Midea Energy

User Manual

BESS

Aqua E 233-110-2h-IEC

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Revision Record

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User Manual

Version: V7

Dear user, we sincerely thank you for using the battery energy storage system product manufactured by Shenzhen Clou Electronics Co. Ltd. (hereinafter referred to as 'BESS'). We truly hope that this product meets your needs, and we look forward to receiving your suggestions on its use!

This manual provides detailed information about the BESS produced by Shenzhen Clou Electronics Co. Ltd., and instructions for installation and use. Please read this manual carefully before use.

About This Manual

This manual mainly introduces the methods of transportation and storage, mechanical installation, electrical connection, power-on operation and power-off shutdown, troubleshooting, and maintenance of the BESS.

➢ Intended Audience

This manual is intended for technicians who install, commission, use, and maintain this product. Please read this manual carefully before starting any operations on the product. Readers should have a basic understanding of electricity, wiring, electrical components, electrical symbols, and mechanical schematics.

➢ Product Services and Consultation

If you want to learn more about product information, service support, successful cases of products and solutions, etc., you can consult our company.

➢ Manual Warning Symbols

To ensure the safety of users' personal and property when using the product, and to use the product more efficiently and optimized, the manual provides relevant information and uses the following symbols to highlight and emphasize.

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

⚠ Danger

Indicates a high potential danger, if not avoided, it will lead to person staff death or serious injury.

Warning

Indicates a moderate potential danger, if not avoided, it may lead to person staff death or serious injury.

Caution

Indicates a low potential hazard, which if not avoided, could result in moderate or minor injury to personnel.

Attention

Indicates a risk that, if not avoided, could lead to equipment malfunction or property loss.

➢ Machine Warning Label

	**PE Mark:** This is the protective earthing PE terminal, which must be reliably earthed to ensure the safety of operators and equipment.
	**General Warning:** This component may contain hazards other than high voltage, users should take note!
	**Electrostatic Warning:** This component may be damaged by electrostatic discharge.
	**Danger Voltage Warning**: This component may contain high voltage hazards, users must pay extra attention!
	**Hot Surface Warning**: Beware of hot surfaces, prevent burns!
	**Touch Warning:** This component has dangers such as high temperature, do not touch directly.

	**PE Mark:** This is the protective earthing PE terminal, which must be reliably earthed to ensure the safety of operators and equipment.
	**Refer to User Manual Prompt:** Before operation, please refer to the corresponding instructions in the user manual.
	**Noise Warning**: The product may generate significant noise during operation, if necessary, please wear earplugs to protect your ears.

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1 Safety Precautions

This chapter introduces safety precautions that must be observed when transporting and storing this product, installing, wiring, etc. Before installing, wiring this product, etc., please read the safety precautions carefully. Safety precautions must be strictly followed during operation. Ignoring safety precautions may cause equipment damage, or even personnel injury or death.

1.1 Transportation and Storage

Danger

1) When moving the product, it should be lifted and placed gently to avoid damage.
2) The equipment must be transported vertically. During transportation, avoid tilting the equipment as it may cause personal injury.

Warning

During transportation and storage, physical impacts and vibrations to the product should be avoided.

Storage Requirements:

1) Before storage, ensure that the BESS door and all internal equipment cabinet doors are securely locked.
2) Storage environmental temperature: -30°C~+55°C, recommended storage temperature: +5°C~+25°C. When stored at other temperatures, adjust according to the following data.

Temperature range attenuation adjustment coefficient:

26℃~40℃ 0.1%/month

41℃~50℃ 0.3%/month

51℃~55℃ 0.6%/month

3) Relative humidity of the storage environment: 0–95%, no condensation. Recommended relative humidity for storage: 45%–85%.
4) Due to the capacity degradation of batteries during long-term storage, it is not recommended to store batteries for extended periods. In addition, even when stored under the recommended optimal storage temperature, batteries will experience irreversible capacity degradation due to calendar effects. The longer the storage time, the greater the irreversible degradation. For specific depreciation values, please refer to the technical agreement.
5) Effectively protect the inlet and outlet of the BESS, and take effective measures to prevent rainwater, sand, dust, etc., from intruding into the cabinet body.
6) Regular Patrol Inspection. Inspect the cabinet body and internal equipment for damage at least once every half month.
7) Before installing BESSs that have been in long-term storage (storage time exceeding six months), open the cabinet door for a visual inspection to ensure there is no condensation on the exterior. Confirm that the cabinet body and internal equipment are undamaged. Additionally, power up and start the system for further checks. If necessary, professional testing should be conducted prior to installation.
8) The energy storage cabinet contains a PCS. Long-term storage may cause degradation of its electrolytic capacitors. If the storage period exceeds six months, the PCS must be inspected and tested by professional personnel prior to commissioning. Direct power-on operation may result in equipment damage. Please contact CLOU for specific maintenance procedures.
9) Be mindful of harsh environmental conditions around the area, such as sudden temperature changes or impacts, to prevent damage to the Pack.
10) Conduct regular inspections to check if the packaging is intact, preventing insect or rodent infestations. If any damage is found, immediately replace the packaging. The box must not be tilted or inverted.
11) If the storage time exceeds one month, it is necessary to perform a charge and discharge cycle once a month during the storage period and maintain the system SOC at around 40%. Otherwise, it may affect battery consistency and lifespan.

1.2 Machine Warning Label

Product cabinet internal and external may have warning labels, their meaning is as follows:

	Grounding Protection
	Electrostatic Sensitive Devices
	Danger High Voltage Warning
	High Leakage Current Warning

1.3 Installation

Warning

1) Please install this product on fire-resistant objects, away from flammable materials, otherwise it may cause a fire.
2) Do not install this product in an environment containing explosive gases, otherwise there is a risk of explosion.
3) Do not install this product on a base that is subject to mechanical vibration.
4) When installing, ensure that the installation environment for this product has good ventilation and heat dissipation. When two or more of these products are placed adjacent to each other, pay attention to the installation position to ensure effective heat dissipation.
5) During installation and maintenance, prevent liquids, dust, or debris from entering the interior of this product, as conductive liquids and debris may cause internal short circuits, leading to equipment damage.
6) When connecting external cables and internal cables of this product, it is essential to ensure the correct torque for cable installation; too little torque may increase contact resistance, causing overheating, while excessive torque may result in screw fatigue and damage.

7) The terminals of the power cables connected to this product must comply with national standards. Using non-standard terminals or poor-quality workmanship may cause overheating of the power cables, and in severe cases, a fire may occur.

1.4 Wiring

Danger

1) All wiring for external accessories must follow the guidance provided in this manual. Wire according to the circuit connection methods provided in this manual correctly; otherwise, danger may arise.
2) Please ensure that the power supply is turned off before wiring.
3) Please ground this product properly according to the standard.
4) Pay attention to the markings on the output terminals. Do not connect the wrong wires, as doing so may damage the equipment.
5) The wire diameter must be selected according to the recommendations in the manual; otherwise, an accident may occur.
6) After power-on, do not open the product panel unnecessarily, as there is a risk of electric shock.
7) After power-on, do not touch the product or surrounding circuits with wet hands, as there is a risk of electric shock.
8) After power-on, do not touch any input/output terminals of the product, as there is a risk of electric shock.
9) Before testing power cables and other external equipment, please disconnect them from the product's connecting cables to prevent accidental damage.

Attention

1) Ensure that the input power voltage level is consistent with the product's rated voltage level.
2) No part of this product requires a withstand voltage test; the product has already undergone this test at the factory. Failure to comply may result in an accident.

3) Ensure that the wiring conforms to EMC requirements and safety standards in the area.

1.5 Operation and Commissioning

Warning

1) Do not touch the heat dissipation outlet cover and louvers during operation, as this may cause burns.
2) Do not manually test signals during operation, as this may cause personal injury or equipment damage.
3) During operation, avoid foreign objects falling into the equipment.
4) When in operation, do not cover the ventilation holes of the product.
5) Do not open the door or panel of this product when it is in operation.

1.6 Maintenance

Danger

1) Do not perform maintenance operations on this product when it is powered on. After disconnecting the power supply, wait for no less than 5 minutes, otherwise the residual charge of the equipment may cause harm to personnel.
2) Do not perform maintenance or servicing on this product unless you are a professional who has received specialized training authorized by our company, as doing so may result in personal injury or equipment damage.
3) All pluggable modules must be inserted or removed with the power off to prevent equipment damage.
4) Do not leave wire ends or tools inside the machine, as this could lead to fire or property damage.

1.7 Battery System Safety

To ensure safe use of the product, please have relevant technical personnel carefully read the following requirements! Otherwise, any component damage or abnormalities, property loss, safety incidents, etc., caused by the following reasons will not fall within the scope of our company's liability.

1 Due to the customer's reasons for not charging the system in time, resulting in capacity loss or irreversible damage to the battery, etc.;

2 Battery damage, dropping, leakage, etc., caused by improper operation or failure to operate the battery as required;

3 Battery damage caused by over-discharge due to the customer's failure to power up in time;

4 Battery frequent over-discharge caused by improper customer maintenance, on-site expansion by the customer, or long-term inability to fully charge, etc.;

5 Battery damage caused by incorrect setting of battery operating parameters due to customer reasons;

6 Direct damage to the battery caused by the on-site operating environment not meeting the environmental requirements for normal operation;

7 Due to the customer's own reasons for changing the battery usage scenario, including but not limited to: connecting additional loads to the battery on their own, etc.;

8 The customer has not carried out proper maintenance of the system according to the accompanying equipment system manual;

9 System damage caused by the customer continuing to use the battery system beyond the warranty period;

10 Mixing the batteries provided by our company with other batteries, including but not limited to: mixing with batteries of other brands, mixing with batteries of different rated capacities, etc.;

11 Product damage or other property loss caused by storing or installing the system together with flammable/explosive materials;

12 System-related operations must be performed by professionals. Personal safety accidents, property loss, etc., caused by not wearing standard protective equipment during operation;

13 Damage to the battery caused by eating, drinking, smoking, etc. near the system;

14 The battery has been stolen.

1.8 Other precautions

1 Use outside of the rated voltage values

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

3 Altitude and derating usage

4 In areas with an altitude exceeding 2000m, due to the thin air causing reduced heat dissipation of this product, it is necessary to use it at a derated level. In such cases, please consult our company for technical advice.

5 Use in harsh weather conditions.

6 When the local weather warning is above a yellow warning for heavy rain and strong winds, sandstorms and other harsh environments, power must be disconnected. When re-powering for use, open the cabinet door to check for any abnormalities.

1.9 Product Scrap and Recycling

1 Recycling Overview

The BESS contains various recyclable and hazardous materials that must be handled properly in accordance with environmental requirements. Follow the instructions below to ensure that the recycling process of the equipment meets environmental protection standards and minimizes impact on the environment as much as possible.

2 Recycling Preparation

Before dismantling and recycling the BESS, make sure that the equipment has been completely powered off and will not cause harm to the operator. The following are the preparations before recycling:

Power Off Procedures: Ensure that the connection with the power grid or other power sources has been disconnected, and that the energy in the battery modules has been safely discharged.

Protective Equipment: Operators should wear insulating gloves, safety goggles, and protective clothing.

Cooling System: If the BESS contains coolant, it should be drained safely under compliant conditions and disposed of by a qualified service provider.

3 Recycling Procedures

PACK

The integrated BESS typically contains lithium-ion or other types of battery packs. Please follow these steps:

i. Remove the battery modules, avoiding mechanical damage or short circuits.

ii. Dispose of the batteries through a professional battery recycling company, avoiding random disposal.

iii. Ensure that the batteries are not exposed to extreme temperatures, open flames, or water to prevent explosions and pollution.

Electrical and Electronic Components

i. Electronic components within the cabinet, including the energy storage converter, control unit, cables, etc., may contain hazardous substances and should be dismantled and handed over to electronic waste recycling agencies.

ii. Avoid damaging the circuit boards during disassembly to prevent leakage of toxic substances.

Metal Structure

i. Metal parts such as the cabinet shell and frame can be recycled and reused. Send metal pieces to your local metal recycling facility.

ii. 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 material markings, send recyclable plastics to your local recycling facilities.

4 Hazardous Substance Disposal

The BESS may contain the following hazardous substances:

i. Lithium Battery Electrolyte: The electrolyte in lithium-ion batteries can be harmful to the environment and must not be disposed of casually.

ii. Coolant: Some cabinets use coolant, which should be recycled and disposed of by a professional organization.

iii. Other Chemicals: Certain electronic components in the cabinet may contain toxic chemicals such as lead, cadmium, etc.

5 Precautions

i. Do Not Disassemble Yourself: Users are prohibited from disassembling the BESS themselves; please contact professionals for operations.

ii. Compliance with Local Regulations: Recycling and disposal procedures should comply with environmental regulations at the location of the equipment.

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

6 Recycling Service Contact Information

For further assistance, please contact our company or your local recycling service provider.

2 Product Description

2.1 Product Overview

The BESS is primarily used in industrial and commercial settings, capable of peak shaving, demand control, demand response, and other power grid auxiliary services.

The BESS integrates Battery Clusters, Control Boxes, PCS, Chiller, LC (Local Controllers), and Fire Protection Systems. The protection rating for the BESS (Battery Compartment) is IP55, and the protection rating for the BESS (Equipment Compartment) is IP54, allowing it to operate outdoors.

The rated charge and discharge power of this BESS is 110kW, and the rated chargeable and dischargeable energy is 233kWh; it supports 3P4W power grid systems, and also supports on-grid and off-grid scenarios.

2.2 Appearance Design

2.2.1 Appearance Introduction

The appearance of the BESS is shown in Figure 2-1.

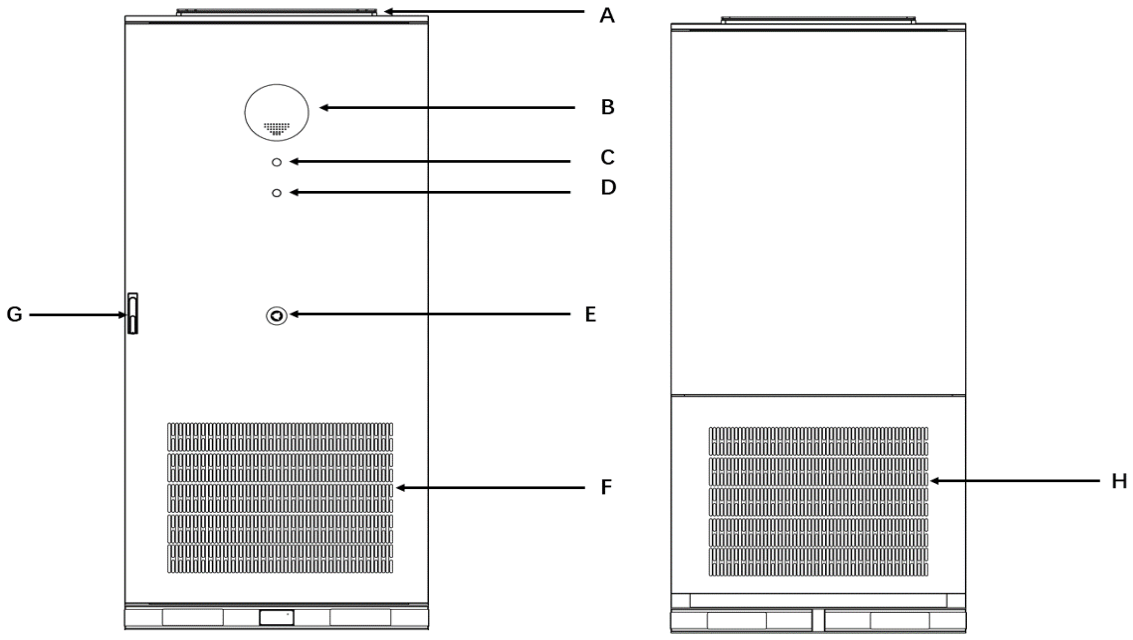


Figure 2-1: Appearance of the BESS

*The above images are for reference only, please refer to the actual product received.

Table2-1: Description of the BESS Appearance

BESS Unit	Serial Number	Details of Major Equipment
BESS	A	Top-mounted Explosion Relief Panel (optional)
	B	Horn Strobes
	C	Operation Indicator Light
	D	Fault Indicator Light
	E	Emergency Stop Button
	F	Inlet of PCS&Liquid Cooling Unit
	G	Front Door Lock
	H	Outlet of PCS&Liquid Cooling Unit

LED Indicator Lights

At the upper end of the LCD touch screen on the BESS, there are 2 LED lights that display the main operating status of the equipment, namely the power indicator light “RUN” and the fault indicator light “FAULT”.

Table2-2 LED Indicator Light Description

Name	Color	Description
RUN	Green	Normal Operation
FAULT	Yellow	A fault has occurred and has not yet been cleared. If the fault is cleared, the indicator light will automatically go out.

Table 2-3 LED Display Status and Operation Instructions

Name	Color	Description
RUN	The operation light is on.	The system is in normal operating condition.
FAULT	The fault light is on.	The system is faulty and the system is in a shutdown state.

Horn Strobe Combination

When the smoke detector or temperature sensor inside the BESS detects thermal runaway, it will activate the horn strobe, indicating that the system is in a dangerous state. Personnel around should immediately move away from the BESS upon hearing the Warning sound.

2.3 Mechanical Parameters

The appearance and dimensions of the BESS are shown in the following Figure 2-2.

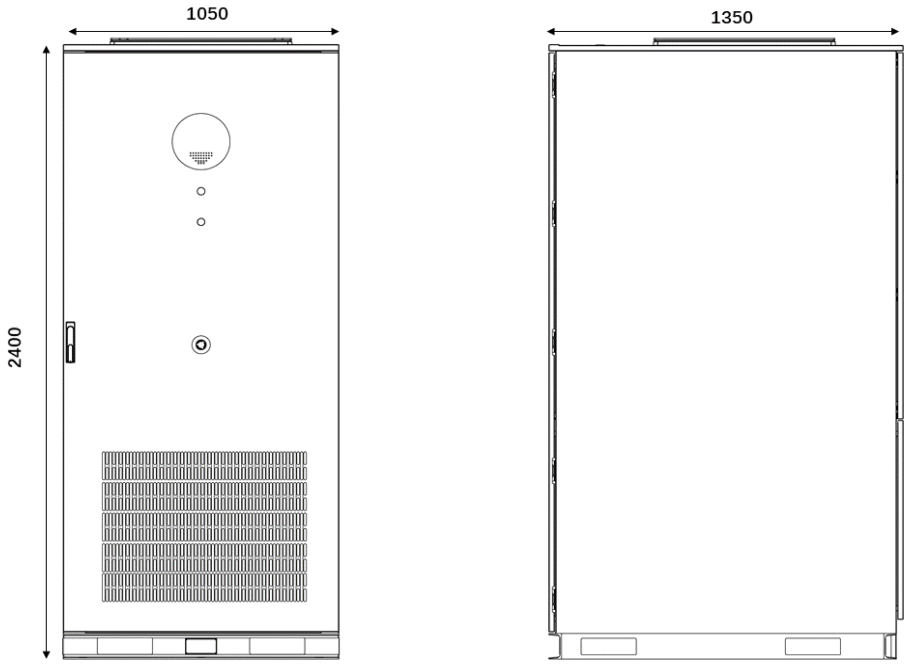


Figure 2-2 BESS Dimension Diagram

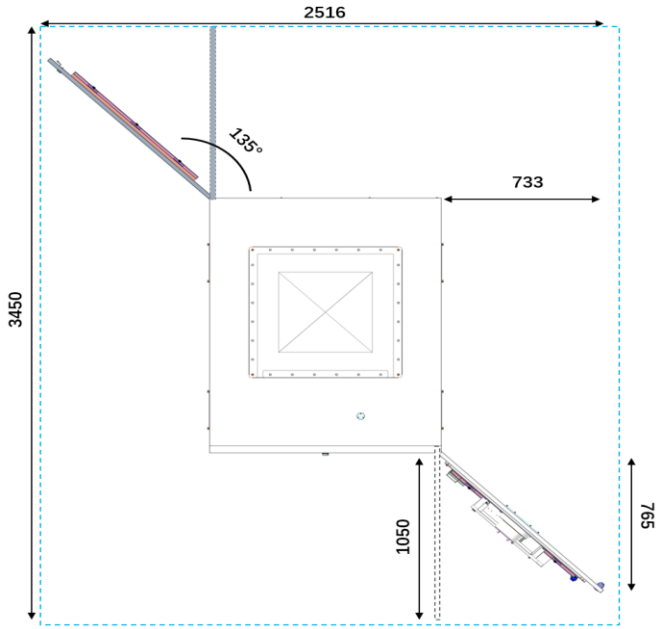


Figure 2-3 BESS Door Opening Footprint Diagram

*The above images are for reference only, please refer to the actual product received.

2.4 Internal Design

2.4.1 Layout of Internal Equipment

The front view of the BESS with the door open is shown in the following Figure 2-4.

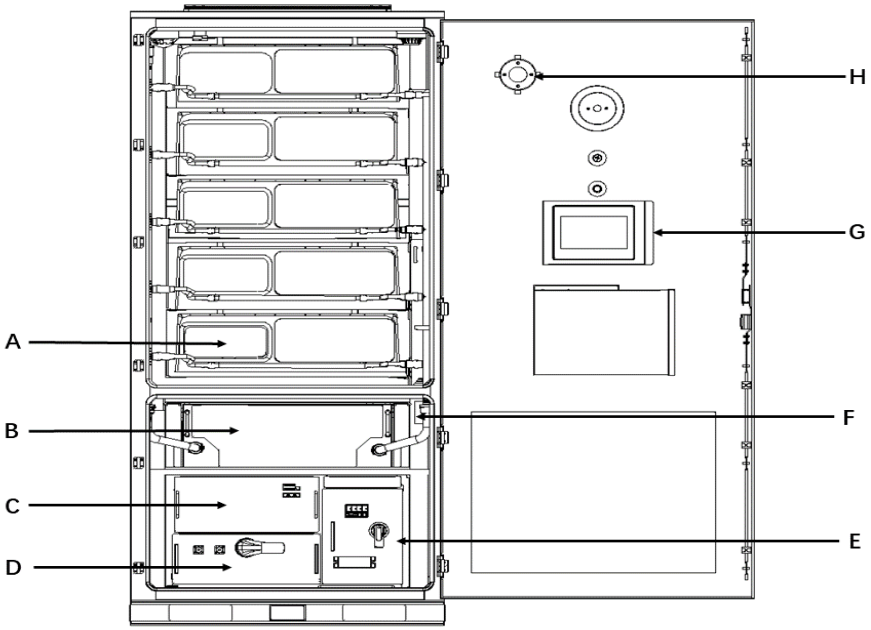


Figure 2-4 BESS Internal Layout Diagram

*The above figures are for reference only, please refer to the actual product received!

Table 2-4 Description of Internal Equipment in BESS

BESS Unit	Serial Number	Details of Major Equipment
BESS	A	Battery Pack (PACK)
	B	Chiller
	C	Power Conversion System (PCS)
	D	Control Box
	E	Power Distribution Box
	F	4G Router (with antenna) (optional item)
	G	Group Local Controller (GLC)/HMI (optional item)
	H	Fire Protection System (see detailed explanation in the Fire Protection System chapter)

Ordering Instructions

1 The fire protection system is divided into a standard version and a high-end version; customers should select the addition of an explosion relief panel based on local regulations and installation site requirements.

2 When the BESS does not have GLC/HMI, and 4G functionality is required, it is necessary to select a 4G router and antenna as optional equipment.

2.4.2 Power Conversion System

The Power Conversion System (PCS) is a bi-directional current controllable conversion device that connects the BESS to the power grid. Its primary function is to facilitate the exchange of energy between the battery and the grid, controlling and managing the charging and discharging of the battery. In grid-

connected mode, peak shaving and valley filling, frequency regulation, virtual capacity enhancement, and off-grid backup power can be achieved. Meanwhile, the PCS also supports multiple charge and discharge modes including constant voltage, constant current, and floating charge.

The BESS is compatible with two types of PCS. When placing an order, it is necessary to clearly note which one is needed. If not specified, Yun Tian PCS will be selected by default.

2.4.2.1 PCS (Yun Tian)

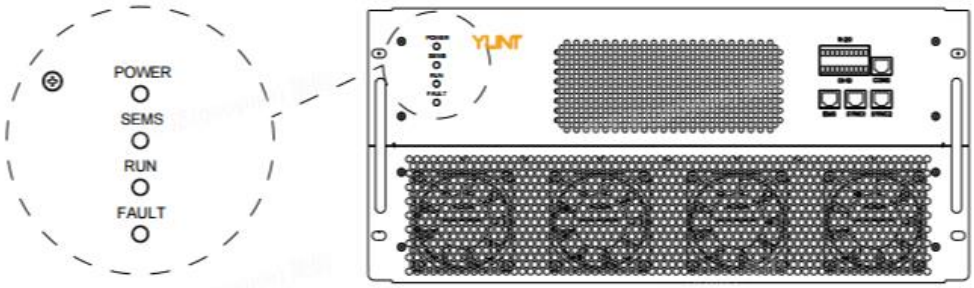


Figure 2-5 Power Conversion System (PCS)

Table 2-5 PCS display status and operation description

Indicator Light	Status	Description
POWER (Green)	Steady	Both battery and power grid are connected
	Fast Flashing	Battery is not connected
	Slow Flashing	Power grid is not connected
	Off	Neither battery nor power grid is connected
SEMS (Green)	Fast Flashing	Normal Communication
	Off	Communication Abnormality
RUN (Green)	Off	PCS is in shutdown state
	Steady	PCS is in standby state

	Fast Flashing	PCS is in charging state
	Slow Flashing	PCS is in discharging state
FAULT (Red)	Slow Flashing	Warning
	Steady	Fault, shutdown state

Note: The fast-flashing cycle is 1 second, and the slow flashing cycle is 3 seconds.

2.4.2.2 PCS（En Jiu）

Figure 2-6 Power Conversion System (PCS)

Table 2-6 PCS display status and operation description

Indicator Light	Status	Description
BT (Green)	Slow Flashing	PCS is in shutdown state
	Fast Flashing	PCS is in standby state
	Steady	PCS is in operating state
BT(Red)	Steady	PCS is in fault state

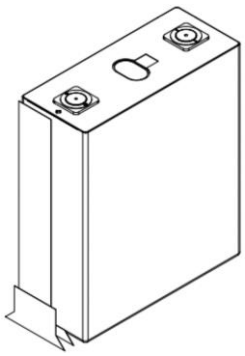
Note: The fast-flashing cycle is 1 second, and the slow flashing cycle is 3 seconds.

2.4.3 String

The following is a typical system architecture for the use of lithium iron phosphate cells. Based on lithium iron phosphate cells, standardized and modular battery modules are developed, which are connected in series and equipped with control boxes to form battery clusters. The battery cluster is connected to the accompanying power conversion system (PCS), forming an electric BESS product (ESS), completing the storage and release of electrical energy.

Cell

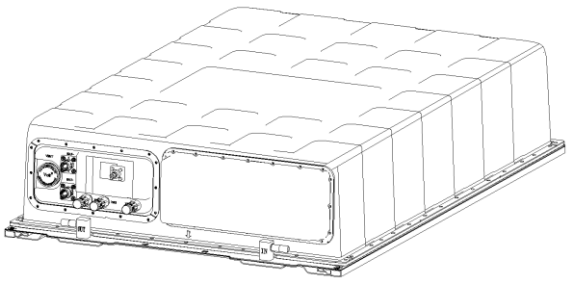
Table2-7 Cell Parameters

Cell	Parameter Name	Parameter Value
	Dimensions (D*W*H)	71.65mm*174.7mm*207.11mm
	Weight	5.43kg
	Rated Capacity	280Ah
	Rated Energy	896Wh
	Rated Voltage	3.2V
	Voltage Range	2.5V~3.65V

Pack

Table2-8 Pack Parameters

Pack	Parameter Name	Parameter Value
	Model	CL530PB280C52B
	Rate	≤0.5P, recommended below 0.5P



Cell Type	Prismatic Aluminum Shell LFP
Configuration	1P52S
Key Components	52cells, 1 BMU
Weight	332kg

Control Box

The control box contains fuses, circuit breakers, and the battery cluster management unit (BCMU), primarily responsible for monitoring the overall string.

2.4.4 Chiller

The chiller is a temperature control product developed for the cabinet. It is suitable for scenarios where equipment inside the cabinet generates a large amount of heat and needs to be completely isolated from the outdoor environment.

2.4.5 Fire Protection System

A fire protection system is installed within the BESS.

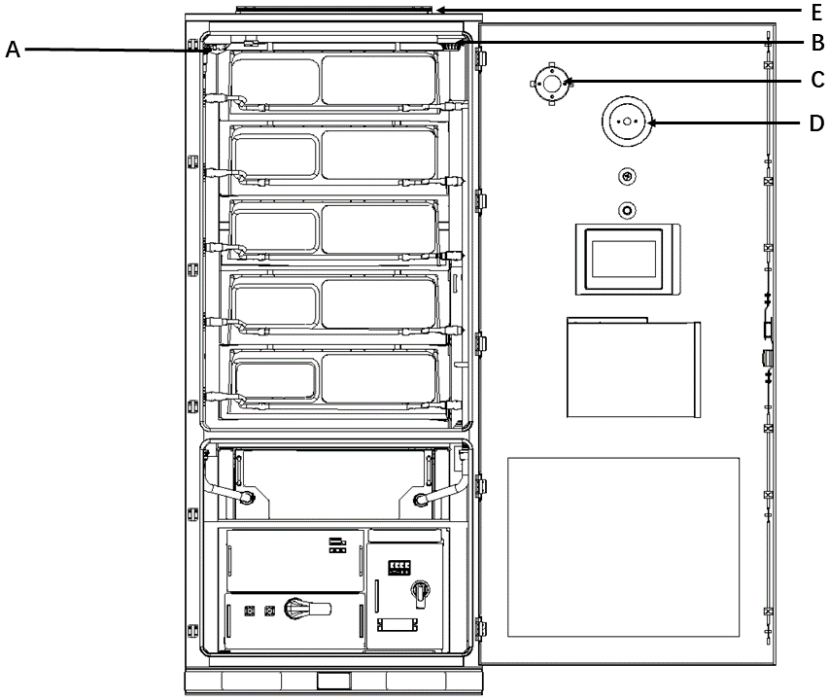


Figure 2-7 Layout Diagram of BESS Fire Protection System

Table 2-9 Fire Protection System Layout Description

Fire Protection System Unit	Serial Number	Details of Major Equipment
Fire Protection System	A	Smoke Detector
	B	Heat Detector
	C	Aerosol Device
	D	Horn Strobes
	E	Explosion Relief Panel (Optional)

2.4.5.1 Standard Fire Protection

1 When the smoke detector or heat detector reaches the threshold and Warnings, it triggers the horn strobes.

2 When the smoke detector reaches the threshold and Warnings and the heat detector reaches the threshold, it triggers the horn strobes; simultaneously, the aerosol is discharged, and the aerosol feedback contact is transmitted to BCMU, which controls the power-off action on the DC side and AC side by BCMU.

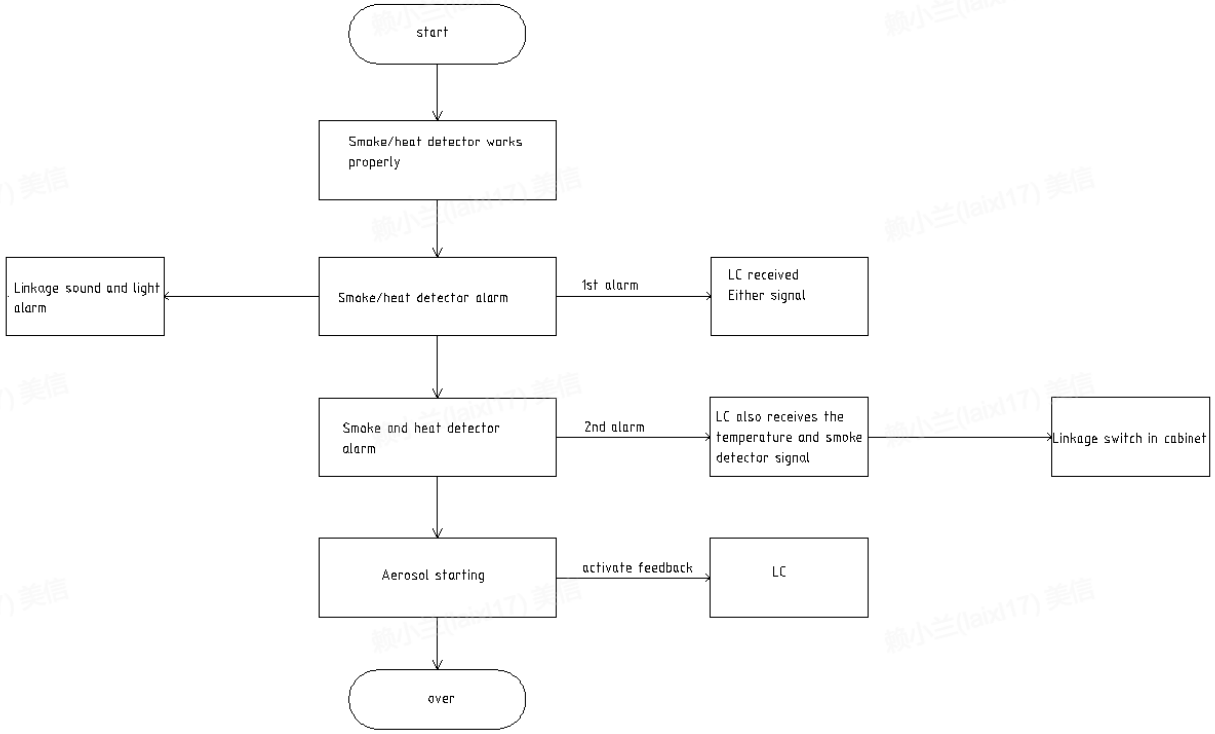


Figure 2-8 Fire Protection System Logic Diagram (without Explosion Relief Panel)

2.4.5.2 High-End Fire Protection

1 When the smoke detector or heat detector reaches the threshold and triggers an Warning, it is linked to the horn strobes.

2 When the smoke detector reaches the threshold and triggers an Warning and the heat detector reaches the threshold, it is linked to the horn strobes; at the same time, aerosol is discharged, and the aerosol feedback contact point is transmitted to the BCMS. The BCMS controls the power-off action of the direct current side and alternating current side of the BESS.

3 When the internal pressure of the cabinet is greater than the explosion relief panel's pressure relief threshold, the explosion relief panel opens, releasing the pressure in the battery compartment.

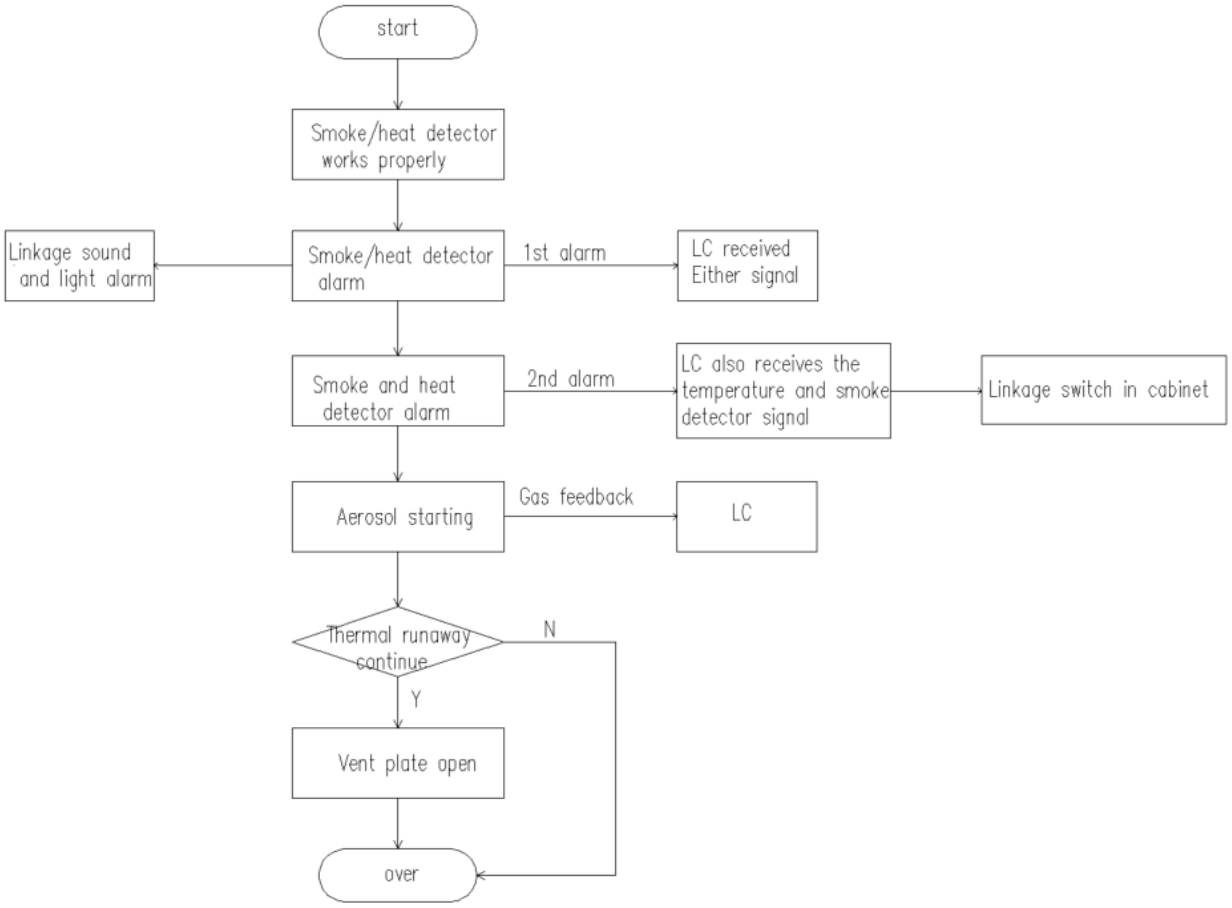


Figure 2-9 Fire Protection System Logic Diagram (with Explosion Relief Panel)

3 Mechanical Installation

Warning

Throughout the entire process of mechanical installation, it is essential to strictly adhere to the relevant standards and requirements of the project location.

3.1 Transportation Conditions

All equipment in the BESS has been pre-installed and secured inside the cabinet before leaving the factory; thus, the entire cabinet can be transported during transportation.

Warning

1) During the entire process of loading, unloading, and transportation, it is mandatory to comply with the safety regulations for outdoor cabinets in the country/region where the project is located!
2) Any tools or machinery used in operations on the BESS must be maintained.
3) All personnel involved in loading, unloading, and securing activities should receive appropriate training, particularly concerning safety aspects.

Attention

Throughout the loading and unloading, transportation process, it is essential to always bear in mind the mechanical parameters of the BESS.

Transporting the mobile BESS requires meeting the following conditions:

i. All doors of the BESS must be securely locked.
ii. Based on the site conditions, select an appropriate forklift or handling tool. The chosen tool must have sufficient load-bearing capacity, arm length, and turning radius.

iii. If it is necessary to move on slopes, additional traction devices may be required.

iv. Clear all obstacles that exist or may exist during the movement, such as trees, cabling, etc.

v. Transportation of the BESS should be carried out under favorable weather conditions whenever possible.

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

3.2 Forklift Transportation

The BESS is equipped with dedicated fork pockets for forklift transportation. It can be moved by front forks or side forks.

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

i. The forklift should be equipped with sufficient load capacity (at least2.5t).

ii. When transporting the BESS, the length of the tines should be at least1450mm.

iii. The tines should be inserted into the fork pockets at the bottom of the workstation (refer to the diagram below for the location of the fork pockets). The depth of the plug-in pile number should be the depth of the pile number, i.e., the BESS should be at least1450mm.

iv. The transportation, movement, and placement of the BESS should be slow and steady. It is recommended to try transportation.

v. The BESS can only be placed on a flat surface. This place should have good drainage, with no obstructions or bulges.

Figure 3-1 Forklift Transportation

Warning

1) Move the BESS through the front bottom insertion hole, rear insertion hole, left insertion hole, right insertion hole.
2) Under no circumstances should the BESS be moved by inserting the foot into any position other than the fork hole.

Attention

Before delivery, the plug holes of the BESS are sealed with a cover plate.

3.3 Lifting and Transportation

3.3.1 Precautions for Lifting

When lifting the equipment, the following requirements must be met at a minimum:

i. Safety on site must be guaranteed during lifting.

ii. During lifting and installation operations, there should be a professional on-site directing the entire process.

iii. The strength of the lifting slings used must be able to bear the weight of the equipment.

iv. Ensure that all sling connection points are safe and reliable, ensuring that each section of the slings connected to the corner pieces are of equal length.

v. The length of the slings can be adjusted appropriately according to the actual requirements of the site.

vi. Throughout the lifting process, ensure that the equipment remains stable and does not tilt.

vii. Take all necessary auxiliary measures to ensure the safe and smooth lifting of the equipment.

viii. The following figure illustrates the crane operation during the lifting process of the equipment. In the figure, the inner dotted circle indicates the crane's operating range. When the crane is working, no one is allowed to stand within the outer solid circle!

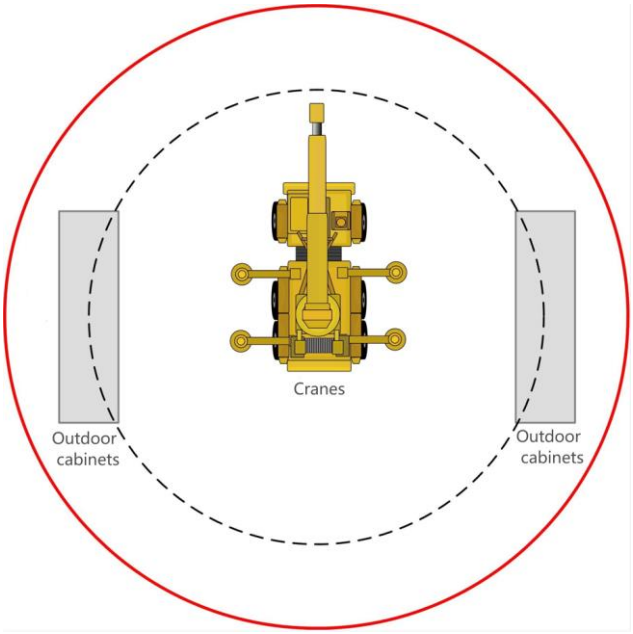


Figure 3-2 Crane Operation Schematic Diagram

3.3.2 Lifting Operation

During the lifting of the equipment, each operation should be carried out as follows:

i. The equipment should be lifted vertically, and there should be no dragging on the ground or the top of the lower cabinet during lifting. The cabinet body should not be dragged on any surface.

ii. After the equipment is lifted 300mm off the support surface, it should be paused to check the connection between the lifting device and the equipment. Only after confirming that the connection is secure, can the lifting proceed.

iii. After the equipment is in place, it should be gently placed down and allowed to settle steadily. It is strictly prohibited to place the equipment outside the vertical drop area by swinging the lifting device.

iv. The site where the equipment is placed should be solid and level, with good drainage, free of obstructions or protrusions.

v. Lifting straps equipped with hooks or U-hooks can be used for overhead lifting of the BESS, and the lifting device must be correctly connected to the cabinet (lifting ropes pass through the forklift holes).

Figure 3-3 Schematic Diagram of BESS Lifting

3.4 Installation Environment Requirements

3.4.1 General Requirements

- The installation environment shall be kept clean and free of excessive dust and oil particles. No corrosive gas shall be present around the installation area to prevent corrosion and damage to equipment components.
- The ambient operating temperature of the equipment shall be controlled within −30°C to +55°C to ensure optimal operation of the energy storage cabinet. Excessively high or low ambient temperature will shorten the service life of the equipment.
- Installation in areas with severe salt damage is strictly prohibited, such as industrial zones with medium or high salinity, coastal areas, and tropical/subtropical industrial zones with extremely high humidity and corrosive atmosphere.
- The PCS generates noise during operation; installation in residential areas is not recommended.
- Installation of the equipment in areas with strong electromagnetic interference is strictly prohibited.
- Keep air inlets and outlets unobstructed to ensure smooth ventilation.

3.4.2 Selection of Installation Location

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

- Consideration should be given to the climatic conditions and geological conditions (such as stress wave emission, groundwater level) of the BESS installation location.
- The surrounding environment should be dry with good ventilation, and far from flammable and explosive areas.
- The soil at the installation site needs to have a certain degree of compactness. It is recommended that the relative density of the soil at the installation site ≥98%. If the soil is loose, it is imperative to take measures to ensure the stability of the foundation.

3.4.3 Foundation Selection

Warning

Given the substantial weight of the BESS, a detailed examination of all site conditions (primarily geological and environmental climate conditions) must be conducted prior to initiating foundation construction. Only after this thorough assessment can the design and construction of the foundation commence.

An ill-conceived foundation construction plan could result in significant difficulties or issues with the placement of the BESS, door operation, and future operations. Therefore, the installation foundation for the BESS must be designed and constructed according to specific standards beforehand, to accommodate mechanical support, cabling routing, and maintenance requirements.

The foundation construction must at least meet the following requirements:

i. The bottom of the foundation pit for constructing the foundation must be compacted and leveled.

ii. The foundation must be sufficient to provide effective load-bearing support for the energy storage integrated system, made with reinforced concrete, where the compressive strength of the concrete cannot be lower than C30 (the weight of a single BESS is approximately2.5t).

iii. Elevate the energy storage integrated system to prevent rainwater erosion of the base and interior. It is recommended that the foundation be about200mm above the level ground at the installation site.

iv. Drainage measures should be constructed in accordance with local geological conditions.

v. Construct a concrete foundation with sufficient cross-sectional area and height. The height of the foundation will be determined by the construction party based on the on-site geology.

vi. When constructing the foundation, consideration should be given to the cabling layout.

vii. The maintenance platform is built around the foundation, providing convenience for future maintenance.

viii. According to the location and size of the cable entry and exit points on the BESS, during the foundation construction, sufficient space should be reserved for the AC cable troughs, and cable conduits should be pre-installed.

ix. Determine the specifications and quantity of the perforated pipes based on the cable model and the number of incoming and outgoing lines.

x. Both ends of all pre-buried pipes are temporarily sealed to prevent impurities from entering; otherwise, it would be inconvenient for later cabling.

xi. After connecting all cables, the cable entry and exit points as well as the joints are sealed with fire-resistant mud or other suitable materials to prevent rodents from entering.

3.4.4 Other Protective Measures

Attention

The installation site should have a drainage system constructed to prevent the bottom of the BESS or the equipment inside from being submerged in water during seasons of abundant rainfall or heavy precipitation.

Attention

Do not plant trees in close proximity to the installation area. To prevent branches from being blown down by strong winds or leaves from falling and blocking the cabinet doors or air inlets of the BESS.

3.5 Fixed Installation

After confirming that the foundation construction meets the requirements and is sufficiently dry, solid, and level, place the BESS in the designated position using a forklift. Two (a total of four) elongated holes are reserved on the front and back of the BESS, use M12 expansion bolts to fix the BESS to the foundation.

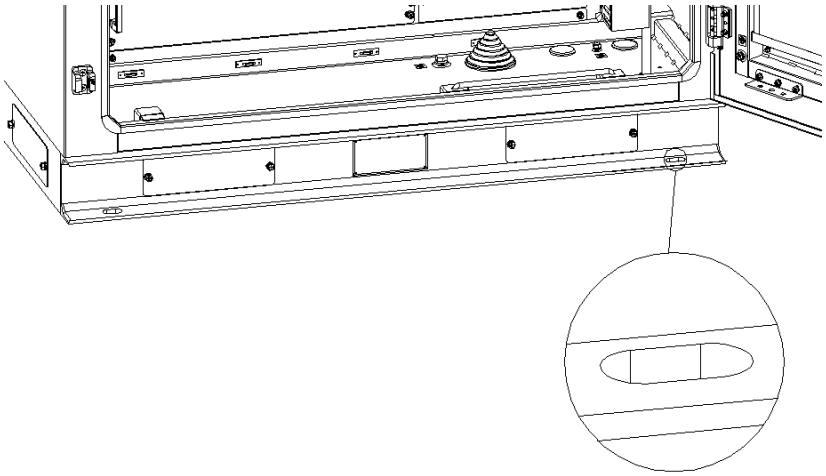


Figure 3-4 BESS Fixation

Recommended Installation Space

The BESS can be installed in parallel on multiple sides, and the distance between the left side, right side, and adjacent BESSs can be chosen to not need to be reserved, or a certain space can be appropriately reserved (50mm).

A clearance of 2500mm needs to be reserved in front of the cabinet (wherein 1050mm facilitates door opening for installation, maintenance, wiring, etc. However, considering the maintenance equipment for battery packs/non-battery packs, a minimum clearance of 2500mmneeds to be reserved in front.

A clearance of 1050mm is required behind the cabinet body for heat dissipation and maintenance, and it is recommended to reserve this space to facilitate door opening for operations; If the rear space is limited, not less than 900mm must be reserved (this distance only meets normal maintenance, the door cannot be fully opened).

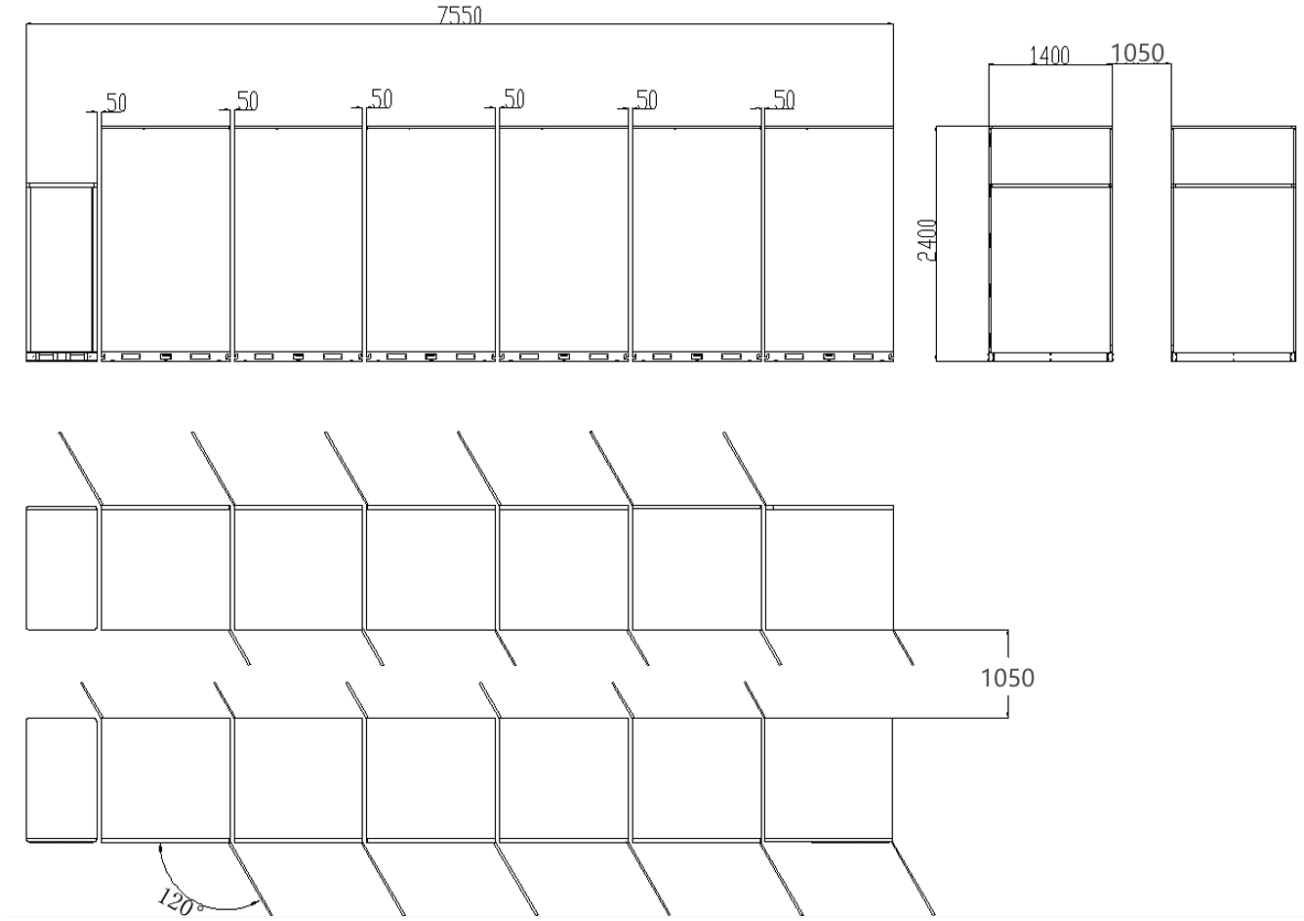


Figure 3-5 Schematic Diagram of Parallel Installation of BESSs (Example of 6 BESSs + 1 Busbar Cabinet)

4 Electrical Connection

4.1 Safety Precautions

4.1.1 General Principles

Danger

High Voltage Hazard! Electric Shock Hazard!

1) Do Not Touch Live Parts!

2) Before installation, ensure that neither the AC nor DC sides are energized.

3) Do not place the energy storage integrated system on a flammable surface.

Danger

When an earth fault occurs in the BESS, parts that were originally uncharged may have lethal high voltage. If accidentally touched, it is extremely dangerous! Before operation, ensure that there is no grounding fault in the system and also take relevant safety measures.

Warning

1) All electrical connections must comply with the relevant standards and regulations of the country/region where the project is located.

2) The energy storage integrated system can only be connected to the grid side after obtaining permission from the local power supply company and installation completion by professional technical personnel.

Warning

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

Warning

Before wiring, disconnect the AC and DC sides of the energy storage integrated system.

Warning

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

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

Warning

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 in accordance with the torque described in this manual.

Warning

Only qualified electrical engineers can perform work related to electrical connections. Please adhere to the various requirements outlined in Section 1 Safety Precautions of this manual. Our Company shall not be held liable for any personal injury or property loss resulting from ignoring these safety instructions.

Warning

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

Warning

Please strictly follow the wiring identifiers inside the equipment when performing wiring operations.

Attention

1) The installation design of the energy storage integrated system must comply with the relevant standards or regulations of the country/region where the project is located.

2) If the installation design requirements given in this manual are not followed, or if the relevant electrical standards or regulations of the installation location are not adhered to, causing failure of the BESS or system, it will not be covered by the warranty coverage.

4.1.2 Five Safety Rules

Throughout the entire process of electrical connections, and all other operations performed on equipment such as the energy storage integrated system, the following five safety rules must be adhered to:

i. Disconnect all external connections of the energy storage integrated system, as well as the connections to the internal power supply of the equipment.
ii. Ensure that no accidental re-energization can occur at any disconnected points.
iii. Use a multimeter to verify that the equipment interior is completely de-energized.
iv. Implement necessary earthing.
v. Cover adjacent potentially energized parts with insulating material cloth for the operational section.

4.2 Wiring Overview

The wiring diagram for the BESS is shown below:

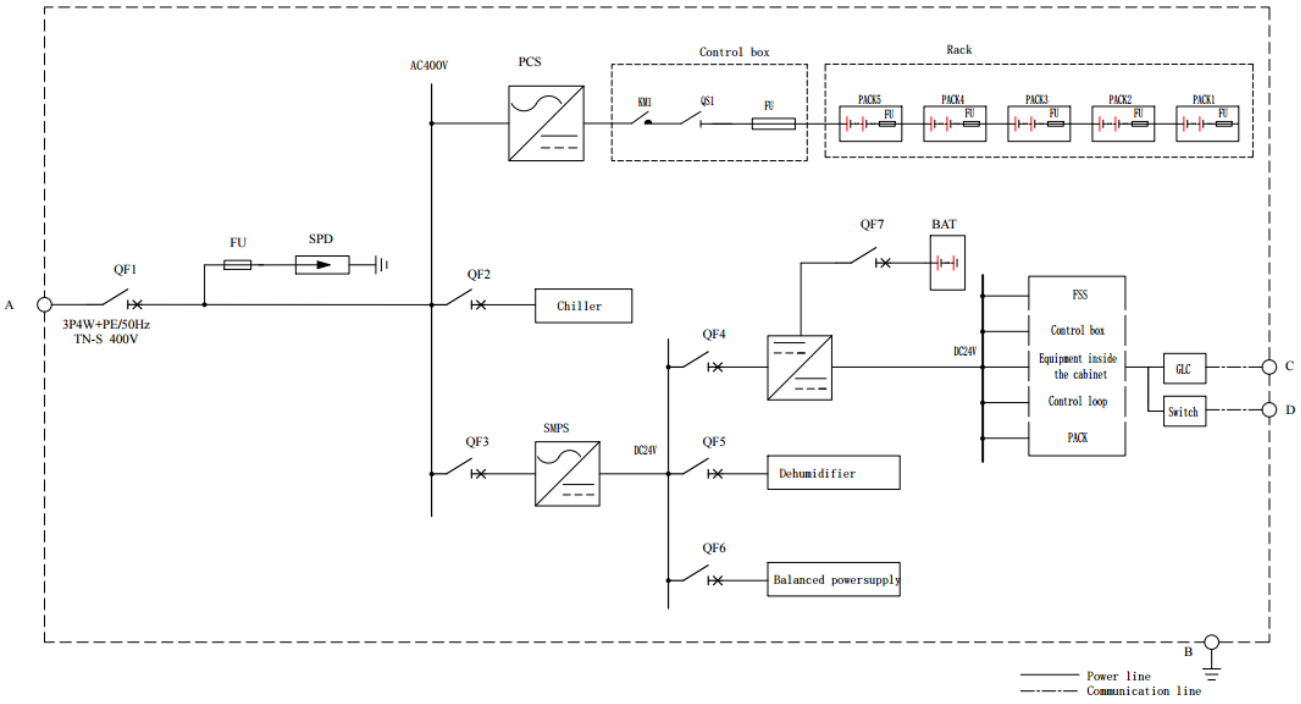


Figure 4-1 BESS Wiring Diagram

Table 4-1 Interface

Serial Number	Description	Recommended Specifications
A	AC Output Port	1*（4×70mm2）/400V/#Cu
B	Grounding Point	35mm2 or Earthing Flat Steel
C	GLC Interface	RVVSP 2*0.5
D	**Switch Interface	CAT-5 Ethernet Cable

Note: All cables connected in this table are configured for a single BESS and are not included in the supply scope;

** refers to an optional item

Warning

1) All electrical connections must be made strictly in accordance with the wiring schematic diagram.
2) All electrical connections must be performed when the equipment is completely de-energized.

Warning

Only qualified electrical engineers can perform work related to electrical connections. Please comply with the various requirements given in the “Safety Precautions” section of this manual. Our company assumes no liability for any personal injury or property loss resulting from ignoring these safety instructions.

Attention

1) The installation design of the BESS must comply with relevant standards or regulations in the country/region where the project is located.

2) If the installation does not follow the installation design requirements specified in this manual, causing failure of the BESS, busbar cabinet, or system, it will not be covered by the warranty.

4.3 Wiring Components

Warning

Incorrect wiring sequence may lead to fire. Please pay attention to the connection sequence of the wiring components.

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

Attention

1) The length of the screws selected should be appropriate, slightly protruding from the installation hole. Too long may affect the insulation performance of the equipment and even cause a short circuit.

2) After installation, check the connection between the copper lugs and the copper busbars for any heat shrink tubing that may have been clamped. If clamped, remove it promptly; otherwise, it may lead to poor contact or even damage to the equipment.

The fixing screws and other parts used for connecting the power cables of the BESS are already installed on the corresponding copper busbars at the time of delivery. Please strictly follow the description in this section to connect the cables.

4.3.1 Copper Wire Connection

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

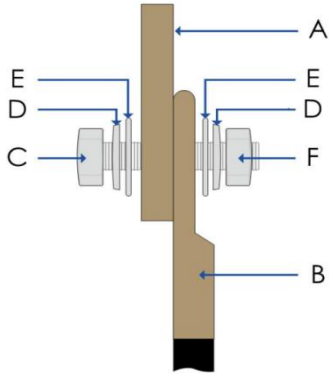


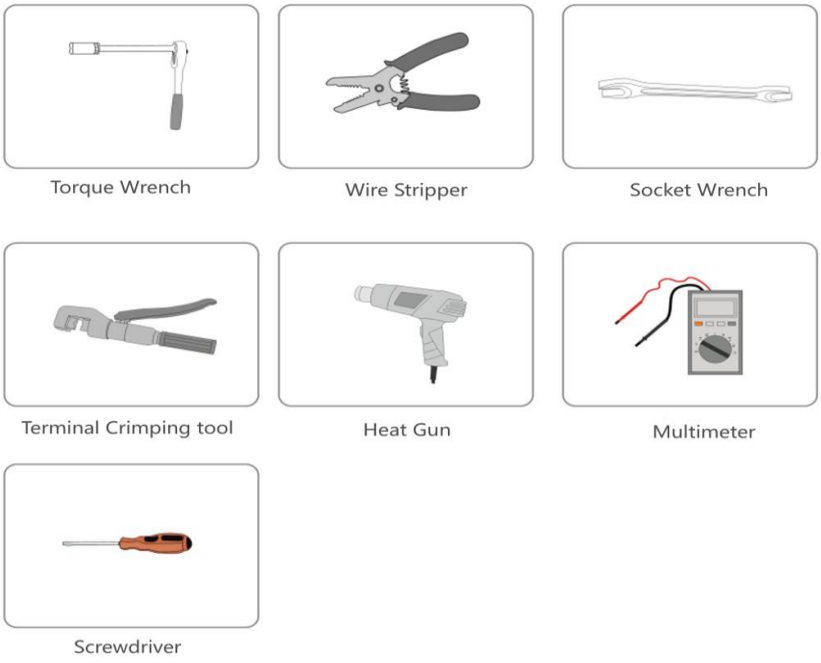
Figure 4-2 Copper Terminal Connection Sequence

Numbering	Name	Numbering	Name
A	Copper Busbar	D	Spring Washer
B	Copper Terminal	E	Flat Washer
C	Bolt	F	Nut

4.4 Electrical Wiring Preparation

4.4.1 Installation Tools

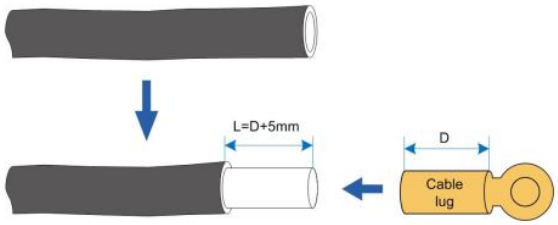
Before installation, you need to prepare at least the following tools and parts:



4.4.2 Making Terminal Blocks

Follow the steps shown below to make the terminals.

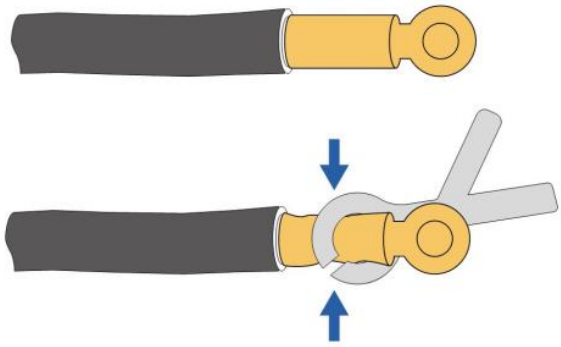
Step 1 Remove the insulation from the cable, the length of the insulation removed from the end of the cable should be the depth of the copper lug crimp hole plus about 5mm.



Step 2 Crimp the copper lug.

1 Place the exposed copper core part of the stripped wire end into the crimp hole of the copper lug.

2 Use the terminal crimping machine to tightly crimp the wire lug. The number of crimps should be more than two.

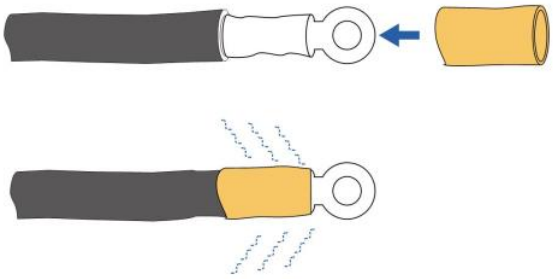


Step 3 Install heat shrink tubing.

1 Select heat shrink tubing that is more consistent with the cable size, the length should exceed the wire lug crimping tube by about 2cm.

2 Slip the heat shrink tubing over the wire lug, so that it completely covers the crimping hole of the wire lug.

3 Use a hot air blower to shrink the heat shrink tubing.



——End

4.4.3 Open cabinet door

Open the door before connecting the cables.

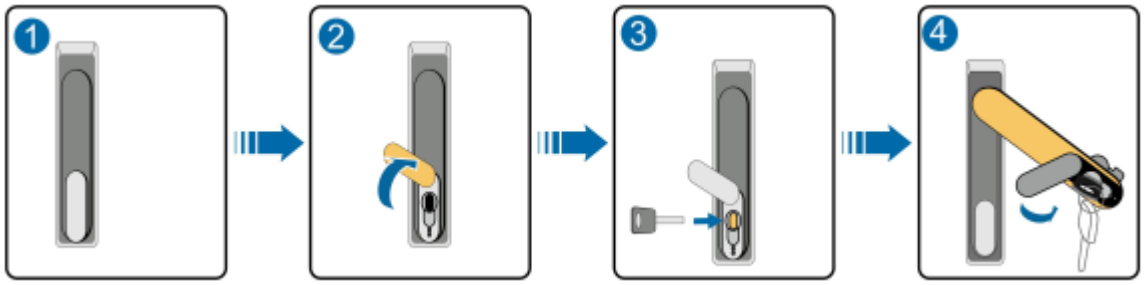


Figure 4-3 Steps for opening front door

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

4.4.4 Inspect Cabling

Warning

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

Wiring between internal equipment in the BESS has been completed before leaving the factory. The user needs to:

i. Check if the connecting cables are damaged, if so, immediately replace with cables of the same specification type.

ii. Check whether the cable connections have been tightened in place. Ensure that all terminal connections are tightened.

4.4.5 Precautions during wiring

Warning

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 forcefully to avoid damaging their insulation properties.
3) All cables and wires should be allowed a certain amount of flex space.
4) Take necessary auxiliary measures to reduce the stress on cables or wires.
5) After each step of wiring operation, carefully check to ensure that the wiring is correct and secure.

4.5 Earthing Connection

4.5.1 Introduction

Warning

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

Warning

The grounding wire must be properly grounded! In addition:

1) An electrical shock that could be fatal may occur in the event of a fault!
2) Lightning can damage the equipment!
3) The equipment may not function properly!

Attention

During grounding, please note:

1) The grounding connection between the equipment and the grounding electrode must be securely fixed.
2) Measure the grounding resistance after grounding, the grounding resistance should not exceed 0.1Ω.

4.5.2 Equal potential bonding of internal equipment

Before leaving the factory, the wiring from the main electrical equipment inside the BESS to the grounding terminal has been completed. The following operations need to be performed:

i. By measuring the conductivity from the grounding terminals of each device to the main grounding copper busbar, the effectiveness of all internal grounding connections is ensured.
ii. For the BESS, the shielding layers and protective layers of all external cables should also be grounded at appropriate locations within the BESS.

4.5.3 External Grounding

Warning

Cable connections must strictly follow the wiring identifiers inside the equipment.

The BESS includes both internal and external grounding.

Prior to delivery, grounding of the internal equipment in the BESS has been completed.

Earthing

It is recommended to use grounding flat steel or 35mm² copper earthing cable to reliably connect the grounding point with the cabinet body grounding point.

If using cabling, it is recommended to use crimping SC35-10 or DT35-10 wiring terminals; for specific steps, please refer to “4.3.1” for preparing the cable; Use an M10 bolt to fix the SC/DT terminal to the wiring hole, tightening torque 40 N • m.

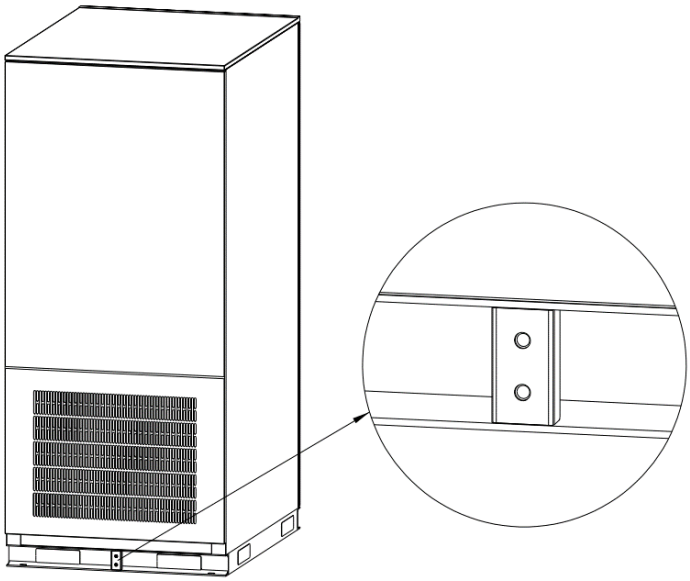


Figure 4-4 Schematic Diagram of BESS Earthing

Please, in accordance with the actual on-site conditions and following the instructions of the power station staff, install the external grounding.

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

4.6 AC Wiring

4.6.1 Safety Precautions

Warning

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

1) Ensure that the AC/DC switches of the energy storage converter are in the off state, ensuring that the terminal connections are not energized.

2) When connecting to the power grid, permission must be obtained from relevant departments and all safety instructions related to the power grid must be followed.

Warning

1) When connecting to the AC grid, disconnect the upstream AC circuit breaker and ensure that there is no voltage at the contact terminal using a multimeter.

2) Connection to the utility grid can only occur after obtaining approval and following all relevant safety instructions.

3) The AC output is not grounded internally in the equipment.

4) DC and AC circuits are isolated from the enclosure; if required by applicable national electrical codes, system grounding must be performed by the installer.

4.6.2 AC Output Wiring Procedure

Step 1 Disconnect the upstream AC circuit breaker and measure with a multimeter to ensure that the terminals are voltage-free.

Step 2 Introduce the cables into the cabinet through the bottom cable entry holes (as shown in the following figure at port A) and proceed to the wiring area of the power distribution box.

Step 3 Ensure that the AC cable connection sequence is correct.

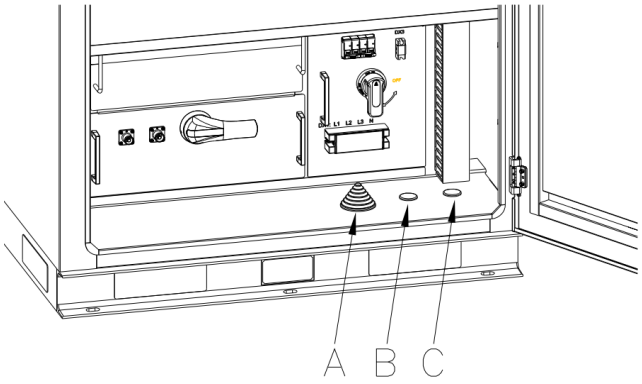


Figure 4-5 External Cable Entry Hole Location Diagram

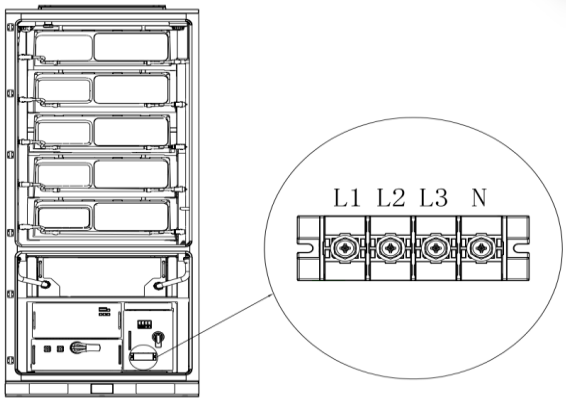


Figure 4-6 AC Output Wiring Position Diagram

Step 4 Use wire stripper to remove the cable protective layer, exposing the copper core part.

Step 5 Use SC/DT terminal crimping, refer to “4.4.2 Prepare cable”. It is recommended that the cross-sectional area of the copper cable is not less than 70mm².

Step 6 Use M10 bolt to fix the SC/DT terminal to the wiring hole, and the tightening torque is 40 N • m. (For detailed operations, refer to 4.3.1"Copper Wire Connection.")

Step 7 After wiring is complete, gently pull on the cabling to ensure there is sufficient slack.

4.7 GLC Interface (Optional)

When used as the host; or when the customer needs to connect multiple power meters externally, the GLC needs to be installed. The GLC wiring steps are as follows:

1 The cable is introduced into the cabinet through the bottom cable entry hole of the BESS (such as port B in Figure 4-5), and enters the GLC;

2 Connect according to Table 4-2 interface description.

Electric meter precautions

To ensure network smoothness, low latency, and minimal signal attenuation, it is recommended to use shielded twisted pair cable for the electric meter wiring; cable length should be ≤300m. First choice DT/L 645 protocol (if using Modbus RTU protocol, please communicate with Clou in advance)

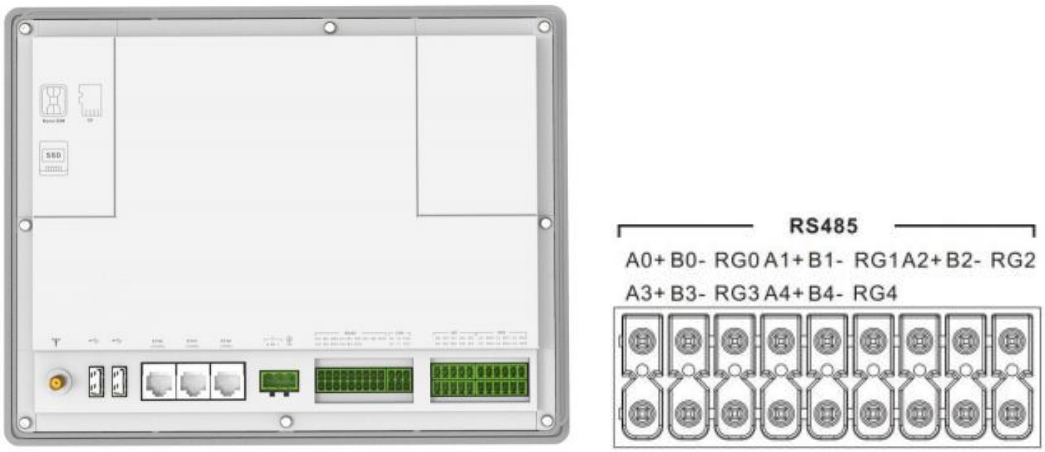


Figure 4-7 GLC RS485 Interface Diagram

Table 4-2 Interface Description

Serial Communication Interface Name	Description	Electric Meter
A0+/B0-/RG0	COM1:RS485	Meter 1
A1+/B1-/RG1	COM2:RS485	Meter 2
A2+/B2-/RG2	COM3:RS485	Meter 3
A3+/B3-/RG3	COM4:RS485	Meter 4
A4+/B4-/RG4	COM5:RS485	Meter 5

4.8 4G Router Interface (Main Cabinet)

When the BESS is used as the main cabinet, data can be transmitted to the cloud platform via a 4G router.

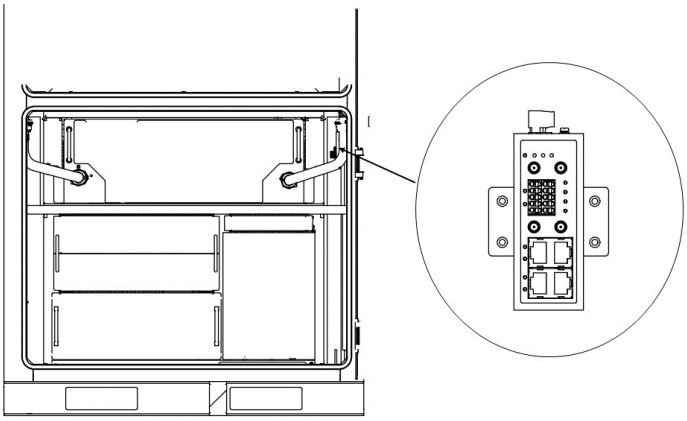


Figure 4-8 4G Router Interface Diagram

Table 4-3 Interface Description

Interface Name	Description
1#	ETH0 of GLC of the cabinet
2#	ETH1 of LC of the cabinet
3#	Port 4# of switch of slave cabinet
4#	Reserved

4.9 Switch Interface (Optional)

In the case of multiple BESSs being used in parallel, the switch is used to connect to each slave unit.

Wiring Instructions

the network cable is introduced into the cabinet from the bottom cable entry hole (as shown in Figure 4-5 B port), entering the switch wiring area.

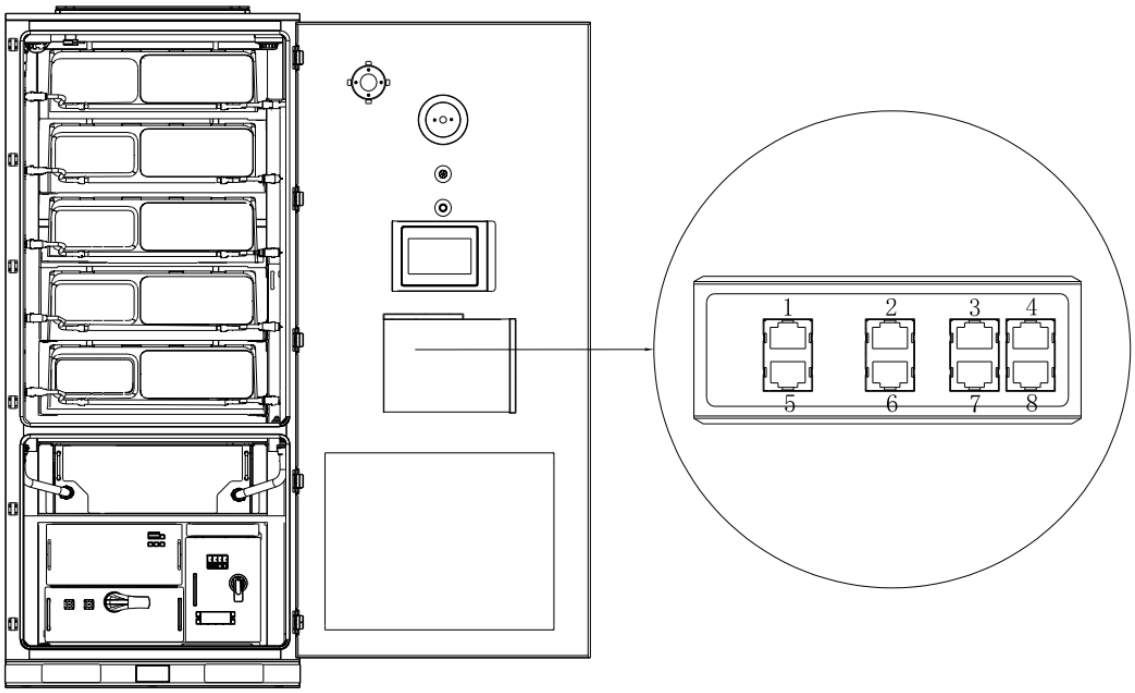


Figure 4-9 Switch Wiring Position Diagram

Table 4-4 Interface Description

Interface Name	Description
2#	ETH1 of LC of the cabinet
3#	Port 4# of switch of slave cabinet
4#	Port 3# of 4G router of main cabinet; Port 4# of switch of slave cabinet

Diagram of the cascading connections for multiple switches：

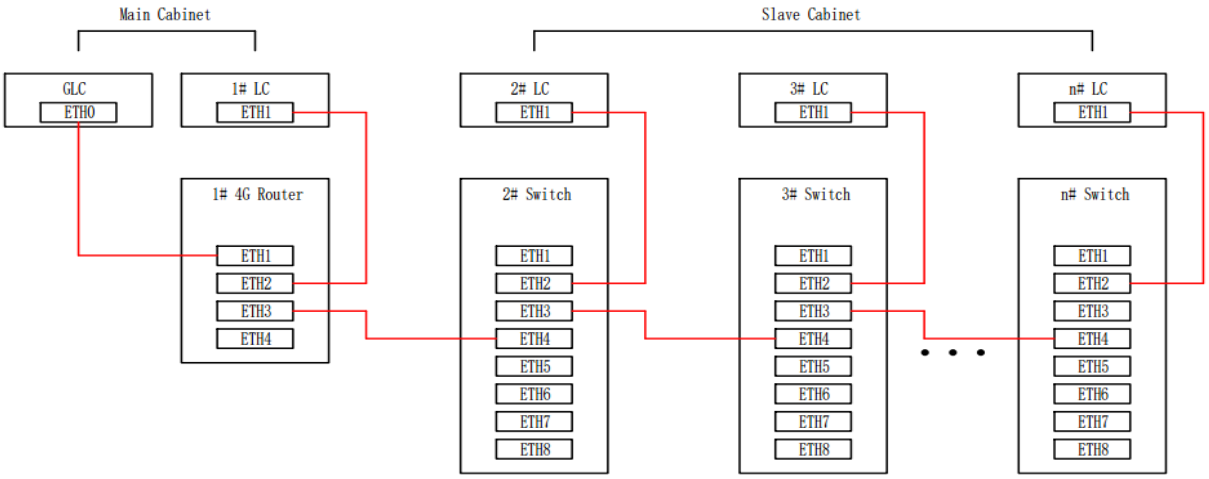


Table 4-10 Diagram of switch wiring

4.10 Operation after Wiring

After all electrical connections are completed, a thorough and careful inspection of the wiring should be carried out. At the same time, the following operations also need to be performed:

1 Check that all air inlets and outlets are not obstructed or blocked by foreign objects.

2 Seal any gaps around outdoor cabinet cable entries and perimeters with fireproof and waterproof materials to ensure a tight seal.

Warning

1) If sealing is not done correctly, it may lead to moisture entering the equipment.

2) If sealing is not done correctly, it may lead to rodents entering.

Secure the Cabinet Door

Step 1 Reinstall the wiring area protective cover following steps opposite to the removal method (refer to 'Opening the Cabinet Door').

Step 2 Lock the cabinet door and remove the key.

Attention

After closing the cabinet door, ensure that the sealing strip around the door is not curled!

5 Power On/Off Operations

5.1 Power On Operation

5.1.1 Pre-Power on Inspection

Before powering on, please carefully verify the following items to ensure accuracy.

1 Check if the wiring is correct.

2 The protective cover inside the equipment is securely installed.

3 The emergency stop button is in a released state.

4 Check to ensure there are no grounding faults.

5 Use a multimeter to check if the AC and DC side voltages meet the start-up conditions and there is no risk of overvoltage.

6 Check to ensure that no tools or parts are left inside the equipment.

7 Check that all air inlets and outlets are not obstructed or blocked by foreign objects.

5.1.2 Power-On Procedures

Before powering on, a comprehensive and meticulous inspection of the equipment must be conducted to ensure all specifications are met before proceeding with power-on.

1 The outdoor cabinet's power and communication wiring have been completed.

2 Ensure that the outdoor temperature is between -30 ~ 55°C

Attention

It is not recommended to perform power-on operations at temperatures below -30°C. If the temperature is too low, the system will take more than 24 hours to heat up the battery cells, during which time the system cannot operate normally.

For the positions of each circuit breaker, please refer to Figure 5-1.

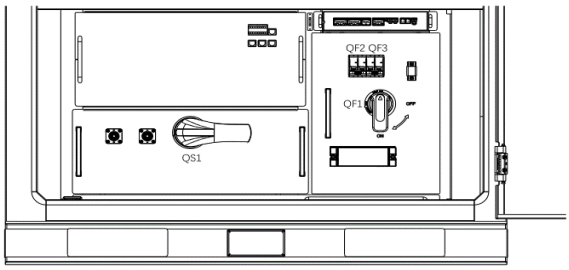


Figure 5-1(a) Switch Operation Position Diagram (Open Front Door)

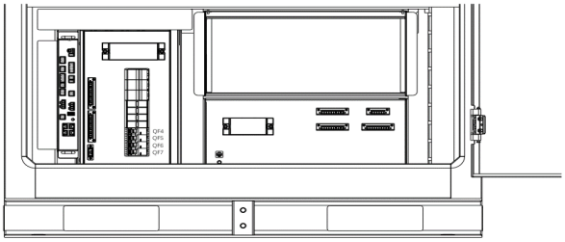


Figure 5-1(b) Switch Operation Position Diagram (Open Rear Door)

Step 1 Complete all wiring as per Chapter 4, measure voltage and frequency to meet system requirements, proceed to the next operation;

Step 2 Close the QF1 (AC Main Switch) on the front panel of the power distribution box, the system AC side is powered up;

Step 3 Close the QF2 on the front panel of the power distribution box (liquid cooling unit switch), the liquid cooling system is now powered on;

Step 4 Close the QF3 on the front panel of the power distribution box (switch power supply switch), the BESS switch power supply is now powered on; at this point, all 24Vdc auxiliary power supply main circuits in the cabinet are energized.

Step 5 Close the auxiliary power supply of the BESS in sequence: Close the QF4(UPS switch) on the back panel of the power distribution box, the UPS battery is powered up; Close the QF5(dehumidifier switch) on the back panel of the power distribution box, the dehumidifier is powered up; Close the QF6(PACK balanced power consumption switch) on the back panel of the power distribution box PACK balanced power consumption is powered up; Close the QF7on the back panel of the power distribution box (UPS battery switch), completing the energization of the UPS battery;

Step 6 Close the QS1switch on the front panel of the control box (DC main circuit switch), completing the energization of the battery cluster.

——End

At this point, the system energization is complete, and you can check the operation touchscreen to verify if the system is functioning normally. For detailed touch screen operation, please read the <GLC/EMS/Cloud Platform Operation Manual> carefully.

5.2 Power Down Operation

For the locations of each circuit breaker, refer to Figure 5-1 on the previous page.

Step 1 First, control the touch screen interface to shut down the system, then operate the switch to cut off power; For detailed touch screen operation, please read the <GLC/EMS/Cloud Platform Operation Manual> carefully.

Step 2 Disconnect the system control power supply inside the BESS, sequentially turn offQF4 (UPS switch), QF5 (dehumidifier switch), QF6 (PACK balance power switch), the 24V equipment in the BESS is powered off;

Note: When not in use, the UPS must be disconnected from the battery by switching off QF7(UPS Battery Switch) before the battery is stored for a long time. The battery must be charged to the point where the UPS LED (Battery Capacity) shows green before disconnecting QF7. The UPS should be powered on and checked every month to ensure that the UPS LED (Battery Capacity) remains green during long periods of non-use. If the light is not green, the battery must be recharged. Failure to follow these instructions resulting in over-discharge damage to the battery will not be covered by our company.

Step 3 Disconnect the QF on the front panel of the power distribution box2(Liquid Cooling Unit switch), the liquid cooling system power-off is complete.

Step 4 Disconnect the QF on the front panel of the power distribution box3(Switch Power Supply Switch), the switch power supply power-off is complete.

Step 5 Disconnect the QF on the front panel of the power distribution box1(AC Main Switch), the AC side of the system power-off is complete;

Step 6 Disconnect the QS1 on the front panel of the control box (DC Main Circuit Switch), the DC main circuit power-off is complete.

——End

At this point, the system power-off is complete.

5.3 Recommended Charging and Discharging Methods

Charging Method

To ensure optimal performance and longevity of the energy storage system, follow the recommended charging protocol below:

Phase 1: Constant Power Charging (0.5CP)

- Power: 110 kW
- End Condition: Continue charging at this power level until the cell voltage reaches 3.55V.

Phase 2: Constant Power Charging (0.25CP)

- Power: 55 kW
- End Condition: Continue charging at this reduced power level until the cell voltage reaches 3.65V.

Discharging Method

For safe and efficient energy utilization, adhere to the following discharging protocol:

Phase 1: Constant Power Discharging (0.5CP)

- Power: 110 kW
- End Condition: Continue discharging at this power level until the cell voltage drops to 2.7V.

Phase 2: Constant Power Discharging (0.25CP)

- Power: 55 kW
- End Condition: Continue discharging at this reduced power level until the cell voltage reaches 2.52V.

Pre-Charge and Pre-Discharge Conditions

To prevent damage to the energy storage system and ensure safety during operation:

Temperature Requirement: Charging or discharging is only permitted when the system's internal temperature is above 0°C.

Heating Mechanism: If the system is below 0°C, activate the cooling system heating mechanism to bring the system to an acceptable temperature range before initiating charging or discharging.

Temperature Monitoring: Use the system’s built-in sensors to verify the temperature before starting the charging or discharging process.

6 Maintenance Instructions

This chapter provides the following information:

- Maintenance and repair procedures must be carried out according to certain rules to ensure the availability of parts
- When the equipment is under maintenance, how to replace components
- Our company does not bear any responsibility for personnel injuries and property loss caused by improper intentions or failure to correctly follow the instructions and warning information in this document when disassembling, installing, maintaining, etc.
- You must follow the warning information when installing and maintaining the system.

Warning

1) Read the entire document before installing the system. Failure to follow safety protocols or the instructions and warnings in this document may result in electric shock, serious injury, or death, and may damage the system, rendering it inoperable.
2) The energy storage cabinet and battery modules have considerable weight. It is recommended to use professional equipment for moving or lifting.
3) Follow the instructions in this document to install and maintain the system.
4) Do not operate if any equipment is defective, cracked, broken, or otherwise damaged.
5) Ensure the circuit breaker is in the off position before performing any electrical wiring.
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.

Attention

1) Do not lean anything on the BESS or stack anything on it, nor should you hang anything on the Battery Pack or on the wires leading to the Battery Pack.

2) Do not use components or cabling other than those specified in this manual for system assembly.

3) Ensure that there is no water source above or near the Battery Pack, including fire sprinklers or faucets, air conditioning drips, etc.

Attention

Measure the voltage first when performing maintenance or repair work. This voltage can be measured on the copper busbar of the AC circuit breaker.

6.1 Precautions Before Maintenance

When performing maintenance or inspections on the BESS, to ensure the safety of the operator, the system must be shut down and de-energized before maintenance, and the following steps must be followed:

1 Ensure the energy storage converter is disconnected from the grid and shut down.

2 Make sure the energy storage converter cannot be accidentally re-energized.

3 Disconnect all external connections to the BESS.

4 Disconnect the internal power supply of the BESS, manually turn off the UPS (if available).

5 Check if the switches inside the system have been disconnected.

6 Implement necessary earthing connections.

6.2 Maintenance Items and Cycles

Due to the effects of environmental temperature, humidity, dust, vibration, and long-term use, components inside the BESS will age and wear, potentially leading to latent failures in the BESS. Therefore, it is necessary to perform daily and periodic maintenance on the BESS to ensure its normal operation and service life. All measures and methods that contribute to maintaining the BESS in good working condition fall within the scope of maintenance work.

The purpose of maintenance is to protect the specific environment of the electrical cabinet. Dust and contaminants must be removed at specific intervals, and locally damaged parts must be replaced.

Common maintenance items and cycles are shown in Table6-1 below.

Table 6-1 System Maintenance Items and Cycles

Serial Number	Inspection Content	Cycle
1	System Software and Operation Status Check	Every 6 months
2	Complete Machine Cabinet and Environment Inspection	Every 6 months
3	Liquid Cooling Unit Maintenance Inspection	Every 6 months
4	Comprehensive Fire Protection System Inspection	Every 12 months
5	Power Circuit and Circuit Main Switch Inspection	Every 12 months
6	UPS Inspection	Every 12 months
7	Signal Circuit Inspection	Every 12 months
8	System Cleaning	Every 12 months
9	Safety Function Check	Every 12 months

10	Earthing Reliability Check	Every 12 months
11	Label Detachment	Whenever label detachment is found

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

6.3 System Software and Operation Status Check

1 Read data from the software and check all setting parameters.

2 If software upgrade is required.

6.4 Complete Machine Cabinet and Environment Inspection

1 Cabinet door seal aging, cabinet door tightness.

2 Whether the cabinet body paint is damaged, whether rust occurs on the outer surface and screws.

3 Whether the cabinet grounding is effective.

4 Dust accumulation on the dustproof net.

6.5 Chiller Maintenance Inspection

1 After setting parameters according to the local normal climate for the chiller, maintenance checks should be conducted every 6 months. If extreme or abnormal weather conditions occur, adjustments can be made based on the actual local climate during maintenance of the chiller.

2 The inlet and outlet air filters of the chiller should be cleaned regularly based on the working environment, usually checked and cleaned once every 6 months; if there is a lot of sand, oil, fiber, willow fluff, etc., in the surrounding environment, the cleaning time for the chiller 's filter should be shortened.

3 Coolant Leakage Check

a) Inspect the battery pack inlet and outlet, the coolant pipe connection, the top exhaust valve joint, the bidirectional check valve plug, and the coolant machine inlet and outlet.

b) Contact our company's service engineer in a timely manner for component replacement and fluid replenishment based on the leakage location.

4 On the EMS, HMI, or liquid-cooling unit screen, check the coolant pressure and temperature.

- In self-cycle/cooling/heating mode:
  - If the supply pressure > 3.0 bar, switch to standby mode and drain coolant until the return pressure falls within the range below.
  - If the return pressure is < 1 bar, switch to standby mode and replenish coolant until the return pressure rises within the range below.
- In standby mode:
  - If the return pressure is < 0.7 bar, replenish coolant until the return pressure rises to the range below.

The required return pressure in standby mode depends on the return coolant temperature:

- Below 10°C: 1.1–1.4 bar
- 10°C or above: 1.4–1.7 bar

Note: For the liquid replenishment operation, refer to the *Liquid Cooling Unit User Manual.*

6.6 Comprehensive Fire Protection System Inspection (not applicable to some products)

Caution: Before inspection or debugging, disconnect the power cord of the aerosol equipment to prevent accidental discharge!

1 Check if there are any abnormalities with the fire control panel (if any), whether the dates of the aerosol fire suppression equipment (if any) are within the validity period, and if there is any damage or obvious abnormality to the device appearance;

2 Inspect if the detectors and audible and visual Warnings are in normal working condition;

3 Smoke and temperature detectors require cleaning once every 12 months;

4 Inspect the explosion relief device and fire water connector for damage and abnormalities.

6.7 Power Circuit and Circuit Main Switch Inspection

1 Tighten the bolts on the power grid and battery connection cables.

2 Tighten the grounding wire (PE) and other grounding wires in the cabinet body.

3 Inspect various switches in the main circuit, including the main circuit breaker, grid connection switch, and fuses.

6.8 UPS Check

1 During normal use, a check should be performed every 12 months to ensure the UPS is functioning properly, with the UPS LED (Battery Capacity) showing green.

2 When not in use, the connection between the UPS and the battery must be disconnected by QF7(UPS Battery Switch). Before disconnecting QF7, ensure that the battery charge level is indicated as green on the UPS LED (Battery Capacity) for long-term storage.

3 And when not in use for a long time, power-on checks must be performed every month to ensure the UPS LED (Battery Capacity) remains green. If it is not green, charging is required.

4 If battery damage occurs due to over-discharge from non-compliance with operational requirements, our company will not assume responsibility.

6.9 Signal Circuit Inspection

Check annually for looseness at terminals and plug connections.

6.10 System Cleaning

1 Use a brush to clean and remove dust from inside the cabinet. The person performing the cleaning must comply with relevant safety regulations. Cleaning must be done using a vacuum cleaner and brush, and high-pressure air should be used for areas that are difficult to reach directly.

2 Clean the dust off the dustproof cover.

3 Dustproof cotton is located at the front and rear bottom of the BESS, requiring regular maintenance or replacement. When maintaining the dustproof cotton, the front and rear louver windows on the top of the cabinet must be removed. The location of the dustproof cotton is shown in Figure7-1.

Note: The specifications for the dustproof cotton are: aluminum frame 30PPI filter mesh, aluminum frame dimensions 780*560*10mm.

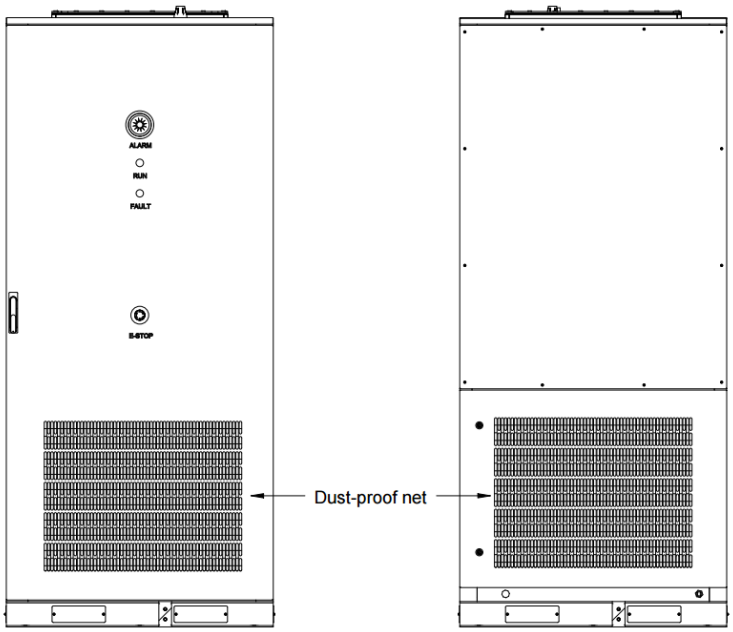


Figure 6-1 Schematic diagram of the dustproof cotton position

6.11 Safety Function Check

1 Inspect whether there is any looseness in the emergency shutdown circuit.

2 Pressing the emergency stop button should enable an emergency shutdown; after rotating to reset, normal operation should resume.

6.12 Earthing Reliability Check

1 Check the protective earthing of each cabinet within the system.

2 Inspect the system lightning protection earthing.

6.13 Check for missing labels

The warning symbols on the labels contain important information for safe operation of the BESS. During each system maintenance, if you find any labels missing, please promptly affix new ones.

6.14 Component Maintenance

Danger

1) Do not perform maintenance on this product while it is powered on. After disconnecting the power, wait at least 5 minutes, otherwise, the residual charge in the equipment may cause injury.

2) Only personnel with professional training authorized by our company should perform maintenance and servicing on this product, otherwise, it may result in personal injury or equipment damage.
3) All pluggable modules must be inserted or removed when the power is off, otherwise, the equipment may be damaged.
4) It is strictly forbidden to leave wire ends or tools inside the machine, as this may cause a fire or property damage.

6.14.1 Replace SPD

In case of SPD damage due to induced lightning or overcurrent, follow these replacement steps:

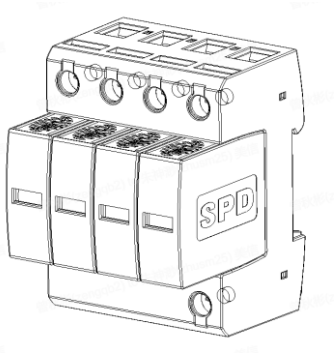


Figure 6-2 SPD Diagram

1） Check if the SPD indicator strip has changed from green to red;

2） Turn off QF1(Power Distribution Box Main Switch);

3） Use a multimeter to check and confirm power is off;

4） Remove the damaged SPD;

5） Insert a new SPD of the same model;

6） Re-engage QF1(AC Main Switch).

6.14.2 Replace Fuses

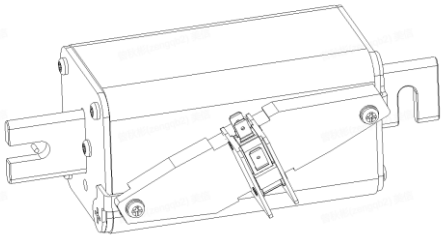


Figure 6-3 Schematic Diagram of Fuses

1） Fuse failure, unable to recover;

2） BESS shutdown;

3） Turn off QF1(Power Distribution Box Main Switch);

4） Disconnect the QS1 (DC Isolating Switch) on the front cover of the Control Box;

5） Use a multimeter to check and confirm power is off;

6） Unplug the quick connector for the battery cluster (this step requires wearing insulating gloves);

7） Remove other cabling;

8） Pull out the control box, then you can open the cover and replace the fuses (must be the same type!).

6.14.3 Replace Contactor

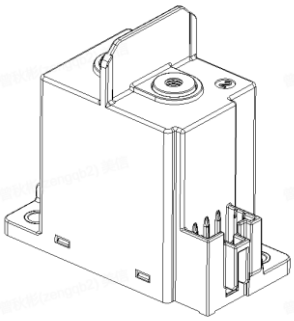


Figure 6-4 Contactor Schematic Diagram

1） Positive/Negative Pole Relay Stuck, unable to recover;

2） BESS shutdown;

3） Turn off QF1(Power Distribution Box Main Switch);

4） Disconnect the QS1 (DC Isolating Switch) on the front cover of the Control Box;

5） Use a multimeter to check and confirm power is off;

6） Unplug the quick connector for the battery cluster (this step requires wearing insulating gloves);

7） Remove other cabling;

8） Pull out the control box, then you can open the cover and replace the contactor (must be the same type!).

6.15 Other

When the BESS does not output as expected or there are abnormal changes in charging and discharging, before consulting our company's maintenance personnel, please pay attention to check the following matters:

- The status of all switches inside the BESS;
- The open circuit voltage of the battery cluster;
- Whether the emergency shutdown knob is in the pressed state;
- Whether the cabinet and power grid are correctly connected and powered on;
- Whether the communication inside the cabinet is normal.

7 Event/Fault Troubleshooting

This chapter introduces separately for GLC and LC.

7.1 GLC Event/Fault Troubleshooting

When an event/fault occurs in GLC, the fault status will be displayed on the home screen (or on the web or cloud).

Serial Number	Event/Fault Name	Description	Event/Fault Resolution
1	BESS Communication Abnormal	BESS Offline	Check if the network cable connecting the BESS to the GLC has disconnected. If the event persists, please contact Clou.
2	Meter Communication Abnormal	Meter Offline	Check if the RS485 cables connecting each meter to the GLC have disconnected.

7.2 LC Event/Fault Resolution

When an event/fault occurs on the LC, the fault status is displayed on the HMI (or web or cloud).

Serial Number	Event/Fault Name	Description	Event/Fault Resolution
1	Emergency Stop State Warning Protection for BESS	Emergency Stop DI is 0	Check if the emergency stop button on the BESS has been pressed. If the event persists, please contact Clou.
2	Water Ingress Status Warning Protection for BESS	Water Immersion DI is 0	Check if there is water infiltration at the bottom of the BESS; if so, drain the water and wait for the status to recover.

3	BESS SPD Status Warning Protection	SPD DI is 0	Check if there is a malfunction in the Power Distribution Box's SPD (the indicator strip changes from green to red); if so, replace with a new SPD.
4	BESS Front Door Status Warning	BESS Front Door DI is 0	Record of Opening the Front Cabinet Door; please check if the door is not tightly closed.
5	BESS Rear Door Status Warning	BESS Rear Door DI is 0	Record of Opening the Rear Cabinet Door; please check if the door is not tightly closed.
6	BESS Aerosol State Warning Protection	Aerosol DI is 1	Triggered when a fire emergency occurs; Do not open the cabinet door immediately; Observe that there is no smoke or flame from the BESS, wait for 2 hours before opening the cabinet door to check.
7	BESS Smoke Detector Warning Protection	Smoke Sensing DI is 0	Triggered when a fire emergency occurs; Do not open the cabinet door immediately; Observe that there is no smoke or flame from the BESS, wait for 2h hours before opening the cabinet door to check.
8	BESS Temperature Sensing Status Warning Protection	Temperature Sensing DI is 0	Triggered when a fire emergency occurs; Do not open the cabinet door immediately; Observe that there is no smoke or flame from the BESS, wait for 2h hours before opening the cabinet door to check.

9	PCS Communication Abnormality	PCS Offline	Check if the RS485 cabling of the BESS PCS has disconnected. If the event persists, please contact Clou.
10	Dehumidifier Communication Abnormality	Dehumidifier Offline	Check if the RS485cabling of the dehumidifier in the BESS has disconnected. If the issue persists, contact Clou.
11	Liquid Cooling Unit Communication Abnormal	Liquid Cooling Unit Offline	Check if the RS485 cabling of the Liquid Cooling Unit in the BESS has disconnected. If the event persists, please contact Clou.
12	Dehumidifier Failure	Dehumidifier Reports Failure	Check if the dehumidifier in the BESS has failed; if it has, replacement is required, please contact Clou.
13	PCS Failure	PCS Reports Failure	Check if the PCSin the BESS has failed; if it has, replacement is required, please contact Clou.
14	Liquid Cooling Unit Failure	Liquid Cooling Unit reports a fault	Check if the liquid cooling unit in the BESS has failed; if it has, please contact Clou for replacement.
15	Fire Protection System Failure	Smoke Sensing DI is 0 && Temperature Sensing DI is 0 && Aerosol DI is 0	Check if the fire protection system in the BESS has failed; if it has, please contact Clou for replacement.
16	PCS AC Power Loss Event	For PCS three-phase AC voltage, any phase voltage drops below 196 V	Check if there is a power outage in the power grid, you can use a multimeter to troubleshoot; once the power grid returns to normal, the fault will be resolved.

17	BESS AC Circuit Breaker Trip Protection	AC Circuit Breaker DI is 0	The AC main incoming switch trips. 1) First, rule out fire Warning caused: triggered when a fire Warning occurs; Do not open the cabinet door immediately; Observe that there is no smoke or flame from the BESS, wait for 2 hours before opening the cabinet door to check. 2) First, rule out whether it is caused by water infiltration: if water infiltration occurs; if so, drain the water and wait for the status to recover.
18	Fuse Failure	Change in Fuse Auxiliary Contact	Check if this fault is a false Warning; if not a false Warning, please contact Clou.
19	Positive Relay Adhesion	The change in the auxiliary contact of the positive contactor does not match the actual state	Check if this fault is a false Warning; if not a false Warning, please contact Clou.
20	Negative Relay Adhesion	The change in the auxiliary contact of the negative contactor does not match the actual state	Check if this fault is a false Warning; if not a false Warning, please contact Clou.

8 Warranty and Disclaimer

8.1 Quality Assurance

Evidence

Our Company, within the warranty period, requires customers to present the invoice and date of purchase of the product. The trademark on the product should be clearly visible; otherwise, we reserve the right not to 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 Waiver

In the event of the following circumstances, Our Company reserves the right not to provide quality assurance:

- Problems arising from disassembling the product or failing to maintain it correctly;
- When the entire unit or components have exceeded the free warranty period;
- Exceeding the operational usage limits specified in relevant international standards;
- Problems arising from failure to properly install and operate according to the manual;
- Product damage caused by non-normal natural environment;
- Machine damage caused by the use of non-standard components or non-our company software;
- Product damage caused by damage to external equipment;
- All accidents caused by unauthorized modification or maintenance of this product;
- Safety incidents, property loss, and equipment damage caused by forced power-on due to unresolved system failures attributable to customer reasons.

For product failures caused by the above reasons, when customers request repair services, our company's service organization can provide paid repair services upon determination. When repairs or modifications to this product are required, please contact our company in advance.

8.2 Disclaimer

 If the equipment operator does not follow the standard procedures outlined in this manual, our company will not be held responsible for any consequences.