



Specification

Rechargeable Lithium-ion Battery

HZEB-HCT-200

Integrated Energy Storage System

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1. Foreword

This Manual revolves around the HZEB-HCT-200 energy storage product. HZEB-HCT-200 is a lithium iron phosphate battery energy storage system. It is primarily applicable in various energy storage usage scenarios. If you have any questions, please contact your supplier for advice and explanations.

1.1 Applicable product

This Manual applies to the following model:

HZEB-HCT-200

1.2 Legal statement

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Please note that our company may make modifications to contents of this Manual without prior notice. If any changes are made to its information, we will not notify you separately.

1.3 Revision history

The latest version in the "Revision history" contains updates from all previous versions of this Manual.

V1.0.0.20240219

- **First issue.**

V1.1.0.20240302

- **Added information about the Power Conversion System (PCS)**

V1.2.0.20240311

- **Updated the system dimension information**

V1.3.0.20240312

- **Removed the information about the explosion-proof ventilation system**

V2.0.0.20240920

- **Reset the version update**

2. System Scheme

2.1 System overview

The 200 kWh energy storage system (hereinafter referred to as "the system") is primarily composed of a lithium iron phosphate battery system, PCS, cooling system, fire suppression system, etc. It is configured in an all-in-one cabinet form, suitable for a variety of usage scenarios. It incorporates a battery management system (BMS) and an energy management system (EMS), which can effectively prevent overcharging and over-discharge. The system also includes short-circuit protection, overvoltage protection, real-time monitoring, and advanced control functions.

The system is generally connected to the public grid at a voltage level of 400 V (the actual connection scheme is subject to the agreed-upon design plan). It is primarily used for energy storage or to match photovoltaic power generation, and it also has "Peak Cut" and emergency power supply functions, thereby enhancing the economic efficiency and stability of electricity usage for customers.

2.2 System features

The energy storage system features an outdoor cabinet design, making it easy to install, transport, maintain, and expand. The system consists of high-energy-density, cost-effective, and high-safety lithium iron phosphate battery units connected in a certain series and parallel configuration, along with an advanced battery management system. It is flexible, reliable, and easy to expand and upgrade. In addition, the system has the following features:

- Include comprehensive, multi-level battery warning and protection strategies, ensuring high safety
- Feature comprehensive communication, monitoring, management, and control capabilities, ensuring continuous and stable operation for a long time
- Equipped with an intelligent temperature control system inside the cabinet, minimizing the impact of external environmental conditions on the internal equipment and making the system suitable for a wide range of applications
- Equipped with automatic fire alarm and automatic fire extinguishing system inside the cabinet

2.3 System dimension and layout

2.3.1 System dimension

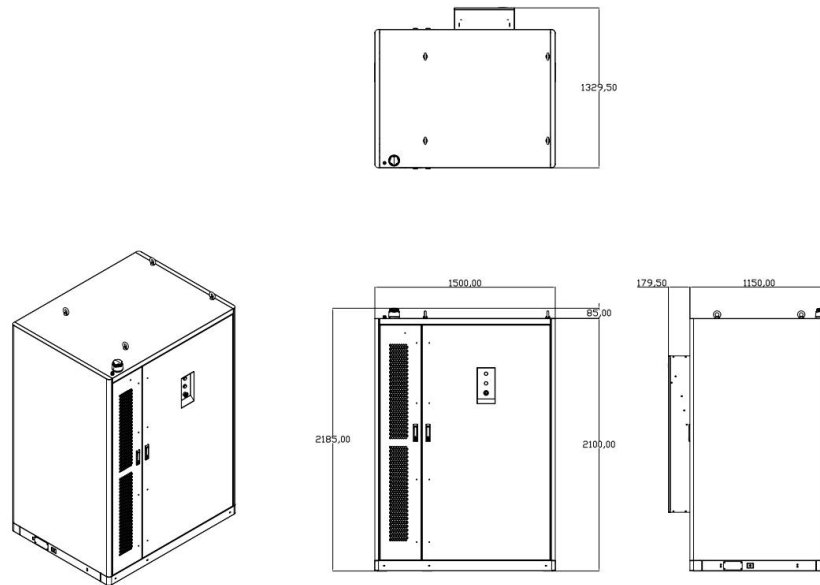


Figure System dimension

2.3.2 System layout

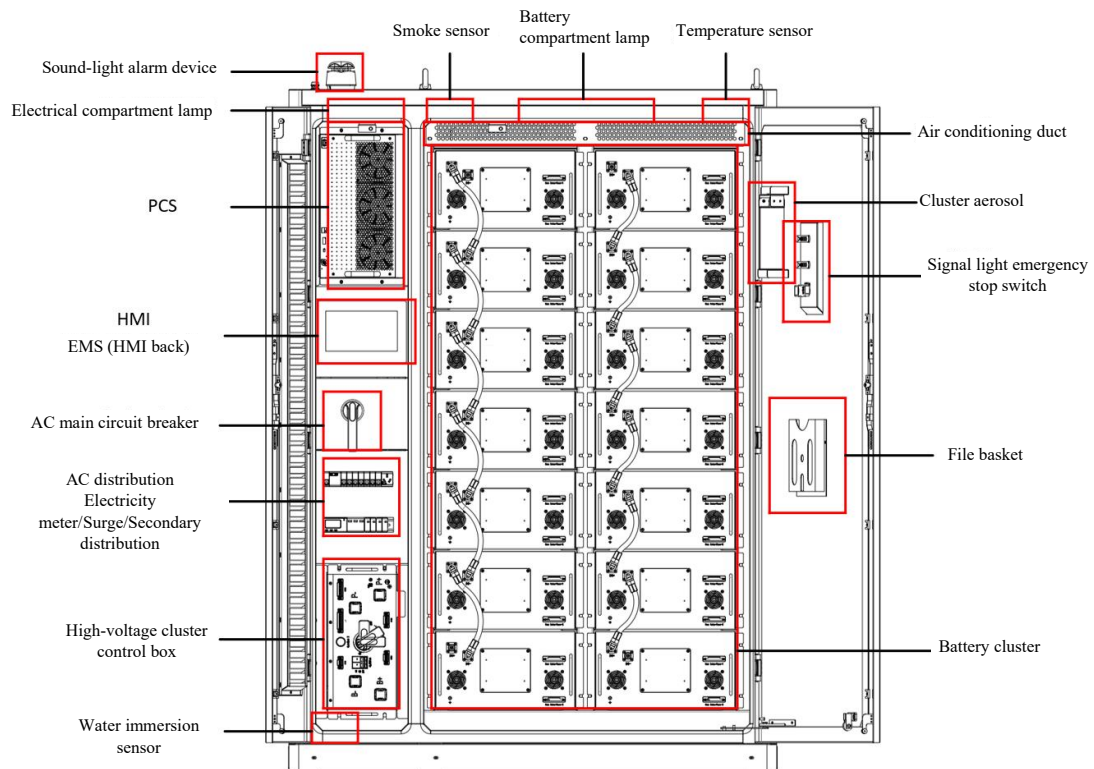


Figure System layout (front)

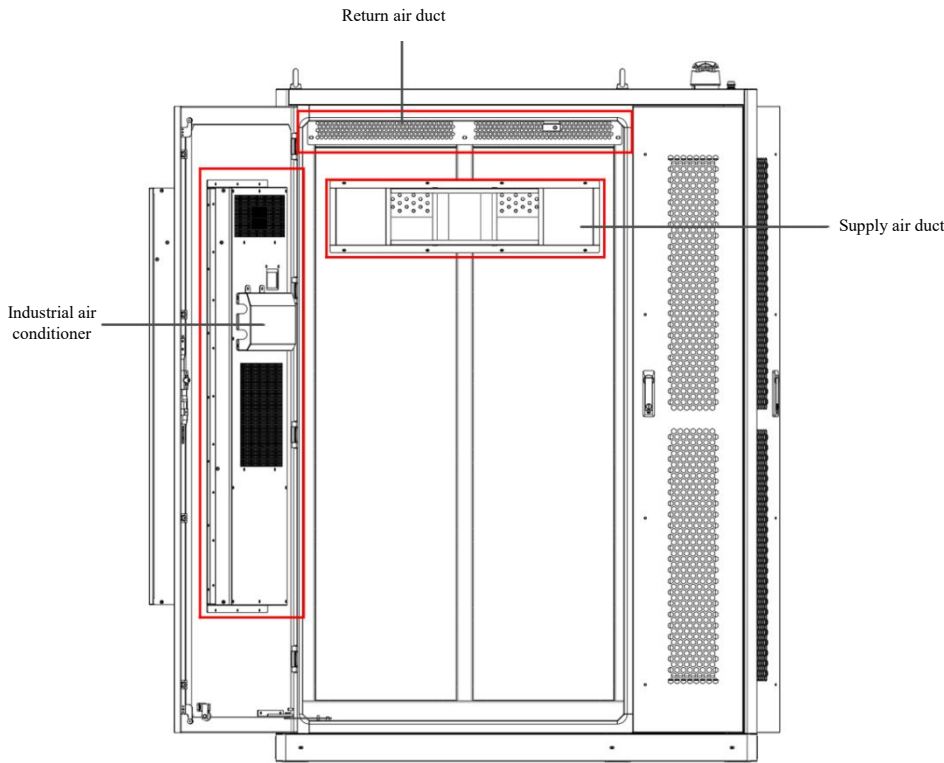


Figure System layout (back)

2.4 System configuration

| S/N | Name | Quantity | Unit | Description |
|-----|----------------------------------|----------|------|--|
| 1 | Outdoor cabinet | 1 | Pcs | 200.7 kWh rated energy storage |
| 2 | Battery pack | 14 | Pcs | 1P16S, single pack energy capacity: 14.336 kWh |
| 3 | High-voltage cluster control box | 1 | Pcs | 150A HV BOX |
| 4 | Power conversion system (PCS) | 1 | Set | 100kW(AC/DC) |
| 5 | Energy management system (EMS) | 1 | Set | EMS |
| 6 | Industrial air conditioner | 1 | Set | Total cooling capacity: 3.2 kW (subject to actual operation) |
| 7 | Fire protection system | 1 | Set | Aerosol fire suppression system |
| 8 | Lighting system | 1 | Set | In-cabinet lighting |

Table System configuration

The energy storage system configuration includes:

Battery cabinet: It is the mounting position of the battery boxes (and related control parts)

Lithium batteries: 3.2 V/280 Ah lithium iron phosphate batteries connected in series constitute a battery cluster.

Power conversion system (PCS): It is a current conversion unit that switches between AC and DC

Battery management system (BMS): BMS is designed for secondary (rechargeable) batteries to improve battery utilization and prevent overcharge and over-discharge. This system can control the charging and discharge of the energy storage system and monitor the battery SOC information according to commands

Energy management system (EMS): In the energy storage system, EMS can control charging and discharging equipment, protect the equipment and devices, and manage standby, operation, and shutdown of battery packs. It can achieve full station visualization and intelligence via LAN connection.

Industrial air conditioner: It can control the operating temperature of the system and provide a good working environment for the energy storage system, thereby extending the service life of the system.

Fire protection system: It can detect and suppress the initial fire protection problems of the system due to thermal runaway and other reasons.

Lighting system: It offers basic lighting to assist relevant personnel in operation and maintenance inside the cabinet in case of insufficient lighting.

2.5 System parameters

| Battery specification | HZEB-HCT-200 |
|-------------------------|--------------|
| Battery type | LFP |
| Rated energy | 200.7kWh |
| Rated voltage | 716.8V |
| Operating voltage range | 627.2-806.4V |
| Rated current | 140A(0.5C) |
| AC specification | |
| Rated power | 100kw |
| AC rated voltage | 400V |

| | |
|----------------------|-------------------------|
| Wiring | 3P4L+PE |
| Rated frequency | 50Hz |
| Maximum AC current | 144A |
| System specification | |
| Dimensions | 1500*1329.5*2185 |
| Weight | 2500kg |
| Temperature range | -10°C-55°C |
| Humidity range | 5%–90% (non-condensing) |
| Protection level | IP54 |
| Noise | 80dB |
| Altitude | ≤2000m |
| Cooling mode | Intelligent air cooling |
| Communication mode | Ethernet /RS485/CAN |

Table System parameters

3. Battery system

The total energy of this system is 200.7 kWh. Lithium iron phosphate batteries, each rated at 3.2 V/280 Ah and configured in a 1P16S arrangement, constitute a battery pack; 14 such battery packs are connected in series, forming the system's DC side. The rated DC-side voltage is 716.8 V, and the rated charge/discharge current is 0.5 C.

3.1 System configuration parameters

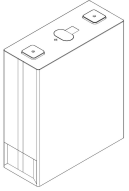
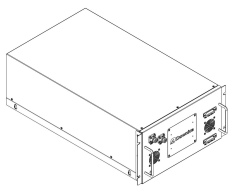
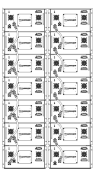

| S/N | Description | Unit | Rated Voltage | Rated Capacity | Rated Energy | Quantity |
|-----|-----------------|---|---------------|----------------|--------------|----------|
| 1 | Battery |  | 3.2V | 280Ah | 896Wh | 224 |
| 2 | Battery pack |  | 51.2V | 280Ah | 14336Wh | 14 |
| 3 | Battery cluster |  | 716.8V | 280Ah | 200704Wh | 1 |
| 4 | Battery system |  | 716.8V | 280Ah | 200704Wh | 1 |

Table DC side configuration parameters

3.2 Cell parameters

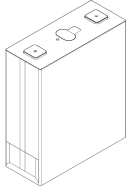
| Unit | Model/Description | 280Ah |
|---|-----------------------------|--------------------|
|  | Cell type | LFP |
| | Rated capacity (Ah) | 280 |
| | Charge-discharge rate | $\leq 0.5C/0.5C$ |
| | Energy density (Wh/kg) | ≥ 162.9 |
| | Application area | BEV/ESS |
| | Dimensions (L×W×H, mm) | 174.2*71*207.1±0.8 |
| | International certification | GB/T 36276-2018 |

Table Cell parameters

3.3 Battery pack parameters

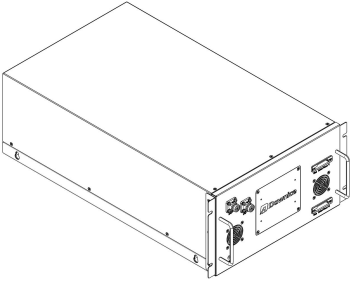
| Unit | Model/Description | HZEB-HCT-15 |
|--|-----------------------------|--|
|  | Cell type | LFP |
| | Maximum charge rate | $\leq 0.5C$ |
| | Rated charge-discharge rate | 0.5C |
| | Maximum discharge rate | $\leq 0.5C$ |
| | Cell combination method | 1P16S |
| | Nominal capacity | 280Ah |
| | Nominal energy | 14.336kWh |
| | Nominal voltage | 51.2V |
| | Operating voltage range | 43.2-57.6V |
| | Operating temperature range | Discharge: -10°C to 55°C ; Charging: 0°C – 55°C |

Table Battery pack parameters

3.4 Battery cluster parameters

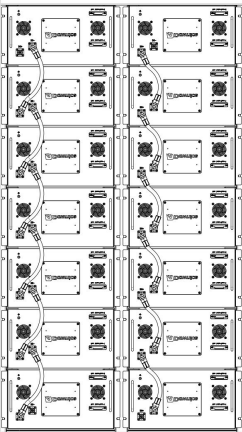
| Unit | Model/Description | HZEB-HCT-200 |
|---|-----------------------------|--|
|  | Cell type | LFP |
| | Maximum charge rate | $\leq 0.5C$ |
| | Rated charge-discharge rate | 0.5C |
| | Maximum discharge rate | $\leq 0.5C$ |
| | System configuration method | 1P224S |
| | Nominal capacity | 280Ah |
| | Nominal energy | 200.7kWh |
| | Nominal voltage | 716V |
| | Operating voltage range | 604.8-806.4V |
| | Operating temperature range | Discharge: -10°C to 55°C ; Charging: 0°C – 55°C |

Table Battery cluster parameters

3.5 High-voltage cluster control box parameters

3.5.1 External dimension

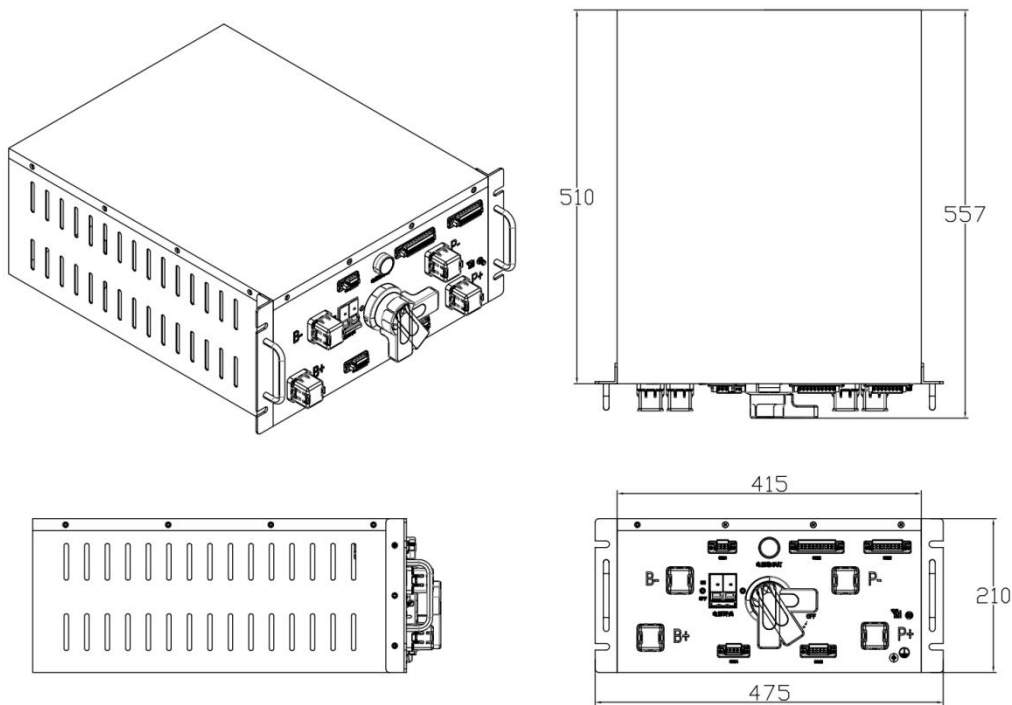


Figure Appearance of cluster control box

3.5.2 Control panel

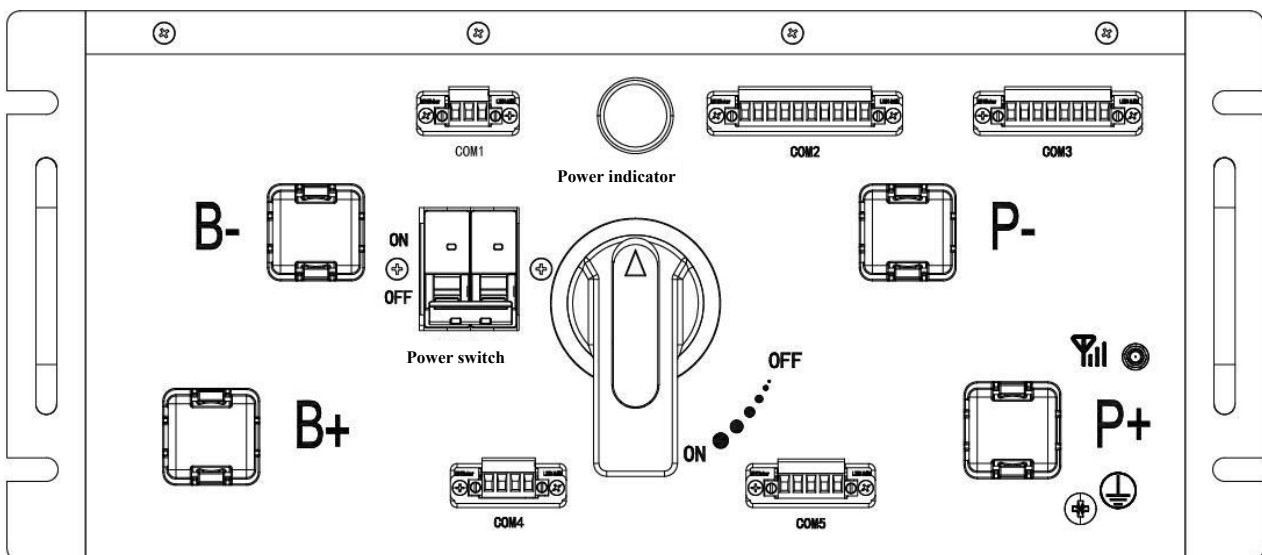


Figure Control panel

Power input/output interface definition:

| Interface Definition | Function Description | Remark |
|----------------------|---|--|
| B+ | Battery cluster input positive terminal | Connect to the battery cluster positive terminal, with the interface using a M8 bolt |
| B- | Battery cluster input negative terminal | Connect to the battery cluster negative terminal, with the interface using a M8 bolt |
| P+ | PCS input positive terminal | Connect to the PCS positive terminal, with the interface using a M8 bolt |
| P- | PCS input negative terminal | Connect to the PCS negative terminal, with the interface using a M8 bolt |

Table Cluster control box interface definition

Port definition:

| S/N | I/O | COM Port | Definition | Function Description |
|-----|-----|-----------|------------|--|
| 1 | I | COM1(3P) | AC220V-N | N |
| 2 | / | | / | / |
| 3 | I | | AC220V-L | L |
| 1 | I/O | COM2(10P) | CAN1R | Terminal resistor |
| 2 | I/O | | CAN1H | Isolated CAN (Connect to PCS or external device) |
| 3 | I/O | | CAN1L | |
| 4 | I/O | | CAN1G | |
| 5 | I/O | | RS485-A1 | Isolated 485 (Connect to PCS or external device) |
| 6 | I/O | | RS485-B1 | |
| 7 | I/O | | RS485-G1 | |
| 8 | I/O | | RS485-A0 | Non-isolated 485 (Connect to display screen or external device) |
| 9 | I/O | | RS485-B0 | |
| 10 | I/O | | RS485-G0 | |
| 1 | O | COM3(8P) | GND | Switch quantity detection |
| 2 | O | | SWITCH_IN | Short circuit effective |
| 3 | / | | SW2_IN | Dry contact 2 (0.1 A) |
| 4 | I/O | | SW2_OUT | |
| 5 | I/O | | SW1_IN | Dry contact 1 (0.1 A) |
| 6 | / | | SW1_OUT | |
| 7 | O | | 24V+_OUT | Output 24 V+ (Rated 75 W) |
| 8 | O | | 24V-_OUT | Output 24 V- (Rated 75 W) |
| 1 | I/O | COM4(4P) | DEBUG_CANH | Debug CANH |
| 2 | I/O | | DEBUG_CANL | Debug CANL |
| 3 | I | | 24V+_IN | Input 24 V+ |
| 4 | I | | 24V-_IN | Input 24 V- |
| 1 | I/O | COM5(5P) | SPI-H | Intranet daisy chain communication H |
| 2 | I/O | | SPI-L | Intranet daisy chain communication L |
| 3 | / | | / | / |
| 4 | O | | FAN+ | Fan power output 24 V+ |
| 5 | O | | FAN- | Fan power output 24 V- |

Table Cluster control box port definition

4. Power Conversion System (PCS)

4.1 PCS overview

Power conversion system (PCS), a key component in electrochemical energy storage systems, serves to connect the battery system with the grid (and/or load), enabling bidirectional conversion of electrical energy. It can not only control the charging and discharging processes of the battery and convert between AC and DC, but also directly supply power to AC loads in the absence of the grid.

The PCS is primarily composed of a DC/AC bidirectional converter and a control unit. The PCS controller receives control commands from the backend via communication, and based on the sign and magnitude of the power command, it controls the converter to charge or discharge the battery, thus regulating the active and reactive power of the grid. Additionally, the PCS controller can communicate with the BMS via a CAN interface to obtain status information of the battery packs, thereby enabling protective charging and discharging of the battery and ensuring safe operation.

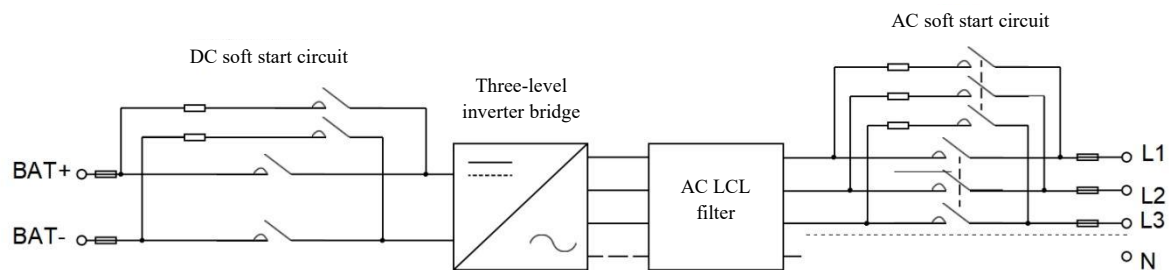


Figure Electrical principle of PCS

4.2 PCS features

- Comprehensive fault protection functions
- Charge-discharge switching time: ≤ 20 ms
- Maximum conversion efficiency: 98.5%
- Compatible with three-phase three-wire/four-wire systems
- Supports hot swapping of PCS modules for rapid maintenance

4.3 PCS parameters

| Item | EPCS105-AM |
|--------------------------------|---------------------------------|
| DC side | |
| Voltage range at full load (V) | 615-950(3W+PE)/680-950(3W+N+PE) |
| Maximum current | 170A |
| AC side | |
| Rated voltage | 230/400 |
| Voltage deviation | -10%~+15% |
| AC output type | (3W+PE)/(3W+N+PE) |
| Rated output power (kW) | 105 |

| | |
|------------------------------|---|
| Maximum output power (kW) | 116 |
| Maximum current (A) | 167 |
| Rated grid frequency (Hz) | 50/60 |
| Power factor | 0.99 |
| Power factor range | 1 (leading)–1 (lagging) |
| Current distortion rate | <3% (rated power) |
| Overload capacity | 110% long-term |
| Maximum discharge efficiency | 98.5% |
| System parameters | |
| Dimensions (mm) | 484*703*256.5 |
| Altitude (m) | 4,000 (derating over 2,000) |
| Operating temperature | –30°C to 55°C (derating over 45°C) |
| Storage temperature | –45°C–70°C |
| Humidity | 0% RH–95% RH, non-condensing |
| Cooling method | Intelligent forced air cooling |
| Communication interface | CAN/RS485 |
| Reference standards | GB/T 34120-2017 , GB/T 34133-2017 , EN 62477 , EN IEC 61000 ,EN50549-1 , |
| Power grid support | L/HVRT, active and reactive power control |

Table PCS parameters

5. Battery Management System (BMS)

5.1 BMS overview

Battery management system (BMS) is a real-time monitoring system composed of electronic circuits and devices, which can effectively monitor battery voltage, battery current, insulation status of the battery cluster, state of charge (SOC), and the status of battery modules and individual cells (voltage, current, temperature, SOC, etc.). The BMS can manage the charging and discharging process of the battery cluster with safety, give an alarm and initiate emergency protection for potential faults, and perform safety and optimization control over the operation of battery modules and clusters, thereby ensuring safe, reliable, and stable battery operation.

5.2 BMS features

- General control + master control + slave control
- Three-level BAU integration with EMS
- Stable and reliable daisy chain communication
- Advanced parallel SOP management and circulating current control
- Support Wi-Fi/Bluetooth/4G communication, be capable of maintaining online status
- Automatic address allocation
- Remote monitoring, early warning/alarm/diagnosis/positioning, OTA updates

5.3 BMS parameters

| Item | | Main Parameters |
|---|------------------------|---|
| Operating temperature | | -40°C-85°C |
| Operating humidity | | 5-95% |
| Cell voltage detection accuracy | | ±5mV |
| Enclosure temperature detection accuracy | | ±1°C |
| Balancing control | | Supported, up to 100 mA |
| High voltage detection accuracy | | ±0.5% or 0.5 V |
| Current detection accuracy | | ±0.5% FSR |
| Insulation detection accuracy | | +10% or 10 KQ |
| State of Charge (SoC) estimation accuracy | | <5% |
| System power supply | | Voltage range: 6 V–36 V (typical values: 12 V, 24 V) |
| Energy consumption | Running | 200mA@12V |
| | Power-off | 100uA@12V |
| Acquisition unit | High voltage detection | 6 channels, BAT+/HV1/HV2/HV3/HV4; PACK- (Total negative adhesion detection) |
| | Current detection | Shunt, supporting (measurement cycle <250 ms); HALL, supporting single-range 5V HALL; preferred shunt |
| | Insulation detection | Support (battery pack B+/B -, range: 0 MQ–6 MQ) Measurement accuracy: 10% or 10 KΩ |
| | Temperature detection | 5 channels (temperature sensor default model: NTC103), measurement accuracy: ±1°C |
| Data storage | Onboard storage | 128 MB SLC NAND FLASH |
| RTC | | Time synchronization function, capable of accepting IRIG-B (DC) code synchronization or network synchronization |

Table BMS parameters

6. Energy Management System (EMS)

6.1 EMS overview

Energy management system (EMS), as the core unit for energy management within the energy storage system, possesses functions such as acquisition of data from power stations and monitoring of power stations, energy scheduling and control, fault detection, and safety protection. These functions help enhance the operating efficiency and economic performance of the energy storage system and ensure the safe, reliable, and stable operation of the power station.

6.2 EMS features

- Seamless integration of EMS with BMS
- Three-level BAU integration with EMS
- Support energy management strategies based on time periods and load
- Support station-wide OTA updates
- Support energy data analysis and prediction
- Be capable of independently implementing device management strategies and various energy management strategies
- Be capable of carrying out remote monitoring and implementing more complicated energy management strategies via the cloud platform

6.3 EMS module and parameters



Figure Physical EMS module

EMS parameters:

| Item | Main Parameters |
|-----------------------|-----------------|
| Operating temperature | −40°C to +70°C |
| Operating humidity | 5%–95% |

| Working voltage | DC 9 V–36 V (typical value: 24 V) | |
|---------------------------------|---------------------------------------|---|
| Rated power | 8 W (CPU at full load) | |
| CPU | 800 MHz processor | |
| RAM | DDR3 512MB | |
| Memory | eMMC 4GB | |
| Watchdog | Onboard independent hardware watchdog | |
| Hardware interfaces/peripherals | Quantity | Remark |
| Ethernet | 2 ports | 10/100 Mbps |
| USB | 2 ports | Host |
| CAN-bus | 3 ports | Isolation |
| RS485 | 4 ports | Isolation |
| RS232 | 1 port | Debug port |
| TF card | 1 port | Standard TF card slot |
| LVDS | 1 port | Physical interface is DVI |
| ADC | 4 ports | 0 mA–20 mA, 0 V–10 V, accuracy: $\pm 1\%$, sampling rate: 40 SPS |
| DI | 8 ports | Optocoupler isolation |
| DO | 8 ports | Relay isolation |
| DOH | 4 ports | Isolated high-side driver, 2.5 A continuous |
| DOL | 2 ports | Isolated low-side driver, 1 A continuous |
| Super-capacitor | 1 port | Power-off endurance: 5s |
| LED indicator | 8 ports | Of these, 4 ports are programmable |

Table EMS parameters

6.4 HMI

Human-machine interface (HMI), also known as the user interface, serves as the medium for interaction and information exchange between the system and the user, converting information from its internal form into a format acceptable to the user, thereby simplifying the operation process and enhancing usability.

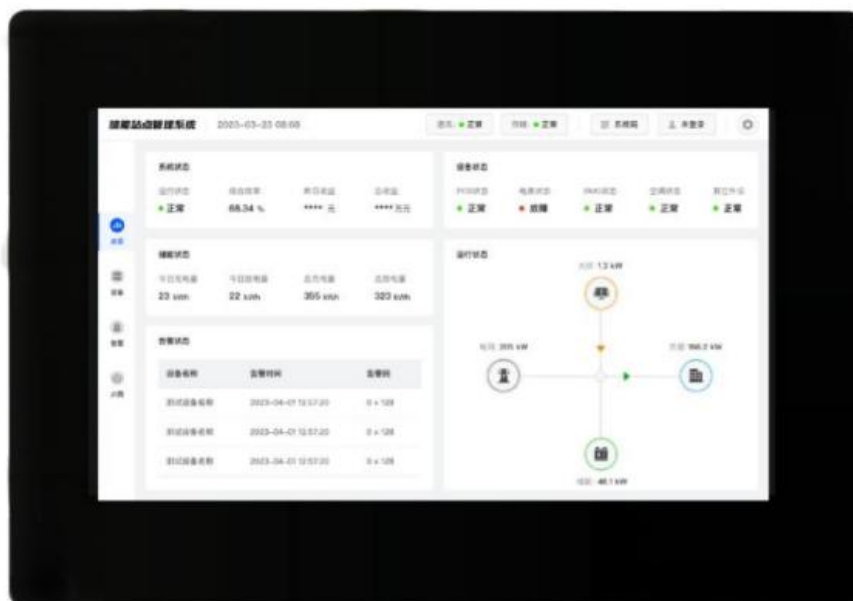


Figure HMI

HMI parameters:

| Item | Parameters | Description |
|-----------------------|--|------------------|
| Operating temperature | -20-+70°C | |
| Operating humidity | 10-90%RH | |
| Input voltage | 11-33V | |
| Working current | 510 mA (backlight at full brightness) | |
| | 140 mA (backlight off) | |
| Active area | 224.05 mm (width)×126.56 mm (height) | 1,024×600 pixels |
| Viewing area | 273.8 mm (width)×191.4 mm (height) | 1,024×600 pixels |
| Screen resolution | 1,024×600 pixels | |
| Backlight type | LED | |
| Backlight brightness | 350nit | |
| Serial port baud rate | 9,600 bps (typical) | |
| Serial port mode | CANH/CANL: Standard CAN levels | |
| | 485A/485B: Standard 485 levels | |
| | Serial TX/RX: Standard RS232 levels (not connected by default) | |
| U disk port | Have | |
| Touch screen type | Capacitive touch screen overlay on the structure | |
| Flash memory | 16MB | |
| Supported peripherals | U disk for upgrades, buzzer for alarm, Ethernet interface | |

Figure HMI parameters

6.5 HMI page information

Overview:

The default display of the screen shows the overview page, which is divided into five areas: system status, energy storage status, alarm status, equipment status, and operation status.

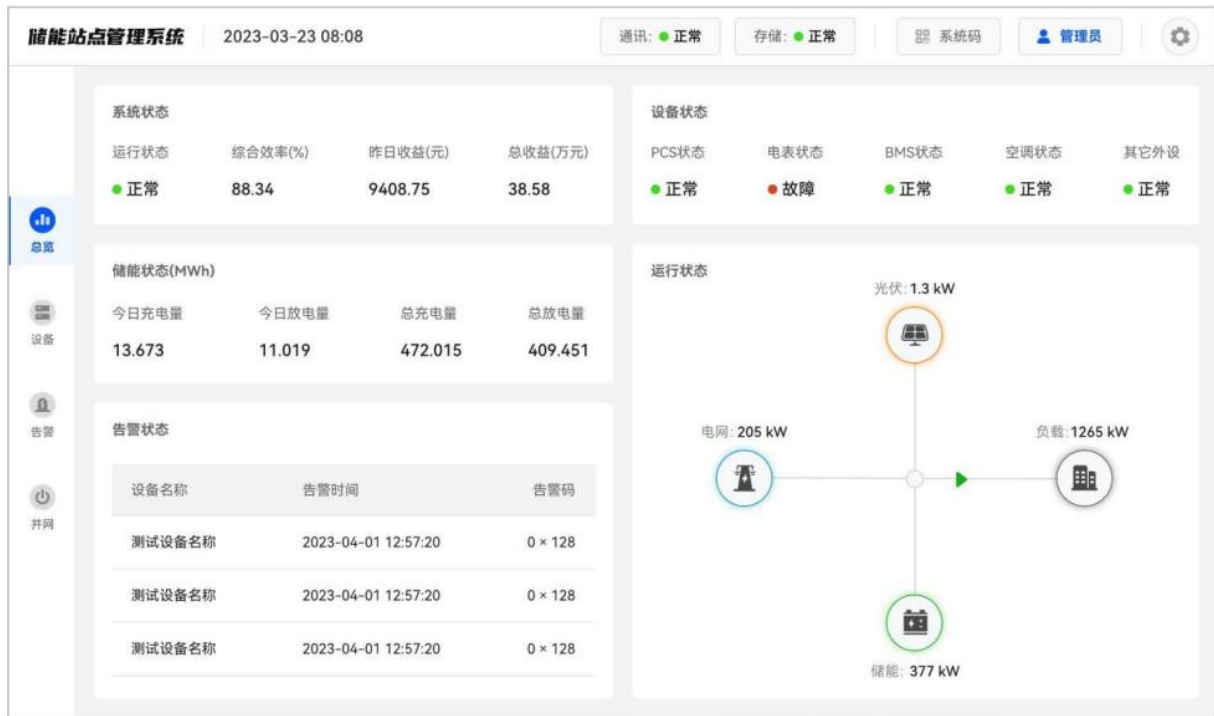


Figure HMI overview

Equipment:

PCS Information: Display the PCS operating status and related parameters

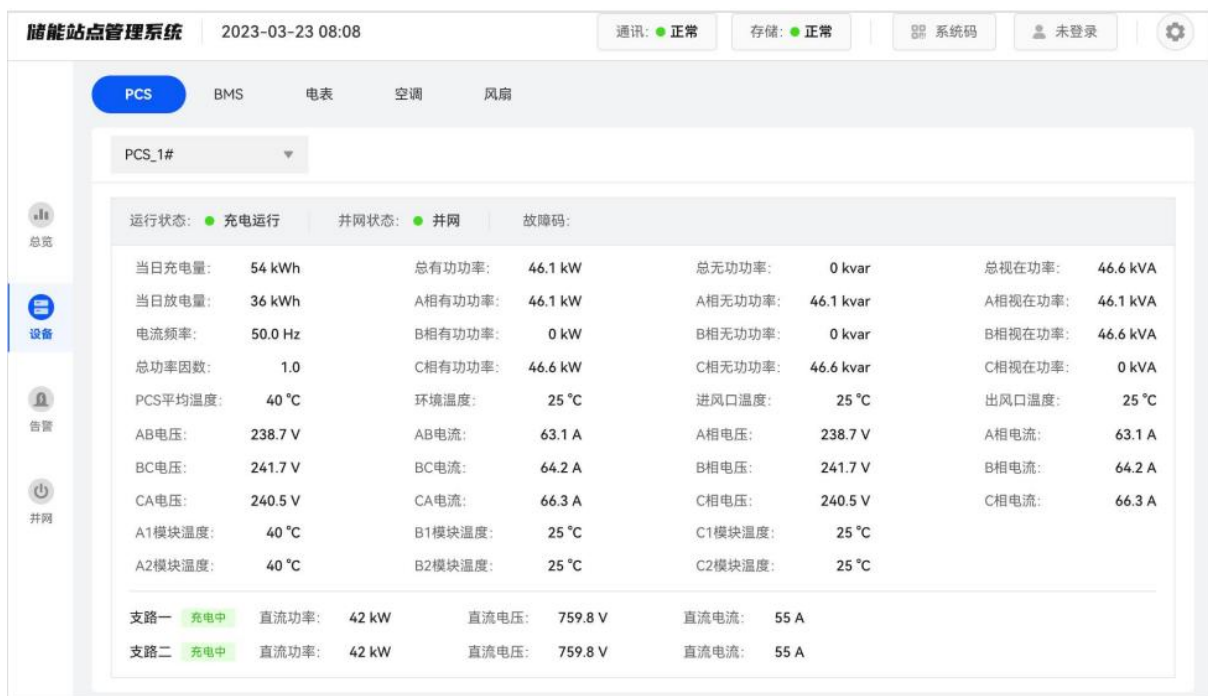


Figure HMI-Equipment-PCS

BMS Information: Default to battery pack view, displaying data with the battery pack as the smallest unit. Users can switch between pack, cluster, and cell views via the dropdown menu

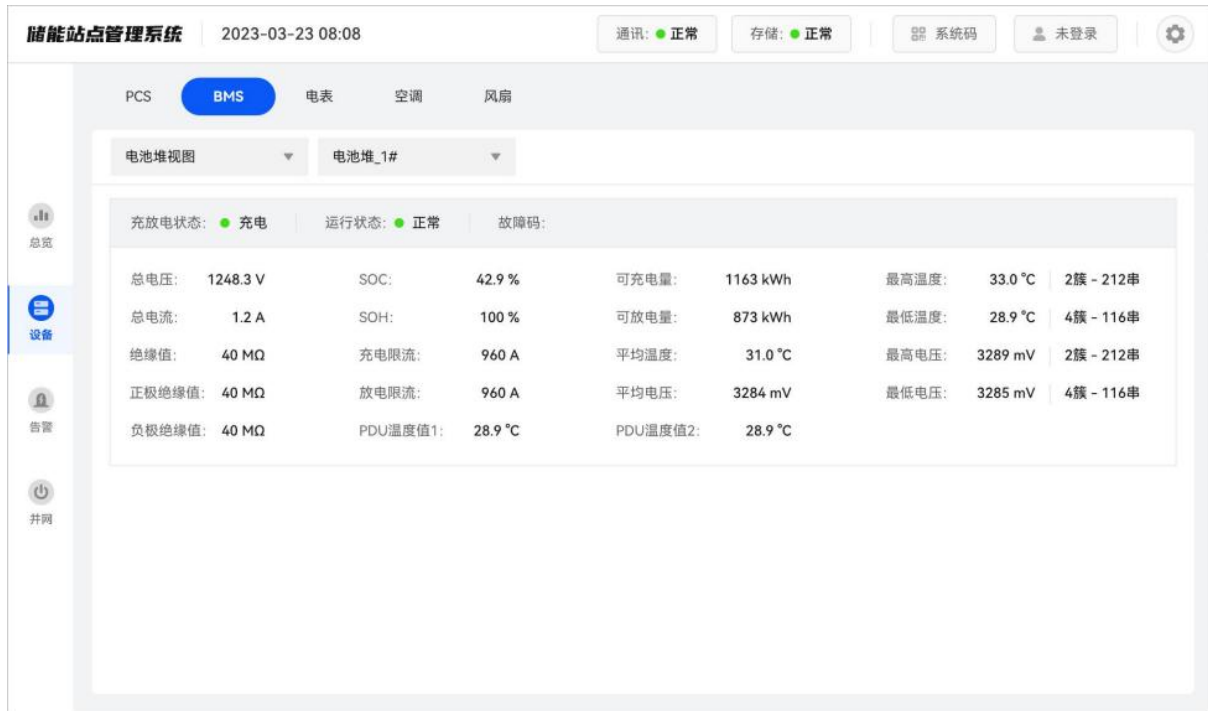


Figure HMI-Equipment-BMS-Pack Information

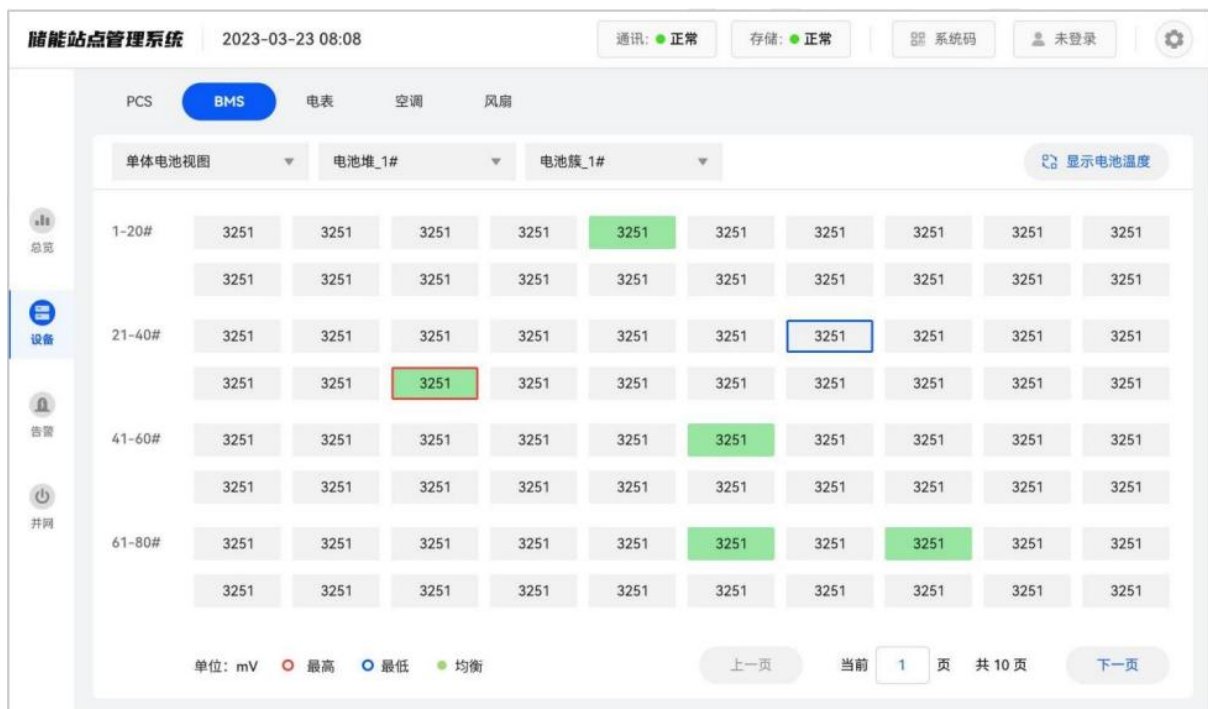


Figure HMI-Equipment-BMS-Cell Information

Air conditioner information:

Display the air conditioner information of the system

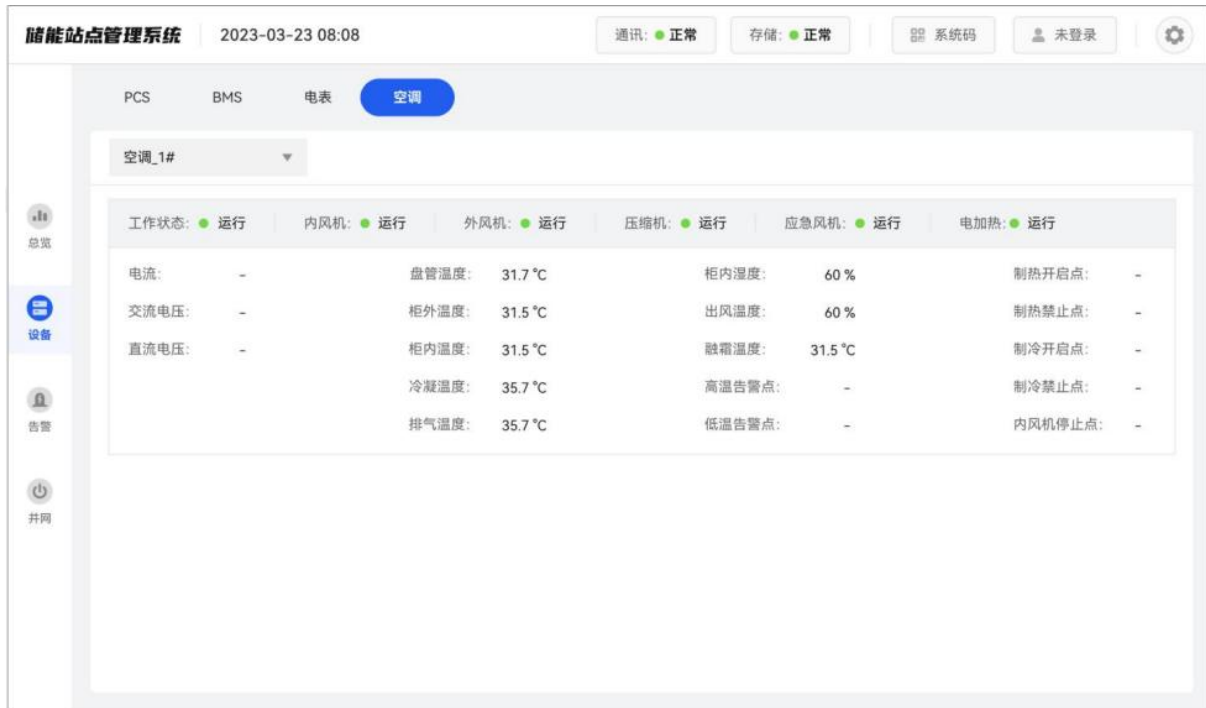


Figure HMI-Equipment-Air Conditioner

Alarm:

Display the real-time alarm information for the current status



Figure HMI-Alarm

※ Real-time alarms display all alarm names for the battery cluster, differentiated by color to indicate the current status, and sorted in descending order of alarm severity.

7. Thermal Management

7.1 Cooling system overview

The energy storage cabinet is equipped with an air conditioning cooling system and a cooling air duct. In conjunction with the battery pack cooling fans, it regulates the temperature inside the energy storage cabinet. The air conditioning system is connected to the general control via the RS485 communication protocol. In addition to enabling coordination between the air conditioner and the fire protection system, it also allows the setting of parameters such as the cooling start point, cooling deviation, heating start point, heating deviation, and temperature thresholds for activating cooling or heating based on the battery cell temperature. Moreover, it also supports manual activation of the air conditioner and can control the air conditioning based on the battery cell temperature.

7.2 Battery pack fan

Each battery pack has 2 fans for cooling, with each fan providing 30 CFM of airflow. Together, the two fans provide 60 CFM of airflow. The fans are powered by 24 V DC, with an individual power consumption ≤ 4 W and a startup power consumption ≤ 6 W.

The battery box cooling fans are controlled individually for each battery cluster, with the battery management main control unit managing the start and stop of the fans for each cluster. The battery management system (BMS) can control the fans' start and stop based on the temperature of the battery cells. The temperature control thresholds can be set through the BMS display. By default, when the BMS detects that the temperature of any cell exceeds 30°C, it activates the fans for the corresponding battery cluster. Conversely, the fans will be turned off when the temperature of the entire cluster falls below 25°C.

Control strategy for battery box fan:

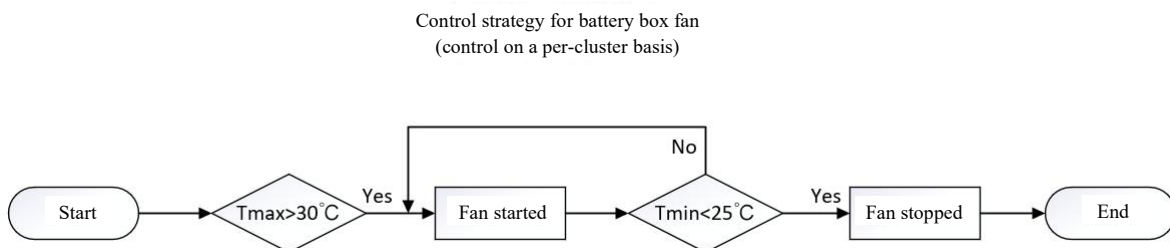


Figure Fan control strategy

7.3 Air conditioner design

The energy storage air conditioner is an industrial air conditioning unit specifically designed for energy storage systems. It features an integrated structure and high airflow design, providing a safe, reliable, and energy-efficient precision temperature control solution. The air conditioner offers both cooling and heating functions to meet various environmental application needs.

Air conditioner control strategy:

(Control strategy values can be adjusted according to customer needs)

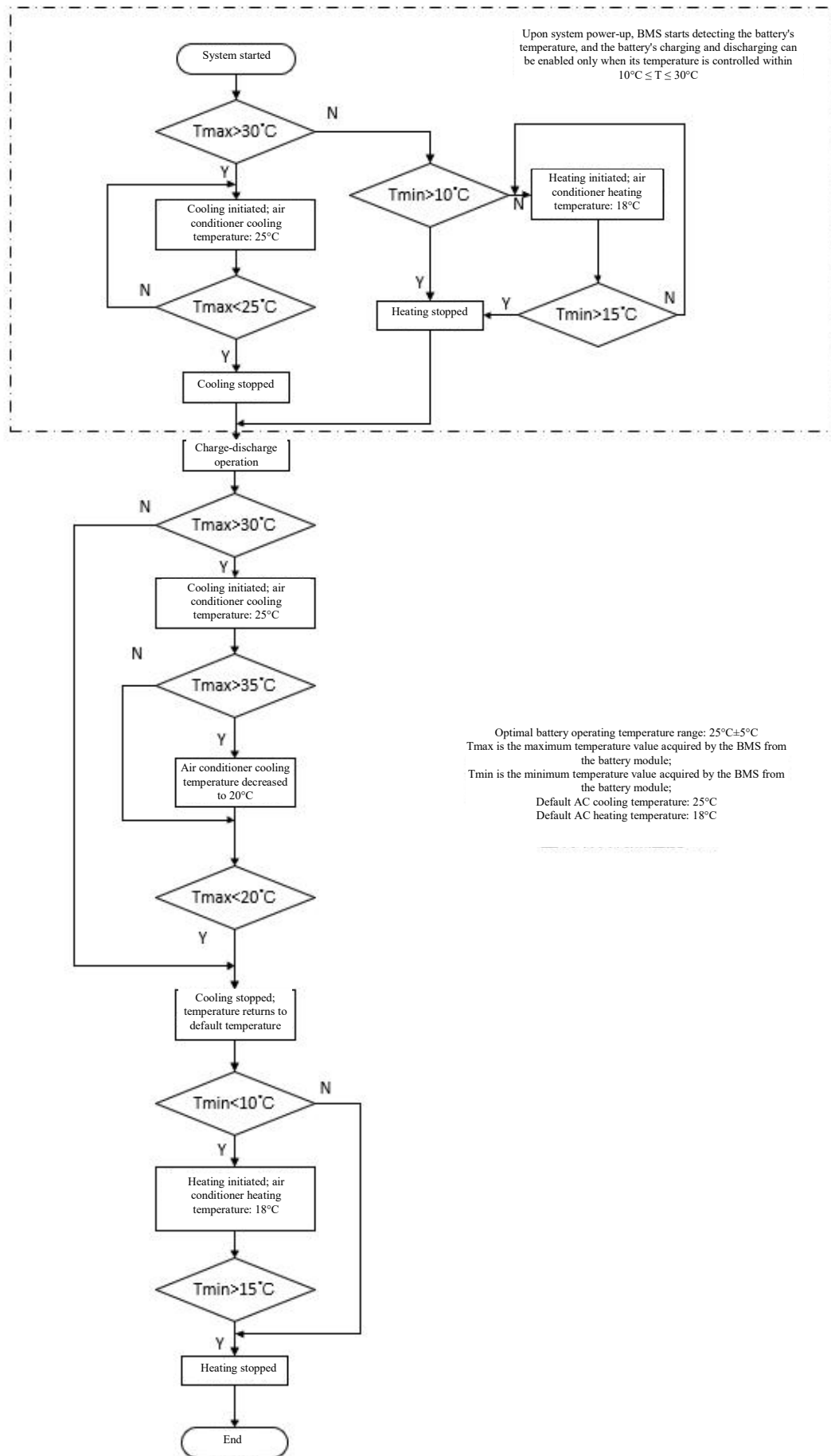


Figure Air conditioner control strategy

7.4 Air conditioner parameters

| Item | Technical Parameters |
|-----------------------------|-------------------------|
| Rated voltage | AC 220 V |
| Rated power | 1.6/1.2 kW |
| Rated current | 7.1/5.4 A |
| Rated cooling capacity | 3.2 kW |
| Heating power | 1 kW |
| Maximum operating current | 9.5 A |
| Air flow of internal blower | 1,300 m ³ /h |
| Air flow of external blower | 1,300 m ³ /h |
| Temperature control range | 20°C to 50°C |
| Ambient temperature | −40°C to 50°C |
| Refrigerant | R134a |
| Noise | 70 dB |
| Installation method | Wall-mounted type |
| Protection level | Internal/external IP55 |
| Dimensions | 550×276×1,350 (mm) |
| Net weight | About 75 kg |

Table Industrial air conditioner parameters

8. Fire Protection System

8.1 Analysis of the characteristics of electrochemical energy storage fire

- Fire classification: In lithium-ion battery systems, fires are primarily classified as Class B, Class C, and Class E fires;
- Fire characteristics: In lithium battery energy storage systems, thermal runaway of the battery leads to jet flames;
- Experiments have demonstrated that lithium iron phosphate battery may still catch fire after thermal runaway, and it releases a significant amount of flammable gases, posing an explosion risk. This is due to the presence of various reactive chemical substances in electrochemical energy storage battery. During a fire, the electrolyte decomposes when heated, leading to intense reactions that release large quantities of toxic and harmful gases (such as CO, HF, SO₂, HCl), flammable gases (such as CO, H₂, CH₄, C₂H₄, C₃H₆, alkanes), and heat. This not only endangers the lives of rescue personnel and trapped individuals but also poses a high risk of secondary disasters, such as poisoning and explosion injuries.
- Energy storage stations store large amounts of load capacity, with numerous batteries and modules. Due to the high current, voltage, and capacity, a fault can easily trigger thermal runaway in the cells, leading to a chain reaction and a large-scale energy release, which can result in intense fires or explosions. Additionally, all modules in the energy storage station carry high voltage. After an incident, residual charge remains in other parts, which can lead to electrical leaks and explosions. Firefighters face risks of electric shock during response efforts.

8.2 Main parameters of fire protection equipment

8.2.1 Fire protection equipment of battery pack

| Item | Parameters |
|--|--|
| Model/Specifications | QRR0.04G/S-MC-40-F-02-11 |
| Temperature range of work environment | -30°C-+70°C |
| Relative humidity of work environment | ≤95%RH |
| Ejection time | ≤3s |
| Name and content of oxidant | Strontium nitrate, potassium nitrate 50%–58% |
| Nozzle thermal distances at 400°C, 200°C, 75°C | 0.3 m, 0.5 m, 0.8 m |
| Net weight per unit | 280±30g |
| Specification and dimension | 135×104.5×14mm |
| Starting mode | Hot start |
| Protection space | 0.8m ³ |
| Start temperature of thermal initiator | 170±10°C |
| Validity | 10 years |

Table Fire protection equipment of battery pack

8.2.2 Fire protection equipment of battery cluster

| Item | Parameters |
|--|--|
| Model/Specifications | QRR0.3G/S-Q |
| Temperature range of work environment | -50°C-+90°C |
| Relative humidity of work environment | ≤95%RH |
| Ejection time | ≤14S |
| Ejection delay time | ≤5S |
| Nozzle thermal distances at 400°C, 200°C, 75°C | 0.05 m, 0.12 m, 0.3 m |
| Enclosure surface temperature | ≤150°C |
| Name and content of oxidant | Strontium nitrate 50%–58% |
| Start-up current | ≥700mA |
| Specification and dimension | 68.5mm×46mm×255mm |
| Multi-unit linking method | Series combination |
| Starting mode | Electric start or thermal start |
| Feedback signal | Passive switch signal |
| Fire suppression effectiveness | 100 g/m ³ –130 g/m ³ |
| Validity | 10 years |

Table Fire protection equipment of battery cluster

9. Dynamic environment system

Access control: Whether the outdoor cabinet door being closed can be obtained through the cloud, avoiding property damage

Water immersion: The outdoor cabinet's water (accumulation) situation can be obtained through the cloud, and warning can be carried out to avoid system damage caused by water immersion

Emergency stop: The emergency brake switch quickly stops the system operation when the system control fails, avoiding damage caused by energy loss control

10. List of main devices

| S/N | Name | Content | Quantity | Unit | Remark |
|-----|----------------------------------|--|----------|------|---------------------|
| 1 | External cabinet | Protection level IP54 | 1 | Pcs | |
| 2 | Battery pack | 1P16S; 14.336 kWh | 14 | Pcs | 280 Ah battery cell |
| 3 | High-voltage cluster control box | 150A | 1 | Pcs | |
| 4 | BMS | HZ-YD-P720 | 1 | Set | |
| 5 | EMS | HZ-YD-G700 | 1 | Set | |
| 6 | HMI | HZ-YD-101FCW | 1 | Pcs | |
| 7 | Inverter | EPCS-105-AM | 1 | Pcs | |
| 8 | Industrial air conditioner | Refrigerating capacity 3.2 kW | 1 | Pcs | |
| 9 | Fire protection system | Fire suppression device | 1 | Set | |
| 10 | Dynamic environment system | Dynamic environment device of the system | 1 | Set | |
| 11 | Wire harnesses | Internal harnesses of the system | 1 | Set | |
| 12 | Accessories | Internal accessories of the system | 1 | Set | |



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