity stored in the energy storage system can flow into the grid. On the system "System" ->"Parameter Settings" ->"Advanced Settings (Password 888888)" ->"MSTS Parameters" ->"Anti backflow Enable" setting interface, as shown in the following figure:



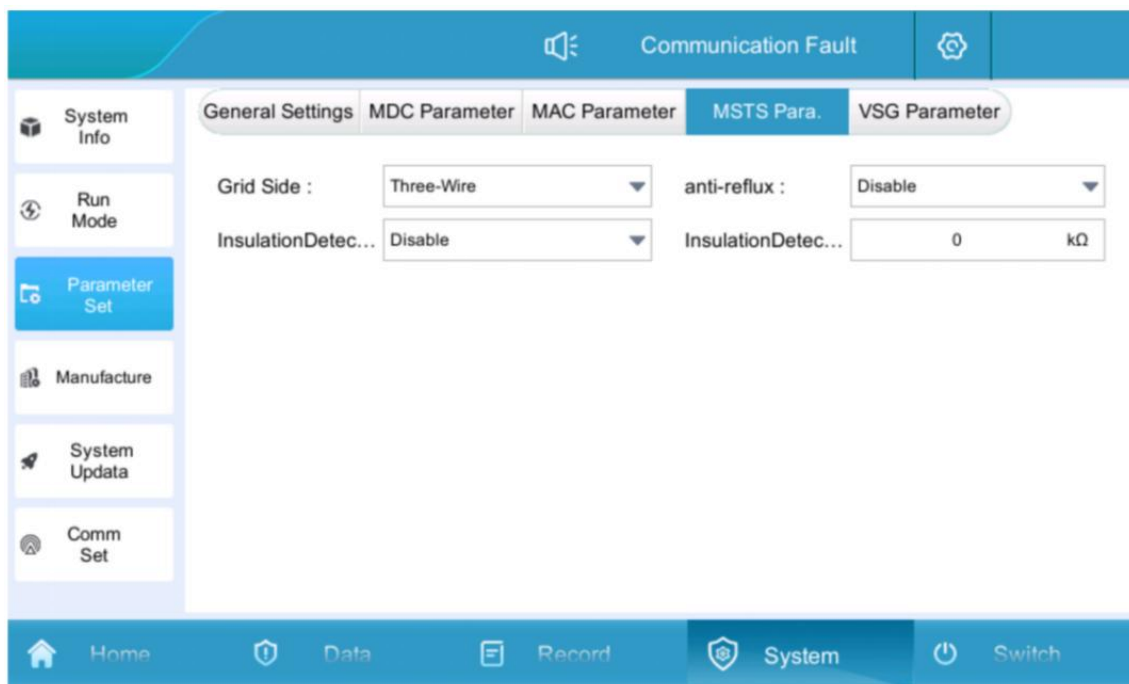


Figure5.4.1-2 Anti backflow setting interface

5.4.2 Grid ON Manual Mode

1. Click on "System" -> "Run Mode" to enter the Figure 5.4.2-1 page.

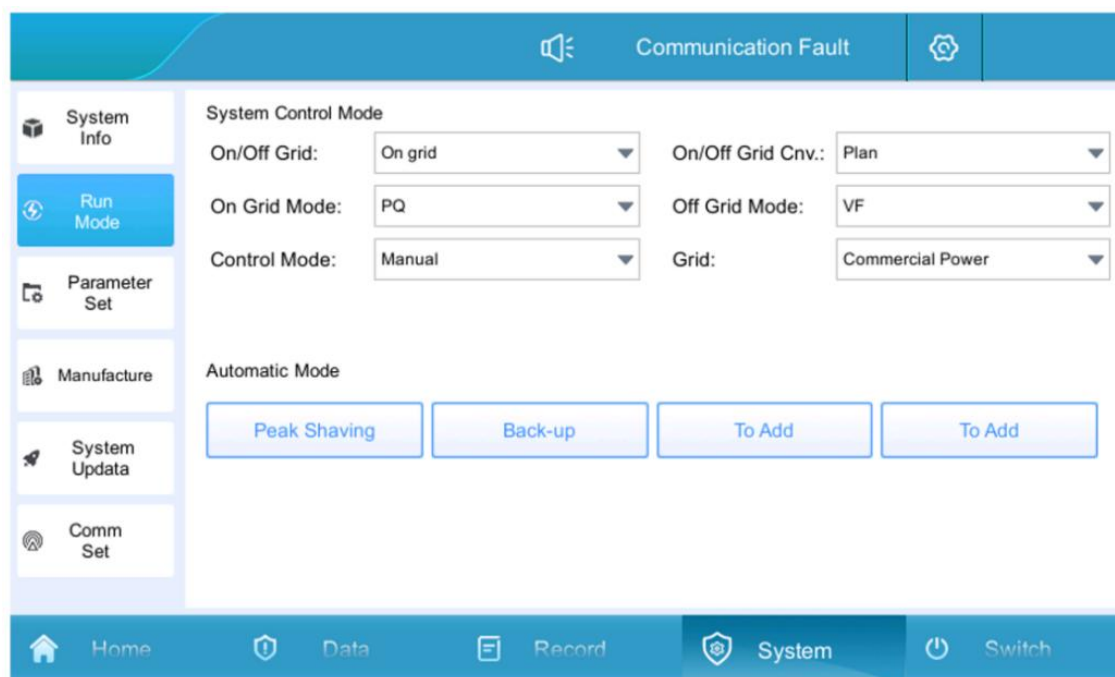


Figure5.4.2-1 Manual mode setting for grid connection

2. Set the control mode to "manual mode" and set the corresponding active power on the "parameter settings" page Power factor The magnitude of reactive power, the machine operates according to the set value (positive value for discharge, negative value for charging). The power setting interface is shown in Figure 5.4.2-2.

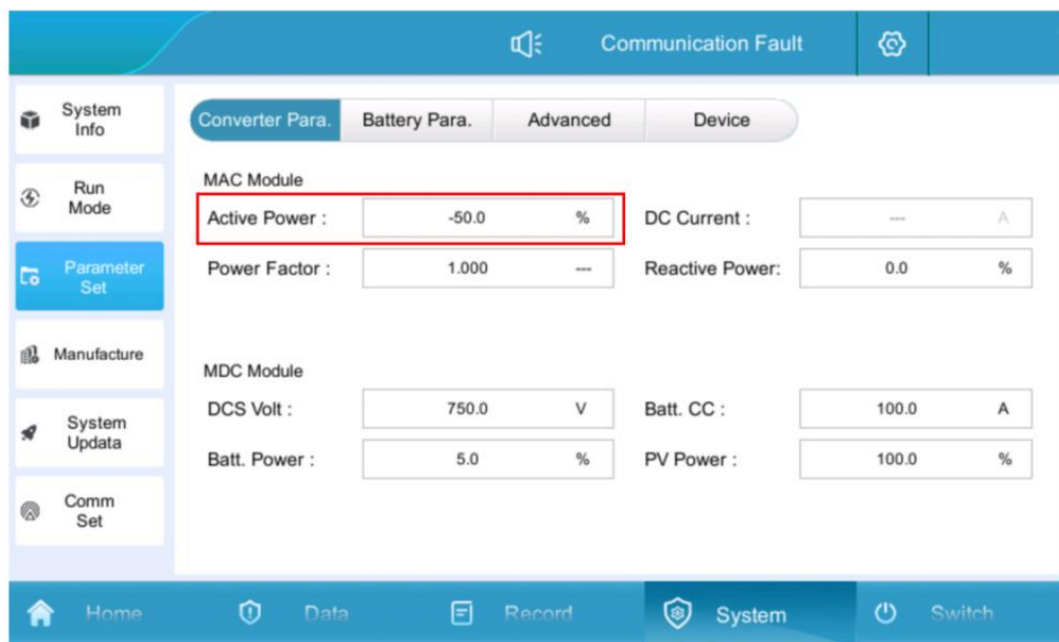


Figure5.4.2-2 Power setting interface

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

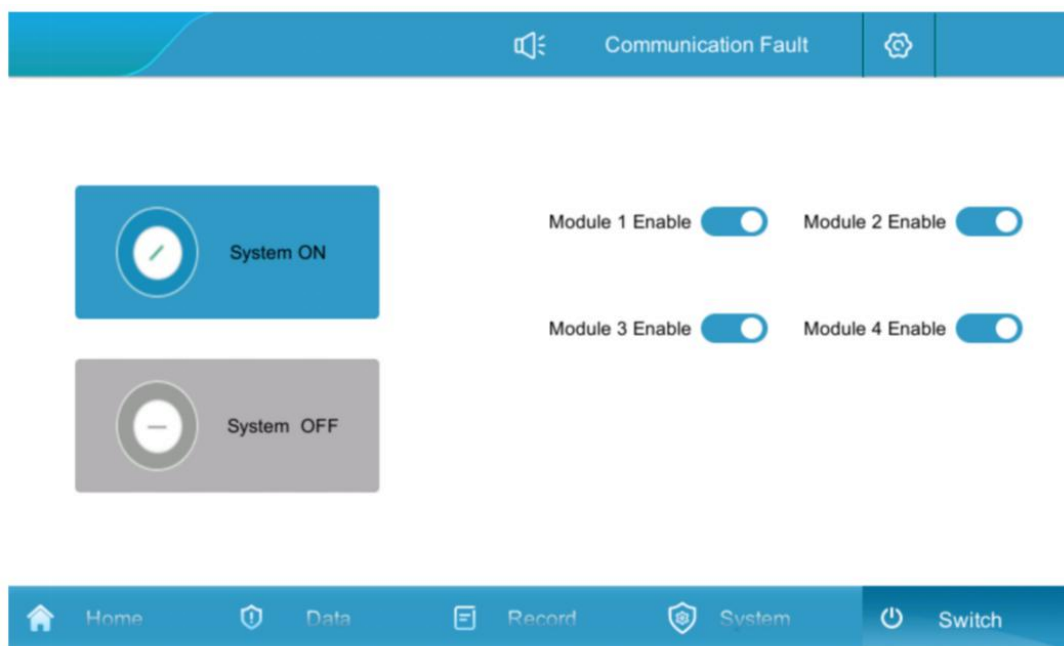


Figure5.4.2-3 Power on/off interface

5.4.3 Grid connected automatic mode

Peak shaving and valley filling mode:

1. Click on "System" -> "Operation Mode", then click on the "Peak shaving and valley filling" button to enter the settings page;

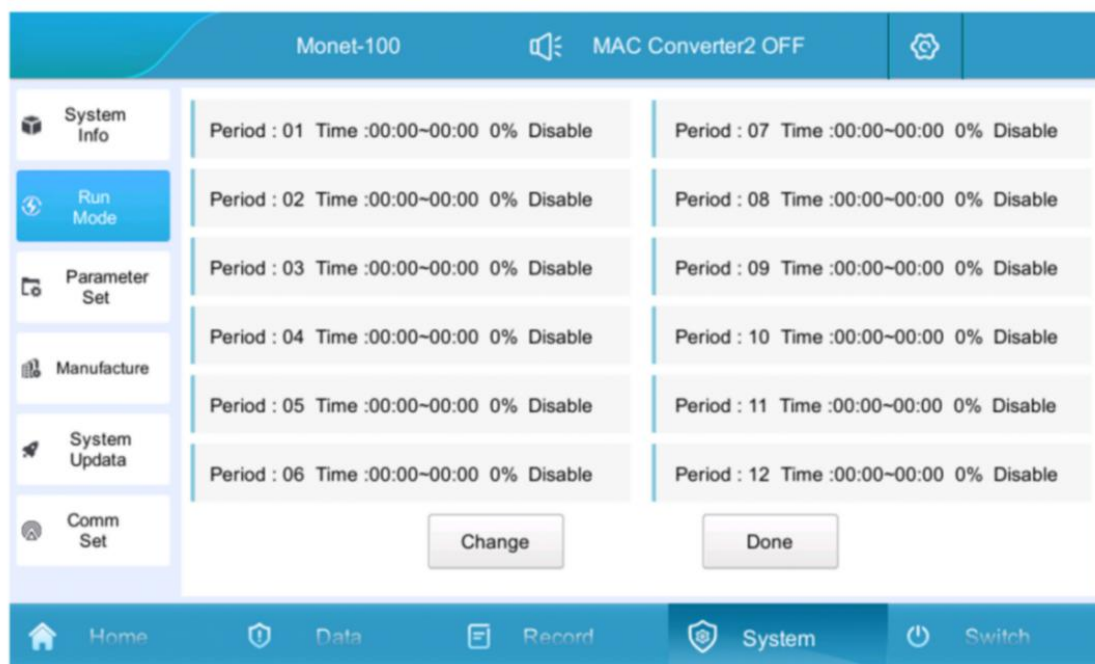


Figure 5.4.3-1 Peak shaving and valley filling operation setting interface

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 to enable in period 1; Click on the next button to enter time slot 2 settings. After completing all time slot settings, save and exit;

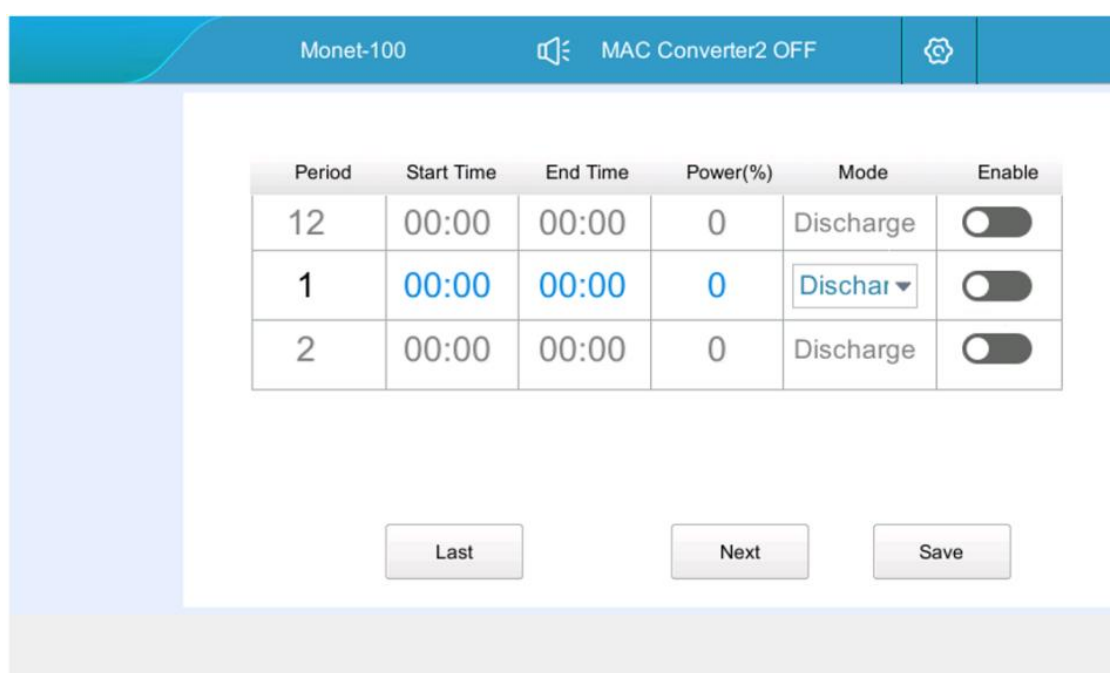
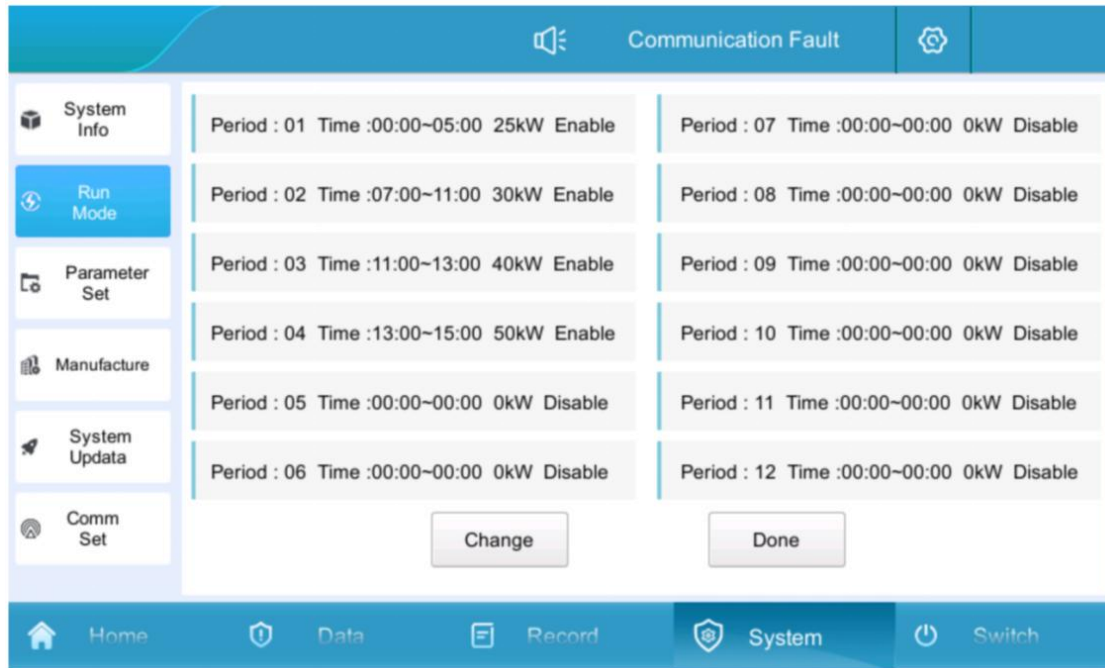


Figure 5.4.3-2 Peak shaving and valley filling charging and discharging time setting interface

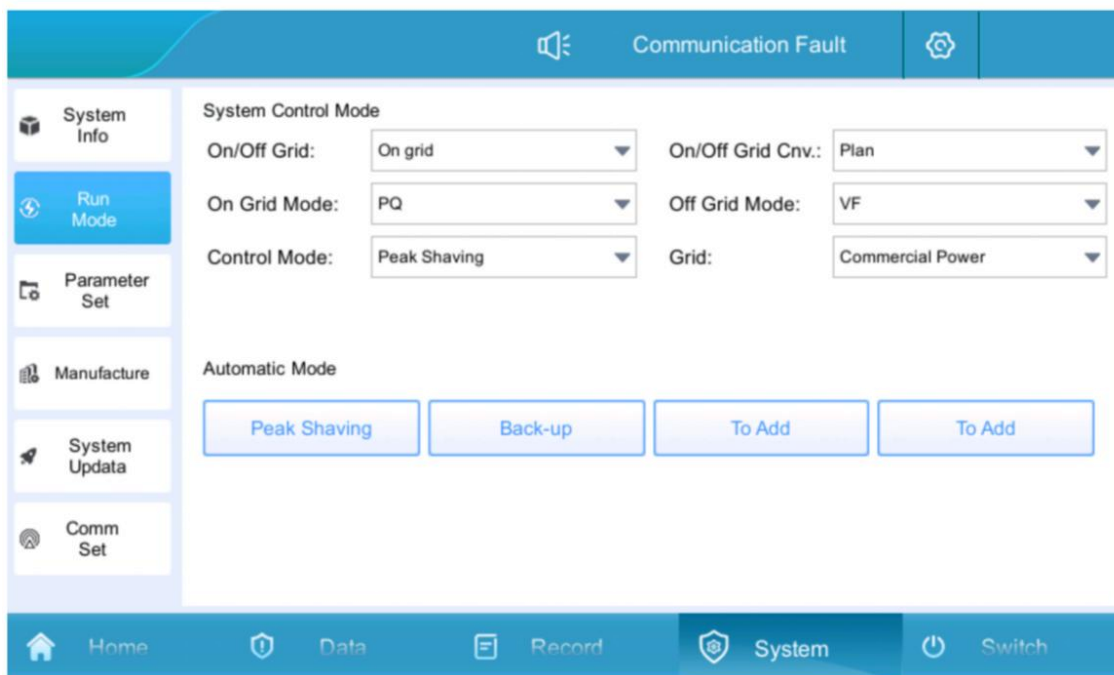
3. Automatically jump to the following interface, click the Done button;



Period	Time	Power	Status
Period : 01	Time :00:00~05:00	25kW	Enable
Period : 02	Time :07:00~11:00	30kW	Enable
Period : 03	Time :11:00~13:00	40kW	Enable
Period : 04	Time :13:00~15:00	50kW	Enable
Period : 05	Time :00:00~00:00	0kW	Disable
Period : 06	Time :00:00~00:00	0kW	Disable
Period : 07	Time :00:00~00:00	0kW	Disable
Period : 08	Time :00:00~00:00	0kW	Disable
Period : 09	Time :00:00~00:00	0kW	Disable
Period : 10	Time :00:00~00:00	0kW	Disable
Period : 11	Time :00:00~00:00	0kW	Disable
Period : 12	Time :00:00~00:00	0kW	Disable

Figure5.4.3-3 Peak shaving and valley filling charging and discharging setting interface

4. Change "Control Mode" to "peak shaving " ;



System Control Mode

On/Off Grid: On grid On/Off Grid Cnv.: Plan

On Grid Mode: PQ Off Grid Mode: VF

Control Mode: Peak Shaving Grid: Commercial Power

Automatic Mode

Peak Shaving Back-up To Add To Add

Figure5.4.3-4 Peak shaving and valley filling control mode

5. At this time, it is in automatic mode: pause, click "switch" ->"system on" to complete the local automatic control mode setting.

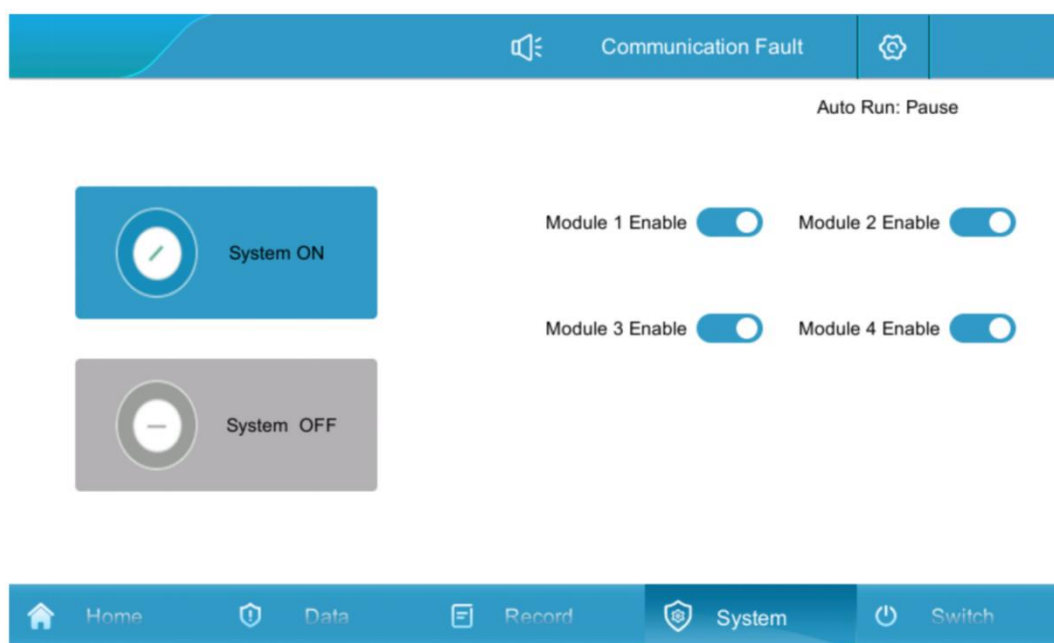


Figure5.4.3-5 Local control operation mode enabled

5.4.4 Automatic off grid switching

Grid on to off grid:

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

Off grid to grid on :

When the system is running in an off grid state and the power grid is incoming, STS detects the incoming power from the power grid and transmits the information to PCS, and STS tracks the phase of the power grid. When the amplitude is synchronized with the PCS operating off grid, the PCS notifies the STS to issue a closing instruction, and at the same time, the PCS automatically switches from off grid mode to grid connected mode, and the system executes the grid connected strategy.

The specific setting method is as follows:

Manual and off grid switching mode:

1. Click on "System" -> "Run Mode" to enter the current page;
2. Select "Plan Trigger" in the "Off grid Switching" option and set it as a plan trigger;
3. When operating in grid connected mode, it can be manually switched to off grid mode and set "parallel off grid" to "off grid";
4. When operating in off grid mode, it can be manually switched to grid connected mode (assuming the presence of mains power), and the "off grid" setting should be set to "grid connected".

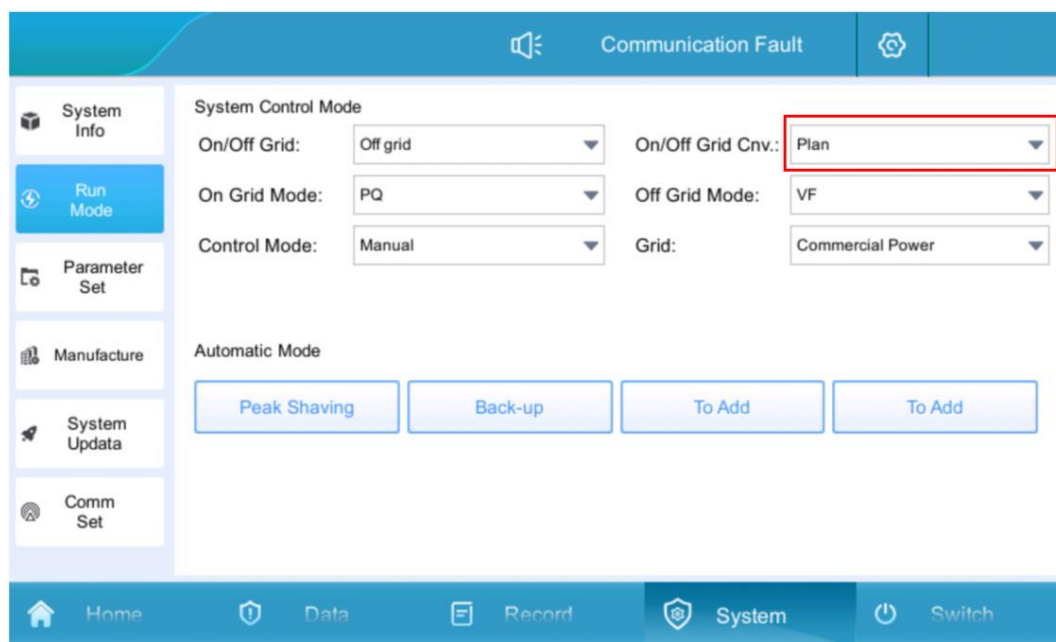


Figure5.4.4-1 Manual and off grid switching mode setting interface

Automatic off Grid mode:

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

When the power grid suddenly loses power while operating in grid connected mode, the energy storage converter automatically switches from grid connected mode to off grid mode, and the system can output a stable 400V/50Hz three-phase AC voltage;

When operating in off grid mode, the energy storage converter automatically switches from off grid mode to grid connected mode when the power grid suddenly comes on.

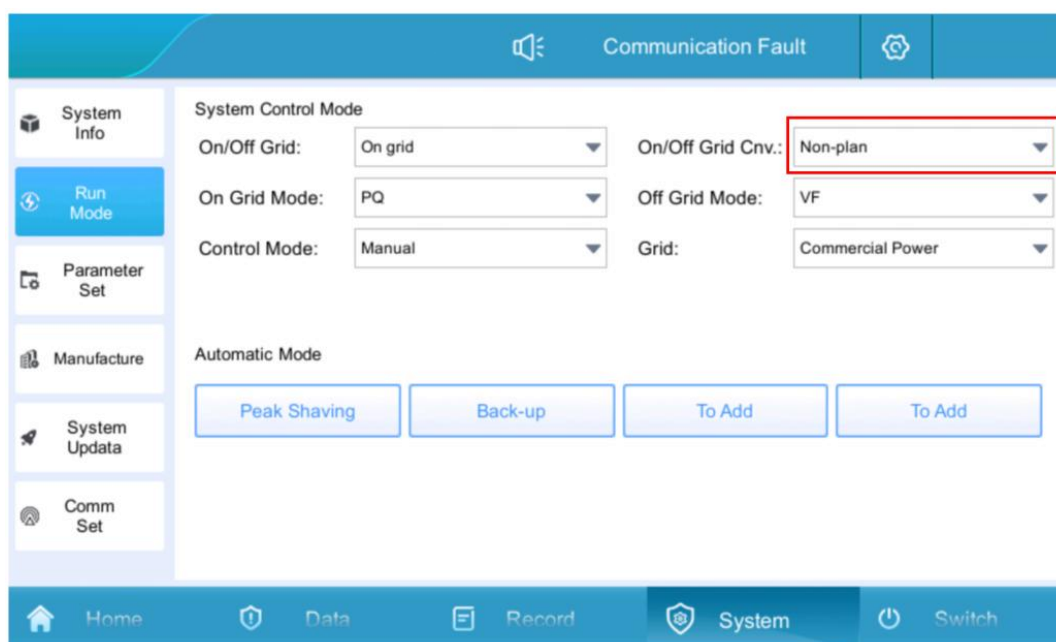


Figure5.4.4-2 Automatic and Off Grid Switching Mode Setting Interface

5.4.5 Battery parameter settings

1. Click on "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 to set the lower limit of SOC to no less than 5%.



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



Figure5.4.5 Battery charging and discharging settings interface

5.4.6 Data Viewing and Exporting

1. Click on "Records" -> "Data Report Table" to enter the current page.
2. Check the current day Month Annual and total charging and discharging capacity.
3. Insert the USB flash drive, wait for it to connect, click on data export, and wait for the export to complete.

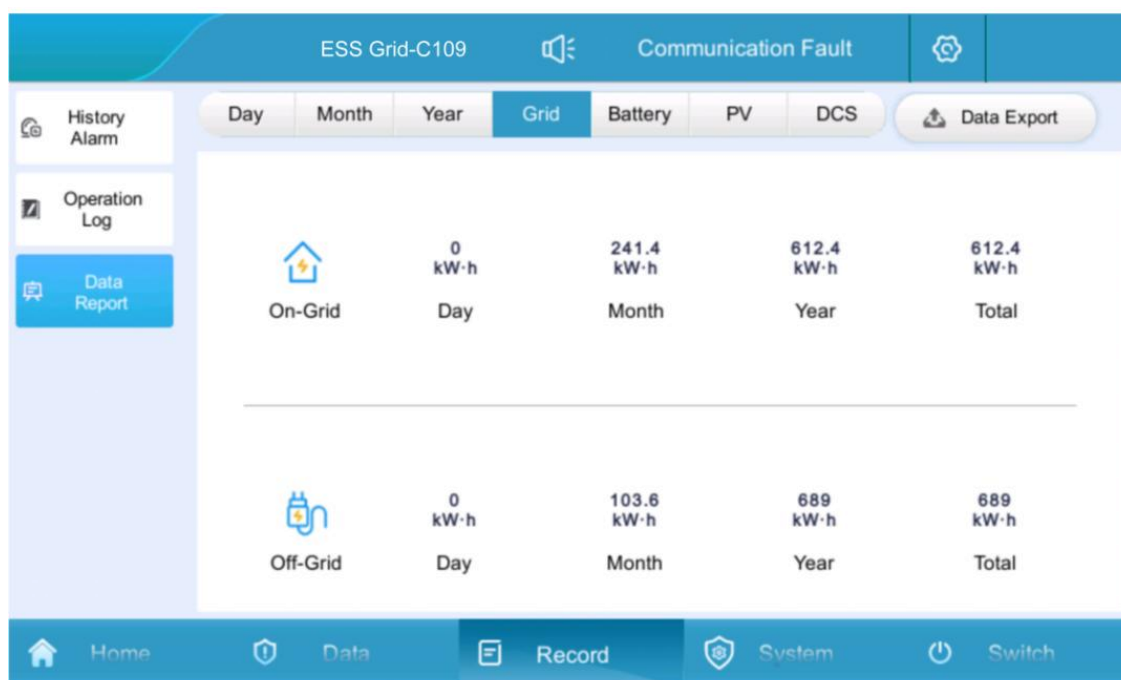


Figure5.4.6-1 Datagram Table interface

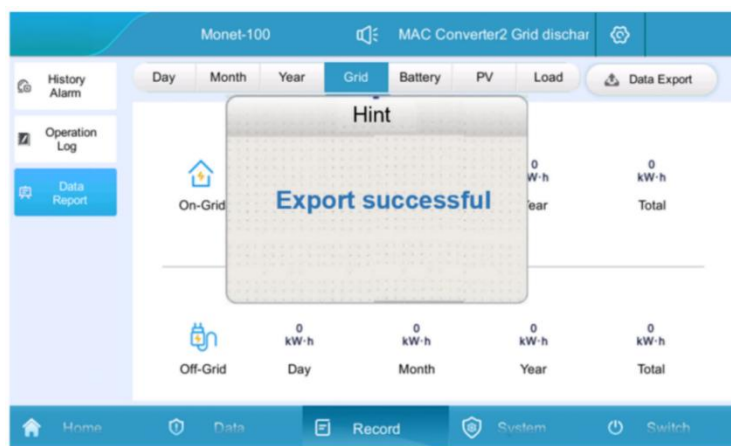


Figure5.4.6-2 Data export interface

5.4.7 Software Upgrade

Software upgrade includes: integrated screen software Upgrade of three types of software: power module DSP software and power module ARM software. Before upgrading, turn off the system on the "switch" page of the touch screen, which means that the software must be upgraded during the system shutdown process.

1.Firstly, prepare a USB flash drive One computer, create a new folder on the USB drive and name it "Update" to store the burned files;



Figure5.4.7-1 Create an upgrade software folder

2.Copy the DSP.LCD.ARM firmware required for system upgrade to the Update folder;

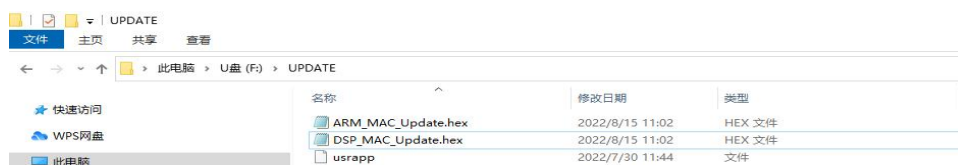


Figure5.4.7-2 Storage upgrade software

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

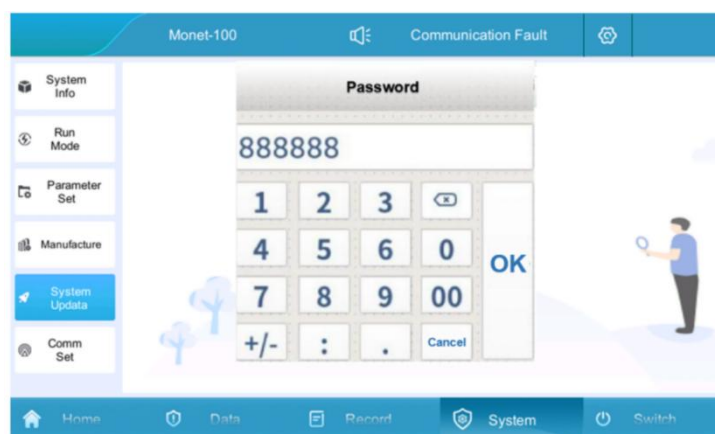


Figure5.4.7-3 Password verification

4. Insert a USB flash drive into the back of the LCD integrated screen, and the interface shows that the USB flash drive is connected, and the upgrade file is detected;
5. Upgrade the all-in-one screen software, click on "LCD Upgrade", wait for about 15 seconds, and there will be a prompt indicating successful upgrade;

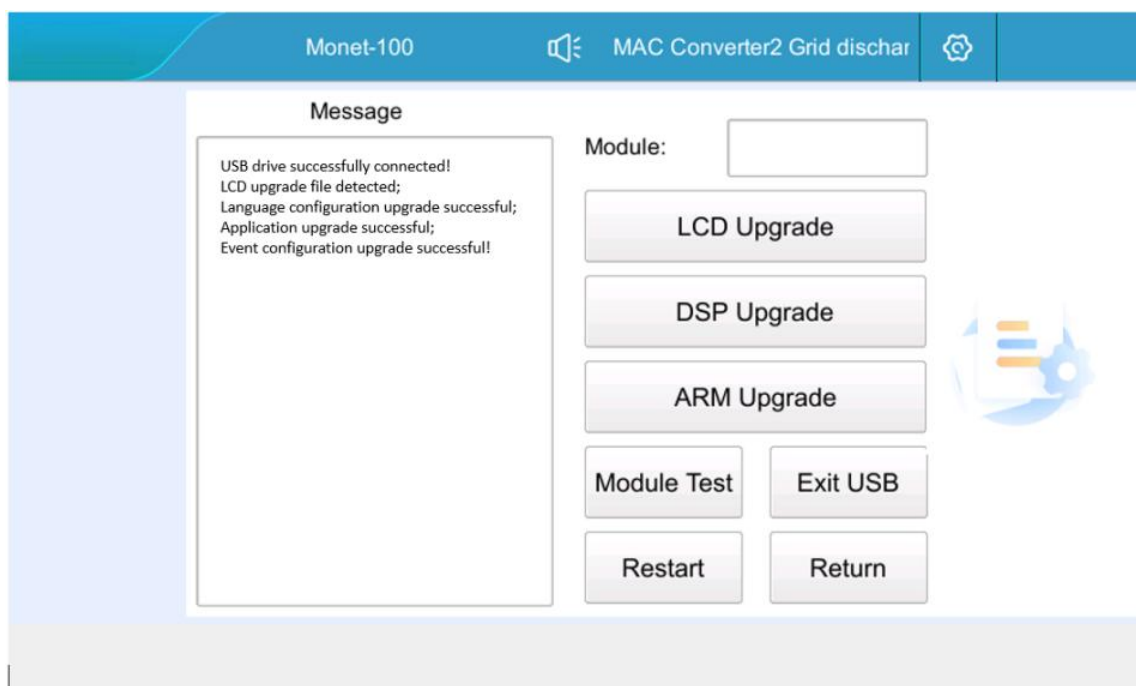


Figure5.4.7-4 Upgrade software and restart interface

6. After upgrading the LCD integrated screen software, click the "restart" button to refresh the version and take effect; Customers can upgrade the DSP and ARM according to their actual situation and then click "restart".
7. Upgrading the power module DSP/ARM requires selecting the module to be upgraded in the module box of the "System Upgrade" interface;
8. Click on 'DSP/ARM Upgrade' and wait for about 5 minutes for a prompt indicating successful upgrade. Complete system upgrade.



Illustration: When the system has multiple modules, it is recommended to upgrade from module 1 first, and then upgrade from module 2 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 is low to upgrade and reduce interference with daily work.

06 Alarm and Maintenance

6.1 Alarm Handling



Illustration:

Maintenance personnel for energy storage systems must hold a Special Operation Certificate for Electricians (China) or an equivalent electrician license compliant with local regulations.

They must complete specialized operation and maintenance training for energy storage systems, demonstrate proficiency in operational procedures, and possess comprehensive electrical safety protection and emergency response capabilities.

Terminology explanation :

NO.	Terminology	Explanation
1	fault	The equipment has malfunctioned and the system has stopped running
2	alarm	The output power of the device may decrease or some functions may fail due to external factors, but it does not affect the system's charging and discharging functions
3	Normal operation	Refers to the system that works every day
4	Interval operation	A system with an irregular monthly operating frequency that cannot guarantee daily operation
5	Long term storage	Battery systems that have not started working for more than 3 consecutive months

Fault alarm Table:

NO.	Alarm/Fault	Component	Problem
1	Door contact alarm	Battery compartment	The energy storage cabinet door is open
2	Firefighting fault	Battery compartment	Battery overheating or fire
3	Lightning arrester alarm	Electrical compartment	Lightning arrester malfunction
4	Compressor alarm	Air conditioner	1.Loose wiring 2.Compressor damage
5	Outdoor fan alarm	Air conditioner	1. Loose wiring 2. Fan damage
6	Overvoltage in the power grid/Undervoltage fault	Power grid /oil engine	Abnormal voltage on the grid side

7	Overfrequency of power grid /Underfrequency fault	Power grid /oil engine	Abnormal frequency on the grid side
8	Island protection failure	Power grid /oil engine	Abnormal voltage on the grid side
9	High/Low Voltage Crossing Alert	Power grid /oil engine	Abnormal voltage on the grid side
10	Grid voltage unbalanced fault	Power grid /oil engine	Abnormal voltage on the grid side
11	Wrong phase of power grid	Power grid /oil engine	Wrong phase sequence connection on the grid side
12	DC voltage High/Low Fault	Battery	Abnormal battery voltage
13	Bus overvoltage fault	PCS	1. Load imbalance 2. Software abnormality
14	Half voltage of busbar unbalanced fault	PCS	1. Load imbalance 2. Software abnormality
15	Overtemperature and derating alarm	PCS	Internal temperature too high
16	Power transistor overheating fault	PCS	Internal temperature too high
17	Balance bridge Overheating fault	PCS	Internal temperature too high
18	DC overcurrent fault	PCS	Excessive DC current
19	Balance bridge overcurrent fault	PCS	Excessive internal current
20	Over load/Overcurrent fault	PCS	Excess power/current on the communication side
21	Wave by wave current limiting fault	PCS	Excessive current on the AC side
22	Communication interruption fault	Local controller forenergy storage inverter	Communication interruption
23	Parallel /synchronization failure	PCS	Parallel/synchronous signal interruption
24	Relay open circuit /Short circuit fault	PCS	Internal relay abnormality Software abnormality
25	Fan alarm	PCS	Internal fan abnormality
26	Leakage current fault	PCS	1. Excessive leakage current 2. Software abnormality
27	Insulation resistance abnormal malfunction	Energy storage inverter/battery	Low ground insulation Software abnormality
28	Module loss alarm	PCS	Module to screen Communication interruption

29	Low DC voltage alarm	PCS	The battery is not turned on
30	Low voltage side one circuit Low voltage of two channels	Photovoltaic DC converter	Photovoltaic open circuit voltage below 250V

Table6.1-1

Handling methods Table:

NO.	Solution
1	1. Check if the cabinet door is completely closed; 2. Check if the cable on the door magnetic sensor is disconnected; 3. Check if the position of the door magnetic sensor is offset.
2	1. Immediately press the EPO button and quickly move away from the energy storage cabinet; 2. Observe continuously for 30 minutes at a safe distance. If there is smoke Fire phenomenon, please call the fire alarm number; If there are no abnormalities, manually clear the activity alarm and contact the manufacturer.
3	1. Check if the signal line connection of the lightning arrester is loose; 2. Check if the lightning arrester indicator changes color; 3. Replace the AC lightning arrester.
4	1. Disconnect the power distribution switch, open the air conditioning junction box, and check if the wiring is loose; 2. Observe whether there is obvious damage to the appearance of the compressor and whether there is a burning smell. If so, contact the manufacturer.
5	1. Disconnect the power distribution switch, open the air conditioning junction box, and check if the wiring is loose; 2. Observe whether the fan is significantly damaged and whether there is a burning smell. If so, please contact the service hotline.
6	Check if the voltage on the grid side is abnormal;
7	Check if the frequency on the grid side is abnormal;
8	Check if the voltage on the grid side is abnormal;
9	Check if the voltage on the grid side is abnormal;
10	Check if the voltage on the grid side is abnormal;
11	Swap any two cables in the ABC three wires;
12	Check if the DC input voltage is abnormal;
13	1. Check if the DC wiring is loose or abnormal; 2. Contact the manufacturer.
14	1. Check if the load is abnormal; 2. Contact the manufacturer.
15	1. Check if the air inlet and outlet of the electrical compartment are blocked; 2. Check if the internal fan is running properly; 3. Contact the manufacturer.
16	1. Check if the air inlet and outlet of the electrical compartment are blocked; 2. Check if the internal fan is running properly; 3. Contact the manufacturer.

17	1. Check if the air inlet and outlet of the electrical compartment are blocked; 2. Check if the internal fan is running properly; 3. Contact the manufacturer.
18	1. Check if there is a short circuit or damaged circuit on the DC side; 2. Replace the energy storage inverter module or contact the manufacturer.
19	1. Check if the off grid load exceeds the limit; 2. Replace the energy storage inverter module or contact the manufacturer.
20	1. Check if the voltage of the power grid is normal; 2. Check whether there is a short circuit or damaged circuit on the DC side; 3. Check if the off grid load exceeds the limit; 4. Replace the energy storage inverter module or contact the manufacturer.
21	1. Check if the voltage of the power grid is normal; 2. Check if the off grid load exceeds the limit; 3. Replace the energy storage inverter module or contact the manufacturer.
22	1. Check if the communication network cables between modules are loose or abnormal; 2. Check if the communication network cable of the local controller is loose or abnormal;
23	1. Check if the parallel cables are loose or abnormal; 2. Check if the parallel setting is abnormal; 3. Hardware circuit damage.
24	1. Replace the energy storage inverter module; 2. Contact the manufacturer to replace internal panels.
25	1. Replace the energy storage inverter module; 2. Contact the manufacturer to replace internal panels.
26	1. Check whether the leakage current Hall is loose or abnormal in wiring; 2. Check if the grounding wire is disconnected;
27	1. Check whether the AC/DC cables are damaged or short circuited to ground; 2. Check if the battery circuit is damaged or short circuited to ground.
28	Check if the communication network cables between modules are loose or abnormal;
29	Check if the battery is turned on;
30	Measure the positive and negative DC voltage of photovoltaic switches using a multimeter, Is it greater than 250V.

Table 6.1-2



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

6.2 System Maintenance

Before conducting maintenance and repair 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 it is in the OFF state.

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

After the maintenance and repair work is completed, the operator should ensure that:

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

2. Firefighting facilities should continue to operate normally.

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 devices or damage to internal equipment. To extend the service life and improve equipment performance, it is recommended to regularly perform the following maintenance checks on energy storage devices: replace aging or damaged components. And due to the ambient temperature Humidity Dust Potential problems may exist during the operation of the system due to factors such as vibration and aging of internal components in the inverter. To ensure the long-term stable operation of the energy storage system, maintenance personnel should conduct regular inspections in accordance with Table 6.2 to promptly identify and address any issues. The specific maintenance cycle recommendations are as follows:

1. In severe sandstorms It is recommended to perform monthly maintenance on systems installed in high salt spray or heavy industrial parks.

In areas with good climate conditions, it is recommended to maintain the energy storage system every three months.

Maintenance Processing Table:

Object	Action	Reference standards
Cabinet	1.Check the appearance of the entire machine 2.Check the ventilation openings 3.Check the condition of the door lock	1.No obvious coating peeling off Scratches or rust; 2.No obvious signs of water leakage; 3.The ventilation opening has no dust accumulation; 4.The door lock is not damaged
Air conditioner	1.Check for noise and vibration 2.Clean the filter screen	1.Fan The compressor rotates normally without any lag abnormal noise 2.The surface of the filter is clean and unobstructed
Firefighting	1.Check the appearance 2.Check the wiring harness	1.The wiring is firm and free of pollutants
PCS	1.Check for noise and vibration 2.Check the ventilation openings on the front panel 3.Check the contact surface of the rear copper bar	1.The front panel fan rotates normally without any lag abnormal noise 2.The front panel vent table is clean and unobstructed 3.Copper bars and contact surfaces are free from corrosion, discoloration, and dust accumulation
STS	1.Check for noise and vibration 2.Check the ventilation openings on the front panel 3.Check the contact surface of the rear copper bar	1.The front panel fan rotates normally without any lag abnormal noise 2.The surface of the front panel ventilation opening is clean and unobstructed 3.Copper bars and contact surfaces are free from corrosion, discoloration, and dust accumulation
DC/DC	1.Check for noise and vibration 2.Check the ventilation openings on the front panel	1.The front panel fan rotates normally without any lag abnormal noise 2.The front panel vent table is clean and

	3.Check the contact surface of the rear copper bar	unobstructed 3.Copper bars and contact surfaces are free from corrosion, discoloration, and dust accumulation
Electrical	1.Check the lightning arrester 2.Check the circuit breaker and contactor 3.Check the contact surface of the copper busbar of the cable	1.Lightning arrester Circuit breaker. The contactor is normal 2.The connecting wire of the screw socket is not loose or detached 3.Copper bars and contact surfaces are free from corrosion, discoloration, and dust accumulation
Battery pack	1.Check for noise and vibration 2.Check the contact surface of the copper busbar of the cable	1.The battery pack fan rotates smoothly without any lag abnormal noise 2.The front panel vent table is clean and unobstructed 3.The connecting wire of the screw socket is not loose or detached 4.Copper bars and contact surfaces are free from corrosion, discoloration, and dust accumulation

Table6.2

6.3 Dust removal treatment

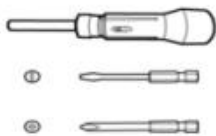
6.3.1 Preparation before dust cleaning



Note:

Please prepare at least the following tools, as insufficient tools may prevent maintenance from being completed; The tools used, such as the handle of a Phillips screwdriver, need to be insulated and protected, or insulated tools should be used.

Dust cleaning tool:

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

Protective tools:

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

6.3.2 Dust cleaning and Maintenance

Cleaning and Maintenance Table:

Category	Action	Reference standards	System status
Cabinet	Clean the ventilation opening	1.The ventilation opening has no dust accumulation	Power off
Cabinet	Clean the dust-proof cotton	1.Entry of insects, mice, snakes and other animals	Power off
Cabinet	Rinse appearance	1.The dust-proof cotton has no obvious discoloration or debris	Power off
Air conditioner	Clean the radiator	1.The surface of the radiator table is clean and unobstructed; 2.The fan rotates normally without any lag abnormal noise	Power off
Power Distribution Region	Check for foreign objects in the distribution area	1.The area is clean No foreign matter	Power off
Note: It is recommended to clean up every sandstorm that occurs in dusty areas; It is recommended to clean once before entering summer; In other regions, according to the actual situation, ensure that the filter or condenser is not blocked; The longest service life of dust-proof cotton is 2 years. Recommended tool: High pressure water gun.			

Table6.3.2

6.3.3 Operating steps

Step 1: Power off the system and shut it down

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

2. Disconnect the auxiliary power switch of the system and the battery auxiliary power switch;

Disconnect the QF1 load switch QF2 Grid switch, QF3 Photovoltaic switch;

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

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

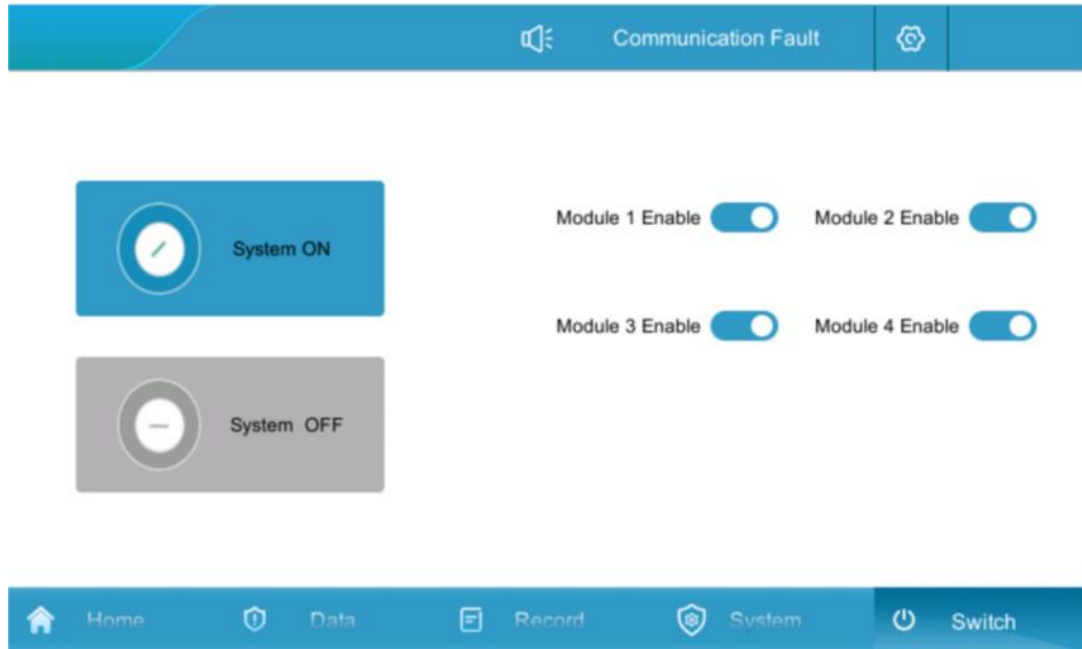


Figure6.3.3-1

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

Step 3: Disconnect the upper level distribution box circuit breaker of the mains circuit breaker and hang the "Do Not Close" maintenance sign.

Use a multimeter to measure whether the device is still charged inside, and only proceed to the next step when the device is no longer charged;



Figure6.3.3-2

Step 4: Open the cabinet door, release the buckle of the dust-proof cotton frame, remove the dust-proof cotton, and place the aluminum alloy frame and dust-proof cotton flat in a safe storage area.

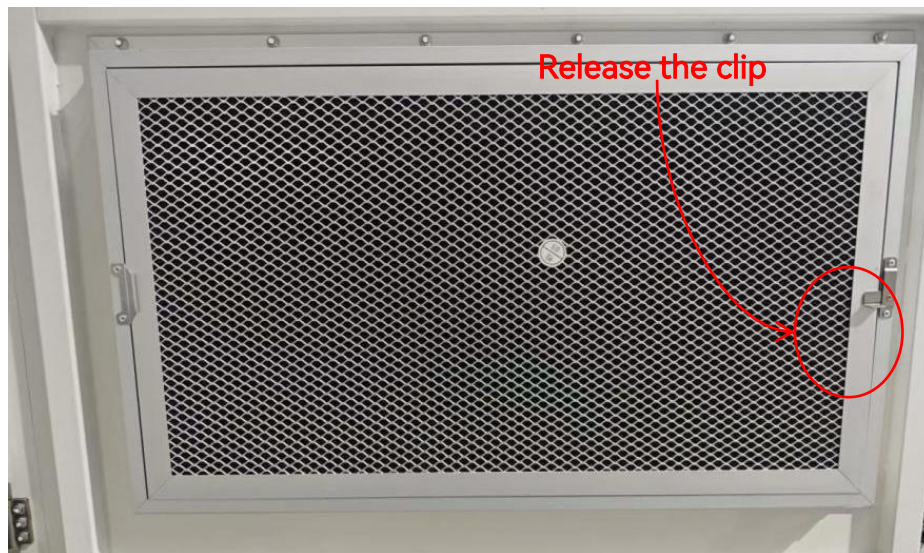


Figure6.3.3-3

Step 5: Rinse the dust-proof cotton with a high-pressure water gun. If it is too dirty, use a cleaning agent to clean it.

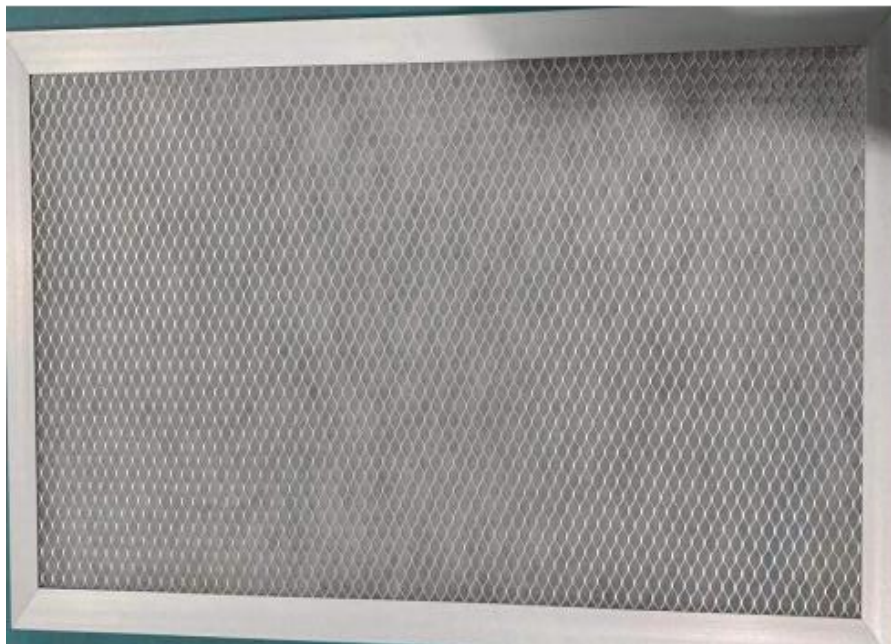


Figure6.3.3-4

Step 6: Place the cleaned dust-proof cotton into the aluminum alloy dust-proof cotton frame and dry it, then fix it with a buckle.

Step 7: Restart the device.

6.4 Warranty service

6.4.1 Warranty period

Under the correct use of the product, the warranty period stipulated in the business contract shall prevail.

6.4.2 Warranty Coverage

During the warranty period, if the product malfunctions due to quality issues, our company will provide customers with free repair or replacement of the product. Customers should

reserve reasonable response time for our company's repairs, and the replaced products will be handled by our company. Customers are required to provide relevant proof of product purchase and ensure that the product trademark is clearly visible, otherwise our company reserves the right not to provide warranty guarantee.

6.4.3 Disclaimer

In the event of the following situations, our company reserves the right not to provide quality assurance, but we can still offer paid repair services.

1. The warranty period has expired;
2. Unable to provide proof of product purchase;
3. During transportation Damage caused during loading and unloading process;
4. Incorrect installation Damage caused by modification or disassembly by unauthorized personnel;
5. Damage caused by operating under abnormal usage conditions or environments;
6. Machine malfunction or damage caused by the use of non Nantong components or software;
7. Due to fire Earthquake Malfunctions caused by uncontrollable factors such as floods.

Appendix

Emergency Handling

When the battery drops or is subjected to strong impact

If there is a noticeable odor be damaged. Smoking Fire and other situations:

Immediately evacuate personnel, report to the police, and contact professionals.

Firefighting equipment should be used by professionals to extinguish fires while ensuring safety.

If there is no obvious deformation or damage to the appearance and no odor appears

Smoking catch fire:

Warehouse scene: Evacuate personnel, have professional personnel use mechanical tools to transport batteries to an open and safe area, contact service engineers, let them sit for 1 hour, and monitor the battery temperature (within the range of room temperature $\pm 10\text{ }^{\circ}\text{C}$) before processing.

On site energy storage system: Evacuate personnel, close the energy storage system door, have professional personnel transport the battery to a safe location, contact the service engineer, and let it sit for 1 hour before processing.

When a flood occurs

Power off the system while ensuring personal safety.

If any part of the battery is submerged in water, do not touch the battery to avoid electric shock.

Do not use batteries that have been submerged in water. Contact the recycling company for disposal.

When a fire occurs



Warning:

Power off the system under safe conditions.

Use carbon dioxide FM-200 or ABC dry powder fire extinguisher for extinguishing fires.

Firefighters should avoid contact with high-voltage components to prevent the risk of electric shock.

High temperature of the battery may cause deformation Electrolyte leakage and toxic gas release require wearing respiratory protective equipment and staying away from the scene to avoid skin irritation and chemical burns.

When the sound and light alarm is activated

Do not approach or open the door, stay away immediately.

Cut off power remotely while ensuring personal safety.

When exhaust start occurs

On site personnel protection: It is prohibited to operate directly towards the exhaust port.

Post maintenance: Contact the service engineer for evaluation.

Emergency response in case of refrigerant leakage



Warning:

Immediately cut off power, evacuate personnel, and prohibit open flames/spark operations (explosion-proof).

After troubleshooting, clean the interior of the system, power it on again, and check if the system is working properly. If there are any abnormalities, please contact the relevant engineer in a timely manner for handling.

Maintenance points: :

Use a leak detector to locate the leakage point (check the compressor shaft seal and condenser joint);

Small leakage: tighten the seal after recovering the refrigerant;

Big leakage: Replace components.

When a fire extinguishing agent erupts or catches fire

Suggestions for operation and maintenance personnel:

Evacuate the scene and report to the police, providing the type of battery pack System capacity Information such as location distribution.

Do not re-enter the combustion area or open the energy storage system door, isolate the site and monitor it.

Power off the system remotely (to ensure its own safety).

Provide product information and user manuals to firefighters.

After extinguishing the fire, it should be handled by professional personnel. It is prohibited to open the door without authorization.

Contact a service engineer to evaluate maintenance.

Suggestions for firefighters:

Refer to the product information provided by the operation and maintenance personnel.

Do not open the energy storage system door before ensuring safety.

Extinguish the fire through control measures to prevent it from spreading to surrounding energy storage cabinets.



User Manual

BSL NEW ENERGY TECHNOLOGY CO., LTD

www.bsl-battery.com
inquiry@bsl-battery.com

Follow us on:     

Add: Building 2, Area D, Qunyi Intelligent
Manufacturing Industrial Park, Tonghu
Ecological Intelligence Zone, Zhongkai,
Huizhou, Guangdong, China

Website



Tiktok



Youtube

