Power

Escape215-R

INSTALLATION MANUAL

Escape215-R BESS User Manuel

Table of Contents

1. About this Manual

1.1 Application Range

This manual is applicable to the following intelligent energy storage cabinet Escape215-R.

1.2 Product Model

Model	Configuration	Communication Mode
Escape215-R	Including EMS, high-voltage box, PCS, 1P240S, fire protection system and liquid-cooled system	Support 4G, CAN communication, WiFi, and Ethernet communication

1.3 Purpose

The purpose of this Manual is to provide details about Escape215-R and instructions for installation and operation.

1.4 Target Readers

This Manual is intended for professional technicians who need to install, operate, and maintain Escape215-R, as well as users who perform daily operations.

1.5 Usage of Manual

Please read this Manual carefully before using this product, and keep it properly for easy access by operation and maintenance personnel.

The contents of this Manual as well as images, marks and symbols used herein are properties of PowerPlus Energy. The contents shall not be publicly reproduced in whole or in part without our written authorization.

As the contents of this Manual will be constantly updated and corrected, there may be differences with actual product or errors. Users shall refer to the actual product purchased.

1.6 Usage of Symbols

This Manual includes essential information to ensure the safety of users and property, as well as to help you use the product effectively and efficiently. Important points are marked with the symbols outlined below.

Danger

"Danger" indicates a highly potential hazardous situation which, if not avoided, will result in death or serious injury.

Warning

"Warning" indicates a moderately potential hazardous situation which, if not avoided, could result in death or serious injury.

Caution

"Caution" indicates a lowly potential hazardous situation which, if not avoided, could result in moderate or minor injury.

Notice

"Notice" indicates a potential risk which, if not avoided, could result in device malfunctioning or property damage.

"Instructions" are additional information in this Manual that emphasises and complements the contents, provides tips or tricks for optimizing the use of product and helps you solve a problem or save time.

2. Safety Instructions

This chapter mainly introduces the safety precautions that need to be observed during operation of the Escape215-R.

Escape215-R has been designed and tested in accordance with international safety requirements. However, as a power energy storage product, its installation, test run, operation and maintenance must comply with relevant safety regulations.

Incorrect use or faulty operation may result in:

- Harm to the life and personal safety of operator or a third party
- Damage to Escape215-R or other property belonging to operator or a third party

Please read the information following “Danger”, “Warning”, “Caution”, “Notice” and “Instructions” carefully, which will provide some protection for your personal safety and help extend the service life of RX-215k.

Warning

Only professional electricians or professionally qualified personnel shall operate and connect wires for this product.

Before Installation

Notice

When you receive this product, first check Escape215-R for damage during transportation. If you find any problems, please contact PowerPlus Energy or transportation company immediately.

Before using Escape215-R, the operator must be familiar with all safety instructions and provisions related to installation, operation and maintenance in this Manual.

Correct handling, loading/unloading, positioning, installation, operation and maintenance are reliable guarantees for safe and reasonable use of Escape215-R.

During Installation

Notice

Escape215-R shall only be used for the purposes specified in this Manual. Unauthorised modifications or use of parts not sold or recommended by us may result in fire, electric shock, and other injuries.

Notice

When installing, always disconnect all electrical connections and turn off input switch of preceding stage to ensure that Escape215-R is not live.

Repair and Replacement

Warning

Escape215-R shall only be repaired by our service department or professionally qualified personnel. Users shall not engage in maintenance, module replacement and other operations by themselves. Otherwise, it may cause serious personal injury or major property damage!

Notice

Please do not replace internal elements of Escape215-R without permission. Otherwise, PowerPlus Energy will not be responsible for any quality guarantee or joint liability for any damage caused thereby.

3. Product Description

3.1 Introduction to Product

Escape215-R is a 100kW/215kWh energy storage system, which consists of one 215kWh standard energy storage battery cabinet. The dimensions of energy storage cabinet is W1,300mm × D1,330mm × H2,180mm (including feet).

The battery system adopts a multi-level modular design of battery cell → battery module → battery cluster.

The prefabricated battery cabin integrates lithium iron phosphate energy storage battery cell (cell), battery rack (rack), high-voltage control box, power conversion system (PCS), data acquisition device, liquid-cooled system device, fire protection system, connecting cables, control cables, door lighting, and other device into the energy storage cabinet.

3.1.1 Introduction to Battery Cell (Cell)

Escape215-R adopts 280Ah lithium iron phosphate battery for energy storage, where the battery cell is of a square aluminum casing structure, the positive and negative poles are located at the same end face, the nominal capacity of battery cell is 280Ah, and the nominal voltage is 3.2V.

3.1.2 Introduction to High-voltage Control Box

The high-voltage control box of Escape215-R has functions such as acquisition of battery cluster voltage and current, as well as control and protection of loop contactor for battery cluster, etc., and accommodates circuit breaker, contactor, fuse, circulating control circuit, current sensor, energy storage battery cluster module (ESBCM) and switching power supply etc.

3.1.3 Power Conversion System (PCS)

Escape215-R is fitted with a 100kW hybrid inverter (PCS). The power conversion system is a conversion device between grid and battery, which can charge and discharge the battery. It can invert direct current from battery into alternating current that can be accepted into grid and rectify alternating current from grid into direct current that can be charged into battery.

3.1.4 EMS System

EMS system of Escape215-R realizes full life cycle management of each device in the energy storage system. This system can acquire data and control PCS, high-voltage control box, energy meter, and power and environment supervision device in real time through telemetry, remote communication, remote control and remote regulation technologies, analyse and predict the energy consumption data of station through big data technology to help enterprises understand the running state of entire station's power system in real time, and perform energy coordination and control of each node of source, grid, load and storage in the station according to the strategies of peak load shifting, storage-optical connection coordination and demand control to ensure stable running of the Escape215-R.

3.1.5 Liquid-cooled System Device

The liquid-cooled system of Escape215-R is equipped with an air-cooled water chilling unit, which is an all-in-one product developed for heat dissipation in the energy storage (e.g., battery) industry. It is applicable to the device in cabinet with large heat generation, and sensitive to ambient temperature.

3.2 Electrical Frame of Energy Storage System

The electrical frame of 100kW/215kWh energy storage system is shown in the figure below:

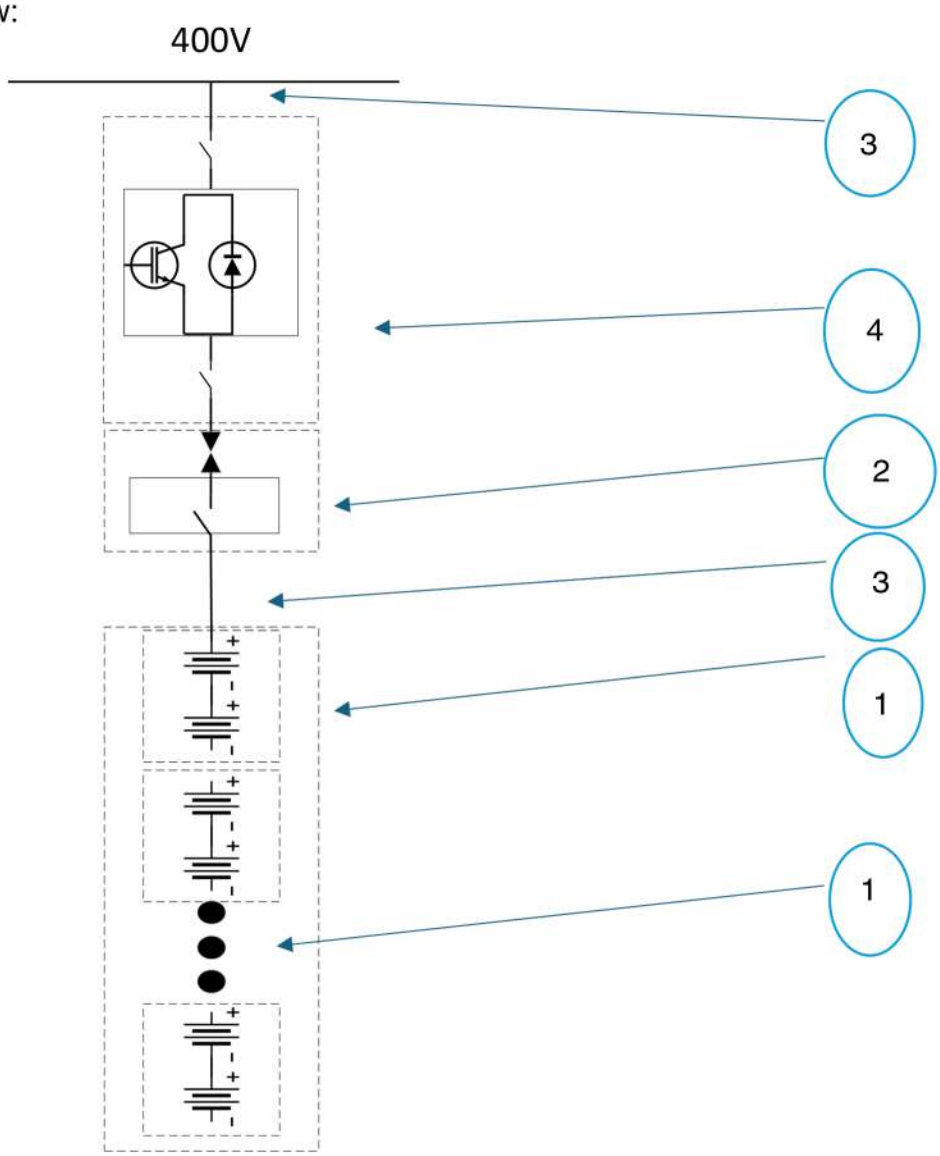


Figure 1 Electrical Frame Diagram of Energy Storage System

S/N	Name	Specification, Model & Parameter	Quantity
1	Battery Pack	1P48S 153.6V, 43kWh	5 pcs
2	High-Voltage Box	1,000V 250A	1 unit
3	Power harness	Single-core harness, UL11627, OD14.3mm	1 set
4	Power conversion system	INPPCS-100/0.4-W-14-C1-OS	1 unit

3.3 Topological Graph of System Communication

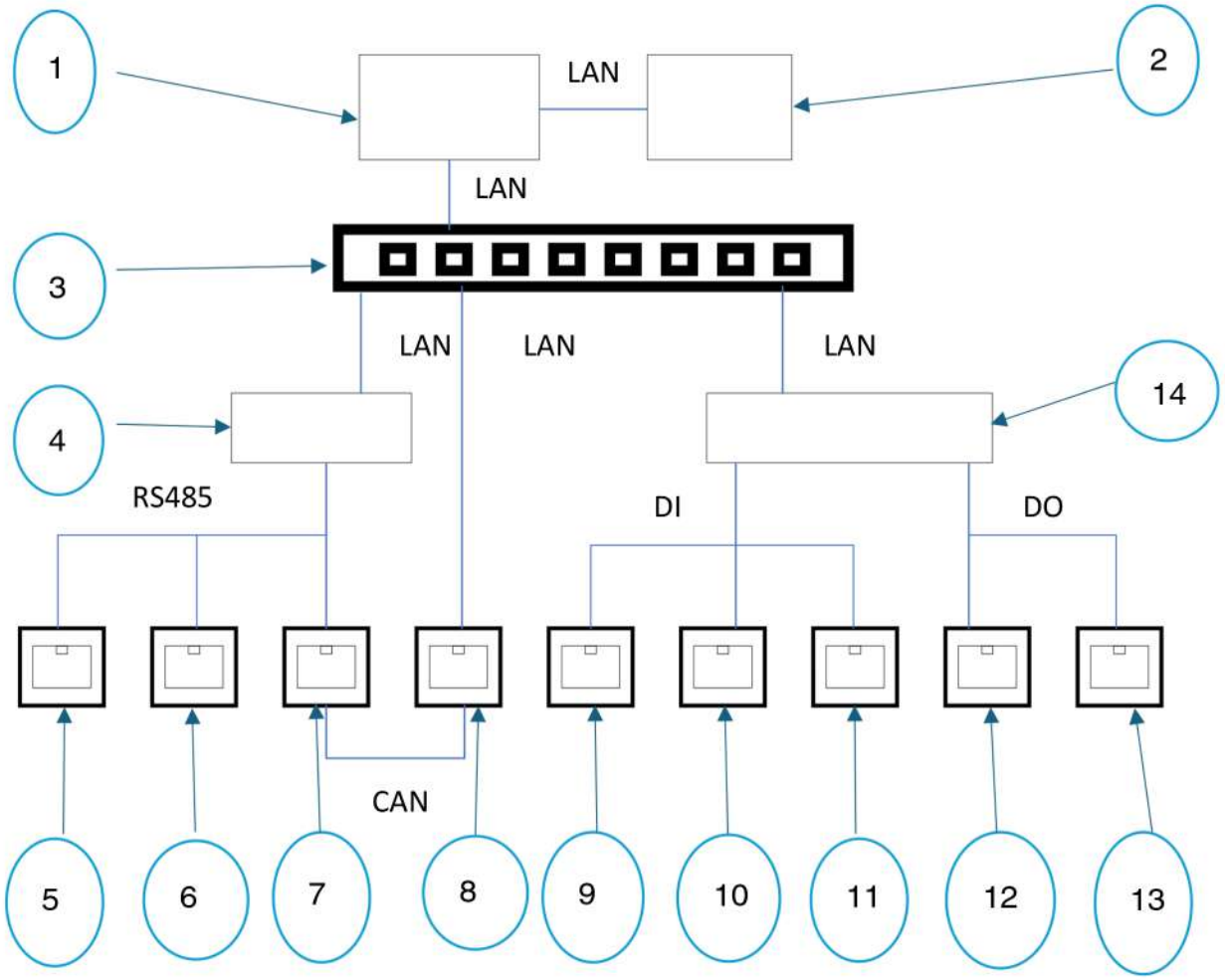


Figure 2 - Topological Graph of System Configuration

S/N	Name	S/N	Name
1	EMS All-in-One Machine	8	PCS
2	4G Module	9	Level1 Fire Alarm Signal
3	Switch	10	Level2 Fire Alarm Signal
4	Serial Server	11	Emergency Stop Signal
5	Dehumidifier	12	Running Lamp Signal
6	Liquid-Cooled Main Unit	13	Fault Lamp Signal
7	Main Control of BMS	14	IO Controller

3.4 Product Appearance

Figure 3 - Exterior View

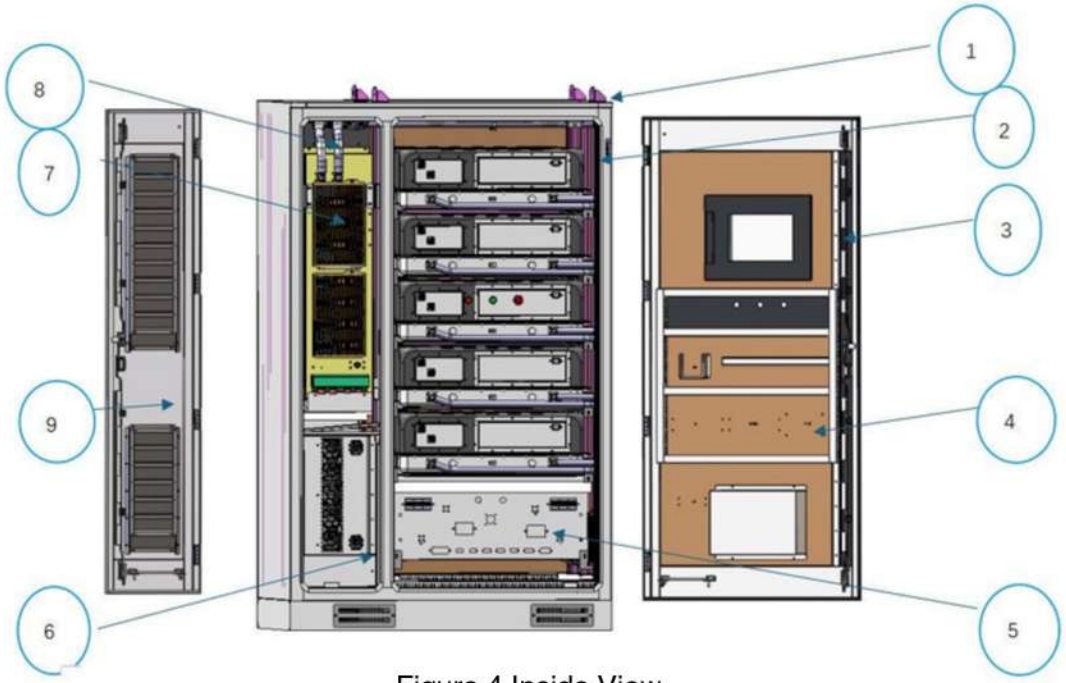


Figure 4 Inside View

S/N	Name
1	Cabinet Body
2	Battery Module
3	All-in-One Machine
4	Right Door Plank
5	High-Voltage Box
6	PCS
7	Liquid-Cooled Main Unit
8	Liquid-Cooled Pipeline
9	Left Door Plank

3.5 Product Dimensions

The external dimensions of Escape215-R are shown in the figure below:

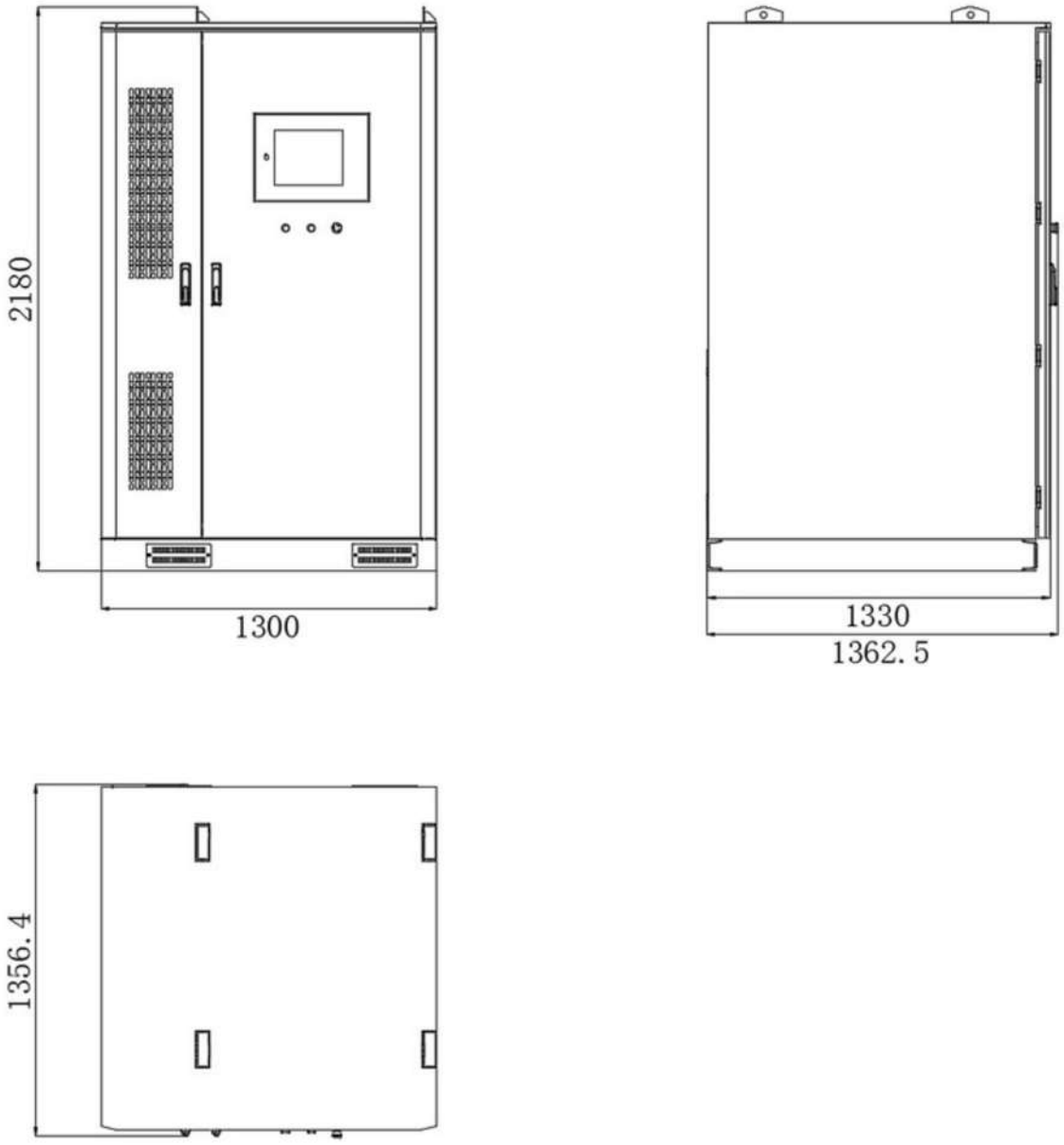


Figure 5 External Dimensions

Width(W)	Height (H)	Depth (D)
1,330mm	2,180mm	1,300mm

4. Product Installation

4.1 Unpacking and Check

Check the deliverables according to packing list in the package. The deliverables shall include:

S/N	Name	Instructions
A	Escape215-R	
B	Accompanying documents	Inspection record, packing list
C	Decorating plate	Decorating plate for bottom forklifting holes (4pcs)
D	Retaining bolt	M5×10 cross recessed pan head screw (10pcs)
E	Retaining bolt	M8×16 hexagon head cross combination bolt (4pcs)
F	Retaining bolt	M6×14 hexagon head cross combination bolt (2pcs)
G	Series power cable	Power cable connecting battery packs (1pc)

4.2 Requirements for Installation Site

- When selecting an installation site, the climatic, environmental and geological conditions of installation site shall be fully considered (maximum altitude is 3,000m and derating is required at an altitude above 2,000m).
- The surrounding environment shall be dry and well ventilated.
- Ensure that there are no trees around installation site to prevent strong winds from blowing down branches or leaves to block the door or air inlet of integrated energy storage system.
- The installation site shall be kept away from the area where toxic and harmful gases may concentrate, and away from flammable, explosive and corrosive materials.
- The installation site of device should be kept away from residential areas to avoid noise.
- In order to ensure better heat dissipation and maintenance of device, it is recommended to reserve enough space around the installation site of cabinet body.
- More than 30mm shall be reserved on the left and right sides of cabinet, and more than 1,000mm shall be reserved in front of and behind it.

4.3 Installation Foundation

> **Warning**
>
> The device is heavy, therefore, the conditions of installation site (mainly including geological, environmental and climatic conditions, etc.) shall be investigated in detail before the foundation is constructed. Then, the foundation shall be designed and constructed on this basis.

An unsuitable foundation design can cause significant issues during installation, including difficulty positioning the equipment, restricted door operation and complications during ongoing operation. To avoid these problems, the installation foundation must be designed and constructed in line with appropriate standards and completed prior to installation. This ensures adequate mechanical support, suitable cable routing, and safe access for future maintenance and servicing.

At a minimum, the following requirements must be met when constructing the foundation:

- The base of the construction pit must be compacted and properly filled.
- The foundation must be capable of providing sufficient load-bearing support for the equipment.
- The cabinet should be elevated to prevent rainwater from entering or damaging the base and interior. A foundation height of approximately 300 mm above the surrounding ground level is recommended. Drainage provisions should be designed to suit local geological conditions.
- A concrete foundation with adequate cross-sectional area and height must be installed. The final height is to be determined by the construction contractor based on site geology.
- Cable routing requirements must be incorporated into the foundation design.
- A maintenance platform should be constructed around the foundation to allow safe and convenient access for future servicing.
- Sufficient space must be reserved for cable trenches based on the position and size of the cabinet's cable entry points, and conduit must be pre-installed.
- The size and number of conduits must match the type and quantity of incoming and outgoing cables.
- Both ends of all conduits must be temporarily sealed to prevent contamination, which may impede future cable installation.
- Once all cables are installed, all cable entries, exits and joints must be sealed using refractory mortar or other suitable materials to prevent rodent ingress.
- The earthing system must be installed in accordance with the relevant national or regional standards applicable to the project location.

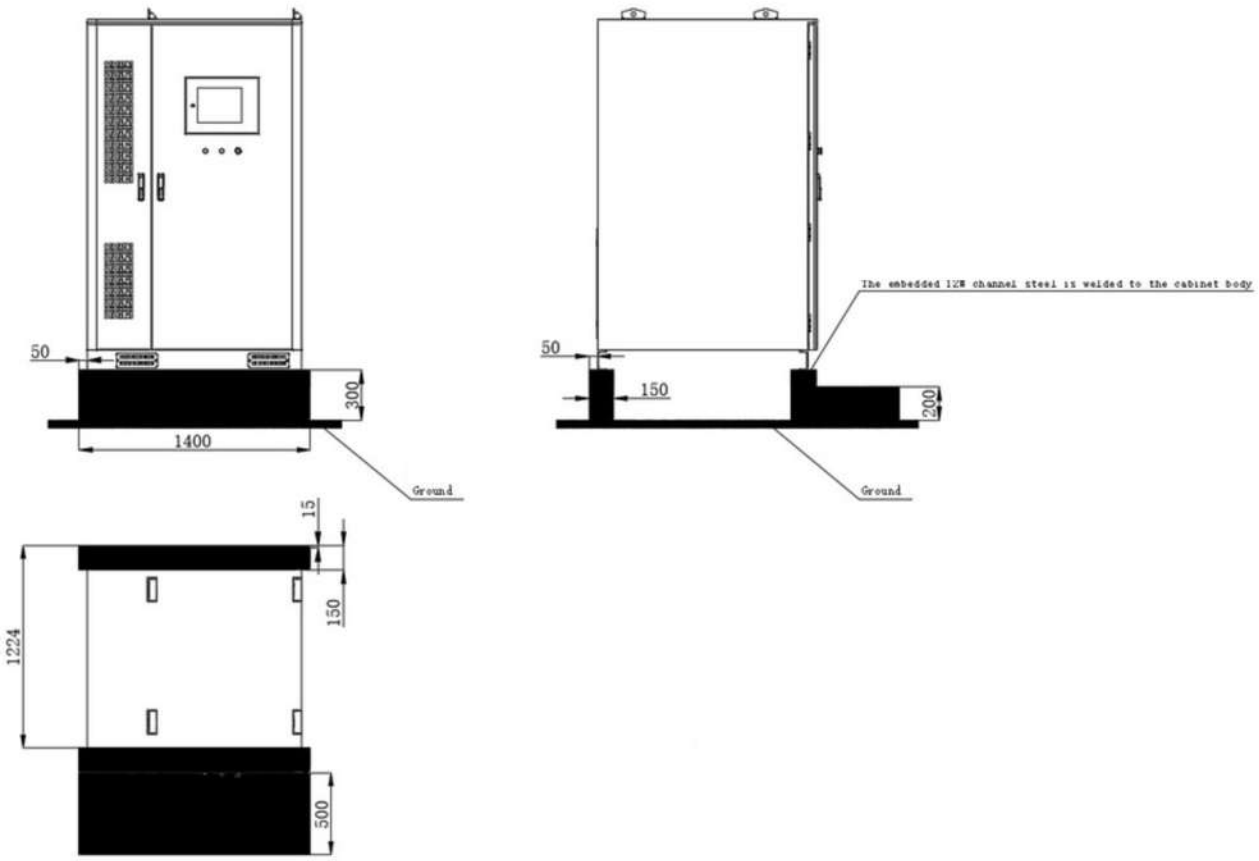


Figure 6 Installation Dimensions

4.4 Installation Method

4.4.1 Transportation by Forklift Truck

If the installation site is flat, energy storage cabinet can be move by forklift truck. The Escape215-R is equipped with lifting holes at the bottom of the BESS, which are specially designed for transportation by forklift truck. The device shall be moved through front lifting holes.

If the device is to be transported by forklift truck, the following requirements shall be met:

- The forklift truck shall have sufficient carrying capacity.
- The length of forks shall meet the lifting requirements of device.
- The energy storage cabinet should be transported and moved slowly and steadily.
- The energy storage cabinet shall be placed in a stable position, which shall be well drained without any obstructions.
- The lifting holes of energy storage cabinet shall be exposed before delivery, and shall be sealed with decorating plate for accessory after on-site installation is completed.

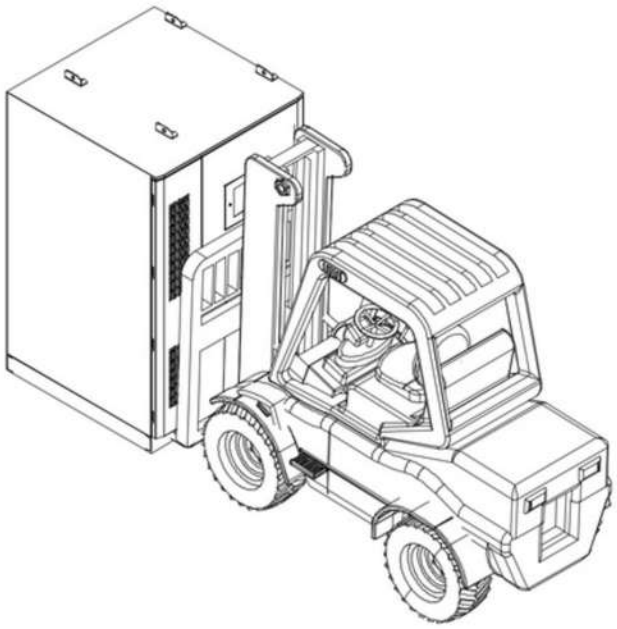


Figure 7 Diagram of Transportation by Forklift Truck

4.4.2 Transportation by Crane

Warning

- In the whole lifting process of device, it is necessary to operate in strict accordance with the safe operation procedures of crane.
- Nobody should stand within 5m-10m of operation area. In particular, nobody shall stand under the boom and lifted or moved machine to avoid casualties.
- In case of bad weather conditions, such as heavy rain, fog, strong wind, etc., the lifting work shall be stopped.

When lifting the device, the following minimum requirements must be met:

- Site safety must be ensured at all times during lifting activities.
- A qualified person must be appointed to supervise and guide the lifting and installation process on site.
- Slings used for lifting must be rated to safely carry the full weight of the device.
- All sling connections must be secure and reliable, and any sling sections attached to corner points must be of equal length.
- Sling length may be adjusted as needed to suit site conditions.
- The device must be lifted smoothly and kept level throughout the operation.
- The device must be lifted using a cross-sling arrangement underneath the base.
- Any necessary auxiliary equipment or controls must be used to ensure safe and smooth lifting.
- Once the device is positioned, it must be lowered slowly and carefully. It must not be swung or moved outside the vertical drop line using the spreader.
- A forklift or hoist must be used to unload the cabinet to its installation location. The lifting hole diameter is 26 mm, and protective paint must be reapplied to the lifting points after installation.

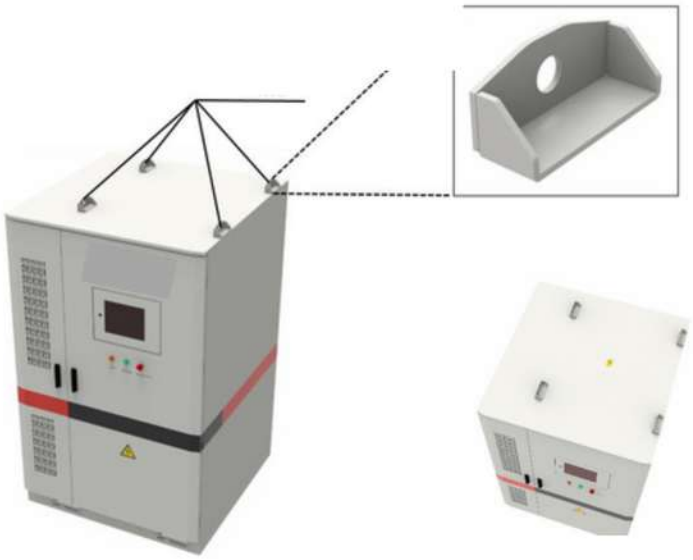
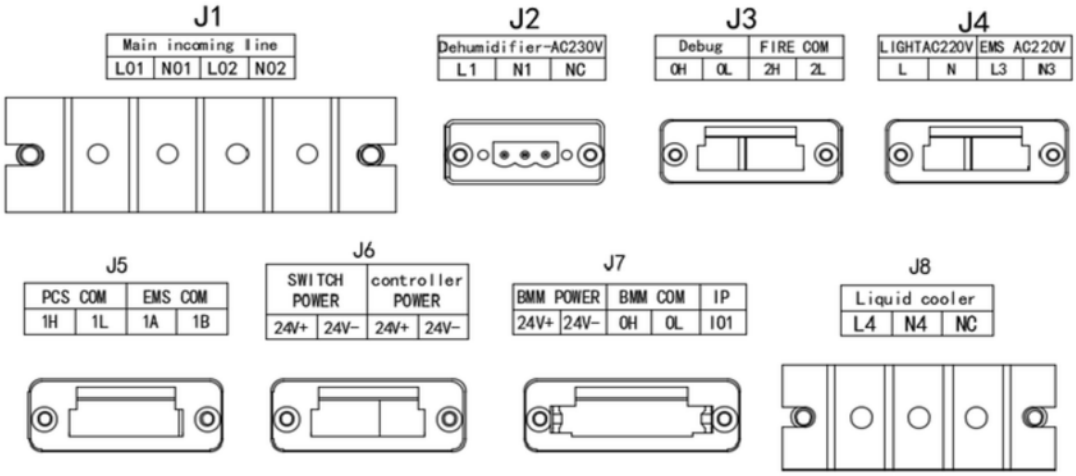


Figure 8 Diagram of Lifting Position

5. Electrical Connection

5.1 Introduction to Terminals

5.1.1 Introduction to Low-voltage Terminals in High-voltage Box



	Source	Termination	Description
J1	2-circuit external AC230V	J1 interface of high-voltage box	Main incoming power supply for power distribution
J2	Interface of high-voltage box	Power interface of dehumidifier	230V power supply for dehumidifier
J3	Interface of high-voltage box	Communication interface of upper computer for debugging/communication interface of fire protection	BMS debugging interface and fire protection communication
J4	interface of high-voltage box	Power interface of lighting/ Power interface of all-in-one machine	Power supply for lighting/power supply for all-in-one machine
J5	interface of high-voltage box	Communication interface of PCS/ Communication interface of EMS	Communication between BMS and PCS/EMS
J6	interface of high-voltage box	24V power interface of switch and controller	24V power supply for switch, controller etc.
J7	interface of high-voltage box	Communication interface of power supply for slave control of battery cluster	Communication of power supply for slave control of battery cluster
J8	interface of high-voltage box	Power interface of liquid-cooled unit	Power supply for liquid-cooled unit

5.1.2 Connection of Communication Interfaces of PCS

In addition to connection of power cables, the power conversion system (PCS) also has the connection of auxiliary power supply as well as input and output of some node signals, which are led to the terminal strip through clusters of cables in the cabinet.

The ports that need to be externally connected on the terminal strip are defined as shown in the figure below.

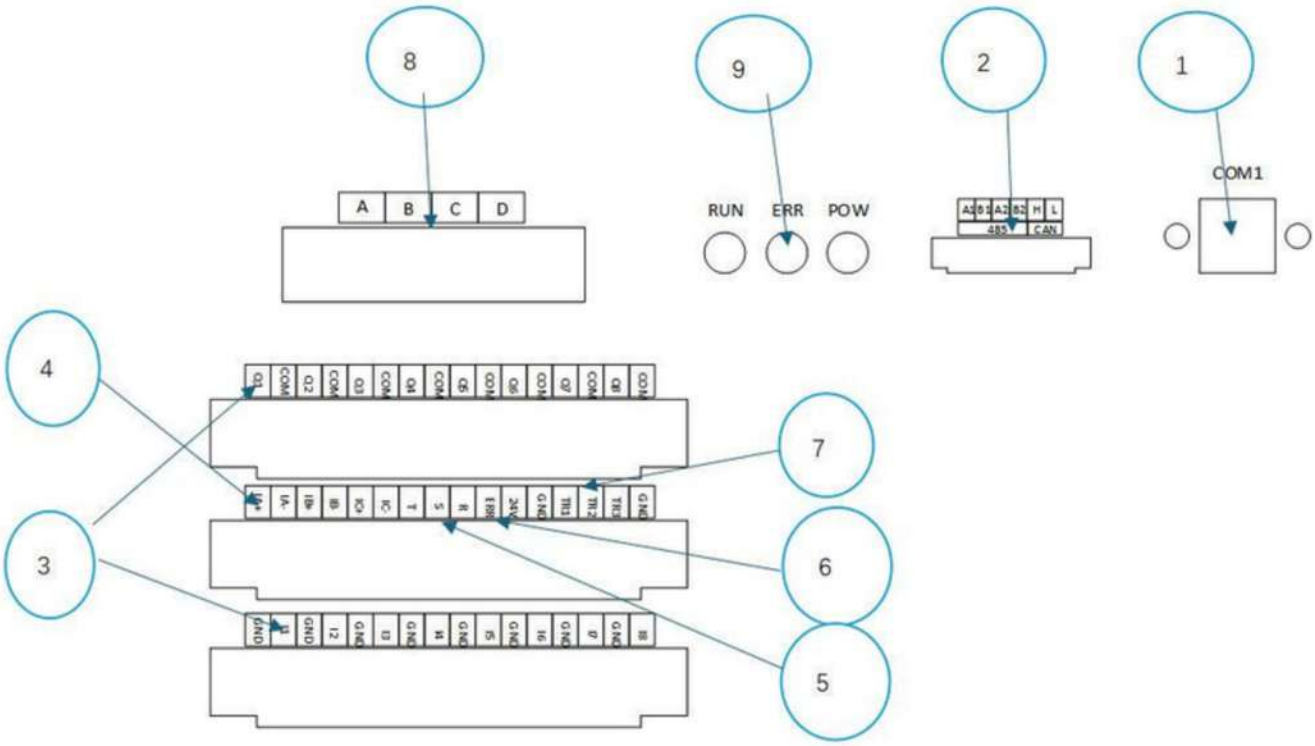


Figure 10 Terminal Diagram of PCS

Main External Device of Terminal Strip

S/N	Component Name	Description
1	COM1	Reserved network interfaces, where COM1 is used for debugging network interface and EMS communication network interface.
2	CAN, 485-1/2	CAN interface and 485-1 interface used for communication of BMS, and 485-2 interface for communication between PCS and DCDC module;
3	I1-8, Q1-8	For DI input detection interface (which is active internally and only needs to be disconnected/short-circuited externally, where DI1 and DI3-DI8 are normally open, and normal opening/normal closing of DI2 can be set on the upper computer); The pre-set definitions of DI interface and DO interface are shown in the figure below; For DO interface (dry contact, only supports external 24V power supply)
4	IA+, IA-, IB+, IB-, IC+, IC-	For current sampling signal of on-grid/off-grid switch in accordance with on-grid/off-grid switching requirements;
5	T, S, R	Reserved terminals, which is not connected
6	ERR	Fault indicator lamp signal for STS, which may not be connected;
7	Tr1, Tr2, Tr3, GND	GND: GND of trigger signal; Tr1, Tr2, Tr3: Trigger signal of STS, which can be connected to only one phase;
8	A/B/C/N	Voltage sampling on grid side, which is generally used with on-grid/off-grid switching cabinet
9	RUN, ERR, POW	When DC is connected, this indicator lamp will be always on; when a fault occurs in work, this indicator lamp will be always on; when it is running properly, this indicator lamp will be always on; when it is standby, this indicator lamp will flash

5.2 Internal Structure

The internal layout of Escape215-R is shown in the figure below:

Figure 11 Internal Structure

S/N	Name
1	Liquid-cooled pipeline
2	Liquid-cooled unit
3	PCS
4	High-voltage box
5	Battery pack
6	All-in-one machine
7	Switch
8	IO Controller
9	Serial server
10	UPS

5.3 Electrical Connection

5.3.1 Safety Precautions

⚠ Danger

- Danger High Voltage!
- Danger of Electric Shock! Never touch any live part!
- Before installation, please ensure that both AC and DC sides are electrically isolated.

⚠ Warning

- The entry of sand or moisture can damage electrical equipment and reduce its long term performance.
- During periods of frequent sandstorms, or when the surrounding relative humidity exceeds 95%, electrical connection work must not be carried out.
- Electrical connections should only be performed when conditions are dry, with no sandstorm activity and clear weather.

⚠ Warning

- Before making any connections, the polarity of all input cables must be verified to ensure each input is correctly matched.
- During electrical installation, cables and conductors must not be pulled excessively, as this may damage their insulation.
- Allow adequate bending space for all cables and conductors.
- Use appropriate supporting or strain-relief measures to minimise stress on cables and conductors.
- After each stage of the connection process, check the work carefully to confirm all connections are correct and secure.

5.3.2 Electrical Connection

1) Preparation of Installation Tools


Safety gloves


Protective glasses


Safety boots


Protective clothing


Torque


Wire stripper


Hydraulic

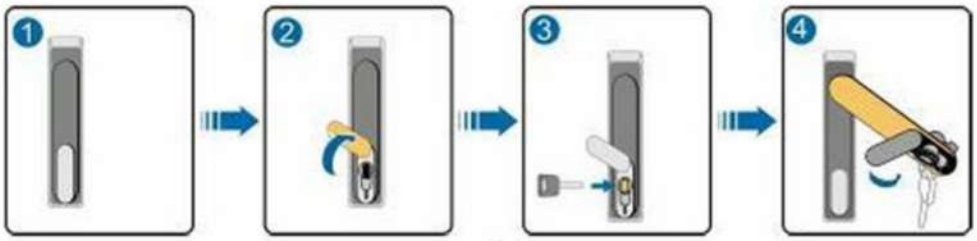

Heat gun


Multimeter


Screwdriver


Torque wrench

2) Opening of Cabinet Door



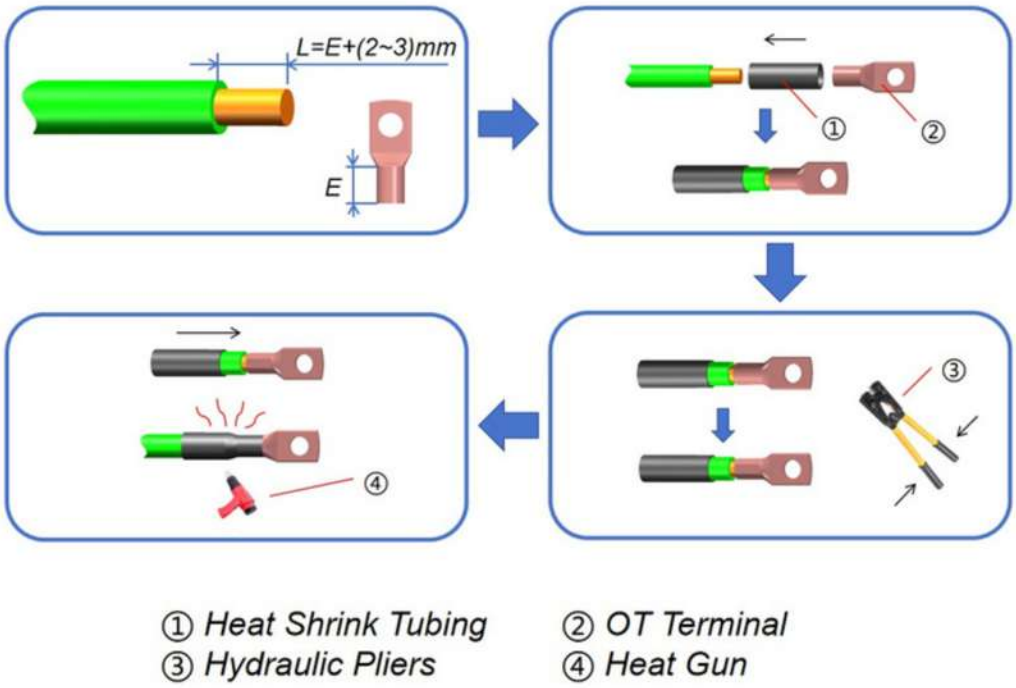
1	Locked state
2	Move the cover up above lock hole
3	Insert the door key and turn it clockwise
4	Turn the handle clockwise to open

3) Preparation of Cables

The cables selected must meet the following requirements:

- Cable diameter must be chosen based on the maximum current-carrying requirement, with allowance for cable length made.
- All DC cables (comms and signal) must be of the same specification and material.
- All three-phase AC output cables must be of the same specification and material.
- Flame-retardant cables must be used.
- All cables must comply with local laws, regulations and applicable standards.
- Cable colours shown in this manual are for reference only. Select cable colours in accordance with local standards.

4) Crimping of OT Terminals

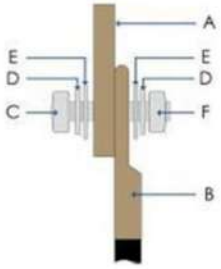


① *Heat Shrink Tubing* ② *OT Terminal*
③ *Hydraulic Pliers* ④ *Heat Gun*

Figure 12 Crimping Diagram of OT Terminals

5) Connection of Copper Cables

If a copper cable is selected, the connection sequence of parts to be connected is shown in the figure below.



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

Figure 13 Connection Sequence of Copper Terminal

5.4 Earthing Connection

The BESS is earthed at the lower-right corner on the back of the cabinet, where an earthing point with a dedicated mounting hole is provided. The earthing cable must be connected to this point on the Escape215-R enclosure. The earthing resistance must be less than or equal to 4 Ω.

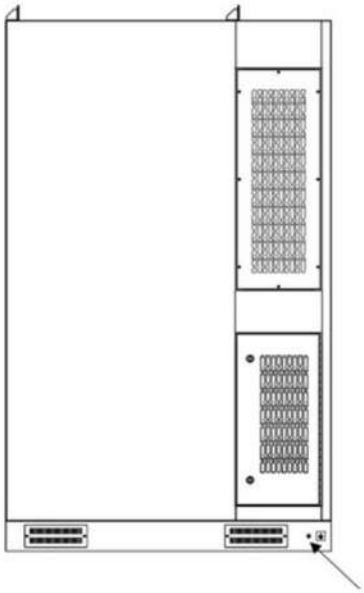


Figure 14 Earthing Diagram of Cable

5.5 AC Connection

Escape215-R is designed with a terminal strip of external AC power supply, which is located on the right side of PCS mounting bay at the rear of the cabinet, as shown in the figure below:

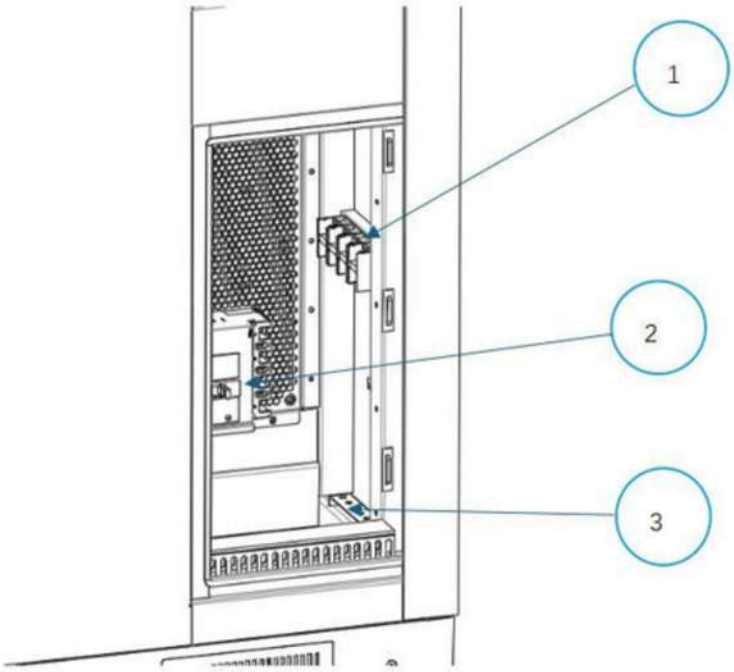


Figure 15 Position Diagram of External AC Connection

S/N	Material Name	Purposes
1	Connection terminal strip	3-phase 4-wire incoming connection of main loop
2	Moulded case circuit breaker	Output connection of PCS
3	Earthing busbar in cabinet body	Earthing position of component in energy storage cabinet

Warning

Accidental exposure to a live terminal can result in a fatal hazard of electric shock!

- Ensure that AC/DC switch of power conversion system has been turned off and connection terminal is electrical isolated.
- When connecting to the grid, always obtain permits from relevant department, and observe all safety commands and specifications related to the grid.

5.6 Battery Connection

The battery modules adopts liquid-cooling technology, which are grouped in 1P48S internal cell arrangement. The batteries inside the BESS are connected only in series. Five standardised liquid-cooled battery modules are connected in series by power cables into a cluster, and the battery system has a total of one cluster. The total positive and total negative terminals of the cluster are connected to high-voltage B+ and B-. After the product is delivered to site, the positive and negative terminals of unconnected battery pack shall be connected.

5.7 Checks after Connection

Once electrical connection is completed, the following operations shall be performed:

- Check whether the cable connection is correct.
- Pull the cable to ensure that it is secured correctly.
- Plug the connection ports and gaps at the bottom with fireproof sealant.
- Determine that the rotation of three phases is correct.

6. Power-on and Shutdown

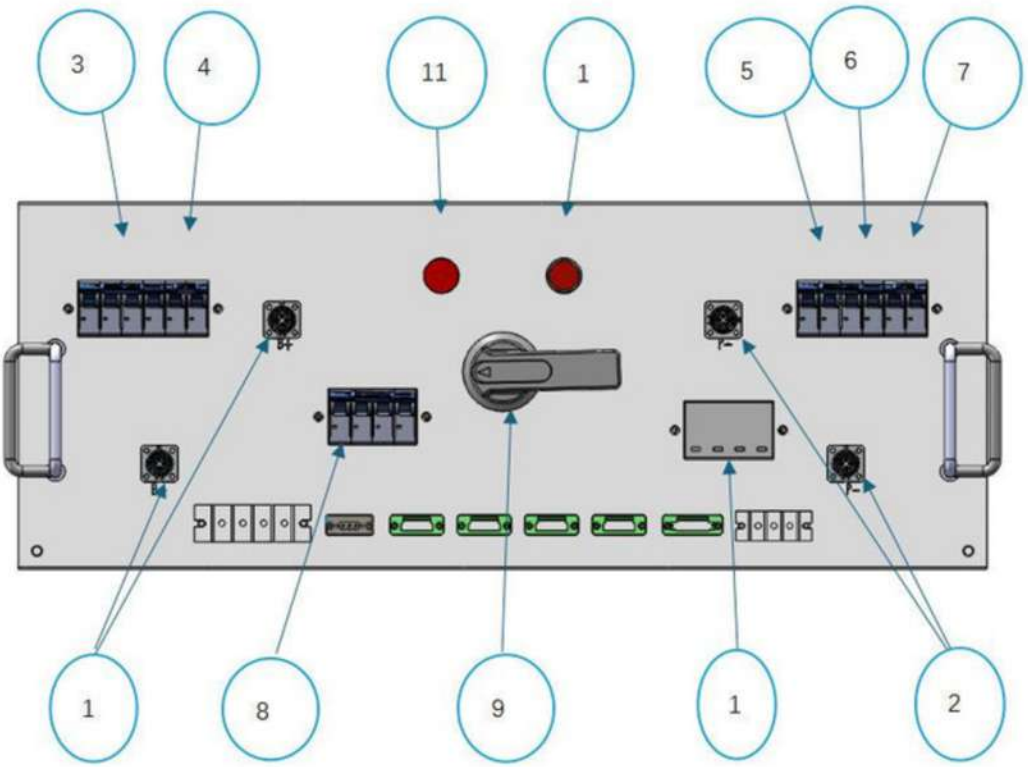


Figure 16 Diagram of Power-on and Shutdown Marks

S/N	Name	Specification and model	Purposes
1	B+ B-	ES091-01M6	Connect total positive and total negative contactors of battery
2	P+ P-	ES091-01M6	Connect P+ of PCS
3	1QF1	NDB1-63C63/4P/AC400V & 415V/63A	Main switch of two 230V auxiliary electrical incoming lines
4	1QF3	NDB1-63C10/AC230V/10A	Power supply for dehumidifier

S/N	Name	Specification and model	Purposes
5	1QF4	NDB1-63C10/AC230V/10A	Power supply for BMS
6	1QF5	NDB1-63C10/AC230V/10A	Power supply for cabinet lamp and EMS
7	1QF6	NDB1-63-C32/2P/AC230V/32A	Switch of liquid-cooled unit
8	1FS1	TNM-SCB/40/standby protector/0/0/AC230/400V/	Power switch of standby protection of surge protector
9	Manual operating mechanism	Auxiliary accessories for DC circuit breaker	Handle of DC circuit breaker switch
10	Self-lock switch of button with lamp	MP2-42R-20+MLBL-07R	Power on/off indication of high-voltage box
11	Yellow indicator lamp	CL2-502Y/0/22mm/16mA/DC24V/yellow	Indication of fault indicator lamp
12	Surge protector	DG M TT 385 CN FM	Lightning protection for power distribution in energy storage cabinet

6.1 Power-on

Step 1: Check power connectors ① and ②, and confirm they are connected firmly;

Step 2: Ensure that the supply of external 230V alternating current is normal; turn on air switch ③ (the air switch will be turned “ON” when it is pushed up, and turned “OFF” when it is pushed down);

Step 3: Turn on the air switches ④, ⑤, ⑥, ⑦ and ⑧ of power supply respectively (the air switch will be turned “ON” when it is pushed up, and turned “OFF” when it is pushed down) to power on high-voltage box, and press the switch ⑩ of power indicator lamp to ensure that the power indicator lamp is normally on;

Step 4: Turn the handle ⑨ of circuit breaker to position “ON”;

Step 5: Wait for about 30s until main positive and main negative contactors in high-voltage box are closed, and total voltage output is detected at “P+”/“P-”;

Step 6: High voltage is applied successfully. The DC side of PCS will be powered on, and the system will enter pre-start state.

6.2 Shutdown

Step 1: Turn the handle ⑨ of circuit breaker to position “OFF”;

Step 2: Wait until main positive and main negative contactors in high-voltage box are opened, no total voltage output is detected at “P+”/“P-”, no voltage is detected at DC side of PCS and the system enters OFF state;

Step 3: Press self-lock switch ⑩ of button with lamp to turn off power indicator lamp.

Step 4: Turn off the air switches ④, ⑤, ⑥, ⑦ and ⑧ of power supply respectively (the air switch will be turned “ON” when it is pushed up, and turned “OFF” when it is pushed down) to power off high-voltage box, and turn off air switch 1QF1 (the air switch will be turned “ON” when it is pushed up, and turned “OFF” when it is pushed down);

Step 5: Turn off air switch ③ (the air switch will be turned “ON” when it is pushed up, and turned “OFF” when it is pushed down);

Step 6: Energy storage system has been shut down.

7. Introduction to Battery Cell, Battery Pack and Battery Cluster

7.1 Introduction to Battery Cell

The Escape215-R adopts 280Ah lithium iron phosphate battery for energy storage, where the battery cell is of a square aluminium casing structure, the positive and negative poles are located at the same end face, the nominal capacity of battery cell is 280Ah, and the nominal voltage is 3.2V.

Figure 17 Appearance Diagram of Battery Cell

- The standard charge/discharge current of cell is 0.5C/0.5C, the maximum continuous charge/discharge current is 1C/1C, and the maximum pulse charge/discharge current (30s) is 2C/2C;

- The limit charge/discharge voltage of cell is 3.65V/2.5V. In order to protect the cycle life of battery, the Escape215-R is pre-set as follows:

When Discharging: 3.0V for Level-1 alarm, 2.9V for Level-2 alarm and 2.7V for Level-3 alarm;
When Charging: 3.55V for Level-1 alarm, 3.6V for Level-2 alarm and 3.65V for Level-3 alarm;
In the charge/discharge process, when the voltage of single cell reaches trigger threshold of alarm, the system control will make corresponding actions according to alarm level.

The details are as follows:

Items	Alarm Level	Trigger threshold of alarm	Actions of System Control
Charge Process	1	3.55V	Report an alarm
	2	3.6V	Disable charging; enable discharging
	3	3.65V	Output a dry contact, and actuate trip process with delay of 3s
Discharge Process	1	3.0V	Report an alarm
	2	2.9V	Enable charging; disable discharging
	3	2.7V	Output a dry contact, and actuate trip process with a delay of 3s

- The recommended use window of cell SOC is 10%-90%;
- The operating temperature of cell when charging is 0℃ to 55℃.

In case of cell charging, the logic between temperature alarm threshold and system control is as follows:

Items	Alarm Level	Trigger threshold of alarm	Actions of System Control
High temperature when charging a cell (°c)	1	50	Report an alarm
	2	55	Disable charging; enable discharging
	3	60	Output a dry contact, and actuate trip process with delay of 3s
Low temperature when charging a cell (°c)	1	5	Report an alarm
	2	0	Enable charging; disable discharging
	3	-5	Output a dry contact, and actuate trip process with a delay of 3s

- The operating temperature of cell when discharging is -20℃ to 55℃.

In case of cell discharging, the logic between temperature alarm threshold and system control is as follows:

Items	Alarm Level	Trigger threshold of alarm	Actions of System Control
High temperature when discharging a cell (°c)	1	50	Report an alarm
	2	55	Disable charging; enable discharging
	3	60	Output a dry contact, and actuate trip process with delay of 3s
Low temperature when discharging a cell (°c)	1	-10	Report an alarm
	2	-20	Enable charging; disable discharging
	3	-25	Output a dry contact, and actuate trip process with a delay of 3s

- The monthly self-discharge rate of cell is ≤3% (25±2℃; 30%-50% SOC memory);
- The dimension of single cell is W(173.7±0.5mm) × D(72.0±1.0mm) × H(207.5±0.5mm).

7.2 Introduction to Battery Pack

The Escape215-R is equipped with liquid-cooled battery modules which are connected only in series, and each battery module independently integrates BMU and communication interface etc. The appearance diagram of battery module is shown in the figure below:

Figure 18 - Appearance Diagram of Battery Module

Parameters of Battery Module	Rated capacity (Ah)	280Ah
	Rated voltage (V)	153.6V
	External dimensions (LxDxH, mm)	814 x 1,100 x 250
	Weight (kg)	310

- Two handles at the front end of battery pack are convenient for the operators to perform maintenance including replacing battery packs;
- The rated overload current of positive and negative connectors is 250A;
- The voltage/temperature probe on CCS component (total positive/negative terminals) and slave control board of BMS will work together to monitor the voltage and temperature of cells in battery pack;

- Slave control of BMS (Level-1 BMS) is a collecting module suitable for lithium ion battery management with integrated equalisation function. This module provides real-time monitoring of the voltage and temperature of a single cell (cell) with equalisation capability, and can form a highly flexible battery management system (BMS) with BCM via CAN or SPI bus.

1. A single module supports voltage monitoring of up to 6-64 single cells (cells);
2. A single module supports NTC temperature monitoring of up to 0-64 circuits, which is default to 10K 3435 NTC;
3. It supports battery equalisation management, which can effectively improve battery uniformity and extend battery life;
4. It supports thermal management, which can actively manage the battery temperature according to temperature state of battery, realise control functions of cooling, heating and temperature uniformity improvement and extend battery life;
5. The modules of CAN series support Bootloader upgrade and 1 CAN, and can upgrade the firmware online through CAN bus;
6. It supports alarm functions such as cell over voltage/under voltage, under temperature/over temperature, disconnection of collecting harness, communication loss etc.

7.3 Introduction to Battery Cluster

The battery system of Escape215-R is composed of multiple battery clusters connected in parallel, and the battery cluster is composed of 5 battery packs, a high-voltage box, power harnesses connecting between clusters, and collecting wires between clusters.

Its diagram is as follows:

Figure 19 Diagram of Battery Cluster

Five battery packs in battery cluster are connected through DC power cables, and their total positive/negative terminals are connected to B+/B- of high-voltage box through cables. The communication between slave control of BMS in battery pack and main control in high-voltage box is implemented via CAN. Parameters of Battery Cluster:

Parameters of Battery Cluster Weight (kg)	Rated capacity (Ah)	280
	Rated voltage (V)	768
	Voltage range (V)	648-876
	Weight (kg)	1,700
	Operating temperature when charging (°C)	0 to 55
	Operating temperature when discharging (°C)	-20 to 55

8. Introduction to High-voltage Box

The high-voltage control box of Escape215-R BESS is a high-voltage power loop management unit specially designed for energy storage system, which is an intermediate unit connecting battery cluster and power conversion systems.

The high-voltage control box has functions such as acquisition of battery cluster voltage and current, as well as control and protection of loop contactor for battery cluster, etc., and accommodates circuit breaker, contactor, fuse, circulating control circuit, current sensor, energy storage battery cluster module (ESBCM) and switching power supply etc.

The electrical characteristics, heat dissipation performance, safety performance, operability and maintainability of each component have been fully considered in the design of high-voltage control box to ensure that it is featured with reasonable space layout, compact structure, flexible configuration, safety and reliability etc.

The high-voltage control box has a built-in energy storage battery cluster module (ESBCM) with CAN and RS-485 communication bus interfaces, which can realize the communication function between high- voltage control box and energy storage battery management module (ESBMM), main unit of energy storage battery management system (ESMU) and power conversion system, as well as control, protection and data communication functions of energy storage battery cluster.

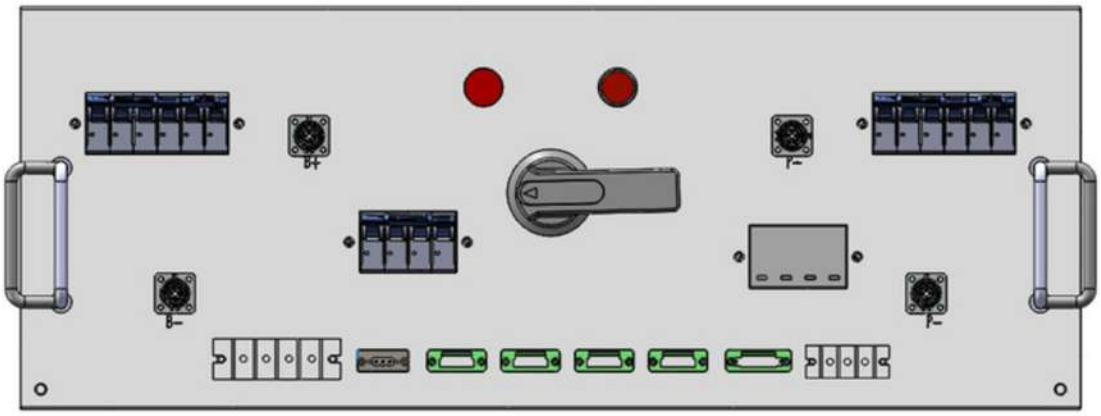


Figure 20 Appearance Diagram of High-voltage Box

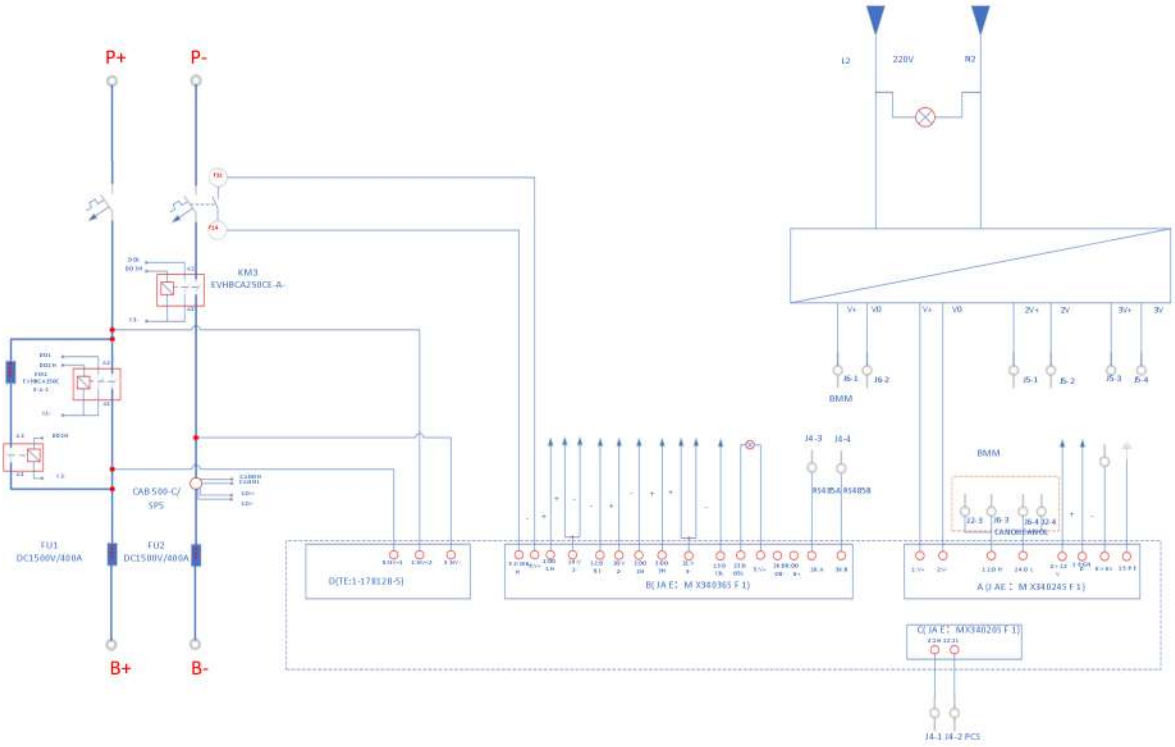


Figure 21 Electrical Diagram of High-voltage Box

Serial Number	Item
1	Total negative relay
2	DC contactor
3	Total positive relay
4	DC contactor
5	Hall sensor
6	Battery positive

7	Load positive
8	Load negative
9	Feedback - of circuit breaker
10	Feedback + of circuit breaker
11	Total positive terminal +
12	Total positive terminal -
13	Feedback - of total positive terminal
14	Feedback + of total positive terminal
15	Circulation -
16	Circulation +
17	Total negative terminal -
18	Total negative terminal +
19	Feedback - of total negative terminal
20	Feedback + of total negative terminal
21	Fault lamp -
22	Fault lamp +
23	Power supply for BMM
24	Communication of all-in-one machine
25	Power supply for switch
26	Power supply for controller
27	Communication of BMM and Hall
28	Power supply - for Hall
29	Power supply + for Hall
30	Automatic addressing
31	Earthing
32	Communication of PCS
33	230V power input

Port definition	Functional instructions	Remarks
B+	Positive input terminal of battery cluster	Connect positive terminal of battery cluster
B-	Negative input terminal of battery cluster	Connect negative terminal of battery cluster
P+	Positive output terminal of high-voltage box	High-voltage box outputs to positive terminal of battery collection panel/PCS
P-	Negative output terminal of high-voltage box	High-voltage box outputs to negative terminal of battery collection panel/PCS
1QF1 main switch	Main incoming line of power distribution	Main switch of power distribution, which controls power supply for power distrib.
1FS1	Power switch of standby protection	Power supply for standby protection
1QF3	Power switch of dehumidifier	Power switch for dehumidifier
1QF4	Power switch of BMS	Power switch of BMS
1QF5	Power switch of EMS and lighting	Power switch of EMS and lighting
1QF6	Power switch of liquid cooled main unit	Power switch of liquid-cooled main unit
Switch of battery cluster	Switch of battery cluster	Manually control high-voltage output for battery cluster (handle of circuit breaker)

9. Introduction to PCS

9.1 Introduction to PCS System

The power conversion system is a conversion device between grid and battery, which can charge and discharge the battery. It can invert direct current from battery into alternating current that can be accepted into grid, and rectify alternating current from grid into direct current that can be charged into battery.

9.2 Appearance of Power Conversion system

Figure 22 Appearance Diagram of Power Conversion System

9.3 Technical Parameters of PCS

The Escape215-R is fitted with a 100kW IN-POWER PCS. Technical parameters below:

AC parameters	
Rated AC power	100kW
Connection mode	3-phase 4-wire
AC overload capacity	1.1 x 10min; 1.2 x 1min
Parameters of grid-connected running mode	
Allowable grid voltage	340-460V
Allowable grid frequency	50/60Hz
Total current harmonic distortion rate	≤3%
Voltage ripple coefficient	≤1%
Power factor	-0.99 - 0.99
DC parameters	
Rated DC power	100kW
DC voltage range	630 - 900Vdc

Maximum DC power	190A
Voltage regulation accuracy	≤2%
Current regulation accuracy	≤5%
System parameters	
Maximum conversion efficiency	≥98%
Dimension (WxHxD)	W480mm X H269mm X D659mm
Weight	70kg
Noise	<75dB
Protection level	IP20
Allowable ambient temperature	-20°C to 60°C
Cooling mode	Forced air cooling
Allowable relative humidity	0-95% (without condensation)
Allowable altitude	3,000m (derating above 3,000m)
Display and communication parameters	
Communication interface	RS485, Ethernet, CAN
Communication protocols	Modbus TCP/RTU, IEC104
BMS access	Support

9.4 System Diagram

As the primary actuator and core component of the energy storage system, the PCS performs AC/DC conversion between the grid and the battery, enabling bidirectional energy flow.

Using advanced control strategies, it manages battery charging and discharging, regulates the power flow of the energy storage system, and provides comprehensive protection functions—including anti-islanding, DC over-voltage, and AC over- and under-voltage protection—to ensure compliance with grid-connection requirements.

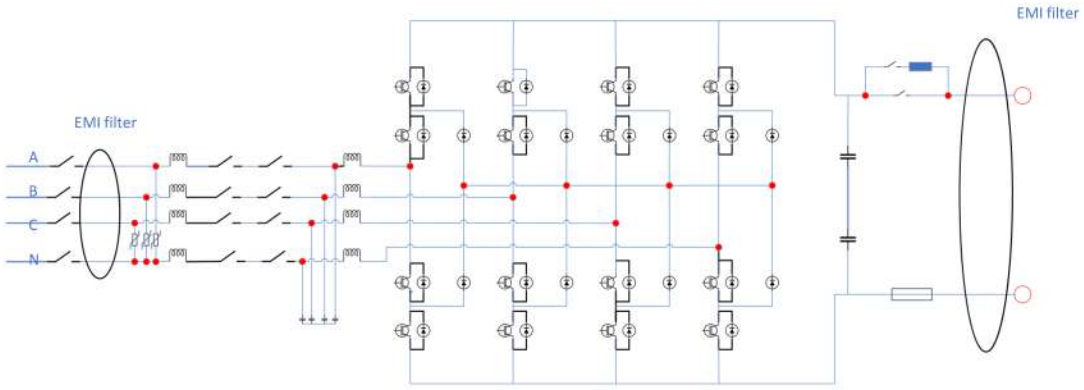


Figure 23 Topological Graph of Power Conversion System

9.5 Electrical Connection

The PCS operates with a hazard of high-voltage shock and shall only be operated by skilled electricians. All operations related to device must be carried out in a voltage-free state. If input and output terminals are not connected correctly the PCS will be damaged!

Failure to observe this warning message could result in serious personal injury or major property damage, or even death. List of INPPCS-100/0.4-W-14-C Cables

Model	INPPCS100	Description
Diameter of mounting hole	M8 crimping terminals for AC side, DC sides and PE	
BT+ of battery module	≥50mm2×1pc	BT+
BT- of battery module	≥50mm2×1pc	BT-
Grid	≥50mm2×4pcs	ABCN
Protective earthing (PE)	≥16mm2×1pc	PE

10. EMS System

10.1 Home Page

The home page displays topological graph of energy storage system, and the basic data of device is displayed in real time on this graph, and the refresh rate is 1s.

On the home page, you can view current running mode, as shown in the figure below:

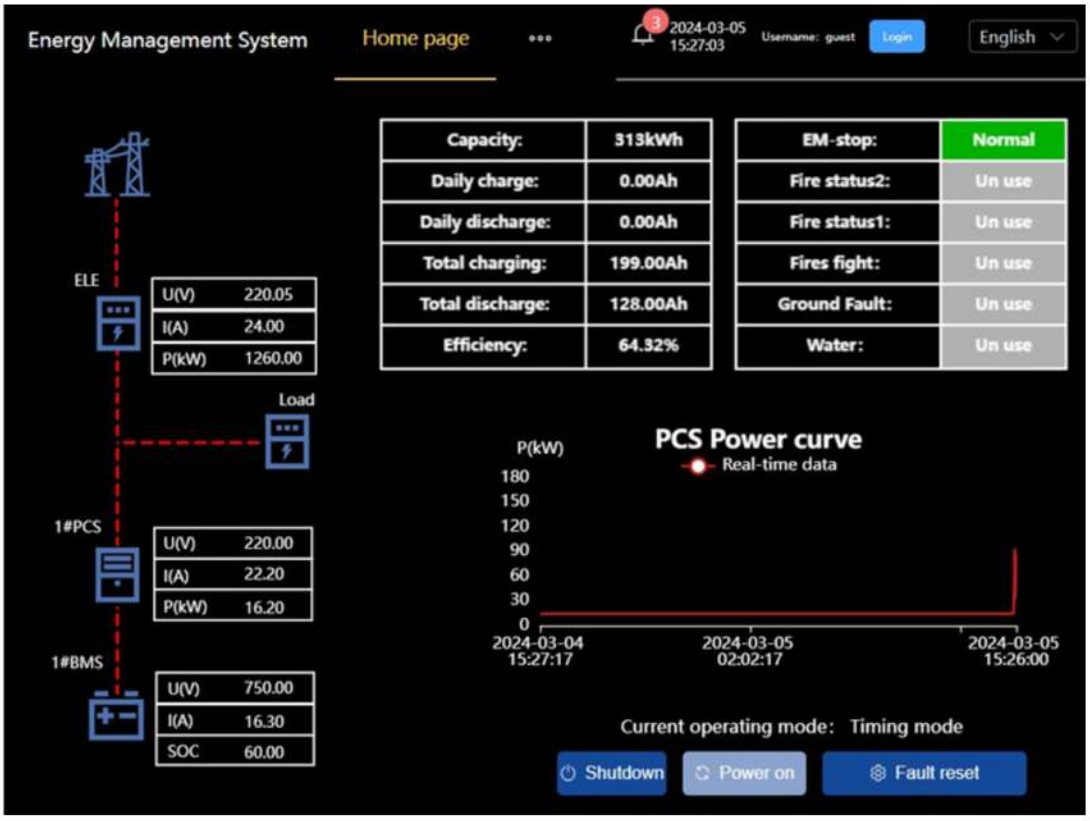


Figure 24 Home Page Diagram of System

① Grid: Display grid voltage, current and power in real time.
② PCS: Display state, voltage, current and power of PCS device in real time.
③ BMS: Display voltage, current and SOC (state of charge) of BMS device in real time.
④ Display the number of current alarm messages. After the fault is eliminated, it will display “Normal”.
⑤ Display the current version No. and local time of EMS.
⑥ Display the current username. User roles include guest and administrator. Click the login button in the upper right corner and enter the username and password to enter administrator mode.
⑦ Display the basic information of energy storage device, including energy storage capacity, current charging/discharging capacity, and charging/discharging efficiency. Total efficiency is the product of total discharge divided by total charge.

⑧ Display the state of auxiliary device in container, such as waterlogging, fire alarm, smoke detection, emergency stop, fan, access control, etc.
⑨ Display PCS power curve. Each device supports viewing detailed data. Click device icon to enter device details, as shown in the figure below.

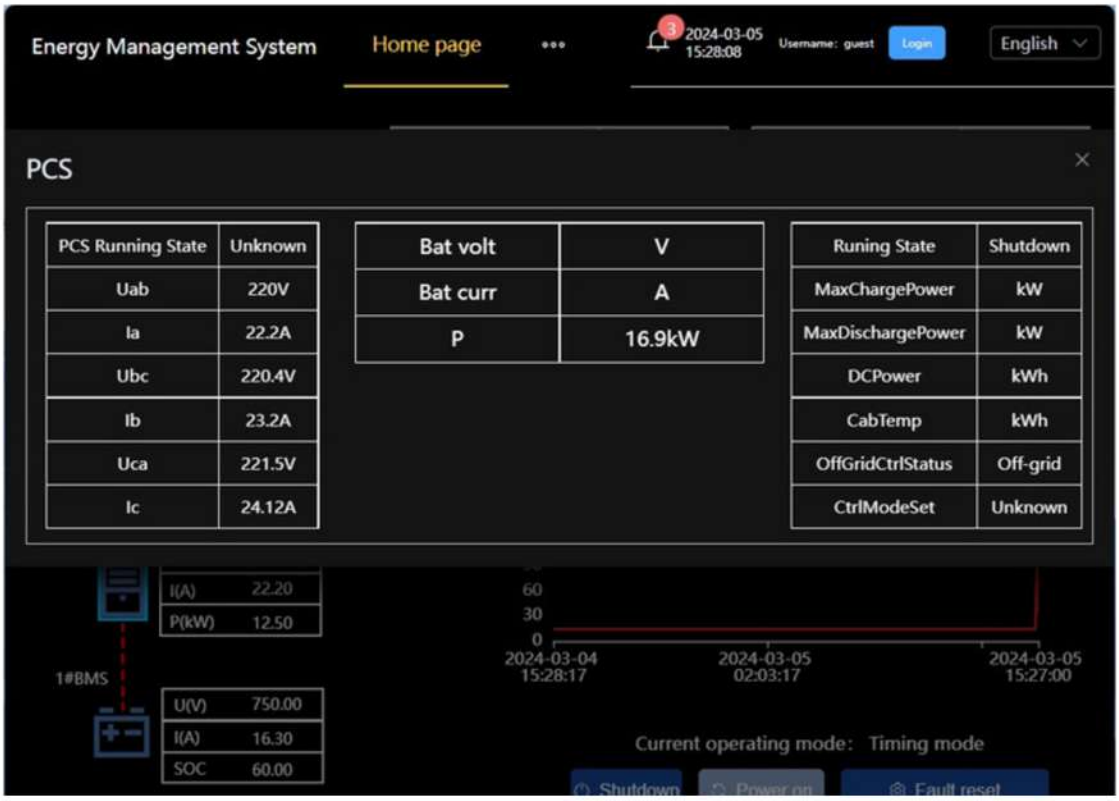


Figure 25 PCS Clicking on “Cluster 1”, “Cluster 2”, “Cluster 3” and “Cluster 4” will display the details of each cluster.

Figure 26 BMS

Notice: Click device icon in the upper left corner to view the details.

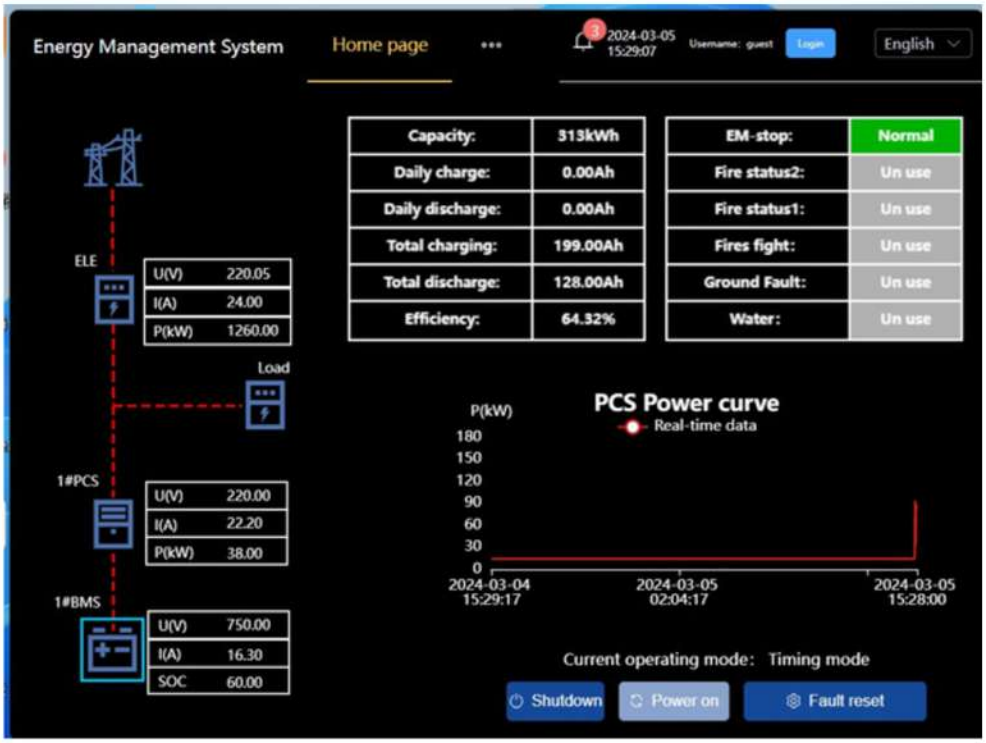
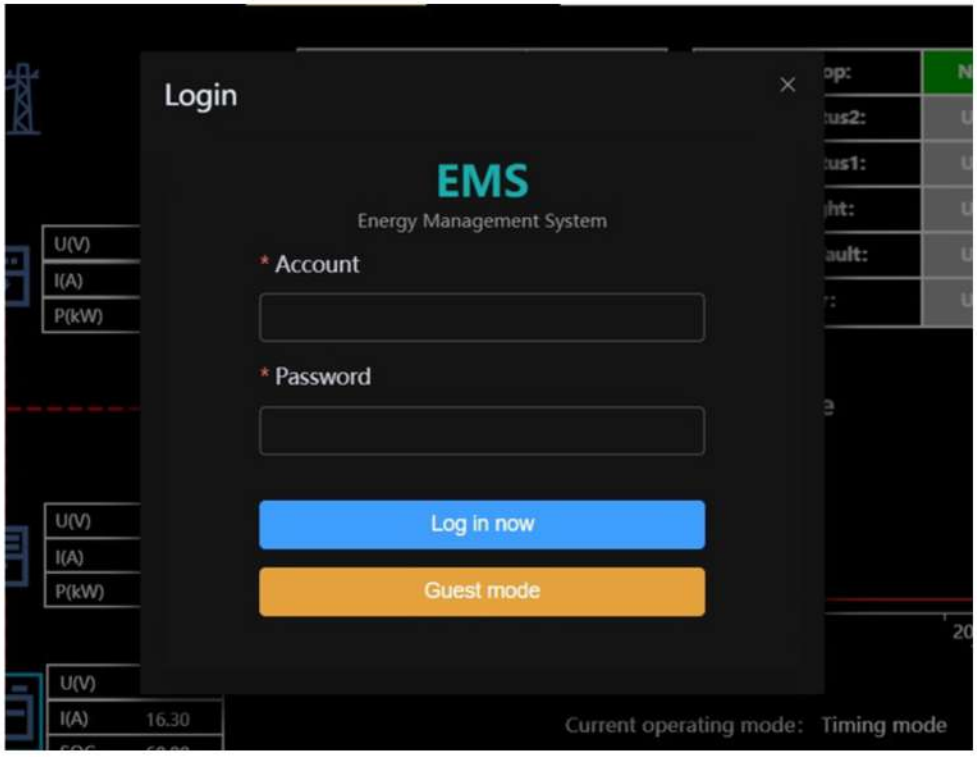


Figure 27 Diagram of Icon Clicking Positions

10.2 Login Screen

When the client software is first launched and users enter as a “guest”, they can only monitor the data but cannot remotely control or change configurations. You need to login as an administrator by clicking “Login” button in the upper right corner to implement remote control and parameter adjustment, as shown in the figure below:



Notice:
Please be careful when operating with the following username and password.

Administrator Username: admin; Password: 888888.
You can modify policy parameters and device control after logging in administrator account.

Start Username: admin; Password: 123456. After logging in, users can run the system automatically according to set policy.

10.3 Device Monitoring

The device monitoring content includes real-time data and alarm data. The alarm data is displayed in green when it is normal, and is displayed in red when there is an alarm.

10.3.1 PCS

Click “PCS” in the tree structure on the left to display real-time data and real-time alarm information of PCS. Different PCS data can be selected by selecting from the drop-down menu on the right. Click “Previous page” or “Next page” to switch data items and alarm content.

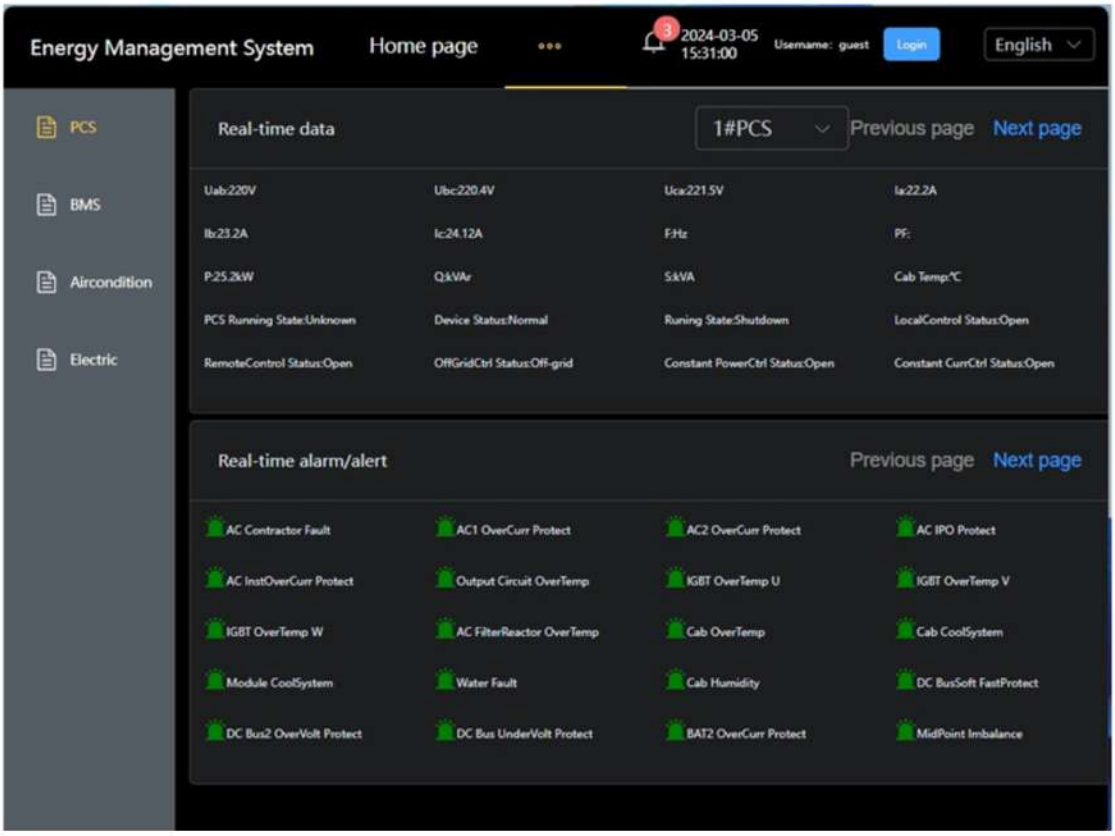


Figure 29 PCS

10.3.2 BMS

Click “BMS” in the tree structure on the left to display real-time data and real-time alarm content of BMS. To view different BMS device data, select from the first drop-down list. To view the real-time data of entire cluster and sub-clusters, select from the second drop-down list.

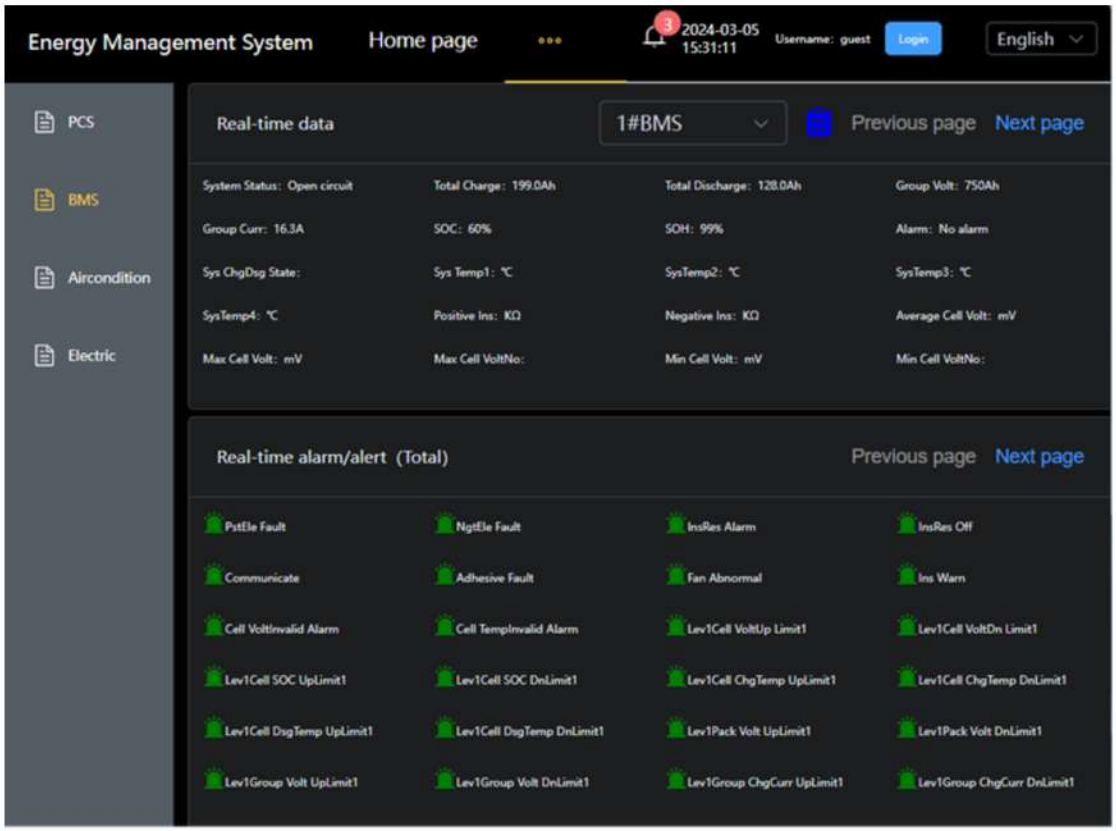


Figure 30 BMS

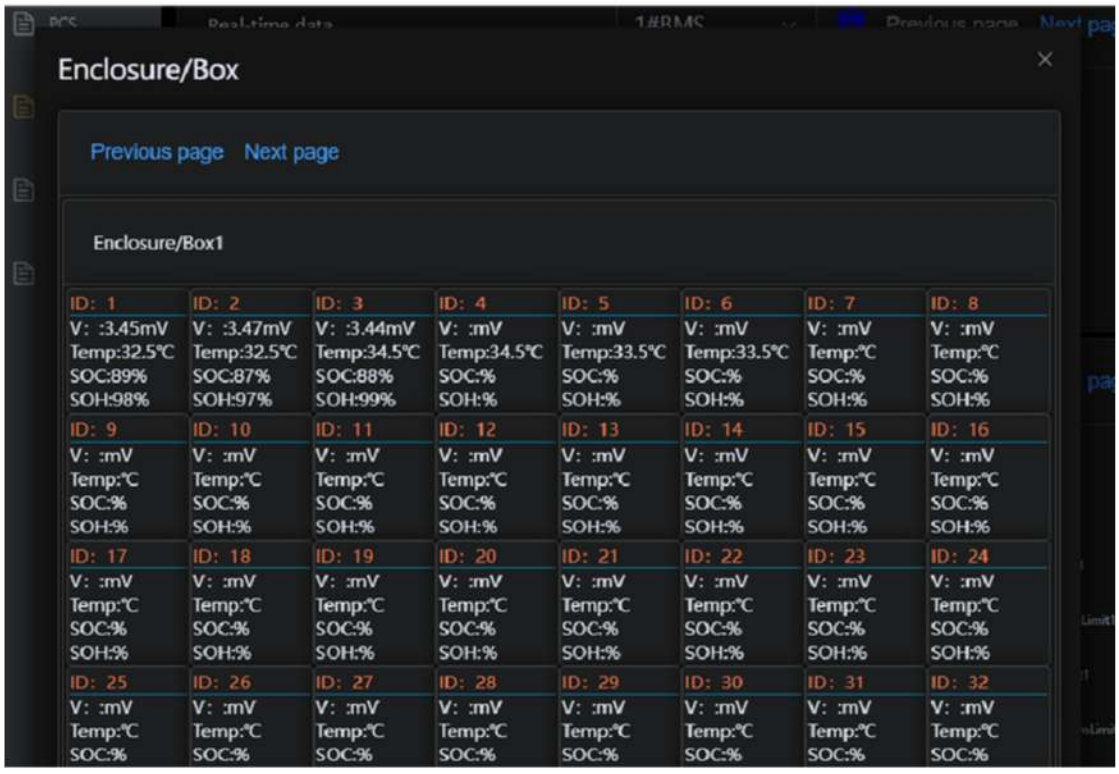


Figure 31 Battery

Clicking the battery icon on the right side of this page will display individual battery data of that battery pack.

10.3.3 Energy Meter

If feeder instrument or total incoming instrument is connected on project site according to customer needs, select “Instrument” in the tree structure on the left, and select it from the drop-down menu on the right side of this page to display real-time data of instruments in AC cabinet and instruments in feeder cabinet.

10.4 Data Monitoring

10.4.1 Real-time Data

To view real-time data, select “Real-time Data” from the tree structure on the left. Then, filter and search for the device you are interested in, select the data items you want to view, and click “Query” to display the details of these data items, as shown in the figure below:

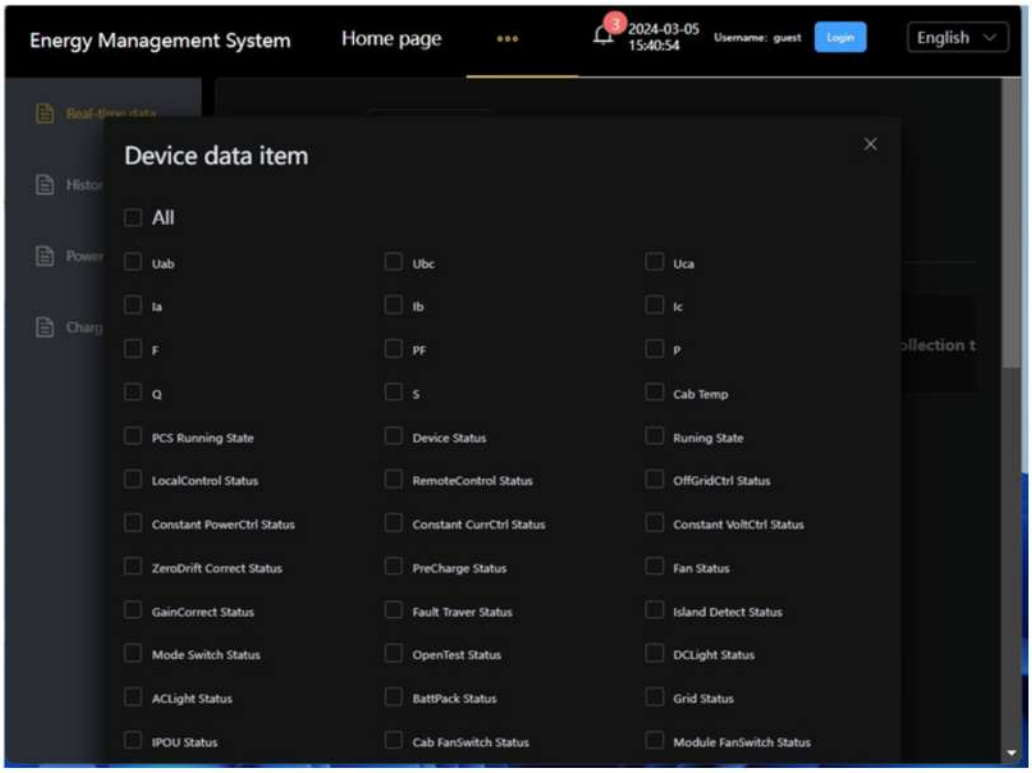


Figure 33 Real-time Query Conditions

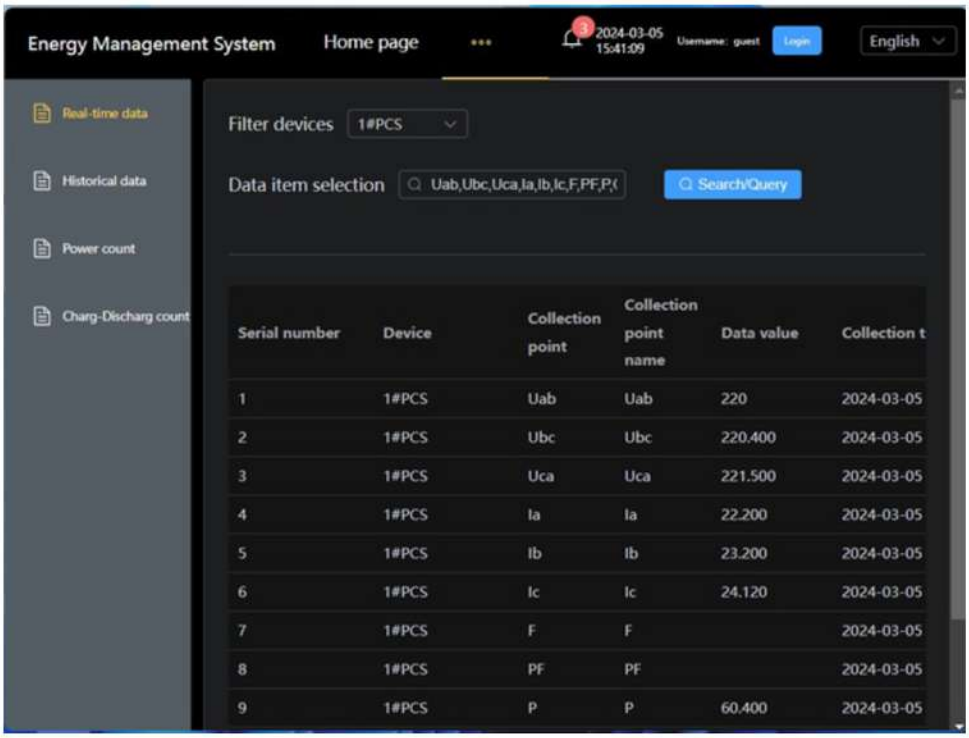
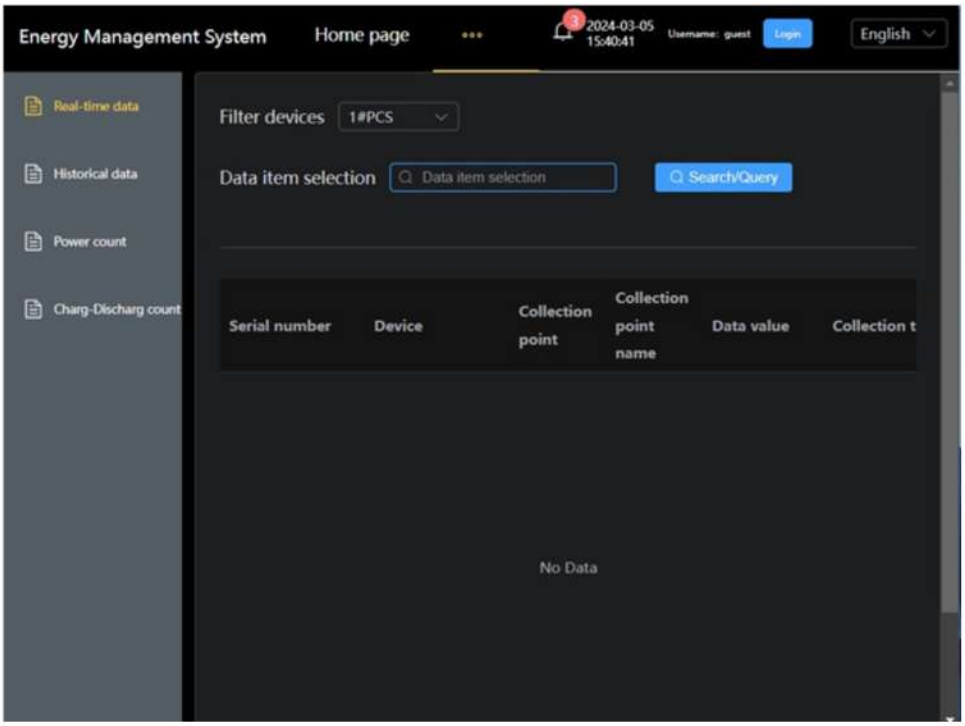


Figure 34 Query Results of Real-time Data

10.4.2 Historical Data



Click the tree structure on the left and select “Historical Data”. Select the period for query and data items you want to query. You can select different data items for different devices. Click space beyond pop-up box to confirm the selection conditions, as shown in the figure below:

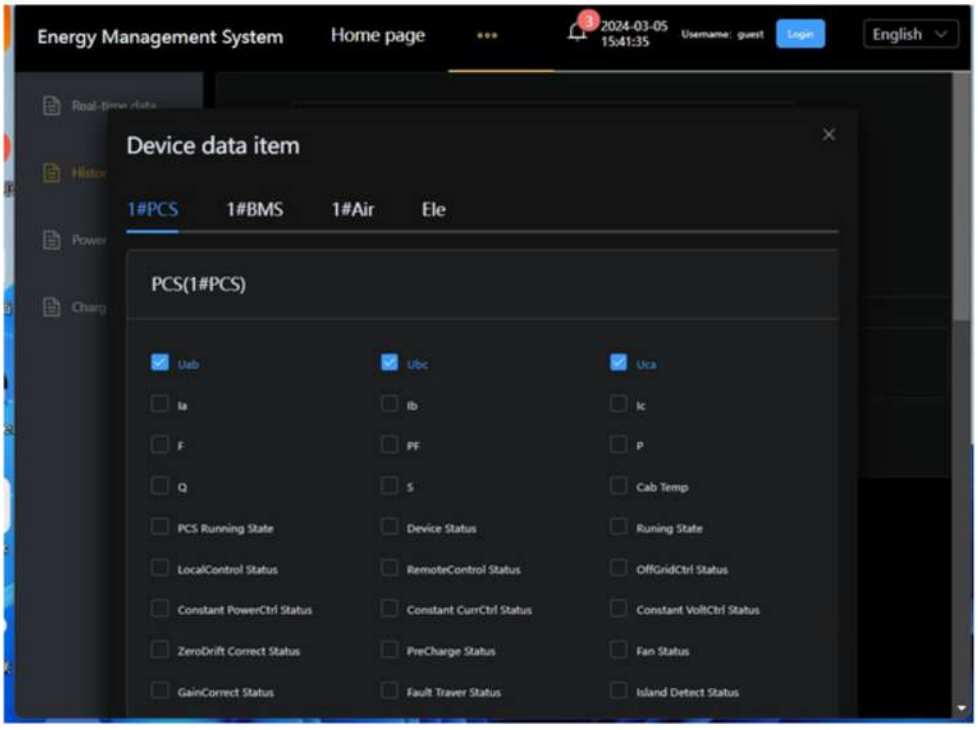


Figure 35 Query Conditions of Historical Data

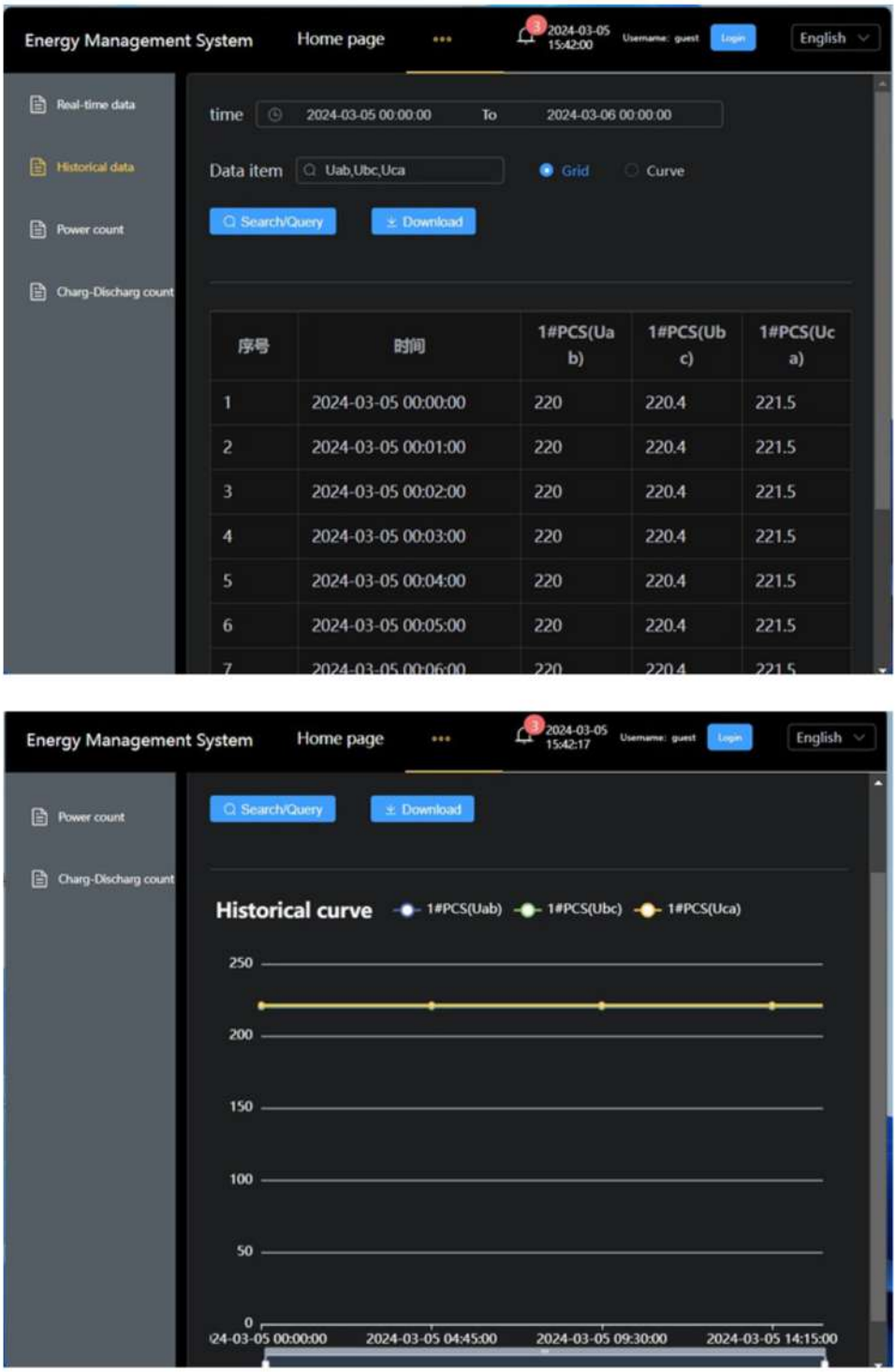


Figure 36 Query Results of Historical Data

10.5 Energy Storage Mode

10.5.1 Mode Parameter Data

1) Click “Energy Storage Mode” to display current operating mode, parameter details, etc., as shown in the figure below. Select a different mode and click “Mode Setting” to switch between operating modes.

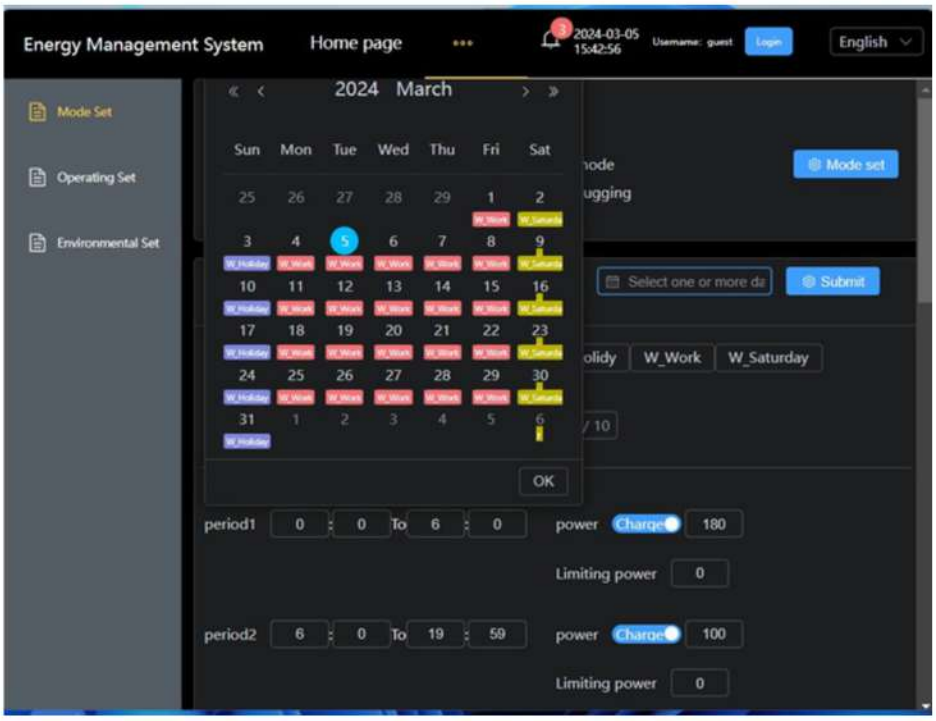


Figure 37 Setting of Energy Storage Mode

2) In timing mode, users can customise the operating mode, such as “working days”, “overtime days”, “holidays”, etc. For different operating modes, users can set different charge/discharge power for different periods. Users can then select one or more days from the calendar on the right and click “Submit” to make changes as shown in the figure below.

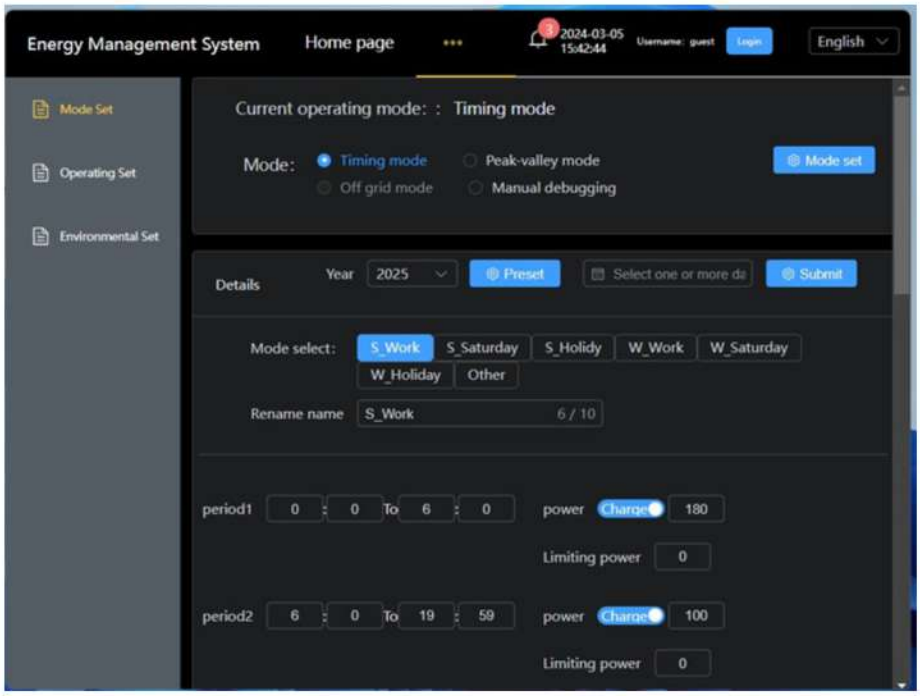


Figure 38 Parameter Setting of Timing Mode

3) In peak-valley mode, you can set peak-valley periods and cycle times in different months. Click “Submit” to make changes. Peak-valley mode is a special form of timing mode, which is formed to simplify timing mode, as shown in the figure below:

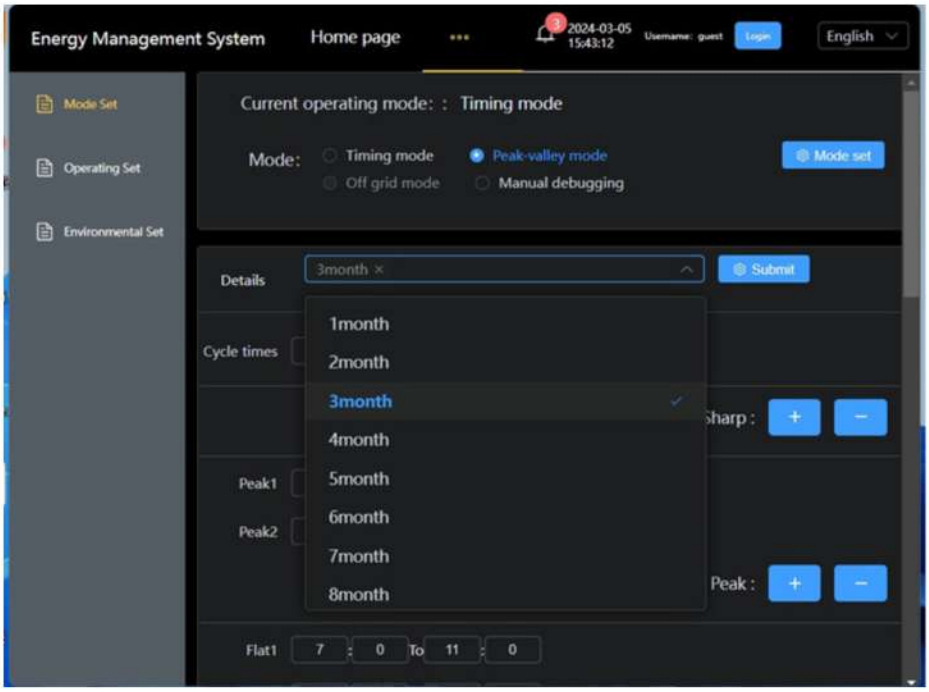
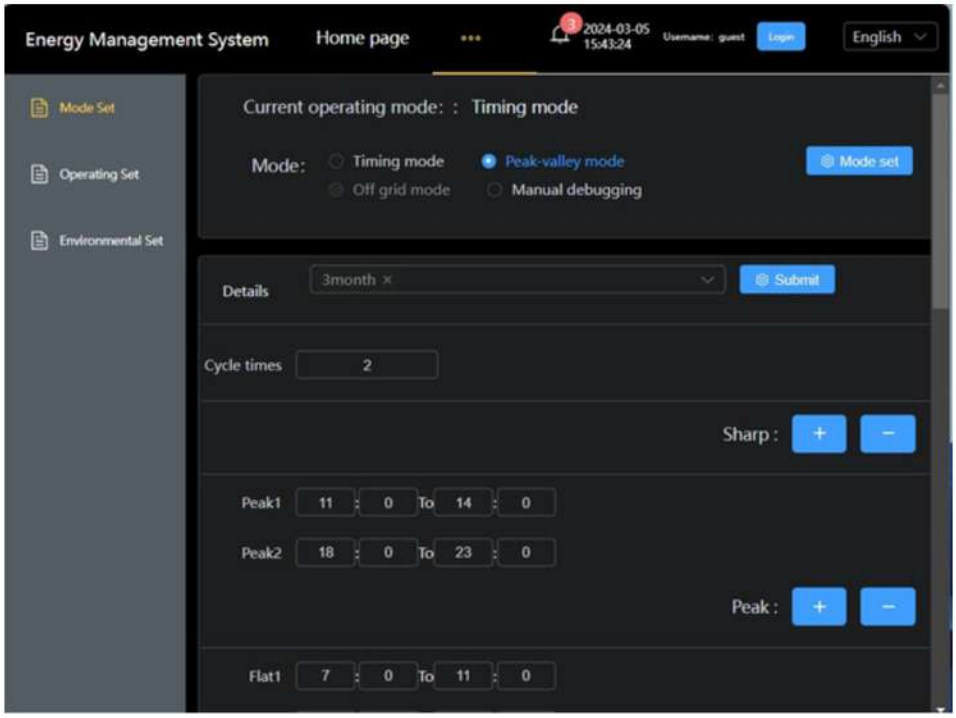


Figure 39 Parameter Setting of Peak-valley Mode



4) In off grid mode, the storage system is powered by load and runs automatically.

5) In manual debugging mode, the device can be manually controlled.

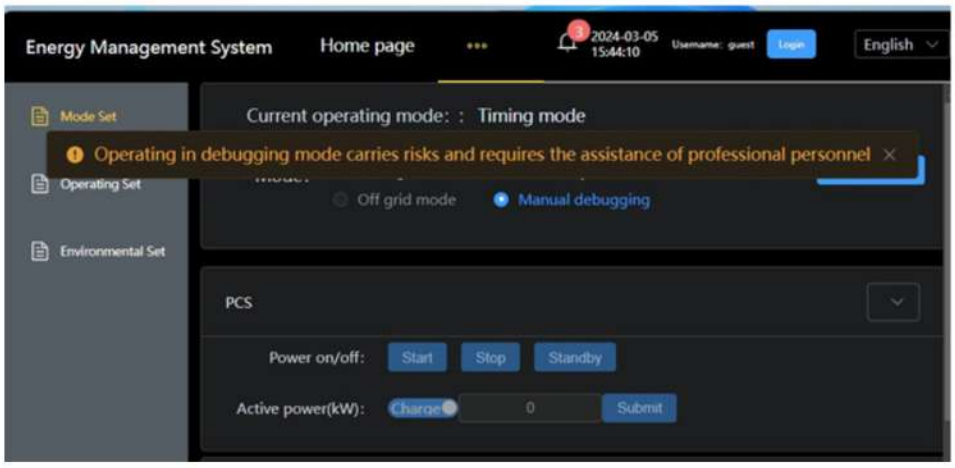


Figure 40 Manual Control

10.5.2 Running Parameter Data

Configuration of running parameters is to set protection parameters for system protection during normal charge/discharge. Charge starts when remaining SOC of battery is less than or equal to charging limit SOC. Discharge starts when remaining SOC of battery is more than or equal to discharging limit SOC.

If voltage of any battery is above maximum voltage limit, PCS will be shut down. If voltage of any battery is less than the difference between maximum single-cell voltage limit and hysteresis value, PCS will be powered on.

If voltage of any battery is less than minimum single-cell voltage limit, PCS will be shut down.

If voltage of any battery is more than sum of minimum single-cell voltage limit and hysteresis value, PCS will be powered on, as shown in the figure below:

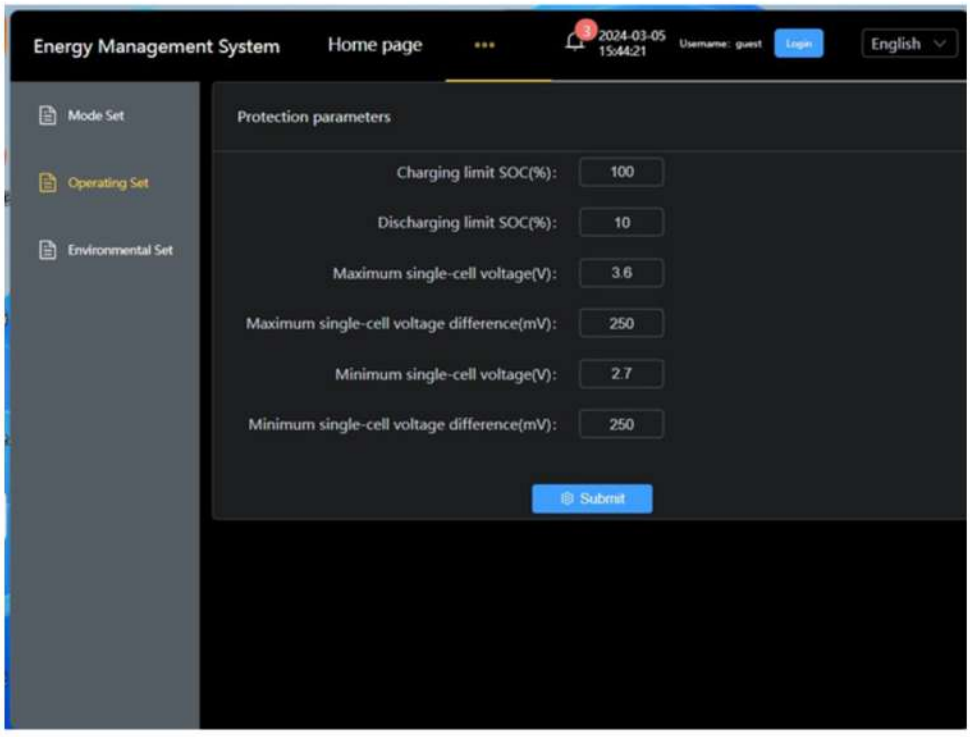


Figure 41 Configuration of Running Parameters

10.5.3 Power and Environment Parameter Data

Configuration of environment parameters is to configure the start/stop limit of air conditioner. The parameters to be configured include heating start temperature, cooling start temperature, heating stop temperature, and cooling stop temperature, as shown in the figure below:

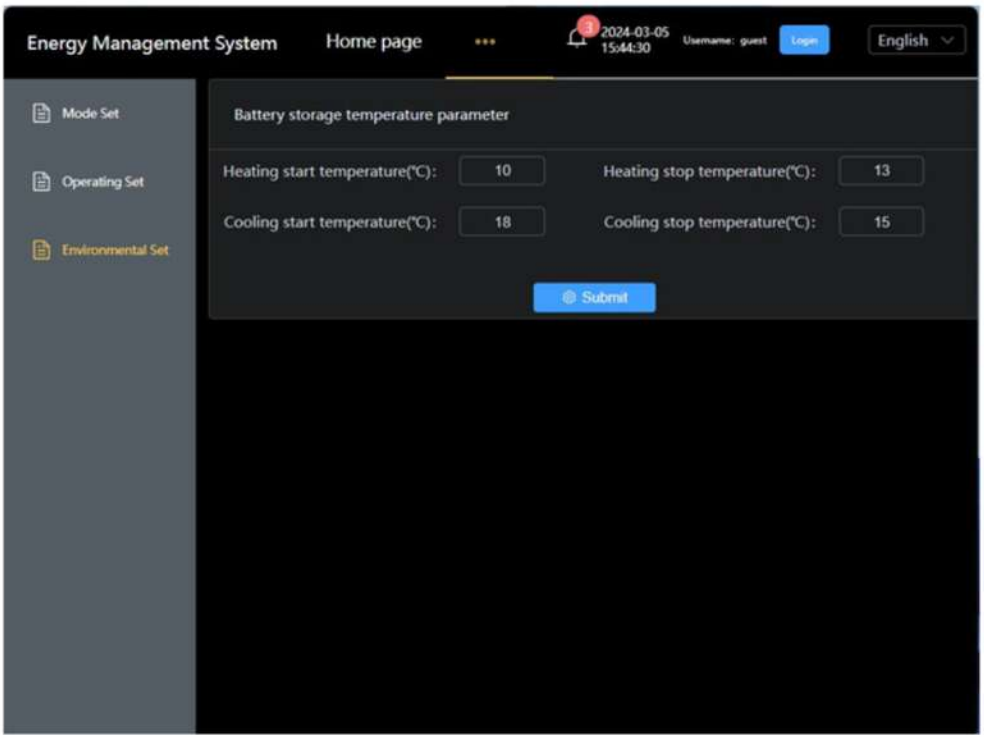


Figure 42 Configuration of Environment Parameters

10.6 System Configuration

10.6.1 IP Parameters

Click “IP Parameters” in the tree structure on the left to set network IP. During debugging, the IP address of PC is consistent with IP address of system, as shown in the figure below:

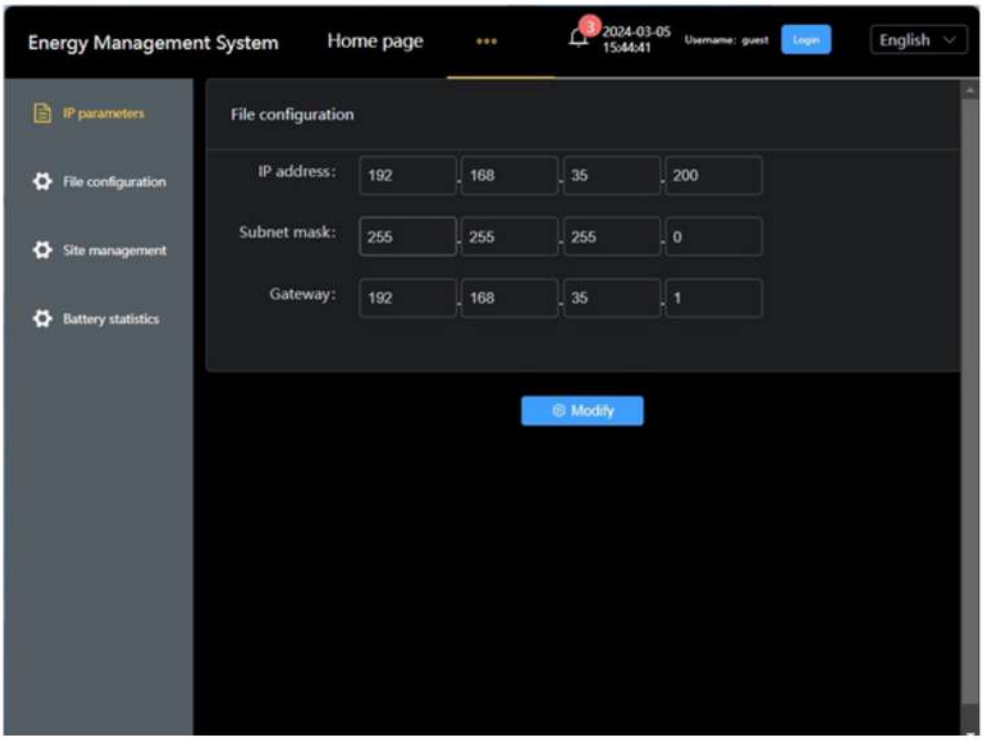


Figure 43 Network Setting

10.6.2 File Configuration

File configuration is to operate the collected files, including adding, deleting, modifying, and searching etc.

Note: File configuration works only in administrator mode.

The configuration collection files involved are consistent with the protocols of STS, PCS, BMS, energy meter, inverter, and air conditioner, as shown in the figure below:

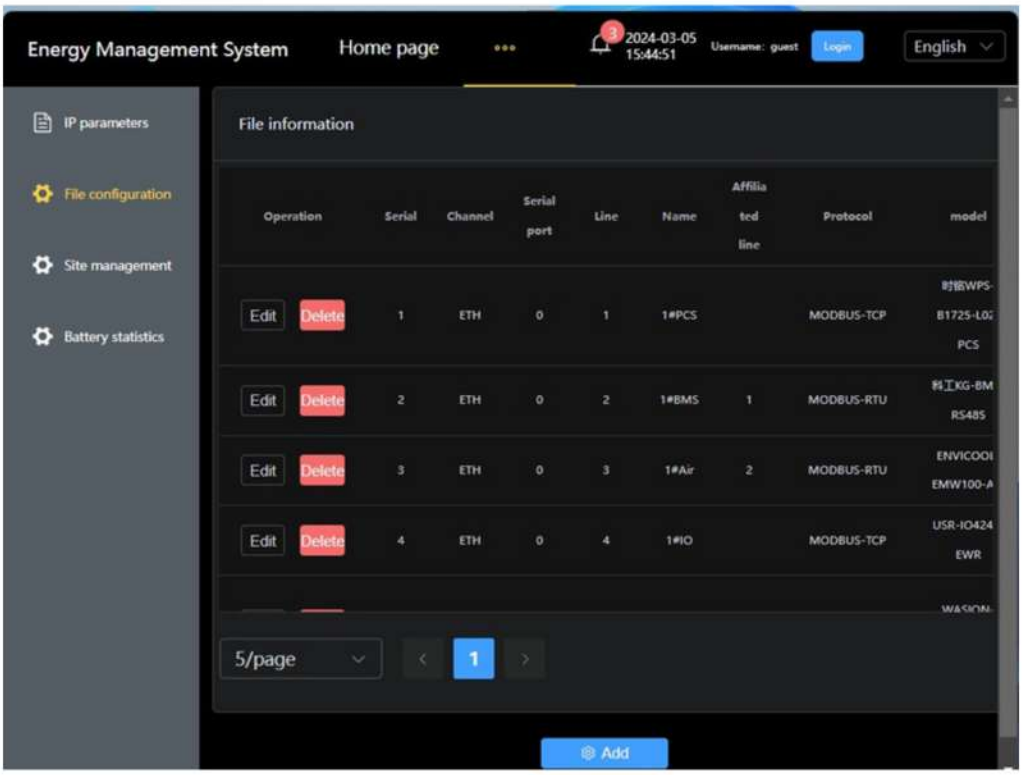


Figure 44 File Setting

Click “Add” button to add a new file, as shown in the figure below:

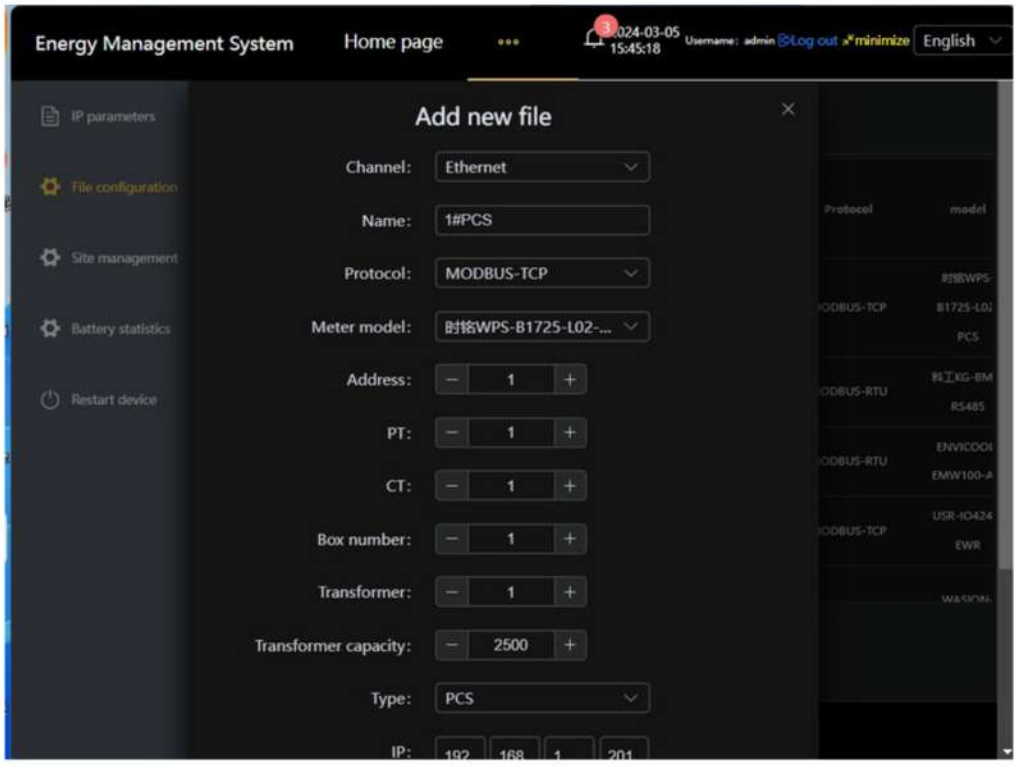


Figure 45 Adding of New File

10.7 Alarm Logs

10.7.1 Current Alarms

Click “Current Alarms” in the tree structure on the left to display the alarms that are currently occurring on collected device, including self-reported alarms, offline alarms, and threshold alarms, as shown in the figure below:

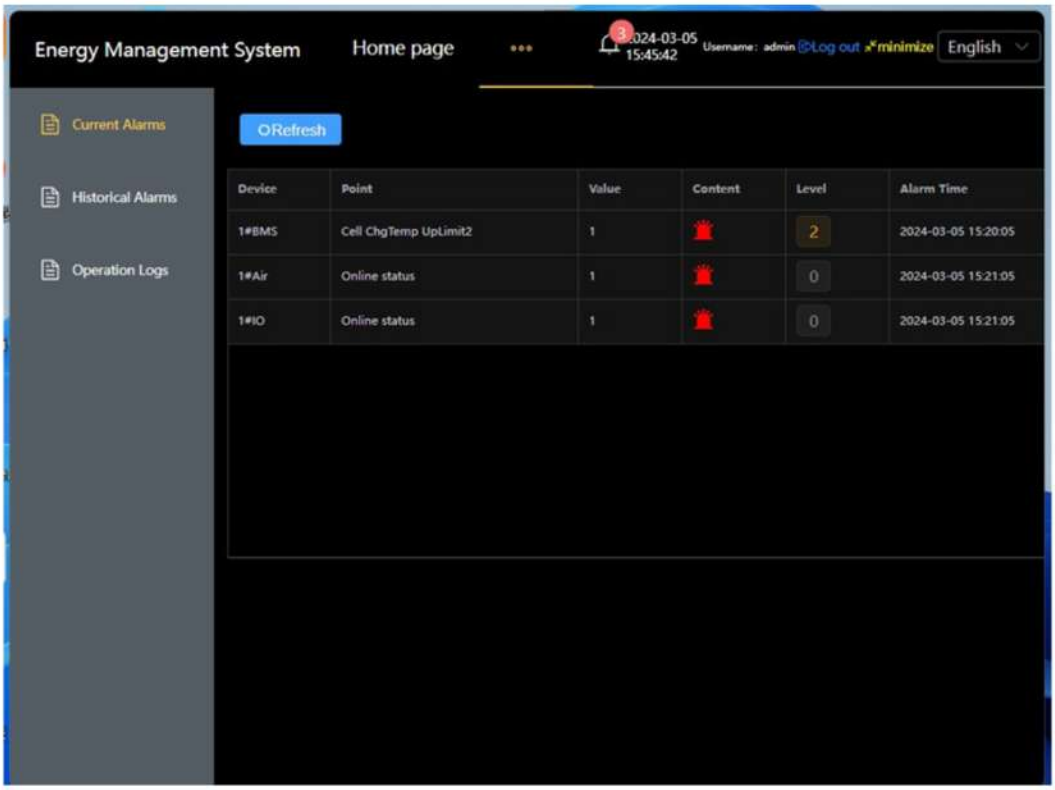


Figure 46 Current Alarms

10.7.2 Historical Alarms

Click “Historical Alarms” in the tree structure on the left, select a device, select the period to be queried, and click “Query” to display historical alarm records, including alarm device, point, value, content, level, event time, and recovery time, as shown in the figure below:

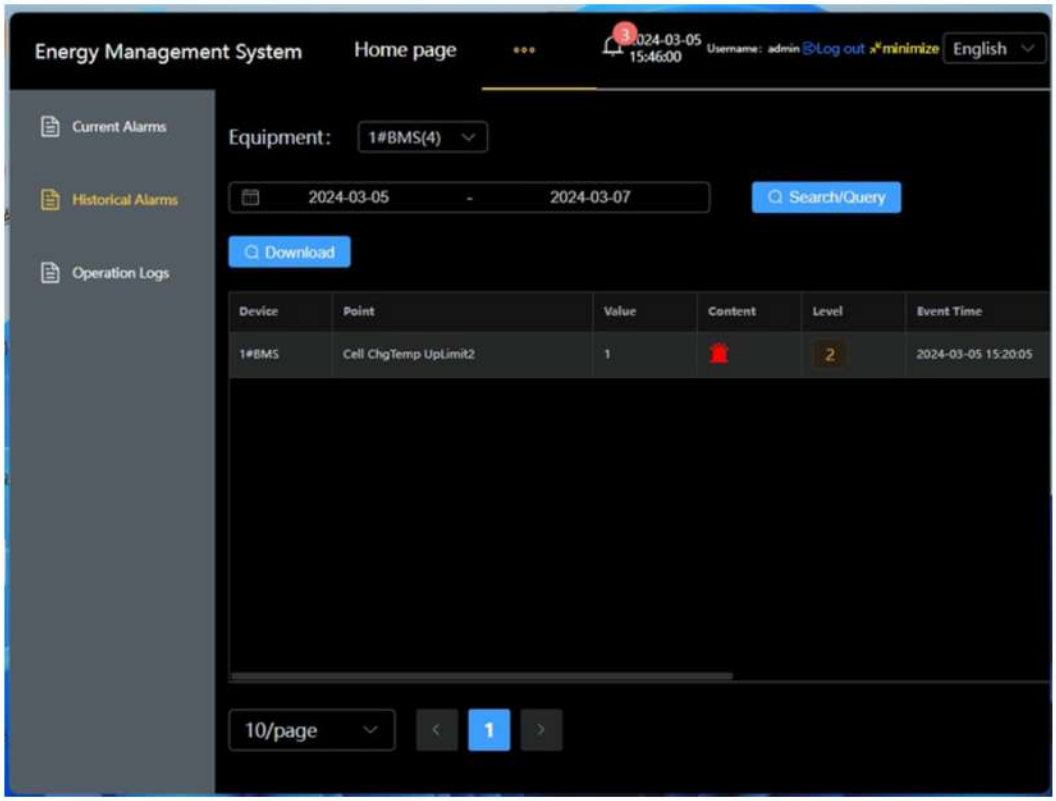


Figure 47 Historical Alarms

10.7.3 Operation Logs

Click “Operation Logs” in the tree structure on the left, select a device, select the period to be queried, and click “Query" to display all operation logs, as shown in the figure below:

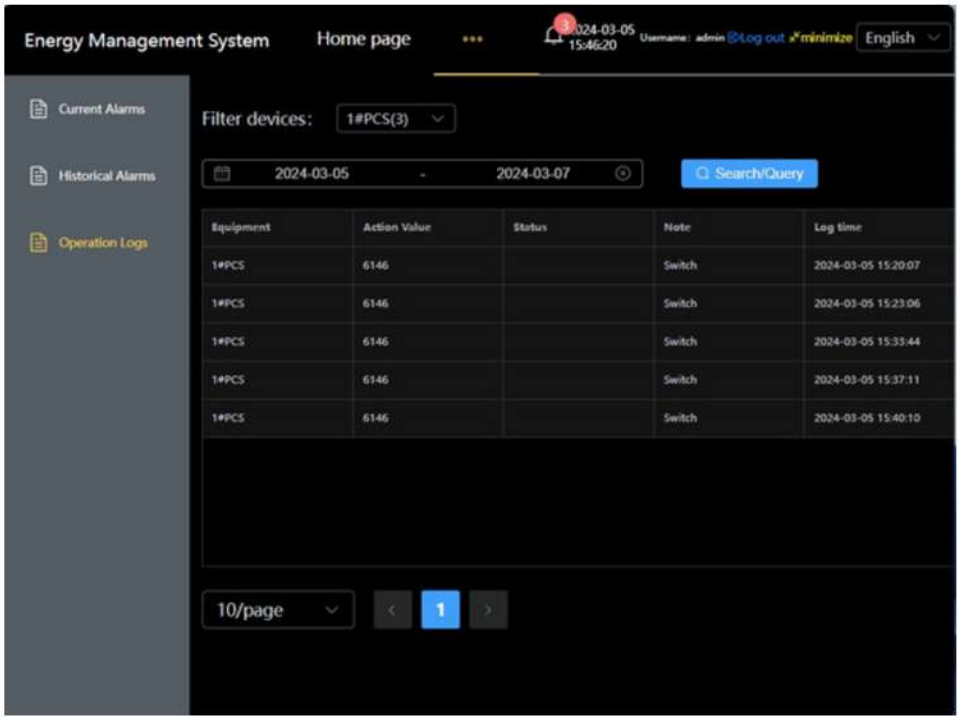
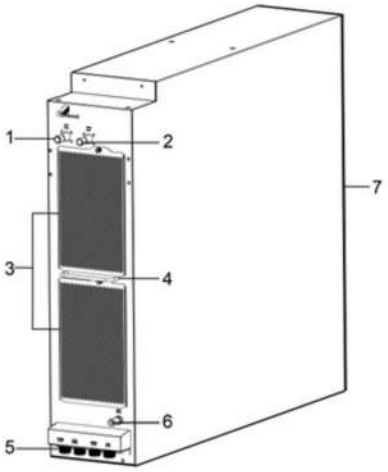


Figure48 Operation Logs

11. Liquid-cooled System

11.1 Introduction to Liquid-cooled Water Chilling Unit

The appearance and structure of water chilling unit of the Escape215-R liquid-cooled energy storage cabinet are shown in as below:



1: Liquid inlet

2: Liquid outlet

3: Air inlet

4: Pull ring

5: Connection terminal for users

6: Liquid filling/drain port

7: Air outlet

11.2 Characteristics of Liquid-cooled Water Chilling Unit

Characteristics	Instructions
Advanced design	• With an integral structure, all components are encapsulated in one chassis, which is easy to install and maintain. It is space-saving via modular design, compact structure and embedded installation in customer's frame.
Full functionality	• Supports intelligent cooling and heating functions. • Supports power failure memory and auto-start function.
Safety and reliability	• The liquid cooling mode has small temperature difference and fast cooling, which can effectively extend the battery life and delay its attenuation. • Supports 24h x 365d continuous running.
Energy efficiency	• High-efficiency controller is adopted to control cooling output on demand for the purpose of realising optimal cooling and lowest energy consumption. • Inverter compressor and inverter pump are equipped to realise dual-inverter regulation of cooling system and coolant circulation system.

11.3 Operational Description of Liquid-cooled Water Chilling Unit

1) Intelligent Cooling/Heating

Water chilling unit is equipped with a high-efficiency controller and supports external display to visually set control parameters, which is convenient to operate.

The controller monitors liquid supply temperature in real time (control temperature type is configurable) and intelligently adjusts it according to target temperature setting, so that the operating temperature of battery in container is stable within appropriate range.

- When liquid supply temperature is higher than cooling set point and cooling start condition is met, the unit will starts cooling, select and output different cooling capacity according to actual temperature.
- When liquid supply temperature is lower than cooling set point, the unit will save energy by shutting down the compressor and reducing the speed of circulating water pump.
- When liquid supply temperature is lower than heating set point and heating start condition is met, the unit will start the electric heater.

2) CAN/Modbus Communication

Water chilling unit is provided with a communication interface to communicate with upper computer through communication protocol.

By sending request messages, the upper computer can query running state of the unit, report alarms and set control parameters to realise remote monitoring of the unit.

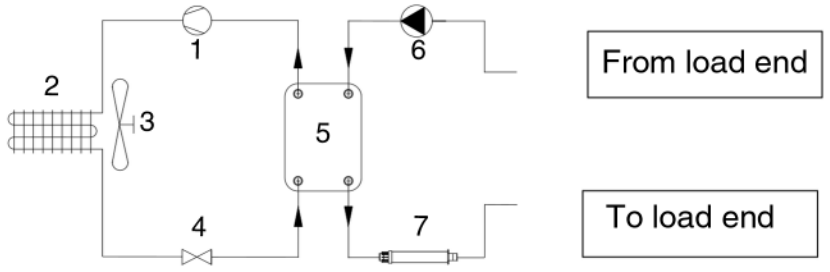
3) Power Failure Memory and Auto-start

When power failure occurs in the running process of water chilling unit, the parameter setting information before power failure will be memorised.

It will start automatically after power supply is resumed, and automatically and intelligently run according to the parameter settings before power failure.

11.4 System Principle of Liquid-cooled Water Chilling Unit

The air-cooled water chilling unit is composed of a cooling circulation system and a coolant circulation system. The implementation principle of system is shown in the figure below:



1: Compressor
2: Condenser
3: External circulation fan
4: Throttling element
5: Plate heat exchanger
6: Circulating water pump
7: Electric heater

The workflow of air-cooled water chilling unit is as follows:

1. When liquid outlet temperature reaches cooling start point, the compressor will start to compress the gaseous refrigerant.
2. The water chilling unit executes temperature control logic based on liquid supply temperature.
3. As the high-temperature refrigerant is condensed by condenser, it changes from gaseous state to liquid state.
4. External circulation fan draws in external air and discharges the heat released when refrigerant is condensed into ambient air.
5. The throttling element (electronic expansion valve) throttles and reduces pressure of condensed refrigerant.
6. The refrigerant enters plate heat exchanger to evaporate and absorbs the heat of coolant flowing through the plate heat exchanger.
7. The circulating water pump continuously transports coolant to plate heat exchanger, exchanges heat with refrigerant, and transports the cooled coolant to container to reduce temperature of battery pack.

11.5 Control Logic of Liquid-cooled Water Chilling Unit

<table>
<tr><th>Items</th><th>Control Logic</th><th>Instructions</th></tr>
<tr><td rowspan="2">Cooling</td><td>When cooling demand is ≥50%, the cooling will be started.</td><td rowspan="2">Cooling Demand (%) = (Liquid Supply Temperature - Cooling Set Point) / Cooling Sensitivity × 100%

When the cooling set point is 18℃ and cooling sensitivity is 3℃, the cooling start point will be 19.5℃ (18℃+3℃×50%=19.5℃), and cooling stop point will be 16.5℃ (18℃-3℃×50%=16.5℃).

If the liquid outlet temperature is used as actual control temperature:
• When the liquid outlet temperature is ≥ 19.5℃, the unit will start cooling.
• When the liquid outlet temperature is ≤ 16.5℃, the unit will stop cooling.</td></tr>
<tr><td>When cooling demand is ≤-50%, the cooling will be stopped.</td></tr>
<tr><td rowspan="2">Heating</td><td>When heating demand is ≥100%, the heating will be started.</td><td rowspan="2">Heating Start Point (%) = (Heating Set Point - Liquid Supply Temperature) / Heating Sensitivity × 100%

When the heating set point is 15℃ and heating sensitivity is 3℃, the heating start point will be 12℃ (15℃-3℃×100%=12℃), and heating stop point will be 15℃ (15℃-3℃×0%=15℃).

If the liquid outlet temperature is used as actual control temperature:
• When the liquid outlet temperature is ≤ 12℃ the unit will start heating.
• When the liquid outlet temperature is ≥ 15℃ the unit will stop heating.</td></tr>
<tr><td>When heating demand is ≤0%, the heating will be stopped.</td></tr>
</table>

11.6 Running Mode of Liquid-cooled Water Chilling Unit

Mode	Instructions
Stop	When the water chilling unit is in stop mode, other devices such as internal circulating water pump will not run except for electronic control part.
Auto-circulation	When the water chilling unit works in auto-circulation mode, only internal circulating water pump will run. The water pump runs at low speed and none of other devices run.

Mode	Instructions
Cooling	When there is cooling demand, the cooling function will be started, internal circulating water pump, compressor and fan will enter running state, and internal circulating water pump will run at high speed. When there is no cooling demand, the compressor will be turned off, fan will stop running, and internal circulating water pump will run at low speed. When there is heating demand, only the internal circulating water pump will be turned on. The internal circulating water pump will run at low speed, and none of other devices such as electric heater will run.
Heating	When there is heating demand, the heating function will be started internal circulating water pump and electric heater will enter running state, and internal circulating water pump will run at high speed. When there is no heating demand, the electric heater will be turned off, and internal circulating water pump will run at low speed. When there is cooling need, only the internal circulating water pump will be turned on. The internal circulating water pump will run at low speed and none of other devices such as compressor will run.
Full-auto	In full-auto mode, the water chilling unit will automatically enter running modes of cooling, heating and auto-circulation according to actual demand.

11.7 Parameter Specification of Liquid-cooled Water Chilling Unit

Parameters	Specification
Operating voltage range	230V±15%50/60Hz
Running temperature range	-30°C to +55°C
Running humidity range	5% to 95%
Storage temperature range	-40°C to +70°C
Storage humidity range	5% to 95%
Transport performance	It can be transported by land, air and sea

Parameters	Specification
Operating altitude	0m to 4,000m When the altitude is more than 1,000m, please derate by 3% for every 1,000m.
External dimensions (W×D×H)	275mm×1,150mm×1,040mm
Running temperature range of coolant	5°C-35°C
Running pressure range of coolant	0.1bar to 2.8bar
Protection level	IPX5 (complete machine)
Noise	Common Noise (Class-2/3/4) • Class-2: 60dB(A) during daytime; 50dB(A) during nighttime • Class-3: 65dB(A) during daytime; 55dB(A) during nighttime • Class-4: 70dB(A) during daytime; 60dB(A) during nighttime
ROHS directive	ROHS2.0

12. Troubleshooting and Maintenance

⚠ Warning

Do not open the door for maintenance of outdoor battery cabinet in rainy, humid or windy weather. Otherwise, PowerPlus Energy will not be responsible for any losses caused thereby.

Avoid opening cabinet door when humidity is high in rain, snow or dense fog. After closing cabinet door, confirm that sealing strips around the door are not curled.

In order to reduce the danger of electric shock, do not perform any other maintenance or overhaul operations other than those specified this Manual. If necessary, contact customer service staff of PowerPlus Energy for maintenance and overhaul.

12.1 Common Troubles and Troubleshooting

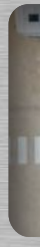
S/N	Description of faults	Troubleshooting
1	After powering on, display screen of BMS does not light up	Confirm whether the voltage of power supply is DC24V; Check whether the connection is correct; Contact PowerPlus Energy
	After powering on, display screen of EMS does not light up	
2	After powering on, display screen of BMS cannot enter main menu	Display control program of BMS/system program of EMS is not refreshed; Update the software; Contact PowerPlus Energy
	After powering on, display screen of EMS cannot enter main menu	
3	The interface flickers or skips	Check whether the power supply port EARTH of display control is earthed or properly earthed; Check whether the power supply for display controller is earthed or properly earthed; Contact PowerPlus Energy

4	Display control of BMS has no battery information or incomplete information	Check whether the program version and parameter configuration of display control are correct; Check whether the communication harness between display control and main control is connected reliably and wire sequence is correct; Check whether SD is abnormal; Contact PowerPlus Energy
5	Display control of BMS reports BMM communication fault	Check the harness of corresponding BMM module; Check whether the address of corresponding BMM module is correct; Check the parameter settings of display control and main control; Contact PowerPlus Energy
6	Display control of BMS indicates indicates -- for temperature.	Check whether the harness at corresponding temperature point is firm; Check the parameter settings; Contact PowerPlus Energy
7	Display control indicates that the voltage of some batteries is 0V	Check whether the connector of corresponding collecting wire is firm; Check the parameter settings; Contact PowerPlus Energy
8	The system is powered on without fault, but high-voltage box relay is not closed	Check whether the circuit breaker of high-voltage box is closed; Check whether to close circuit breaker first before supplying power to system; Contact PowerPlus Energy
9	BMS cannot communicate with PCS (R485 or CAN)	Check whether the communication cables (A, B) or (H, L) are reversed; Whether the configuration of communication address between display control and PCS is correct (address); Contact PowerPlus Energy

10	PCS cannot communicate with EMS (LAN)	Check whether the network cable is damaged, whether the crimping of registered jacks at both ends of network cable meets requirements and whether they are crimped tightly; Contact PowerPlus Energy
	BMS cannot communicate with EMS (LAN)	
11	The communication between switch, serial server and EMS background is not available or intermittent	Check whether the indicator lamp of network port and network cable are normal; Check whether the IP address of network port is correctly configured (whether there are conflicts.
12	The waterlogging sensor signal cannot be acquired	Check whether the positive and negative poles of power supply for waterlogging module are correctly connected, whether 485A/B are reversed, and whether the waterlogging sensor is damaged.

Helping power possibilities.

One system at a time.



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