SUNGROW
Clean power for all

System Manual

Energy Storage System

PowerStack-ST215kWh-100kW-2h/ST225kWh-110kW-2h

All Rights Reserved

About This Manual

This manual gives an introduction to the transport and storage, mounting, electrical connection, powering on/off, troubleshooting, and maintenance of the Energy Storage System ("ESS").

Target Group

This manual is intended for operators of the energy storage plant and qualified technical persons. The installation and operation must be performed only by qualified technical persons, who must:

- Have received professional training
- Have read through this manual carefully and have a good understanding of the relevant safety instructions
- Be familiar with applicable local standards and the relevant safety code for electrical system

How to Use This Manual

Read the manual and other related documents before performing any operation on the product. Documents must be properly kept and be available at all times.

To increase customer satisfaction, the product and its manual will be updated and improved constantly. If the manual you have received is slightly inconsistent with the real product, it is probably owed to a product update. In such a case, the real product should take precedence. You can find the latest manual at **support.sungrowpower.com**, or reach your sales for the manual.

The figures in this manual are for reference only. The real product may differ.

Symbols in the Manual

To ensure the safety of life and property for users when using the product and to improve the efficiency of product use, the manual provides relevant safety information, which are highlighted by the following symbols.

Symbols that may appear in this manual are listed below. Please read carefully for better use of this manual.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

Indicates a slightly hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Indicates a potential hazard which, if not avoided, will result in device malfunction or property damage.

Indicates supplementary information, emphasis on specific points, or tips related to the use of the product that might help to solve your problems or save your time.

Signs on the Product

Observe the safety signs on the product at all times, which include:

Sign	Explanation
	Hot surface! Do not touch. Otherwise, it may cause personal injuries.
	Disconnect the equipment from all the external power sources before maintenance!
	High voltages inside! Touching it may result in an electric shock.
	Danger of death due to high voltages! After the equipment is disconnected from the external power source, wait at least 5 minutes before touching any of its internal conductive parts.
	Beware of heavy weights! Lifting the heavy object directly may cause back injury. Please lift it with the assistance of proper tools.
	Beware of explosion.
	Beware of corrosion.
	Do not dispose of it together with household waste.
	No fires.
	A medical facility should be set up nearby.
	If it gets in your eyes, flush your eyes immediately with running water or saline, and seek medical advice in time.

Sign	Explanation
	Protective earthing (PE) terminal. This terminal should be connected for reliable grounding, to ensure the safety of the operator.
	Read the instructions before performing any operation on the product.
	Wear safety goggles.

Contents

All Rights Reserved I
About This Manual II
1 Safety Precautions 1
1.1 Personnel Requirements 1
1.2 Electrical Safety 1
1.3 Battery Safety 2
1.4 Hoisting and Transportation 4
1.5 Installation and Wiring 4
1.6 Operation and Maintenance 4
1.7 Product Disposal 5
2 Product Description 6
2.1 Product Overview 6
2.2 External Design 7
2.2.1 ESS External Design 7
2.2.2 Mechanical Parameters 8
2.2.3 Ventilation Design 9
2.3 Internal Design 10
2.3.1 Internal Components 10
2.3.2 PCS (SC125CX) 11
2.3.3 Power Distribution Box 12
2.3.4 Battery 14
2.3.5 Energy Management Controller (Optional) 19
3 Transport and Storage 22
3.1 Precautions 22
3.2 Transport Methods 22
3.3 Transport Requirements 22
3.4 Storage Requirements 23
4 Mechanical Installation 25
4.1 Inspection Before Installation 25
4.1.1 Deliverables Inspection 25
4.1.2 Equipment Inspection 25

4.2 Installation Environment Requirements 25
4.2.1 Installation Site Requirement 25
4.2.2 Foundation Requirements 26
4.2.3 Installation Space Requirements 27
4.3 Handle with Forklift 31
4.4 Hoisting 32
4.4.1 Precautions 32
4.4.2 Hoisting 33
4.5 ESS Fixing 34
5 Electrical Connection 36
5.1 Precautions 36
5.2 Electrical Connection Overview 36
5.3 Preparation Before Wiring 38
5.3.1 Prepare Installation Tools 38
5.3.2 Open Cabinet Door 39
5.3.3 Prepare Cables 39
5.3.4 Copper Wire Connection 40
5.3.5 Aluminum Wire Connection 41
5.3.6 Cable Inlet Design 41
5.4 Ground Connection 42
5.5 AC Connection 44
5.5.1 Safety Precautions 44
5.5.2 AC Output Wiring 44
5.6 Auxiliary Power Supply Wiring 45
5.7 Communication Wiring 46
5.7.1 Ethernet Communication 46
5.7.2 EMS/LC Communication Wiring 46
5.8 Post-wiring Operation 47
6 Battery Connection 49
6.1 Precautions 49
6.2 Battery Wiring 50
7 Powering up and Shutdown 54
7.1 Powering up 54
7.1.1 Inspection Before Powering up 54
7.1.2 Powering Up Steps 54
7.2 Shutdown 55

7.2.1 Planned Powering Down....55
7.2.2 Emergency Shutdown....55
8 Fire Suppression....56
8.1 General Rules....56
8.2 Fire Suppression System....56
8.3 Detection and Alarm System....57
8.4 Fire Extinguishing System....57
8.5 Backup Protection System....58
9 Troubleshooting....59
10 Routine Maintenance....60
10.1 Precautions Before Maintenance....60
10.2 Maintenance Item and Interval....60
10.2.1 First Grid Connection....60
10.2.2 Once a Month....61
10.2.3 Once Every Six Months....62
10.2.4 Once a Year....62
10.3 Liquid Cooling System Maintenance....63
10.4 Container Maintenance....64
10.4.1 Cleaning Container Appearance....64
10.4.2 Checking Door Locks and Hinges....68
10.4.3 Checking Sealing Strips....68
10.5 Battery Maintenance....68
10.5.1 Regular Maintenance and Maintenance Cycle....68
10.5.2 Maintenance Precautions....71
10.5.3 Maintenance....71
10.6 Coolant Replacement....73
10.7 Fire Cylinder Maintenance....75
10.7.1 Cylinder Pressure Drop Handling....75
10.7.2 Gas Cylinder Inspection....76
11 Appendix....77
11.1 Abbreviations....77
11.2 Technical Data....78
11.3 Tightening Torques....79
11.4 Quality Assurance....79
11.5 Contact Information....80

1 Safety Precautions

1.1 Personnel Requirements

The hoisting, transportation, installation, wiring, operation, and maintenance of the equipment must be carried out by qualified electrical technicians in accordance with local regulations. Qualified technicians must:

- Have certain electrical wiring, electronic, and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Be familiar with the composition and working principles of the equipment and its upstream and downstream equipment.
- Have received professional training in the installation and commissioning of electrical equipment.
- Be able to respond quickly and effectively to dangers or emergencies that may occur during the process of installation and commissioning.
- Be familiar with applicable local standards and specifications of the country/region where the project is located.

1.2 Electrical Safety

⚠ DANGER

- **Touching the power grid or the contact points and terminals in the devices connected to the power grid may lead to electric shock!**
- **The battery side or the power grid side may generate voltage. Always use a standard voltmeter to ensure that there is no voltage before touching.**

⚠ DANGER

- **Lethal voltages are present inside the product!**
- **Note and observe the warnings on the product.**
- **Respect all safety precautions listed in this manual and other pertinent documents.**
- **Respect the protection requirements and precautions of the lithium battery.**

DANGER

- **Electricity may still exist in the battery when the power supply of the equipment is disconnected. Wait 10 minutes to ensure the equipment is completely voltage-free before any operation.**

WARNING

- **All hoisting, transportation, installation, wiring, operation, and maintenance must be carried out complying with the relevant codes and regulations of the country where the project is located.**

WARNING

- **Always use the product in accordance with the requirements described in this manual. Otherwise, equipment damage may occur.**

NOTICE

To prevent misuse or accidents caused by unrelated personnel, observe the following precautions:

- **Post prominent warning signs around the product to prevent accidents caused by false switching.**
- **Place necessary warning signs or barriers near the product..**

1.3 Battery Safety

WARNING

Do not leave the product in a low voltage or low SOC condition for a long period of time. Loss of capacity due to the following conditions is not covered by the warranty.

- **Battery discharge cell voltage is below 2.7V for 120 consecutive hours.**
- **Any cell cluster SOC is 0% for 120 consecutive hours.**
- **Battery discharge cell voltage ≤2V.**

NOTICE

- **In order to avoid triggering the warranty expiration condition, when the "Cell Under-voltage Fault" is triggered, the user must contact the local team of Sungrow within 24 hours and follow the requirements of Sungrow to carry out the next operation.**
- **If the system is configured with the "Active power up" function, Sungrow will enable this function by default when the device is shipped from the factory. When the SOC is too low, the system will charge the battery with a low current until the SOC reaches a safe threshold (the safe threshold can be set) automatically. In order to minimize the risk of under-voltage of the battery that may void the warranty, Sungrow recommends that users do not turn off the "Active power up" function.**

NOTICE

- **During maintenance or shutdown, if the SOC of any battery cluster is 0%, the SOC needs to be charged to 15% and above within 120 hours.**
- **If the SOC of any battery cluster is 0% during operation, the SOC needs to be charged to 5% and above within 2 hours. Or when the SOC reaches 0%, a command can be issued by the host computer EMS to change the system mode to recharge mode.**

For safe use of the product, the technician should carefully read and strictly observe the safety requirements. SUNGROW shall not be liable for product functional abnormality, component damage, personal safety accident, property loss, or other damage caused by the following reasons:

- Batteries are not charged as required, thus resulting in battery capacity loss or irreversible damage.
- Batteries are damaged or dropped, or have leaked, due to improper operations or failure to perform operations as required.
- Batteries are damaged due to overdischarge as they have not been powered on in time.
- Batteries are damaged due to the use of improper equipment for charging and discharging.
- Batteries are frequently overdischarged due to improper maintenance; battery capacity is incorrectly expanded; or batteries have not been fully charged for a long time.
- Battery operation parameters are not correctly set.
- Batteries are damaged because their operating environment does not meet the requirements.
- The customer uses the batteries beyond the scenarios specified in this manual, including but not limited to, connecting extra loads.

- Batteries are not maintained in compliance with the requirements specified in the system manual.
- The product is damaged due to the customer's continued use of batteries beyond the warranty period.
- The product is damaged due to the use of defective or deformed batteries.
- Use the batteries provided by SUNGROW together with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property loss are caused due to storing or installing batteries together with flammable/explosive materials.
- Personal safety accidents and property loss are caused by battery-related operations performed by non-qualified personnel, or by personnel not wearing qualified protective equipment during operations.
- Batteries are damaged due to improper behaviors, such as eating, drinking, and smoking near the battery.
- Batteries are stolen.

1.4 Hoisting and Transportation

⚠ WARNING

- **When walking on the top of the equipment, be sure to follow the standard procedure for working at heights.**

1.5 Installation and Wiring

⚠ WARNING

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

⚠ WARNING

Only equipment designated by Sungrow Power Supply Co., Ltd (hereinafter referred to as "SUNGROW") can be used. Failure to use equipment designated by SUNGROW may cause damage to the protection function and injury to personnel.

1.6 Operation and Maintenance

⚠ DANGER

Dismantling or burning the battery may cause it to catch fire.

⚠ WARNING

Personal protective equipment is required for maintenance and service of the equipment.
Maintenance personnel must wear protective equipment such goggles, helmets, insulated shoes, gloves, etc.

⚠ WARNING

There are no user-maintainable parts inside the battery unit.
Only personnel approved by SUNGROW can remove, replace and dispose of the batteries. Users are not allowed to maintain batteries without guidance.

⚠ WARNING

To avoid electric shock, do not perform any other maintenance operations beyond those described in this manual.
If necessary, contact Sungrow Customer Service for maintenance.

⚠ WARNING

To ensure continuous fire protection, replacement of internal components should only be performed by professional personnel.

⚠ WARNING

Protective tools such as goggles are required when carrying out coolant (glycol solution) or liquid cooling pipeline maintenance.

NOTICE

Do not spray paint any internal or external component of the product.
Do not use cleaning agents to clean the product or expose it to harsh chemicals.

1.7 Product Disposal

When the equipment or its internal components reach end-of-life, do not dispose of it together with household wastes. Some components inside the equipment can be recycled, while some may pollute the environment.
Contact an authorized local facility for collection.

2 Product Description

2.1 Product Overview

The electrical equipment, communication device, temperature control device, and fire suppression system of the ESS all adopt an integrated design. For electrical equipment, the LFP battery system is designed with a liquid cooling system, while the PCS adopts forced air cooling for heat dissipation. The battery system and the PCS are integrated into an all-in-one outdoor-type cabinet. For communication devices, the LC integrates the functions of BSC, and the CMU is built into the PCS. The integrated design makes the entire system more compact in structure and easy to maintain.

With an all-in-one design, the ESS allows flexible configuration and easy installation and O&M, with only a small space required. It also supports ancillary service functions such as demand control, gaining revenue from peak-to-trough price spread, demand response, and virtual plant.

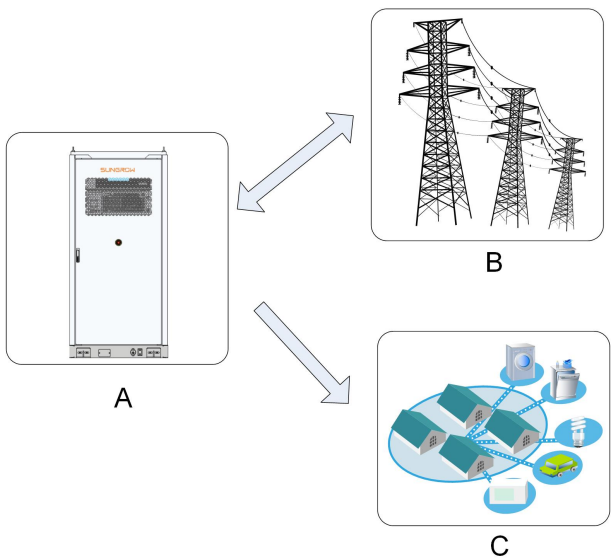


figure 2-1 Typical Application of the ESS

*The figure is for reference only. The real product may differ.

No.	Name
A	ESS
B	Utility grid
C	Loads

2.2 External Design

2.2.1 ESS External Design

The external design of the ESS is shown in the figure below.

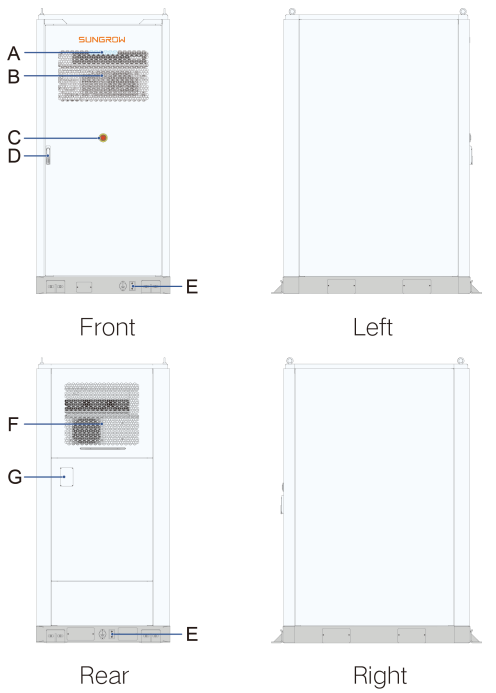


figure 2-2 External Design

*The figure is for reference only. The real product may differ.

No.	Name
A	LED indicator
B	Air inlet
C	Emergency stop button
D	Door lock
E	Grounding point
F	Air outlet
G	Nameplate

NOTICE

The nameplate contains critical parameter information related to the ESS and should be protected against damages during transportation, installation, maintenance, overhaul, and other operations. Do not damage or remove the nameplate!

LED Indicator

The LED indicator is located at the top of the ESS cabinet. The description of the LED indicator status is shown as follows.

table 2-1 LED Indicator Status

Indicator Status		Description
	Steady on	The system works normally (charging/discharging)
	Blink with fading effect at 2s intervals (breathing)	The system is normal and currently not charging/discharging
	Steady on	There is a fault in the system (the auxiliary power supply is not disconnected)
	Off	The auxiliary power supply is disconnected

Emergency Stop Button

In case of an emergency, press this button, and the system will then stop running immediately.

DANGER

After the emergency stop button is pressed, the system will shut down and the DC contactor will open. However, the internal auxiliary power supply and the PCB board will still carry voltage. Do not touch them!

2.2.2 Mechanical Parameters

Overall Dimensions

The dimensions of the ESS are shown in the figure below.

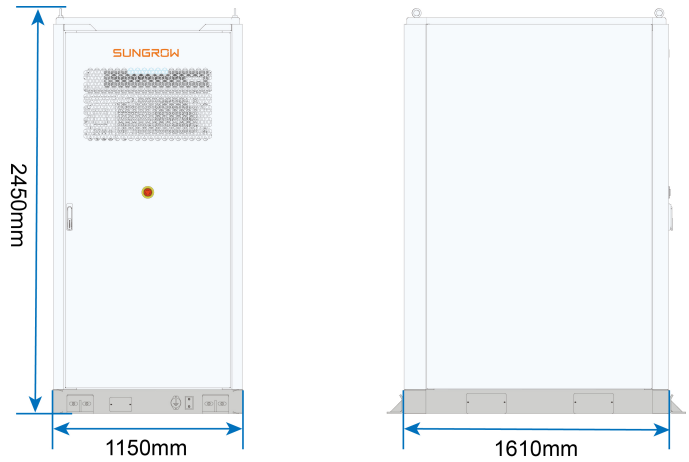


figure 2-3 Overall Dimensions

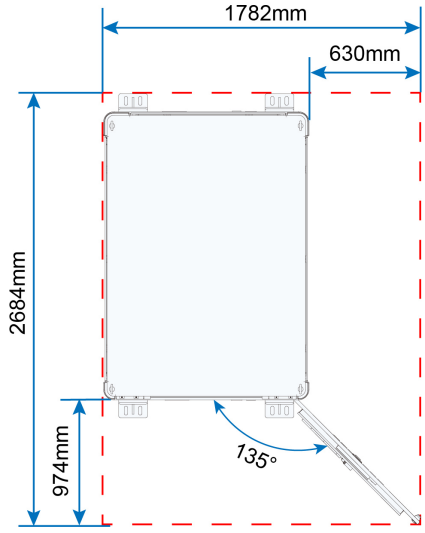


figure 2-4 Dimensions of ESS with Its Door Fully Opened

*The figure is for reference only and the real product may differ.

2.2.3 Ventilation Design

The ESS has an air inlet at its front and an air outlet at its rear, as shown in the figure below.

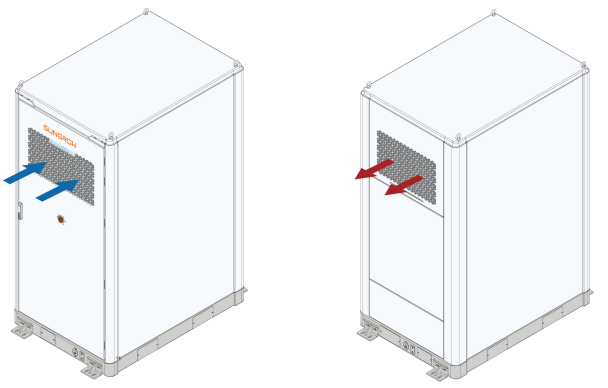


figure 2-5 Air Inlet and Outlet

*The figure is for reference only and the real product may differ.

2.3 Internal Design

2.3.1 Internal Components

The main electrical equipment inside the ESS cabinet are shown in the figure below.

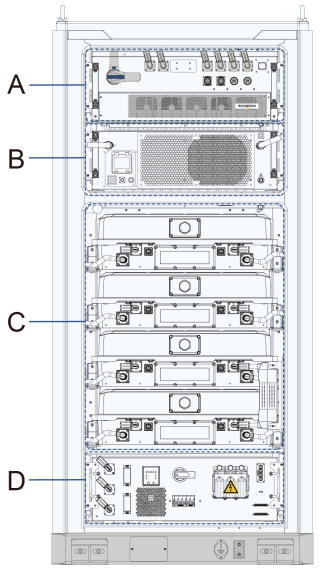


figure 2-6 Internal Structure

No.	Name
A	PCS (SC125CX)
B	Liquid cooling unit
C	Battery RACK (compartment)
D	Power distribution box

*The figure is for reference only and the real product may differ.

2.3.2 PCS (SC125CX)

PCS External Design

The external design of the SC125CX Power Conversion System (PCS) is shown in the figure below.

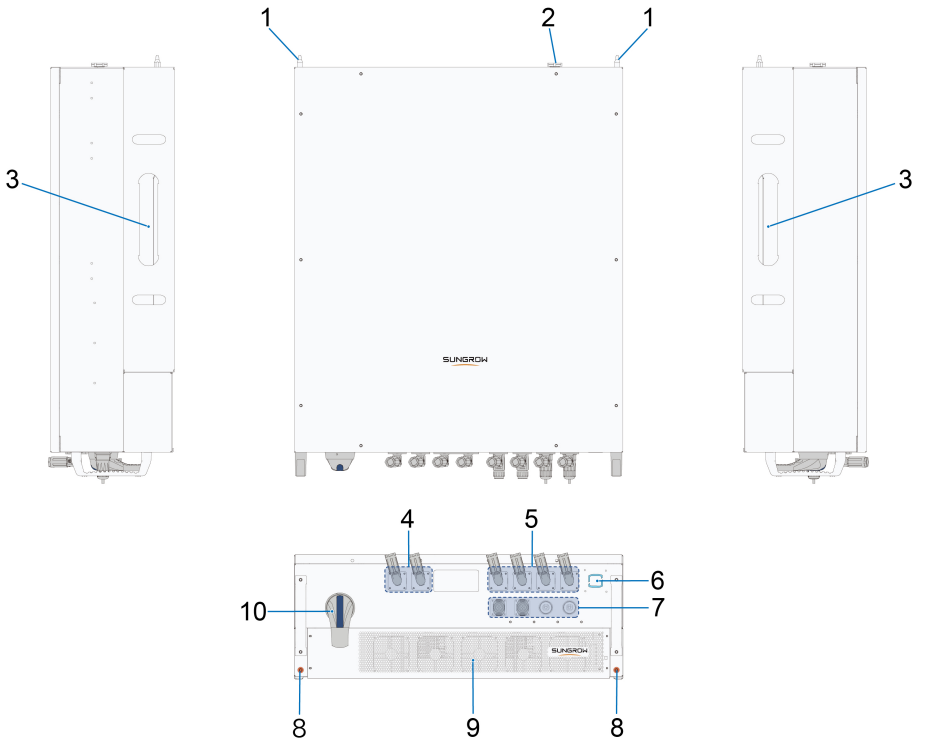


figure 2-7 PCS External Design

*The figure shown here is for reference only. The real product may differ.

No.	Name	Description
1	Locating pin	Used to restrict the free movement of the PCS.
2	Vent valve	Resistant to dust and water; air permeable.
3	Guide rail	Used for the transport, installation, and removal of the device.
4	DC input ports	Device DC wiring area.
5	AC output ports	Device AC wiring area.
6	LED indicator	Indicates the current operating status.
7	Communication ports	Used for the communication wiring of the device.
8	*Additional grounding terminal	Terminal used for additional protective grounding, as specified in EN 50178.

No.	Name	Description
9	Air inlet cover	Fans are installed at the back of the cover plate, used for forced cooling.
10	DC switch	Used to disconnect the device from the battery safely.

⚠ WARNING

*** During product use, avoid DC positive/negative-to-ground short circuits and short circuits between positive and negative. Otherwise, it may lead to serious damages to the PCS.**
In case a short circuit fault has occurred, the whole PCS should be replaced.

LED Indicator Panel

The LED indicator panel serves as an interface for human-machine interaction and is used to indicate the current operating status of the PCS.

table 2-2 LED Indicator Status

Indicator	Status	Description
Blue	Steady on	The device is running.
	Blink fast (Interval: 0.2s)	The device has connected to bluetooth and data communication is in process. There is no fault in the device.
	Blink slow with fading effect (Interval: 2s)	The device has been powered on and is in the emergency stop, standby, or startup state.
Red	Steady on	A fault has occurred (the device cannot connect to the grid).
	Blinking	The device has connected to bluetooth and data communication is in process. There is a fault in the device.
Off	Off	The AC and DC sides are both disconnected from power.

2.3.3 Power Distribution Box

External Design

The external design of the power distribution box is shown in the figure below.

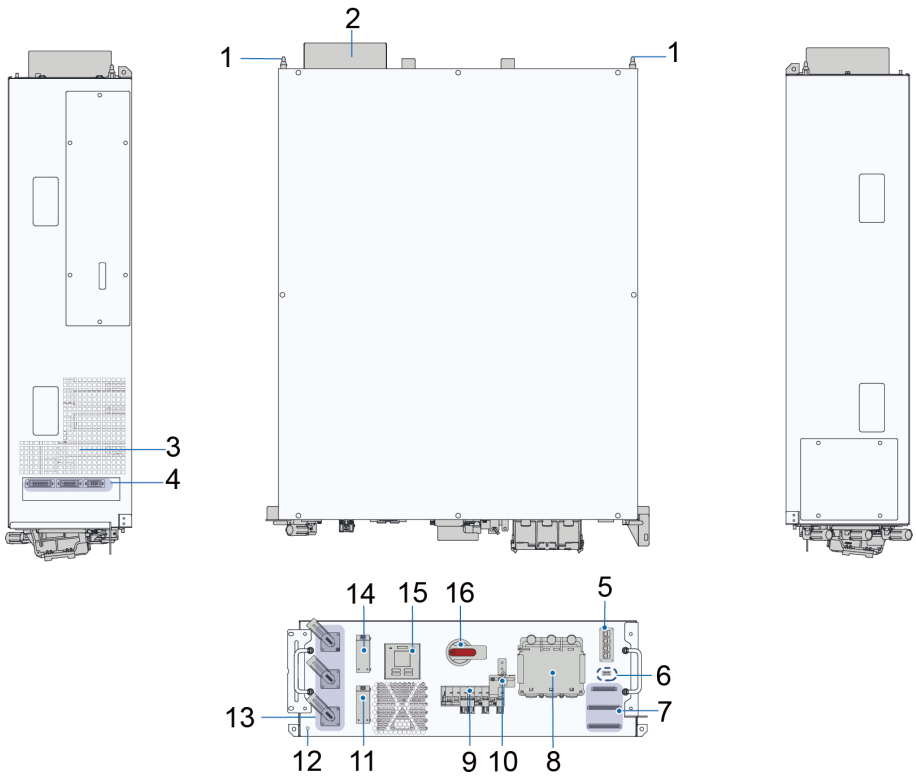


figure 2-8 External Design

*The figure shown here is for reference only. The real product may differ.

No.	Name	Description
1	Locating pin	Used to restrict the free movement of the power distribution box.
2	Air outlet	Used to exhaust the circulating hot air from the power distribution box.
3	Air inlet	Used to bring circulating cool air into the power distribution box.
4	Connection ports 3–4	Used for power supply or communication wiring of the 24Vdc device inside the cabinet.
5	Communication port	Used for the communication wiring of the device.
6	USB port	Port for system operation log transfer.
7	Connection ports 1–2	Communication ports for LC and EMS.
8	AC output port	Used for device AC output wiring.
9	Miniature circuit breaker	AC auxiliary power supply and UPS control switch.

No.	Name	Description
10	Miniature circuit breaker lock	Lock the miniature circuit breaker when the power is cut off.
11	*Auxiliary power supply port	Used for external power supply wiring.
12	Additional protective grounding terminal	Terminal used for additional protective grounding, as specified by EN 50178.
13	AC input port	Connected to PCS AC side.
14	Power port for liquid cooling unit	Used for power supply wiring of the liquid cooling unit.
15	UPS	Uninterruptible power supply.
16	Main AC switch	Used to disconnect the device from the loads safely.

*The system is equipped with an internal power supply as standard equipment.

2.3.4 Battery

Cell

table 2-3 Cell Parameter 1 (CATL)

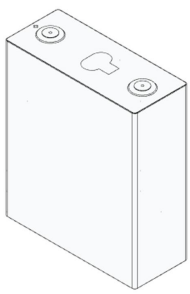
Cell	Parameter	Value
	Dimensions (Thickness * Height * Width)	（71.7 ± 0.8） mm *（207.2 ± 0.8） mm *（173.9 ± 0.8） mm
	Weight	（5.34 ± 0.2） kg
	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V
	Voltage range	2.5 V to 3.65 V (cell temperature T>0℃) 2.0 V to 3.65 V (cell temperature T≤0℃)

table 2-4 Cell Parameter 2 (CALB)

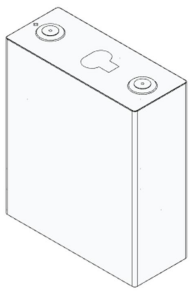
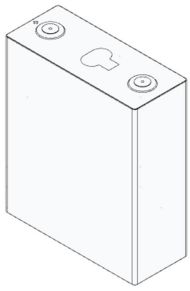
Cell	Parameter	Value
	Dimensions (Thickness * Height * Width)	(71.57 ± 0.5) mm * (207.20 ± 0.8) mm * (174.7 ± 0.8) mm (with terminal) (71.57 ± 0.5) mm * (204.57 ± 0.8) mm * (174.7 ± 0.8) mm (without terminal))
	Weight	(5.35 ± 0.16) kg
	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V
	Voltage range	2.5 V to 3.65 V (cell temperature 0℃ to 55℃) 2.0 V to 3.65 V (cell temperature -30℃ to 0℃)

table 2-5 Cell Parameter 3 (EVE)

Cell	Parameter	Value
	Dimensions (Thickness * Height * Width)	(71.7 ± 0.8) mm * (207.2 ± 0.5) mm * (173.7 ± 0.5) mm (with terminal)
		(71.7 ± 0.8) mm * (204.6 ± 0.5) mm * (173.7 ± 0.5) mm (without terminal))
	Weight	(5.49 ± 0.3) kg
	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V
	Voltage range	2.5 V to 3.65 V (cell temperature T>0℃) 2.0 V to 3.65 V (cell temperature T≤0℃)

Battery PACK

The battery module (PACK) is mainly composed of cells connected in series, and has functions such as battery voltage/temperature sampling and balancing control. It is designed with a dedicated battery management chip and able to receive control commands through daisy chain communication and report the collected data.

table 2-6 Battery PACK Parameter 1 (CATL)

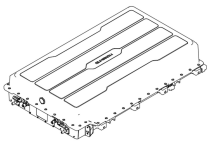
PACK Parameter	Parameter	Value
	Model	P537AL-111/ P537BL-111
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P60S
	Key components	60 cells, 1 BMU, 1 fuse
	Weight	378 ± 9.0kg
	Protection rating	IP65

table 2-7 Battery PACK Parameter 2 (CATL)

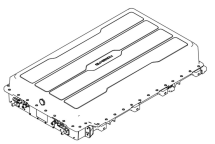
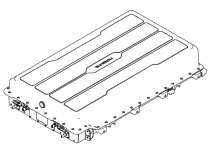
PACK Parameter	Parameter	Value
	Model	P573-111/ P573B-111
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P64S
	Key components	64 cells, 1 BMU, 1 fuse
	Weight	395 ± 9.6kg
	Protection rating	IP65

table 2-8 Battery PACK Parameter 3 (CALB)

PACK Parameter	Parameter	Value
	Model	P537AL-181/ P537BL-181
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P60S
	Key components	60 cells, 1 BMU, 1 fuse
	Weight	380 ± 11kg

PACK Parameter	Parameter	Value
	Protection rating	IP65

table 2-9 Battery PACK Parameter 4 (CALB)

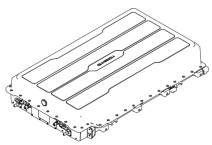
PACK Parameter	Parameter	Value
	Model	P573AL-181/ P573BL-181
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P64S
	Key components	64 cells, 1 BMU, 1 fuse
	Weight	400 ± 12kg
	Protection rating	IP65

table 2-10 Battery PACK Parameter 5 (EVE)

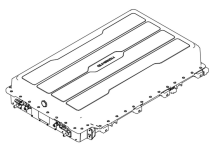
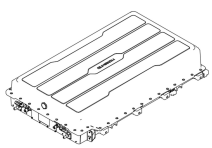
PACK Parameter	Parameter	Value
	Model	P537AL-141/P537BL-141
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P60S
	Key components	60 cells, 1 BMU, 1 fuse
	Weight	380 ± 11kg
	Protection rating	IP65

table 2-11 Battery PACK Parameter 6 (EVE)

PACK Parameter	Parameter	Value
	Model	P573AL-141/P573BL-141
	Dimensions (width * height * depth) (terminals and faucets not considered)	(868 ± 5 mm) * (247 ± 5 mm) * (1442 ± 5 mm)
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Combination	1P64S

PACK Parameter	Parameter	Value
	Key components	64 cells, 1 BMU, 1 fuse
	Weight	400 ± 12kg
	Protection rating	IP65

Rack

The battery RACK is composed of multiple PACKs and fuses.

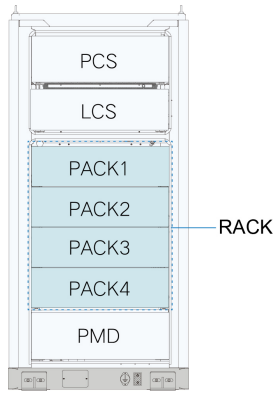
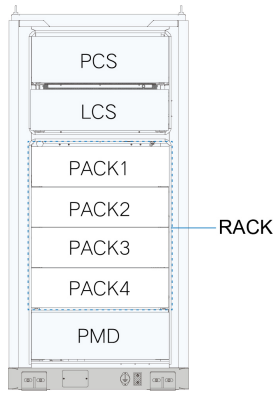
The battery RACK parameters are shown in the following table:

table 2-12 RACK Parameters

RACK Model	DC output voltage range	Rated power	Rated voltage	Short-circuit current
R0215BL-ACAA	648 to 876 V	107 kW	768 V	≤20kA
R0229BL-ACAA	691.2 to 934.4 V	114 kW	819.2 V	≤20kA
R0215BL-AFAA	648 to 876 V	107 kW	768 V	≤20kA
R0229BL-AFAA	691.2 to 934.4 V	114 kW	819.2 V	≤20kA
R0215BL-AHAA	648 to 876 V	107 kW	768 V	≤20kA
R0229BL-AHAA	691.2 to 934.4 V	114 kW	819.2 V	≤20kA

Rack Structure

table 2-13 Rack Structure

Model	Rack Structure
ST215kWh-100kW-2h	
ST225kWh-110kW-2h	

Note: PACK stands for battery module, PACK represents a 1P60S PACK, PACK represents a 1P64S battery PACK. PCS stands for power conversion system, LCS for liquid cooling unit, and PMD for power distribution box.

2.3.5 Energy Management Controller (Optional)

The EMS300CP energy management system controller can collect the operation data of the ESS and upload them to iSolarCloud so that users can monitor and control the system operation remotely.

The EMS300CP board is optional. It is built into the ESS power distribution box. You may read the label on the power distribution box to understand whether the product has an EMS300CP board or not.

Auxiliary Meter

In addition to the ESS operation data, the EMS300CP also needs to collect the meter data, as required by some particular functions. Therefore, please install the following two meters first before installing the ESS.

- Gateway meter: Zero export, demand control.
- Electricity meter: Overload protection.

Local Monitoring on Web

The internal communication wiring between the EMS300CP and the ESS has been completed upon delivery. Connect the PC to the communication port on the ESS on site. Then, you may access the EMS300CP Web system on the PC.

The homepage of the EMS300CP Web system is shown below:

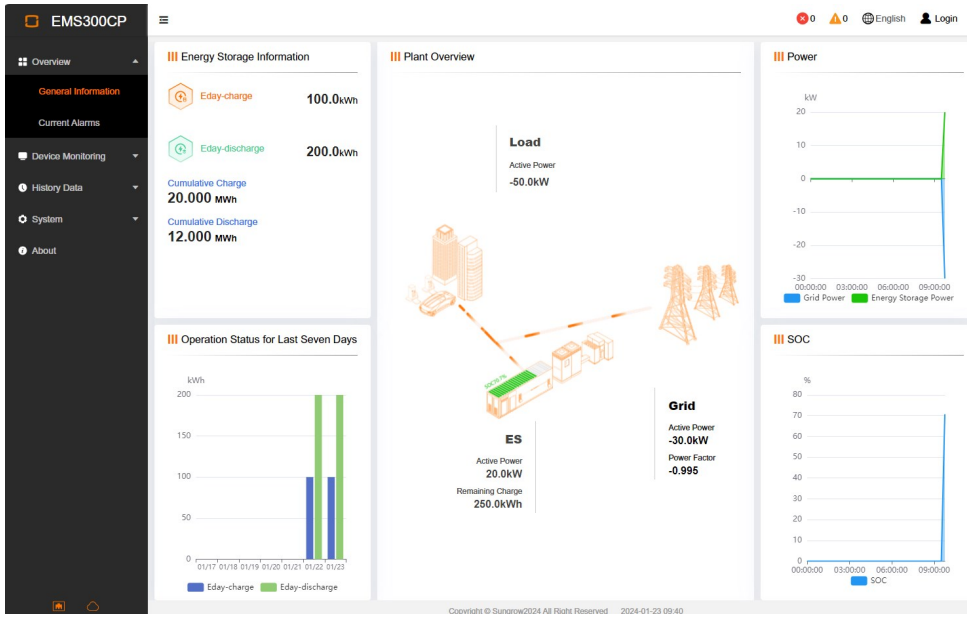


figure 2-9 EMS300CP Web Homepage

You can scan the QR code on the nameplate at the rear of the ESS cabinet to get the EMS300CP user manual, or scan this QR code directly:

Remote Monitoring on iSolarCloud

You can also monitor the ESS remotely via iSolarCloud. You can log in to the iSolarCloud Web system on the PC, or download the iSolarCloud App from an application store on your phone: . The iSolarCloud APP and EMS300CP are connected through WIFI.

figure 2-10 EMS300CP iSolarCloud Homepage

3 Transport and Storage

3.1 Precautions

⚠ CAUTION

- **Failure to transport and store the product in accordance with the requirements in this manual may invalidate the warranty.**

3.2 Transport Methods

The ESS can be transported by land and sea. It adopts an integrated and easy-to-lift design that facilitates transport. Currently, permission has not been granted to transport the ESS by air, and no relevant guide for rail transport is available.
The ESS can be transported by truck within the country.

NOTICE

In most cases, the total weight of the truck that carries the ESS will exceed the general weight limit on the road. Therefore, you may need to acquire an overweight permit from the relevant local agency in that area.

3.3 Transport Requirements

The ESS leaves the factory with most of its internal components fixed inside its body. You may lift or move the ESS as a whole directly during transport.

⚠ WARNING

In the whole process of loading, unloading, and transport, follow strictly the applicable safe operation procedure for outdoor-type cabinets in the country/region where the project is located.

- **All the tools used on the ESS, or during operation, must have undergone proper maintenance.**
- **All personnel engaged in loading, unloading, and anchoring operations should have received relevant training, especially in safety.**

During the whole process of loading, unloading, and transport, always keep in mind the mechanical parameters (overall dimensions and weight) of the ESS.

To transport and move the ESS, make sure the below requirements are met:

- All the doors of the ESS are locked.
- Select an appropriate crane or lifting tool according to the on-site conditions. The tool used must have a sufficient load capacity, boom length, and swing radius.
- It is recommended to use one crane to lift the ESS.
- Extra traction may be required to move the ESS along a slope.
- Remove all obstacles that exist or may exist along the route, such as tree branches and cables.
- Transport or move the ESS in good weather, whenever possible.
- Be sure to set up warning signs or fence off warning zones to prevent irrelevant personnel from entering the operating area, thus avoiding accidents.
- Do not put the ESS upside down, nor stack them up, during transport.
- If the ESS is transported by land, be sure to fix the lifting rings at the top of the ESS to the transport vehicle using ropes, to prevent it from getting overly tilted during transport.

After the ESS arrives at the project site, remove the diagonal fixing pieces at the top four corners of the equipment, and keep them properly.

3.4 Storage Requirements

- In order to prevent condensation inside the ESS cabinet, or the bottom of the room is soaked by rain in the rainy season, the ESS base must be raised, and the specific raising height should be reasonably determined according to the site geological and meteorological conditions.
- Store the ESS on a dry, flat, and solid platform with sufficient carrying capacity and without any vegetation cover. The storage ground must be flat, without accumulated water, concave and convex or uneven, and the flatness should be no more than 5mm.
- Before storage, ensure that the doors of the ESS and all internal equipment are locked.
- System storage environment temperature: -30 ℃ to +50 ℃, recommended storage temperature: -30 ℃ to + 25 ℃.

  The battery attenuation coefficients at other temperatures are listed below.

Temperature range	Attenuation coefficient
26 ℃ to 40 ℃	0.1%/month
41 ℃ to 50 ℃	0.3%/month

- Long-term storage of batteries is not recommended because it may cause the decrease in battery capacity. Even if the battery is stored at the recommended storage temperature, irreversible capacity fade will still occur during periods of rest. The longer it has been stored, the greater the capacity fade. Please refer to the technical protocol for specific rate of capacity fade.

- When UPS is not running, it needs to be recharged once every six months.
- The storage relative humidity should be always between 0 and 95% without condensation.
- The air inlet and outlet of the ESS should be effectively protected, and effective measures should be taken to prevent rain water, sand and dust from penetrating into the ESS.
- Carry out periodic inspections. Perform at least one routine inspection on the device every half month. Inspect the packaging for damages, and make sure there is no damage caused by pests and animals. Re-pack the device immediately if the packaging gets damaged. Check the cabinet and the inner equipment for damage.
- Before installing an ESS that has been stored for more than six months, open the door to visually check and ensure that the cabinet and internal devices are intact. Check the product after it is powered on and starts. If necessary, request professionals for testing before installation.
- Packs should be stored in a clean and dry place and not be exposed to the blazing sun and rain. No harmful gases, flammable and explosive products, and corrosive chemicals should be placed at the storage site. Protect the batteries from mechanical shock, heavy pressure, strong magnetic field, and direct sunlight.
- Prevent any damage to the Pack caused by possible hazards in the surrounding environment, such as sudden temperature changes or collisions.
- The packing box such cannot be tilted or turned upside down.

If the ESS have been stored for more than 6 months, charge it to raise the system SOC to 30%–40%. The SOC of internal Packs must be the same after charging.

4 Mechanical Installation

4.1 Inspection Before Installation

4.1.1 Deliverables Inspection

Check whether deliverables are complete against the attached packing list.

4.1.2 Equipment Inspection

- Check whether the product you have received matches the order you have placed.
- Inspect the product and its internal components, and make sure there is no damage.
- Ensure the gateway meter and electricity meter used in conjunction with EMS300CP have been installed.

In case of any problem or doubt, contact your transport service provider or SUNGROW in time.

⚠ WARNING

- **Proceed with installation only if the equipment is intact without any signs of damage!**

Before installation, ensure that:

- **The product is in good condition, without any damage.**
- **All the components inside the product are intact without any signs of damage.**

4.2 Installation Environment Requirements

4.2.1 Installation Site Requirement

- The climate environment and geological conditions, such as stress wave emission and underground water level, should be fully considered when selecting the installation site.
- The environment around the installation site should be dry and well ventilated.
- There should be no trees around the installation site to prevent branches or leaves blown off by heavy winds from blocking the door or air inlet of the energy storage system.
- The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive and corrosive materials.
- The installation site should be far away from residential areas to avoid noises.

NOTICE

Do not install the device in an environment with vibration and strong electromagnetic field. Strong-magnetic-field environments refer to places where magnetic field strength measures over 30 A/m.

4.2.2 Foundation Requirements

WARNING

Considering the equipment's heavy weight, before foundation building, perform a thorough inspection on the installation site first (from the aspects of geology, environment, and climate, etc.). You can only proceed with foundation design and construction after confirming that the installation site meets all relevant requirements.

An improperly built foundation may lead to difficulties or troubles in equipment mounting, opening and closing of cabinet doors, and future operation of the equipment. Therefore, the foundation must be designed and constructed in compliance with certain standards, to meet the requirements of mechanical support, cable laying, and future maintenance.
Make sure at least the below requirements are met during foundation building:

- The bottom of the foundation pit must be compacted, filled and made even.
- The foundation should be built in compliance with the foundation drawing provided, or approved, by SUNGROW. The tolerance for the upper surface of the foundation is ±5mm.
- The foundation should provide sufficient and effective support for the equipment.
- The equipment should be positioned in a higher place, to protect its base and interior from rain erosion. It is recommended to build a foundation about 300mm higher than the horizontal ground on site.
- Set up a proper drainage system based on the local geological conditions.
- Build a cement foundation with sufficient cross-sectional area and height. The foundation height should be determined by the constructor based on the on-site geological conditions.
- Take cable laying into consideration when building the foundation.

In the process of foundation building, remove the muck immediately after excavation, to avoid affecting the hoist and transport of the equipment.

- Build a platform around the foundation to facilitate future maintenance.
- During the foundation building, reserve sufficient space for the AC side cable trench according to the position and size of the cable inlet and outlet on the equipment, and embed the cable conduit in advance.

- Determine the specifications and quantity of the perforating gun according to the model and quantity of cables used.
- Both ends of each embedded conduit should be temporarily sealed off to prevent the ingress of foreign matters. Otherwise, it may lead to difficulties in wiring.
- After all the cables are connected, seal off the cable inlet and outlet and the connectors with fireproof mud or other suitable materials, to prevent rodents from entering the equipment.

Pre-bury the grounding unit according to the applicable standards of the country/region where the project is located.

4.2.3 Installation Space Requirements

For better heat dissipation and ease of maintenance, it is recommended to reserve sufficient space around the ESS during installation.

NOTICE

The distance here refers to the distance from the wall or other equipment to the ESS cabinet, not to the ESS foundation.

Installation of One ESS

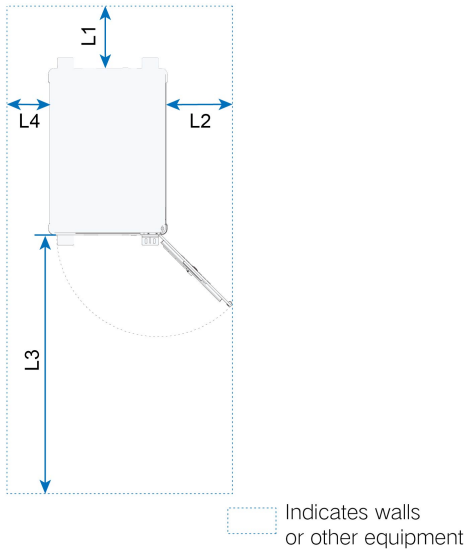


figure 4-1 Space Required for One ESS

Maintenance Item	Space Requirements
Maintenance tooling for non-PACK components	L1≥600mm, L2≥430mm, L3≥2500mm, L4=0
PACK maintenance tooling	L1≥600mm, L2≥630mm, L3≥2000mm, L4≥400mm

If the ESS is installed with its back against a movable frame structure, the minimum space behind its back can be reduced to 300mm.

Installation of Multiple ESS

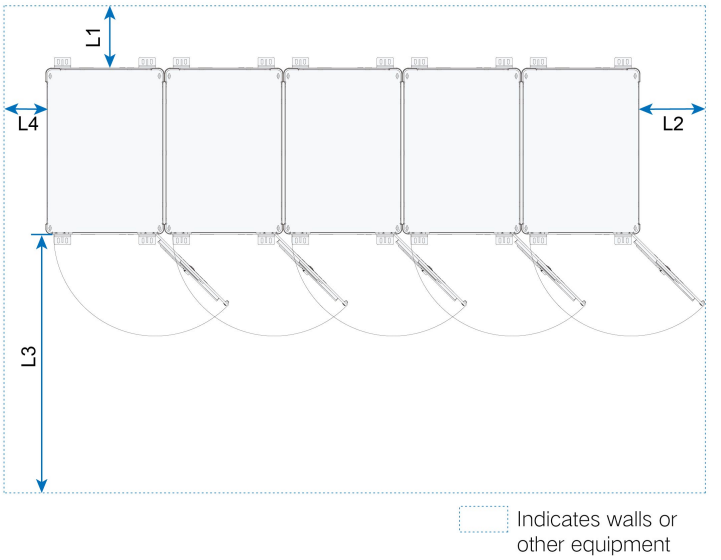


figure 4-2 Space Required for ESS in One Row

Maintenance Item	Space Requirements
Maintenance tooling for non-PACK components	L1≥600mm, L2≥430mm, L3≥2500mm, L4=0
PACK maintenance tooling	L1≥600mm, L2≥630mm, L3≥2000mm, L4≥400mm

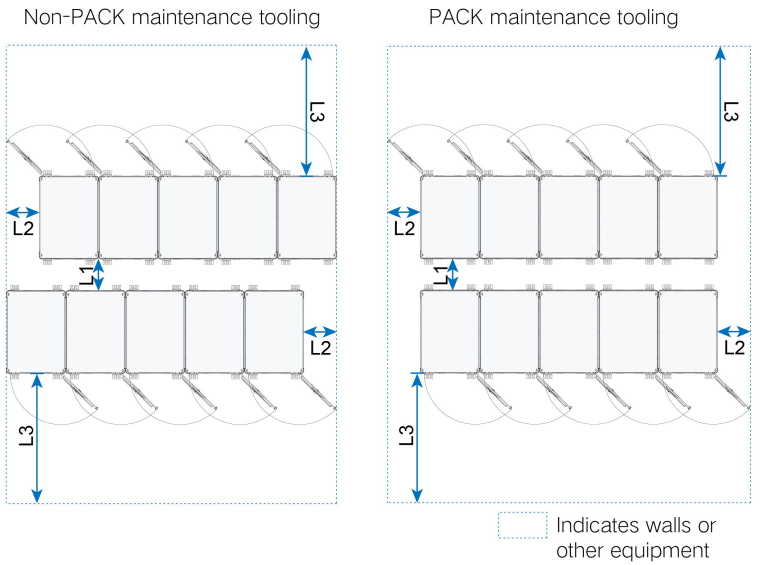


figure 4-3 Space Required for ESS in Two Rows

Maintenance Item	Space Requirements
Maintenance tooling for non-PACK components	L1≥600mm, L2≥430mm, L3≥2500mm
PACK maintenance tooling	L1≥600mm, L2≥630mm, L3≥2000mm

If the ESS is installed with its back against a movable frame structure, the minimum space behind its back can be reduced to 300mm.

* The figure is for reference only. The product received may differ.

Space Requirements for Top Heat Dissipation (Indoors)

To install the ESS indoors, exhaust equipment with sufficient exhaust air rate is required. To ensure good heat dissipation over the top of the ESS, reserve sufficient space between the ESS and the ceiling.

If the ambient temperature is 45℃ and several ESS are installed shoulder-by-shoulder with their back 300mm away from the wall, the recommended height from the top of the ESS to the ceiling is:

- ESS with one side against the wall: Height ≥800mm.
- ESS with two sides against the wall: Height ≥1200mm.
- If the height above the ESS is 400mm, the space between two ESS should be ≥200mm, and the distance from one side of the ESS to the wall should be ≥600mm.

If the height above the ESS is 0, the space between two ESS should be ≥400mm, and the ESS back should be ≥600mm away from the wall.

If the ESS is installed with its side against the wall and the height from its top to the ceiling is 0, it cannot operate at full power.

4.3 Handle with Forklift

You can move the ESS using a forklift if the ground on the installation site is flat. Forklift pockets are provided at the bottom of the ESS for the insertion of forklift forks.
To move the ESS using a forklift, make sure the below requirements are met:

- The forklift has sufficient load capacity.
- The forks are long enough for moving the equipment.

The forks should be inserted into the forklift pockets at the bottom of the equipment (see the figure below for the positions of the pockets). The depth of the forks inserted into the pockets should be the depth of the pockets.

- Handle, move, and place the ESS slowly and steadily. It is suggested to try a little first before handling, to make sure all requirements are met.
- Position the ESS on a stable surface only, and this place should be free of obstacles or protrusions, with good drainage.

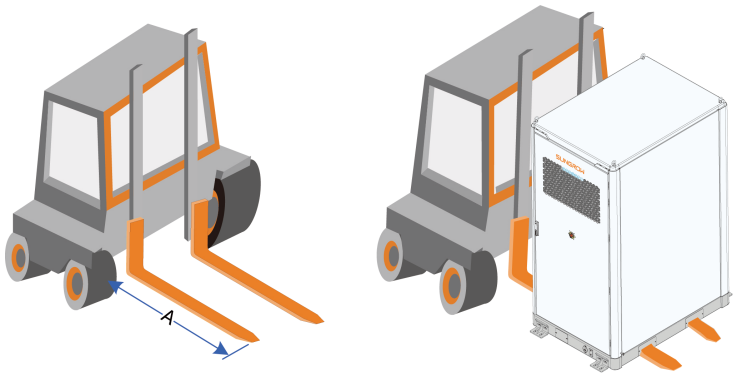


figure 4-4 Handle with Forklift

WARNING

- **Move the ESS using a forklift by the bottom forklift pockets.**
- **Never insert the forklift forks into any position on the equipment else than the bottom pockets.**

The ESS will be delivered with forklift pockets exposed to air. It is suggested to cover the pockets with sealing plates after the installation is completed. The sealing plates are included in the accessories.

4.4 Hoisting

4.4.1 Precautions

WARNING

- **Perform operation in strict accordance with the safe operation procedure of the crane in the whole process of hoisting.**
- **No one is allowed to stay within 5m to 10m of the operating area. In particular, do not stand anywhere under the crane boom or the equipment that has been lifted up, to avoid personal injuries or death.**
- **In case of severe weather, such as heavy rain, fog, and strong wind, stop the hoisting work immediately.**

During equipment hoisting, make sure at least the following requirements are met:

- It is safe on site.
- The whole hoisting work on site is performed under the guidance of qualified technical persons.
- The slings used must be of sufficient strength for the load to be lifted.
- Make sure the connections of slings are all secure and reliable, and the length of the sling connected to each corner fitting is the same.
- The sling length can be adjusted based on the actual situation on site.
- Ensure the equipment is held steady and does not tilt in the whole process.
- Take all necessary auxiliary measures to ensure the safety of the equipment and the successful completion of the hoisting work.

The figure below shows how the equipment is lifted by the crane. The inner dashed circle in the figure indicates the crane's work zone. While the crane is working, do not stand anywhere in the area of the red solid circle.

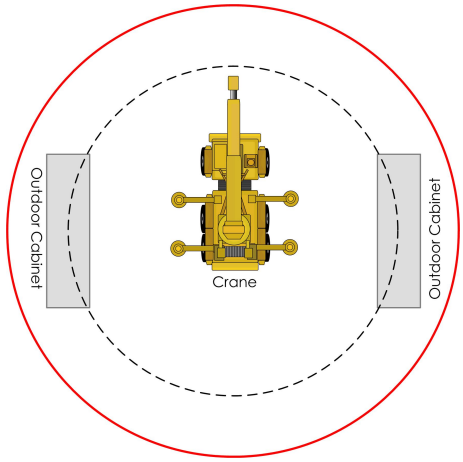


figure 4-5 Crane Operation

4.4.2 Hoisting

Lift the equipment according to the following requirements:

- The equipment should be lifted vertically. Do not drag the equipment along the ground, nor drag it along the top surface of the equipment underneath it. Do not push or pull the equipment along any surface.
- Suspend hoisting when the equipment is lifted 300mm off the supporting surface. Then, check the connection between the slings and the equipment. Continue hoisting only after you have confirmed that the connections are all secure.
- When the equipment is moved to the target position, lay it down gently and steadily. Do not attempt to throw it to place. Make sure it lands vertically.
- The equipment should be positioned on a flat and solid surface with good drainage, free of obstacles or protrusions.
- You may use slings with lifting hooks or U-shaped hooks to lift the ESS. The lifting devices should be connected to the ESS properly.
- Considering on-site conditions, lift the ESS by its four lifting rings, with non-vertical forces applied.

figure 4-6 ESS Hoisting

*The figure shown here is for reference only. The real product may differ.

4.5 ESS Fixing

After moving the ESS to the target position, fix it in place. You can fix the equipment by welding or using L-shaped angle steels.

Fixed by welding

Fix the ESS bottom to the foundation by welding. Apply anti-corrosion treatment to the welding points after welding is completed.

Fixed with L-shaped angle steels

As shown in the figure below, mounting holes for L-shaped angle steels are provided at the bottom of the ESS.

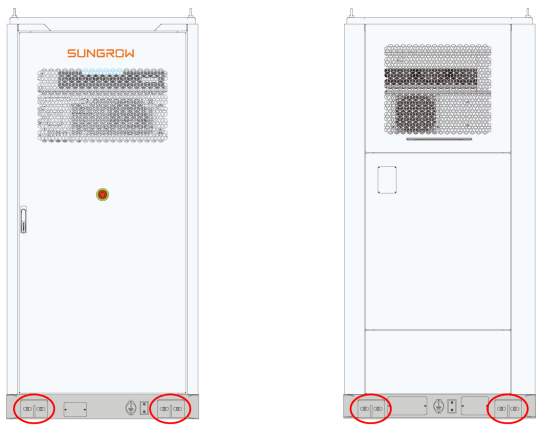


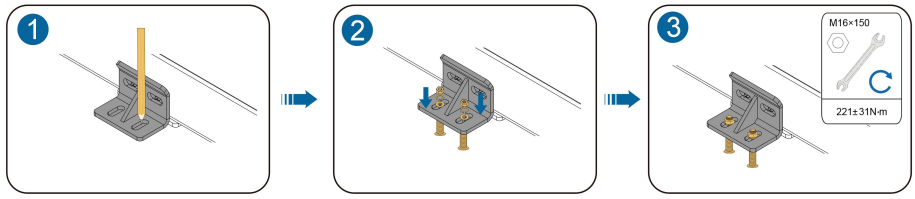
figure 4-7 L-shaped Angle Steels

Installation Tools

Tools that may be used when installing the L-shaped angle steels are as follows:

No.	Name	Source
1	Marker	Not included in the scope of supply
2	Hammer drill	Not included in the scope of supply
3	Angle steel	Included in the scope of delivery
4	M16 expansion bolt	Not included in the scope of supply
5	M16 screw	Included in the scope of delivery

Installation Method



5 Electrical Connection

5.1 Precautions

DANGER

High voltage! Electric shock!

- **It is strictly forbidden to directly touch the live parts in the unprotected state!**
- **Before installation, ensure that the all switches are off.**

WARNING

Sand and moisture penetration may damage the electrical equipment in the system, or affect their operating performance!

- **Avoid electrical connections during sandstorms or when the relative humidity in the surrounding environment is greater than 95%.**
- **Perform electrical connection when there is no sandstorm and the weather is fair and dry.**

WARNING

- **Before wiring, check and ensure that the polarity of all input cables is correct.**
- **During electrical installation, do not forcibly pull any wires or cables, as this may compromise the insulation performance.**
- **Ensure that all cables and wires have sufficient space for any bends.**
- **Adopt the necessary auxiliary measures to reduce the stress applied to cables and wires.**
- **After completing each connection, carefully check and ensure that the connection is correct and secure.**

WARNING

When an external short circuit occurs in the RACK circuit and the switch box fuse produces a protective action, the fuse and the two DC contactors must be replaced at the same time.

5.2 Electrical Connection Overview

The wiring diagram of the ESS is shown below:

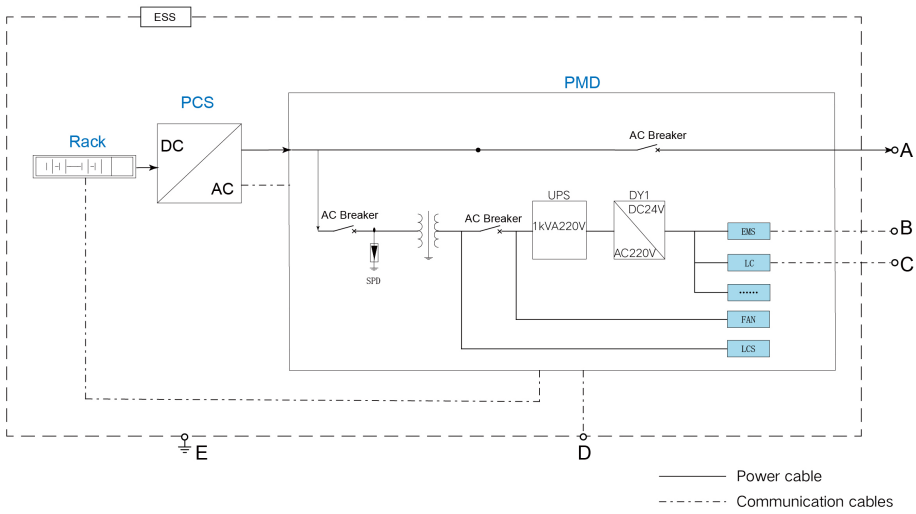


figure 5-1 Wiring Diagram

table 5-1 Interface Description

No.	Name	*Recommended cable specifications
A	AC output port	3×95mm²/copper wire 3×150mm²/aluminum wire
B	**EMS communication interface (connection port 2)	2×0.5mm² shielded twisted-pair cable
C	LC communication interface (connection port 1)	2×0.5mm² shielded twisted-pair cable
D	Ethernet communication port	CAT5A network cable
E	Grounding point	70mm²–95mm² yellow-green cable or grounding flat steel

*The above cables are not included in the scope of delivery and should be prepared separately.

**The EMS is optional.

⚠ WARNING

- **Electrical connections must all be performed in strict accordance with the wiring diagram.**
- **Electrical connections must all be performed when the equipment is completely voltage-free.**

⚠ WARNING

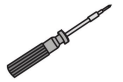
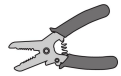
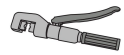
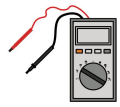
Operations related to the electrical connection must only be performed by qualified electrical engineers, all in compliance with the "Safety Precautions" specified in this manual. SUNGROW shall not be held liable for any personal injury or property damage arising from failure to follow the safety instructions.

NOTICE

- **The installation scheme of the ESS must conform to the applicable standards or regulations in the country/region where the project is located.**
- **Failing to follow the relevant installation requirements in this manual may result in equipment or system failure, and the damage caused therefrom will not be covered by warranty.**

5.3 Preparation Before Wiring

5.3.1 Prepare Installation Tools

Item	Name and Graphics		
Installation tool	 Torque screwdriver	 Wire stripper	 Hydraulic pliers
	 Heat gun	 Multimeter	 Screwdriver
	 Torque wrench		
Protective tools	 Safety gloves	 Goggles	 Safety shoes
	 Protective clothing		

5.3.2 Open Cabinet Door

Open the cabinet door before wiring.

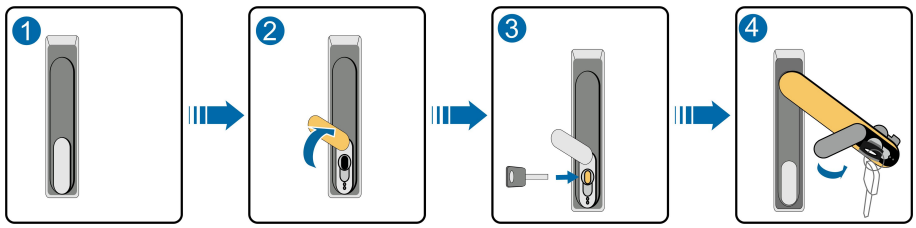


figure 5-2 Open the Front Door

Step	Description
1	Door locked
2	Move the cover above the lock hole
3	Insert the door key and turn it clockwise
4	Rotate the handle clockwise to the position shown in the figure to open the front door

5.3.3 Prepare Cables

The cables must meet the following requirements:

- The current carrying capacity of the cable meets requirements. Factors affecting the current carrying capacity of a conductor include but are not limited to:
  - Environmental conditions;
  - Type of the insulation material of the conductor;
  - Cabling method;
  - Material and cross-sectional area of the cable.
- Select cables with a proper diameter according to the maximum load, and the cables should be long enough.
- All DC input cables must be of the same specifications and materials.
- AC output cables of three phases must be of the same specifications and materials.
- Only flame retardant cables can be used.

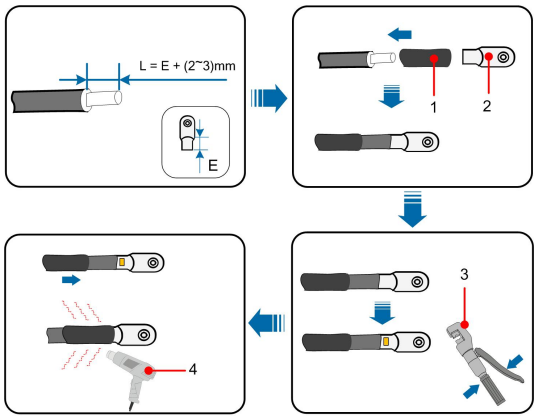
NOTICE

- **The cables used should comply with requirements of local laws and regulations.**
- **The cable color in figures in this manual is for reference only. Please select cables according to local standards.**

Crimp terminal

Crimp OT/DT terminals

Follow the steps shown below to crimp terminal.



No.	Description	No.	Description
1	Heat shrink tubing	2	OT/DT terminal
3	Hydraulic pliers	4	Heat gun

5.3.4 Copper Wire Connection

When copper cables are selected, the connection sequence of wiring parts is shown in the following figure.

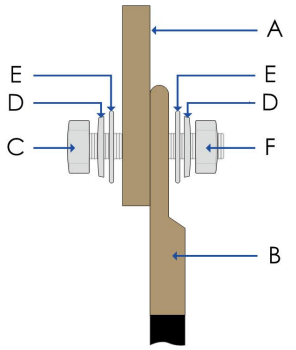


figure 5-3 Copper cable terminal connection sequence

No.	Name	No.	Name
A	Copper bus bar	D	Spring washer
B	Copper connection terminal	E	Flat washer
C	Bolt	F	Nut

NOTICE

Bolt fastening should be firm and reliable, and the exposed wire buckle should not be less than 2 buckles.

5.3.5 Aluminum Wire Connection

When the aluminum wires are selected, a copper-to-aluminum adapter terminal is needed as shown below:

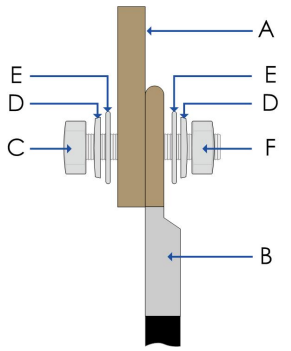


figure 5-4 Copper-to-aluminum adapter terminal connection

No.	Name	No.	Name
A	Copper bus	D	Spring washer
B	copper-toaluminum adapter terminal	E	Flat washer
C	Bolt	F	Nut

NOTICE

Bolt fastening should be firm and reliable, and the exposed wire buckle should not be less than 2 buckles.

5.3.6 Cable Inlet Design

Cables connecting the external devices to the ESS can be led through the cable inlet at the bottom of the ESS.

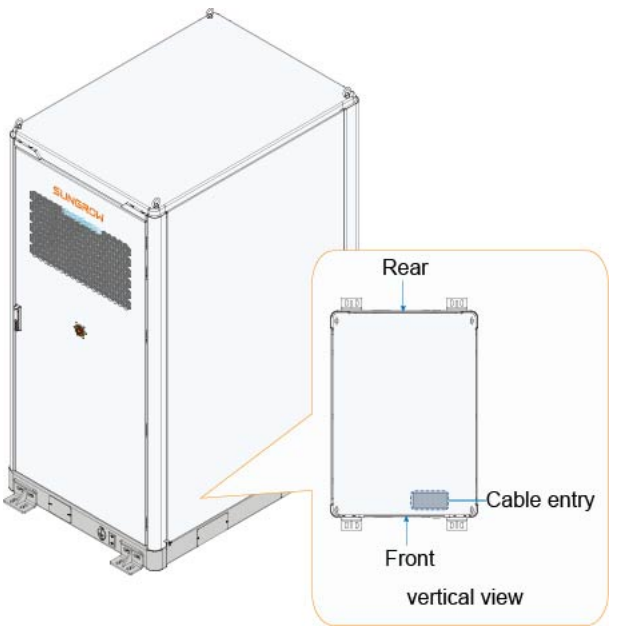


figure 5-5 Cable Inlet

5.4 Ground Connection

NOTICE

Grounding must be completed by strictly following the applicable local standards and regulations.

Overview

Grounding can be made in the following two ways: welding a grounding flat steel, or connecting a grounding cable. For the location of the grounding point, see "**ESS External Design**".

Grounding Flat Steel (Recommended)

Remove the protective tape from the grounding point and weld the hot-dip galvanized flat steel to the grounding point (the area where the flat steel and the ESS are joined together should be 40mm x 70mm). Spray paint the whole fixing area after completing welding.

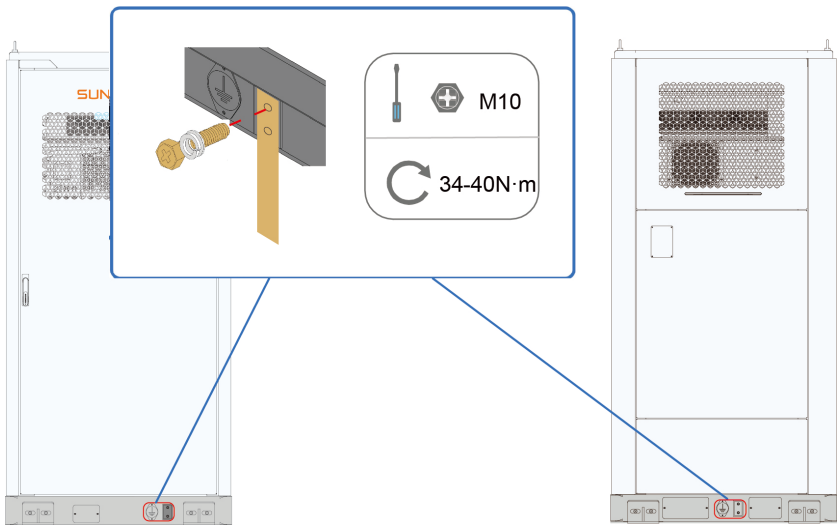


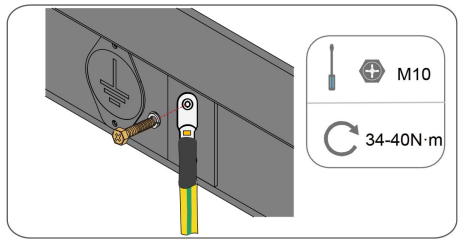
figure 5-6 ESS Grounding Diagram

*The figure is for reference only and the actual product shall prevail.

Grounding Cable

Use a 70 mm²–95 mm² copper grounding cable to connect the target grounding point to the grounding point on the ESS properly and reliably (the grounding point is covered with protective tape upon delivery, which should be removed before wiring).

Crimp the DT terminal. For details, see "5.3.3 Prepare Cables". Secure the DT terminal to the wiring hole with an M10 bolt at a tightening torque of 34–40N.m.



*The figure is for reference only and the actual product shall prevail.

Carry out external ground connection in compliance with the actual on-site conditions and the instructions by the plant staff.

Measure the ground resistance after completing the grounding. Make sure the resistance does not exceed 4Ω.

The specific ground resistance should comply with the applicable national/local standards and regulations.

5.5 AC Connection

5.5.1 Safety Precautions

⚠ WARNING

Accidental touching of live terminals can cause fatal electric shock!

- **Ensure that the AC/DC switches of the PCS are open, and that the wiring terminals are dead.**
- **Connecting to the power grid must be approved by the relevant department and comply with all power-related safety instructions and specifications.**

⚠ WARNING

- **When connecting to the AC grid, disconnect the upstream AC side circuit breaker to ensure that there is no voltage at the contact terminals.**
- **Connect to the grid only if approved by the utility grid and all relevant safety instructions are followed.**
- **The AC output is not grounded inside the device.**
- **The DC and AC circuits are isolated from the enclosure. If required by the relevant national electrical codes, the installer is required to connect the system.**

5.5.2 AC Output Wiring

Step 1 Turn off the upstream AC circuit breaker and measure with a multimeter to ensure no voltage is present at the terminals.

Step 2 Lead the cable to the AC wiring area inside the cabinet through the cable inlet.

Step 3 Make sure the AC cables are connected properly in the correct positions.

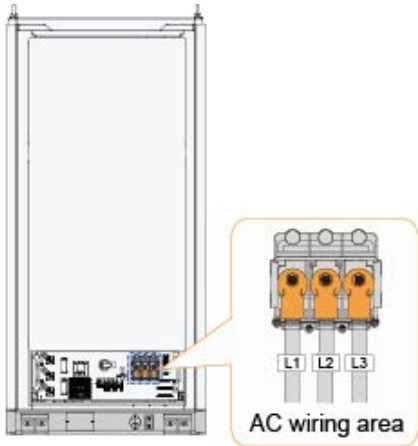


figure 5-7 AC Wiring Area

Step 4 Strip the protective layer of the cables using a wire stripper to expose the copper cores.

Step 5 Crimp the OT terminals. For details, see "5.3.3 Prepare Cables".

Step 6 Secure the OT terminals to the wiring holes with M12 bolts at a tightening torque of 40 N·m (for detailed wiring instructions, please refer to "5.3.4 Copper Wire Connection" and "5.3.5 Aluminum Wire Connection").

Step 7 Pull the cables back slightly after wiring to ensure the cables are long enough.

Step 8 Close the protective cover for terminals, fasten the protective buckles on both sides, and tighten the four screws.

NOTICE

- **Perform wiring in strict accordance with the correct phase sequence.**

- - End

5.6 Auxiliary Power Supply Wiring

The system supplies power to liquid cooling units, 24Vdc device, fans, and other devices inside the cabinet through auxiliary external power supply or auxiliary internal power supply. Auxiliary internal power supply is used for the system by default.

Power Supply Mode Setting

System auxiliary power supply is divided into internal power supply and external power supply:

- When the system adopts external power supply, the connection port is located at the auxiliary power connection port on the power distribution box in the ESS cabinet;
- When the system adopts internal power supply, the connection port is located at the XK4 terminal in the power distribution box in the ESS cabinet.

Auxiliary external power supply wiring steps

Step 1 Confirm that the circuit breakers of the upstream and downstream equipment are all open.

Step 2 Pass the cable through the cable inlet and outlet into the ESS.

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

table 5-2 Port definition

Mode	Port	* Recommended cable specification
400Vac external power supply	Auxiliary power supply L1	4mm^2
	Auxiliary power supply L2	
	Auxiliary power supply L3	

*The cable specifications are recommended. You may make adjustments based on actual needs.

Step 4 Perform wiring according to the port identification on the cabinet and the above port definitions. After the wiring is completed, the terminals need to be tightened. The tightening torque is: 5 N·m.

- - End

•

5.7 Communication Wiring

External Ethernet communication interface, LC communication interface (connection port 1), and EMS communication interface (connection port 2) are provided inside the ESS cabinet.

5.7.1 Ethernet Communication

The location of the Ethernet communication ports is shown in the figure below.

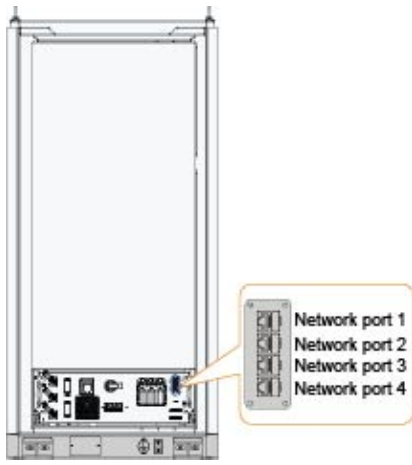


figure 5-8 Communication Interface

table 5-3 Interface Description

Name	Description
Network port 1	Connected to PCS
Network port 2	Connected for inter-cabinet networking
Network port 3	Connected for inter-cabinet networking
Network port 4	Reserved for 0.25C system networking

5.7.2 EMS/LC Communication Wiring

Port 1 and Port 2 on the distribution box hold the power supply and communication connection terminals for LC and EMS respectively.

The positions of the LC communication interface (port 1) and EMS communication interface (port 2) are shown in the figure below.

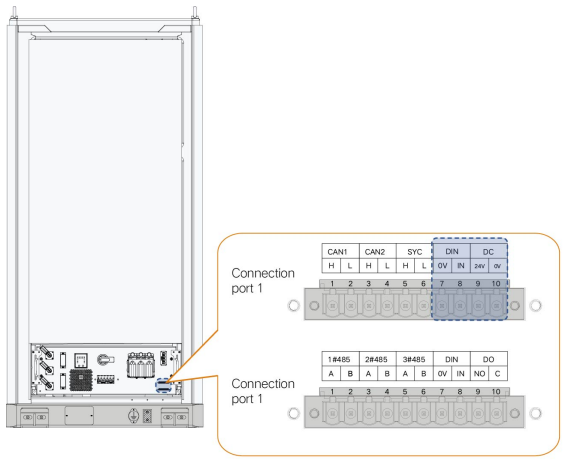


figure 5-9 Communication Interface

- EMS is optional. Port 2 is invalid if the equipment does not have an EMS.
- Positions 7–10 in Port 1 (marked blue in the figure) are optional.

5.8 Post-wiring Operation

Inspect the wirings thoroughly and carefully after all electrical connections have been completed. In addition, perform the following operations:

- Confirm that there is no obstruction or blockage by foreign objects at the air inlet and outlet.
- Seal off the cable inlet and outlet of the ESS cabinet, by filling the gap around them with fire-/water-proof materials.

WARNING

- **Moisture may get in if the product is not properly sealed.**
- **Rodents may get in if the product is not properly sealed.**

Lock the cabinet door

Step 1 Mount back the protective cover for the wiring area, by completing the steps for removal (see "Open Cabinet Door") in reverse.

Step 2 Lock the cabinet door and pull out the key.

- - End

NOTICE

After closing the cabinet door, make sure the sealing strip around the door does not curl.

6 Battery Connection

6.1 Precautions

Always follow the safety instructions in this manual. In order to avoid personal injury and property damage that may occur during installation or operation, and extend the service life of this product, please carefully read all safety instructions.

Improper or incorrect use may result in:

- A threat to the life and personal safety of the operator or third parties;
- Damage to the energy storage system or other property of the operator or third party.

- The safety precautions in this manual do not cover all specifications to be followed, and all operations should be performed based on the site conditions.
- SUNGROW shall not be liable for any loss arising from failure to follow the safety precautions in the manual.

⚠ WARNING

- **While installing the device with hazardous voltage, follow relevant regulations and local installation safety guidelines.**
- **Please observe the regulations on the correct use of tools and personal protective equipment.**
- **All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.**
- **Tools with an insulating protective coating must be used.**

- Connecting cables should meet the voltage and current requirements.
- All connectors must be safe and reliable to avoid loosening or virtual contact. They must be corrosion-resistant, wear-resistant and shock-proof.
- All connections must comply with the requirements of relevant national standards to prevent arc discharge in any form.
- The connections of internal batteries must be equipped with anti-vibration and antiloosening devices. Temperature, voltage and current sensors must be connected safely and reliably, to prevent loosening, ageing and extrusion. All sensor cables must be free of metal exposure.
- Any type of short circuit should be prevented in the connection process.
- Operators must use this product with personal protective equipment.

- All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.
- Key connections must be correct, reliable (without loosening) and in good contact, without short-circuits.
- All the finished connections must be measured and confirmed one by one.
- All connections must not be in contact with the casing or other components or shortcircuited.
- If there are other uncertain factors, please consult the after-sales technicians of SUNGROW before any operation.

6.2 Battery Wiring

Tools

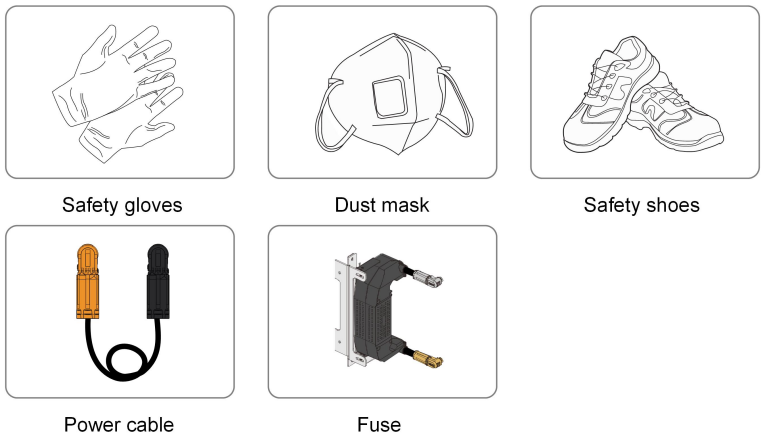


figure 6-1 Installation Tools

Step 1 Before connecting the power cable, put on insulated shoes and safety gloves. Before connecting the power cable between PACKs, disconnect the wiring between the PACK and the PCS first.

Step 2 Install the fuse. Open the cabinet door, and remove the sponge separators that hold the fuse plugs.

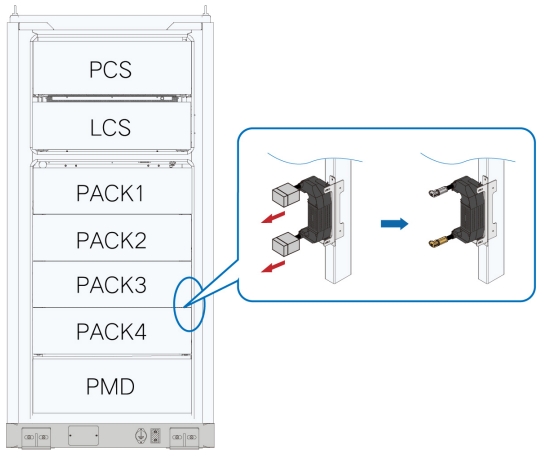


figure 6-2 Position of Fuse

Step 3 Insert the plugs that come with the fuse into the PACK bases properly.

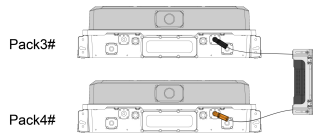


figure 6-3 Insert Fuse Plugs into PACK Bases

WARNING

When the aviation plug is connected in place, you will hear a "click". Please make sure the connection is secure.

- Insert the positive aviation plug into the positive on the PACK base, and the negative plug into the negative on the base. Orange indicates positive, and black indicates negative. When the aviation plug is connected in place, you will hear a "click".
- When connecting the power cables, you can adjust the position of the fuse properly.

Step 4 Connect the power cables between the PCAKs. The positive connector of the power cable between the PACKs has been secured on the RACK, and the negative connector is fixed on the side bracket with the quick-connect clip and cable tie.

⚠ WARNING

When the aviation plug is connected in place, you will hear a "click". Please make sure the connection is secure.

NOTICE

When connecting the power cable between the PACKs, take down the negative connector of the power cable from the quick-connect clip on the side bracket, and then insert it into the negative on the base.

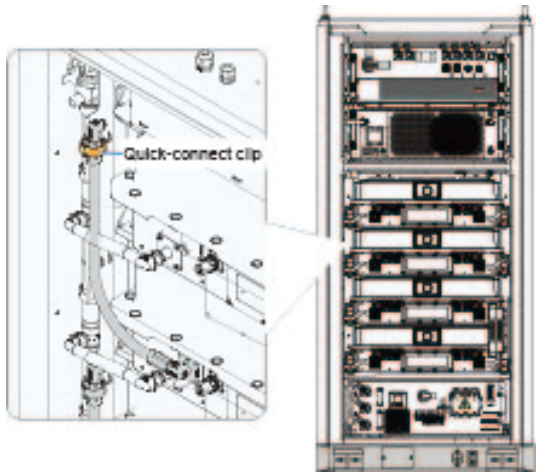


figure 6-4 Quick-connect Clip

1 Connect the BAT- of Pack1# to the BAT+ of Pack2#;

2 Connect the BAT- of Pack2# to the BAT+ of Pack3#.

Step 5 Connect the power cable between the PACK and the PCS:

1 Connect the BAT+ of Pack1# to the BAT+ of PCS;

2 Connect the BAT- of Pack4# to the BAT- of PCS.

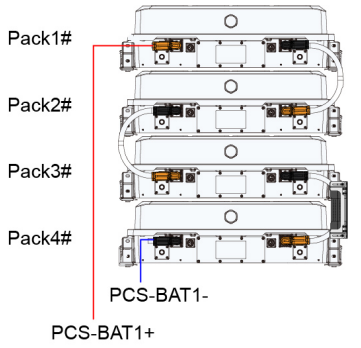


figure 6-5 PACK Wiring Diagram

WARNING

When the aviation plug is connected in place, you will hear a "click". Please make sure the connection is secure.

- - End

7 Powering up and Shutdown

7.1 Powering up

⚠ WARNING

- **The equipment can only be put into operation after confirmation by a professional and approval of the local energy department.**

⚠ WARNING

- **For equipment that has a long shutdown time, inspect it thoroughly and carefully and make sure all the indicators meet the relevant requirements before powering up.**

7.1.1 Inspection Before Powering up

Before powering up the equipment, check the following items carefully.

- Check whether the wiring is correct.
- Check whether the protective covers inside the equipment are installed firmly.
- Check whether the emergency stop button is released.
- Check and ensure that there is no grounding fault.
- Check whether the AC and DC voltages meet startup conditions and ensure that there is no over-voltage with a multimeter.
- Check and ensure that no tools or components are left inside the equipment.
- Check all air inlets and outlets for blockage.
- If the equipment has been stored for more than six months, the top radiator fan should be checked for proper rotation, noise or stalling before powering up.

7.1.2 Powering Up Steps

The equipment must be checked thoroughly and carefully to ensure all indexes are acceptable before power on.

- Power and communication wiring of the ESS has been completed.
- Please make sure the outdoor temperature is -30 ℃ to 50 ℃.

Power-on operation at a temperature lower than -30 ℃ is not recommended. If the temperature is too low, the system will heat the battery for 24 hours or more, during which time, the system cannot operate normally.

Step 1 PCS: Rotate the handle of DC load switches of each PCS to "ON", and ensure that the emergency stop button on the cabinet is in reset status.

Step 2 Close QF1 (AC MAIN SWITCH) on the panel, and the AC side of the system is powered on.

Step 3 Close Q1 (AC AUX SWITCH) on the panel, and the auxiliary power supply is powered on.

Step 4 Close Q2 (UPS SWITCH) on the panel, press the startup button on the UPS, and the auxiliary distribution and power supply of the system is completed (switches, LC, fans and other equipment are powered on).

Step 5 Start up the system through the software.

NOTICE

If the battery cabinet is equipped with a liquid cooling unit, check the status of the circuit breaker in the liquid cooling unit, and close the circuit breaker if it is not closed.

- - End

7.2 Shutdown

7.2.1 Planned Powering Down

Planned powering down is the planned outage state of facilities due to the needs of overhaul, test and maintenance.

Stop the system through the software, and disconnect the battery relay (In emergencies, press the emergency stop button on the cabinet).

Step 1 Power-down preparations: Stop the system through the software (In emergencies, press the emergency stop button on the cabinet).

Step 2 Turn off the UPS and disconnect Q2 (UPS SWITCH) on the panel.

Step 3 Disconnect Q1 (AC AUX SWITCH) on the panel.

Step 4 Disconnect QF1 (AC MAIN SWITCH) on the panel.

Step 5 Rotate the handle of DC load switches of each PCS to "OFF".

DANGER

Before operating the AC terminal, be sure to disconnect the upper switch of the energy storage battery cabinet.

- - End

Test the electricity after the system discharges completely

7.2.2 Emergency Shutdown

Contact the local fire department in case of an emergency.

8 Fire Suppression

- The equipment has an internal automatic fire suppression system. Do not flip the fire suppression switch unless an emergency occurs.

8.1 General Rules

Please comply with the fire laws and regulations of the country/region where the project is located.
Perform regular inspection and maintenance on the fire suppression system regularly to ensure it can function properly.

8.2 Fire Suppression System

The fire suppression system (FSS) is set inside the ESS cabinet. Each cabinet has a FSS that can function independently, without interfering with each other.
The FSS of the ESS contains a fire detection and alarm system, a fire extinguishing system, and a backup protection system.

NOTICE

To ensure its accuracy, the detector should be tested for functionality and calibrated every six months. If the detector fails the test, investigate the cause, and calibrate or replace the detector if necessary.

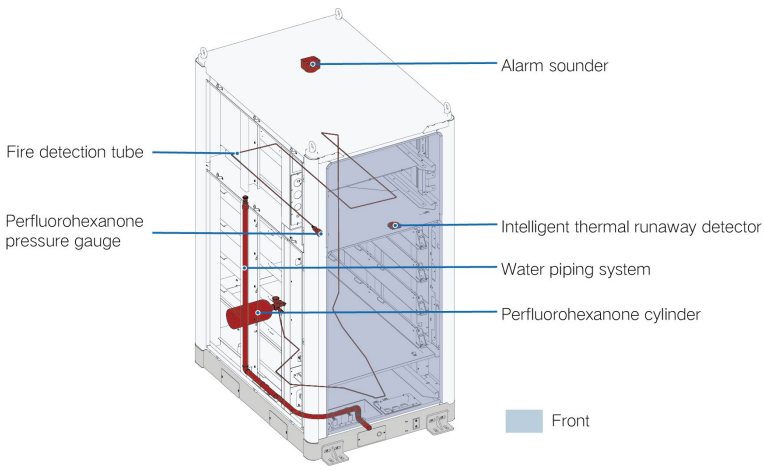


figure 8-1 Fire Suppression System

8.3 Detection and Alarm System

The detection and alarm system is able to discover fires early in their development and thus helps to reduce the risk of fires to the minimum.

The system contains an intelligent thermal runaway detector and an alarm sounder.

The intelligent thermal runaway detector is capable of detecting the change of temperature and gas concentration. When the temperature or concentration of flammable gas inside the ESS cabinet reaches the set threshold, it will send an alarm signal to LC. The LC will then shut down the corresponding ESS and activate the alarm sounder.

8.4 Fire Extinguishing System

The FSS of the ESS is designed with a detection-tube-type perfluorohexanone fire extinguisher.

Once the temperature inside the ESS cabinet reaches 170°C, the fire detection tube bursts, and the extinguishant released by the perfluorohexanone fire extinguisher will go into the cabinet through the rupture to extinguish the fire.

The same time the extinguishant is released, the pressure switch will feed back a relevant signal to the LC. The LC will then shut down the ESS and activate the alarm sounder.

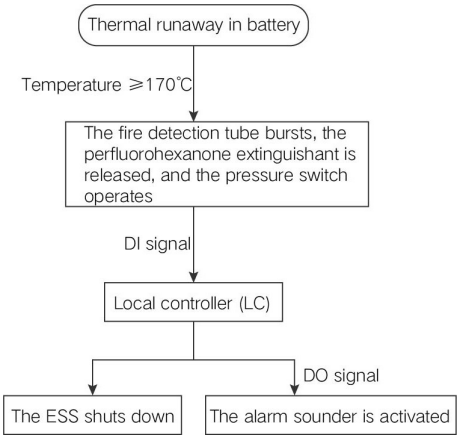


figure 8-2

8.5 Backup Protection System

In addition to the fire extinguishing system, the ESS cabinet also has a backup protection system, in case the fire keeps spreading even after the fire extinguishing system has acted.

⚠ WARNING

Users need to prepare a fire pipe separately and connect it properly to the piping system inside the cabinet. Otherwise, the backup protection system cannot function properly.

The FSS piping system has been integrated into the ESS cabinet before it leaves the factory. The backup protection system will not engage in the fire-fighting linkage control. You need to turn on the water pipe switch manually.

9 Troubleshooting

In case of anything abnormal with the ESS, it is suggested to perform troubleshooting by referring to the troubleshooting methods mentioned in the LC200 user manual first.
For more information, please refer to the below documents:

Document	QR Code
LC200 User Manual	

If the problem persists or there are any other questions, please contact SUNGROW. It would be helpful if you could provide the below information:

- Model and S/N of the ESS and its internal device;
- Fault information and a brief description of the fault;
- A photo of the fault, if possible.

10 Routine Maintenance

10.1 Precautions Before Maintenance

WARNING

- **Do not open the door to maintain the device in rainy, humid or windy days. SUNGROW shall not be held liable for any damage caused by violation of the warning.**
- **Avoid opening the container door when the humidity is high in rain, snow or fog, and make sure that the seals around the container door do not curl when the door is closed.**

In fair weather, it is recommended to open the container door to dehumidify the equipment.

WARNING

- **To avoid electric shock, do not perform any other maintenance operations beyond this manual.**
- **If necessary, contact SUNGROW customer service for maintenance.**

10.2 Maintenance Item and Interval

10.2.1 First Grid Connection

Inspection Item	Inspection Method
Electrical connection	Check the following items. If any item does not meet the requirements, take corrective measures immediately: • Check the materials and specifications of the input and output cables. • Check the materials, specifications, and orientations of the wiring terminals. • Check the sizes of bolts and the orientation of their washers.

10.2.2 Once a Month

Inspection Item	Inspection Method
ESS cabinet	• Check the cabinet for oxidation and rust. • Check the cabinet and its internal components for deformation and damage. • Check whether there are flammables on the top of the cabinet. • Check whether the welding points between the cabinet and the foundation steel plate are firm and secure, and whether there is rust or corrosion. • Check whether the lock of the cabinet door can operate smoothly and properly, • Check whether the sealing strip is fixed properly. • Check whether there are foreign matters, fallen screws, dust, dirt, or condensation inside the cabinet.
Air inlet and outlet	Check whether the air inlet and outlet of the ESS cabinet are blocked.
Cables	Check the cables for damages.
System status	• Check whether the internal devices make abnormal noises during operation. • Check whether the temperature inside the ESS cabinet is too high. • Check whether the humidity inside the ESS cabinet is within the normal range.

10.2.3 Once Every Six Months

Inspection Item	Inspection Method
Safety function	• Check whether the emergency stop button can function properly. • Simulate a shutdown. • Check whether the warning signs and other marks on the ESS are all legible and free from dirt. Replace them in time if the signs or marks are indistinct or damaged.
Internal components	• Check the cleanliness of the circuit board and other elements and components. • Check whether the fans can operate normally and whether there is abnormal noise during operation. • Check the temperature of the heat sink and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary. • Replace the air filter screen if necessary.
Component maintenance	• Inspect all metal components for rust and corrosion regularly (once every six months). • Perform annual inspection of contactors (auxiliary switches and miniature circuit breakers) to ensure they can operate properly. • Check the operation parameters (especially voltage and insulation). • Check whether there is a UPS that is not running. A UPS in rest needs to be charged once every six months.

10.2.4 Once a Year

Inspection Item	Inspection Method
Grounding of the cable shielding layer	Check whether the cable shielding layer is in good contact with the insulating bushing, and whether the grounding copper bar is firmly fixed.
SPD and fuse	Check whether the SPD and fuse are firmly secured.

Inspection Item	Inspection Method
Wiring and cable arrangement	• Check whether the cables are laid and arranged properly, and whether there is a short circuit or other abnormal symptoms. In case of anything abnormal, take corrective measures immediately. • Check whether the cable inlet and outlet holes of the ESS cabinet are all sealed off properly. • Check if the power cables are loose. If so, fasten the cable at the specified torque. • Check the power cables and control cables for damage. In particular, check the area where the cable comes in contact with the metal surface for signs of cuts. • Check whether the insulating tapes wrapped around the power cable wiring terminals have peeled off.
Grounding and equipotential bonding	• Check whether the ground connection has been completed properly. Make sure the ground resistance does not exceed 4Ω. • Check whether the equipotential bonding inside the ESS has been properly completed.

10.3 Liquid Cooling System Maintenance

The recommended maintenance intervals are listed below, which however may need to be adjusted based on the installation environments of the product.

The maintenance interval of the product is subject to factors like plant size, installation position, and on-site environment. For the equipment working in sandy or dusty environments, it is necessary to shorten the interval and increase the frequency of maintenance.

Item	Content	Inspection Method	Maintenance tools
Fans	Check whether the fan blades can rotate properly and are free of damage. If not, replace the fan.	1. The fan blade rotates smoothly without making abnormal noise; 2. There is no damage to the fan blade. Note: This inspection should be performed at least once every six months. Damage inspection is not mandatory.	Screwdriver with long handle
Water pump	1. Check whether an area of over 5% of the air intake hole for heat dissipation on the water pump is blocked. If so, clear the blockage with a brush; 2. Inspect the pump body (not the pipe joining points) visually, and see if there is visible dripping (except condensation). If so, replace the sealing ring of the pump.	1. The water pump operates smoothly without making abnormal noise; 2. There is no visible dripping on the pump body (except condensation).	Brush
Water system	Check whether the HMI of the liquid cooling unit reports an alarm.	Check if the unit reports a "water level too low" alarm. Refill coolant into the water tank if the alarm is reported.	Slotted screwdriver, Phillips screwdriver, water pump, water pipe, clamp

10.4 Container Maintenance

10.4.1 Cleaning Container Appearance

Clean the top and then the sides. Wash it directly, or wash and flush with water simultaneously.

Check the container appearance:

Case 1：Dirt on surface caused by water spots and dusts can be cleaned.

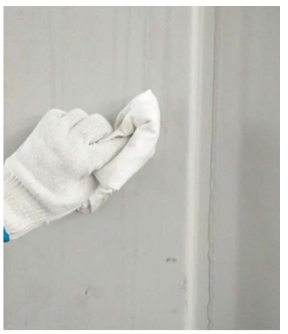
Case 2：Surface dirt and damaged finish, which cannot be cleaned.

Case 3：Primer is damaged, and the base material is exposed.

Maintenance Steps for Case 1:

Material:

- Cleaning cloth
- Water
- Alcohol or other non-corrosive detergent

Graphics	Description
	1. Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on surface. 2. If the dirt cannot be cleaned with water, scrub with 97% alcohol till the surface is acceptable. (Or try to use non-corrosive detergents that are generally used locally)

Maintenance Steps for Case 2:

Material:

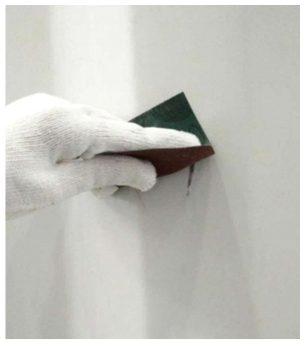
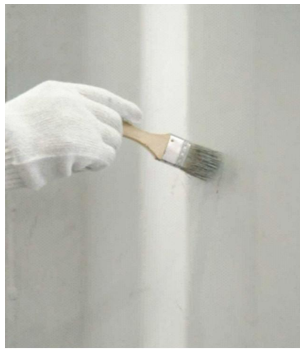
- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Brush
- Paint

Graphics	Description
	1. Polish the paint surface with blistering or scratches with an abrasive paper for a smooth surface.
	2. Wet the cleaning cloth with water or 97% alcohol, and scrub the damaged parts to remove surface stains.
	3. Perform paint repair for the scratched parts with a soft brush after the surface is dried; brush the paint as uniform as possible.

Maintenance Steps for Case 3:

Material:

- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Zinc primer
- Brush
- Paint

Graphics	Description
	1. Polish the damaged parts with an abrasive paper to remove rust and other burrs for a smooth surface
	2. Wet the cleaning cloth with water or 97% alcohol, and scrub the damaged parts to remove surface stains and dust.
	3. Spray the parts with base material exposed with zinc primer for protection after drying of the surface. Ensure to spray to cover the bare base material completely.
	4. Perform paint repair for the damaged parts with soft brush after the primer is dried, and brush the paint uniformly.

Check whether the protective paint sprayed on casing of the product is fallen off or peeled off; if so, repair it timely.

Spray a special protective paint to the exterior of the product every 3 to 5 years.

10.4.2 Checking Door Locks and Hinges

Check whether the door locks and hinges of the container can be used normally after cleaning. Lubricate the door lock holes and hinges properly when necessary.

10.4.3 Checking Sealing Strips

If the sealing strip is in good condition, it can effectively prevent water seepage inside the container. Therefore, carefully check the sealing strip and replace it immediately if there is any damage.

10.5 Battery Maintenance

10.5.1 Regular Maintenance and Maintenance Cycle

Below is the recommended maintenance cycle. The actual maintenance cycle should be adjusted according to the specific installation environment of this product.

The power station scale, installation location and on-site environment affect the maintenance cycle of this product. In sandy or dusty environments, it is necessary to shorten the maintenance cycle and increase the frequency of maintenance.

⚠ WARNING

Do not leave the product in a low voltage or low SOC condition for a long period of time. Loss of capacity due to the following conditions is not covered by the warranty.

- **Battery discharge cell voltage is below 2.7V for 120 consecutive hours.**
- **Any cell cluster SOC is 0% for 120 consecutive hours.**
- **Battery discharge cell voltage ≤2V.**

NOTICE

- **In order to avoid triggering the warranty expiration condition, when the "Cell Under-voltage Fault" is triggered, the user must contact the local team of Sungrow within 24 hours and follow the requirements of Sungrow to carry out the next operation.**
- **If the system is configured with the "Active power up" function, Sungrow will enable this function by default when the device is shipped from the factory. When the SOC is too low, the system will charge the battery with a low current until the SOC reaches a safe threshold (the safe threshold can be set) automatically. In order to minimize the risk of under-voltage of the battery that may void the warranty, Sungrow recommends that users do not turn off the "Active power up" function.**

NOTICE

- **During maintenance or shutdown, if the SOC of any battery cluster is 0%, the SOC needs to be charged to 15% and above within 120 hours.**
- **If the SOC of any battery cluster is 0% during operation, the SOC needs to be charged to 5% and above within 2 hours. Or when the SOC reaches 0%, a command can be issued by the host computer EMS to change the system mode to recharge mode.**

Maintenance performed once every two years

Inspection item	Inspection method
Battery cluster status and cleanliness	Check the following items. In case of nonconformity, take corrective actions immediately: • Check the battery cluster and internal devices for damage or deformation. • Check the internal devices for abnormal noise during operation. • Check whether the temperature inside the battery cluster is too high. • Check whether the internal humidity and dust of the battery cluster are within the normal ranges. If necessary, clean the battery cluster. • Check whether the air inlet and outlet of the battery cluster are blocked.
Warning sign	Check whether the warning sign and label are legible and dirty. If necessary, replace them.
Wire and cable	Check whether the switch gear and battery module are connected correctly and whether the battery modules are also connected correctly.
Corrosion	Check the battery cluster for internal oxidation or rust.

Maintenance performed once a year

Inspection item	Inspection method
Switch gear and battery module box	Check the following items. In case of nonconformity, take corrective actions immediately: • Check whether there are flammable objects at the top of the battery cluster. • Check whether the battery cluster is secured at the fixing point on the foundation plate and whether there is rust. • Check the box for damage, paint peeling, oxidation, etc. • Check whether there are foreign objects, dust, dirt and condensate inside the battery cluster.
Wire and cable layout	The inspection must not be carried out until all internal devices of the battery cluster are powered off! In case of nonconformity found in inspection, take corrective actions immediately: • Check the cable layout for short circuit and compliance with the specifications. If case of any abnormality, take corrective actions immediately. • Check whether all wire inlets and outlets of the battery cluster are sealed properly. • Check the battery cluster for internal seepage of water. • Check whether the power cables and copper busbars are loose, and tighten them according to the aforesaid torque. • Check the power cable and communication cable for damage, especially cut marks on the surface exposed to the metal surface.
Grounding	Check whether the grounding is correct. The grounding resistance should not be greater than 4Ω.
Fan	• Check the fan for faults (e. g. locked rotor and stalling). • Check the fan for abnormal noise during operation.
Screw	Check whether screws inside the battery cluster fall off or are rusted.

Maintenance performed once every six months

Inspection item	Inspection method
Ambient temperature and humidity inspection	• Check whether the temperature in the ambient temperature record is within the operating range. • Check whether the humidity in the ambient humidity record is within the operating range.
Function inspection	• Check the operating status of the DC contactor: Send the Start/Stop command in the power-off status and check whether the system works properly. • Measure whether the 24V output voltage is within the range in the specification. • Check whether the current, voltage and temperature in the operation record of the battery cluster are within the operating ranges.

10.5.2 Maintenance Precautions

For safe and efficient maintenance of the system, maintenance personnel must carefully read and observe the following safety requirements:

1 Have the electrician certificate issued by the Work Safety Supervision Bureau, and receive professional training before assuming their work.

2 Follow relevant safety precautions, use necessary tools, and wear personal protective equipment.

3 Do not wear metal accessories such as jewelry or watches.

4 Never touch the high-voltage positive and negative electrodes of the energy storage system by both hands at the same time under all circumstances.

5 Prior to the maintenance of the energy storage system, disconnect all high-voltage and low-voltage switches.

6 Do not clean this product directly with water. If necessary, use the vacuum cleaner to clean it.

7 Plug and remove cables in accordance with the specifications, without brute force or violent operation.

8 After maintenance is completed, clean tools and materials in time and check whether there are metal objects left inside or at the top of the product.

9 In case of any doubt on operation and maintenance of this product, contact the Customer Service Center of SUNGROW instead of operation without permission.

10.5.3 Maintenance

1 Operating temperature: The working temperature should be kept between -30℃–50℃. The temperature charging and discharging should be 15℃–30℃ and typically 25℃.

2 The RACK should not be charged or discharged with high magnifying power. The continuous charging and discharging current of a single rack should not exceed the rated current.

3 When the energy storage system is not used in a long time, it should be charged once every six months, until its SOC is 30%–40%.

4 When the system is used after long-term storage, it should be fully charged at least once to restore the best performance of the battery.

5 Regularly check whether the air duct of the cooling system is blocked and clean the system. In particular, clean the air inlet and outlet of the fan and use a vacuum cleaner if necessary, to maintain free air circulation inside the cabinet. Before dust removal, the power supply must be cut off. It is forbidden to rinse the system with water.

6 Regularly check whether the fastening bolts of the high-voltage cables and connecting busbars of the energy storage system are loose, whether the contacts are in good conditions, and whether the terminal surfaces are severely corroded or oxidized.

7 Regularly check the protective covers of high-voltage positive and negative electrodes of the PACK for ageing, damage and missing.

8 Regularly check cables for loosening, ageing, damage and fracture and inspect whether the insulation is in good conditions.

9 Regularly check the battery cabinet for pungent odor and high-voltage connections for burning odor.

10 Regularly check whether the voltage, temperature and other data of the monitoring upper computer are correct and whether there are fault alarms in the alarm column.

11 Regularly check whether the status and alarm indicators of the energy storage system are in good conditions and whether they work properly.

12 Regularly check whether the emergency stop button of the energy storage system can be used, in order to quickly shut down the system in an emergency.

13 Regularly check whether the fire extinguishers are in good conditions and within the validity period.

14 Never use different types of battery modules in series or parallel.

15 PACK A and PACK B are prohibited from replacing each other.

⚠ WARNING

- **The battery is potentially dangerous, so appropriate protective measures must be taken during operation and maintenance!**
- **Incorrect operation may cause severe personal injury and property damage!**
- **Use the appropriate tools and protective equipment during battery operation.**
- **Battery maintenance must be performed by those who have battery expertise and received safety training.**

10.6 Coolant Replacement

Object	Standard	Period	Tools
Coolant	1. There are obvious impurities in antifreeze; 2. Antifreeze is significantly darker in color.	5–6 years	Water pump, hose, hose clamp, slotted screwdriver Note: Please contact Sungrow Customer Service to replace hardware facilities

WARNING

Normally coolant is not a health hazard, excessive exposure may cause irritation to the eyes, skin and breathing.

NOTICE

The coolant in the refill tank must not exceed the "H" line.

Personal protection

Wear personal protective equipment (PPE) when changing coolant. PPE should comply with relevant national standards, including but not limited to the following protective equipment.

Protective parts	Protective equipment
Respiratory protection	Under normal conditions of use, it is generally not necessary to wear respiratory protection equipment. If the engineering control facility does not maintain the air concentration at a level sufficient to protect the health of personnel, choose respiratory protection equipment suitable for the conditions of use and in compliance with relevant legal requirements. If you need to wear a safety filter mask, please choose a suitable mask and filter combination. Choose a filter suitable for a mixture of particulate/organic gas and vapor [boiling point >65 ℃ (149 ℉)].
Hands protection	Use oil-resistant, chemical-resistant protective gloves.
Eyes protection	Please use protective goggles.
Skin and body protection	Use non-permeable protective clothing and safety shoes.

Disposal considerations

Waste types	Disposal measures
Coolant	Discharges are made in accordance with local regulations and are not disposed of haphazardly.
Rubbish remnant	Separate and recycle, and if it meets the relevant regulations, it can be burned or reused.
Containers	Dispose of in accordance with all applicable local and national regulations. Use recovery/recycling where feasible, otherwise incineration is the recommended method of disposal. Empty containers may contain hazardous residues. Do not cut, puncture or weld on or near to the container. Labels should not be removed from containers until they have been cleaned. Contaminated containers must not be treated as household waste. Containers should be cleaned by appropriate methods and then re-used or disposed of by landfill or incineration as appropriate. Do not incinerate closed containers.

Accidental release measures

When a coolant leak occurs, refer to the following measures to deal with it.

- Immediately contact a professional to have uninvolved persons evacuated quickly to safety.
- Cut off the source of the spill as far as possible and prevent it from entering spaces such as sewers, drains and bodies of water.
- When cleaning up spilled liquids, wear protective equipment to protect your body from contact with the spilled or released material.
- Use sand, mud or other materials that can be used as barriers to set up barriers to prevent diffusion. Recover liquid directly or store in absorbent. Clean the contaminated area with detergent, water and a hard broom. Put the collected liquid in a disposable container.

First aid measures

Contact method	Measures
Inhalation	Move to fresh air. If breathing has stopped, give artificial respiration first aid. Seek medical attention.
Skin contact	Take off contaminated clothing. Rinse the skin thoroughly with soap and water. Seek medical attention if skin inflammation or rash occurs.

Contact method	Measures
Eyes contact	Flush eyes with plenty of water for at least 15 minutes. Seek medical attention.
Ingestion	If ingested, but conscious, water or milk to drink and actively seek medical help, do not induce vomiting unless instructed by healthcare patients. If you cannot get help from a doctor, please send the patient and the container and label to the nearest medical emergency center or hospital. Do not give any food to unconscious patients.

10.7 Fire Cylinder Maintenance

10.7.1 Cylinder Pressure Drop Handling

Gas fire extinguishing equipment in the common pressure gauge disk is generally divided into red zone and green zone. The green zone is the normal pressure range, and the red zone is the abnormal pressure range, including low pressure and overpressure, of which low pressure is the most common.

When the pointer is in the low-pressure area, there are two general types:

- Pressure leakage and pressure drop in the storage vessel.
- A pressure leak at the gauge connection resulted in a pressure drop; there was no pressure drop in the storage vessel.

Cylinder pressure drop handling

When the pressure gauge switch is closed, the inflatable head and hexagonal valve seat close fit, at this time the gas inside the cylinder can not be connected with the pressure gauge interface, the pressure value displayed is only the pressure value of the gas stored between the end of the pressure gauge and the inflatable head cavity, not the actual pressure inside the storage vessel. Therefore, the pressure drop in the pressure gauge under the locked state of the pressure gauge switch does not necessarily mean that the pressure drop in the storage vessel.

When the scene found that the pressure gauge drop pressure, first check whether the pressure gauge is tightened, and the pressure gauge and hexagonal nut connection whether there is a gasket (generally white or transparent color), if there is a gasket will be the pressure gauge switch to open (with a wrench stuck in the pressure gauge after the hexagonal nut can be rotated counterclockwise for about a quarter of a turn), at this time to see whether the pressure gauge pointer position is normal. If the pressure value returns to normal, close the pressure gauge switch (tighten the hexagonal nut behind the pressure gauge clockwise).

NOTICE

If you still find that the pressure value is not normal, it may be caused by damage to the pressure gauge or leakage of cylinders, etc., turn off the pressure gauge switch first and notify the equipment manufacturer in time, so that the manufacturer can deal with it as soon as possible to ensure normal operation of the system.

10.7.2 Gas Cylinder Inspection

Inspection Interval

The date to perform the very first inspection of a gas cylinder should be calculated from its date of manufacture. For the seamless steel gas cylinders, welded steel gas cylinders (not including liquefied petroleum gas cylinders and liquefied dimethyl ether cylinders), and seamless aluminum-alloy steel pipes that are filled with other gases, the inspection interval should be 3 years and the service life should be 20 years.

However, perform inspection earlier if there is anything abnormal with the gas cylinder:

- There is severe corrosion or damage to the gas cylinder, or its safety and reliability are doubtful.
- The gas cylinder is about to be put into use again, after it has been stored or held out of service for a period of time longer than one maintenance interval.
- A traffic accident has happened, and it may affect the safety of the vehicle-mounted gas cylinder.
- An earlier inspection is required as per the relevant standards of gas cylinders, or the inspection personnel deems it necessary to perform an inspection in advance.

NOTICE

Non-qualified personnel are not allowed to disassemble the cylinder or it s accessories.

11 Appendix

11.1 Abbreviations

Abbreviation	Definition
B	
BM	Battery Module (or PACK)
BC	Battery Cluster (or RACK)
BMU	Battery Management Unit
BCMU (CMU)	Battery Cluster Management Unit (CMU for short)
BSMU (SMU)	Battery System Management Unit (SMU for short)
BMS	Battery Management System
BSC	Battery System Controller
BCP	Battery Collection Panel. Battery DC inputs are combined into the BCP DC copper bar, and connected to the PCS DC side through the copper bar on the other side of the BCP.
BSP	Battery Power Supply Panel. It is used as an auxiliary power supply for the components inside the battery, such as lighting, FSS, etc.
D	
DC/DC	DC/DC Converter
L	
LC	Local Controller
P	
PCS	Power Conversion System
S	
SCADA	Supervisory Control and Data Acquisition System
S/G	Switch Gear
SOC	State Of Charge
SOH	State Of Health

11.2 Technical Data

Product Model	ST215kWh-100kW-2h	ST225kWh-110kW-2h
Battery Side		
Cell Type	LFP	
System Battery Configuration	240 S1P	256 S1P
Rated Battery Capacity	215kWh	229kWh
Battery Voltage Range	648V–876V	691.2V–934.4V
PCS Side		
Rated Output Power	100kW	110kW
Total Harmonic Distortion (THD)	<3% (at rated power)	
DC Component	<0.5% (at rated power)	
Rated Grid Voltage	380V / 400V	
Grid Voltage Range	323V–418V	340V–440V
Rated Grid Frequency	50Hz	
Grid Frequency Range	45Hz–55Hz	
System Parameters		
*Dimensions (Width * Height * Depth)	1150 * 2450 * 1610 mm	
*Weight	Approx. 2820kg	Approx. 2900kg
Max. Round-trip Efficiency	≥90%	
IP Rating (Battery Compartment)	IP55	
Auxiliary Power Supply	Internal power supply, external power supply	
Corrosion Protection	C3	
Operating Humidity Range	0–95% (no condensation)	
Operating Temperature Range	-30 to 50℃ (derate at >45℃)	
Max. Operating Altitude	3000m	
Cooling Method	Intelligent liquid cooling	

Product Model	ST215kWh-100kW-2h	ST225kWh-110kW-2h
Fire Suppression System	Intelligent thermal runaway detector, alarm sounder, detection-tube-type perfluorohexane fire extinguisher	
Communication	Ethernet	
Communication Protocol	Modbus TCP	
Standard	GB/T36276, GB/T34131, GB/T 34120 GB/T 34133	

*The technical data is for reference only, please refer to the information on the nameplate of the product.

11.3 Tightening Torques

To avoid poor contact caused by the loosening of copper cable lugs due to stress, and to prevent heat or even fire due to increased contact resistance, make sure to tighten the screws on the cable lugs at the recommended torques:

Bolt	Torque(N·m)	Bolt	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

*Torque values listed in the table are intended for the bolt and nut assembly, and do not apply to riveted nuts or riveted screws, etc. The torque to be adopted should depend on the actual situation.

**Secure the cable at a proper point to reduce the stress on the cable lug.

11.4 Quality Assurance

When product faults occur during the warranty period, SUNGROW ENERGY STORAGE TECHNOLOGY CO., LTD.(SUNGROW) will provide free service or replace the product with a new one.

Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, SUNGROW has the right to refuse to honor the quality guarantee.

Conditions

- After replacement, unqualified products shall be processed by SUNGROW.
- The customer shall give SUNGROW a reasonable period to repair the faulty device.

Exclusion of Liability

In the following circumstances, SUNGROW has the right to refuse to honor the quality guarantee:

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in harsh conditions beyond those described in this manual.
- The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from SUNGROW.
- The fault or damage is caused by the use of non-standard or non-SUNGROW components or software.
- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of SUNGROW.

11.5 Contact Information

In case of questions about this product, please contact us.

We need the following information to provide you the best assistance:

- Model of the device
- Serial number of the device
- Fault code/name
- Brief description of the problem

For detailed contact information, please visit: **https://en.sungrowpower.com/contactUS**

SUNGROW

Sungrow Power Supply Co., Ltd.

www.sungrowpower.com

M-D-001005