Midea Energy

Aqua-X-261-125-2h-IEC

User Manual

V2

Revision History

Version	Revision content	Revision date
V0	Initial release	2025-09-10
V1	Updated company logo.	2026-03-05
V2	● Updated 1.1.8.3.3 Maintenance and inspection of the liquid cooling system ● Updated1.4.4 Storage requirements ● Updated 1.5.1 Installation requirements	2026-03-23

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Contents

1 About This Manual

1.1 Preface

This manual mainly introduces the transportation and storage, mechanical installation, electrical connection, power-on operation and power-off shutdown, troubleshooting, and maintenance of the PV and Energy Storage Cabinet (hereinafter referred to as "the equipment"). Please read this manual carefully before using the equipment.

In order to continuously improve customer satisfaction, this product manual is in the process of continuous improvement and upgrade. All illustrations in this manual are for reference only. The actual product received shall prevail.

1.2 Applicable product

The manual is applicable to the energy storage cabinets of the following models only:

Product model	Configuration
CL511DESS120/125/261W3A	With 2*MPPT modules, 1*PCS module, 1*STS module
CL511DESS60/125/261W3A	With 1*MPPT module, 1*PCS module, 1*STS module
CL511DESS0/125/261W3A	With 1*PCS module, 1*STS module
CL511DESS120/125/261W0A	With 2*MPPT modules, 1*PCS module
CL511DESS60/125/261W0A	With 1* MPPT module, 1*PCS module
CL511DESS0/125/261W0A	With 1*PCS module

1.3 Applicable personnel

This manual is applicable to the technicians responsible for installing, debugging, using and maintaining the equipment. All installation operations in the manual must be carried out by professional technicians, who shall receive relevant training, be familiar with the content of this manual, and understand the local electrical system standards and relevant safety regulations.

2 Safety precautions

This chapter introduces the safety precautions for the transport, storage, installation, wiring, operation and debugging of the equipment. Please carefully read the content of this chapter before operation and follow the safety regulations contained herein strictly during operation. Neglecting these safety precautions may result in equipment damage and even personal injury.

2.1 Symbol description

This manual contains relevant safety signs to ensure user's personal and property safety when using the equipment.

Danger

Indicates highly potential hazards, which may result in death or serious injury, if not avoided.

Warning

Indicates moderately potential hazards, which may result in death or serious injury, if not avoided.

Caution

Indicates low potential hazards, which may result in moderate or minor personal injury, if not avoided.

Note

Indicates potential risks, which may result in the equipment shutdown or property loss, if not avoided.

Pay attention to the warning signs on the product. The specific instructions are as follows:

	**PE identification:** This is the protective grounding PE end, which needs grounding reliably to ensure the safety of both operators and equipment.

	**General warning:** Attention! This component may pose a danger other than high voltage!
	**Static warning:** This component may be damaged due to electrostatic discharge.
	**Dangerous voltage warning:** Special attention! This component may pose a high voltage hazard!
	**Hot surface warning:** Pay attention to hot surfaces to prevent burns!
	**Touch warning:** This component is dangerous due to high temperature and cannot be touched directly.
	**Tips for referring to the user manual:** Please refer to the corresponding instructions in the user manual before operation.
	**Noise warning:** The equipment may produce loud noise during operation. If necessary, please wear earplugs to protect your ears.
	**No tilting:** It is strictly prohibited to tilt or invert the equipment.
	**Static sensitive components:** The electronic components that are sensitive to static electricity, against which, anti-static measures must be taken during operation.
	**High-voltage danger warning:** Pay attention to high voltage danger, ensure reliable grounding before connecting the power supply.
	**Warning of large leakage current:** Pay attention to large leakage current, ensure reliable grounding before connecting the power supply.

2.2 Transportation and storage

Danger

The equipment must be transported vertically, and avoided from tilting during transport; otherwise, personal injury may occur.

Warning

- Protect the equipment from physical impacts and vibrations during transport and storage.
- Handle the equipment with care to avoid damaging it.

2.3 Mechanical installation

Warning

- Please install the equipment on a flame-retardant object and keep it away from flammable materials; otherwise, fire disaster may occur.
- Do not install the equipment in an environment containing explosive gases; otherwise, explosion may occur.
- Do not install the equipment on a base with mechanical vibration.
- Please install the equipment in a place with good ventilation and heat dissipation. When two or more sets of the equipment are placed near each other, pay attention to the installation position to ensure proper heat dissipation effect.
- While installing and maintaining the equipment, prevent liquids, dust or debris from entering the equipment, for conductive liquids and debris may cause internal short circuit, resulting in the equipment damage.
- When connecting external cables and internal cables of the equipment, please ensure that the installation torque of the cables is correct. Insufficient torque may increase contact resistance, leading to overheating while a too large torque may cause screw damage.
- The power cable terminals used for connecting the equipment must comply with relevant national standards. The application of any terminal that does not meet standards or construction that does not meet quality standards can cause overheating of the power cable and more seriously, fire disaster.

2.4 Wiring

Danger

- Please connect all peripheral accessories as per the circuit connection methods specified in this manual strictly; otherwise, danger may occur.
- Please confirm that the power has been turned off before wiring.
- Please ground the equipment correctly and properly according to standards.
- Pay attention to the labeling of the output terminals and avoid incorrect connection strictly; otherwise, the equipment may be damaged.
- Determine the wire diameter according to the recommendations in the manual; otherwise accidents may occur.
- Do not open the panel of the equipment after powering it on, unless it is necessary; otherwise, electric shock may occur.
- It is strictly prohibited to touch the equipment and surrounding circuits with wet hands after powering on the equipment; otherwise, electric shock may occur.
- It is strictly prohibited to touch any input/output terminals of the equipment after powering on the equipment; otherwise, electric shock may occur.
- Before testing power cables and other external equipment, please disconnect them from the cables used for connecting them with the equipment to prevent accidental damage.

Note

- Ensure that the voltage level of the input power supply is consistent with the rated voltage level of the equipment.
- All components of the equipment do not require voltage withstand testing, as they've been tested before leaving the factory. It is strictly prohibited to conduct pressure tests without authorization; otherwise accidents may occur.
- Ensure that the distribution lines comply with EMC requirements and safety standards in the area where they are located.

2.5 Operation and debugging

Warning

- It is strictly prohibited to touch the heat dissipation hood and louvers while operating the equipment; otherwise, burns may occur.
- It is strictly prohibited to manually detect signals while operating the equipment; otherwise, personal injury or equipment damage may occur.

- Avoid debris from falling into the equipment when the equipment is running.
- Do not cover the equipment's ventilation holes when the equipment is running.
- Do not open the door or panel of the equipment when it is running.

2.6 Maintenance

Danger

- It is forbidden to maintain the equipment that is powered on. After the equipment is powered off, wait for 5min at least before any operation; otherwise, the residual charge of the equipment may cause personal injury.
- It is forbidden to repair and maintain the equipment by anyone that is not authorized by the Company and does not receive professional trainings; otherwise, personal injury or equipment damage may occur.
- All pluggable plugins must be plugged in and out after powering off the equipment; otherwise, equipment damage may occur.
- It is strictly prohibited to leave wire ends or tools in the equipment; otherwise, fire disaster or property damage may occur.

2.7 Safety of battery system

To use the equipment safely, relevant technicians shall carefully read the following requirements! Component damage or abnormalities, property damage, safety accidents, etc. caused by the following reasons are not within the scope of the warranty services provided by the Company.

- Capacity loss or irreversible damage to the battery by customer's failure to charge the system within the period required.
- Battery damage, falling, leakage, etc. caused by improper operation or failure to operate the battery according to requirements.
- Battery damage ascribed to over-discharge after the customer's failure in timely power-on.
- Frequent over-discharging of battery due to customer's improper maintenance.
- Battery damage caused by customer's on-site expansion or full charging in the long run.
- Battery damage caused by the customer's failure in correctly setting the battery operating parameters.
- Direct battery damage caused by the on-site operating environment which fails to meet the requirements for normal operation.
- Damage by customer's arbitrary change of battery use scenario, including but not limited to: connecting additional loads to the battery.

- Damage by customer's failure in maintaining the system correctly according to the corresponding user manual.
- System damage caused by the customer's continued use of the battery system whose warranty period has expired.
- Damage by customer's mixed use of the batteries provided by the Company with batteries from other suppliers, including but not limited to: mixed use with other brands, mixed use of batteries of different rated capacities, etc..
- Product damage or other property damage caused by customer's storing or installing the system together with flammable/explosive materials.
- System related operations must be performed by professionals; personal safety accidents, property losses, etc. caused by operator's failure in wearing standard protective equipment during operation.
- Battery damage caused by eating, drinking, smoking, etc. near the system.
- Battery stealing.

2.8 Other precautions

- **Use beyond rated voltage**

  It is not allowed to use the equipment beyond the working voltage range. If necessary, please use the corresponding voltage boosting or dropping device for voltage transformation.

- **Altitude and derating use**

  The equipment's heat dissipation effect may deteriorate in the regions where the altitude is above 2,000m due to the thin air. Therefore, the equipment shall be used by derating. For details, please consult the Company.

- **Equipment use in adverse weather conditions**

  Power off the equipment in advance if severe weather conditions, such as rainstorm and gale above yellow warning level, sandstorm, etc. may occur according to the local weather forecast. When powering on the equipment, open the cabinet door to check if any abnormality.

2.9 Equipment scrap and recycling

2.9.1 Recycling

The equipment includes various kinds of recyclable and hazardous materials, which must be

properly disposed of in accordance with environmental protection requirements. Please recycle the equipment according to the following instructions to ensure the compliance with environmental protection standards and minimize the impact on the environment.

2.9.2 Preparations before recycling

Before dismantling and recycling the equipment, please ensure that it has been completely powered off and will not cause harm to the operators. Before recycling the equipment, please finish the steps below:

- Power-off: Ensure that the equipment has been disconnected from the grid or other power sources and that the energy in the battery module has been safely released.
- Protective equipment: Operators should wear insulated gloves, goggles, and protective clothing.
- Cooling device: If the equipment contains coolant, please safely discharge it as per the requirements and hand it over to a suitable processing agency for disposal.

2.9.3 Recycling requirements

Battery module

In general, the equipment contains lithium-ion or other types of battery packs. Therefore, please recycle the equipment as per the following requirements:

- Remove the battery module to avoid mechanical damage or short circuit.
- Hand over the battery to a professional battery recycling agency for disposal instead of discarding it at will.
- Ensure that the battery is not exposed to extreme temperature, open flame or water to avoid explosions and contamination.

Electric and electronic components

- The electronic components inside the cabinet, including the power convert system (PCS), control unit, cables, etc., may contain harmful substances, so they shall be disposed of by professional electronic waste recycling agency.
- Avoid damaging the circuit board while disassembling the equipment to prevent the leakage of toxic substances.

Metal structure

- The metal components such as the shell and frames can be recycled and reused. After disassembly, send the metal parts to the local metal recycling center for disposal.
- Remove the dirt and oil on the surface while recycling the structure.

Plastic and other materials

The equipment may contain plastic and other non-metallic materials. According to the material identification, send the recyclable plastic materials to the local recycling facility.

2.9.4 Treatment of hazardous substances

The equipment may contain the following harmful substances:

- Li-ion battery electrolyte: The electrolyte in lithium-ion batteries may be harmful to the environment so it cannot be discarded at will.
- Coolant: Some equipment models may contain coolant, which should be recycled and processed by professional agencies.
- Other chemicals: Some electronic components in the equipment may contain toxic chemicals such as lead, cadmium, etc.

2.9.5 Precautions

- Do not disassemble the equipment arbitrarily: Users are prohibited from disassembling the equipment arbitrarily. Instead, please disassemble it by professionals.
- Compliance with local regulations: The equipment should be recycled and disposed of as per the environmental regulations of the site where the equipment is located.
- Contact recycling agency: User is suggested to contact the local electronic waste or battery recycling agency to ensure that the equipment is recycled as per laws and regulations.

2.9.6 Contact of recycling agency

For more assistance, please feel free to contact the Company or your local recycling agency.

3 Product description

3.1 Naming rules

The product model CL511DESS120/125/261W3A is explained as below:

CL511DESS: Clou's electronic industrial and commercial energy storage product.

120: The rated power on the PV side is 120 kW.

125: The rated charging and discharging power is 125 kW.

261: The nominal energy on the DC side is 261 kWh

W3A: STS version available (W0A indicates no STS version).

3.2 Product overview

The PV and energy storage cabinet mainly used in industrial and commercial scenarios, it can realize grid auxiliary service functions, such as peak-valley arbitrage, demand control, demand response, and power flow control. It is also suitable for off-grid scenarios such as PV factories and backup power sources.

The equipment is mainly composed of battery clusters, control box, power distribution system, power convert system (PCS), PV DC converter (MPPT), static transfer switch (STS), liquid cooling system, BCMU (BMS and environmental controller), EMS (energy management system), and fire suppression systems. The product has a protection rating of IP54, it can be used outdoors.

The core electrical parameters of the equipment: Rated charging and discharging power 125 kW, rated rechargeable and dis-chargeable power 261 kWh, optional MPPT quantity: 0/1/2, corresponding power 60/120 kW, STS (optional), corresponding power 250 kW, 3P4W grid systems supported as well. It is suitable for seamless, manual and off-grid scenarios.

3.3 Core functions

1. **Demand control strategies:**
   - Fixed demand control: Control the energy storage charging power by taking the fixed demand value declared by the user as the upper limit, to ensure that the total electricity load does not exceed the declared value.

- Demand following control: By taking the actual maximum demand generated in the current month as reference, when the total load is about to exceed the dynamic value, the energy storage charging power will drop automatically to ensure that the maximum demand record for the current month is not refreshed.

2. **Peak-load shaving strategy**: Charges during low electricity price periods (valley/flat) and discharges during high electricity price periods (peak/peak) to reduce electricity costs.
3. **Anti-overload strategy**: Monitors the load during charging to ensure it does not exceed the transformer capacity, thus avoiding equipment overload or damage.
4. **Anti-backflow strategy:** Monitors discharging in real time to prevent energy from being sent back to the grid.
5. **Off-grid power supply:** Automatic switching in case of grid failure to ensure uninterrupted power supply for critical loads.
6. **Black start:** Restores the energy storage system to supply power via manual operation after long-term power outage of the power grid.
7. **Grid connection and off-grid switch strategy**
   Grid connection → Off grid: Automatically disconnect the power grid upon detecting a power outage and switch to independent power supply mode.
   Off grid → grid connection: After the power grid is restored, it will automatically synchronize the phase and switch back to grid-connected mode.
8. **PV and energy storage integration strategy:** Prioritizes the PV power supply; supplements energy storage when PV power is insufficient; automatically switches to grid power supply when energy storage is insufficient.
9. **PV and energy storage integration + peak-load shaving strategy**
   Control principle: Prioritize PV for load; distribute surplus electricity as needed; supplement insufficient energy by power grid.
   - Valley period (charging prioritized)

   Surplus PV: Load supply + energy storage, surplus electricity connected to the grid or for preventing backflow.
   General PV: Prioritize load; supply surplus electricity for energy storage with small power or activate the power grid combined with high-power charging.
   - Peak period (discharging prioritized)

   Surplus PV: Supplying load, surplus electricity is charged or connected to grid based on energy storage status.
   Insufficient PV: Supplement energy by energy storage discharge; switch to power grid for power supply after energy stored is consumed.
   - Static period

   Full energy storage: Keep standby, direct load supply by PV; supplement insufficient energy by power grid.
   Insufficient energy storage: Supplement electricity when there is surplus PV power; otherwise, load supply by PV + power grid.

3.4 Appearance design

3.3.1 Appearance

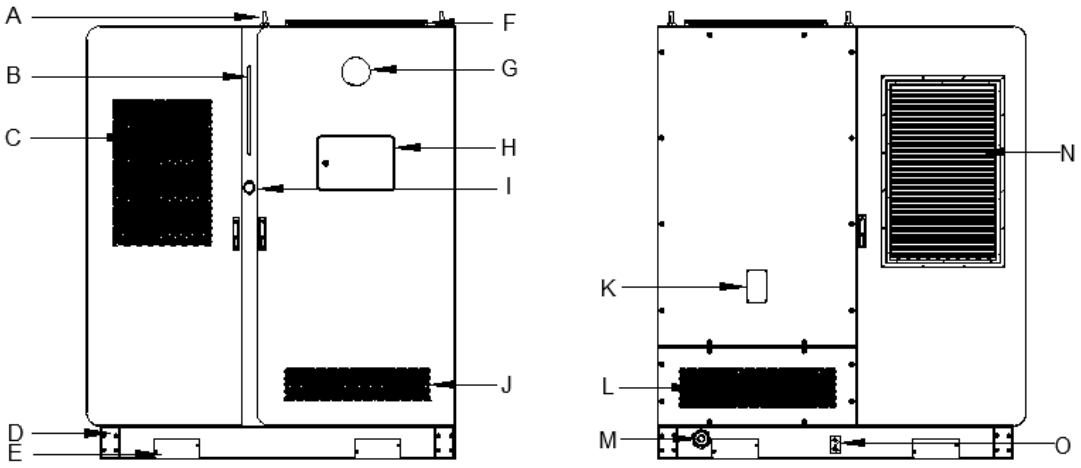


Figure 3-1 Product Appearance

Table 3-1 Component description

Callout	Description
A	Lifting eye
B	LED indicator
C	Air inlet louver
D	Corner fittings
E	Forklift hole
F	Explosion vent panel(optional)
G	Horn strobe
H	EMS
I	E-stop button
J	Air inlet louver
K	Nameplate
L	Air outlet louver
M	Fire hose coupling(optional)
N	Air outlet louver (noise-reduction louvers can be used)
O	Ground point

LED indicator

An LED light board is designed on the equipment to intuitively display the equipment status, including running, fault, alert, etc.

Table 3-1 Descriptions of LED indicators

Status	Color	Description
Running	Green	The equipment runs normally
Fault	Red	The equipment malfunctions, has stopped and needs maintenance
Alert	Yellow	The equipment runs normally when alert occurs; the indicator will be normally on in green after the alert disappears
Low battery level	Blue	The equipment has low battery and needs recharging

Table 3-2 LED display status and running

Display status	Description
Green indicator is steady on	The system is running normally
Red indicator is steady on	The system has malfunctioned and stopped
Red indicator flashes quickly	The system triggers a fire malfunction and requires immediate treatment
Red indicator flashes slowly	The system is operating with a fault. It is used only when MPPT is selected, and the PCS/STS is faulty but MPPT can still charge battery
Yellow indicator flashes slowly	There is an alert event in the system, which does not affect the equipment running
Blue indicator flashes slowly	The system is about to discharge fully with a low battery level
Green breathing status	The system is under start or upgrading

Horn strobe

When the smoke or temperature detector inside the equipment detects a fire, it will activate the horn strobe, indicating that the system is in a dangerous state. After hearing the alarm sound, the workers nearby should immediately stay away from the energy storage cabinet.

3.3.2 Mechanical parameters

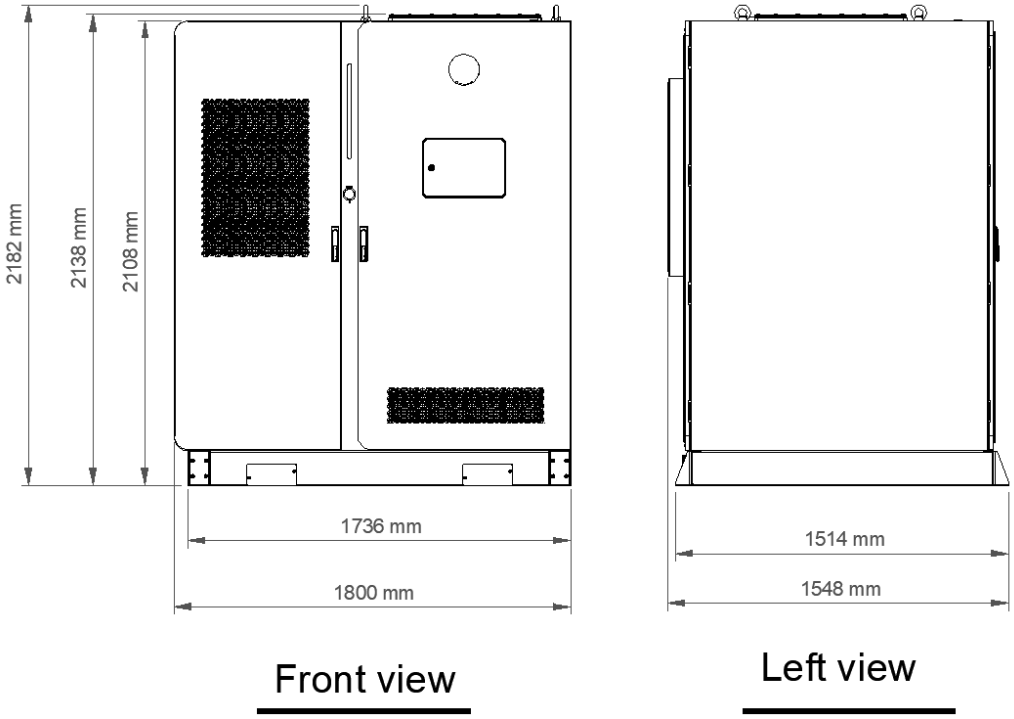


Figure 3-1 Outline dimension drawing

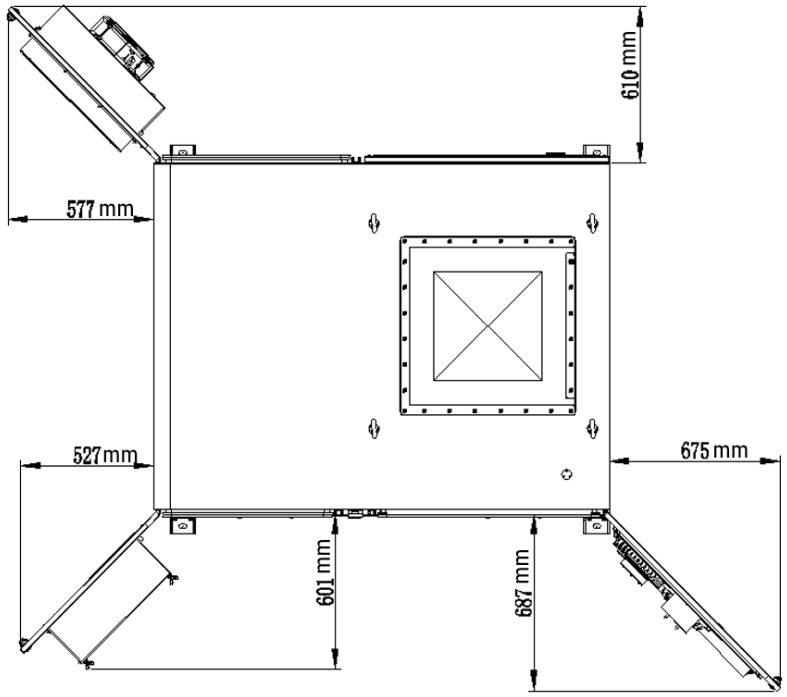


Figure 3-2 Size diagram of the equipment after door opening

*The above images are for reference only. The actual product may vary!

3.5 Internal design

3.5.1 Internal layout

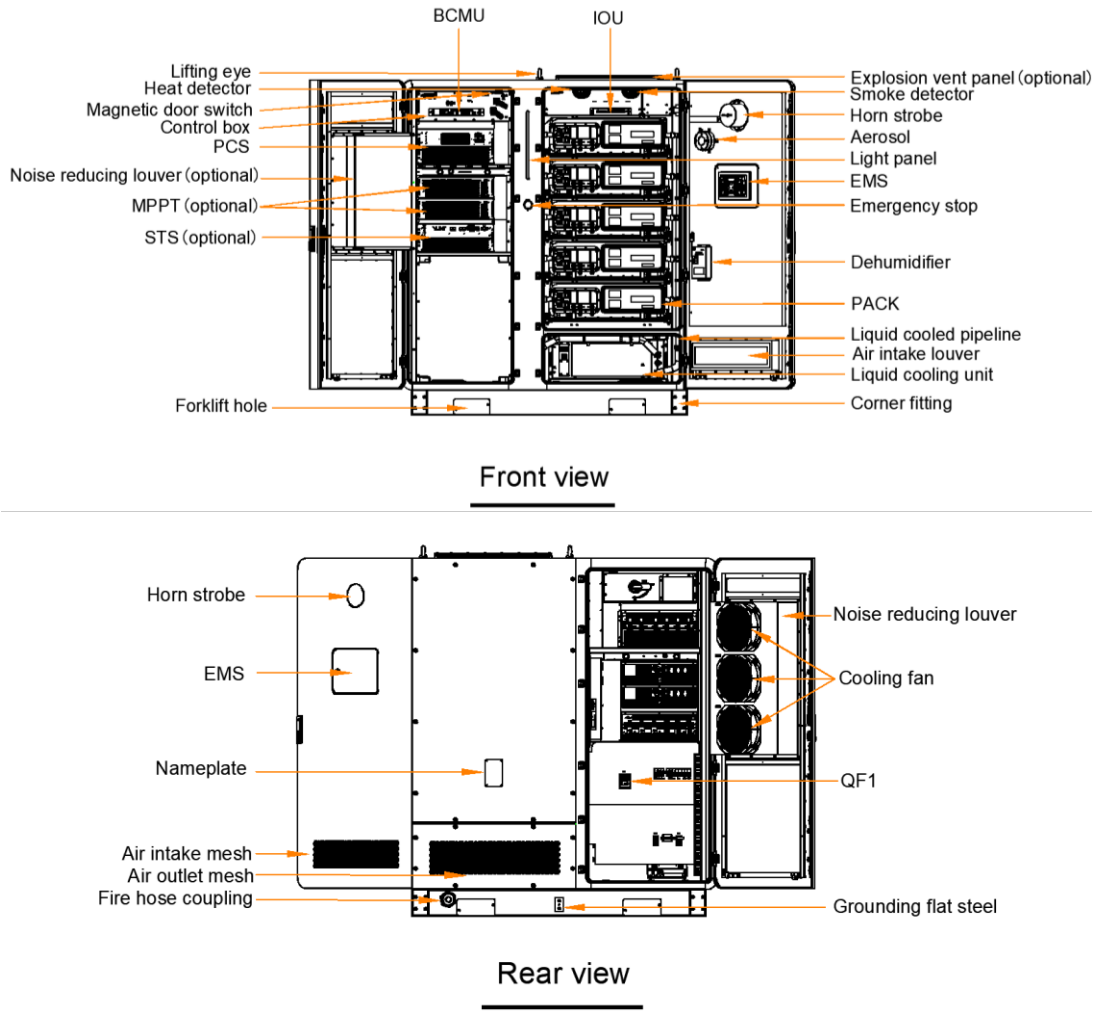


Figure 3-3 Internal layout diagram of the equipment

Ordering instructions:

- An antenna is required if 4G function is needed for the equipment.
- STS and its supporting bypass switches and load switches are optional.
- MPPT is optional (Qty.: 0/1/2).
- The fire suppression system can be further divided into standard and high-end versions. Customers need to choose whether to add explosion-relief board and fire water interfaces according to local regulations and installation site requirements.
- Noise-reduction louvers are optional. The number of fans on the back door of the cabinet should be determined based on the specific configuration.

3.5.2 Battery system

The following is a typical system architecture for the use of lithium iron phosphate batteries. Based on lithium iron phosphate battery cells, standard and unitized battery modules are developed, which are connected in series and paired with control box to form a battery cluster. The battery cluster is connected to the supporting power convert system (PCS) to form a power Integrated Solar and Energy Storage System (ESS), which stores and releases electrical energy.

At present, the equipment is compatible with four types of cells. The parameters in Tables 3-3 and 3-4 are listed by taking the Chuneng 314Ah cell as an example. If other manufacturer's cells are used, the parameter values may differ slightly.

3.5.2.1 Cell

Appearance

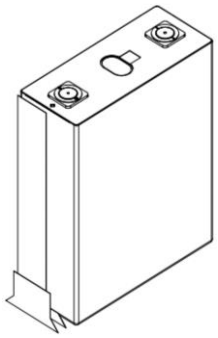


Figure 3-4 Appearance of the battery cell

Specification

Table 3-3 Cell specification

Parameters	Parameter value
Dimensions (D×W×H)	71.7 mm×174.3 mm×207.2 mm (±0.5)
Weight	5.7 ± 0.1 kg
Rated capacity	314 Ah
Rated energy	1004.8 Wh
Rated voltage	3.2 V
Voltage range	2.5 V – 3.65 V

3.5.2.2 PACK

Appearance

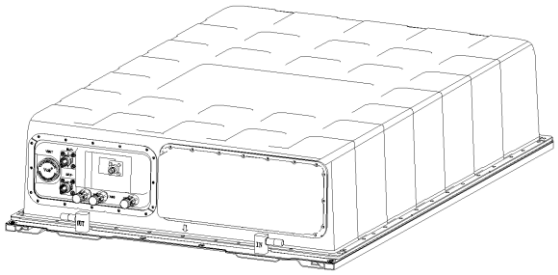


Figure 3-5 Appearance of the battery pack

Specification

Table 3-4 PACK specification

Parameters	Parameter value
Rate	≤0.5P, recommended value: Below 0.5P
Cell type	Square aluminum shell LFP
Configuration	1P52S
Key components	52 cells, 1 BMU
Weight	345 kg

3.5.2.3 Control box

The control box includes fuse, contactor, high voltage sampling unit (SAUs) and battery cluster management unit (BCMU). It is mainly used for monitoring the battery cluster.

Appearance

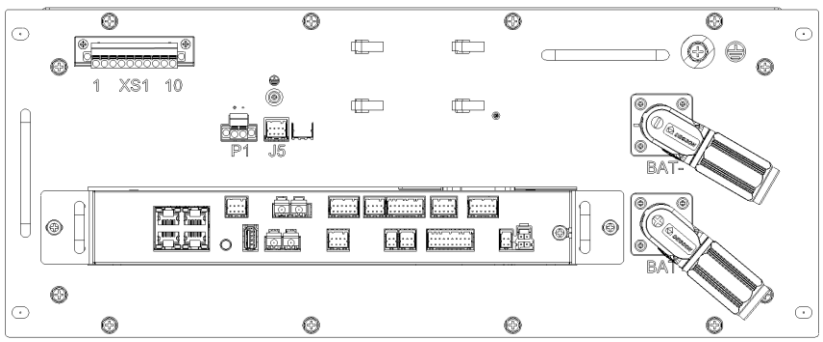


Figure 3-6 Front panel of the control box

Specification

Parameters	Parameter value
Rated current	157 A
Rated voltage	800 VDC
Shell dimensions (D×H×W)	780 mm×185 mm×550 mm
Weight	35 kg

3.5.3 Power Module

3.5.3.1 PCS (Yuntian)

The power convert system (PCS) is a bidirectional current controllable conversion device that connects the equipment and the power grid. It is mainly used for energy exchange between the battery and power grid, and for controlling and managing battery charging and discharging. In grid connected mode, it can realize peak-load shaving, peak shaving and frequency regulation, virtual capacity expansion, and off-grid backup for power grid. The PCS also supports multiple charging and discharging modes including constant voltage, constant current and float charging.

Appearance

Figure 3-7 Appearance of PCS

Table 3-5 PCS display status and operation description

Indicator	Status	Description
POWER (green)	Steady on	Both the battery and the power grid are connected
	Quick flash	The battery is not connected
	Slow flash	The power grid is not connected
	Off	Both the battery and the power grid are not connected
SEMS (green)	Quick flash	Normal communication
	Off	Communication anomaly
RUN (green)	Off	PCS stops
	Steady on	PCS is under standby status
	Quick flash	PCS is running

Indicator	Status	Description
FAULT (red)	Slow flash	Alert
	Steady on	Fault, shutdown status

Note: The cycle of quick and slow flash is 1s and 3s respectively.

3.5.3.2 STS (Yuntian)

The static transfer switch (STS) is an automatic dual-power switching system. It switches power supply between two independent AC power sources. If fault occurs to one power source, STS will automatically switch to the other to supply power to the load. Different from the traditional automatic transfer switches (ATS), STS can switch load quickly to ensure uninterrupted operation of precision electronic equipment.

Appearance

Figure 3-8 Appearance of STS

Table 3-6 STS display status and operation description

Indicator	Status	Description
POWER (green)	Steady on	Power-on via PCS port or grid port
	Quick flash	Software upgrade
	Slow flash	Power-on via external 24V
	Off	No power at PCS port and grid port, and external 24V
SEMS (green)	Quick flash	Normal communication
	Off	Communication anomaly
RUN (green)	Off	STS stops
	Steady on	STS connected to grid
	Quick flash	STS off grid
	Slow flash	Grid-connected switch is closed
FAULT (red)	Slow flash	Alert
	Steady on	Fault, shutdown status

Note: The cycle of quick and slow flash is 1s and 3s respectively.

3.5.3.3 MPPT (Yuntian)

The PV direct current converter (MPPT) is mainly used for converting electrical energy between low voltage DC (PV) and high voltage DC (battery). It is widely used in industries such as industrial and commercial energy storage, PV power generation, etc.

Appearance

Figure 3-9 Appearance of MPPT

Table 3-7 MPPT display status and operation description

Indicator	Status	Description
POWER (green)	Steady on	The converter has a low-voltage side battery, PV side, or high-voltage side power supply access
	Off	The converter system is not energized
SEMS (green)	Steady on	Normal communication
	Off	Communication anomaly
RUN (green)	Steady on	The converter is running
	Off	The converter is not running
FAULT (red)	Steady on	Alert occurs to the converter, which can run continuously
	Flash	Converter fault, shutdown status
	Off	The converter has no fault or alert

3.5.4 Chiller

As a temperature control product developed for the equipment, the liquid cooling system is integrated with cooling and heating functions. It adjusts the temperature through a temperature control management unit to provide a favorable working temperature environment for the components inside the cabinet.

Appearance

Figure 3-10 Appearance of chiller

Specification

Table 3-8 Chiller specification

Item	Specification
Rated AC input power supply	220 V±15%, 50/60 ± 3 Hz
Cooling capacity	5 kW
Heating capacity	2 kW
Fluid flow	46.5L/min@60kPa
Dimensions (W×D×H)	700 mm × 900 mm × 245 mm
Refrigerant	R134a

3.5.5 Distribution system

The distribution system includes circuit breaker, UPS, AC lightning protection circuit and 24V busbar distribution unit. It is mainly used for protecting the main circuit and supplying power to auxiliary circuits.

3.5.6 Fire suppression system

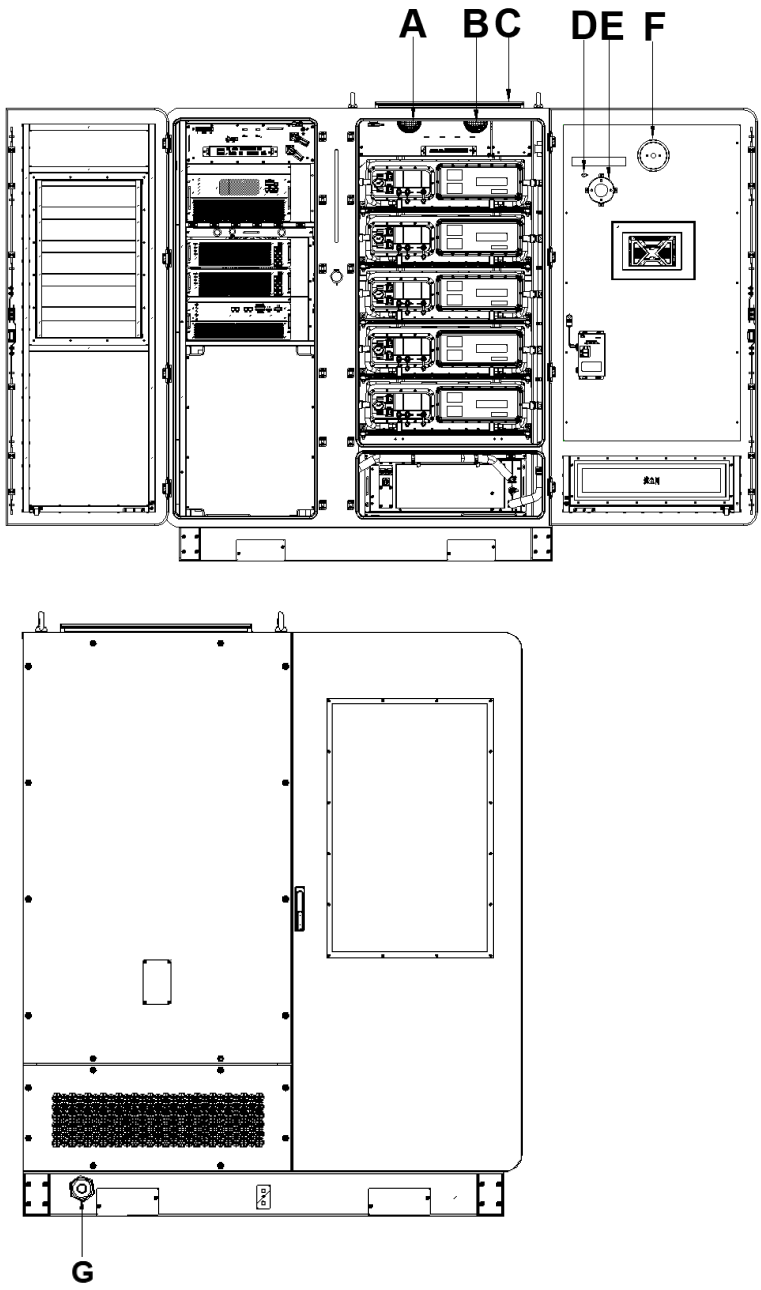


Figure 3-11 Internal layout diagram of fire suppression system

Table 3-9 Component descriptions

Callout	Description
A	Smoke detector
B	Heat detector
C	Explosion vent panel (optional)
D	Aerosol feedback device
E	Aerosol
F	Horn strobe
G	Fire hose coupling(optional)

3.5.6.1 Standard Fire Protection

- When the smoke detector and heat detector reaches the threshold alarm, the horn strobe will be linked, and the detector alarm signal will be transmitted to BCMU.
- When both the smoke detector and heat detector reach the threshold alarm, the horn strobe will be linked, and aerosol will be sprayed. The aerosol spraying feedback signal will be transmitted to BCMU. After receiving both smoke detector and heat detector alarm signals, BCMU will be linked for cutting off power supply.

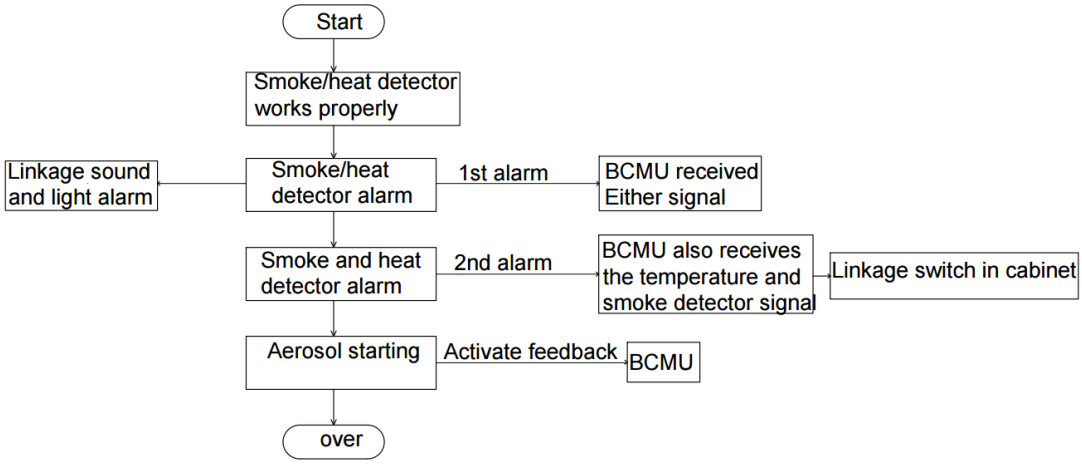


Figure 3-12 Cabin-level fire linkage logic diagram

3.5.6.2 High-End Fire Protection

- When the smoke detector or heat detector reaches the threshold alarm, the horn strobe will be linked, and the detector alarm signal will be transmitted to BCMU.
- When both the smoke detector and heat detector reach the threshold, the horn strobe will be linked, and aerosol will be sprayed. The aerosol spraying feedback signal will be transmitted to BCMU. After receiving both smoke detector and heat detector alarm signals, BCMU will be linked for cutting off power supply.
- When the pressure inside the cabinet exceeds the opening pressure value of the explosion-relief board, the explosion-relief board will open and the pressure in the battery compartment will be released to prevent explosion.
- When fire reoccurs inside the cabinet, water can be manually supplied to the cabinet through the external water interface for putting out the fire.

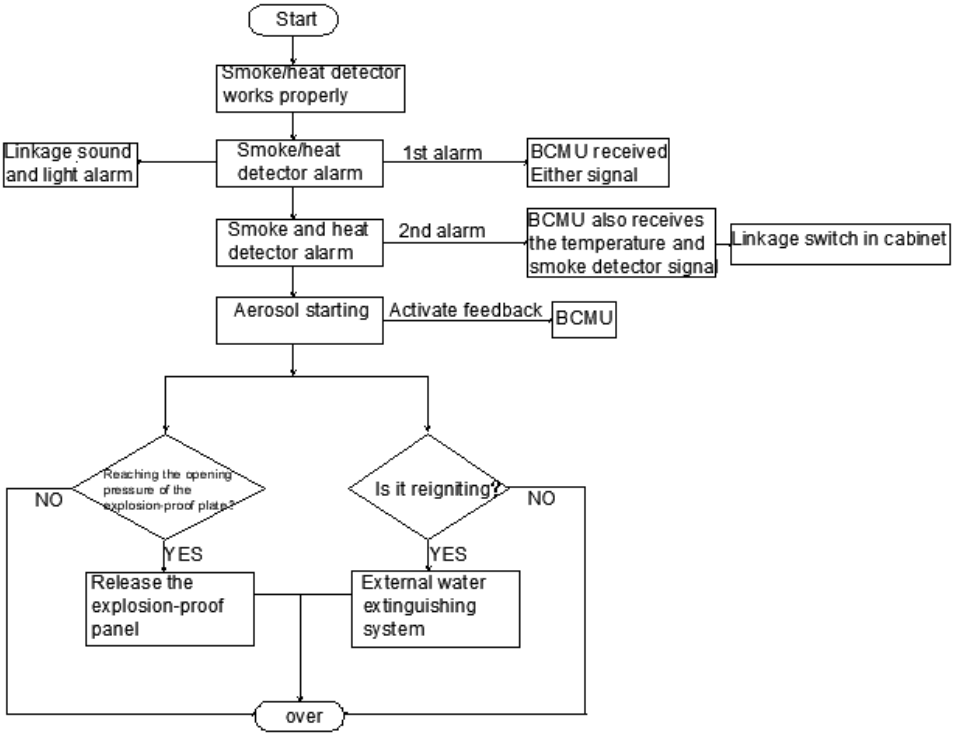


Figure 3-13 Linkage logic diagram of high-end version fire linkage

4 Transport and storage

4.1 Transportation conditions

Warning

- Please handle and transport the equipment as per the safety regulations for outdoor cabinet operations in the country/region where the project is located!
- All machines and tools used for the equipment shall be well maintained.
- All personnel responsible for handling and securing the equipment shall receive corresponding training, especially safety trainings.

Note

Always keep in mind the equipment's mechanical parameters while handling and transporting it.

The devices inside the equipment have been installed and secured before leaving the factory. The equipment can be transported integrally. When transporting or moving the equipment, please ensure:

- All doors of the equipment can be tightly locked.
- Choose a suitable forklift or other transport tool based on the site conditions. The tools used must have sufficient load-bearing capacity, and with suitable arm length and rotation radius.
- Use traction device, if the equipment needs moving on a slope.
- Clear all existing or potential obstacles during the movement, such as trees, cables, etc.
- Transport and move the equipment in good weather conditions as much as possible.
- Set warning signs or tapes around the work area to prevent irrelevant personnel from entering the forklift transportation area, thus avoiding accidents.

4.2 Transport by forklift

4.2.1 Precautions

Warning

- Move the equipment via the front and rear holes at the bottom
- It is forbidden to move the equipment by inserting the fork arm into a position outside the hole.
- Move the equipment by strictly following the safety operating procedures of forklift.
- It is strictly prohibited to stand under and around mobile machines to avoid injury and death accidents.

Note

The hole sealing plate is shipped with the cabinet together and should be assembled after the cabinet is installed.

4.2.2 Requirements for transport by forklift

The equipment is designed with dedicated holes so that it can be transported via the front holes.

Before transport by forklift, please ensure:

- The load-bearing capacity of the selected forklift shall not be less than 4t.
- The length of the fork arm should be at least 1,600mm.
- During hoisting, the fork arm must be fully inserted into the hole at the bottom of the cabinet (see the figure below for the hole position), and the insertion depth should reach the full depth of the hole (≥1,600mm).
- Hoist the equipment slowly and steadily and avoid sudden stops or violent shaking during the entire process.
- Place the equipment on a solid, flat and unobstructed or protruding site with good drainage conditions.

Figure 4-1 Transport by forklift

4.3 Transport by hoisting

4.3.1 Precautions

Before hoisting the equipment, at least ensure:

- The hoisting site is safe during the entire process.
- Professional personnel are designated for guiding the hoisting.
- The strength of the sling used can withstand the equipment's weight.
- All sling connections are safe and reliable, and each section of the sling connected to the corner fittings has the same length.
- The length of the sling can be adjusted appropriately based on site realities.
- The equipment is stable and is not skewed during the entire hoisting process.
- Take all necessary auxiliary measures to ensure the hoisting safety and smoothness of the equipment.
- Stop hoisting, in case of adverse weather conditions such as heavy rain, heavy fog, strong wind, etc.

The following diagram illustrates the crane operation of the equipment during the hoisting process. To be specific, the dashed circle on the inner layer represents the operating range of the crane. No one is allowed to stand within the solid circle on the outer layer when the crane is working!

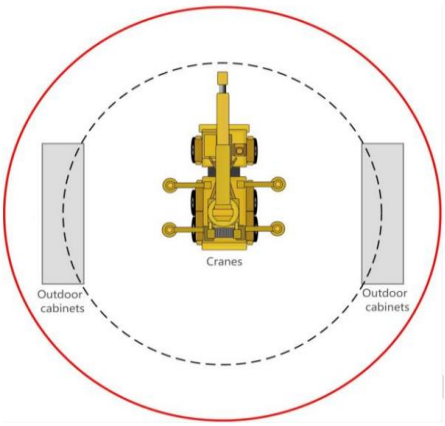


Figure 4-2 Schematic diagram of crane hoisting

4.3.2 Requirements for transport by hoisting

When hoisting the equipment, ensure each link satisfies the following requirements:

- Hoist the equipment vertically and avoid dragging it on the ground or the top of the lower cabinet during hoisting. Do not drag or push the cabinet on any surface.
- Suspend hoisting after the equipment is hoisted 300mm off the support surface, to check the connection between the hoisting device and the equipment. Continue to hoist after confirming the connection.
- After the equipment reaches the desired site, place it gently and smoothly. It is strictly prohibited to place the equipment off the vertical landing site by swinging the hoisting device.
- The site where the equipment is placed should be solid, flat, well-drained, and free of obstacles or protrusions.
- Hoist the equipment using suspension cables with hook or U-shaped hook. Ensure the correct connection of the hoisting device with the equipment (the hoisting rope should pass through the hoisting hole).

Figure 4-3 Hoisting diagram of the equipment

4.4 Storage requirements

- Before storage, ensure that the doors of and the devices inside the equipment are locked tightly.
- Storage temperature: -30°C–+55°C, recommended storage temperature: +5°C–+25°C. Make adjustment according to the following data when the equipment is stored at other temperature.

Temperature range	Attenuation adjustment coefficient
26°C–40°C	0.1 %/month
41°C–50°C	0.3 %/month
51°C–55°C	0.6%/month

- In consideration of battery capacity degradation after long-term storage, it is not recommended to store batteries for a long time. In addition, irreversible capacity degradation will occur to battery even under the recommended optimal storage temperature. The longer the storage time, the greater the irreversible degradation. Please refer to the technical agreement for specific degradation values.
- Relative storage humidity: 0–95%, no condensation. Recommended relative humidity for storage: 45%–85%.
- Protect the air inlet and outlet of the equipment effectively, and take effective measures to prevent rainwater, dust, and other debris from entering the equipment.
- Check the equipment at least once every two weeks, to check if the equipment and the devices inside are intact.
- Before installing the equipment that has been stored for more than six months, open the doors to visually check the inside. Ensure that there is no condensation on the exterior of the equipment and that both the equipment and the devices inside are intact. Check them again after power-on and startup. If necessary, perform test by professional personnel before installation.
- The energy storage cabinet contains a PCS. Long-term storage may cause degradation of its electrolytic capacitors. If the storage period exceeds six months, the PCS must be inspected and tested by professional personnel prior to commissioning. Direct power-on operation may result in equipment damage. Please contact CLOU for specific maintenance procedures.

- Pay attention to the harsh environments, such as sudden cold or hot weather conditions, collisions, etc., to avoid damaging the PACK.
- Regularly check if the packaging is intact and free from insect and rodent. If the package is confirmed damaged, replace it immediately. Do not tilt or invert the packaging box.
- If the equipment is stored for longer than one month, charge and discharge the equipment regularly (one month) during the storage period to maintain the system SOC at around 40%; otherwise, it may affect battery consistency and service life.

5 Mechanical installation

5.1 Installation requirements

Warning

Please install the equipment as per the relevant local standards and requirements.

Note

Drainage system is required on the installation site to prevent the equipment's bottom or devices inside from being soaked in water during rainy seasons or in case of heavy rainfall.

Note

Do not plant trees around the installation site to avoid branches from being knocked down by strong wind or fallen leaves from blocking the door or air inlet of the equipment.

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

5.1.1 Installation site

Please choose the installation site according to the following principles at least:

- Take the local climate environment and geological conditions (such as stress wave emission and groundwater level) into full consideration.
- Ensure that the surrounding environment of the installation site is dry, well ventilated, and the site is far away from flammable and explosive areas.
- Ensure the compactness of soil at the installation site (recommended relative compactness of the soil ≥ 98%). If the soil is loose, please take measures to ensure the stability of foundation.

5.1.2 Installation base

Warning

In consideration of the equipment's heavy weight, fully investigate the installation site's various conditions (mainly including the geological and environmental climate conditions, etc.) before foundation design and construction.

Unreasonable foundation construction plan can bring many difficulties or troubles to the placement, door opening/closing, and operation of the equipment. Therefore, the equipment foundation must be designed and constructed according to certain standards in advance to meet the requirements of mechanical support, cable routing, as well as maintenance and repair in later stage. At least the following requirements should be met when constructing the foundation:

- The bottom of the foundation pit for building the foundation must be compacted and filled.
- The foundation should provide full and effective load-bearing support for the energy storage integration system, and be made of reinforced concrete, the compressive strength of which should not be lower than C30 (the weight of a single set of equipment is about 2.9t).
- Raise the equipment to prevent rainwater from eroding the base and the inside. It is suggested to raise the foundation about 200mm above the horizontal ground level of the installation site.
- Take the corresponding drainage measures based on local geological conditions.
- Construct a cement foundation with sufficient cross-sectional area and height, which is determined by the construction organization based on the site geology.
- Consider cable wiring while constructing the foundation.
- The maintenance platform is built around the foundation, to facilitate maintenance.
- Based on the position and size of the cable inlet/outlet holes on the equipment, leave a sufficient space for the AC cable tray or pre-embed cable conduits during foundation construction.
- Determine the specifications and quantity of perforated tubes based on cable models and the number of incoming and outgoing lines.
- Seal both ends of all embedded pipes temporarily to prevent impurities from entering the inside; otherwise, problems may bring to wiring in later stage.
- After connecting all cables, seal the cable inlets and outlets and joints with fire-resistant mud or other suitable materials to prevent rodents from entering.

5.2 Fixing

Place the equipment in the preset position after confirming that the foundation meets the construction requirements and has been fully dry, sturdy, and flat. 2 (4 in total) holes are reserved at the front and rear of the equipment to fix it on the foundation using M12 expansion bolts.

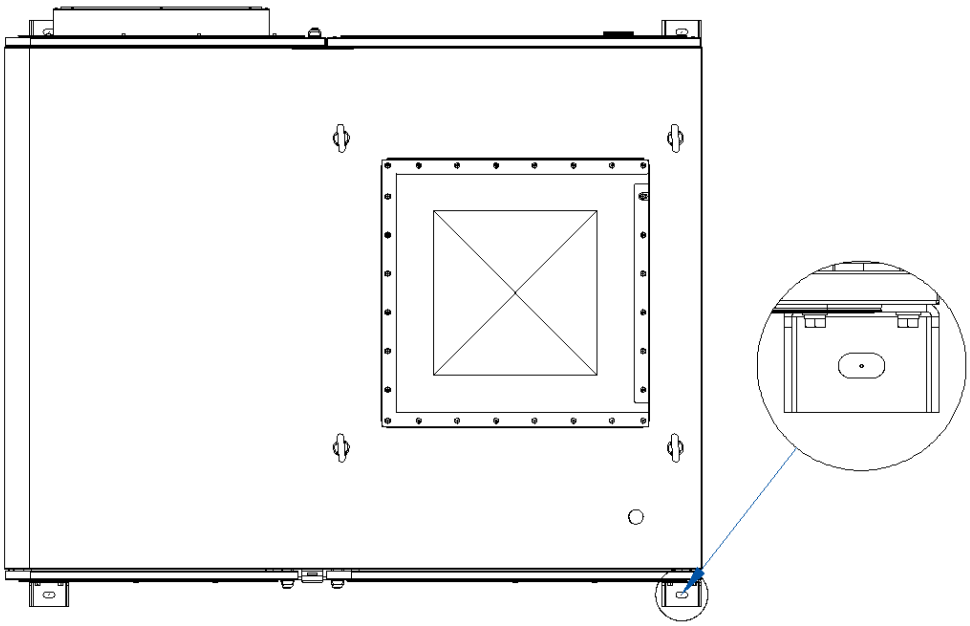


Figure 5-1 Fixing of the equipment

Recommended installation space

- The equipment can be mounted by integrating several cabinets. Distance is not required between the left and right sides of the cabinet, and the adjacent cabinet (certain space (50mm) can also be reserved).
- A distance of 2,500mm should be reserved in front of the cabinet (including a distance of 1,100mm for opening the door for installation, maintenance, wiring, and other operations); however, at least 2,500mm should be reserved in front after considering maintenance fixtures for battery packs/non battery packs.
- A 2,500mm space for heat dissipation and maintenance operations should be reserved on the back of the cabinet.

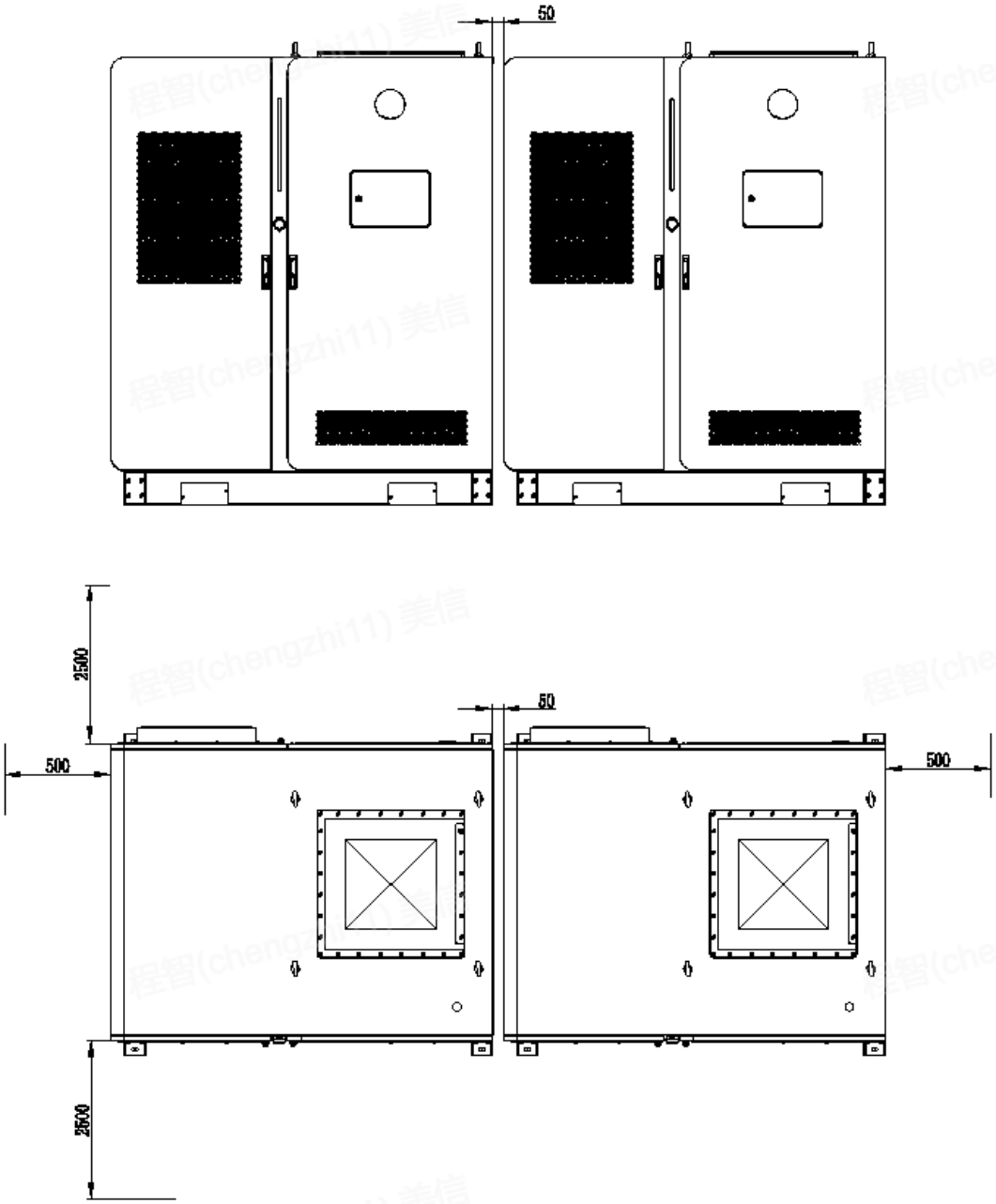


Figure 5-2 Schematic diagram of the cabinets installed side by side (2 cabinets)

6 Electrical connection

6.1 Safety precautions

Danger

High-voltage Danger! Electric Shock!

- Do not touch live parts!
- Please ensure that both the AC and DC sides are not electrified before installation.
- Do not place the equipment on flammable surfaces.

Danger

When a grounding fault occurs to the equipment, the parts that are not charged before may have fatal high voltage. It is very dangerous if touching it by accident! Before operation, please ensure that there is no grounding fault in the system, and take relevant protective measures.

Warning

- All electrical connections must comply with the relevant standards and specifications of the local country/region.
- Connect the energy storage integration system and the power grid after obtaining permission from the local power supply company and the equipment is installed by professional technicians.

Warning

- Install the equipment by professional electricians or personnel with professional qualifications.
- Please strictly follow the wiring labels inside the equipment during wiring.
- Before wiring, disconnect the AC and DC sides of the energy storage integration system.

Warning

The sandstorms and moisture entering the equipment may damage the electrical equipment inside the equipment or affect the equipment's running performance!

- Avoid electrical connections during windy and sandy seasons, or when the relative humidity in the surrounding environment exceeds 95%.
- Instead, perform electrical connections when there is no wind or sand and the weather is clear and dry.

Warning

- Failure to comply with torque requirements may result in fire disaster at the connected site!
- During the electrical connection, fasten the bolts strictly according to the torque described in this manual.

Warning

- Finish electrical connections by qualified electrical engineers only.
- Please comply with the safety precautions in Chapter 2 of this manual. The Company is not held liable for any personal injury or property damage caused by neglecting these safety instructions.

Warning

Please lay cables by ensuring electrical insulation and as per the EMC regulations. Lay the power cables, power and communication cables in layers. When necessary, provide protection and support for the cables to reduce the cable stress.

Warning

Please strictly follow the wiring labels inside the equipment during wiring.

Note

- The installation design of the energy storage integration system must comply with the relevant standards or specifications of the local country/region.
- The Company does not provide warranty services for the equipment or system faults caused by user's failure in installation as per the installation requirements in this manual or relevant local electrical standards or specifications.

Please abide by the following 5 safety rules during electrical connections and all other operations on energy storage integration systems:

- Disconnect all external connections of the energy storage integration system and the connection to the internal power supply of the equipment.
- Ensure that all disconnected sites are not accidentally reconnected.
- Ensure that the interior of the equipment has been completely deenergized using a multimeter.
- Take necessary grounding measures.
- Insulate and cover the nearby potentially live parts of the operating section with fabric made of insulating material.

6.2 Check before wiring

Warning

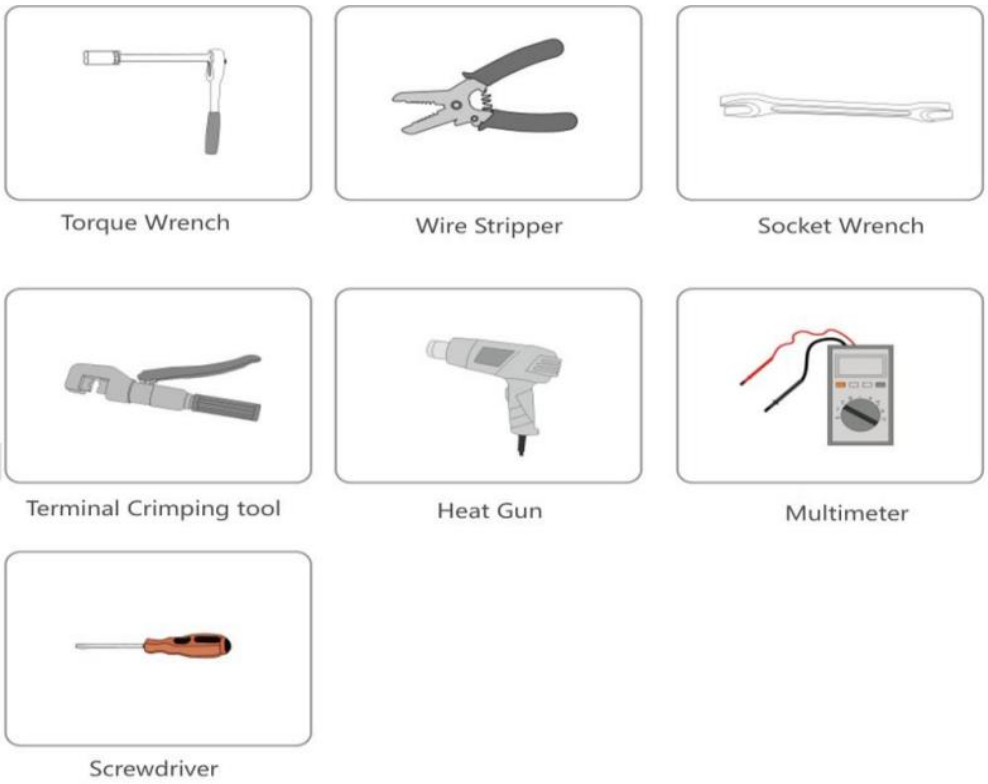
Poor insulation or cable damage may pose a danger. Before electrical connection, check for the integrity and insulation of all cables. Replace damaged cables in time.

The wiring work between the internal devices of the equipment has been completed before leaving the factory. User needs to:

- Check if the connected cables are damaged. If so, immediately replace them with cables of the same specification and model.
- Check if the cable connections are securely fastened and ensure that all wiring terminals are securely fastened.

6.3 Preparations before wiring

6.3.1 Installation tools



6.3.2 Open the cabinet door

Open the cabinet door before cable connection.

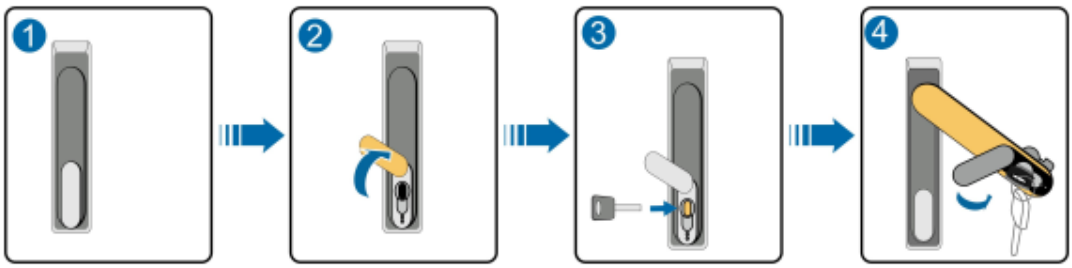


Figure 6-1 Door opening steps

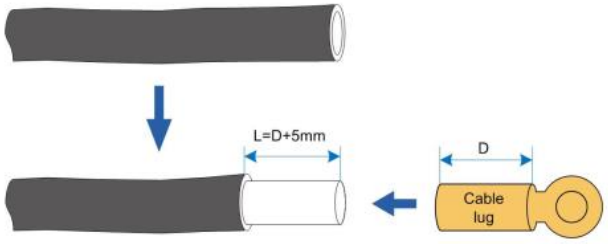
Steps	Description
1	Lock state
2	Move the cover upwards above the locking hole
3	Insert the door key and turn it clockwise
4	Rotate the handle counterclockwise to the position shown in the figure to open the front door

6.3.3 Terminal crimping

Follow the steps below for terminal crimping.

Step 1. Peel off the insulation at the end of the cable.

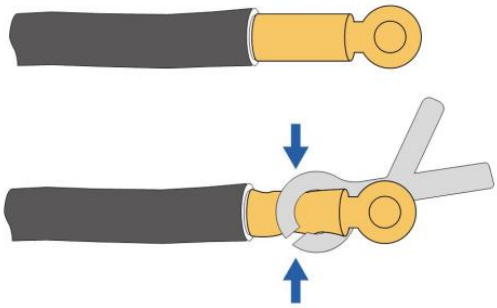
The length of insulated leather peeled (L)=the depth of the copper plug pressure hole for wiring (D)+about 5mm.



Step 2. Crimp the terminal block.

a. Place the exposed copper core of the peeled wire end into the crimping hole of the wiring copper plug.

b. Use a terminal crimping machine to tighten the copper plug of the wiring and crimp the terminal block for at least twice.

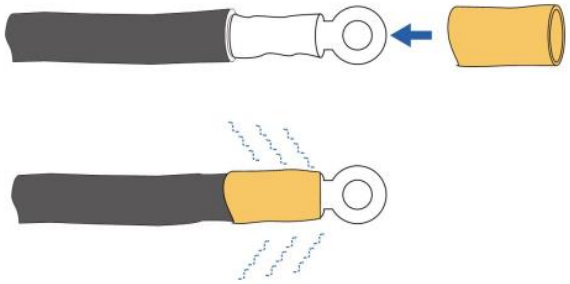


Step 3. Assemble heat shrink tubing.

a. Choose a heat shrink tubing that matches the cable size, with a length about 2cm longer than the copper plug pressure conduit.

b. Place the heat shrink tubing over the copper connector plug, to completely cover the crimping hole of the copper connector plug.

c. Tighten the heat shrink tubing using a hot air dryer.



——End

6.3.4 Connection cables

Warning

- Incorrect wiring sequence on the AC side of the equipment may cause fire. Please pay attention to the connection sequence of the wiring components.
- During connection, ensure that the connectors are securely fastened. Any insufficient connection or oxidation of contact surface may cause excessive heat, resulting in fire disasters.

Note

- The width and length of the wiring copper plug should be appropriate. A too wide plug may not fit into the wall terminal or affect the insulation performance between device phases, and even cause short circuit problems.
- After installation, check the overlap between the copper plug of the wiring and the through wall terminal to see if any heat shrink tubing is clamped. Remove the clamped tubing in time; otherwise it may cause poor contact and even equipment damage.

The fixing screws and other parts used for the power cable wiring of the equipment have been installed at the corresponding terminal fixing positions when leaving factory. Please strictly follow the description in this section during cable connection.

See the figure below for the copper cable connection.

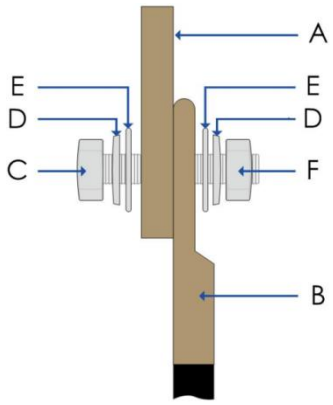


Figure 6-2 Wiring parts

No.	Name	No.	Name
A	Copper busbar	D	Spring washer
B	Copper terminal	E	Flat washer
C	Bolt	F	Nut

6.3.5 External cable entrance hole

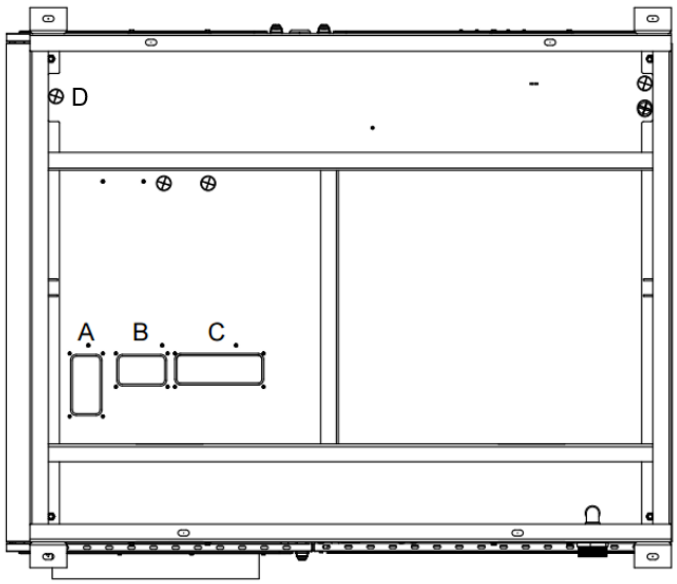


Figure 6-1 Position of external cable entrance hole

No.	Name
A	PV cable entrance hole
B	Key load wiring hole
C	400V AC cable entrance hole of grid
D	Communication cable entrance hole

6.4 Wiring overview

Warning

- Before wiring, check for the polarity of all input cables to ensure that each input polarity is correct.
- During electrical installation, do not forcefully pull or tug on cables or wires to avoid damaging their insulation performance.
- Leave a certain bending space for all cables and wires.
- Take necessary auxiliary measures to reduce the stress on cables or wires.
- After finishing each wiring step, carefully check the wiring to ensure it is correct and secure.

Warning

- All electrical connections must strictly follow the wiring schematic diagram.
- All electrical connections must be performed after powering off the equipment completely.

See the wiring diagram of the equipment below:

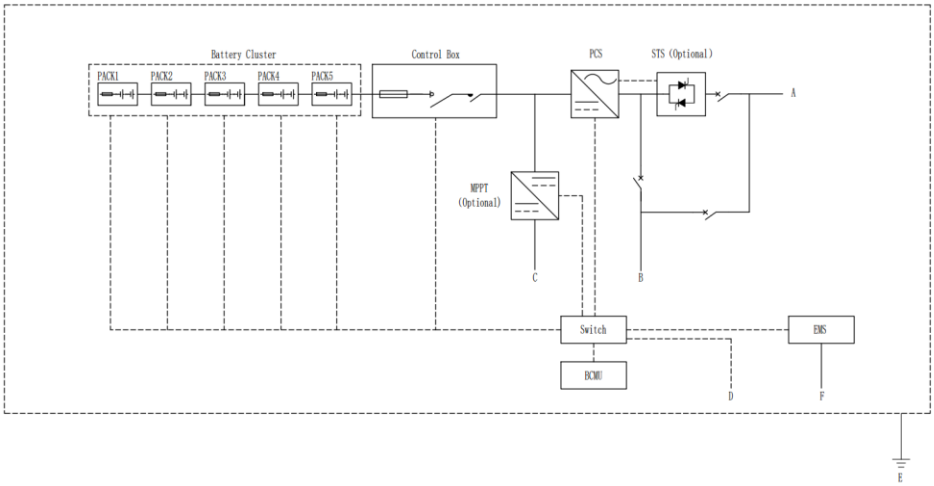


Figure 6-3 Wiring diagram of the equipment

Table 6-1 Interface *

No.	Interface	Recommended cable specification
A	Grid AC input port	2×(3×95mm²+2*50mm²)/copper wire/400VAC
B	Load AC output port	3×95mm²+2*50mm²/copper wire/400VAC

C	PV input port	4×(2×6mm²)/copper wire/1000VDC (Amount for 1 MPPT)
D	Ethernet communication port	CAT5A network cable
E	Grounding point	95mm ² yellow green copper cable or grounding flat steel
F	**Communication interface of EMS electric meter (TD3 terminal block)	2×0.5mm² shielded dual-twisted wire

*The cables connected in this table are configured based on the single-cabinet standard and are not within the scope of supply.

**EMS can be in 3 or 11 serial ports for connecting different numbers of electricity meters.

6.5 Grounding connection

6.5.1 Precautions

Warning

The grounding connection must comply with the grounding standards and specifications of the local country/region.

Warning

The grounding wire must be well grounded! Otherwise,

- Fatal electric shock may occur when malfunction happens!
- Lightning may damage the equipment!
- The equipment fails to run normally!

Note

During grounding, please note:

- Fix the grounding connection between the equipment and the grounding electrode reliably.
- After grounding, measure the grounding resistance, which should not exceed 0.1Ω (please follow local regulations for the specific grounding resistance requirements).

6.5.2 Equipotential connection of internal equipment

Before leaving the factory, the wiring from the main electrical equipment inside the equipment to the grounding terminal has been completed. Finish the work below on site:

- Ensure the effectiveness of each internal grounding connection by measuring the conductivity from the grounding terminals of each device to the main grounding copper bar.
- The shielding layer, protective layer, etc. of the external cables connected to the equipment should also be grounded at proper site of the equipment.

6.5.3 External grounding

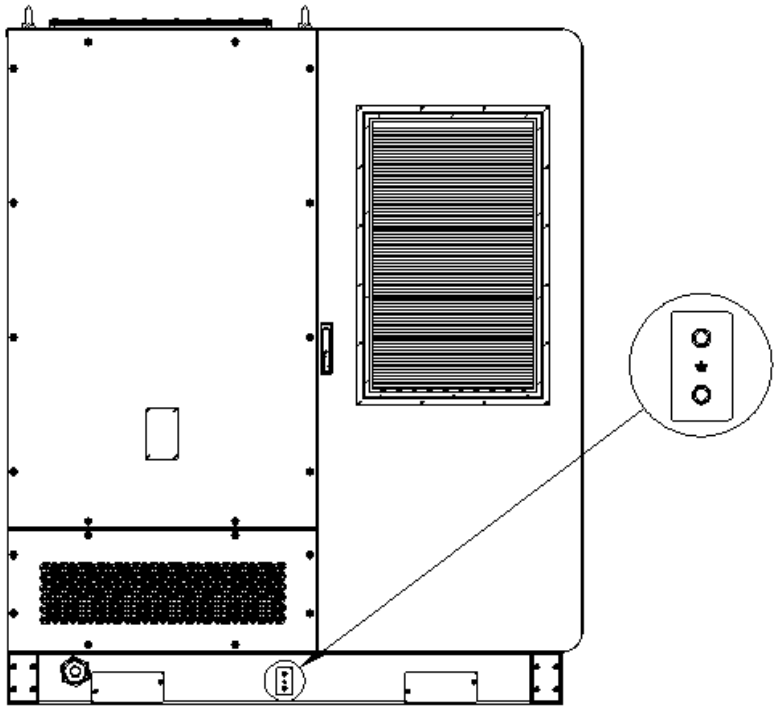


Figure 6-4 Grounding diagram of the equipment

Steps

Use grounding flat steel or 95mm² grounding cable for grounding. The grounding cable is taken as an example in the following operation steps:

Step 1. Locate the grounding point of the cabinet, as shown in Figure 6-4.

Step 2. 95mm² copper grounding cable is recommended to crimp OT95-10 or DT95-10 terminal blocks. Please refer to 6.3.3. Terminal crimping.

Step 3. Use M10 bolts to secure the OT/DT terminals to the wiring holes with a tightening torque of 40 N·m.

Step 4. After grounding, measure the grounding resistance, which should be ≤ 0.1Ω (please follow local regulations for the specific grounding resistance requirements).

Note

Please install external grounding based on site realities and under the instructions of the power station staff.

6.6 AC wiring

6.6.1 Precautions

Warning

Accidental touch of the live terminals can result in fatal electric shock hazards!

- Ensure that the PCS AC/DC switches are in the disconnected state and that the wiring terminals are not energized.
- Apply to relevant authorities for approval before connecting to the power grid. Connect the power grid as per the safety instructions and regulations related to the power grid.

Warning

- Before connecting to the AC power grid, disconnect the upstream AC side circuit breaker and ensure no voltage at the contact terminals.
- Connect the power grid only after obtaining approval from the public power grid authority and by following all relevant safety instructions.
- The communication output is not grounded inside the equipment.
- DC and AC circuits are isolated from the casing. The installation staff shall connect them to the system, if required by relevant national electrical regulations.

6.6.2 Grid AC input wiring

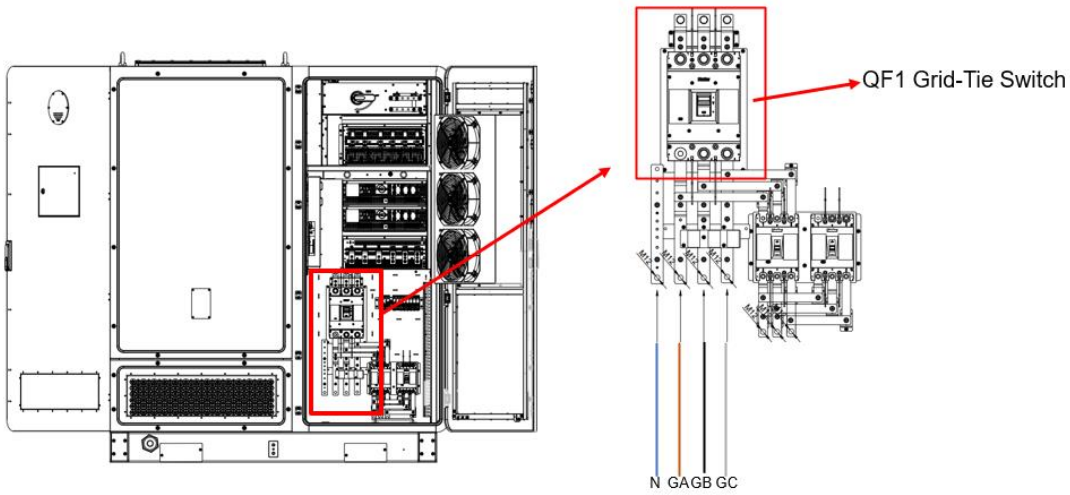


Figure 6-5 Grid AC input wiring area

Steps

Step 1. Disconnect the upstream AC circuit breaker and grid-connected circuit breaker QF1 and measure the voltage with a multimeter to ensure that there is no voltage at the terminals.

Step 2. Introduce the cable into the grid AC input wiring area inside the cabinet through cable entrance port C in Figure 6-1.

Step 3. Mark the cable phase sequence to ensure the correct connection sequence of AC cables.

Step 4. Use copper cables the area of which is no less than 95mm² to crimp OT/DT terminals. Please refer to 6.3.3 Terminal crimping.

Step 5. Use M12 bolts to secure the OT/DT terminals to the wiring holes with a tightening torque of 75 N·m. Please refer to 6.3.4 Connection cables.

Step 6. After the wiring is completed, gently pull the cable to ensure there is enough margin.

6.6.3 Load AC input wiring

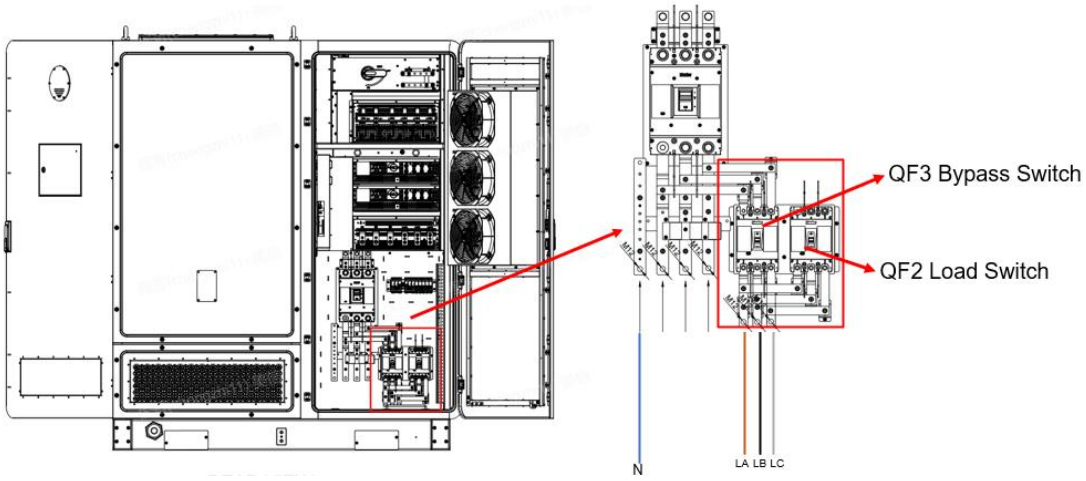


Figure 6-6 Load AC input wiring area

Steps

Step 1. Disconnect the upstream AC circuit breakers QF2 and QF3 and measure the voltage with a multimeter to ensure that there is no voltage at the terminals.

Step 2. Introduce the cable into the grid AC input wiring area inside the cabinet through cable entrance port B in Figure 6-1.

Step 3. Mark the cable phase sequence to ensure the correct connection sequence of AC cables.

Step 4. Use copper cables the area of which is no less than 95mm² to crimp OT/DT terminals. Please refer to 6.3.3 Terminal crimping.

Step 5. Use M12 bolts to secure the OT/DT terminals to the wiring holes with a tightening torque of 75 N·m. Please refer to 6.3.4 Connection cables.

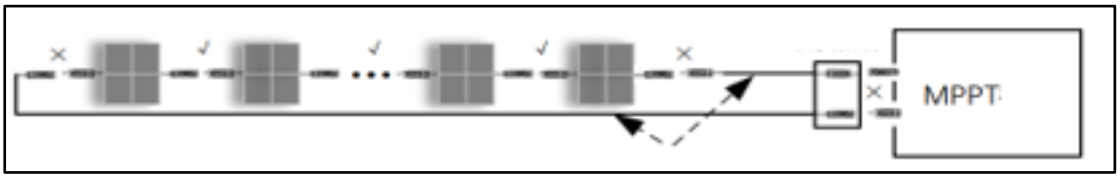
Step 6. After the wiring is completed, gently pull the cable to ensure there is enough margin.

6.6.4 PV wiring

Precautions

Note

- Before using the MPPT module for the first time, customer needs to install the PV cables and MC4 terminals.
- Before wiring the MC4 quick plug terminal, the customer needs to disconnect the transfer cable between the front stage of the PV board and the MPPT module.



Before connecting the PV quick-plug terminal of the lined end of the shipped accessories for the first time, ensure that the transfer cable between two poles of the PV panel and the MPPT module has been disconnected.

- The PV panel comes with quick-plug cables of anode and cathode outputs with a standard length.
- A transfer cable is required between the PV panel and MPPT after considering the transmission distance.
- MC4 configured by the PV manufacturer is required for connecting the transfer cable to the PV end.
- The Company's MC4 is required for connecting the transfer cable to our MPPT end.
- Before prefabricating the transfer cable for the first time on site and maintaining our MPPT, customer shall disconnect the transfer cable and PV panel. See the "X" connection in the above figure for the disconnection point. Live operation is prohibited.

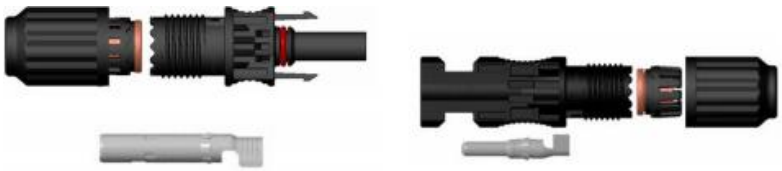
Operation of MC4 terminal wiring

Note

- Before using MPPT for the first time and subsequent maintenance, operate it as per the above wiring specifications and power-off procedures; otherwise, electric shock may occur.
- It is strictly prohibited to disconnect the transfer cable during MPPT operation. Correct disconnection sequence: Stop MPPT and ensure the isolation switch on the MPPT module is disconnected.
- The MC4 terminal connected to our MPPT must be the terminal accompanied with the equipment, not other models purchased by customer.
- It is recommended to use tin-plated cables for the PV cables connected to our MC4.
- With IP68, the connector cannot be put inside water in the long run.
- Prevent MC4 connector from contacting with corrosive substances.

Follow the steps below for terminal crimping.

Step 1. Match the outer shell and terminal core of the male and female wire ends.



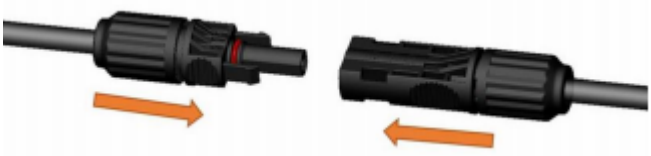
Step 2. Peel off the insulation at the end of the transfer cable, and control the stripping length L within 7-8mm. The number of broken strands in the wire core should not exceed 3.

Step 3. Insert the stripped cable cores into the crimping area of the MC4 metal terminal, and make sure that all cores are inside the terminal holes.

Step 4. Press the wire core and MC4 metal terminal tightly using crimping pliers.

Step 5. Thread the crimped female and male terminals through the tail cover and sealing ring respectively, then insert the plug (anode) and socket (cathode) correspondingly, and pre-assemble the terminal block until it engages. When it is set in place, a "click" sound can be heard, and the terminal cannot be pulled out again after insertion.

Step 6. After installing the MC4 terminal of the transfer cable, plug it into the MC4 terminal of the MPPT module board.



Wiring Steps

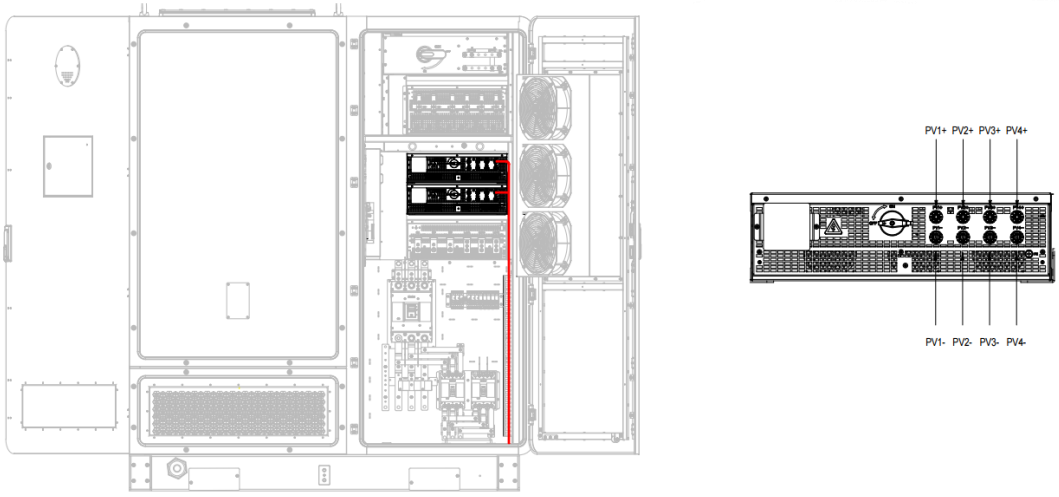


Figure 6-7 Wiring diagram of MPPT

Step 1. Disconnect the MPPT low-voltage side isolation switch and make measurement using a multimeter to ensure no voltage at the terminals.

Step 2. Introduce the cable into the cabinet through the cable entrance hole A in Figure 4-5 to make the cable enter the MPPT wiring area.

Step 3. Cable with an inner diameter cross-sectional area of 6mm2 and an outer diameter of 6-7mm is recommended. Please refer to the operation instructions for MC4 terminal wiring for details.

Step 4. Mark the cable phase sequence to ensure the correct connection sequence of PV cables.

Step 5. After the wiring is completed, gently pull the cable to ensure there is enough margin.

6.7 Switch wiring

Introduce the network cable into the cabinet through the bottom D port of the equipment to finally enter the switch wiring area.

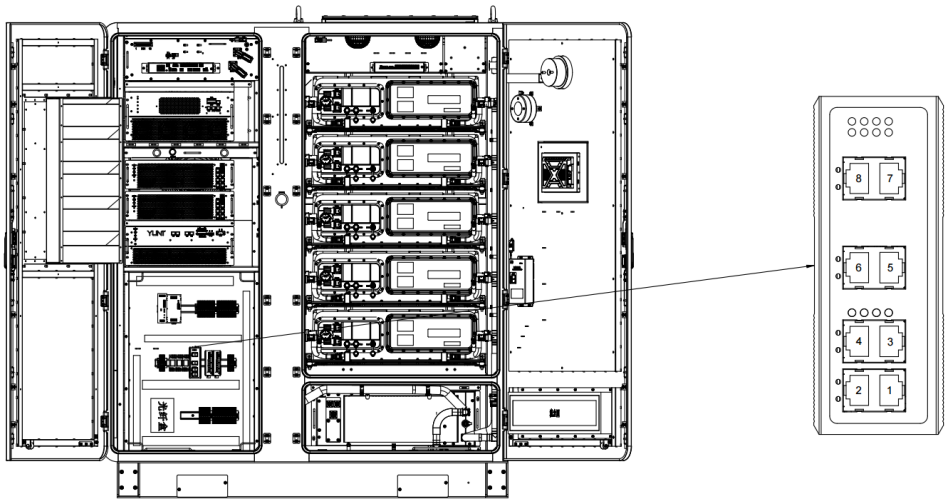


Figure 6-8 Location of switch wiring

Table 6-2 Master interface

Interface	Description
Network port 1	Connection to EMS
Network port 2	Connection to BCMU
Network port 3	For network connection among cabinets
Network port 4	For network connection among cabinets
Network port 5	Connection to PCS
Network port 6	Connection to MPPT1
Network port 7	Connection to MPPT2
Network port 8	Connection to 4G router

Table 6-3 Slave interface

Interface	Description
Network port 1	Idle
Network port 2	Connection to BCMU
Network port 3	For network connection among cabinets
Network port 4	For network connection among cabinets
Network port 5	Idle
Network port 6	Connection to MPPT1
Network port 7	Connection to MPPT2
Network port 1	Idle

6.8 EMS interface

Install EMS, when the switch is used as a master or multiple meters need connecting externally. Introduce the connection cable between EMS and external electric meter into the cabinet through the inlet hole D at the bottom of the equipment (Figure 6-1) and connect it to the reserved wiring terminal for EMS output.

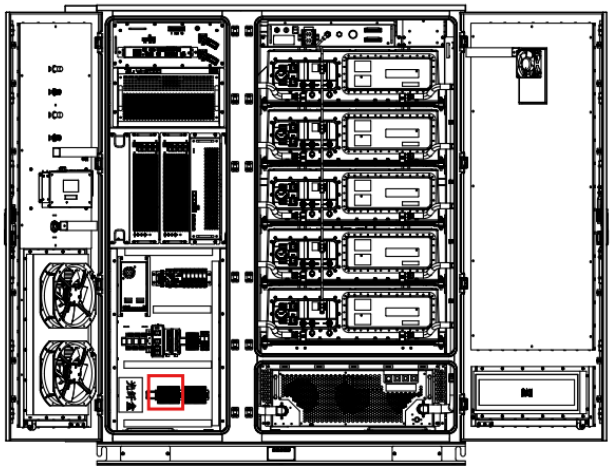


Figure 6-9 Location diagram of communication terminal of TD3 electric meter

Precautions for electric meter:

- It is recommended to use shielded twisted pair cables for meter wiring, with a cable length of ≤ 300m, in order to ensure smooth network, and low latency and signal attenuation.
- The DT/L 645 protocol is recommended first (if using Modbus RTU protocol, please communicate with Clou in advance)

Table 6-4 shows the schematic diagram of RS485 interface. External wiring diagram should be issued for specific projects based on realities; wiring on site shall be performed under guidance. The strategy meters are connected to COM5 and COM4 in priority.

Table 6-4 EMS communication interface

Name of serial communication interface	Description	Electric meter
COM1	RS485	Electric meter 1
COM2	RS485	Electric meter 2
COM3	RS485	Electric meter 3
COM4	RS485	Electric meter 4
COM5	RS485	Electric meter 5
COM6	RS485	Electric meter 6
COM7	RS485	Electric meter 7
COM8	RS485	Electric meter 8
COM9	RS485	Electric meter 9
COM10	RS485	Electric meter 10
COM11	RS485	Electric meter 11

6.9 Operation after wiring

After all electrical connections are completed, comprehensively and carefully check the wiring and the following contents:

- Check if any obstructions or blockages in all air inlets and outlets.
- Tightly seal the entrance and exit holes of outdoor cabinets and the joints around them using fire-resistant and waterproof materials.
- Reinstall the wiring area protective cover, lock the cabinet door, and pull out of the key.

Warning

- Moisture may enter the equipment if sealing is incorrect.
- Rodents may enter the equipment if sealing is incorrect.

Note

After closing the cabinet door, confirm that the sealing strips around the cabinet door do not curl!

7 Power-on/off Operations

7.1 Check before power-on

Carefully check the following items before power-on.

- Check for the wiring.
- Ensure that the protective cover inside the equipment is securely installed.
- Ensure that the e-stop button is in the released state.
- Ensure there are no grounding faults.
- Check if the AC and DC side voltages meet the starting conditions and there is no risk of overvoltage using a multimeter.
- Check the interior of the equipment to ensure no tools or parts left behind.
- Ensure that all air inlets and outlets are unobstructed or blocked by any objects.

7.2 Power-on

Note

- Live operation below -30°C is not recommended. Recommended power-on/off temperature: -20°C.
- If the temperature is too low, the system will heat cell for 24 hours or more, during which the system cannot run normally.

Before powering on the equipment, check it in detail and comprehensively to ensure that all indicators meet the requirements.

- Complete the power and communication wiring of the outdoor cabinet.
- Please ensure the equipment runs when the outdoor temperature is -30–+55°C.

Power-on steps

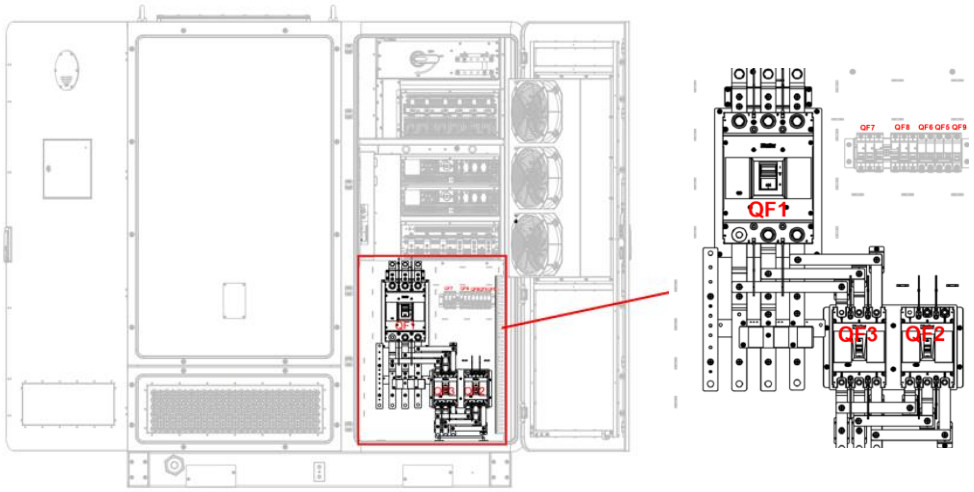


Table7-1 Location diagram of operation switch

No.	Name
QF1	Grid-connected circuit breaker
QF2	Load circuit breaker
QF3	Bypass circuit breaker
QF4	Surge protection circuit breaker
QF5	Chiller circuit breaker
QF6	Dehumidifier/fan circuit breaker
QF7	Backup power switch
QF8	UPS circuit breaker
QF9	Lead-acid battery circuit breaker

Step 1: Complete all wiring according to Chapter 6 and measure voltage and frequency to ensure compliance with system requirements.

Step 2: Check the E-stop switch on the cabinet door. If it is not in normal condition, reset it.

Step 3: Close QF1 and QF2 to power on the AC side of the system.

Step 4: Close QF5 to power on the chiller.

Step 5: Close QF6 to power on the dehumidifier and fan.

Step 6: Close QF8 to power on the UPS.

Step 7: Close QF9 to power on the lead-acid battery.

Step 8: Press the main power switch of the fire controller, and the button with a green backlight. Power-on is complete if the button indicator is on in green. Turn the power switch to the "automatic" state, and the fire protection system will act formally.

Note: QF7 is a backup power supply switch (power supplied from UPS). When the UPS lead-acid battery runs out of power and the system can obtain power from the grid, power is supplied via grid after closing QF7. A foolproof lever is set between QF7 and QF8. To use the black start function, close QF8 and turn off QF7.

——End

The system is powered on after finishing all the steps above. Check if the operation touch screen and the system are normal. For details about touch screen operation, please refer to the *EMS/Cloud Platform Operation Manual*.

7.3 Power-off

Step 1. Shut down the system via the touch screen, and then power off the switch. For details about touch screen operation, please refer to the *EMS/Cloud Platform Operation Manual*.

Step 2. Disconnect QF9 to power off the lead-acid battery.

Note: When not in use, the QF9 must be disconnected from the UPS and battery.

Step 3. Disconnect QF8 to power off the UPS.

Step 4. Disconnect QF6 to power off the dehumidifier and fan.

Step 5. Open and close QF5 to power off the chiller.

Step 6. Disconnect QF1 and QF2 to power off the AC side of the system.

——End

Then the system is powered off.

8 Maintenance

8.1 Precautions

Warning

- Read the entire document before installing the system. Violating safety operating procedures or failure in following the operating instructions or warning messages contained herein may result in electric shock, serious injury, or even death, as well as system damage and operation failure.
- The equipment and battery module have a certain weight. It is recommended to move or hoist them using professional equipment.
- Please install and maintain the system according to the instructions herein.
- If the equipment has defects, cracks, fractures or other damages, stop operating the equipment.
- Disconnect the circuit breaker before electrical wiring.
- Do not insert any foreign objects into any part of the cabinet.
- Do not expose the cabinet or its components to direct flames.
- Do not install cabinets near heating equipment.
- Do not immerse the cabinet or its components in water or other liquids

Note

- Do not lean or stack any items on the equipment or hang any items on the battery pack or wires leading to the battery pack pipeline.
- Do not use accessories or cables other than those specified in this manual to assemble the system.
- Ensure there is no water source above or near the battery pack, including fire sprinklers or faucets, air conditioning drips, etc.

Note

Before maintaining or repairing the equipment, measure the voltage via the copper bar of an AC circuit breaker.

Before maintaining or overhauling the equipment, power it off in order to ensure the operator's safety. The equipment must be powered off during maintenance, which shall follow the steps below:

- Control the off-grid shutdown of PCS.
- Ensure that the PCS is not accidentally powered on again.
- Disconnect all external connections of the equipment.
- Disconnect the internal power supply of the equipment and manually turn off the UPS (if any).
- Check if the switch in the system has been disconnected.
- Take necessary grounding measures.

8.2 Maintenance items and cycle

The parts inside the equipment may be aged and worn due to the ambient temperature, humidity, dust, vibration, and long-term use, etc., leading to potential malfunctions. Therefore, maintain the equipment on a daily and regular basis to ensure its normal operation and service life. All measures and methods that facilitate the running performance of the equipment fall under the scope of maintenance.

Maintenance is aimed to protect the specific environment of the equipment. During maintenance, remove the dust and pollutants and replace the locally damaged components according to specific cycles.

Table 8-1 System maintenance items and cycles

No.	Check items	Cycle
1	System software and running status	Every 6 months
2	Cabinet and operating environment	Every 6 months
3	Maintenance and inspection of the liquid cooling system	Every 6 months
4	Comprehensive inspection of fire protection system	Every 12 months
5	Power loop and loop main switch	Every 12 months
6	UPS	Every 12 months
7	Signal circuit	Every 12 months
8	System cleaning	Every 12 months
9	Safety functions	Every 12 months
10	Grounding reliability	Every 12 months
11	Label drop	Upon discovery of label drop

Note: The actual interval of maintenance depends on the installation environment and operating conditions of the cabinet.

8.3 Daily check

8.3.1 System software and running status

- Read data from the software and check various settings parameters.
- Upgrade the software, if necessary.

8.3.2 Cabinet and operating environment

- Aging of rubber strip of the cabinet door, and closing of cabinet door.
- Check if the exterior paint of the cabinet as well as the rusting of outer surface and screws.
- Check if the cabinet is grounded effectively.
- Remove the dust and dirt on the dustproof net.

8.3.3 Maintenance and inspection of the liquid cooling system

1. After setting parameters of the liquid cooling system based on the local normal climate, check and maintain the liquid cooling system once every 6 months. Under extreme climate or abnormal conditions, adjust the parameters above properly based on local realities while maintaining the unit.
2. Clean the inlet and outlet air filters of the liquid cooling system regularly (once every 6 months in general). If there is a lot of dust, oil stains, fibers, willow catkins, etc. in the surrounding environment, clean them at a higher frequency.
3. Check the leakage of cooling fluid:
   - Check the water inlet and outlet of battery pack, liquid cooling pipeline connected site, joint of top exhaust valve, water inlet and outlet of liquid cooling machine, etc.
   - Contact our service engineers promptly to replace components and replenish liquid in time based on the leaked position.
4. Check whether the coolant is sufficient through any one of the following two methods:
   - Check for any low liquid level alarm in the coolant reservoir through EMS or the screen on the external liquid cooling unit.
   - Remove the front cover of the liquid cooling unit and check whether the liquid level in the coolant reservoir is below the replenishment port.

   If the coolant is insufficient, add coolant until the liquid level in the reservoir is near the replenishment port, ensuring the reservoir is full without any overflow. For the detailed replenishment operation, refer to the *Liquid Cooling Unit User Manual.*

8.3.4 Comprehensive inspection of fire protection system (not required for some products)

Note: Before inspection or debugging, unplug the power cord of the aerosol device to avoid accidental spraying!

- Check if the fire control unit is normal (if any), if the aerosol fire extinguishing equipment (if any) is within its expiration date, and if the device appearance abnormal.
- Check if the detector and sound and light alarm are in normal working condition.
- Wipe the smoke and temperature detectors clean every 12 months.
- Check if the explosion-proof device and fire water joint are damaged or abnormal.
- Perform linkage test against the fire protection system once a year.

8.3.5 Check of power circuit and main switch circuit

- Tighten the bolts connecting the power grid and battery cables.
- Secure the grounding wire (PE) and other grounding wires of the cabinet.
- Check all types of switches in the main circuit, including main circuit breakers and fuses.

8.3.6 UPS

- When not in use, the QF9 (lead-acid battery switch) must be disconnected from the UPS and battery.
- If it is left idled for a long time, power it on for every other one month for check:
- Check the main power circuit: If the UPS indicator is normal after closing QF8 (mains power switch 220Vac), then the UPS main power supply circuit is normal. Otherwise, the UPS is faulty.
- Check backup circuit: If the power indicator on the door of the equipment is normal after disconnecting QF8 and closing QF9, then the battery circuit is normal. Otherwise, check the UPS battery circuit.
- The Company is not liable for the battery damage caused by over-discharge without following the requirements.
- Please entrust a professional agency to test the lifespan of lead-acid batteries within 3-5 years. To replace the battery, please contact the Company first.

8.3.7 Signal circuit

Check if the terminals and plug connections become loose every year.

8.3.8 Safety functions

- Check if the e-stop circuit is loose.
- Check if the equipment can stop immediately after pressing the e-stop button and if it can be restored normally after reset through rotation.

8.3.9 Grounding reliability

- Check the protective grounding of each cabinet shell inside the system.
- Check the lightning protection grounding of the system.

8.3.10 Label drop

The warning signs on the labels contain important information for safe operation of the equipment. If the label is found dropping during system maintenance, please promptly attach a new one.

8.4 System cleaning

- Clean the dust inside the cabinet by the personnel complying with relevant safety regulations with a brush and take the dust out. Use vacuum cleaners and brushes to clean the equipment, and high-pressure gas to clean the areas that can be hardly reached directly.
- Clean the dust from the dust cover.
- Dust-proof cotton pads at the front and rear of the bottom of the equipment need maintaining and replacing regularly. When maintaining the dust-proof cotton, open the cabinet door and remove the louvers. See Figure 7-7 for the position of the dust-proof cotton.

Note: The specifications of the dust-proof cotton: Aluminum frame 45PPI filter screen; size of the aluminum frame: 690*155*10mm for the front and rear doors of the battery compartment; 500*730*10mm for the front and rear doors of the equipment compartment.

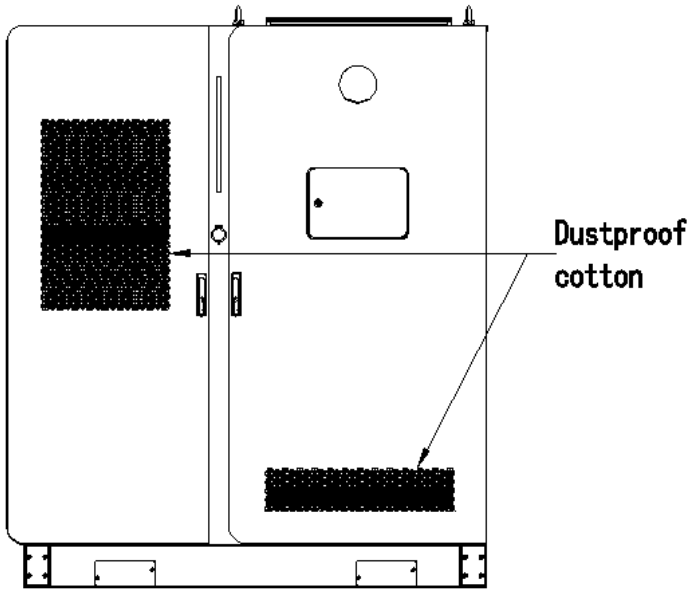


Figure 8-1 Location diagram of dust-proof cotton

8.5 Component maintenance

Danger

- It is forbidden to maintain the equipment under power-on status. After disconnecting the power supply, wait for at least 5 min before maintenance; otherwise, the residual charge of the equipment may cause harm to personnel.
- Please maintain the equipment by the personnel authorized by the Company only, who have received specialized training; otherwise, personal injury or equipment damage may occur.
- All pluggable plugins must be plugged in and out after power-off. Otherwise, the device may be damaged.
- It is strictly prohibited to leave wire ends or tools inside the machine; otherwise, fire disaster or property damage may occur.

8.5.1 Replacement of lightning arrester

Replace the lightning arrester damaged by induced lightning or overcurrent according to the following steps:

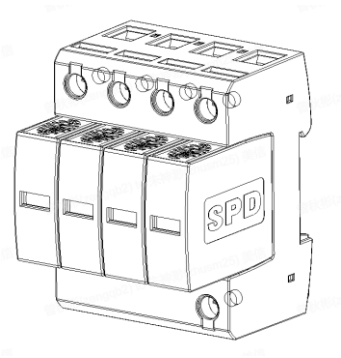


Figure 8-2 Schematic diagram of lightning arrester

Operation steps

Step 1. Check if the lightning arrester indicator bar has turned red from green.

Step 2. Disconnect all switches inside the cabinet and open the fuse at the front end of the lightning arrester.

Step 3. Check using a multimeter to confirm it has been powered off.

Step 4. Remove the damaged lightning arrester.

Step 5. Replace it with a new one of the same model.

Step 6. Close all switches again and close the fuse at the front end of the lightning arrester.

8.5.2 Fuse replacement

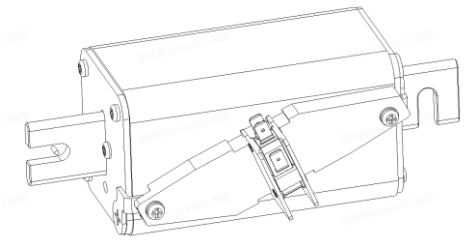


Figure 8-3 Schematic diagram of fuse

Operation steps

Step 1. Fuse is faulty and cannot be recovered.

Step 2. Shut down the equipment.

Step 3. Disconnect all switches inside the cabinet.

Step 4. Check using a multimeter to confirm it has been powered off.

Step 5. Unplug the quick plug connector of the battery cluster (please wear insulated gloves).

Step 6. Dismantle other cables.

Step 7. Pull out the control box, then open the cover and replace the fuse (the new fuse must be in the same model with the old one!).

8.5.3 Contactor replacement

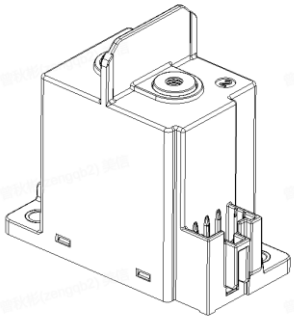


Figure 8-4 Schematic diagram of contactor

Operation steps

Step 1. The anode/cathode relay is stuck and cannot be restored.

Step 2. Shut down the equipment.

Step 3. Disconnect all switches inside the cabinet.

Step 4. Check using a multimeter to confirm it has been powered off.

Step 5. Unplug the quick plug connector of the battery cluster (please wear insulated gloves).

Step 6. Dismantle other cables.

Step 7. Pull out the control box, then open the cover and replace the contactor (the new contactor must be in the same model with the old one!).

8.6 Others

When the equipment fails to output as expected or the charge and discharge energy is abnormal, please check the followings before consulting our maintenance personnel:

- Status of all switches inside the equipment.
- Open circuit voltage of the energy storage battery clusters.
- Check if the e-stop knob is pressed.
- Check if the cabinet is properly connected to the power grid and powered on.
- Check the communication inside the cabinet.

9 Malfunction/Troubleshooting

9.1 EMS malfunction/troubleshooting

When an EMS malfunction/fault occurs, the fault status will be displayed on the main screen (or web and cloud end).

No.	Malfunction/Fault	Description	Malfunction/Troubleshooting
1	Communication abnormality of the equipment	The equipment is disconnected	Check if the network cable connecting the equipment and EMS/BCMU is disconnected. If the problem still exists, please contact Clou.
2	Communication anomaly of electric meter	The electric meter is disconnected	Check if the RS485 cables connecting each electric meter to EMS are disconnected. If the problem still exists, please contact Clou.

9.2 EMS/BCMU malfunction/Troubleshooting

When a EMS/BCMU malfunction/fault occurs, the fault status will be displayed on the main screen (or web and cloud end).

No.	Malfunction/Fault	Description	Malfunction/Troubleshooting
1	Contactor sticking	The auxiliary contact changes of the contactor do not match the realities	Check if this fault is a false alarm. If not, please contact the Company.
2	Fuse failure	Change of fuse auxiliary contact	Check if this fault is a false alarm. If not, please contact the Company.
3	Alert protection of the equipment's SPD status	SPD DI is 0	Check if the SPD of the distribution box is faulty (the indicator bar turns red from green). If so, please replace it with a new SPD.

4	Opening protection of the equipment's AC circuit breaker	AC circuit breaker DI is 0	The AC main incoming line switch trips. 1) Check if fire signal triggers synchronously, and if the equipment has smoke or flames. If so, please contact a professional fire agency. 2) Check if the e-stop signal triggers during synchronization, and if so, eliminate the e-stop fault first.
5	Alert protection of the equipment's e-stop status	E-stop ID is 0	Check if the equipment's e-stop button is pressed. If the problem still exists, please contact Clou.
6	Alert protection of the equipment's aerosol status	Aerosol DI is 0	Triggered in case of fire alarm Please do not open the cabinet door immediately; instead, check if the equipment has smoke or flame. Open the door after leaving it still for 2hr.
7	Alert protection of the equipment's smoke sensing status	The smoke sensor DI is 0	Triggered in case of fire alarm Please do not open the cabinet door immediately; instead, check if the equipment has smoke or flame. Open the door after leaving it still for 2hr.
8	Alert protection of the equipment's temperature sensing status	The temperature sensor DI is 0	Triggered in case of fire alarm Please do not open the cabinet door immediately; instead, check if the equipment has smoke or flame. Open the door after leaving it still for 2hr.
9	Dehumidifier failure	Dehumidifier report failure	Check if there is any malfunction in the equipment's dehumidifier; before replacing the dehumidifier, please contact the Company.
10	PCS/MPPT/STS fault	PCS/MPPT/STS reporting fault	Check if there is any malfunction in the equipment's PCS/MPPT/STS; before replacing them, please contact the Company.
11	Failure of the liquid cooling system	Report failure of the liquid cooling system	Check if there is any malfunction in the equipment's liquid cooling system; before replacing the system, please contact the Company.
12	PCS/MPPT/STS communication anomaly	PCS/MPPT/STS disconnection	Check if the RS485 cable of the equipment's PCS/MPPT/STS is disconnected. If the problem still exists, please contact Clou.

13	Communication anomaly of dehumidifier	The dehumidifier is disconnected	Check if the RS485 cable of the equipment's dehumidifier is disconnected. If the problem still exists, please contact Clou.
14	Communication anomaly of the liquid cooling system	The liquid cooling system is not online	Check if the RS485 cable of the equipment's liquid cooling system is disconnected If the problem still exists, please contact Clou.

10 Appendix

10.1 Abbreviations

Abbreviations	Full name
AC	Alternating Current
BAMU	Battery Array Management Unit
BCMU	Battery Cluster/String Management Unit
BESS	Battery Energy Storage System
BMS	Battery Management System
BMU	Battery Management Unit
CAN	Controller Area Network
DC	Direct Current
EMS	Energy Management System
ESS	Energy Storage System
FSS	Fire Suppression System
LCS	Liquid Cooling System
LFP	Lithium Iron Phosphate
PCS	Power Conversion System
PPE	Personal Protective Equipment
SOC	State of Charge
SOE	State of Energy
SOH	State of Health
SPD	Surge Protection Device
UPS	Uninterruptible Power Supply

10.2 Quality assurance

Evidence

When applying for warranty services during the warranty period, customer needs to show the invoice and date of purchase of the equipment to the Company and ensures the trademark on the equipment is clear, otherwise, the Company may refuse to provide the warranty services.

Conditions

- The Company has the rights to dispose of the defective product replaced
- The customer shall leave reasonable time for the Company to finish repairing

Exemption of liability

The Company has the rights to refuse warranty services in any of the following circumstances:

- Problems arising from arbitrary disassembly or improper maintenance of the equipment.
- The warranty term of the whole equipment and components has expired.
- The equipment is used beyond the scope of operation specified in relevant international standards.
- Problems arising from failure to install and operate the equipment correctly according to the user manual.
- Equipment damage caused by abnormal natural environment.
- Equipment damage caused by the use of non-standard components or software not from the Company.
- Equipment damage caused by external device damage.
- All accidents caused by customer's arbitrary modification or repair of the equipment.
- Safety accidents, property damage and equipment damage caused by powering on the equipment forcibly by the customer before troubleshooting.

If the customer applies for repairing services against the faults in any of the circumstances above, the Company will provide paid maintenance services through proper judgment. If customer needs to repair or modify the equipment, please contact the Company in advance.

Disclaimer

10.3 Contacts

For any questions about the equipment, please feel free to contact us. In order to provide you with faster and better service, please provide your following information:

- Product model
- Product serial number
- Fault code/name
- Fault description

Headquarters Tel.: 0755-33309999, official website: https://www.szclou.com