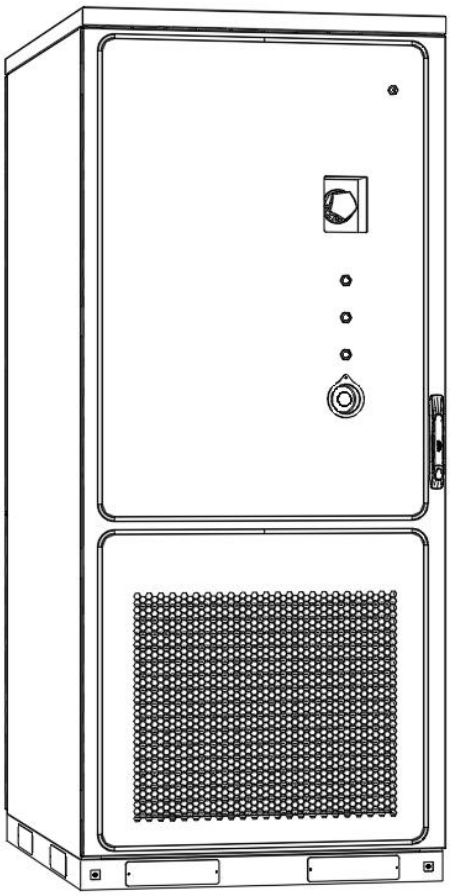
Liquid Cooling Outdoor

Energy Storage System User Manual



Version: V1.0

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1 Overview

1.1 Scope of application

This product manual applies to the following types of energy storage systems:

LES - 241 L 60

LES - 241 L 80

LES – 241 L 120

- Note: "**241**" indicates the rated capacity of the battery (in kWh);
- "**L**" indicates a Liquid-cooling energy storage battery system;
- "**60**", "**80**", "**120**" represent PCS power (in kW) ;

Please keep this product manual properly and ensure relevant personnel can access it easily.

1.2 Introduction

This manual contains the following main contents.

content	Brief Description
Safety Tips	Safety precautions must be taken when installing, operating, maintaining, and overhauling the energy storage system.
Product Description	The appearance, performance characteristics, composition, and internal equipment layout of the energy storage system.
Delivery	Delivery, inspection matters, etc. when the user receives the product.
Install	The mechanical transportation, installation, and electrical connection methods of the energy storage system.
Power on/off	Procedures for starting/stopping internal equipment during normal maintenance/inspection, etc.
LCD operation	The functions and usage of the human-machine interface, etc.
Fire Instructions	The main fire-fighting equipment in the energy storage system.
Troubleshooting	Simple troubleshooting methods, etc.
Daily operation instructions	Daily operation precautions and daily maintenance guidance of the energy storage system.
other	The technical data of the energy storage integration system, quality assurance terms, and contact information.

1.3 Reading Target

This manual is intended for personnel who are engaged in transportation, installation, or other operations of this energy storage system. Readers must at least meet the following requirements:

- Certain expertise in electronics, electrical wiring, and mechanics, and be familiar with electrical and mechanical schematics are required.
- Should be familiar with the composition and working principle of the energy storage system. Should be familiar with the composition and working principle of the energy storage system and its upstream and downstream equipment.
- Should have received professional training related to the installation and commissioning of electrical equipment.
- Should have the ability to respond to emergencies or dangers that occur during installation or trial operation.
- Should be familiar with the relevant standards and regulations of the country where the project is located.
- Should be familiar with the contents described in this manual.

Only personnel who meet the above requirements can perform installation, operation, maintenance, and repair operations of the energy storage integration system. Unauthorized personnel are not allowed to do any operations on the energy storage integration system, and should maintain a sufficient safety distance from the system to avoid accidents.

1.4 Explanation of Symbols

To ensure users' personal and property safety when using this product and to use this product efficiently, the manual provides relevant safety operation information and emphasizes it with appropriate symbols. The following are the symbols used in this manual, please read them carefully.

Danger

DANGER indicates a high-level potentially hazardous situation that, if not avoided, will result in death or serious injury.

Warning

WARNING indicates a hazardous situation with a moderate risk, which, if not avoided, could result in death or serious injury.

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

	Notes "Notes" are additional information in the manual that emphasizes and supplements the content. It may also provide tips or tricks for optimizing the use of the product, which can help you solve a problem or save you time.

Please always pay attention to the hazard warning signs on the device, which include:

Symbols	Description
	Indicates that there is a high voltage inside. Touching it may cause an electric shock.
	Indicates that the temperature here is higher than the acceptable range for the human body. Please do not touch it arbitrarily to avoid personal injury.
	Maintenance and repair operations can only be carried out after the system has been powered off for 10 minutes.
	Indicates that this is the protective grounding (PE) terminal, which needs to be firmly grounded to ensure the safety of operators.

1.5 Manual Usage

Please read this manual carefully before transporting and installing this product. Please keep this manual and other materials in the product components together to ensure that relevant personnel can access them anytime. Non-internal personnel of our company may not publicly reprint all or part of the content without written authorization. To continuously improve customer satisfaction, our products and product manuals are in continuous improvement and upgrading. If there is a difference between the manual and the product in your hand, it may be due to the product version upgrade. Please refer to the specific product. If you still have questions, please get in touch with us.

	Note This manual for the electrical equipment within the Energy Storage Integration System is a companion manual shipped with the product. Before installing and operating this product, please read the manual carefully and perform operations per the manual requirements.

1.6 Abbreviation

Full name	Abbreviation
Energy storage system	ESS
Energy storage battery system	BESS
Power Conversion System	PCS
Battery Pack	PACK
Temperature control system	HVAC (Heating Ventilation Air Conditioning)
Fire protection system	FSS (Fire Suppression System)
Switch Box	S/G (Switch Gear)
Local Controller	LC (Local Controller)
Battery Management System	BMS (Battery Management System)
Battery Rack	Rack
EMS Controller	EMS (Energy Management System)

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

2 Safety Instructions

The safety instructions in this manual must be strictly followed at all times. To avoid possible casualties, and property losses during installation or operation, and to effectively extend the service life of the energy storage system, please be sure to read all safety instructions carefully.

2.1 Electricity safety matters

Danger

There is a risk of electric shock if you touch the power grid or the internal connection conductors or terminals between the power grid and the product

- Do not touch terminals or conductors connected to the grid circuit.
- Observe all instructions and safety documents regarding connection to the power grid.

Danger

Lethal high voltage exists inside the product!

- Pay attention to and comply with warning signs on the product.
- Observe the safety precautions listed in this manual and other related documentation for this product.
- Observe the relevant safety precautions and protection precautions for lithium batteries.

Danger

Damaged equipment or system failure may cause electric shock or fire!

- Perform a preliminary visual inspection of the equipment for damage or other hazards before operating.
- Check whether other external devices or circuit connections are secure.
- Make sure this equipment is in a safe state before operating it.

Warning

The installation and operation of the energy storage system must comply with the relevant standards and specifications of the country/region where the project is located.

Note

An automatic fire extinguishing system is equipped inside the product. The fire switch must not be triggered unless it is an emergency.

2.2 Personnel requirements

- Only professional electricians or qualified personnel can operate this product.

- Operators should be fully familiar with the composition and working principle of the energy storage system.
- Operators should be fully familiar with the relevant standards and specifications of the country/region where the project is located.
- Operators should be fully familiar with the product manuals of this product and the internal electrical equipment.

2.3 Manual Storage

The product manual is an important and indispensable part of the product. The manual contains important information on the transportation, installation, inspection, and maintenance of the product. Please be sure to read this manual carefully before transporting, installing, inspecting, and maintaining the product.

- Please strictly follow the descriptions in this manual to transport, install, inspect, and maintain this product. Otherwise, equipment damage, personal injury, and property loss may occur.
- This manual should be kept properly to ensure that it is available at any time for transportation, installation, and operation personnel.

2.4 Battery Protection

Danger
High DC voltage! The danger of electric shock! The batteries connection in the system will occur a high voltage. If touched accidentally, there will be an electric shock, even life-threatening danger.

When installing, maintaining, or overhauling, ensure that:

- The energy storage battery is completely disconnected.
- Place obvious warning signs at the disconnection point to ensure accidental reconnection.

2.5 Ground fault protection

Danger
When a ground fault occurs, the originally non-powered parts may have fatal high voltages. An accidental touch is very dangerous! Before operation, please ensure there is no ground fault of the ESS. Meanwhile, relevant protective measures are necessary.

2.6 Electrified Inspection

Danger

There is a high voltage of the equipment inside the ESS. An accidental touch may cause a fatal electric shock. Therefore, for electrified measurement, you should:

- Take protective measures (such as wearing insulating gloves, etc.).
- There must be an accompanying person to ensure personal safety.

2.7 Testing Equipment

When performing electrical connections, trial runs, and other operations of the ESS, relevant electrical testing equipment is required to ensure that each electrical parameter meets the requirements.

Danger

- Select high-quality testing equipment whose testing range, usable conditions, etc. meet the on-site requirements.
- Ensure that the connection and use of testing equipment are correct and standardized to avoid dangers such as arcing.
- If measurements are made while power is on, protective measures must be taken (such as wearing insulating gloves).

2.8 Complete power-off operation

Only when it is ensured that all equipment and systems in the ESS are completely de-energized can any operations be performed on it.

- Ensure that powered-off equipment cannot be accidentally powered back on.
- Use a multimeter to ensure that there is no voltage inside the device.
- Perform necessary grounding.
- Use an insulating cloth to insulate and cover the possibly live parts near the operating part.
- During the whole operation, the escape route must be kept clear.
- After the energy storage integration system is completely shut down, be sure to wait for at least 20 minutes before operating the energy storage integration system.
- Make sure the energy storage system is completely de-energized.

2.9 Arc protection

Danger

To avoid unnecessary casualties and equipment damage, this product must be operated strictly per the description in this manual. Improper operation may cause arc hazards and may even cause other risks such as fire and explosion. The company does not assume any responsibility for arc, fire, explosion, and

	other accidents caused by failure to operate according to the machine markings or product manuals.

Below improper operations may cause an arc, fire, explosion, or other dangers inside the cabinet. And always remember that once an accident occurs, it must be handled by qualified professionals. Improper operation of existing accidents may cause more extensive failures or accidents.

- Plug and unplug the DC side high-voltage fuses of each device while it is powered on.
- Touching uninsulated ends of cables that may be live.
- Touching wiring busbars, terminals, or other parts inside the machine that may be energized.
- The power cable connection is loose.
- Parts such as screws accidentally fall into the power module.
- Improper operation by untrained and unqualified operators, etc.

Before operating the equipment, you must assess whether there is an arc risk in the operating area. If there is an arc risk, you need to:

- Operators must receive relevant safety training in advance.
- Try to assess the area where the shock could occur.
- Before operating in areas where electric shock is possible, you must wear protective clothing that meets the requirements.

2.10 Electrostatic Protection

	**Caution** Contact or improper handling of printed circuit boards or other electrostatically sensitive components can cause damage to the device. ● Avoid unnecessary contact with the circuit board. ● Observe electrostatic protection regulations, such as wearing an anti-static wrist strap.

2.11 LCD parameter settings

Some of the configurable parameters in the LCD are closely related to the operation of the ESS and its internal devices. These parameters can only be modified and set after a reliable analysis and evaluation of the system's operating conditions.

Warning

- Inappropriate parameter settings may affect the normal functioning of internal devices.
- Only authorized professionals can set parameters.

2.12 Protection against wind, sand, and moisture

In case of severe weather such as sandstorms, thunderstorms, strong winds, hail, or when the relative humidity of the surrounding environment is greater than 95%, do not open the energy storage system cabinet door.

2.13 Machine body warning label protection

Warning labels on the product and the internal electrical equipment contain important information for safe operation of the product and the internal equipment. It is strictly forbidden to tear or damage them!

Caution

Do not tear or damage the signs

- Ensure that warning labels on the machine are always clearly readable.
- If the warning label on the machine is damaged or blurred, it must be replaced immediately.

2.14 Safety warning sign protection

When transporting, installing, inspecting, and maintaining the outdoor cabinet of the energy storage system on-site, please observe the following precautions to prevent unrelated personnel from approaching and causing mis-operation or accidents:

- Place conspicuous warning signs at the front and rear switches of the outdoor cabinet of the energy storage system to prevent accidents caused by accidental closing of the switch.

- Erect warning signs or set up safety warning tape near the on-site operation area.

2.15 Transportation and Inspection

Improper transportation methods may cause equipment damage or personal injury. The outdoor energy storage cabinet must be transported or moved in strict accordance with the operating procedures of the transportation equipment.

Warning
Only intact outdoor ESS cabinets can be installed and used!

When receiving the outdoor ESS cabinet, first check whether the received cabinet is complete according to the delivery list. Then check whether there is any damage during transportation. If damage is found, please contact the transporter or dealer immediately and provide photos of the damaged area so that we can provide you with the fastest and best service.

2.16 Installation and trial operation

The installation and operation environment of the outdoor cabinet is outdoors, and its installation location and foundation must meet the requirements. In addition, during the entire process of electrical connection, operations must be carried out strictly per regulations.

Warning
The outdoor cabinet can only be put into operation after being installed and confirmed by professionals and approved by the local power department. Please close all power distribution circuit breakers before operating the equipment, and it is strictly forbidden to disconnect them during the operation of the machine.

Caution
Before commissioning the outdoor ESS cabinet, the installation must be fully and carefully checked again.

- Check the installation.
- Check that no tools or parts have been left inside the equipment.
- Check system parameters.

2.17 Daily Operation and Maintenance

During daily operation, the energy storage system and the doors of the internal equipment cabinets must be closed and locked, and the keys must be removed and properly kept by a designated person to prevent accidents caused by unauthorized entry, or internal equipment from being exposed to rain or animal attacks. At the same time, outdoor cabinets and internal equipment should be inspected and maintained regularly to ensure the long-term and reliable operation of the energy storage system.

Warning
If you are working with the equipment energized, be sure to take good insulation protection and ensure that at least two workers are on-site at the same time. The power station where the outdoor cabinet is located is usually

	located in a wild environment away from the urban area. Appropriate field rescue facilities should be prepared as needed so that they can be implemented when needed.

During daily operation and maintenance, you should also pay attention to the following items:

- Avoid inspecting and maintaining the devices in the outdoor ESS cabinet in rainy or humid weather conditions. The intrusion of moisture may damage the electrical equipment.
- Each electrical device in the outdoor ESS cabinet is affixed with a nameplate. The nameplate contains important parameter information about the device, and you should pay attention to protection when performing various operations on it.
- Some equipment in the outdoor cabinet may have heating components. When the equipment stops working, such components will still have a high temperature. Please wear anti-scalding gloves when operating such components.
- The power unit and cooling fan in the energy storage system may generate some noise during operation. When some equipment fails, the noise will be even louder. It is recommended to wear anti-noise earplugs when approaching outdoor cabinets.
- Comply with all installation requirements for fire suppression systems.
- When necessary, equip with appropriate protective equipment, such as goggles, insulating gloves, insulating shoes, etc., and take all necessary auxiliary measures to ensure the safety of personnel and equipment.

2.18 Product Decommissioning

When the energy storage system or its internal devices need to be discarded, they cannot be treated as regular waste. Some components of the internal machine can be recycled and reused, but some components will pollute the environment. Please contact a local authorized professional recycling agency to properly dispose of the product and internal components.

2.19 Manual Instructions

Note

- To facilitate reading, a large number of pictures are included in this manual. The pictures are for illustration only. For specific details of the product, please refer to the actual product received.
- Please keep this manual and other related documents near the equipment so that they can be used at any time during installation, operation, maintenance, and repair.
- All descriptions in this manual are based on the standard integrated Energy Storage System. Users with special needs should indicate them to GOLEN staff at the time of ordering. We will do our best to meet your needs. Please refer to the actual product you receive for specific details.
- This manual cannot cover all possible situations during installation, operation, maintenance, and overhaul. If you encounter a situation that is not explained in this manual, please contact GOLEN promptly.

3. Product Description

3.1 Basic Features

This energy storage system is mainly used in industrial and commercial scenarios. The energy storage system consists of converters, energy storage batteries, distribution boxes, air conditioners, fire-fighting equipment, etc. The protection level of the energy storage system outdoor cabinet is IP54, and it can be installed outdoors. The system application diagram is shown in the figure below.

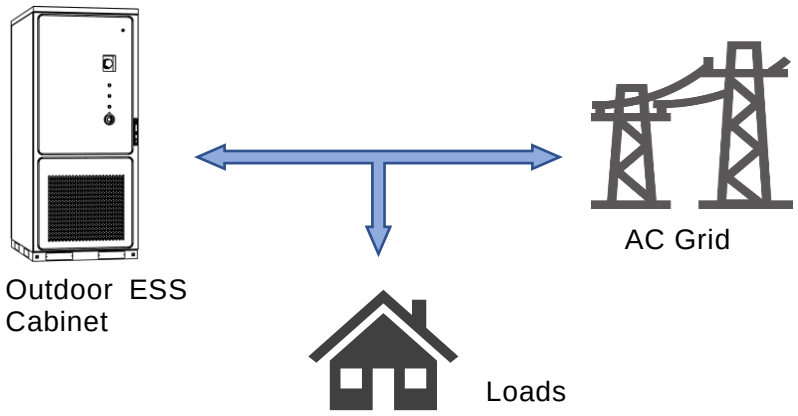


Figure 3-1 Typical application system diagram

3.2 Design

3.2.1 Mechanical dimensions

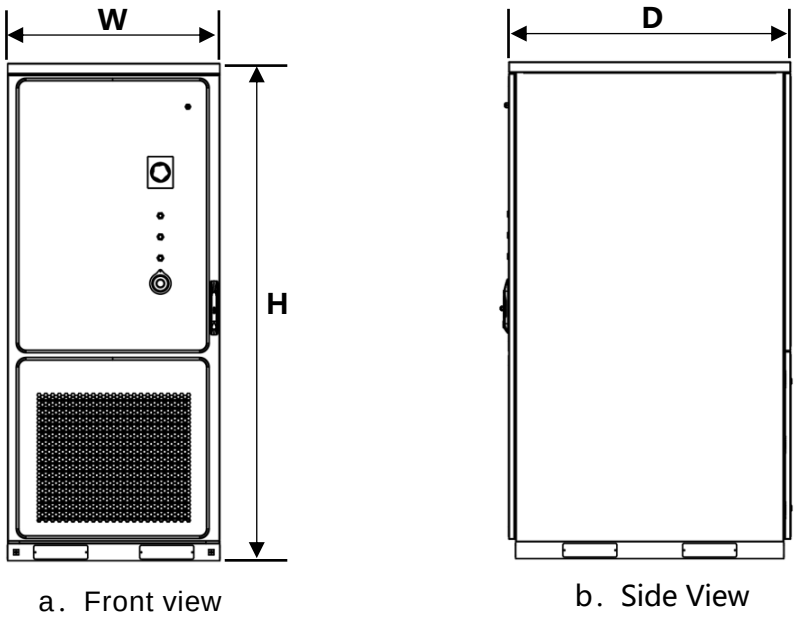
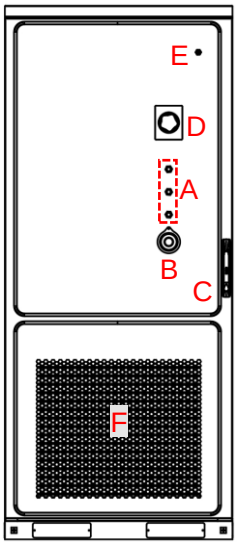
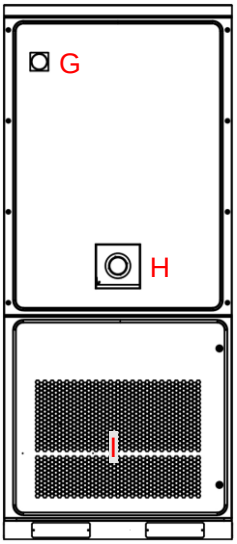


Figure 3-2 Dimensions of energy storage integrated outdoor cabinet

Product Model	Dimensions: W×D×H	net weight
LES-241L60	1000×1330×2350mm	2500kg
LES-241L80	1000×1330×2350mm	2500kg
LES-241L120	1000×1330×2350mm	2500kg

3.2.2Appearance Introduction

Energy storage system outdoor cabinet:

view	Note
	Front View A: Indicator light B: Emergency stop button C: Door lock D: Sound and light warning light E: 4G antenna outlet hole F: Air intake window
	Rear View G: Explosion-proof valve H: Fire protection interface I: Air outlet

3.2.3 Ventilation design

Ventilation of ESS Cabinet is to ensure that sufficient cooling air is supplied to the batteries, converters, and other equipment, and ventilation shutters are provided at the front and rear doors of the cabinet. For specific locations, please refer to the exterior of the outdoor cabinet.

The heat run is shown below.

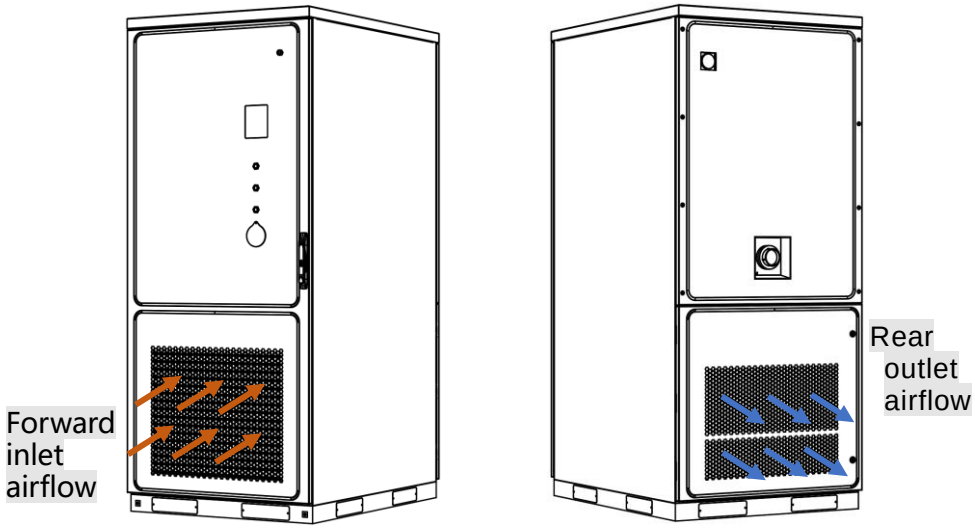
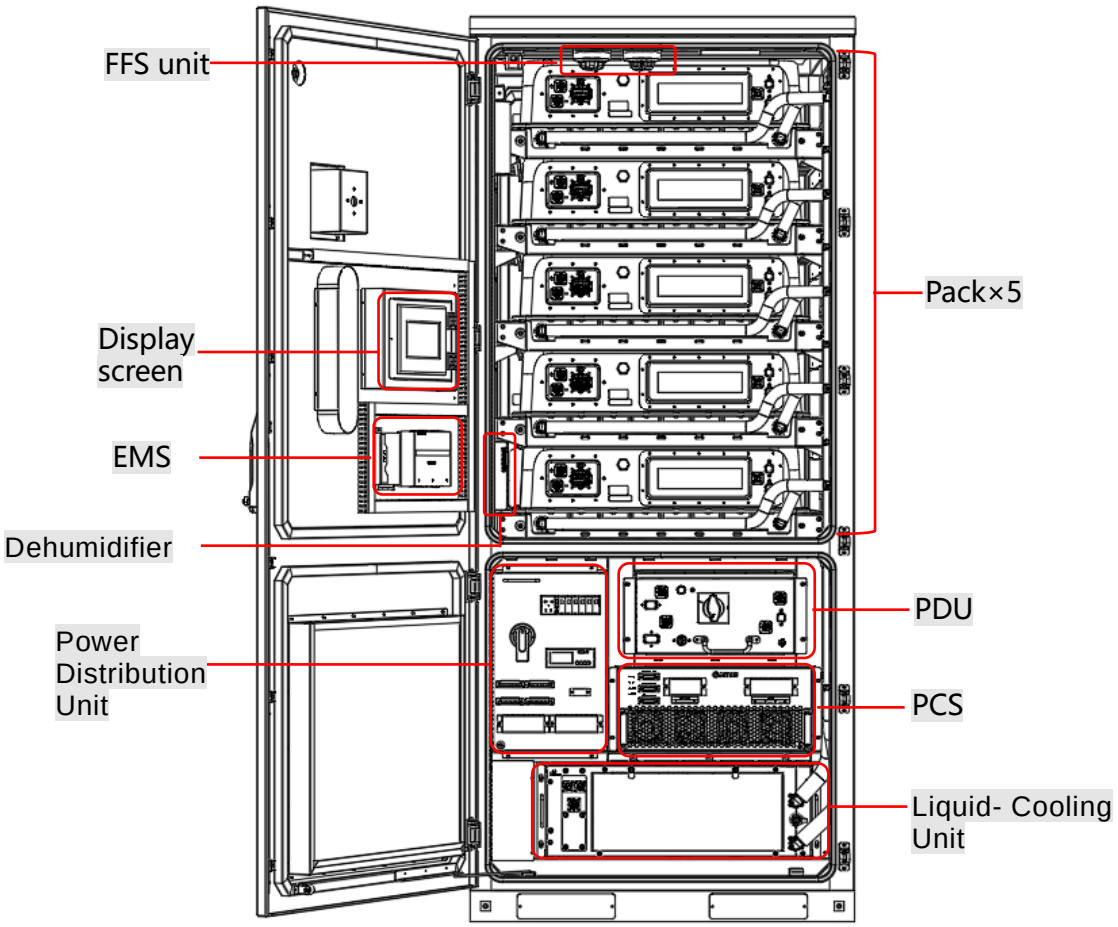


Figure 3-3 Schematic diagram of outdoor cabinet ventilation

3.3 Internal Design

3.3.1 Internal equipment layout



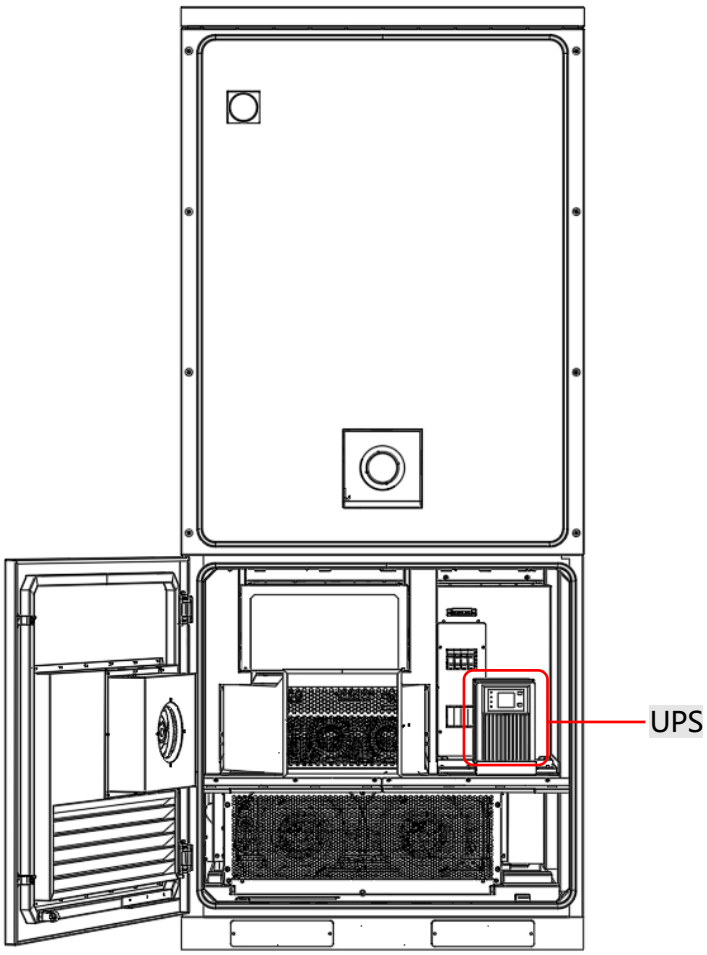


Figure 3-4 Internal equipment layout

3.3.2 Energy Storage Converter

The energy storage converter adopts advanced digital control technology, optimizes the control function, and improves the system reliability. It is suitable for various battery charging and discharging conditions. It adopts a modular structure design and is easy to install and maintain. The main functions are as follows:

- Active power regulation and reactive power compensation;
- AC and DC dual input redundant power supply mode to ensure the reliability of control power supply;
- Membrane capacitor design , long service life ;
- Modular design , easy to maintain from the front;

3.3.3 LED indicators

Three LED lights that display the system operation status are installed above the front door outer panel of the energy storage integrated

outdoor cabinet, namely the power indicator light "Power", the operation indicator light "Operation" and the fault indicator light "Fault".

Table 3-1 LED indicator light description

name	color	Note
Power on	Green	Control circuit power supply
Run	Green	Normal operation
Fault	Red	A malfunction has occurred and has not yet been corrected. If the fault is eliminated, the indicator light will go out automatically.

Table 3-2 LED display status and operation description

Display Status				Note
Power	Run	Fault	" Power " light is on	Control power supply status
Power	Run	Fault	" Power " light is on " Run " light is on	Normal system operation status
Power	Run	Fault	" Power " light is on " Fault " light is on	System failure and system shutdown status
Power	Run	Fault	All off	Power off state

3.3.4 LCD screen

Users can view the operation information of the energy storage integrated outdoor cabinet through the LCD touch screen to realize the system control function. The specific functions are as follows:

- Control the operation of energy storage system
- Display real-time operation data
- Display fault information
- Adjust operating parameters
- View historical data

3.3.5 Emergency stop button

The emergency stop button is used to disconnect the PCS from the DC and AC sides in case of a fault or emergency.

Warning

Hazard of electric shock!
The emergency stop button may only be used to shut down the converter in critical situations!
Improper use of the emergency stop button may cause damage to the PCS.
If the emergency stop button is pressed under load, the PCS related

components will be subjected to greater stress. Frequent use may easily cause component damage.

When the emergency stop button is pressed, the connection between the PCS and the DC and AC sides is immediately disconnected, and the button will be locked. To restart the PCS, you must turn the emergency stop switch clockwise to release the lock. Then restart the PCS through the LCD screen.

3.3.6 Overview of switch positions

The locations of the circuit breakers are as follows:

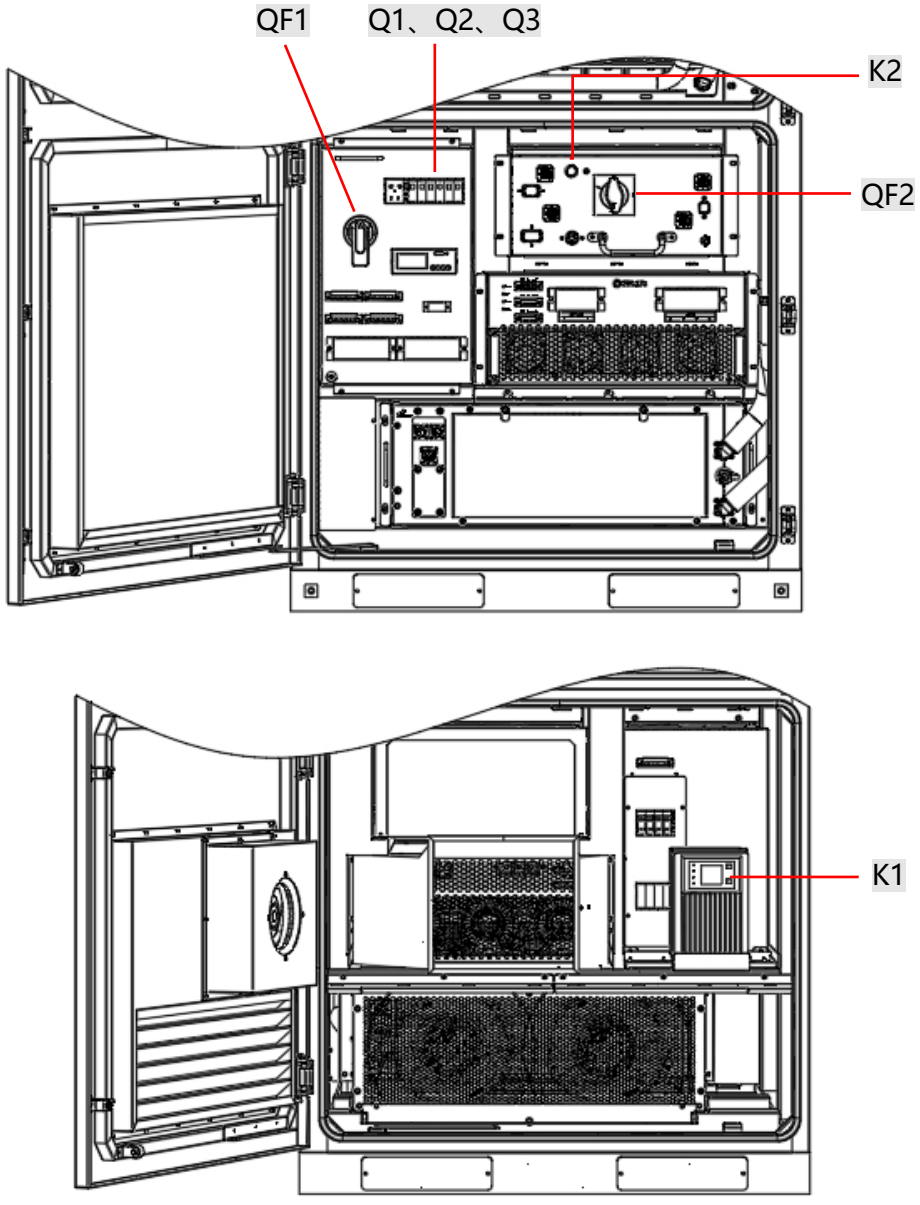


Figure 3-5 Overview of operating switch positions

Table 3-3 Switch symbol definition

Label	Note
QF 1	AC circuit breaker
QF 2	DC circuit breaker
Q 1	Air conditioner power switch
Q 2	220V power switch
Q 3	System power switch
K 1	UPS power button
K 2	BMS auxiliary power button

3.3.7 Battery Cluster

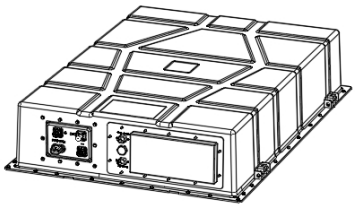
The following is a typical system architecture for the use of iron-lithium batteries. Based on iron-lithium cells, standardized and unitized battery modules are developed. The battery modules are connected in series and equipped with switch boxes and distribution boxes to form a high-voltage battery cluster. The battery cluster is connected to a matching energy storage converter (PCS) to form an electric energy storage system product (ESS) to complete the storage and release of electrical energy.

Table 3-4 Battery cell parameters

Battery Cell	Parameter name	Parameter Value
	Rated capacity	314
	Rated voltage	3.2 V
	Voltage range	2.8 ~ 3.65 V
	Energy Density	≥175 kg
	size	174×72×204mm

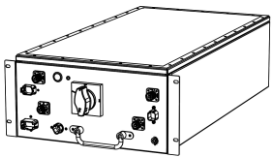
The battery module is mainly composed of battery cells connected in series and parallel and has functions such as voltage and temperature collection and balance control of each battery cell. It adopts a dedicated battery management chip design, receives control commands through daisy chain communication, and reports collected data.

Table 3-5 Parameters of LiFePO4 battery

LFP Battery	Parameter name	Parameter Value
	Nominal voltage	153.6 V
	Rated energy	4 8.23kWh
	Combination	1P 48S
	Cooling method	Liquid Cooling
	weight	3 1 5 kg
	Dimensions (mm)	787×1069×234

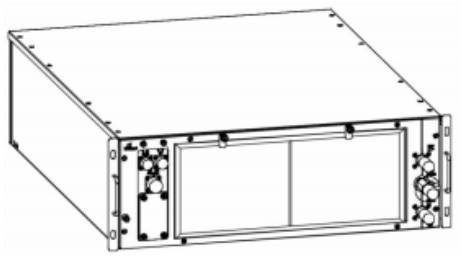
The switch box contains fuses, relays, and a battery cluster management unit (BCU), which is mainly responsible for monitoring the entire battery cluster.

Table 3-6 Switch box parameters

Switch Box	Parameter name	Parameter Value
	size	648×483×222.5mm
	weight	25 kg
	Rated current	250 A
	Rated voltage	1 000 V
	Voltage sampling range	0 V~ 1500 V

3.3.8 Air conditioning design

The air conditioner with heat exchanger is a temperature control product developed for cabinets. It is suitable for scenarios where the equipment inside the cabinet emits a lot of heat and needs to be completely isolated from the outdoor environment. This unit has four modes, including cooling mode, self-circulation mode, standby mode, and heating mode. The unit can intelligently switch between the four modes according to the parameters fed back by the battery during operation.



Air conditioning filling maintenance steps:

1. Connect the injection pipe of the injection tool to the injection port of the air conditioner and lock the injection pipe with a hose clamp.

2. Remove the mesh sheet metal and open the ball valve inside the injection port and the exhaust valve on the air conditioner external pipe.

3. Turn on the power to the injection pump.

4. Observe the inlet and outlet water pressures of the air conditioning unit.

5. When the outlet water pressure reaches 1.5-2 bar, close the ball valve and the injection pump at the injection port and stop adding liquid. Let the liquid circulate for a while. If the outlet water pressure drops, continue to add liquid. When the outlet water pressure is stable and does not drop, the addition is completed.

3.3.9 Cable entry design

To facilitate cable connection on site, all cables between devices inside the outdoor ESS cabinet have been connected before delivery. The cables connecting the outdoor cabinet and external devices can enter the interior from the cable entry at the bottom of the cabinet.

3.3.10 Fire Protection Design

The outdoor ESS cabinet can be generally divided into two separate protection areas. The concept of "cluster-level protection" is mainly to provide fire protection for the two separate protection areas respectively and to link the entire system to act, which can truly extinguish the fire quickly and prevent it from re-igniting, ensuring the safe use of the ESS cabinet.

4 Delivery and storage

4.1 Scope of supply

Table 4-1 Supply scope of integrated outdoor ESS cabinet

Serial number	name	quantity	Note
1	Integrated outdoor ESS cabinet	1	
2	Portkey	2	
3	Data logger antenna	1	
4	document	1	Include product manual, warranty card, quality inspection report, certificate of conformity

4.2 Identifying the Energy Storage System

Users can identify the cabinet through the nameplate. The nameplate contains information such as model, serial number, main technical parameters, and manufacturing date.

Warning
The nameplate contains important parameter information related to the cabinet and should be protected during transportation, installation, maintenance, and repair. Destruction or removal is strictly prohibited!

4.3 Identification and inspection of transport integrity

The outdoor ESS cabinet has been carefully inspected by our staff and securely packaged before leaving the factory. However, the equipment may still be collided or even damaged during transportation. After receiving the equipment, you first need to check the integrity and soundness of the transportation. At least the following items should be carefully checked:

- Check that all delivered components are complete against the "Scope of delivery".
- Confirm that the energy storage system and internal equipment models received are consistent with the models you ordered previously.
- Carefully check the energy storage system and its internal equipment to see if there is any damage during transportation.

During the inspection process, if you find any problems or have any questions, please contact the transporter or our company on time.

Warning

Only a complete and undamaged energy storage system can be installed and put into trial operation! Before installation, please ensure that:

- The energy storage system itself is intact and has no damage.
- All equipment in the energy storage system is intact and has no damage.

4.4 Storage

After the delivery work is completed, if it is not installed immediately, please properly store the integrated outdoor ESS cabinet as described in this section.

- To prevent condensation inside the energy storage integrated outdoor cabinet, or to prevent the bottom of the cabinet from being soaked by rainwater during rainy seasons, the energy storage integrated outdoor cabinet should be stored in an indoor environment, such as a large warehouse or workshop.
- If the energy storage must be stored outdoors due to site conditions, the base of the energy storage integrated outdoor cabinet must be raised. The specific height should be reasonably determined based on site geological and meteorological conditions. At the same time, heating should be provided for the internal equipment of the energy storage integrated outdoor cabinet when the ambient temperature is too low.
- Storage environment temperature: -30 ℃ ~ +50 ℃; Storage environment relative humidity: 0 ~ 95%, no condensation.
- Store the energy storage integrated outdoor cabinet on a dry, flat, solid surface with sufficient load-bearing capacity and without any vegetation cover. The storage surface must be flat, without stagnant water, and without bumps or undulations.
- During storage, ensure that the doors of the energy storage integrated outdoor cabinets are locked.
- Effective measures must be taken to prevent rain, sand and dust from entering the energy storage integrated outdoor cabinet. At least the air inlet and outlet of the energy storage integrated outdoor cabinet must be effectively protected.
- Regular inspections: At least once every half month, check whether the cabinet and the internal equipment are intact.

5 Mechanical Installation

5.1 Conditions of Transportation

All of the equipment of the integrated ESS outdoor cabinet has been installed and fixed inside before leaving the factory. During transportation, the cabinet can be hoisted and transported as a whole.

Warning

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

- The energy storage integrated outdoor cabinet and any machinery and equipment used in the operation should be maintained.
- All personnel engaged in loading, unloading, and bolting should receive appropriate training, especially safety training.

Caution

During loading, unloading, and transportation, the mechanical parameters of the cabinet must be kept in mind at all times.

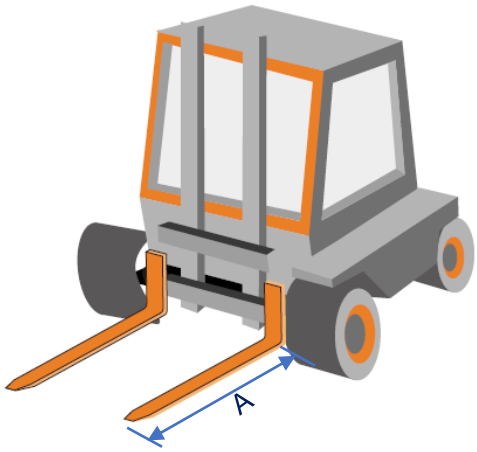
to transport or move the outdoor ESS cabinets must follow:

- The energy storage integrated outdoor cabinets are locked.
- Select a suitable crane or lifting tool according to the site conditions. The selected tool must have sufficient load-bearing capacity, arm length, and rotation radius.
- If it is necessary to move on a slope, etc., additional traction equipment may be required.
- Clear all existing or potential obstacles during the move, such as trees, cables, etc.
- Cabinet should be transported and moved under good weather conditions.
- Be sure to set up warning signs or warning tapes to prevent non-staff from entering the lifting and transportation area to avoid accidents.

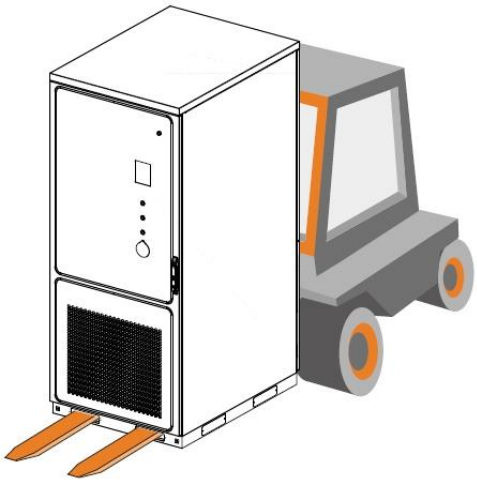
5.2 Forklift transportation

If the installation site is flat, you can use a forklift to move the energy storage integrated outdoor cabinet. The bottom of the energy storage integrated outdoor cabinet is equipped with fork holes specifically for forklift transportation. If a forklift is used for transportation, the following requirements should be met:

- The forklift should be equipped with sufficient load-bearing capacity (at least 6 tons).
- The length of the arm should be at least 1800mm.
- The lifting arm should be inserted into the holes on the bottom of the cabinet (see the image below for the location of the lifting holes).
- The integrated outdoor ESS cabinet should be slow and steady. It is recommended to try transportation.
- The cabinet can only be placed in a stable place with good drainage and no obstacles or bulges.



A≥1800mm



Load-bearing ≥ 6t

Warning

- Please transport the cabinet via the bottom lifting holes from the front.
- It is forbidden to transport cabinets via any other holes rather than the designated lifting holes.

Note

Before delivery, the lifting holes of the integrated outdoor ESS cabinet are exposed to the outside. It is recommended to seal the holes with the accessory sealing plate after the on-site installation is completed.

5.3 Lifting transportation

Warning

- During the entire process of lifting the outdoor ESS cabinet, the safety operating procedures of the crane must be strictly followed.
- It is strictly forbidden to stand within 5m to 10m of the operating area, especially under the crane arm and under the hoisted or moving machine, to avoid accidents.
- In case of adverse weather conditions, such as heavy rain, fog, strong wind, etc., the lifting work must be stopped.

When lifting the integrated outdoor ESS cabinet, must follow:

- Site safety must be ensured during lifting.
- During lifting and installation operations, there should be professional personnel on-site to direct the entire process.
- The strength of the slings used should be able to bear the weight of the outdoor ESS cabinet.
- Sling lifting only can be used for the transportation of non-unpacked cabinets.
- The length of the sling can be adjusted appropriately according to the actual requirements on site.
- During the lifting process, it is necessary to ensure that the cabinet is stable and not tilted.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the energy storage integrated outdoor cabinet.

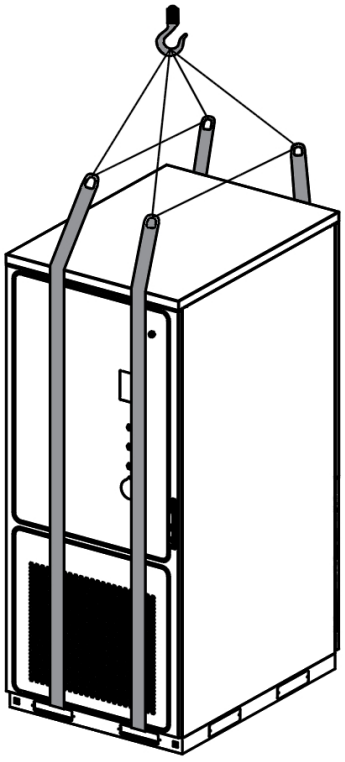


Figure 5-1 Schematic diagram of lifting belt

The following figure shows the crane operation during the lifting process of the outdoor ESS cabinet. The inner dotted circle indicates the crane operation range. When the crane is working, it is strictly forbidden to stand in the outer circle!

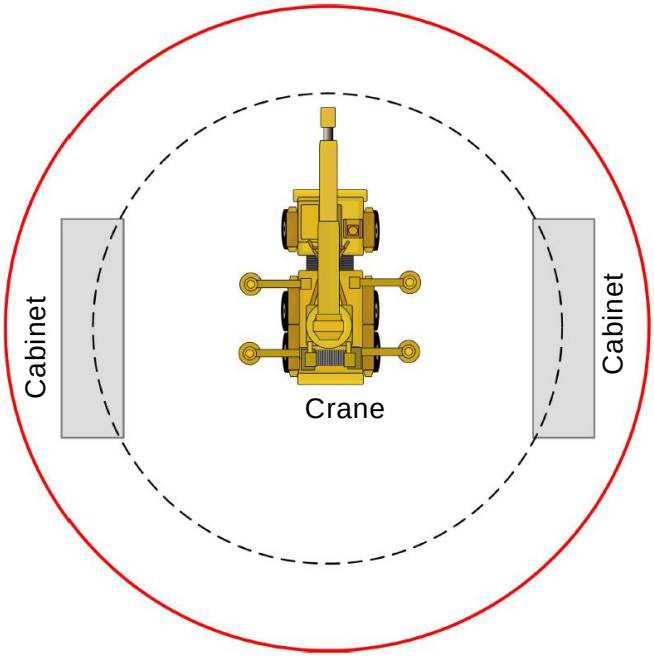


Figure 5-2 Schematic diagram of crane operation

5.4 Foundation Construction

5.4.1 Installation site selection

When selecting an installation site, please follow:

- The climate, environment, geological conditions (such as groundwater level), and other characteristics of the installation site should be fully considered.
- The surrounding environment should be dry and well-ventilated, away from flammable and explosive areas.
- The soil at the installation site needs to be compact to a certain degree. It is recommended that the relative density of the soil at the installation site be ≥98%. If the soil is loose, please be sure to take measures to ensure that the foundation is stable.

5.4.2 Foundation requirements

⚠	**Warning** The ESS cabinet is relatively heavy. So before building the foundation, the various conditions of the installation site (mainly geological conditions and environmental and climatic conditions, etc.) should be carefully investigated. Based on that the foundation can the designed and start the construction.

An unreasonable foundation construction plan will bring great difficulties or troubles to the placement, opening, and closing of the door and subsequent operation of the energy storage system. Therefore, the installation foundation of the energy storage system must be designed

and constructed in advance according to certain standards to meet the requirements of mechanical support, cable routing, and subsequent maintenance and inspection.

The construction of the foundation shall meet the following:

- The land used for the construction of foundation platforms must be filled and compacted.
- The foundation must be sufficient to provide effective load-bearing support for the outdoor ESS cabinet.
- It is recommended that the foundation platform for ESS cabinet installation be at least 30 centimeters above the ground to prevent rain erosion.
- Appropriate drainage systems need to be constructed in combination with local geological conditions.
- Build a cement foundation with sufficient cross-sectional area and height. The foundation height is determined by the construction party based on the site geology.
- Cable routing should be taken into consideration when constructing the foundation.
- The maintenance platform is built around the foundation to facilitate subsequent maintenance.
- According to the location and size of the cable inlet and outlet of the cabinet, sufficient space should be reserved for the cable routing during foundation construction, and the cable through pipe should be pre-embedded.
- The specifications and quantity of the cable through pipe are determined according to the cable model and the number of inlet and outlet cables.
- Both ends of all pre-embedded pipes are temporarily sealed to prevent impurities from entering to avoid inconvenience for wiring.
- After all cables are connected, the cable inlet and outlet pipes, and the joints should sealed with refractory putty or other suitable material to prevent rodent entry.

	**Note** Pre-install the grounding units according to relevant standards in the country/region where the project is located.

5.4.3 Other Protective Measures

Caution
A drainage system should be built at the installation site to prevent the bottom of the outdoor ESS cabinet or the equipment inside the cabinet from being soaked by water during rainy seasons or heavy precipitation.

Caution
Do not plant trees close to the installation site to prevent blowing down branches or leaves by strong wind that may block the door or air inlet of cabinets.

5.5 Fixed installation

After confirming that the foundation construction meets the requirements and is dry, solid, and flat enough, transport the integrated outdoor ESS cabinet to the predetermined location. Use fastening bolts to fix the cabinet to the foundation.

6 Electrical connections

6.1 Safety Cautions

6.1.1 General

Danger!

Danger of high voltage! Risk of electric shock!

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

Danger!

When a ground fault occurs, the originally non-powered parts may have fatal high voltages. If accidentally touched, it is very dangerous! Before operation, please make sure that there is no ground fault in the system, and at the same time, take relevant protective measures.

Warning

- All electrical connections must comply with the relevant standards and regulations of the country and regions where the project is located.
- The outdoor ESS cabinet can be connected to the grid only after obtaining permission from the local power supply company and after installation by professional technicians.

Warning

Only professional electricians or qualified personnel can make electrical connections to this product. Please perform wiring operations strictly per the wiring marks inside the device.

Warning

Before wiring, the AC and DC sides of the ESS must be disconnected.

Warning

The entry of wind, sand, and moisture may damage the electrical equipment in the ESS cabinet or affect the equipment's operating performance!

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

Warning
Failure to comply with the torque requirements may cause a fire in the connecting point! During electrical connection, the bolts must be tightened strictly according to the torque required in this manual.

Warning
Only qualified electrical engineers can perform related to electrical connections. Please comply with the requirements in section 2 Safety Instructions in this manual. GOLEN does not assume any responsibility for personal injury, death or property loss caused by ignoring these safety instructions.

Warning
When laying cables, electrical insulation must be ensured and EMC specifications must be followed. Power cables, power supplies, and communication cables should be laid in layers. When necessary, cables should be protected and supported to reduce stress on them.

Warning
Wiring operations must be strictly according to the wiring marks inside the device.

Notice
- The installation design of the ESS cabinet must comply with the relevant standards or specifications of the country/region where the project is located.
- All system failure or damage of this outdoor ESS cabinet will not be covered by the warranty if the installation design hasn't followed the requirements given in this manual, or hasn't been carried out per the relevant electrical standards or specifications of the installation location.

6.1.2 Five Safety Rules

During the whole electrical connection process, as well as all other operations on outdoor ESS cabinet, the following five safety rules must be followed:

- Disconnect all external connections to the ESS cabinet and the connection to the internal power supply of the device.
- Ensure that disconnected points cannot be accidentally powered on.
- Use a multimeter to ensure that there is no voltage inside the device.
- Grounding is required.
- For the possibly live parts near the operating part, use an insulating cloth to cover and insulate them.

6.2 Wiring components

Warning

Incorrect wiring sequence may cause a fire. Please pay attention to the connection sequence of the wiring components. When connecting, ensure that the connectors are tight. If the connection is not sufficient or the contact surface is oxidized, it will cause excessive heat and may cause fire.

Caution

- The screw length should be appropriate, just enough to slightly protrude from the mounting hole. If it is too long, it may affect the insulation performance of the equipment or even cause a short circuit.
- After the installation is completed, it is necessary to check whether part of the heat shrink tubing is clamped at the connection between the wiring copper nose and the copper busbar. If it is clamped, it should be removed in time, otherwise it may cause poor contact or even damage the equipment.

Note

Before performing electrical wiring, should clean the wiring terminals first and do not touch them directly with your hands after cleaning.

The fixing screws and other parts used for the power cable connection have been packed in special packaging bags when the cabinet is delivered. Please strictly follow the description in this section for cable connection.

6.2.1 Copper Wire Access

If copper cable is selected, the connection sequence of the wiring components as below.

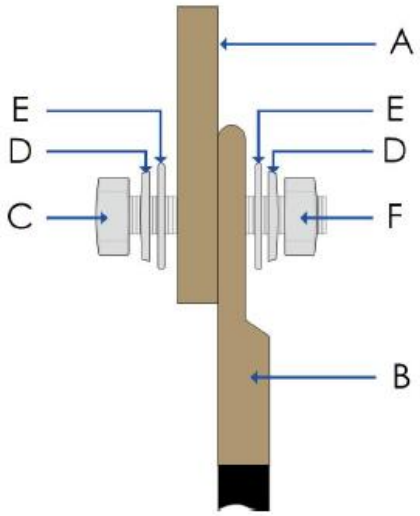


Figure 6-1 Copper terminal connection sequence

A	B	C	D	E	F
Copper busbar	Copper Terminal Blocks	Screws	Butterfly gasket	Flat Washer	Nuts

6.2.2 Alumium wire access

If aluminum cables are selected, copper-aluminum transition terminals are required. The connection sequence of the wiring components as follow:

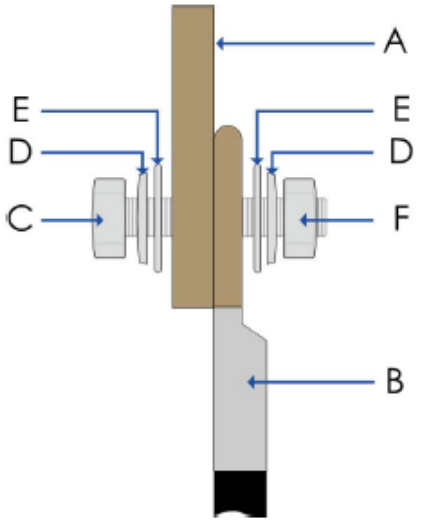


Figure 6-2 Connection sequence of copper-aluminum transition terminals

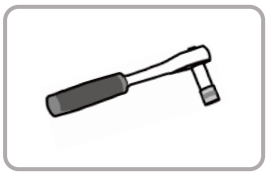
A	B	C	D	E	F
Copper busbar	Copper and aluminum terminals	Screws	Butterfly gasket	Flat Washer	Nuts

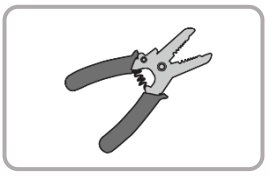
6.3 Electrical connection preparation

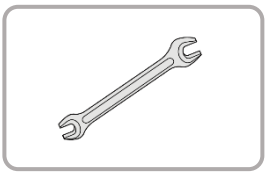
Before delivery, the cable connections between devices inside the ESS cabinet have been completed.

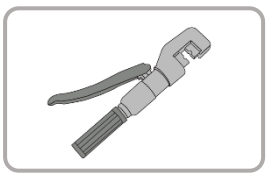
6.3.1 Installation Tools

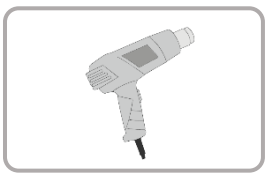
Before installation, you need to prepare following tools and parts:

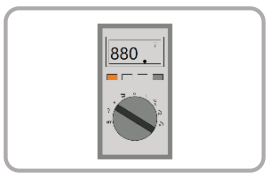

Torque Wrench


Wire Stripper


Wrench


Terminal Crimping Tool


Hot Blowers



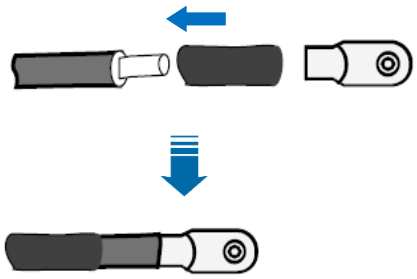
Multimeter


Screwdriver

6.3.2 Making Terminal Blocks

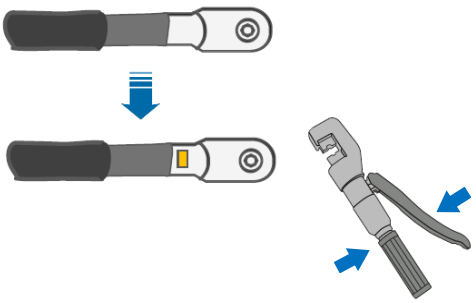
Follow the steps below to make the terminal blocks.

Step 1: Strip off the insulation at the end of the cable. The length of the insulation stripped off at the end of the cable should be the depth of the copper nose crimping hole plus about 5mm.



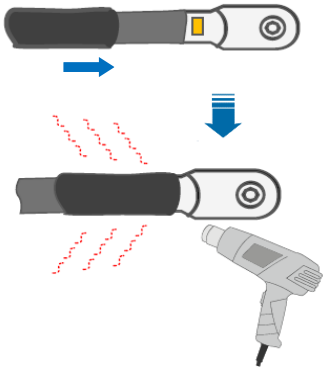
Step 2: Crimp the copper lugs.

1. Place the exposed copper core part of the stripped wire into the wire crimping hole of the wiring copper nose.
2. Use a terminal crimping tool to crimp the copper lugs. The number of crimps should be more than two.



Step 3: Install the heat shrink tubing.

1. Choose a suitable heat shrink tubing, and the length should be about 2cm longer than the copper nose crimping tube.
2. Put the heat shrink tubing on the wiring copper nose to completely cover the wire-pressing hole of the wiring copper nose.
3. Use a hot blower to tighten the heat shrink tubing.

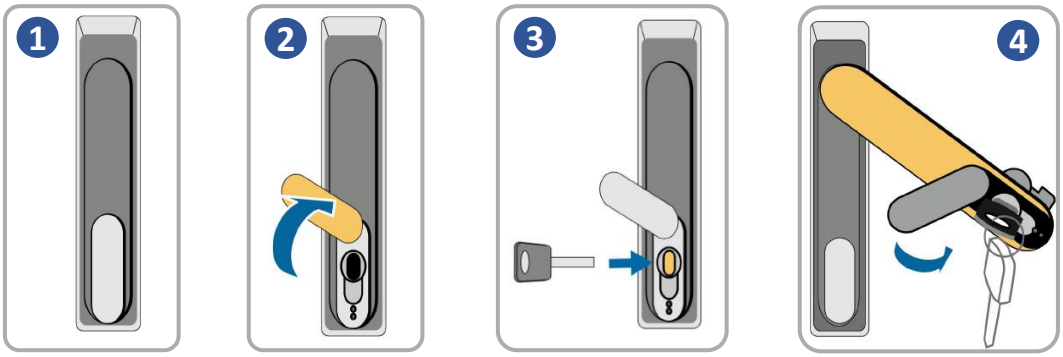


- -Finish

	Note If multi-core cables are used, it is recommended to add cable protection finger sleeves at the bifurcation points to prevent cracking of the outer insulating skin.

6.3.3 Door opening of the cabinet

Open the door of the cabinet before the cables are connected.



Serial number	Note
1	Locked state
2	Move the cover-up over the locking holes
3	Insert the door key and turn it clockwise
4	Turn the handle anticlockwise to the position shown in the picture to open the front door

6.3.4 Sealing Plate Removing

Before connecting the cables, remove the cover plate of the wiring area at the bottom of the cabinet.

6.3.5 Cables Checking

Warning
Before making electrical connections, ensure all cables' integrity and insulation. If there are damaged cables, replace them immediately. Poor insulation or damaged cables may cause danger.

The wiring work between the internal equipment of the outdoor ESS cabinet has been completed before leaving the factory. Users need to:

- Checking whether the connecting cables are damaged. If any damage is found, replace them with cables of the same specifications immediately.
- Check that the cable connections are tight enough. Make sure all wiring terminals are tight.

6.3.6 Wiring Precautions

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

6.4 Ground connection

6.4.1 Introduction

Warning
The ground connection must comply with the grounding standards and regulations of the country/region where the project is located.

Warning
The grounding wire must be well grounded! Otherwise:
- Failure may result in fatal electric shock!
- Lightning may damage the device!
- The ESS cabinet may not function properly!

Caution

During grounding, please note:

- The ground connection between the cabinet and the grounding electrode must be securely fastened.
- After grounding, measure the grounding resistance, which should be not greater than 0.1Ω.

6.4.2 Internal Equipment Equipotential Connection

Before leaving the factory, the wiring of the main electrical equipment inside the outdoor ESS cabinet to the grounding terminal has been completed. The connection between the cabinet and the ground must be completed on-site, and the following operations must be performed on-site:

- The conductivity must be tested from the grounding terminal of each equipment to the main grounding copper busbar to ensure the effectiveness of grounding.
- The shielding layer, protective layer, etc. for the cables connecting should also be grounded.

6.4.3 External Grounding

Warning

Connecting cables strictly according to the wiring marks inside the cabinet.

Before delivery, the grounding of the internal equipment of the outdoor ESS cabinet has been completed. The following figure shows the location of the external grounding point.

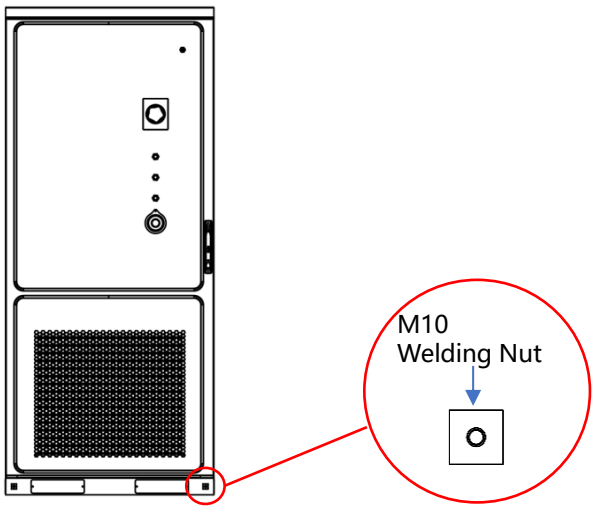


Figure 6-3 External grounding point location diagram

Please install the external grounding according to the actual situation of the project site and the instructions of the power station staff. The grounding resistance must be measured after the grounding connection is completed.

	Note The grounding resistance value also needs to refer to the relevant standards of the country/region where the project is located.

	Warning If you have any questions during the grounding connection process, please contact the relevant staff in time. Failure to follow the installation specifications, unauthorized installation, or modification may cause safety accidents or equipment damage.

6.5 AC cable connection

6.5.1 Safety Precautions

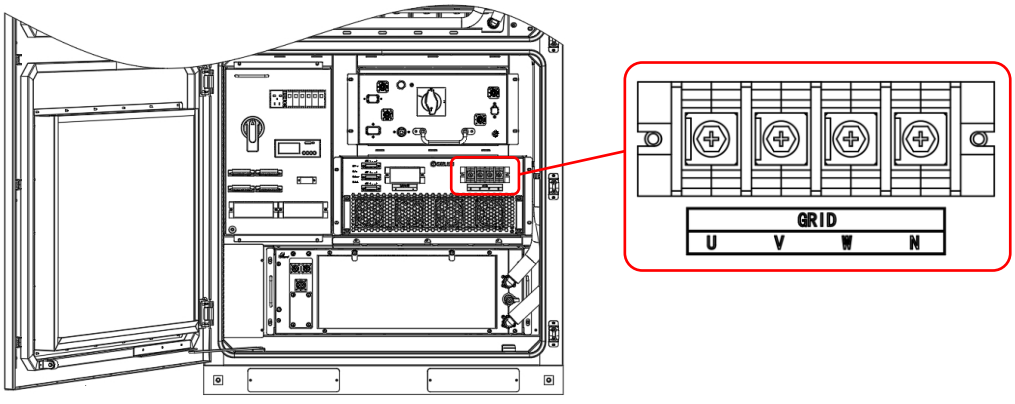
	Warning Accidental contact with live terminals may result in fatal electric shock! ● Ensure that the AC and DC switches of the PCS are in the off state and that the wiring terminals are not powered. ● When connecting to the power grid, permission must be obtained from the relevant authorities and all power grid-related safety directives and regulations must be followed.

6.5.2 Wiring steps

Step 1 Disconnect the upstream AC circuit breaker and test with a multimeter to ensure that there is no voltage at the terminals.

Step 2 Routing the cable through the bottom cable entry hole into the outdoor cabinet.

Step 3: Ensure that the AC cables are connected in the correct order.



Step 4: Crimp the terminals. Refer to "6.4.2 Making the Terminal Blocks"

Step 5: Wiring.

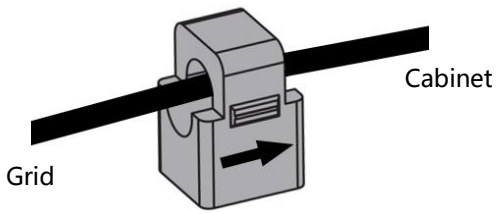
1. Choose the appropriate screws.
2. Crimp the copper lugs onto the AC copper busbar and install them according to the connection sequence of “6.3.1 Copper wire access” and “6.3.2 Aluminum wire access”.
3. Tighten the screws with a screwdriver or wrench. See the table in the appendix for tightening torque.

Step 6: Ensure the cable connections are tight enough.

Caution

The length of the wiring screw should be appropriate, slightly exposed from the copper busbar installation hole. Too long may affect the insulation performance or even cause a short circuit. Check whether the heat shrink tubing is clamped at the connection between the wiring copper nose and the copper busbar. If it is clamped, remove it immediately, otherwise it may cause poor contact or even heat damage.

Step 7 Install the three bayonet-type current transformers provided with the cabinet on the AC input cable phases A, B, and C. Note that the direction on the current transformer points to the cabinet side.



--Finish

6.6 4G Communication Wiring

The outdoor ESS cabinet is equipped with a 4G wireless communication collector. The collector antenna installation steps are as follows:

Step 1 Take out and attach the suction cup extension antenna to a suitable position on the outside of the cabinet.

Step 2: Routing the antenna extension cable into the outdoor cabinet through the cable entry hole.

Step 3: Turn the waterproof locking nut clockwise.

Step 4: Connect the antenna to the 4G wireless collector.

- -Finish

The working information of the ESS (power generation, alarm, working status) can be uploaded to the server through the 4G network. Users can log into the account on the website to view the operating status of the energy storage system according to their needs.

6.7 Wiring and waterproofing

According to the design of the inlet and outlet holes of the outdoor ESS cabinet, the cables must be laid in the cable trough at the bottom of the cabinet and routed into the cabinet through the inlet and outlet holes at the bottom of the cabinet. Meanwhile, appropriate cables should be selected as required. When wiring, electrical insulation must be ensured and EMC specifications must be complied with. Power cables, power source cables, and communication cables should be laid in layers. When necessary, provide protection and support for the cables to reduce the stress on the cables. After confirming that all wiring connections are correct and tight. The gaps in the cable inlet and outlet holes at the bottom of the cabinet need to be sealed with fireproof mud. The installation foundation of the outdoor ESS cabinet needs to be waterproofed.

6.8 Ending the electrical connection

Warning
After the electrical connection is completed, check the connection of all cables to ensure that all connections are correct and tight.

After all electrical connections have been made, a thorough and careful inspection of the wiring should be performed.

- The energy storage outdoor cabinet needs to be effectively protected, such as using fireproof mud to seal the gaps between cables. If waterproof terminals are used for sealing, it is necessary to check whether the waterproof terminals are tightened. Unused terminals need to be sealed.
- Re-place all protective grilles securely.
- The installation foundation of the outdoor ESS cabinet needs to be waterproofed.

6.9 UPS Notes

A set of UPS (uninterruptible power supply) is equipped in the outdoor cabinet. For specific operations, refer to the UPS manual. During the operation of the system, relevant operations and processing must be performed according to the user manual attached to it.

The UPS must be recharged when the energy storage system stops for 3 to 6 months. Otherwise, the UPS may not work properly.

7 Power on and off Operation

7.1 Power-on Operation

For the location of each circuit breaker, please refer to "3.3. 6 Overview of switch locations".

Step 1: Connect the primary main circuit, test the voltage and frequency until they meet the system requirements, and proceed to the next step.

Step 2: Connect the AC main circuit breaker QF1.

Step 3: Connect the 220V power switch Q2.

Step 4 Connect the auxiliary power switch Q3.

Step 5 Press the UPS power button K 1 to turn on the UPS. The touch screen, fan, and fire protection are powered on.

Step 6 Connect the air conditioner power switch Q 1 and the air conditioner will operate normally.

Step 7 Press the K2 button switch of the high voltage box to power on the BMS.

Step 8 Connect the high voltage box DC circuit breaker QF 2.

- -Finish

From now on, the system is powered on and you can check the touch screen to see if the system is normal.

7.2 Power-off Operation

Step 1 Click the LCD shutdown button and wait for the PCS to shut down.

Step 2: Disconnect the DC circuit breaker QF 2.

Step 3 Press the K2 button switch of the high voltage box to power off the BMS.

Step 4 Disconnect the air conditioner power switch Q1.

Step 5: Press the UPS power button K 1 to shut down the UPS. At this time, the touch screen, fan, and fire protection system are powered off.

Step 6: Disconnect the auxiliary power switch Q3.

Step 7 Disconnect the 220V power switch Q2.

Step 8 Disconnect the AC main circuit breaker QF1.

- -Finish

8 LCD operation

This section introduced the content of the LCD interface and operation method.

8.1 LCD Screen Position

The LCD touchscreen is located on the inside of the cabinet door, basically at eye level, making it convenient for users to view data and perform related operations.

8.2 Backlight function

If the user does not perform any click operation on the LCD within 3 minutes, the LCD backlight will turn off. When the user performs any operation, the LCD backlight will turn on.

	Note In order to facilitate users to operate the LCD, this section configures a large number of pictures of the LCD interface. The parameter values and other specific details in the pictures are for illustration purposes only. Users should refer to the actual display on the LCD screen of the product received.

8.3 Default Home Page

When the system is powered on, the LCD will start automatically and display the startup page. After the startup is complete, the default main page will be displayed.

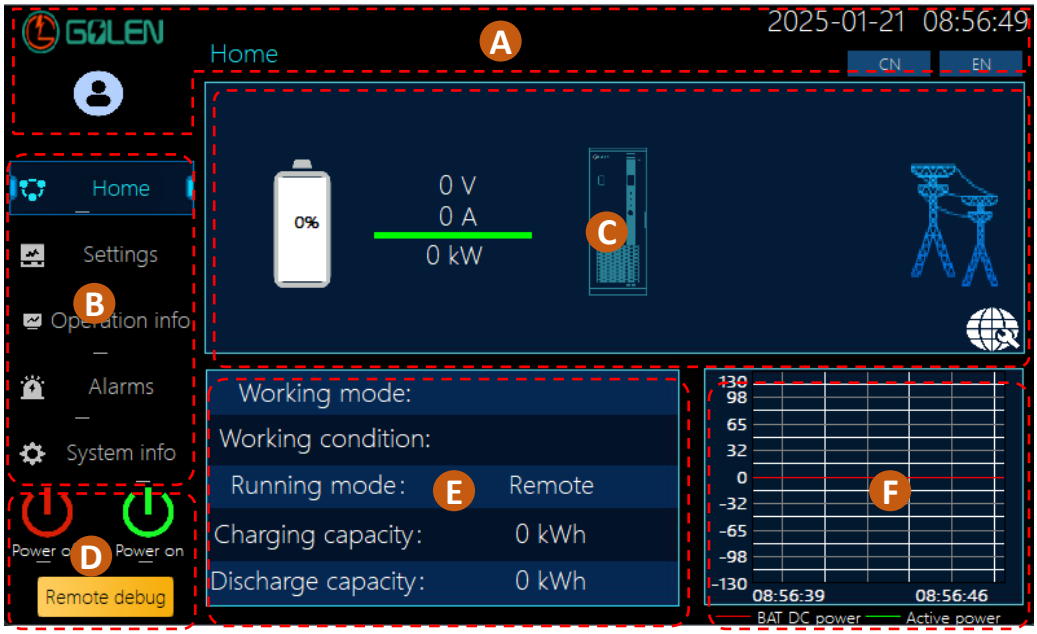


Figure 8-1 LCD screen main page

Table 8-1 Main page description

Serial No.	Area	Note
A	Status Bar	All pages share a status bar, which displays fault information, account information, time and date, and Chinese and English switching Click on the "Account" to jump directly to the login interface Click the "Time" to jump directly to the time and date setting interface Click on the "Chinese and English" to select the Chinese and English interface
B	Secondary menu button	All pages share a secondary submenu area, which can be clicked and jump to the corresponding secondary interface.
C	Charging and discharging animation	Intuitively displays the state of energy flow and the current battery pack SOC value, DC voltage, DC current, grid voltage, grid current, and grid power.
D	Power button	Perform power on/off operation.
E	Real-time information display	Contains information such as operating mode, working mode, working status, system charge and discharge capacity, etc.
F	Real-time power curve monitoring	Real-time power curve monitoring.

For convenience, the all "main page" mentioned are referred to this display page. The description of various operations and entry into submenus at all levels also starts from the main page.

Warning
The LCD screen contains a large number of parameters related to the operation of the energy storage system. All parameter modifications and settings must be completed by designated professionals. Do not modify parameters that you do not understand without authorization.

8.4 Login Account

For power on/off and setting operations, you must log in first. The system provides an Administrator account. Click the password input box and enter the password on the pop-up numeric keypad.

The default password for Administrators is: 12345

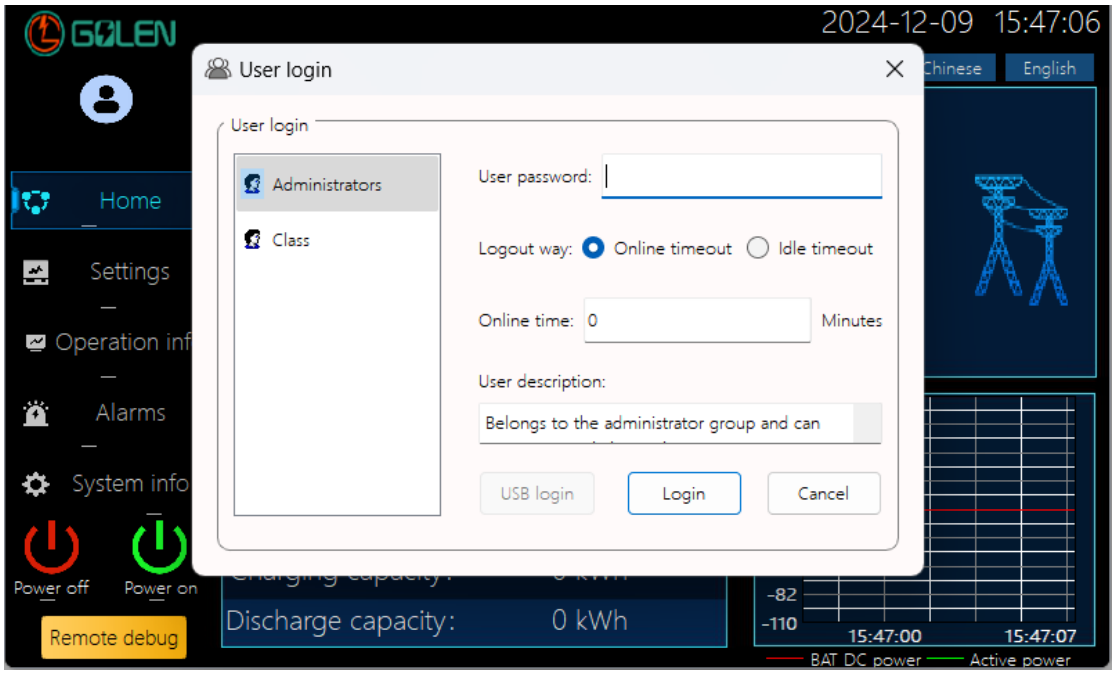


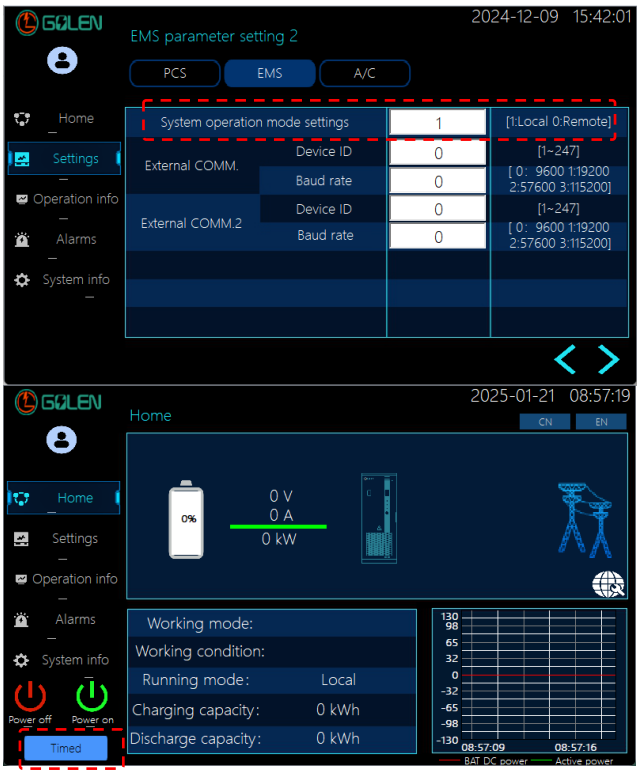
Figure 8-2 Login interface

8.5 Mode Settings

8.5.1 On-grid Mode

When the power grid is normally working, you can choose to set the timed charging and discharging mode.

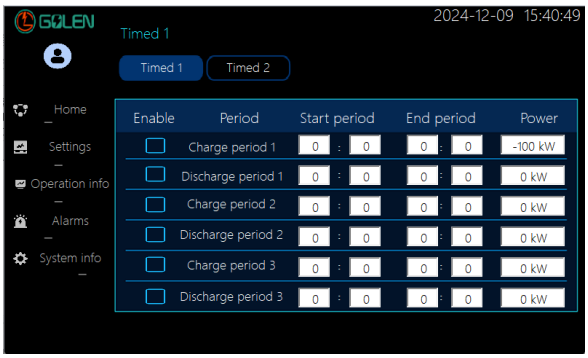
Timed charge and discharge mode: set to rectify the grid power to charge the battery packs to store energy during the off-peak period; invert the battery pack power and discharge to the grid during the peak period.



On-grid mode:

After selecting "1: Local" in the system operation mode settings, return to the main page and select "Timed Charge and Discharge Mode".

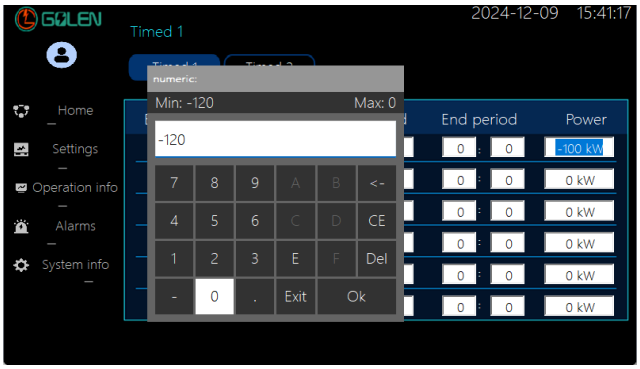
Clicking on the "timed charge and discharge mode" will jump to the charge and discharge period setting interface, where you can independently set five periods for charge and discharge.



Charging and discharging period settings:

1. Set the charging period and discharging period;
2. When setting, ensure that the charging period and the discharging period do not overlap. When the charging and discharging periods conflict, charging takes priority and the discharging period is invalid.

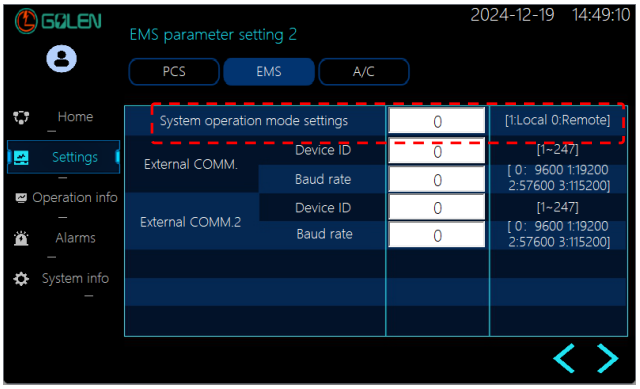
Click the page button to display the next page of parameters.



Charge and discharge power settings:

1. Set the charging power and discharging power for each period separately;
2. Click the enable box on the left to activate the corresponding period;

8.5.2 Remote control



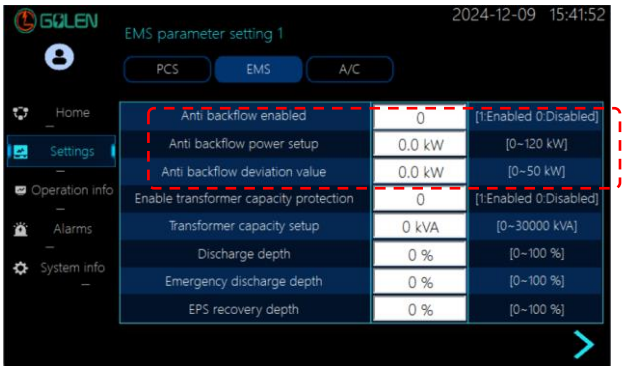
Remote Control:

Select 0 for the system operation mode setting, and the system can be controlled through the cloud platform.

If the local mode is used, in this mode, the user needs to manually set the operating parameters through timed charging and discharging.

If the system is equipped with an EMS system or software, you can choose to use the remote control mode. After selecting remote control, the EMS or software will perform parameter settings and power on and off operations.

8.5.3 Anti-backflow setting



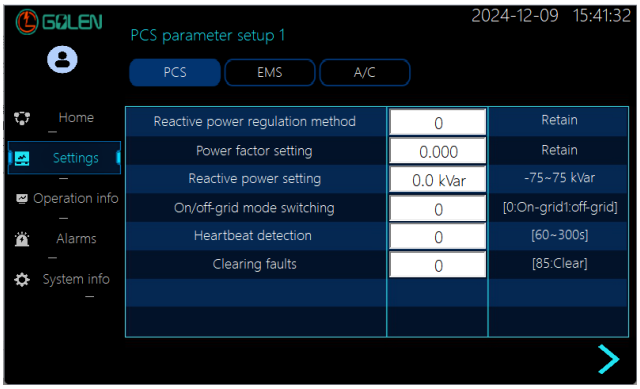
Anti-backflow setting:

1. Set the anti-backflow function to enable (" 0" means disable, " 1" means enable);
2. Set the reverse flow power value;
3. Backflow power deviation (correct the backflow power deviation caused by measurement accuracy. The calibration has been completed before leaving the factory. Please modify this parameter value with caution).

The anti-backflow function is used to limit the on-gird power. After the anti-backflow function is enabled, the on-grid power will be clamped under the set backflow power value.

8.6 Parameter Settings

On the left side of the parameter setting interface, there are PCS, EMS, air conditioner, and other subsystem operation parameter setting tabs. Click to enter the corresponding parameter setting page. (Here takes PCS parameter setting as an example for operation instructions).

<table>
<tr>
<td> 
</td>
<td>PCS parameter settings
Set the on-grid and off-grid mode switching, power factor setting, reactive power regulation setting, heartbeat detection, etc.

Click the page button to display the next page of parameters</td>
</tr>
</table>

<table>
<tr>
<td>  </td>
<td>Note
Reactive power regulation mode: 1: Reactive current mode; 2: Power factor mode; 3: Reactive power mode.</td>
</tr>
</table>

<table>
<tr>
<td>  </td>
<td>Note
Each setting parameter box has a setting range. When entering parameters, they must be within the required range. Otherwise, it will be invalid.</td>
</tr>
</table>

<table>
<tr>
<td>  </td>
<td>Warning
All settings on this page are key parameters required for system operation. They can be set by installers or administrators. They are usually set at the factory or by on-site installers. It is not recommended for users to modify them themselves.</td>
</tr>
</table>

8. 7 Operation information

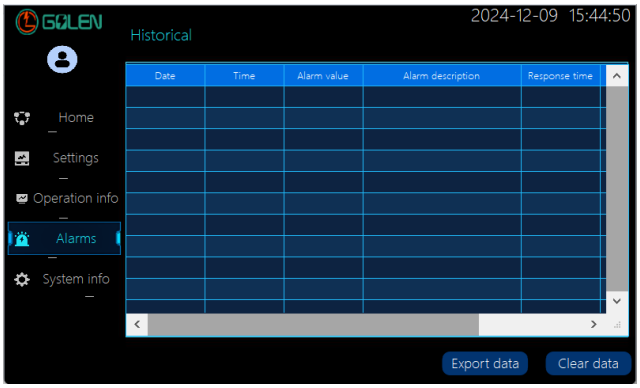
On the left side of the operation information interface, there are tabs for subsystem operation information such as PCS, BMS, air conditioner, electric meter, EMS, and fire protection. Click to enter the corresponding operation information page.

PCS operation information
Real-time display of PCS output voltage, output current, output power, grid frequency, DC voltage, DC current, DC power, etc.

Click the page button to display the next page of parameters

8. 8 Warning information

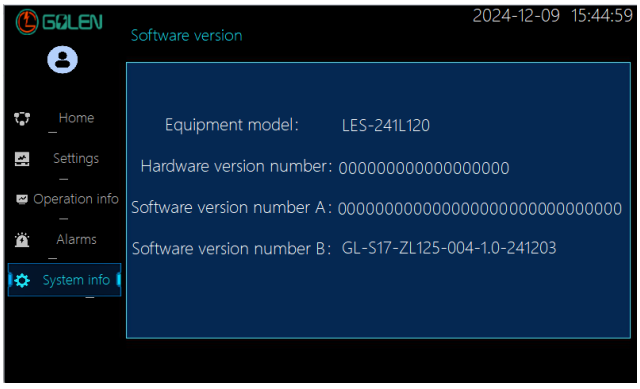
The warning information page records the date, time, and details of the fault warning. Red warning information is a newly generated warning, and white warning information is historical warning information. Click the "Clear Data" button in the lower right corner to clear the warning information (clearing data requires administrator privileges).



Historical warning information:
A red warning indicates a new warning has occurred, and a white warning indicates that the warning has ended.

Click the down-page-button to display the next page of information.

8. 9 System Information



System Information:
Contains device model, hardware version number, and software version number.

9 Firefighting Instructions

9.1 General

Please comply with the fire protection laws and regulations of the country/region where the project is located. Regularly inspect and maintain fire protection equipment to ensure that all functional indicators are normal.

9.2 Firefighting plan and firefighting strategy

Fire protection plan:

The electrochemical energy storage fire suppression system is mainly composed of two parts: a fire detection and alarm system and an aerosol fire extinguishing system. In terms of fire detection, the strategy of cabinet-level detection and cabinet spraying is adopted; in terms of fire extinguishing, an aerosol fire extinguishing device is used to achieve active protection.

Firefighting strategy:

The system has two levels of fire alarm, namely level 1 and level 2.

Fire protection level 1 fire alarm (smoke sensor): When the smoke detector reaches the preset smoke concentration threshold, the alarm signal is output through the dry contact, the controller turns on the sound and light alarm, the system shuts down for protection, and displays a level 1 fire alarm signal on the EMS screen.

Fire protection level 1 fire alarm (temperature sensing): When the temperature of the temperature detector reaches the preset threshold, an alarm signal is output through the dry contact, the system shuts down for protection, and a level 1 fire alarm signal is displayed on the EMS screen.

Fire protection level 2 fire alarm (spray): When the smoke and temperature detectors reach the preset thresholds at the same time, the controller turns on the sound and light alarm, the system shuts down for protection and starts the fire extinguishing device to spray aerosols on the entire cabinet while outputting a level 2 fire alarm signal to the EMS system.

	**Note** Suffocation hazard! A large amount of gas will be generated when the device automatically extinguishes the fire. Do not approach the outdoor ESS cabinet during the fire extinguishing process.

10. Troubleshooting

10.1 Fault Information

Table 11-1 Fault information

Fault	Processing
Emergency Stop	a. Immediately shut down the faulty system and disconnect its external power grid; b. Check whether the emergency stop button is pressed; c. Check whether the wiring of the emergency stop button feedback contact is abnormal; d. If the problem cannot be solved, please contact GOLEN.
AC circuit breaker disconnected	a. Immediately shut down the faulty system and disconnect its external power grid; b. Check whether the circuit breaker QF 1 is disconnected; c. Check whether the wiring of the feedback contact of circuit breaker QF 1 is abnormal; d. If the problem cannot be solved, please contact GOLEN.
Lightning arrester failure	a. Immediately shut down the faulty system and disconnect its external power grid; b. Check whether the lightning arrester is faulty; c. Check whether the auxiliary contact wiring of the lightning arrester is disconnected; d. If the problem cannot be solved, please contact GOLEN.
Ambient over temperature	a. Immediately shut down the faulty system and disconnect its external power grid; b. Check whether the air conditioning system is faulty or overloaded; c. Check whether the ambient temperature is too high; d. If the problem cannot be solved, please contact GOLEN.
CMU communication failure	a. Check whether the communication line is loose; b. If the problem cannot be solved, please contact GOLEN.
CMU Waring	a. Check the specific fault through the CMU information interface; b. Find the troubleshooting method in the manual; c. If the problem cannot be solved, please contact GOLEN.
PCS communication failure	a. Check whether the communication line is loose;

	b. If the problem cannot be solved, please contact GOLEN.
PCS Warning	a. Check the specific fault through the PCS information interface; b. Find the troubleshooting method in the manual; c. If the problem cannot be solved, please contact GOLEN.
SOC High Warning	a. Check the system battery SOC value; b. If the problem cannot be solved, please contact GOLEN.
SOC Low Warning	a. Check the system battery SOC value; b. If the problem cannot be solved, please contact GOLEN.

11 Daily Operation and Maintenance

11.1 Safety precautions

Warning
There is a fatal high voltage inside the ESS cabinet. If you accidentally touch it, there is a risk of fatal electric shock. After shutting down, please wait at least 10 minutes before opening the cabinet door. Before performing maintenance work, make sure that the equipment is completely de-energized.

Warning
Only qualified and authorized personnel can perform maintenance and other operations on the ESS cabinet. When performing maintenance work, do not leave metal parts such as screws and washers in the energy storage system. Otherwise, the equipment may be damaged!

Warning
The entry of wind, sand, and moisture may damage the electrical equipment in the ESS cabinet or affect the equipment's operating performance!

- In windy and sandy seasons, or when the relative humidity in the surrounding environment is greater than 95%, do not open the cabinet door.
- All maintenance work can only be started when there is no wind or sand and the weather is clear and dry.

Warning
If only the AC and DC switches are disconnected, the cable connection terminals inside the cabinets are still energized! To avoid the risk of electric shock, before maintenance and repair operations:

- Disconnect the AC and DC switches.
- Disconnect the front and rear circuit breakers of the ESS cabinet.

11.2 Maintenance Introduction

11.2.1 Overview

The ESS cabinet has an IP54 protection level and is suitable for outdoor use. However, harsh environments or long-term operations will still cause aging of the cabinet or damage to internal equipment. Regular maintenance and inspection of the ESS cabinet and replacement of aging and damaged components will effectively extend its service life and improve the performance of internal equipment.

Note
Occasional inspections are necessary, especially when the overall system performance is poor.

11.2.2 Maintenance Cycles

To ensure the good operation status of each piece of equipment in the outdoor ESS cabinet, it should be maintained regularly. The maintenance cycles given in this section are reference values. The actual maintenance cycle should be reasonably determined in combination with the actual environmental conditions of the project site. If the operating environment of the outdoor ESS cabinet is relatively harsh, such as in a desert area, the corresponding maintenance cycle should be shortened. In particular, the cleaning of the inside and outside, anti-corrosion and anti-rust work, etc., should be more frequent. If the system is installed in a desert area, it is recommended that the inside and outside of the outdoor ESS cabinet should be carefully inspected and thoroughly cleaned after each sandstorm.

Warning

It is necessary to regularly check whether the air conditioning system and fan in the cabinet are operating normally, and observe whether there is any friction noise during operation. If there is, it may be caused by dust entering. It is necessary to stop the outdoor ESS cabinet and remove the dust. After the cabinet is completely powered off, it is necessary to wait at least 10 minutes for the internal capacitor to discharge. Before removing the dust, please use a multimeter to measure and confirm that the inside of the machine is completely de-energized to avoid electric shock.

Warning

Some maintenance work requires the removal of the protective grilles inside the machine. After all maintenance work is completed, all removed protective grilles must be re-placed. Make sure all grilles are tightened in place.

Warning

When performing routine maintenance and inspection on the outdoor ESS cabinet and internal equipment, if any non-conformity is found, please correct it immediately. If you have any questions, please contact GOLEN immediately.

Table 11-1 Maintenance work (once every two years)

Project List	Inspection method
System status and cleaning	Check the following items and correct them immediately if they do not meet the requirements: • Check whether the outdoor ESS cabinet and internal equipment are damaged or deformed. • Check whether there is any abnormal noise during the operation of the internal equipment.

	• Check whether the temperature inside the outdoor ESS cabinet is too high. • Check whether the humidity and grayscale inside the cabinet are within the normal range. Clean if necessary. • Check whether the air inlet and outlet of the cabinet are blocked.
Warning signs	Check that warning signs and labels are visible and not damaged. Replace if necessary.
Cable shield grounding	Check whether the cable shielding layer is in good contact with the insulation sleeve; and whether the grounding copper busbar is fixed in place.
Lightning arrester	Check whether the lightning protection equipment is well-fastened.
Corrosion	Check whether there is oxidation or rust inside the energy storage integrated outdoor cabinet.

Table 11-2 Maintenance work (once a year)

Project List	Inspection method
Cabinet exterior	Check the following items and correct them immediately if they do not meet the requirements: • Check whether there are flammable objects on the top of the outdoor ESS cabinet. • Check whether the welding points between the cabinet and the foundation steel plate are firm and whether there is any rust. • Check whether the cabinet casing is damaged has paint peeling, or is oxidized. • Check whether the cabinet door locks can be opened flexibly. • Check whether the sealing strips are well fixed.
Inside the cabinet	Check whether there is foreign matter, dust, dirt, or condensed water inside the energy storage integrated outdoor cabinet.
Air inlet and outlet	Check whether the air inlet and outlet are blocked by dust or debris.
Wiring and Cable Routing	• Check whether the cable arrangement is standardized and whether there is a short circuit. If there is any abnormality, correct it immediately. • Check whether all inlet and outlet holes of the outdoor ESS cabinet are well sealed. • Check whether there is water seepage inside the cabinet. • Check if the power cable connection is loose and re-tighten it according to the previously specified torque. • Check whether the power cables and control cables are damaged, especially whether any cuts on the

	surface come into contact with the metal surface.
Grounding and equipotential bonding	• Check whether the ground connection is correct and the ground resistance value shall not be greater than 4Ω. • Check whether the equipotential connection inside the cabinet is correct.
fan	• Check the operating status of the fan. • Check to see if the fan is blocked. • Check whether the fan makes any abnormal noise during operation.
Screws	Check whether there are any screws dropped inside the outdoor ESS cabinet.

Table 11-3 Maintenance work (once every six months to one year)

Project List	Inspection method
Security Features	• Check the emergency stop button and the stop function of the LCD. • Simulate downtime. • Check the warning labels on the machine and other equipment labels. If they are blurred or damaged, please replace them in time.
Internal component inspection	• Check the cleanliness of circuit boards and components. • If necessary, replace the air filter. • Attention! The ventilation of the air inlets must be checked. Otherwise, if the module is not cooled effectively, it may malfunction due to overheating.
Device maintenance	• Carry out regular inspections (six months) of all metal components for corrosion. • Annual inspection of contactors (auxiliary switches and micro switches) ensures that they are in good mechanical condition. • Check operating parameters (especially voltage, insulation, etc.).

Note

The table only recommends routine maintenance cycles for products. The actual maintenance cycle should be reasonably determined in combination with the specific installation environment of the product.

The scale of the power station, its location, and the on-site environment will affect the maintenance cycle of the product. If the operating environment is windy or dusty, it is necessary to shorten the maintenance cycle and increase the maintenance frequency.

11.3 System Cleaning

1 1. 3 .1 Overview

Cleaning around and inside the outdoor ESS cabinet is an important part of maintenance work. Due to the influence of temperature, humidity, dust, and internal equipment vibration in the environment of the cabinet, dust will accumulate inside, block the air inlet and outlet, or enter the internal equipment, which will lead to potential failure of internal equipment, shorten the service life of the product or reduce power generation. During the normal operation of the product, regular inspection and cleaning should be carried out to ensure that the internal equipment is in a relatively good operating environment to a certain extent.

11.3.2 Cleaning cycle

The cleaning cycle outdoor ESS cabinet should be reasonably determined in combination with its operating environment, such as climate conditions, to ensure that the exterior and interior of the outdoor ESS cabinet are in good clean condition. If the operating environment is relatively harsh, such as in a desert area, the maintenance cycle should be shortened.

11.3.3 Internal cleaning

It is not recommended to sweep the dust inside the cabinet directly with a broom. Otherwise, it will easily cause dust to fly. It is recommended to use a vacuum cleaner to absorb the dust.

11.3.4 Internal cleaning of foundation

The user should regularly enter the foundation to check the cleanliness of the foundation and, if necessary, clean it with a vacuum cleaner.

11.3.5 Door lock and hinge inspection

After cleaning, check whether the door locks and hinges of the cabinet can be used normally and are in good condition. If necessary, lubricate the door lock holes and hinges.

11.3.6 Sealing strip inspection

A sealing strip in good condition is an important guarantee to effectively prevent water seepage inside the cabinet. It should be carefully checked and replaced immediately if damaged.

12 Appendix

12.1 Technical Parameters

model	LES- 241L60	LES- 241L80	LES- 241L120
Battery parameters			
Battery Type	Lithium Iron Phosphate		
Battery Module Capacity	48. 2 kWh		
Battery module quantity	5		
Rated power	241kWh		
Rated voltage	768 V		
Voltage range	672~876 V		
Charge and discharge rate	≤ 0.5 C		
On-Grid connection			
Rated Power	60kW	80kW	12 0 kW
Maximum output	95A	127A	191A
Rated grid voltage	3/ N/PE, 230/400Vac		
Rated grid frequency	50 Hz		
Grid frequency range	47 ~53Hz		
THDi	<3% (@ rated power)		
DC component	< 0.5 % In		
Power Factor	> 0.99 (@rated power)		
Off-grid parameters			
Rated output power	60kW	80kW	12 0 kW
Maximum output	95A	127A	191A
Rated output	3/ N/PE , 230/400Vac		
Rated output	5 0 Hz		
THDu	<3% (@ linear load)		
Unbalanced load capacity	100 %		
General parameters			
Protection level	IP 54		
Fire protection	have		
Operating	-20 ~ + 50 ℃		
Relative humidity	0~95%, no condensation		
PCS cooling method	Intelligent air cooling		
Battery cooling	Air conditioning water cooling		
Maximum altitude	4000m (> 2000m need to reduce the rating)		
Communication	RS 485, CAN		
Communication	Modbus		
weight	2500 kg		
Dimensions (width x	1000×1330×2350mm		

12. 2 Tightening torque

To prevent the copper lug from loosening due to force, causing poor contact, or increased contact resistance leading to heating or even fire, ensure that the following torque requirements are met when tightening the screws of the copper lug:

Screws	Torque (N•m)	Screws	Torque (N•m)
M3	0.7~1	M8	18~23
M4	1.8~2.4	M10	34~40
M5	4~4.8	M12	60~70
M6	7~8	M16	119~140

12.3 Quality Assurance

If a product fails during the warranty period, Golen Power Technology Co., Ltd. (hereinafter referred to as Company) will repair or replace it with a new product free of charge.

Evidence

During the warranty period, our company requires customers to present the invoice and date of purchase of the product. Meanwhile, the trademark on the product should be visible, Otherwise, we have the right to not provide quality assurance.

condition

- The replaced unqualified products shall be handled by our company
- The customer should allow our company a reasonable time to repair the faulty equipment.

In the following circumstances, our company has the right not to provide quality assurance:

- The whole machine and parts have exceeded the free warranty period
- Shipping damage
- Improper installation, modification, or use
- Operation in extremely harsh environments beyond those described in this manual
- Machine failure or damage caused by installation, repair, modification, or disassembly by personnel other than our company’s service department.

- Beyond the scope of installation and use specified in relevant international standards
- Damage caused by abnormal natural environment

If the above situation causes product failure and the customer requires repair service, our company's service department can provide paid repair service after failure analysis.

12. 4 Contact Details

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

- Device Model
- Device serial number
- Fault code/name
- Brief description of the fault phenomenon

Golen Power Technology Co., Ltd

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