



User Manual

Energy Storage Battery

BS09-112-D-P

DC-side Energy Storage System

YCL-TF-F2004-SYSC215|V1.3.0.20260623

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- * Reverse engineering, hacking, or any other operations that compromise the original programming of the software developed by the manufacturer are prohibited.

Disclaimer

Our company shall not be liable for any personal injury, property damage, product damage, or consequential damages arising from or caused by any of the following circumstances:

- * Equipment damage caused by force majeure events such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, and voltage fluctuations;

- * Failure to use the product in accordance with the instructions in this manual;

- * The installation, operation, and storage environment does not comply with relevant international, national, or regional standards;

- * Unqualified personnel shall not be allowed to install, use, repair, dismantle, or otherwise operate the equipment;

- * Using unauthorized spare parts;

- * Unauthorized modification or technical changes to the product or software;

- * You made a mistake in shipping the goods yourself or through a third party;

- * The materials and tools you provided yourself do not meet international, national, or regional standards;

- * Damage caused by your own or a third party's negligence, intentional misconduct, fault, or improper operation.

1. Safety Precautions

1.1 Safety precautions

Read all safety instructions carefully before performing any work and follow them when handling batteries.

Incorrect operation may result in:

- Injury or death of the operator or third party;
- Damage to system hardware.

Skills of qualified personnel:

- Training in electrical system installation and commissioning and hazard handling;
- Understand this manual and other related documents;
- Know your local regulations and directives.

1.2 Personnel requirements

The lifting, loading, transportation, installation, wiring, operation, and maintenance of energy storage systems must be performed by qualified electrical technicians or other professionals. These qualified technicians should meet the following requirements:

- Operators should be thoroughly familiar with the structure and operating principles of the entire energy storage system;
- Operators should be thoroughly familiar with this Manual;
- Operators should be thoroughly familiar with the relevant standards of the country/region where the project is located;
- Operators should be able to respond quickly to hazards or emergencies that occur during construction and installation.

1.3 Electrical safety



- Never touch terminals or conductors connected to the power grid, as this could cause electric shock; all circuit connectors must be disconnected during maintenance;
- Both batteries and the power grid can generate voltage; you must use a standard voltmeter to ensure there is no voltage before touching them;
- Working on live wires is strictly prohibited; doing so could result in fire or personal injury.



- The product contains a fatal voltage!
- There is a fatal high voltage between the positive and negative electrodes of the energy storage battery pack;
- Damaged equipment or system malfunctions can cause electric shock and fire;
- When maintaining the equipment, ensure that the connection between the energy storage

converter and the energy storage battery pack is completely disconnected;

- Pay attention to and follow the warning labels on the product;
- Comply with all safety precautions listed in this manual and other relevant documents;
- Comply with the requirements and precautions for the use and protection of lithium batteries;
- You can only operate the equipment after confirming that it is in a safe condition.

 Warning

- All installation, wiring, operation, and maintenance must comply with the relevant laws and regulations of the equipment installation location and the project site;

- This product must be used in accordance with the instructions in this manual; otherwise, it may result in personal injury or equipment damage.

 Notice

- Avoid unnecessary contact with the circuit board;
- Comply with electrostatic discharge (ESD) protection guidelines, such as wearing anti-static wrist straps.

 Instruction

- Set up warning signs or safety warning tape near the operating area;
- After maintenance or repair operations are completed, be sure to remove the cabinet key and keep it safe.

1.4 Environmental safety

 Danger

- Do not place the equipment in flammable, explosive, or dusty environments, as this may cause fire or explosion hazards.

 Danger

- Do not place flammable or explosive materials around the battery pack;
- Do not block or occupy escape routes with clutter or in any other manner.

 Notice

- Do not use the product in environments exceeding the specified temperature range;
- Do not use the product in environments exceeding the specified humidity levels;
- Do not use the product at altitudes exceeding the specified limits.

1.5 Mechanical safety



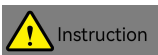
- When working at heights, safety helmets and other safety equipment must be worn and secured to sturdy structural members to prevent falls;
- Before installation, ensure the equipment is securely fixed to prevent it from tipping over and injuring people or damaging the equipment.



- When using a forklift, ensure the forks are in the center position before lifting to prevent tipping;
- Before moving, secure the equipment to the forklift with ropes. During movement, assign a dedicated person to supervise;
- Lifting personnel must complete and pass relevant training before being allowed to perform the work;
- Place warning signs and barriers to isolate the lifting area;
- The lifting conditions must meet the operational requirements;
- Do not allow personnel to walk underneath during lifting operations;
- During lifting operations, ensure the angle of the lifting cables is less than 90° .



- Prepare for load-bearing before moving heavy objects;
- When multiple people are involved in moving, distribute the load evenly to ensure balanced weight distribution;
- Wear protective gloves, safety shoes, and other safety gear when moving heavy objects;
- When working at heights, wooden ladders or insulated ladders should be used; straight ladders are prohibited;
- When using a ladder, it must be placed on a stable surface, and someone must hold the ladder while working.



- Scratches that occur during transportation and installation must be repaired promptly, and scratched areas must not be exposed for extended periods;
- Unauthorized welding, cutting, or other operations on the equipment are prohibited;
- Use the correct basis and master the correct way to use the tools.

1.6 Operation and maintenance



- The equipment contains high voltage, accidental contact could result in a fatal electric shock hazard;
- When performing live measurements, proper protective measures should be taken (such as

wearing insulating gloves and insulating shoes);

- High-voltage work should be carried out by two people to ensure personal safety.



- Users must not perform battery maintenance without prior instruction. Do not perform any maintenance other than those described in this manual, as this may damage the battery;
- Disassembling or repairing the battery may cause it to catch fire. Replacing internal parts must be performed by a qualified professional;
- Do not spray paint on the internal or external parts of the product;
- Do not use cleaning agents or products to clean this product or expose it to harsh chemicals.



When performing electrical measurements, connections, and trial runs on equipment:

- Select high-quality measuring equipment whose range and operating conditions meet the requirements of the site;
- Ensure that the measuring equipment is connected and used correctly and in accordance with regulations to avoid dangers such as electric arcs.

1.7 Battery safety

Before installing or using the battery, please read the user manual carefully and follow all instructions or warnings in the document. Otherwise, it may result in electric shock, serious injury or death, or damage the battery and render it unusable.

The battery needs to be charged within 48 hours after being fully discharged, otherwise it will cause the battery capacity to degrade or be irreversibly damaged; if the battery needs to be stored for a long time, it should be charged at least once every 6 months.

- Do not store batteries with flammable or explosive materials;
- Do not connect the battery directly to the solar cable;
- Do not put any foreign objects inside the battery compartment;
- Do not use our batteries with other batteries, including but not limited to batteries of other brands or capacities;
- Handle or process with care to prevent battery damage, dropping, or leakage;

Please refer to this manual for battery use and maintenance.

1.8 Product disposal



- When a product needs to be disposed of, it should not be treated as regular waste. Some parts can be recycled, while others may cause environmental pollution;
- Our company has priority in recycling end-of-life batteries;
- For used batteries that are not recycled by our company, please contact your local authorized professional recycling organization or manufacturer for disposal.

Note: This manual may not cover all possible situations during operation, maintenance, and repair. If you encounter circumstances not explained in the manual, please follow the relevant local regulations and standards and contact our company promptly.

About The Manual

This manual provides information on the transportation and storage, mechanical installation, electrical connections, start-up and shutdown operations, troubleshooting, and maintenance of battery energy storage systems. Before transporting, storing, installing, operating, using, or/and maintaining the equipment, please read this manual first, strictly follow its contents, and adhere to all safety precautions indicated on the equipment and in this manual. In this manual, "equipment" refers to the products, software, components, spare parts, and/or services related to this manual; "our company" refers to the manufacturer (producer), seller, or service provider of the equipment; and "you" refers to the entity responsible for transporting, storing, installing, operating, using, and/or maintaining the equipment.

This document applies to the following product models of our company:

BS09-112-D-P

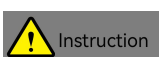
※Unless otherwise specified, in this manual, the terms "system" and "energy storage system" refer to this particular product model.

How To Use This Manual

Please read this manual carefully before using the product and keep it in an easily accessible place. To provide the best customer experience, the content of this manual may be updated and revised, therefore some errors or slight discrepancies with actual conditions may exist. We will not notify you of any changes in information. Please obtain the latest manual from your sales channels.

Symbol explanation is to ensure user safety and property security while using this product, and to ensure optimal and effective product use, this manual provides users with the following safety information highlighted by the symbols below.

The following symbols may appear in this manual to highlight information; their meanings are as follows:

	This indicates a dangerous situation. Failure to take action could result in a high-risk situation such as death or serious injury.
	This indicates a potential for damage or injury. Failure to take precautions could result in a medium-level risk, such as serious personal injury or damage.
	This indicates a potential for damage or injury. Failure to take precautions may result in minor or moderate injury or loss.
	This indicates a potential for equipment damage or property loss. Failure to take precautions may result in equipment damage, data loss, performance degradation, or other unforeseen consequences.

This product is designed as an integrated system and must be operated by trained and qualified personnel, including but not limited to:

- * Technical Support Engineer
- * Installation Engineer
- * Commissioning Engineer
- * Electrical Engineer
- * Maintenance Engineer

Operators should be familiar with the characteristics and safety requirements of lithium batteries. If you are unsure whether you possess the necessary skills to complete this integration, please do not use this product.

2. Product Introduction

2.1 Energy storage system introduction

The **BS09-112-D-P** is an energy storage battery system product independently developed and manufactured by our company. When paired with an energy storage inverter, it can provide reliable power to various devices and systems. The device consists of an integrated outdoor cabinet, which can accommodate various inverter models for hanging on the outside. It features rapid deployment and wide applicability.

The system consists of high-density, high-safety lithium iron phosphate battery cells connected in series. It includes battery storage units, a power distribution system, a battery management system, a thermal management system, and a fire suppression system. It features high safety, high reliability, rapid deployment, and intelligent management, and can be widely applied in various scenarios.

- The battery storage unit is responsible for storing electrical energy;
- The power distribution system is responsible for supplying power to the equipment inside the cabinet;
- The battery management system is responsible for monitoring and managing battery voltage, current, temperature, etc;
- The thermal management system is responsible for managing the equipment temperature;
- The fire suppression system is responsible for detecting abnormal temperatures and smoke inside the cabinet and suppressing initial fires;

2.2 Product appearance

2.2.1 Product dimensions

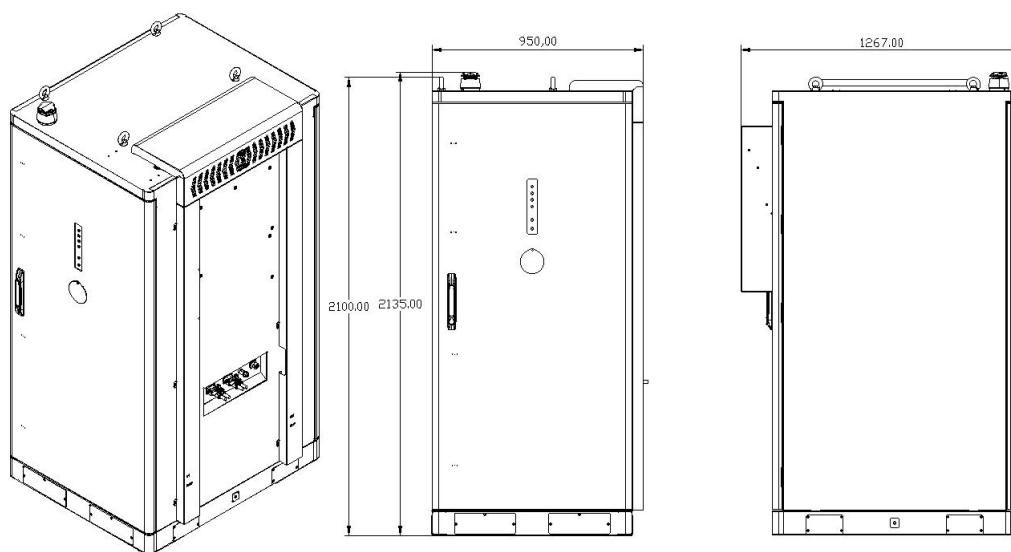


Figure 2.2.1 Product Dimensions

2.2.2 Rack appearance

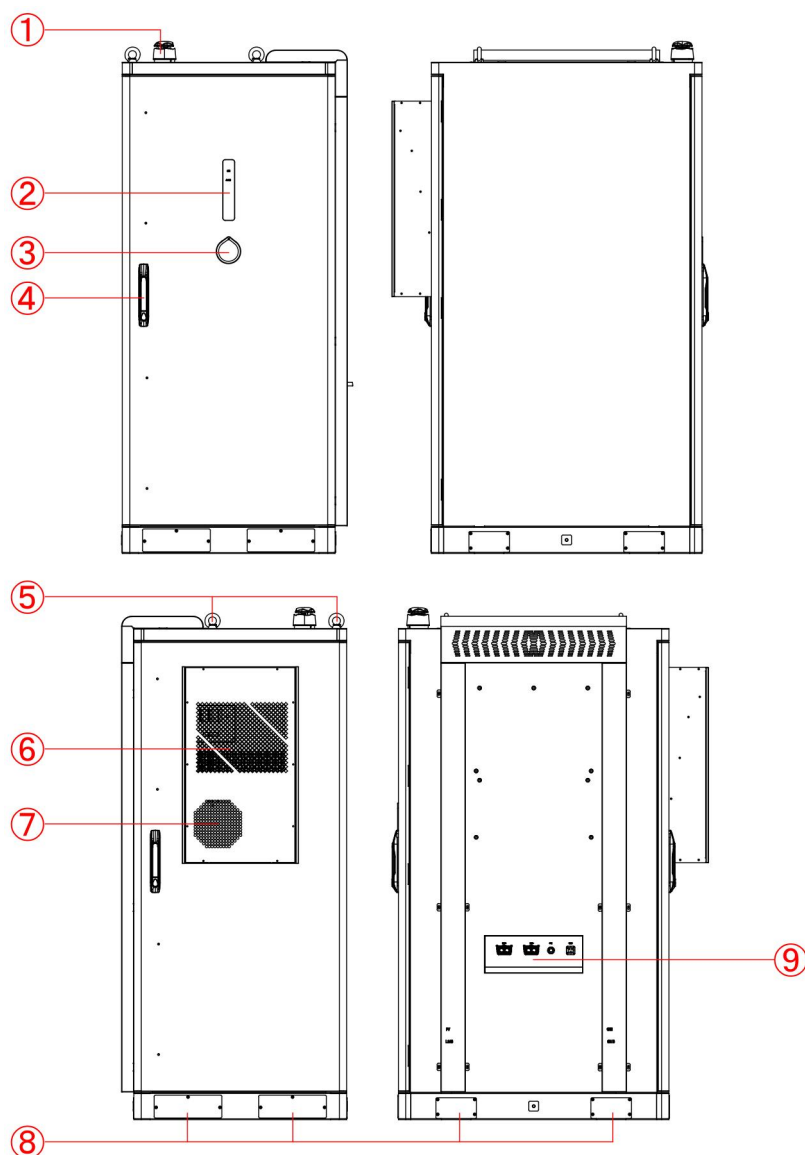


Figure 2.2.2 Rack appearance

Table 2.2.2 Rack appearance

No.	Name	Explanation
1	Audible and visual alarm	After the fire alarm is triggered, a red light alarm and a buzzer sound will be emitted.
2	Indicator light panel	Status indicator lights and power indicator lights: green light indicates operation, red light indicates alarm.
3	Emergency stop switch	Press the "Stop System" button when the equipment malfunctions.
4	Door switch	Insert key to open/close door
5	Lifting rings	Transfer and hoisting position
6	Air conditioner vent	The hot air from the air conditioner is expelled here.
7	Air conditioning air inlet	Outdoor air enters the air conditioner from here.
8	Forklift	Transfer forklift position
9	Cable interface	Cable interface connected to the inverter

2.3 Air conditioning design

The system has a built-in air conditioning system, which uses air-cooled air conditioning to maintain a constant temperature during operation.

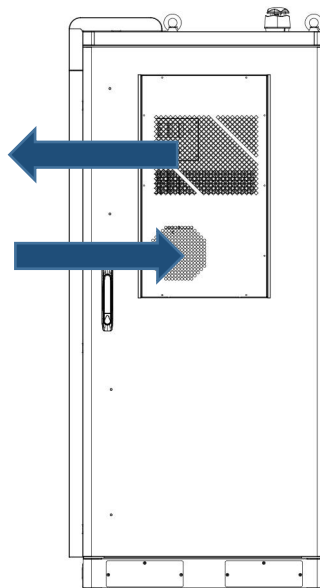


Figure 2.3Air Conditioning Design

Table 2.3 Air conditioning parameters

No.	Item	Unit	Data	
1	Power supply system	—	1/PE AC 230V 50Hz	1/PE AC 230V 60Hz
2	Rated power (cooling/heating)	kW	1.0/1.2	1.3/1.3
3	Rated current (cooling/heating)	A	4.6/5.3	5.7/5.6
4	Rated cooling capacity	kW	2.0	2.0
5	Heating power	kW	1.0	
6	Maximum operating current	A	7.0	
7	Internal fan air volume	m³/h	800	
8	outdoor fan air volume	m³/h	900	

9	Temperature control range	°C	20~50
10	Humidity control	——	Yes
11	Operating ambient temperature	°C	-40~50
12	Do the components comply with RoHS?	——	Yes
13	Refrigerant	——	R134a
14	Controller Type	——	Button digital controller
15	Equipment exterior color	——	RAL7035 Small wrinkles
16	Noise	dB (A)	72
17	Power connection method	——	Terminal blocks
18	Condensate treatment methods	——	The water collects in a drip tray and is discharged through a drain pipe.
19	Installation method		Wall-mounted installation
20	IP rating	——	Inner and outer sides IP55
21	External dimensions	mm	483×220×833
22	Net weight	kg	Approximately 38
23	Special requirements	——	Inner side with lower return air and upper outlet air

2.4 Internal design

2.4.1 Internal design

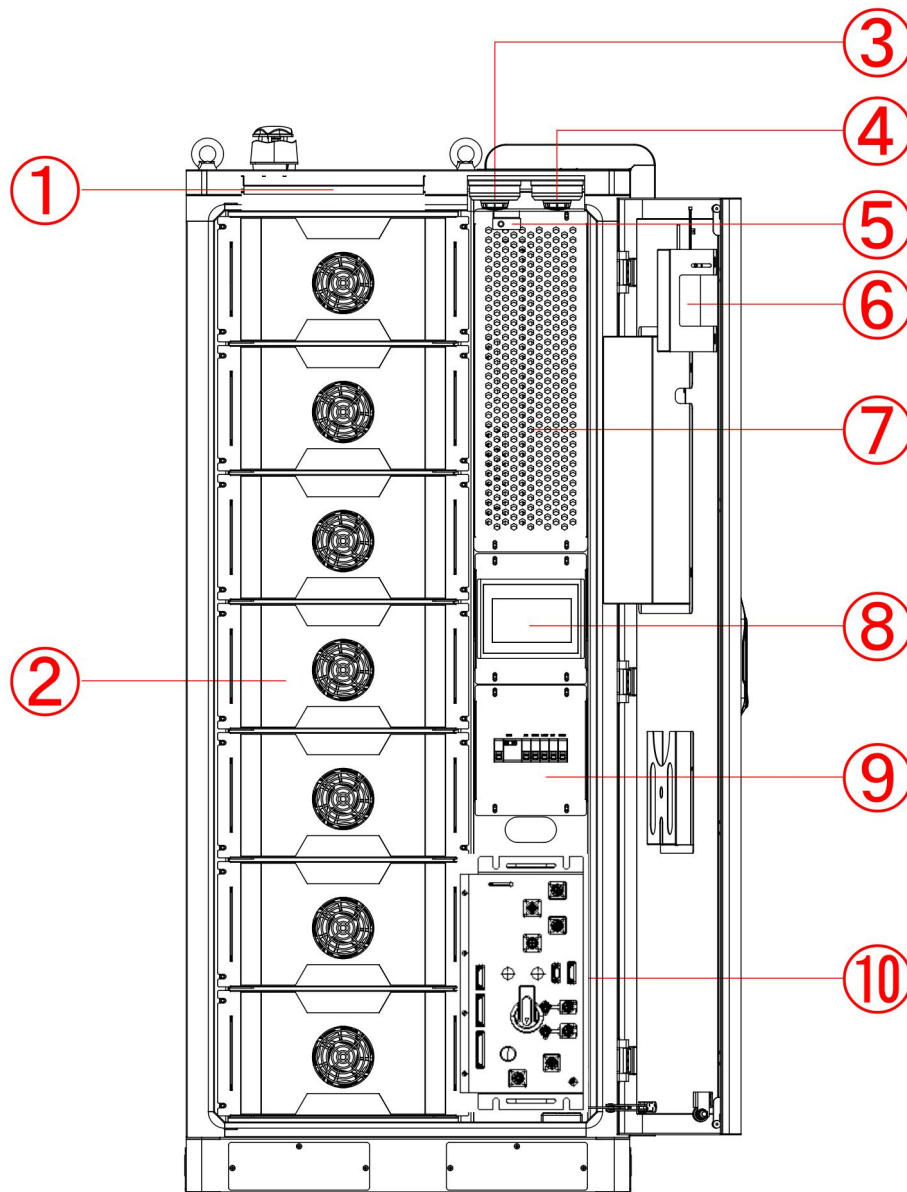


Figure 2.4.1 Internal Design

Table 2.4.1 Internal Design

No.	Name	Explanation
1	Lighting	Provide cabinet lighting
2	Battery pack	DC-side battery pack
3	Temperature detector	The temperature inside the cabinet was detected, and an over-temperature alarm was triggered.
4	Smoke detector	Smoke detection inside the cabinet triggered a smoke alarm.
5	Limit switch	Check if the system cabinet is closed.
6	Aerosol suppressor	When a fire is detected in the system, aerosol is released to extinguish the fire.
7	Return air duct	Air conditioning internal circulation duct, recovering hot air
8	HMI display	System information display
9	Distribution switch	Controlling power on and off
10	Energy storage cluster control box	Battery system primary circuit control box

2.4.2 Battery design

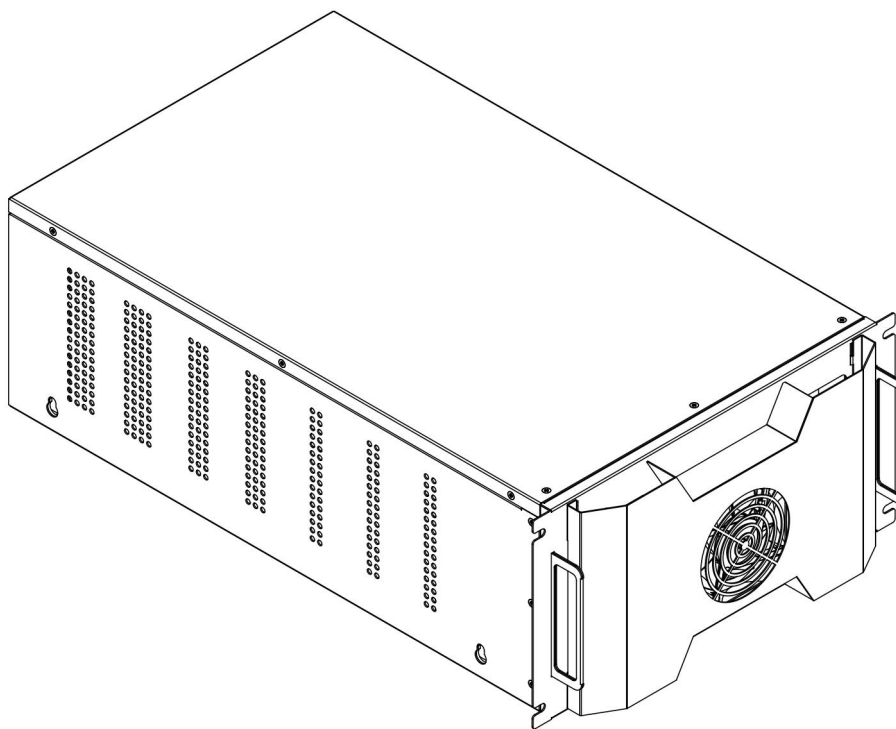


Figure 2.4.2 Battery Pack

Table 2.4.2 Battery Pack

Battery Type	LiFePO ₄
Voltage	51.2Vdc
Nominal Capacity	314Ah
Nominal Energy	16.076kwh
Charge/Discharge Current	157A
Charging Temperature Range	0~55°C
Discharging Temperature Range	-20~55°C
Storage Temperature	0~35°C
IP Rating	IP20
Dimension(W*D*H)	490*77*245mm
Weight	117kg

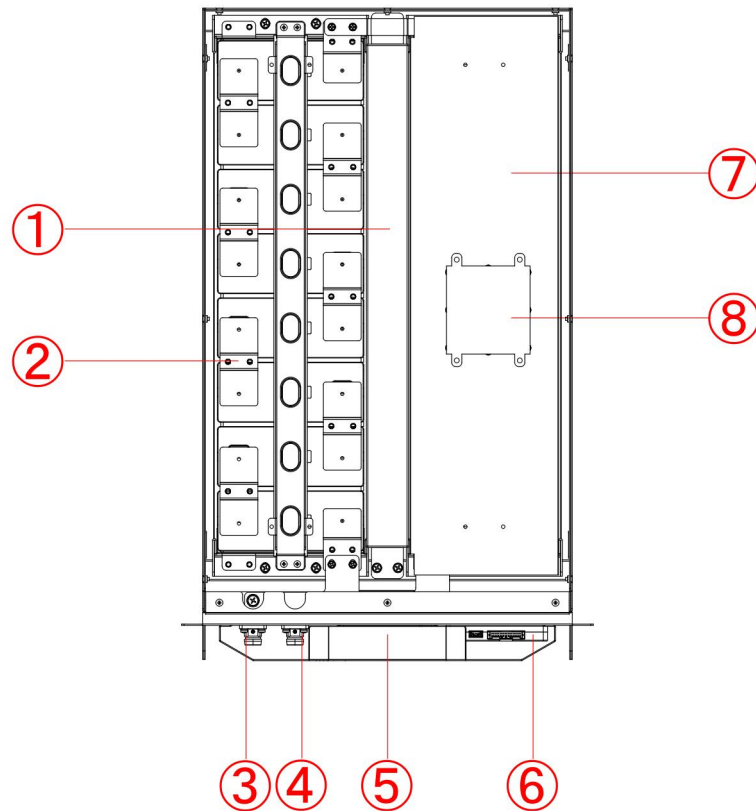


Figure 2.4.2 Battery Pack Design

Table 2.4.2 Battery Pack Design

No.	Name	Explanation
1	Heat dissipation airflow	Controlling heat dissipation flow to ensure consistent temperature
2	Connection sampling	Battery series connection and battery sampling module
3	Battery pack positive terminal	The temperature inside the cabinet was detected, and an over-temperature alarm was triggered.
4	Battery pack negative terminal	Smoke detection inside the cabinet triggered a smoke alarm.
5	Fan	Promote air circulation
6	BMU system	Battery monitoring
7	Battery module	Energy storage and output
8	Aerosol module	Battery pack temperature detection and fire control (optional)

2.4.3 Battery pack fan

The battery pack cooling fans are configured on a per-cell basis and can be independently controlled by the battery management main control unit (BMS) to start and stop on a per-cell basis. The BMS can automatically control the fan start and stop based on the collected cell temperatures. By default, when the BMS detects a single cell temperature higher than 28 degrees Celsius, the fan in the corresponding cell cluster is activated; when the temperature of the entire cell cluster is lower than 25 degrees Celsius, the fans are turned off.

Fan parameters:

Table 2.4.3 Fan parameters

Item	Remarks
Rated voltage	DC24V
Operating voltage	DC 21.6V-26.4V
Start-up voltage	≤ DC 12V(ON/OFF)
Operating current	110mA±10%
Noise	28.0dB

Battery box fan control strategy:

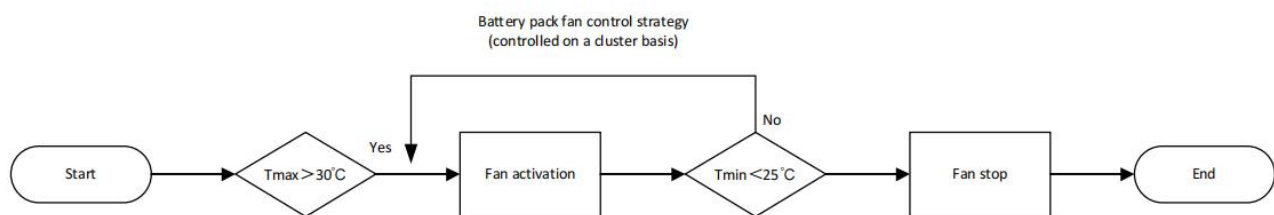


Figure 2.4.3 Battery pack fan control logic

2.4.4 Power distribution unit

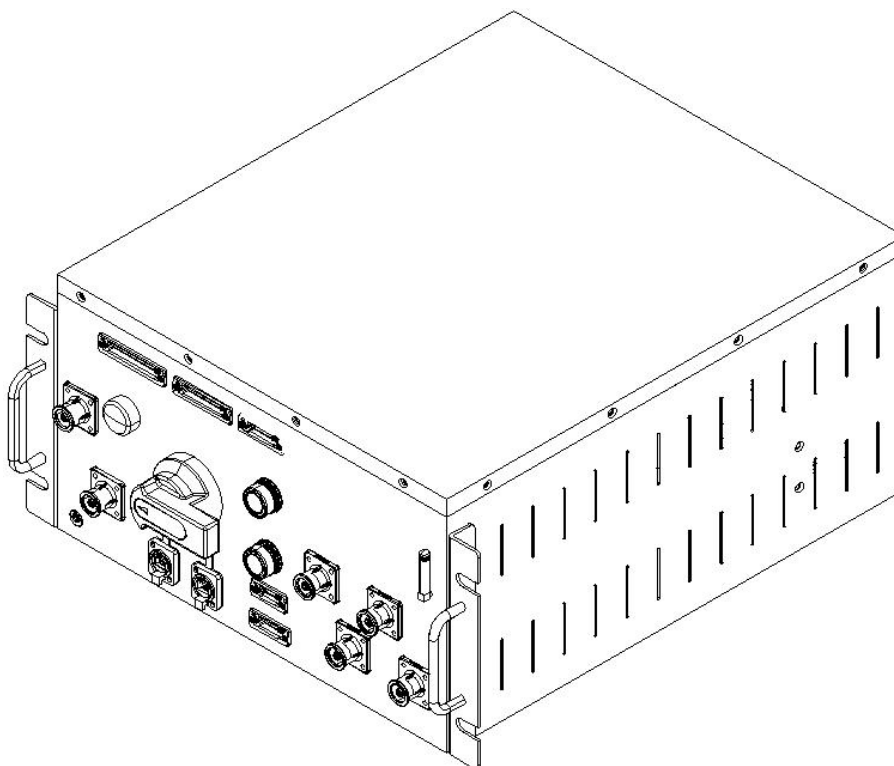


Figure 2.4.4 PDU

Table 2.4.4 PDU

Operating Voltage	80~1000Vdc
Maximum Charge/Discharge Current	200A
Operating Temperature	-20~60°C
IP Rating	IP20
Dimension(W*D*H)	504*557*245mm

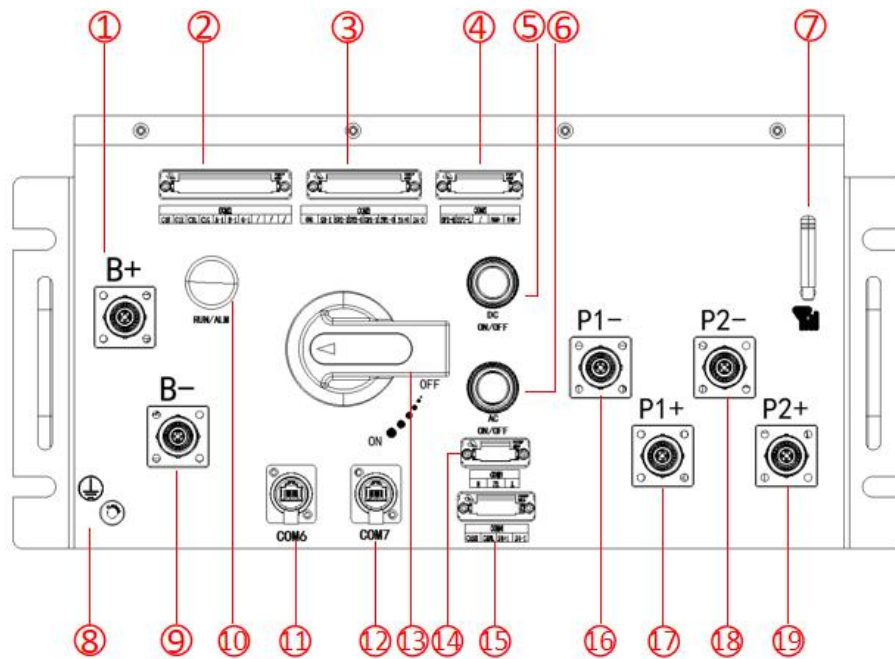


Figure 2.4.4 PDU Description

Table 2.4.4 PDU Description

No.	Name	Explanation
1	B +	Battery cluster positive terminal connection position
2	COM2	Used for communication with external devices such as PCS
3	COM3	Dry contact signal usage
4	COM5	Battery pack communication interface; Battery pack 24V power supply interface
5	DC ON/OFF	Internal DC/DC start switch
6	AC ON/OFF	Internal 24V start switch
7	Antenna	WiFi antenna interface
8	Grounding Point	PDU grounding point
9	B -	Battery cluster negative terminal connection position
10	Dual-color Indicator Light	Battery operation fault indicator light
11	COM6	Reserved RJ45 parallel interface (input)
12	COM7	Reserved RJ45 parallel interface (output)
13	Breaker	Manually control the connection between the battery pack and the external environment.
14	COM1	220V power input interface
15	COM4	BMS Upgrade Interface
16	P1 -	PCS negative terminal connection position (P1 and P2 are at the same point)
17	P1 +	PCS positive terminal connection position
18	P2 -	PCS Negative Connection Position
19	P2 +	PCS positive terminal connection position

Communication port definition:

Table 2.4.4 Communication Port Definitions

NO.	I/O	COM port	Definition	Explanation
1	I	COM1 (3P)	AC220V-N	External input 220V power supply neutral wire
2	/		AC220V-PE	External input 220V power ground wire
3	I		AC220V-L	External input 220V power live wire
1	I/O	COM2 (10P)	CAN1R	Termination resistor
2	I/O		CAN1H	Isolate CAN, communicate with PCS interface or connect to external devices.
3	I/O		CAN1L	
4	I/O		CAN1G	
5	I/O		RS485-A1	Isolated 485, communicating with I/O modules, interface or connecting to external devices.
6	I/O		RS485-B1	
7	I/O		RS485-G1	
8	I/O		RS485-A0	Non-isolated 485, communication interface with display screen or connection to external devices.
9	I/O		RS485-B0	
10	I/O		RS485-G0	
1	O	COM3 (8P)	GND	Switch quantity detection short circuit effective
2	O		SWITCH_IN	
3	/		SW2_IN	Dry contact 2 (0.1A)
4	I/O		SW2_OUT	
5	I/O		SW1_IN	Dry contact 1 (0.1A)
6	/		SW1_OUT	
7	O		24V+_OUT	Output 24V + (rated 75W)
8	O		24V-_OUT	Output 24V - (rated 75W)
1	I/O	COM4 (4P)	DEBUG_CANH	Debugging CANH on the host computer
2	I/O		DEBUG_CANL	Debugging CANL on the host computer
3	I		24V+_IN	External DC input24V +
4	I		24V-_IN	External DC input24V -
1	I/O	COM5 (5P)	SPI-H	BMU intranet daisy chain communication H
2	I/O		SPI-L	BMU intranet daisy chain communication L
3	/		/	/
4	O		FAN+	Fan power supply AC output 24V +
5	O		FAN-	Fan power supply AC output 24V -
1	I/O	COM6 (8P)	DEBUG_CANH	Debugging CANH on the host computer
2	I/O		DEBUG_CANL	Debugging CANL on the host

				computer
3	/		GND	/
4	I/O		CAN1H	Isolate CAN, communicate with PCS interface or connect to external devices.
5	I/O		CAN1L	
6	I		COM_DI	Parallel input signal
7	I/O		RS485-A1	Isolated 485, communicating with I/O modules, interface or connecting to external devices.
8	I/O		RS485-B1	
1	I/O	COM7 (8P)	DEBUG_CANH	Debugging CANH on the host computer
2	I/O		DEBUG_CANL	Debugging CANL on the host computer
3	/		GND	/
4	I/O		CAN1H	Isolate CAN, communicate with PCS interface or connect to external devices.
5	I/O	COM7 (8P)	CAN1L	
6	O		COM_DI	Parallel output signal
7	I/O		RS485-A1	Isolated 485, communicating with I/O modules, interface or connecting to external devices.
8	I/O		RS485-B1	

2.4.5 Indicator lights

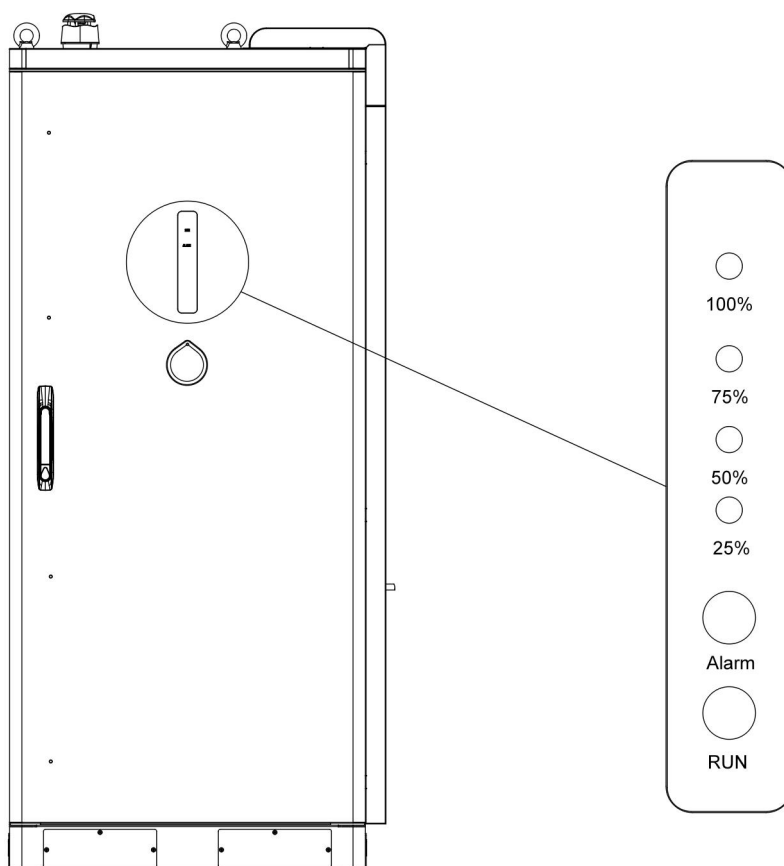


Figure 2.4.5 Cabinet indicator lights

Operation indicator light: A green light indicates that the battery is running.

Alarm indicator light: A red light indicates that the battery is issuing a fault alarm.

SOC indicator light: The corresponding number of green SOC lights will illuminate according to the battery's SOC value.

The following is a level 2 alarm fault: the cabinet alarm red light is on and the operation indicator light is off.

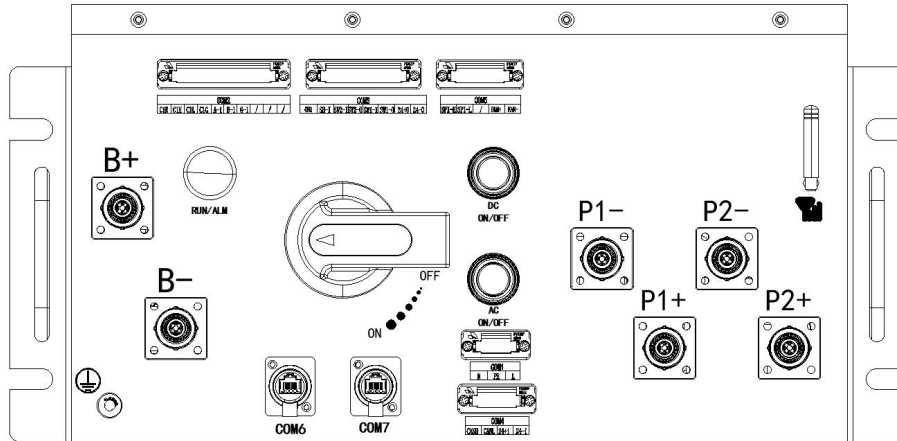


Figure 2.4.5 PDU indicator light

The PDU indicator light is a dual-color indicator. A solid green light indicates normal system operation, while a red light indicates an alarm from the PDU.

The following are level 2 alarm faults: the rack alarm red light is on, and the PDU alarm indicator red light is on.

Table 2.4.5 Level 2 fault information

1	System Failure	11	Overcurrent Discharge Fault
2	Emergency Stop Triggered	12	Overcurrent Charging Fault
3	Low Total Battery Voltage Fault	13	Intranet Communication Failure
4	High Total Battery Voltage Fault	14	Precharge Failure
5	Low Cell Voltage Fault	15	Relay Fault
6	High Cell Voltage Fault	16	Insulation Test Fault
7	Differential Pressure Fault	17	Abnormal Temperature Reading Inside Cabinet
8	Individual High Temperature Failure	18	Abnormal Smoke Detection Inside Cabinet
9	Individual Low Temperature Failure	19	Fire Sprinkler
10	Temperature Difference Fault		

2.4.6 Display screen

Front page

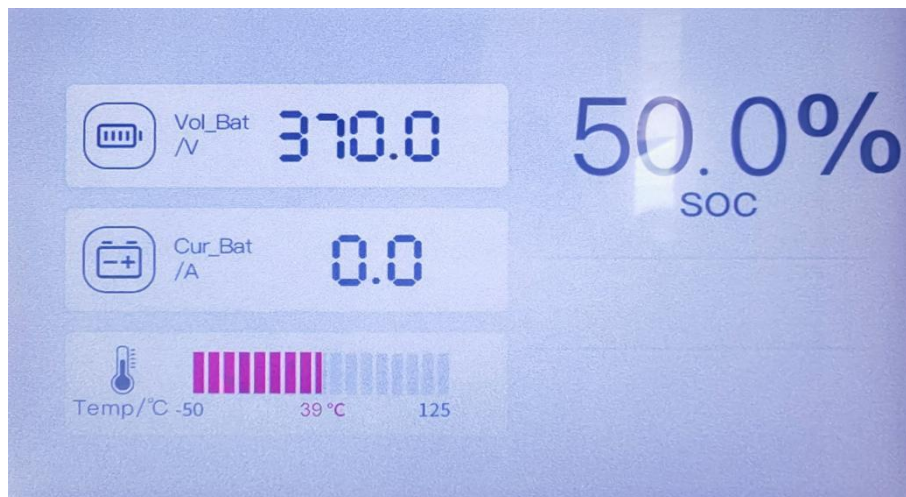


Figure 2.4.6 HMI Homepage View

Displays brief information such as battery voltage, current charge/discharge status, temperature, SOC, and faults.

System information

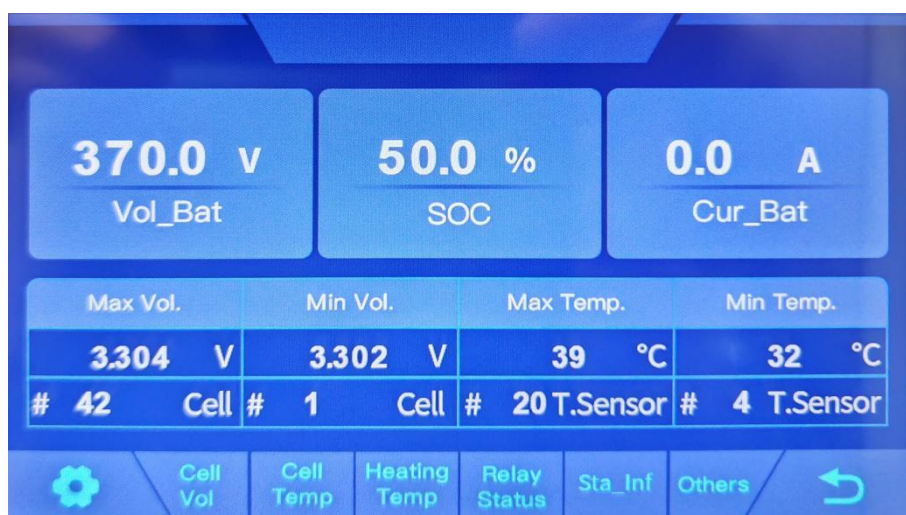


Figure 2.4.6 HMI System Information View

Displays information such as battery voltage, SOC, charge/discharge current, extreme voltage, extreme voltage number, extreme temperature, and extreme temperature number.

Individual information



Figure 2.4.6 HMI Individual Information View

Displays information about the corresponding individual battery cell.

Operation information

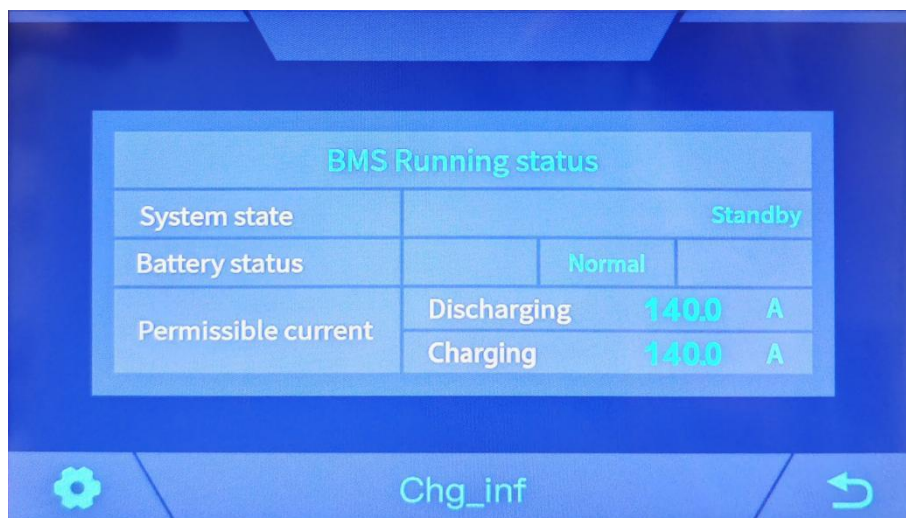


Figure 2.4.6 HMI Operation Information View

Displays operating status, charging/discharging status, and charging/discharging current limit information.

Diagnostic information

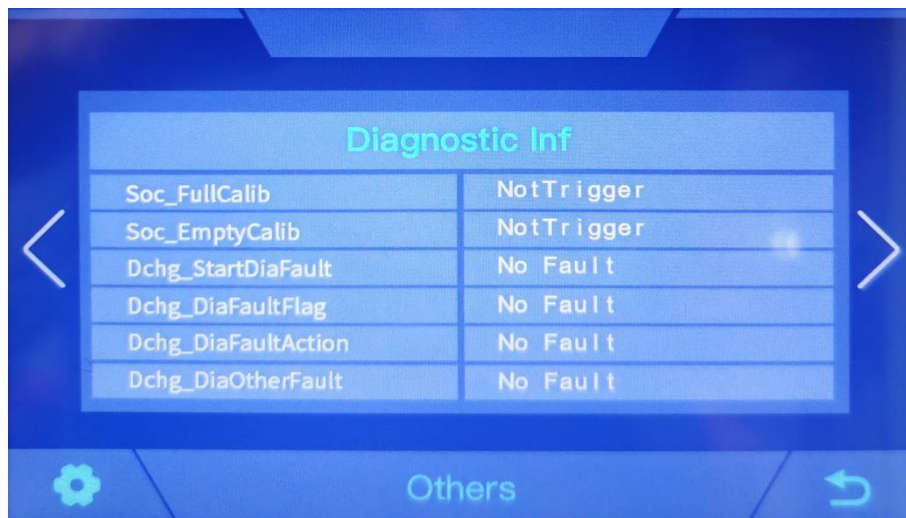


Figure 2.4.6 HMI Diagnostic Information View

Display fault diagnosis information.

2.5 CAN analyzer connection

2.5.1 CAN box connection

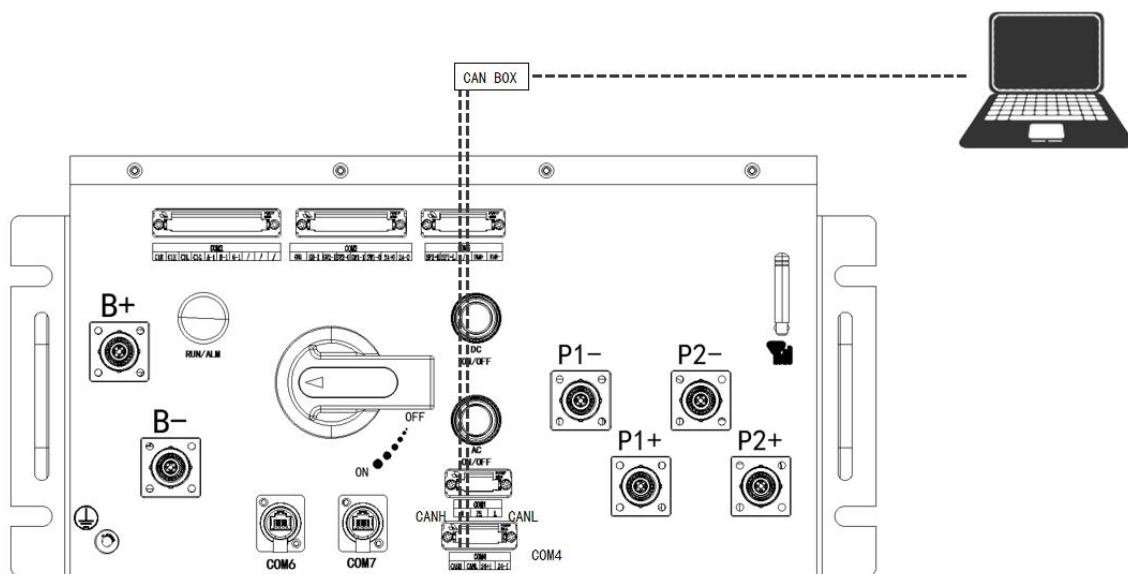


Figure 2.5.1 CAN BOX Connection

Connect the CANH and CANL interfaces of the CAN box to the CANH and CANL interfaces of the COM4 of the high-voltage box, respectively, and connect the other end to the USB port of the computer.

2.5.2 Host computer operation

After opening the host computer, the following interface will appear:

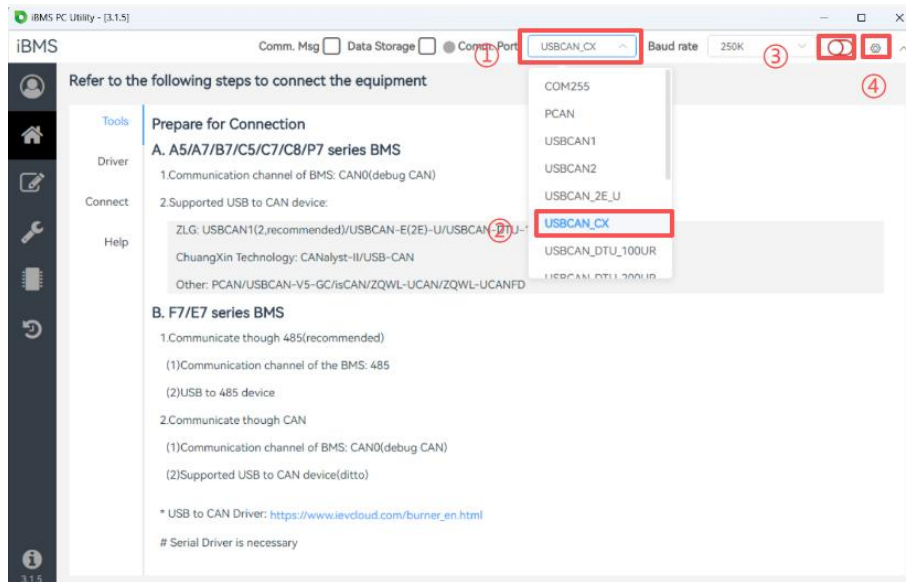


Figure 2.5.2 Host computer login

Click ① Communication Port Selection ② USBCAN_CX, click ③ Open Host Computer, and click ④ to enter the port and language modification interface.

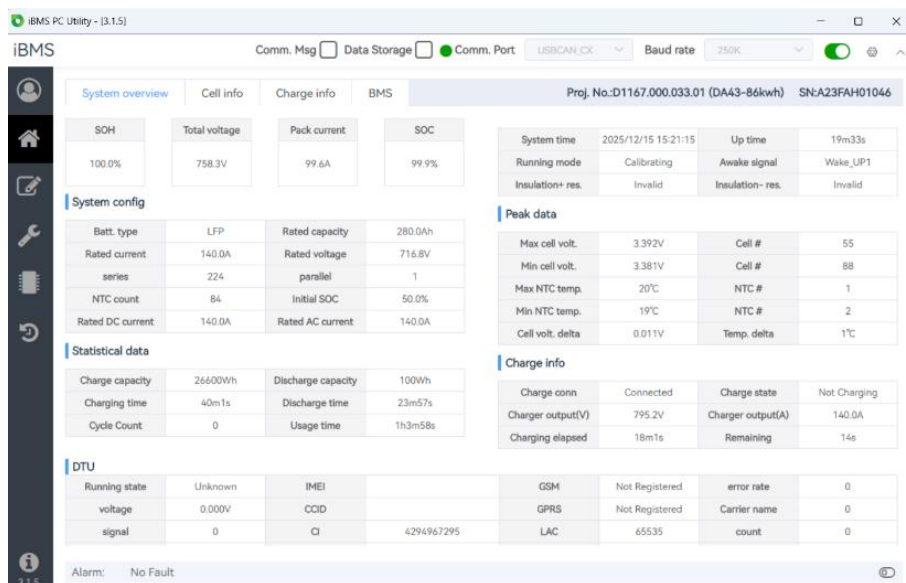


Figure 2.5.2 Battery Information Interface

Using a host computer allows you to view the current battery status information, individual battery cell voltage and temperature information, and battery fault information, which is more conducive to data monitoring and fault diagnosis.

Note: The CAN analyzer is an optional product.

3. Transportation and Storage

3.1 Transportation

3.1.1 Handling requirements



During the moving process, comprehensive safety measures must be implemented. When moving items, handle them gently, avoid dragging or throwing them on rough surfaces.

- When moving heavy objects, be prepared to bear the weight to avoid being crushed or twisted by the heavy objects;
- When two or more people are moving heavy objects together, one person should give instructions, and they should lift or lower the equipment simultaneously in a coordinated manner;
- When handling equipment by hand, wear protective gloves and safety shoes to prevent injury;
- When lifting equipment by hand, first approach the object, squat down, and use the strength of your straight legs (do not use your back) to slowly and steadily lift the object. Never suddenly lift or twist your torso;
- When moving or lifting the equipment, hold the equipment handle or support the bottom edge of the equipment, and do not hold the handles of the modules installed inside the equipment;
- Do not lift heavy objects above waist height quickly. First, place the heavy object on a workbench or other suitable surface at waist height, adjust the position of your hands, and then lift it;
- When moving heavy objects, force must be applied evenly and steadily; the movement speed should be uniform and low; and positioning should be smooth and slow to avoid any impacts or drops that could scratch the equipment surface or damage its components and cables;
- When moving heavy objects, be especially careful around workbenches, ramps, stairs, and other slippery areas. When moving heavy objects over thresholds, ensure the threshold is wide enough for the equipment to pass through to prevent injury or abrasions to fingers;
- When moving heavy objects, move your feet instead of twisting your waist. When lifting and passing heavy objects simultaneously, point your feet in the direction you want to move them first, and then lift them;
- When using a forklift to move the equipment, the forklift must be positioned in the middle to prevent tipping. Before moving, secure the equipment to the forklift with ropes; during movement, it must be supervised by a designated person;
- The tilt angle should meet the requirements: with packaging, the tilt angle $\alpha \leq 15^\circ$; after removing the packaging, the tilt angle $\alpha \leq 10^\circ$;

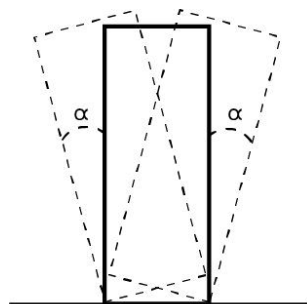


Figure 3.1.1 Inclination angle

- During handling and transportation, the air conditioner must be kept upright; it is forbidden to lay it flat or upside down.

3.1.2 Transportation requirements

- Rough handling during loading and unloading is prohibited, as it may cause battery short circuits, damage (such as leakage or rupture), fire, or explosion;
- During moving, ensure that the battery is transported according to its specified orientation. Do not invert, tilt, drop, expose to mechanical impacts, or subject to rain, snow, or immersion in water.
- Batteries must be transported separately. For cabinets equipped with batteries, transportation with the batteries installed is prohibited. If the cabinet needs to be transported or moved, the batteries must be removed first;
- The battery is certified according to UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and is classified as a Class 9 hazardous material;
- The transport service provider must have qualifications for handling hazardous materials. The use of open-top vehicles is strictly prohibited;
- The battery can be shipped directly to the site, provided it meets the transportation requirements for vehicles, ships, and other modes of transport;
- The international regulations for the transport of hazardous materials should be complied with, and the regulatory requirements of the origin country, transit countries, and destination country authorities should be met;
- Sea transport or well-maintained highways should be used for shipping; rail and air transport are not supported. During transport, minimize bumps and tilting as much as possible;
- For sea transport, adhere to the requirements of the International Maritime Dangerous Goods Code;
- Before transport, the battery packaging must be checked for completeness and integrity. Ensure there are no signs of odor, leakage, smoke, or fire; otherwise, transport is prohibited;
- The transport packaging must be sturdy. Handle with care during loading, unloading, and transit, and implement moisture protection measures.

3.2 Storage requirements



Due to the characteristics of lithium batteries, storage must adhere to specific battery storage requirements. Failure to do so may result in permanent damage or performance degradation.

- Battery packs should not be stored for extended periods. Long-term storage of lithium batteries can lead to capacity loss, with an irreversible capacity loss of 3% to 10% typically occurring after 12 months at recommended storage temperatures;
- The battery should be stored in a clean, dry place, and should be protected from dust and moisture. Avoid exposure to rain or standing water;
- The environment must be free from corrosive or flammable gases;
- The battery should not be stored tilted or inverted;
- For equipment other than battery packs that has been stored for two years or more, it must be inspected and tested by a professional before use;

3.2.1 Energy storage system storage (excluding battery pack)

- Avoid removing the packing during long-term storage;
- Avoid stacking storage;
- Store (long-term or temporary) on a flat surface;
- Close the cabinet door tightly;
- Storage environment temperature: $-40^{\circ}\text{C} - +60^{\circ}\text{C}$, relative humidity: 5% RH–90% RH;

3.2.2 Battery pack storage

● Batteries should be stored indoors, away from direct sunlight and rain, in a dry and well-ventilated area. The surroundings should be clean, free from excessive infrared or other radiation, organic solvents, corrosive gases, and conductive metallic dust. Keep them away from heat and ignition sources;

● If a battery shows signs of fault (such as carbonization, leakage, swelling, or water ingress), it must be promptly transferred to a hazardous materials storage area, kept at least 3 m away from flammable materials, and disposed of as soon as possible;

● When storing batteries, place them according to the packaging labels. Do not store them upside down, on their side, or tilted. Ensure stacking complies with the requirements specified on the outer packaging;

● Batteries should be stored separately from other equipment and should be avoided stacking too high. Ensure that the site is equipped with appropriate fire safety measures, such as fire sand and extinguishers;

● After discharging, batteries may experience static power consumption of internal modules and self-discharge, which could lead to damage from over-discharge. Avoid storing batteries in a low-charge state and promptly recharge them. If a battery experiences permanent fault due to lack of recharging beyond the recommended period, the Company will not provide warranty services. Scenarios triggering low-charge storage include but are not limited to:

- Battery power cables or signal lines are not connected;
- The battery cannot enter charging mode due to a system fault after discharging in an energy storage system;
- The battery cannot enter charging mode due to improper configuration of the energy storage system;
- The battery cannot enter charging mode due to prolonged loss of AC power;
- The battery cannot enter charging mode due to the control system, PCS (Power Conversion System), or main circuit components not being properly closed or engaged.

3.2.3 Storage environment requirements

- Environmental temperature: $-30^{\circ}\text{C} \sim +50^{\circ}\text{C}$ (excluding battery pack);
- Environmental temperature: $0\sim 30^{\circ}\text{C}$ (battery pack); It is recommended to store the battery pack in a constant temperature environment of 25°C . Long term storage may affect the performance and service life of the battery;
- Relative humidity: 5% RH–90% RH (recommended around 45% RH) ;
- Dry, ventilated, and clean;
- Avoid contact with corrosive organic solvents, gases, and other substances;

- Avoid direct sunlight;
- The distance from the heat source should not be less than two meters;
- When storing, it is necessary to disconnect from the external connection. If there is an indicator on the battery pack panel, the indicator should be in the off state;
- Report any overdue storage promptly;
- When shipping batteries, follow the first-in, first-out principle;
- Move batteries gently during transport, and avoid damaging them.

4. Installation Site Requirements

4.1 Location requirements

- This system is only applicable to outdoor scenes;
- The installation environment horizontal surface should be elevated above the area historical highest water level and at least 300 mm above the ground. The installation site must not be in a low-lying area;
- The installation site and a 3-meter surrounding area of the energy storage system or energy storage station should be free of vegetation and flammable plants to prevent fires caused by wildfires during high summer temperatures;
- The safety distance between the energy storage system and buildings should comply with local fire safety regulations or standards;
- The safety distance between energy storage systems and Class A production buildings must be $\geq 12\text{m}$; with Class B production buildings, $\geq 10\text{m}$; with Class C, D, and E production buildings meeting fire resistance ratings I or II, $\geq 10\text{m}$; with Class III fire resistance production buildings, $\geq 12\text{m}$; and with residential buildings, $\geq 12\text{m}$. If the exterior walls of adjacent buildings are non-combustible and there are no doors, windows, or exposed combustible eaves, the fire separation distance can be reduced by 25% from the aforementioned safety distances.
- If the specified safety distances cannot be met, a fire wall must be installed between the battery equipment room, energy storage room, or energy storage installation area and Class C, D, and E buildings. The fire wall should have a fire resistance rating of at least 3 hours and extend 1 m beyond the outer contours of the energy storage system in terms of length and height. Additionally, the fire wall design should consider space requirements for equipment transportation, installation, and maintenance.
- The energy storage system or energy storage station must be situated in an environment free from explosion or fire risk.
- The site should have convenient transportation access and reliable fire suppression system equipment.

Description 1

- During the installation, commissioning, and operation phases of the energy storage system, the fire safety principle should be prioritized. At least two gas fire extinguishers, such as those using halon, perfluorohexane, or carbon dioxide, should be placed near each unit;

- Please reserve a water fire extinguishing system interface for the energy storage system site;
- Ensure the site meets the immediate space requirements and provides additional space for future expansion based on the full life cycle needs;
- Choose a place with good ventilation;
- The energy storage system should not be installed in areas prone to salt damage or pollution, as it will suffer from corrosion. It is suitable for use in the following or better environments:
 - The energy storage system is suitable for outdoor environments more than 2,000 m from the coast. It is not recommended for use within 500 m–2,000 m of the coast (if needed, confirm with the distributor or our engineers). The system should not be used within 500 m of the coast;
 - 1,500 m–3,000 m away from heavy pollution sources such as smelters, coal mines, and thermal power plants;
 - 1,000 m–2,000 m away from moderate pollution sources such as chemical, rubber, and electroplating;
 - 500 m–1,000 m away from light pollution sources such as food, leather, heating boilers, slaughterhouses, centralized garbage dumps, and sewage treatment plants.

Description 2

If the safety distance at the selected site does not meet relevant national standards, it is advisable to choose a new location. The site should avoid scenarios not recommended by industry standards and regulations, including but not limited to the following areas, regions, and locations:

- Areas with strong vibration, intense noise sources, and significant electromagnetic interference;
- Places with dust, oil smoke, harmful gases, or corrosive gases;
- Places where corrosive, flammable, or explosive materials are produced or stored;
- Places with existing underground facilities;
- Areas with poor geological conditions, such as rubber soil, soft soil layers, or surfaces prone to water accumulation and subsidence;
- Areas beneath water reservoirs, water landscapes, or water intake rooms.

Description 3

- If placement in a potentially water-accumulating area is unavoidable, install barriers, drainage facilities, or elevate the ground;
- Cable trenches should not be used as drainage channels, and all openings for cable routing (such as holes where cables pass through partition walls or floors) should be fire-resistant sealed;
- Earthquake faults and earthquake zones with a seismic intensity higher than nine degrees;
- Areas prone to direct hazards such as mudslides, landslides, quicksand, or sinkholes;
- Within the boundaries of mining subsidence (displacement) zones;
- Historical and cultural heritage protection areas within the blasting hazard zone;
- Areas that may be flooded after a dam or dike breach;
- Important water supply source sanitary protection zone;
- Crowded places, high-rise buildings, and underground structures;
- Intersections of arterial street and heavily trafficked areas.

Site selection requirements for flood control and drainage:

- The site design elevation for large-scale electrochemical energy storage systems (power $\geq$ 100MW) should be higher than the flood level at a frequency of 1% or the historical highest water level;
- For medium and small-sized electrochemical energy storage systems (power $<$ 100MW), the site design elevation should be higher than the flood level at a frequency of 2% or the historical highest water level;
- If the site design elevation cannot meet the above requirements, choose an alternative site or implement various flood and drainage measures based on different conditions;
- For energy storage stations along rivers, lakes, or coastal areas affected by wind and waves, flood protection facilities should be designed to accommodate a 2% wave height plus an additional 0.5 m for safety;
- When there is significant runoff entering or crossing the site perimeter, it is advisable to install ditches or drainage (cut-off) channels to manage surface water drainage systematically.

Fence against illegal entry:

It is recommended to use solid walls or fences for isolation and protection around the energy storage area. The fence should have a lockable gate, and its height should be greater than 2.2 m. Firewalls may replace part or all of the fencing, depending on the design considerations.

4.2 Foundation requirements

Foundation design requirements:

- The energy storage system must be installed on a concrete or other non-combustible surface. Ensure that the installation plane is level, stable, and even, with sufficient load-bearing capacity. Installation on surfaces with depressions or inclines is prohibited;
- The equipment foundation should be designed based on a load-bearing capacity of 2,750 kg per unit. If the foundation load-bearing capacity is insufficient, it must be reassessed;
- The bottom of the equipment foundation pit must be thoroughly compacted and levelled;
- After excavation of the equipment foundation, avoid water exposure and disturbance. If water exposure occurs, continue excavation and replace the disturbed material;
- The horizontal deviation between the equipment foundation and the equipment contact surface must not exceed 3 mm;
- The foundation must be higher than the local historical highest water level and at least 300 mm above the ground;
- Construct drainage facilities based on local geology and municipal drainage requirements to prevent water accumulation at the equipment foundation. The equipment foundation must meet the drainage requirements for the area's historical maximum rainfall, and the discharged water should be treated in accordance with local laws and regulations;
- When constructing the equipment foundation, consider the routing of energy storage system cables by reserving trenches or entry holes;

- The reserved holes in the equipment foundation and the entry holes at the bottom of the equipment should be properly sealed;
- Users must verify the foundation design parameters of the energy storage system based on the project's installation environment, geology, and seismic requirements.

4.3 Forklift requirements

- Do not move the energy storage system after the battery pack harness has been installed;
- If using a forklift for cabinet installation, the forklift load capacity must be ≥ 3 t;
- If using a forklift for battery pack installation and maintenance, the forklift load capacity must be ≥ 1 t;
- Recommended fork length: 1,300 mm–1,500 mm, width: 80 mm–160 mm, and thickness: 25 mm–80 mm;
- Forklift lifting height requirement: when the foundation height is ≤ 0.3 m, the lifting height should be ≥ 2 m; when the foundation height is greater than 0.3 m, the lifting height increases accordingly.

4.4 Lifting requirements

Personnel involved in lifting operations must receive relevant training and be certified as competent before they can perform the tasks.

- The lifting area must be marked with temporary warning signs or fenced off for isolation;
- The foundation for lifting operations must meet the load-bearing requirements for the crane;
- Before lifting, ensure that the crane and lifting ropes meet the load-bearing requirements;
- Before lifting, ensure that the lifting tools are securely fixed to fixed structures or walls that meet the load-bearing standards;
- During lifting operations, do not walk under the crane boom or the lifted load;
- During lifting operations, do not drag wire ropes or lifting equipment, and avoid using hard objects for impact;
- During lifting, ensure that the angle between the two cables does not exceed 90° ;
- When installing or dismantling lifting equipment, avoid dragging it across the cabinet to prevent scratches;
- Do not perform lifting or moving operations after the battery pack has been installed in the energy storage system.

Lifting precautions:

Before lifting:

- Crane lifting capacity ≥ 3 t, working radius ≥ 2 m. If the on-site working conditions do not meet requirements, consult a professional for assessment;
- Personnel involved in lifting operations must receive relevant training and be certified as competent before they can perform the tasks;
- Lifting tools must be inspected and complete before use;
- Ensure that lifting tools are securely fixed to load-bearing structures or walls;

- When using outdoors, it is recommended to perform lifting operations in clear, calm weather conditions;
- Confirm that the crane and steel cables meet the requirements before proceeding with the lift;
- The doors of the equipment have all been closed and locked;
- Ensure the safe and reliable connection of steel cables;
- It is recommended to use a left-to-right or right-to-left lifting sequence to ensure a smooth lifting operation.

During lifting:

- Unauthorized personnel must not enter the lifting area, and no one should stand under the crane boom;
- Ensure the crane is positioned correctly and avoid long-distance lifting;
- Maintain stability, ensuring that the diagonal tilt of the cabinet does not exceed 5°;
- Ensure that the angle between the two cables does not exceed 90°;
- Lift and place the equipment gently. Lower the cabinet slowly and steadily to avoid impacting the internal components;
- When the cabinet contacts the base, wait until the load on the base is evenly distributed before removing the lifting cables;
- Do not drag wire ropes or lifting equipment, and avoid equipment collisions;
- Only proceed with lifting subsequent cabinets after the initial cabinet has been securely fixed.

5. Mechanical Installation

5.1 Pre-installation inspection

5.1.1 Unpacking

Depending on the type of wooden crate, there are two ways to open it:



Figure 5.1.1 Diagram illustrating the operation of securing wooden crates.

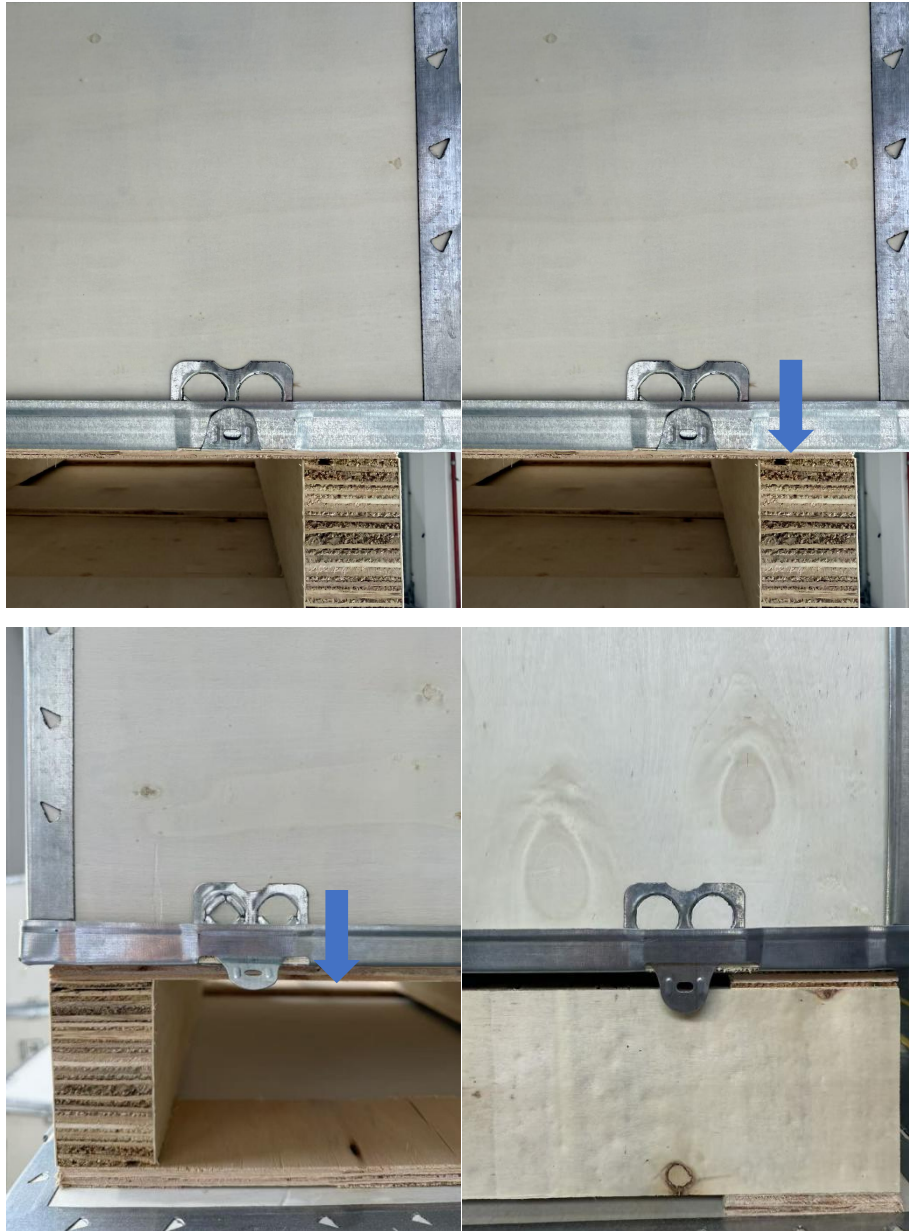


Figure 5.1.1 Diagram illustrating the operation of securing wooden crates.

Remove the top panel and then the four side panels:

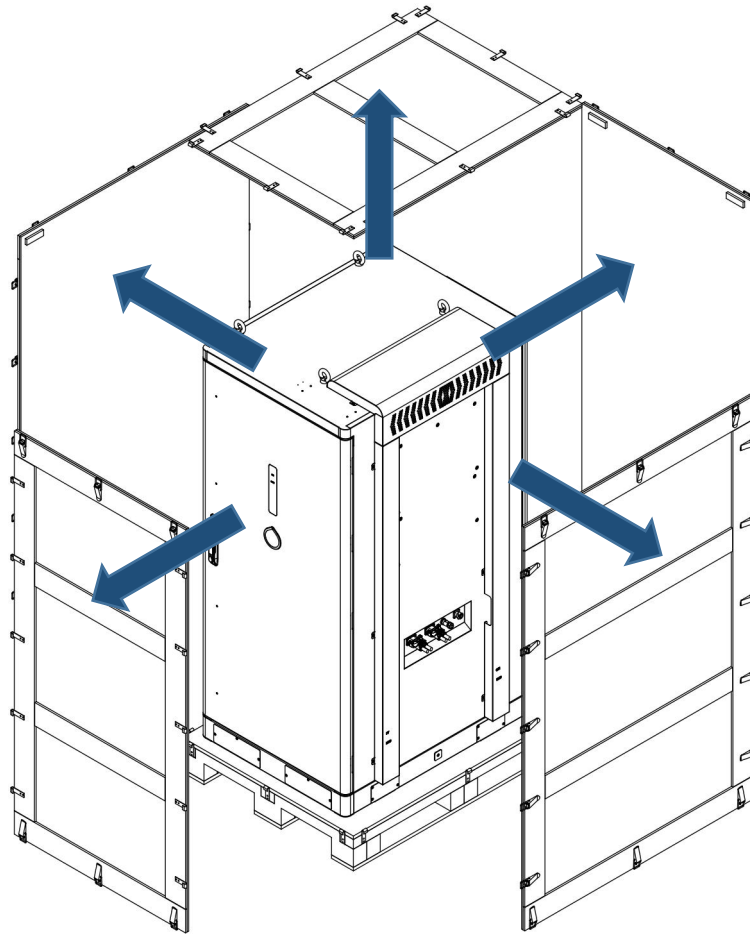


Figure 5.1.1 Wooden crate assembly and disassembly diagram

Remove the bottom panel of the cabinet:

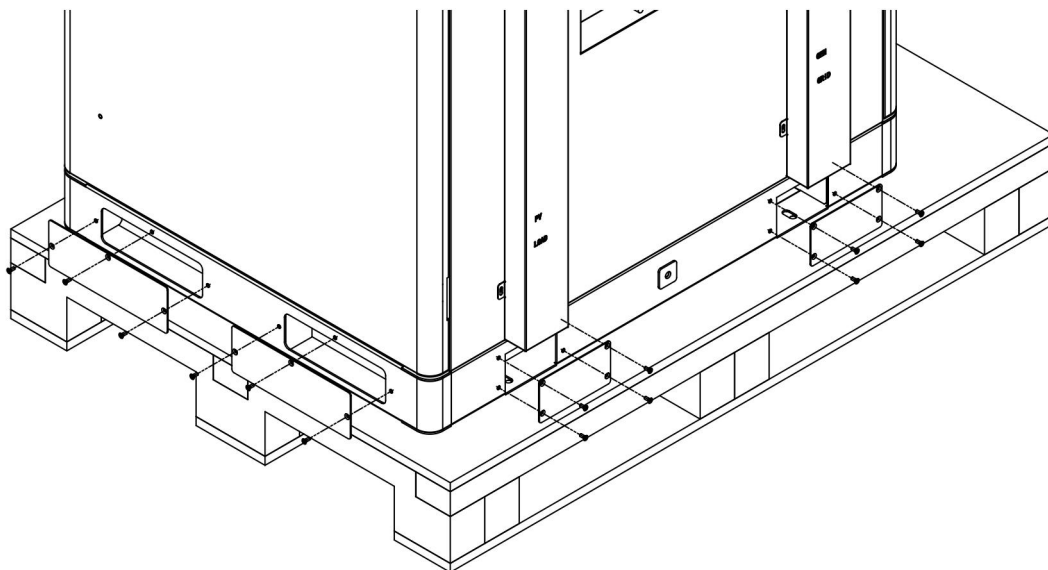


Figure 5.1.1 Forklift hole baffle assembly and disassembly diagram

Remove the four fixing screws on the left and right sides:

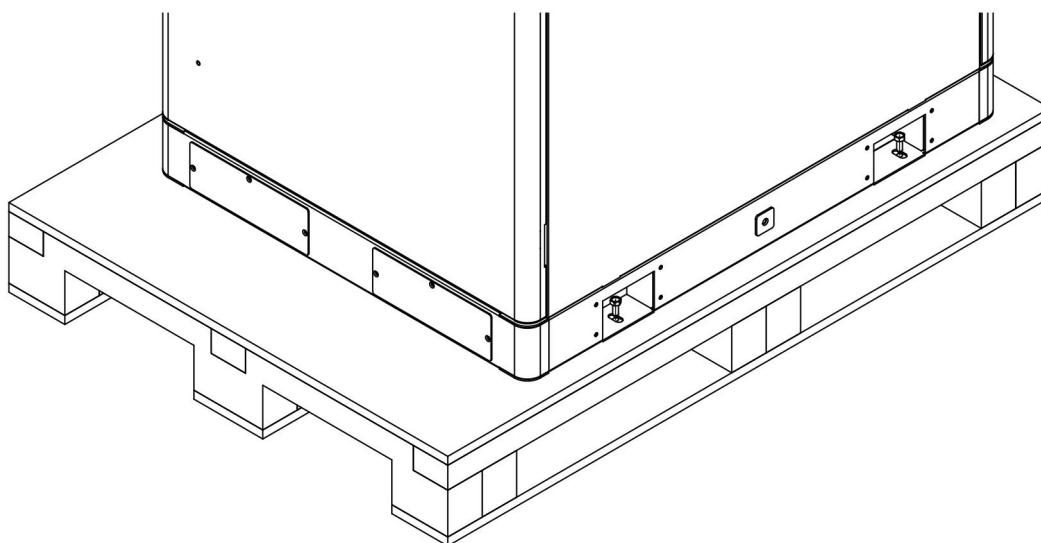


Figure 5.1.1 Diagram of disassembly and assembly of wooden base plate

5.1.2 Accessories check

Before installing the product, please carefully check the following accessories:

Figure 5.1.2 Parts List

No.	Accessories	Appearance	Explanation	Quantity
1	Battery		Provide power	1
2	Power lines between batteries		35 square millimeters red (210mm) power lines	6
3	Power line between high voltage box/battery		35 square millimeters red (2900mm) power line	1
4	Power line between high voltage box/battery		35 square millimeters black (1200 mm) power line	1
5	Power line between high voltage box/PCS		16 square millimeters red wire divided into two sections (1500mm) power line	1
6	Power line between high voltage box/PCS		16 square millimeters black wire divided into two sections (1500mm) power line	1

7	External cabinet adapters to PCS		220V power supply line	1
8	External cabinet/PCS communication line		RJ45 Cat6 network cable	1
9	Inverter mounting plate screws		M8 bolts	9
10	User Manual		Product Manual	1

5.1.3 Product inspection

Inspect the internal products and equipment for damage. If any problems or questions are found, please contact the seller.

5.2 Installation environment

- The installation environment should be dry and well-ventilated, and the installation site should be far away from toxic, harmful, flammable, explosive gases, and corrosive environments.
- The installation site should be far away from residential areas to avoid noise pollution.
- The installation ground should be flat, firm, and free from tilting or subsidence.
- The system is only suitable for outdoor installation.
- The water level of the installation environment should be at least 300mm above the historical highest water level of the area, and the installation location should not be in a low-lying area.
- Sufficient space should be reserved for the laying and routing of AC and DC cables during construction.
- The installation site of the energy storage system or energy storage power station and its surrounding 3m radius should be free of vegetation and flammable plants to prevent wildfires caused by high summer temperatures from igniting the energy storage system.
- After all cables are installed, they should be sealed with fire-resistant sealant to prevent small animals or insects from entering the equipment.

5.3 Install the foundation

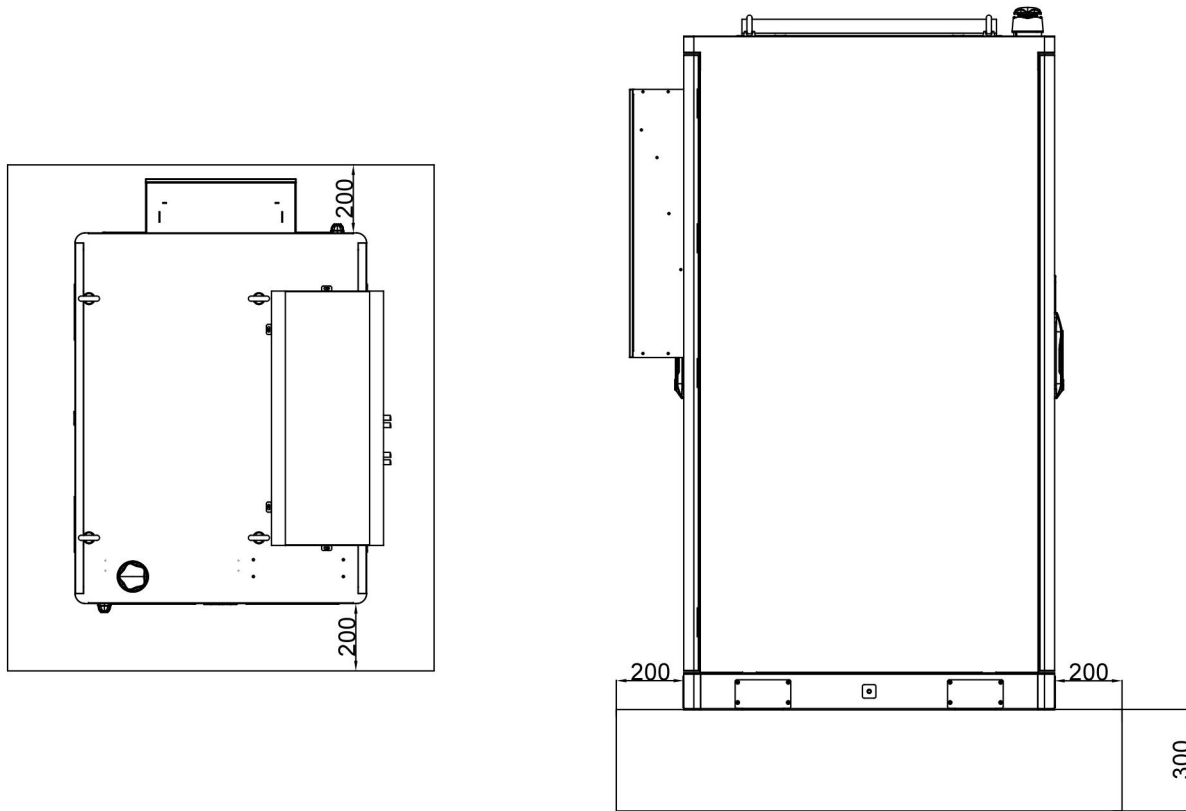


Figure 5.3 Foundation installation diagram

5.4 Infrastructure requirements

Improper foundation construction will cause a large number of problems during installation and maintenance and affect the stable operation of the system. Therefore, when constructing the installation base, it is necessary to ensure that the foundation meets the necessary requirements for mechanical support, cable layout, and maintenance of the system.

The following necessary requirements must be met when constructing infrastructure for energy storage systems:

- 1、 Install the cabinet on concrete or other non-combustible construction materials;
- 2、 The foundation should be flat, level, and solid, and have sufficient bearing capacity and will not tilt or sink in the future;
- 3、 The default construction method is C30 grade concrete with a construction height of 300mm;
- 4、 The reinforcement in the foundation shall be HRB400 grade 3 threaded steel bars with a diameter of 12mm and a laying spacing of 150mm. The steel bars shall be derusted and then treated with anti-corrosion;
- 5、 The foundation pit must not be soaked in water after excavation, and drainage facilities should be built on the foundation, and the drainage performance should meet the drainage requirements of the local maximum historical rainfall;
- 6、 Foundation surface level error $\leq 3\text{mm}$;
- 7、 The bearing capacity of the foundation is configured according to the total weight of the equipment placed on the foundation;

Cable trench requirements:

- 1、 The cable trench should have enough space to meet the bending radius of the cable;
- 2、 To prevent foreign objects from entering and damaging the cable lines, cable trenches should be treated for dust and rodent control;
- 3、 To prevent cable aging, short circuit, etc., the cable trench should be waterproof and moisture-proof;
- 4、 Cable trenches should not be used as drainage channels, and openings for cable routing (such as holes where cables pass through partition walls and floor slabs) should be fire-blocked.



When designing and constructing the foundation, the design requirements such as the environment of the project location, foundation bearing capacity, address adjustment, natural disasters, etc. should be considered.

5.5 Inverter installation

- 1、 Use the included M8*22 bolts to mount the inverter bracket onto the system cabinet;
- 2、 Secure the inverter to the inverter bracket to complete the installation.

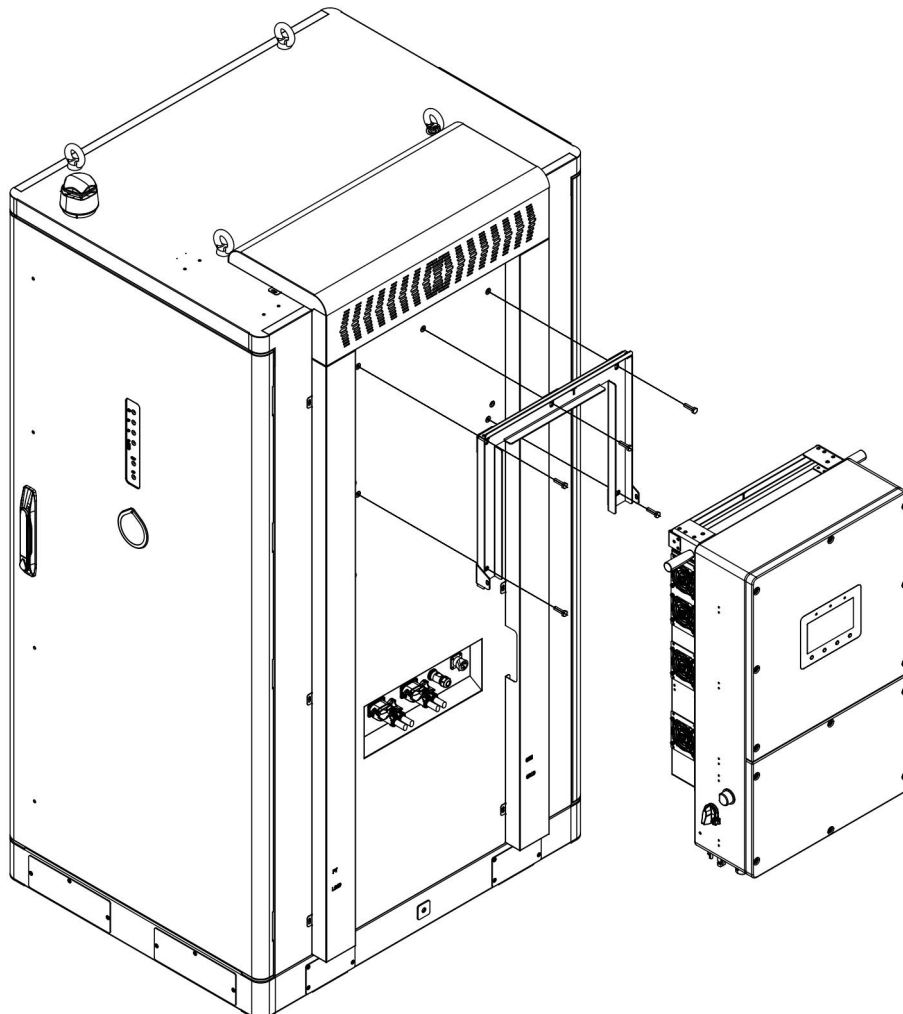


Figure 5.5 Inverter installation diagram

※The installation methods vary depending on the inverter model, the diagram is for reference only.

5.6 Transportation and lifting

5.6.1 Forklift transportation

If the site is flat, you can use a forklift to move the device. There is a special forklift handling socket at the bottom of the device.

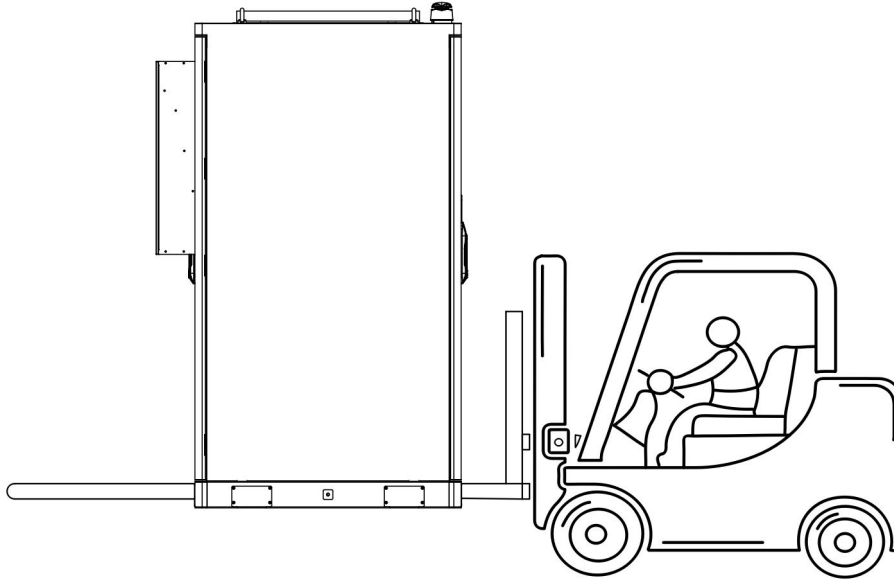


Figure 5.6.1 Schematic diagram of cartridge transportation

Notice

- The forklift should have sufficient carrying capacity;
- The forklift's pins should meet the lifting requirements of the equipment;
- When lifting, pay attention to the center of gravity of the equipment and lift slowly;
- It is prohibited to stand on the forklift or use the forklift to lift people;
- Avoid sharp turns when transporting equipment;
- When moving the equipment, the speed should be kept below 5 km/h.

Note: Forklifts are only permitted to be operated from the front and rear. Lifting from the side may cause the forklift to tip over due to a shift in the center of gravity, resulting in personal injury and equipment damage.

5.6.2 Hoisting

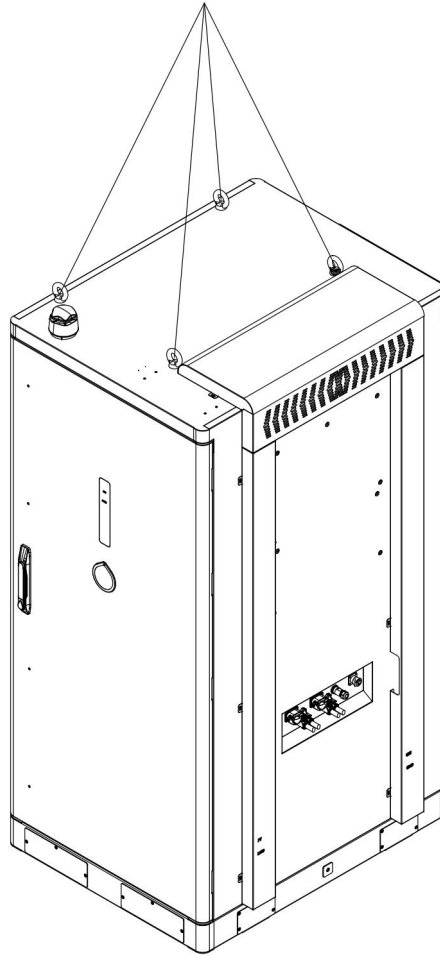


Figure 5.6.2 Lifting and transportation diagram

Notice

- When hoisting, you should use lifting equipment with sufficient load-bearing capacity;
- The entire lifting process requires professional guidance;
- When lifting, ensure that the lifting rope is firm;
- During lifting, personnel are prohibited from standing within 1000mm of the lifting area;
- Only vertical lifting is allowed;
- The equipment is not allowed to be dragged on the ground or other flat surfaces during hoisting;
- During hoisting operations, ensure that the angle between each two cables is no greater than 90° .

Note: During hoisting operations, the angle between any two cables must not exceed 90° ; otherwise, hoisting accidents may occur, resulting in personal injury and equipment damage.

5.7 Equipment fixation

The diagram shows that expansion bolts are typically used to fix the server rack in place. However, the actual method of fixing the equipment rack should be determined based on the site conditions, such as the floor material and drilling progress.

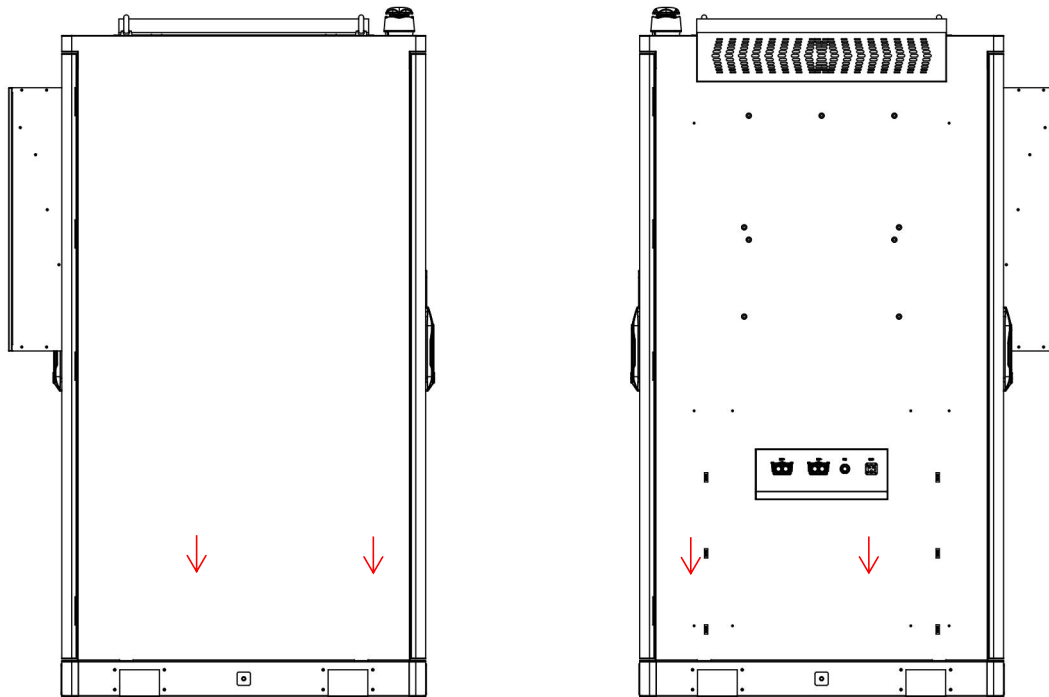


Figure 5.7 Equipment fixing diagram

6. Cable Installation



- Beware of high voltage electric shock;
- Do not touch live parts without protection;
- Before installation, confirm that there is no voltage on any components on the AC and DC sides.



• Moisture and dust can damage electrical equipment or affect its operation and performance. Do not perform electrical installations in environments with absolute humidity $\geq 90\%$ or dusty conditions;

- Before connecting the cable, please check and confirm that the cable polarity is correct;
- All cables need to have sufficient bending space.

6.1 Electrical connection overview



- All connections must be made strictly according to requirements and drawings;
- All connections must be made with the equipment completely powered off;
- Only qualified electrical engineers and relevant personnel may make electrical connections, and

must comply with the requirements in "1. Safety Precautions" of this manual;

- The company is not liable for personal injury or property damage caused by neglecting these safety instructions.

6.2 Preparation before connection

Prepare tools

- The illustrated tools are for reference only, please refer to the actual product;
- Due to varying site conditions, this tool list does not exhaustively list all tools that may be needed.

On-site installers and users should prepare any tools not listed based on the actual situation.

Installation tools

Table 6.2 Installation Tools

No.	Accessories	Appearance	Explanation
1	Hammer		Unboxing
2	Utility knife		Unboxing
3	Screwdriver		Fixed battery assembly
4	Handheld electric drill		Fixed battery assembly
5	Insulated torque wrench		Install cables and busbars
6	Insulated torque wrench		Install cables and busbars
7	Multimeter		Measure battery voltage

Protective tools

Table 6.2 Protective Equipment

No.	Accessories	Appearance	Explanation
1	Insulating gloves		Prevent electric shock
2	Safety shoes		Prevent injury from falling objects
3	Helmet		Protect head
4	Reflective vest		Improve visibility
5	Dust mask		Prevent dust
6	Goggles		Protect your eyes

Door opening method

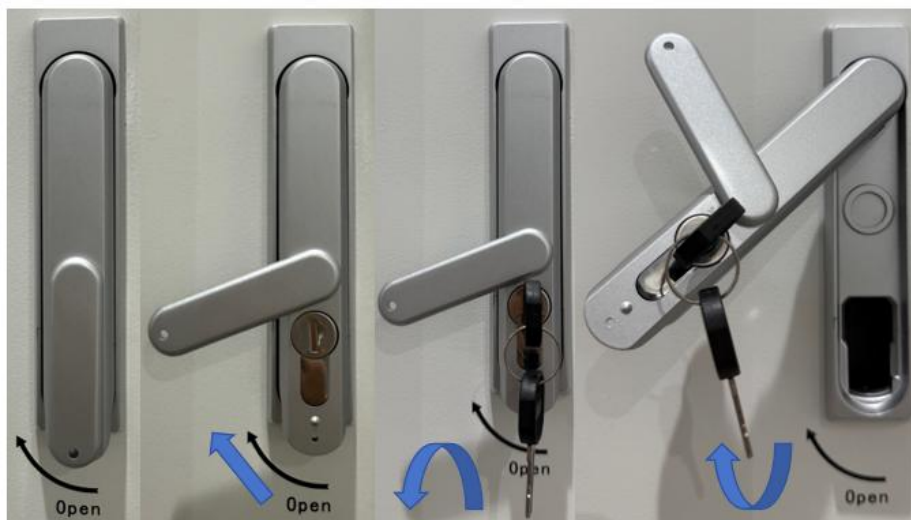


Figure 6.2 Door opening method diagram

- 1、 Rotate the keyhole cover counterclockwise to expose the keyhole;
- 2、 Insert the key;
- 3、 Rotate the key clockwise to pop out the handle;
- 4、 Rotate the handle counterclockwise and pull it out to open the cabinet door.

6.3 Cable connection

6.3.1 Internal connections of the battery system

Battery pack connection:

- 1、 Use the 210mm battery pack power cable included in the accessories to connect the battery packs directly;
- 2、 Use the 2900mm battery positive terminal to power distribution unit B+ power cable provided in the accessories to connect the positive terminal of the top battery pack in the cabinet to the PDU;
- 3、 Use the 1200mm battery negative terminal to power distribution unit B-power cable provided in the accessories to connect the negative terminal of the bottom battery pack in the cabinet to the PDU.

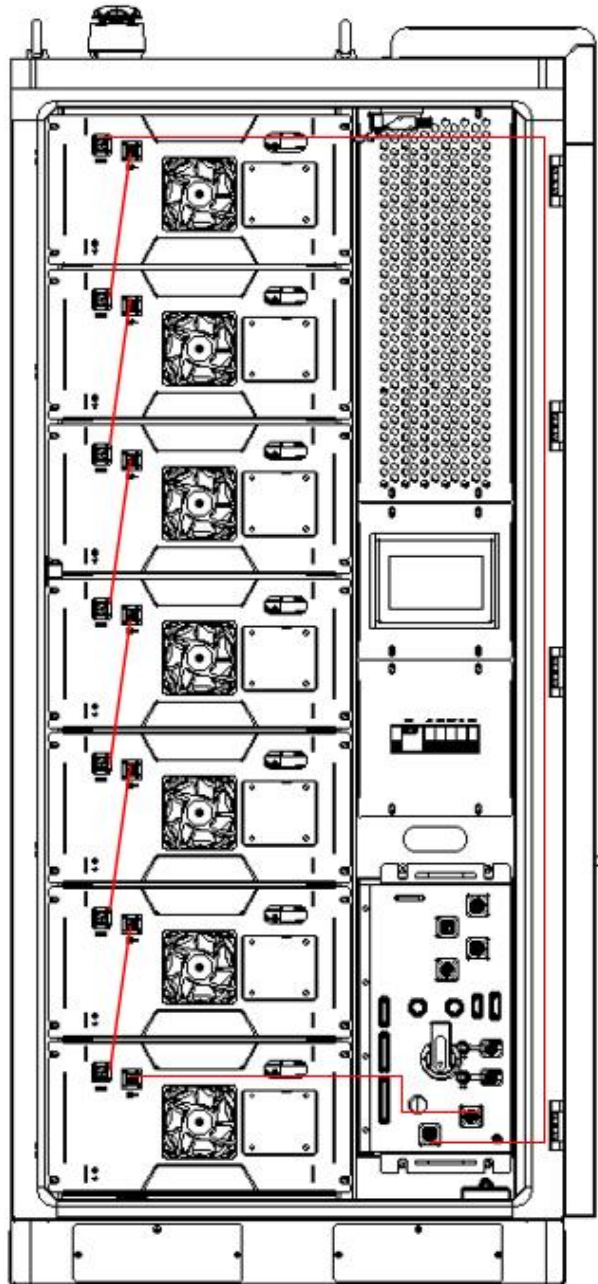


Figure 6.3.1 Battery connection diagram

7. System Operation



Energy storage systems require professional verification and approval from relevant authorities in accordance with local regulations before they can be put into operation;

For equipment that has been stored or not operated for an extended period, a thorough and careful inspection should be conducted before powering it on to ensure that all operating conditions meet requirements.

Please check the following items before powering on the equipment:

- Check that the wiring is correct and secure;
- Check that the emergency stop button is pressed;
- Confirm that the grounding meets requirements using a grounding resistance tester;
- Use a multimeter to confirm that the AC/DC voltage meets the operating start-up conditions and ensure there are no abnormalities such as overvoltage, undervoltage, phase loss, or phase reversal;
- Ensure that there are no tools, parts, or other foreign objects inside the equipment;
- Seal all wiring holes with fire-retardant putty;
- Ensure that all heat dissipation channel openings are free of foreign objects blocking or obstructing them.

7.1 Inspection before powering on

Table 7.1 Power-on Check

No.	Check Items	Check Content
1	Equipment appearance	●The equipment appearance is intact and undamaged. If there is paint peeling, please repair the paint. ●The equipment labels are clear and visible, and damaged labels should be replaced in time.
2	Cable appearance	●The cable protection layer is wrapped intact without obvious damage. ●The conduit cable and hose are intact.
3	Cable connection	●The cable connection position is the same as the design. ●The terminal production meets the specifications and the connection is firm and reliable.
4	Cable routing	●Cut the wire buckle joints neatly without any exposed spikes or other phenomena. ●Leave a margin as required at the turning point and do not tighten it.
5	Switch	●The external distribution cabinet switch is in the OFF state. ●The battery cluster switch is in the OFF state.

7.2 System power on

After confirming the cable connection:

- 1、Close ①HV BOX miniature circuit breaker;
- 2、Close ② Circuit breaker manually;
- 3、Close ③ DC push button switch;
- 4、Press button ④ AC switch.

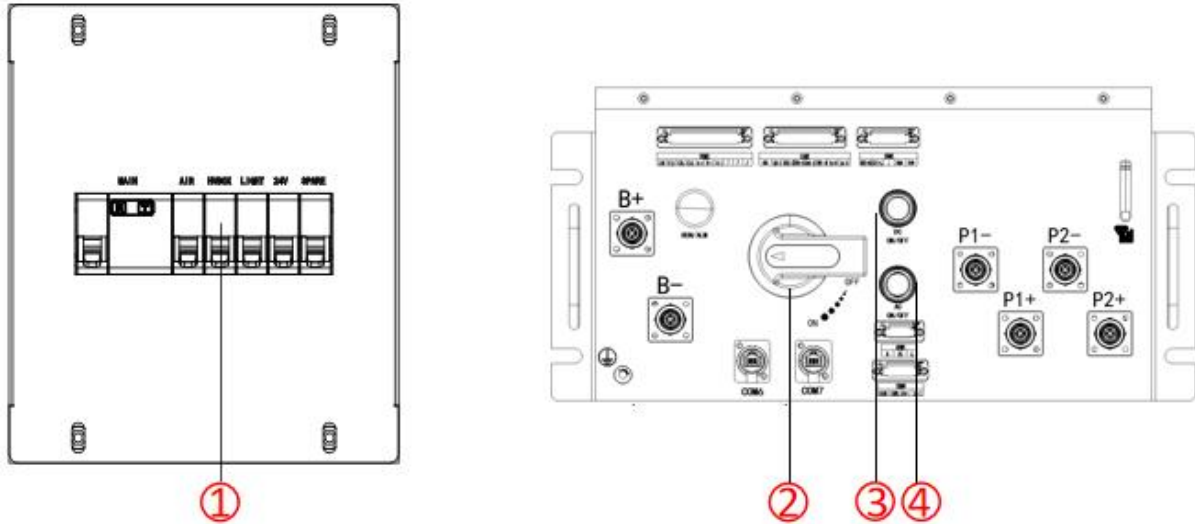


Table 7.2 System power-on diagram

7.3 System power off

- 1、Press button ① to reset the switch;
- 2、Disconnect the PDU power miniature circuit breaker;
- 3、Disconnect ③ Circuit breaker manually;
- 4、Disconnect the ④HV BOX miniature circuit breaker.

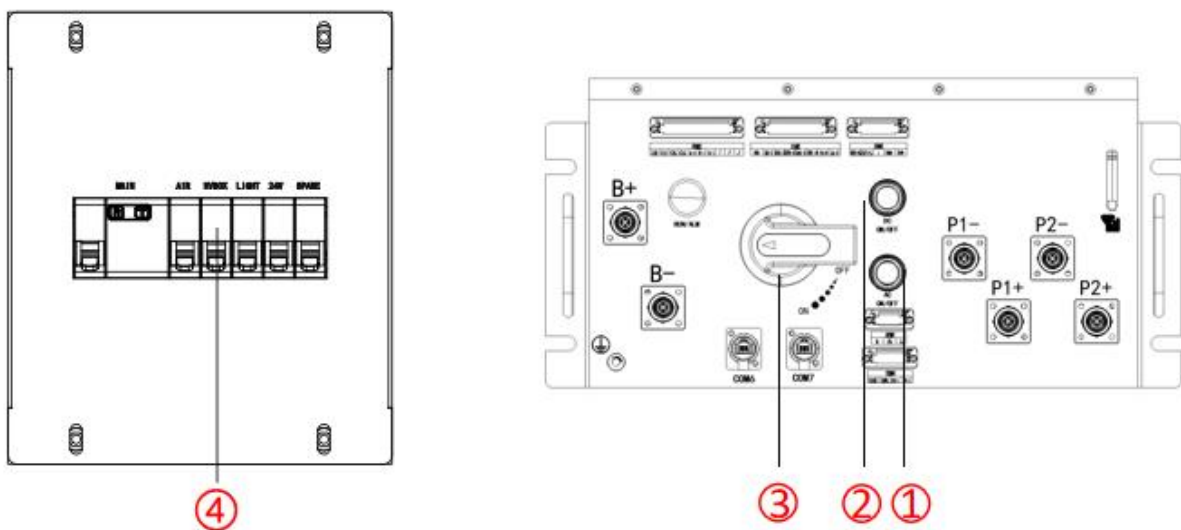


Figure 7.3 System power off diagram

7.4 APP download

This app allows users to view battery information online in real time, primarily to facilitate domestic and international customers in monitoring battery information and understanding battery status anytime, anywhere.



Figure 7.4 APP Display

7.4.1 Android version download

Visit the official website of Udan Technology <https://www.udantech.com/#/> , Click on the "Applications" section in the top navigation bar, scroll down to the mobile app module, and you will see the WeChat mini-programs and mobile app downloads available.

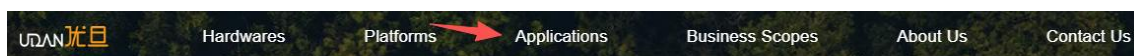


Figure 7.4.1 APP Web page

Move your mouse over the image area to scan the QR code and download.

Mobile APP

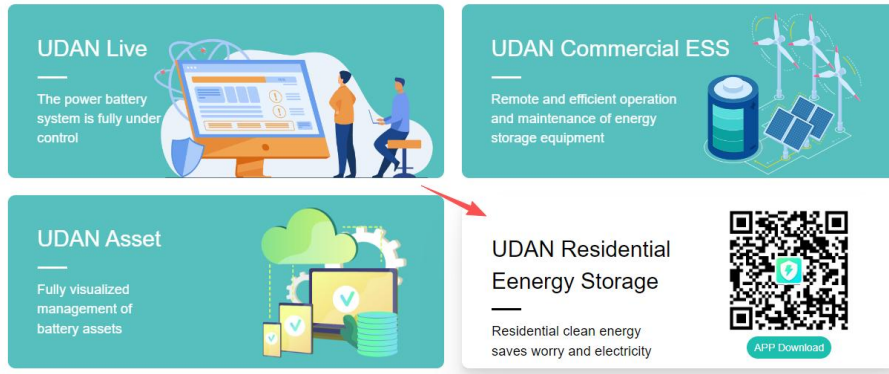


Figure 7.4.1 APP Download

7.4.2 IOS version download

Go to your phone's App Store, search for "Udan HESS", and you can download and install it.

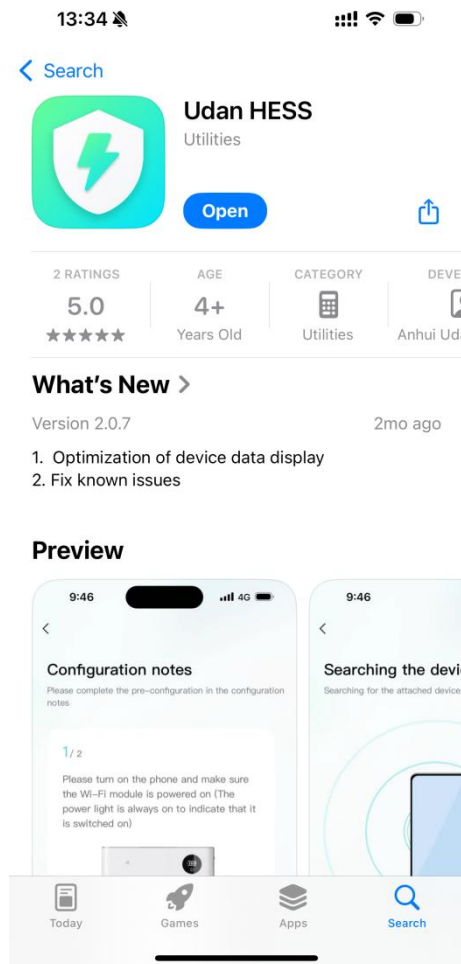


Figure 7.4.2 APP Download

7.5 APP login

7.5.1 Log in

- After opening the app, you will be taken to the login screen where you can log in to your account;
- Currently, login via email account is supported.

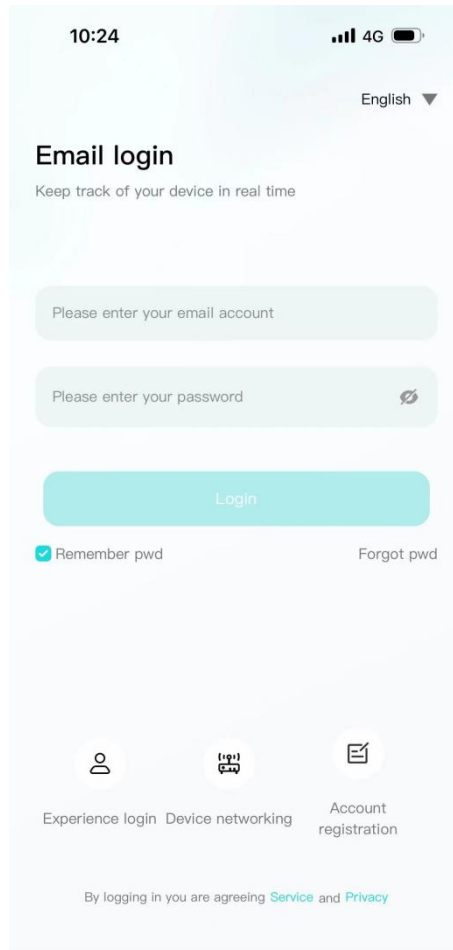


Figure 7.5.1 APP Login

7.5.2 Register

- At the bottom of the login page, click the "Account Registration" button to begin the registration process;
- Currently, registration via email account is supported. After registration, a device verification process is required, which involves entering the device's serial number (SN) or device QR code for identification.

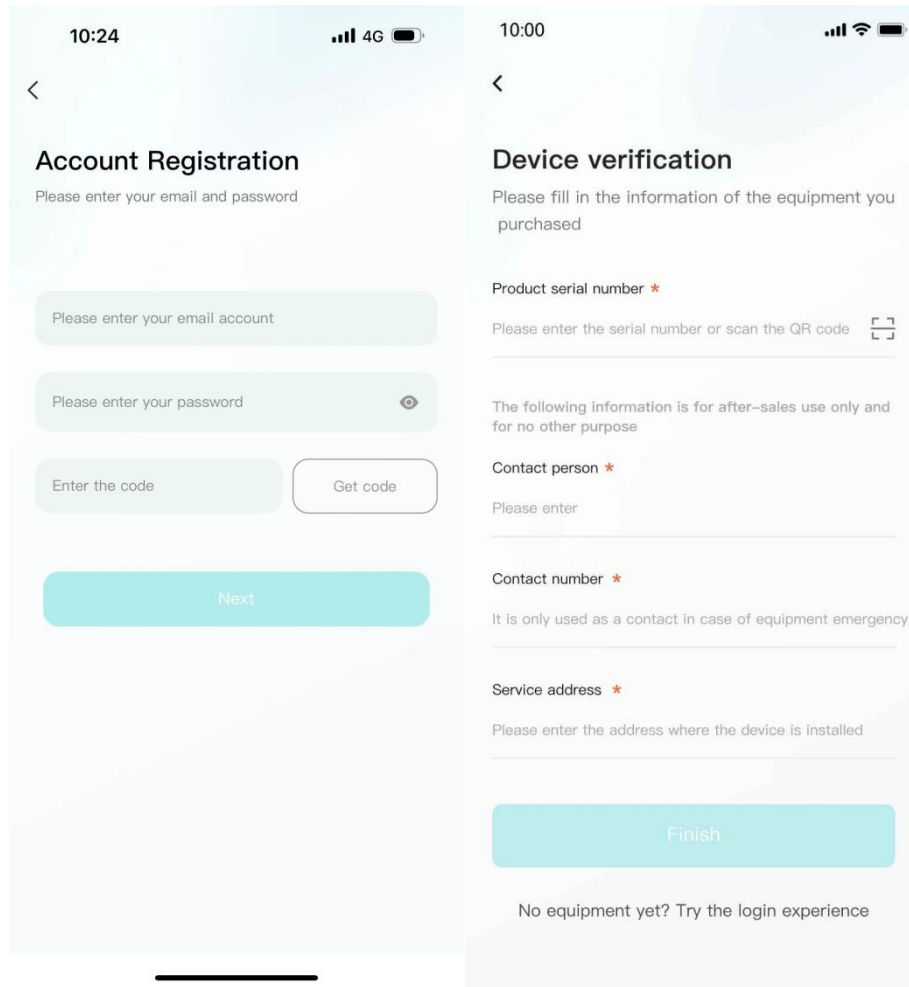


Figure 7.5.2 APP Registration

7.5.3 Experience login

At the bottom of the login page, click the "Experience Login" button to experience the app's functions as a guest without registration.

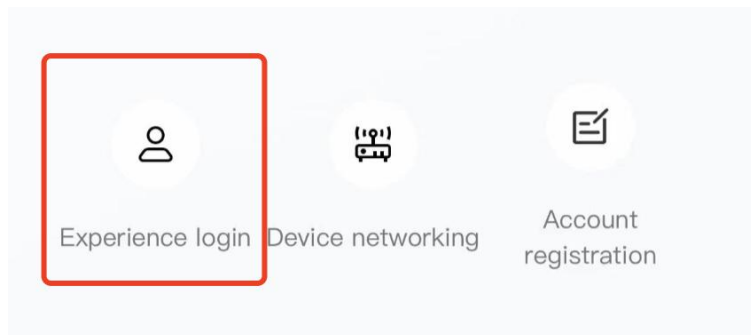


Figure 7.5.3 Experience Login

7.6 Equipment distribution network

7.6.1 Distribution network preparation

Ensure the device is powered on and that Bluetooth and Wi-Fi are enabled on your phone.

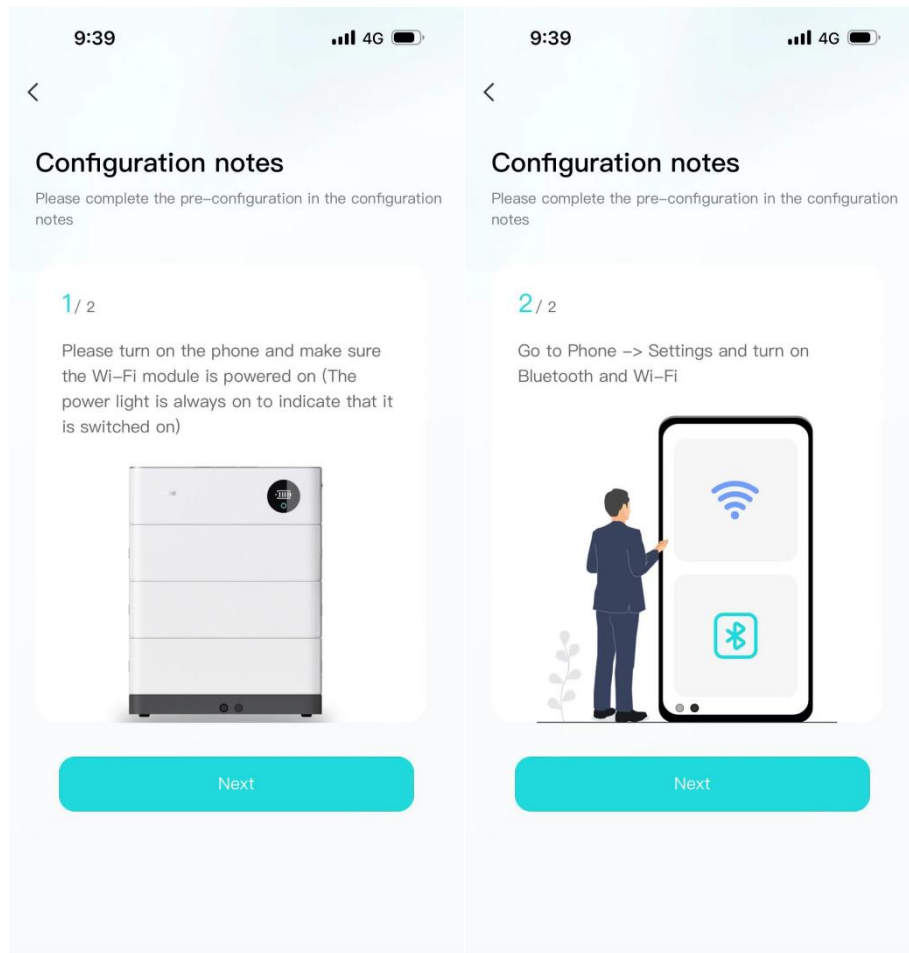


Figure 7.6.1 Preparations before power distribution network

7.6.2 Connecting devices

The current app supports Bluetooth search, device scanning, and manual input of the serial number (SN) code.

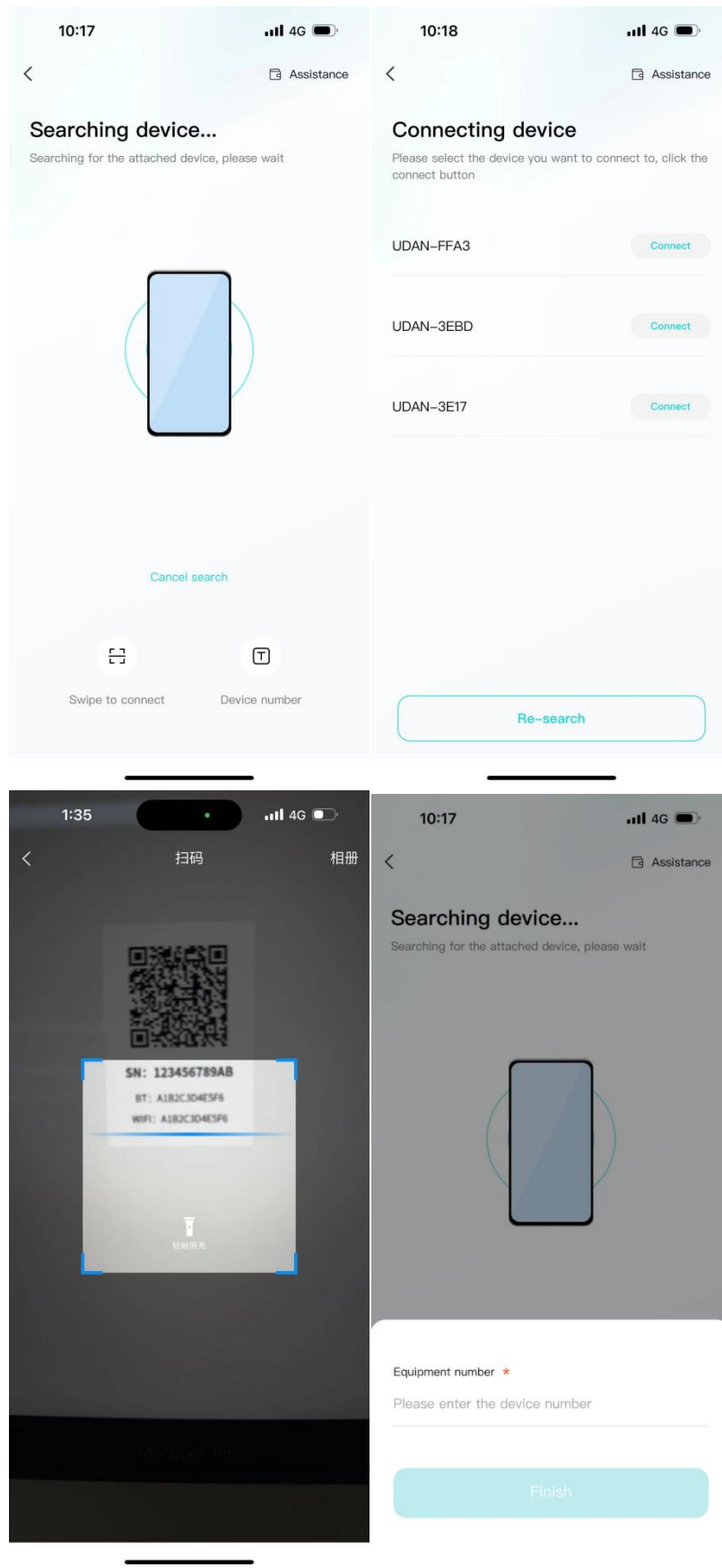


Figure 7.6.2 Connecting Devices

7.6.3 Connect to WiFi

After the device is connected, proceed with the WiFi connection process. Select the desired WiFi network and click the "Connect" button. Enter the WiFi password and click the "Done" button to complete the network configuration.

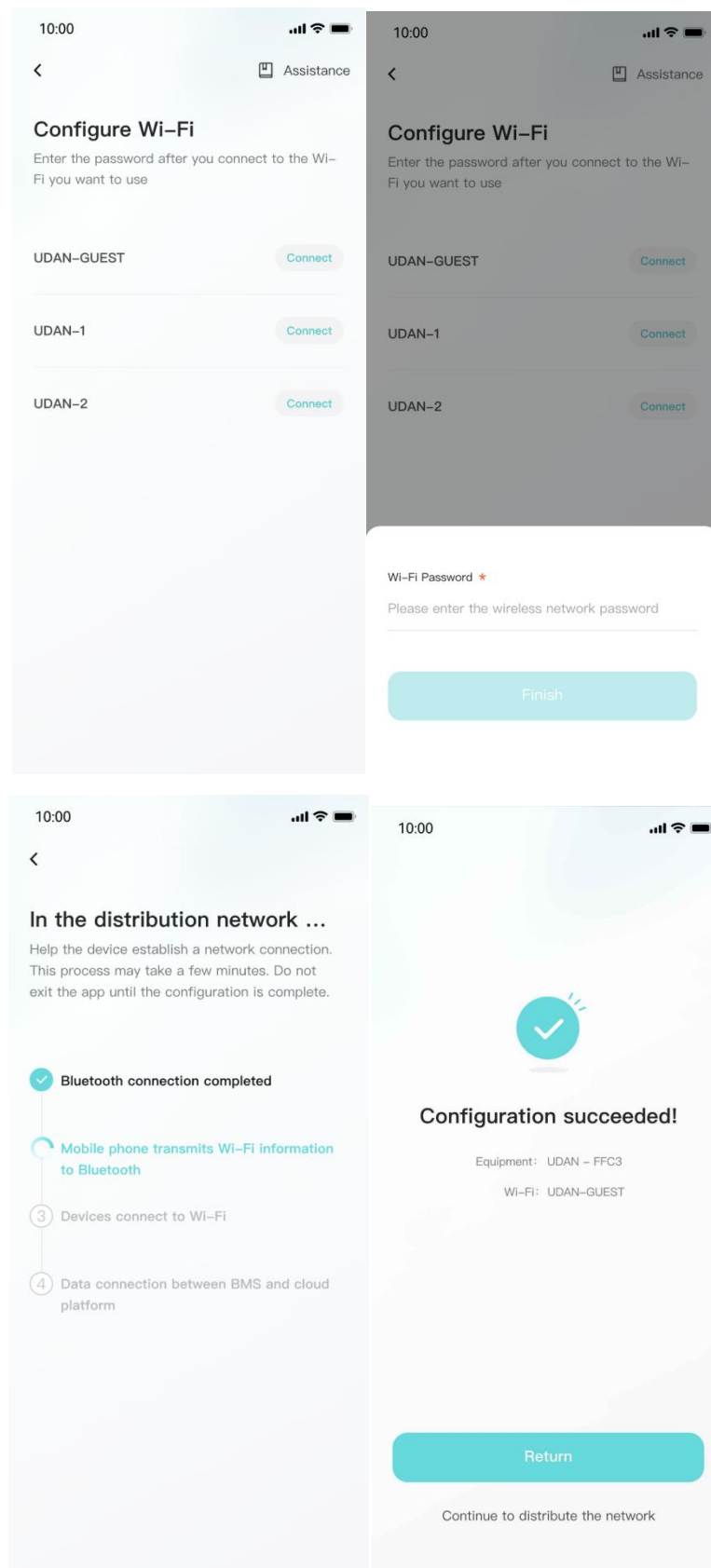


Figure 7.6.3 Connecting to WiFi

7.7 APP interface

7.7.1 Interface description

The device homepage is used to display information about the devices currently being managed.

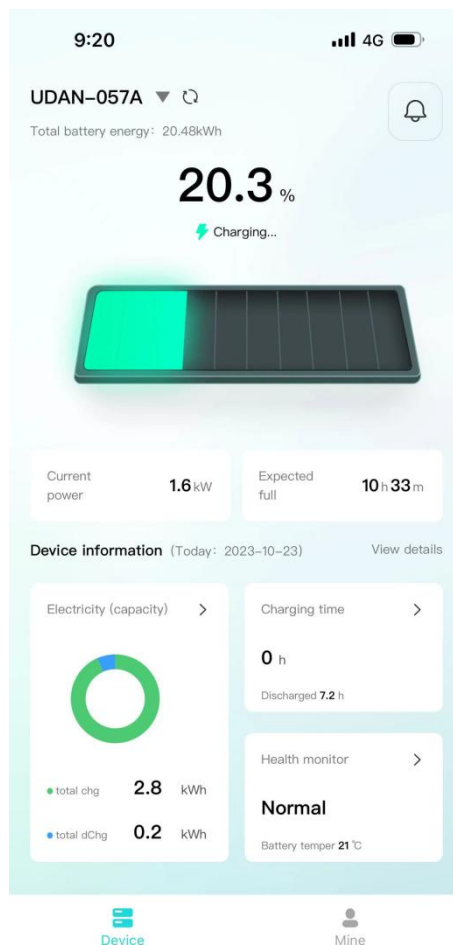


Figure 7.7.1 Device Homepage

Top area: Displays device name, battery level, and message entry.

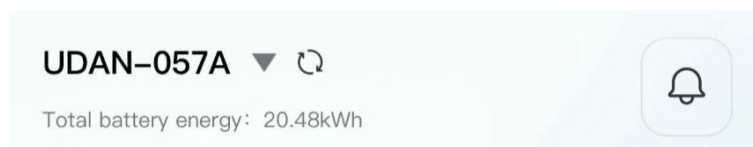


Figure 7.7.1 Top area

Middle area: Displays the current battery charge/discharge status, battery percentage, current power, and estimated full charge time.

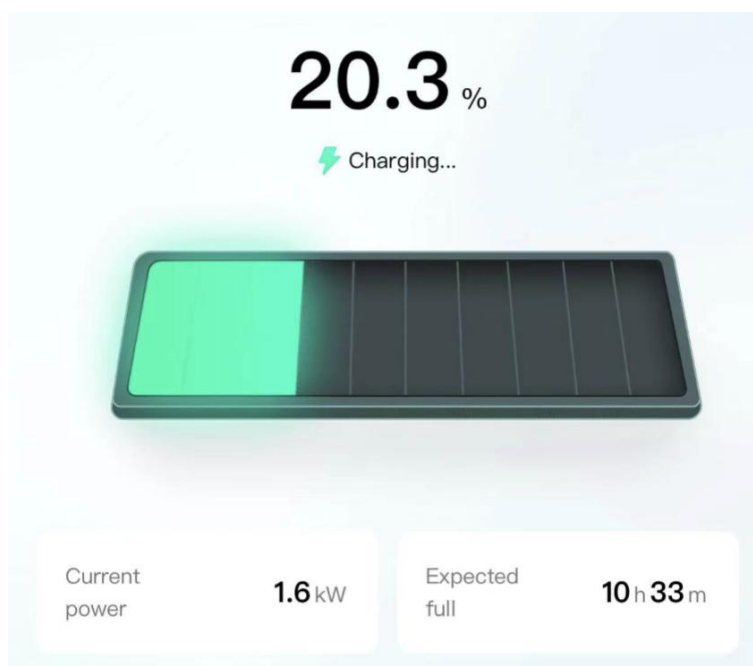


Figure 7.7.1 Middle Area

Bottom area: Displays daily device battery level, charging time, and health monitoring overview data in card format. Click on the corresponding card to view details.

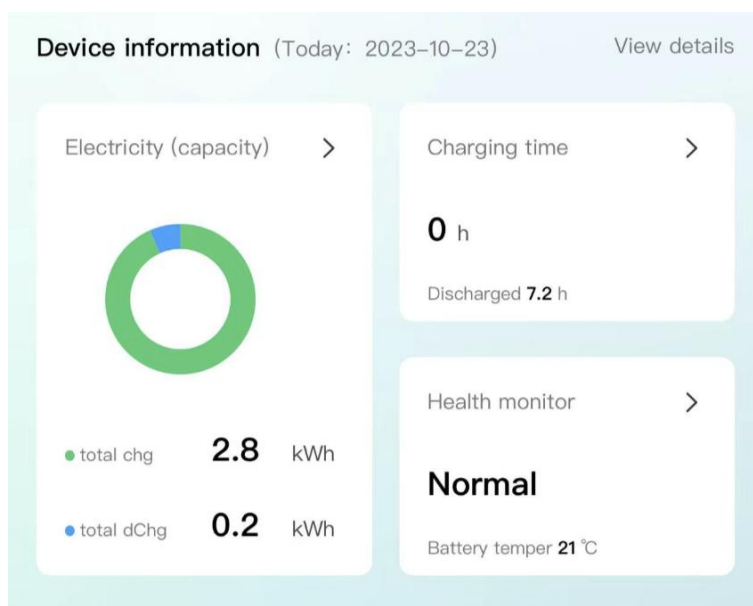


Figure 7.7.1 Bottom area

7.7.2 Data details

Displays current device data details, allowing users to view battery level, charging/discharging power, and charging/discharging time data separately, with support for time filtering.

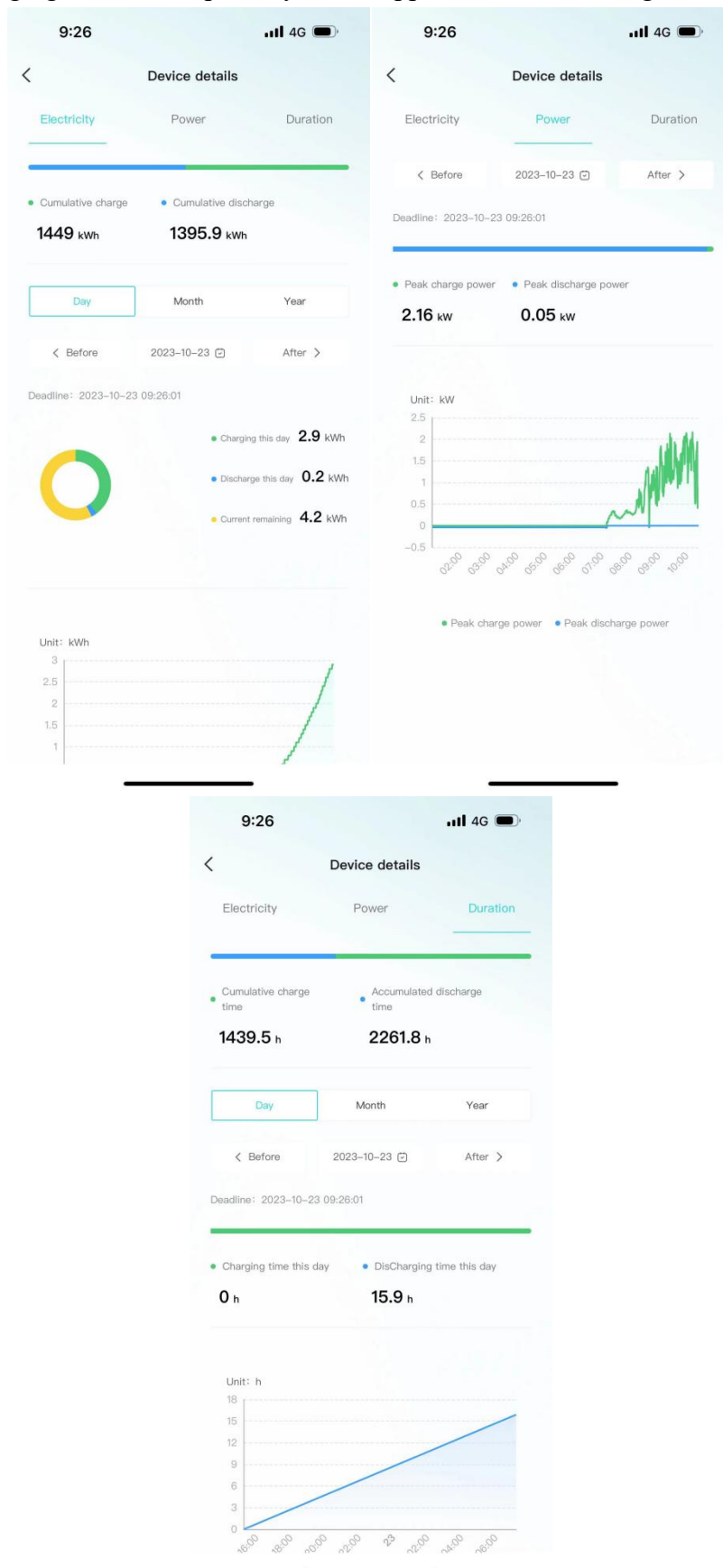


Figure 7.7.2 Data Details

7.7.3 My Interface

- My page allows users to view their devices, add devices, configure WiFi, update software, access after-sales service, provide problem feedback, and configure app settings;
- Click "My Devices" to access device management. Here you can view all devices managed by your current account, switch the device displayed on your homepage, and unbind devices, among other operations;
- Click "Add Device" to enter the QR code scanning page;
- Click "Device Network Configuration" to enter the device network configuration process.

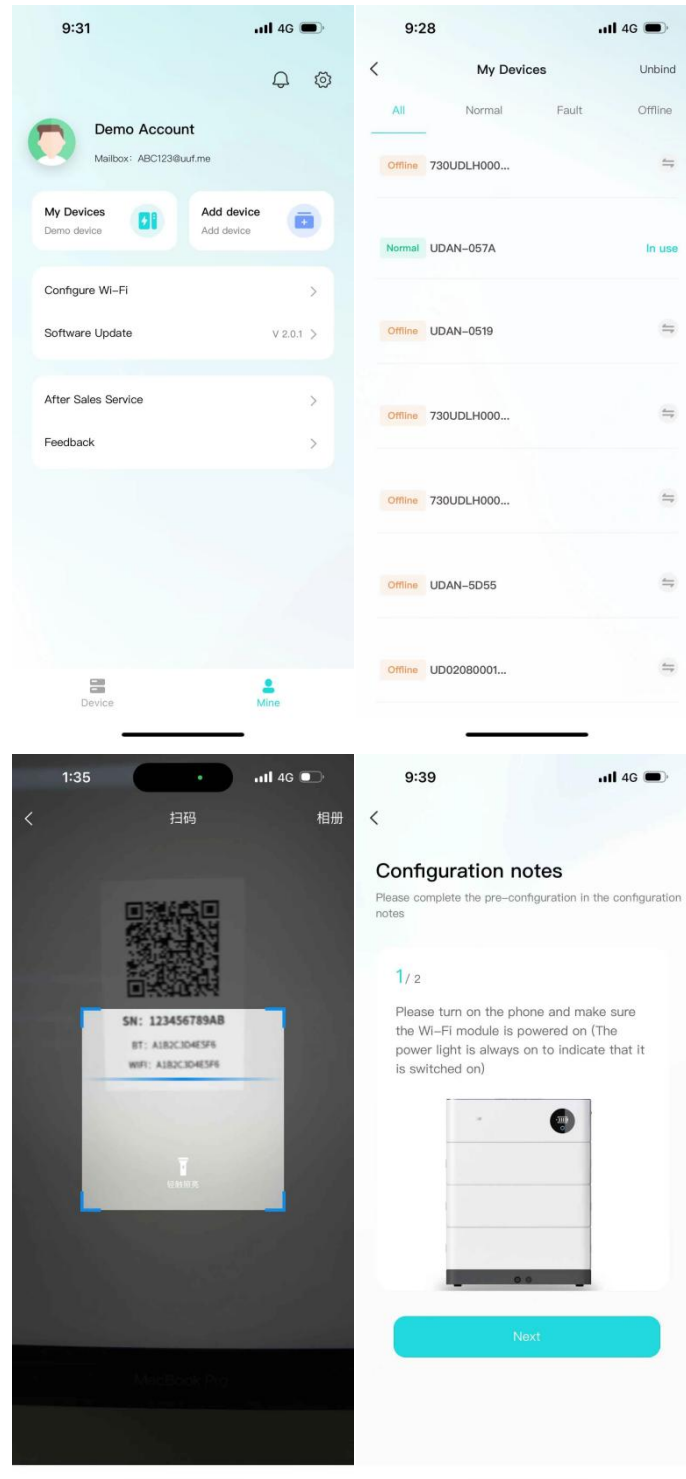


Figure 7.7.3 My Interface

8. Fire Protection System



Please comply with the fire safety regulations of the country or region where the project is located.

Regularly inspect and maintain fire-fighting equipment to ensure the normal operation of the fire-fighting system.

When the detection equipment detects abnormal temperature or smoke inside the cabinet, the audible and visual alarm will light up red and sound an alarm, while simultaneously spraying aerosol to prevent a fire.

※If the fire is too large, evacuate as soon as possible and call the fire department.

8.1 Fire protection layout

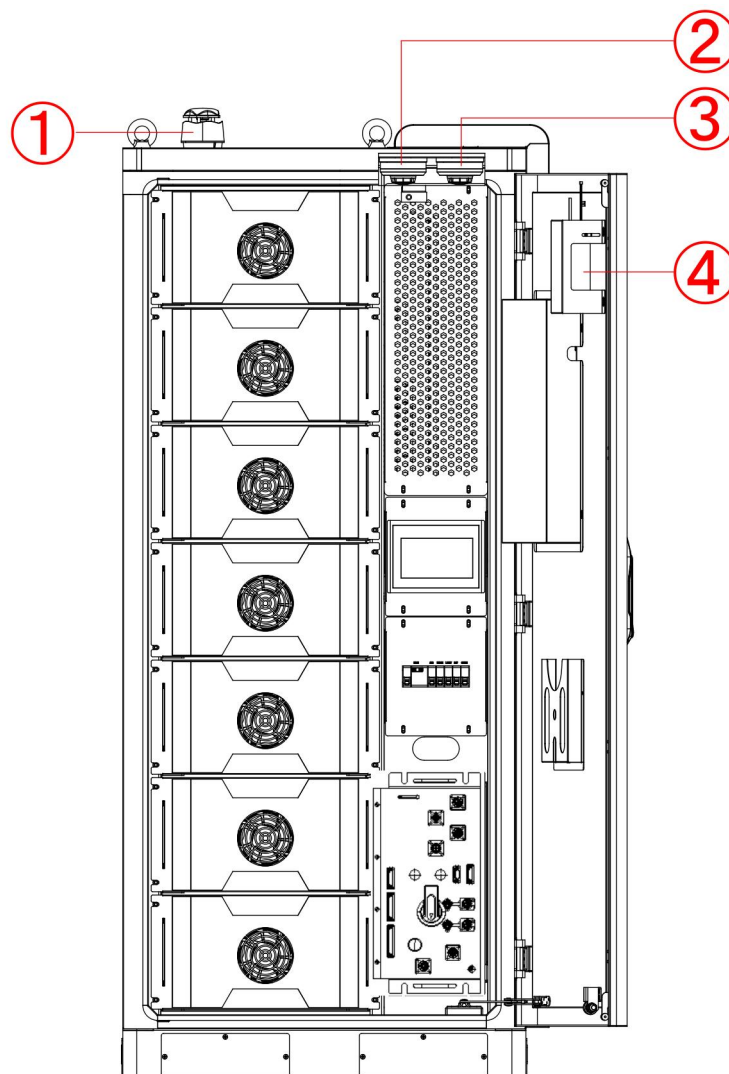


Figure 8.1 Firefighting equipment

Table 8.1 Firefighting equipment

NO.	Name	Explanation
1	Audible and visual alarm	After the fire alarm is triggered, a red light alarm and a buzzer sound will be emitted.
2	Temperature detector	The temperature inside the cabinet was detected, and an over-temperature alarm was triggered.
3	Smoke detector	Smoke detection inside the cabinet triggered a smoke alarm.
4	Aerosol inhibitors	When a fire is detected in the system, aerosols are released to extinguish the fire.

8.2 Fire extinguishing mechanism

The fire-suppressing effect of thermal aerosols is mainly reflected in the following aspects:

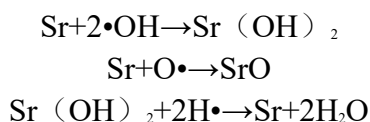
The extinguishing mechanisms of general fire extinguishing agents mainly include isolation, asphyxiation, cooling, and chemical inhibition. Different extinguishing agents have different extinguishing mechanisms. The extinguishing mechanism of thermal aerosols is mainly reflected in two aspects: one is the cooling effect of endothermic decomposition, and the other is the chemical inhibition effect of the gas and solid phases, which work synergistically. In addition, the gaseous components in the aerosol extinguishing agent products also play a certain auxiliary role.

1) Cooling and extinguishing effect of endothermic decomposition

The cooling effect of thermal aerosol fire extinguishing agents mainly relies on the endothermic decomposition of metal oxides and carbonates. The heat released by any fire in a short period is limited. If the solid particles in the aerosol can absorb some of the heat released by the fire source within a short time, the flame temperature will decrease. This reduces the heat radiated to the burning surface and the heat used to break down vaporized combustible molecules into free radicals, thus inhibiting the combustion reaction to some extent.

2) Gas-phase chemical inhibition

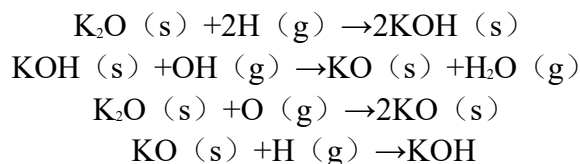
Under heat, the vaporized metal ions such as Sr, K, Mg, or electron-losing cations from the decomposition of thermal aerosol fire extinguishing agents exist in the form of vapor. These vapors undergo multiple chain reactions with active groups $H\cdot$, $\cdot OH$, and $O\cdot$ during combustion. Sr is used as an example below:



This process is repeated, and a large number of active groups in the combustion are consumed, the concentration decreases continuously, and combustion is suppressed.

3) Solid-phase chemical inhibition

Solid particles in thermal aerosol fire extinguishing agents can adsorb chain reaction intermediates $\cdot OH$, $H\cdot$, and $O\cdot$, and catalyze their recombination into stable molecules, thereby interrupting the branched chain reaction in the combustion process. The following example uses K:



In the fire extinguishing process described above, several extinguishing mechanisms interact and work synergistically. However, the transport effect of gases and the heat absorption and cooling effect of metal oxides or carbonates only play an auxiliary role. The main extinguishing effect relies on the chemical inhibition effect of the gas and solid phases.

8.3 Thermal aerosol fire extinguishing equipment

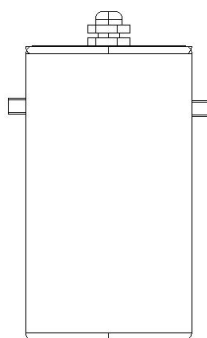


Figure 8.3 Schematic diagram of thermal aerosol

Technical parameters:

Figure 8.3 Description of thermal aerosol

Thermal Aerosol	Content	Technical Parameters
	Startup Method	Electric start
	Feedback Signal	Passive switching signal
	Maximum Protection Volume	3.33 m ³
	Discharge Time	20±5 s
	Validity Period	15 years
	External Dimensions	160×80×80 mm
	Usage Environment	-40℃~+55 ℃
	Extinguishing Agent Quality	200 g

8.4 Temperature sensor

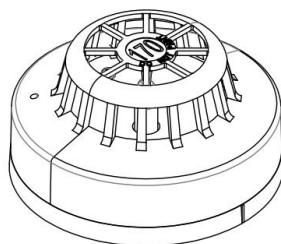


Figure 8.4 Temperature sensor schematic diagram

Technical parameters:

Table 8.4 Temperature sensor description

Temperature Sensor	Content	Technical Parameters
	Operating Voltage	24 VDC (16 VDC~28 VDC)
	Static Current	$\leq 60\mu\text{A}$
	Alarm Current	$\leq 55\text{ mA}$
	Category Settings	Can be set to A1R, A2S, BS
	Maximum Ripple Voltage	2 V (peak value)
	Alarm Reset	Instantaneous power outage (10 s Min, 1.0 VDC Max)
	Enclosure IP Rating	IP2X
	Relative Humidity	$\leq 95\%$, Non-condensing dew
	External Dimensions	Diameter 100mm, height 53.3mm (with base)
	Weight	Approximately 110g (with base)

8.5 Smoke sensor

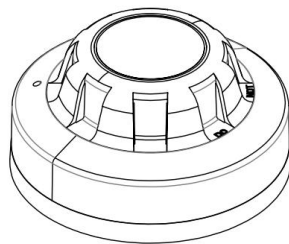


Figure 8.5 Smoke sensor schematic diagram

Technical parameters:

Figure 8.5 Smoke Sensor Description

Smoke Sensor	Content	Technical Parameters
	Operating Voltage	24 VDC (16 VDC~28 VDC)
	Monitoring Current	$\leq 60\mu\text{A}$
	Alarm Current	$\leq 55\text{ mA}$
	Environment Temperature	- 10 °C~ + 50 °C
	Maximum Ripple Voltage	2 V (peak value)
	Alarm Reset	Instantaneous power outage (10 s Min, 1.0 VDC Max)
	Enclosure IP Rating	IP2X
	Relative Humidity	$\leq 95\%$, Non-condensing dew
	External Dimensions	Diameter 100mm, height 44.5mm (without base)
	Weight	Approximately 110g

8.6 Audible and visual alarm device

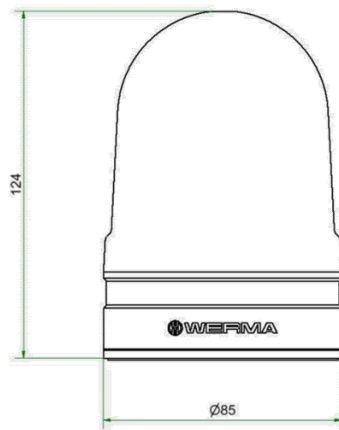


Figure 8.6 Schematic diagram of sound and light alarm device

Technical parameters:

Figure 8.6 Description of the audible and visual alarm device

Audible and visual alarm device	Content	Technical parameters
	Height	125mm
	Diameter	85mm
	IP rating	IP66
	Operating temperature	-30°C~ + 50°C
	Operating voltage	DC24 V
	Operating current	140mA
	Optical signal image	Flashing, solid light
	Noise	85dB

9. System Maintenance

9.1 Maintenance instructions

With the increase of service life and the influence of environmental temperature, humidity, dust, and vibration, the components inside the energy storage system will age, which will affect the performance of the energy storage system and even lead to malfunctions that cannot function properly.

Therefore, it is necessary to implement daily and regular maintenance on the energy storage system to ensure its normal operation and service life. All measures and methods that contribute to the good working condition of energy storage systems belong to the scope of maintenance work.

In case of fault, please contact our company. At the same time, provide the following information to provide you with better service:

- Photos of the fault site;
- Model and serial number of the faulty product;
- Information on relevant components connected to the product;
- Installation and connection plan for energy storage system;
- Fault information and brief description.

9.2 Maintenance precautions



Only personnel who have received relevant training and qualifications can perform maintenance operations on the energy storage system.



When performing maintenance, avoid leaving metal items such as screws and washers inside the energy storage system to prevent potential damage to the system.

When servicing and maintaining the energy storage system, safety should be the top priority. To protect the operators, the following rules must be followed:

- Disconnect the external connection of the energy storage system;
- Ensure that the energy storage system is not accidentally powered on;
- Before maintenance, use a multimeter to measure and ensure that the components being maintained are not electrified;
- Ensure that the system is well grounded.

9.3 Quarterly maintenance

Table 9.3 Quarterly Maintenance Checklist

Maintenance Project	Maintenance Content	Reference Standard	Is the system powered off?
Cabinet	Visual inspection: ·Overall appearance ·Rust condition ·Door lock condition ·Various ports	·No obvious peeling or mottled paint · No obvious paint loss or rust ·Undamaged door lock ·No dust accumulation at the ports ·No animals such as snakes, rats, or insects have entered	No
Air Conditioner	·Inspect the exterior ·Clean the filter	·No obvious damage to the exterior ·No obvious paint peeling or rust ·No loose or missing screws ·The fan rotates normally without jamming or abnormal noise ·The filter screen is clean and unclogging	No
Indicator Lights	Check the indicator light status	The indicator light is solid green.	No
Power Distribution Area	Check the power distribution area for foreign objects.	The area is clean and free of foreign objects.	No

Note: Monthly maintenance is recommended in environments with temperatures $\geq 35^{\circ}\text{C}$ or $\leq 0^{\circ}\text{C}$; other situations will be determined based on the actual circumstances.

9.4 Semi-annual maintenance

Table 9.4 Semi-annual Maintenance Checklist

Maintenance Project	Maintenance Content	Reference Standard	Is the system powered off?
Air Conditioner	Visual inspection: · Appearance · Rust condition · Screws · Fan · Filter Cleaning the fan filter	· No obvious damage to the exterior · No obvious paint peeling or rust · No loose or missing screws · Fan rotates normally without jamming or abnormal noise · The filter surface is clean and free of blockages. Clean and clog-free filter	No
Temperature Sensor Smoke Sensor	Note: Disconnect the trigger signal line of the aerosol fire suppression module first to prevent false spraying. Use specialized instruments to randomly inspect the smoke and temperature detectors, testing their trigger and alarm actions.	When the indicator light turns red, it triggers the audible and visual alarm device, suppressing the module's output electrical signal on the model line.	Yes
Aerosol Suppression Module	· Inspect the module for any damage or breakage · Clean the module as necessary · Check the cables for damage, looseness, or detachment	· Module intact, nozzle undamaged · Machine body clean and dust-free · Cables undamaged, connections secure	Yes
Note: It is recommended to clean up after each sandstorm in dusty areas; other areas should decide based on the actual situation. Note: The trigger connection wires must be disconnected before maintaining the fire protection system to prevent accidental spraying.			

9.5 Annual maintenance

Table 9.5 Annual Maintenance Checklist

Maintenance Project	Maintenance Content	Reference Standard	Is the system powered off?
Battery Pack	Visual inspection: • Appearance	• No obvious damage to the exterior. • No obvious paint peeling or rust.	Yes

	• Rust condition • Screws and bolts • Fan • Connecting cable	•No screws or bolts are loose or missing. •The fan rotates normally without jamming or abnormal noise; the ventilation panel is clean and unobstructed. • Power and communication cables are securely connected and not loose or missing.	
Indicator Lights	Check the indicator light status	The indicator light is solid green.	No

10. Troubleshooting

Table 10 Troubleshooting

Fault Type	Fault Status	Cause of The Fault	Troubleshooting
Communication Failure	Inverter communication failure Internal network communication failure Device data not displayed	Incorrect or loose communication interface with inverter; incorrect protocol or baud rate selection. Incorrect or loose PDU/battery pack connection harness. Incorrect or loose communication harness with device; incorrect protocol or baud rate selection.	Check the wiring harness connections and device settings. If the problem persists, please contact an engineer.
Battery Failure	Battery voltage too high Battery voltage too low Battery leakage	Damage caused by overcharging, resulting in battery voltage consistently exceeding the maximum voltage. Damage caused by over-discharging or prolonged storage, resulting in battery voltage consistently below the minimum voltage. Damage caused by external impacts such as short circuits, punctures, or other injuries.	Repair and replacement
Overvoltage Protection	The battery trips due to a 3.65V overvoltage protection mechanism triggered during charging.	Inverter communication or settings malfunction caused the inverter to continue charging.	If the battery cannot recover on its own, please contact an engineer for assistance.

Undervoltage Protection	When the battery discharges, it triggers the 2.5V undervoltage protection of a single cell to cut off power.	Inverter communication or settings malfunction caused the inverter to fail to stop discharging.	If the battery cannot recover on its own, please contact an engineer for assistance.
High Temperature Protection	Maximum single-unit temperature above 55 degrees Celsius	The environment temperature is too high or there is a heat source near the battery.	If the battery cannot recover on its own, please contact an engineer for assistance.
Low Temperature Protection	Minimum single-unit temperature below 0 degrees Celsius	Battery temperature too low	If the battery cannot recover on its own, please contact an engineer for assistance.
Discharge Low Temperature Protection	Minimum single-unit temperature below -20 degrees Celsius	Battery temperature too low	If the battery cannot recover on its own, please contact an engineer for assistance.
BMS Failure	Sampling failure	Sampling point detached or disconnected. Sampling temperature sensor malfunction. Sampling circuit malfunction	Contact an engineer for repair or replacement.

11. Battery Recycling

Advanced hydrometallurgical processes are used to recover aluminum, copper, lithium, iron, and other metals from discarded LiFePO₄ batteries, achieving a comprehensive recovery efficiency of up to 80%. The specific process steps are as follows:

11.1 Cathode material recycling process and steps

Aluminum foil is an amphoteric metal used as a collector.

1) First, it is dissolved in an alkaline NaOH solution, allowing aluminum to enter the solution as NaAlO₂. After filtration, the filtrate is neutralized with sulfuric acid solution, and then precipitation is performed to obtain Al(OH)₃. When the pH value is above 9.0, most of the aluminum will precipitate, and the resulting Al(OH)₃ can be analyzed to achieve a level of chemical purity.

2) The filter residue was dissolved in sulfuric acid and hydrogen peroxide, allowing lithium iron phosphate to enter the solution as Fe₂(SO₄)₃ and Li₂SO₄, separating it from the carbon black and carbon coating the surface of the lithium iron phosphate. After filtration, the pH of the filtrate was adjusted with NaOH and ammonia. First, iron was precipitated with Fe(OH)₃, and the remaining solution was precipitated with saturated Na₂CO₃ solution at 90°C.

3) Since FePO₄ is slightly soluble in nitric acid, the filter residue is dissolved in nitric acid and hydrogen peroxide to directly precipitate FePO₄. Impurities such as carbon black are separated from the acidic solution. Fe(OH)₃ is leached from the filter residue, and Li₂CO₃ is precipitated at 90°C with saturated Na₂CO₃ solution.

11.2 Anode material recycling

The recycling process for anode materials is relatively simple. After separating the anode plates, the purity of copper can reach over 99%, which can be used for further purification of electrolytic copper.

11.3 Diaphragm recycling

The membrane material is harmless and has no recycling value.

11.4 List of recycled equipment

Automatic dismantling machine, crusher, wet metal pool, etc.

12. Appendix

Table 12 System Parameters

Model Name	BS09-112-D-P DC-side Energy Storage Battery System
Main Specifications	
Battery Type	LiFePO ₄
Pack Energy(kWh)	16.076
Pack Voltage(V)	51.2
Pack Capacity(Ah)	314
Number of Battery Packs	7
System Rated Voltage(V)	358.4
System Voltage Range(V)	313.6~403.2
System Nominal Energy(kWh) ^[1]	112.53
Usable Energy(kWh@90%DOD)	101.28
Charge/Discharge Current(A) ^[2]	157
Other Specifications	
Dimension(W*D*H)	950*1267*2135mm
Weight(kg)	1342
Operating Temperature Range	-10~55°C(>45°C derating)
Storage Temperature	0~35°C
Display Mode	indicator light panel
Communication Interface	CAN;RS485
BMS Communication Method	CAN
IP Rating	IP54
Cooling Method	Intelligent Air Cooling
Noise	75dB
Relative Humidity	<90%
Altitude	≤2000m
Cycle Life ^[3]	≥8000 Cycles (25°C, 0.5C/0.5C,90%DOD,70%EOL)
Installation	Ground-mounted
Warranty Period ^[4]	5 +5 years
Cumulative Discharge Energy	180.7MWh
Certifications	MSDS,UN38.3

[1]DC available energy: Test environment 25°C, 0.5C charge and discharge, 90% DOD; due to different system configuration parameters, the system available energy may vary.

[2]Charge and discharge current: The current is affected by temperature and SOC.

[3]Cycle life: A standard for battery cell life; cells that meet this standard are used.

[4]Warranty period: Applicable conditions are subject to the warranty agreement.



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※ The product information and parameters are subject to change without prior notice.