OLP Rack mounted LFP rechargeable Li-ion battery system

User Manual

OLiPower Energy & Automation Technology Co.,Ltd

Warning!

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1. The device has a high voltage. Improper operation may cause electric shock or fire, resulting in personal injury or equipment damage. Please operate in a standardized manner:

Please follow the operating procedures and safety precautions given in this manual.

Please observe the safety and Warning signs on the equipment.

Please follow the requirements of this manual, use the correct tools, and use the tools correctly.

Please comply with the tightening torques specified in this manual and mark the torque markings correctly.

Please comply with the relevant safety regulations of the power plant and implement the work ticket system as required.

Please arrange for professionals to install, operate and maintain the equipment. Unauthorized personnel are not allowed to approach the equipment. Warning isolation must be set up when the equipment is operated.

Please ensure that the Warning signs and safety signs on the equipment are clearly visible. If there are any defects, please replace them in time.

2. It is prohibited to install, operate or maintain equipment while it is energized.

Do not use water to clean the equipment.

It is prohibited to change the structure and installation sequence of the equipment without authorization.

It is prohibited to put damaged equipment into operation.

Personnel who are not wearing safety protective equipment are prohibited from installing, operating or maintaining the equipment.

Do not power on the equipment before the installation is completed or confirmed by professionals.

When the equipment is running, it is forbidden to open the cabinet door frequently.

3. It is prohibited to perform electric welding, drilling, cutting and other operations on the equipment.

Do not touch the device casing at will, as this may result in burns.

During the operation of the equipment, if personal injury occurs or equipment is damaged, the operation should be stopped immediately.

During operation, metal objects such as metal chips and screws should be prevented from

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entering the equipment.

4. Safety Symbol Description

	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.

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Catalogue

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1. Abbreviations

Abbreviation	Description – EN
OLP	OLiPower Technologies Co.,Ltd
BESS	Battery Energy Storage System
BMS	Battery Management System
BMU	Battery Management Unit
BSU	Battery Sampling Unit
BOL	Beginning of Life
CAN	Controller Area Network
DC	Direct Current
DOD	Depth of Discharge
EOL	End of Life
ESS	Energy Storage System
HMI	Human Machine Interface
IP	Ingress Protection
kWh	Kilo-Watt Hour
MCB	Main Circuit Breaker
MCCB	Molded Case Circuit Breaker
ms	millisecond
PDU	Power Distribution Unit
SCADA	Supervisory Control and Data Acquisition
SOC	State of Charge
SOE	State of Energy
SOH	State of Health
SOP	State of Power

Table 1 Abbreviations

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2. Safety Precautions

This chapter introduces safety notices. Before performing any operation on the device, please carefully read the user manual, follow the operating and installation instructions, and comply with all danger, warning, and safety information to avoid personal injury and equipment damage caused by abnormal operation.

2.1. Safety Notice

This section mainly introduces safety precautions during operation and maintenance. For detailed information, please refer to the safety instructions in the relevant sections.

Caution!

- Before operation, please carefully read the announcement and operating instructions in this section to avoid accidents.
- The prompts in the user manual, such as "Danger", "Warning", "Caution", etc., are not include all safety notices. They are just supplementing to safety notices during operation.
- Any equipment damage caused by violation of general safety operation requirements or safety standards for design, production, and use will not be in the scope of product warranty.

2.1.1. Usage Notice

Danger

Do not touch terminals or conductors connected to the power grid to avoid fatal risks!

Warning

There are no operating components inside the device. Please do not open the system casing by yourself, otherwise it may cause electric shock. The system damage caused by illegal operations exceeds the warranty scope.

Danger

- Damaged equipment or equipment malfunctions may result in electric shock or fire!
- Before performing any operation on the equipment, please visually inspect whether the equipment is damaged or dangerous.
- Check if the connections of other external devices or circuits are secure.

Danger

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Before inspection or maintenance, if the DC and AC sides have just been powered off, it is necessary to wait for 20 minutes to ensure that the equipment is completely discharged before proceeding with the operation.

Warning

When repairing, ensure that all switches are completely disconnected and set warning signs at the disconnected position to avoid accidental re-connection.

Warning

Please do not put your fingers or tools into the rotating fan to avoid personal injury or equipment damage.

Caution!

Do not allow liquids or other objects to enter the cabinet.

Warning

If a fire occurs, please use a dry powder fire extinguisher. If a liquid fire extinguisher is used, it may cause electric shock.

Warning

The label on the device contains important information about safe operation. Do not tear or damage them!

2.1.2.Static Protection

Caution!

To prevent damage to sensitive components (such as circuit boards) caused by human static electricity, please make sure to wear an anti-static wristband and ensure the other end is properly grounded before touching sensitive components.

2.1.3.Grounding Requirements

Warning

- High risk of leakage! Before making electrical connections, the equipment must be grounded. The grounding terminal must be grounded.
- When installing equipment, it must be grounded first. When dismantling the device, the grounding wire must be removed at the end.
- Do not damage the grounding wire.

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- The equipment should be permanently connected to the protective grounding. Before operation, the electrical connections should be checked to ensure reliable grounding of the equipment.

2.1.4.Moisture Protection

Caution!

- Moisture intrusion may cause system damage!
- Observe the following items to ensure that the equipment is functioning properly.
- Do not open the cabinet door of the equipment when the environmental humidity exceeds 95%.
- Do not open the cabinet door of the equipment for maintenance or repair in damp or humid weather.

2.1.5.Security Warning Label Setting

- To prevent accidental personnel approaching the equipment cabinet or improper operation, the following requirements should be followed during installation, daily maintenance, or repair.
- Set warning labels at the switches of the battery input and AC input to prevent improper switching.
- Set up warning signs or safety warning tapes in the operating area to prevent personal injury or equipment damage.
- After maintenance, make sure to remove the key to the equipment cabinet door and store it properly.

2.1.6.Measurement During Equipment Operation

There is high voltage in the device. If accidentally touched, it may cause electric shock. Therefore, when conducting measurement operations during equipment operation, the operator must be accompanied by someone and take protective measures (such as wearing insulated gloves).

The measuring device must meet the following requirements:

- The measuring range and operational requirements of the measuring device meet the on-site requirements.
- The connection of the measuring device should be correct and standardized to avoid arcing.

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2.2. Operator Requirements

- The operation and wiring of the equipment should be carried out by qualified personnel to ensure that the electrical connections comply with relevant standards.
- Before installing, operating, and maintaining the equipment, the operator must understand the safety notice, know the correct operation, and receive strict training.
- The operator should be familiar with the structure and working principle of this product.
- Operators must be familiar with relevant national and regional standards.

2.3. Operating Environment Requirements

The operating environment may affect the service life and reliability of the equipment. Therefore, please avoid using the device in the following environments:

- Places where the temperature and humidity exceed the technical specifications (temperature: -20 ℃~+45 ℃; relative humidity: 0%~95%).
- Places with vibration or impact.
- Places with dust, corrosive substances, salt, or flammable gases.
- Poor ventilation or enclosed areas.

3. Product Introduction

This chapter mainly introduces the product features, appearance and operation panel, working principle, operation mode, etc.

3.1. Product Overview

3.1.1. 电池簇铭牌

Plate material: 304 stainless steel

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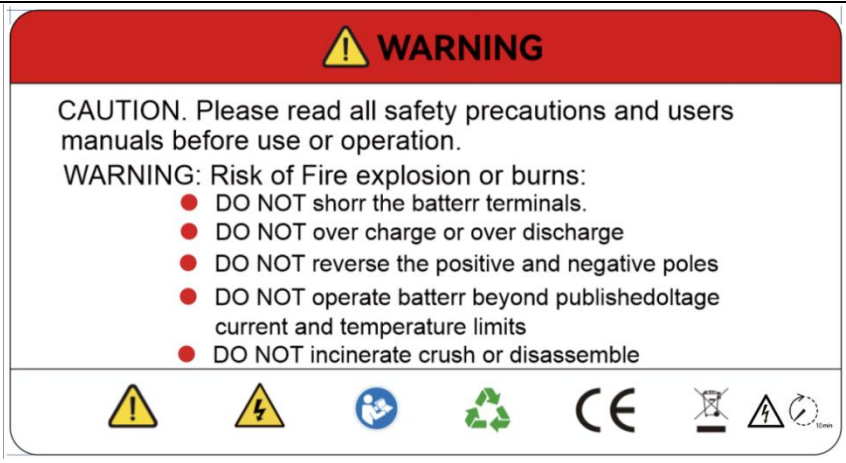

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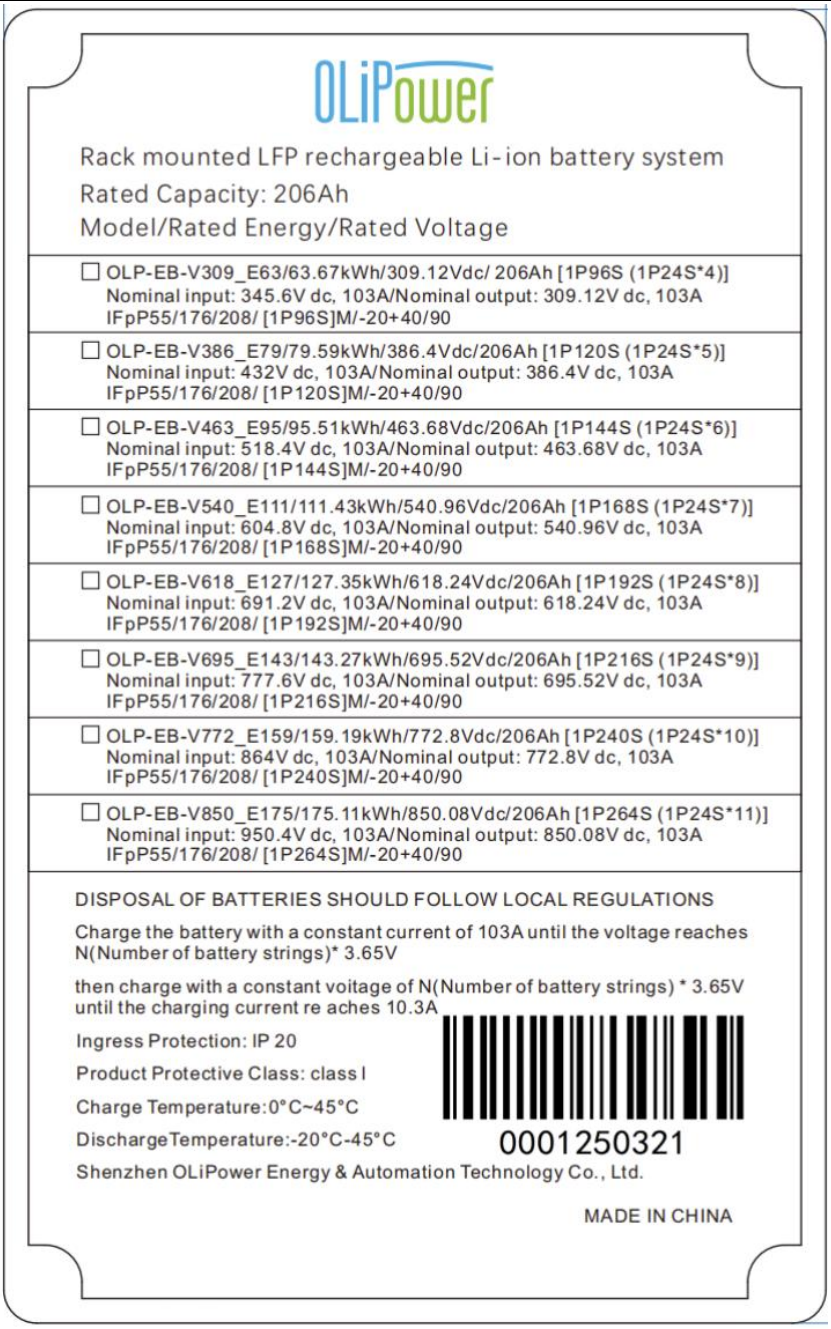

3.1.2.Energy Storage System

➢ Air-cooled Battery Pack

The battery module is a sealed unit with air-cooled cooling. The ventilation holes on the casing measure 6mm × 18mm, preventing direct access to the internal cells and terminals.

The battery pack contains battery cells, BSU (Battery Data Acquisition Unit), temperature sensors, and liquid cooled chassis. The BSU collects data from the battery

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cells and uploads it to the battery management system.

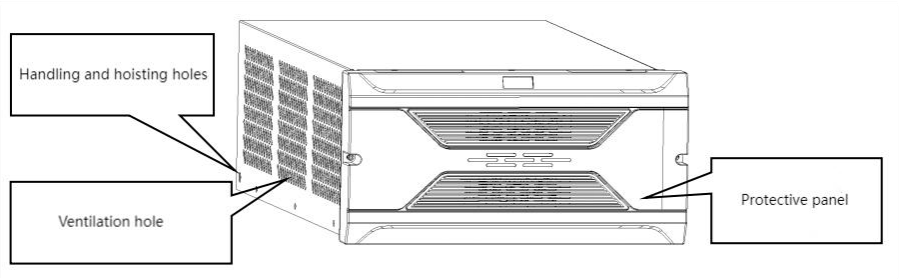

Figure 3.1.1-1 Appearance of Battery Pack

➢ Battery pack parameter list:

No.	Item	Specifications/Parameters	Note
1	Nominal Voltage (V)	77.28	
2	Working Temperature Range (V)	67.2~86.4	
3	Rated Capacity (Ah)	≥206.0	25±2℃, 0.5C, 2.5-3.65V
4	Rated Energy (kWh)	≥15.91	25±2℃, 0.5C, 2.5-3.65V
5	AC Resistance (mΩ)	≤12.0	New battery status, at 1KHz
6	Configuration	1P24S	
7	Insulation Value (MΩ)	≥300	Set the test voltage 1000V, the test resistance value > 300MΩ is judged as normal.
8	Withstanding Voltage Value	3300V,1mA	Set the test voltage 3300VDC, climb time 0.1S, test time 3S, leakage current <1mA is judged as normal.
9	Weight (Kg)	~120±1Kg	
10	Dimension (W*D*H) (mm)	464*230*880mm	
11	Standard Charge/Discharge Current (A)	103/103	25±2℃

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12	Maximum Continuous Charge/Discharge ratio	1P/1P	25±2℃/20-45℃
13	Charging Temperature Range	0~45	
14	Discharging Temperature Range	-20~45	
15	Humidity (%)	0~95	No condensation
16	Module Cooling Method	Forced air-cooled	
17	Module Heating Method	None	
18	SOC (Charge on shipment)	30±5%	
19	Module Self-Discharge Rate	≤3% / month	New shipped cells, 25±2°C, 30% storage within 3 months
20	Cycles	≥6000	0.5C，95%DOD，80%SOH
21	IP Rating	IP20	
22	Altitude (m)	≤2000	
23	Storage Temperature Range (℃)	-20~45	
24	Anti-corrosion grade	C3	
25	Service Life	10 years or 6000 cycles	Whichever condition comes first
26	Attestation	EC62619 IEC62040 IEC61000 UN38.3 MSDS	

Table 3.1.1-2 Battery Pack function Parameters

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➢ Interface definition

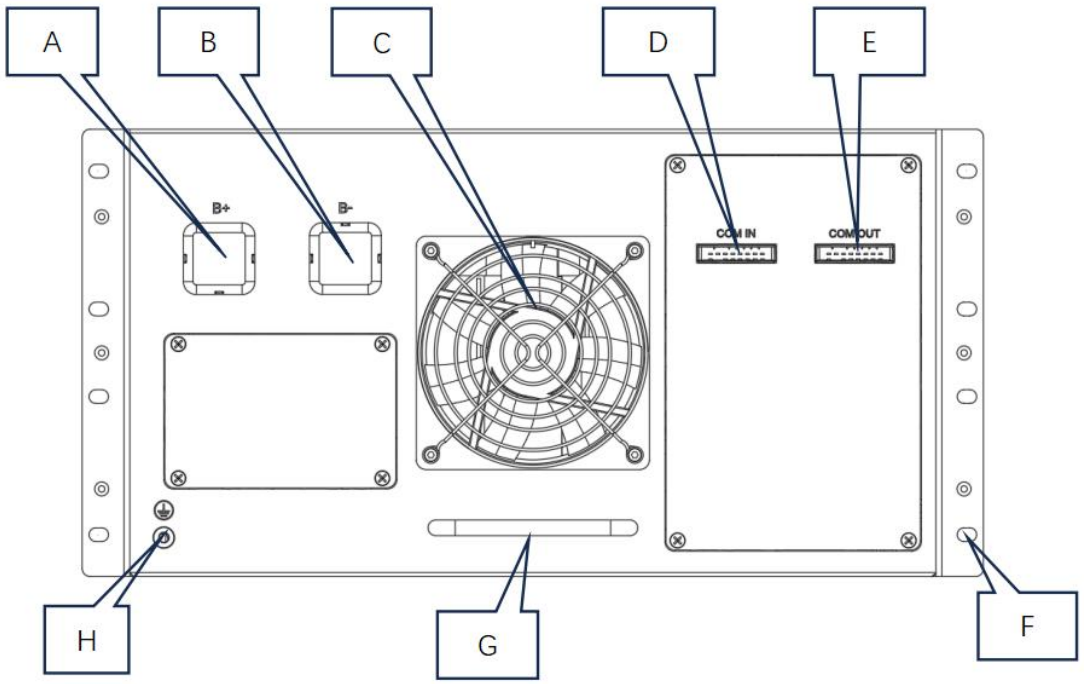

Figure 3.1.1-3 Battery pack panel interface

No.	Item	Identification	Note
A	Positive Pole	B+	
B	Negative Pole	B-	
C	Fan		
D	Power Supply and	COM IN	
E	Power Supply and	COM OUT	
F	Pack Fixing Holes		
G	Handle		
H	Grounding Bolt Hole		

Table 3.1.1-4 Description of battery pack panel interface

➢ High-voltage control box

The high-voltage control box contains BMU (Battery Management Unit) high-voltage contactors, high-voltage fuses, current transformers, etc. Used to control the closure and disconnection of DC circuits. Realize various levels of protection for DC side voltage,

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temperature, and current.

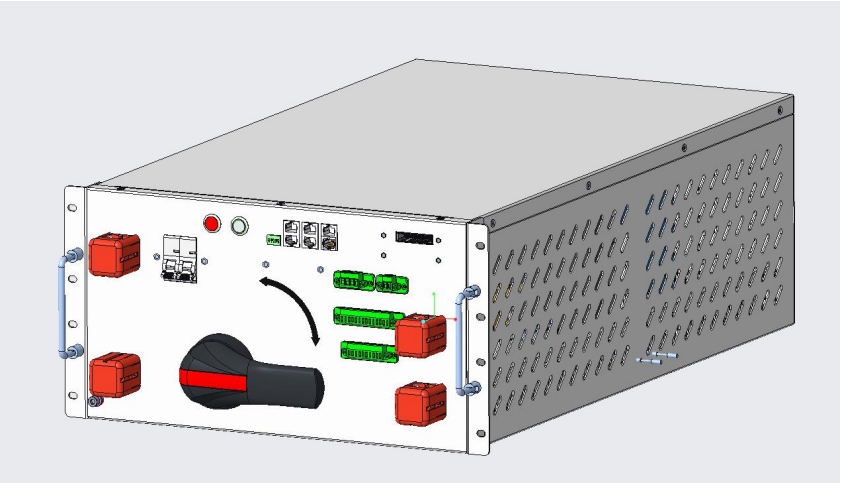

Figure 3.1.1-5 Appearance of High Voltage Control Box

➢ HV box parameter list:

No.	Item	Specifications/Parameters
1	Max. Working Voltage of Main Circuit	DC 1000V
2	AC Power Supply	AC230V 50Hz 10A
3	Rated Charge/Discharge Current	103A/103A
4	Max. Charge/Discharge Current	200A/200A
5	Active Protection	250A contactor
6	Passive Protection	315A/1500Vdc Fuse
7	Manual circuit breaker	250A/1500Vdc Isolation switch
8	General Operating Temperature	25°C
9	Storage Temperature Range	-20°C to +45°C
10	Series Unit	4~11 Battery modules in series
11	External Communications Interface	CAN3/RS485-1
12	Parallel Communication Interface	CAN2
13	Internal Communication	CAN1

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	Interface	
14	Maintenance Monitoring Interface	RS232
15	Thermal Management Communication Interface	RS485-2
16	Dimensions (W*H*D)	464*230*720 mm
17	Weight	~30kg
18	IP Rating	IP20

Table 3.1.1-6 High Voltage Control Box function Parameters

- Interface definition

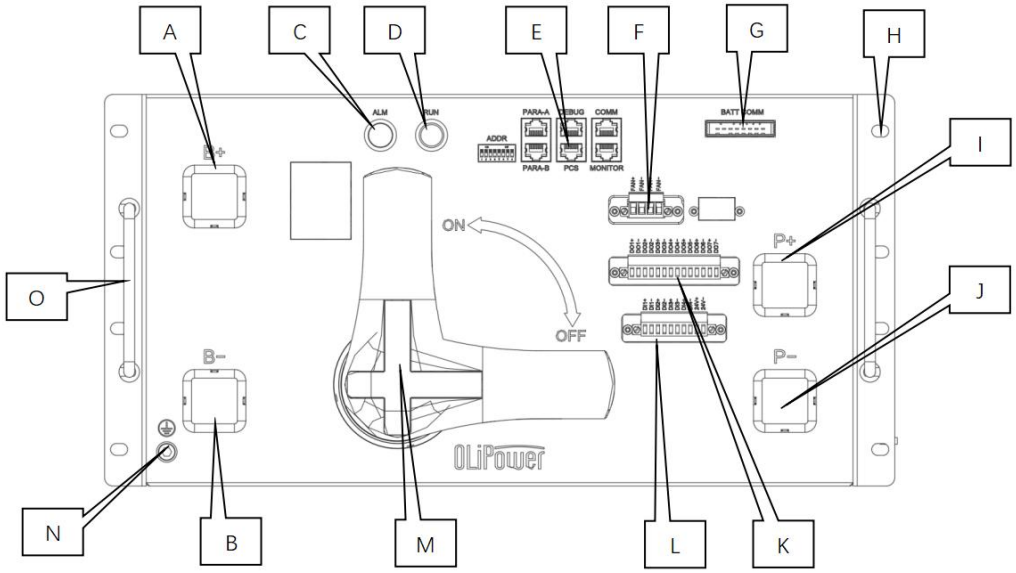

Figure 3.1.1-7 High Voltage Control Box interface

No.	Item	Identification	Note
A	Battery Positive Pole	B+	Red
B	Battery Negative Pole	B-	Black
C	Fault Indicator Light	ALM	Red
D	Operation Indicator Light	RUN	Green
E	Interface Board		
F	Pack Fan Control Terminal		
G	Pack Communication Interface		

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H	Rack Fixing Hole		
I	Inverter Positive Pole	P+	Red
J	Inverter Negative Pole	P-	Black
K	DO Terminal Block		
L	DI Terminal Block		
M	Disconnector Switch		When the handle of the isolating switch is moved up or down, the switch remains ON, allowing DC connection. When the switch is OFF, it isolates all live components on the DC side, preventing contact with live parts.
N	Grounding Terminal		
O	Handle		

Table 3.1.1-8 Description of High Voltage Control Box interface

3.1.2.Product Series Parameter Table

Item		Specification
Battery cluster (1 high-voltage control box, 4 battery modules)		
Model	OLP-EB-V309_E63	parameter
Battery Cabinet Parameters	Rated Voltage (V)	309.12Vdc
	Voltage Range(V)	268.8~345.6Vdc
	Cluster Configuration	1P24S-4S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	63.67kWh
	HV BOX Voltage (V)	1000
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(No condensation)
	Latitude(m)	≤3000
	weight	510±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle

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Battery cluster (1 high-voltage control box, 5 battery modules)		
Model	OLP-EB-V386_E79	parameter
Battery Cabinet Parameters	Rated Voltage (V)	386.4Vdc
	Voltage Range(V)	336~432Vdc
	Cluster Configuration	1P24S-5S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	79.59kWh
	HV BOX Voltage (V)	1000
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(，No condensation)
	Latitude(m)	≤3000
	weight	630±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle
Battery cluster (1 high-voltage control box, 6 battery modules)		
Model	OLP-EB-V463_E95	parameter
Battery Cabinet Parameters	Rated Voltage (V)	463.68Vdc
	Voltage Range(V)	403.2~518.4Vdc
	Cluster Configuration	1P24S-6S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	95.51kWh
	HV BOX Voltage (V)	1000
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(，No condensation)
	Latitude(m)	≤3000
	weight	750±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle
Battery cluster (1 high-voltage control box, 7 battery modules)		
Model	OLP-EB-V540_E111	paramete
Battery Cabinet Parameters	Rated Voltage (V)	540.96Vdc
	Voltage Range(V)	470.4~604.8Vdc
	Cluster Configuration	1P24S-7S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	111.43kWh
		1000

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	HV BOX Voltage (V)	
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(，No condensation)
	Latitude(m)	≤3000
	weight	870±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle
Battery cluster (1 high-voltage control box, 8 battery modules)		
Model	OLP-EB-V618_E127	paramete
Battery Cabinet Parameters	Rated Voltage (V)	618.24Vdc
	Voltage Range(V)	537.6~691.2Vdc
	Cluster Configuration	1P24S-8S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	127.35kWh
	HV BOX Voltage (V)	1000
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(，No condensation)
	Latitude(m)	≤3000
	weight	990±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle
Battery cluster (1 high-voltage control box, 9 battery modules)		
Model	OLP-EB-V695_E143	paramete
Battery Cabinet Parameters	Rated Voltage (V)	695.52Vdc
	Voltage Range(V)	604.8~777.6Vdc
	Cluster Configuration	1P24S-9S
	Rated Charge/Discharge Current(A)	103A
	Max. Charge/Discharge Current(A)	200A（25±2℃/20-45℃）
	Rated Energy (kWh)	143.27kWh
	HV BOX Voltage (V)	1000
	Working Temperature (℃)	-20~+45
	Storage Temperature (℃)	-20~+45
	Humidity	0~95%RH(，No condensation)
	Latitude(m)	≤3000
	weight	1110±5kg
	Production/Manufacturing Address:	China
	quality assurance	6000 cycle
Standard charging method:		

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Charge the battery with a constantcurrent of 103A until the voltage reaches N(Numberof battery strings)* 3.65V then charge with a constant voitage of N(Number of battery strings) 3.65V until the charging current re aches 10.3A

Table 3.1.2-1 Product Series Parameter Table

- Battery cluster

The battery cluster is equipped with a battery module and a high-voltage control box inside. The power circuit is connected in series with power cables, and the communication circuit is connected with shielded multi-core wires.

Configuration	1P264S
Nominal energy	175.11kWh
Operating Voltage Range	739.2~950.4Vdc
Max. Charge/Discharge current	200A
Dimension (W*D*H) mm	464*880*1900mm
Weight	≈1350kg
Accreditation	EC62619 IEC62040 IEC61000 UN38.3 MSDS

Table 3.1.1-9 Technical Parameters of Battery Clusters

Battery Management System

Battery management systems are categorized into 2 levels: BMU and BSU.

- The BSU is installed in the battery module and is responsible for collecting data from the battery cells in the battery module and uploading it.
- The BMU is installed in the high-voltage control box and is responsible for receiving and processing the battery cell voltage and temperature data uploaded by the BSU, the current transformer data, as well as SOC calculations and corrections, and executing all levels of logic protection such as current, voltage, and temperature.

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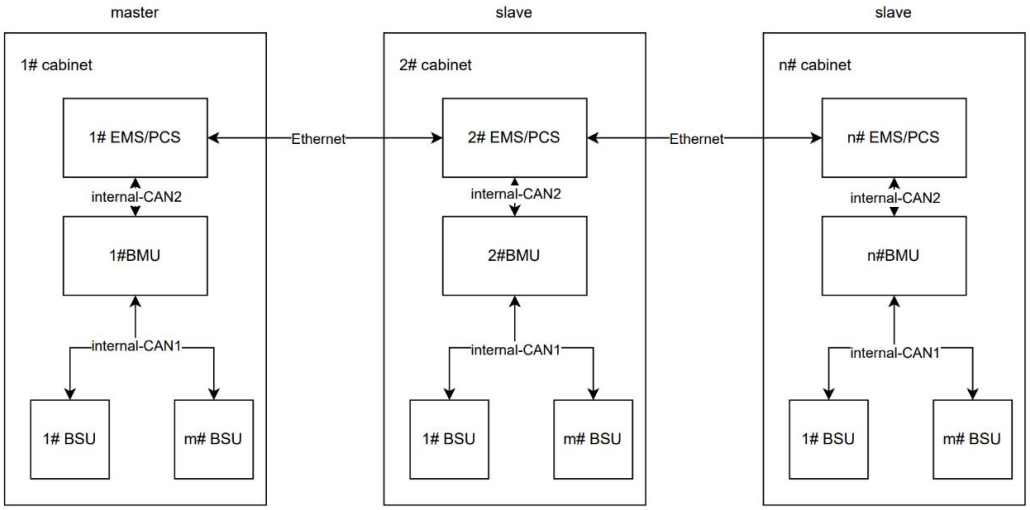

Figure 3.1.1-10 Management System Topology

NO.	Items	Parameters
1	Supply Voltage	BMU&BSU：24Vdc
2	Individual Voltage Sampling Accuracy	±5mV（0℃~60℃）
3	Total Voltage Sampling Accuracy	1% FSR
4	Total Voltage Sampling Range	0~1500Vdc
5	Current Sampling Accuracy	1%RDG
6	Current Sampling Range	-200~+200A
7	Temperature Sampling Accuracy	±2℃（-10℃~+50℃）
8	SOC Accuracy	≤5%; The system needs to be fully charged once a month

Table 3.1.1-11 Battery Management Unit

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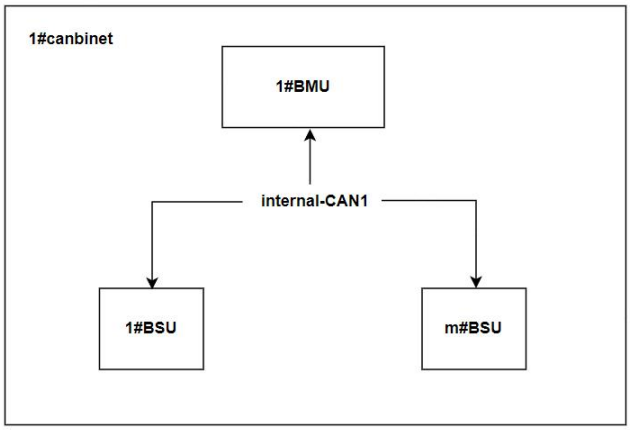

Figure 3.1.1-12 Topology diagram of battery management unit

4. System lock function

The battery system has a non-resettable function to stop operation when one or more cells in the battery system deviates from the operating region during operation. This feature shall not be user resettable or allow for automatic reset.

The battery's functionality can be restored only after a professional has checked that the battery's condition meets the conditions for normal operation.

The system lock is designed to prevent the spread of malfunctions, avoid secondary accidents (e.g. thermal runaway, fire, etc.), and improve overall passive safety.

System lock trigger parameter:

No.	Name of event	Trigger conditions	Release conditions
1	HIGH VOLTAGE FAULT LOCK	Max Cell voltage >=3800mV, 5s	Max Cell voltage <3800mv, Unlocked by RS485 command.
2	LOW VOLTAGE FAULT LOCK	Min Cell voltage <=1900mV, 5s	Min Cell voltage > 1900mv, Unlocked by RS485 command.
3	HIGH TEMPERATURE LOCK	Max cell temperature>= 62℃,5s	Max cell temperature <62°C, Unlocked by RS485 command.
4	LOW TEMPERATURE LOCK	Min cell temperature<=-22℃,5s	Min cell temperature > -22°C, Unlocked by RS485 command

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5	OVER CURRENT LOCK	Charge and discharge current logic is the same Current > 205A 60S Current > 210A 30S Current > 220 2S If any of the above conditions are triggered, an overcurrent will occur, and 3 restarts are allowed after the overcurrent occurs, with a 15-minute delay between events, and no recovery will be made after the 4th attempt	Restart the battery, Unlocked by RS485 command
6	CONTACTOR FAIL LOCK	Contactor fault: Simply described, the current battery contactor has been disconnected, but there is still a continuous rise in current or voltage	Restart the battery, Unlocked by RS485 command
7	SAMPLING CHIP FAILURE LOCK	The sampling chip reporting fails	Restart the battery, Unlocked by RS485 command

5. Installation

This chapter introduces the installation of energy storage cabinets, including preparation before installation, installation environment, inverter installation, electrical connection requirements, etc.

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5.1. Installation Preparation

5.1.1. Installation Tools

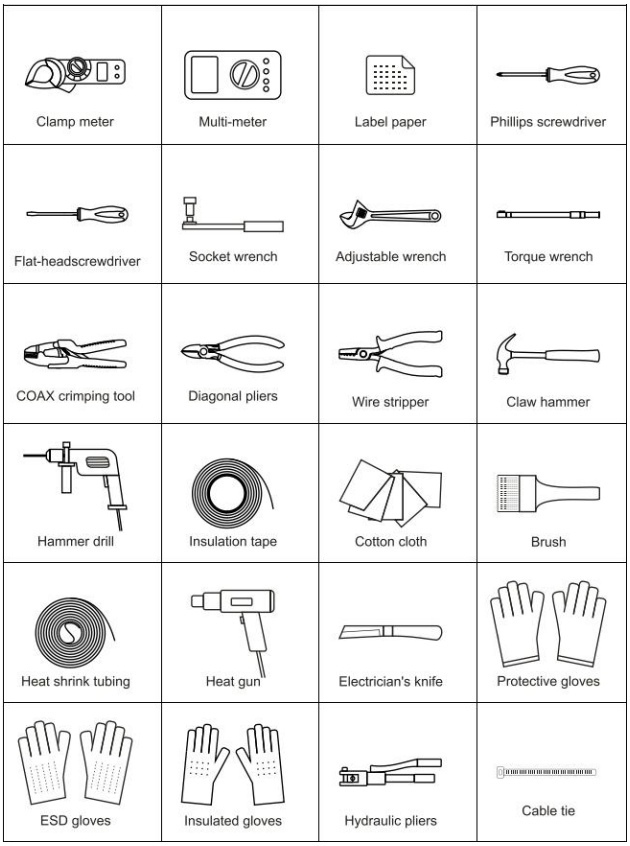

Figure 5.1.1-1 Installation Tools Table

Caution!

The installation tools must be insulated to avoid electric shock.

5.1.2. Battery Cluster Installation

During the installation of the battery cluster, please note that it is installed from the top to the bottom, not from the bottom to the top, and during the dismantling of the battery cluster, please note that it is taken from the bottom to the top, not from the top to the bottom. Each battery box weight ≈ 130kg, the installation requires four people at the same time using hooks inserted into small holes, together with the electric forklift wheels (as shown below), the battery box in the movement of the need for people to help, to prevent the battery box

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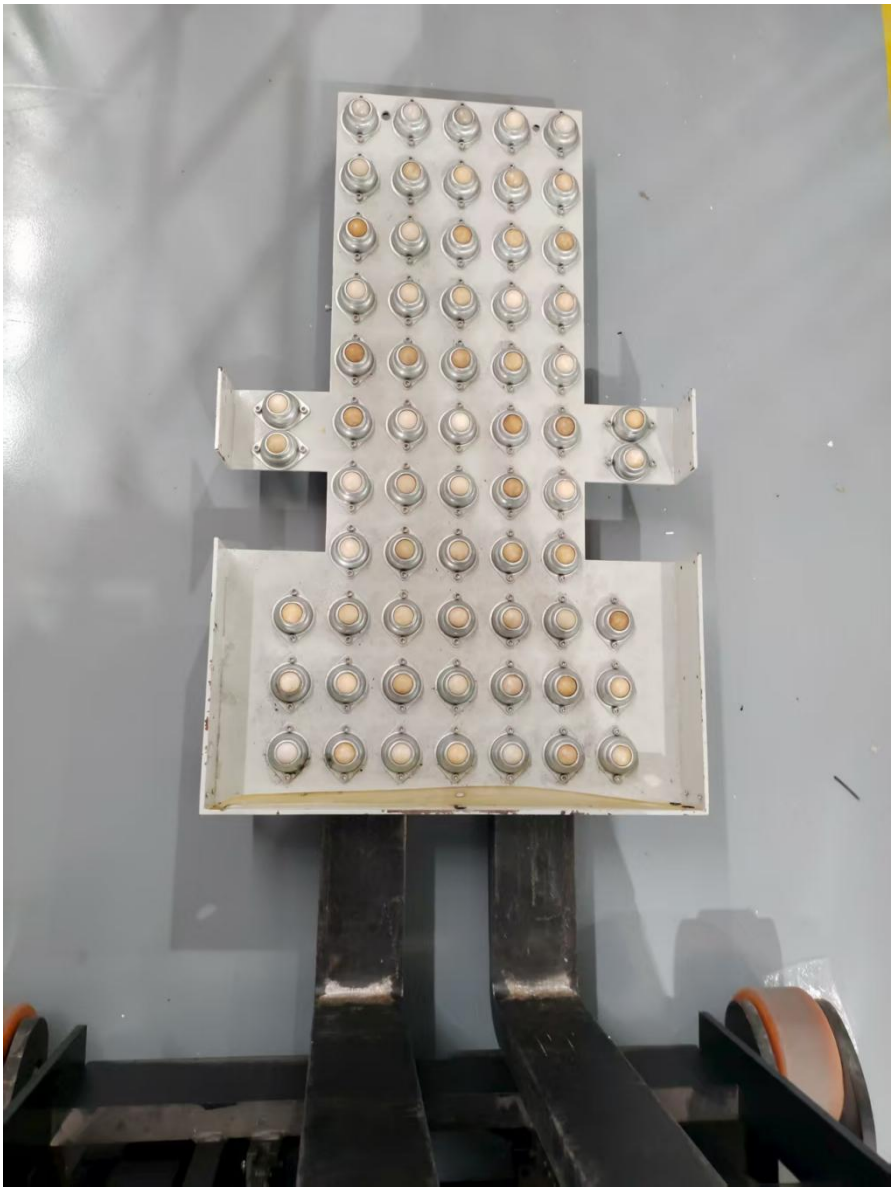
slipped and pay attention to the full and so on, to the mouth of each slot need to be slowly pushed into the installation in place, around the battery box can not be touched, can not be off the paint, can not be contaminated, can not be gaps and so on, all the battery box installation is complete! After the battery box and ground line need to be fixed with M6 * 20 cup head socket head screws lock, and then use the power cable for each battery box positive and negative series connection up, use M8 * 16 cup head socket head screws fastening, cover the red and black insulated cover, docking power lines and communication lines, and do a good job of each line marking for later troubleshooting anomalies and maintenance.



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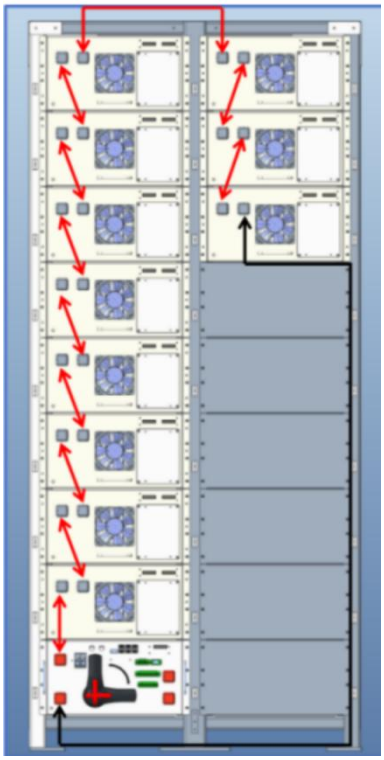
The high-voltage enclosure of the battery cluster, along with the DC-side power lines and wiring configuration of the battery pack, should be arranged as shown in the diagram below.

- The DC side battery modules are connected using 25mm² power cables rated for DC1000V voltage.
- Red indicates the DC positive power cable
- Black indicates the DC-side negative power cable



- The wiring between the battery pack and the DC side of the inverter should follow the diagram below:
- The DC side battery modules are connected using 25mm² power cables rated for DC1000V voltage.
- Red indicates the DC positive power cable
- Black indicates the DC-side negative power cable

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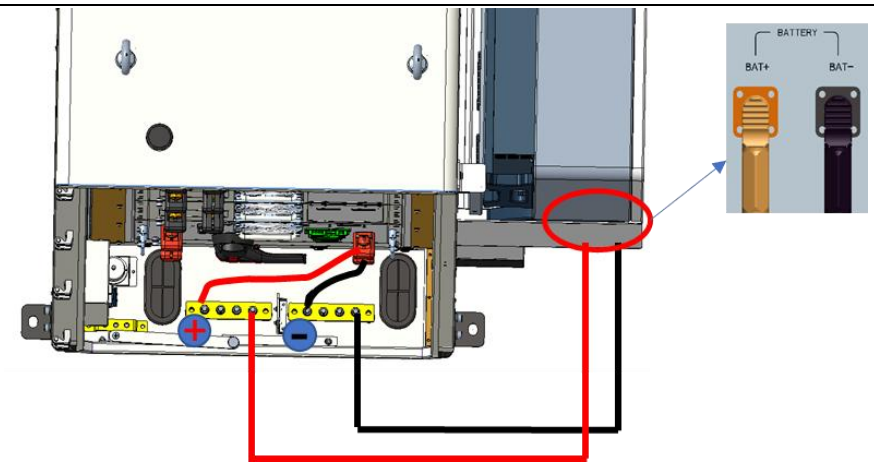
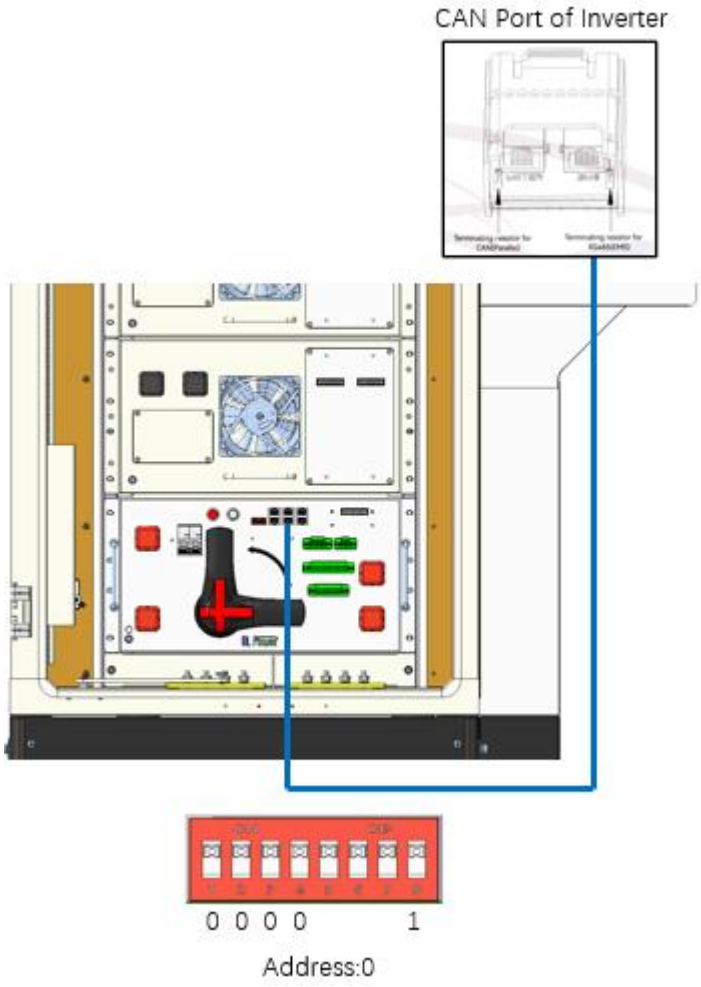


power line wiring diagram



communication line wiring diagram

- Positive terminal wiring: The O-type terminal is secured to the positive terminal block, and the quick connector is connected to the inverter's BAT+ terminal.
- Negative terminal wiring: The O-type terminal is secured to the negative terminal block, and the quick connector is connected to the inverter's battery (BAT-).
- Communication cable: The crystal connector with 'PCS' marking is inserted into

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the PCS port of the interface board, while the other end is connected to the BMS port of the inverter's COM2.

5.1.3. Installation Environment

The installation environment of energy storage cabinets should meet the following requirements:

- The energy storage cabinet is an outdoor cabinet that meets the IP54 protection level and is installed in a dry, dust-free environment.
- The venue must maintain a good ventilation environment, avoid direct sunlight as much as possible, and have necessary fire prevention, waterproofing, and rodent and insect prevention measures.
- The site should be kept away from areas where toxic and harmful gases are concentrated, as well as from flammable, explosive, and corrosive materials.
- The installation surface of the site must be flat and dry, and there must be no standing water. The ground must be higher than the highest level of standing water in previous years
- The ground level of the venue should not shake and should be able to bear the weight of the cabinet. It is prohibited to have dents or tilts.
- Adequate space must be left in front, back, left, right, and above the energy storage cabinet for heat dissipation, maintenance, and evacuation.
- Energy storage cabinets must be kept away from heat sources such as hot water systems, gas heaters, and boilers, with a recommended safety distance of at least 3 meters (10 feet). For high-power heat sources (e.g., large boilers), the distance should be further increased to prevent external high temperatures from triggering thermal runaway within the battery.
- When installed outdoors, energy storage cabinets must maintain a minimum clearance of 1 to 3 meters between the cabinet enclosure and the walls of residential or sensitive buildings, as specified by local fire safety regulations.
- Avoid opening cabinet doors and installing in rainy or humid weather conditions.
- The temperature should be within the range of -20 ℃ to+50 ℃ to ensure that the energy storage cabinet operates in good.

5.2. Handling

Caution!

Precautions for long-distance transportation:

- Please strictly package the product before transportation by vehicle. Closed boxes

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must be used for long-distance transportation!

- It is strictly prohibited to mix and transport this product with equipment or items that may affect or damage it!

Caution!

Precautions for forklift handling:

- A forklift test fork is required, and if it is not suitable, the forklift foot position needs to be adjusted. After the fork is suitable, lift up the cabinet and then move it!
- During the transportation process, the equipment tilt angle should be less than 8 ° and the height of the undulations should be as low as possible!
- Do not use hydraulic trucks for long-distance transportation or on sloping roads!
- When taking off and landing, handle with care to avoid impact or vibration of the forklift. When descending, be careful not to press your feet!
- When moving, someone needs to support you left and right, and pay attention to the flatness of the ground!
- Considering that the equipment is relatively high and may obstruct the driver's line of sight, it is recommended to arrange personnel to guide the driver according to the situation!
- In the scenario where the cabinet is filled with batteries, be sure to pay attention to the center of gravity of the cabinet. It is strictly prohibited to use a crane to lift only from the top of the cabinet, as it may cause damage to the cabinet!

5.3. Electrical Installation

Caution!

Precautions for Electrical Installation:

To ensure the safety of installation personnel, necessary safety protection measures must be taken during electrical installation of this product. The following regulations must be followed during electrical installation:

- Professional personnel are required to install the cabinet, strictly following the instructions in the user manual during the installation process!
- Installation personnel must comply with the relevant electrical operation regulations of the country or region where they are located!
- Installation while live is not allowed!
- Before installation, the external wiring of the cabinet must be disconnected to ensure that all components inside the cabinet are in a dead state!
- Warning signs must be left at the power-off location, and if necessary, locked with a lock to prevent being re powered on during installation!
- The voltage of the conductive part of the inverter is too high, which may cause electric shock to people. When installing the inverter, please ensure that the AC power supply

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and the power switch are normal, and the DC side of the inverter is completely disconnected.

- Do not connect the N line as a protective ground wire to the bushing on the inverter. Otherwise, it may cause electric shock.
- The positive and negative poles of the PV string are extremely ungrounded; otherwise, it will cause serious damage to the inverter.
- Static electricity may damage the electronic components of the inverter. Anti-static measures should be taken for maintenance during installation and the installation process.
- Do not use terminals of other brands or models other than those in the accessory packaging. We reserve the right to reject all damages caused by the mixed use of application terminals.
- Moisture and dust can damage the inverter. Please ensure the sealing of the cable joints. If the inverter is damaged due to poor connection of the cable connector, the warranty claim will be invalid.

5.3.1.Startup

After confirming the correctness of the pre-boot check, perform the boot operation in sequence:

1) Confirm that the cable has been connected as required;
2) Close the high-voltage control box - disconnector Q01;
3) Close the power circuit breaker Q02 of the air conditioner inside the cabinet;
4) The RUN light (green) on the high-voltage control box is always on;
5) Power on completed.

5.3.2.Inverter Monitoring Setting

- Inspection and Manufacturing
- Inspection list:
  - ① CAN connection between the battery and the inverter.
  - ② Ground wire connection between the inverter and the battery.
  - ③ Insert the communication module.
  - ④ Multi-functional interface insertion.
  - ⑤ Wiring and power supply of smart electricity meters.
- Setting Priority：
  - ① The fuse at the AC terminal is closed (if any).
  - ② The AC circuit breaker is closed.
  - ③ The DC switch of the battery is closed.
  - ④ Battery power button.

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⑤ Turn on the photovoltaic DC switch of the inverter.

➢ If everything is ready, please scan the QR code below with your mobile phone to download the MetaEss APP.

➢ After downloading the MetaEss APP, open the main interface of the APP (as shown in the following figure).

① Select the corresponding language in the upper left corner.

② Click on Direct connection of the device.

③ Search for the device to connect to the inverter's WiFi. Use a mobile device to search for the inverter's WiFi. Search for a WIFI named Wifi-apxxxxxx, whose last few digits are the same as the inverter's SN code. Please ensure that the WiFi stick or the 2-in-1 module is connected to the inverter before operation. After connecting, return to the MetaEss APP and click on Device Direct Connection. Log in using the installer role (default password: 123456).

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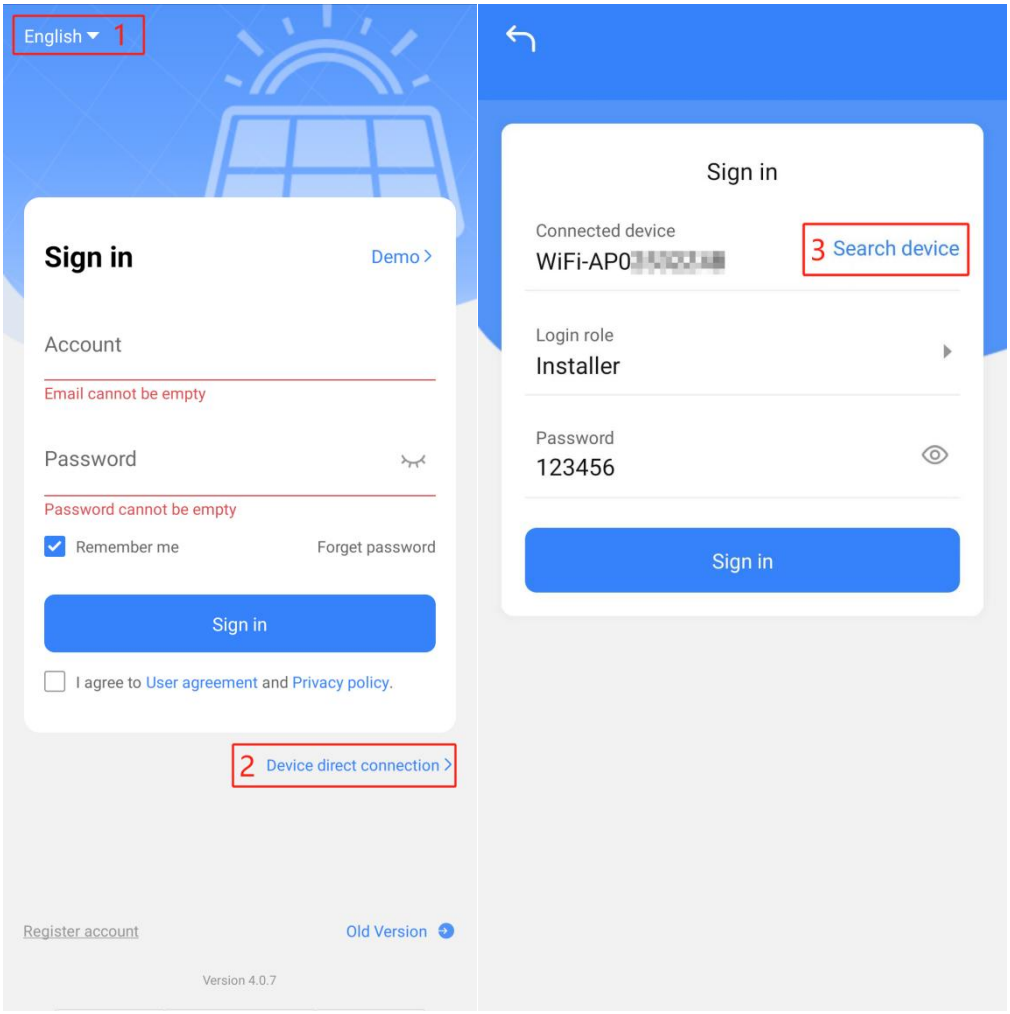

➢ Quick configuration and WiFi (as shown in the following figure).

① Complete the inverter parameter Settings according to the quick configuration steps.

② Connect the inverter to the customer's WiFi (please disconnect the mobile data when connecting).

➢ Create power stations and accounts.

① Log in to your organization account (please obtain the account from your superior organization).

② Create a power station using customer information (the customer account and password will be sent to the email address you filled in).

③ Add an inverter to this power station (the SN code and check code are indicated on the nameplate).

④ 。After successful configuration, launch the inverter monitoring app. Once the device is operational, you can track the battery system status through this app.

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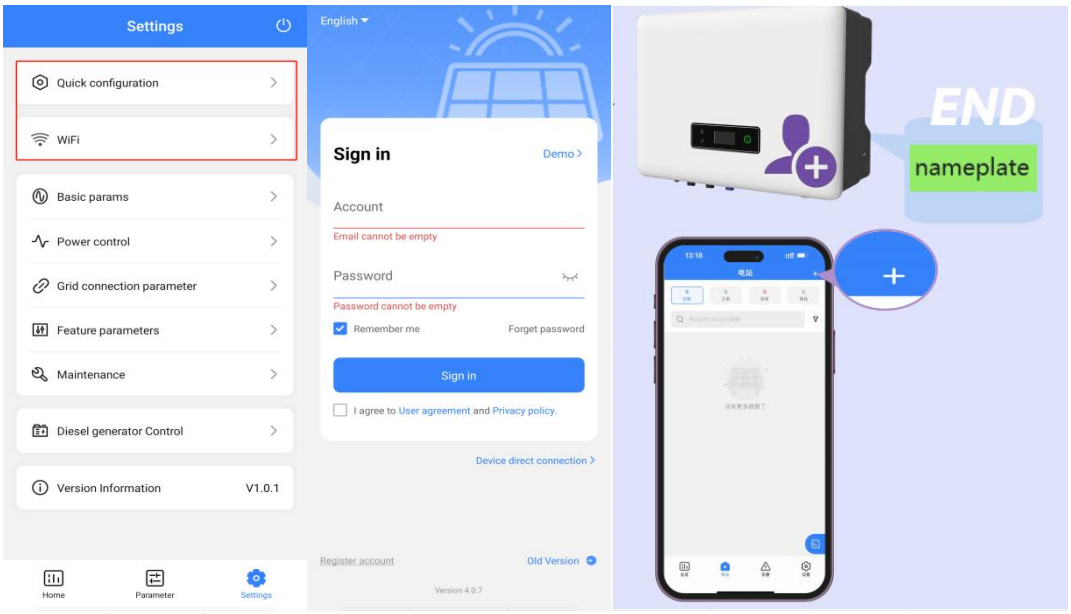

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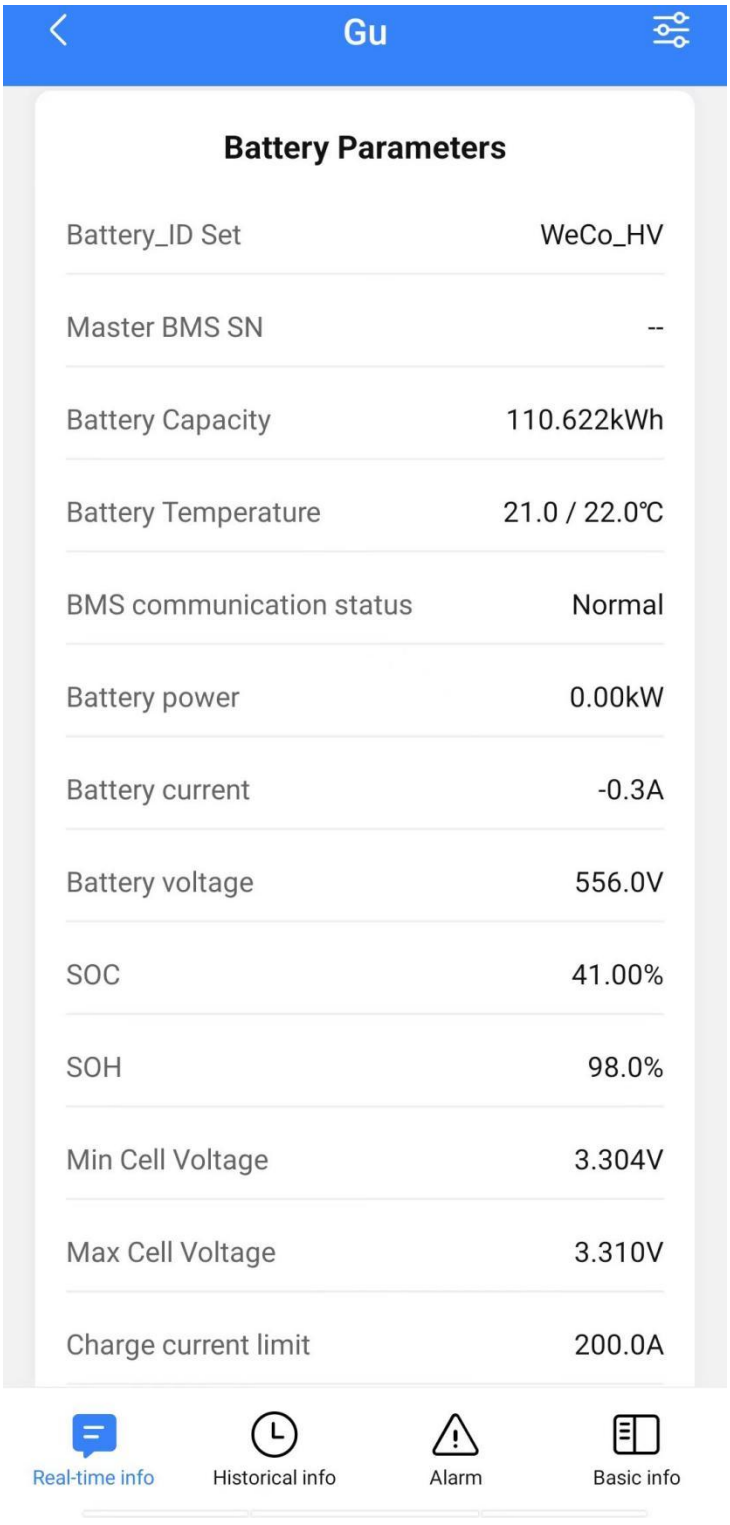

5.3.3.Shutdown

After confirming that the shutdown is possible, perform the shutdown operation in

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sequence:

Confirm that the power output has stopped;

1) Disconnect the power circuit breaker Q02 of the air conditioner inside the cabinet;
2) Disconnect the high-voltage control box - isolation switch Q01;
3) Shutdown completed.

5.3.4. Wiring Inspection

Before wiring operations, ensure that the following checks are completed:

- The cables used for wiring have met the corresponding requirements for wire diameter and shielding.
- Ensure good grounding of equipment and products.
- The conductor of the grounding system should be multi-stranded copper-core insulated wires or cables, and the marking color should be two colors of yellow and green, and the cross-sectional area of its copper core should not be less than 25mm^2 , and the grounding wire from the grounding terminal of the support body to the grounding trunk or the grounding conductor between the grounding wire should adopt the SC25-10 copper nose, and be connected by stainless steel bolts with stainless steel anti-loosening gaskets of no less than M10, Protection pipe should be installed in the parts susceptible to mechanical damage.
- The relevant accessories for wiring are ready.
- The cable needs to meet the voltage insulation level and have necessary protection to avoid scratching the insulation skin of the cable.

After the wiring operation, ensure that the following checks are completed:

- Measure whether the voltage on the incoming side is within the specified range and confirm that there are no faults such as phase loss or short circuit.
- The power input terminal has been correctly connected and securely fastened.
- The grounding wire has been reliably grounded.

6. Fault Handling

Caution!

Please do not disassemble machine components during self-inspection.

6.1. Fault List

NO.	Fault name	Possible reasons	Fault handling

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1	Overvoltage Fault of Battery Cell	1. BMS malfunction 2. Voltage collection point malfunction 3. Overcharging	1. Replace BMS 2. Check the voltage collection point 3. Stop charging
2	Undervoltage Fault of Battery Cell	1. BMS malfunction 2. Voltage collection point malfunction 3. Long term non-charging	1. Replace BMS 2. Check the voltage collection point 3. Charge in a timely manner
3	Battery Total Voltage Overvoltage Fault	Overcharging	Stop charging， Check the inverter
4	Battery Total Voltage Undervoltage Fault	Long term non charging	Charge in a timely ， Check the inverter manner
5	High Temperature Fault During Battery Charging	1. BMS malfunction 2. Temperature collection point malfunction 3. Air Conditioning Abnormal	1. Replace BMS 2. Check the Temperature collection point 3. Check the air conditioner wiring harness and restart the air conditioner
6	Low Temperature Fault During Battery Charging	1. BMS malfunction 2. Temperature collection point malfunction 3. Air Conditioning Abnormal	1. Replace BMS 2. Check the Temperature collection point 3. Check the air conditioner wiring harness and restart the air conditioner
7	High Temperature Fault During Battery Discharge	1. BMS malfunction 2. Temperature collection point malfunction 3. Air Conditioning Abnormal	1. Replace BMS 2. Check the Temperature collection point 3. Check the air conditioner wiring harness and restart the air conditioner
8	Low Temperature Fault During Battery Discharge	1. BMS malfunction 2. Temperature collection point malfunction 3. Air Conditioning	1. Replace BMS 2. Check the Temperature collection point 3. Check the air conditioner wiring

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		Abnormal	harness and restart the air conditioner
9	Battery Charging Overcurrent Fault	Charging current exceeds the maximum current of the battery	Reduce charging power
10	Battery Discharge Overcurrent Fault	Discharge current exceeds the maximum current of the battery	Reduce discharge power
11	Low Insulation Fault	1. Not grounded 2. Rainwater or liquids entering the equipment	1. Check if the grounding circuit is installed correctly 2. Check if the equipment is wet
12	SOC Low Alarm	Low battery level	Charging processing
13	Air Conditioner Communication Failure	BMS and air conditioner communication line disconnected	Check the communication line between BMS and air conditioner
14	Fire Trigger	The temperature sensor and smoke sensor are triggered simultaneously, and the fire extinguishing device is activated	Contact the manufacturer
15	BMS Communication Failure	1. BMS malfunction 2. BMS communication line disconnected	1. Replace BMS 2. Check the BMS communication cable
16	Emergency Stop Triggered	Check the wiring of the emergency stop function	Check the energy storage cabinet and restore it manually after no faults are found

Table 6.1-1 Fault List

7. Daily Maintenance and Upkeep

Due to the influence of temperature, humidity, dust, and vibration in the environment, the components inside the energy storage cabinet may age, which may cause potential failures or reduce the service life of the cabinet. Therefore, it is necessary to carry out daily and regular maintenance work on the energy storage cabinet.

Caution!

- Personnel with professional qualifications are required to maintain the energy storage

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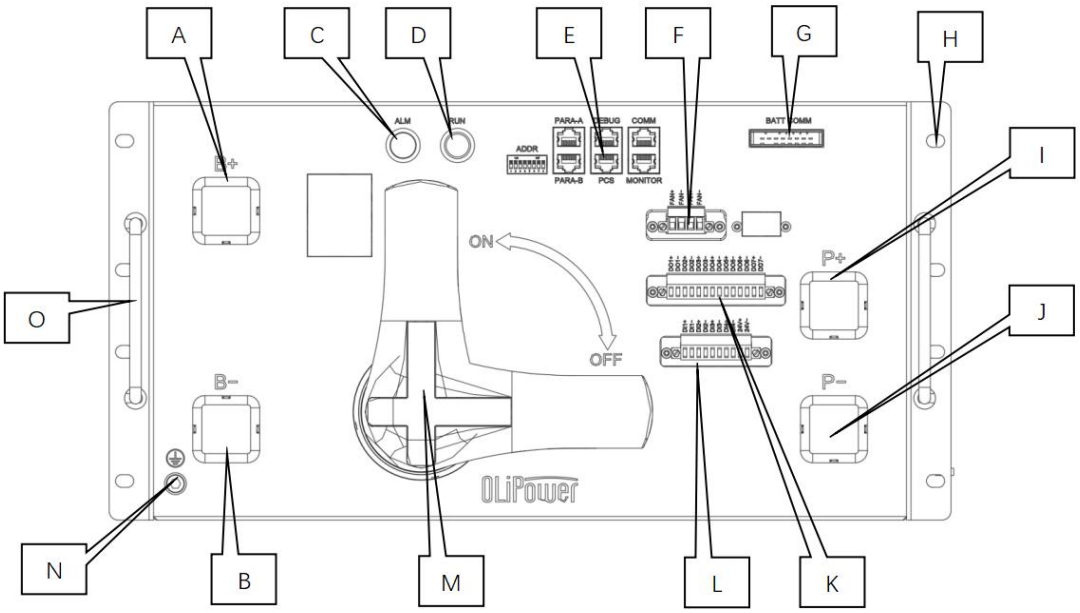
cabinet.

- The cabinet is equipped with strong electricity, and necessary safety precautions must be taken before starting maintenance.
- Before maintenance, it is necessary to ensure that all power sources have been disconnected.



- During maintenance, it is necessary to strictly follow the correct operating procedures.
- There are energy storage capacitors inside the energy storage cabinet. After power off, it is necessary to wait for more than 20 minutes to confirm that the inverter is in a dead state before maintenance can be carried out.
- After the power is disconnected, a warning sign should be hung at the disconnection location to prevent someone from powering on during maintenance.

- To avoid accidental danger, maintenance personnel should wear insulation protective equipment during the maintenance process.

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7.1. Daily Inspection Items

Daily inspection items should be implemented according to the following key points:

NO.	Daily inspection items	Remarks
1	Real time monitoring of the input, output voltage, current, and operating status of the energy storage cabinet is required, Assign personnel to observe at designated locations, and promptly carry out maintenance if any abnormal work or voltage/current is found.	
2	Is there any abnormal noise inside the energy storage cabinet.	
3	Is there any odor inside the energy storage cabinet.	
4	Observe the temperature within the normal range based on the internal temperature displayed on the screen.	
5	Check the exterior surface of the chassis for any damage, clean any dirty areas with water or alcohol, and touch up any damaged paint on the surface.	

Table 7.1-1 List of Daily Inspection Items

Attention: It is recommended to check once a week.

7.2. Regular Inspection Items

Regular inspections mainly target areas that are difficult to detect during daily inspections and operations：

NO.	Regular inspection items	Remarks
1	Check the appearance of the energy storage cabinet for any damage or rust.	
2	Use a temperature measuring instrument to check the internal temperature of the equipment without any abnormalities.	
3	Check that the ventilation, ambient temperature, humidity, dust, and other environmental conditions around the equipment meet the requirements.	
4	Check for any signs of aging or damage to the cable insulation layer. If any issues arise, additional insulation measures should be taken or the cable should be replaced.	
5	Check that there are no signs of aging or burning at the wiring bolts, and shake them by hand to confirm that they are tightened.	

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Table 7.2-1 Regular Inspection Item List

Attention: It is recommended to check every three months.

1.Electrical Connection Inspection and Maintenance

- Inspect the power supply inlet, terminal block, terminal post, and wire nose crimping points for looseness, overheating, discoloration, or burn marks.
- Inspect the connectors, aviation plugs, and couplers to ensure they are properly inserted, free from loosening, oxidation, or deformation.
- Check the grounding bolts, terminals, and PE protective grounding to ensure they are securely fastened, with no loose connections or broken wires.
- Inspect the appearance of cables and harnesses for damage, exposure, compression, or aging cracks.
- Check the circuit breaker, contactor, and relay. Ensure all indicators are normal, with no abnormal noises or burn marks.
- Re-tighten the loose terminals according to torque specifications; clean the oxidized contacts.
- Immediately shut down or power off upon detecting abnormalities. Operation with potential hazards is strictly prohibited.

2. ESD (Electrostatic Discharge) System Inspection and Maintenance

- Inspect the anti-static workbench mat and anti-static floor for damage, warping, and ensure proper grounding connection.
- Check the anti-static wristband/legband for correct wearing, qualified resistance, and reliable grounding.
- Check the equipment grounding and ESD grounding post for secure, oxidation-free, and loose-free connections.
- Check the ion fan / electrostatic eliminator for normal operation, uniform airflow, and clean filter screen.
- Check the ESD warning signs to ensure they are complete, clear, and not detached.
- Do not place items that generate static electricity (e.g., plastic bags, ordinary foam) in ESD zones.

3. ESD and Electrical Area Cleanliness Requirements

- Power off before cleaning / Lock the equipment with a sign, and do not wipe live parts while powered on.
- Clean with an anti-static brush, compressed air, alcohol, or anti-static cloth.
- Clean the terminal blocks, connectors, and internal components of the equipment, ensuring they are free from dust, oil stains, and conductive particles.
- Clean the interior of the cabinet, air ducts, and filters to ensure no dust accumulation, debris, and proper ventilation.
- Clean the ESD workbench and floor, ensuring no debris, oil stains, or materials prone to static electricity.
- Post-cleaning inspection: No residual liquid, no looseness, no short-circuit risk.

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Exception Handling

- Record and label the non-conforming items immediately.
- General issues shall be rectified on-site; major hazards shall result in immediate shutdown and reporting.
- After the maintenance, the equipment must be re-inspected and confirmed before it can be put into use.

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