Exhibit 3

Energy Storage System

Operation & Maintenance Handbook

Product Name：BP-ES-125kW-261kWh-B02

C&I Energy Storage System（125kW/261kWh）

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Outlines

This document mainly introduces the product introduction, application scenarios, installation and testing, system maintenance and technical data of the liquid-cooled outdoor cabinet series for energy storage systems.

Symbol Definition

In order for the user to better ensure personal and property safety/better use of this product when installing this product, the messages are clarified in this manual and using industry standard symbols highlighted . The following symbols are used in this product, please read them carefully for better use of this manual.

Indicates that failure to avoid will result in injury or death or will result in a serious accident or injury.

Indicates the presence of high-risk level injuries

Indicates that failure to avoid will result in injury or death or will result in a serious accident or injury.

Indicates the presence of medium-risk injuries

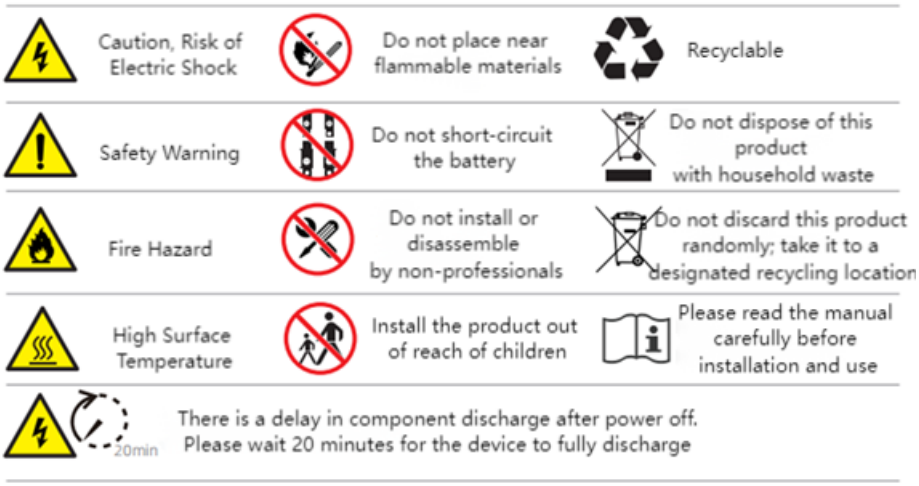
Indicates that failure to avoid will result in minor or moderate injury to personnel.

Indicates the presence of low-risk level injuries

Indicates additional clarification of key information in the text

"Description" is not a safety warning message and does not relate to personal, equipment or environmental injury information.

Definition of marking



Definition of acronyms

acronyms	full name	acronyms	full name
FPC	Flexible printed circuit	SOC	State Of Charge
BMS	Battery management system	BM	Battery Module
BMU	Battery management unit	PCS	Power Conversion System
BOL	Begin of life	EOL	End of life
Bus-bar	Current connection betwee cells	OCV	Open circuit voltage
CAN	Controller area network	S/G	Switch Gear
SOH	State of Health	DOD	Depth of discharge

Catalogue

1 Safety Instructions

Representations

01. Damage to equipment caused by force majeure, such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and extreme weather;

02. Failure to operate under the conditions of use required by the product handbook;

03. Failure to follow the operating instructions and safety warnings in the product and documentation;

04. Unauthorised disassembly, alteration of products or modification of software code;

05. Damage caused by not storing the product in accordance with the product documentation;

06. Installation and use of the environment does not meet the relevant international, national or regional standards;

07. Installation and use of equipment by unqualified personnel;

08. Your own materials and tools do not meet the requirements of local laws and regulations and relevant standards;

09. Damage to the product caused by the user or a third-party transport company appointed by the user when the user transports the product himself;

10. Damage caused by you or a third party through negligence, intent, gross negligence, mishandling, or for reasons not attributable to us.

The Company shall not be liable for any of the following or the results thereof:

01. Before transporting, storing, installing, operating, using or/and maintaining the equipment, read this handbook, operate it in strict accordance with its contents, and follow all safety precautions marked on the equipment and in the manual.

02. In this manual, "equipment" and "product" refer to products, software, components, spare parts or services related to this manual;

"The Company" means the manufacturer (producer), seller or service provider of the equipment;

"You" means the person who transports, stores, installs, operates, uses or maintains the Equipment.

03. In this manual .The "DANGER", "WARNING", "CAUTION", and "NOTICE" do not imply that all safety precautions should be observed You must also comply with relevant international, national or regional standards and industry practices.

04. The Company shall not be liable for any damages resulting from violation of the requirements for safe operation or from violation of the safety standards for the design, production and use of the equipment.

05.This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment malfunction, abnormal equipment function, or damage to parts, and these losses are not covered by the equipment warranty.

06. The use of the equipment in an environment that does not meet the design specifications may cause personal injury or death, property damage, etc., and the Company shall not be liable for compensation.

07. All operations such as transport, storage, installation, operation, use and maintenance should comply with applicable laws, regulations, standards and normative requirements.

08. It is prohibited to reverse engineer, decompile, disassemble, adapt, implant or other derivative operations on the equipment software, to study the internal implementation logic of the equipment in any way, to obtain the source code of the equipment software and to violate intellectual property rights, and to disclose the results of any performance tests of the equipment software.

1.1 Personal Safety

Danger

- Be sure to keep the power off throughout the installation process. It is prohibited to install or disassemble the machine with electricity, or to make sockets and connectors. Installation with electricity may generate electric arcs, electric sparks, or fire and explosion, which may lead to fire or personal injury in serious cases.
- When the equipment is electrically charged, be sure to operate it in a standardised and correct manner. Otherwise, fire, electric shock or explosion may occur, resulting in injury or property damage.

Warning

- Do not deactivate equipment protection devices and ignore warnings, cautions and precautions in manuals and on equipment.
- If, during the operation of equipment, a malfunction is detected that may result in personal injury or damage to the equipment, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.
- Do not power up the unit until it has been installed or confirmed by a qualified person.
- Direct contact, contact with other conductors or indirect contact with the power supply equipment through wet objects is prohibited.
- The voltage at the point of contact should be measured before contacting any conductor surface or terminal to confirm that there is no risk of electric shock.

Installation Operator Requirements:

Personnel responsible for the installation and maintenance of the equipment must be professionals and trained personnel who have been rigorously trained in the correct operating methods and are aware of the various safety precautions and relevant standards in their country/region.

Professionals:

Knowledge of equipment principles and construction, experience in training or operating equipment, and the ability to be aware of the various potential sources of hazards during installation, operation, and maintenance of equipment.

Trained personnel:

(b) Has the appropriate technical and safety training and experience necessary to be aware of the dangers that may be posed to him when carrying out an operation and to be able to take measures to minimise the risk to himself and other persons.

1.2 Electrical Safety

Danger

- Before making electrical connections, make sure the unit is undamaged, otherwise electric shock or fire may result.
- Unregulated and incorrect operation may cause accidents such as fire or electric shock.
- During operation, foreign objects must be prevented from entering the interior of the equipment, as this may result in short-circuit failure or damage to the equipment, derating or loss of power to the load, and personal injury.
- When equipment is installed, the protective earth wire must be installed first; when equipment is removed, the protective earth wire must be removed last.
- When the unit is in operation, the casing is hot and there is a risk of burns, so do not touch it.
- In the event of a fire, evacuate the building or equipment area and ring the fire alarm or call the fire alarm. Under no circumstances should you re-enter a burning building or equipment area.

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Danger

Electrically charged measurements

High voltages are present in the equipment within the Energy Storage Integration System, and accidental touching may pose a risk of fatal electric shock. It is important to observe the following requirements when making measurements with electricity:

- Take proper precautions (e.g. wear insulated gloves rubber shoes, etc.).
- At least one professional must accompany you during surveying operations to ensure personal safety.

Danger

Full power-off operation

It must be ensured that the equipment and systems within the integrated energy storage system are completely unpowered before the integrated energy storage system is operated.

- Ensure that a disconnected device cannot be accidentally repowered. Use a multimeter to ensure that the inside of the unit is completely de-energised.
- Ensure correct earthing as necessary. Ensure that escape routes are clear throughout the operation.
- Ensure that the Energy Storage Integration System has been completely de-energised and confirm this by measuring with a multimeter. Use insulating material to insulate and cover potentially electrically live parts adjacent to the operating section.
- Always wait at least 20 minutes after the Energy Storage Integration System has been completely decommissioned before operating the Energy Storage Integration System.

1.3 Battery Protection

Danger

This product contains high voltage! Danger of electric shock! The battery in the system generates a high voltage when connected, which can cause electric shock or even life-threatening injury if accidentally touched.
When installing, maintaining and overhauling the equipment, it is necessary to ensure that:

- All storage batteries were completely disconnected and remained disconnected for 20 minutes.
- Provide visible warning signs at the connection disconnections of the energy storage batteries to ensure that they cannot be accidentally reconnected.

Danger

- Short the positive and negative terminals of the battery, otherwise it will cause a short circuit of the battery. (A short-circuited battery will instantaneously generate a high current and release a large amount of energy, causing the battery to leak, smoke, release flammable gases, runaway heat, catch fire or explode.)
- It is strictly prohibited to maintain the battery with electricity, otherwise it will cause short circuit of the battery.
- It is strictly prohibited to expose the battery to high temperature environments or around heat generating equipment, such as high temperature sunlight, fire sources, transformers, heaters, etc.. (Overheating may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.)
- It is strictly prohibited for the battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.
- Please obtain the battery recommended by the manufacturer's sales through proper channels. Using or replacing the battery with an incorrect model will pose a risk of fire or explosion.
- A battery is a closed system that does not release any gases under normal operating conditions. If the battery is subjected to extreme abuse, such as fire, pinprick, extrusion, lightning strike, overcharging or other severe conditions that may lead to thermal runaway of the battery, it may lead to battery breakage or abnormal chemical reaction inside the battery, which may lead to electrolyte leakage or generation of CO_2 or H_2 gases, and the site should ensure that flammable gases are discharged normally to avoid leading to combustion or corrosion of the equipment.

- In the event of a battery accident, non-professionals should stay away (electrolyte is toxic and volatile) and contact a professional immediately.
- In case of battery accident, professionals should wear goggles, rubber gloves, gas mask, protective clothing, etc., power down the equipment in time and take out the leaking battery, and contact technical engineers or after-sales service to deal with it.

Warning

- Battery storage and transit, before removing the packaging need to ensure that the outer packaging box is intact without damage, in accordance with the identification of the box is placed correctly, it is strictly prohibited to inverted, sideways, vertical, tilted placement, stacked in line with the requirements of the packaging on the yardage, to avoid any impact or fall, etc. caused by the battery damage.
- Batteries should be installed in areas away from liquids, and are strictly prohibited from being installed under air conditioning outlets, vents, machine room outlet windows, water pipes and other locations prone to water leakage, in order to prevent liquids from entering the interior of the equipment and causing equipment malfunction or short-circuit.
- Tighten the fastening screws of the copper rows or cables according to the torque specified in the text, and periodically check whether they are tightened, whether there are rust, corrosion or other foreign materials, and dispose of them cleanly, otherwise the screws are falsely connected will lead to excessive connection voltage drop, and even burn the battery with a large amount of heat when the current is high.
- After discharging the battery, the battery should be recharged in a timely manner, otherwise the battery may be damaged due to over-discharge.

1.4 Environmental Protection

Do not open the Energy Storage Integrated System cabinet door in case of dust storms, thunderstorms, high winds, hail, or other inclement weather, or when the relative humidity of the surrounding environment is greater than 95%.

At the end of the severe weather, please treat your surroundings promptly.

The warning labels on the product and on the electrical equipment inside contain important information about the safe operation of the product and the equipment inside, and must not be torn off or damaged!

- - Ensure that body warning signs are always legible.
- - Always replace the body warning label as soon as it is damaged or obscured.

2 Packaging, Transport

2.1 Packaging Accessories

Items	Model/Specification	Unit (of measure)	Quantities
energy storage system	125kW261kWh	interleave	1
Certificate of Conformity	/	pcs	1
quality control report	/	pcs	1
Product Manual	/	pcs	1

When the unit arrives, open the package and check the following items:

- Visually inspect the appearance of the product to check for shipping damage in transit. Notify the carrier immediately of any damage;
- Check whether the attachment models are complete and correct. If you find that the accessories are missing or the models do not match, you should make on-site records in time and contact our marketing department immediately against the list of shipped attachments.
- It is prohibited to tilt or put down the equipment during the handling process, otherwise the internal devices will be subjected to greater stress, and damage to the devices may occur, affecting the performance.

2.2 Transport Conditions

⚠ WARNINGS

- The various devices of the integrated energy storage system have been installed and fixed in the cabinet of the integrated energy storage system before leaving the factory, and the integrated energy storage system can be lifted and transported as a whole during transport. During the whole process of loading, unloading and transporting, the safety regulations for outdoor work in the country or region where the project is located must be observed!
- Any machinery used in the lifting of the integrated energy storage system shall be maintained.
- All personnel involved in loading, unloading and bolting should receive appropriate training, particularly in safety.
- Carry out integral lifting and transport.

⚠ NOTICE

- The mechanical parameters of the integrated energy storage system need to be kept in mind during the entire process of loading, unloading and transport.
- Transport mobile energy storage integrated systems need to fulfil the following conditions:
- Each door of the integrated energy storage system is locked tight.
- Additional traction devices may be required if movement on slopes etc. is required.
- Remove all obstacles that are or may be present during the movement., such as trees, cables, etc.,
- Whenever possible, the installation of the integrated energy storage system should be carried out under favorable weather conditions.
- Warning signs or warning tapes must be installed as required to avoid non-staff entering the lifting and transport area to avoid accidents.
- Select the appropriate lifting tools according to the site conditions.
- The selected crane must have sufficient load capacity, boom length and swivel radius.

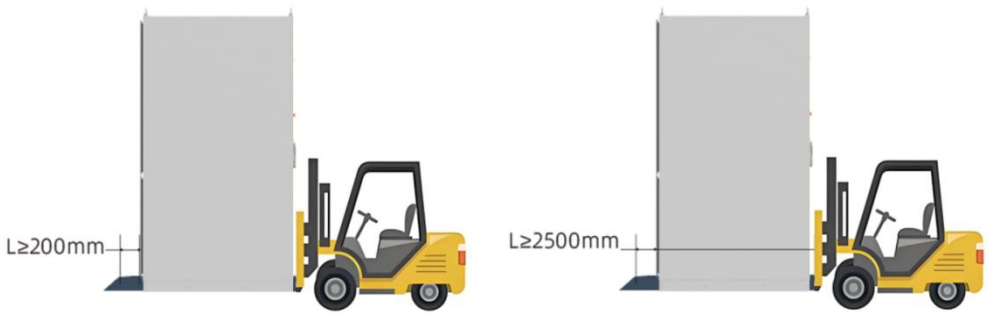
2.3 Forklift Transport

If the installation site is level, the EIS can be moved using a forklift truck, which is equipped with a slot in the bottom of the EIS specifically for transport by forklift truck. If a forklift truck is used for transport, the following requirements should be met:

- Forklift trucks should be equipped with sufficient load capacity (please ensure that $t \geq 3t$).
- The length of the pins is ≥2500mm, the thickness of the fork tines is ≤55mm and the width is ≤190mm.
- The pins should go through the slots on the bottom of the energy storage system.
- The transport movement and dropping off of the integrated energy storage system and batteries should be slow and steady.
- The integrated energy storage system and batteries should only be placed in a level and adequately supported area that is well drained and not in an area that is susceptible to flooding.

⚠ Attention

Move the energy storage integrated system through the slot at the bottom of the energy storage system. Handling by forklift must be done safely.



2.4 Lifting

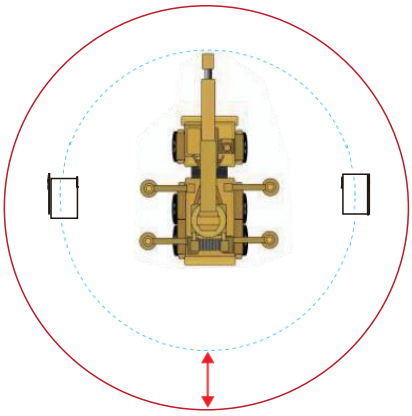
Lifting Precautions

⚠ Warning

- Throughout the lifting process of the integrated energy storage system, the safe operation procedures of the crane should be strictly observed.
- It is strictly forbidden to stand people within 5m~10m of the lifting operation area, especially under the lifting arm and under the lifting or moving machine, to avoid casualties. In case of bad weather conditions, such as heavy rain, fog, strong winds, etc., should immediately stop lifting work, and do a good job of site protection.
- When lifting the integrated energy storage system, the following requirements must be met: the site must be secured during lifting.
- When carrying out lifting and installation operations, professional personnel should be on site to direct the whole process. The strength of the slings used should be able to withstand the weight of the integrated energy storage system.
- Ensure that all sling connections are safe and reliable, and ensure that the sections of sling connected to the corner pieces are of equal length. The length of the slings can be adjusted appropriately according to the actual requirements of the site.
- The entire lifting process must ensure that the energy storage integrated system is smooth and does not deflect.
- Please use the four lifting rings of the Energy Storage Integrated System to lift the Energy Storage Integrated System.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the integrated energy storage system.

⚠ Danger

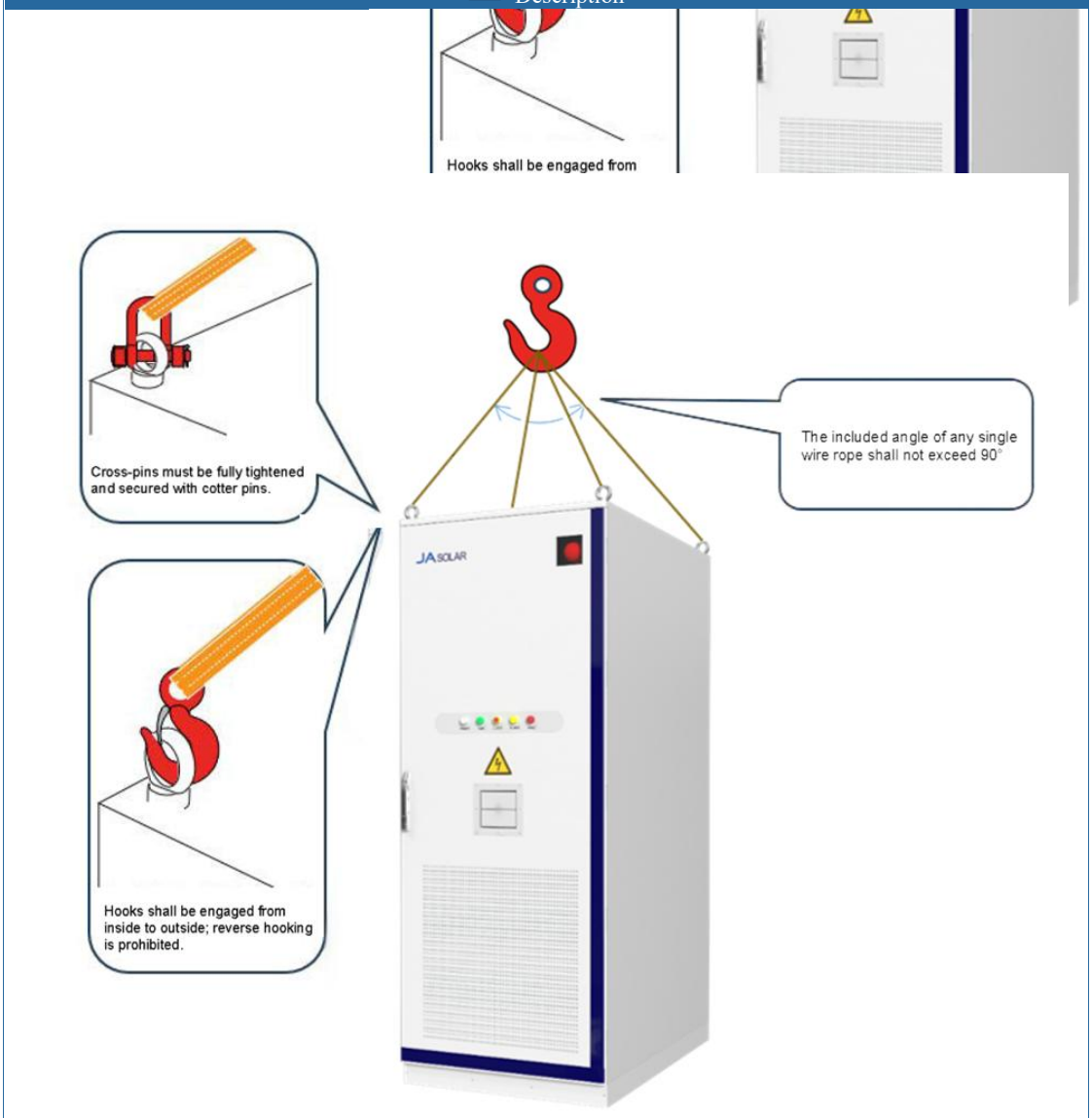
- The blue dotted circle in the crane operation schematic indicates the scope of crane operation.
- When the crane is working, no one is allowed to stand in the solid red circle!



⚠ Warning

- The integrated energy storage system can be lifted using slings with hooks or U-hooks.
- Please connect the lifting device and the energy storage integrated system correctly.

⚠ Description



Crane Operation

During lifting of the integrated energy storage system, all operational aspects shall be carried out according to the following requirements:

- The Energy Storage Integration System shall be lifted vertically, with no dragging on the floor or roof, and shall not drag or push the Energy Storage Integration System on any surface.
- The integrated energy storage system shall be suspended after being lifted 300mm away from the support surface, the connection between the spreader and the integrated energy storage system shall be checked, and the system after confirming that the connection is firm shall be lifted only.
- The integrated energy storage system shall be placed gently in place for a smooth landing, and it is strictly prohibited to place the integrated energy storage system outside the vertical landing by flinging the spreader.
- The site on which the integrated energy storage system is placed should be firm and level, well drained, and free of obstacles or protrusions.
- On the site, the integrated energy storage system shall be secured by four bottom corner pieces.

- Due to site constraints, please use non-vertical force to lift from the four lifting rings of the integrated energy storage system.
- It is strictly forbidden to lift the energy storage integrated system through the bottom slot.
- When lifting and transporting, all safety operation standards and norms of the country or region where the project is located shall be strictly observed.
- We are not responsible for any personal injury or property damage caused by violation of relevant requirements or other safety norms.

3 Products

3.1 Overview of the Programme

This 261kWh outdoor energy storage cabinet adopts the design scheme of liquid-cooled outdoor cabinet for lithium iron phosphate batteries. It is equipped with auxiliary equipment such as batteries, battery management system (BMS), local controllers and fire protection system to provide comprehensive support for energy storage operation.

Outdoor cabinets are equipped with excellent multi-protection functions, which can ensure up to 10 years of stable operation without interference from corrosion, fire, water, dust (wind and sand) and ultraviolet rays. Specifically, as follows:

- **Anti-corrosion**: Within 10 years, the appearance, mechanical strength and degree of corrosion of the outdoor cabinets will always be suitable for actual use.
- **Fire prevention**: outdoor cabinet shell structure, thermal insulation and heat preservation materials, internal and external decorative materials, etc. are all flame-retardant materials to ensure fire safety.
- **Waterproof**: no water accumulation, seepage or leakage at the top of the box, no water ingress at the sides and no water seepage at the bottom.
- **Anti-dust (anti-wind and sand)**: Even when encountering windy and sandy weather, it can effectively block dust from entering the cabinet and maintain the effectiveness of this function for a long time.
- **Earthquake-proof**: In the transport process and earthquake and other conditions, the mechanical strength of the outdoor cabinet and its internal equipment meets the requirements, and there will be no failure such as deformation, abnormal function or inability to operate after the earthquake.
- **UV protection**: the materials inside and outside the outdoor cabinets will not deteriorate due to UV radiation and will not absorb UV heat.

3.2 Programme Design

3.2.1 System Components

According to the product design requirements, the system consists of energy storage converter, battery cluster, liquid cooling unit, fire protection system, and is equipped with lightning protection and flooding protection. It can realize the functions of peak shaving and valley filling, demand control and backflow prevention.

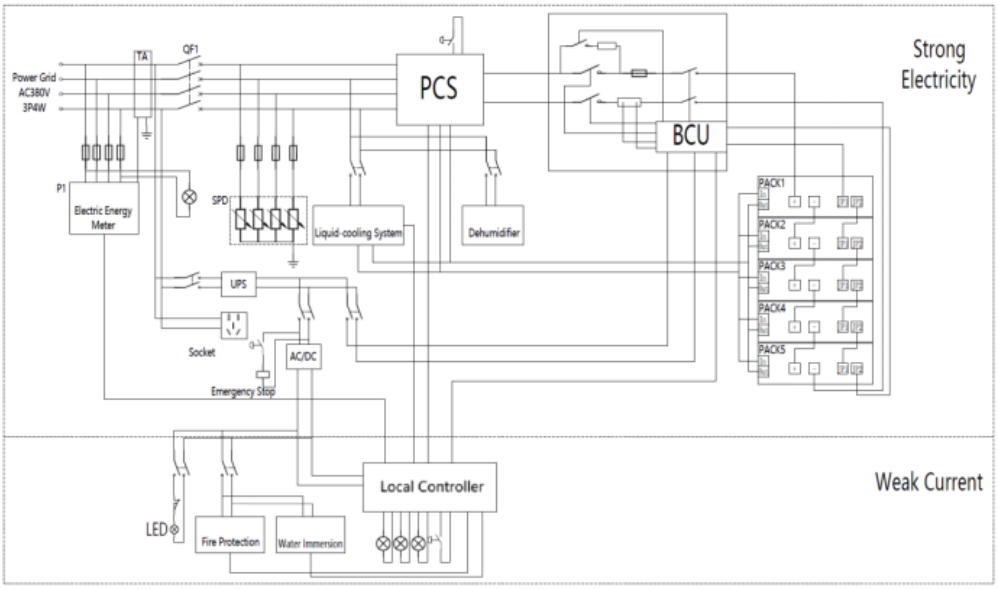


Figure: System Topology

Table: System Parameters

DC parameters	battery capacity	261kWh
	Cell Capacity	314Ah (LFP)
	Battery PACK	1P260S
	rated voltage	832VDC
	DC Voltage Range	728Vdc ~ 936Vdc
	Charge/discharge ratio	0.5P
AC parameters	rating	125kW
	rated voltage	400V
	access method	3P4W+PE
	rated frequency	50/60Hz
	power factor	＞0.99 -1 (ahead) ~ +1 (behind)
	THDi	<3% (rated power)
protective function	AC side	Molded Case Circuit Breakers
	DC side	Disconnecting switch + fuse
	fire-fighting	Aerosol + water fire fighting
environmental conditions	operating temperature	-30~50°C (>45°C derating)
	height above sea level	≤2000m
	relative humidity	0~95% (no condensation)

physical property	weights	~2.8T
	Dimensions (W*H*D)	~989mm*2471.5mm*1465mm
	Anti-corrosion grade	C4
	protection class	IP54
other than	Heat dissipation method	liquid cooling
	communication interface	CAN/Ethernet/485

3.2.2 Cells and PACKs

The project adopts 3.2V/314Ah square aluminum shell battery with high capacity, high energy density, prismatic structure, and safe, reliable and long-life lithium iron phosphate material, the units are as follows:

norm	parameters	appearances
chemical material	LFP	
sizes	~L174*H207*W71.6	
weights	5.60±0.2Kg	
quantitative (science)	314Ah	
nominal energy	1004.8Wh	
input voltage	3.2V	
voltage range	2.5-3.65V (T>0C) 2.0-3.65V (T≤0C)	
temperature range	Charge: 0℃~60℃ Discharge: -20℃~60℃	
internal resistance	≤0.25mΩ	

The 1P52S liquid-cooled battery plug-in box consists of two 1P26S battery modules, a BMU, a liquid-cooled plate and a number of wiring harnesses. Battery management unit is the smallest plug-in unit of the battery management system. Battery management unit consists of power supply module, single cell acquisition module, temperature sampling module, channel switching module, equalization control module, communication module, CPU and its peripheral circuits, and it can measure real-time voltage of single cell, total voltage of battery strings, voltage of external power supply, ambient temperature of the batteries, equalization voltage measure the voltage of single cell through 485 communication module.(over-under-voltage protection), equalization current (charging/discharging), and it can Charging/discharging), and through the 485 communication bus real-time monitoring data can be actively reported to the battery cluster management unit and accept the cluster management unit control instructions, detailed specifications are as follows:

norm	parametric	appearances
Grouping method	1P52S	
Main components	Cell, BMU, CCS	
sizes	~L1140*W790*H245mm	
weights	~323kg	
quantitative (science)	314Ah	

energies	52.2496kWh	
input voltage	166.4Vdc	
voltage range	145.6~187.2V	
runtime multiplier	0.5P	
Storage humidity	5%~95% RH	

3.2.3 Battery Cluster Rack

Each battery cluster of this energy storage system consists of 5 battery insertion boxes, and the control of the battery cluster is completed by a BCU. Battery cluster management unit collects the battery module information downward and provides the information to the upper local controller. Battery cluster management unit collects the battery voltage, current, temperature and other information of the cluster to protect and control the battery cluster, in order to ensure the safe operation of the battery cluster. Detailed specifications are listed in the table below:

norm	parametric
Grouping method	1P260S
sizes	~L1140*W790*H1300mm
weights	~2.1T
quantitative (science)	314Ah
energies	261kWh
voltage range	728Vdc~936Vdc

3.2.4 Battery Management System BMS

Battery management system according to the energy storage battery system into groups to match and coordinate, using a layered topology configuration, the above contains battery modules, battery clusters with a two-tier architecture of the battery management system to optimize the state of the battery operation control and overall management. The specific realization level of each function in the functional requirements of the battery management system is determined by the topological configuration of the battery management system, and is realized in situ in a hierarchical manner.

The energy storage system battery management system adopts a two-level management architecture consisting of Battery Management Units (BMU) and Battery Cluster Management Units (BCMU); the BMU collects the voltage, temperature, individual state of charge (SOC), state of health (SOH), and other data from the battery cell box through the control module, which is then transmitted to the high-voltage box BCU main control module via a daisy chain; the BCU module within the PCS mainly uploads subordinate control data, controls the closing/opening of contactors, and detects cluster current and total cluster voltage; the BCU uploads all information within the cluster to the local controller; the BCU is responsible for communication with the PCS, dry contact output, etc.; the BCU also communicates with the local controller to upload relevant BMS information; the BMS can achieve optimized control and comprehensive management of the battery operating status.

Table Slave Module Technical Parameters

serial number	Parameter name	unit (of measure)	Standard parameter values	note

1	Number of voltage samples	bunch or cluster	52	
2	Number of Temperature Collections	times	28	
3	Individual Voltage Measurement Range	V	0~5	
4	Cell Voltage Detection Accuracy	mV	≤±3	
5	Cell Voltage Sampling Period	ms	≤100	
6	Cell temperature detection range	℃	-40~125	
7	Cell temperature detection accuracy	℃	≤2	
8	Core temperature sampling period	ms	≤500	
9	Battery equalization method	/	passive equilibrium	
10	Battery equalization current	mA	100	
11	Communication method	/	daisy chain	

3.2.5 Cooling Systems

Table of technical parameters

serial number	Parameter name	unit (of measure)	Standard parameter values	note
Size, quality & mounting				
1	Dimensions (H x W x D)	mm	245 × 700 × 900	
2	Mass (without refrigerant)	kg	85	
3	Installation	/	drawer-type	
4	application environment	/	Outdoor	
5	Inlet and outlet pipe connection form	/	DN20 Quick coupling	
Environmental Protection & Performance				
6	Range of working environments	ºC	-30~+55	
7	Storage environment range	ºC	-40~+70	
8	noise level	dB(A)	70	
9	Anti-corrosion grade	/	C3M	
10	Appearance of equipment color	/	Outdoor Orange RAL7035	
11	IP Protection Rating	/	IPX5	
12	refrigerants	/	R134a	

13	refrigerant carrier (chemistry)	/	50 per cent aqueous solution of ethylene glycol	
14	RoHS Certification	/	be	
15	Design life	Year	10	
16	Air outlet method	/	exhaust	
Cooling/heating capacity				
17	Cooling Capacity@L35/W18	kW	5.0	
18	Heating capacity @Tu=10°C	kW	2.0	
19	water discharge temperature	ºC	18	
Parameter setting				
20	Liquid temperature setting range	ºC	10 to 35 (heating point ≤ cooling point)	
21	Default Cooling Setpoint	ºC	18	
22	Default heating set point	ºC	15	
23	communications protocol	/	CAN	
24	readable data	/	Inlet and outlet water temperature, inlet and outlet water pressure, ambient temperature, etc. Write the outlet water temperature Degree setpoints, operating modes, etc. are based on the communication protocol point list.	
Circulating water flow				
25	Rated circulating water flow	L/min	46.5	
26	Rated external circulation head	kPa	60	
power consumption				
27	Refrigeration input power@L35/W18	kW	2.4	
28	Heating input power @Tu=10°C	kW	2.35	
29	Self-circulating model (single pump operation) power	kW	0.25	
30	Maximum power consumption	kW	3.6	
Power supply system				
31	Rated Working Voltage	V, Hz	220V 50/60Hz	
32	Supported Voltage Range	V, Hz	220V±15%,50/60±3Hz	

33	Maximum operating current	A	19.2	

Based on the operating conditions of the whole energy storage system, we analyze the cooling and heating requirements of the whole system, and carry out the design of the thermal management system, such as reasonable system layout, selection of liquid-cooling units and pipelines, and thermal management control strategy. Through the thermal management system, the battery is ensured in all stages of charging, discharging and resting. The temperature control system of the outdoor cabinet is composed of a 5kW liquid-cooling unit and liquid-cooling pipeline, which can realize the temperature control inside the external cabinet. The control system automatically controls the work of the temperature control system according to the indoor and outdoor temperatures and humidity to ensure that the cooling capacity of the chiller unit into the cabinet can achieve the chiller water outlet temperature within the range of 18℃ ≤ T ≤ 20℃ under the limit temperature of 45℃.

The liquid cooler has the ability of self-diagnosis, safety voltage protection, refrigeration high and low pressure protection, exhaust and suction temperature protection, high and low liquid level protection, and circulating pipeline pressure abnormality protection.

3.2.6 Fire Protection System

The fire extinguishing system utilizes a hot aerosol extinguishing device. The aerosol extinguishing agent is a solid energetic chemical material classified as pyrotechnic composition. When the thermal detection wire senses a fire signal, it immediately activates and transmits the signal to initiate the extinguishing device, which then discharges the agent to suppress the fire. The aerosol extinguishing agent features compact size, normal pressure storage, and requires no pipeline installation or maintenance. It provides highly efficient and rapid fire suppression while being non-toxic, harmless, safe, reliable, and environmentally friendly.

The fire suppression mechanism of hot aerosol primarily consists of two aspects:

(1) Physical heat absorption: The aerosol particles absorb heat from the fire through phase-change processes such as thermal melting and vaporization. For instance, when solid particles transform into gaseous state under high temperature, they absorb substantial thermal energy.

(2) Chemical inhibition: The extinguishing agent is activated through redox reactions, triggering chemical processes that generate large volumes of inert gases, water vapor, and trace solid particles. These components form a mixed gas that is ejected from the nozzle of the automatic fire suppression device. The resulting aerosol (mixed smoke) effectively suppresses the combustion reaction, thereby achieving fire extinguishment.

3.2.7 Energy Storage Converters

PCS module adopts modular design, with constant voltage, constant current and constant power modes, supporting off-grid and grid-connected operation and intelligent switching between multiple modes, as well as reactive power compensation and harmonic compensation functions. It adopts advanced control algorithm to realize parallel connection of multiple machines and has excellent load adaptability and grid adaptability.

- Bi-directional energy flow, fast response, charge/discharge conversion time <100ms
- Highly reliable protection against high and low temperatures, humidity, salt spray and other harsh environments.
- Wide operating temperature range: -30°C to 55°C
- Three-phase 100% unbalanced load, support access to single-phase load, flexible load configuration

Table: Technical Parameters of Energy Storage Converters

DC Side Parameters	
voltage range	580~1000 Vdc
DC Maximum Current	216A
AC Side Parameters	
rating	125kW
overload capacity	110%
Rated Input Voltage	400Vac, 3P+N+PE
Total current harmonic distortion rate	<3% (full load)
power factor	＞0.99 1cap~1ind
common parameter	
Working altitude	4000m (>3000m derating)
Maximum conversion efficiency	98.5%
Dimensions (W*D*H)	444mm*720mm*220mm

List of configurations

serial number	name (of a thing)	Specification	unit (of measure)	quantities
1.	Energy storage converter	125kW	piece	1
2.	local controller	BAU-B30	piece	1
3.	DC system	3.2V314Ah 1P52S*5 Battery Cluster	interleave	1
4.	liquid cooler	5kW	interleave	1
5.	fire-fighting	Aerosol	interleave	1
6.	Molded Case Circuit Breakers	NDM3-315	piece	1
7.	surge protector	ZGG40	piece	1
8.	Multi-function digital display	ADW300	piece	1
9.	current transformer	AKH-0.66/30I	piece	3

4 Storage Security Management

- The storage environment should meet the requirements of local regulations and standards. Stacking of dangerous goods should be in accordance with relevant regulations. Dangerous goods stored in the same stock should meet the segregation requirements.
- Dangerous goods sub-assembly, modification, opening of boxes and drums inspection should be carried out in a safe place outside the warehouse. At the end of the operation, the storage area and storage room should be inspected and confirmed to be safe before leaving.
- Cleaning of dangerous goods containers should be left to qualified units.
- If the battery malfunctions (carbonization, leakage, expansion, water ingress, etc.), it shall be promptly transferred to the hazardous materials warehouse for separate storage, with a distance of not less than 3m from the surrounding combustible materials, and scrapped as soon as possible for disposal.
- When storing the battery, it should be placed correctly according to the identification of the packing box, and it is strictly prohibited to place it upside down, sideways or tilted, and when stacking it, it should meet the yardage requirements on the outer packaging.

- When storing batteries, please store them separately, avoid mixing them with other equipment and avoid stacking them too high. When storing a large number of batteries on site, it is recommended to have fire-fighting facilities that meet the requirements, such as fire-fighting sand, fire extinguishers and so on.
- The ambient air must not contain corrosive or flammable gases.
- Storage environment requirements:
  - Ambient temperature: -10℃～55℃, recommended storage temperature: 0℃～30℃ (6months);
  - Relative humidity: 5%RH to 95%RH;
  - Store in a dry, ventilated, clean room;
  - Avoid contact with corrosive organic solvents, gases and other substances;
  - Avoid direct sunlight;
  - The distance from the heat source must not be less than two meters without a significant amount of infrared light;
  - No metallic conductive type dust, etc.
- During storage, relevant proof of compliance with product storage requirements, such as temperature and humidity log data, photos of the storage environment and inspection reports, need to be kept.
- Battery storage must be disconnected from the outside and the circuit breaker must be in the off position.
- The warehouse manager should keep monthly statistics on battery storage and regularly inform the planning link about the battery inventory. For batteries with storage time close to 15 months (-10℃～25℃), 9 months (-25℃～35℃) or 6 months (-35℃～55℃), timely arrangement of replenishment of electricity will be made.
- When stored beyond the expiry date, they need to be inspected and tested by a professional before being put into use.
- Stored batteries should be shipped on a first-in, first-out basis.
- After the battery production test is completed, it needs to be replenished to a minimum of 30% SOC before storage.

Warning

- Battery replenishment before the need for battery appearance inspection, inspection of qualified batteries can be the next step in the replenishment of electricity processing, unqualified batteries scrapped.
- If the battery does not appear battery deformation, battery shell broken, battery leakage, it is judged to be the appearance of the inspection pass.

Overdue storage judgement conditions:

- Batteries that are deformed, broken, or leaking are directly scrapped, regardless of storage time.
- The storage time is calculated from the latest charging time marked on the supplemental power label on the outer package of the battery, and after the battery has been qualified for supplemental power, the latest charging time of the supplemental label and the next charging time will be refreshed (the next charging time = the latest charging time + supplemental power cycle).
- The maximum permissible period and number of storage replenishments is 3 years or 3 times, e.g. 1 replenishment every 8 months, maximum 3 times permitted; 1 replenishment every 12 months, maximum 3 times permitted.
- Exceeding the maximum permissible period and number of times is recommended to scrap the battery.
- There is capacity loss in long-term storage of lithium batteries, and lithium batteries generally have an irreversible capacity loss of 3% to 10% after 12 months of storage at the recommended storage temperature.

- If the customer performs the discharge test acceptance in accordance with the specification, there is a risk of failing a battery whose capacity after storage is less than 100 percent of the rated capacity.

Warning

- When the battery SOC is reduced to 0% or when it automatically shuts down, it needs to be recharged in time within 7 days. Permanent battery failure due to overdue recharge for customer reasons.
- We do not provide the corresponding warranty service.

5 Installation

5.1 Location Selection

5.1.1 Fundamental Requirements

- The protection class of the energy storage system is suitable for outdoor installation. However, as electronic equipment, long-term placement in places with high humidity is strictly prohibited.
- Considering that noise will be generated during the operation of the energy storage system. Therefore, it is recommended that the installation environment be far away from residential areas.
- Ensure that there are no corrosive or flammable gases around the installation location.

5.1.2 Installation Environmental Requirements

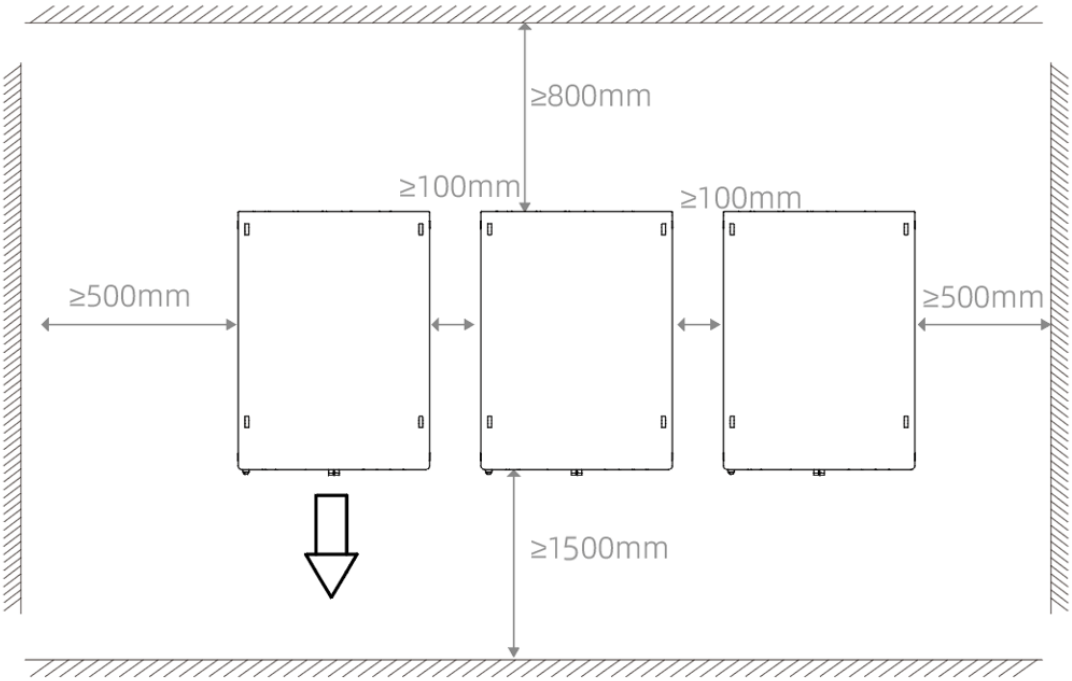
- It is strictly prohibited to install and operate the energy storage system beyond the range specified in the technical specifications, otherwise the performance and safety of the equipment will be affected.
- Site selection should be in accordance with local laws and regulations and relevant standard requirements, the installation and maintenance of the energy storage system must be operated by professional and technical personnel, and the use of the system must strictly comply with relevant safety regulations.
- The energy storage system needs to be installed on the ground with sufficient load-bearing capacity and flatness, without rubber soil, weak soil or easy to sink and other adverse geological, if the ground does not have sufficient support and flatness, it needs to be ensured by other means (such as making foundations).
- Low-lying areas that are prone to waterlogging and snow logging are strictly prohibited, and the site level should be higher than the highest historical water level in the area.
- Snow accumulation is strictly prohibited, and snow accumulation is prohibited beyond the base position of the energy storage system.
- It is strictly prohibited to install the energy storage system in a location where it can be flooded by water, and to elevate the energy storage system to prevent rainwater from eroding the base of the energy storage system as well as its interior.
- If the energy storage system is installed in a site with heavy vegetation, in addition to routine weeding, the ground underneath the equipment needs to be hardened, e.g., by laying cement, gravel, etc.
- Adequate space for opening the door needs to be reserved for the installation of the energy storage system.
- The energy storage system should be installed in a well-ventilated place with high airflow. Reserve enough ventilation space to ensure fresh air supply. Clean the air inlet and outlet regularly to avoid the air inlet being blocked by foreign objects.
- It is strictly prohibited to place any objects within the installation area of the energy storage system.
- When installing, operating, or maintaining the energy storage system, you need to clear the top of the system of any standing water, ice, snow, or other debris before opening the door to avoid debris falling into the interior of the equipment.

- It is strictly prohibited to be placed in an environment containing corrosive gases or liquids, dust, fumes, volatile gases, infrared and other radiation, radiation, organic solvents or excessive salt.
- It is strictly prohibited to place flammable, explosive and corrosive items around the energy storage system.
- It is strictly prohibited to install the energy storage system in environments with metallic conductive dust, or conductive magnetic dust.
- It is strictly prohibited to install the energy storage system in an area that is prone to microorganisms such as fungi and mold.
- It is strictly prohibited to install the energy storage system in the area of strong vibration, strong noise sources and strong electromagnetic field interference.
- It is strictly prohibited to install the energy storage system in a site accessible to children.
- It is strictly forbidden to install the energy storage system in areas where animals can intrude.
- Avoid installation near high temperature heat source or low temperature cold source environment (-20~45℃ environment is preferred); humidity 0~95%RH, no condensation; altitude ≤2000m.
- The installation of special scenarios requires prior consultation with the manufacturer and a written response. Otherwise, the company has the right to refuse to repair the machine damage caused by the installation environment.

5.2 Recommended Clearances

When installing the energy storage system, a suitable and sufficient distance must be kept from walls and other equipment to meet the requirements for narrowest maintenance access, escape routes, ventilation, etc.

This subsection describes the recommended space requirements for the energy storage system when the product is installed. The rear (500mm) and side (800mm) distances from the fence shown in the pictures are the space for future maintenance. If site conditions permit, it is recommended that a larger spacing be selected to ensure reliable and efficient operation of the energy storage system.



5.3 Recommended Mounting Angle

Ensure that the unit is installed horizontally and not tilted, horizontal or upside down.

5.4 Direction of Ventilation

Energy storage system operation will produce a lot of heat, when the temperature of the equipment is too high will affect the electrical performance of the equipment, or even damage the equipment, in the selection of the installation environment need to fully consider the release of these heat to ensure the normal and efficient operation of the equipment.

In order to meet the ventilation requirements of the energy storage system the installation environment needs to meet the following conditions:

ventilation environment

- The energy storage system should be installed in a well-ventilated location with high airflow.
- The air intake should have an adequate supply of fresh air.
- The air inlet and outlet should be cleaned regularly to avoid the air inlet being blocked by sediment.

5.5 Base Construction Requirements

5.5.1 Other Protective Measures

The overall weight of the integrated energy storage system is relatively heavy, and the conditions of the installation site should before the foundation is constructed (mainly geological conditions and environmental and climatic conditions, etc.) be examined in detail. Only on this basis can the design and construction of the foundation begin.

5.5.2 Installation Conditions

- Working temperature: -30~50℃ (derating above 45°C);
- Storage temperature: -30~55℃;
- Relative humidity: 0~95%RH, no condensation;
- Altitude: ≤2000m;
- Verticality: no vibration and vertical inclination not exceeding 5°;
- Pollution level: Class II;
- Site environment: the surrounding environment is dry, well ventilated, and away from flammable and explosive areas the soil at the installation site needs to have a certain degree of compactness;
- Soil requirements for the installation site: the relative compactness of the ground soil is ≥98 per cent. If the soil is loose, be sure to take measures to ensure a firm foundation;
- Installation in a working environment with metallic conductive type dust is strictly prohibited.

5.5.3 Foundation Construction

Unreasonable foundation construction plan will bring more difficulties or troubles to the placement, opening and closing of the door and later operation of the integrated energy storage system. Therefore, the foundation of the integrated energy storage system must be designed and constructed in accordance with certain standards beforehand in order to meet the requirements of mechanical support, cable routing, and later maintenance and overhaul.

At a minimum, the following requirements shall be met when constructing foundations:

- The bottom of the pit where the foundation is to be built must be compacted and filled. It is recommended to use pebbles for compaction at the bottom of the product foundation to avoid settlement of the foundation.
- The foundation is sufficient to provide effective load-bearing support for the integrated energy storage system.
- Elevate the EIS to prevent rainwater from eroding the base of the EIS as well as the interior. It is recommended that the foundation be approximately 300-450mm above the level of the ground at the installation site.
- Drainage measures need to be constructed to take into account local geological conditions.
- Construct a concrete foundation of sufficient cross-sectional area and height (product installation height should be greater than the historical water level of one in 100 years). The height of the foundation is to be determined by the builder based on the site geology.
- Consideration should be given to cable routing when constructing the foundation. Excavated soil from the foundation should be removed immediately so as not to interfere with the subsequent lifting of the integrated energy storage system.
- The maintenance platform is built around the foundation, bringing convenience for later maintenance.

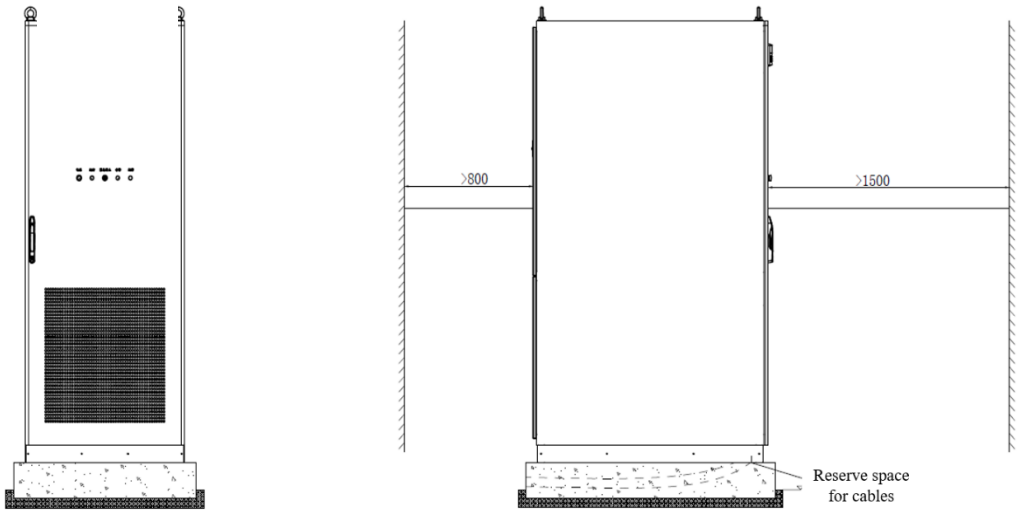
- Depending on the location and dimensions of the cable entrances and exits of the battery outdoor cabinet, sufficient space is to be reserved for the cable ducts on the AC/DC side and pre-embedded in the cable conduit during foundation construction.
- Determine the specification and number of shot tubes according to the cable type and the number of incoming and outgoing wires.
- The ends of all pre-buried pipes are temporarily sealed to prevent the entry of impurities; otherwise, wiring is inconvenient at a later stage.
- After connecting all cables, cable entrances and exits, as well as joints, are sealed with fire-resistant mud or other suitable material to prevent rodent entry.
- Pre-built earthing units according to the relevant standards of the country/region where the project is located.

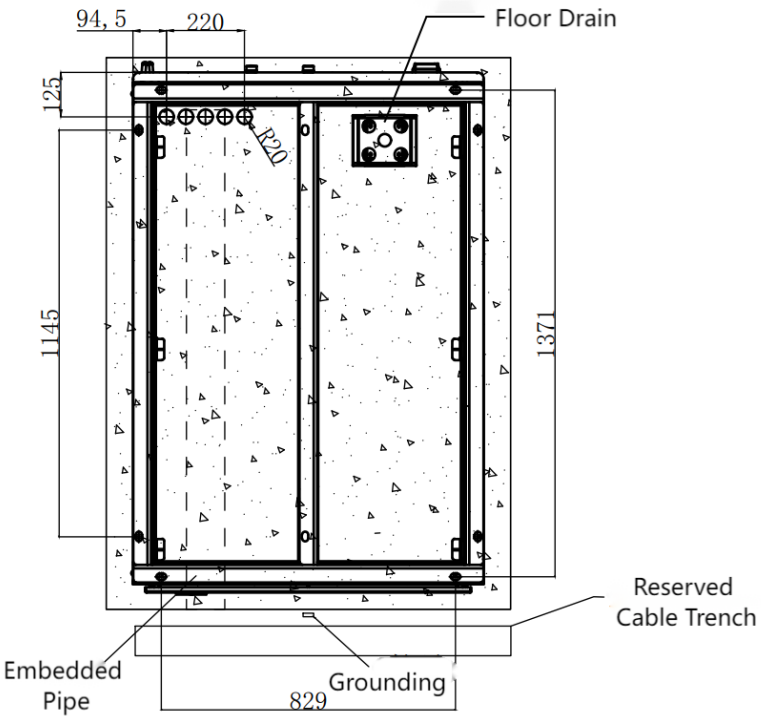
5.5.4 Other Protective Measures

The installation site shall be constructed with a drainage system to avoid flooding of the bottom of the Energy Storage Integration System or the equipment inside the cabinet during the rainy season or during heavy precipitation.

Do not plant trees within close proximity of the installation site. This is to prevent high winds from knocking down tree branches or dropping leaves that could block the Energy Storage Integrated System cabinet door or air inlet and outlet vents.

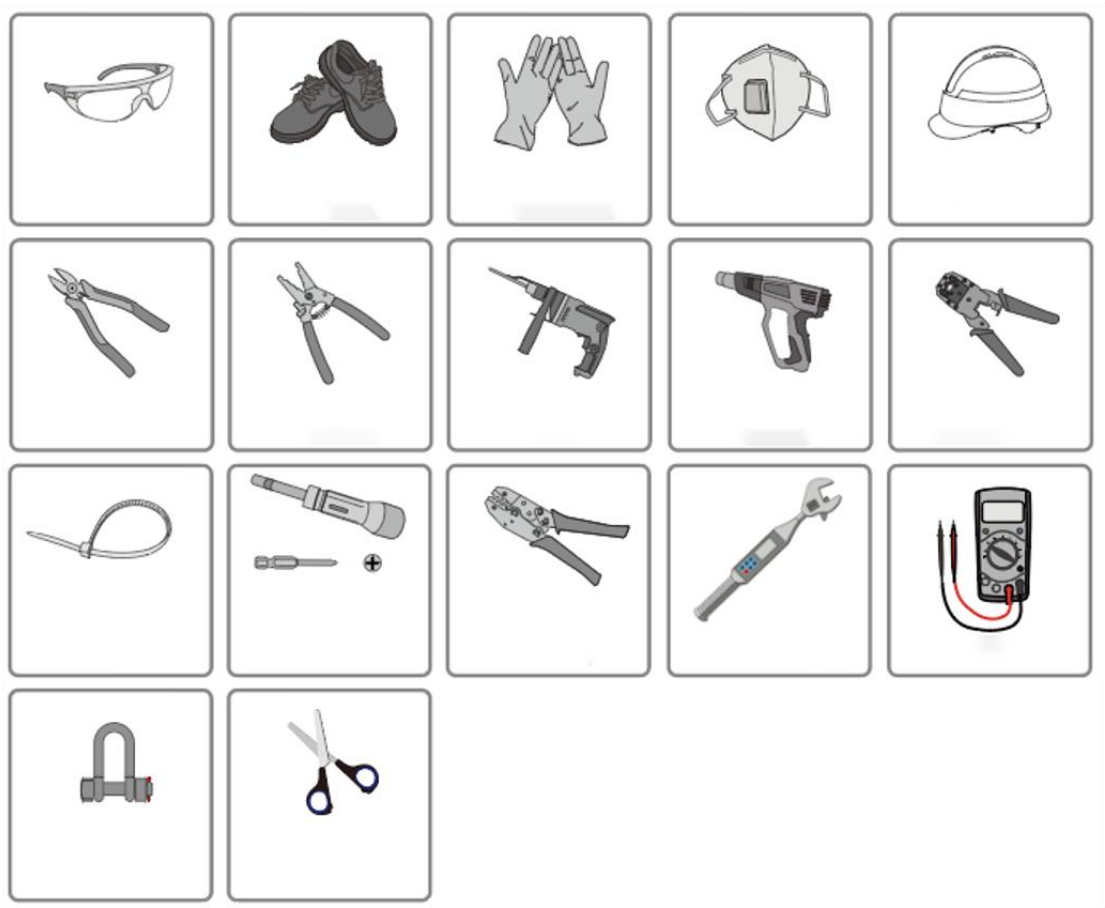
5.5.5 Foundation Technical Drawings




94, 5
220
Floor Drain
125
R20
1145
1371
Reserved
Cable Trench
Embedded
Pipe
Grounding
829

5.6 Preparation for Installation

For installation, use following installation tools.



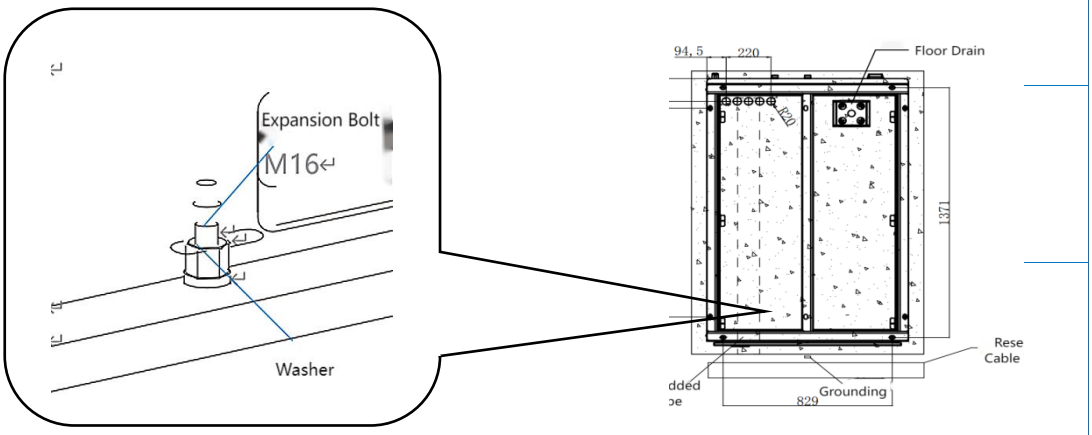
5.7 Mechanical Installation

- After confirming that the foundation is constructed to meet the requirements and is sufficiently dry, firm and level, lift the product onto the foundation. Secure the product to the foundation using the fastening bolts
- Note: Please make sure that the forklift truck you use meets the specifications, and place the product according to the center of gravity of the product to avoid the product tipping over and causing unnecessary damage.

Base steel fixing

⚠ instructions

There are 8 screw holes in the base steel, φ18×10 long waist holes, and M16 bolts are used.



Confirmation of air inlet and outlet

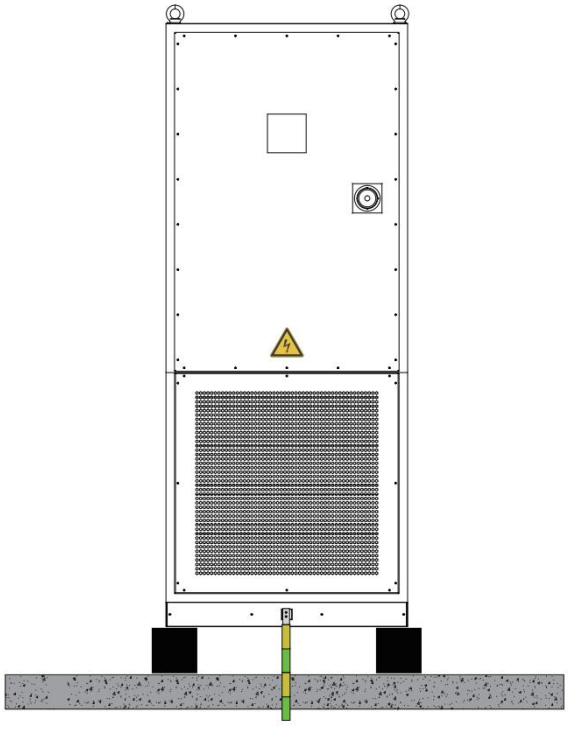
Before switching on the Energy Storage Integrated System, make sure that the air inlet and outlet are unobstructed.

5.8 Grounding Programme

Danger

- Ensure that the energy storage converter AC and DC switches are disconnected and that the terminals are not energized.
- When connecting to the AC grid, disconnect the circuit breaker on the upstream AC side to ensure that there is no voltage at the contact terminals.
- Connection to the grid can only be made with the approval of the utility grid and following all relevant safety instructions.
- The AC output must ensure that the device is properly grounded internally.
- DC and AC circuits are isolated from the enclosure and system connections are required to be made by the installer if required by the relevant National Electrical Code.
- The length of the terminal screw should be appropriate, slightly exposed to the copper row of mounting holes can be, too long may affect the insulation or even short circuit.
- Check whether part of the heat-shrinkable sleeve is pinched at the connection between the wiring copper nose and the copper row, if it is pinched, it should be removed immediately, otherwise it may lead to poor contact or even heat damage.

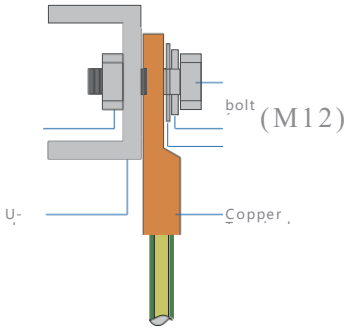
The wiring in the diagram is only schematic and is subject to actual wiring.



Instructions

Please provide your own protective earthing flat steel (hot-dip galvanized flat steel). For single installation or prototype testing, it is possible to use wire grounding without protective grounding flat bar.

Warnings



- . The ground connection between the equipment and the grounding electrode must be reliable.
- . Measure the grounding resistance after grounding, the grounding resistance should be no more than 0.1Ω.
- . Please make the grounding part rust-proof after finishing the work, no matter it is welded or screwed.
- . Land resistivity of large sandy, rocky discs and other soils, in order to meet the requirements of low grounding resistance, often used by a number of grounding body in parallel with the composition of the grounding network.
- . Large-scale photovoltaic power plant requires more steel materials, and grounding area, to achieve the required grounding resistance often will have - certain difficulties, can try to reduce the resistivity of the soil near the grounding body, so as to achieve the purpose of reducing grounding resistance.

5.9 Load/Grid Connection

⚠ take note of

. When wiring, the AC wires should match the "A", "B", "C", "N" ports of the AC terminals exactly, "PE" ports. If the cables are connected incorrectly, the equipment may be damaged. . Make sure that the wire cores are fully connected to the terminal holes and are not exposed.

. Ensure that the cables are connected tightly, otherwise the equipment may be damaged due to overheating of the terminals during operation.

Step 1: Remove the baffle in front of the wiring area.

Step 2: Strip the cable to the appropriate length and pass it through the bottom threading area.

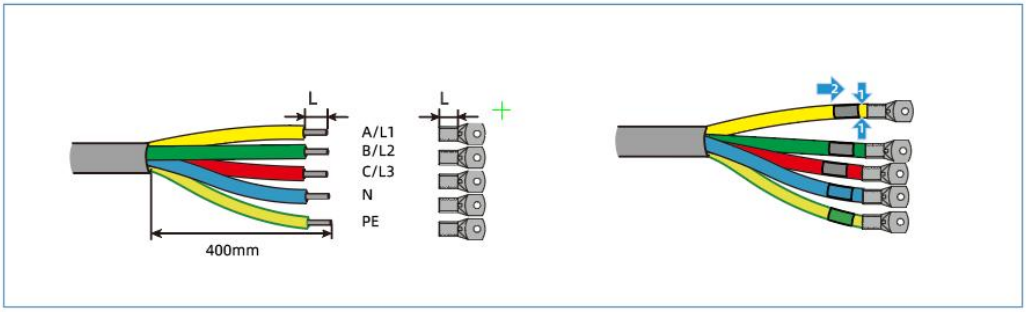
Step 3: Crimp the AC line 0T terminal to the AC cable.

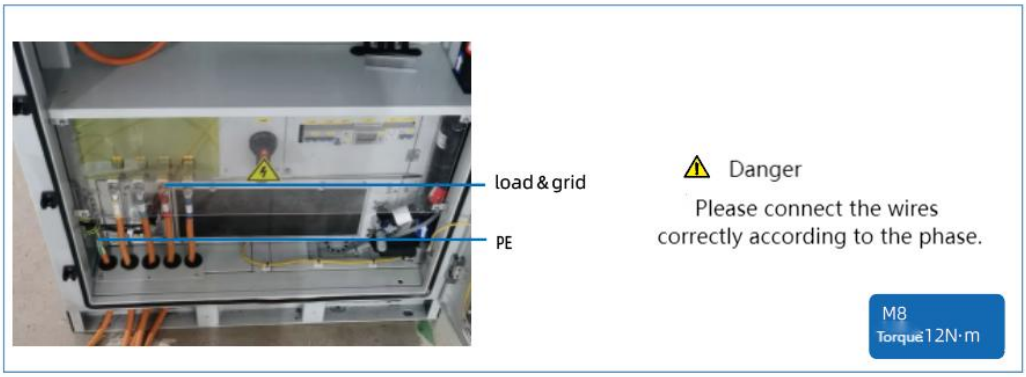
Step 4: Connect the AC cable to the energy storage system terminals.

Step 5: Install the baffle in front of the wiring area.

Dangerous

Disconnect the AC circuit breaker and measure with a multimeter to ensure that there is no voltage at the terminals and keep it disconnected for 20 minutes before operating.





5.10 Cabling and Waterproofing

- When the equipment requires an upward route, overhead cabling shall be used. If downward routing is required, cables should be routed in a concealed trench. The principle of electrical connection is safe, reliable and standardized.
- It is strictly prohibited to loop and twist the power cord in the process of power cord deployment. If the length of the power cord is found to be insufficient, the power cord must be replaced again, and it is strictly prohibited to make joints or welding points in the power cord.
- When high-voltage cable lines and low-voltage cable lines are arranged side by side, high-voltage cables and low-voltage wiring harnesses should be spaced more than 200mm apart, and the spacing between high-voltage cables should be more than 2 times the diameter of high-voltage cables, so as to ensure heat dissipation between cables.
- According to the design of the inlet and outlet holes of the integrated energy storage system, the cables shall be laid in the space below the integrated energy storage system and introduced to the devices through the inlet and outlet holes at the bottom of the cabinet. At the same time should be in accordance with the integrated energy storage system within the requirements of each device to select the appropriate cable.
- Wiring terminals, splices and other unnecessary exposures should be adequately insulated.
- After confirming that all wiring is correct and secure. The gap between the cable entry and exit holes on the side of the battery outdoor cabinet needs to be sealed with bricks or fireproof mud. At the same time, the entire energy storage integrated system installation foundation needs to be waterproofed.
- When strong and weak power are laid in the same channel, shielding measures need to be considered.
- When external conditions (such as laying method or ambient temperature, etc.) change, it is necessary to refer to local regulations and norms for cable selection verification, such as whether the load capacity to meet the requirements.
- Cables used in high temperature environments may cause the insulation to deteriorate and break, the distance between the cable and the periphery of the heat generating device or heat source area is at least 30mm.

- When the temperature is too low, violent shocks and vibrations may cause brittle cracking of the cable's plastic sheath. To ensure construction safety, the following requirements should be followed:
  - All cables should be laid and installed above 0°C. When handling cables, especially when working in a low-temperature environment, they should be handled gently.
  - If the cable is stored in an ambient temperature below 0°C, the cable must be moved to a room temperature environment for storage for more than 24 hours before deploying the cable.
- It is prohibited to push down the cable directly from the car and other irregular operations, to avoid cable breakage leading to a decline in the performance of the cable, affecting the current-carrying and temperature rise.

5.11 Closing the Electrical Connection

After all electrical connections have been made, the wiring should be thoroughly and carefully inspected.

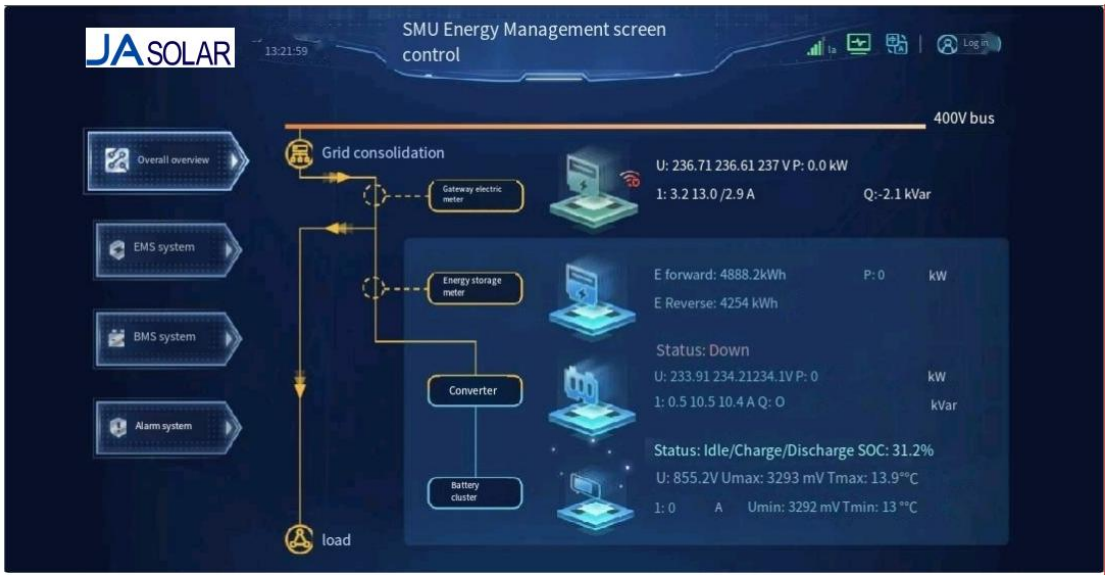
- All cable connections need to be checked. Make sure all connections are correct and tight.
- Effective protection of the inlet and outlet holes of the integrated energy storage system is required, e.g. between cable gaps, sealed with fireproof mud.
- If waterproof terminals are used for sealing, the waterproof terminals need to be checked for tightness. For terminals that are vacant and not in use, they need to be sealed.
- Securely restore the protective netting in its entirety.
- Waterproofing of the foundation at the bottom of the external cabinet of the energy storage integration system is required.
- Part of the project requires on-site power connection, liquid cooling unit injection pressure measurement, communication connection, program refreshing, etc. This operation needs to be carried out by professional operators, and the manufacturer will follow up on-site to assist.

6 Human-Machine Interface

6.1 Functions

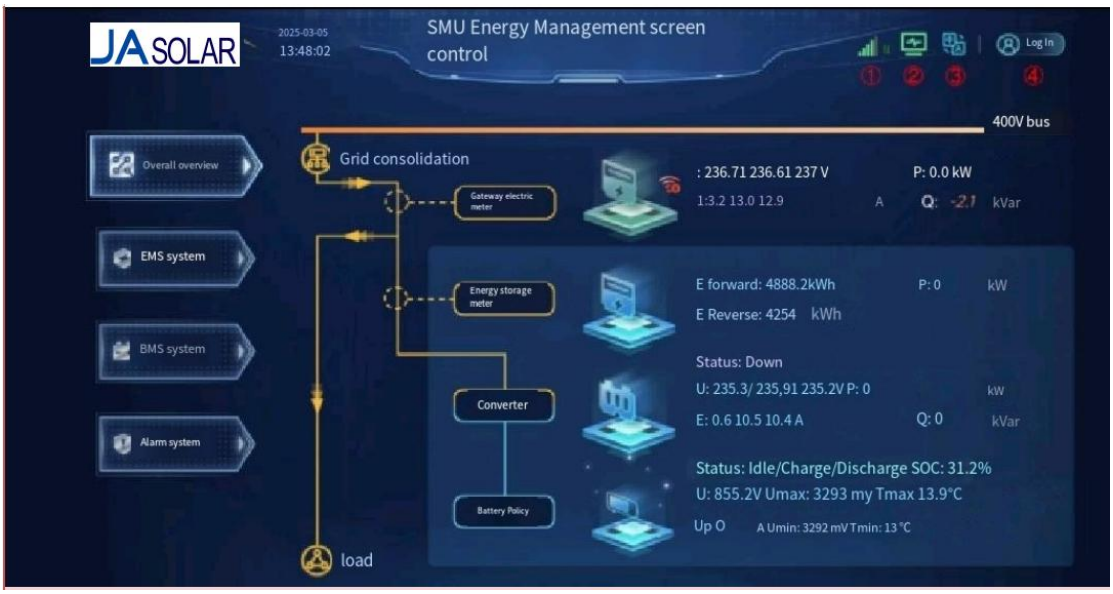
6.1.1 System Home Page

When the energy storage system is powered on, the SMU energy management screen control system will automatically start and display the home screen.



The left area of the home screen displays key status and data of the SMU energy management screen control system and alarms, including: overall overview, EMS system, BMS system, and alarm system.

The top right area of the home interface shows the wireless network status, background connection status, Chinese and English switching buttons, and login button.



① Wireless Network Icon: This icon indicates the current 4G wireless network status and signal strength of the EMS controller. Green indicates a good 4G wireless network connection, red indicates a bad 4G wireless network connection, and grey indicates no wireless network connection. By placing the cursor on the icon, users can check the of the current system4G wireless signal strength and networking status.

② Backstage connection icon: this icon shows the connection status between SMU screen control system and EMS controller backstage. The green color indicates that the background connection is normal, and the red color indicates that the background connection has failed.

③Language Switching Button: This button is used to switch the language. Users click can view this button to the types of languages supported by the system and switch the desired language. The grey font is the currently used language and the highlighted font is the switchable language.

Note: Switching languages requires a reboot of the controller system to take effect.

④Login button: Users can log in to the SMU energy management screen control system by clicking this icon.

6.1.2 Main Interface

If you need to log in to the system as a registered user, enter your password and click Login.

To log in to the system anonymously, you can click Anonymous Login. Users who log in anonymously will only have access to system information and will not be able to edit or modify it.

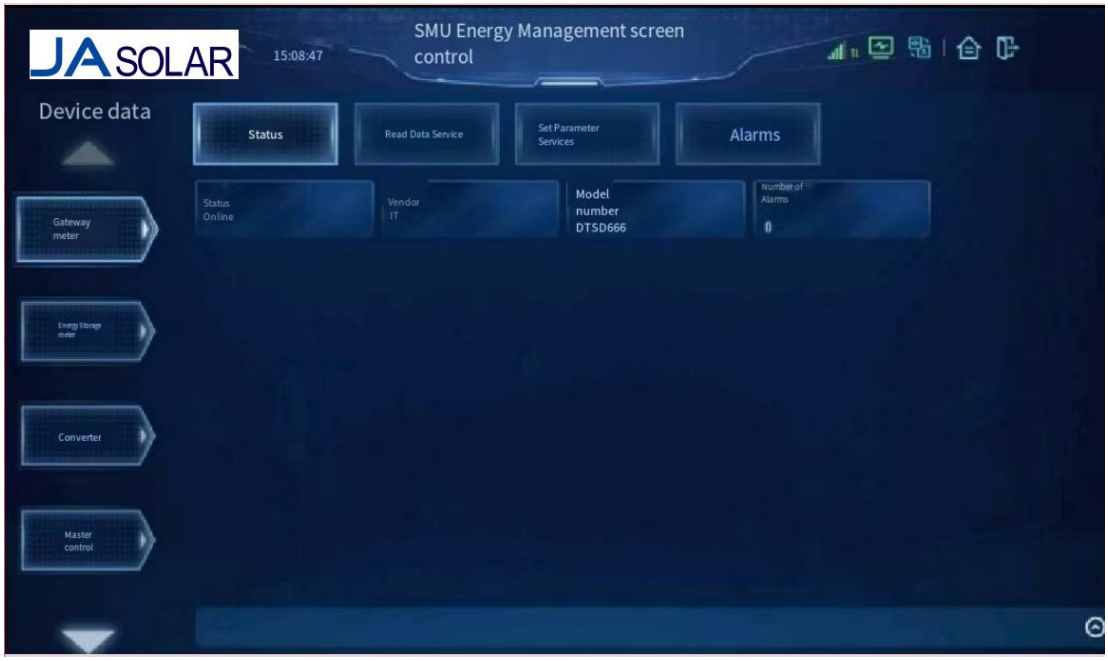
After successfully logging in, the screen displays the SMU Energy Management Screen Control System function the main interface of EMS

By clicking the page down or page up buttons, the user can view all the sub-functional modules of the system monitoring.

6.1.3 Subfunction Module - System Monitoring

6.1.4 Subfunction Module - Energy Management

6.1.5 Subfunction Module - Device Data

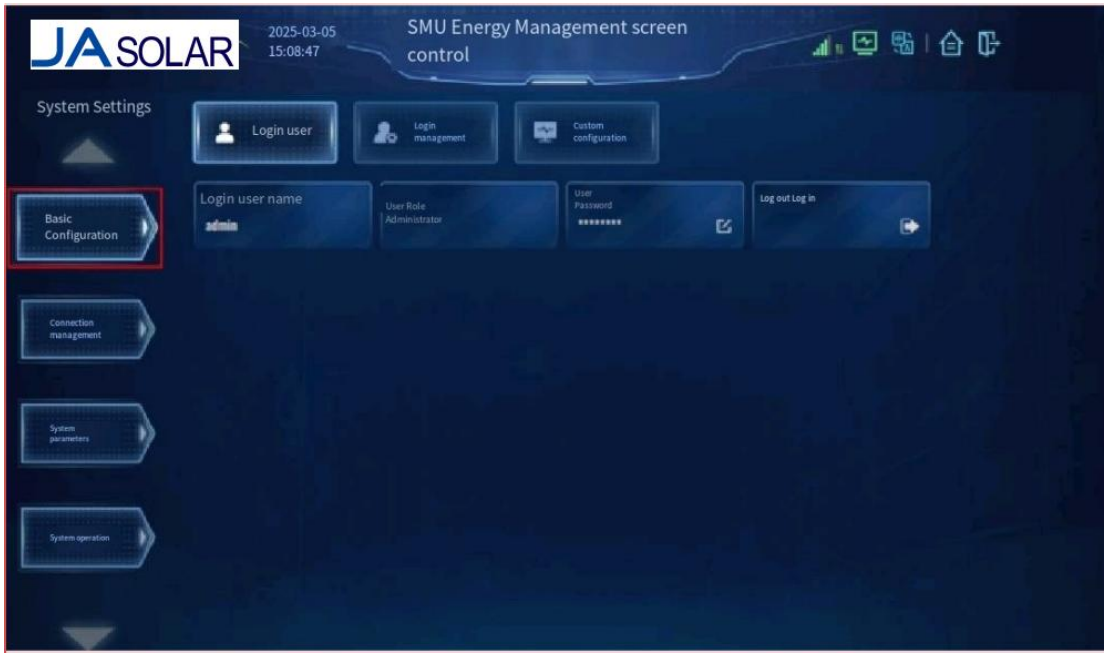


6.1.6 Subfunction Module - Device Management

Users can view and set the configuration of ports such as RS485 serial port, LAN network port, WAN network port, CAN port and DIDO by selecting Port Configuration in the left panel area.

6.1.7 Subfunction Module - System Settings

Users can select the basic configuration in the left panel area to change the password and reset the password for the login account of the energy storage system, and at the same time, it supports users to upload the required LOGO and customize the interface display.



6.2 Operational Procedures

See the JA Solar SMU Screen Control System User Manual for details.

7 Commissioning & Testing

Danger

- Only specialised technicians are allowed to work on the equipment.
- This product is commonly used in industrial, high-energy locations. During operation, the product contains electrically charged parts, so the unauthorised removal of necessary covers, or improper use, misuse and lack of maintenance may result in significant personal injury or property damage.
- It is the responsibility of the user to commission the equipment in compliance with the recognised technical regulations of the country in which it is located, as well as other regional regulations for its use.
- The safety tips in this manual must be read and followed!
- Ensure that the equipment is well grounded.
- Needs to cover or isolate neighbouring live parts.
- If the fuse on the current branch is tripped, the fault current may have been cut off. In order to reduce the risk of fire and electric shock, the conductive parts and other components of the product should be inspected and damaged parts should be replaced. After the fuse has tripped, the should be identified and eliminated"cause of disconnection" .

7.1 Pre-Commissioning Checklist

Before commissioning, the following items must be rechecked and measured in order to avoid damage to the equipment and loss of property:

Checking the installation	in the end
Disconnect the battery-side and grid-side switches before measurement to ensure that the DC and AC sides of the converter are not charged.	
- Positive and negative connections between the battery and converter, AC phase sequence is correct and has been tightened, measure the resistance between the three phases, it should be megohm level, if K level or less need to check the wiring.	
- External control cables, earth wires, and communication wires have been tightened.	
- Earth wire resistance is less than 0.1Ω, cables are intact, not broken or cracked, and screens for vents are intact.	
- Clean up the installation area with no tools or foreign objects left in the installation area.	
Check cable connections	
- Check the connecting cable for damage and replace it immediately if it is damaged.	
- Check the cable connections by referring to the system wiring diagram and adjust immediately if there is any abnormality.	

- Check that the cables are securely connected and tighten them immediately if there is any abnormality.	
- Check the PE equipotential connection to ensure that the PE earth terminal on the AC side is connected to the equipotential connection point in the electrical control room and is well earthed.	
Check energy storage switch	
- Check the status of AC circuit breakers and DC load switches to ensure they are disconnected.	
- Check the emergency stop button to make sure it is released and working.	
- Check the various electrical switches and buttons on the energy storage converter and its front and rear stages to ensure that they operate flexibly and in accordance with the specification.	
Checking the battery pack	
- Check the DC side voltage, which is required not to exceed the maximum permissible input of the converter.	
- Check that the open circuit voltage of the battery pack meets the requirements.	
Check grid-side voltage	
- Check the AC grid side frequency and require that it does not exceed the permissible grid frequency range on the AC side of the converter.	
- Checking three sets of line voltages on the AC grid side: L1-L2, L1-L3, L2-L3, and three sets of phase voltages L1-N, L2-N, L3-N.	
- It is required that the measured values do not exceed the permissible grid voltage range on the AC side of the converter and that the three phases are balanced.	

7.2 Start-up Procedure

01	Measure the input voltage with a multimeter, and after detecting no error. Switch on the input power supply switch.
02	Switch on all input power supplies in turn.
03	Switch on the power supply to the liquid-cooled unit
04	Close the cluster level circuit breaker and the "Standby Indicator" (yellow) lights up when there are no faults in the unit.
05	Close the disconnect switch in the convergence cabinet before closing the PCS DC side circuit breaker.
06	Confirm the communication of the energy storage system at the PCS or BAU terminal, and when the PCS or BAU terminal indicates that the equipment is normal, the charging and discharging operation can be performed. When the energy storage system performs charging and discharging, the "Operation Indicator" (green colour) lights up.
07	The "Fault indicator" (red) lights up when there is a serious fault in the energy storage device.

7.3 Shutdown Operation Procedure

01	Firstly, reduce the power on the PCS side to "0kW" and disconnect the circuit breaker on the DC side of the PCS.
02	Disconnect the disconnect switch in the DC convergence cabinet.

03	Disconnect power to auxiliary control equipment.

Danger

In case of emergency shutdown of the energy storage system, press the emergency stop button directly.

8 Maintenance Guide

8.1 Maintenance Precautions

Scope of Application

This method is applicable to the operation and maintenance management of energy storage systems.

This method includes the basic requirements for system operation and maintenance management, site requirements, personnel requirements, service requirements, safety management, emergency handling for unexpected events, operation and maintenance records, and operation and maintenance evaluation and improvement.

Basic Requirements

01. The operation and maintenance management of energy storage systems must comply with national laws and regulations and the requirements of relevant standards.

02. The operation and maintenance management of energy storage systems must have a sound management system and safety specifications.

03. The operation and maintenance management of the energy storage system must clearly define the responsibilities of each position, work processes, and duties, and establish operational procedures for each position.

Equipment Requirements

01. The equipment infrastructure must be complete and comply with national or industry-related standards. The use, maintenance, and management of the equipment must be the responsibility of designated personnel.

02. Operation and maintenance personnel must conduct weekly, monthly, quarterly, and annual inspections of the system according to the inspection system.

03. The internal environment of the equipment must be kept clean and tidy, with the surface of the charging equipment being clean and free of rust and stains.

04. The area around the electrical facilities within the equipment should be free of flammable and explosive materials, as well as pollutants and corrosive substances.

Personnel Requirements

General Requirements

01. The system must be operated and maintained by dedicated personnel, with no fewer than 2 responsible individuals at each station.

02. Operation and maintenance personnel must receive safety production education and job skills training, and can only start work after passing the assessment.

03. Operation and maintenance personnel must operate according to the operating procedures and job specifications.

04. Operation and maintenance personnel must be responsible for their work, fulfill service commitments, and use civilized and standardized language.

Job Responsibilities and Requirements

01. The operations and maintenance personnel are responsible for the operation and maintenance of all facilities: monitoring the operational status of all facilities, addressing all facility malfunctions, and maintaining key components of the facilities.

02. The operations and maintenance personnel are responsible for equipment operational safety: establishing a sound equipment safety system, conducting periodic safety inspections, and supervising and reporting on equipment safety conditions.

Job Skills Requirements

01. Operation and maintenance personnel must master the working principles of energy storage systems, common fault handling methods, maintenance methods for energy storage facilities, emergency handling methods, and safety knowledge.

02. Operation and maintenance personnel must understand the relevant regulations and systems for national safety production, and master electrical safety knowledge and accident emergency handling methods.

Danger

Disconnect the DC side isolation switch of the PCS to ensure that the battery is disconnected from the PCS.

Disconnect the circuit breaker inside the PDU, disconnect the connection between the high-voltage box and the battery box, and take the energy storage system offline.

Ensure that the energy storage system is properly grounded; ensure that the energy storage integration system is completely isolated from all DC and AC power sources for at least 20 minutes before checking with a voltmeter.

Ensure that all power sources are disconnected and in a safe state before performing maintenance work.

It must always be remembered that even if the battery cabinet is not in operation, there is still dangerous voltage present inside the battery cabinet.

8.2 Periodic Maintenance

To ensure the proper operation of all devices within the energy storage integration system, regular maintenance should be conducted.

The maintenance cycles provided in this section are for reference; the actual maintenance cycle should be reasonably determined based on the specific environmental conditions at the project site. If the operating environment of the energy storage integration system is harsh, such as in desert areas, the corresponding maintenance cycle should be shortened. In particular, internal and external cleaning, as well as anti-corrosion and rust prevention work, should be performed more frequently.

If the system is installed in a desert area, it is recommended to conduct a thorough inspection and cleaning of the internal and external parts of the energy storage integration system after each sandstorm.

Inspection work should only begin after all internal devices of the energy storage integration system have been completely powered off! During the inspection, if any non-compliance is found, please correct it immediately.

Safety Management

Organization and Personnel

01. The operation and maintenance management system must establish a safety management organization, assign full-time or part-time safety personnel, and clarify the responsibilities of each link.

02. Operation and maintenance personnel must comply with job safety operation specifications, work within designated areas, and are strictly prohibited from operating mechanical and electrical equipment unrelated to their positions.

03. During operations, maintenance personnel must wear work uniforms and insulated shoes as required, and use safety protective equipment.

04. Maintenance personnel must promptly address or report any safety hazards discovered during inspections or troubleshooting.

Equipment

01. Maintenance personnel must ensure the electrical safety of the equipment;

02. Maintenance personnel must promptly replace faulty equipment, and it is strictly prohibited to operate with malfunctioning equipment;

03. The power supply must be cut off before equipment maintenance;

04. Safety management personnel must check various safety signs during weekly, monthly, quarterly, and annual inspections. If any signs are deformed, damaged, or faded, they should be repaired or replaced in a timely manner.

Inspection

01. Safety management personnel must conduct irregular inspections of equipment, correct violations, and must promptly address or report any safety hazards discovered.

Fire Safety

01. Fire safety management must comply with relevant laws, regulations, and standards.

02. Firefighting facilities must be equipped in accordance with laws, regulations, and standards. Firefighting facilities must be complete, effective, and clearly marked.

03. Fire safety inspections must be conducted monthly, and fire safety facilities must be maintained and serviced by designated personnel. The fire extinguishing and monitoring systems must be in good working condition.

04. Fire safety training and emergency drills must be conducted twice a year, and safety management personnel must master fire safety knowledge and be familiar with the location, performance, and usage of fire-fighting equipment.

05. All emergency exit passages must remain unobstructed to ensure timely and effective evacuation of personnel in the event of a fire.

Management of tools and equipment

- The operation and maintenance personnel of the power station must manage the spare parts and tools of the power station facilities, and be aware of the inventory and usage of spare parts.
- The procurement and usage process of spare parts in the power station must be recorded, and any unauthorized claims are strictly prohibited.
- The operation and maintenance team of the power station is equipped with the tools and equipment needed for daily work, including safety protection and maintenance tools, to ensure the normal conduct of inspections, maintenance, and repair work.

Record

Operation and maintenance personnel must record the operation and maintenance service process, including: fault handling records, periodic inspection and maintenance records, and spare parts replacement records.

Operation and maintenance services must retain original data. Records should be timely, accurate, truthful, and complete; All paper records must be converted to electronic files, and the retention period for original paper records must be no less than 3 years; the retention period for electronic records must be no less than 5 years.

Once a month	
Fire Protection Department	01. Inspect and record the operational status of the gas fire extinguishing storage device room and on-site equipment. 02. All system components, including the extinguishing agent storage container, container valve, check valve, connecting pipe, collecting pipe, safety relief device, selection valve, valve drive device, nozzle, signal feedback device, leak detection device, and pressure reducing device, should be free from collision deformation and other mechanical damage. 03. The pressure gauge pointer in the extinguishing agent and driving gas storage containers should be within the effective range.
Once every 3 months	
Energy storage system inspection	01. Check if the appearance of the energy storage system has any damage, deformation, or rust. 02. Listen for any abnormal sounds while the energy storage system is operating. 03. Observe various parameters during operation through BAU. 04. Use thermal imaging cameras and other tools to detect system overheating. 05. Check for any electrolyte leakage from the battery box exterior. 06. Inspect whether the ventilation, environmental temperature, humidity, and dust around the energy storage meet the requirements.
Duct Cleaning	01. Check for dust in the duct. 02. Listen for any abnormal vibrations when the fan is running. 03. Use tools for cleaning.
Fire Protection Department	01. The types and distribution of combustible materials, as well as the openings in the protection area, should meet design requirements. 02. The equipment in the storage device room, the fire extinguishing agent delivery pipelines, and the supports and hangers should be securely fixed without looseness. 03. The connecting pipes should be free of deformation, cracks, and aging. If necessary, send them to a legally recognized quality inspection agency for testing or replacement. 04. Each nozzle opening should be free of blockages. 05. When there are damages and blockages in the fire extinguishing agent delivery pipeline, a tightness test and flushing should be conducted again.
Battery appearance structure inspection	01. Visually check if the casing is clean; if there are stains, they should be wiped clean, and the area should be kept ventilated and dry; 02. Visually check if the casing has any leaks or deformations; if so, it should be replaced in a timely manner; 03. Refer to the records and actually measure whether the ambient temperature is normal.
Voltage and internal resistance	Voltage measurement: Use a multimeter or DC voltmeter to measure the terminal voltage of the battery and the total voltage of the battery pack, record the results and make a judgment.

(conductance) measurement.	Internal resistance (conductance) measurement: Use an internal resistance meter (or conductance meter) to measure the internal resistance (conductance) of individual battery cells and compare them with each other. If there are individual batteries with higher internal resistance, focus on checking the following items: 01. Whether the operating mode of the battery is correct; 02. Whether the battery voltage and temperature are within the specified range; 03. Whether the battery has been subjected to long-term overcharging or undercharging; 04. Has the operating life exceeded the manufacturer's recommended lifespan?
Battery connection inspection	01. Confirm that all battery connection points are secured, with no loose bolts or overheating at the connections.
Every 6 months	
Safety Features	01. Check the emergency stop button and the stop function of the LCD. 02. Simulate a shutdown. 03. Check the body warning labels and other equipment labels; if any are unclear or damaged, please replace them promptly.
Device Maintenance	01. Conduct regular inspections of rust conditions on all metal components. 02. Annual inspection of contactors (auxiliary switches and micro switches) to ensure their mechanical operation is good. 03. Check operating parameters (especially voltage and insulation, etc.). 04. Check if all circuit breakers are malfunctioning. 05. Check if the circuit breaker or load switch is damaged. 06. Check the cleanliness of the circuit board and components. 07. Check the temperature of the heat sink and the presence of dust. If necessary, use a vacuum cleaner to clean the heat module or replace the filter.
Door lock and hinge inspection	01. After the cleaning work is completed, the door locks and hinges of the energy storage integrated system should be checked to ensure they are functioning properly and in good condition. If necessary, appropriate lubrication should be applied to the door lock keyholes and hinges.
Seal strip inspection	01. A well-sealed sealing strip is an important guarantee to effectively prevent water leakage inside the energy storage integrated system. It should be carefully checked, and if damaged, please replace it immediately.
Fan	01. Check the operating status of the fan. 02. Check if the fan is blocked. During operation, is there any abnormal noise?
Supplementary Liquid	Conduct tests every six months, and when the return liquid pressure is below 0.8 Bar, use the supplementary liquid pump to inject coolant for pressurization. 01. Remove the maintenance panel located at the bottom front of the chiller unit and close the ball valve after the liquid discharge port. 02. Open the automatic air vent valve/manual valve at the highest point of the connecting pipeline. 03. Connect the outlet of the replenishment pump to the inlet of the chiller unit using a pipe, and connect the inlet to the external storage tank. 04. After connecting the power supply line of the replenishment pump to the corresponding terminal, power on the chiller unit. 05. Start the replenishment pump to inject the coolant.

	06. Stop the injection when the return liquid pressure stabilizes between 0.8 Bar and 1 Bar. 07. After the injection is completed, close the automatic exhaust valve/manual valve at the highest point of the connecting pipeline, and close the ball valve after the replenishment port. Then remove the replenishment pump and reinstall the maintenance panel below the unit.
Once every 12 months	
Fire Protection Department	01. Conduct one simulated startup test and, if conditions permit, perform one simulated jet test on the gas fire extinguishing system.
Cable Shield Grounding	01. Check if the cable shield is in good contact with the insulating sleeve; ensure the grounding copper busbar is securely fixed.
Lightning Protection Devices and Fuses	01. Check if the lightning protection devices and fuses are properly secured.
Cabinet exterior	01. Check if there are any screws fallen inside the energy storage integration system. 02. Check if there is any oxidation or rust inside the energy storage integration system. 03. Check if the battery compartment door of the energy storage product can be opened normally. 04. Check whether the internal and external environment of the energy storage product is clean, tidy, and free of clutter. 05. Check whether the exterior of the energy storage product has any corrosion or peeling. 06. Check whether the grounding of the energy storage product is normal. 07. Check whether the safety warning labels on the exterior of the product are intact. 08. Are the internal battery group and control cabinet fixed securely? 09. Is the sealing at the entry and exit points of the cable intact? 10. Check the cable trench to prevent damage to the cable, ensuring that the brackets are grounded and that heat dissipation in the trench is good.
Inside the cabinet	01. Check for foreign objects, dust, dirt, and condensation inside the energy storage integration system. 02. Inspect the inlet and outlet of the energy storage integration system, check the temperature of the radiator and for dust. If necessary, a vacuum cleaner can be used to clean the heat dissipation module and other components.
Wiring and Cable Arrangement	01. Check if the cable arrangement is standard and if there are any short circuits or other issues. If any abnormalities are found, they must be corrected immediately. 02. Check whether all the entry and exit holes of the energy storage integration system are well sealed. 03. Check for any signs of water leakage or dampness inside the energy storage integration system. 04. Check if the power cable connections are loose and retighten them according to the previously specified torque. 05. Inspect the power cables and control cables for any damage, especially looking for signs of cuts on the insulation where they contact metal surfaces. 06. Check whether the insulation tape of the power cable terminal is falling off. 07. Check if the grounding connection is correct; the grounding resistance value must not exceed 0.1Ω. 08. Check if the equipotential connections inside the energy storage integrated system are correct.

8.3 System Cleaning

The cleaning of the surroundings and interior of the energy storage integration system is an important aspect of maintenance work. Due to the influence of environmental factors such as temperature, humidity, dust, and internal equipment vibrations, dust can accumulate inside, blocking air inlets and outlets or entering internal equipment, which may lead to potential failures, shorten the lifespan of the equipment, or reduce power generation.

During normal operation of the equipment, regular inspections and cleaning should be conducted to ensure that the internal equipment is in a relatively good operating environment.

Cleaning Cycle	The cleaning cycle of the energy storage integration system should be reasonably determined based on its operating environment, such as climatic conditions, to ensure that both the external and internal cleanliness of the energy storage integration system is maintained. If the operating environment is harsh, such as in desert areas, the maintenance cycle should be shortened.
Internal cleaning of energy storage	For dust inside the energy storage integrated system, it is not recommended to use a broom for direct sweeping, as this may cause dust to become airborne. It is advisable to use a vacuum cleaner to absorb the dust.
Internal cleaning of the foundation	Users should regularly enter the foundation to check the cleanliness inside. If necessary, please use a vacuum cleaner for cleaning.

- The ventilation of the air intake must be checked. Otherwise, if the module cannot be effectively cooled, it may fail due to overheating.
- The above is only a recommended routine maintenance cycle for the product; the actual maintenance cycle should be reasonably determined based on the specific installation environment of the product. Factors such as the scale of the power station, its location, and the on-site environment can all affect the maintenance cycle of the product.
- If the operating environment has a lot of wind-blown sand or thick dust, it is very necessary to shorten the maintenance cycle and increase the maintenance frequency.

8.4 Battery Maintenance

Warning

- Batteries pose potential hazards, and appropriate protective measures must be taken during operation and maintenance!
- Incorrect operation may result in serious personal injury and property damage.
- The correct tools and protective equipment must be used when operating the battery.
- Battery maintenance must be performed by personnel with battery expertise and safety training.

The following are the recommended maintenance cycles; the actual maintenance cycle should be adjusted based on the specific installation environment of the product. Factors such as the scale of the power station, installation location, and site environment can all affect the maintenance cycle of the product.

Inspection content	Inspection method
Function Check	Check the operating status of the DC contactor: In a shutdown state, send open/close commands and check if the operation is normal. • Measure whether the 24V output voltage is within the specified range. • Check the battery cluster operation records to see if the current, voltage, and temperature are within the usage range.
Environmental Temperature and Humidity Check	• Check the environmental temperature records to ensure the temperature is within the usable range. • Check the environmental humidity records to ensure the humidity is within the usable range.
Switch box (if applicable) and battery module housing	Check the following items, and if they do not meet the requirements, please correct them immediately: • Check if there are any flammable objects on top of the battery cluster. • Check if the fixing points of the battery cluster to the foundation steel plate are secure and if there is any rust. • Check if there are any foreign objects, dust, dirt, or condensation inside the battery cluster.
Ground Connection	Check whether the ground connection is correct; the ground resistance value must not exceed 0.1Ω.
Wiring and Cable Arrangement	• Check for foreign objects, dust, dirt, and condensation inside the battery cluster. The wiring and cable arrangement should only be inspected after the internal equipment of the battery cluster is completely powered off! If any non-compliance is found during the inspection, please correct it immediately. • Check whether the cable arrangement is standard and if there are any short circuits or other issues. If any abnormalities are found, they must be corrected immediately. • Check whether all the inlet and outlet holes of the battery cluster are well sealed. • Check for any water ingress inside the battery cluster. • Check if the power cables and busbar connections are loose, and re-tighten them according to the previously specified torque. • Check for any damage to the power cables and communication cables.
Screw	Check for any screws that may have fallen off or are rusted inside the battery pack.

Equipment Maintenance

01. Recommended operating temperature: 0℃~45℃. During charging and discharging, the temperature should ideally be maintained between 15℃~30℃, with 25℃ being the best.
02. It is prohibited to charge and discharge the RACK at high rates; the continuous charge and discharge current of a single RACK must not exceed the rated current.
03. When the battery energy storage system is not in use for an extended period, perform a charge and discharge every six months to maintain the system's SOC between 30% and 40%. After charging, the SOC of all packs must be consistent.
04. Before the first use of a system that has been idle for a long time, it should be fully charged at least once to restore the battery's performance to its optimal state.
05. Regularly (once a day) check the monitoring host for voltage, temperature, and other data to ensure they are normal, and verify that there are no abnormal alarms in the alarm bar.
06. Regularly (once a month) check the status of the battery energy storage system and whether the alarm indicator lights are intact and functioning properly.
07. Regularly (once a month) check if the emergency stop switch of the battery energy storage system is effective, ensuring that the system can be quickly stopped in an emergency.
08. Regularly (once a month) check the fire protection system to ensure it is in good condition and within the validity period.
09. Regularly (once every six months) check if the high-voltage cables and the fastening bolts of the battery energy storage system's connection bus are loose, ensure good contact, and check if the terminal surfaces are severely rusted or oxidized.
10. Regularly (once every six months) check whether the positive and negative high-voltage protective covers of the PACK show signs of aging, damage, or are missing.
11. Regularly (once every six months) check the cables for looseness, aging, damage, and breakage, and ensure that the insulation is in good condition.
12. Regularly (once every six months) check for any irritating odors inside the battery cabinet and whether there is a burnt smell at the high-voltage connection points.
13. Regularly (once a year) check whether the cooling system air ducts are blocked, and clean the system regularly, paying special attention to the cleaning of the fan's intake and exhaust ports. Use a vacuum cleaner if necessary to ensure that air can circulate freely within the cabinet. Power must be turned off before dusting; washing with water is strictly prohibited.
14. It is prohibited to connect different types of battery modules in series or parallel.
15. PACKs are not interchangeable with each other.

8.5 Liquid Cooling System Maintenance

The following are the recommended maintenance cycles; the actual maintenance cycle should be adjusted based on the specific installation environment of the product, such as the scale of the power station, installation location, and on-site conditions.

Maintenance Project	Maintenance Content	Inspection method	Maintenance Tools
Fan	Check whether the fan blades rotate normally and whether the blades are damaged. If they cannot rotate or are	01. The fan blades rotate smoothly and without Abnormal noise;	Long-handled screwdriver

	damaged, the fan needs to be replaced.	02. The fan blades are undamaged. Note: The shortest inspection period is six months; damage inspection is not mandatory.	
Water pump	01. Check if the area of the water pump's heat dissipation air intake is blocked by more than 5%. If so, it needs to be cleaned with a brush; 02. Visually inspect the water pump body (excluding the pipeline connection) for any obvious dripping (excluding condensate). If there is obvious dripping, the water pump sealing ring needs to be replaced.	01. The water pump operates smoothly and without abnormal noise; 02. There is no obvious dripping from the pump body (excluding condensate).	Brush
Water System	Check if the liquid cooling unit HMI has reported any alarms.	Has the unit reported the 'water tank liquid level'? Low warning, received this warning fluid replacement is needed at this time.	flathead screwdriver, Phillips screwdriver, water pump, water pipe, clamp

Factors can affect the maintenance cycle of the product. If the operating environment has a lot of wind and sand or is heavily dusty, it is necessary to shorten the maintenance cycle and increase the maintenance frequency.

Maintenance Project	replacement standard	Inspection Cycle	Maintenance Tools
Coolant Inspection	1. Replace when impurities in the antifreeze are noticeable; 2. Replace when the color of the antifreeze noticeably darkens.	Half a year	Water pump, hose, hose clamp, flathead screwdriver

Waste disposal

Coolant: Discharge according to local regulations, do not dispose of arbitrarily.

Residual waste: Classified recycling, can be incinerated or reused in accordance with relevant regulations.

Containers: Uncontaminated containers can be recycled, while containers that cannot be cleaned must be disposed of.

Leak emergency response

When coolant leaks occur, the following measures can be taken for handling.

• Immediately contact professionals and evacuate unrelated personnel to a safe area.

• Cut off the source of the leak as much as possible to prevent it from entering sewers, drainage ditches, water bodies, and other spaces.

• When clearing the leaked liquid, wear protective equipment to safeguard the body and avoid contact with the spilled or released substances.

• For large leaks: construct a berm or dig a pit to contain it, and use a pump to transfer it to a container; for small leaks: absorb with clay, sand, etc., and dispose of in a sealed container.

First Aid Measures

Inhalation: Move to an area with fresh air and ensure breathing is unobstructed. If breathing is difficult, provide oxygen; if breathing stops, perform artificial respiration immediately and seek medical attention.

Skin Contact: Remove contaminated clothing and wash the affected area with plenty of running water, then seek medical attention.

Eye Contact: Rinse with clean running water or saline for more than 15 minutes and seek medical treatment.

Ingestion: Seek medical help immediately; do not induce vomiting unless directed by a physician. If you cannot get help from a doctor, take the patient, the container, and the label to the nearest medical emergency center or hospital. Do not give any food to an unconscious patient.

8.6 Fault Handling

Danger

Under fault conditions, there may still be lethal high voltage inside the energy storage system! Only qualified technicians (referring to operators who have previously received professional training on equipment troubleshooting operations) may perform the operations described in this chapter. Please only carry out the troubleshooting operations described in this manual. When operating, please adhere to all safety operating regulations.

When the energy storage system cannot charge or discharge as expected, experiences fire failure, or the air conditioning stops, please check the following items:

Confirm the BAU end displays the energy storage system fault information; Confirm whether the BAU is functioning normally;

Is the communication between the energy storage system and the BAU normal; Is the power supply and communication of the fire protection system normal;

Is the air conditioning power supply or communication normal.

Alarm faults and handling methods (if other faults occur, please contact our company's after-sales personnel in a timely manner.)

System Fault Handling and Emergency Plan

Fault Cause Analysis and Tracking

01. The operation and maintenance personnel should investigate the cause of the fault to determine if it is a significant emergency fault (such as fire alarm, insulation fault, BMS tripping fault, overcurrent protection fault, etc.). If it is, the operation and maintenance personnel should immediately go to the site to handle it. If it cannot be resolved quickly, please arrange for personnel from the nearest unit to confirm the safety of the energy storage station.

02. After the operation and maintenance personnel arrive at the site and conduct an inspection, they should restart the PCS after eliminating general faults. For faults that cannot be eliminated, promptly contact the operation and maintenance engineer.

03. If our remote assistance still cannot resolve the issue, we will promptly send relevant personnel to the site to handle it.

04. In the event of a malfunction, if the system operates abnormally, the first step is to clarify the nature of the problem through backend data, SOE event records, etc.

For example, issues such as BMS failure, PCS failure, local controller failure, etc. If it is a BMS failure, the following common BMS failure handling procedures can be followed.

8.7 Accident Handling

The emergency plan is commanded uniformly by the operations and maintenance center, and the operations and maintenance personnel are responsible for its implementation, ensuring that communication remains smooth during the process;

The emergency measures in the emergency plan are implemented by the operations and maintenance personnel to ensure the effectiveness of the emergency response measures;

Comprehensive training and drills for the emergency plan must be conducted every six months, continuously improving based on the issues identified during the drills;

In the event of anomalies or accidents, the system should promptly take correct and effective measures to address the situation, preventing further damage and loss from occurring.

Overheating

When the temperature of the battery pack exceeds the safe usage limit, the management system will issue a warning and require immediate cessation of use. In this case, usage must be stopped immediately, and relevant technical personnel should be notified for a comprehensive inspection. The system can only be used again after troubleshooting.

Electric Leakage

During use, if any signs of electric leakage are detected in the system, all relevant personnel must be evacuated immediately, and technical personnel should be notified to handle the situation. The system can only be used again after troubleshooting. It is strictly prohibited to operate the system with faults or to force continued use.

Short Circuit

In the event of a system short circuit caused by various reasons, it is essential to immediately evacuate relevant personnel, disconnect the associated power supply and electrical equipment (if possible), immediately disconnect the battery from the system, and promptly notify relevant technical personnel to come on-site for repair and troubleshooting. Equipment and components that have been severely short-circuited must be thoroughly tested by the manufacturer before a decision can be made on whether they can continue to be used.

Collision

If the equipment is collided with, deformed, or penetrated by foreign objects for various reasons, the system's power connection should be immediately disconnected, and professional technical personnel should be notified to handle the situation. If the situation is special, personnel wearing necessary protective equipment should handle it on-site before any disassembly work can proceed.

Fire

Step 1: Evacuate personnel on site to a safe area, establish a safety isolation zone, and call the emergency number based on the situation at the scene.

Step 2: Under the condition of ensuring personal safety, proceed with the following operations if possible:

01. If the wiring harness is smoking or on fire, use a carbon dioxide or dry powder fire extinguisher to extinguish the fire.

02. If the energy storage battery catches fire, use a high-pressure water gun to extinguish it from a distance.

03. If you accidentally inhale thick smoke, please evacuate quickly and seek medical attention.

Step three: Notify the system manufacturer to obtain further handling advice.

Water flooding

Step 1: Regardless of whether the system is powered on, evacuate personnel from the site to a safe area and establish a safety isolation zone.

Step 2: Notify the system supplier and wait for the water to recede before performing maintenance.

Step 3: Do not start the system until the manufacturer provides a safety assessment result.

Server downtime

When the server crashes, the operations and maintenance personnel must first ensure whether the device's operating status is safe and contact the server manufacturer’s maintenance engineer to confirm the recovery time. If it cannot be restored within one hour, it needs to be reported to the person in charge, and confirmation must be made after discussion.

Power system outage

When the power supply system of the power station is down, the operations and maintenance personnel must rush to the site immediately to turn off the power switch of the equipment and take a photo of the PCS emergency stop button. At the same time, they must contact the electrical supervisor to confirm the cause of the power outage and the time for restoring power, and report to the leadership. After restoring power, the power must be supplied according to the process, and the normal operation of the equipment must be confirmed.

Personnel electric shock

In the event of an electric shock, the operation and maintenance personnel must first ensure their own safety, then immediately cut off the power supply to the facility, check the condition of the person who has been electrocuted, and call for emergency assistance. For individuals with serious injuries, first aid may be administered. The movement and first aid of the injured must strictly follow relevant regulations to prevent any secondary injuries.

Other accidents

If the system requires maintenance or the removal of equipment or components due to other accidents, the battery circuit should be disconnected first to ensure personnel do not get electrocuted. Disassembly should be carried out in a manner that prevents short circuits, ensuring that there are no collisions, falls, or inversions that could cause secondary injuries during the process.

If any issues are found that may affect the battery or energy storage system, please contact after-sales personnel and do not attempt to disassemble it privately.

If the copper wire inside the conductive wire is exposed, do not touch it. There is a high voltage danger. Please contact after-sales personnel and do not disassemble it privately.

In case of any other emergencies, please contact after-sales personnel immediately. Operate under the guidance of after-sales personnel or wait for them to operate on-site.

8. Paint Repair measures

Check the appearance damage of the energy storage integrated system:

Surface dirt caused by water stains and dust can be cleaned off.

Use a cloth (or other scrubbing tools) dampened with water to scrub the dirty areas of the surface.

If the stains cannot be removed with clean water, it is recommended to scrub with 97% alcohol until the surface cleanliness reaches an acceptable level (you may also try using locally common non-corrosive cleaners).

The finish is damaged, and surface marks cannot be cleaned off.

Use sandpaper to grind the areas of the surface paint that are fuzzy or scratched, to make the surface smooth.	Use a cloth dampened with water or 97% alcohol to wipe the damaged areas, removing surface stains.
After the surface is dry, spray the exposed areas of the substrate with zinc-rich primer for protection. The spraying should completely cover the bare substrate.	After the surface is dry, use a soft brush to touch up the scratched areas of the paint. The paint application should be as uniform and consistent as possible.

Check whether the protective paint on the shell of the energy storage integration system has peeled off or shows signs of paint loss. If any issues are found, please repair them promptly.

This product requires periodic maintenance. It is recommended to reapply the specialized protective paint to the exterior of the energy storage integration system every 5 years.

9 After-sales service

Our company provides customers with comprehensive technical support and after-sales service. The free warranty service period is based on the contract.

The following situations are not covered by our company's free warranty service:

- Failure to operate according to the user manual, resulting in system damage or faults caused by this.
- Wiring and power supply not in accordance with relevant electrical safety standards, or damage caused by poor on-site conditions or faults resulting from this.
- Damage to the system caused by unauthorized modifications by the user, or failures resulting from such modifications.
- Damage to the system or failures caused by irresistible natural factors such as typhoons, earthquakes, floods, fires, or harsh environments (high temperatures, low temperatures, high humidity, acid rain, etc.).
- If the user does not maintain the initial fault state after a failure occurs, and fails to notify the manufacturer in a timely manner while attempting to handle the issue independently, it will result in an inability to make a realistic fault diagnosis.

If you have any questions about this product, please contact us. To provide you with faster and better service, we need your assistance in providing the following information:

(1) Device Model	(2) Device Serial Number (SN Code)
(3) Fault Code/Name	(4) Brief Description of Fault Phenomenon
(5) Equipment installation address	(6) Contact information