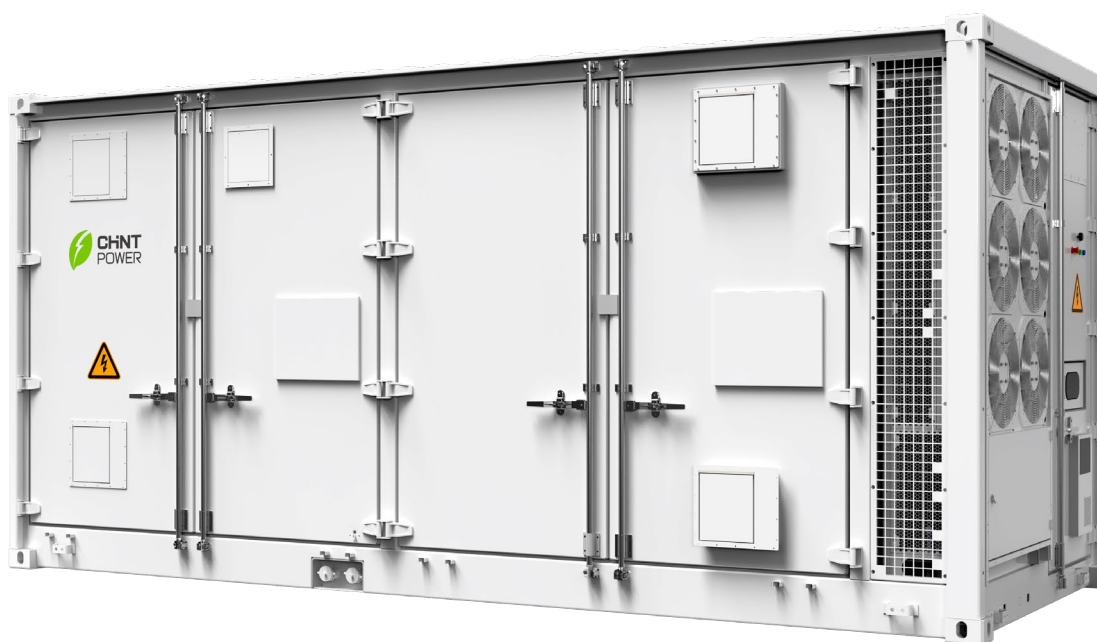

CPS ES-6251kWh Battery Container

User Manual



Shanghai Chint Power Systems Co., Ltd.

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[illegible]

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About This Manual

Document Purpose and Scope

This manual is intended to provide users with comprehensive technical guidance during the processes of transportation, storage, installation, commissioning, and routine maintenance.



- Please hand over this manual to a designated person for safekeeping.
 - Before performing any operations, please read this manual carefully and ensure that you fully understand all the contents.
-

Main content

This manual includes instructions on how to operate the equipment (such as how to debug and properly shut down the equipment), the maintenance plan for the equipment, and considerations for the handling and recycling of system hardware. Therefore, before using this system, please be sure to read this manual carefully and operate the equipment according to the methods described in this manual, otherwise it may cause equipment damage or personal injury.

The abbreviations and related terms mentioned in this manual can be fully understood by referring to the "*Terms and Definitions*" section in annex 4.

Target audience

This manual is suitable for:

- Owner
- After-sales service engineer
- Installation engineer
- Operation and maintenance engineer

Symbol introduction

The symbols in this document are defined as follows:

**DANGER!**

DANGER indicates a hazardous situation with high level of risk which, if not avoided, will result in death or serious injury.

**WARNING!**

WARNING indicates a hazardous situation with medium level of risk which, if not avoided, could result in death or serious injury.

**CAUTION!**

CAUTION indicates a hazardous situation with low level of risk which, if not avoided, could result in minor or moderate injury.

**NOTICE!**

NOTICE indicates a hazardous situation which, if not avoided, could result in equipment working abnormally or property loss.

**IMPORTANT!**

IMPORTANT! indicates important supplementary information or provides skills or tips that can be used to help you solve a problem or save your time.

Important information

- **Operational Compliance:** Read this manual carefully before use, follow the instructions strictly, and observe all safety precautions on product labels and within this manual.
 - **Applicability of Laws and Standards:** In addition to the safety instructions in this manual, you must comply with relevant international, national, or regional laws, regulations, standards, and industry requirements.
-

- **Limitation of Liability:** The Company shall not be liable for any personal injury, death, or property loss resulting from improper equipment use or violation of safety requirements.

Version upgrade

Due to product updates and improvements, the manual content will be updated, adjusted, and revised accordingly. Please refer to the actual product for the product you purchased. You can obtain the latest version of the manual materials through the corresponding sales channels, or you can log in to our official website to download the latest version of the operation and maintenance manual.

1. Safety Information



IMPORTANT!

- Please read this user manual carefully before the installation and operation of this equipment. Chint reserves the right to refuse warranty claims for equipment damage if users fail to install the equipment according to the instructions in this manual.
 - Failure to follow these instructions and other relevant safety procedures may result in voiding of the warranty and/or damage to the inverter or other property.
-

1.1. Safety and Compliance Overview

Operational compliance:

Read this manual carefully before use, follow the instructions strictly, and observe all safety precautions on product labels and within this manual.

Applicability of laws and standards:

In addition to the safety instructions in this manual, you must comply with relevant international, national, or regional laws, regulations, standards, and industry requirements.

Limitation of liability:

The Company shall not be liable for any personal injury, death, or property loss resulting from improper equipment use or violation of safety requirements.

1.2. Personnel Safety and Qualifications



IMPORTANT!

Only qualified professionals can install, operate or maintain equipment.

**DANGER!**

- Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will cause electric arcs, sparks, fire, or explosion, which may result in personal injury.
 - Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.
 - Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.
-

**DANGER!**

- During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.
 - During the normal operation of the equipment, opening battery compartment doors is not allowed. To open them, wait until the system operation is completed before performing operations and maintenance.
-

**CAUTION!**

- During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.
 - Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.
 - When working at heights, wear a safety helmet and safety harness or waist belt and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.
-

1.2.1. Personnel Requirements

- Personnel operating the equipment should be thoroughly familiar with this manual;
- Personnel operating the equipment should be thoroughly familiar with the working principles of the equipment;
- Personnel operating the equipment should be thoroughly familiar with local electrical regulations and standards;
- Only qualified personnel who hold valid electrical knowledge certificates or qualifications, comply with regulatory requirements and safety standards, and have extensive experience in this type of work can operate on circuits and equipment.
- Only qualified personnel familiar with battery PACK and safety precautions can perform the installation and operation of battery PACK. Do not allow unauthorized personnel to access the battery PACK.
- Personnel operating the equipment must be trained and qualified electrical workers; otherwise, they cannot operate the equipment. Improper or incorrect operation may cause serious harm to the operator;
- Transportation, installation, and commissioning can only be performed by professionals designated by the manufacturer;

1.2.2. Authorized Access & Site Control

- **Only authorized professionals** may remove safety barriers, open enclosures, or access internal components. Strictly prohibit unauthorized personnel, untrained individuals, and children from entering the equipment area.
- Personnel performing live-line work, work at heights, or operating specialized hoisting machinery must hold specific task-based certifications required by the local jurisdiction.
- Operating the equipment while under the influence of alcohol, drugs, or in a state of extreme fatigue is strictly prohibited.

1.2.3. Mandatory PPE

Mandatory PPE complying with local statutory standards must be worn throughout on-site operations:

- Eye protection
Safety goggles or face shield to shield against sparks, debris, or accidental electrical contact;
- Hand protection

Insulated gloves rated for the circuit voltage, plus work gloves to prevent abrasion; Insulated gloves rated for circuit voltage; work gloves for mechanical protection against cuts;

- Foot protection

Insulated safety shoes to prevent electric shock or ground current paths;

- Head protection

Hard hat to protect against overhead hazards and falling objects;

- Body protection

Protective clothing or work suit to minimize skin exposure.

1.3. Electrical Safety Principles



DANGER!

- No flammable or explosive items should be stored inside or near the equipment.
- High-voltage energy remains in capacitors. Failure to wait for the full discharge duration may cause electric shock, severe injury, or death.



CAUTION!

- Regularly inspect the safety equipment within the system to ensure that the safety equipment is reliable.
- Before installing and commissioning batteries, prepare firefighting facilities, such as fire sand and carbon dioxide fire extinguishers, according to construction standards and regulations.
- Before putting into operation, ensure that firefighting facilities that comply with local laws and regulations are installed.



NOTICE!

The static electricity generated by human bodies may damage the electrostatic sensitive components on boards, please wear anti-static gloves before touching electronic components.

1.3.1. Basic Electrical Requirements

To prevent electric shock or arc flash injuries, all on-site operations must adhere to the following behavioral standards:

- Eliminate conductive paths by removing all metallic jewelry—including watches, rings, and necklaces—prior to accessing electrical connections.
- Prohibit direct contact with any power terminal or conductor surface until zero voltage is verified via testing.
- Only use certified insulated tools with voltage ratings that align with the specific equipment requirements.
- Never operate power equipment with wet hands, damp clothing, or in the presence of water accumulation.

1.3.2. De-energization and Discharge Protocol

Strictly follow this procedure BEFORE opening the enclosure for maintenance:

- Physically isolate and lock out all AC and DC switches from both the equipment and utility grid sides.
- Verify zero voltage at all contact surfaces using a calibrated multimeter or voltage tester before proceeding.

1.3.3. Grounding Standards

- Establish the protective earth (PE) connection FIRST during installation and disconnect it LAST during removal.
- The equipment must maintain a permanent and reliable connection to the earth potential via PE cables, with impedance meeting local electrical standards.
- Do not operate the equipment if the ground conductor is missing or damaged. Direct grounding of PV strings is prohibited unless an isolation transformer is added to the AC side.

1.3.4. Cabling and Connection Requirements

- Route cables away from heat sinks, ventilation vents, or other high-temperature areas. Ensure adequate safety clearance between cables and heat-generating components to prevent insulation degradation.
- Do not join or weld power cables. If necessary, use a longer cable meeting the required specifications.

- Ensure all terminals are tightened to the specified torque and cable insulation is intact. Damage caused by faulty external power systems or incorrect voltage is excluded from the warranty.

1.3.5. Ingress and Contamination Protection

- Prevent tool fragments, metal shavings, screws, nuts, or cable ties from falling into the equipment. Such materials can trigger short circuits, component failure, or power loss.
- Ensure water, condensation, or any liquids do not enter ventilation openings or internal spaces.
- The use of water, alcohol, oils, or solvents for cleaning electrical components, internally or externally, is strictly prohibited.

1.3.6. External Electrical Risk Protection

- The complete system must implement lightning protection compliant with IEC standards. Damage resulting from substandard lightning protection is excluded from the warranty.
- Consult local utility companies before selecting grid codes. Incorrect configurations may result in the revocation of operating permits.
- Equipment failures triggered by grid voltage surges or external power system faults are not covered by the warranty.
- Before installing and debugging the batteries, please prepare fire-fighting facilities in accordance with construction standards and regulations, such as fire sand and carbon dioxide fire extinguishers. Before putting them into operation, ensure that the fire-fighting facilities are in compliance with local laws and regulations.

1.4. Environment and Site Safety



NOTICE!

- The ground where the equipment is stored must be solid and reliable.
 - When maintaining a liquid-cooled battery system, maintain the battery clusters sequentially. That is, when maintaining a specific battery cluster, only the corresponding battery compartment door of that cluster may be opened; it is strictly prohibited to open multiple battery compartment doors simultaneously (unless multiple clusters require simultaneous maintenance operations).
 - After the liquid-cooled battery system maintenance is completed, the battery compartment doors should be closed immediately; after the doors are closed, the dehumidification air conditioner must first operate to control the humidity inside the compartment to 50% before the system can operate again.
-

1.4.1. Prohibited Installation Environments

Strictly prohibit deploying the equipment in the following environments that may compromise system integrity, trigger safety incidents, or void the warranty:

- **Flammable and Explosive Zones:** Do not install or operate the equipment in locations containing flammable or explosive gases, smog, chemical vapors, or dust.
- **High-Risk Water Areas:** Do not install the equipment directly under water pipes, air conditioning vents, ventilation openings, or windows prone to condensation or leakage. Ensure the installation site is above the historical highest water level and never in areas susceptible to flooding.
- **Extreme Thermal Stress:** Avoid installing the equipment in direct sunlight to prevent efficiency loss. Keep the equipment away from open flames or heat sources (e.g., heaters, boilers). Ensure ventilation and heat dissipation systems are never obstructed or covered.
- **Salt and Corrosive Environments:** Outdoor installation in salt-affected areas (e.g., within 500 meters of the coast) is prohibited unless the equipment holds specific protective certification. Avoid exposure to corrosive gases, volatile solvents, or metallic dust.
- **Avoid low-lying and flood-prone areas.** The installation site that the device is to be located must be higher than the highest water level in history. Since winds and wind-driven waves from rivers, lakes, and seas can affect the device, the foundation must be built higher than the maximum wave height in history.

1.4.2. Site Infrastructure & Structural Requirements

- Ground Support & Stability

The installation ground must be solid, level, and free from subsidence. Do not deploy the equipment on soft or spongy soil.

- Structural Verification

Before mounting, confirm that brackets, poles, or walls are stable and capable of safely supporting the total equipment weight and environmental loads to prevent tilting or collapse.

- Electromagnetic Limits

The magnetic field strength at the installation site should be less than 4 Gauss to ensure the proper operation of internal electronic components.

1.4.3. Vegetation & Site Cleanliness

- Vegetation Control

For outdoor installations, clear weeds around the equipment regularly. It is recommended to harden the ground beneath the equipment (e.g., using cement or gravel) according to the area specified in technical specifications.

- **Waste Removal:** Upon completion of installation, immediately remove all packaging materials, foam, plastics, and cable ties from the equipment area to eliminate fire hazards and maintain ventilation.

1.4.4. Fire emergency Protocols

- **Immediate Evacuation:** In the event of a fire, all personnel must leave the building or equipment area immediately.
- **Alarming:** After evacuation, immediately activate the fire alarm system or call local emergency services.
- **Prohibited Re-entry:** Do not re-enter the affected area under any circumstances until emergency responders confirm it is safe.

1.5. Mechanical Safety

1.5.1. Tool and Structural Integrity

- **Tool Compliance:** Only use complete tools certified by professional organizations. Do not use tools with cracks, scratches, or those past their calibration expiry. Ensure tools are not overloaded.

- **Paint Protection:** Promptly repair any paint scratches caused during transport or installation. Equipment with damaged coating must not be exposed for extended periods to prevent metal substrate corrosion.

1.5.2. Handling and Hoisting Safety

- **Mechanical Assistance:** When using forklifts or pallet jacks, ensure proper tine positioning and securely lock the equipment to the carrier with ropes before movement to prevent tipping.
- **Professional Hoisting:** Hoisting must be performed by certified professionals. Standing or walking beneath hoisted objects is strictly prohibited. Ensure the angle between hoisting ropes meets safety design requirements.

1.5.3. Elevated Work Standards

- Ladder selection

When performing live-line work, wooden or insulating material-made ladders must be used. Before use, it is necessary to ensure the ladder's load-bearing capacity and check the integrity.

- Stability requirements

For single ladders, maintain a 75-degree angle with the ground and implement anti-slip measures. If used to access a platform, the ladder must extend at least 1 meter above the platform level. Make sure the ladder is placed firmly and held steady.

- When working at heights, wear a safety helmet and safety harness or waist belt and fasten it to a solid structure. Do not mount it on an insecure moveable object or metal object with sharp edges. Make sure that the hooks will not slide off.

1.5.4. Drilling Prohibition

- Hardware damage risk

Any form of drilling on the equipment enclosure or structural components is strictly prohibited. Drilling will result in:

- Destroying seal integrity, allowing moisture and dust infiltration;
 - Compromising Electromagnetic Compatibility (EMC) shielding;
 - Metal shavings falling inside, triggering circuit board shorts or severe electrical incidents.
- Site preparation

If drilling is required for site preparation (not on the equipment), pre-identify buried pipes and cables. Immediately clean all shavings after drilling to prevent them from entering the equipment area.

1.6. Labels on Equipment

Symbols	Meaning
	Warning - Electric Shock Hazard! Do not touch system connectors or terminals. Do not open the closed door unless proper lockout/tagout procedures and related training have been performed in accordance with local regulations and requirements.
	Warning - Fire hazard! Fire may occur under certain fault conditions.
	CAUTION symbol When you see this label, please slow down, be vigilant, carefully observe the surrounding environment, and follow the relevant safety regulations.
	Refer to user manual. Before operating the equipment, please read the user manual.
	Wear ear protection! Personnel entering this area or performing operation must wear hearing protection devices.
	Waste holders must not dispose of such equipment in regular trash bins; instead, they must process it through dedicated collection networks.
	Waste holders must not dispose of such equipment in regular trash bins; instead, they must process it through dedicated collection networks. Additionally, batteries containing more than 0.004% lead must be marked with the chemical symbol Pb for the metal concerned.
	Protective earthing. Connect the metal casing of the electrical equipment to the ground to prevent electric shock accidents.
	CE certification. This equipment has passed CE certification
	UN3536 certification. This equipment has passed UN3536 certification.

1.7. Lockout/Tagout Guidance



DANGER!

- Always follow all applicable lockout/tagout procedures. Failure to follow proper lockout/tagout procedures may result in serious injury or death.
 - When power is applied to the equipment, dangerous voltages exist on certain components. To prevent accidental death or injury, non-professionals should not touch any components inside the enclosure. To reduce the risk of electric shock, ensure all equipment is reliably grounded.
-



WARNING!

The doors of the equipment must remain closed unless access to the interior is required. If possible, personnel should maintain a safe distance from the enclosure when the equipment is powered. When working near the equipment, always comply with local and national lockout/tagout guidelines. Lockout and tagout procedures must meet or exceed the requirements mentioned before.

Attention

All guidelines proposed in the Chint safety document. Before entering a potentially hazardous area or starting work on the equipment, please complete the following regulations:

- Identify and wear protective clothing and protective shoes.
- Identify and isolate all power sources and stored energy.
- Use appropriate lockout/tagout devices. When locking/tagging the equipment, do not touch anything inside the equipment unless explicitly instructed in the work procedure.
- Before starting work, complete the site-specific lockout/tagout procedures and safety checklist.

2. System Introductions

System Application

The System features a modular design that is widely used in MW-scale energy storage systems for renewable energy integration, and utility applications. It is mainly applicable to BCP (emergency power supply in case of accidents or disasters), peak-load shifting, PV self-generation and self-consumption, and VPP virtual grid or power grid dispatching system solutions to improve energy utilization efficiency and power quality.

The energy storage system is characterized by high efficiency, energy conservation, environmental protection, high integration, convenient installation, standardized scheme, intelligent control, remote monitoring, easy operation, stable performance, safety and reliability, and long service life.

System Function

- Intelligent management:

The energy storage system consists of large-capacity cells and is an intelligent device supporting management, dispatching, grid connection, black-start and convenient transportation. Main components of the system include battery management system (hereinafter referred to as BMS) and large-scale battery clusters.

- High reliability:

BMS realizes automatic balancing, automatic patrol protection and power data request by monitoring the battery cells in real time, thus ensuring good operation of battery always. The black-start system is adopted to support the operation of energy storage station in case of power failure, thus overcoming the difficulty in power supply.

- High flexibility:

The energy storage system of the whole station can be configured flexibly according to users' requirements. It can be designed for grid-connected wind power/PV energy storage, off-grid energy storage, etc. It is a set of energy storage products with powerful functions, stability and reliability and complete technical indicators.

2.1. Model Description

CPS ES-6251kWh



Figure 2-1 Model introduction

No	Name	Definition
1.	CPS	Company name: Chint Power System
2.	ES	Product category: Energy Storage
3.	kWh	Total Capacity, Unit: kWh

2.2. Dimensions and Appearance

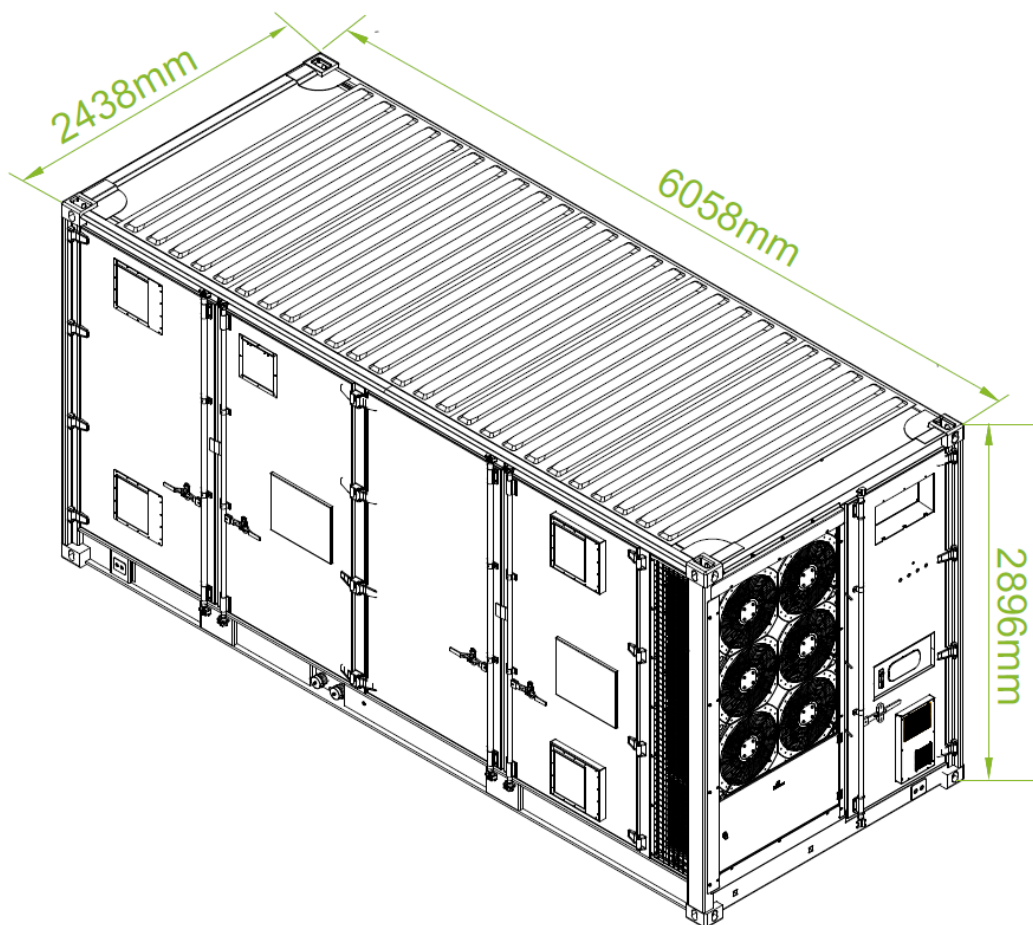


Figure 2-2 Dimensions

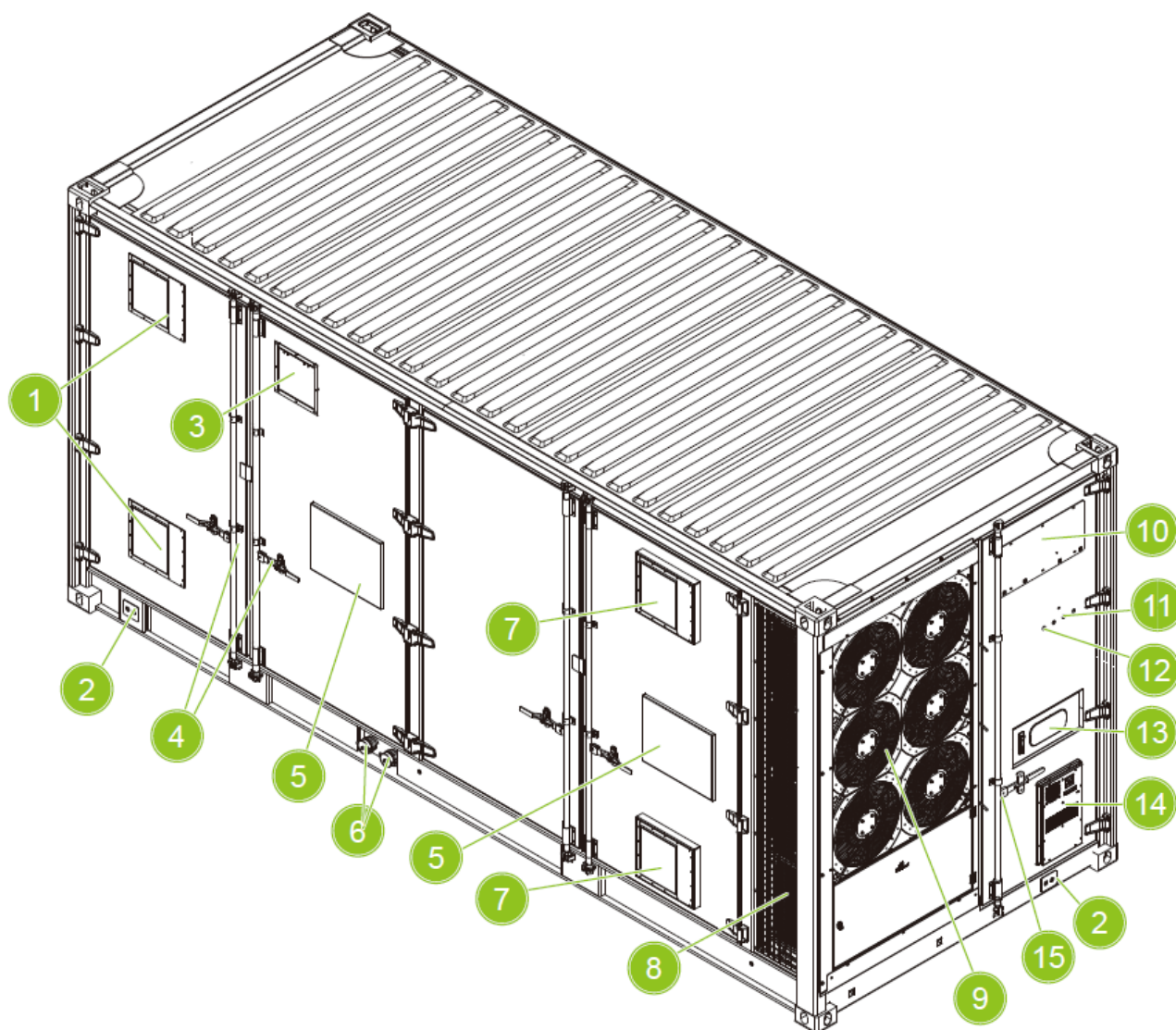


Figure 2-3 Appearance – right front view

- | | | |
|--|----------------------------|--|
| 1. Ventilation inlet | 2. External grounding bars | 3. Pressure relief valve |
| 4. Locking device of double-leaf folding doors | 5. Dehumidifier | 6. Drainage outlet and water spray system intake |
| 7. Ventilation outlet | 8. Cooling grille | 9. Liquid-cooling unit |
| 10. Bleed light & S&L alarm | 11. Indicator Light | 12. Emergency stop button |
| 13. FSS auto/manual switch | 14. Air Conditioner | 15. Locking device of single-leaf door |

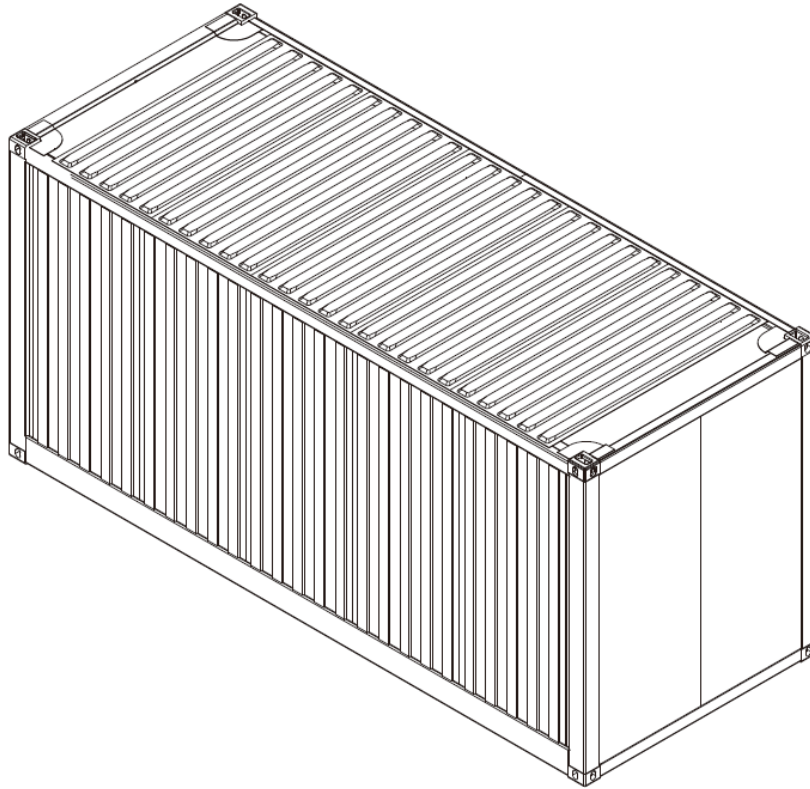


Figure 2-4 Appearance – left rear view

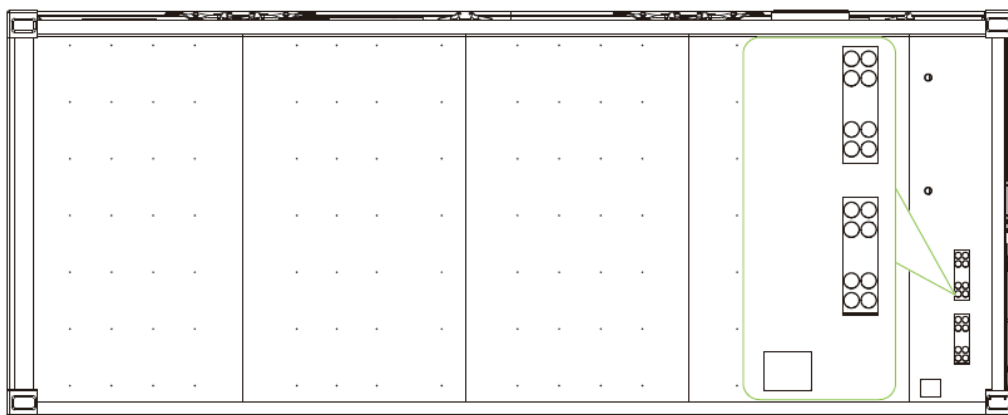


Figure 2-5 Appearance –bottom view



IMPORTANT!

- The above showed structure is the default standard Liquid Cooling Battery Container, hereinafter, we will refer to it simply as 'Model A'.
- To save space in actual installation scenarios, we exchange its left and right-side arrangement and structure, thus forming the model B.
- Model A and Model B have the totally same function and components, and their left and right sides are mirror images.

2.3. Parameters

The technical parameters of this energy storage system are based on the test results of standard battery clusters at room temperature (25±2) °C and humidity (55±20) %.

Table 2-1 Battery System Detailed Specifications

Item	Parameter	Condition
Cell capacity	587/588Ah	Standard charge and discharge CHG/DCHG rate. 0.5C
Serial/parallel mode	8P416S	8P=8 clusters in parallel, 416S = 4×104S PACK in series
Nominal voltage	1331.2V	N.A.
Nominal capacity	6251kWh	Standard discharge
Overall dimension (L*W*H)	238.5 * 96.0 *114.0 (in) /6058 * 2438* 2896 (mm)	See drawings for details
Weight	48.3T	Full load
Discharge cut-off voltage	1164.8V or any battery cell in the battery cluster reaches 2.8V	N.A.
Charge cut-off voltage	1497.6V or any battery cell in the battery cluster reaches 3.6V	N.A.
Rated charge /discharge current	294A	(25±2)°C
Communication mode	CAN, RS485, TCP/IP	N.A.
Operating temperature range	-25~55°C	Derate from 45°C
Storage temperature range	-30~60°C	N.A.
Service life of the product guaranteed under the operating condition	(25±5)°C	N.A.
System thermal management mode	Liquid cooling	N.A.
Fire protection system	FK-5-1-12	It can be replaced with other gas extinguishing chemicals according to customer's requirements and equipped with water spraying system (optional).

Item	Parameter	Condition
IP rating	IP55	N.A.

2.4. Nameplate

Users can identify the energy storage system products through the nameplate, which is in the lower left corner of the end door of the battery container, as shown in the following figure, and the detailed nameplate information is shown below.

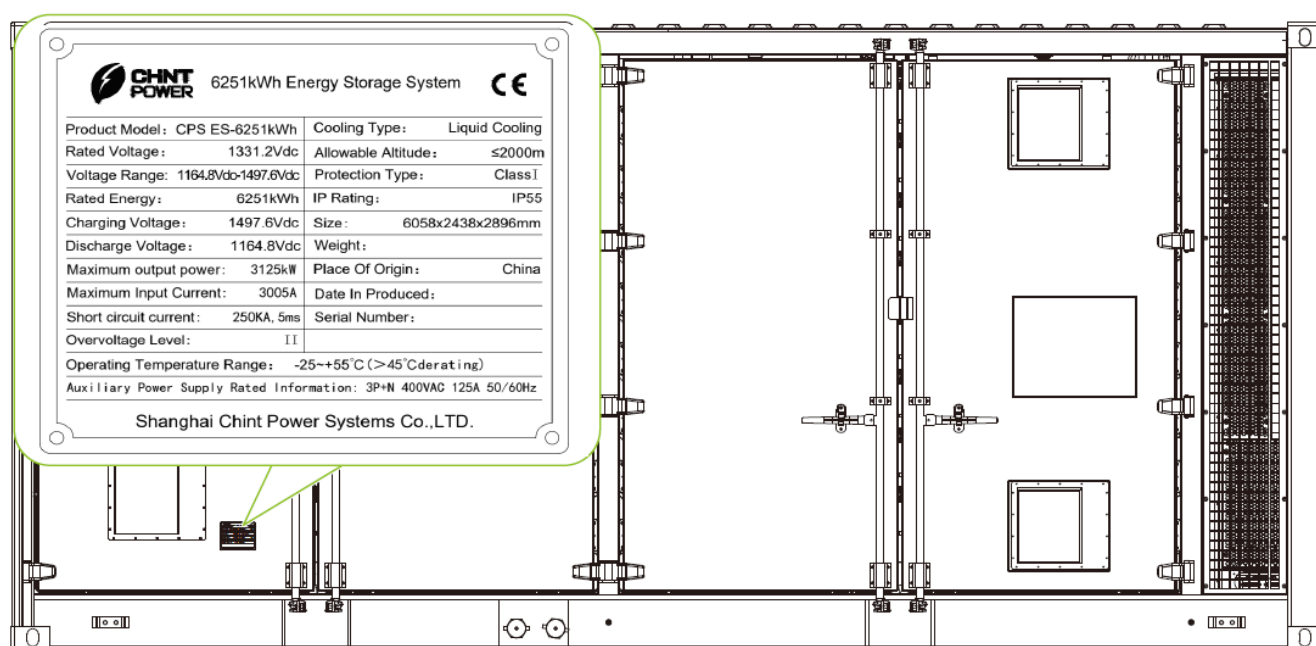


Figure 2-6 Nameplate

Warning:



The parameters on the nameplate of the energy storage system are very important, and it is forbidden to destroy or remove them.

The weight of the final delivery battery container shall prevail.

2.5. System Annotation

Overview

This energy storage system consists of multiple energy storage components, including thermal management system, fire suppression system, power distribution system, battery management system and the most important battery PACK.

The overview of battery compartment is shown below.

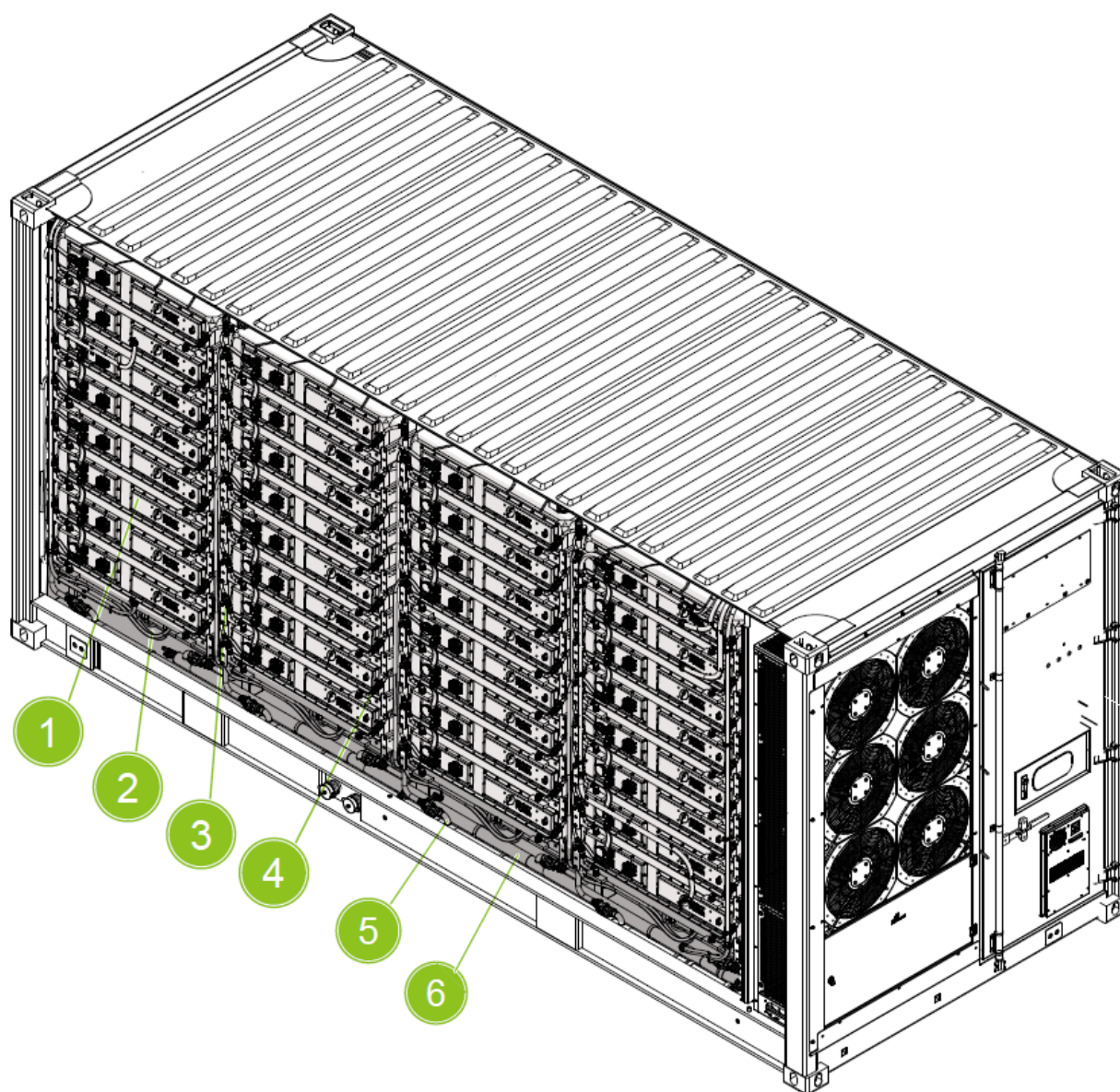


Figure 2-7 Overview of battery compartment

- | | |
|---|--|
| 1. Battery PACK (4 batteries/cluster, 8 clusters) | 2. High-voltage box (2 * 4 in total) |
| 3. Coolant outlet pipe from PACK | 4. Coolant inlet pipe into PACK |
| 5. Coolant outlet pipe from liquid cooling unit | 6. Coolant inlet pipe to liquid cooling unit |

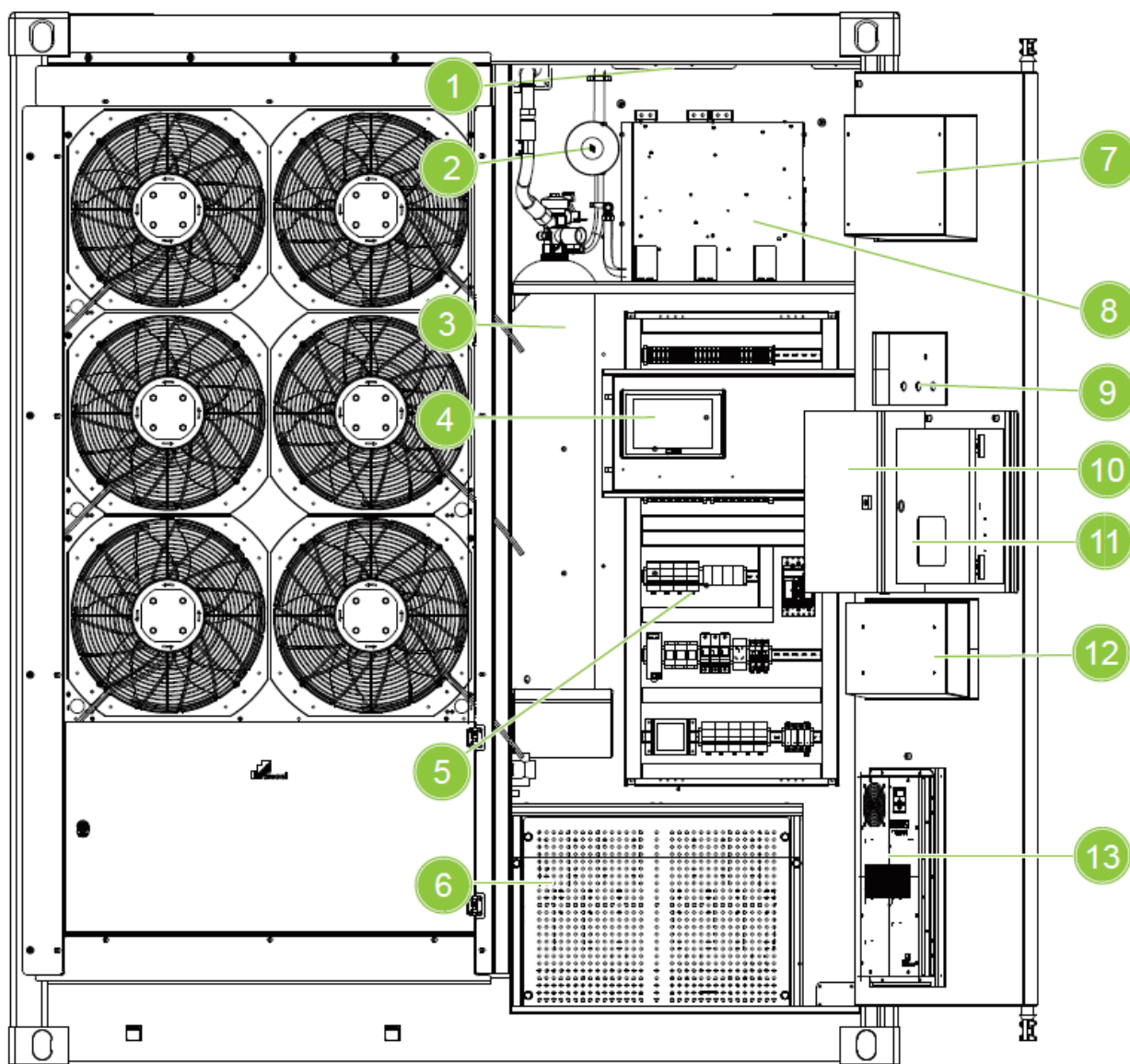


Figure 2-8 Internal components – electrical compartment

- | | | |
|-----------------------------|---------------------------|---|
| 1. Illuminating lamp | 2. Sound alarm | 3. fire extinguisher |
| 4. ESMU | 5. Power distribution box | 6. Combiner |
| 7. Bleed light & S&L alarm | 8. UPS | 9. Indicators and Emergency stop button |
| 10. Fire control module box | 11. FSS Control panel | 12. FSS auto/manual switch |
| 13. Air Conditioner | | |

2.6. Battery System

Overview

The liquid cooling battery cluster is mainly composed of battery module (also battery PACK), high-voltage box and BMS. BMS adopts a 3-level architecture, including ESBMM (Energy Storage Battery Management Module), ESBCM (Energy Storage Battery Control Module) and ESMU (Energy Storage Management unit).

In a standard battery cluster configuration, all battery PACKs share identical structure and configuration with uniform polarity configuration. During system delivery, battery PACKs are pre-installed in position.

There are 2 clusters configured on 1 rack, the upper cluster (1) is called cluster 2 while the lower cluster (2) is called cluster 1. Every cluster is composed of 4 PACKs, which are named as 4#, 3#, 2# and 1# PACK from top to bottom.

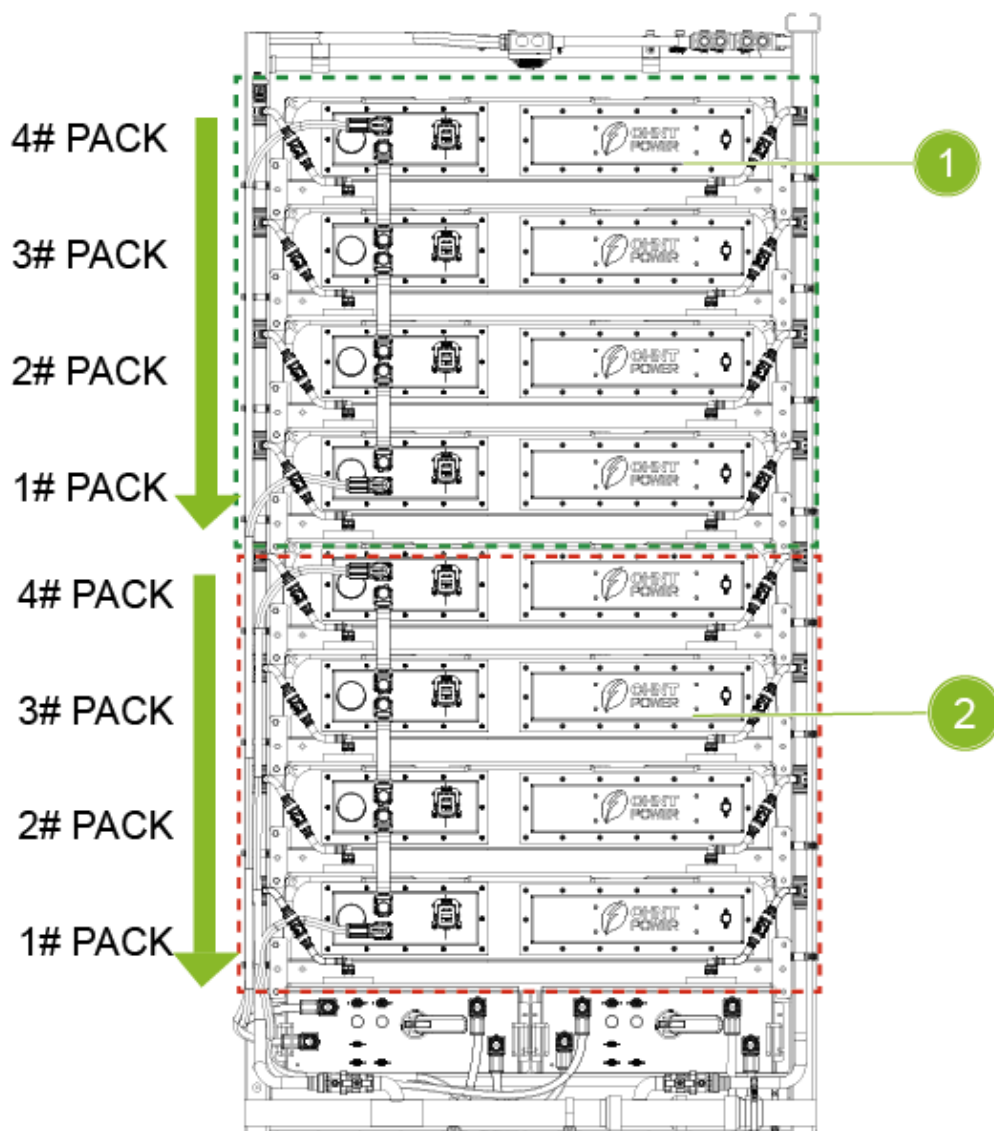


Figure 2-9 battery PACKs

On the far left and far right side, there are Coolant outlet pipes and Coolant inlets, and they connect to main liquid cooling pipes located under the high voltage box and then extend to liquid cooling unit.

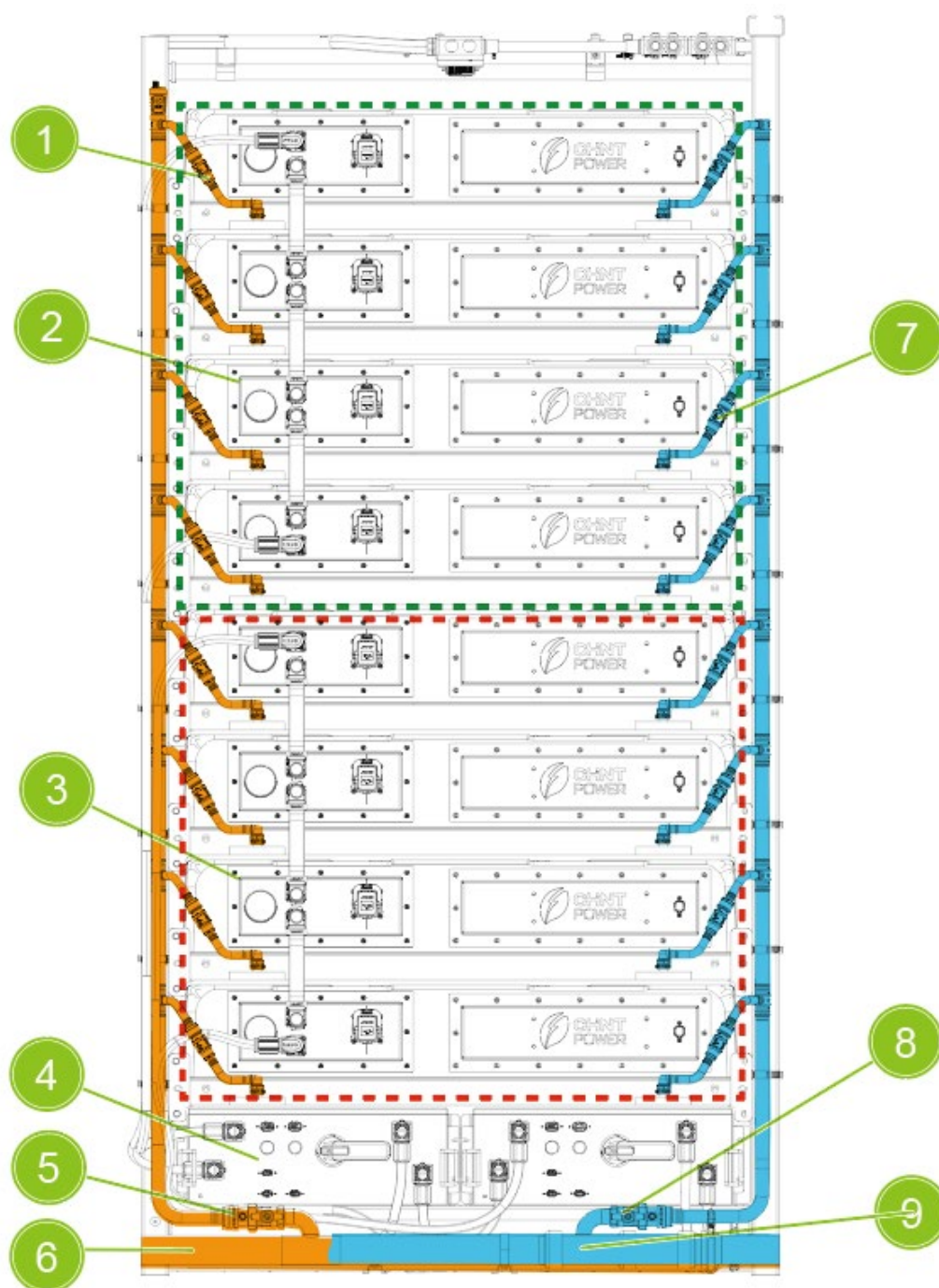


Figure 2-10 liquid cooling system of Battery Cluster

- | | | |
|--------------------------------|------------------------|--|
| 1. Coolant outlet pipe of PACK | 2. PACK of 2nd Cluster | 3. PACK of 1 st Cluster |
| 4. High voltage box | 5. Coolant outlet pipe | 6. Coolant outlet pipe to liquid cooling unit |
| 7. Coolant inlet pipe of PACK | 8. Coolant inlet pipe | 9. Coolant inlet pipe from liquid cooling unit |

In addition to above liquid cooling pipes, every rack includes 8 PACKs, 2 high voltage boxes, as well as power cables and communication cables connected in between.

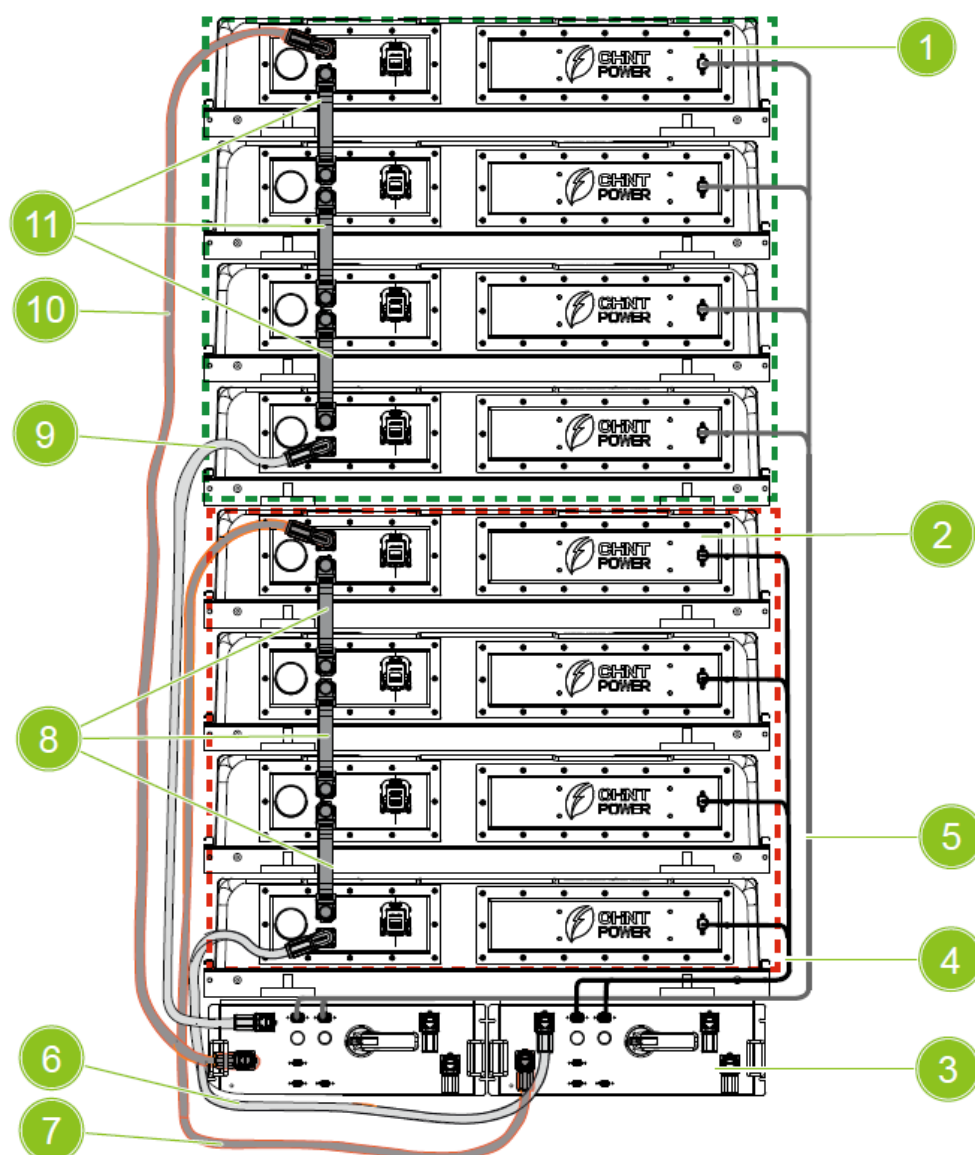


Figure 2-11 power and communication cables of Battery Cluster

- | | | |
|---|--|---|
| 1. 1-4# PACKs of Cluster 2 | 2. 1-4# PACKs of Cluster 1 | 3. High voltage box (left: 2#, right: 1#) |
| 4. communication cables from 1# high voltage box to PACKs of cluster 1 | 5. communication cables from 2# high voltage box to PACKs of cluster 2 | 6. power cable from B- port of 1# high voltage box to B- port of 1# PACK of cluster 1 |
| 7. power cable from B+ port of 1# high voltage box to B+ port of 4# battery PACK of cluster 1 | 8. copper busbar between PACKs | 9. power cable from B- port of 2# high voltage box to B- port of 1# PACK of cluster 2 |
| 10. power cable from B+ port of 2# high voltage box to B+ port of 4# PACK of cluster 2 | 11. copper busbar between PACKs | |

2.6.1. Battery PACK

Battery PACK consists of lithium iron phosphate battery cell 1P104S. The corresponding plugs and sockets of positive and negative power cables are orange and black, as shown below:

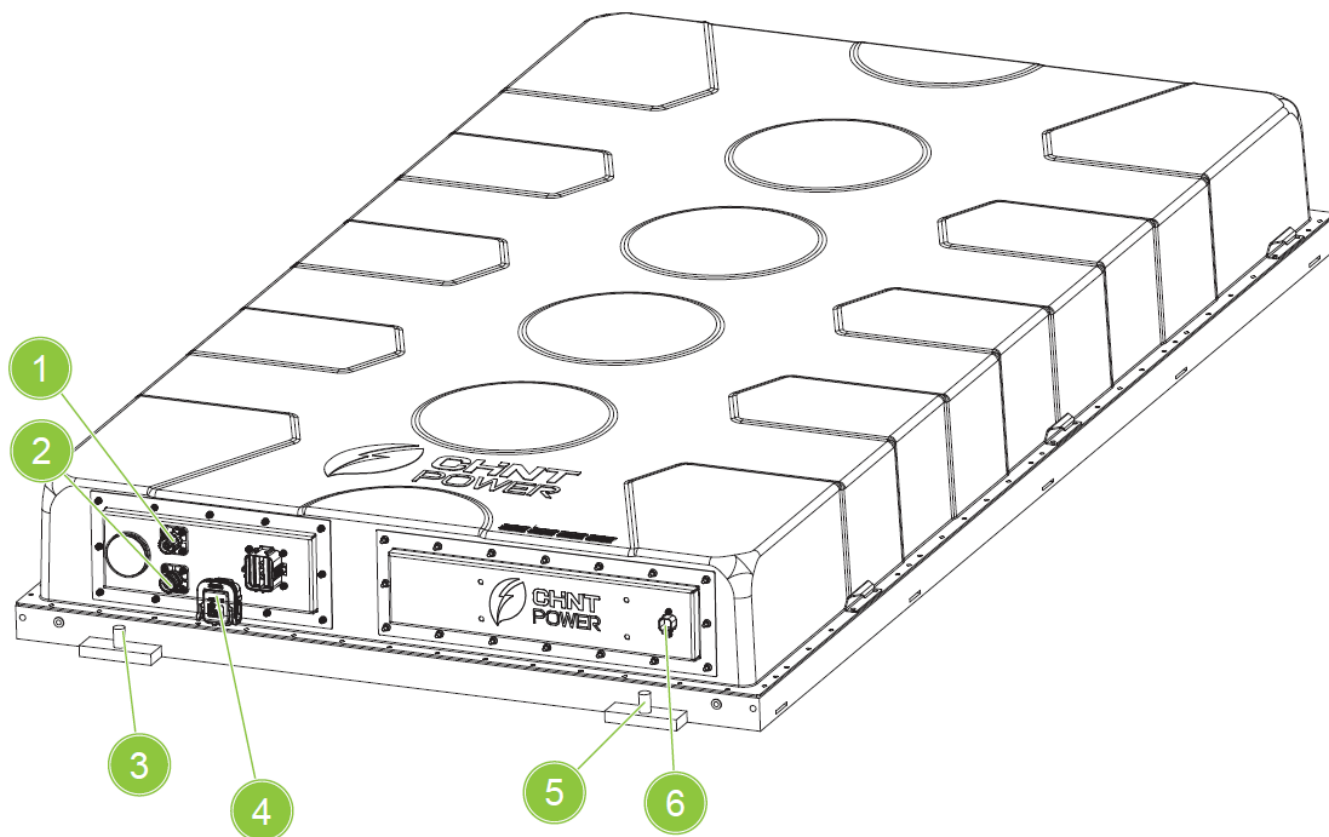


Figure 2-12 Battery pack

- | | | |
|------------------------------------|-------------------------|----------------------------|
| 1. Positive terminal | 2. Negative terminal | 3. Liquid cooling outlet |
| 4. MSD (Manual Service Disconnect) | 5. Liquid cooling inlet | 6. Communication interface |

2.6.2. BMS System

Overview

BMS adopts a 3-level architecture, comprising ESBMM, ESBCM and ESMU. Their installation positions are detailed in the following table:

Table 3- 1 Installation Positions of BMS Components

Level	Name	Position	Function
Level 1, battery PACK level	ESBMM	Inside the battery PACK's maintenance panel	Check voltage and temperature information of battery cells in battery PACK
Level 2, battery cluster level	ESBCM	In high-voltage box	Carry out data collection, analysis and decision-making and cluster level protection; upload the information to ESMU;
Level 3, system level	ESMU	In electrical compartment	Collect the information of each ESBCM and communicate with EMS and SCADA (supervisory control and data acquisition)

ESBMM location

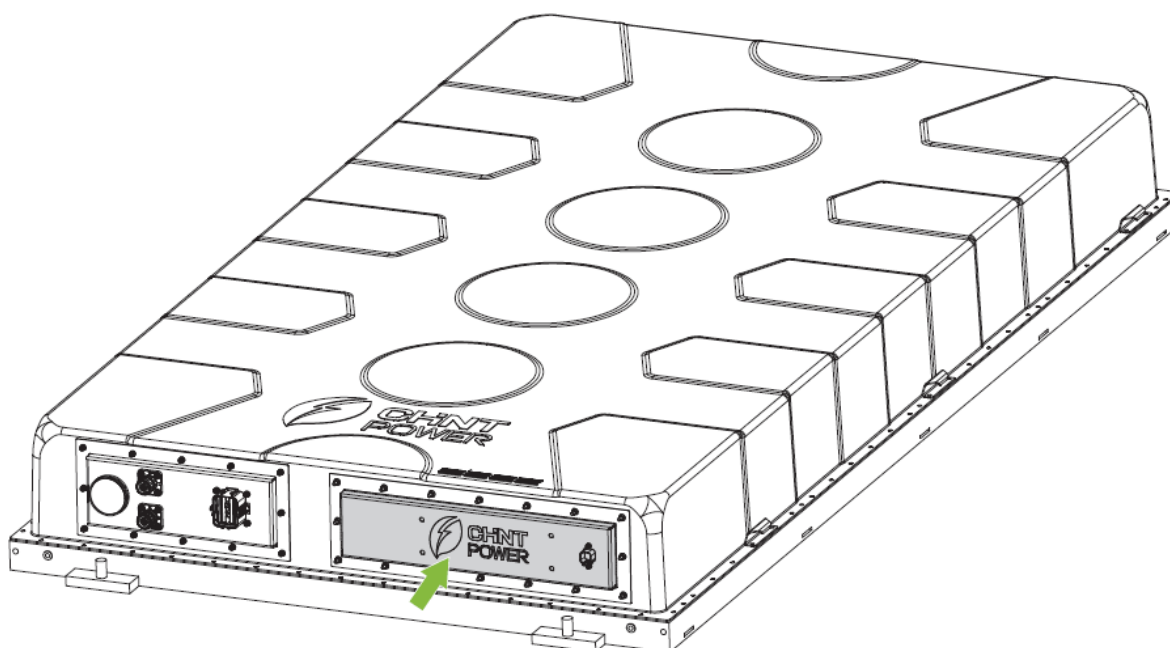


Figure 2-13 ESBMM location

ESMU

The schematic diagram of the installation position of ESMU in the equipment compartment is as follows:

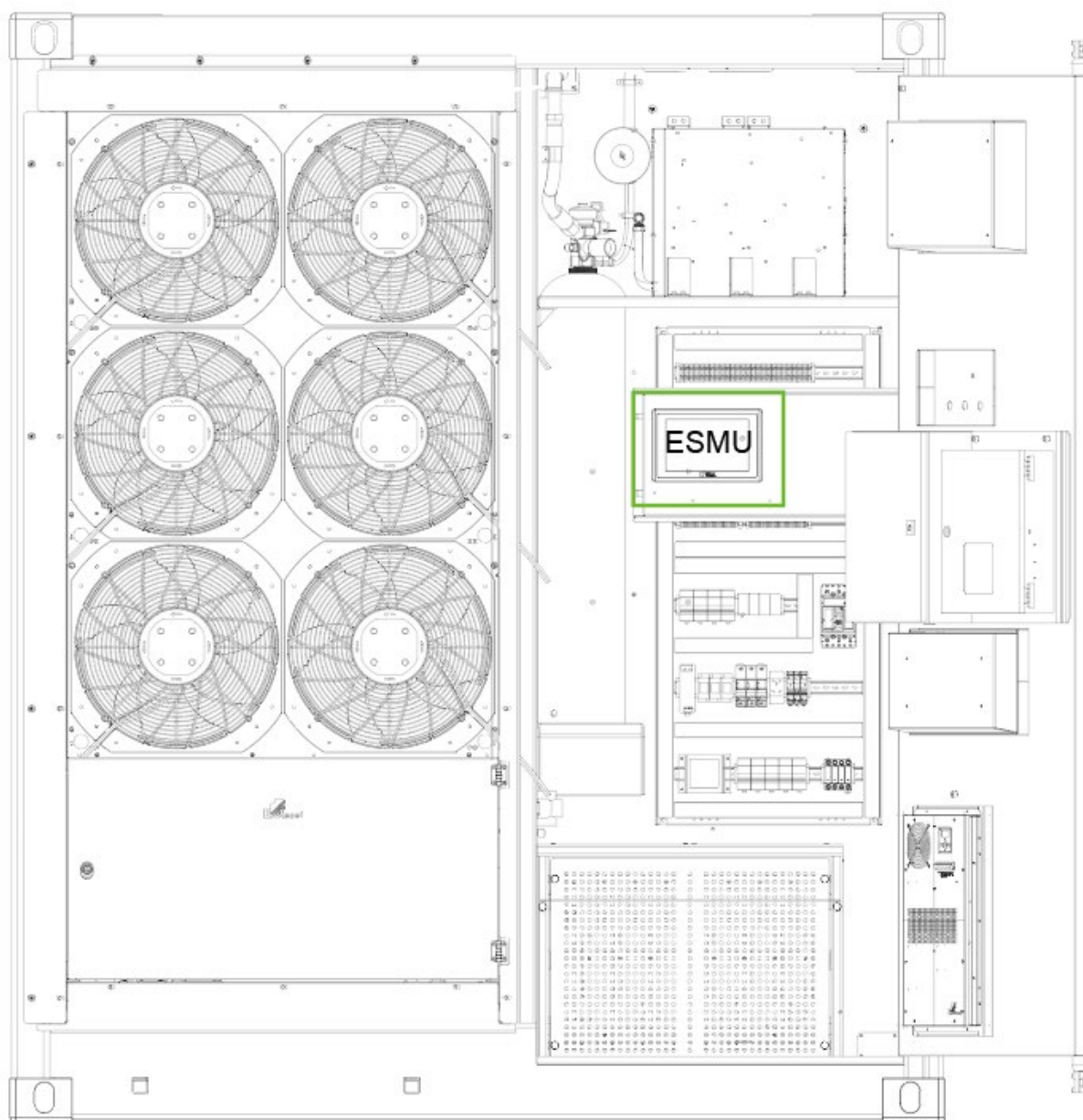


Figure 2-14 Installation Position of ESMU

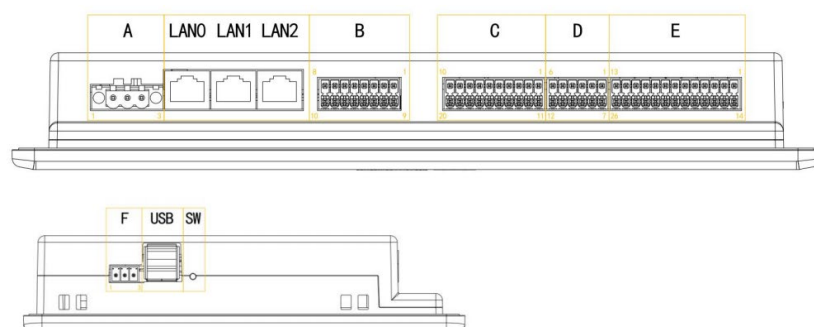


Figure 2-15 Schematic Diagram of ESMU Interface

ESMU has eight interfaces. Interface A is the power port, and LAN is the Ethernet communication port. Interfaces B, C, D, E and F are communication ports, and USB is the port for exporting data and importing upgrade programs.

ESMU has 11 pairs of output dry contact interfaces located on all pins of interface E.

In the conventional design, we only introduce two output dry contact lines. Two wires of each dry contact are connected to the input interface of the PCS dry contact (ESMU DO → PCS DI). When the BMS is normal, the ESMU dry contact outputs a closed signal, and when the BMS fails, the ESMU output is open-circuited.

Interfaces of ESMU are defined as follows:

Table 2-2 Definition of ESMU Interfaces

Port	No.	Definition	Function	Use
A	1	V+	Positive input of power supply	Power input
	2	V-	Negative input of power supply	
	3	PE	System grounding	
LAN	-	LAN0	100M/1000M Ethernet	EMS
	-	LAN1	100M/1000M Ethernet	EMS
	-	LAN2	10M/100M Ethernet	ESBCM
B	8	VDD	Output negative electrode of DI isolated power supply	DI power supply
	16	VSS	Output negative electrode of DI isolated power supply	
	7	DI1H	Detects a high level (24V) is effective	Level-2 warning signal
	15	DI2H	Detects a high level (24V) is effective	-
	6	DI3H	Detects a high level (24V) is effective	Trip signal input
	14	DI4H	Detects a high level (24V) is effective	Emergency stop
	5	DI5H	Detects a high level (24V) is effective	-

Port	No.	Definition	Function	Use
	13	DI6H	Detects a high level (24V) is effective	High density trip signal of combustible Gas
	4	DI7L	Detects a low level (24V-) is effective	-
	12	DI8L	Detects a low level (24V-) is effective	-
	3	DI9L	Detects a low level (24V-) is effective	-
	11	DI10L	Detects a low level (24V-) is effective	-
	2	DI11L	Detects a low level (24V-) is effective	-
	10	DI12L	Detects a low level (24V-) is effective	-
	1/9	DI0+/DI0-	AC (220Vac 50Hz) detection	-
C	10/9	0A/0B	0#RS485	PCS
	8/7	1A/1B	1#RS485	Air conditioner
	6/5	2A/2B	2#RS485	Air conditioner
	4/3	3A/3B	3#RS485	Liquid cooling
	2/1	4A/4B	4#RS485	-
	19/17 /15/13 /11	RB0~RB4	RS485 terminal resistance; if RB is suspended, there is no internal resistor 120R; if RB is short-circuited to xB (0B/1B, etc.), there is an internal resistor 120R	-
	20/18 /16/14 /12/10	RG0~RG4	Shielding grounding point of each RS485, suspended by default	-
D	6/5	0H/0L	0#CAN	ESBCM
	4/3	1H/1L	1#CAN	PCS

Port	No.	Definition	Function	Use
	2/1	2H/2L	2#CAN	-
	11/9 /7	RL0/RL1/RL 2	CAN terminal resistance; if RL is suspended, there is no internal resistor 120R; if RL is short-circuited to xL (0L/1L/2L), there is an internal resistor 120R	-
	12/10 /8	CG0/CG1/C G2	Shielding grounding point of each CAN, suspended by default	-
E	13/26	D0+/D0-	0# normally open dry contact output	-
	12/25	D1+/D1-	1# normally open dry contact output	-
	11/24	D2+/D2-	2# normally open dry contact output	-
	10/23	D3+/D3-	3# normally open dry contact output	-
	9/22	D4+/D4-	4# normally open dry contact output	-
	8/21	D5+/D5-	5# normally open dry contact output	-
	7/20	D6+/D6-	6# normally open dry contact output	-
	6/19	D7+/D7-	7# normally open dry contact output	System fault signal output
	5/18	D8+/D8-	8# normally open dry contact output	System protection trip output
	4/17	D9+/D9-	9# normally open dry contact output	-
	3/16	D10+/D10-	10# normally open dry contact output	-
	2/14	NO11/COM	11# normally open dry contact output	-
	15/14	NO11/COM	11# normally closed dry contact output	
F	1	TX	RS232 sending port	-
	2	RX	RS232 receiving port	
	3	GND	RS232 reference ground	
USB	1	USB1	USB Type A (firmware upgrade port)	-

Port	No.	Definition	Function	Use
	2	USB0	USB Type A	-
-	-	SW	Auxiliary firmware button	-

2.6.3. High-voltage box

Overview

The ESBCM of high-voltage box are shown as below:

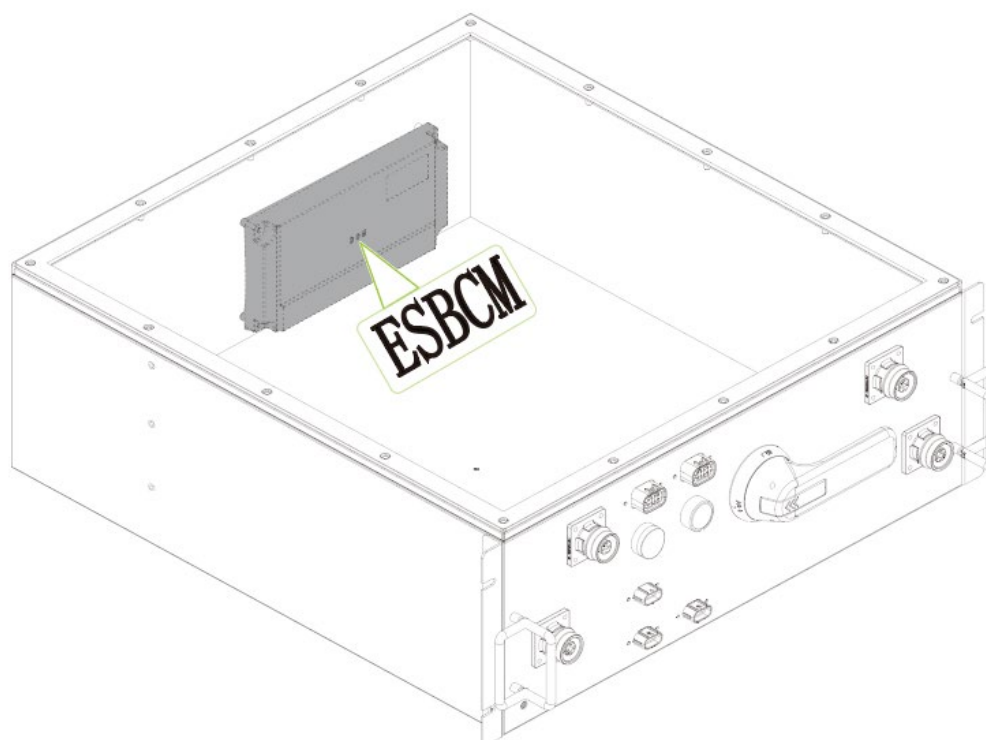


Figure 2-16 ESBCM of High-voltage box

The following figure shows the main component and main interfaces of high-voltage box:

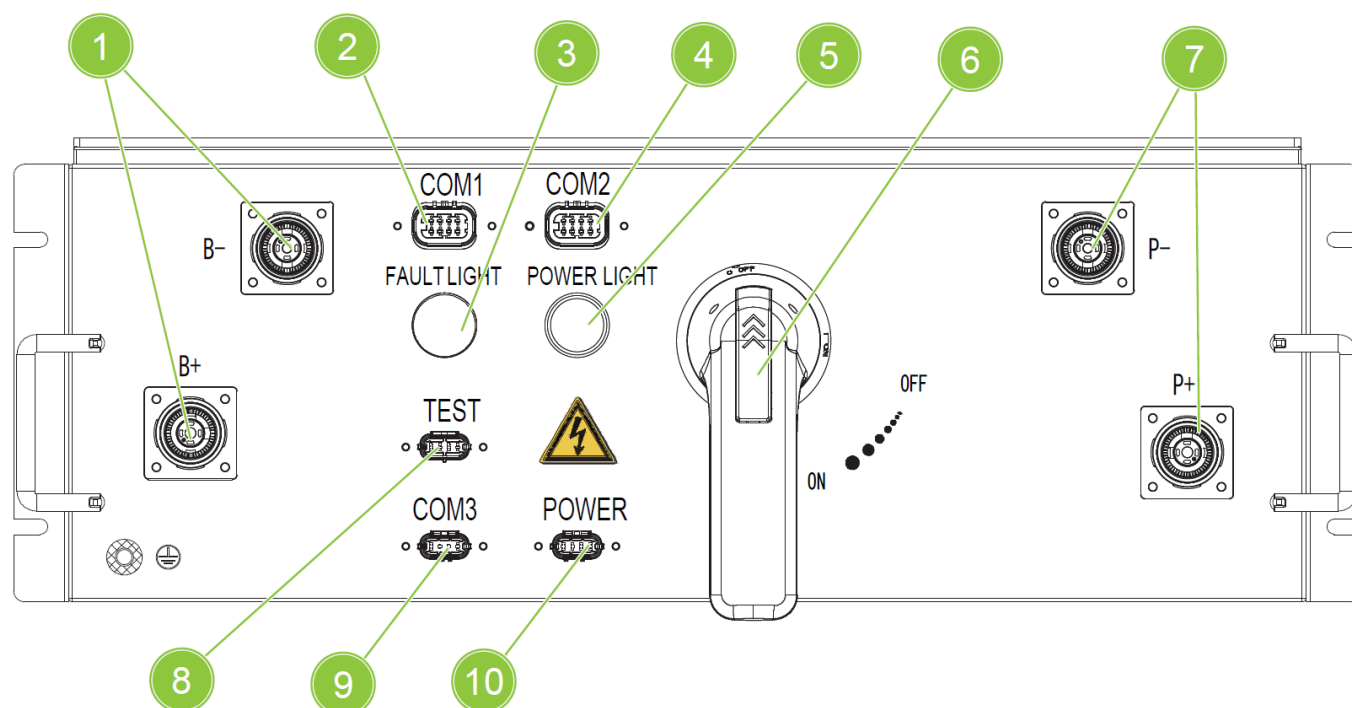


Figure 2-17 High-voltage Box

Table 2-3 Definition of High-voltage Box

No.	Definition	Function
1	Battery cluster plug	DC cable connection plugs of battery PACK
2	COM1	communication input/output interfaces
3	Fault light	Indicating there is failure in the high-voltage box
4	COM2	communication input/output interfaces
5	Power light	Indicator for Power on/off
6	Disconnecter switch	Battery cluster switch at DC side
7	PCS plug	PCS DC cable connection plugs
8	Test	commissioning
9	COM3	communication input/output interfaces
10	Power	Indicating the control power is supplied

The high-voltage box is connected to the battery cluster through "B+" and "B-" terminals, and connected to the copper busbar through "P+" and "P-" terminals on the front of high-voltage box.

The definitions of power supply and communication input/output interfaces are shown below:

Table 2-4 Definition of Power Supply and Communication Input/output Interfaces of High-voltage Box

Name	Function	Definition	Function description	Remarks
Power	BMS POWER	L	External AC220V power input to supply power for BMS switch inside the high-voltage box	
		N		
		L		
		N		
COM1	ESBMM COM	IP1	Daisy-chain communication	To IP2/IM2 of the last ESBMM
		IM1	Daisy-chain communication	
		IP2	Daisy-chain communication	To IP1/IM1 of the first ESBMM
		IM2	Daisy-chain communication	
	NC	NC	Reserved	
		NC	Reserved	
		NC	Reserved	
		NC	Reserved	
COM2	ESBCM COM	DI5L	Main control address input within the high-voltage cabinet	
		V-		
		D07+	Main control address output within the high-voltage cabinet	
		D07-		
		2H	Daisy-chain communication	Connect to the previous 2H/2L of ESMU
		2L	Daisy-chain communication	
		2H	Daisy-chain communication	Connect to the next 2H/2L of ESMU
		2L	Daisy-chain communication	
COM3	PCS COM	1H	Communication with PCS	
		1L		
	PCS Dry Contact	D08+	It is used for fault transmission from BMS to PCS, serious fault output, passive normally closed, and disconnection in case of abnormality (PCS tripping)	
		D08-		
TEST	CAN0	0H	Intranet commissioning port	

Name	Function	Definition	Function description	Remarks
	CAN0	0L	External commissioning port network	
	CAN2	2H		
	CAN2	2L		

2.7. Fire Protection System

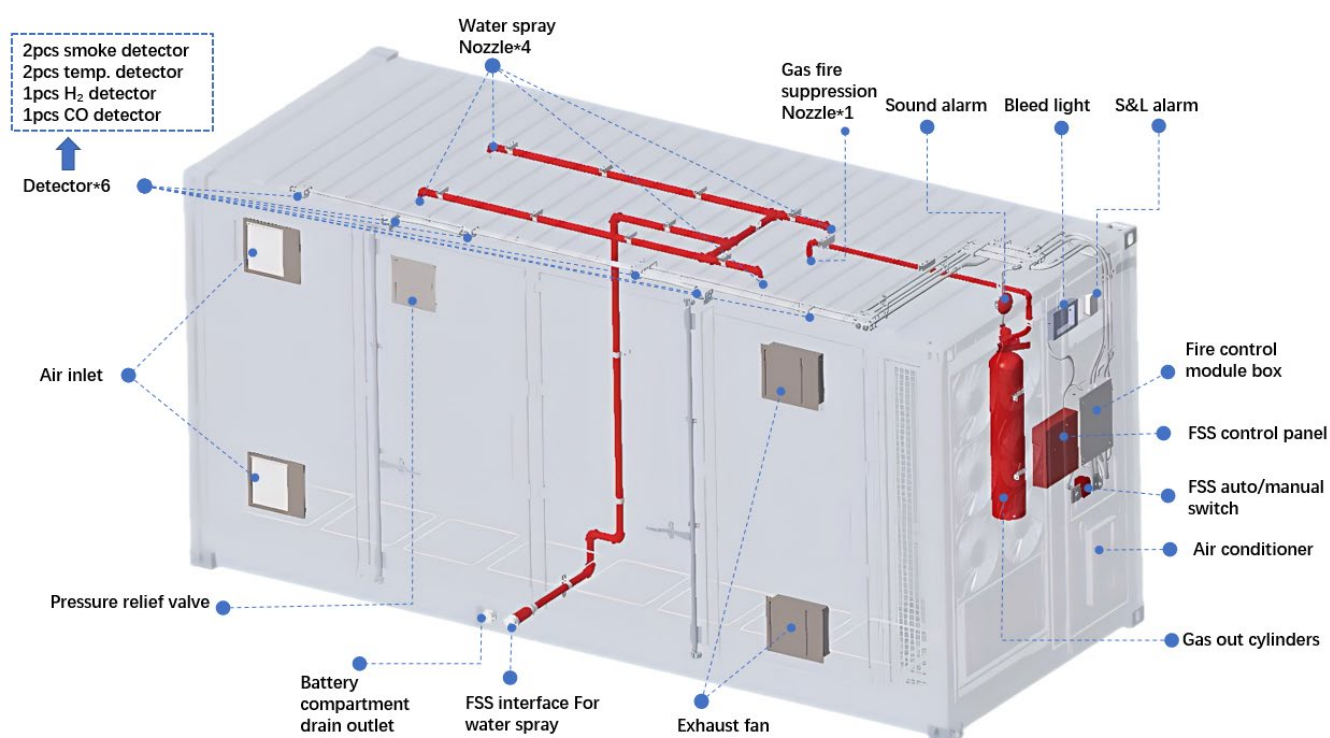


Figure 2-18 Fire Protection System

Fire Detection

2 Smoke detectors, 2 temperature detectors, 1 H₂ detector and 1 CO detector are installed and connected to the "sound and light (S&L) alarm" by the signal input/output module.

The system may consider that there is a fire risk and will trigger the local alarm system "audible and visual alarm". Meanwhile, it is reported to the background monitoring system for remote notification.

Fire Alarm System

There is a manual and automatic fire suppression system (FSS), a sound alarm and S&L alarm. It will warn all persons approaching the container by the sound and light alarm when being started.

Sound and light alarms are set up indoor and outdoor, so that people entering and leaving the container can notice the fire alarm immediately.

Fire extinguishing system

Fire extinguisher is arranged in the electrical compartment. In addition, there are 4 water spray nozzles and 1 gas fire suppression system nozzle arranged on the top of the battery compartment. What's more, 1 FSS interface and 1 drain outlet are arranged in the middle bottom of the battery compartment. They are adequate for the risks inside the container and are checked regularly every 6 months. For the steps of fire extinguisher examination, please refer to the 9.3 Fire Protection Maintenance.

The automatic fire extinguishing system (containing SHTE1230 gas extinguishing agent, harmless to human body) complying with NFPA 2001 will be triggered automatically.

BMS sends out signal to turn off the main switch of power supply. All fans and air conditioners will stop working to prevent fresh air from entering the container. Relief valve of the container will open when exceeding the specified pressure differential between the internal pressure and the external pressure.

FSS auto/manual switch

This is generally used during maintenance. Before repairing or operating, switch shall be set to manual mode. When personnel leave and the area is unattended, switch shall be set to automatic mode.

FSS Control panel

For more information, refer to its specific user manual.

Fire control module box

For more information, refer to its specific user manual.

2.8. Thermal Management System

System overview

The thermal management system takes use of a liquid cooling unit and coolant pipes to adjust the battery temperature within an appropriate range, and uniformly control the temperature of each battery through liquid cooling pipelines and liquid cooling plates.

In addition, an air conditioner is arranged on the bottom of the electrical compartment for temperature control.

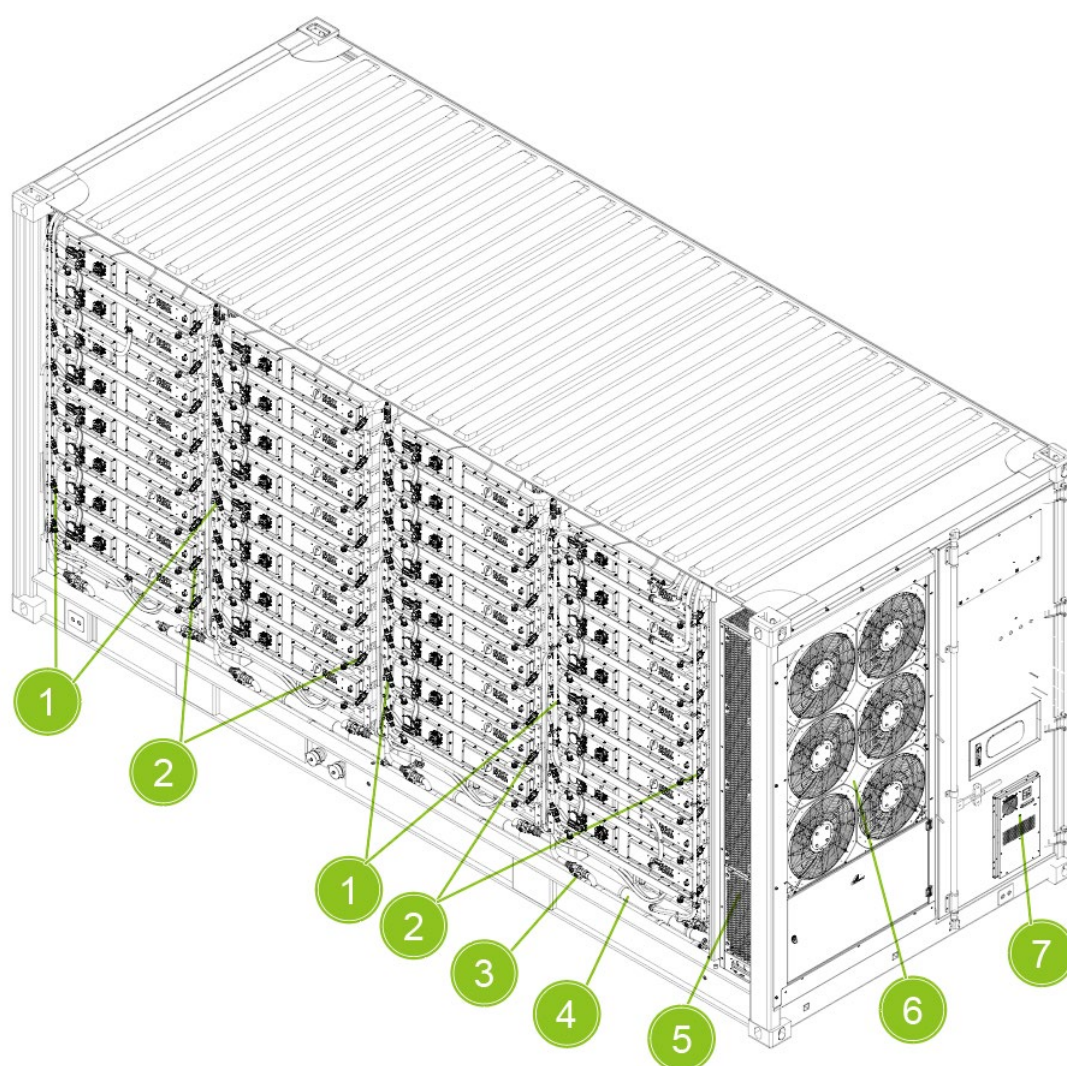


Figure 2-19 Thermal management system

- | | | |
|--|----------------------|---|
| 1. Hot coolant pipe | 2. Cold coolant pipe | 3. Coolant outlet pipe to liquid cooling unit |
| 4. Coolant inlet pipe from liquid cooling unit | 5. Radiator grille | 6. Liquid cooling unit |
| 7. air conditioner | | |

Liquid cooling unit

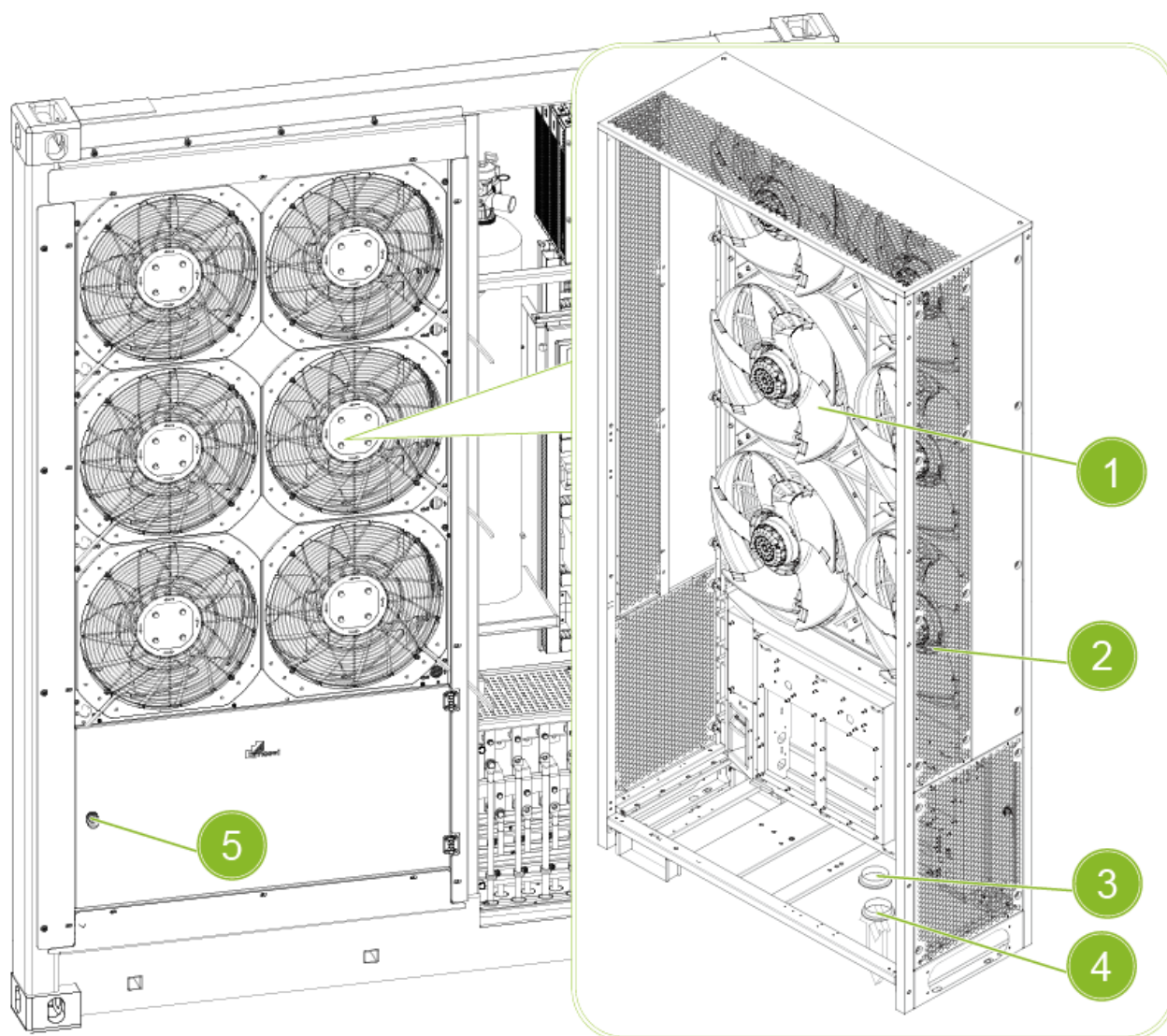


Figure 2-20 Liquid cooling unit overview

- | | | |
|---------------------------------------|---------------------|--------------------------------------|
| 1. fans * 6 | 2. Radiator grille | 3. pipe inlet of liquid cooling unit |
| 4. pipe outlet of liquid cooling unit | 5. Access door lock | |

Air conditioner

For more information, refer to its specific user manual.

2.9. Power Distribution System

Power Distribution System is mainly composed of Power distribution box, ESMU, and UPS.

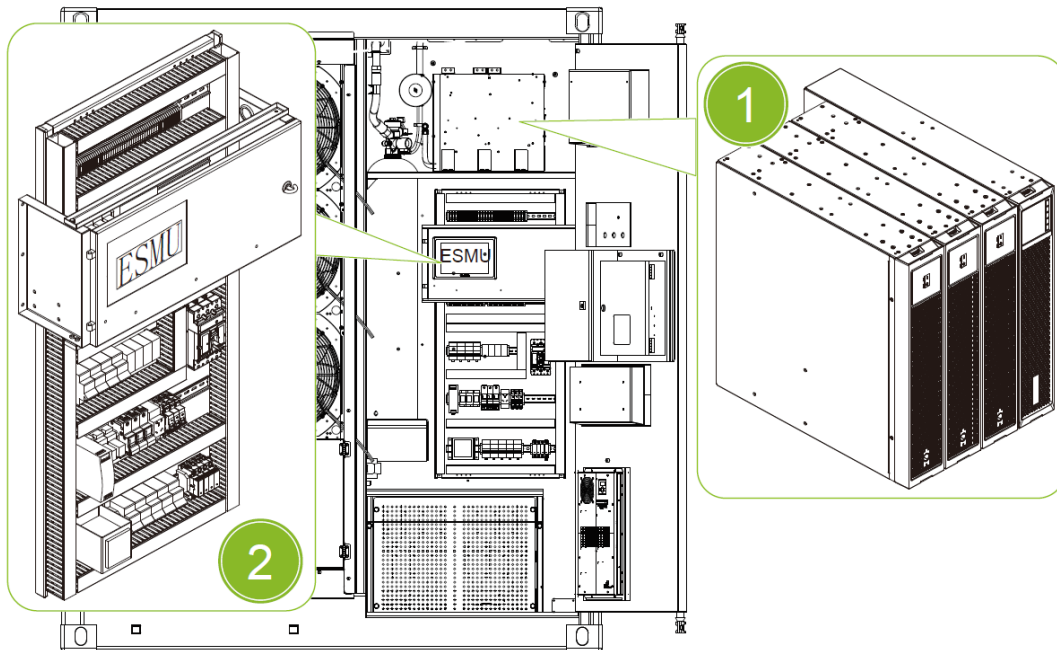


Figure 2-21 Power distribution box overview

1. UPS

2. Power distribution box

UPS

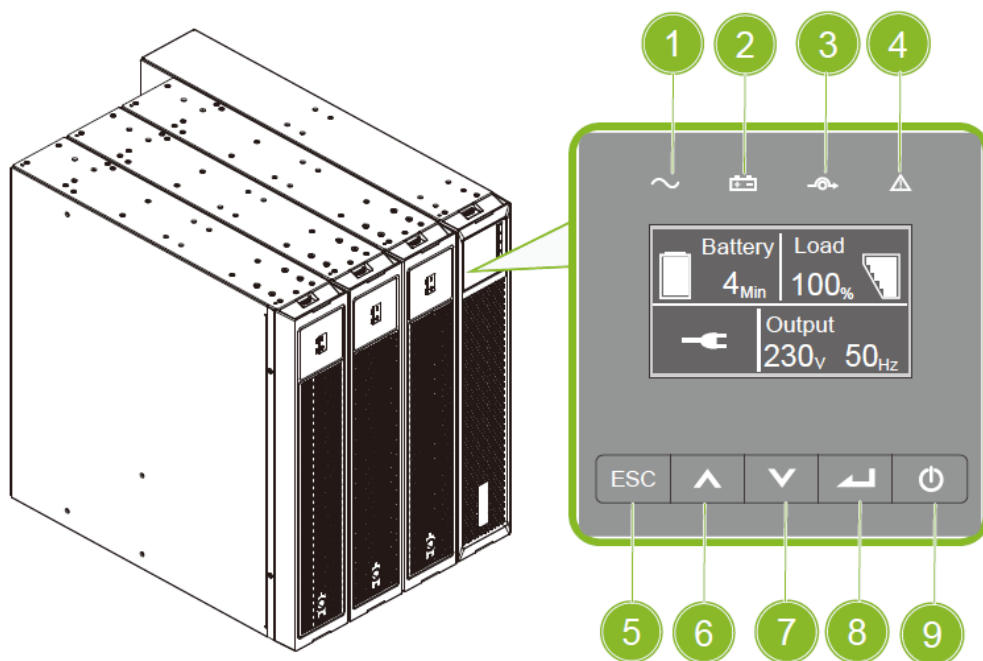


Figure 2-22 Operation panel of UPS

Table 2-5 Operation panel of UPS

No.	Status/ function	Instructions
1	Green On	UPS is in normal online mode or efficient mode
2	Yellow On	UPS is in battery mode
3	Yellow On	UPS is in bypass mode
4	Red On	UPS has an alarm or fault.
5	Exit	Exit the menu/submenu/editing state/dialog box.
	Mute Buzzer	Press this key to temporarily mute the buzzer. The buzzer will sound again when a new alarm or fault occurs.
6	Up	Scroll up through menus, options, pages, dialog buttons, etc. When setting a value, press this key to increase the value.
7	Down	Scroll down through menus, options, pages, dialog buttons, etc. When setting a value, press this key to decrease the value.
8	Confirm	Press this key on the main page to enter the menu list. When a menu, option, etc. is highlighted by the cursor, press this key to enter a submenu or edit the option. Press this key after editing to save the modification. After completing the selection in a dialog box, press this key to confirm the selection.
9	Startup	When the battery is present but the mains is not connected, pressing this key for more than 100 ms and less than 1 s can light up the UPS LCD without starting the UPS.
	Power On	When the machine is powered on, pressing this key for more than 1 s can start the UPS.
	Power Off	Pressing this key for more than 3 s can turn off the UPS.

Power distribution box

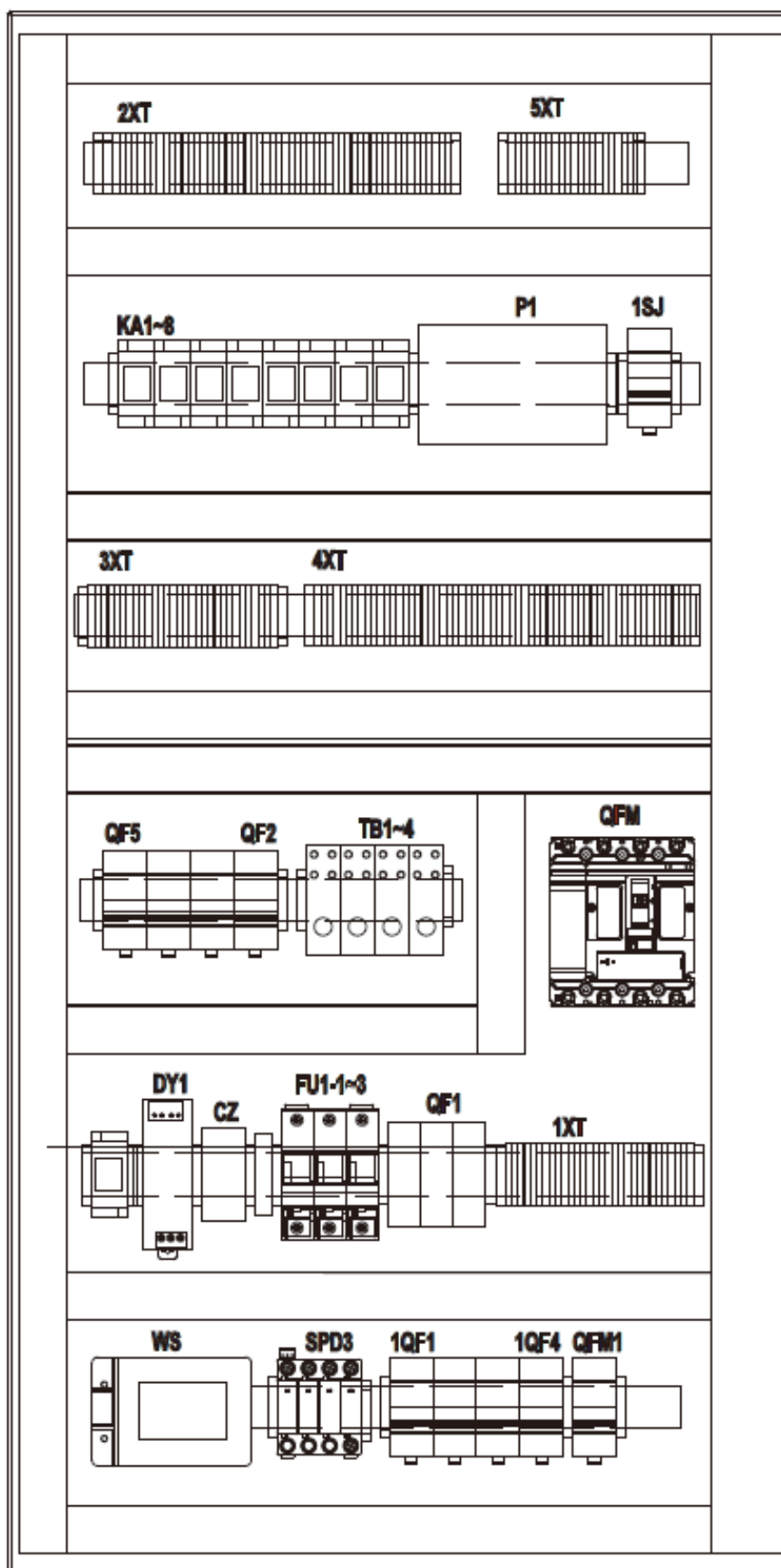


Figure 2-23 Power distribution box interface

Table 2-6 Power distribution box interface

Electrical Codes	Electrical Component Name
2XT	Control Signal terminals
5XT	Dry Contact terminals
KA1-8	Reserved terminals
P1	Reserved terminals
1SJ	Water immersion sensor
3XT	Reserved terminals
4XT	CAN Communication terminals
QF5	Socket power
QF4	Spare circuit breaker
QF3	Dehumidifier power
QF2	Control Power
TB1~4	Line Terminal
QFM	Main switch for auxiliary power supply
DY1	AC/DC Power
CZ	socket
FU1-3	Surge protector
QF1	Circuit breaker of liquid cooling unit power
1XT	Reserved terminals
WS	temperature and humidity controller
SPD3	Surge protector of distribution main inlet wire
1QF1	BMS power
1QF2	Control power
1QF3	Fire power
1QF4	Spare circuit breaker
QFM1	UPS power

2.10. Architecture Diagram

2.10.1. Communication Architecture Diagram



2.10.2. Electrical Architecture Diagram

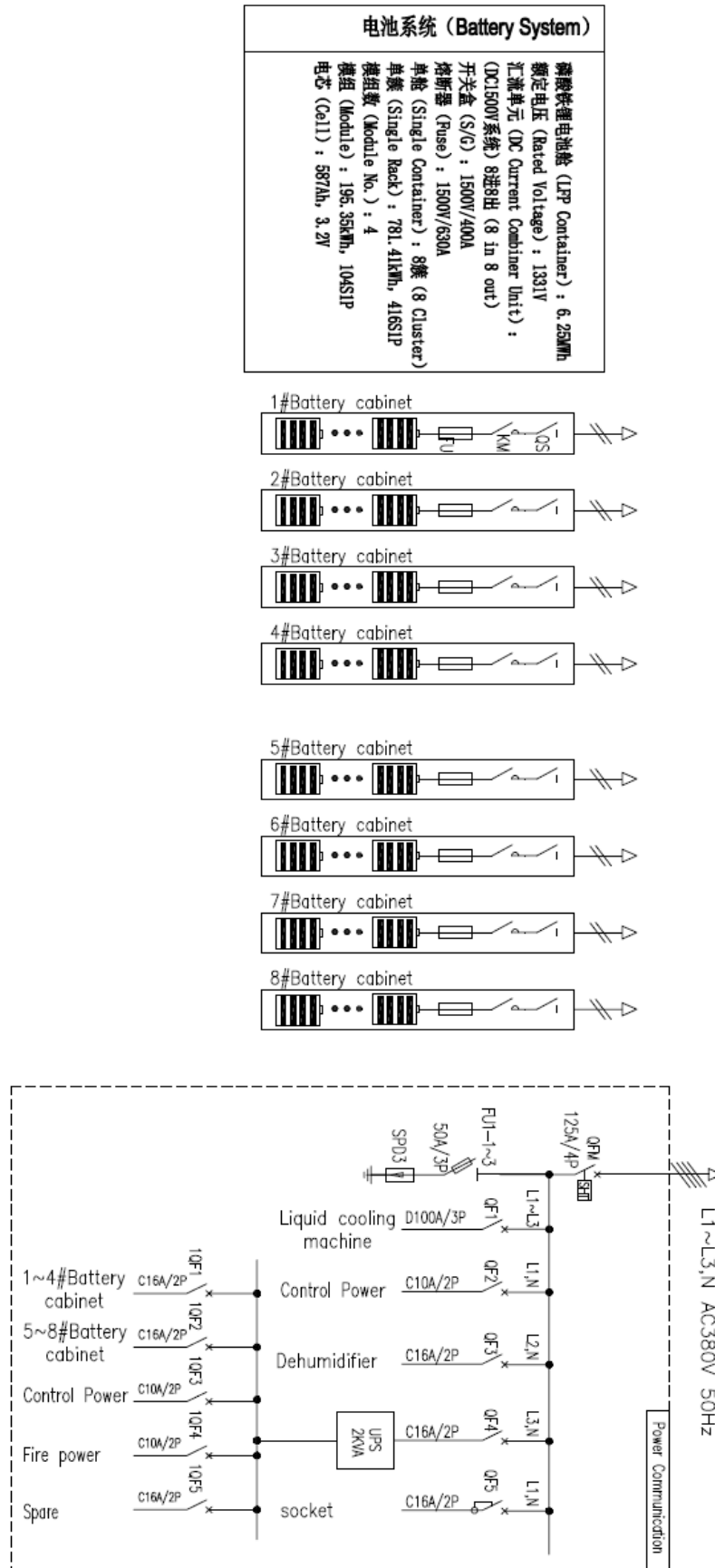


Figure 2-25 System Electrical Architecture

3. Transportation and Storage

3.1. Transportation

3.1.1. Transportation Requirements

Statement

The internal components of the cabinet have been installed and fixed before leaving the factory, allowing for whole machine transportation.

The equipment is transported to the power station site by a freight company, and the on-site power station management personnel will be contacted in advance to negotiate and arrange specific delivery and unloading. The transportation after delivery and unloading needs to be completed by the on-site power station construction personnel.



DANGER!

- During the transportation and handling of the cabinet, it is necessary to comply with the operational safety regulations of the country/region where the project is located.
 - All equipment used during transportation needs to be maintained.
 - All personnel involved in handling and securing should receive appropriate training, especially in safety.
-



WARNING!

Keep batteries in the correct direction during transportation. They must not be placed upside down or tilted, and must be protected against falling, mechanical impact, rains, snows, and falling into water during transportation.



NOTICE!

- Transportation and storage service providers must have the qualifications for dangerous goods operations required by local laws, regulations, and standards.
 - Rigid box trucks shall be used for transportation and pickup trucks are prohibited.
-



NOTICE!

Always keep in mind the mechanical parameters (such as dimensions and weight) of the cabinet during transportation and handling.

Safe transportation and handling protocols

To ensure the safety and integrity of the equipment during logistics and on-site installation, the following guidelines regarding regulatory compliance, packaging, and handling must be strictly observed:

- Regulatory Compliance and Classification

In accordance with the UN Recommendations on the Transport of Dangerous Goods (TDG/UN Orange Book), battery systems are classified as Class 9 hazardous materials. Consequently, all shipments must successfully undergo the specific testing protocols outlined in Part III, Subsection 38.3 of the UN Manual of Tests and Criteria. Logistics operations must adhere to applicable international and local regulations, such as the IMDG Code for sea freight, ADR for road transport, and relevant local standards. All packaging, labeling, and declarations must meet the regulatory requirements of the origin, transit, and destination countries.

- Transportation Mode and Route Selection

Maritime and road transport via established highways are the recommended modes of shipment. Rail and air transport are generally prohibited unless specific exemptions are granted. Routes should be selected to minimize vibration and shock, avoiding uneven terrain that could compromise the structural integrity of the cargo.

- Pre-Shipment Inspection and Declaration

Prior to dispatch, a rigorous inspection is mandatory. The cargo must be accurately declared, and the packaging must be verified as intact, with no signs of leakage, smoke, abnormal odors, or fire hazards. Any unit exhibiting these defects is strictly forbidden from entering the supply chain.

- Packaging and Moisture Protection

Robust packaging capable of withstanding transit stresses is required. Measures must be taken to prevent moisture ingress and physical displacement during loading and unloading. Packages must always remain upright; tilting or inverting the cargo is prohibited. Dangerous goods labels must be clearly visible and affixed according to safety standards.

- Segregation and Compatibility

Unless explicitly permitted by safety regulations, dangerous goods must not be co-loaded with foodstuffs, pharmaceuticals, animal feed, or sharp objects. Where mixed loading of compatible goods is allowed, appropriate segregation must be maintained - typically using a physical barrier of equivalent height and maintaining a minimum clearance (e.g., 0.8 meters) to prevent cross-contamination or damage.

- **Handling of Defective Units**

Defective batteries exhibiting physical damage (scorching, bulging, leakage) require immediate isolation. Terminals must be insulated, and the unit should be secured in an explosion-proof container. Detailed incident logs, including location, time, and symptoms, must accompany the shipment. During transit, such cargo must be routed away from populated areas and critical infrastructure.

- **Storage and Environmental Controls**

Equipment should be stored vertically in a dedicated area, separated from heat sources and protected from precipitation. Stacking must adhere to the manufacturer's specified limits to prevent crushing damage. The storage environment must be monitored, as prolonged exposure to extreme temperatures or humidity can degrade product specifications.

- **Damage Assessment**

If the external packaging is compromised or if the equipment has been subjected to impact or improper orientation, a professional technical assessment is required before installation or commissioning.

Site operations and positioning

- **Equipment Selection and Site Preparation**

Select appropriate lifting machinery, such as cranes or forklifts, based on the specific weight and dimensions of the cabinet. It is imperative that the chosen equipment possesses a load-bearing capacity significantly exceeding the unit's weight to ensure a safety margin. Prior to moving, the path must be cleared of all obstacles, including overhead cables, vegetation, or debris.

- **Environmental Conditions and Safety Perimeters**

Lifting and positioning operations should only be conducted under favorable weather conditions; operations must cease during high winds, heavy rain, or poor visibility. A designated safety zone must be established using warning signs or caution tape to prevent unauthorized personnel from entering the lifting area.

- **Maneuvering on Inclines**

If the equipment must be traversed across sloped surfaces, specialized traction devices or additional anchoring measures are required to prevent slippage or tipping. Extreme caution is advised when navigating gradients.

- **Placement and Foundation Requirements**

The cabinet must be positioned on a solid, level foundation with adequate drainage capabilities. The ground must be free of protrusions that could destabilize the base. During the landing phase, the unit should be lowered gently; dragging, sliding, or forceful pushing of the cabinet is strictly prohibited to prevent structural deformation. The unit should rest solely on its designated base supports.

3.1.2. Crane Lifting

**DANGER!****Falling hazard or death.**

- It is strictly prohibited to lift directly using the hoisting rope. Before lifting, hoisting lugs must be installed.
- Prior to commencing any lifting operations, all operators and on-site personnel must be fully familiar with and strictly adhere to the local laws, regulations, industry standards, and on-site safety operating procedures. Any non-compliant operation may result in severe safety incidents and legal liabilities.
- All personnel involved in lifting operations (including crane operators, signalmen, and ground support staff) must undergo professional training and possess valid corresponding operation certifications. During operations, all personnel are required to correctly wear appropriate Personal Protective Equipment (PPE), such as safety helmets, protective footwear, and gloves.
- During the entire process of lifting the equipment, it is necessary to strictly follow the safety operation procedures of the crane.
- Unauthorized personnel are strictly prohibited from entering the exclusion zone. As shown in Fig. 3-1, the radius must be $R \geq A + 5 \text{ m}$. Standing or walking under the crane boom or the suspended load is strictly forbidden.
- In case of severe weather conditions, such as heavy rain, thick fog, strong wind, etc., the lifting operation should be stopped.

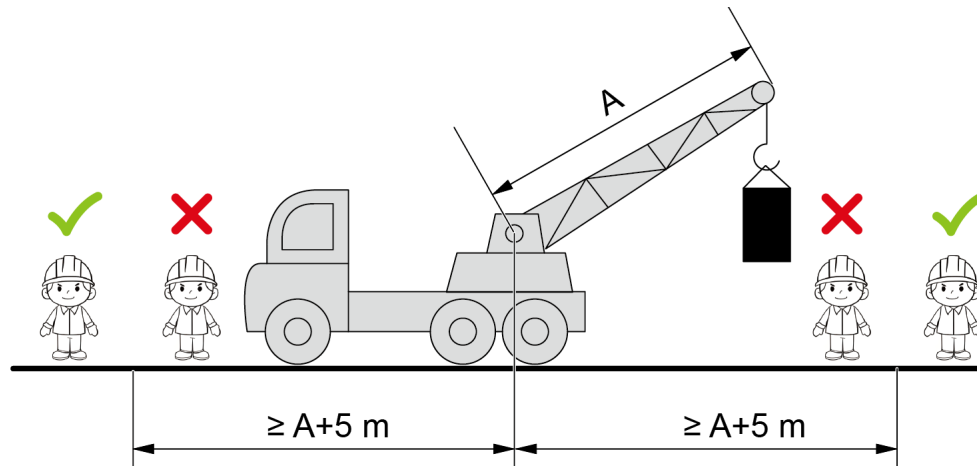


Fig. 3-1 Crane lifting

Crane lifting steps

1. Secure one end of lifting ropes (1) onto 25 T shackles (2) as shown.
2. Secure the other end of lifting ropes (1) onto hook (3) to lift the equipment.

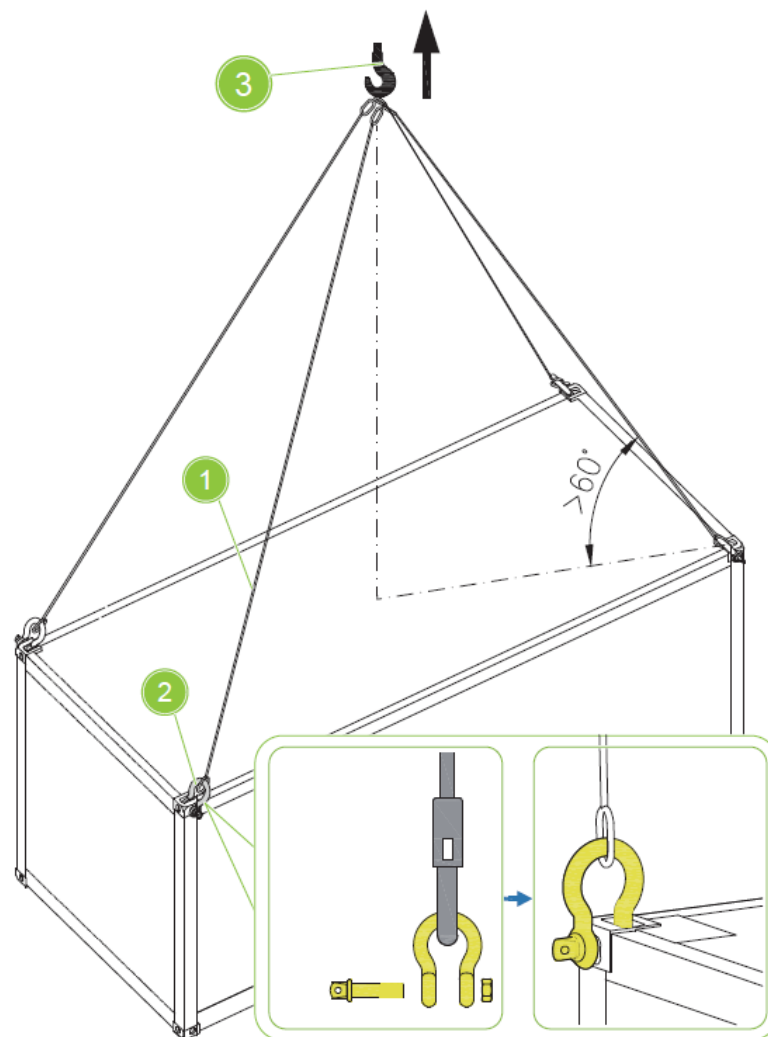


Fig. 3-2 Hoisting

Technical requirements

- The external dimensions of the container corner fittings are 6058*2438*2896 mm, and the estimated total weight of the container is 48.3 T.
- The lifting spreader and slings must be considered by a professional lifting company with enough safety factors. It is recommended to configure 4 pieces of 6.5 m long wire ropes (single rope load capacity greater than 25 tons) and 4 pieces of 25-ton shackles for the lifting operation.
- Before lifting, confirm that there are no people or obstacles around. The lifting angle must be greater than 60°. The lifting speed should be ≤ 5 meters/minute.
- During lifting, the container needs to be well protected, especially at the points of contact with the container body.

3.2. Storage

IMPORTANT!

- If the equipment is not put into use immediately upon arrival, please store the equipment in accordance with the following requirements.
- Damage to the inverter caused by improper storage is not covered by the warranty.

3.2.1. System Storage Requirements

Item	Requirement
Package	Do not store without the original packaging. If the package has been opened, it must be put back into the original packaging and sealed with tape.
Safe storage environment	Temperature -30°C~60°C; humidity $\leq 95\%RH$ (without condensation). Store in a dust-free place.
Recommended storage environment	Temperature: 0~35°C; humidity $\leq 85\%RH$ (without condensation)
Chemical protection	Keep away from corrosive substances such as acids and alkalis; the air must not contain flammable gases.
Storage location	The system should be stored in a dry warehouse to avoid exposure and rain. No harmful gases, flammable or explosive products and corrosive chemicals are allowed in the warehouse. Keep away from mechanical

Item	Requirement
	impact, heavy pressure and strong magnetic field. Avoid direct sunlight and the distance to heat source should be more than 2 m away.

Orientation

Strictly follow the "This Side Up" arrow indicators on the packaging. Tilting or inverting is strictly prohibited.

Stacking limit

Do not exceed the maximum stacking layers indicated on the outer carton.

Safety warning

Handle with care during stacking to prevent equipment tipping, which could cause personal injury or equipment damage.

Temporary outdoor storage

Stacking on pallets is strictly prohibited. Must be covered with waterproof tarps to prevent erosion from rain or standing water.

3.2.2. Battery Storage Requirement

- SOC range of battery storage: 30%~50%, avoid long-term storage of batteries below 15% SOC. If the battery is not used for a long time, it is necessary to cut off the power-consuming equipment in time.
- Perform battery maintenance on the system every six months to prevent battery damage.
- The battery PACK may be recharged up to 3 times during the whole system storage period. If no recharge is performed, the storage period must not exceed 2 years. If it exceeds 2 years, customers need to report to CPS or CPS authorized service providers for a professional inspection. Only after confirming that the performance and safety status of the battery PACK meet the standards can the warranty be reactivated. If customers don't report or the inspection is unqualified, the warranty will be lost.
- Before the first usage of long-time unused system, the battery system must be fully charged at least once to activate the battery system to recover the battery performance to the best condition.
- Safe storage environment: Temperature -30°C~60°C; humidity ≤ 95%RH (without condensation).
- Recommended storage environment: Temperature: 0~35°C; humidity ≤ 85%RH (without condensation).

3.2.3. Periodic Maintenance and Activation

Regular inspection

- It is recommended to inspect the outer packaging of the equipment every three months. If the packaging is damaged (such as due to moisture or insect damage), the packaging material must be replaced in a timely manner.

Activation after long time storage

- If the equipment has been stored for more than 1 year, you need to contact CHINT or distributor to inspect and test the equipment first.

4. Installation



NOTICE!

Do not open the cabinet door when the humidity is high (relative humidity $\geq 80\%$ continuously), for example, on rainy days. If the cabinet door is open for 0.5 hour or longer when the humidity is high, manually perform forced dehumidification. Otherwise, the equipment may fail or the microgrid may collapse.



IMPORTANT!

All personnel involved in installation activities should receive training on the equipment and possess relevant experience. Personnel must meet all the pre-requisites for training and must complete the system training. These personnel include:

- Service personnel who carry out any installation work within the scope of the owner's work as specified in this document.
- Owner representatives who carry out any installation work within the scope of the owner's work as determined in this document.
- Before installing equipment in the cabinet, ensure that the cabinet is firmly fixed and the center of gravity is balanced. Otherwise, the cabinet may tip over or fall, which could cause personal injury and equipment damage.

4.1. Installation Requirements



NOTICE!

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

4.1.1. Site Selection Requirements



NOTICE!

The location selection of equipment and fire safety must comply with local laws and regulations. Reference standards include but are not limited to NFPA 855 "Standard for Installation of Stationary Energy Storage Systems"

Site requirements

- Do not install the equipment in environments prone to fire or explosion. Fire-fighting facilities must be safe, available and compliant.
- The installation site must have good ventilation and be equipped with interfaces for the water fire protection system.
- Ensure that the installation location is higher than the historical highest water level in the area. Do not deploy it in areas that may be flooded by water.
- The equipment should be installed at 30 meters away from third-party wireless communication facilities.

4.1.2. Clearance Requirements



NOTICE!

- The equipment can only be stored temporarily in a stacked way during shipment. However, Chint shall not be held liable for any damage caused during stacking process, such as scratches, deformation, peeled paints, etc.
 - Without prior assessment by our company, do NOT stack any additional devices on the top of the equipment.
-

Installation scenario 1: install one single equipment

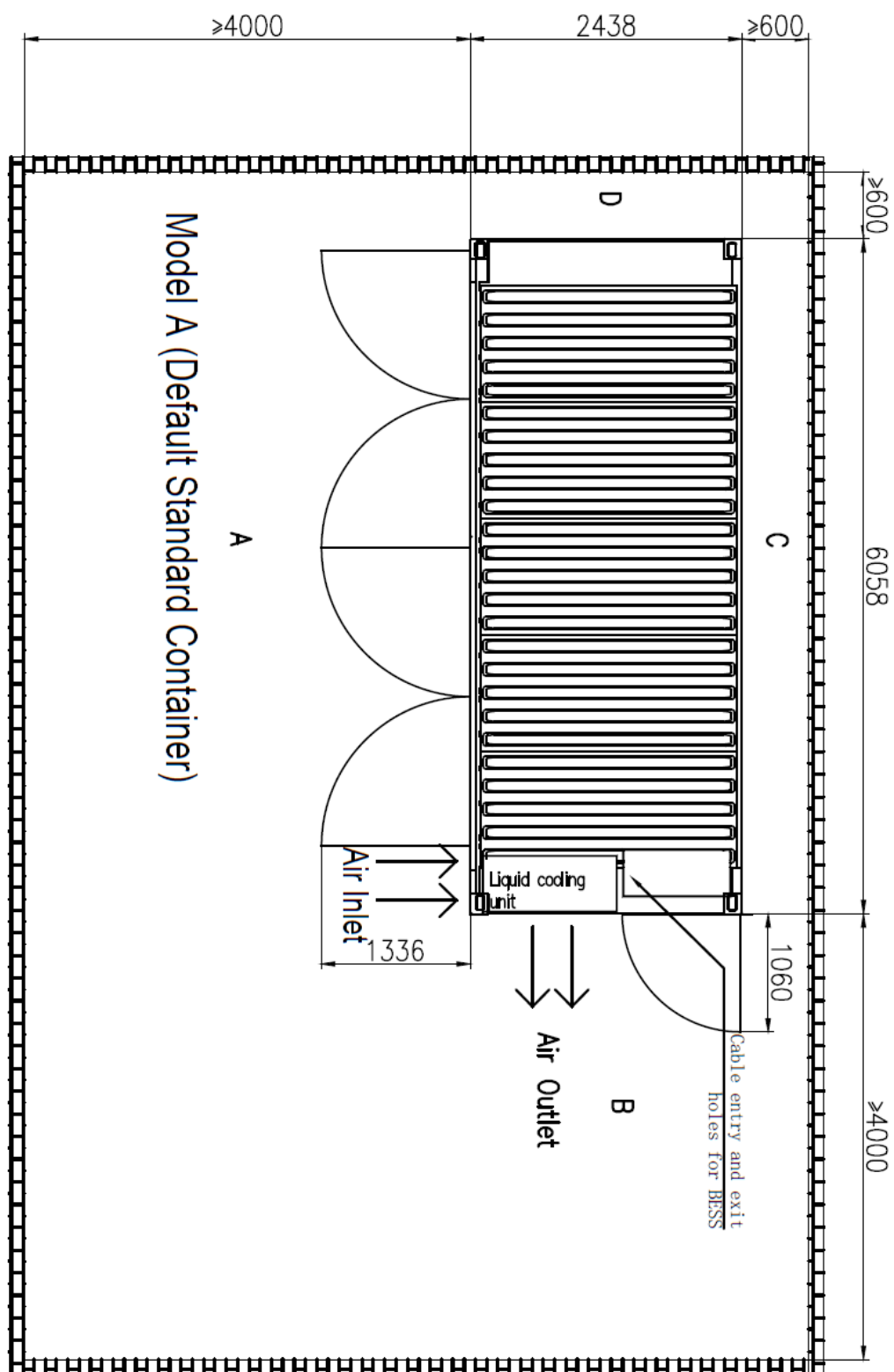


Figure 4-1 Clearance requirements for installing model A

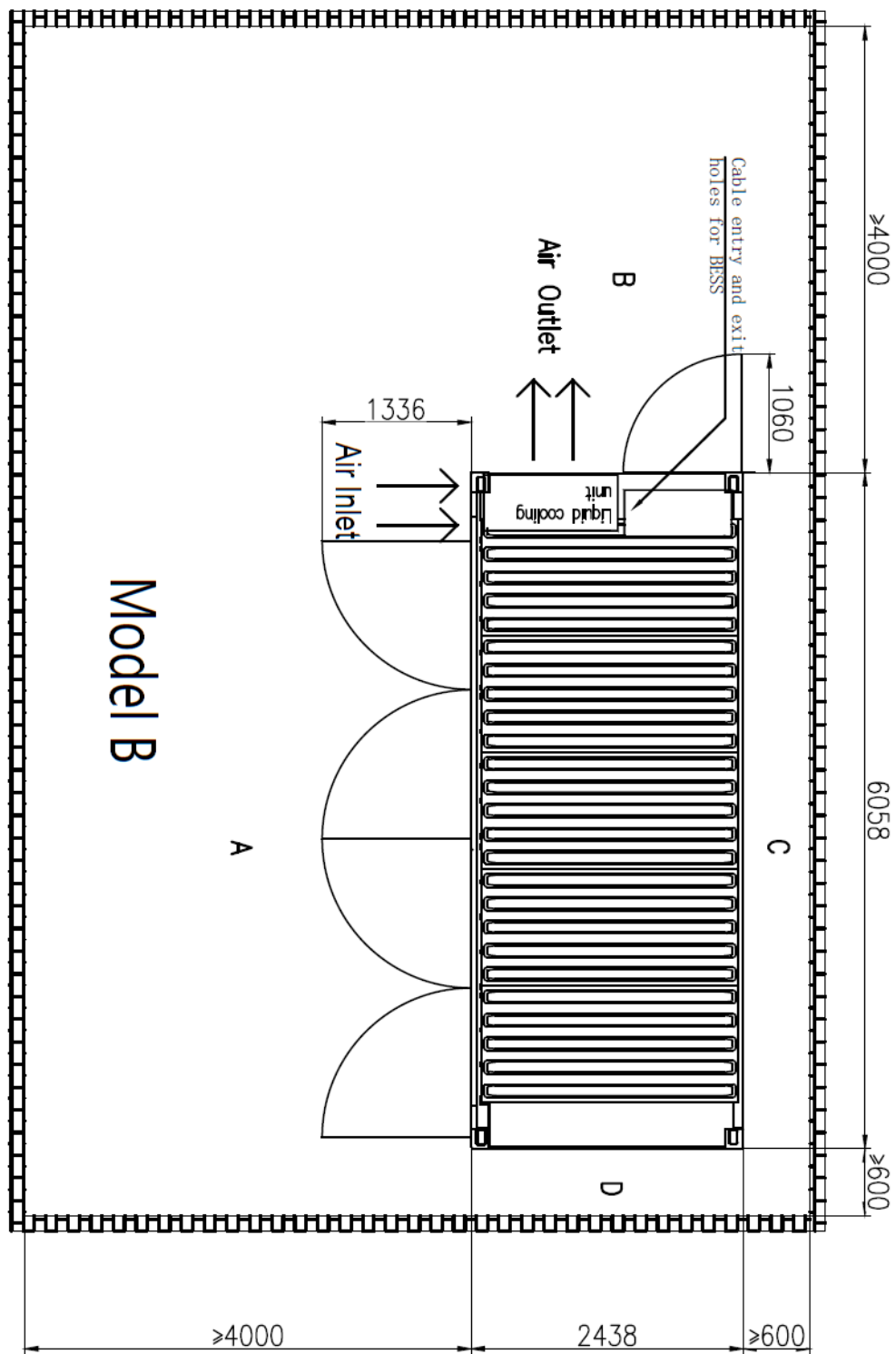


Figure 4-2 Clearance requirements for installing model B

A	Clearance for disassembly and installation of battery PACKs
B	Clearance for liquid cooling unit air exhaust and equipment compartment maintenance
C	Clearance for opening the equipment compartment door
D	Clearance for opening the battery compartment door

Installation scenario 2: install four equipment side by side

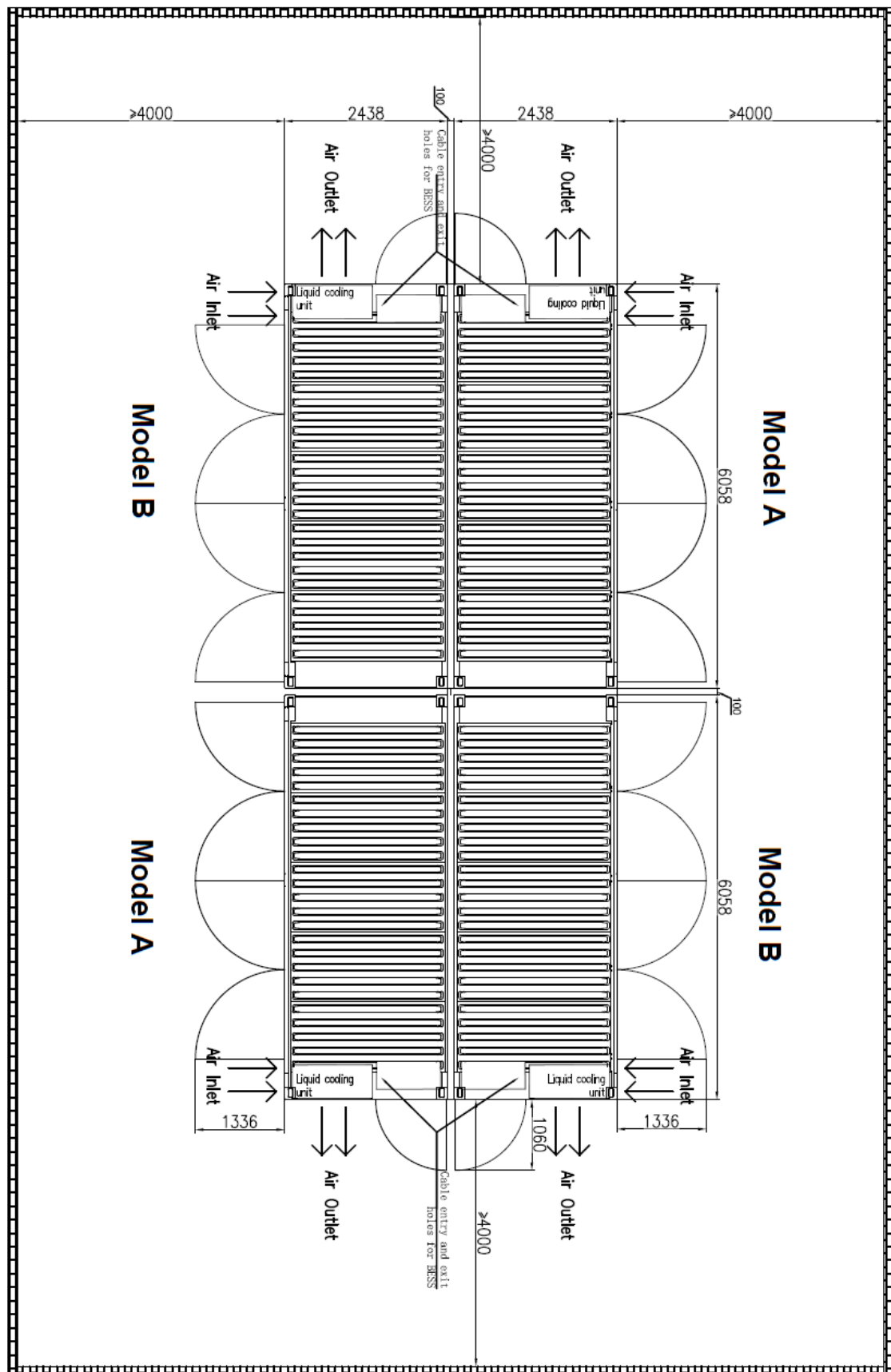


Figure 4-3 Clearance requirements for installing 4 equipment



NOTICE!

The dimensions shown in the clearance requirements are the recommended space to be reserved for daily use of the system. If maintenance involves equipment such as a forklift, additional dimensions required for the operation of this equipment need to be considered.

4.1.3. Foundation Requirements

- The equipment must be installed on a structure with a cement foundation with flame-retardant materials on the surface or a structure supported by channel steel. It is essential to ensure that the foundation is flat, solid, safe, reliable, and has enough load-bearing capacity. Any depression or tilting on the foundation surface is strictly prohibited.
- The equipment can be welded to the foundation steel plate or connected by other methods with equivalent firmness.
- The number of support points and the load-bearing capacity of the support units for the equipment on the foundation are shown in the following figure:

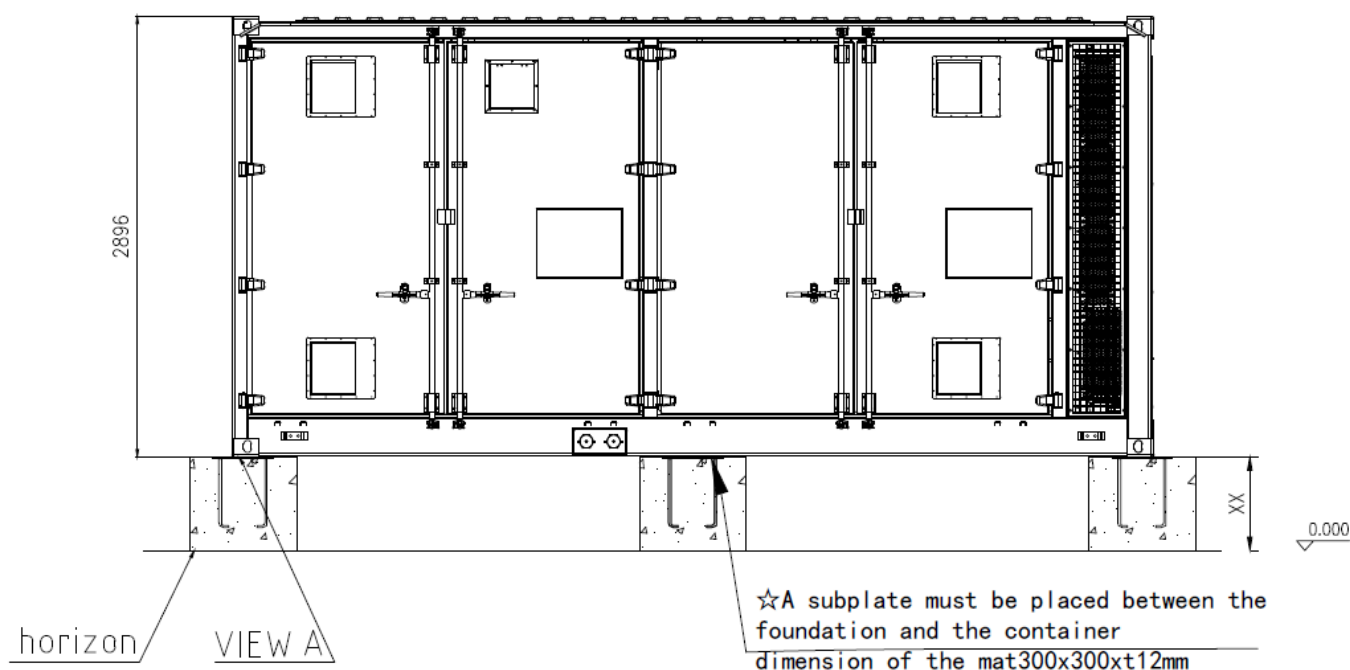


Figure 4-4 schematic diagram of foundation

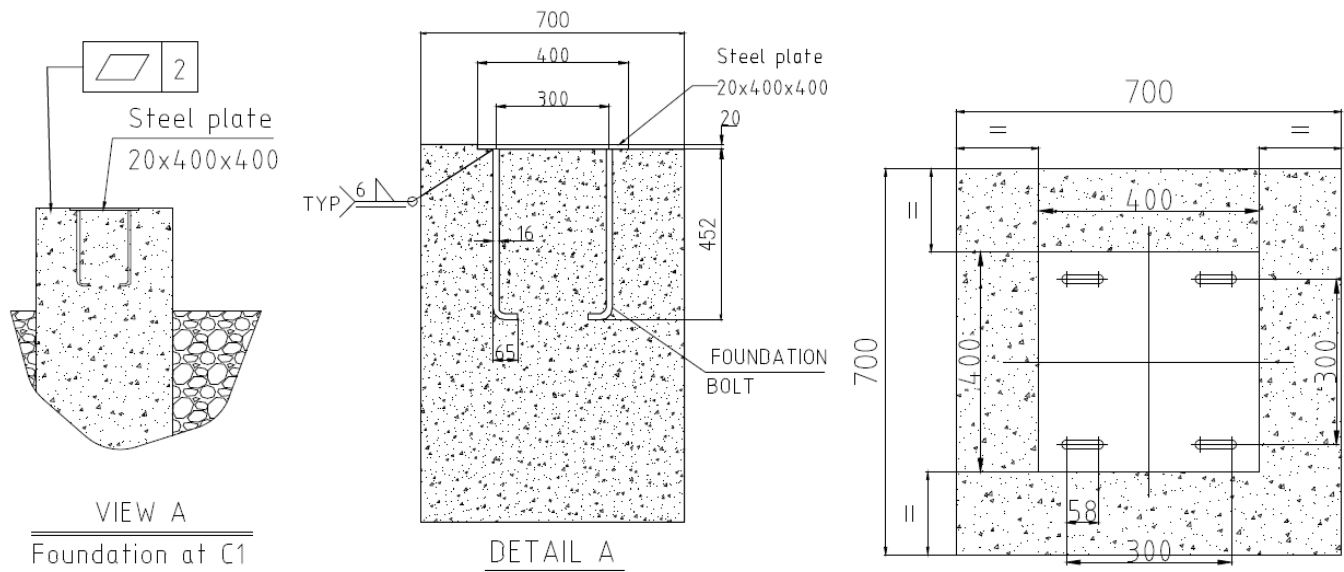


Figure 4-5 Detail view of steel plate

length of container:6058

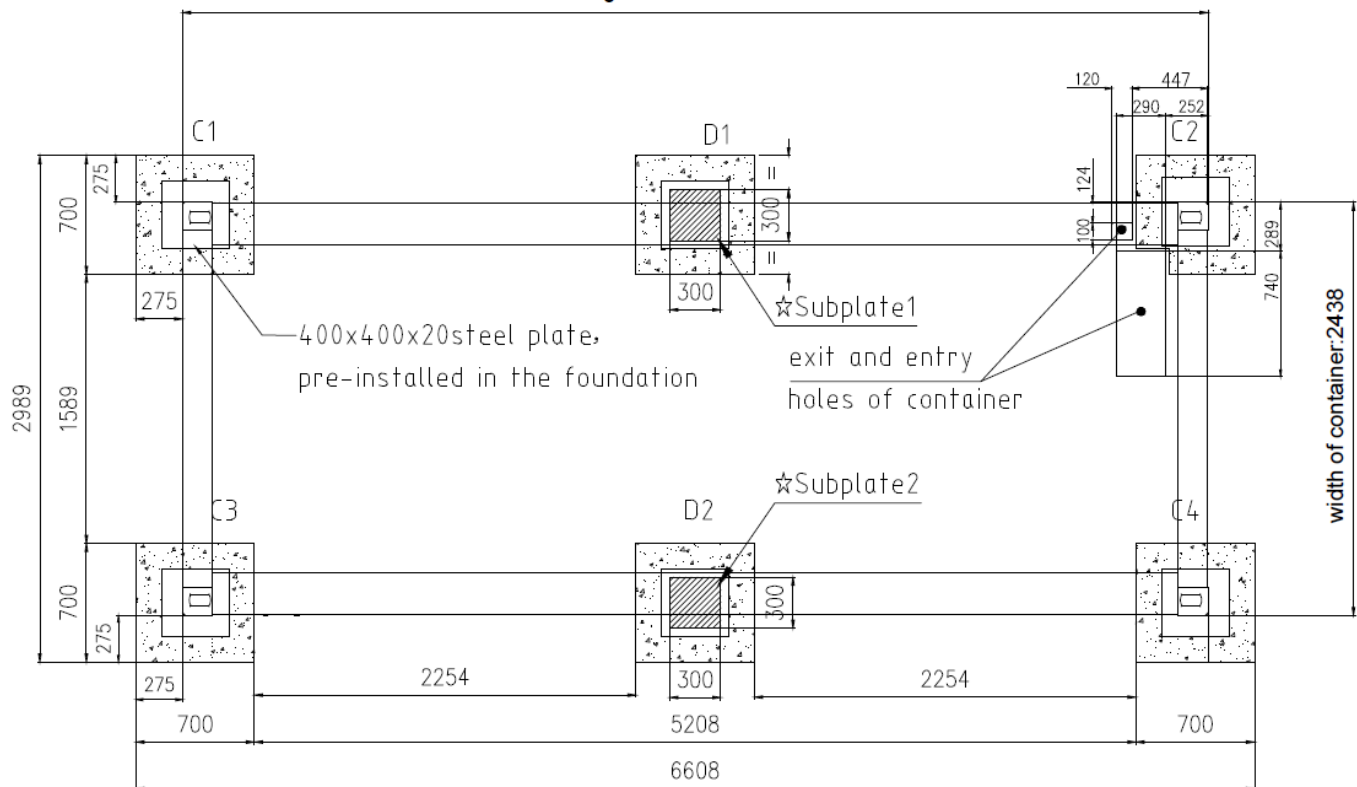


Figure 4-6 Supporting Points of Energy Storage System

Technical Requirements

This foundation drawing is only used as a reference for customers to design the foundation;

The foundation base plane of the container needs to be higher than the horizon and above the maximum precipitation height of the project site;

This project involves fully loaded containers with equipment and battery modules, with a maximum total weight of approximately 48.3 tons. The foundation requires enough strength, and the load on each support point C1-C4 and D1-D2 should be greater than 12.1 tons;

The flatness of the entire foundation base plane should be controlled within $\pm 2\text{mm}$;

Prior to placing the container on the foundation, the subplate must be installed in the position shown in the drawing. The subplate is supplied as part of the container's packaging accessories. Failure to position the subplate correctly will, after the container is fully loaded with battery modules, result in the side door failing to open normally or lead to permanent irreversible deformation - even if subsequent repair attempts are made.

Container corner fasteners are designed for normal operating conditions only. They do not guarantee connection integrity in the event of force majeure, including but not limited to earthquakes, external impacts, and other extraordinary loads.

4.2. Unpacking Check

Accessories shall be subject to the actual accessory list contained in the delivered equipment.

Precautions



IMPORTANT!

- If the installation environment is poor, such as the presence of dust, corrosive gases, splashing water, and drastic temperature differences, etc., do not remove the packaging. If the packaging has been removed, please take dust-proof and anti-condensation measures (such as using dust covers, plastic films, or fabric covers) to avoid condensation or dust accumulation.
 - When removing packaging, use tools carefully to avoid scratching the equipment.
 - During the equipment packaging removal process, ensure the equipment remains stable and balanced, and take appropriate protective measures.
 - After opening the packaging, please check the equipment surface for any obvious scratches, deformations, stains, peeling paint, missing or bulging screws, or other abnormal damages, and notify the transportation provider or installer.
-

4.3. Installation Checklist



NOTICE!

- The installation personnel shall make records according to the checklist after unpacking.
- If any defects are found during the inspection, please contact the After-sales Service Department of Chint to solve the problem.
- To ensure the safety of connecting accessories, all accessory boxes containing connecting accessories should be resealed after inspection, and the required accessories should only be taken out before the battery needs to be connected.

Before installation, all relevant documents, such as contracts, technical agreements, shipping lists and installation drawings, should be collected, and ensured in the final version. These electronic project documents should be handed over to the document management department for archiving.

Technical service personnel should make all preparations before installation and know the initial installation status of the system. The battery has been installed and fixed in the factory, so just check and fill in the BESS installation checklist in turn according to the following steps.

Table 4- 1 Installation Checklist

No.	Steps	Inspection item	Record
1	Preparation	1.1 Ensure the correctness of project data and documents, including packing list and drawings.	
		1.2 Ensure required PPE, tools and lifting device are available.	
2	Product delivery	2.1 Confirm the installation date.	
		2.2 Confirm unloading site conditions and unloading methods.	
		2.3 Delivery: Partial shipment is allowed/Partial shipment is not allowed and relevant parties are informed.	
3	Product arrival	3.1 Unloader: Buyer/ Contractor/Seller	
		3.2 Count the number of accessory boxes	
4	Unpacking inspection	4.1 Check if the file package in the accessory box is complete.	
		4.2 Ensure cables, screws/bolts and other accessories are complete	

No.	Steps	Inspection item	Record
		4.3 Re-seal the accessory box if not install immediately.	
		4.4 Complete receipt for arrival inspection	
5	Check before installation	5.1 Ensure the installation site meets the installation conditions.	
6	Battery cluster system inspection	6.1 Check appearance of battery PACK for damage or leakage.	
		6.2 Confirm battery PACK on the battery rack is fixed.	
7	Inspection of integrity of positive and negative logos and numbers	7.1 Check the serial number sequence of each battery PACK.	
		7.2 Battery PACK stickers should be neat, clean and tidy.	
		7.3 Check whether the positive/negative logos of the battery PACK are complete and clear.	
8	Delivery of documents	8.1 Provide relevant documents, such as user manuals and certificates.	
		8.2 Other documents required	
	Remarks		
	After the above inspection items are completed, please tick in the inspection record, and then go to the next inspection item.		
	Please underline the importance of this part.		

4.4. Install onto foundation

1. Prepare foundation, install steel plate and place subplate onto supporting points according to the 4.1.3 Foundation Requirements.
2. Lift and place the equipment onto the supporting points, referring to 错误!未找到引用源。 错误!未找到引用源。 .
3. Weld the equipment onto the steel plate and subplate of supporting points.



NOTICE!

- When conducting welding operations, please strictly follow the local laws and regulations.
- Welding personnel must possess the necessary qualifications.

- Fire prevention measures must be taken around the equipment.
-

5. Cable Connection



WARNING!

- Do not wear watches, rings, jewelry or other metal items.
- Before entering the construction site, correctly wear a helmet to protect your head. Also, wear insulating gloves and safety shoes.
- Use tools with good insulation to prevent accidental electric shock or short circuit.



IMPORTANT!

Before cable connection:

- Read the 1.3 Electrical Safety Principles carefully;
- Prepare PPE and tools by referring to Annex 12.1 Personal Protective Equipment List & 12.2 Tool List.



IMPORTANT!

To facilitate on-site cable connection, the wiring between the internal devices of the equipment has all been completed before leaving the factory. You only need to finish the following connections between external device and the equipment:

- Grounding
- DC combiner cabinet wiring
- Communication and secondary power supply wiring

5.1. Cable Specifications



NOTICE!

The cable diameter should adhere to applicable regional cable specifications. Key considerations in choosing an appropriate cable encompass its current-carrying capacity, insulation and construction type, connection method (direct burial), surrounding environmental temperature, and the allowable voltage drop across the circuit.

Prepare the cables by referring to the table below.

Table 5-1 Cable specifications

Name	Cable type	Conductor cross sectional area
Grounding cable	Cable specialized for outdoor use	240 mm ²
DC cable	Copper or aluminum-core cables with an operating temperature of 90°C or above (8+ & 8-)	120 -240mm ²
Control cable	6-core copper wire	6*1 mm ²
Secondary power supply cable	Flame-retardant Class C cross-linked polyethylene insulated steel tape armored power cable. 4-core and 2-core copper wire.	4*25 mm ² or 2*2.5 mm ²
COM cable	CAT-5e	TC-ER AWG17 3P+AB

5.2. System Incoming and Outgoing Lines Holes

To facilitate the on-site cable connection, all cables between the internal equipment of the energy storage system have been connected before leaving the factory.

Cables of the energy storage system and external equipment should be routed through the bottom of the container. All cables entering and leaving the energy storage system should be properly protected, such as cable pipes, which need to be protected from rodents.

The cable holes are shown in the following figure.

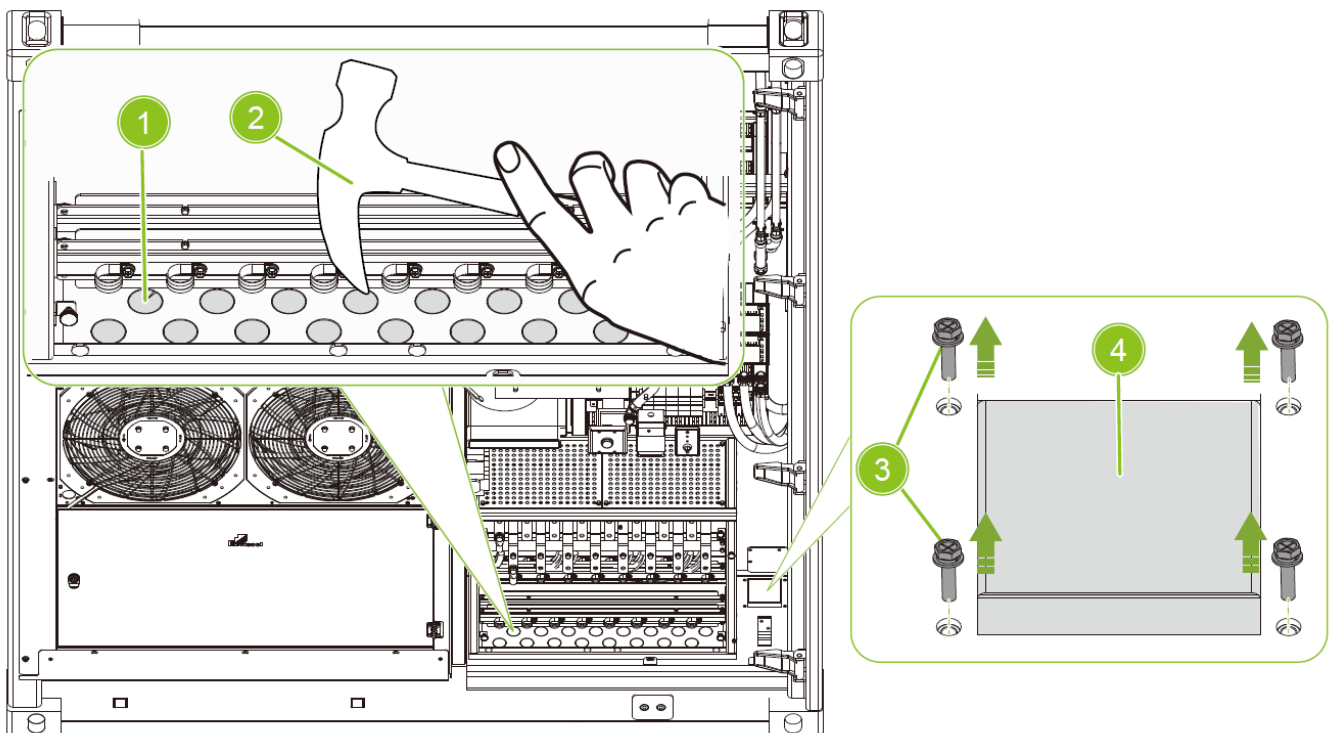


Figure 5-1 Incoming and Outgoing Line Holes

knockout holes (1) are DC output cable ports in the bottom of combiner, DC cables go out through these 16 holes to connect with the DC side input power cable of PCS compartment.

For these round knockout holes, simply knock them out with a hammer (2); no need to remove any screws.

Cable hole (4) can be used as communication/ auxiliary power supply cable port of power distribution box, cables go out through this hole to connect with PCS, EMS (Energy Management System) and other equipment, and auxiliary power supply cables connect with auxiliary control power supply equipment.

Square hole 4 is protected with a square sealing plate, which can only be taken off after removing all its four M6 hexagon head bolts (3) by screwdriver or socket.

After the cables are connected, all cable entrances shall be sealed with fireproof putty or other appropriate materials.

5.3. Grounding



NOTICE!

BOTH grounding points need to be earthed.

It is recommended to use standard copper terminals or copper-aluminum composite terminals.

After wiring, the external grounding position needs to be coated with glue or paint for rust protection.

Overview

To reduce and eliminate the electrical noise in the system and prevent the danger of electric shock, it is necessary to ground the system. Grounding methods and requirements will vary according to specific projects and system configuration. All grounding methods shall comply with Article 250 of NEC.

Grounding includes both equipotential bonding within the PCS Skid ESS and connection to the external grounding terminals.

- Internal grounding

Before leaving the factory, the equipotential bonding connections among all equipment in the ESS have been finalized and are collectively routed to the grounding copper busbar.

- External grounding

To facilitate grounding, two grounding points are both configured outside the ESS, as shown in Figure 2-3 Appearance – right front view.

Two kinds of grounding process are as described below.

OPTION A: Ground by grounding cable.

Step 1. Crimp the cable terminal.

1. Prepare the grounding terminal (240-14 is recommended).

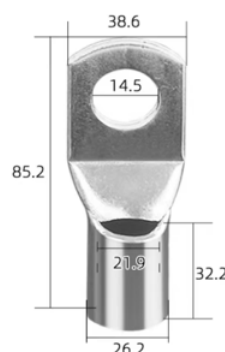


Figure 5-2 Grounding terminal (Unit: mm)

2. Strip off wire and prepare heat-shrink tubing. The specific dimensions can be seen in the following picture.

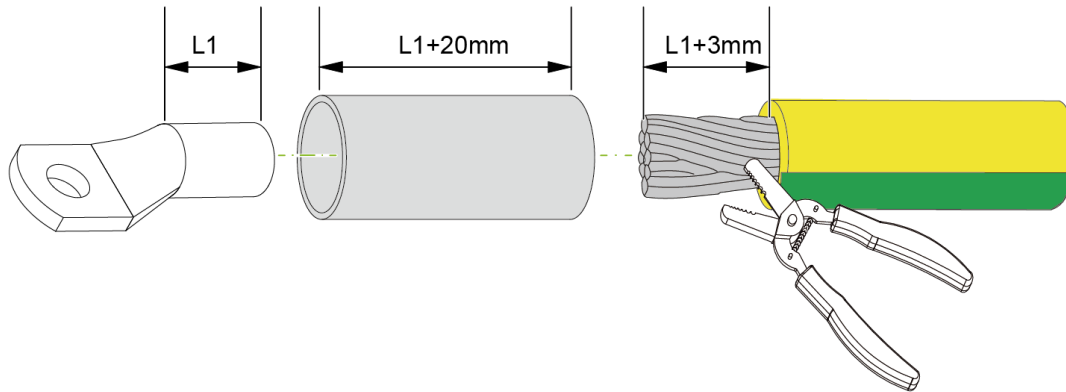


Figure 5-3 Grounding terminal

3. Install the heat-shrink tubing and crimp wire on the terminal.

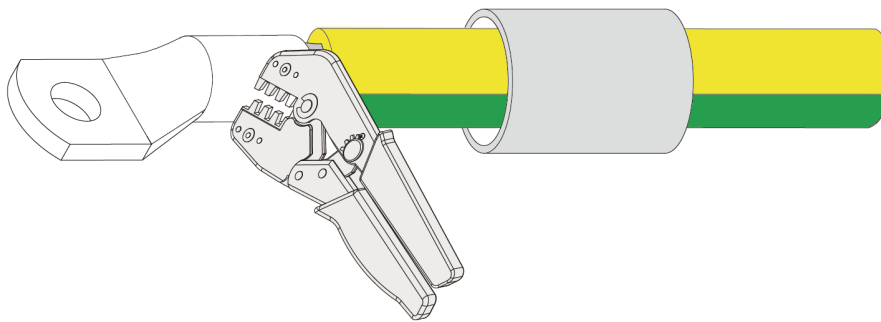


Figure 5-4 Crimp wire on the terminal

4. Seal heat-shrink tubing by using hot air gun.

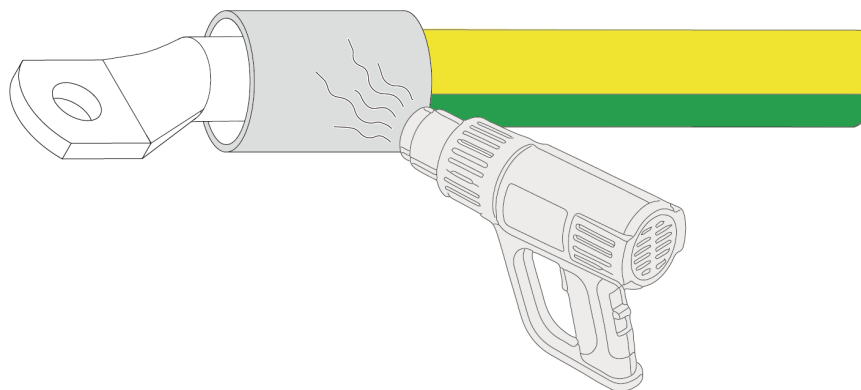


Figure 5-5 Seal the heat-shrink tubing

Step 2. Tighten the grounding cable onto the grounding busbar with M12 combined bolt (prepared by customer).

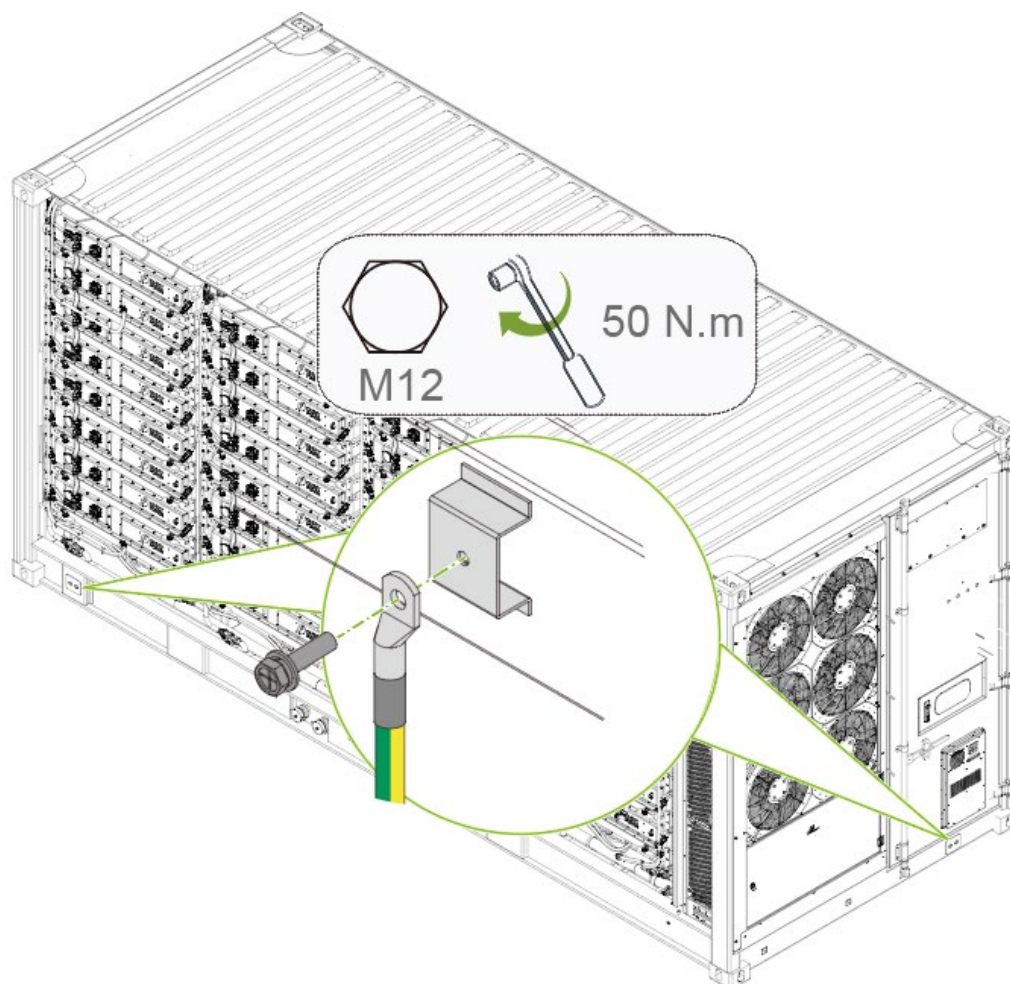


Figure 5-6 Connect the grounding cable

OPTION B: Ground by Hot-dip zinc-coated flat steel sheet (prepared by the customer)

1. Prepare galvanized flat steel as the following figure.

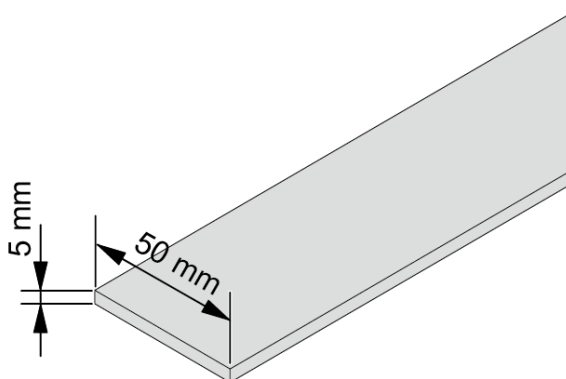


Figure 5-7 galvanized flat steel

2. Drill the installation hole on the galvanized flat steel. Tap the hole with a tap.

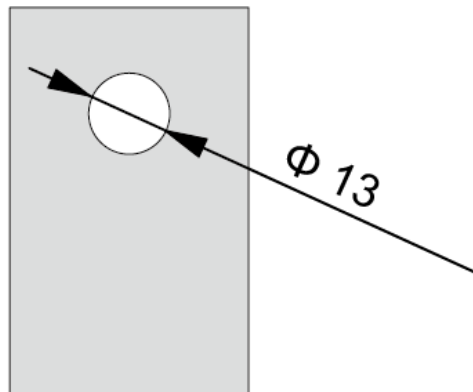


Figure 5-8 Drill installation hole

3. Tighten the galvanized flat steel on the grounding with M12 combined bolt (prepared by customer).

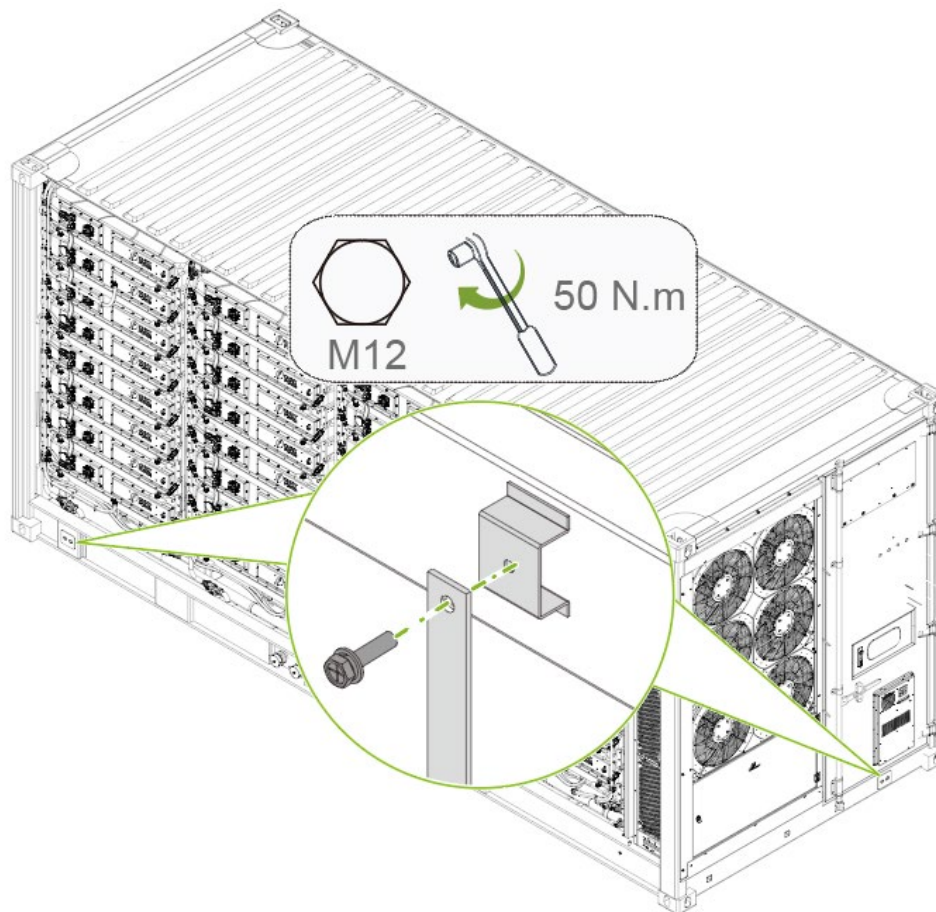


Figure 5-9 Tighten the galvanized flat steel

4. Weld the other side of galvanized flat steel to the substation grounding net in accordance with LEC regulations.

5.4. DC Combiner Cabinet Wiring

Step 1. Crimp the cable terminal.

- Purchase terminals (recommended type: TLK120-12) shown as below.

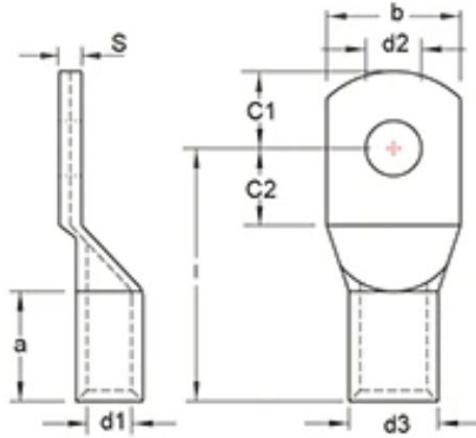


Figure 5-10 terminal specification

Unit	a	b	C1	C2	d1	d2	D3	I	S
mm	26.0	28.0	14.0	14.0	15.0	13.0	19.5	51.0	4.3

Step 2. Crimp terminal on DC cable.

- Strip off the wire and prepare the heat-shrink tubing.

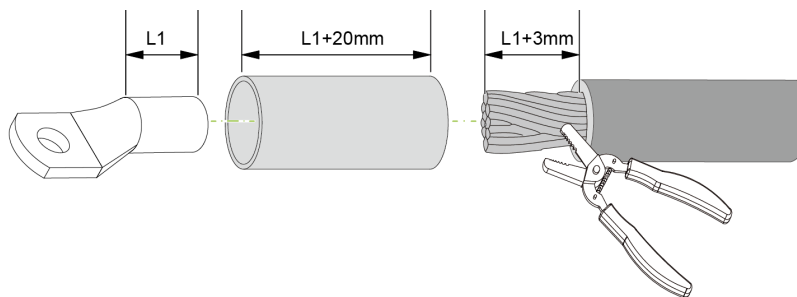


Figure 5-11 Strip wire

- Install heat-shrink tubing and crimp wires on DT terminals (NOVOPRESS MODEL HPM400 Crimping tool is recommended).

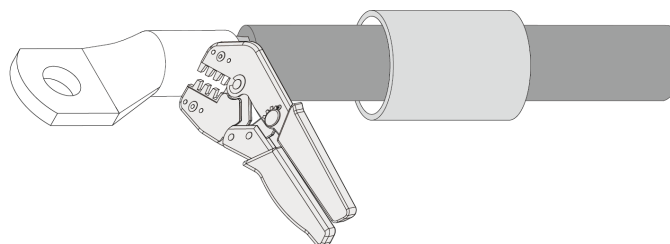


Figure 5-12 Install the DT terminals

3. Seal heat-shrink tubing by hot air gun.

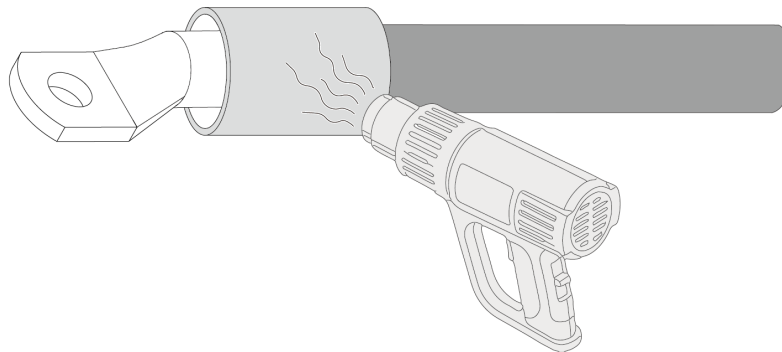


Figure 5-13 Seal the heat-shrink tubing

Step 3. Connect cable onto copper busbar.

1. Route DC cables through the threading hole into the DC combiner.
2. Fasten terminals with fixing bolts.
3. Bundle cables into type R clamps.
4. Seal cable entrances with fireproof putty

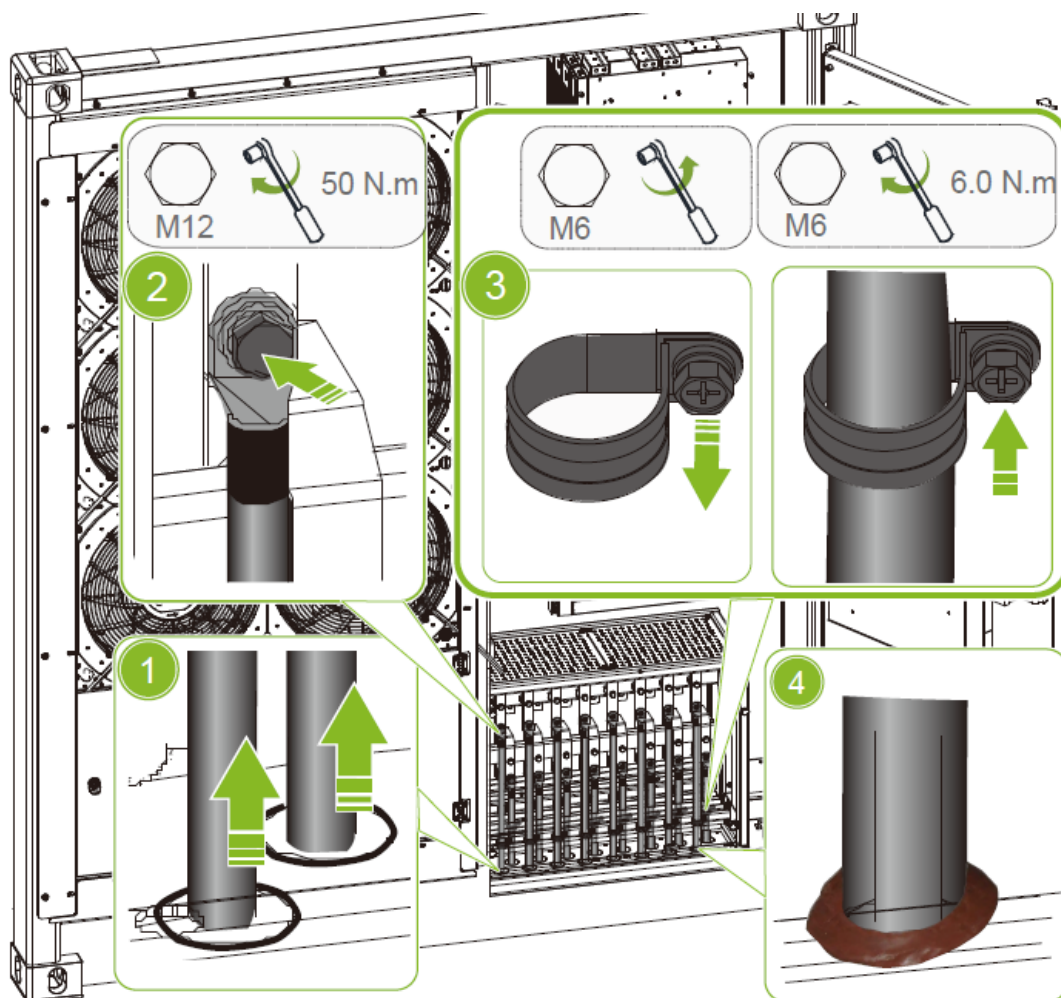


Figure 5-14 Connect cable onto copper busbar

Connect all cables one by one till all the 8+ and 8- cables are connected properly on their busbars.

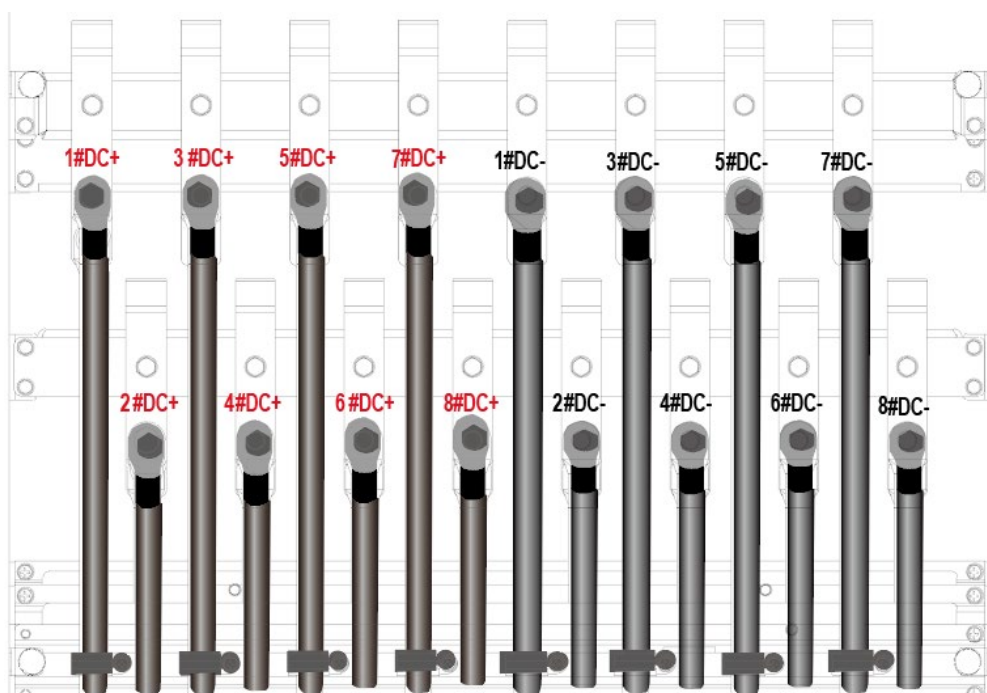


Figure 5-15 Connect all cables

For the detailed steps of fastening terminals, refer to following picture.

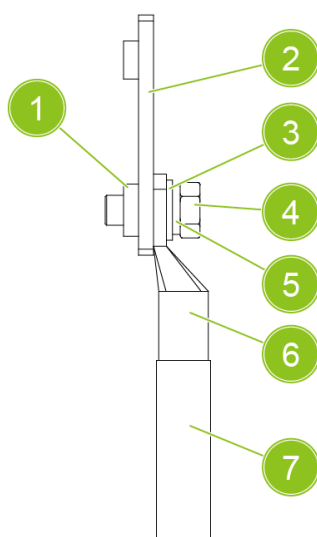


Figure 5-16 Connection of DC Input Cable

- | | | |
|--------------|------------------|----------------|
| 1. Swage nut | 2. Copper bar | 3. Flat washer |
| 4. Screw | 5. Spring washer | 6. Terminal |
| 7. Cable | | |

5.5. Power Distribution Box



NOTICE!

For detailed wiring positions (such as dry contact/control signal/BMS communication terminals), please refer to electrical wiring diagram. The terminal name and number on the delivered product shall prevail.

5.5.1. Connection of Electrical Components

This section introduces the connection methods of different electrical components, include:

- Molded case circuit breaker.
- Miniature circuit breaker
- Terminal block

5.5.1.1. Connection of Molded Case Circuit Breaker

1. Prepare the terminal (25-6 is recommended).

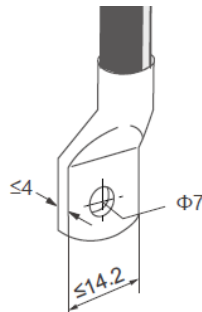


Figure 5-17 Prepare the terminal

2. Crimp terminals on cables in the same way of grounding cable, you can refer to Figure 5-3 Grounding terminal ~ Figure 5-5 Seal the heat-shrink tubing.
3. Loosen and take off the hex socket combination bolt (1).

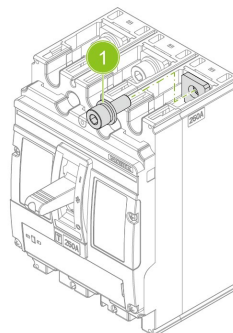


Figure 5-18 Take off the bolt

4. Align the terminal (2) hole with the hole of molded case circuit breaker, tighten the hex socket combination bolt. Torque: 12.5 N.m.

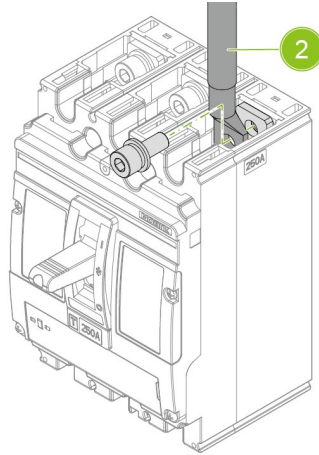


Figure 5-19 Fix the terminal

5.5.1.2. Connection of Miniature Circuit Breaker

1. Prepare the tube terminal (E25-10 is recommended).
2. Strip the jacket and insulation layer of the cable to the appropriate length, exposing the conductor. Insert the conductor into the tube terminals until contacting the terminal's barrel end, align the cable insulation edge with the terminal's crimping wings, then crimp firmly to secure the connection.

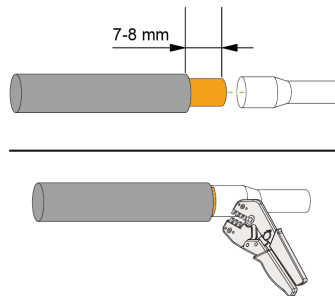


Figure 5-20 Connect the tube terminal and cable

3. Loosen the screw of miniature circuit breaker, insert the tube terminal to the end, then tighten the screw.

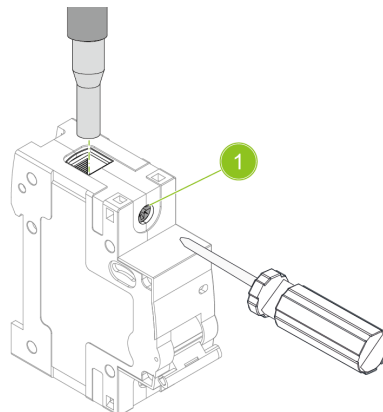


Figure 5-21 Insert the tube terminal

5.5.1.3. Connection of Terminal block

1. Prepare the cold-pressed terminal (E1508 is recommended).
2. Strip the jacket and insulation layer of the cable to the appropriate length, exposing the conductor.

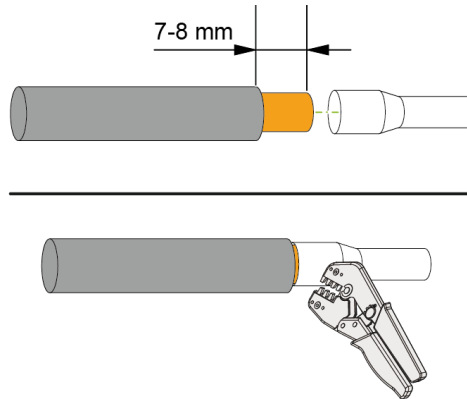


Figure 5-22 Strip the jacket and insulation layer

3. Loosen the screw of the terminal, insert the conductor into the terminal block until contact the end, then tighten the screw.

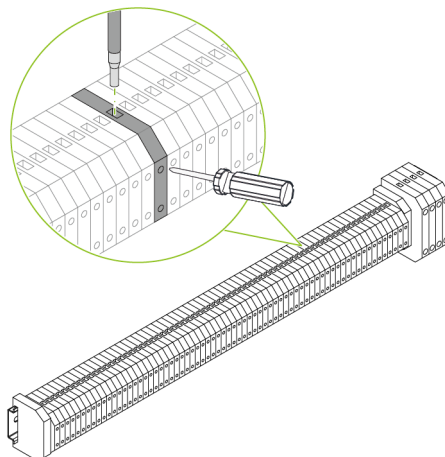


Figure 5-23 Connect cable to terminal block

5.5.2. Control Signal Connection

Connection information

Cable label	From battery container combiner cabinet	To PCS SKID control power cabinet	Cable
1#1KX-1	2XT-25	3XT-32	Control cable 4*1mm ²
	2XT-26	3XT-34	

Connection steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Put the cables in the wire duct (1)
3. Connect the cable to the terminal strip (2), refer to 5.5.1.3 Connection of Terminal block
4. Fix the cables with cable ties (3).

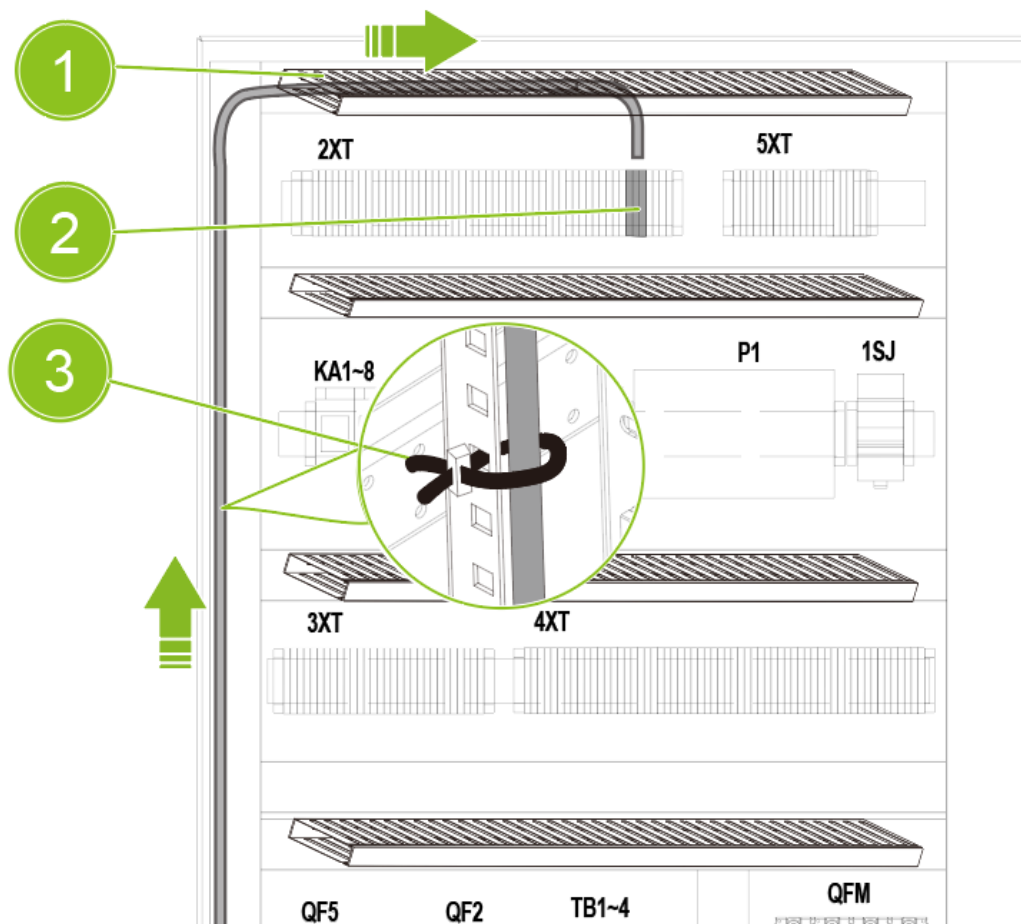


Figure 5-24 Control Signal Connection

5.5.3. Dry Contact Connection
Connection information

Cable label	From battery container power distribution box	Terminal of PCS Skid combiner cabinet	Cable
1#1KX-2	5XT-1	4XT-45	Control cable 6*1mm ²
	5XT-2	4XT-46	
	5XT-3	4XT-47	
	5XT-4	4XT-48	

Cable label	From battery container power distribution box	Terminal of PCS Skid combiner cabinet	Cable
1#1KX-3	5XT-5	4XT-49	Control cable 6*1mm ²
	5XT-6	4XT-50	
	5XT-7	4XT-51	
	5XT-8	4XT-52	
1#1KX-4	5XT-9	4XT-53	Control cable 6*1mm ²
	5XT-10	4XT-54	
	5XT-11	4XT-55	
	5XT-12	4XT-56	

Connect steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Put the cables in the wire duct (1)
3. Connect the cable to the terminal strip (2), refer to 5.5.1.3 Connection of Terminal block
4. Fix the cables with cable ties (3).

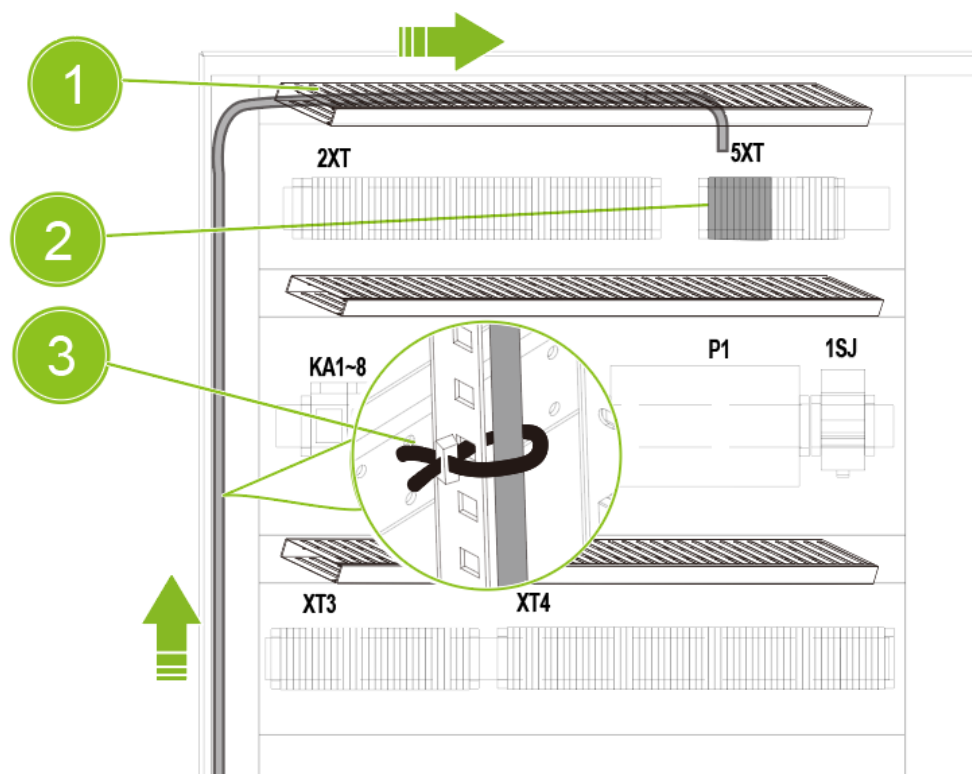


Figure 5-25 dry contact terminal

5.5.4. CAN Communication

Connection information

Cable label	From battery container power distribution box	Terminal of PCS Skid combiner cabinet	Cable
1#1TX-1	4XT-31	4XT-6	Shielded twisted pair, TC-ER AWG17 3P+AB
	4XT-32	4XT-7	
	4XT-33	4XT-8	
	4XT-34	4XT-9	
	4XT-47	4XT-18	
1#1TX-2	4XT-35	4XT-10	Shielded Twisted Pair, TC-ER AWG17 3P+AB
	4XT-36	4XT-11	
	4XT-37	4XT-12	
	4XT-38	4XT-13	
	4XT-49	4XT-19	
1#1TX-3	4XT-39	4XT-14	Shielded twisted pair, TC-ER AWG17 3P+AB
	4XT-40	4XT-15	
	4XT-41	4XT-16	
	4XT-42	4XT-17	
	4XT-51	4XT-37	
1#1TX-4	4XT-43	4XT-25	Shielded twisted pair, TC-ER AWG17 3P+AB
	4XT-44	4XT-26	
	4XT-45	4XT-27	
	4XT-46	4XT-28	
	4XT-53	4XT-38	

Connect steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Put the cables in the wire duct (1)
3. Connect the cable to the terminal strip (2), refer to 5.5.1.3 Connection of Terminal block

4. Fix the cables with cable ties (3).

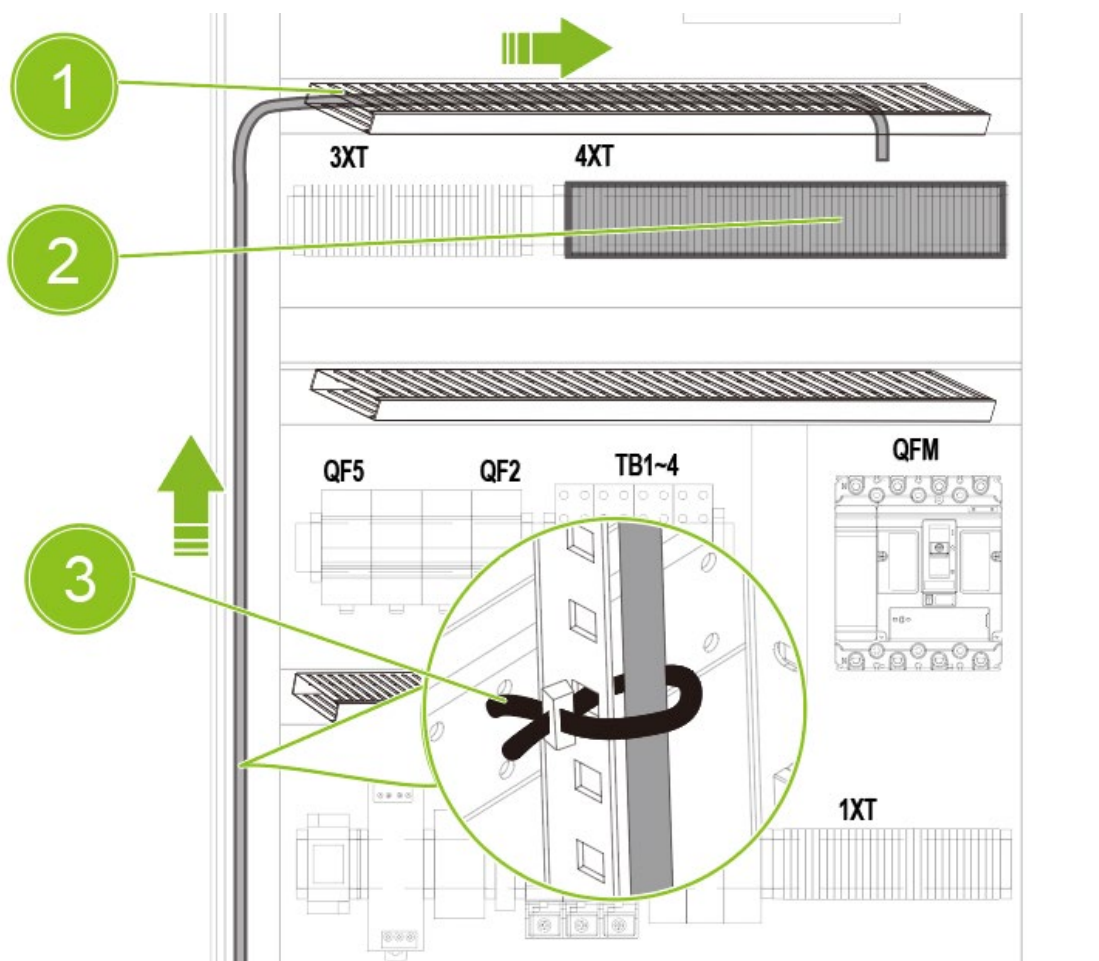


Figure 5-26 dry contact wiring

5.5.5. Main circuit secondary power supply

Connection information

Cable label	From battery container power distribution box	To PCS SKID control power cabinet	Cable
1#1DY1-8	QFM-1	1QF1-2	ZC-YJY22-0.6/1kV 4*25 mm ²
	QFM-2	1QF1-4	
	QFM-3	1QF1-6	
	QFM-N	N	

Connect steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Put the cables in the wire duct (1)
3. Connect the cable to the molded case circuit breaker QFM (2), refer to 5.5.1.1 Connection of Molded Case Circuit Breaker.
4. Fix the cables with cable ties (3).

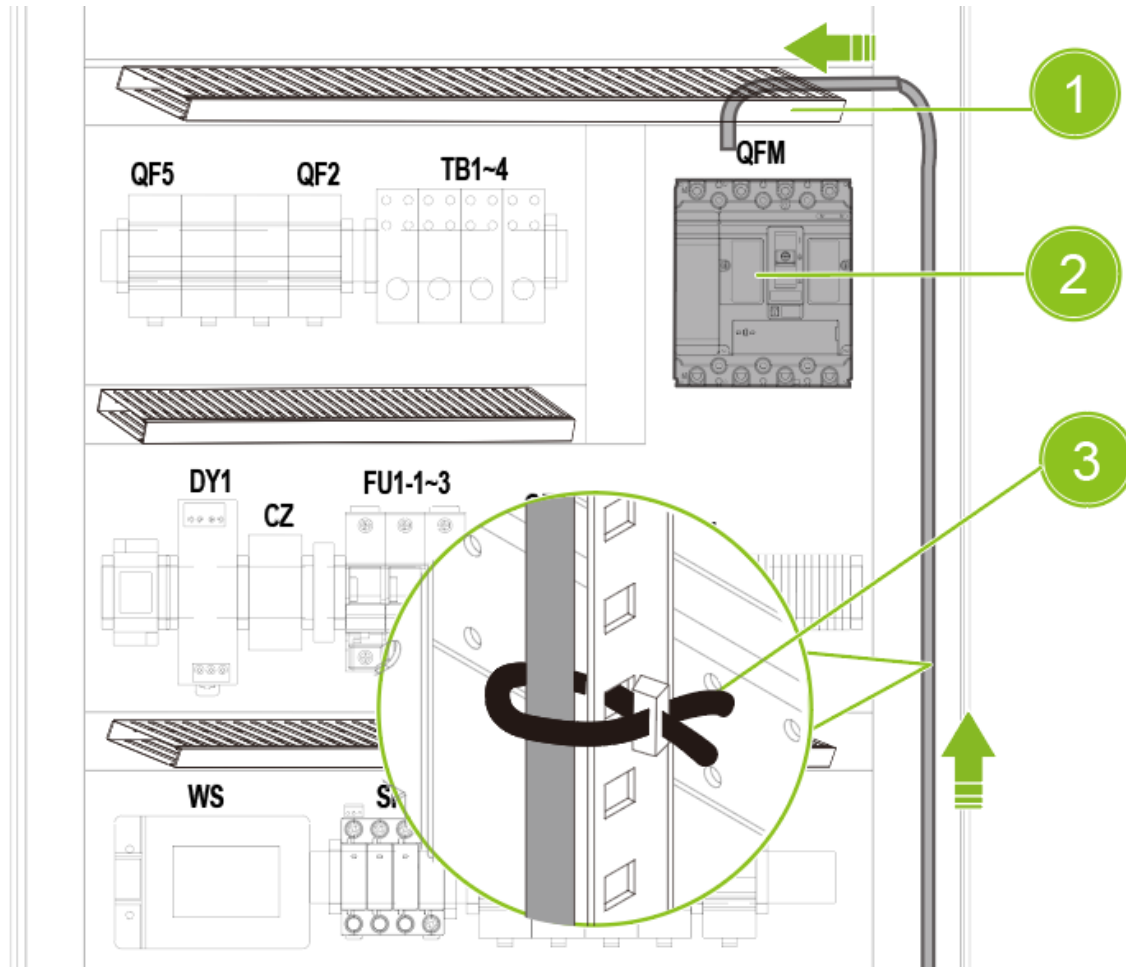


Figure 5-27 Secondary power supply connection

5.5.6. UPS Secondary power supply
Connection information

Cable label	From battery container power distribution box	To PCS SKID control power cabinet	Cable
1#1DY10	QFM1-1	2QF1-2	ZC-YJY22-0.6/1kV 2*2.5 mm ²
	QFM1-3	2QF1-4	

Connect steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Put the cables in the wire duct (1)
3. Connect the cable to the Miniature Circuit Breaker QFM1 (2), refer to 5.5.1.2 Connection of Miniature Circuit Breaker.
4. Fix the cables with cable ties (3).

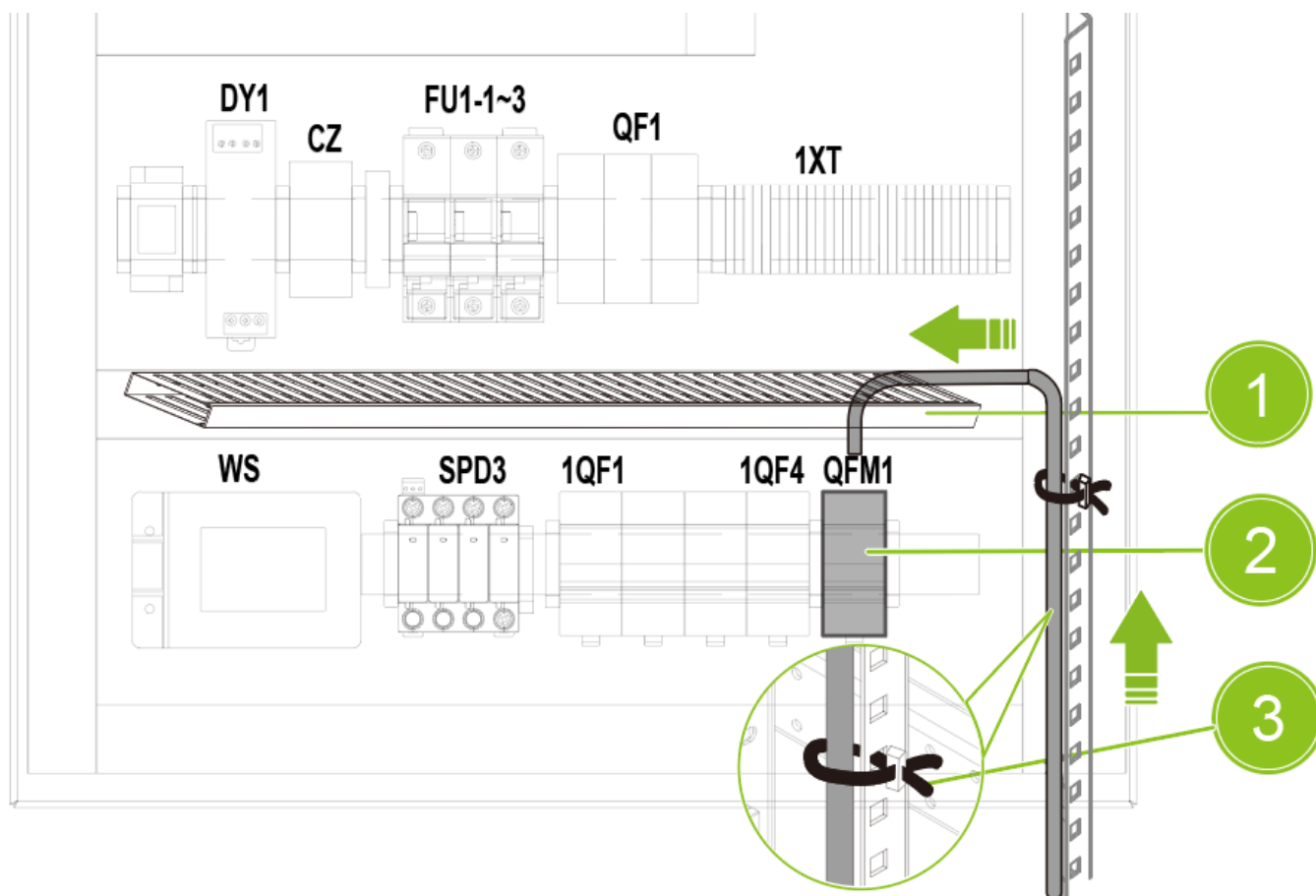


Figure 5-28 UPS Secondary power supply

5.5.7. BMS Communication Connection
Connection information

Cable label	From battery container power distribution box	To PCS SKID control power cabinet	Cable
1#TX-6	Level 3 BMS/(LAN1)	Measurement and control box 3n (LAN1)	SFTP Cat5e

Connection steps

1. Route cable through the communication/ auxiliary power supply cable port of power distribution box as shown in Figure 5-1.
2. Prepare the SFTP Cat5e cable with CAT5e Shielded RJ45 connector (1).
3. Insert the RJ45 connector into the LAN1 (2).
4. Fix the cables with cable ties (3)

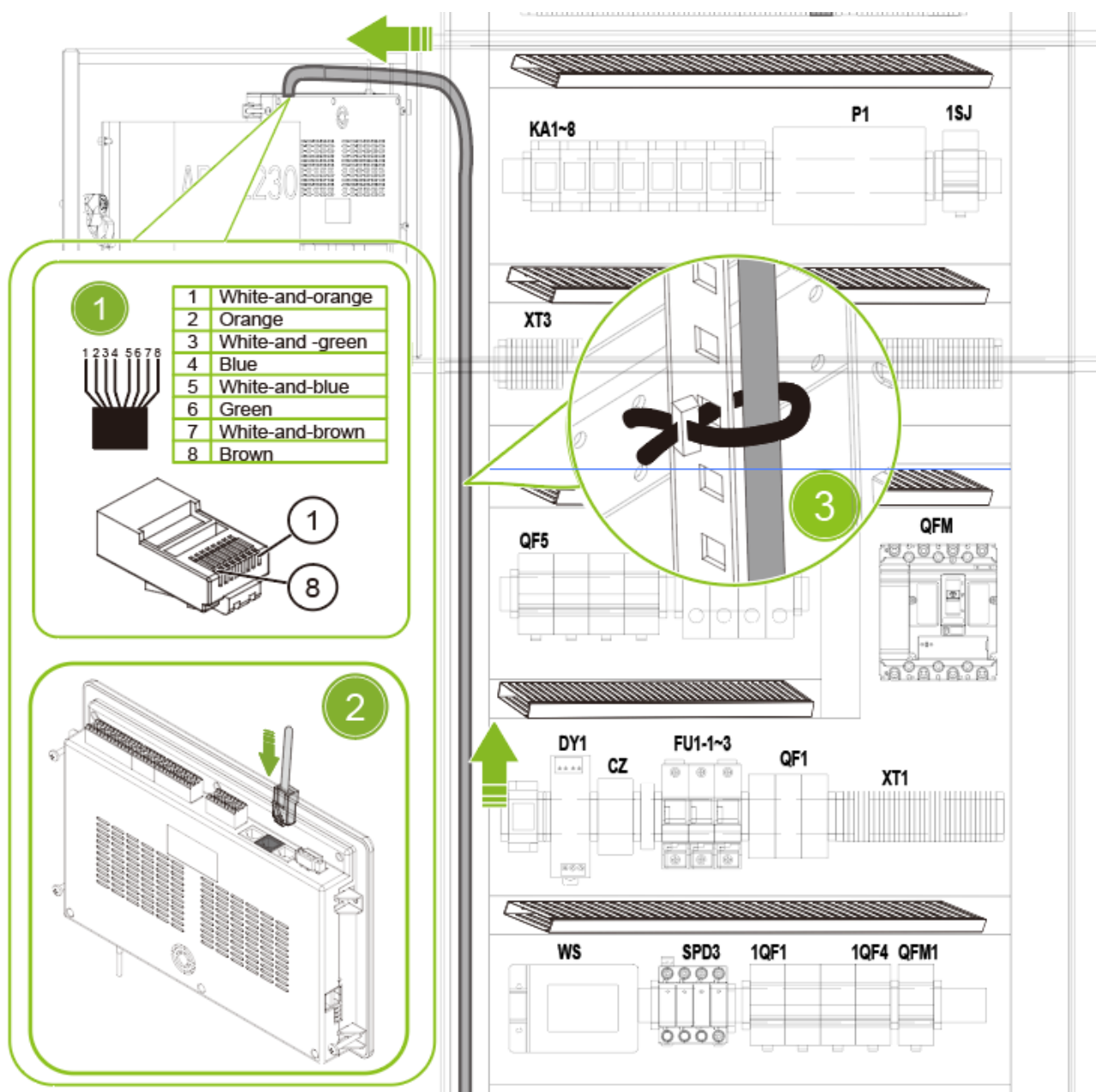


Figure 5-29 BMS Communication

5.5.8. Apply Sealant



NOTICE!

Apply fireproof putty around every bottom incoming cable to prevent water vapor, circulation air and condensing from entering the cabinet.

Apply fireproof putty around communication/ auxiliary power supply cables through cable port (4) as shown in Figure 5-1, refer to Figure 5-14 Connect cable onto copper busbar

5.6. Install MSD on PACK Panels

1. Remove the transparent protection cover.
2. Insert the MSD into the MSD guide slot of pack.
3. Move handle upwards till hearing a “click” sound.
4. Push secondary lock button to lock it.

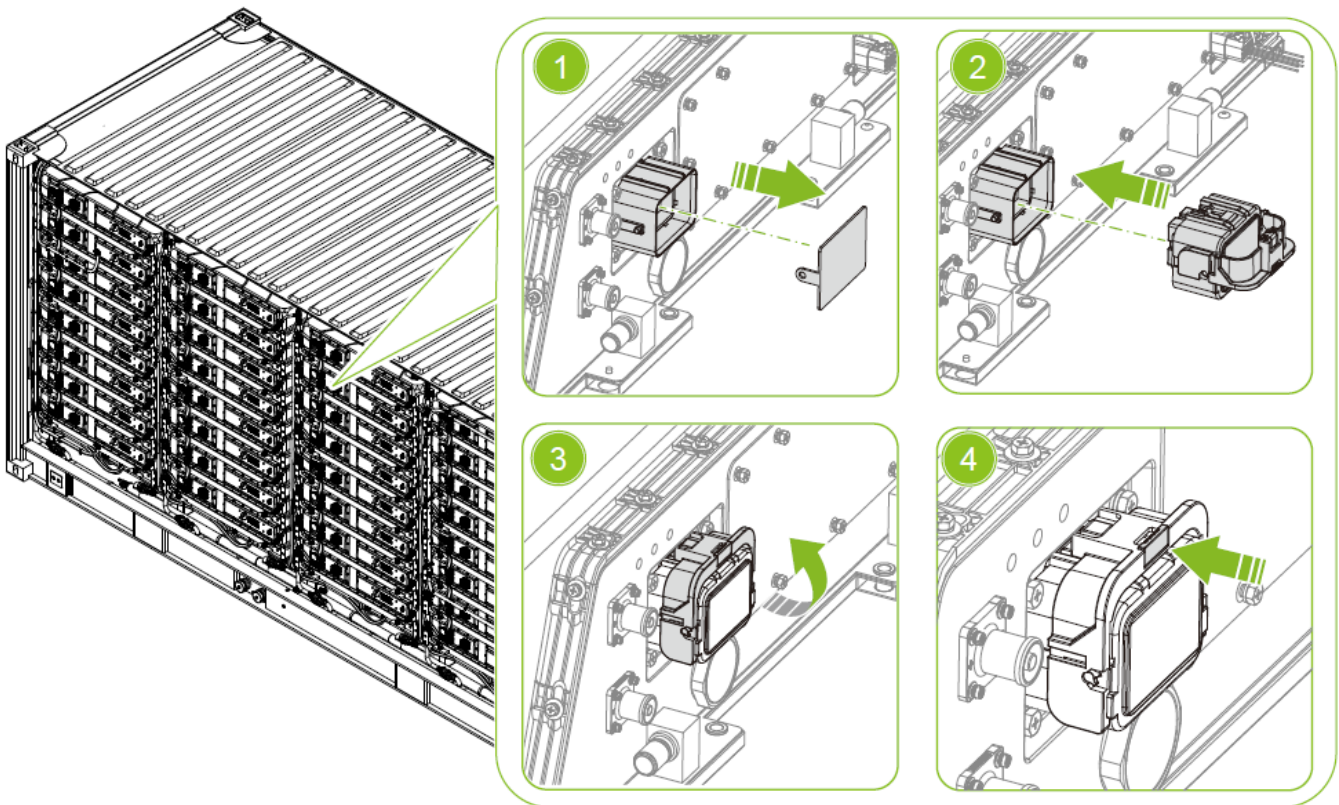


Figure 5-30 Install MSD on PACK Panels

6. Emergency Handling Procedure



WARNING!

To avoid death, personal injury or product damage, please follow all safety procedures stipulated in the national "Environmental Health and Safety (EHS) Guidelines".

Chint's principle is to protect everyone, including employees, customers, and contractors, from potential harm and health damage that may arise from work activities. Chint will provide and maintain a safe and healthy working environment, equipment, and work systems for all employees, and provide them with the necessary information, training, and supervision for this purpose.

Chint will attach great importance to health and safety and comply with all statutory requirements.

6.1. Emergency Stop

Scenarios of emergency stop



DANGER!

In any of the following situations, you must push the emergency stop button immediately.

- Fire and thermal runaway:
Cabinet smoking, catching fire, severe deformation and overheating of the casing, or a distinct burnt smell.
- Liquid leakage:
Electrolyte leakage, bubbling, or the cabinet being soaked in water (such as during heavy rain or pipe burst).
- Electric shock and leakage:
Personnel experiencing electric shock, or a continuous tingling sensation when touching the cabinet.
- Severe abnormal noise:
Abnormal loud noises such as cracking sounds or the opening of pressure relief valves inside the cabinet.

- Mechanical damage:
Severe deformation or tilting of the cabinet due to impact, drop, etc.
- Control system failure:
Severe fault alarms displayed on the monitor and inability to stop the machine through software, or the equipment continuing to charge and discharge out of control.

Mandatory regulations after emergency stop

**IMPORTANT!**

Do not attempt to reset until the fault is resolved:

- After pressing the emergency stop button, the cause must be thoroughly investigated and the fault must be eliminated by professionals. Otherwise, it is strictly prohibited to unscrew (reset) the button and power on.
- The power-on steps after resetting the emergency stop button, you can refer to 7.1 Power on Procedure

**IMPORTANT!**

It is necessary to record:

- In the equipment operation log, record the pressing time, cause, phenomenon and subsequent handling results in detail.

Important distinction

**NOTICE!**

Normal Shutdown:

- During routine maintenance, routine inspections, or planned downtime, please use the normal power-on and power-off procedures (such as touch screens, monitoring systems, or normal power switches).

**NOTICE!**

Prohibited Actions:

- It is strictly forbidden to use the emergency stop button as a regular switch. Frequent operations may damage the equipment or cause unexpected shutdowns.
-

6.2. Leakage of Electrolyte



WARNING!

Electrolyte leakage could result in serious injury. If there is electrolyte leakage, take the following measures immediately:

- Immediately evacuate the area.
 - Provide maximum ventilation, remove harmful objects or gases.
 - Wipe clean with a cloth, dispose of it in a plastic bag, then place it in an iron to allow the Battery to cool and the vapor to dissipate.
 - Avoid skin and eye contact or inhalation of vapor, or use absorbent to remove spilled liquid and incinerate it.
-

First aid measures for different parts are as follows

- **Eye first aid**

Rinse the eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids, while seeking medical assistance.

- **Skin first aid**

Remove contaminated clothing, rinse the skin with plenty of water or shower for 15 minutes, while seeking medical assistance.

- **First Aid for Accidental Inhalation**

Immediately move from the leak area to a place with fresh air, and use oxygen if available.

- **First Aid for Accidental Ingestion**

Immediately drink milk or water, induce vomiting, and seek medical attention immediately if the patient loses consciousness.

6.3. Fire

The fire resistance time of the container body reaches to 90 minutes, which meets the fire protection requirements of EN1364-1. The container is equipped with FK-5-1-12 automatic detection, alarm and fire extinguishing system, and the whole set of fire protection system meets the regulations and certification requirements of the project district. The interior and exterior of the container are equipped with alarm bells and audible and visual alarms, and fire alarms can be seen immediately when the container door is opened and closed.

The container is non-accessible, and anyone can escape from the 20-foot container in a short time.

6.3.1. Classification of Fire Sources

Table 6-1 Classification of fire hazards

No.	Fire risks	Detailed description	Countermeasures
1	Internal short circuit	Undervoltage, overheating and bulging of battery	The system has passed the UL 9540 certification, and the racks have passed the safety test certification of IEC 62619, UL 1973 and EMC.
2	External fire source	There is a risk of battery failure and fire if the temperature exceeds 130°C	The container body is provided with a fireproof insulation layer. The container is kept away from fire and heat sources.
3	External heat source		
4	External short circuit	There may be risks such as external short circuit, arc flash and fire during installation, or if the fuse is not installed properly.	Install screws according to the Installation Instruction Manual and check them thoroughly to ensure tightness.
5	Loose screw	Excessive contact resistance and heating of connections and cables	
6	Overcharge	It occurs only if the system does not detect a BMS failure, protection, parameter error or communication fault	The system complies with UL1973 standard and has software-hardware dual protection, so the risk is low.
7	Over-discharge		

6.3.2. Fire Risk Deduction

Consideration is given to five aspects: component safety, battery cell safety, electrical safety (BMS), mechanical safety and environmental safety.

Safety of parts and components

Table 6-2 Compliance of Parts and Components with UL Standards

No.	Name of parts and components	Standard No.
1	Plastic components	UL 94-V0
2	Fuse	UL 248
4	Relay	UL 61810
5	BMS	UL 991, UL1998
6	Anti-corrosion	UL 50E

Battery cell safety

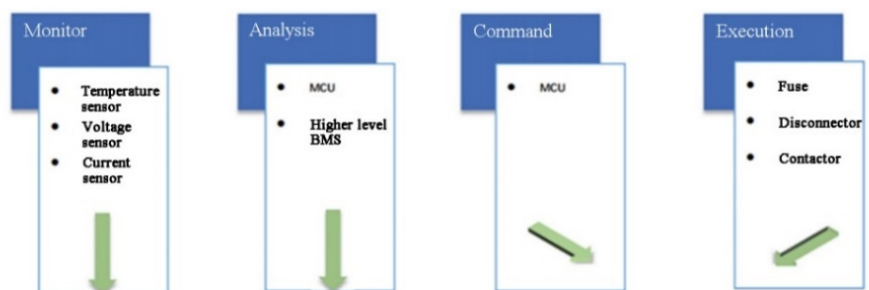
Battery design complies with standards such as UL1642, IEC62133, UN38.3, etc.

Table 6-3 Protection Thresholds (Reference)

BMS function	Detailed description	Parameter
Single cell overcharge	Overcharge voltage protection threshold	3.65V
	Overcharge protection delay time	3s
Single cell over-discharge	Over-discharge voltage protection threshold	2.50V
	Over-discharge protection delay time	3s
	Discharge recovery voltage threshold	3.0V
Battery PACK overcharge	Overcharge voltage protection threshold	379.6 V
	Overcharge protection delay time	3s
	Overcharge recovery voltage threshold	364 V
Battery PACK over-discharge	Over-discharge voltage protection threshold	260 V
	Over-discharge protection delay time	3s
	Discharge recovery voltage threshold	312 V

Overcurrent protection	Discharge overcurrent protection delay time 1	5s
	Discharge overcurrent protection 2	320A
	Discharge overcurrent protection delay time 2	500±50ms
	Charge overcurrent protection 2	320A
Short circuit	Short-circuit protection	-
	Protection condition	Load short circuit
	Recovery condition	Load disconnection
Overtemperature protection	Charge overtemperature protection	55°C
	Charge temperature recovery	45°C
	Discharge overtemperature protection	55°C
	Discharge temperature recovery	45°C
	Charge under temperature protection	0°C
	Charge temperature recovery	5°C
	Discharge under temperature protection	-20°C
	Discharge temperature recovery	0°C

Dual protection mechanism



- Multiple temperature sensors, compared with each other
- Monitor the voltage of cells and PACKs, and compare them through dynamic and static tests
- Current double measurement
- Provide dual analysis logic for each protection
- Chip-level self-check
- Communicate with the upper level and compare with each other
- Monitor whether the fuse, relay and disconnector execute MCU instructions; if not, trigger the node signal to automatically disconnect the fuse

Mechanical safety

Comply with UN38.3 standard and pass static pressure, impact, dropping, installation and other tests.

Environmental safety

Preventive measures: temperature monitoring, UL94-V0 material, metal housing, safety valve design, BMS high temperature protection, etc.

6.3.3. Identify Fire Hazards**Ignition source**

There are no obvious ignition sources in the entire system environment, and smoking is prohibited near the equipment;

Combustion fuel

No fuel, no large amount of paper; only some maintenance record paper.

Work process

No process will cause serious fire hazard.

6.3.4. Measures When There is Fire**Actions to take after hearing the alarm**

- Do not approach, do not open the door, and leave immediately.
- Only when your own safety is ensured can you remotely cut off the power supply.
- Immediately notify the relevant person in charge to investigate the cause of the alarm.

Actions to be taken after discovering a fire

- Use the nearest fire alarm call point to raise the alarm
- Report to the safe assembly point
- Call the fire brigade using a mobile phone (after leaving the equipment)
- Contact them after the fire brigade arrives
- Even if you are confident, do not attempt to handle small fires
- Do not put yourself in danger of fire

6.4. Flood and Water Disaster

- Under the premise of ensuring personal safety, power off the system; for the system power-off operation procedure, please refer to Section 6 System Power On/Off Operation Procedures.
- If any part of the battery is submerged in water, do not touch the battery to avoid electric shock.
- Do not use batteries that have been flooded; contact a battery recycling company for disposal.

7. Operating Procedure

7.1. Power on Procedure

7.1.1. Safety Inspection

Requirements

- The equipment involves high voltage and strong currents. Operation by anyone without professional supervision is prohibited. Operators must enhance their sense of safety and vigilance and always wear personal protective equipment (PPE), especially insulating gloves. The equipment must not be turned off or opened without authorization while it is running. In the event of an accident, quickly disconnect the main circuit breaker and ensure an immediate response is made to the responsible personnel.
- Pay attention to the weather conditions and enhance safety awareness during rainy days. Check the working environment where the equipment is located to ensure it is clean and tidy. Inspect whether the fire safety equipment is well-maintained and whether the escape routes are unobstructed.
- Ensure that the equipment has no insulation faults, and the insulation resistance of all busbars to ground is not less than 2.5MΩ as specified by national standards.
- Check the connection points of all wires to ensure they are secure. Specifically, refer to national standards and visually inspect the electrical safety clearance between the electrodes of the power lines, as detailed in the table below:

Rated line voltage / kV	Electrical clearance/mm	Creepage distance/mm
0.38 (0.4)	8	12 (max)
0.66 (0.69)	10	20 (max)
3 (3.5)	36	75 (max)



NOTICE!

For more information, refer to the standard *UL 1973-2022*.

7.1.2. Power-on Operation Procedures

1. When the equipment is powered on, pressing “Power On” key for more than 1 s to start the UPS (refer to Figure 2-22 Operation panel of UPS), and check whether the UPS output 220V is normal.
2. Close 1QF1\1QF2\1QF3\1QF4 miniature circuit breakers in sequence, refer to Figure 7-2;
3. Close the 1~8# high-voltage box isolating switches in sequence, and press the high-voltage box switch buttons in sequence;

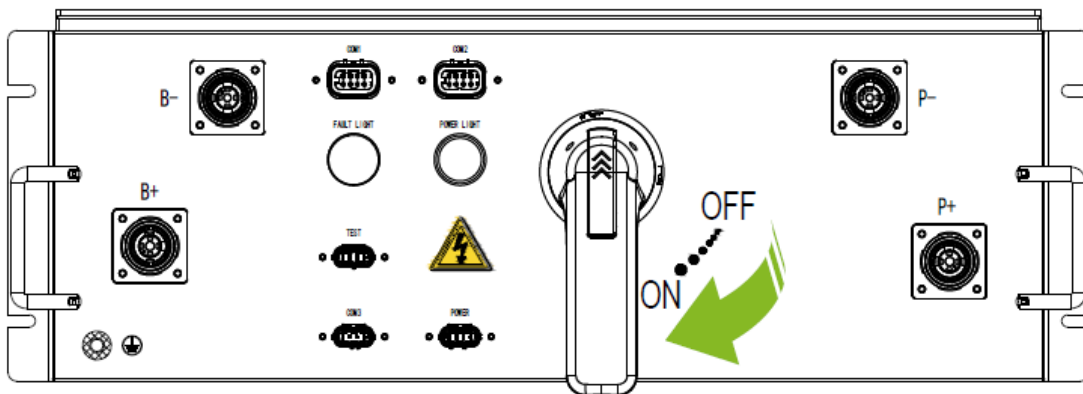


Figure 7-1 Close high-voltage box isolating switch

4. Close the QFM1 circuit breaker, refer to Figure 7-2;
5. Close QF1\QF2\QF3\QF4 breaker in sequence, refer to Figure7-2.

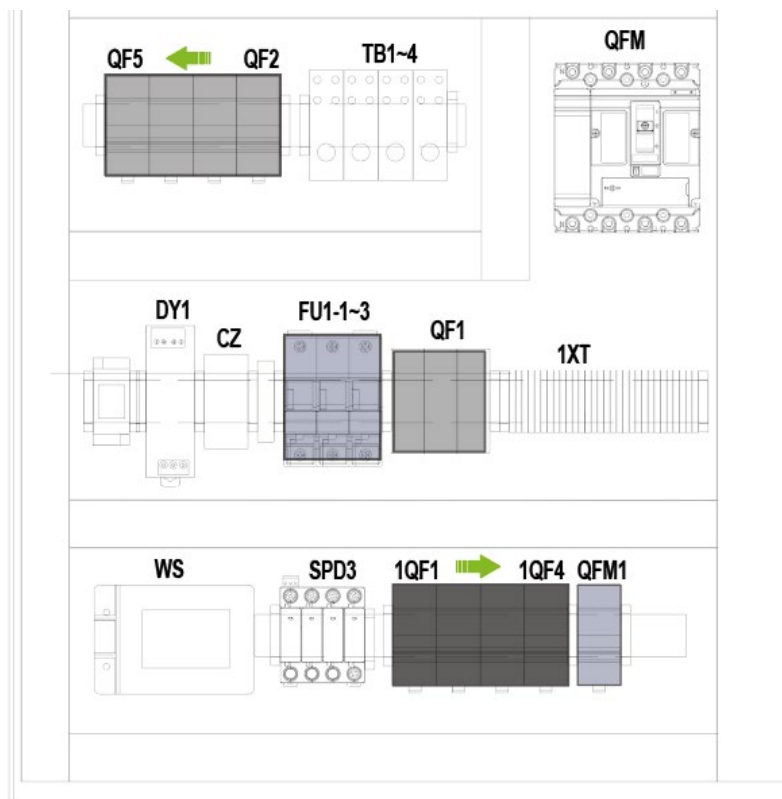


Figure 7-2 Close circuit breakers

7.1.3. Inspection after Power-on

1. Check whether the BMS display screen is functioning properly, and verify whether the total voltage of each battery cluster and the voltage of each battery cell are normal. Ensure that the BMS connection is normal.
2. Check whether each device in the battery system is operating normally, and verify whether the power lines and communication lines of each sub-unit of the BMS are correctly connected.
3. Check if the high-voltage box has any faults and if it is in a normal state.
4. Check if the liquid cooling machine is working properly. If there is a fault, refer to the troubleshooting section.
5. Check if the fire protection system is working properly. If there is a fault, refer to the fire protection product manual.
6. After the equipment is finally installed at the project site, the system should undergo another safety review before it starts operating.



IMPORTANT!

To ensure the continuous and safe operation of the system throughout its entire life cycle, we need to conduct daily inspection and record-keeping.

7.2. AC Input Commissioning



WARNING!

After the above harness is installed, check the bolt fastening, screw fastening torque, high-voltage power cable connection, battery connection and high-voltage box connection by sampling.

After the battery system is installed, turn on the AC input power of BMS before turning on the BMS. Commission AC input of high-voltage box in accordance with the following steps:

1. Before connecting the AC input auxiliary power supply of the high-voltage box, ensure that the handle

of disconnecting switch is in the "OFF" position.

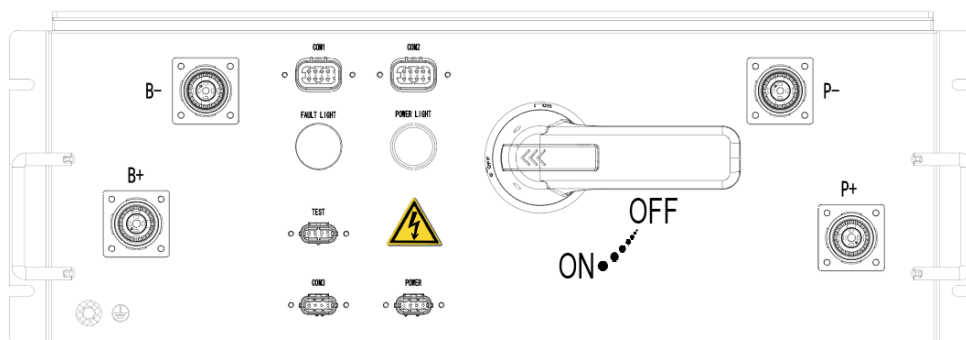


Figure 7-3 Disconnecting Switch in "OFF" Position

2. Turn the handle of disconnecting switch to ON.

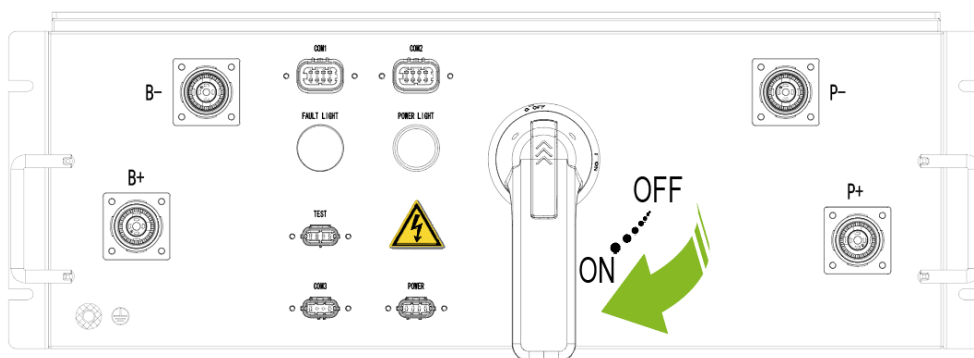


Figure 7-4 Turn Handle of Disconnecting Switch to ON

3. Check the color of the power indicator;
 - If the power indicator lights up as red, it indicates that the power supply of the high-voltage box is normal.
 - If the power indicator lights up as yellow, it indicates that the power supply of the high-voltage box is abnormal/faulty.

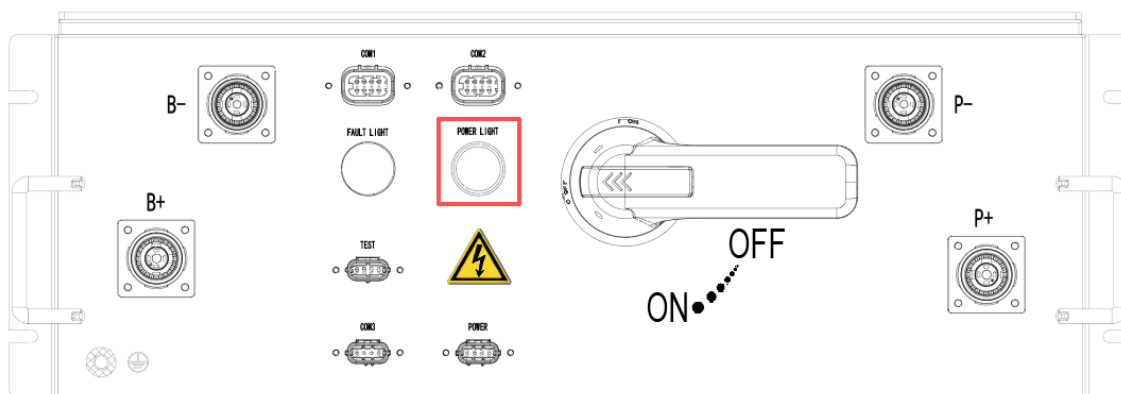


Figure 7-5 Check Color of Indicator

7.3. BMS System Configuration

7.3.1. BMS System Architecture

CHINT strongly recommends that authorized factory representatives configure and debug BMS.

Multiple system-level ESMU can communicate with EMS through Ethernet /ModbusTCP ESMU does not communicate with each other and should be treated as an independent subsystem. EMS identifies different ESMU by IP address. The sample architecture can refer to 2.10.1 Communication Architecture Diagram.

7.3.2. Configuration Preparation

Before system configuration, the following materials shall be prepared:

BMS communication cable: Used for direct connection of CAN, it is a debugging communication line for BMS system debugging

Adapter: The tool used is USB to RS485

RJ45 connector: Used to connect the high-voltage box

D-SUB connector on CAN to RS485 adapter (Brand: ZLG, Model: USBCAN-2E-U)

CAN to RS485 adapter, V2

Standard network cable: Connect to ESMU to realize Modbus TCP communication

Laptop: Operating system with Windows 7 SP1 or higher installed

7.3.3. BMS System Configuration

Warning:

- If multiple battery clusters are installed, the ESBMM address is automatically assigned.
 - When configuring ESBMM, disconnect the DC power line of the high-voltage box and turn off all other ESBMMs.
 - After configuring all ESBMMs, reconnect all DC power cables of high-voltage boxes.
-

ID information of ESBMM

After the system is installed or ESBMM is replaced, there is no need to manually allocate ESBMM address because the daisy-chain communication mode is adopted in the battery cluster.

CAN data uploading

As shown in the figure below, all ESBMMs communicate with ESBCM through daisy chain. Each ESBMM has a unique ID on the battery cluster with the function of address assignment.

ESBCM can collect data from all ESBMMs, and ESBMM can also update data and alerts to ESBCM through a daisy chain.

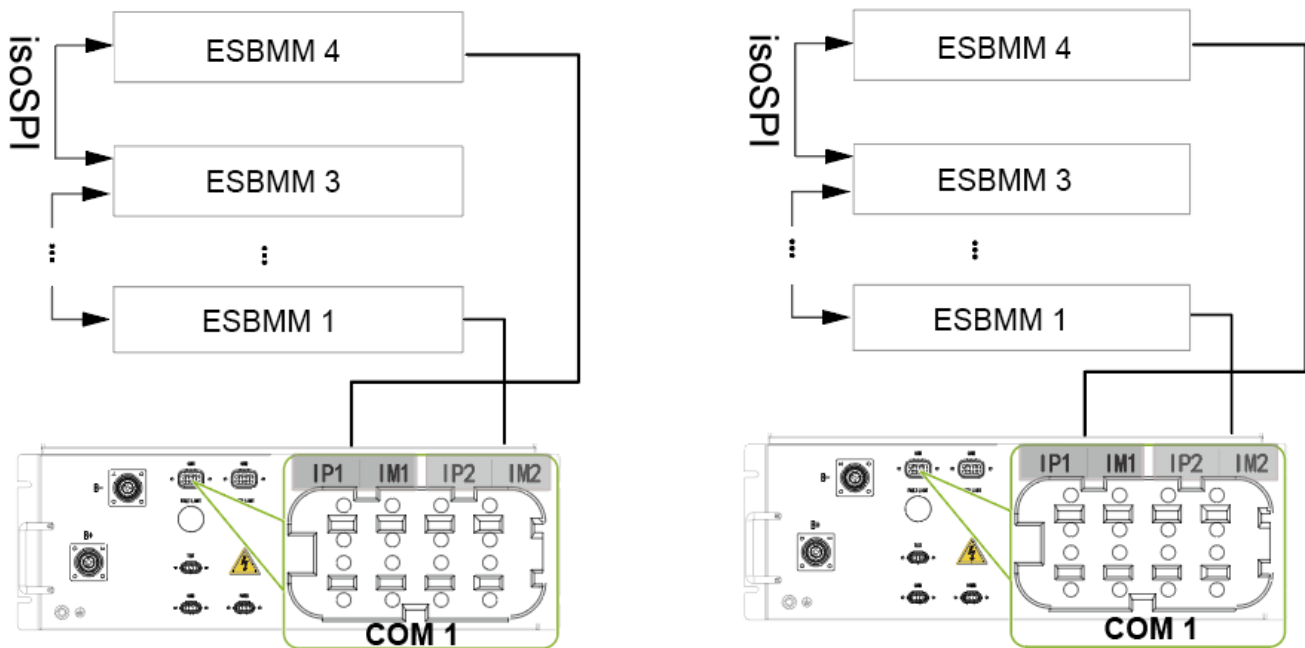


Figure 7-6 Communication Architecture of Multiple ESBMMs

Software upgrading

ESMU can upgrade ESBCM via CAN, upgrading process need to use command line.

7.3.4. ESMU Configuration

Display All Information on Display Screen

The main interface displays voltage, current, SOC, and operating status for each battery cluster, along with the total system voltage and current.

Click the "AI info" button to view real-time parameters, including charge / discharge power, temperature, current, SOC, alarm, etc.



Figure 7-7 Display of Multi-cluster Parameters on HMI (for reference)

Click "Cell info" on the top right side of the page to display the voltage of each battery PACK, temperature at each position, alarm/fault information, etc.

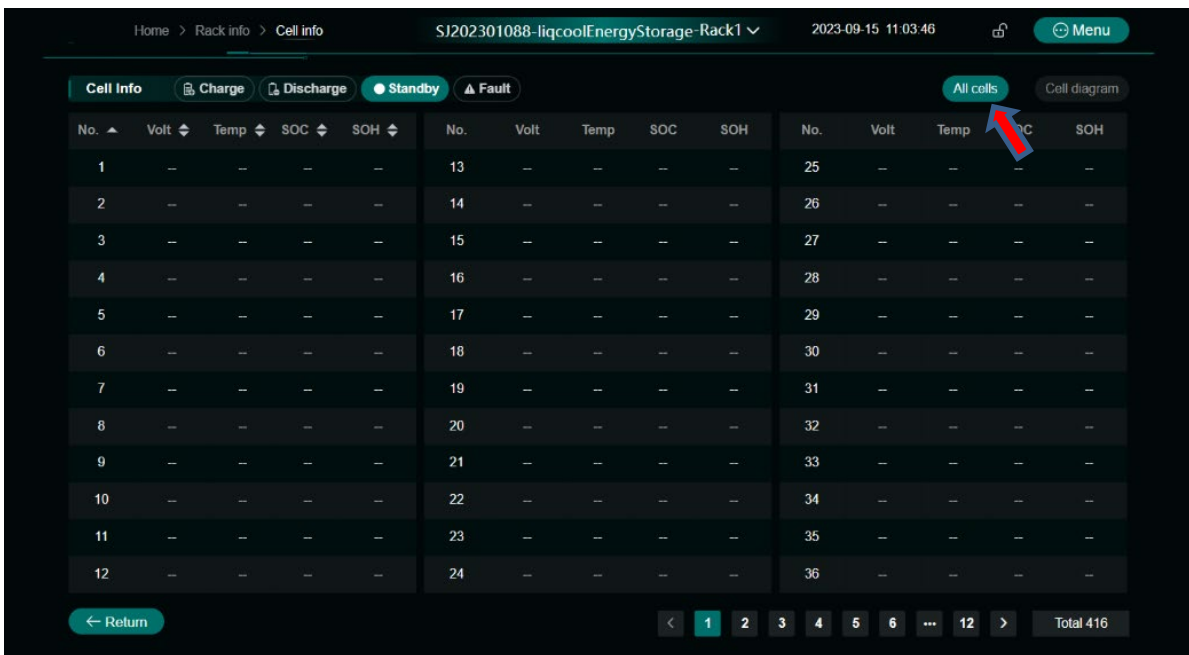


Figure 7-8 Display of Single Cluster Parameters on HMI (for reference)

Parallel connection of battery cluster

To address potential risks such as circulating currents during parallel operation of multiple battery clusters, the BMS program incorporates a pre-connection self-check mechanism. If no faults are detected after self-check, the system automatically establishes grid connection; otherwise, an alarm prompt will appear on the interface, allowing EMS to retrieve fault details via communication protocols.

In case of abnormalities in any battery cluster during operation, the program triggers an automatic disconnection. The operational interface is shown in the following figure:

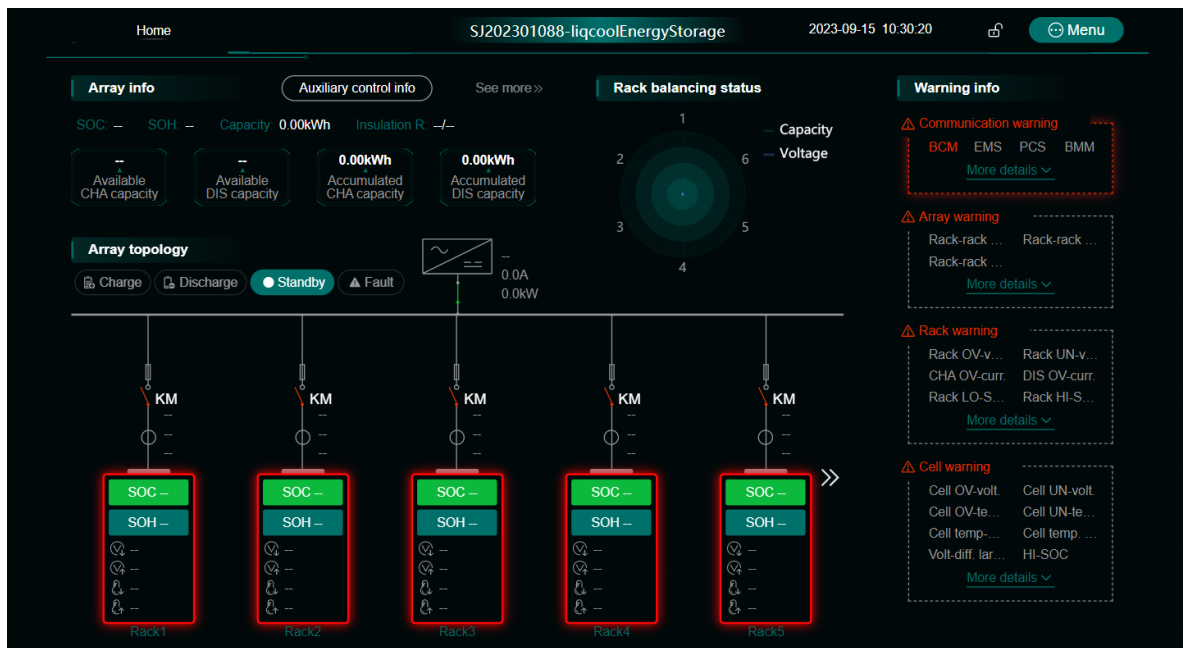


Figure 7-9 Operating Interface of Grid Connection of Battery Cluster (for reference)

7.3.5. Network Interface Configuration

After installation, wiring and configuration are completed, connect the Ethernet cable to ESMU, communicate through MODBUS, and check whether the system BMS provides the correct data.

The default IP address is: 192.168.1.199 (only ESMU LAN/ModbusTCP, which may vary in different systems).

Port No.: 502

7.3.6. Typical Protection Policy

The basic protection policy is summarized as follows (which may vary according to the specific requirements of the application):

1. Source of protection signal
 - Module/unit information based on BMS analysis and triggered alarms
 - BMS hardware fault
 - Communication problems within BMS or with EMS/PCS
 - BMS sends signals to PCS/EMS through Modbus.
2. EMS/PCS turns off the inverter
3. If the inverter is not turned off after 3-5s, BMS activates the hardwired signal to turn off it
4. If the inverter is not turned off after 5s, BMS disconnects the battery by disconnecting the contactor.

7.4. BMS System Test

The parameters of BMS Test may vary depending on the project.

The following tests shall be carried out once every year.

7.4.1. Communication and Control Function Test

Table 7-1 Communication and Control Function Test

Test purpose:			
1. Normal communication between BMS and PCS, EMS shall be ensured. 2. BMS shall be able to open or close the contactor.			
Preconditions:			
Visual inspection of battery, PCS and HMI is completed.			
Test process:			
1. Check the HMI of PCS to confirm whether there is information from BMS. 2. Check the HMI of EMS to confirm whether there is information from BMS. 3. Connect all battery cluster communications in parallel to the display and control. 4. Disconnect the communication connection between battery cluster and display and control. 5. Please refer to the communication architecture diagram (refer to 2.10.1 Communication Architecture Diagram).			
Test parameters:			
PCS, EMS and contactor shall provide normal response			
Test record:			
Category	Test content	Test result (Pass √/Fail ×)	Remarks (If any)
1	Communication between BMS and PCS		
2	Communication between BMS and EMS		
3	Connect all battery clusters in parallel to the display and control		
4	Disconnect the battery cluster from the display and control		

7.4.2. Parameter setting Inspection

Table 7-2 Inspection of Parameter Setting

Test purpose:				
BMS parameter settings shall be correct.				
Preconditions:				
Communication and control function test have been completed.				
Test process:				
1. Check parameter settings on the HMI against the standard table. 2. Battery overvoltage protection threshold shall be 3.5V for primary level, 3.6V for secondary level, and 3.65V for tertiary level. 3. Total overvoltage protection threshold shall be 1456V for primary level, 1497.6V for secondary level, and 1518.4V for tertiary level. 4. Charge overtemperature protection threshold shall be 45°C for primary level, 50°C for secondary level and 55°C for tertiary level.				
Test parameters:				
Parameter setting on BMS				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remarks (If any)
1	Whether it has management authority to set parameters	N/A	N/A	
2	Setting of battery voltage protection threshold			
3	Setting of system total voltage protection threshold			
4	Setting of system charge over-temperature protection threshold			

7.4.3. Alarm and protection function test

Table 7-3 Overvoltage Alarm and Protection Function Test

Test purpose:				
Make sure that BMS can realize the protection function in case of primary, secondary and tertiary overvoltage alarms.				
Preconditions:				
Monitoring function and accuracy test is completed				
Test process:				
- Reset the voltage protection threshold so that the total voltage or unit voltage reaches primary, secondary and tertiary overvoltage alarms respectively. The default total primary overvoltage is 1456V, the default total secondary overvoltage is 1497.6V, and the default total tertiary overvoltage is 1518.4V. - An alarm shall be displayed on the display and control. - Check BMS for corresponding protection function.				
Test parameters:				
- BMS shall notify PCS to reduce the operating power in case of primary overvoltage alarm. - BMS shall notify PCS to stop charging and discharging (with a current limit of 0) in case of secondary overvoltage alarm. - BMS will notify PCS to stop and disconnect the contactor with a delay of 3s in case of tertiary overvoltage alarm.				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remarks (If any)
1	Display and control alarm display	N/A		
2	With primary overvoltage alarm protection function			
3	With secondary overvoltage alarm protection function			
4	With tertiary overvoltage alarm protection function			

Table 7-4 Undervoltage Alarm and Protection Function Test

Test purpose:				
Make sure that BMS can realize the protection function in case of primary, secondary and tertiary undervoltage alarms				
Preconditions:				
Monitoring function and accuracy test is completed				
Test process:				
- Reset the voltage protection threshold so that the total voltage or unit voltage reaches primary, secondary and tertiary undervoltage alarms respectively. The default total primary voltage is 1248V, the default total secondary voltage is 1164.8V, and the default total tertiary voltage is 1040V - An alarm shall be displayed on the display and control. - Check BMS for corresponding protection function.				
Test parameters:				
- BMS shall notify PCS to reduce the operating power in case of primary undervoltage alarm. - BMS shall notify PCS to stop charging and discharging (with a current limit of 0) in case of secondary undervoltage alarm. - BMS shall notify PCS to stop and disconnect the contactor with a delay of 3s in case of tertiary undervoltage alarm.				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remarks (If any)
1	Display and control alarm display	N/A		
2	With primary undervoltage alarm protection function			
3	With secondary undervoltage alarm protection function			
4	With tertiary undervoltage alarm protection function			

Table 7-5 Overcurrent Alarm and Protection Function Test

Test purpose:				
Make sure that BMS can realize the protection function in case of secondary and tertiary overcurrent alarms				
Preconditions:				
Monitoring function and accuracy test is completed				
Test process:				
- Reset the current protection threshold so that the current reaches the secondary and tertiary overcurrent alarms respectively. The default primary overcharge current is 310A, the default secondary overcharge current is 320A and the default tertiary overcharge current is 330A. - An alarm shall be displayed on the display and control. - Check BMS for corresponding protection function.				
Test parameters:				
- BMS shall notify PCS to stop charging and discharging (with a current limit of 0) in case of secondary overcurrent alarm. - BMS shall notify PCS to stop and disconnect the contactor with a delay of 3s in case of tertiary overcurrent alarm.				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remarks (If any)
1	Display and control alarm display	N/A		
2	Realization of secondary overcharge current alarm protection function			
3	Realization of tertiary overcharge current alarm protection function			

Table 7-6 Over-temperature Alarm and Protection Function Test

Test purpose:				
Make sure that BMS can realize the protection function in case of primary, secondary and tertiary over-temperature alarms				
Preconditions:				
Monitoring function and accuracy test is completed				
Test process:				
- Reset the temperature protection threshold so that the temperature reaches primary, secondary and tertiary overtemperature alarms respectively. The default primary overcharge temperature is 45°C, the default secondary overcharge temperature is 50°C, and the default tertiary overcharge temperature is 55°C. - An alarm shall be displayed on the display and control. - Check BMS for corresponding protection function.				
Test parameters:				
- BMS shall notify PCS to reduce the operating power in case of primary over-temperature alarm. - BMS shall notify PCS to stop charging and discharging (with a current limit of 0) in case of secondary over-temperature alarm. - BMS will notify PCS to stop and disconnect the contactor with a delay of 5s in case of tertiary over-temperature alarm.				
Test record:				
Category	Test content	Test data	Test result (Pass √/Fail ×)	Remarks (If any)
1	Display and control alarm display	N/A		
2	Realization of the protection function in case of a primary over-temperature alarm		According to ambient temperature	
3	Realization of the protection function in case of a secondary over-temperature alarm		According to ambient temperature	
4	Realization of the protection function in case of a tertiary over-temperature alarm		According to ambient temperature	

7.5. BMS System Operating Procedure

7.5.1. BMS Operation Inspection

BMS shall run according to the following procedure:

1. Check whether there are system status faults in battery charge and discharge state, voltage, current, SOC, rack operation state, etc. through ESMU. The fault will be shown in “Warning info”. The main interface is shown in the figure below:

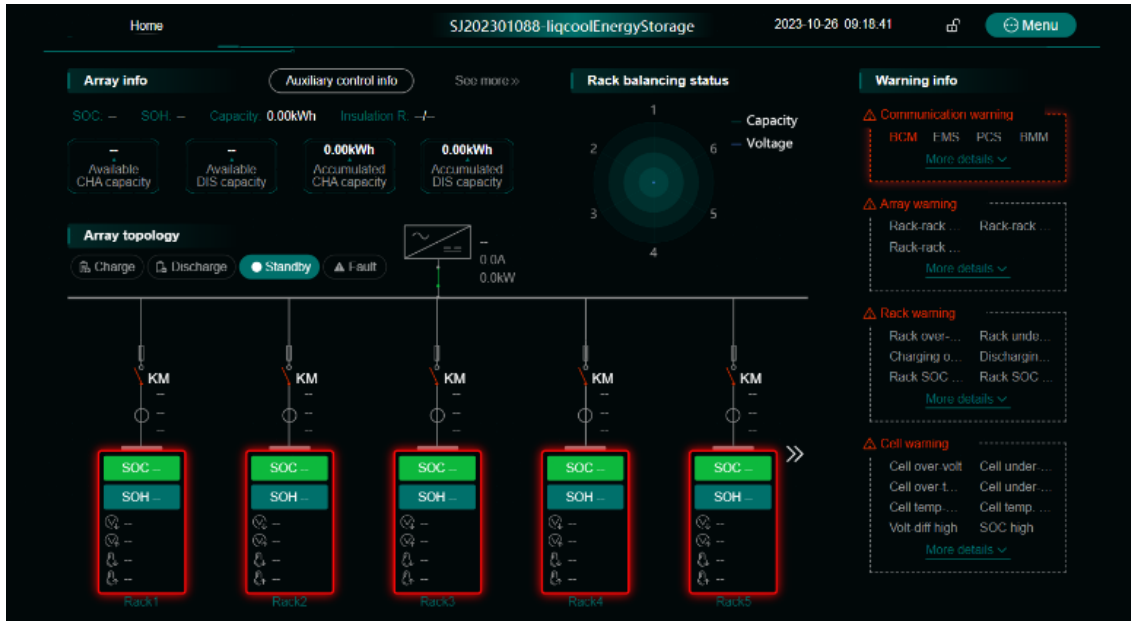


Figure 7-10 Main Interface

2. Open “Array Info”, check the alarm history based on critical alarms and alarms that may not be sent to EMS. The alarm record interface is as follows:

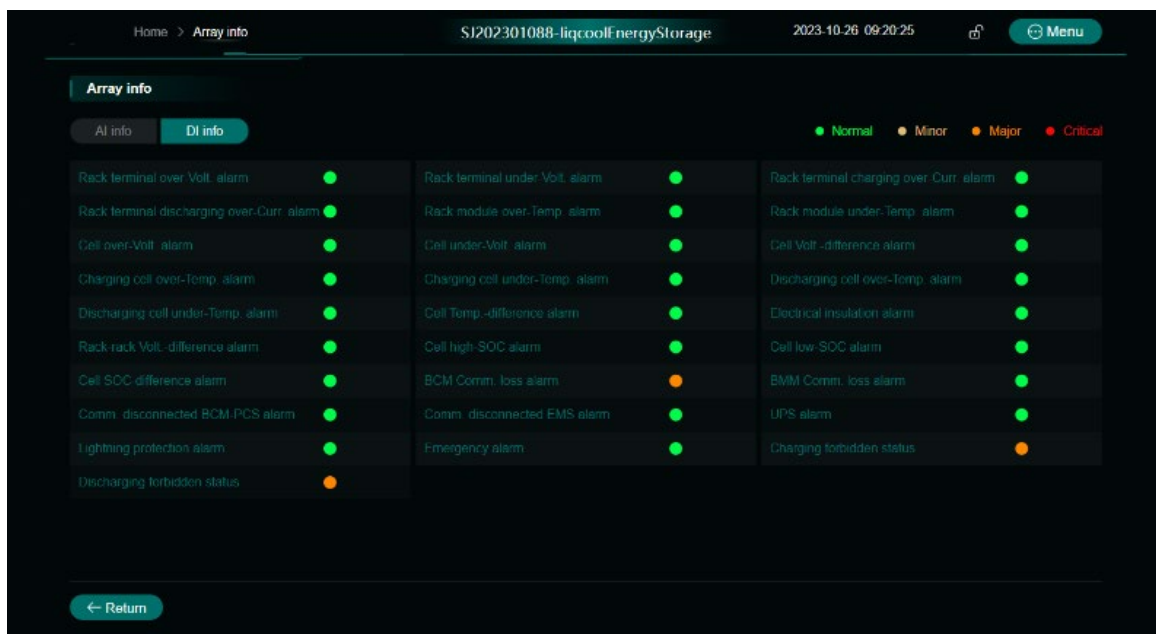




Figure 7-11 Alarm Record Interface

- Check the protection threshold parameter settings according to 错误!未找到引用源。 ensure consistency. Click the “Parameter settings” to check the settings:



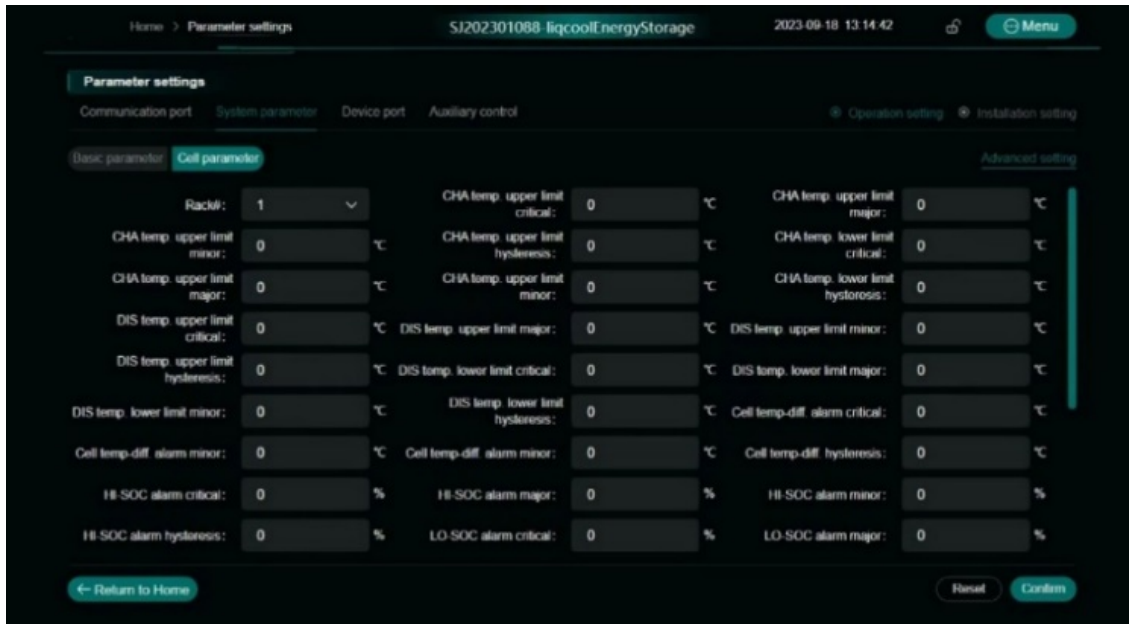
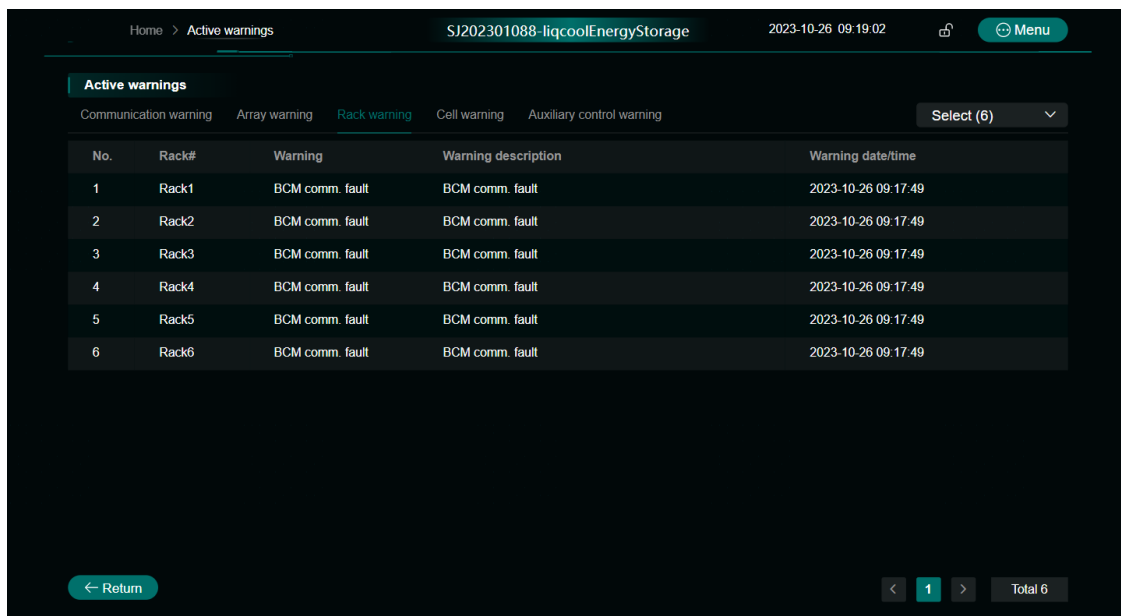


Figure 7-12 Protection Threshold Parameter Settings

4. Check the interface with thermal management system for communication, operation state, temperature range and other faults. The interface is as follows (for reference):



No.	Rack#	Warning	Warning description	Warning date/time
1	Rack1	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49
2	Rack2	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49
3	Rack3	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49
4	Rack4	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49
5	Rack5	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49
6	Rack6	BCM comm. fault	BCM comm. fault	2023-10-26 09:17:49

Figure 7-13 Active Warnings

7.5.2. Automatic Calibration of BMS

The SOC of the battery system needs to be calibrated during maintenance. This calibration requires a full-charge and full-discharge process, and is an automatic process.

Full-charge process:

When the maximum voltage in the battery PACK reaches the fully charged condition, the error judgment and correction of all individual SOC are performed by combining the current voltage distribution with charging rate and temperature. As the operating years increase and the consistency of the battery system changes, the range of set will also change accordingly.

Full-discharge process:

When the minimum voltage in the battery PACK reaches the fully discharge condition, the error judgment and correction of all individual SOC are performed by combining the current voltage distribution with charging rate and temperature. As the operating years increase and the consistency of the battery system changes, the range of set will also change accordingly.

7.6. Power-off Procedure

1. Open QF1\QF2\QF3\QF4 in sequence, refer to Figure 7-2 Close circuit breakers;
2. Open QFM1, refer to Figure 7-2 Close circuit breakers;
3. Open the 1~8# high-voltage box switch buttons;

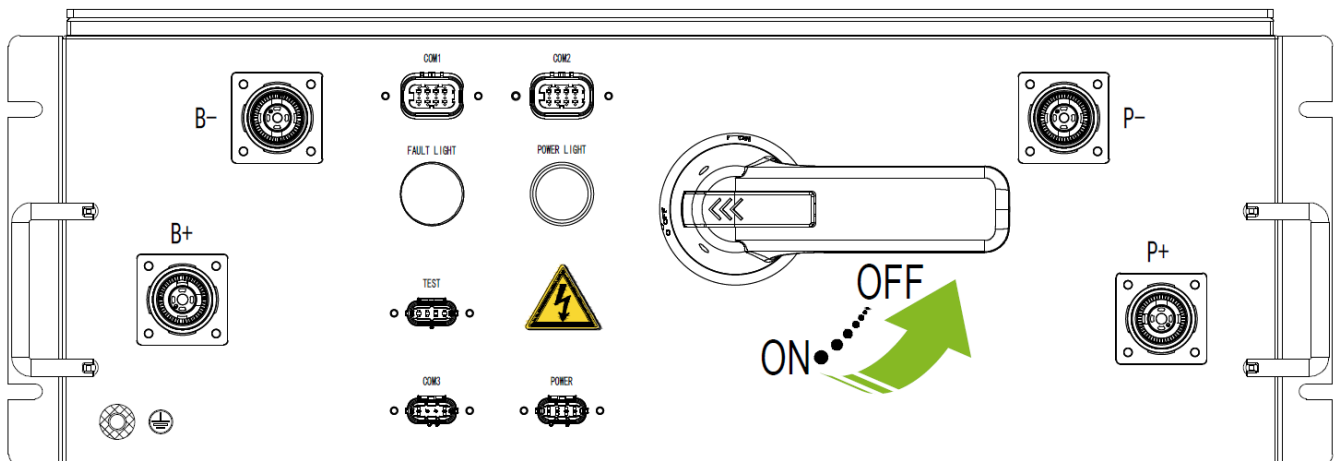


Figure 7-14 Isolating switch

4. Open 1QF1\1QF2\1QF3\1QF4 miniature circuit breakers in sequence, refer to Figure 7-2 Close circuit breakers;
5. Pressing "Power Off" key for more than 3 s to close the UPS (refer to Figure 2-22 Operation panel of UPS).

8. Troubleshooting

BESS is a HV DC system and can only be operated by qualified and authorized personnel!

Make sure to check all cables of BMS for correct connection and settings and check the BESS system for normal startup before checking for fault.

8.1. BMS Troubleshooting

Table 8- 1 Faults and Solutions

No.	Faults	Solutions
1	The display and control cannot work normally after start-up	Record the fault and restart the power supply.
2	No data can be retrieved on the display and control screen	Check the BMS cable for proper connection and the battery cluster for correct IP address.
3	Contactors on the display and control interface fail to close	Check whether the voltage difference between battery clusters is greater than 5V, and BMS will start the protection program at this time.
4	Total voltage of a single battery cluster is too low, and ESBMM is disconnected	Check the 24V line of ESBMM for correct connection; replace the ESBMM module and check it for recovery to normal status.
5	Abnormal voltage sampling of battery cell	Remove the battery PACK and check whether the sampling fuse is blown; replace the ESBMM module and check it for recovery to normal status.
6	ESBMM does not perform balancing function	Remove the battery PACK and check whether the sampling fuse is blown; replace the ESBMM module and check it for recovery to normal status.
7	The ESMU shows that the total voltage of the cluster is normal, but there is no current or three times the current during charging and discharging	Check the cluster circuit for increased contact resistance; battery PACK for tightness; the fuse at DC confluence for damage; the battery PACK for increased internal resistance, and for voltage within the normal range.



NOTICE!

If the BMS fault still cannot be resolved, please contact the after-sales service personnel.

8.2. Liquid Cooling Unit Troubleshooting



WARNING!

- The liquid cooling unit is a professional equipment and can only be operated by qualified authorized personnel.
- Before replacing major components, the power supply and communication must be disconnected first.
- The maintenance and replacement of all components can only be carried out by qualified personnel, and only approved materials, parts and components can be used for replacement.

After the above harness is installed, check the bolt fastening, screw fastening torque, high-voltage power cable connection, battery connection and high-voltage box connection by sampling.

Table 8- 2 Troubleshooting of liquid cooling unit

Fault	Possible Cause	Inspection Item or Treatment Method
Fan Faults		
The external circulation fan does not run	The liquid cooling unit is not powered on	Check whether the power input end of liquid cooling unit is energized.
	Circuit breaker is tripped due to lightning stroke	Check whether the circuit breaker inside the liquid cooling unit is closed.
	Abnormal power input is detected in the liquid cooling unit (such as overvoltage or undervoltage)	Confirm whether the liquid cooling unit has corresponding alarms, and if so, handle them according to the instructions of the liquid cooling unit.
	The fan is stuck	Check whether the fan is stuck by foreign matters.
	The terminal is loose	Check whether the butt terminal of fan is loose.
	Compressor does not start	Refer to the handling method for compressor not started in the instructions of liquid cooling unit
	Control panel fault	Replace the control panel according to the instructions of liquid cooling unit.

	Fan fault	Replace the fan, and replace the external circulation fan according to the instructions of liquid cooling unit
External circulation fan generates abnormal sound	The fan bearing is worn	Replace the fan, and replace the external circulation fan according to the instructions of liquid cooling unit
	The fan blade scratches other objects	Check for interference between cables and fan blades.
Refrigeration System Faults		
Compressor does not start	It is not powered on (in standby state)	Check the main power switch and the operation display interface to see whether the compressor is started.
	Circuit connection is loose	Tighten the circuit connector.
	Open or short circuit	Check the circuit for open or short circuit, and repair the main power supply.
	Converter (VFD) fault	Replace the converter (VFD).
	Control board damage	Replace the control board according to the instructions of liquid cooling unit.
	Compressor motor fault	Replace the compressor
The compressor does not work	No cooling demand	Check the outlet water temperature and compressor output status on the display screen interface. Check whether the operation interface is in cooling state.
	Shutdown delay	The compressor has the shortest shutdown time under normal conditions. If the temperature rises to the starting point again during this period, the compressor will still be started with a delay.
High exhaust pressure	The condenser is blocked by dirt	Clean the condenser with compressed air or a vacuum cleaner equipped with a brush head.
	The external circulation fan does not work	Refer to the above table.
Coolant Circulation System Faults		
Internal circulating water pump does not start	It is not powered on (in standby state)	Check the main power switch and the operation display interface to see whether the compressor is started.
	Circuit connection is loose	Tighten the circuit connector.
	Pump converter fault	Replace the pump converter.

	Pump is in a self-protection state due to no coolant	Check whether there is coolant in the circulation system. If not, replenish it.
	Pump body fault	Replace the water pump. Replace the pump according to the instructions of the liquid cooling unit.
The electric heating tube does not work	No heating demand	Check whether the outlet temperature and heating setpoint are reasonably set.
	Circuit connection is loose	Tighten the circuit connector.
	Overheating protection is activated	Wait for a period and restart the electric heater to observe whether it works normally.
	Electric heater fault	Replace the electric heater. Replace the heater and circulating water pump according to the instructions of the liquid cooling unit.
The automatic topping up pump does not work	Topping up pump fault	Replace the automatic topping up pump.
	The topping up pump is stuck.	Check whether there are foreign matters in the topping up pump, and remove them if any. Replace the topping up pump if it is damaged.
	The terminal is loose	Check whether the butt terminal of topping up pump is loose.
Automatic topping up pump makes abnormal sounds during operation	Axial of topping up pump is worn	Replace the automatic topping up pump.
	Fixing screw of the topping up pump is loose	Tighten screws.

8.3. Fire Product Troubleshooting

Table 8-1 Fire Product Troubleshooting

No.	Fault Information	Fault Cause	Troubleshooting Method
1	POWER FAULT PSU Board	Main Power Loss	Check the main power supply and wiring.
		Abnormal Main Power Voltage	
2	MISSING BATTERY PSU Board	Backup Power Not Connected Correctly	Reconnect the backup power wiring, ensuring correct connection.
		Backup Power Voltage Too Low or Damaged	Continuously charge the backup power for 48 hours. If the fault persists after charging, replace the backup power.

3	GROUND FAULT PSU Board	Ground Fault Exists	Disconnect external device lines one by one for inspection.
4	MISSING Device Name (e.g., Smoke 1) Device Address (e.g., Point 1)	Device Installation or Wiring Error	Check the device installation and wiring.
		Incorrect Device Address	Check if the device address is set correctly.
5	GENERIC FAULT GAS1 1st Alarm	Low Alarm Line Wiring Error for Combustible Gas Detector 1	Check the low alarm line wiring for Combustible Gas Detector 1 for correctness.
		Abnormal Status of Combustible Gas Detector 1.	Check if the working status of Combustible Gas Detector 1 is normal.
6	GENERIC FAULT GAS1 2nd Alarm	High Alarm Line Wiring Error for Combustible Gas Detector 1	Check the high alarm line wiring for Combustible Gas Detector 1 for correctness.
		Abnormal Status of Combustible Gas Detector 1.	Check if the working status of Combustible Gas Detector 1 is normal.
7	GENERIC FAULT GAS1 Fault	Fault Line Wiring Error for Combustible Gas Detector 1	Check the fault line wiring for Combustible Gas Detector 1 for correctness.
8	GENERIC FAULT GAS2 1st Alarm	Low Alarm Line Wiring Error for Combustible Gas Detector 2	Check the low alarm line wiring for Combustible Gas Detector 2 for correctness.
		Abnormal Status of Combustible Gas Detector 2.	Check if the working status of Combustible Gas Detector 2 is normal.
9	GENERIC FAULT GAS2 2nd Alarm	High Alarm Line Wiring Error for Combustible Gas Detector 2	Check the high alarm line wiring for Combustible Gas Detector 2 for correctness.
		Abnormal Status of Combustible Gas Detector 2.	Check if the working status of Combustible Gas Detector 2 is normal.
10	GENERIC FAULT GAS2 Fault	Fault Line Wiring Error for Combustible Gas Detector 2	Check the fault line wiring for Combustible Gas Detector 2 for correctness.

11	GENERIC FAULT Fan Status	Fan Status Line Wiring Error	Check if the fan status line wiring is correct.
12	GENERIC FAULT Aerosol feedback	Aerosol Release Feedback Line Wiring Error	Check if the aerosol release feedback line wiring is correct.
13	LOOP OPEN LOOP 1	Loop Open Circuit	Check the loop wiring. (After restoring correct wiring, reset the fire suppression control panel or wait approximately 2 minutes for the fault to clear automatically.)
14	SHORT LOOP-OUT LOOP 1	Loop Short Circuit	• Check if there is a short circuit in the loop wiring. • Check if the positive or negative loop wiring is reversed. (After restoring correct wiring, reset the fire suppression control panel or wait approximately 2 minutes for the fault to clear automatically.)
15	/	Fire Suppression Control Panel Requires Reset	Reset the fire extinguishing control panel.
16	OPEN OUTPUT Valve	Aerosol discharge circuit fault	Check the wiring of the aerosol discharge circuit.
17	WRONG TYPE Device name (e.g., Smoke 1) Device address (e.g., Point 1)	Wrong detector type	Check if the installation positions of the smoke detector or heat detector are reversed.
18	DOUBLE ADDRESS Device name (e.g., Heat 1) Device address (e.g., Point 2)	Duplicate device address code	Check if the device address code settings are duplicated.
19	DISABLE Automatic Exiting	Fire extinguishing control panel set to manual mode	Rotate the key switch  on the fire extinguishing control panel clockwise, then tap "Enable Auto" on the display to restore the fire extinguishing control panel to automatic mode.
20	GENERIC FAULT Input stop exiting	Emergency stop button pressed	Reset the emergency stop button.
21	OPEN INPUT Manual Stop	Emergency stop button circuit open	Check the wiring of the emergency stop button circuit.

		Emergency stop button end-of-line resistor disconnected	Check if the end-of-line resistor of the emergency stop button is loose or disconnected.
22	SHORT INPUT Manual Stop	Emergency stop button circuit short circuit	Check the wiring of the emergency stop button circuit.
23	OPEN INPUT Manual Exiting	Emergency release button circuit open	Check the wiring of the emergency release button circuit.
		Emergency release button end-of-line resistor disconnected	Check if the end-of-line resistor of the emergency release button is loose or disconnected.
24	SHORT INPUT Manual Exiting	Emergency release button circuit short circuit	Check the wiring of the emergency release button circuit.
Other faults			
1	No display or abnormal display on the fire extinguishing control panel after power-on	Main board damaged Display damaged	• Contact the service provider for replacement. • Contact the service provider for replacement.
2	No response when pressing the fire extinguishing control panel buttons	Button damaged	Contact the service provider for replacement.
Smoke detector faults			
1	Smoke detector does not alarm when tested	Detector damaged	Replace the smoke detector
2	Smoke detector false alarm	Detector contaminated	Contact the service provider to clean the smoke detector
		Detector damaged	Replace the smoke detector
		Water ingress into the detector or circuit causes the fire extinguishing control panel to malfunction.	Replace the smoke detector
		Fire extinguishing control panel main board damaged	Replace the fire extinguishing control panel

Common faults and troubleshooting methods for fan louver			
1	Fan cannot run normally or close	Fan damage	Replace the fan
		Fan circuit abnormality	Check the fan circuit
		Fan control unit not powered or damaged	• Replace the fan control unit • Check the wiring of the DC 24V input terminal
2	Electric actuator cannot open or close normally	Electric actuator damage	Replace the electric actuator
		Electric actuator circuit abnormality	Check the electric actuator circuit
		Fan control unit not powered or damaged	• Replace the fan control unit • Check the wiring of the DC 24V input terminal

8.4. Power Distribution System Troubleshooting



NOTICE!

- Power-off operation: Before touching any electrical component, ensure the system has completely shut down, and follow the operating procedures for power-off, power verification, discharge, and lockout/tagout.
- Personal protection: Wear appropriate personal protective equipment, such as insulated gloves, insulated shoes, and a safety helmet.
- Professional qualifications: Operations must be performed by qualified professional personnel.



Refer to other manual

For detailed procedures, please refer to the power distribution box user manual.

Drawings and manuals: Always keep the electrical schematic diagrams, wiring diagrams, and equipment manuals safe. They are the "map" for troubleshooting.

Troubleshooting follow the principle of "from outside to inside, from simple to complex":

1. Phenomenon confirmation: Identify the alarm information and fault indicator status.
2. External inspection: Check the appearance, connections, and environment.
3. Internal testing: Use tools to measure parameters such as voltage, current, and resistance.
4. Sectional isolation: Locate the faulty section by disconnecting parts of the connections.
5. Component replacement/repair: Address after confirming the fault point.

1. Power Interruption Faults (System cannot power on, charge or discharge)

Table 8-2. Common Fault Types and Detailed Troubleshooting Steps

Check Item	Trouble shooting	Check Item		Possible Causes & Tools
1	External Input	Is the grid-side voltage normal	Is the upstream switch closed	Grid fault, upstream circuit breaker tripped, measure with a multimeter
2	DC Input	Is the battery cluster output voltage normal	Are the battery-side fuse/circuit breaker normal	Battery system protection, loose connector, blown fuse
3	Main Circuit Switch	Are the DC contactor and AC contactor engaging normally	Damaged control coil, auxiliary contact fault, drive signal not received	Listen for sound, measure coil voltage
4	Control power supply	Is the 24V/12V power supply for the controller and relays normal	Switching power supply module fault, fuse blown	This is a very common problem point
5	Emergency stop and interlock	Is the emergency stop button reset	Are all safety interlock signals (door switch, fire signal) normal	Safety circuit triggered

2. Electrical Parameter Anomaly Faults (Unstable voltage, current, frequency)

Table 8-3 Electrical Parameter Anomaly Faults Troubleshooting

No.	Troubleshooting	Check Item	Possible Causes & Tools
1	Measurement Verification	Use a clamp meter and oscilloscope to measure actual values at key points and compare with sensor readings.	Sensor (Hall sensor, voltage transformer) damage or drift.
2	Lines & Connections	Check busbars and cable connection points for overheating, ablation, or looseness.	Increased connection resistance causes voltage drop and heating. Use thermal imager for assistance.
3	Protection Settings	Verify whether the protection thresholds for overvoltage, undervoltage, over-frequency, and underfrequency are set correctly.	Incorrect settings lead to false alarms or false trips.
4	Grounding Check	Check if the system grounding is good and measure the insulation resistance to ground.	Insulation degradation leads to leakage or interference. Use a megohmmeter.

3. Communication and Control Faults (No BMS/EMS data, remote control failure)

Table 8-4 Communication and Control Faults Troubleshooting

No.	Troubleshooting	Check Item	Possible Causes & Tools
1	Physical Layer	Are the communication lines (CAN/RS485/Ethernet) broken or shorted? Are the termination resistors matched and intact?	Wiring errors, port corrosion, electromagnetic interference.
2	Configuration Layer	Are the communication address, baud rate, and protocol format consistent with the BMS and EMS settings?	Parameter configuration error. Consult the equipment manual.
3	Device Layer	Are the communication converter, switch, and communication manager powered normally? What is the indicator light status?	Communication hardware fault. Try restarting or replacing for testing.
4	Software & Logs	Check the fault logs and event records on the controller's local HMI or uploaded to the EMS; they often contain precise codes.	Program error, logic interlock.

4. Protection Device Operation Faults (Circuit breaker tripped, fuse blown)

- Blown fuse: A short circuit fault is highly likely. Thoroughly inspect the lines, capacitors, and power devices downstream of the fuse for breakdown.
- Circuit breaker tripped:
 - Overload trip (time-delayed): Check if the load current exceeds the rated value.
 - Short circuit trip (instantaneous): Identify the short circuit point.
 - Leakage protection trip: Perform a comprehensive insulation test.



NOTICE!

- It is strictly forbidden to directly replace protective devices with a higher rating! The cause must be identified.
-

9. Maintenance and Replacement



DANGER!

Before conducting maintenance operations, please power off the equipment by referring to section 7.6 Power-off Procedure.



NOTICE!

- The operation and maintenance of equipment such as battery PACK, liquid cooling unit, and fire safety system must be performed by qualified and authorized personnel.
- Some maintenance items require the system to be shut down first.

The system which has been running for more than six months or does not run for a long time shall receive a safety maintenance, and corresponding records shall be kept. The specific items are as follows:

- Check whether the safety door, main door and battery cabinet door of the container can be opened normally to ensure a clean and tidy environment inside and outside the container;
- Check whether the fire suppression system can give an alarm and start normally, and whether there is fire protection equipment around the container for emergency use in case of accidents;
- Check whether each power line is insulated abnormally, whether the electrical safety clearance reaches the safety standard, and whether the wiring bolts are loose;
- Check whether the electrical components are normal and whether the power supply doors can be disconnected effectively.

9.1. Battery Maintenance

9.1.1. Battery Recharging

Recharging temperature requirement

Item	Requirement
Working temperature	-20℃~55℃

Item	Requirement
Optimal working environment temperature	20°C~40°C

Recharging steps

- Discharge the battery system to the cut-off condition (total voltage < 1164.8V or minimum voltage < 2.8V), then stop discharging and let it stand for 1 hour.
- Fully charge the battery system (total voltage ≥1497.6V or maximum cell voltage ≥3.6V), and after charging, let it stand for 1 hour.

Recharging power requirement

The cell temperature should be above 0°C during recharging, and the recharging power should comply with the following charge and discharge map.

Cell temp./°C	0	5	10	15	20	25	35	40	45	55	≥60
Max charging power (P)	0.05	0.12	0.25	0.33	0.5	0.5	0.5	0.5	0.5	0.5	0
Max discharging power (P)	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	\

9.1.2. Battery Maintenance

Table 9-1 Battery PACK Maintenance Procedure

Maintenance frequency	Category	Maintenance content	Remarks
Quarterly	Voltage inspection	Check the voltage of battery system with a monitoring system. Check for normal system voltage. For example, whether the voltage of a single battery PACK is too high or too low.	
	SOC inspection	Check the SOC of the battery system through the monitoring system. Check the battery PACK for normal SOC.	
	Cable inspection	Visually inspect all cables of the battery system. Check for broken, aged or loose cable.	

Maintenance frequency	Category	Maintenance content	Remarks
	Balance inspection	The battery PACK will be unbalanced after long-term incomplete charging. Solution: Balanced maintenance shall be carried out every 3 months (until the battery PACK is fully charged), which is completed automatically by the communication between the system and external equipment under normal circumstances.	
	Output relay inspection	The output relay is turned off and on under low load conditions (low current), and the relay can be disconnected and connected normally if a click sound is heard.	
	Inspection of historical records	Analyze the historical records, check for accident (alarm and protection), and analyze its cause.	
Semi-annually	Repeat	Repeat the quarterly maintenance and inspection.	
	Dust inspection	Keep the battery cabinet clean.	
	Temperature	Measure and record the ambient temperature in the battery cabinet.	
	Appearance	Check the appearance cleanliness of each battery PACK; check terminals and terminal cover for damage or overheating.	
	Voltage	Check the voltage of battery system with a monitoring system. Check for normal system voltage. For example, whether the voltage of a single battery PACK is too high or too low.	
	Shutdown and maintenance	It is necessary to maintain some system functions every 6 months during the restart of network management.	
Annually	Repeat	Repeat the quarterly maintenance and inspection.	
	Tightness inspection	Check each cable connector for looseness every year and tighten the loose ones.	
	Discharge test	Perform discharge test once a year under accurate load, and the discharge capacity is 30-40% of the rated capacity. Carry out the 80% DOD capacity test once a year after three-year's operation. The BESS system shall be fully charged prior to the discharge test.	

Table 9-2 Record of capacity test results

[illegible]

9.1.3. Battery Replacement



DANGER!

- This Battery system is a high voltage DC system and can only be operated by qualified authorized personnel.
 - Before replacing major components, the main circuit of the maintenance battery cluster must be disconnected first.
 - All component repairs and replacements can only be performed by qualified personnel, and only approved materials, components, and parts can be used for replacement.
-



WARNING!

- Different types of batteries, for example, batteries of different brands or rated capacities, can't be used together without prior approval from the Company.
 - Do not use a damaged battery (such as damage caused when a battery is dropped, bumped, bulged, or dented on the enclosure), because the damage may cause electrolyte leakage or flammable gas release.
 - Do not perform welding or grinding work around batteries to prevent fire caused by electric sparks or arcs.
 - If batteries are exposed to water accidentally, do not install them. Instead, transport the batteries to a safe isolation point and contact technical engineers in a timely manner.
-



NOTICE!

- In case more than one PACK needs to be removed at once, please mark their cables one by one, so that they can be reconnected correctly later.
 - Please wear anti-static gloves before touching electronic components.
-

Disassemble battery PACK

1. Power off by referring to 7.7 Power-off Procedure;
2. Find the faulty battery PACK, and pull out the MSD (1) in the reverse order of 5.6 Install MSD on PACK Panels.
3. Disconnect power cables, communication harness and copper busbars connected to PACK or high voltage box, referring to Figure 2-11 power and communication cables of Battery Cluster
4. Disconnect the coolant output pipes (3) by disconnecting its connectors (1&2), disconnect the coolant input pipes (6) by disconnecting its connectors (4&5).

Note: place the disassembled components in designated positions for later use.

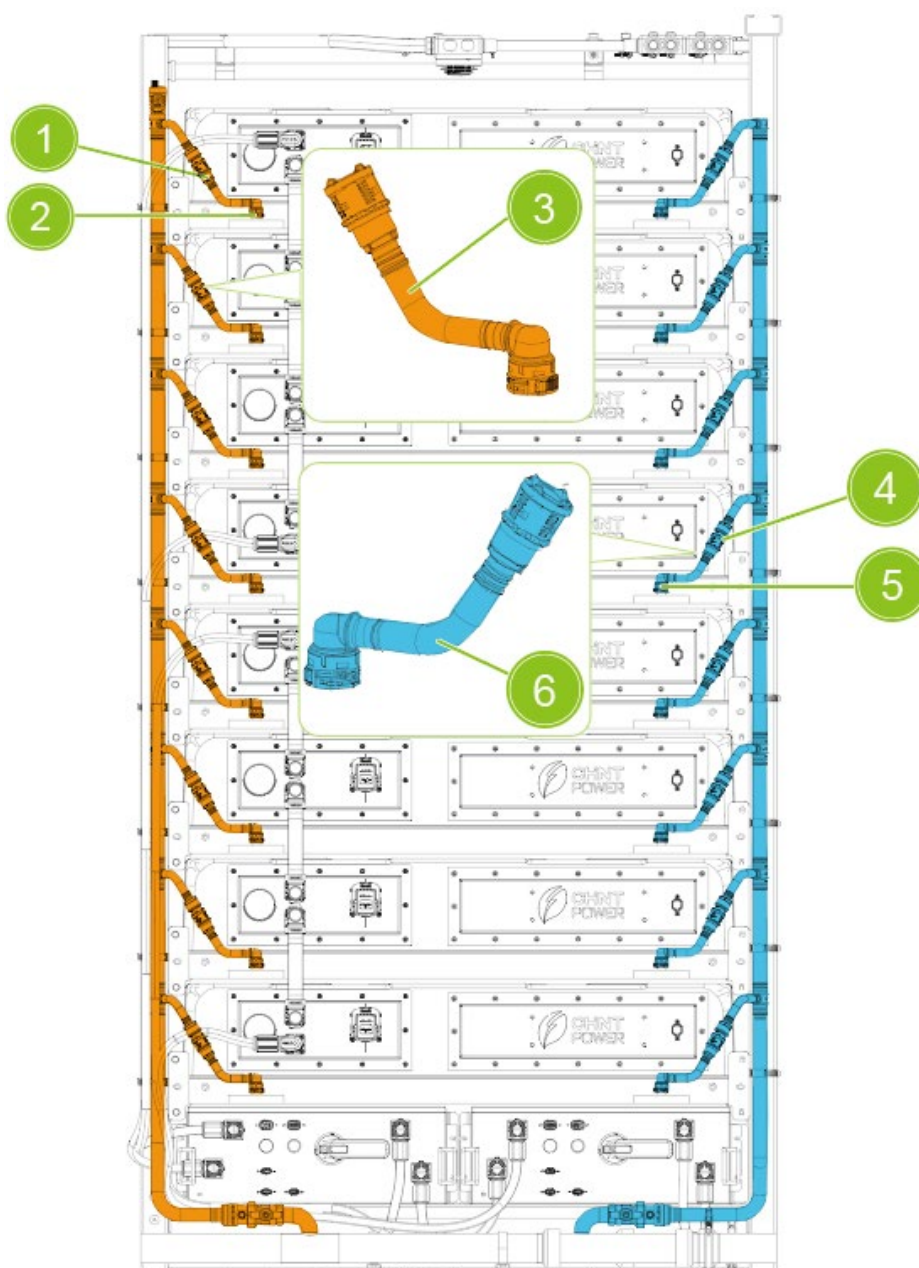


Figure 9-1 Remove the coolant pipes

5. Remove the battery PACK from the battery rack.
 - Remove six M8 fixing screws (1) from the retainer plate (2), and then remove one M8 fixing bolts (3) of grounding cable, all by 13# socket wrench. Note: place them in the specified position for later use.
 - Connect special traction ropes to traction holes (4) and pull the PACK (5) out of the rack slightly.

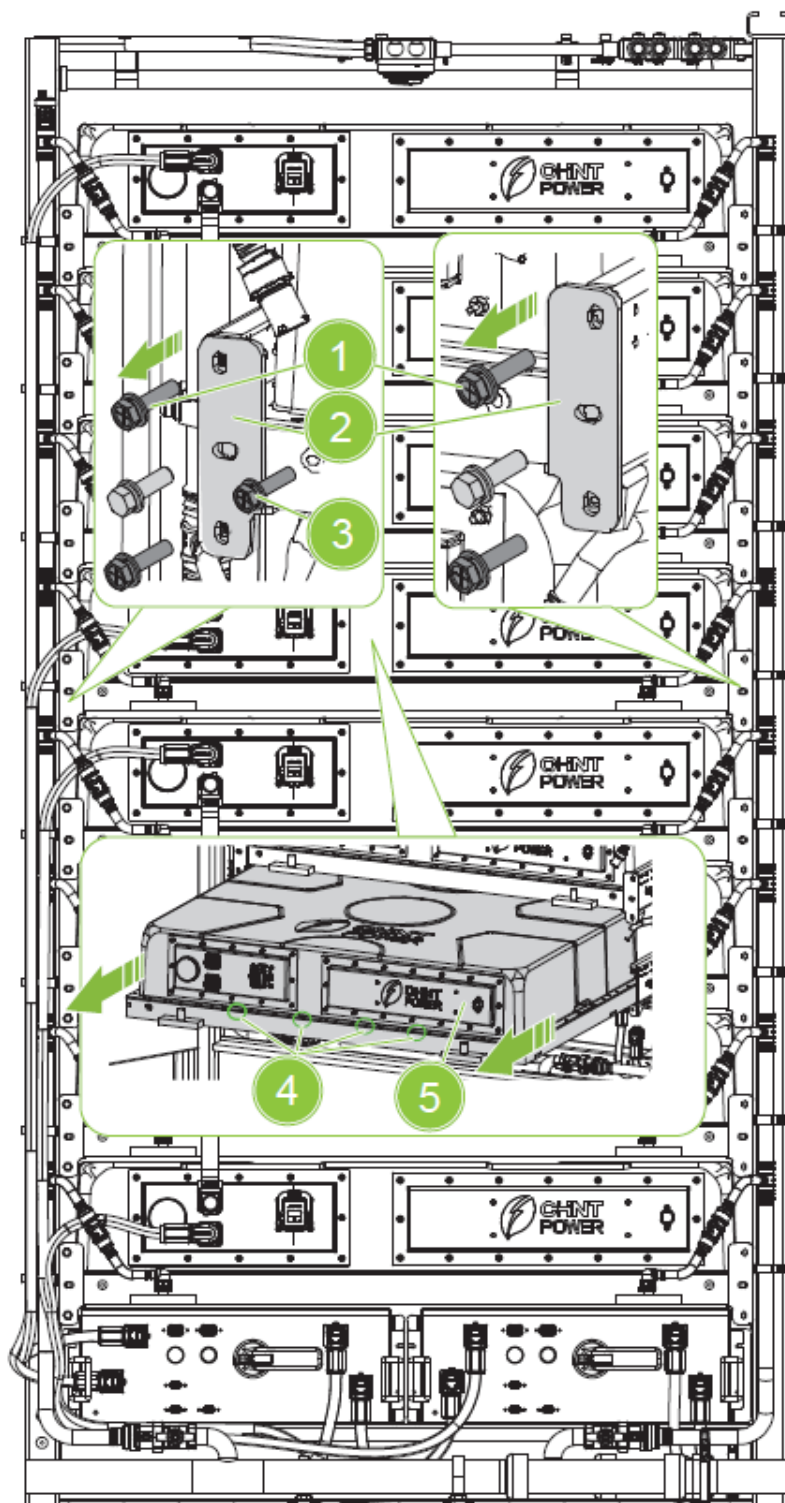


Figure 9-2 Remove the battery PACK



DANGER!

- Single battery pack is appr. 1.25T.
 - Protective measures shall be taken to prevent falling of battery PACK.
 - During handling process, please pay attention to personnel protection to prevent personnel injury or death from the battery pack falling.
6. Move the special forklift with rolling platform (prepare by customer) to the bottom of the target battery PACK, move the battery PACK onto the forklift, and completely pull it out from the rack.

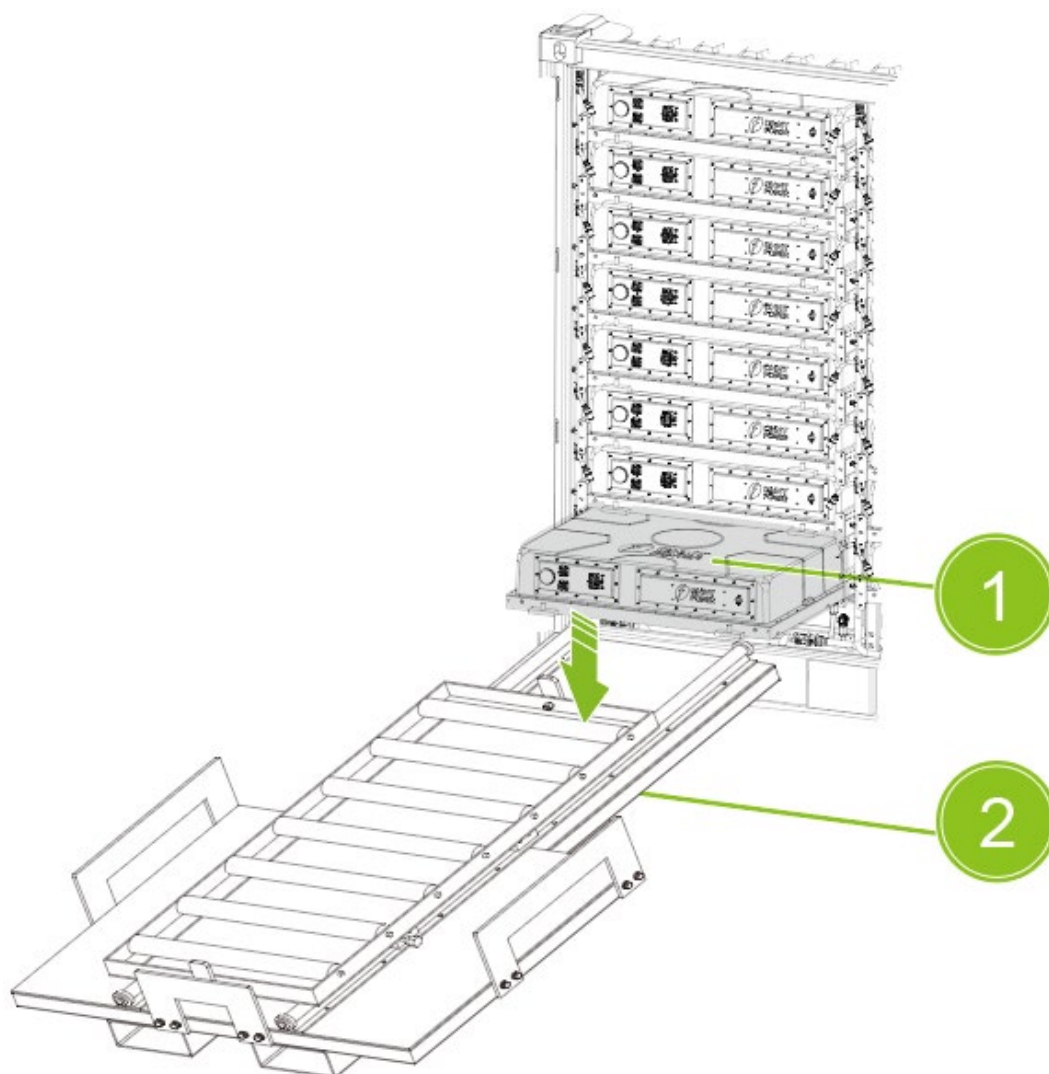


Figure 9-3 Place the battery PACK on the lifting tool

Install the battery pack



WARNING!

- Ensure that disconnecting switch on the high-voltage box is in the "OFF" position. Ensure that there is no 120/220VAC auxiliary control power input in the high-voltage box.
- Execute operations with caution to prevent electrical shorts between battery PACK positive/negative terminals.
- Ensure terminals remain isolated and avoid contact with non-designated surfaces during installation.
- After installing power cables for each battery PACK, ensure proper insertion of cable connectors

The whole installation order of PACKs shall follow the basic principle of "from top to down". In other words, install the 4# ~1# PACK of cluster 2 (1) one by one at first, then the 4# ~1# PACK of cluster 1 (2).

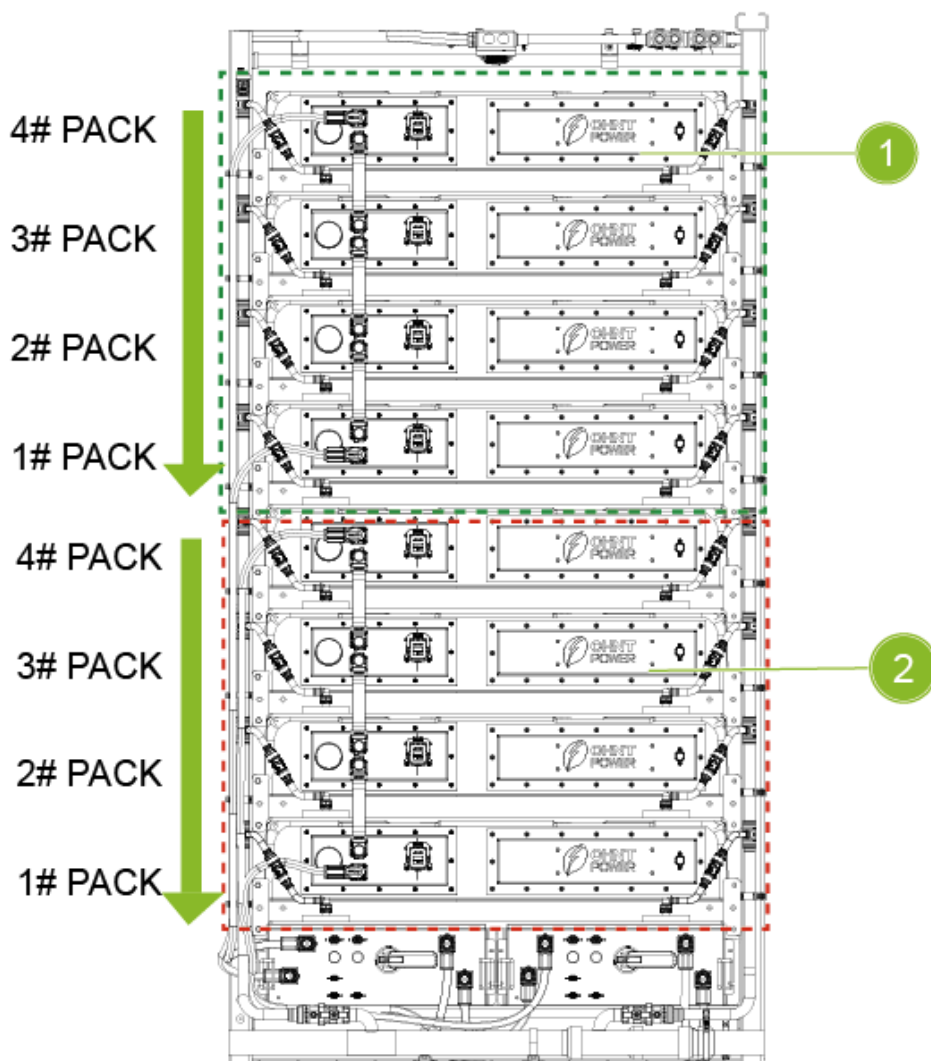


Figure 9-4 install order of PACKs

For the detailed installation steps, please refer to the following instructions.

1. Use the special forklift with rolling platform (2, prepare by customer) to lift the new battery PACK (1), push it onto the rack.

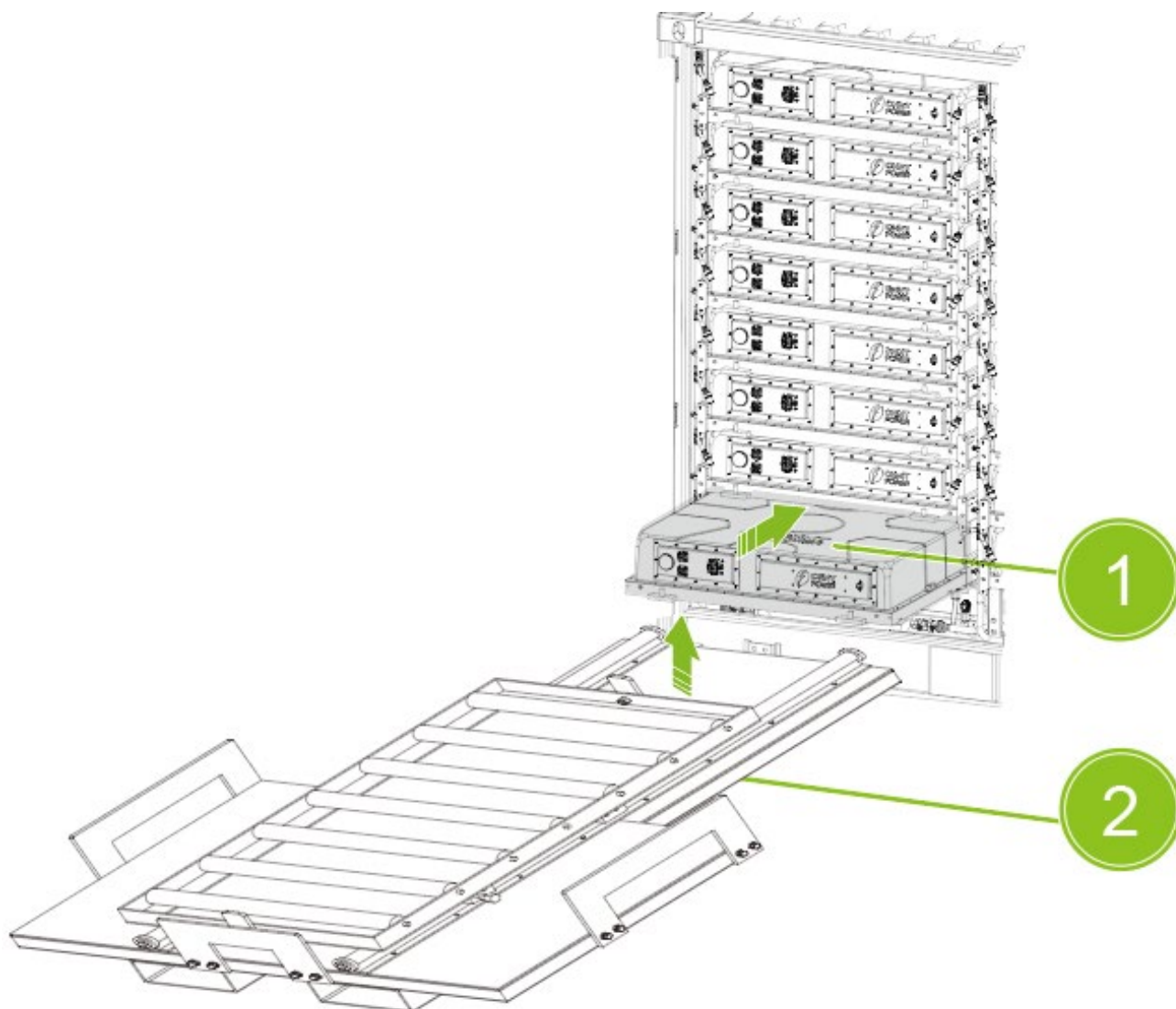


Figure 9-5 Place the battery PACK on the lifting tool



DANGER!

- Single battery pack is appr. 1.25T.
- Protective measures shall be taken to prevent falling of battery PACK.
- During handling process, please pay attention to personnel protection to prevent personnel injury or death from the battery pack falling.

2. Install six M8 fixing screws (1) on the retainer plate (2), install one M8 fixing bolts (3) of grounding cable. Tool: 13# socket wrench, tightening torque: 12.5N.m.

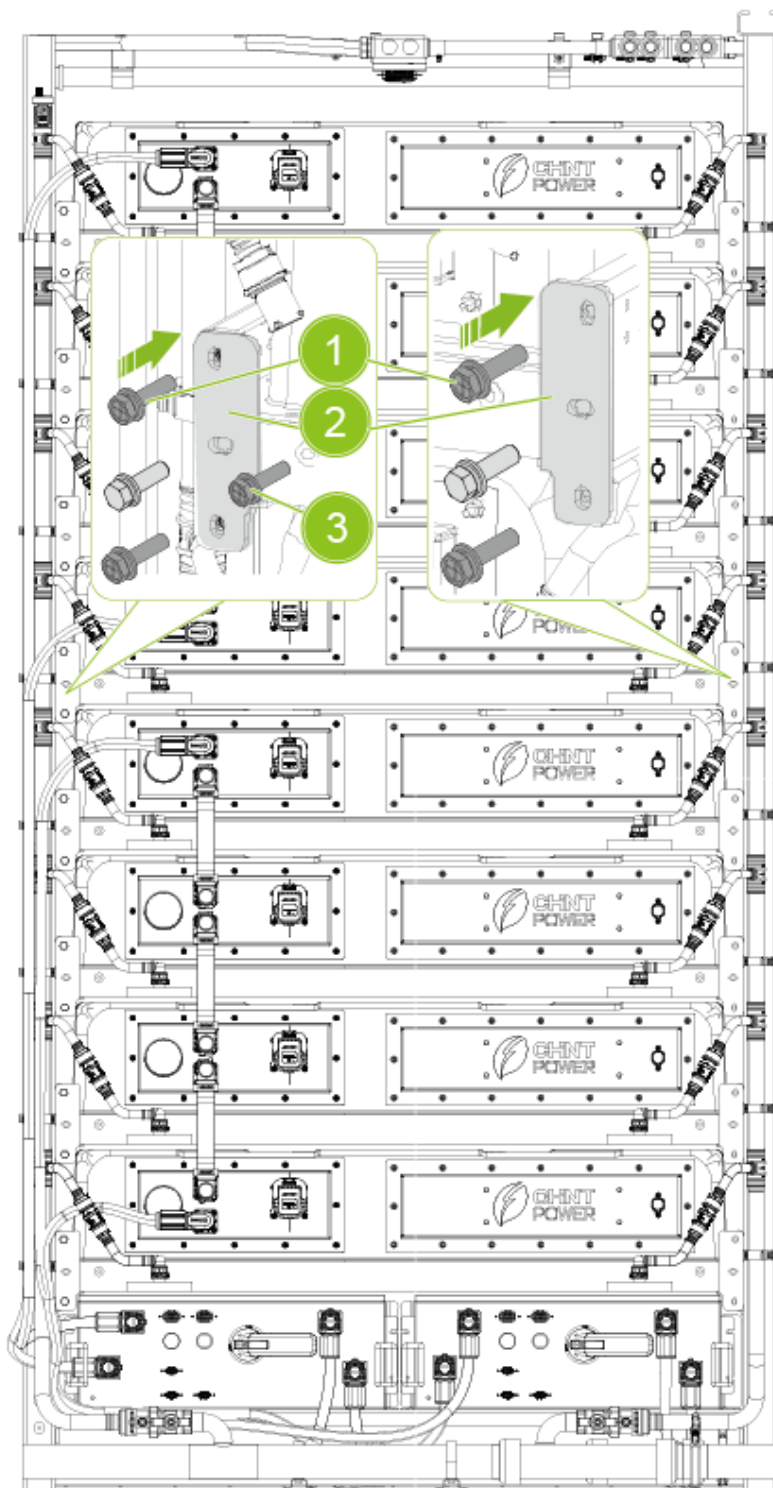


Figure 9-6 Remove the battery PACK

3. Reconnect the coolant output pipe (3) by disconnecting its connectors (1&2), reconnect the coolant input pipe (6) by disconnecting its connectors (4&5).

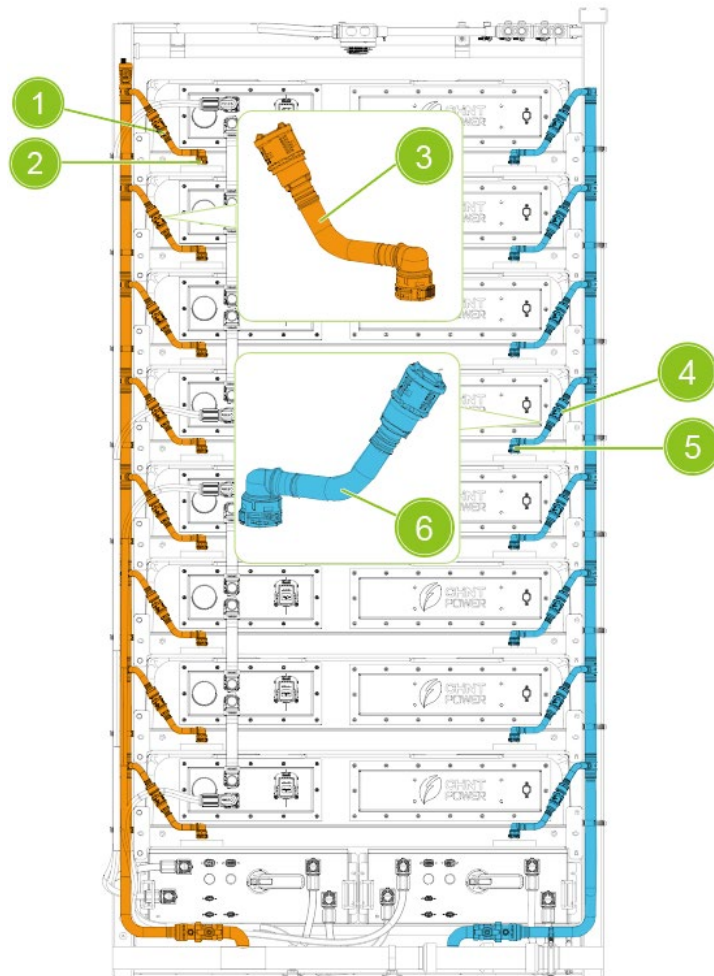


Figure 9-7 Reconnect the coolant pipes

4. Reconnect power cables, communication harness and copper busbars connected to PACK or high voltage box, referring to Figure 2-11 power and communication cables of Battery Cluster
5. Install the MSD, referring to 5.6 Install MSD on PACK Panels.



NOTICE!

- Before installing the new battery PACK, please verify whether the capacity of the battery PACK matches the system: if they do not match, consult a battery PACK engineer.
- After the installation of the new battery PACK, power on the system, and then confirm the status information of the target battery PACK through the display and control interface to determine if the fault has been resolved or proceed with the next step of operation. Please contact professionals or manufacturers for handling if there is any other abnormal information.

9.2. Liquid Cooling Unit Maintenance

Table 9-3 Maintenance Procedure for Liquid Cooling Unit

Frequency	Category	Maintenance standard	Method	Treatment
Quarterly	Appearance of unit	The unit is clean and free of dust and dirt;	Visual inspection	Remove dust and dirt from the unit with a brush or cotton cloth 10 minutes after power failure.
	Reliability of fan operation	The fan is free from dust, and there are no obstructions at the air outlet.	Visual inspection	Clean the dust on the fan with a brush 10 minutes after power failure. Clear the obstacles at the air outlet.
	Condenser cleaning	The condenser is not blocked by dust and foreign matters	Visual inspection	Clean the condenser with compressed air or a vacuum cleaner equipped with a brush 10 minutes after power failure.
		The fin is free of serious bending deformation.	Visual inspection	Correct with tools such as fin comb 10 minutes after power failure.
Semi-annually	Repeat	Repeat the quarterly maintenance and inspection.		
	Reliability of power cables and terminals on the wiring panel	Electrical cables and wiring terminals are not loose.	Visual inspection	Tighten the loose cable with a screwdriver 10 minutes after power failure.
		Electrical cables are free of aging, damage, abnormal heating and other abnormalities.	Visual inspection	Replace the power cable 10 minutes after power failure.
		Wiring panel is free of dust	Visual inspection	Clean the dust with a brush 10 minutes after power failure.
	Reliable operation of fan	The fan blades are not damaged, and the fan rotates smoothly without abnormal sound.	Visual inspection	Tighten the fan 10 minutes after power failure, and check whether there are internal cables interfering with the rotation of the fan. If the fan fails, replace it.
	Coolant	1. The concentration meets the range requirements 2. PH and electrolyte concentrations meet the requirements	1. Coolant detector; 2. Visual inspection;	Replace the coolant 10 minutes after power failure.

Frequency	Category	Maintenance standard	Method	Treatment
		3. No dirt, sediment and algae is detected		

9.3. Fire Protection Maintenance

Table 9-4 Fire Protection Maintenance Procedure

Frequency	Category	Maintenance content	Remarks
Monthly	Signboard inspection	Check warning signs in the protection area, including those of manual starter, emergency stop switch and manual/automatic change-over switch (emergency service switch), to confirm that all of them are in their original positions, installed firmly, and not damaged.	
	Repeat	Repeat the routine maintenance and inspection.	
	Equipment tightness	Check whether all equipment that keeps the tightness of protection area is intact. Fire damper and other linkage equipment shall be subject to a linkage test every six months.	
	Cylinder	Use a pressure gauge to test the cylinder pressure every six months to check whether indication of the pressure gauge on the cylinder head valve is accurate; Remove the electromagnetic starter, emergency mechanical starter and high-pressure release hose from the cylinder head valve before pressure measurement; Re-install them to the cylinder head valve after the pressure measurement if it is confirmed that the control panel works normally.	
Quarterly	Repeat	Repeat the monthly maintenance and inspection.	
	Control panel	Check the control panel and confirm that it works normally. If there is a fault signal on the control panel, notify the professional company in charge of maintenance for inspection.	

Frequency	Category	Maintenance content	Remarks
	Control switch	Check whether the manual starter, emergency stop switch and manual/automatic change-over switch are in their original positions and in normal working conditions.	
	Gas extinguishing cylinder	Check the electromagnetic starter of selector valve, starter connector and emergency mechanical starter for normal operating conditions; Check the pressure switch for secure installation and normal operating conditions; Check whether the pressure gauge of each cylinder is within the green normal pressure range; Check the electromagnetic starter, starter connector and emergency mechanical starter of each active cylinder for normal operating conditions.	
Annually	Repeat	Repeat the monthly maintenance and inspection.	
	Integrity of protection area	Investigate whether the protection area is consistent with the originally designed system protection area and whether the integrity of the protection area is damaged.	
	Sprinkler/ nozzle	Check all nozzles to confirm that they are in the original positions, and the pressure relief device is in the original position and its size and opening diameter is the same as that originally designed. Check the nozzle for corrosion and damage, and confirm that the nozzle is not blocked inside or outside.	
	Pipeline	Check condition of the pipe network, confirm that the pipe network is fastened on the support, and all pipe fittings and fasteners are connected firmly, and prepare a pipeline purging scheme according to the actual situation on site.	
	Cylinder support	Check all cylinder supports and confirm that all cylinders are installed firmly on the supports. Check for corroded, damaged or missing parts.	
	High-pressure release hose	Check the condition of all cylinder high-pressure release hoses. Look for signs of structural issues such as wear or	

Frequency	Category	Maintenance content	Remarks
		aging, and verify that all the hose connections are secure and in good condition.	
	Starter	Check the electromagnetic starter and mechanical starter for complete functions.	
	Control panel	Check the control panel for changes, corrosion or damage. Test the control panel according to the corresponding control panel operation manual.	
	Detector	Check all detectors to confirm that they are in place, clean and undamaged. Test all detectors in accordance with debugging requirements. Test the sensitivity of each detector according to the procedures of the detector manufacturer if necessary.	
	Warning indicator	Check each buzzer, flashing light and alarm bell. Check the alarm condition and verify that it can operate correctly when being energized. Reset the alarm circuit after each alarm device is tested.	
	Operating mode	Perform a simulation test on the overall system in three operating modes, and make sure that all tests meet the system debugging requirements.	

[illegible]

9.4. Power Distribution Box Maintenance

Preventive maintenance: Regularly tighten electrical connections, clean dust, and record trends of key parameters to prevent problems before they occur.



NOTICE!

- Power-off operation: Before touching any electrical component, ensure the system has completely shut down, and follow the operating procedures for power-off, power verification, discharge, and lockout/tagout.
- Personal protection: Wear appropriate personal protective equipment, such as insulated gloves, insulated shoes, and a safety helmet.
- Professional qualifications: Operations must be performed by qualified professional personnel.



Refer to other manual

For detailed maintenance procedures, please refer to the power distribution box user manual.

9.5. System Maintenance

The product appearance should be kept intact. If there is paint peeling, it should be repainted immediately. Visually inspect the extent of paint damage on the product, prepare the corresponding tools and materials, and assess the quantity of materials on-site based on the repainting situation.

Check the appearance damage and select the appropriate solution based on different levels of damage.

- Solution 1: Surface dirt can be wiped off
- Solution 2: Surface dirt cannot be wiped off
- Solution 3: Primer damage exposes the substrate

Operation steps of Solution 1

1. Prepare tools and materials: cloth, water, alcohol or other non-corrosive cleaners.
2. Use a cloth (or other scrubbing tool) dipped in water to scrub the dirty areas of the surface; use a cloth (or other scrubbing tool) dipped in water to scrub the dirty areas of the surface.

Operation steps of Solution 2

1. Prepare tools and materials: sandpaper, cloth, water, alcohol, zinc-rich primer, brush, and paint with the corresponding color number of the cabinet.
2. Use sandpaper to sand the areas where the surface paint is raised or scratched to make the surface smooth.
3. Use a cloth dipped in water or 97% alcohol to scrub the damaged areas to remove surface stains.
4. After the surface is dry, use a soft brush to touch up the paint on the scratched areas, and try to keep the paint application as even and consistent as possible.

Operation steps of Solution 3

1. Prepare tools and materials: sandpaper, cloth, water, alcohol, brush, and cabinet paint with the corresponding color code.
2. Gently sand the damaged area with fine sandpaper to remove dirt or rust.
3. Moisten a cloth with anhydrous ethanol and wipe the sanded or repair area to remove surface dirt and dust, then dry it with a clean cloth.
4. Use a brush or spray gun to apply zinc-rich primer to the damaged coating area.
5. Depending on the degree of paint damage, choose one method from spray paint, brush paint, or spray gun application to evenly touch up the damaged coating area until the damage marks are no longer visible.
6. After painting, let it sit for about 30 minutes, then observe whether the touched-up area meets the requirements.

10. Quality Assurance

10.1. Liability Exemption



NOTICE!

The Company shall not be liable for any consequences or losses arising from the following circumstances and reserves the right to refuse warranty services:

1. Exceed the quality assurance period of the product.
2. Cannot provide product serial number or the SN is not clear/complete. Incorrect or inappropriate use of the product (including installation and use).
3. Damage during transportation/storage/handling.
4. Misuse, abuse, intentional damage, negligence or accidental damage.
5. Improper commissioning, testing, operation, maintenance or installation performed by customer, including but not limited to:
 - Failure to meet safe operating environment or system requirements of external electrical parameters provided in written document;
 - Failure to operate the covered product in accordance with the product's operating manual or user guide;
 - Relocate and reinstall systems not in accordance with the requirements of Chint power;
 - Unsafe electrical or chemical environment or other similar kind of conditions;
 - Direct failure caused by wrong voltage or faulty power system;
 - Unauthorized disassembly of the products, or unauthorized modification of the product or provided software;
6. Entrust installation, maintenance personnel not designated by the CHINT to install, repair and disassemble the products.
7. Damages caused by ignoring the safety warnings in the manual or break the rules in relevant statutory safety regulations.
8. Damages caused by operating environment beyond the requirements of the product user manual or failure to commissioning, install, use and maintain the equipment according to the requirements of the product user manual.
9. Unforeseen disasters or irresistible accidents (including but not limited to acts of public enemies, acts of government agencies or domestic or foreign institutions, vandalism, riots, fires, floods, typhoons, explosions or other disasters, epidemic or quarantine restrictions, labor disturbances or labor shortages, accidents, cargo embargoes or any other events beyond the control of CHINT).
10. The lightning protection measures have not been implemented or are not in accordance with standards (lightning protection measures should comply with the relevant national and IEC standards; otherwise, it may result in damage to photovoltaic devices such as modules, inverters, distribution facilities, etc., due to lightning strikes).

-
11. Equipment failure or software damage caused by using non-standard components/accessories, connection of incompatible configurations (such as batteries, etc.) or other brand products or accessories without permission, improper configuration selection/storage/use.
 12. Abnormal battery degradation or damage caused by improper use or maintenance.
 13. For any matters not covered herein, please refer to the warranty documents published on the company's official website.

10.2. Quality Clause (Warranty Clause)

1. For products that fail during the warranty period, our company will repair or replace new products free of charge;
2. Customer shall present the invoice of the product and date of purchase. At the same time, the trademark on the product should be clearly visible, otherwise we have rights to refuse quality assurance.
3. The unqualified product under replacement should be returned to our company;
4. It is necessary to provide a reasonable time for the company to overhaul the equipment.
5. For more warranty terms, refer to the applicable standard warranty policy in place at time of purchase.

If you have any questions about the equipment, please contact us, we will be very happy to help you.

11. Disposal



WARNING!

- This device cannot be disposed of and scrapped as household waste.
- When the service life of the equipment or its internal components expires, please dispose of or recycle it in accordance with the applicable electrical waste disposal or recycling laws in the installation location.

12. Annex

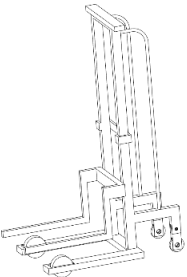
12.1. Personal Protective Equipment List

Category	Sample	QTY	Requirements
Safety helmet			Your hard hats must meet one of the two types: TYPE 1: Protects the top of the head; TYPE 2: Protects both the top and the sides of the head. Your hard hats must meet with one of the three classes: CLASS G: These are general hard hats rated for 2,200 volts. CLASS E: These are electrical hard hats rated for 20,000 volts. CLASS C: These are conductive hard hats, and they do not offer electrical protection at all 1) Wear a helmet correctly before entering the construction site to protect your head. 2) The helmet shall meet the requirements of GB 2811-2007 Safety Helmet.
Electrician clothes			Service personnel on site shall wear electrician's clothes.
Protective shoes			1) Wear protective shoes during battery PACK transportation and installation. 2) Service personnel on site shall wear protective shoes.
Insulating gloves-480V ac			Maintenance personnel on site shall wear insulating gloves.
Insulating gloves-1500V dc			Maintenance personnel on site shall wear insulating gloves.
Masks			Service personnel on site shall wear masks

Note: Other types of PPE and their corresponding quantity depend on the requirements on site.

12.2. Tool List

No.	Name	Material	Spec.	Sample	Qty.	Calibrate Date	Validity
1	Laptop				2		
2	Tape measure	Steel	5m		1		
3	Wrench (insulated)	Stainless steel	1 set		1		
4	Socket wrench (Insulation)	Stainless steel	1 set		1		
5	Insulated torque wrench	Stainless steel	1 set		2		
6	Screwdriver	Stainless steel	1 set		1		
7	Gradiometer (Gradiometer)	Aluminum alloy	1000 mm		1		
8	Electric wrench				1		

No.	Name	Material	Spec.	Sample	Qty.	Calibrate Date	Validity
9	Electric drill				1		
10	Multimeter-DC 2000V				1		
11	Battery tester		HIOK I 3564		1		
12	Lift truck				1		

12.3. Suggestions on Anti-corrosion Grades

Grade	Degree of corrosion	Typical environment
C3-M	Medium	Coastal cities' buildings, low-salinity coastal areas, and production sites with condensate water
C4-M	High	Coastal industrial zone, port facilities, chemical plants, bridges, high-salinity coastal areas
C5-M	extreme high	Offshore drilling platforms, cross-sea bridges, ships, areas that are frequently exposed to seawater splashing or immersion

12.4. Terms and Definitions

Terms	Definitions
Battery PACK	Battery assembly consisting of battery cells connected in series, parallel, or both, with a pair of positive and negative output terminals, which should also include housings, management and protection components.
High voltage box	It is used for the protection and control during charging and discharging of battery cluster, and consists of the cluster-level battery management unit, relay, fuse, power resistor and disconnecter.
Battery cluster	Battery assembly that is connected by the battery PACK in series and can run independently after being connected with a PCS and ancillary facilities, which shall also include the battery management system, monitoring and protection circuit, electrical and communication interfaces and other components.
PCS	Power Conversion System, accepts the EMS or BMS requirements, and charges and discharges batteries.
BMS	Battery Management System, used to detect the voltage, current, temperature and other parameter information of the battery and manage and control the state of the battery.
ESBMM	Energy Storage Battery Management Module, the slave module in BMS, which is used to collect the voltage and temperature of single battery in the battery PACK, and achieve the balance management of battery.
ESBCM	Energy Storage Battery Control Module, the main control module in BMS, which enables the real-time monitoring of battery cluster parameters, fault handling, SOC/SOH estimation, insulation detection, alarm display, remote monitoring, relay control, equalization algorithm, and collection of total voltage and main loop current, communication with ESBMM in the system BMS, and communication with the master control module and uploading of real-time battery data.
ESMU	Energy Storage Management Unit, the master control module in BMS, which communicates with the main control module to query the information inside the module, and summarizes the information of multiple battery clusters; communicates with HMI to query on the corresponding HMI; communicates with the background to query in the corresponding background; communicates with PCS to control the charging and discharging of PCS; and inputs and outputs dry contacts as required, and communicates with air conditioning, fire protection and other system equipment as required.
EMS	Energy Management System of the whole power station, used for dispatching, monitoring and management of the whole power station.
LEMS	Local Energy Management System, also local controller, used for managing the local equipment.
Distribution box	It is mainly used to supply power to the system communication components and system equipment, and is arranged in the equipment compartment.

Fire protection system	Mainly including FK-5-1-12, detector, audible and visual alarm, etc., which are arranged in the battery compartment.
Thermal management system	Use a liquid cooling unit to adjust the battery temperature within an appropriate range, and uniformly control the temperature of each battery through liquid cooling pipelines and liquid cooling plates.
Circulation	When the battery PACK is charged and discharged once as per the specified standard, it is considered as a cycle.
MSD	Maintenance Switch Disconnecter, used as a manual maintenance switch.
Measurement unit	Unit of voltage: "V" (volt) Unit of current: "A" (ampere) Unit of power: "W" (watt) Unit of capacity: "Ah" (Ampere-Hour) Unit of energy: "Wh" (Watt-Hour) Unit of internal resistance: "mΩ" (milliOhm) Unit of temperature: "°C" (degree Celsius) Unit of length: "mm" (millimeter) Unit of time: "s" (second) Unit of frequency: "Hz" (Hertz) Unit of mass: "kg" (kilogram) Unit of force: "N" (Newton)

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