User Manual

Pi STATION 230EX

Liquid Cooling Outdoor Rated BESS

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Contents Subject to Change without Further Notice

Foreword

It has become a social consensus that wind power, photovoltaic and energy storage will be developed on a larger scale in order to achieve the goal of carbon peaking and carbon neutrality.

With the increasing pressure on power system peak and frequency regulation, safe, environmentally friendly and low-cost energy storage technology will also become an inevitable choice for energy transformation under the goal of carbon neutrality in the future.

The Pi Station 230 series of energy storage products will perfectly solve the needs of small industrial and commercial user-side energy storage applications, through the two-way charging and discharging of energy storage to realize peak shaving and valley filling, demand management, standby power supply, peak frequency regulation, transformer capacity expansion and other functions for the enterprise to manage the use of energy.

This document describes how to install, electrically connect, commission and troubleshoot the Pi station 230 energy storage system. Please read this manual carefully for safety information and to familiarize yourself with the functions and features of the energy storage system before installing and using it.

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Chapter 1 Safety Precautions

Overview

Before transporting, storing, installing, operating, using and maintaining the equipment, read this manual, follow it strictly, and follow all safety precautions marked on the equipment and in the manual. Compliance with relevant international, national or regional standards, and industry practices is required. The Company shall not be liable for any violation of the requirements for safe operation or for any violation of the safety standards for the design, manufacture and use of the equipment.

This equipment should be used in an environment that conforms to the design specifications, otherwise the equipment failure, abnormal equipment function or component damage that may be caused is not covered by the equipment quality warranty; otherwise the Company shall not be liable for any personal injury or death, property damage, etc., that may be caused.

Transportation, storage, installation, operation, use, maintenance and all other operations should comply with applicable laws and regulations, standards and specifications.

Reverse engineering, decompiling, disassembling, adapting, implanting or other derivative operations of the equipment software are prohibited, as well as researching the internal implementation logic of the equipment, obtaining the source code of the equipment software, and infringing on intellectual property rights in any way, or disclosing the results of any equipment software performance tests.

The Company shall not be liable for any of the following circumstances or the results thereof:

Damage to the Equipment caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and extreme weather;

Do not operate under the conditions of use described in this manual;

The installation and use environment does not comply with relevant international, national or regional standards;

Installation and use of equipment by unqualified personnel;

Failure to follow the operating instructions and safety warnings in the product and documentation;

Unauthorized disassembly, alteration of products or modification of software code;

Damage caused by transportation by you or a third party commissioned by you;

Damage caused by storage conditions that do not meet the requirements of the product documentation;

Your own materials and tools do not meet the requirements of local laws and regulations and relevant standards;

Damage caused by you or a third party that is negligent, willful, grossly negligent, improperly operated, or not caused by us.

1.1. Personal safety

The installation process is strictly prohibited to operate with electricity. It is prohibited to install or remove cables with electricity. The wire and cable cores will arc, spark or catch fire and explode at the moment of contact with the conductor, which can lead to fire or personal injury.

When equipment is energized, unregulated and incorrect operation may produce a fire, electric shock, or explosion, resulting in injury, death, or property damage.

It is strictly prohibited to wear watches, bracelets, bangles, rings, necklaces and other easily conductive objects during operation to avoid being burned by electric shock.

Special insulated tools must be used during operation to avoid electric shock or short-circuit faults, and the insulation voltage rating must meet the requirements of

local laws and regulations, standards and codes.

The insulation voltage withstand level must meet the requirements of local laws and regulations, standards and codes.

Specialized protective gear must be used during operations, such as wearing protective clothing, insulated shoes, goggles, helmets, insulated gloves, etc.

1.1.1. General Requirements

Do not deactivate equipment protection devices and ignore warnings, cautions and precautions in manuals and on equipment.

During the operation of the equipment, if a fault is found that may lead to personal injury or equipment damage, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.

Do not power up the unit without completing the installation or without confirmation from a professional.

It is prohibited to contact the power supply equipment directly, with other conductors or indirectly through wet objects, and the voltage at the point of contact should be measured before contacting any conductor surface or terminal to confirm that there is no danger of electric shock.

When the unit is in operation, the housing is hot and there is a danger of burns, so do not touch it.

Do not allow fingers, parts, screws, tools or veneers to touch the running fan to avoid injury to hands or damage to the unit.

In the event of a fire, immediately evacuate the building or equipment area and ring the fire alarm, or call the fire alarm. Under no circumstances should you re-enter a burning building or equipment area.

1.1.2. Personnel requirements

Personnel who operate equipment include professionals and trained personnel.

Professional: A person who is familiar with the principles and construction of the equipment, who has experience in training or operating the equipment, and

who is aware of the various potential sources and levels of hazard during the installation, operation and maintenance of the equipment.

Trained Person: A person with the appropriate technical and safety training and experience necessary to be aware of the hazards that may be presented to him when carrying out an operation and to take steps to minimize the risk to himself or to other persons.

Personnel responsible for the installation and maintenance of the equipment must be trained in the correct methods of operation and be aware of the various safety precautions and the relevant standards of the country/region in which they are working.

Only qualified professionals or trained personnel are permitted to install, operate and maintain the equipment.

Only qualified professionals are allowed to remove safety features and service equipment.

Personnel in special scenarios such as electrical operation, work at heights, and operation of special equipment must have special operation qualifications required by the local country/region.

Operators of medium-voltage equipment must hold a high-voltage electrician's license.

Replacement of equipment or parts (including software) must be done by an authorized professional.

Keep persons other than those operating the equipment away from the equipment.

1.2. Electrical safety

Before making electrical connections, make sure the unit is undamaged, otherwise electric shock or fire may result.

Unregulated and incorrect operation may cause accidents such as fire or electric shock.

During operation, foreign objects must be prevented from entering the interior of the equipment, as this may result in short-circuit failure or damage to the equipment, derating or loss of power to the load supply, and personal injury.

When installing equipment that requires grounding, the protective ground wire must be installed first; when removing the equipment, the protective ground wire must be removed last. No cables are allowed to pass through the air inlet or outlet of the equipment.

1.3. Environmental safety

It is strictly prohibited to place the equipment in an environment where flammable or explosive gases or fumes are present, and it is forbidden to carry out any operation in such an environment.

It is strictly prohibited to store flammable or explosive materials in the equipment area.

It is strictly prohibited to place the equipment close to sources of heat or fire, such as fireworks, candles, heaters or other heat generating devices, as heat exposure to the equipment may result in damage to the equipment or cause a fire.

The equipment should be installed in an area away from liquids, and it is strictly prohibited to be installed under water pipes, air outlets and other locations that are prone to condensation; it is strictly prohibited to be installed under air conditioning outlets, vents, server room outlet windows and other locations that are prone to leakage to prevent liquids from entering into the interior of the equipment and causing equipment malfunctions or short circuits.

Do not block vents, cooling systems or cover with other items while the unit is in operation to prevent heat damage to the unit or fire.

1.4. Mechanical safety

Work at height must wear a helmet, safety belt or waist rope, tied to a solid and sturdy structural components, is strictly prohibited to hang on the moving not solid objects or sharp edges of the metal to prevent the hook slipped off the fall accident.

Tools need to be prepared and qualified by professional organizations, prohibit the use of scarred and unqualified or beyond the inspection of the validity of the tool, to ensure that the tool is solid, not overloaded.

Before installing the equipment into the cabinet, first make sure that the cabinet has been fixed well to avoid the cabinet being tilted and collapsed due to the unstable center of gravity, resulting in the installer being smashed and the equipment being broken and other problems.

When pulling equipment out of the cabinet, be careful of equipment that may be unstable or heavy when installed in the cabinet to avoid being crushed or smashed.

1.5. Energy storage system security

It is forbidden to open the cabinet door while the system is running.

Avoid standing at the cabinet door (including within the opening range of the door) when the energy storage system is malfunctioning.

Emergency evacuation of the site should be carried out when the fire audible and visual alarms are triggered.

The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to avoid entry of unauthorized personnel during the operation of the equipment, which may result in personal injury or property damage.

1.6. Battery Safety

It is strictly prohibited to short-circuit the positive and negative terminals of the battery, otherwise it will cause a short circuit of the battery. Battery short-circuit will instantly generate a large current and release a large amount of energy, causing battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion. In order to avoid short-circuiting the battery, the battery is not allowed to be charged for maintenance.

Do not expose the battery to high temperature environments or around heat generating devices such as high temperature sunlight, sources of ignition,

transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.

It is strictly prohibited to subject the battery to mechanical vibration, dropping, collision, piercing by hard objects and pressure shock, or it may lead to battery damage or fire.

It is strictly prohibited to disassemble, modify or damage the battery (e.g. inserting foreign objects, extruding with external force, immersing in water or other liquids), which may cause battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.

It is strictly prohibited for the battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.

Using or replacing batteries of incorrect type poses a risk of fire or explosion. Use batteries of the specified type recommended by the manufacturer.

Battery electrolyte is toxic and volatile. When electrolyte leakage occurs or there is an abnormal odor, avoid contact with the leaking liquid or gas. Non-professionals should stay away and contact a professional immediately to handle the situation. Professionals should wear goggles, rubber gloves, gas masks, protective clothing, etc., promptly power down the equipment and remove the leaking battery, and contact a technical engineer to handle the situation.

A battery is a closed system that does not release any gases under normal operating conditions. If under extreme abuse, such as in fire, pinprick, extrusion, lightning strike, overcharging or other severe conditions that may lead to thermal runaway of the battery, it may lead to breakage of the battery or abnormal chemical reaction inside the battery, which may lead to leakage of electrolyte or generation of gases such as CO, H2, etc., the site should ensure that the measures for the discharge of flammable gases are normal, so as to avoid leading to combustion or corrosion of the equipment.

Battery combustion produces gases that can irritate eyes, skin and throat.

The battery should be installed in an area away from liquids, and it is strictly prohibited to be installed under air conditioning openings, vents, water pipes and other locations prone to water leakage to prevent liquids from entering the interior of the equipment causing equipment failure or short circuit.

Battery installation and testing shall be equipped with fire fighting facilities, such as fire sand, carbon dioxide fire extinguishers, etc., in accordance with the requirements of the construction standard specifications.

Before putting into operation, it must ensure that fire protection facilities are in place that meet the requirements of local laws, regulations and codes.

Before removing the packaging of the battery, storage and transit, to ensure that the outer box is intact and without damage, in accordance with the identification of the box is placed correctly, it is strictly prohibited to inverted, sideways, vertical, tilted placement, stacked in line with the requirements of the outer packaging of the yardage, to avoid any impact or fall, etc. caused by the battery damage to the end of life.

After the battery is unpacked, it should be placed in the required direction, and it is strictly prohibited to place it upside down, sideways, upright, tilted and stacked, to avoid any impact or fall which may cause the battery to be damaged and scrapped.

Regularly check whether the screws are tightened, whether there are rust, corrosion or other foreign objects, and dispose of them cleanly, otherwise the screws are falsely connected will lead to excessive connection voltage drop, and even burn the battery with a large amount of heat when the current is high.

After discharging the battery, the battery should be recharged in a timely manner, otherwise the battery may be damaged due to over-discharge.

Chapter 2 System Introduction

2.1. Design statement

The Pi station 230 energy storage system consists of a battery PACK, a battery management system (BMS), a bi-directional converter for energy storage (PCS), a fire protection system, an energy management system (EMS), a liquid-cooling unit, and a dehumidifier, which enables the bi-directional flow of electrical energy.

2.2. System Features

Modular design: flexible configuration, supports parallel expansion;

Efficient heat dissipation design: precise and efficient control of the thermal effect of the system, prolonging the life of the battery;

Efficient dehumidification design: High-efficiency dehumidifier, precise control of humidity inside the cabinet;

Reliable battery management system: real-time monitoring of system battery operation to ensure reliable system operation;

Intelligent operation and maintenance platform: professional cloud platform management team, remote monitoring, accurate fault location;

2.3. Accreditation

The details of the certification are shown in Table 2.1 below.

Table 2.1 Certification List

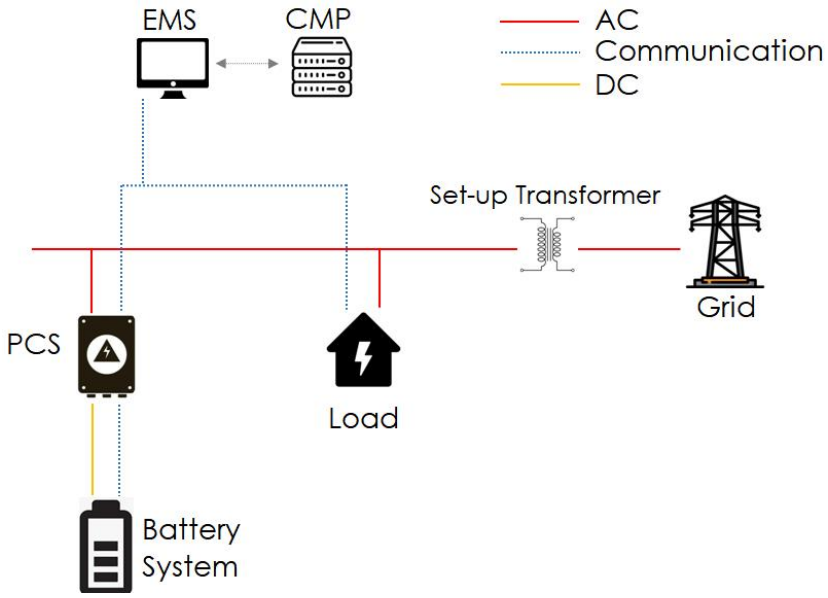
CELL	IEC62619:2022, IS16046 (PART 2) : 2018 /IEC 62133-2 : 2017, UL1642, UL1973, UL9540A, GB/T36276-2023, GB 38031-2020, GB/T 31486-2015, GB/T 31484-2015. GB/T 30512-2014, UN38.3, REACH, RoHS

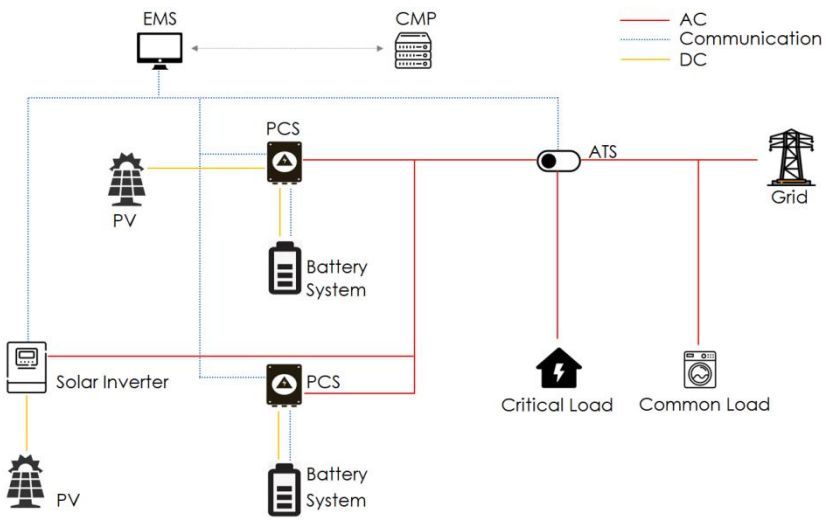
PCS	CE-EMC, CE-LVD, South Africa NRS097, 50549-1 European general, 50549-2 European general, 50549-1 Netherlands, 50549-1 C10/11 Belgium,50549-1 Greece, 50549-1 Sweden, 50549-1 Poland, England-G99, VDE-AR-N 4105:2018, GB/T 34120-2017
System	UN38.3, IEC62619, IEC63056, IEC62477, CE-EMC

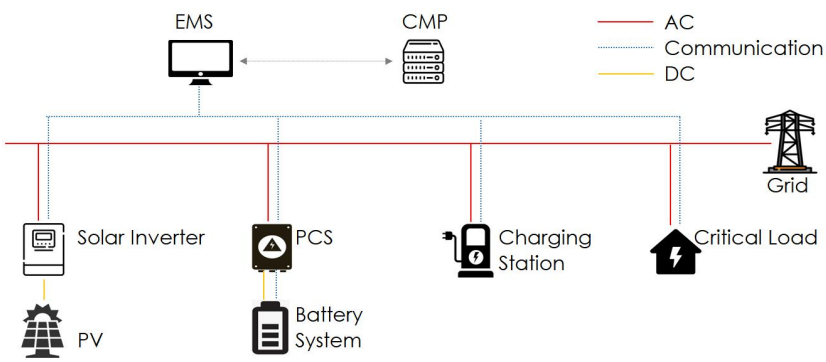
2.4. Application scenario

The system application scenarios are shown in Table 2.2 below.

Table 2.2 Application Scenarios

Scene 1	Application Scenario Name	peak-to-valley arbitrage
	Schematic diagram	
	Description of the main functions	Industrial and commercial energy storage systems mainly charge when the price of electricity is in the valley or flat, and discharge when the price of electricity is in the peak or peak, and obtain the income of electricity price difference

		by cutting peaks and filling valleys; it can also manage the maximum demand, eliminate short-time electricity consumption peaks, and reduce the user's expenditure of the basic electricity bill.
Scene 2	Application Scenario Name	Microgrid energy storage
	Schematic diagram	
	Description of the main functions	According to the characteristics of the "high seaside no" area, the energy storage system can be combined with local power points to form a small microgrid, which can be connected to the power grid to realize long-term power supply to users and ensure uninterrupted operation of important loads.
Scene 3	Application Scenario Name	optical storage and charging

	Schematic diagram	
	Description of the main functions	Optical storage charging system, energy storage can absorb photovoltaic power generation surplus or charging in the electricity price of electricity in the trough period, in the peak of electricity consumption and electricity price peak discharge, alleviate the urban distribution network capacity tension situation, enhance the charging station operating income level.

2.5. System architecture

The architecture of the grid-connected system is shown in Figure 2.1 below.

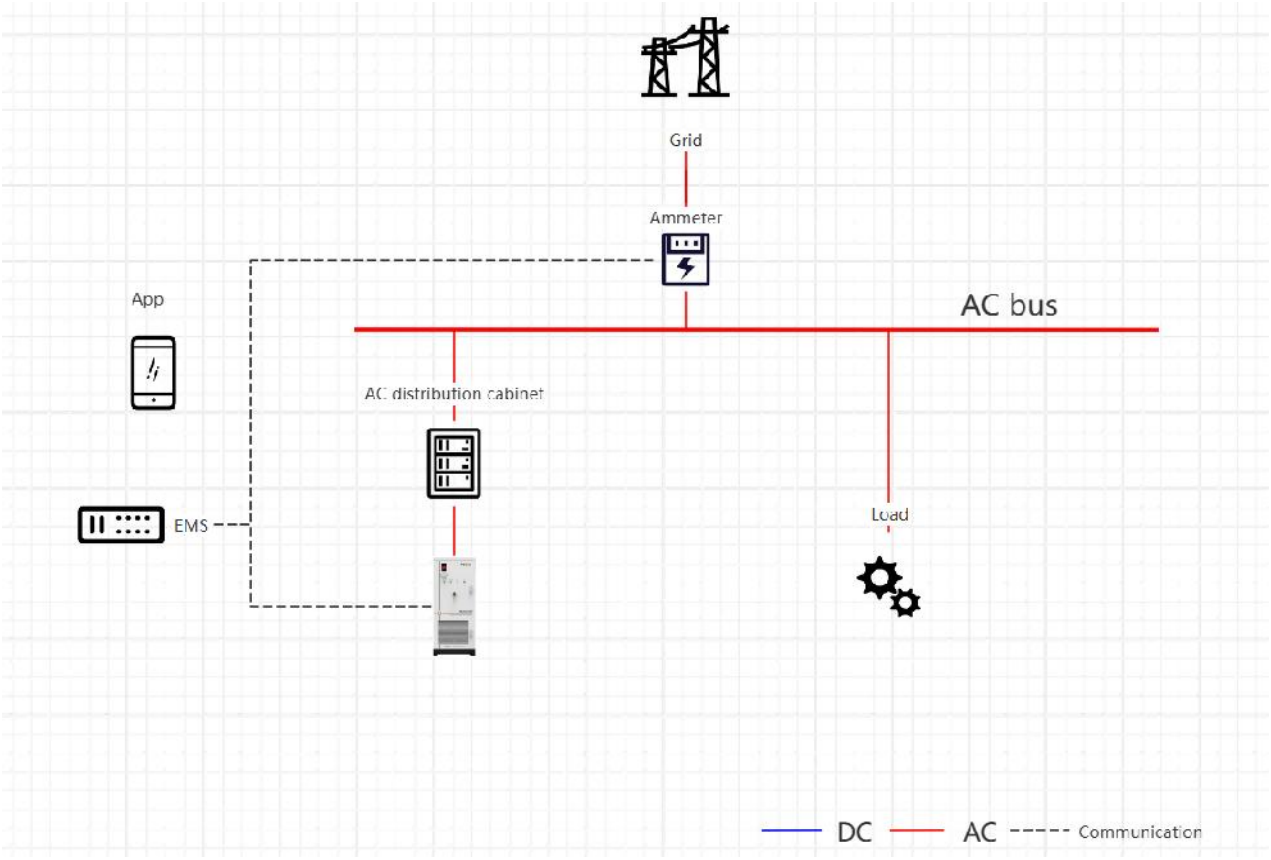


Figure 2.1 Grid-connected System Architecture Diagram

The off-grid system architecture is shown in Figure 2.2 below.

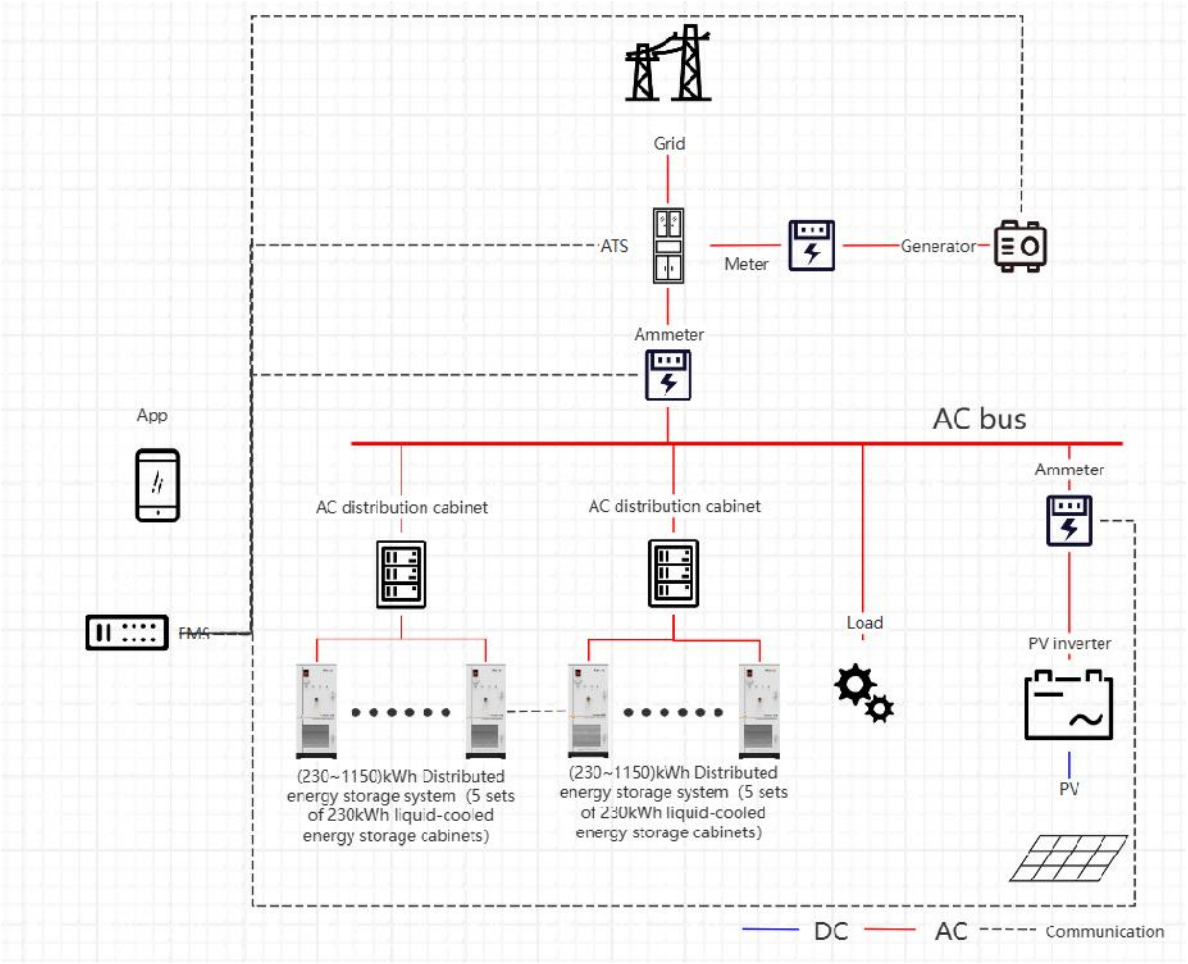


Figure 2.2 Off-grid System Architecture Diagram

Chapter 3 Products

3.1. Product Model

Product model: PI STATION 230 EX.

Table 3.1 Product Model Descriptions

PI	STATION	230	EX
Pytes (name)	Energy storage site	System capacity 230KWh	Integrated energy storage

3.2. Product Layout

The product size layout is shown in Figure 3.1.

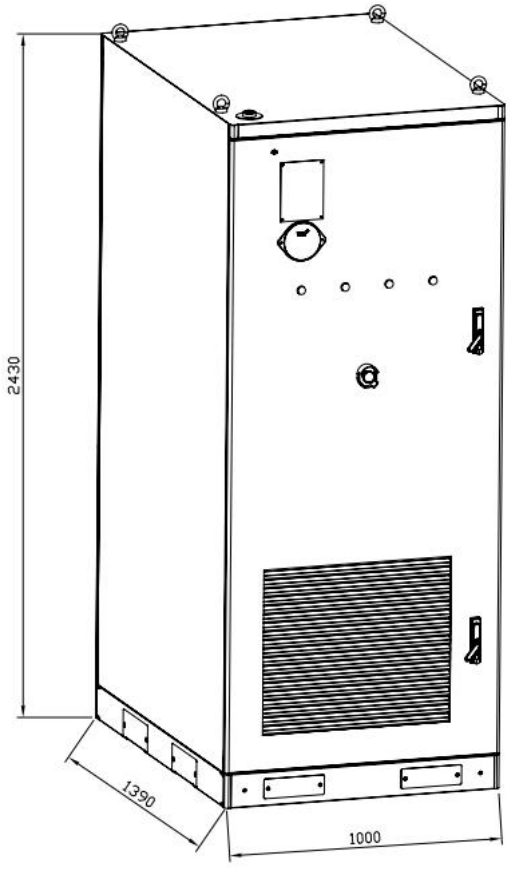


Fig.3.1 Product Dimension Layout Diagram

Three views of the product are shown in Figure 3.2.

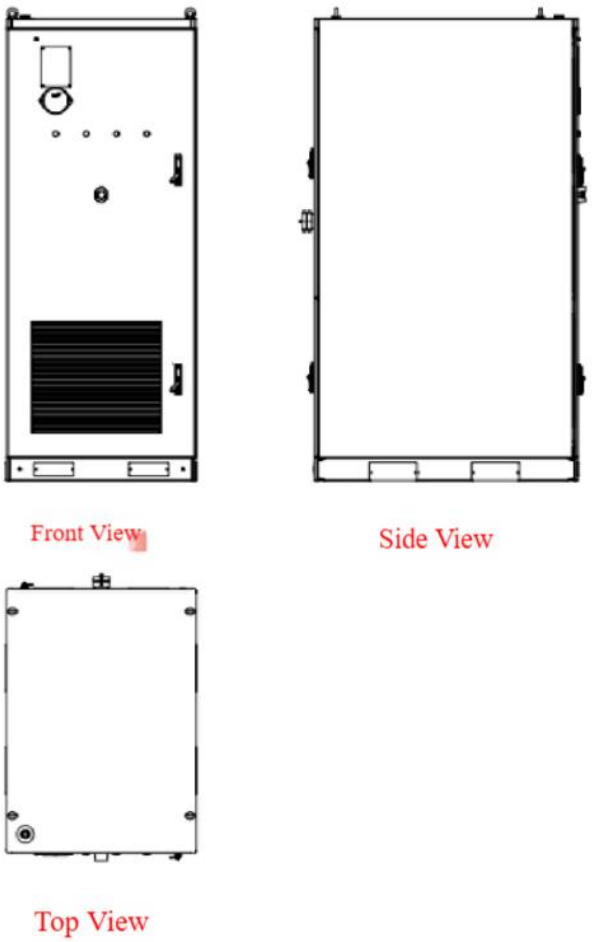


Figure 3.2 Three-view drawing of the product

The system heat dissipation principle is shown in Figure 3.3.

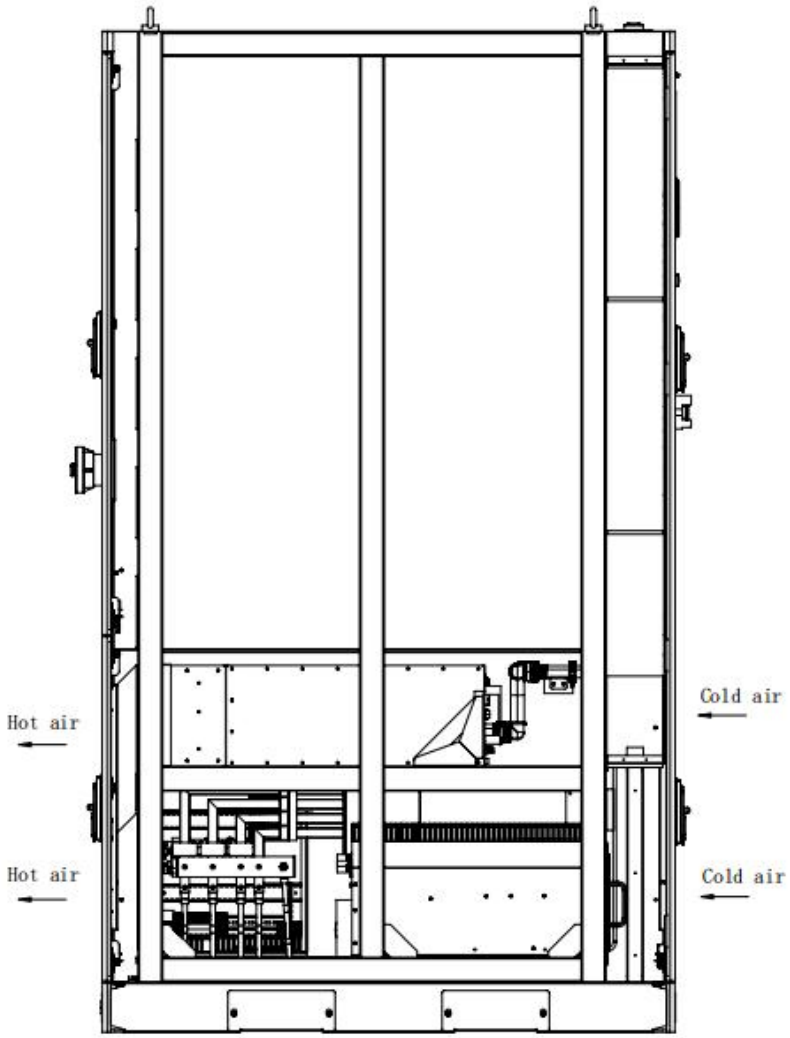


Figure 3.3 System Heat Dissipation Schematic Diagram

The system appearance layout is shown in Figure 3.4.

Figure 3.4 System external layout diagram

The internal layout of the system is shown in Figure 3.5.

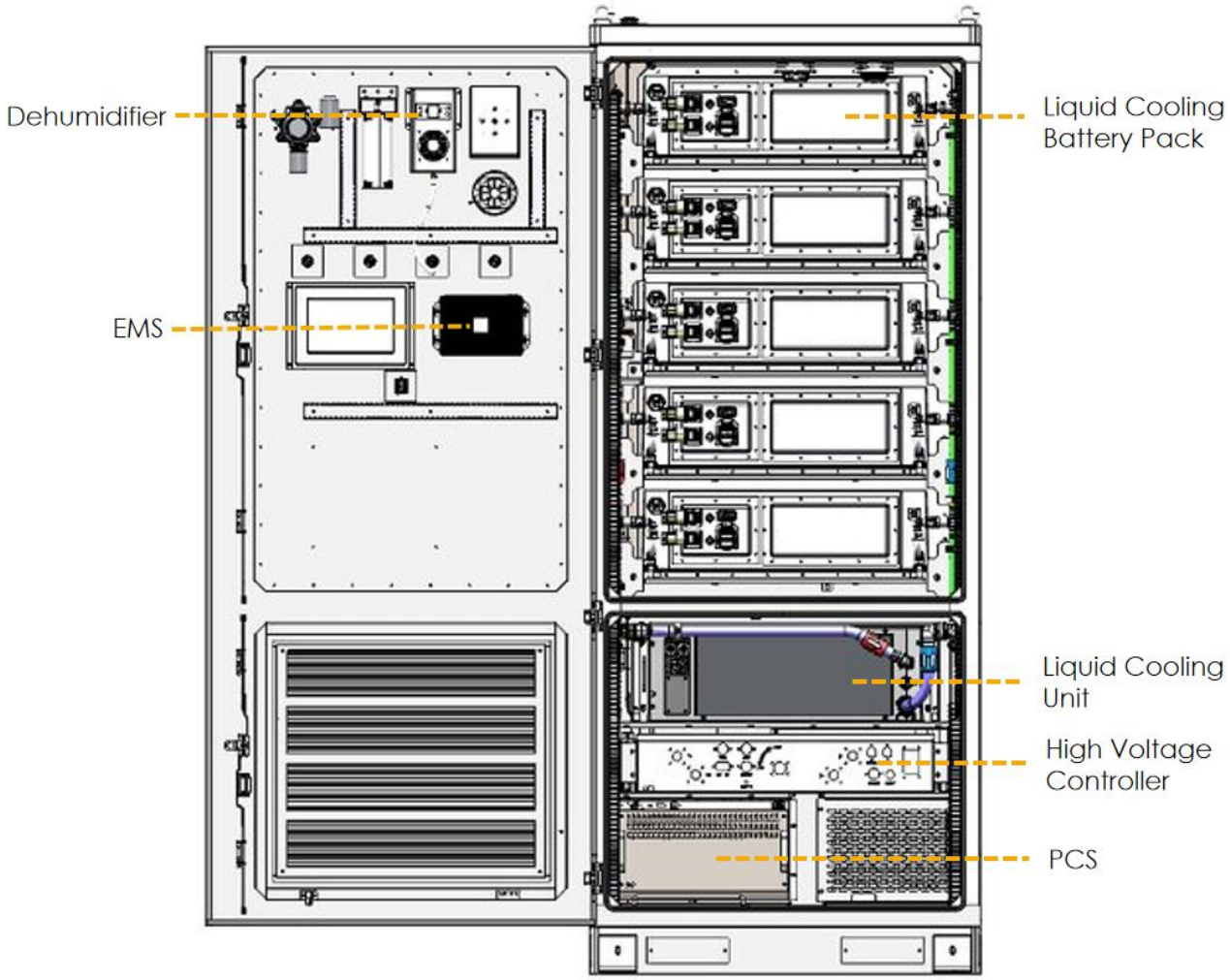


Fig.3.5 Internal diagram of system layout

3.3. System topology

The system communication topology is shown in Figure 3.6.

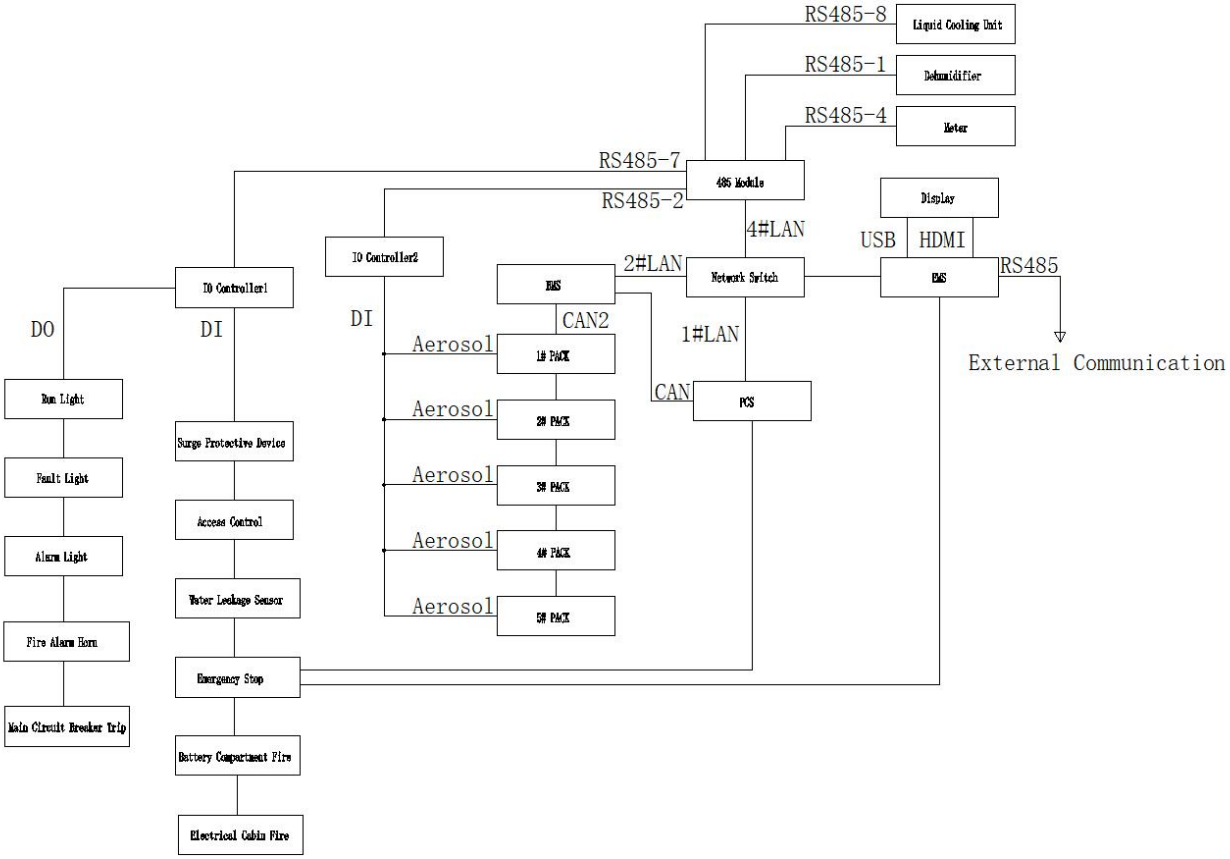


Figure 3.6 System Communication Topology Diagram

The system power topology is shown in Figure 3.7.

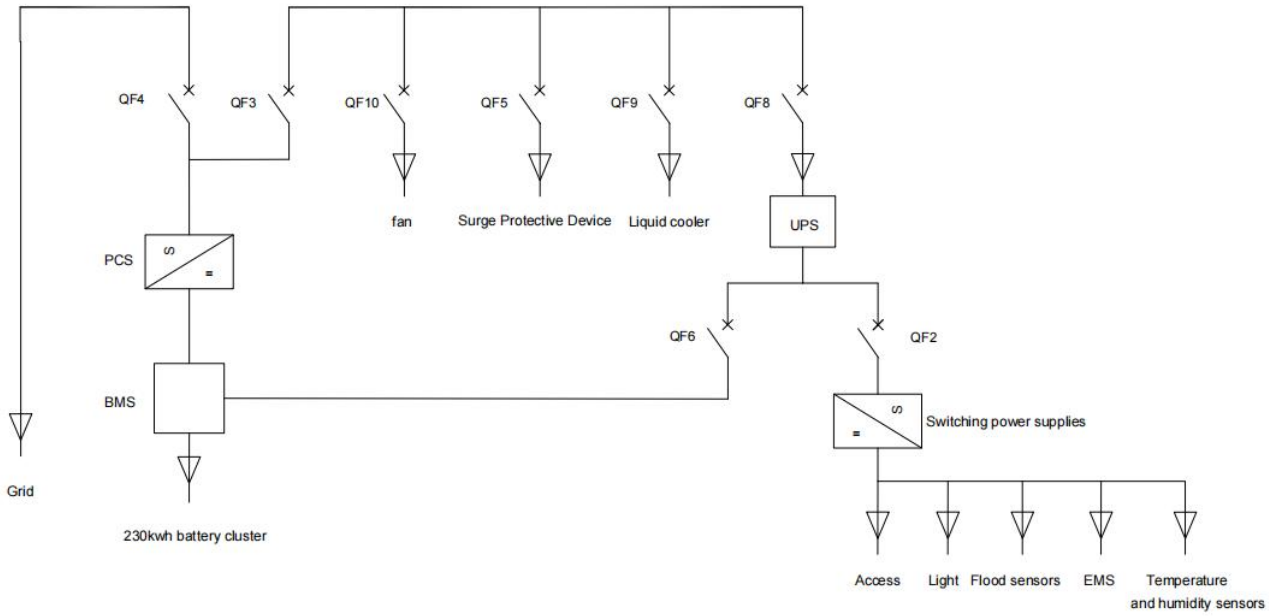


Figure 3.7 Power Supply Topology Diagram

3.4. Product Parameters

The technical parameters of the system are shown in Table 3.2.

Table 3.2 System Technical Specification

model number	PI STATION 230
AC parameters	
Grid-connected access method	3L+N
Rated Output Voltage (Vac)	400
Rated output power (kW)	105
Maximum output power (kVA)	115
Rated frequency (Hz)	50
power factor	1 (ahead) - 1 (behind)
DC parameters	

Battery configuration capacity (kWh)	232.96
Battery grouping method	260S1P
Maximum Voltage Range (Vdc)	676~949
Depth of discharge	90% DOD
Cycle life	≥6000 times (@20~35°C, 0.5P/0.5P, 90% DOD, EOL70%)
system parameter	
Dimensions (W*H*D)	1000mm*2430mm*1390mm
weights	2500kg
noises	≤78dB
protection class	IP54
Permissible ambient temperature	-20～60℃
Cooling method	Liquid Cooling + Dehumidification
Working environment humidity (%RH)	5 to 95 (non-condensing)
Allowed Poster Height	≤2000m
Communication parameters	
communication interface	RS-485/Ethernet
human-computer interaction	Industrial Displays

3.5. Liquid Cooled Battery Pack

Liquid-cooled battery PACK adopts 1P52S grouping method, which consists of 280Ah square case cells encapsulated in the form of 1 parallel and 52 strings. Meanwhile, it is equipped with liquid-cooling plate on the upper lid and lower case, manual service switch (MSD), explosion-proof valve, PACK fire protection interface, BMS, power & communication interface, etc. The overall protection level reaches IP67.

3.5.1. Exterior condition

An exterior view of the liquid-cooled PACK is shown in Figure 3.8.

Fig.3.8 Module diagrammatic sketch

3.5.2. Technical Parameters

The technical parameters of the battery pack are shown in Table 3.3.

Table 3.3 Module technical specification

serial number	name (of a thing)	Technical Parameters	note
1	series-parallel connection	1P52S	
2	nominal capacity	280Ah	
3	nominal energy	46.592kWh	@0.5C, 100% DOD, 25°C
4	nominal voltage	166.4V	
5	operating voltage	130 to 189.8V	Single cell 2.5V～3.65V
6	operating temperature	Charging: 0~55℃ Discharging: -30~60°C	
7	sizes	1132mm×810mm×242mm	Depth x Width x Height
8	weights	335 kg	

Core: Core is the core component of the battery PACK, the core of this product is lithium iron phosphate core, single cell specifications for 280Ah, 3.2V, capacity of 896Wh.

BMS: The first-level structure of BMS is responsible for supervising the state of single cell in the battery box, and the second-level of BMS manages the voltage and temperature in the battery module, and implements equalization, temperature control and other management.

Liquid Cooling Plate: Located at the bottom of the battery PACK, it dissipates heat through coolant.

3.6. Energy storage converter

3.6.1. Introduction to PCS

Bidirectional converter is a device to realize the two-way conversion of electric energy, which can reverse the DC power of the battery into AC power, and deliver it to the power grid or give it to the AC loads to use; and it can also rectify the AC power of the power grid into DC power, and charge the battery.

3.6.2. Product Features

(1) Flexible Configuration

Three-level modular design, bi-directional energy conversion; supports multiple charging and discharging modes of constant voltage, constant current and constant power.

(2) Efficient and stable

Iterative module upgrading, higher stability; device long life; application diversity; on-demand deployment, peak shaving local automatic operation.

(3) Safe and reliable

Supports linkage with BMS and EMS systems; has a variety of protection functions such as reverse power protection: AC overvoltage protection; AC undervoltage protection; AC side overcurrent protection; AC frequency overlimit protection; phase sequence error protection; DC bus overvoltage protection; DC

bus undervoltage protection; over-temperature protection; emergency shutdown protection; and communication fault protection.

3.6.3. PCS Schematic

The PCS schematic is shown in Figure 3.9.

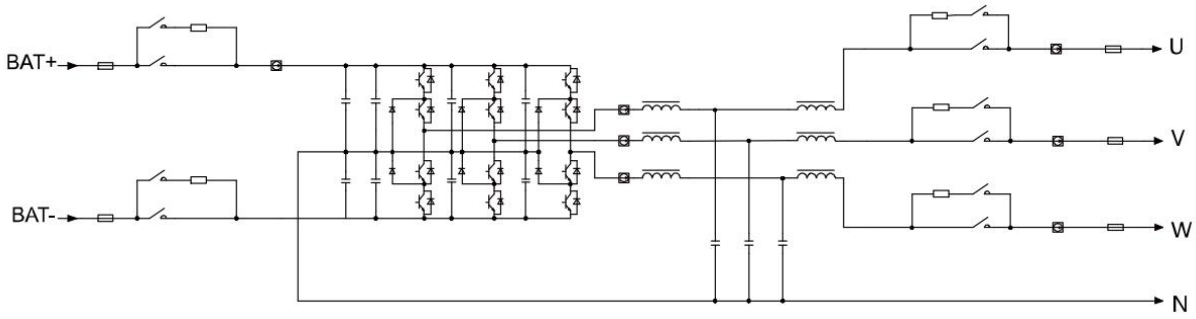


Fig.3.9 PCS schematic diagram

3.6.4. PCS view

The PCS appearance is shown in Figure 3.10.

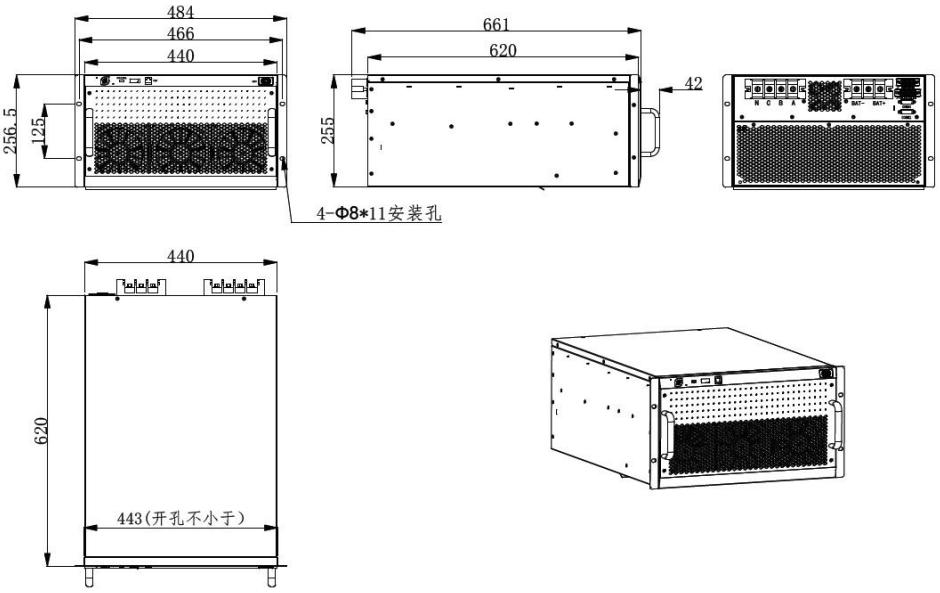


Figure 3.10 PCS exterior view

3.6.5. PCS Interface Description

The signal ports on the front of the PCS module are shown in Figure 3.11.

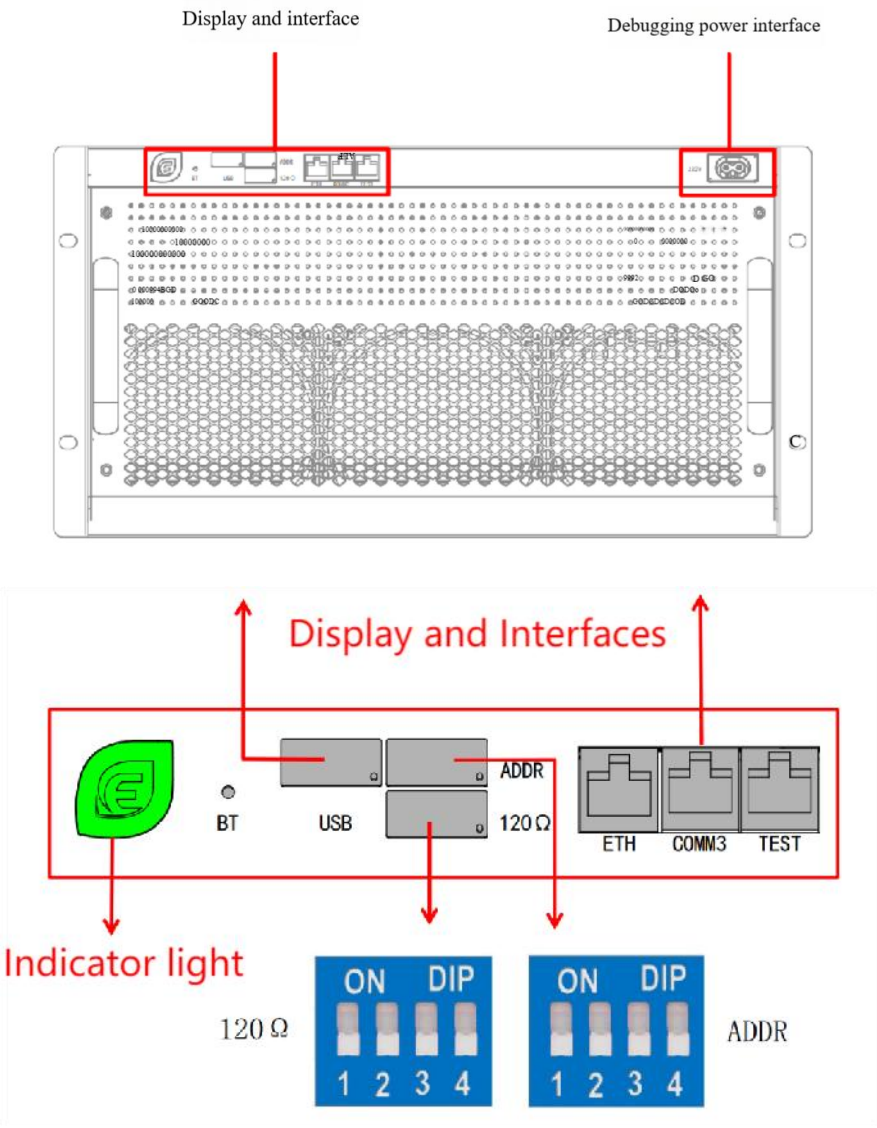


Fig.3.11 PCS outside diagram

PCS port descriptions are shown in Table 3.4.

Table 3.4 Port specification table

Symbol/Name	Functional Description
indicator light	Long green light when running output power; Standby (0kW operation) green light 0.5s fast flash; Green light flashes slowly for 1s when it is not switched on and there is no fault; When there is no fault, the green light flashes slowly for 1s; when there is a fault, the red light is on for a long time.
USB	Reserved USB port for upgrading software/configuration files
ADDR	ADDR is the module address setting (binary) Bit 4 is the lowest bit (right to left)
120Ω	Reserve matching resistor for CAN communication
ETH	Ethernet port, supports ModBus TCP protocol, can be connected to EMS or switches
COMM3	reserve
TEST	1/ 2: DRM0 (reserved); 3 ~ 7: background debugging communication port (dedicated for debugging).
Debugging Power Interface	220V AC power input (for commissioning)

3.7. BMS unit

The control layer of the battery management system is organized in master-control levels, with one master-control level controlling a number of battery clusters in parallel, and each master-control level obtaining information on battery voltage, temperature, etc. from the slave-control level.

Level 1 is responsible for collecting battery voltage and temperature information, equalization control, etc.

The second stage is responsible for managing all the first stage in the battery cluster, and acquires the single voltage and temperature information of all the first stage through CAN bus. At the same time, it has the current acquisition of battery cluster, total voltage acquisition, leakage detection, and alarm judgment, and disconnect the high-voltage power contactor when the state of the battery pack is abnormal, so as to make the battery cluster out of operation, and guarantee the safe use of the battery. Doing a centralized data transmission and background communication functions.BMS topology is shown in Figure 3.12.

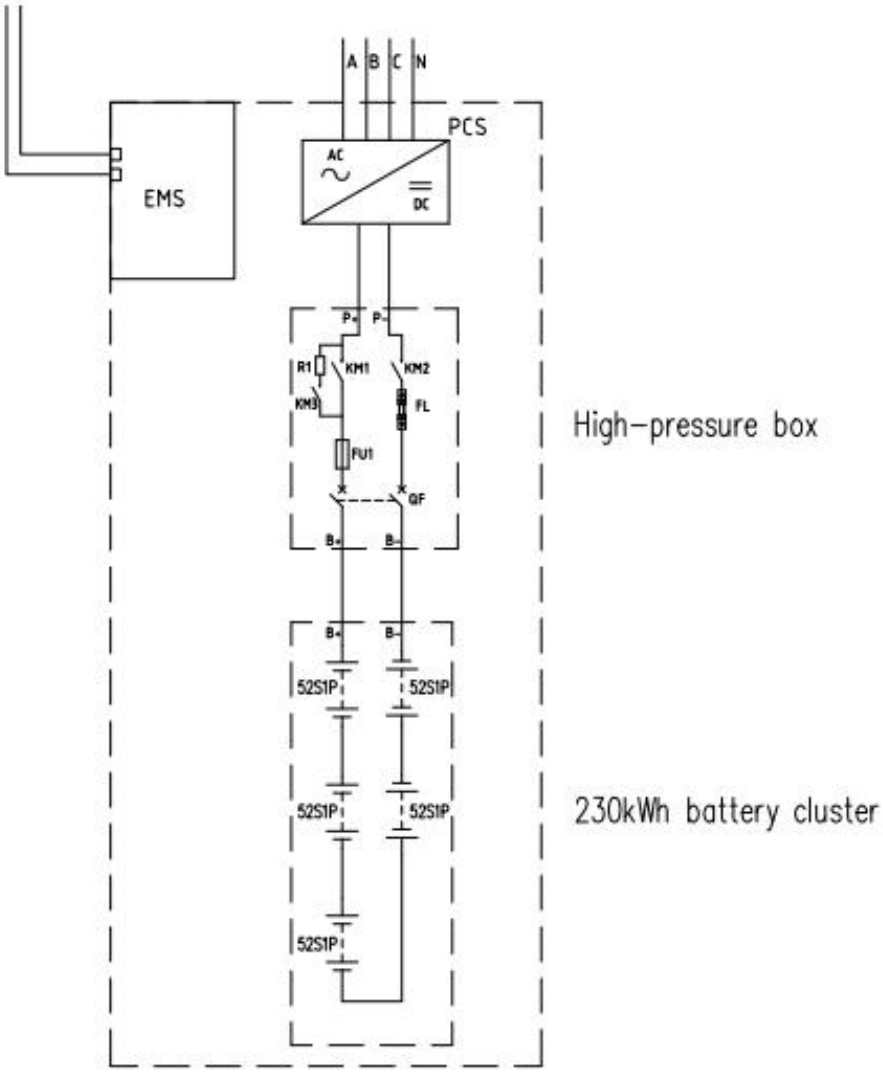


Fig.3.12 BMS topology diagram

3.7.1. BMS Parameters

The BMS technical parameters are shown in Table 3.5.

Table 3.5 BMS technical specification

Item		Technical Parameters	note
BMS Parameters	Current acquisition range/accuracy	±800A/+0.5%FSR	
	Voltage acquisition range/accuracy	0-1500V/±0.3%	
	Insulation detection range/accuracy	0-100MΩ/ <+10K	
	Voltage Acquisition Cycle	<100ms	
	Current acquisition cycle	<100ms	
	Temperature Acquisition Cycle	<200ms	
	With or without equalizing current	With	
	Equalization	passive equilibrium	
	Error of two SOC measurements	≤5%	
	Temperature measurement error	±2°C	
	SOC Estimation	Accuracy <5%	
	SOH Estimation	Accuracy <5%	
	safeguard	Including: overcharging, over-discharging, over-temperature, short-circuit protection, and the protection value can be adjusted.	
	BMS pickup method	external power supply	

3.7.2. High voltage box

The high voltage box is an interface unit that connects the battery cluster to the PCS for high voltage power circuit management of the battery cluster, and the panel of the high voltage box is shown in Figure 3.13.

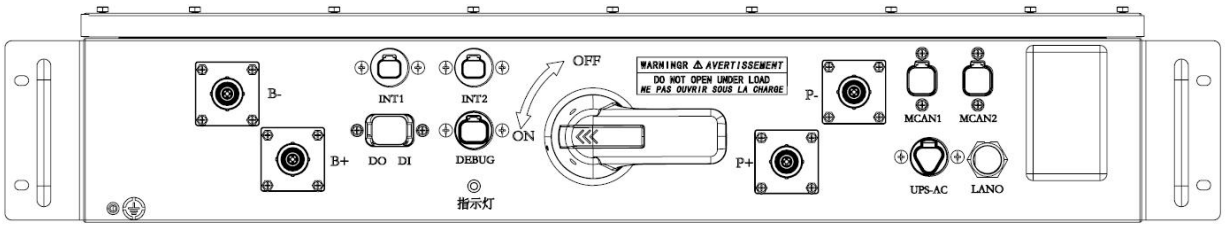


Fig.3.13 Switch gear diagrammatic sketch

3.8. Environmental control systems

3.8.1. Introduction of liquid cooling unit

It adopts the liquid cooling cooling method and is equipped with high energy-efficiency frequency conversion liquid cooling radiator. According to the demand of load, intelligent program control can realize multi-stage automatic liquid cooling volume adjustment to save energy consumption; meanwhile, it is equipped with dehumidifier to ensure the reliable operation of liquid cooling system under reasonable humidity. The exterior dimensions of the liquid cooler are shown in Figure 3.14.

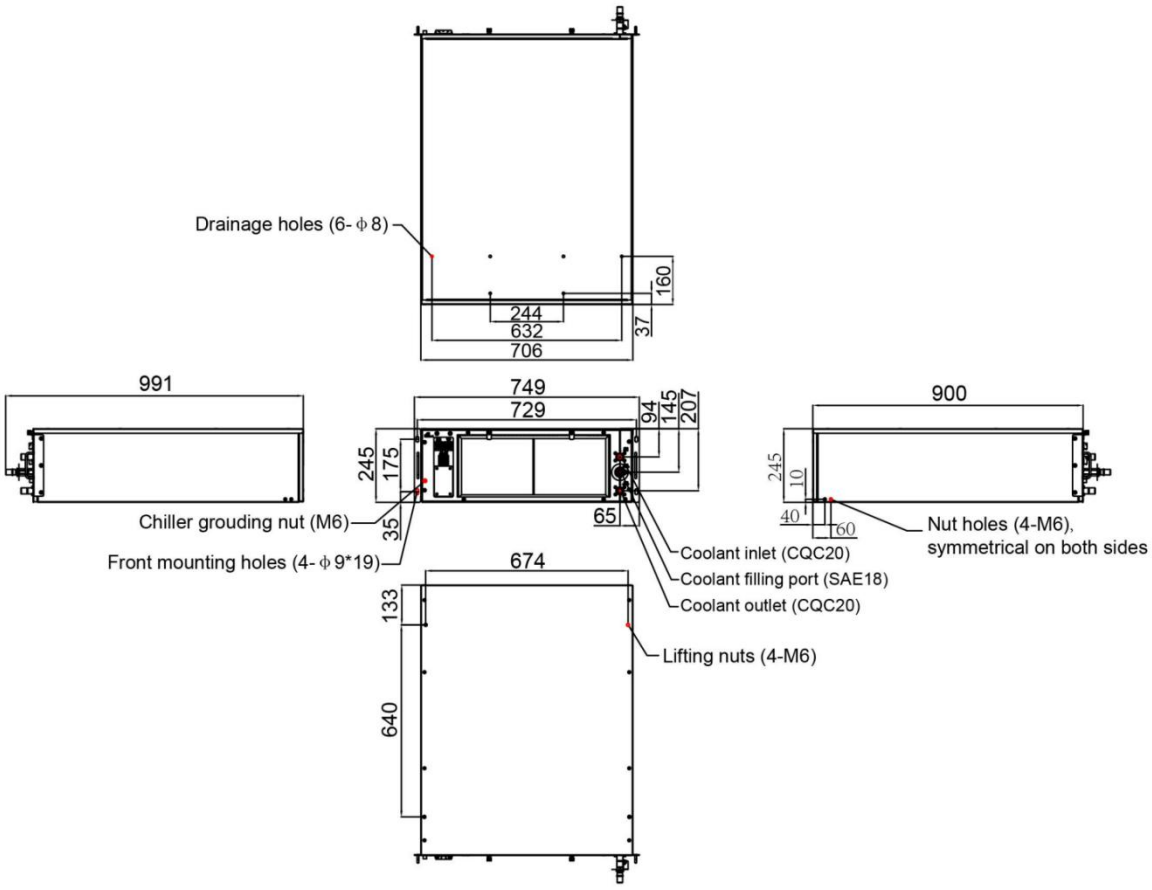


Fig.3.14 Chiller diagrammatic sketch

The schematic diagram of the liquid cooler is shown in Figure 3.15. Liquid cooler includes: ① compressor ② condenser ③ external circulating fan ④ throttling original ⑤ plate heat exchanger ⑥ circulating water pump ⑦ electric heater

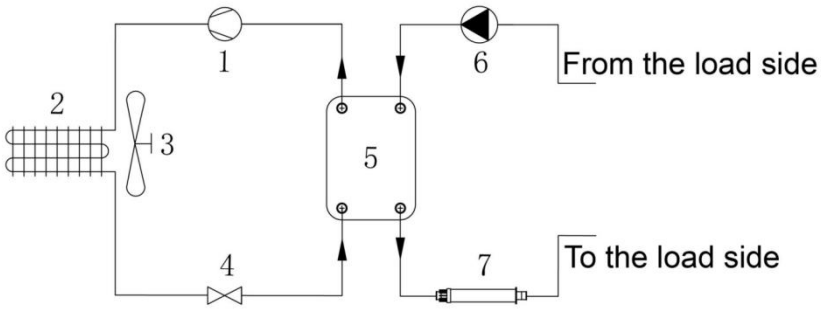


Fig.3.15 Chiller schematic diagram

3.8.2. Liquid-cooled unit technical parameters table

The technical parameters of the liquid-cooled unit are shown in Table 3.6.

Table 3.6 Chiller technical specification

Item	Parameters
Operating Voltage Range	220V±15%, 50/60±3Hz
Operating ambient temperature range	-30°C ~ +55°C
Operating Relative Humidity Range	5% ~ 95%
Storage ambient temperature range	-40°C ~ +70°C
Storage environment humidity range	5% ~ 95%
Transportation performance	Adaptable to transportation by land, sea, etc.
Working altitude	≤1000m (Derating increase <5% for every 1000m of elevation, maximum application altitude ≤4000m)
Overall dimensions (W×D×H)	700mm x 900mm x 245mm (without flange)
Maximum flow rate	50L/min
IP Protection Rating	IPX5 Description: For use in IP55 environments.
Return temperature range	-30°C~55°C
Discharge temperature range	5°C~40°C

3.8.3. Introduction to dehumidifiers

This project is equipped with dehumidifier refrigeration dehumidification, using the form of airflow organization of the lower send back, rapid cooling, professional dehumidification, effective control of the relative humidity in the cabinet, with the electric heating function, to maintain the temperature inside the cabinet, which can realize the intelligent stabilization of temperature and humidity in the warehouse.

The dehumidifier schematic is shown in Figure 3.16.

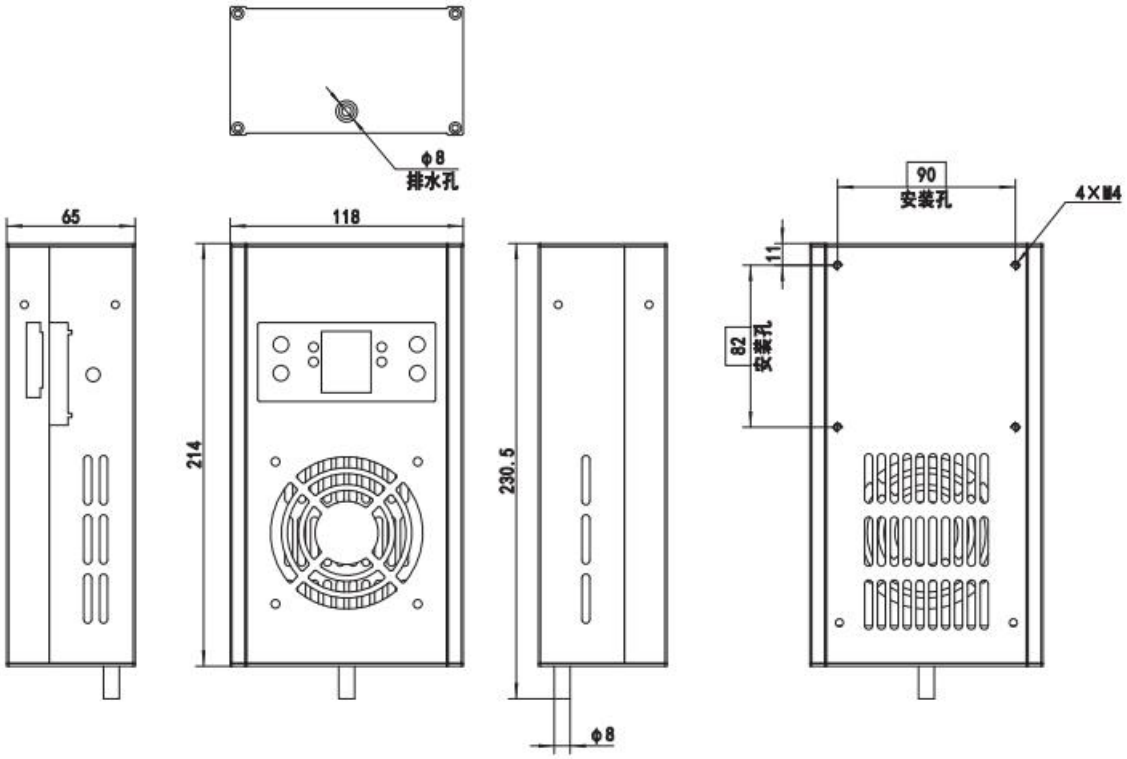


Fig.3.16 Dehumidifier diagram

The technical parameters of the dehumidifier are shown in Table 3.7.

Table 3.7 Dehumidifier technical specification

Item	Technical Parameters	Item	Technical Parameters
operating voltage	24V	Dehumidification efficiency	≥460 ml/day (temperature 35°C, humidity 85% RH)
Dehumidification power	60W	operating temperature	-30℃~55℃
Humidity monitoring range	0%RH~100%RH	Temperature detection range	-25℃~60℃
Dehumidification start-up value	45%RH-95%RH	Dehumidification temperature	5℃~45℃
Humidity measurement accuracy	±3%RH	Temperature measurement accuracy	±1°C
Display method	Double row 3-digit display	Display resolution	0.1
Shell Materials	aluminum	volumetric	214x118x65 mm (H "W "D)
net weight	1.8kg	waste pipe	Silicone inner diameter 8 mm, outer are diameter 10 mm, long celiac 150 cm

3.8.4. Introduction of Flood Transmitter

Flood transmitter is a split rail mounted ordinary probe flood transmitter, the principle of impedance change between the two levels of the probe in contact with water, through a special integrated chip on the flood input signal signal amplification, shaping, comparison, output dry contact or high and low level

change signals, indicating whether the transmitter is located in the location of water when the electrodes detected water, short circuit between the electrodes, the EMS reported flooding alarms.

Supply Voltage: DC 24V (12V~36V); Operating Temperature: Transmitter -20℃~60℃, Sensor 0℃~60℃; Operating Humidity: Transmitter 0%RH ~80%RH, Sensor 0%RH ~95%RH.

The outline diagram of the flood transmitter and the outline diagram of the sensor are shown in Fig. 3.17 and Fig. 3.18 below.

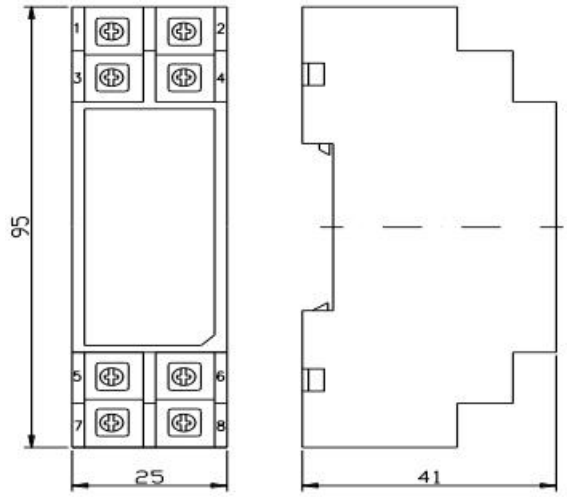


Fig.3.17 Diagram of a water flood transmitter

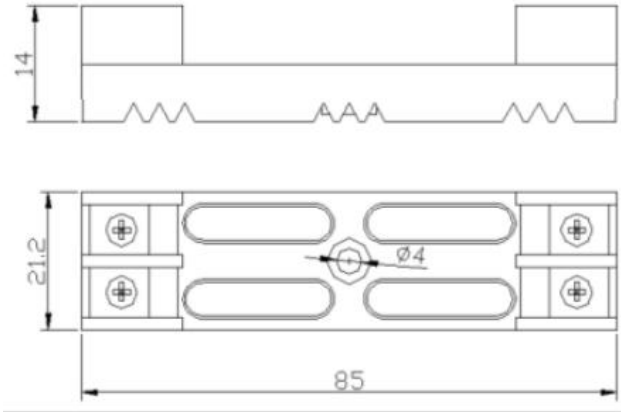


Fig.3.18 Sensor diagram

3.9. Fire protection system

3.9.1. System configuration

233 The liquid-cooled industrial/commercial cabinet is composed of 1 electrical compartment; 1 battery compartment consisting of 5 battery PACKs.

PACK Level Fire Fighting: Each battery PACK has a built-in Thermal Aerosol Fire Extinguisher Black QRR0.144G/S-MS-144-F-02-11. When a fire is detected inside the PACK, the Thermal Aerosol Fire Extinguisher Black QRR0.144G/S-MS-144-F-02-11 will accurately extinguish the PACK where the fire occurs.

Cabin-level fire protection: Electrochemical composite temperature, smoke and CO detectors are arranged on the top of the battery compartment and the electrical compartment. When a fire is monitored in the cabin, the hot aerosol fire extinguishing device carries out a total flooding of the cabinet.

3.9.2. Multi-function detector

The Multi-function Detector is a set of fire detection and early warning focused on the interior of rechargeable energy storage systems, which uses a high sensitivity fire data sensor. The technical parameters are shown in Table 3.8.

Table 3.8 QRR0.144G/S-MS-144-F-02-11 technical specification

Item	Psarameters	Item	Parameters
Model Specification	qrr0.144g/s-ms-144-f-02-11	Net	450±40g
Operating temperature range	-40℃～＋70℃	Size	155×104.6×16mm
Relative humidity of working	≤95%RH	activation	hot start
Spraying time	≤12s	Protection	2m³
Name and content of oxidizer	Strontium nitrate, potassium	Thermal	185±10°C
Nozzle 400°C, 200°C, 75°C	0.2m, 0.3m, 0.4m	validity	10 years

The multifunction detector QRR0.144G/S-MS-144-F-02-11 is shown in Figure 3.19.

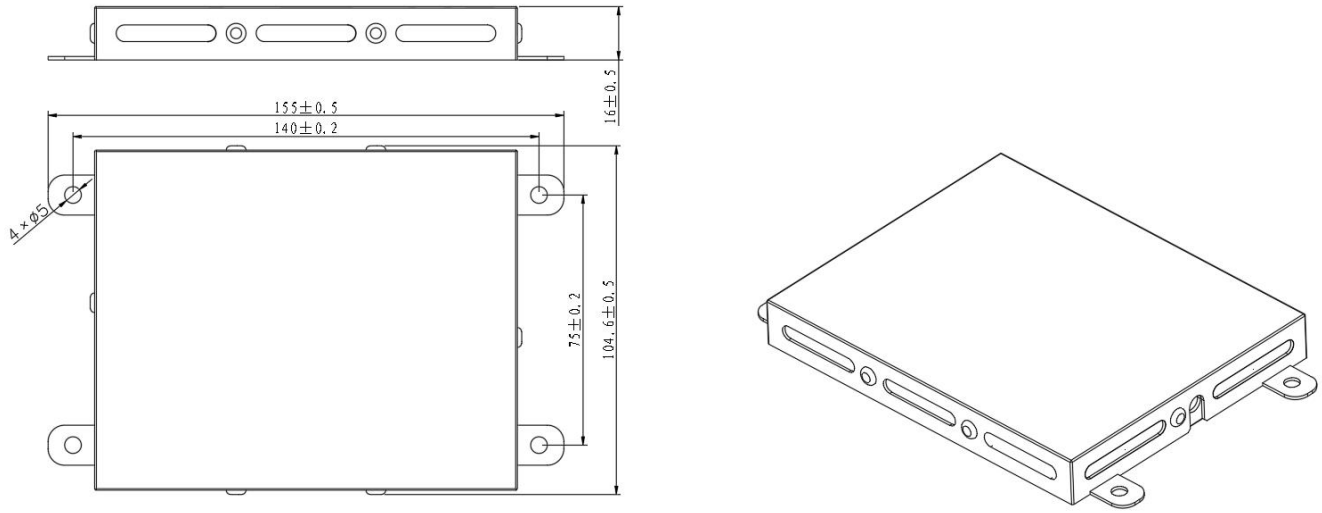


Fig. 3.19 QRR0.144G/S-MS-144-F-02-11 diagrammatic sketch

3.9.3. Aerosols

Thermal aerosols inhibit fires in the following ways:

The fire extinguishing mechanism of general extinguishing agent mainly includes isolation method, asphyxiation method, cooling method and chemical inhibition method, and different extinguishing agents have different fire extinguishing mechanisms. The fire extinguishing mechanism of thermal aerosol is mainly reflected in two aspects: on the one hand, it is the cooling effect of heat-absorbing decomposition, and on the other hand, it is the chemical inhibition of gas phase and solid phase, which are synergized with each other. In addition to the aerosol fire extinguishing agent products in the gas-phase components also play a certain role in assisting.

①Heat-absorbing decomposition of cooling and fire extinguishing effect

The cooling effect of thermal aerosol fire extinguishing agents relies mainly on the heat-absorbing decomposition of metal oxides and carbonates. Any fire in a relatively short period of time to release the heat is limited, if in a relatively short period of time the solid particles in the aerosol can absorb a part of the heat released by the fire source, then the temperature of the flame will be lowered, the

heat radiated to the combustion surface and used to the already vaporized combustible molecules cracked into free radicals will be reduced, and the combustion reaction will be inhibited to a certain extent.

②Gas phase chemical inhibition

Under the action of heat, hot aerosol fire extinguishing agent decomposition of vaporized metal ions such as Sr, K, Mg or cations that have lost electrons in the form of vapors, and the combustion of the active groups H-, -OH and O- to take place in many chain reactions, the following Sr as an example :

Sr+2-OH→Sr(OH)2 Sr+O-→SrO Sr(OH)2+2H-→Sr+2H2O

By repeating this, the reactive groups in combustion are consumed in large quantities, the concentration decreases continuously, and combustion is suppressed.

③Solid phase chemical inhibition

Solid particles in thermal aerosol fire extinguishing agents are able to adsorb the chain reaction intermediates -OH, H- and O- and catalyze their recombination into stable molecules, thus interrupting the branching chain reaction of the combustion process, as exemplified by the following example with K:

K2O (s) + 2H (g) → 2KOH (s) KOH (s) + OH (g) → KO (s) + H2O (g)

K2O(s) + O(g) → 2KO(s) KO(s) + H(g) → KOH

In the above fire extinguishing effect, several fire extinguishing mechanisms interact with each other, synergistic play, but the transmission of gas and metal oxides or carbonates of the heat-absorbing cooling effect is only to play an auxiliary effect, and the main fire extinguishing effect is still rely on the gas, solid-phase chemical inhibition.

A schematic of the fire protection system is shown in Figure 3.20.

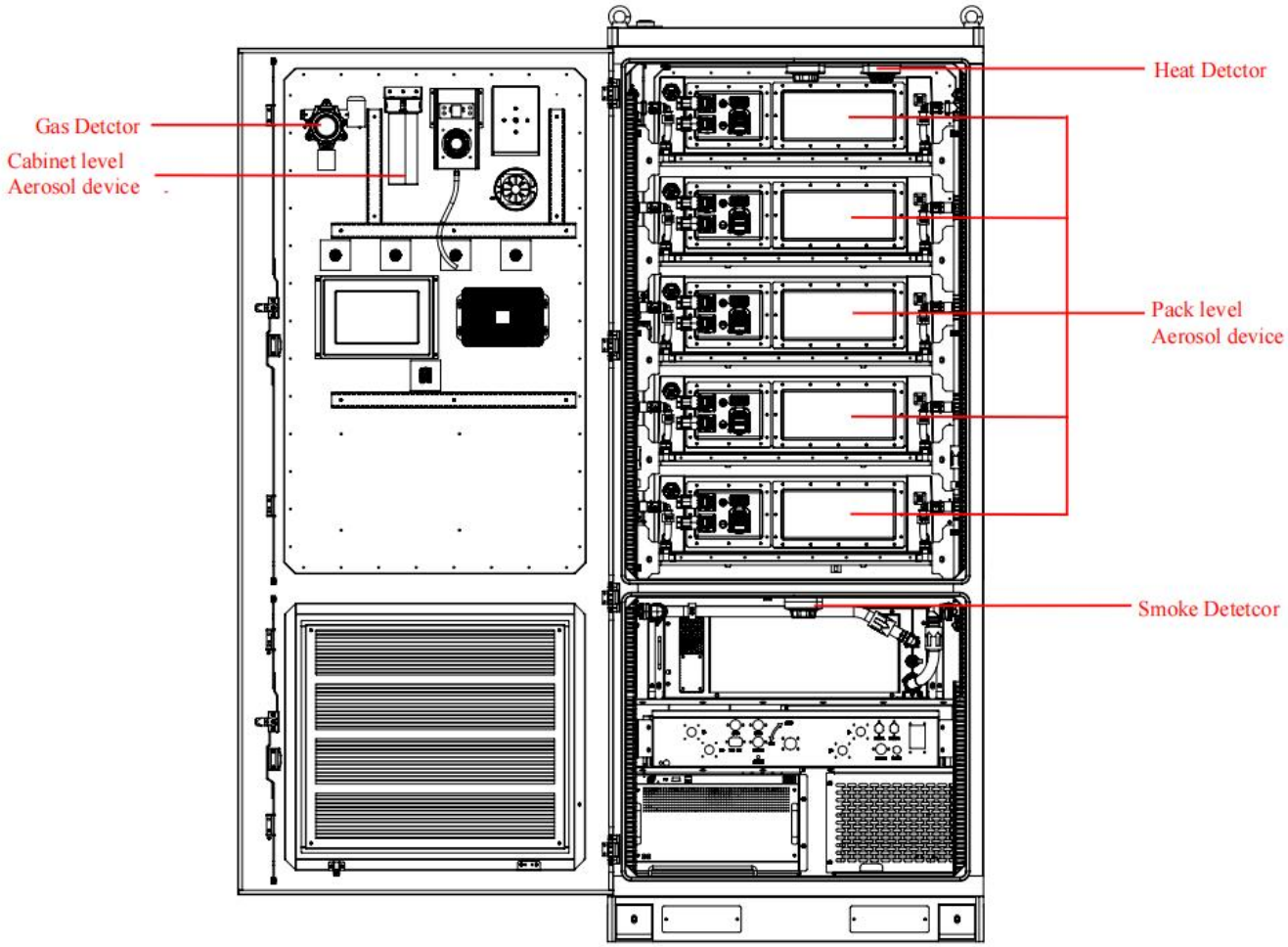


Fig.3.20 diagrammatic sketch

3.10. EMS

3.10.1. System diagram

The framework diagram of the energy storage system monitoring module is shown in Figure 3.21.

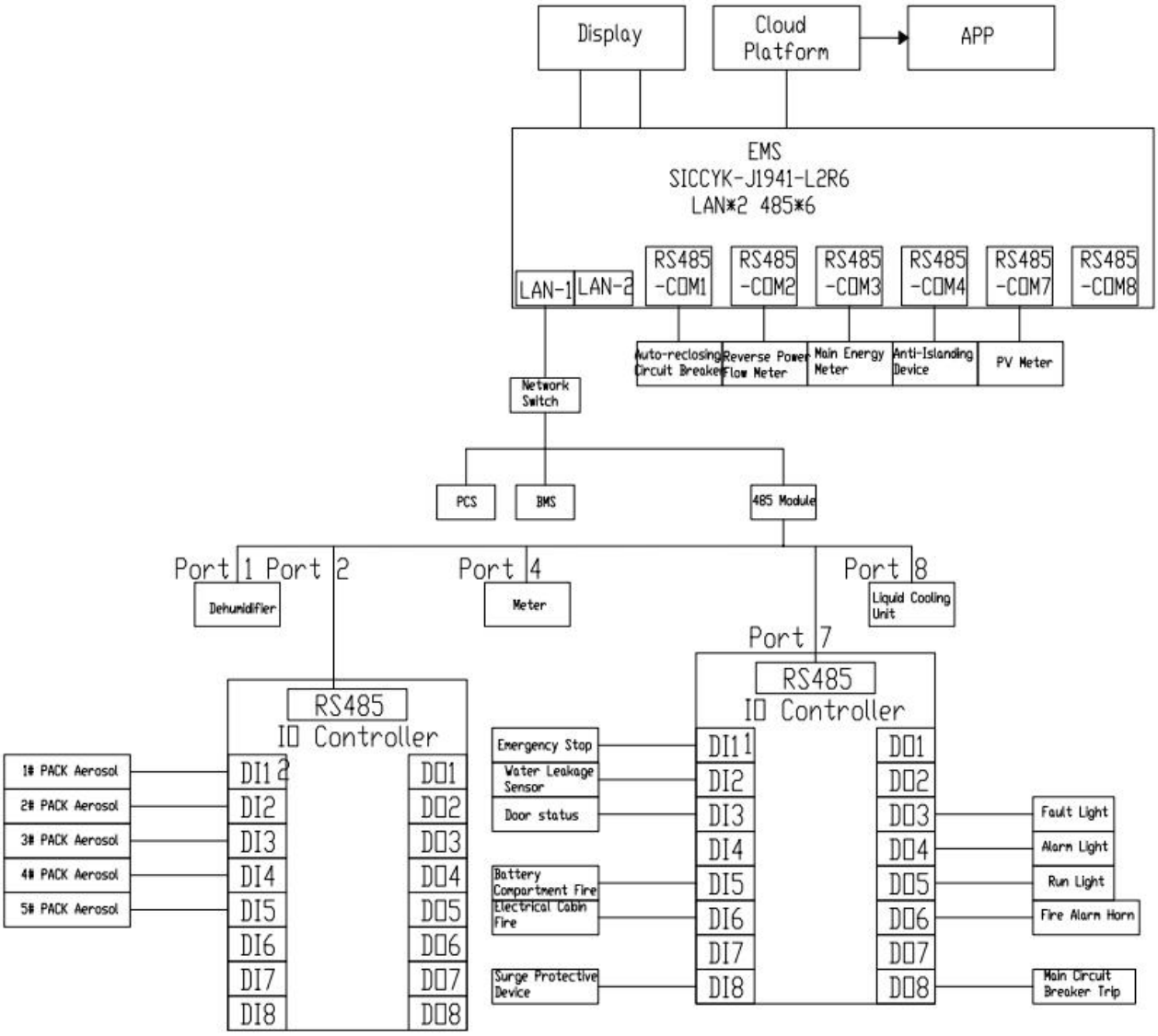


Fig.3.21 Energy storage system monitoring module

3.10.2. IO Control Sheet

The IO control table is shown in Table 3.9.

Table 3.9 IO control table

DIO Schedule							
DI Input				DO Output			
DI	**Port description**	**Semaphore is 0**	**Semaphore is 1**	**DO**	**Port description**	**Semaphore is 0**	**Semaphore is 1**
DI1	Emergency stop button	Emergency stop	Normal	DO1			
DI2	Flooded by water	Normal	Open	DO2			
DI3	Door status	Close	Open	DO3	Fault Light	Off	On
DI4				DO4	Alarm Light	Off	On
DI5	Aerosol spraying	Normal	Sprinkling	DO5	Run Light	Off	On
DI6	Battery compartment fire	Fire	Normal	DO6	Fire Alarm Horn	Off	On
DI7				DO7			
DI8	Surge Protective Device	Normal	Alarm	DO8	Main Circuit Breaker Trip	Off	On

3.10.3. Function Introduction

Home: View the basic information of the power station; real-time power operation; communication status of the equipment in the power station.

Main Wiring Diagram: Display the wiring diagram of the power station; dynamically display the changes of real-time data of power, SOC and other equipment on the diagram.

Equipment monitoring: Monitor the data status of various types of equipment in the power station, including PCS, BMS, battery clusters, meters, air conditioners, etc.; some of the equipment supports switching and configuration.

Failure alarms: alarm information display of power station equipment; can be filtered by equipment type, level, status and time.

Curve report: display revenue, charge/discharge amount, SOC curve, storage power, PCS power curve, display battery temperature, battery voltage, meter report; display battery temperature, battery voltage, meter report; can be customized to view the data.

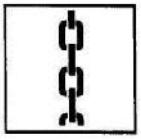
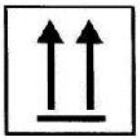
Policy Management: Supports Manual Mode; Supports Preset Policy Mode: contains common policy configurations; Supports Intelligent Policy Mode.

Chapter 4 Storage and transportation

4.1.Stockpile

During transportation, in order to ensure that the outdoor energy storage cabinet is in a better state of protection, please try to choose packaging for transportation, and follow the instructions of the various signs on the packaging for transportation, packaging signs illustrated in Table 4.1

Table 4.1 Explanation of Packaging Markings

Icon	Description
	Center of gravity marking to indicate the location of the center of gravity of the outdoor energy storage cabinet
	Lifting sign indicating the position of the chain or rope when lifting the outdoor energy storage cabinet
	Upward markings indicating how the energy storage cabinet should be placed during handling and placement prohibit inverted, horizontal or tilted placement.
	Put the sign lightly, and avoid violent friction or collision during transportation and placement.
	Moisture marking, transportation and storage should be done in such a way as to avoid exposure of outdoor cabinets for energy storage to rain or moisture.

Since the center of gravity position is not the mechanical center of the Energy Storage Outdoor Cabinet, attention must always be paid to the center of gravity markings on the box during shipping.

Outdoor packing box, tilt angle >5° is strictly prohibited during movement. Due to the volume and weight problems, the tilt angle is too large may cause the equipment to be inverted, resulting in casualties or equipment damage.

Physical shocks to the equipment, such as sudden lowering and lifting, should be avoided during handling.

When transporting the Energy Storage Outdoor Cabinet, avoid rain or adverse weather conditions, and if unavoidable, take the necessary protective measures.

If on-site installation is not carried out immediately after the completion of the delivery and acceptance work, the energy storage outdoor cabinets with external packaging should be stored in a ventilated, dry and tidy indoor environment. And pay attention to the following points:

Restore the package to the condition in which it was received and the desiccant in the package must be retained.

The floor of the storage level is level enough to carry the weight of the storage outdoor cabinet and its outer packaging.

Equipment storage should pay attention to ventilation and moisture, and it is strictly prohibited to store the environment with stagnant water.

The storage environment temperature requirement is -40℃~ +60℃ and the storage environment relative humidity requirement is 0 ~ 100% without condensation.

Take care to handle the harsh environment around you, such as sudden cold, heat, collision, etc., so as not to damage the equipment.

Check regularly, at least once a week. Check whether the packaging is intact and undamaged to avoid insect bites and rodent bites; damaged outer packaging should be replaced immediately.

If stored for more than 6 months, the package should be opened for inspection and repacked after replacing the desiccant.

The entire unit is stored in an outdoor cabinet and should not be disassembled for handling or storage. Equipment failure due to modifications not authorized by Pytes Electric

Not covered by warranty.

When transporting and storing the equipment, it is strictly forbidden to stack it and not to allow other items to be piled on top of it.

The transportation and storage environment of the equipment should be free of corrosive gases, high temperature and heat sources, free of dust, and in line with the requirements of fire protection, and open storage is strictly prohibited.

4.2. Haulage

It is not recommended to remove the energy storage outdoor cabinets from their shipping boxes for short distances, it is preferable to use a forklift to move the entire box, when moving the box, attention should be paid to the location of the center of gravity marking and lifting marking, and to ensure that the means of transport has sufficient load-bearing capacity, the use of lifting is strictly prohibited. Mobile energy storage outdoor cabinets without boxes are usually installed near the equipment and it is recommended that they are best operated with a forklift, which requires the removal of the bottom baffle.

Using a forklift truck to move the outdoor energy storage cabinet is the standard way of handling. When handling, the center of gravity of the outdoor energy storage cabinet should be made to fall between the two forks of the forklift truck and be inserted in advance to ensure that it will not tilt after being lifted. As shown in Figure 4.1, the fork arm length of the forklift shall not be less than 1.5 m, and the pallet truck bearing capacity is >2500 kg. When using the forklift to lift, put down and move the outdoor energy storage cabinet, it should be ensured that the movement is slow and smooth and the outdoor energy storage cabinet must be placed on a solid and flat ground. During the whole operation process, the forklift

safety regulations must be strictly observed. Due to the large size of the outdoor energy storage cabinet, the driver's view may be blocked, so the assistance of a cooperative person is required.

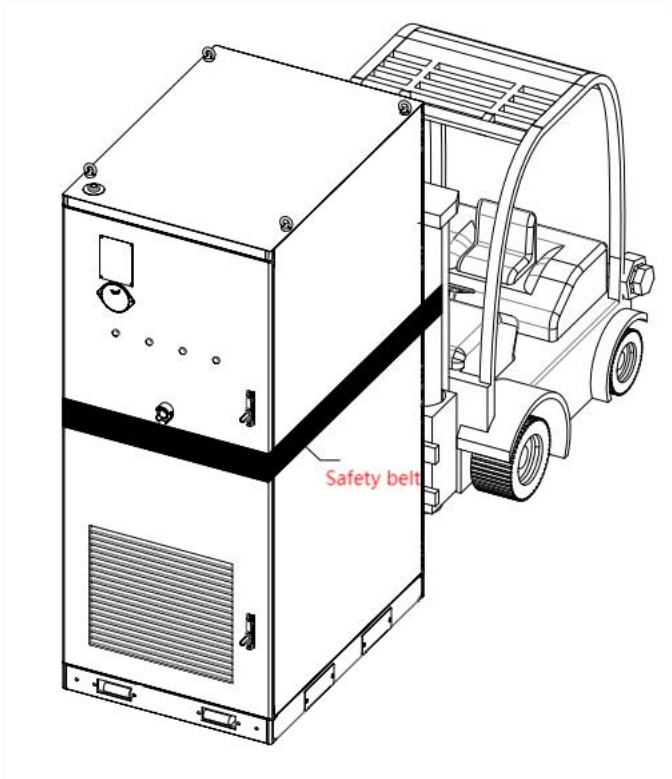


Figure 4.1 Forklift Transport Diagram

When carrying heavy objects, you should be prepared to bear weight to avoid being crushed or sprained by heavy objects.

Carrying heavy loads must be balanced and smooth; moving speed should be even and low speed; positioning requirements are smooth and slow to avoid any impact or fall, etc. to scratch the surface of the equipment or damage to the equipment components and cables.

When using a forklift to move, the forklift must be forked in the center position to prevent tipping over. Before moving, please use the rope to fasten the equipment on the forklift; when moving, it needs to be guarded.

Rough loading and unloading is prohibited, as this may result in short-circuiting, damage (leakage, rupture, etc.), fire or explosion of the battery.

It is prohibited to handle the battery through the terminals, bolts or cables to avoid damage to the battery. The battery should be handled in the required direction and should not be inverted, tilted, dropped, mechanically impacted, rained or snowed on, or dropped into water.

According to the classification of dangerous goods in the UN Recommendations on the Transport Of Dangerous Goods Model Regulations (TDG or Orange Book), the battery belongs to Class IX and has passed the relevant tests required by Chapter 38.3 of Part III of the UN Recommendations on the Transport of Dangerous Goods Manual of Tests and Criteria. The battery is classified as dangerous goods of Class IX and has passed the relevant tests required by the UN Recommendations on the Transport of Dangerous Goods Manual of Tests and Criteria, Part III, Chapter 38.3.

Chapter 5 System Installation

5.1. Installation requirements

5.1.1. Basic requirements

PI Station 230 Energy Storage Integrated Cabinet has a protection level of IP54 and can be installed outdoors, but should not be placed in a high humidity environment for a long period of time. Due to the noise generated during operation, the storage inverter should be installed in a location far away from residential areas and the installation location should be free of corrosive and flammable gases.

The outdoor energy storage cabinet must be installed on a suitable concrete foundation with a fire-resistant surface and the converter inlet and outlet must not be obstructed.

The installation floor is dry, level, free of stagnant water, and the floor is not loose enough to fully support the weight of the energy storage outdoor cabinet.

Installation site environment: Temperature range: -20°C~55°C; Relative humidity range: 0~95%, non-condensing.

Energy storage integration cabinet grounding resistance <4Ω.

The control cabinet should be mounted in a location that ensures that the LED indicators and LCD touch screen are easily viewed.

If the machine is placed directly outside, it is recommended to take the necessary shading measures to avoid the temperature of the machine rising due to direct sunlight, resulting in a reduction of the machine's operating capacity.

5.1.2. Outdoor Requirements

The PI Station 230 can be operated in an ambient temperature range of -20°C to 55°C. When the temperature is above 45°C, the machine will run at a lower rate. When the temperature is below -20°C, it needs to be warmed up before running at high power. The sunlight intensity should be ≤ 1200 W/m^2 and it is recommended that converters installed outdoors take the necessary shading measures.

Since the electrical room of the integrated energy storage cabinet is the side air outlet and front air outlet of the battery room, it is recommended that the integrated cabinet be installed in such a way as to ensure at least 1 meter of air duct for each side and front.

The energy storage cabinet needs to be installed on a concrete foundation or a structure supported by a steel channel with a flame-retardant surface. It is necessary to ensure that the foundation is level, firm, safe and reliable, with sufficient bearing capacity, and it is strictly prohibited to install it in a place where the foundation is depressed or inclined.

During foundation construction, the cable trench is pre-set according to the overall design of the power station and the location of the incoming and outgoing cables at the bottom of the energy storage cabinet.

Pre-embedded holes need to be opened on the base, and the size of the pre-embedded holes must be exactly the same as the positioning holes in the base of the energy storage cabinet to ensure that the energy storage cabinet is firmly connected to the foundation.

5.1.3. Space requirements

The Energy Storage Integration Cabinet must be installed at a sufficient distance from walls and other equipment to meet the requirements for the narrowest access aisles, evacuation routes, and ventilation. This subsection requires minimum space requirements for proper operation of the Energy Storage Integration Cabinet. If site conditions permit, it is recommended that greater spacing be selected to ensure reliable and efficient operation of the Energy Storage Integration Cabinet. This is shown in Figure 5.1 below.

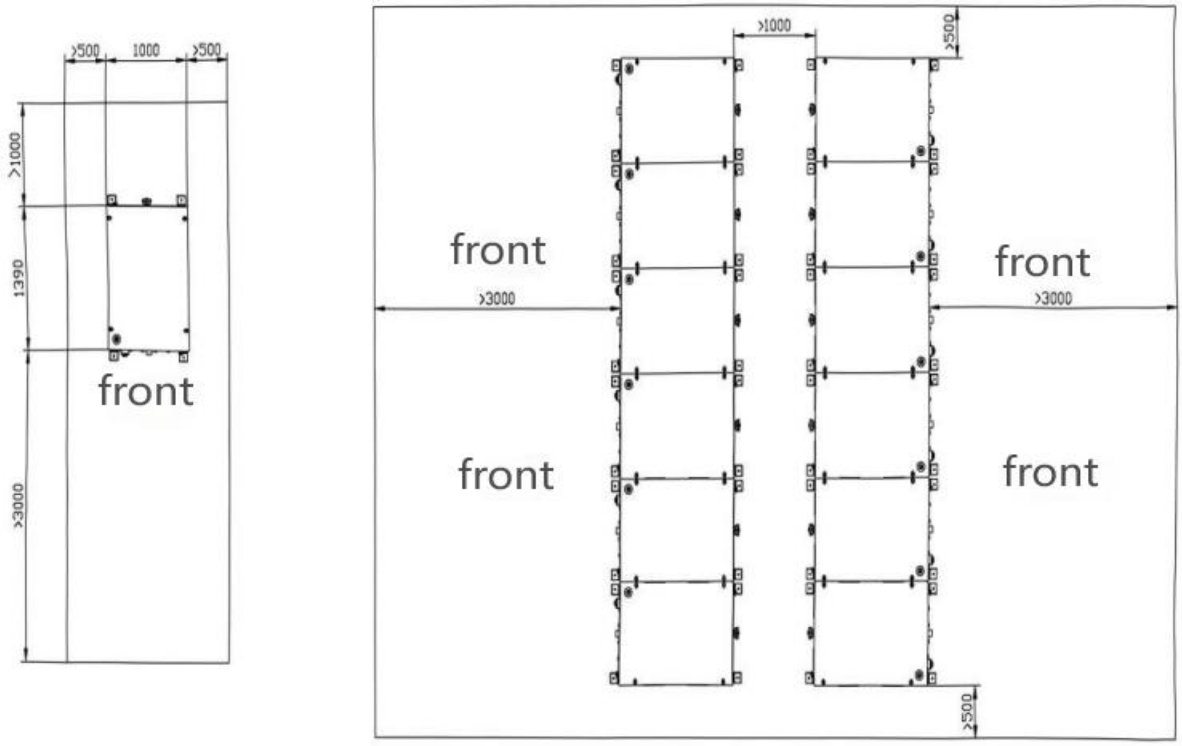


Figure 5.1 System Installation Space Requirements Chart

5.1.4. Ventilation requirements

Frequency converter operation will produce a lot of heat, high temperature will directly affect the electrical performance of the equipment, and even damage the equipment, so in planning the installation environment of the frequency converter, should give full consideration to the equipment's ventilation and heat dissipation needs, in order to ensure that the normal and efficient operation of the equipment.

In order to ensure the reliable and efficient operation of the energy storage cabinet, please regularly clean the grills, filters and filter pads at the air inlet and outlet of the equipment, and regularly check whether the exhaust fan of the equipment is working properly, so as to meet the ventilation requirements of the integrated energy storage cabinet, whose installation environment needs to meet the following requirements.

Energy storage cabinets should avoid installation in poorly ventilated locations with low airflow.

The air intake should have an adequate supply of fresh air.

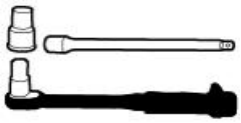
The quality of the air must be ensured. If the air contains too much sand, dust and other suspended matter, the purity of the air can be improved by measures such as installing a filter at the air intake grille.

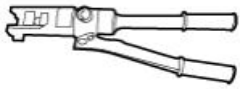
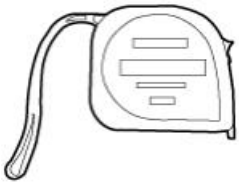
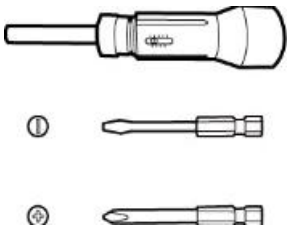
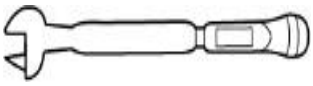
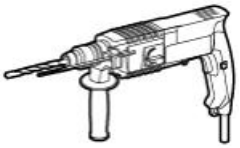
The ventilation system of the energy storage cabinet must be independent of the ventilation system of other equipments and not affect each other. Cooling ducts should be designed by professionals in advance to avoid the cabinet being in the phenomenon of return air. At the same time, each combination must be sealed to prevent air leakage, and the sealing material chosen should be able to withstand temperatures of at least 80° Celsius. After installing the cooling air ducts, the cabinet should be checked for fixed screws, washers and other components.

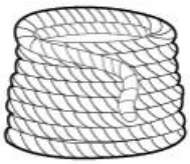
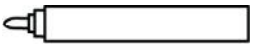
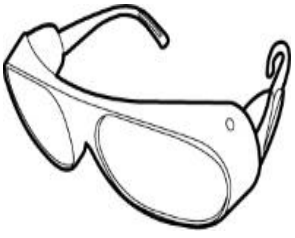
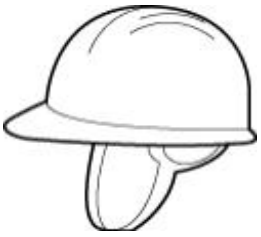
5.2. Installation Tools

The following tools are required before installation, as shown in Table 5.2:

Table 5.2 Installation tools

			
Phillips Insulated Torque Screwdriver	Insulated torque socket wrenches (incl. extensions)	Insulated torque screwdriver	art knife

 wire stripper	 hydraulic press	 Multimeter (DC voltage range≥ 15000V DC)	 steel tape measure
 adjustable wrench	 rubber mallet	 torque screwdriver	 Allen key
 hammer	 Combination Sleeve	 Open-end torque wrench	 Combination Wrench
 level (device determine horizontal)	 dust catcher	 pneumatic drill	 Drill 12mm

 heat shrink tubing	 heat gun	 zip ties	 insulated ladder
 cable cars	 sling	 forklift trucks	 (permanent) marker (pen)
 Terminal Crimping Pliers	 wire stripper	 network wiring pliers	 Ratcheting Crimping Pliers
 Large Range Clamp Ammeter	 Extra large range clamp-on ammeter	 infrared thermometer	 Universal Plug Conversion Socket
 High-voltage insulated gloves	 safety goggles	 safety helmets	 safety footwear

5.3. Product Installation

5.3.1. Unpacking

The exterior of the energy storage outdoor cabinet package is shown in Figure 5.3. After it will be transported to the vicinity of the installation site, the shipping carton will be unpacked, and the disassembly steps are as follows.

① Remove the top panel of the packing box.

② Remove the wooden side panels of the packing box.

③ Remove the shielding material from the box.

④ Remove the anchors securing the outdoor energy storage cabinets to the shipping pallets.

⑤ Remove the outdoor energy storage cabinet and the transportation wooden pallet, and strictly prohibit the outdoor energy storage cabinet from being transported on the wooden pallet again.

Figure 5.3 ESS Cabinet Outer Packaging Diagram

5.3.2. Verification of information

Before leaving the factory, the outdoor energy storage cabinet has been inspected and securely packed by Pytes staff. After removing the energy storage transportation packaging, please check the following items.

Check whether the data on the nameplate of the product matches with the ordering contract, e.g., product model, rated capacity, voltage level, etc.

Check that factory documentation and accessories are complete.

Check that the appearance of the storage outdoor cabinet is as described in this manual.

Check the energy storage outdoor cabinet for deformation, peeling paint, and loose parts.

The packing list for the energy storage outdoor cabinet is shown in Table 5.1.

Table 5.1 Packing

serial number	Name	quantities
1	PI Station 230 Energy Storage Outdoor Cabinet (includes door key and related accessories)	1 set
2	PI Station 230 datasheet	1 copy
3	inspection report	1 copy

Installation and commissioning can only be carried out if the inspection is correct and complete and if there is no damage to the outdoor cabinet of the energy storage, the inspection process, and in case of problems, please contact the transporter or Pytes technicians.

5.3.3. Installation of rings

Install the top lifting ring of the energy storage system as shown in Figure 5.4.

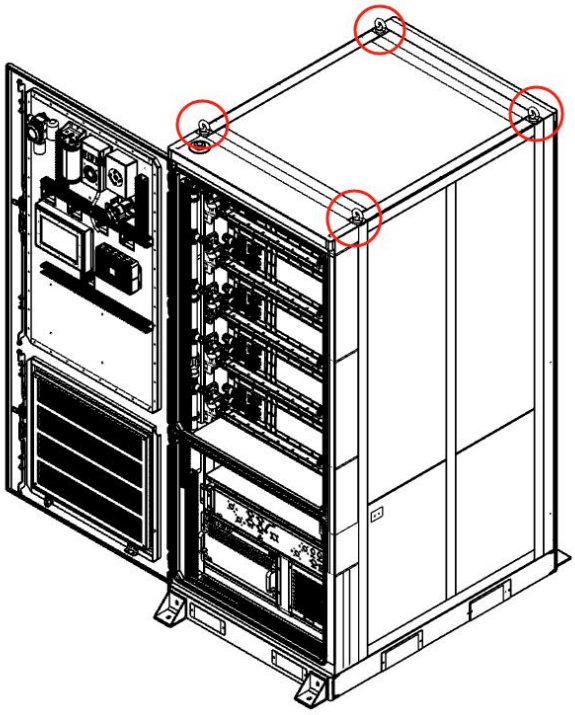


Figure 5.4 Top Ring Diagram of the System

5.3.4. Product Installation

Use a crane or forklift to place the energy storage system into the mounting position, as shown in Figure 5.5.

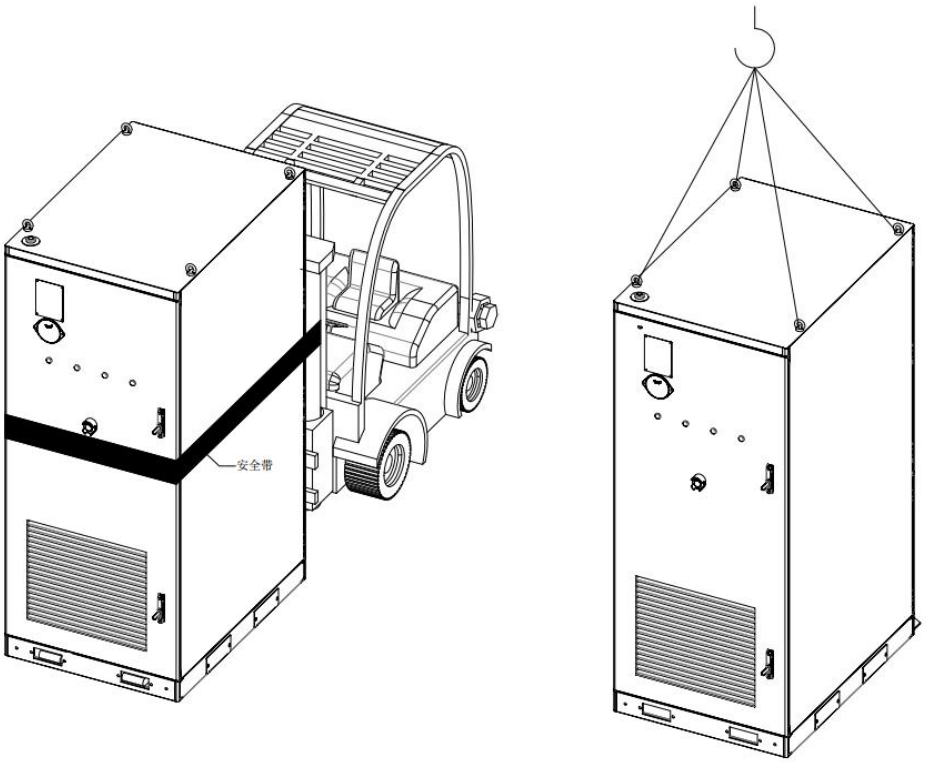


Figure 5.5 System Installation Diagram

5.3.5. Product fixation

Install the feet in the corners of the cabinet first, and use screws to secure the feet. As shown in Figure 5.6.

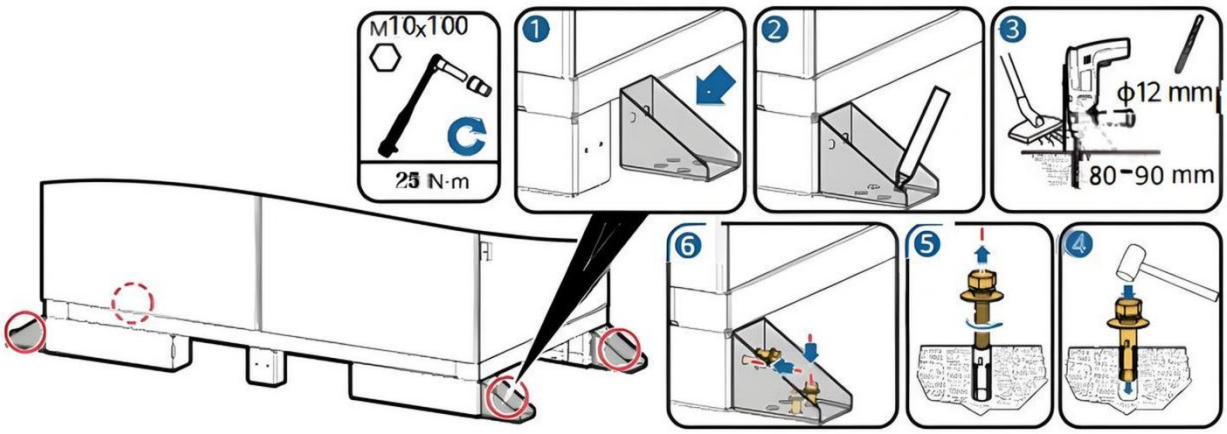


Figure 5.6 Installation Diagram of System Foundation

If the Energy Storage Cabinet is fixed to a channel, the cable trench should be laid and the channel cut out should conform to the installation requirements of the Energy Storage Cabinet before the unit is finally fixed. If the energy storage cabinet is fixed to a concrete floor, expansion screws should be used to fix the cabinet to the holes in the floor. The method of fixing the energy storage cabinet is shown in Figure 5.3. The following steps need to be followed to fix the energy storage integrated cabinet.

① Select the appropriate tool to transport the energy storage cabinet to the mounting location and align the mounting holes.

② Fix the energy storage cabinet on the foundation with M10×100 expansion bolts, or fix it on the steel base with M10×40 bolts through the waist hole of the base.

③ Install the bottom baffle of the energy storage cabinet to complete the fixed installation of the energy storage cabinet.

5.4. Electrical Connections

5.4.1. Security rules

Make sure the mounting cables and equipment are not charged before installation.

The capacitors inside the energy storage converter are hazardous energy storage devices and no flammable or explosive materials shall be placed in the

vicinity of the energy storage converter All electrical connections shall be in accordance with the standards of the country in which the item of electrical connection requirements is located.

The energy storage converter can only be connected to DC with the permission of the local electric utility and after installation by a qualified technician.

Only a qualified electrician or competent person may make electrical connections to this product.

Strictly observe the wiring symbols inside the unit.

The following safety rules must be observed during the electrical connection of the energy storage converter and during subsequent maintenance and repair operations.

① Disconnect all external connections to the energy storage converter and the unit's internal power supply.

② Ensure that the energy storage converter is not accidentally re-energized.

③ Use a multimeter to ensure that the energy storage converter is completely de-energized internally.

④ Make the necessary grounding and short-circuit connections.

⑤ Insulate and cover potentially energized parts adjacent to the operating section with fabric made of insulating material.

5.4.2. Wiring components

The power supply cable of the outdoor cabinet for energy storage uses fixing screws and other components, and the equipment has been packaged in a uniform bag at the factory, so please pack it in strict accordance with the rules for tightening screws for cable connection When connecting cables, make sure that the joints are tightened. Poor connection or oxidization of the contact surfaces may lead to localized heat buildup, which in turn may cause fire and combustion When connecting the wiring, use appropriately sized copper wires and securely fasten them to the wiring copper strips using copper terminals.

5.4.3. Preparation Work

① Open the front door of the outdoor energy storage cabinet.

② outdoor energy storage cabinets and other overall design of the bottom into the bottom out of the structure, the bottom of the storage cabinet is reserved for the user wiring entrance hole, all external wiring from the bottom of the machine to prevent foreign objects from entering. The bottom of the equipment has an inlet hole, which is sealed with sealing mud after the wiring is completed.

5.4.4. Cable requirements

Cable selection requirements are as follows:

The selected cable must have sufficient current-carrying capacity. The current-carrying capacity of a conductor is related to the environmental conditions, the type of conductor insulation, the method of laying, the wire and the cross-sectional area.

The wire diameter of all cables must be selected according to the maximum current on both sides of the energy storage converter with allowances.

Connecting wires on the same side should be of the same gauge and type.

Please use flame retardant cables.

Recommended specifications for connecting cable diameters are shown in Table 5.3:

Table 5.3 Recommended Specifications for Cables

(electric) cable	Conductor Diameter Requirements (Copper Core)	Mounting Bolt Specifications
Grid side phase A B C N	Recommended ≥70mm2	M10x30
grounding wire	Recommended ≥40mm2	M10x30

Overloading of the cable is strictly prohibited, the current in the 1 mm^2 cable must not exceed 3A.

5.4.5. Caveat

All connecting cables must be checked for insulation and integrity before all electrical wiring is carried out.

Do not use poorly insulated, partially exposed, or damaged cables Make sure the polarity of either side of the cable is correct before wiring.

When wiring, do not pull on the cables to avoid damaging their insulation. All cables should be left with a certain amount of bending space.

Take the necessary auxiliary measures to minimize the stress on the cable.

The length of the screws should be selected appropriately; excessively long screws may affect the insulating properties of the device.

Installation should prevent part of the heat-shrinkable sleeve from being pinched between the copper nose and the copper row, or it may result in poor contact or even damage to the equipment.

After each step of the wiring operation, the wiring should be carefully checked to ensure that it is correct and secure.

Incorrect wiring can lead to fire and combustion, so pay attention to the order in which the wiring components are connected.

When connecting, make sure the connection is secure. Poor connections or oxidized contact surfaces can lead to localized heat build-up, which in turn may cause fire and combustion.

After all electrical connections have been made, the wiring should be thoroughly inspected to verify proper wiring and then the incoming gaps should be sealed with fireproof mud to prevent small animals from entering.

5.4.6. DC Side Wiring

Before wiring the DC side, the following checks should be performed.

Measure the open-circuit voltage of the battery/busbar bank, confirm positive and negative cable rods, and mark them.

High-voltage insulated gloves must be worn before any operation.

The open-circuit voltage of the battery pack is strictly prohibited to exceed the maximum DC input voltage of the outdoor energy storage cabinet, and too high an open-circuit voltage will cause damage to the outdoor energy storage cabinet.

The positive and negative terminals of the battery pack are connected to the positive and negative copper rows of the outdoor energy storage cabinet correspondingly, and cannot be connected inversely.

When it clicks, the cable terminals are fully inserted and the connection is complete.

Step 1: Connect the positive terminal of the high voltage box to the positive terminal of BAT1 as shown in Figure 5.7.

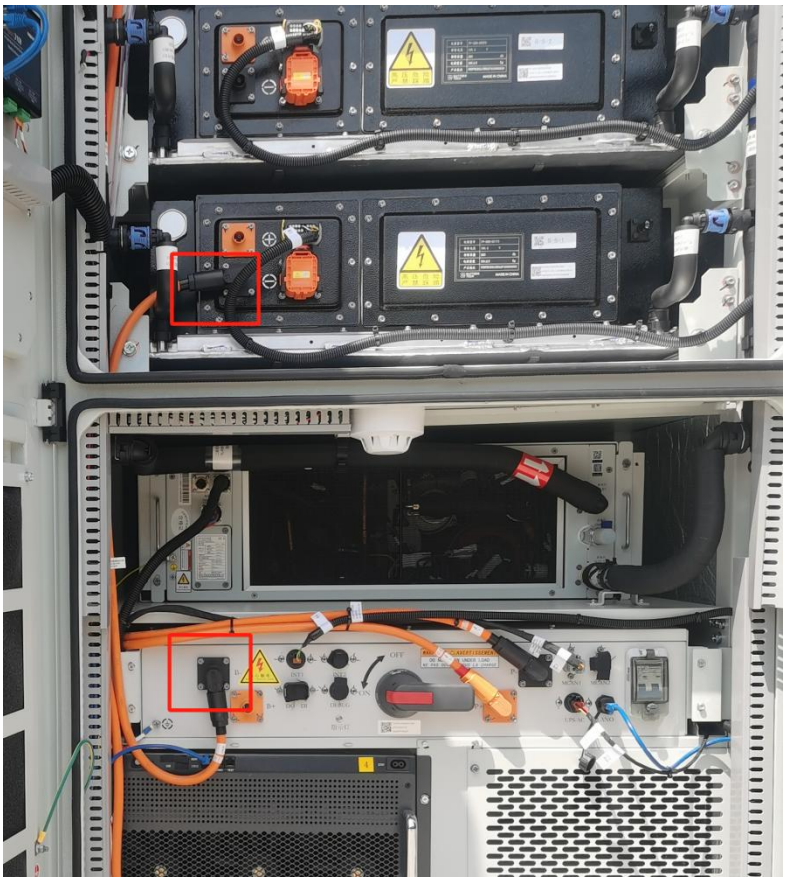


Figure 5.7 Diagram of Power Line Connections

Step 2: Connect the battery modules in series, from the negative terminal of BAT1-1 to the positive terminal of BAT1-2, and then connect the BAT1-BAT5's in sequence, as shown in Figure 5.8.

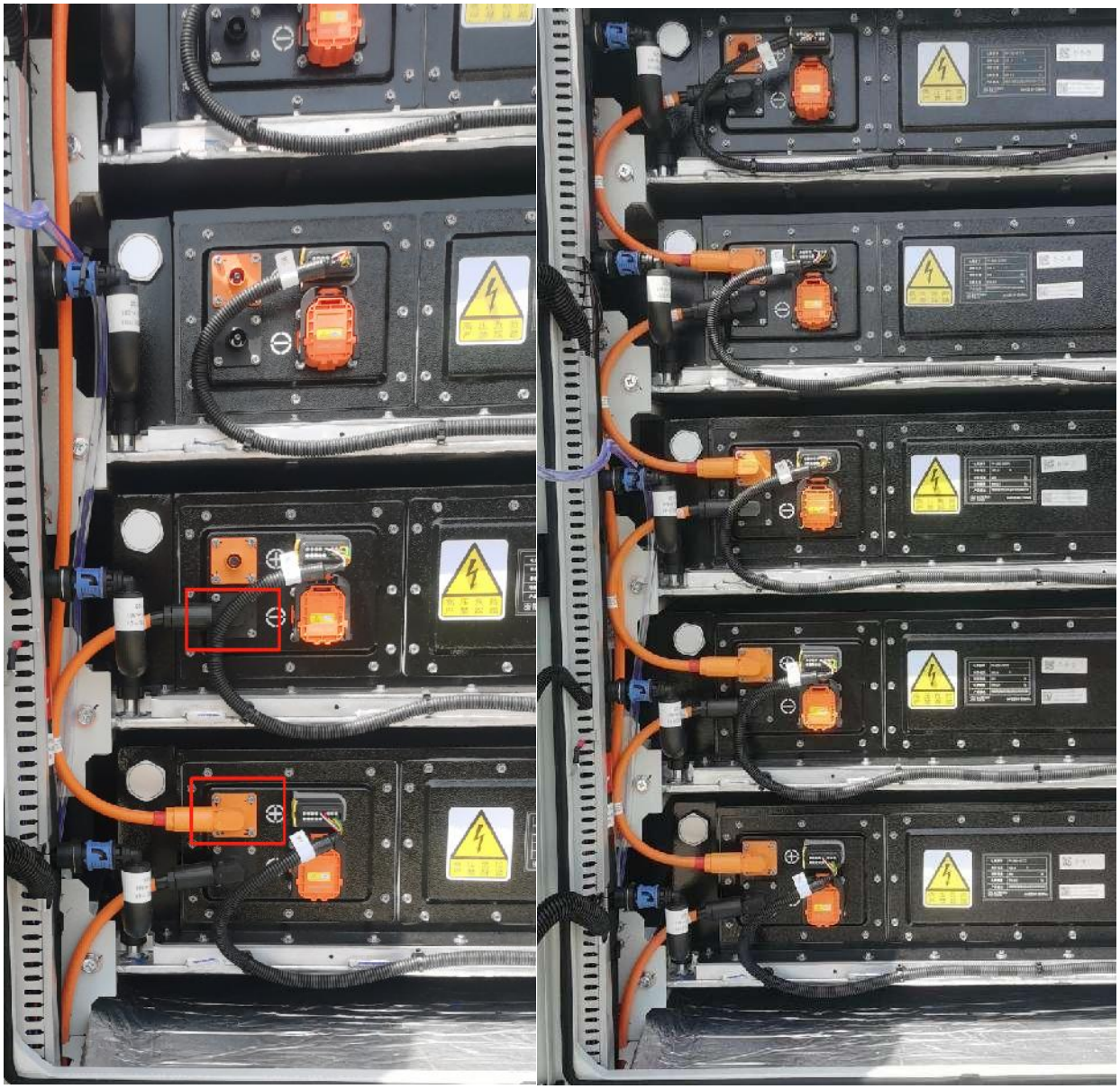


Figure 5.8 Diagram of Power Line Connections

Step 3: Connect the positive terminal of the high voltage box to the positive terminal of the BAT5 as shown in Figure 5.9.

Figure 5.9 Diagram of Power Line Connections

The final battery power line connection diagram, shown in Figure 5.10.

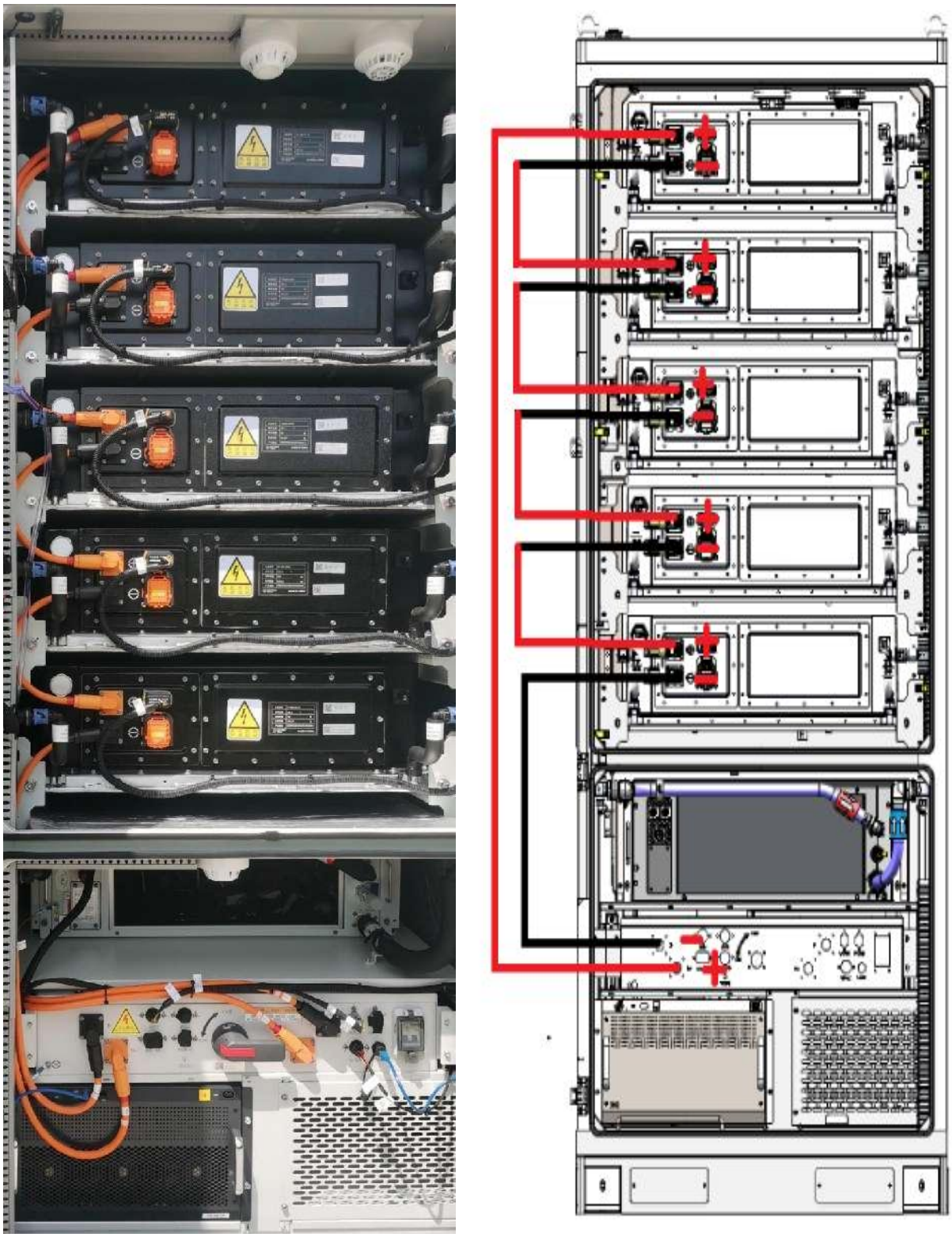


Figure 5.10 Diagram of Power Line Connections

5.4.7. AC wiring

The construction blueprint is shown in Figure 5.11:

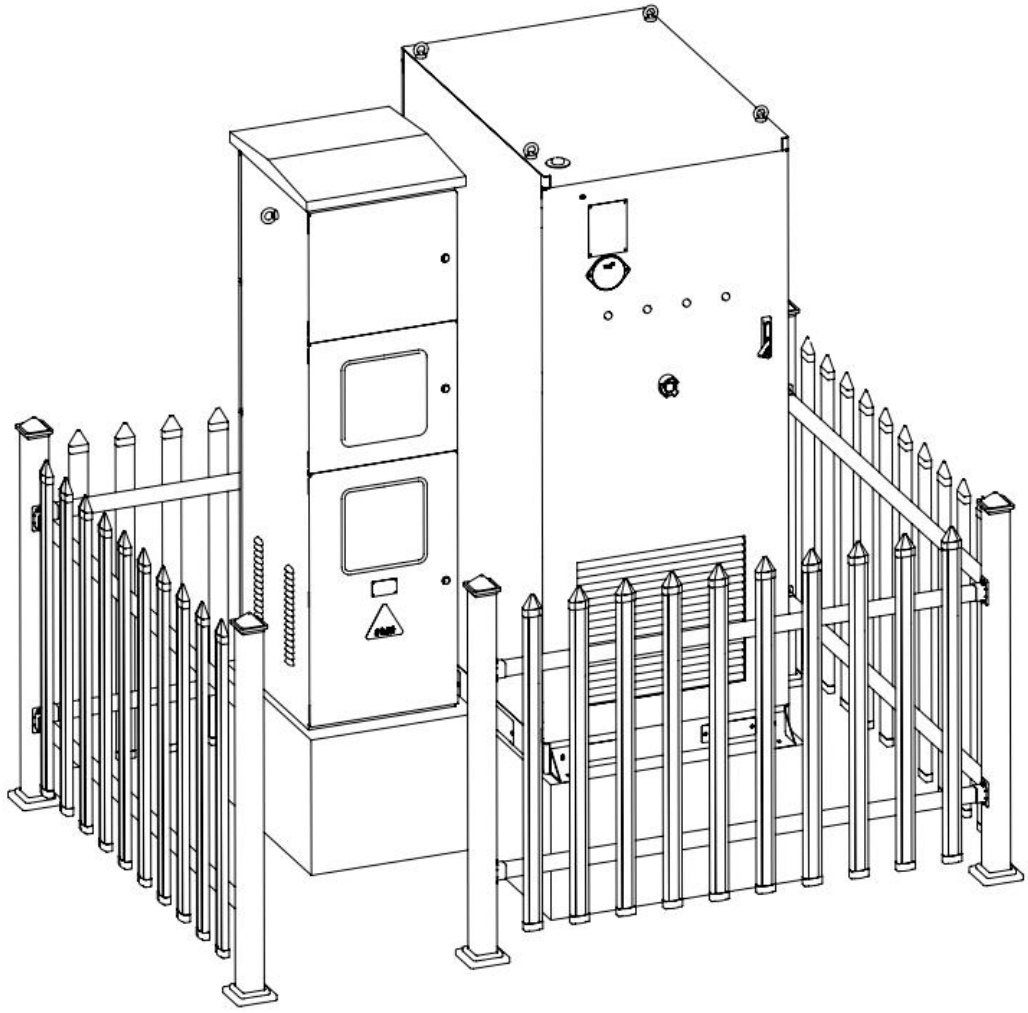


Figure 5.11 Construction Blueprint

(1) Before turning on the AC side, perform the following checks:

① Measure the AC line voltage to ensure that the AC line voltage is within the normal AC voltage range of the energy storage outdoor cabinet.

② Confirm the cable phase sequence and mark it.

③ Before wiring, ensure that the grid-side distribution circuit breaker is in the disconnected state and that both AC and DC disconnect switches are in the disconnected state.

(2) The procedure for wiring the AC side cable is as follows:

① Confirm that the grid distribution switch on the back stage of the AC side of the energy storage outdoor cabinet is off.

② Verify that both the AC and DC disconnect switches of the energy storage outdoor cabinet are disconnected.

③ Determine the phase sequence of the AC connection cable and mark it.

④Select suitable size bolts and use a wrench to fix the connection of "A" phase, "B" phase, "C" and "N" phase cables to the guillotine switch of the grid-connecting cabinet respectively, as shown in Figure 5.12. "A" phase, "B" phase, "C" and "N" phase cables are connected to the guillotine switch of the grid-connecting cabinet, as shown in Figure 5.12.

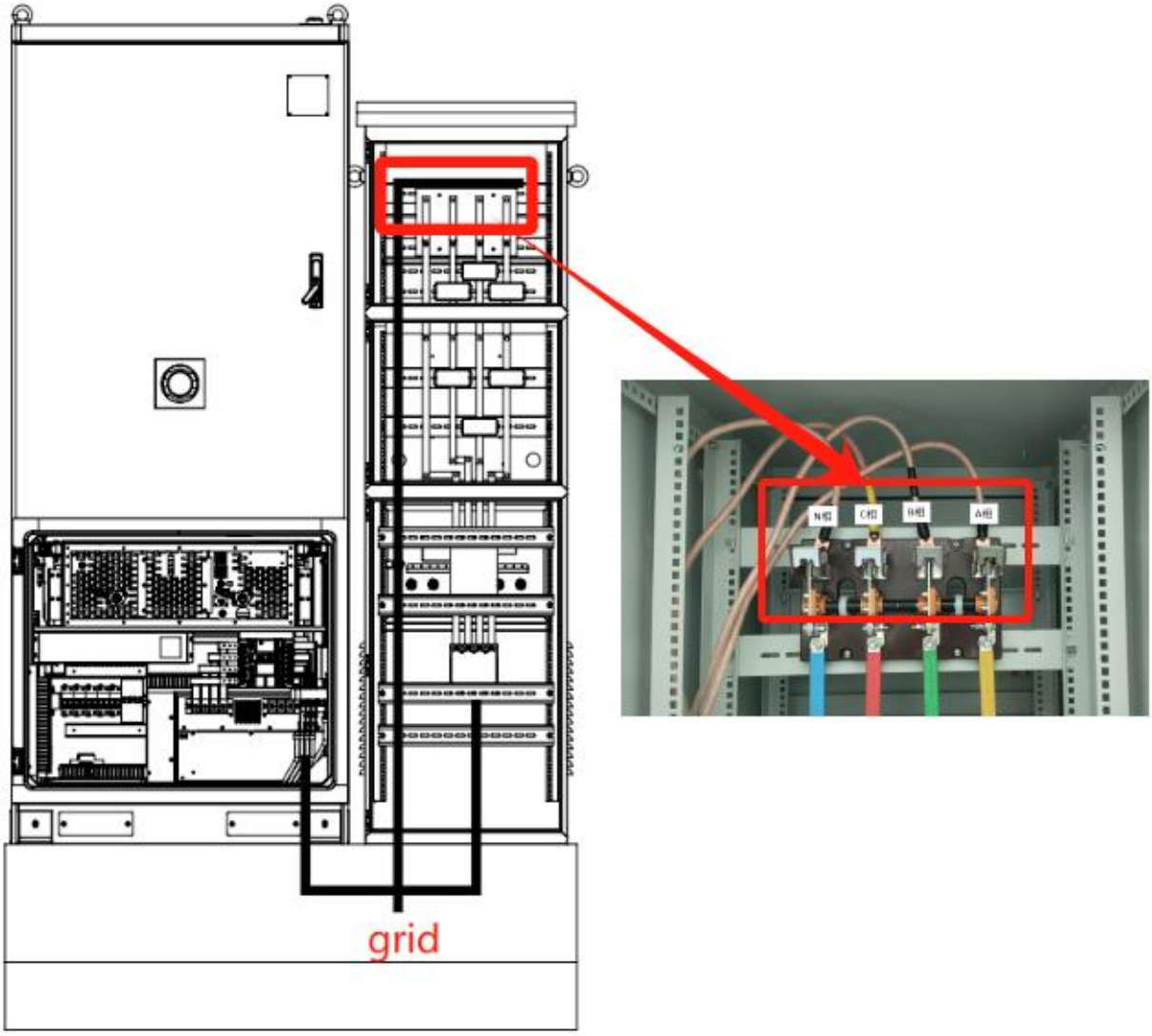


Figure 5.12 Grid Wiring Diagram

⑤ Connect the phase "A", "B", "C" and "N" cables of the energy storage cabinet to the circuit breaker of the grid-connected cabinet as shown in Figure 5.12. The "A", "B", "C" and "N" phase cables of the storage cabinet are connected to the circuit breaker of the grid-connected cabinet as shown in Figure 5.12.

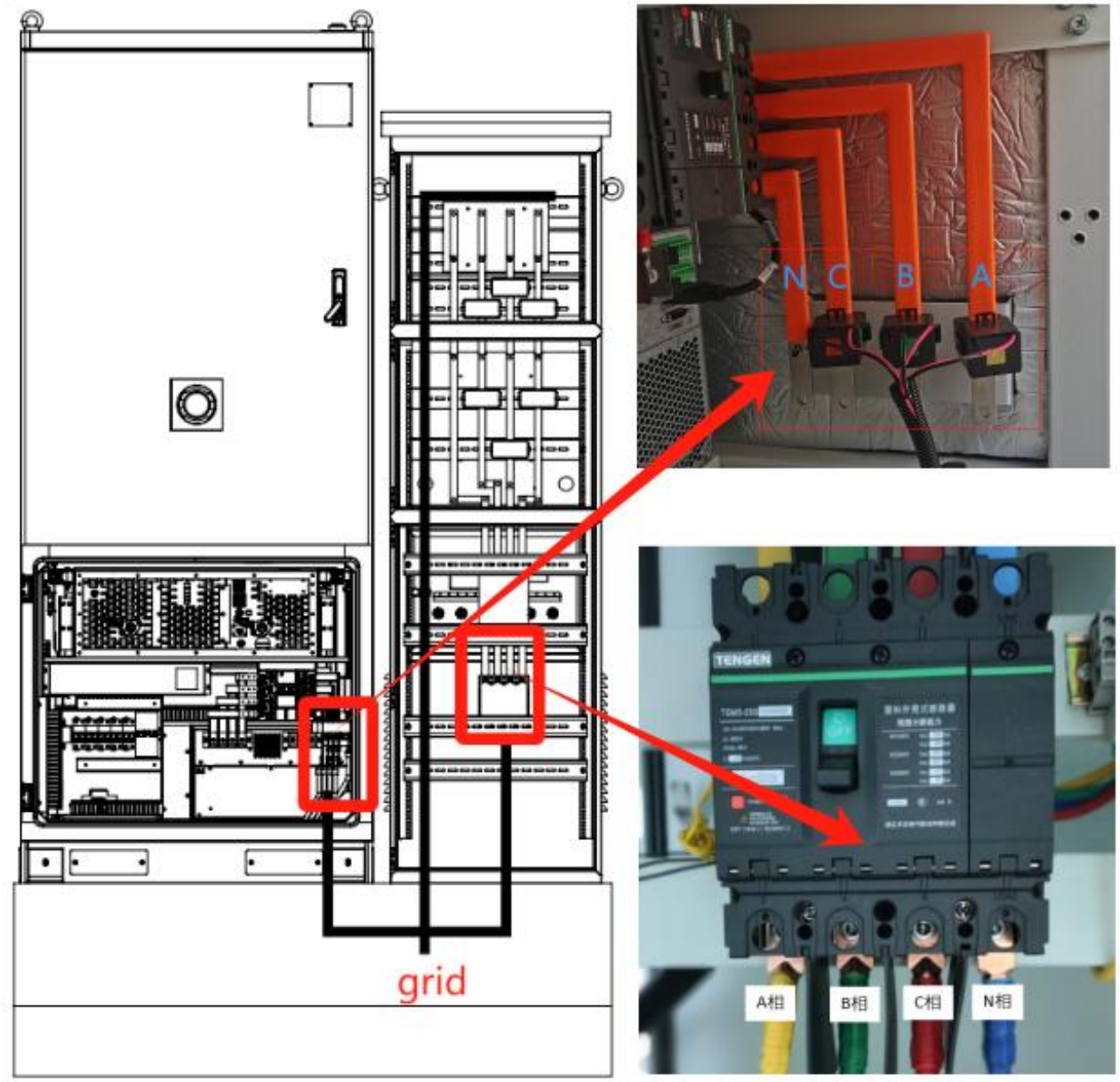


Figure 5.13 Grid Wiring Diagram

(3) Grid-connected cabinets (reclosing, anti-islanding and grid-connected meters) and anti-reverse current meter communication connections

① Upper: Top indicates the upper terminal of the double-layer terminal block; Lower: Bottom indicates the lower terminal of the double-layer terminal block; the lower terminal of the terminal block of the grid-connected cabinet, the labeling here refers to the lower terminal. As shown in Figure 5.14 and Figure 5.15.

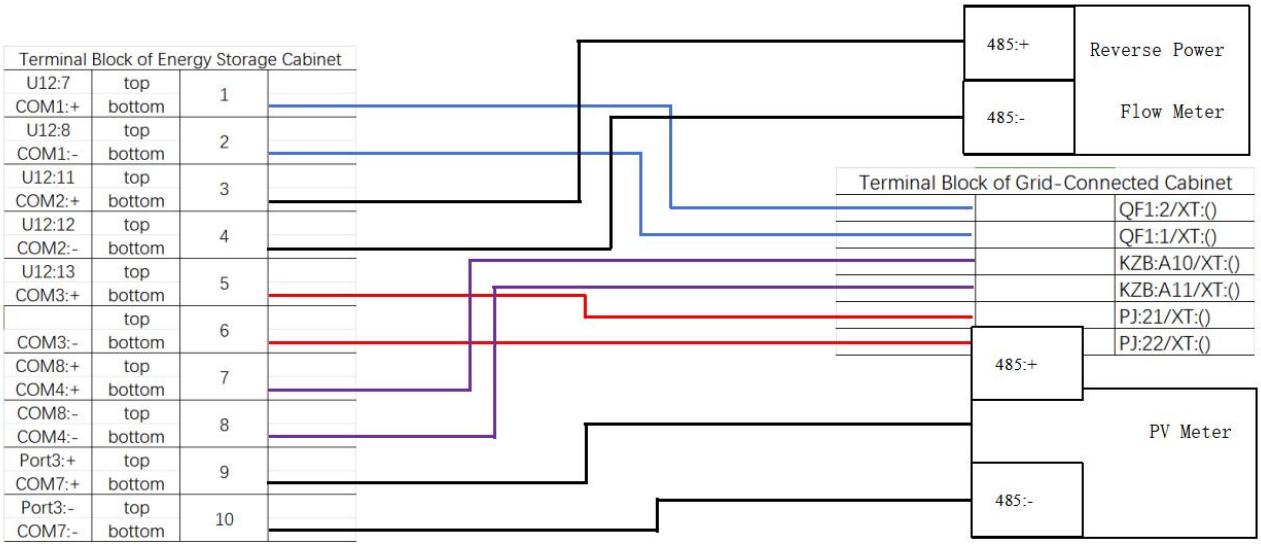


Figure 5.14 Port Principle Diagram

Figure 5.15 Port Diagram

② Top: The top identifies the upper terminals of the double-deck terminal block. Bottom: The bottom identifies the lower terminals of the double-deck terminal block.

③ The lower terminals 1 and 2 of the double-wired terminal block at the rear of the energy storage cabinet are connected to the sixth and fifth last terminals of the grid-connected cabinet, respectively.

④ Terminals 3 and 4 on the lower level of the double terminal strip at the rear of the energy storage cabinet are connected to terminals 21 and 22 of the inverse power meter, respectively.

⑤ The lower terminals 5 and 6 of the double terminal block at the rear of the energy storage cabinet are connected to the penultimate and penultimate terminals of the grid-connected cabinet respectively.

⑥ The lower terminals 7 and 8 of the double-wired terminal strip at the rear of the energy storage cabinet are connected to the penultimate fourth and penultimate third terminals of the grid-connected cabinet, respectively.

⑦ Terminals 1 and 2 (lower level, double terminal strip, rear panel of ESS cabinet) should be connected to: terminals 21 (A+) and 22 (B-) of the inverse active power meter, or the RS-485 communication port (A+/B-) of the PV inverter.

⑧ The upper terminals 1 to 5 of the double terminal strip at the rear of the energy storage cabinet are the parallel connection terminals for the PCS units inside the energy storage cabinet. In projects requiring off-grid parallel operation, these terminals must be connected to each other in all storage cabinets, as shown in Figure 5.16.

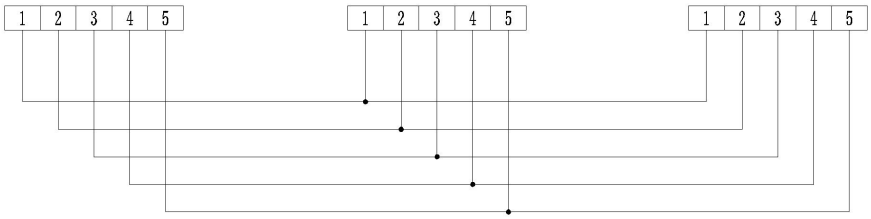


Figure 5.16 PCS Port Diagram

⑨ For the terminal strip in the grid-connected cabinet, the labeling refers to the bottom (lower level) terminals. Port 21 is 485:+ and port 22 is 485:-, as shown in Figure 5.17.

Figure 5.17 Diagram of Electrical Meter Port

⑩ Anti-reverse current meter setting, key description as shown in Table 5.5 below, parameter setting: meter address is set to "2" as required, current ratio is set according to the installation specifications of the transformer.

Table 5.5 Key descriptions

Key icon	Key Name	Key Function
	Voltage and current class up button	View voltage and current in the view screen Upward flipping and blinking shift in the programming interface
	Power class down button	View power in the view screen Flip down and modify blinking bits in the programming interface
	Electricity Programming OK button	View the power in the view screen Press and hold 3S to enter/exit the menu Short press OK in the programming screen to save the settings

Chapter 6 system operation

6.1. Personnel protection

Relevant operators must wear personal protective equipment (PPE) such as insulated gloves, goggles, safety gloves, helmets and safety shoes as shown in Figure 6.1.

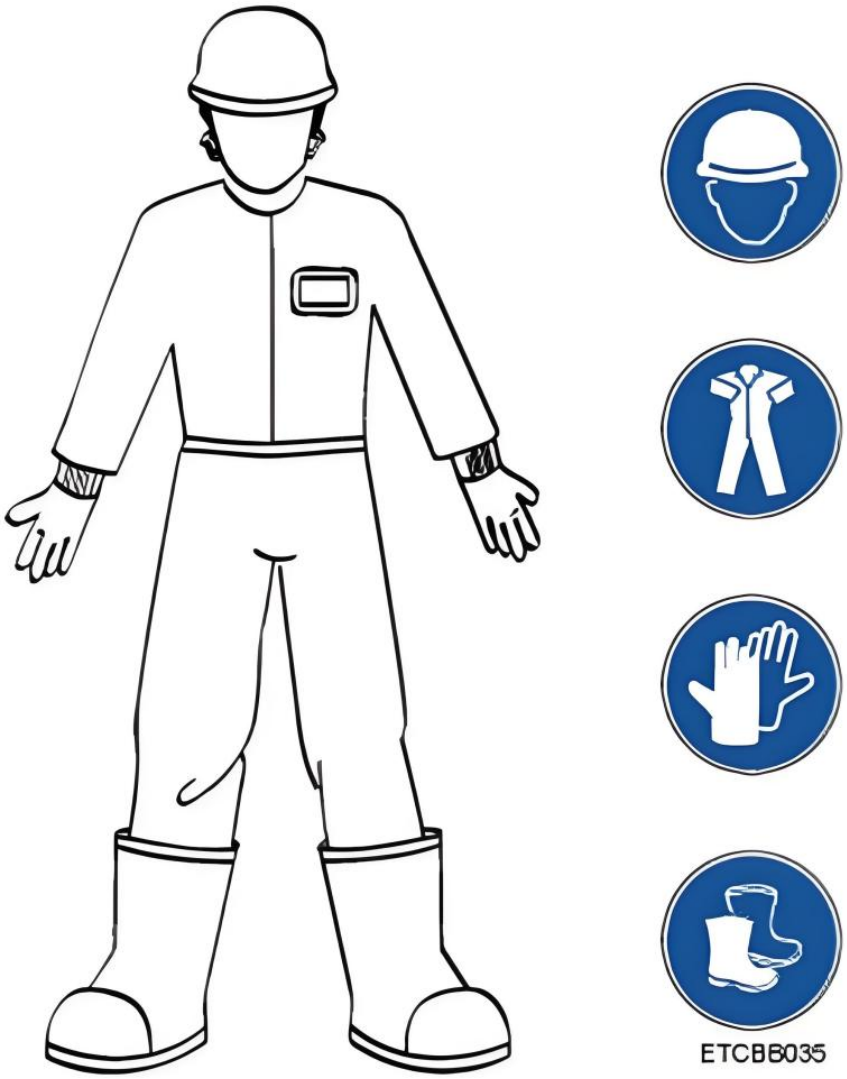


Figure 6.1 Illustration of Protective Equipment

6.2. Pre-opening check

Confirm the switching status as shown in Table 6.1 before turning on the power. Check the status of each switch listed in the table and put a warning sign "Commissioning/Maintenance, No Closing" on the operating position of the equipment; meanwhile, lock the grid-connected cabinet to prevent other personnel from misoperation.

Table6.1 Internal switch status check

serial number	Switch Name	switching state
1	Grid Tie Cabinet Load Circuit Breaker	turn off (electric switch)
2	QF4 (cabinet main switch)	turn off (electric switch)
3	QF3 (distribution main switch)	turn off (electric switch)
4	QF2 (switching power supply)	turn off (electric switch)
5	QF5 (Surge Protector)	turn off (electric switch)
6	QF6 (high voltage box)	turn off (electric switch)
7	QF8 (UPS)	turn off (electric switch)
8	QF9 (liquid cooler)	turn off (electric switch)
9	QF10 (fan)	turn off (electric

		switch)

6.3. Power-on operation

(1) The operation must be performed by a professional electrical technician in compliance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the instructions in 6.1 above.

(2) In the process of powering up, it should be observed while powering up, and the abnormal phenomenon is found that the battery is immediately powered down, and the reason is identified and solved.

The battery should be powered up immediately when abnormalities are found, and the causes should be identified and solved.

Sequence of operations:

Step 1: Close the load circuit breaker of the grid-connecting cabinet, as shown in Figure 6.2.

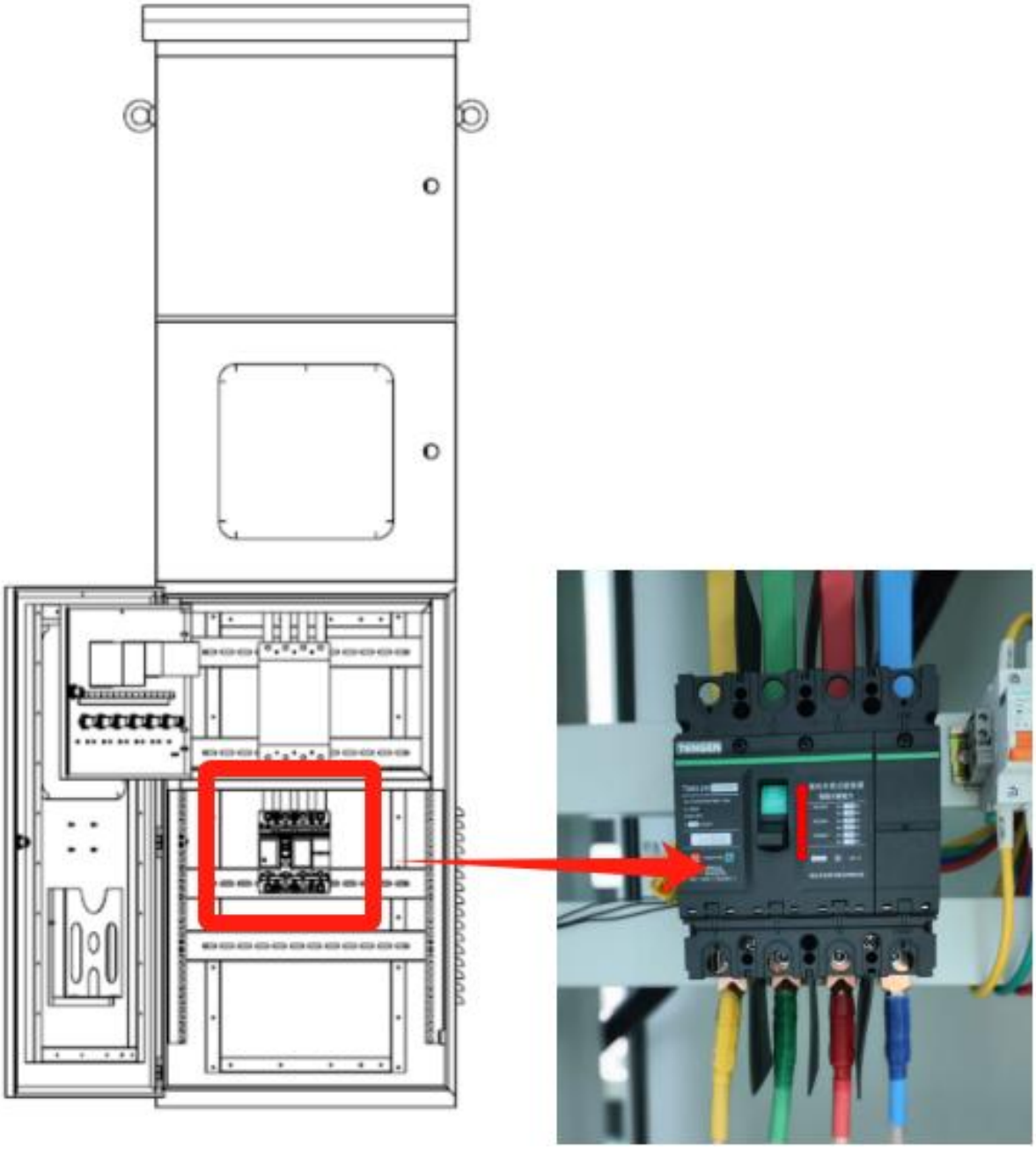


Figure 6.2 Grid-connected cabinet load circuit breaker

Step 2: Close QF4 (the switch between the AC side of the liquid-cooling system and the grid) as shown in Figure 6.3.

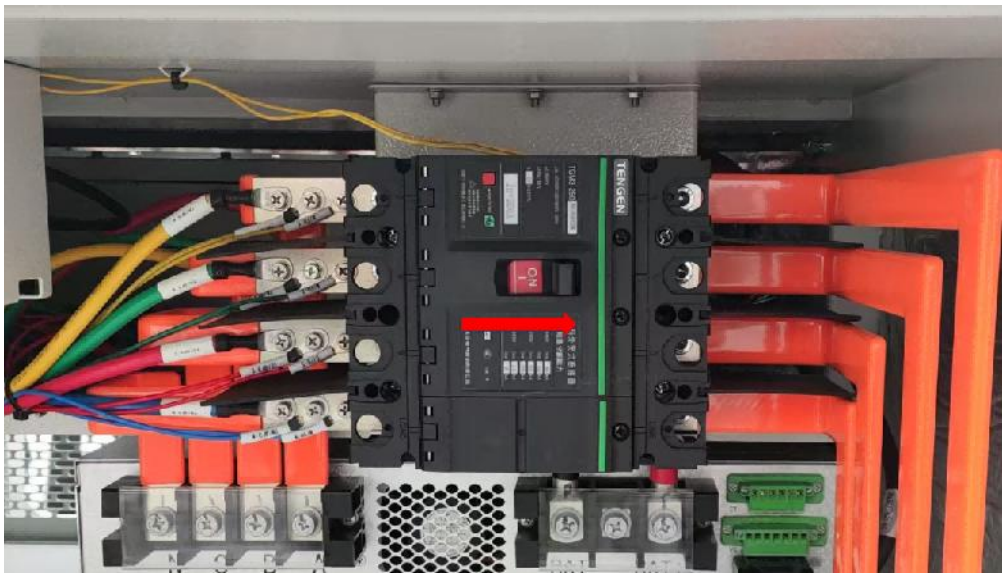


Figure 6.3 QF4 closed

Step 3: Close the switches of each component of the liquid cooling system in turn (QF3→QF2→QF6→QF10→QF5→QF9) as shown in Figure 6.4.

Figure 6.4 Switch Circuit Diagram

Step 4: Turn on the UPS by long-pressing the ON button on the UPS, as shown in Figure 6.5.

Figure 6.5 Turn on the UPS

Step 5: Close the disconnect switch on the high voltage box as shown in Figure 6.6. The equipment components are energized as shown in Figure 6.7 Equipment Circuit Diagram.

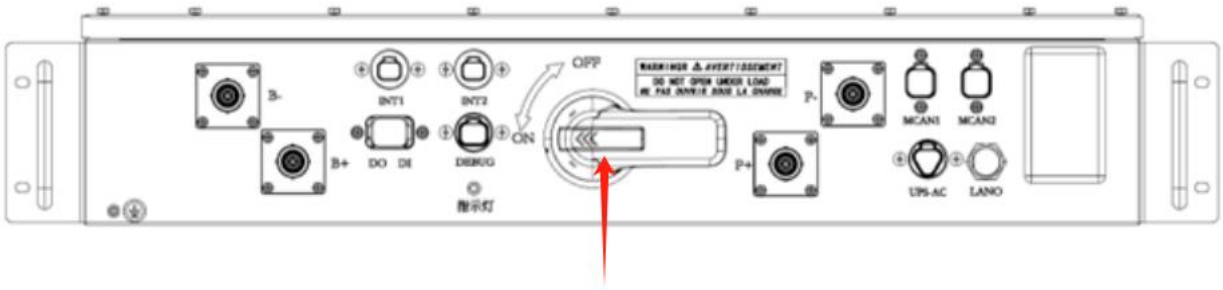


Figure 6.6 Schematic Diagram of High Voltage Box

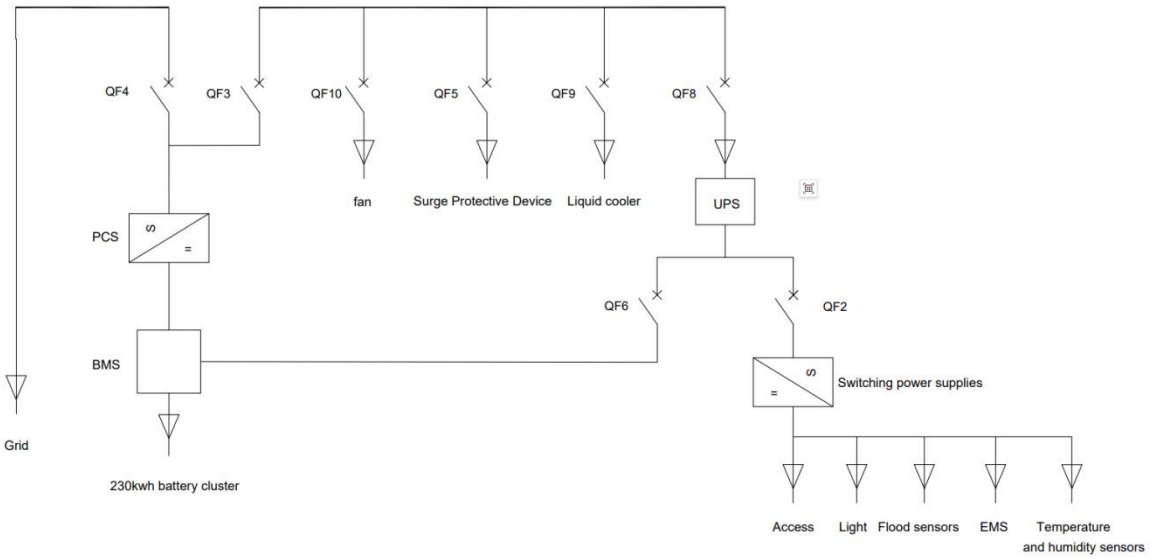


Figure 6.7 Circuit Diagram of Equipment

Step 6: Close the cabinet door.

Step 7: Login to the cloud platform and close the contactor of the high-voltage box in "Control Center - Device Control - BMS", as shown in Figure 6.8.

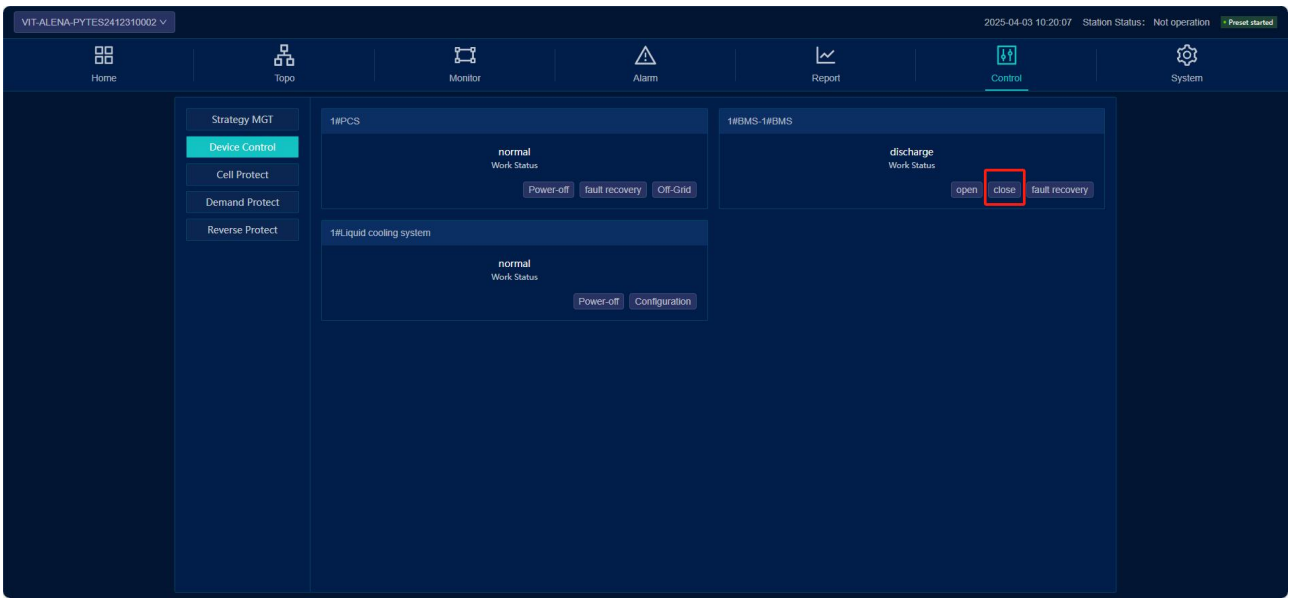


Fig.6.8 Close the high pressure box contactor

Step 8: Login to the cloud platform and turn on the liquid cooler in "Control Center - Equipment Control - Liquid Cooling Unit", as shown in Figure 6.9.

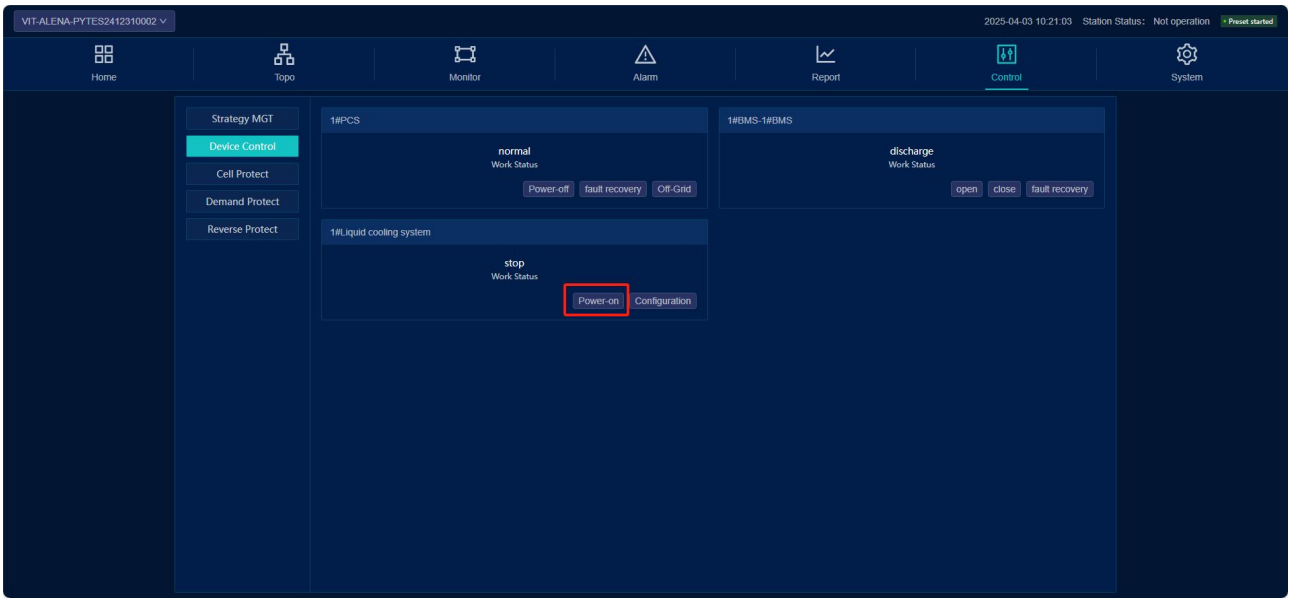


Fig.6.9 The liquid cooler starts

Step 9: Start the runtime policy.

6.4. Power-down operation

(1) The operation must be performed by a professional electrical technician in accordance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the description in 1.1 above.

(2) Prerequisites for power down, when the original operating state of the system is grid-connected, the system is connected to the grid and the system is running with power.

Sequence of operations:

Step 1: Log in to the cloud platform and stop the policy in "Control Center - Policy Management", as shown in Figure 6.10.

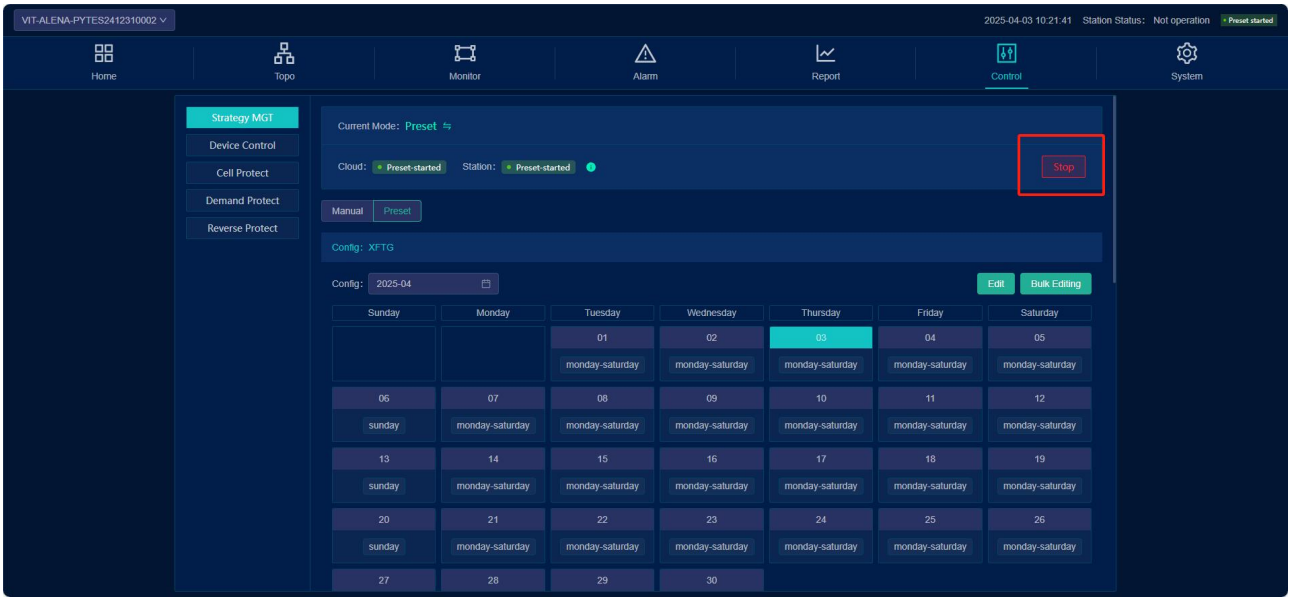


Fig.6.10 Stop strategy

Step 2: Log in to the cloud platform, and in "Control Center - Equipment Control - Liquid Cooling Unit", turn off the liquid cooling unit when its operation status is standby, as shown in Figure 6.11.

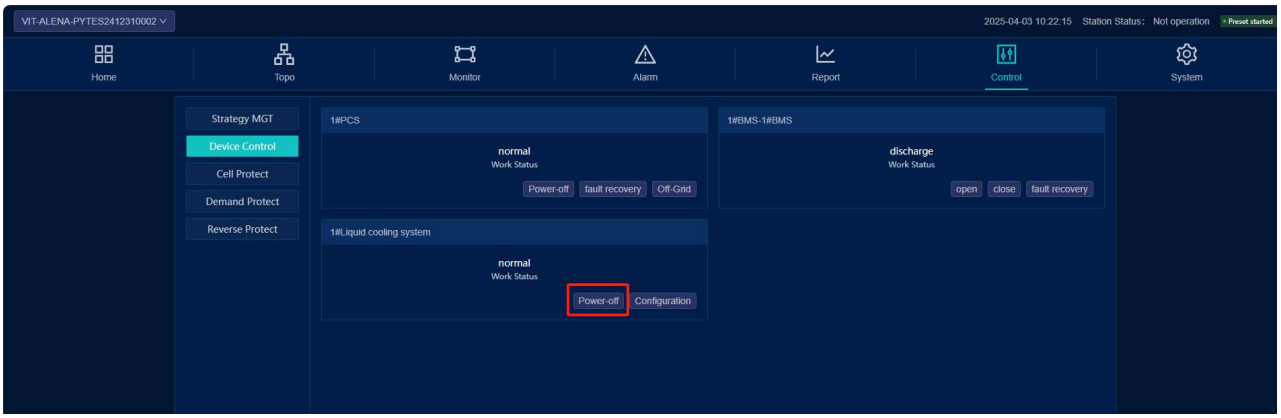


Fig.6.11 Turn off the liquid cooler

Step 3: Close the disconnect switch on the high voltage box as shown in Figure 6.6.

Step 4: Disconnect the switches of each component of the liquid cooling system in turn (QF9→QF5→QF10→QF6→QF2→QF3) as shown in Figure 6.4.

Step 5: Press and hold the OFF button on the UPS to turn off the UPS as shown in Figure 6.12.

Figure 6.12 Shutting down UPS

Step 6: Turn off QF4 (the switch between the AC side of the liquid-cooling system and the power grid) as shown in Figure 6.13.

Figure 6.13 QF4 disconnected

6.5. EMS Frequently Used Instructions

6.5.1. Web-based login

Enter your account and password (default is admin admin) in the input box and click the "Login" button to enter the system. If you are unable to log in, please contact Pytes technical support.

6.5.2. View Project Status

On the EMS home page you can see a graphical representation of the current state of the energy storage, the SOC, and the associated power. This is shown in Figure 6.14 below.

Fig.6.14 Energy storage system monitoring module status diagram

6.5.3. View device status

Entering the [Device Monitor] menu, you can check the operation status of PCS, BMS, air conditioner, meter, etc. As shown in Figure 6.15 below.

Fig.6.15 Real-time operation diagram of monitoring module equipment of energy storage system

6.5.4. View historical data

Enter the [Curve Report] menu, you can view the preset common report statistics; if you want to see other data, you can customize the curve query, the operation is as follows: the first step: click to add data; the second & third step: in the right side of the pop-up window to select the type of equipment and select the required measurement points; the fourth & fifth step: select the time period, click on the query, you can show the corresponding curve, as Figure 6.16.

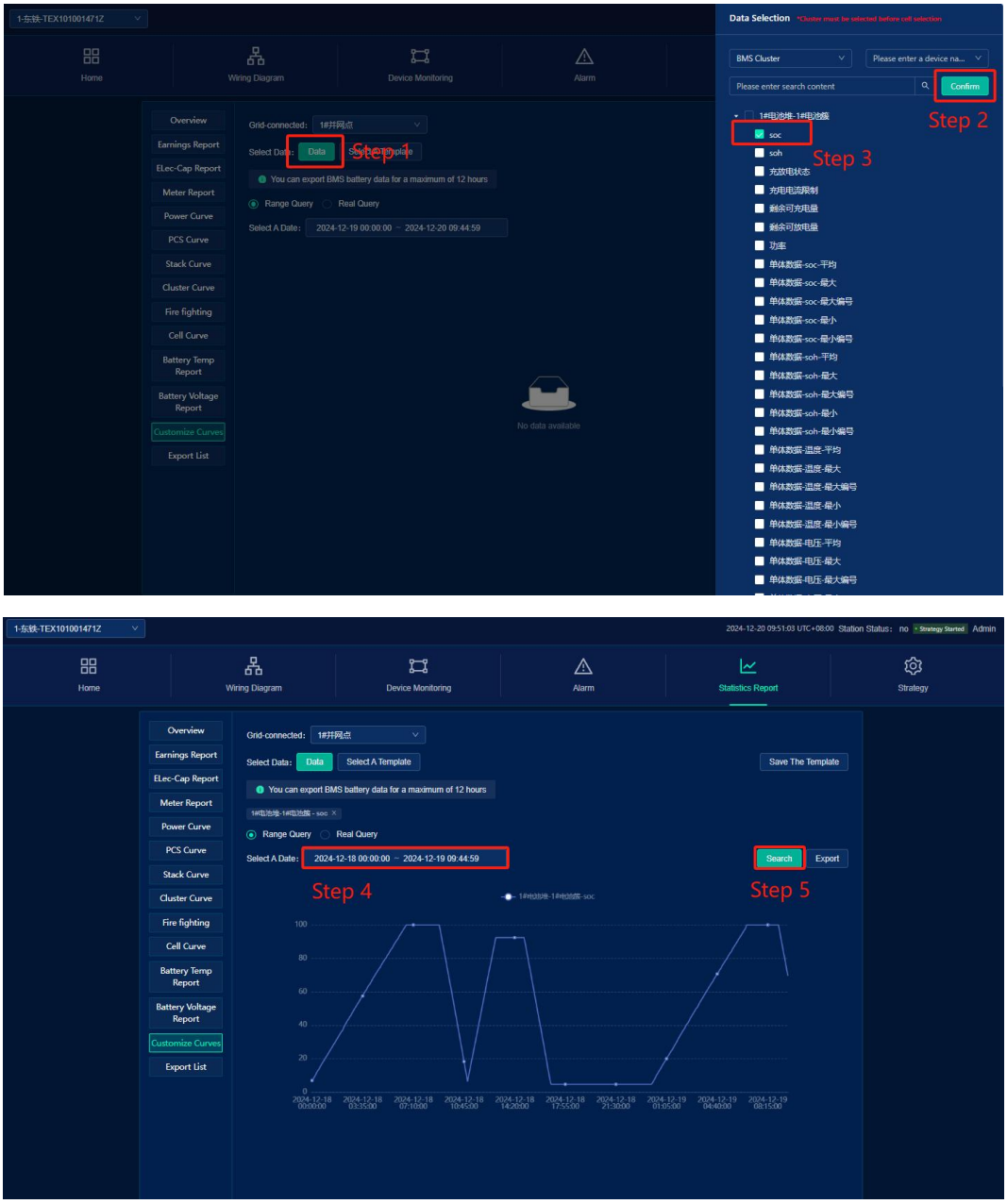


Fig.6.16 Energy storage system monitoring module to view the historical data chart

6.5.5. Configuration Policy

When you enter the [Policy Management] module, for security reasons, you need to enter the password and click "OK", as shown in Figure 6.17 below. If the password is correct, you can enter the module, and the password is issued by the platform together with the account password. If you are not sure about the password, please consult your platform administrator or our commercial staff.

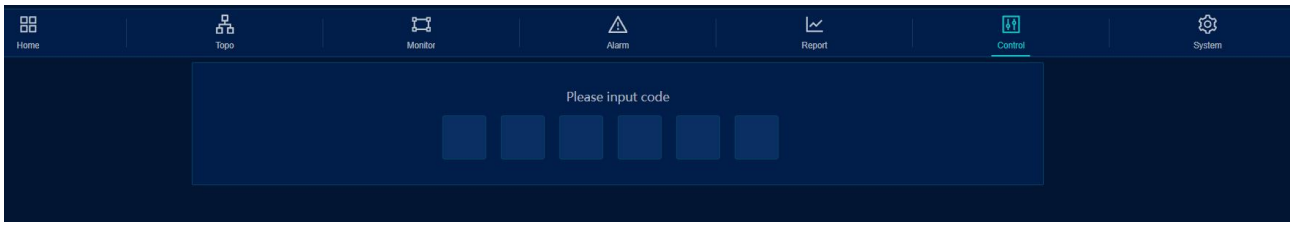


Fig.6.17 Password entry

The system supports two modes and can be freely switched: manual policy and preset policy, as shown in Figure 6.18.

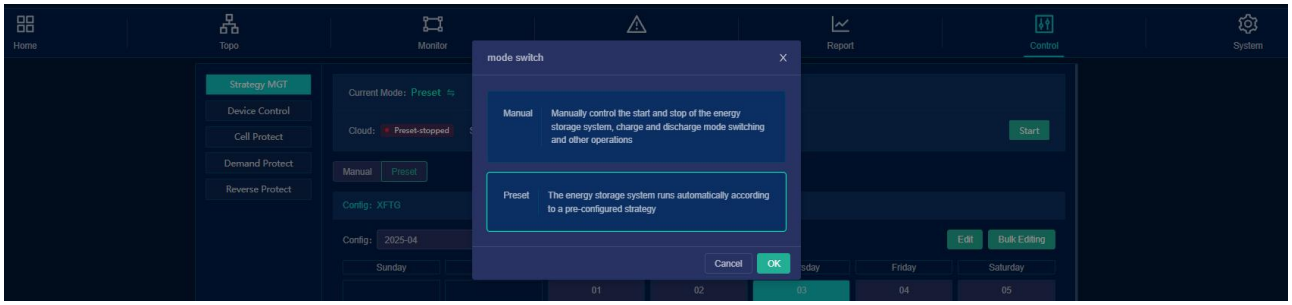


Fig.6.18 Type of policy

Manual strategy mode: operation and maintenance personnel manually control the energy storage system start and stop, charging and discharging mode switching and other operations. The interface also displays real-time operation core data for easy monitoring, as shown in Figure 6.19.

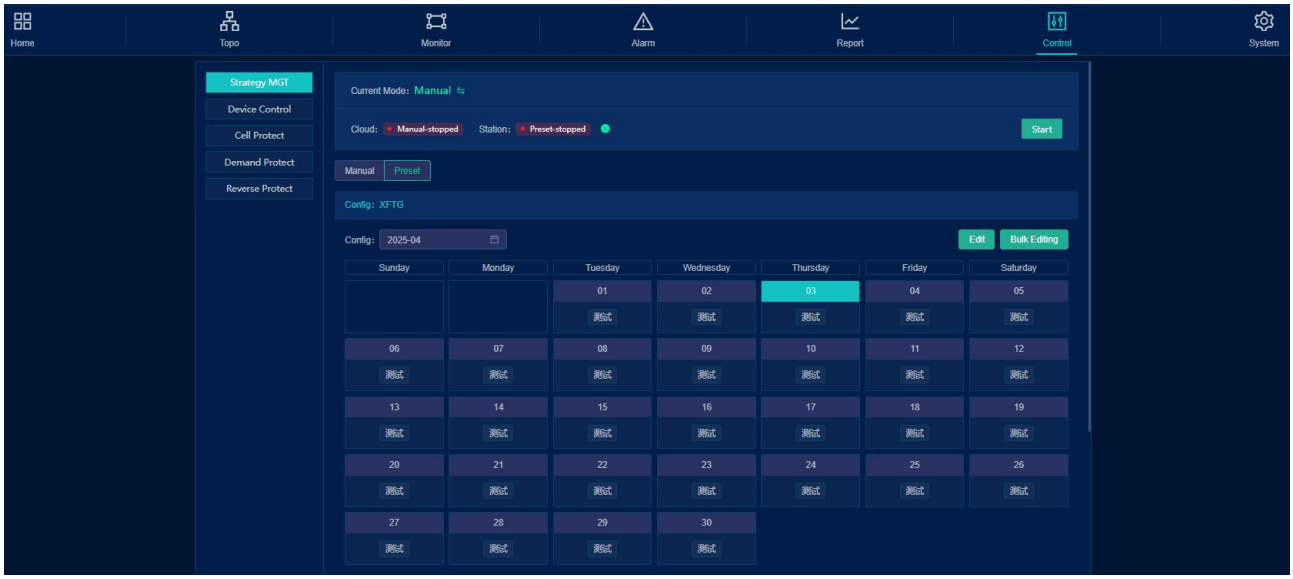


Fig.6.19 Manual strategy

Pre-configured strategy mode: The energy storage system runs automatically according to the pre-configured strategy, supports a variety of common strategies, and after the initial configuration, you can enter the operation. In the strategy home page, you can view all the strategies that can be configured for use in this station, and synthesize the intelligent execution of multiple strategies. In the peak shaving and valley filling strategy page, it realizes the configuration of time-sharing charging and discharging strategy of the power station. When the inverse power generated by the power station reaches the limit value and lasts for a certain period of time, the inverse power protection strategy is activated. When the demand of the power station exceeds the set demand limit value, the demand control strategy is activated.

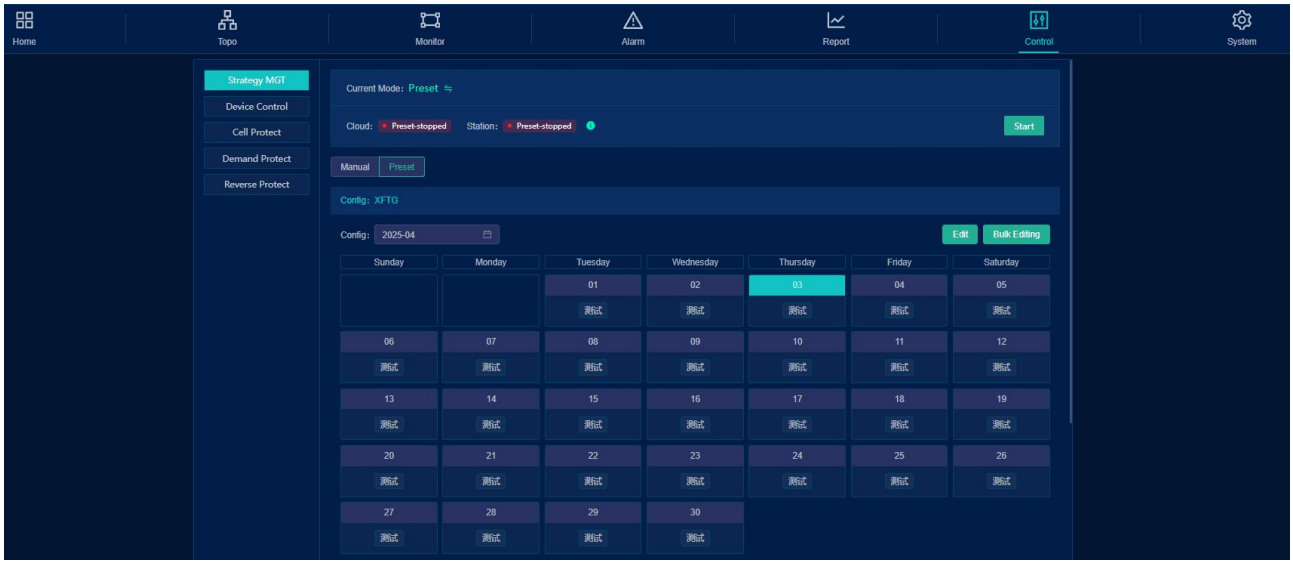


Fig.6.20 Preset strategy

6.5.6. Dispel Alarms

Step 1: Go to the Single Station Monitor of the modified site, click System Management in the upper right corner, and click Alarm Cleanup on the left side.

Step 2: Click the right side to enter the alarm clearing interface, select the date when the alarm appears, select the time period and click Query, enter the

secondary password to confirm the deletion after displaying the number of alarms, and refresh the page.

PS: If you need to delete the whole day's data, you need to select the start time 00:00 and the end time 23:59 of the time period.

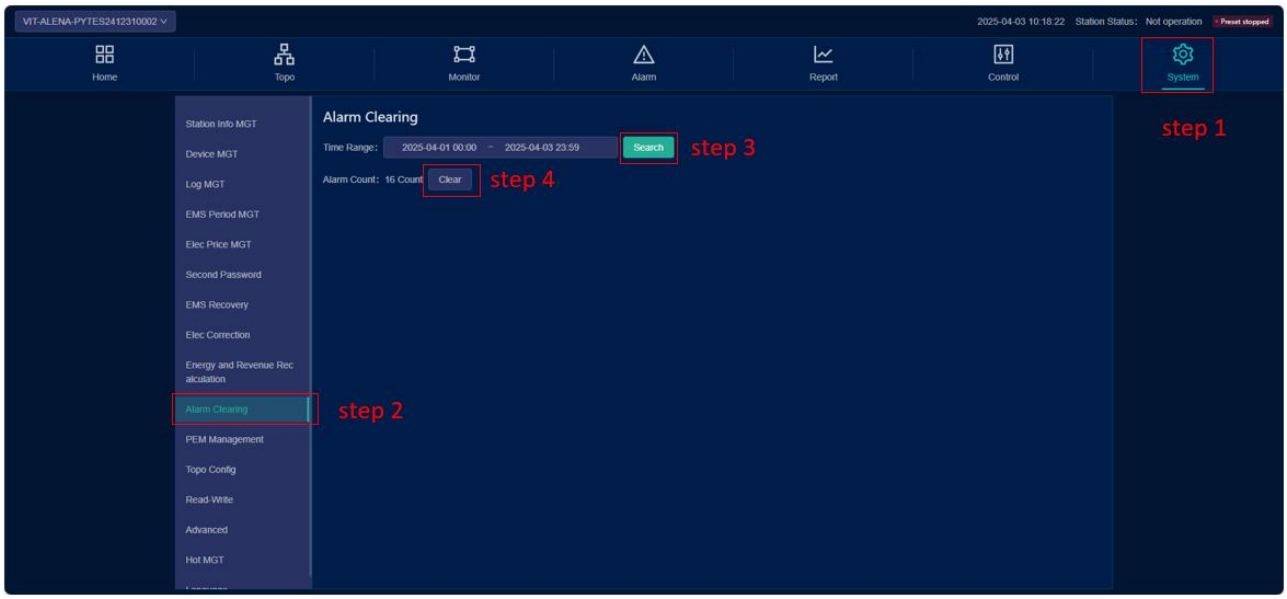


Fig.6.21 Manually clear the alerts

Chapter 7 Safeguard

Regular maintenance keeps the integrated energy storage plant in top condition and extends its service life.

CAUTION: Contact with energized parts may cause serious injury or even death. Before starting the cleaning and maintenance work, you must stop the equipment and cut off the power supply to make sure that the equipment is not in working condition; check to make sure that all the threaded connectors are tightened; the maintenance personnel is a trained and qualified professional with electrical related expertise and electrician's license; the maintenance personnel should wear personal protective equipment.

7.1. Maintenance Cycle

The maintenance intervals of the energy storage system are shown in Table 7.1

Table 7.1 Maintenance Projects and Cycles

cyclicality	Maintenance projects
Every 6 months	Check electrical connections
Every 6 months	Clean power cables
Every 6 months (increased cleaning frequency depending on the amount of dust in the environment)	Cleaning Dust Mesh
Every 6 months	Cleaning the fan
Every 6 months	Checking the appearance of equipment, ventilation and airtightness of equipment rooms
Every 6 months	Checking PCS operational and historical parameters

Every 6 months	Measuring the temperature rise of power cables
Every 6 months	PCS maintenance
Every 6 months	Liquid Cooling System Maintenance

7.2. Check electrical connections

Regularly check electrical connections for firmness and reliability. Inspect the Prefabricated Generating Station every 6 months. Locations to be inspected include:

① Before performing maintenance, always make sure to disconnect all power sources to prevent electric shock;

② Check the connection of the medium-voltage cables to see whether the bolts at the cable connections are loose, as well as whether there are phenomena such as melting, blackening, corrosion, etc.; if any of the above occurs, tighten the bolts or replace them with bolts of the same specifications in a timely manner;

③Check whether the copper bar and cable connection are reliable; check whether the screws connecting the cable are loose and whether there is melting, blackening, corrosion, etc.; if the above situation occurs, tighten the bolts or replace the bolts with the same specifications in time;

④ Check whether the connection of the low voltage signal cable in the DC low voltage control panel is reliable, and whether the communication cable is loose. If the cable is loose, tighten it promptly.

7.3. Cleaning the power cord

Be sure to clean the power cord every six months. When cleaning the power cord, please note the following:

① Before performing maintenance, always make sure that all power sources are turned off to avoid the risk of electric shock;

② To avoid rusting of the cable connection area, do not use conductive liquids such as water to clean the power cord, and do not use any wet cloth to clean the power cord connector;

③ Remove dust from the insulation of the power cable with a dry cloth or dry brush, and clean the metal connectors and fixing screws with a dry brush;

④ The copper busbar connected to the power cable and the magnetic component connector also need to be cleaned of dust;

⑤ If any of the fixing bolts are rusty, replace them promptly.

7.4. Clean Dust Wipes

Be sure to clean the dust wad every 6 months. When cleaning and replacing the dust wad, please note the following:

① Before cleaning and replacing the dust wadding, always make sure that all power sources are turned off to avoid the risk of electric shock;

②The dust screen contains the front door dust screen and the rear door dust screen of the electrical compartment;

③ Use a wrench to remove the four bolts of the dust screen guard to open the guard and remove the dust screen as shown in Figure 7.1 ;

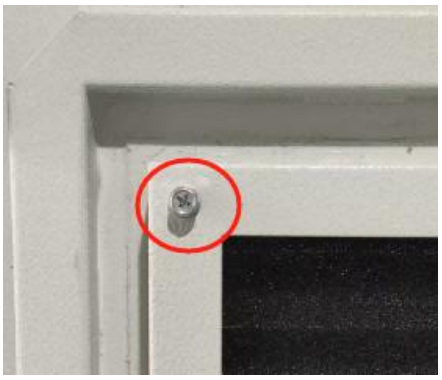


Figure 7.1 Guard Plate Bolt

④ Use an air gun or water to clean the dust and dirt on the dust screen, as shown in Figure 7.2;

Figure 7.2 Clean Dust-Proof Screen Mesh

⑤ Re-fasten the dust net after cleaning it.

⑥Shorten the cleaning cycle of the dust screen according to the dust content of the environment where the equipment is used, and replace the dust screen if it is too dusty and dirty to be completely cleaned.

7.5. Clean the fan.

Be sure to clean the fan every 6 months. When cleaning the fan, please note the following:

① Before cleaning and replacing the dust wipes, make sure that all power sources are turned off to avoid the risk of electric shock.

② Use a vacuum cleaner or air gun to clean the appearance of the fan and the blades at the dust and dirt, such as found broken fan blades, abnormal noise, unable to rotate and other abnormalities need to replace the fan.

7.6. Check device status

After the integrated energy storage plant has been in operation for 6 months, it is necessary to inspect its appearance as well as the ventilation and sealing between the equipment. Please note the following points during the inspection:

① Check the appearance of the equipment for obvious deformation, dents, cracks and rust;

② Check for foreign matter blockage in the air ducts at the air inlet and outlet of the PCS module;

③ Check whether the waterproof rubber strips of the front and rear door panels are cracked or detached.

Note: If any abnormality is found during the above inspection, please deal with it in time to avoid converter failure due to prolonged idling.

7.7. Check PCS status

After the integrated energy storage power plant has been put into operation for 6 months, it is necessary to check the operation and historical parameters of the PCS. Through the monitoring backend of the power plant or our company's monitoring backend, check the real-time data of the running PCS to see if there is any abnormality in voltage, current, power, power factor and other related data. In addition, check its historical records to see if there are any abnormal alarms or faults.

7.8. Measuring cable temperature

After 6 months of operation of the integrated energy storage plant, it is necessary to check the temperature rise of the PCS DC and AC power cables.

Please note the following points during the inspection:

① Use a thermal imaging analyzer to scan the DC and HV cables of the PCS in operation and check the DC and AC power cables of the equipment for abnormal temperatures. If abnormal temperatures are found in the power cables, take prompt action to prevent major malfunctions;

② In the case of an abnormal increase in temperature of power cables, be sure to disconnect all power sources while handling the fault to avoid the risk of electric shock.

7.9. PCS Maintenance

Perform maintenance on the PCS every 6 months while the equipment is in use. Maintenance requirements and procedures are listed below:

① Before cleaning and replacing the dust wadding, ensure that all power sources are turned off to avoid the risk of electric shock.

② Check the PCS ground connection; the electrical connection of DC input and output; and the electrical connection of AC input and output are normal and not loose.

③ Dust and debris should be cleaned from the terminals and PCS intake mesh.

7.10. Liquid Cooling System Maintenance

Perform maintenance on the liquid cooling system every 6 months while the equipment is in use. The maintenance requirements and procedures are as follows:

① If fluid leakage occurs inside the Pi station 230 outdoor cabinet, stop the machine and contact a professional for repair.

②Confirm that the liquid cooler is working normally and there is no abnormal alarm state of liquid pressure. If the liquid pressure is too low for alarm, you need to refill the coolant;

③ Clean the surface of the liquid cooler of dirty dust;

④Confirm that the power cable and signal cable of the wiring panel of the liquid cooler are free from aging, breakage and other abnormalities;

⑤ Remove the dust cap of liquid cooler liquid injection port and slowly open the valve of liquid injection port to receive a small amount of coolant. Observe and confirm that the coolant is free of dirt, precipitation and algae, etc., and determine whether the coolant indexes meet the requirements as shown in Table 6.3, such as not meeting the requirements of the use of the coolant needs to be replaced.

Table 6.3 Specifications of Coolant

parameters	retrieve a value
PH value	7.5-8.5
conductivity (elec.)	200-3000 μS/cm

evaporation residue	<500 mg/dm³
sediment	<3 mg/dm³
durometer	3-8°dH (for German-speaking areas)
Ca+ Mg	0.5-2 mmol/l (for international regions)
bicarbonate	1-5 mmol/dm³ (60-300 mg/dm³)
Free carbon monoxide	<10 mg/dm³
sulfide	<0.01 mg/dm³
chloride	<50 mg/dm³
nitrate	<250 mg/dm³
nitrite	<0.1 mg/m³
CSB	<7 mg/dm³
NH4	<0.05 mg/dm³
Fe	<0.1 mg/dm³
Mn	<0.1 mg/dm³
Cu	<0.1 mg/dm

⑥ If you purchase coolant on your own, choose a coolant with freezing point lower than the lowest local temperature, recommended 40% to 50% ethylene glycol concentration, good anti-corrosion properties for aluminum, and maintain it according to the requirements of the coolant supplier. It is recommended to increase the maintenance frequency. Water-cooled piping should be observed during annual maintenance and replaced immediately if it is damaged.

The steps for adding liquid to the liquid cooler are as follows:

Step 1: Turn on the device by following the power-up procedure in section 6.3 (Note: no policy is enforced).

Step 2: Remove the liquid injection port dust cap and connect the liquid injection pump, liquid coolant and liquid cooler injection port as shown in Figure 7.3 and 7.4.

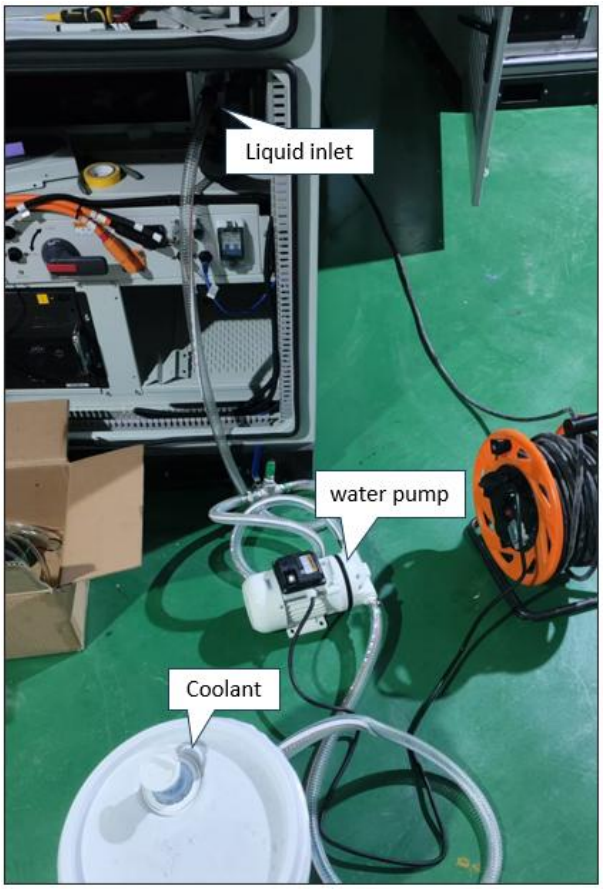


Figure 7.3 Liquid Injection Connection

Figure 7.4 Liquid Injection Connection

Step 3: Insert the exhaust pipe into the top left side of the battery compartment liquid cooling line and the other end of the exhaust pipe into the coolant container as shown in Figure 7.5.

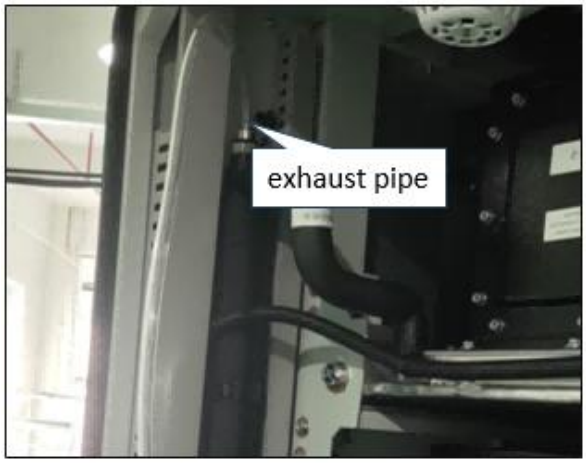


Figure 7.5 Exhaust Pipe Connection

Step 4: Open the liquid cooler injection port valve and start the pump switch, the pump began to inject liquid into the liquid cooler, liquid injection process, pay attention to the coolant page synchronization to add coolant.

Step 5: Turn on the liquid cooler through cloud control when the exhaust pipe starts to have coolant return, as shown in Figure 7.6. Add liquid process pay attention to the liquid cooler water pressure, water pressure > 2.5bar suspend the start of the water pump, until the pressure drops to 1bar when restarted.

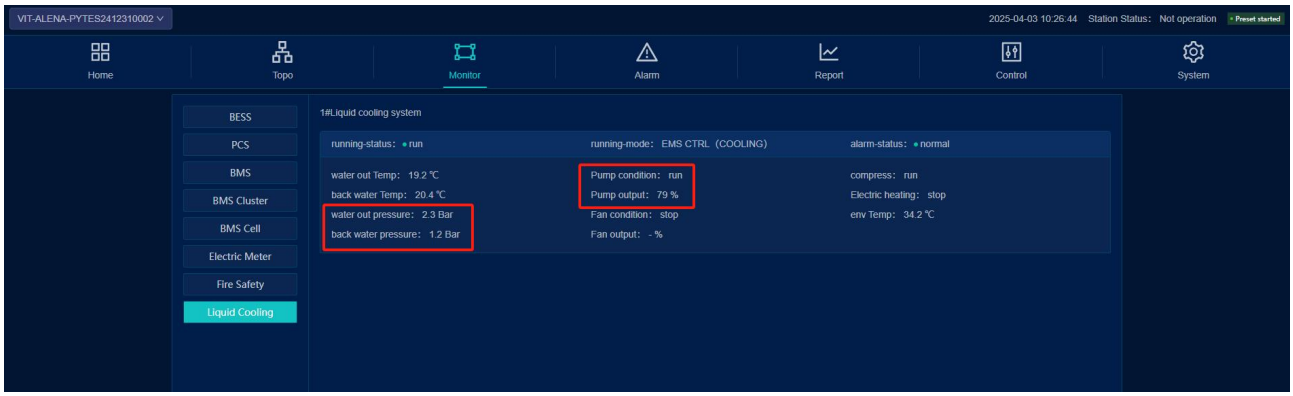


Figure 7.6 Status of Liquid Cooling Machine

Step 6: Continuously add liquid to the exhaust pipe until no obvious air bubbles flow out with the coolant, close the internal circulation of the liquid cooler, close the valve of the liquid cooler injection port and the water pump, and remove the exhaust pipe when the static pressure of the liquid cooler drops to 1 bar.

Step 7: Remove the water pump hose, liquid cooler water injection port cover the dust cap, as shown in Figure 7.7, to complete the addition of liquid.

Figure 7.7 Liquid cooling machine injection port

7.11. System Storage Requirements

(1) Store on a level floor with the door closed tightly.

(2) Temperature of storage environment: -30℃～ +60℃, relative humidity: 5% RH~95% RH.

(3) SOC interval for storage battery storage: 48%～ 51%.

(4) Perform inspections of the energy storage system every three months and keep records of the inspections.

(5) Do battery maintenance on the system every three months to prevent causing battery damage.

(6) Before the first use of the long-playing system, in order to activate the battery system needs to do at least one full charge, in order to restore the performance of the battery to the best state.

7.12. Battery Maintenance

Maintenance procedure

Option 1 (recommended when the battery system SOC is at the low end)

(1) Discharge the battery system to the cut-off condition (average cell voltage ＜ 3.1V or minimum voltage＜ 2.8V), then stop discharging and leave it for 1 hour.

(2) Automatic full charging of the battery system (maximum cell voltage > 3.6 V), after charging, leave for 1 hour.

(3) Stop discharging the battery system to 50%.

Option 2 (recommended when battery system SOC is at the high end)

(1) Automatic full charging of the battery system (maximum cell voltage > 3.6V), after charging, leave it for 1 hour.

(2) Discharge the battery system to the cut-off condition (average cell voltage ＜ 3.1V or minimum voltage＜ 2.8V), then stop discharging and leave it for 1 hour.

(3) Stop charging the battery system to 50%.

7.13. Battery Cluster Replacement

The battery cluster replacement procedure and requirements are as follows:

(1) The operation must be performed by a professional electrical technician in accordance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the description in 1.1 above.

(2) De-energize the equipment (refer to 6.4 for operating procedures), ensuring that the grid-side distribution circuit breaker is in the disconnected state and that both the AC and DC disconnect switches are in the disconnected state.

(3) Disconnect the battery cluster from the liquid cooling line as shown in Figure 7.8.

Figure 7.8　Disconnecting the water pipe connection

（4）Remove the battery cluster power and communication harnesses, and remove the front and rear battery cluster retaining bolts and front bezel as shown in Figure 7.9.

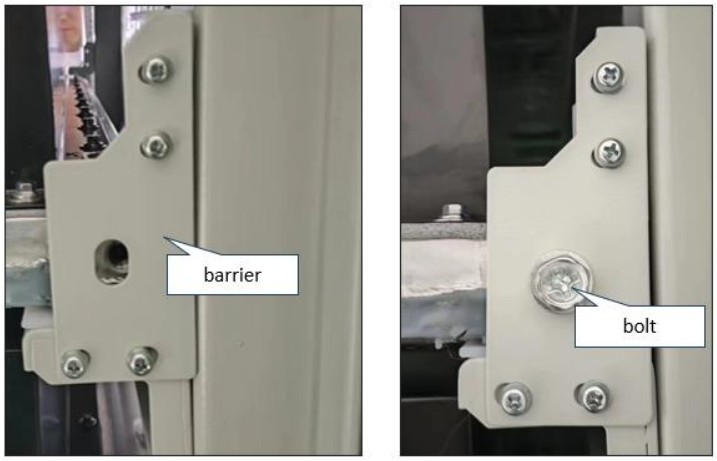


Figure 7.9　Bolt and Damper Plate

(5) Remove the old battery using a forklift in conjunction with the Battery Cluster Installation Tool, as shown in Figure 7.10.

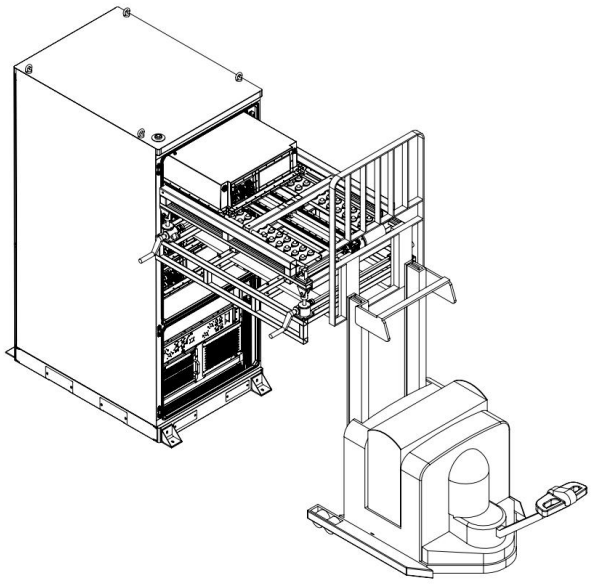


Figure 7.10 Battery Cluster Loading and Unloading

(6) Install the new battery cluster into the storage cabinet as shown in Figure 7.11.

(7) Reconnect the battery cluster power harness, communication harness, and liquid cooling lines to complete the battery cluster installation, as shown in Figure 7.11.

Figure 7.11 Installation Status of Battery Clusters

7.14. Maintenance of firefighting systems

Open the cabinet door and observe that the temperature and smoke sensors are clean and undamaged in appearance;

Low voltage on the outdoor cabinet, observe the temperature and smoke sensor indicators flashing every few seconds, i.e., normal operating conditions.

Chapter 8 Site Description

8.1. Site Selection Requirements

(1) The installation level should be higher than the highest historical water level in the area and at least 300mm above the horizontal ground level, and the installation location should not be in a low-lying area.

(2) The energy storage system or energy storage plant must be located in an environment free from the risk of ignition and explosion.

(3) Choose a well-ventilated place.

Site locations should avoid scenarios that are not recommended by industry standards and regulations, including, but not limited to, the following lots, districts, and places:

(1) Strong vibration, strong noise sources and strong electromagnetic field interference areas.

(2) Places that produce or have dust, fumes, harmful gases, corrosive gases, etc.

(3) Places that produce or store corrosive, flammable and explosive substances.

(4) Places with underground facilities.

(5) There are rubber soil, weak soil layer and other adverse geological conditions, easy to accumulate water and easy to sink the ground.

(6) Cisterns, water landscaping, and underneath water intake houses.

(7) Earthquake faults and seismic zones with an intensity of defense higher than nine degrees.

(8) Sections with direct hazards such as mudslides, landslides, quicksand, and caves.

(9) Within the boundaries of mining trap (misalignment) zones.

8.2. Space requirements

The minimum space requirements for installing O&M are shown in Figure 8.1 below.

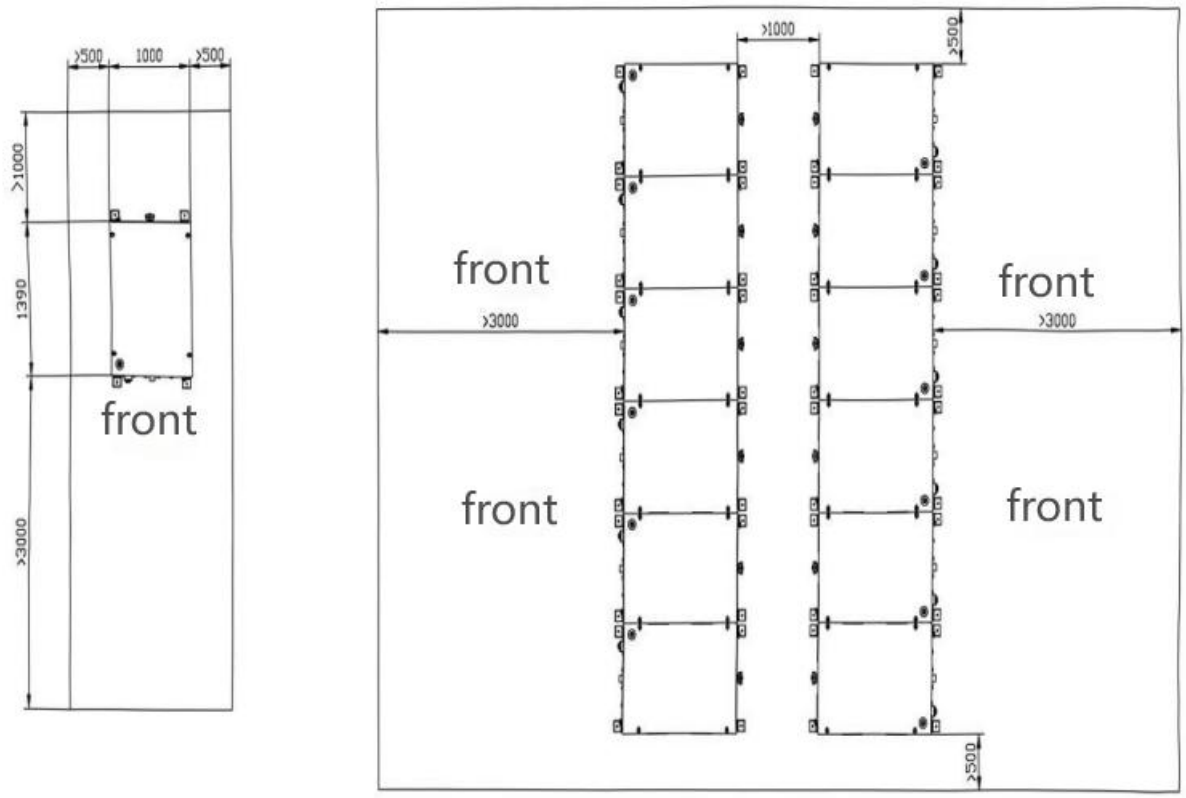


Fig.8.1 Installation space diagram

8.3. Foundation requirements

(1) The energy storage system must be installed on concrete or other noncombustible surfaces, and the mounting plane must be level, firm, and flat with sufficient bearing capacity.

The installation plane must be level, firm, and flat, with sufficient bearing capacity, and depressions or tilting are prohibited.

(2) The foundation plan is not to be taken as final construction drawings and is for reference only, please contact our product manager for details.

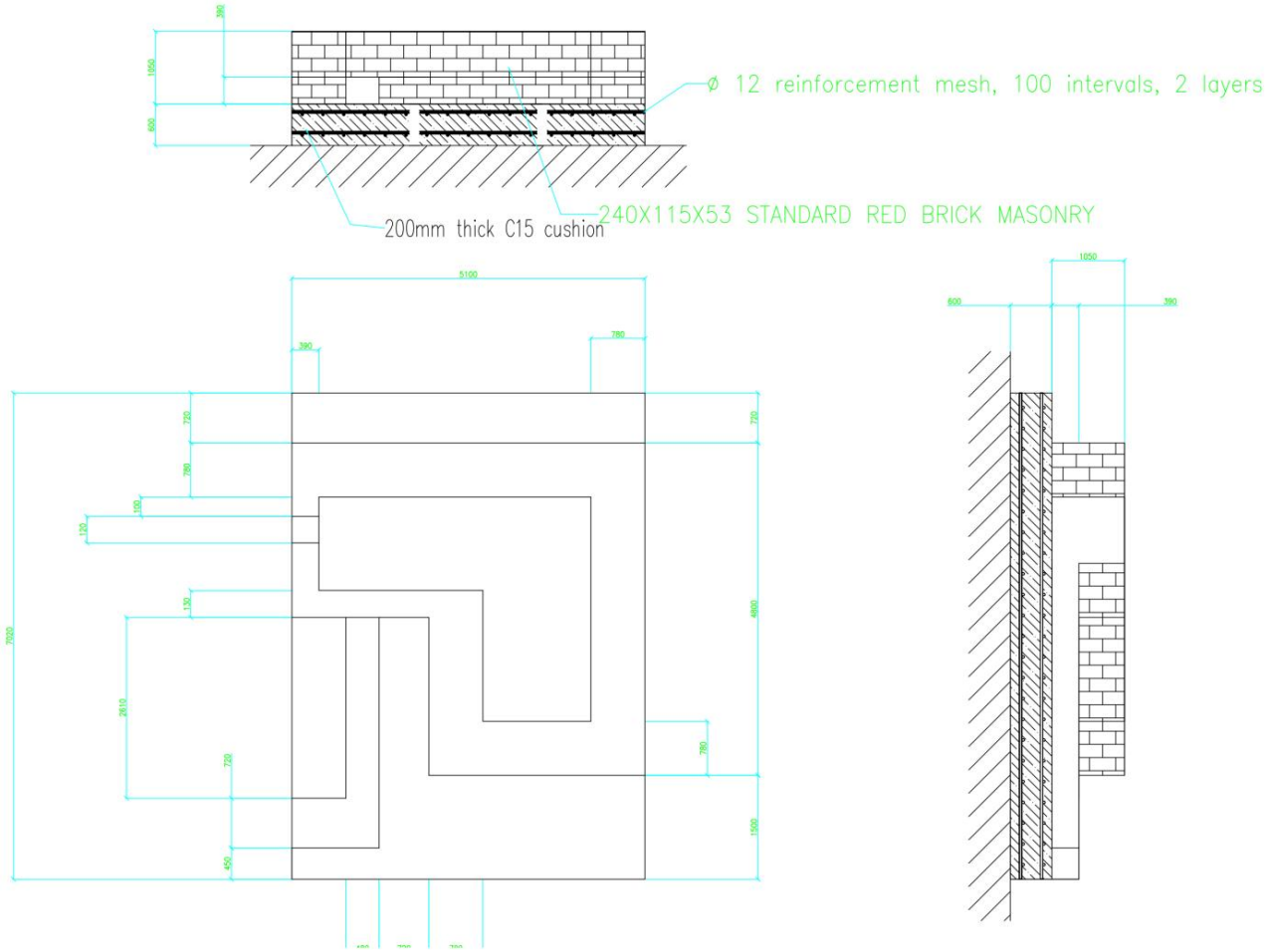


Fig.8.2-1 ground plot

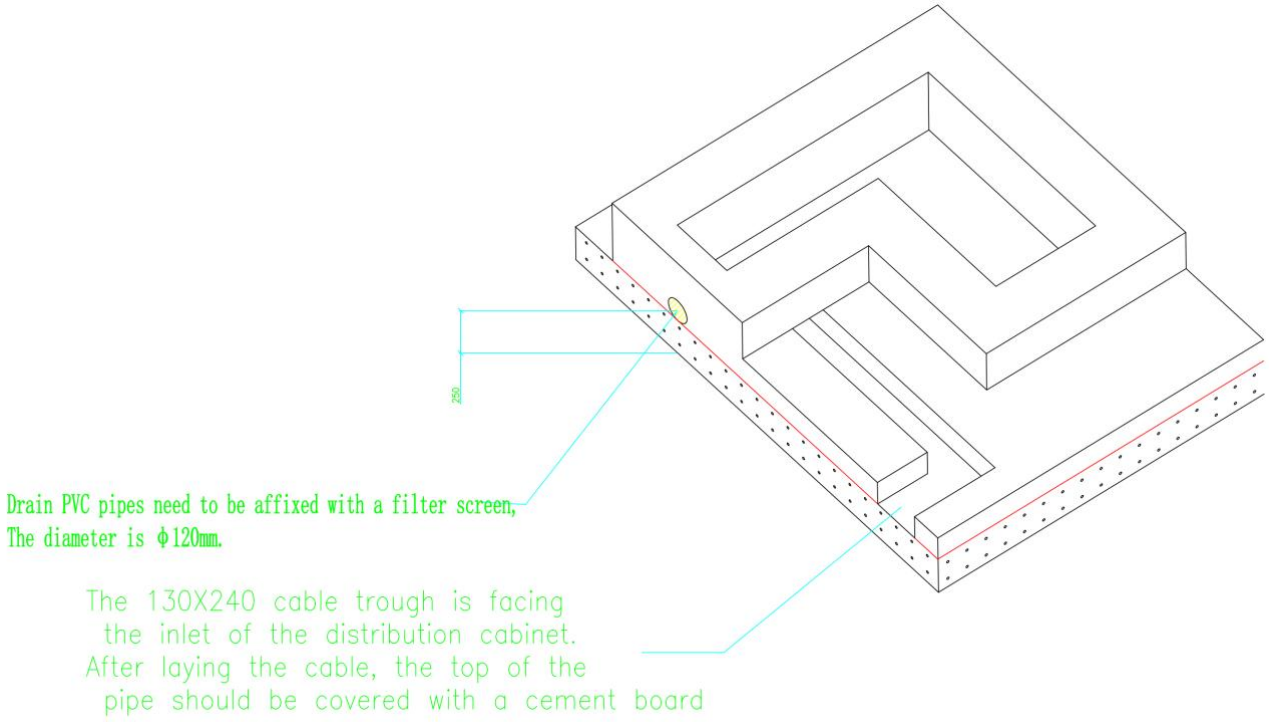


Fig.8.2-2 ground plot

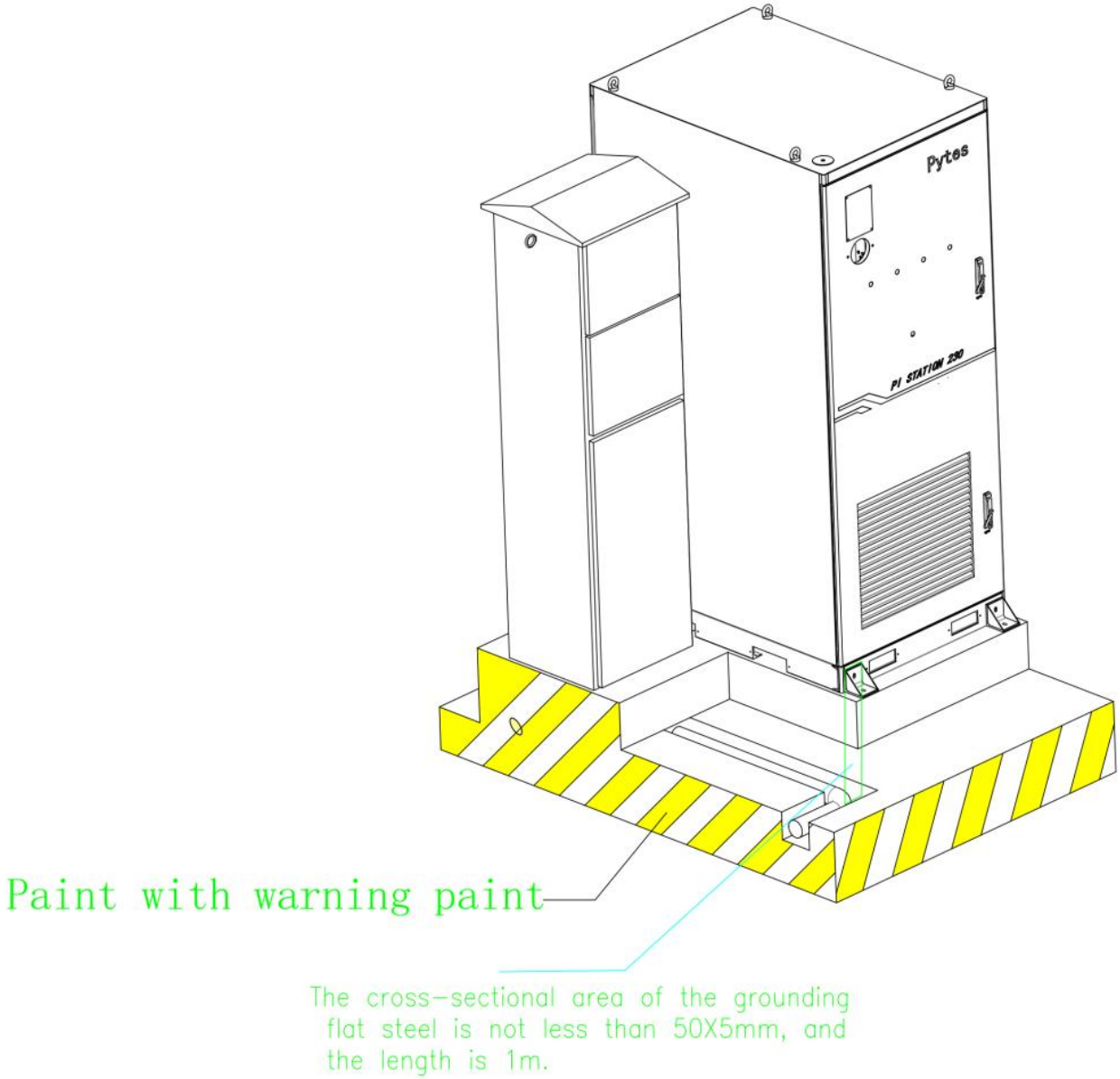


Fig.8.2-3 ground plot