RENEPOLY

PCS User Manual for Series Energy Storage Converter Cabinet

Guangzhou Renepoly Energy Technology Co., Ltd.

Catalogue

1.About this manual

1.1 Foreword

Dear customer, thank you very much for using the energy storage converter cabinet developed and produced by Guangzhou Renepoly Energy Technology Co., LTD. We sincerely hope that this product will meet your needs, and we also look forward to more valuable comments on the performance and functionality of the product, which we will continue to improve.

1.2 Applicable products

This manual is applicable to PCS series energy storage converter of Guangzhou Renepoly Energy Technology Co., Ltd. The product model is as follows:

PCS-120

PCS-215

PCS-257

This manual is hereinafter referred to as the "Energy Storage Converter Cabinet".

1.3 Manual instructions

- This manual is a PCS series special instruction manual provided by Guangzhou Renepoly Energy Technology Co., LTD. The manual details product information, installation instructions, operation, maintenance and troubleshooting. Before installing and commissioning the running equipment, the user must read and understand all the instructions contained in this manual and be familiar with the relevant safety

symbols.

- Readers need to have a certain electrical theory, electrical wiring and professional mechanical knowledge. Please read this manual carefully before installing this product and ensure that it is easily accessible by relevant personnel.
- The contents, pictures, signs, symbols and so on used in this manual are all owned by Guangzhou Renepoly Energy Technology Co., LTD. Non-personnel of the Company shall not publicly reprint all or part of the content without written authorization.

Chapter 1 : Safety instructions

Please read the safety instructions in this section carefully before installing and using the energy storage converter. If the company fails to install or use the manual and causes personal injury or equipment damage, the company has the right not to assume responsibility and quality assurance!

Symbol interpretation in this manual:

Symbol	Illustrate
Dangerous: 	Indicates a high potential danger and failure to avoid situations that would result in death or serious injury.
Warning: 	Indicates a moderate potential danger and failure to avoid conditions that could lead to death or serious injury.
Attention: 	Indicates a potential risk of failure to avoid situations that may cause equipment failure or property damage.
Illustration: 	Represents additional information in the manual, an emphasis on and supplement to the content, and may also provide tips or tips for optimizing the use of the product to help you solve

	a problem or save you time.

Chapter 2: A general introduction

2.1 Energy storage system

PCS-120/215/257Energy storage converter cabinet system is mainly suitable for all kinds of industrial and commercial or large energy storage systems. The energy storage system is generally composed of battery cabinet, energy storage converter cabinet, EMS management system, confluence cabinet, etc. (see Figure 2-1). When the battery discharges, the direct current into AC current at the same frequency and phase as the power grid, and incorporated into the power grid after the transformer boost; when charging, the power grid is connected by the transformer step-down into the energy storage current cabinet into the DC current with the same frequency and phase as the battery to charge the battery.

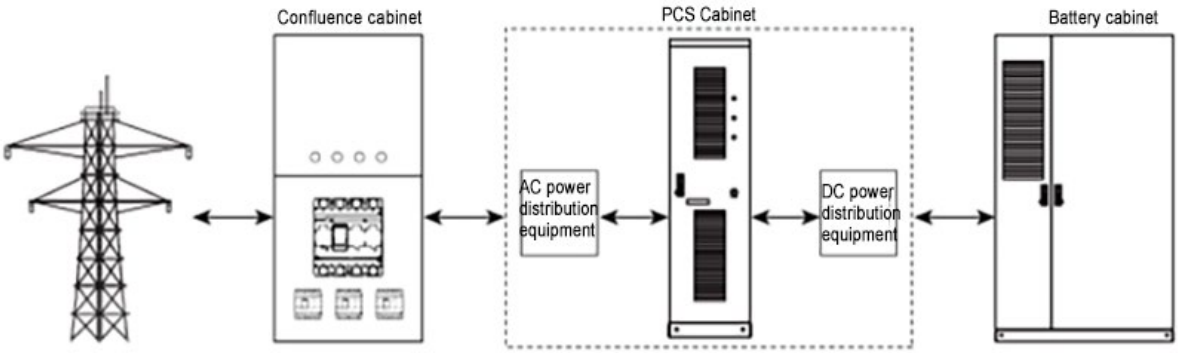
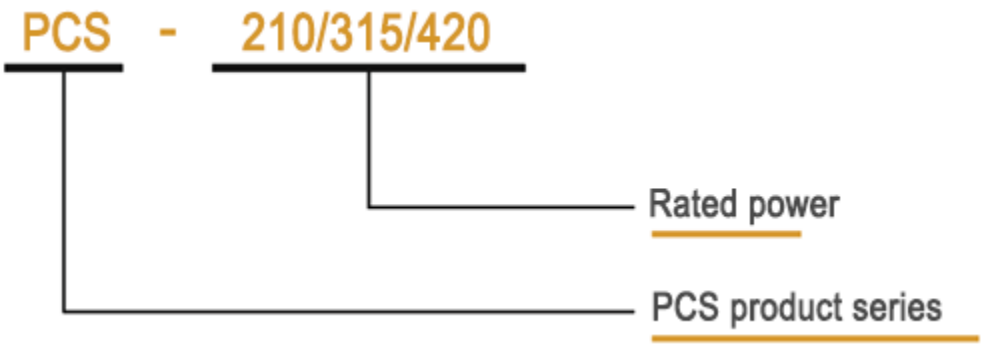


Figure 2-1 Block diagram of energy storage system

2.2 Model interpretation



2.3 Product characteristics

- Operation stability:Multiple machines can be directly parallel, each cluster distribution management and other functions;
  Power factor 0.8~1.0 range adjustment.
- On the safe side ： High protection level (IP54, C4);
  Linkage with BMS and EMS to support system multiple protection。
- Capacity expansion is convenient： Modular design, can be optimized according to the project scale, power situation configuration, easy capacity.
- Efficient conversion： Charge-discharge conversion time less than 80ms, power response time less than 60ms.
- Compatibility of systems.

2.4 Basic schematic diagram of the energy storage converter cabinet

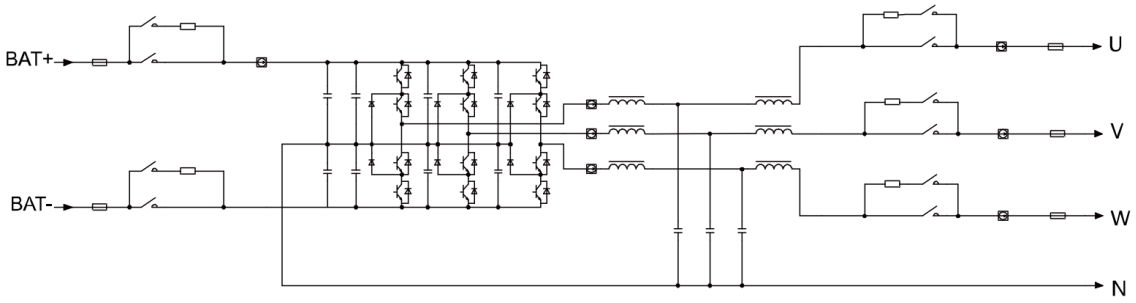


Figure 2-2 Basic schematic diagram of energy storage converter cabinet

2.5 Product Parameter

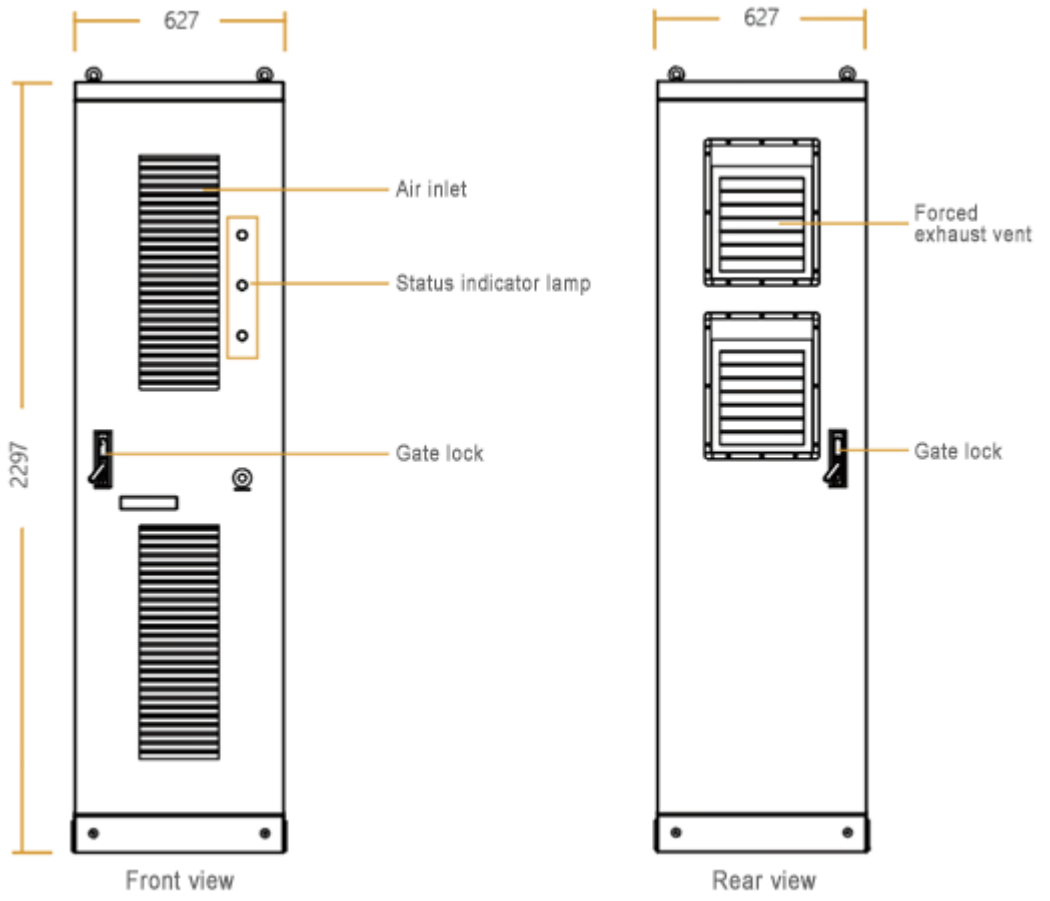
PCS -210/315/420

Model	PCS-210kW	PCS-315kW	PCS-420kW
DC side parameters			
DC voltage range	615-950V(3P3W)/650-950V(3P4W)		
Maximum DC current	288A	432A	577A
Number of DC circuits	1	1	1
AC side parameters (grid-connected)			
Rated output power	210kW	315kW	420kW
Max output power	231kW	347kW	462kW
Rated grid voltage	400V		
Grid voltage range	320V-460V		
Rated alternating current	303A	454A	606A
Rated grid frequency	50HZ/60HZ		
Total current waveform distortion rate	<3%(Rated power)		
Power factor	>0.99(At rated power)		
Adjustable range of power factor	-1(Lead)~1 (Lag)		
AC side parameters (off-grid)			
AC off-grid voltage	400V		
AC off-grid frequency	50Hz/60Hz		
AC voltage range	±3%		
Output voltage accuracy	1%		
Off-grid output voltage distortion rate	< 3% (Linear load)		
Efficiency			
Maximum efficiency	98.2%		
Common parameter			
Dimensions (width * depth * height)	624*1150*2300mm		
Weight	400kg		
Isolation method	Transformerless isolation		
Protection grade	IP54		
Operating temperature range	-25℃~55℃ (>45℃ Derating)		
Relative humidity (without condensation)	≤95%RH		
Cooling method	Intelligent air cooling		
Working altitude	2000m (>2000m Derating)		
Communication interface	RS485/CAN		
Communication protocol	Modbus		

Note: Before using this product, please read the relevant product configuration instructions carefully.

IEC CE UN38.3

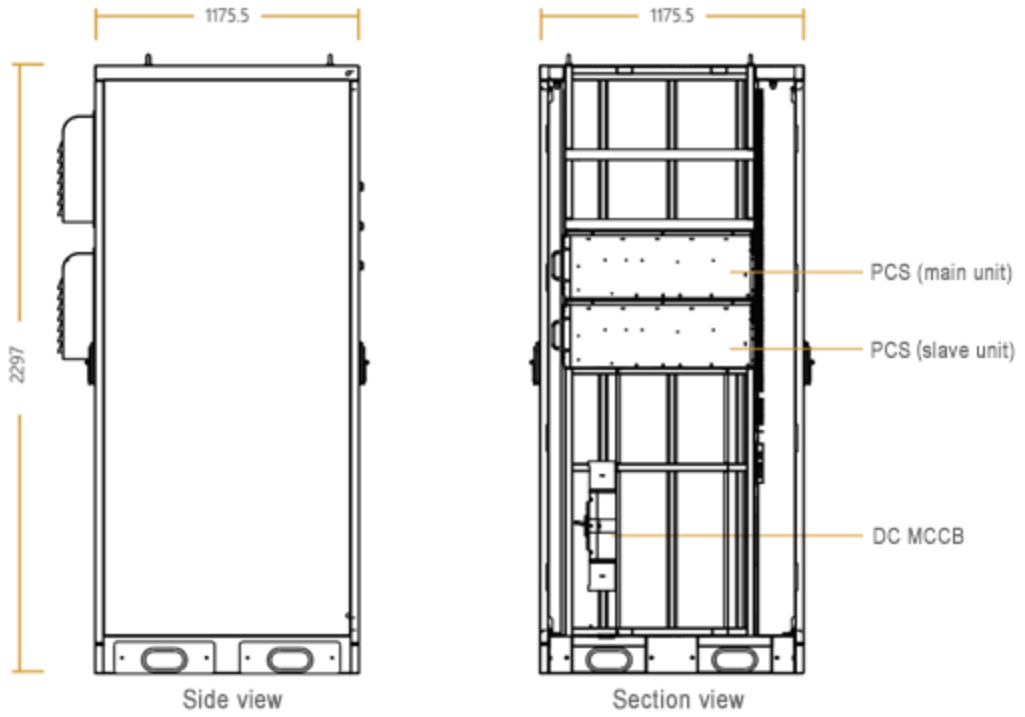
2.6 Product dimensions and appearance description



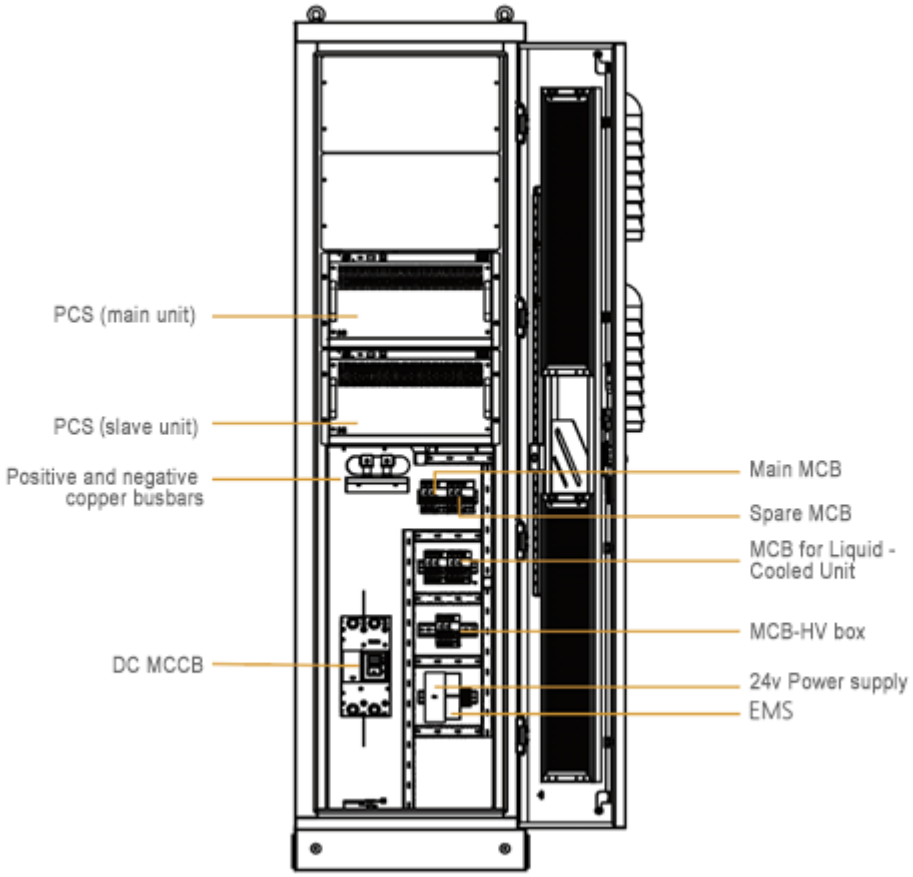
The meaning of the detailed LED status indicator light is shown in the table below:

Status lamp	Name	Status	Meaning
Red	Run the indicator light	Light	The system is operating normally
		Dark	The system stops running
Green	Power light	Light	Normal communication of the system
		Dark	The system has no

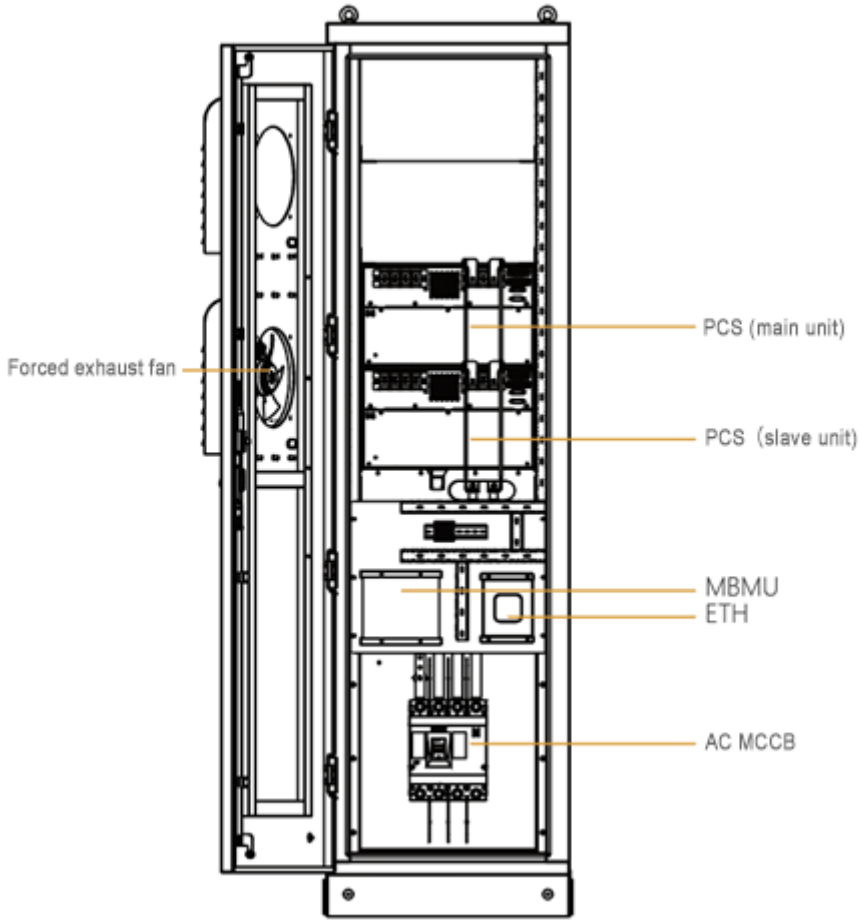
			communication
Yellow	Fault status indicator light	Light	Break down
		Dark	No fault or no working power supply



2.7 Introduction of the major internal components



Front view internal diagram



Rear view internal diagram

Chapter 3: Equipment Installation

The following content is the installation instructions of this energy storage converter cabinet. Please read it carefully and follow the steps to install this product.

3.1 Basic Requirements

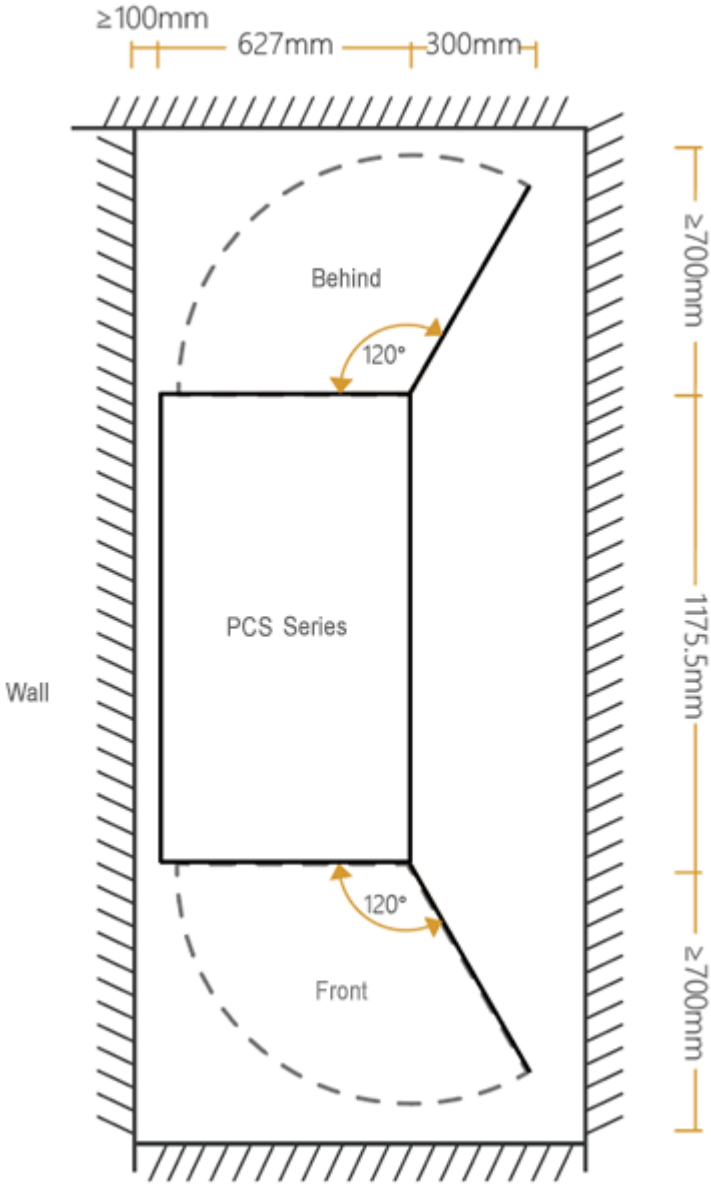
- Check the environmental parameters of the product (protection grade, working temperature, humidity, etc.);
  Requirements for specific project locations;
- Whether the grid connection license has been obtained from the local

power department;

- Verify that the power grid voltage is within the normal range;
- The installer must be a professional electrician or must be professionally trained;
- Energy storage converter cabinet is installed in a place far away from flammable and explosive materials;
- Determine that the temperature of the energy storage converter does not exceed the temperature range specified in the data sheet of the energy storage cabinet to reduce unnecessary power loss.

3.2 Maintenance space requirements for the installation site

The maintenance space of the front door of the cabinet shall be no less than 0.7m, the left side no less than 0.1m, the right side no less than 0.5m, and the cabinet rear door shall be no less than 0.7m (refer to the figure below). The specific installation distance shall be subject to the requirements of the local design and installation specifications.



3.3 Hoisting operation

Transportation and lifting mode：

(1) The energy storage converter cabinet can be lifted from the base surface。

(2) M10 (2) ring screws can be used on both sides and front handles, see lifting dimensions。

(3) Manual installation: Two people should grasp the handle and the

bottom edge to install the energy storage converter cabinet onto the rack.

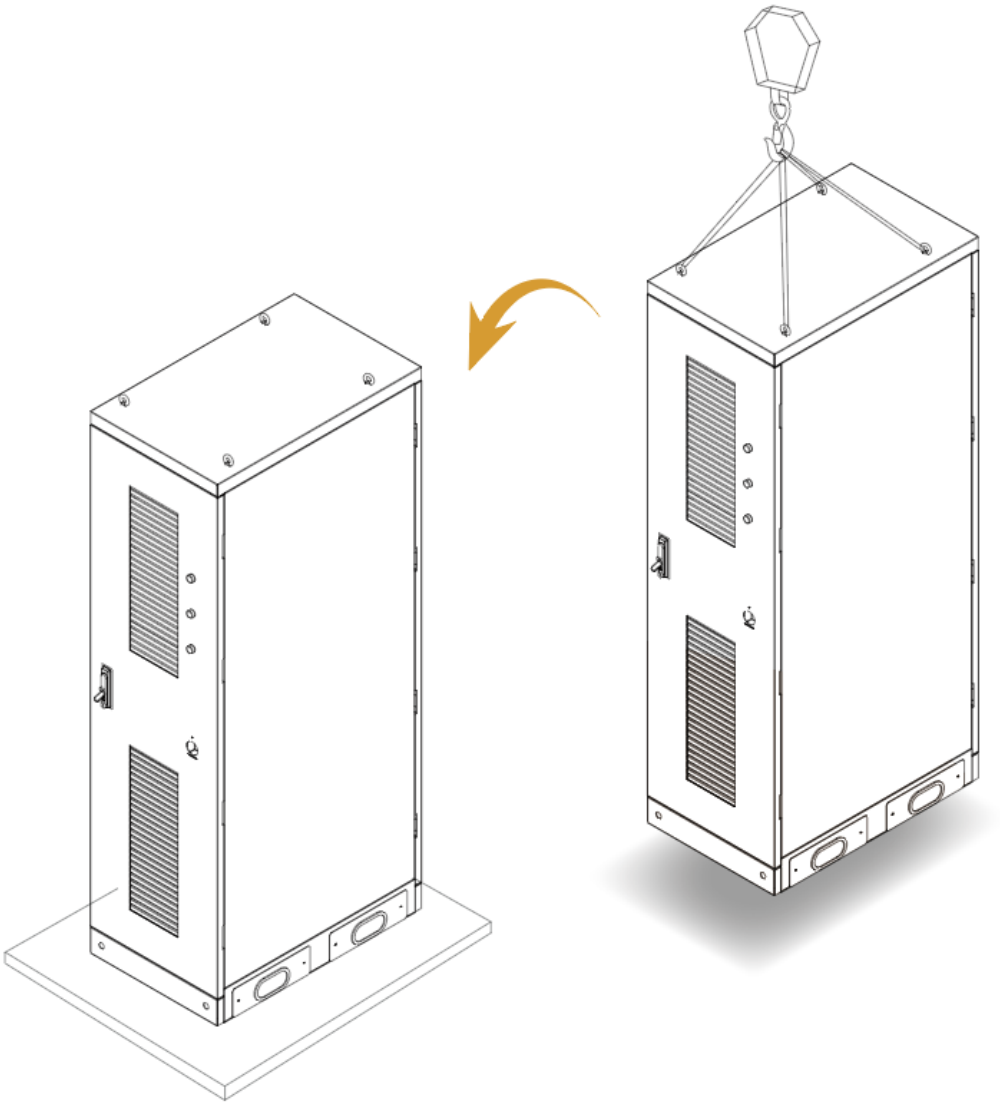


Figure 3-9&3-10 Lift way

3.4 Storage

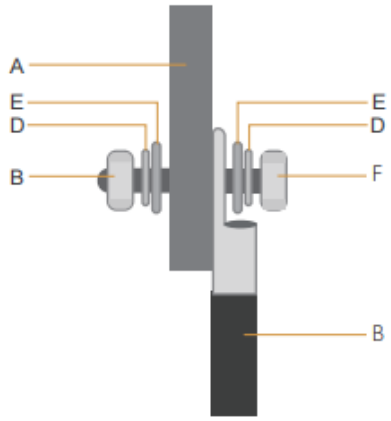
The PCS series energy storage converter cabinets should be stored in a dry warehouse and should not be exposed to direct sunlight or rain. Toxic and harmful gases, flammable and explosive products, and corrosive

chemical substances are not allowed in the warehouse. Mechanical impacts, heavy pressure, and strong magnetic fields should be avoided, and direct sunlight should also be avoided. The distance from a heat source should not be less than 2 meters, and the distance from walls, windows, or air inlets should be at least 50 centimeters.

Chapter 4: Electrical Connection

4.1Cable connection mode

The terminal models of the cables are recommended in the following



below:

A	B	C	D	E	F
Copper row	Copper terminal	Nut bolt	Die-shaped gasket	Flat gasket	Blind nut

4.2 DC connection

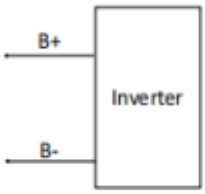
To ensure the optimal performance of the energy storage converter cabinet, please read the following guidelines before making the DC connection:

(a)Ensure that the maximum open-circuit voltage of the battery module is lower than 1200Vdc under any circumstances.

(b) Confirm that the battery modules connected to an energy storage converter cabinet are of the same type.

(c) The external wiring shall be configured according to the following conditions:

Table 4-1 External DC cable

Model			
Power	210kW	315kW	420kW
Current	288A	432A	577A
DC cable	100mm2	185mm2	240mm2

(e) Use a crimping tool to connect the DC cable to the two matching OT95 - 8 type terminals/positive and negative high - voltage connectors, and cover the bare copper part with a heat - shrinkable tube.

Tools: Crimping pliers, heat gun

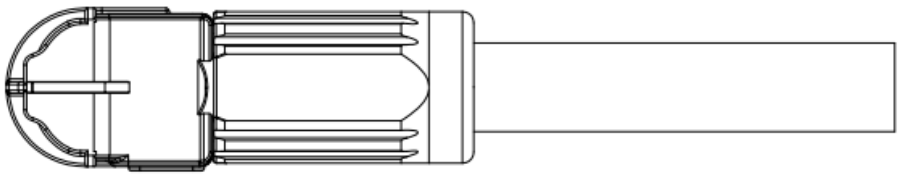
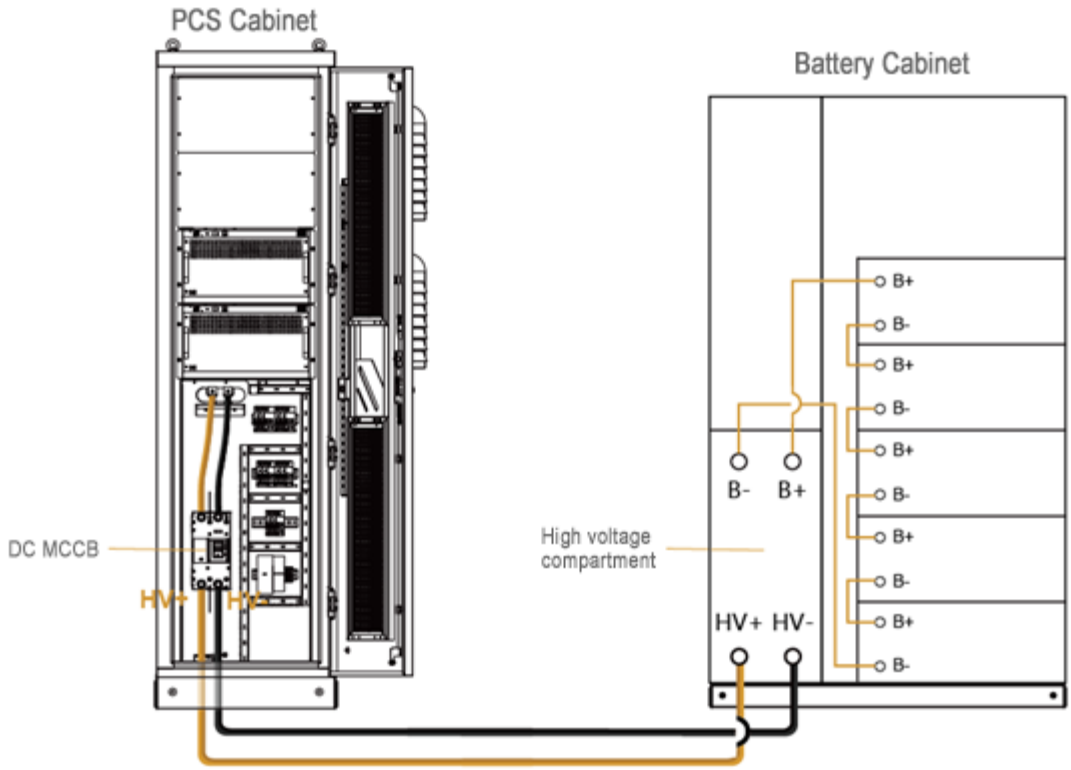


Figure 4-4 Press DC cable

(f) Connect the end of the DC cable with the OT terminal to the DC circuit breaker and secure it with an M10 screw. Insert the other end into the HV+ and HV- sockets of the high-voltage box.

Tools: Hex key. Torque to be applied: 20 N.m.

Connect the left incoming terminal of the DC-side molded case circuit breaker to the HV+ of the high-voltage box of the battery cabinet, and connect the right incoming terminal of the DC-side molded case circuit breaker to the HV- of the high-voltage box of the battery cabinet.



⚠ Attention	To avoid cable reverse, note positive and negative polarity (orange positive, black negative).

Warning	When installing the DC-side circuit, ensure that the AC side of the energy storage converter cabinet is disconnected from the power grid and that the circuit breaker on the AC side of the energy storage converter is in the off state.

4.3 AC connection

The following describes how to connect the AC cable:

a) Remove the six screws on the baffle of the AC circuit breaker and take off the cover plate.

b) After opening it, carefully observe the positions of the incoming terminals of phases A, B, C and N of the AC circuit breaker. 。

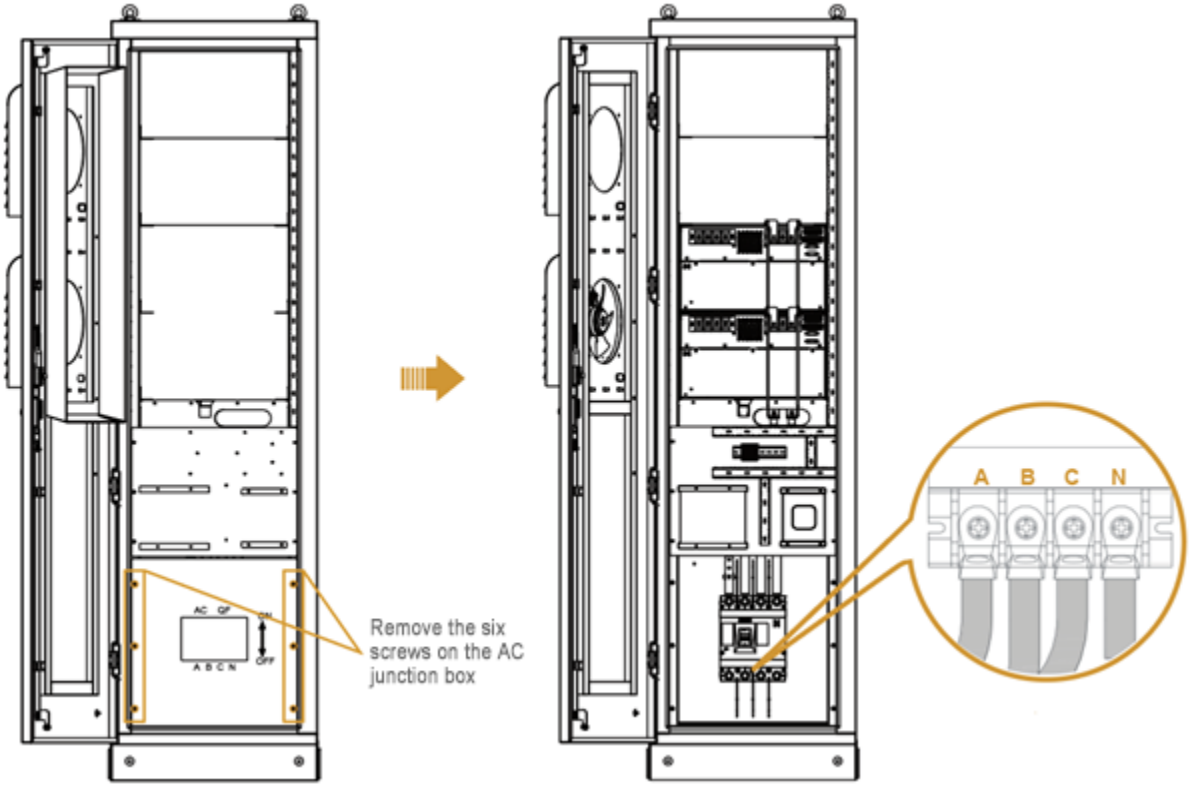


Figure 4 - 5 Schematic diagram of the removal of the AC junction box and the connection of the AC input and output lines

c) Thread one side of the cable through the bottom cable inlet, and then

lead it out upwards. Connect the phase A, B, C and N cables to the correct positions of the incoming terminals of the circuit breaker. Connect the other side of the cable to the phase A, B, C and N interface of the outgoing terminals of the corresponding circuit breaker in the busbar cabinet. 。

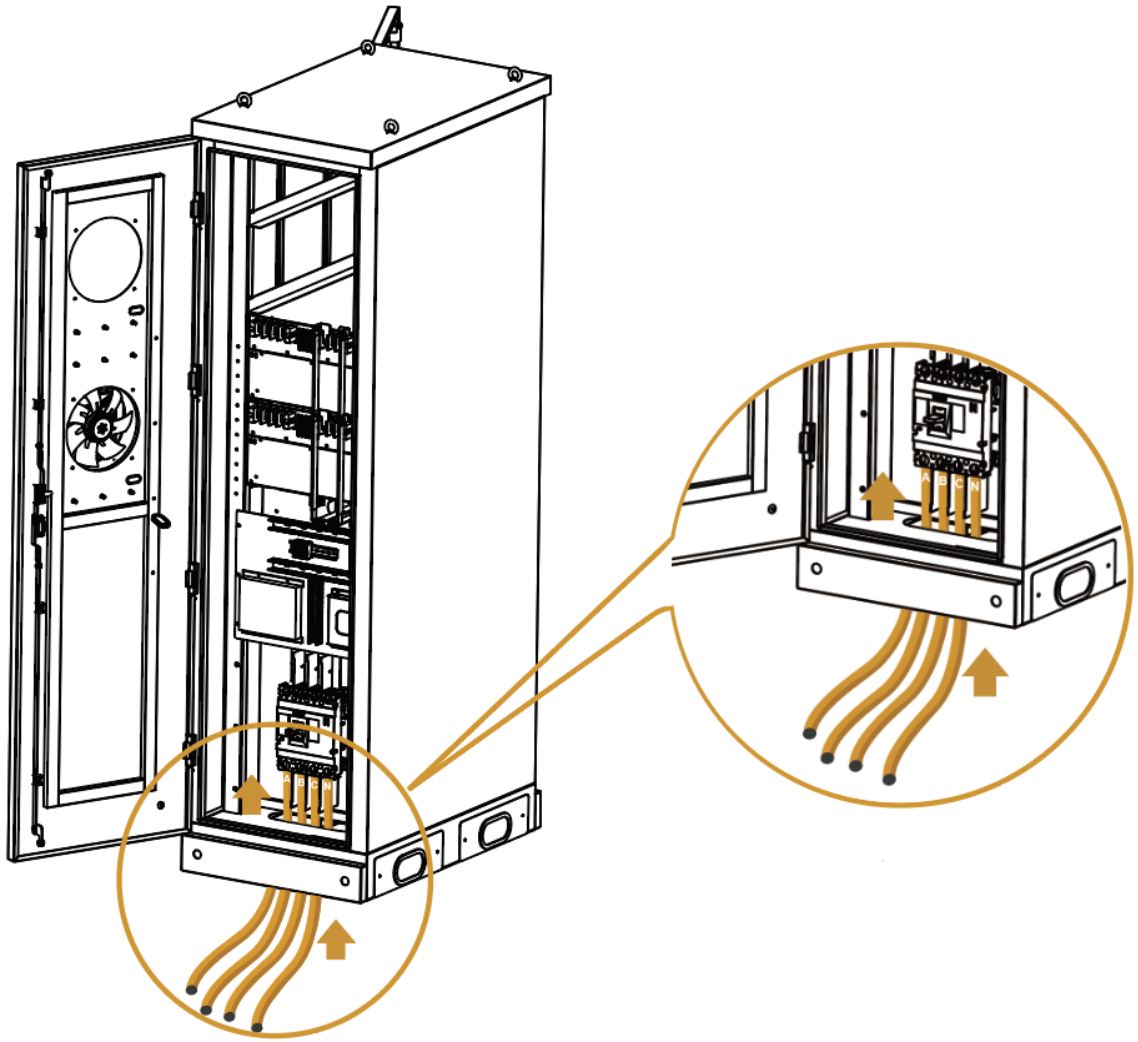
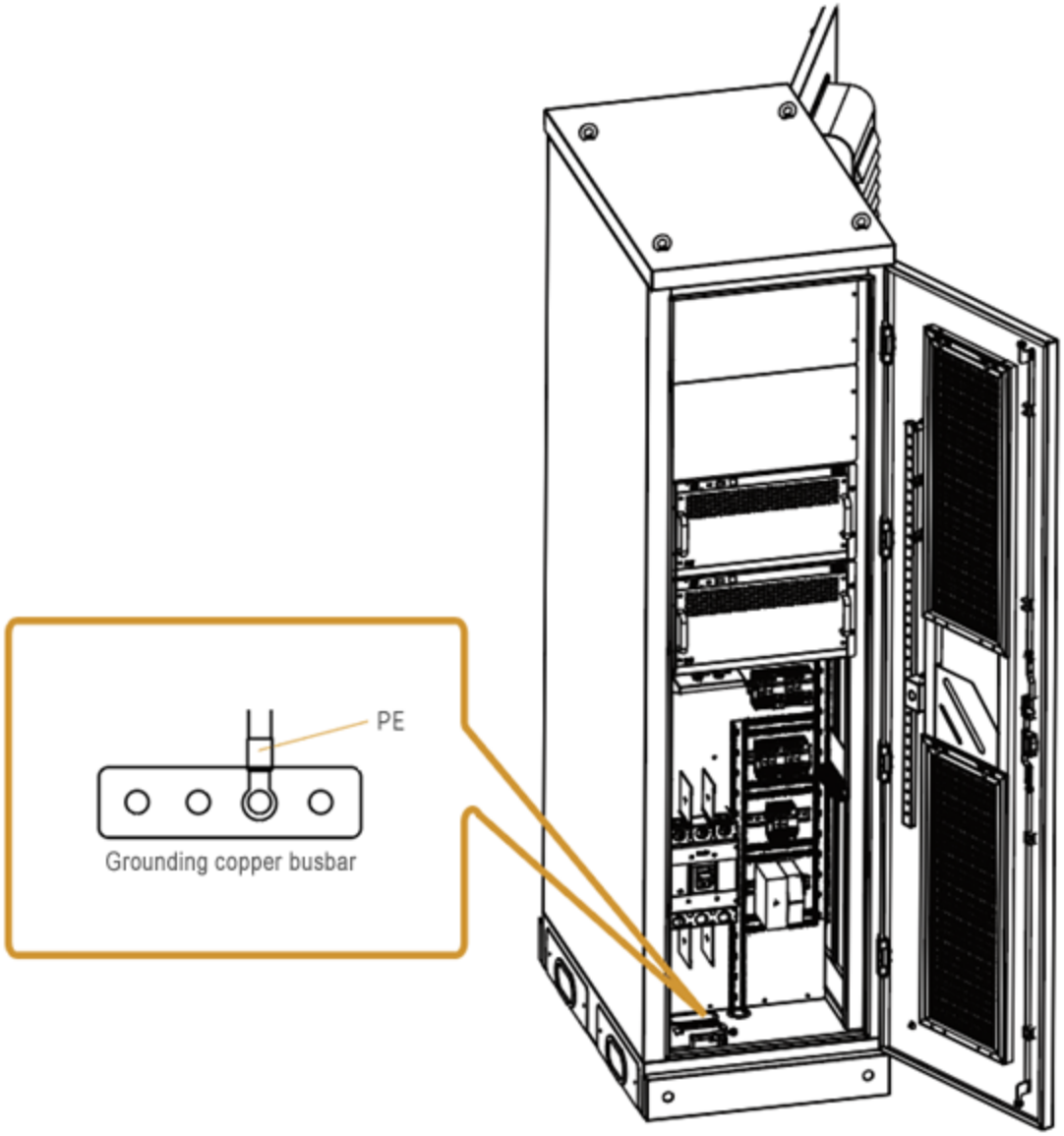


Figure 4-5 Schematic diagram of threading the cables on the AC side

 Warning	When installing the AC-side circuit, ensure that the AC side of the energy storage converter cabinet is disconnected from the power grid and that the circuit breaker on the AC side of the energy storage converter is in the off position.

4.4 Grounding connection

Use an M6x20mm bolt to connect the coiled grounding cable to the grounding stud (the other three grounding holes have been installed before leaving the factory, and you only need to connect to the hole



positions as shown in the following figure).

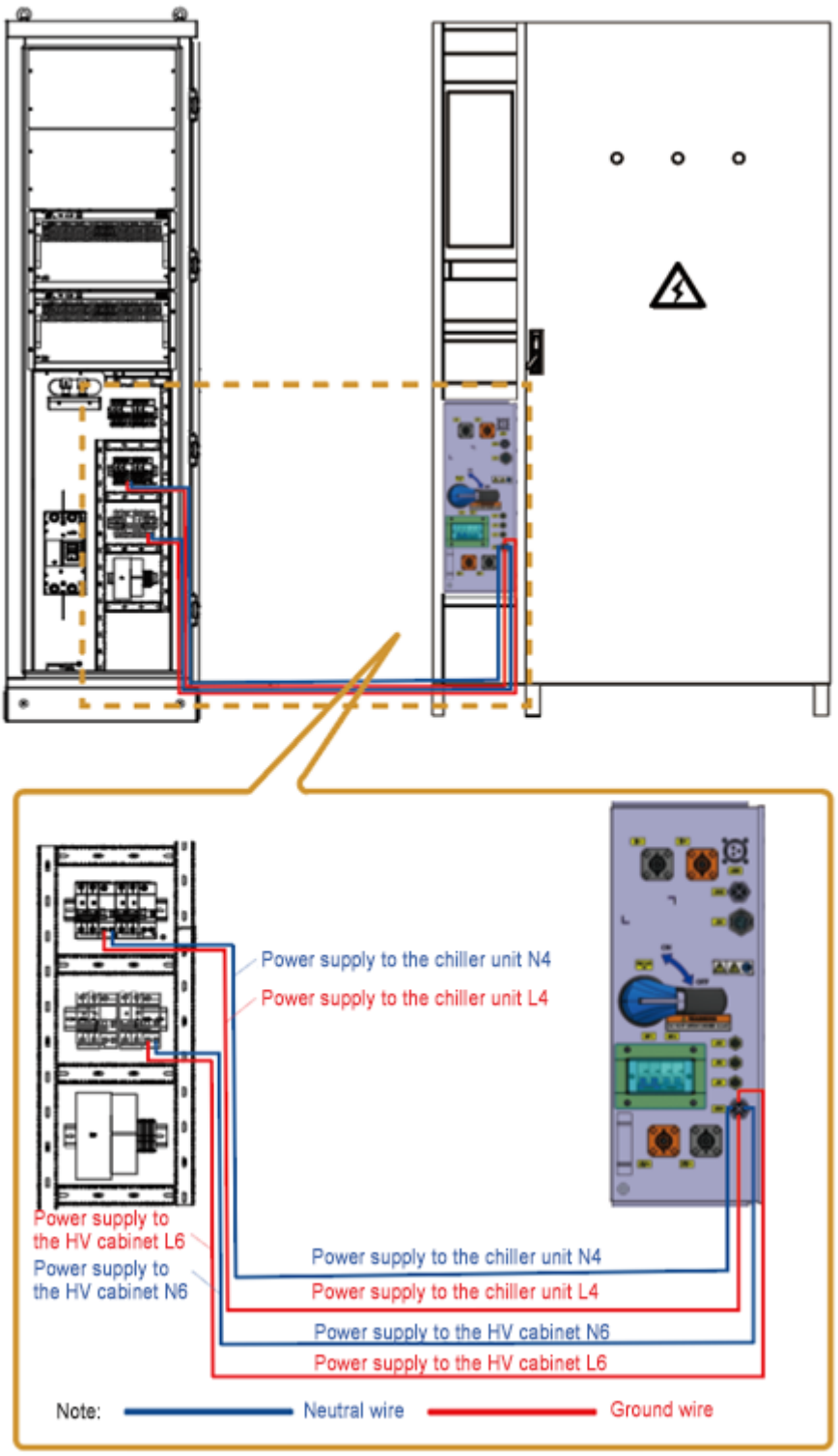
Figure 4-6 Wiring Diagram of the Grounding Cable

Warning	When installing the grounding circuit, ensure that the AC side of the energy storage converter cabinet is disconnected from the grid and that the AC circuit breaker of the energy storage converter is in the off state.

4.5 Power connection

Connect the end of the BAT/water machine power supply harness with

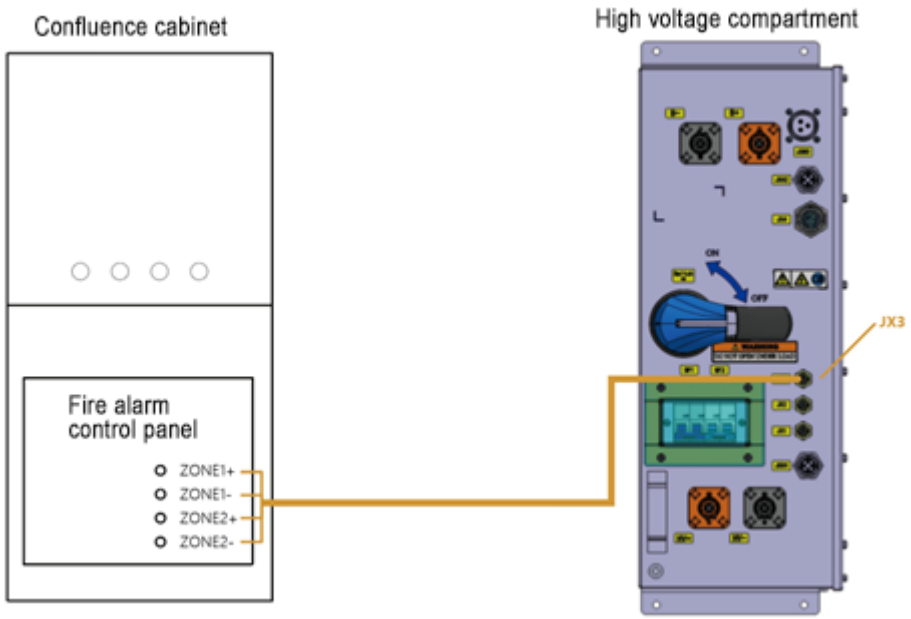
the aviation plug to the JXH1 terminal of the high-voltage box. Connect the two wires with a cross-sectional area of 1.5 square millimeters at the other end to the outgoing terminal of QF6 of the PCS, and connect the two wires with a cross-sectional area of 4 square millimeters to the outgoing terminal of QF4 of the PCS. The power supply wiring is shown in



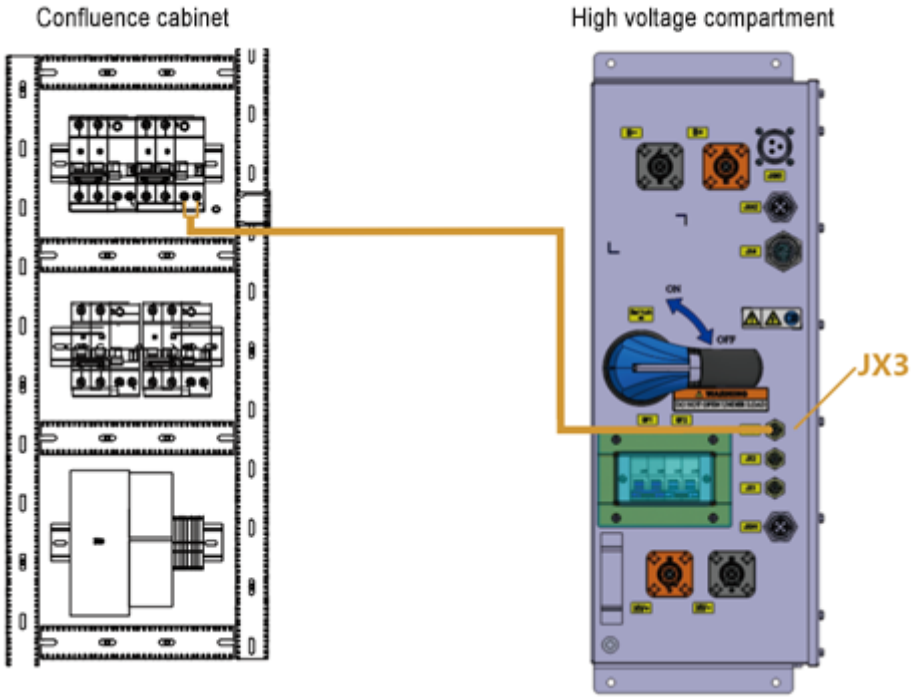
the following figure:

4.6 Communication connection

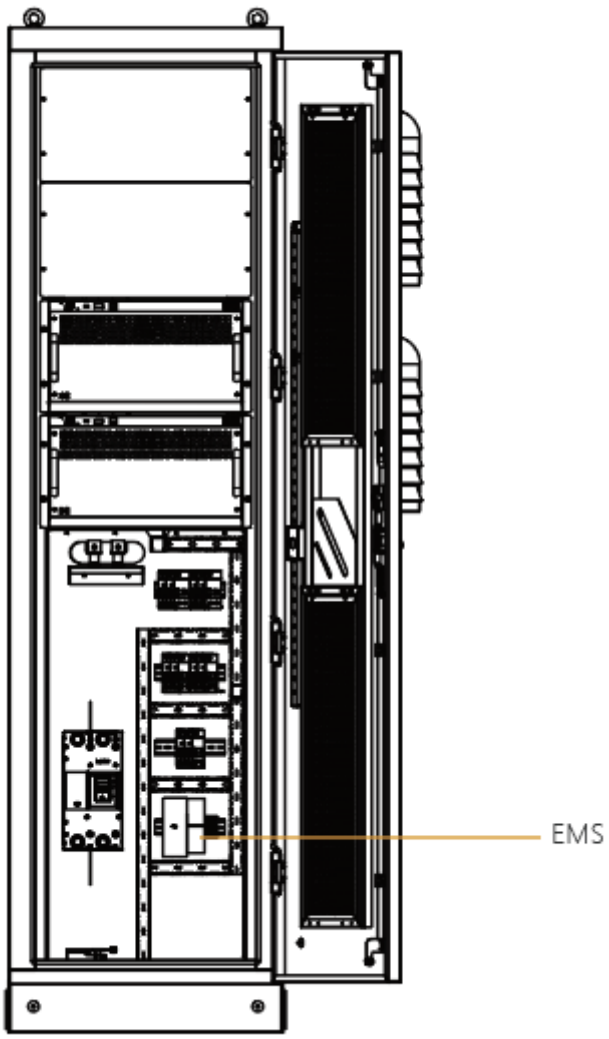
1. Connection of the fire protection communication wiring harness: Connect one end of the 20-meter-long fire protection communication wiring harness with an aviation plug to JX3 of the first high-voltage box. Connect the four-core fire protection wiring harness at the other end to ZONE1+, ZONE1-, ZONE2+ and ZONE2- of the fire protection main unit respectively; Connect one end of the 10-meter-long fire protection communication wiring harness with an aviation plug to JX3 of the second high-voltage box, and connect one end of the 10-meter-long fire protection communication wiring harness with an aviation plug to JX3 of the third high-voltage box, and so on. Connect the four-core wiring harness at the other end of all the 10-meter-long fire protection wiring harnesses to ZONE1+, ZONE1-, ZONE2+ and ZONE2- of the fire protection main unit respectively.



2. MBMU-BAT communication harness connection: connect the end of the 20m / 10m long fire communication harness belt aviation plug to the JX 3 of the high pressure box, and the two-core 485 communication line at the other end is connected to the offline end of the 7 (CAN _ H) and 8 (CAN _ L) terminal rows at the front of the PCS respectively.



3. The EMS (Energy Management System) of the energy storage converter is connected to the superior EMS inside the busbar cabinet through a network cable.



Warning	When installing the grounding circuit, ensure that the AC side of the energy storage converter cabinet is disconnected from the grid, and the AC circuit breaker of the energy storage converter is in the off state.

Chapter 5 Trial run

5.1 Inspection before the Trial Operation

Warning:

Before powering on and operating, it is necessary to conduct pre-operation inspections, eliminate potential hazards, and ensure safety.

5.1.1 Mechanical Installation Inspection

Ensure that the installation bracket is secure and all screws have been tightened to the specified torque value.

5.1.2 Inspection of the Connection Cables of the Energy Storage Converter Cabinet

- Confirm that all cable connections are firm and reliable, without any incorrect or missing connections;
- Ensure that all cables are arranged reasonably and will not be mechanically damaged;
- Pay special attention to whether the positive and negative polarities of the DC cables on the input side are correct;
- Pay special attention to whether the connection of the output cables is correct.

5.1.3 Electrical inspection

- Ensure that all power switches on the AC and DC sides are in the off state. □
- Test that the voltages on the AC/DC sides are both 0V. □
- Test that the internal resistance to the ground of the three-phase

wires at the incoming terminals of the AC circuit breaker is within the normal range.

5.2 Steps for the Trial Operation

After the pre-operation test and inspection are completed and confirmed to be correct, conduct the trial operation of the energy storage converter cabinet according to the following steps.

1.) Close and confirm that all the doors of the battery cabinets are in the closed state.

2.) Close the main circuit breaker of the AC power distribution cabinet, and observe and confirm that devices such as the display screen and the controller are operating normally.

3.) Close the circuit breakers of the AC power distribution cabinets corresponding to all PCSs in sequence.

4.) Close the AC circuit breakers of all PCSs in sequence, and observe and confirm that all the inverter modules have been powered on normally (the green indicator light is on).

5.) Close the DC circuit breakers of all PCSs in sequence.

6.) Close QF3 (main switch), QF4 (liquid cooling unit), QF5 (controller power supply) and QF6 (high voltage box) of all PCSs in sequence, observe and

confirm that all the liquid cooling units are operating normally, and observe and confirm that the indicator lights of all the controllers are operating normally.

7.) Close the isolating switches of all the high voltage boxes in sequence, wait for a few seconds, observe and confirm that the green indicator light of the battery cabinet is on, and observe and confirm that the green and yellow indicator lights of the PCS are on.

8.) Issue the BMS startup command through the display screen, wait for a few seconds, observe and confirm that the red indicator light of the battery cabinet is on, and observe and confirm that the yellow indicator light of the PCS is off (if the yellow indicator light is not off, it means there are other faults, please contact the engineer to troubleshoot the cause of the faults).

9.) Issue the PCS startup command through the display screen. When the PCS is in the shutdown state, issue the specified power, observe and confirm that the PCS can operate normally, and then issue the shutdown command, and the trial operation is over.

Note:

Before selecting the grid regulations, please contact your local power supply company first. If the energy storage converter cabinet is set to operate under the wrong grid regulations, the power supply company may

cancel the operation permit of the device.

Please ensure that the entire system complies with national standards and application safety regulations before operating the energy storage converter.

Work mode

6.1 Power on

Close the AC circuit breaker of the power distribution cabinet and all the AC and DC circuit breakers of the PCS. After confirming that there are no faults in the system, issue the startup commands for the PCS and the EMS. At the same time, issue a zero-power command to the PCS, and the energy storage converter cabinet will enter the standby mode.

6.2 Close down

Manual Shutdown: Issue a shutdown command for the PCS on the display screen, and the energy storage converter cabinet will enter the shutdown mode.

Fault Shutdown: When a fault occurs in the battery cabinet/PCS/power distribution cabinet, the PCS and the battery cabinet will automatically shut down.

Remote Shutdown: The EMS issues a shutdown command for the PCS, and the energy storage converter cabinet will enter the shutdown mode.

6.3 Work mode

There are four working modes, and for each mode, there is corresponding content to indicate that mode.

(1) Power-on Self-check

This status indicates that during the power-on process of the energy storage converter cabinet, it is checking whether the power-on conditions are met.

(2) Normal Operation

This status indicates that the energy storage converter cabinet is in a normal working state, and the yellow indicator lights of both the PCS and the battery cabinet are off.

(3) High-voltage Status

This status indicates that the energy storage converter cabinet is in a high-voltage state, and the red indicator lights of the battery cabinet are all on.

(4) Fault Status

This status indicates that the energy storage converter cabinet is in a fault state, and the yellow indicator lights of both the PCS and the battery cabinet are on. It is necessary to contact an engineer to deal with the fault. Normal power-on and power-off can only be carried out after the fault is eliminated.

Danger Isolation Strategy:

When the system is in a dangerous state, open the cover of the

emergency stop button of the corresponding PCS and press the emergency stop button. The PCS will be in a fault shutdown state.

6.4 Combined to the grid

The ZMP series energy storage converter cabinets have the anti-islanding safety function. It will continuously check whether the AC power grid meets the conditions for grid-connected power generation, and also detect whether the battery has sufficient energy. After all the conditions are met, the energy storage converter will enter the grid-connected power generation mode. During grid-connected power generation, the energy storage converter cabinet can detect the power grid at any time. If an abnormality occurs, the energy storage converter cabinet will trip according to the configured protection settings. When the power generation is insufficient to ensure the operation of the energy storage converter, the energy storage converter cabinet will enter the standby state. When the battery voltage change is stable and higher than the required set value, the energy storage converter cabinet will attempt to start grid-connected power generation again.

Chapter 7 Product Maintenance and dismantling

7.1 Common troubleshooting

Warning	1.Abnormal temperature sensor	Definition: Note the abnormal temperature detection.
		Possible causes:

		1.Poor contact of the interface plug-in of the temperature sensor; 2. The temperature sensor is damaged.
		Recommended handling measures: 1. Observe the temperature display value. 2. Disconnect the DC switch and let the system be powered on again. 3. Contact the after-sales service personnel.
	2.Communication failure	Definition: Internal communication failure of the inverter.
		Possible causes: 1. Poor contact of the interface plug of the internal communication cable of the inverter.
		Recommended handling measures: 1. Observe for 5 minutes to see if the inverter can automatically eliminate this alarm. 2. Disconnect the DC switch and let the system be powered on again. 3. Contact the after-sales service personnel.
	3.External fan failure	Definition: The externally visible fan is operating abnormally.
		Probable cause :

		1. The fan is blocked from rotating. 2. The service life of the fan has ended. 3. The connection of the fan interface plug-in is poor.
	4.Power grid voltage failure	Definition: The grid voltage exceeds the specified range.
		Possible causes: 1. There is an abnormality in the grid voltage. 2. The connection line between the inverter and the grid has poor contact.
		Recommended handling measures: 1. Observe for 10 minutes to see if the inverter can automatically eliminate this alarm. 2. Check if the grid voltage is within the specified range. 3. Check if the grid connection line is disconnected or has had any abnormalities. 4. Contact the after - sales service personnel.
Fault	5.Abnormality of the grid voltage	Definition: The grid voltage exceeds the specified range.
		Possible causes: 1. There is an abnormality in the grid voltage. 2. The connection line between the inverter and the grid has poor contact. 3. Contact the after-sales service personnel.

		Recommended handling measures: 1. Observe for 10 minutes to see if the inverter can automatically clear this alarm. 2. Check whether the grid voltage is within the specified range. 3. Check whether the grid connection line has been disconnected or has had any abnormalities.
	6.Abnormality of the grid frequency	Definition: There is an abnormality in the frequency of the grid voltage.
		Possible causes: 1. There is an abnormality in the grid frequency. 2. The connection line between the inverter and the grid has poor contact.
		Recommended handling measures: 1. Observe for 10 minutes to see if the inverter can automatically eliminate this alarm. 2. Check whether the grid frequency is within the specified range. 3. Check whether the grid connection line has been disconnected or has experienced any abnormalities. 4. Contact the after-sales service personnel.

7.2 Product maintenance

7.2.1 Electrical connection check

Conduct a maintenance inspection of all the connecting cables in the energy storage converter cabinet once every six months to one year.

1.) Check whether the connecting cables are loose.

2.) Check whether the connecting cables are damaged. In particular, check if there are any scratches on the outer skin that comes into contact with the metal surface. Repair or replace the cables if necessary.

7.2.2 Cleaning of the air inlet and outlet

A large amount of heat will be generated when the energy storage converter cabinet is in operation. To ensure reliable operation and to achieve good ventilation and heat dissipation for the energy storage converter cabinet, it is necessary to regularly inspect the air inlet and outlet, confirm that there is no obstruction to the ventilation. When necessary, use a soft brush or a vacuum cleaner to clean the air inlet and outlet of the energy storage converter cabinet.