BluePulse Series

Commercial and Industrial Battery Cabinet User Manual

Model: BC(80~120)DE2A/ BC100DE2A-AU



Overview

This manual describes the key features, performance specifications, system principles, and external structure of the BC120DE2A series commercial and industrial battery cabinets, and also provides installation, use, operation, and maintenance instructions.

Intended audience

This document is primarily intended for the following engineers:

- Sales engineer
- Technical support engineer
- Systems engineer
- Hardware installation engineer
- Commissioning engineer
- Maintenance engineer

Symbol conventions

The following symbols may appear in this document. Their meanings are as follows:

Symbol	Description
DANGER	Indicates a hazard with a high level of risk that will result in death or serious injury if not avoided.
WARNING	Indicates a hazard with a medium level of risk that may result in death or serious injury if not avoided.
CAUTION	Indicates a hazard with a low level of risk that may result in minor or moderate injury if not avoided.
NOTICE	Used to convey equipment or environmental safety warning information. Failure to avoid this may result in equipment damage, data loss, performance degradation, or other unforeseen consequences. A "NOTICE" does not involve personal injury.
Description	Additional explanation of key information in the main text. "Description" is not a safety warning and does not relate to personal injury, equipment damage, or environmental hazard.

Revision history

Version	Revision date	Revision description	Internal document number
V00	February 5, 2026	Initial draft	/
V01	August 3 ， 2026	formal version	

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1 General safety precautions

1.1 GENERAL SAFETY

Declaration

Before installing, operating, or maintaining the equipment, read this manual and follow all safety precautions marked on the equipment and in this manual.

The "CAUTION", "WARNING", and "DANGER" items in this manual do not represent all safety requirements but are supplementary to them. KSTAR New Energy assumes no liability for any violations of general safety operating requirements or safety standards for the design, manufacture, and use of the equipment. This equipment must be used in an environment that meets the design specifications; otherwise, equipment malfunction may occur, and any resulting abnormal operation, component damage, personal injury, or property loss is not covered by the equipment warranty.

Local laws, regulations, and codes must be observed when installing, operating, and maintaining the equipment. The safety precautions in this manual are intended only as a supplement to local laws, regulations, and codes.

KSTAR New Energy shall not be liable under any of the following circumstances.

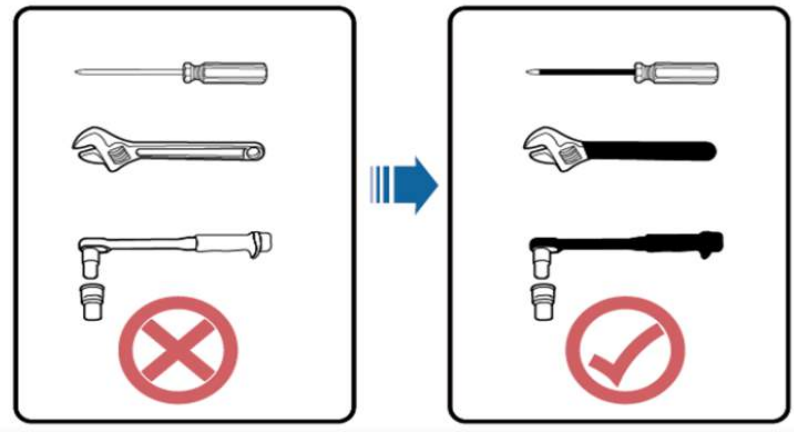
- Operation under conditions not specified in this manual;
- Installation and use in an environment that exceeds the requirements of relevant international or national standards;
- Unauthorized disassembly or modification of the product, or modification of the software code;
- Operation not in accordance with the operating instructions and safety warnings in the product and documentation;
- Equipment damage caused by abnormal natural conditions (force majeure, such as earthquakes, fires, storms, etc.);
- Transportation damage resulting from transportation arranged by the customer;
- Damage caused by storage conditions that fail to meet the product documentation requirements.

General requirements

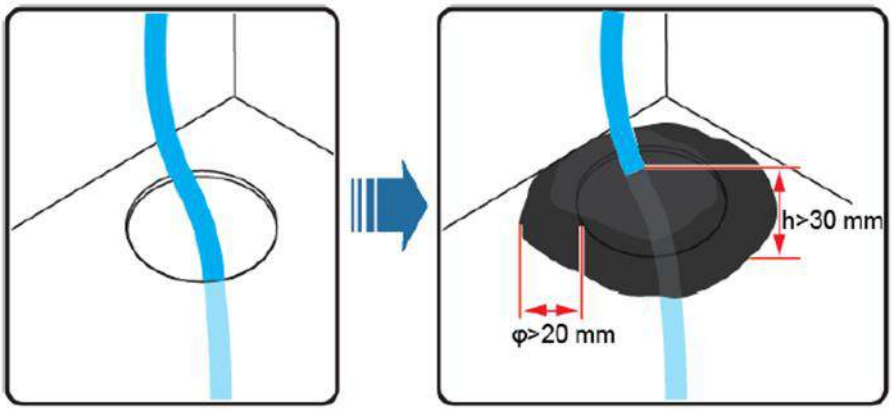
- Installation, use, and operation of outdoor equipment and cables (including, but not limited to, handling equipment, operating equipment and cables, plugging/unplugging signal interfaces connected outdoors, working at height, and outdoor installation) are strictly prohibited during severe weather such as thunderstorms, rain, snow, and winds of Beaufort scale 6 or above.
- It is strictly prohibited to wear watches, bracelets, bangles, rings, necklaces, or other conductive objects during installation, operation, and maintenance to prevent electric shock burns.
- Specialized personal protective equipment (PPE) must be used during installation, operation, and maintenance, such as insulated gloves, safety goggles, protective clothing, hard hats, and safety shoes, as shown below.



- Installation, operation, and maintenance must be performed in strict accordance with the sequence of steps in the instruction manual.
- Before contacting any conductor surface or terminal, measure the voltage at the contact point to confirm the absence of electric shock hazard.
- After equipment installation, remove all empty packaging materials, such as cardboard boxes, foam, plastic, and cable ties, from the equipment area.
- In the event of a fire, evacuate the building or equipment area and activate the fire alarm or call the fire department. Re-entry into a burning building is strictly prohibited under any circumstances.
- Do not disable protective devices or ignore warnings, cautions, and preventive measures in the manual and on the equipment. Hazard signs that have become illegible due to prolonged use must be replaced promptly.
- Only personnel authorized to operate the equipment are permitted to approach it.
- Tool handles must be insulated, or insulated tools must be used, as shown below.



- All cable entry holes must be sealed. Use fire-rated sealant to seal holes with cables installed, and use the cabinet's provided covers to seal unused holes. The correct fire-rated sealant installation standard is shown in the figure below.



- It is strictly prohibited to alter, damage, or obscure labels and nameplates on the equipment.
- When installing the equipment, use appropriate tools to tighten screws.
- Live work is strictly prohibited during installation.
- Paint scratches incurred during equipment transportation and installation must be repaired promptly. Long-term exposure of scratched areas to the outdoor environment is strictly prohibited.
- Before operation, securely fasten the equipment to the floor or another stable structure, such as a wall or mounting rack.
- Do not use water to clean electrical components inside or outside the cabinet.
- Do not modify the equipment's structure, installation sequence, etc., without authorization.

Personal safety

- If a fault that may cause personal injury or equipment damage is detected during operation, immediately stop the operation, report to the supervisor, and implement effective protective measures.
- To avoid electric shock hazard, do not connect Safety Extra-Low Voltage (SELV) circuits to Telecommunication Network Voltage (TNV) circuits.
- Do not power on the equipment until installation is complete and confirmed by a qualified professional.

1.2 PERSONNEL REQUIREMENTS

- Personnel responsible for installing and maintaining KSTAR equipment must undergo rigorous training to understand all safety precautions and master correct operating procedures.
- Only qualified professionals or trained personnel are permitted to install, operate, and maintain the equipment.
- Only qualified professionals are authorized to remove safety devices and service the equipment.
- Personnel operating the equipment, including operators, trained personnel, and professionals, must hold the special operation qualifications required by local regulations, such as for high-voltage work, working at height, and special equipment operation.
- Professional: A person with training or experience in equipment operation who is aware of the various potential sources and levels of hazard during installation, operation, and maintenance.
- Trained personnel: Personnel who have received appropriate technical training and possess the necessary experience to recognize the hazards they may encounter during an operation and can take measures to minimize risks to themselves and others.
- Operator: Personnel, other than trained or professional personnel, who may come into contact with the equipment.
- Replacement of equipment or components (including software) must be performed by a professional or authorized personnel.
- Removal of the battery pack top cover by unauthorized technical personnel is prohibited.

1.3 ELECTRICAL SAFETY

Grounding requirements

- For equipment requiring grounding, the protective earth conductor must be installed first during installation; When removing equipment, the protective earth conductor must be disconnected last.
- Do not damage or tamper with the grounding conductor.
- Do not operate the equipment without the grounding conductor installed.
- The equipment must be permanently connected to a protective earth. Before operating the equipment, inspect its electrical connections to ensure it is reliably grounded.

General requirements

- Use dedicated insulated tools when performing high-voltage operations.

AC and DC operation requirements

⚠ DANGER

Installing or removing power cords while energized is prohibited. When a power cord conductor contacts a live terminal, an arc or spark may occur, potentially causing fire or personal injury.

- If the equipment is labeled with the "High Leakage Current" symbol, the protective earth terminal of the equipment chassis must be grounded before connecting the AC input power to prevent electric shock from leakage current.
- The power switch must be turned off before installing or removing the power cord.
- Before connecting the power cord, verify that the labeling on the cord is correct.
- If the equipment has multiple inputs, disconnect all inputs and wait until the equipment is completely de-energized before performing any work.
- It is not recommended to use circuit breakers with residual current protection.
- If the power cord is damaged, it must be replaced by the manufacturer, its authorized agent, or a qualified professional to mitigate risk.
- Personnel performing high-voltage operations or installing AC equipment must be qualified for high-voltage and AC work.

Wiring requirements

- Cables used in high-temperature environments may suffer insulation aging or damage. Maintain a minimum distance of 30 mm between cables and the periphery of heat-generating components or heat sources.
- No cables are permitted to pass through the equipment's air inlet or outlet vents.
- Cables must meet the VW-1 flame retardancy rating.
- Cables of the same type should be bundled together. Cables of different types must be separated by at least 30 mm and must not be twisted or crossed.
- At low temperatures, severe impact or vibration may cause the cable's plastic sheath to crack brittly. To ensure construction safety, the following requirements must be followed:
- All cables must be installed at temperatures above 0°C. Handle cables gently, especially during low-temperature installations.
- If cables have been stored below 0°C, they must be acclimatized in a room-temperature environment for at least 24 hours before installation.
- Do not push cables directly off a vehicle or perform other improper handling.
- Cable selection, routing, and installation must comply with local laws, regulations, and codes.

Electrostatic discharge (ESD) protection requirements

NOTICE

Static electricity generated by the human body can damage electrostatic-sensitive components on circuit boards, such as large-scale integrated circuits (LSIs).

- Static electricity generated by the human body can damage electrostatic-sensitive components on circuit boards, such as large-scale integrated circuits (LSIs). Before touching the equipment, handling a circuit board, or an application-specific integrated circuit (ASIC) chip, wear anti-static gloves or an anti-static wrist strap, with the other end of the strap properly grounded.
- When handling a circuit board, hold it only by the edges where no components are mounted. Do not touch the components with your hands.
- Removed circuit boards must be packaged in anti-static material for storage or transport.

Neutral-to-ground voltage

- It is recommended that users balance the three-phase load to keep the neutral-to-ground voltage below 2 V to meet power distribution requirements.

1.4 INSTALLATION ENVIRONMENT REQUIREMENTS

- Do not obstruct ventilation openings or cooling systems during equipment operation to prevent fire from overheating.
- Install the equipment in an area away from liquids. Do not install it below water pipes, air outlets, or other locations prone to condensation; Do not install it below air conditioning outlets, ventilation grilles, server room cable exit windows, or other locations prone to water leakage to prevent liquid ingress, which could cause equipment failure or short circuits.
- If liquid is found inside the equipment, immediately power it off and notify the administrator.
- Do not place the equipment in an environment with flammable or explosive gases or fumes, and do not perform any operations in such an environment.
- Equipment installation should be away from desert or dusty environments.

Working at height

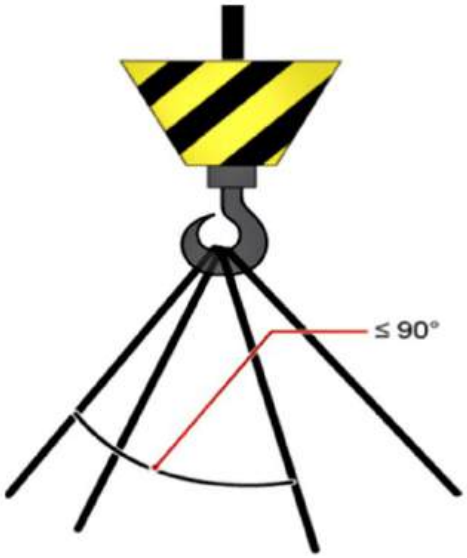
- Any work performed at a height of 2 meters or more above the ground is considered work at heights.
- Work at heights must be stopped under any of the following conditions: rainwater on steel pipes has not dried, or other hazardous conditions exist. After the above conditions have passed, the company's safety officer and relevant technical personnel must inspect all work equipment and grant approval before work resumes.
- Work at heights must comply with local regulations for working at height.
- Personnel must receive relevant training and obtain the required certification before performing work at heights.
- Before working at height, carefully inspect access tools and safety equipment, such as hard hats, safety harnesses, ladders, staging, scaffolding, and lifting equipment. If any item fails to meet requirements, rectify the issue immediately or refuse to work at heights. Ensure proper safety protection: wear a hard hat and safety harness or lanyard, secured to a solid and robust structural member. Never attach to unstable, movable objects or sharp-edged metal to prevent hook slippage and fall accidents.
- At the work-at-heights site, establish a danger exclusion zone with clear signage, and strictly prohibit unauthorized personnel from entering.
- Secure all tools and instruments to prevent them from falling and injuring others.
- It is strictly prohibited for workers at height to throw objects to the ground, and vice versa. Use strong ropes, hoists, aerial work platforms, or cranes to transfer objects.
- Guardrails and warning signs must be installed at edges and openings of elevated work areas to prevent falls.

- Do not store scaffolding, staging, or other debris on the ground directly below the elevated work area. Ground personnel are strictly prohibited from staying or passing directly beneath the elevated work area.
- Scaffolding, staging, work platforms, etc., for work at heights must undergo prior safety inspection and certification to ensure structural integrity and that scaffolding is not overloaded.
- If the site supervisor or safety officer finds personnel working at height not complying with regulations, they must immediately instruct them to correct the violation; otherwise, their work must be stopped.

1.5 MECHANICAL SAFETY

Lifting safety

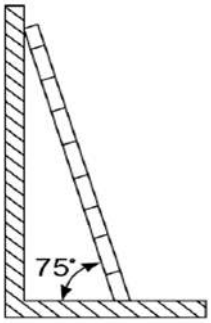
- When lifting heavy loads, never walk under the boom or the suspended load.
- Personnel performing lifting operations must be trained and qualified before commencing work.
- Lifting equipment must be inspected and fully equipped before use.
- Before lifting, ensure the lifting equipment is securely anchored to a load-bearing fixture or wall.
- During lifting, ensure the angle between the two sling legs does not exceed 90°, as shown in the figure below.



- During lifting, do not drag wire ropes or lifting gear, and do not strike them with hard objects.

Ladder safety

- Use a wooden or fiberglass ladder when there is a risk of electrical contact during work at heights.
- When using a step ladder, the spreader brace must be secure, and someone must hold the ladder during work.
- Before using a ladder, ensure it is in good condition and its load capacity meets requirements. Overloading is strictly prohibited.
- Place ladders on stable surfaces. The optimal ladder angle is 75°, which can be measured with an angle gauge, as shown below. When using a ladder, position the wider base feet downward or use protective measures at the base to prevent slipping.



- When climbing a ladder, observe the following to minimize hazards and ensure safety.
- Maintain body stability.
- The operator should not stand higher than the fourth rung from the top of the ladder.
- Ensure your center of gravity does not extend beyond the side rails of the ladder.

Drilling safety

The following safety precautions must be observed when drilling into walls or floors:

NOTICE

Drilling into the equipment is strictly prohibited. Drilling can compromise the equipment's electromagnetic shielding and damage internal components and cables. Metal shavings from drilling can enter the equipment and cause circuit board short circuits.

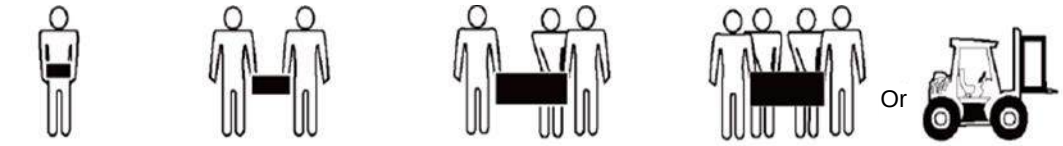
- Prior to drilling, obtain agreement from the customer, contractor, and KSTAR.
- Wear safety goggles and protective gloves when drilling.
- During drilling, shield the equipment to prevent debris from entering. Clean up all debris immediately after drilling.

Heavy lifting safety

⚠ DANGER

When pulling equipment out of a cabinet, be cautious of unstable or heavy equipment mounted on the cabinet to avoid crushing or impact injuries.

- When lifting heavy objects, prepare properly to avoid being crushed or sprained.



<18 kg (<40 lb) | 18 kg–32 kg (40 lb to 70 lb) | 32 kg–55 kg (70 lb to 121 lb) | >55 kg (>121 lb)

- Wear protective gloves when manually handling equipment to prevent injury.
- When moving or lifting the equipment, grasp the equipment handles or support the bottom edge, not the handles of installed internal modules.
- Avoid scratching the cabinet surface or damaging cabinet components and cables during equipment handling.
- When using a forklift, insert the forks at the center position to prevent tipping. Before moving, secure the equipment to the forklift with straps; Specialized personnel must supervise the move.
- For transportation, prefer rail, sea freight, or well-maintained roads to ensure equipment safety. Minimize bumps and tilting during transport.
- Move the cabinet carefully to avoid any impact or drop that could damage the equipment.

1.6 BATTERY SAFETY

Basic requirements

Before performing any battery work, carefully read the operational safety precautions and understand the correct battery connection method.

DANGER

- Do not expose batteries to high-temperature environments or near heat-generating equipment, such as direct sunlight, open flames, transformers, or heaters. Battery overheating may cause an explosion.
- Incinerating batteries is strictly prohibited, as it may cause an explosion.
- Do not disassemble, modify, or damage batteries (e.g., by inserting foreign objects or immersing in water or other liquids) to prevent leakage, overheating, fire, or explosion.
- Wear safety goggles, rubber gloves, and protective clothing to guard against hazards from electrolyte spillage. If battery electrolyte leaks, avoid skin or eye contact. If contact occurs, immediately flush with water and seek medical attention.
- Use dedicated insulated tools.
- Handle batteries in the orientation specified by the manufacturer. Inversion or tilting is strictly prohibited.
- The battery circuit must remain disconnected during installation, maintenance, and other operations.
- Use only the specified battery model. Using non-specified batteries may cause damage.
- Dispose of used batteries in accordance with local laws and regulations. Do not dispose of them as household waste. Improper battery disposal may cause an explosion.
- Fire-fighting equipment that meets requirements, such as fire sand and water-based fire extinguishers, must be available on site.

NOTICE

To ensure battery safety and the accuracy of battery management functions, use only the batteries configured by KSTAR for the PCS host. KSTAR is not responsible for battery-related failures resulting from the use of non-KSTAR configured batteries.

Battery installation specifications

Before battery installation, observe the following basic safety precautions to ensure safety:

- Install batteries in a well-ventilated, dry, and cool location, away from heat sources, flammables, humidity, intense infrared radiation, organic solvents, and corrosive gases, and implement fire prevention measures. Batteries must be placed horizontally and secured.
- Pay attention to polarity during installation. Short-circuiting the positive and negative terminals of the same cell or battery string is strictly prohibited, as it will cause a battery short circuit.
- Periodically inspect battery terminal screws to ensure they are tight and not loose.
- Never place installation tools on the battery during the installation process.

Battery short-circuit protection

DANGER

A battery short circuit generates an instantaneous high current and releases substantial energy, which can cause personal injury and property damage.

To prevent short circuits, online maintenance of batteries is not permitted.

Lithium battery special scenarios

Safety precautions for lithium battery operation include those for lead-acid batteries, plus the following additional considerations.

⚠ WARNING

Using an incorrect replacement battery model poses an explosion risk.

- Replace only with the same or similar model recommended by the manufacturer.
- Do not invert, tilt, or subject lithium batteries to impact during handling.
- The lithium battery module circuit must remain disconnected during installation, maintenance, and other operations.
- Do not charge lithium batteries below the lower operating temperature limit (charging is prohibited at 0°C) to prevent internal short circuits caused by low-temperature charging crystallization.
- Do not exceed the specified temperature operating range, as this will affect battery performance and safety.
- Do not expose lithium battery modules to fire.
- Upon completion of maintenance, return the used lithium battery module to the service center.

1.7 TRANSPORTATION AND STORAGE

1.7.1 Warning

⚠ CAUTION

Failure to transport and store the product as required by this manual may void the warranty

1.7.2 Transportation methods

The BC80~120DE2 energy storage cabinet weighs approximately 1.4 tons and can be transported by land or sea. It features an integrated, easy-to-lift design for convenient transportation. Air transportation is not currently authorized, and no railway transportation guidelines are available.

NOTICE

In most cases, the total weight of a truck carrying the energy storage cabinet will exceed the general weight limits on public roads. You may therefore need to obtain an overweight permit from the appropriate local authority in that region.

1.7.3 Transportation requirements

When the energy storage cabinet leaves the factory, most of its internal components are secured inside the cabinet.

During transportation, the energy storage cabinet can be lifted or moved as a whole unit.

⚠ WARNING

Throughout loading, unloading, and transportation, strictly follow the battery cabinet safety operating procedures applicable in the project's country or region.

- All personnel involved in loading, unloading, and anchoring operations must receive relevant training, particularly on safety.
- Do not transport the energy storage cabinet when the temperature is below -30°C.

Description

Bear in mind the mechanical parameters of the energy storage cabinet (external dimensions and weight) at all times during loading, unloading, and transportation.

When transporting or moving the energy storage cabinet, ensure that the following requirements are met:

- All doors of the energy storage cabinet are locked.
- Select a suitable crane or lifting tool based on site conditions. The tool used must have sufficient load capacity, boom length, and swing radius.
- It is recommended to lift the energy storage cabinet with a single crane.
- Moving the energy storage cabinet along a slope may require additional traction.
- Clear any existing or potential obstacles along the route, such as tree branches and cables.
- Transport or move the energy storage cabinet in good weather whenever possible.
- Warning signs or a cordoned-off warning area must be set up to prevent unauthorized personnel from entering the work area and to avoid accidents.
- The energy storage cabinet must remain upright during transportation.
- Ensure that the base of the energy storage cabinet remains level throughout transportation, with a maximum permissible tilt of 15°.
- Avoid collisions or strong vibrations during transportation.
- If the energy storage cabinet is transported by land, use ropes to secure the lifting rings on top of the cabinet to the transport vehicle to prevent excessive tilting during transportation.

Description

After the energy storage cabinet arrives at the project site, remove the diagonal fasteners at the four top corners and store them properly.

- The transport vehicle must comply with local traffic regulations.
- The vehicle should maintain a constant speed as much as possible during transportation. Sudden braking is not allowed.
- The logistics carrier should monitor abnormal driving behavior through a logistics tracking platform or the vehicle's onboard GPS system and issue an early warning or manual intervention alert. If any visible damage is found during unpacking on site, the carrier should provide driving records as evidence for determining liability.

1.7.4 Storage requirements

NOTICE

Store the product in accordance with the storage requirements. Damage caused by failure to meet storage requirements is not covered by the warranty.

- During storage, properly file all documents demonstrating compliance with the product storage requirements, including ambient temperature and humidity logs, photos, and inspection reports.
- The base of the energy storage cabinet must be raised a certain height off the ground to avoid internal condensation and to prevent the bottom of the cabinet from being soaked by rain during the rainy season. The height should be determined based on the site's geological and meteorological conditions, among other factors.
- Store the energy storage cabinet on dry, flat, solid, hard ground free of any vegetation. The surface requirements are as follows:
  - The surface must have sufficient load-bearing capacity to support the equipment.
  - The surface must be flat, with a level deviation of 0-10 mm, and the slope must be less than 5°.
  - The surface must provide good drainage to prevent water accumulation or flooding around the energy storage cabinet.
- Before storage, ensure that the doors of the energy storage cabinet and all internal equipment are locked. During storage, avoid opening the doors unless necessary.
- During storage, maintain a clearance of 150 cm in front of and 150 cm behind the energy storage cabinet.

- The ambient temperature range for system storage is 0°C to 35°C.

Description

Long-term battery storage is not recommended, as it may lead to a reduction in battery capacity. Even when the battery is stored at the recommended optimal storage temperature, irreversible capacity degradation still occurs while in an idle state, and this degradation becomes more severe as the storage time increases. Refer to the technical agreement for the specific degradation amount.

- The relative humidity for storage is 5%-95%, non-condensing.
- Use effective protective measures on the air inlet and outlet of the energy storage cabinet. During storage, ensure that the protective film on the air inlet and outlet remains intact. In addition, take effective measures to prevent the ingress of rain, dust, and sand.
- It is recommended to replace the desiccant every six months. Use montmorillonite desiccant, 500 g per bag. Place one bag of desiccant in each of the left and right compartments of each cabinet. Before operation, remove all desiccant from the cabinet.
- Conduct a periodic inspection at least once every two weeks. Check for signs of damage caused by pests or animals, and inspect the energy storage cabinet and its packaging, terminals, cables, and internal components for damage or aging. Promptly address any issues found, or replace parts if necessary.
- Before installing an energy storage cabinet that has been stored for more than 6 months, open its doors and perform a visual inspection. Ensure that the energy storage cabinet and all internal components are intact. In addition, perform an inspection after power-on and startup. If necessary, have qualified personnel perform testing before installation.
- Avoid storing the energy storage cabinet in areas containing flammable or explosive materials. Ensure that there are no fire hazards.
- Avoid storing the energy storage cabinet in dusty environments with large amounts of dust, smoke, or fibrous particles. These particles may adhere to the equipment's air inlet, outlet, or heat sink, impairing heat dissipation performance and potentially damaging the equipment.
- Avoid storing the energy storage cabinet in locations where corrosive gases or dust may be generated or accumulate.
- Do not store the energy storage cabinet in an environment contaminated by halogen or sulfur pollutants.
- Do not store the energy storage cabinet in locations with vibration or a magnetic field strength exceeding 30 A/m.
- When storing battery packs separately, in addition to the energy storage cabinet storage requirements, the following requirements must also be observed:
- Store battery packs indoors in a clean, dry location, away from direct sunlight or rain.
- Keep the storage area free of hazardous gases, flammable and explosive materials, and corrosive chemicals. Avoid mechanical shock, high pressure, and strong magnetic fields.
- Protect battery packs from harsh environmental conditions, such as sudden temperature changes or impacts, to avoid damage.
- Do not tilt battery packs or turn them upside down.

If the energy storage cabinet has been stored under the conditions specified above for more than 6 months, perform a charge/discharge cycle until the system SOC reaches 30%-40%. Ensure that the SOC value is consistent after charging.

2 Overview

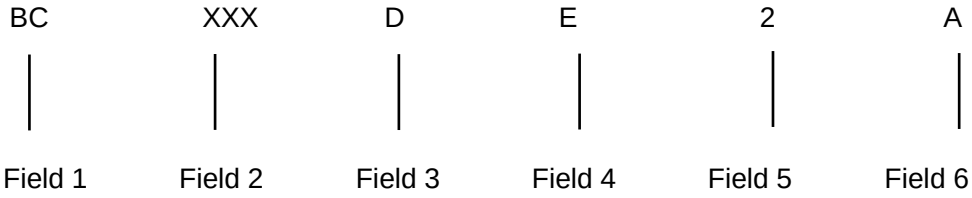
2.1 PRODUCT INTRODUCTION

The commercial and industrial battery cabinet includes a high-voltage box and battery modules, as well as modules such as the EMS, MBMU, SBMU, and BMU, and can store and release electrical energy according to the requirements of the EMS energy management system. Both the input and output ports of the commercial and industrial battery cabinet are high-voltage DC.

- Battery charging: The output of the battery cabinet is connected to the power conversion system (PCS) terminals (BAT+, BAT-), and under the control of the PCS, the battery is charged, transferring energy from photovoltaics or the mains into the battery.
- Battery discharging: When photovoltaic energy is insufficient to power the load, the system controls the battery to supply the load, outputting the stored battery energy to the load through the PCS.

2.1.1 Product model and naming rules

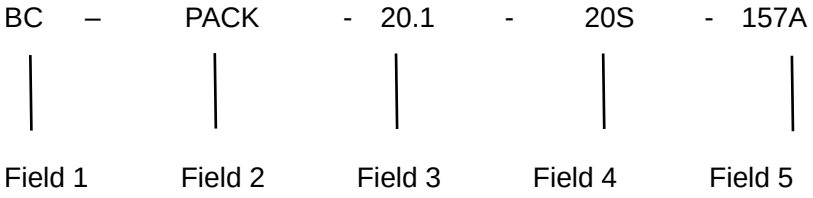
2.1.1.1 Battery cabinet model naming rules



Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Battery Cabinet	Energy 120 ： 120.57 kWh	Blank: Indoor D: Outdoor	E: With EMS	2: Second-generation upgraded version	A: 314 Ah cell

2.1.1.2 Battery module model naming rules

314Ah battery module naming:



Field 1	Field 2	Field 3	Field 4	Field 5
Battery Cabinet	Battery module	Energy 20.1: 20.1 kWh	20 cells connected in series	Maximum cell current 314 Ah：157 A

2.1.2 Product appearance

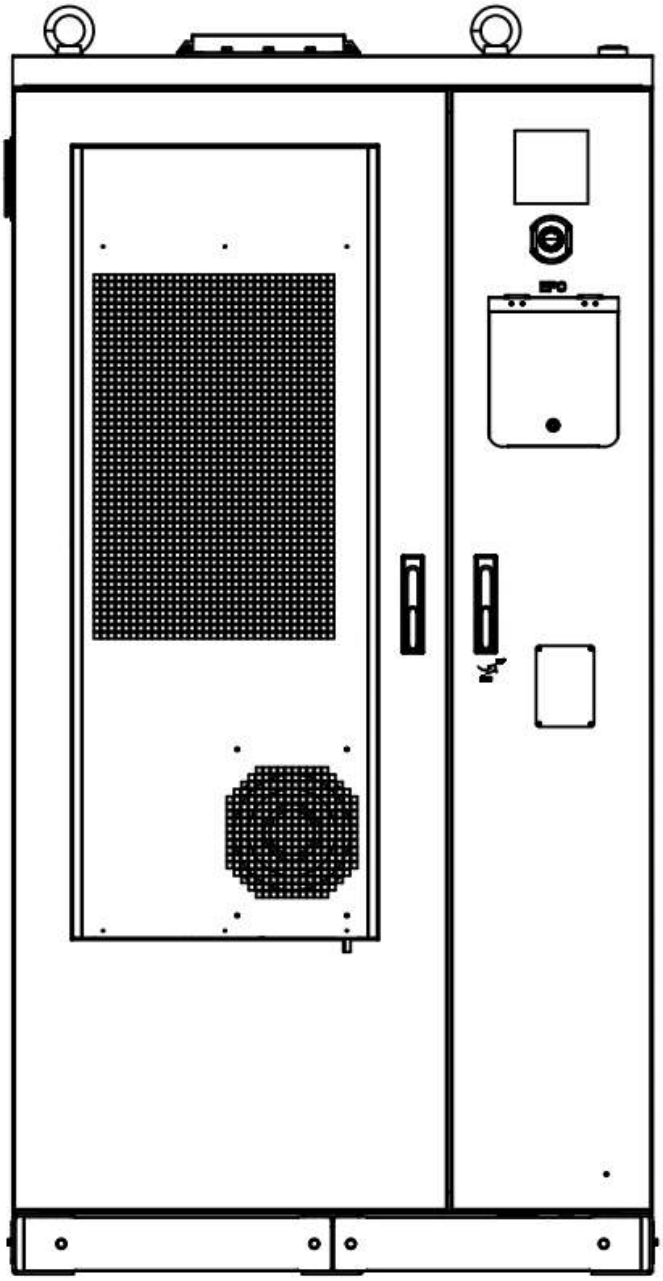


Figure 2-1 Front view of the BC120DE2A battery cabinet

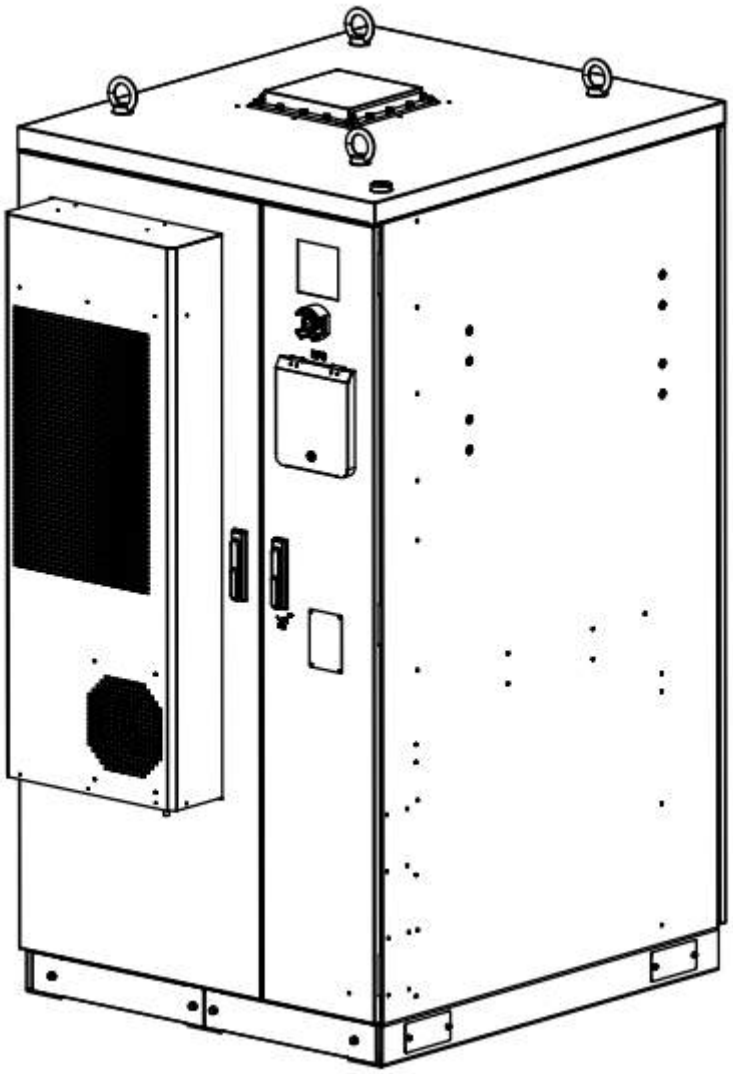


Figure 2-2 Side view of the BC120DE2A battery cabinet

Functions of the battery cabinet include managing battery clusters, communicating with the PCS, displaying and saving all system data, EMS management, and modifying system parameters, among others. The front door of the battery cabinet is equipped with an EMS display screen.

2.1.3 Product structure

The battery cabinet mainly contains a battery pack, high-voltage box, air conditioner, EMS, emergency stop switch, water immersion sensor, fire suppression management unit, aerosol fire suppression device, smoke sensor, CO alarm, audible and visual alarm, explosion venting panel, safety valve, and other components. The figure below uses the BC120DE2A as an example.

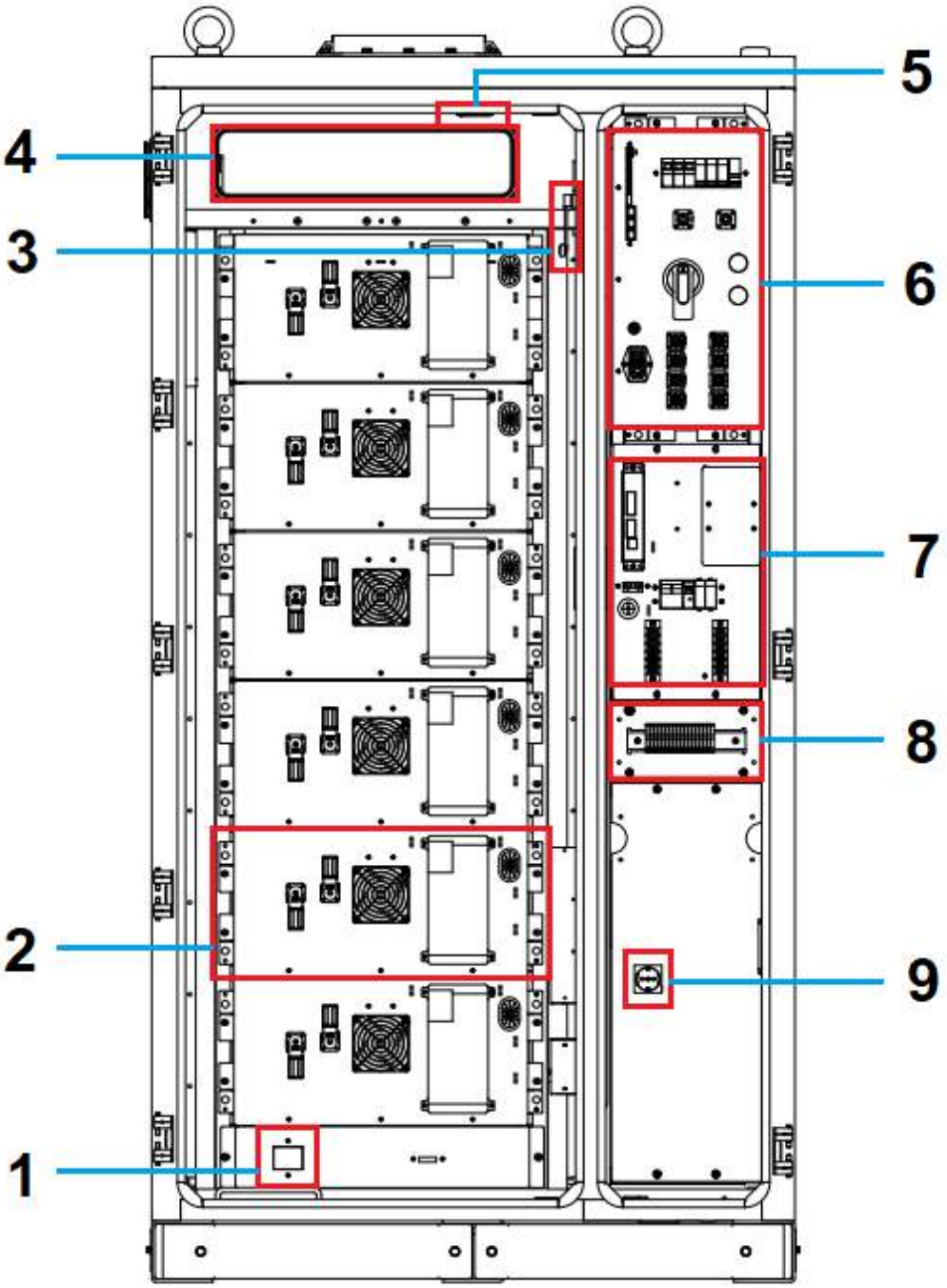


Figure 2-3 Internal structure of the BC120DE2Aproduct cabinet

The internal components of the BC120DE2A product cabinet are described as follows:

Serial number	Component
1	Water immersion sensor
2	Battery pack
3	Access control switch
4	Vent
5	Smoke sensor
6	High-voltage box
7	Distribution panel

8	Terminal block
9	European-standard socket (not included in the BC120DE2A series)

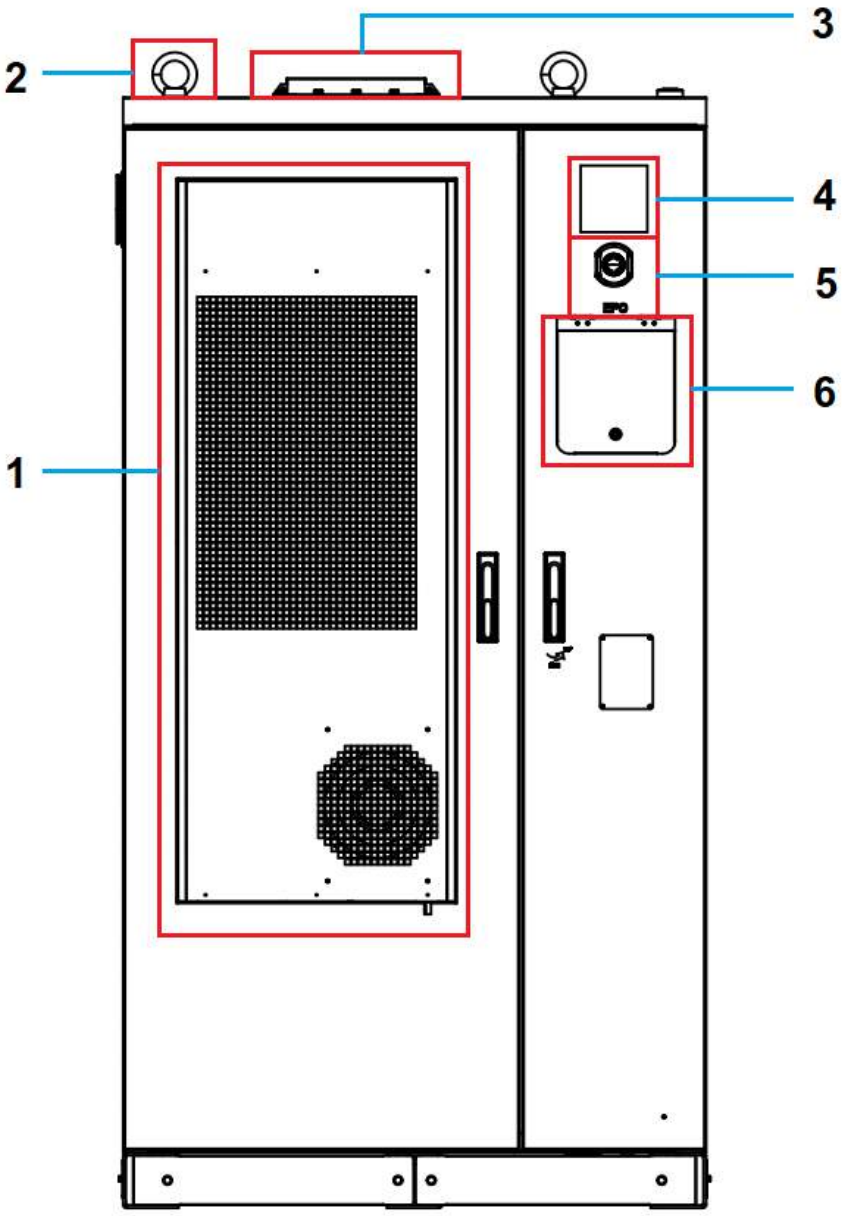


Figure 2-4 External structure of the BC120DE2A product

The external components of the BC120DE2A product are described as follows:

Serial number	Component
1	Air conditioner
2	Lifting ring
3	Explosion venting panel
4	Audible and visual alarm
5	Emergency stop switch
6	EMS

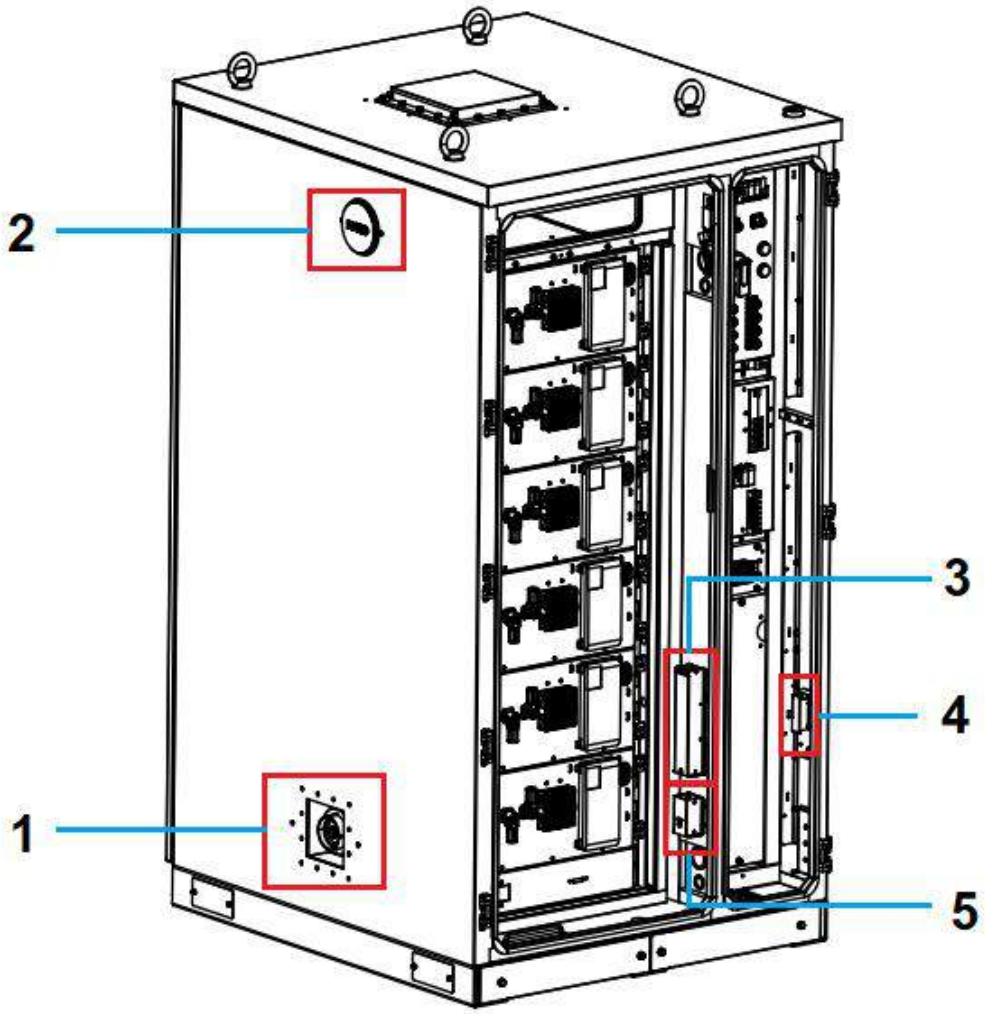


Figure 2-5 Structure of the BC120DE2A product cabinet door (side view)

The components of the BC120DE2A product are described as follows:

Serial number	Component
1	Fire suppression water inlet
2	Safety valve
3	Aerosol fire suppression device 1
4	Ethernet surge protector
5	Fire suppression management unit

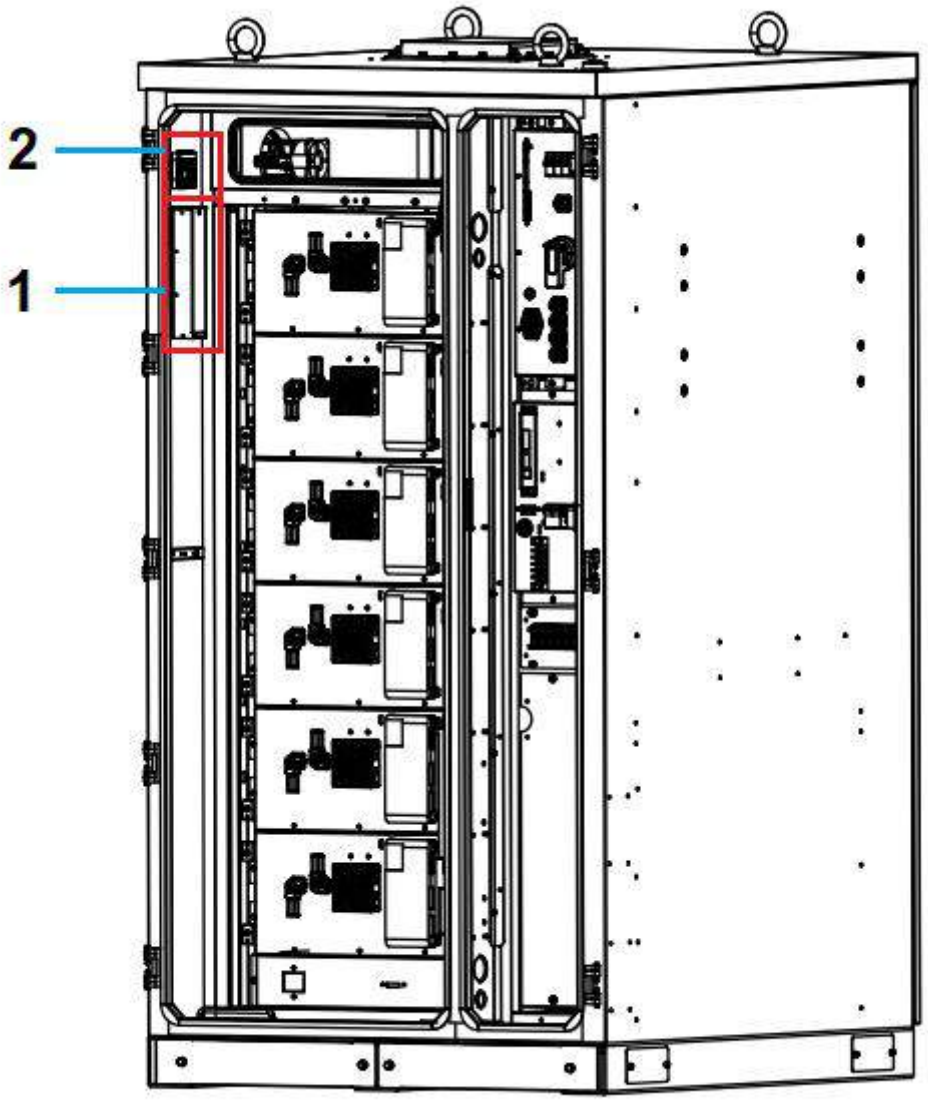


Figure 2-6 Structure of the BC120DE2A product cabinet door (side view 2)

The components of the BC120DE2A product are described as follows:

Serial number	Component
1	Aerosol fire suppression device 2
2	CO sensor

2.2 BATTERY SYSTEM INTRODUCTION

2.2.1 Cell

The appearance and technical parameters of the cell are as follows:

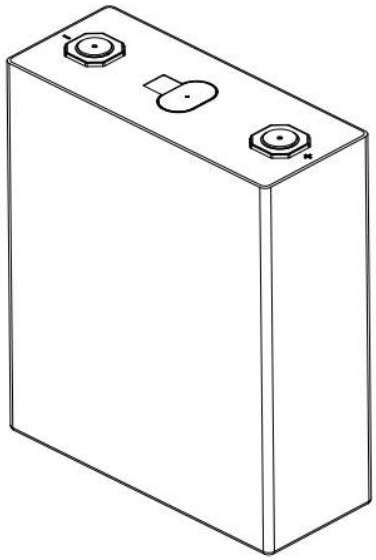


Figure 2-7 Cell appearance and structure

The specifications of the 314Ah cell are as follows:

Item	Characteristics
Cell type	Prismatic lithium iron phosphate
Nominal voltage	3.2 V
Rated capacity	314 Ah
Rated energy	1004.8 Wh
Maximum continuous charge current	0.5 C
Recommended charge current	≤0.5 C
Maximum continuous discharge current	0.5 C
Recommended discharge current	≤0.5 C

2.2.2 Battery module

Function: The battery module contains a battery pack made up of cells and serves as the power source for the entire system. The BMU unit in the battery module collects information such as voltage and temperature of the lithium battery and uploads it to the SBMU control unit. The battery module also has a fire suppression unit with automatic fire extinguishing.

The appearance and technical parameters of the battery module are as follows:

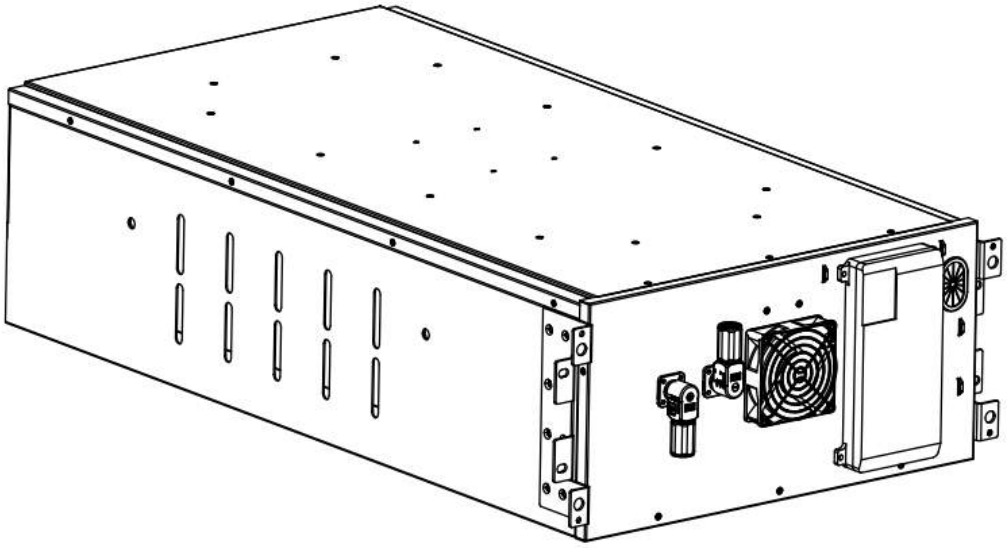


Figure 2-8 Battery module structure

Technical parameters of the 314Ah battery module:

Item	Characteristics
Series-parallel configuration	20S1P
Rated voltage	64 V
Rated capacity	314 Ah
Rated energy	20.096 kWh
Rated charge voltage	72 V
Recommended charge and discharge current	≤157 A @25±5℃
Weight	140 Kg

The dimensions of the battery module (mm) are as follows:

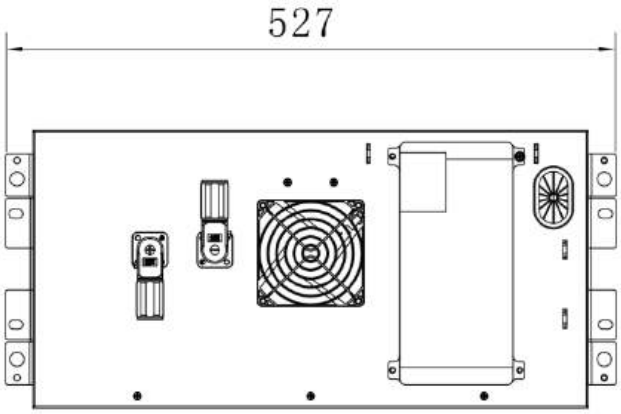


Figure 2-9 Front view of the battery module

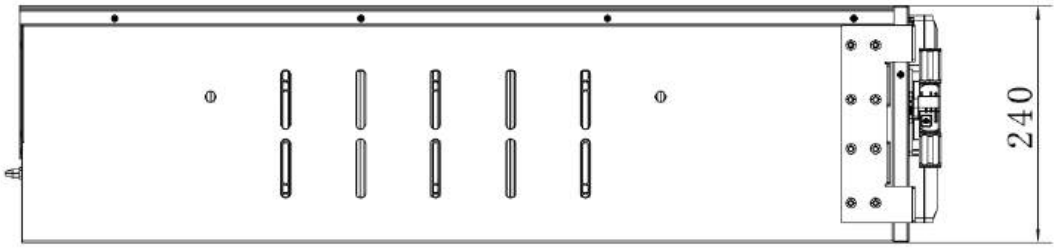


Figure 2-10 Side view of the battery module

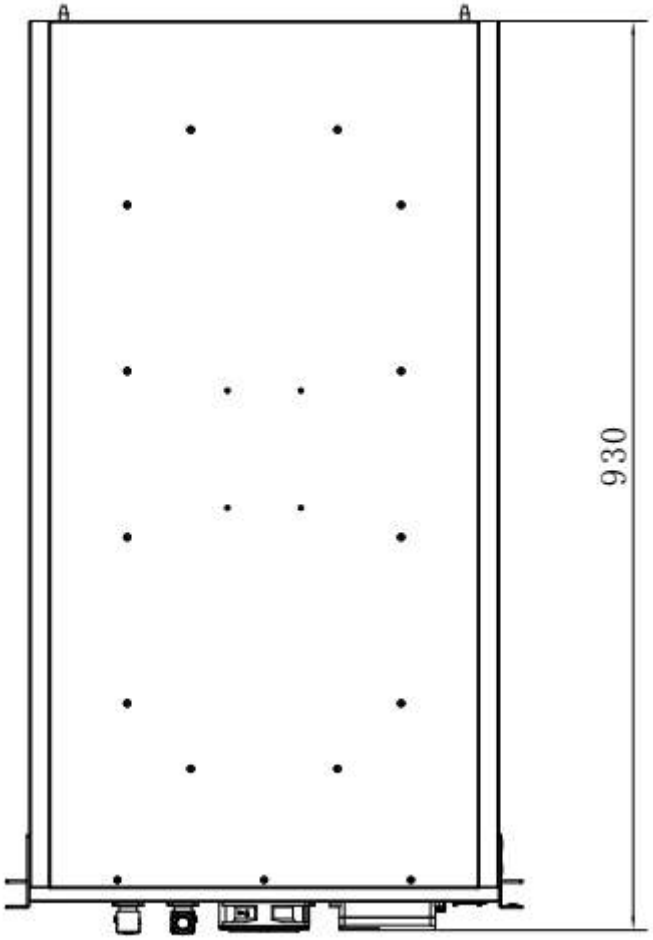


Figure 2-11 Top view of the battery module

The ports of the battery module are described as follows:

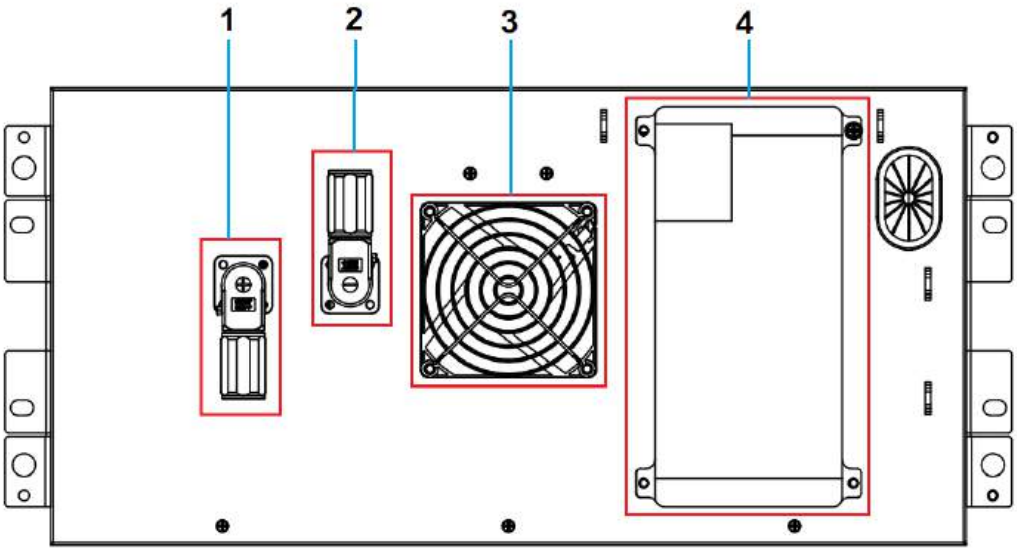


Figure 2-12 Battery module

Serial number	Port	Description
1	B+	Battery module positive
2	B-	Battery module negative
3	DC fan	Battery pack cooling fan
4	BMU	Battery Management Unit (BMU)

Battery module charging instructions:

If customers need to charge individual battery modules, they must strictly configure the charger according to the recommended values specified above; otherwise, the battery module may be damaged.

2.2.3 Battery cabinet

The technical parameters of the BC120DE2A series battery cabinet are as follows:

Item	Characteristics			
	BC80DE2A	BC100DE2A	BC100DE2A-AU	BC120DE2A
Total energy	80.38kWh	100.48kWh	100kWh	120.57kWh
Rated voltage	256VDC	320VDC	320VDC	384VDC
Depth of Discharge	98%			
Operating voltage range	228VDC~288VDC	285VDC~360 VDC	285VDC~360VD C	342VDC~432VD C
Cell specification	314Ah			
Battery clusters per cabinet	1			
Rated charge current	157A			
Rated discharge current	157A			
Monitoring parameters	Battery cluster voltage, current, cell voltage, cell temperature, ambient temperature, etc.			
Communication method	CAN/RS485/Ethernet			
Operating temperature range	-30℃–+50℃			
Storage temperature range	-30°C to +60°C (25°C recommended for long-term storage)			

Relative humidity	5%-95% (non-condensing)			
Temperature control method	Air conditioner cooling or heating			
Net weight (approximate)	1207kg	1347kg	1347kg	1487kg
Product dimensions	W1062 mm*D1371 mm*H2083 mm			
Protection class	IP54			
Recommended altitude	≤3000 m (derating above 2000 m)			
AC input short-circuit current (Icc)	6 KA			
AC external protective device current	20 A			
Maximum short-circuit current and duration	2.61 kA/1.068 ms			
Noise level	≤70 dB			
Shipping state of charge	40%SOC			

2.2.4 Air conditioner

The appearance and technical parameters of the air conditioner are as follows:

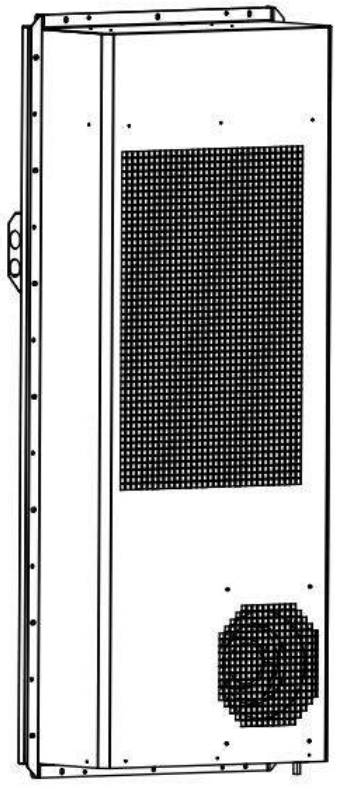


Figure 2-13 Air conditioner structure

Item	Parameter
External dimensions (W x D x H)	550mm*288mm*1350mm
Rated operating voltage	220 V 50 Hz
Maximum operating current	11.5 A

Mounting method	Door-mounted
Weight	62 kg
Operating environment range	-40℃–+55℃
Cooling capacity	3.0 kW
Heating capacity	2.0 kW

The dimensions of the air conditioner (mm) are as follows:

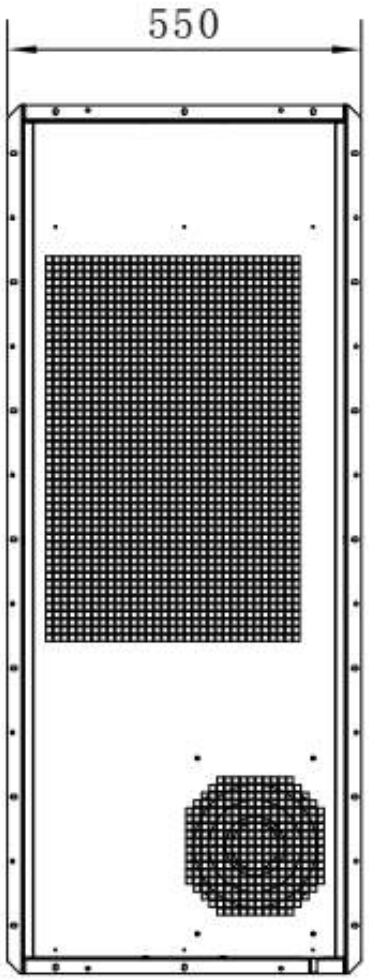


Figure 2-14 Front view of the air conditioner

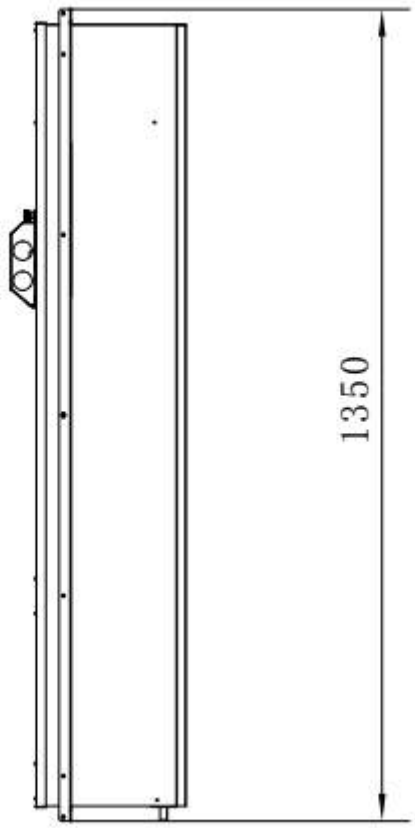


Figure 2-15 Side view of the liquid cooling unit

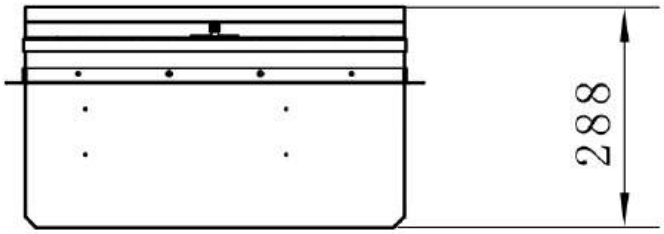


Figure 2-16 Top view of the liquid cooling unit

The wiring ports of the air conditioner are described as follows:

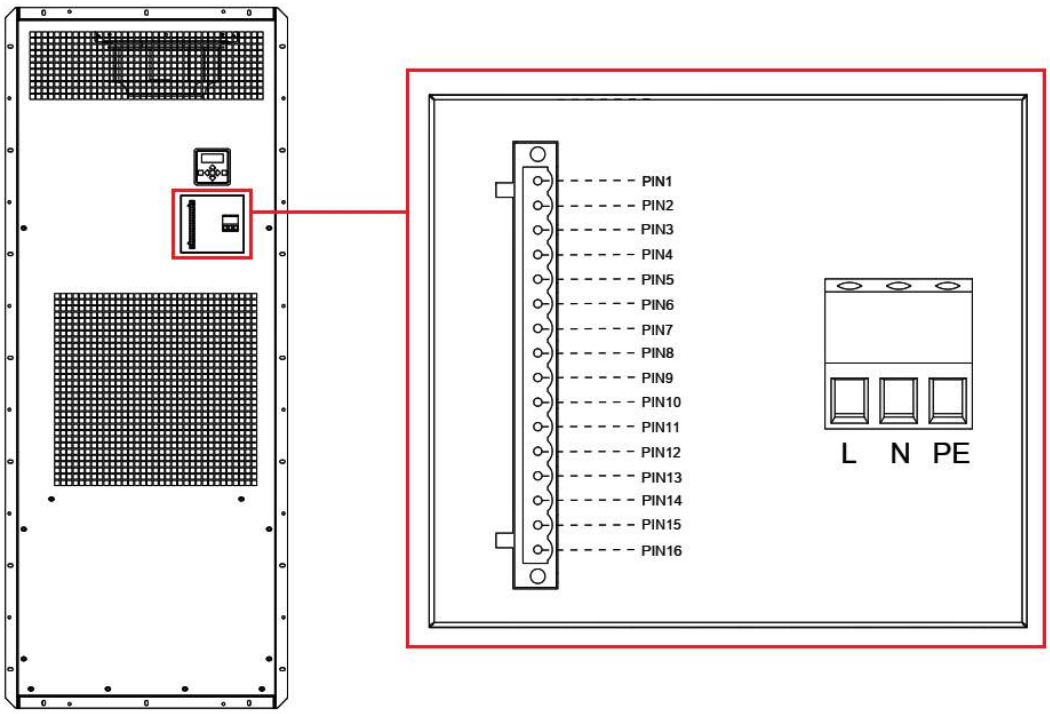


Figure 2-17 Air conditioner wiring ports

Port description

Port	Description
L	Air conditioner power input port (220V 50Hz)
N	
PE	
PIN8：RS485A	Air conditioner RS485 communication port
PIN9：RS485B	

2.2.4 High-voltage box

The high-voltage box is the switching and protection device for the battery cluster output. Its internal components mainly include DC contactors, DC fuses, circuit breakers, shunts, and the SBMU.

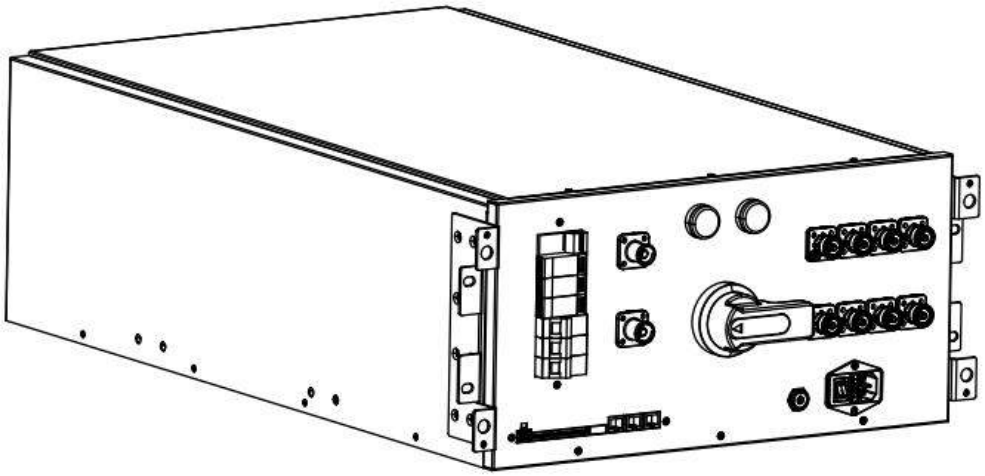


Figure 2-18 High-voltage box structure

The dimensions of the high-voltage box (mm) are shown in the figure below:

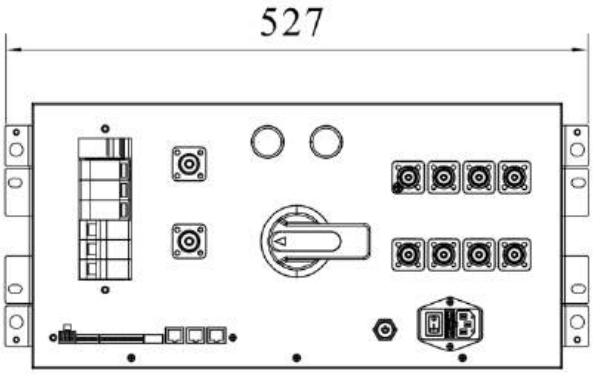


Figure 2-19 Front view of the high-voltage box

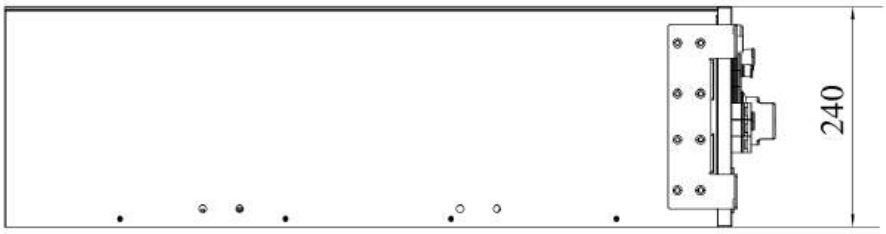


Figure 2-20 Side view of the high-voltage box

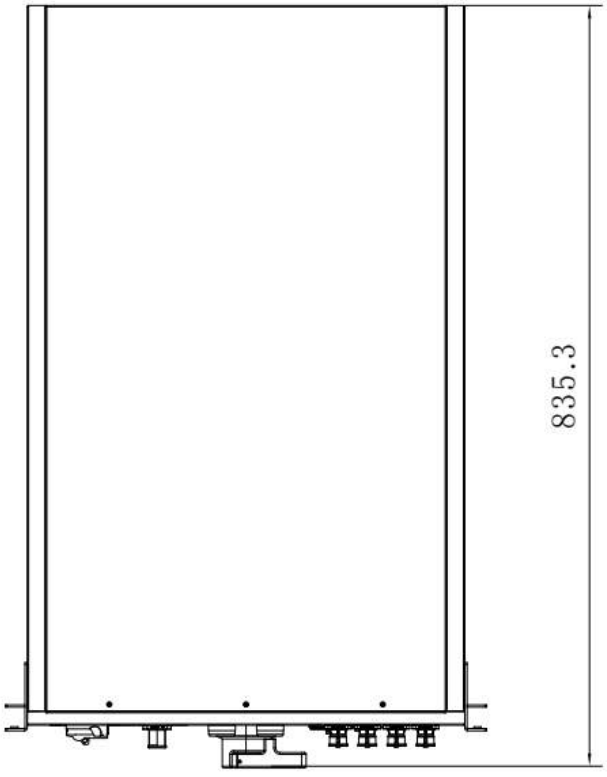


Figure 2-21 Top view of the high-voltage box

The functions of the high-voltage box are as follows:

(1) On/off control

The main contactors (positive and negative contactors) control the connection and disconnection of the battery cluster's high-voltage circuit, enabling the battery cluster to be brought into or taken out of

operation, and supporting start/stop control of charge and discharge operations.

(2) Pre-charge management

Equipped with a pre-charge resistor and a pre-charge contactor, which slowly charge the bus capacitors through the pre-charge circuit before the battery cluster is brought into operation, suppressing inrush current at closing and protecting core components such as contactors, fuses, and the PCS from impact damage.

(3) Fault protection

- Short-circuit protection: Fuses or circuit breakers rapidly disconnect the high-voltage circuit when a serious fault such as a short circuit or overcurrent is detected, preventing the fault from spreading and protecting the safety of the battery cluster and external equipment.
- Overvoltage/undervoltage protection: Monitors the battery cluster voltage and triggers a protective mechanism when the voltage exceeds the safe range, preventing overcharging or overdischarging of the battery.
- Insulation monitoring: Continuously monitors the insulation resistance of the high-voltage circuit to ground, and promptly issues an alarm or disconnects the circuit if a decrease in insulation or a leakage risk is detected.

(4) Parameter monitoring and data acquisition

Built-in voltage, current (shunt), NTC, and other sensors collect the voltage, current, temperature, and other parameters of the battery cluster in real time, providing data support to the Battery Management System (BMS) and Energy Management System (EMS) for battery status monitoring, charge/discharge control, fault diagnosis, and other purposes.

(5) Emergency isolation and maintenance support

Equipped with a circuit breaker that can be manually opened to disconnect the high-voltage circuit in an emergency or during maintenance, providing physical isolation to ensure the safety of maintenance personnel and facilitate equipment maintenance and servicing.

The port definitions on the high-voltage box panel are as follows:

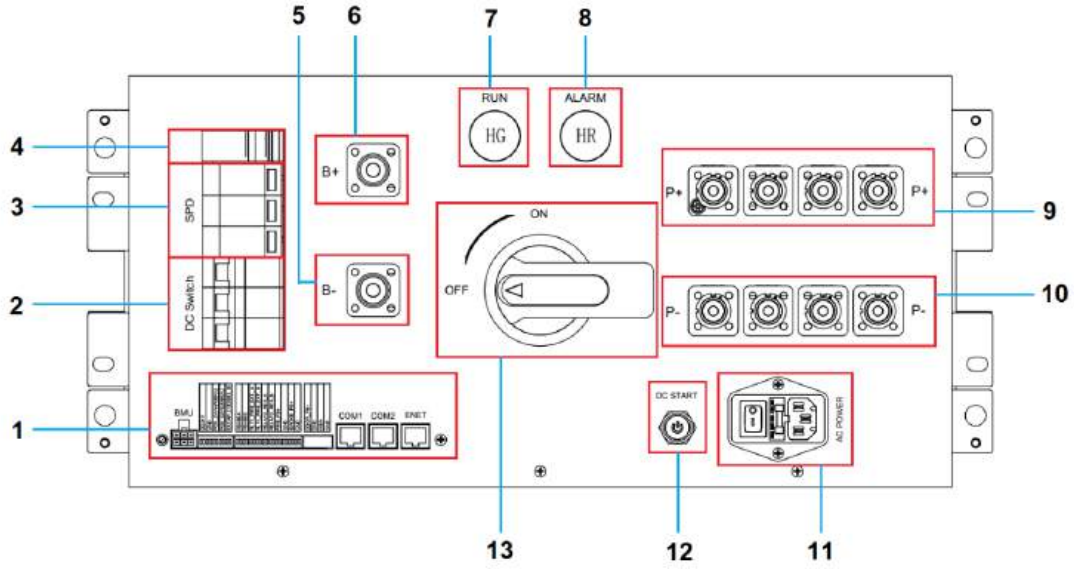


Figure 2-22 High-voltage box panel

Panel definitions:

Serial number	Port	Port description
1	IO	High-voltage box external interface port
2	DC SWITCH	DC auxiliary power switch

3	SPD	DC power surge protective device (SPD)
4	FUSE	Ceramic fuse, fast-blow, 6A/1000Vdc
5	B-	Negative terminal of series-connected battery modules
6	B+	Positive terminal of series-connected battery modules
7	RUN	Operation indicator light
8	ALARM	Alarm indicator light
9	P+	DC output positive
10	P-	DC output negative
11	AC POWER	AC auxiliary power input (plug: IEC C13 interface)
12	DC START	DC start button/black start button
13	Molded case circuit breaker handle	DC system switch

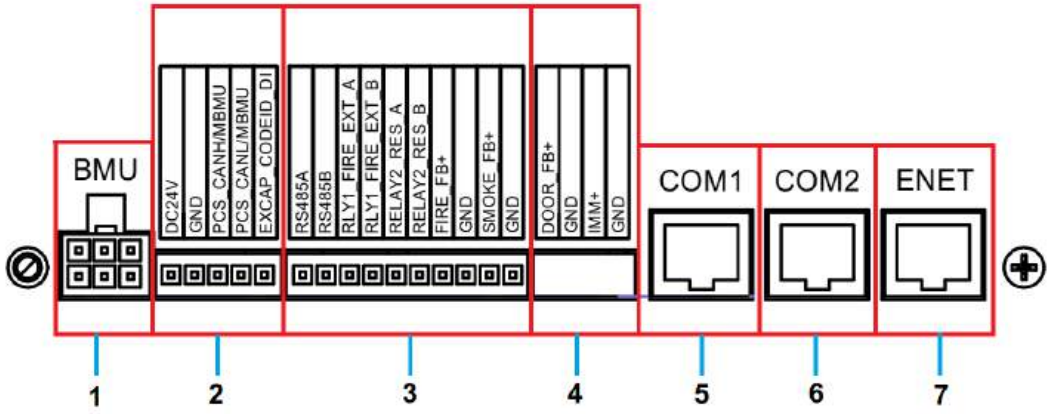
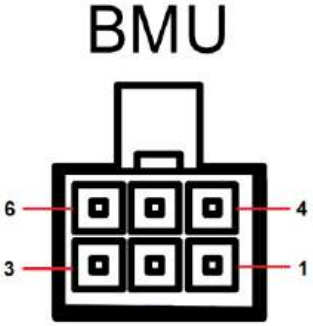


Figure 2-23 IO port diagram

IO port definitions:

Serial number	Port	Port description
1	BMU	Communication port with the BMU
2	J8	IO1
3	J2	IO2
4	J7	IO3
5	COM1	Upstream parallel connection port
6	COM2	Downstream parallel connection port
7	ENET	Ethernet communication



BMU port pin number description

BMU port definitions:

BMU port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	24V	BMU interface	1	BMU
2	GND		2	
3	BMU_CANH		3	
4	BMU24V_START		4	
5	BMU_CODEID_DO		5	
6	BMU_CANL		6	

IO1 port definitions:

IO1 terminal			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	DC24V	External 24V power supply	J1-24V	EMS-FDB
			24V	Smoke sensor
			24V	EXCHANGE adapter board
2	GND		J1-GND	EMS-FDB
			GND	Smoke sensor
			GND	EXCHANGE adapter board
3	CANH	CAN communication (SBMU-MBMU)	J1-13	MBMU
4	CANL		J1-14	
5	EXCAP_CODEID_DI	Address coding input		

IO2 port definitions:

IO2 terminal			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	RS485A	RS485 communication (Air conditioner - SBMU)	485A	Air conditioner
2	RS485B		485B	
3	RLY1_FIRE_EXT_A	Fire suppression dry contact	PIN1	Terminal block W
4	RLY1_FIRE_EXT_B		PIN2	
5	RELAY2_RES_A	Reserved dry contact		
6	RELAY2_RES_B			
7	FIRE_FB+	Fire suppression feedback	NO	Aerosol fire suppression device
8	GND		COM	
9	SMOKE_FB+	Smoke sensor feedback	PIN24	Terminal block N
10	GND		PIN25	

IO3 port definitions:

IO3 terminal			Mating connector	
Pin number	Signal	Description	Pin number	Mating device

1	DOOR_FB+	Access control feedback	22	Access control switch
2	GND		21	
3	IMM+	Water immersion feedback	NO	Water immersion adapter board
4	GND		COM	

COM1 port definitions:

COM1 port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	DC24V		1	Upstream cabinet parallel connection port
2	DC24V		2	
3	GND		3	
4	NC		4	
5	EXCAP_CODEID_DI	Address coding input	5	
6	GND		6	
7	CANH	SBMU parallel connection CAN	7	
8	CANL		8	

COM2 port definitions:

COM2 port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	DC24V		1	Downstream cabinet parallel connection port
2	DC24V		2	
3	GND		3	
4	NC		4	
5	EXCAP_CODEID_DO	Address coding output	5	
6	GND		6	
7	CANH	SBMU parallel connection CAN	7	
8	CANL		8	

ENET port definitions:

ENET port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1		Standard Ethernet	1	NC
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	

2.2.5 AC distribution panel

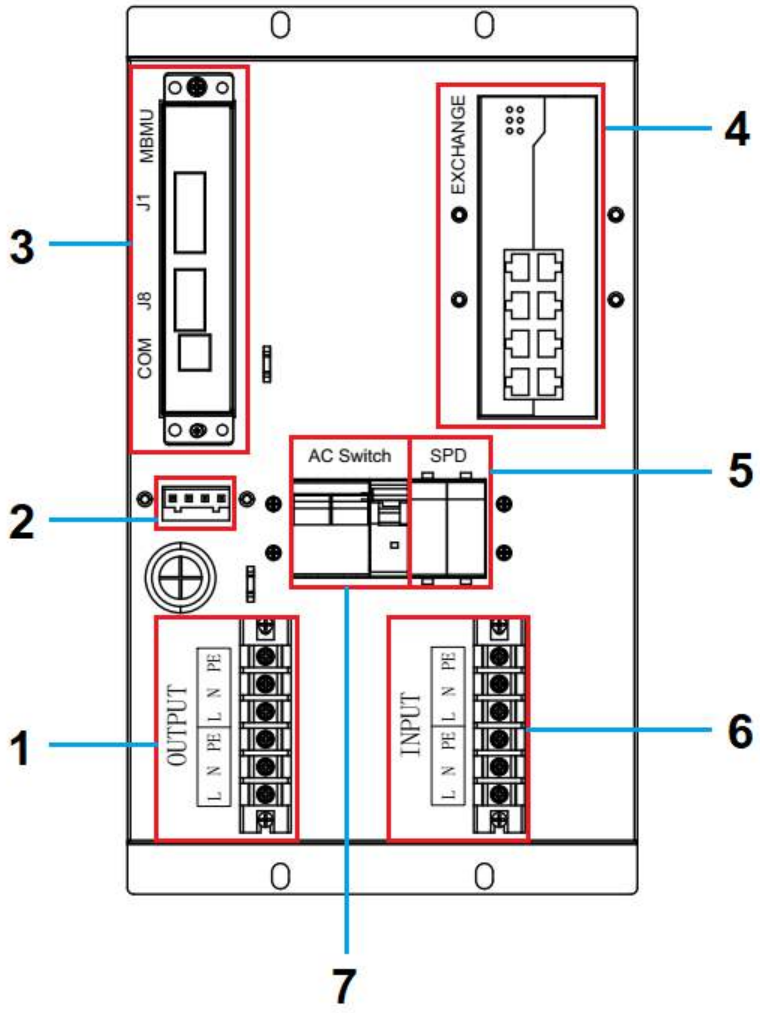


Figure 2-24 AC distribution panel

The ports on the AC distribution panel are described as follows:

Serial number	Port	Description
1	OUTPUT	AC output
2	EXCHANGE adapter board	24V power supply port
3	MBMU	Master Battery Management Unit (MBMU)
4	EXCHANGE	Switch
5	SPD	Surge protective device (SPD)
6	INPUT	System AC main input
7	AC SWITCH	System AC main input switch

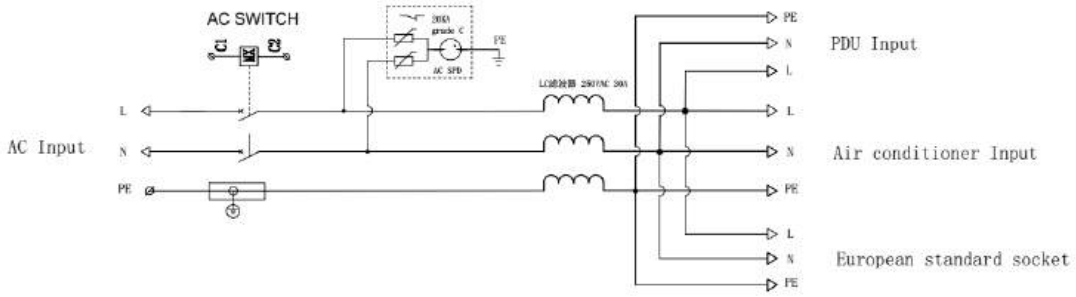


Figure 2-25 AC distribution diagram

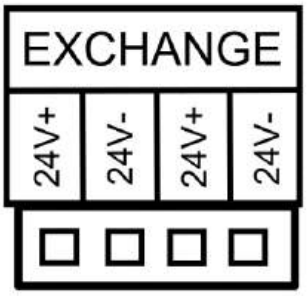


Figure 2-24 EXCHANGE adapter board

EXCHANGE adapter board port definitions:

Mating connector (inside the communication panel)		EXCHANGE adapter board port			Mating connector (battery cabinet)	
Pin number	Mating device	Pin number	Signal	Description	Pin number	Mating device
24V	Switch	1	24V+	Switch & MBMU 24V power supply	J1-PIN1	MBMU
GND		2	24V-		J1-PIN2	
		3	24V+		IO1-PIN1	High-voltage box
		4	24V-		IO1-PIN2	

2.2.6 MBMU

The MBMU can communicate with the SBMU, PCS, and EMS, and receives feedback signals from the safety valve, emergency stop switch, smoke sensor, and CO sensor to execute the corresponding system operating strategy.

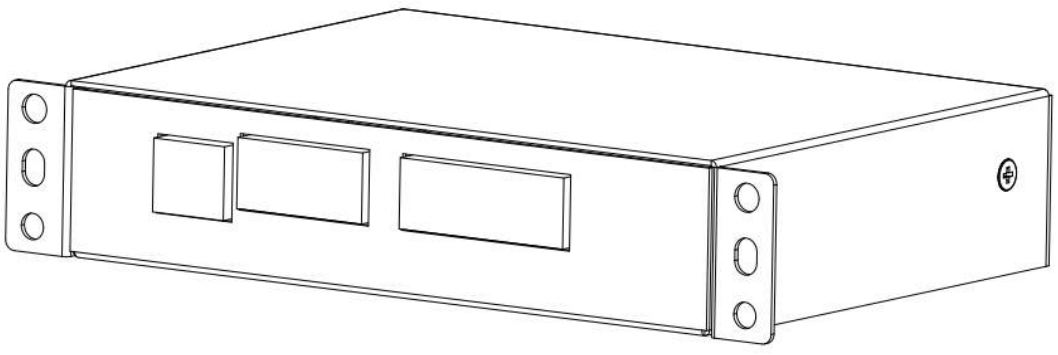


Figure 2-26 MBMU structure

The MBMU dimension diagram is as follows:

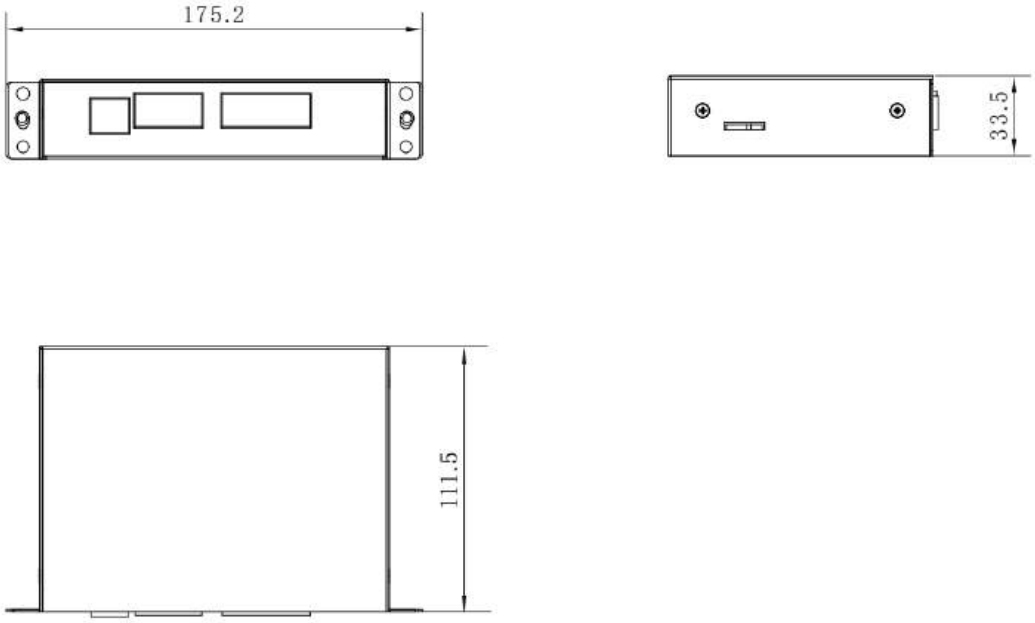


Figure 2-27 MBMU dimension diagram

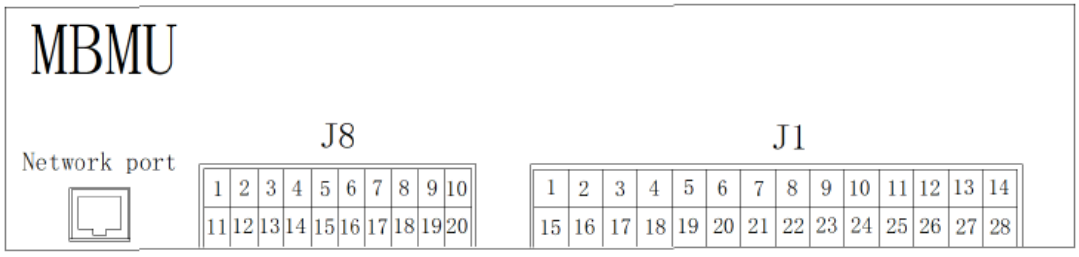


Figure 2-28 MBMU panel

J8 port definitions:

J8 port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	Valve-2_QD+	Safety valve 2 drive	PIN17	Terminal block N
2	Valve-2_QD-		PIN18	
3	Valve-1_QD+	Safety valve 1 drive	PIN15	
4	Valve-1_QD-		PIN16	
5	AVA power NO	Audible and visual alarm power dry contact	PIN21	
6	AVA power COM		PIN22	
7	Valve power NO	Safety valve power dry contact	PIN6	
8	Valve power COM		PIN7	
9	Valve-1_FB+	Safety valve 1 feedback	PIN11	
10	Valve-1_FB-		PIN12	
11	Valve-2_FB+	Safety valve 2 feedback	PIN13	
12	Valve-2_FB-		PIN14	
13	12V	Reserved 12V power supply	NC	NC
14	GND			

15	EPO_FB+	Emergency stop feedback	PIN26	Terminal block N
16	EPO_FB-		PIN27	
17	SMOKE_FB+	Smoke sensor feedback	PIN24	
18	SMOKE_FB-		PIN25	
19	RES_FB_DET1+	Reserved	NC	NC
20	CO_FB+	CO alarm feedback	PIN3	Terminal block N

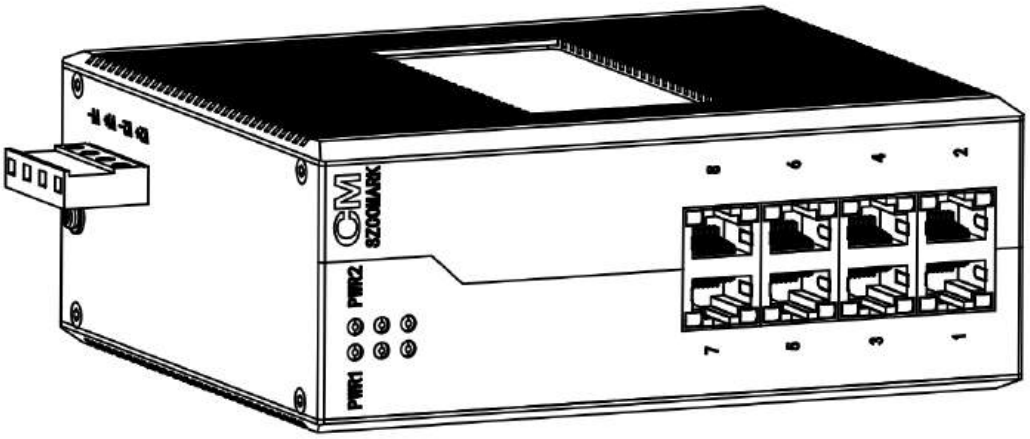
J1 port definitions:

J1 port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	24V+	MBMU power supply	24V+	EXCHANGE adapter board
2	24V-		24V-	
3	CO_24V+	CO alarm power supply	PIN1	Terminal block N
4	CO_GND		PIN2	
5	24V+	Safety valve & AC circuit breaker trip signal 24V	PIN5	
6	24V+	Safety valve exhaust fan & audible and visual alarm 24V	PIN20	
7	GND	Safety valve GND	PIN9	
8	GND	Audible and visual alarm GND	PIN23	
9	MX-GND	AC circuit breaker trip signal GND	PIN4	
12	FAN-GND	Safety valve exhaust fan GND	PIN19	
13	CANH1	CAN communication (MBMU-SBMU)	3	High-voltage box IO1
14	CANL1		4	
15	CANH2	CAN communication (MBMU-PCS)	3	Terminal block W
16	CANL2		4	

Network port definitions:

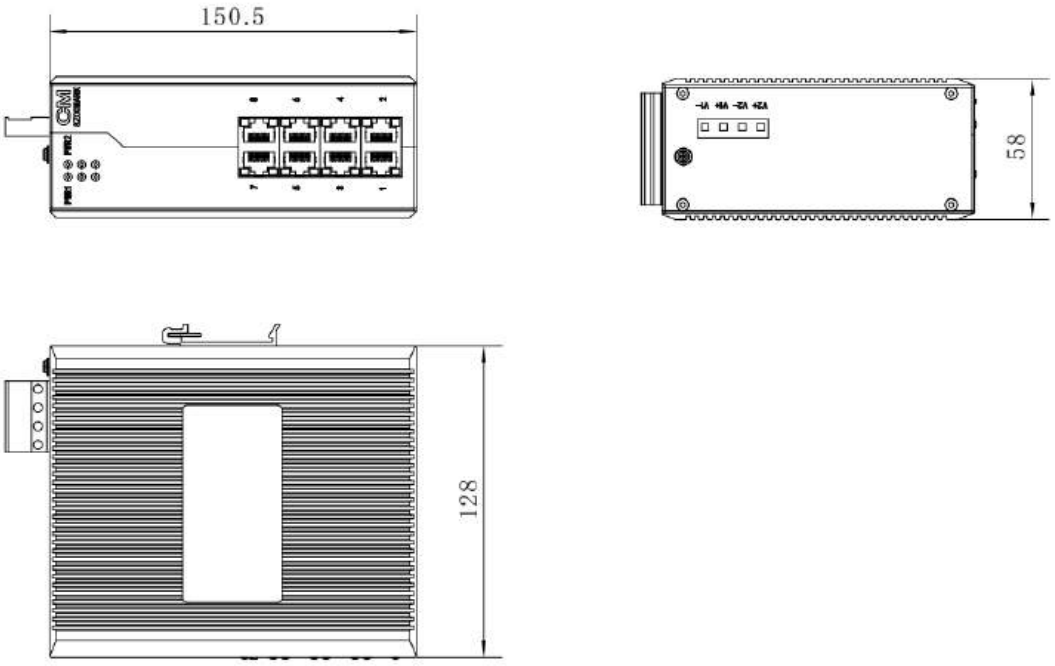
Network port			Mating connector	
Pin number	Signal	Description	Pin number	Mating device
1	Standard Ethernet	Ethernet communication (MBMU-EMS)	1	EMS
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	

2.2.7 Switch (optional)

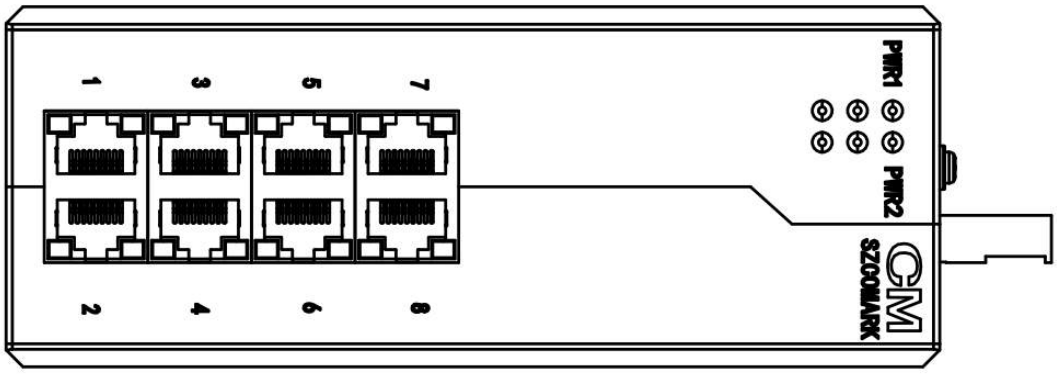


Switch structure diagram

The switch dimension diagram is as follows:



Switch dimension diagram



Switch panel

Switch port definitions:

Serial number	Port	Port description
1	Standard Ethernet	Connect to the MBMU network port
2	Standard Ethernet	NC
3	Standard Ethernet	NC
4	Standard Ethernet	NC
5	Standard Ethernet	NC
6	Standard Ethernet	NC
7	Standard Ethernet	NC
8	Standard Ethernet	Connect to EMS-J7

2.2.8 Water immersion panel

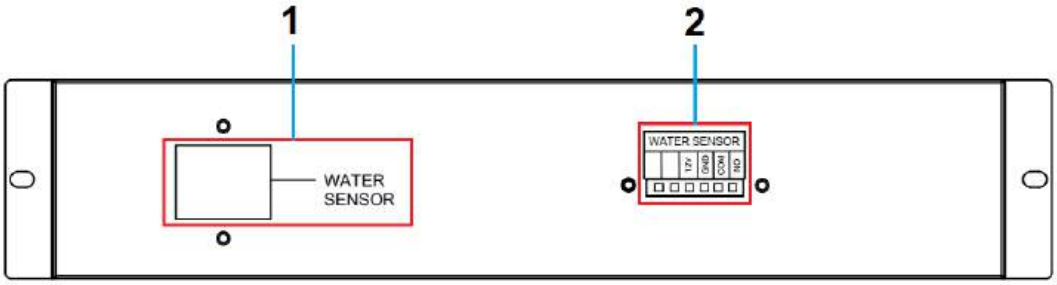


Figure 2-24 Water immersion panel

The ports on the water immersion panel are described as follows:

Serial number	Port	Description
1	WATER SENSOR	Water immersion sensor
2	WATER SENSOR adapter board	Water immersion sensor adapter board

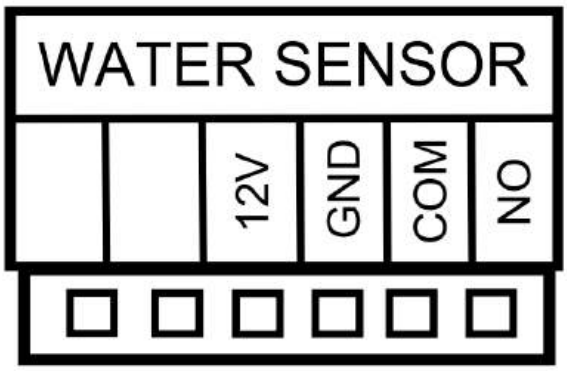


Figure 2-24 WATER SENSOR adapter board

WATER SENSOR adapter board port definitions:

Mating connector (inside the communication panel)		EXCHANGE adapter board port			Mating connector (battery cabinet)	
Pin number	Mating	Pin number	Signal	Description	Pin number	Mating device

	device					
		1			J1-PIN1	MBMU
		2			J1-PIN2	
12V	Water immersion sensor	3	12V	Water immersion sensor power supply	J1-V+	EMS
GND		4	GND		J1-GND	
COM		5	COM	Water immersion sensor feedback	IO3-PIN4	High-voltage box
NO		6	NO		IO3-PIN3	

2.2.9 Fire suppression system

When the temperature-sensing cable detects that the battery cabinet temperature has reached a certain level, it activates the fire suppression starter box, which in turn activates the combined fixed aerosol fire suppression device. At this point, the battery cabinet discharges aerosol, triggering a fire suppression alarm.

It is recommended that users test the fire suppression system every 6 months.

(1) Battery level detection

Press the test button; if the battery level indicator on the left side of the starter box panel lights up, the battery pack has sufficient charge; If the battery level indicator does not light up, the battery is not connected or its charge is below the normal value, and the fire suppression starter box needs to be replaced.

(2) Circuit detection

Press the test button; if the circuit indicator on the right side of the starter box panel lights up, the fire suppression device is connected normally; If the circuit indicator does not light up, the fire suppression device is not properly connected, and the connecting wiring to the fire suppression device should be checked for disconnection.

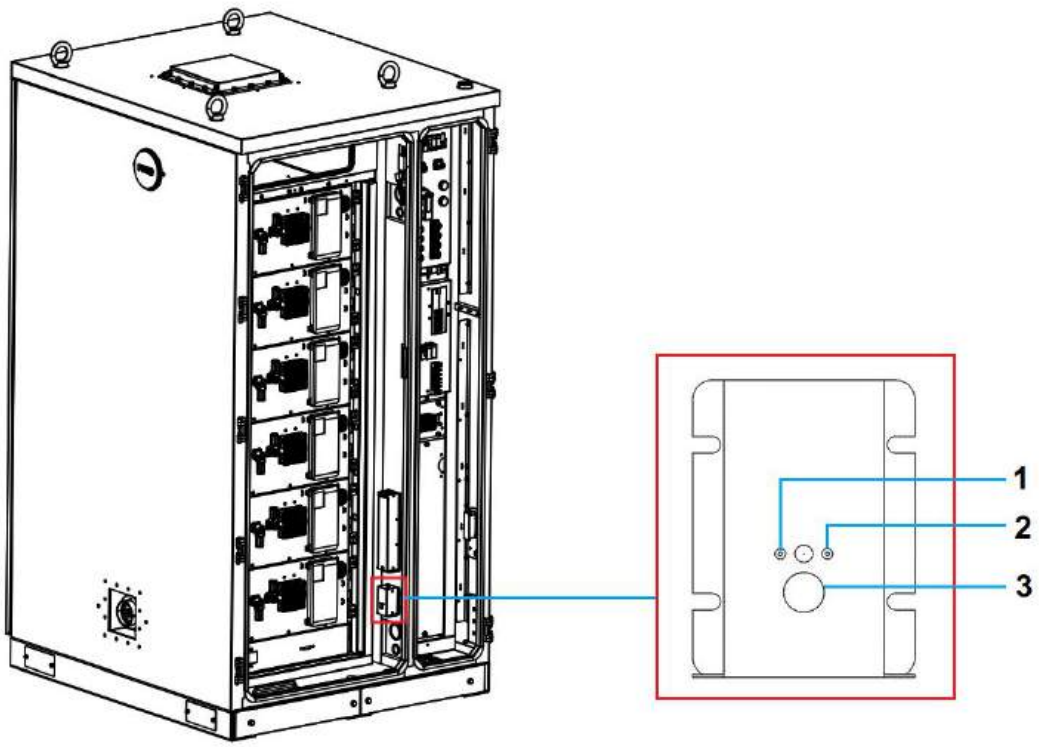


Figure 2-29 Fire suppression starter box description

Serial number	Description
1	Battery level detection indicator
2	Circuit detection indicator
3	Test button

2.2.10 Charge/discharge power curve

2.2.10.1 280Ah cell charge/discharge power curve

(1) Relationship between the charge current limit and voltage

Below 2.5V, charge at 0.1C current; From 2.5V to 3.45V, charge at 0.5C current; Above 3.45V, the charge power must be derated, and when the voltage reaches 3.55V, the charge current is 0.

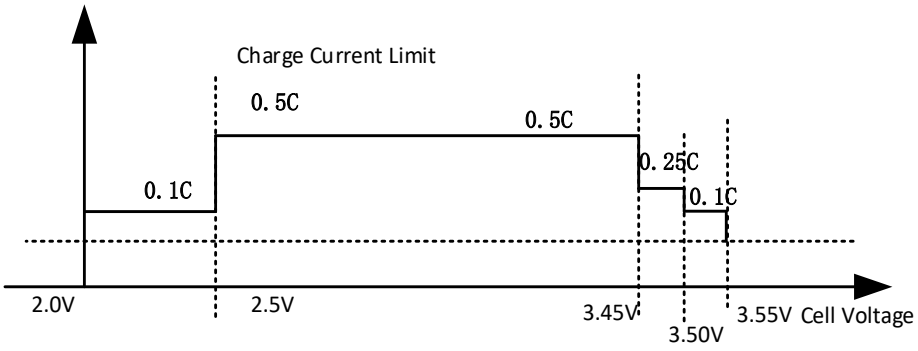


Figure 2-30 Relationship curve between the charge current limit and voltage (Cell Max Voltage)

(2) Relationship between the charge current limit and cell temperature

Below 22°C, the relationship curve between the charge current limit and temperature is established according to the battery specification's charging requirements; Above 45°C, the charge power must be derated, and when the temperature reaches 60°C, the charge current is 0.

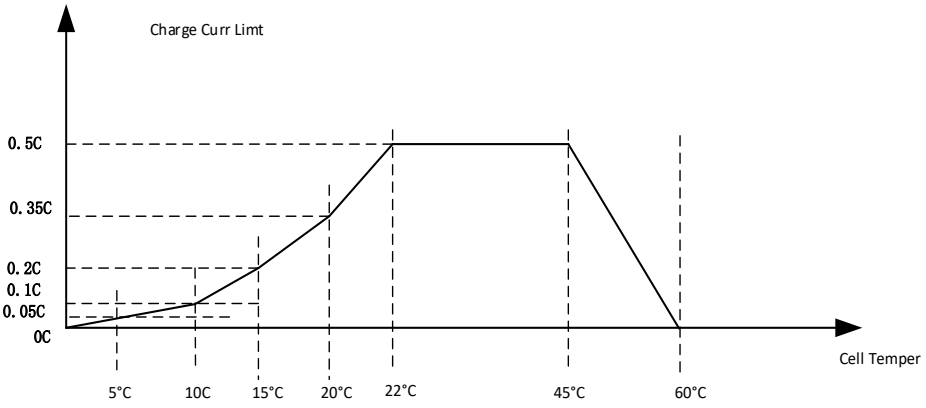


Figure 2-31 Relationship curve between the charge current limit and cell temperature

(The min temperature and max temperature are detected simultaneously, and the lower of the two corresponding current limit values is used)

(3) Relationship between the discharge current limit and voltage

When the cell voltage is >3.05V, the discharge current is 0.5C; When the voltage drops to 3.05V, the discharge current is 0. When the cell voltage is ≤3.05V, the current limit must be reduced from 0.5C to 0 over 6 s at a rate of 0.1C/s; it must not be limited to 0 directly. When the cell voltage is ≤3.05V and the current limit has been reduced to 0, the cell voltage must reach ≥3.2V before the current limit is released again.

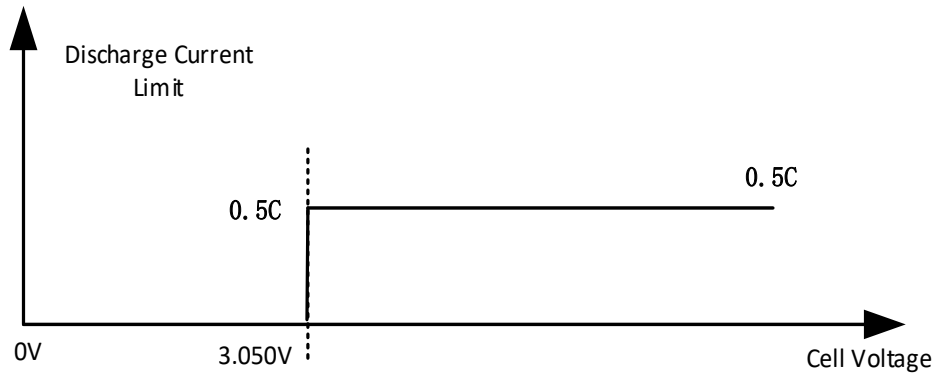


Figure 2-32 Relationship between the discharge current limit and voltage (Cell Min Voltage)

(4) Relationship between the discharge current limit and cell temperature

Between -10°C and 45°C, the discharge current is limited to 140A; When the temperature exceeds 45°C, the discharge current must be derated, and when the temperature reaches 55°C, the discharge current limit is 0.

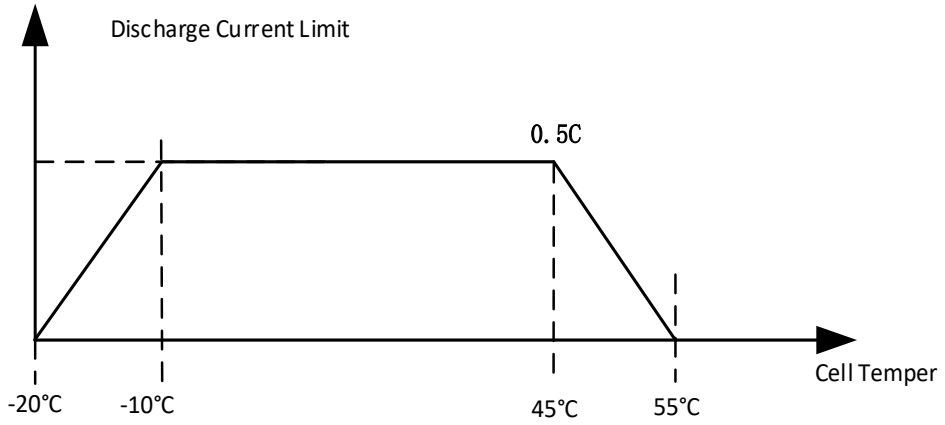


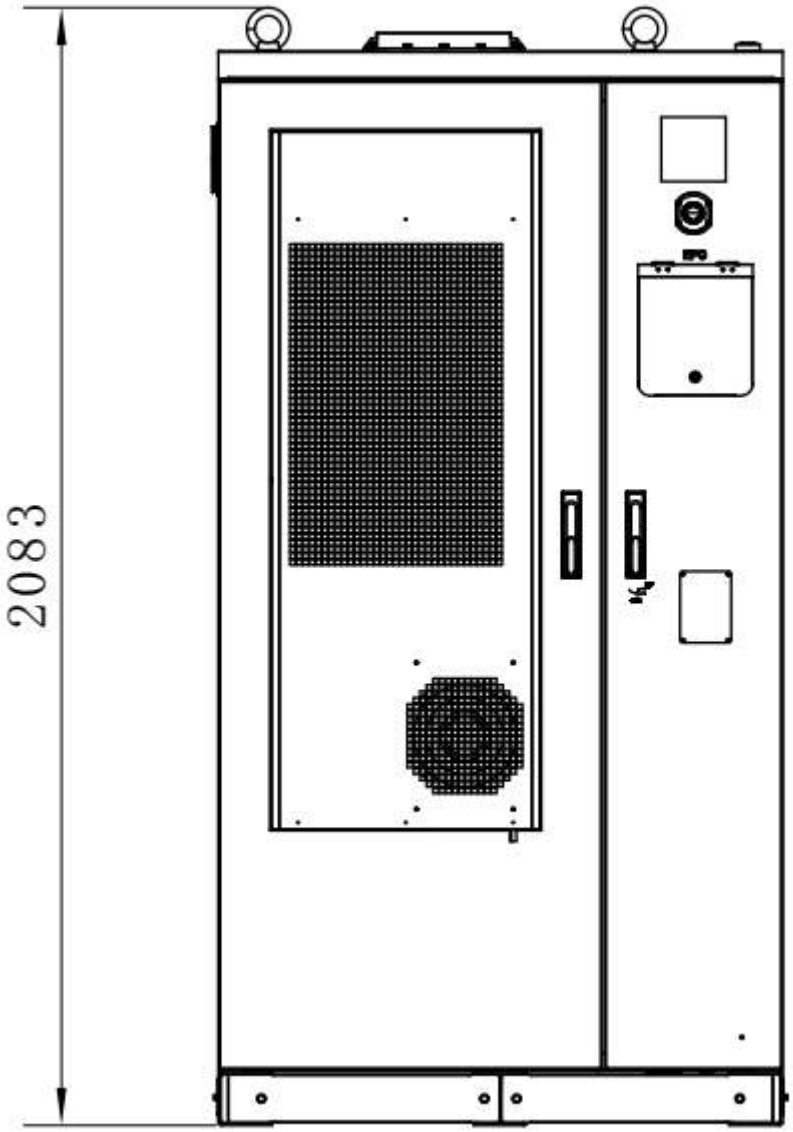
Figure 2-33 Relationship between the discharge current limit and cell temperature

(The min temperature and max temperature are detected simultaneously, and the lower of the two corresponding current limit values is used)

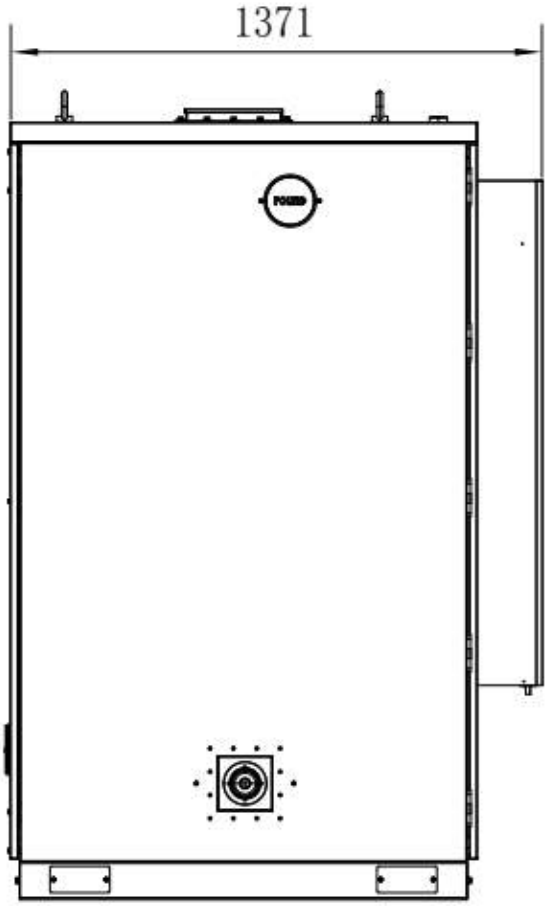
3 Installation

3.1 SITE PLANNING

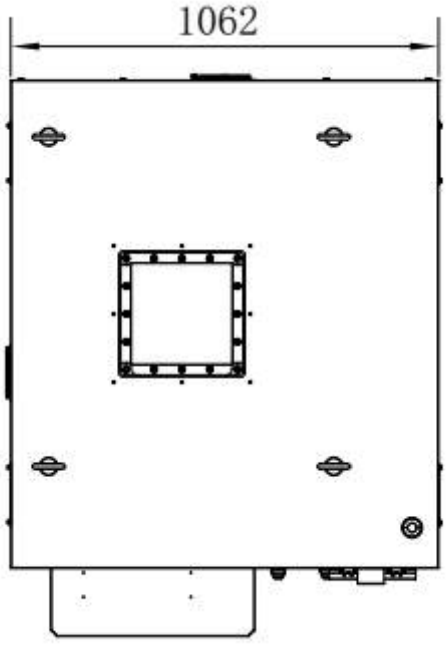
3.1.1 Battery cabinet dimensions



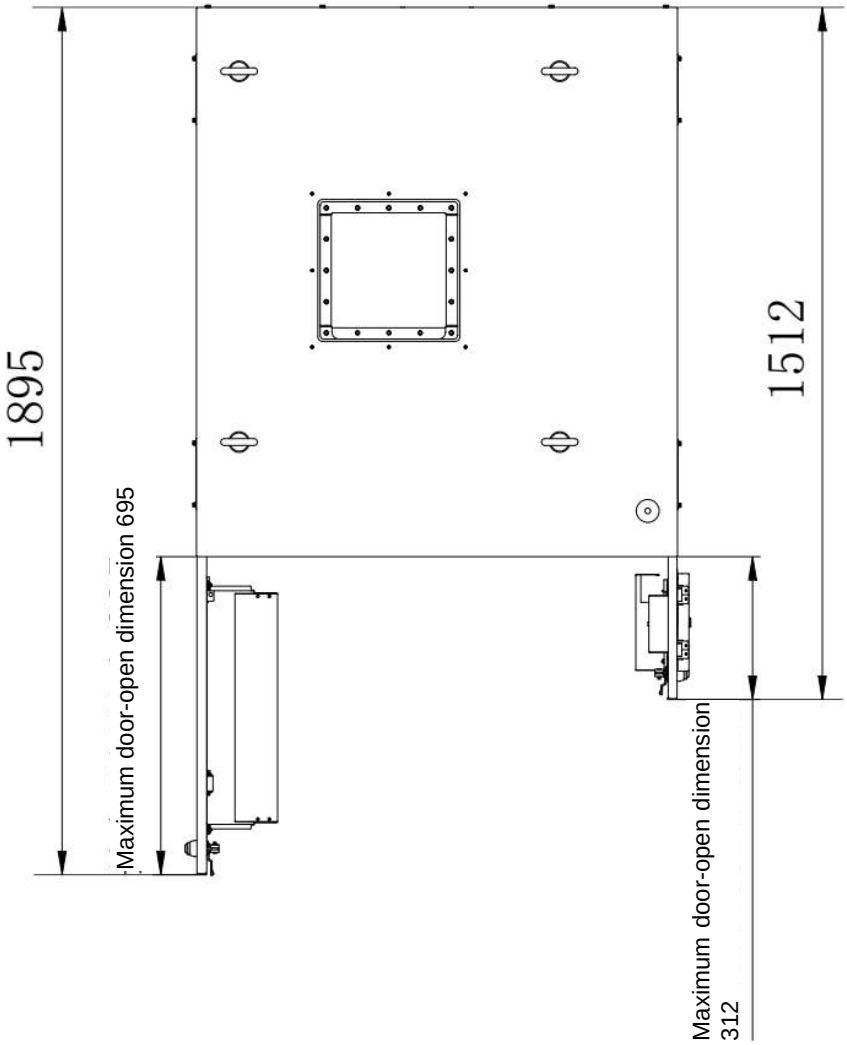
Dimension diagram of the front view of the BC120DE2A battery cabinet (mm)



Dimension diagram of the side view of the BC120DE2A battery cabinet (mm)



Dimension diagram of the top view of the BC120DE2A battery cabinet (mm)



Dimension diagram of the top view of the BC120DE2A battery cabinet with the door open (mm)

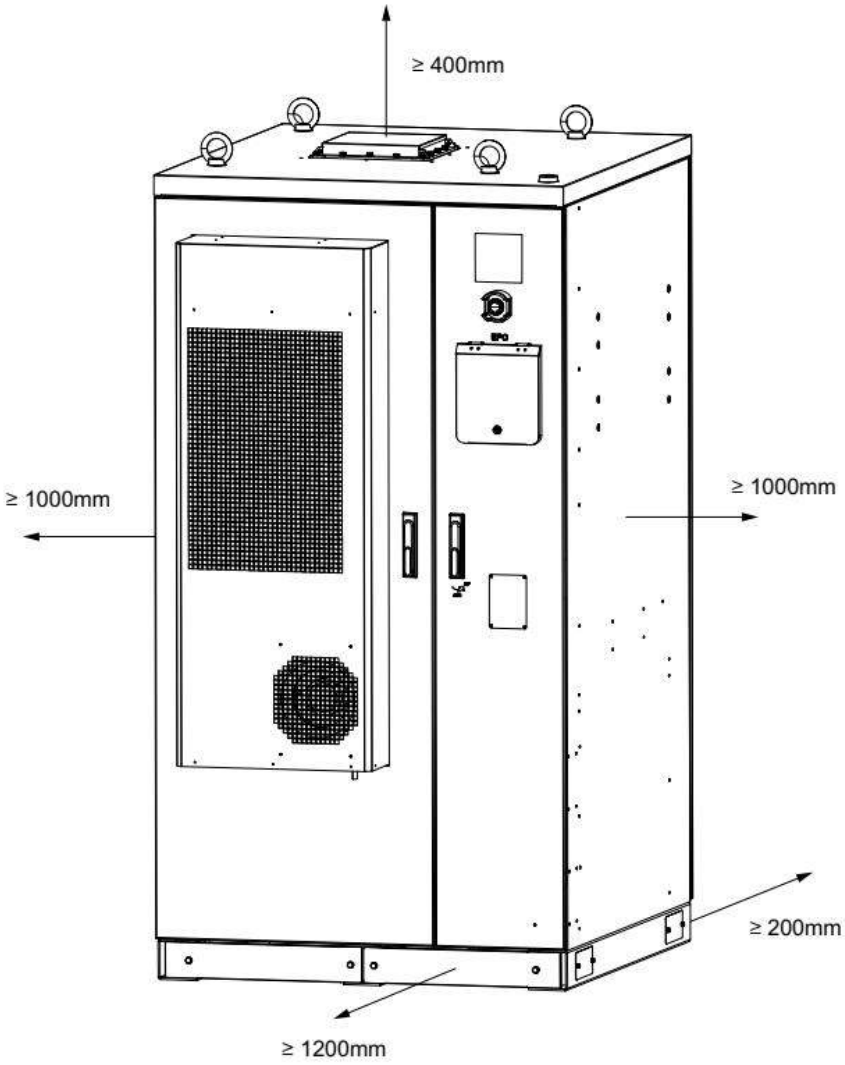
3.1.2 Installation precautions

- It is recommended to install a fence around the energy storage battery cabinet to keep out unauthorized personnel.
- Place the battery cabinet on level ground, ensuring it is stable, without shaking or tilting.
- The installation of the battery cabinet should take into account the load-bearing capacity of the installation ground or floor slab (as required by the building drawings).
- Do not cover the vents with any objects, as this would obstruct heat dissipation from the battery cabinet, raise the internal system temperature, and affect the safety and service life of the battery.
- Keep the installation environment of the battery cabinet well ventilated, and avoid installing it in locations with excessively high or low temperatures or high humidity; Keep away from water, flammable gases, or corrosive agents, and away from heat sources; it is recommended to avoid direct sunlight; Keep the air inlet/outlet as free of dust as possible.
- Avoid use in environments with dust, volatile gases, corrosive gases, or excessive salinity, and do not place flammable or explosive items around the battery cabinet.
- To reduce the likelihood of fire and the resulting damage, the walls, ceiling, and floor of the room housing the battery cabinet should be made of fire-resistant materials wherever possible, and a portable water-based fire extinguisher should be provided.
- Follow applicable safety codes during installation.

3.1.3 Space reservation

A certain amount of operating and ventilation space must be reserved around the cabinet:

- The front requires door opening and maintenance access; a ventilation and operating space of ≥1200 mm is recommended in front, and ≥200 mm at the rear;
- For side-mounted PCS units, an operating space of ≥1000 mm is recommended;
- An operating space of ≥400 mm is recommended above.

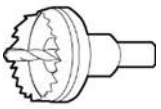
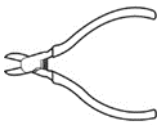
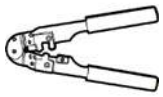
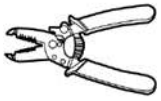
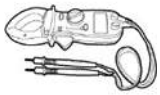
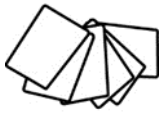
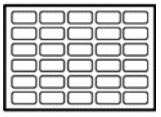
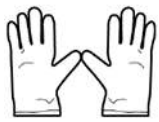
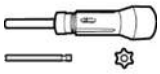
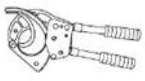
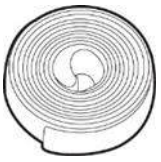


3.2 TOOL AND INSTRUMENT PREPARATION

DANGER

Use insulated tools to prevent electric shock.

Table 3-1 Tools and instruments required

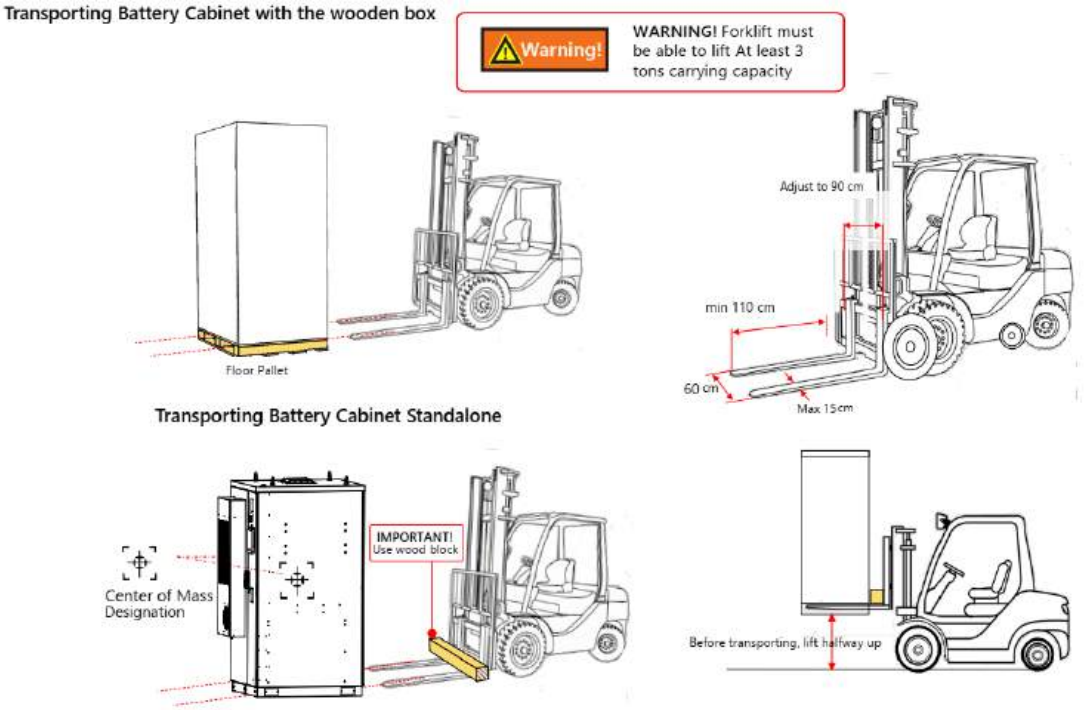
Tools and instruments			
Electric forklift	Manual pallet jack	Ladder	Rubber mallet
			
Impact drill	Manual impact drill bit	Alloy hole saw	Heat gun
			
Diagonal cutting pliers	Crimping tool	Wire stripper	Electro-hydraulic crimping tool
			
Clamp ammeter	Multimeter	Cable ties	Level
			
Insulating tape	Cotton cloth	Label	Electrician's knife
			
Anti-static gloves	Lead-lined rubber gloves	Heat-resistant gloves	Insulated safety shoes
			
Torque screwdriver	Cable cutter	Brush	Flat-head screwdriver (2–5 mm)
			
Phillips screwdriver (M3 / M4 / M5 / M6 / M8)	Insulated torque wrench (M6/M8/M12/M16)	Heat-shrink tubing	Insulated adjustable wrench
			

Crane			
			

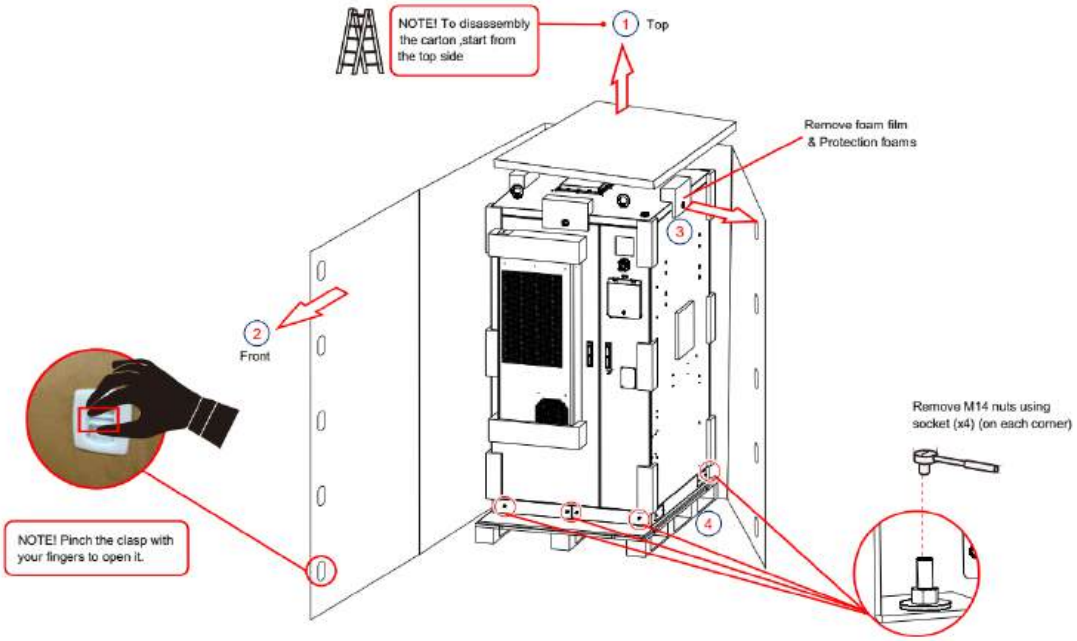
3.3 REMOVING THE PACKAGING

Procedure

- Step 1 Use a forklift to transport the battery cabinet to the designated location.



- Step 2 Remove the outer packaging of the battery cabinet.
- Step 3 After confirming the equipment is intact, remove the bolts securing the battery cabinet to the pallet and lift the battery cabinet off the pallet.



3.4 SINGLE-CABINET INSTALLATION

3.4.1 Installation environment

- Do not install the battery cabinet in locations with high or low temperatures or humidity that exceed the technical specifications.
- The battery cabinet should be kept away from water sources, heat sources, and flammable or explosive materials.
- Avoid installing the battery cabinet in a desert or its surrounding environment.
- Avoid installing the battery cabinet in environments with direct sunlight, dust, volatile gases, corrosive substances, or excessive salinity.
- Avoid installing the battery cabinet on an unstable or vibration-prone foundation.
- It is strictly forbidden to install the battery cabinet in a working environment containing conductive metallic dust.
- The optimal operating temperature for the cells inside the battery cabinet is 20°C to 30°C. Taking into account both the cooling capacity of the air conditioner and the optimal operating temperature of the cells, it is recommended that the optimal ambient temperature of the battery cabinet not exceed 45°C; Above 45°C, derating is recommended, at a rate of 10% for every 1°C increase, in order to maintain the optimal operating temperature of the cells inside the cabinet; The maximum recommended ambient temperature is 50°C. Prolonged exposure above 50°C may accelerate battery aging.

3.4.2 Installing the cabinet

3.4.2.1 Selecting the installation location

When selecting an installation site, follow at least the following principles:

- The climate and geological conditions (such as stress wave emission and groundwater level) of the energy storage integrated system installation site should be fully considered.
- The surrounding environment must be dry, well-ventilated, and away from flammable and explosive areas.
- The soil at the installation site needs to have a certain degree of compactness; it is recommended that the relative density of the soil at the installation site reach 98%. If the soil is loose, measures must be taken to ensure a stable foundation.

3.4.2.2 Foundation requirements

⚠ WARNING

The energy storage integrated system as a whole is heavy. Before constructing the foundation, a detailed survey of the conditions at the installation site (mainly geological conditions and environmental/climatic conditions) should first be conducted. Only on this basis can the design and construction of the foundation begin.

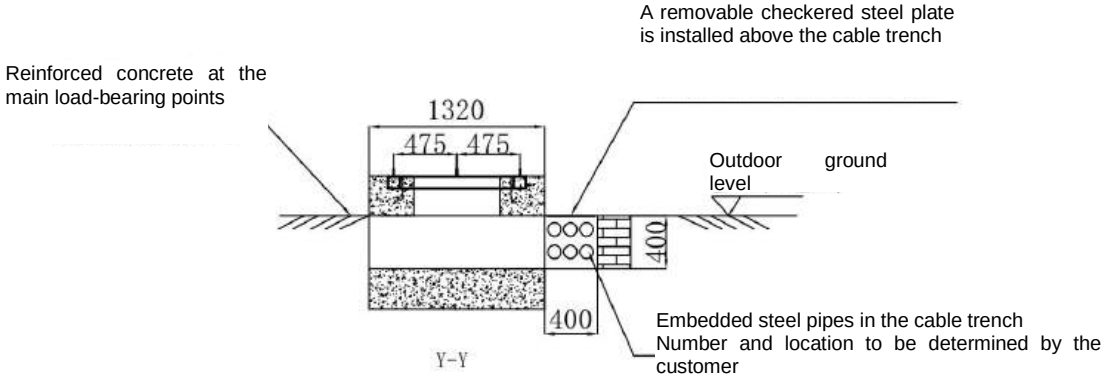


Figure 3-1 Reference front view of the battery cabinet installation foundation (Y-Y)

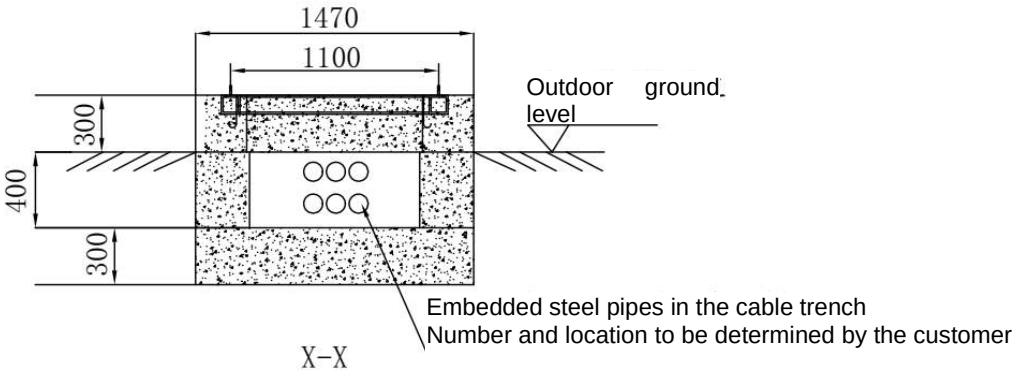


Figure 3-2 Reference front view of the battery cabinet installation foundation (X-X)

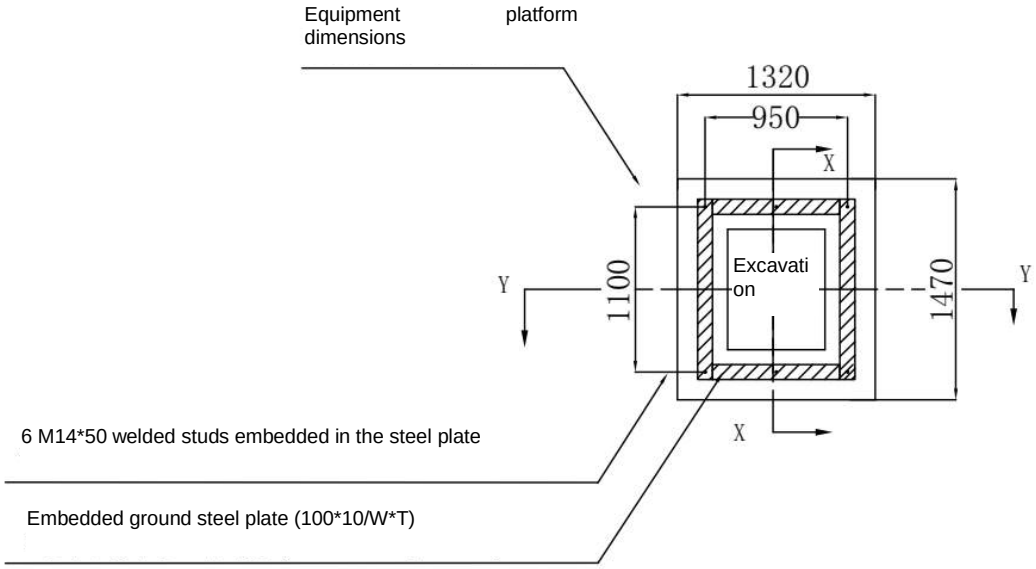


Figure 3-3 Reference top view of the battery cabinet installation foundation

An unreasonable foundation construction plan can cause significant difficulty or inconvenience for placement of the energy storage integrated system, door opening/closing, and later operation. Therefore, the installation foundation of the energy storage integrated system must be designed and constructed in advance according to certain standards, in order to satisfy the requirements for mechanical support, cable routing, and later maintenance and servicing.

The foundation construction must meet at least the following requirements:

- The bottom of the foundation pit must be thoroughly compacted and leveled.
- The foundation must provide sufficient load-bearing support for the energy storage integrated system.
- Raise the energy storage integrated system to prevent rainwater from eroding the base and interior of the energy storage integrated system. It is recommended that the foundation be approximately 300 mm above the level ground at the installation site.
- Corresponding drainage measures should be constructed based on local geological conditions.
- Construct a concrete foundation with sufficient cross-sectional area and height. The height of the foundation is determined by the construction party based on the site's geological conditions.
- Cable routing should be taken into account when constructing the foundation.

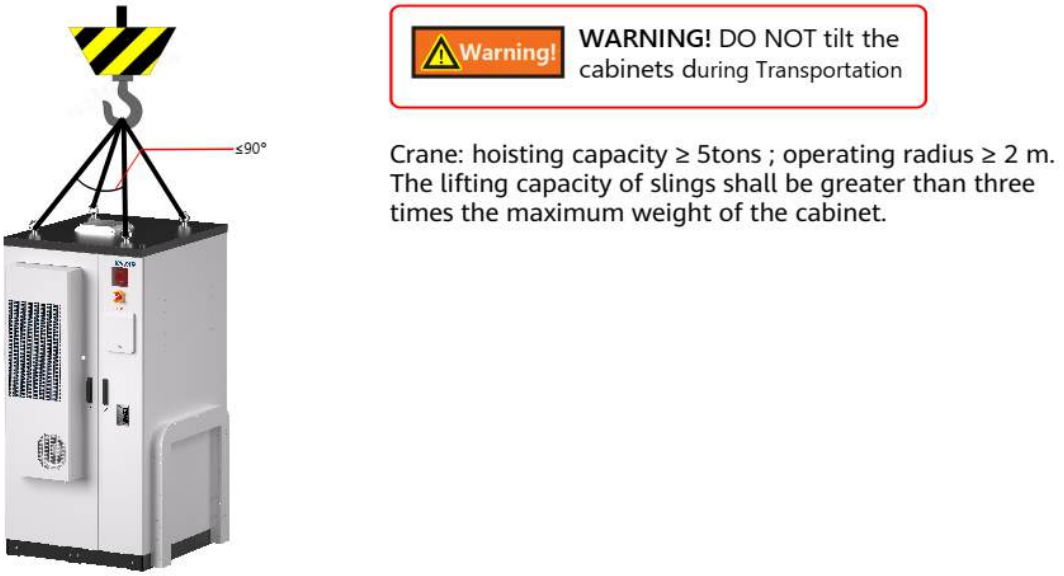
- A maintenance platform is built around the foundation to facilitate later maintenance.
- Based on the location and dimensions of the cable entry and exit points on the battery cabinet, sufficient space for the AC/DC-side cable trenches should be reserved during foundation construction, with cable conduits pre-embedded.
- The specifications and number of perforated conduits are determined based on the cable model and the number of incoming/outgoing cables.
- Both ends of all pre-embedded conduits are temporarily sealed to prevent the entry of debris; otherwise, later cable routing will be inconvenient.
- After all cables are connected, the cable entry and exit points, as well as the joints, should be sealed with fire-resistant mud or other suitable materials to prevent the entry of rodents.

NOTICE

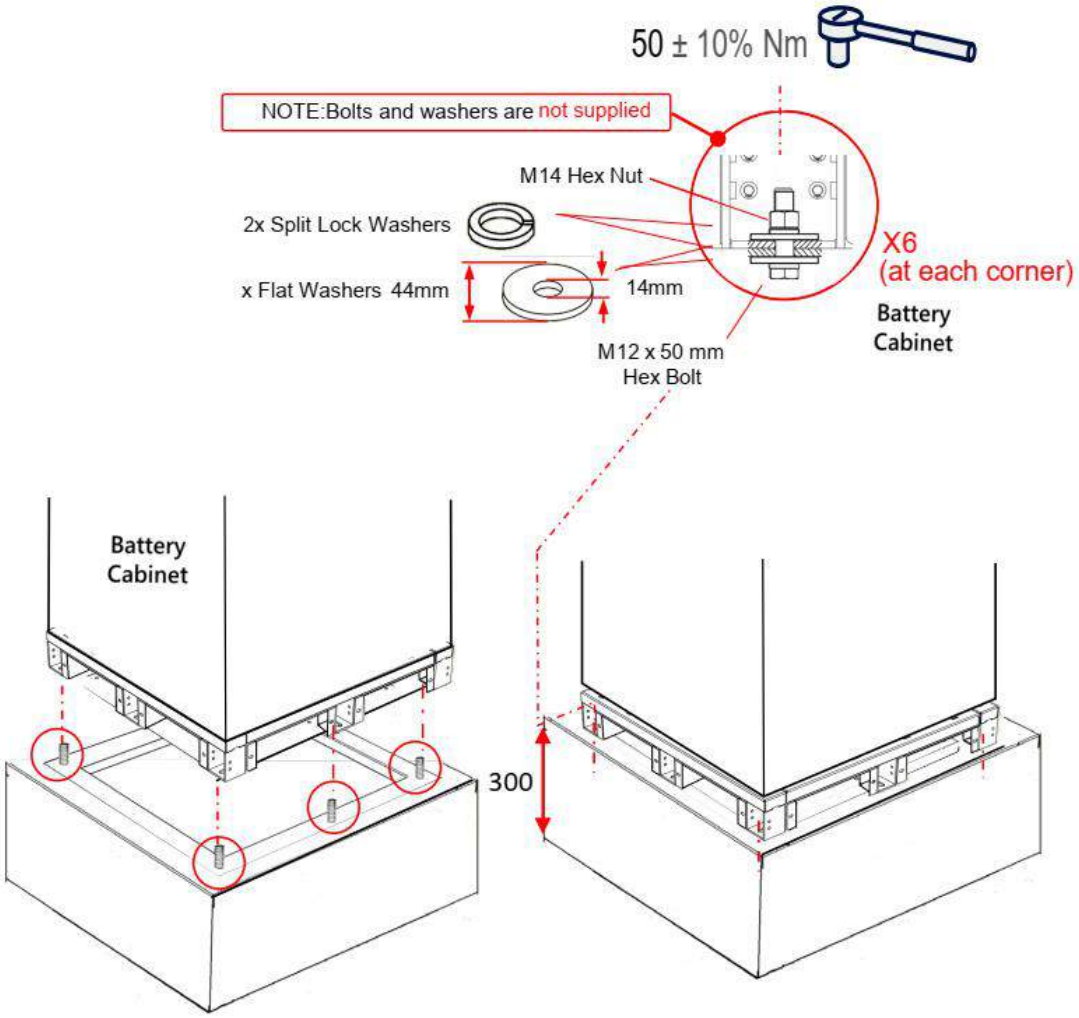
Pre-install grounding units according to the relevant standards of the country/region where the project is located.

3.4.2.3 Fixed installation

- After confirming that the foundation is constructed as required and is sufficiently dry, solid, and flat, lift the outdoor battery cabinet and the power conversion system (PCS) into the predetermined position.
- Secure the outdoor battery cabinet to the foundation using fastening bolts. After fixing is complete, apply anti-rust treatment to the U-shaped angle steel, such as spraying anti-rust paint, and place a fire extinguisher next to the battery cabinet.



Battery cabinet lifting diagram



Foundation installation diagram

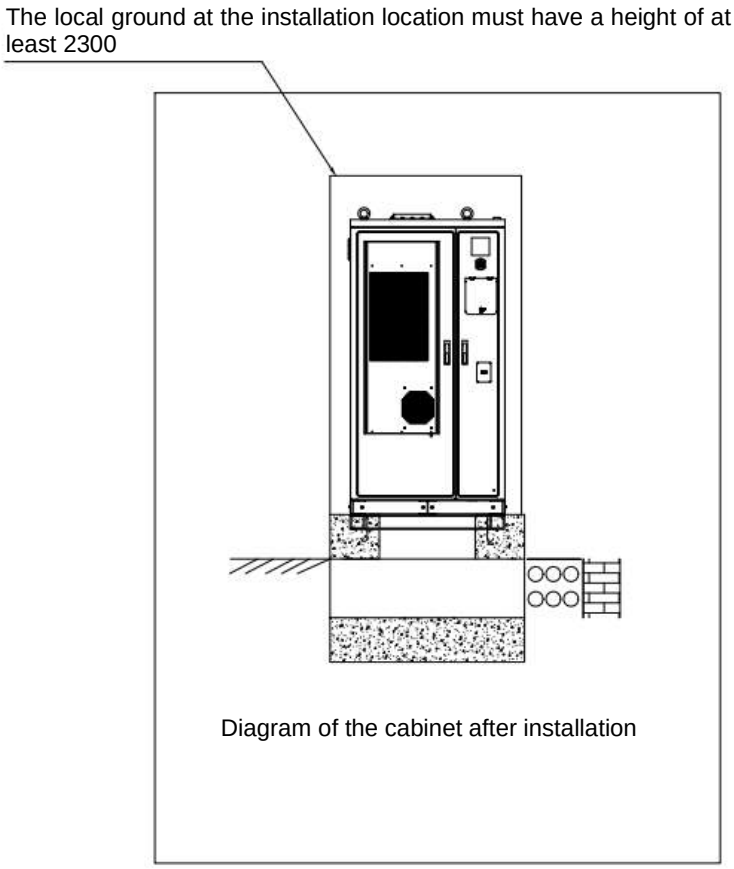


Diagram of the battery cabinet after installation (front view)

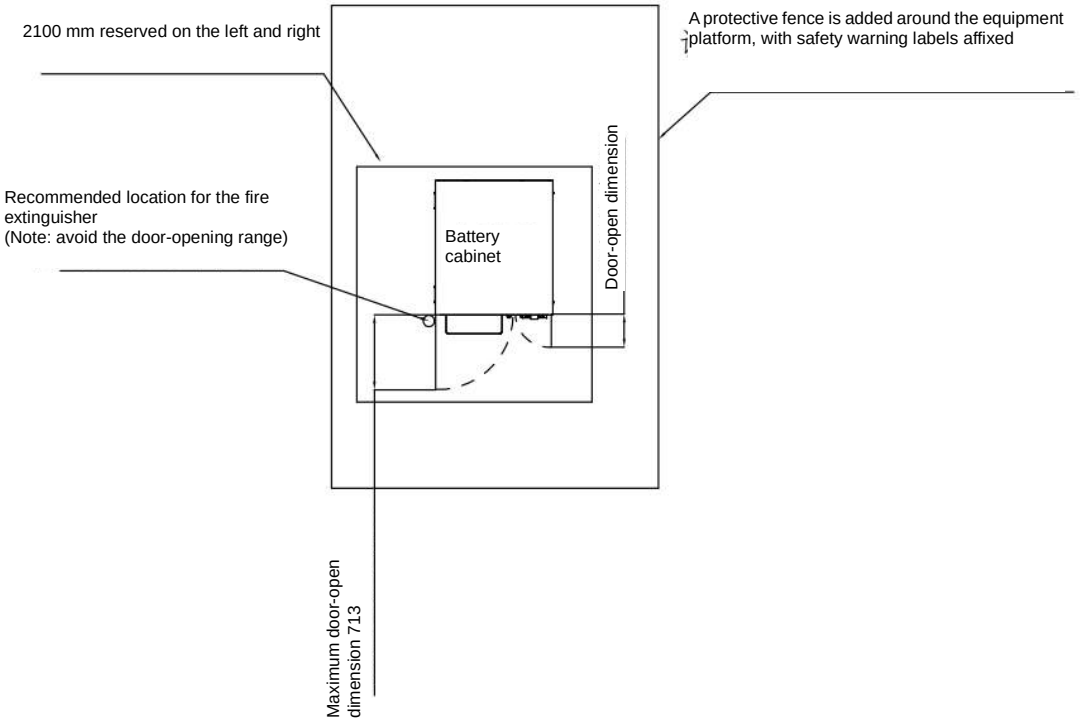


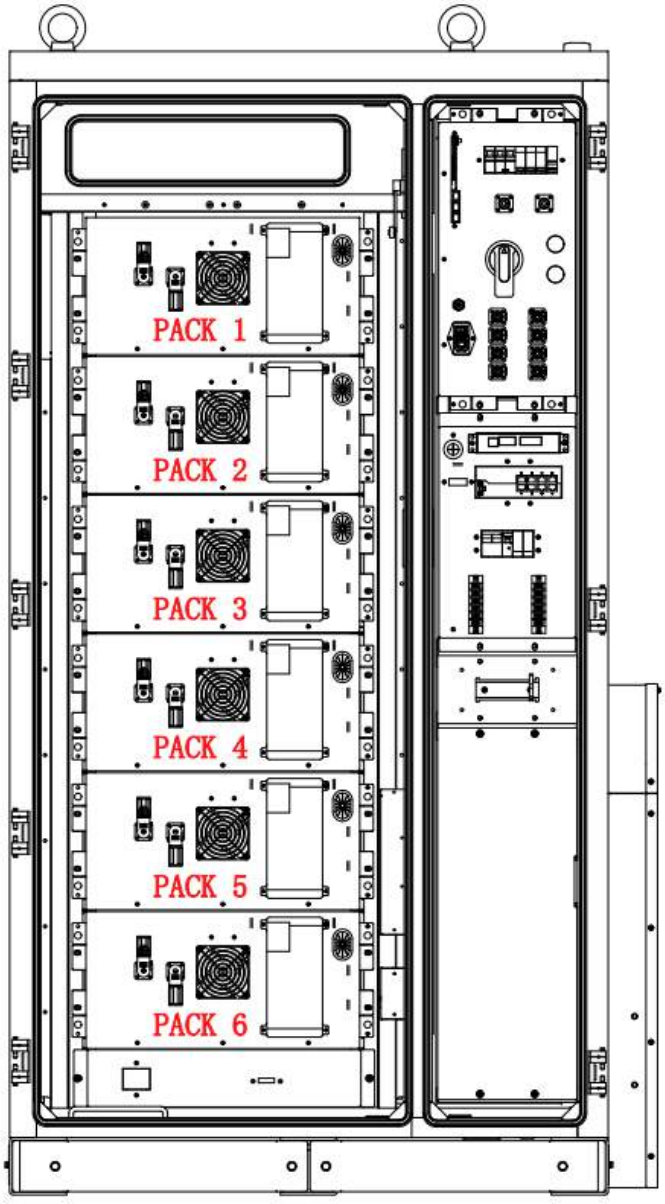
Diagram of the battery cabinet after installation (top view)

3.4.3 Instructions for cable installation between battery modules

DANGER

Before servicing the connections between battery modules, the energy storage system must be powered off.

The connections between battery modules have already been completed when the battery cabinet is shipped. If the customer still needs to service the connections between battery modules, refer to the following:



Battery pack numbering description

(1) Power cable connection

Wear insulated gloves. The power cables between battery modules are connected in series from PACK1 to PACK6, with the positive terminal of PACK1 connected to B+ on the high-voltage box and the negative terminal of PACK6 connected to B- on the high-voltage box.

Power cable connection table

PACK Number	Positive terminal	Negative terminal
PACK1	Connect to high-voltage box B+	Connect to PACK2 positive

		terminal
PACK2	Connect to PACK1 negative terminal	Connect to PACK3 positive terminal
PACK3	Connect to PACK2 negative terminal	Connect to PACK4 positive terminal
PACK4	Connect to PACK3 negative terminal	Connect to PACK5 positive terminal
PACK5	Connect to PACK4 negative terminal	Connect to PACK6 positive terminal
PACK6	Connect to PACK5 negative terminal	Connect to high-voltage box B-

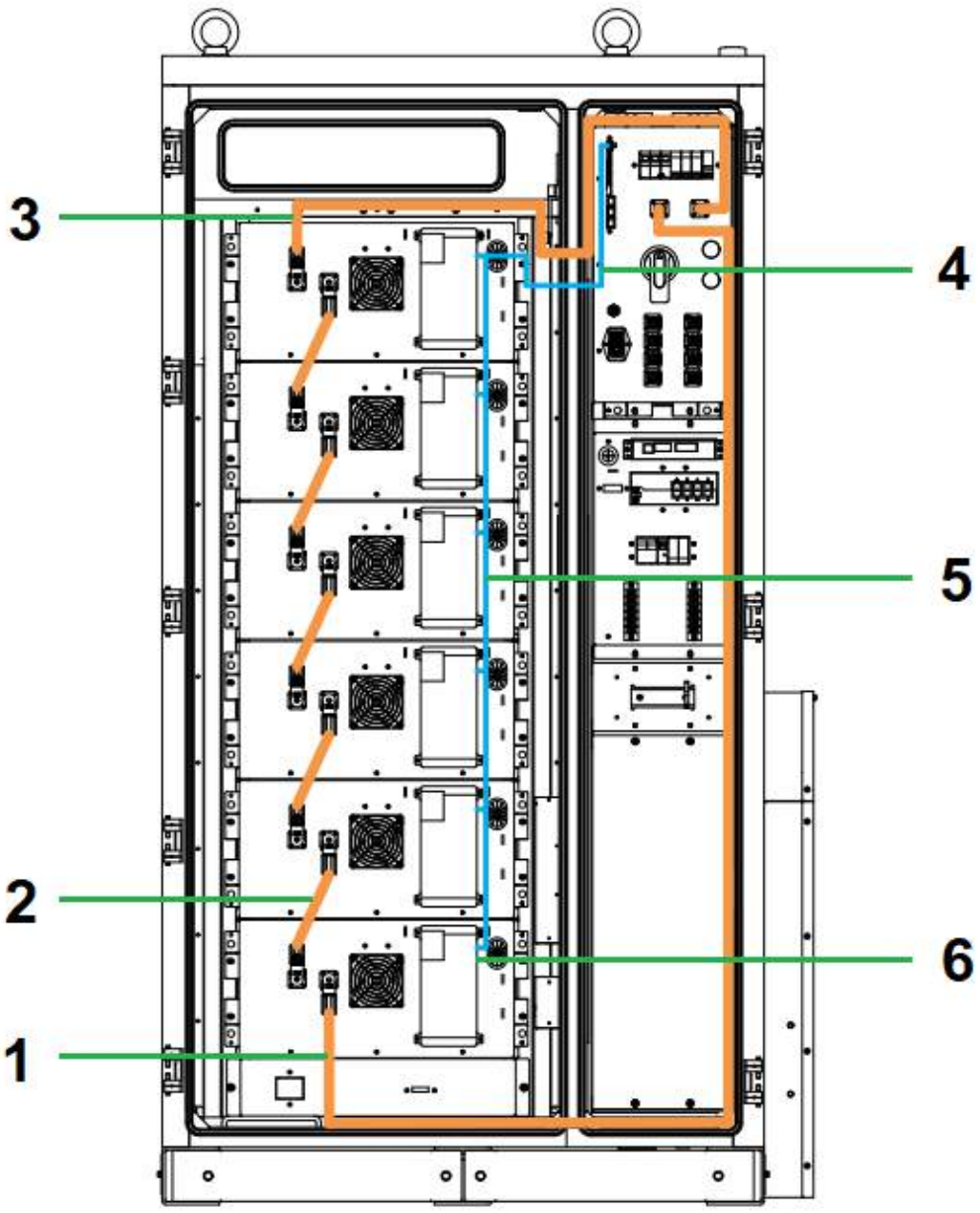
(2) Communication cable connection

The J5 terminal of PACK1 is connected to the BMU terminal on the high-voltage box, and the J4 terminal of PACK6 is connected to a 120Ω terminating resistor. The communication cables between battery modules are connected in series from PACK1 to PACK6.

Communication cable connection table

PACK Number	J4	J5
PACK1	Connect to PACK2_J5	Connect to high-voltage box BMU
PACK2	Connect to PACK3_J5	Connect to PACK1_J4
PACK3	Connect to PACK4_J5	Connect to PACK2_J4
PACK4	Connect to PACK5_J5	Connect to PACK3_J4
PACK5	Connect to PACK6_J5	Connect to PACK4_J4
PACK6	Connect to 120Ω terminating resistor	Connect to PACK5_J4

For specific wiring, refer to the diagram below (using the BC120DE2A as an example).



Battery module power connection diagram

Serial number	Part	Part description
1	Power cable from battery pack B- to high-voltage box B-	Negative power cable from the battery module to the high-voltage box
2	Power cable between battery packs	Quick-connect power cable between battery modules, black and red paired with each other
3	Power cable from battery pack B+ to high-voltage box B+	Positive power cable from the battery module to the high-voltage box
4	Communication cable from battery pack to high-voltage box	BMU-SBMU CAN communication cable
5	Communication cable between battery packs	BMU cascade CAN bus communication cable
6	Termination resistor	120Ω terminating resistor

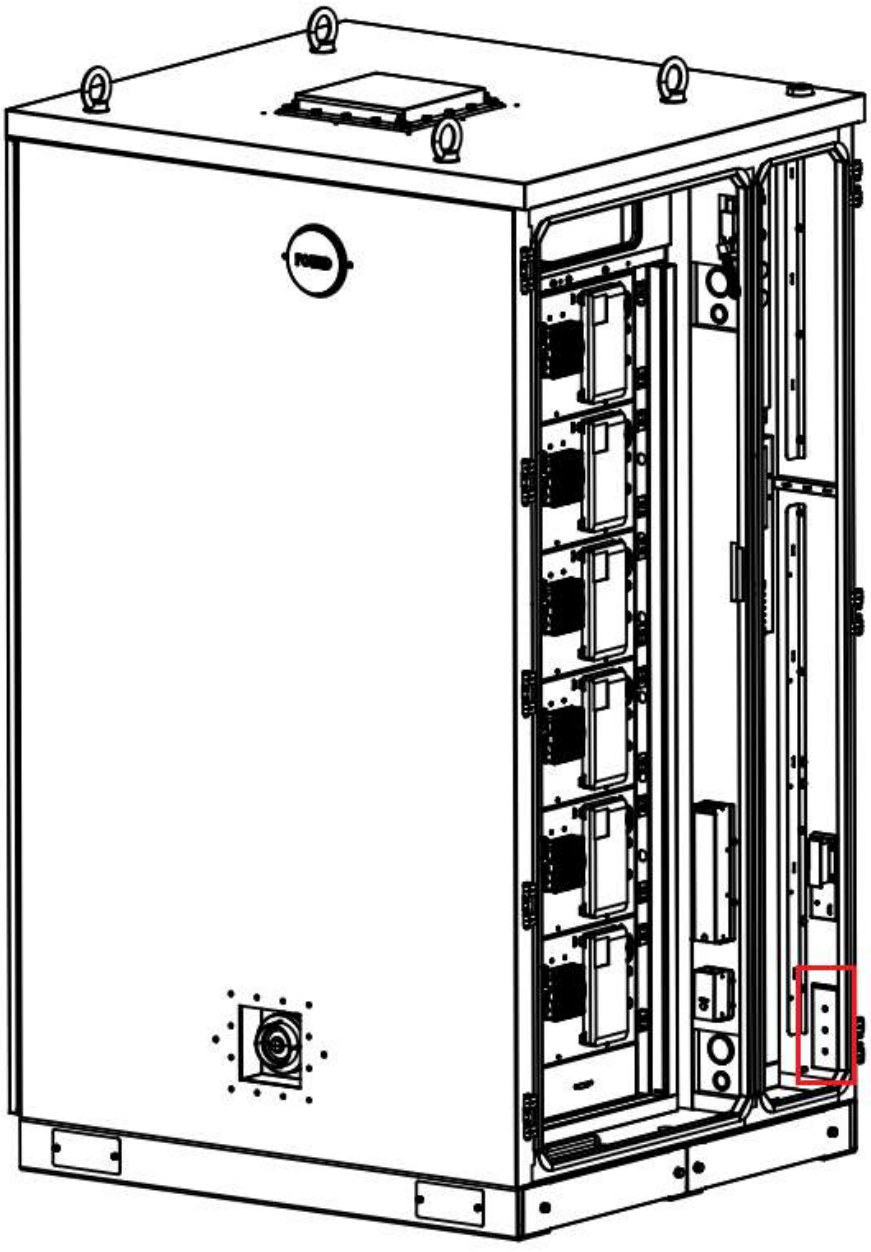
3.4.4 Instructions for grounding cable installation

DANGER

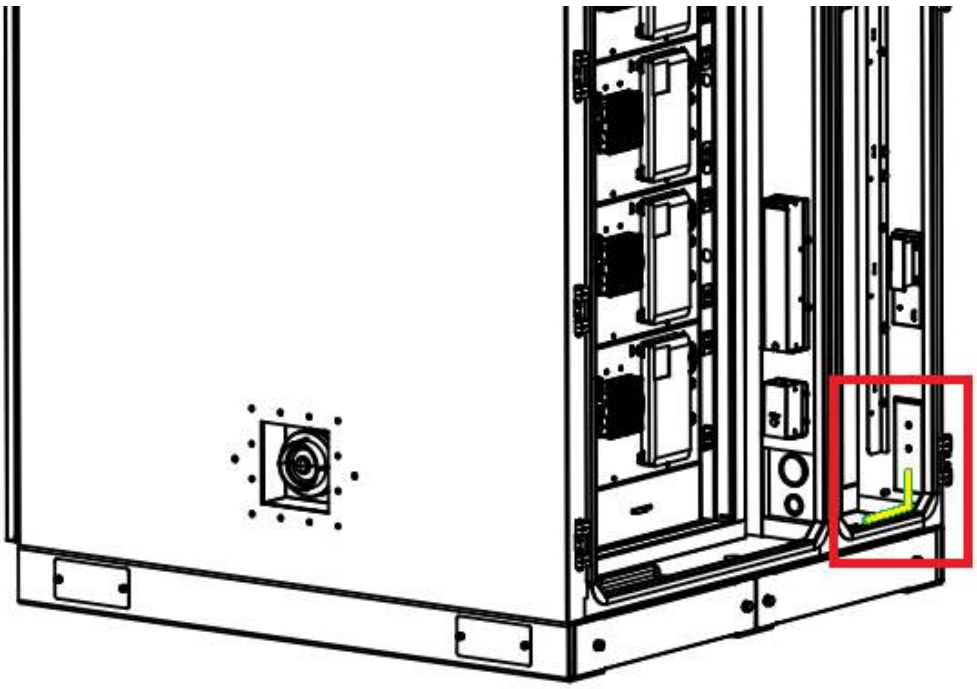
The energy storage cabinet must be grounded during use.

- Terminal: DT35-6
- Ground wire gauge: 2AWG

Refer to the diagram below for grounding wire installation.



Grounding wire location



Grounding wire installation diagram

3.5 ELECTRICAL CONNECTIONS

DANGER

Before installation, confirm that the circuit breaker switch on the high-voltage box is in the off position.

3.5.1 AC input connection

Step 1 Confirm that the circuit breaker switches on the AC distribution box are all in the "OFF" position.

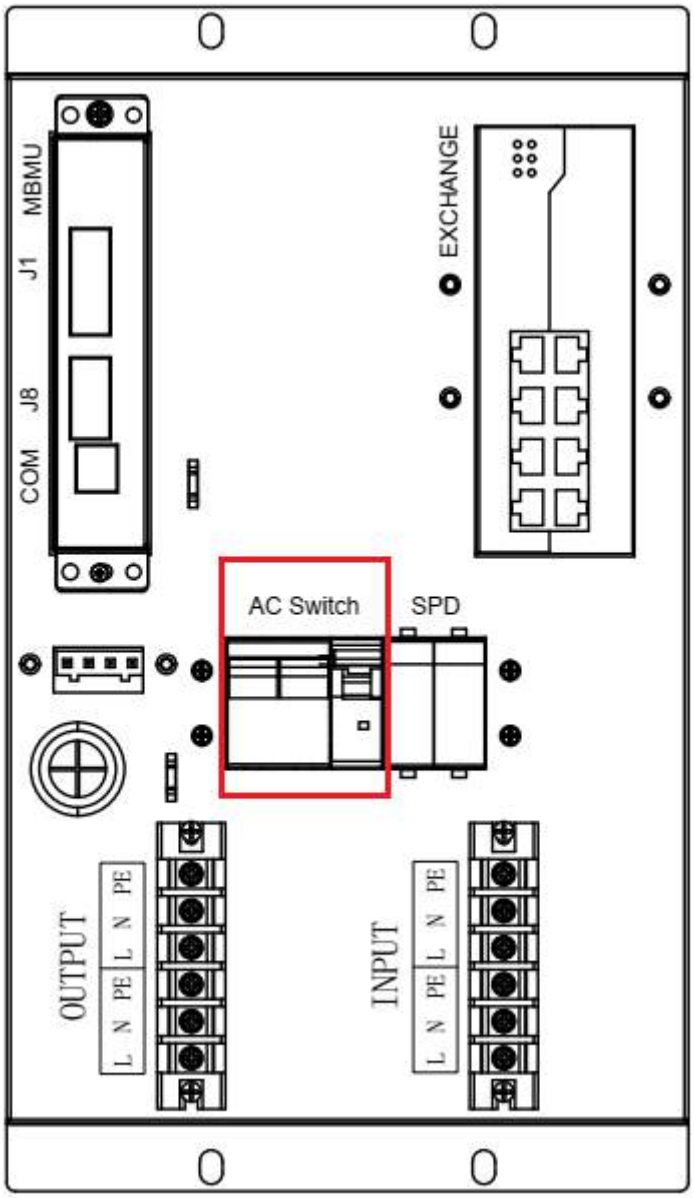
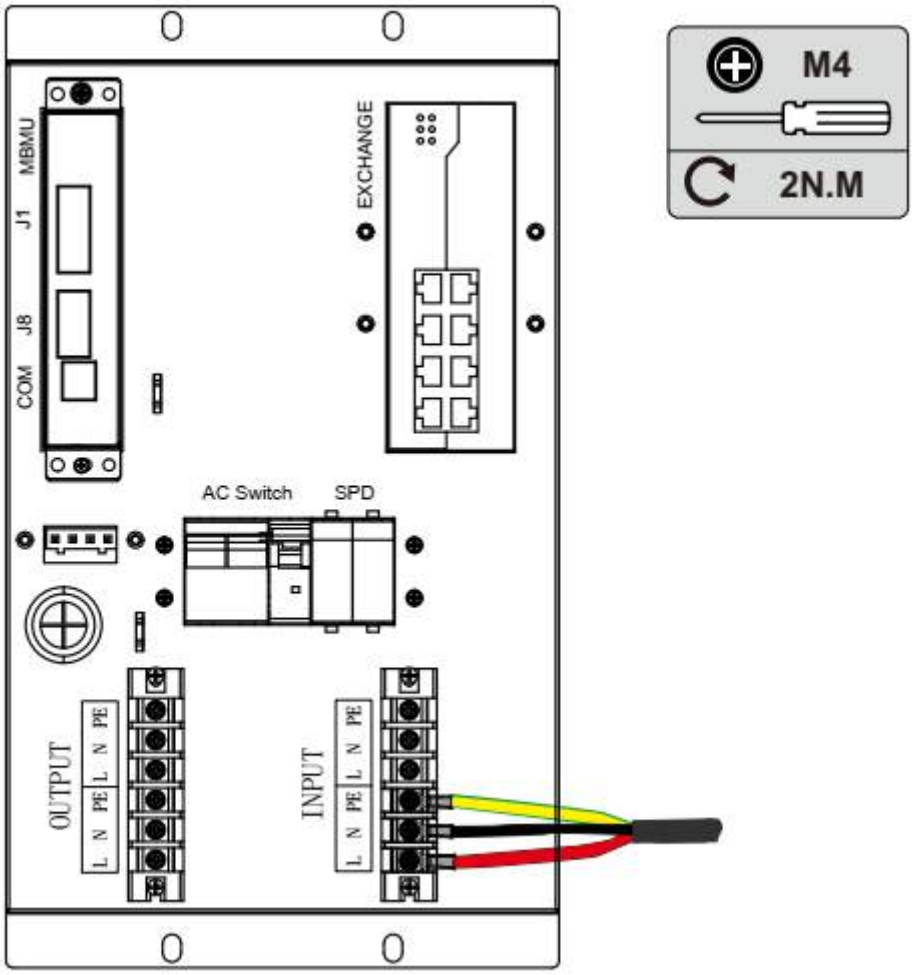


Figure 3-5 AC distribution box

NOTICE

- The AC input is single-phase 220VAC. Before wiring, confirm that the operation is not live.
- The overvoltage category of the AC input is AC OVC II.
- The AC input supplies 220VAC AC power to the air conditioner and the AC-DC power module inside the high-voltage box.

Step 2 Connect the L/N/PE wires of the single-phase 220VAC mains power line to the corresponding terminals as identified in the figure below, and tighten with bolts (torque ≤2 Nm).



Mains power wiring diagram

NOTICE

- The 3 remaining terminals on the INPUT side are reserved AC input wiring terminals, which can be used for AC power transfer;
- The two sets of L, N, PE terminals on the OUTPUT side are used for internal AC power wiring to the high-voltage box and air conditioner, respectively;
- AC wiring terminal: UI5.5-5;
- AC wiring gauge: 6mm2;
- After the AC input wiring is complete, cover it with the transparent protective cover.

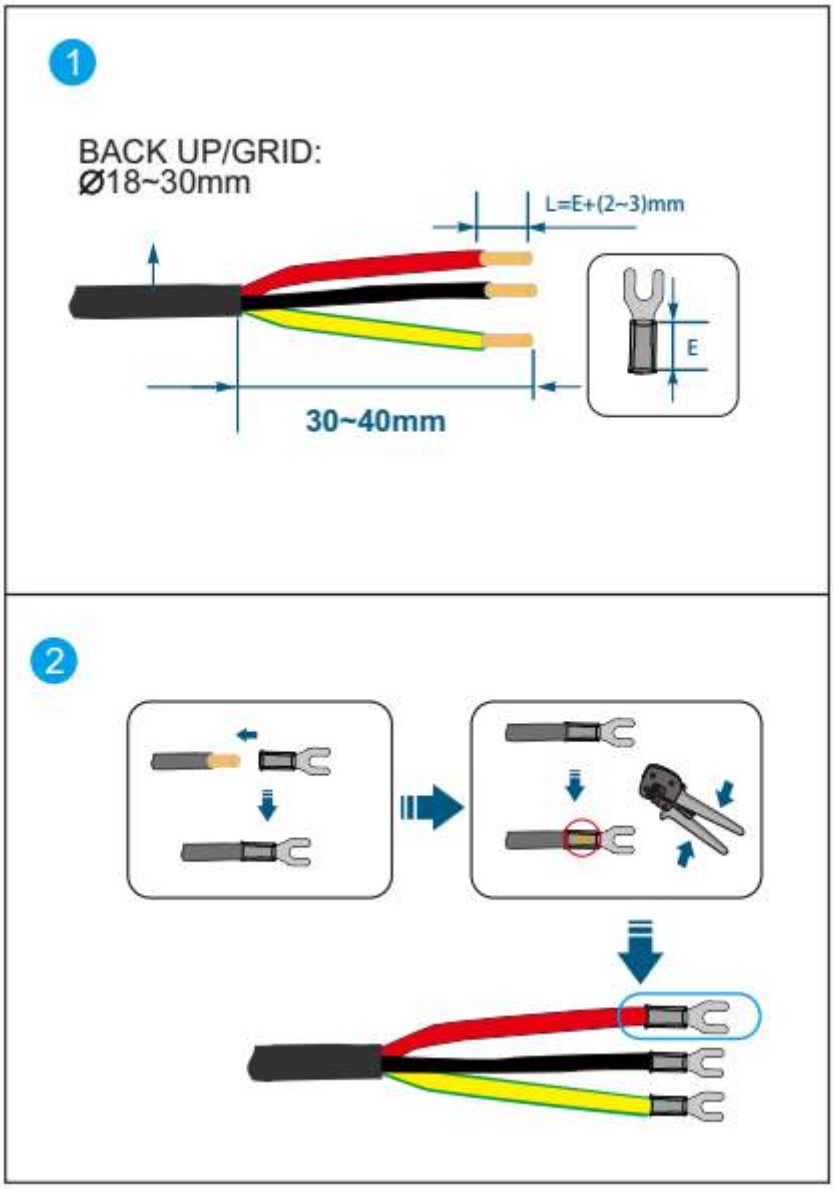


Figure 3-10 AC terminal crimping diagram

3.6 ENERGY STORAGE CABINET ELECTRICAL CONNECTION DIAGRAM

3.6.1 System schematic diagram

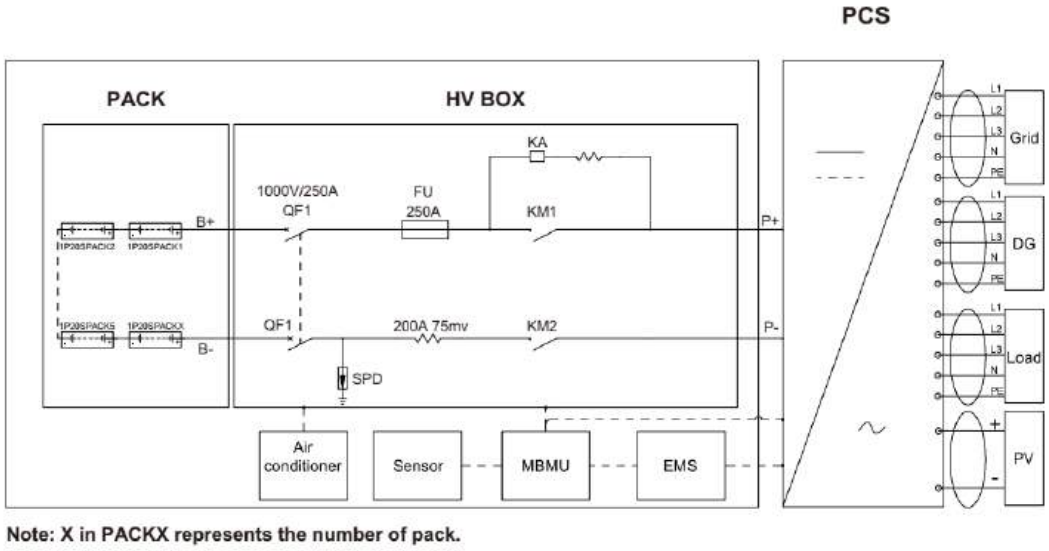


Figure 2-18 Electrical connection diagram (1)

3.6.2 AC auxiliary power supply schematic diagram

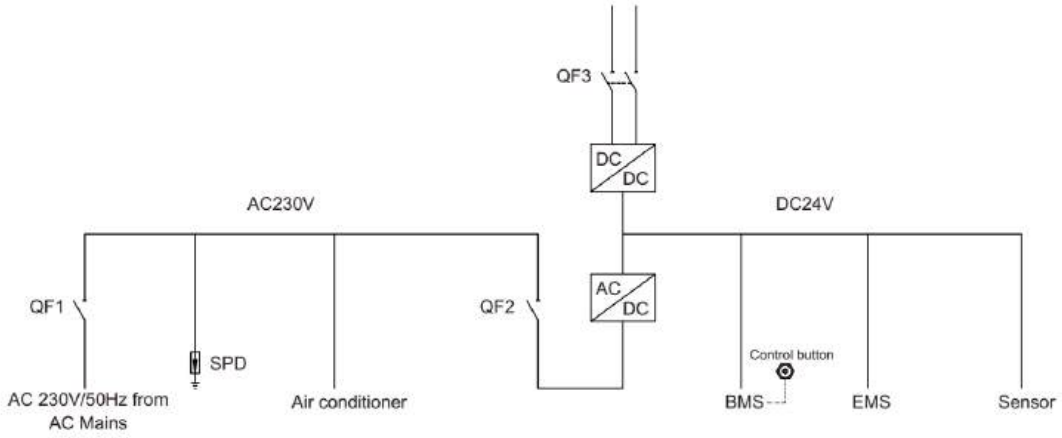
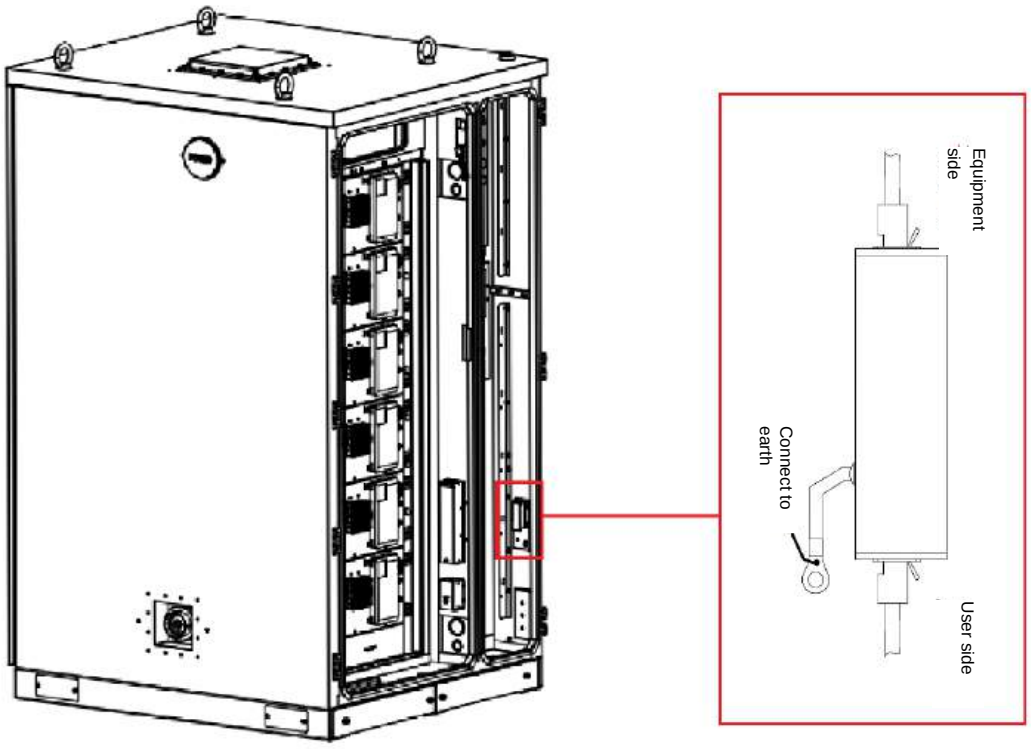


Figure 2-19 Electrical connection diagram (2)

3.7 COMMUNICATION WIRING INSTRUCTIONS

(1) Ethernet communication interface wiring

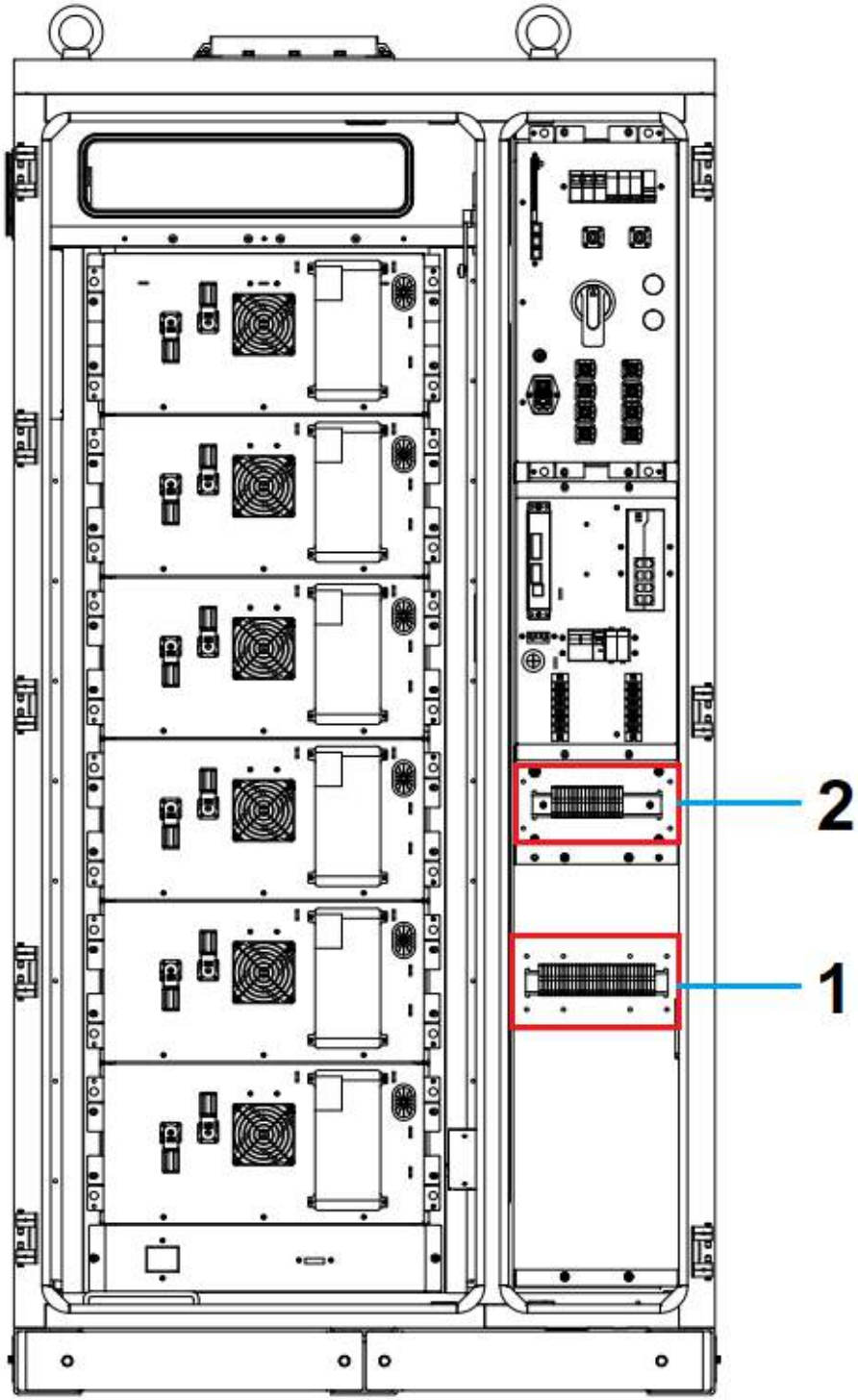
The battery cabinet has a built-in Ethernet surge protective device (SPD), which is already connected to the network port of the EMS controller. When users need to connect to the cloud platform or a higher-level monitoring system, they can simply connect a standard network cable directly to the Ethernet SPD.



Ethernet wiring diagram

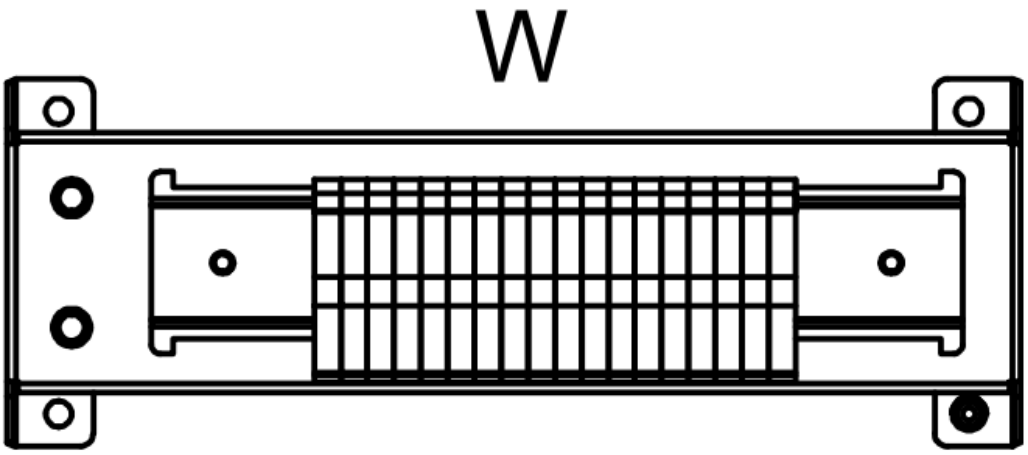
(2) Terminal block definitions

The battery cabinet has two sets of communication terminal blocks in total. W is the external terminal block, used for communication with the PCS and external communication; N is used for internal transfer; see the table below for details.



Terminal block location diagram

Serial number	Component
1	Terminal block N
2	Terminal block W



W terminal block diagram

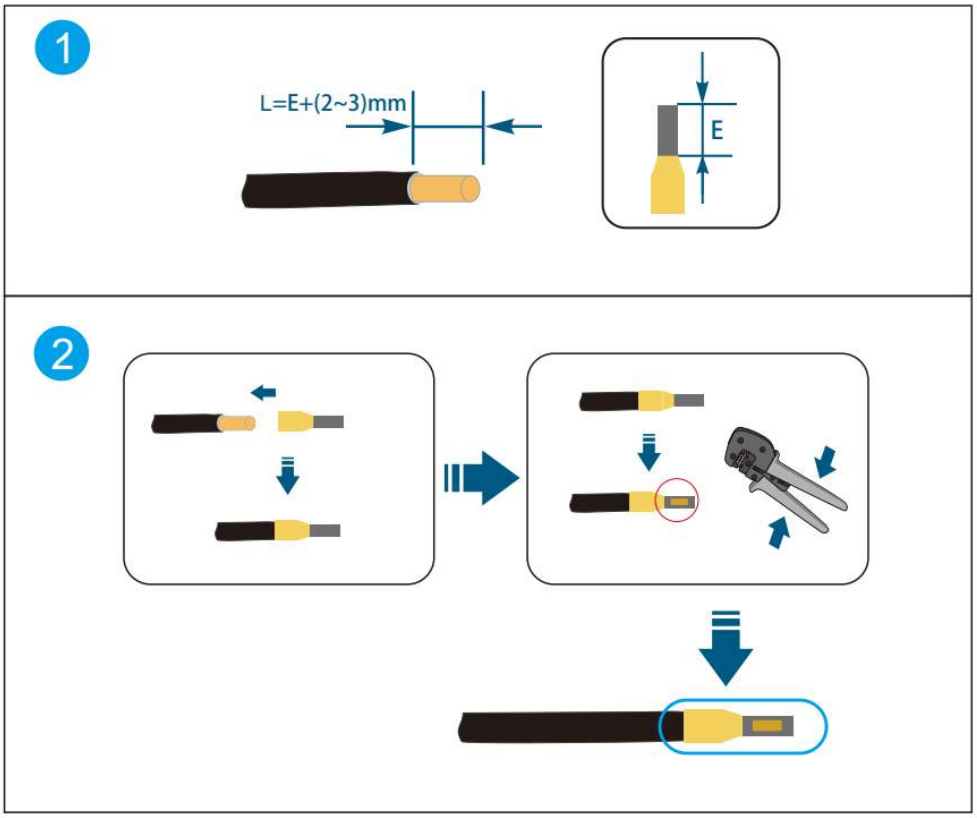
W terminal block definitions:

Mating connector (upper)		Terminal block W			Mating connector (lower)	
Pin number	Mating device	Pin number	Signal	Description	Pin number	Mating device
3	High-voltage box IO2 terminal	1	Fire suppression dry contact FB+	Customer fire suppression	Customer-side definitions	Customer fire suppression
4		2	Fire suppression dry contact FB-			
PIN15	MBMU-J1	3	CANH	CAN communication (MBMU-PCS)	6	PCS
PIN16		4	CANL		5	
JP2-H1	EMS	5	CANH	CAN communication (EMS-PCS)	3	
JP2-L1		6	CANL		4	
JP5-A1		7	485A	RS485 communication (EMS-PCS)	1	
JP5-B1		8	485B		2	
JP7-A2	EMS	9	485A	RS485 communication (EMS-meter)		Meter
JP7-B2		10	485B			
JP9-A3		11	485A	RS485 communication Reserved for customer		Reserved
JP9-B3		12	485B			
JP11-A4		13	485A	RS485 communication (EMS-PV inverter)		PV inverter
JP11-B4		14	485B			
J12-NO6		15	PV inverter trip+	PV inverter trip drive		PV inverter trip device

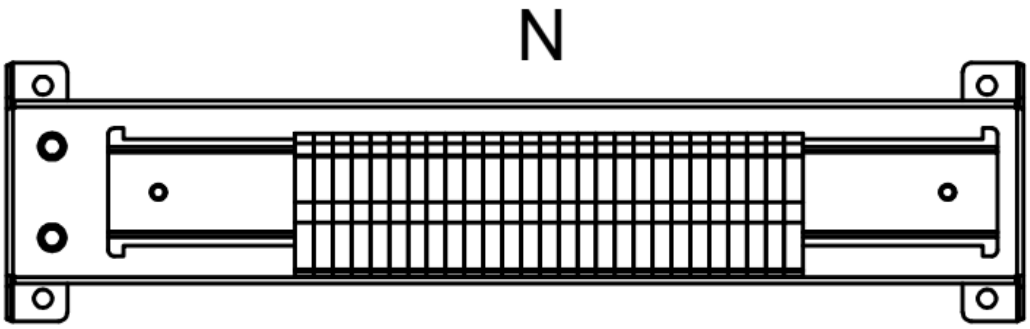
J12-COM6		16	PV inverter trip-			
J12-NO5		17	Mains circuit trip+	Mains trip drive		Mains trip device
J12-COM5		18	Mains circuit trip-			

NOTICE

- Communication cable terminal: E0508;
- Communication cable gauge: 22AWG;



Communication cable terminal crimping diagram



N terminal block diagram

N terminal block definitions:

Mating connector (upper)		Terminal block N			Mating connector (lower)	
Pin number	Mating device	Pin number	Signal	Description	Pin number	Mating device
J1-PIN3	MBMU	1	24V	CO sensor power supply	24V	CO sensor
J1-PIN4		2	GND		GND	
J8-PIN20		3	CO-FB+	CO sensor feedback	FB	CO sensor
J1-PIN9	MBMU	4	GND	AC trip device GND	GND	AC trip device
J1-PIN5		5	24V	AC trip device & safety valve 24V	24V	
J8-PIN7	MBMU	6	Dry+	Safety valve power dry contact	NC	NC
J8-PIN8		7	Dry-		24V	Safety valve 1
NC	NC	8	Dry-		24V	Safety valve 2
J1-7	MBMU	9	GND	Safety valve GND	GND	Safety valve 1
NC	NC	10	GND		GND	Safety valve 2
J8-9	MBMU	11	FM1_DI+	Safety valve 1 feedback signal	DI+	Safety valve 1
J8-10		12	FM1_DI-		DI-	
J8-11		13	FM2_DI+	Safety valve 2 feedback signal	DI+	Safety valve 2
J8-12		14	FM2_DI-		DI-	
J8-3	MBMU	15	FM1_QD+	Safety valve 1 drive signal	QD+	Safety valve 1
J8-4		16	FM1_QD-		QD-	
J8-1		17	FM2_QD+	Safety valve 2 drive signal	QD+	Safety valve 2
J8-2		18	FM2_QD-		QD-	
J1-12	MBMU	19	GND	Safety valve 1 fan GND	Fan-	Safety valve 1
J1-6	MBMU	20	24V	Safety valve 1 fan & audible and visual alarm 24V	Fan+	Safety valve 1
J8-5	MBMU	21	SG_Dry+	Audible and visual alarm power dry contact	NC	NC
J8-6		22	SG_Dry-		24V	Audible and visual alarm
J1-8	MBMU	23	GND	Audible and visual alarm GND	GND	Audible and visual alarm
J8-17	MBMU	24	SMOKE_DI+	Smoke sensor feedback signal	DI+	Smoke sensor
J8-18		25	SMOKE_DI-		DI-	

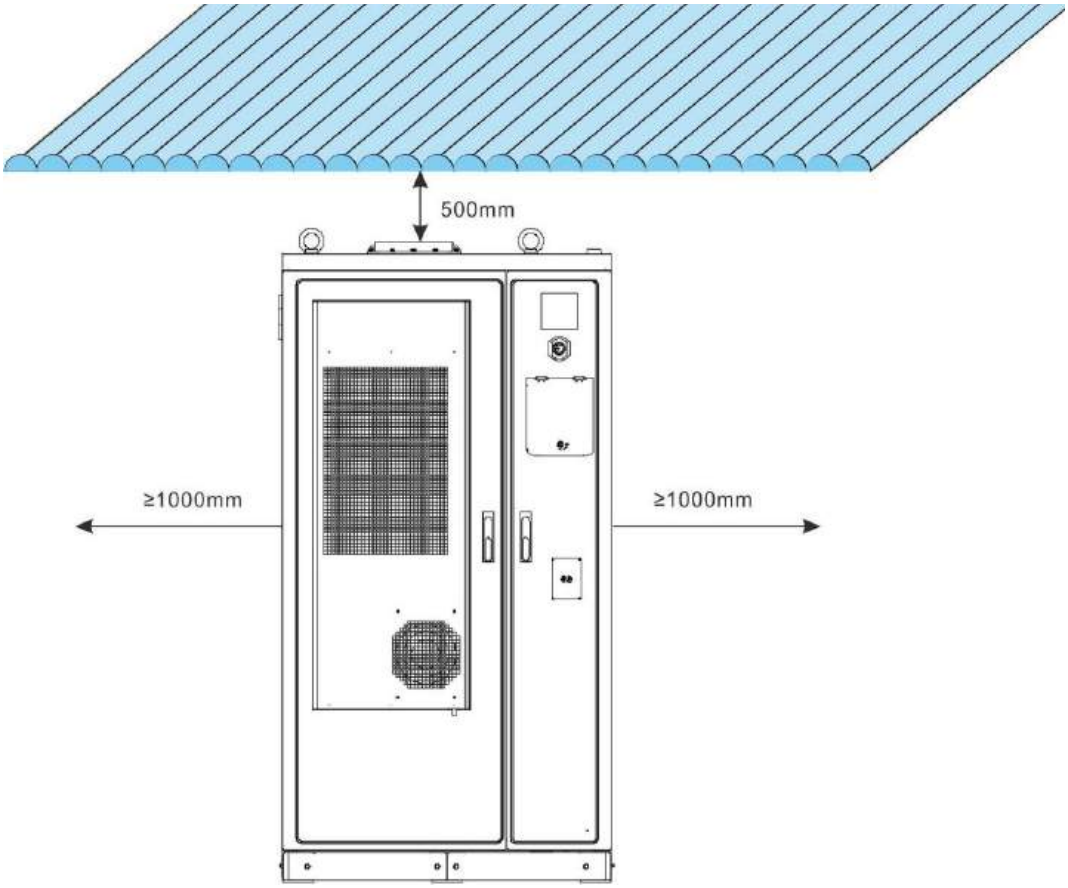
J8-15	MBMU	26	EPO_DI+	Emergency stop switch feedback signal	DI+	Emergency stop switch
J8-16		27	EPO_DI-		DI-	

3.8 INSTALLING THE CANOPY

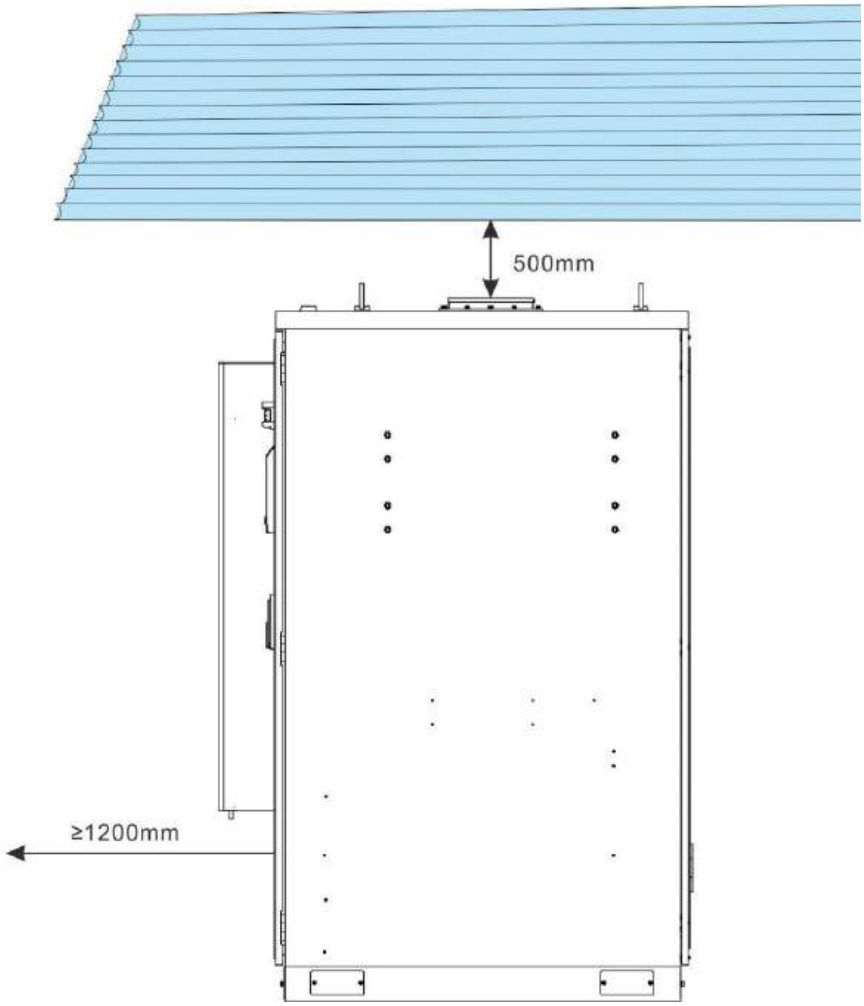
Given that the ESS has an IP rating of IP54, installing a canopy provides physical protection and environmental adaptability for the outdoor energy storage battery cabinets, ensuring the safe, stable, and efficient operation of the energy storage system.

Canopy Installation Recommendations:

- The canopy should extend 1.2 meters beyond the front of the energy storage cabinet;
- The canopy should extend 1 meter beyond each side of the energy storage cabinet;
- The canopy should be positioned 0.5 meters above the top of the energy storage cabinet.



Front view of the installed canopy



Side view of the installed canopy

4 Operating guide

4.1 POST-INSTALLATION INSPECTION

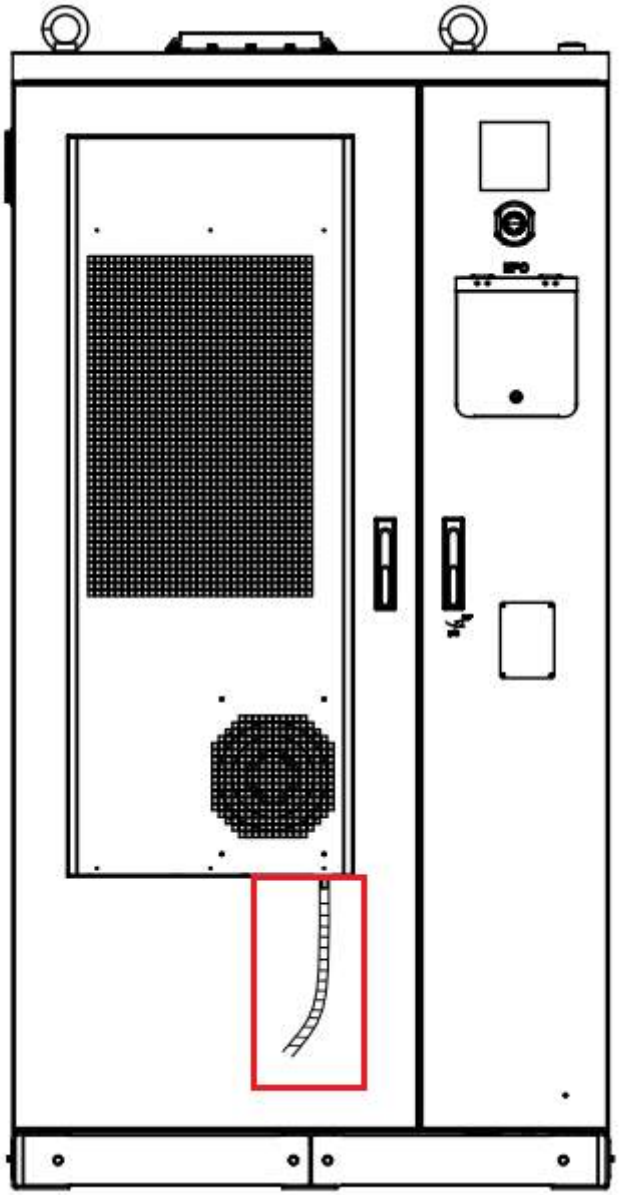
⚠ DANGER

- Personnel responsible for installation and maintenance must first undergo rigorous training to understand all safety precautions and master correct operating procedures.
- Only qualified professionals or trained personnel are permitted to install, operate, and maintain the equipment.

Inspection steps

Before power-on, carefully check the following items to ensure they are correct.

- Check that the wiring is correct.
- The emergency stop button is in the released position.
- Check to ensure there is no ground fault.
- Use a multimeter to check whether the AC (customer's external power supply) and DC side voltages meet the start-up conditions and are free of overvoltage risk.
- Check to ensure that no tools or parts have been left inside the equipment.
- Check that all air inlets and outlets are free of foreign objects and blockages.
- Check that the protective film on all air inlets and outlets has been completely removed, with no foreign objects or blockages.
- Check whether the EMS protective cover has been lowered.
- Check that the drain pipe is not kinked and the drain outlet is free of foreign objects or blockages; a water collection tray must be placed under the cabinet.



Drain pipe location diagram

4.2 OPERATING ENVIRONMENT CHECK

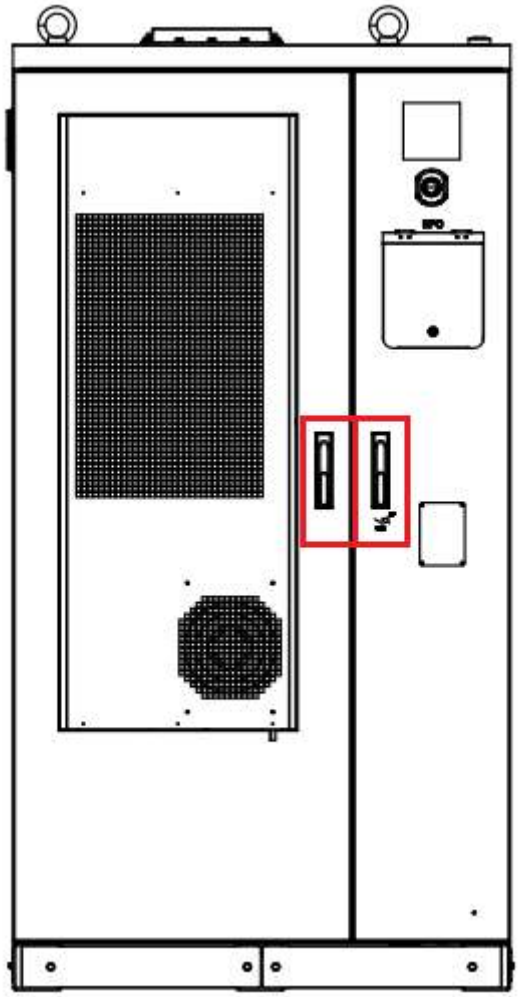
Operating temperature check

Operating temperature of the battery cabinet: -30°C to +50°C

Operating humidity check

Operating humidity of the battery cabinet: 5%-95% (non-condensing)

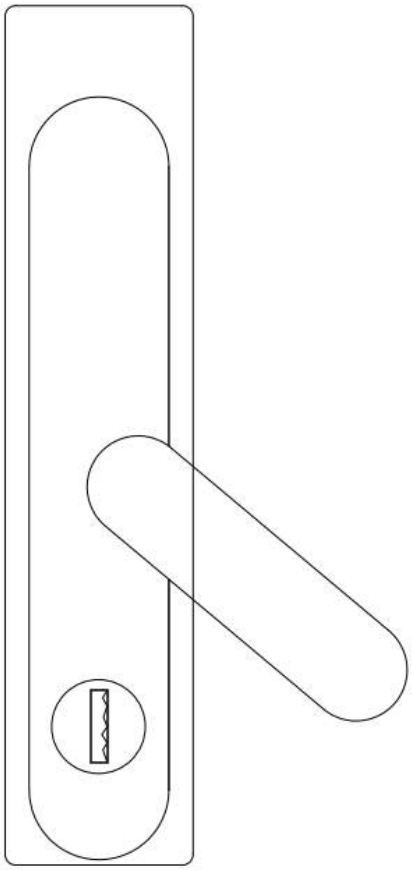
4.3 DOOR-OPENING OPERATION



Door lock location diagram

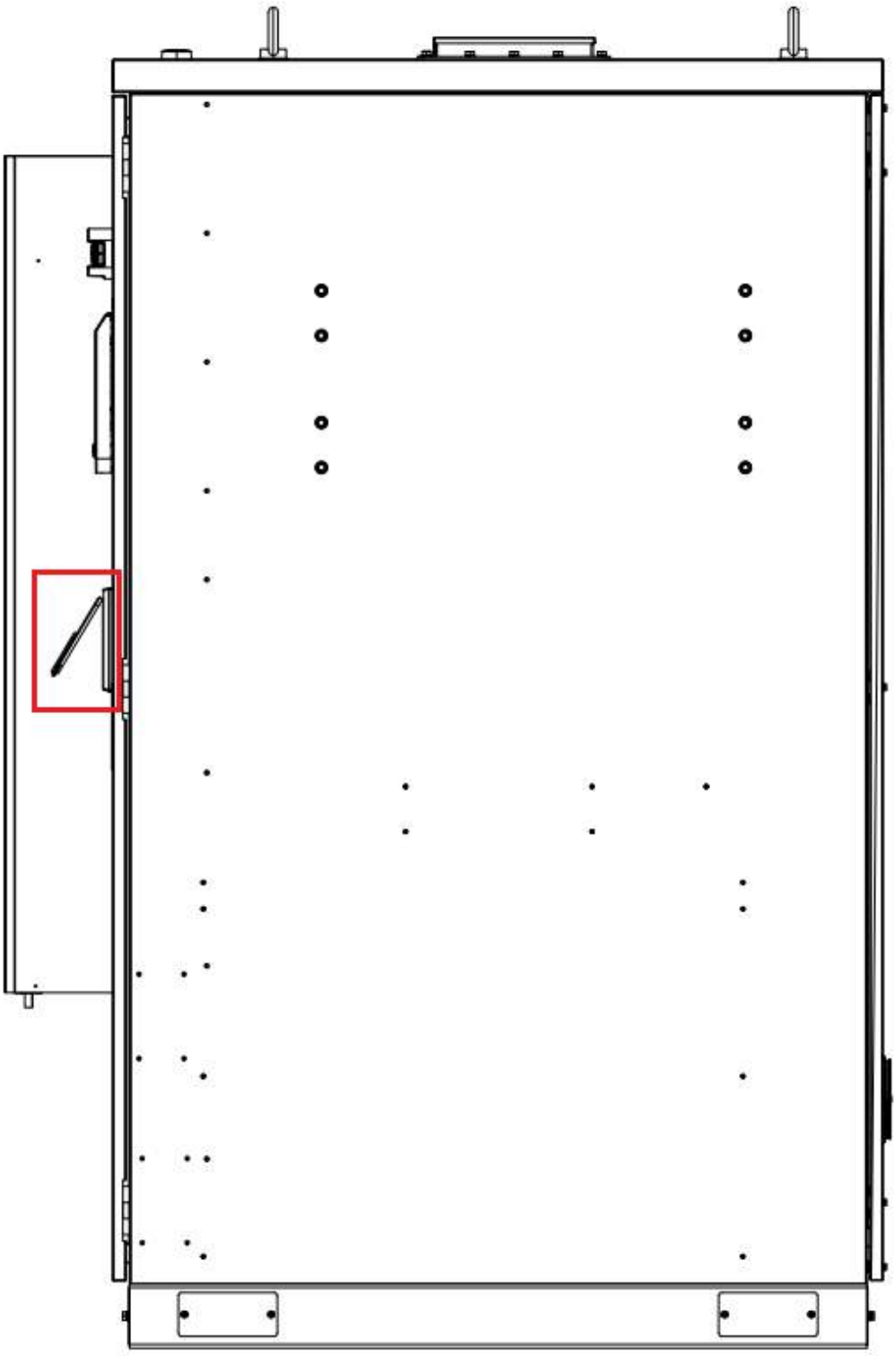
Step 1

Turn the cover to the right and insert the key into the lock hole;



Step 2

Turn the key clockwise to release the latch while pulling the handle outward;



Step 3

Turn the handle 90° to the right to open the cabinet door.

4.4 POWER-ON OPERATION

4.4.1 Prerequisites

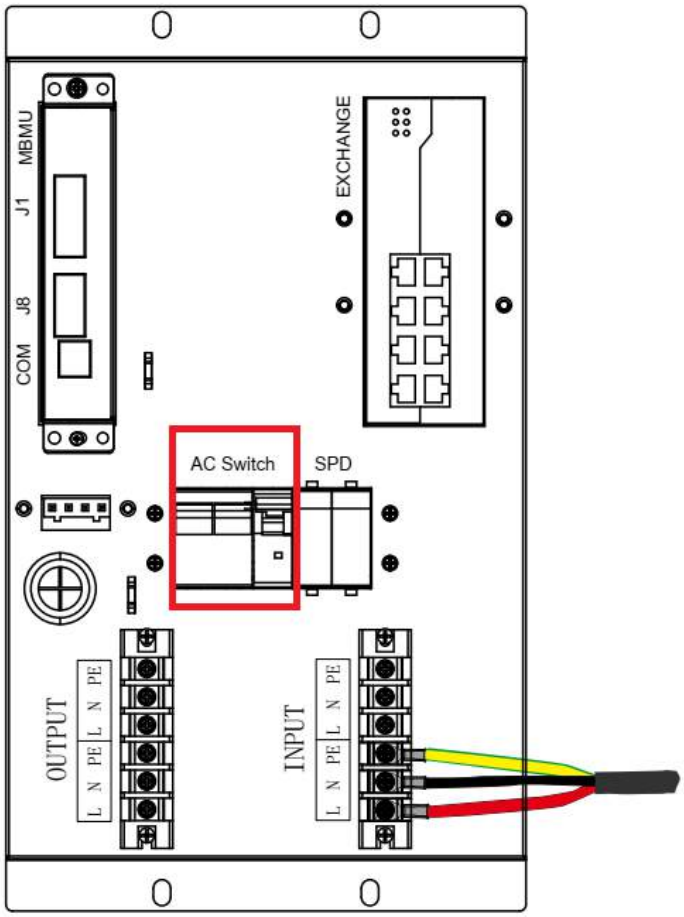
- Before powering on, ensure all post-installation inspection items have been completed.
- Before power-on, measure the input voltage of the battery cabinet to confirm it is within the normal range (BC70DE2 & BC63DE2-AU: 228VDC-288VDC; BC89DE2 & BC80DE2-AU: 285VDC-360VDC; BC120DE2A: 342VDC-432VDC).

- Before powering on, ensure all switches are in the "OFF" position.

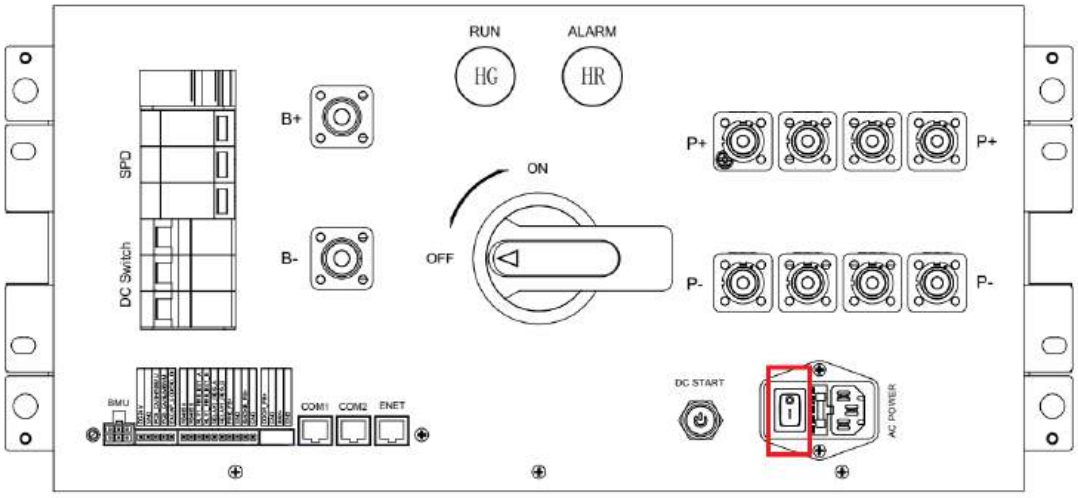
4.4.2 Procedure

4.4.2.1 If 220 VAC mains power is available

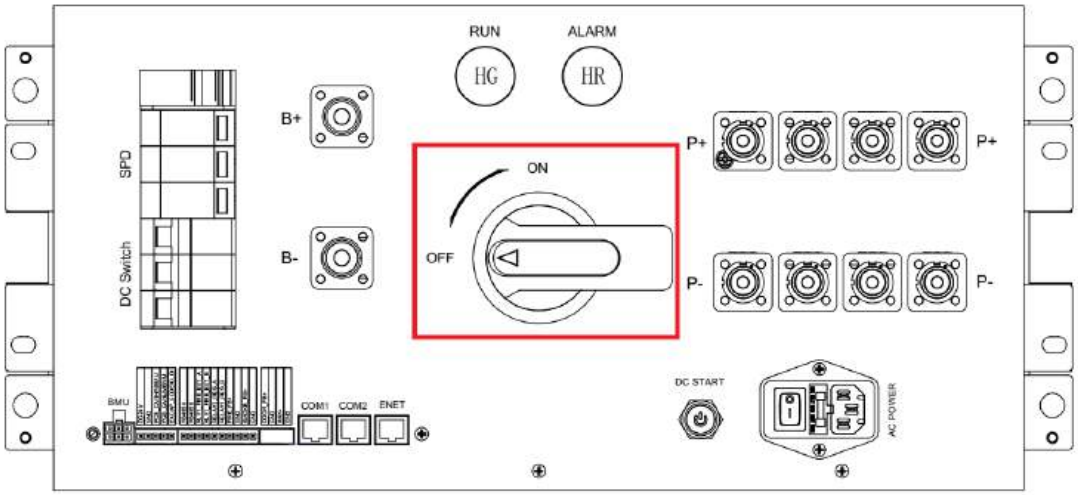
Step 1 Set the miniature circuit breaker on the AC distribution box to the "ON" position;



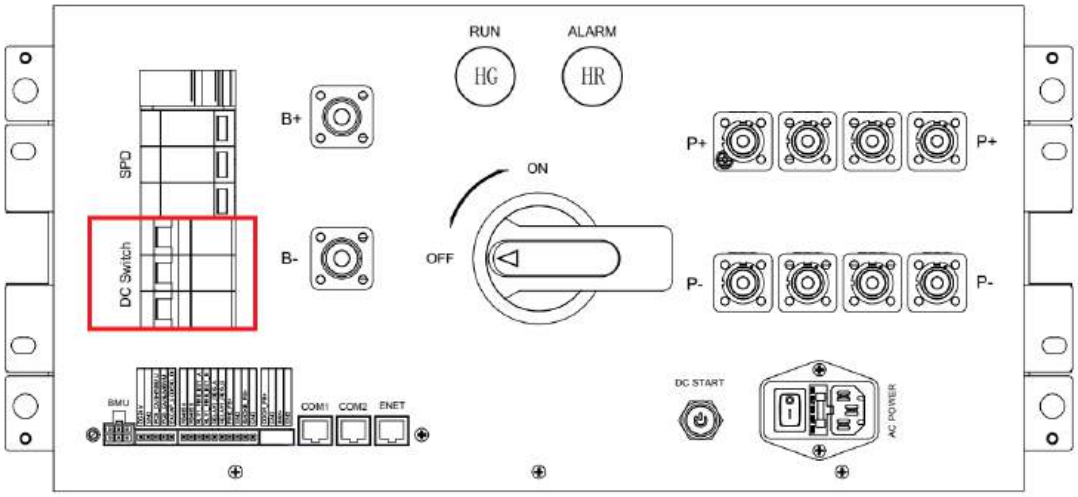
Step 2 Close the rocker switch next to the three-hole plug on the high-voltage box;



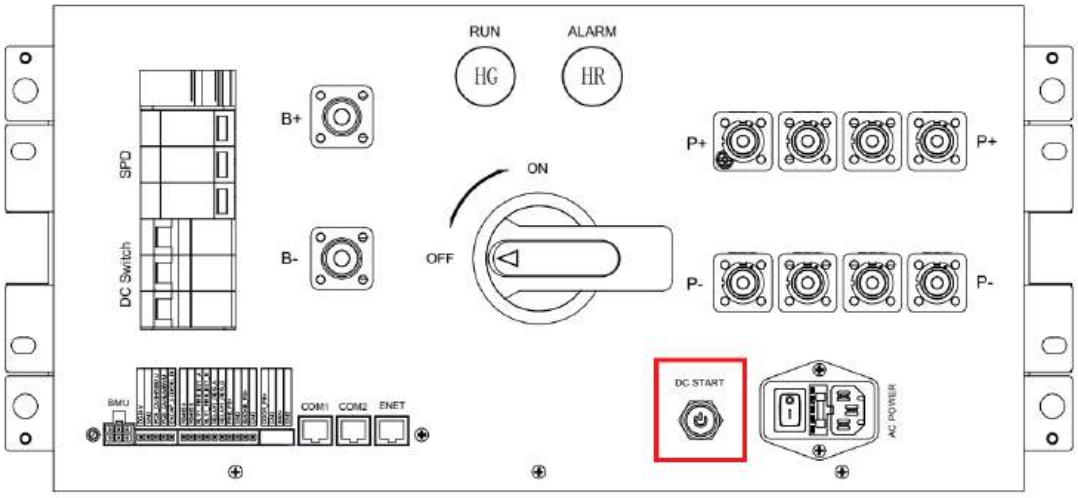
Step 3 Set the DC molded case circuit breaker handle on the high-voltage box to the "ON" position;



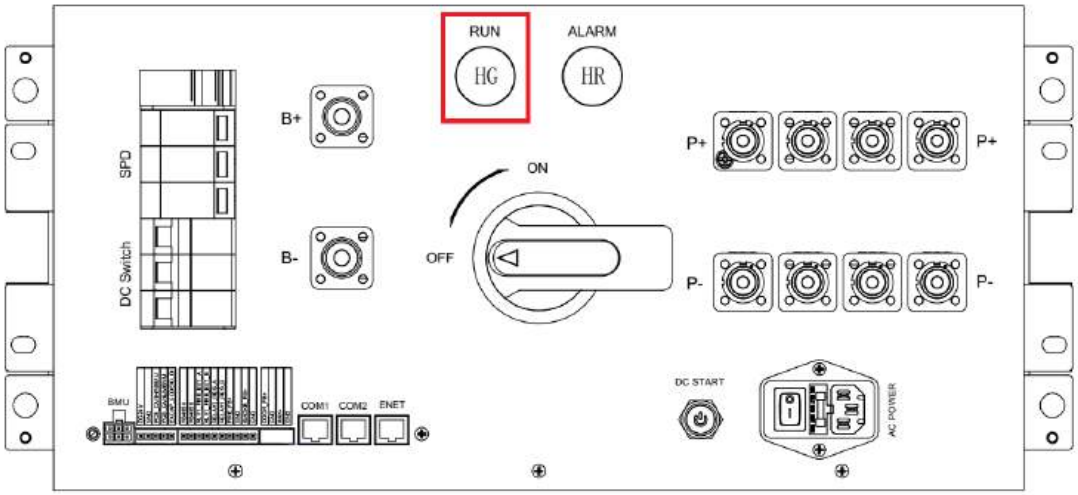
Step 4 Set the DC SWITCH on the high-voltage box to the "ON" position;



Step 5 Press and hold the DC START button on the high-voltage box (3-6 seconds); once a crisp closing sound is heard from the high-voltage contactor inside the high-voltage box, release the button to complete DC black-start (this step is not required if a PCS is connected and communicating normally, as the system will power on automatically);



Step 6 Confirm whether the green indicator light on the high-voltage box is steadily lit;



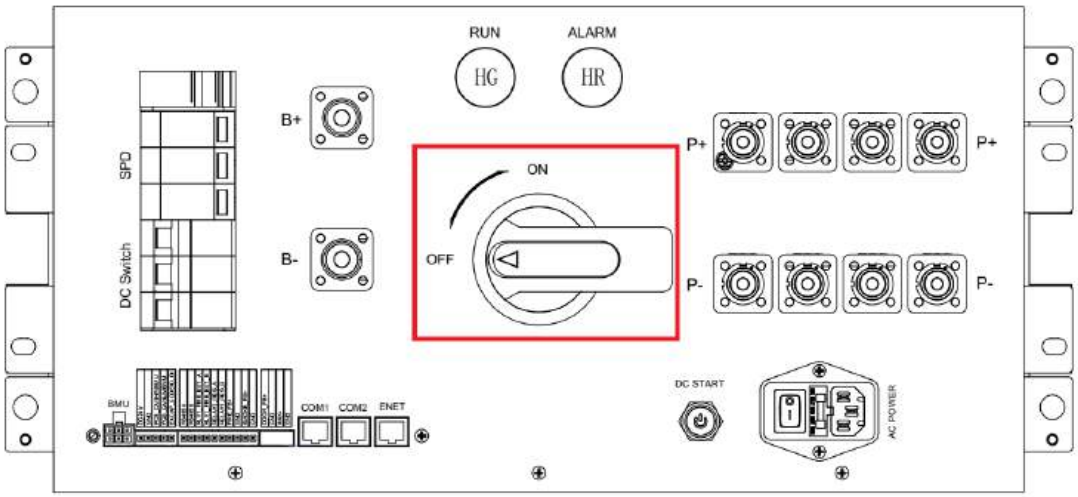
Step 7 Confirm whether the air conditioner is operating normally;

Step 8 Check the EMS display screen on the front door of the battery cabinet to verify that the battery cabinet parameters are normal and free of errors.

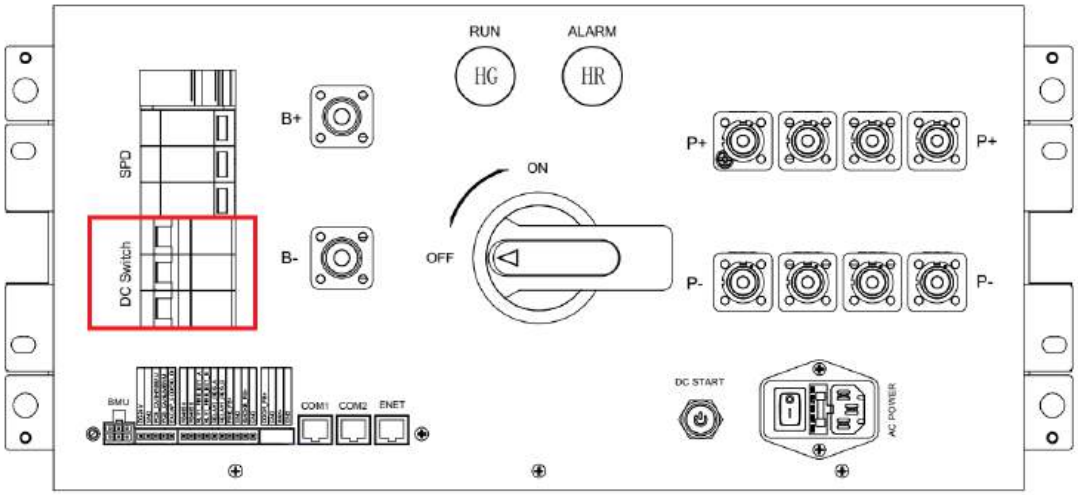
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4.4.2.2 If 220 VAC mains power is not available

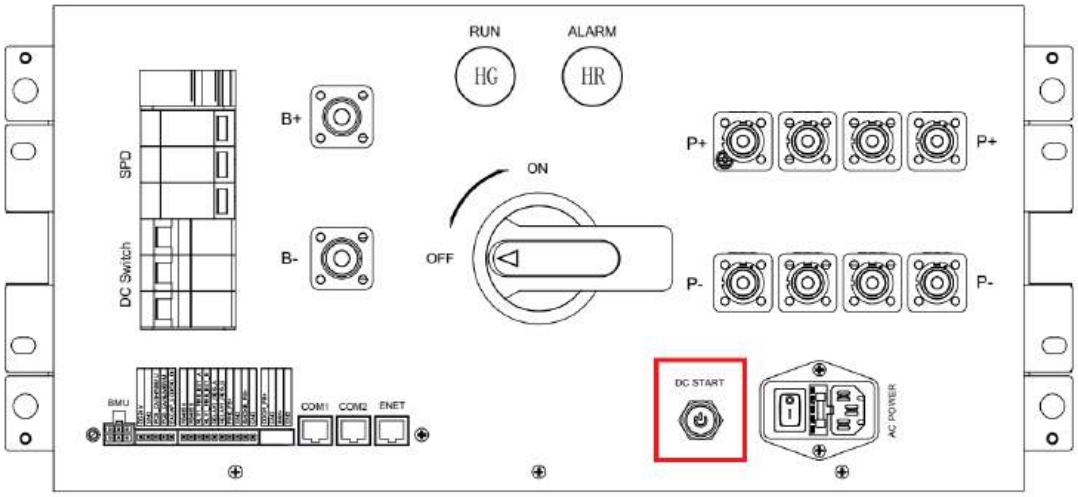
Step 1 Set the DC molded case circuit breaker handle on the high-voltage box to the "ON" position;



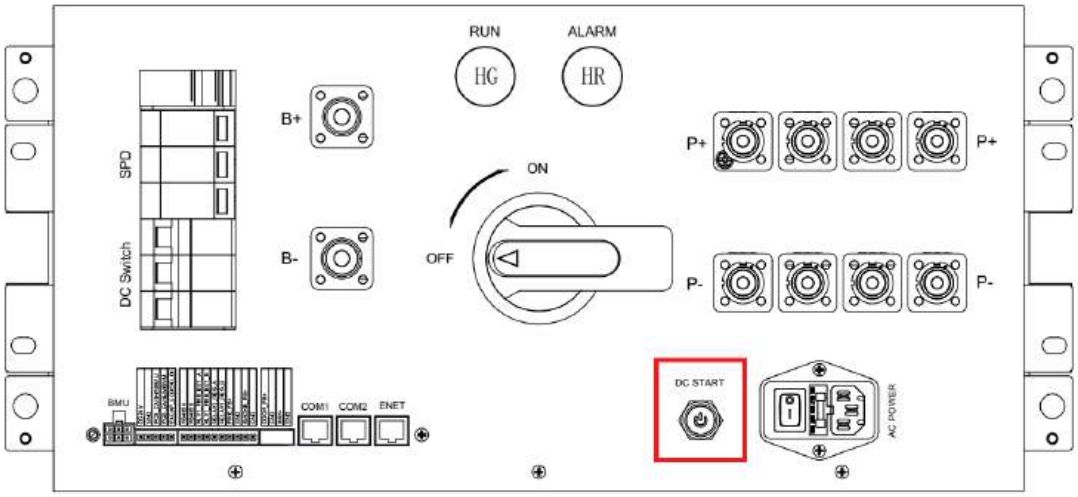
Step 2 Set the DC SWITCH on the high-voltage box to the "ON" position;



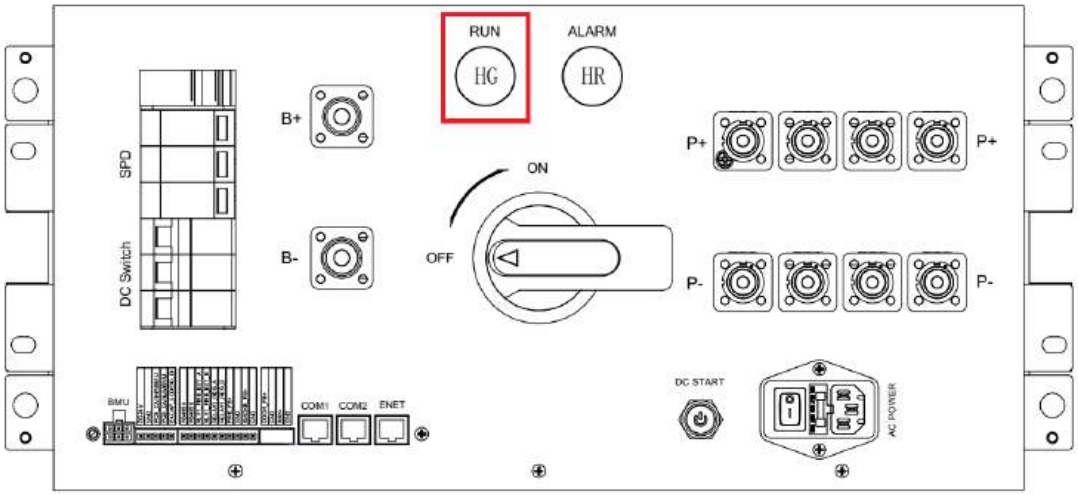
Step 3 Press the DC START button on the high-voltage box to start the DC auxiliary power supply;



Step 4 Press and hold the DC START button on the high-voltage box (3-6 seconds); once a crisp closing sound is heard from the high-voltage contactor inside the high-voltage box, release the button to complete DC black-start;



Step 5 Confirm whether the green indicator light on the high-voltage box is steadily lit;



Step 6 Check the EMS display screen on the front door of the battery cabinet to verify that the battery cabinet parameters are normal and free of errors.

--End

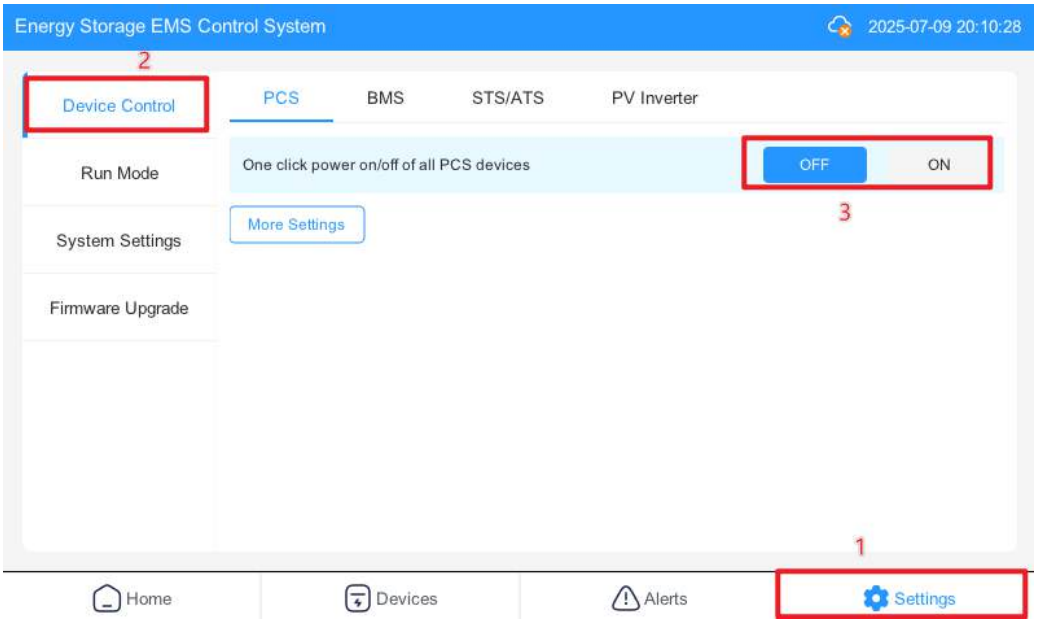
4.5 POWER-OFF OPERATION

4.5.1 Power-off steps

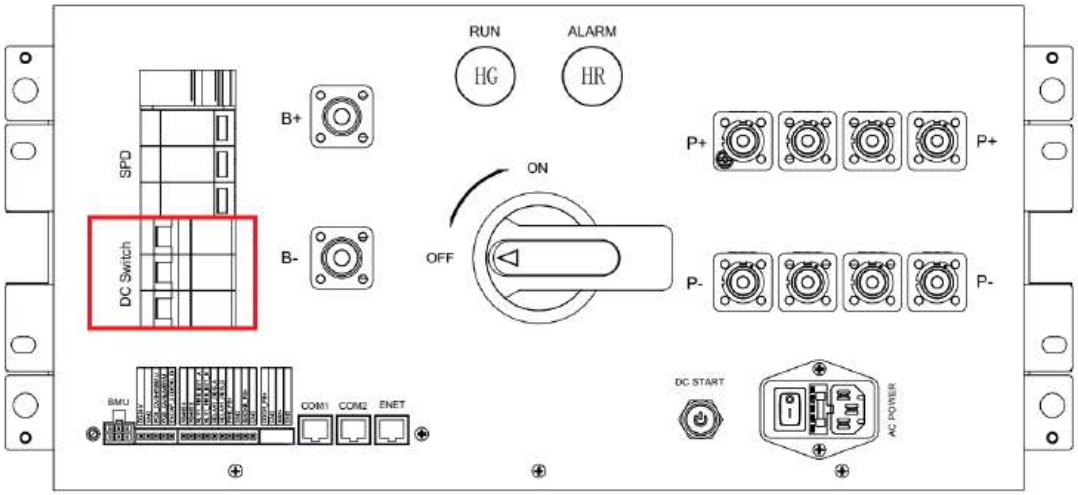
Step 1 Use the EMS screen to shut down the PCS with one click;

Tap "Settings->Device Control->PCS" to turn the PCS on or off.

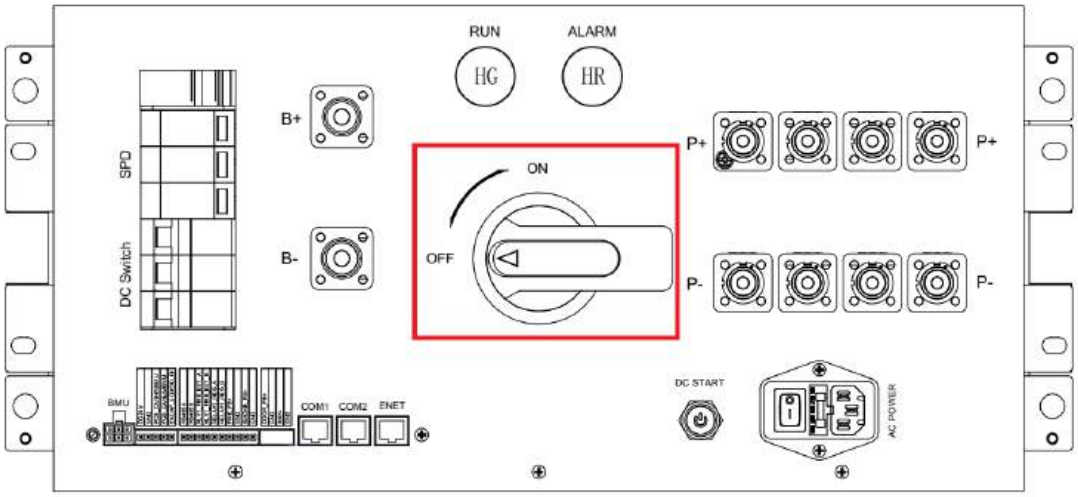
Note: A password dialog box will pop up; the password is "000000".



Step 2 Set the DC SWITCH on the high-voltage box to the "OFF" position;



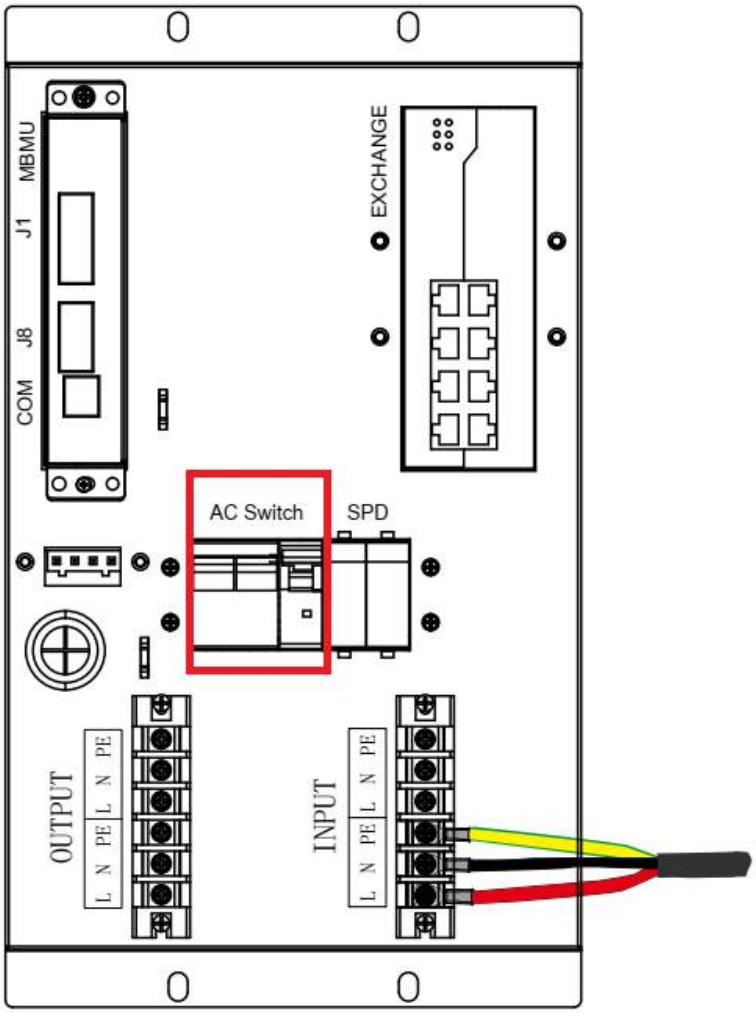
Step 3 Set the DC molded case circuit breaker handle on the high-voltage box to the "OFF" position;



NOTICE

The DC Switch and Switch Handle must both be operated to the OFF/Isolated position during shutdown. When correctly operated, both the positive (+) and negative (−) DC terminals are isolated from the downstream circuit, preventing access to live parts.

Step 4 Set the miniature circuit breaker on the AC distribution box to the "OFF" position;


MBMU
J1
J8
COM
EXCHANGE
AC Switch
SPD
OUTPUT
L N PE
L N PE
INPUT
L N PE
L N PE

--End

4.5.2 Emergency power-off

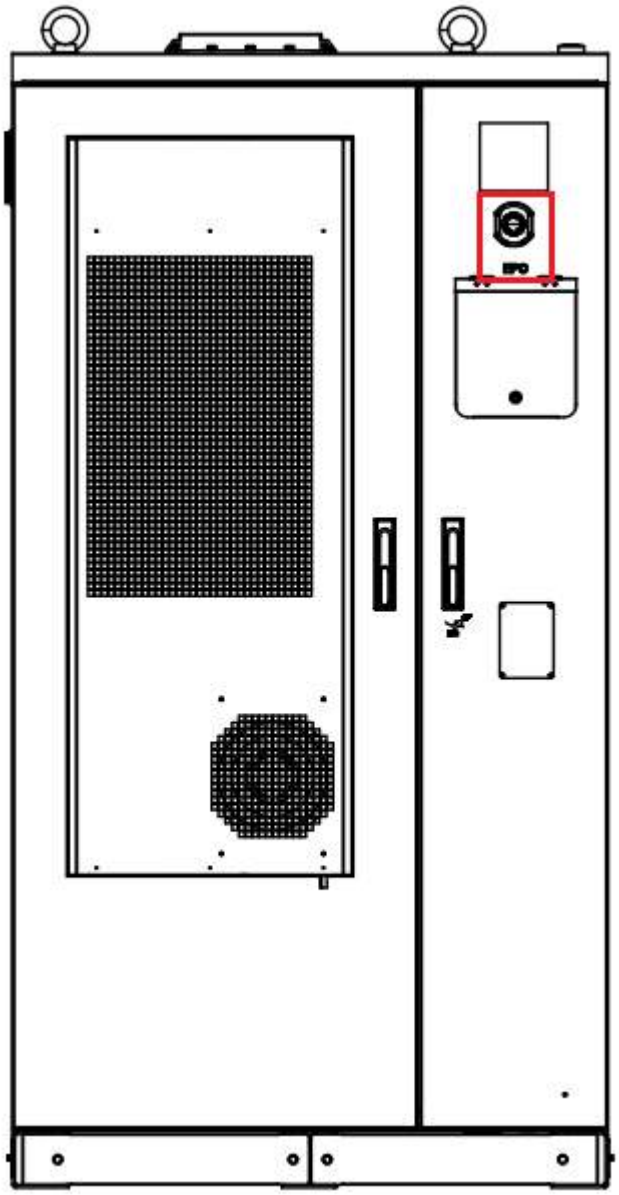


Figure 4-1 Emergency stop switch button

When the emergency stop switch is pressed, the molded case circuit breaker and DC SWITCH on the high-voltage box will trip open, and the AC SWITCH on the AC distribution box will trip open, cutting off power to the energy storage battery cabinet.

4.6 BATTERY CABINET TRIAL RUN

The battery cabinet exchanges energy with the outside world through the power conversion system (PCS). It is recommended to carry out the following items before the trial run:

(1) Capacity calibration

Ensure that the battery can complete a full, normal charge/discharge cycle. If the rated capacity needs to be corrected, a deep charge/discharge cycle can be performed during the trial run and commissioning. It is recommended to perform a capacity calibration during the trial run, conducting a full-charge test at the product's rated power, i.e., charging to SOC=100%.

(2) Operating stability

Components such as the power circuit, communication, and data acquisition should be operated at rated power during commissioning. This is to identify any abnormalities in the system installation. Any

anomalies such as over-temperature, over-current, over-voltage, or over-discharge must be addressed immediately to prevent safety hazards.

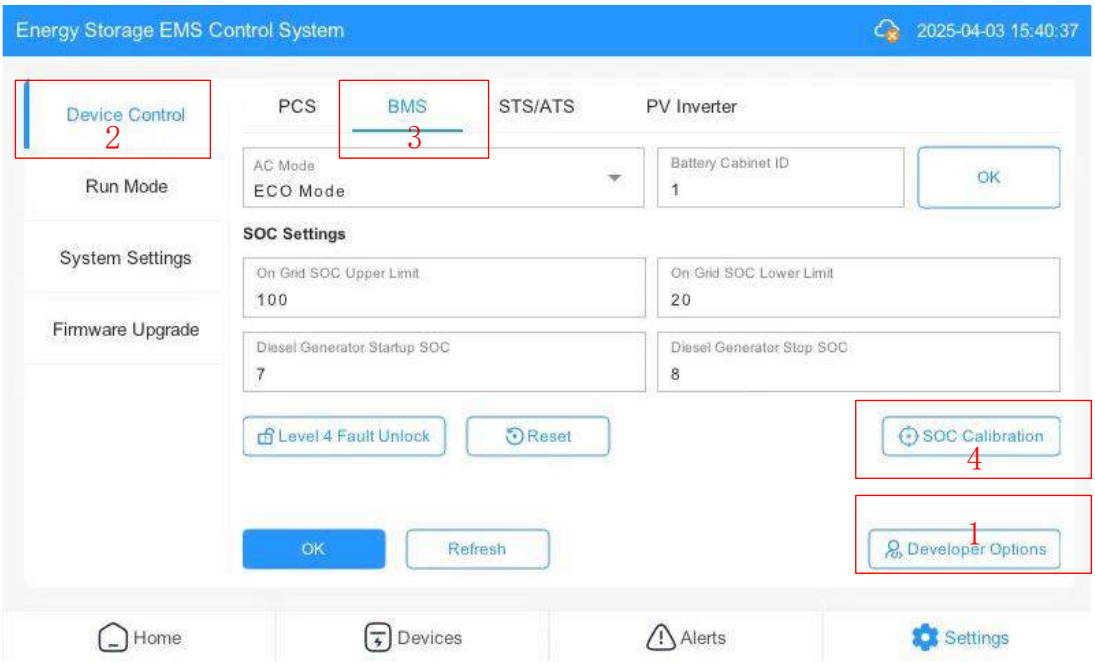
4.7 INTRODUCTION TO THE SOC CALIBRATION FUNCTION

Description

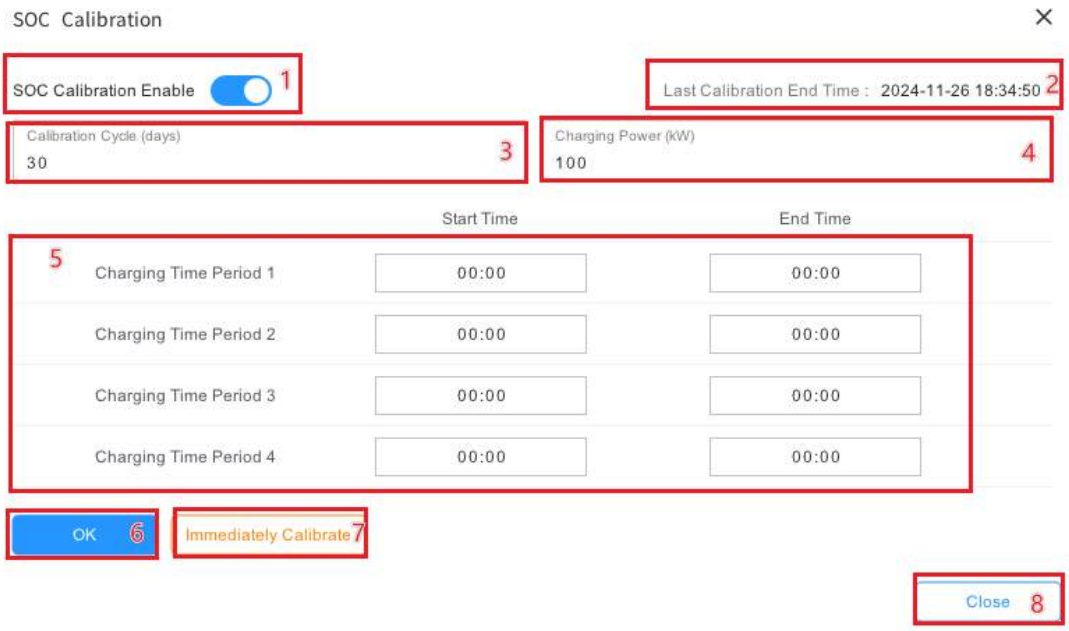
It is recommended that customers charge to full during off-peak electricity usage periods.

Step 1 Enter the SOC calibration screen

Tap "Settings," "Device Control," "BMS," and then "SOC Calibration" in sequence;



Step 2 Enable the SOC calibration function



(1) SOC calibration function switch; when turned off, the EMS does not execute this module's function. Enabled by default.

(2) Time of the last full SOC charge.

(3) When the system's SOC has not reached 100% for the set cycle duration, the EMS executes the

SOC calibration logic and automatically controls the equipment to perform SOC calibration. Range: 7-100 days.

(4) Maximum charge power limit for SOC calibration; the EMS performs SOC calibration on the system subject to both the demand and this maximum charge power limit.

(5) Preset calibration time; during this time period, the EMS begins controlling the equipment to perform charge calibration. The default time period is 00-00 for both, meaning SOC calibration is not performed.

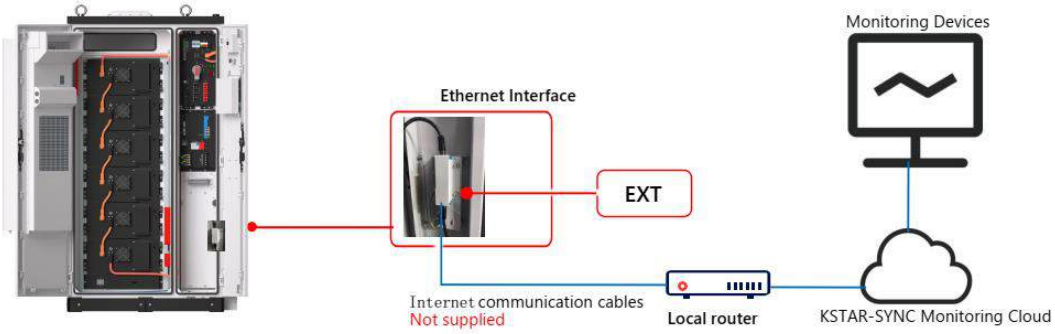
(6) Tap "OK" to complete the parameter settings for items ①③④⑤.

(7) This button changes according to status. ① If the equipment is not currently undergoing SOC calibration, the button reads "Immediately Calibrate," meaning "calibrate immediately"; tap this button to start calibration immediately. ② If "Immediately Calibrate" is tapped, the button changes to "Cancel Calibration"; tapping "Cancel Calibration" cancels the current calibration. ③ If calibration was entered due to the cycle timer, the button changes to "Calibrating"; to cancel calibration, tap button 1 to interrupt the current calibration.

(8) Tap "Close" to exit this screen.

4.7 CONNECTING TO THE CLOUD PLATFORM

The Energy Storage EMS is pre-installed on the EMS touch screen on the front door of the battery cabinet. During commissioning, no external network connection is required to access the local EMS screen. After the cabinet is powered on, the EMS touch screen communicates with the EMS controller through the internal Ethernet connection. For connection to a cloud platform or upper monitoring system, connect a standard Ethernet cable to the Ethernet lightning arrester/user interface shown in Section 3.7.

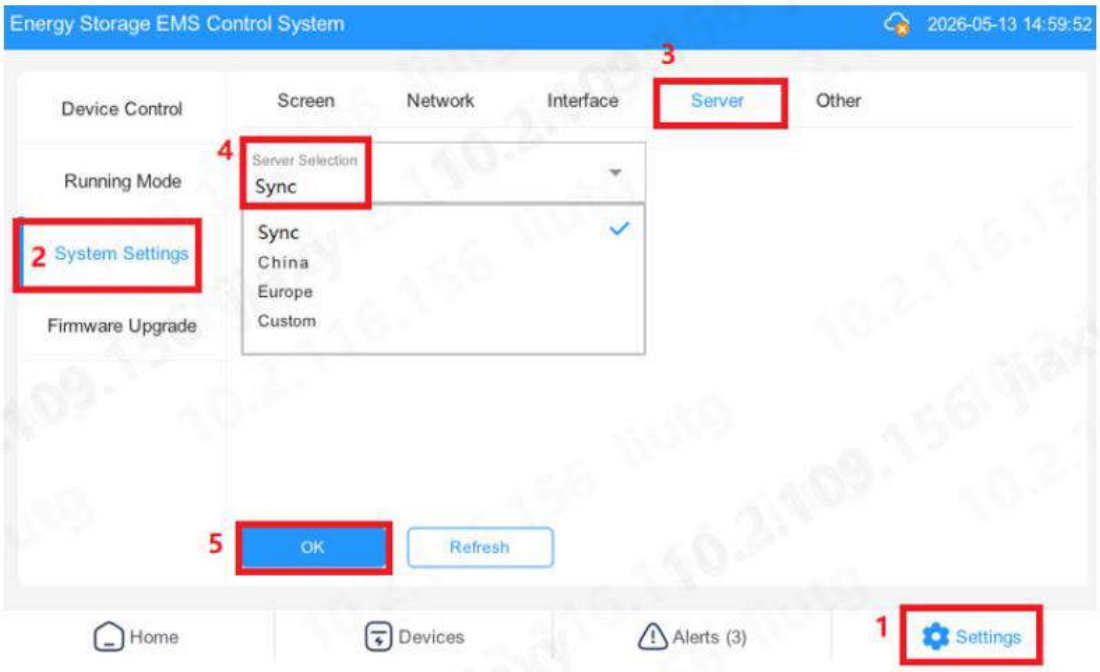


Cloud platform wiring diagram

4.7.1 Network wiring & settings

Step 1

"Setting"-"System Settings"-"Server"-"Sync"-"OK

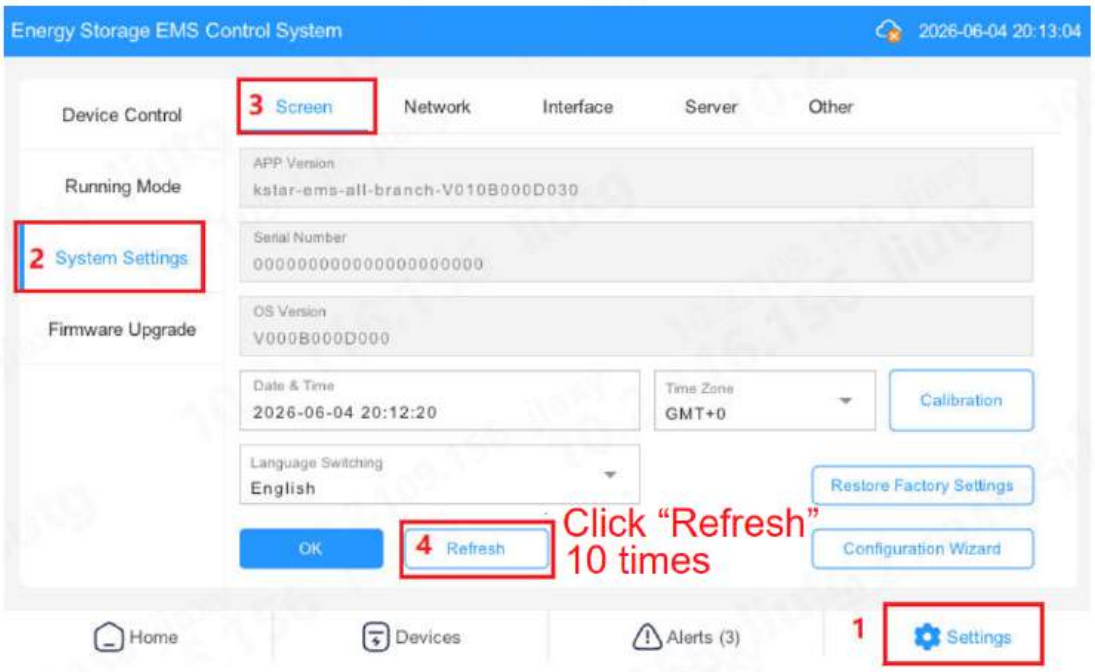


Step 2

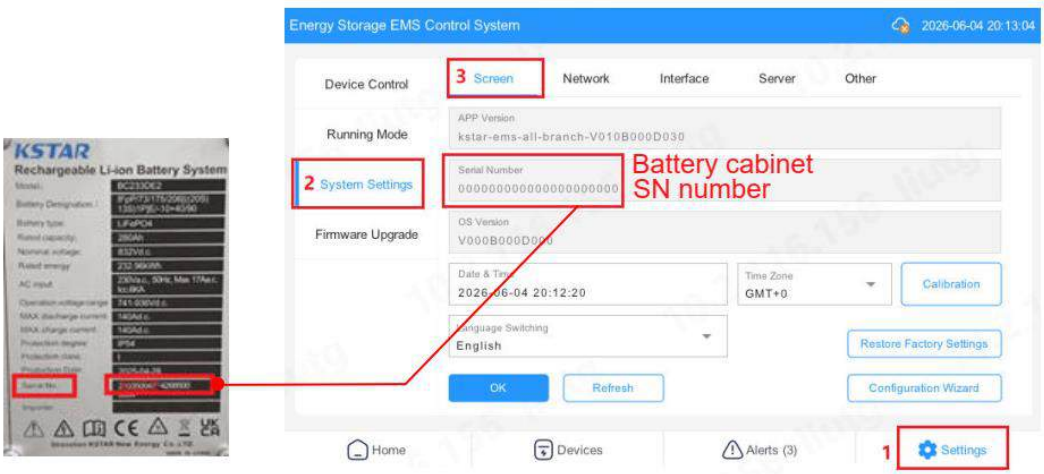
NOTICE

If the S/N on the EMS screen matches that of the battery cabinet, there is no need to modify the S/N. The S/N must match the battery cabinet S/N, and letter case must be observed.

(1)"Setting"-"System Settings"-"Screen", Click this to "Refresh" 10 times to set the SN number, click "OK" at the bottom to save set.



(2)"Setting"-"System Settings"-"Screen", Set this SN number as the battery cabinet SN number, click "OK" at the bottom to save set.



Step 3

NOTICE

The device supports Ethernet, DHCP. Please inform the customer to open the following address for the IP port used by the company and allow the firewall to pass through.

51.141.112.234 2800 (encrypted)

51.141.112.234 2900 (unencrypted)

111.230.141.84 2800 (encrypted)

111.230.141.84 2900 (unencrypted)

20.82.106.247 19636 (encrypted)

20.82.106.247 9636 (unencrypted)

193.112.41.194 21

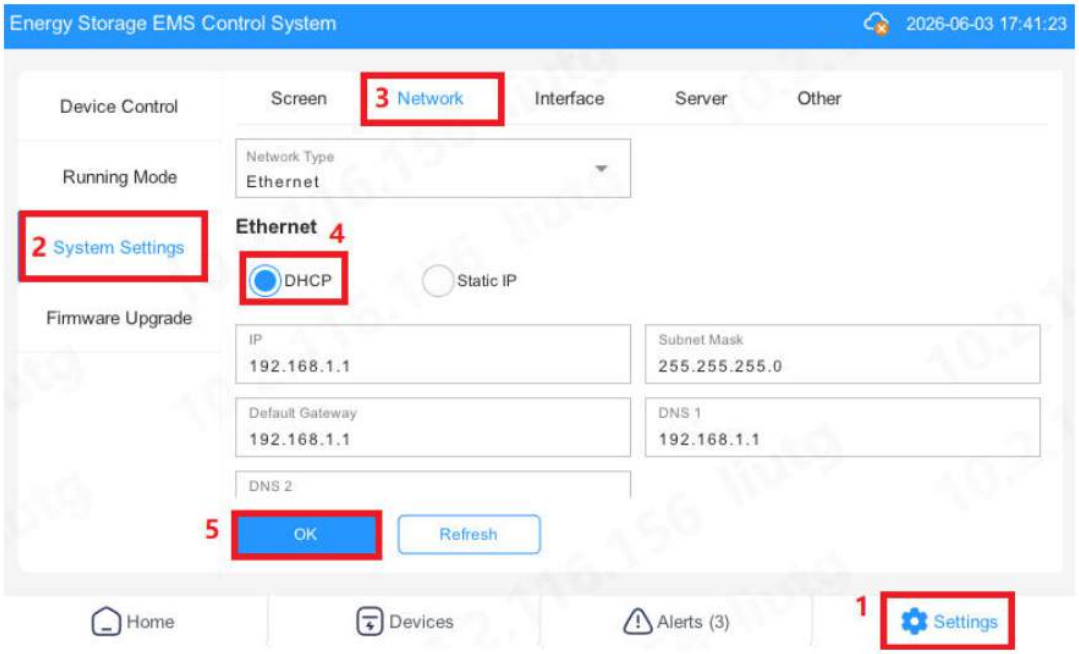
51.141.112.234 2700

159.75.9.163 2700

Unable to access the internet without using the collector.

Automatic DHCP networking

"Setting"-"System Settings"-"Network"-"DHCP"-"OK"

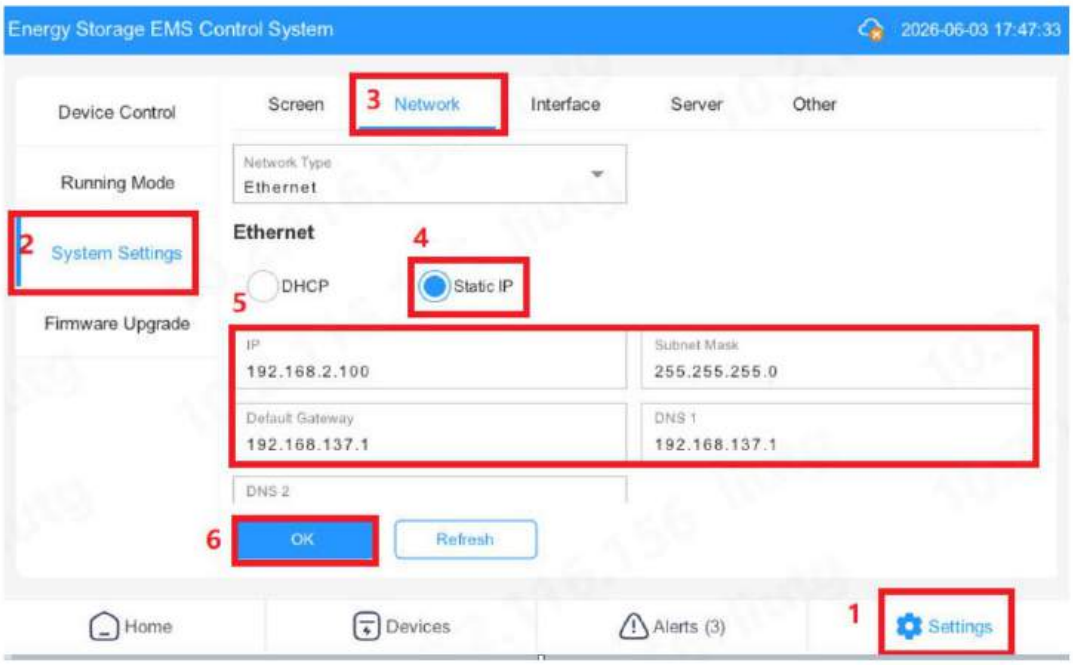


NOTICE

If the user's network does not have automatic DHCP networking, the user needs to configure the static IP address of the network port used for networking manually.

"Setting"-"System Settings"-"Network"-"Static IP"-"OK"

Enter the static IP address of the network port; after the settings are complete, tap "OK"



4.7.2 Connecting the data logger to the KSTAR Sync platform

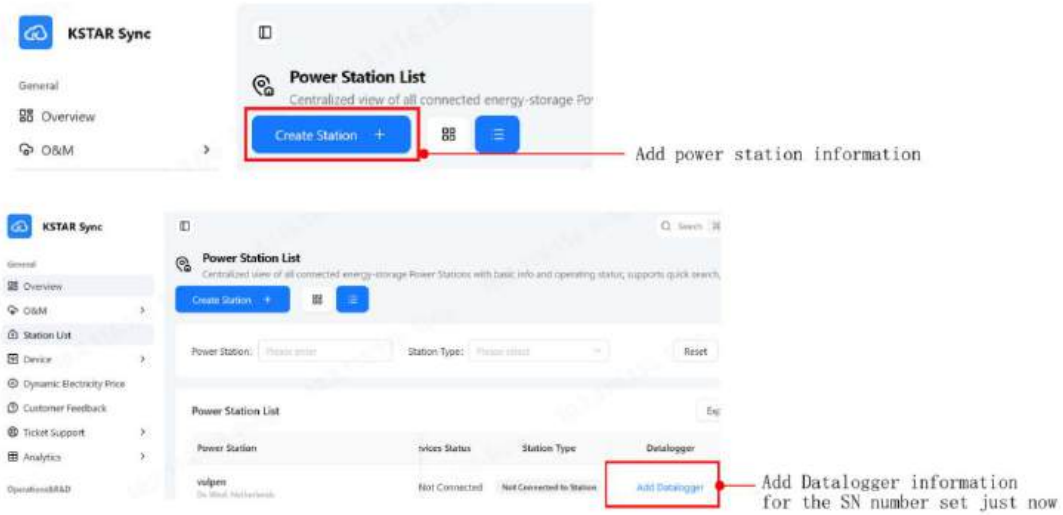
NOTICE

Register using the KSTAR Sync website or by downloading the app on a mobile phone;

Log in to Sync, and then add the power station and data logger information.

(1) Using the KSTAR Sync website

- KSTAR Sync website address: https://sync.ksdatacloud.com/



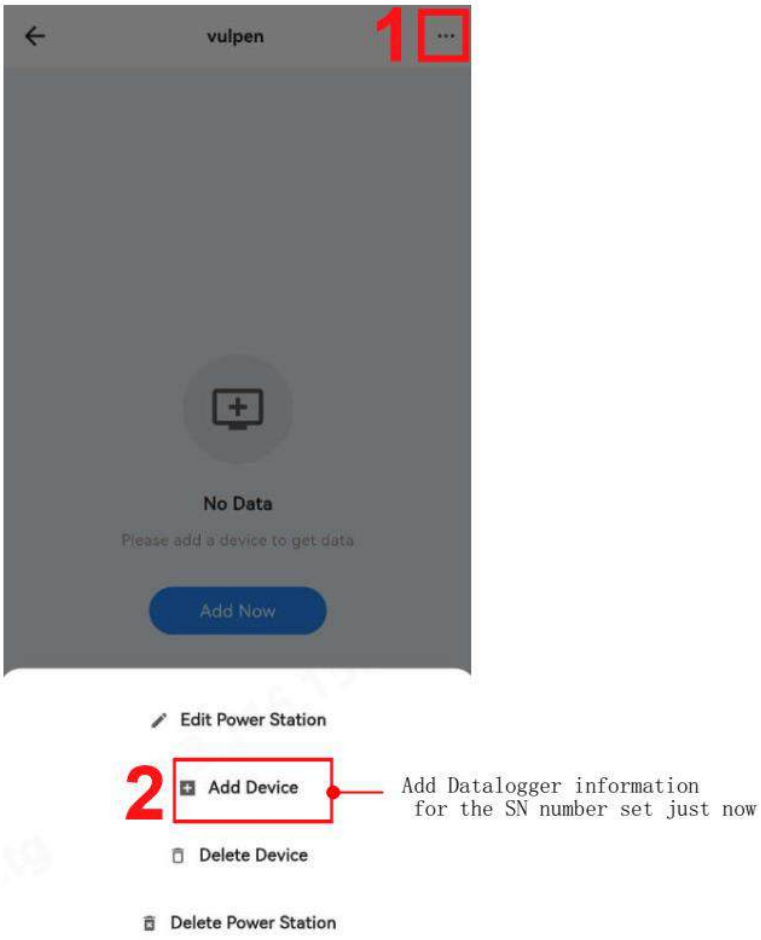
(2) Using the mobile app

Step 1 Download and register for the KSTAR Sync app on your mobile phone

- Android phones: Visit the Google Play Store, search for and download KSTAR Sync.
- IOS phones: Visit the App Store, search for and download KSTAR Sync.
- Scan the QR code with your phone to download KSTAR Sync.

Step 2 Log in to Sync on the mobile app, and then add the power station and data logger information




vulpen
1
No Data
Please add a device to get data
Add Now
Edit Power Station
2
Add Device
Add Datalogger information
for the SN number set just now
Delete Device
Delete Power Station

5 Routine maintenance

NOTICE

All internal maintenance and upkeep work on the battery cabinet must be performed using insulated tools and by personnel who have received the relevant training. Components behind protective covers that require tools to access are non-serviceable by the user. For maintenance, contact KSTAR New Energy for details.

The battery cabinet must be periodically maintained as required below; otherwise, its normal operation will be affected and its normal service life reduced.

5.1 DAILY MAINTENANCE

Log in to the EMS management system to check for alarm information, and confirm there are no major or minor alarms. If there is an alarm, handle it according to the alarm reference.

5.2 QUARTERLY MAINTENANCE

Quarterly maintenance checklist

Maintenance category	Maintenance action	Reference standard	System power-off required
Cabinet	Visual inspection: ● Overall appearance ● Corrosion condition ● Door lock condition ● Vent	● No noticeable coating peeling or scratches ● No noticeable paint peeling or corrosion[1] ● Door lock undamaged ● No entry by insects, rodents, snakes, or other animals ● No dust accumulation at the vents	No
Air conditioner[2]	● Visual inspection ● Clean the filter screen[3]	● No noticeable damage to appearance ● No noticeable paint peeling or corrosion ● No loose or missing screws ● Fan rotates normally, without sticking or abnormal noise ● Filter screen surface clean, unobstructed	No
Battery pack	● Check on the EMS whether SOC calibration is enabled	● It is recommended that users enable SOC calibration[4]	No
Safety valve/explosion venting panel[5]	Visual inspection: ● Appearance ● Corrosion condition ● Presence of foreign objects/ice or snow coverage	● No noticeable paint peeling or corrosion ● Safety valve/explosion venting panel undamaged ● No foreign objects/ice or snow coverage on top	No

Note [1]: If paint peeling occurs, see **Section 5.2.1** for touch-up painting.

Note [2]: In high-temperature (≥35°C) or low-temperature (≤0°C) environments, monthly maintenance is recommended. For specific air conditioner maintenance, see **Section 5.2.2**.

Note [3]: In dusty regions, monthly cleaning is recommended, plus cleaning after each sandstorm; cleaning is recommended before entering summer; for other regions, ensure the filter screen or condenser is unobstructed based on actual conditions. Recommended tool: high-pressure water gun.

Note [4]: For enabling SOC calibration, see **Section 4.6**.

Note [5]: In areas with severe sand, dust, ice, or snow, perform maintenance based on actual conditions to ensure there are no foreign objects or snow accumulation on the safety valve/explosion venting panel. When removing foreign objects/snow, clean within the designated area to avoid improper action damaging the venting device.

5.2.1 Touch-up painting steps

(1) Surface preparation: Clean the damaged area with water or alcohol to remove oil and dust. Use sandpaper dipped in water to sand the edges of the scratch until the surface is smooth and flat.

(2) Masking and primer: Use tape to mask off areas not being repainted to prevent overspray. If bare metal is exposed, first spray anti-rust primer and let it dry for approximately 15-30 minutes.

(3) Applying the topcoat and clear coat: Shake the paint can well, and spray the color coat in light, multiple passes from a distance of 20 cm from the peeled area, with a 5-10 minute interval between coats. Once the color coat is fully dry, apply a clear coat to add gloss and protection.

(4) Drying and polishing: Air-dry or bake the paint; once fully cured, polish with wax to blend the new paint with the surrounding surface.

5.2.2 Air conditioner maintenance

Periodic inspection

(1) Check whether the power cable and communication cable of the air conditioner are normal;

(2) Check whether the air conditioner is operating normally, and whether there is a noticeable temperature difference between the air inlet and outlet inside and outside the cabinet when the cooling system starts;

(3) Check whether the fan and compressor are operating normally while the system is running, with no noticeable abnormal noise or vibration;

(4) Check the mechanical structure for damage or deformation;

(5) Check whether the internal/external circulation air inlets and outlets of the air conditioner, and the mesh screens at the air inlets and outlets of the cabinet's protective cover, are blocked;

(6) Based on the air quality of the actual operating environment, arrange for maintenance personnel to inspect the cabinet air conditioner every 3-6 months.

Periodic maintenance

During operation of the cabinet air conditioner, dust accumulates on the fins of the heat exchanger, increasing thermal resistance and affecting heat exchange performance; in severe cases, this can lead to a decline in air conditioner performance. It is recommended to clean and maintain the heat exchanger every 3-6 months, with the maintenance interval determined by the air pollution level of the region and operating time. Do not use hot water or organic solvents such as gasoline for cleaning; compressed air may be used to clean the condenser.

5.3 SEMI-ANNUAL MAINTENANCE

Semi-annual maintenance checklist

Maintenance category	Maintenance action	Reference standard	System power-off required
Air conditioner	Visual inspection: ● Appearance ● Corrosion condition ● Screws ● Fan ● Filter screen	● No noticeable damage to appearance. ● No noticeable paint peeling or corrosion. ● No loose or missing screws. ● Fan rotates normally, without sticking or abnormal noise.	No

		● Filter screen surface clean, unobstructed.	
Fire suppression system	● Visually inspect whether the appearance of the smoke sensor and CO sensor is normal, and whether the inspection light blinks normally; For fire suppression management unit inspection, see **Section 2.2.7**. ● Use dedicated test equipment to apply smoke to the smoke sensor and CO sensor for sampling inspection, and test the sensor's response.	● Sensor indicator light and response are normal	No
Terminal blocks/EMS/MBMU, etc.	● Perform necessary cleaning of the modules ● Check that cables are undamaged, not loose, and not disconnected	● Housing is clean and free of dust. ● Cables are undamaged, with connections secure.	Yes
Note [1]: In dusty regions, cleaning is recommended after each sandstorm; cleaning is recommended before entering summer; for other regions, ensure the filter screen or condenser is unobstructed based on actual conditions. Recommended tool: high-pressure water gun.			

5.4 ANNUAL MAINTENANCE

Annual maintenance checklist

Maintenance category	Maintenance action	Reference standard	System power-off required
Battery pack	Visual inspection: ● Appearance ● Corrosion condition ● Screws ● Fan ● Front panel vents	● No noticeable damage to appearance ● No noticeable paint peeling or corrosion ● No loose or missing screws ● Fan rotates without sticking or abnormal noise ● Front panel vent surface clean, unobstructed	Yes

5.5 ALARM REFERENCE

BMS alarm codes

Alarm	Alarm code
EMS-BMS communication interrupted	ID000000
Internal communication fault	ID000001
Pre-charge failure	ID000002

Display screen communication fault (reserved)	ID000003
PCS communication fault	ID000004
Cluster 1 alarm	
Level-4 alarm: cell voltage too high	ID000005
Level-4 alarm: cell voltage too low	ID000006
Level-4 alarm: total voltage too high	ID000007
Level-4 alarm: total voltage too low	ID000008
Level-4 alarm: battery discharge temperature too high	ID000009
Level-4 alarm: battery charge temperature too high	ID000010
Level-4 alarm: main positive relay fault	ID000011
Level-4 alarm: main negative relay fault	ID000012
Level-4 alarm: fire suppression fault	ID000013
Level-4 alarm: water immersion fault	ID000014
Level-3 alarm: cell voltage too high	ID000015
Level-3 alarm: cell voltage too low	ID000016
Level-3 alarm: excessive cell voltage difference (level 1)	ID000017
Level-3 alarm: total voltage too high	ID000018
Level-3 alarm: total voltage too low	ID000019
Level-3 alarm: battery discharge temperature too high	ID000020
Level-3 alarm: battery discharge temperature too low	ID000021
Level-3 alarm: battery charge temperature too high	ID000022
Level-3 alarm: battery charge temperature too low	ID000023
Level-3 alarm: charge overcurrent	ID000024
Level-3 alarm: discharge overcurrent	ID000025
Level-3 alarm: insulation fault	ID000026
Level-3 alarm: pre-charge fault	ID000027
Level-3 alarm: AFE chip fault	ID000028
Level-3 alarm: balancing circuit fault	ID000029
Level-3 alarm: current sensor fault	ID000030
Level-3 alarm: pole temperature too high	ID000031
Level-2 alarm: cell voltage too high	ID000032
Level-2 alarm: cell voltage too low	ID000033
Level-2 alarm: total voltage too high	ID000034
Level-2 alarm: total voltage too low	ID000035
Level-2 alarm: battery discharge temperature too high	ID000036
Level-2 alarm: battery discharge temperature too low	ID000037

Level-2 alarm: battery charge temperature too high	ID000038
Level-2 alarm: battery charge temperature too low	ID000039
Level-2 alarm: charge overcurrent	ID000040
Level-2 alarm: discharge overcurrent	ID000041
Level-2 alarm: internal communication fault	ID000042
Level-2 alarm: cell voltage fault	ID000043
Level-2 alarm: cell temperature fault	ID000044
Level-2 alarm: high-voltage abnormality fault	ID000045
Level-2 alarm: pole temperature too high	ID000046
Level-2 alarm: access control alarm	ID000047
Level-1 alarm: B+ pole temperature fault	ID000048
Level-1 alarm: B- pole temperature fault	ID000049
Level-1 alarm: cell voltage too high	ID000050
Level-1 alarm: cell voltage too low	ID000051
Level-1 alarm: total voltage too high	ID000052
Level-1 alarm: total voltage too low	ID000053
Level-1 alarm: battery discharge temperature too high	ID000054
Level-1 alarm: battery discharge temperature too low	ID000055
Level-1 alarm: battery charge temperature too high	ID000056
Level-1 alarm: battery charge temperature too low	ID000057
Level-1 alarm: excessive cell temperature difference	ID000058
Level-1 alarm: charge overcurrent	ID000059
Level-1 alarm: discharge overcurrent	ID000060
Level-1 alarm: pre-charge fault	ID000061
Level-1 alarm: pole temperature too high	ID000062
Level-1 alarm: ambient temperature fault	ID000063
Level-1 alarm: ambient temperature too high	ID000064
Level-1 alarm: ambient temperature too low	ID000065
Air conditioner communication status, cluster 1 air conditioner data	ID000066
Air conditioner fault status	ID000067
Access control status	ID000068
Battery/inverter communication status, cluster 1 data	ID000069
Cluster 2 alarm	
Level-4 alarm: cell voltage too high	ID000070
Level-4 alarm: cell voltage too low	ID000071
Level-4 alarm: total voltage too high	ID000072
Level-4 alarm: total voltage too low	ID000073

Level-4 alarm: battery discharge temperature too high	ID000074
Level-4 alarm: battery charge temperature too high	ID000075
Level-4 alarm: main positive relay fault	ID000076
Level-4 alarm: main negative relay fault	ID000077
Level-4 alarm: fire suppression fault	ID000078
Level-4 alarm: water immersion fault	ID000079
Level-3 alarm: cell voltage too high	ID000080
Level-3 alarm: cell voltage too low	ID000081
Level-3 alarm: excessive cell voltage difference (level 1)	ID000082
Level-3 alarm: total voltage too high	ID000083
Level-3 alarm: total voltage too low	ID000084
Level-3 alarm: battery discharge temperature too high	ID000085
Level-3 alarm: battery discharge temperature too low	ID000086
Level-3 alarm: battery charge temperature too high	ID000087
Level-3 alarm: battery charge temperature too low	ID000088
Level-3 alarm: charge overcurrent	ID000089
Level-3 alarm: discharge overcurrent	ID000090
Level-3 alarm: insulation fault	ID000091
Level-3 alarm: pre-charge fault	ID000092
Level-3 alarm: AFE chip fault	ID000093
Level-3 alarm: balancing circuit fault	ID000094
Level-3 alarm: current sensor fault	ID000095
Level-3 alarm: pole temperature too high	ID000096
Level-2 alarm: cell voltage too high	ID000097
Level-2 alarm: cell voltage too low	ID000098
Level-2 alarm: total voltage too high	ID000099
Level-2 alarm: total voltage too low	ID000100
Level-2 alarm: battery discharge temperature too high	ID000101
Level-2 alarm: battery discharge temperature too low	ID000102
Level-2 alarm: battery charge temperature too high	ID000103
Level-2 alarm: battery charge temperature too low	ID000104
Level-2 alarm: charge overcurrent	ID000105
Level-2 alarm: discharge overcurrent	ID000106
Level-2 alarm: internal communication fault	ID000107
Level-2 alarm: cell voltage fault	ID000108
Level-2 alarm: cell temperature fault	ID000109
Level-2 alarm: high-voltage abnormality fault	ID000110

Level-2 alarm: pole temperature too high	ID000111
Level-2 alarm: access control alarm	ID000112
Level-1 alarm: B+ pole temperature fault	ID000113
Level-1 alarm: B- pole temperature fault	ID000114
Level-1 alarm: cell voltage too high	ID000115
Level-1 alarm: cell voltage too low	ID000116
Level-1 alarm: total voltage too high	ID000117
Level-1 alarm: total voltage too low	ID000118
Level-1 alarm: battery discharge temperature too high	ID000119
Level-1 alarm: battery discharge temperature too low	ID000120
Level-1 alarm: battery charge temperature too high	ID000121
Level-1 alarm: battery charge temperature too low	ID000122
Level-1 alarm: excessive cell temperature difference	ID000123
Level-1 alarm: charge overcurrent	ID000124
Level-1 alarm: discharge overcurrent	ID000125
Level-1 alarm: pre-charge fault	ID000126
Level-1 alarm: pole temperature too high	ID000127
Level-1 alarm: ambient temperature fault	ID000128
Level-1 alarm: ambient temperature too high	ID000129
Level-1 alarm: ambient temperature too low	ID000130
Air conditioner communication status, cluster 2 air conditioner data	ID000131
Air conditioner fault status	ID000132
Access control status	ID000133
Battery/inverter communication status, cluster 2 data	ID000134
EPO status	ID000265
Excessive branch cluster voltage difference alarm (level 1)	ID000266
Master MBMU-slave MBMU communication interrupted (level 1)	ID000267
MBMU level-2 charge/discharge overcurrent fault	ID000268
Cluster 1	
Excessive total voltage difference	ID000300
Surge protective device (SPD) fault	ID000301
Total voltage sampling fault	ID000302
SBMU-BMU communication fault	ID000303
SBMU-MBMU communication fault	ID000304
BMU automatic addressing failure	ID000305

AFE communication fault	ID000306
Battery system fault	ID000307
Cluster 2	
Excessive total voltage difference	ID000320
Surge protective device (SPD) fault	ID000321
Total voltage sampling fault	ID000322
SBMU-BMU communication fault	ID000323
SBMU-MBMU communication fault	ID000324
BMU automatic addressing failure	ID000325
AFE communication fault	ID000326
Battery system fault	ID000327

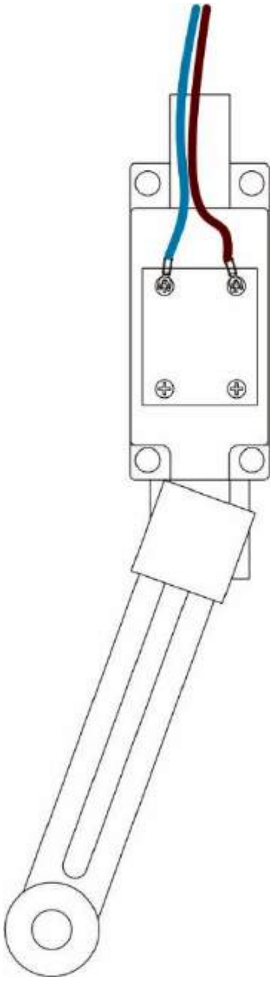
Several common fault alarms and their handling measures are listed below for user reference.

5.5.1 Access control alarm

The access control alarm is used to detect the status of the battery cabinet door; when the door is closed, there is no access control alarm; When the door remains open for more than 2 minutes, an access control alarm is triggered. If an access control alarm is triggered while the door is closed, the issue needs to be investigated.

(1) Check whether the access control mechanical travel switch is loose or abnormal. If the access control mechanical travel switch is faulty, the access control switch needs to be replaced. For specific replacement steps, see the ***BC107DE2/BC120DE2A Maintenance Manual***.

(2) If the access control mechanical travel switch is not faulty but the access control alarm is still triggered, remove the access control switch and check whether it is wired correctly. Refer to the figure below for correct wiring.

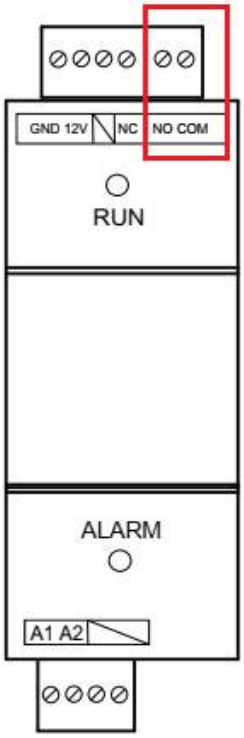


5.5.2 Water immersion alarm

The water immersion alarm is used to detect whether the battery cabinet has been flooded; when the battery cabinet is not flooded, there is no water immersion alarm; When the battery cabinet is flooded, a water immersion alarm is triggered. If a water immersion alarm is triggered while the battery cabinet is not flooded, the issue needs to be investigated.

(1) When the battery cabinet is flooded, a water immersion alarm is triggered. Drain the water first; once the water level has fully evaporated, the water immersion alarm will clear.

(2) If a water immersion alarm is still triggered while the battery cabinet is not flooded, remove the water leakage alarm from the battery cabinet and check the feedback port of the water leakage alarm. Under normal conditions, the feedback port is in the normally open state. If the feedback port is not in the normally open state, the water leakage alarm is faulty and needs to be replaced. For specific replacement steps, see the ***BC107DE2/BC120DE2A Maintenance Manual***.



Water leakage alarm feedback port



Water leakage alarm feedback port test

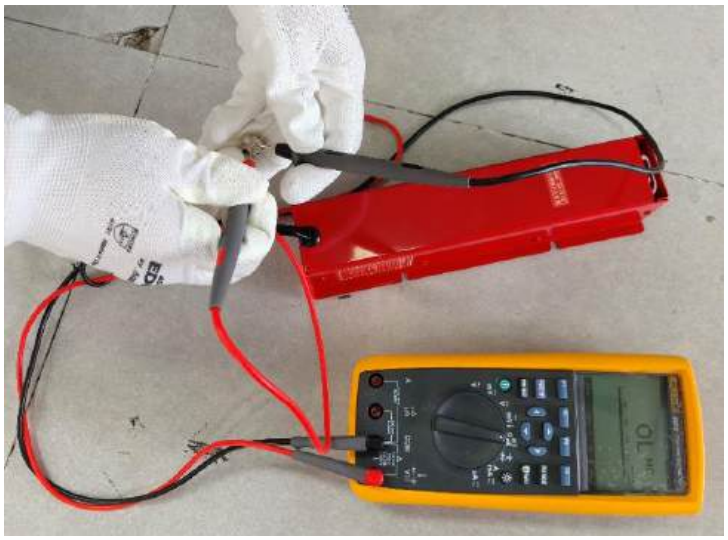
5.5.3 Fire suppression alarm

The fire suppression alarm is used to detect whether the battery cabinet's aerosol fire suppression device has discharged; when it has not discharged, there is no fire suppression alarm; When the battery

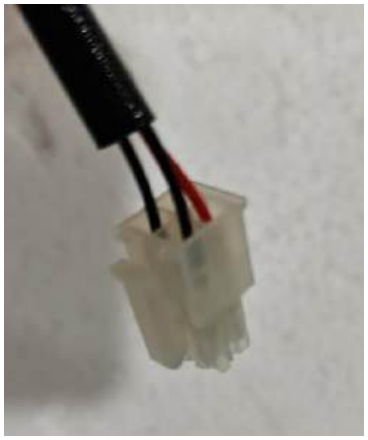
cabinet's aerosol fire suppression device discharges, a fire suppression alarm is triggered. If a fire suppression alarm is triggered while the aerosol has not discharged, the issue needs to be investigated.

(1) When the temperature-sensing cable detects that the battery cabinet temperature has reached a certain level, it activates the fire suppression starter box, which in turn activates the combined fixed aerosol fire suppression device. At this point, the battery cabinet discharges aerosol, triggering a fire suppression alarm. After the aerosol discharges, first check whether a fire has occurred in the battery cabinet. If a fire has occurred, the battery cabinet must be scrapped; if not, clean the discharged aerosol from inside the battery cabinet and replace the fire suppression system. For specific replacement steps, see the ***BC107DE2/BC120DE2A Maintenance Manual***.

(2) If a fire suppression alarm is still triggered while the aerosol has not discharged, check the aerosol feedback port. Under normal conditions, the feedback port is in the normally open state. If the feedback port is not in the normally open state, the aerosol fire suppression device is faulty and needs to be replaced. For specific replacement steps, see the ***BC107DE2/BC120DE2A Maintenance Manual***.



Aerosol feedback port test



Aerosol feedback port (black, 2-wire)

5.5.4 PCS-BMS communication fault

Cause of fault: Abnormal CAN communication between the PCS and MBMU.

Solution:

(1) Check whether the PCS has started up normally.

(2) Check whether the CAN communication cable has poor contact, is wired incorrectly, or is not connected.

5.5.5 Air conditioner communication fault

Cause of fault: Abnormal RS485 communication between the air conditioner and SBMU.

Solution:

(1) Check whether the air conditioner is powered on.

(2) Check the air conditioner communication cable harness.

(3) Air conditioner fault, etc.

5.5.6 BMS communication fault

Cause of fault: Abnormal network port communication between the EMS and MBMU.

Solution:

(1) Check whether the communication network cable is connected properly and whether it has been plugged into the wrong network port.

(2) Check whether the screen IP is set correctly and whether the BMS IP is set correctly; if both are correct, replace the network port or network cable.

5.5.7 Excessive cell temperature difference

Cause of fault: Temperature difference between cells ≥10°C

Solution:

(1) Use the EMS screen or platform to check the temperature of all cells, and determine whether only a single cell has a comparatively high temperature or the pack as a whole is running high.

(2) If the pack as a whole is running high, check whether the air conditioner is operating.

(3) If a single cell has a comparatively high temperature, swap the BMU of the pack in question with a BMU from another pack with a normal temperature; after swapping, check whether the high-temperature reading follows the BMU. If it does, replace the BMU; if the high-temperature point remains in the original pack, replace the pack.

6 Accessory list

Energy storage cabinet system	User manual	Certificate of conformity	Warranty card
			
Key	Base baffle	Factory test report	Flexible conduit
			
Fire-resistant mud	Desiccant	Ground wire	Wire duct
			
Stylus			
			

Packing list

Serial Number	Name	Number	Unit	Purpose
1	Energy storage cabinet system	1	PCS	Standard configuration.
2	Fireproof mud	2	KG	Standard configuration(Fire mud 0.5kg(4pcs))screw M6*20(8pcs))
3	Base baffle	4	PCS	Battery cabinet base baffle
4	Desiccant	1	PCS	Moisture-proof
5	Ground wire	0.7	M	Connection of battery cabinet and ground wire copper bar
6	User manual	1	PCS	User manual
7	Wire trunking	1	PCS	Trunking for connection to PCS
8	Corrugated pipe	1	PCS	Bellows for PCS connection line(Corrugated pipe Φ29mm 5.5M and Corrugated pipe Φ17mm 10m，screw M4*10(16pcs))
9	Factory test report	1	PCS	Standard configuration
10	Certificate of conformity	1	PCS	Standard configuration
11	Warranty card	1	PCS	Standard configuration

12	Key	1	PCS	Standard configuration(includes EMS baffle and door key)
13	Touch screen pen	1	PCS	Standard configuration

7 Terminology

(1) Cell

A single electrochemical cell.

(2) Battery Module

An assembly of multiple cells connected in series, parallel, or series-parallel, featuring only one pair of positive and negative output terminals, used as a power source.

(3) Battery Cluster

Multiple battery packs, a high-voltage box, and connecting cables together form a complete battery cluster, capable of independently exchanging energy with external systems and providing self-protection.

(4) Battery Array

Multiple battery clusters form a battery array, in which a three-tier architecture control mode centrally manages energy exchange with the underlying clusters.

(5) Battery Management System

An electronic device that controls or manages the electrical or thermal performance of the battery system, including:

- Battery Management Unit (BMU)
- Slave Battery Management Unit (SBMU)
- Master Battery Management Unit (MBMU)
- Energy Management System (EMS)

(6) Battery System

An energy storage device comprising integrated battery modules or packs, a battery management system (BMS), high-voltage circuits, and low-voltage circuits.

(7) Battery Capacity

The amount of energy a battery can store.

(8) State of Charge (SOC)

The percentage of a battery cell's, module's, pack's, or system's actual capacity that can be discharged under manufacturer-specified conditions, also known as remaining capacity.

(9) State of Health (SOH)

The ratio of a battery's actual performance to its nominal design specifications.