

User Manual

Ener Hexon[®] Smart215Air Cooled Energy Storage System

ESBU- YTDS5T0215-P0100A –Ver1.1



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Ener Hexon[®] Smart215Air Cooled Energy Storage System

About the manual

Product applied

This user manual mainly introduces the transportation and storage, mechanical installation, electrical connection, power on and off operation, fault handling, and maintenance methods of the battery energy storage system. This manual is only applicable to the intelligent distributed energy storage product developed by YOTAI Digital Energy Technology (Shenzhen) Co., Ltd., product name : Ener Hexon[®] Smart215Air Cooled Energy Storage System, type: YTDS5T0215-P0100A.

For readers

This manual is applicable to personnel involved in the installation, operation, maintenance, and other related work of this product. Readers need to possess certain electrical and related professional knowledge and qualifications.

All installation operations must be completed by professional technicians only. Professional technicians must meet the following requirements:

- After specialized training and obtaining qualification recognition
- Read this manual in its entirety and master the safety precautions related to operation
- Familiar with local standards and relevant safety regulations for electrical systems

Sign

In order to ensure the personal and property safety of users when using the product, and to use the product more efficiently and correctly, the manual provides relevant information and highlights it with the following signs.

The following are signs that may be used in this manual. Please read them carefully to better use this manual.

The following signs may appear in this article, representing the following meanings:

Signs	Meanings
	Used to warn of urgent dangerous situations If not avoided, it may result in death or serious personal injury to personnel
	Used to warn of potential hazardous situations If not avoided, it may lead to death or serious personal injury
	Used to alert potential hazardous situations If not avoided, it may result in moderate or minor personal injury
	Used to transmit equipment or environmental safety warning information If not avoided, it may result in device damage, data loss, reduced device performance, or other unpredictable outcomes. Personal injury not included.
	Used to highlight important/critical information, best practices, and tips, etc. Not a safety warning message and does not involve personal, equipment, or environmental harm

Signs on product

When performing installation, operation, maintenance, and other tasks, please pay attention to the warning signs on the product, including but not limited to the following content:

Signs	Signs Meaning
	This sign indicates that it contains high voltage or electricity, and touching it may pose a risk of electric shock
	Used to alert potential hazardous situations If not avoided, it may result in moderate or minor personal injury
	This sign indicates that this is the protective grounding (PE) terminal, which needs to be firmly grounded to ensure the safety of operators
	Functional Earthing
	Be careful of tripping
	Wearing peacemaker prohibited
	No smoking
	No flame
	No climbing
	No touching
	No stepping
	No entry
	No leaning
	Read the instructions before use May cause danger if not followed
E-Stop	Emergent stop

Abbreviation

The following abbreviations may appear in this article, unless otherwise specified, their meanings are as follows:

No.	ABB	text
1	BMS	Battery Management System
2	BCMU	Battery Cluster Management Unit
3	BMU	Battery Management Unit
4	PCS	Power Conversion System
5	EMS	Energy Manage System
6	ESS	Energy Storage System
7	BESS	Battery Energy Storage System
8	PE	Protective conductor
9	SOC	State of Charge
10	SOH	State of Health

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1 Safety Notice

1.1 General safety notice

Before transporting, storing, installing, operating, using, and maintaining the equipment, please read this manual, strictly follow the contents of the manual, and follow all safety precautions indicated on the equipment and in the manual.

The "Instructions", "Caution", "Warning" and "Danger" items in the manual do not represent all safety precautions that should be followed, but only serve as a supplement to all safety precautions. You also need to comply with relevant international, national or regional standards, as well as industry practices. Our company shall not be held responsible for any violations of general safety operation requirements or safety standards for the design, production, and use of equipment.

This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment failure, and the resulting abnormal equipment functions or component damage are not within the scope of equipment quality assurance; Otherwise, our company shall not be liable for any personal injury, property damage, etc. that may be caused.

Local laws, regulations, and standards should be followed when transporting, storing, installing, operating, using, and maintaining equipment. The safety precautions in the manual are only supplementary to local laws, regulations, and norms.

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

- 1) The installation and usage environment does not comply with the provisions of relevant international, national, and regional standards.
- 2) Do not operate under the usage conditions described in this manual.
- 3) Unauthorized disassembly, alteration of products, or modification of software code.
- 4) Not following the operating instructions and safety warnings in the product and documentation.
- 5) Equipment damage caused by abnormal natural environments (earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, force majeure).
- 6) Transportation damage caused by you or your authorized third-party transportation.
- 7) Damage caused by storage conditions not meeting product documentation requirements.
- 8) You or a third party's negligence, improper operation, or intentional damage causes damage to the hardware or data of the device.
- 9) System damage caused by your or third-party reasons, including relocation and installation of systems that do not comply with the requirements of this manual, as well as damage caused by adjustments, changes, or removal of identification marks that do not comply with the requirements of this manual.
- 10) Defects, malfunctions or damages caused by actions, events, negligence or accidents beyond the reasonable control of the seller, including power outages or electrical failures, theft, war, riots, internal strife, terrorism, intentional or malicious damage, etc.

NOTICE

Reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on device software are prohibited. It is not allowed to study the internal implementation of the device, obtain the source code of the device software, steal intellectual property, or disclose the results of any device software performance testing in any way.

1.2 Personal Safety



DANGER

1) Live operation is strictly prohibited during the installation process. It is prohibited to install or remove cables with electricity. When the cable core comes into contact with the conductor, it may generate arcs, electric sparks, or cause fires or explosions, which can lead to fires or personal injuries;

2) When the equipment is live, improper and improper operation may result in fire, electric shock, or explosion, leading to personal injury or property damage;

3) It is strictly prohibited to wear conductive objects such as watches, bracelets, rings, necklaces, etc. during the operation process to avoid electric shock and burns;

Special insulation tools must be used during the homework process to avoid electric shock injuries or short circuit faults. The insulation withstand voltage level must meet local laws, regulations, standards, and regulatory requirements;



WARNING

Special protective equipment must be used during the operation process, such as wearing protective clothing, insulated shoes, goggles, safety helmets, insulated gloves, etc.

1.2.1 General Requirements

1) Do not disable the equipment protection device or ignore the warnings, alerts, and preventive measures in the manual and on the equipment.

2) In the process of equipment operation, if any faults that may cause personal injury or equipment damage are found, the operation should be immediately terminated, reported to the responsible person, and effective protective measures should be taken.

3) Do not power on the device until it has been installed or confirmed by a professional.

4) It is prohibited to directly contact, use other conductors to contact, or indirectly contact power supply equipment through damp objects. Before touching any conductor surface or terminal, the voltage at the contact point should be measured to confirm that there is no risk of electric shock.

5) When the device is running, the temperature of the casing is high and there is a risk of burns. Do not touch.

6) It is strictly prohibited for fingers, components, screws, tools, or boards to come into contact with the running fan to avoid personal injury or equipment damage.

7) If a fire occurs, evacuate the building or equipment area and press the fire alarm bell, or call the fire alarm number. Under no circumstances should one re-enter the burning building or equipment area.

1.2.2 Request for staff

The lifting and transportation, installation and wiring, operation and maintenance of equipment must be carried out by professional electrical technicians who comply with local regulations. Wear equipment that meets local safety protection requirements when operating the device.

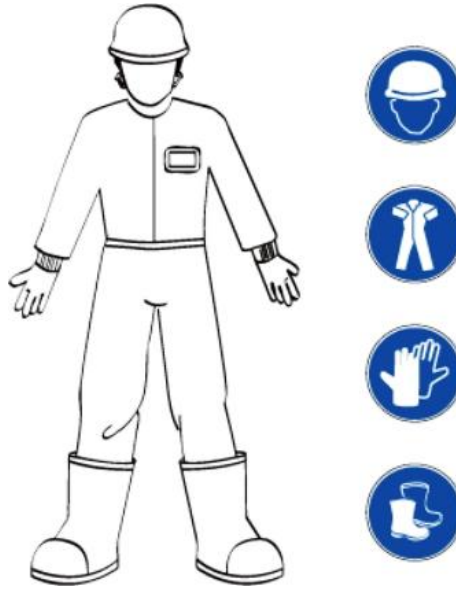


Figure 1-1 Dress code

Operators must meet the following requirements:

- 1) During installation, operation, and maintenance, it is strictly prohibited to wear conductive objects such as watches, bracelets, bracelets, rings, necklaces, etc., in order to avoid electric shock and burns.
- 2) When carrying out transportation, transit, installation, wiring, and maintenance operations, it is necessary to comply with the laws, regulations, and relevant standards of the country or region.
- 3) Familiar with the composition and working principle of the entire energy storage system, and operate according to the manual description.
- 4) Should have received professional training related to electrical equipment installation and commissioning, possess certain knowledge in electronics, electrical wiring, and mechanical engineering, and be familiar with electrical and mechanical schematics.
- 5) Should have emergency response capabilities in case of danger or unexpected situations during installation or commissioning.

1.3 Electrical Safety



- 1) Before making electrical connections, please ensure that the equipment is not damaged, otherwise it may cause electric shock or fire;
- 2) Improper and improper operation may cause accidents such as fire or electric shock;
- 3) During the homework process, it is necessary to prevent foreign objects from entering the interior of the equipment, otherwise it may cause equipment short circuit faults or damage, load power supply derating or power failure, and personal injury;



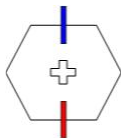
When installing equipment that requires grounding, a protective grounding wire must be installed first; When dismantling equipment, the protective grounding wire must be removed last.

NOTICE

Cables are not allowed to pass through the air inlet and outlet of the equipment.

1.3.1 General Requirements

- 1) Installation, operation, and maintenance must be carried out in accordance with the steps in the manual. Do not modify, install, or change without authorization
 - 2) Equipment, please do not change the installation sequence without authorization.
 - 3) It is necessary to obtain permission from the electricity department of the country or region where it is located before it can be connected to the grid for operation.
 - 4) Comply with the safety regulations of the power station, such as implementing the operation ticket and work ticket system.
 - 5) Install temporary fences or warning ropes in the work area, and hang "No Entry" signs. Non staff are strictly prohibited from entering.
 - 6) Before installing or removing power cables, the equipment itself and its front and rear switches must be disconnected.
 - 7) When liquid enters the interior of the device, please immediately turn off the power and prohibit further use.
 - 8) Before operating the equipment, it is necessary to carefully check that the tools used meet the requirements and register them; After the operation is completed, retract it by number to prevent it from being left inside the device.
 - 9) Before installing power cables, it is necessary to confirm that the cable labels are correctly labeled and that the cable terminals have been insulated and protected.
 - 10) When installing the equipment, it is necessary to use a torque tool with a suitable range to tighten the screws. When tightening with a wrench, it is necessary to ensure that the wrench is not skewed and the torque value error does not exceed 10% of the specified .
- The screws should be fixed with torque tools and double checked with red and blue markings. After the installation personnel confirm that the screws are tightened, apply blue markings on the screws; After the inspector confirms the tightening, apply a red mark (the line mark should cross the edge of the screw).



- 11) After installation, ensure that all electrical component protective shells, insulation sleeves, and other devices are in place to avoid the risk of electric shock.
- 12) If the device has multiple inputs, all inputs should be disconnected and the device can only be operated after it is completely powered off.
- 13) When maintaining the electrical or distribution equipment of the power supply equipment, it is necessary to disconnect the corresponding output switch of the power supply equipment.
- 14) During equipment maintenance, hang a "No Switching On" sign on the up and down switches or circuit breakers, and post warning signs to prevent accidental connections. The fault must be resolved before power can be restored.
- 15) When conducting fault diagnosis and troubleshooting, if a power outage is necessary, the following safety measures must be taken: power off >electricity inspection>installation of grounding wire>hanging signs and installing barriers.
- 16) Please regularly check the screws of the device connection terminals to ensure they are tightened.
- 17) If the cable is damaged, it must be replaced by professionals to avoid risks.
- 18) It is strictly prohibited to artificially alter, damage or cover the signs and nameplates on the equipment, and

to promptly replace any signs that have become unclear due to long-term use.

19) It is prohibited to clean the internal and external electrical components of the equipment with solvents such as water, alcohol, or oil.

1.3.2 Grounding Request

1) The grounding impedance of the equipment should meet the requirements of local electrical standards.

2) The equipment should be permanently connected to the protected area. Before operating the equipment, the electrical connections of the equipment should be checked to ensure that it is reliably grounded.

3) It is prohibited to operate the equipment without a grounding conductor installed.

4) Do not damage the grounding conductor.

5) For devices using three core sockets, it is necessary to ensure that the grounding terminal in the three core socket is connected to the protective ground.

6) For high contact current device, the protective grounding terminal of the device casing must be grounded before connecting the input power supply to prevent the device's contact current from causing electric shock to the human body.

1.3.3 Wiring Request

1) The selection, installation, and routing of cables must comply with local laws, regulations, and standards.

2) During the process of laying the power cord, it is strictly prohibited to have any twisting or twisting. If the length of the power cord is found to be insufficient, it must be replaced again. It is strictly prohibited to make joints or solder joints in the power cord.

3) All cables must be securely connected, well insulated, and of appropriate specifications.

4) Cable trays and wire holes should have no sharp edges, and cable conduit or wire hole positions must be protected to prevent cables from being damaged by sharp edges, burrs, etc.

5) If the cable is connected from the top of the cabinet to the cabinet, it needs to be bent in a U-shape outside the cabinet before entering the cabinet.

6) Similar cables should be tied together, with a straight and neat appearance, and no outer skin damage; Different types of cables should be laid at least 30mm apart, and it is prohibited to wrap or cross lay them with each other.

7) After completing or leaving the wiring process, immediately seal the cable mouth with sealing mud to prevent water vapor and small animals from entering.

8) Buried cables need to be reliably fixed using cable brackets and cable clamps. The cables in the backfilled soil area should be tightly attached to the ground to prevent deformation or damage caused by stress during backfilling.

9) When external conditions (such as laying methods or environmental temperatures) change, it is necessary to refer to IEC-60364-5-52 or local regulations and specifications for cable selection verification, such as whether the current carrying capacity meets the requirements.

10) The use of cables in high-temperature environments may cause aging and damage to the insulation layer. The distance between the cable and the periphery of the heating device or heat source area should be at least 30mm.

11) When the temperature is too low, severe impact and vibration may cause brittle cracking of the plastic outer skin of the cable. To ensure construction safety, the following requirements should be followed:

All cables should be laid and installed at temperatures above 0 °C. When handling cables, especially during construction in low-temperature environments, they should be handled with care.

If the storage environment temperature of the cable is below 0 °C, the cable must be moved to room temperature for more than 24 hours before laying it out.

12) Prohibit non-standard operations such as directly pushing cables off the vehicle to avoid cable damage that may cause a decrease in cable performance and affect current carrying and temperature rise.

1.3.4 Anti static requirements

Static electricity generated by the human body can damage static sensitive components on single boards, such as BMU boards.



- 1) Wear anti-static gloves before touching equipment or holding a single board;
- 2) When holding a single board, it is necessary to hold the edge of the board that does not contain any components, and it is prohibited to touch the components with hands;
- 3) The dismantled single board must be packaged with anti-static packaging material for storage or transportation.

1.4 Environment requirement



- 1) It is strictly prohibited to place the equipment in an environment with flammable, explosive gases or smoke, and any operation is prohibited in such an environment;
- 2) It is strictly prohibited to store flammable and explosive materials in the equipment area;
- 3) It is strictly prohibited to place equipment near heat or fire sources, such as smoke, candles, heaters, or other heating devices. Heating the equipment may cause damage or fire.



- 1) The equipment should be installed in an area away from liquids, and it is strictly prohibited to install it below water pipes, air outlets, or other locations that are prone to condensation; It is strictly prohibited to install under air conditioning vents, ventilation openings, computer room outlet windows, and other locations that are prone to water leakage, in order to prevent liquids from entering the equipment and causing equipment failure or short circuits.
- 2) When the device is running, do not cover the ventilation openings, cooling system, or use other objects to prevent high temperature damage to the device or fire.

1) The temperature and humidity environment for equipment storage should be suitable, stored in a clean, dry, well ventilated area, and protected from dust and condensation.

2) It is strictly prohibited to install and operate equipment beyond the technical specifications, otherwise it will affect equipment performance and safety.

3) It is strictly prohibited to install, use, and operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoors, high-altitude operations, outdoor installation, door opening, etc.) in adverse weather conditions such as lightning, rain, snow, and winds above level six.

4) It is strictly prohibited to install equipment in environments with dust, smoke, volatile gases, corrosive gases, infrared radiation, organic solvents, or high salt content.

5) It is strictly prohibited to install equipment in environments with metallic conductive dust and magnetic conductive dust.

6) It is strictly prohibited to install equipment in areas that are prone to the growth of fungi, molds, and other microorganisms.

7) It is strictly prohibited to install equipment in areas with strong vibration, strong noise sources, and strong electromagnetic field interference.

8) The site selection should comply with local laws, regulations, and relevant standards.

9) The installation environment should have a solid ground without any adverse geological conditions

such as rubber soil, weak soil, or easy sinking. It is strictly prohibited to choose low-lying areas or areas prone to water accumulation. The station level should be higher than the historical highest water level in the area.

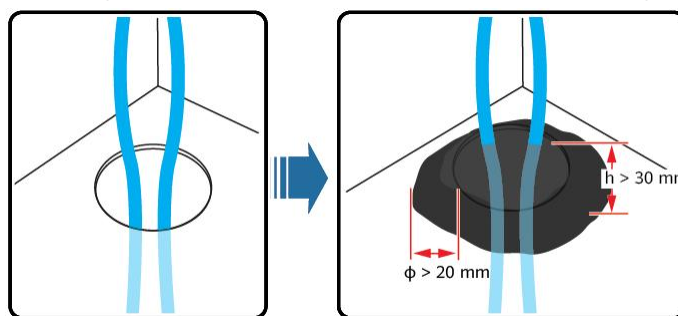
10) It is strictly prohibited to install equipment in locations where water can submerge it.

11) If the equipment is installed in a place with lush vegetation, in addition to routine weeding, it is necessary to harden the ground below the equipment, such as laying cement, stones, etc.

12) During installation, operation, and maintenance, it is necessary to first clean the accumulated water, ice, snow, or other debris on the top before opening the door to prevent debris from falling into the interior of the equipment.

13) When installing equipment, please ensure that the installation surface is sturdy and meets the load-bearing requirements of the equipment.

14) All routing holes need to be sealed. Seal the routing holes that have already been routed with sealing mud, and seal the routing holes that have not been routed with the equipment's built-in cover. The correct sealing mud sealing construction standard is shown in the following figure.



1.5 Mechanical Safety

DANGER

During high-altitude operations, safety helmets, safety belts, or waist ropes must be worn and tied to sturdy structural components. It is strictly prohibited to hang them from moving unstable objects or sharp metal edges to prevent hooks from slipping and causing falling accidents.

WARNING

- 1) Tools must be fully prepared and inspected by professional institutions to be qualified. It is prohibited to use tools with scratches, unqualified inspection or expired inspection period to ensure that the tools are firm and not overloaded.
- 2) Before installing the equipment into the cabinet, first ensure that the cabinet is securely fixed to avoid tilting and collapsing due to unstable center of gravity, which may cause injury to the installation personnel or damage to the equipment.
- 3) When pulling equipment out of the cabinet, be careful to install equipment that may be unstable or heavy inside the cabinet to avoid being crushed or hit.
- 4) It is strictly prohibited to drill holes on the equipment. Drilling can damage the sealing, electromagnetic shielding performance, internal components, and cables of the equipment. The metal shavings generated by drilling can enter the equipment and cause a short circuit on the circuit board.

1.6 Transportation and installation safety

1.6.1 General Requirements

- 1) Paint scratches that occur during equipment transportation and installation must be repaired in a timely manner, and it is strictly prohibited to expose the scratched parts for a long time.
- 2) Without the evaluation of our company, it is prohibited to perform arc welding, cutting and other operations on the equipment.
- 3) Without evaluation by our company, it is prohibited to install other devices on top of the equipment.

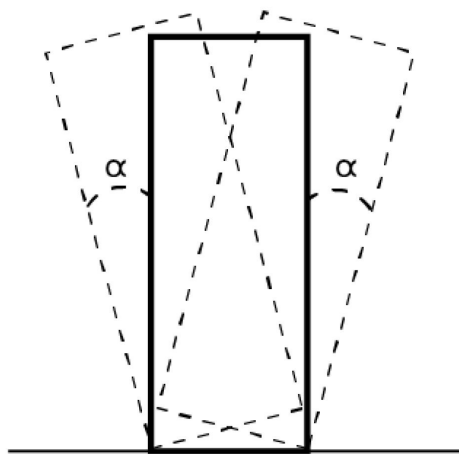
- 4) When working in the space above the top of the equipment, additional protection should be added at the top of the equipment to prevent damage to the equipment.
- 5) Please use the correct tools and master the proper usage of the tools.

1.6.2 Safety of heavy object transporting



Figure 1-4 Coordinate when moving heavy objects

- 1) When carrying heavy objects, choose appropriate handling tools and a suitable number of people to work together according to the different weights of the goods, and ensure the safety of packaging and handling the goods.
- 2) When handling equipment by hand, protective gloves, anti smashing shoes, and other safety equipment should be worn.
- 3) During the transportation of equipment, it is necessary to avoid scratching the surface of the equipment, damaging components or cables.
- 4) When using a forklift for transportation, the forklift must be positioned in the middle to prevent tipping over.
- 5) Before moving, please fasten the equipment to the forklift with ropes; When moving, a dedicated person is needed to take care of it.
- 6) Be careful when moving the device to avoid impact or falling.
- 7) When transporting, sea freight or highways with good road conditions should be chosen, and railways and air freight are not supported. During transportation, bumps and tilts should be minimized as much as possible.
- 8) The inclination angle of the cabinet should meet the requirements shown in the diagram. The inclination angle with packaging should be $\alpha \leq 15^\circ$, and after removing the packaging, the inclination angle should be $\alpha \leq 10^\circ$.



1.6.3 High altitude safety

- 1) Operations carried out at a distance of more than 2 meters from the ground are considered high-altitude operations, and guardians must be appointed for high-altitude operations.
- 2) Operators must undergo relevant training and obtain relevant qualifications before working at heights.
- 3) High altitude operations should be stopped when the rainwater on the steel pipe is still wet or in other potentially dangerous situations. After the above situation, various operating equipment must be inspected by the safety manager and relevant technical personnel to confirm safety before operation can be carried out.

- 4) At the site of high-altitude operations, a dangerous restricted area should be designated, clearly marked, and unrelated personnel are strictly prohibited from entering.
- 5) Guardrails and signs should be installed at the edges and holes of high-altitude operations to prevent slipping and stepping into the air.
- 6) Scaffolds, springboards, or other debris are strictly prohibited from being piled up on the ground below the high-altitude work area. Ground personnel are strictly prohibited from staying or passing directly below the high-altitude work area.
- 7) Carry proper operating equipment and tools to prevent equipment damage or personal injury caused by tool falling.
- 8) It is strictly prohibited for high-altitude workers to throw objects from high altitude to the ground, and throwing objects from the ground to high altitude is strictly prohibited. Objects should be transported using slings, baskets, elevated vehicles, or cranes.
- 9) Efforts should be made to avoid working on both upper and lower levels simultaneously. If unavoidable, a dedicated protective shed or other protective measures must be set up between the upper and lower layers, and it is strictly prohibited to stack tools and materials on the upper layer.
- 10) When dismantling scaffolding upon completion of work, it should be done in layers from top to bottom. It is strictly prohibited to dismantle both layers at the same time. When dismantling a certain part, other parts should be prevented from collapsing.
- 11) High altitude operators should strictly follow the high-altitude safety regulations for their work, and our company is not responsible for accidents caused by violations of high-altitude safety regulations.
- 12) It is strictly prohibited to play and frolic during high-altitude operations, and it is strictly prohibited to rest in the high-altitude operation area.

1.6.4 Ladder usage safety

- 1) When conducting high-altitude operations involving electricity, wooden or insulated ladders should be used.
- 2) Priority should be given to using platform ladders with protective barriers for high-altitude operations, and the use of straight ladders is prohibited.
- 3) Before using the ladder, please confirm that the ladder is intact and the load-bearing capacity meets the requirements. Overloading is strictly prohibited.
- 4) The ladder must be placed in a stable place and must be supported by someone during operation.



- 5) When climbing ladder, staffs should keep their body steady and ensure that their center of gravity does not deviate from the edge of the ladder frame to reduce danger and ensure safety.
- 6) The rope must be securely fastened when using a zigzag ladder.

1.6.5 Hoisting Safety

1. The battery cabinet and packaging wooden box do not support lifting transportation.

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1.6.6 Lifting safety

- 1) Prior to drilling, the consent of the client and contractor should be obtained.
- 2) Safety protective equipment such as goggles and gloves should be worn during drilling.
- 3) Please avoid pre-embedded pipelines or lines when drilling to avoid short circuits or other hazards.
- 4) When drilling, the equipment should be covered and protected to prevent debris from falling into the interior of the equipment. After drilling, debris should be cleaned up in a timely manner.

1.7 Equipment Safety

1.7.1 Energy Storage System Safety



- 1) Do not open the cabinet door while the system is running.
- 2) When the energy storage system malfunctions, please avoid standing at the cabinet door (including within the opening range of the cabinet door).

NOTICE

The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to prevent unauthorized personnel from entering during equipment operation, which may cause personal injury or property damage.

- 1) The installation layout of energy storage systems must meet the fire distance or firewall requirements specified by local standards, including but not limited to the requirements of GB 51048-2014 Design Code for Electrochemical Energy Storage Power Plants and NFPA 855 Standard for Installation of Stationary Energy Storage Systems.
- 2) The energy storage system should undergo regular fire inspections, no less than once a month.
- 3) When conducting live inspection of the system, attention should be paid to the danger warning signs on the equipment to avoid standing at the cabinet door.
- 4) After the replacement of power components or wiring changes in the energy storage system, it is necessary to manually initiate wiring detection and topology identification to avoid abnormal system operation.
- 5) It is recommended that users bring their own camera devices to record the detailed process of installing, operating, and maintaining the equipment.

1.7.2 Battery Safety



- 1) It is strictly prohibited to short-circuit the positive and negative terminals of the battery, otherwise it may cause a short circuit in the battery. A battery short circuit can instantly generate a large current and release a large amount of energy, causing battery leakage, smoking, release of flammable gases, thermal runaway, fire or explosion. To avoid battery short circuits, live maintenance of the battery is not allowed.
- 2) Do not expose the battery to high temperature environments or around heating devices, such as high-temperature sunlight, fire sources, transformers, heaters, etc. Overheating of batteries may cause leakage, smoking, release of flammable gases, thermal runaway, fire or explosion.
- 3) It is strictly prohibited for batteries to be subjected to mechanical vibration, falling, collision, hard object puncture, and pressure impact, otherwise it may cause battery damage or fire.
- 4) It is strictly prohibited to disassemble, modify or damage batteries (such as inserting foreign objects, external pressure, immersion in water or other liquids), in order to avoid battery leakage, smoking, release of flammable gases, thermal

runaway, fire or explosion.

- 5) It is strictly prohibited for battery terminals to come into contact with other metal objects, as this may cause heating or electrolyte leakage.
 - 6) There is a risk of fire and explosion if the battery model used or replaced is incorrect. Please use the battery model recommended by the manufacturer.
 - 7) The battery electrolyte is toxic and volatile. When electrolyte leakage or abnormal odor occurs, contact with the leaked liquid or gas should be avoided. Non professionals are not allowed to approach, please contact professionals immediately for assistance. Professional personnel should wear goggles, rubber gloves, gas masks, protective clothing, etc., power off the equipment in a timely manner, remove leaking batteries, and contact technical engineers for handling.
 - 8) The battery is a closed system that does not release any gas during normal operation. If in extreme abuse situations, such as fire, needle puncture, compression, lightning strikes, overcharging, or other adverse conditions that may cause thermal runaway of the battery, it may lead to battery damage or abnormal chemical reactions inside the battery, resulting in electrolyte leakage or the production of gases such as CO and H₂. The site should ensure that combustible gas emission measures are normal to avoid combustion or corrosion of equipment.
 - 9) The gas generated by battery combustion can irritate the eyes, skin, and throat. Please take precautions.
-



WARNING

- 1) The battery should be installed in an area away from liquids, and it is strictly prohibited to install it under air conditioning vents, ventilation openings, computer room outlet windows, water pipes, and other locations that are prone to water leakage, in order to prevent liquid from entering the equipment and causing equipment failure or short circuit;
 - 2) When installing and debugging batteries, fire-fighting facilities such as fire sand and carbon dioxide fire extinguishers must be equipped in accordance with construction standards and specifications. Before putting into operation, it is necessary to ensure that fire-fighting facilities that comply with local laws, regulations, and regulatory requirements are in place;
 - 3) Before unpacking the battery, ensure that the outer packaging box is intact and undamaged during storage and transportation. Place it correctly according to the packaging box label, and strictly prohibit reverse, side, upright, or tilted placement. When stacking, comply with the stacking requirements on the outer packaging to avoid any impact or drop that may cause battery damage or scrap;
 - 4) After unpacking the battery, place it in the required direction. It is strictly prohibited to place it upside down, sideways, upright, tilted, or stacked to avoid any impact or drop that may cause damage or scrap to the battery;
 - 5) Tighten the fastening screws of copper bars or cables according to the torque specified in the text, regularly check whether they are tightened, whether there are rust, corrosion or other foreign objects, and clean them up. Otherwise, virtual connection of screws will cause excessive voltage drop in the connection, and even generate a large amount of heat and burn out the battery when the current is high;
-

-
- 6) After discharging the battery, it should be charged in a timely manner, otherwise it may cause damage to the battery due to overdischarging.
-

Declaration: We are not responsible for any damage to the batteries provided by our company caused by the following reasons:

- 1) Battery damage caused by earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, and force majeure;
- 2) Direct damage to the battery caused by the operating environment of on-site equipment or external power parameters not meeting the requirements for normal operation, including but not limited to the actual operating temperature of the battery being too high or too low, unstable power grid conditions, frequent power outages, etc;
- 3) Battery damage, drop, leakage, rupture, etc. caused by improper operation or failure to connect the battery as required;
- 4) The battery was installed on site and connected to the system, but due to your fault, it was not powered on in a timely manner, resulting in damage caused by over discharge of the battery;
- 5) Due to your failure to conduct timely inspection, the battery was damaged;
- 6) You have not set the battery operation management parameters correctly;
- 7) You mix the batteries provided by our company with other batteries, causing accelerated capacity degradation, including but not limited to: mixing with other brands of batteries, mixing with batteries of different rated capacities, etc;
- 8) Improper maintenance by you has resulted in frequent overdischarging of the battery, on-site expansion, or prolonged inability to fully charge it;
- 9) You have not properly maintained the battery according to the operating manual of the supporting equipment, including but not limited to: not regularly checking whether the battery terminal screws are tightened, etc;
- 10) Battery damage caused by your failure to store according to storage requirements (such as storing in a damp, rainy, or other environment);
- 11) Due to your failure to charge in a timely manner, the battery has been stored beyond its expiration date, resulting in capacity loss or irreversible damage to the battery;
- 12) Battery damage caused by you or a third party, including but not limited to: unauthorized relocation or installation of batteries without following our company's requirements;
- 13) You are not aware of our company and may change the battery usage scenario on your own;
- 14) You can connect additional loads to the battery yourself;
- 15) The battery has exceeded its maximum storage period;
- 16) The battery has exceeded its warranty period.

1.7.2.1 General Requirement



-
- 1) Do not expose the battery to high temperature environments or heat generating devices such as sunlight, fire sources, transformers, heaters, etc. Overheating of batteries may cause fires and explosions.
 - 2) Do not disassemble, modify or damage the battery (such as inserting foreign objects, immersing in water or other liquids, etc.) to avoid battery leakage, overheating, fire or explosion.
 - 3) Lithium ion/sodium ion battery energy storage systems have a high risk of fire. Before carrying out battery work, the following safety risks should be fully considered:
 - 4) The battery electrolyte is flammable, toxic, and volatile.
 - 5) Thermal runaway of batteries can produce flammable gases, as well as harmful gases such as CO and HF.
 - 6) The accumulation of combustible gases generated after thermal runaway of batteries poses a risk of explosion and detonation. The energy storage system needs to be loaded and unloaded in accordance with the laws, regulations, and industry standards of the region. Rough loading and unloading can cause short circuits or damage to the batteries inside the cabinet, which may lead to battery leakage, rupture, explosion, or fire.
-
- 1) Batteries must be stored in a separate warehouse and in their outer packaging, avoiding mixing with other materials, storing outdoors, and stacking batteries too high. The site must have fire-fighting facilities that meet the requirements, such as fire sand, fire extinguishers, etc.
 - 2) Under normal circumstances, do not disassemble the battery packaging. If it is necessary to recharge the battery, it must be recharged by professionals according to the requirements. After the power supply is completed, the battery still needs to be put back into the packaging.
 - 3) After unpacking the outdoor scene battery, it is recommended to power it on within 24 hours. If it cannot be powered on in time, the battery should be placed indoors in a dry, non corrosive gas environment.
 - 4) The battery should be placed correctly according to the anti inversion label or tag on the packaging box to avoid battery cell leakage caused by long-term storage inversion.
 - 5) Batteries should be avoided from impact.
 - 6) When handling batteries, they should be carried in the direction required by the battery, and inversion or tilting are prohibited.
 - 7) Please use the battery within the temperature range specified in this manual. When the ambient temperature of the battery is below the lower limit of the operating temperature, charging is prohibited to avoid crystallization caused by low-temperature charging and internal short circuit of the battery.
 - 8) Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as household waste. Improper disposal of batteries may lead to environmental pollution.
 - 9) Do not use damaged batteries (dents or other damages on the battery casing), as damaged batteries may release flammable gases. Do not store damaged batteries near undamaged products.
 - 10) The storage location of damaged batteries should not contain flammable materials, and non professionals should not approach them.
 - 11) During the storage period of damaged batteries, they should be monitored to ensure that there are no signs of smoke, flames, electrolyte leakage, or heating.
 - 12) If the battery pack accidentally gets wet, it is prohibited to continue installation. Transport it to a safe

isolation point and apply for spare parts replacement in a timely manner.

- 13) No direct sunlight or rain, dry and well ventilated, clean surrounding environment, no large amount of infrared radiation, organic solvents, corrosive gases, etc.

1.7.2.2 Power Replenishment Requirements

- 1) If the battery has not been charged for more than 8 months, it needs to be recharged. If not recharged as required, it may affect the performance and service life of the battery.
- 2) The completion time of battery production can be consulted with our service engineers.



NOTE

Before installing the battery pack, it should be checked for any abnormalities.

Abnormal battery pack refers to any of the following phenomena:

- 1) The outer shell of the battery pack is significantly deformed or damaged;
- 2) Is the total positive to negative voltage of the battery pack approximately 0V;
- 3) The impedance of the positive or negative ear of the battery pack to ground is less than 50k Ω .

1.7.2.3 Battery Installation Requirements

- 1) Please use batteries of the designated model. Using batteries of non designated models at will may result in battery damage.
- 2) Before installing the battery, check if the packaging is intact. Batteries with damaged packaging cannot be used.
- 3) The battery should be placed horizontally and fixed.
- 4) During the battery installation process, it is prohibited to place installation tools, debris, etc. on the battery.
- 5) During battery installation, pay attention to the positive and negative poles and do not short-circuit the positive and negative terminals of the battery.
- 6) During the installation process, use a torque wrench to ensure that the connection terminals are tightened, and regularly check to ensure that the connection terminals are not loose.

1.7.2.4 Battery short-circuit protection



DANGER

Battery short circuit can generate instantaneous high current and release a large amount of energy, which may cause personal injury and property damage.

- 1) When installing and maintaining the battery, it is necessary to wrap the exposed cable terminals on the battery with insulating tape.
- 2) Prevent foreign objects (such as conductive objects, screws, liquids, etc.) from entering the interior of the battery and causing a short circuit.

1.7.2.5 Hazard and Toxicity Statement



DANGER

1) Hazard:

Contact between battery terminals and other metals may cause heating or electrolyte leakage. Electrolyte is flammable, and if it leaks, the battery should be immediately removed from the fire.

2) Toxicity:

The steam generated by battery combustion may irritate the eyes, skin, and throat.

1.7.2.6 Measures for handling battery abnormalities



- 1) When electrolyte leakage or abnormal odor occurs, contact with the leaked liquid or gas should be avoided. Non professionals are not allowed to approach, please contact professionals immediately for assistance. Professional personnel should wear goggles, rubber gloves, gas masks, protective clothing, etc. to prevent the hazards caused by electrolyte leakage.
- 2) Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If in contact with battery electrolyte, the following measures need to be taken.
- 3) Inhalation: Evacuate the contaminated area, immediately inhale fresh air, and seek medical assistance immediately.
- 4) Eye contact: Immediately rinse the eyes with plenty of water for at least 15 minutes, do not rub, and seek medical help immediately.
- 5) Skin contact: Immediately wash the contact area with plenty of water and soap, and seek medical help immediately.
- 6) Ingestion: Seek medical assistance immediately.

1.7.2.7 Battery Drop

- 1) When the battery drops (with or without packaging), but there is no obvious deformation or damage to the appearance and no obvious odor, smoke, or fire occurs, operate it under the premise of ensuring safety.
- 2) Warehouse: Evacuate personnel and have professional personnel use mechanical tools to transport the batteries to a safe and open area. Contact our service engineer and let them sit for 1 hour while monitoring the battery temperature within ± 10 °C for further processing.
- 3) On site energy storage system: Evacuate personnel, close the energy storage system door, have professional personnel use mechanical tools to transport the battery to a safe and open place, and contact our company's service engineer to let it sit for 1 hour before processing.
- 4) When the battery drops and shows obvious odor, damage, smoke, or catches fire, immediately evacuate personnel, contact professionals, and call the police in a timely manner. Professional personnel will use fire-fighting facilities to extinguish the fire while ensuring safety.
- 5) After the battery falls, it is prohibited to continue using it. Please contact our service engineer for evaluation.

1.7.3 Safety of getting power from the backup socket



The backup socket supplies single-phase 230Vac 50Hz power. The rated current of the equipment used must not exceed 10A, and the equipment should have safety certifications such as CE or UL. When using electricity, the cable leads should be properly protected to ensure electrical safety.

The spare socket is an IEC standard 5-pin 10A/230Vac socket. It is necessary to prepare a converter with safety certifications such as CE or UL by yourself in accordance with local regulatory requirements.

1.8 Maintenance and Replacement



Before removing the components from the cabinet, please confirm that other components on the cabinet are not loose and have no safety hazard.

- 1) When maintaining the energy storage system, there must be two or more personnel on site.
- 2) During equipment maintenance, insulation materials should be used to cover nearby live parts.
- 3) It is prohibited to open the cabinet door in weather conditions such as rain, snow, lightning, dust, and heavy fog.

- 4) Before the fan is powered off or stops rotating, it is forbidden for fingers, components, screws, tools, or boards to come into contact with the running fan.
- 5) Do not power on the device before troubleshooting.
- 6) When conducting live inspection of the system, attention should be paid to the danger warning signs on the equipment and avoid standing at the door of the energy storage cabinet.
- 7) Devices other than the battery pack must wait for 15 minutes after being powered off to ensure that the device is out of power before they can be operated.
- 8) For switches that need to be disconnected for maintenance purposes, clear labels should be affixed to the switches.
- 9) After the replacement of power components or wiring changes in the energy storage system, it is necessary to manually initiate wiring detection and topology identification to avoid abnormal system operation.
- 10) After completing maintenance and replacement operations, the battery cabinet door should be locked in a timely manner and the key should be properly kept.

2 Product Introduction

2.1 Energy Storage System Composition

This product is an intelligent distributed energy storage system, which is carried by a battery cabinet. The cabinet is mainly composed of battery PACK, sub control box, PCS, BMS, temperature control system, fire protection system, grounding system, etc. The schematic diagram of the battery cabinet is shown in the following figure:



Figure 2-1 Battery cabinet diagram

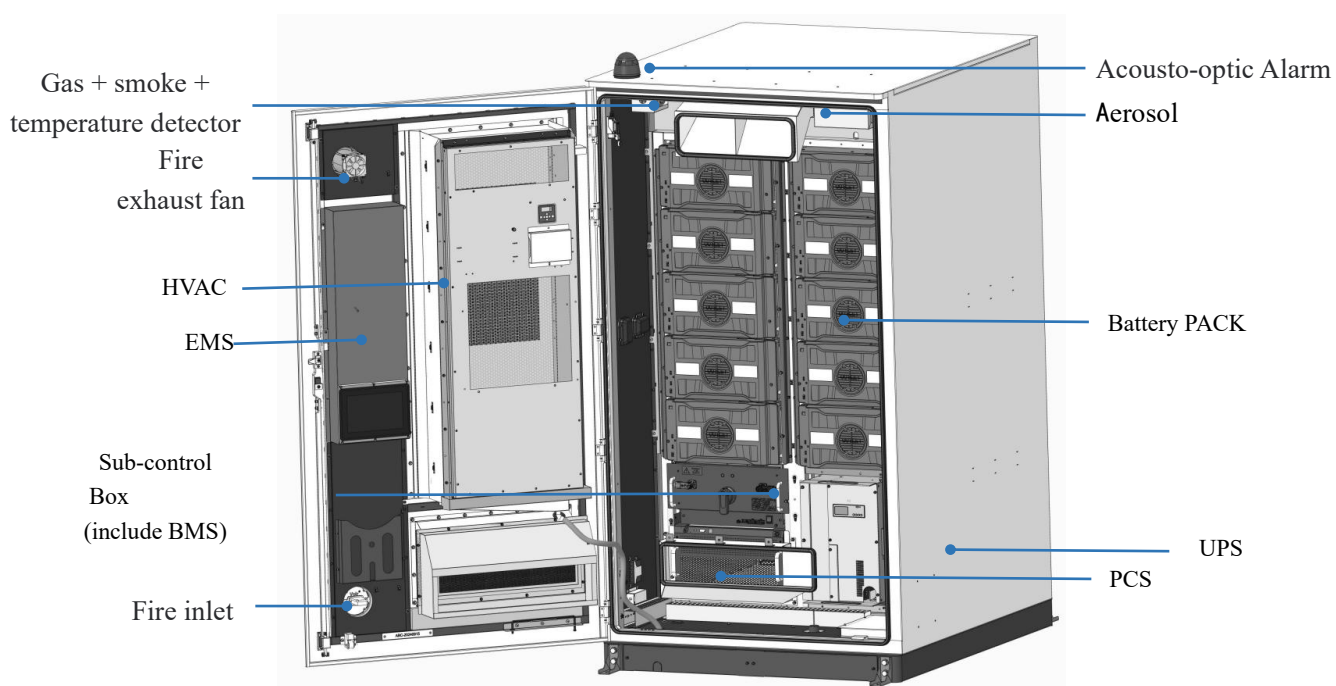


Figure 2-2 Internal layout of the battery cabinet

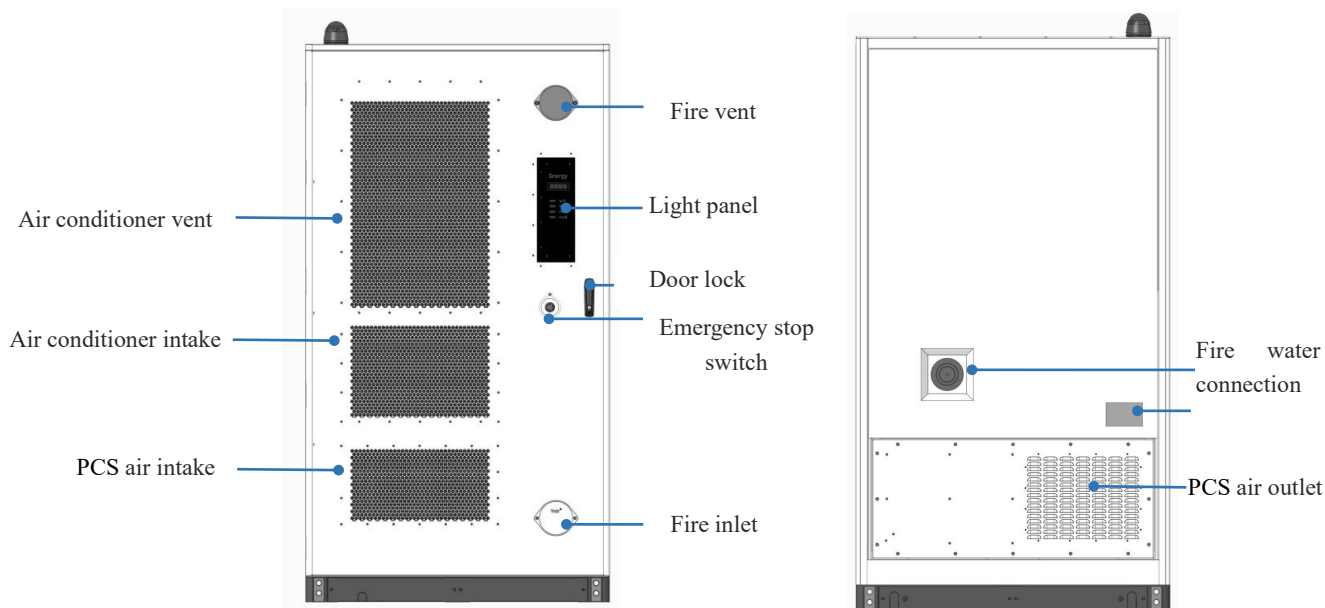


Figure 2-3 External structure of the battery cabinet

2.1.1 Battery PACK

The battery PACK mainly consists of 24 battery cells, 1 fan, 1 BMU, as well as structural and electrical components used to carry the battery cells. The PACK integrates temperature controlled air ducts and has a rated capacity of 21.504 kWh.

The specific parameters of the battery PACK are as follows:

Table 2-1 Battery PACK specifications

Serial Number	Project	Parameter	Addition
1	Cell type	LFP-3.2V-280Ah	
2	Battery PACK string method	1P24S	
3	Nominal capacity [Ah]	280	
4	Nominal energy [kWh]	21.504	
5	Nominal voltage [Vdc]	76.8	
6	Voltage range [Vdc]	67.2~86.4	
7	Charge discharge rate	≤0.5CP	
8	Cooling method	Smart air cooling	
9	Working temperature range [°C]	0 ~ +45	
10	Storage temperature [°C]	-20 ~ +45	
11	Working humidity range	0~95%RH	No immersion
12	Installation method	Installation on indoor battery rack	
13	Altitude [m]	3000	Power derating at >3000
14	Weight [kg]	154±3	

Battery PACK is shown in the following picture:



Figure 2-4 Battery PACK

2.1.2 Sub control box

The sub control box is the control part of the entire battery cluster, whose main function is to control the main circuit breakpoint, manage the charging and discharging process of the battery cluster safely, and ensure the safe, reliable, and stable operation of the battery. Its interior is mainly composed of aluminum shell resistors, fuses, splitters, DC contactors, and outer shells.

The specifications and parameters of the control box are shown in the table below.

Table 2-2 Specifications of the sub-control box

Serial Number	project	Parameter	Addition
1	Maximum voltage [Vdc]	1000	
2	Rated power [kW]	200	
3	Rated current [A]	200	
4	Maximum current [A]	220	
5	Temperature range [°C]	-25 ~ +55	
6	Humidity range	0~95%RH	No immersion
7	communication interface	RS485/CAN	
8	Communication Protocol	MODBUS/CAN2.0B	
9	Altitude [m]	3000	Power derating at >3000
10	Protection level	IP20	
11	Weight [kg]	30±3	

Sub control box product is shown in the following picture:



Figure 2-5 Schematic diagram of the control box

2.1.3 PCS

The main specifications and parameters of PCS are shown in the table below:

Table 2-3 PCS specifications

Serial Number	Project		Parameter
1	Electrical specifications	DC input voltage	650~950V (3W+N+PE)
		AC input line voltage	400V±15%
		Number of phases	3-phases 4-wires
		Capacity	100kW
		Frequency	50Hz/60Hz
		Power factor	0.99 (Rated power)
		Maximum efficiency	98.2%
2	Communication interface	Dry contact point	EPO/DI/DO
		Signal communication	RS485/CAN
3	Environmental specifications	Place of use	Indoor, not exposed to direct sunlight, free of dust, corrosive or flammable gases, oil mist, water vapor, dripping water or salt, etc
		Working altitude	Below 3000 meters, use with reduced rating when above 2000 meters
		Storage temperature	-45°C ~+70°C
		Working temperature	-30 ° C to+55 ° C (derating at>45 °C)
		Humidity	Less than 95% RH, no condensation of water droplets
		Vibration	Less than 5.9 meters per second (0.6g)
4	Structure	Protection level	IP20
		Pollution degree	II
		Net weight	~58kg
		Cooling method	Intelligent air cooling

The PCS module is shown in the following figure:



Figure 2-6 Diagram of PCS

2.1.4 BMS

The BMS system of this project adopts a two-level architecture (BCMU, BMU), mainly used for real-time monitoring of the battery pack. It can detect the voltage, voltage, current, temperature, etc. of the battery cells, and judge the operating status of the battery in real time. It uploads battery pack status information and alarm information, and if necessary, cuts off the output of the battery pack circuit for protection.

2.1.4.1 BMU

BMU is an important component of energy storage battery management system (BMS), which plays a decisive role in the safe application and extended lifespan of energy storage battery packs when used in groups. BMU achieves real-time monitoring of battery status by accurately collecting the voltage and temperature of each individual battery. At the same time, BMU also has functions such as temperature information monitoring and collection, passive balancing management of battery cells, and module fan control.

Product Features&Features:

1. The battery cell voltage function has the characteristics of high collection accuracy and fast speed; Widely used in lithium iron phosphate batteries;
2. Temperature sampling function: The collection has high precision and reliability characteristics, including 13 individual temperature acquisition channels and 1 passive equalization circuit temperature acquisition channel, with a collection range of -40 to +125 ° C;
3. Balance: 24 passive balance functions, passive 100mA balance current;
4. Communication with BCMU: Supports adaptive communication and collaborates with BCMU to achieve automatic address encoding for all BMUs;
5. Fan speed regulation&fault feedback detection: According to the temperature control strategy, it supports PWM wave to adjust the fan speed, and can also detect the fault status of the fan;
6. It has rich self diagnostic functions and supports functional safety certification requirements;
7. Comply with 1500V safety regulations;
8. UL94-V0 flame retardant rating design.

2.1.4.2 BCMU

BCMU is the control core of the battery management system, which communicates with BMU to detect battery cell voltage, temperature, and other external characteristic parameters such as total voltage, charge and discharge current, and ground insulation resistance of the battery cluster. It estimates and monitors the internal state of the battery (capacity, SOC, SOH, etc.) according to appropriate algorithms, and based on this, realizes charge and discharge management, thermal management, insulation detection, cell balance management, and

Ener Hexon® Smart215Air Cooled Energy Storage System

fault alarm of the battery pack; It can exchange data with EMS through Ethernet communication.

Product Features&Features:

The collection function of total voltage, charging and discharging current, and ground insulation resistance of the battery cabinet;

Battery cabinet charging and discharging management, cluster internal thermal management based on temperature control strategy;

High reliability design: Product software, hardware, and structural design are designed according to relevant professional standards;

High security: With complete protection functions and multiple redundant protection measures, it can protect the battery in various situations of exceeding limits and accidents;

Strong anti-interference ability: fully considering the high-power and complex wiring electromagnetic environment of the energy storage system, all component selection meets high reliability requirements, and effective isolation and filtering are used for input and output interfaces and communication interfaces to meet the application requirements of harsh electromagnetic environments;

Accurate signal acquisition and SOC estimation: International renowned brand high-precision sampling chips are selected, combined with the advantages of various SOC algorithms in the industry, and have intelligent learning functions to ensure the accuracy of sampling and SOC estimation;

Rich external interfaces: rich input and output interfaces such as switch quantity, analog quantity, communication port, etc., to meet the interface requirements of the project;

Reliable data storage: The storage of alarm information, reset information, and sampling anomaly information can be exported as needed;

Flexible configuration upgrade, the product can be flexibly configured using the upper computer software according to different application requirements, and the program can be quickly upgraded through the CAN communication port.

2.1.5 Temperature Control System

This energy storage system adopts an air-cooled design. The battery cabinet is equipped with an integrated air conditioning unit and a matching air duct, which extends to each battery PACK. Each PACK is equipped with a fan and can receive instructions from BMS for speed control to ensure consistent temperature control inside the battery cabinet. The schematic diagram of the temperature controlled air conditioner and its air duct is shown in the following figure:

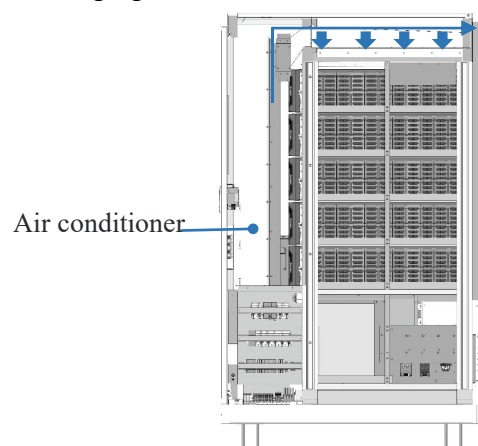


Figure 2-7 Air conditioner and its air duct (right view)

2.1.6 Fire protection system

This project selected an aerosol fire agent, mechanical hot start (starting temperature $\geq 95^{\circ}\text{C}$), for the fire fighting in the entire cabinet. Its working principle is: when a fire occurs, the fire extinguishing device will activate the aerosol generator in the fire extinguishing device after the open fire ignition temperature reaches 95°C , and the aerosol generator will decompose the chemical coolant through the heat released by the REDOX reaction, so that the aerosol generator and the coolant can participate in the fire extinguishing together.

When a smoke detector or a temperature detector in the energy storage cabinet alarms, a single alarm signal is sent to the EMS, the aerosol does not act, and the audible and visual alarm sends an alarm sound and light signal.

When a smoke detector and a temperature detector in the energy storage cabinet alarm at the same time, the alarm signal will be sent to the EMS. When the temperature in the battery compartment reaches the threshold value ($\geq 95^{\circ}\text{C}$), the aerosol fire extinguishing device will automatically start, and the fire extinguishing agent will be erupted into the protected area to implement the fire extinguishing. The duration is about 30 minutes. At the same time, the sound and light alarm sends out alarm sound and light signal.

After the fire extinguishing agent is successfully sprayed, the feedback device will send the feedback signal to the EMS, which will close the fire exhaust system, and the linkage system will be powered off. The DC switch and the AC main switch will automatically open the brake.

When the hydrogen detector detects that the hydrogen concentration is 10%LEL, the EMS system will automatically fire exhaust system and carry out air exchange of the energy storage cabinet, while the sound and light alarm will issue alarm sound and light signal, until the concentration drops to 10%LEL, the fire exhaust system and sound and light alarm will automatically close.

The energy storage cabinet is configured with a fire water connector DN65. When an uncontrollable fire occurs in the energy storage cabinet, fire fighters of the local fire department can inject fire water into the energy storage cabinet after the upper power supply of the energy storage cabinet is powered off and personnel are evacuated to control the fire, prevent the fire from expanding, and reduce economic losses.



1) The fire water interface of the energy storage cabinet is only allowed to be used in the case of uncontrollable fire. If the customer uses it in the special case of non-controllable fire, improper operation and direct water injection will cause damage to the equipment, and our company will not be responsible.

2) Fire water injection into the energy storage cabinet should be carried out by trained professional fire personnel. Before the fire situation has not been eliminated, personnel are forbidden to approach.

The technical parameters of aerosols are as follows:

Table 2-4 Aerosol technical parameters

Serial number	Project	Specifications
1	Model specifications	Stat-X
2	Working environment temperature range	$-40^{\circ}\text{C} \sim +54^{\circ}\text{C}$
3	Relative humidity of working	$\leq 95\% \text{RH}$

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	environment	
4	Spray time	$\leq 21S$
5	Spray lag time	30min
6	Cover area	$\leq 8.08m^3$
7	Mechanical starting temperature	$\geq 95^{\circ}C$
8	Capacity	The dosage is 500g
9	Net weight per unit	3400g
10	Specification and dimension	Length 216mm x diameter 127mm
11	Starting mode	Manipulator temperature starting
12	Design quantity	$67g/m^3 \sim 97g.m^3$
13	Start Temperature	$\geq 95^{\circ}C$
14	Validity	More than 10 years

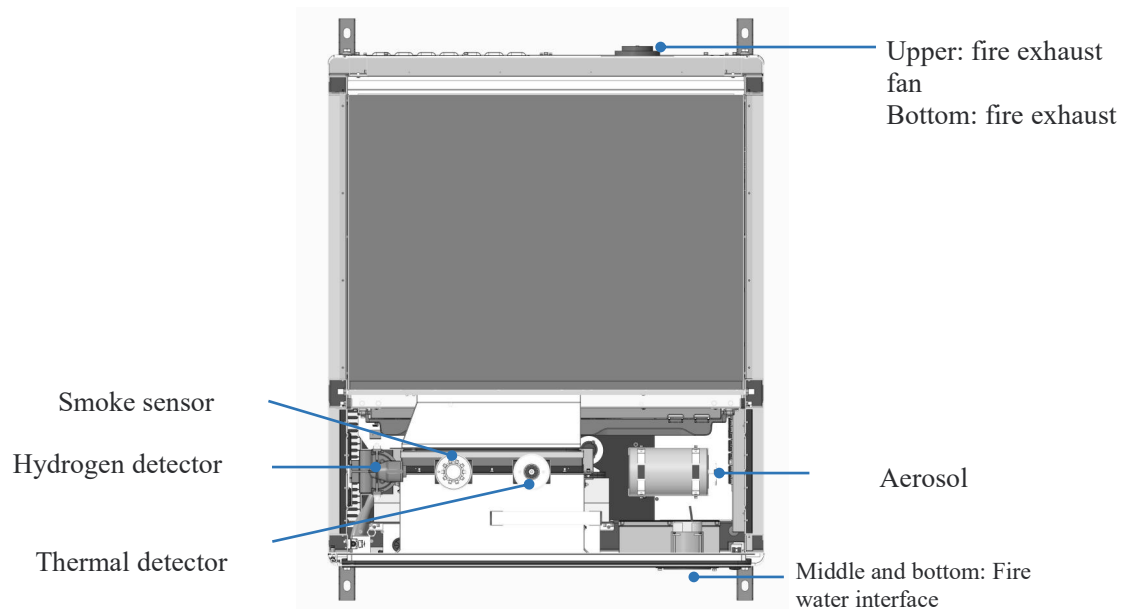


Figure 2-8 Schematic diagram of fire extinguishing equipment (from top view)

2.1.7 Grounding System

Battery cabinet grounding A is set outside the battery cabinet, as shown in the following figure.

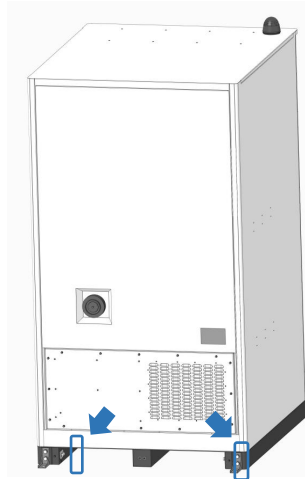
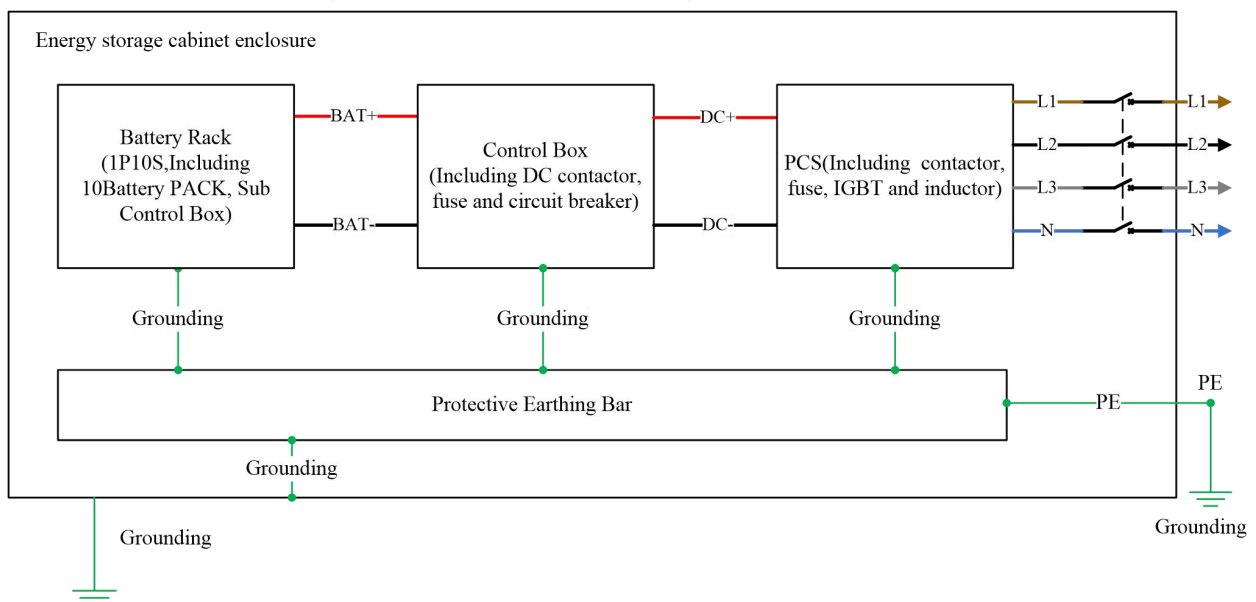


Figure 2-9 Battery cabinet ground point

A protective grounding copper bar PE for external and internal connections is installed inside the battery cabinet, as shown in the schematic diagram in Section 4.3.2. The above grounding system and the overall wiring are shown in the following insulation frame diagram.:

Figure2-9-1 Insulation Frame Diagram of Battery Cabinet



2.1.8 Emergency stop system

The implementation of the emergency stop function in this project mainly includes electrical emergency stop and software emergency stop, both of which participate simultaneously to ensure the safe completion of the emergency stop action;

Install an emergency stop switch on the front door of the battery cabinet for manual operation and pressing in case of emergency to control the emergency stop of the battery system;

BMS can detect cabinet door emergency stop and aerosol feedback signals, and control the system emergency stop through software;

EMS can detect cabinet door emergency stop, aerosol feedback signal, and BMS output emergency stop signal, and control the system emergency stop through software.

When an emergency situation occurs and manual pressing of the emergency stop button is required, the emergency stop button can be pressed. The location of the emergency stop button is shown in the following figure.

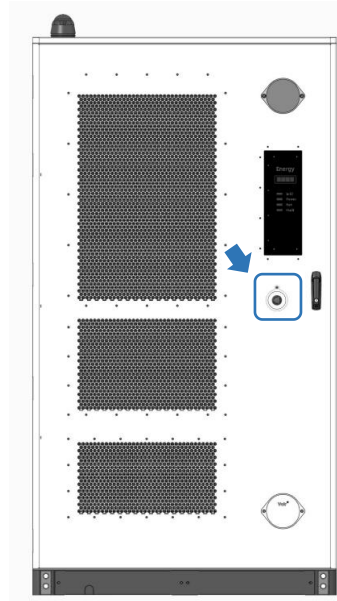


Figure 2-10 Position of the emergency stop button

2.2 Electrical schematic diagram

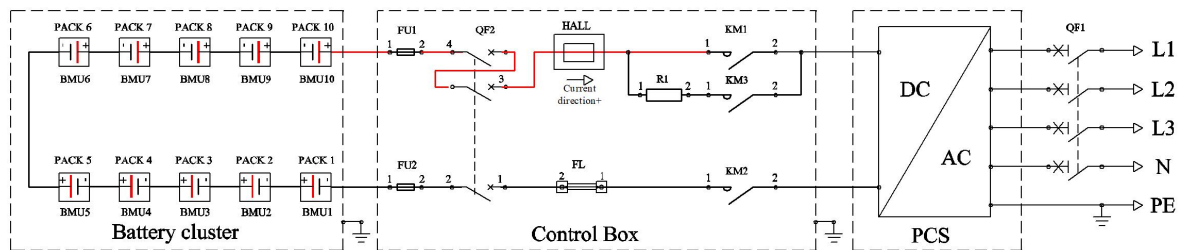
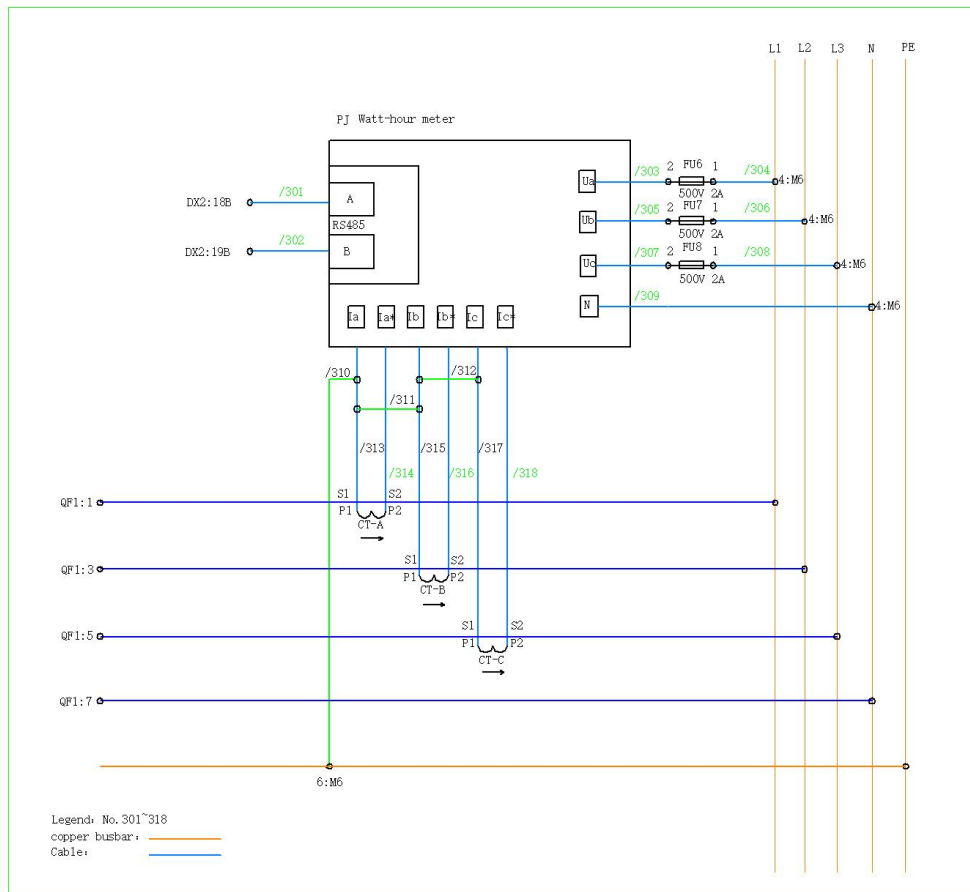
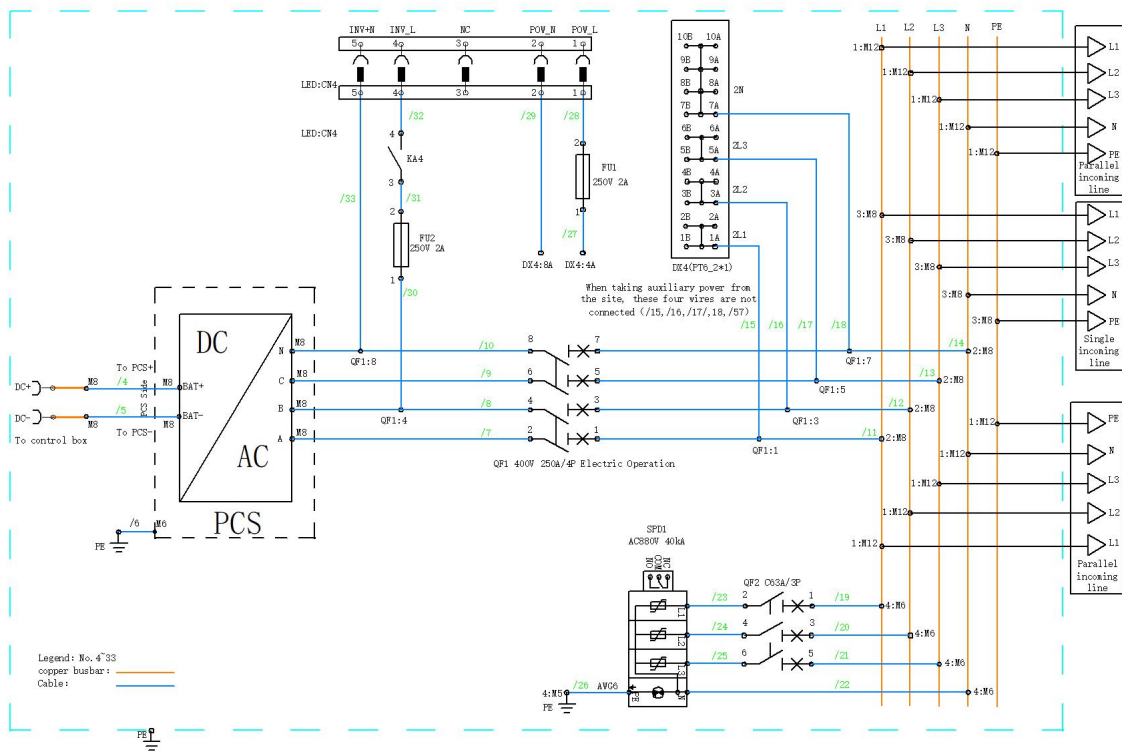
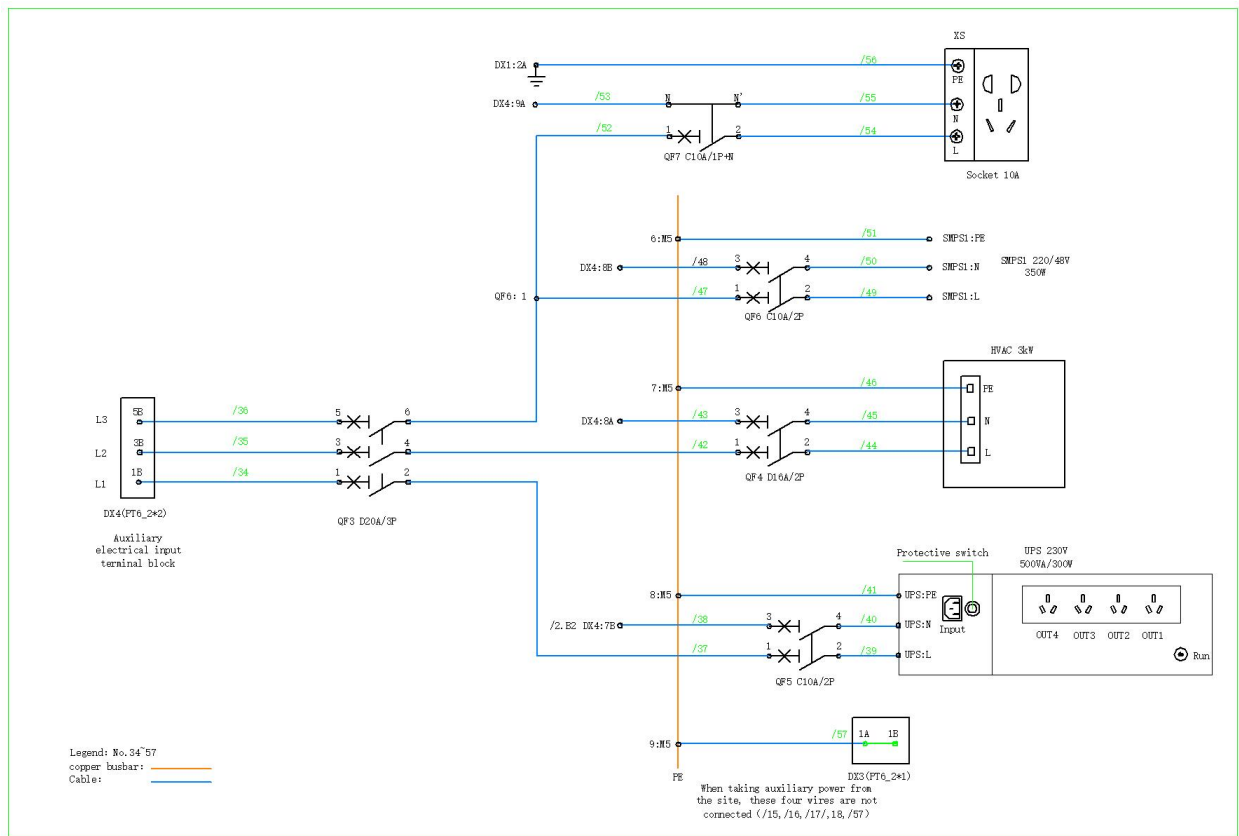


Figure 2-11 System electrical schematic diagram





2.3 Communication topology

The system communication topology is shown in the following figure.

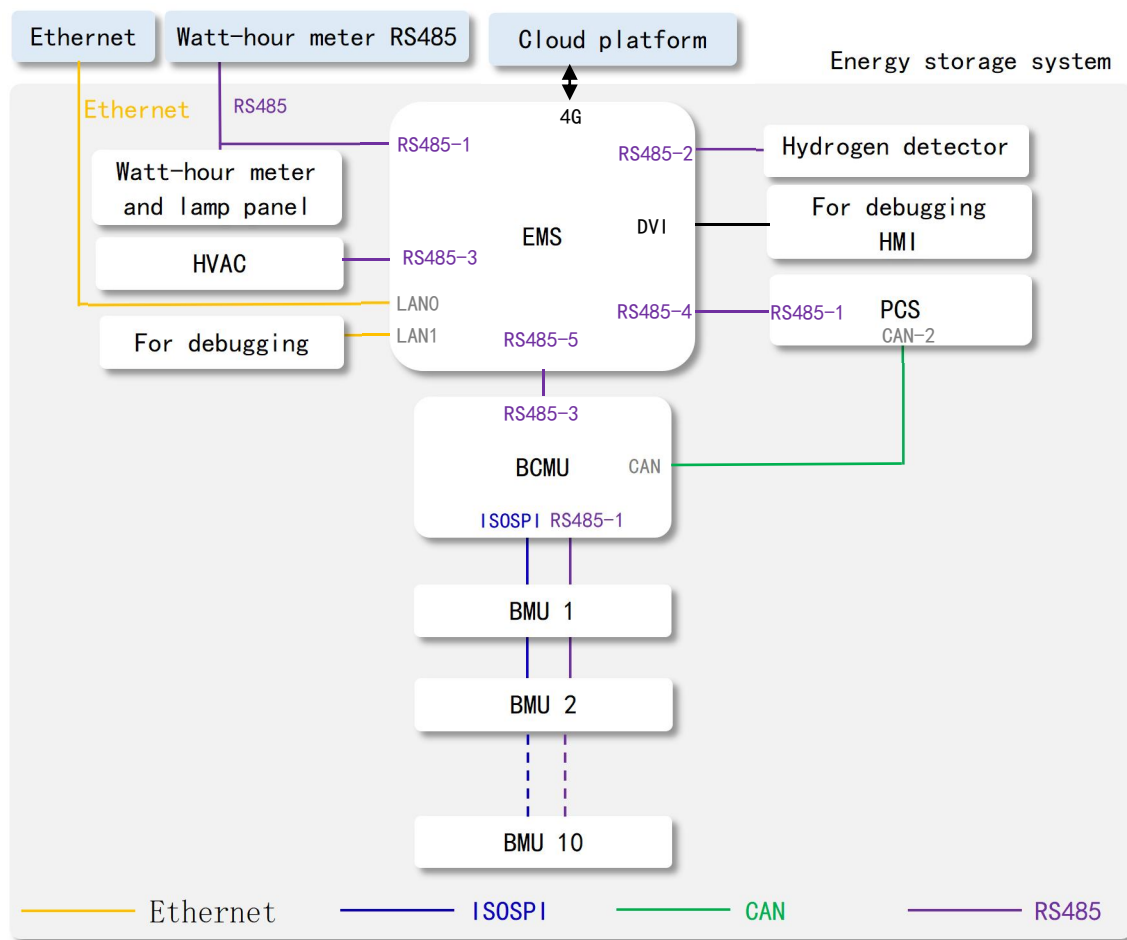


Figure 2-12 System communication topology

2.4 Product Specifications

Table 2-5 Specifications

Serial number	category	Name	Parameter	Remark
1	DC parameters	Cell type	LFP-3.2V-280Ah	
		Battery PACK string method	1P24S	Rated 76.8V , 21.504kWh
		Rated capacity of battery [kWh]	215.04	
		Nominal voltage [Vdc]	768	
		Voltage range [Vdc]	672~864	
		Charge discharge rate	≤0.5CP	
		Cooling method	Forced air cooling	
2	AC parameters (grid connected)	Rated power	100kW	
		Rated grid voltage	400VAC	
		Voltage range of power grid	320~460V	
		Rated current	144A	

		Rated grid frequency	50Hz/60Hz	
		Grid frequency range	45~55Hz/55~65Hz	
		Total current waveform distortion rate	<3% (rated power)	
		power factor	> 0.99 (rated power)	
		Adjustable range of power factor	-1 (leading)~1 (lagging)	
3	AC parameters (grid off)	Ac off-grid voltage	400VAC	
		Ac off-grid frequency	50Hz/60Hz	
		Ac voltage range	±3%	
		Off-grid output voltage distortion rate	< 3% (linear load)	
4	System parameter	Auxiliary electrical parameters	5kVA-400Vac/50Hz	~3N+PE
		Fire protection system	S-type aerosol	
		Anti corrosion grade	C3	
		Protection level	IP54	
		Working temperature range [°C]	-15 ~ +45	
		Storage temperature [°C]	-20 ~ +55	SOC@30%~50%, <6 months
		Working humidity range	0~95%RH	No immersion
		Installation method	Outdoor installation	
		working condition	Maximum of 2 charges and 2 discharges per day	
		System communication interface	Ethernet/RS485	
		External System Communication Protocol	Modbus TCP/IEC104/Modbus RTU	
		Altitude [m]	Within 3000m	Power derating at>2000
		Size [mm] (D * W * H)	1400*1200*2200	
		Weight [kg]	About 2450kg	
		Noise[dB]	≤70	25°C@1m

3 Structural fixation and installation

3.1 Installation environment requirements

3.1.1 Site selection requirements

NOTICE

The site selection must meet the requirements of GB 51048 Design Code for Electrochemical Energy Storage Power Stations, NFPA 855 Standard for the Installation of Stationary Energy Storage Systems, and local regulations.

The energy storage system is only suitable for outdoor scenarios and requires outdoor layout. It does not support indoor layout. The general requirements for site selection are as follows:

- 1) The installation location should not be in low-lying areas, and the installation level should be higher than the historical highest water level in the area.
- 2) The distance from the airport, landfill, riverbank or dam should be $\geq 2000\text{m}$.
- 3) Choose an open location and ensure that there are no obstacles within a 10m radius of the station.
- 4) Maintain a distance of at least 50m from residential areas to avoid noise pollution.
- 5) Having convenient transportation conditions and reliable fire suppression system equipment.
- 6) Meet the required site area in the near future and leave room for expansion according to the needs of the entire lifecycle.
- 7) Choose a place with good ventilation.
- 8) Energy storage systems installed in salt affected areas may corrode and potentially cause fires. Do not install energy storage systems outdoors in salt affected areas. Salt damaged areas refer to areas within 2000 meters of the coast or affected by sea winds. The area affected by sea breeze varies depending on meteorological conditions (such as typhoons, seasonal winds) or terrain (with dams, hills).



NOTE

- 1) When the safety distance of the site selection cannot meet the requirements of relevant national standards, it is recommended to reselect the site.
- 2) If there is no more suitable site selection, it is recommended to refer to DBJT 15-81-2022 "Technical Code for Fire Resistance Design of Concrete Structures in Buildings" and install firewalls with a fire resistance of not less than 3 hours for safety protection. The thickness of the firewall should be $\geq 200\text{mm}$, as shown in the following figure. At the same time, the requirements for equipment transportation, installation, maintenance and other space should be considered.
- 3) Suggestion to refer to T/CEC 373-2020: The length and height of the firewall should exceed the outline of the prefabricated cabin by 1m each; At the same time, referring to NFPA 855-2020 "Installation Standard for Fixed Energy Storage Systems": when there is a 1-hour fire-resistant independent firewall, the spacing is allowed to be reduced to 914mm.

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

- 1) Strong vibration, strong noise sources, and strong electromagnetic field interference areas.
- 2) Places that generate or have dust, oil fumes, harmful gases, corrosive gases, etc.
- 3) Places where corrosive, flammable, and explosive materials are produced or stored.
- 4) Places with existing underground facilities.
- 5) There are unfavorable geological conditions such as rubber soil and weak soil layers, which are prone to water accumulation and sinking on the ground.
- 6) Earthquake faults and seismic areas with a fortification intensity higher than nine degrees.
- 7) Areas with direct hazards such as mudslides, landslides, quicksand, and caves.

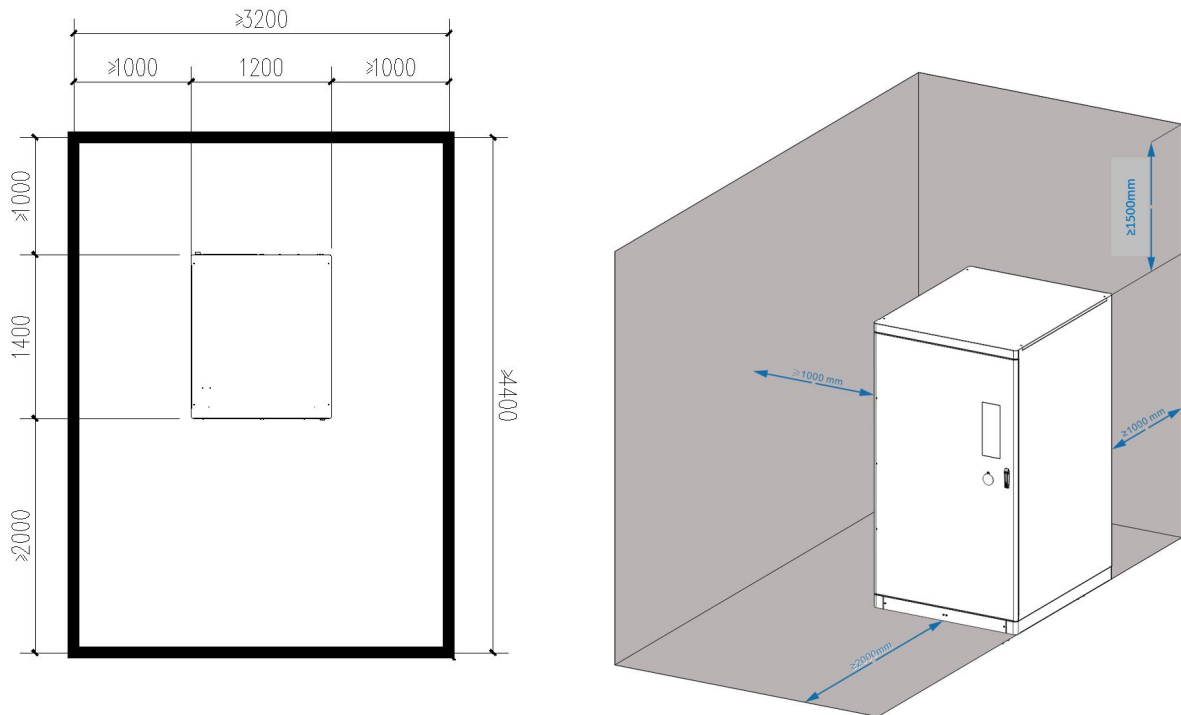
- 8) Within the boundary of the mining subsidence (displacement) zone.
- 9) Within the hazardous range of blasting.
- 10) The area that may be submerged after a dam or embankment collapses.
- 11) Important water source hygiene protection zone.
- 12) Historical relics and historic sites protection area.
- 13)Densely populated areas, high-rise buildings, and underground structures.
- 14) Comply with local building Code requirements or International Fire Code.

3.1.2 Space requirements

To ensure the normal maintenance of equipment inside the cabinet and facilitate the normal movement of transportation tools, it is recommended to reserve sufficient space around the installation position of the cabinet. The minimum size of reserved space shall not be lower than the minimum size shown in the diagram below, as shown in the figure below.

- 1) Reserve an installation spacing of $\geq 1000\text{mm}$ on the long side of the energy storage system and $\geq 2000\text{mm}$ on the air conditioning installation side.
- 2) A maintenance channel should be set up around or on one side of the cabinet, with a clear width of $\geq 1000\text{mm}$.
- 3) It is recommended to use physical walls or fences for isolation and protection in the energy storage equipment area. Firewalls can replace some or all of the walls, and the thickness of the firewall should be $\geq 200\text{mm}$. The designer can consider it comprehensively.
- 4) The above spacing design only considers installation and operation requirements, and the final spacing determination must also meet local fire safety requirements.
- 5) No items are allowed to be stacked on the top of the cabinet. Lifting or transporting by hoisting the top is prohibited during installation and transportation.

Figure 3-2 Device installation space



3.1.3 Foundation Requirement



The energy storage battery cabinet is relatively heavy as a whole, and before constructing the foundation, a detailed investigation of the installation site's various conditions (mainly referring to geological and environmental climate conditions, etc.) should be carried out. Only on this basis can the design and construction of the foundation begin.

The storage location of the battery cabinet needs to be pre prepared by a professional construction team, with sufficient space around for installation and maintenance. If the power line goes through the bottom cable well, the foundation preparation needs to be made in advance, and the overall requirements for lightning protection, waterproofing, rodent and insect prevention, and ventilation should be met. The installation foundation of the battery cabinet must first be designed and constructed according to certain standards to meet the requirements of mechanical support, cable routing, and later maintenance and repair. In addition, the foundation of the energy storage battery cabinet should be designed based on the actual terrain while meeting the relevant standards for local power facility construction. The following is a typical design diagram of a battery cabinet foundation.

At least the following requirements should be met during foundation construction:

- 1) The soil at the installation site of the tank cabinet needs to have a certain degree of compactness. It is recommended that the relative density of the soil at the installation site be $\geq 98\%$. If the soil is loose, please take measures to ensure the stability of the foundation.
- 2) The bottom of the foundation pit for building the battery cabinet must be compacted and filled to provide sufficient and effective support for the cabinet.
- 3) The foundation of the battery cabinet shall be made according to the foundation drawing provided by the supplier or confirmed by our company, with a surface tolerance requirement of $\pm 5\text{mm}$.
- 4) Raise the foundation surface of the energy storage battery cabinet to prevent rainwater from corroding the base and interior of the cabinet.
- 5) The cross-sectional area and height of the foundation should meet the requirements.
- 6) Corresponding drainage measures should be constructed based on local geological conditions.
- 7) Construct a cement foundation with sufficient cross-sectional area and height. The height of the foundation is determined by the construction party based on the site geology.
- 8) Cable wiring should be considered when constructing the foundation.
- 9) The maintenance platform is built around the foundation, providing convenience for later maintenance.
- 10) According to the position and size of the cable inlet and outlet on the energy storage cabinet, sufficient space should be reserved for the AC/DC side cable tray during foundation construction, and cable conduits should be embedded in advance.
- 11) Determine the specifications and quantity of perforation tubes based on the cable model and the number of incoming and outgoing lines.
- 12) A drainage system should be constructed to prevent the bottom or internal equipment of the energy storage cabinet from being soaked in water during rainy seasons or heavy rainfall.
- 13) Both ends of all embedded pipes are temporarily sealed to prevent impurities from entering; Otherwise, later wiring will be inconvenient.
- 14) After connecting all cables, the cable entrances, exits, and joints should be sealed with fire-resistant mud or other suitable materials to prevent rodents from entering.

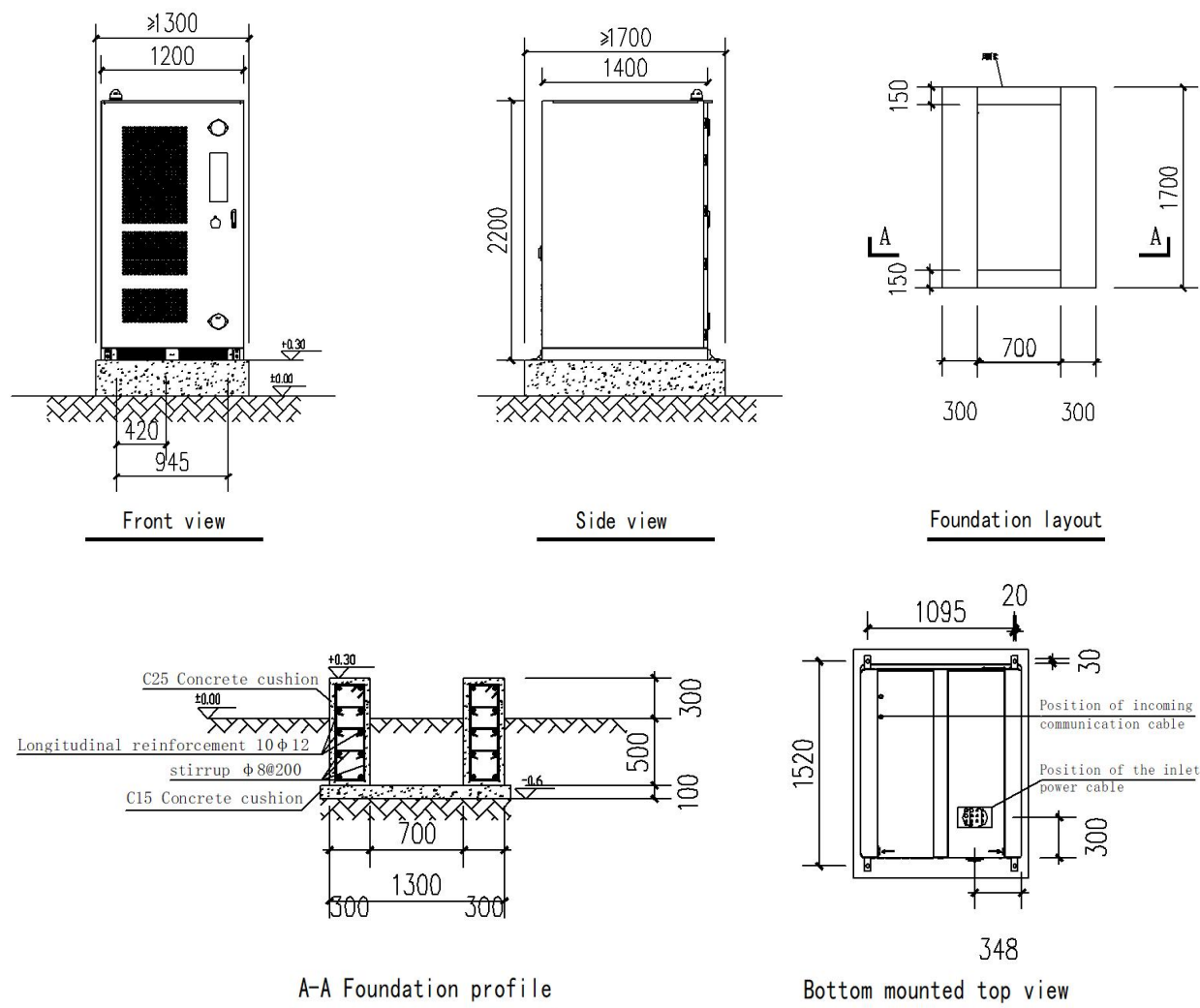


Figure 3-3 Installation base of the energy storage cabinet

3.2 Pre-installation Check

3.2.1 Tool preparation

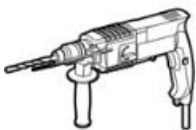
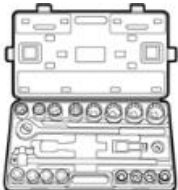
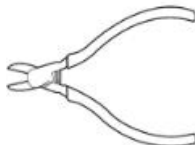
The tools that need to be prepared before equipment installation include installation tools and personal protective equipment, as shown below.

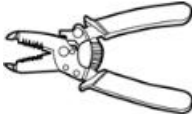
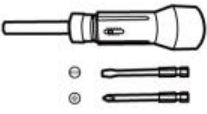
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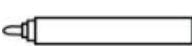
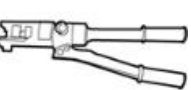
The tools used, including socket wrenches, torque wrenches, screwdrivers, and other handles, need to be insulated and protected, or insulated tools should be used.

1) Install tools

Table 3-1 Lists the common installation tools

 Percussion drill (Bit: Φ14mm、Φ16mm、			
--	---	--	---

Φ20mm)	Complete set of socket wrench	Torque wrench	Diagonal pliers
			
Wire stripper	Cross/straight screwdriver	Rubber hammer	Tool knife

			 A multimeter DC voltage range ≥ 1500V DC
Wire cutter	Crystal head crimping pliers	Vacuum cleaner	
			
Marking pen	Steel tape	Digital or bubble level ruler	Hydraulic tongs
			
Heat shrinkable sleeve	Hot-air gun	Cable tie	Insulated ladder

2) Personal Protection tool

			
Safety gloves	Protective goggles	Dust mask	Safety shoes

			
Reflective Vest	Safety helmet	Medical box	

3.2.2 Installation environment inspection

Inspect each item according to the site requirements, and implement installation only after meeting the requirements. Our company will not be held responsible for any losses caused by forced installation that does not meet the requirements.



WARNING

Mark the safety zone: Circle the safety zone with red construction markers, remove obstacles within the safety zone, and hang construction signs and safety warning signs in prominent places.

3.3 Component installation

3.3.1 Energy storage system fixation

1) Prepare installation tools

The following tools may be used when installing L-shaped anchor connection fixing blocks:

Serial number	Name	Source of components
1	Marking pen	Not included in the scope of supply
2	Impact drill	Not included in the scope of supply
3	Anchor connection fixing block	Included in the scope of supply
4	M16 × 110 expansion bolt	Included in the scope of supply
5	M10 × 40 screw	Included in the scope of supply

2) Installation steps

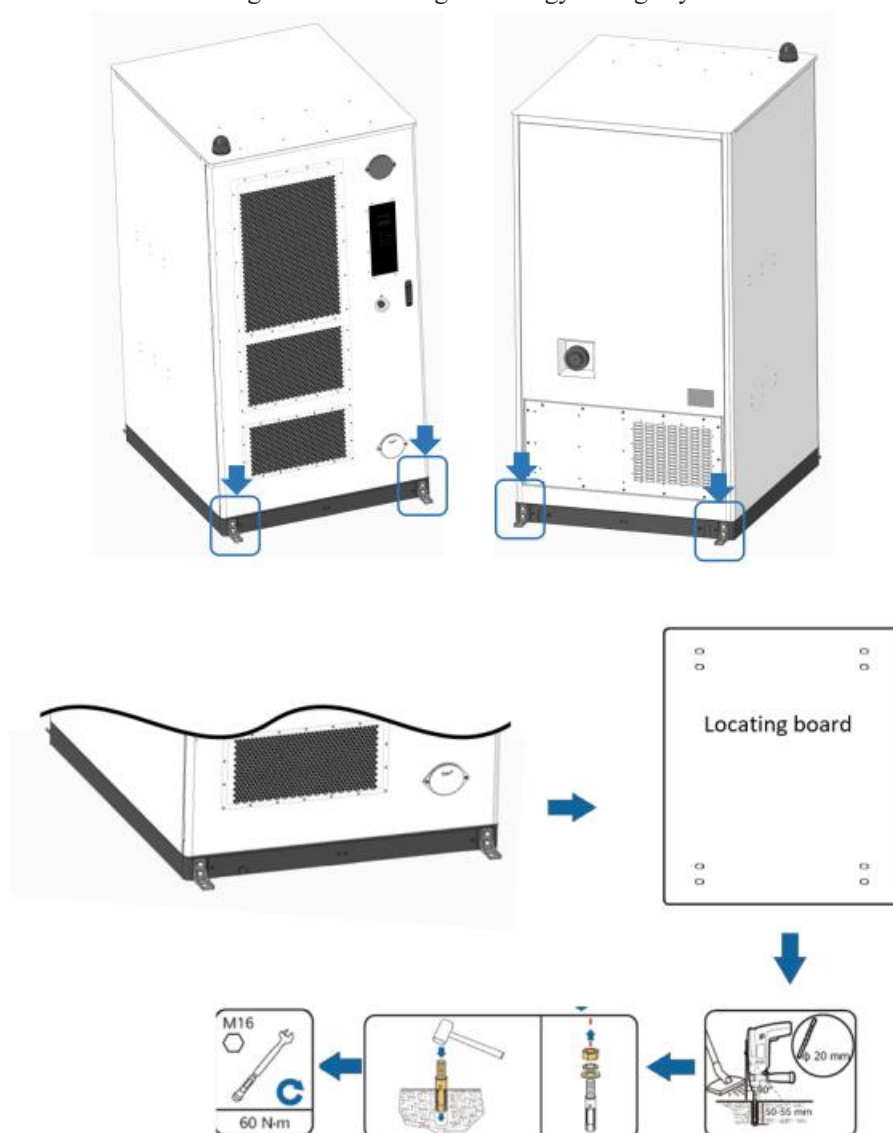
Open the accessory packaging box, retrieve the angle steel from the cardboard box, and secure the energy storage system using four foot connection blocks.



NOTE

The flatness of the concrete support platform is crucial for the installation of the energy storage system. Please install the energy storage system after the concrete support platform meets the requirements.

Figure 3-4 Securing the energy storage system



3) Follow-up procedure

After securing the energy storage system, check the installation to ensure normal use and smooth subsequent installation.

Numbe	Inspection content	Inspection method	Inspection standards
1	Are the bolts and nuts tightened	Use a wrench to verify with the specified torque	Meet the torque standard
2	Can the cabinet door be opened and closed normally	Check the opening and closing operation of the system cabinet	Can open and close smoothly

4 Electrical installation

4.1 Ground connection

4.1.1 Prerequisite



WARNING

It is strictly prohibited to install fuses, switches, and other equipment on the protective grounding wire.



CAUTION

Grounding complies with local electrical safety regulations.

- 1) The installation of the energy storage system has been completed
- 2) Grounding requirements have been clearly defined.

4.1.2 Background information

The specific requirements for protecting the grounding wire are as follows:

Cable	Type	Cable cross-sectional area range	Outside diameter	source
Protective grounding	1) Single core outdoor copper core cable	4mm ² ~6mm ²	4mm~6mm	User provided
	2) Supporting OT/DT terminals			

The specifications of the protective grounding wire are determined by this table or calculated according to IEC 60364-5-54.

4.1.3 Connecting the PGND cable



NOTICE

Connect the grounding wire to the external grounding bar of the battery cabinet. The tightening torque of grounding screw M10 is 22 N.m ± 10%. The grounding wire is yellow-green in color, with a cross-sectional area larger than 4mm², and maintenance operations must be performed by professional personnel.

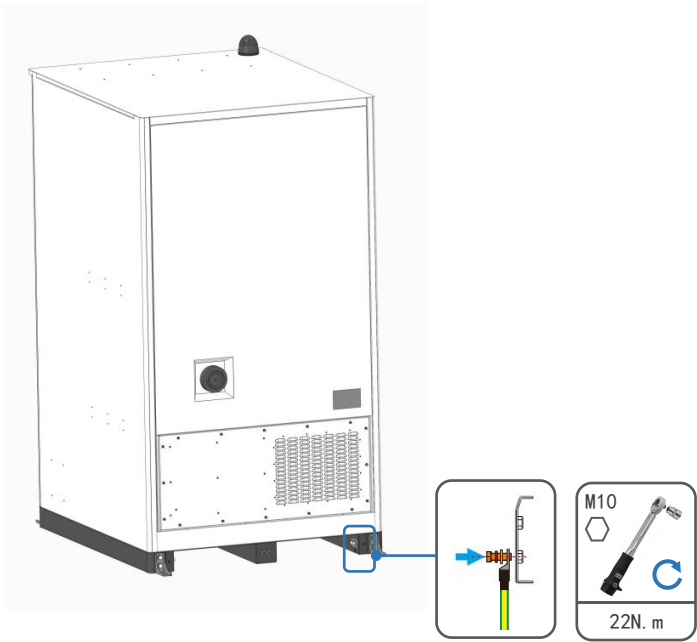


Figure 4-1 Connecting a PGND cable or plate to the cabinet

Ener Hexon[®] Smart215Air Cooled Energy Storage System

4.2 Communication line connection

4.2.1 Background information

The recommended communication cables are as follows:

Recommended cables	Type	Range of cross-sectional area of conductor	Source
RS485 communication cable	Outdoor shielded dual core cable	0.2mm ² ~1.5mm ²	User provided
Network cable	Cat 5e or higher specifications	/	

4.2.2 Connect RS485 communication line

Connect the RS485 communication line of the energy meter to the EMS inside the cabinet.

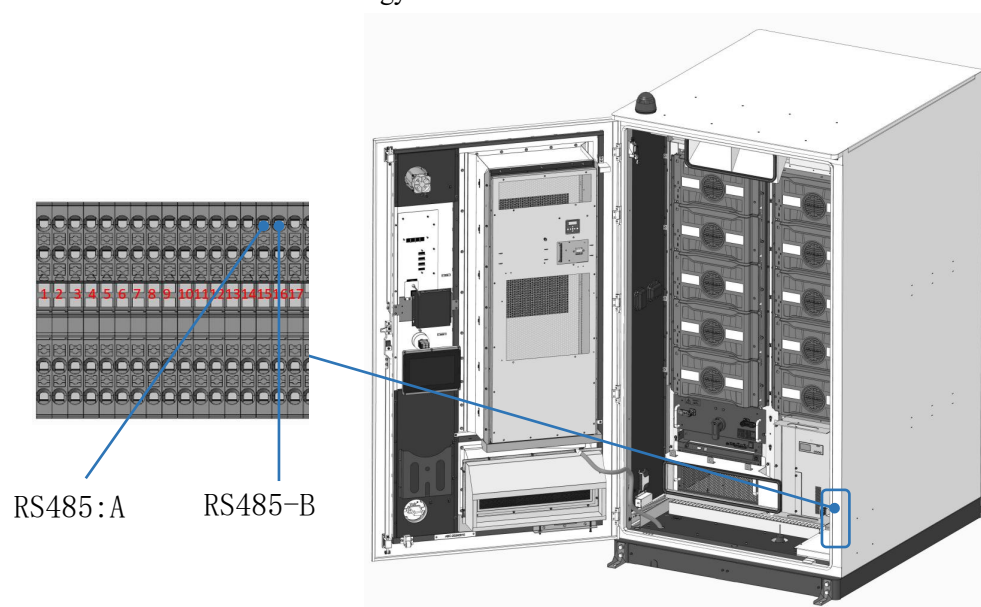


Figure 4-2 EMS diagram

Equipment	Sign	Statement
EMS	DX2:15A	Energy MeterRS485A1
EMS	DX2:16A	Energy MeterRS485B1

4.2.3 Connect Ethernet cable

Connect the Ethernet communication cable to the switch inside the cabinet.

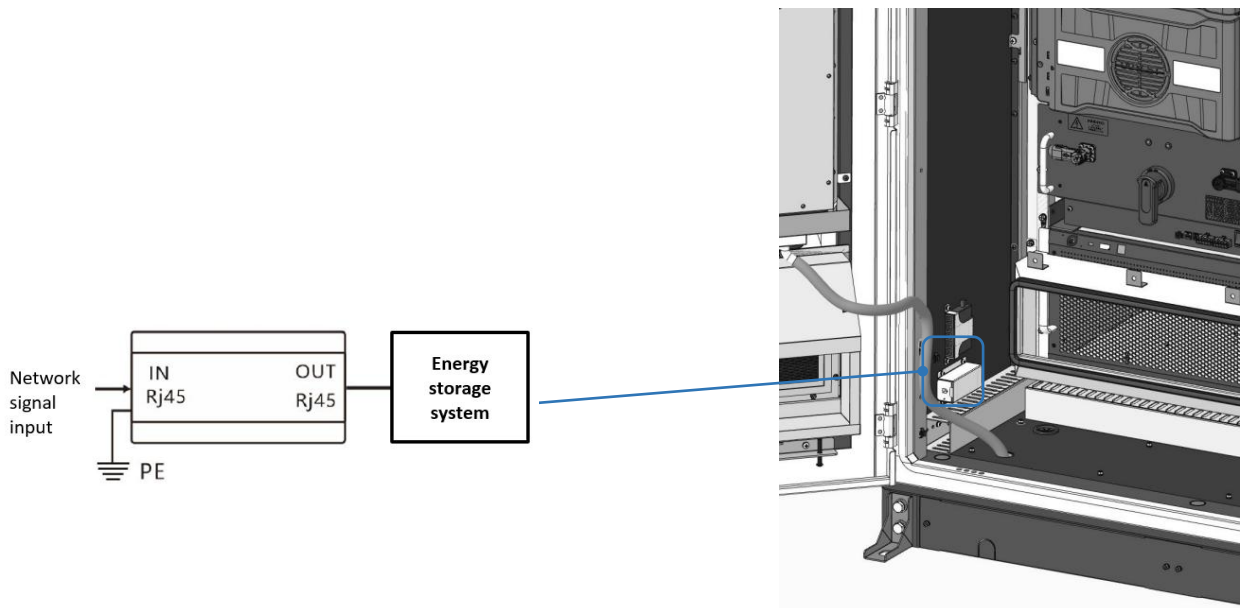


Figure 4-3 Communication surge arrester diagram

port	characteristic	explain
LAN	IN/RJ45	Subscriber-external Ethernet communication

4.3 AC grid-connected wire wiring

4.3.1 background information

The AC grid-connected cables are recommended as follows:

Recommended single machine wiring:

Recommended cable	type	Range of the conductor cross-sectional area	external diameter	origin
protective earth wire	Single-core outdoor copper-core cable and M 8 OT / DT terminals	$S_p \geq S/2$	/	User self-provided
AC line (multi-core)	Four-core (L1, L2, L3, N) outdoor cable and M 12 OT / DT terminal	$\geq 4 \times 70 \text{mm}^2$	30mm~50mm	User self-provided
AC line (single-core)	Non-magnetic, single-core outdoor cable and M 12 OT / DT terminals	$\geq 4 \times 70 \text{mm}^2$	30mm~50mm	User self-provided

3 parallel machines, and the length of parallel cable is less than 50 meters, wiring recommended:

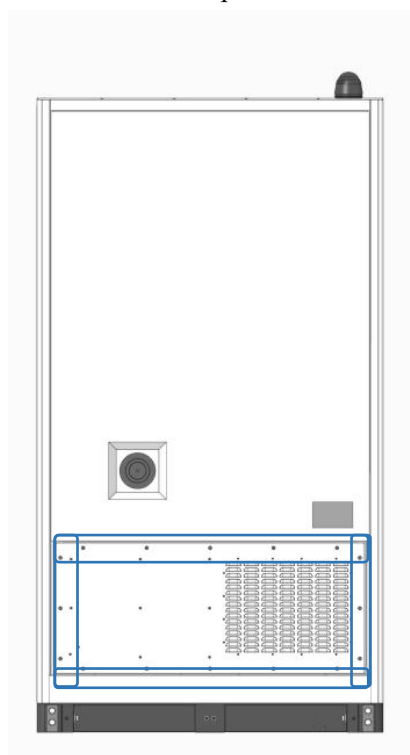
Recommended cable	type	Range of the conductor cross-sectional area	external diameter	origin
protective earth wire	Single-core outdoor copper-core cable and M 8 OT / DT terminals	$S_p \geq S/2$	/	User self-provided
AC line (multi-core)	Four-core (L1, L2, L3, N) outdoor cable and M12 OT / DT terminal	$\geq 4 \times 240 \text{mm}^2$	50mm~90mm	User self-provided
AC line (single-core)	Non-magnetic, single-core outdoor cable and M12 OT / DT terminals	$\geq 4 \times 240 \text{mm}^2$	50mm~90mm	User self-provided

Protection ground specifications are determined by this table or calculated according to IEC 60364-5-54.

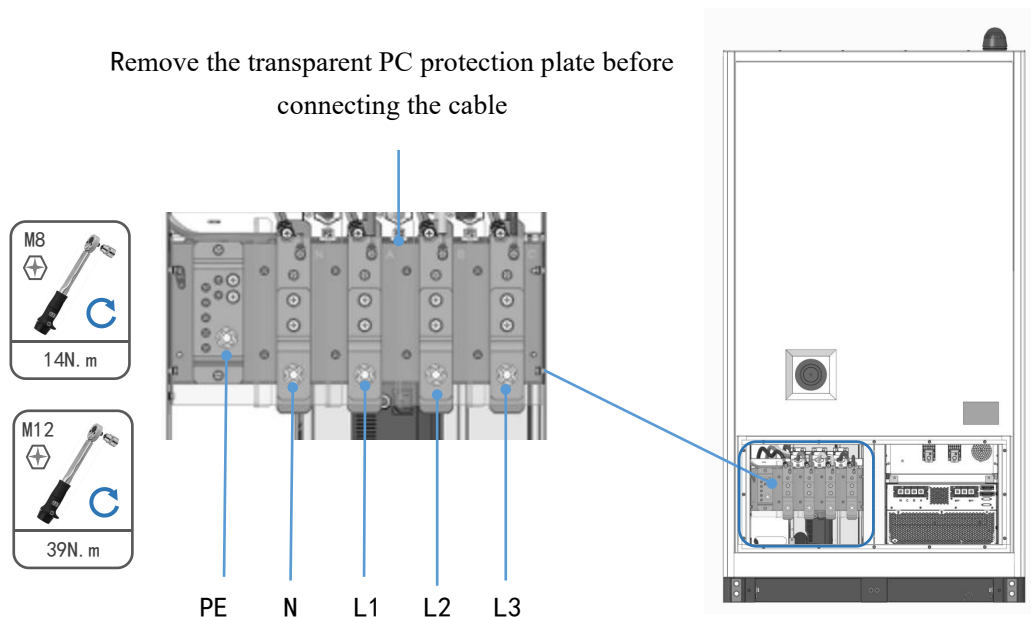
4.3.2 Connect the AC grid-connected cable

- 1) Remove the removable plate on the back of the cabinet.

Figure 4-4 Remove the removable plate on the back of the cabinet.



2) Connect AC lines.



3) Install and remove the cover plate.



When connecting the AC cables, ensure that all cables can not be damaged or broken. Ensure that the N-cable connection is reliable, otherwise, the damage to the AC equipment in the system will be caused.

After the AC line is connected, ensure that the OT terminal and the copper row, and the AC input line is vertically downward.

The bolts shall be pre-installed at the recommended torque value M 8 @ 14 Nm and M 12 @ 39 Nm.

Verify that the torque value set by the torque wrench is M814N m. M 12 @ 39 Nm shall check the torque value of the installed bolts.

The nut checked by the torque value is underlined with a marker.

5 System on and off electricity

5.1 System on electricity



WARNING

- 1) The energy storage system can only be put into operation after being confirmed by professionals.
- 2) For the energy storage system with a long shutdown time, the equipment must be comprehensively and carefully checked before being powered on to ensure that all the indicators meet the requirements before it can be powered on.

5.1.1 Check before charging

- 1) Before calling on, please check the following items carefully to be correct:
- 2) Check that the wiring is correct.
- 3) The shield inside the equipment is firmly installed.
- 4) The emergency stop button is being released.
- 5) Check to ensure that there is no ground fault.
- 6) Use a multimeter to test whether the AC and DC side voltage meets the starting conditions, and there is no overvoltage danger.
- 7) Check to ensure that no tools or parts are left inside the equipment.

5.1.2 Up and down power operation during grid connection



WARNING

If the circuit breaker is disconnected during the power process, stop closing other circuit breakers and check the disconnected circuit immediately.

Power up the energy storage system:

Step 1 Battery cabinet for auxiliary power supply:

Check and confirm that the AC lightning protection device is normal, the indicator is green and normal, the red is damaged, close the AC lightning protection switch QF 2, and hit to the ON position.

Manually close the auxiliary power supply switch QF 3 to the ON position.

Close the UPS city power supply switch QF 5 and hit the ON position. Press the UPS on / off button on the front will sound a short beep, and the green Power On (power on) indicator light is on, indicating that UPS has started power supply, 24V switch power supply and lighting power supply.

24V ship power supply switch SB with closed control control box (control box), panel 24V indicator light is on, indicating BMS power supply.

Close the 48V switch power supply switch QF 6 and hit to the ON position.

If the socket power supply is required, manually close the socket power supply switch QF 7 and hit it to the ON position.

Manually close the air conditioner power supply switch QF 4, hit to the ON position, and turn on the air conditioner.

Complete the auxiliary power supply.

Step 2 Turn the DC breaker handle of the control box (control box) to ON and close the DC breaker.

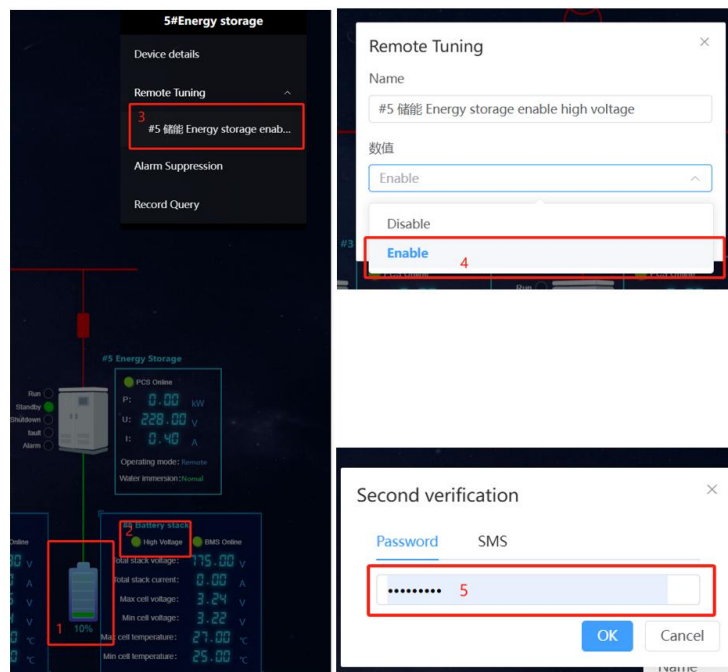
Step 3 Take out the sheet metal switch key near the AC circuit breaker QF 1, and insert in the closing or switch operating hole, operate 180 clockwise, prohibit counterclockwise operation, you will hear a clear click, indicating the window shows red, indicating the switch closing, PCS AC side power supply, panel light board power supply;

Step 4 Log in the EMS operation interface through the small program, double click the energy storage icon through the EMS control screen, pop remote adjustment in the upper right corner, click the remote adjustment, control the high pressure enabling on the BMS, wait for about 5s, observe the high pressure

enabling state light on the BMS is green, indicating that the operation is successful.

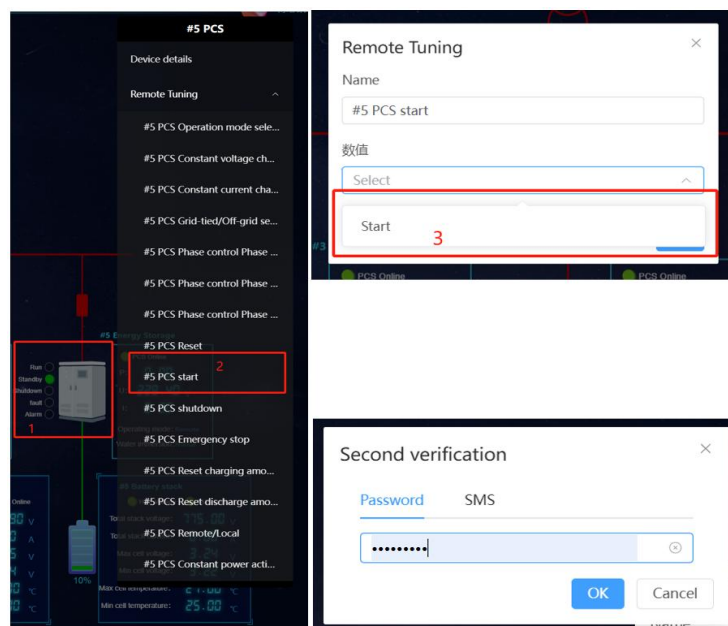
Note: The UPS writes the protection switch of the input. If it cannot be started normally, check whether the protection switch of the UPS is closed.

For more UPS information, check the UPS Installation and Operation Manual.

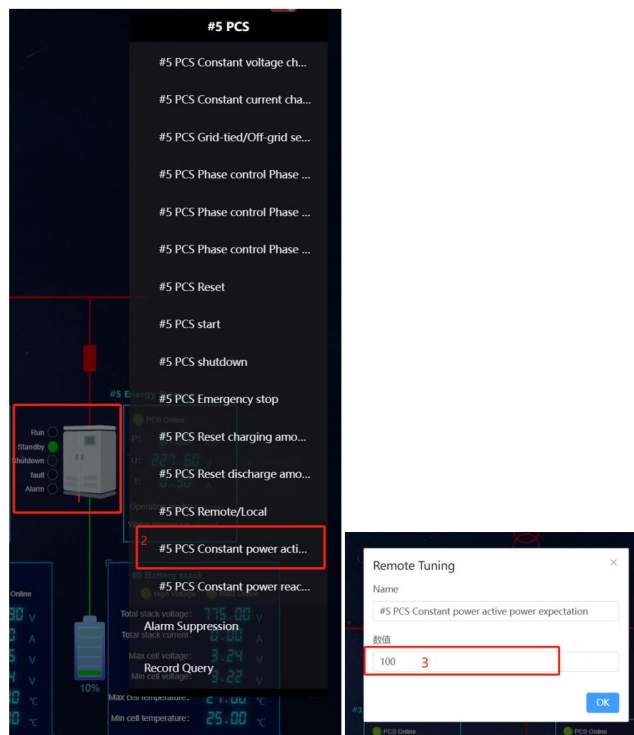


(The password is your account login password)

Step 5 Through the EMS small program operation control system to start, the EMS control screen double-click the PCS icon, pop up the remote control in the upper right corner, click the remote control, the operation control PCS start.(Account number and password are the same as above).



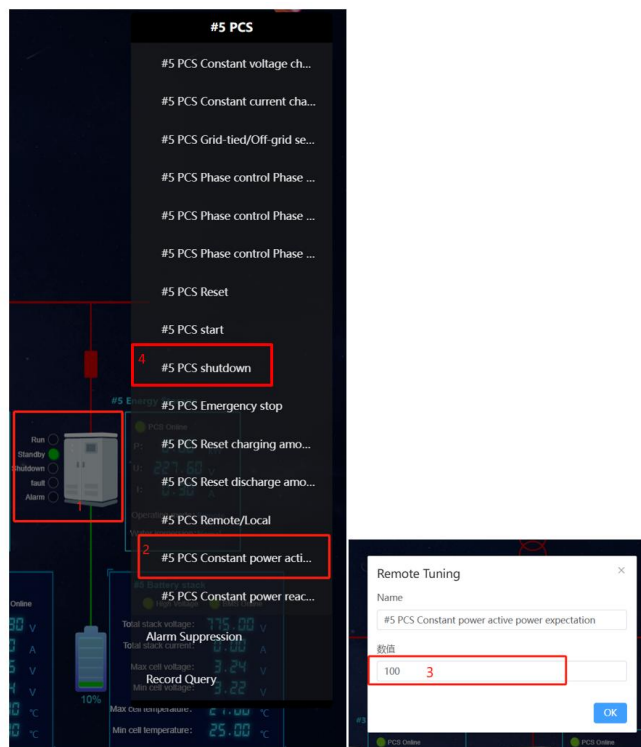
The energy storage system is powered on. After waiting for 1 minute, double-click the PCS icon, and the power value of the PCS can be distributed to the energy storage system (greater than 0 means charging, less than 0 means discharge, and equal to 0 means standby)



5.2 Normal electricity

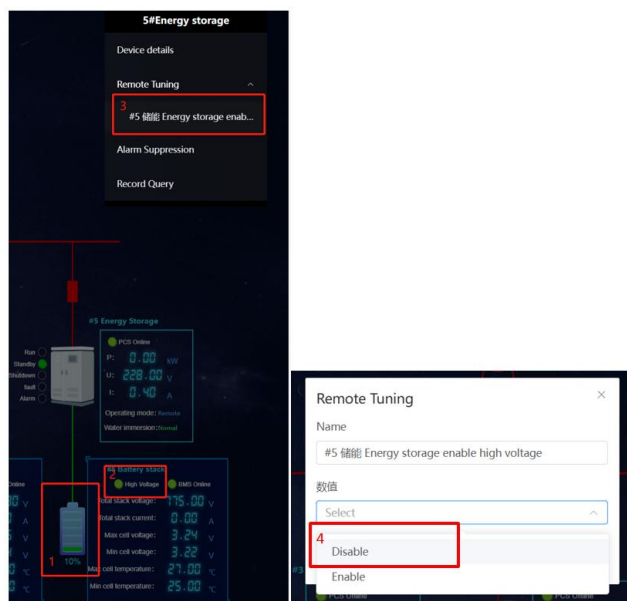
Power down the energy storage system:

Step 1 Through the EMS applet, double click the PCS icon, operation control PCS power to 0, continue to operate PCS shutdown.



Step 2 Double-click the energy storage icon through the EMS control interface, pop up the remote adjustment in the upper right corner, click the remote adjustment, control the high pressure enabling under the BMS, wait for about 5s, observe the high pressure enabling state light on the BMS dimming,

indicating that the operation is successful.



Step 3 Take out the sheet metal switch key near the AC circuit breaker QF 1, and insert it into the closing or switch operating hole, operate 180° clockwise, prohibit counterclockwise operation, you will hear the crisp click, the window shows green, indicating the switch switch; display white, indicating stripping, PCS AC side power off, power off panel light board;

Step 4 Turn the control box DC circuit breaker handle to OFF and switch the DC circuit breaker.

Step 5 Battery cabinet auxiliary power down:

Shutdown the air conditioning and disconnect the air conditioning power supply switch QF 4 to the OFF position.

Disconnect the socket power supply switch QF 7 and call it to the OFF position.

Disconnect the 48V switch power supply switch QF 6 to the OFF position.

Disconnect the 24V ship power supply switch SB of the separate control box (control box), panel 24V indicator light off, indicating the BMS power off.

Disconnect UPS city power supply switch QF 5, call to OFF position, keep pressing the power button for at least 2 seconds, release the button after hearing a short beep, and UPS will shut down. 24V switch power power off, and lights power off.

Disconnect the auxiliary power supply switch QF 3 and switch to the OFF position.

Check and confirm that the AC lightning protection device is normal, the indicator is green, red is damaged, disconnect the AC lightning protection switch QF 2 and hit to the OFF position.

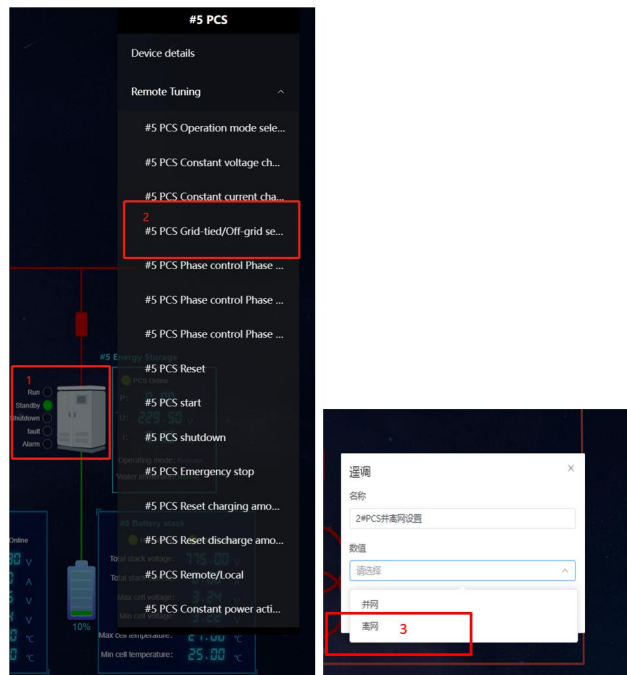
Complete the auxiliary power supply.

The energy storage system is completed. After the energy storage system is powered off completely, the discharge time of the capacitor inside the PCS is 0.54 seconds, so as to avoid the risk of electric shock caused by residual voltage.

5.3 On and off power operation from grid connection to off grid

5.3.1 Power-switching operation

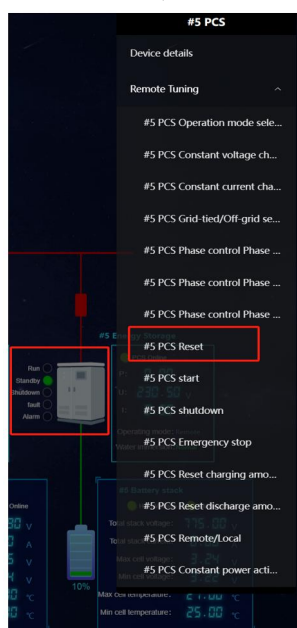
Step 1 When the system mains suddenly cuts off when the grid is connected to the grid, first cut off the external mains of the energy storage cabinet, and then switch to the off-grid mode;



Step 2 display off-grid mode 3-5 seconds after the switch;

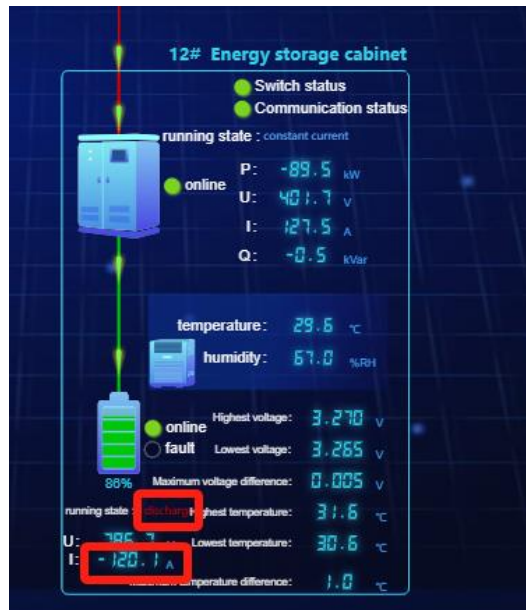


Step 3 Double click the PCS icon, click PCS reset, 3-5 seconds later, pcs from red light to green light means that the reset is successful;



Step 5 Observe the current of the BMS and showing the discharge state indicates the grid-connected switching

and off-grid operation.

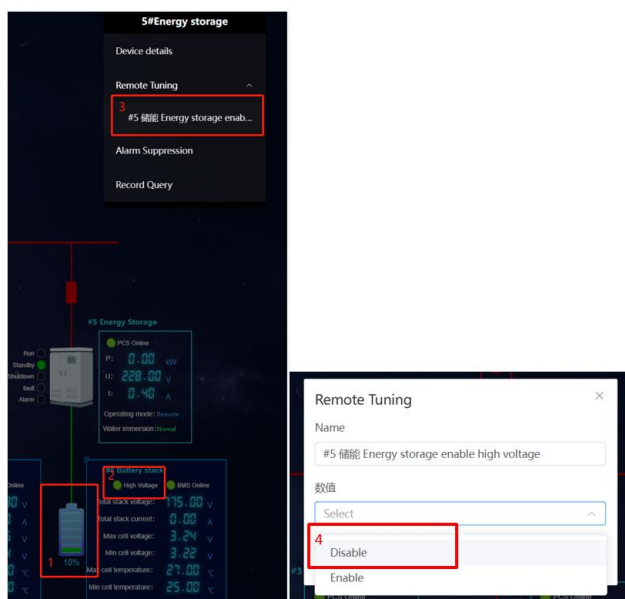


5.3.2 Off-grid and current electric operation

Step 1 Operation PCS power-off, and the PCS shutdown state light is on after 3-5 seconds.



Step 2 Double-click the energy storage icon through the EMS control screen, pop up remote adjustment in the upper right corner, click remote adjustment, control the high voltage enabling under BMS, wait for about 5s, observe the high voltage enabling light on the BMS, indicating that the operation is successful.



Step 3 Take out the sheet metal switch key near the AC circuit breaker QF 1, and insert it into the closing or switch operating hole, operate 180° clockwise, prohibit counterclockwise operation, you will hear the crisp click, the window shows green, indicating the switch switch; display white, indicating stripping, PCS AC side power off, power off panel light board;

Step 4 Turn the control box DC circuit breaker handle to OFF and switch the DC circuit breaker.

Step 5 Battery cabinet auxiliary power down:

Shutdown the air conditioning and disconnect the air conditioning power supply switch QF 4 to the OFF position.

Disconnect the socket power supply switch QF 7 and call it to the OFF position.

Disconnect the 48V switch power supply switch QF 6 to the OFF position.

Disconnect the 24V ship power supply switch SB of the separate control box (control box), panel 24V indicator light off, indicating the BMS power off.

Disconnect UPS city power supply switch QF 5, call to OFF position, keep pressing the power button for at least 2 seconds, release the button after hearing a short beep, and UPS will shut down. 24V switch power off, and lights power off.

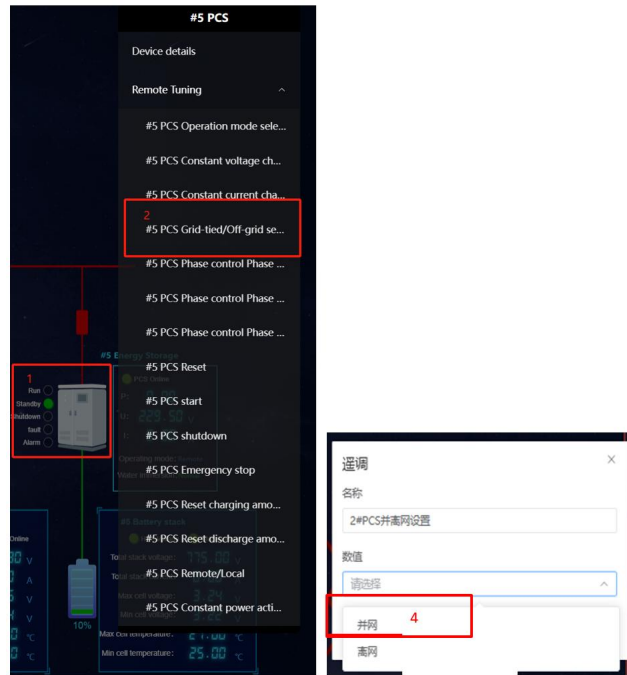
Disconnect the auxiliary power supply switch QF 3 and switch to the OFF position.

Check and confirm that the AC lightning protection device is normal, the indicator is green, red is damaged, disconnect the AC lightning protection switch QF 2 and hit to the OFF position.

Complete the auxiliary power supply. The energy storage system is completed. After the energy storage system is powered off completely, the discharge time of the capacitor inside the PCS is 0.54 seconds, so as to avoid the risk of electric shock caused by residual voltage.

5.3.3 Power-on operation of off-grid transfer

When the system is off the grid, the system needs to be switched to the grid connected mode, the energy storage cabinet must be switched to the grid connected mode, and then the external market of the energy storage cabinet; Step 1 Double-click the PCS icon on the EMS display interface, click and off-grid setting, select grid-connected, switch to off-grid state, observe for 3-5 seconds, show the PCS grid-connected state light is on, indicating the successful switch to grid connection.



Step 2 After confirming that the off-grid mode is grid-connected mode, close the mains outside the energy storage cabinet to connect the mains.

Note: During off-grid operation, if the customer directly operates improper grid connection will cause equipment damage, our company is not responsible. The off-grid operation part of this section is only applicable to the equipment equipped with off-grid module.

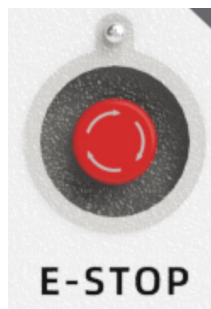
5.3.4 Current current current operation

Refer to section 5.2.

5.4 Abnormal system power supply

5.4.1 Power down under emergency shutdown

When the energy storage cabinet is in debugging or off-grid mode, and an emergency occurs, such as smoke, fire, burning odor and spark, remove the red emergency stop button (E-STOP) protective cover of the energy storage cabinet panel, and take the emergency stop button immediately.



When the danger is eliminated by the professional, and the safety of the equipment and the surrounding environment is confirmed, the emergency stop button (E-STOP) of the energy storage cabinet is rotated clockwise to remove the emergency stop signal.



-
- 1) The emergency stop button of the energy storage cabinet is only allowed to be used in emergency situations. If the customer uses it in non-emergency situations, the direct emergency stop of improper operation will cause equipment damage, and our company is not responsible.
 - 2) The troubleshooting of the energy storage cabinet should be carried out by qualified professionals. Before the danger is eliminated, power transmission is prohibited, closing and opening of the energy storage cabinet is prohibited.
-

5.4.2 Electricity under fire accident

Please contact the local fire protection agency professionals in time.

5.4.3 Urgent power stop caused by failure

Please contact our postsales staff in time.

6 routine maintenance

6.1 Notice before maintenance



- 3) Do not open the door of the battery cabinet in rainy, wet or windy weather. If it is not avoided, Yongtai number will not bear any responsibility for the loss caused.
- 4) Avoid opening the cabinet door when the humidity is high in rain, snow or heavy fog. When the cabinet door closes, the seal around the cabinet door should not be curled.
- 5) In order to reduce the risk of electric shock, do not perform any maintenance or overhaul operations beyond this manual. If necessary, contact yongtai number of customer service personnel for maintenance and overhaul.

6.2 List and cycle of cabinet maintenance items

The following is the recommended maintenance cycle, and the actual maintenance cycle should be adjusted according to the specific installation environment of the product.

Factors such as station size, installation location and site environment will affect the maintenance cycle of the product. If the operating environment is windy or thick, it is necessary to shorten the maintenance cycle and increase the maintenance frequency.



- 1) During maintenance or shutdown, the following conditions continue for more than 120 hours, the capacity loss is not within the warranty:
- 2) The battery discharge voltage is 2.5V below the minimum battery voltage.
- 3) The cell cluster SOC is 0%.

6.2.1 Maintenance work (once every two years)

order number	project list	inspection method
1	System status and cleaning	1) Check the following items, if not met, please correct immediately: 2) Check whether the battery cabinet and the internal equipment are damaged or deformed. 3) Check whether there is any abnormal noise in the internal equipment during the operation process. 4) Check whether the temperature in the battery cabinet is too high. 5) Check whether the humidity and gray scale inside the battery cabinet are within the normal range. Clean it up, if necessary. Check whether the air inlet and outlet of the battery cabinet are blocked. If the blockage affects the operation of the equipment, use a vacuum cleaner to clean or rinse with water.
2	Warning logo	Check whether the warning signs and labels are clearly visible and not defiled. Replace it, if necessary.
3	Cable shielding layer is grounded	Check whether the cable shielding layer and the insulation casing contact well; whether the grounding copper row is fixed in place.
4	Lightning protection equipment and fuse	Check whether the lightning protection equipment and fuse are well fastened.
5	Corrosion	Check whether there is oxidation or corrosion inside the outdoor cabinet.

6.2.2 Maintenance work (once a year)

order number	project list	inspection method
1	Outside the cabinet	1) Check the following items, if not met, please correct immediately: 2) Check for flammable objects at the top of the battery cabinet. 3) Check whether the welding point of the battery cabinet and the foundation steel plate is firm and whether there is corrosion. 4) Check whether the battery cabinet shell is damaged, paint drop, oxidation, etc. 5) Check whether the cabinet door lock can be opened flexibly. 6) Check whether the seal strips are well fixed.
2	Inside the cabinet	Check for foreign matter, dust, dirt and condensate water inside the energy storage system cabinet.
3	Into, outlet	Check the air conditioning temperature and dust. If necessary, clean the air conditioner with a vacuum cleaner.
4	Wiring and cable arrangement	1) After the internal equipment of the energy storage cabinet is completely cut off, check the work again! During the inspection, if any non-conformance is found, please correct it immediately:
5	Ground equipotential connections and	1) Check whether the grounding connection is correct, and the grounding resistance value should not be greater than 4 Ω.
6	electric fan	1) Check whether the equipotential connection inside the energy storage system cabinet is correct.
7	nut bolt	View the running status of the fan.

6.2.3 Maintenance work (every six months to a year)

order number	project list	inspection method
1	safety function	1) Check the stop function of the emergency stop push button. 2) Simulation shutdown. 3) Check the warning signs and other signs. If any fuzzy or damaged, please replace them in time.
2	Internal component inspection	1) Check the cleaning of the circuit board and the components. 2) Check the air conditioning temperature and water pipe dust. If necessary, clean once every six months. You can use a vacuum cleaner to clean the air conditioning module, and the water pipe can be removed and washed. 3) The air filter is cleaned every six months and can be directly removed and cleaned. If the filter is damaged, it should be replaced. pay attention to! The ventilation of the air conditioning air intake must be checked. Otherwise, if the air conditioner cannot be effectively cooled, it will fail due to overheating.
3	Device	1) Routine inspection of the corrosion of all metal elements (every six

maintenance

months).

- 2) Annual inspection of the contactor (auxiliary switch and micro-switch) to ensure that its machinery runs well.
- 3) Check the operating parameters (especially the voltage and insulation parameters).

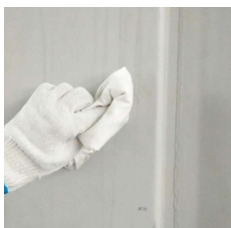
6.3 Maintenance cabinet

6.3.1 External surface of the cleaning cabinet

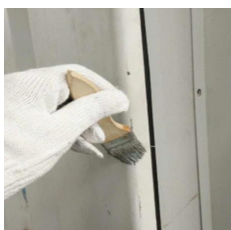
It is recommended to clean the top before cleaning the sides. It can be cleaned directly or washed with water while washing:

Situation 1: the dirty surface dirt caused by water stains and dirt can be cleaned clean

Maintenance materials: cloth, water, alcohol or other non-corrosive cleaners

graphic	step
	1) Use a rag (or other scrubbing tools) to scrub the dirty surface. 2) If water cannot be cleaned, scrub with 97% alcohol until surface cleanliness is acceptable.(Try a non-corrosive cleaner available locally)

Situation two: the surface dirt & top paint is damaged, the surface traces can not be cleaned.

graphic	step
	1) Use sandpaper to gauntcoat or scratch the surface to smooth the surface
	2) Use a rag stained with water or 97% alcohol to scrub the damaged area and remove surface stains.
	3) After the surface is dry, paint the paint as uniform as possible.

Maintenance materials: sandpaper, cloth, water, alcohol, hair brush, paint.

Situation 3: the primer shows the substrate.

Maintenance materials: sandpaper, cloth, water, alcohol, zinc-rich primer, hair brush, paint.

graphic	step
---------	------



- 1) Use sandpaper to polish the damaged paint to remove rust and other burrs to smooth the surface.



- 2) Use a rag stained with water or 97% alcohol to scrub the damaged area and remove surface stains and dust.



- 3) After dry surface, spray zinc rich primer against the exposed substrate. The spraying shall be completely covered with the bare substrate.



- 4) After the primer is dry, use the soft brush to paint the damaged parts, and the paint should be uniform.



NOTE

- 1) It is necessary to check whether the protective paint sprayed on the energy storage cabinet shell falls off and falls. If found, please repair it in time.
- 2) Special protective paint should be repainted on the whole outside of the energy storage cabinet every 5 years.

6.3.2 Check the door locks and hinges

After the cleaning work, check whether the door locks and hinges of the energy storage cabinet can be used normally and whether they are in good condition.

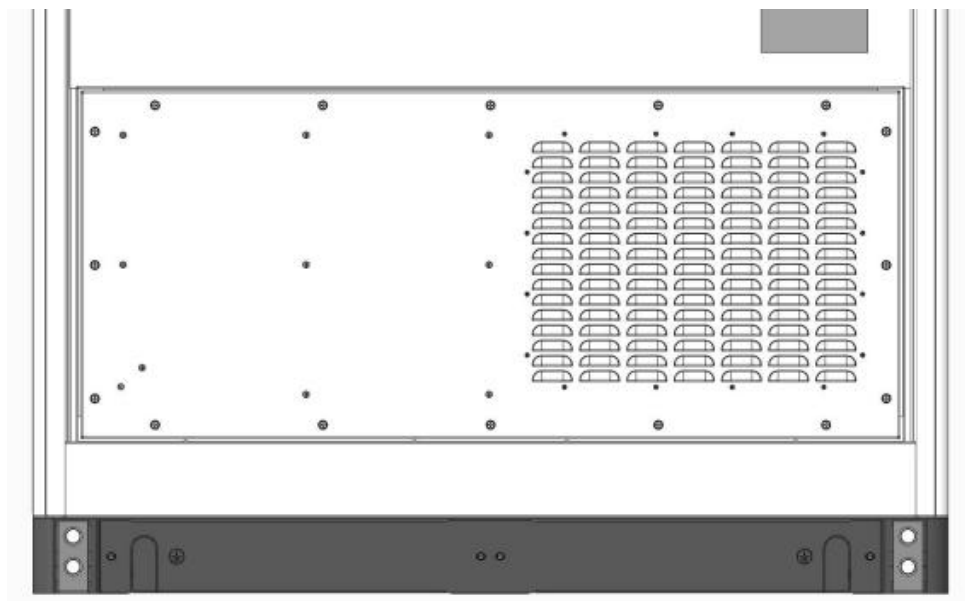
If necessary, the lock holes and hinges should be properly lubricated

6.3.3; Check the sealing strip

The sealing strip in good condition is an important guarantee to effectively prevent water seepage inside the battery cabinet. It should be carefully checked. If there is any damage, please replace it immediately.

6.3.4 Anti-rust treatment.

After the equipment is installed, check whether the surface of the cabinet is scratched or has paint chipped off. When installing the screws for the rear fixed sealing plate, be careful to prevent the paint from being damaged by the fixation. Check if the screws or the cabinet surface are damaged; if so, paint must be applied for rust prevention treatment.



7 Alarm / fault reference

7.1 EMS Alarm / fault

The following is the EMS alarm / fault list.

Table 7-1 EMS alarm / fault list

order number	order number	order number	order number
1	The BMS communication is missing	1. The BMS is not powered on. 2. The communication wiring harness is loose.	1. Check whether the BMS has normal power supply; 2. Check whether the cable harness is loose and whether the wire harness is damaged;
2	PCS communication lost missing	1. The PCS is not powered on. 2. The communication wiring harness is loose.	1. Check whether the PCS has normal power supply; 2. Check whether the cable harness is loose and whether the wire harness is damaged;
3	lost contact with electricity meter communication	1. The meter is not charged. 2. The communication wiring harness is loose.	1. Check whether the electricity meter is in normal power supply; 2. Check whether the cable harness is loose and whether the wire harness is damaged;
4	Aerosol signal alarm	1. Smoke or partial overheating in the battery cabinet. 2. The battery cabinet is already on fire.	1. Please remotely monitor continuously for 30 minutes whether there are other abnormalities (such as abnormal temperature, abnormal battery voltage, abnormal battery temperature, abnormal hydrogen concentration). If so, please shut down the remote system. During remote monitoring, it is forbidden to approach the battery cabinet or open the cabinet door. 2. If there is no other abnormality in the remote monitoring, arrange the personnel with safety training to the site and observe continuously for 30 minutes outside the safe distance. If there is smoke or fire, please turn off the remote system, and the site personnel should stay away as soon as possible and call the fire alarm. 3. If there is no abnormality between remote monitoring and on-site observation, the battery cabinet door can be opened to observe whether the aerosol is sprayed. If so, please contact the service hotline, if no, the aerosol module is faulty and replace the aerosol.
5	Electrical emergency stop signal alarm	The battery cabinet door emergency stop button has been pressed or the emergency stop button is damaged.	1. The emergency stop button can be reset. 2. The emergency stop button is damaged, so replace the emergency stop button.
6	The BMS emergency stop signal alarm	1. Battery triple alarm. 2. The emergency stop button is pressed or damaged.	1. Observe whether there is any abnormality in the battery cabinet and whether the BMS is monitored remotely; 2. Return to the emergency stop button, or replace the emergency stop button.

7.2 BMS emergency report

The following is the BMS alarm / fault list.

Table 7-2 BMS alarm / fault list

order number	order number	order number	order number
1	A Pack fan fault occurs	1. Insufficient power supply. 2. The fan is damaged or	1. Check whether the 48V fan power supply is reliably connected.

		blocked with foreign bodies.	2. Check whether the fan piece is damaged, remove the foreign bodies around the fan, check for abnormal power supply, and then reinstall the fan.
2	BMU hardware malfunction	BMU damage	1. BMU restart to restart. 2. Replug the BMU. 3. If the above is not solved, replace the BMU.
3	BCMU hardware malfunction	BCMU damage	1. BCMU restart to restart. 2. Replug BCMU. 3. If the above is not solved, replace the BCMU.
4	Fuse fault	The fuse is damaged	The fuse is damaged
5	Contactor adhesion failure	1. Damaged contactor 2. Conactor feedback contact wiring error	1. Replace the contactor. 2. Correct the wiring.
6	A BMU communication failure	The communication wire plug is loose	Replace the communication harness
7	Current sensor fault	1. Sampling line of the shunt is loose 2. The shunt is damaged or reversed 3. The acquisition module is damaged	1. Re-fix the shunt sampling signal line; 2. Measure whether the shunt is normal and the signal output is normal. If it cannot be solved, replace the shunt; 3. Replace the BCMU
8	NTC hitch	Sampling anomaly	Restart / disassemble / replace the BMU
9	Emergency stop signal alarm	The battery cabinet door emergency stop button has been pressed or the emergency stop button is damaged.	1. The emergency stop button can be reset. 2. The emergency stop button is damaged, so replace the emergency stop button.
10	Water flooding signal alarm	The battery cabinet is flooded, or the water immersion sensor is damaged	1. Please check whether there is any water inside the battery cabinet. If so, please drain the water adequately. 2. Please confirm whether the water immersion sensor in the battery cabinet is intact. If no, replace the damaged equipment; if so, manually clear the alarm.
11	Aerosol signal alarm	Smoke or partial overheating or fire in the battery cabinet is on fire.	1. Please remotely monitor for 30 minutes for other abnormalities (such as abnormal temperature, abnormal battery voltage, abnormal battery temperature, abnormal combustible gas concentration). If so, please shut down the remote system. During remote monitoring, it is forbidden to approach the battery cabinet or open the cabinet door. 2. If there is no other abnormality in the remote monitoring, arrange the personnel with safety training to the site and observe continuously for 30 minutes outside the safe distance. If there is smoke or fire, please turn off the remote system, and the site personnel should stay away as soon as possible and call the fire alarm. 3. If there is no abnormality between remote monitoring and on-site observation, the battery cabinet door can be opened to observe whether the aerosol is sprayed. If so, please contact the service hotline, if no, the aerosol module is faulty and replace the aerosol.
12	The AC lightning protection device is	The AC lightning protection device is	1. Please check whether the AC lightning protection device signal line connection is loose.

	faulty	faulty	2. Please check the AC lightning protection device indicator for discoloration. 3. Please replace the AC lightning protector.
13	Total voltage overvoltage 1 / 2 / 3 level alarm	The total battery voltage is above the one / 2 / tertiary alarm threshold	Let it stand for more than 30 minutes or discharge until it will return to normal;
14	Total voltage undervoltage 1 / 2 / 3 level alarm	The total battery voltage is below the one / 2 / tertiary alarm threshold	Hold still for more than 30 minutes or charge back to normal;
15	Single overpressure one / two / three level alarm	The battery voltage is higher than the one / 2 / tertiary alarm threshold	Let it stand for more than 30 minutes or discharge to return to normal;
16	Single underpressure one / two / three level alarm	The battery cell voltage is lower than the one / two / three-level alarm threshold	Hold still for more than 30 minutes or charge back to normal;
17	The discharge current is excessive in one / two / third level alarm	The dispatching power is too large	Issue a reasonable dispatching power
18	Charging current is too large for one / two / third level alarm	The dispatching power is too large	Issue a reasonable dispatching power
19	Discharge battery over temperature one / 2 / 3 level alarm	1. Heat dissipation fan plug is loose 2. Heat dissipation fan fault 3. Failure of the air-conditioning coolant 4. The air-conditioning refrigeration system is not started.	1. Reunplug the fan plug cable. 2. Power the fan separately and check whether the fan is normal. 3. Replace the coolant. 4. Check the refrigeration system.
20	Discharge battery undertemperature one / two / three level alarm	The air-conditioning heating system is not started	Check the heating system.
21	Charging battery over temperature one / two / three level alarm	1. Heat dissipation fan plug is loose 2. Heat dissipation fan fault 3. Failure of the air-conditioning coolant 4. The air-conditioning refrigeration system is not started.	1. Reunplug the fan plug cable. 2. Power the fan separately and check whether the fan is normal. 3. Replace the coolant. 4. Check the refrigeration system.
22	Charging battery undertemperature one / 2 / 3 level alarm	The air-conditioning heating system is not started	The air-conditioning heating system is not started
23	Insulation resistance value is too low for one / two / three level	1. Excessive moisture / dust 2. Short circuit to the ground	1. Tide removal and dust removal. 2. Insulate the ground with the help of the instrument measurement system. 3. Check whether the power line is firm and

	alarm	3. Poor contact with the power line	reliable.
24	High pressure box connector temperature over the high / two / three level alarm	The fan in the separate control box is faulty, and the 48V power supply is abnormal.	The fan in the separate control box is faulty, and the 48V power supply is abnormal.
25	Monompressure difference one / two / three alarm	Check whether the fan power supply is normal or replace the fan.	Check whether the fan power supply is normal or replace the fan.
26	Single unit temperature difference of one / two / three level alarm	1. Heat dissipation fan plug is loose 2. Heat dissipation fan fault 3. Failure of the air-conditioning coolant 4. The air-conditioning refrigeration system is not started.	1. Reunplug the fan plug cable. 2. Power the fan separately and check whether the fan is normal. 3. Replace the coolant. 4. Check the refrigeration system.
27	SOC low one / 2 / 3 alarm	The battery SOC is below the primary / secondary / tertiary alarm threshold	The battery SOC is below the primary / secondary / tertiary alarm threshold

7.3 PCS alarm

Refer to the alarm / fault list in the PCS user manual.

7.4 Air-conditioning alarm

The following is the air conditioning alarm / fault list.

Table 7-4 List of air conditioning alarm / fault

order number	order number	order number	order number
1	Return air temperature sensor fault alarm	1. Loowiring of return air temperature sensor. 2. The sensor is damaged, open circuit or short circuit.	1. Please select the appropriate time to turn off the system and take good safety protection measures. 2. Check whether the wiring is loose. 3. Change the return air temperature sensor.
2	Return air humidity sensor fault alarm	1. Loowiring of return air humidity sensor. 2. The sensor is damaged, open circuit or short circuit.	1. Please select the appropriate time to turn off the system and take good safety protection measures. 2. Check whether the wiring is loose. 3. Change the return air humidity sensor.
3	Air supply temperature sensor fault alarm	1. Free of wiring of air supply temperature sensor. 2. The sensor is damaged, open circuit or short circuit	1. Please select the appropriate time to turn off the system and take good safety protection measures. 2. Check whether the wiring is loose. 3. Change the supply air supply temperature sensor.
4	High temperature alarm	After the unit starts up continuously for 10 minutes, the return air temperature is higher than the high temperature alarm point	1. Check the air conditioning parameter "high temperature alarm point" to ensure that the parameter is set reasonably; 2. If the parameters are set reasonably, please check the other alarm of the air conditioner and maintain them according to the corresponding repair suggestions. If there is no other alarm, please turn off the air conditioner and contact the

			service hotline.
5	Low temperature alarm	After the unit starts up continuously for 10 minutes, the return air temperature is lower than the low temperature alarm point	1. Check the air conditioning parameter "low temperature alarm point" to ensure that the parameter is set reasonably; 2. If the parameters are set reasonably, please check the other alarm of the air conditioner and maintain them according to the corresponding repair suggestions. If there is no other alarm, please turn off the air conditioner and contact the service hotline.
6	High wet alarm	After the unit starts up continuously for 10 minutes, the return air humidity is higher than the high wet alarm point	1. Check the air conditioning parameter "high humidity alarm point" to ensure that the parameter is set reasonably; 2. If the parameters are set reasonably, please check the other alarm of the air conditioner and maintain them according to the corresponding repair suggestions. If there is no other alarm, please turn off the air conditioner and contact the service hotline.
7	Low wet alarm	After the unit starts up continuously for 10 minutes, the return air humidity is lower than the low wet alarm point	1. Check the "low wet alarm point" to ensure that the parameter is set reasonably; 2. If the parameters are set reasonably, please check the other alarm of the air conditioner and maintain them according to the corresponding repair suggestions. If there is no other alarm, please turn off the air conditioner and contact the service hotline.
8	High pressure alarm	1. High-voltage switch is disconnected 2. High-voltage wiring is loose	1. Check whether all the system valve parts are open. 2. Check whether the condenser is dirty and blocked. If it is dirty and blocked, please clean the condenser. 3. Check whether the condensing fan is operating normally. 4. Check whether the high-voltage wiring is well connected.
9	High voltage lock alarm	1. Three high pressure alarm or condensation high temperature alarm within 1 hours.2. The high pressure alarm or condensation high temperature alarm lasts for 10 minutes.	1. Check whether all the system valve parts are open. 2. Check whether the condenser is dirty and blocked. If it is dirty and blocked, please clean the condenser. 3. Check whether the condensing fan is operating normally. 4. Check whether the high-voltage wiring is well connected.
10	Low pressure alarm	1. Low-voltage switch is disconnected 2. Low-voltage wiring is loose	1. Check whether all the system valve parts are open. 2. Check whether the system refrigerant is insufficient or leakage. 3. Check whether the low-voltage wiring is well connected.
11	Low voltage lock alarm	1. Three low pressure alarm or evaporation low temperature alarm within 1 hours.	1. Check whether all the system valve parts are open. 2. Check whether the system refrigerant is insufficient or leakage. 3. Check whether the low-voltage wiring is well

		2. Low pressure alarm or evaporation low temperature alarm lasts for 10 minutes.	connected.
12	Condensation temperature sensor fault alarm	1. Unstable wiring or incorrect wiring. 2. The sensor is damaged, open circuit or short circuit.	1. Please select the appropriate time to turn off the system and take good safety protection measures. 2. Check whether the wiring is loose. 3. Change the condenser temperature sensor.
13	Evaporation temperature sensor fault alarm	1. Vaporizer temperature Degree of sensor wiring is loose. 2. The sensor is damaged, open circuit or short circuit.	1. Please select the appropriate time to turn off the system and take good safety protection measures. 2. Check whether the wiring is loose. 3. Change the evaporator temperature sensor.
14	Condensed high temperature alarm	The condensation temperature is higher than the condensation high temperature alarm point	Please check other related alarms of the air conditioner and maintain them according to the corresponding repair suggestions. If there are no other related alarms, please turn off the air conditioner and contact the service hotline.
15	Evaporation low temperature alarm	The evaporation temperature is lower than the evaporation low-temperature alarm point	Please check other related alarms of the air conditioner and maintain them according to the corresponding repair suggestions. If there are no other related alarms, please turn off the air conditioner and contact the service hotline.

appendix

A mp OT / DT terminal

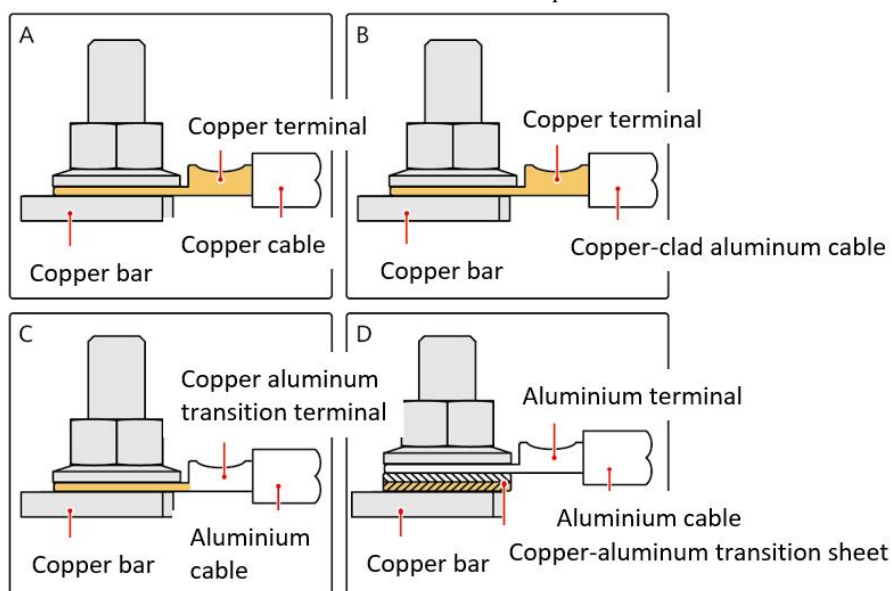
- 1) A. 1 OT /DT terminal requirements
- 2) When using copper core cables, use copper wiring terminals.
- 3) When using the copper-clad aluminum cables, please use the copper wiring terminals.
- 4) When using aluminum alloy cable, please use copper aluminum transition terminal, or aluminum terminal with copper aluminum transition gasket.



NOTE

- 1) It is strictly prohibited to connect aluminum terminal directly, otherwise it will cause electrochemical corrosion and affect the reliability of cable connection.
- 2) When using copper-aluminum transition terminal, or aluminum terminal combined with copper-aluminum transition pad, it shall meet the requirements of IEC61238-1.
- 3) When using the copper-aluminum transition gasket, please pay attention to the positive and negative sides to ensure that the aluminum surface of the gasket and the aluminum terminal contact, the copper surface and the terminal row contact.

Sec.1 OT / T DT terminal requirements



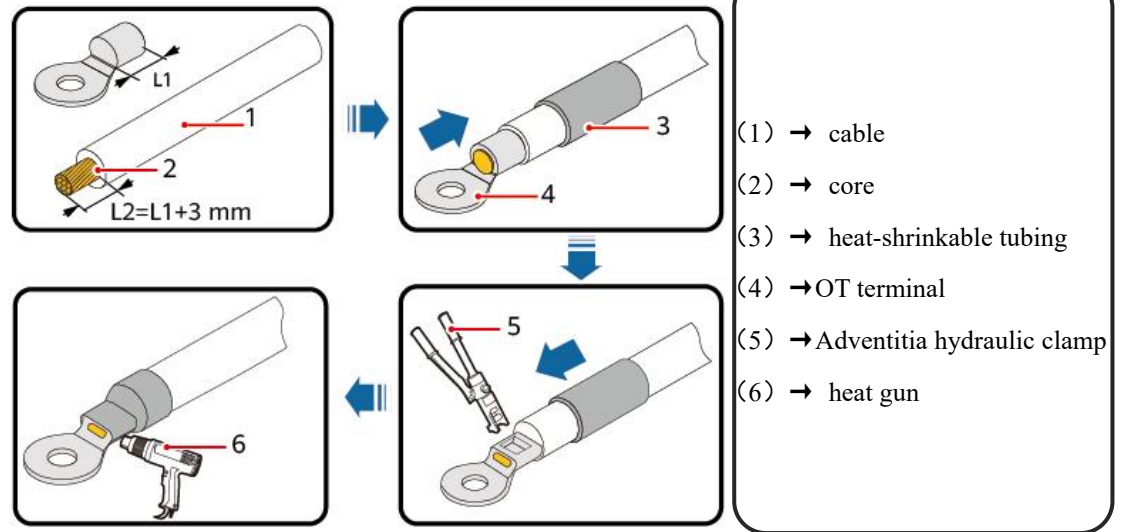
A.2 OT/DT Terminal pressing



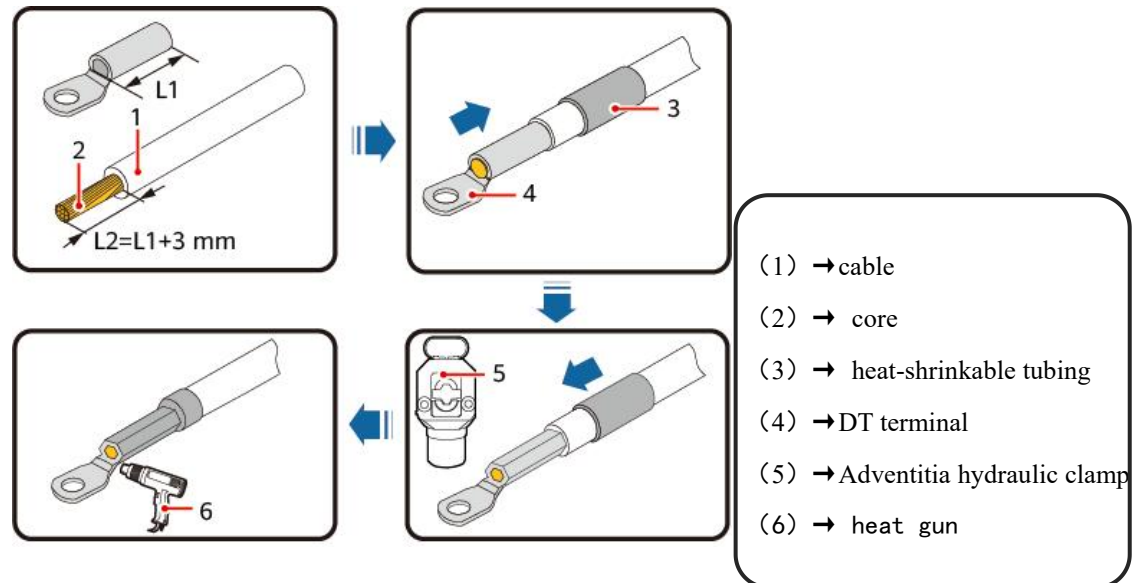
NOTE

- 1) Do not scratch the core.
- 2) The cavity formed by the conductor crimp of the OT / DT terminal shall completely coat the wire core, and the wire core is tightly bound with the OT / DT terminal without loosening.
- 3) The line can be coated with heat-shrink sleeve or insulation tape. Take the heat shrink sleeve as an example.
- 4) In the process of using hot air gun, please pay attention to protection to prevent the equipment.

Sec. 2 The OT terminal



Sec. 3 Crimp DT terminal



B How to fill the paint

B.1 Preconditions

In the case of no outdoor shade, it is strictly prohibited to repair the paint in rain, snow, strong wind, sandstorm and other severe weather.

The required paint has been prepared according to the color plate provided at delivery.

B.2 Description of paint painting

The appearance of the equipment shall be kept in good condition. If the paint is removed, the paint shall be repaired immediately.



NOTE

Visually measure the damage of the equipment, prepare corresponding tools and materials, and evaluate the material quantity on site according to the paint repair.

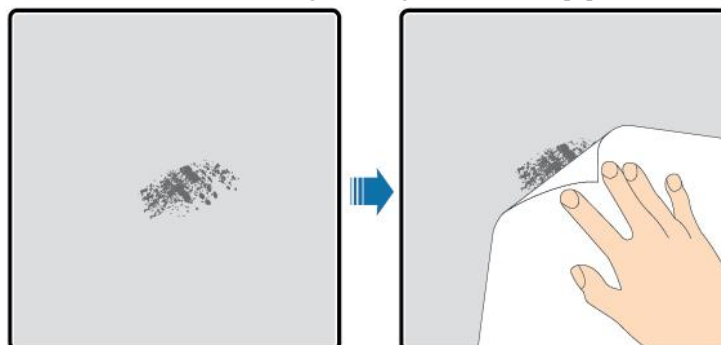
Schedule 1

The degree of damage to paint surface	The degree of damage to paint surface	The degree of damage to paint surface	The degree of damage to paint surface
Shallow scratches	Hand paint or paint, brush (small area paint to be prepared), fine sandpaper, absolute ethanol, cotton cloth, spray gun (large area paint to be prepared).	Refer to B.3 Step 1 + Step 2 + Step 4 + Step 5 Operation.	The color of the finish paint (acrylic paint) refers to the color plate provided at delivery and the pantone number indicated on the color plate.
(No steel substrate)			A small number of scratches and small area of stains, rust recommended to use hand spray paint or paint.
No wiping of stains, rust	Hand paint or paint, zinc rich primer, brush (small area paint to be prepared), fine sandpaper, absolute ethanol, cotton cloth, spray gun (large area paint to be prepared).	Follow Step 1 + Step 2 + Step 3 + Step 4 + Step 5.	A large number of scratches and a large area of stains, rust need to use a paint spray gun for paint spraying.
Deep scratches	LOGO and pattern damage should provide LOGO size and color number, and find local advertising spraying suppliers to develop and perform repair solutions according to LOGO size, color and damage.		The film should be as thin and uniform as possible, do not make the film dripping, to keep the surface smooth.
(Primer damage exposing steel plate substrate)	If the impact area is less than 100mm ² and the depth is less than 3mm, the unsaturated polyester resin putty (Poly-Putty base) (atomic ash) is used to fill it in, and then fill it with deep scratch paint. If the impact area is greater than 100mm ² or the depth is greater than 3mm, the local supplier should provide a separate repair plan according to the situation.		After placing the surface of the supplementary paint for about 30min, the subsequent operation can be carried out.

B.3 Operation steps

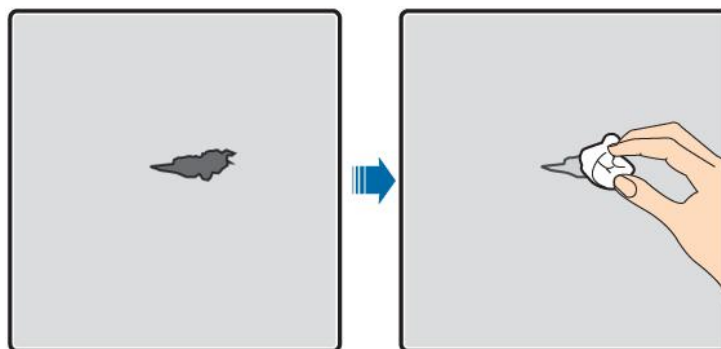
Step 1 Gently polish the damaged area with fine sandpaper to remove dirt or rust.

See. 4 Grthe damaged damage with fine sandpaper



Step 2 moisten the cotton cloth with anhydrous ethanol and wipe the polished area or the repaired area to remove surface dirt and dust, and then dry with a clean cotton cloth.

Sec. 5 The of is treated with absolute ethanol



Step 3 Apply a zinc-rich primer on the damaged coat with a brush or spray gun.



NOTE

- 1) If the base material is exposed in the area to be repaired, apply the epoxy zinc-rich primer first until the paint is dry, and then apply the acrylic finish paint.
- 2) Choose epoxy-rich zinc primer or acrylic finish according to the coating color of the equipment surface.

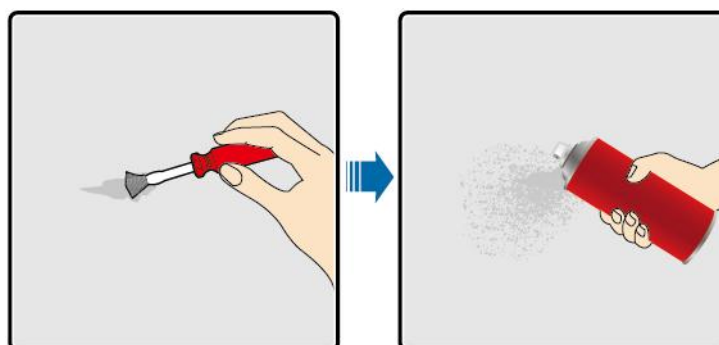
Step 4 According to the degree of paint surface damage, select a way from spray paint, brush paint, spray gun spraying to evenly paint the coating damage, until the coating damage trace is not exposed.



NOTE

- 1) Pay attention to the brush coated paint film should be as thin and uniform as possible, paint film can not be dripping shape, to keep the surface smooth.
- 2) For different colors of equipment patterns, other colors other than the damaged paint should be covered with tape and white paper before the paint, so as to avoid pollution to other colors during the operation of the paint paint.

Sec. 6 Repair the damaged coating of the equipment



Step 5 After painting, place it for about 30min, and then see if the paint filling area meets the requirements.



NOTE

- 1) The paint filling area shall be in the same color with the surrounding area, measuring the color difference with $\Delta E \leq 3$. If the colorometer cannot be used, confirm that there is no obvious edge between the recoating area and the surrounding area. The paint shall also be free of bumps, scratches, flaking, or cracks.
- 2) If it is painted, it is recommended to spray 3 times before observing whether to meet the requirements; if not, spray repeatedly until the requirements are met.