


**User\_manual**  
**Combiner cabinet**  
**CLMG-1125**



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## Revision Record

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# User\_manual

Version: A0

Dear User, thank you very much for using the commercial and industrial busbar cabinet products produced by Shenzhen Clou Electronics Co., Ltd. We sincerely hope that this product will meet your needs and look forward to your valuable suggestions during the use of the product!

This manual provides detailed information about the product and installation and usage instructions for the commercial and industrial busbar cabinet manufactured by Shenzhen Clou Electronics Co., Ltd. Please read this manual carefully before use.

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This manual primarily introduces the transportation and storage, mechanical installation, electrical connections, power-up operation and power-down operation, troubleshooting, and maintenance methods for the busbar cabinet.

## ➤ Target Audience

This manual is intended for technicians who will be installing, commissioning, using, and maintaining this product. Please read this manual carefully before beginning any operations on the product. Readers should have a basic understanding of electrical systems, wiring, electrical components, electrical symbols, and mechanical diagrams.

## ➤ Product Services and Consultation

For more information about product details, service support, and successful cases of products and solutions, please consult our company.

## ➤ Manual Warning Symbols

To ensure the safety of users and property when using the product, and to optimize the efficient use of the product, the manual provides relevant information and highlights it with the following symbols.

The following lists the symbols that may be used in this manual. Please read them carefully to better use this manual.

### **Danger**

Indicates a high potential hazard that, if not avoided, could result in death or serious injury.

### **Warning**

Indicates a moderate potential hazard, which if not avoided, may lead to death or serious injury.









### **Caution**

Indicates a low potential hazard, which if not avoided, may lead to moderate or minor injury.

### **Note**

Indicates a potential risk, which if not avoided, may cause the equipment to fail to operate normally or result in property damage.

## ➤ Machine Warning Label

	<p><b>PE Marking:</b> This is the protective earth PE terminal, which must be reliably grounded to ensure the safety of the operator and the equipment.</p>
	<p><b>General Warning:</b> This component may pose hazards other than high voltage, users should be cautious!</p>
	<p><b>Static Warning:</b> This component may be damaged by electrostatic discharge.</p>
	<p><b>High Voltage Warning:</b> This component may present a high voltage hazard; users should exercise extra caution!</p>
	<p><b>Hot Surface Warning:</b> Beware of hot surfaces to prevent burns!</p>
	<p><b>Touch Warning:</b> This component has hazards such as high temperature and should not be touched directly.</p>
	<p><b>Refer to User Manual Note:</b> Please refer to the relevant instructions in the user manual before operation.</p>
	<p><b>Noise Notice:</b> The product may produce significant noise during operation; it is advisable to wear earplugs to protect your hearing when necessary.</p>

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# 1 Safety Precautions

This chapter introduces the safety precautions that must be followed when transporting and storing, installing, wiring, and other operations on this product. Before installing, wiring, and other operations on this product, please read the safety precautions carefully. Safety precautions must be strictly followed during the operation. Ignoring safety precautions may result in equipment damage, and even bodily injury.

## 1.1 Transportation and Storage

### Danger

- 1) When handling the product, lift and place it gently to avoid damaging the product.
- 2) The equipment must be transported in an upright position. During transportation, avoid tilting the equipment to prevent bodily injury.



### Warning

During transportation and storage, avoid physical impacts and vibrations to the product.





Storage Requirements:

- 1) Before storage, ensure that the busbar cabinet doors and all internal equipment cabinet doors are securely locked.
- 2) Storage ambient temperature:  $-30^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ .
- 3) Storage relative humidity: 0% to 95%, non-condensing.
- 4) Effectively protect the air inlets and outlets of the busbar cabinet, and take effective measures to prevent rainwater, sand, and dust from entering the cabinet interior.
- 5) Regular inspection. Inspect at least once every half month to check if the cabinet and all internal equipment are intact and undamaged.

- 6) Before installing a Combiner cabinet that has been stored for a long time (storage time exceeding six months), first open the cabinet door for a visual inspection to ensure there is no condensation on the exterior of the cabinet. Confirm that the cabinet and internal equipment are intact and undamaged. At the same time, a power-on and startup inspection should be conducted. If necessary, it must be tested by a professional before installation.
- 7) Regular inspections should be carried out to check if the packaging is intact and undamaged, to prevent damage from insects or rodents. If damage is found, it should be replaced immediately. The packaging box should not be tilted or inverted.

## 1.2 Machine Warning Label

The cabinet of the product, both inside and outside, may be labeled with warning labels, the meanings of which are as follows:

	Ground Protection
	Electrostatic Sensitive Components
	High Voltage Warning
	High Leakage Current Warning

## 1.3 Wiring

### Danger

- 1) All wiring for peripheral accessories must follow the guidance in this manual, and must be wired according to the connection methods provided in this manual, otherwise, danger may occur.
- 2) Before wiring, ensure that the power supply is turned off.
- 3) Please ensure that this product is properly and correctly grounded according to the standards.

- 4) Pay attention to the markings on the output terminals, and strictly avoid incorrect wiring, which may damage the equipment.
- 5) The wire gauge must be selected according to the recommendations in the manual, otherwise, accidents may occur.
- 6) Do not open the panel of this product after power-on unless necessary, as there is a risk of electric shock.
- 7) Do not touch this product or surrounding circuits with wet hands after power-on, as there is a risk of electric shock.
- 8) Do not touch any input or output terminals of this product after power-on, as there is a risk of electric shock.
- 9) Before testing power cables and other external equipment, disconnect them from this product to prevent accidental damage.

### Note

- 1) Ensure that the voltage level of the input power supply matches the rated voltage level of this product.
- 2) No dielectric strength tests are required for any part of this product, as this test has been performed at the factory; otherwise, accidents may occur.
- 3) Ensure that the wiring meets EMC requirements and safety standards of the area.

## 1.4 Operation and commissioning

### Alarm

- 1) Do not touch the cooling outlet hood and louvers during operation, as it may cause burns.
- 2) Do not manually test signals during operation, as it may cause bodily injury or equipment damage.
- 3) Avoid dropping foreign objects into the equipment during operation.
- 4) Do not cover the ventilation holes of the product during operation.

- 5) Do not open the doors or panels of this product during operation.

## 1.5 Maintenance

### **Danger**

- 1) Do not perform maintenance operations on this product while it is powered on. After disconnecting the power, wait for at least 5 minutes; otherwise, residual charges in the equipment may cause bodily injury.
- 2) Do not attempt to repair or maintain this product without being a professionally trained personnel authorized by the company, as it may cause bodily injury or equipment damage.
- 3) All pluggable modules must be inserted or removed while the power is off, otherwise the equipment may be damaged.
- 4) Do not leave wire ends or tools inside the machine, as it may cause a fire or damage to property.

## 1.6 Product safety

To safely use the product, please have relevant technical personnel carefully read the following requirements! Otherwise, component damage or abnormalities, property loss, or safety accidents caused by the following reasons are not within the company's liability.

- 1) The customer has not properly maintained or serviced the system according to the accompanying equipment user manual.
- 2) Storing or installing the system with flammable/explosive materials can cause product damage or other property loss.
- 3) System-related operations must be performed by professionals. Personal safety accidents, property damage, etc., caused by not wearing standard-compliant protective equipment during operation.

## 1.7 Other Precautions

### 1) Use outside the rated voltage

Do not use this product outside the operating voltage range. If necessary, use the corresponding step-up or step-down device for voltage transformation.

### 2) Altitude and Derating Usage

In areas with an altitude exceeding 2000m, the cooling effect of this product may be reduced due to thin air, and it may be necessary to use it at a derated capacity. Please consult our company for technical advice in such cases.

### 3) Use in Harsh Weather Conditions

In the event of a local weather warning of heavy rain, strong wind yellow warning or above, sandstorms, and other severe conditions, power must be disconnected. When re-energizing, the cabinet door must be opened to check for any abnormalities.

## 1.8 Installation

### Alarm

- 1) Install this product on a fire-resistant surface, away from flammable materials, to prevent fires.
- 2) Do not install this product in an environment containing explosive gases, as this may pose a risk of explosion.
- 3) Do not install this product on a base that experiences mechanical vibration.
- 4) During installation, ensure that the installation environment provides good ventilation and heat dissipation. When placing more than two of these products adjacent to each other, pay attention to the installation position to ensure proper heat dissipation.
- 5) During installation and maintenance, prevent liquids, dust, or debris from entering the interior of the product, as conductive liquids and debris can cause internal short circuits, leading to equipment damage
- 6) When connecting external cables to the internal cables of the product, ensure that the cable installation torque is correct. Insufficient torque may increase contact resistance, causing overheating, while excessive torque may cause screw fatigue damage.

## 1.9 Product Disposal and Recycling

### 1 Recycling Overview

The Combiner cabinet contains various recyclable or hazardous materials that must be disposed of in accordance with environmental requirements. Follow the instructions below to ensure that the recycling process of the equipment meets environmental protection standards and minimizes environmental impact.

### 2 Recycling Preparation

Before dismantling and recycling the Combiner cabinet, ensure that the equipment is completely powered off and will not pose a risk to the operator. The following are the preparatory steps before recycling:

**Power-off Steps:** Ensure that the connection to the power grid or other power sources is disconnected.

**Protective Equipment:** Operators should wear insulating gloves and protective clothing.

### 3 Recycling Steps

#### **Electrical and Electronic Components:**

Electronic components inside the cabinet, including control units, cables, etc., may contain hazardous substances and should be disassembled and handed over to electronic waste recycling facilities. Avoid damaging the circuit board during disassembly to prevent the leakage of toxic substances.

#### **Metal Structure:**

Metal parts of the cabinet shell, frame, etc., can be recycled and reused. Send the metal parts to a local metal recycling station. Ensure that surface dirt and grease are removed during the recycling process.

#### **Plastics and Other Materials:**

The cabinet may contain plastics and other non-metallic materials. Based on the material identification, send recyclable plastics to local recycling facilities.

### 4 Precautions

**Do Not Disassemble:** Users are prohibited from disassembling the BESS. Please contact a professional for any necessary operations.

**Compliance with Local Regulations:** Recycling and disposal procedures should comply with the environmental regulations of the location where the equipment is installed.

Contact Recycling Services: We recommend that users contact local electronic waste or battery recycling service providers to ensure legal and compliant recycling and disposal.

## **5 Recycling Service Contact Information**

For more assistance, please contact our company or a local recycling service provider.

# 2 Product Description

## 2.1 Product Overview

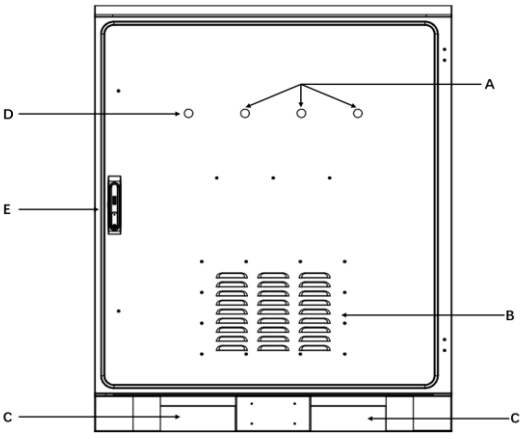
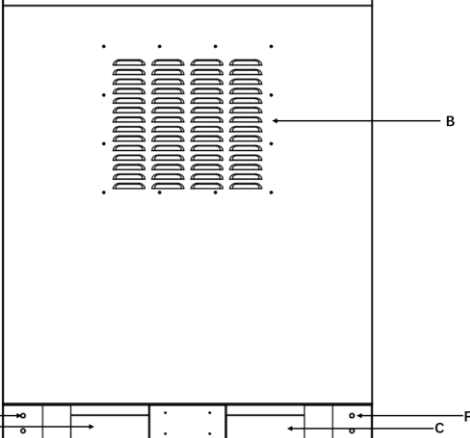
This Combiner cabinet is primarily used in commercial and industrial settings, integrating multiple BESS combiner switches, a local controller, and system power distribution.

The protection rating of the Combiner cabinet is IP54, allowing it to operate outdoors, and it supports up to 9 BESS with a rated power of 125 kW and a voltage of 4 00VAC.

## 2.2 Appearance Design

### 2.2.1 Appearance Introduction

Table 2-1 Combiner cabinet Appearance

View	Description
	<p>Front View</p> <p>A: Operation Indicator Light</p> <p>B: Ventilation Holes</p> <p>C: Forklift Holes</p> <p>D: Fault Indicator Light</p> <p>E: Front Door Lock</p>
	<p>Rear View</p> <p>F: Grounding Hole</p>

\*The above images are for reference only. Please refer to the actual product received!


## LED Indicator Light

Four LED lights are installed at the top of the Combiner cabinet to display the energized and operational status of the equipment, including the power indicator light “PWR”, and the operation indicator lights “RUN1, RUN2, RUN3”.

Table 2-2 LED Indicator Light Description

Name	Color	Description
Powersupply	Green	The main circuit of the system has been powered
Operation	Green	NormalOperation

Table 2 -3 LED Display Status and Operation Description

Name	Color	Description
 RUN	Green	System is operating normally or in a powered state

## 2.3 Mechanical Parameters

### Combiner cabinet Dimensions

The appearance and dimensions of the Combiner cabinet are shown in the following figure.

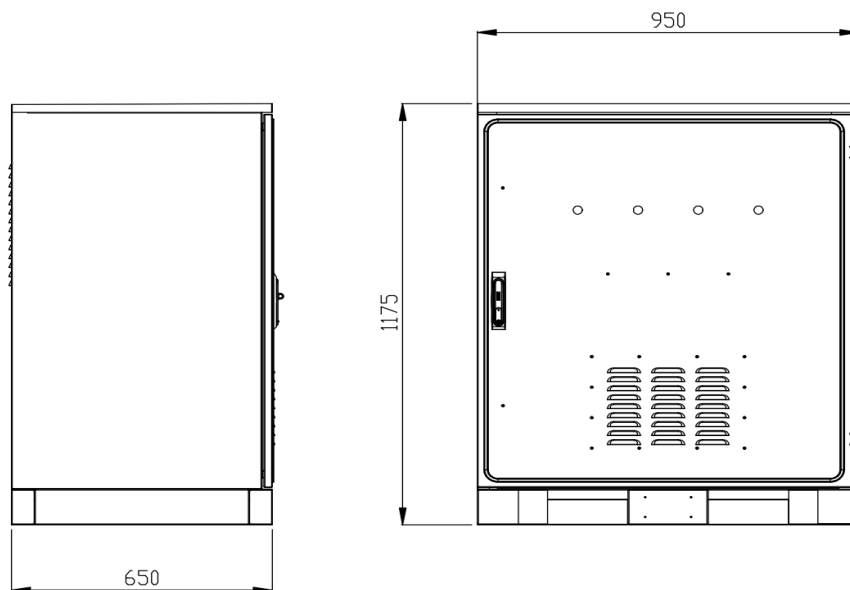


Figure 2-1 Combiner cabinet Dimensions

\*The above images are for reference only. Please refer to the actual product received!

## 2.4 Internal Design

### 2.4.1 Internal Equipment Layout

The door layout of the Combiner cabinet is shown in the following Figure 2 -2.

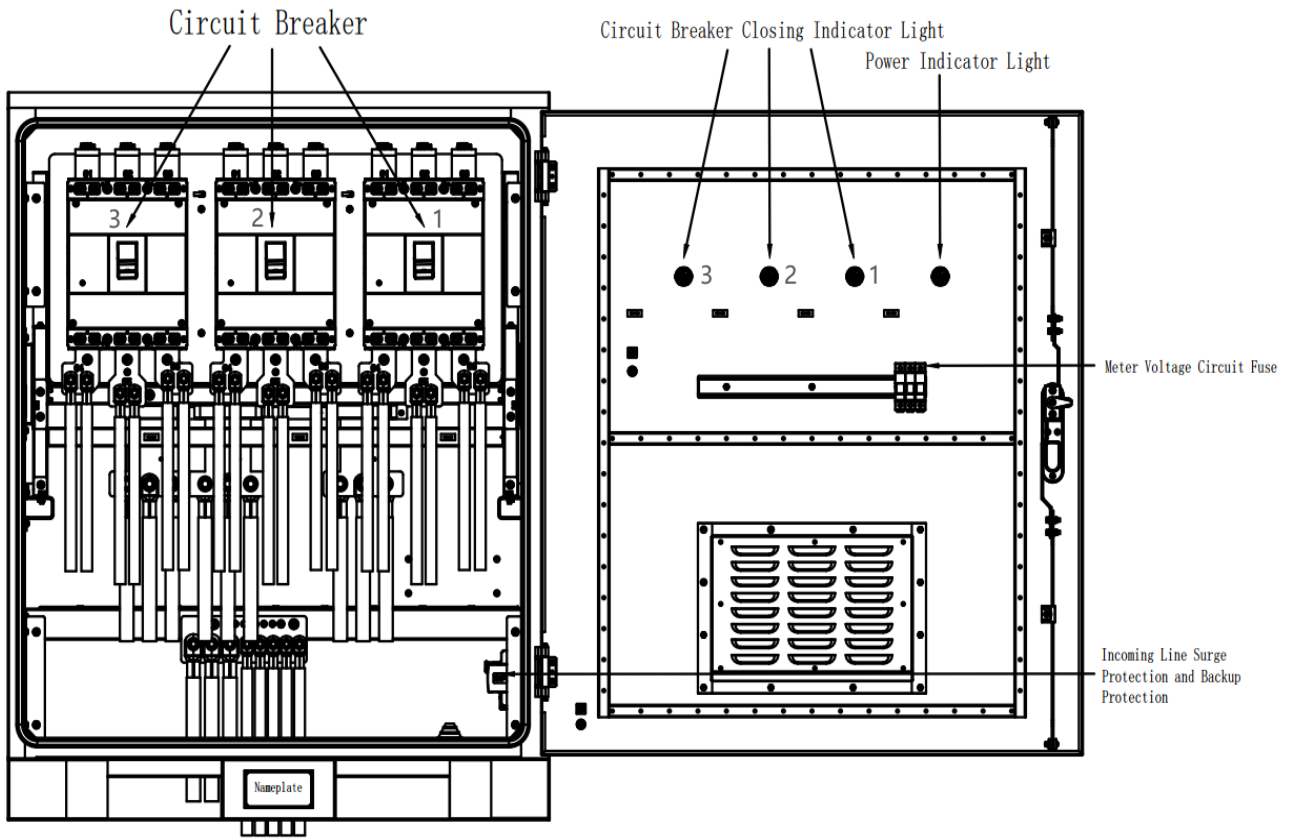


Figure 2-2 Combiner cabinet Internal Layout

\*The above figure is for reference only, please refer to the actual product received!

## 2.4.2 Overview of Switch Positions

The positions of the circuit breakers in the Combiner cabinet are as follows:

QF1 for disconnecting/protecting BESS 1~3#; QF2 for disconnecting/protecting BESS 4~6# (if required); QF3 for disconnecting/protecting BESS 7~9# (if required).

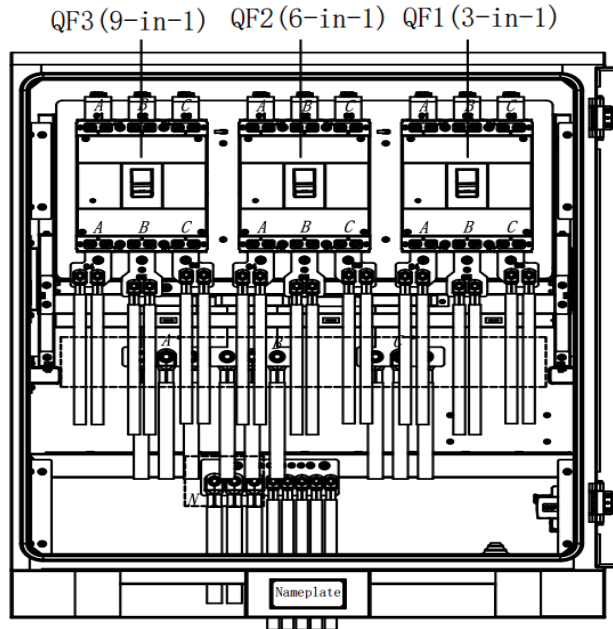


Figure 2-3 Overview of Switch Positions

## 2.4.3 Cable Entry Design

To facilitate cable connections on-site, all cables for internal equipment in the Combiner cabinet have been connected before delivery.

Cables connecting the Combiner cabinet and external equipment can enter the interior through the bottom cable entry, with the length determined by the site conditions.

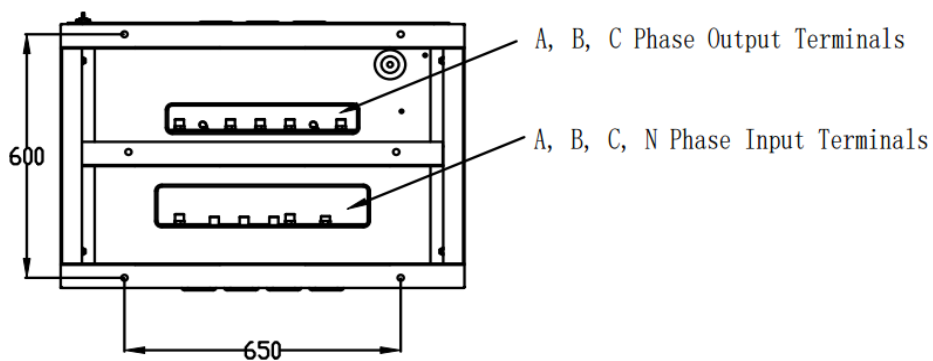


Figure 2-4 Cable Entry Definition for Combiner cabinet (Top View)

# 3 Mechanical Installation

## Alarm

Throughout the entire process of mechanical installation, all relevant standards and requirements of the project site must be strictly followed.

### 3.1 Transport Conditions

Various devices inside the Combiner cabinet are already installed and fixed before leaving the factory; the Combiner cabinet can be transported as a whole during transit.

## Alarm

- 1) Throughout the loading, unloading, and transportation process, the safety regulations for outdoor cabinet operations in the country/region where the project is located must be strictly followed!
- 2) Any machinery and tools used in the operation of the BESS should be maintained.
- 3) All personnel involved in loading, unloading, and securing should receive appropriate training, especially in safety.

## Note

Throughout the loading, unloading, and transportation process, the mechanical parameters of the BESS must be kept in mind at all times.

The transportation and movement of the Combiner cabinet must meet the following conditions:

All cabinet doors of the Combiner cabinet must be securely locked.

Based on the site conditions, select an appropriate forklift or handling tool. The selected tool must have sufficient load-bearing capacity, arm length, and turning radius.

If it is necessary to move on a slope, additional traction equipment may be required.

Clear all obstacles that may exist during the movement, such as trees, cables, etc.

Transportation and movement of the Combiner cabinet should be carried out under the best possible weather conditions.

It is imperative to set up warning signs or warning tapes to prevent unauthorized personnel from entering the forklift transportation area to avoid accidents.

## 3.2 Equipment Transportation

The bottom of the Combiner cabinet is equipped with dedicated forklift transport slots (see the following figure), which allow the Combiner cabinet to be moved by forklift.

### Alarm

- 1) Move the Combiner cabinet using the front or side slots at the bottom.
- 2) Under no circumstances should the Combiner cabinet be moved by inserting the forks into any position other than the designated slots.
- 3) Throughout the entire process of moving the equipment, strict adherence to forklift safety operating procedures must be maintained.
- 4) No one should stand below or around the moving machine to prevent injury or death.
- 5) In case of adverse weather conditions, such as heavy rain, dense fog, strong winds, etc., transportation work should be stopped.

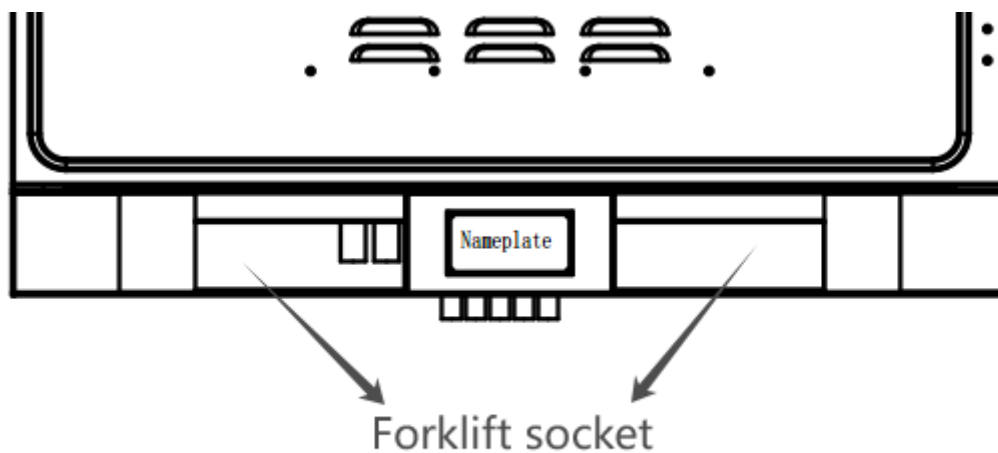


Figure 3-1 Schematic Diagram of Fork Holes at the Bottom of the Cabinet

If the forklift transportation method is used, the following requirements must be met:

- The forklift should be equipped with sufficient load capacity (at least 300 Kg).
- The prongs inserted into the Combiner cabinet should be at least 6 50 mm.

The prongs should be inserted into the fork-shaped holes at the bottom of the workstation (for the location of the fork-shaped holes, refer to the schematic diagram).

- The transportation, movement, and placement of the Combiner cabinet should be slow and steady. A trial transport is recommended.
- The Combiner cabinet can only be placed on a level surface. The location should have good drainage and be free of any obstructions or protrusions. The Combiner cabinet should be secured with four base corner pieces.

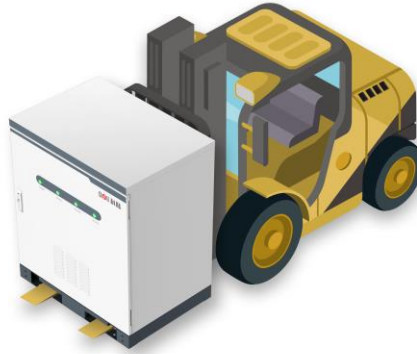


Figure 3-2 Forklift Transportation

\*This diagram is for reference only, please refer to the actual product received!

### Note

The plug holes of the Combiner cabinet are sealed with covers before delivery. After the cabinet is installed, the covers must be reinstalled in their original positions.

## 3.3 Construct Foundation

### 3.3.1 Site Selection for Installation

When selecting an installation site, please adhere to the following principles at a minimum:

- The climate environment and geological conditions (such as stress wave emission, groundwater level) of the installation site for the Combiner cabinet should be fully considered.
- The surrounding environment should be dry, well-ventilated, and away from flammable and explosive areas.
- The soil at the installation site needs to have a certain degree of compaction. It is recommended that the relative density of the soil at the installation site be  $\geq 98\%$ . If the soil is loose, it is essential to take measures to ensure the stability of the foundation.

### 3.3.2 Foundation Selection

#### Alarm

The Combiner cabinet is relatively heavy, and before constructing the foundation, a detailed investigation of the installation site conditions (mainly geological and environmental climate conditions) should be conducted. Only on this basis can the design and construction of the foundation begin.

An unreasonable foundation construction plan can cause significant difficulties or problems for the placement of the Combiner cabinet, opening and closing the door, and subsequent operation. Therefore, the installation foundation of the Combiner cabinet must be designed and constructed according to certain standards in advance to meet the requirements for mechanical support, cable routing, and future maintenance and inspection.

When constructing the foundation, the following requirements must be met:

- The bottom of the foundation pit must be compacted and leveled.
- The foundation must provide sufficient support for effective load-bearing, and it should be made of reinforced concrete. The compressive strength of the concrete must not be less than C30( the weight of a single Combiner cabinet is approximately 300kg ).
- Elevate the energy storage integration system to prevent water erosion of the Combiner cabinet base and interior. It is recommended that the foundation be about 200 mm higher than the level ground at the installation site.
- Drainage measures appropriate to local geological conditions must be constructed.
- Construct a concrete foundation with sufficient cross-sectional area and height. The height of the foundation should be determined by the construction party based on the site's geological conditions.
- Consider cable routing when constructing the foundation.
- The maintenance platform is built around the foundation, facilitating future maintenance.
- Based on the location and size of the cable entry and exit points on the Combiner cabinet, sufficient space should be reserved for the AC cable tray during foundation construction, and the cable conduits should be pre-installed.

- Determine the specifications and quantity of the perforated pipes based on the cable type and the number of incoming and outgoing wires.
- Both ends of all pre-buried pipes should be temporarily sealed to prevent impurities from entering; otherwise, it will be inconvenient for later wiring.
- After connecting all cables, seal the cable entry and exit points and the joints with fire-resistant mud or other suitable materials to prevent rodents from entering.

### 3.3.3 Other protective measures

#### Note

A drainage system should be constructed at the installation site to prevent the bottom or internal equipment of the BESS from being soaked by water during rainy seasons or heavy rainfall.

#### Note

Do not plant trees in close proximity to the installation site. To prevent strong winds from knocking down branches or blowing leaves that could block the doors or air inlets of the BESS.

## 3.4 Fixed installation

After confirming that the foundation construction meets the requirements and is sufficiently dry, solid, and level, use a forklift to place the Combiner cabinet in the designated position.

Secure the Combiner cabinet to the foundation using fastening bolts.

Recommended installation space

The Combiner cabinet is generally used in conjunction with a stored energy cabinet. The Combiner cabinet can be installed in multiple cabinets, and the space between its left and right sides and adjacent stored energy cabinets can either be left unreserved or a certain space (50mm) can be reserved as appropriate.

At least 1 000 mm of space should be reserved in front of the cabinet to facilitate opening the door for installation, maintenance, wiring, and other operations,

The back of the cabinet requires ventilation and maintenance, and it is recommended to reserve 500 mm from the wall;

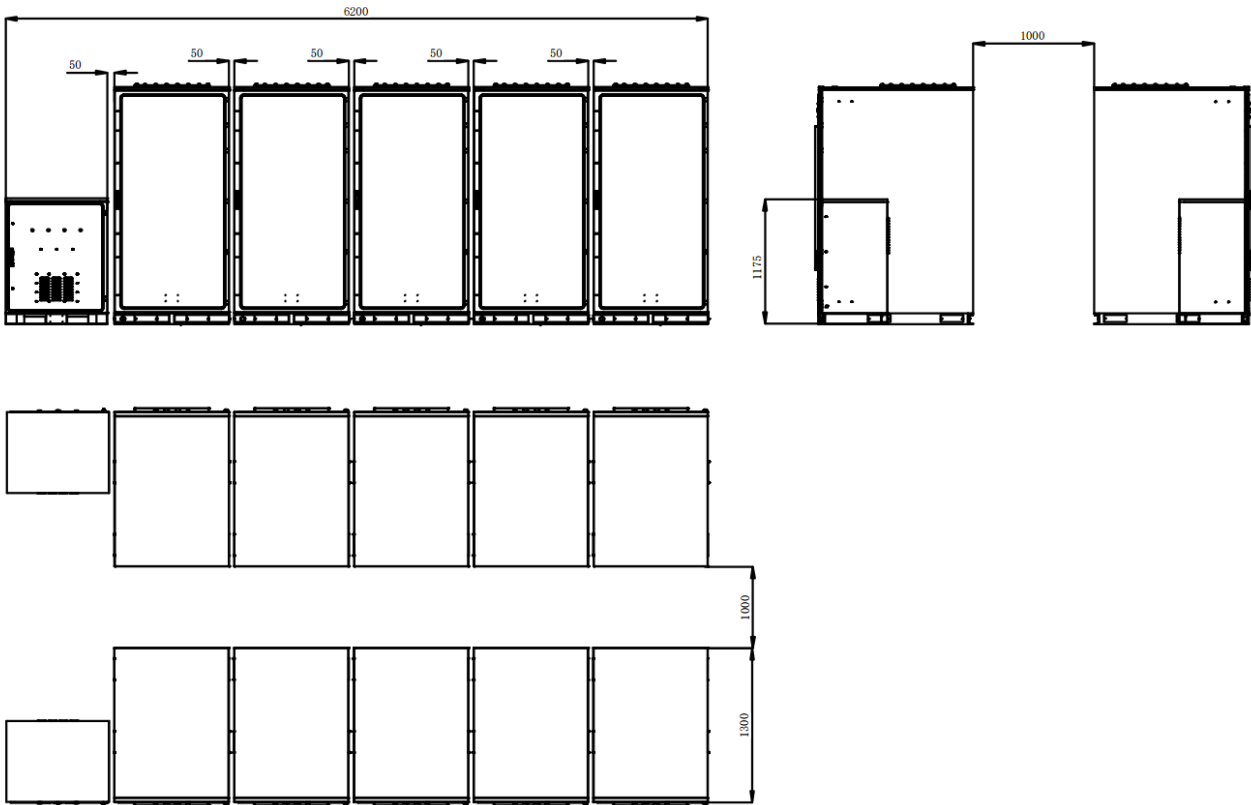


Figure 3-3 Parallel Installation Diagram of Stored Energy Cabinets (Example with 5 Stored Energy Cabinets + 1 Combiner cabinet)

# 4 Electrical connection

## 4.1 Safety Precautions

### 4.1.1 General provisions

#### Danger

High Voltage Hazard! Risk of Electric Shock!

- 1) Do not touch live parts under any circumstances!
- 2) Ensure that both the AC and DC sides are de-energized before installation.
- 3) Do not place the energy storage integrated system on flammable surfaces.

#### Danger

In the event of a ground fault in the combiner cabinet, parts that are normally non-energized may carry lethal high voltage. Accidental contact with these parts is extremely dangerous! Before operating, ensure that no ground fault has occurred within the system and take appropriate protective measures.

#### Alarm

- 1) All electrical connections must comply with the relevant standards and regulations of the country/region where the project is located.
- 2) The combiner cabinet can only be connected to the grid side after obtaining permission from the local power supply company and completion of installation by qualified technical personnel.

### Alarm

Only qualified electricians or personnel with professional qualifications should perform electrical connections on this product. Please strictly follow the wiring labels inside the device when performing wiring operations. Before wiring, disconnect the AC and DC sides of the energy storage integrated system.

### Alarm

The entry of sand and moisture may damage the electrical equipment inside the BESS or affect the performance of the equipment!

- 1) During the sandstorm season, or when the relative humidity of the surrounding environment exceeds 95%, electrical connection work should be avoided.
- 2) Start all connection work only when there is no sandstorm and the weather is clear and dry.

### Alarm

Failure to comply with torque requirements may result in a fire at the connection point!

During the electrical connection process, bolts must be tightened strictly according to the torque described in this manual.

### Alarm

Only qualified electrical engineers are allowed to perform electrical connection work. Please comply with all requirements given in the Safety Precautions section of this manual. Our company will not assume any responsibility for personal injury or property damage resulting from the neglect of these safety instructions.

### Alarm

When laying cables, ensure electrical insulation and comply with EMC standards; power cables should be laid separately from power and communication wiring. And when necessary, provide protection and support for the cables to reduce the stress on the cables.

### Alarm

Please strictly follow the wiring labels inside the device when performing wiring operations.

### Note

The installation design of the Combiner cabinet must comply with the relevant standards or regulations of the country/region where the project is located.

If the installation design requirements given in this manual are not followed, or if the installation is not carried out in accordance with the relevant electrical standards or regulations of the installation location, and this results in a malfunction of the Combiner cabinet or system, it will not be covered by the warranty.

## 4.1.2 Five Safety Rules

During the entire process of making electrical connections and all other operations performed on the Combiner cabinet and other equipment, the following five safety rules must be observed:

- Disconnect all external connections to the Combiner cabinet, as well as the connection to the internal power supply of the equipment.
- Ensure that all disconnect points cannot be accidentally re-energized.
- Use a multimeter to ensure that the equipment is completely de-energized internally.
- Perform necessary grounding.
- For parts near the operating section that may be energized, use insulating material to cover them.

## 4.2 Wiring Overview

The wiring diagram of the Combiner cabinet is shown in the following figure:

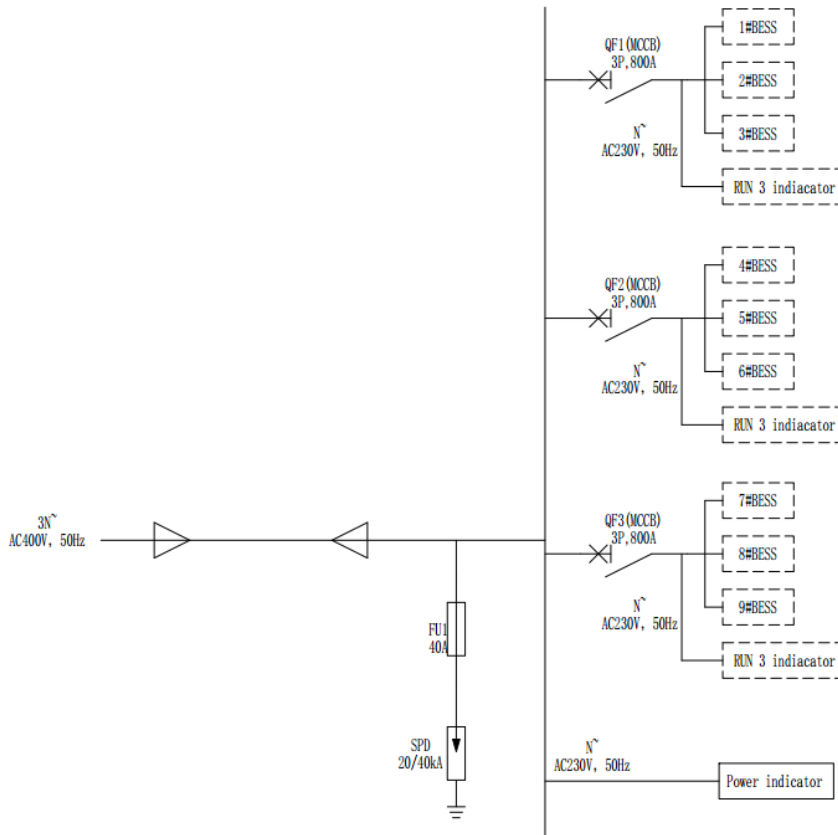


Figure 4-1 Electrical Topology Diagram

### Alarm

- 1) All electrical connections must be made strictly according to the wiring schematic.
- 2) All electrical connections must be made with the equipment completely de-energized.

### Alarm

Only qualified electrical engineers should perform electrical connection work. Please comply with all requirements given in the 'Safety Precautions' section of this manual. Our company shall not be liable for any personal injury or property damage resulting from the neglect of these safety instructions.

### ⓘ Note

- 1) The installation design of the Combiner cabinet must comply with the relevant standards or regulations of the country/region where the project is located.
- 2) If the installation is not carried out according to the installation design requirements provided in this manual, any resulting faults in the Combiner cabinet or system will not be covered by the warranty.

## 4.3 Wiring components

### ⚠ Alarm

Incorrect wiring sequence may cause a fire. Pay attention to the connection order of the wiring components.

When connecting, ensure that the connectors are securely fastened. Insufficient connection or oxidation of the contact surface can also cause excessive heat, which may lead to a fire.

### ⓘ Note

- 1) The length of the screws should be appropriate, just protruding from the installation hole; too long may affect the insulation performance of the equipment and even cause a short circuit.
- 2) After installation is complete, check the connection between the copper lugs and the copper busbar to ensure no part of the heating shrink tube is clamped. If clamped, remove it promptly; otherwise, it may cause poor contact, or even damage the equipment.

The fixing screws and other parts used for connecting power cables in the Combiner cabinet are already installed on the corresponding copper busbars when the equipment is delivered. Please strictly follow the description in this section to connect the cables.

### 4.3.1 Copper wire connection

If copper cable is selected, the connection sequence of the wiring parts is as shown in the following figure.

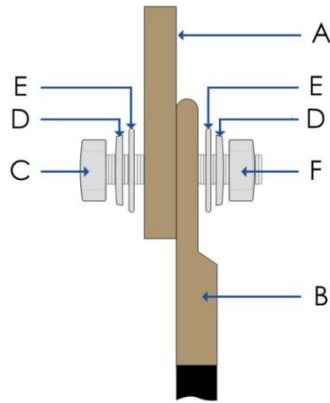


Figure 4 -2 Copper terminal connection sequence

Number	Name	Number	Name
A	Copper busbar	D	Washer
B	Copper terminal	E	Flat Washer
C	Bolt	F	Nut

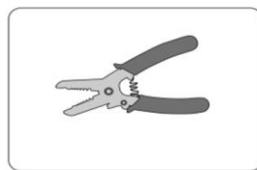
## 4.4 Electrical Wiring Preparation

### 4.4.1 Installation Tools

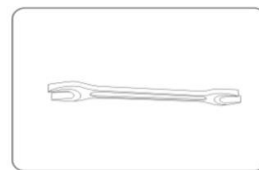
Before installation, you need to prepare at least the following tools and parts:



Torque Wrench



Wire Stripper



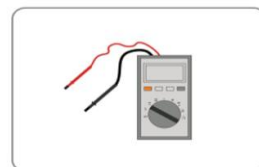
Socket Wrench



Terminal Crimping tool



Heat Gun



Multimeter



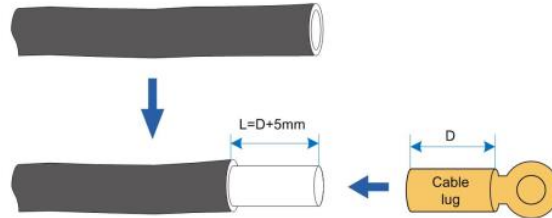
Screwdriver

## 4.4.2 Making Terminal Lugs

Follow the steps below to make terminal lugs.

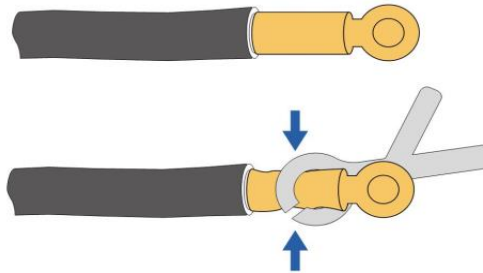
### Step 1 Strip the insulation from the cable.

The length of insulation to be removed from the end of the cable should be the depth of the crimping hole of the terminal lug plus about 5mm.



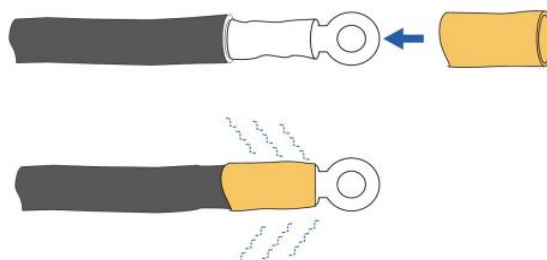
### Step 2 Crimp the terminal lug.

- 1 Place the exposed copper core of the stripped wire into the crimping hole of the terminal lug.
- 2 Use a terminal crimping machine to secure the copper terminal. The number of crimps should be more than two.



### Step 3 Install the heating shrink tube.

- 1 Select a heating shrink tube that matches the cable size, the length should exceed the crimped section of the copper terminal by about 2cm.
- 2 Place the heating shrink tube over the copper terminal, ensuring it fully covers the crimped holes of the terminal.
- 3 Use a heat gun to shrink the heating shrink tube.



—End

### 4.4.3 Open the cabinet door

Open the door before connecting the cables.

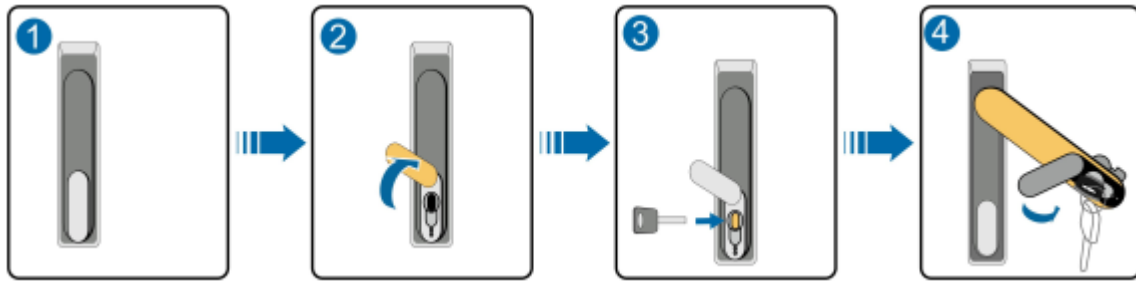


Fig. 4 -3 Steps to open the front door

Step	Description
1	Locked State
2	Move the cover upward to above the locking hole
3	Insert the door key and turn it clockwise
4	Turn the handle counterclockwise to the position shown in the figure to open the front door

### 4.4.4 Cable Entry Design

Cables connecting the energy storage device and external equipment can enter the interior from the cable entry at the bottom of the cabinet, see 2.4.3 section.

### 4.4.5 Check Cables

#### Alarm

Before electrical connections, check to ensure the integrity and insulation of all cables. If there are any damaged cables, replace them promptly. Poor insulation or cable damage can be hazardous.

Wiring between internal components of the Combiner cabinet is completed before leaving the factory. The user needs to:

- Check if the connection cables are damaged, and if so, immediately replace them with cables of the same specifications.
- Check that the cable connections are securely tightened. Ensure all terminal blocks are tightened.

#### 4.4.6 Precautions for Wiring

##### Alarm

- 1) Before wiring, you must check the polarity of all input cables to ensure that the polarity of each input is correct.
- 2) During electrical installation, do not pull on the cables or wires to avoid damaging their insulation.
- 3) All cables and wires should have sufficient space for bending.
- 4) Take necessary auxiliary measures to reduce the stress on cables or wires.
- 5) After each wiring operation, carefully check to ensure the wiring is correct and secure.

### 4.5 Ground Connection

#### 4.5.1 Introduction

##### Alarm

The grounding connection must comply with the grounding standards and regulations of the country/region where the project is located.

##### Alarm

The earth wire must be properly grounded! In addition:

- 1) Faults can cause fatal electric shocks!
- 2) Lightning can damage the equipment!
- 3) The equipment may not operate properly!

### Note

During grounding, note the following:

- 1) The grounding connection between the equipment and the grounding electrode must be securely fastened.
- 2) Measure the grounding resistance after grounding; the grounding resistance should not exceed  $0.1\Omega$  (the value should be based on local regulations).

### 4.5.2 Equal Potential Bonding of Internal Equipment

Before leaving the factory, the wiring from the main electrical equipment inside the Combiner cabinet to the earth terminal has been completed. The connection between the Combiner cabinet and the ground must be completed on-site, and the following operations must be performed on-site:

- Ensure the effectiveness of all internal grounding connections by measuring the conductivity from each equipment grounding terminal to the main grounding copper busbar.
- The shielding layers and protective layers of cables connected externally to the Combiner cabinet should also be grounded at an appropriate location on the Combiner cabinet.

### 4.5.3 External Grounding

#### Alarm

Strictly follow the wiring labels inside the equipment for cable connections.

The Combiner cabinet includes both internal and external grounding. For grounding, you can choose to connect to the external grounding flat steel or the internal PE copper busbar.

Before delivery, the grounding of the equipment inside the Combiner cabinet has been completed.

Please combine the actual situation on site and follow the instructions of the power station staff for the installation of external grounding.

After the grounding connection is completed, the grounding resistance must be measured.

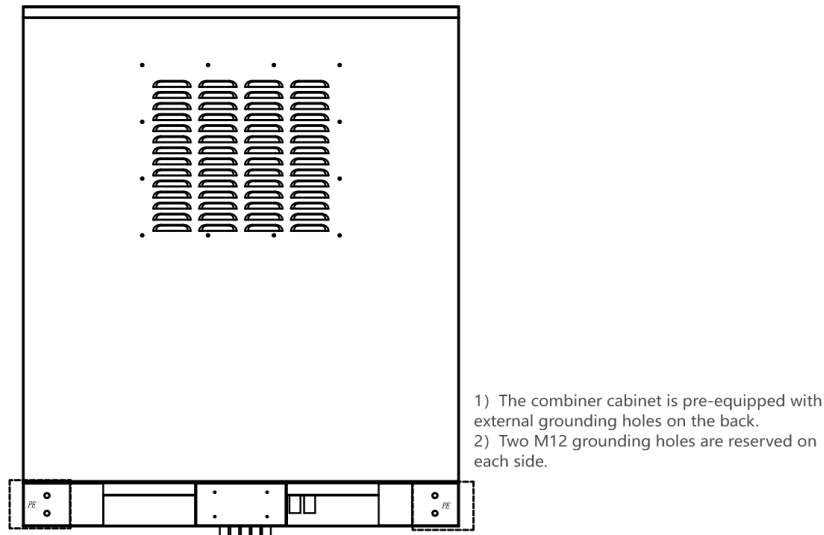


Figure 4-4 External Grounding Flat Steel of the Combiner cabinet

## 4.6 External Wiring of the Combiner cabinet

### 4.6.1 Safety Precautions

#### Alarm

Accidental contact with live terminals can result in fatal electric shock!

- 1) Ensure that the AC/DC switch of the energy storage converter is in the off position, ensuring that the terminals are not energized.
- 2) When connecting to the grid, it must be approved by the relevant department, and all safety instructions and regulations related to the grid must be followed.

#### Alarm

The Combiner cabinet is only suitable for TN-C or TN-S grounding systems.

When using a TN-C grounding system, the PE bar of the Combiner cabinet needs to be connected to the N bar; when using a TN-S grounding system, disconnect this copper bar!

## 4.6.2 Wiring from the Combiner cabinet to the BESS

### 4.6.2.1 Overview of wiring from the Combiner cabinet to the BESS

The wiring diagram is shown in Figure 4- 5.

- 1) This copper bar is used to connect the BESS;
- 2) Each copper bar for A/B/C phases has 2M8 wiring holes reserved, and the N phase has 5 M8 wiring holes reserved;
- 3) Each copper bar supports a maximum of 3 wiring paths, with the extra two paths requiring positive and negative connections, using 70 square cables and SC70-8 terminals;
- 4) QF1 connects to storage cabinets 1~3, QF2 connects to storage cabinets 4~6, QF3 connects to storage cabinets 7~9,

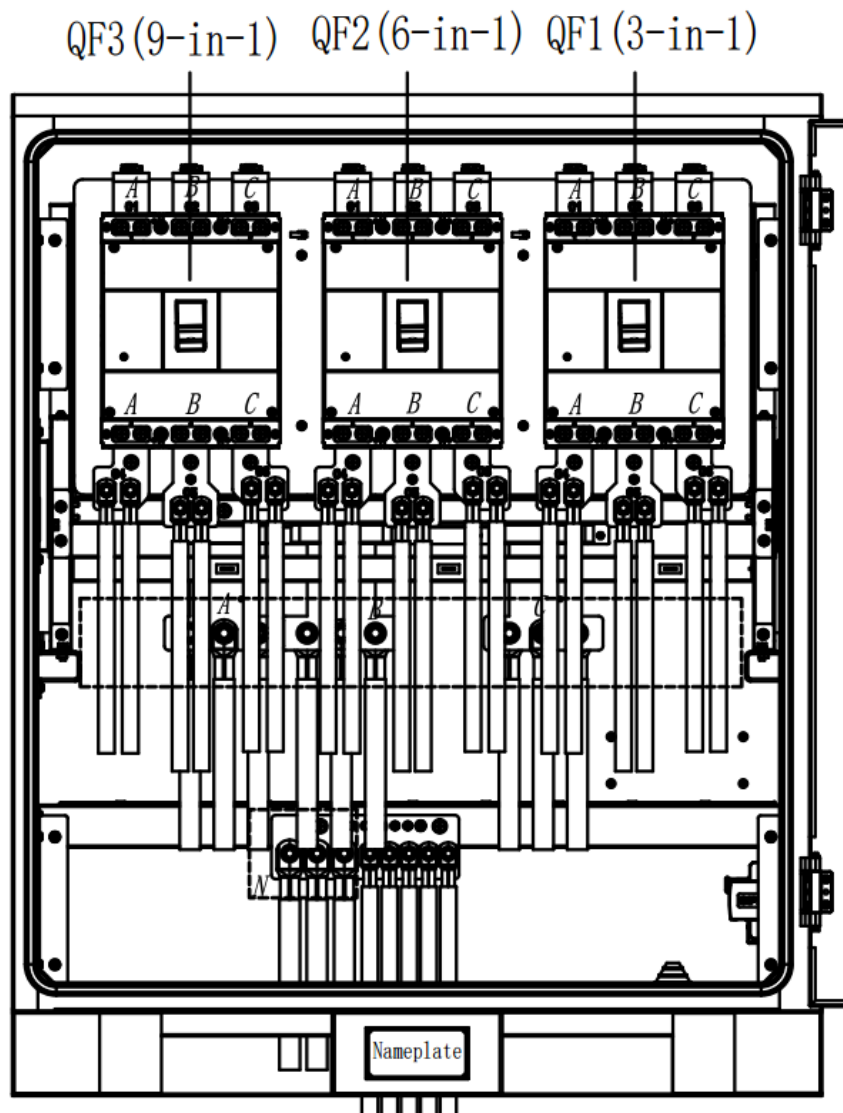


Figure 4-5 Wiring Overview

#### 4.6.2.2 Wiring Steps from Combiner cabinet to Storage Cabinets

**Step 1** Confirm that the circuit breakers of the upstream and downstream equipment are in the open state.

**Step 2** Feed the cable through the bottom cable entry hole into the interior of the Combiner cabinet, it is recommended to use 70 mm<sup>2</sup> or larger cross-sectional area cable.

**Step 3** Ensure the correct sequence of AC cable connections.

**Step 4** Crimp the terminal, refer to “Making Terminal Connections” .

**Step 5** Wiring.

1 Copper busbar connection refers to the above Figure 4 -5 (a)(b).

2 Press the copper lug onto the AC copper busbar, and install it in the sequence of 'Copper Wire Connection'.

3 Tighten the screws with a screwdriver or wrench. Refer to the table below for the tightening torque.

**Step 6** Confirm the wiring is secure.

#### Note

The length of the terminal screws should be appropriate, just enough to protrude slightly from the copper busbar mounting holes. Too long may affect insulation performance or even cause a short circuit. Check if any part of the heat shrink tube is caught between the terminal lug and the copper busbar. If caught, remove it immediately; otherwise, it may lead to poor contact, or even overheating and damage.

——End

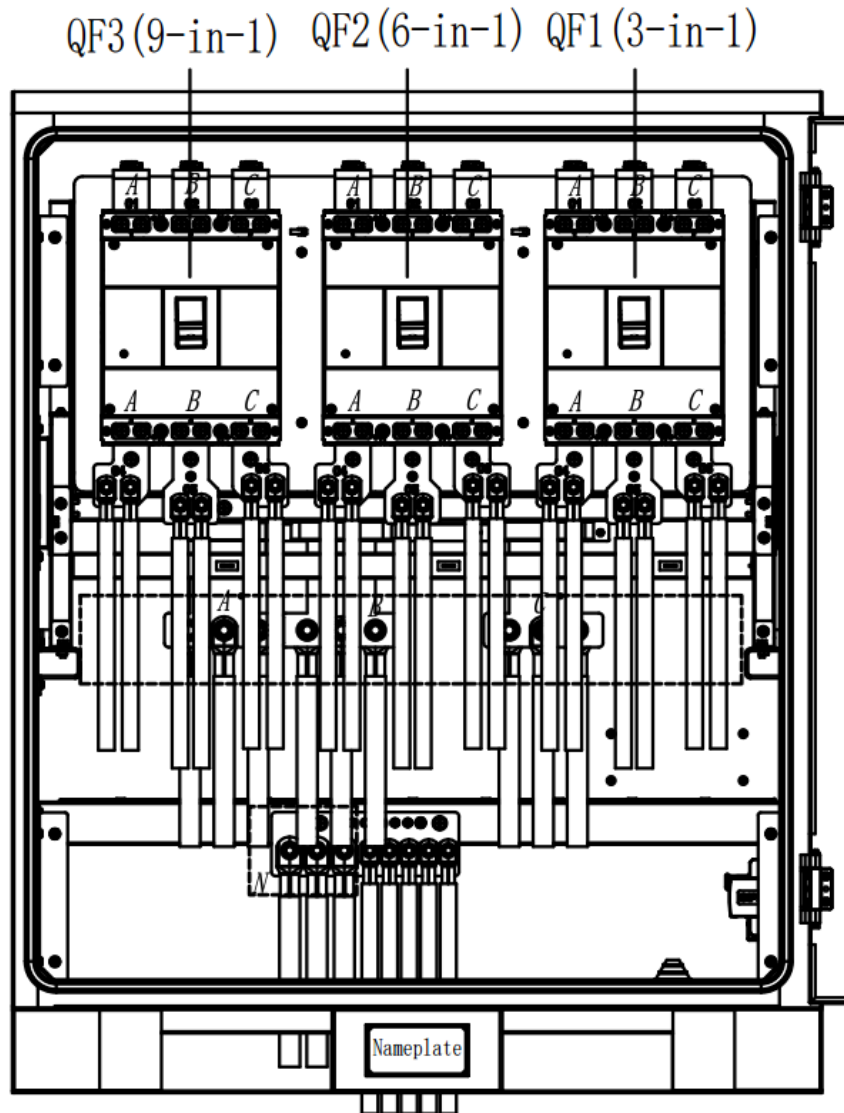
#### 4.6.3 Wiring the Combiner cabinet to the Grid

##### 4.6.3.1 Overview of Combiner cabinet to Grid Wiring

Wiring diagram is shown in Figure 4-6.

- 1) This copper busbar is used for connecting to the grid side;
- 2) Each busbar is provided with 3M12 wiring holes;

3) Each busbar supports a maximum of 6 wiring connections, which must be connected in both positive and negative directions, using 240 mm<sup>2</sup> cables and SC240-12 terminals;



#### 4.6.3.2 Wiring Steps

**Step 1** Disconnect the upstream and downstream AC circuit breakers and use a multimeter to ensure that there is no voltage at the terminals.

**Step 2** Feed the cable through the bottom cable entry hole into the Combiner cabinet, with the actual cable type based on the design institute's cable recommendations.

**Step 3** Ensure the correct sequence of AC cable connections.

**Step 4** Crimp the terminal, refer to “Making Terminal Connections”.

**Step 5** Wiring.

1 Refer to Fig. 4- 6 (a)(b).

2 Press the copper lug onto the AC copper busbar, and install it in the sequence of 'Copper Wire Connection'.

3 Tighten the screws with a screwdriver or wrench. Refer to the table below for the tightening torque.

**Step 6** Confirm the wiring is secure.

**ⓘ Note**

The length of the terminal screws should be appropriate, just enough to protrude slightly from the copper busbar mounting holes. Too long may affect insulation performance or even cause a short circuit. Check if any part of the heat shrink tube is caught between the terminal lug and the copper busbar. If caught, remove it immediately; otherwise, it may lead to poor contact, or even overheating and damage.

——End

# 5 Power On/Off Operations

## 5.1 Power On for Commissioning

### Alarm

- 1) After confirmation by professionals and approval from the local power department, the energy storage system equipment can be put into operation.
- 2) If the Combiner cabinet has been shut down for an extended period, a comprehensive inspection of the energy storage system equipment must be conducted before power-on. Only after meeting all the required standards can the power-on procedure be carried out according to the steps.

### 5.1.1 Pre-Power-On Inspection

Before power-on, please carefully check the following items to ensure there are no errors.

- Check if the wiring is correct.
- Check that the internal access door shield is securely installed.
- The emergency stop button is in the released state.
- Check to ensure there are no grounding faults.
- Use a multimeter to check if the AC and DC side voltages meet the start-up conditions and there is no overvoltage risk.
- Inspect to ensure that no tools or parts are left inside the equipment.
- Check that all air inlets and outlets are not blocked or obstructed by foreign objects.

### 5.1.2 Power-on procedure

The positions of each circuit breaker, please refer to “2.4.3 Overview of Switch Positions”

**Step 1** Complete the auxiliary power and primary main circuit wiring, measure the voltage and frequency to meet the system requirements, proceed to the next step;

**Step 2** Power on the main circuit power supply inside the Combiner cabinet: operate the main circuit AC switches QF1, QF2, QF3 to close; ( 1 dragging 9 applies; if the number of BESS is 1~3, only QF1 closes; 4~6 units, QF1 and QF2 close ) ;

**Step 3** Then close the circuit breakers of the BESS.

From this point, the system is powered up, and you can check the operation of the touch screen to ensure the system is functioning normally.

### **5.1.3 Power Down Operation**

The positions of each circuit breaker, please refer to “2.4.3 Overview of Switch Positions”

Step 1 Disconnect the AC main circuit of the Combiner cabinet: operate the main circuit AC switches QF1~QF3 to disconnect;

——End

From this point, the system power down is complete.

# 6 Maintenance Instructions

This section provides the following information:

- Maintenance and repair procedures must be carried out according to certain rules to ensure the availability of components.
- How to replace components when the equipment is under repair.
- Our company does not assume any liability for personal injury or property damage resulting from improper intent or failure to correctly follow the instructions and warnings in this document regarding the removal, installation, and maintenance of the equipment.
- When installing and maintaining the system, you must follow the warning information.

## Alarm

- 1) Read the entire document before installing the system. Violating safety operating procedures or not following the operational instructions or warning information in this document can result in electric shock, serious injury, or death, and may damage the system, rendering it inoperable.
- 2) The Combiner cabinet has a certain weight. It is recommended to use professional equipment when moving or lifting.
- 3) Please follow the instructions in this document for installing and maintaining the system.
- 4) Do not operate if the equipment has defects, cracks, breaks, or other damage.
- 5) Before performing electrical wiring, ensure that the circuit breaker is in the off position.
- 6) Do not insert foreign objects into any part of the cabinet.
- 7) Do not expose the cabinet or its components to direct flames.
- 8) Do not expose the cabinet or its components to direct flames.
- 9) Do not install the cabinet near heating equipment.
- 10) Do not immerse the cabinet or its components in water or other liquids.

### ⚠ Note

- 1) Do not use components or cables not specified in this manual to assemble the system.
- 2) Ensure there is no water source above or near the battery pack, including fire sprinklers or faucets, air conditioner drips, etc.

### ⚠ Note

Measure the voltage before performing maintenance or repair work. This voltage can be measured on the copper bus of the AC circuit breaker.

## 6.1 Precautions Before Maintenance

When performing maintenance or inspection on the energy storage system, to ensure the safety of the operators, the system must be shut down and de-energized before maintenance, and the following steps must be followed:

1. Shut down the power equipment at both the front and rear control levels.
2. Ensure that the Combiner cabinet cannot be accidentally re-energized.
3. Disconnect all external connections to the Combiner cabinet.
4. Disconnect the internal power supply connections and switches of the Combiner cabinet, and manually shut down the UPS (if applicable).
5. Check that all switches within the system have been disconnected.
6. Implement necessary grounding connections.

## 6.2 Maintenance Items and Schedules

Due to the effects of ambient temperature, humidity, dust, vibration, and long-term use, the components inside the Combiner cabinet may age and wear, leading to potential faults in the Combiner cabinet. Therefore, it is necessary to implement daily and regular maintenance of the Combiner cabinet to ensure its normal operation and service life. All measures and methods that help maintain the Combiner cabinet in good working condition fall within the scope of maintenance work.

The purpose of maintenance is to protect the specific environment of the Combiner cabinet. Dust and contaminants must be removed and partially damaged components replaced according to a specific schedule.

Common maintenance items and cycles are shown in Table 6 -1.

Table 6-1 System Maintenance Items and Cycles

No.	Inspection Content	Cycle
1	Cabinet and Environment Inspection	Every 6 months
2	Main circuit and auxiliary circuit breaker inspection	Every 12 months
3	System cleaning	Every 12 months
4	Grounding reliability check	Every 12 months
5	Fan (if applicable) maintenance inspection	Every 6 months
6	Label detachment	Whenever a label is found detached

Note: The actual intervals between maintenance should depend on the installation environment of the electrical cabinet and the operating conditions.

### **System software and operation status check**

1. Read data from the software, check all setting parameters.
2. Perform software upgrades when necessary.

### **Cabinet and Environment Inspection**

1. Check the aging of the door seals, and the tightness of the cabinet doors.
2. Check if the cabinet's exterior paint is damaged, and if the outer surface and screws are rusted.
3. Check if the cabinet grounding is effective.
4. Dust on the dust filter.

### **Inspection of the power circuit and the main circuit breaker**

1. Tighten the bolts of the grid and battery connection cables.
2. Tighten the ground wire (PE) and other ground wires in the cabinet.
3. Inspect various switches in the main circuit, including circuit breakers and fuses.

## System cleaning

1. Use a brush to clean the dust inside the cabinet and remove it. Cleaning personnel must be qualified according to relevant safety regulations. A vacuum cleaner and brush must be used to clean the equipment, and high-pressure gas must be used for areas that are difficult to reach directly.
2. Clean the dust from the dust cover.
3. The louvers on the front and back of the Combiner cabinet need to be cleaned regularly. The louver positions are shown in Figure 6-1.

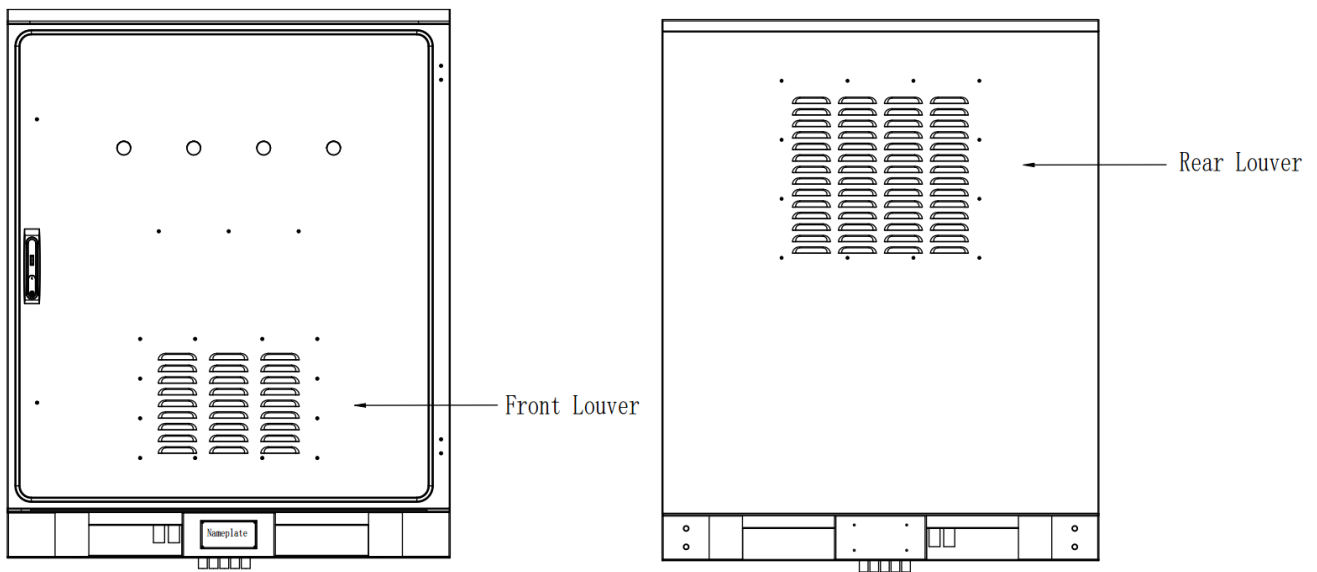


Figure 6 -1 Louver Position Diagram

## Grounding reliability check

1. Check the protective grounding of the cabinet shells within the system.
2. Check the lightning protection grounding of the system.

## Label detachment

The warning labels on the labels contain important information for safe operation of the energy storage system. During each system maintenance, if any labels are found to be missing, please promptly replace them with new labels.

## 6.3 Troubleshooting

When the energy storage system does not output as expected or the charge and discharge quantities change abnormally, before consulting our company's maintenance personnel, please pay attention to the following checks:

- the status of all switches inside the Combiner cabinet;
- whether the emergency stop button is in the pressed state;
- whether the cabinet and the power grid are correctly connected and powered;
- whether the communication inside the cabinet is normal.

## 6.4 Troubleshooting

### Common Faults and Solutions for Combiner cabinetes

Table 6-2 Common Faults and Solutions for Combiner cabinetes

No.	Fault Phenomenon	Troubleshooting
1	Circuit breaker cannot open or close	Please contact Clou to replace the switch.
2	Surge protector activated, surge protection indicator is red	Please contact Clou to replace the surge protector.
3	Abnormal indicator light display	Please contact Clou to replace the indicator light.
4	Blown fuse	Please contact Clou to replace the fuse.

# 7 Warranty and Disclaimer

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## 7.1 Quality Assurance

### Evidence

Our company requires customers to present the invoice and date of purchase of the product within the warranty period. At the same time, the trademark on the product should be clearly visible; otherwise, we reserve the right to not provide quality assurance.

### Conditions

- Defective products that have been replaced should be handled by our company.
- Customers should allow our company a reasonable amount of time to repair faulty equipment.

### Liability Exemption

In the following situations, our company has the right to not provide quality assurance:

- When any disassembly of the product or improper maintenance has caused issues;
- When the entire unit or parts have exceeded the free warranty period;
- When the operation and use exceed the scope specified in relevant international standards;
- When problems arise due to incorrect installation and operation not in accordance with the manual instructions;
- Damage to the product caused by abnormal natural conditions;
- Damage to the machine caused by using non-standard components or non-company software;
- Damage to the product caused by the failure of external equipment;
- All accidents caused by unauthorized modification or repair of the product;
- Safety accidents, property damage, or equipment damage caused by forced power-on due to system malfunctions not resolved due to customer reasons.

For product faults caused by the above reasons, when customers request repair services, our service institution will determine whether paid repair services can be provided. If you need to repair or modify the product, please contact us in advance.

## **7.2 Disclaimer**

Copyright, Shenzhen CLOU Electronics Co., Ltd. All rights reserved. If the equipment operator does not operate according to the manual standards, the company shall not be responsible for any consequences.

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