ZetaCube

C&I Energy Storage System
User Manual

June 17, 2025

Version: V1.3

Documentation update logs

No	Version	Revision	Revision date	Editor
1	V1.0	Primer	2025/03/15	Xue Gao
2	V1.1	Add the introduction and parameters of various components in the electrical cabinet	2025/05/06	Xiaobin Qiao/ Yunshou Qian
3	V1.2	Introduction to installation and power-on and power-off operations	2025/05/30	Xue Gao
4	V1.3	Add A4 version electrical cabinet and STS cabinet introduction	2025/06/17	Xiaobin Qiao/ Mingyang Hou

Contents

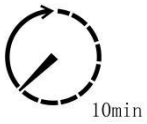
Caution

The target group of this document is operators and qualified technicians of energy storage power plants. The main content is the product introduction, use, parameters, transportation, installation, operation, maintenance instructions, etc. of the ZetaCube industrial and commercial energy storage system, which may be modified according to user or customer feedback, and you can get the latest version on the www.zetatech-energy.com. Your purchase of products, services or features, etc., shall be subject to the terms and conditions of the Company's commercial contract, and all or part of the products, services, and features described in this document may be excluded from your purchase, and the Company makes no representations or warranties, express or implied, as to the contents of this document, unless otherwise agreed in the contract. This manual is intended for operators and qualified technicians of energy storage power plants.

Warning Sign

The icons that appear in this article and in the products nameplate are paraphrased below:

	This designation means that there is a high temperature hazard here in the product, please avoid contact to avoid personal injury.
 **Danger**	Used to warn of urgent and dangerous situations that, if not avoided, could result in death or serious personal injury
 **Warning**	Used to alert to potentially dangerous situations that, if not avoided, could result in death or serious personal injury
 **Caution**	Used to alert to potentially dangerous situations that, if not avoided, could result in moderate or minor personal injury

	This logo means that the product contains a high voltage hazard inside, and touching it may cause an electric shock hazard.
	This designation means that after the system is powered off, it is necessary to wait for 10 minutes after the internal capacitor discharge is completed before the operation.
	This designation means that you need to read all the operating instructions before operating.
	This designation means that the product requires protective grounding (PE), which must be connected to the grounding wire. The connection must be firm and reliable to ensure the safety of the operator.

1. Safety operation requirements

1.1. Declaration

Before transporting, storing, installing, operating, using, or maintaining this product, read this manual thoroughly. Strictly adhere to the contents of this manual and observe all safety precautions marked on both the product and in the manual.

The contents of this manual do not imply all safety matters that must be observed. You must also comply with all relevant international, national, or regional standards.

The company assumes no liability for any violation of safety operation requirements or any failure to comply with safety standards governing the design, manufacture, and use of the equipment.

The company shall not be responsible for any of the following items or their consequences:

- Product damage caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts,

typhoons, hurricanes, tornadoes, and extreme weather;

- Product installation and usage environments that do not comply with relevant international, national, or regional standards;
- Failure to follow the operating instructions and safety warnings in the product and documentation;
- Damage caused by you or a third party entrusted by you for transportation;
- Damage caused by storage conditions that do not meet product requirements;
- Damage caused by negligence, intentional acts, improper operation by you or a third party, or not caused by us.
- Improper or unqualified installation, debugging, startup, or use.
- Insufficient ventilation and circulation, resulting in minimized cooling and natural airflow.
- Installed in corrosive environments.
- Unauthorized repair attempts.
- Failure to properly maintain the equipment.

1.2. Operator requirements

Danger

- There is a deadly high pressure inside the device!
- Observe and obey the warning signs on the device.
- Adhere to the safety precautions listed in this manual and other relevant documents for this equipment.
- Adhere to battery protection requirements and precautions.
- There is a risk of electric shock to the power supply or touchpoint, terminals, etc. connected inside the touch device!
- Special protective equipment must be used during operation, such as protective clothing, insulated shoes, goggles, helmets, and insulated gloves.

Warning

- Always use the energy storage system in accordance with this manual.
- Place visible warning signs or safety tape near the energy storage system to prevent accidents.

The lifting, transportation, installation and wiring, and operation and maintenance of the energy storage system must be carried out by professional technicians in accordance with local regulations. Operators responsible for equipment installation and maintenance must meet the following requirements:

- Received professional training related to the installation and commissioning of electrical equipment, proficient in electrical power, electronics, electrical wiring, mechanical engineering and other professional knowledge, familiar with electrical and mechanical schematic diagrams, familiar with the composition and working principle of energy storage systems and their front and rear equipment, and able to understand various potential sources and levels of danger during equipment installation, operation and maintenance;
- Must have a professional electrician construction certificate and qualification (including but not limited to electrical operation, high-altitude work and special equipment operation qualifications) recognized by the law of the region where this product is used, and be familiar with relevant local laws and regulations;
- In the event of a dangerous or unexpected situation during installation or commissioning, it has the ability to handle emergency incidents in accordance with the laws and regulations of the region where the product is used.
- Operators must first receive strict training from ZETATECH, master the correct operation methods, master the provisions of this manual, have professional class skills and a high degree of responsibility.
- When operating or maintaining the energy storage system, you need to wear hard hats, insulating gloves, insulating shoes, goggles, and metal accessories such as

watches, bracelets, rings, necklaces, etc. are strictly prohibited.

- Keep people other than those operating the equipment away from the equipment.
- It is strictly forbidden to operate with electricity during the installation process. It is forbidden to install or remove the cable with electricity. The wire and cable core will generate arcs, sparks or fire explosions when it contacts the conductor, which can lead to fire or personal injury.
- When equipment is powered on, unregulated and incorrect operation can cause fire, electric shock, or explosion, resulting in injury, death, or property damage.
- Special insulation tools must be used during operation to avoid electric shock or short circuit failure, and the insulation voltage resistance level must comply with local laws, regulations, standards and codes.
- During the operation of the equipment, if a malfunction that may cause personal injury or damage to the equipment is detected, the operation should be immediately terminated, the person in charge should be reported, and effective protective measures should be taken.
- Do not start the device without completing the installation or professional confirmation.
- It is forbidden to contact the power supply equipment directly, with other conductors, or indirectly through wet objects. Before touching any conductor surface or terminal, the voltage at the POC should be measured to confirm that there is no risk of electric shock.
- Do not let fingers, parts, screws, tools, etc. come into contact with the running fan to avoid injury or damage to the equipment.
- In the event of a fire, evacuate the building or equipment area and sound or dial the fire alarm. Under no circumstances should you re-enter the burning building or equipment area.

1.3. Equipment Safety Instructions

1.3.1. Electrical Safety Notice

Danger

- When the energy storage system fails, avoid standing within the opening range of the cabinet door and door
- It is forbidden to open the cabinet door when the system is running.
- There is a lethal high voltage inside the product!
- Do not touch the terminals or conductors connected to the grid circuit.
- Pay attention to all instructions or safety instructions regarding connection to the power grid and follow the warning labels on the product.

- The layout of the energy storage system installation must comply with the fire spacing or firewall requirements specified by local standards, including but not limited to the specifications of GB 51048-2014 Design Specification for Electrochemical Energy Storage Power Plants and NFPA 855 Installation Standard for Stationary Energy Storage Systems.
- After the power component of the energy storage system is replaced or the wiring is replaced, it is necessary to manually start the wiring detection to avoid abnormal operation of the system.
- Energy storage systems must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to avoid unauthorized personnel entering during the operation of the equipment, which may lead to personal injury or property damage.
- Before operation, initially visually inspect the equipment for damage or other hazards, check whether other external devices or circuit connections are safe, and confirm that the equipment is in a safe state before operation.
- There is a high voltage in the equipment, and accidental touch may lead to a fatal

electric shock hazard. Therefore, when measuring with electricity, you should:

•Do a good job of protection (e.g. wearing insulating gloves, wearing insulating shoes, etc.).

•At least two personnel must be present to ensure personal safety.

- When the energy storage electrical cabinet is electrically connected, practice running and other operations, in order to ensure that the electrical parameters meet the requirements, it is necessary to use relevant electrical measurement equipment.

•Select high-quality measuring equipment that meets on-site requirements, such as range and serviceable conditions.

•Make sure that the connection and use of measuring equipment are correct and standardized to avoid arcing and other hazards.

1.3.2. Battery Safety Notice

Danger

- Do not expose the battery to high temperature environments or around heating equipment, such as high temperature heat sources, ignition sources, transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, flammable gas release, thermal runaway, fire or explosion.
- It is strictly forbidden to disassemble, modify or damage the battery (e.g. inserting foreign objects, extrusion, immersion in water or other liquids), which may cause the battery to leak, smoke, flammable gas release, thermal runaway, fire or explosion.
- It is strictly forbidden to perform mechanical vibration, drop, collision, hard object piercing and pressure shock on the battery, otherwise it may cause battery damage or fire.
- It is strictly forbidden for the battery terminals to come into contact with other

metal objects, which may cause heat generation or electrolyte leakage.

For the safe use of the product, technicians should carefully read and strictly abide by the safety requirements. The company does not assume any responsibility for abnormal product function, component damage, personal safety accident, property loss or other damage caused by the following reasons:

- The battery is not charged as required, resulting in capacity loss or irreversible damage to the battery.
- The battery is damaged, dropped or leaked due to improper operation or failure to operate as required.
- The battery is not powered on in time, and excessive discharge will cause damage to the battery.
- The battery is damaged due to improper use of charging and discharging equipment.
- Batteries are often over-discharged due to improper maintenance, incorrect capacity expansion, or if they are not fully charged for a long time.
- The battery operating parameters are set incorrectly.
- Damage to the battery due to the unsatisfactory working environment of the battery.
- Customers use batteries outside the scenarios specified in this manual, including but not limited to connecting additional loads.
- The battery is not maintained according to the system manual.
- The product is damaged due to the customer's continued use of the battery beyond the warranty period.
- Product damage due to the use of defective or deformed batteries.
- Use the company's batteries with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property damage is caused by the storage or installation

of batteries containing flammable/explosive materials.

- Personal safety accidents and property damage caused by non-professional battery-related operations, or accidents or losses caused by not wearing qualified protective equipment during operation.
- Behavior such as eating, smoking, etc. near the battery causes battery damage.
- The battery was stolen.

1.3.3. Environmental requirements

Danger

- It is strictly forbidden to store flammable or explosive items in the equipment area.
- It is strictly forbidden to place the equipment in an environment with flammable or explosive gases or fumes, and any operation in this environment is prohibited.
- It is strictly forbidden to place equipment near heat or ignition sources, such as fireworks, candles, heaters, or other heating devices. Heat applied to the equipment may damage the equipment or cause a fire.

- Equipment should be stored in a suitable temperature and humidity environment, in a clean, dry, well-ventilated area, and protected from dust and condensation.
- Relative humidity: 5%~ 95%, no condensation, working environment air pressure 79.5kPa~ 106kPa;
- It is strictly forbidden to install and operate the equipment outside the scope specified in the technical specifications, otherwise it will affect the performance and safety of the equipment.
- It is strictly forbidden to install, use and operate outdoor equipment and cables

(including but not limited to handling equipment, operating equipment and cable plugging, signal interfaces connected to outdoor areas, working at heights, outdoor installation, door opening, etc.) under severe weather conditions such as lightning, rain and snow, and winds above level 6.

- It is strictly forbidden to install equipment in environments with radioactive radiation such as dust, smoke, volatile gases, corrosive gases, infrared rays, organic solvents or high salt content.
- It is strictly forbidden to install equipment in environments with metal conductive dust or conductive magnetic dust.
- Installation environment The ground should be solid, free of soft soil, soft foundation or easy to sink and other adverse geological conditions. It is strictly forbidden to choose low-lying areas or areas prone to water accumulation. The height of the site landmark should be higher than the local historical highest water level.
- If the equipment is installed in a site with dense vegetation, in addition to regular weeding, the ground under the equipment needs to be hardened, such as laying cement, gravel, etc.
- When installing, operating or maintaining equipment, clean the water, ice, snow or other debris on the top of the equipment before opening the door to prevent debris from falling into the equipment.
- When installing equipment, ensure that the installation surface is sturdy and meets the load-bearing requirements of the equipment.
- After the equipment is installed, cartons, foam, plastics, cable ties, and other packaging materials should be removed from the equipment area.

1.4. Electrostatic protection

The accumulation of static electricity may cause electric shock, fire, explosion, failure and damage of electronic devices, etc. There are circuit boards or other static

sensitive components in the energy storage system. In order to prevent or reduce the harm of static electricity, it is necessary to do a good job of static protection to suppress the generation of static electricity, accelerate the leakage of static electricity, and carry out static electricity neutralization. Its prevention methods include but are not limited to:

- When touching a device, before holding a single board, exposed circuit board module, or application specific integrated circuit (ASIC) chip, etc., please adhere to electrostatic protection specifications, wear anti-static overalls, anti-static gloves, or wristbands, and the other end of the anti-static wristband should be well grounded.
- During the process of replacing components, all uninstalled equipment and devices should be kept in the packaging bag with electrostatic shielding function, and the temporarily removed equipment and devices should be placed on the foam pad with anti-static function;
- Do not touch solder joints, pins, or exposed circuits.

2. Reference standards

EN 62477-2022	Safety requirements for power electronic converter systems and equipment
IEC 62619-2022	Safety requirements for batteries and battery packs with alkaline or other non-acid electrolytes in industrial applications
IEC 61000-6-4-2019	Electromagnetic compatibility (emc) - part 6-4: generic standards - industrial emission standards
IEC 61000-6-2-2019	Electromagnetic compatibility (emc) - part 6-2: generic standards - industrial environment general standards
FCC-15	FCC Part 15 Subpart B Radiated Emissions
UL9540A	Test method standard for thermal runaway fire propagation assessment of battery energy storage system
UN38.3	United Nations Manual of Tests and Standards for the Transport of Dangerous Goods - Code of Practice for Rechargeable Lithium Batteries

3. System introduction

3.1. System Description

ZetaCube, an industrial and commercial energy storage battery system, is composed of a battery cabinet and an electrical cabinet. It adopts a modular design and has the characteristics of rapid expansion in power and capacity to meet diverse customization needs. The battery cabinet contains 261kWh energy storage battery clusters, fire protection systems, liquid cooling systems, high-voltage boxes and other equipment. The electrical cabinet includes PCS, EMS, MPPT, STS, etc., and can provide customized demand solutions.

ZetaCube is mainly used in scenarios such as energy storage engineering, energy storage + photovoltaic systems, integrated PV-energy storage-charging stations, and microgrids. It mainly saves electricity costs for enterprises through peak-to-valley electricity price differences, demand response, and auxiliary services.

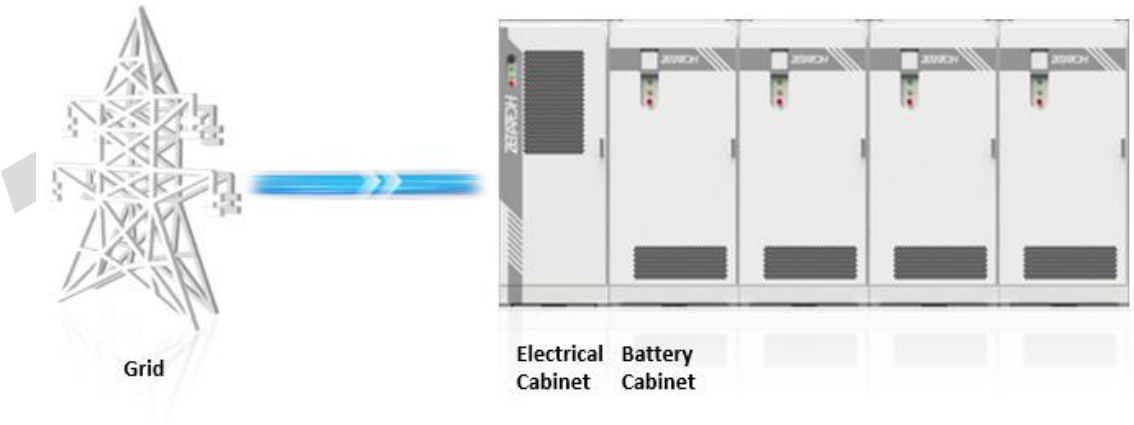


Fig 3-1 Typical application scenarios of ZetaCube

3.2. Product features

- Flexible capacity expansion

  For different capacity requirements, ZetaCube can flexibly expand capacity on the AC and DC sides. Up to 4 battery cabinets and 1 400V electrical cabinet can work in parallel, extending the system duration from the default 2 hours to 8 hours.

- Higher protection level

  The battery compartment can reach IP55 protection level and adapt to a variety of application environments. The standard cabinet anti-corrosion grade is C3H, which meets most application environments and supports customized C4, C5 and other higher anti-corrosion grades;

- Efficient liquid cooling system
  - Each battery cabinet is equipped with a liquid cooling system, which can thermally manage the battery cluster, enabling the battery to operate at the most suitable temperature range, improving the temperature balance in the cabinet and prolonging the service life of the system.
  - The liquid cooling system is isolated from the battery system in separate warehouses, and the liquid cooling unit is located at the lower part of the cabinet, which effectively avoids the risk of leakage of the liquid cooling unit and greatly improves safety and reliability.
  - By adding an anti-condensation device, the dew point temperature can be effectively reduced and the possibility of condensation can be reduced.
- Multi-level fire protection

  Each battery cabinet is equipped with a complete range of fire protection measures, including detection, fire suppression, explosion-proof, and explosion venting, to maximize the failure protection of the battery cabinet.

3.3. Application Function

（1） Peak shaving and valley filling

Users can configure the electricity price template and plan curve template according to the local time-of-use electricity price, and set the charging and discharging power in different time periods. The charging and discharging plans are arranged according to the predetermined plan curve, and the energy storage system

releases electric energy as a power source during the peak period of electricity consumption, and absorbs electric energy as a load during the trough period of electricity consumption, so as to improve the economy and safety of power grid operation.

（2） Off-grid backup power

Equipped with a bidirectional inverter and STS automatic switching device, it can switch to energy storage power supply mode within 20ms when the grid is powered off, and continuously provide power for key loads.

It supports the rapid construction of local microgrids when the power grid is completely paralyzed, and prioritizes the operation of core equipment.

It can actively cut off the mains power to simulate power outage drills to verify the reliability of the backup power system, and at the same time support the pure green power supply mode of photovoltaic + energy storage in the off-grid state, which is suitable for industrial parks with strict environmental protection requirements.

（3） Photovoltaic consumption

Photovoltaic self-generation and self-consumption: real-time detection of photovoltaic and load power, when the photovoltaic is greater than the load power, energy storage for charging; When the PV is less than the load power, the energy storage is discharged. After the energy storage is fully charged, the power of photovoltaic power generation is limited to ensure that power is not sent to the power grid, and the electricity of the grid is used as little as possible.

Residual power consumption：real-time detection of photovoltaic and load power, when the photovoltaic is greater than the load power, the energy storage is charged, until the energy storage is fully charged, the photovoltaic power generation power is limited, and the power is not reversed to the power grid.

（4） Intelligent management platform

Adopting the product architecture of cloud deployment + cloud operation and maintenance, the cloud platform integrates EMS, BMS, PCS, fire protection and other

subsystems to realize the functions of big data analysis of battery performance, refined management of power plant operation, and intelligent early warning of battery safety. The cloud platform monitors the temperature and voltage of the battery pack in the battery cluster in real time, analyzes the battery status, and immediately notifies the operation and maintenance personnel for maintenance if any abnormalities are found.

4. Product information

4.1. Model Definition

- ZetaCube System model

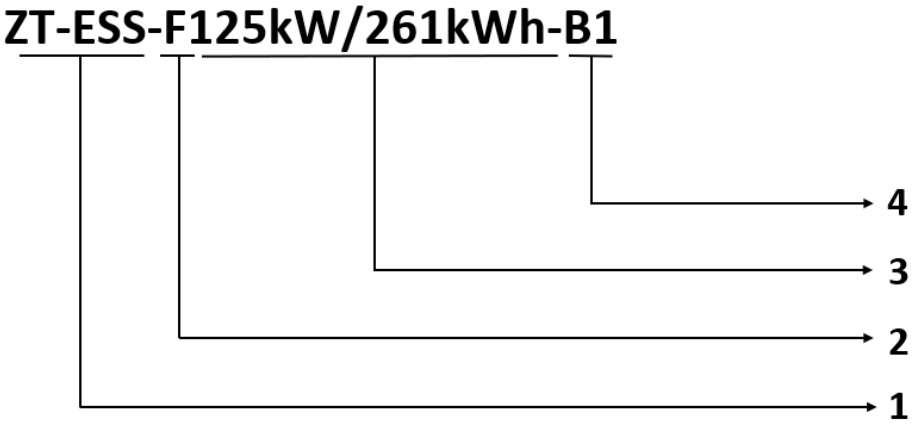


Fig 4-1 ZetaCube System model

Table 4-1 System Type Definition

NO.	Code	Definition
1	ZT-ESS	ZETATECH brand energy storage system
2	F/D/L	Market area code
3	125kW/261kWh	125kW electrical cabinet and 261kWh battery cabinet system
4	B1	Electrical cabinet code

- Battery cabinet model

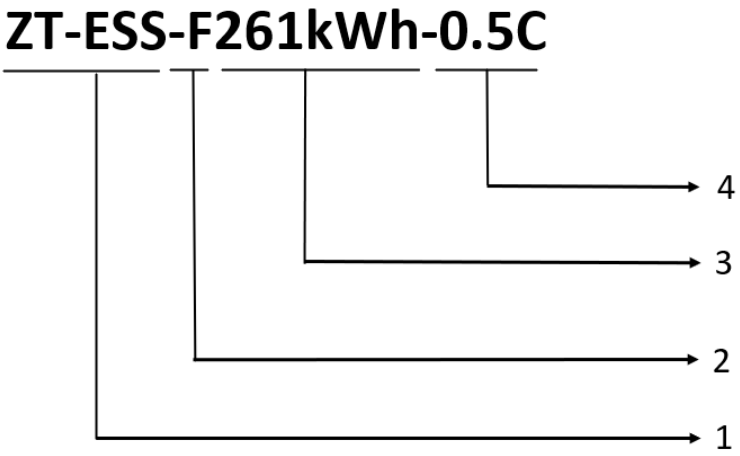


Fig 4-2 ZetaCube-Battery Cabinet Model

Table 4-2 ZetaCube-Battery Cabinet Model definition

NO.	Code	Definition
1	ZT-ESS	ZETATECH brand energy storage system
2	F/D/L	Market area code
3	261kWh	Battery cabinet capacity 261kWh
4	0.5C	The maximum power supported by the battery cabinet

- Electrical cabinet model

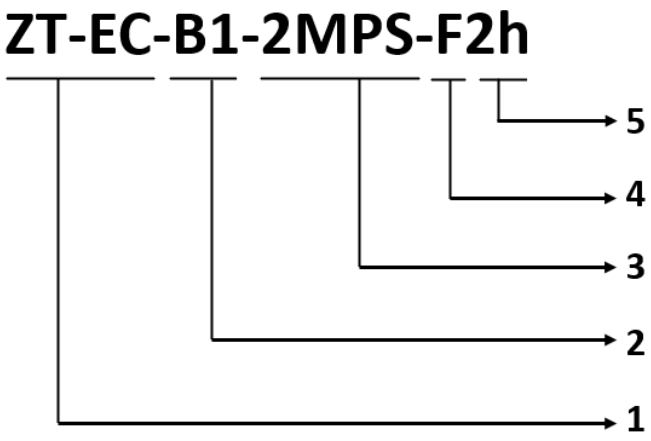


Fig 4-3 Electrical cabinet model

Table 4-3 Electrical Cabinet Model Explanation

NO.	Code	Definition
1	ZT-EC	ZETATECH's energy storage electrical cabinet
2	B1	Electrical cabinet configuration code
3	2MPS	2MPPT+PCS+STS
4	F	Matching battery cabinet version code
5	2h	Matching battery cabinet energy storage time

4.2. Battery cabinet

4.2.1. Battery cabinet appearance and layout

Fig 4-4 Side view of battery cabinet shaft

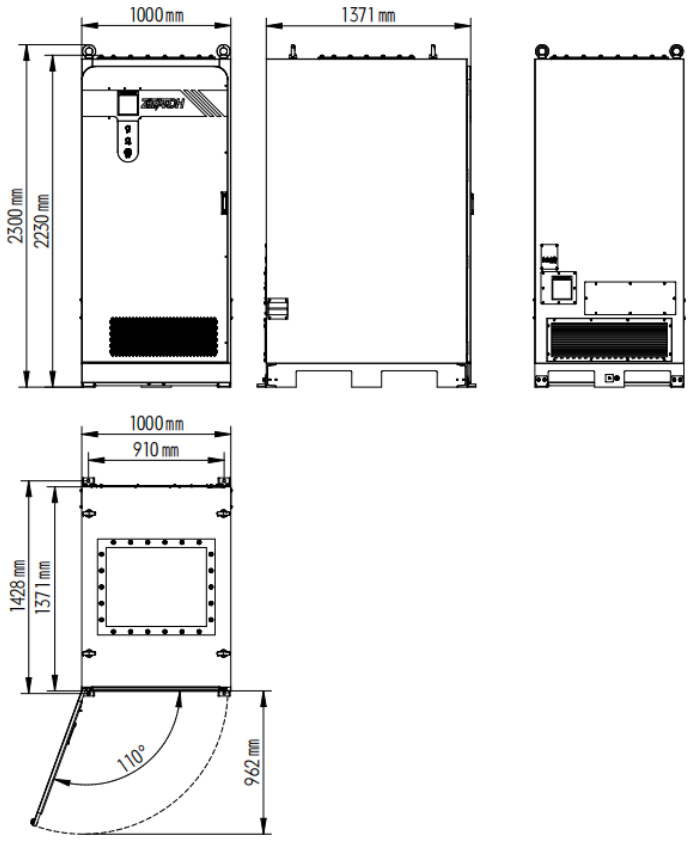


Fig 4-5 Battery cabinet size

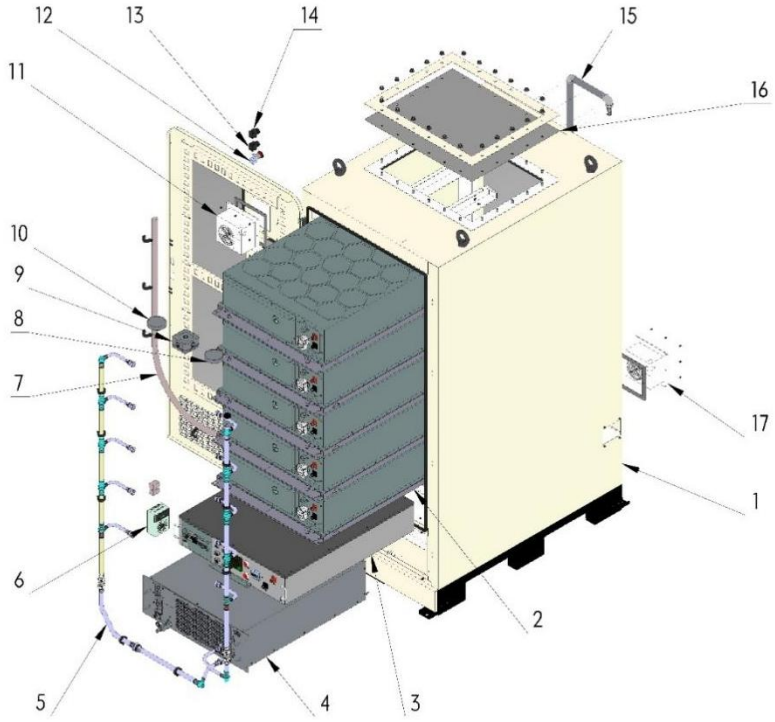


Fig 4-6 Battery cabinet internal layout

（For reference only, please refer to the actual product received.）

Table 4-4 Introduction of battery cabinet internals

NO.	Name	Qty	Explain
1	Cabinet	1	
2	PACK	5	
3	HVB	1	
4	Liquid cooling unit	1	
5	Liquid cooling pipeline	1	
6	Dehumidifier	1	
7	Perfluorohexanone fire extinguishing device	1	
8	Temperature detector	1	
9	Combustible gas detector	1	
10	smoke detector	1	
11	Explosion-proof exhaust fan	1	
12	emergency stop switch	1	
13	Warning light	1	
14	Running light	1	
15	Fire hose	1	
16	Blast plate	1	
17	Explosion-proof inlet fan	1	

4.2.2. Battery cabinet technical parameters

Table 4-5Battery cabinet technical parameter table

Battery Parameters	
Model	ZT-ESS-F261kWh-0.5C
Cell type	LFP 3.2V/314Ah
Battery PACK configuration	52S/52.2kWh

Battery system configuration	(52S)5S
Battery voltage range	702~936V
Battery system capacity	261kWh
Temperature detection	battery cell + aluminum bar
DC side system efficiency	> 95%
Charge-discharge rate	0.5C
Allowable discharge temperature	-28℃~56℃
Allowable charging temperature	1℃~56℃
Allowable relative humidity	< 95%（no condensation）
Secure	
DC input protection	Load switch + Fuse
Fire protection system	Perfluorohexanone + water firefighting
General Parameters	
Dimensions	W1000*D1383*H2189
Weight	2376±50kg
Protection class	Battery compartment IP55 Liquid cooling chamber IPX4
Cooling method	Liquid cooling
Max. altitude	⩽4000m
Communication	
Communication interface	RS485/Ethernet
Communication protocol	IEC61850/MODBUS-RTU/ MODBUS-TCP

4.2.3. Schematic diagram of battery cabinet

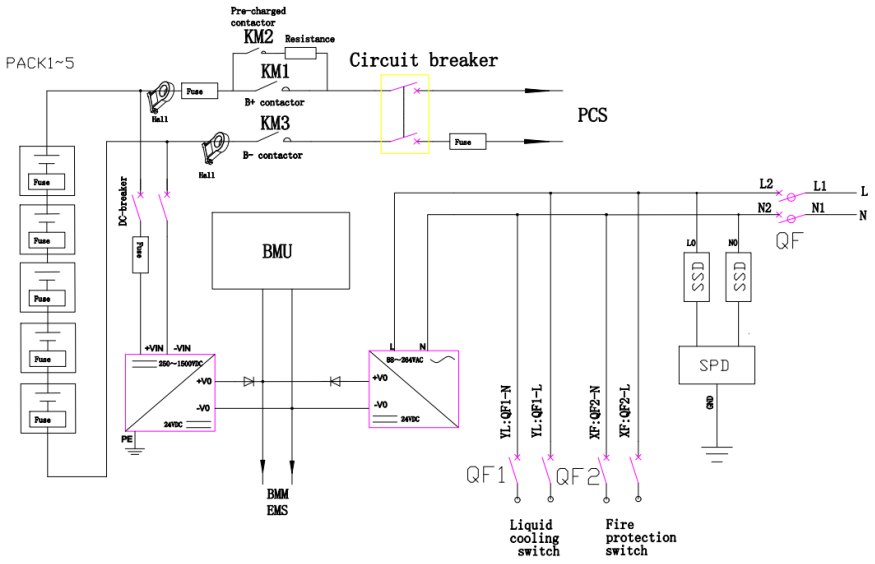


Fig 4-7 Principle Topology

4.2.4. Battery cabinet interface definition

When the battery cabinet is connected to external auxiliary sources and PCS and other equipment, it needs to be connected through the high-voltage box interface on the back of the cabinet. The interface layout is as follows:

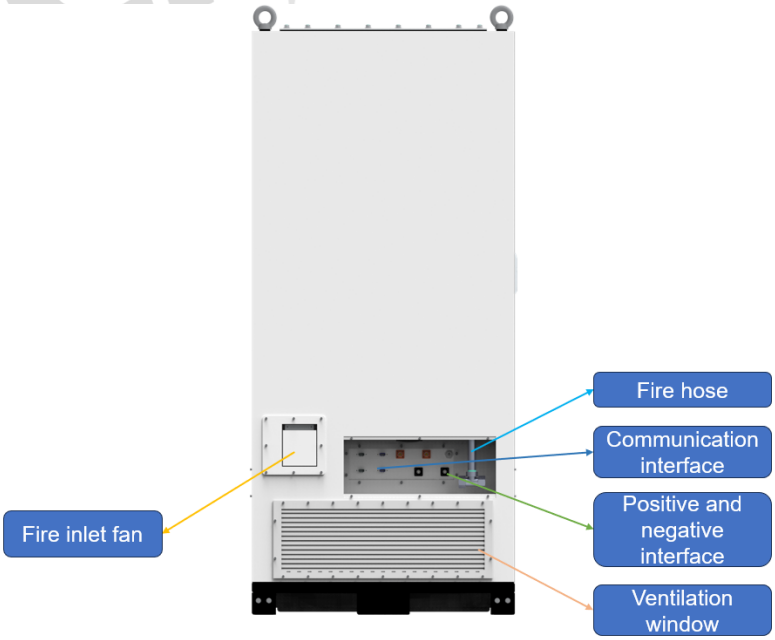


Fig 4-8 Battery cabinet back interface (cabinet cover is hidden)

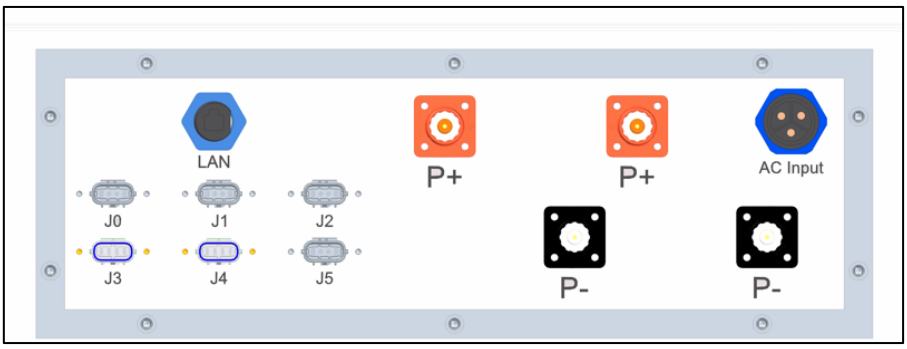


Fig 4-9 High pressure box back interface

The functions and pin definitions of each interface are as follows:

Table 4-6 High Voltage Box Interface Definition

Interface name	Interface definition
AC Input：	AC 220V power connection（1:L，2:N）
P-：	Negative output of the battery
P+：	Positive output of the battery
J5：	Standby
J4：	PCS Communication (CAN Communication)
J3：	Debug interface
J2：	Master Addressing (Multiple Clusters)
J1：	Master Addressing (Multiple Clusters)
J0：	24V DC output
LAN：	Communicates with EMS

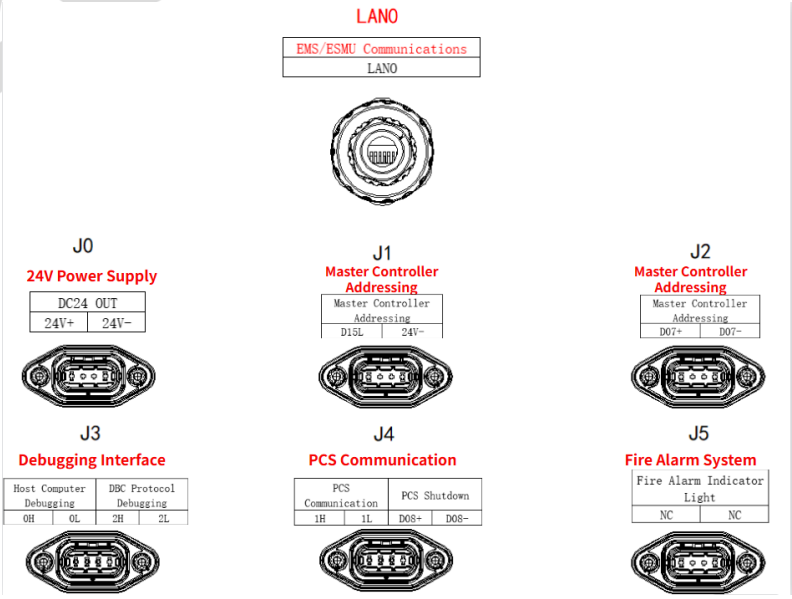


Fig 4-10 Pin definitions of each interface

4.3. Electrical cabinets

The electrical cabinet supports PCS, EMS, MPPT, STS and other functions, and can also provide a variety of other configuration solutions, which can be customized on demand. The appearance and size are as shown in the figure:

Fig 4-11 Electrical cabinet shaft side view

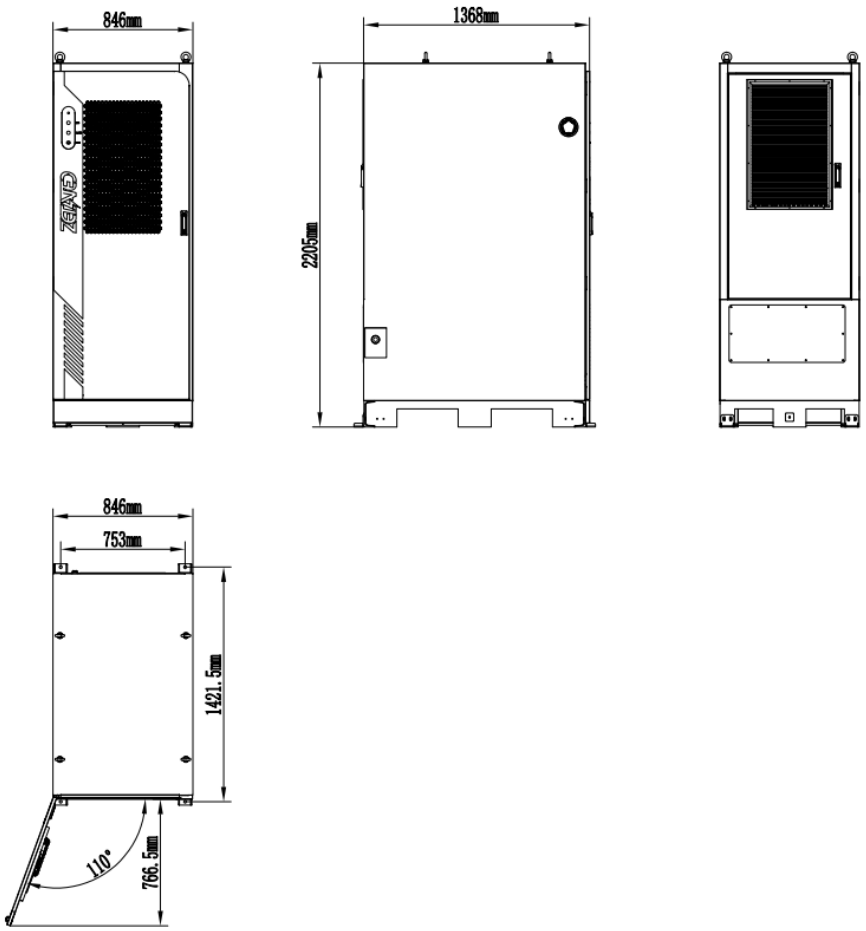


Fig 4-12 Electrical cabinet size drawing

Table 4-7 Electrical cabinet configuration scheme

	PCS/ 125kW	EMS	ESMU (BMS）（Matching ≥ 2 Battery Cabinet）	MPPT/ (Optional)	STS/ (Optional)
B1 (Full version)	1	1	1	200kWp	250kW
A2 (Support customization)	2	1	1	/	/
A3 (Support customization)	3	1	1	/	/
A4 (Support customization)	4	1	1	/	/

STS(Support customization)	/	/	/	/	800kW

4.3.1. B1 electrical cabinet

4.3.1.1. B1 electrical cabinet layout

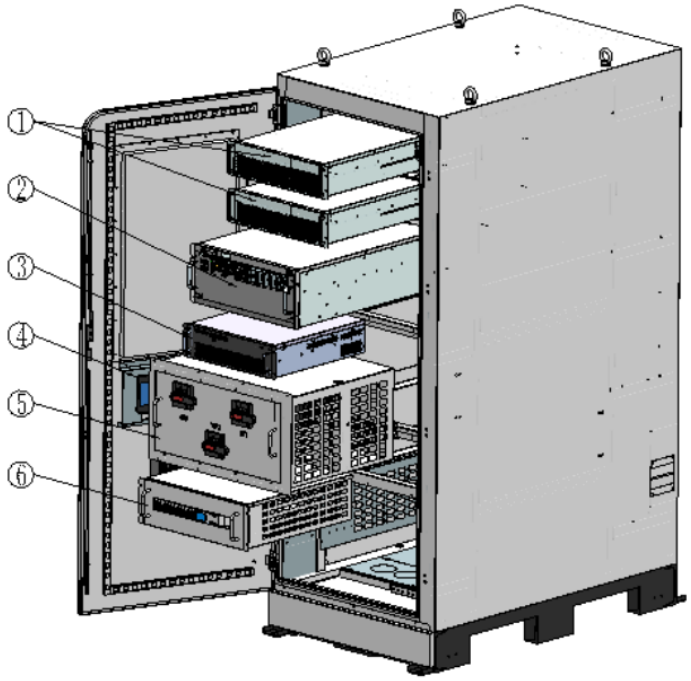


Fig 4-13 B1 electrical cabinet internal layout (B1 version)

Table 4-8 B1 electrical cabinet internal components

NO	Name	Quantity
1	MPPT	2
2	PCS	1
3	STS	1
4	EMS	1
5	Main circuit switch box	1
6	Control power box	1

4.3.1.2. B1 electrical cabinet technical parameters

Table 5-3 B1 version electrical cabinet parameters

Electrical Parameters	
MPPT Maximum Allowable Input Voltage	700 V
MPPT Maximum Input Power	100 kW × 2 or 50 kW × 2
PCS DC Input Voltage	615–950 V (3W + PE) / 650–950 V (3W + N + PE)
AC Rated Output Voltage	230/400 V
Rated Output Power	125 kW × N (Number of PCS Units)
Protection	
DC Input Protection	Dual Protection: DC-side Fuse + Fast Circuit Breaker
AC Output Protection	Circuit Breaker
General Parameters	
Dimensions (mm)	W846 × H2210 × D1462
Weight	640 ± 20 kg
Protection Rating	Electrical Compartment IPX4
Operating Temperature	-25℃ to 55℃ (Derating above 45℃)
Hight(m)	≤3000 m (Derating above 2000 m)
Cooling Method	Air Cooling
Communication	
Communication Interface	RS485 / Ethernet
Communication Protocol	IEC 61850 / Modbus-RTU / Modbus-TCP

4.3.1.3. B1 electrical cabinet architecture diagram

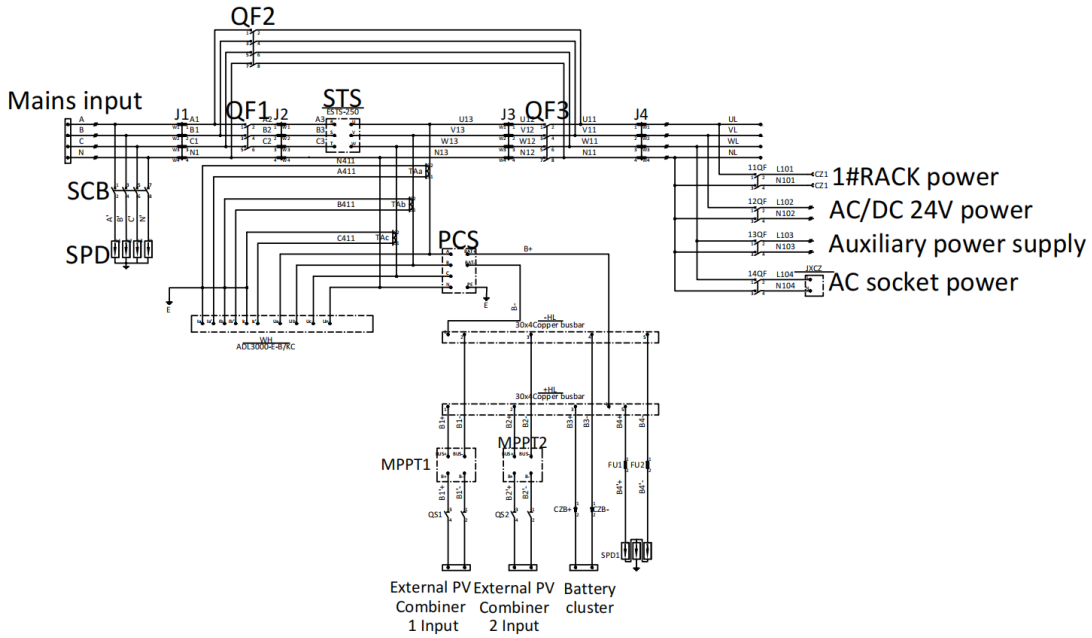


Figure 5-8: Schematic diagram of electrical cabinet system and distribution circuit

Note: QF2 serves as the bypass circuit breaker (normally in the open position), designed to disconnect QF1/QF3 when abnormalities occur in the STS or PCS, then close the QF2 bypass circuit breaker to provide power to the load.

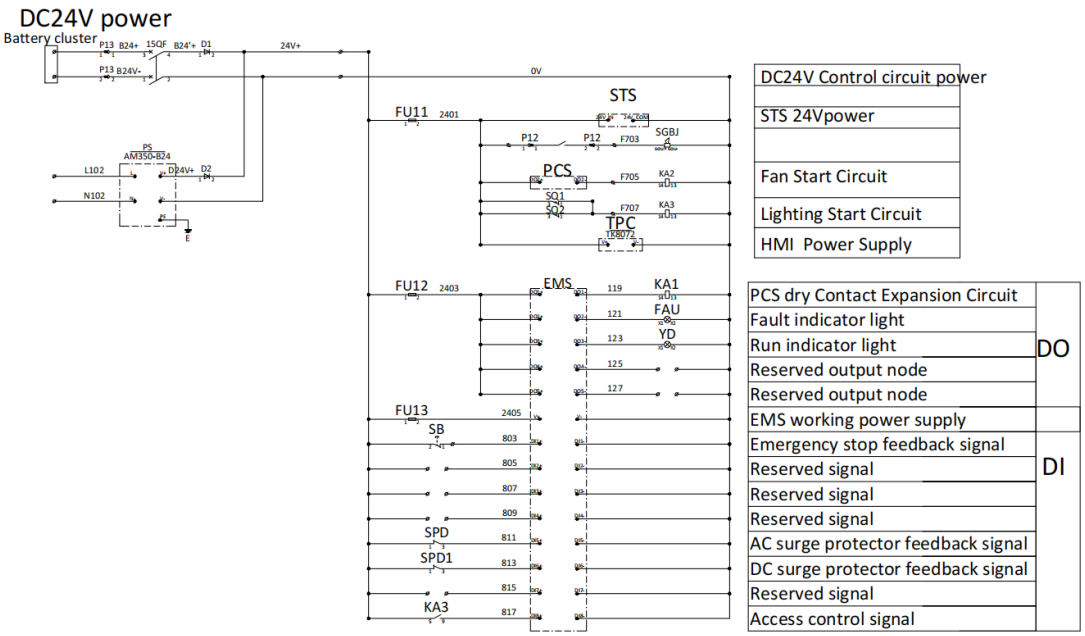


Figure 5-9: EMS Control Schematic Diagram

4.3.1.4. B1 electrical cabinet interface definition

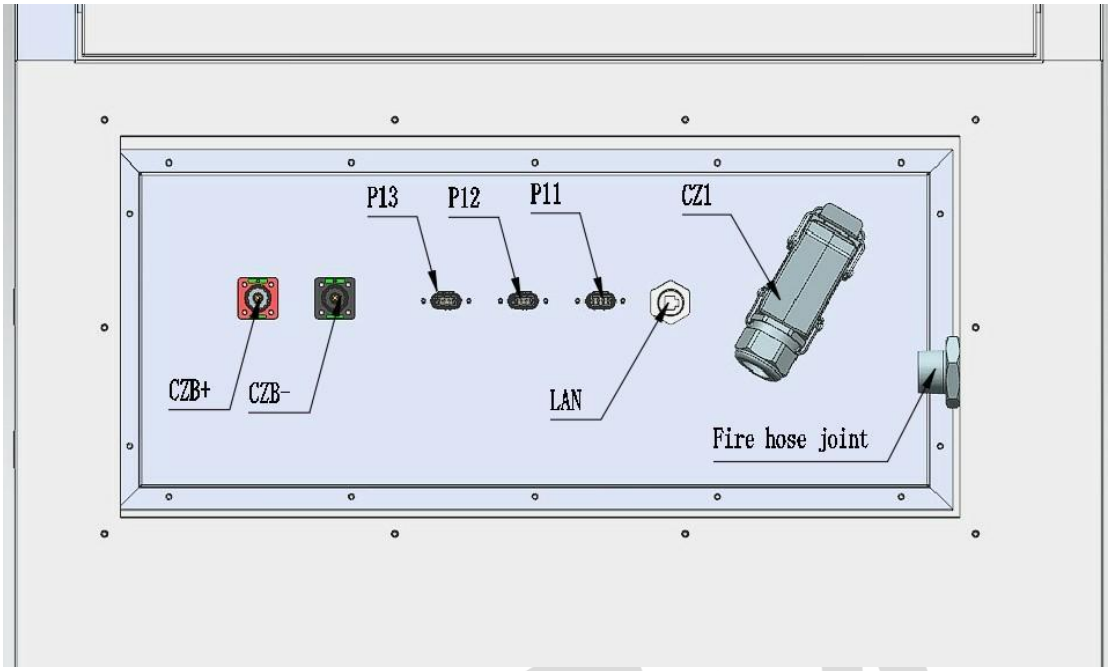


Figure 5-10 2H version electrical cabinet back interface

Table 5-4 Definition of Electrical Cabinet Rear Interface

Name	Interface definition
CZ1	AC 220V auxiliary power output (1: L, 2: N)
CZB–	Battery negative input
CZB+	Battery positive input
P12	Fire alarm contact input
P11	BMS-PCS communication (CAN bus)
P13	24V DC input
LAN	EMS-BMS communication interface

4.3.2. A4 electrical cabinet

4.3.2.1. A4 electrical cabinet layout

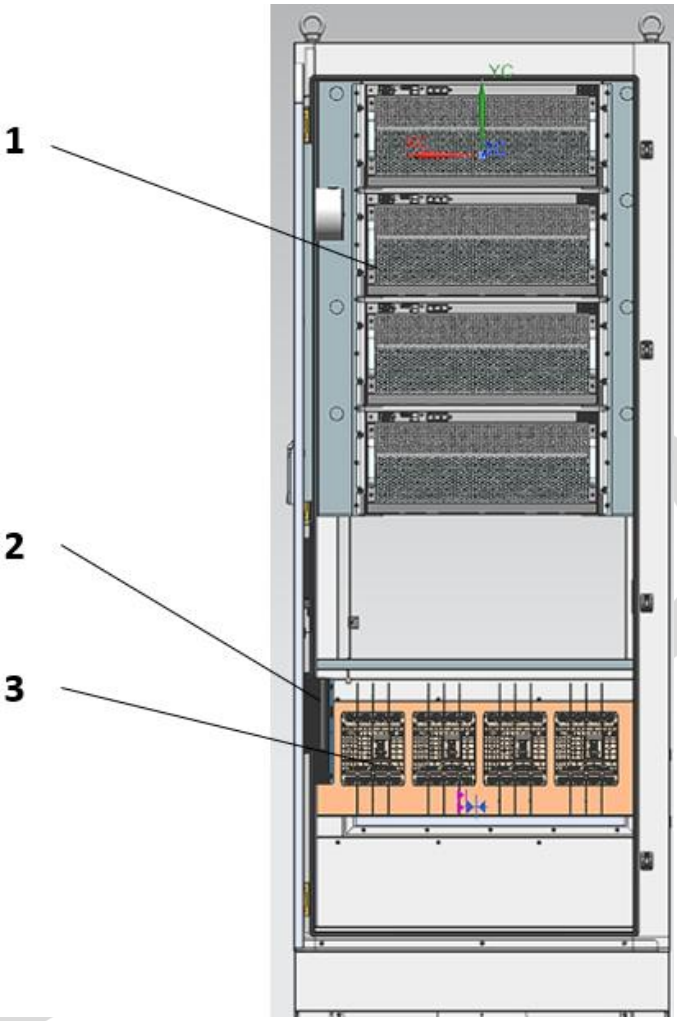


Fig 4-14 A4 electrical cabinet layout

Table 4-9 A4 electrical cabinet internal components

NO	Name	Number
1	PCS	4
2	EMS	1
3	PCS AC side circuit breaker	4

4.3.2.2. A4 electrical cabinet technical parameters

Electrical Parameters	
PCS DC Input Voltage	615–950 V (3W + PE) / 650–950 V (3W + N + PE)
AC Rated Output Voltage	230/400 V±15%（50/60Hz）
Rated Output Power	4*125 kW × N
Rated Output Current	722A
Protection	
DC Input Protection	Dual Protection: DC-side Fuse + Fast Circuit Breaker
AC Output Protection	Each PCS is equipped with an independent circuit breaker, which supports overload and open circuit protection
AC bus protection	Surge backup protector + surge protector
General Parameters	
Dimensions (mm)	W846 × H2210 × D1462
Weight	769 ± 20 kg
Protection Rating	IPX4
Operating Temperature	-25℃ to 55℃ (Derating above 45℃)
Hight(m)	≤3500 m (Derating above 2000 m)
Cooling Method	Air Cooling
Communication	
Communication Interface	RS485 / Ethernet
Communication Protocol	IEC 61850 / Modbus-RTU / Modbus-TCP

4.3.2.3. A4 electrical cabinet architecture diagram

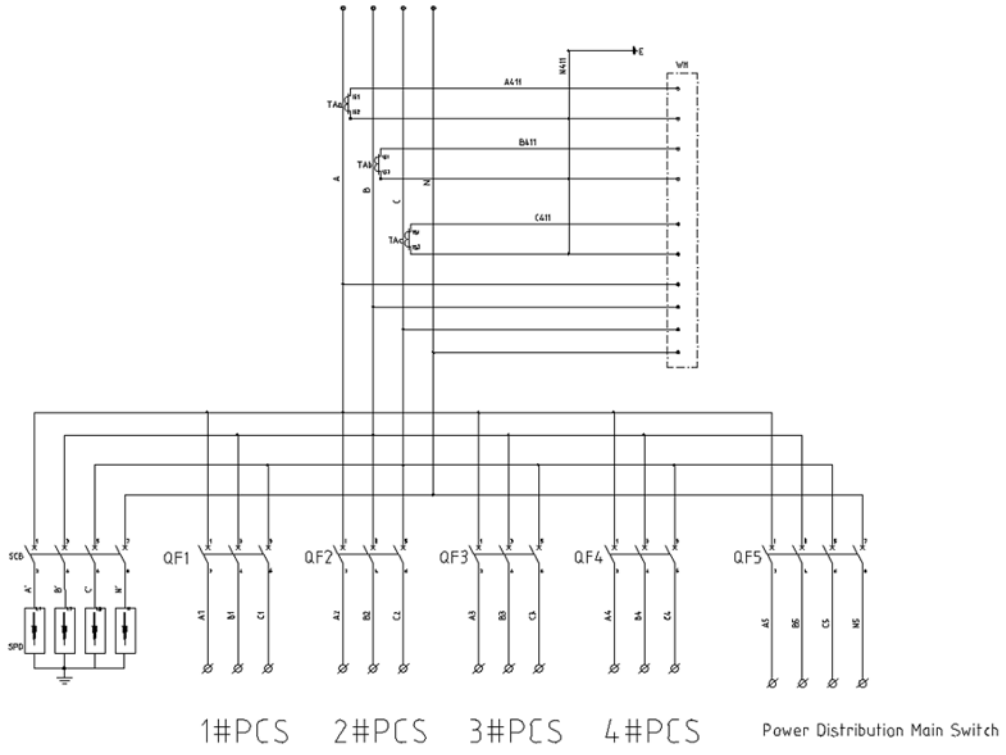


Fig 4-15 A4 electrical cabinet architecture diagram

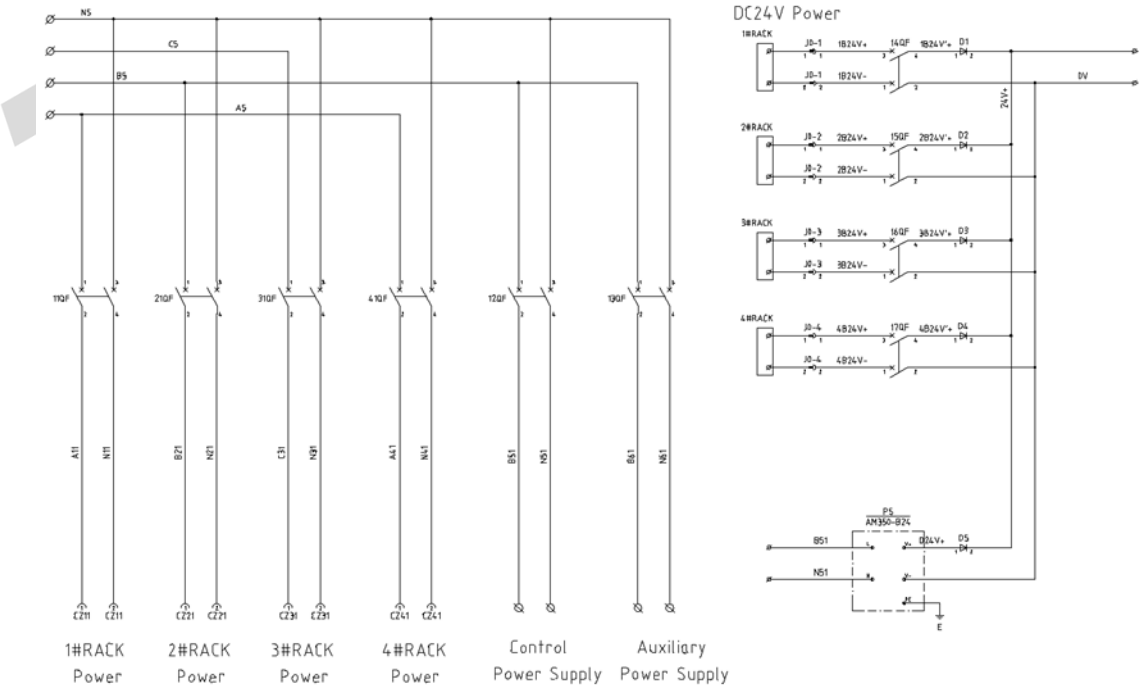


Fig 4-16 A4 electrical cabinet distribution circuit topology diagram

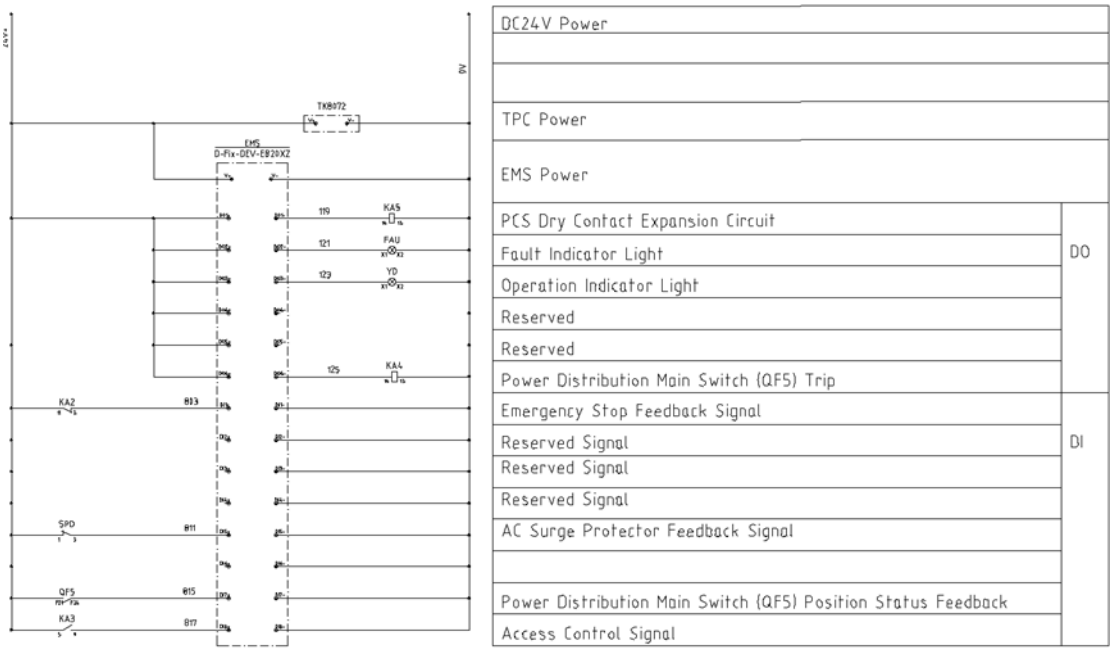


Fig 4-17 A4 of electrical cabinet EMS control schematic

4.3.2.4. A4 version electrical cabinet interface definition

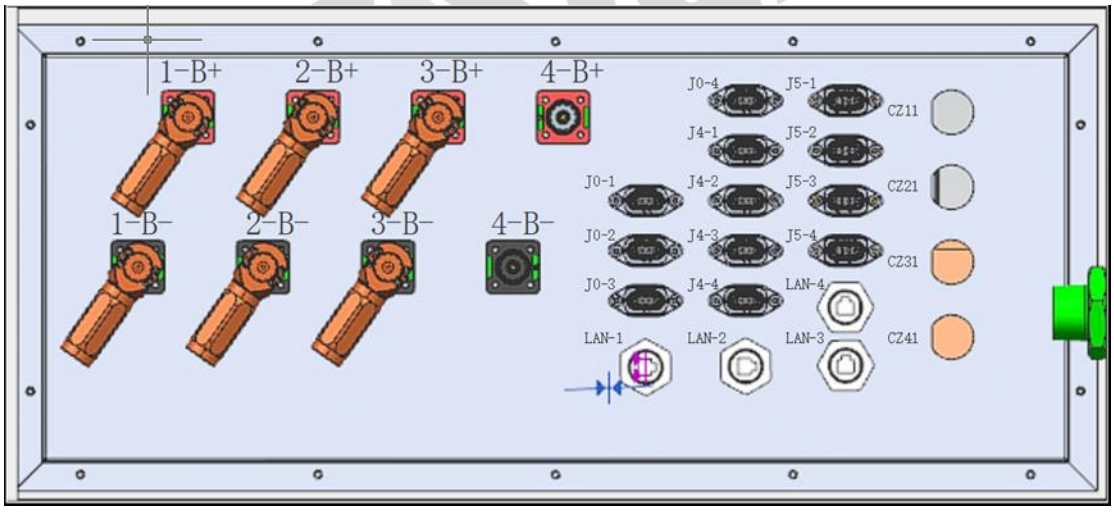


Fig 4-18 A4 electrical cabinet interface diagram

Table 5-4 Definition of A4 Electrical Cabinet Rear Interface

Name	Interface definition
CZX1（X=1.2.3.4）	AC 220V auxiliary power output (1: L, 2: N);
X-B-（X=1.2.3.4）	Battery negative input
X-B+（X=1.2.3.4）	Battery positive input
J5-X（X=1.2.3.4）	Fire alarm contact input
J4-X（X=1.2.3.4）	BMS-PCS communication (CAN bus)

J0-X（X=1.2.3.4）	24V DC input
LAN-X（X=1.2.3.4）	EMS-BMS communication interface

4.3.3. STS grid-connected and off-grid switching cabinet

The power of this STS cabinet is 800kW.

4.3.3.1. STS cabinet technical parameters

Table 5-4 STS cabinet technical parameters

Electrical parameters	
System wiring method	3W+N+PE
Energy Access Mode	Network load storage
System power	800kW
Grid side rated voltage	400/230AC(-10%~+15%)
Maximum current on the grid side	1155A
Energy storage side rated voltage	400/230AC(-10%~+15%)
Rated current on energy storage side	722A
Load side rated voltage	400/230AC(-10%~+15%)
Load side rated current	722A
and/off-grid switching time	＜20mS
Protection	
Grid side lightning protection	backup + lightning protection device
Power grid side over-current and over-temperature	compound circuit breaker

protection	
Energy storage side over-current and over-temperature protection	compound circuit breaker
Load side over-current and over-temperature protection	compound circuit breaker
Systemic excision protection	emergency stop
General Parameters	
Dimensions (mm)	W846 × H2210 × D1462
Weight	340 ± 20 kg
Protection Rating	IPX4
Operating Temperature	-25℃ to 55℃ (Derating above 45℃)
Hight(m)	≤3000 m (Derating above 2000 m)
Cooling Method	Air cooling
Communication	
Communication Interface	RS485 / Ethernet/CAN2.0
Communication Protocol	IEC 61850 / Modbus-RTU / Modbus-TCP

4.3.3.2. STS Cabinet electrical topology diagram

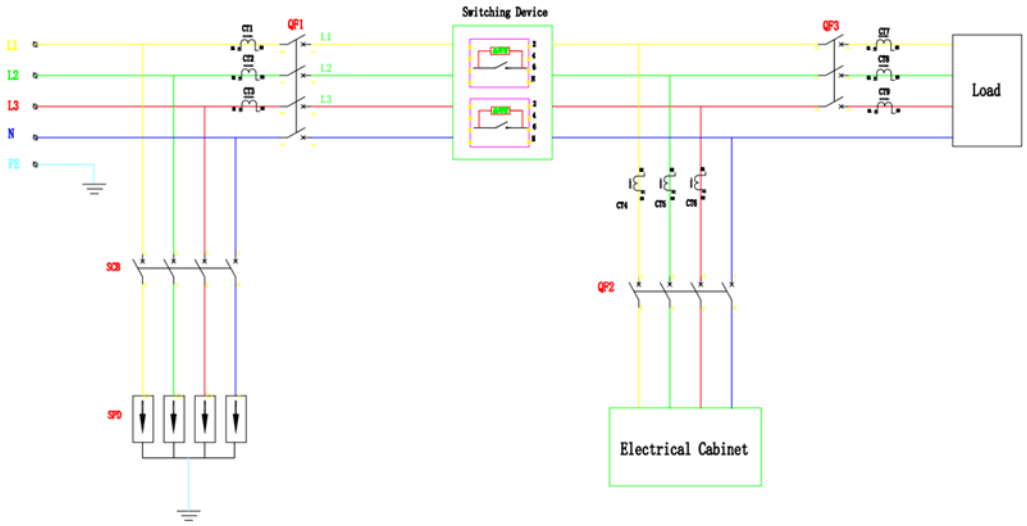


Fig 4-19 STS cabinet topology diagram

4.3.3.3. Definition of STS cabinet interface

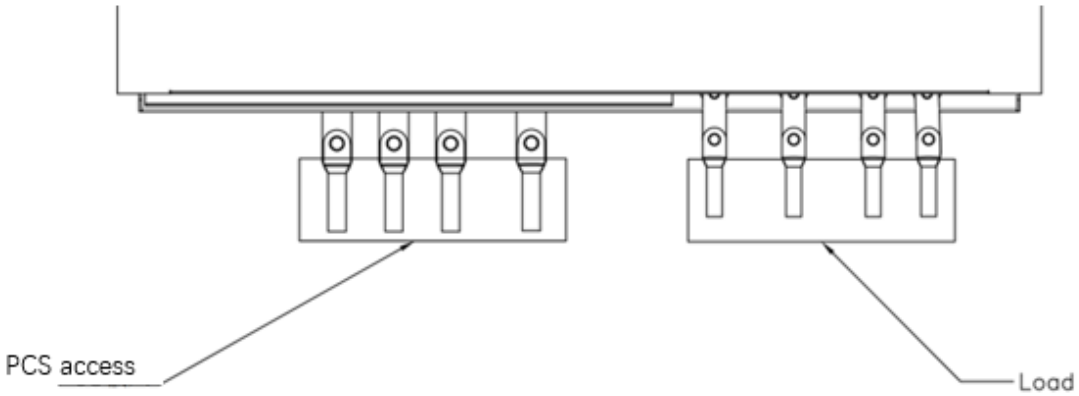


Fig 4-20 STS Cabinet interface definition 1

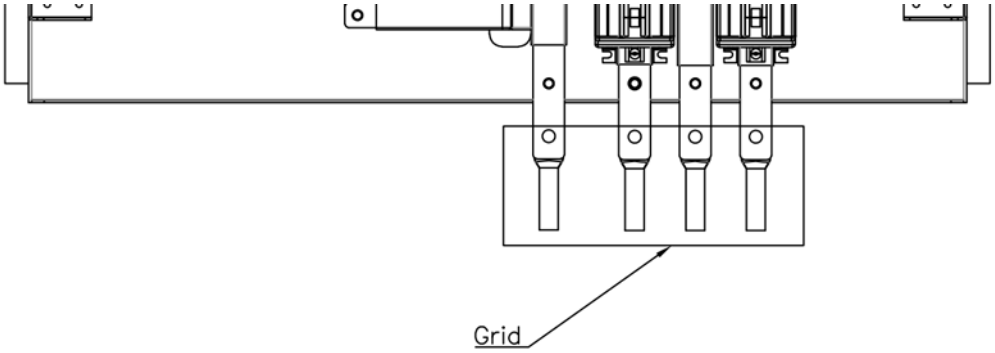


Fig 4-21 STS Cabinet interface definition 2

Table 5-4 Definition of STS Cabinet Interface

Interface name	Interface definition
PCS	Energy storage output access (1-4) channels
Load	Output port to power the load
Grid	grid access port
P12	Fire alarm contact input
P11	BMS-PCS communication (CAN bus)
P13	24V DC input
LAN	EMS-BMS communication interface

4.4. System Architecture

- 1 125kW electrical cabinet is used in combination with 1-4 battery cabinets

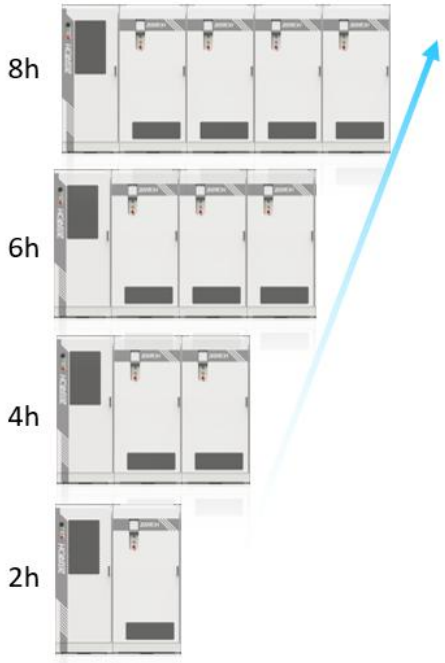


Fig 4-22 1 125kW electrical cabinet combined with 1-4 battery cabinets

- Multiple 125kW systems are connected in parallel, up to 500kW/4176kWh

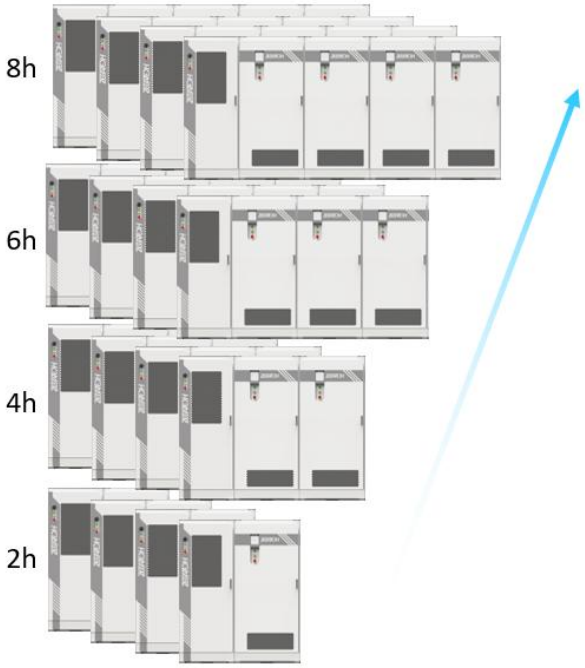


Fig 4-23 4 125kW electrical cabinets combined with 1-4 battery cabinets

5. Introduction of key components of the product

5.1. Battery cluster

The 261kWh battery pack consists of 5 battery liquid-cooled packs and 1 high-voltage box (integrated power supply unit). Each liquid-cooled pack is made up of 52 314Ah high-performance lithium iron phosphate cells that support 0.5P charging and discharging in series. The high-voltage box contains the battery cluster management unit and protection and control electrical components for the management and protection of the entire battery cluster operating state

Table 5-1 Battery cluster parameter table

Project	Parameter	Remark
Group approach	(52S)5S	
Rated capacity	314Ah	
Rated energy	261kWh	
Rated voltage	832V	
Recommended voltage range	702~936V	The lower limit voltage 2.7V The upper limit voltage 3.6V
Battery cluster weight	1725±25kg	
Battery cluster Size	W780±10mm*D1161±10mm *H1580±10mm	
Standard charging method	Charge to 936V with a constant power of 130624W	At 25℃±2℃
Standard discharge method	Discharge to 702V with a constant power of 130624W	At 25℃±2℃
Maximum	201A	

charge/discharge current		
Charging temperature range	1℃-56℃	
Discharge temperature range	-28℃~56℃	
Ambient humidity range	5%-95%	
Storage temperature range	0℃~35℃（A year） -20℃-45℃（A month）	
Insulation standards	＞1000Ω/V，1000VDC	
Withstand voltage standard	3390VDC, leakage current less than 10mA; 2400VAC, no breakdown or flashover occurs.	
Methods of Communication	CAN/485/LAN	

5.1.1. Battery cluster safety function settings

A single battery cabinet adopts a leader/follower two-level battery management system (BMU-BCU) architecture, and a three-level battery management architecture (BMU-BCU-ESMU) is adopted when two or more battery cabinets are used in parallel, with complete battery protection functions

BMS monitors the battery cell voltage and temperature with high accuracy and high reliability in real time, and calculates the state of charge (SOC) of the battery energy storage device with high accuracy, and realizes the power balance between the battery cells through the passive equalization control circuit. Once the battery data is found abnormal, the fault alarm or protection is immediately carried out.

BMS can achieve battery overvoltage/undervoltage protection, charge and

discharge high temperature/low temperature protection, charge and discharge overcurrent protection, single pressure difference protection, low insulation resistance protection, communication fault protection, collection fault protection, etc.

5.1.2. System Lock

The battery system is set with three-level protection functions (alarm, protection, system lock). To achieve full control and protection of the energy storage battery. The system lock function has the characteristics of non-automatic reset. When one or more batteries in the battery system deviate from the operation area (voltage, current, temperature exceed the cell window) during operation, stop running. This function cannot be reset by the user or allows automatic reset. It needs to be unlocked by professional technicians after confirming that the product status is OK.

The unlocking step uses multiple steps and different values to unlock to avoid customer mis-operation.

5.2. Fire protection system

The fire protection system used in this energy storage cabinet is composed of a fire detection system, a perfluorohexanone suppression pipe fire extinguishing system, a combustible gas detection and ventilation and exhaust system, and a water spray system.

Fire detection system: including smoke, temperature and sound and light alarm, smoke temperature detector can output signal to BMS.

Perfluorohexanone suppression tube fire extinguishing system: Install a T-Tube perfluorohexanone flexible suppression tube in the battery cabinet. When smoke and temperature detect a fire, start the sound and light alarm, and the BMS will receive the fire alarm signal. When the temperature rises to 93 ° C, the suppression tube releases the fire extinguishing agent (FK5112), and completely submerges the cabinet to extinguish the fire.

Combustible gas detection and ventilation and exhaust system: The combustible gas detection system has a dry contact signal output function, and the ventilation and exhaust system equipment mainly includes the air inlet and exhaust port and the air outlet.

When the concentration of combustible gas in the protection area reaches the whole value of low concentration, the detection system operates, and at the same time outputs the dry contact signal to the BMS, and outputs the control signal to the ventilation and exhaust system, starts the fan and window, and performs forced exhaust. After the fan starts, the dry contact signal is output to the BMS. When the combustible gas concentration is high, the combustible gas detector outputs the fault signal to the BMS.

Water spray system: composed of nozzle, pipe network, water inlet interface and other parts. When a fire occurs in the system, the project water source can be used to extinguish the fire

The flowchart is as follows:

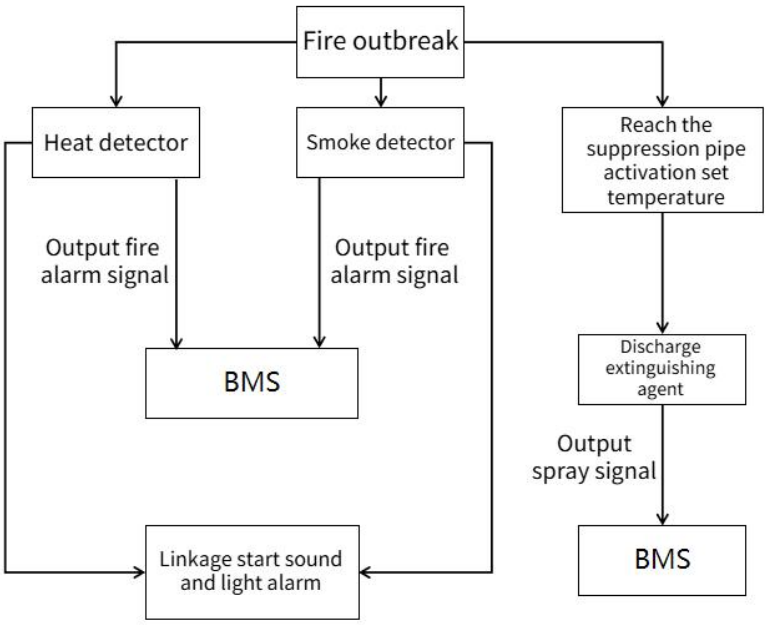


Fig 5-1. Fire system operation logic

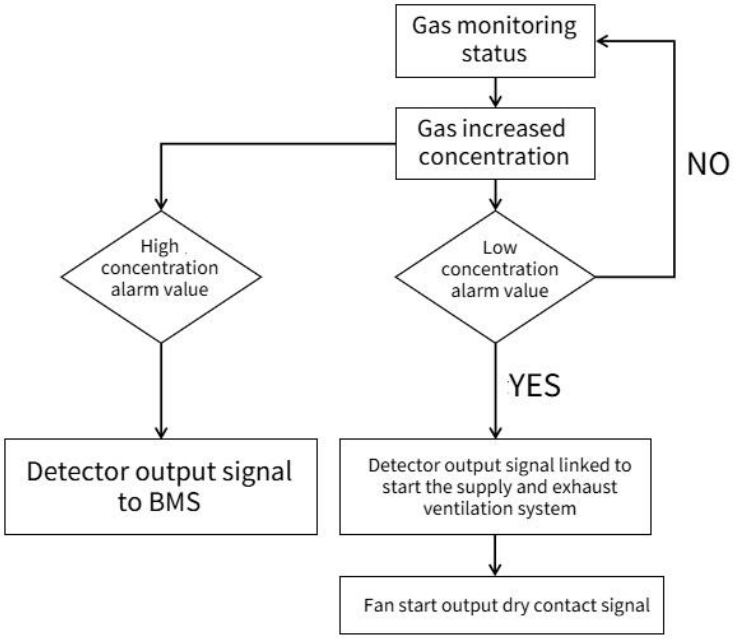


Fig 5-2 Flow chart of combustible gas detection and ventilation system

5.3. Thermal management system

The thermal management system of this energy storage cabinet is composed of a liquid cooling unit, a liquid cold plate and a liquid cooling pipeline. The liquid-cooled unit realizes efficient heat dissipation and precise temperature control of energy storage equipment through the circulation of cooling medium.

（1） Parameters

Table 5-2 Liquid Cooling Parameters

Rated flow rate of liquid-cooled unit	30L/min
Maximum flow rate of liquid-cooled unit	50L/min
Cooling medium	50% ethylene glycol aqueous solution

（2） The main functions include:

Refrigeration: The temperature of the cooling medium is reduced by the compressor refrigeration cycle.

Heating: Built-in electric heater heats up the cooling medium.

Self-circulation: Only the water pump is started, no cooling or heating is carried out.

Auto mode: Automatically switch cooling/heating according to the set temperature to maintain a constant temperature.

（3） Workflow

➢ Refrigeration cycle:

- The refrigerant (R410A) absorbs the heat of the cooling medium in the evaporator and vaporizes into a cryogenic gas.

- The compressor compresses the gas into a high-temperature and high-pressure state and delivers it to the condenser for heat dissipation and liquefaction.

- The liquid refrigerant is throttled and depressurized by the expansion valve before re-entering the evaporator cycle.

➢ Cooling medium circulation:

- The water pump drives the glycol mixture to flow through the evaporator for cooling and conveying it to the energy storage device to absorb heat.

- The high-temperature cooling medium is returned to the unit and cooled again to form a closed loop.

➢ Control process:

- After setting the target temperature, the unit automatically adjusts the operation of the compressor, water pump and heater.

- Real-time monitoring of liquid temperature, pressure, flow rate and other parameters, trigger alarm or shutdown protection when abnormal.

5.4. Cabinet

This energy storage cabinet fully takes into account the impact of all possible environmental conditions on the operation of the equipment during the design and manufacturing process, and takes a number of corresponding measures to ensure the safe and stable operation of the equipment at the project location. The overall

protection level of the cabinet is IP55. It has good functions of anti-salt spray, moisture-proof, anti-corrosion, fire prevention, heavy rainfall prevention, waterproof, typhoon-proof, dust-proof (incoming trend), shock-proof, anti-theft, anti-ultraviolet and so on.

Dust: in the cabinet into the trend and equipment into the trend of the installation can be easily replaced standard ventilation filter, at the same time, in the face of strong wind and sand electrical can effectively prevent dust into the energy storage cabinet.

Moisture-proof: The cabinet is equipped with a moisture-repelling device, which automatically detects the humidity in the cabinet. When the humidity is $\geqslant$ 55%, the dehumidification device starts, and when the humidity reaches or $\leqslant$ 50%, the device stops working (this setting value is the factory default and can be adjusted according to the actual situation), which can avoid condensation of internal components.

Insulation: Thickened thermal insulation cotton is used around the inner wall of the battery compartment cabinet.

Seismic resistance: The seismic function guarantees that the mechanical strength of the energy storage cabinet and its internal equipment meets the requirements under transportation conditions, and there will be no deformation resulting in abnormal function, and no operation failure will be caused after vibration.

5.5. MPPT

This energy storage system allows photovoltaic access and provides two MPPT channels. Users can choose between the following two models:

Table 5-3 MPPT Model and parameter table

MPPT Model	INP-DCDC-100/0.3-W	EDCS50-M-MH（Optional）
Rated Power	100 kW	50 kW
Maximum Power	110 kW	55 kW
MPPT Voltage Range	250 V – 700 V	100 V – 700 V

MPPT Full-Load Voltage	365 V – 700 V	344 V – 700 V
Maximum Operating Current	275 A	160 A
Peak Efficiency	99.5%	99%

- MPPT model: INP-DCDC-100/0.3-W, system topology diagram

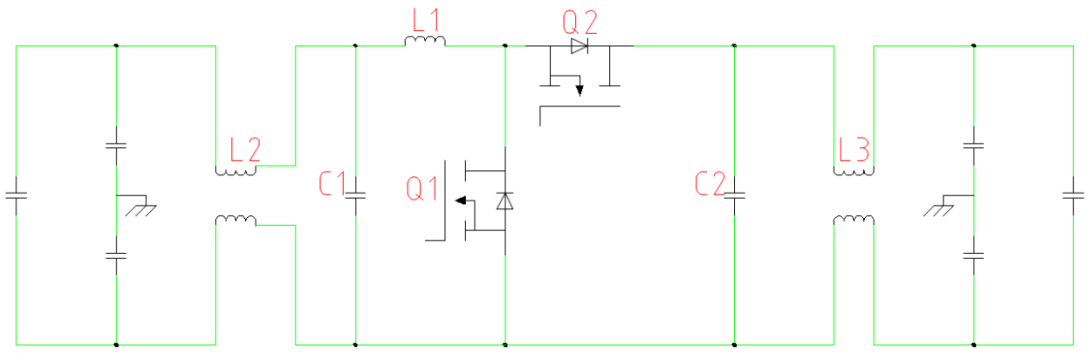


Fig 5-3 100kW MPPT system topology diagram

- MPPT model: EDCS50-M-MH, system topology diagram:

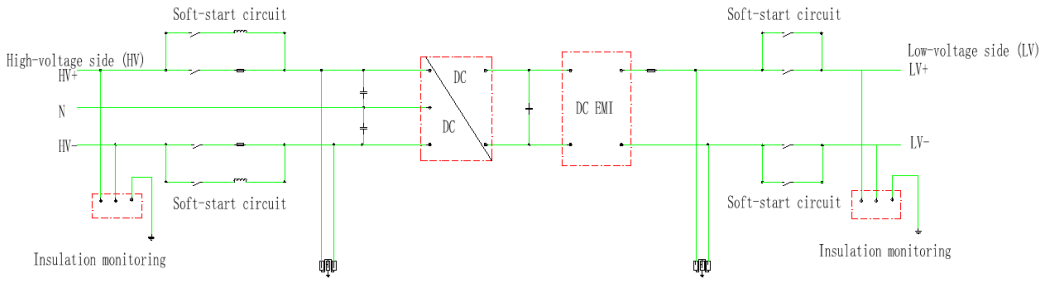


Fig 5-4 50kW MPPT system topology diagram

5.6. PCS

The energy storage converter PCS (Power Conversion System) can control the charging and discharging process of the battery. The converter is composed of a bidirectional AC/DC converter and a Control Unit. It receives control commands through the communication interface and sends the commands to the power part to control the charge/discharge of the battery, thereby realizing the regulation of the active power and reactive power of the power grid. The converter can also operate off-grid to provide energy to the load in an isolated island environment.

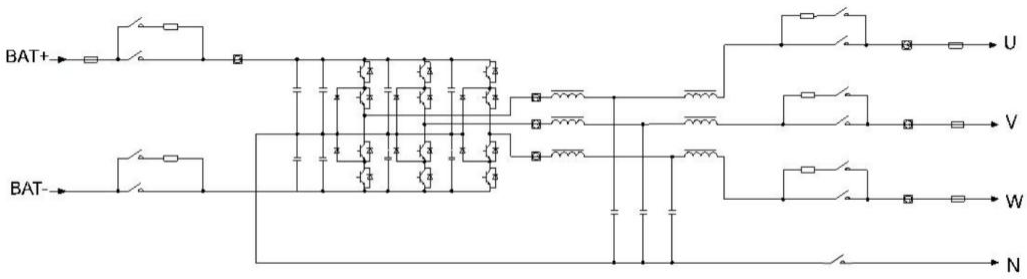


Fig 5-5 PCS schematic

Table 5-4 Technical parameters

DC Side	
Operating Voltage Range (V)	615–950 (3W+PE) / 650–950 (3W+N+PE)
Full-Load Voltage Range (V)	615–950 (3W+PE) / 680–950 (3W+N+PE)
Maximum Current (A)	203 A
Number of Input Circuits	1
AC Side (Grid-Tied)	
Rated Voltage (V)	230/400
Voltage Tolerance	-15% to +15%
AC Output Type	3W+PE (Three-Phase Three-Wire) / 3W+N+PE (Three-Phase Four-Wire)
Rated Output Power (kW)	125
Maximum Output Power (kW)	137.5
Maximum Current (A)	200
Rated Grid Frequency (Hz)	50/60
Power Factor	0.99
Power Factor Range	1 (leading) ~ 1 (lagging)
Current THD	<2% (at rated power)
DC Component	<0.5%
Maximum Efficiency	98.5%

AC Side (Off-Grid)	
Rated Output Voltage (V)	230/400
AC Voltage Ramp Rate	<3% (linear load)
Rated Frequency (Hz)	50/60
Rated Output Power (kW)	125
Maximum Apparent Power (kVA)	137.5
Maximum Output Current (A)	2000
Grid Support Functions	LVRT (Low Voltage Ride-Through)/HVRT (High Voltage Ride-Through), Active/Reactive Power Control

5.7. STS

The Static Transfer Switch (STS) functions as a grid-tied/off-grid transfer switch, enabling a seamless transition from grid-connected to off-grid mode within ≤20 ms. This ensures uninterrupted operation of connected equipment and continuous power supply to critical loads.

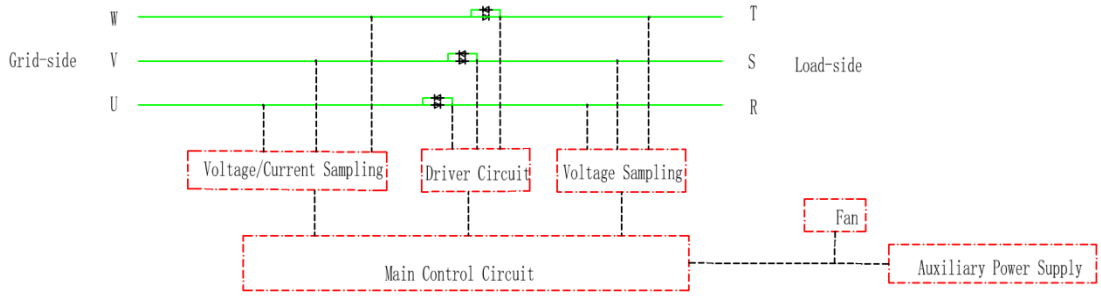


Fig 5-6 Electrical Schematic Diagram

Table 5-5 STS parameters

Model	ESTS-250
Grid Port Power	250 kW
Grid-side Rated Current	361 A

Load-side Port Power	250 kW
Critical Load Power	125 kW
Note	Critical Load Power + PCS-side Power ≤ Product Maximum Power
Rated Voltage	400 V
Grid Voltage Range	400 V ±15%
Rated Frequency	50/60 Hz
Grid/Off-grid Switch Time	<20 ms
Efficiency	>99.5%

5.8. Energy Management System & Cloud Platform

The EMS (Energy Management System) is mainly responsible for the overall monitoring, energy scheduling, and management of the power station. It serves as the central brain of the entire system. It can be adapted to microgrids, energy storage power stations, new energy management and dispatching of various types of power stations such as energy power stations and charging stations.

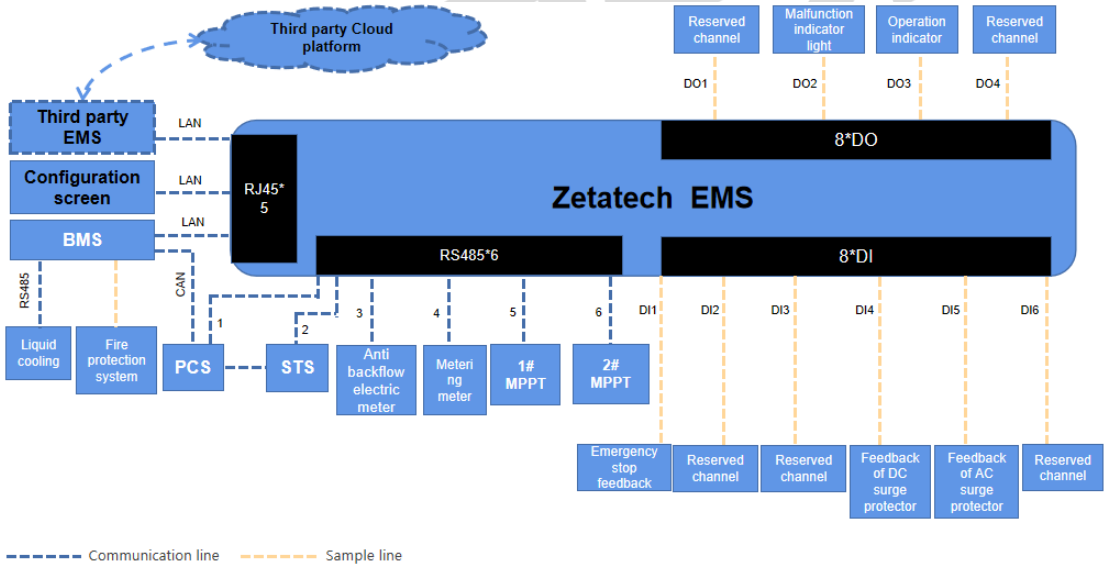


Fig 5-7 EMS system topology diagram

The typical hardware configuration and accessory parameters of the EMS Control Unit are shown in the table below.

Table 5-6 Typical Configuration Parameter Table

Serial Number	Project	Specification
1	Processor	Intel Celeron 3855U / i3 - 7100U / i5 -

		6200U
2	Memory	8GB DDR4
3	Storage	128GB mSATA
4	Network	5xRJ45 interfaces (4 ports POE - 802.3af)
5	USB	4xUSB3.0 interfaces (external)
6	Serial port	6xRS - 485 (isolated serial ports)
7	Keyboard and mouse interface	USB interface
8	GPIO	8xDI optocoupler isolation, 8xDO relay output, 2kV isolation
9	Anti-vibration performance	3Grms @ 5 ~ 500Hz, random, 1hr / axis
10	Anti-shock performance (mechanical shock)	10G, 11-second interval, half-sine wave
11	Power supply	DC 9 ~ 36V (2 - Pin 3.81mm pitch terminal block)
12	Weight	2.4kg
13	Power consumption	< 25W

Table 5-7 EMS performance parameters

Serial Number	Technical Indicator Item	Indicator
1	Telemetry response time	1s
2	Tele-signal change response time	≤ 1s
3	Telecontrol command response time	≤ 1s
4	Real-time data update cycle of analog quantity on the screen (if any)	≤ 3s
5	Real-time data update cycle of switch quantity on the screen (if any)	2s
6	Number of system-supported status quantities	1000
7	Number of system-supported analog	≥ 3000

	quantities	
8	Number of system-supported control quantities	≥ 1000
9	Historical curve sampling interval	1 second ~ 30 minutes, adjustable
10	System-supported historical data storage	≥ 3 years
11	Protocol support	IEC104 / Modbus / MQTT / Http

The cloud platform is an energy management system based on cloud computing and big data technology, which can assist users in centralized monitoring, data storage, panoramic analysis, fault warning, profit analysis, and profit settlement of energy storage, photovoltaic, and other systems.

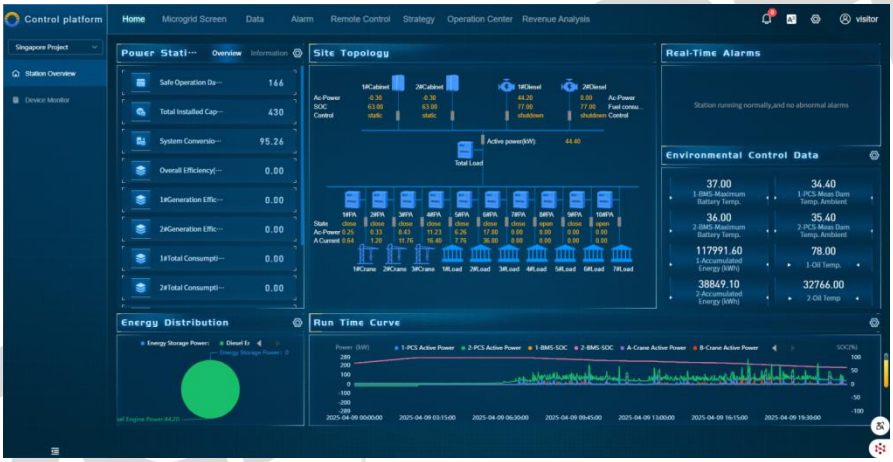


Fig 5-8 Cloud Platform Interface 1

Fig 5-9 Cloud Platform Interface 2

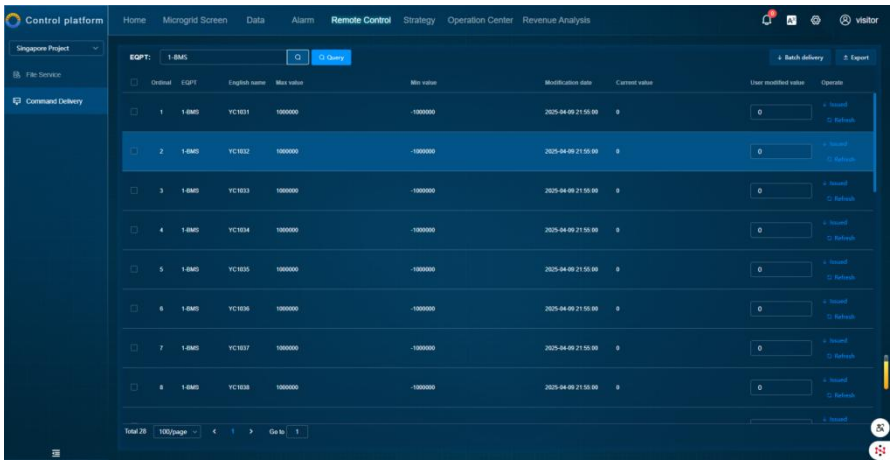


Fig 5-10 Cloud Platform Interface 3

6. Transportation and storage

Warning

- During the entire process of loading, unloading, and transportation, the container operation safety regulations of the country/region where the project is located must be complied with!
- During the entire process of loading, unloading and transportation, it is necessary to meet the operating specifications and regulatory requirements of the transportation container in the country of origin, route country, and destination country.
- During operation, the mechanical parameters (dimensions and weight) of the energy storage system should be kept in mind.
- All personnel involved in loading, unloading, and bolting should receive safety training.

Caution

- Failure to transport and store in accordance with the requirements of this manual may void the warranty.

6.1. Shipping Requirements

（1） The energy storage system can be transported by sea and land, it meets the transport requirements of UN38.3, and is not currently allowed for air transport and does not support rail transport；

（2） The state of charge of the battery during transportation is 25%-30%;

（3） During transportation, it is necessary to prevent violent vibration, impact, extrusion, sun and rain, and shall not be upside down；

（4） In the process of loading and unloading, handle it gently and prevent throwing, rolling, and heavy pressure. Especially when loading into a shipping container, the product should be fixed and buffered to prevent the collision and extrusion of the product during transportation;

（5） Transport trucks should choose highways as much as possible to avoid bumps on the way.

6.2. Handling requirements

When handling, forklifts or cranes can be selected according to the site conditions of the project site.

Warning

- When carrying out handling and installation operations, a special installation isolation area needs to be set up;
- If the energy storage cabinet is defective, cracked, or damaged, please do not install it;
- Do not attempt to open, disassemble, repair, tamper with or modify the energy storage cabinet during installation;
- In order to protect the energy storage cabinet and its components from damage during transportation, please handle it with care; Do not hit, pull, drag or step on the energy storage cabinet. Do not expose the energy storage cabinet to any

strong external force;

- Do not insert foreign objects into any part of the energy storage cabinet;
- Do not expose the energy storage cabinet or its components directly to flames, water, or other liquids;
- Do not install energy storage cabinets near heating equipment;

6.2.1. Hoisting operations

(1) The total weight of the battery cabinet (including packaging) is about 3 tons, and the electrical cabinet is about 1 ton, please choose a crane of suitable tonnage according to the maximum weight of the equipment and the site conditions, and when lifting, you can use the nylon lifting rope (belt) or wire rope that meets the requirements of the bearing capacity (at least 5 tons is recommended);

(2) It should be lifted vertically, and should not appear on the ground dragging, and should not be dragged on any surface;

(3) After the lifting cabinet body is 300mm off the ground, the movement should be suspended, the connection of the spreader should be checked, and the lifting can be continued only after the connection is firmly determined;

(4) During the whole lifting process, it should be carried out slowly, pay attention to the balance state of the box, the speed of the box should not be moved too fast, and the diagonal of the cabinet should be tilted ≤5°;

(5) During the whole lifting process, it is strictly forbidden to stand under the energy storage cabinet and crane, and pay attention not to touch the staff when the cabinet is hoisted and landed

(6) When hoisting, the lifting rope needs to hook all the four lifting rings on the top of the energy storage cabinet, and the length of the lifting rope is greater than 1.5m, otherwise it will cause damage to the energy storage cabinet

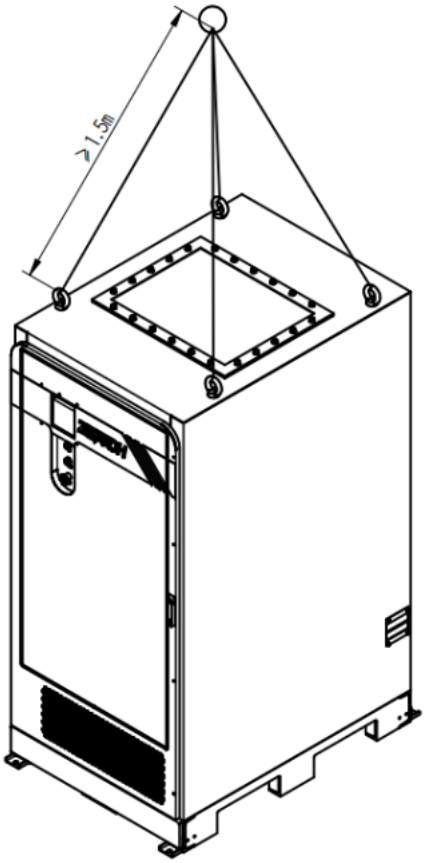


Fig 6-1 Hoisting Schematic Diagram

6.2.2. Forklift operations

(1) The forklift used should have sufficient carrying capacity (at least 5 tons recommended);

(2) The forks of the forklift used should be inserted into the full depth of the energy storage cabinet, that is, the fork length should be at least 1500mm;

(3) Before forking, the fork must be tested; In the process of putting down and moving, it is necessary to ensure that it is slow and steady;

(4) Considering the safety factors in the forklift process, it is recommended to bundle a safety belt around the energy storage cabinet and connect it to the forklift beam. The specific forklift operation can be shown in the following figure:

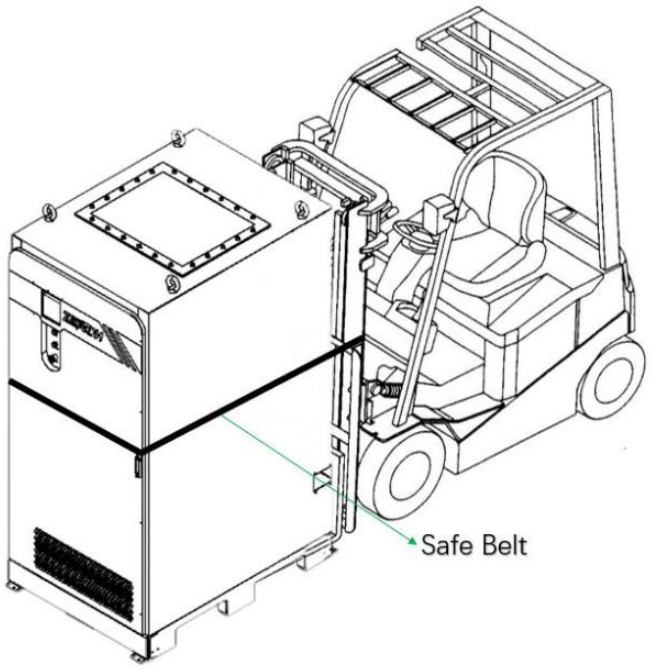


Fig 6-2 Forklift Operation Diagram

6.3. Storage requirements

Prompt
• Before storage, the energy storage system should be checked and the data recorded. Make sure the cabinet door and the door of each device inside are locked and the power switch is in a safe state. • During the storage process, it is necessary to provide relevant proof of compliance with the storage requirements of the product, such as temperature and humidity log data, photos of the storage environment and inspection reports. • The storage and transportation time of the energy storage system should not exceed 6 months in total (calculated from the time of shipment), and it should be used in a timely manner, and there will be capacity loss in the long-term storage of the lithium battery system.

- Recommended storage temperature: 0° C~25° C; If it cannot be met, the storage

temperature range within one month: -20 ° C-45 ° C, and the storage temperature range within one year: 0 ° C-35 ° C;

- Relative humidity: 5%RH~80%RH;
- dry, ventilated, clean;
- Avoid contact with corrosive organic solvents, gases and other substances;
- The distance from the heat source should not be less than two meters;
- The storage location of the energy storage system should have sufficient bearing capacity (single cabinet ⩾ 4t), the ground should be level, no slopes, and no material accumulation around.
- Before storage, the energy storage system should be reasonably protected according to local meteorological conditions to avoid rainwater or groundwater erosion;
- The storage location should be protected from mechanical shock, heavy pressure and strong magnetic fields.
- Check the packaging at least once every half a month to avoid insects and rodents, and replace it immediately if it is damaged. Before installing an energy storage system that has undergone long-term storage (more than 3 months), it should be inspected and tested by a professional before being put into use.
- Long-term storage of batteries is not recommended due to capacity degradation when stored for long periods of time. In addition to this, even if the battery is stored at the recommended optimal storage temperature, there will be irreversible capacity degradation due to the calendar effect, the longer the storage, the greater the irreversible degradation, please refer to the technical protocol for specific degradation values. In-stock batteries are shipped on a first-in, first-out basis.
- Calculated from the date of shipment, the energy storage system with a storage period of more than 3 months under the above conditions should be charged and discharged once to make the system SOC reach 30%~40%, and the SOC of each

battery cabinet needs to be consistent after charging.

7. Mounting fixtures

Warning

- Warning signs should be clearly marked in the operating area, and there should be at least one qualified supervisor on site responsible for industrial safety.
- Operators must be trained and certified before taking up their duties.
- Operators should do a good job of personal protection, wear helmets and safety belts; use a variety of tools that are reasonable and compliant; Any tools used in operation should be maintained and quality checked.
- If special operations or work at height are required, they should report to safety personnel in advance and take precautions.
- In case of inclement weather or unexpected circumstances, stop working immediately.

7.1. Installation requirements

The external environment meets the requirements of GB 51048-2023 China Design Code for Electrochemical Energy Storage Stations. Overseas projects comply with the "NFPA 855 Standard for the Installation of Stationary Energy Storage Systems" or "IEC 62933-5-2 Safety Requirements for Grid Integration BESS".

The equipment should be installed in an area away from liquids, and should not be installed under water pipes, air outlets, and other locations prone to condensation; It should not be installed in air conditioning outlets, vents, server room outlets, and other locations that are prone to water leakage to prevent liquids from entering the equipment and causing equipment failure or short circuit.

It is forbidden to place the equipment in an environment with flammable or explosive gases or fumes, and it is forbidden to perform any operation in such an environment.

Installing energy storage systems in areas affected by salt spray can lead to corrosion and can lead to fires. Therefore, ordinary energy storage systems should not be installed in areas affected by salt spray, except for specially customized energy storage systems that have been pre-ordered. The areas affected by salt spray are those within 2 km of the coast or those affected by sea winds. Areas affected by sea breezes vary depending on meteorological conditions (e.g., typhoons, seasonal winds) or topography (presence of dikes, hills).

Site selection requirements:

- The installation location should not be located in a low-lying area, and the installation level should be at least 300 mm above the historical high water level in the area
- The distance from the airport, landfill disposal site, river bank or dam should be ≥ 2 km.
- Choose an open, well-ventilated location and make sure there are no obstructions within 10m of the site.
- Considering safety, the distance of the energy storage system from residential buildings ≥12m, and the distance from schools, hospitals, and other densely populated buildings %3E30.5m, or the distance should follow local distances or regulations. If this safety distance is not met, a firewall should be built between the energy storage system and the building, as well as convenient transportation conditions and a reliable fire protection system.
- Site locations should avoid scenarios that are not recommended by industry standards and regulations, including but not limited to:
  ① areas of strong vibration, strong noise sources and strong electromagnetic fields;
  ② Places where dust, smoke, toxic gases, corrosive gases, etc. are generated or present;
  ③ Where corrosive, flammable and explosive substances are produced or

stored.

④ Sites with underground facilities.

⑤ Poor geological conditions such as rubbery soils, soft soils, and ground prone to waterlogging and subsidence.

⑥ Seismic faults and seismic zones with a defensive intensity higher than 9 degrees.

⑦ There are parts that are directly dangerous, such as mudslides, landslides, quicksand, and caves.

⑧ Within the boundaries of the mining trap (staggered) area.

⑨ within the blasting hazard range.

⑩ Areas that may be flooded if a dam or levee bursts.

⑪ Important water supply source sanitation protection zone.

⑫ Conservation area of historical monuments and sites.

⑬ Densely populated places, high-rise buildings, underground buildings.

7.2. Foundation recommendation

7.2.1. Foundation construction conditions

(1) The energy storage equipment must be installed on concrete or other non-combustible surfaces, and must ensure that the installation plane is horizontal (the horizontal error of the contact surface between the equipment foundation and the cabinet is ≤3mm), firm and flat, with sufficient bearing capacity, and it is forbidden to have depressions or tilts, the equipment foundation is configured according to the total weight of the equipment, and the pit bottom of the equipment foundation must be compacted and filled.

(2) The electrical cabinet equipment adopts the way of lower outlet, and when building the foundation, it is necessary to consider the outgoing problem of the

equipment, and it is necessary to reserve the trench or other outgoing holes for outlets.

There are the following requirements for the trench: the trench needs to have the necessary waterproof and moisture-proof design to prevent the aging of the cable and the short circuit, which will affect the normal operation of the energy storage equipment. Due to the large power of the equipment and the thickness of the required cables, the cross-sectional area of the cables needs to be fully considered in the design of the trench.

(3) The customer can determine the number of cable brackets according to their needs, and the weight and size of the cable brackets need to be fully considered.

(4) The foundation soil needs to have a certain degree of compactness, it is recommended that the relative compactness of the soil at the installation site $\geqslant$ 98%, if the soil is loose, please be sure to take corresponding measures to ensure that the foundation is stable

(5) The foundation is made according to the foundation plan provided by ZETATECH or the foundation plan confirmed by our company.

7.2.2. Installation space

In order to ensure that the air inlet can better air intake and maintenance space requirements, the maintenance space of the front door of the cabinet is required to be not less than 2500mm, and the left and right sides between the cabinets are required to be less than 50mm, which is convenient for the wiring between the electrical cabinet and the battery cabinet / between the battery cabinet and the battery cabinet, and the space of the rear door of the cabinet is recommended to be greater than 1.5m, if the actual conditions on site cannot be met, at least more than 800mm is required to facilitate operation and maintenance. The specific installation distance is subject to the requirements of the local design and installation specifications.

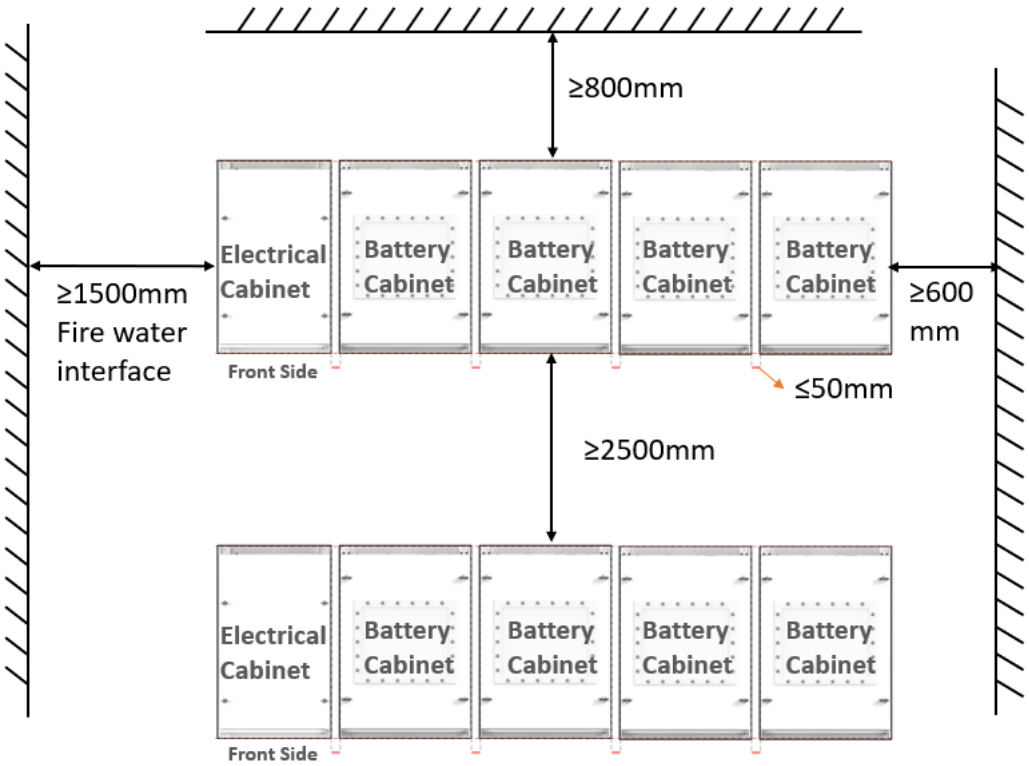


Fig 7-1 Recommended Installation Distance

Fire water pipe joints are reserved near the energy storage electrical cabinet to facilitate the connection of fire water pipes, and water fire fighting can be implemented in case of emergency.

7.2.3. Recommended foundation construction drawings

The following picture is a schematic diagram of the foundation construction recommended by ZETATECH, and more detailed foundation drawings need to be obtained from a professional third-party construction team or contact ZETATECH.

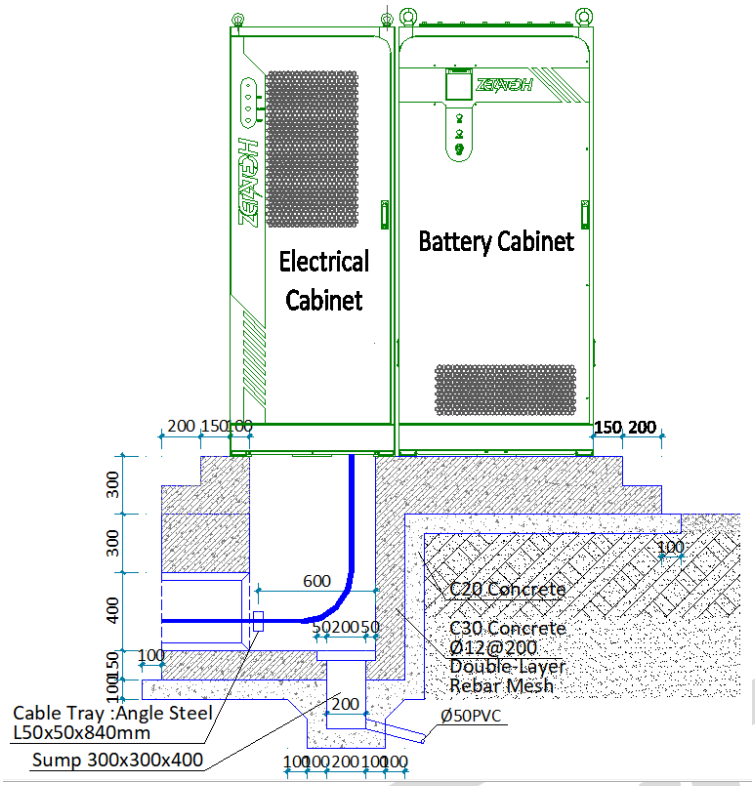


Fig 7-2 One electrical cabinet + one battery cabinet foundation

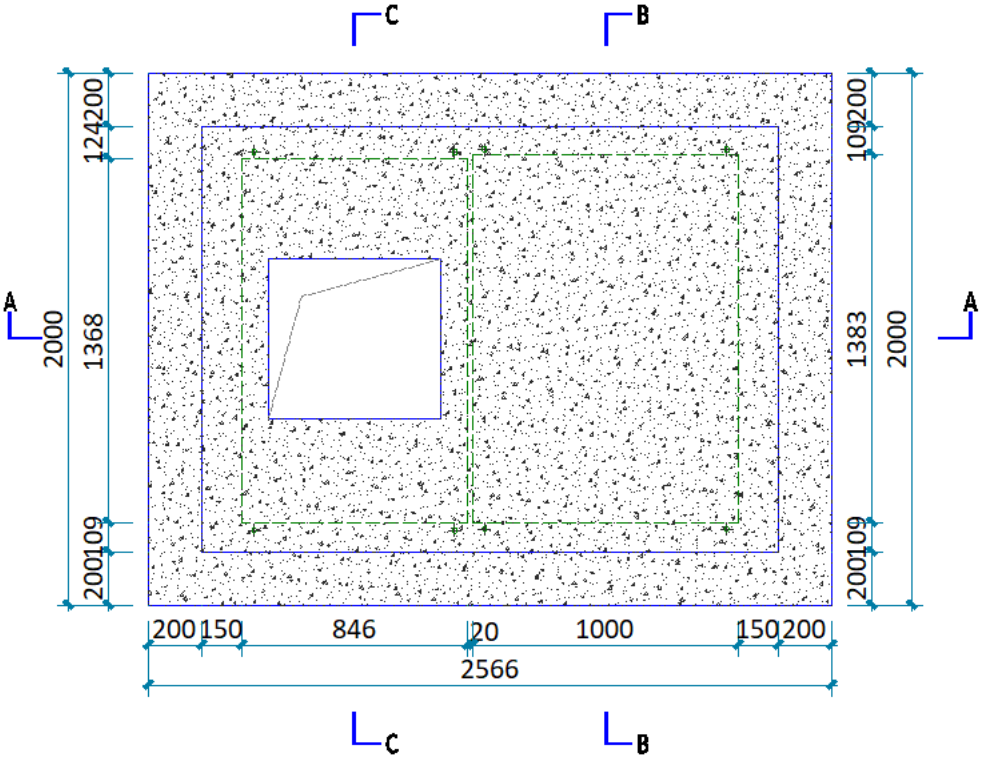


Fig 7-3 One electrical cabinet + one battery cabinet foundation size

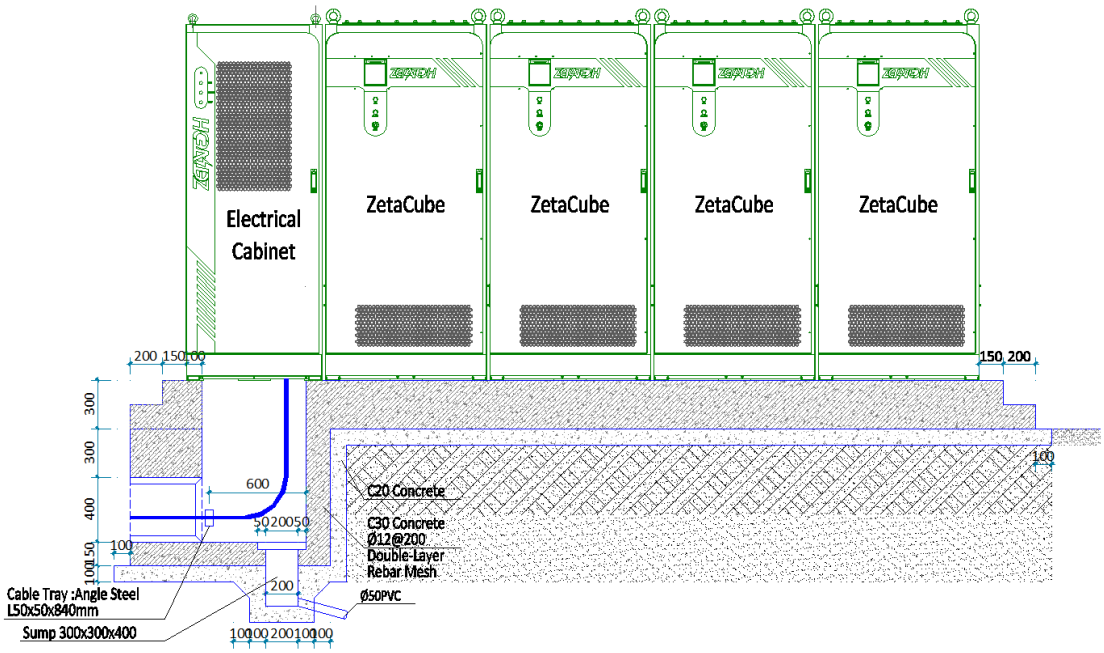


Fig 7-4 One electrical cabinet + four battery cabinet foundations

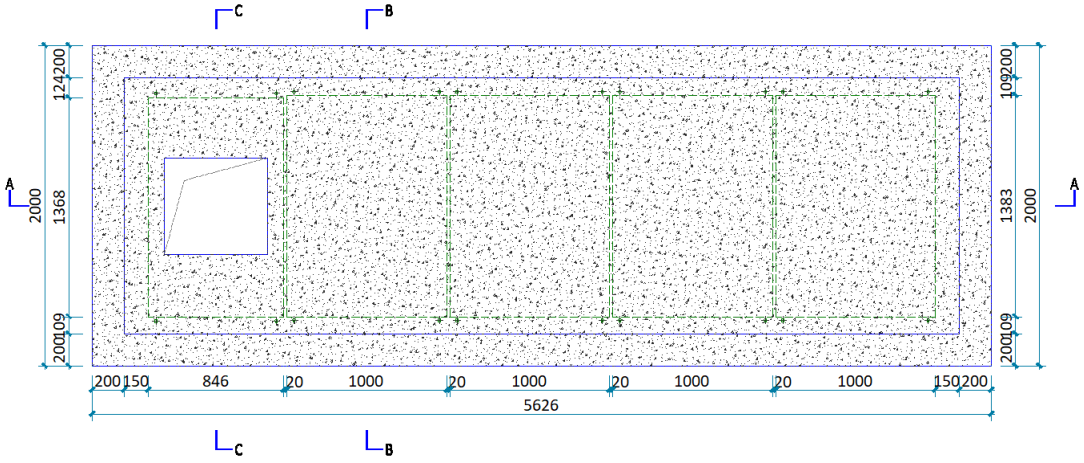


Fig 7-5 One electrical cabinet + four battery cabinet foundation dimensions

7.2.4. Optional Steel Base

On the foundation where there is no trench or it is not convenient to dig the trench, the steel base can be used for the parallel connection of the electrical cabinet and the battery cabinet, and the installation of the steel base must require the foundation to be leveled to ensure that all cabinets are horizontal and stable after installation. All cabinets are screwed to the base.

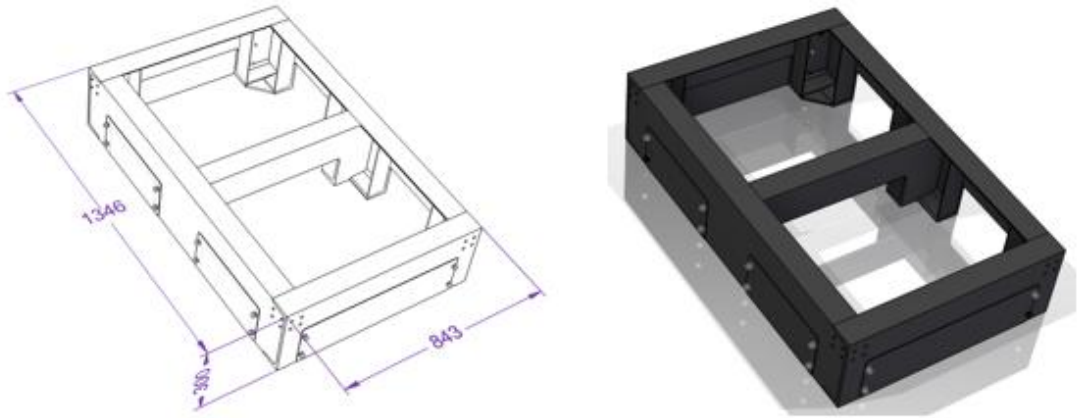


Fig 7-6 Electrical cabinet steel base

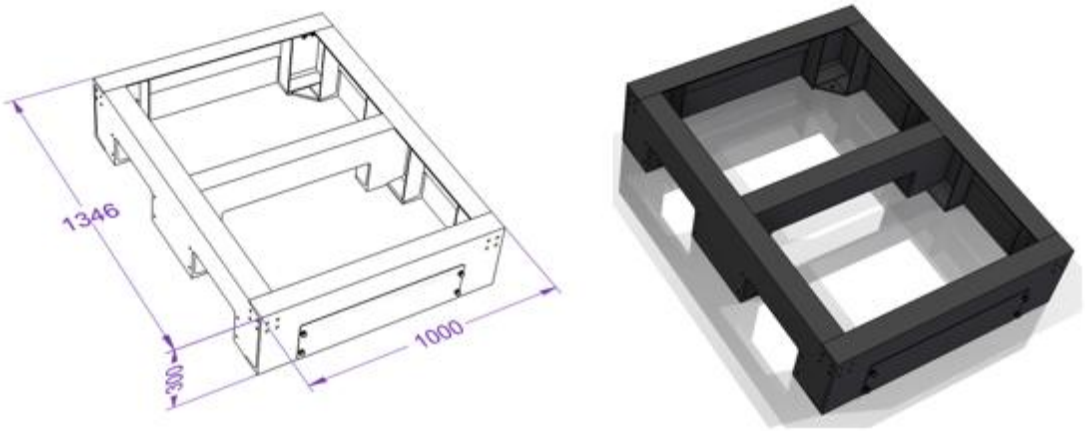


Fig 7-7 Battery cabinet steel base

Table 7-1 Steel Base Parameters

Name	Size/mm	Weight/kg
Electrical cabinet mounts	1346*843*300	≤175
Battery cabinet mount	1346*1000*300	≤190

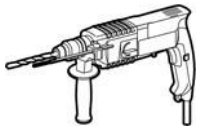
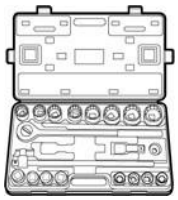
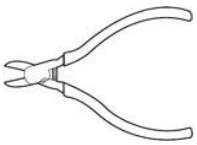
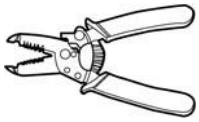
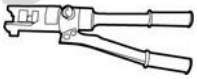
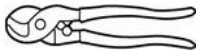
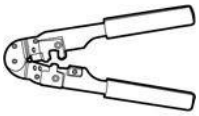
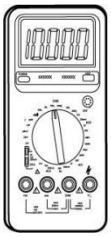
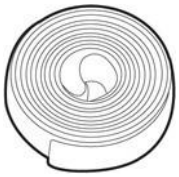
7.3. Installation and fixing

7.4. Installation tool preparation

Prompt
The tool handles used, including socket wrenches, torque wrenches, screwdrivers,

etc., need to be insulated.

Table 7-2Installation & Wiring Tools

 Hammer drill (drill bit : Φ14mm、 Φ16mm)	 Torque socket wrench	 Moment of force spanner	 Diagonal pliers
 Wire strippers	 One word screwdriver Knife head :0.6mm× 3.5mm	 Rubber mallet	 Utility knife
 Marker	 Steel measuring tape	 Level	 Hydraulic tong
 Cable cutter	 Crystal head clamp	 Vacuum clear	 Multimeter DC voltage range ≥ 1500V DC
 Heat-shrinkable sleeve	 Heat gun	Tie-line belt	 Insulation ladder

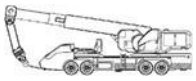
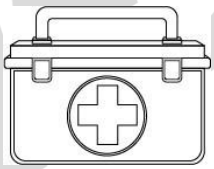
 Crane	 Lifting rope		

Table 7-3Personal Protective Equipment

 Safety gloves	 Safety goggles	 Dust mask	 Safety boots
 Reflective waistcoat	 Safety helmet	 Field medical chest	

7.4.1. Check before installation

- ✓ Check the completeness of the deliverables against the enclosed packing slip.
- ✓ Check that the system you actually receive matches the model you ordered.
- ✓ Inspect the energy storage system and internal equipment to ensure there is no damage such as holes, cracks, or other signs of possible internal damage.
- ✓ If you find a problem or have questions, or if the device model does not match, please contact your dealer.
- ✓ Before installation, ensure that cranes, slings, forklifts, etc. meet the load-bearing requirements;
- ✓ The preparation of the steel cable for lifting has been completed;

- ✓ The foundation has been built as required;
- ✓ Meet the weather requirements for lifting and forklift transportation; When installing outdoors, in case of bad weather conditions, such as heavy rain, fog, wind, etc., the lifting work should be stopped.

7.4.2. Installation fixed work

Warning
Only a complete energy storage system without any damage can be installed!

Step 1

Use a ruler to determine the base point of the energy storage system installed on the concrete support platform, ensure that the cabinet is aligned before and after, the left and right spacing should not exceed 5cm, and record the reference point with a marker.

Step 2

Remove all packaging materials from the electrical cabinet and battery cabinet.

Fig 7-8 Unpacking

- ➢ **Step 3**

Locate the cabinet key and open the door, remove the carton containing the mounting accessories, count the type and quantity of all accessories according to the packing list, and contact the dealer if there is anything missing. Remove the 4 lifting

rings (Fig7-9: ①) from the attachment, attach them to the top of the cabinet, and confirm that each lifting ring is tightened.

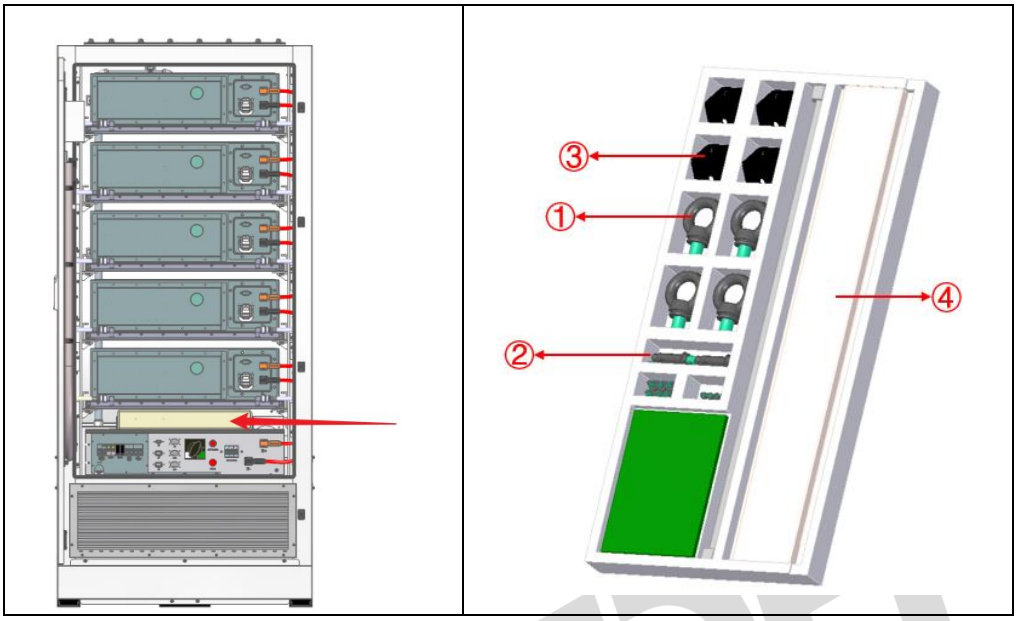


Fig 7-9 Battery Cabinet Accessory

- **Step 4**

Confirm the orientation of the battery cabinet and electrical cabinet, and use a forklift or crane to place the equipment in a pre-designed position and orientation. When the energy storage system is in contact with the concrete support platform, wait until the four support stress surfaces are relatively uniform, and then disassemble the lifting cable and forklift arm. It must be ensured that the base of the energy storage system coincides with the position of the base drawn on the concrete support platform.

- **Step 5**

Fixing the entire system on a concrete platform:

a. Remove the base (Fig7-9: ③) and the matching screws and expansion screws (Fig7-9: ②) from the attachment

b. Place the feet in the four corners of the cabinet respectively, and mark the punching position corresponding to the expansion screws of the feet with a watercolor pen

c. Make a Φ18mm hole (depth≥100mm) at the marked position

d. Knock the expansion bolt into the hole and remove the nut and gasket

e. After placing the foot, tighten the two fixing screws (M10, recommended torque: 25Nm▪) to fix the footing with the cabinet, and tighten the expansion screw (M14, recommended torque: 55Nm▪) after installing the gasket and nut of the expansion bolt.

f. Cycle the above steps in turn until all the feet are in place

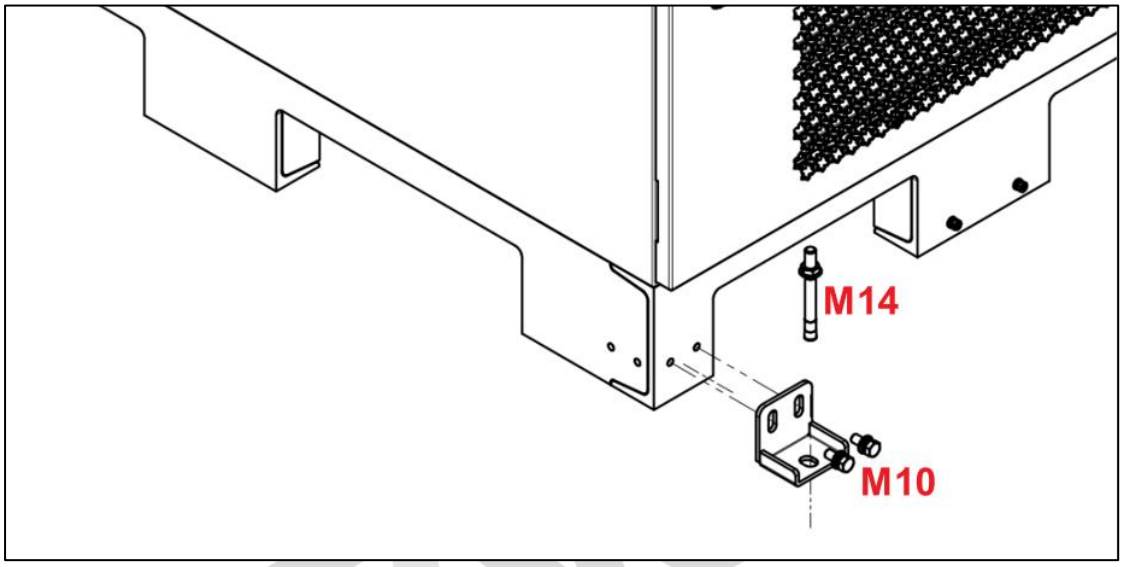


Fig 7-10 Foot Installation Drawing

- **Step 6**

Remove the prongs from the fitting and attach the prongs to the base, remove the prongs covering sheet metal (Fig7-9: ④) and the matching screws (M6, recommended torque: 5Nm▪).

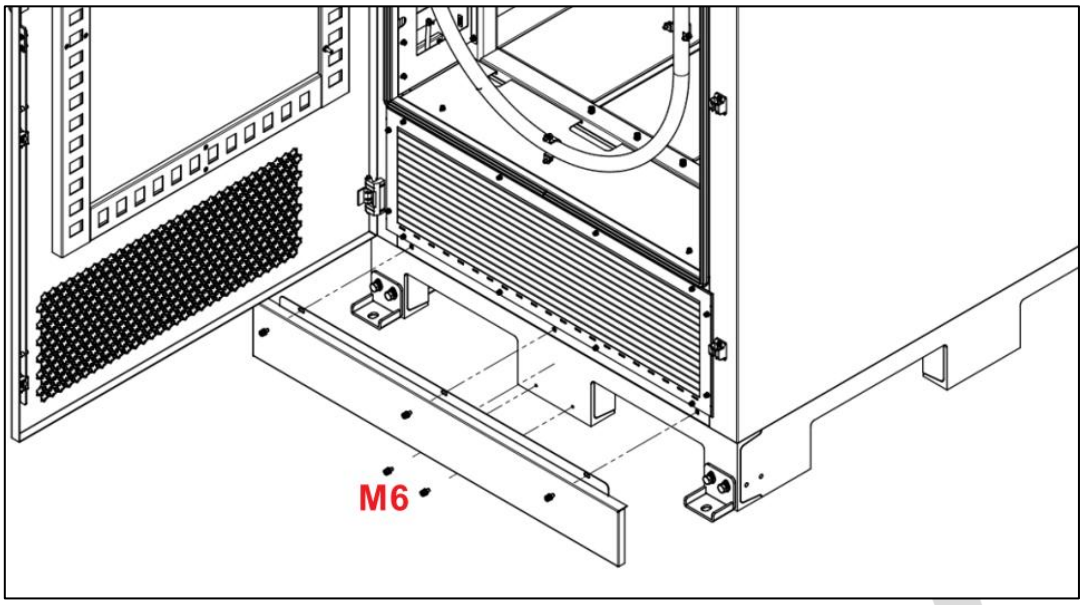


Fig 7-11 Pin Sheet Metal Mounting

- **Step 7**

After fixing, remove the cabinet brush on the side of the last battery cabinet, take out the 'wiring duct side baffle' and matching screws (M4, recommended torque: 2.2N▪m) from the accessories, and install them in the position of the original cabinet brush.

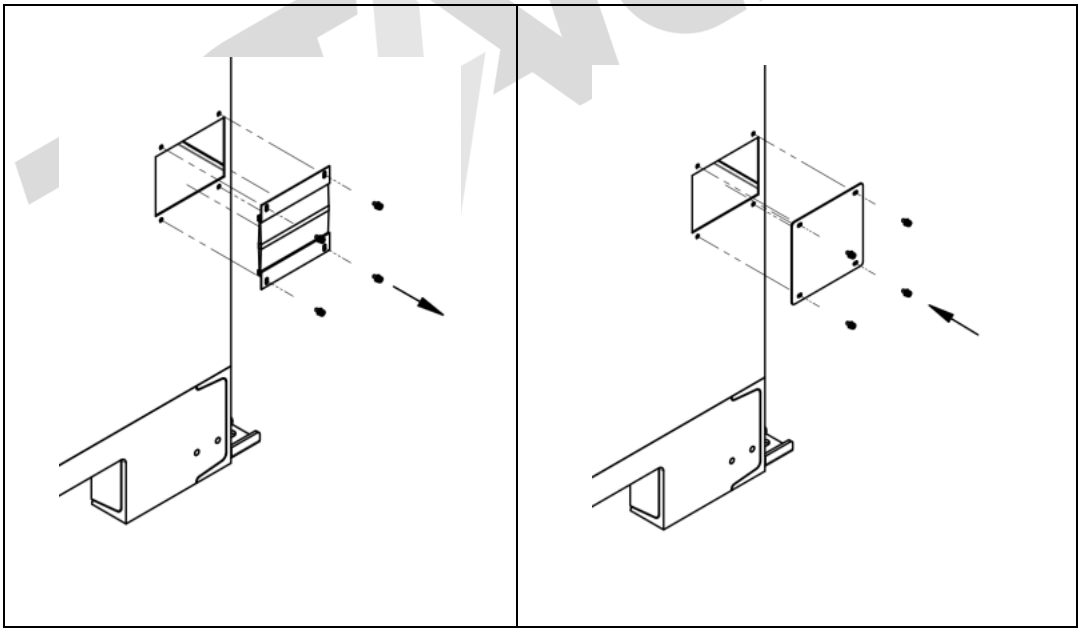


Fig 7-12Install the side bezel of the wiring duct

7.4.3. Steel base mounting

If the installation scheme of the steel base is selected on site, the following steps are followed.

- Step 1

According to the actual situation, remove the packaging of the steel base and lift the base to the determined installation position

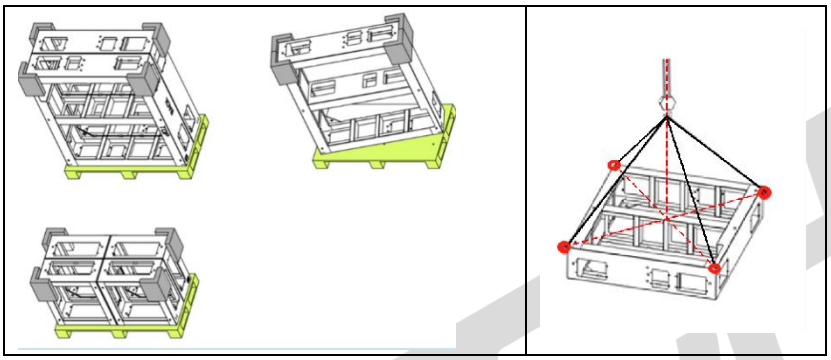


Fig 7-13 Take out the steel base

- Step 2

Remove the fixing plate and M10 screws and M16×150 expansion screws from the accessory package. Pay attention to distinguish between the front fixing plate of the cabinet, the back mounting plate and the fixed plate of the cabinet

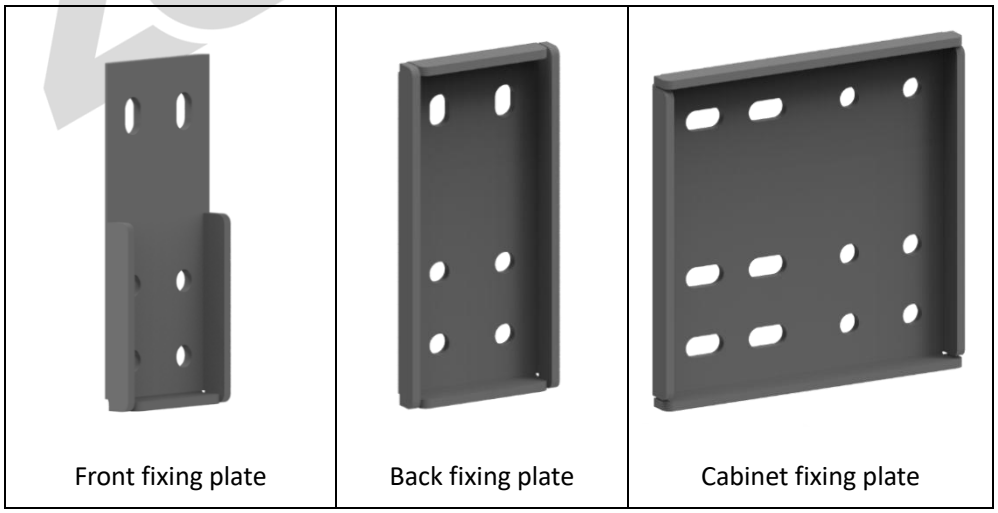


Fig 7-14Fixed Plate

➢ Step 3

Make a ϕ20mm hole (depth ≥ 150mm) in the installation and positioning of the steel base, knock the expansion bolt into the hole, and tighten the expansion screw (M16, recommended torque torque: 90Nm▪) after installing the gasket and nut.

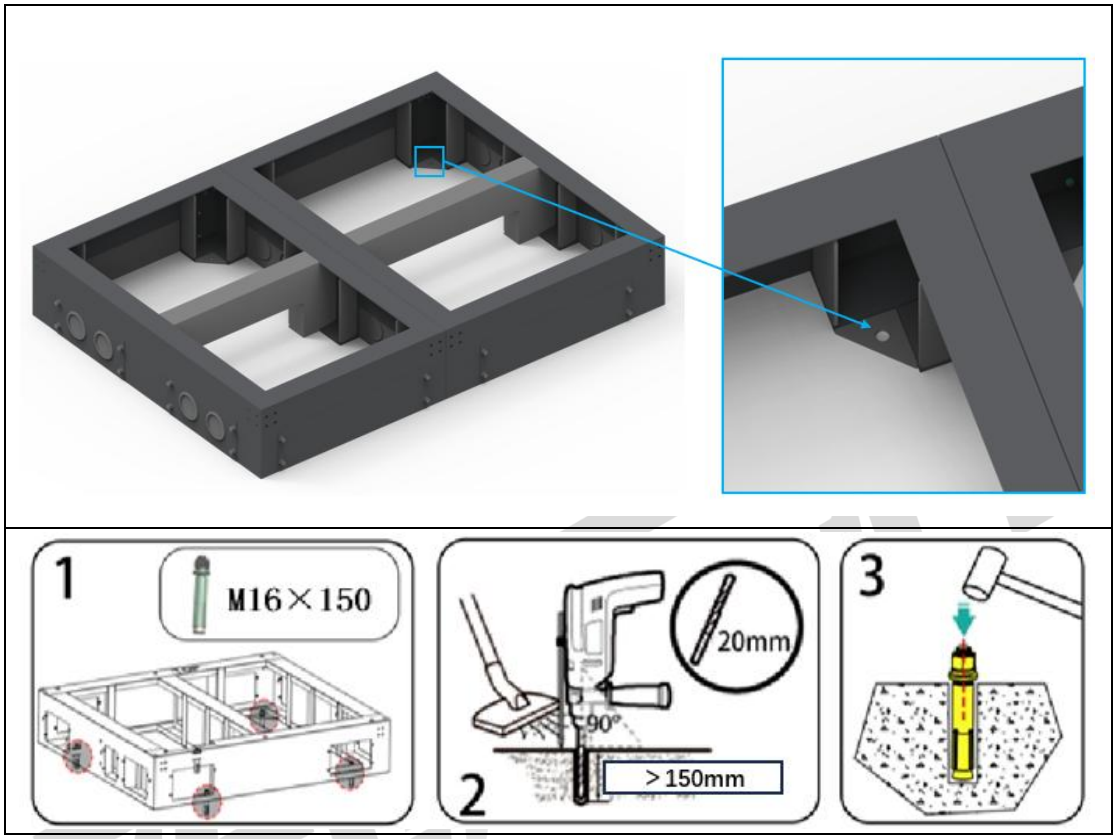


Fig 7-15 Fixed Base

➢ Step 4

Place the electrical cabinet of the battery cabinet on the steel base, pay attention to alignment, and fix the electrical cabinet, battery cabinet and base firmly with M10 (recommended torque: 25Nm▪) bolts.

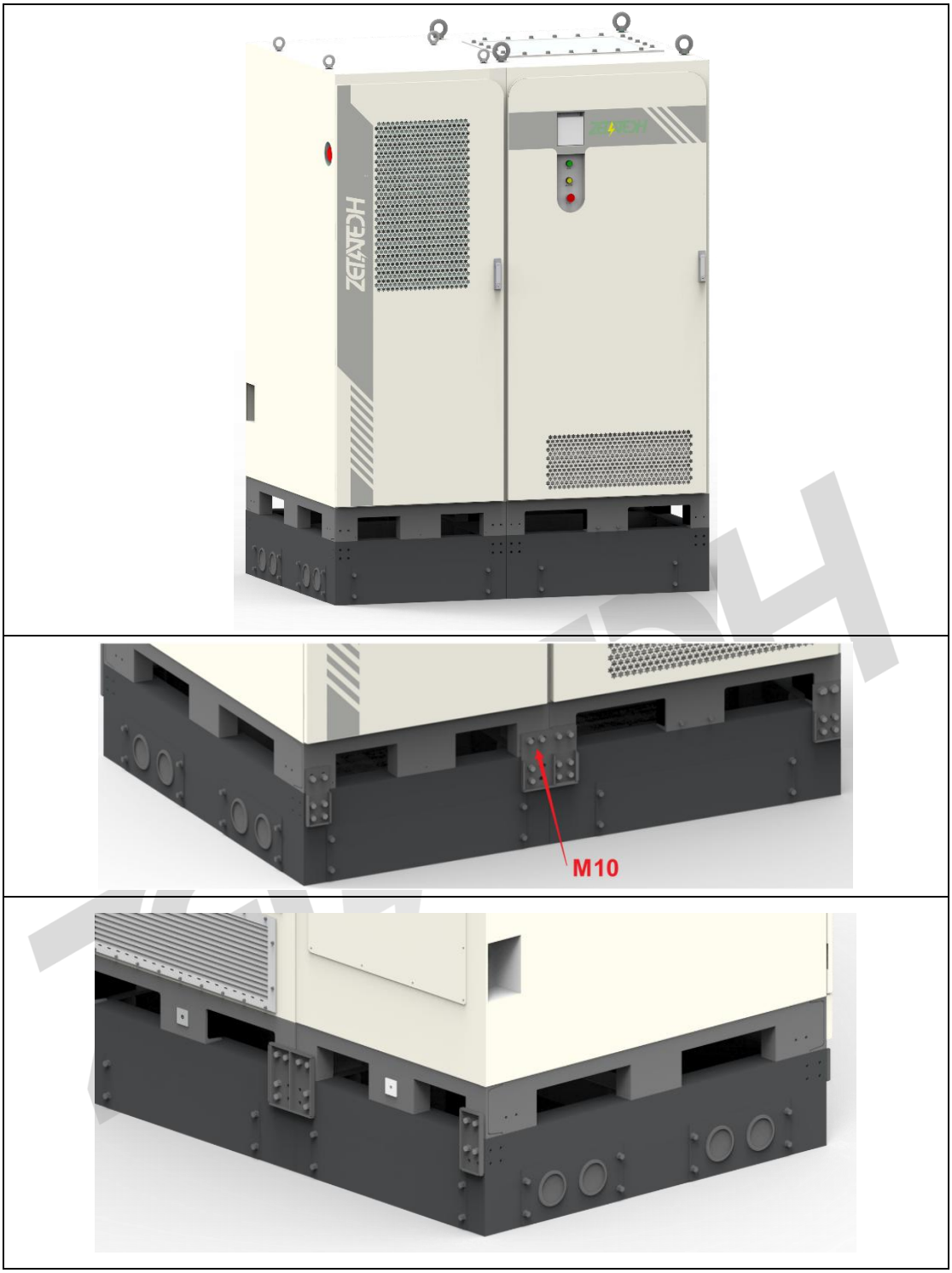


Fig 7-16 Installing the cabinet

- Install the prongs to cover the sheet metal back into the cabinet and fix it completely.

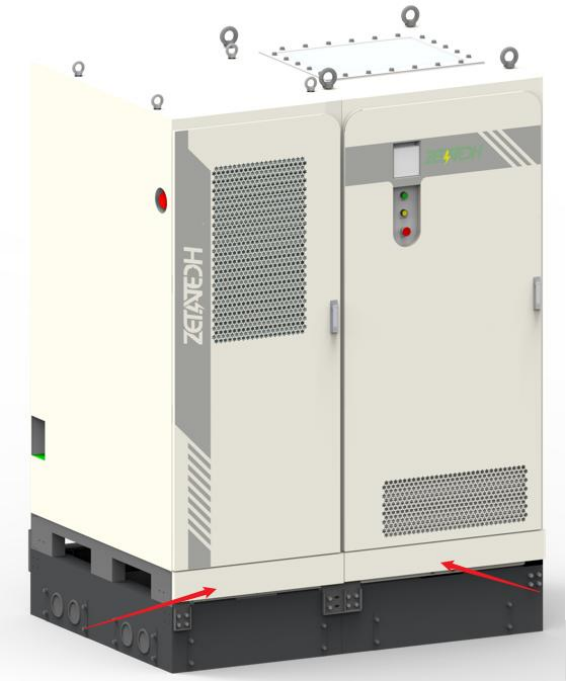


Fig 7-17 Installation Complete

Prompt
The outer end face of the base (×4) baffle must be installed, and the opening method of the wire hole is subject to the actual thing, if the site needs to add another wire hole, the coil must be installed; There is no need to install a baffle on the inside of the base; If there is an error between the length and width of the base and the length and width of the cabinet, the backing plate can be added when installing the fixing plate.

8. Electrical connections

Danger
• High pressure danger! Risk of electric shock! • Do not touch the live parts! • Make sure that both the AC side and the DC side are not charged before installation. • Do not place equipment, tools, and other items on flammable surfaces.

Warning

- Before wiring, check and make sure all input cables are of the correct polarity.
- During electrical installation, do not forcibly pull wires or cables to avoid damaging the insulation performance.
- Make sure all cables and wires have plenty of room where they bend.
- Necessary auxiliary measures should be taken to reduce the stress on the cables and wires.
- After completing each connection, double-check and make sure that the connection is correct and secure.

8.1. Safety precautions

8.1.1. Cabling requirements

- Cable selection, routing, and routing must comply with local laws, regulations, and specifications.
- It is strictly forbidden to have loops or stranding during the laying of power cables. If the length of the power cord is found to be insufficient, the power cord must be replaced, and it is strictly forbidden to make joints or soldering points in the power cord.
- All cables must be securely connected, well insulated, and of the right size.
- The cable trough and threading hole should have no sharp edges, and the cable threading or vihole position should be protected to avoid the cable being damaged by sharp edges and burrs.
- The same kind of cables should be bundled together, with a straight and neat appearance without skin damage; Different types of cables should be spaced at least 30mm apart, and it is forbidden to wrap around each other or cross lay.

- When the wiring is completed or left halfway, the cable hole should be immediately sealed with sealing mud to prevent water vapor and small animals from entering.
- The buried cable needs to be reliably fixed with cable brackets and clamps, and the cable in the backfill area should be tightly attached to the ground to prevent the cable from being deformed or damaged due to the force of the backfill.
- When external conditions (such as laying method or ambient temperature, etc.) change, the cable selection should be rechecked with reference to IEC-60368-5-52 or local specifications, such as whether the current carrying capacity meets the requirements.
- Cables used in high-temperature environments may cause insulation deterioration and breakage, and the distance between the cable and the perimeter of the heating device or heat source area should be at least 30mm.
- Severe shock and vibration at temperatures that are too low can cause the plastic sheath of the cable to crack brittle. All cables should be laid and installed in an environment above 0° C. When handling cables, especially when working in low temperature environments, they should be handled with care.

8.1.2. Short-circuit protection protection requirements

When installing and maintaining the battery module, wrap the exposed cable terminals on the battery with insulating tape.

Avoid foreign objects (such as conductive objects, screws, liquids, etc.) from entering the battery and causing short circuits.

 **Danger**
• Before making electrical connections, make sure that the equipment is not

damaged, otherwise it may cause electric shock or fire.

- Improper operation may cause accidents such as fire or electric shock.
- After the short-circuit protection device is damaged, it needs to be replaced by a professional, and it is necessary to ensure that the factors causing the short-circuit have been eliminated and the system is in a power-off state.

Warning

When installing equipment that needs to be grounded, a protective grounding wire must be installed first; When disassembling the equipment, the protective grounding wire must be removed last.

The energy storage system is equipped with the following protection devices, and if short circuit protection occurs, it can be replaced according to the following parameters and requirements.

Table 8-1 Protection Device Parameters

Number	The name of the protection device	Model and parameters	Precautions when replacing
1	Primary fuse	A372102-400 YW,250V 400A	Located in the battery pack, you need to disconnect the MSD and remove the cover before replacing
2	Secondary fuses	A4305-350A，1000V,350A	It is located in the high-voltage box, and the high-voltage box module needs to be removed

			before the internal device is replaced
3	DC power supply fuses	HV110.5A-AP，1000V,5A	It is located in the high-voltage box, and the high-voltage box module needs to be removed before the internal device is replaced
4	breakers	NDM3Z-250VZ/3341,1500V,250A	It is located in the high-voltage box, and the high-voltage box module needs to be removed before the internal device is replaced
5	Surge protectors	DAC50S-20-320	It is located in the high-voltage box, and the high-voltage box module needs to be removed before the internal device is replaced

8.2. Grounding requirements

（1） The ground impedance of the equipment must meet the requirements of the local electrical standard.

（2） The device should be permanently connected to the ground point. Before installing the equipment, the grounding wire must be installed; When disassembling the equipment, remove the grounding wire last; Before operating the equipment, check the electrical

connections of the equipment to ensure that it is securely grounded.

（3） Do not damage the grounding conductor.

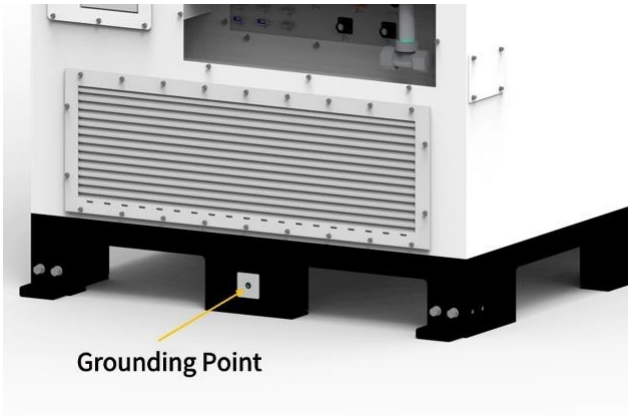


Fig 8-1 Cabinet Ground Position

（4） The grounding method can be fixed with a grounding flat steel or with a grounding cable.

（5） Please install the external grounding according to the actual situation of the project site and according to the instructions of the power station staff. After the ground connection is completed, the ground resistance should be measured, and the resistance value should not be greater than 4 Ω.

8.3. Preparation for wiring

8.3.1. Prepare the cables

The required cables are shown in the table below, where the inter-cabinet cable routing includes DC power cable wiring and signal cable wiring, which are shipped with the cabinet and connected by plug-ins.

Table 8-2 Cable Requirements Table

Name	Type	Cross-sectional area	Terminal	Use	Remark

		selection range			
Grid access cable	Outdoor copper core wire or armored cable	Single phase = 3 * 185mm ²	DT185-12	Grid and off-grid cabinet cable	Customer-brought
ground wire	Outdoor copper core wire or armored cable	120mm^2	SC120-12	System grounding wire	Customer-brought
Load side AC output line	Outdoor copper core wire or armored cable	Single phase =2*150m m^2	DT150-12/SC150-12	Load side output line	Customer-brought
Cabinet cable	Outdoor copper core wire or armored cable	⩾70mm^2	SC70-10	Power cable between electrical cabinet and parallel grid cabinet	Determined according to the installation location
Mains AC input power cord	Outdoor copper core wire or armoured cable	≥95mm²	M12 OT/DT terminals	AC input power cord of energy storage	Customer-brought

				electrical cabinet	
Load-side AC output power cord	Outdoor copper core wire or armoured cable	≥50mm²	M10 OT/DT terminals	Load-side AC output power	Customer-brought
Protect the grounding wire	Single-core outdoor copper core wire or grounded flat steel	Copper core wire: 25~50mm²	M10 OT/DT terminals	The specifications of the grounding wire/flat steel are subject to the drawings of the design institute	Customer-brought
		Flat steel cross-section: 40mm×4mm			
DC parallel cabinet power cord	The length and specifications are configured according to the installation arrangemen	DC+:50mm²	Comes with power terminals	The energy storage cabinet is used when it is used in conjunction with the battery cabinet	Included with the cabinet
		DC:50mm²			

Connecting power and communication harnesses between cabinets (battery cabinet to electrical cabinet)	t specified in this manual, if there are other layout solutions, you need to notify ZETATECH in advance for wiring harness customization	/	Comes with terminals	The energy storage cabinet is used when it is used in conjunction with the battery cabinet	Included with the cabinet
Communication network cables		Outdoor shielded network cable, internal resistance 1.5Ω/10m	Crystal Head(RJ45)	BMS-to-EMS communication (between energy storage cabinet and electrical cabinet)	Included with the cabinet
AC220V power cord		/	Comes with terminals	AC220V auxiliary power cord (electrical cabinet to battery cabinet)	Included with the cabinet

Prompt
• The cables used should comply with local laws and regulations.

- The cable colors mentioned in the illustrations in this manual are for reference only, and the actual color selection should follow the local cable standards.
- The cable diameter should be selected according to the maximum load capacity, with sufficient length margin.
- All DC input cables should be of the same specification and material.

8.3.2. Cable entry design

The connecting cables of the electrical cabinet to external equipment enter and exit from the bottom of the cabinet. The parallel cables of the electrical cabinet and the battery cabinet enter and exit from the side behind the cabinet. All cables leading out of the cabinet need to be properly protected, e.g. through pipes, to prevent rats from damaging the cables. After the wiring work is completed, the inlet and outlet holes of the energy storage cabinet should also be tightly sealed with fireproof mud or other suitable materials.

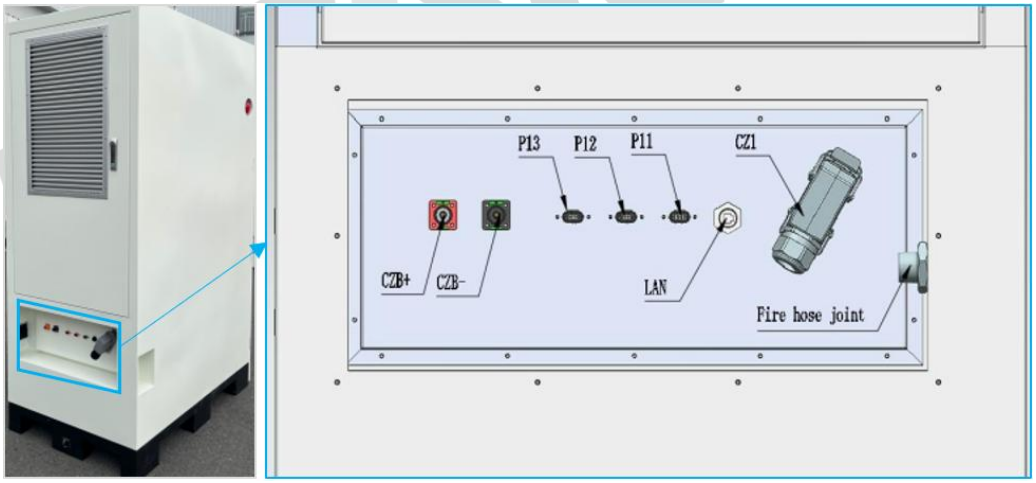


Fig 8-2Wiring at the back of the electrical cabinet

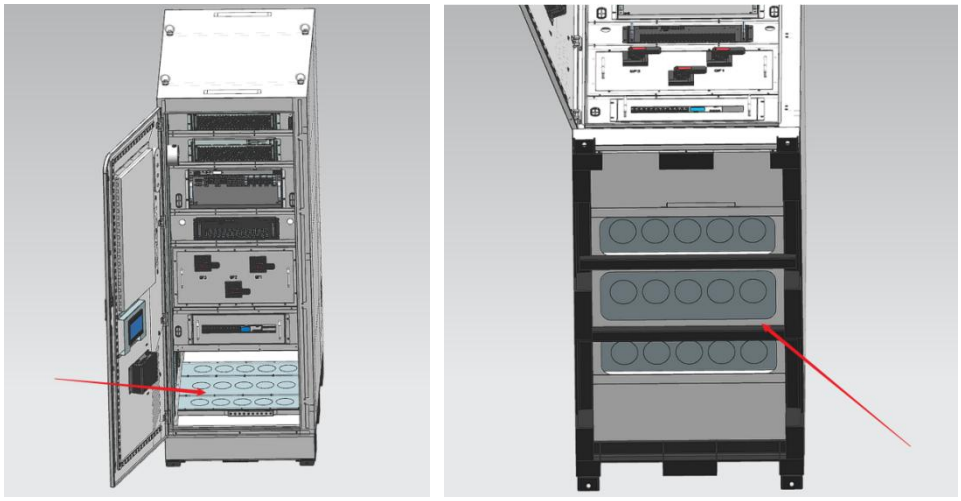


Fig 8-3 Electrical cabinet bottom inlet

(The specific hole location is subject to the actual product)

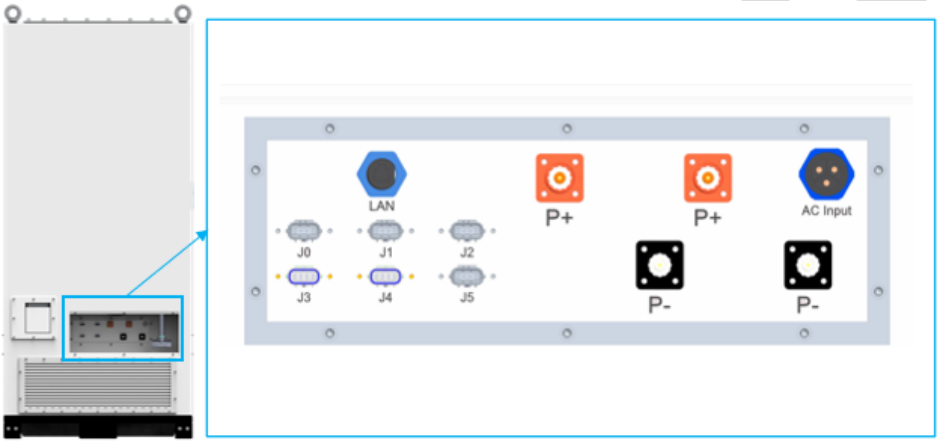


Fig 8-4 Battery cabinet wiring

8.3.3. Ground connection

The grounding connection can be made by means of grounding flat steel or grounding cable

- Grounding flat bars

  Use M10×30 screws to fix the grounding flat bar on the two grounding points of the energy storage cabinet and the base of the battery cabinet

- Grounding cable

  Using a 25 mm² to 50 mm² grounding cable, the cable is crimped onto the DT terminal and fastened with M10×30 screws after crimping. Reliably

connect the two grounding points of the energy storage cabinet and the battery cabinet to the grounding point of the field grounding grid.

After all fixation is completed, it needs to be painted. When installing grounding, it is necessary to combine the actual situation of the project site and follow the instructions of the power station staff. After the grounding connection is completed, the grounding resistance should be measured, and the resistance value should not be greater than 4Ω.

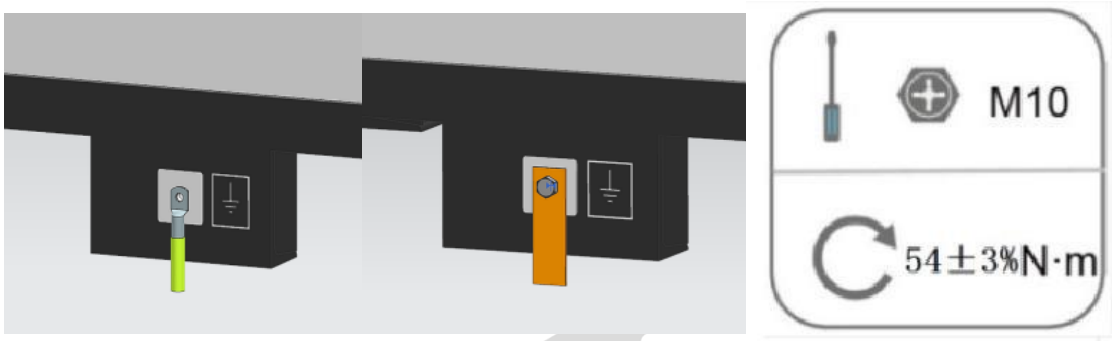


Fig 8-5 Grounding Position

8.3.4. Cabinet indirect wiring

Cabling between the electrical cabinet and the battery cabinet and between the battery cabinet and the battery cabinet includes DC power cable wiring and signal cable wiring, which are shipped with the cabinet and are plug-in.

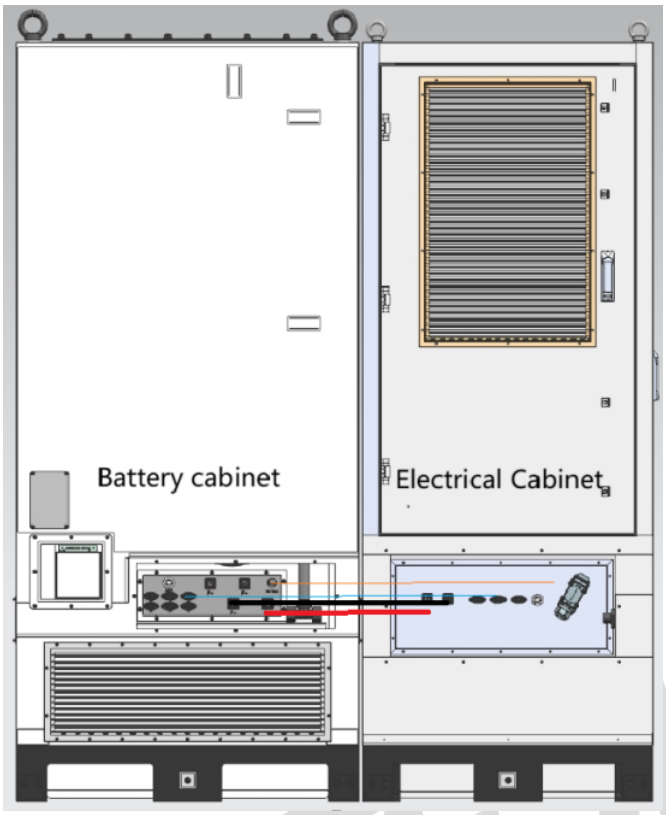


Fig 8-6 Cable Connection

➢ **Step 1**

Locate the paralleling cable that came with the cabinet

Table 8-3 Cables included with the cabinet

Category	Description	Remark
The power cable from the battery cabinet to the electrical cabinet	One red, one black, with plugs at both ends	Included with the cabinet
Communication network cables	RJ45 connectors at both ends	Included with the cabinet
AC220V power cord	Plugs at both ends	Included with the cabinet
Communication cable from the battery cabinet to the electrical cabinet	Communication connector terminals at both ends	Included with the cabinet

➢ **Step 2**

Plug in the corresponding wire according to the wire mark on the wiring harness, first insert the power cord and communication cable into the electrical cabinet side, and ensure that the terminals are inserted in place and locked; Then, according to the cable identification, it is led to the corresponding interface of the battery cabinet for wiring.

The following table shows the correspondence between the interface between the electrical cabinet and the battery cabinet, and ensure that the connector is installed according to the corresponding interface when installing the connector on site.

Table 8-4 Interface Correspondence

High voltage box interface	Electrical cabinet interface
AC Input	CZ1
P–	CZB–
P+	CZB+
J5	P12
J4	P11
J0	P13
LAN	LAN

➢ **Step 3**

After all the cables of the battery cabinet and the electrical cabinet are connected, tie and fix the cables, and check again whether the plug is inserted in place. (Judgment method: (1) You can hear the "click" sound of being installed in place; (2) There is no loosening of the reverse pulling cable).

➢ **Step 4**

Once wiring is complete, gently pull the cable to make sure there is a margin.

➢ **Step 5**

Once the cables are connected, attach the cover at the terminal to the cabinet.

8.3.5. External cable connection

The external AC grid cable is connected to the GRID terminal at the rear of the switch room in the electrical cabinet.

The external AC load cable is connected to the LOAD terminal at the rear of the switch room.

The photovoltaic (PV) cable is connected to the underside of the disconnector in the electrical cabinet.

The cable wiring is as follows:

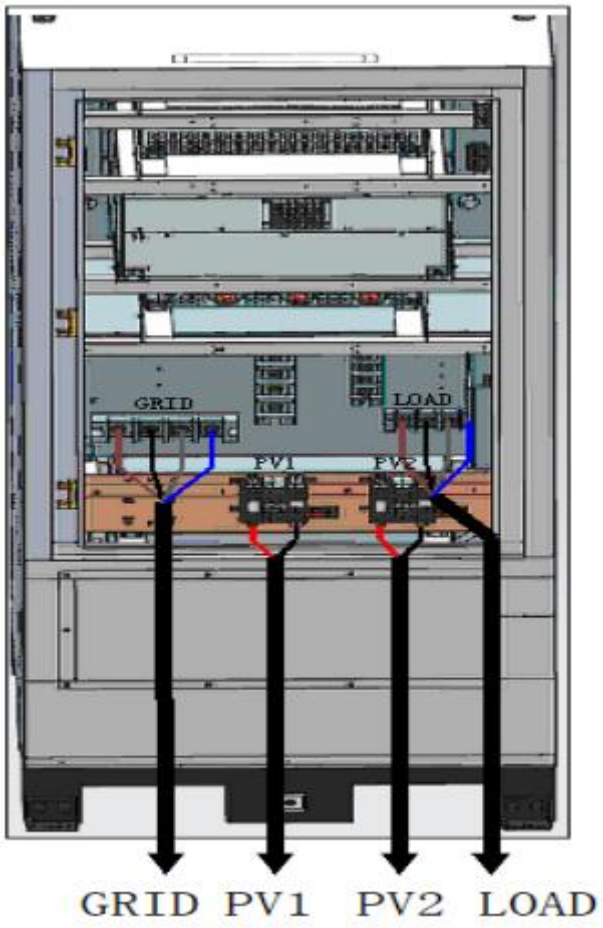


Table 8-5 External cable connection

- **Step 1**

Disconnect all circuit breakers and disconnectors in the electrical cabinet. Use the multimeter to confirm that the power cord to the battery cabinet is powered off.

- **Step 2**

Thread the cable through the inlet hole at the bottom of the electrical cabinet and lead it out to the corresponding wiring position according to the cable identification.

- **Step 3**

Cut excessively long cables with a wire trimmer, use wire strippers to strip the cable sheath and expose the copper core, and crimp the appropriate OT terminals for the cable.

- **Step 4**

Connect the cable with the crimped terminal to the corresponding interface of the electrical cabinet.

Grid input power cable: Use M12 bolts (recommended torque: 36Nm▪) to secure the OT terminals to the terminal holes.

Load output power cable: Use M10 bolts (recommended torque: 25Nm▪) to secure the OT terminals.

PV input power cable: Use M10 bolts (recommended torque: 25Nm▪) to secure the OT terminals.

8.3.6. Operate after wiring

Once all the cables are routed, you also need to do the following:

Use fireproof and waterproof materials to tightly seal the outlet holes and gaps around the energy storage system.

All dismantled wiring covers, door panels and screws need to be reinstalled and restored.

8.4. Fire hose installation

After the wiring is completed, it is necessary to connect the fire hose between the electrical cabinet and the battery cabinet, and between the battery cabinet and

the battery cabinet.

Step 1

Take out the fire hose that comes with the cabinet, check and confirm whether the number and status of the water pipe and sealing ring are correct, and contact your dealer if there is any omission.

Step 2

Remove the sealing cover of the tee joint on the fire hose behind the cabinet

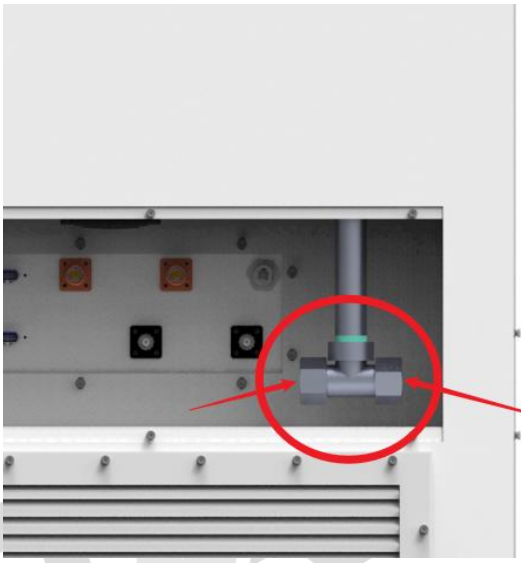


Table 8-6 Fire Water Connectors

Step 3

One end of the fire hose is connected with the fire water connector of the electrical cabinet, and the other end is connected with the connector of the battery cabinet after passing through the wire hole between the cabinets, and if there are multiple battery cabinets, the fire water pipes of the battery cabinet and the battery cabinet are connected in the same way.

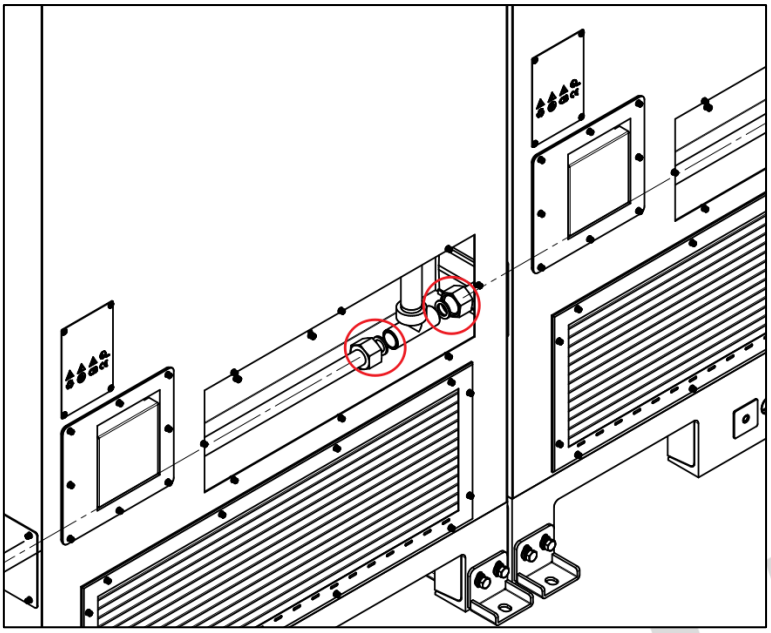


Table 8-7 Water Pipe Connection Locations

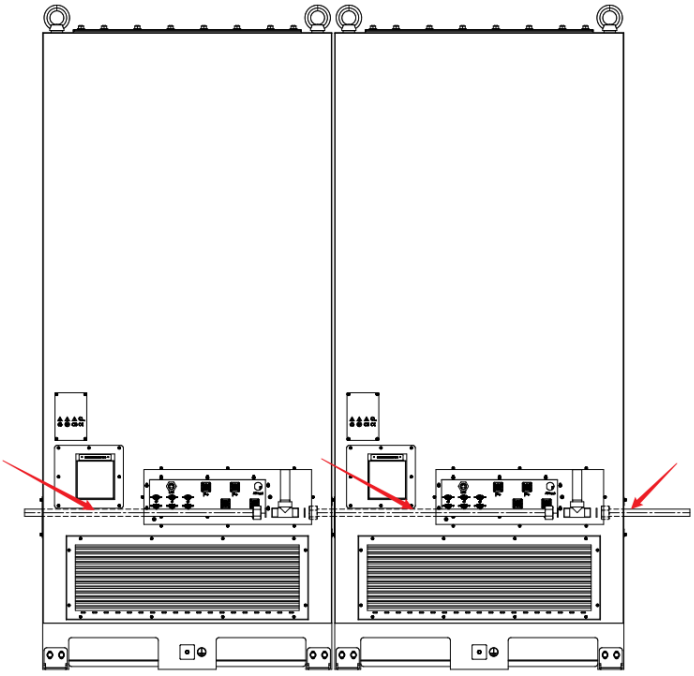


Table 8-8 Fire Water Pipe Connections

Caution

Make sure that each joint of the fire hose is tightened and that each connection is sealed

9. The operation process of powering on and off the system

Warning

- The energy storage system used in the grid can only be put into operation after confirmation by a professional and approval from the local power authority.
- For BESS with long downtimes, inspect the equipment thoroughly and carefully

9.1. Indicator status description

➢ **Battery cabinet indicator light description**

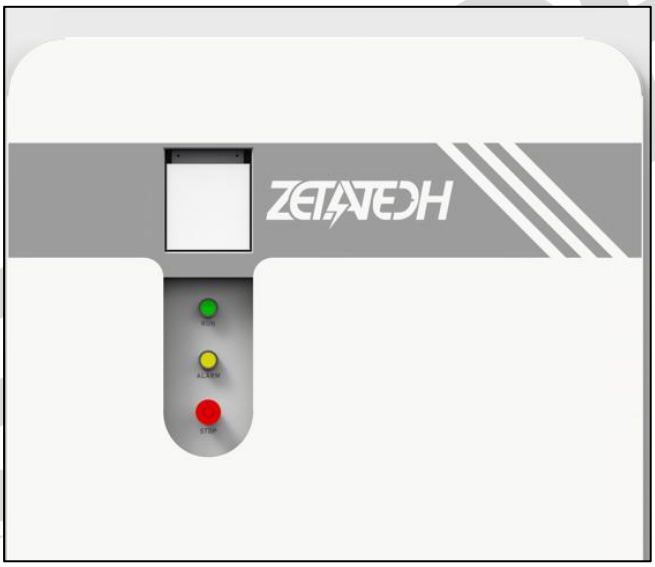


Fig 9-1Battery cabinet indicator

Table 9-1 Battery Cabinet Indicator Description

The name of the indicator	Indicator status	Hidden meaning	Note
RUN	Green Always On	Running (AC/DC relay fully closed, and charging or discharging)	
ALARM	Yellow always on	Third level alert	
Extinguish	Go out/OFF	Standby State	No alarm

➢ **Electrical cabinet indicator light description**

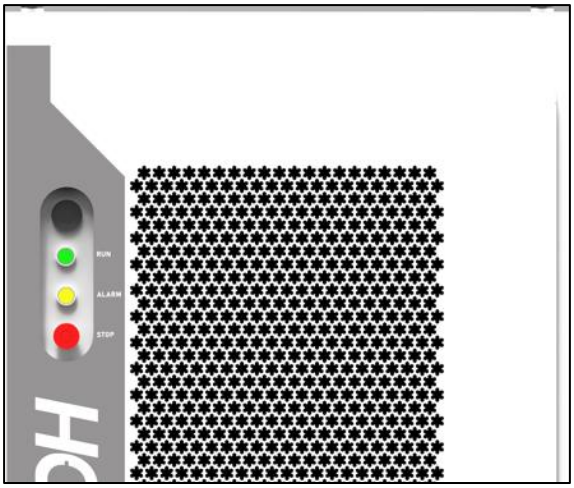


Fig 9-2 Electrical Cabinet Indicator

Table 9-2 Electrical Cabinet Indicator Description

The name of the indicator	Status	Meaning	Remark
RUN	Green Always On	Running (charging or discharging)	
ALARM	Yellow always on	Critical alarms	Serious alarms for electrical cabinets, fire alarms, liquid cooling alarms, etc
Extinguish	Go out	Standby State	No alarm

➢ **Description of the indicator light of the high-voltage box**

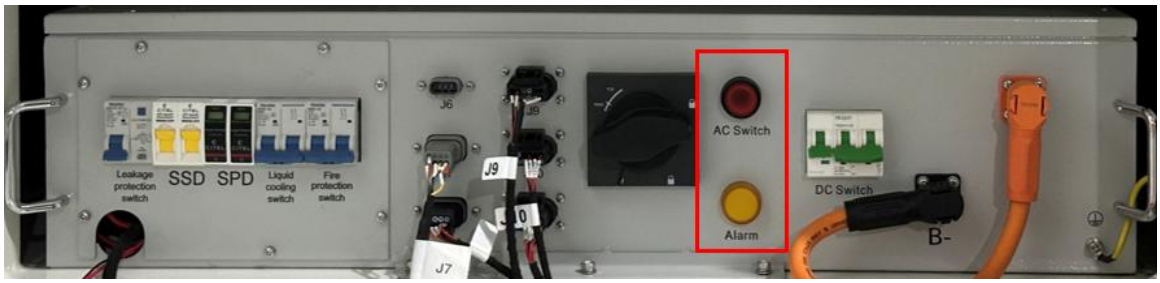


Fig 9-3High Voltage Box Indicator

Table 9-3High Voltage Box Indicator Description

The name of the indicator	Indicator status	Hidden meaning	Note
Alarm	Yellow light always on	Device Alarms	All alarms, including Level one, level two and Level three
AC Switch	Red light always on	AC/DC 24V powerd	
Go out		No auxiliary power on the DC side of the system	

- **PCS Indicator Description**

Fig 9-4 PCSLED

Table 9-4 PCS indicator status description

Name	Status
Light	The green light is always on when the operating output power is running; Green light flashes quickly for 0.5s when standby (0kW operation); When the power is not turned on and there is no fault, the green light

	flashes slowly for 1s; The red light will be on for a long time when the fault is broken.

9.2. Power-down and power-on operation

The premise of the power-on operation is that the energy storage system is in a normal state of not starting, specifically all the switches of the high-voltage box, auxiliary power supply module and system combiner module are in the shutdown state, and the three-phase AC input power line is connected and has normal voltage input.

9.2.1. Check before powering on

Before powering on the device, carefully check the following:

Check that the wiring is correct.

Check that the protective cover inside the device is securely installed.

Check that the E-STOP button is released.

Check and make sure there is no ground fault.

Check whether the AC and DC voltages meet the starting conditions, and use a multimeter to confirm that there is no overvoltage.

Check to make sure that no tools or parts are left inside the device.

Check that all air inlets and outlets are clear to ensure that there are no foreign objects blocking or blocking.

Check that the cabinet door is closed.

9.2.2. Power-on operation

9.2.2.1. Power on the battery cabinet:

- Step 1

After confirming that the battery cluster P+, P- wiring harness and communication wiring harness are installed correctly, and the AC auxiliary source wiring harness is

firmly connected. After the energy storage system is in a normal and non-start-up state, the operator needs to take insulation protection measures.

Fig 9-5 Battery cabinet rear panel wiring diagram

- Step 2

After confirming that the power cables between all battery packs in the energy storage cabinet are connected correctly, the operator should wear insulating gloves, insert the positive and negative power line plugs into the corresponding battery cluster terminals (the other end has been connected to the B+ and B- terminals of the high-voltage box at the factory), and ensure that the plugs are fully inserted into place.

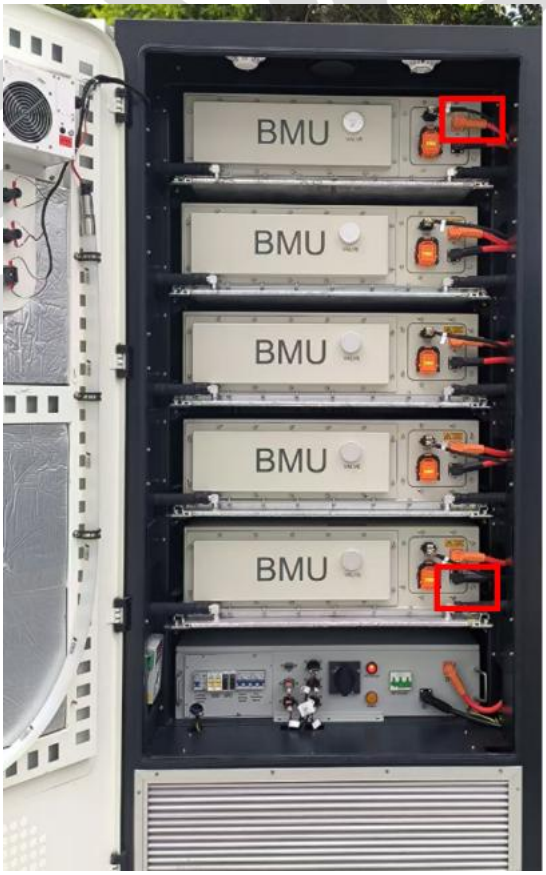


Fig 9-6Connects the battery cluster terminals

➢ Step 3

Place the molded case circuit breaker (1) of the high voltage box in the battery cabinet in the "ON" position. Then open the leakage protection switch (2), the liquid cooling switch (3), the fire switch (4), the AC switch (5) and the DC switch (6). The battery cabinet is powered on.

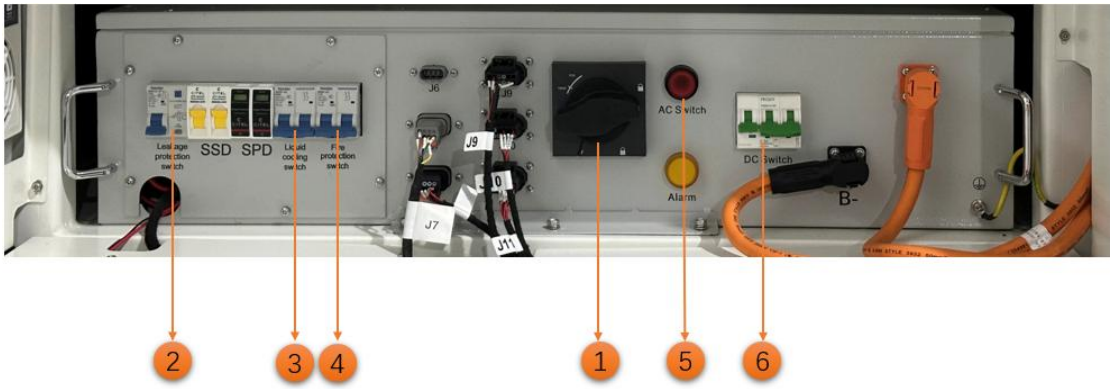


Fig 9-7 Battery cabinet power-on sequence

9.2.2.2. Power on the B1 electrical cabinet

➢ Step 1

Make sure all switches in the electrical cabinet are in the OFF position.

➢ Step 2

Close the 15QF miniature circuit breaker (MCB) in the cabinet (battery pack DC24V power input switch).

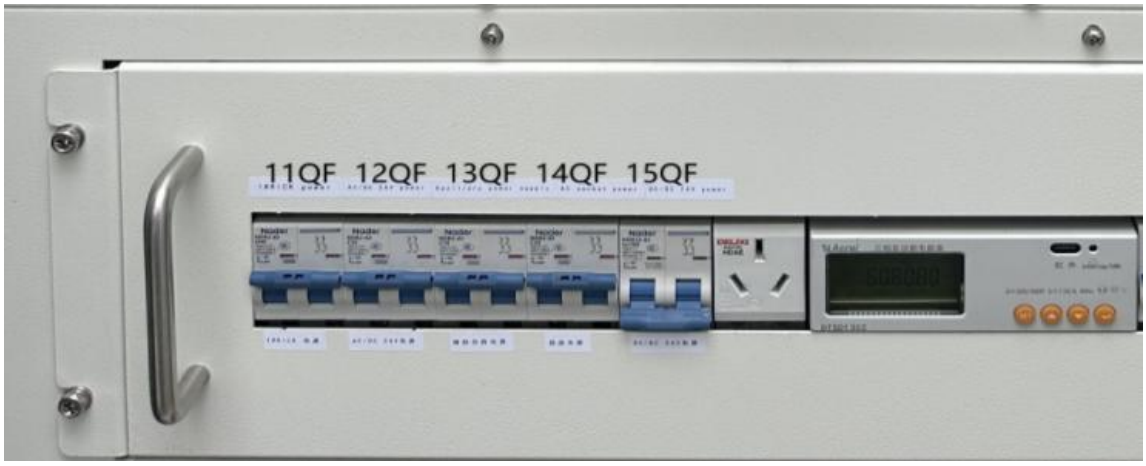


Fig 9-8 Miniature Circuit Breaker Position

- Step 3

After confirming that the STS (static transfer switch), EMS (energy management system) and HMI/SCADA screens are powered on normally (the power indicator of the device is on), close the QF1 main circuit breaker and the QF3 energy storage converter load circuit breaker.

Fig 9-9Circuit breaker location

- Step 4

Connect the PV system according to the user's requirements and turn off the QS1/QS2 switch.

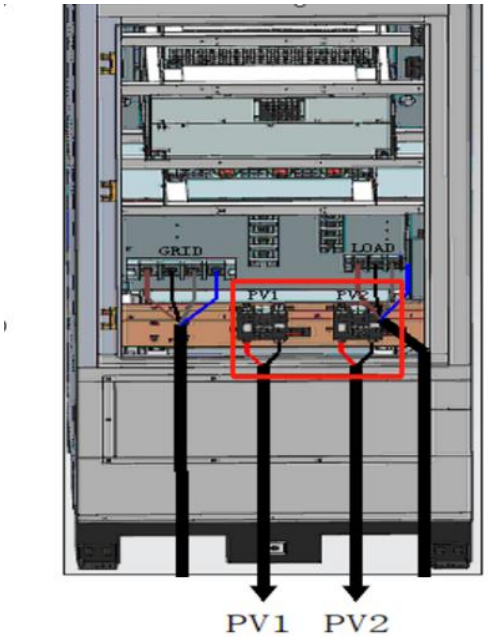


Fig 9-10 PV switch position

- Step 5

Wait for the energy storage system to operate normally.

- Step 6

Close the 12QF miniature circuit breaker (MCB) (AC/DC24V power input switch) in the cabinet.

- Step 7

Shut down the 11QF, 13QF, and 14QF circuit breakers in any order as the user needs. Complete the power-on process of the electrical cabinet.

Under normal system conditions:

Normally closed (NC) circuit breakers: QF1, QF3, 11QF-15QF.

Normally Open (NO) circuit breaker: 12QF (default).

9.2.2.3. A4 electrical cabinet is powered on

- Step 1

Make sure that all switches in the electrical cabinet are in the OFF position.

- Step 2

Close all PCS AC side circuit breakers in the electrical cabinet in turn.

- Step 3

Close any one of the DC miniature circuit breakers 14 to 17QF in the electrical cabinet, and keep the other paths in the exit state.

Note: 14QF~ 17QF corresponds to 1~ 4 #battery cluster DC24V power supply, which is used to realize black start power supply. Normally, only one of them needs to be closed. When the battery cluster fails to exit operation, the corresponding miniature circuit breaker needs to be exited;

- Step 4

Close the QF5 (distribution master switch) in the electrical cabinet.

- Step 5

Sequentially close the 12QF (cabinet control power supply), 13QF (cabinet auxiliary power supply) and 11QF/21QF/31QF/41QF 1~ 4 #battery cluster auxiliary source circuit breakers in the electrical cabinet.

Complete the power-on process of the electrical cabinet.

9.2.2.4. STS cabinet power on

- Step 1

Make sure that all switches in the electrical cabinet are in the OFF position.

- Step 2

Close all loads, power grids, and energy storage side circuit breakers in the electrical cabinet in sequence

- Step 3

The corresponding secondary circuit breaker in the closed cabinet.

Complete STS cabinet process.

9.2.3. Normal power-off operation

Danger

- It is forbidden to cut off power with load
- Personnel performing power-off operations must wear insulated protective gear.

9.2.3.1. B1 electrical cabinet power-down operation

During the power-off operation, personnel must avoid load breaking/closing or plugging and unplugging of the following components under load: AC side circuit breaker QF1/QF3, PV input side disconnector QS1/QS2, molded case circuit breaker QF in the high-voltage box, and battery pack positive and negative bus plugs.

- Step 1

PCS and MPPT must stop charging/discharging.

- Step 2

Manually disconnect the circuit breaker QF3 (Fig9-9) on the load side in the electrical cabinet.

- Step 3

Manually disconnect the switch on the high-voltage box (Fig9-7) in the battery cabinet, first turn the DC circuit breaker switch (1) on the high-voltage box to the OFF state, then disconnect the DC power switch (6) and the AC power button switch (5), and finally turn off the fire switch (4) in turn Liquid-cooled switch (3) and leakage protection switch (2) are sufficient.

- Step 4

Manually disconnect the PV input disconnector QS1/QS2 (Fig9-10) in the electrical cabinet.

- Step 5

Unplug the positive and negative power bus plugs of the battery cluster from the

Pack (Fig9-6).

- Step 6

Manually disconnect the AC circuit breaker QF1 (Fig9-9) in the electrical cabinet.

- Step 7

Disconnect the circuit breaker 11QF~15Q (Fig9-8) of the electrical cabinet control power box in turn, and then complete the power-off operation

9.2.3.2. A4 electrical cabinet power-down operation

In the power-off operation, personnel try to avoid load breaking/closing or plugging and unplugging the following components under load: PCS AC side circuit breakers QF1~ QF4, and off-grid cabinet loads, power grids, energy storage side circuit breakers, molded case circuit breakers QF in high-voltage boxes, and battery pack positive and negative bus plugs.

- Step 1

Control PCS to stop charging/discharging.

Switch off the grid cabinet STS to keep it off the grid.

- Step 2

Manually disconnect the circuit breakers QF1~ QF4 on the AC side of PCS in the electrical cabinet.

- Step 3

Disconnect the battery cluster auxiliary source circuit breaker (11QF/21QF/31QF/41QF) in the electrical cabinet in turn, and exit 13~ 17QF. At this point, the electrical cabinet completes the power-down process.

- Step 4

Manually disconnect and disconnect the circuit breakers corresponding to the load, power grid, and energy storage side in the grid cabinet, and then cycle the corresponding circuit breakers in the secondary loop. At this point, the power-down process is completed.

- Step 5

Manually disconnect the switch on the high-voltage box in the battery cabinet, first turn the DC circuit breaker switch ① on the high-voltage box to the OFF state, then disconnect the DC power switch ④ and the AC power button switch ⑤, and finally turn off the fire switch ④, liquid cooling switch ③, and leakage protection switch ② in turn.

- Step 6

Unplug the battery pack positive and negative power bus plug of the battery cabinet from the Pack (Fig9-6).

So far, the system power-down operation is completed.

9.2.4. Emergency power-off operation

In the event of an emergency shutdown (such as smoke, fire, electric shock, water invasion, etc.), please press the emergency stop switch on the electrical cabinet and battery cabinet, after pressing the emergency stop switch of the electrical cabinet, the entire energy storage system will be powered off urgently, and the battery cabinet will stop working urgently after pressing the emergency stop button of the battery cabinet.

Fig 9-11 E-STOP switch position

- After pressing the emergency stop button on the front door of the battery cabinet, all positive and negative main relays in the high-voltage box and the molded case circuit breaker QF in the high-voltage box are immediately disconnected, and the battery cabinet is powered off.
- After pressing the emergency stop button on the front door of the electrical cabinet, the PCS immediately stops the battery charging and discharging, and disconnects the STS, and at the same time, all the positive and negative main relays and auxiliary relays in the high-voltage box are automatically disconnected immediately, and the whole system is powered off.
- After the emergency stop buttons are pressed, manually disconnect the molded case circuit breaker (Fig9-7: (1)) on the high-voltage box in the battery cabinet, and manually disconnect the electrical cabinet circuit breaker QF1 and QF3 (Fig9-9);

- The emergency power-off operation can be terminated at this step; If necessary, continue to disconnect all circuit breakers in the control power box (Fig9-8) in the electrical cabinet

10.Introduction to the configuration screen

10.1. Login screen

Username: A Password: 111

Fig 10-1 Login screen

10.2. Primary system diagram

The primary system diagram mainly includes:

The real-time power generation and cumulative power generation of MPPT1 and MPPT2;

Real-time values of SOC and SOH of battery system;

Real-time active power and reactive power of PCS;

Total active power and reactive power of microgrid;

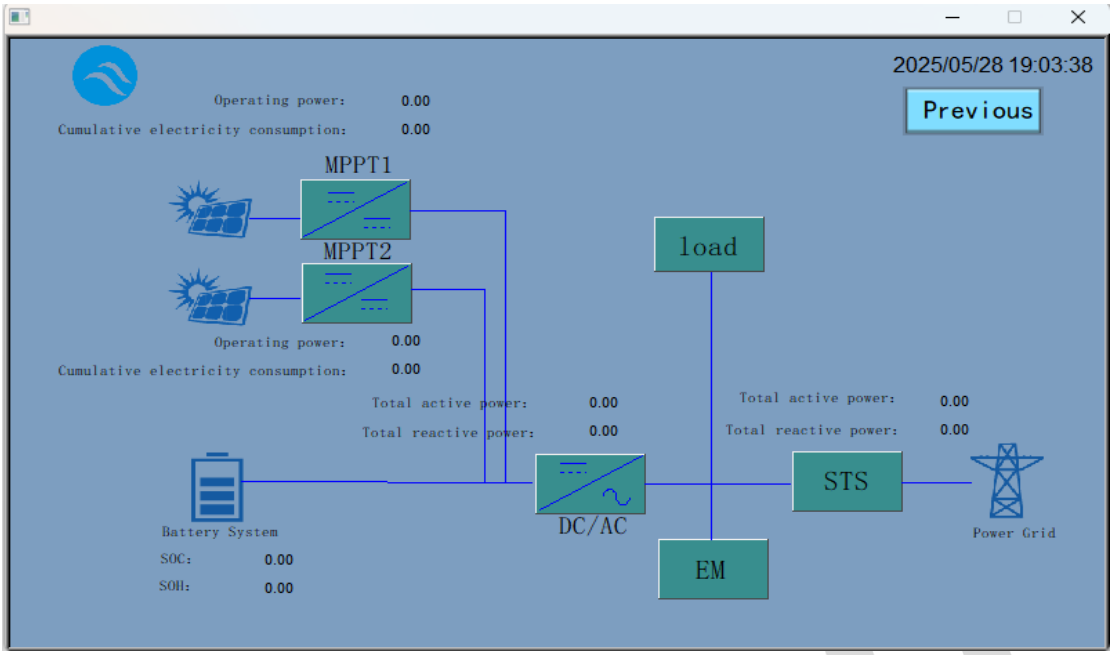


Fig 10-2 Primary system diagram

10.3. PCS data monitoring

The data collected by the energy storage PCS monitoring function mainly includes the following aspects:

Voltage, current, power on the DC side: These parameters reflect the DC input and output status of the PCS.

Three-phase active power, reactive power, three-phase voltage, three-phase current, power factor, frequency: these parameters help to evaluate the AC output quality of the PCS.

Operation status, alarm and fault information: This information is used to monitor the operation of the PCS, and to detect and deal with abnormalities in time.

Daily Input Electricity, Daily Output Electricity, Cumulative Input Electricity, Cumulative Output Electricity: These data are used to count and analyze the energy flow of PCS.

Voltage, current, and temperature of the battery pack: These parameters reflect the state of the battery and help ensure the safe and efficient operation of the battery

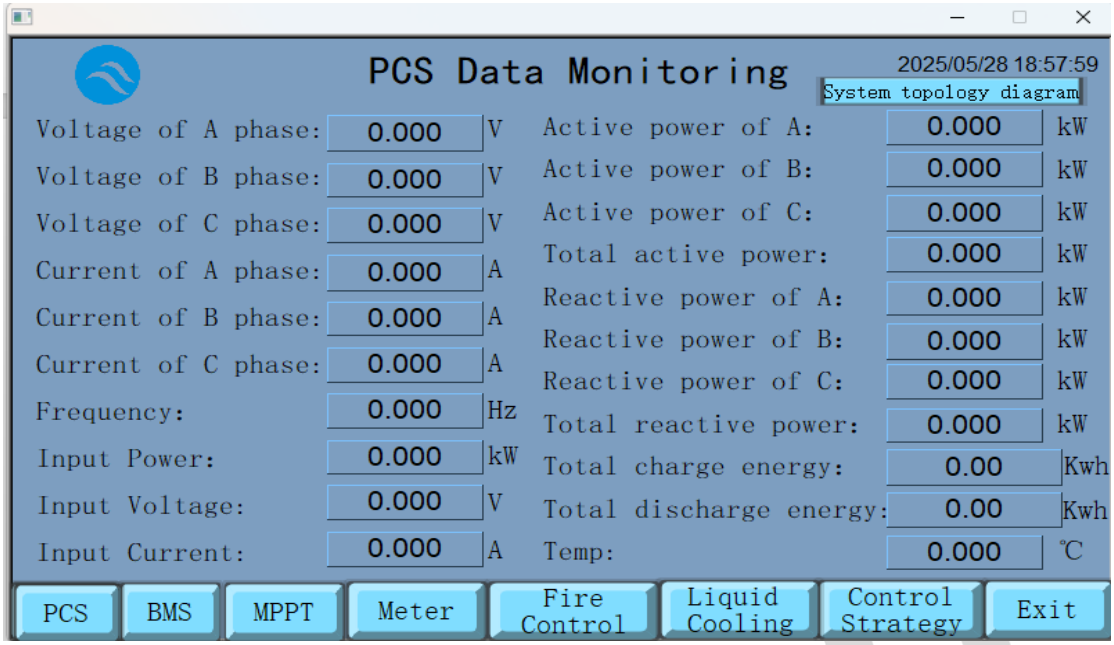


Fig 10-3 PCS data monitoring

10.4. BMS data monitoring

The monitoring function of the BMS (battery management system) mainly collects the following data:

Voltage data: The BMS collects the voltage of each string of cells, the total voltage inside the battery system (Vbat) and the total voltage outside the battery system

Current data: The BMS monitors the charge-discharge current of the battery through the current sensor

Temperature data: The BMS uses a temperature sensor to monitor the temperature change of the battery

Other data: The BMS also collects data such as the total battery pack voltage, charge/discharge current, and cell voltage, which are useful for estimating the battery's state of charge (SOC), state of health (SOH), and power state (SOP).

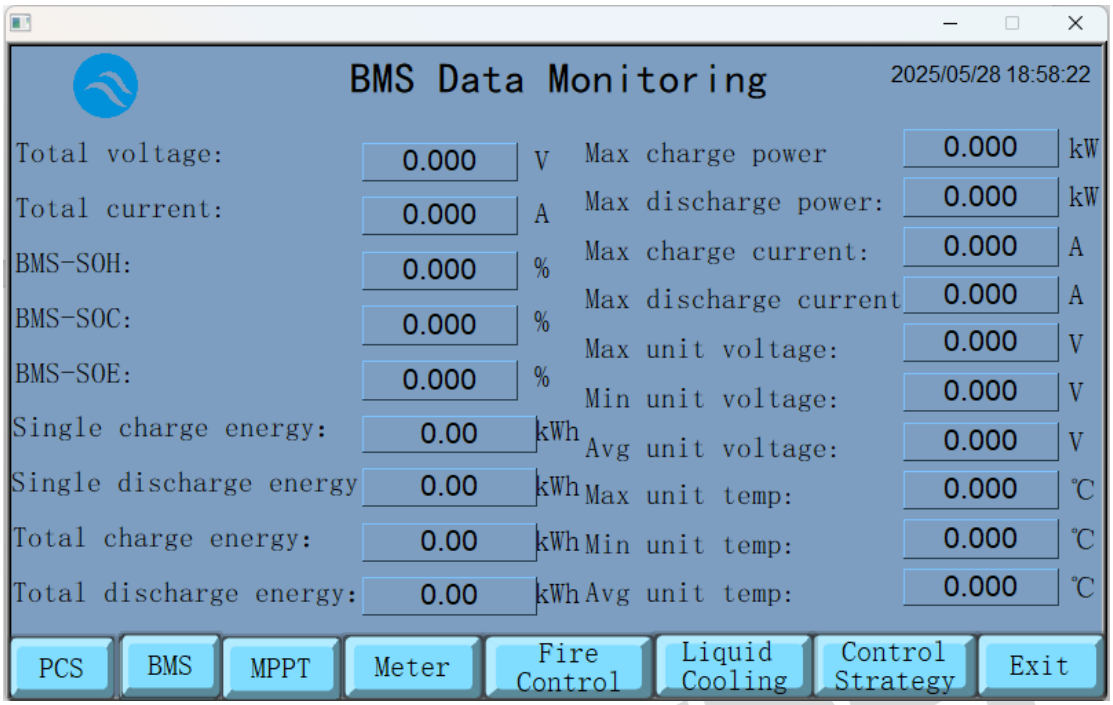


Fig 10-4 BMS data monitoring

10.5. Meter data monitoring

The data collected by the energy storage meter monitoring function includes the following:

Energy metering: Energy storage meters can accurately measure the amount of electric energy used, including active energy and reactive energy, and provide users with detailed electricity consumption data.

Voltage and current: The energy storage meter can monitor the changes of voltage and current in real time to ensure the stable operation of the system.

Active power and reactive power: These parameters reflect the actual power consumption and energy conversion efficiency of the system.

Apparent power: Indicates the total power capability of the device, including active power and reactive power.

Power Factor: Reflects the energy efficiency of the circuit, which is the ratio of the basic quantity to the easy quantity.

Frequency: Indicates the stability and load of the power system.

Battery state of charge: Real-time monitoring of the charging and discharging status of the energy storage battery to ensure the healthy operation of the battery.

Charge/discharge power: Monitor the charge/discharge power of the energy storage system to provide support for energy management.

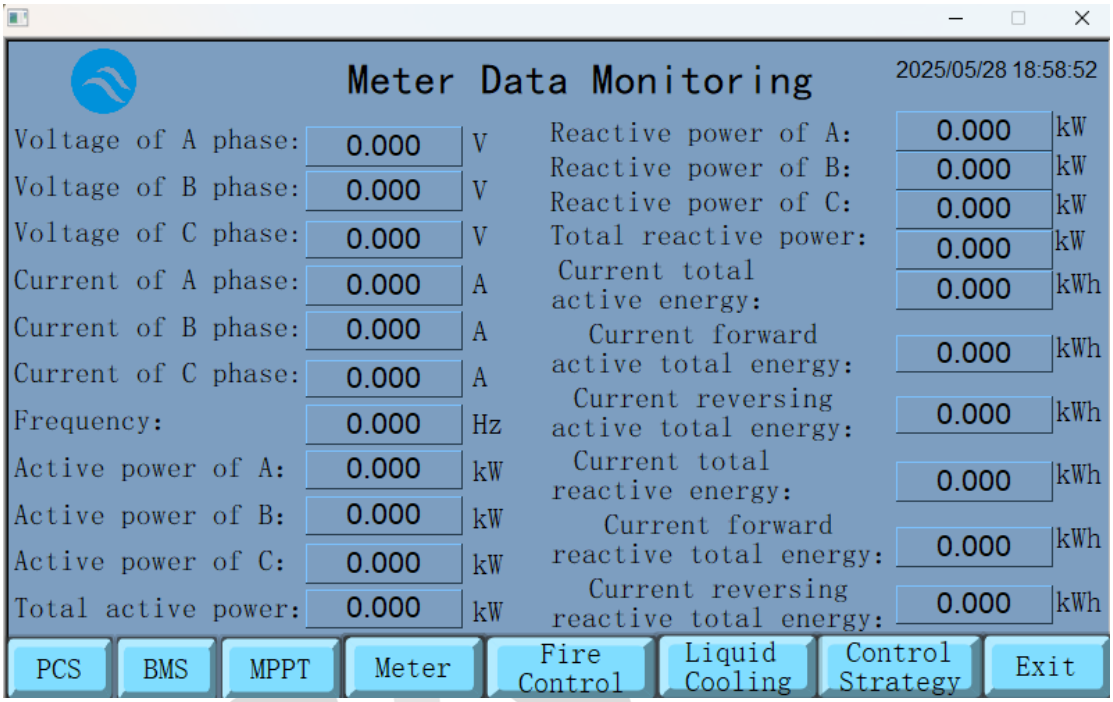


Fig 10-5 Meter Data Monitoring

10.6. Fire data monitoring

The energy storage fire protection function mainly collects the following data:

System Fault Signal: Fire Total Fault Flag, Alarm Light will be displayed when the fire protection system fails.

Fire extinguisher spraying signal: An alarm light will be displayed when the fire is sprayed.

Fire Level 1 Alarm Signal: An alarm light will be displayed when the fire alarm level 1 is triggered.

Fan start-up feedback signal: This signal light will be displayed when the fan is started.

Fig 10-6 Fire Data Monitoring

10.7. Liquid-cooled data monitoring

The monitoring function of the energy storage liquid-cooled unit mainly collects the following data:

Temperature data: Monitor the temperature of the battery module to ensure that it operates within a safe range to avoid performance degradation and safety hazards caused by high temperatures.

Pressure data: Monitor the pressure of the liquid cooling system to ensure that the internal pressure of the system is within a safe range and avoid leakage or damage caused by abnormal pressure.

Humidity & Pressure Data: Monitor ambient humidity and system pressure to ensure liquid cooling systems are operating in the right environment.

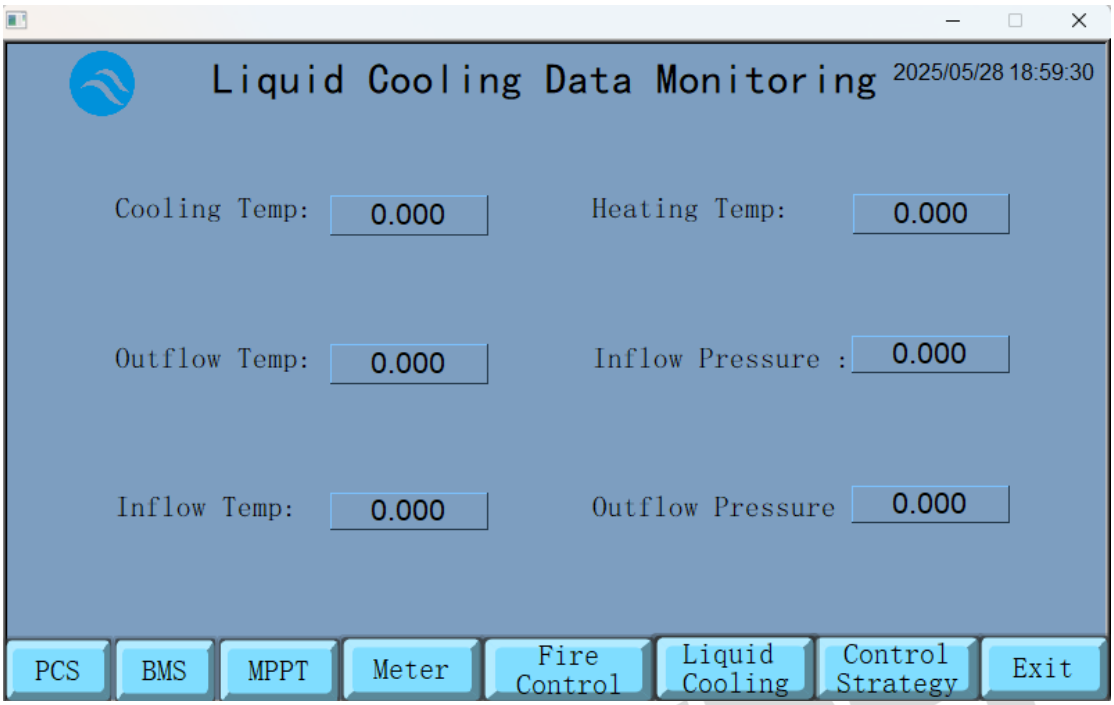


Fig 10-7 Liquid Cooling Data Monitoring

10.8. Plan curve monitoring

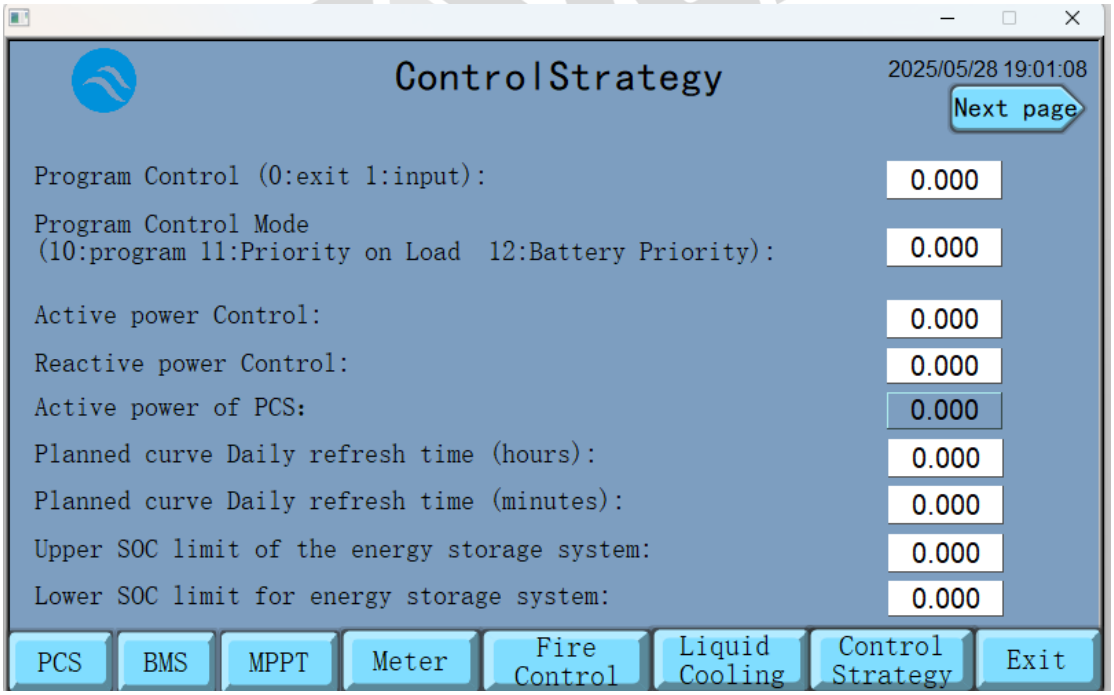


Fig 10-8 Planning Curve Monitoring Interface 1

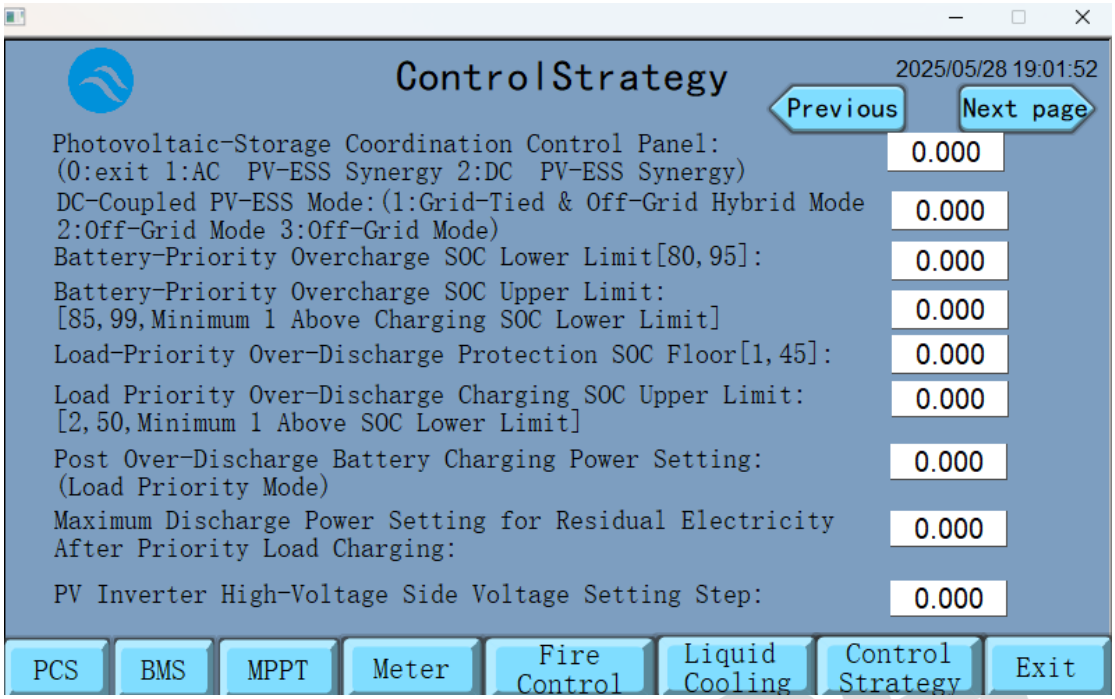


Fig 10-9 Planning Curve Monitoring Interface 2

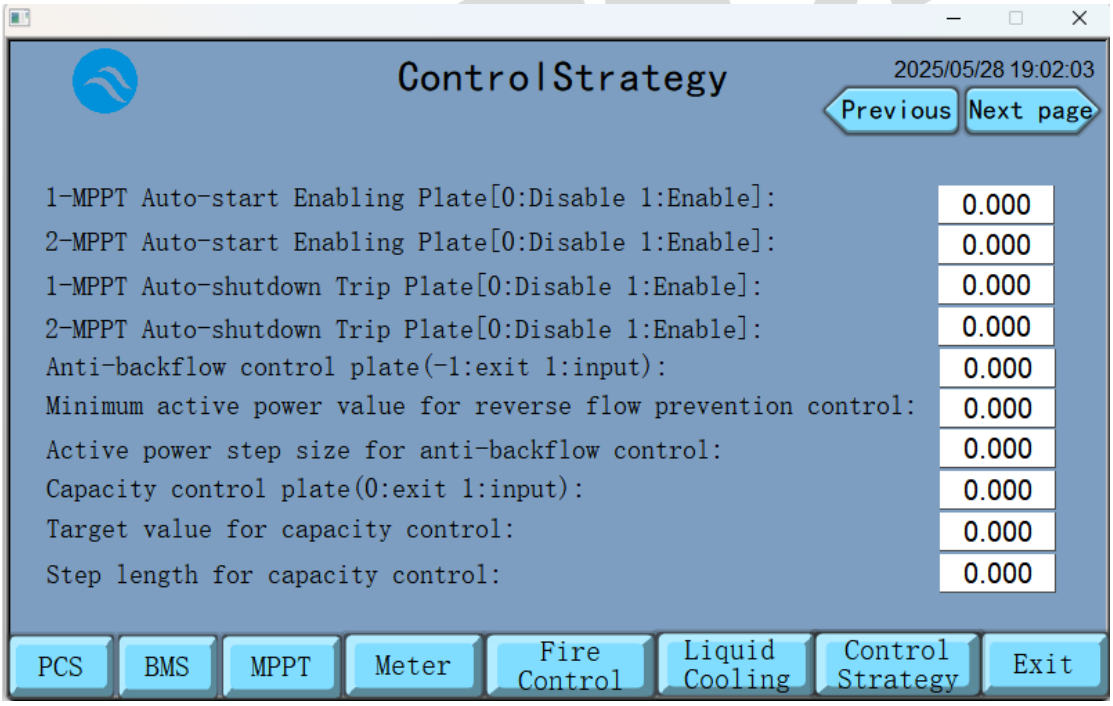


Fig 10-10 Planning Curve Monitoring Interface 3

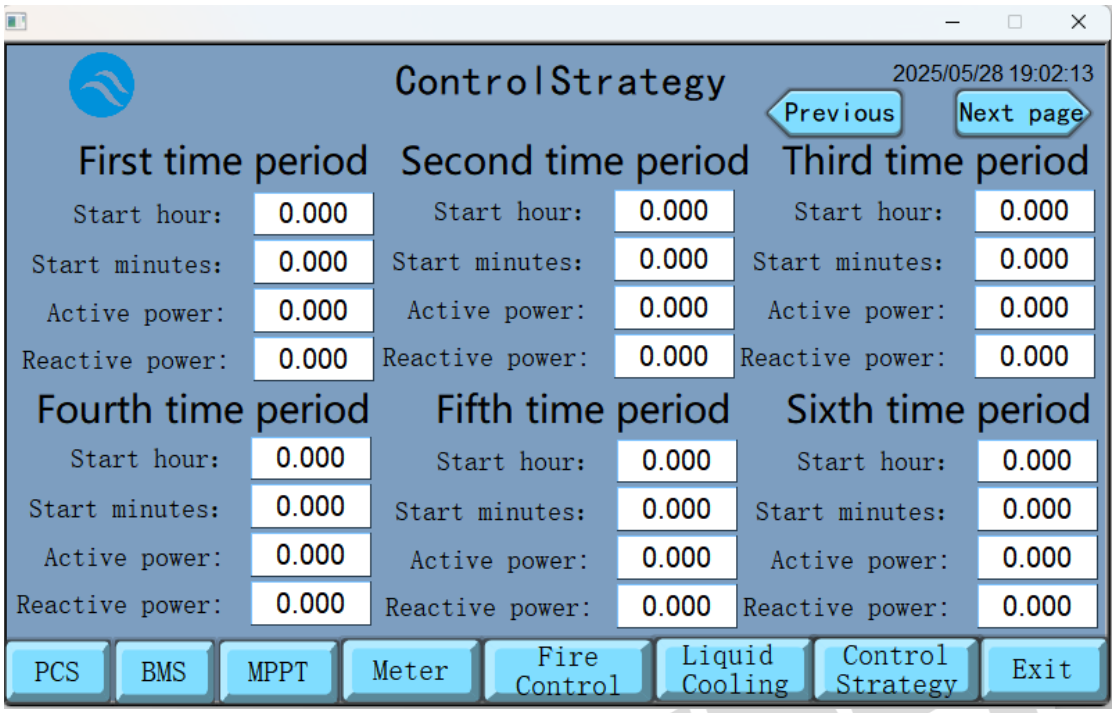


Fig 10-11 Planning Curve Monitoring Interface 4

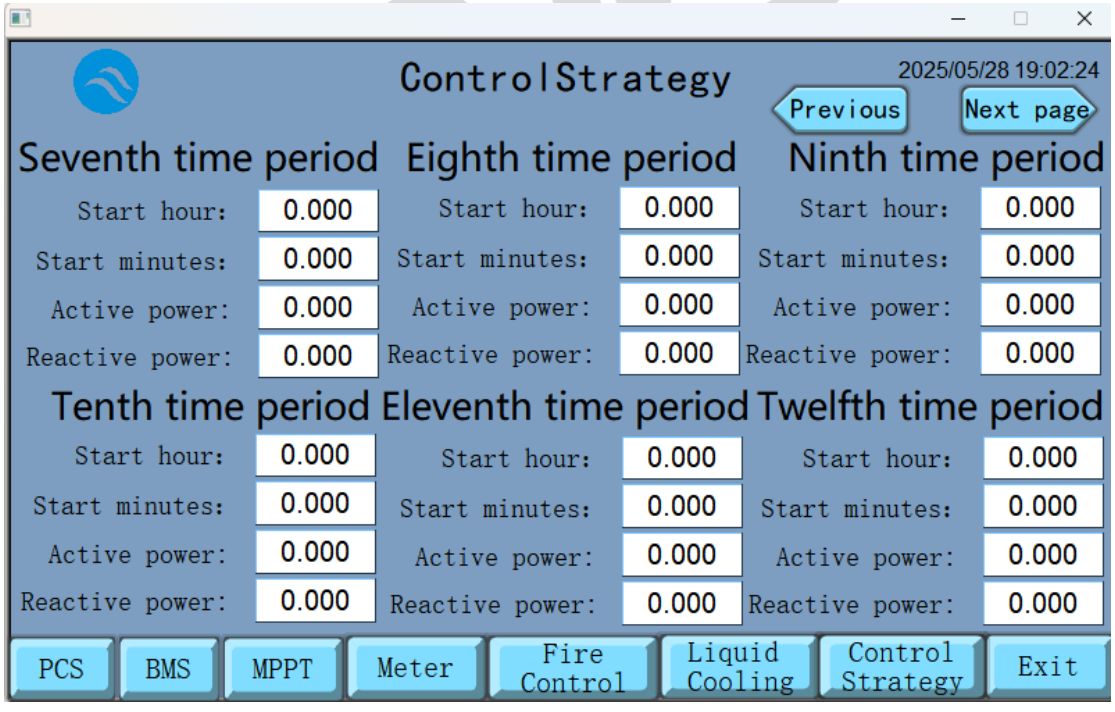


Fig 10-12 Planning Curve Monitoring Interface 5

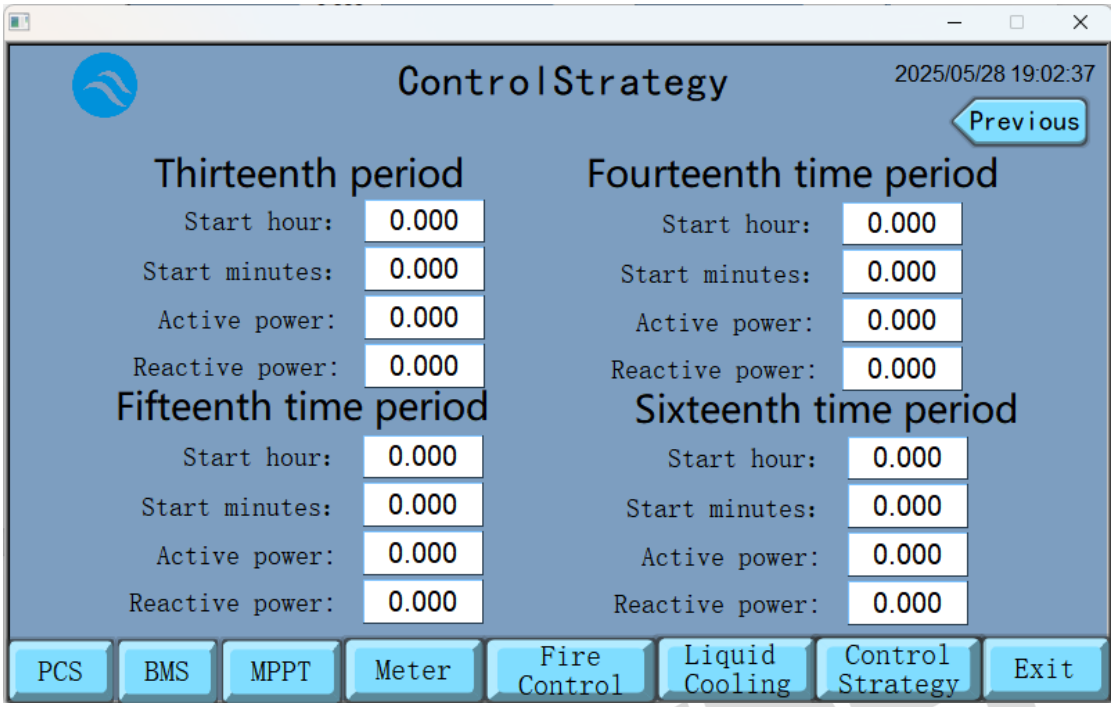


Fig 10-13 Planning Curve Monitoring Interface 6

The energy storage plan curve function mainly collects the following data:

The total input of the program is controlled by the pressure plate: the input and exit of the control plan curve;

Control mode: 0: Plan 1: Real-time;

Remote control of real-time active target: remote control of real-time active target;

Remote control of real-time reactive power target: remote control of real-time reactive power;

Energy storage unit 1 input [0: exit 1: input]: control energy storage unit input exit;

PCS device start: control PCS device start;

PCS equipment shutdown: control PCS equipment shutdown;

PCS Fault Reset: Control PCS Fault Reset;

PCS Remote/Local Setup: Set PCS Remote On-Site;

Daily refresh time of the planning curve (hours): The time when the planning curve is issued (hours);

Daily refresh time of the plan curve (minutes): The time when the plan curve is

issued (minutes);

Upper limit of SOC of energy storage system: Set the upper limit of energy storage SOC;

Lower SOC limit of energy storage system: set the lower limit of energy storage SOC;

Capacity control platen (0: exit, 1: input): capacity control platen input and exit;

Capacity Control Target: Set the capacity control target value;

Capacity Control Step: Set the capacity control step.

Anti-backflow control platen (0: exit, 1: input): anti-backflow control platen input and exit;

Anti-reverse control active minimum value: set the target value of anti-reverse flow active minimum value;

Anti-reverse control active action step: set the anti-backflow control step;

Photovoltaic absorption control pressure plate (0: exit, 1: general function 2: low power charging): photovoltaic absorption control pressure plate selection configuration (0: exit, 1: general function 2: low power charging);

Minimum active value of photovoltaic absorption control: set the target value of the minimum active value of photovoltaic absorption control;

Photovoltaic consumption control step: set the photovoltaic consumption control step;

The first to sixteenth time periods start hours, start minutes, active power, reactive power: the first to sixteenth time periods start hour setting, start minute setting, active power setting, reactive power setting.

11.System maintenance requirements

Warning

- Please do not open the door of the battery cabinet for maintenance in rainy, wet or windy weather, and we will not be responsible for any damage caused if

you fail to avoid it.

- Avoid opening the door on foggy days with rain, snow, or high humidity, and make sure the seal around the door does not curl when the door is closed.
- To reduce the risk of electric shock, do not perform any maintenance or overhaul operations other than those described in this manual. If necessary, please contact our customer service staff for maintenance and overhaul.

11.1. Normal use of the system

The system in normal use refers to the system that runs every day or at irregular intervals every month, and such systems need to be maintained regularly, refer to the maintenance requirements and cycles in Section 11.4, and conduct system inspections every 12 months, refer to Appendix A, and make inspection records.

11.2. A system that has not been used for a long time

A system that has not been used for a long time refers to an energy storage system that has not been started for more than 3 months.

SOC range of battery cabinet storage: 20%~50%, avoid long-term storage of battery cells below 15% SOC, and cut off power-consuming equipment in time when the battery is not used for a long time.

1)Inspect the energy storage system every 3 months, refer to Appendix A, and make inspection records;

2)Charge and discharge the energy storage system every 3 months to prevent battery damage;

3)Before the first use of the system, the battery system needs to be fully charged at least once to restore the performance of the battery to the best state.

11.3. Maintenance precautions

This energy storage system product has a high level of protection and can be used

outdoors, but long-term operation in a harsh environment will still cause the aging of energy storage equipment or damage to internal equipment, and regular maintenance and inspection of energy storage equipment will be carried out Replacing aging and damaged parts will effectively extend their service life and improve the performance of internal equipment.

The maintenance cycle given in this section is a reference value, and the actual maintenance cycle should be reasonably determined in combination with the actual environmental conditions of the project site. In particular, internal and external cleaning, anti-corrosion and anti-rust work, etc., should be more frequent. Specific maintenance requirements can be consulted after the site selection and operating conditions are determined.

11.4. Maintenance requirements

Table 11-1 Energy Storage Cabinet Maintenance Requirements

Project	Inspection items	Method	Frequency
Full Container	Structural parts	Check the following items and correct them immediately if they do not meet the requirements:	Annual inspection
		Check whether the cabinet and internal equipment are damaged or deformed	
		Check whether there is any abnormal noise during the operation of the internal device	
		Check to see if the temperature inside the cabinet is too high	

		Visually inspect the inside of the system for signs of damage, metal fatigue, water damage, stains, and water ingress. If there are signs of metal fatigue or rust, rust should be removed and rust inhibitor applied. Seal areas where water ingress is likely or has occurred.	
	Logotype	Check that warning signs and labels, etc., are clearly visible and free of defacement. If it is defaced, it needs to be replaced.	Annual inspection
	Exterior of the cabinet	Check the following items and correct them immediately if they do not meet the requirements:	Annual inspection
		Check whether the contact between the cabinet and the foundation steel plate is firm and whether there is corrosion	
		Check the cabinet shell for damage	
		Check whether the cabinet door lock can be opened flexibly without abnormal	

		noise, and lubricate if necessary.	
		Check whether the seals are well fixed and whether there are any aging breaks	
		Inspect all anchor bolts for signs of damage, metal fatigue or vandalism. If there are signs of metal fatigue or rust, rust should be removed and rust inhibitor applied.	
	Air inlet and outlet	Check whether the inlet and outlet shutters and filters are clean, if necessary, use a vacuum cleaner to clean the dust, and replace the dust cotton regularly according to the use conditions.	Quarterly inspections
		Ensure adequate ventilation to effectively remove the heat generated by the appliance and maintain the ambient temperature within the specified range.	
	Cable	Wait for 10 minutes after the internal equipment of the battery cabinet is completely powered off, and then start the	Annual inspection

		inspection work! During the inspection, if you find any non-conformities, please correct them immediately.	
		Check whether the cable layout is standardized, whether there is a short circuit, etc. If there is any abnormality, it should be corrected immediately	
		Check that all the inlet and outlet holes of the cabinet are well sealed	
		Check whether there is water seepage inside the box	
		Check whether the power cable connection is loose and tighten it according to the torque specified before	
		Check whether the power cable and control cable are damaged, especially whether there are traces of lacerations on the skin in contact with the metal surface	
		Check whether the insulating wrap of the terminal block has fallen off	

		Check whether the grounding cable shield is in good contact with the insulating sleeve; Whether the grounding copper bar is fixed in place	
Liquid cooling system (Power off for 10 minutes during maintenance, wear protective equipment, dispose of waste parts according to environmental protection requirements, and prohibit the random emission of ethylene glycol.)	Piping reliability	Whether there is coolant leakage at the interface of the liquid cooling unit, liquid cooling pipeline and liquid cooling floor plate.	Semi-annual inspection
	Electrical system	Check the reliability of the cable connection, clean the dust, and test the air opening function.	Semi-annual inspection
	Appearance and fans	Clean the surface of the unit and check whether the fan blades are damaged or dirty to ensure smooth rotation.	Semi-annual inspection
	Condenser	Use compressed air or a vacuum cleaner to remove dust and foreign objects.	Semi-annual inspection
	Cooling medium	Detect pH value (7.5~8.5), conductivity (200~1000 S/cm) and impurity content, and replace or purify regularly.	Semi-annual inspection
Firefighting	Check the sensing device	Make sure they are installed in the correct position, making sure there is no damage	Quarterly inspections

		Make sure they are clean and not covered in grease, dust, paint, or any other dirt	
		Check the sensitivity of each detector according to the detector manufacturer's instructions	
	Inspect all parts	Look for signs of damage	Quarterly inspections
		Find loose or broken parts and reconnect them to the system	
		Check whether the U-tube is leaking and whether the content of the fire extinguishing agent is normal	
		Check for twisted or dented parts	
		Whether the fire hose connection is blocked	
	Clean	Make sure that the battery cabinet is completely powered off at an interval of 10min, and carry out the following cleaning	Quarterly inspections
		Clean the bars and terminals	
		Clean the ventilation baffle	
		Check whether the fan is abnormal, and whether the fan	

		is blocked by dust and foreign matter	
Battery	SOC calibration	If you need to conduct a standard full-charge and full-discharge process experiment, the software will automatically calibrate;	Monthly inspection
		If it cannot be satisfied, a standard full charge or full discharge experiment can be carried out, and the software will automatically calibrate;	
	Connectors and indicators	Visually check that the connectors of all battery management systems (BMS) are working properly and that the indicators are in order	Annual inspection
	Overall	Visually inspect batteries for damage, rust, discoloration, condensation, or leakage, and repair or replace them as needed.	Annual inspection
		Visually inspect the battery power cord and communication cable for damage, detachment, cracking, rust, etc., and repair or replace them as needed.	

		At the applicable voltage, the insulation resistance between the positive electrode of the battery and the ground, and between the negative electrode of the battery and the ground, is measured.	
Safety and functional checks	Overall	Check whether the E-STOP button is functioning properly.	Annual inspection
		Check that all communication functions are working properly.	
		Check the operating condition of the surge protector by checking the status of the surge protector on the main circuit and control circuit.	
		Check if the fuse is blown. Inspect the protected circuit and if damage is found, troubleshoot the fault that caused the fuse to blow or damage before replacing the fuse and re-attaching the circuit.	
		Check the operation of the fan to see if there is wear and abnormal noise, and make sure	

		that the fan can work properly according to the control signal.	

12. Warranty conditions

The warranty is subject to ZETATECH's warranty agreement.

Appendix A

Table inspection table

Inspection items	Inspection method	Yes/No	Exception logging
Whether the fire extinguishing system is complete	Visual		
Whether the fire extinguishing system is within the validity period	Visual		
Whether the heat dissipation system is complete	Visual		
Whether the air duct of the heat dissipation system is blocked	Visual		
Whether the appearance of the energy storage cabinet is deformed	Visual		
Whether the appearance of the energy storage cabinet is rusty and damaged	Visual		
Whether there is water vapor inside the energy storage cabinet	Visual		
Whether the low-voltage wiring harness is loose or damaged	Visual		
Whether the high-voltage wiring harness is loose or damaged	Visual		

Whether the wiring harness interferes with the structural member	Visual		
Whether the high-voltage connection is ablated	Visual		
Whether the fixing bolts of the structural parts are loose or missing	Visual		
Whether the MSD is complete and reliable to install	Visual		
Whether the liquid cooling line is broken	Visual		
Whether there is a foul odor in the energy storage cabinet	Nasal sniffing		
Whether there is any pungent odor in the energy storage cabinet	Nasal sniffing		
Whether there is a burning smell at the high-pressure connection	Nasal sniffing		
Whether the profile data is complete	Monitor the host computer		
Whether the single voltage data is complete	Monitor the host computer		
Whether the temperature data of the monomer is complete	Monitor the host computer		

Alarm box for abnormalities	Monitor the host computer		