



BSL NEW ENERGY TECHNOLOGY CO., LTD

User Manual

ESS-GRID Cabinet Series

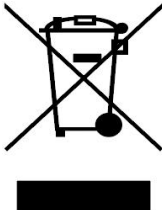
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Identification Instructions

	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
	CE certification
	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 of with other household wastes throughout the EU. To prevent possible environmental or human health harm from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmentally safe recycling.

Version History

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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	11
2.7 Product Specifications	11
2.8 Component Introduction	14
2.8.1 Battery Pack	14
2.8.2 High Voltage Control Box	15

2.8.3 Battery Management System	16
2.8.4 Energy Storage Converter Power (PCS) Module	17
2.8.5 DC/DC Converter Power Module	18
2.8.6 Standalone Off-grid Switching Module STS	20
2.8.7 Three-phase Isolation Transformer	21
2.8.8 Temperature Control System	22
2.8.9 Thermal Runaway Suppression System	23
2.8.10 Entrance guard Switch	25
2.8.11 Local Management System	26
2.9 Configuration List	27

03 Transportation and storage.....28

3.1 Packaging and Storage	28
3.1.1 Product Packaging	28
3.1.2 Product Storage	28
3.2 Transportation and Handling	29
3.2.1 Product Transportation	29
3.2.2 Product Handling	29

04 Product installation.....31

4.1 Installation Environment	31
4.2 Space Preparation	32
4.3 Foundation Preparation	34
4.4 Preparations Before Installation	35
4.5 Basic Installation	36

4.6 Mechanical Installation	37
4.7 Electrical Connections	39
4.7.1 Grounding Connection	39
4.7.2 Power line connection	39
4.8 Check after Equipment Wiring	47

05 Startup and Debugging 48

5.1 Pre-check before Power On	48
5.2 Pre-check before Startup	48
5.3 Startup Procedure	49
5.4 Trial Run	49
5.5 Normal Shutdown	50
5.6 Emergency Stop and Shutdown	50

06 Operation and Handling 51

6.1 Human-Computer Interaction Interface	51
6.2 Power On/Off Operations	53
6.3 Communication Settings	54
6.4 Operating Mode Settings	56
6.4.1 Introduction to Operating Modes	56
6.4.2 Grid connection: Manual mode	57
6.4.3 Grid connection: Automatic mode	59
6.4.4 Automatic Switching from On/Off-Grid Mode	63
6.4.5 Battery Parameter Settings	65
6.4.6 Environmental Monitoring Interface	66

6.4.7 Data Viewing and Export.....	67
6.4.8 Software Upgrade.....	68
6.5 Router Connection Operation.....	70
6.5.1 SIM card Installation.....	70
6.5.2 Network Connection.....	70

07 Alarm and Maintenance..... 73

7.1 Alarm Handling.....	73
7.2 System Maintenance.....	76
7.3 Cleaning and Dust Removal Process.....	78
7.3.1 Preparations Before Dust Removal.....	78
7.3.2 Cleaning and Maintenance.....	79
7.3.3 Operating Steps.....	79
7.4 Warranty Services.....	81
7.4.1 Warranty Period.....	81
7.4.2 Warranty Scope.....	81
7.4.3 Disclaimer Statement.....	81

Appendix..... 82

Emergency Response Procedures for Energy Storage Systems.....	82
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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-GR1D Cabinet Series is composed of 15 battery Packs, 1 high-voltage box, 1 125kW PCS, 3 50kW DC units, 1 150kW STS, and 1 125kVA isolation transformer. Each Pack is formed by 16 battery cells connected in series. The rated capacity of each cell is 314Ah or 280Ah. The high-voltage control box includes the Battery Cluster Management Unit (BCU) and some protective and control electrical components, which are used to manage and protect the operation status of the entire battery cluster. The integrated cabinet adopts a compartmentalized design of battery compartment and electrical compartment, making installation and maintenance very convenient.

2.2 Product Description

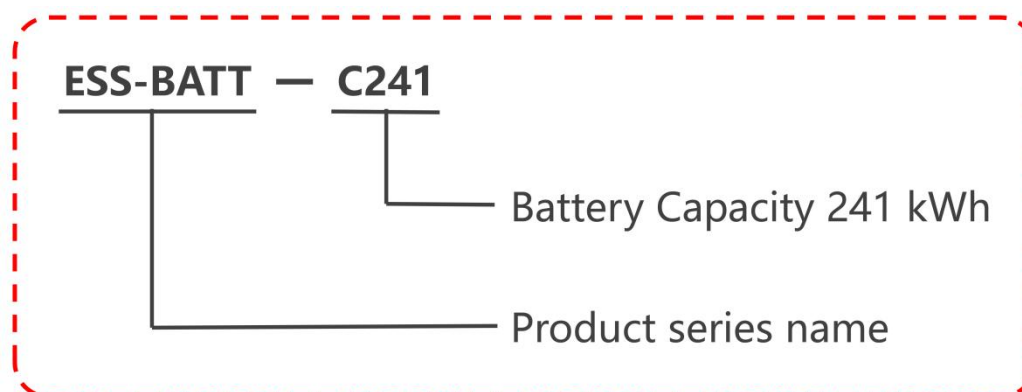


Figure 2.2



Illustration:

The isolation transformer, STS grid-tie/off-grid switching device, and DC power module are optional components. The system's rated output power and battery capacity can be flexibly configured according to specific project requirements.

2.3 Product Application

The integrated energy storage cabinet combines core components such as the energy storage battery, modular STS, modular PCS, modular DC/DC converter, energy management and monitoring system, power distribution system, environmental control system, and fire protection system. Designed with a modular PCS structure, it facilitates system maintenance and future expansion. The commercial & industrial storage cabinet supports front-side maintenance, effectively reducing the required footprint and dedicated service access space. The product features high safety and reliability, rapid deployment, excellent cost-effectiveness, high energy efficiency, and intelligent management capabilities.

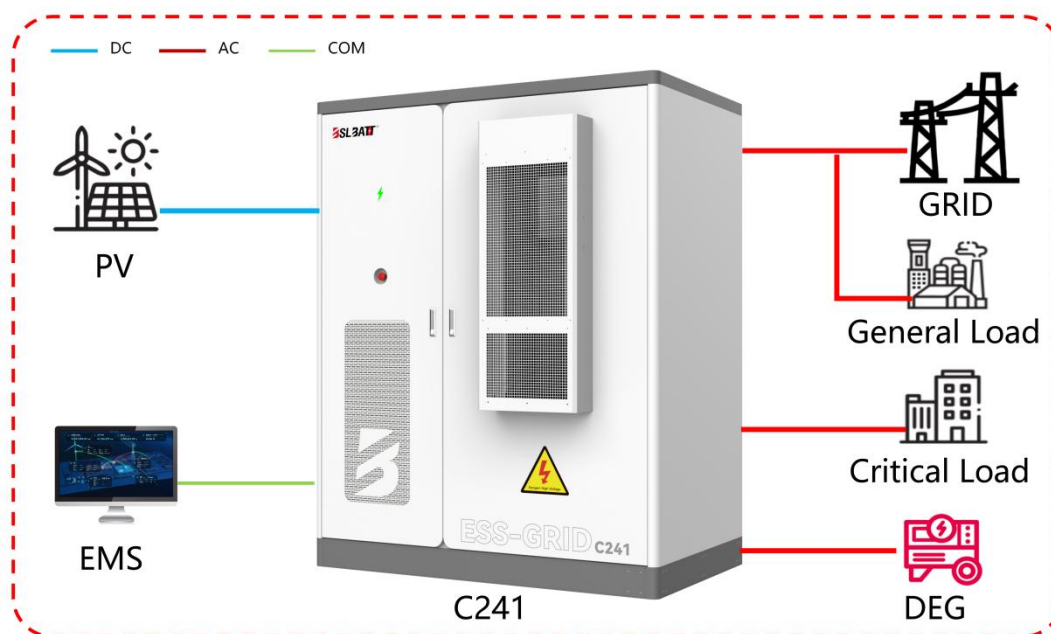


Figure 2.3-1

Under common application scenarios, the operational strategies of the energy storage system are as follows:

1. Peak Shaving and Valley Filling

During off-peak hours when time-of-use electricity prices are low: the energy storage cabinet automatically charges. Once fully charged, it remains on standby.

During peak hours when electricity prices are high: the energy storage cabinet automatically discharges to capture price arbitrage, thereby improving the economic efficiency of the PV-storage-charging system.

2. PV-Storage Coordination

The system monitors local load power in real time. PV generation first supplies the local load; any surplus energy is stored in the battery.

When PV generation is insufficient to meet the local load demand, priority is given to using the energy stored in the battery.

Dual-Unit Parallel Configuration: This series of integrated units supports parallel operation. By connecting two units of the same model in parallel, the total power output capacity of the system can be effectively expanded.

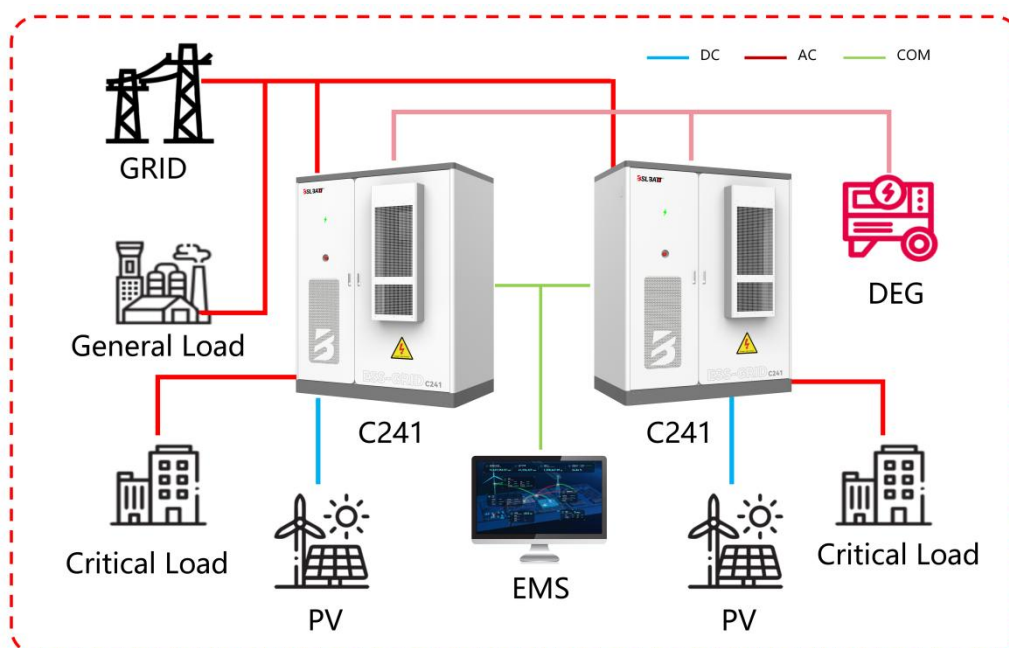


Figure 2.3-2

Multi-Battery Capacity Expansion: The commercial & industrial integrated energy storage unit supports multi - unit parallel connection with battery cabinets of the same type, effectively expanding the overall capacity of the energy storage system. Depending on the user's specific needs, the number of DC battery cabinets connected in parallel can be selected, with up to three units allowed, thereby increasing the total system capacity.

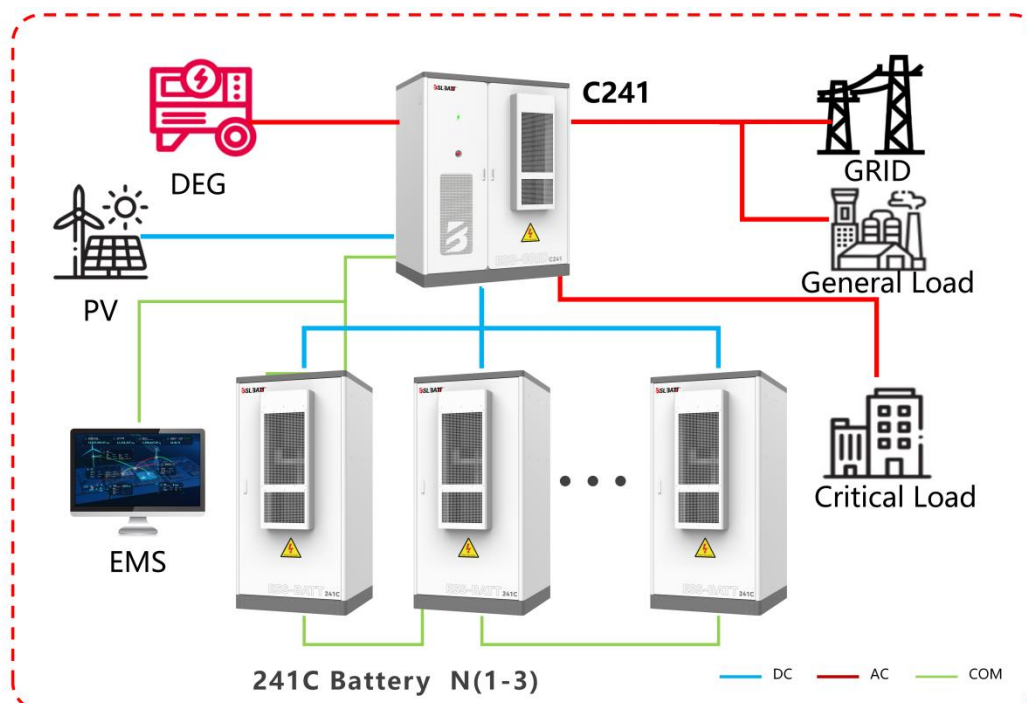


Figure 2.3-3

2.4 Product Appearance

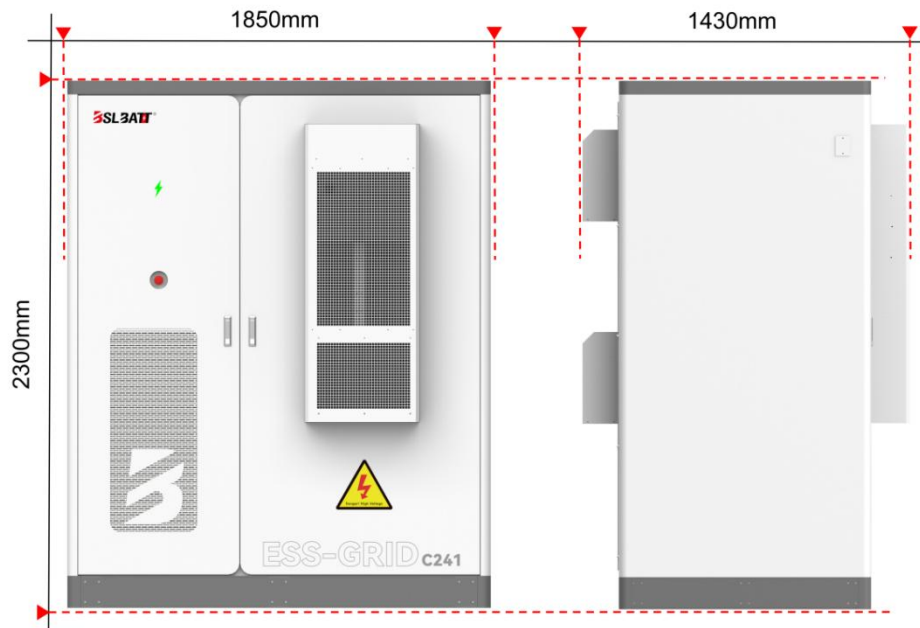


Figure 2.4

2.5 Communication Topology Diagram

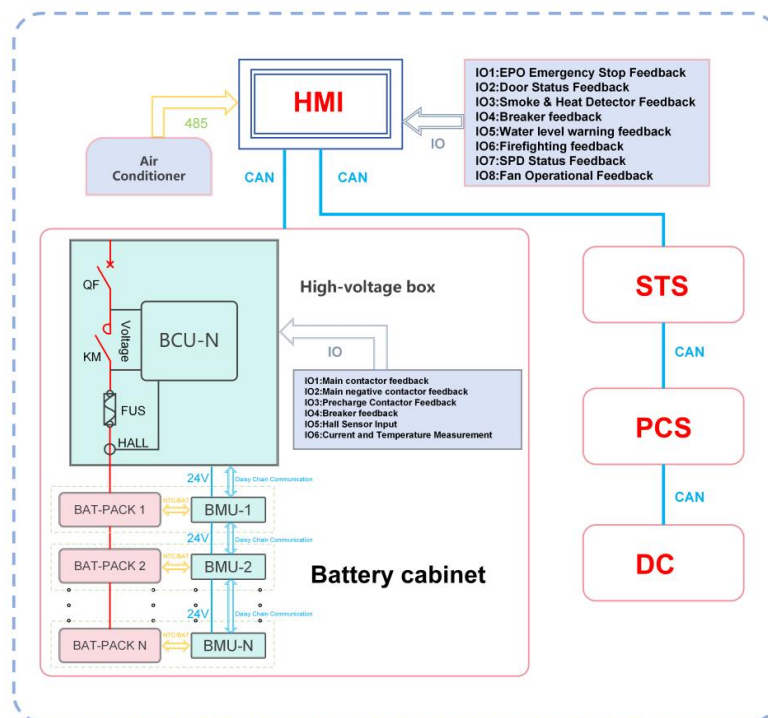


Figure 2.5



Illustration:

Different projects have different configurations and communication methods. The actual situation will depend on the delivery.

2.6 Electrical Circuit Diagram

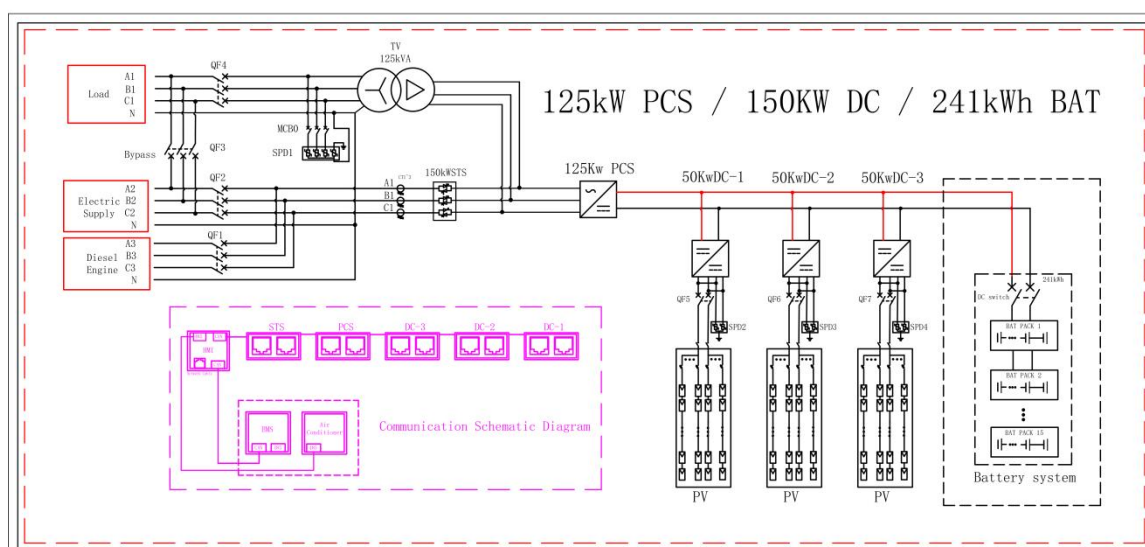


Figure 2.6



Illustration:

Figure 2.6 illustrates the C241 system configuration featuring grid- tied/islanded operation, an isolation transformer, and PV input. Specific configurations and wiring may vary by project; actual implementation shall be based on the shipped product.

2.7 Product Specifications

ESS-GRID Cabinet series Parameter

Model	ESS-GRID C200	ESS-GRID C215
System Parameter	100kW/ 200kh	100kW/ 215kWh
Cooling Method	Air-cooled	
Battery Parameters		
Rated Battery Capacity	200.7KWh	215.0KWh
Rated System Voltage	716.8V	768.0V
Operating voltage Range	627.2V~795.2V	672.0V~852.0V
Cell Capacity (LFP)	280Ah	
Rated Charge,Discharge Current	140A	
Battery Series-paralle Connection Method	1P*16S*14S	1P*16S*15S
Charge tempuDischarge temp.Method	0~55℃/-20~55℃	
PV Parameters		
Starting Voltage	200V	
Max.PV Power	150KW	

MPPT Quantity	3	
MPPT Voltage Range	250-620V	
MPPT Full Load Open Circuit Voltage Range (Recommended)*	345V-580V	345V-620V
AC Parameters		
Rated AC Powver	100kW	
Nominal AC Current Rating	144A	
Max.AC Current Rating	159A	
Rated AC Voltage	400Vac/230Vac,3W+N+PE/3W+PE	
DC Side Voltage Range	580-1000V(3P3W)/670~1000V(3P4W)	
DC Side Full Load Voltage Range	625-927V(3P3W)/680-927V(3P4W)	
Rated Frequency	50Hz/60Hz(±5Hz)	
Total Curent Harmonic Distortion (THDI)	<3% (Rated Power)	
Power Factor Adjustable Range	1 Ahead ~ +1 Behind	
General Parameters		
Protection Level	IP55	
Fire Protection System	Hot-air aerosol	
Isolation Method	Isolated (Transformer Optional)	
Operating Temperature	-25℃~60℃ (>45℃ derating)	
Altitude	3000m	
Communication Interface	RS485/CAN/ Etherner	
Dimension (W*D*H,mm)	1850*1430*2300(±5)	
Weight (With Batteries Approx.)	3150kg+3%	3250kg+3%

Table 2.7-1

ESS-GRID Cabinet series Parameter

Model	ESS-GRID C225	ESS-GRID C241
System Parameter	125kW/ 215kWh	125kW/ 241kWh
Cooling Method	Air-cooled	
Battery Parameters		
Rated Battery Capagity	225.0KWh	241.1KWh
Rated System Voltage	716.8V	768.0V
Operating voltage Range	627.2V~795.2V	672.0V~852.0V
Cell Capacity (LFP)	314Ah	
Rated Charge,Discharge Current	157A	

Battery Series-parallel Connection Method	1P*16S*14S	1P*16S*15S
Charge tempuDischarge temp.Method	0~55℃/-20~55℃	
PV Parameters		
Starting Voltage	200V	
Max.PV Power	150KW	
MPPT Quantity	3	
MPPT Voltage Range	250~620V	
MPPT Full Load Open Circuit Voltage Range (Recommended)*	345V~580V	345V~620V
AC Parameters		
Rated AC Powver	125kW	
Nominal AC Current Rating	181A	
Max.AC Current Rating	199A	
Rated AC Voltage	400Vac/230Vac,3W+N+PE/3W+PE	
DC Side Voltage Range	580~1000V(3P3W)/670~1000V(3P4W)	
DC Side Full Load Voltage Range	625~927V(3P3W)/680~927V(3P4W)	
Rated Frequency	50Hz/60Hz(±5Hz)	
Total Curent Harmonic Distortion (THDI)	<3% (Rated Power)	
Power Factor Adjustable Range	1 Ahead ~ +1 Behind	
General Parameters		
Protection Level	IP55	
Fire Protection System	Hot-air aerosol	
Isolation Method	Isolated (Transformer Optional)	
Operating Temperature	-25℃~60℃ (>45℃ derating)	
Altitude	3000m	
Communication Interface	RS485/CAN/ Etherner	
Dimension (W*D*H,mm)	1850*1430*2300(±5)	
Weight (With Batteries Approx.)	3150kg+3%	3250kg+3%

Table 2.7-2



Note:

The actual parameters have been set according to the customer's requirements before the product was manufactured.

2.8 Component Introduction

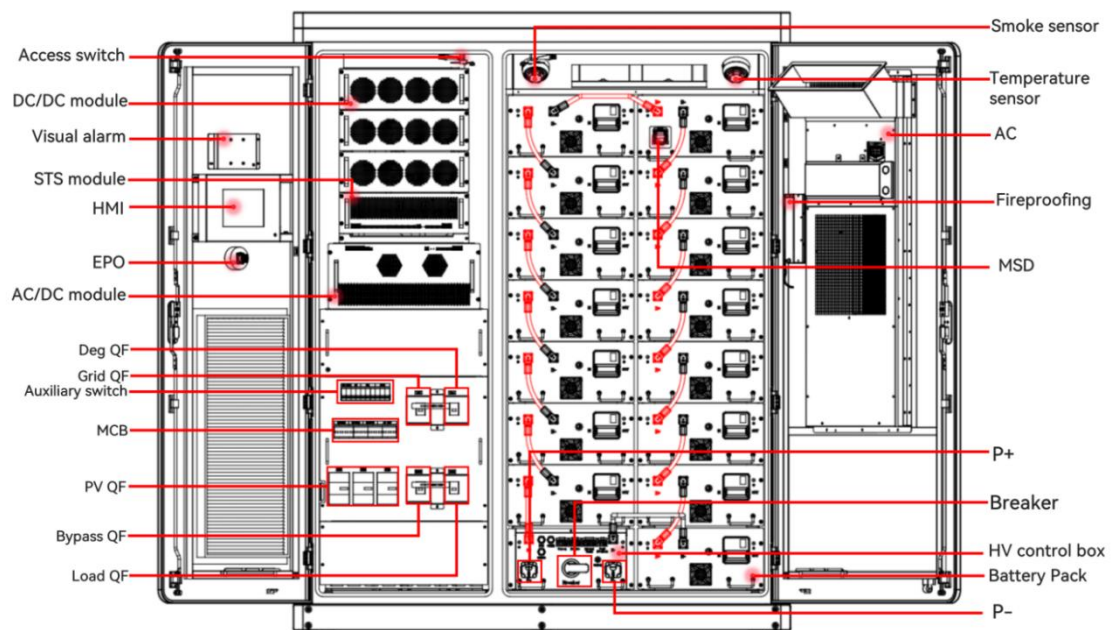


Figure 2.8

2.8.1 Battery Pack

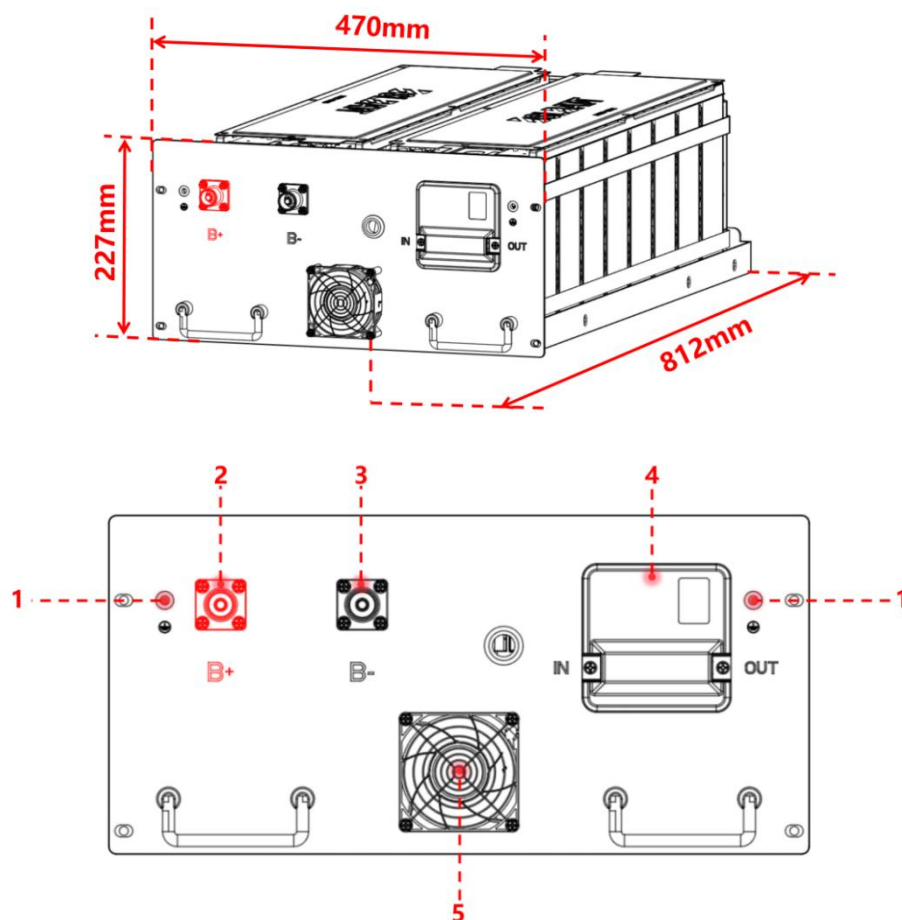


Figure 2.8.1

NO.	Model name	Descriptions
1	Grounding terminal	For grounding connection between batteries
2	Positive output	Connect the positive terminal
3	Negative output	Connect the negative terminal
4	BMU	Battery Management Unit
5	Cooling fan	Cool the battery to reduce the chance of thermal runaway.

Table 2.8.1

2.8.2 High Voltage Control Box

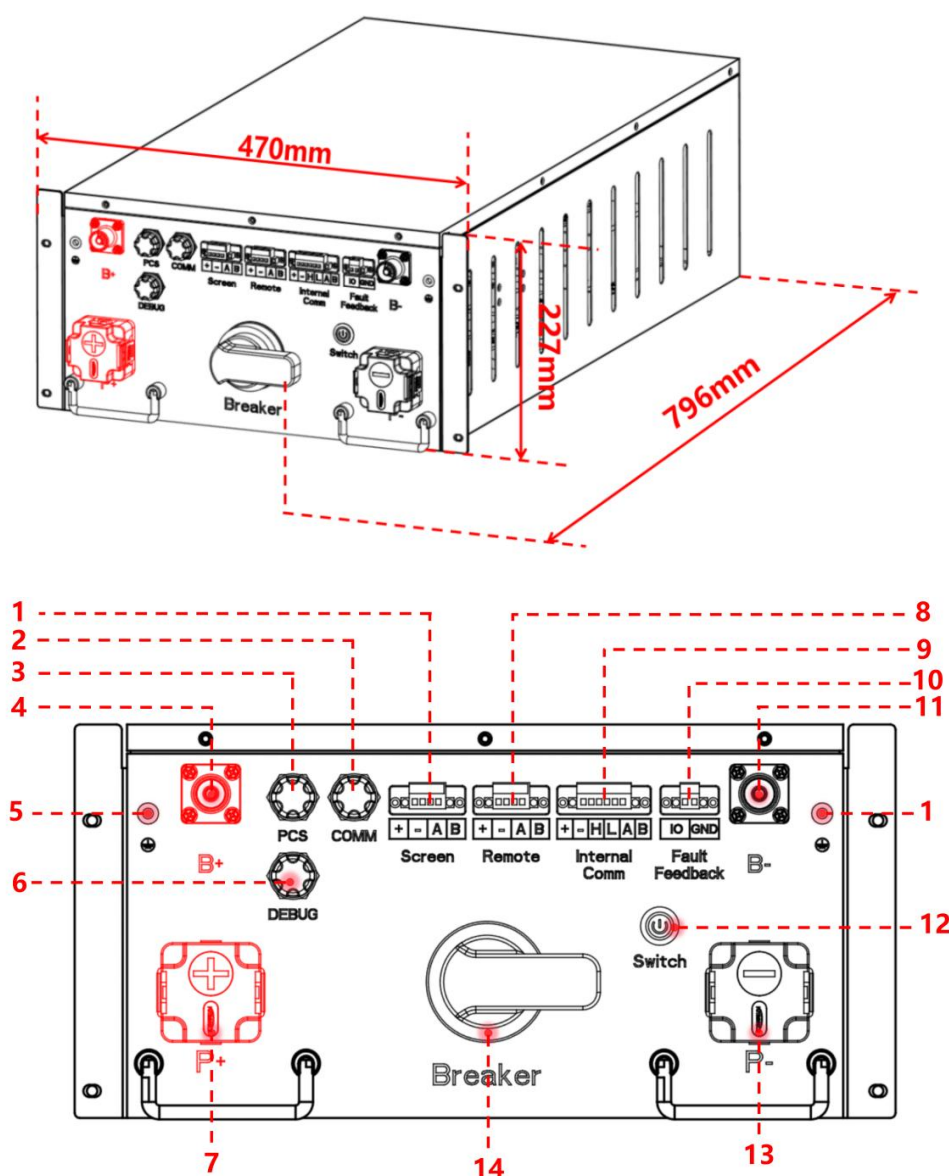


Figure 2.8.2

NO.	Model name	Descriptions
1	Screen	HMI communication interface
2	COMM	Address confirmation for parallel connection with another battery system

3	PCS	PCS communication connection
4	Battery positive connection port	Connect the positive terminal
5	Grounding terminal	Ground connection for the high-voltage control box
6	Debugging	Communicating with the computer, monitoring and upgrading the battery.
7	System positive output port	Connect the external positive DC cable, which can be connected to the positive terminal of the inverter.
8	Remote	Intelligent gateway communication interface
9	Internal Comm	BMU connection from control interface and fan control signal connection
10	Feedback	Fire alarm feedback interface
11	Battery negative connection port	Connect the negative terminal
12	Switch	Control the "on/off" of the low-voltage circuit in the battery system
13	System negative output port	Connect the external negative DC cable, which can be connected to the negative terminal of the inverter.
14	Isolating circuit breaker	Control the on and off of the high-voltage circuit of the battery.

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 batteries selected by our company come with an integrated BMS, which operates at two levels: BMU (Battery Management Unit) and BCU (Battery Control Unit).

The BMU is located inside the battery cabinet. It collects data from individual cells within the cabinet, uploads the data to the BCU, and executes cell balancing within the cabinet based on instructions issued by the BCU.

The BCU is housed in the main control cabinet. It manages the battery cabinet, receives detailed data uploaded by the internal BMU, samples the cabinet voltage and current, performs SOC calculation and correction, handles cabinet pre-charging, standby, and charge- discharge management, and uploads relevant data to the EMS.

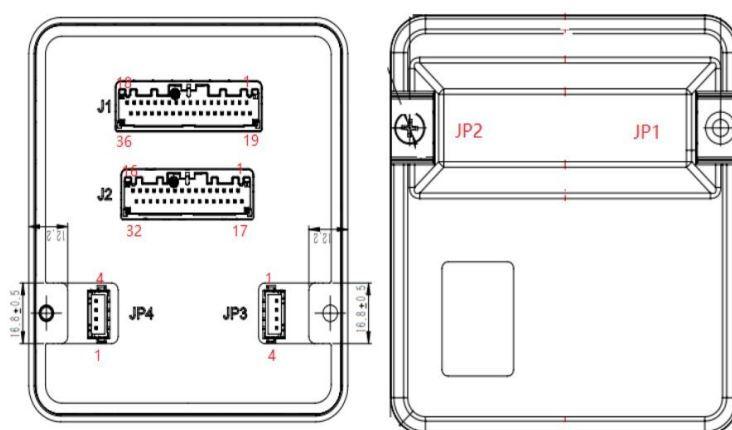


Figure 2.8.3-1 BMU

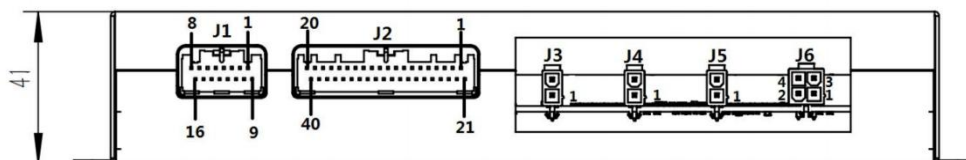


Figure 2.8.3-2 BCU

2.8.4 Energy Storage Converter Power (PCS) Module

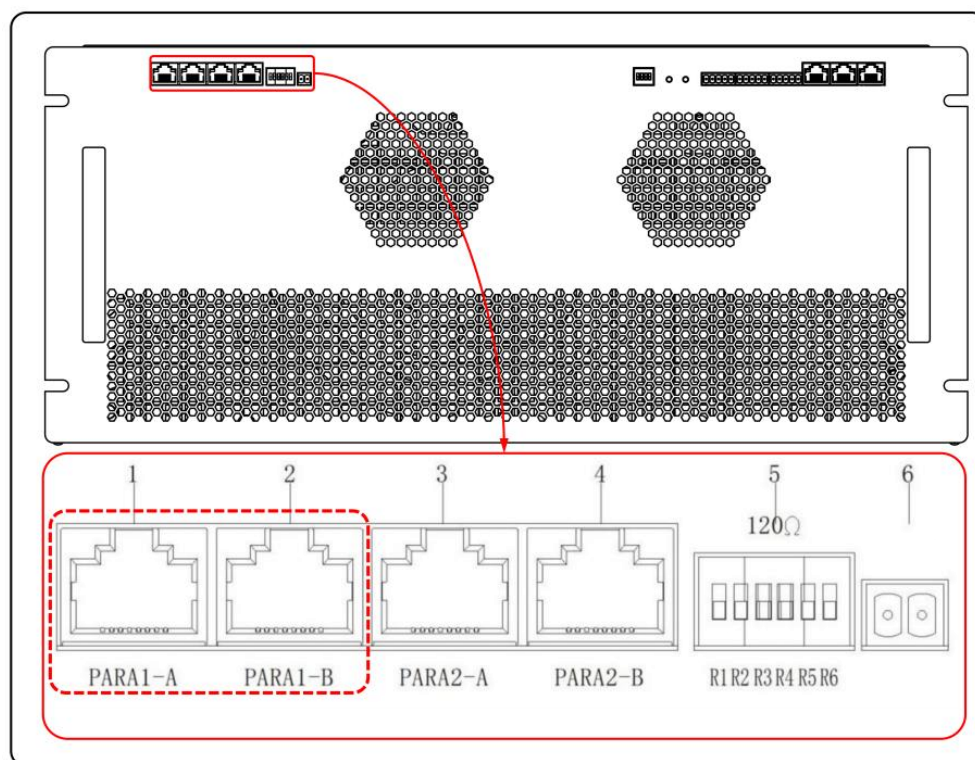


Figure 2.8.4-1



Illustration:

In the parallel connection ports, the "A" and "B" interfaces of PARA1 (module parallel interface) are connected in parallel with no priority difference between them. All internal PCS modules must ensure proper connection of the parallel interface; otherwise, system abnormalities may occur during operation.

Serial number	Name
1	PARA1-A
2	PARA1-B
3	PARA2-A
4	PARA2-B
5	R1, R2, R3, R4, R5, R6
6	Internal Debug

Table 2.8.4-1 Parallel Connection Port Table

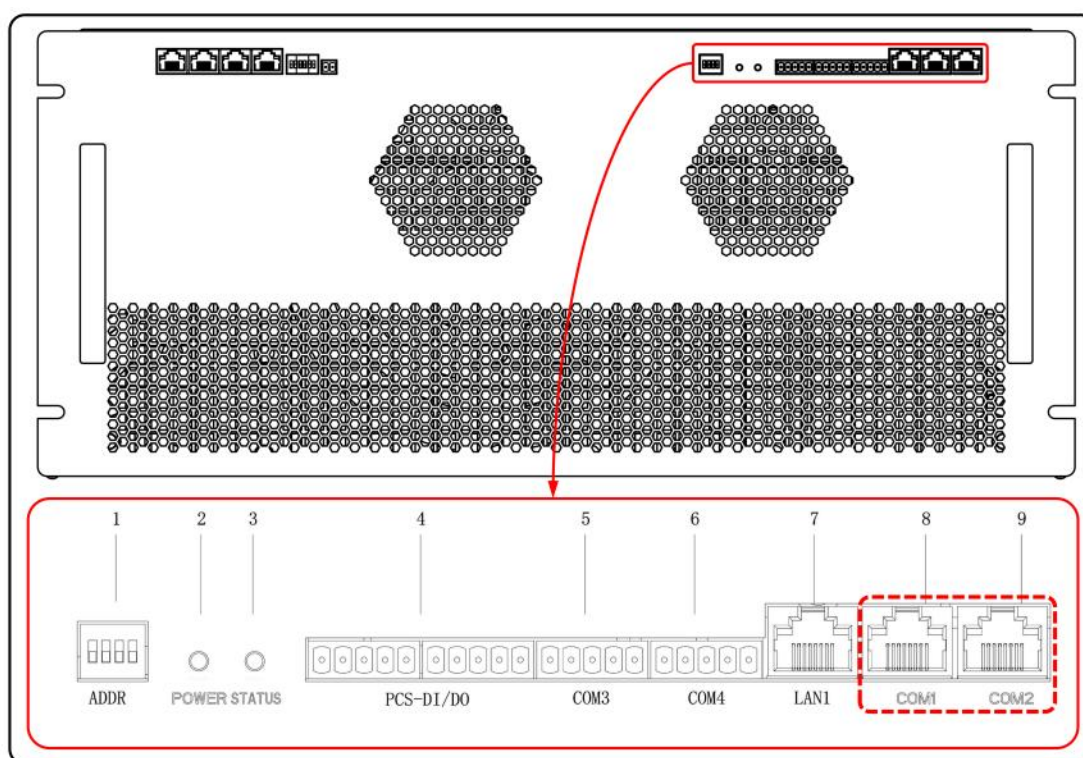


Figure 2.8.4-2 Signal Port Interface Diagram

**Illustration:**

1. The COM1 and COM2 signal ports are parallel-connected and serve as the PCS module's external communication interfaces.
2. For parallel operation of multiple modules, each must be assigned a unique hardware address. If two modules share the same address, address conflicts will occur, preventing correct identification of parallel-connected units and compromising normal system operation.

Serial number	Name	Description
1	ADDR	DIP switch address
2	POWER	Power indicator (Red)
3	STATUS	Status indicator (Green)
4	PCS-DI/DO	PCS digital input/output dry contact port
5	COM3	PCS CAN & RS485 communication port
6	COM4	PCS CAN & RS485 communication port
7	LAN1	PCS Ethernet port
8	COM1	PCS CAN & RS485 communication port
9	COM2	PCS CAN & RS485 communication port

Table 2.8.4-2 Signal Port Interface Table

2.8.5 DC/DC Converter Power Module

For remote areas such as islands, mountainous regions, border outposts, locations with unstable power supply, or newly built zero- carbon technology parks, users can configure a DC converter power module of appropriate capacity based on specific project

requirements. This module charges the battery through DC coupling, thereby establishing an integrated power supply system that deeply combines photovoltaic generation and energy storage.

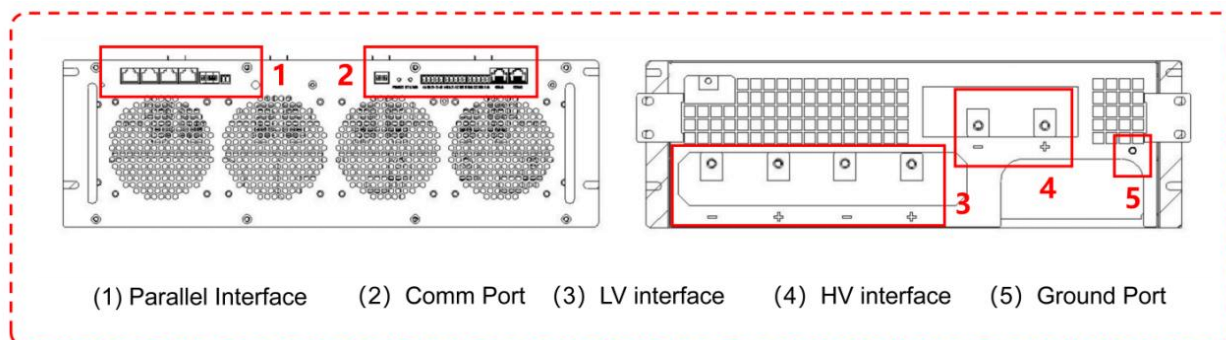


Figure 2.8.5-1

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

Table 2.8.5-1

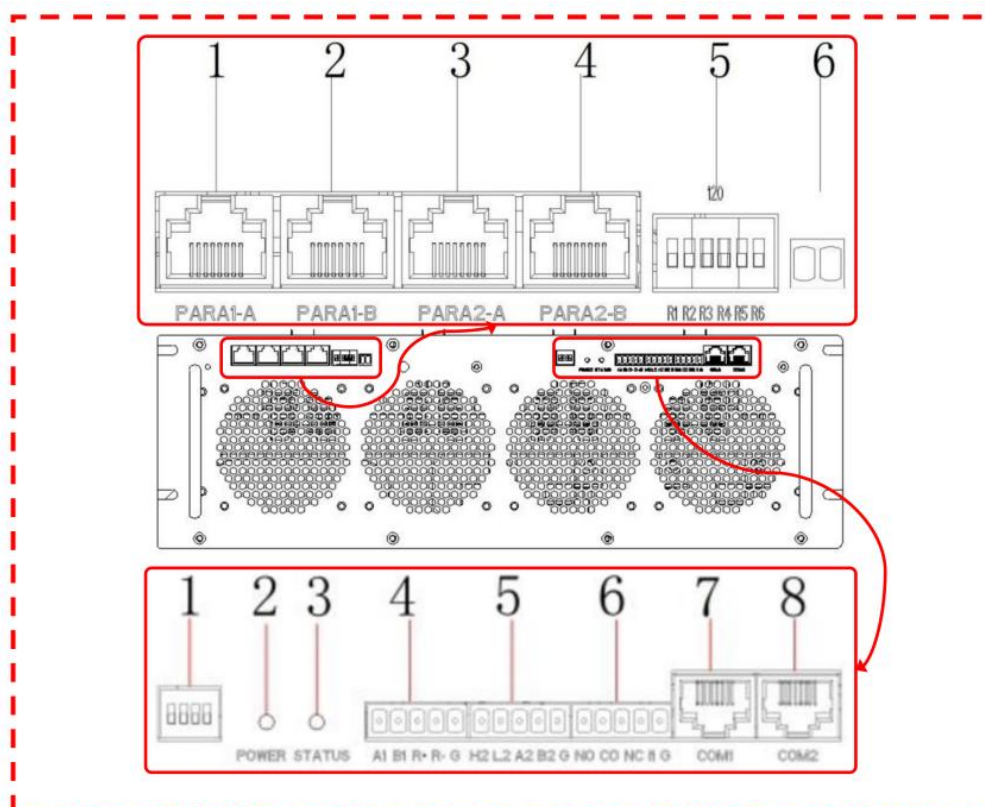


Figure 2.8.5-2

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)

Table 2.8.5-2

2.8.6 Standalone Off-grid Switching Module STS

For areas with unstable power grids and frequent power outages, users can configure an STS module according to project requirements. The STS enables seamless switching between grid-tied and islanded modes, along with automatic control functions.

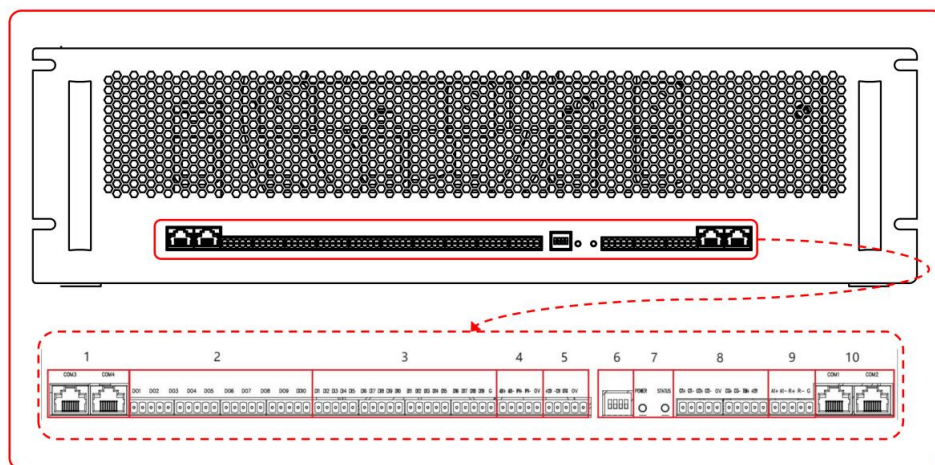


Figure 2.8.6 STS

STS Module Table

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 Three-phase Isolation Transformer

For off-grid application scenarios, a three-phase isolation transformer is configured to provide complete electrical isolation between the output and input ends, serving functions such as harmonic filtering and inrush current prevention. The parameters of the isolation transformer module are as follows:

Model	MTFI-3125A
Rated power	125kVA
Dimensions (W * D * H)	600*410*670mm
Insulation grade	H
Connection group	Dyn11
Primary side input voltage	400V
Primary side input current	180A
Rated frequency	50Hz
Secondary output voltage	400V
Secondary output current	180A
Surge capability	110%
Type of cooling	Dry self-cooling
Efficiency	> 97.5%
Noise	≤65dB

Table 2.8.7

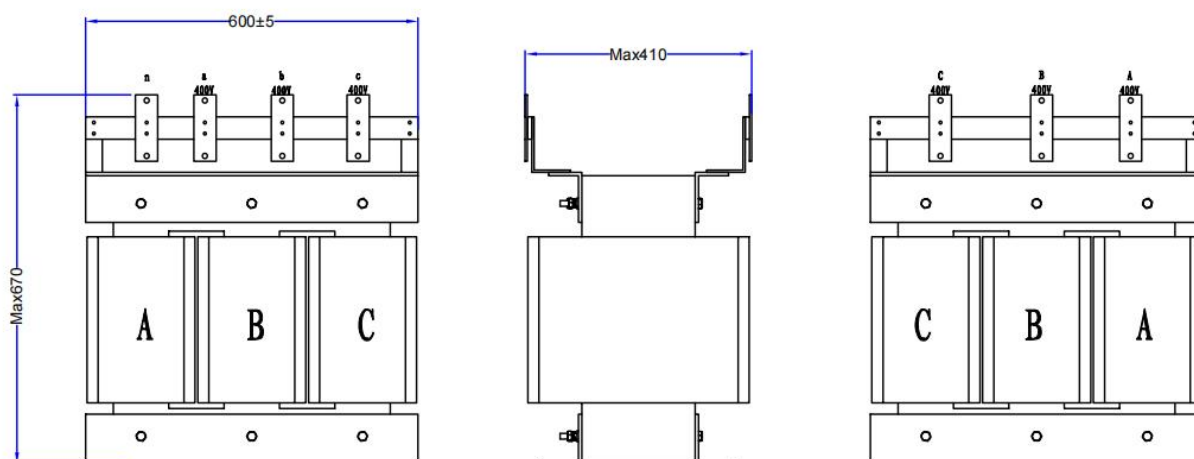


Figure 2.8.7-Transformer

2.8.8 Temperature Control System

Industrial-grade air conditioner

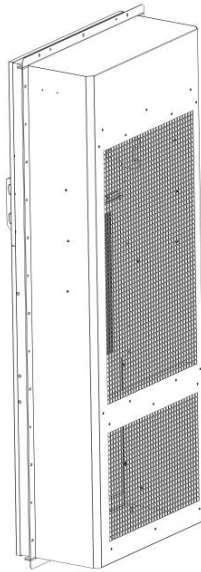


Figure 2.8.8

Product Name	Industrial air conditioners
Fixed way	Semi-embedded
Power supply	220±15%VAC~50Hz
Refrigeration capacity	3000W@L35/L35
Power consumption	1070W@L35/L35
Internal circulation air volume	850 m3/h
Operating temperature range	-40°C~+55°C
Protection level	IP55
Refrigerant	R134a
Dimensions	1300*500*250(mm,HxWxD)
Heat input	2000W

Table 2.8.8

2.8.9 Thermal Runaway Suppression System

Smoke detector

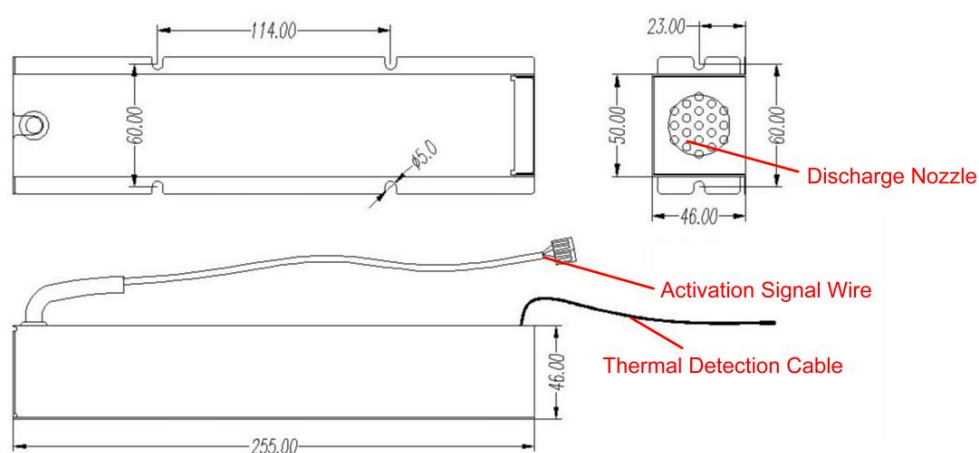


Figure 2.8.9-1

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℃~+55℃
Relative humidity	<95%RH(Without condensation)
Smoke sensitivity	0.4dB/m
Alarm temperature level	A2R

Table 2.8.9-1

Fire protection system



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 2.8.9-2

Pressure Relief Valve

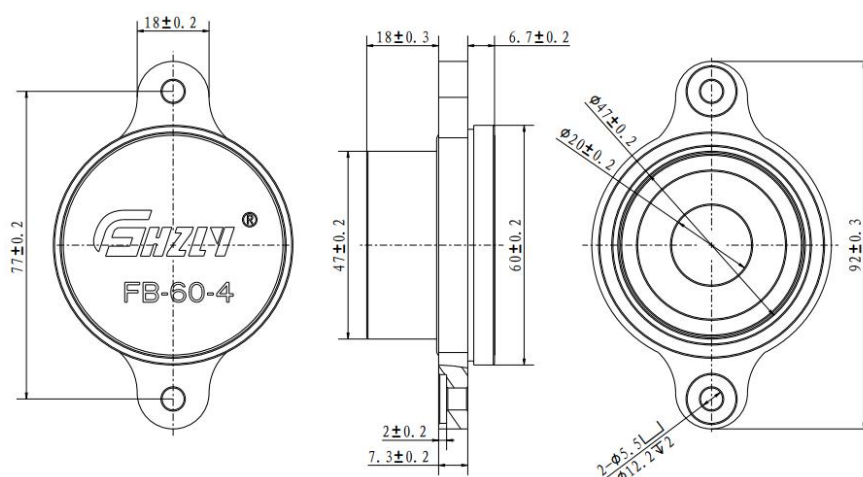


Figure 2.8.9-3

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 2.8.9-3



Illustration:

1. Pressure Equalization: During normal operation, the product effectively balances the pressure difference between the inside and outside of the battery cabinet when external

environmental conditions (such as temperature and altitude) change, preventing seal failure caused by the pressure difference exceeding its design tolerance.

2. Rapid Pressure Relief: In the event of battery pack abnormalities (such as thermal runaway or a sudden internal pressure rise), the product is equipped with a rapid pressure relief mechanism to promptly release internal pressure and ensure system safety.

2.8.10 Entrance guard Switch

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

Name	Parameters
Rated burden	5A/250VAC
Operating speed	5mm-50cm/s
Operation frequency	Machine: 120 times /min Electricity: 30 times/ min
Insulation resistance	100mΩ or more
Contact resistance	25mΩ initial value
Dielectric Strength	Non-wired 1000VAC Between each terminal: 1500VAC
Vibration	Incorrect operation 10-55Hz reverse amplitude
Impact	Durable: 1000m/s ² Incorrect movement: 300 m/s ³
Life Span	Electricity: More than 100,000 times Machine: More than 1,000,000 times
Level of protection	IP65
Operating temperature	-20~+60°C
Utilize humidity	<85%

Table 2.8.10



Note:

1. Do not disassemble the access control switch by yourself to avoid causing more severe damage or safety risks.
2. Do not forcefully close or open the door in an abnormal manner.

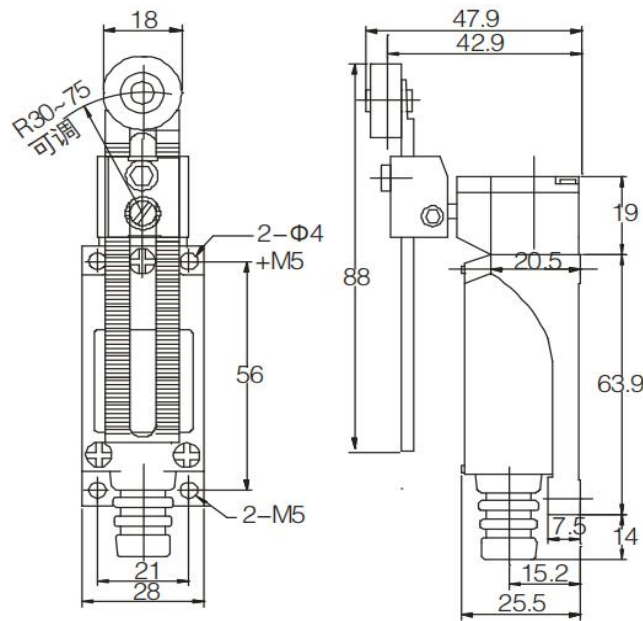


Figure 2.8.10-Access control

2.8.11 Local Management System

The microgrid management system (Lotus-ESS) is an intelligent energy management system developed by our company for microgrid systems. It is mainly used in various capacity energy storage stations and photovoltaic-storage-charging integrated power stations.

The product integrates human-machine interface (HMI), port control and communication, system parameter and operation strategy setting functions, to achieve monitoring and management of the energy storage system.

The product's hardware resources and parameters are as follows:

Product model	Lotus - ESS
Power input	DC 12V
Output control	Three-way isolated output switch quantity
Input control	Six-channel isolated input switch quantity
Serial port communication	2 channels of isolated RS232, 4 channels of isolated RS485
Fieldbus	2-channel CAN bus interface
Ethernet port	10/100M Ethernet port (RJ45)
Expansion storage	1 USB port, 1 SD card slot
Sound alarm	1 controllable buzzer
Program characterization	1 operation indicator light, 1 status indicator light, 1 alarm indicator light
Abnormal manifestations	1 hardware watchdog timer
Real-time clock	1 Group of RTC (Real-Time Clock) devices

Table 2.8.11



Figure 2.8.11-HMI

2.9 Configuration List

ESS-GRID C241 Configuration List

Name	Model	Unit	Quantity	Remarks
Battery system	314Ah, 241kWh	Set	1	With control-box
Energy storage converter	BSL-125AC	Set	1	Modularization
DC converter power module	BSL-50DC	Set	2	Modularization
STS Off-Grid Switching Module	BSL-150STS	Set	1	Modularization
Air system	AC3000P 220±15%VAC~50Hz	Set	1	Intelligent air-cooling
Fire extinguishing system	QRR0.3G/S	Set	1	Thermosensitive line activation type
Three-phase isolation transformer	AC 400/400V, 125kVA	Set	1	Dyn11
Auxiliary system	Access control, power distribution, smoke and heat detectors, cables, etc.	Set	1	Matching
Management system	Lotus-ESS	Set	1	Matching

Table 2.9



Note:

The actual configuration will be based on the supply arrangement.

03 Transportation and storage

3.1 Packaging and Storage

3.1.1 Product Packaging

To ensure that the product is well protected during transportation, a specific wooden box is used for packaging. The equipment packaging includes the following basic parameters (and may include others), which need to be carefully verified according to the project requirements:

Parameter	Illustration
Model	Product model
Size	Size after product packaging
Weight	Total weight after product packaging
Identification	Face up, handle with care, center of gravity position, etc.

Table 3.1.1



Figure 3.1.1-Packaging illustration



Note:

The actual configuration will be based on the supply arrangement.

3.1.2 Product Storage

If the product is not to be transported or installed immediately, it must be stored indoors. The storage location must meet the following conditions:

Parameter	Requirement
Storage temperature (excluding the battery)	-25°C~+60°C
Battery Storage temperature	20°C ~ 30°C
Storage relative humidity	< 90% (Non-condensation)
Altitude	< 3000m

Table 3.1.2

When the battery is in low power storage mode, it is necessary to recharge according to the maximum time interval allowed by the battery's SOC at complete discharge. If no recharge is performed beyond this maximum time interval, the battery may be damaged due to over-discharge.

The SOC value before power-off for storage operation	The longest interval for recharging power
SOC=50%	6 months
30%≤SOC<50%	4 months
5%≤SOC<30%	20 days
SOC<5%	48h

Table 3.1.3



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 maintain optimal protection for the equipment, it is recommended to transport it in its original packaging.
2. The equipment must be transported in accordance with the instructions and markings on the packaging to prevent personal injury and equipment damage.
3. Rail transport and air transport are not recommended for energy storage batteries. For road transport, the speed should be limited to 80 km/h on flat roads and 60 km/h on rough roads. In case of any discrepancy, local traffic regulations shall prevail.

3.2.2 Product Handling

1. When using a forklift for handling, ensure that the forklift has sufficient load capacity and that the equipment's center of gravity remains positioned between the forks to prevent personal injury and equipment damage.
2. For transportation with batteries installed, the forklift must have a load capacity of ≥ 3.5 tons; for transportation without batteries, the load capacity must be ≥ 1.5 tons.

3. Recommended fork dimensions: length ≥ 1.5 m, width 80–160 mm, thickness 25–70 mm.

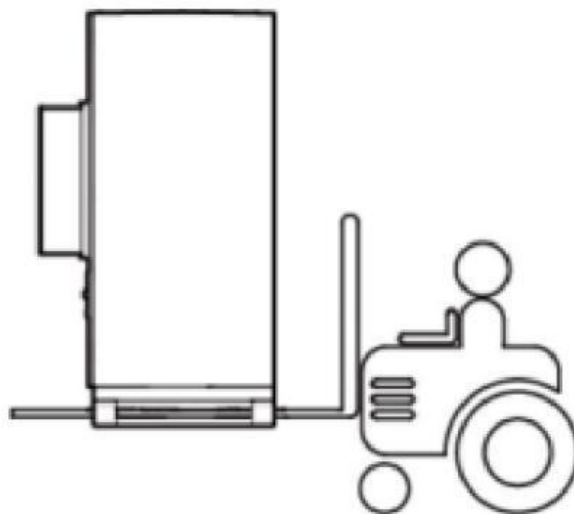


Figure 3.2.2 – Handling Diagram



Notice: Avoid rough handling during transportation or installation, as it may cause battery short-circuit, damage (e.g., leakage, rupture), fire, or even explosion, and always prioritize personal safety.

04 Product installation

4.1 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 ≥ 2 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.

4.2 Space Preparation

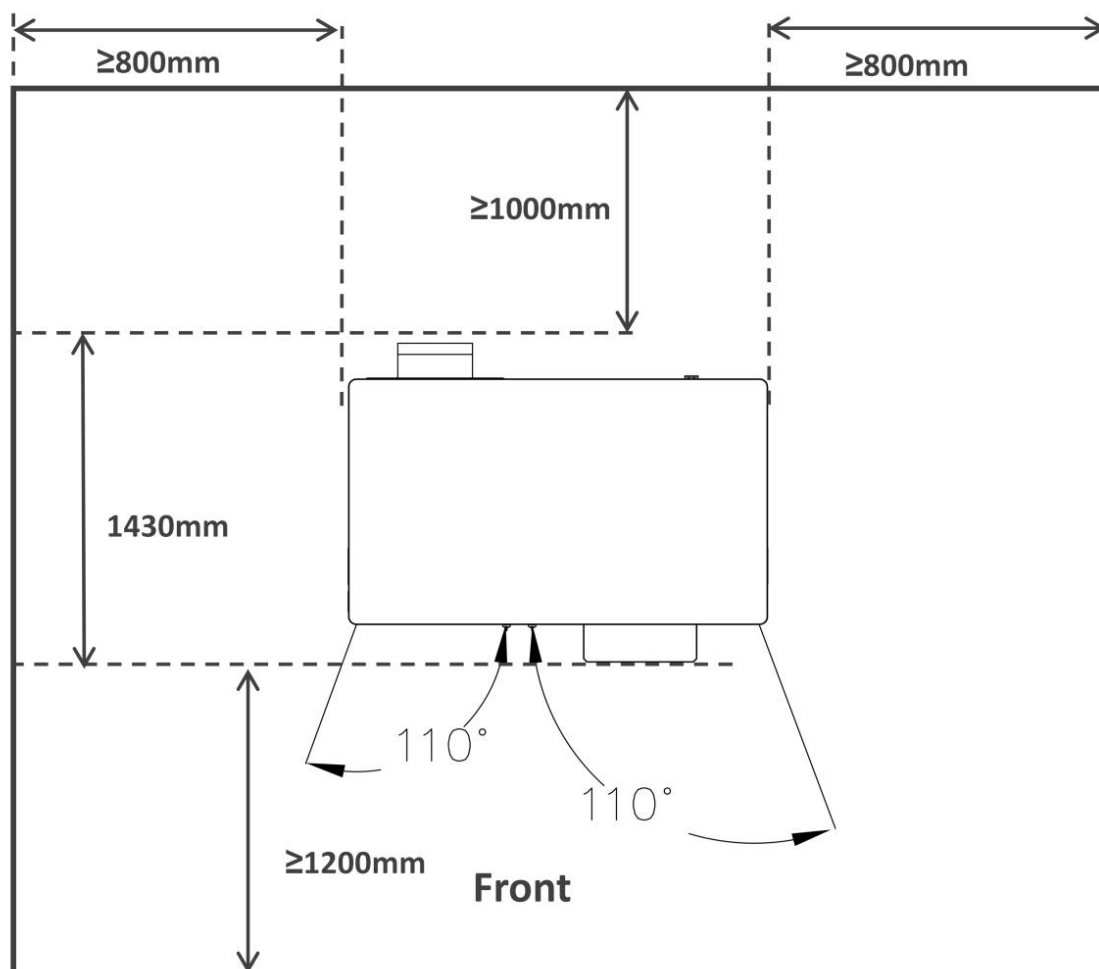


Figure 4.2-1

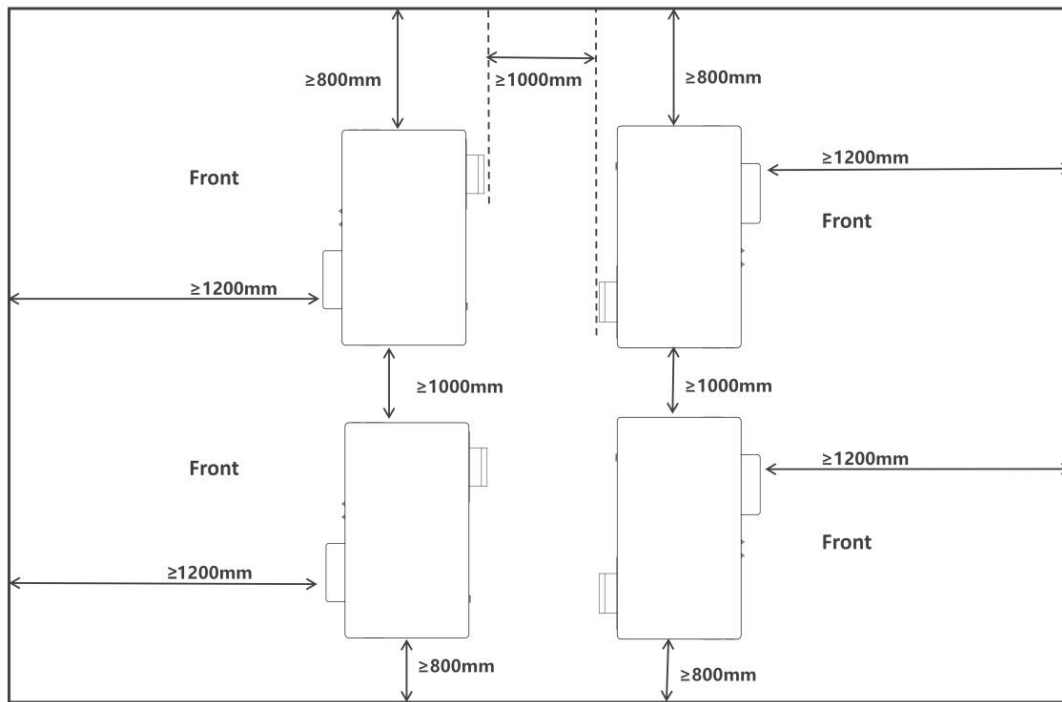


Figure4.2-2



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.

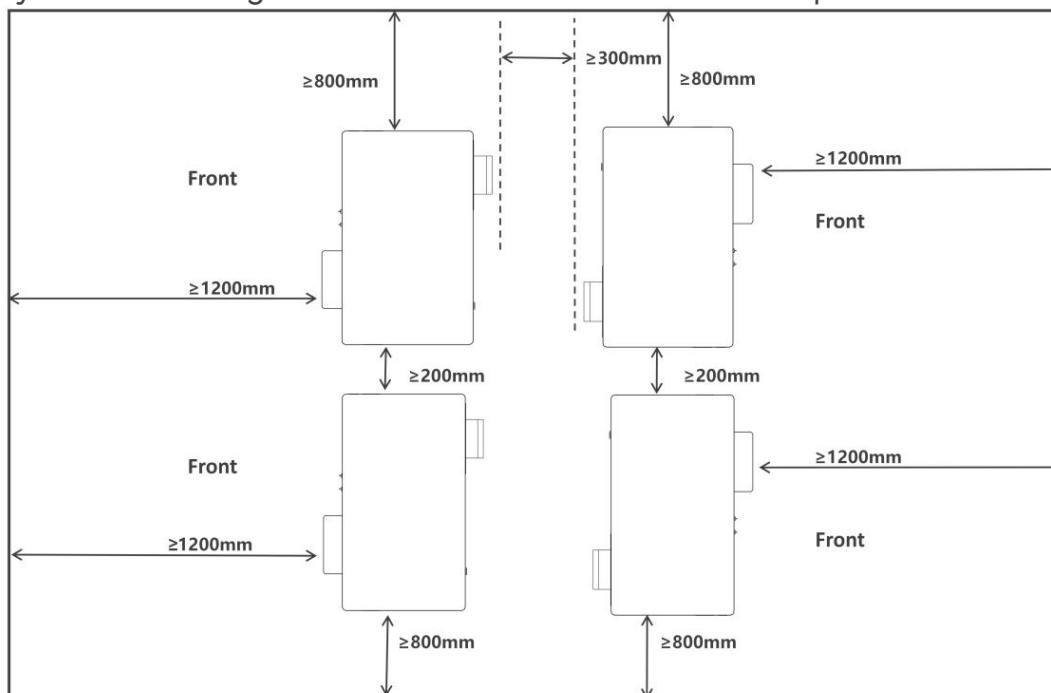


Figure4.2-3



Illustration: The above figure shows the minimum space requirement.

4.3 Foundation Preparation

Foundation reference diagram

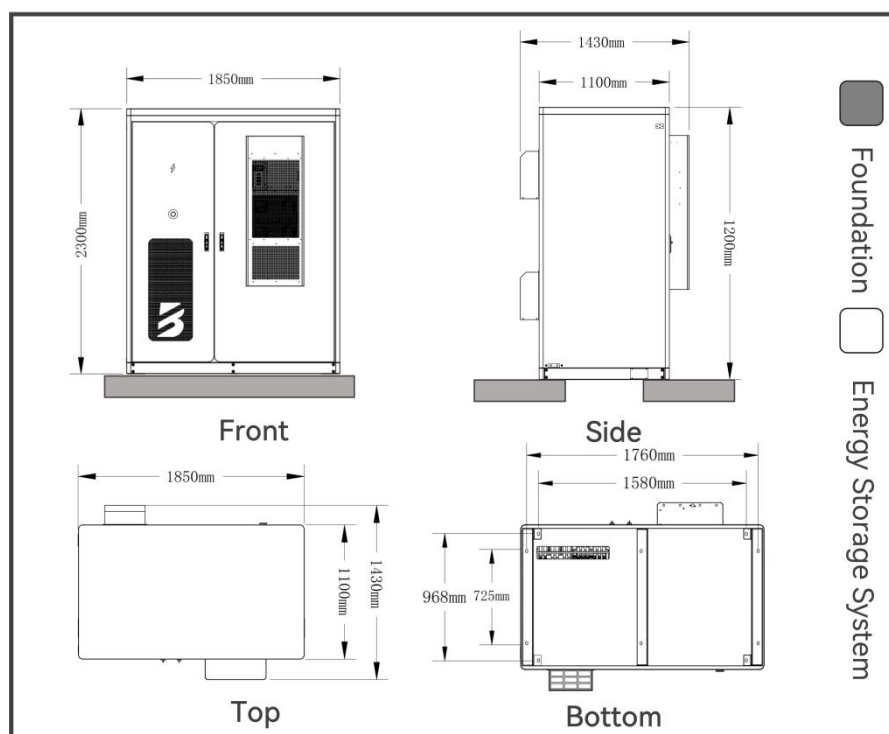


Figure4.3



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.

4.4 Preparations Before Installation

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

Table 4.4-1 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	

Table 4.4-2 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	

Table 4.4-3

4.5 Basic Installation

Step 1: ensuring that the product is free from any abnormalities and all accessories are complete. Then, you can refer to the following suggestions for mechanical installation:

1. Select the installation position of the equipment in advance according to the product size, and ensure proper positioning and fixation; it is recommended that the foundation be as shown in Figure 4.5.-1.
2. Based on the weight of the product, the selected installation location must have sufficient load-bearing capacity.
3. The grounding point is reliable and ensures that the grounding resistance is less than 4Ω

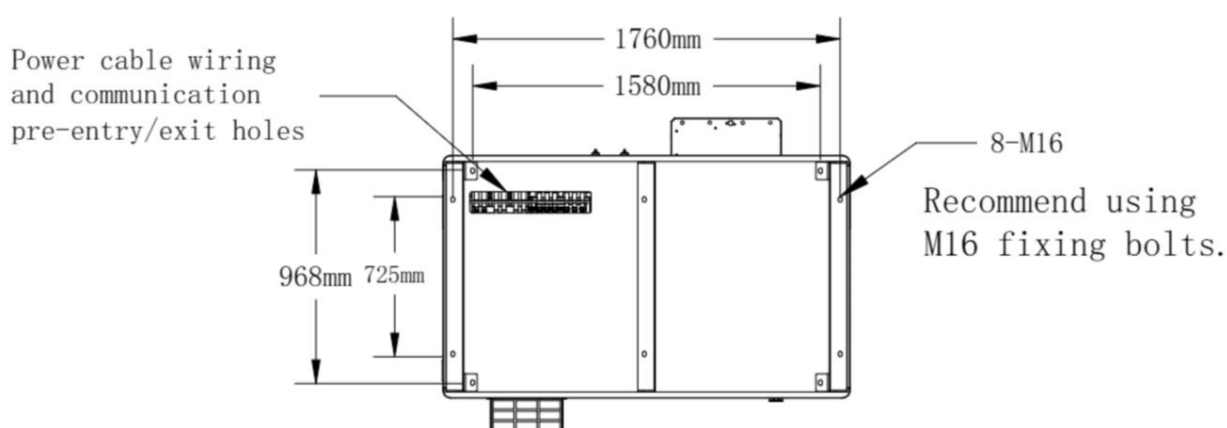


Figure 4.5-1 Basic Reference Diagram

**Note:**

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

Step 2: After removing the packaging wooden box, first remove the bottom guardrail of the equipment. The removed guardrail and screws should be stored properly. They need to be reinstalled after the equipment is in place.

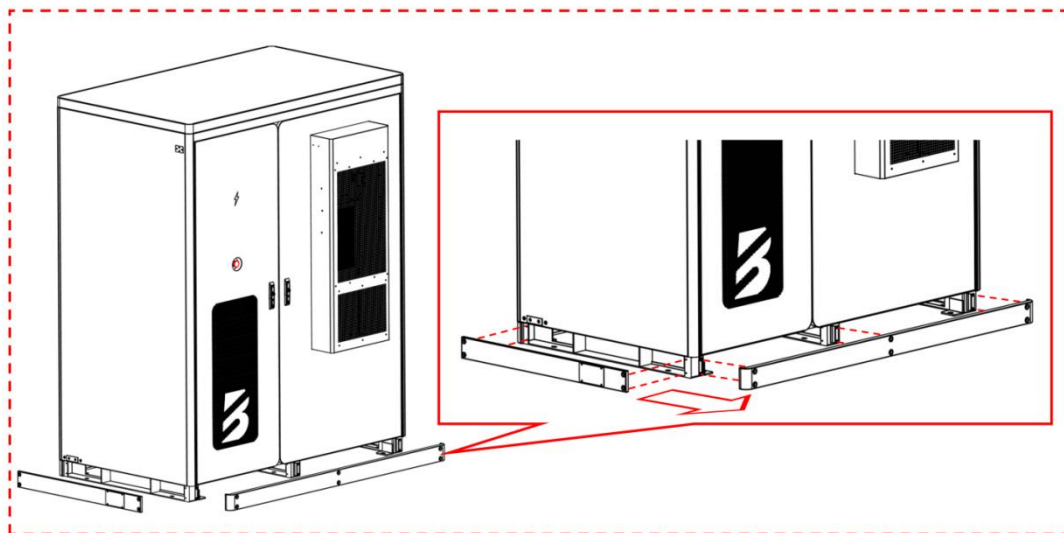


Figure 4.5-2 Schematic Diagram of the Bottom Enclosure of the Equipment

Step 3: Use a forklift to position the equipment onto the foundation, ensuring that the equipment's fixing holes align with the pre-drilled nuts in the foundation. Then, tighten them with M16X40 bolts.

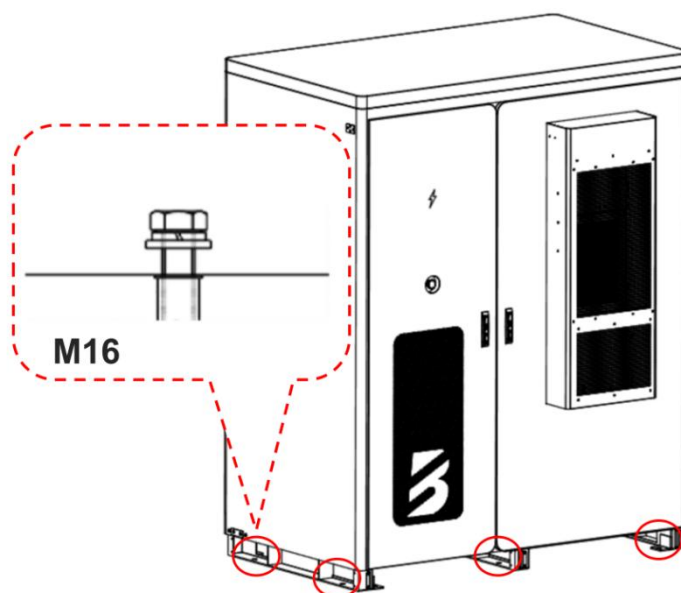


Figure 4.5-3 Schematic Diagram of Bolt Tightening at the Bottom of the Equipment

4.6 Mechanical Installation

**Note:**

When conducting the installation of the battery pack, it is recommended to use forklifts or other auxiliary installation tools. Four or more people are required to operate collaboratively during the transportation of the battery pack. During the process, handle with care and avoid any bumps. Pay attention to personal safety and do not remove the protective components on the battery terminals during the transportation.

The installation of the battery pack should follow the bottom-up sequence for fixation. The forklift should also be coordinated with the installation sequence of the battery pack to prevent the risk of tipping over due to an excessively high center of gravity. The battery pack installation operation can only be carried out after the forklift has completely stopped running, and no one is allowed to stand or extend any part of their body below the installation area.

Step 1: is to install the battery pack.

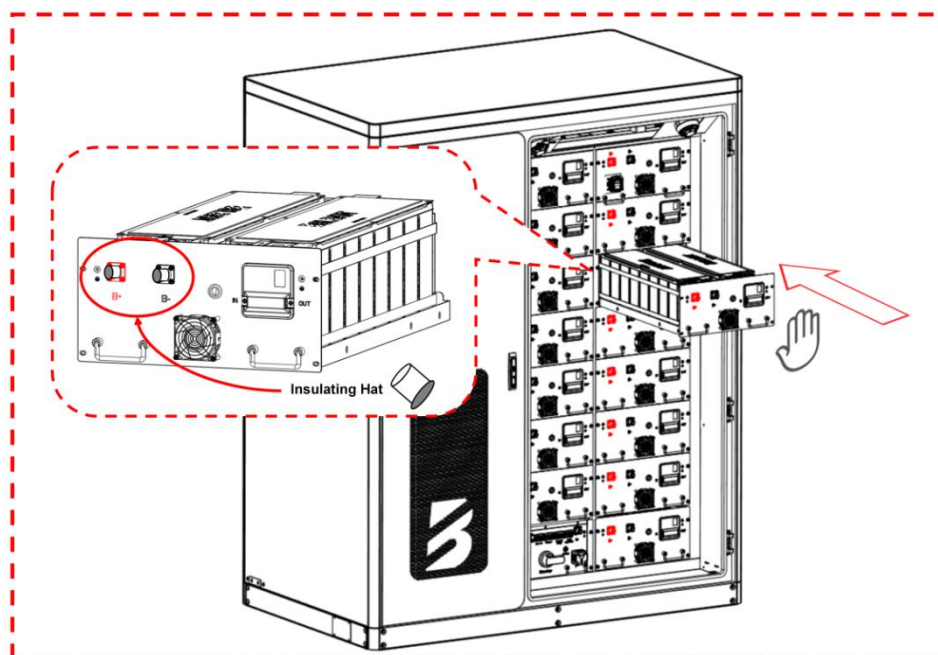


Figure 4.6-1

Step 2: Secure the battery pack

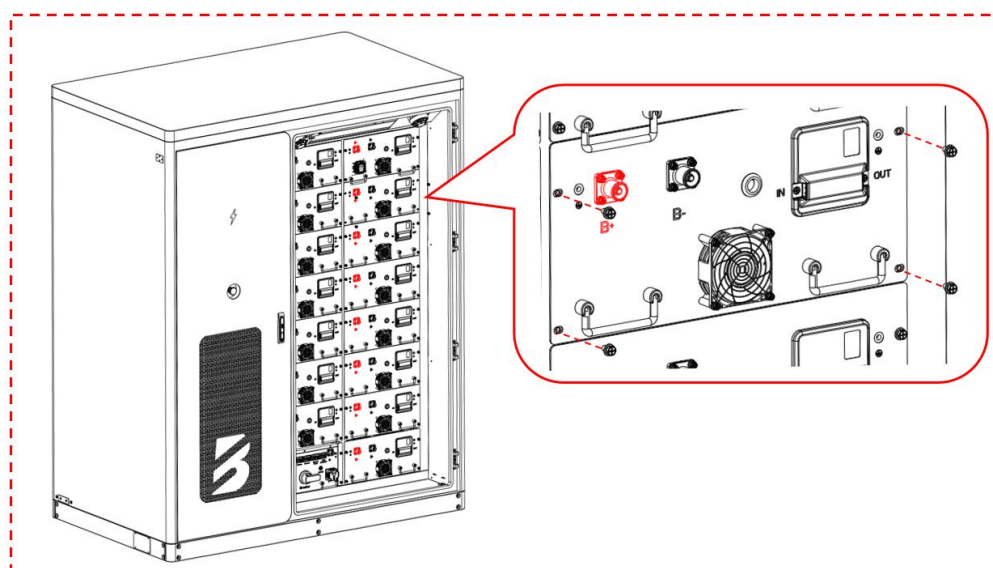


Figure 4.6-2



Illustration:

Unless there are special requirements for the project, the installation and fixation of the battery pack inside the cabinet have already been completed before the product was manufactured.

4.7 Electrical Connections

4.7.1 Grounding Connection



Note:

1. Protective ground wire, recommended specification: Type: outdoor single core copper wire, conductor cross section: 6mm²;
2. Please ensure that the cable is not loose after being pressed in place;
3. Before making the electrical connection, please perform the grounding connection as the first step, and the protective ground line should be removed as the last step when the battery system is removed.

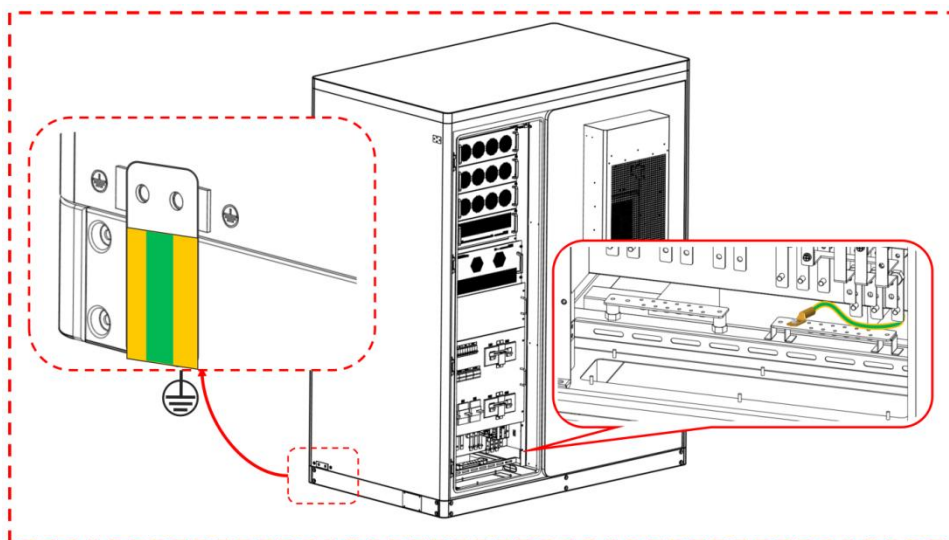


Figure 4.7.1

4.7.2 Power line connection



Danger:

1. During the connection process, pay attention to the positive and negative terminals. It is strictly prohibited to short-circuit the positive and negative terminals of the battery pack.
2. Smoking or using open flames near the battery is strictly prohibited.
3. On-site, there must be fire-fighting facilities that meet the requirements, such as fire sand and fire extinguishers.
4. Please use special protective equipment and special insulating tools to avoid electric shock injuries or short-circuit faults.



Note:

When connecting and securing the battery pack, make sure that the cables are undamaged.

Step 1: Pull out the MSD repair switch

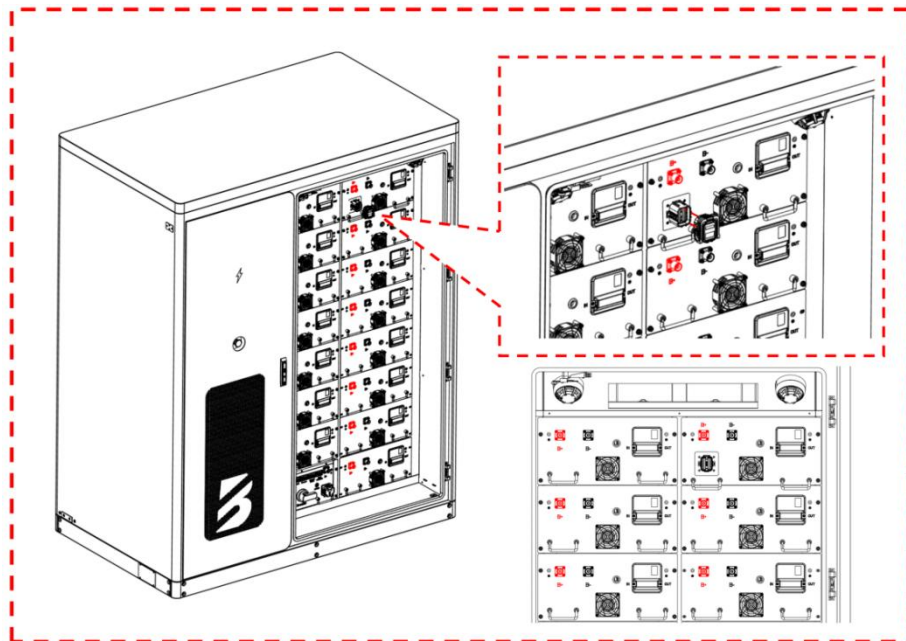


Figure 4.7.2-1

Step 2: Internal connections within the battery cluster (between battery PACK)

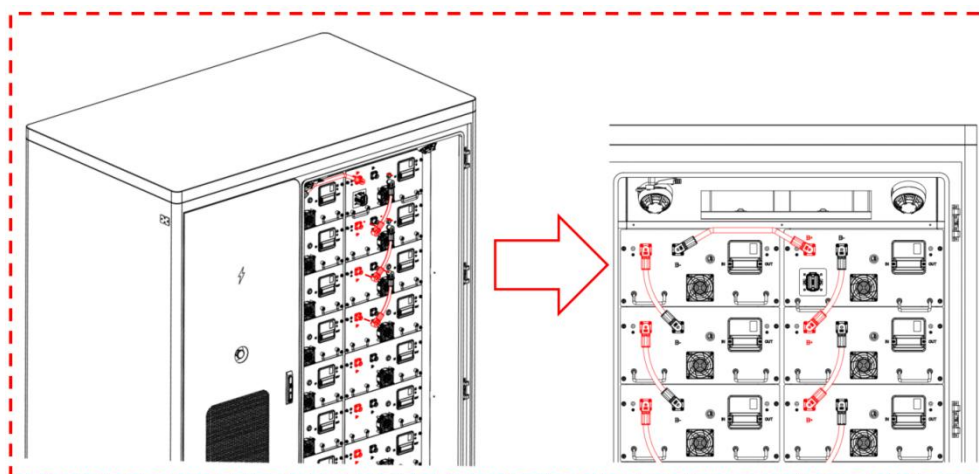


Figure 4.7.2-2

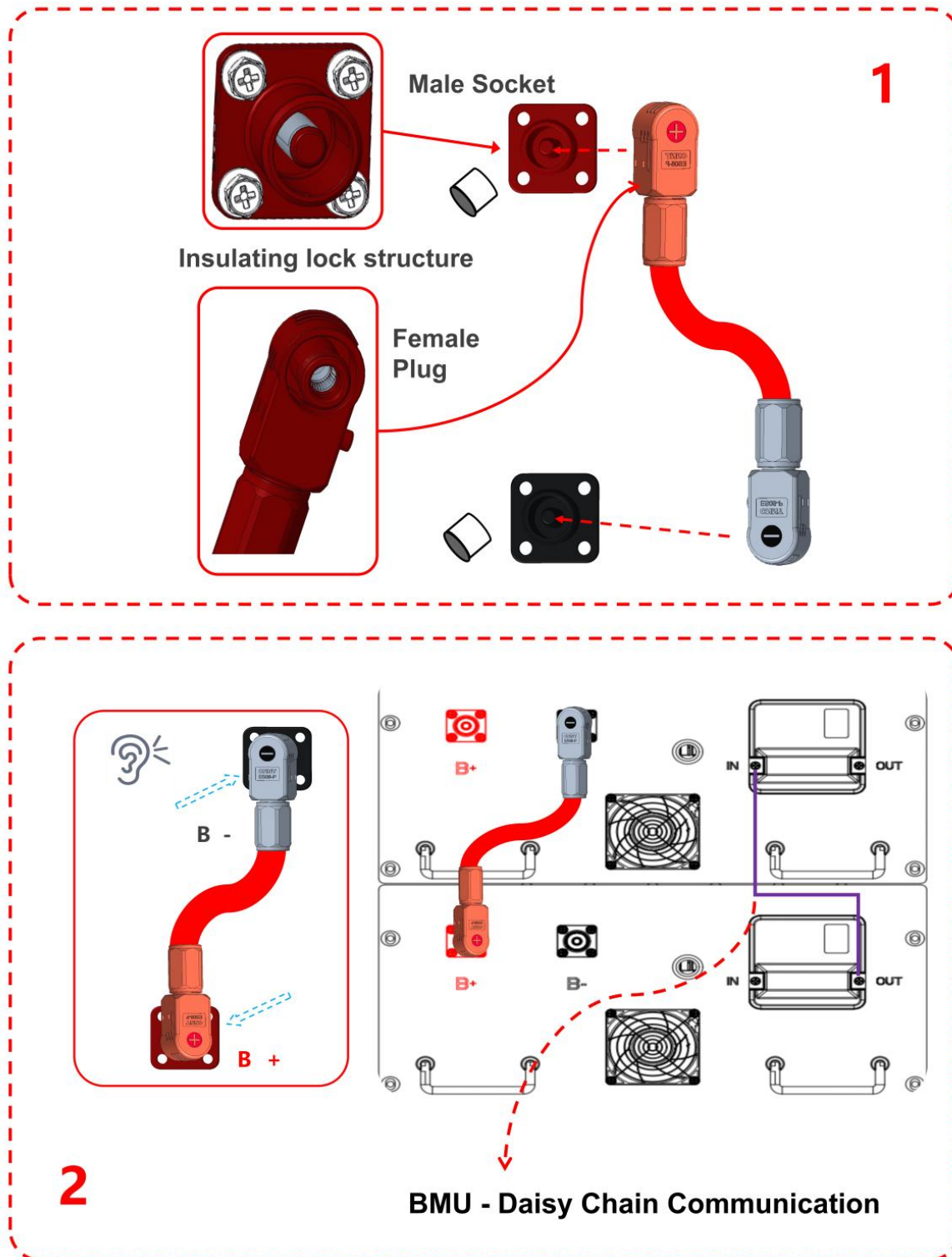


Figure 4.7.2-3



Illustration:

Unless there are special requirements for the project, the connections within the battery packs inside the cabinets have already been completed before shipment.

Step 3: Connect the PCS to the high-voltage control box



Note:

The PCS module has been pre-installed in the electrical compartment of the cabinet, and the DC side cables of the PCS have been connected before leaving the factory. The other end of these cables is connected to the high-voltage control box inside the battery compartment.

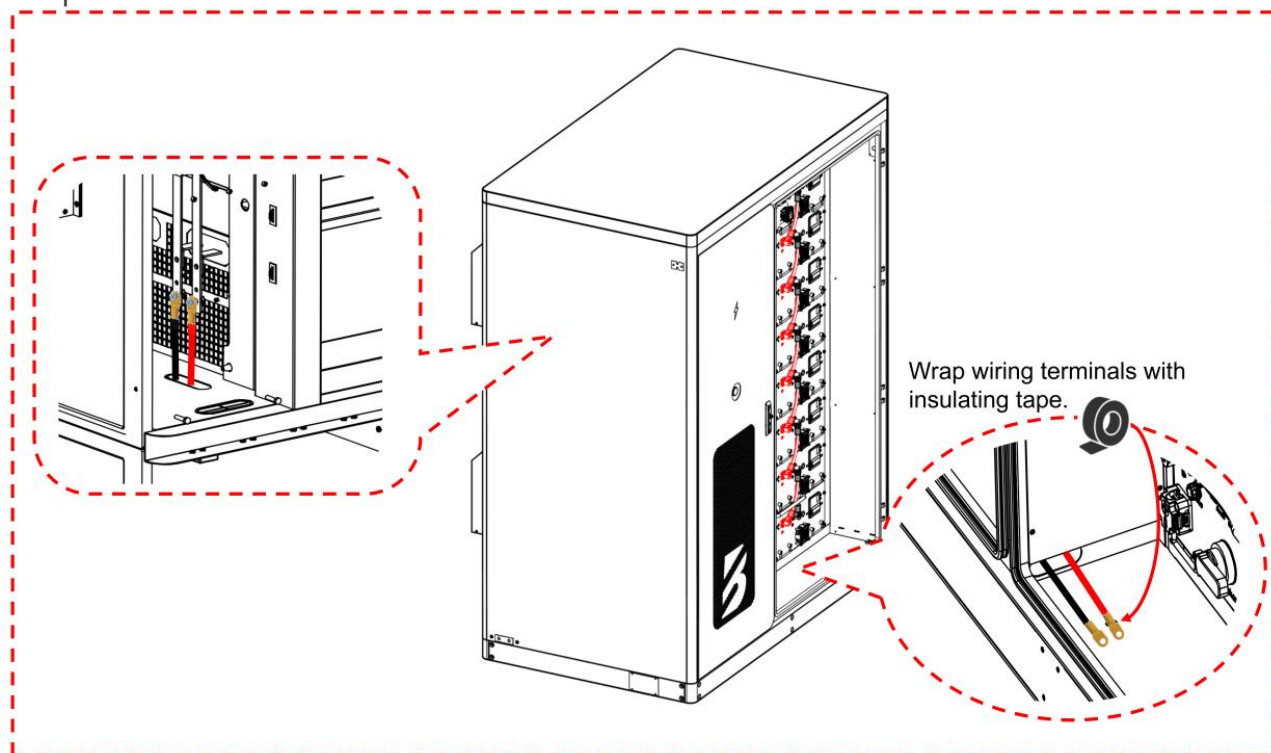


Figure 4.7.2-4



Note:

In the event of power failure, remove the protective covers on the "P+" and "P-" ports on the control box, connect the cables, and secure them with M8 bolts.



Illustration:

Unless there are special requirements for the project, the connections on the control box inside the cabinet have already been completed before the product was manufactured.

Step 4: Close the protective cover and the MSD switch

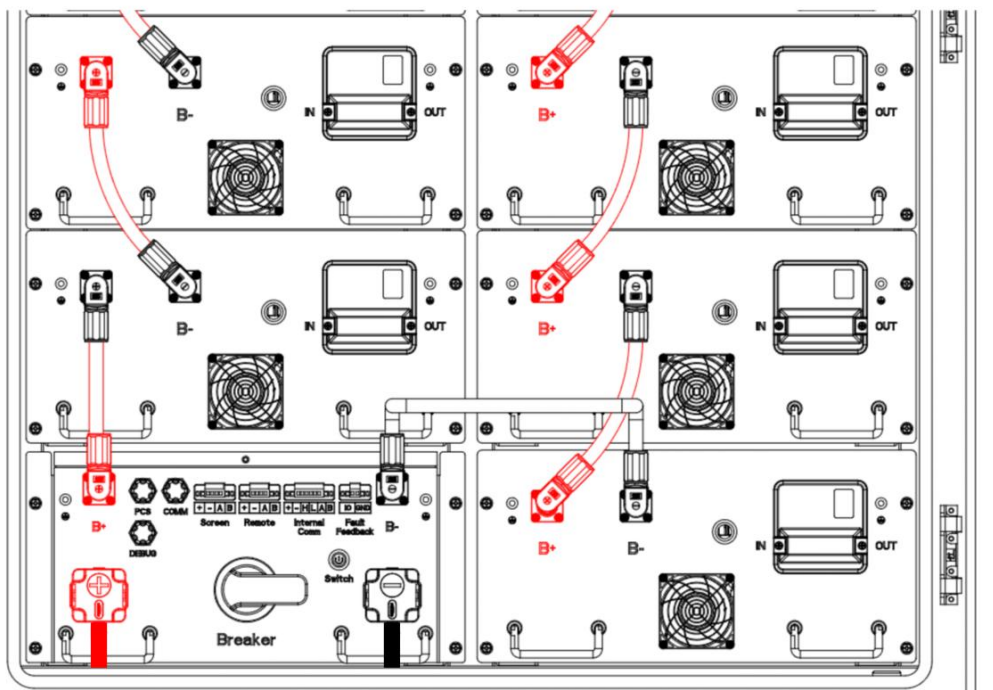
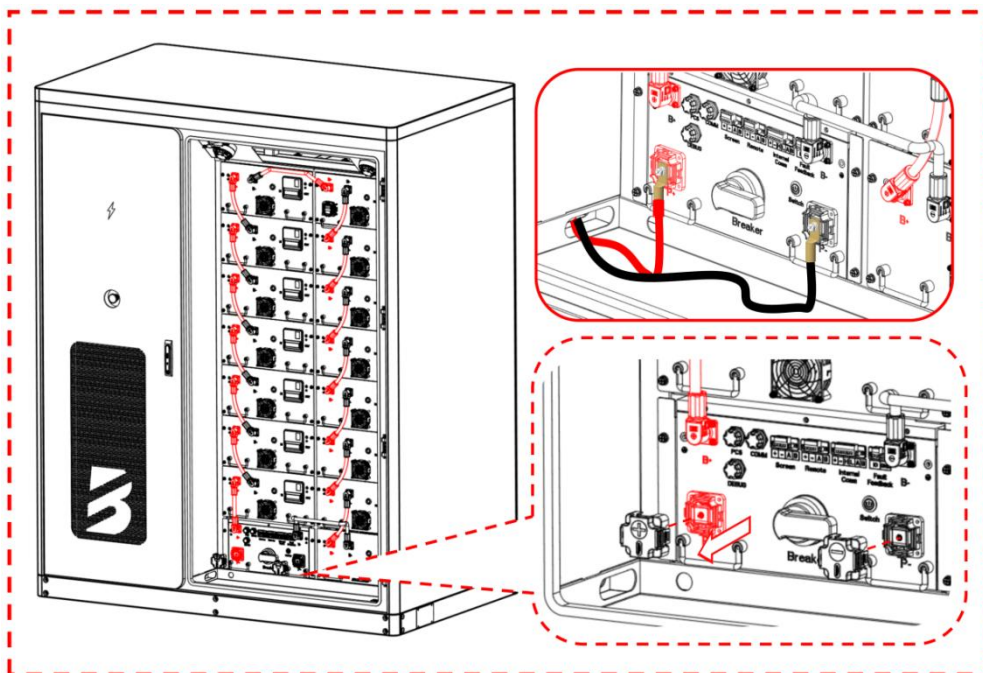


Figure 4.7.2-5



Illustration:

Unless there are special requirements for the project, it has been completed before leaving the factory.

Step 5: External connection of the system

The C241 product adopts an all-in-one structure. The wiring inside the DC side has already been completed. On-site, only the electrical cable installation for the AC side and external communication needs to be carried out. According to the product's power and cable

specifications, the wiring reference as shown in Table 4.7-1 should be provided. The selection of cable diameter should comply with local cable standards. Factors affecting the selection of cables include: rated current, cable type, laying method, environmental temperature and the maximum acceptable line loss.

Model capacity	AC Cable	Neutral Wire	Ground Wire	Positive , 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 4.7.2-1



Danger:

When conducting electrical installations, the following suggestions can be followed for electrical installation:

1. Before wiring, check that all switches inside the equipment are in the off position to ensure the equipment is de-energized before proceeding;
2. Before wiring, disconnect the power grid switch to ensure the cables are de-energized before proceeding;
3. Ensure the phase sequence of the cables is correct. You can add different colored insulating sheaths or markings to distinguish them and prevent incorrect phase sequence;
4. The connection points between the cable terminals and the copper busbars need to be pressed tightly. The length of the screws should be appropriate to avoid affecting insulation and tightening;
5. The communication cables and power cables should be laid separately as much as possible. During the laying process, ensure that the insulation layers of the cables are not damaged;
6. The grounding cable must be reliably connected to the grounding copper busbar. The cross-sectional area of the cable must meet the design requirements;
7. All AC cables need to enter the equipment through the bottom inlet holes and be connected to the corresponding phase sequence after entering the equipment;
8. After wiring, seal the wiring gaps with fireproof mud to prevent external insects and rodents from entering and damaging the equipment or cables.

To prevent the wiring terminals from loosening due to force and causing poor contact resulting in increased contact resistance and overheating, it is necessary to ensure that the bolts used to tighten the wiring terminals meet the torque requirements listed in Table 4.7.2-2:

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 4.7.2-2

The inlet and outlet lines of the energy storage system are arranged in a bottom-in-bottom-out manner. After removing the switch cover, it is as shown in Figure 4.7.2-6. The lower ends of the copper bars A/B/C/N of the switch are reserved with φ

11mm and $\phi 13\text{mm}$ openings for customers to connect the wires, or the openings can be made according to the customer's requirements.

The protective ground wire is connected to the PE copper bar. The grounding impedance of the equipment meets the requirements of national standard *GB 50054* and local electrical standards.

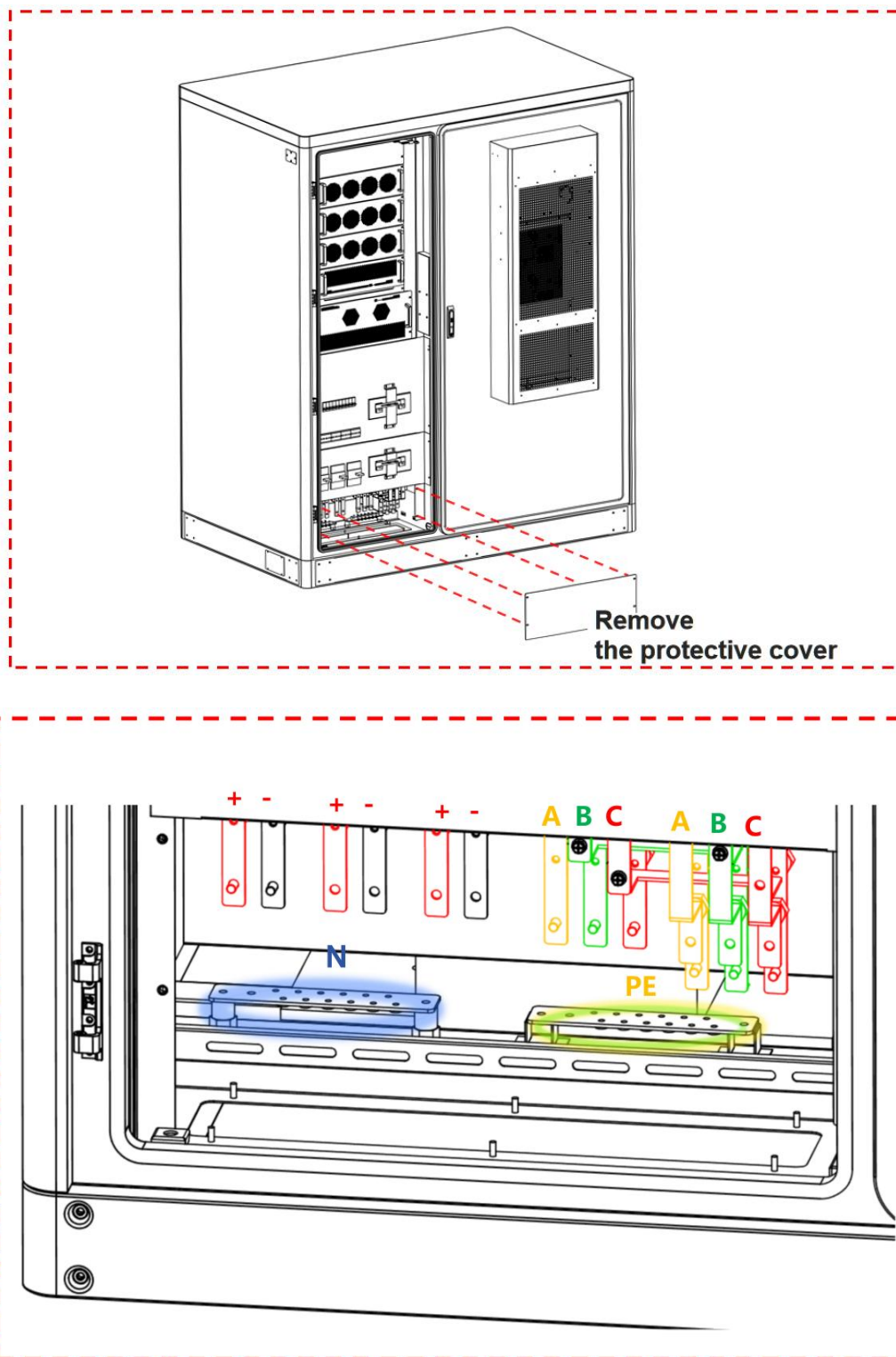


Figure 4.7.2-6 Wiring Diagram

The following is a schematic diagram illustrating the installation of components such as terminals and fixing screws when connecting the system power cable:

The connection specifications for the cable and the copper busbar are as shown in the figure below.

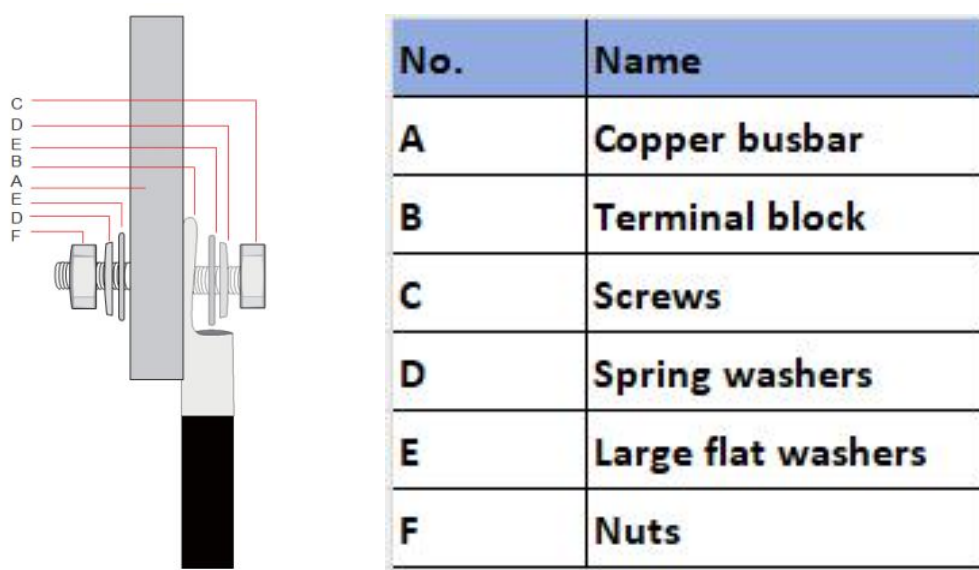


Figure 4.7.2-7 Installation of wiring terminals



Note:

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



Illustration:

1. The ESS-GRID series energy storage system adopts a centralized control architecture, realizing unified management and coordination of multiple DC battery cabinets through the Bus Control Unit (BAU).
2. Two CAN communication ports, "DEBUG" and "COMM", are configured on the panel of the high-voltage box in the battery cabinet. Their functions are parallel and independent, with no dependency in the operational sequence. Specifically, both ports support the CAN bus communication protocol, and are respectively used for system debugging (DEBUG) and conventional communication (COMM). They do not affect each other in physical connection and data transmission, and can perform data exchange simultaneously or separately.

4.8 Check after Equipment Wiring

After the installation is completed, in order to prevent damage to the equipment and property loss, it is necessary to conduct another inspection and measurement of the following items.

NO.	Inspection item
1	Before measurement, disconnect the battery side and electrical side switches to ensure that the energy storage device is not electrified.
2	The positive and negative connections between the battery and the energy storage device are correct, the AC phase sequence is accurate and has been tightened. Measure the resistance between the three phases. It should be in the mega-ohm range. If it is in the kilo-ohm range or smaller, the wiring needs to be checked.
3	The external control cables, grounding wires and communication lines have been securely fastened.
4	The resistance of the grounding wire is less than 4Ω , and the cable is in good condition with no damage or cracks.
5	Clean up the installation area. Ensure that no tools or foreign objects are left behind within the installation area.
6	Fireproof mud is used to seal the gaps in the cables to prevent small animals from entering.

Table 4.8

05 Startup and Debugging

5.1 Pre-check before Power On

1. Check whether the circuit breakers inside the energy storage converter cabinet are in the disconnected state.
2. Verify that all communication and power cable terminals are securely connected.
3. Inspect whether the communication and power wiring harnesses as well as the power cables in the energy storage converter cabinet are correctly connected.
4. Check all communication connections on the modules and the integrated display-control unit inside the energy storage converter cabinet for any issues.

5.2 Pre-check before Startup

Before starting the product, please ensure that the installation has been completed according to specifications and a comprehensive inspection has been carried out. Only when all requirements are met should the product be powered on and put into operation.

1) Appearance Inspection

- a. The equipment exterior shall be intact, free from structural damage, corrosion, or paint peeling. If paint damage is found, promptly perform touch-up painting.
- b. All equipment labels and markings shall be clear and complete. Any that are damaged or illegible must be replaced immediately.

2) Grounding Inspection

A dedicated grounding point shall be present on the cabinet, and the grounding connection must be secure and reliable. All internal grounding conductors must be reliably connected to the grounding copper busbar.

3) Cable Inspection

- a. Cable protective sleeves/jackets shall be intact with no visible damage.
- b. Terminal crimping must comply with standards, and all connections shall be firm without looseness.
- c. Labels on both ends of each cable shall be clear and correct. Cable routing shall follow the principle of separating power and signal cables. Adequate slack must be left at bends; cables must not be pulled taut.
- d. Cable mounting bolts shall be tightened, and cables must not move when gently pulled. All cable entry holes must be properly sealed.

4) Busbar Inspection

Busbars shall show no cracks or significant deformation. Bolts at connection points must be tightened. Phase sequence markings shall be clear and correctly aligned. No foreign objects or debris shall be present on the busbars.

5) Component Inspection

All circuit breakers shall be in the OFF position. The indicator on surge protective devices (SPDs) must show green (normal status).



Note:

1. Insulated gloves are required for operation.
2. 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.

5.3 Startup Procedure

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

1. Use a multimeter to confirm that the grid voltage is within the specified range ($400V \pm 10\%$).
2. Refer to Figure 5.3. Close the Pre-charge Switch, Air Switch, DC Switch, and close the Grid QF to complete the soft startup of the transformer.
3. Close the DC Switch and DC Breaker (rotate to the ON position), close the Load QF, and close the PV QF.
4. On the "System" -> "Parameter Set" interface, set the converter parameters. On the "System" -> "Run mode" interface, select the desired operation mode (manual mode, peak shaving and valley filling mode, backup mode).
5. On the "Switch" page of the HMI integrated screen, enable all modules. Then click "Inverter Start" to complete the power-on process.

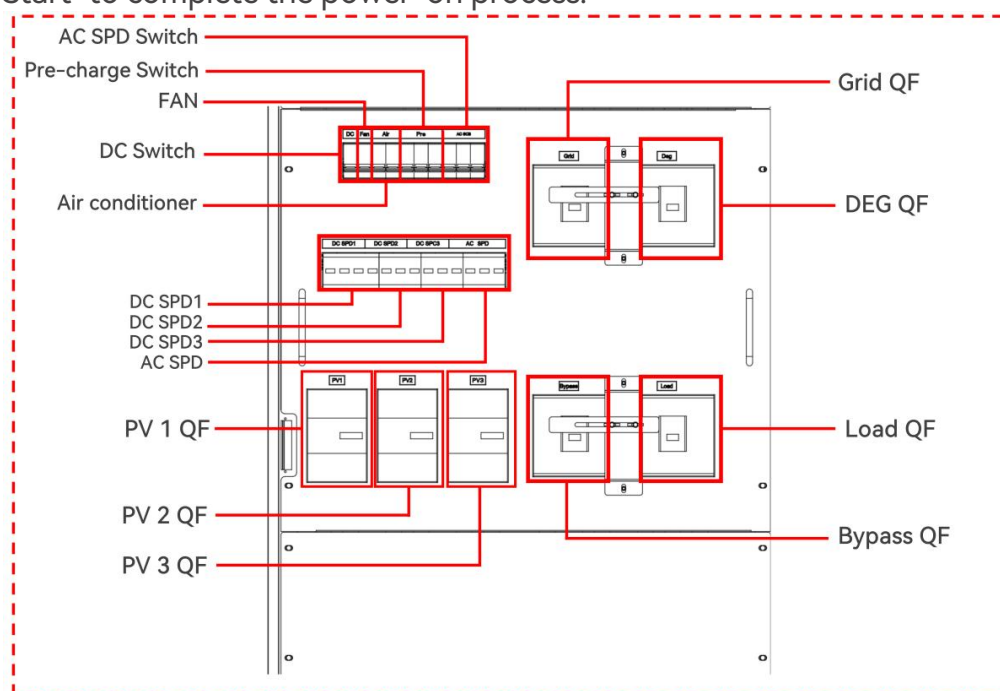


Figure 5.3 Switch Position Diagram



Note:

When using Deg QF, be sure to disconnect Grid QF first; when conducting equipment maintenance and using the Bypass QF, be sure to disconnect the Load QF first.

5.4 Trial Run

After the electrical installation of the equipment is completed, in order to ensure the stable operation of the system, the initial startup requires professional electrical technicians to power on the equipment and set the operation mode and parameters:

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

Step 2: In the "Data" -> "Environment Monitoring" section, turn on the air conditioner. After enabling all the modules on the "Switch" interface, click "System On".

Step 3: During operation, monitor the parameters of the screen PCS, battery and air conditioner. If any abnormalities are detected, stop the machine immediately for inspection.

Step 4: Run for 0.5 hours;

Step 5: Set the active power to -5%. At this point, the battery charges at 5% of the system's rated power.

Step 6: During operation, monitor the parameters of the screen PCS, battery and air conditioner. If any abnormalities are detected, stop the machine immediately for inspection.

Step 7: Run for 0.5 hours;

Step 8: After completing the 1-hour trial run without any abnormalities, close the system on the "Switch" interface.

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

5.5 Normal Shutdown

When the product requires regular maintenance, it needs to be shut down. The normal shutdown procedure for the product is as follows:

Step 1: On the touch screen interface, click "System Shutdown".

Step 2: Refer to Figure 5.3 and disconnect the systems: Air Switch, Pre-Charge, and Pre-Charge Switch.

Step 3: Separate Deg QF, Grid QF, Bypass QF, Load QF and PV QF.

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

Step 5: Wait until the busbar discharge is complete, the touch screen goes off, and the equipment is powered off.

5.6 Emergency Stop and Shutdown

When the product malfunctions or in case of an emergency requiring an immediate shutdown, the following emergency shutdown procedure can be followed:

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

Step 2: Refer to Figure 5.3, shutdown all auxiliary power switches, AC/DC molded-case switches, and Battery DC Breaker of the system;

Step 3: Once the fault or danger has been resolved and it is necessary to start the operation, press the EPO button to reset.



Illustration:

After pressing the "EPO" emergency shutdown button, all the Deg QF, Grid QF, PV QF, auxiliary power switch, and high-voltage box DC breaker need to be turned off. After the HMI touch screen powers off, it is necessary to wait for 10 minutes before you can turn on the machine!

06 Operation and Handling

6.1 Human-Computer Interaction 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 6.1, the homepage interface displays the real-time power of the system Voltage. electric current. Electricity generation Operating mode Work status and other related information.

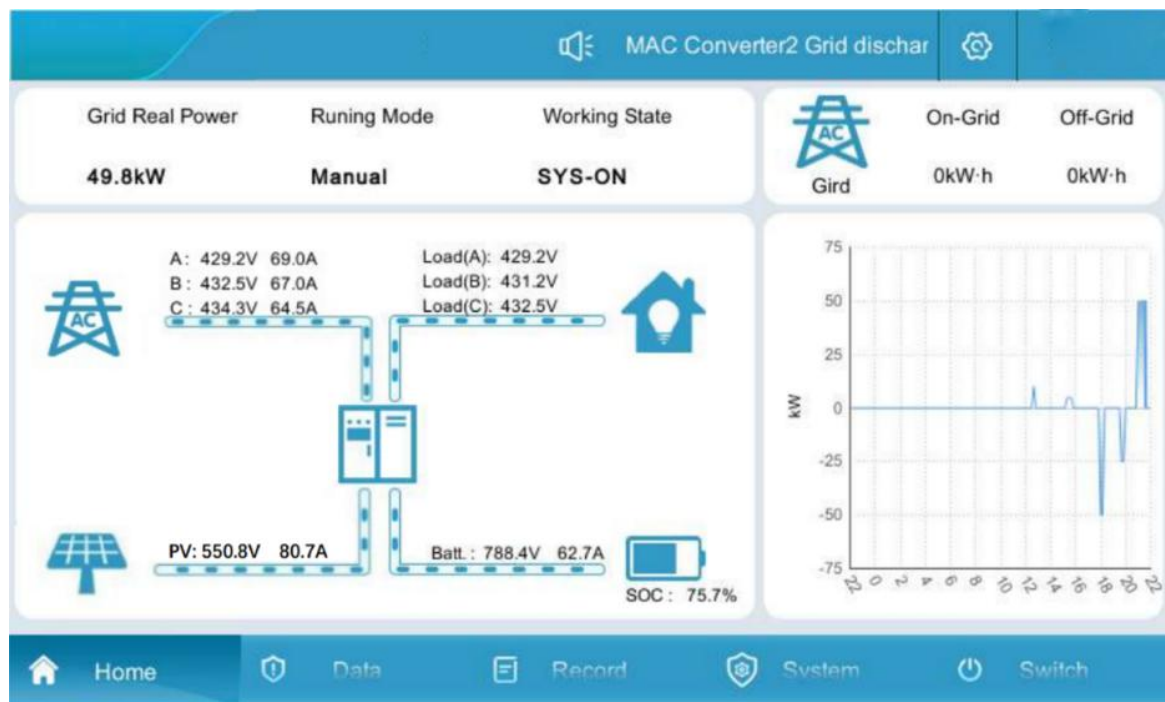


Figure6.1 Homepage

Expand each menu item:

HMI display and control integrated screen menu Table

Serial number	Menu name	Menu item	Parameter Function
1	Homepage	Null	Display the operating status of the system and the charging and discharging curves for the current day
2	Data	Real-Time Data	All analog quantity data of the converter are displayed
		Real-Time Status	Display of converter operating status and switch status
2	Data	Real-Time Alarm	Current system alarm information
		Batery Data	Battery data display and battery on/off

3	Record	settings	
		Environmental Monitoring	Motion monitoring display and air conditioning parameter settings
		History Alarm	Display historical alarm records
		Operation log	Display operation log
		Data Report	Export historical records
		System info	Display system information
4	System	Run mode	System operation mode settings
		Parameter set	Transformer and battery parameter settings
		Manufacture	Equipment manufacturer settings
		System Update	System software upgrade
5	Switch	COmm set	Set up communication settings
		System Switch	System power on/off
6	HMI indicator light	The indicator light on the left side of the HMI	① The first one from top to bottom is the power indicator light: When the HMI touch screen is powered on normally, the green light flashes;
7	HMI indicator light	The indicator light on the left side of the HMI	② The second from the top is the status indicator light: When the system has a fault, the green indicator light does not illuminate; when the system is fault-free, the green indicator light remains constantly on.
8	HMI indicator light	The indicator light on the left side of the HMI	③ The third from the top from the top down is the fault indicator light: When the system has a fault, the red indicator light flashes; when the system is fault-free, the red indicator light remains off (with a flashing frequency of once every 1 second)
9	System indicator light	Status indicator	① When the system is in standby mode and there is a fault, the system indicator light will be red.
10	System indicator light	Status indicator	② When the system is running and there are no faults, the system indicator light will be green.
11	System indicator light	Status indicator	③ When the system is running and there is a fault, the system indicator light will be yellow.
12	System indicator light	Status indicator	④ When the system is in standby mode and there is no fault, the system indicator light will not be illuminated.

Table 6.1

6.2 Power On/Off Operations

1. System startup: First, check the power-on status of the entire machine. Refer to Figure 5.3 for closing the Pre-Charge Switch and DC Switch, then close the Grid QF to complete the soft startup of the transformer.
2. Close the Load QF and the PV QF. (Note: When using the Deg QF for equipment, be sure to disconnect the Grid QF first; when using the Bypass QF for equipment maintenance, be sure to disconnect the Load QF first.)
3. The screen takes approximately 30 seconds to start up.
4. On the "System" -> "Parameter Set" interface, set the converter parameters. On the "System" -> "Run Mode" interface, select the desired operation mode, including grid connection and control mode manual, peak shaving and valley filling mode, and backup mode.
5. On the "Switch" page of the HMI integrated screen, enable all modules (or only some of them as needed). Click "System ON", and the normal startup time is approximately 30 seconds. Refer to Figure 6.2-1.
6. Converter Shutdown: When the converter is in operation, click "Shutdown" as shown in Figure 6.2-2;
7. Disconnection of the auxiliary power switch of the inverter
8. Disconnect Grid QF, and also disconnect Load QF and PV QF.

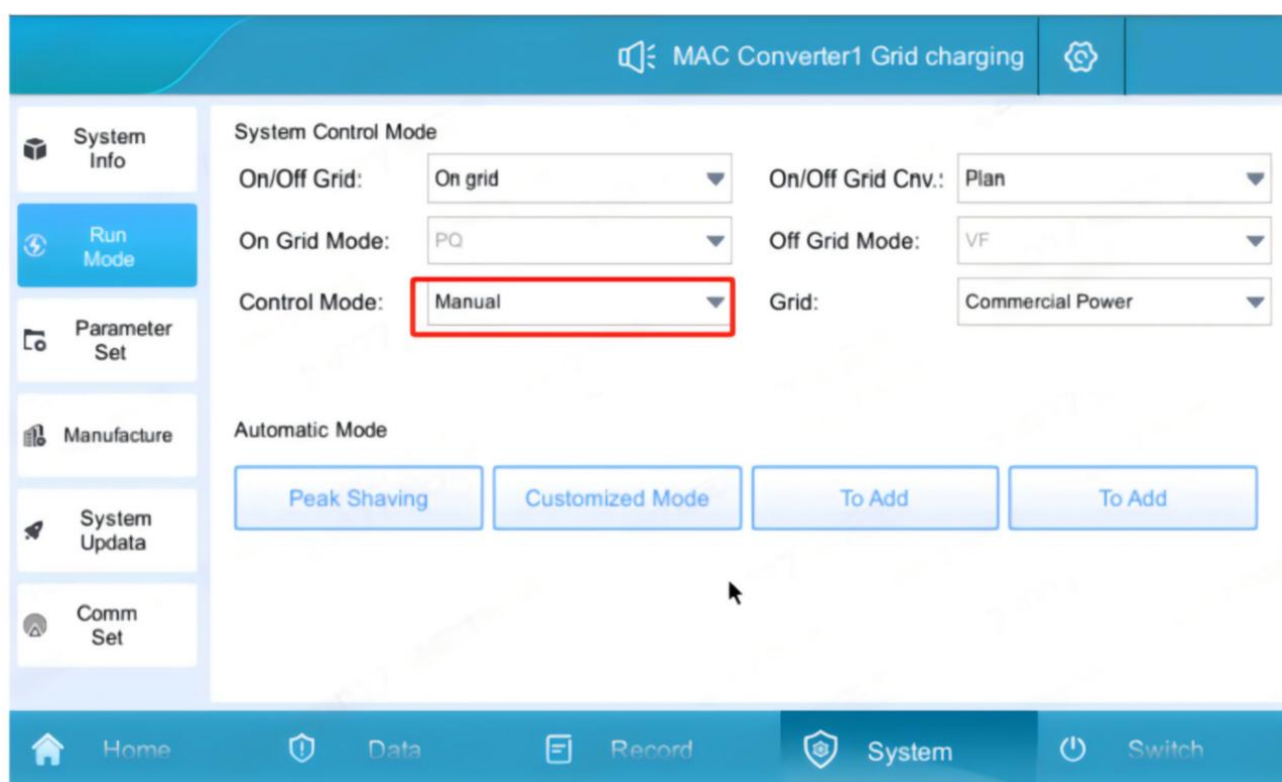


Figure 6.2-1 Run Mode Interface

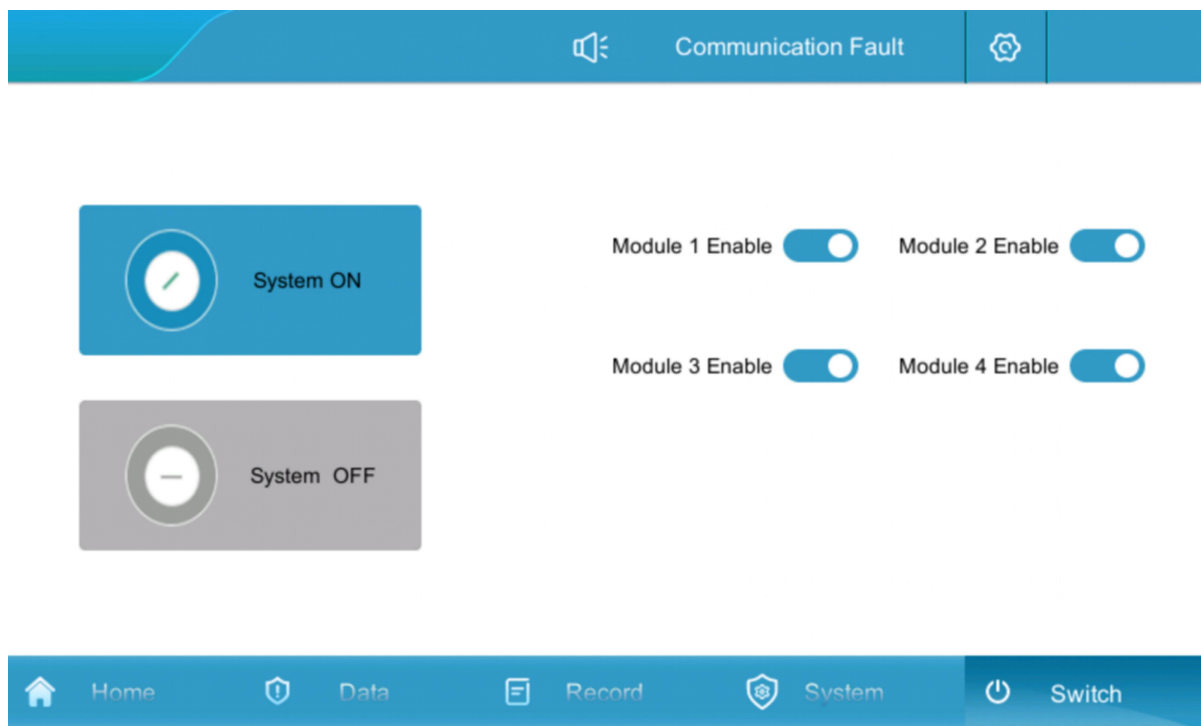


Figure 6.2-2 Power On/Off Interface

6.3 Communication Settings

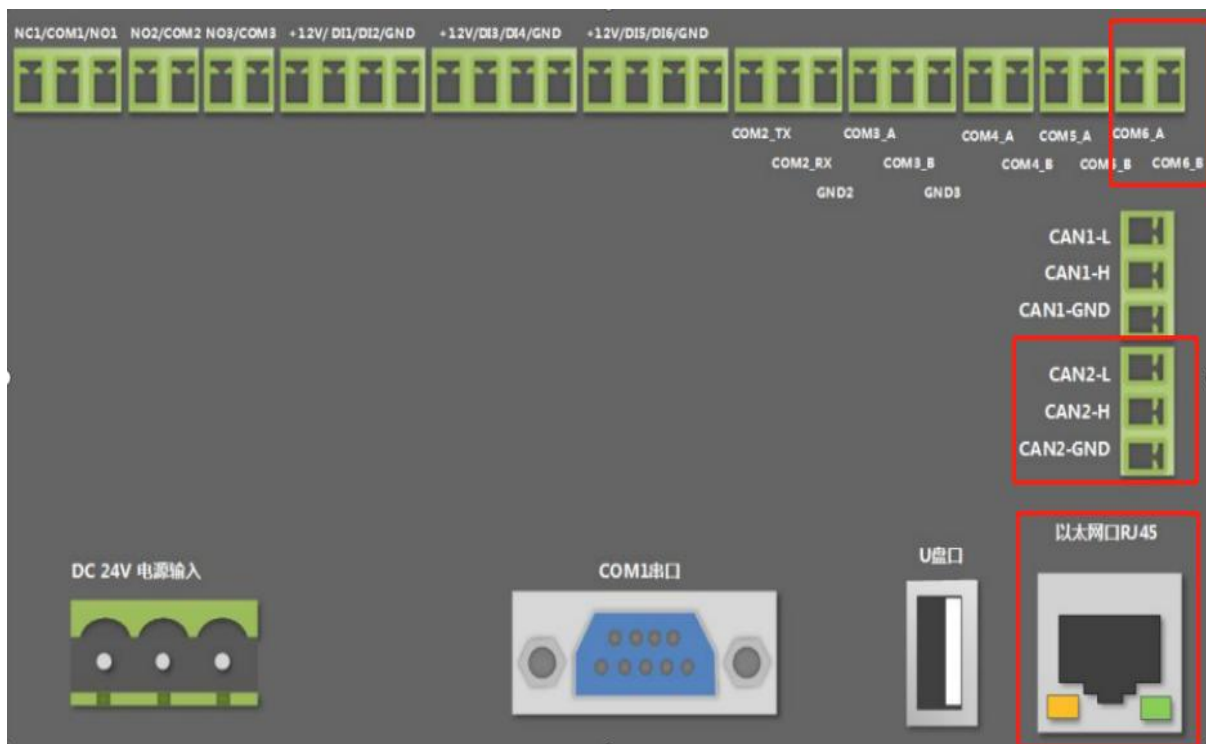


Figure 6.3-1 Communication Check



Illustration:

Communication settings refer to the protocol settings for communication between the HMI integrated screen and the battery BMS, as well as between the LCD touch screen and the EMS backend.

1. Check that the battery BMS communication cable has been properly connected to the CAN2_H and CAN2_L terminals on the back of the touch screen.
2. Check that the rear-end EMS communication line has been connected to the COM6_A and COM6_B terminals on the back of the touch screen, or to the network port position.
3. Click on the "System" option on the HMI integrated screen, then select "Communication Settings" to enter the communication settings interface.
4. Battery BMS communication settings: Set the CAN baud rate to 250 kbps;
5. Backend EMS Communication Settings 1: If using RS485 communication, set the local address of the communication panel to 1. If multiple energy storage systems are connected to the backend, the addresses cannot be duplicated.

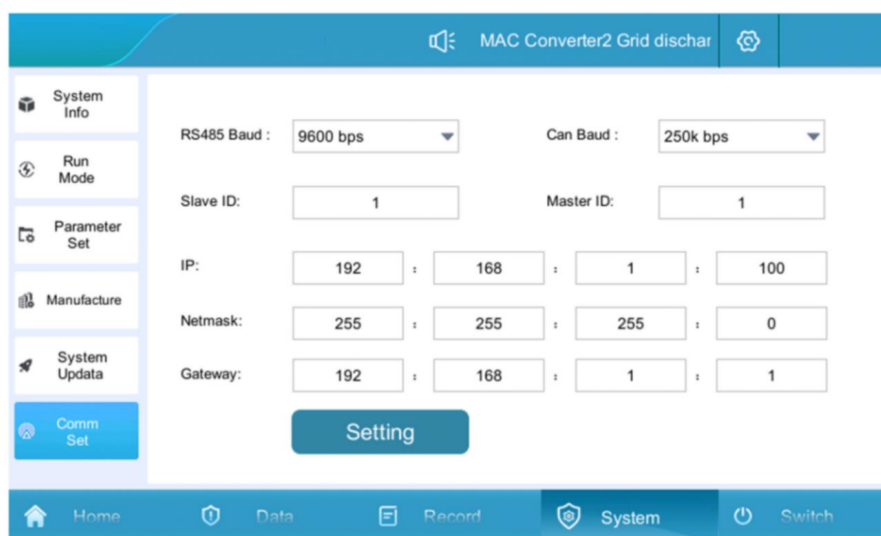


Figure 6.3-2 Communication Settings Interface

6. Backend EMS Communication Settings 2: If Ethernet communication is used, the storage system itself acts as the server. The default address for the host is set to 192.168.1.100. The corresponding local address on the communication panel is set to 1, and the server port is set to 502. If multiple storage systems are connected to the backend IP address, they must not be the same. After modifying the IP address, click the "Set" button to configure the IP address.



Figure 6.3-3 Address Configuration Interface

6.4 Operating Mode Settings

6.4.1 Introduction to Operating Modes

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

1. Grid-connected manual mode: In this mode, the energy storage system operates in grid connection mode, but the start-up and shutdown need to be manually controlled by the user through the LCD touch screen. Users can adjust the active power, reactive power and power factor of charging and discharging in the "Parameter Set" section.
2. Grid-connected automatic mode: This mode is suitable for peak shaving and valley filling scenarios. The system automatically connects to the grid and operates based on the preset charging and discharging power. In the backup mode application, when the battery reaches the preset State of Charge (SOC), the mains power stops charging.
3. Automatic off-grid switching mode: In the grid-connected state, if the power grid loses power, the inverter will automatically switch to the off-grid mode, maintaining a 400V/50Hz three-phase AC voltage output; in the off-grid state, if the power grid is restored, the inverter will automatically switch back to the grid-connected mode.

Explanations:

a. The off-grid switching can be set to either scheduled triggering or unscheduled triggering. When set to unscheduled triggering: When the mains power is cut off, it will automatically switch to off-grid operation, and the system can output a stable 400V/50Hz three-phase AC voltage; when the mains power is restored, it will automatically switch to grid-connected mode operation.

Set to scheduled triggering: In grid-connected mode, it can be manually switched to off-grid mode operation. Set "On/Off Grid" to "Off Grid", and in off-grid mode, it can be manually switched to grid-connected mode operation (provided that mains power is available). Set "On/Off Grid" to "Grid Connected".

The interface for setting is as shown in the following figure:

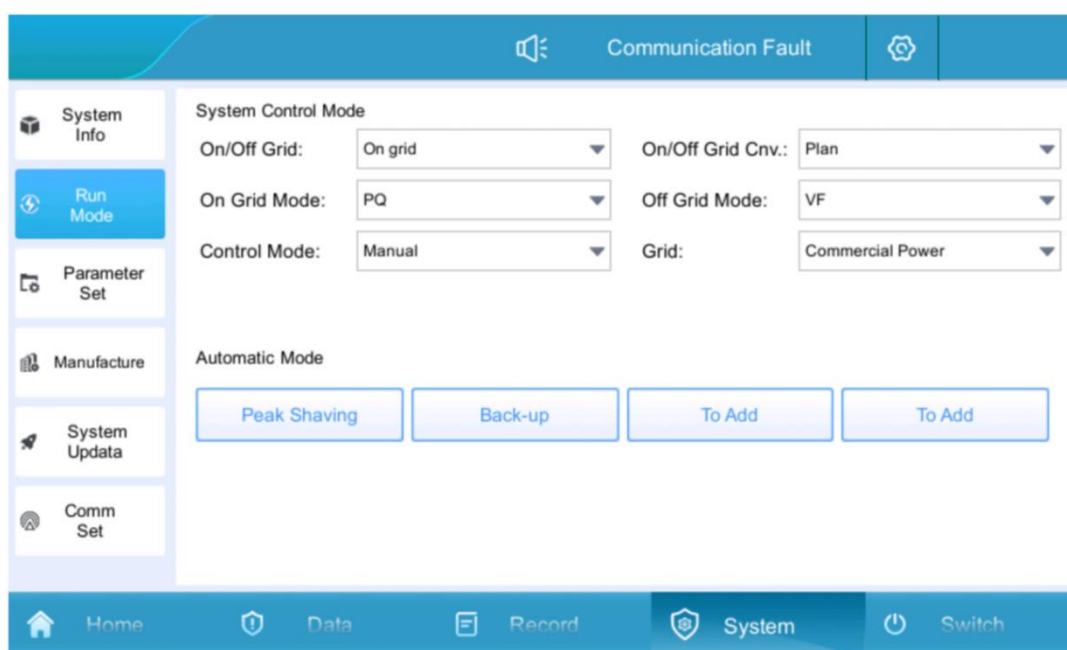


Figure 6.4.1-1 Standalone and Off-grid Settings Interface

b) In grid-connected mode, the anti-reflux function can be set to be enabled or disabled. If set to enabled: the energy stored in the system will not be fed back to the grid. If set to disabled: the energy of the storage system can flow into the grid. In the setting interface of "System" -> "Parameter Set" -> "Advanced (Password 888888)" -> "MSTS Para." -> "anti-reflux", it looks like the following figure:

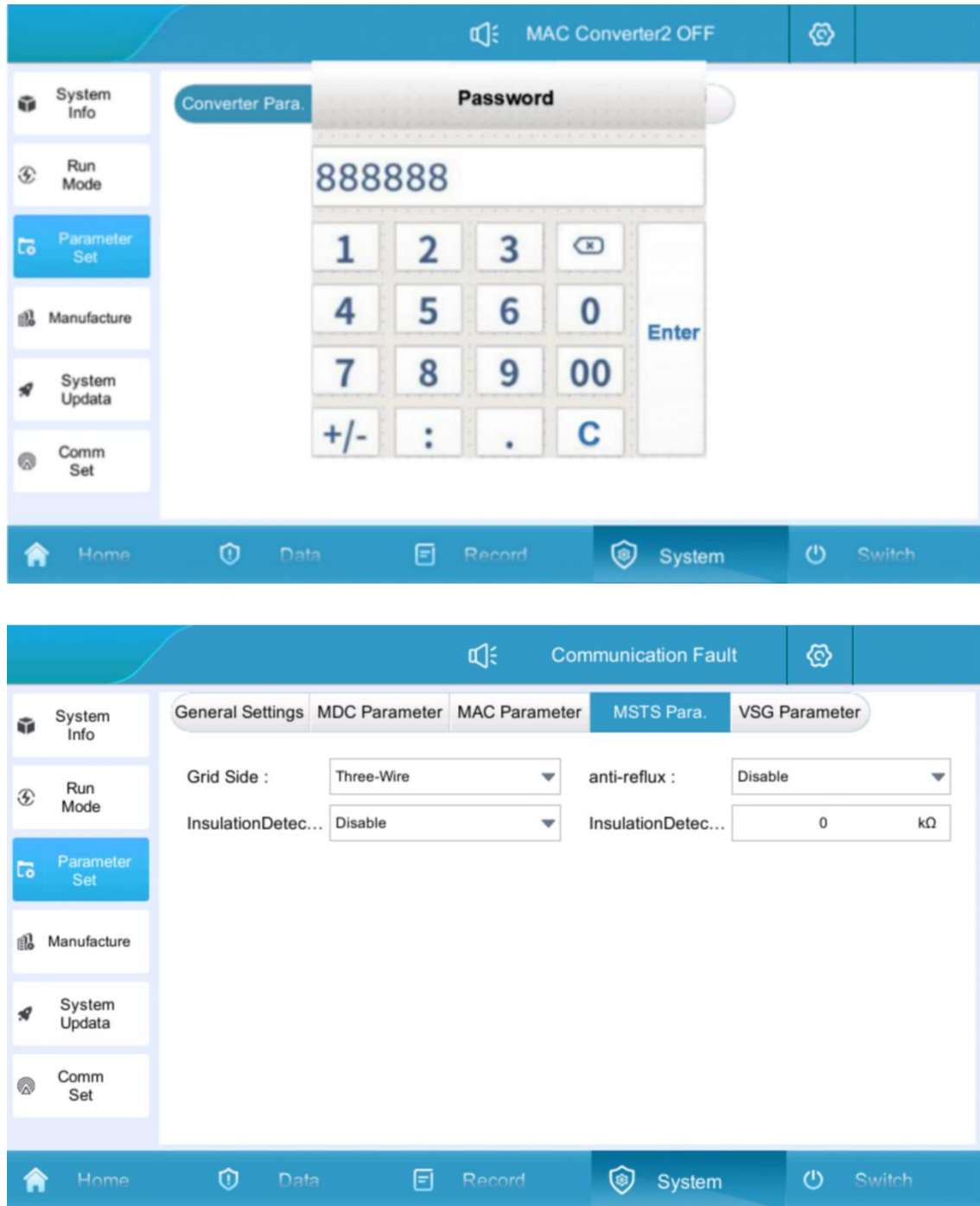


Figure 6.4.1-2 Backflow Prevention Settings Interface

6.4.2 Grid connection: Manual mode

1. Click on "System" -> "Run mode" to enter the page shown in Figure 6.4.2-1.

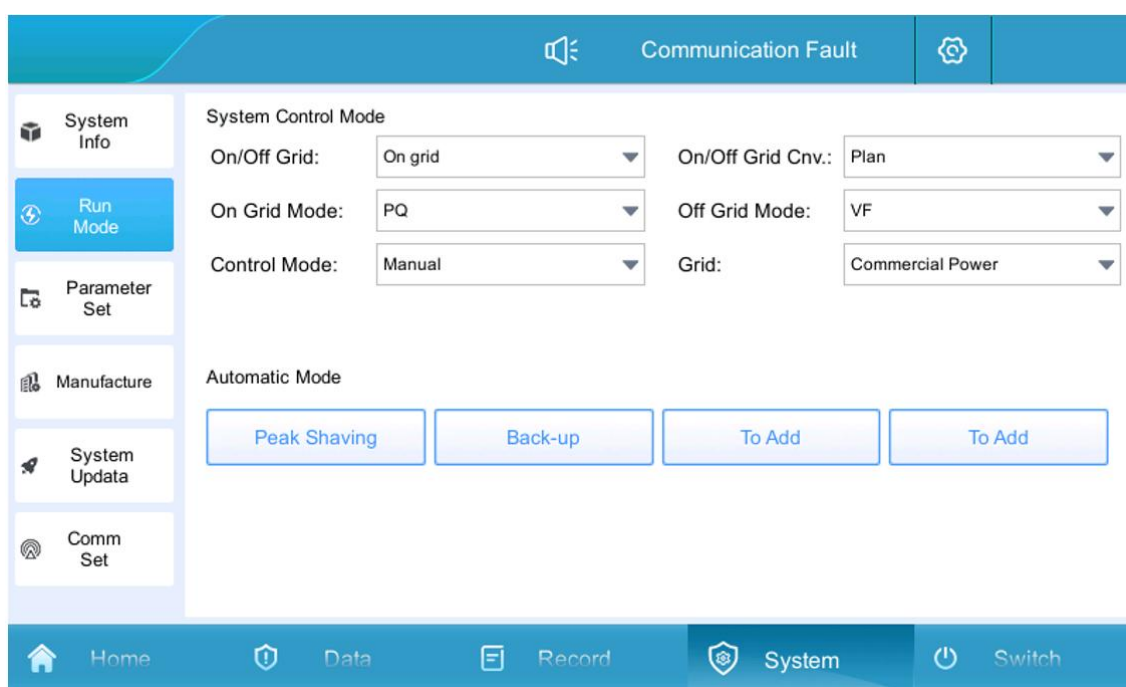


Figure 6.4.2-1 Grid connection manual mode settings

2. Set the control mode to "Manual Mode". On the "Parameter Set" page, set the corresponding active power, power factor, and reactive power values. The machine will operate according to the set values (positive values indicate discharging, and negative values indicate charging). The power setting interface is shown in Figure 6.4.2-2.

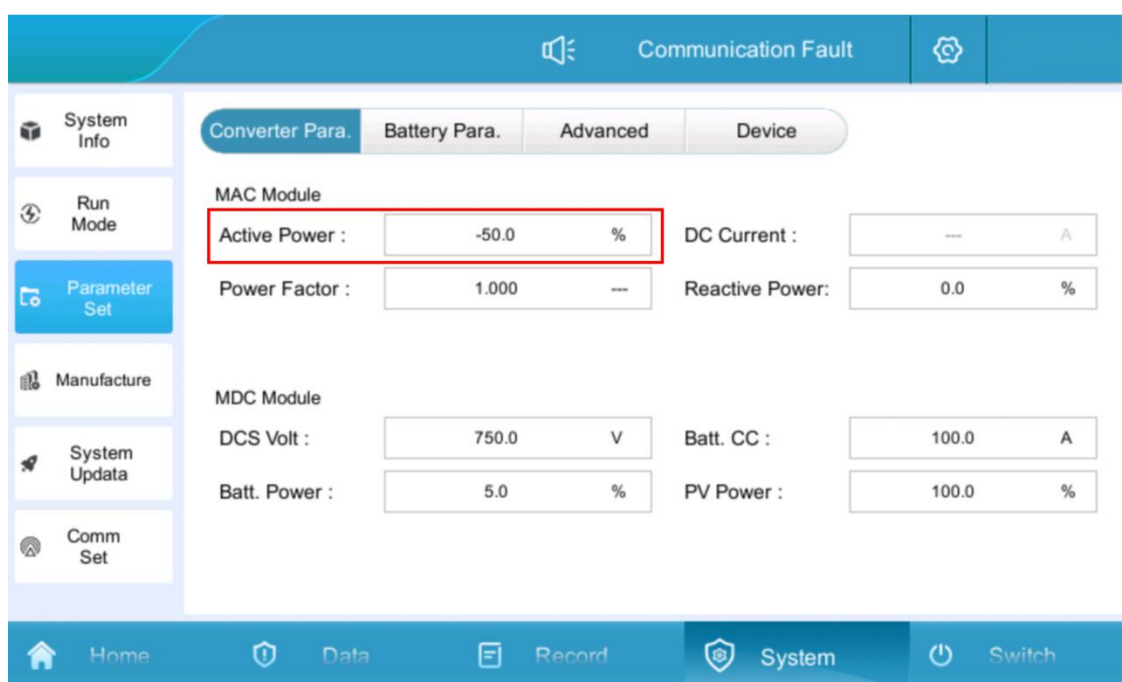


Figure 6.4.2-2 Power Settings Interface

3. Enter the "Switch" page. According to your needs, enable the power module (it is recommended to enable all of them). Finally, click "System Start" to confirm.

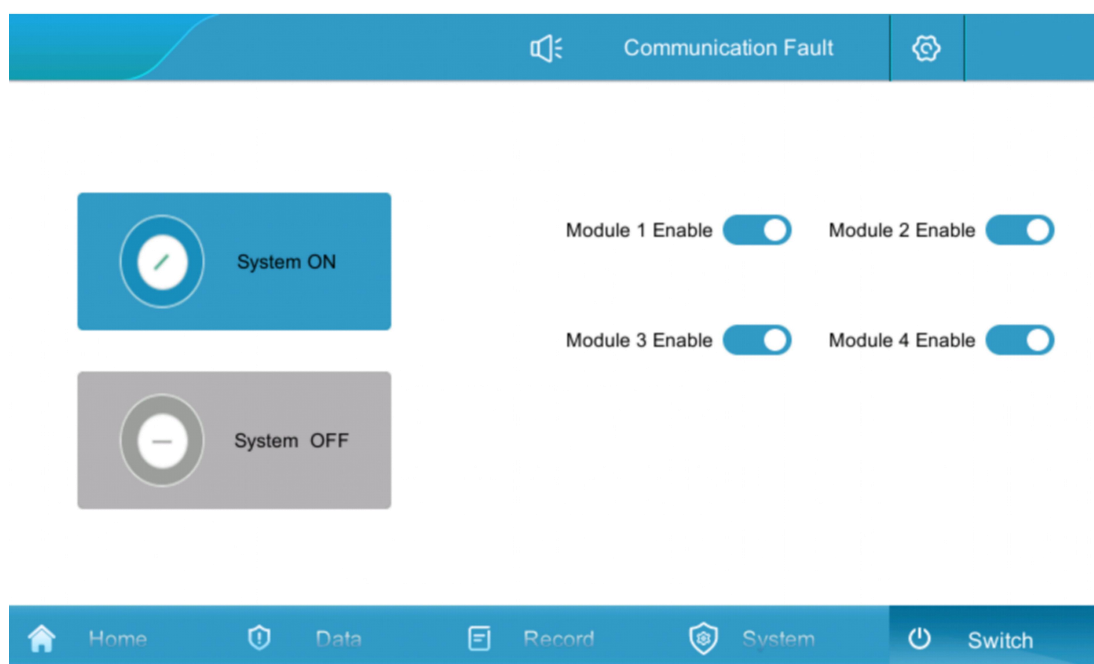


Figure 6.4.2-3 Power On/Off Interface

6.4.3 Grid connection: Automatic mode

Peak shaving and valley filling mode:

1. Click on "System" -> "Run mode", then click the "Peak and Valley Compensation" button to enter the settings page.

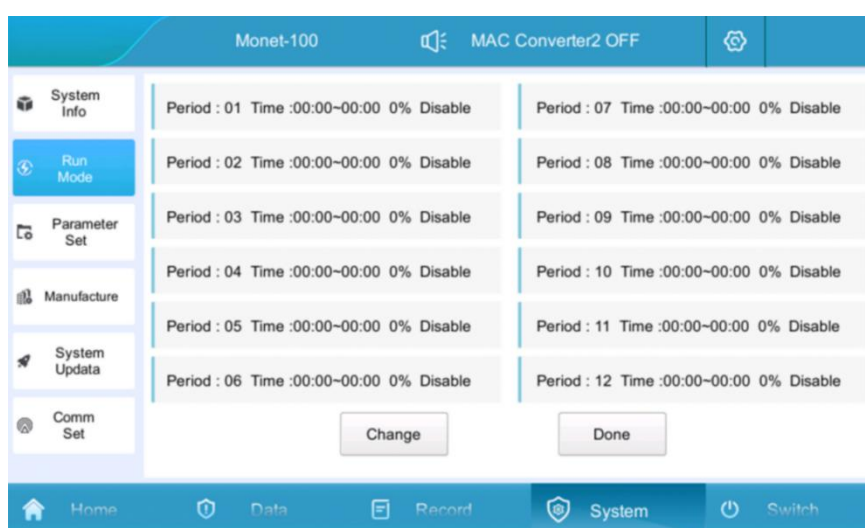


Figure 6.4.3-1 Peak shaving and valley filling operation settings interface

2. Clicking on "Modify" allows you to set the peak shaving and valley filling operation periods and power: Set the start and end times for period 1, the charging and discharging power, and whether to enable it; Click the next button to enter period 2 settings, complete all period settings, and then save and exit.

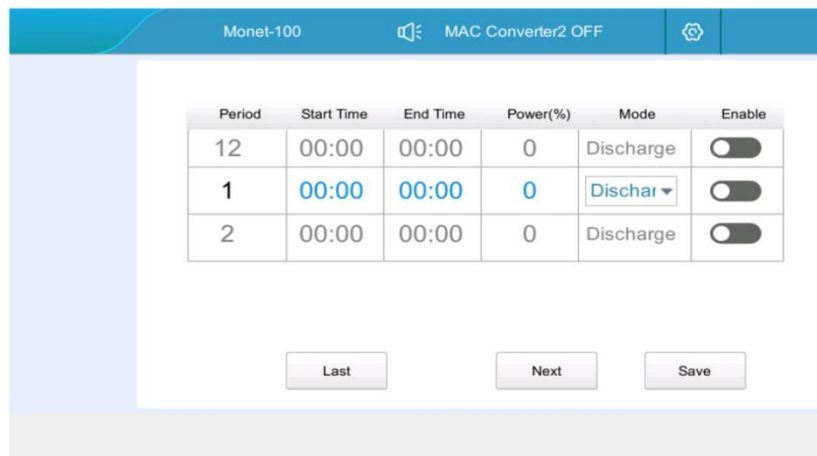


Figure 6.4.3-2 Peak shaving and valley filling charging and discharging time setting interface

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

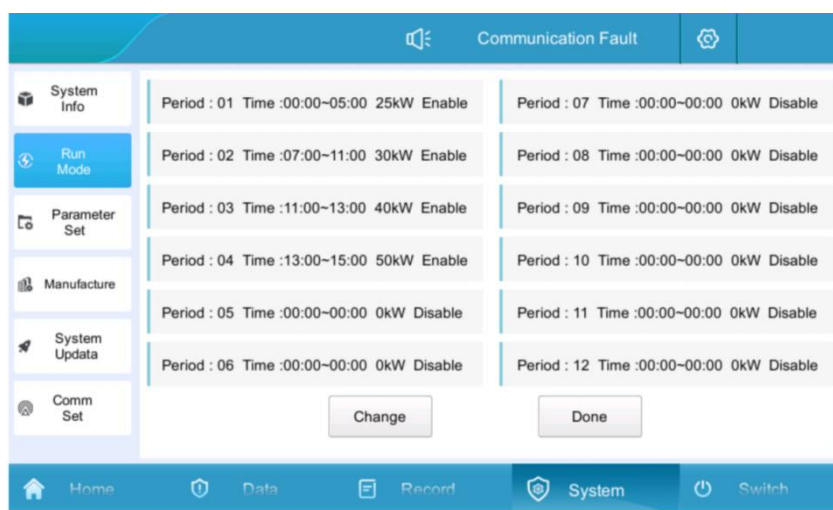


Figure 6.4.3-3 Peak shaving and valley filling charging and discharging settings interface

4. Change "Control Mode" to "Peak Shaving".

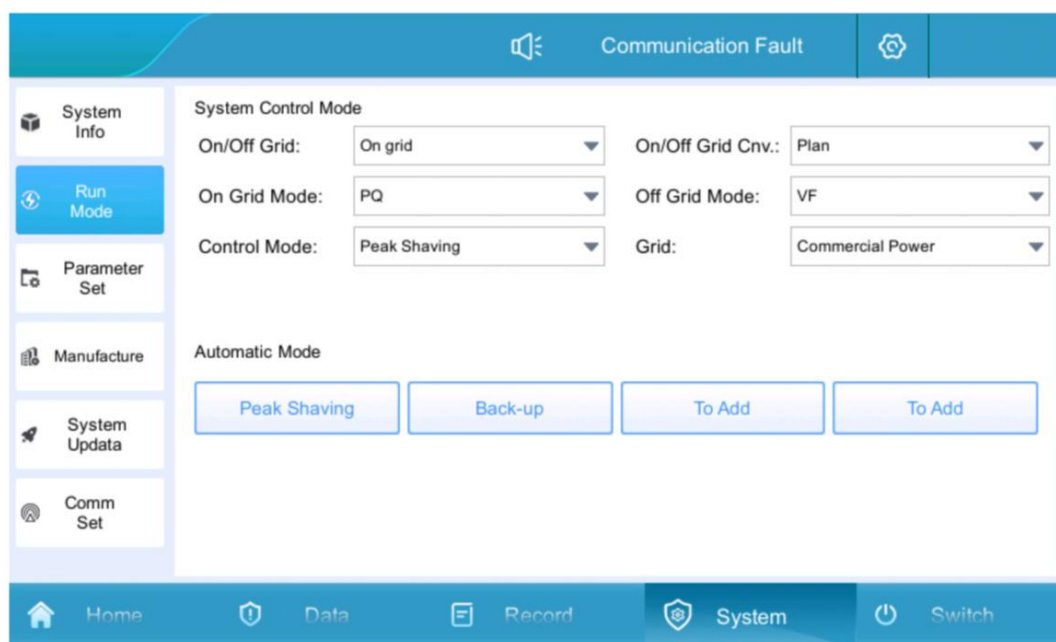


Figure 6.4.3-4 Peak shaving and valley filling control mode

5. At this point, it is in the automatic mode: Pause, click "Switch" -> "System ON" to complete the local automatic control mode setting.

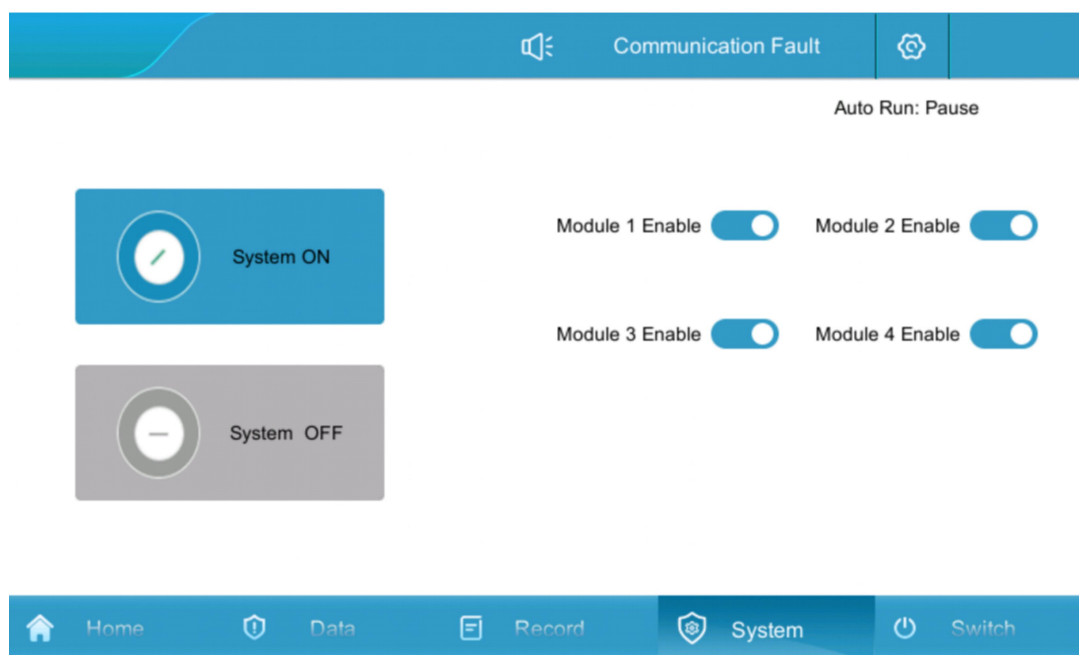


Figure 6.4.3-5 Local Control Operation Mode Enabled

BackUp Mode:

1. Click on "System" -> "Run mode", then click the "Backup mode" button to enter the settings page;
 - a. When mains power charging is enabled: Allow mains power to charge the battery;
 - b. Battery charging power: Set the required battery charging power value;
 - c. When mains power charging is prohibited: Do not allow mains power to charge the battery.
 - d. Generator: Set to enabled, allow the generator to supply power to the load; set to prohibited, do not allow the generator to supply power to the load.
 - e. Generator charging: Set prohibited, do not allow the generator to charge the battery; set enabled, allow the generator to charge the mains power (provided that the generator is enabled first).
 - f. Battery maintenance SOC: When the battery SOC discharges to the set value of battery maintenance SOC, the battery stops discharging, and the load is supplied by the mains power or the generator.

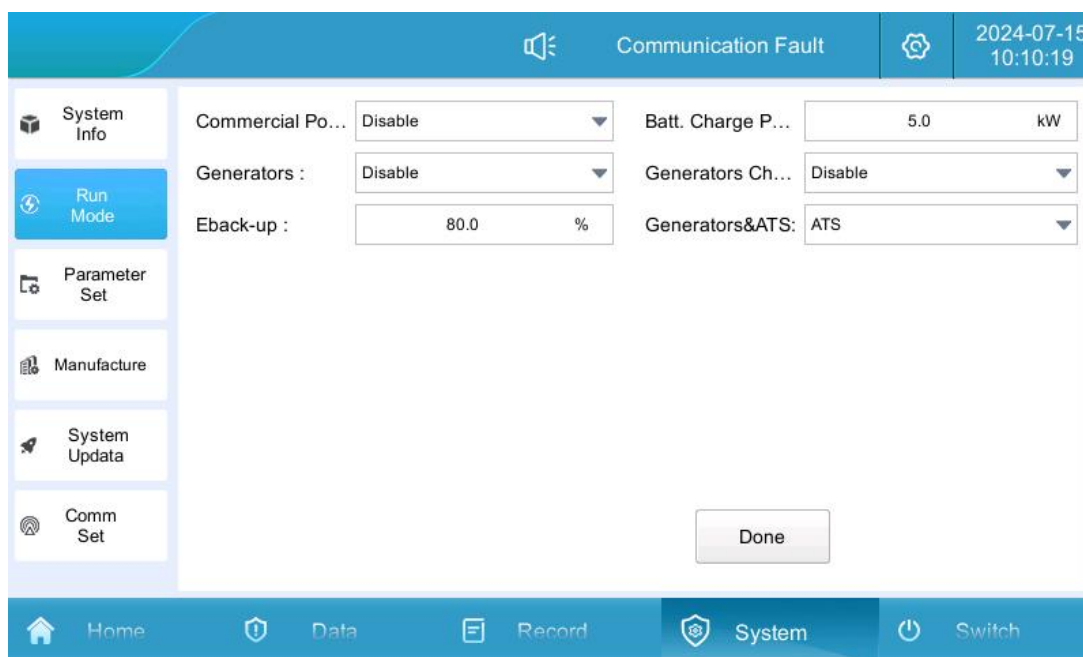


Figure 6.4.3-6 – The Backup Mode Settings Interface 1

2. When the generator operates in reverse mode, disconnect the grid switch, close the generator switch, and close the load switch.
 - a. Click "System" -> "Run mode" -> "Grid" and set it as a generator;
 - b. Click the "Backup mode" button to enter the settings page, and set "Generator" to enabled;
 - c. Set the "Battery charging power" to the required power value for battery charging.

**Illustration:**

After the generator is started, it supplies power to the load and charges the battery to maintain the SOC of the battery. The system will automatically switch to off-grid operation to supply power to the load. When the mains power is restored, the oil engine switch needs to be manually disconnected, and the mains power switch should be closed. Set "grid" to mains power, enter the backup mode, execute the backup mode logic. When the mains power charges the battery to the backup SOC, it will no longer charge the battery.

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

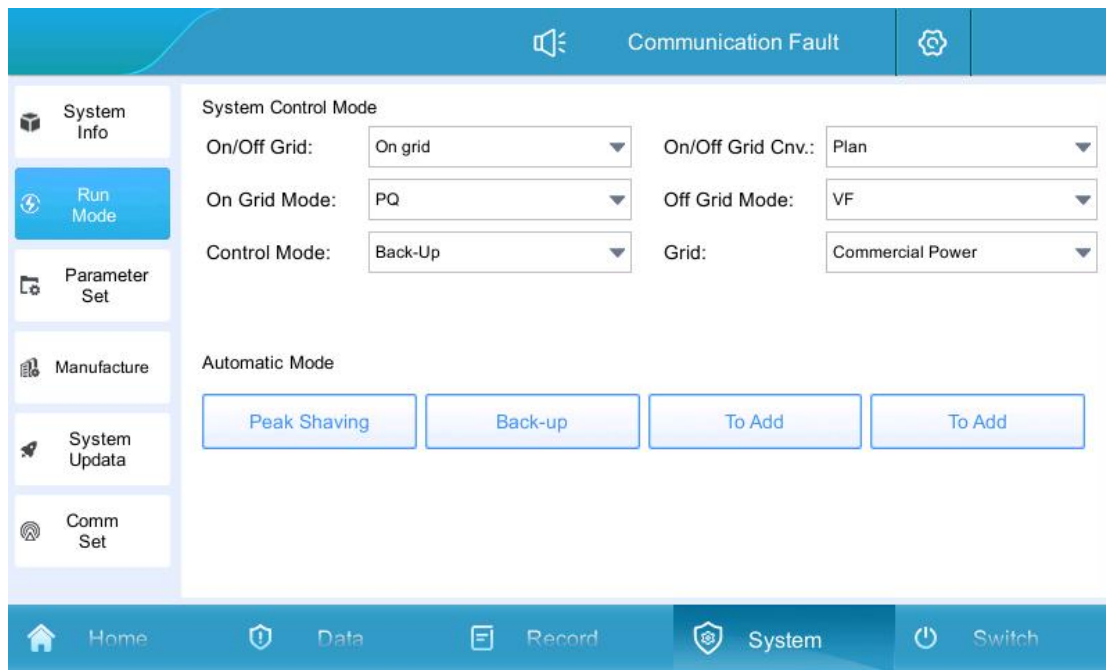


Figure 6.4.3-7 - Backup Mode Settings Interface 2

4. At this point, it is in the automatic mode: Pause. Click "Switch" -> "Enable" to complete the setting of the local automatic control mode.

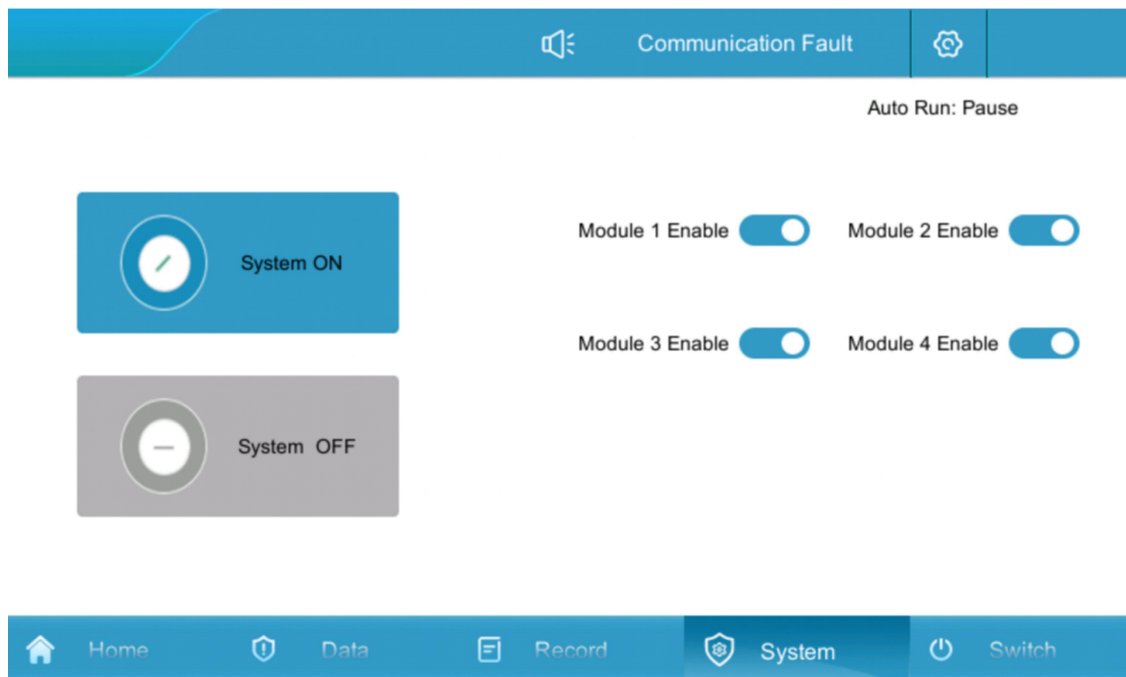


Figure 6.4.3-8 Automatic control mode operation has begun

6.4.4 Automatic Switching from On/Off-Grid Mode

Grid connection to off-grid:

When the system is operating in grid-connected mode and the grid suddenly loses power, the STS detects the grid power outage and transmits the power outage information to the

PCS and performs the disconnection operation. At the same time, after receiving the STS signal, the PCS automatically switches from the grid-connected mode to the off-grid mode for operation. The system can output a stable 400V/50Hz three-phase AC voltage.

Off-grid to Grid-connected Conversion:

When the system is operating in an off-grid state and the grid power is restored, the STS detects the grid power restoration and transmits the grid power restoration information to the PCS. As the STS synchronizes the grid phase and amplitude with the PCS in off-grid operation, the PCS notifies the STS to issue the closing command. At the same time, the system automatically switches from the off-grid mode to the grid-connected mode and executes the grid connection 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. In the "On/Off Grid Cnv." section, select "Plan" and set it to trigger by plan.
3. When operating in grid-connected mode, it can be manually switched to off-grid operation mode by setting the "grid-off-grid" option to "off-grid".
4. When operating in off-grid mode, it can be manually switched to grid-connected mode (provided that mains power is available). Set the "Grid/Off-grid" option to "Grid-connected".

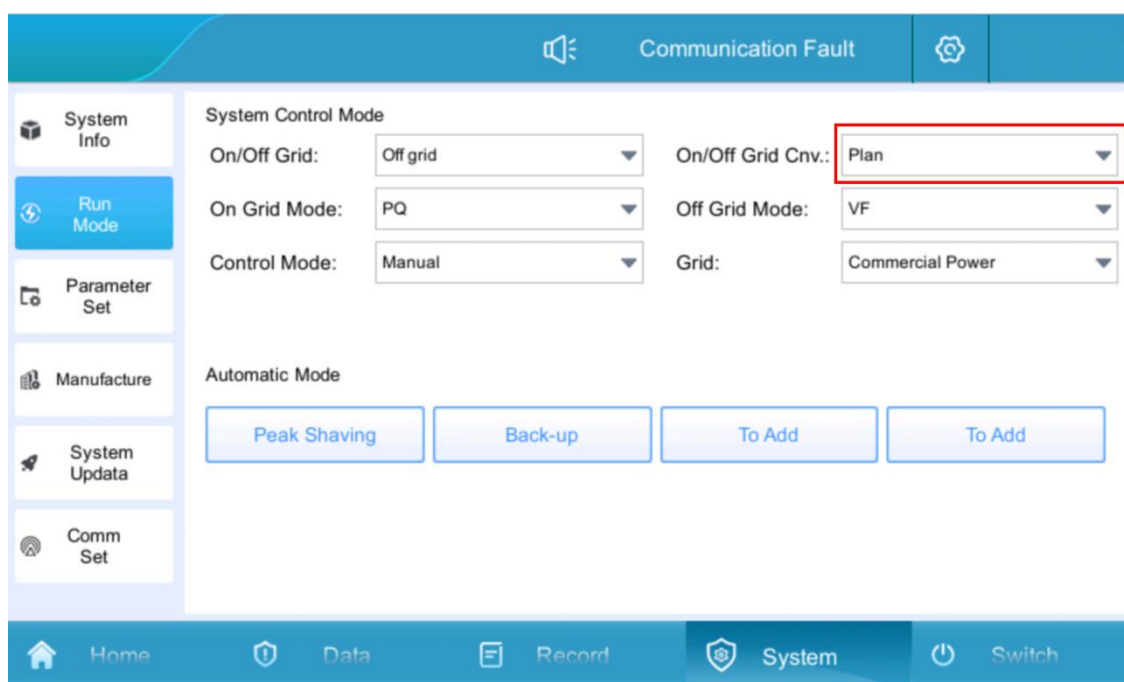


Figure 6.4.4-1 Manual and Off-grid Switching Mode Settings Interface

Automatic disconnection network mode:

1. Click on "System" -> "Run mode" to enter the current page. Set "On/Off Grid Cnv." to "Non-Plan".
2. When the grid suddenly loses power while the system is in grid-connected mode, the energy storage converter will automatically switch from grid-connected mode to off-grid mode operation. The system can then output a stable 400V/50Hz three-phase alternating current voltage.

3. When the power grid suddenly resumes power supply while the system is in off-grid mode, the energy storage converter will automatically switch from off-grid mode to grid-connected mode for operation.

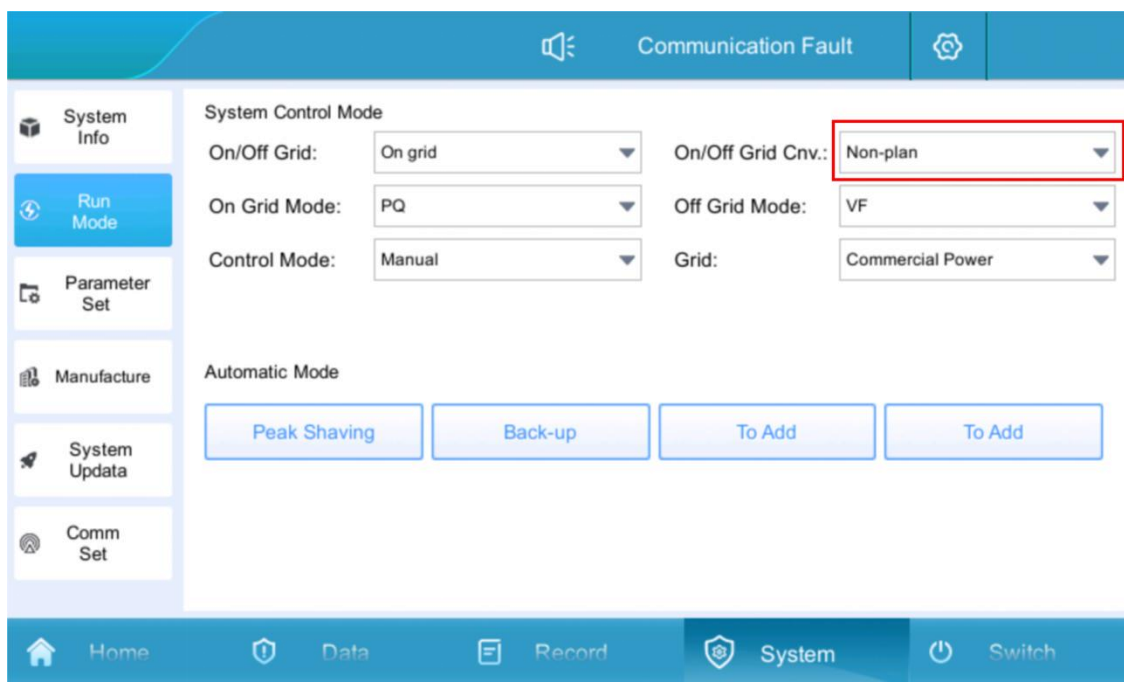


Figure 6.4.4-2 Automatic On/Off Grid Switching Mode Settings Interface

6.4.5 Battery Parameter Settings

1. Click on "System" -> "Parameter Set" to enter the current page;
2. The customer sets the upper and lower limits of SOC according to their own requirements.
3. It is recommended that the lower limit setting value for the SOC should not be lower than 5%.



Note:

The battery parameters have been preset before the system was manufactured. It is not recommended to make any modifications by yourself.

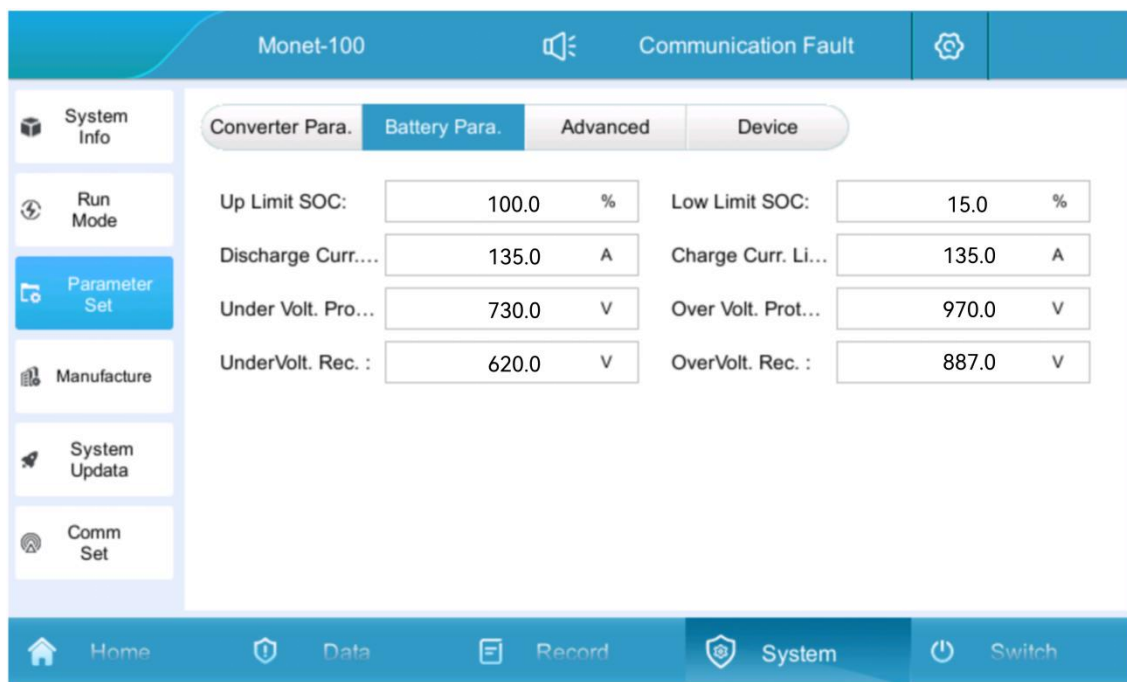


Figure 6.4.5 Battery Charging and Discharging Settings Interface

6.4.6 Environmental Monitoring Interface

1. Click on "Data" -> "Environment Monitoring" to enter the following interface;
2. You can view the real-time environmental status of the system, as well as the air conditioning parameter settings and the status of whether the air conditioning is on or off, on the interface.

Refrigeration mode:

When the temperature is greater than or equal to the set cooling point, the air conditioner will start to cool. When the temperature is lower than the difference from the cooling point, the air conditioner will stop cooling. The difference value is defaulted to 5°C (adjustable from 1 to 10°C).

Heating mode:

When the temperature is lower than the heating threshold, the air conditioner heating is activated. When the temperature reaches the heating threshold plus the deviation value, the heating is turned off. The deviation value is set to 5°C (adjustable from 1 to 10°C).

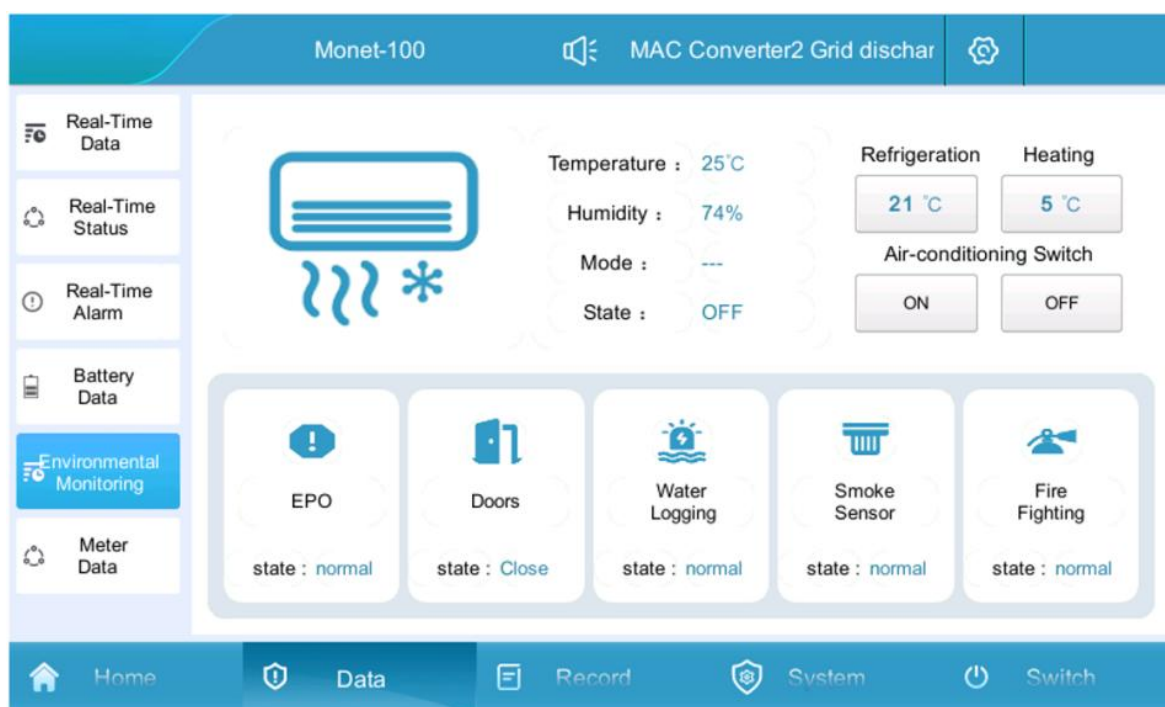


Figure 6.4.6 Environmental Monitoring Interface

6.4.7 Data Viewing and Export

1. Click on "Record" -> "Data Report" to enter the current page.
2. Check the current day, month, year, as well as the total charging and discharging electricity.
3. Insert the USB drive, wait for it to connect, then click on "Data Export" and wait for the export process to complete.

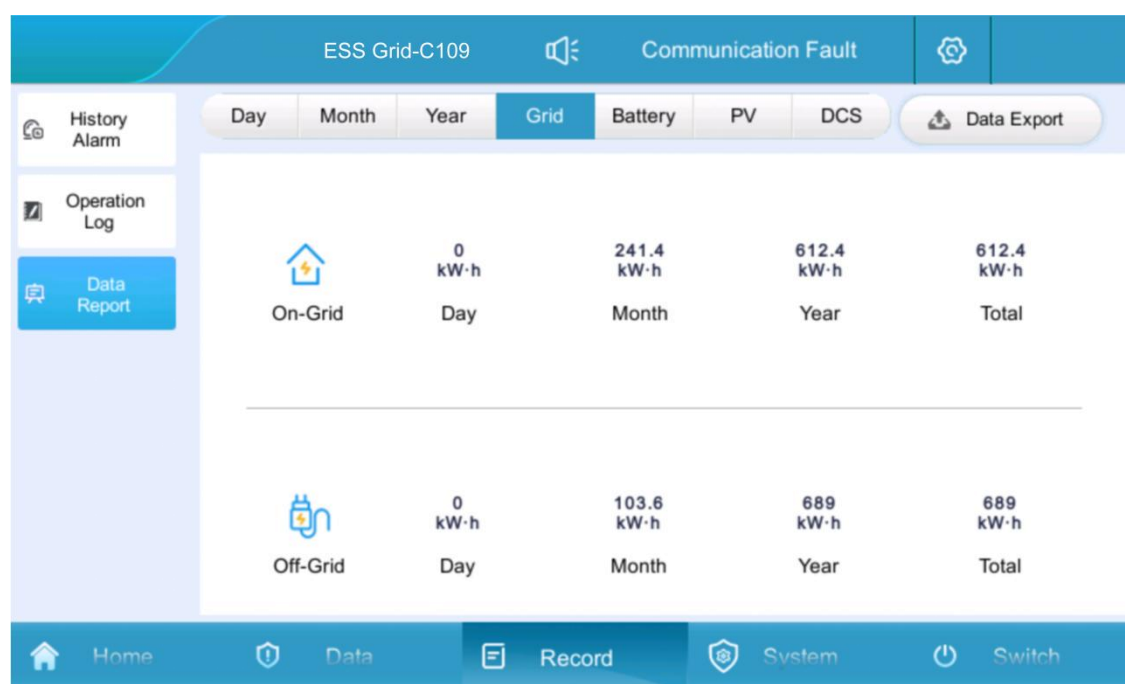


Figure 6.4.7-1 Data Report Interface

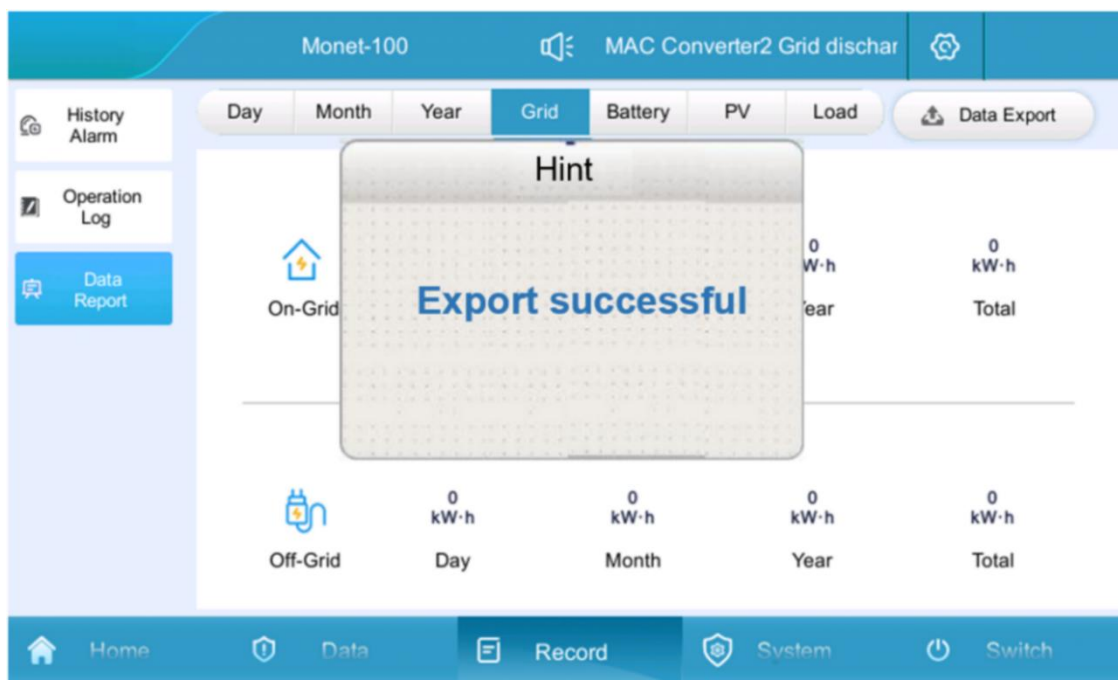


Figure 6.4.7-2 Data Export Interface

6.4.8 Software Upgrade

The software upgrade includes the upgrades of three types of software: the integrated screen software, the power module DSP software, and the power module ARM software. Before the upgrade, the system must be shut down on the "switch" page of the touch screen, which means the upgrade can only be performed during the period when the system is not running.

1. First of all, prepare a USB drive and a computer. Create a new folder on the USB drive and name it "UPDATE" to store the burned files.



Figure 6.4.8-1 Create the upgrade software folder

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

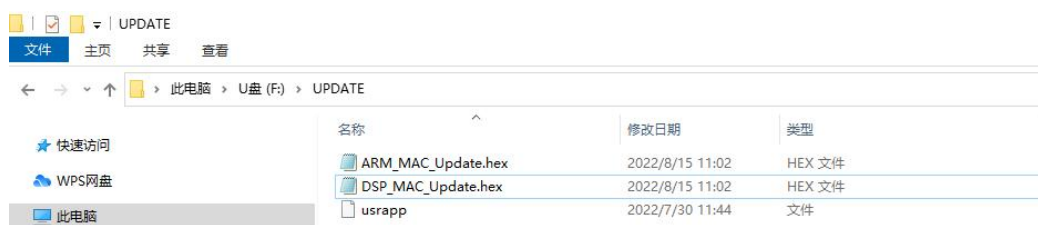


Figure 6.4.8-2 Storage of Upgrade Software

3. Click on "System" -> "System Upgrade", enter the password "888888", and you will be directed to the upgrade page.

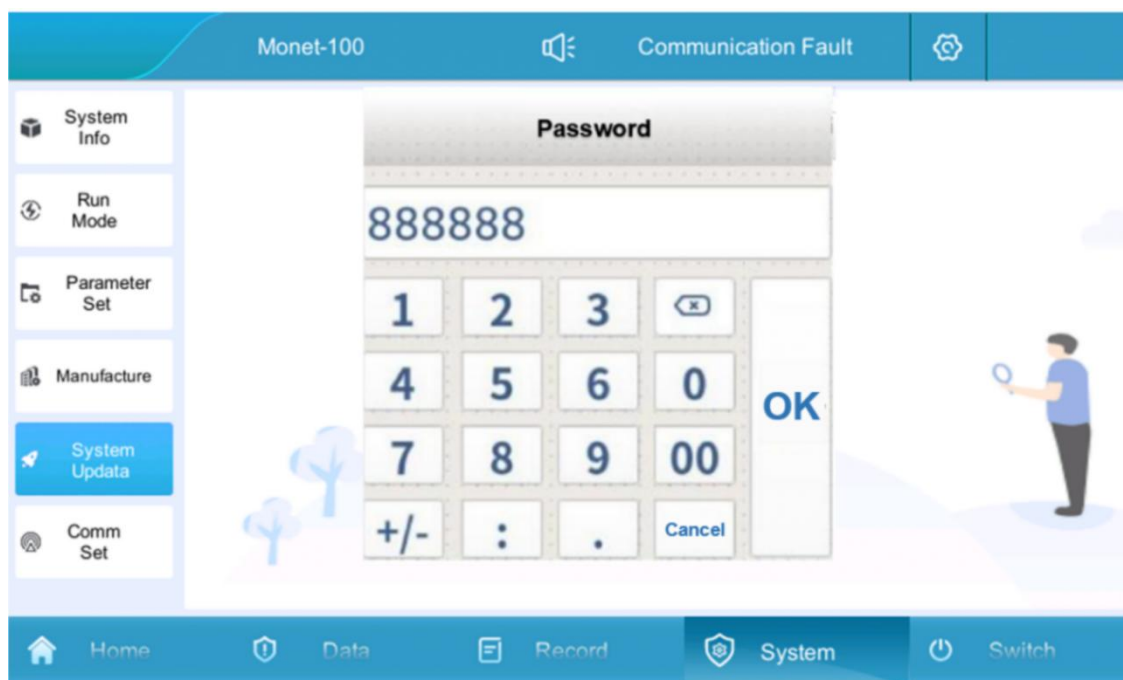


Figure 6.4.8-3 Password Verification

4. Insert the USB drive into the back of the LCD integrated screen. The interface will display that the USB drive has been connected and an upgrade file has been detected.
5. Upgrade the integrated screen software. Click on "LCD Upgrade", and wait for about 15 seconds. Then you will receive a prompt indicating that the upgrade was successful.

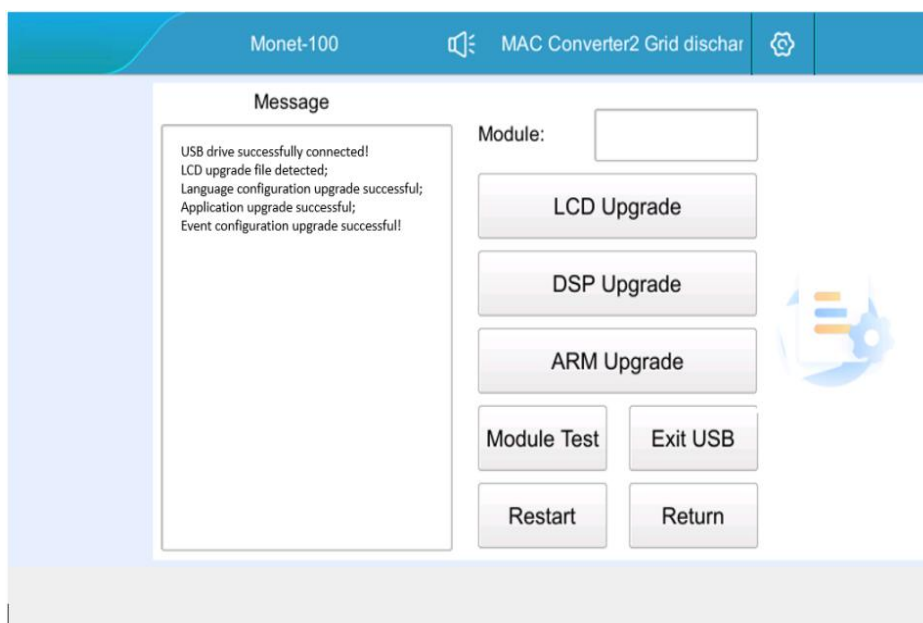


Figure 6.4.8-4 Upgrade Software and Restart Interface

6. After the LCD integrated screen software is upgraded, click the "Restart" button, and the version will be updated and take effect. Customers can upgrade the DSP and ARM according to the actual situation, and then click "Restart".
7. For the upgrade of the power module's DSP/ARM, you need to select the module to be upgraded in the "System Upgrade" interface's module box.
8. Click on "DSP/ARM Upgrade", and wait for about 5 minutes. Then you will be prompted that the upgrade is successful. The system upgrade is completed.



Illustration:

When the system has multiple modules, it is recommended to upgrade Module 1 first. After that, proceed to upgrade Module 2 and continue this process until all modules have been upgraded.



Note:

- 1.The upgrade process may take some time. Please reserve sufficient time to ensure that the upgrade does not get interrupted.
- 2.Choose a time when the system usage is relatively low for the upgrade, in order to minimize the disruption to daily operations.

6.5 Router Connection Operation

6.5.1 SIM card Installation

The following operations are carried out in the power-off state:

- ①As shown in the figure below, press the yellow button shown and the card slot can be popped out.



Figure 6.5.1-1 Router Card Slot Location Diagram

- ② Remove the card slot.



Figure 6.5.1-2 Router card slot removal diagram

- ③Insert the SIM card (provided by the customer) into the card slot, with the chip sense facing up (the SIM card must fit the size of the card slot).
- ④Install the card slot into the router, the front of the card slot corresponds to the “SIM” silk screen in the right direction.

6.5.2 Network Connection

Connect the computer to the LAN port of the router through the network cable, connect the WiFi antenna and full-band antenna to the corresponding antenna interface in turn, insert the SIM card (provided by the customer) in the state of power failure (the front of the

card slot corresponds to the direction of the silkscreen of“SIM”) (the SIM card needs to be taken out only after the power is cut off), and observe the indicator lights after the power is turned on: After powering on, observe the indicator lights: PWR is always on, LAN is flashing, 4G light (3G+2G light) is on, and all signal lights are on, which means the signal is good.

(1) Configure the network card of your computer and choose to obtain IP address automatically;

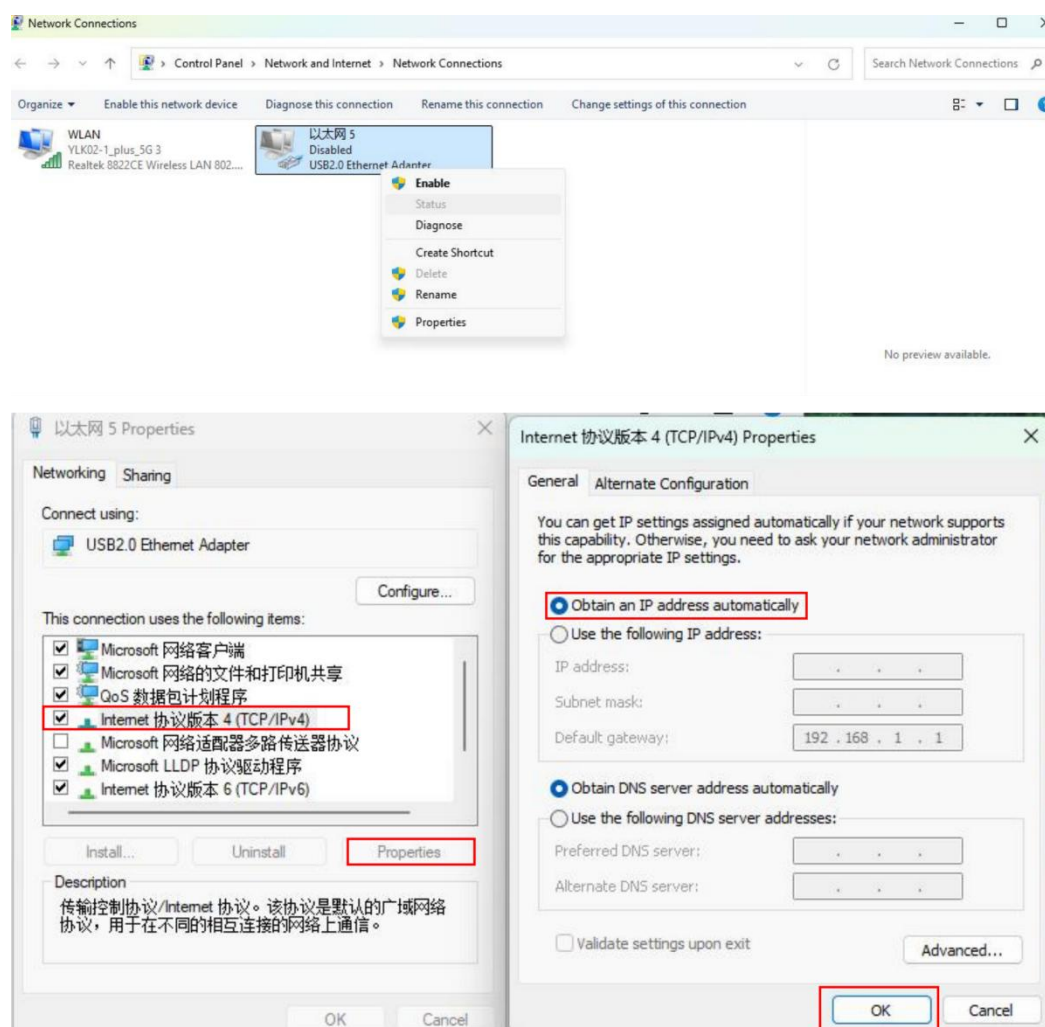


Figure 6.5.2-1 IP Acquisition Diagram

(2) Internet test: Power on the router, wait for about 2 minutes, the 2/3G indicator light will start to light up, indicating that the router's 4G networking is successful, and then you can directly access the Internet. Let's check the network status through the default parameters of the router.

Router Initial Value

Parameter	Initial value
Username	Root

Password	Root
----------	------

Self IP address

192.168.1.1

Table 6.5.2

(3) Enter: 192.168.1.1 in your computer's browser and hit enter. The following figure shows the router login screen. Enter root for both username and password.

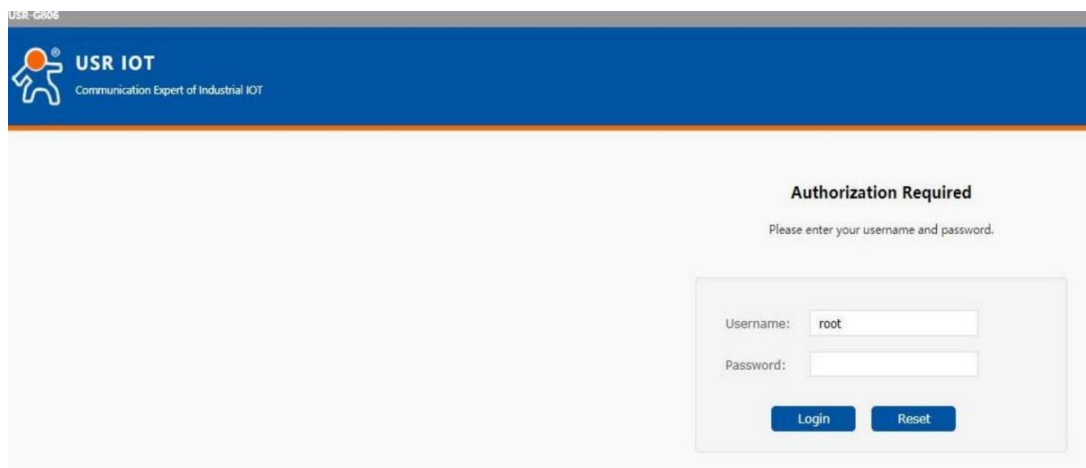


Figure 6.5.2-2 Landing on the home page

(4) Left menu bar, select Network => Network Diagnostics => Ping tool, can ping through the domain name (here to Baidu as an example), that is, the network is normal. You can also directly open the browser, directly enter the website URL you want to log in.

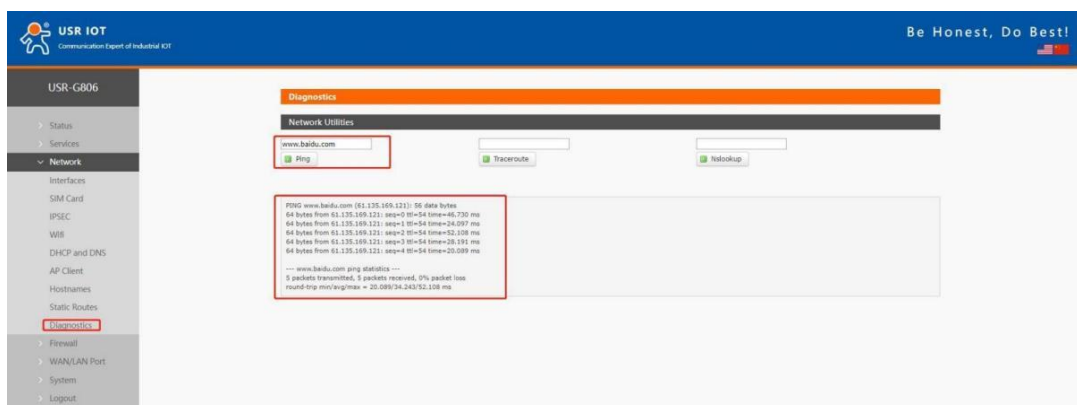


Figure 6.5.2-3 Network Diagnostics Page

07 Alarm and Maintenance

Related explanation:

Serial Number	Term	Explanation
1	Failure	When a device malfunctions, the system stops operating.
2	Alarm	When a device's output power decreases or some functions fail due to external factors, but the system's charging and discharging functions are not affected.
3	Normal operation	Refers to a system that is working every day.
4	Interval operation	Refers to a system with an irregular monthly operation frequency and cannot guarantee daily operation.
5	Lost in use	Refers to a battery system that has not been started for more than 3 consecutive months.

7.1 Alarm Handling

Fault Alarm Handling Method Table

Alarm/Fault	Component	Problem	Solution
Water flooding failure	Battery holder	Storage cabinet flooded	1. Check if there is any water accumulation inside the cabinet. 2. Confirm whether the distributed energy storage cabinet is leaking and whether the equipment inside is in good condition.
Door magnetic alarm	Battery holder	The storage cabinet door is open.	1. Check if the cabinet door is completely closed. 2. Check if the cables on the door magnetic sensor are disconnected. 3. Check if the position of the door magnetic sensor is misaligned.
Fire alarm failure	Battery holder	Battery overheating or catching fire	1. Press the EPO button immediately and quickly move away from the energy storage cabinet. 2. Observe from a safe distance for 30 minutes. If there is smoke or fire, please call the fire alarm number; if there are no abnormalities, manually clear the activity alert and contact the manufacturer.
Lightning arrester alarm	Battery holder	Lightning arrester failure	1. Check if the signal lines of the lightning protection device are loose. 2. Check if the indicator of the lightning protection device has changed color. 3. Replace the AC lightning protection device.

Compressor alarm	Air conditioner	1. Wiring loose 2. Compressor damaged	1. Disconnect the power switch, open the air conditioner wiring box, and check if the wiring is loose. 2. Observe whether there is any obvious damage to the compressor's appearance and whether there is a burnt smell. If so, contact the manufacturer.
Outdoor fan alarm	Air conditioner	1. Wiring loose 2. Fan damaged	1. Disconnect the power switch, open the air conditioner wiring box, and check if the wiring is loose. 2. Observe if the fan has any obvious damage or a burnt smell. If so, please contact the service hotline.
Grid overvoltage /Undervoltage fault	Grid / Generator	Abnormal voltage at the grid connection point	Check whether the voltage at the grid connection side is abnormal.
Grid over-frequency / Under-frequency fault	Grid / Generator	Grid-connected side frequency anomaly	Check whether the frequency at the grid connection side is abnormal.
Island protection failure	Grid / Generator	Abnormal voltage at the grid connection point	Check whether the voltage at the grid connection side is abnormal.
High/Low Voltage Crossing Alarm	Grid / Generator	Abnormal voltage at the grid connection point	Check whether the voltage at the grid connection side is abnormal.
Grid voltage imbalance fault	Grid / Generator	Abnormal voltage at the grid connection point	Check whether the voltage at the grid connection side is abnormal.
Grid phase disconnection	Grid / Diesel	Incorrect phase sequence at the grid connection side	Swap any two of the three cables in the ABC line set
DC voltage high /Low fault	Battery	Abnormal battery voltage	Check whether the DC input voltage is abnormal.
Bus overvoltage fault	Energy storage converter	1. Load imbalance 2. Software anomaly	1. Check if the DC wiring is loose or abnormal. 2. Contact the manufacturer.
Busbar half-voltage imbalance fault	Energy storage converter	1. Load imbalance 2. Software anomaly	1. Check if the load is abnormal. 2. Contact the manufacturer.
Over-temperature alarm triggered	Energy storage converter	Excessive internal temperature	1. Check if the air inlets and outlets of the electrical compartment are blocked. 2. Check if the internal fans are operating normally.

			3. Contact the manufacturer.
Power transistor over-temperature fault	Energy storage converter	Excessive internal temperature	1. Check if the air inlets and outlets of the electrical compartment are blocked. 2. Check if the internal fans are operating normally. 3. Contact the manufacturer.
Balance bridge over-temperature fault	Energy storage converter	Excessive internal temperature	1. Check if the air inlets and outlets of the electrical compartment are blocked. 2. Check if the internal fans are operating normally. 3. Contact the manufacturer.
DC overcurrent fault	Energy storage converter	Excessive direct current	1. Check if there is a short circuit or line damage on the DC side. 2. Replace the energy storage inverter module or contact the manufacturer.
Balance bridge overcurrent fault	Energy storage converter	Excessive internal current	1. Check if the off-grid load exceeds the limit. 2. Replace the energy storage inverter module or contact the manufacturer.
Output overload /Overcurrent fault	Energy storage converter	Excess power/current on the transmission side	1. Check if the grid voltage is normal. 2. Check if there is a short circuit or line damage on the DC side. 3. Check if the off-grid load exceeds the limit. 4. Replace the energy storage converter module or contact the manufacturer.
Wave-by-wave current-limiting failure	Energy storage converter	Excessive side current during communication	1. Check if the grid voltage is normal. 2. Check if the off-grid load exceeds the limit. 3. Replace the energy storage converter module or contact the manufacturer.
Communication interruption failure	Local controller of the energy storage converter	Communication outage	1. Check if the communication cables between the modules are loose or malfunctioning. 2. Check if the communication cable of the local controller is loose or malfunctioning.
Parallel operation /synchronization failure	Energy storage converter	Intermittence of the parallel/synchronous signal	1. Check if the connection cables of the dual-computer system are loose or abnormal. 2. Check if the settings of the dual-computer system are abnormal. 3. Hardware circuit damage.
Relay open /Closed circuit fault	Energy storage converter	Internal relay malfunction, software malfunction	1. Replace the energy storage converter module. 2. Contact the manufacturer to replace the internal components.
Fan 1/2/3 alarm	Energy storage converter	Internal fan malfunction	1. Replace the energy storage converter module. 2. Contact the manufacturer to replace the internal fan.
Leakage current fault	Energy storage converter	1. Excessive leakage current 2. Software anomaly	1. Check if the Hall sensor for leakage current is loose or malfunctioning in its wiring. 2. Check if the grounding wire is disconnected.

Insulation impedance abnormality fault	Energy storage converter / Battery	Low insulation to the ground	1. Check if the AC and DC cables are damaged or have a ground short circuit. 2. Check if the battery circuits are damaged or have a ground short circuit.
Module loss alarm	Energy storage converter	Module communication with the screen has been interrupted.	Check whether the communication cables connecting the modules are loose or malfunctioning.
DC voltage low alarm	Energy storage converter	Battery not turned on	Check if the battery is turned on.
The voltage on the low-voltage side is low for both circuits one and two.	Photovoltaic DC Converter	The open-circuit voltage of the photovoltaic cell is lower than 250V.	Measure the DC voltage between the positive and negative terminals of the photovoltaic switch using a multimeter. Check if it is greater than 250V.

Table 7.1



Warning:

The above-mentioned alarms and faults are common ones. If any faults other than those listed in Table 7.1 occur, please contact the manufacturer directly.

7.2 System Maintenance

Before conducting maintenance and repair operations on the energy storage system, the operators must follow the following safety procedures:

1. Disconnect the DC circuit breaker switch on the high-voltage cabinet panel and make sure it is in the OFF position.
2. Inspect the fire-fighting equipment to ensure that it is in normal working condition.

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

1. The DC circuit breaker switch is in the ON position.
2. Fire-fighting facilities remain in normal working condition.

This energy storage system product has a high level of protection and is suitable for outdoor environments. However, prolonged operation in harsh conditions may lead to aging of the energy storage equipment or damage to the internal components. To extend the service life and improve the performance of the equipment, it is recommended to conduct the following maintenance checks on the energy storage equipment regularly: replace aging or damaged components. Moreover, due to factors such as environmental temperature, humidity, dust, vibration, and the aging of internal components of the inverter, potential problems may arise during the operation of the system. To ensure the long-term stable operation of the energy storage system, maintenance personnel should conduct regular inspections as per Table 7.2 to promptly identify and address any issues. The specific maintenance cycle is as follows:

1. For systems installed in areas with severe dust, high salt spray or in heavily industrialized zones, it is recommended to perform maintenance once a month.
2. In regions with favorable climatic conditions, it is recommended to perform maintenance on the energy storage system once every three months.

Maintenance Processing Table

Maintenance object	Motion	Reference standard
Cabinet	1. Inspect the overall appearance of the machine. 2. Check the ventilation openings. 3. Inspect the door lock condition.	1. There is no obvious peeling of coating, scratches or rust. 2. There are no obvious water leakage marks. 3. The ventilation openings are free of dust accumulation. 4. The door locks are undamaged.
Air conditioner	1. Check for noise and vibration. 2. Clean the filter.	1. The fans and compressors rotate normally without any jamming or abnormal noise. 2. The surface of the filters is clean and there is no blockage.
Fire protection	1. Inspect the appearance 2. Inspect the wiring harness	The wiring is firmly connected and free of contaminants.
PCS	1. Check for noise and vibration. 2. Inspect the front panel ventilation holes. 3. Check the contact surface of the rear copper bus.	1. The fan on the front panel rotates normally without any jamming or abnormal noise. 2. The surface of the ventilation openings on the front panel is clean and free of blockages. 3. The copper strips and contact surfaces are free from corrosion, discoloration, or dust accumulation.
STS	1. Check for noise and vibration. 2. Inspect the front panel ventilation holes. 3. Check the contact surface of the rear copper bus.	1. The fan on the front panel rotates normally without any jamming or abnormal noise. 2. The surface of the ventilation openings on the front panel is clean and free of blockages. 3. The copper strips and contact surfaces are free from corrosion, discoloration, or dust accumulation.
DC/DC	1. Check for noise and vibration. 2. Inspect the front panel ventilation holes. 3. Check the contact surface of the rear copper bus.	1. The fan on the front panel rotates normally without any jamming or abnormal noise. 2. The surface of the ventilation openings on the front panel is clean and free of blockages. 3. The copper strips and contact surfaces are free from corrosion, discoloration, or dust accumulation.
Transformer	1. Inspect the appearance 2. Insulation test	1. The outer shell is clean, with no obvious cracks, deformations, etc. 2. The insulating materials are undamaged, not discolored or charred, and the insulation resistance is within the specified range.
Electric	1. Inspect the lightning arrester. 2. Check the circuit breakers and contactors. 3. Inspect the contact surfaces of the cable copper busbars.	1. The lightning arresters, circuit breakers and contactors are in good condition. 2. The connection lines of the screw sockets are not loose or fallen off. 3. The copper bars and contact surfaces are not corroded, discolored or covered with dust.

Battery pack	1. Check for noise and vibration. 2. Check the contact surfaces of the cable and copper strips.	1. The fan of the battery pack rotates smoothly without any stalling or abnormal noise. 2. The surface of the front panel ventilation holes is clean and free of blockages. 3. The connection lines of the screw sockets are not loose or detached. 4. The copper bars and contact surfaces are not corroded or discolored, and there is no accumulation of dust.
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Table 7.2

7.3 Cleaning and Dust Removal Process

7.3.1 Preparations Before Dust Removal



Note:

Please prepare at least the following tools. If the tools are insufficient, there may be a possibility that the maintenance cannot be completed. The handles of the tools such as the Phillips screwdriver need to be insulated for protection, or insulated tools should be used.

Cleaning tools:

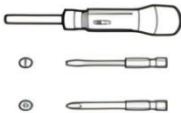
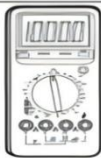
 Cross screwdriver	 Multimeter	 Rubber hammer	 Insulated ladder
 Vacuum cleaner	 Water Gun		

Figure 7.3.1-1

Protective equipment:

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

Figure 7.3.1-2

7.3.2 Cleaning and Maintenance

Cleaning and Maintenance Schedule

Category	Action	Reference standard	Whether system powered off
Cabinet	Clean the ventilation openings	There is no dust accumulation at the ventilation openings.	Yes
Cabinet	Cleaning dust-proof cotton	No insects, rats, snakes or other animals entered.	Yes
Cabinet	Rinsing the appearance	The dust-proof cotton has no obvious color changes or impurities.	Yes
Air conditioner	Clean the radiator	1. The surface of the radiator is clean and free of obstructions. 2. The fan rotates normally without any stalling or abnormal noise.	Yes
Power distribution area	Check if there are any foreign objects in the power distribution area.	Clean and free of foreign objects within the area	Yes
Note: In sand-dust areas, it is recommended to clean the filter once after each sandstorm; it is advisable to clean once before the onset of summer; for other areas, ensure that the filter or condenser is free of blockages based on actual conditions; the dust-proof cotton should be used for a maximum of 2 years. Recommended tool: High-pressure water gun.			

Table 7.3.2

7.3.3 Operating Steps

Step 1: Power off and shut down the system

1. Click on the touchscreen switch interface and select "System Off".;
2. Disconnect the auxiliary power switch and the DC power switch;
Disconnect Deg QF, Grid QF, Load QF and PV QF;
3. Disconnect the DC Breaker of the battery's high-voltage control box;
4. Shut off the upper-level power switch of the system and hang a "Do Not Close" maintenance sign.

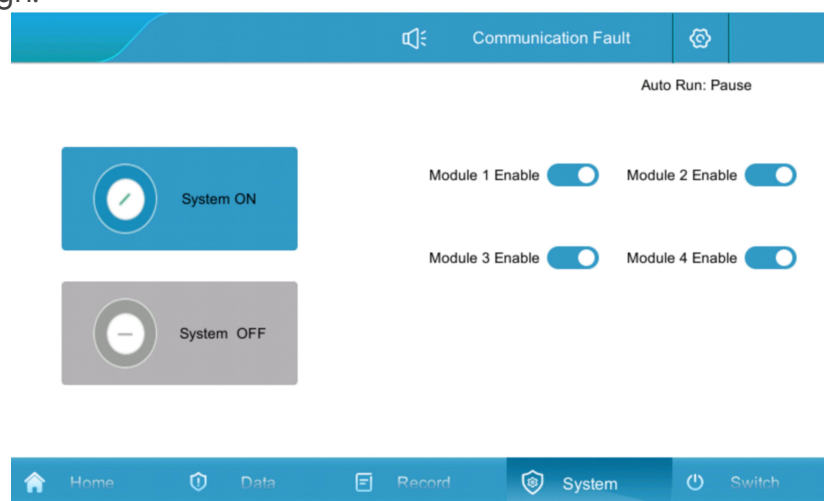


Figure 7.3.3-1

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

Step 3: Disconnect the main circuit breaker of the power supply distribution box and hang a "Do Not Close" maintenance sign.

Use a multimeter to check if the equipment is still energized inside. Only proceed with the next step when the equipment is no longer powered.



Figure 7.3.3-2

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



Figure 7.3.3-3

Step 5: Use a high-pressure water gun to rinse the dust-proof cotton. If it gets too dirty, you can clean it with a cleaning agent.

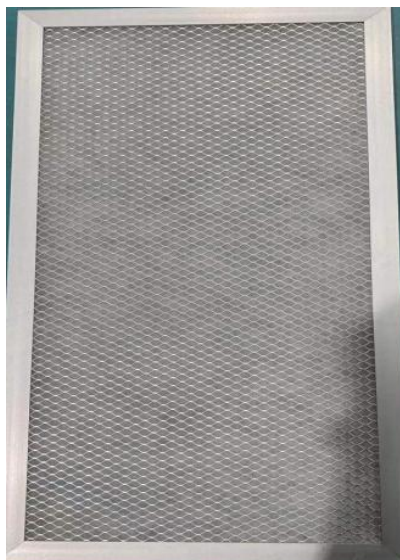


Figure 7.3.3-4

Step 6: After the dust-proof cotton has been cleaned, place it in the aluminum dust-proof cotton frame, let it dry, and then fix it with the clips.

Step 7: Restart the machine

7.4 Warranty Services

7.4.1 Warranty Period

Provided that the product is used correctly, the warranty period shall be in accordance with the agreement stipulated in the business contract.

7.4.2 Warranty Scope

During the warranty period, the company will provide free repair or replacement for any malfunction caused by defects in the product itself. The customer shall allow a reasonable response time for the company to carry out repairs. Replaced products shall be disposed of by the company. The customer must present valid proof of purchase and ensure that the product trademark is clearly visible; otherwise, the company reserves the right to decline warranty coverage.

7.4.3 Disclaimer Statement

Under the following circumstances, the company shall have the right to decline warranty coverage but may still provide paid repair services.

1. The product has exceeded the warranty period.
2. Valid proof of purchase cannot be provided.
3. Damage caused during transportation or handling.
4. Damage resulting from improper installation, modification, or repairs performed by unauthorized personnel.
5. Damage caused by operation under abnormal conditions or in unsuitable environments.
6. Malfunction or damage resulting from the use of non-Naton components or software.
7. Failures caused by force majeure, such as fire, earthquake, or flood.

Appendix

Emergency Response Procedures for Energy Storage Systems

Battery Drop or Severe Impact

If obvious odor, damage, smoking, or fire is observed:

Immediately evacuate all personnel, call emergency services, and contact professional emergency responders.

Only trained personnel should attempt to extinguish the fire using appropriate firefighting equipment, while ensuring their own safety.

If no obvious deformation, damage, odor, smoking, or fire is observed:

Warehouse Scenario: Evacuate personnel. Using specialized mechanical tools, trained personnel must move the battery to an open, safe outdoor area. Contact a service engineer immediately. Monitor the battery for at least one hour, ensuring its temperature stabilizes within a range of $\pm 10^{\circ}\text{C}$ of ambient temperature, before proceeding with further handling.

Energy Storage System Site: Evacuate personnel and close the cabinet doors. Trained personnel must move the battery to a safe area. Contact a service engineer. The battery must be left untouched for at least one hour before any further assessment or handling is performed.

Flood Occurrence

Immediately power down the energy storage system, but **only** if it is absolutely safe to do so.

If any part of the battery has been submerged, **DO NOT TOUCH** the battery to avoid the risk of electric shock.

DO NOT continue to use batteries that have been submerged in water. Contact the designated recycling company for professional disposal in accordance with hazardous waste treatment procedures.

In Case of Fire



Warning:

Power down the system if it is safe to do so.

Use a carbon dioxide (CO_2), FM-200, or ABC dry chemical fire extinguisher to fight the fire. Firefighters must avoid contact with high-voltage components to prevent the risk of electric shock.

High battery temperatures may cause deformation, electrolyte leakage, and the release of toxic gases. Wear appropriate respiratory protection, keep a safe distance from the scene, and avoid skin exposure to prevent irritation and chemical burns.

When the audible and visual alarm is activated

DO NOT approach or open the equipment doors. Immediately evacuate the area.

If it is safe to do so, cut off the system power remotely.

In case of vent activation

On-site personnel protection: It is strictly forbidden to operate directly facing or in close proximity to the vent outlet to avoid injury from expelled high-temperature gases or materials.

Post-incident maintenance: A service engineer must be contacted to conduct a comprehensive inspection and professional assessment of the system.

Emergency handling in case of refrigerant leakage



Warning:

Immediately cut off power and evacuate personnel. Prohibit any open flames or spark-generating operations (to prevent deflagration).

After troubleshooting, clean the interior of the system. Restore power and check if the system is functioning normally. If any abnormalities are detected, contact the relevant engineer promptly.

Key Repair Points:

Use a leak detector to locate the leak (check compressor shaft seals and condenser joints).

Minor Leak: Recover the refrigerant, then tighten the seals.

Major Leak: Replace the faulty components.

In the Event of Fire Suppressant Discharge or Fire

Instructions for Operations and Maintenance Personnel:

Evacuate Immediately and Alert: Evacuate the area immediately and call the emergency services. Provide information such as the battery type, system capacity, and location layout.

Do Not Re-enter and Isolate the Area: Do not re-enter the fire zone or open the energy storage system cabinet doors. Isolate the scene and maintain a watch.

Remotely Power Down Safely: Power down the system remotely, but **only** if you can do so safely.

Provide Product Information: Provide the firefighters with detailed product information and the user manual.

Leave Handling to Professionals After the Fire: After the fire is extinguished, only trained professionals may handle the system. **DO NOT OPEN** the cabinet doors under any circumstances.

Contact Service Engineer: Contact a service engineer for a comprehensive system assessment and subsequent maintenance.

Instructions for Firefighters:

Refer to Provided Information: Refer to the product information provided by the operations personnel for context.

Do Not Open Doors Until Safe: Do not open the energy storage system cabinet doors before ensuring it is safe to do so.

Control and Contain the Fire: Employ control measures to extinguish the fire and prevent it from spreading to adjacent energy storage cabinets.



User Manual

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