KSTAR

BC107DE

User Manual of Industrial and Commercial Battery Cabinet

Overview

This manual introduces the main features, performance indicators, system principles and appearance structure of BC107DE industrial and commercial battery cabinet, and provides instructions for its installation, use and operation, and maintenance and management.

Readers

This document is primarily intended for the following engineers:

Sales engineer

Technical support engineer

System engineer

Hardware installation engineer

Commissioning engineer

Maintenance engineer

Symbol conventions

The following symbols may appear in this document and have the following meanings.

Symbol	Description
DANGER	It indicates a high-risk hazard that, if not avoided, will result in death or serious injury.
WARNING	It indicates an intermediate-risk hazard that, if not avoided, may result in death or serious injury.
CAUTION	It indicates a low-risk hazard that, if not avoided, may result in minor or moderate injury.
NOTICE	It is used to transmit equipment or environmental safety warning information. If not avoided, it may cause equipment damage, data loss, reduced equipment performance or other unpredictable results. "Instructions" do not involve personal injury.
Instruction	Supplementary explanations for key information in the text. "Notes" are not safety warning information, and do not involve personal, equipment and environmental injury.

Revision history

Version	Revision date	Revision content	Internal document number
A	Feb 28, 2025	First draft	/

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1 General safety precautions

1.1 General safety

Statement

When installing, operating and maintaining the equipment, please read this manual first and follow all safety precautions identified on the equipment and in the manual.

The "Caution", "Warning" and "Danger" in the manual do not represent all the safety matters that should be observed, but only serve as a supplement to all safety precautions. Shenzhen Kstar New Energy Co., Ltd. shall not be liable for any violation of general safety operation requirements or violation of design, production and use of equipment safety standards. This equipment shall be used in an environment that meets the requirements of the design specification, otherwise it may cause equipment failure, and the resulting functional abnormalities or component damage of the equipment, and personal safety accidents or property losses, etc. are not within the scope of equipment quality assurance. Local laws, regulations and specifications shall be complied with during installation, operation and maintenance of the equipment. The safety precautions in the manual are only a supplement to local laws, regulations and specifications.

Shenzhen Kstar New Energy Co., Ltd. shall not be liable in the event of any of the following circumstances.

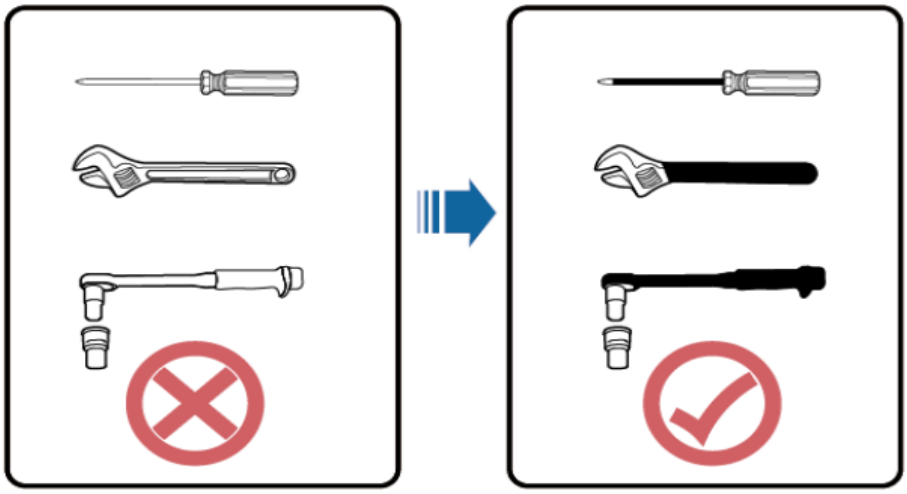
- Not operating under the conditions of use described in this manual.
- The installation and use environment exceeds the requirements of relevant international or national standards.
- Unauthorized disassembly, modification of the product, or modification of the software code.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, etc.).
- Transport damage caused by the customer's own transportation.
- Damage caused by storage conditions not meeting the requirements of product documentation.

General requirements

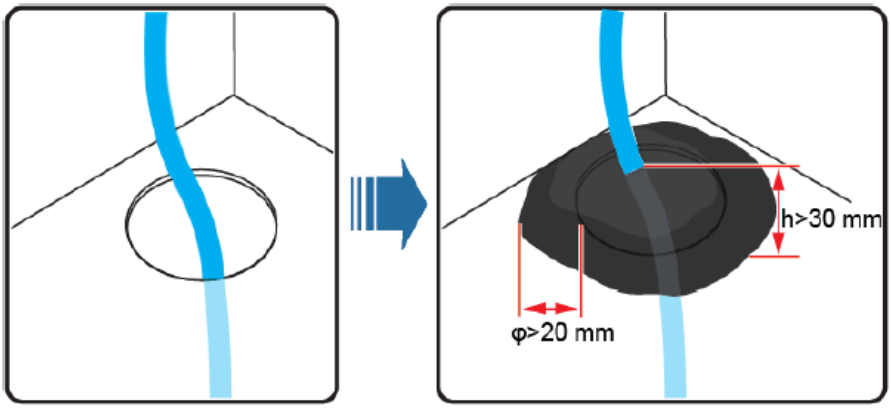
- It is strictly prohibited to install, use and operate outdoor equipment and cables under bad weather conditions such as lightening, rain, snow, level six or above gales (including but not limited to handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoors, working at heights, outdoor installation, etc.).
- It is strictly forbidden to wear watches, bracelets, bangles, rings, necklaces and other conductive objects during installation, operation and maintenance to avoid electric shock and burns.
- Special protective equipment must be used during installation, operation and maintenance, such as insulating gloves, goggles, safety clothing, safety helmet, safety shoes, etc., as shown in the figure below.

- Installation, operation and maintenance must be carried out in the order of steps in the instruction manual.
- Before touching any conductive surface or terminal, measure the voltage at the point of contact to confirm that there is no risk of electric shock.
- After installation of equipment, empty packaging materials such as cartons, foam, plastic, cable ties, etc. should be removed from equipment area.
- If a fire occurs, evacuate the building or equipment area and press the fire alarm or call the fire department. It is strictly prohibited to re-enter a burning building under any circumstances.

- Do not disable protective devices and ignore warnings, cautions, and precautions in manuals and on equipment. Replace danger signs that become unclear due to long-term use in time.
- Except for the personnel operating the equipment, no other persons are allowed to approach the equipment.
- The tool handles used need to be insulated or insulating tool should be used, as shown in the figure below.



- All wiring holes must be sealed. Use fire-resistant clay to seal wiring holes with cables and the cabinet's provided covers to seal unused wiring holes. The correct fire-resistant clay sealing standard is shown in the diagram below.



- It is strictly prohibited to alter, damage, or obscure equipment labels and nameplates.
- During installation of equipment, screws must be tightened using appropriate tools.
- It is strictly forbidden to operate with power on during the installation process.
- Any paint scratches occurring during equipment transportation or installation must be repaired promptly. Exposed scratches must not remain exposed to outdoor environments for an extended period.

- Before operation, the equipment must be securely fixed to the floor or other stable structures such as walls or mounting racks.
- Washing electrical components inside or outside the cabinet with water is prohibited.
- Unauthorized modifications to the equipment's structure, installation sequence, or other configurations are not allowed.

Personal safety

- During equipment operation, if any faults that may cause personal injury or equipment damage are detected, operations must be immediately halted. The issue should be reported to the responsible person, and effective protective measures should be taken.
- To avoid the risk of electric shock, safety extra-low voltage (SELV) circuits must not be connected to telecommunications network voltage (TNV) circuits.
- Do not power on the equipment unless installation is complete and verified by a qualified professional.

1.2 Personnel requirements

- Personnel responsible for installing and maintaining Kstar equipment must undergo strict training, understand all safety precautions, and master correct operating procedures.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are permitted to remove safety devices and perform equipment maintenance.
- Personnel operating the equipment, including operators, trained personnel, and professionals, must possess special operation qualifications as required by local regulations, such as high-voltage operation, working at heights, and special equipment operation certifications.
- Professionals: Individuals with training or operational experience who fully understand potential hazards and risk levels during equipment installation, operation, and maintenance.
- Trained personnel: Individuals who have received the necessary technical training and have relevant experience, enabling them to recognize potential risks during operations and take measures to minimize dangers to themselves and others.
- Operators: Personnel who may come into contact with the equipment but are not

classified as trained personnel or professionals.

- Equipment or component (including software) replacement must be carried out by professionals or authorized personnel.

1.3 Electrical safety

Grounding requirements

- For equipment requiring grounding, the protective ground wire must be installed first during installation and removed last during dismantling.
- It is strictly prohibited to damage the grounding conductor.
- Do not operate the equipment without the grounding conductor properly installed.
- The equipment must be permanently connected to a protective ground. Before operating the equipment, check the electrical connections to ensure it is reliably grounded.

General requirements

- When performing high-voltage operations, use specialized insulating tools.

AC and DC operation requirements

⚠ DANGER

It is strictly prohibited to install or remove power cables while the equipment is energized. The moment the power cable core contacts the conductor, an arc or electrical spark may occur, potentially causing fire or personal injury.

- If the equipment has a "High Leakage Current" warning label, the protective grounding terminal on the equipment chassis must be connected before connecting the AC input power supply to prevent electric shock hazards from leakage current.
- Before installing or removing power cables, turn off the power switch.
- Before connecting power cables, verify that the power cable labels are correct.
- If the equipment has multiple power inputs, all inputs must be disconnected, and the equipment must be completely powered off before any operation.
- It is not recommended to use circuit breakers with leakage protection.
- If the power cable is damaged, it must be replaced by the manufacturer, an authorized service agent, or a qualified professional to avoid risks.
- Personnel performing high-voltage operations or installing AC-powered equipment must hold appropriate qualifications for high-voltage and AC electrical

work.

Wiring requirements

- Using cables in high-temperature environments may cause insulation aging or damage. The distance between cables and heat-generating components or heat source areas must be at least 30 mm.
- Cables must not pass through the equipment's air intake or exhaust vents.
- Cables must meet VW-1 flame retardant rating requirements.
- Cables of the same type should be bundled together, while different types of cables must be routed separately with a minimum spacing of 30 mm. Intertwining or crossing of cables is strictly prohibited.
- In low-temperature environments, severe impacts or vibrations may cause the plastic insulation of cables to become brittle and crack. In order to ensure construction safety, the following requirements shall be followed:
  - All cables should be installed at temperatures above 0° C. When handling cables, especially in low-temperature environments, they should be handled with care to prevent damage.
  - If the storage ambient temperature of the cable is below 0° C, the cable must be stored in a room-temperature environment for at least 24 hours before installation.
  - Improper handling, such as directly pushing cables off a vehicle, is strictly prohibited.
  - Cable selection, installation, and routing must comply with local laws, regulations, and standards.

Electrostatic discharge protection requirements

NOTICE

Electrostatic discharge from the human body can damage static-sensitive components on the single plate, such as large-scale integrated circuits (LSI).

- Electrostatic discharge from the human body can damage static-sensitive components on the single plate, such as large-scale integrated circuits (LSI). Before touching equipment, holding single plate, or integrated circuits (ASICs), personnel must wear anti-static gloves or an anti-static wrist strap. The wrist strap must be properly grounded.
- When holding single plates, hold them by the edges where there are no components. Touching components with your hands is prohibited.

- Single plates that have been removed must be stored or transported using anti-static packaging materials.

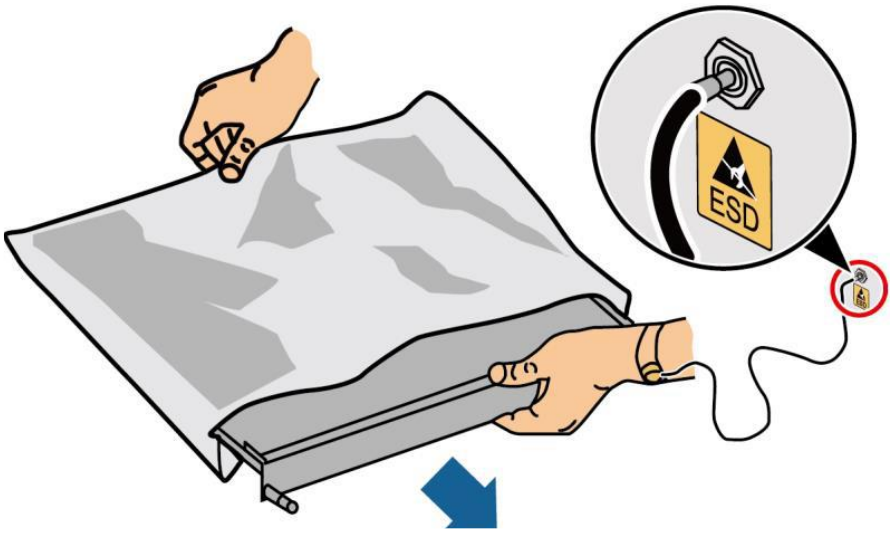


Fig. 1-1 Illustration of Wearing an Anti-Static Wrist Strap

Zero-to-ground voltage

- Users are advised to balance the three-phase load to ensure that the zero-to-ground voltage remains below 2V, thereby meeting distribution system requirements.

1.4 Installation environment requirements

- Do not block ventilation openings or the cooling system while the equipment is operating, as this may lead to overheating and pose a fire hazard.
- The equipment must be installed in areas away from any sources of liquid. Installation directly beneath water pipes, air outlets, or other locations prone to condensation is strictly prohibited. Do not place the equipment beneath air conditioning vents, exhaust ports, or cable entry windows in equipment rooms where water leakage may occur, as this may result in liquid ingress that could lead to malfunction or electrical short circuits.
- If any liquid is found to have entered the equipment, immediately power it off and notify the system administrator.
- Do not install or operate the equipment in environments containing flammable or explosive gases or smoke.
- The equipment must not be installed in or near desert or dust-prone environments.

Working at heights

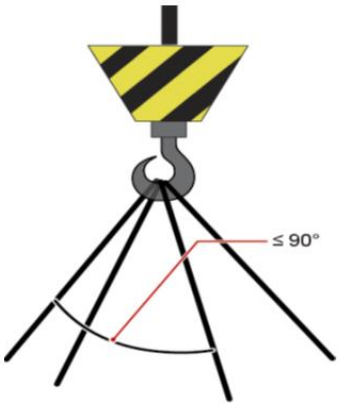
- Work performed at heights of 2 meters or more above ground level is classified as working at heights.
- When any of the following conditions occur, working at heights should be stopped: steel pipes are wet from rain, as well as any other situations where hazards may arise. Resumption of work is only permitted after a thorough inspection of all related equipment has been carried out by the company's Safety Officer and relevant technical personnel, and formal approval has been granted.
- During working at heights, all local regulations for elevated operations must be followed.
- Personnel must complete relevant safety training and obtain proper certification before being authorized to engage in working at heights.
- Before working at heights, carefully inspect climbing tools and safety equipment, such as safety helmets, safety harness, ladders, planks, scaffolds, hoisting equipment, etc. If any items do not meet requirements, immediately make improvements or refuse to perform work at heights. When taking safety protection measures, wear safety helmets, safety harness, or waist ropes secured to solid structural components. It is strictly prohibited to attach them to unstable moving objects or sharp-edged metals, as this prevents hooks from slipping and causing fall accidents.
- At worksites involving working at heights, a clearly marked danger zone must be established with prominent signage, and unauthorized personnel are strictly prohibited from entering.
- All necessary tools and equipment must be securely carried to prevent accidental drops that could injure others.
- When working at heights, personnel are strictly prohibited from throwing objects from elevated positions to the ground. Similarly, throwing objects from the ground to elevated positions is strictly forbidden. Instead, use guide ropes, lifting baskets, aerial work platforms, or cranes to transfer objects.
- Guardrails and warning signs must be installed at edges and openings in the area of working at heights to prevent accidental falls.
- The ground area beneath the area of working at heights must be kept clear of scaffolds, planks, and other miscellaneous items. Ground personnel must not remain in or pass through the area of working at heights.
- All scaffolding, planks, work platforms, and related equipment used for working at heights must undergo a prior safety inspection to ensure structural soundness. Scaffolding must not be overloaded under any circumstances.

- If the site supervisor or safety officer observes any personnel performing work at heights in violation of established safety regulations, they must immediately issue a correction order. Otherwise, the operation shall be stopped.

1.5 Mechanical safety

Hoisting safety

- When hoisting heavy objects, it is strictly prohibited to walk under the boom or suspended load.
- Personnel performing hoisting operations must undergo relevant training and may only begin work after being certified as qualified.
- Hoisting tools must be inspected, and all required tools must be present before use.
- Before hoisting operations, ensure hoisting tools are securely fixed to load-bearing fixtures or walls.
- During hoisting operations, ensure the angle between the two cables does not exceed 90°, as shown in the figure below.

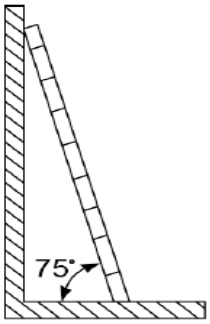


- During hoisting, dragging of wire ropes or lifting accessories is prohibited, and impact with hard objects is forbidden.

Ladder safety

- For high-elevation operations where electrical hazards may be present, wooden or fiberglass ladders should be used.
- When using an A-frame ladder, the restraining rope must be secure, and someone must hold the ladder during operation.
- Before using any ladder, verify it is in good condition and its load capacity meets requirements. Exceeding the weight limit is strictly prohibited.

- Ladders must be placed on stable ground. The ladder's inclination should ideally be 75° , which can be measured with a square as shown in the figure below. When using a ladder, position the wider steps at the bottom or implement protective measures at the ladder base to prevent slippage.



- When climbing a ladder, please observe the following actions to reduce risks and ensure safety.
- Maintain a stable body position.
- The highest standing position for workers should not exceed the 4th step from the top of the ladder.
- Ensure your center of gravity remains within the edges of the ladder frame.

Drilling safety

- When drilling into walls or floors, the following safety precautions must be considered:

NOTICE

Drilling into equipment is strictly prohibited. Drilling will damage the equipment's electromagnetic shielding performance, internal components, and cables. Metal shavings produced during drilling may enter the equipment and cause circuit board short circuits.

- Before drilling, obtain approval from the customer, contractor, and KSTAR.
- Wear safety goggles and protective gloves when drilling.
- During drilling operations, shield equipment properly to prevent debris from falling into the equipment. Clean up debris promptly after drilling is completed.

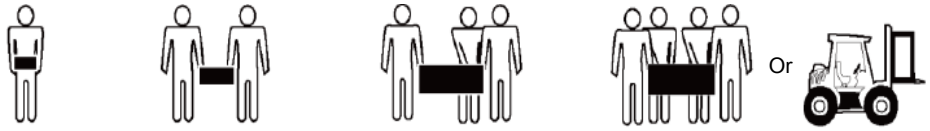
Safety in handling heavy objects

⚠ DANGER

When pulling equipment out of a cabinet, be careful of potentially unstable or heavy equipment mounted in the cabinet to avoid being crushed or injured.

- When handling heavy objects, prepare properly for the weight to avoid being

crushed or spraining muscles.



18 kg (< 40 lbs) | 18 ~ 32 kg (40 ~ 70 lb) | 32 ~ 55 kg (70 ~ 121 lb) | >55 kg (>121 lb)

- When handling the equipment by hand, wear protective gloves to avoid injury.
- When moving or lifting the equipment, hold it by its handles or by equipment bottom edge, not by the handles of installed modules.
- When moving the equipment, avoid scratching the cabinet surface or damaging the cabinet components and cables.
- When the forklift is used for transportation, the forklift must be in the middle position to prevent tipping over. Before moving, fasten the equipment to the forklift with ropes; when moving, special personnel shall be assigned to watch over it.
- When transporting, try to choose rail transportation, sea transportation or roads with good road conditions to ensure the safety of equipment. Bumping and tilting shall be minimized during transportation.
- Be careful when moving the cabinet to avoid any impact or drop that may cause damage to equipment.

1.6 Battery safety

Basic requirements

Before battery operation, the safety precautions of operation must be carefully read, and the correct connection methods of battery must be mastered.

⚠ DANGER

- Do not expose battery to high temperature environments or around heating equipment, such as sunlight, fire, transformers, heaters, etc. Overheating of the battery may cause explosion.
- It is strictly forbidden to burn battery, otherwise it may cause explosion.
- It is strictly forbidden to disassemble, modify or damage battery (such as inserting foreign objects, and immersing in water or other liquids) to avoid battery electrolyte leakage, overheating, fire or explosion.

- Please wear goggles, rubber gloves and protective clothing to prevent hazards caused by electrolyte overflow. If the battery leaks, do not allow the skin or eyes to come into contact with the leaked liquid. If it comes into contact with your skin or eyes, rinse immediately with clean water and go to the hospital for medical treatment.
- Please use special insulating tools.

- The battery shall be handled in the direction required by battery. It is strictly forbidden to carry it upside down or tilt it.
- During installation, maintenance and other operations, battery circuit shall remain disconnected.
- Please use the specified battery type. Using battery other than the specified type may cause battery damage.
- Please dispose of used battery in accordance with local laws and regulations. Do not treat battery as household waste. Improper battery disposal may cause battery explosion.
- The site must be equipped with fire-fighting facilities that meet the requirements, such as fire sand, dry powder fire extinguishers, etc.

NOTICE

To ensure the safety of battery use and the accuracy of battery management functions, please use the battery configured with the PCS host by Kstar. Kstar shall not be responsible for battery related faults arising from the use of battery not configured by Kstar.

Battery installation specification

- Before installing battery, pay attention to the following basic precautions for the sake of safety:
- The battery shall be installed in a well-ventilated, dry, and cool environment, away from heat sources, flammable materials, moisture, and environments with large amounts of infrared radiation, organic solvents and corrosive gases, and fire prevention measures shall be taken. The battery shall be placed and fixed horizontally.
- Pay attention to the positive and negative electrodes during battery installation. It is strictly forbidden to short-circuit the positive and negative electrode of the same battery or the same group of battery, otherwise it will cause battery short circuit.
- Please check the battery terminal screws regularly to make sure they are tightened and not loose.
- It is strictly forbidden to place installation tools on battery during battery installation.

Battery short circuit protection

⚠ DANGER

Battery short circuit will produce instantaneous high current and release a large amount of energy, which may cause personal injury and property loss.

To avoid battery short circuit, the battery is not allowed to be maintained with circuit connected.

Special scenarios of lithium battery

For the safety precautions of lithium battery operation, please refer to the lead-acid battery, and pay attention to the following matters.

⚠ WARNING

There is a risk of explosion if the battery is replaced with an incorrect model.

- Replace the battery only with the same or similar type recommended by the manufacturer.
- When transporting lithium battery, do not invert, tilt or collide it.
- During installation, maintenance and other operations, the lithium battery module circuit shall remain disconnected.
- When the operating temperature of lithium battery is below the lower limit, it is forbidden to charge it (charging is forbidden at 0℃) to avoid internal short circuit of the battery due to crystallization caused by low temperature charging.
- Do not exceed the temperature range, as this will affect the battery performance and safety.
- Do not throw lithium battery module into fire.
- When maintenance is completed, the used lithium battery module shall be returned to the maintenance site.

1.7 Others

Transportation, storage and maintenance

- During long-term storage, the battery needs to be charged and discharged once every 6 months as specified in the specification.
- Be careful not to drop battery when loading and unloading it during transportation, and do not turn it over, making sure it faces up.

Warning and caution

Please read the specification and the warning signs on the surface of the battery box carefully before using the battery. Improper use of the battery may cause overheating damage to the battery. Shenzhen Kstar New Energy Co., Ltd. will not bear any responsibility for any accidents caused by failure to operate according to the specification. In order to use and handle the battery safely, please read the operation instructions carefully before use.

2 Overview

2.1 Product introduction

The industrial and commercial battery cabinet contains HVB and battery module, as well as EMS, SBMU, BMU, MBMU and other modules, which can store and release electric energy according to the requirements of EMS. The input and output ports of the industrial and commercial battery cabinet use high-voltage direct current.

- Battery charging: the output of the battery cabinet is connected to the energy storage terminals (BAT +, BAT-) of the PCS. Under the control of the PCS, the battery is charged and the energy in the PV or mains is transferred to the battery.
- Battery discharging: when the PV energy is insufficient to supply power to the load, the system needs to control the battery to supply power to the load, and the stored battery energy is output to the load through the PCS.

2.1.1 Product appearance

(1) Front view of the battery cabinet

(2) Side view of the battery cabinet

Fig. 2-1 Schematic diagram of the battery cabinet

The main battery cabinet includes functions such as managing the battery cluster, communicating with PCS, displaying and saving all data of the system, EMS management, and modifying the system parameters. The EMS display is located on the front door of the rack of the main battery cabinet.

2.1.2 Product structure

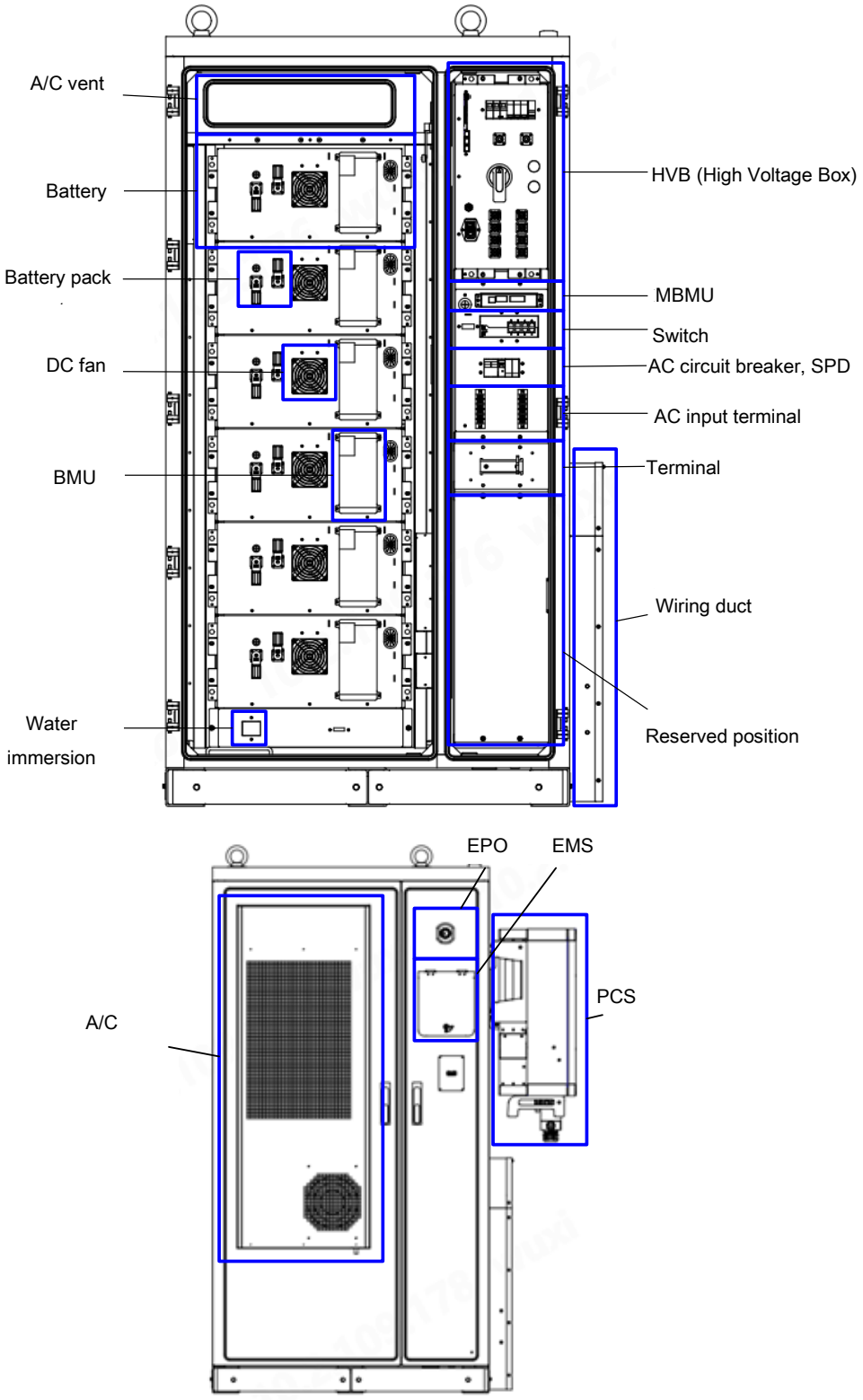


Fig. 2-2 Product structure

2.1.2.1 High Voltage Box

The HVB (High Voltage Box) contains the protective components of the whole system, such as relays, circuit breakers, fuses, DC lightning protectors.

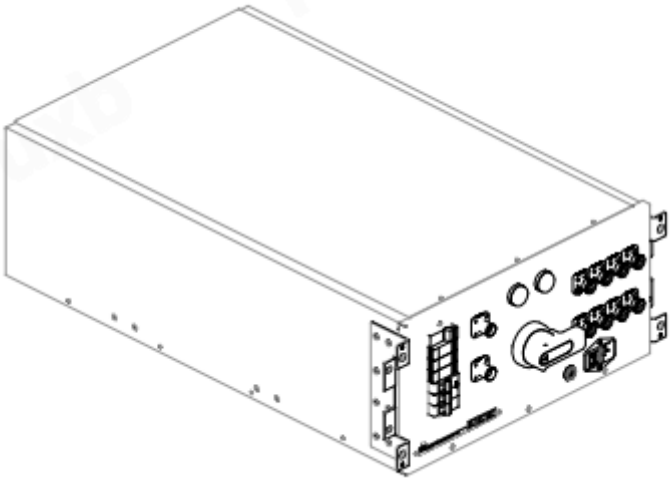


Fig. 2-3 HVB

Functions

The HVB is used to collect information such as the total battery voltage, current, temperature and external digital input signals, and cooperate with BMS to execute system operation strategy. The HVB dimensions are as follows:

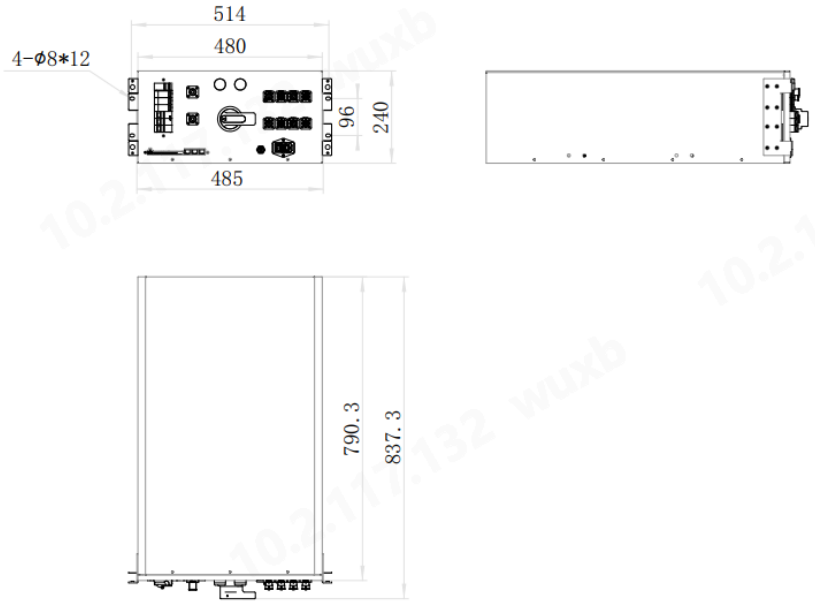


Fig. 2-4 Dimensions of HVB (mm)

2.1.2.2 Battery module

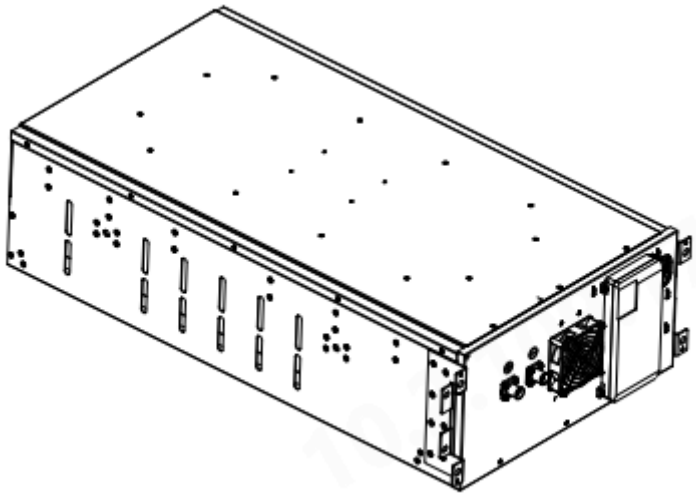


Fig. 2-5 Battery module

Functions

The battery module contains a battery module composed of cells and is the power source of the whole system. The BMU unit configured in the battery module is used to collect the voltage, temperature and other information of the lithium battery, and upload the information to the SBMU control unit. The battery module also has a fire-fighting unit for automatic fire extinguishing. The battery module size is as follows:

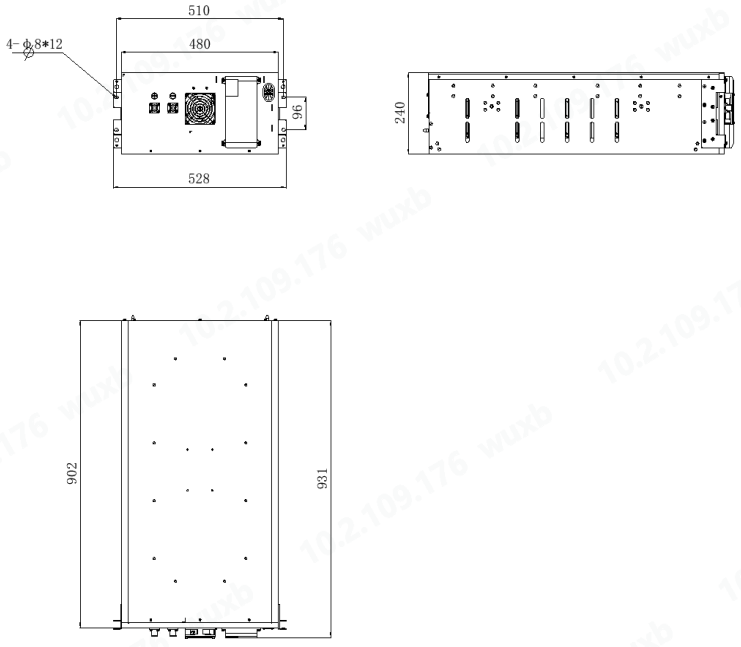
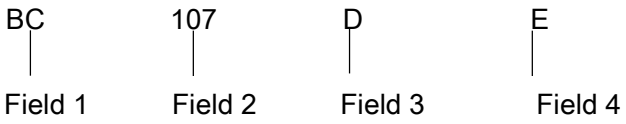


Fig. 2-6 Battery module size (mm)

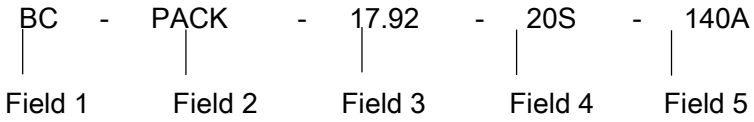
2.1.3 Product model and naming rules

2.1.3.1 Naming rules for the battery cabinet model:



Field 1	Field 2	Field 3	Field 4
BC: Battery cabinet Industrial and commercial battery cabinet	Energy 107: 107 kWh	D: Outdoor Vacancy: Indoor	E: With EMS Vacancy: without EMS

2.1.3.2 Naming rules for the battery module model:



Field 1	Field 2	Field 3	Field 4	Field 5
BC: Battery cabinet Industrial and commercial battery cabinet	PACK Battery module	Energy 17.92: 17.92 kWh	20S: 20 cells in series	140A: Maximum current of cell

2.2 Battery system parameters

2.2.1 Cell parameters

S/N	Item	Characteristics
1	Cell type	Square lithium iron phosphate (LFP)
2	Nominal voltage	3.2V

3	Rated capacity	280Ah
4	Rated energy	896Wh
5	Maximum continuous charge current	0.5C
6	Recommended charge current	≤0.5 C
7	Maximum continuous discharge current	0.5C
8	Recommended discharge current	≤0.5 C

2.2.2 Battery module parameters

S/N	Item	Characteristics
1	Series-parallel configuration	20S1P
2	Rated voltage	64V
3	Rated capacity	280Ah
4	Rated energy	17.92kWh
5	Rated charge voltage	72V
6	Recommended charge and discharge current	≤140A @25±5℃
7	Weight	Approx.137 Kg

Charging instructions for battery module:

If the customer needs to charge the separate battery module, the charger shall be set in strict accordance with the recommended values of the above battery module parameters, otherwise it is easy to cause damage to the battery module.

2.2.3 Battery cluster parameters

S/N	Item	Characteristics
1	Series-parallel configuration	120S1P
2	Rated voltage	384V

3	Rated capacity	280Ah
4	Rated energy	107.52kWh
5	Rated charge voltage	432V
6	Maximum charge and discharge current	140A

2.2.4 Battery cabinet parameters

S/N	Item	Characteristics
1	Total energy	107.52kWh
2	Rated voltage	384VDC
3	Recommended depth of discharge	90%
4	Operating voltage range	342VDC–432VDC
5	Number of battery clusters/cabinets	1
6	Maximum charge current	140A (0.5C)
7	Maximum discharge current	140A (0.5C)
8	Monitoring parameters	Battery cluster voltage, current, cell voltage, cell temperature, ambient temperature, etc.
9	Means of communication	CAN/Ethernet
10	Operating temperature range	-30℃ - +50℃
11	Storage temperature range	-30°C - +60°C (25°C recommended for long term storage)
12	Relative humidity	5%~95%, non-condensing
13	Temperature control mode	A/C cooling or heating
14	Net weight	Approx. 1438 Kg
15	Product size	W1050 mm*D1371 mm*H2000 mm (including A/C)
16	IP rating	IP54
17	Recommended altitude	≤3000 m
18	Short-circuit current under AC	6KA

	input conditions (Icc)	
19	Current of the external protective device	20A
20	Maximum short-circuit current and time	2.61KA/1.068ms
21	Noise level	≤70 dB

2.2.5 High voltage box interface

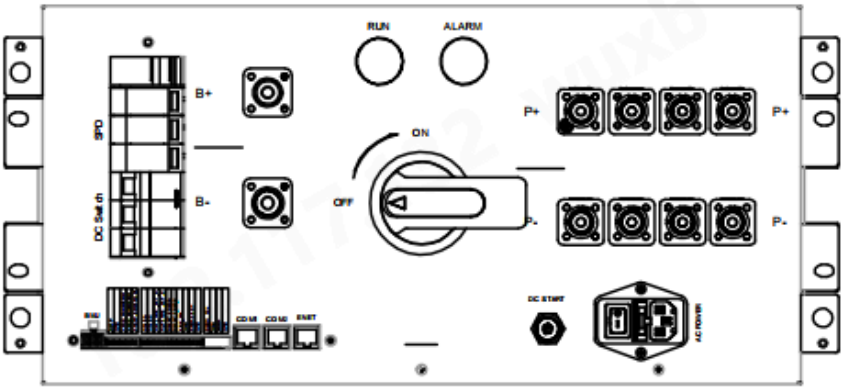


Fig. 2-7 HVB panel

Panel element definitions:

Port	Port description
P+	DC output positive
P-	DC output negative
B+	Series-connected battery module positive
B-	Series-connected battery module negative
DC START	DC start button/black start button
AC POWER	220 V AC input
RUN	Operation indicator light
ALARM	Warning indicator light
Circuit breaker handle	DC system switch
DC Switch	DC power switch
SPD	Lightning protection module

Definition of low-voltage/communication port:

Port	Port description
PCS_CAN/MBMU	CAN interface communication of PCS or CAN
RLY_FIRE_EXT	Reserved dry contact 1
BMU	Battery module information interface
24VOUT	24V power output port
RELAY2_RES	Reserved dry contact 2
RS485A/RS485B	A/C communication interface
FIRE_FB+	Fire protection feedback input
SMOKE_FB+	Reserved feedback
DOOR_FB+	Door status detection
IMM+	Water immersion test
GND	Each FB+ signal and 24V paired with a GND

RJ45 description

RJ45 port	Port description
COM1	Parallel cabinet CAN input line (first cabinet suspended)
COM2	CAN output line of parallel cabinet (terminal resistance 120 Ω connected to the end cabinet)
ENET	Ethernet, 100M Ethernet, network port

BMU interface

+24V	Power supply input of BMU
GND	
BMU_CANH	CAN communication
BMU24V_START	BMU24V enable
BMU_CODEID_DO	Automatic encoding hardware flag bit (output)
BMU_CANL	CAN communication

2.2.6 Switch interface

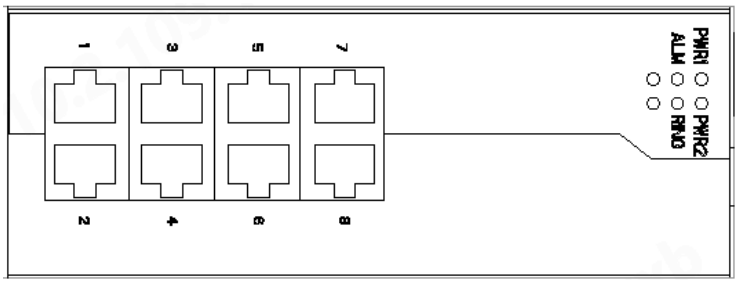


Fig. 2-8 Switch panel

Switch interface

1	EMS communication
2	MBMU communication
3	Reserved
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved

2.2.7 MBMU interface

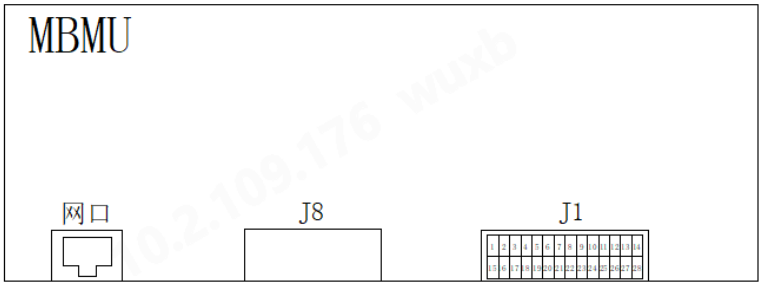


Fig. 2-9 MBMU panel

MBMU interface

Network port	Communication	
J8	Reserved	
J1	1	24V
	2	GND
	13	CANH1
	14	CANL1
	15	CANH2
	16	CANL2

2.2.8 Front door panel

Description of cabinet panel

Fig. 2-10

EPO: EPO is an emergency stop button. When pressed, the battery cabinet will be cut off from high voltage and AC power, and the battery cabinet will be powered off.
Under the EPO button is the EMS. Open the protective cover with the key to see the screen.

2.2.9 Charge and discharge curve

1. The relationship curve between charge current and voltage: Charge with a current of 0.1C below 2.5V, charge with a current of 0.5 C between 2.5V-3.45V. Above 3.45V, the charging power needs to be derated. When the voltage reaches 3.55V, the charge current is 0. For more intuitive reference, please refer to the following relationship curve between charging current limit and voltage.

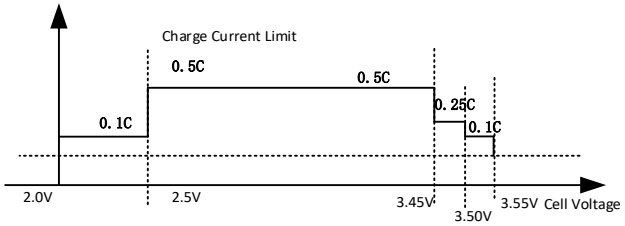


Fig. 2-11 Relationship curve between charging current limit and voltage

2. The relationship curve between discharge current and voltage: When the voltage

reaches 3.05V, the discharge current is 0. For more intuitive reference, please refer to the following relationship curve between discharge current limit and voltage.

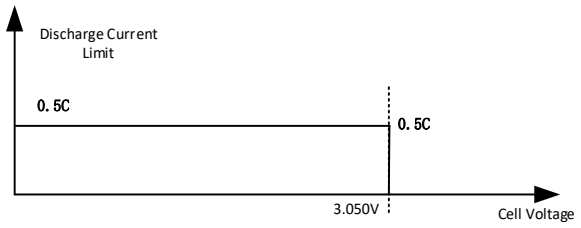


Fig. 2-12 Relationship curve between discharge current limit and voltage

3. The relationship curve between charge current and temperature: Below 22℃, the relationship curve between charging current limit and temperature is formulated according to the charging requirements of battery specification. When the temperature is above 45℃, the charging power needs to be derated. When the temperature reaches 60℃, the charge current is 0. For more intuitive reference, please refer to the following relationship curve between charging current limit and temperature.

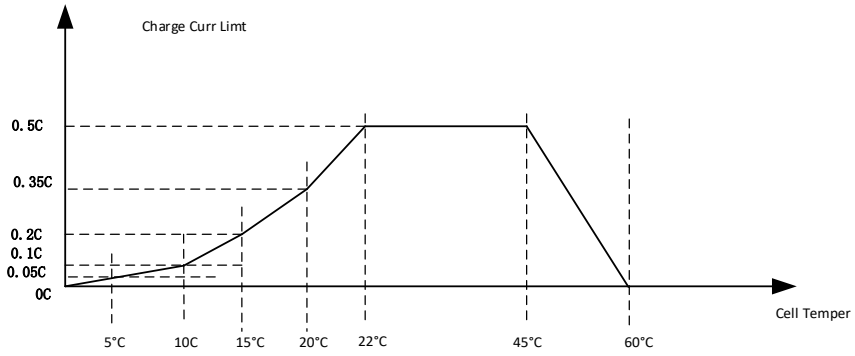


Fig. 2-13 Relationship curve between charging current limit and temperature

4. The relationship curve between discharge current and temperature: Between -10° C and 45° C, the discharge current is limited to 140A. When the temperature exceeds 45° C, the discharge current needs to be derated. When the temperature reaches 55° C, the discharge current is limited to 0. For more intuitive reference, please refer to the following relationship curve between discharge current limit and temperature.

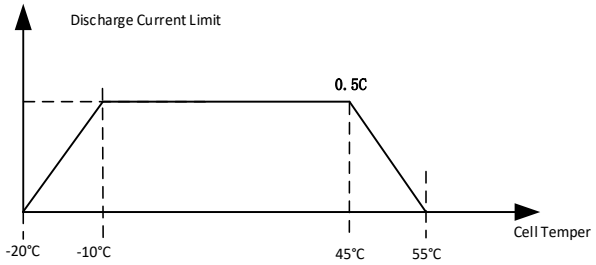


Fig. 2-14 Relationship curve between discharge current limit and temperature

3 Installation

3.1 Site planning

3.1.1 Battery cabinet size

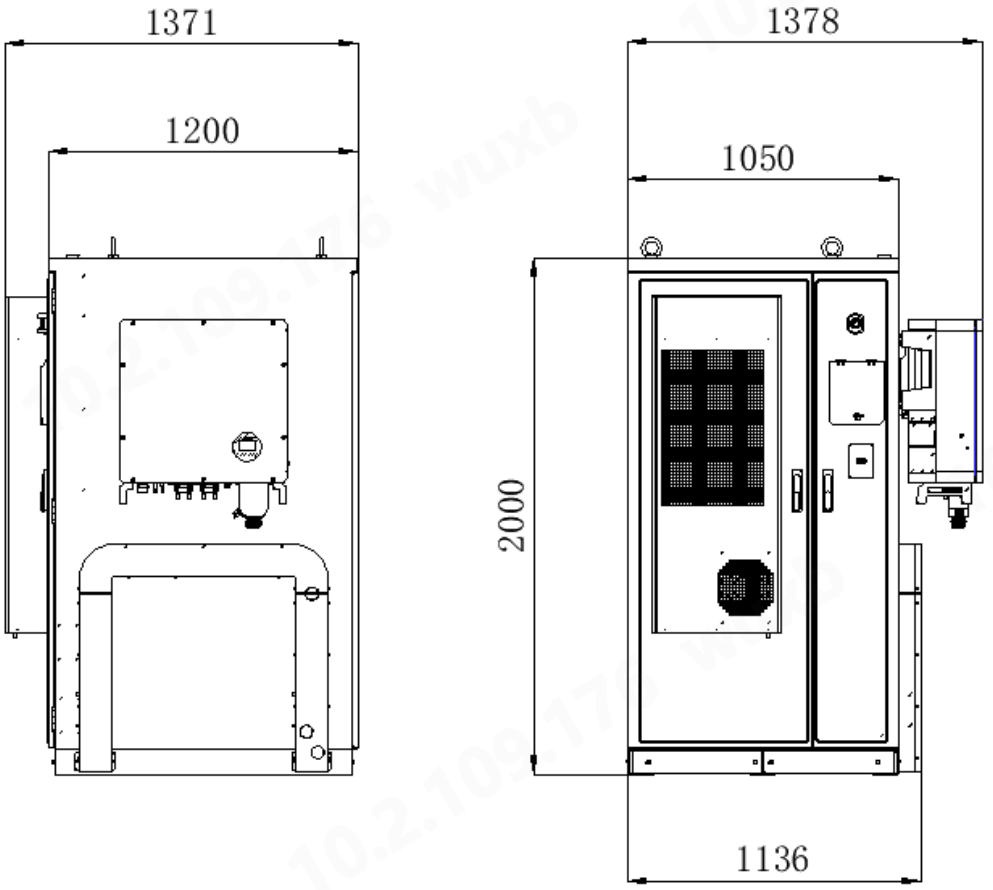


Fig. 3-1 Cabinet size (mm)

3.1.2 Precautions for installation

Please place the battery cabinet on a level ground to ensure that it is placed smoothly without shaking or tilting.

When installing the battery cabinet, be sure to consider the bearing and load capacity of the installation ground and floor (according to the requirements of the architectural drawings).

Please do not cover the vents with objects to avoid hindering the heat dissipation of the

battery cabinet, which may cause the internal temperature of the system to rise and affect the safety and service life of the battery.

Please ensure proper ventilation in the installation area of battery cabinet. Avoid installing it in places with extremely high or low temperatures or high humidity. Keep it away from water, flammable gases or corrosive agent, and heat sources. Avoid direct sunlight exposure, and try to keep the air intake and exhaust vents free from dust.

Please avoid using it in the environment with dust, volatile gas, corrosive gas or high salt content, and do not place flammable and explosive materials around the battery cabinet. In order to reduce the possibility of fire and the damage caused thereby, try to ensure that the walls, ceilings and floors of the room where the battery cabinet is placed are made of fireproof materials, and provide portable dry powder fire extinguishers.

Please refer to the relevant applicable safety regulations for installation.

3.1.3 Space reservation

A certain space for operating and ventilation shall be reserved around the cabinet:

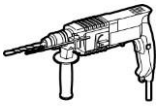
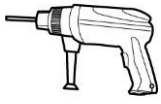
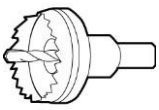
- Considering that door opening and maintenance are required from the front, it is recommended to reserve a ventilation and operating space of 1,200 mm.
- Considering that PCS is hung on the right side, it is recommended to reserve an operating space of 1,000 mm.

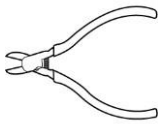
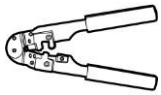
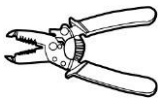
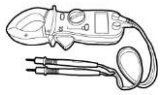
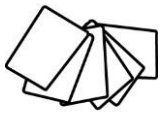
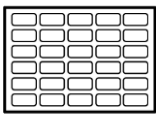
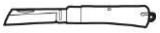
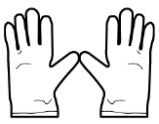
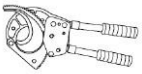
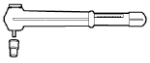
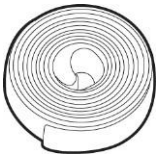
3.2 Preparation of tools and instruments

⚠ DANGER

Use insulating tools to avoid electric shock.

Table 3-1 Preparation of Tools and Instruments

Tools and Instruments			
Electric forklift	Manual forklift	Ladder	Rubber hammer
			
Impact drill	Manual impact	Alloy hole saw	Heat gun
			

Diagonal scissor	Crimping tool	Stripping forcep	Electro-hydraulic
			
Clamp-on ammeter	Multimeter	Cable tie	Measuring level
			
Insulating tape	Cotton cloth	Label	Electrician knife
			
Anti-static gloves	Lead rubber gloves	Heat-resistant gloves	Insulated protective
			
Torque screwdriver	Cable cutter	Brush	Flat head screwdriver (2
			
Phillips screwdriver (M3/M4/M5/M6/M8)	Insulated torque wrench (M6/M8/M12/M16)	Heat shrink tubing	Insulated adjustable wrench
			

3.3 Unpacking

Operation steps

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

Step 2: Remove the outer packaging of battery cabinet.

Step 3 After confirming that equipment is intact, remove the bolts that secure battery cabinet to the pallet and move the battery cabinet off the pallet.

3.4 Installation of single cabinet

3.4.1 Installation environment

- Do not install battery cabinet in an environment with temperature (high temperature and low temperature) or humidity out of the technical specifications.
- Keep the battery cabinet away from water sources, heat sources and flammable and explosive substances.
- Avoid installing the battery cabinet in desert or peripheral desert environments;
- Avoid installing the battery cabinet in areas exposed to direct sunlight, dust, volatile gases, corrosive substances, or excessive salt content.
- Avoid installing the battery cabinet on unstable or vibration-prone foundations.
- Strictly prohibit installation of battery cabinet in environments with conductive metal dust.
- The optimal operating temperature for battery cells within the cabinet is 20° C to 30° C. Taking into account the cooling capacity of the air conditioning system and the cells' optimal working temperature, the recommended maximum ambient temperature for the battery cabinet should not exceed 45° C. If the temperature exceeds 45° C, it is recommended to derate the usage. For every 1° C increase, reduce the load by 10% to maintain the best temperature for the cell in the cabinet. The maximum ambient temperature is recommended not to exceed 50° C. Long-term exposure to temperatures above 50° C may accelerate battery aging.

3.4.2 Installation of cabinet

3.4.2.1 Selection of installation site

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

• The climate environment, geological conditions (such as stress wave emission, groundwater level) and other characteristics of integrated energy storage system shall be fully considered.

• The surrounding environment shall be dry, well ventilated and away from flammable and explosive areas.

• The soil at the installation site shall be compacted to a certain degree. It is recommended that the relative compactness of the soil at the installation site be ≥ 98%. If the soil is loose, measures must be taken to ensure a stable foundation.

3.4.2.2 Foundation requirements

Warning

The integrated energy storage system is generally heavy, so a detailed investigation of the installation site conditions (mainly geological conditions and environmental climatic conditions, etc.) shall be conducted prior to foundation construction. Only on this basis can the design and construction of the foundation be started.

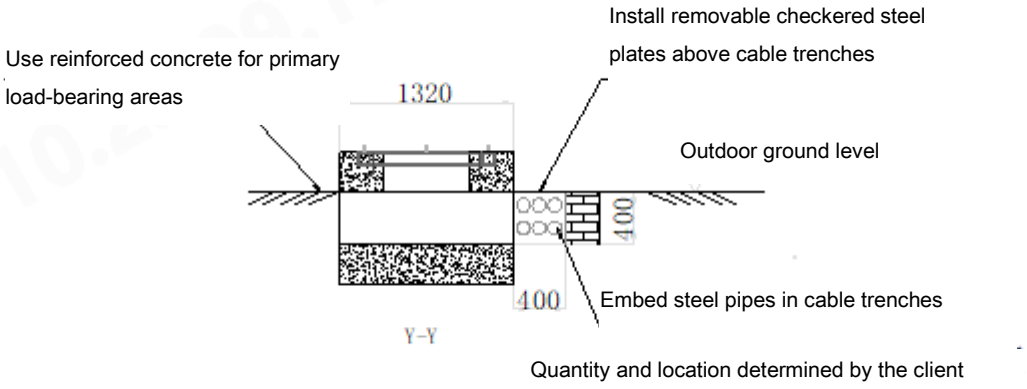


Fig. 3-2 Front View of Foundation Reference for Battery Cabinet Installation

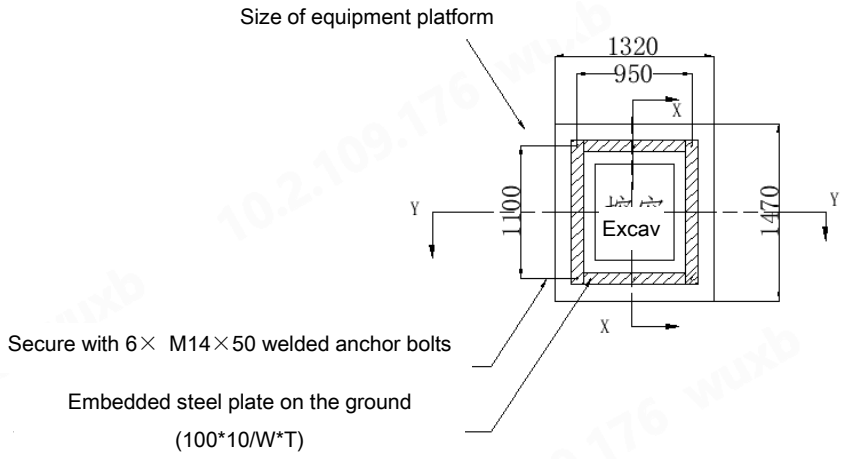


Fig. 3-3 Top View of Foundation Reference for Battery Cabinet Installation

• An unreasonable foundation construction plan may cause great difficulties or troubles to the placement, opening and closing of doors and subsequent operation of integrated energy storage system. Therefore, the installation foundation of integrated energy storage system must be designed and constructed in advance according to specific

standards, so as to meet the requirements of mechanical support, cable routing, subsequent maintenance and inspection, etc.

• The construction of foundation shall at least meet the following requirements:

• The bottom of the foundation pit must be compacted and filled.

• The foundation must be sufficient to provide effective load-bearing support for integrated energy storage system.

• The integrated energy storage system shall be raised to prevent rainwater from eroding the base and interior of the integrated energy storage system. It is recommended that the foundation be about 300 mm above the horizontal ground at the installation site.

• According to local geological conditions, appropriate drainage facilities shall be constructed.

• A cement foundation with sufficient cross-sectional area and height shall be constructed. The height of the foundation shall be determined by the construction contractor according to the site geological conditions.

• Cable routing shall be considered during foundation construction.

• The maintenance platform shall be built around the foundation to facilitate future maintenance.

• Sufficient space shall be reserved for AC/DC cable ducts during foundation construction, with pre-embedded conduits, based on the location and dimensions of the outdoor battery cabinet's cable entry/exit points.

• Specification and quantity of perforating tubes shall be determined based on the cable model and the number of incoming and outgoing lines.

• Both ends of all pre-buried pipes are temporarily sealed to prevent impurities from entering; otherwise, later wiring will be inconvenient.

• After connecting all cables, the cable entries and exits as well as the joints are sealed with refractory putty or other suitable material to prevent entry of rodents.

Install grounding units compliant with applicable national/regional standards.

3.4.2.3 Fixed installation

• After confirming that foundation construction meets the requirements and is dry, solid and flat enough, hoist the outdoor battery cabinet and PCS to the predetermined location.

• Fix the outdoor battery cabinet to the foundation with fastening bolts. After fixing, the U-shaped angle steel shall be subject to anti-rust treatment, such as spraying anti-rust paint, etc., and a fire extinguisher shall be placed next to the battery cabinet.

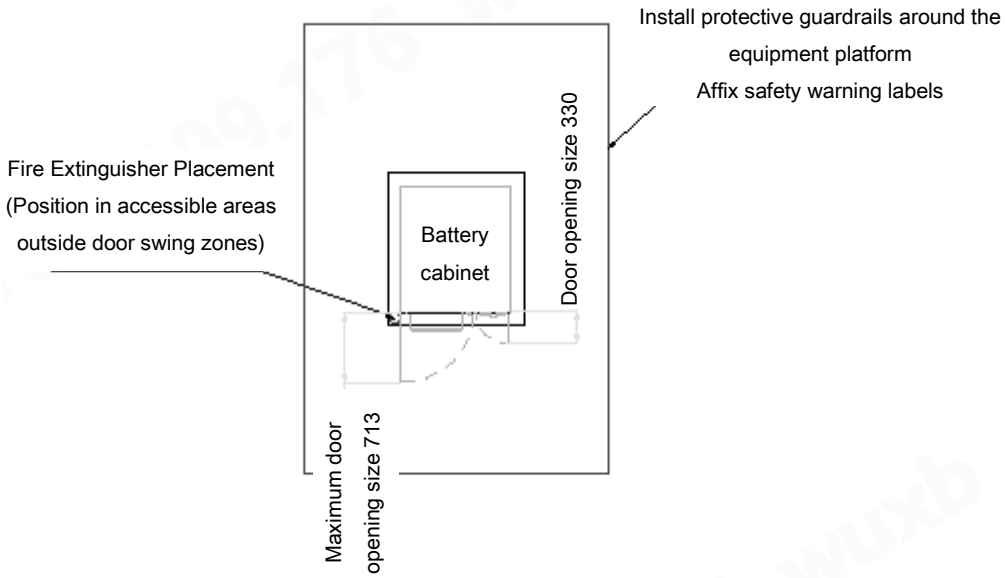


Fig. 3-4

3.4.3 Instructions for installation of cable between battery modules

3.4.3.1 Battery module

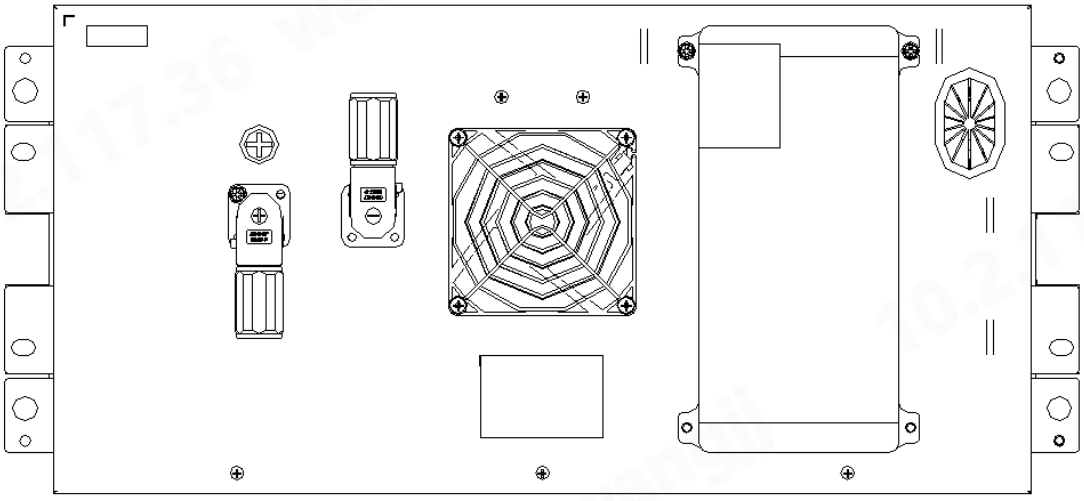
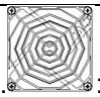


Fig. 3-5 Battery module

Notes:

1. ⊖: Battery Module: negative (-);
2. ⊕: Battery Module: positive (+);

3.  : DC Fan;

4.  : BMU (Battery Management Unit).

3.4.3.2 Battery module power connection instructions (check the cable label)

The connection between battery modules has been completed when the battery cabinet is shipped. If the customer still needs to maintain the connection between battery modules, please refer to the following:

Component specification:

Name	Description
Serial quick-plug	Quick-plug power cable between battery modules, black and
"B+, B-" power cable	Module 01 "B-" and HVB "B-" wiring, module 06 "B+" and HVB "B+" wiring
BMU acquisition	Cell acquisition and temperature acquisition
BMU cascade	BMU cascade CAN bus communication cable and power
BMU fan drive cable	BMU fan drive cable

Cable connection between battery modules:

Wear the insulating gloves and install the quick-plug power cable from the battery module at the lower left corner upwards in turn. HVB B - is connected to the sixth PACK negative electrode, the sixth PACK positive electrode is connected to the fifth PACK negative electrode, and so on, and the first PACK positive electrode is connected to HVB B+. The power circuit wiring is completed. Except that the two ends of the quick-plug power cable connected to the HVB are two black and two red quick-plug, the others are one black and one red plug.

The sequence of communication cascade cable is consistent with that of the PACK power cable; the suspended end of the communication socket of the sixth BMU needs to be connected to a terminal resistor.

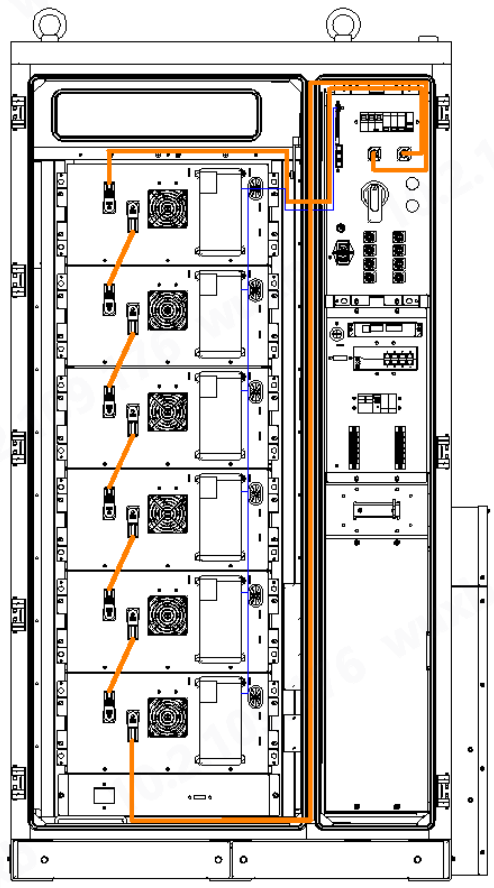


Fig. 3-6 Schematic diagram of single cabinet power cable and communication cable

3.5 Electrical connection

DANGER

Before installation, make sure that the circuit breaker switch on the HVB is closed

3.5.1 AC input connection

Step 1: Make sure the AC Switch is in the "OFF" position.

Note: the AC input is 220 VAC single-phase AC power, and it is necessary to confirm that it is non-live operation before wiring.

The over-voltage level of AC input is AC OVC II.

The AC input provides AC 220VAC power supply for the AC/DC power module of the air conditioner and HVB.

Step 2: Connect the L/N/PE wires of the mains single-phase 220VAC power cable to the corresponding terminal according to the markings in the figure below, and tighten them

with bolts (torque ≤ 2 N.M).

Note: The 3 terminals on the right side of the "INPUT" terminal are reserved AC input wiring terminals, which can be used for AC power transfer. The 2 sets of terminals at the "OUTPUT" terminal are used for internal wiring such as the AC power supply of the HVB and the air conditioner.

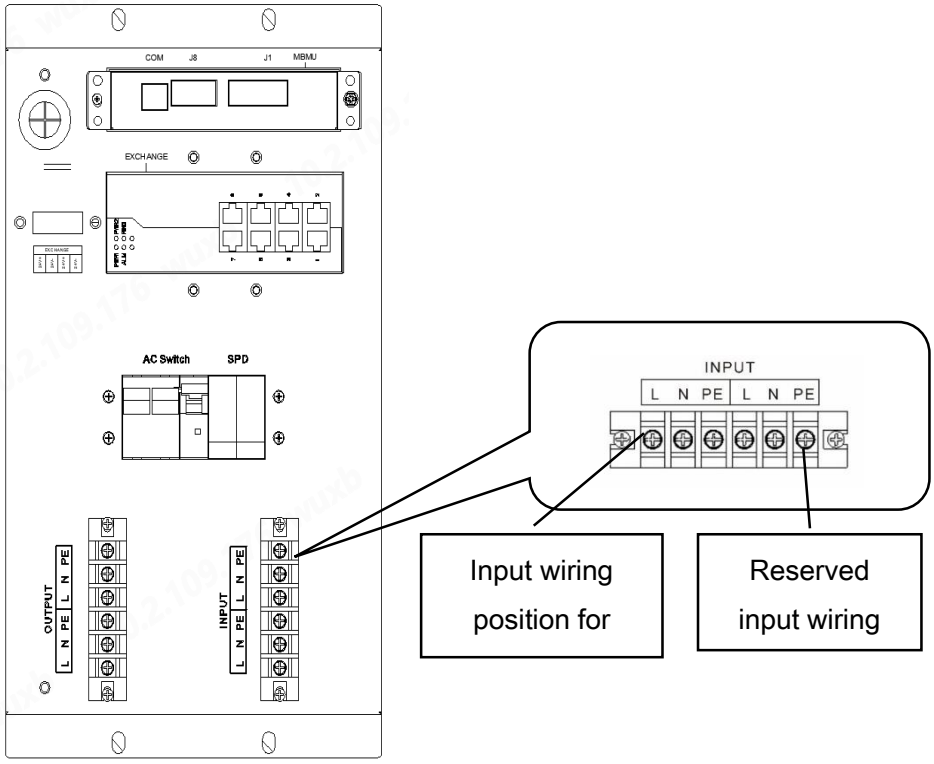


Fig. 3-7 Mains AC input connection

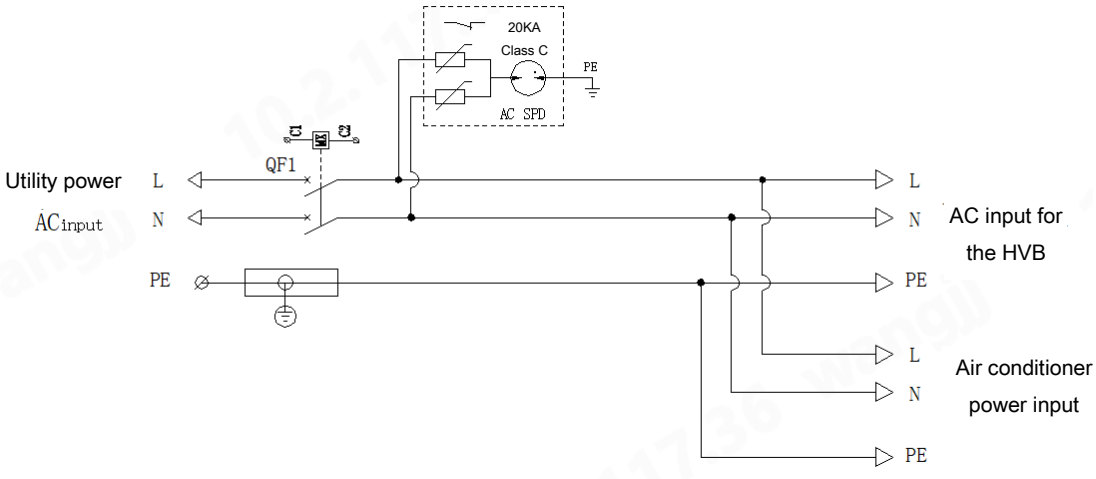


Fig. 3-8 Schematic diagram of AC power distribution

The specification of the air conditioner is as follows:

Item	Specification
Power supply	220VAC 50HZ
Refrigerating capacity	3000W
Heating capacity	2000W
Installation method	Door mounted, integrated with the chassis
Working environment range	-40℃~+55℃

3.6 Communication wiring description

1) Network communication interface wiring

The battery cabinet is equipped with an Ethernet lightning protector, which has been connected to the network port of the EMS controller. The user needs to connect to the cloud platform or the host monitoring system, and directly connect to the Ethernet lightning protector through the standard network cable;

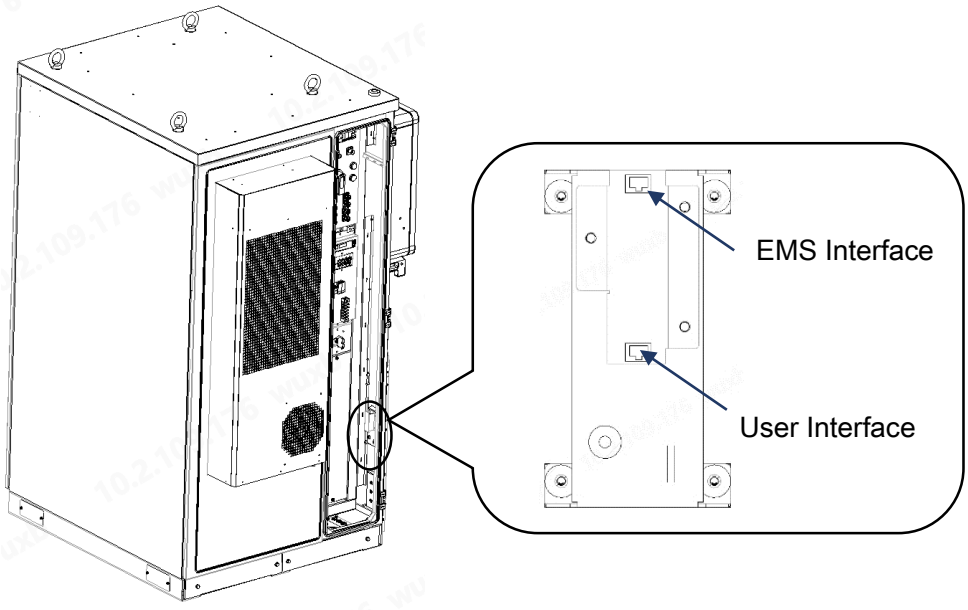


Fig. 3-9 Interface diagram of Ethernet lightning protector

2) PCS (KAC) communication wiring

Connect the four-core signal cable to the wiring bar at the bottom right of the battery cabinet, and connect the other end to the PCS communication interface as shown in the following figure.

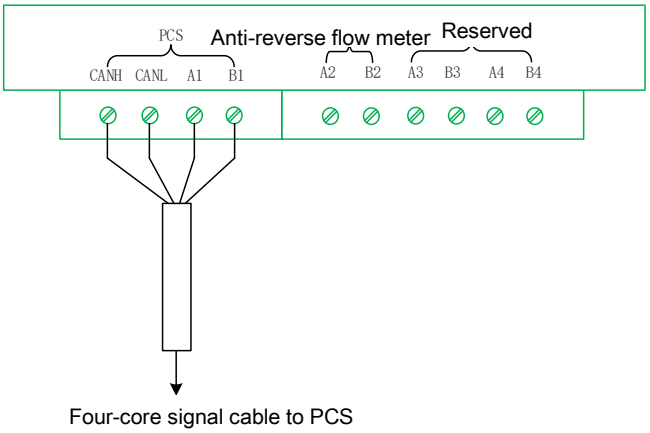


Fig. 3-10 PCS communication cable connection

3.7 EMS wiring diagram

As an energy management unit, EMS not only controls the working mode of the whole system, but also undertakes the function of human-computer interaction to facilitate users to view system information. The EMS has rich peripheral interfaces, in addition to some system communication interfaces, there are also interfaces for the AC main circuit tripping, EPO and smoke detection of the battery cabinet. Connect the Ethernet cable to the J6 network port, the Ethernet lightning protector network port to connect to the Kstar cloud platform KEMS.

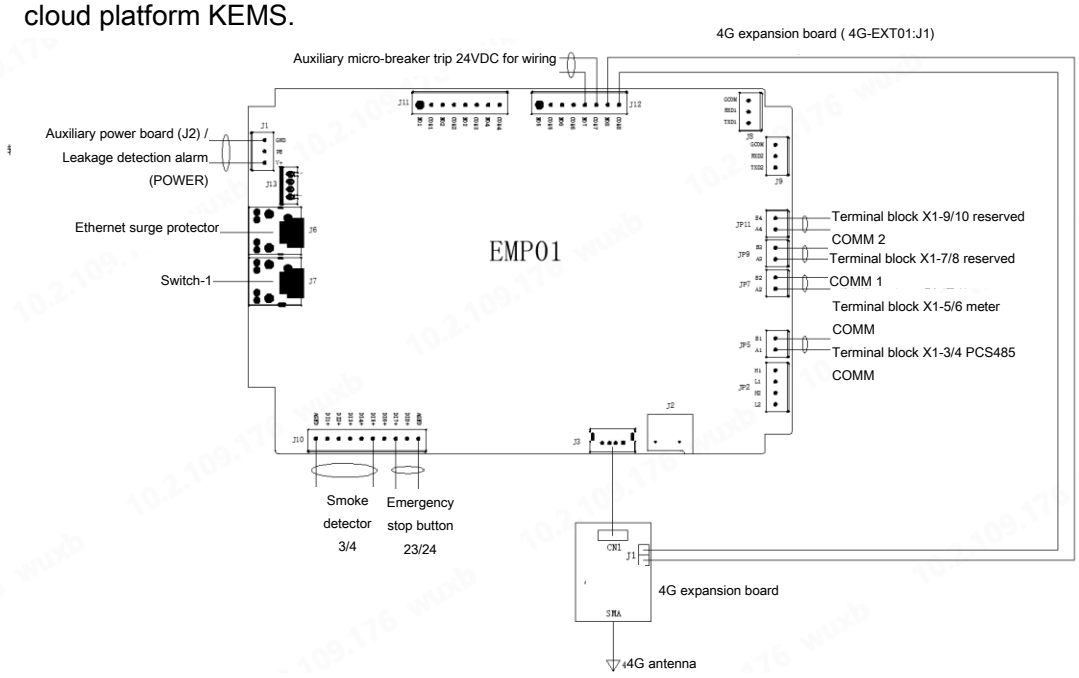


Fig. 3-11 Schematic diagram of EMS wiring

4 Operation instructions

4.1 Inspection after installation

DANGER

- Personnel responsible for installing and maintaining equipment must undergo rigorous training to fully understand safety precautions and master correct operational procedures.
- Only qualified professionals or trained personnel are permitted to install, operate, or maintain the equipment.

Inspection steps:

Step 1 Inspection of the fixing of the module box

● Check whether the battery module, HVB, and battery cabinet are all securely fixed:

Step 2 Inspection of power harness

● Check whether the power cables between battery modules and between battery module and HVB are firmly plugged in;

● Check whether the P+/P- quick-plug power cable is connected in reverse and whether the plug and socket are completely locked;

● Check whether the 220VAC mains input cable is connected in reverse, and whether the fastening bolts are missing, loose, or not torqued;

Step 3 Inspection of communication harness

● Check whether the communication power supply harnesses between battery modules, between battery module and HVB, between HVBs, between HVB and MBMU module, and between HVB and EMS are loose or missing;

● Check whether the power supply and communication harness between the PCS CAN communication harness and the MBMU module is loose or missing;

● Check whether the CAN communication harness of HVB outside the cabinet is correctly connected to the interface of HVB inside the cabinet, and whether it is loose or missing;

Step 4 Inspection of power supply, drive, and communication harnesses of the fire start box

● Check the power supply of the fire start box. At this time, the power indicator light of the fire start box should be in a steady or flashing state. If the battery indicator light fails to illuminate, please contact Shenzhen Kstar New Energy Co., Ltd.

● Check whether the fire start, power supply, feedback and other wiring harnesses are loose or missing;

If any abnormality is detected and cannot be recovered, please contact the customer service center of Shenzhen Kstar New Energy Co., Ltd.

4.2 Inspection of operating environment

Inspection of operating temperature The operating temperature of the battery cabinet: -30℃~50℃

Inspection of operating humidity The operating humidity of the battery cabinet: 5%~95%, no condensation

4.3 Power-on operation

4.3.1 Prerequisites

- Before powering on, please make sure that all post-installation check items have been completed.
- Before powering on, measure the input voltage of battery cabinet and make sure it is normal (between 342VDC and 432VDC).
- Before powering on, make sure all switches are in the off position.

4.3.2 Operation steps

- **If there is 220V AC mains input**

Step 1: Supply power to the 220VAC port of battery cabinet;

Step 2: Close the AC air switch in the cabinet: close the rocker switch next to the three-pin plug HVB;

Step 3: Turn the switch handle of the HVB battery cabinet to the "ON" position and confirm whether the green light of the indicator light is always on;

Step 4: Confirm whether the air conditioner is running;

Step 5: Check the EMS display on the front door battery cabinet to verify if the EMS display parameters are normal or if there is any fault;

----End

- **If there is no 220V AC mains input**

Step 1: Turn the DC switch of the HVB in the battery cabinet to the "ON" position;

Step 2: Turn the switch handle of the HVB in the battery cabinet to the "ON" position;

Step 3: Press the "DC START" button on the HVB battery cabinet. After starting up, the indicator light will be on. Press and hold the "DC START" button for 3-6 seconds. When

you hear the crisp closing sound of the high-voltage contactor in the HVB, you can release the button to achieve DC black start.

Step 4: Confirm that the green light of indicator light is always on;

Step 5: Close the rocker switch of the HVB; Power supply switching can be realized when there is main power;

Step 6: Check the EMS display on the front door battery cabinet to verify if the EMS display parameters are normal or if there is any fault;

Step 7: Close the "AC Switch" circuit close in the cabinet.

----End

After all the clusters in the energy storage battery cabinet have been successfully self-checked, the cluster DC contactor in the system is closed through the touch screen of the system or other system control tools. After the DC contactor is closed, check whether there is a system failure. After all battery clusters in the system are online, the high-voltage power-on operation of the system is completed.

4.4 Power-off operation

4.4.1 Power-off steps

Step 1: Confirm through the system's EMS whether the PCS is charging or discharging and whether the power is zero or set the PCS operating power to zero;

Step 2: Turn the switch handle on the HVB battery cabinet to the "OFF" position;

Step 3: Turn the DC switch on the HVB battery cabinet to the "OFF" position;

Step 4: Disconnect the rocker switch of "AC POWER" on HVB;

Step 5: Disconnect the "AC Switch" in the cabinet;

----End

4.4.2 Emergency power-off

Fig. 4-1 Emergency Stop Button

Press the emergency stop switch. The HVB breaker will be disconnected, the AC air circuit breaker will be tripped, and the battery system will be powered off.

4.5 Trial operation of battery cabinet

The battery cabinet exchanges energy with external systems through the PCS Precautions during trial operation are as follows:

Capacity calibration: Ensure that the battery can undergo a complete and normal charge and discharge cycle. If the rated capacity needs to be corrected, deep charge and discharge shall be carried out during the trial operation and joint commissioning. It is recommended to calibrate the capacity once during the trial operation, with the charge and discharge depth DOD=100%. The test shall be carried out according to the rated power of the product. The default process is "discharge + standing (2h) + fully charged", as detailed below:

- Discharge: battery cluster is discharged to SOC=0%.

- Standby: Standing for more than 2 hours (standing for SOC correction). When standing, there must be no charging discharge current, and there is no requirement for auxiliary power supply in HVB.
- Fully charged: After the resting time is up, a full charge test is performed, i.e. charging to SOC=100%.
- If not used for a long time (6 months), the battery storage battery should be recharged to over 50% SOC in time. Considering that the SOC may have accumulated errors caused by long-term shallow charging and discharging, it is recommended to shut down the SOC after full charging.

Operation stability: Power circuits, communications, data collection, and other components should be operated at rated power during debugging if conditions permit. It is used to determine whether there is any abnormality in all links of the system installation. Especially in the case of over-temperature, over-current, over-voltage, over-discharge, and other abnormal conditions, it should be handled in time to avoid potential safety hazards.

5 Routine maintenance

NOTICE

● All battery cabinet internal maintenance work shall be carried out with an insulating tool and by trained personnel. Devices behind the protective cover that can only be opened with tools are not user-maintainable devices. If maintenance is required, please consult Shenzhen Kstar New Energy Co., Ltd. for details.

● The battery cabinet shall be regularly maintained according to the following requirements, otherwise, the normal operation of the battery cabinet will be affected, and the normal service life of the battery cabinet will be reduced.

5.1 Maintenance

The battery system needs to be inspected regularly every month to observe whether there are abnormal warnings and the current cabinet status during this period.

● Observe whether there is current warning information of BMS in the EMS interface. If there is a warning, review all recent operations to determine whether it is reasonable.

● Check the historical data during this period to see if there is a serious fault. Mainly observe the battery history information of the whole cluster on the EMS interface and observe whether there is a false alarm or an irreducible warning. Refer to Table 5-1 for specific warning types.

● Regularly inspect and check the fire power indicator light. Replace the fire extinguisher's power battery promptly when it's running low. Don't impact the effect of consumer fire extinguishers.

● A dirty and blocked A/C condenser is the main cause of reduced cooling capacity. To keep the A/C working optimally, it's recommended that the condenser be cleaned every 6 months.

Table 5-1 Failure Warning Query Table

Failures	Description	Solutions to common failures (non-exhaustive)
Access control warning	The battery cabinet door status is monitored, and a warning will be issued if the door remains open for more than 2 minutes. If the door is closed but	1. Check if the access control mechanical travel switch is loose or malfunctioning. 2. Check if the normally open and normally closed wiring is correct. 3. Check the voltage at the interface

	the warning persists, further investigation is required.	of the HVB panel base to determine if there is a false trigger.
Water immersion warning	Check for false alarms and verify whether the cabinet is submerged in water	1. If the cabinet is soaked in water, drain water first. Once the water level line evaporates, the warning will reset. 2. In case of a false alarm, check the harness. 3. Measure the voltage at the HVB panel interface for further assessment.
Fire warning	Check for false alarms; Check if a fire is occurring.	1. In the event of a fire, first assess the situation in the cabinet to check for any signs of fire. If a fire is present, the cabinet is likely considered damaged beyond repair. If there is no fire or smoke, first check the integrity of the cabinet. If it is intact, clean the aerosol inside the cabinet first. The fire extinguisher that has been used must be replaced. 2. If it is a false alarm, check for any abnormalities in the harness. And measure the voltage at the HVB panel interface to ensure its normal after disconnecting the external harness.
Contactor failure or sticking	Sticking or inability to close	Use the upper computer to check if the contactor's drive is consistent with the feedback. If they are not consistent, the contactor is faulty. If there is drive, the auxiliary contact is disconnected; If there is no drive, the auxiliary contact is closed.

Cell overvoltage level 4	Cell voltage up to 3.8V, SOC at100%	The upper computer needs to contact the lock-in status and adjust the cell overvoltage parameter values accordingly for a full discharge. After recovery, restore the cell overvoltage parameter to its original value. Investigate the cause of overvoltage level 4.
Cell overvoltage levels 1, 2, and 3	Cell voltage between 3.6V and 3.8V, SOC at 100%	It can be restored using the system's forced release function.
Cell undervoltage level 4	The highest cell voltage is lower than 2.5V	The cell should be scrapped if the cell voltage is lower than 2.0V; For level 4 undervoltage (higher than 2.0V), the unlocking status must be released through the upper computer, and the parameter value should be modified accordingly. Restore the energy through the system's strong charging function. Restore the parameter values once the warning resets. Investigate the cause of the undervoltage.
Cell undervoltage levels 1, 2, and 3	Cell voltage between 2.5V and 3.0V	It can be restored using the system's strong charging function
Cell pressure difference warning in cluster	Pressure difference greater than 500mV	1. When the vehicle is running close to full load, it is normal for this to occur after the platform voltage is crossed. 2. As the electric cabinet is used over time, it gradually ages, and the internal resistance of the cell increases. This is more likely to occur during high-current charging and discharging. This is normal. As long as the cell voltage, temperature, and

		current remain within their respective normal ranges, the system operates as expected.
A large cell voltage jump in the battery system during idle time.	A voltage jump is greater than 10mV when the system is standing idle.	1. Check if he wiring is loose 2. Replace the corresponding BMU
Cell over-temperature warning	A situation of cell temperature ≥45℃	1. Check if the A/C is functioning normally. 2. Check if the ambient temperature is high. 3. Check if the BMU temperature sampling works wrongly 4. Check if NTC is faulty
Charging temperature is too low	The temperature of the cell is ≤ 0℃	1. Check if the A/C is heating normally 2. Check if the ambient temperature is too low 3. Check if the NTC acquisition is normal 4. Check if the BMU acquisition is normal 5. Check if the wiring is loose
The discharge temperature is too low	The temperature of the cell is ≤-25° C	1. Check if the A/C is heating normally 2. Check if the ambient temperature is too low 3. Check if the NTC acquisition is normal 4. Check if the BMU acquisition is normal 5. Check if the wiring is loose
PCS-BMS communication failures	Abnormal CAN communication	1. The PCS or BMS CAN communication is malfunctioning; The PCS has not been started, etc 2. Check if the harness has poor

		contact, is incorrectly connected, or is not connected at all
Parallel communication failures	SBMU-MBMU CAN communication	1. Insufficient or excessive terminal resistance 2. Check the harness for poor contact or any abnormalities 3. The board works abnormally, etc.
A/C communication failures	485 Communication	1. Check the harness 2. The A/C is not turned on 3. The board works abnormally 4. A/C failures, etc.
BMS communication failures	BMS-EMS Ethernet communication	1. Communication interruption and reconnection 2. Poor contact 3. PHY chip failures, etc.
Insulation failures	Insulation resistance <1KΩ/V	1. There is an electrical leak, and the sampling line or high-voltage side harness is in direct or indirect contact with the enclosure. 2. The board works abnormally.
Pre-charging failures	Pre-charging failure has occurred three times consecutively	1. The load capacitance is excessive 2. Load short circuit 3. The pre-charging circuit power device is damaged, etc 4. The board works abnormally
SPD lightning protection failures	Lightning protector warning is triggered	1.The normally open and normally closed terminals of the lightning arrester are reversed 2. The lightning arrester is damaged 3. The board works abnormally
Positive and negative terminal temperature failures	Pole temperature	1. Poor contact at the pole 2. Check if the board works normally 3. Poor harness contact, etc.
Excessive cell temperature	Temperature difference between cells ≥ 10 ℃	1. Check if the A/C is functioning properly, including whether

difference		cooling, heating, and air supply are normal in their respective states. 2. Check if he board sampling is abnormal

6 Accessories list

A single battery cabinet contains the following accessories (placed in the accessory box):

S/N	Name	Quantity	Use
Accessory 1	Fireproof mud	1 pack	Fill the through holes for the input and output of the battery cabinet.
Accessory 2	Base baffle	1 pack	Battery cabinet base baffle
Accessory 3	Desiccant	1 pack	Moisture proof
Accessory 4	Ground wire	1 piece	Connection of the battery cabinet to the ground copper bar
Accessory 5	User Manual	1 copy	User Manual
Accessory 6	Cable trunking	1 set	Cable trunking for PCS wiring connection
Accessory 7	Corrugated pipe	1 set	Corrugated pipe for PCS wiring connection

7 Terminology

1 Cell

Single cell.

2 Battery module

A combination of multiple cells connected in series, parallel, or series-parallel, with a single pair of positive and negative output terminals, used as a power source.

3 Battery Cluster

Multiple battery packs, a HVB and connecting cables form a complete battery cluster, capable of independently performing energy interaction and self-protection functions.

4 Battery Array

Multiple battery clusters form a battery array, which manages energy interaction of the clusters through a three-tier control architecture.

5 Battery Management System (BMS)

An electronic device that controls or manages the electrical or thermal performance of the battery system.

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 that includes the integration of battery modules or battery packs, battery management system, high-voltage circuits, and low-voltage circuits.

7 Battery Capacity

The size of the battery's energy storage capacity.

8 State of Charge (SOC)

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

9 State of Health (SOH)

The ratio of the battery's actual performance to its normal design specifications.