HANERSUN

HNESS 230-L

Energy Storage Cabinet User Maunal

100kW / 230kWh

2024 V1.0

Contents

Disclaimer

Before installing, operating, and maintaining the equipment, please read this manual carefully and follow all safety instructions in this manual and instructions on the equipment.

The terms "caution," "warning," and "danger" in this document are not exhaustive of all safety instructions. The company assumes no responsibility for any consequences arising from violating of general safety requirements, design regulations, or operation rules.

Ensure the device is used in an environment compliant with the design specifications. Otherwise, it may cause equipment failure, damage, and personal injury not covered by the warranty.

Please adhere to local regulations and standards when installing, operating, and maintaining equipment.

The safety precautions in this document are only supplementary to local laws and regulations:

Our company assumes no responsibility for the consequences caused by the following situations.

(1) Non-compliance with the rules and safety precautions specified in this manual.

(2) Installation did not follow relevant international or national standards.

(3) Unauthorized modification of products, software, or removal of products components.

(4) Failure to operate by the operating instructions and safety precautions.

(5) Equipment damage due to force majeure, such as earthquakes, fires, storms, etc.

(6) Damage caused by the customer during transportation or storage under conditions not meeting the requirements specified in relevant documents.

Target Audience

This manual is prepared for:

(1) Sales Engineer

(2) System Engineer

(3) After-sale Engineer

(4) Technical Support Engineer

(5) Installation and Maintenance Personnel

Notation Definition

Symbol	Description
	Indicates a highly potentially hazardous result in death or serious injury.
	Indicates a moderately potentially hazardous situation, which if not avoided will result in death or serious injury.
	Indicates a moderate potential hazard, which if not avoided, may result in minor or moderate injury to personnel.
	Supplement important information. "NOTICE" is not a safety warning and does not involve information about personal harm, equipment, or environmental risks.

1. Safety Precautions

Before installing, operating, and maintaining the equipment, please read this document carefully and follow strictly obey all safety precautions on the equipment and within this document. The terms "**caution**," "**warning**," and "**danger**" are used to highlight specific safety instructions, but they do not represent all safety precautions.

The company assumes no responsibility for any consequences resulting from the violation of general safety requirements and safety standards for design, production, and use. Ensure that the device is used in an environment that meets its design requirements. Otherwise, the equipment, malfunction, damage, personal injury, or property damage will not be covered by the warranty.

Comply with local laws and regulations when installing, operating, and maintaining equipment. The safety precautions in this document are only supplementary to local laws and regulations.

1.1.General Requirements

⚠ **Danger**

Do not operate with power

- It is prohibited to install or operate outdoor equipment and cables (including but not limited to shifting equipment, operating equipment and cables, and connecting and disconnecting signal ports) under severe weather conditions such as thunderstorms, rain, snow, and level of wind above 6.
- After the equipment is installed, please remove excess packaging materials in the equipment area, such as cartons, foam, plastic, cable ties, etc.
- In the event of a fire, leave the building or equipment area immediately and press the fire alarm or call the emergency services. Keep yourself and your team far away from the burning equipment area.
- Do not write, damage, or cover warning signs on the equipment.
- When installing the device, use appropriate tools to secure all screws properly.

- Understand the components and functions of energy storage systems and relevant local standards.
- Promptly repair any scratches on the equipment caused by transportation or installation. Avoid prolonged outdoor exposure of equipment with scratches.
- Do not open the device's console panel or alter the internal structure or installation procedures without the manufacturer's consent.

1.2.Personnel Requirements

- The operators should obtain relevant certificates that comply with local regulations.
- Only qualified professionals or trained persons can install, operate, and maintain the equipment.
- Operators must protect and maintain equipment according to relevant safety standards.
- Operators must be knowledgeable in first aid procedures.
- Operators must wear protective equipment and ensure all activities comply with local laws and regulations.
- If construction machinery such as forklifts and cranes are needed on-site, they must be operated by qualified operators.
- Unauthorized replacement of the device's software, casing, or components is prohibited. Any alterations will result in the invalidation of liability and warranty.
- Strict adherence to the user manual is required for all operations. Equipment damaged due to non-compliance with this manual will not be covered by liability or quality guarantees.

1.3.Personnel Safety

⚠ **Danger**

Installation, commissioning, and maintenance of the equipment must be operated by qualified personnel.

- Appropriate protective equipment should be worn during the operation.

- If there is a possibility of personal injury or equipment damage, the operation should be stopped immediately, and practical protective measures should be taken.
- Use tools correctly to avoid personal injury or equipment damage.
- To ensure personal safety and normal use of the equipment, the equipment must be reliably grounded before use.
- When a battery fails, temperatures may exceed the burn threshold of touchable surfaces. Therefore, please avoid direct contact with the battery.
- Do not disassemble or damage the battery. The electrolytes released are harmful to the skin and eyes. Avoid contact with electrolytes.
- Do not place extraneous objects on top of the equipment.
- Do not place flammable and explosive items around the equipment.
- To prevent explosions and personal injury, do not place batteries in a fire. Do not place the battery module in water or other liquids.
- Avoid short-circuiting battery terminals, as this can cause fires, electric shocks, and generate high short-circuit currents.
- When using batteries, please pay attention to the following points:

(1) Take off metal objects on your body, such as watches, and rings.

(2) Use tools with insulation

(3) Wear rubber gloves and do not place tools or metal parts on top of the battery or other components.

(4) Please switch off the charging power source before connecting or disconnecting the battery.

(5) Make sure battery terminals are not short-circuited or grounded unintentionally.

- It is prohibited to use water to clean electrical components inside and outside the cabinet.
- Do not stand, sit, or lean on the sides of the equipment.

1.4.Electrical Safety

Danger

Ensure the unit is intact before connecting the cables. Otherwise, it may cause fire!

Do not connect or disconnect the cables with power. It can create an arc or spark, which can result in fire or personal injury!

- Ensure equipment is properly grounded by installing a PE protective ground wire first during installation.
- Before operating the equipment, check the electrical connections and ensure the equipment is reliably grounded.
- Make sure all electrical connections comply with local electrical codes.
- Get approval from the grid company before connecting to the grid.
- Cable laying should comply with local regulations.
- Appropriate measuring equipment must be used, and local standards and instructions must be followed.
- Before taking any measurements, the operating manual of the measuring device must be read.
- When performing high-voltage operations, special insulated tools must be used.
- When equipment is connected to the system, a safety officer must be assigned to ensure that the switches upstream and downstream are turned off during the installation or maintenance period to avoid electrical shock.
- During the wiring process, two or more operators are not allowed to connect the same wire at the same time.
- During the installation process, each completed item must be inspected once and cross-checked.
- Before connecting the power cable, please confirm that the label on the power cable is correct.
- If the device has multiple inputs, disconnect all inputs before operating the device.
- When wiring, the distance between the cable and the heating component or heating area should be no less than 30 mm. Avoid damaging the cable insulation.

- Cables of the same type need to be bundled together. When laying out different types of cables, the spacing should be no less than 30 mm.

1.5. Battery Safety

Explosion risk

(1) Do not let the battery suffer a strong impact.

(2) Do not crush or puncture batteries.

(3) Don't throw batteries in the trash.

Recycling of batteries follows local regulations!

Environmental risks

(1) Do not expose batteries to temperatures exceeding 55 ℃.

(2) Do not place the battery near a heat source.

(3) Do not expose batteries to direct sunlight.

(4) Do not let the battery come into contact with conductive objects.

Risk of electric shock

(1) Do not disassemble the battery.

(2) Do not touch the battery with wet hands.

(3) Do not expose the battery to moisture or liquid.

(4) Batteries should be kept away from children and animals.

Risk of damage

(1) Do not allow batteries to come into contact with liquids.

(2) Do not expose batteries to high pressure.

(3) Do not place any objects on top of the battery.

1.6.Response to Emergency Situations

- Damaged

Warning

Solids, liquids, and gases spilled from leaking batteries are toxic!

When a battery leaks a corrosive electrolyte, avoid touching the leaked liquid or gas. Direct contact may cause skin irritation or chemical burns. If exposed to spilled material, take the following measures:

(1) Accidental inhalation of harmful substances: Evacuate personnel from the contaminated area and seek medical attention.

(2) Eye contact: Rinse eyes with clean water for 15 minutes and seek medical attention immediately.

(3) Skin contact: Wash the affected area thoroughly with soap and water and seek medical attention.

(4) Accidental ingestion: induce vomiting and seek medical attention.

- Fire

Warning

Batteries catch fire and burn and are difficult to extinguish!

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(1) It is prohibited to use dust fire extinguishers to extinguish fires.

(2) Immediately evacuate people and flammable, explosive materials to a safe area.

(3) If conditions permit, immediately cut off the upper power supply and stay away from the battery, waiting for the battery to burn out.

(4) If a battery-powered fire must be extinguished, use a water-based insulating fire extinguisher.

- Soaking

Warning

There is a danger of electric shock when the battery pack is immersed in wate, and it must be well insulated when touched!

If the battery pack is soaked in water, please do not carry or move the battery pack immediately. Leave the battery pack in place until the water around the battery pack is completely dry and evaporates.

1.7. Storage Requirements

- **General requirements**

Notice

If the battery is stored for more than 3 months, it needs to be charged and maintained once (SOC ≥ 30%) to ensure battery activity!

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(1) Do not store the energy storage system for a long time; long-term storage of lithium batteries can cause capacity loss.

(2) Lithium batteries experience irreversible capacity loss of 3% to 10% when stored at the recommended temperature for more than 12 months.

(3) Do not tilt or invert, and stacking storage is strictly prohibited.

- **Storage requirements**

(1) Please store the products in a clean, dry, dust-free, and moisture-resistant area.

(2) The air in the storage area shall not contain corrosive or flammable gases.

(3) Storage temperature: -20°C ~ +55°C; humidity: 5% RH ~ 95% RH.

Avoid direct sunlight or rain; keep dry, ventilated, and clean.

Avoid significant infrared radiation, organic solvents, or corrosive gases, and keep away from sources of fire and flammable explosives.

Caution

When installing equipment that has been stored for a long time, the cabinet door should be opened for inspection before installation to ensure that the equipment is intact and undamaged. If necessary, it must be tested by professional personnel before installation!

After the completion of delivery and acceptance, if the equipment cannot be installed immediately, the following points should be paid attention to:

(1) Restore the packaging to its original condition.

(2) The desiccant inside the packaging should be retained and not discarded.

(3) Store the equipment indoors.

(4) When storing equipment, pay attention to ventilation and moisture prevention, and stay away from water and fire sources.

(5) Be mindful of harsh environmental conditions, including sudden temperature changes and physical impacts, to prevent equipment damage.

(6) Conduct weekly inspections to ensure the packaging remains intact and is free from insect or rodent damage; replace any damaged packaging immediately.

(7) If the storage time exceeds six months, the packaging should be opened for inspection, repackaged, and the desiccant replaced.

1.8.Transportation Requirements

Danger

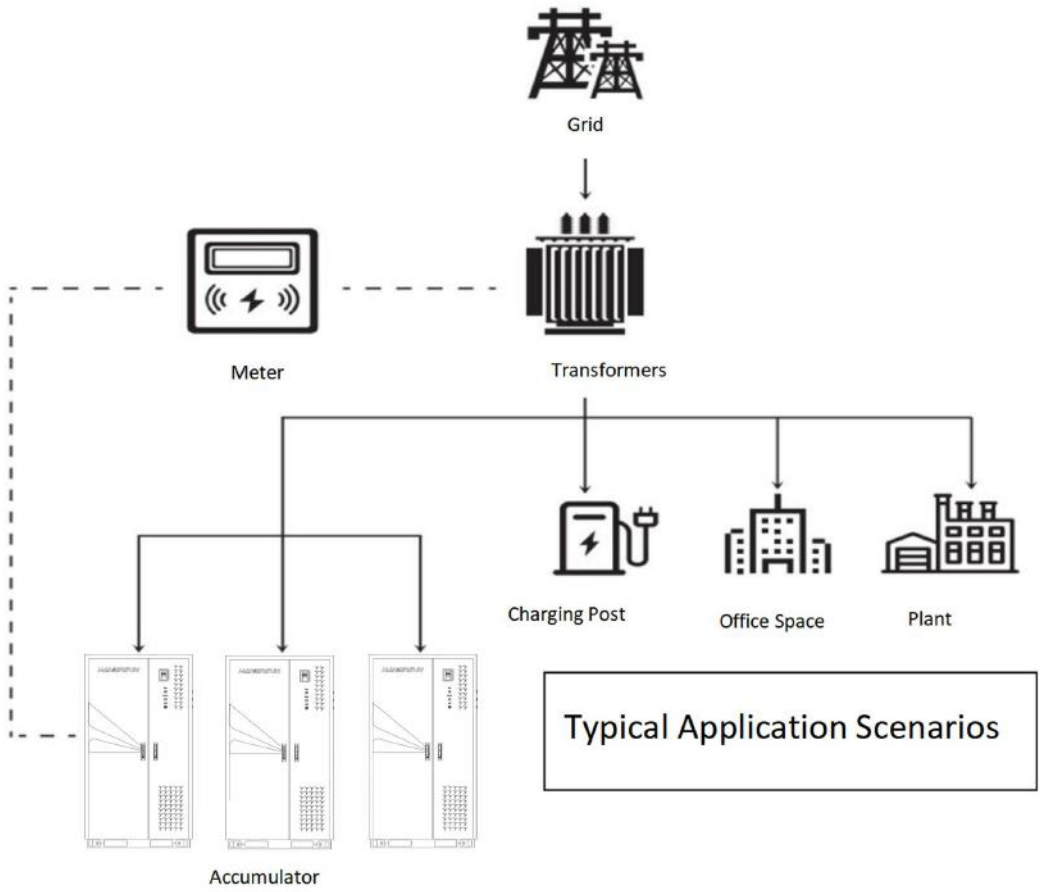
Follow local laws and industry standards when handling and transporting lithium battery packs. Improper operation may result in equipment damage or short-circuiting, which could lead to electrolyte leakage, rupture, explosion, or fire hazard!

- Energy storage systems or batteries shall not be transported by rail or air.
- For sea transport requirements, refer to the International Maritime Dangerous Goods Code (IMDG Code).
- The requirements for land transportation refer to the International Regulations for the Transport of Dangerous Goods by Road (ADR) or the Regulations for the Transport of Dangerous Goods by Road (JT/T 617).
- During transportation, comply with the regulatory requirements of the transportation regulatory authorities of the departure country, transfer country, and destination country.
- Comply with international regulations for the transportation of dangerous goods and the regulatory requirements of relevant national transportation regulatory agencies.
- Vehicles used for land transportation should have a load capacity greater than 2.5 tons.
- Speed limit for land transport: 80 km/h on flat roads and 60 km/h on rugged roads. In case of any conflict, the local traffic regulations shall prevail.
- Do not stack during temporary storage and transportation.
- Falling, tipping, and mechanical impact should be avoided during transportation.

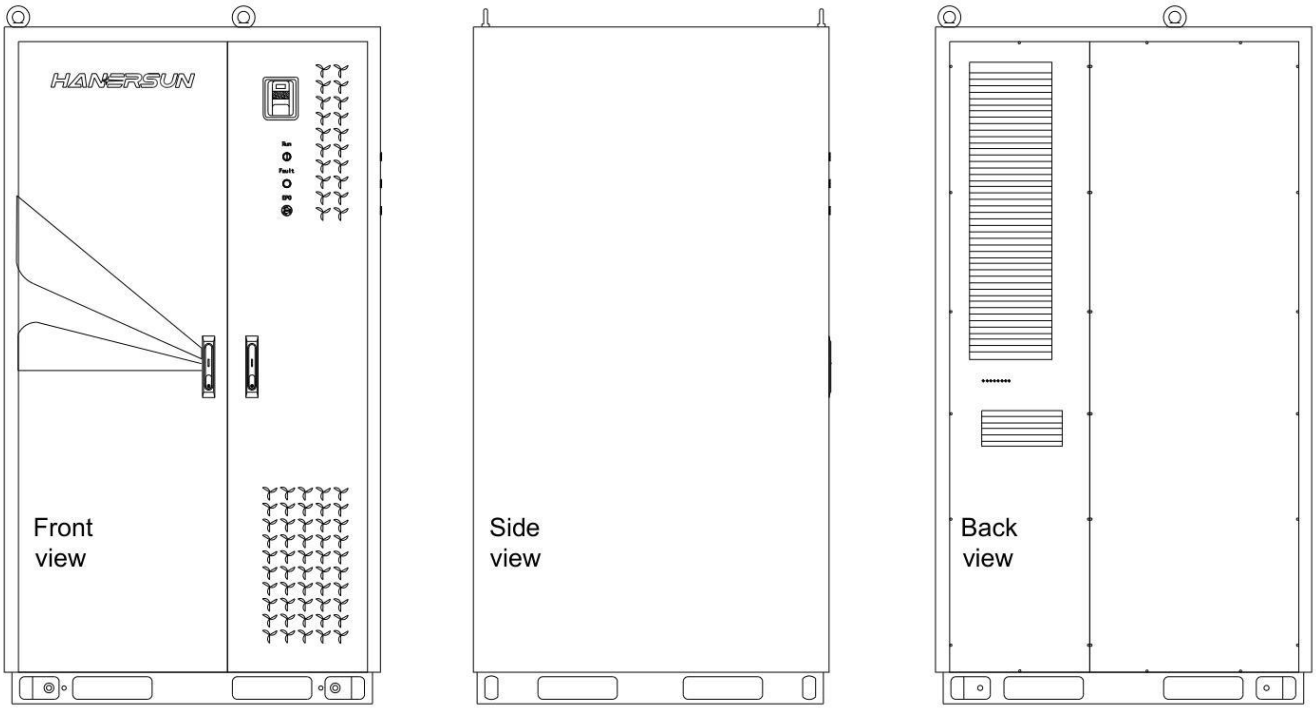
2. Product Description

2.1. Introduction

The HNESS series energy storage cabinet is a power energy storage device integrated with core components such as lithium-ion battery packs, lithium battery management systems, power control modules, AC and DC bidirectional converters, liquid cooling temperature control systems, and energy management systems. It can be flexibly integrated into all key stages of the power system, including generation, transmission, distribution, and delivery. It is capable of storing and releasing electric energy according to the directives of the energy management system, performing functions such as peak shaving and valley filling, load curve smoothing, wind and solar energy absorption, and power quality regulation.

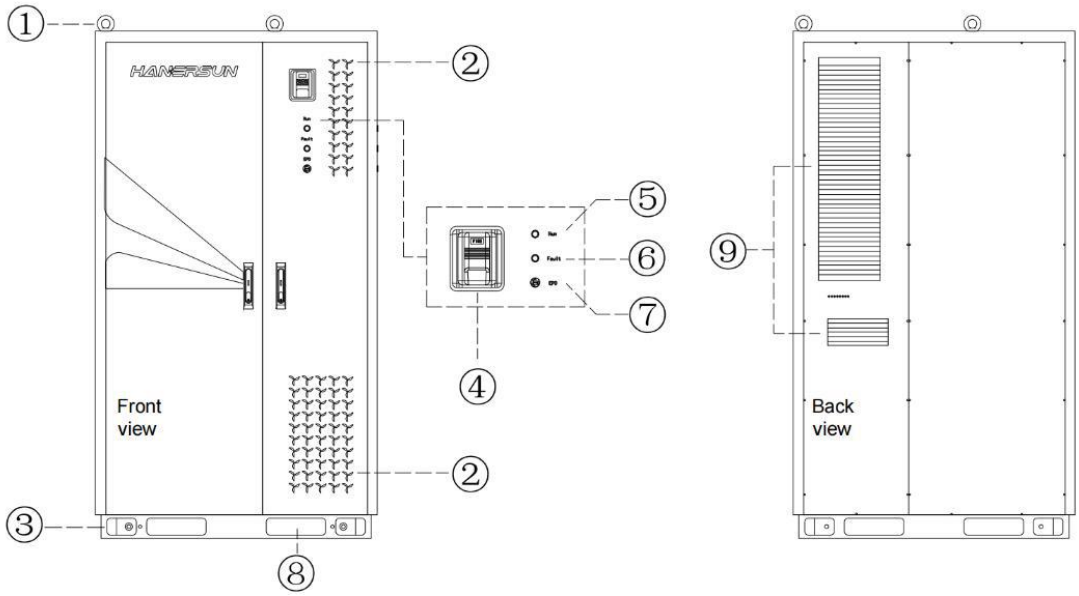


2.2. Appearance Dimensions

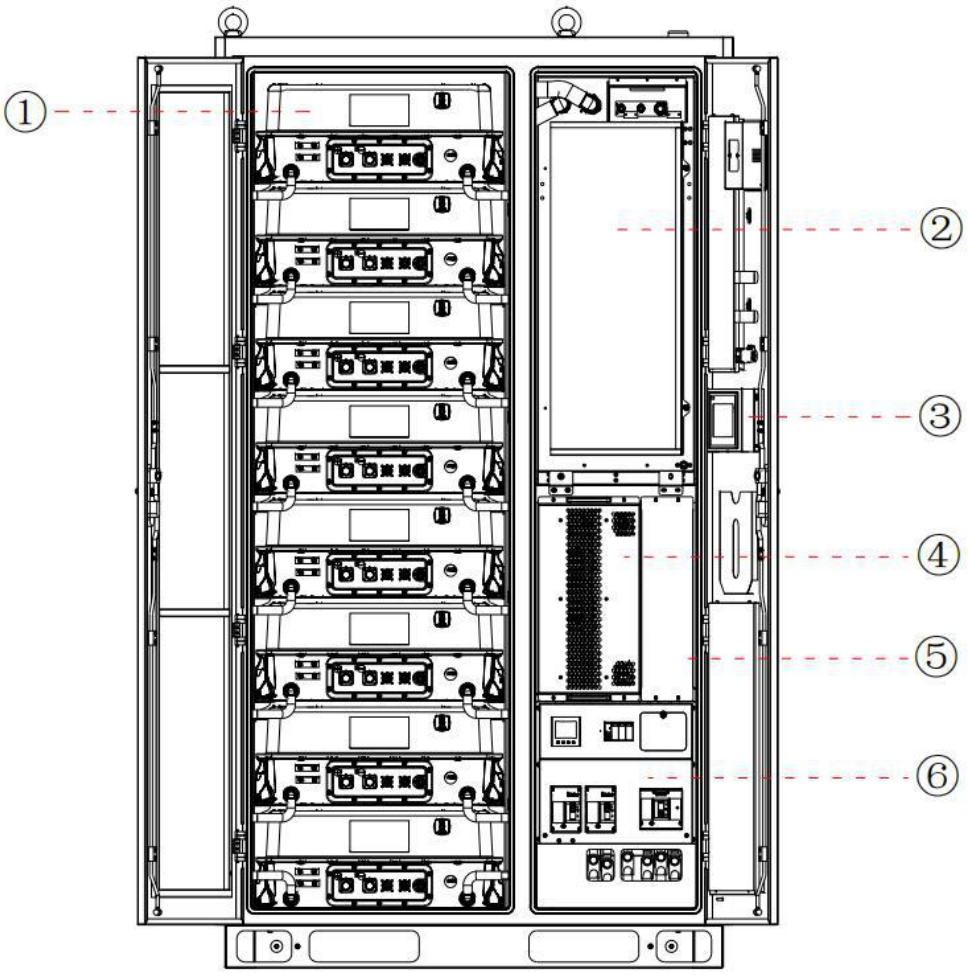


Model	Width(mm)	Height (mm)	Depth(mm)	Weight (kg)
HNESS230-L	1320	2370	1280	≤2500

2.3. Equipment Layout



Mark	Describe	Remark
1	Cabinet lifting rings	For shifting
2	Air inlet	
3	Ground point	
4	Audible alarm	
5	Running lights	
6	Fault indicator	
7	Emergency stop switch	
8	Forklift hole	For shifting
9	Heat outlet	



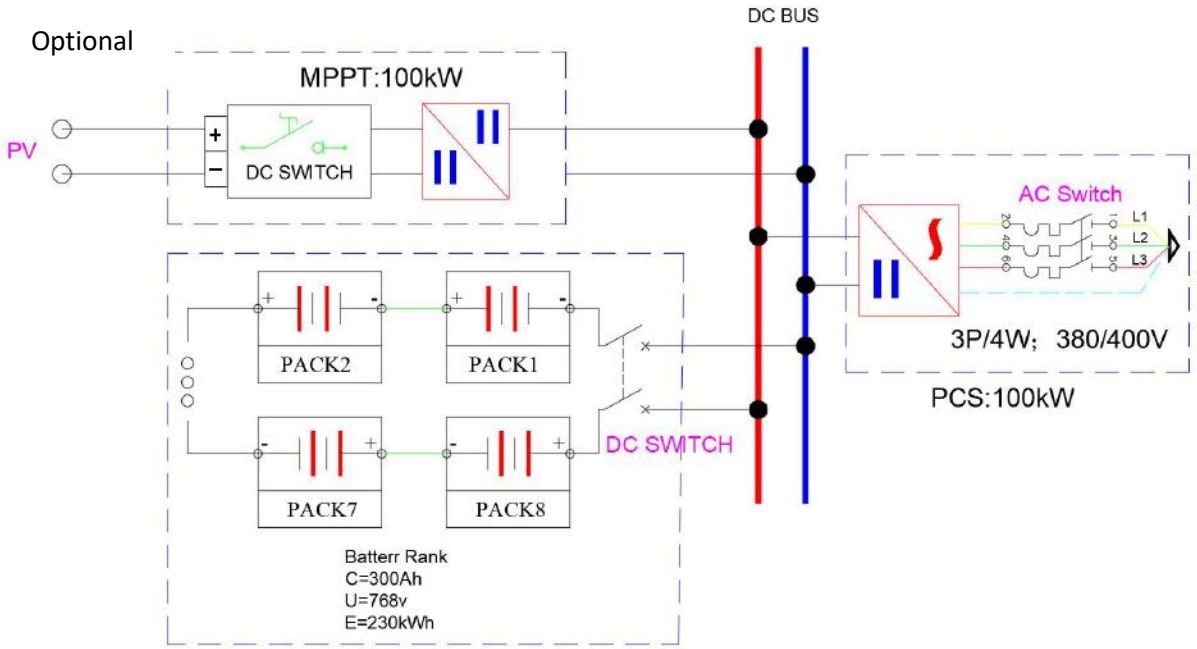
Mark	Describe	Remark
1	Battery pack module	96V/300Ah
2	Temperature control unit	Liquid cooling unit
3	Local display	
4	Energy storage bidirectional converter	100kW
5	PV Controller (optional)	100kW
6	Control unit	

2.4. System Parameters

Model	HNESS 230-L
Battery Parameters	
Cell type	LiFePO4
Cell specifications	3.2V/100Ah
System configuration	3P240S
Rated capacity	230.4kWh
voltage range	684~852V
AC Grid Connection Parameters	
Rated output power	100kW
Overload capacity	1.1 times long term, 1.2 times 1min
Rated voltage	AC400V
Rated output current	140A
Communication access Method	3L/N
Grid voltage range	400V (-20%~+15%)
Grid frequency range	50Hz/60Hz±2.5Hz
Current total harmonic distortion rate	≤3% (full load)
Power Factor	-0.99~+0.99
DC component of current	≤0.5%
Charge-discharge conversion time	<100ms

Off-grid Parameters	
AC off-grid voltage	AC400V
AC voltage range	AC400V±3%
AC off-grid frequency	50Hz/60Hz
Off-grid output THDU	≤3% (inductive load)
Unbalanced load capacity	100%
PV Parameter (Optional)	
PV MPPT range	300-570v
Open circuit voltage	600v
Max. current	200A
Number of MPPT	1
General Parameters	
Dimensions (W*H*D)	1320*2370*1280
Maximum weight	≤2500kg
Operating temperature	-20℃~50℃
Altitude	<2000m
Temperature control method	Battery: liquid cooling; electrical compartment: natural air cooling
Noise	<75db

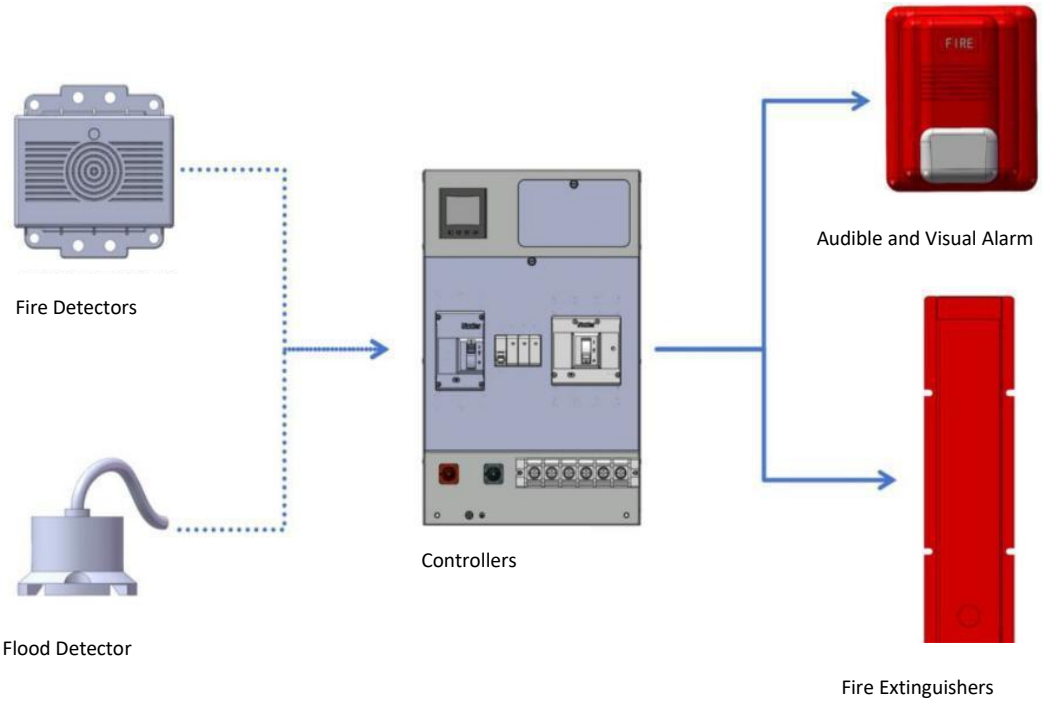
2.5.System Main Circuit Topology



Note: Photovoltaic interface is optional

2.6 .Fire Protection System

- The system has built-in fire detectors to monitor temperature, salt spray, harmful gas concentration, water immersion, and other conditions inside the cabinet in real-time.
- The fire extinguisher has an active or passive activation function. When a fire occurs and the system power supply is normal, the controller activates and releases the fire extinguisher, which suppresses the spread of the fire and at the same time turns on the audible and visual alarm for alarm prompts.
- When the system power supply is abnormal, the fire extinguisher will be automatically released through temperature activation.



- The fire extinguisher uses an S-type hot aerosol fire extinguishing agent. Its main principles are as follows:

(1) After the fire-extinguishing agent is released, an oxidation-reduction reaction occurs to form a large amount of agglomerated fire-extinguishing aerosol, whose components include N2 and CO2 metal salt solids.

(2) The process involves dual-phase inhibition, affecting both the gaseous and solid phases. Heat causes the vaporized metal ions or cations within the aerosol to react with the active combustion groups, neutralizing a significant number of these groups and reducing combustion free radicals. Concurrently, aerosol particles adsorb and chemically react with active combustion groups, further reducing the number of active groups and combustion free radicals.

(3) Reducing oxygen N2 and CO2 in the fire extinguishing aerosols can reduce oxygen concentration in combustion.

3. Installation

Warning

Isolation zones must be set up during installation, commissioning, and maintenance to prevent unrelated personnel from entering the site!

- Please check the delivery list before installation to ensure that all accessories are not missing.
- Please check the integrity of the equipment before its installation. Confirm that the equipment has not suffered destructive damage during transportation or storage.
- During the installation process, lifting, fork lifting, moving, etc. of the equipment require professional operators.
- It is prohibited to install, use, and operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment, and cables, connecting and disconnecting signal cables for outdoor ports, high-altitude operations, and outdoor installations) in adverse weather conditions such as thunderstorms, rain and snow, and winds above level 6.
- The equipment must be safeguarded with protective measures such as fences, and safety warning signs should be erected for isolation to prevent unauthorized personnel from entering the operating equipment. Otherwise, it may cause personal injury or property damage.
- During installation, it is prohibited to block the air vents and cooling system to prevent high temperatures from causing fires.

3.1. Installation Site

This system is designed for outdoor use. When installed indoors, please fully refer to local laws and regulations!

Notice

The selection of installation sites for energy storage systems should refer to relevant standards such as GB 51048-2014 "Design Code for Electrochemical Energy Storage Stations" and NFPA 855 "Installation Standard for Fixed Energy Storage Systems", and meet local laws, regulations, and fire safety requirements!

General requirements:

- This system should not be installed in low-lying areas, and the risk of flooding should be fully considered.
- Choose an open area and ensure that there are no obstacles within 10 meters.
- Maintain a distance of at least 50 meters from residential areas to avoid noise pollution.
- Maintain a distance of at least 2 km from the coast to prevent equipment from being corroded by salt and alkali.
- The installation location should be far away from water sources or chemical liquid storage areas, such as organic solvents.
- The installation location should be away from sources of fire and flammable and explosive materials.
- The installation location should be away from flammable and explosive gases or smoke.
- If the equipment is installed on a site with abundant vegetation, regular cleaning of weeds is necessary to prevent them from entering the equipment and causing fire hazards.

Notice

When the safety distance cannot meet the relevant standards and local laws and regulations, it is recommended to relocate.

If there is no more suitable venue, it is recommended to install fireproof partition walls to achieve a safety protection of not less than 3 hours and fully consider the space requirements for equipment transportation, installation, and maintenance.

According to the recommendation of T/CEC 373-2020, the length and height of the fireproof partition wall should exceed the outer contour of the prefabricated module by 1 m, respectively. According to NFPA 855-2020, "Installation Standard for Fixed Energy Storage Systems," if there are independent fire partitions with a fire resistance time of at least 1 hour, the spacing can be reduced to 914 mm.

The site selection for installation should avoid scenarios that are not recommended by industry standards and regulations, including but not limited to the following locations, regions, and venues:

(1) Areas with strong vibration, strong noise sources, and strong electromagnetic interference.

(2) Places where dust, oil fumes, harmful gases, or corrosive gases are generated or present.

(3) Places with existing underground facilities.

(4) Ground with unfavorable geological conditions such as rubber soil and soft soil layers, as well as ground that is prone to water accumulation, subsidence, and collapse.

(5) Areas with earthquake faults or mining subsidence.

(6) Areas with direct risks such as mudslides, landslides, quicksand, and karst caves.

(7) The area within the danger zone of blasting.

(8) If a dam or flood control embankment breaches, the area may be submerged.

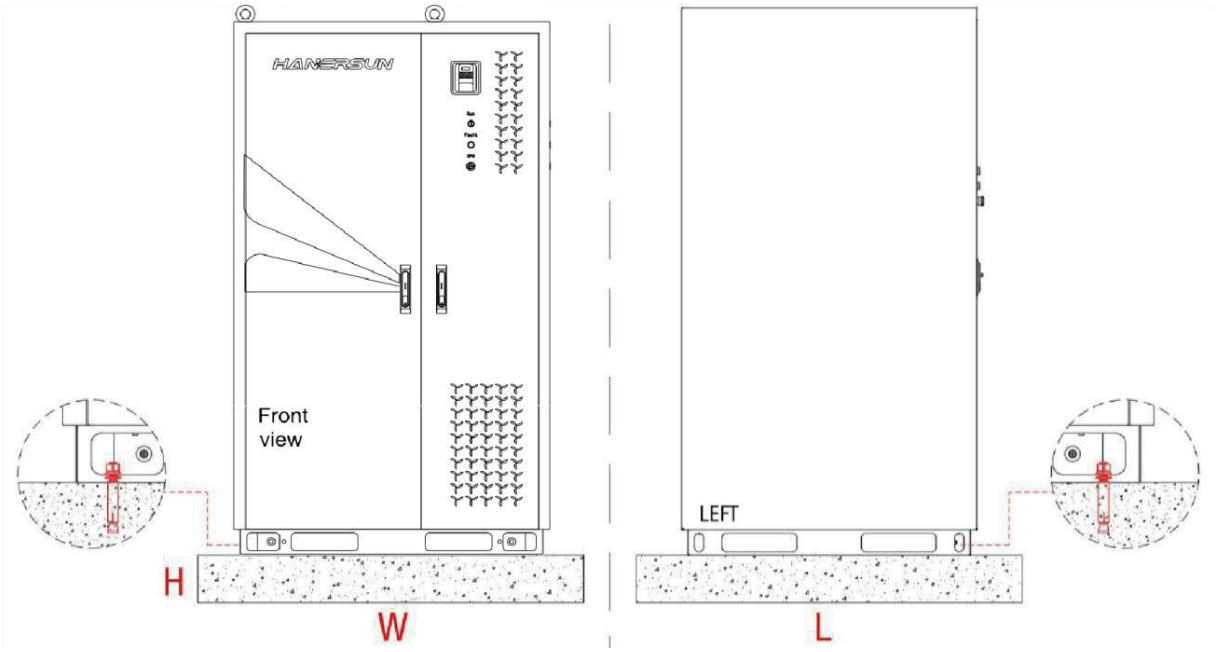
(9) Important water source protection area.

(10) Cultural relics and historic sites protection area.

(11) Crowded places, high-rise buildings, or underground structures

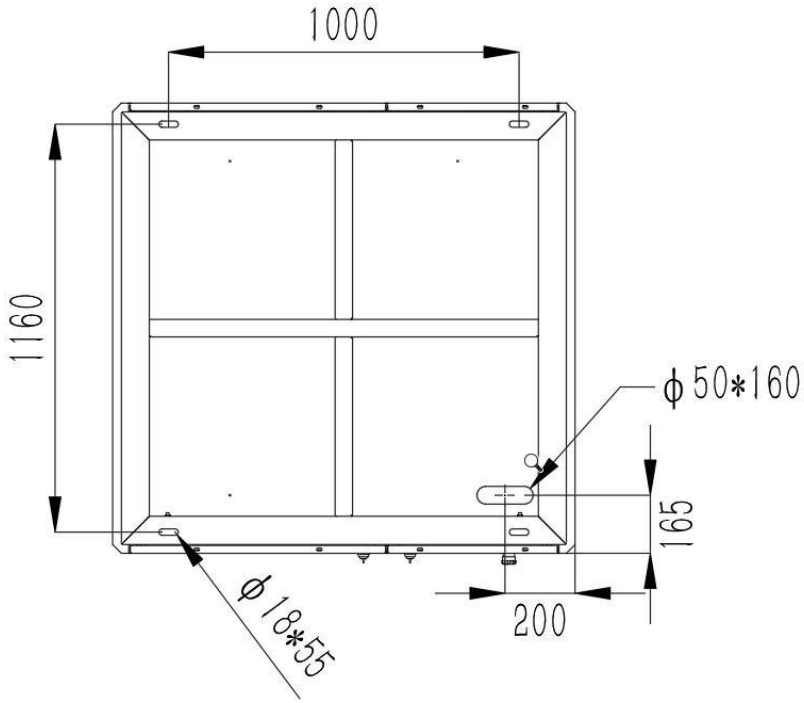
3.2. Equipment Base

For outdoor use, the device should be installed and fixed to the base. The base can be steel or concrete.

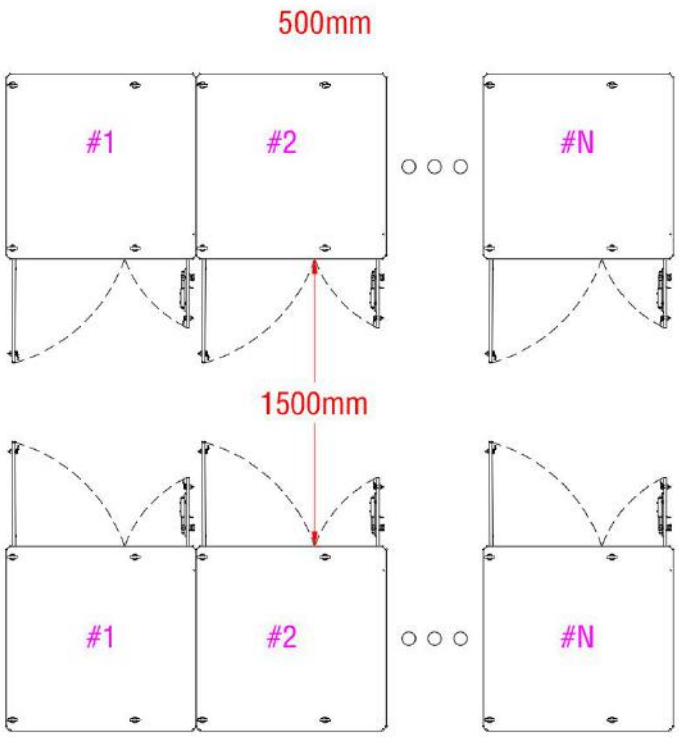


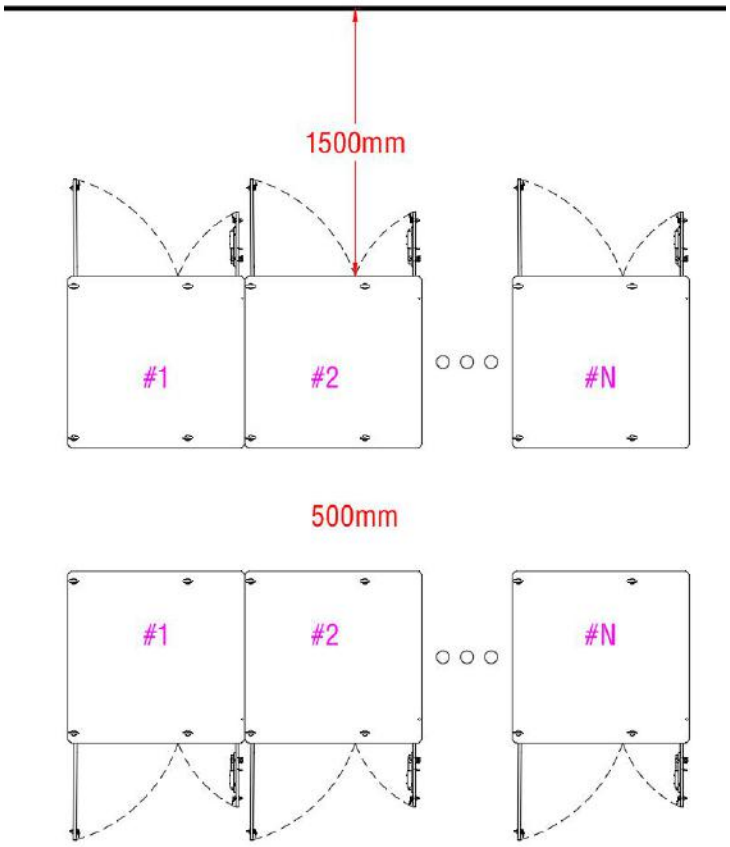
Basic Requirements		
Serial number	**Category**	**Parameter**
1	Basic size W	W≥1320mm
2	Base size L	W≥1280mm
3	Base height H	Adjust according to local rainfall
4	Carrying capacity	> 2.5t/ m²
5	Flatness	<3mm/m²
6	Service life	20 years

The equipment is connected and fixed to the base through M14 expansion bolts. Expansion screws can be pre-embedded or drilled on-site. The hole dimensions (viewed from above) are as follows.



When multiple units are arranged, it is recommended to reserve a distance of more than 1.5m between devices and a distance of more than 0.5m between the back and the wall.




1500mm
#1
#2
#N
500mm
#1
#2
#N

3.3. Equipment moving

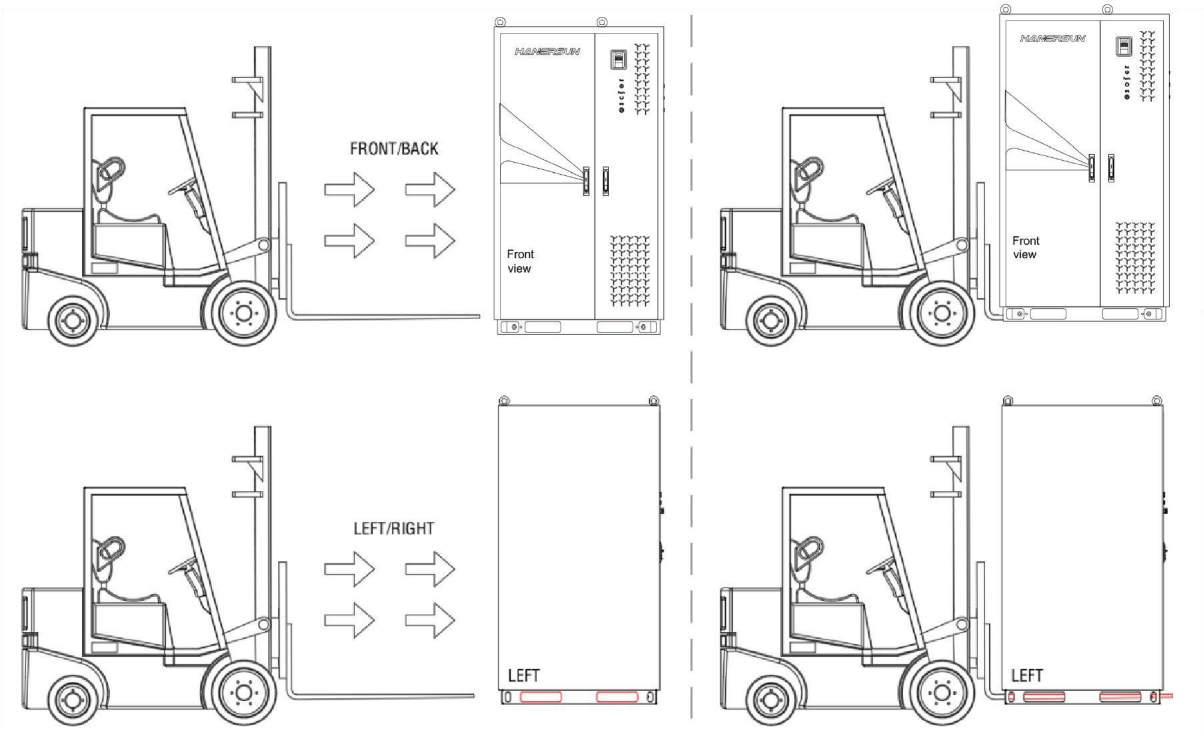
The equipment can be fork lifted and moved through the front/rear or left/right forklift holes of the base.

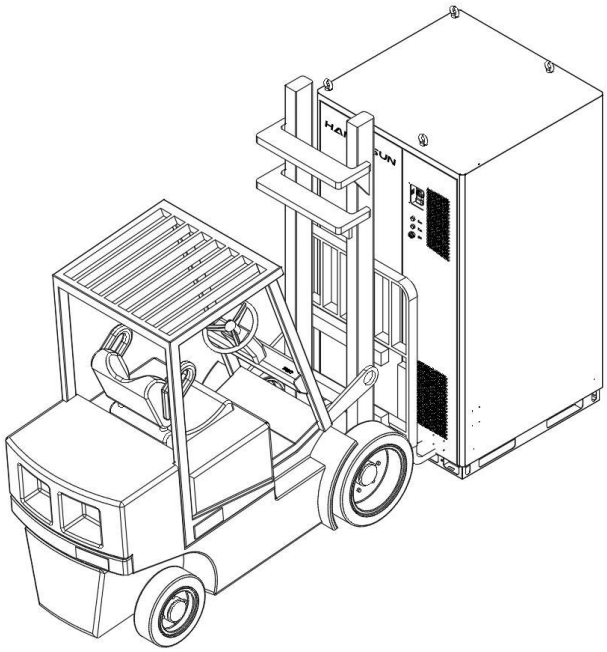
Caution

Please make sure the load capacity of the forklift meets the requirement, suggested ≥3t.

Please make sure the fork leg length meets the requirement, suggested ≥1.5m.

When using forklift trucks, please tie up and fix the equipment according to the site conditions, and place it to be overturned.





3.4.Hoisting

The unit can be lifted and moved by the top lifting rings.

Danger

Please ensure that the load capacity of the crane or lifting tools, cable hooks, and other components meets the requirements, and it is recommended to be ≥ 3.5t.
When using lifting and moving, please take safety precautions.

Notice

(1) High altitude operations

(2) Take protective measures, wear safety helmets, safety belts, waist belts, etc., and fasten the safety belts and waist belts to rigid structures. Do not hang on unstable moving objects or metal with sharp edges to prevent the hook from slipping and causing a falling accident.

(3) When conducting high-altitude operations, clear signs of "no entry" should be set up to delineate restricted areas.

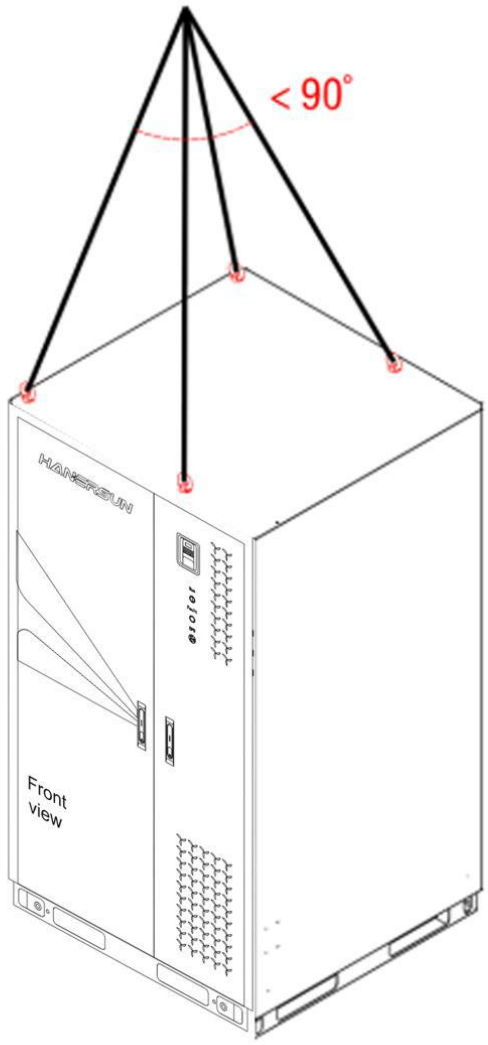
(4) Do not stack scaffolding, springboards, and other miscellaneous items on the ground below the work platform. Ground personnel are not allowed to stay or pass under the work platform.

(5) Conduct safety inspections on scaffolding, springboards, and work platforms to ensure structural rigidity and prevent overloading.

(6) Do not throw objects from high places to the ground, nor from the ground to high places.

(7) Please use professional tools such as ropes, baskets, elevated vehicles, or cranes to transport vehicles or equipment.

(8) Do not work at heights on rainy days, in strong winds, thunderstorms, or other dangerous situations.



3.5. Electrical Connection

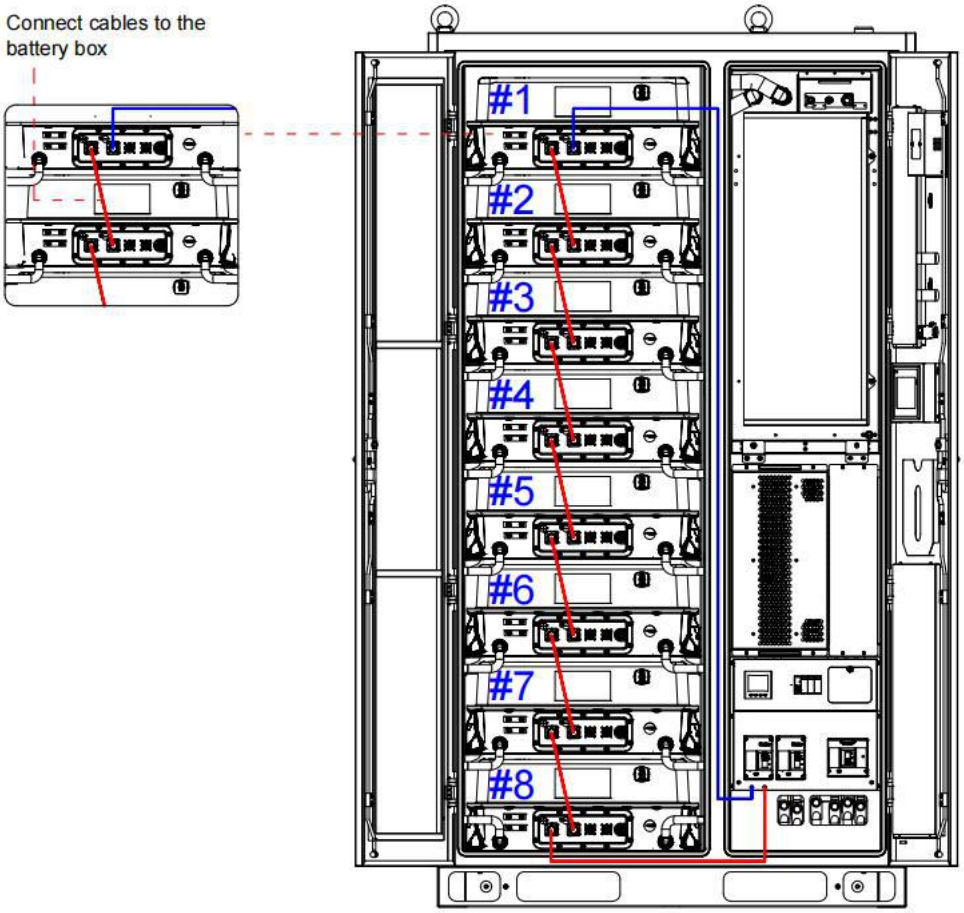
Open the left cabinet door and connect the accessory cables in series.

Danger

Please make sure that the upper and lower power supplies are disconnected before electrical connections are made!

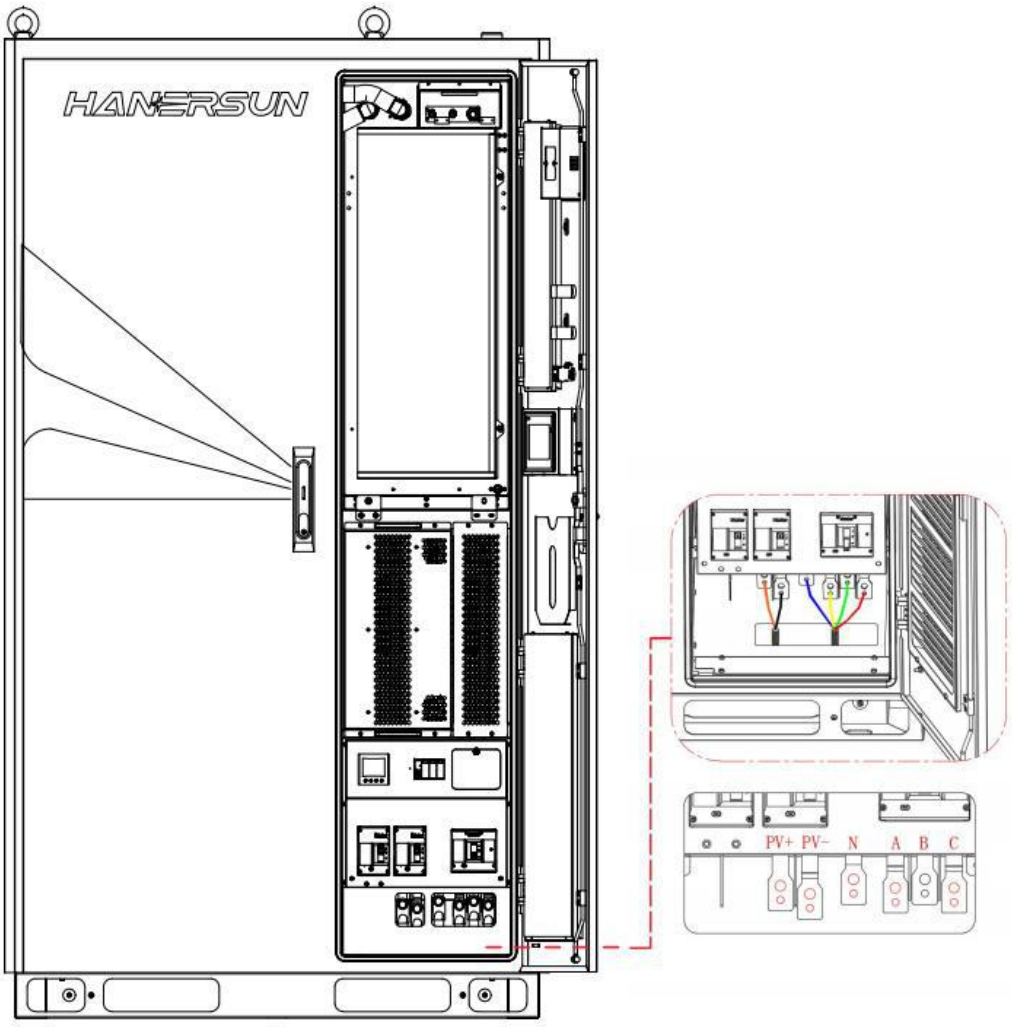
Battery connection is a high-voltage operation, please wear insulated gloves!

Open the left cabinet door and use the accessory cable to connect in series.



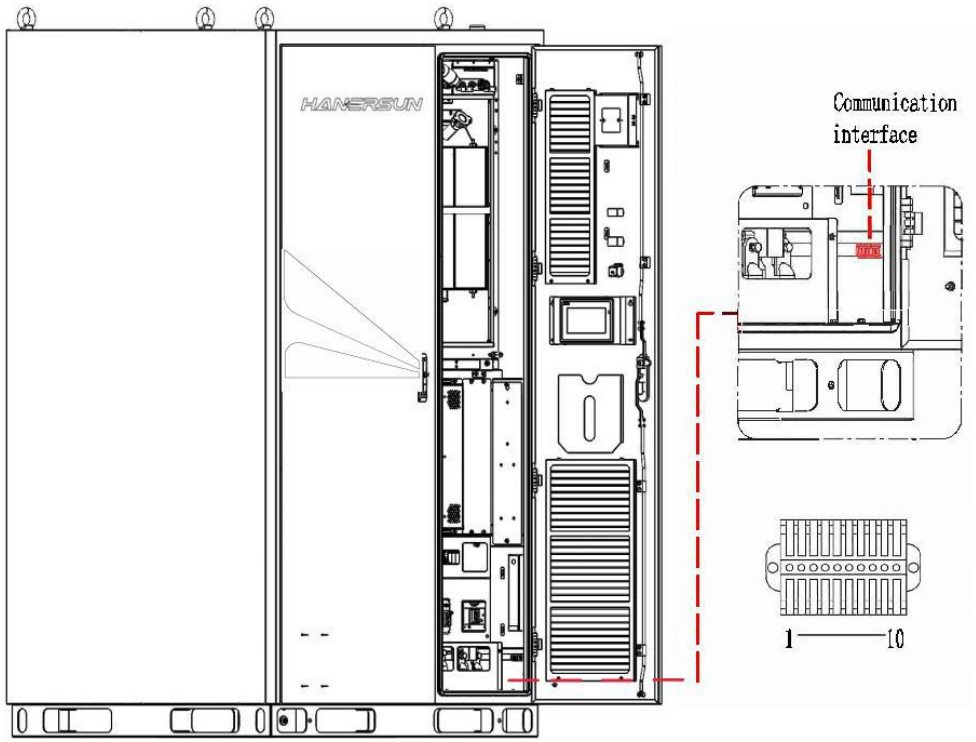
Note: To ensure transportation and storage safety, the high-voltage connecting cables between the battery boxes will be removed when the device is shipped.

- Open the right cabinet door, guide the external cables through the outlet holes at the bottom of the cabinet to the wiring panel, and lock it.



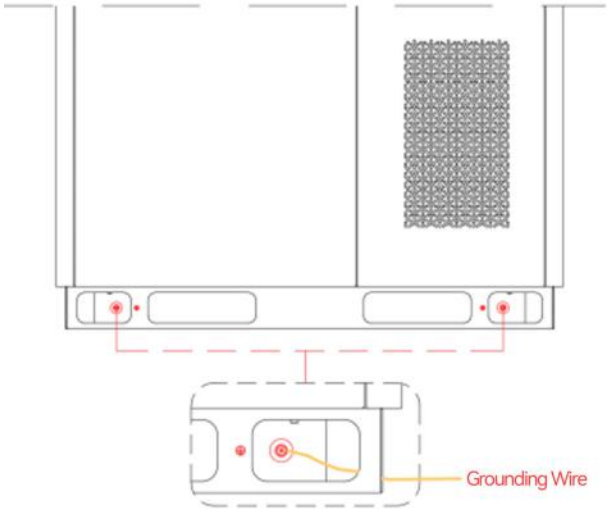
Serial Number	Mark	Comment	Recommended Cable Diameter
1	PV+	Photovoltaic positive electrode	Copper cable≥70mm²
2	PV-	Photovoltaic negative electrode	
3	A	Gird phase A	Copper cable≥50mm²
4	B	Gird phase B	
5	C	Gird phase C	
6	N	Gird phase N	

- The communication and parallel communication lines of the electric meter are led to the "communication interface" through the outlet holes at the bottom of the cabinet

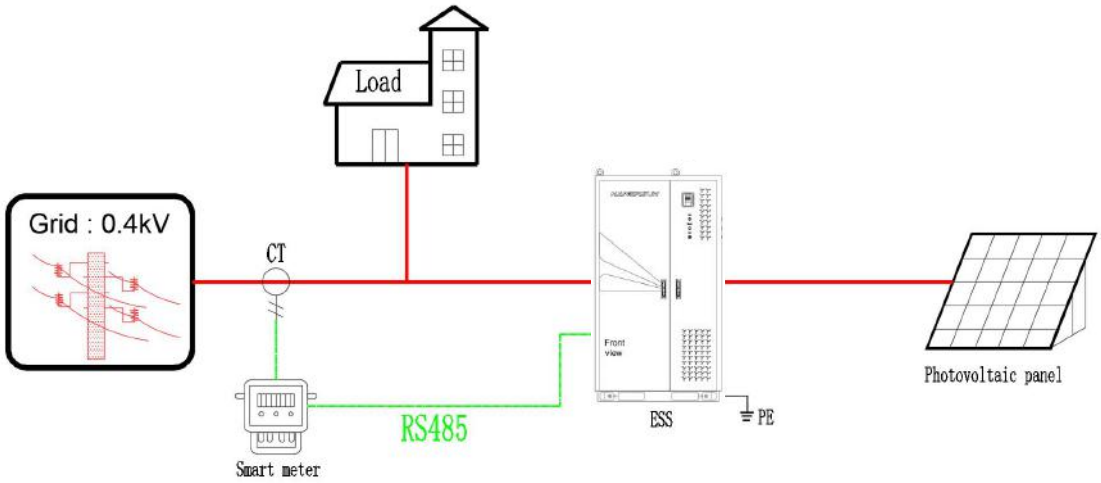


Communication Definition		
Foot Position	**Definition**	**Remarks**
1	24V-	24V external power supply, debugging for use
2	24V+	
3	EMS-RS485B	Connection to the collection meter
4	EMS-RS485A	
5	EMS-CAN2L	CAN communication reserved
6	EMS-CAN2H	
7	EMU-CAN1L	System parallel use
8	EMU-CAN1H	
9	EMU-CAN1L	
10	EMU-CAN1H	

- After the cable is connected, please pay attention to seal the outlet hole to avoid external intrusion and damage the equipment.
- The grounding point of the cabinet shell needs to be connected to the local wiring network. There are grounding points on both sides of the front base of the cabinet, and the interface is M8. It is recommended to use 25mm ^{2} cables.



3.6. Grid Connection



- The hybrid energy storage system has a built-in MPPT module to support PV access. The PV string convergence is connected to the energy storage equipment, see 2.4 for specific parameters and 3.5 for electrical connections.
- The energy storage system is connected to the user's 0.4kV AC side of the household bus or transformer lower bus, and connected to the power grid.
- Current transformers are installed at the system access point to monitor the microgrid data, and the current transformers are connected to the electricity meter, which is connected to the energy storage system through the RS485 communication cable.

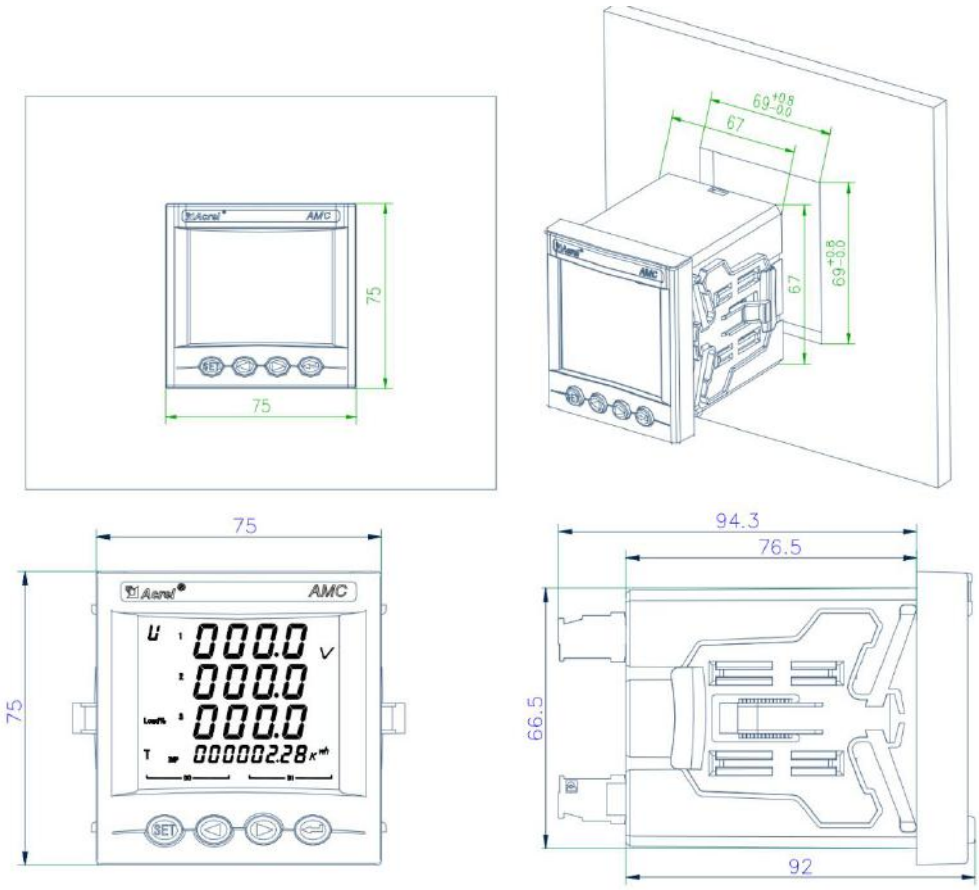
3.7. Electricity Meter Installation

Current transformer：

When installing the equipment, please select and purchase the current transformer according to the field conditions.

Meter：

The default meter model of the system is AMC72L-E4 / KC (II), and the appearance and installation dimensions are as follows.

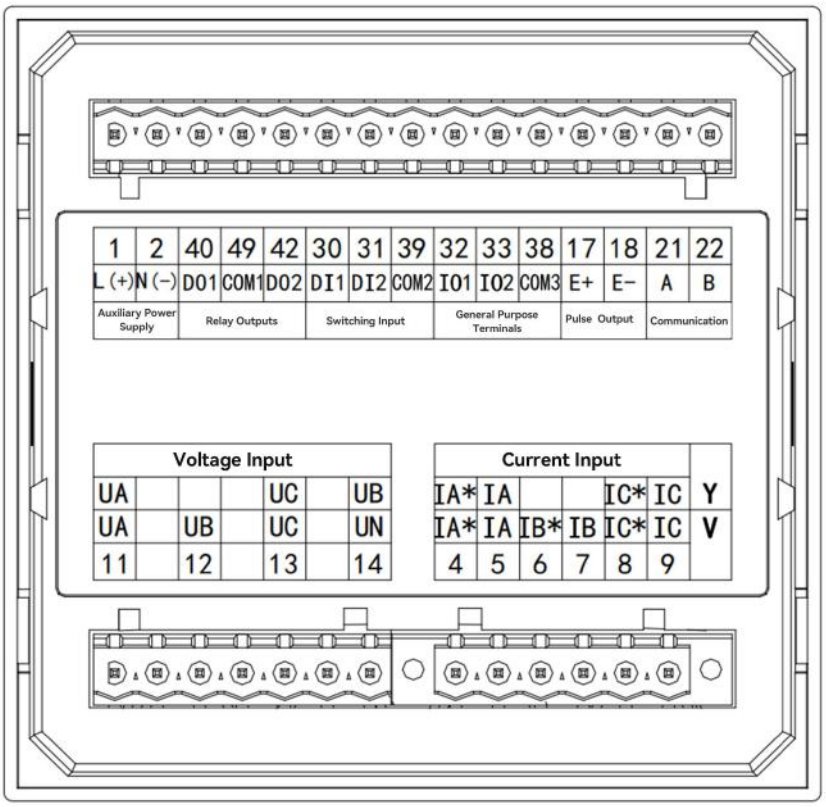


Wiring method:

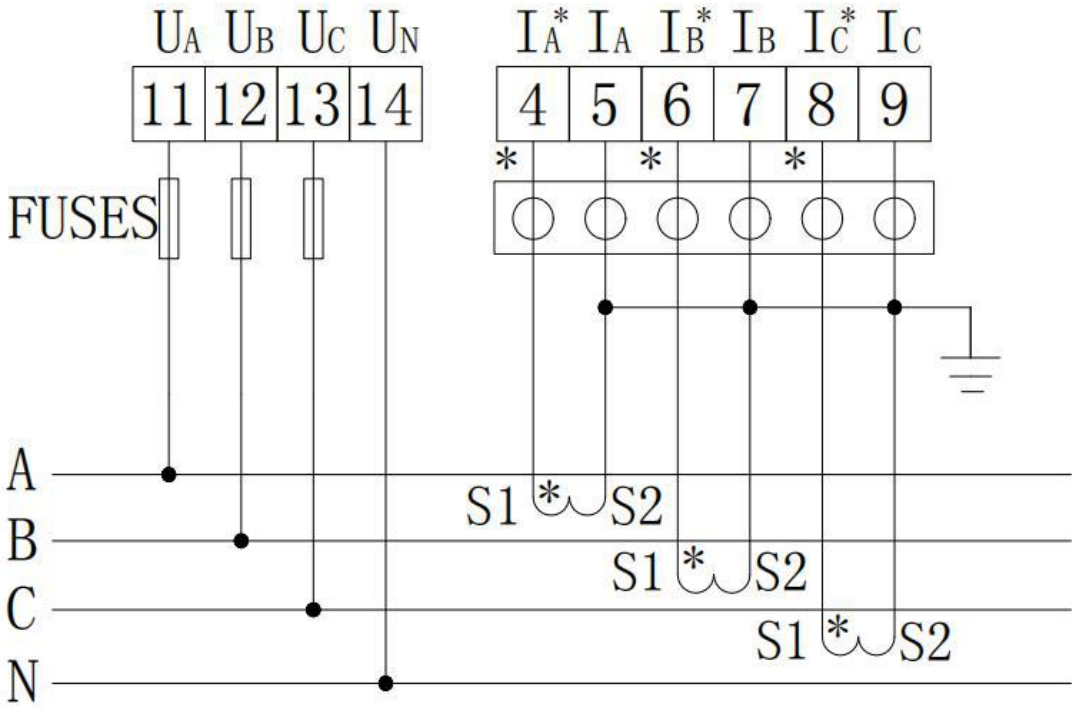
According to different design requirements, it is recommended to add fuses (BS88 1A gG) to the power and voltage input terminals to meet the safety requirements of relevant electrical specifications.

(1) The electricity meter wiring is defined as follows:

No.1,2 foot access to 220V auxiliary power supply; 21,22 foot access to RS485 communication line to the energy storage system.



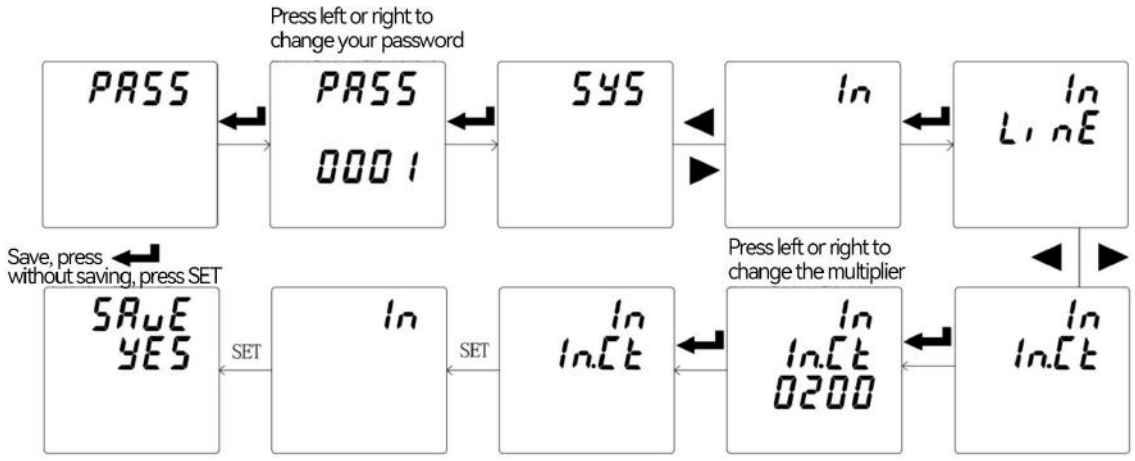
(2) Wiring method for instrument terminals (three-phase four wire 3CT)



3.8.Electricity meter commonly used Settings

- CT change ratio settings

For example, using CT at 1000A / 5A, the variable ratio is set as follows.



4. Commissioning

Warning

Do not open cabinet doors in the rain!

For initial startup commissioning and operating parameter configuration, please contact the engineer or apply for remote support!

4.1.Power On

Warning

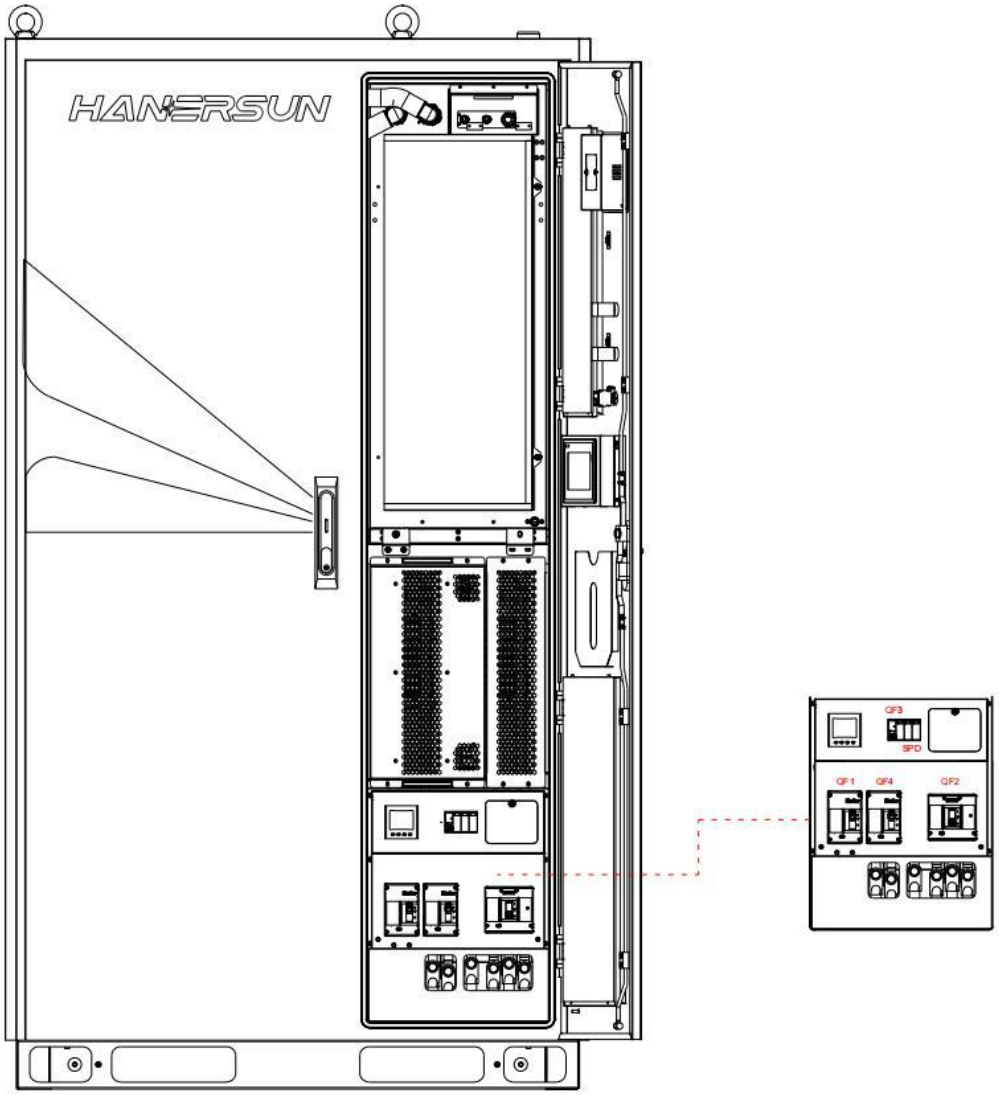
Make sure all electrical connections are correct and reliable before turning on the machine!

- Check the EPO switch to ensure that it is in a reset state.

Notice

If the QF 1 and QF 2 circuit breakers are closed in the EPO switch lock state, the circuit breaker tripping coil will be damaged!

- Closed circuit breaker QF 1 ~ QF 4 (no closed order).



NO.	Sign	Remark
1	QF1	Battery DC Circuit Breaker
2	QF2	AC Circuit Breaker for Municipal Power Supply
3	QF3	AC auxiliary circuit breaker
4	QF4	PV circuit breaker
5	SPD	Surge Protectors

After the system self-test, the indicator (see 2.3 for details) is on. You can be viewed through the local display.

Notice

If the malfunction light comes on when the power is turned on, contact a technician immediately for troubleshooting and repair!

4.2.Shutdown

- Shutdown operation under normal conditions:

(1) Click the shutdown button on the local display homepage.

(2) After the indicator light goes out, close QF2-QF3-QF1 in sequence.

- Please use the EPO switch for emergency shutdown.

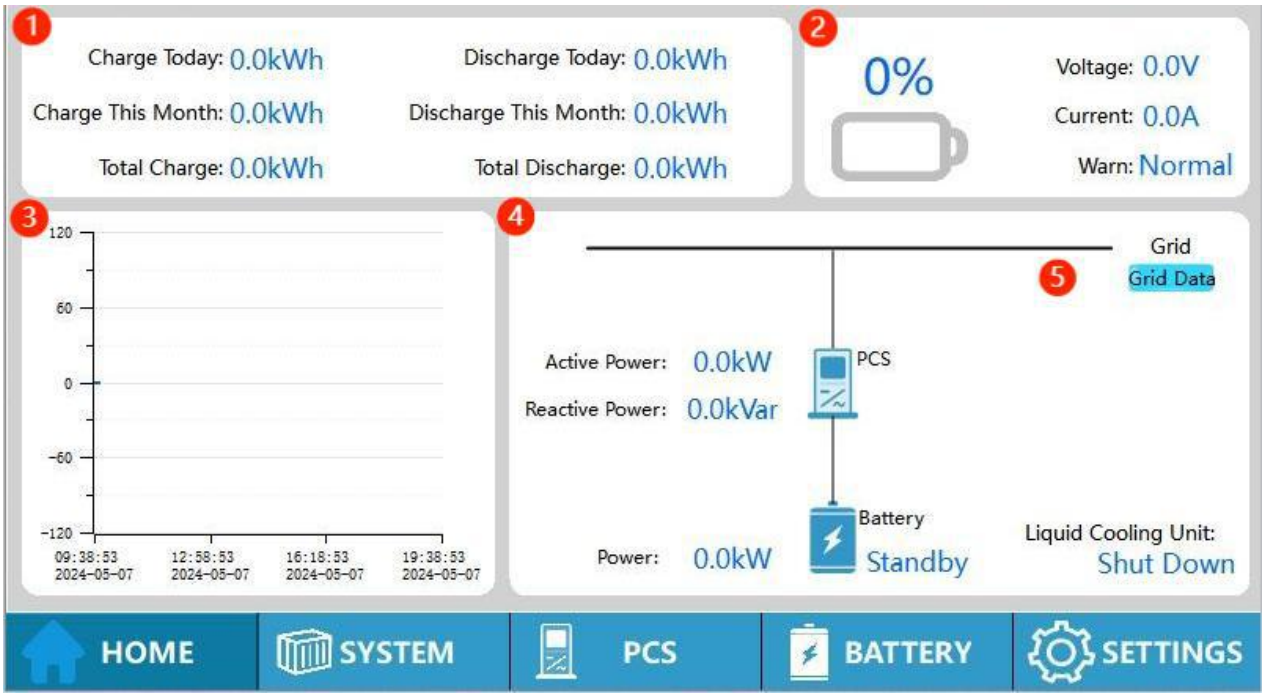
Notice

Do not use the EPO switch for normal shutdown, it may cause damage to the unit!

4.3. Display Screen

Data Display

- Homepage



1	Display the cumulative day, month, and total charge/discharge capacity of the current cabinet.
2	Displays the current SOC, voltage, current, and fault information of the battery system in the current cabinet.
3	Display the operating power curve for the last 10h of the current cabinet.
4	Displays the current cabinet equipment power value and the energy flow direction.
5	Display the current grid meter data.

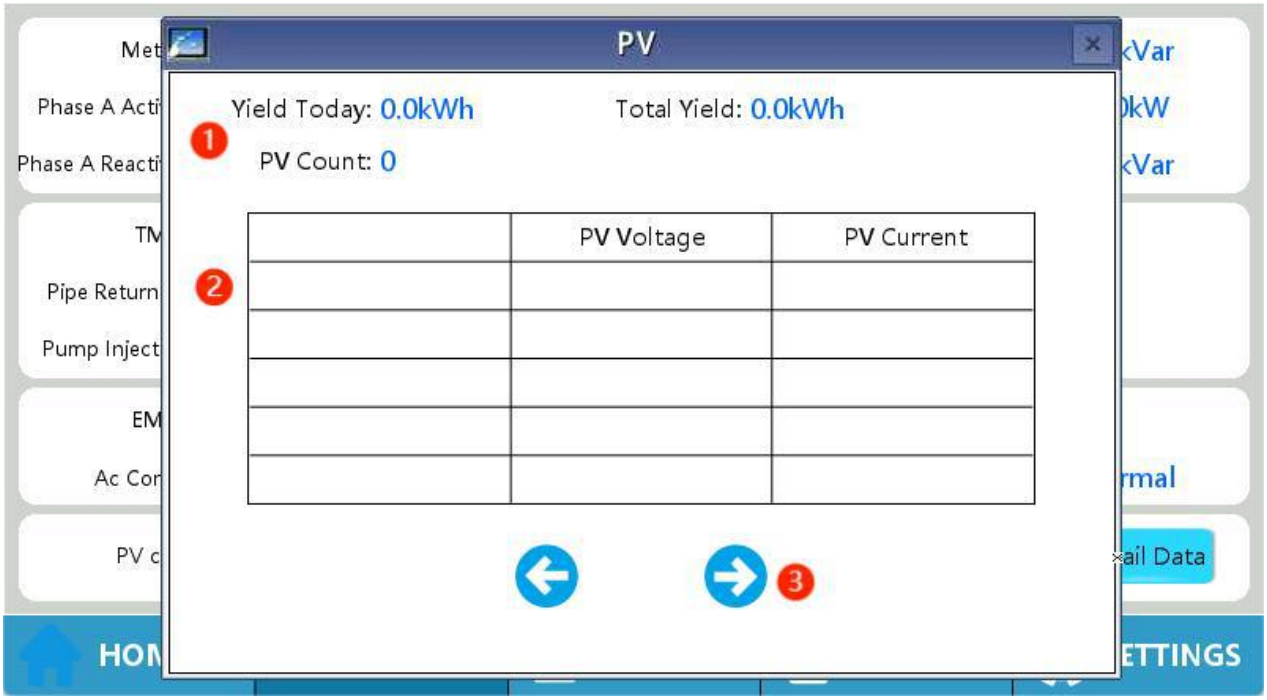
- System page

Switch the system data page to display the detailed data of the AC side, liquid-cooled unit (TMS) and energy management unit (EMU) in the current cabinet.

NO.	Descriptions
1	Displays the three-phase active power value, reactive power value and total active power value on the AC output side of the cabinet, and the communication status of the cabinet electricity meter.
2	Displays the current working status and basic data of the liquid-cooled unit (TMS) in the cabinet, and the TMS communication status.
3	Displays the current communication status of the energy management unit (EMU) in the cabinet and the real-time status of the AC contactor, AC circuit breaker and fire alarm in the cabinet, as well as the software version number.
4	Display the photovoltaic communication status, the PV number and the PV total power.
5	Click to display the detailed photovoltaic data.

- PV Details

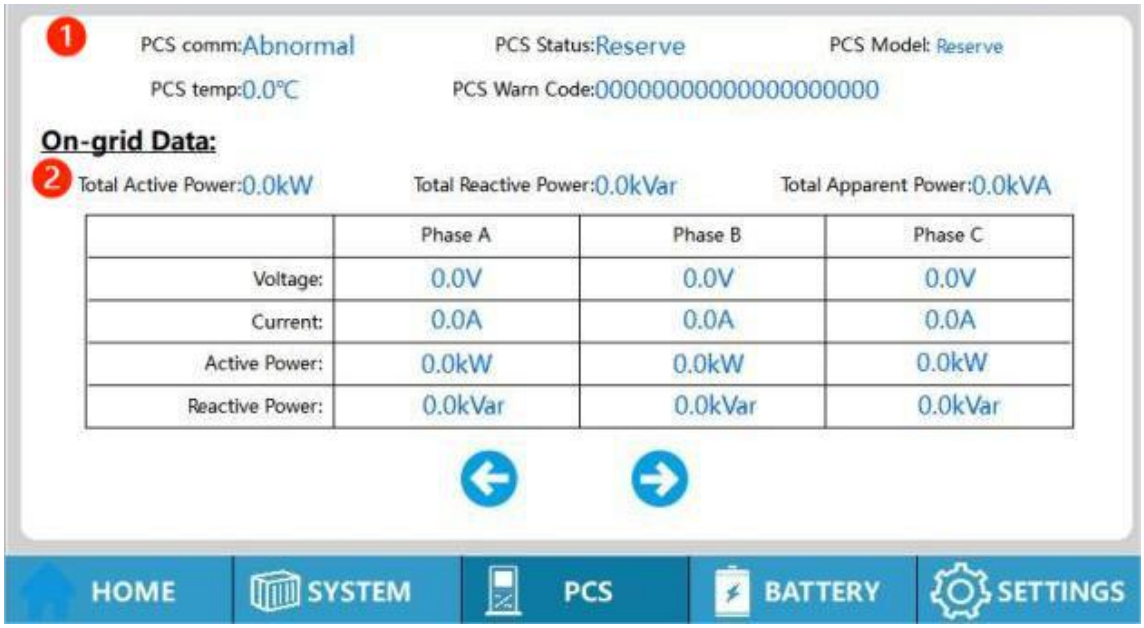
Click Detail Data , Display the detailed PV access data of the current cabinet, showing the daily power generation and total power generation.

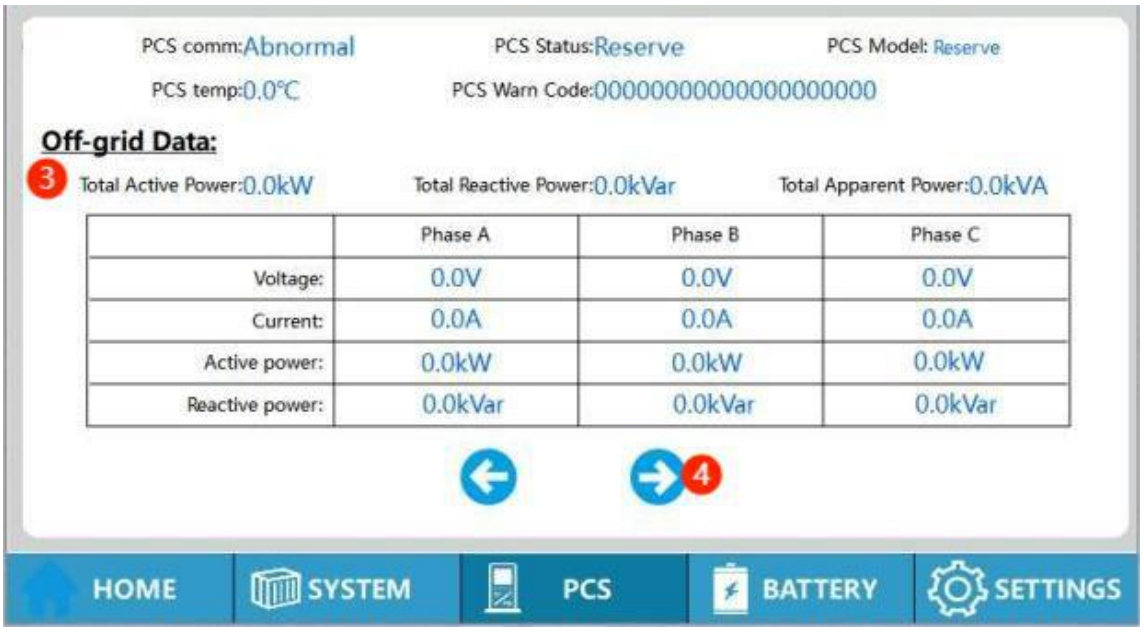


NO.	Describe
1	Display the daily power generation, total power generation, and number of photovoltaic circuits connected to the cabinet.
2	Displays the voltage and current of each PV.
3	Switch page.

- PCS page

Switch the PCS data page to display the current detailed data of the PCS device in the system.

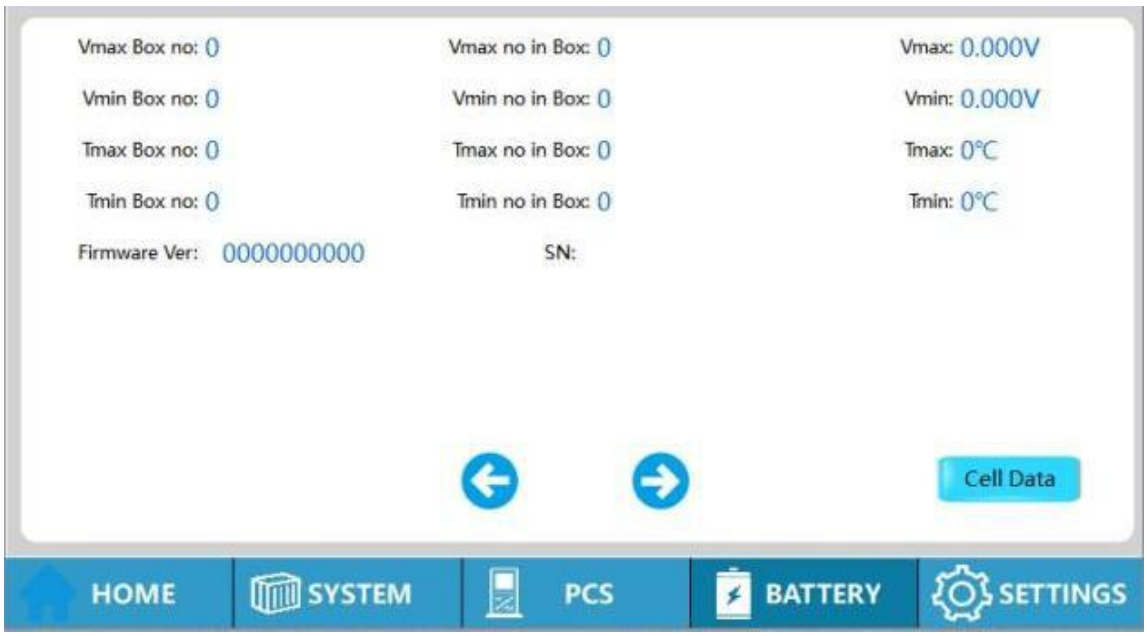




NO.	Describe
1	Displays the current cabinet PCS communication status, working mode, working status, temperature, and fault code.
2	Displays the current cabinet PCS grid-connected data.
3	Displays the current cabinet PCS off-grid data.
4	Click the arrow to switch the PCS and off the data.

- Battery page

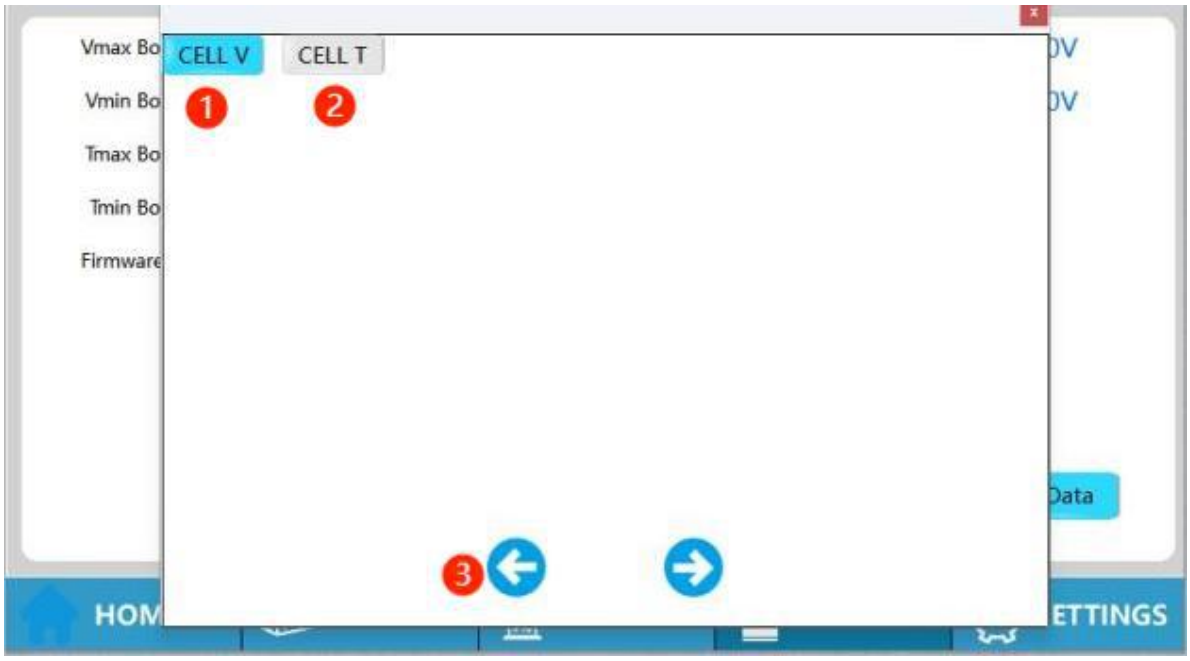
Switch the energy storage data page to display the current detailed data of the battery system in the cabinet.



NO.	Describe
1	Switch page.
2	Click "Cell Data" to display the battery cell details.

- Energy storage cell data

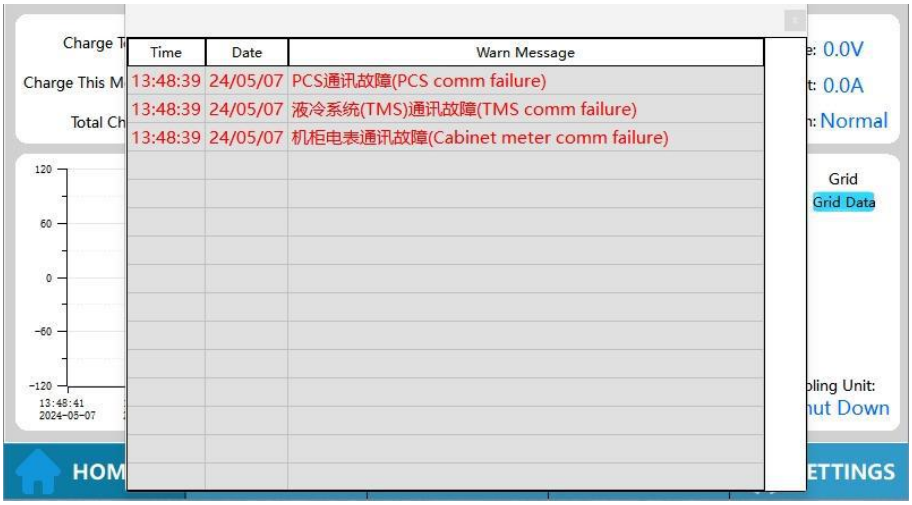
Click the single data button on the energy storage data page, and the pop-up window displays the single voltage and single temperature data.



NO.	Describe
1	Click "Cell V" to display the battery cell voltage details.
2	Click "Cell T" to display the details of the cell temperature.
3	Click the arrow to switch the data page.

- Fault display window

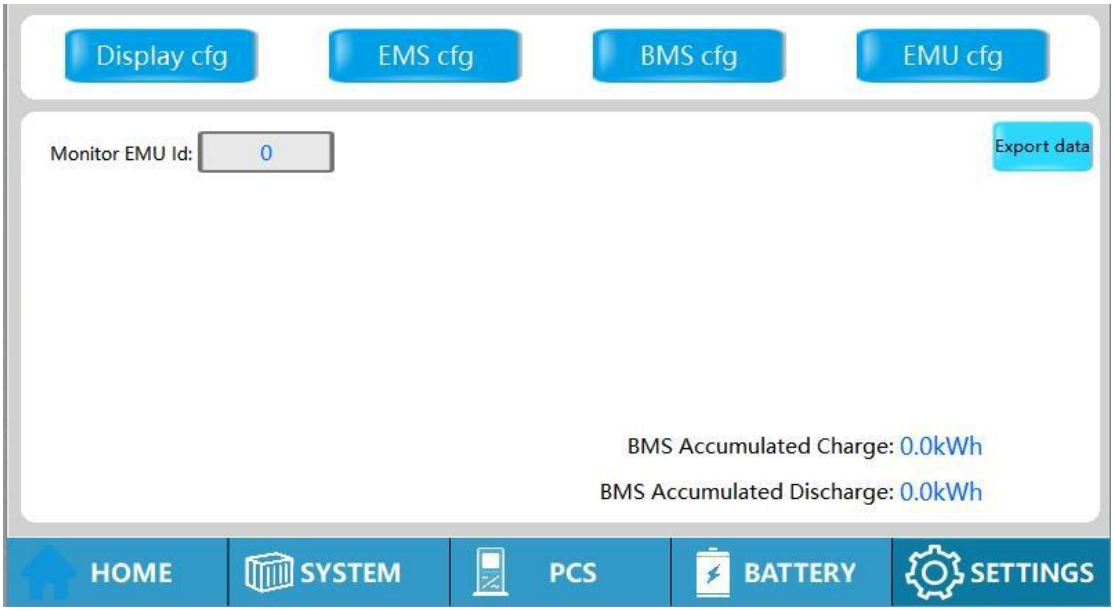
When there is a fault in the system, the yellow fault icon shown in ① will appear at the top of the screen. Click the icon to display the failure window to display the specific fault information of the current system.



4.4. Parameter configuration

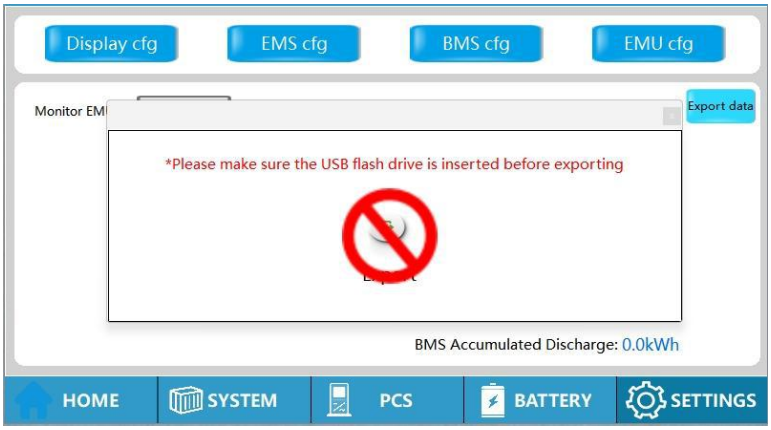
- Setting page

Switch to the parameter configuration page, display the entrance buttons for configuring various devices in the system, and display the monitoring ID on the screen. The default display screen monitoring ID is 1. When the system is used in parallel with multiple clusters, the monitoring ID needs to be consistent with the actual system EMU ID in order to correctly display the system data of the current cluster. Click on the display screen ID input box to change the ID value. (EMU ID will be explained in the 5.2.5 Cluster Parameter Configuration section)



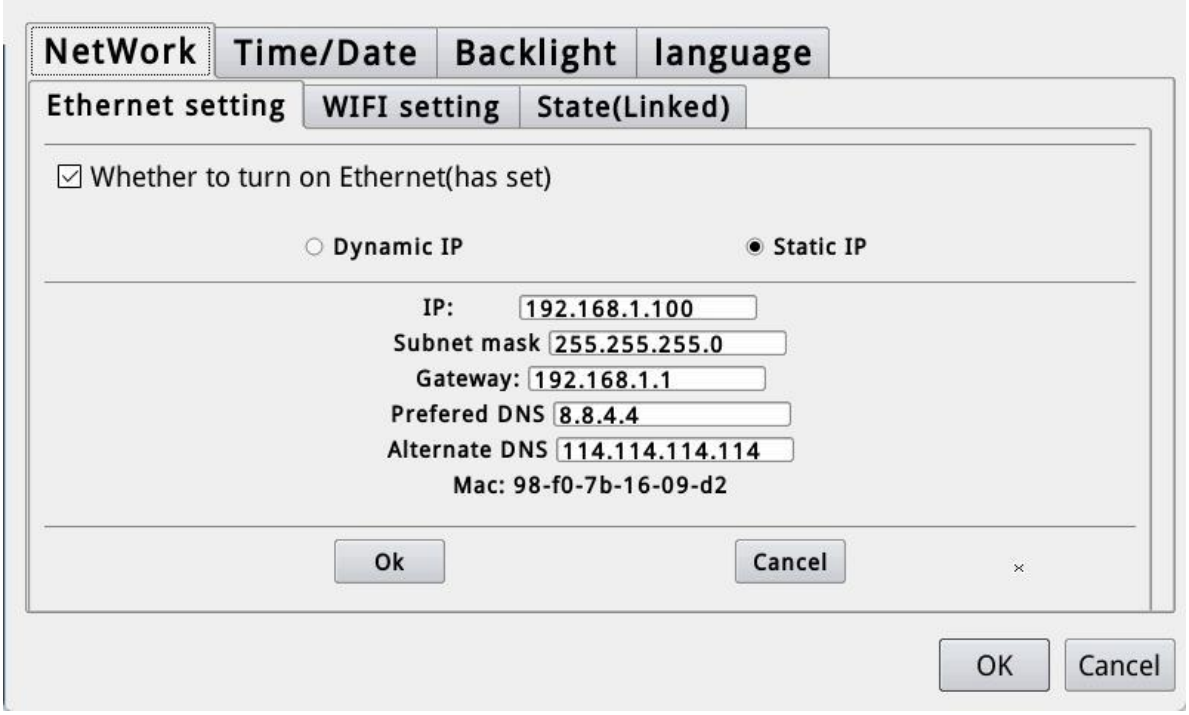
Click 

, export historical data, after the export window pops up, insert the USB flash drive into the display screen and click the start export button to export historical data to the USB flash drive.



- Display configuration

Click Display cfg, display screen configuration button. Enter the display configuration page to set some parameters of the display screen.



- EMS Configure

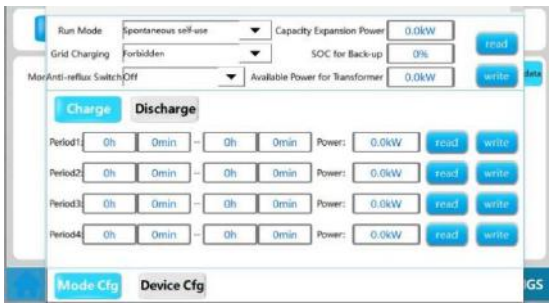
Click EMS cfg, the EMS Configuration button, The EMS Configuration window is up, where mode configuration and device configuration operate for EMS devices.

The parameter setting steps are as follows: Click the "Read" button to obtain the current parameter value of the device, set the parameter value, and click "Write" button to send the parameter value to the device.

Click Device Cfg the Device Settings page, according to the number of system battery clusters, the number of PCS, the number of PV, the number of grid side meters, the corresponding setting to the EMS controller.

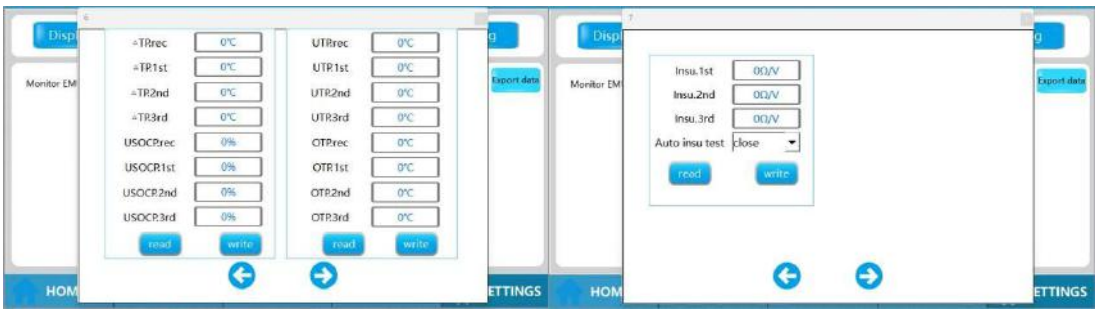
The EMS time currently only supports reading. If you need to set the EMS time, change the display time according to section 4.3.

The mode strategy supported by this EMS control controller is described in Section 4.3.



- BMS configure

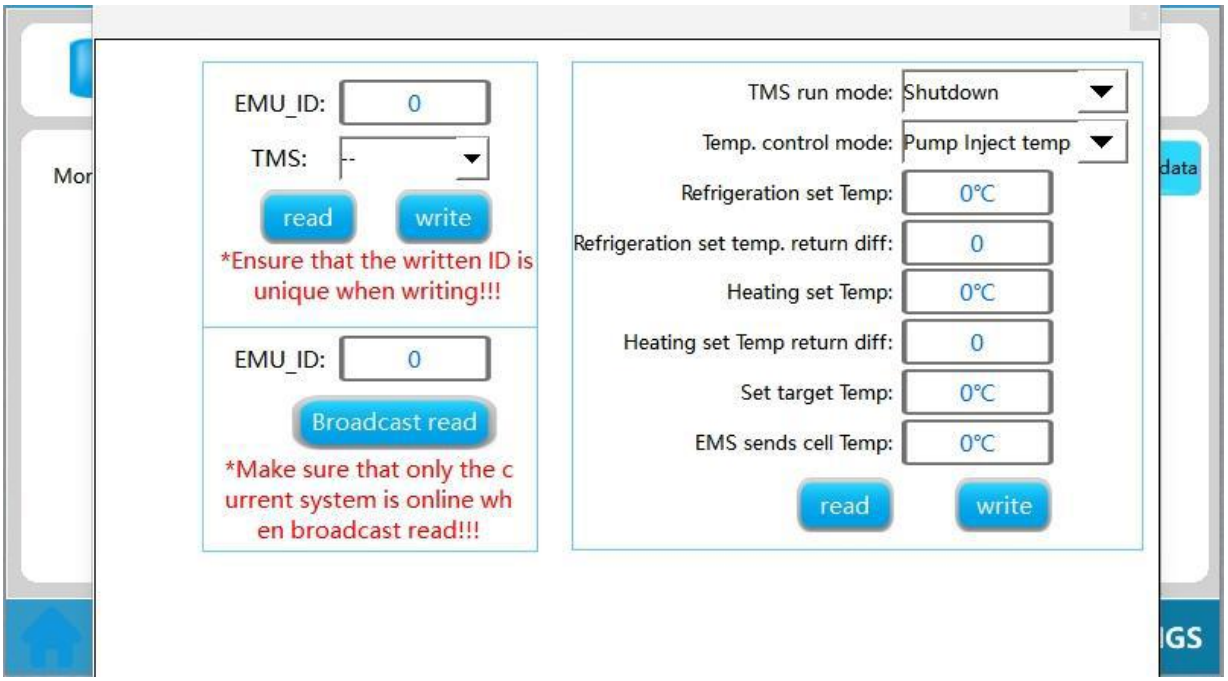
Cilck BMS cfg ,BMS parameter configuration button. The BMS parameter configuration window will pop up, where the BMS protection parameters in the battery system can be configured.



- EMU configure

Cilck EMU cfg ,parameter configuration button. The cluster parameter configuration window is pop up, where the ID and liquid cooling unit can be configured.

Note: Before broadcasting reads, ensure that only the current cluster is online (you can power down the other clusters and keep the current cluster powered up, again keeping only the current cluster online when writing IDs).



4.5. EMS Model Strategy

- Self-use mode

  The main goal of this model is to make use of photovoltaic power, preferentially when the load is abundant. Excess power can be stored in batteries to meet the early morning or night power supply needs.

  When selecting this mode, perform the following setting steps on the EMS mode configuration page of the display: ① Set the starting period of charge and discharge, and the maximum power, ② open the anti-counter current switch, ③ open the mains power charging to enable.

- Peak shifting and valley filling mode

  Charging at valley time and discharging at peak time can reduce the fluctuation of load and make the power system run more smoothly and operate more safely. For individuals, the electricity is bought cheaply in the valley and stored in the battery. At the peak, instead of using the grid electricity, the electricity is bought directly in the valley to reduce the cost.

  When selecting this mode, perform the following setting steps on the EMS mode configuration page of the display screen: ① Turn on the mains charging enabled.④ Set the peak and valley charge and discharge period, and the maximum power value.

- Factory expansion mode

  Factory expansion refers to the process where the factory's purchased power exceeds the capacity of the transformer, and the battery releases the stored backup power to reduce peak power, thereby reducing the cost of transformer capacity expansion.

  When selecting this mode, the following setting steps need to be performed on the EMS mode configuration page of the display screen: ① Set the expansion power value, ② Turn on the anti back flow switch, ③ Turn on the mains charging enable. ④ Set the charging period and maximum power value.

- Inspection and Maintenance

  Influenced by ambient temperature, humidity, dust, and vibration, the components within the equipment are subject to aging and wear, which may lead to potential failures. Therefore, conducting daily checks and regular maintenance is essential to ensure the equipment operates normally and extends its service life.

Warning

Only qualified electrical engineers are permitted to carry out the work described in this chapter!
Do not leave metal parts such as screws, washers, etc. inside the machine when carrying out maintenance work, as this may damage the equipment!

- Before performing hardware maintenance on the device, please do the following

(1) Turn off the equipment and the front-end power distribution of the equipment to ensure that the parts that need to be contacted are not electrified.

(2) Switch off the voltage to all auxiliary circuits. Wait at least 15 minutes for the intermediate circuit capacitors to discharge.

(3) With all circuit breakers in the off position, ensure no hazardous voltages are present by measuring the voltage at each node. Additionally, check the insulation resistance of the equipment shell to confirm it is safe to proceed with maintenance.

The recommended routine maintenance cycles and work content are as shown in the following table:

Notice

The above table is only the recommended routine maintenance intervals for the product.
The actual maintenance intervals should be determined by the specific environment in which the product is installed. If the environment is dirty, it is very necessary to shorten.

Check Content	Inspection Method	Maintenance Cycle
System operating status and environmental conditions	1. Visually inspect the equipment for damage or deformation. 2. Listen to the equipment for any abnormal sounds. 3. When the system is running, check whether all variables are normal. 4. Check whether the main components are normal.	1 time/6 months

	5. Check whether the device shell is heating normally. 6. Observe whether the air inlet and outlet are normal. 7. Check the humidity and dust around the equipment,all air inlet passages	
System cleaning	1. Check the cleanliness of circuit boards and components. 2.Check thermostat, radiator temperature, and dust.	1 time/6 months
Electrical connections	1.Check if the cable and terminal block are securely fixed, and if there are any signs of arcing or rust. 2.Check the cable for damage, especially cuts on the skin in contact with metal surfaces. 3.Check whether the insulation dressing of the cable terminals falls off. 4.Check whether the cable wiring distribution is abnormal.	1 time/6 months
Fan	1. Check the fan blades for cracks. 2. Listen to see if there is any abnormal vibration when the fan is running. 3. If there is any abnormality in the fan, it must be replaced in time.	1 time/6 months
Temperature control	1. Visually check for loose wiring. 2. Check whether the waterway pipeline is damaged and leaking liquid. 3.Check the condenser cleaning condition and clean the condenser with compressed air. 4.Check the pressure gauge of liquid cooled unit to confirm whether refrigerant is needed.	1 time/3 months
Switch	1. Perform routine inspections of all metal components for corrosion. 2. The annual inspection of the contractor ensures that its mechanical operation is in good condition. 3. Check operating parameters (especially voltage and insulation).	1 time/6 months

Security function	1. Check the emergency stop button and LCD stop function. 2. Simulate shutdown and check shutdown signal communication. Check warning labels and replace if necessary.	1 time/6 months

5.Maintenance of the Liquid-cooling System

System uses ethylene glycol type coolant, and it is recommended to replace the coolant every three years based on the operation of the equipment. When users purchase replacement on their own, need to choose a coolant with a freezing point lower than the local minimum temperature. It is recommended to use ethylene glycol coolant with a concentration of 40% to 50%.

Notice

If coolant leakage is found, please stop the machine in a timely manner and contact the seller for handling!

- Users can view the pressure data of the liquid cooling system through the local display screen.Under different temperature and working conditions, there may be some differences in pressure data, but the normal pressure range should be between 120~250kPa. When the pressure is abnormal, please stop the machine in a timely manner and contact the seller for maintenance and troubleshooting.

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