SKBES0232-950 Liquid Cooling Energy Storage Cabinet User Manual

Shanghai Sunnic New Energy Technology Co., Ltd

Document Revision History

No.	Version	Revision Date	Revision Overview	Remark
1	A1.0	2024.1.22	First Edition	
2	A1.1	2024.5.16	Structural Optimization	

Profile

This manual provides users with product information, detailed instruction of installing and using, and daily maintenance precautions for the liquid-cooling energy storage cabinet, and does not include all information about the energy storage system. To ensure that the liquid-cooling energy storage cabinet can be correctly installed and used and its superior performance can be brought into play, please read the manual in detail and follow all safety precautions in the manual before transporting, installing, operating, and maintaining the liquid-cooling energy storage cabinet.

The use of this liquid-cooling energy storage cabinet must comply with local laws and regulations on grid-connected power generation. Please keep this manual properly for reference at any time.

Shanghai Sunnic New Energy Technology Co., Ltd reserves the right to continuously improve the product and update the contents of this manual without prior notice. Due to the continuous updates of the product, there may be discrepancies between the actual product and the data. Please refer to the actual product for accuracy.

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Safety Precautions

Liquid-cooling energy storage cabinets are designed and tested in strict accordance with relevant national safety standards. As electrical and electronic equipment, relevant safety regulations must be strictly followed during their installation, functioning, operation and maintenance. Improper use or misoperation may result in:

- Damage to the life and personal safety of the operator or third party.
- Damage to the liquid-cooling energy storage cabinet or other property belonging to the operator/third party.

This chapter mainly explains the warning signs used in this manual and provides safety guidance for the entire use process of the liquid-cooling energy storage cabinet.

Security Statement

In the event of any of the following circumstances, our company reserves the right not to provide quality assurance.

- Shipping damage.
- Damage caused by storage conditions not meeting the requirements of product documentation.
- Improper equipment storage, installation and use.
- Unqualified personnel are allowed to install and use the equipment.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Operation in harsh environments beyond product and documentation specifications.
- Operation beyond the parameters specified in the applicable technical specifications.
- Unauthorized disassembly, modification of the product or modification of the software code.

- Equipment damage caused by abnormal natural environment (force majeure, such as lightning strike, earthquake, fire, storm, etc.).
- The warranty period has expired and the warranty service has not been extended.
- The tasks exceed the installation and operating environments specified in the relevant international standards.

Security Level Definition

Logo	Name	Description	Abbreviation
 Danger	Danger	Failure to comply with the requirements could result in serious personal injury or even death.	
 Warning	Warning	Failure to comply with the requirements may result in personal injury or equipment damage.	
 Prohibition	Static electricity sensitive	Failure to comply with the requirements may result in damage.	
 Notice	Notice	Steps taken to ensure correct operation.	

Safety Guide

 Danger	1) After receiving this product, please first confirm that the packaging of this product is intact. If you have any questions, please immediately contact the transportation company or Shanghai Sunnic New Energy Technology Co., Ltd. 2) The installation and operation of the liquid-cooling energy storage cabinet must be completed by professional technicians who have received special training, have read and are familiar with all the contents of this manual, and are familiar with the safety requirements of the electrical system. 3) It is forbidden to connect or disconnect the liquid-cooling energy storage cabinet, open the cabinet for inspection, or replace components when the cabinet is powered on. Before wiring or inspection, you must first confirm that the DC side (Isolating switch in the high-voltage box) and the AC side upstream circuit breaker of the liquid-cooling energy storage cabinet have been disconnected, and wait at least 35 minutes from the last power-on. 4) Set up obvious signs at the front and rear switches of the liquid-cooling energy storage cabinet to prevent accidents caused by accidental closing of the switch. 5) Put up warning signs or establish safety warning tapes near the operating area. 6) After maintenance and inspection operations are completed, be sure to remove the cabinet door key and keep it properly. 7) During the entire process of maintenance, inspection and other operations on the liquid-cooling energy storage cabinet, the escape passage must be completely unobstructed. It is strictly prohibited to pile up debris in the escape passage or occupy the

	escape passage in any form. 8) The voltage between the positive and negative poles of the energy storage battery pack is very high. If accidentally touched, there will be electric shock or even life-threatening danger. 9) The voltage between the positive and negative poles of the energy storage battery pack is very high. When maintaining the equipment, ensure that the connection between the energy storage inverter and the energy storage battery is completely disconnected. 10) The voltage between the positive and negative poles of the energy storage battery pack is very high. Put up warning signs at the disconnection point to ensure that it will not be accidentally reconnected.
 Warning	1) Make sure there is no other electronic or electrical equipment around the installation location that generates strong electromagnetic interference. 2) Unauthorized modifications to the liquid-cooling energy storage cabinet are strictly prohibited. 3) All electrical installations must comply with local and national electrical codes.
 Prohibition	It is forbidden to open the control room of the liquid-cooling energy storage cabinet without authorization. The electronic components in the liquid-cooling energy storage cabinet are electrostatic-sensitive devices. Anti-static measures must be taken during authorized operations.
	Grounding mark: the liquid-cooling energy storage cabinet must be reliably grounded.
Note: Professional technicians who can perform installation, cable connection,	

commissioning, maintenance, troubleshooting, and replacement of liquid-cooling energy storage cabinets must meet the following criteria:
1) Operators must undergo professional training. 2) The operator must read this manual completely and master the safety matters related to operation. 3) Operators need to be familiar with relevant safety regulations of electrical systems. 4) Operators must be fully familiar with the composition and working principle of the entire energy storage system, as well as the relevant standards of the country / region where the project is located. 5) Operators must wear personal protective equipment.

Safety Precautions

- The product illustrations in this manual sometimes show the product without the cover or safety cover in order to show the product details. When using this product, please be sure to install the cover or safety cover as required and operate according to the manual.
- The product illustrations in this manual are examples only and may be slightly different from the products you ordered. Please refer to the actual ordered products for details.

Unpacking and Acceptance

Warning

- If you find that the product and its accessories are damaged, rusted, or have been used during unpacking, please do not install them!
- If you find that water has entered the product, parts are missing or damaged when unpacking, please do not install it!
- Please check the packing list carefully. If you find that the packing list does not

match the product name, do not install it!

Danger

- Before unpacking, please check whether the outer packaging of the device is intact and whether there is any damage, soaking, moisture, deformation, etc.
- Please open the package in order of layers and do not knock violently!
- When unpacking, please check whether the surface of the equipment and accessories is damaged, rusted, or bumped.
- After unpacking, please check the packing list carefully to see if the quantity and information of the equipment and accessories are complete.

Storage and Transportation Period

Warning

- Please be sure to use professional lifting equipment and have qualified professionals move large or heavy products. Otherwise, there is a risk of injury or product damage!

Danger

- When moving the product, please be sure to lift and place it gently, and always pay attention to objects under your feet to prevent tripping or falling. Otherwise there is a risk of injury or product damage!
- When carrying the product by hand, be sure to hold the product enclosure firmly to prevent product parts from falling, otherwise there is a risk of injury!
- Please store and transport the product in strict accordance with the storage and transportation conditions required by the product, otherwise there is a risk of product damage.
- Avoid storage and transportation in places exposed to water splashing, rain, direct sunlight, strong electric fields, strong magnetic fields, strong vibrations, etc.
- Avoid storing the product for more than 3 months. If the storage time is too long, please implement more stringent protection and necessary inspections.

- Please pack the product strictly before transporting it by vehicle. For long-distance transportation, a closed box must be used.
- It is strictly forbidden to transport this product together with any equipment or items that may affect or damage this product.

Installation

Danger

- Only professionals who have received relevant training on electrical equipment and have electrical knowledge can operate it. Non-professionals are strictly prohibited from operating it!

Warning

- Please be sure to read the product manual and safety precautions carefully before installation!
- Do not install this product in places with strong electric fields or strong electromagnetic interference!
- Before installation, ensure that the mechanical strength of the installation location is sufficient to support the weight of the device, otherwise mechanical hazards may occur.
- During installation, do not wear loose clothing or accessories, otherwise there may be a risk of electric shock!
- When installing the product in a closed environment (such as a cabinet or case), please use a cooling device (such as a cooling fan or cooling air conditioner) to fully cool it down to meet the requirements of the installation environment. Otherwise, it may cause overheating or fire.
- Modification of this product is strictly prohibited!
- It is strictly forbidden to turn the fixing bolts and marked bolts of product parts and components!
- When this product is installed in a cabinet or terminal equipment, the cabinet or terminal equipment needs to provide corresponding fireproof enclosures, electrical protection enclosures, mechanical protection enclosures and other

protective devices. The protection level should comply with relevant IEC standards and local laws and regulations.

- When you need to install equipment with strong electromagnetic interference such as transformers, please install shielding protection devices to avoid malfunction of this product!
- Please install the product on flame-retardant objects such as metal, and do not allow flammable objects to contact the product or attach flammable objects to the product. Otherwise there is a risk of fire.

Notice

- During installation, please cover the air inlet and outlet of the product with cloth or paper to prevent foreign matter such as metal shavings during drilling, oil, and water from entering the product and causing product failure. After the operation, please remove the covering to prevent the covering from blocking the ventilation holes and affecting heat dissipation, causing abnormal heating of the product.

Wiring

Danger

- Non-professionals are strictly prohibited from installing, wiring, maintaining, inspecting or replacing parts of the equipment!
- Before wiring, please cut off the power supply of all devices. After cutting off the power supply, there will be residual voltage in the internal capacitor of the device. Please wait at least for the time specified on the warning label of the product before wiring and other operations. Measure the DC voltage of the main circuit and confirm that it is under the safe voltage, otherwise there will be a risk of electric shock.
- Please turn off the power before performing wiring work, removing the product cover or touching the circuit board, otherwise there is a risk of electric shock.
- Please make sure that the equipment and products are well grounded,

otherwise there will be a risk of electric shock.

Warning

- It is strictly forbidden to connect the input power supply to the output terminal of the device or product, otherwise it may cause damage to the equipment or even cause a fire.
- The cables used for wiring must meet the corresponding wire diameter and shielding requirements. The shielding layer of the shielded cable needs to be reliably grounded at one end!
- Please tighten the terminal screws according to the tightening torque specified in the manual. Insufficient or excessive tightening torque may cause overheating and damage of the connection part, resulting in fire hazard.
- After wiring is completed, make sure all cables are connected correctly and there are no fallen screws, washers or exposed cables inside the product, otherwise there may be a risk of electric shock or damage to the product.

Notice

- Please follow the steps specified in the electrostatic prevention measures (ESD) and wear an anti-static wrist strap when performing wiring operations to avoid damaging the device or the circuits inside the product.
- When wiring the control circuit, please use a twisted-pair shielded wire and connect the shielding layer to the grounding terminal of the product for grounding; otherwise, the product may malfunction.

Power On

Danger

- Before powering on, please make sure the product is properly installed and the wiring is secure.
- Before powering on, please make sure that the power supply meets the product requirements to avoid product damage or fire!
- It is strictly forbidden to open the product cabinet door or product protective

cover, touch any terminal of the product, or disassemble any device or component of the product when the power is on; otherwise there is a risk of electric shock!

Warning

- After completing the wiring work and parameter setting, please conduct a test run of the machine to confirm that the machine can operate safely. Otherwise, personal injury or equipment damage may occur.
- Before powering on, please make sure that the rated voltage of the product is consistent with the power supply voltage. If the power supply voltage is incorrect, there is a risk of fire.
- Before powering on, make sure there are no people around the product or machine, otherwise injury or death may result.

Runtime

Danger

- Non-professionals are strictly prohibited from operating the product, otherwise there may be a risk of personal injury or death!
- It is strictly forbidden to touch any wiring terminals of the equipment, dismantle any devices or parts of the equipment and products during operation, otherwise there is a risk of electric shock!

Warning

- It is strictly forbidden to touch the device enclosure, fan or resistor to test the temperature, otherwise it may cause burns!
- During operation, avoid other objects or metal objects from falling into the device, otherwise it may cause fire or product damage!

Maintenance

Danger

- Non-professionals are strictly prohibited from installing, wiring, maintaining, inspecting or replacing parts of the equipment!

- It is strictly forbidden to perform equipment maintenance when the power is on, otherwise there is a risk of electric shock!
- After disconnecting the power supply to all devices, wait at least the time specified on the warning label on the product before performing any equipment maintenance or other operations.

Warning

- Please perform daily and regular inspections and maintenance of equipment and products in accordance with the equipment maintenance and servicing requirements, and keep maintenance records.

Reparation

Danger

- Non-professionals are strictly prohibited from installing, wiring, maintaining, inspecting or replacing parts of the equipment!
- It is strictly forbidden to repair the equipment when the power is on, otherwise there is a risk of electric shock!
- When repairing, be sure to shut down the device and confirm that the energy storage system has stopped running before performing maintenance or inspection operations on the equipment.
- After disconnecting all equipment from power, wait at least the time specified on the warning label on the product before inspecting or repairing the equipment.
- Even if all external circuits are disconnected, there is still high voltage between the positive and negative poles of the energy storage battery pack. Some measurement parameters need to be performed under power. Special instruments must be used during the test and measurements must be performed by professionals.
- Do not modify the internal devices of the battery system to avoid danger.

Warning

- Please report equipment repairs in accordance with the product warranty agreement.
- When a fuse blows, a circuit breaker trips, or an Electrical Leakage Circuit Breaker(ELCB) trips, please wait at least the time specified on the warning label on the product before connecting the power supply or operating the machine. Failure to do so may result in personal injury, death, or equipment damage.
- When the equipment fails or is damaged, it is important that professionals perform troubleshooting and repairs on the equipment and products in accordance with the maintenance instructions, and keep maintenance records.
- Please replace the consumable parts according to the product replacement instructions.
- Do not continue to use a damaged machine, otherwise it may cause personal injury or greater damage to the product.
- After replacing the device, be sure to recheck the device wiring and re-set parameters.

Discard

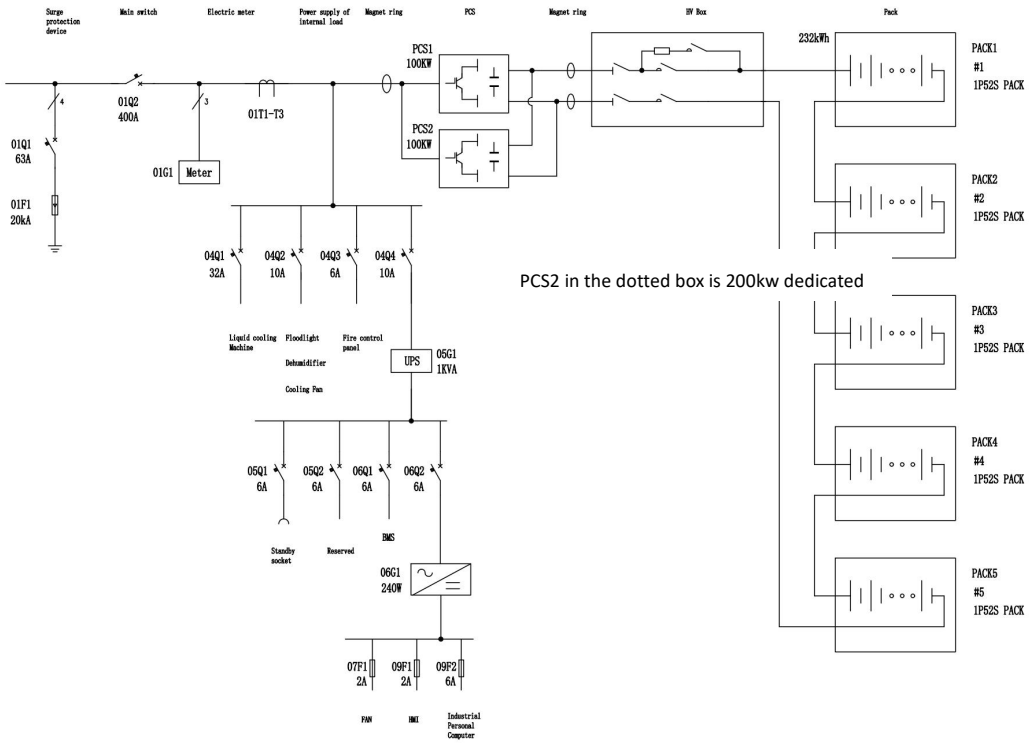
Warning

- Please discard equipment and products in accordance with relevant national regulations and standards to avoid property loss or casualties!
- Please dispose of and recycle discarded equipment and products in accordance with industrial waste treatment standards to avoid polluting the environment.

1. Product Information

1.1 Product Drawings and Working Modes

1.1.1 Energy Storage Cabinet System Diagram



1.1.2 Operation Mode

The liquid-cooling energy storage cabinet supports both grid-connected and off-grid operation modes.

- Grid-connected operation:

The AC side is connected to the power grid, while the DC side is internally connected to a lithium battery. This setup can be used in various applications such as power capacity expansion, solar energy storage and charging, and peak shaving and valley filling. Depending on the chosen operating mode, the lithium battery can be charged or discharged with constant voltage, constant current, or constant power.

- Off-grid operation:

The DC side of the smart energy storage terminal is connected to a lithium battery. When the system is in operation, it can output a three-phase AC voltage with a fixed

frequency and effective value, thereby achieving continuous power supply to the AC side load.

1.2 Nameplate Description

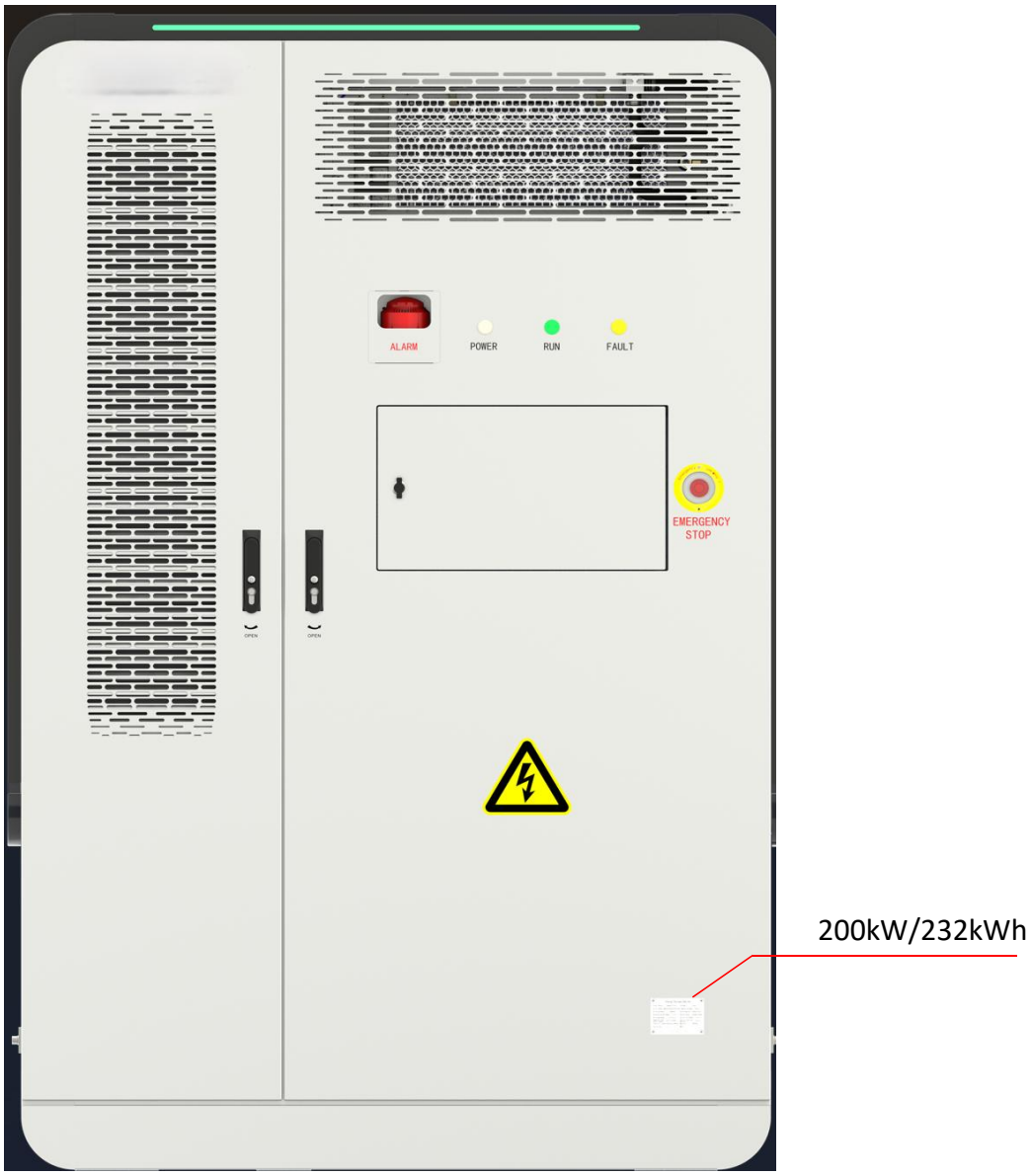


Figure 1: Nameplate Description Diagram

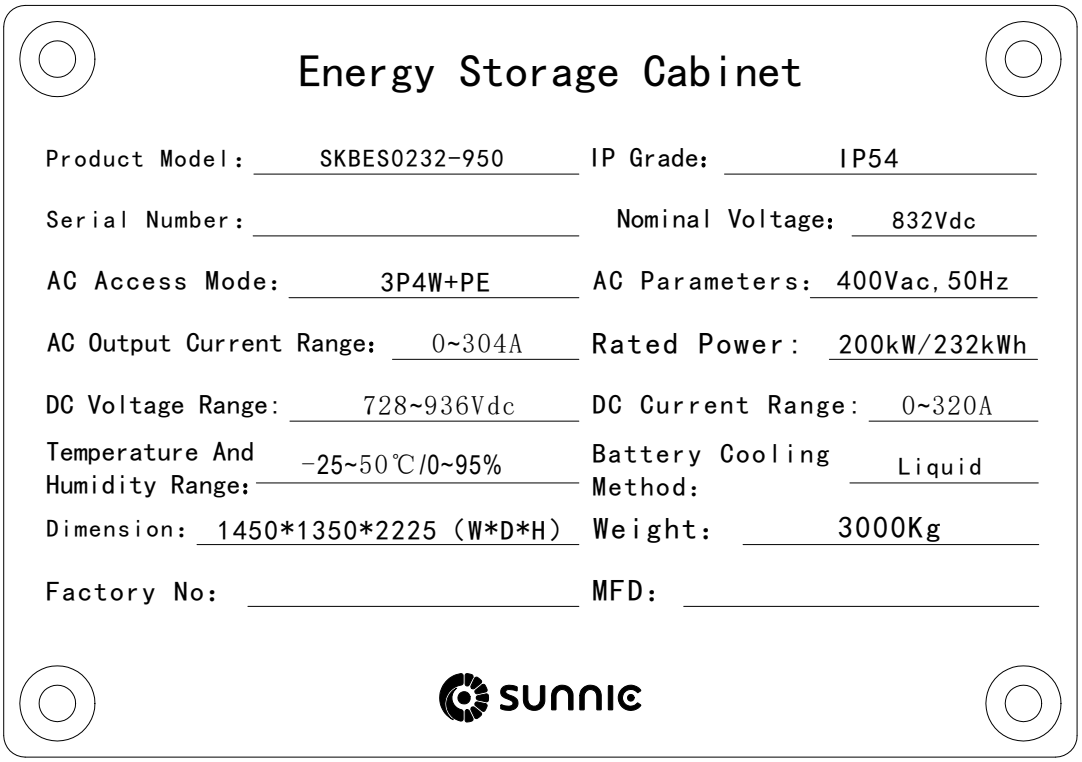


Figure 2: 200kW/232kWh Nameplate Parameter Diagram

1.3 Product Specifications

Table 1: Electrical Specifications

Item		200kW
DC Battery Parameters	Cell Type	LFP3.2V/280Ah
	Battery Pack Configuration	1P52S/46.592kWh
	Battery System Configuration	1P260S
	Battery Voltage Range	728VDC～936VDC
	Battery System Capacity	232kWh
	Temperature Inspection Subject	Battery cell + copper bus
	Charge and Discharge Rate	≤ 1P

AC Parameters (Grid-connected)	Rated Power	200kW
	Maximum Output Power	230kW
	Rated Grid Voltage	400VAC ± 10%
	Rated Grid Frequency	50/60Hz , ± 5Hz
	Power Factor	- 1 (leading) ～1 (lagging)
	AC Current Harmonics (THDi)	<3% (rated output power)
	Feed-in Method	Three-phase four-wire
	Overload Capacity	1.1 times long term
Remark	Expansion Capability	100kW+STS Solution

Table 2: Technical Specifications

Item		Specification
	Overvoltage Protection	AC Type II
	Fire Protection System	Aerosol
Feed-in Method		AC side
Environmental Requirements	Allowable Ambient Temperature	-25 ℃ ～ +50 ℃
	Allowable Ambient Humidity	0～95%RH without condensation
	Maximum Operating Altitude	2000m
	Protection Level	IP54
	Cooling Method	PCS air cooling/battery liquid cooling

1.4 Component Description

1.4.1 Component Diagram and Description

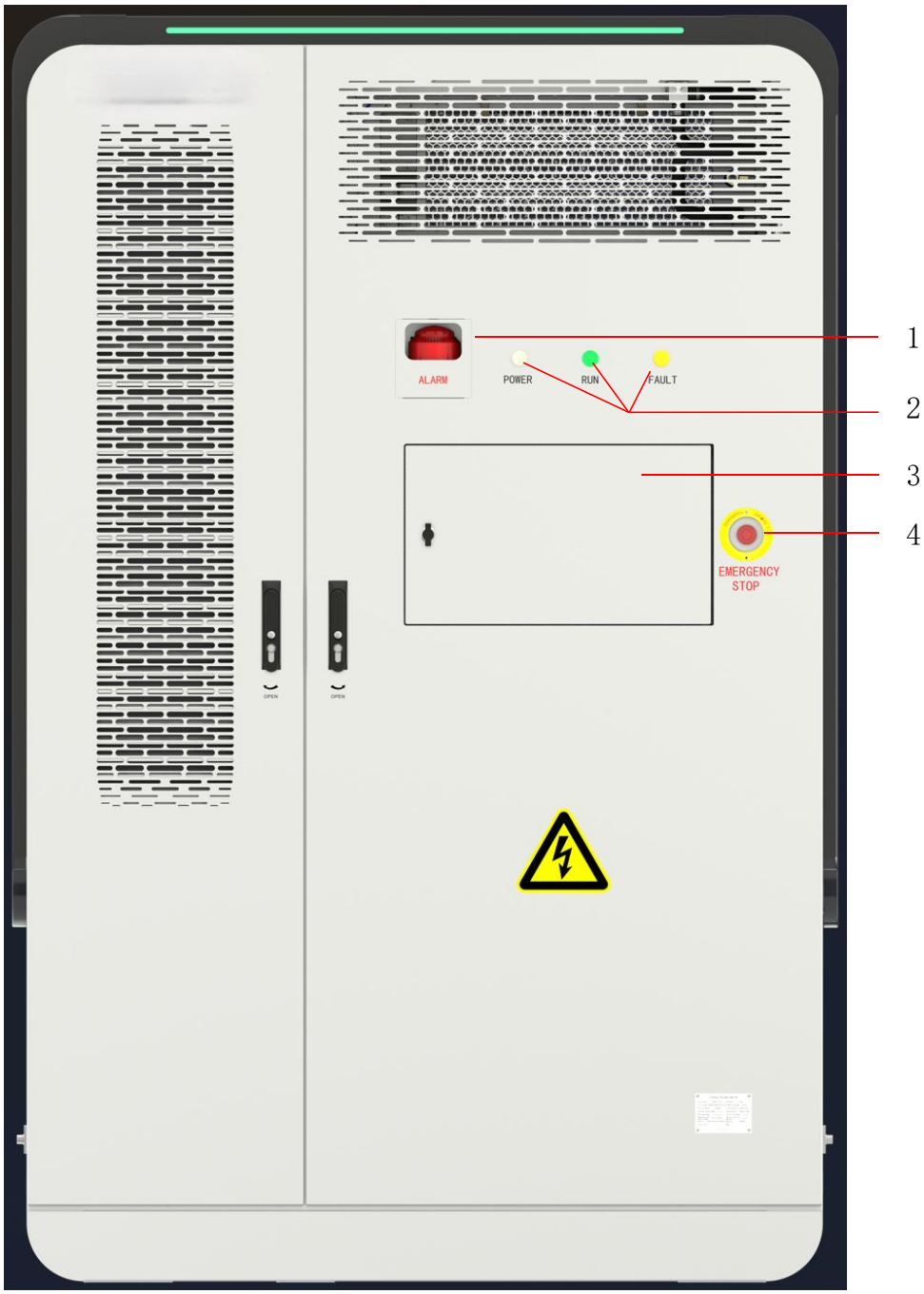


Figure 3: Front View (Door Closed)



Figure 4: 200kW/232kWh (Door Open)

Table 3: Component Description Diagram

No.	Name	Description
1	Sound and Light Alarm	The sound and light alarm will trigger a buzzer sound when the fire starts or equipment malfunctions.
2	Indicator Lights	. Power indicator light: White, lights up when the liquid-cooling energy storage cabinet is powered on. . Operation indicator light: Green, lights up when the liquid-cooling energy storage cabinet is operating normally. . Fault indicator light: Yellow , lights up when the

		liquid-cooling energy storage cabinet malfunctions.
3	Touchscreen	Liquid-cooling energy storage cabinet system display and operation interface. For detailed information, please refer to *Sunnic LEMS User Manual*.
4	Emergency Stop Switch	When the equipment is in abnormal state, press the button to stop the system operation.
5	PCS	The energy storage inverter is responsible for the energy exchange between the battery pack and the grid.
6	Distribution Box	Turn on and off the power supply in the energy storage cabinet.
7	UPS	Uninterruptible power supply ensures that the liquid-cooling energy storage cabinet can operate normally when the power supply is abnormal.
8	LEMS	The local energy management system is responsible for the energy scheduling and monitoring of the liquid-cooling energy storage cabinet system.
9	Liquid Cooling Unit	Add liquid coolant to cool the battery pack.
10	BMS	The energy storage battery management system (5 liquid-cooling battery boxes +1 high-voltage control box) is responsible for the management, protection and monitoring of the battery pack.
11	Electric Box	
12	Aerosol	Automatic spray to extinguish the fire when the battery cluster is out of thermal control.
13	Fire Panel	When there is a fire hazard in the liquid-cooling energy storage cabinet, the system will automatically activate the fire extinguishing device.

Remark:

- PCS : Power Conversion System.

- UPS : Uninterruptible Power Supply.
- LEMS : Local Energy Manage System.
- BMS : Battery Management System.

1.4.2 Energy Storage Battery System

1.4.2.1 Battery Box

The battery box contains 52 cells and a CSC (Cell Supervision Circuit). A battery box contains 8 NTC temperature sampling units, and the CSC collects the voltage, current, and temperature of the cells inside the battery box.

Table 4: Battery Box Technical Parameters

Item		Specification
Basic Parameters	Nominal Power	46.592kWh
	Number of Cells	52
	Monthly Self-discharge Rate of Battery Cells	≤3.5% ,25 ℃,30%SOC
	Voltage Range	145.6VDC ~ 187.2VDC (Cell : 2.8VDC ~ 3.6VDC)
	Rated Voltage	166.4VDC
	Rated Charge and Discharge Rate	1P
	Maximum Continuous Current	320A 1min
	Balance Method	Passive Balance
Working Environment	Electric Box Operating Temperature Range	Charging: 0～55 ℃ ; Discharging: -20℃ ~ + 55 ℃
	Storage Temperature	-30 ℃ ~ +60 ℃
	Recommended Operating	21 ± 3 ℃ , average 21 ℃

	Temperature	
Auxiliary Power Supply General Parameters	Control Circuit Voltage Range	20VDC~26VDC
	Control Circuit Power Consumption	2W
	Size	810mm × 1152mm × 243.4mm
	Weight	330 ± 10kg
	Protection Level	IP66
	Cooling Method	Liquid cooling
	Communication Method	CAN
Testing and Certification	Battery Module	UN38.3 UL9540A (V3)

1.4.3 Liquid Cooling Unit

The liquid cooling unit is used to regulate the temperature of the battery pack in the energy storage system to ensure that it always operates within the appropriate temperature range to maintain the optimal working state of the system.

1.4.3.1 Coolant Filling

Filling is the first time to add coolant to the chiller. The operation steps are as follows:

1) Open the terminal pipeline valve to ensure that all terminal branches remain connected.
2) Use a pipe to connect the outlet of the replenishment pump to the replenishment port of the chiller, and connect the inlet of the replenishment pump to the filling port of the unit's water system through a quick connector.
3) Open the mini ball valve at the injection port.
4) Power on the unit, enter the local automatic mode, open all valves, and issue

the "automatic liquid replenishment start" command at the same time. At this time, the liquid replenishment pump is turned on, and it can be observed that the pressure sensor readings at the inlet and outlet of the water system gradually increase. When the pressure sensor increases to 2.5 bar, stop replenishing.

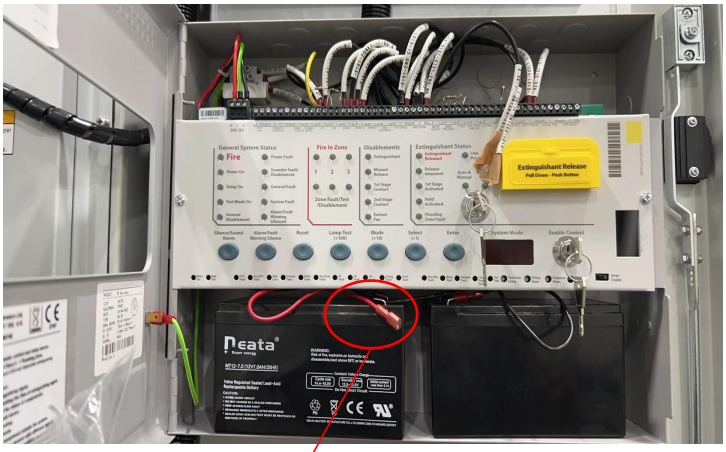
5) Turn off the power to the unit, close the maintenance ball valve at the injection port, and remove the injection pump.

For detailed liquid replenishment procedures, please refer to the liquid cooling unit manufacturer's instructions.

1.4.4 Fire Protection System

Table 5: Fire Protection System Composition

No.	Main Components
1	Host: Fire alarm control device for energy storage power station
2	Detectors: Carbon monoxide, smoke and temperature detection devices for energy storage power stations
3	300g aerosol fire extinguishing device



①



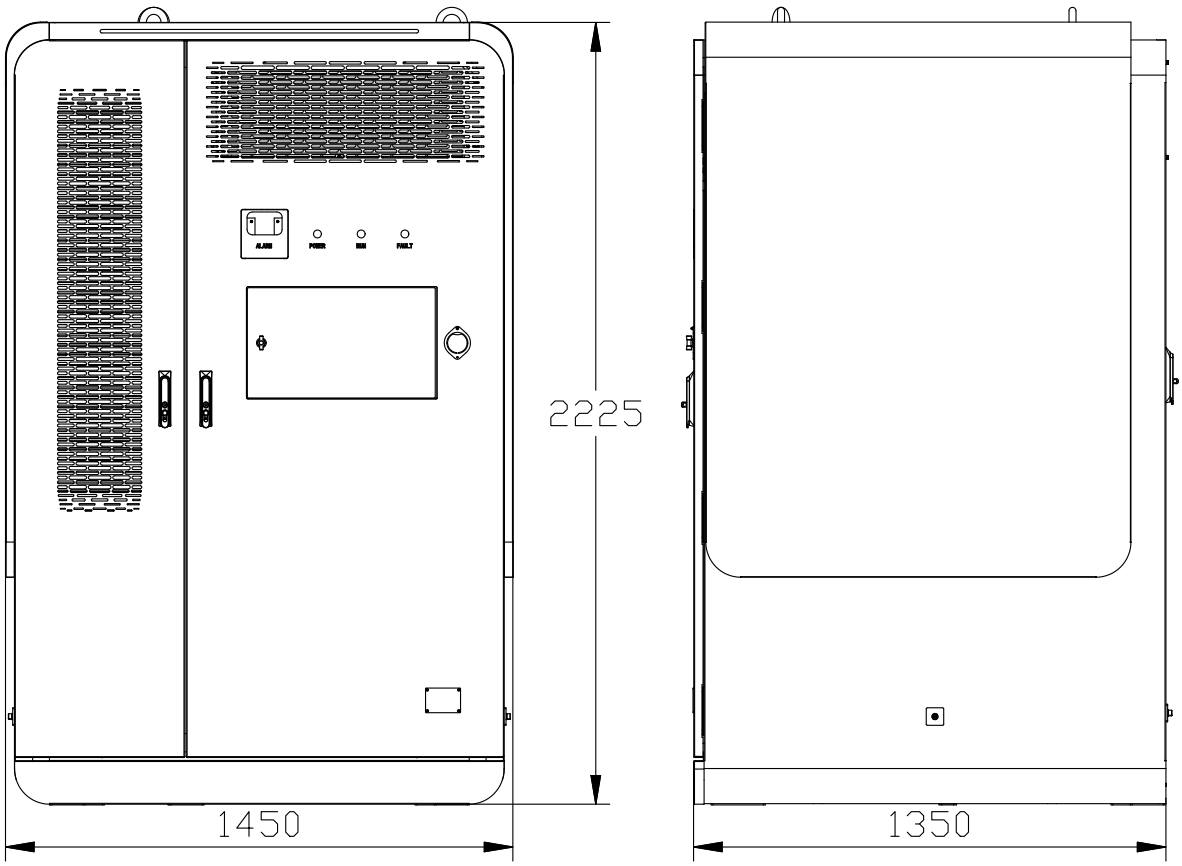
②

Note: Before the liquid-cooling energy storage cabinet is transported, the connections ① and ② in the picture will be disconnected. After the on-site installation is completed, the two groups need to be connected to the corresponding positions before the power is officially turned on.

- Position the connector by inserting it into the terminals of the backup battery.
- Position the connector by plugging it into the green terminal as shown in the figure.

If this part of the wiring is not completed, an audible alarm will sound inside the fire panel.

1.5 Product Size



Weight: 3000kg

Figure 5: Product Dimensions (unit: mm)

2. Unpacking and Transfer

2.1 Unpacking

2.1.1 Unpacking and Inspection

After unpacking, the following items must be checked:

Table 6: Inspection After Unpacking

No.	Check Item	Completion
1	There is no damage, scratches, dents, etc. on the appearance.	☐
2	The product is ordered with a complete range of options.	☐
3	The nameplate information is consistent with the ordered product model.	☐
4	The warning label should not be damaged, scratched, blurred, etc.	☐

2.1.2 Unpacking Notes

- It is not allowed to remove the packaging of the liquid-cooling energy storage cabinet during storage, and it can only be removed when it is installed.
- When receiving goods from the transportation company, be sure to carefully inspect the products and check each item received against the delivery note . If any goods are missing or damaged, notify the transportation company immediately upon discovery.
- Before unpacking, please check whether the outer packaging of the product is intact and whether it is damaged, soaked, damped, deformed, etc.
- Please open the package in order of layers. Heavy knocking is strictly prohibited!
- When unpacking, please check whether the product and its accessories have any damage, rust, or bumps on the surface.

2.2 Storage

- When storing, please pack the products in our company's packaging boxes according to the original packaging.
- Keep the temperature between -35℃ and +60℃.
- The device must be placed in a clean and dry space, and avoid being placed in environment with water splashing, rain, humidity, high temperature or intense direct sunlight.
- There are no harmful gases, flammable, explosive products or corrosive chemicals in the storage space.
- When storing for a long time, the modules must be covered or appropriate measures must be taken to ensure that they are protected from contamination and environmental influences.
- Avoid mechanical shocks, heavy pressure, strong electric fields and strong magnetic fields.
- Avoid direct sunlight, keep the distance from heat sources ≥2m , the packaging box should be ≥20cm off the ground, and ≥50cm away from walls, windows or air inlets.

Notice:

- Under the above conditions, products stored for more than 3 months need to be recharged.
- Under the above specified conditions, products stored for more than 6 months must undergo capacity verification testing.
- Under the above conditions, products stored for more than 1 year must be re-inspected and can only be used after passing the inspection.

2.3 Transportation

2.3.1 Transportation Tools Preparation

Table 7: Mechanical Installation Tool List

Tool	Quantity	Instructions for Use
Forklift	1	For indoor and outdoor transportation (forklift rated lifting capacity is not less than 3t)

2.3.2 Forklift Transportation

Notice:

- A test fork is required. If it is not suitable, the forklift foot position needs to be adjusted. After the test fork is suitable, lift the liquid-cooling energy storage cabinet and move it to the appropriate position.
- During transfer, the tilt angle of the liquid-cooling energy storage cabinet must be less than 5° and the fluctuation height must be as low as possible.
- It is forbidden to use hydraulic cart to transport over long distances or on slopes, otherwise the hydraulic cart may be damaged.
- Lifting and lowering needs to be done gently to avoid shock or vibration. When lowering the forklift, be careful not to press on your feet.
- Considering that the equipment is high and may obscure the driver's view, it is recommended to arrange personnel to guide the driver as appropriate.

2.3.3 Transfer before Unpacking

2.3.3.1 Transfer Method

The unpacked items are transported by forklift.

2.3.3.2 Forklift Transfer Steps

The packaged liquid-cooling energy storage cabinets are moved by forklift on the pallet below the packaging, and the operators must be trained.

Adjust the width of the forklift foot so that the center of gravity falls in the middle of the forklift foot. Insert it in the position shown in the figure below.

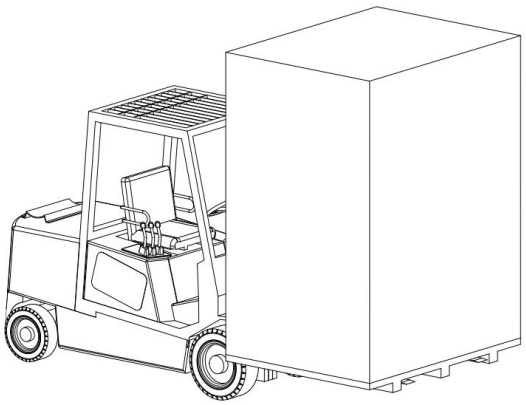


Figure 6 Forklift Transfer Diagram

2.3.4 Transfer after Unpacking

Notice:

- When using equipment transfer, try to transport it on wooden boards after unpacking. Inverted or sideways transfer is not permitted.

Forklift Transfer:

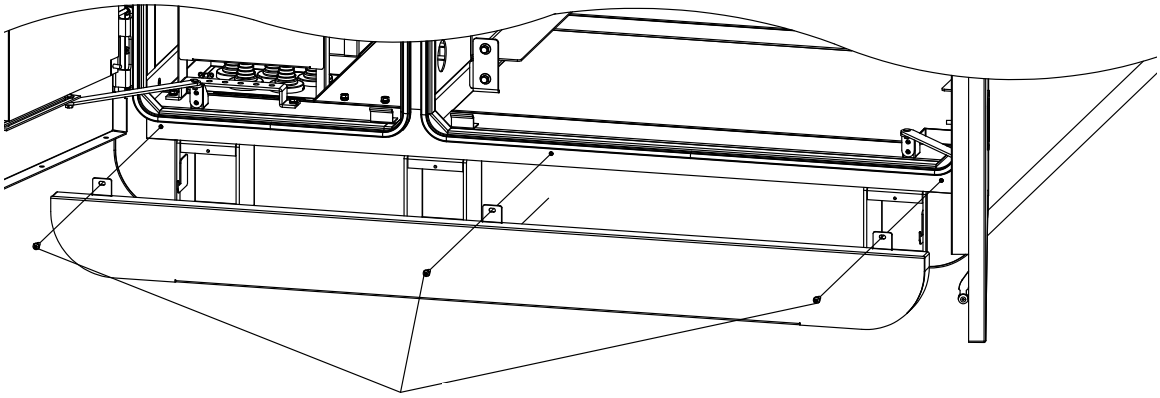


Figure 7: Removing the Front Cover of the Cabinet Front Base Diagram

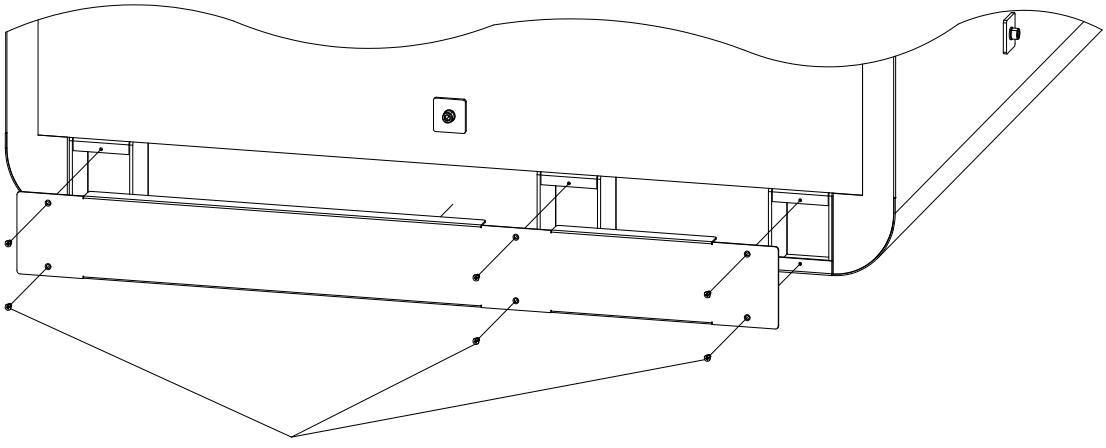


Figure 8: Removing the Rear Cover of the Cabinet Rear Base Diagram

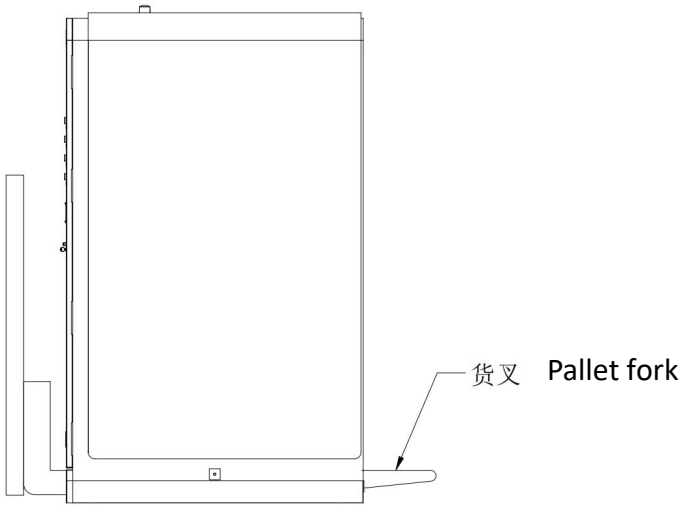


Figure 9: Forklift Transfer without Packaging Diagram

Crane Transfer:

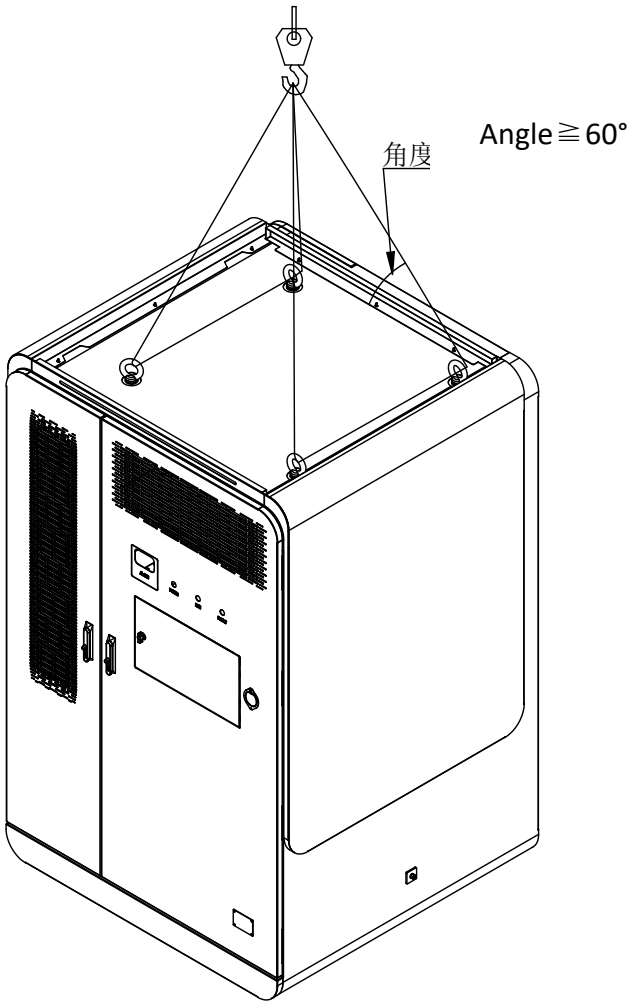


Figure 10: Crane Transfer without Packaging Diagram

3. Mechanical Installation

3.1 Safety Warning

During installation, ignoring the following safety tips may result in equipment damage, personal injury or serious casualties. Please strictly follow the following safety tips.

Danger:

- The installation must be performed by professionals and all warnings must be followed to ensure the equipment is installed correctly.
- Before installation, ensure that the mechanical strength of the installation location is sufficient to support the weight of the device, otherwise mechanical hazards may occur.
- Do not wear loose clothing or accessories during installation, otherwise there may be a risk of electric shock!

Notice:

- To facilitate installation and maintenance, it is recommended to leave enough space around the equipment: sufficient cooling airflow, required clearance, and space required for cables and cable support structures.
- Make sure any spanning components or racks where components are mounted are properly grounded and that the connecting surfaces are unpainted.

3.2 Preparation before Installation

3.2.1 Installation Environment Requirements

Table 8: Installation Environment Requirements

Item	Environmental Requirements

Installation Site Requirements	- Good ventilation must be maintained. - The air inlet and outlet must be professionally protected from rain, wind, sand and dust. - Try to install the product without trees around it to prevent strong winds from blowing down branches or leaves that may block the product door or air inlet. - The installation location should be as far away from rivers and lakes as possible. - Necessary fireproofing, waterproofing and rodent-proofing treatments are required. - Keep away from areas where toxic and harmful gases are concentrated. - Keep away from flammable, explosive and corrosive substances. - Whenever possible, choose a site that is relatively close to a water source supply for fire fighting.
Foundation Requirements	- The installation surface must be flat and dry, and no water accumulation is allowed on the ground. - Make sure the ground is level without wobbling and can carry the weight of the liquid-cooling energy storage cabinet.
Space Requirements	Sufficient space must be left in the front, back, left, right and top of the liquid-cooling energy storage cabinet for heat dissipation, maintenance and escape. See *3.2.2.2 Installation Space Requirements* for details.

Notice:

- The intrusion of moisture can easily damage the energy storage terminal. To ensure the normal use of the energy storage terminal:
- Do not open the cabinet door when the air humidity is 95% .
- Avoid opening the cabinet door, performing maintenance or overhauling, and

other operations in rainy or humid weather conditions.

3.2.2 Installation Site Requirements

3.2.2.1 Foundation Requirements

The liquid-cooling energy storage cabinet must be installed on concrete or other non-flammable surfaces. The installation plane must be level, firm, flat , and have sufficient bearing capacity. No dents or tilts are allowed. When constructing the foundation, it is necessary to consider the outlet of the liquid-cooling energy storage cabinet and reserve trenches or inlet holes. Please refer to the following figure for the installation hole location diagram:

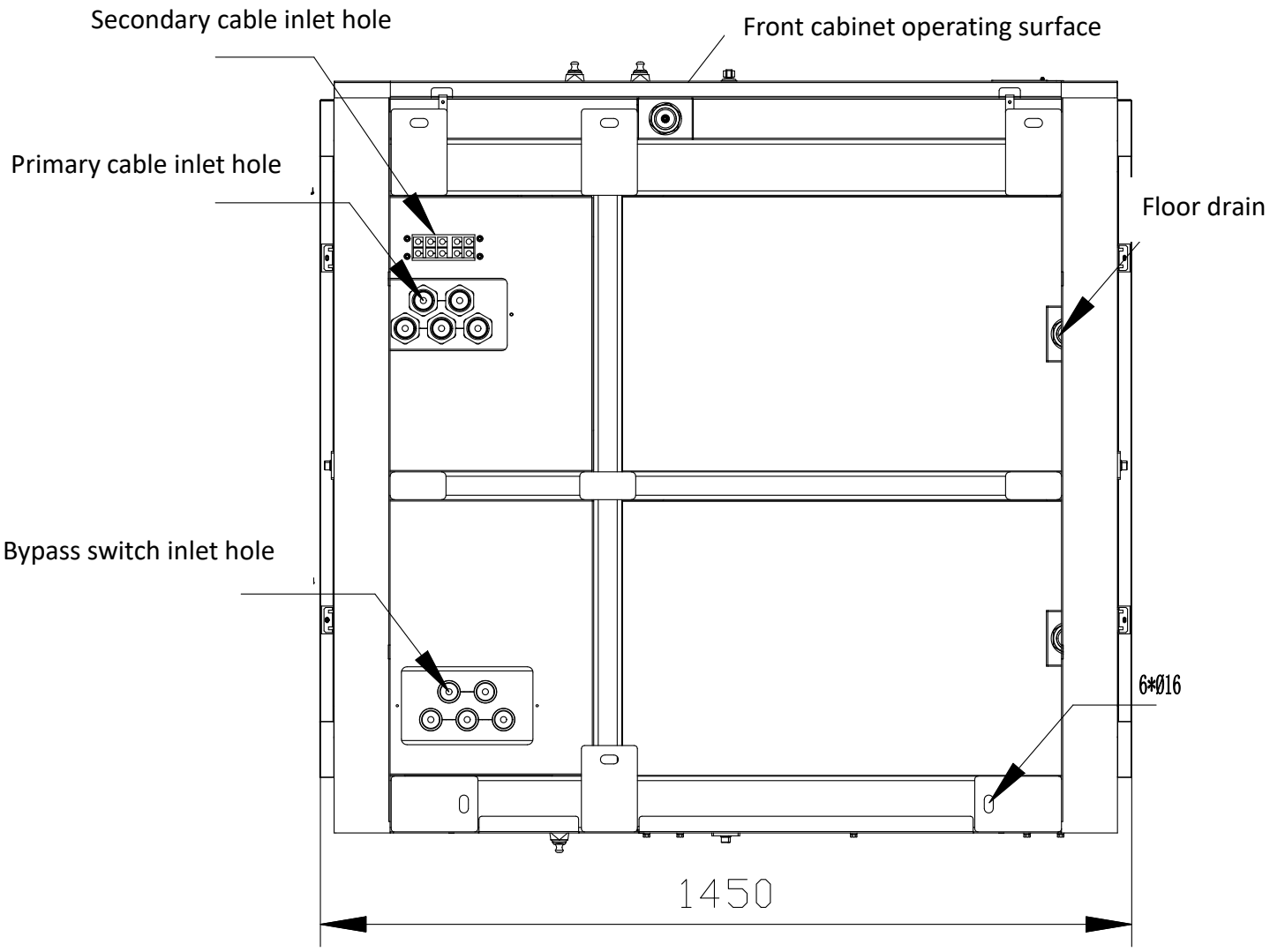


Figure 11: The Bottom of the Device (unit: mm)

3.2.2.2 Installation Space Requirements

Space requirements for parallel installation of liquid-cooling energy storage cabinets:

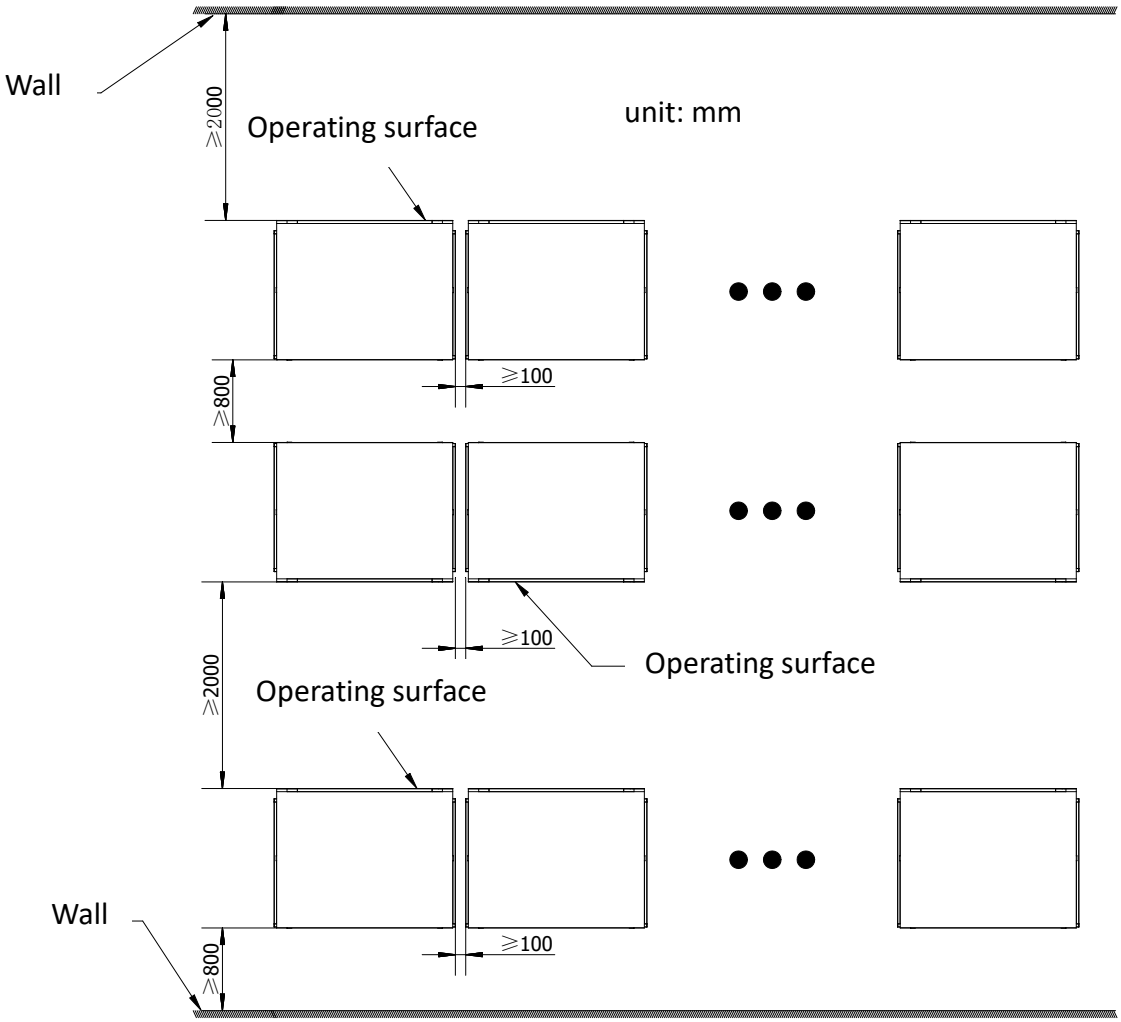


Figure 12: Installation Space Requirements for Liquid-cooling Energy Storage Cabinets (unit: mm)

Notice:

- When moving the liquid-cooling energy storage cabinet, it must be handled with care.
- When placing the cabinet, make sure that the installation surface has no dents and is not unable to bear the weight of the liquid-cooling energy storage cabinet.

3.3 Post-installation Inspection

After the installation is completed, please check each item according to the table below and tick the items that meet the requirements.

No.	Items	Treatment	Confirmation
1	The liquid-cooling energy storage cabinet shall be installed on the pre-designed fixed points as required and shall not be loose.	If it is loose, tighten the screws again.	☐
2	The installation space complies with the space dimensions recommended in "*3.2.2.2 Installation Space Requirements*" .	If there is insufficient space, it is recommended to redesign the outer cabinet before installation.	☐
3	Check whether the cooling circuit is circulating normally.	If abnormal, please adjust the position of the water pipe.	☐

4. Electrical Installation

4.1 Terminal Description

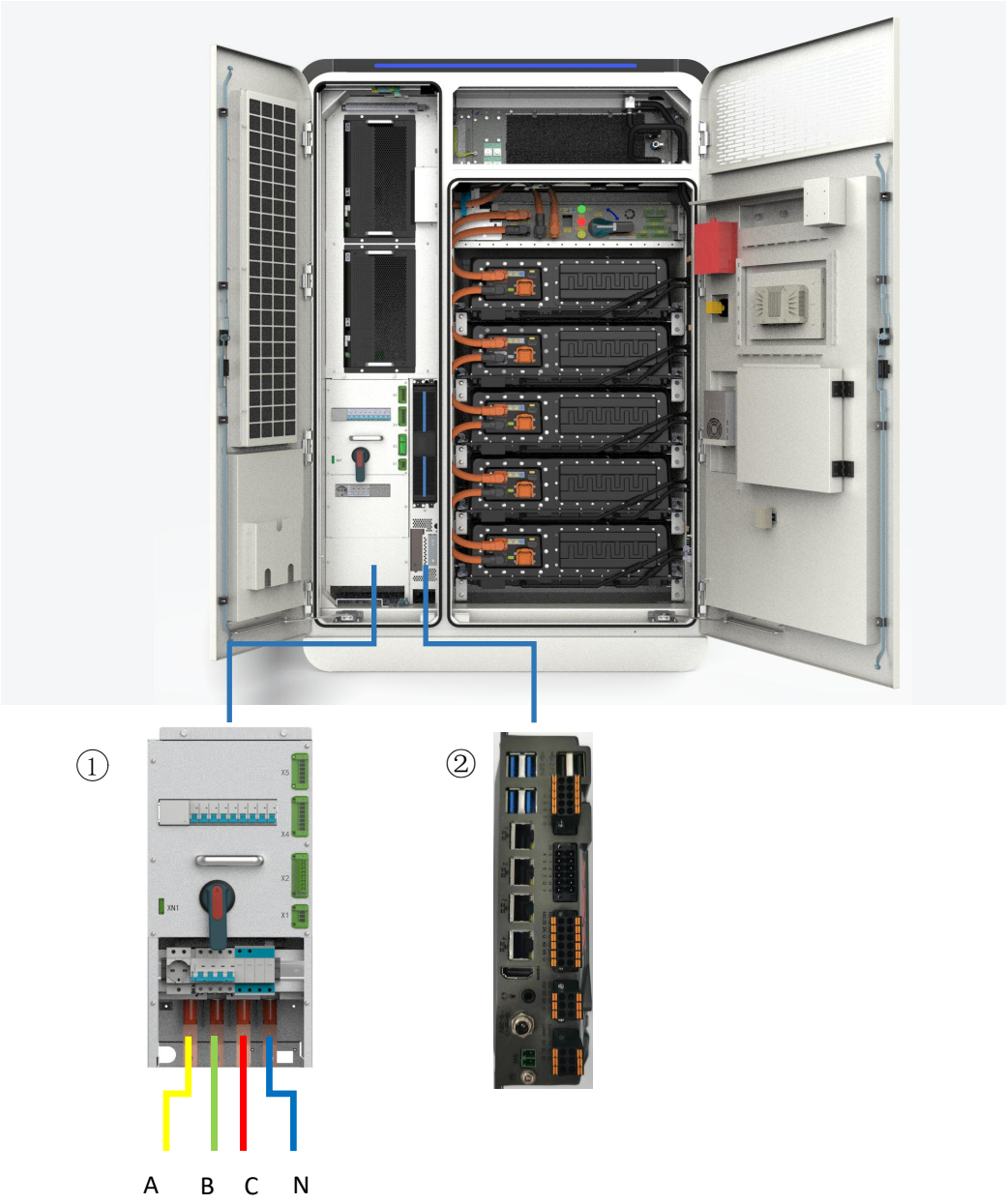


Figure 13: Terminal Distribution Diagram

Table 9: Terminal Description

No.	Item	Clarification
①	A phase, B phase, C phase, N phase	AC side wiring copper bar, from left to right ABCN
②	Network port	Network port 3 is the external network interface (please refer to the following diagram for parallel wiring)

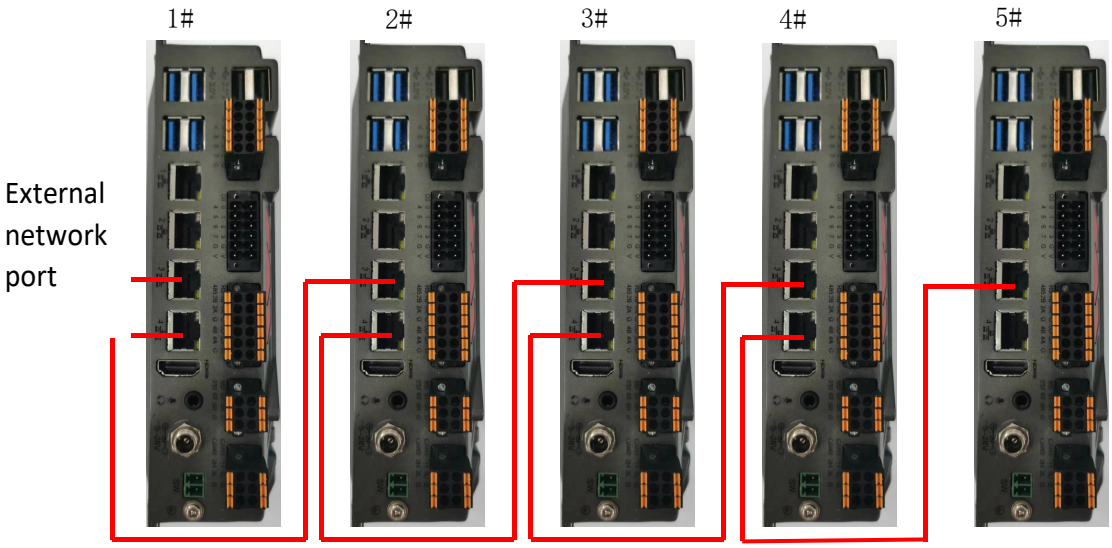


Figure 14: Parallel Wiring Diagram

Note: The red line in the diagram uses CAT-5E and above network cables.

4.2 Safety Warning

To ensure the safety of the installers, necessary safety precautions must be taken when performing electrical installation of this product. The following procedures must be followed when performing electrical installation:

Danger:

- Only professionals can install the liquid-cooling energy storage cabinet, and the installation process must strictly follow the instructions in the user manual.

- The installer must comply with the relevant electrical operating regulations of the country or region in which they are located.
- Installation is not allowed when the power is on; otherwise there is a risk of electric shock.
- Before installation, all switches of the liquid-cooling energy storage cabinet and the external front stage must be disconnected, and wait for 35 minutes to confirm that all cables and the inside of the liquid-cooling energy storage cabinet are in a power-free state.
- A warning sign must be left at the disconnected position to prevent the power from being reconnected during installation.
- Necessary grounding and short-circuit connections must be made.
- Parts with electricity must be handled as necessary and isolated with insulating materials to avoid harm to personnel.

4.3 Preparation before Wiring

4.3.1 Installation Tool Preparation

Table 10: Electrical Installation Tools

Tool Name	Quantity	Use Instruction
Flexible Torque Wrench	1	Fasten nut
Sockets & Wrenches	1 set	The maximum torque must be greater than 45N·m
Phillips Screwdriver	2	For M6,M5,M4 screws
Automatic Stripping Machine	1 set	Strip the cable outer sheath
Steel Ruler	1	Measure wire length

Automatic Crimping Machine	1 set	Crimp the wire core, sealing plug with sheet-type jack and wire ear
Impact Drill	1 set	Drill holes for expansion bolts
Multi-meter	1 set	Check whether the equipment wiring is normal
Heat Gun	1	Heat shrink terminal head production
Digital or Bubble Level	1	Measure equipment installation level
Claw Hammer	1	Expansion bolt installation
Steel Tape	1	For equipment installation and positioning
Wire Cutters	1	Cut wires and cables
Safety Goggles	1 pair	Personal protective equipment
Safety Shoes	1 pair	Personal protective equipment
Safety Gloves	1 pair	Personal protective equipment

4.3.2 Cable Preparation

Table 11: Terminal Cable Manufacturing Recommendation for 200kW All-in-one Cabinet

Terminals	Rated Voltage	Rated Current	Terminal Model	Cable Recommendations
Phase A on AC Side	400V AC	342A	TLK120 -10	120mm^2
Phase B on AC Side	400V AC	342A	TLK120 -10	120mm^2
Phase C on AC Side	400V AC	342A	TLK120 -10	120mm^2
Phase N on AC Side	400V AC	342A	TLK120 -10	120mm^2
Ground Wire	-	-	TLK50 -10	50mm^2

External Communications	-	-	RJ45	Category 5 shielded twisted pair cable
485 Communications	-	-	ET0.5 -10	Shielded twisted pair

Notes :

- The communication cable is thin and needs to be protected to avoid being torn by force.
- The recommended cable diameter is the minimum cable diameter when the distance between the liquid-cooling energy storage cabinet and the upper-level distribution cabinet is less than 10m. If the distance is greater than this distance, select the cable diameter based on the actual distance on site.
- The cables must meet the voltage insulation level and must be provided with necessary protection to prevent the cable insulation from being scratched or damaged.

4.4 Inspection before Wiring

Before wiring, please make sure to complete the following inspections.

Table 12: Pre-wiring Checklist

No.	Check Items	Confirmation
1	The wiring cables have met the corresponding wire diameter and shielding requirements.	☐
2	The equipment and products are well grounded.	☐
3	Follow the steps specified for electrostatic discharge prevention (ESD) and wear an anti-static wrist strap.	☐
4	Related options for wiring are ready.	☐

4.5 Enclosure Grounding

Connect the grounding wire of the liquid-cooling energy storage cabinet. The grounding points are located on both sides of the cabinet and at the lower right corner of the back (Refer to the bellowing figure).

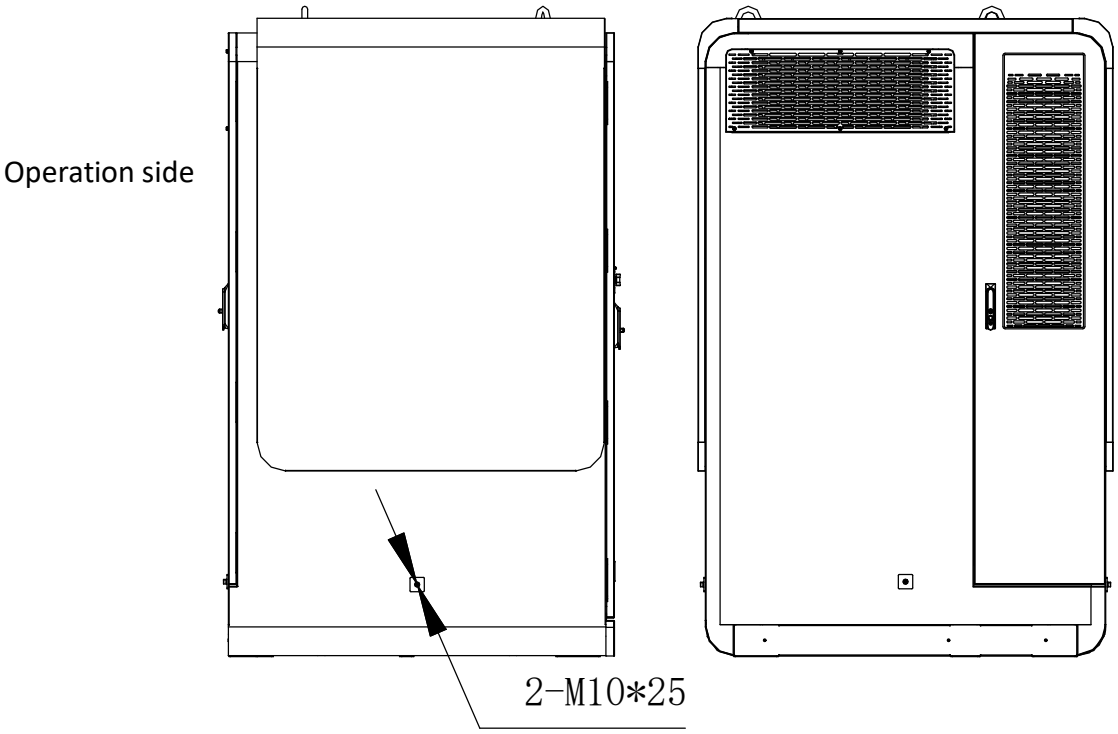


Figure 15: Grounding Location Diagram

4.6 Inspection after Wiring

After wiring is completed, in order to avoid equipment damage and property loss,the following items must be checked and measured again:

Table 13: Post-installation Checklist

No.	Check Items	Completion
1	Before measurement,disconnect the switches on the battery side and the grid side to ensure that the converters on DC and AC side are not energized.	☐
2	The positive and negative connections and AC phase sequence between the battery and the converter are correct and tight.The	☐

	insulation resistance of the three phases should be measured at Meg ohm level. If it is K level or less, the line should be checked.	
3	The external control cables,grounding cables,and communication cables are fastened.	☐
4	The resistance of the ground cable is less than 0.1Ω. Ensure that the cable is intact and free from damage or cracks.	☐
5	Clean the installation area. No tools or foreign bodies are missing in the installation area.	☐

5. Debugging and Running

5.1 Pre-operation Inspection

Before running,check the following items:

Table 14: Pre-operation Checklist

No.	Check Items	Confirmation
1	Check whether the liquid-cooling energy storage cabinet and devices have condensation (water film or water droplets on the surface). If yes, the cabinet fan must be opened for ventilation until the phenomenon disappears. Check pipe connections to ensure that no leakage occurs.	☐
2	Measure whether the incoming line voltage of the liquid-cooling energy storage cabinet is within the specified range, and confirm that no faults such as phase loss and short circuit exist.	☐
3	Power input terminals (A, B, C, and N) must be properly connected and secured.	☐
4	The liquid-cooling energy storage cabinet must be reliably grounded.	☐
5	The control signal cables are connected correctly.	☐
6	The distribution terminal is intact and insulated.	☐

7	There are no foreign bodies such as wire heads and metal chips inside and outside the liquid-cooling energy storage cabinet that may cause short circuits of signal cables and power cables.	▭
8	The cooling circuit is functioning normally.	▭

5.2 Boot Procedure

After the check is correct before starting, the energy storage liquid cooling energy storage cabinet can be started.

1. Measure the incoming line voltage. If it is within the range of 400V±10%,close the incoming line circuit breaker 01Q2. The white indicator lights up.
2. Close the front-end surge protection circuit breaker 01Q1.
3. Close the mains power supply circuit breaker 04Q1~4,and the liquid cooling unit,lighting,fire panel,etc. will be powered.
4. Open the fire panel, connect the battery power supply positive and negative cables, and connect the aerosol control cable (Refer to 1.4.4 for details).
5. If the indicator light on the UPS panel is not on,you need to press and hold the power button on the UPS panel (about two seconds) until it turns on after a "beep" sound and enters online mode.
6. Close the switch power input circuit breakers 05Q1~Q2,06Q1~2,the switch power supply is running,the 24VDC power supply in the cabinet is turned on,and the power indicator of the liquid cooling energy storage cabinet is on. The industrial computer is powered on,and the power indicator of the industrial computer and the network cable indicator light up. After the industrial computer starts, it is connected to the network. The low voltage LV indicator of the high voltage box lights up.
7. Insert the MSD into each pack and close the isolating switch on the high voltage box.
8. After the power-on is completed,set the parameters on the HMI screen (refer to

Sunnic LEMS User Manual).

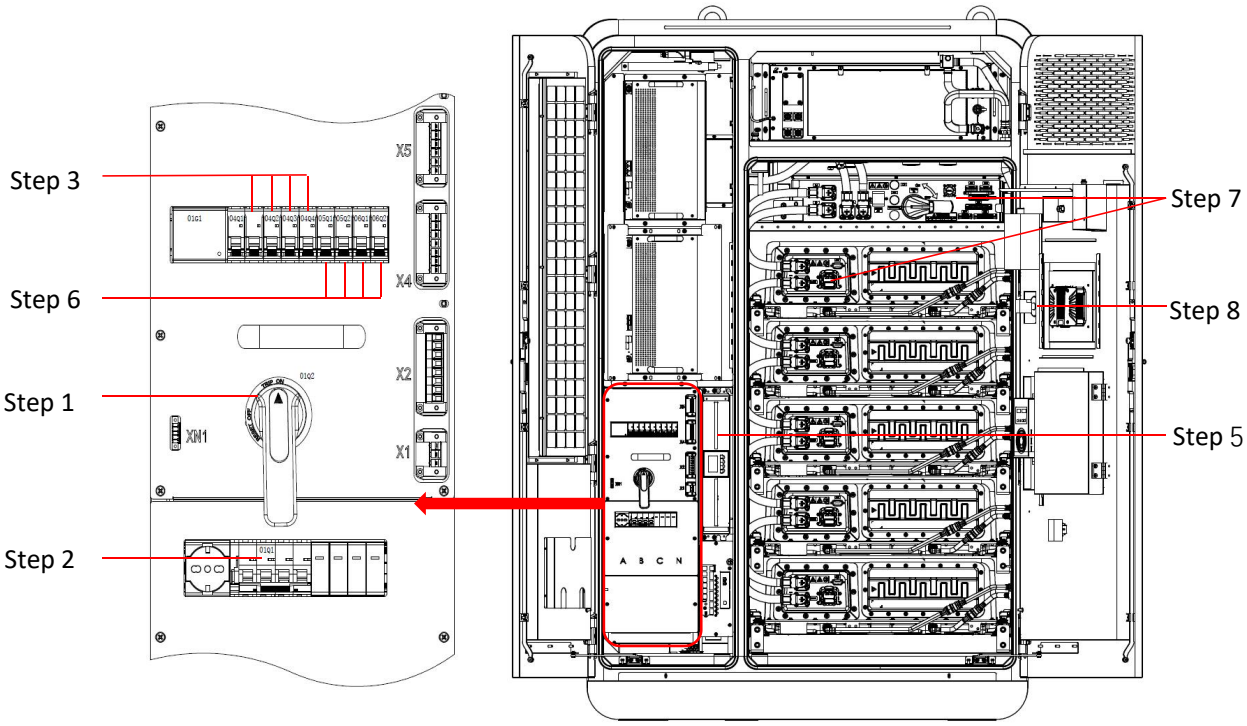


Figure 16: Boot Procedure

Notice:

The liquid-cooling energy storage cabinet must be started in strict accordance with the above steps,otherwise it may be damaged or cause the liquid-cooling energy storage cabinet to malfunction.

6. LEMS System Operation

Refer to *Sunnic LEMS User Manual* for details.

7. Preventive and Corrective Maintenance

The ambient temperature, humidity, dust, and vibration may cause the components in the liquid-cooling energy storage cabinet to age, which may cause potential faults of the liquid-cooling energy storage cabinet or reduce the service life of the cabinet. Therefore, it is necessary to implement daily and regular

maintenance work for the integrated storage cabinet.

Notice:

- Only qualified personnel can maintain the liquid-cooling energy storage cabinet.
- There is strong electricity in the cabinet,so necessary safety precautions must be taken before starting maintenance.
- Before maintenance,make sure the power supply is disconnected.
- During maintenance,correct operating procedures must be strictly followed.
- There are energy storage capacitors inside the liquid-cooling energy storage cabinet. After power is turned off,you must wait for more than 35 minutes to confirm that the converter is in a power-free state before maintenance can be performed.
- After the power is disconnected,a warning sign must be hung at the disconnection point to prevent anyone from powering on during maintenance.
- To avoid unexpected dangers,maintenance personnel should wear insulating protective equipment during maintenance.

7.1 Daily Inspection Items

Daily check items shall be carried out according to the following points:

Table 15: Daily Inspection Items List

No.	Daily Inspection Items	Confirmation
1	The input and output voltage and current as well as the operating status of the liquid-cooling energy storage cabinet need to be monitored in real time,and designated personnel should be assigned to observe at designated locations. If any abnormal operation or voltage and current are found,maintenance should be carried out in a timely manner.	☐

2	Listen for any abnormal noise inside the liquid-cooling energy storage cabinet.	□
3	Smell for any peculiar smell inside of the liquid-cooling energy storage cabinet.	□
4	Read the system internal temperature and observe that the temperature is within the normal range.	□

7.2 Regular Inspection Items

Regular inspection are mainly aimed at areas that are difficult to inspect during daily check and daily operations:

Table 16: Regular Inspection Items List

No.	Regular Inspection Items	Confirmation
1	Check whether the device is damaged or rusted.	□
2	Use a temperature measuring instrument to check the equipment's internal temperature and find no abnormalities.	□
3	Check whether the ventilation,ambient temperature,humidity,dust and other conditions around the equipment meet the requirements.	□
4	Check the cable insulation layer's aging or damaging situation. If any such damage occurs,appropriate insulation measures should be taken or the cable should be replaced.	□
5	Check the connecting bolts' aging or burning situation, and shake them by hand to confirm that they are tightened.	□
6	Check whether the cooling fan is operating normally.	□
7	Check the filter to see if it needs to be cleaned of dust once every six months.	□

If there are other problems, please contact the manufacturer.