iHouse 20ft 500/1075
Energy Storage System

User Manual

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Software Licensing

• Any use of part or all of the data in the firmware or software developed by our company for commercial purposes is prohibited.

• It is prohibited to decompile, decrypt or perform other operations that damage the original program design on the software developed by our company.

Overview

This manual mainly introduces the methods of transportation and storage, mechanical installation, electrical connection, power-on and power-off, fault handling and maintenance of energy storage integrated systems.

Target Audience

This manual is intended for operators of energy storage power stations and electrical technicians with corresponding qualifications.

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

- After special training
- Read this manual completely and understand the safety precautions related to operation
- Familiar with local standards and relevant safety regulations for electrical systems

Manual Usage

Please read the manual carefully before using the product and keep it in a safe place where it is easily accessible.

In order to continuously improve customer satisfaction, this product and manual are in continuous improvement and upgrade. If there is a difference between the manual you have received and the product, it may be due to product version upgrade. Please refer to the actual product.

The contents of the manual will be continuously updated and revised, but it is inevitable that there will be slight discrepancies or errors with the actual product. Users should refer to the actual product purchased and can obtain the latest version of the manual through sales channels.

The pictures in this manual are for reference only. The actual product shall prevail.

Symbol Usage

In order to ensure the personal and property safety of users when using the product and to use the product more efficiently and optimally, the manual provides relevant information and uses the following symbols to highlight it.

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

Danger

Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

Alarm

Indicates a situation with a moderately hazardous situation which, if not avoided, could result in death or serious injury.

Caution

Indicates a situation with a low risk of hazard which, if not avoided, may result in moderate or minor injury.

Notice

Indicates a potential hazard, which, if not avoided, may result in equipment failure or property damage.

Explanation of symbols on the product

Logo	Logo Explanation
	This symbol indicates that the temperature here is higher than the acceptable range for human body. Please do not touch it arbitrarily to avoid personal injury.
	This symbol indicates that all external power connections must be disconnected before performing maintenance on the equipment!
	This symbol indicates that there is high voltage inside the machine. Touching it may cause electric shock.
	This symbol indicates the presence of dangerous high voltage! After the device is disconnected from the external power supply, you need to wait 5 minutes before touching the internal conductive components.
	This symbol means be careful with heavy objects. Lifting heavy objects may cause back injuries. Please use appropriate tools to lift.
	This symbol indicates explosion warning.
	This symbol indicates caution regarding corrosion.
	This symbol indicates that it should not be disposed of with household waste.
	This symbol means fireworks are prohibited.
	This symbol indicates that a medical point should be set up nearby
	This symbol means that if it comes into contact with eyes, rinse immediately with running water or saline and seek medical attention promptly.
	This symbol indicates that this is the protective grounding (PE) terminal, which needs to be firmly grounded to ensure the safety of operators.
	This symbol means to read the instructions before performing any operation on the product.
	This symbol indicates that goggles should be worn.

Terminology

Abbreviation	Illustrate
ESS	Energy Storage System
BESS	Battery Energy Storage System
PCS	Power Conversion System (Converter)
S/G	Switch Gate
LFP	Lithium Iron Phosphate
BMS	Battery Management System
FSS	Fire Safety System
LCS	Liquid Cooling System
LC	Local Controller
EMS	Energy Management System
SCADA	Supervisory Control And Data Acquisition

Unless otherwise specified below, the above-mentioned equipment will be replaced by abbreviations.

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01 Safety Precautions

Declaration

Before transporting, storing, installing, operating, using or/and maintaining the equipment, please read this manual first, operate strictly in accordance with the contents of the manual, and follow the symbols on the equipment and all safety precautions in the manual. In this manual, "equipment" refers to the products, software, components, spare parts and/or services related to this manual; "the company" refers to the manufacturer (producer), seller and/or service provider of the equipment. "You" refers to the entity that transports, stores, installs, operates, uses or/and maintains the equipment.

The "Danger", "Alarm", "Caution" and "Notice" items in this manual do not represent all the safety items that should be observed. You must also comply with relevant international, national or regional standards and industry practices. **We do not assume any responsibility for any violation of safety operation requirements or violation of safety standards for design, production and use of equipment.**

This equipment should be used in an environment that meets the design specifications. Otherwise, the possible equipment failure, equipment malfunction or component damage is not within the scope of the equipment quality assurance. Otherwise, we will not be liable for compensation for personal injury, property loss, etc.

All operations including transportation, storage, installation, operation, use and maintenance must comply with applicable laws, regulations, standards and specifications.

We shall not be liable for any of the following circumstances or their consequences:

- Equipment damage caused by earthquake, flood, volcanic eruption, mudslide, lightning strike, fire, war, armed conflict, typhoon, hurricane, tornado, extreme weather, or force majeure;
- Not operated within the conditions of use described in this manual;
- The installation and use environment do not comply with relevant international, national or regional standards;
- Unqualified personnel installing and using the equipment;
- Failure to follow the operating instructions and safety warnings in the product and documentation;
- Unauthorized disassembly, modification of the product or modification of the software code;

- Damage caused by transportation by you or a third party you entrust;
- Damage caused by storage conditions not meeting the requirements of product documentation;
- The materials and tools you bring do not meet the requirements of local laws, regulations and relevant standards;
- Damage caused by your or a third party's negligence, intent, gross negligence, improper operation or reasons not attributable to our company.

1.1 Personal Safety

Danger

It is strictly forbidden to operate with power on during the installation process. It is forbidden to install or remove cables with power on. When the cable core contacts the conductor, arcs or sparks will be generated, which may cause fire or personal injury.

Danger

When the equipment is energized, irregular or incorrect operation may cause fire or electric shock, resulting in personal injury or property loss.

Danger

During operation, it is strictly forbidden to wear watches, bracelets, rings, necklaces and other conductive objects to avoid electric shock and burns.

Danger

Special insulating tools must be used during the operation to avoid electric shock or short circuit failure. The insulation withstand voltage level must meet the requirements of local laws, regulations, standards and specifications.

Alarm

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

Figure 1-1 Special protective equipment

General Requirements

- Do not disable equipment protective devices and ignore warnings, cautions, and precautions in the manual and on the equipment.

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

- Do not power on the device before the installation is completed or the device has not been confirmed by a professional.

- It is prohibited to directly touch, use other conductors to touch, or indirectly touch the power supply equipment through wet objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to confirm that there is no risk of electric shock.

- It is strictly forbidden to touch the running fan with fingers, parts, screws, tools or boards to avoid injury to hands or damage to the equipment.

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

Personnel Requirements

- Personnel who operate the equipment include professionals and trained personnel.

  - Professionals: People who are familiar with the principles and structure of the equipment, have experience in training or operating the equipment, and are aware of the various potential sources of danger and the magnitude of danger during the installation, operation, and maintenance of the equipment.

  - Trained personnel: Personnel who have received appropriate technical and safety training and have the necessary experience, are aware of the dangers that may be brought to them when performing a certain operation, and can take measures to minimize the dangers to themselves or other people.

- Personnel responsible for installing and maintaining the equipment must first undergo rigorous training, master the correct operating methods, and understand various safety precautions and relevant standards of the country/region where they are located.

- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety features and repair equipment.
- Personnel involved in special scenarios such as electrical operations, high-altitude operations, and special equipment operations must have special operation qualifications required by the local country/region.
- Replacement of equipment or parts (including software) must be performed by authorized professionals.
- Except for those who are operating the equipment, no one else should approach the equipment.

1.2 Electrical Safety

Danger

Before making electrical connections, make sure the device is not damaged, otherwise it may cause electric shock or fire.

Danger

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

Danger

During operation, foreign objects must be prevented from entering the equipment, otherwise it may cause equipment short circuit failure or damage, load power supply reduction or power failure, and personal injury.

Alarm

When installing equipment that needs to be grounded, the protective ground wire must be installed first; when removing the equipment, the protective ground wire must be removed last.

Caution

No cables are allowed to pass through the air inlet and outlet of the equipment.

Caution

Considering the impact of electrochemical corrosion between copper and aluminum, it is strictly forbidden to use aluminum wire for direct access.

Notice

To prevent irrelevant personnel from approaching the energy storage cabinet and causing misoperation or accidents, please observe the following precautions:

- Place eye-catching warning signs around the energy storage cabinet to prevent accidents caused by accidental closing of the switch.
- Put up warning signs or set up safety warning tapes near the equipment.

General Requirements

- Installation, operation and maintenance must be carried out in the order of steps in the manual. Do not modify, add or change the equipment without authorization, and do not change the installation sequence without authorization.
- Install temporary fences or warning ropes in the work area and hang a "No Entry" sign. Non-staff are strictly prohibited from entering.
- Before installing or removing power cables, the device itself and its front and rear switches must be disconnected.
- If you find liquid has entered the device, please turn off the power immediately and do not continue to use it.
- Before operating the equipment, you need to carefully check that the tools used meet the requirements and register them in the book; after the operation, collect them according to the number to prevent them from being left inside the equipment.
- Before installing power cables, make sure that the cable labels are correctly marked and the cable terminals are well insulated.
- When installing the equipment, you need to use a torque tool with a suitable range to tighten the screws. When tightening with a wrench, make sure the wrench is not skewed and the torque value error does not exceed 10% of the specified value.
- The screws should be fixed with a torque tool and double-checked with red and blue markings. After the installer confirms that the screws are tightened, a blue marking will be painted on the screws; after the inspector confirms that they are tightened, a red marking will be painted (the marking line needs to cross the edge of the screw).

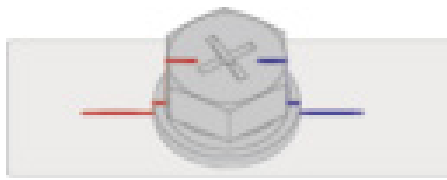


Figure 1-2 Screw fastening mark

- After installation, ensure that all electrical component protective covers, insulating sleeves and other devices are in place to avoid the risk of electric shock.
- If the power input to the equipment is permanently connected, a readily accessible disconnect device shall be provided externally to the equipment.
- If the device has multiple inputs, all inputs of the device should be disconnected and the device can be operated only after it is completely powered off.
- When maintaining the power consumption or distribution equipment at the downstream of the power supply equipment, it is necessary to disconnect the output switch corresponding to the power supply equipment.

- When maintaining the equipment, hang a "Do Not Close" sign on the upstream and downstream switches or circuit breakers and post a warning sign to prevent accidental connection. The power can be turned on again only after the fault is resolved.
- When diagnosing and troubleshooting a fault, if a power shutdown is required, the following safety measures must be completed: power shutdown > electrical test > install grounding wire > hang signs and install barriers.
- Please check the terminal screws of the equipment regularly to make sure they are tightened and not loose.
- If the cable is damaged, it must be replaced by a professional to avoid risks.
- It is strictly forbidden to artificially alter, damage or cover the logos and nameplates on the equipment, and the logos that become unclear due to long-term use must be replaced in a timely manner.
- Do not use water, alcohol, oil or other solvents to clean the electrical parts inside and outside the equipment.

Grounding Requirements

- The grounding impedance of the equipment should meet the requirements of local electrical standards.
- The equipment should be permanently connected to the protective ground. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.
- The protective grounding of the equipment and the grounding screw of the metal casing should have a reliable electrical connection (the connection resistance should not be greater than 0.1 ohms).
- Do not operate the equipment without an installed grounding conductor.
- Do not damage the grounding conductor.
- If it is a large contact current device, before connecting the input power, the protective grounding terminal of the device casing must be grounded to prevent the contact current of the device from causing electric shock to the human body.

Wiring Requirements

- The selection, installation and routing of cables must comply with local laws, regulations and specifications.
- When laying the power cord, it is strictly forbidden to make loops or twists. If the power cord is found to be insufficient, it must be replaced. It is strictly forbidden to make joints or welding points in the power cord.
- All cables must be securely connected, well insulated, and of appropriate specifications.
- Cable troughs and wire holes should have no sharp edges, and the cable conduits or wire holes must be protected to prevent the cables from being damaged by sharp edges, burrs, etc.
- Cables of the same type should be bundled together, with a straight and neat appearance and no outer sheath damage; cables of different types should be laid separately and must not be entangled or crossed with each other.
- When you leave after completing wiring or during wiring, you must immediately seal the cable opening with sealing mud to prevent moisture and small animals from entering.
- Buried cables need to be securely fixed using cable supports and cable clamps. Cables in the backfill area must be in close contact with the ground to prevent deformation or damage caused by stress when backfilling.
- When external conditions (such as laying method or ambient temperature) change, it is necessary to refer to IEC-60364-5-52 or local regulations and specifications to verify cable selection, such as whether the current carrying capacity meets the requirements.
- It is prohibited to perform irregular operations such as pushing the cables directly off the vehicle to avoid cable damage which may lead to degradation of cable performance, affect current carrying capacity and temperature rise, etc.

1.3 Battery Safety

In order to use the product safely, please read and comply with the following safety requirements carefully. Product malfunction or component damage, personal safety accidents, property losses, etc. caused by the following reasons are not within the scope of our company's responsibility.

- The battery is not charged beyond the expiration date due to customer reasons, resulting in capacity loss or irreversible damage to the battery.
- Battery damage, falling, leakage, etc. caused by improper operation or failure to operate the battery as required.
- Battery damage caused by over-discharge due to customer's failure to power on in time.
- Battery damage caused by improper charging and discharging equipment used by the customer.
- Frequent over-discharge of batteries due to improper customer maintenance, on-site capacity expansion or long-term inability to fully charge, etc.
- Battery damage caused by the customer's failure to correctly set battery operating parameters.
- Direct damage to the battery due to the on-site operating environment not meeting the environmental requirements for normal operation.
- The battery usage scenario is changed due to customer reasons, including but not limited to: connecting additional loads to the battery.
- The customer did not properly maintain the battery according to the system manual of the supporting equipment.
- Product damage caused by customers continuing to use batteries beyond the warranty period.
- Product damage caused by using a defective or deformed battery.
- Mixing the batteries provided by our company with other batteries, including but not limited to: mixing with batteries of other brands, mixing with batteries of different rated capacities, etc.
- Product damage or other property loss caused by storing or installing batteries together with flammable/explosive materials.
- Battery-related operations must be performed by professionals. Failure to wear protective equipment that meets the standards during operation may result in personal safety accidents, property losses, etc.
- Battery damage caused by eating, drinking, smoking, etc. near the battery.
- The battery was stolen.

1.4 Environmental Requirements

Danger

It is strictly forbidden to place the device in an environment with flammable or explosive gas or smoke, and it is forbidden to perform any operation in such environment.

Danger

It is strictly forbidden to store flammable and explosive items in the equipment area.

Danger

It is strictly forbidden to place the device near heat or fire sources, such as fireworks, candles, heaters or other heating devices. Heat to the device may cause damage to the device or cause a fire.

Alarm

The equipment should be installed in an area away from liquids. It is strictly forbidden to install it under water pipes, air outlets and other locations where condensation water is likely to be generated. It is strictly forbidden to install it under air conditioning outlets, ventilation outlets, computer room outlet windows and other locations prone to water leakage to prevent liquid from entering the equipment and causing equipment failure or short circuit.

Alarm

When the device is running, do not block the ventilation openings, cooling system or cover them with other objects to prevent high temperature from damaging the device or causing a fire.

General Requirements

- The temperature and humidity environment for storing the equipment should be appropriate. It should be stored in a clean, dry, well-ventilated area and protected from dust and condensation.

- It is strictly forbidden to install and operate the equipment beyond the scope specified by the technical indicators, otherwise it will affect the performance and safety of the equipment.
- 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, opening doors, etc.) in severe weather such as lightning, rain, snow, and gale force 6 or above.
- It is strictly forbidden to install the equipment in an environment with dust, smoke, volatile gas, corrosive gas, infrared and other radiation, organic solvents or excessive salt.
- It is strictly forbidden to install the equipment in an environment with metallic conductive dust or magnetic dust.
- It is strictly forbidden to install the equipment in areas prone to the growth of microorganisms such as fungi and mold.
- It is strictly forbidden to install the equipment in areas with strong vibration, strong noise source and strong electromagnetic field interference.
- The site selection should comply with local laws, regulations and relevant standards.
- The installation environment must have a solid ground surface without rubber soil, soft soil or soil prone to sinking. It is strictly forbidden to select low-lying areas, areas prone to water accumulation or snow accumulation, and the site level should be higher than the historical highest water level in the area.
- If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground under the equipment needs to be hardened, such as laying cement, gravel, etc.
- During installation, operation and maintenance, you must first clean up the accumulated water, ice, snow or other debris on the top before opening the door to prevent debris from falling into the equipment.
- When installing the device, make sure the mounting surface is sturdy and meets the load-bearing requirements of the device.
- All wiring holes need to be sealed. Use sealing mud to seal the wiring holes that have been routed, and use the covers that come with the equipment to seal the wiring holes that are not routed. The correct sealing mud sealing construction standards are shown in the figure below.

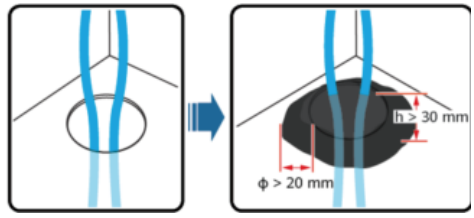


Figure 1-3 Construction standards for sealing the wiring hole with mud

1.5 Mechanical Safety

Danger

When working at heights, you must wear a safety helmet, safety belt or waist rope and tie it to a firm and sturdy structure. It is strictly forbidden to hang on moving unstable objects or metal with sharp edges to prevent the hook from slipping and causing a fall accident.

Alarm

Tools must be fully prepared and inspected by professional organizations. It is prohibited to use tools that have scars, fail inspections, or have exceeded the inspection validity period. Ensure that the tools are firm and not overloaded.

Alarm

It is strictly forbidden to drill holes on the device. Drilling will damage the sealing, electromagnetic shielding performance, internal components and cables of the device. The metal chips generated by drilling will enter the device and cause a short circuit.

General Requirements

- Paint scratches that occur during equipment transportation and installation must be repaired in a timely manner, and it is strictly forbidden to expose the scratched parts for a long time.
- Without our company's evaluation, it is prohibited to perform arc welding, cutting and other operations on the equipment.
- It is prohibited to install other equipment on top of the equipment without evaluation by our company.
- When working in the space above the top of the equipment, additional protection should be provided on the top of the equipment to prevent damage to the equipment.
- Please use the right tools and know how to use them correctly.

Lifting Safety

- Personnel performing lifting operations must undergo relevant training and be qualified before they can take up their posts.
- Temporary warning signs or fences must be erected in the lifting area to isolate it.
- The foundation for lifting operations must meet the load-bearing requirements of the crane.
- Before lifting, ensure that the lifting tools are firmly fixed to a fixed object or wall that meets the load-bearing standards.
- During hoisting, it is strictly forbidden to walk under the boom or the hoisted object.
- During lifting, it is prohibited to drag the wire rope or lifting equipment, and it is prohibited to use hard objects to hit.
- During the lifting process, ensure that the angle between the two cables is no greater than 90 °, as shown in the figure below.

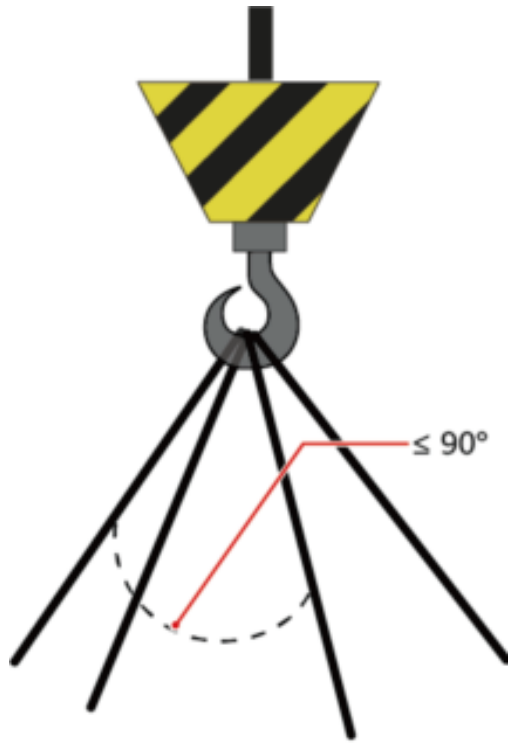


Figure 1-4 Cable angle requirements during lifting process

1.6 Installation and Wiring

Alarm

During the entire process of mechanical installation, the relevant standards and requirements of the project location must be strictly observed.

1.7 Operation and Maintenance

Alarm

- Personal protective equipment is required when performing maintenance and inspection on the energy storage cabinet.
- Maintenance personnel must wear safety goggles, helmets, insulating shoes, gloves, etc.

Alarm

- There are no user-serviceable parts inside the battery unit.
- Users are not allowed to maintain the battery by themselves. Onlypersonnel approved by Dowell company, can remove, replace or dispose of the battery.

Alarm

- To reduce the risk of electric shock, do not perform any servicing other than that specified in this manual.
- If necessary, contact Dowell company’s relevant personnel for repair.

Alarm

- To ensure continued fire protection, replacement of internal components must be performed by qualified personnel only.

Danger

Disassembling or incinerating the battery may cause it to catch fire.

Notice

- Do not spray any parts inside or outside the equipment.
- The device should not be cleaned with detergents or exposed to harsh chemicals.

1.8 Product Scrapping

When the energy storage system as a whole or a single device inside needs to be discarded, it cannot be treated as regular waste. Some components of the internal machine can be recycled and reused, but some components will pollute the environment.

Please contact a local authorized professional recycling agency to properly dispose of the product and its internal components.

02 Product Description

2.1 Product Introduction

The 500/1075 Energy Storage System optimizes and integrates 105kW PCS, batteries, BMS, EMS, thermal management, power distribution and fire protection, adopts a single string design, and achieves zero loss in parallel. It has the functions of energy consumption, peak shaving and valley filling, emergency backup power, and dynamic capacity expansion.

Main feature

- Cost-effective
  - -Zero parallel battery packs, no circulating current
  - -Equipment efficiency optimal fit control, system efficiency > 85 %
- Safe and reliable
  - -Fire protection partitions at cell level within pack
  - -Active safety monitoring and fire extinguishing
- Smart and friendly
  - -Remote monitoring
  - -Intelligent wireless, remote upgrade

2.2 Exterior Design

The appearance of the energy storage system is as follow

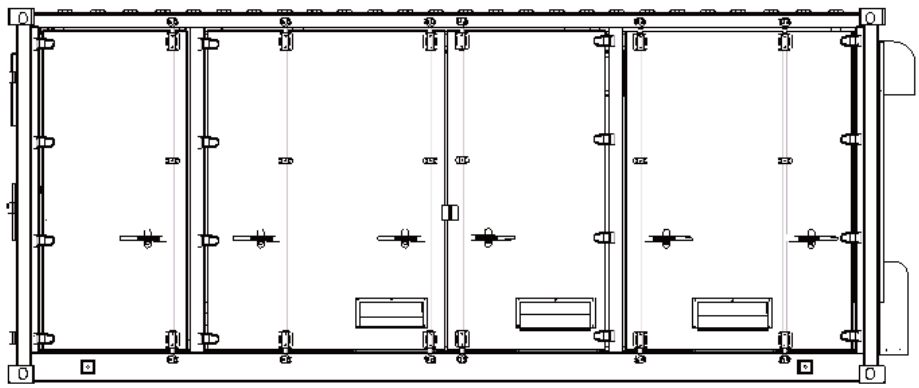


Table 2-1 Description

Abbreviation	Illustrate
Weight	≈16.8 t
Size	6058 x 2438 x 2591mm (W x D x H)
Temperature control method	Air conditioning: 9 kW x 2 (cooling); 3Kw x 2 (heating)
Routing method	Bottom in and bottom out
Protection level	IP55
Corrosion resistance	C3
Installation	Floor installation
Fire protection configuration	Heat detectors, smoke detectors, gas detectors, thermal aerosols

Notice

The nameplate contains important parameter information, which should be carefully protected during transportation, installation, maintenance, and repair. Destruction or removal is strictly prohibited!

2.3 Internal Design

The system adopts All-in-one design, integrated the PCS and batteries into one system.

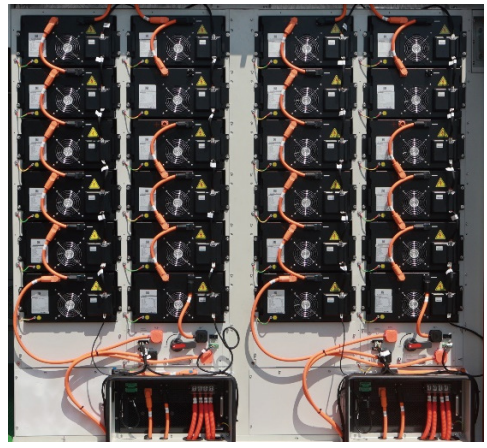


Figure 2-3 Internal structure

03 Transportation and Storage

3.1 Notes

Caution

Failure to comply with this manual's transportation and storage requirements may void the warranty.

3.2 Mode of Transportation

Suitable for trucks and ships, during transportation, it should be covered with awnings, sun-proof, and loaded and unloaded in a civilized manner. The packaging box containing the product can be transported by any means of transportation. During loading and unloading, the battery should be handled with care and prevented from being thrown, rolled, or pressed. During transportation, it should be avoided from direct rain, snow, and mechanical impact.

3.3 Transportation Requirements

All equipment in the container has been installed and fixed in the container before leaving the factory, and the container can be lifted and transported as a whole during transportation.

Alarm

During the entire process of loading, unloading and transportation, the outdoor cabinet operation safety regulations of the country/region where the project is located must be followed!

- Containers and any machinery used in the operation should be maintained.
- All personnel engaged in loading, unloading and bolting should receive appropriate training, especially safety training.

The following conditions must be met for transporting mobile equipment:

- The appliance door is locked.
- Select a suitable crane or lifting tool according to the site conditions. The selected tool must have sufficient load-bearing capacity, arm length and rotation radius.
- If it is necessary to move on a slope, etc., additional traction equipment may be required.
- Clear all existing or potential obstacles during the move, such as trees, cables, etc.
- Whenever possible, equipment should be transported when weather conditions are good.
- Be sure to set up warning signs or warning tapes to prevent non-staff from entering the lifting and transportation area to avoid accidents.
- When transporting by land, be sure to use ropes or fasteners to secure it to the transport vehicle to avoid displacement and collision during transportation.

3.4 Storage Requirements

To prevent condensation inside the container or the bottom of the container from being soaked by rainwater during rainy seasons, the container should be stored in a higher place.

- The container base must be raised, and the specific height should be reasonably determined according to the on-site geological and meteorological conditions. At the same time, heating should be provided for the internal equipment of the container when the ambient temperature is too low.
- Store the container on a dry, flat, solid surface with sufficient load-bearing capacity and without any vegetation. The storage surface must be flat, without stagnant water, uneven or bumpy, and the flatness should not exceed 5mm.
- Before storage, ensure that the container doors and internal equipment are locked.
- Storage environment temperature: -30 ℃~+40 ℃, recommended storage temperature: -10 ℃ ~+25 ℃.
- When storing at other temperatures, adjust according to the following data.

Temperature range	Attenuation adjustment factor
26 ℃ ~40 ℃	0.1 % /month
41 ℃ ~50 ℃	0.3 % /month
51 ℃ ~60 ℃	0.6 % /month

- Long-term storage of batteries will cause capacity decay, so long-term storage of batteries is not recommended. In addition, even if the battery is stored at the recommended optimal storage temperature, it will also experience irreversible capacity decay due to calendar effects. The longer the storage time, the greater the irreversible decay. For specific decay values, please refer to the technical agreement.
- Storage environment relative humidity: 0~95%, non-condensing.
- The air inlet and outlet of the container energy storage system should be effectively protected, and effective measures should be taken to prevent rain, sand and dust from entering the interior.
- Regular inspections: At least once every half month, check whether the cabinet and the internal equipment are intact.
- Before installing a container energy storage system for long-term storage (storage time exceeds half a year), you should open the door of the container for a visual inspection to check if there is condensation inside the container. Ensure that the container and internal equipment are intact. At the same time, you need to power on and start the system for inspection. If necessary, you must have a professional perform a test before installation.
- Pay attention to the harsh environment around you, such as sudden cold, sudden heat, collision, etc., to avoid damage to the pack.
- Perform regular inspections to prevent insects and rodents from gnawing on internal cables.
- Calculated from the date of shipment from Dowell company, the energy storage system with a storage period of more than 5 months under the above conditions must undergo a complete charge and discharge to bring the system SOC to 30%~40%, and the SOC must remain consistent after recharging.

04 Mechanical Installation

Alarm

During the entire process of mechanical installation, the relevant standards and requirements of the project location must be strictly observed.

4.1 Pre-installation Inspection

4.1.1 Check the delivery items

- Check that all items are included in the delivery against the enclosed packing list.

4.1.2 Check equipment

- Check whether the energy storage system actually received is consistent with what is stated in the order agreement.
- Check the exterior and interior to ensure there is no damage.

If you find any problems or have any questions, please contact the transporter or our company in time.

Alarm

- Only complete and undamaged devices may be installed!

Before installation, please ensure:

- The box itself is intact and has no damage.
- All equipment in the box is intact and without any damage.

4.2 Installation Environment Requirements

4.2.1 Site selection requirements

- When selecting an installation site, the characteristics of the site's climate environment, geological conditions (such as stress wave emission, groundwater level), etc. should be fully considered.
- The surrounding environment should be dry and well ventilated.
- Make sure there are no trees around the installation location to prevent strong winds from blowing down branches or leaves that may block the door or air inlet of the energy storage integrated system.
- Keep away from areas where toxic and harmful gases are concentrated; keep away from flammable, explosive and corrosive items.
- To avoid noise, the equipment should be installed away from residential areas.

4.2.2 Foundation requirements

Alarm

The equipment is heavy, so before building the foundation, we should first conduct a detailed investigation of the installation site conditions (mainly geological conditions and environmental climatic conditions, etc.). Only on this basis can we start the design and construction of the foundation.

An unreasonable foundation construction plan will bring great difficulties or troubles to the placement of equipment, opening and closing doors, and subsequent operation. Therefore, the installation foundation must be designed and constructed in accordance with certain standards in advance to meet the requirements of mechanical support, cable routing, and subsequent maintenance and inspection.

The construction of the foundation shall at least meet the following requirements:

- The bottom of the foundation pit for building the foundation must be compacted and filled.
- The foundation must be sufficient to provide effective load-bearing support for the equipment.
- Raise the container to prevent rainwater from eroding the base and interior of the container. It is recommended that the foundation be about 300-500 mm higher than the horizontal ground at the installation site.
- Appropriate drainage measures need to be constructed in combination with local geological conditions.
- Cable routing should be taken into consideration when constructing the foundation.
- According to the position and size of the cable inlet and outlet at the bottom of the container, sufficient space should be reserved for the main cable, auxiliary cable and communication cable trough during foundation construction.
- Determine the specifications and quantity of cable troughs based on cable model, number of incoming and outgoing lines, and routing.
- After all cables are connected, the cable entries and exits as well as the joints are sealed with refractory putty or other suitable material to prevent rodent entry.

4.2.3 Installation space requirements

To ensure better heat dissipation and maintenance of the equipment, it is recommended that the distance from obstacles in the length direction of the box be no less than 3000mm, and the distance from obstacles in the width direction of the container be no less than 3000mm.

4.3 Lifting and Transportation

4.3.1 Precautions for lifting

Alarm

- During the entire process of lifting the equipment, operations must be carried out strictly in accordance with the safety operating procedures of the crane.
- It is strictly forbidden to stand within 5m to 10m of the operating area, especially under the crane arm and under the hoisted or moved machine, to avoid casualties.
- In case of adverse weather conditions, such as heavy rain, fog, strong wind, etc., the lifting work should be stopped.

When lifting the equipment, at least the following requirements must be met:

- Site safety must be ensured during lifting.
- During lifting and installation operations, there should be professional personnel on site to direct the entire process.
- The strength of the sling used should be sufficient to bear the weight of the equipment.
- Make sure all sling connections are secure and that the sling sections connected to the corner fittings are of equal length.
- The length of the sling can be adjusted appropriately according to the actual requirements on site.
- During the entire lifting process, the equipment must be kept stable and not tilted.
- Please lift the top four corners of the container.
- The following figure shows the crane operation during the lifting process. In the figure, the inner dotted circle indicates the crane operation range. When the crane is working, it is strictly forbidden to stand in the outer solid circle!

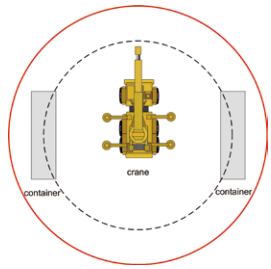


Figure 4 .4 Schematic diagram of crane operation

4.3.2 Lifting operation

During the lifting of the equipment, each operation link should be carried out according to the following requirements:

- The equipment should be lifted vertically and should not be dragged on the ground during lifting.
- After the lifting rope is fully stressed, the lifting action should be suspended and the connection between the lifting equipment, rope and equipment should be checked. Lifting can only be carried out after confirming that the connection is firm.
- After the equipment is in place, it should be placed gently and land steadily.
- The site for temporary storage of equipment should be solid and flat, with good drainage and no obstacles or protrusions.

05 Electrical Connections

5.1 Safety Precautions

Danger

Danger of high voltage! Risk of electric shock!

- It is strictly forbidden to touch the live parts!
- Before installation, make sure that both the AC and DC sides are not powered.
- Do not place the device on flammable surfaces.

Alarm

The entry of wind, sand and moisture may damage the electrical equipment in the energy storage system or affect the operating performance of the equipment!

- Electrical connection work should be avoided during windy and sandy seasons or when the relative humidity in the surrounding environment is greater than 95%.
- Start all connection work when there is no wind or sand and the weather is clear and dry.

Alarm

- Before wiring, you must check the polarity of all input cables to ensure that the polarity of each input is correct.
- During electrical installation, do not pull cables or wires with force to avoid damaging their insulation.
- All cables and wires should have sufficient space for bending.
- Take necessary auxiliary measures to reduce the stress on cables or wires.
- After each wiring operation, you need to check carefully to ensure that the wiring is correct and firm.

5.2 Wiring Overview

The schematic diagram of the energy storage system is shown below:

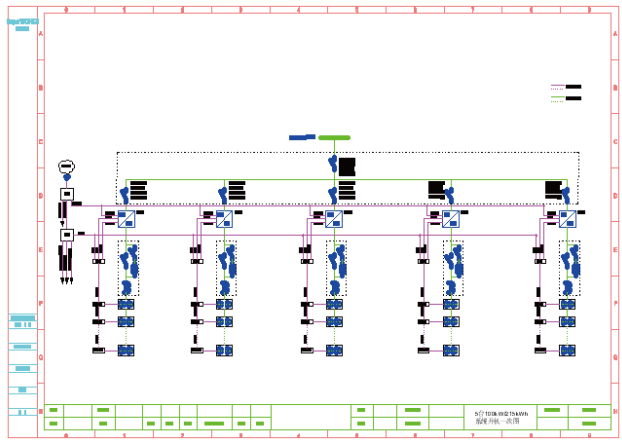


Figure 5.1 System main electrical wiring diagram

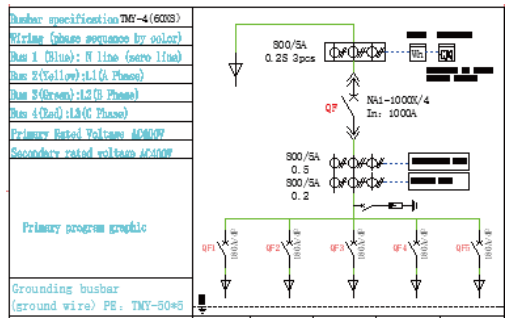
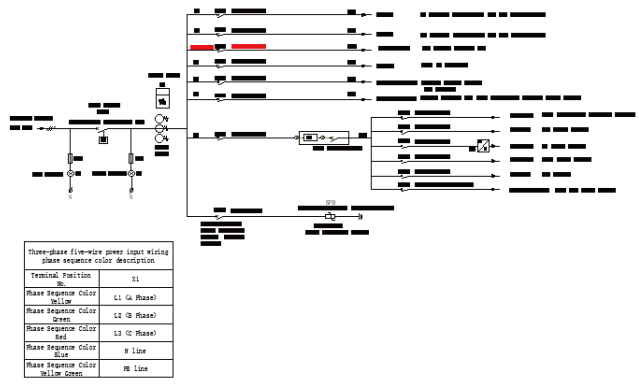


Figure 5.2 System auxiliary power supply wiring diagram



Three-phase five-wire power input wiring phase sequence color description	
Terminal Position No.	X1
Phase Sequence Color Yellow	L1 (A Phase)
Phase Sequence Color Green	L2 (B Phase)
Phase Sequence Color Red	L3 (C Phase)
Phase Sequence Color Blue	N line
Phase Sequence Color Yellow Green	PE line

- * The diagram only describes the wiring principle that requires on-site operation, and the internal wiring is for reference only.

Table 5.1 Interface description

Serial number	Describe	Recommended
A (yellow)	Energy storage grid-connected cabinet phase A to grid phase A	240mm² * 2
B (green)	Energy storage grid cabinet phase B to grid phase B	240mm² * 2
C (red)	Energy storage grid-connected cabinet phase C to grid phase C	240mm² * 2
N (blue)	Energy storage grid cabinet N line to grid N line	240mm² * 2
PE (yellow-green)	Energy storage grid-connected cabinet grounding wire to grid grounding wire	150mm² * 2
A/B/C/ N /PE (yellow/green/red/ blue/yellow-green)	System auxiliary power supply terminal X1 to grid power supply interface	3*10 mm² +2* 6 mm²

The above cables are not included in the scope of supply and need to be prepared separately.

Alarm

- All electrical connections must be made strictly in accordance with the wiring schematic diagram.
- All electrical connections must be made when the equipment is completely de-energized.

Alarm

Only qualified electrical engineers can perform work related to electrical connections. Please comply with the requirements given in the "Safety Instructions" of this manual. The company does not assume any responsibility for personal injury or property loss caused by ignoring these safety instructions.

Notice

- The installation design of the product must comply with the relevant standards or specifications of the country / region where the project is located.
- If the installation is not performed in accordance with the installation design requirements given in this manual, and product or system failure occurs, it will not be covered by the warranty.

5.3 Preparation Before Wiring

5.3.1 Installation tool preparation

5.3.2 Prepare the cables

The selected cables must meet the following conditions:

- Have sufficient current carrying capacity. Factors that affect the current carrying capacity of conductors include but are not limited to:

  -Environmental conditions

  -Conductor Insulation Type

  -Cable laying method

  -Cable material and cross-sectional area

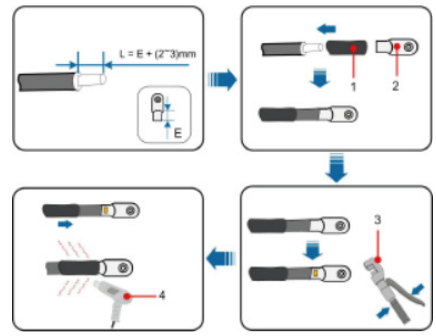
- The cable diameter must be selected according to the maximum current carrying capacity, and a margin must be left for the length.
- The specifications and materials of three-phase AC output cables should be consistent.
- Be sure to choose flame-retardant cables.

Notice

- The cables used should comply with local laws and regulations.
- The cable colors shown in this manual are for reference only. Please select cables according to local cable standards.

Crimp DT terminal

Serial	Describe
1	Thermal casing
2	DT Terminal
3	Hydraulic pliers
4	Heat Gun



5.3.3 Copper wire access

When the copper cable terminals are connected, the connection sequence of the wiring components is as shown in the figure below.

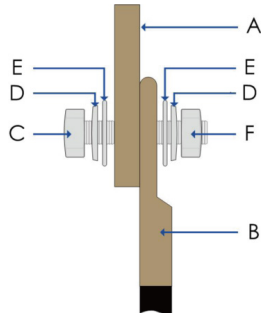


Figure 5.4 Copper terminal connection sequence

Serial number	Nameame
A	Copper busbar
B	Copper Terminal Blocks
C	bolt
D	Spring pad
E	Flat pad
F	Nuts

5.3.4 Cable entry design

Cables connecting the product and external devices can enter the interior through the bottom cable entry of the container.

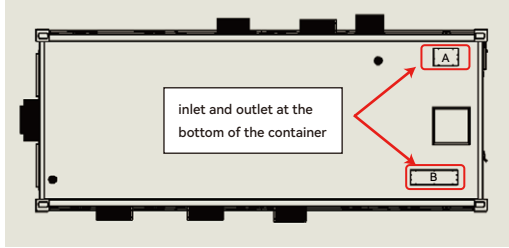


Figure 5.6 Schematic diagram of the inlet and outlet of the container

Serial	Illustrate
A	Auxiliary power supply, communication cable inlet/outlet
B	AC power cable inlet/outlet hole

5.4 Ground Connection

Notice

The grounding method must comply with the standards and regulations of the installation location.

Introduction

There are two grounding methods: using grounding flat steel for welding or using grounding cables for fixing. For the location of the grounding point, refer to " Container Appearance ".

Grounding flat steel (recommended)

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

5.5 AC Wiring

5.5.1 Safety precautions

Alarm

Accidental contact with live terminals can result in fatal electric shock!

- Ensure that the AC and DC switches of the battery energy storage system are in the off state and that the wiring terminals are not energized.
- When connecting to the power grid, permission must be obtained from the relevant authorities and all power grid-related safety directives and regulations must be followed.

Alarm

- When connecting to the AC grid, disconnect the upstream AC side circuit breaker to ensure that there is no voltage at the contact terminals.
- Connection to the grid should only be done with approval from the utility grid and following all relevant safety instructions.
- The AC output is not grounded inside the device.
- The DC and AC circuits are isolated from the enclosure and require the installer to make the battery energy storage system connections if required by the relevant national electrical codes.

5.5.2 Container main power wiring steps

- step 1 Disconnect the upstream AC circuit breaker and measure with a multimeter to ensure that there is no voltage at the terminals.
- Step 2 Lead the cable into the cable entry hole and into the AC wiring area of the energy storage grid cabinet.
- Step 3 Make sure the AC cables are connected in the correct order.
- Step 4 Use wire strippers to strip off the cable shield to expose the copper core.
- Step 5 Use DT terminal crimping.
- Step 6 Use M12 bolts to fix the DT terminal to the wiring hole with a tightening torque of 60~70N · m .

Notice

Be sure to connect the wires strictly according to the terminal phase sequence.

5.6 Container Auxiliary Power Supply Connection

Power supply mode

The system auxiliary power supply is external power supply, and the connection port is located at the X1 terminal block of the power distribution cabinet inside the box.

- step 1 Confirm that the circuit breakers of the upstream and downstream devices are in the disconnected state.

- Step 2 Pass the cables through the cable entry and exit holes into the electrical cabinet.

- Step 3 Make sure the AC cables are connected in the correct order.

Auxiliary source type	Port	Illustrate	*Recommended cable
Power grid	X 1	Connect external power supply L1/L2/L3/N	3*10 mm^2 +2* 6 mm^2
	PE row	Connect the external power upply ground wire	

- * The cable specifications are recommended values and can be adjusted according to actual needs.

- Step 4 Connect the terminals according to the port labels on the cabinet and the above port definitions. After the connections are completed, tighten the terminals.

5.7 Communication Wiring

The reserved network cable in the power distribution cabinet in Container 2# is connected to the switch in the power distribution cabinet in Container 1#.

5.8 Operation After Wiring

After all electrical connections are completed, the wiring should be thoroughly checked. At the same time, the following operations are also required:

- Check that all air inlets and outlets are not blocked or clogged by foreign objects.
- The wire entry and exit holes and the gaps around the box should be tightly sealed with fire-proof and waterproof materials.
- Put all the protective covers back firmly.

Alarm

- Failure to seal properly may allow moisture to enter the device.
- Failure to seal properly may allow rodents to enter.

06
Power on and Power off

6.1 Power on and Commissioning

Alarm

- The energy storage system can only be put into operation after confirmation by professionals and permission from the local power department.

Alarm

- For energy storage system with long downtime, a comprehensive and detailed inspection must be carried out on the equipment before powering on to ensure that all indicators meet the requirements before powering on.

6.1.1 Check before power on

Before powering on, please check the following items carefully to ensure they are correct.

- Check whether the wiring is correct.
- The protective cover inside the device is installed securely.
- The emergency stop button is released.
- Check to make sure there is no ground fault.
- Use a multimeter to check whether the AC and DC voltages meet the starting conditions and are free of overvoltage hazards.
- Check to make sure no tools or parts have been left inside the equipment.
- Check that all air inlets and outlets are not blocked or clogged by foreign objects.

6.1.2 Power on steps

step 1 Power on and prepare.

- Complete the wiring of power cables and communication cables in the electrical cabinet;
- In-box power distribution cabinet and grid-connected cabinet: Check that all switches and circuit breakers are in the disconnected state;

Step 2 Power on the power distribution cabinet.

- Close the QF1 main switch → Close the lightning protection module QF 16 switch → Close the air conditioner QF 2, QF3 switches (start operation) → Close the UPS input QF 4 switch (start operation) → Close the PCS strong exhaust fan QF 5 switch → QF6 lighting switch, QF7 module socket switch must be closed → Close the energy storage grid cabinet QF 8 → Press the UPS power button for 4 seconds and release it after the beeping sound → Close the UPS output QF 9 switch → Close the fire fan QF10 switch → Close the BMS power supply QF 11 switch → Close the DC power supply (220V to 24V switching power supply) QF 12 switch → Close the fire power supply QF 13 switch → Close the PDU socket QF 14 switch → Close the battery pack fan power supply QF15 switch. Press the power switch of each cluster of high-voltage boxes (boat-type switch, 5 clusters in total) → log in to the BMS display screen (BAU) → check that there is no abnormality in the voltage and temperature sampling → close the circuit breaker of each cluster of high-voltage boxes (5 clusters in total) → BMS automatically detects that there is no fault and closes the contactor of each high-voltage box to complete power-on (software execution).

Step 3 The grid-connected cabinet is powered on.

- Set the "local/remote" switch of the cabinet door to "local", press the green "closing" button, and then the "closing indicator" light will light up and set the "local/remote" switch to "remote", indicating that the QF frame circuit breaker is closed successfully; open the cabinet door and then close the QF1-QF5 circuit breakers and surge protection circuit breakers in sequence.

Step 4 The control software controls the system startup.

- On the EMS, operate "start high-voltage box", "start PCS", give charge and discharge instructions and power values (charging is a negative power value, discharging is a positive power value) in sequence to complete the system operation process.

6.2 Power off and Shutdown

6.2.1 Planned shutdown

step 1 Power-off preparation: The control software controls the PCS to stop charging and discharging, and controls the PCS to shut down.

Step 2 The system is powered off.

- Disconnect the QF1-QF5 circuit breaker of the energy storage grid cabinet → operate the "local/remote" switch on the cabinet door to "local", and press the "open" button to disconnect the frame circuit breaker → operate the EMS control to disconnect the high-voltage box → disconnect the high-voltage box circuit breaker (a total of 5 clusters) → disconnect the high-voltage box power switch (boat-type switch, a total of 5 clusters) → disconnect the QF15-QF9 switches in the distribution cabinet in turn → press the UPS shutdown button (OFF) for 4 seconds and release it after the beeping sound → disconnect the QF8-QF1 and QF16 switches in the distribution cabinet in turn.

Step 3 After disconnecting all switches and circuit breakers, perform an electrical test to confirm that power is off.

6.2.2 Unplanned (Emergency) shutdown

- When an emergency shutdown occurs due to a fire alarm, it is necessary to contact professional personnel from the local fire agency.

- When an emergency shutdown occurs that is not due to a fire alarm, arrange for operation and maintenance personnel to investigate and repair it.

07 System Operation

7.1 Basic Operations of BAU

7.1.1 System startup

After the display and control module is powered by DC24V, it automatically enters the power-on interface.

7.2 Brief Description of BAU Menu

The display control, also known as the BAU screen, is a stack-level management host for battery energy storage systems; it performs numerical calculations, performance analysis, alarm processing, and record storage on the real-time battery data uploaded by the primary BMS (BMU) and secondary BMS (BCU). In addition, it can realize linkage control with PCS, energy storage dispatch monitoring system (EMS), etc., optimize the load control strategy according to the output power requirements and the SOC of each battery group, and ensure the stable operation of all battery systems.

- Supports management of up to 10 battery packs;
- Support monitoring and displaying single cell battery voltage data;
- Support monitoring and display of cluster voltage, current and insulation data;
- Supports display of battery cell, cluster and stack SOC and SOH data;
- Supports monitoring and display of ambient temperature and single cell battery temperature data.

- Support abnormal communication alarm between BMU and BCU, and abnormal communication alarm between BCU and BAU;
- Support single battery overvoltage and undervoltage alarm;
- Support battery cluster overvoltage, undervoltage, overcurrent and insulation alarm;
- Supports alarm for single battery temperature being too high or too low.
- Support single battery voltage overvoltage and undervoltage protection;
- Support battery cluster battery overvoltage, undervoltage, short circuit, and overcurrent protection;
- Support single battery temperature over-high and under-low protection;
- Support online insulation detection, fault detection, thermal management control and protection functions;
- Support local network parameter settings;
- Support TCP/IP and MODBUS communication parameter settings;
- Support basic equipment parameter settings;
- Support battery pack parameter settings;
- Support serial port configuration parameter settings;

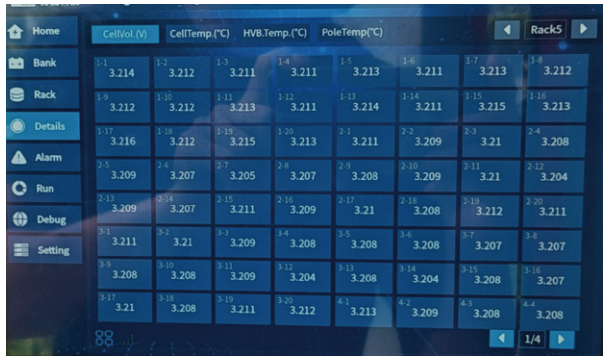


Figure 7-2 Setting interface

08 Fire Instructions

8.1 General

Please comply with fire codes and regulations in the country where your project is located. Regularly inspect and maintain fire-fighting equipment to ensure that all functional indicators are normal.

8.2 Fire Extinguishing Equipment

The container is equipped with a thermal aerosol fire extinguishing system, which is a set of efficient fire extinguishing equipment. It detects through fire detection devices such as smoke detectors and temperature detectors. When an abnormality is detected, a signal is sent through the external terminal of the switch box to the station-level alarm host for fire warning.

Notice

In order to ensure the accuracy of the detector, the detector needs to be functionally tested and calibrated every six months.

8.3 Aerosol Fire Fighting System

A hot aerosol fire extinguishing system is installed in the box. When smoke + temperature alarm occurs in the box, the aerosol fire extinguishing system will automatically start.

09 Troubleshooting

Some fault information and solutions:

Fault	Fault name	Processing
System-level critical failure	Fire warning level >0	Turn off BCU, PCS and air conditioners of all battery clusters.
	Emergency stop button pressed	Turn off the high voltage box, PCS and air conditioner of all battery clusters.
Stack-level critical failure	Water flooding, firefighting, temperature and humidity communication abnormalities	Turn off the high voltage box, PCS and air conditioner of all battery clusters.
Stack-level general failure		
Communication	BAU and BCU communication failure	Shut down the BCU and PCS of the cluster.
	Air conditioning communication alarm	Shut down the BCU and PCS of the cluster.
	I O communication failure	Shut down the BCU and PCS of the cluster.
	PCS communication failure	Shut down the BCU and PCS of the cluster.
PCS	Overcurrent, undervoltage, loss of voltage, overvoltage, etc.	Shut down the BCU and PCS of the cluster.
BCU	Fuse abnormality	Shut down the BCU and PCS of the cluster.
	BCU internal CAN communication failure	Shut down the BCU and PCS of the cluster.
	The total voltage sampling is abnormal.	Shut down the BCU and PCS of the cluster.
	The charging cell is seriously overheated.	Shut down the BCU and PCS of the cluster.

Fault	Fault name	Processing
BCU	The discharge monomer is seriously overheated	Shut down the BCU and PCS of the cluster.
	Battery pole is seriously overheated	Shut down the BCU and PCS of the cluster.
	The voltage sampling line is broken.	Shut down the BCU and PCS of the cluster.
	BMU sampling circuit abnormality	Shut down the BCU and PCS of the cluster.
	Temperature sampling line is broken	Shut down the BCU and PCS of the cluster.
	The main circuit is not connected	Shut down the BCU and PCS of the cluster.
IO	none	
Air conditioner	Air conditioning failure	Shut down the BCU and PCS of the cluster.