SUNGROW
Clean power for all

User Manual

Energy Storage System

PowerStack-ST225kWh-110kW-2h-IEC

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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.

Sign	Explanation
	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.
	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

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 (State Of Charge) 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.**

⚠ WARNING

Over or under voltage fault & alarm (detailed information can be found in the Communication protocol > BSC300 Info-3x table > CMU (Battery Cluster Management Unit) fault word and CMU alarm word).

- **Fault: “Cell over voltage fault”, “Cell under voltage fault”, “Total over voltage fault”, “Total under voltage fault”.**
- **Alarm: “Cell over voltage alarm”, “Cell under voltage alarm”, “Total over voltage alarm”, “Total under voltage alarm”.**

End users must assign a high priority to above listed faults and alarms reported by the SUNGROW LC (Local Controller). When an alarm or fault is triggered, the user interface should prominently highlight these issues. Furthermore, end users should promptly contact SUNGROW for timely resolution to prevent battery warranty loss due to over-discharge or overcharge.

NOTICE

- **In order to avoid triggering the warranty expiration condition, when the “Cell Under-voltage Fault” or “Cell Over-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, When the Battery Energy Storage System Container minimum rack SOC reaches the threshold for this function (the threshold can be set from 0 to the lower SOC protection value, and the threshold does not exceed 5% SOC), the system will charge the battery with low power until the SOC reaches a safe threshold (5% SOC) automatically, The recharging power can be set within the range of 100 kW to 150 kW. During Active power up, when the Supervisory Control And Data Acquisition (SCADA) issues a charging instruction, the LC controller will prioritize the SCADA charging instruction. When the SCADA issues a discharging instruction, the LC controller will respond according to the specific system SOC value. SUNGROW will enable this function by default when the device is shipped from the factory, 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

- **If the system will not be in operation for an extended period (7 days or more), it's recommended to increase the SOC lower limit protection value to above 10% SOC. Additionally, it is important to regularly check the system's SOC to avoid the risk of over discharge which will cause warranty expiration.**
- **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 SCADA 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.

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 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.

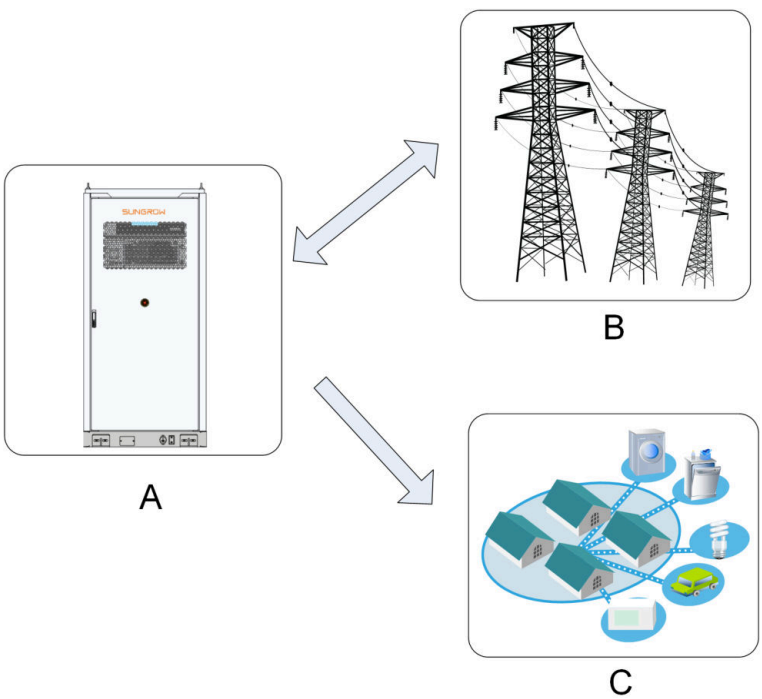


Figure 2-1 Typical Application of the ESS

*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.

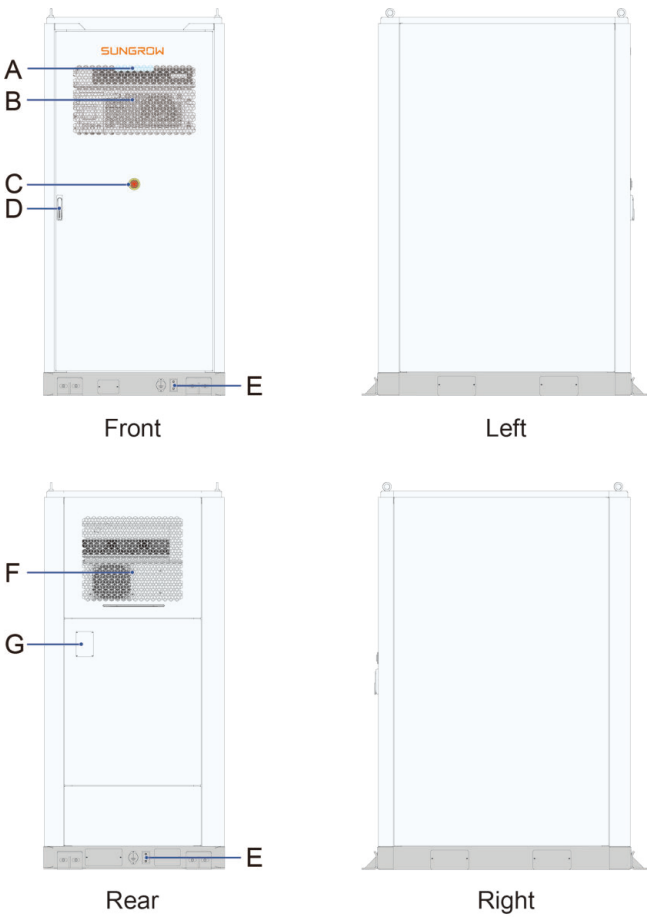


Figure 2-2 External Design

*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.

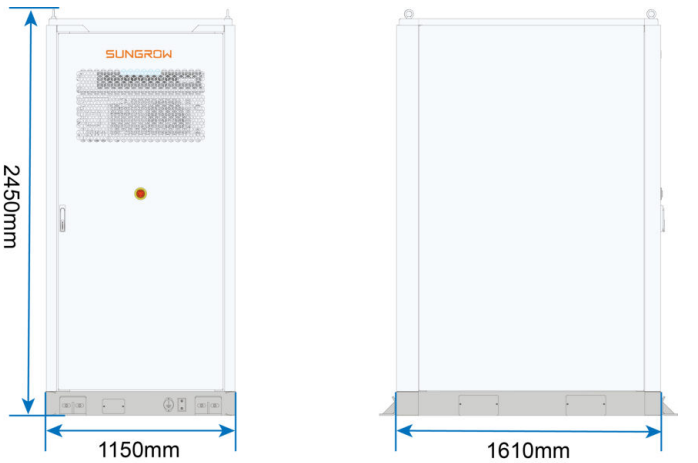


Figure 2-3 Overall Dimensions

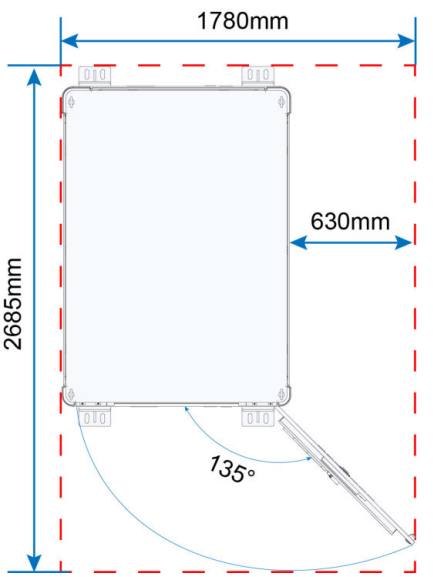


Figure 2-4 Dimensions of ESS with Its Door Fully Opened

*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.

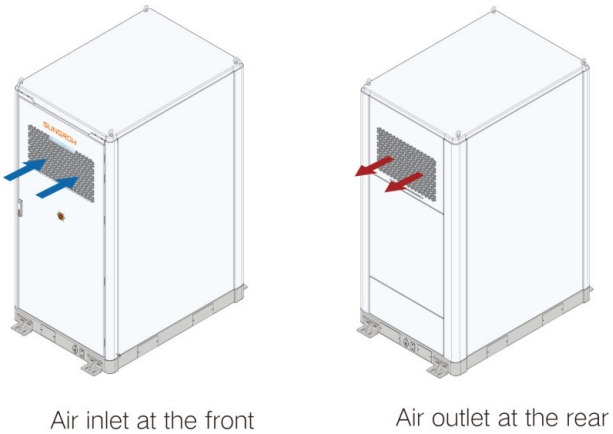


Figure 2-5 Air Inlet and Outlet

*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 below.

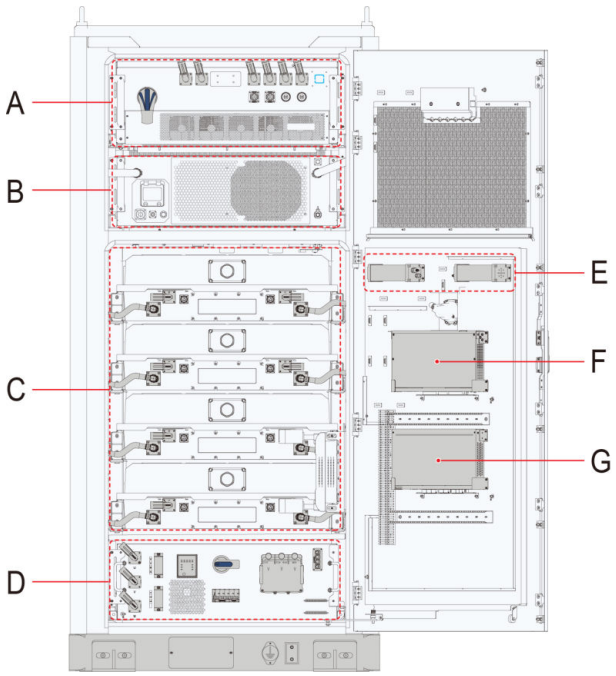


Figure 2-6 Internal Structure of ESS Cabinet

No.	Name
A	PCS (SC110CX)
B	Liquid cooling unit
C	Battery RACK (compartment)
D	Power distribution box
E	Temperature-controlled aerosol
F	LC300
G	EMS300CP (Optional)

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

2.3.2 PCS (SC110CX)

PCS External Design

The external design of the SC110CX Power Conversion System (PCS) is shown in the figure below.

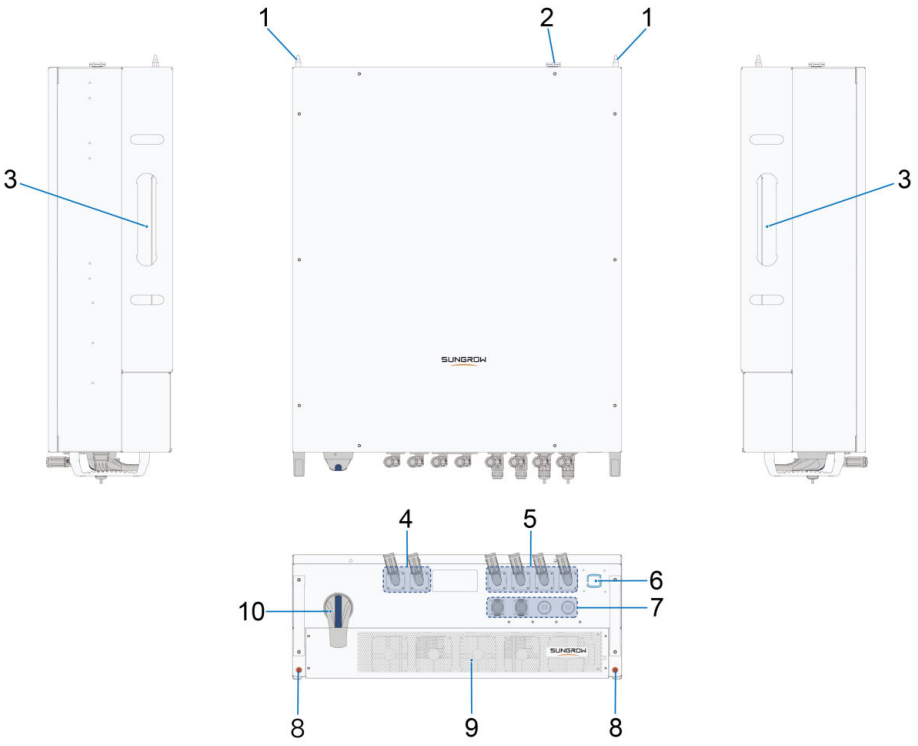


Figure 2-7 PCS External Design

*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 wiring area	-
5	AC wiring area	-
6	LED indicator	Indicates the current operating status.
7	Communication ports	Communication wiring area.
8	*Additional grounding terminal	Terminal used for additional protective grounding, as specified in EN 50178.
9	Air inlet cover	Fans are installed at the back of the cover plate, used for forced cooling.

No.	Name	Description
10	DC switch	Used to disconnect the equipment from the battery safely.

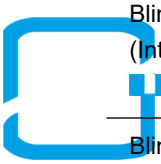
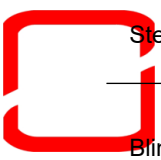
⚠ WARNING

*** 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).
	Blink	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

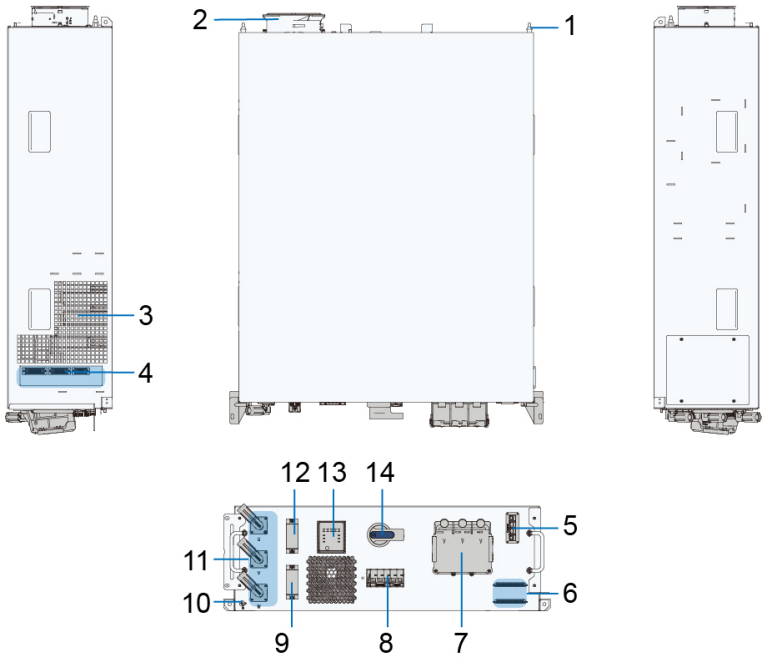


Figure 2-8 External Design of Power Distribution Box

*The figure here is for reference only and 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 4–6	Used for power supply or communication wiring of the 24Vdc device inside the cabinet.
5	Communication port	Used for the communication wiring of the equipment.
6	CONN1–2	Ports for FSS, LC, and PCS.
7	AC output port	Used for AC output wiring of the equipment.
8	Miniature circuit breaker (MCB)	Q1 AC auxiliary power supply and UPS control switch.

No.	Name	Description
9	*AUX POWER	Used for external power supply wiring.
10	Additional protective grounding terminal	Terminal used for additional protective grounding, as specified by EN 50178.
11	AC input port	Connected to PCS AC side.
12	LCS POWER	Used for power supply wiring of the liquid cooling unit.
13	UPS	Uninterruptible power supply.
14	AC MAIN SWITCH	Used to disconnect the equipment from the loads safely.

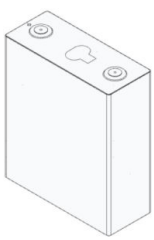
*The system is provided with an internal power supply as standard equipment.

2.3.4 Battery

Cell and PACK

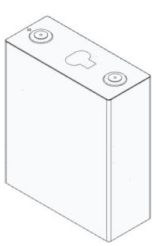
The PACK (battery module) is mainly composed of cells connected in series. It is equipped with functions such as battery voltage and temperature sampling and balancing control. Designed with chips dedicated to battery management, it receives control commands and uploads the collected data over daisy chain communication.

Table 2-3 Cell and PACK Data - CATL

Cell	Parameter	Value
	Type	CB310
	Dimensions (thickness * height * width)	(71.7±0.8) mm * (207.2±0.8) mm * (173.9±0.8) mm
	Weight	(5.34±0.20) kg
	Rated capacity	280Ah
	Rated energy	896Wh
	Rated voltage	3.2V
	Voltage range	2.5V–3.65V (cell temperature 0℃ <T ≤55℃) 2.0V–3.65V (cell temperature –30℃≤ T ≤0℃)

Cell	Parameter	Value
PACK	**Parameter**	**Value**
	Model	P573-111/P573B-111
	Dimensions (W*H*D) (wiring terminals and faucets not considered)	(868±5) mm * (247±5) mm * (1415±5) mm
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Configuration (series and parallel)	1P64S
	Key components	64 cells, 1 BMU, 1 fuse
	Weight	(400±12.0) kg
	IP rating	IP65

Table 2-4 Cell and PACK Data - CALB

Cell	Parameter	Value
	Type	L173F280A
	Dimensions (thickness * height * width)	(71.57±0.5) mm * (207.2±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	280Ah
	Rated energy	896Wh
	Rated voltage	3.2V
	Voltage range	2.5V–3.65V (cell temperature 0℃< T ≤55℃) 2.0V–3.65V (cell temperature –30℃≤ T ≤0℃)

Cell	Parameter	Value
PACK	**Parameter**	**Value**
	Model	P573AL-181/P573BL-181
	Dimensions (W*H*D) (wiring terminals and faucets not considered)	(868±5) mm * (247±5) mm * (1415±5) mm
	C Rate	≤0.5C
	Cell type	Prismatic cell with aluminum shell, LFP
	Configuration (series and parallel)	1P64S
	Key components	64 cells, 1 BMU, 1 fuse
	Weight	(400±12.0) kg
	IP rating	IP65

RACK

RACK is mainly composed of several PACKs and fuse.

RACK data is shown in the table below.

Table 2-5 RACK Data - CATL

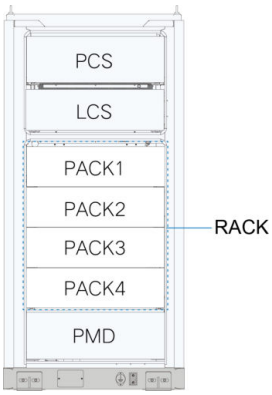
RACK Model	DC output voltage range	Rated power	Rated voltage	Short-circuit current
R0229BL-ACAA	691.2–934.4V	114.7 kW	819.2V	≤20kA

Table 2-6 RACK Data - CALB

RACK Model	DC output voltage range	Rated power	Rated voltage	Short-circuit current
R0229BL-AHAA	691.2~934.4 V	114.7 kW	819.2V	≤20kA

RACK Structure

Table 2-7 RACK Structure

Model	Arrangement
ST225kWh-110kW-2h-IEC	

Note: PACK indicates an 1P64S PACK (battery module). PCS stands for power conversion system, LCS for liquid cooling unit, and PMD for power distribution box.

2.3.5 EMS Controller (Optional)

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

The EMS300CP controller is optional. It is built into the ESS power distribution box. Users can read the label on the power distribution box to understand whether the product has an EMS300CP controller 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 in the factory. Connect the PC to the communication port on the ESS at the site. Then, you can access the EMS300CP Web system on the PC.

The homepage of the EMS300CP Web system is shown below:

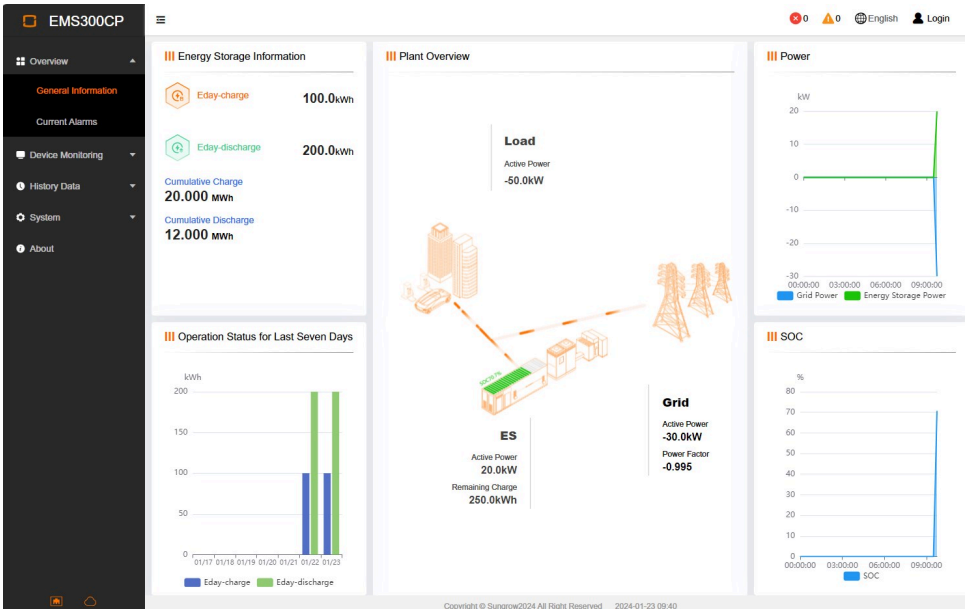


Figure 2-9 EMS300CP Web Homepage

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 EMS300CP can only be configured locally by connecting it to a PC via Ethernet. It accesses the Internet through a router with network access. After the plant is registered on iSolarCloud, users can monitor the system remotely using the App.

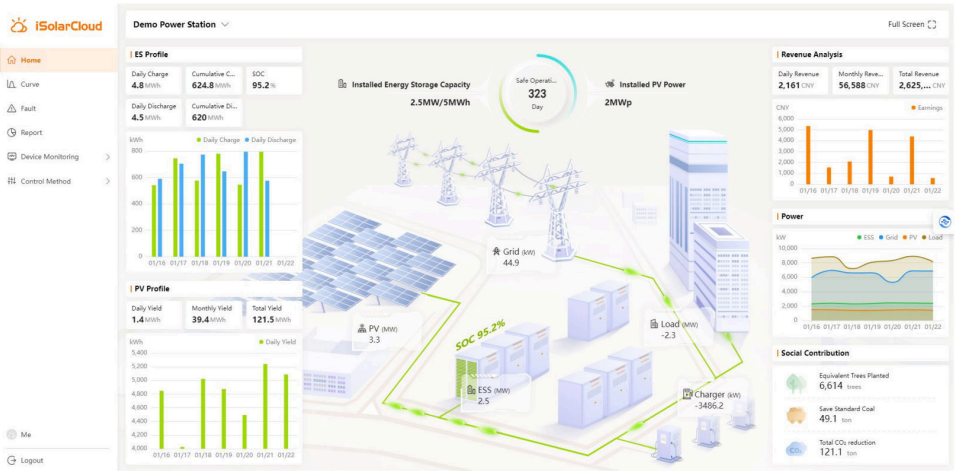


Figure 2-10 EMS300CP iSolarCloud Homepage

2.4 Transformer Cabinet

Transformer cabinet is optional.

2.4.1 Cabinet Appearance

The appearance of LVS250UD is shown in the following figure.

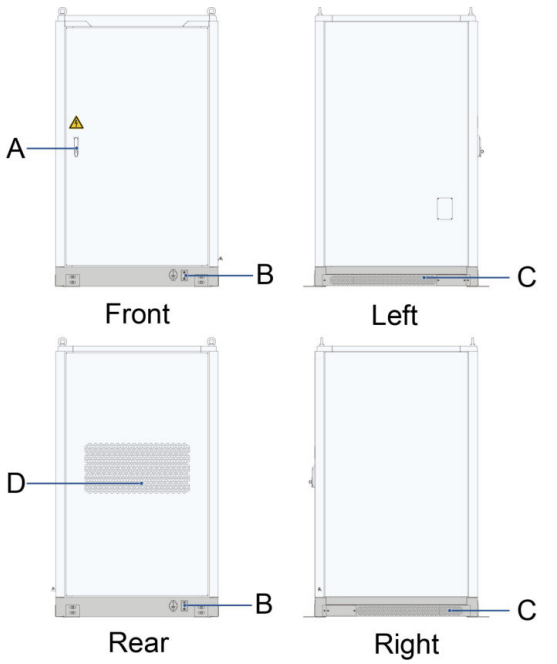


Figure 2-11 Appearance of LVS250UD

No.	Name
A	Door lock
B	Grounding point
C	Air inlet
D	Air outlet

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

2.4.2 Mechanical Parameters

The external dimensions of LVS250UD are shown in the figure.

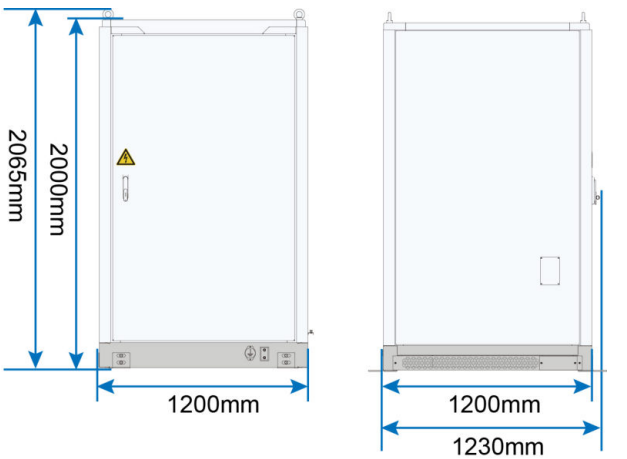


Figure 2-12 Dimensions of LVS250UD

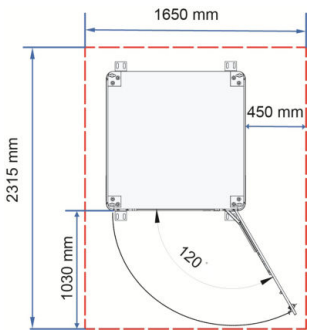


Figure 2-13 LVS250UD dimensions diagram (door open)

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

2.4.3 Internal Equipment

The main electrical equipment in the LVS250UD is shown in the figure below.

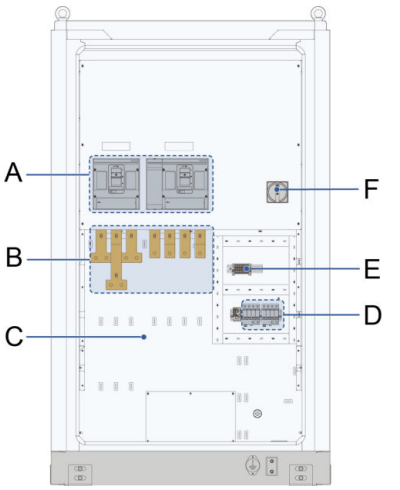


Figure 2-14 Internal layout of the LVS250UD

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

No.	Name
A	Moulded case circuit breakers
B	Wiring copper bars
C	Transformer
D	Surge protection device (SPD)
E	Wiring terminals
F	AC load switch

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 secured 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 ESS 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 must have received relevant training, especially in safety.**
- **Do not transport the ESS when the temperature is below -30 ℃.**

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.
- The ESS must stand upright during transport.
- Ensure the base of the ESS remains level throughout the whole transport process, with a maximum allowable tilt of 15°.
- Avoid collision or strong shock during transport.
- If the ESS is transported by land, use ropes to secure the lifting rings at the top of the ESS to the transport vehicle, 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, and store them properly.

- Transport vehicles must comply with local traffic regulations.
- During transportation, the vehicle shall maintain a constant speed whenever possible. Sudden braking is not allowed.
- The logistics carrier shall monitor abnormal driving behavior through the logistics tracking platform or the vehicle’s on-board GPS system and issue early warnings or manual intervention alerts. If any visible damage is found during on-site unpacking, the carrier shall provide driving records as evidence for responsibility determination.

3.4 Storage Requirements

- The ESS base must be elevated off the ground to a certain height, to avoid condensation inside the ESS and prevent the ESS bottom from getting soaked by rain water in rainy seasons. The height should be decided according to the on-site geological and meteorological conditions, etc.
- Keep the ESS on a dry, flat, and solid platform that has a sufficient load capacity and is not covered by any vegetation. The surface where the ESS is stored must be flat, without bumps or rolls-and-swells. It should have an unevenness of ≤ 5mm and be free of water accumulation.

- During storage, ensure that the doors of the ESS and all its internal components are locked.
- During storage, maintain a space of 200 cm at the front of the cabinet and a space of 60 cm at the back.
- Storage ambient temperature: -30℃ to +50℃; recommended storage temperature: -30℃ to 25℃.
- Long-term storage of the battery is not recommended as it may lead to battery capacity attenuation. Even if the battery is stored at the most recommended storage temperature, irreversible capacity attenuation will still happen during the period of rest, and such attenuation will become severer as the storage time lengthens. Please refer to the technical agreement for the specific amount of attenuation.
- The UPS that is not put into operation needs to be charged once every six months.
- The relative humidity of the storage environment should be between 0% and 95%, non-condensing.
- Take effective measures to protect the air inlet and outlet of the ESS and prevent the ingress of rainwater, sand, and dust into the equipment.
- Carry out routine inspections. Perform routine inspections at least every half a month. Inspect the packaging for intactness and signs of damage caused by pests or animals. Re-package the equipment immediately if the packaging gets damaged. Inspect the ESS cabinet and its internal components for damages.
- Before installing an ESS that has been stored for more than six months, open the door and conduct a visual inspection first. Make sure the ESS and its internal components are all intact without any damage. Meanwhile, perform inspections after powering on and starting up. If necessary, ask qualified personnel to test the equipment before installation.
- PACKs should be stored in a clean and dry place and must not be left out in the heat of the sun or rain. The place must be free of hazardous gas, flammables, explosives, or corrosive chemicals. Besides, avoid mechanical shock, great pressure, strong magnetic field, or direct sunlight.
- Avoid damages to the PACK caused by severe environmental conditions such as sudden temperature changes or collisions.
- The packing crate cannot be tilted or turned upside down.

If the ESS has been stored for over 6 months (from the date it is delivered from SUNGROW) under the required conditions mentioned above, perform charging/discharging once until the system SOC reaches 30%–40%. Make sure the SOC value is consistent after re-charging.

4 Mechanical Installation

⚠ WARNING

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

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.
- If the product is equipped with an EMS300CP controller, ensure the gateway meter and electricity meter used with the EMS300CP have been installed before commissioning.

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 Battery Energy Storage System Container.

- The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive and corrosive materials.
- It is suggested the product be installed in a place away from the residential area. Ensure the distance and noise requirements specified by the local laws and regulations are met. If the requirements cannot be met due to geographical restrictions, use noise mitigation measures. For detailed solutions, consult with the designer or SUNGROW.
- Avoid installing the Battery Energy Storage System Container in dusty environments with a large amount of dust, smoke, or floc. These particles may cling to the air inlets/ outlets or heat sink of the Battery Energy Storage System Container, thus impairing its heat dissipation performance or even getting it damaged.
- Avoid installing the Battery Energy Storage System Container in places where corrosive gas or dust may be produced or accumulated, or in places within 30km (20 miles) of saline-alkaline land or pollution-generating industrial complex such as chemical plants and power plants (chemical gas class: 1C1, solid particle level: 1S2).
- Do not install the Battery Energy Storage System Container in environments contaminated with halogen or sulfur pollutants.
- There are no underground facilities at the site.

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.). Foundation design and construction can be carried out only 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 objects. 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 effective heat dissipation and ease of maintenance, it is recommended to reserve sufficient space around the ESS during installation.

NOTICE

The clearance here refers to the clearance between cabinets, not foundations.

Single ESS

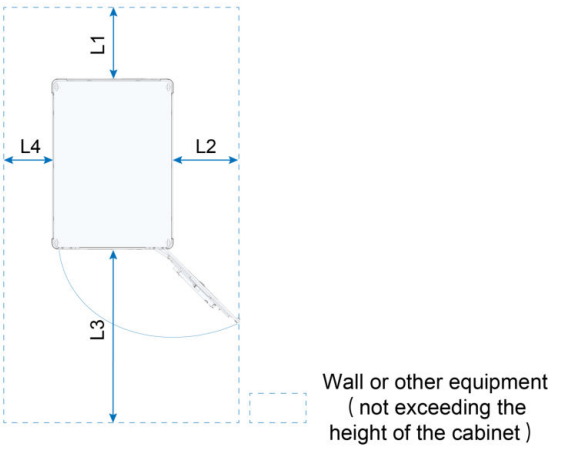


Figure 4-1 Clearance Requirements for One ESS

Maintenance Item	Clearance Requirements
Automatic liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2500 mm, L4 ≥ 430 mm
Manual liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2000 mm, L4 ≥ 430 mm

Multiple ESSs

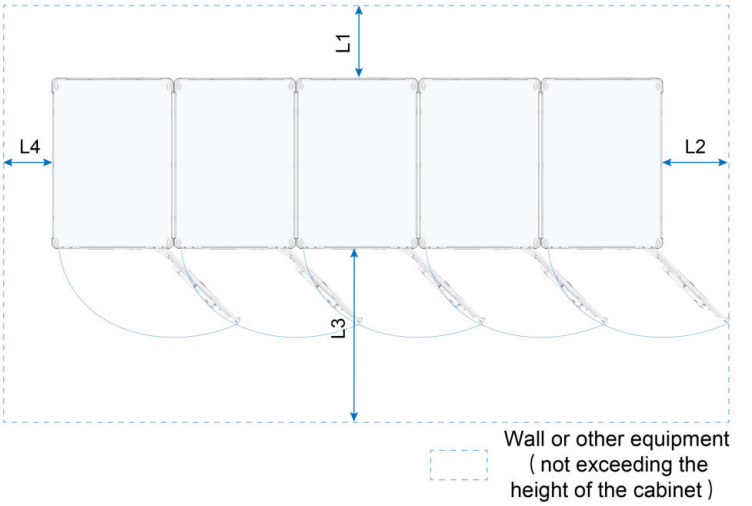


Figure 4-2 Clearance Requirements for ESSs in One Row

Maintenance Item	Clearance Requirements
Automatic liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2500 mm, L4 ≥ 430 mm
Manual liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2000 mm, L4 ≥ 430 mm

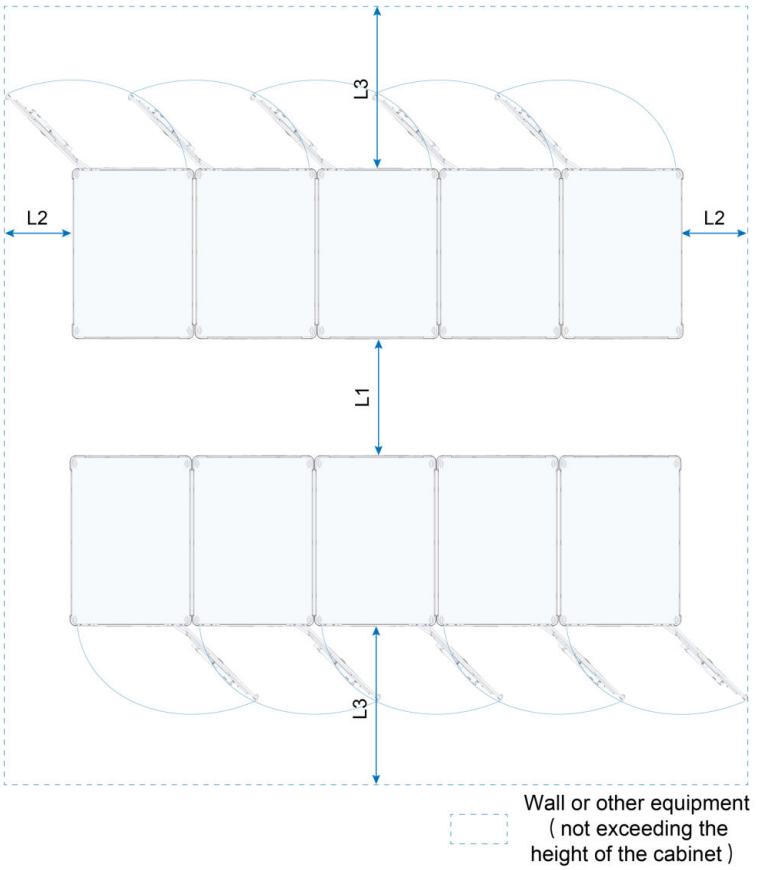


Figure 4-3 Clearance Requirements for ESSs in Two Rows (Back-to-Back)

Maintenance Item	Clearance Requirements
Automatic liquid cooling maintenance tooling	L1 ≥ 600 mm, L2 ≥ 630 mm, L3 ≥ 2500 mm
Manual liquid cooling maintenance tooling	L1 ≥ 600 mm, L2 ≥ 630 mm, L3 ≥ 2000 mm

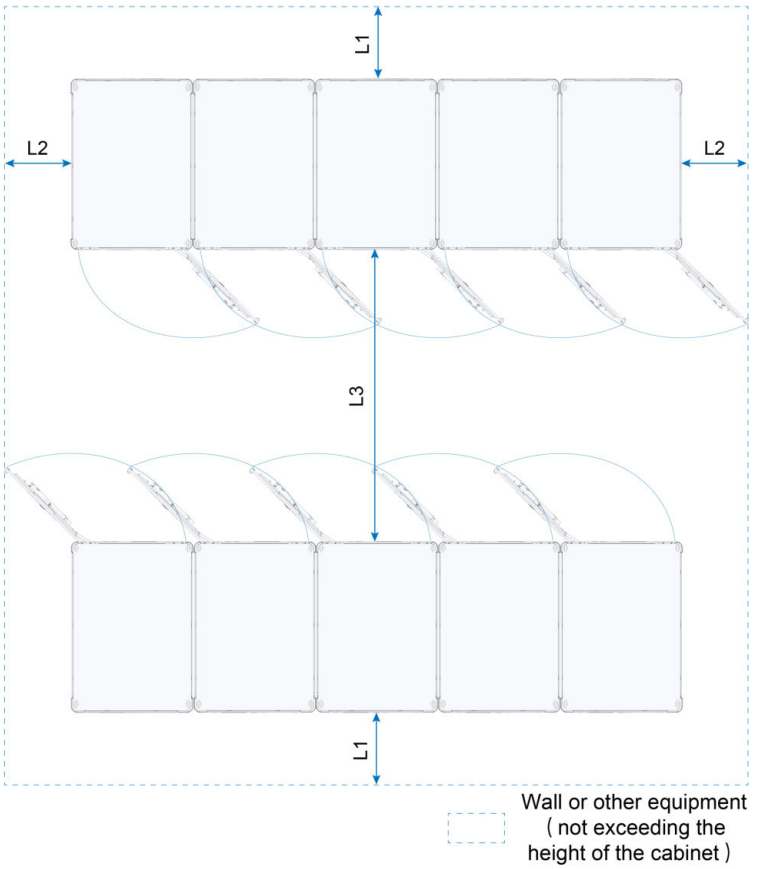


Figure 4-4 Clearance Requirements for ESSs in Two Rows (Face-to-Face)

Maintenance Item	Clearance Requirements
Automatic liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2500 mm
Manual liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 630 mm, L3 ≥ 2000 mm

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

When arranging the ESSs in two rows, ensure that the two rows are aligned on both sides. Avoid misaligned arrangements to minimize the risk of hindered heat dissipation.

Installation Scenario with Firewalls

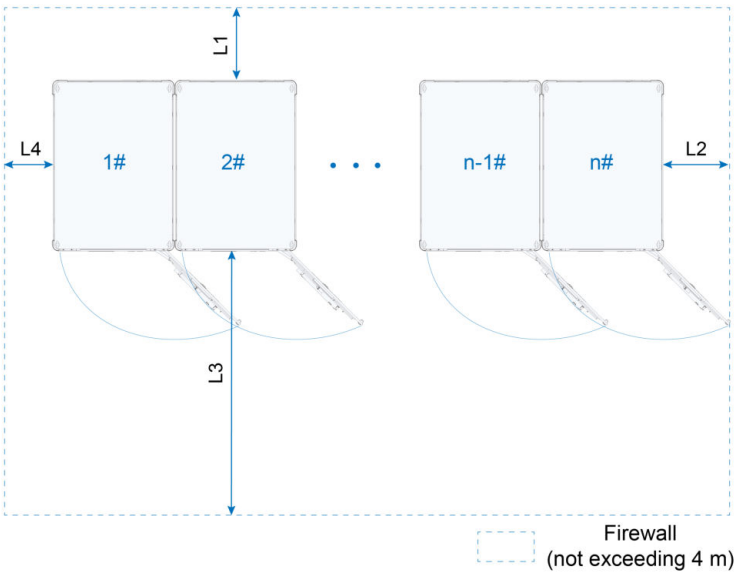


Figure 4-5 Clearance Requirements for ESSs in One Row

Number of ESSs	Clearance Requirements
n = 5	• With walls on all four sides: L1 ≥ 500 mm, L2 ≥ 630 mm, L3 ≥ 3000 mm, L4 ≥ 600 mm • With walls on the back only: L1 ≥ 300 mm • With walls on the left and right sides: L2 ≥ 630 mm, L4 ≥ 430 mm • With walls on the front and back: L1 ≥ 500 mm, L3 ≥ 2800 mm
n = 10	• With walls on all four sides: L1 ≥ 800 mm, L2 ≥ 630 mm, L3 ≥ 3000 mm, L4 ≥ 600 mm • With walls on the back only: L1 ≥ 600 mm • With walls on the left and right sides: L2 ≥ 630 mm, L4 ≥ 430 mm • With walls on the front and back: L1 ≥ 600 mm, L3 ≥ 3000 mm
n = 15	• With walls on all four sides: L1 ≥ 1200 mm, L2 ≥ 630 mm, L3 ≥ 3500 mm, L4 ≥ 600 mm • With walls on the back only: L1 ≥ 1000 mm • With walls on the left and right sides: L2 ≥ 630 mm, L4 ≥ 430 mm

Number of ESSs	Clearance Requirements
	• With walls on the front and back: L1 ≥ 1200 mm, L3 ≥ 3500 mm

Single Transformer Cabinet

For the arrangement of a single transformer cabinet, the clearances required on its front, back, left, and right sides are shown below, where: L1 ≥ 600 mm, L2 ≥ 450 mm, L3 ≥ 1200 mm, L4 ≥ 400 mm.

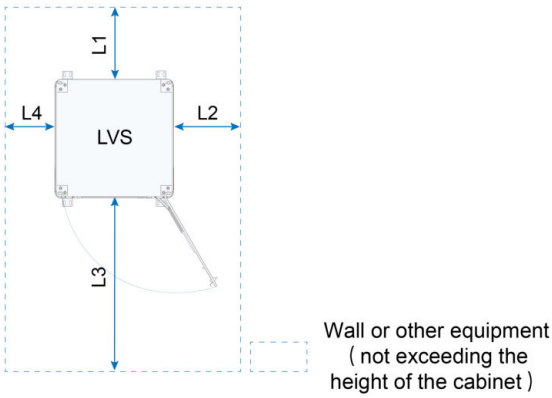


Figure 4-6 Clearance Requirements for One Transformer Cabinet

ESS-Plus-Transformer Cabinet Arrangement

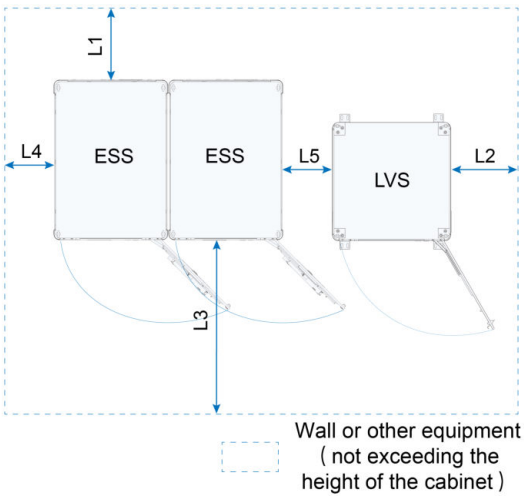


Figure 4-7 Clearance Requirements for ESS-Plus-Transformer Cabinet Arrangement

Maintenance Item	Clearance Requirements
Automatic liquid cooling	L1 ≥ 300 mm, L2 ≥ 450 mm, L3 ≥ 2500 mm, L4 ≥ 430 mm, L5 ≥ 400 mm

Maintenance Item	Clearance Requirements
maintenance tooling	
Manual liquid cooling maintenance tooling	L1 ≥ 300 mm, L2 ≥ 450 mm, L3 ≥ 2000 mm, L4 ≥ 430 mm, L5 ≥ 400 mm

- When firewalls taller than the ESS are present on the front, back, left, and right sides of the ESS or transformer cabinet, the space above the cabinet must remain open and free of obstructions. The height of the surrounding walls (especially the front and back ones) must not exceed 4 meters.
- If pile foundations or other open foundations are used on-site and there are no obstructions at the air inlets at the bottom of the transformer cabinet, the bases of the transformer cabinet and the ESS can be placed tightly against each other, shoulder-to-shoulder (i.e., L5 ≥ 0 mm). All other clearance requirements remain unchanged.

Top Heat Dissipation Requirements for Indoor Installations

To install the ESS indoors, exhaust equipment with sufficient air flow rate is required. For good heat dissipation on top, reserve sufficient space above the ESS.

If the ESS is installed indoors, the temperature at the air inlet must not exceed 45°C to ensure long-term stable operation. The recommended clearances above the ESS are as follows:

- ESS with one side against the wall: Clearance ≥ 800 mm.
- ESS with two sides against the wall: Clearance ≥ 1200 mm.
- If the clearance above the ESS is 400 mm, the clearance between two ESSs shall be ≥ 200 mm, and the distance from one side of the ESS to the wall shall be ≥ 600 mm.
- If the clearance above the ESS is 0, the clearance between two ESSs shall be ≥ 400 mm, and the ESS back shall be ≥ 600 mm away from the wall.

NOTICE

Ensure a ventilation rate of 2500 m^3/h and a cooling capacity of 7 kW at the air outlet on the rear of each ESS.

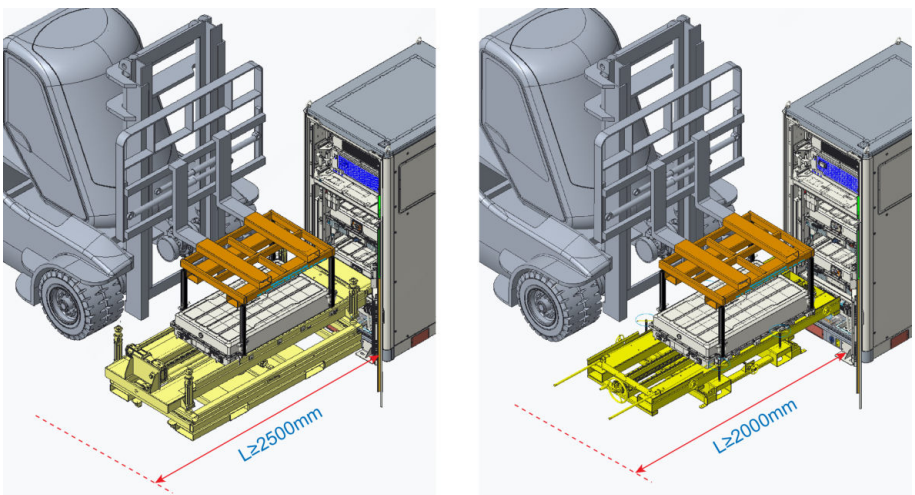
NOTICE

For outdoor installations, if nearby wall structures are present above or on the sides of the ESS, or if the ESS is placed under a canopy, it shall be regarded as an indoor installation.

- Installing the ESS outdoors is recommended, as per the general plant design standards.
- If indoor installations are selected due to layout constraints: SUNGROW specifies indoor arrangement requirements from the perspective of product design and maintenance only. The owner/EPC shall consider plant-level requirements in these cases.

Instructions for PACK Maintenance Tooling

Two types of PACK maintenance tooling are available for the ESS: automatic and manual. The required clearance for maintenance during installation must be determined based on the dimensions of the selected tooling. For details, please refer to the illustration below.



Automatic PACK tooling maintenance Manual PACK tooling maintenance

Figure 4-8 The Required Clearance for Maintenance

4.3 Handle with Forklift

The ESS can be moved 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.

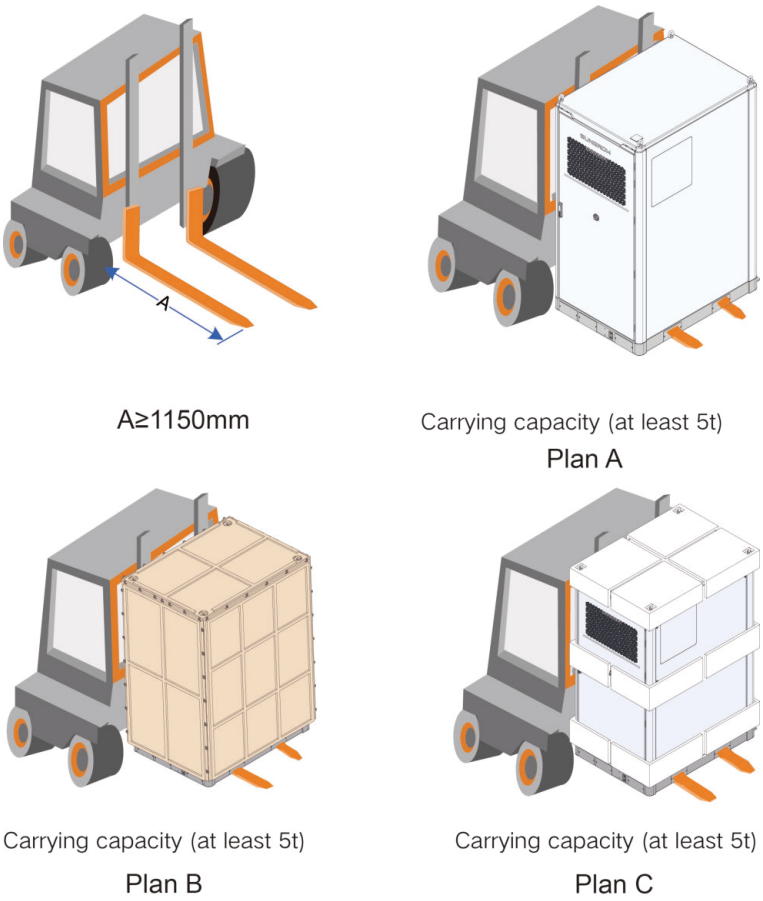


Figure 4-9 Handle with Forklift (ESS)

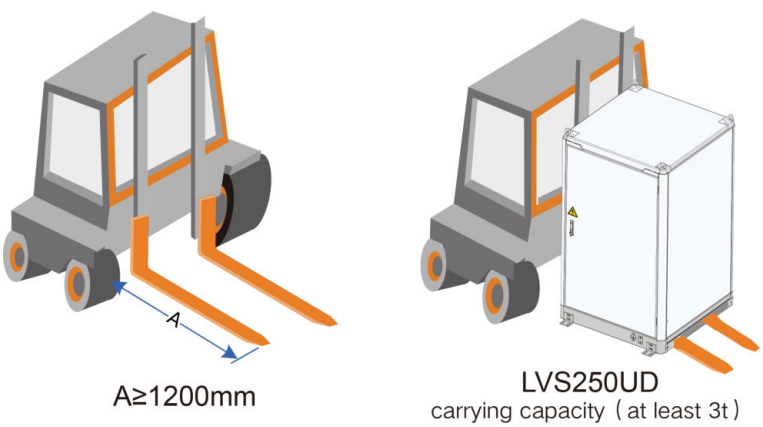


Figure 4-10 Handle with Forklift (LVS250UD)

If the product is not shipped in wooden packaging, please disregard forklift handling plans B and C.

⚠ 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.**
- **When using a forklift, make sure the cargo straps are not damaged.**

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 and Transport

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.

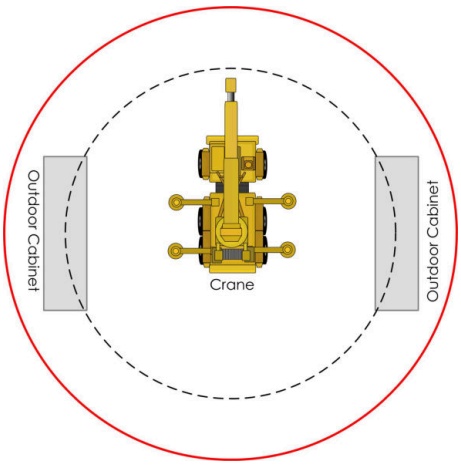


Figure 4-11 Crane Operation

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.

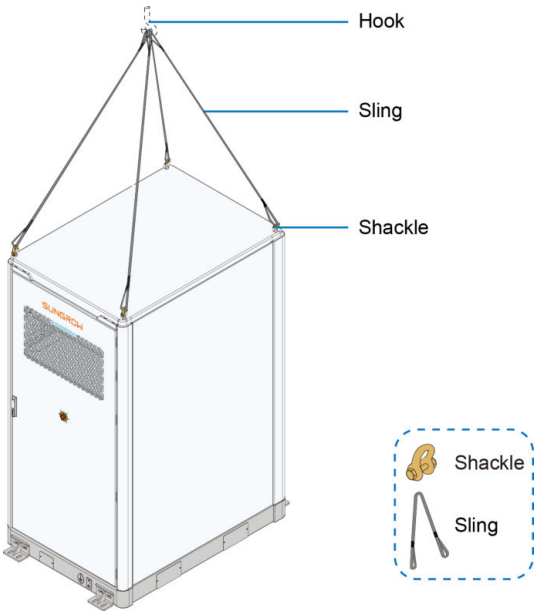


Figure 4-12 ESS Hoisting

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

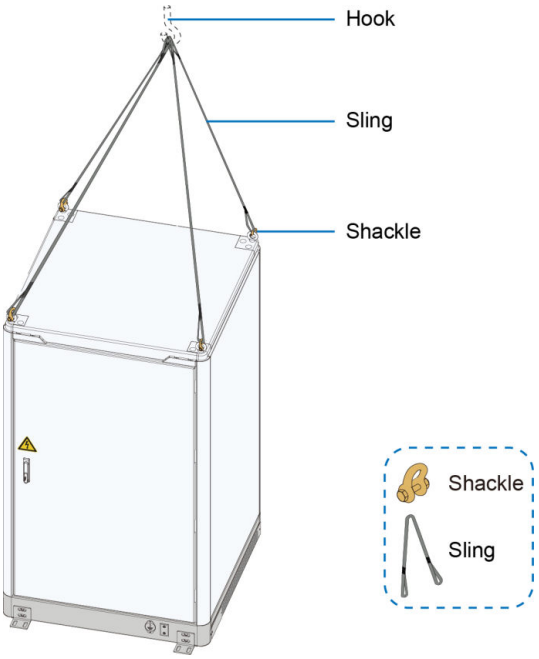


Figure 4-13 LVS250UD lifting diagram

*This picture is for reference only, please refer to the actual product received!

Transformer cabinet is optional.

4.5 Cabinets Fixing

After moving the cabinets 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 cabinets 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 cabinets .

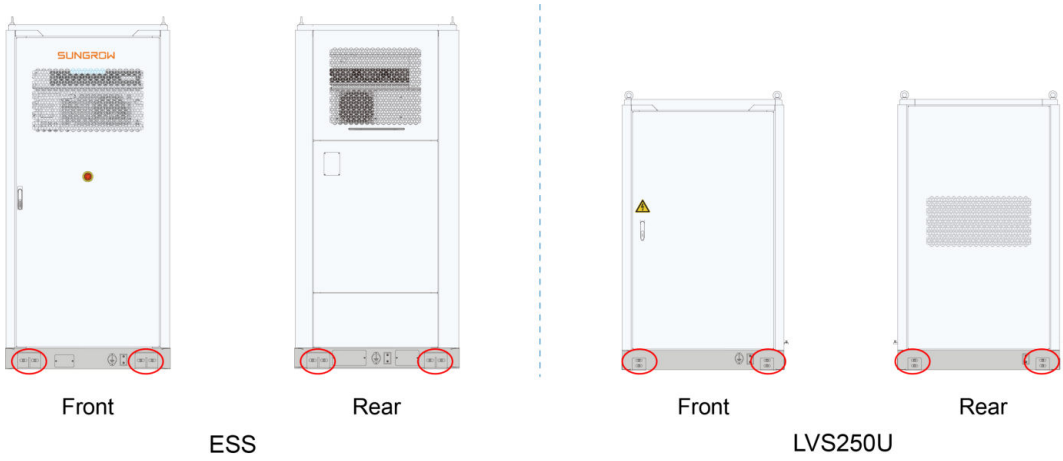


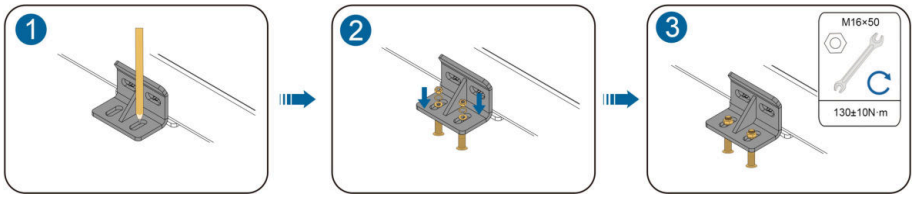
Figure 4-14 L-shaped Angle Steels

Installation Tools

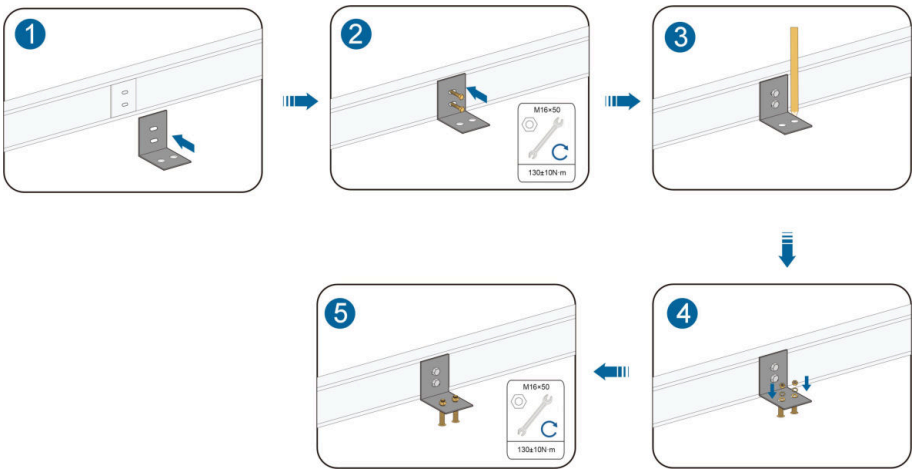
Tools that may be used when installing the L-shaped angle steels are as follows:

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 1



Installation Method 2



Please choose the installation method according to the actual situation.

4.6 EMS300CP Installation (Optional)

Prerequisite

SUNGROW supplies the required quantity of EMS300CP devices based on the plant configuration. Please determine the location of the battery cabinet for EMS300CP installation according to the plant layout and solution.

Installation Position

The EMS300CP is packed together with the installation accessories. Follow the instructions below to install and wire the EMS300CP.

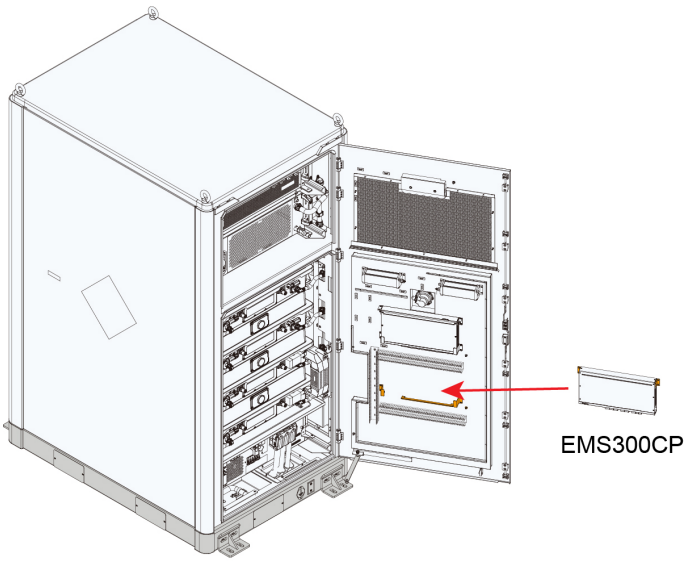


Figure 4-15 EMS300CP Installation Position

Installation Procedure

Step 1 Remove the support plate and angle brackets 3–4 from the door.

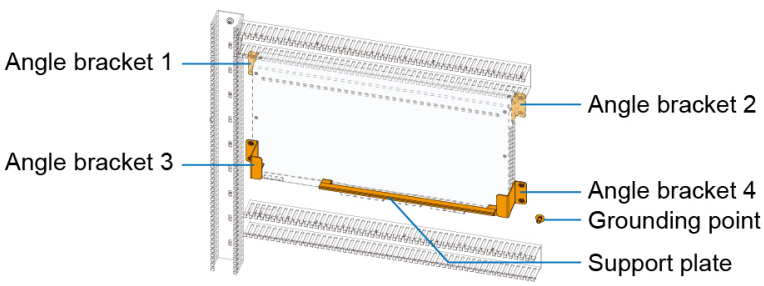


Figure 4-16 Accessory Introduction

Step 2 Install the two angle brackets 1–2 on the upper left and right sides of the EMS using M3×8 cross-recessed screws. Torque: (0.7–1) N·m.

Step 3 Place the EMS in the designated position on the door. Then, fix the angle brackets at four locations using M5×12 cross-recessed hex bolts (with indentation). Torque: (4–4.8) N·m.

Step 4 Wire the EMS following the instructions below.

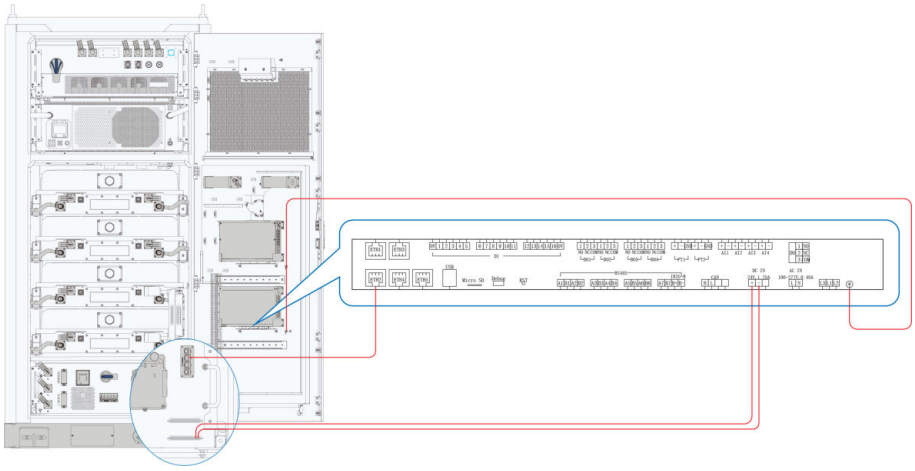


Figure 4-17 Wiring Instructions

Table 4-1 Port Description

EMS300CP Port	Description	Recommended Cable Specifications
ETH2	Connected to NET:2	CAT6A network cable
DC IN:+	Connected to CONN2:13	18*2C AWG shielded twisted-pair cable
DC IN:-	Connected to CONN2:14	
Grounding point	Connected to the grounding point located next to the EMS300CP installation position	15AWG yellow-green cable or grounding flat steel

Secure the terminal of the yellow-green cable to the grounding point with an M6 bolt. Torque: (7–8) N·m.

NOTICE

The required cables are provided by SUNGROW. Follow the cable routing requirements during wiring. Route the cable through the cable duct whenever possible.

Step 5 Reinstall the support plate on the door with M5 flange nuts. Torque: (4–4.8) N·m.

--End

Properly keep the removed parts during installation. Do not throw them away.

4.7 Removing Wooden Packaging (Optional)

To ensure product safety during long-distance transportation, some products are shipped in wooden packaging. Proceed with the following operation based on actual on-site conditions.

Mechanical Data

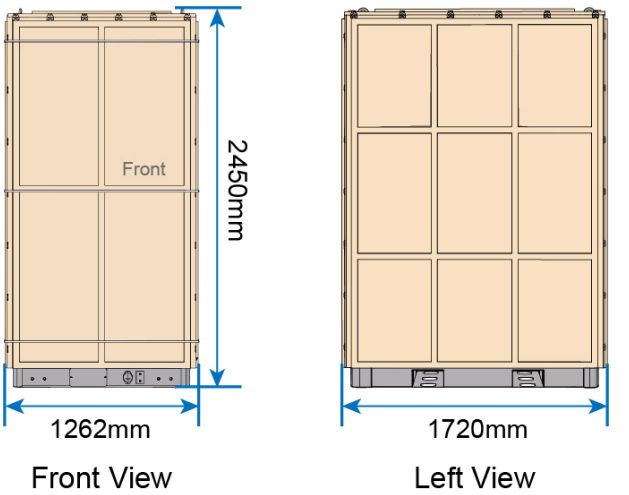


Figure 4-18 Mechanical Data

NOTICE

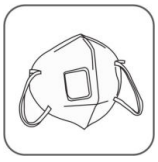
During transportation, pay attention to the dimensions and protection of the wooden packaging and product to avoid crushing or impact.

Tool Preparation

Table 4-2 Tools

Tool		
		
Scissors	Claw hammer	Slotted screwdriver

Table 4-3 Personal Protective Equipment

Tool			
 Safety gloves	 Goggles	 Insulated shoes	 Protective clothing
 Dust mask	 Safety helmet	 Fluorescent vest	 Safety harness for working at height

Removal Procedure

After the product arrives at the installation site and before beginning installation, wear personal protective equipment and use appropriate tools to remove the wooden packaging. Take proper precautions to ensure personal safety during the removal process.

⚠ WARNING

Take proper precautions: Wear safety gloves and goggles to protect hands and eyes from wood splinters or metal debris. When working at height, maintenance personnel must follow prescribed procedures and wear a safety helmet, safety harness, and other personal protective equipment appropriate for work at height.

Step 1 Cut off the PET straps around the packaging using scissors.

Step 2 Insert a slotted screwdriver or claw hammer into the gap between the latch and the wooden crate, and gently pry to disengage the latch.

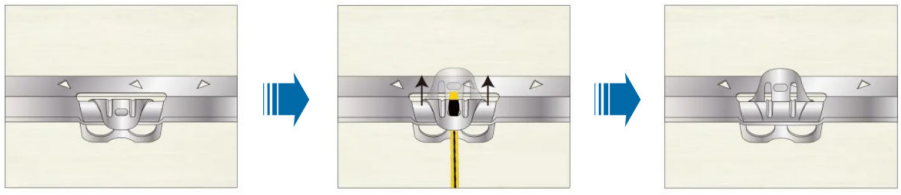


Figure 4-19 Remove Latches

If the latch is tight, tap the screwdriver gently with a hammer to help loosen it.

Step 3 Remove the latches in diagonal pairs to avoid applying uneven force to the crate.

Step 4 Once all latches are removed, remove the front and rear boards, side boards, and the top cover in order.

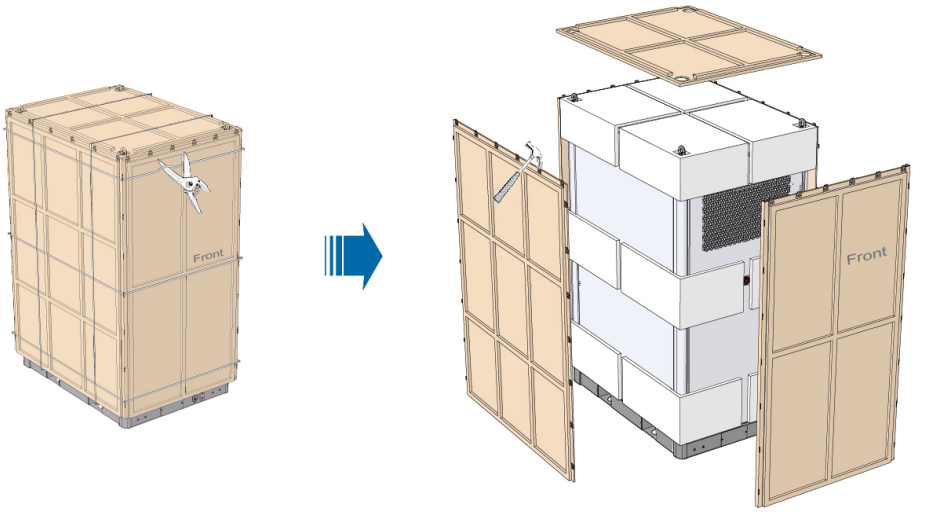


Figure 4-20 Remove Wooden Packaging

NOTICE

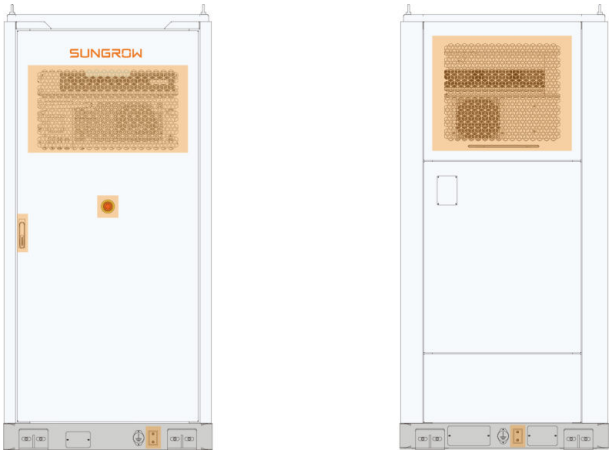
Avoid using excessive force. If a latch is stuck, apply lubricant or tap it gently to loosen it before prying.

--End

4.8 Film Removal

After fixing the battery container , remove the 3M films at the air inlets and outlets and the position where the door lock is mounted.

Remove the 3M film with the yellow label "Key" to obtain the key to open the battery container door.



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

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:

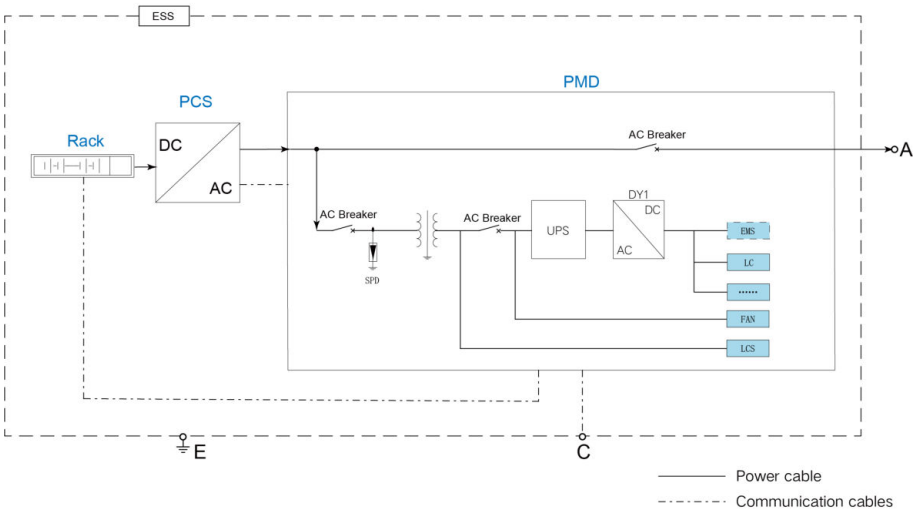


Figure 5-1 ESS Wiring Diagram (On-grid)

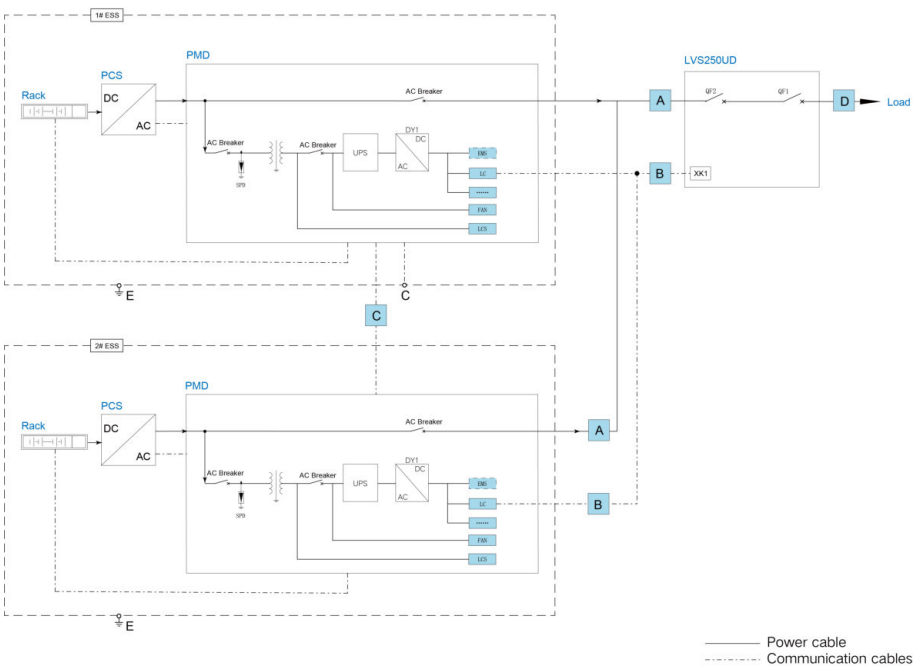


Figure 5-2 ESS-LVS Wiring Diagram (Off-grid)

Table 5-1 Interface Description

No.	Name	*Recommended cable specifications
A	AC output port	3×95mm^2/copper wire
		3×150mm^2/aluminum wire

No.	Name	*Recommended cable specifications
B	LC communication port (connection port 1)	2×1.5mm^2 shielded twisted-pair cable
C	Ethernet communication port	CAT6A S/FTP network cable
D	LVS250UD AC side to load	240 mm^2
E	Grounding point	70mm^2–95mm^2 yellow-green cable or grounding flat steel

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

**If aluminum cables are selected for on-site use, it is imperative to use them in conjunction with copper-aluminum transition terminals or copper-aluminum transition washers.

***The EMS is optional.

Each transformer cabinet can be adapted to one or two ESS cabinets.

⚠ 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

- **Installation and wiring of the ESS must conform to the applicable standards or regulations in the country/region where the project is located.**
- **Wiring or installation not in accordance with the relevant instructions provided in this manual may result in equipment or system failure, which will not be covered by the 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.

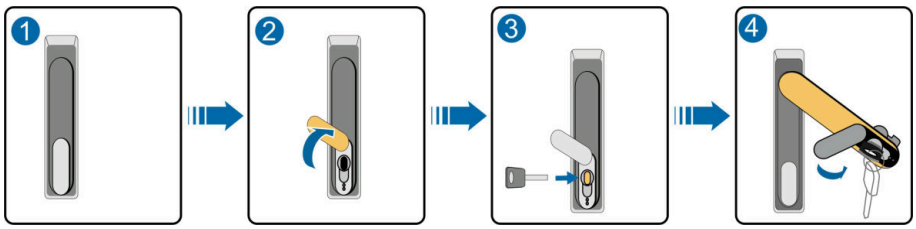


Figure 5-3 Open the Front Door

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 counterclockwise to the position shown in the figure to open the front door

5.3.3 Prepare Cables

DANGER

Before electrical connection, check and ensure that the cables are all intact and well-insulated. Poor insulation or cable damage may result in safety hazards. If necessary, replace the cable immediately.

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.
- Ensure that all cables and wires have sufficient space for any bends.
- During electrical connection, do not forcibly pull any wires or cables, as this may diminish their insulation performance.
- 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.

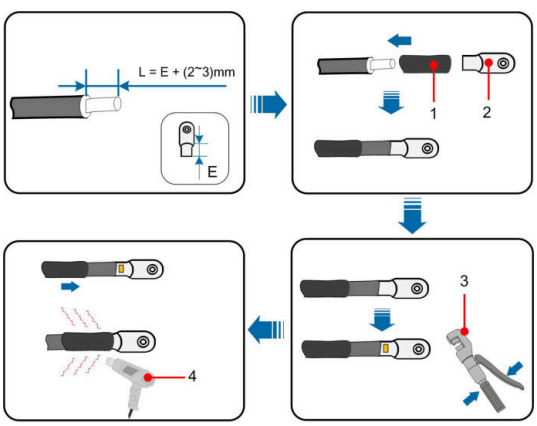
- Keep a sufficient distance between the cables and the heat-generating components, to prevent the cable insulation layer from aging or getting damaged due to high temperature.
- After completing each connection, carefully check that the connection is correct and secure.
- Adopt necessary auxiliary measures to reduce the stress applied to cables and wires.
- Select cables with appropriate cross-sectional areas, according to the actual environmental conditions for heat dissipation of the cables laid on-site.
- Select communication cables equipped with corresponding shielding protection features according to the requirements of SUNGROW.
- Secure the power cables and the communication cables separately. Ensure a minimum space of 10cm between the lines of strong and weak electricity to avoid electromagnetic interference.
- Inspect the connection between the wiring terminal and the copper bar. If any part of the heat-shirk tubing is caught between them, remove it immediately. Otherwise, it may lead to poor contact or even damage due to heat.

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 OT/DT terminals

Follow the steps shown below to crimp terminal.

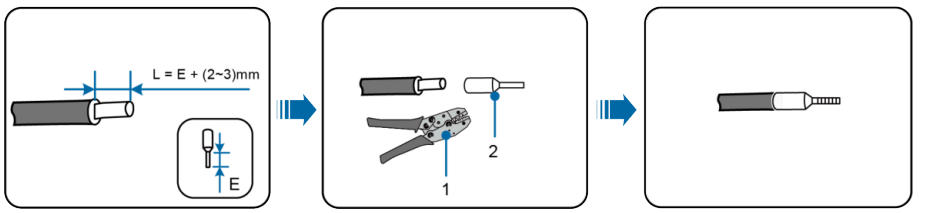


No.	Name	No.	Name
1	Heat shrink tubing	2	OT/DT terminal
3	Hydraulic pliers	4	Heat gun

NOTICE

- **Strip the cables with caution. Avoid scratching the core wires.**
- **After crimping, the conductor crimp barrel of the OT/DT terminal must fully enclose the core wire, forming a closed cavity that ensures a tight and secure connection between the wire and the terminal.**
- **Take appropriate protective measures when using a heat gun to prevent heat damage to the equipment.**

Crimp the Ferrule



No.	Name
1	Crimping tool
2	Ferrule

5.3.4 Cable Connection

DANGER

- **When fastening the product and terminals, tighten the fasteners at the specified torques using proper tools and leave marks accordingly. Failure to do so may damage the product, and such damage will not be covered by the warranty. Unreliable connection may cause fire or even burn the product.**
- **During electrical connection, do not forcibly pull any wires or cables, as this may diminish their insulation performance.**
- **Do not connect aluminum terminals directly to the copper bar, as this may cause galvanic corrosion and compromise the reliability of the connection.**

NOTICE

- **When using copper-aluminum bimetallic washers, the outer profile of the washer must be no smaller than that of the OT/DT terminal. Pay attention to the correct orientation, ensuring that the aluminum side of the washer contacts the aluminum terminal, and the copper side contacts the copper bar.**
- **It is recommended to source the washers and terminals from the same manufacturer.**
- **The bolts must be securely tightened, with at least two exposed threads remaining.**
- **Use screws of an appropriate length for wiring. The screw shall protrude 2–3 threads (approximately 3 mm) through the mounting hole in the copper bar. Using overly long screws may compromise insulation performance or even cause short circuits.**

5.3.4.1 Main Power Supply Wiring

Main power supply wiring can use copper cables, copper-clad aluminum cables, or aluminum alloy cables.

- When using copper-core cables or copper-clad aluminum cables, select copper terminals, and complete the connections by referring to the figure below.

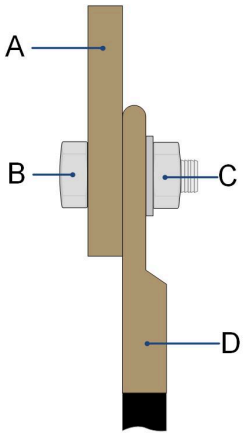


Figure 5-4 Connection Using Copper Terminal

Item	Name	Item	Name
A	Copper bar	C	Flange nut
B	Bolt	D	Copper terminal

- When selecting aluminum alloy cables, use copper-aluminum bimetallic terminals, or aluminum terminals in combination with copper-aluminum bimetallic washers. Please complete the connections by referring to the figure below.

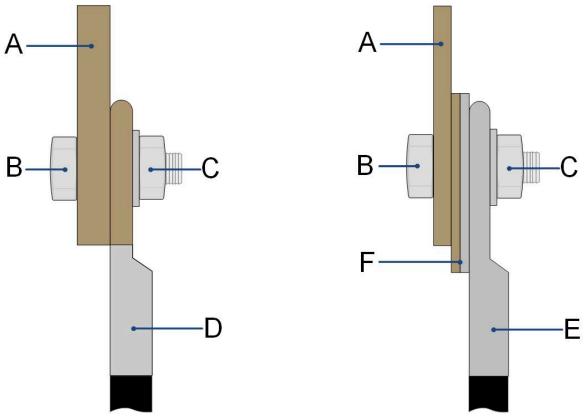


Figure 5-5 Connections Using Copper-Aluminum Bimetallic Terminal (Left) and Aluminum Terminal (Right)

Item	Name	Item	Name
A	Copper bar	D	Copper-aluminum bimetallic terminal
B	Bolt	E	Aluminum terminal
C	Flange nut	F	Copper-aluminum bimetallic washer

5.3.4.2 Auxiliary Power Supply Wiring

Auxiliary power supply wiring can use copper cables, copper-clad aluminum cables, or aluminum alloy cables.

- When using copper-core cables or copper-clad aluminum cables, select copper terminals, and complete the connections by referring to the figure below.

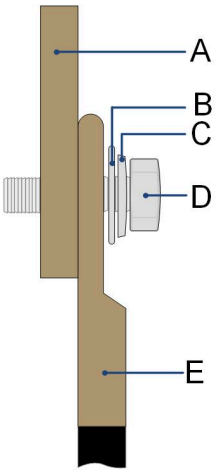


Figure 5-6 Connection Using Copper Terminal

Item	Name	Item	Name
A	Copper bar	D	Bolt
B	Flat washer	E	Copper terminal
C	Spring washer		

- When selecting aluminum alloy cables, use copper-aluminum bimetallic terminals, or aluminum terminals in combination with copper-aluminum bimetallic washers. Please complete the connections by referring to the figure below.

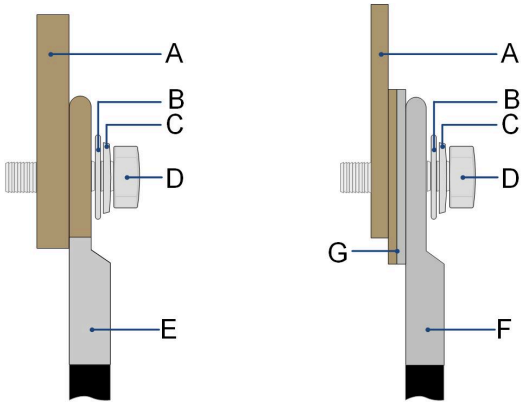


Figure 5-7 Connections Using Copper-Aluminum Bimetallic Terminal (Left) and Aluminum Terminal (Right)

Item	Name	Item	Name
A	Copper bar	E	Copper-aluminum bimetallic terminal

Item	Name	Item	Name
B	Flat washer	F	Aluminum terminal
C	Spring washer	G	Copper-aluminum bimetallic washer
D	Bolt		

5.3.5 Cable Inlet Design

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

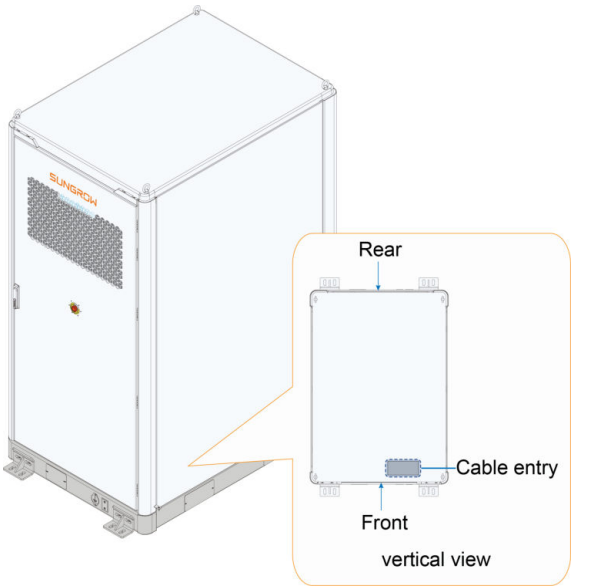


Figure 5-8 Schematic diagram of BESS inlet and outlet

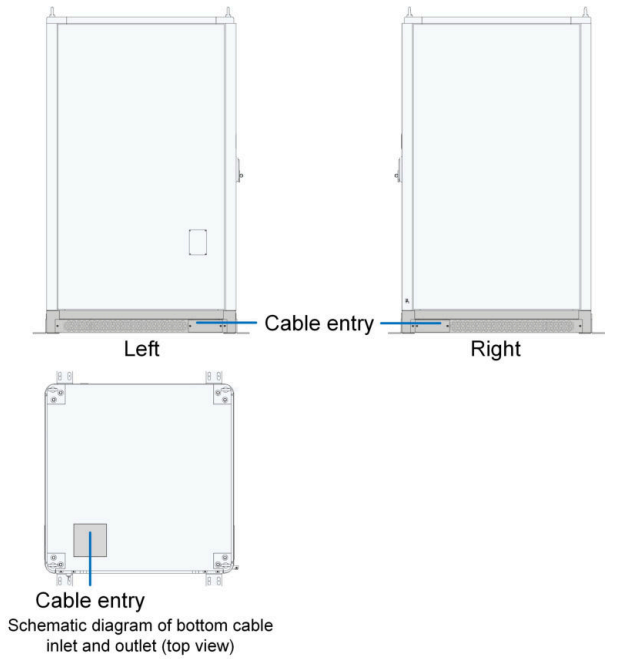


Figure 5-9 Schematic diagram of LVS250UD inlet and outlet

5.4 Ground Connection

NOTICE

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

NOTICE

- **Before grounding, clean the periphery of the threaded port of the grounding point and the surface of the grounding point, to ensure reliable grounding.**
- **After grounding, apply anti-corrosion treatment for the entire grounding area.**

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**”.

Devices installed on-site by users (such as wireless routers) should be properly grounded by connecting to a nearby grounding point.

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.

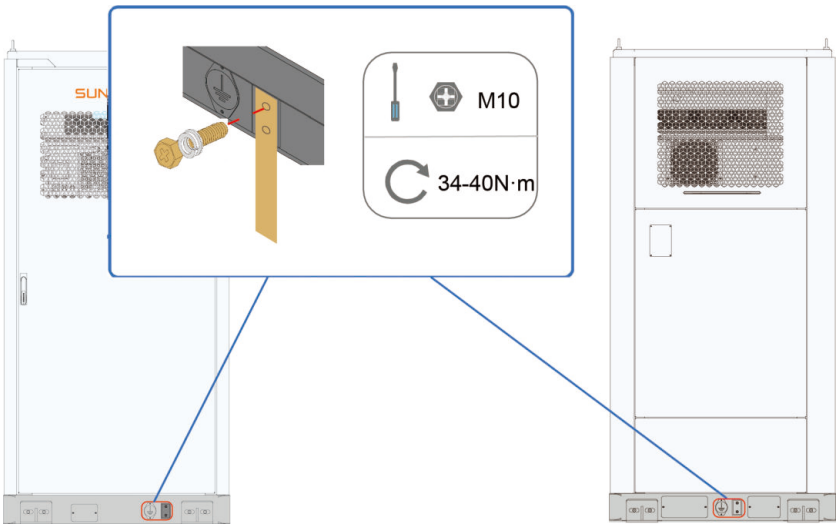


Figure 5-10 BESS grounding diagram

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

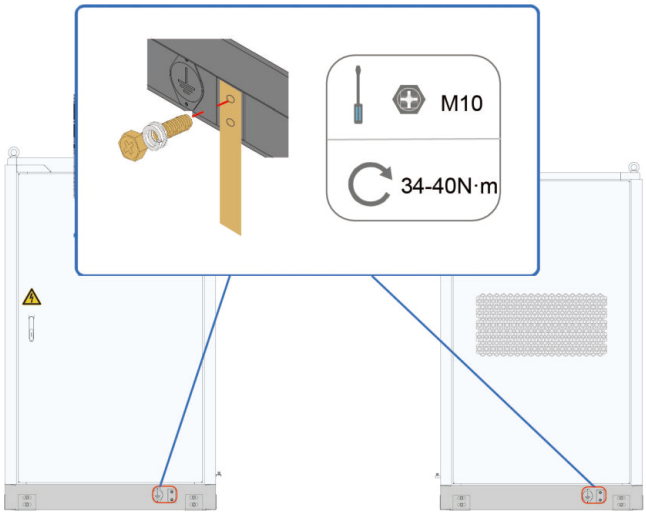


Figure 5-11 LVS250UD grounding diagram

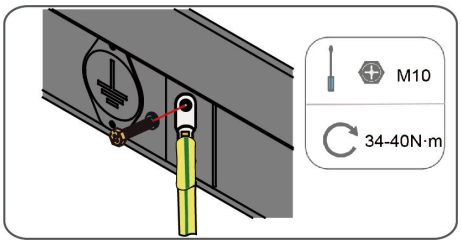
*The figure is for reference only and the actual product shall prevail.

Transformer cabinet is optional.

Grounding Cable

Use a 70 mm^2–95 mm^2 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 DC/AC power converter cabinet 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 Overview of the Wiring Area

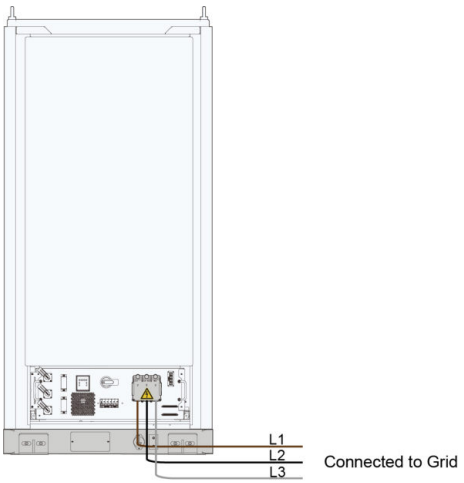


Figure 5-12 ESS Wiring Overview (On-grid)

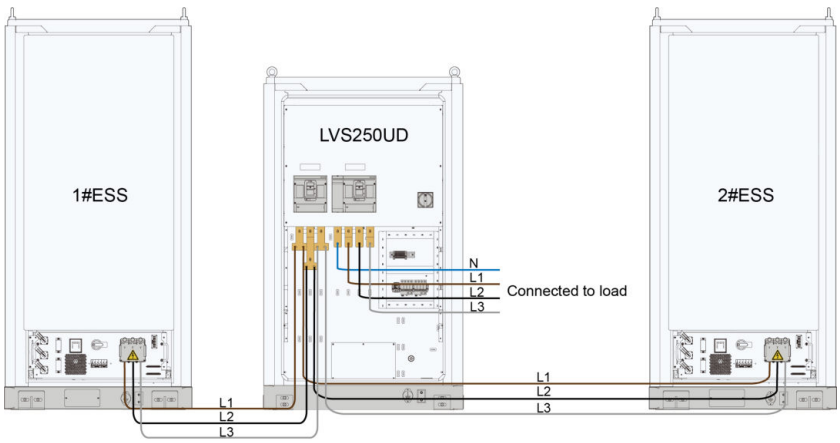


Figure 5-13 ESS+LVS Wiring Overview (Off-grid)

- Transformer cabinet is optional.
- The system comes standard with a 0.5C battery system and is compatible with a 0.1C design.

5.5.3 ESS 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.

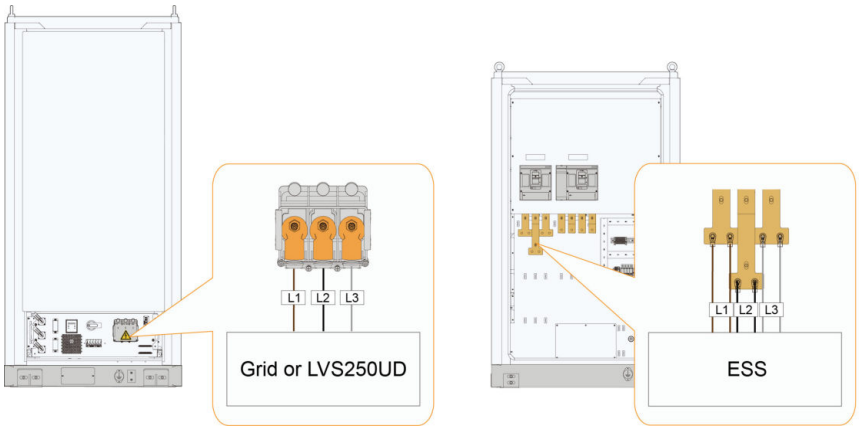


Figure 5-14 AC Wiring Area

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

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

Step 6 Secure the terminals to the wiring holes of ESS or LVS250UD with bolts.

- ESS: 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 5.3.4.1 Main Power Supply Wiring and 5.3.4.2 Auxiliary Power Supply Wiring.
- LVS250UD: Secure the OT terminals to the wiring holes with M10 bolts at a tightening torque of 34~40 N·m (for detailed wiring instructions, please refer to 5.3.4.1 Main Power Supply Wiring and 5.3.4.2 Auxiliary Power Supply Wiring.

Step 7 Pull gently the cables backward 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

5.5.4 LVS250UD-Load Connection Steps

Transformer cabinet is optional.

Step 1 Make sure the upstream and downstream switches are disconnected.

Step 2 Pass the cables into the LVS250UD cabinets from the inlet holes.

Step 3 Make sure that the AC cable connection sequence is correct.

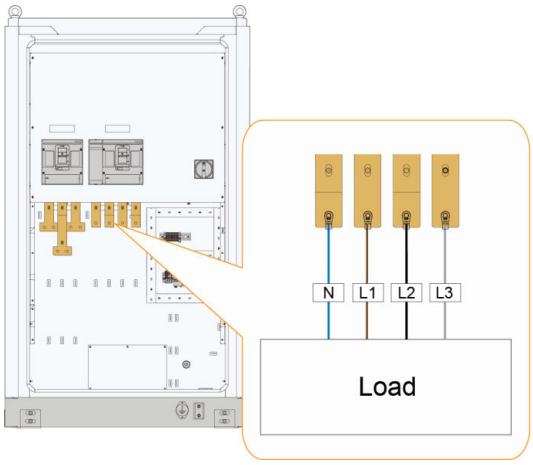


Figure 5-15 LVS250UD-Load wiring area

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

Step 4 Strip the protective layer of the cable to expose the copper core of the wire with strippers.

Step 5 Crimp with OT terminal, refer to5.3.3 Prepare Cables.

Step 6 Secure the OT terminal to the wiring hole by M10 bolt with a tightening torque of 34~40 N·m. Refer to the 5.3.4.1 Main Power Supply Wiring and5.3.4.2 Auxiliary Power Supply Wiringconnection sequence for installation.

Step 7 Pull the cable back slightly after wiring to ensure that the cable is long enough.

NOTICE

- **Strictly follow the phase sequence to connect cables.**

--End

5.6 Communication Wiring

The ESS cabinet houses the ports for external Ethernet communication, LC communication, EMS communication, and FSS power supply wiring.

5.6.1 EMS/LC/External FSS Power Supply Wiring

The CONN1 and CONN2 on the power distribution box house the terminals for EMS, transformer, ATS, LC, and external FSS power supply wiring.

Positions of CONN1 and CONN2 are shown in the figure below.

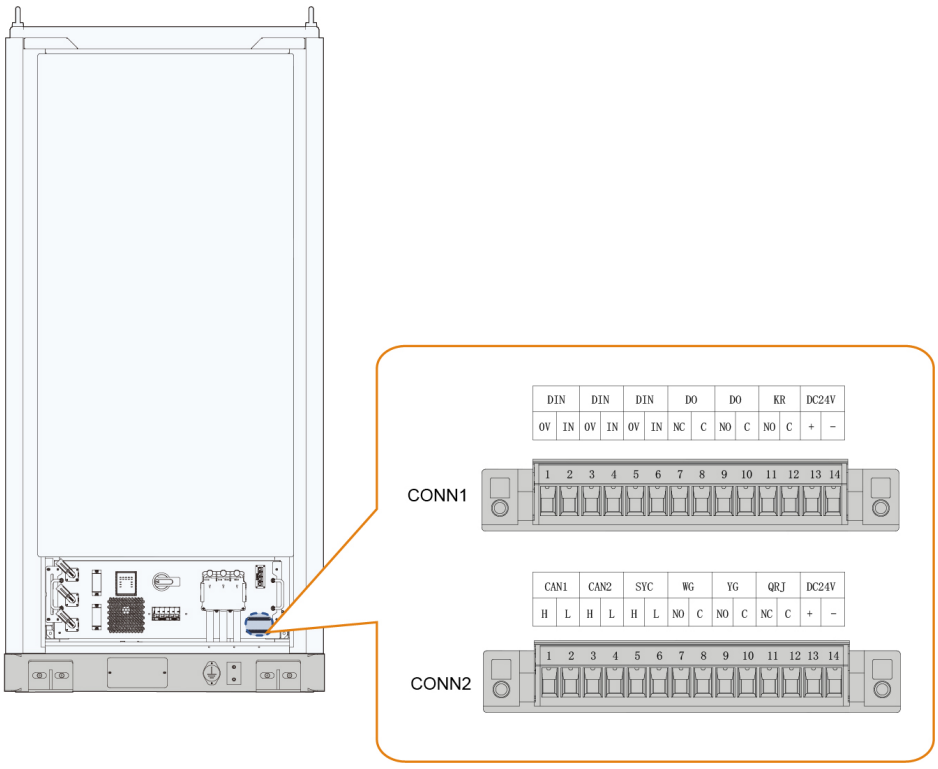


Figure 5-16 Communication Ports

Port	Point	Usage
CONN1	CONN2-1/2	Dry contact reserved for LC
	CONN2-3/4	LC “transformer cabinet overtemperature fault” dry contact input
	CONN2-5/6	Dry contact reserved for LC
	CONN2-7/8	Reserved NC (normally closed) DO port
	CONN2-9/10	Reserved NO (normally open) DO port
	CONN2-11/12	FSS "flammable gas detector" dry contact output
	CONN2-13/14	24V power reserved

Port	Point	Usage
CONN2	CONN2-1/2	CMU communication wiring, reserved for maintenance
	CONN2-3/4	PCS parallel communication wiring
	CONN2-5/6	EMS RS485 communication
	CONN2-7/8	FSS "heat detector triggered" dry contact output
	CONN2-9/10	FSS "smoke detector triggered" dry contact output
	CONN2-11/12	FSS "aerosol extinguishant spraying" dry contact output
	CONN2-13/14	24V power reserved

If there is no transformer cabinet, CONN1 3–4/7–8 do not need to be wired.
EMS is optional. If no EMS is equipped, CONN2 13–14 are invalid.

5.6.2 Fault Dry Contact Signal Connection (Off-grid)

Prerequisite

The cable from the transformer cabinet is connected to the ESS cabinet for the transmission of dry contact signals such as transformer cabinet fault signal and fault linkage signal between ESS cabinets. The output port is located on the XK1 terminal block of the transformer cabinet and the input port is located on the CONN1/2 terminal block of the ESS cabinet.

Step 1 Confirm that the circuit breakers of the front and rear equipment are all off.

Step 2 Pass the cables out of the transformer cabinet and into the ESS cabinet through the inlet and outlet holes.

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

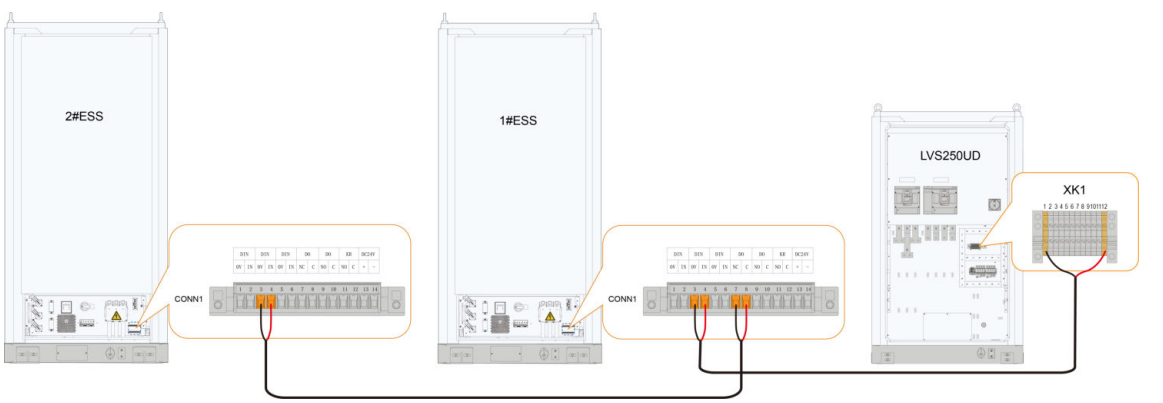


Table 5-2 Port description

Cabinet	Mark	Description	*Recommended specification
Transformer cabinet	XK1-1	Connected to CONN1-3 of 1#ESS	1.5 mm^2
	XK1-12	Connected to CONN1-4 of 1#ESS	
ESS cabinet	1#ESS-CONN1–7	Connected to CONN1-3 of 2#ESS	1.5 mm^2
	1#ESS-CONN1–8	Connected to CONN1-4 of 2#ESS	

*The noted cable specifications are recommended values. It can be adjusted according to actual needs.

Transformer cabinet is optional.

Step 4 Wiring according to the port identification and definition. Tighten with a screwdriver with a torque of 0.7±0.1 N·m.

⚠ WARNING

After wiring completion, parameter configuration must be performed via the LC300 web interface. For details, contact SUNGROW.

--End

5.6.3 Ethernet Communication

Positions of the Ethernet communication ports are shown in the figure below.

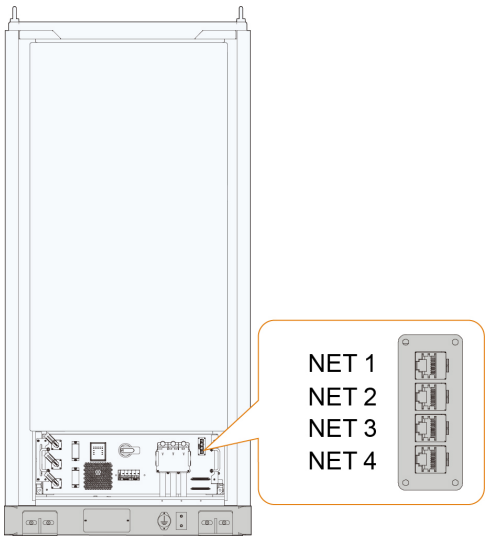


Figure 5-17 Communication Ports

Table 5-3 Port Description

Name	Description
NET1	Connected to PCS (the internal wiring has been completed)
NET2	Used for inter-cabinet networking
NET3	Used for inter-cabinet networking
NET4	Reserved

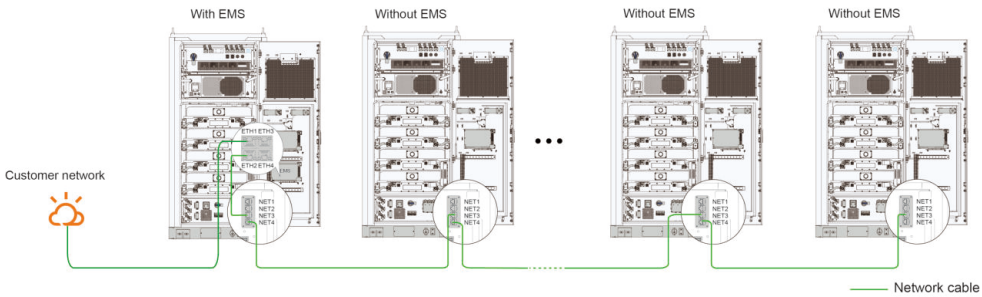


Figure 5-18 Inter-cabinet Networking

- In off-grid mode, the system supports up to 10 cabinets in parallel. In grid-connected mode, the system supports up to 25 cabinets in parallel. The cabinet with an EMS is accessed to the customer network and connected hand-in-hand with other cabinets that do not have EMS.
- Users can check the label on the power distribution box to understand whether the product is equipped with an EMS controller.
- NET2 and NET3 are used for inter-cabinet networking and no distinction is made between them.

5.7 Post-wiring Work

Prerequisite

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

- Check 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-stop 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 Battery Energy Storage System Container 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

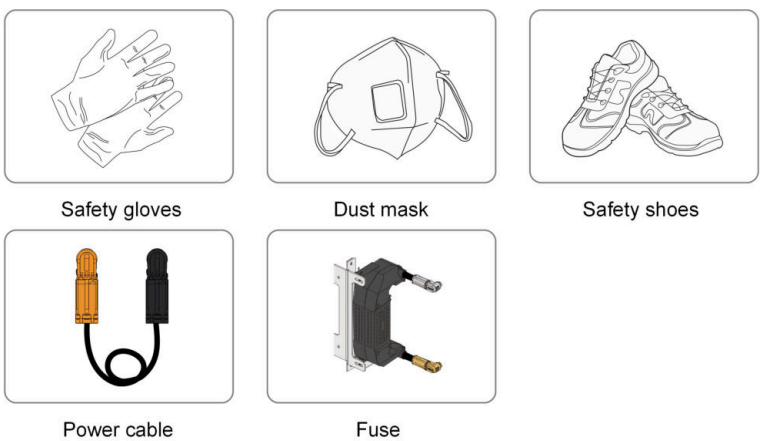


Figure 6-1 Installation Tools

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.

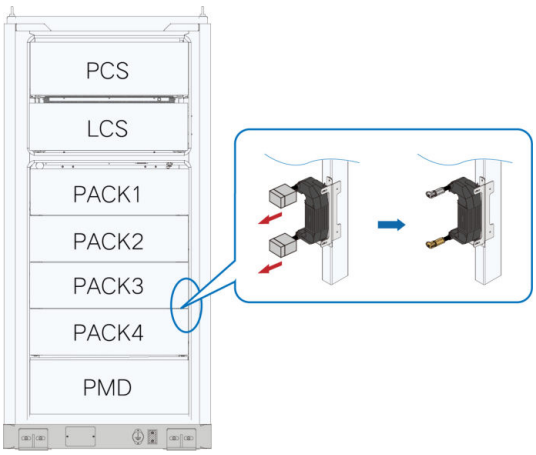


Figure 6-2 Position of Fuse

This step is ignored If the fuse has been installed before shipment.

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

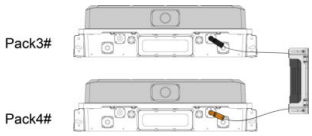


Figure 6-3 Insert Fuse Plugs into PACK Bases

⚠ 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 secured 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.

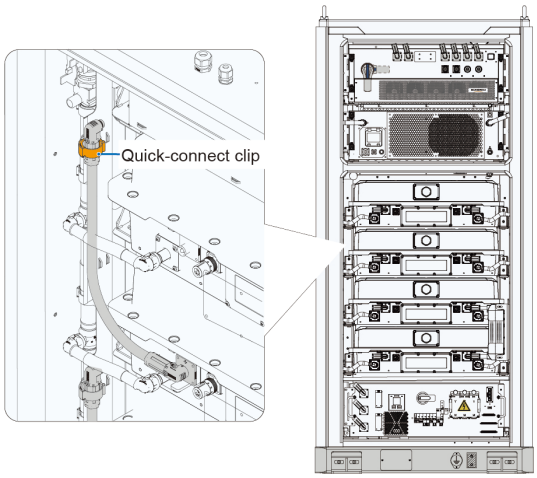


Figure 6-4 Quick-connect Clip

a. Connect the BAT- of Pack1# to the BAT+ of Pack2#;

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

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

a. Connect the BAT+ of Pack1# to the BAT+ of PCS;

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

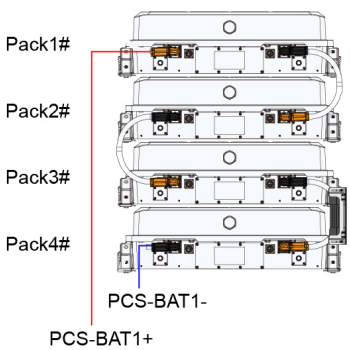


Figure 6-5 PACK Wiring Diagram

⚠ 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 on Steps

Inspect the equipment thoroughly before powering it on. The equipment can only be powered on after all the inspection items are confirmed to meet the requirements.

Prerequisite

- The power and communication wiring of the ESS have been completed.
- The outdoor temperature is in the range of -30℃ to 50℃.

It is not recommended to power on the equipment at temperatures below -30°C. If the temperature is too low, it will take 24 hours or more for the system to heat the cells. During this period, the system cannot operate normally.

Step 1 Power up the transformer cabinet.(Not configured please skip this step.)

a. Close the moulded case circuit breaker QF2 (AC MAIN SWITCH 1#) and completion of the closure of the ESS side switch.

b. Close the moulded case circuit breaker QF1 (AC MAIN SWITCH 2#) and completion of the closure of the load/grid side switch.

c. Close the switch QS1 (AC FAN), completion of AC supply to the fan.

Transformer cabinet is optional.

Step 2 Power up the ESS cabinet.

a. PCS: Set the DC-side load switch of the PCS to "ON". Make sure the emergency stop button on the cabinet is in the reset state.

b. Turn on the QF1 (main AC switch) on the panel to power the AC side of the system.

c. Turn on the Q1 (auxiliary AC switch) on the panel to power on the auxiliary power supply.

d. Turn on the Q2 (UPS switch) on the panel, and press the power button on the UPS. The system auxiliary power supply will start working (devices including the switch, LC, and fans have all been powered on).

e. Start up the system through the control software.

NOTICE

If the cabinet is equipped with a liquid cooling unit, check the status of the circuit breakers inside the liquid cooling unit. Close the circuit breaker that has not been closed.
The 1#FSS DC24V and 2#FSS DC24V must not be closed at the same time.

--End

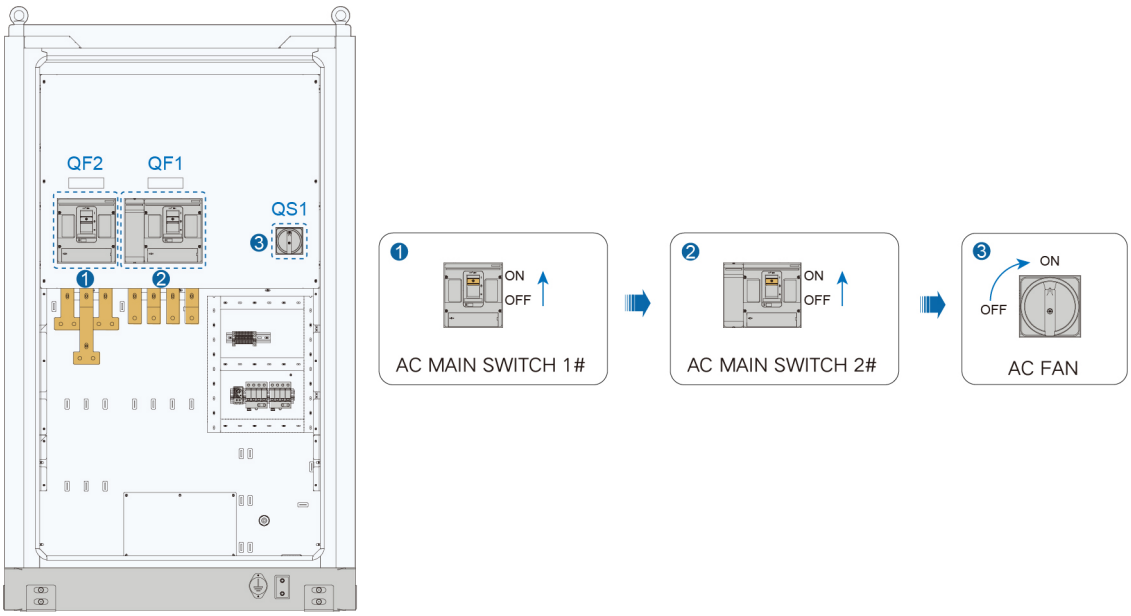


Figure 7-1 LVS250UD Powering on Steps

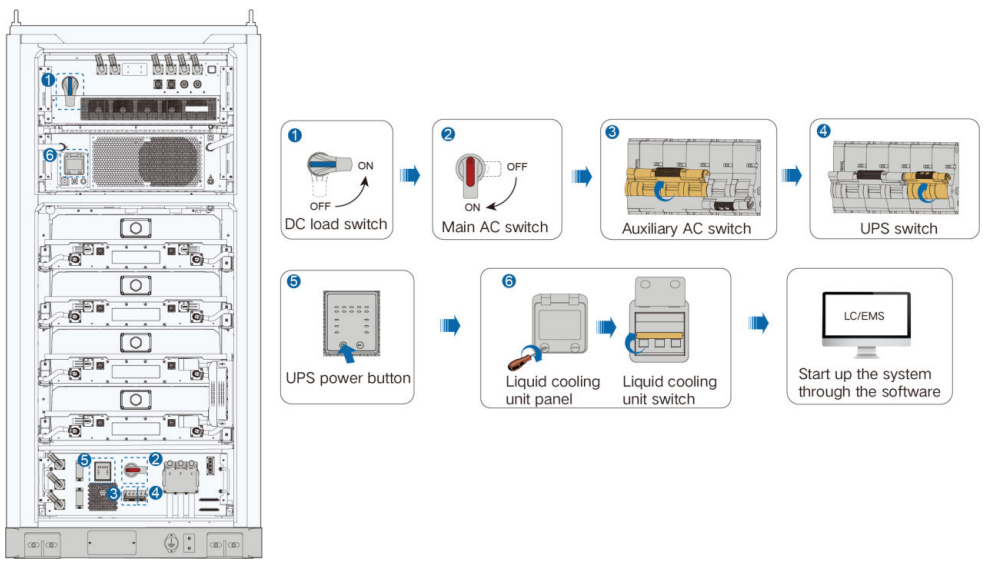


Figure 7-2 ESS Powering on Steps

- Auxiliary power supply supplies power to devices such as switches, LCs, and fans.
- The liquid cooling unit may have been closed before leaving the factory, and when powered on, only the closing status needs to be checked.

7.2 Shutdown

7.2.1 Planned Shutdown

Planned shutdown refers to an interruption to the equipment operation that is scheduled in advance for overhaul, test, or maintenance.

Prerequisite

Shut the system down via the control software, and switch off the battery relay (in case of an emergency, you can press the emergency stop button on the cabinet).

Step 1 Preparation for powering off: Shut down the system via the control software (in case of an emergency, you can press the emergency stop button on the cabinet).

Step 2 Power down the BESS cabinet.

a. Turn off the UPS. Turn off the Q2 (UPS switch) on the panel.

b. Turn off the Q1 (auxiliary AC switch) on the panel.

c. Turn off the QF1 (main AC switch) on the panel.

d. Rotate the PCS DC load switch to "OFF".

DANGER

Before working on the AC wiring terminals, be sure to turn off the upstream switches of the ESS first.

Step 3 Power down the transformer cabinet.(Not configured please skip this step.)

a. Disconnect the fan switch QS1 (AC FAN).

b. Disconnect the moulded case circuit breaker QF1 (AC MAIN SWITCH 2#).

c. Disconnect the moulded case circuit breaker QF2 (AC MAIN SWITCH 1#).

--End

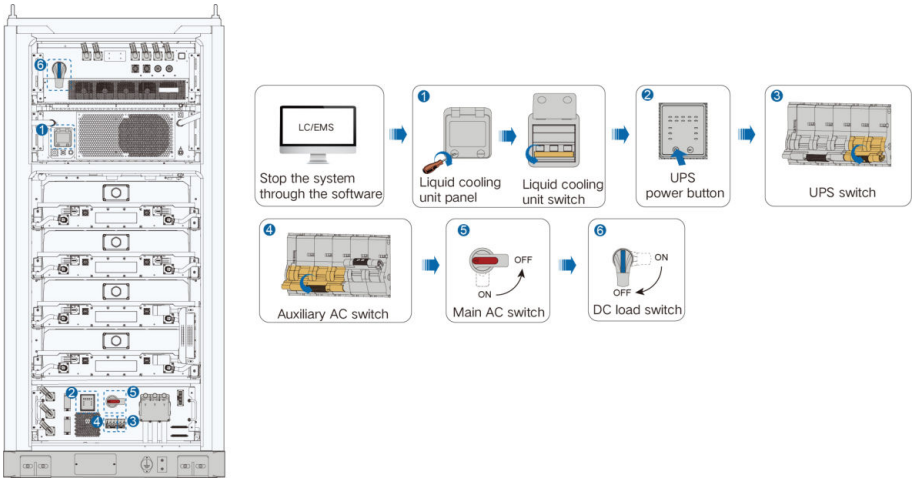


Figure 7-3 ESS Powering off Steps

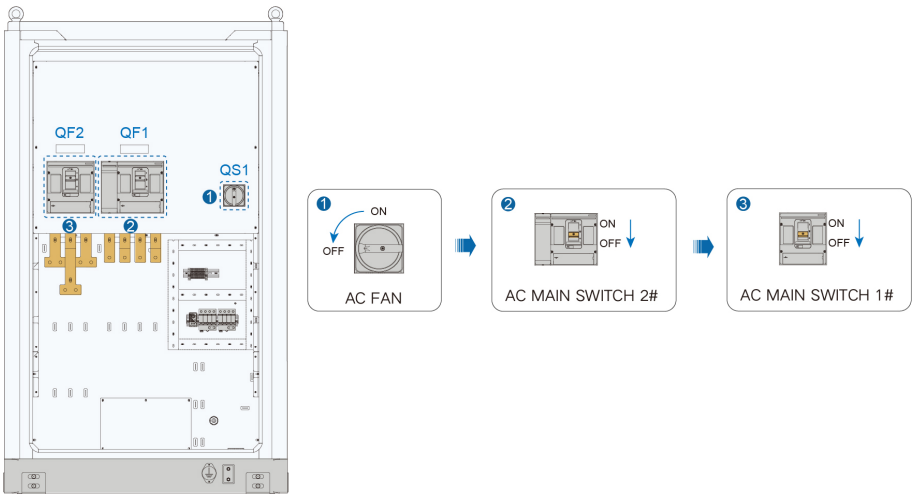


Figure 7-4 LVS250UD Powering off Steps

DANGER

Before performing operation on the AC wiring terminals, be sure to turn off the upstream switches of the ESS first.

Test the voltage after the system self-discharge is completed.

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 an 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.

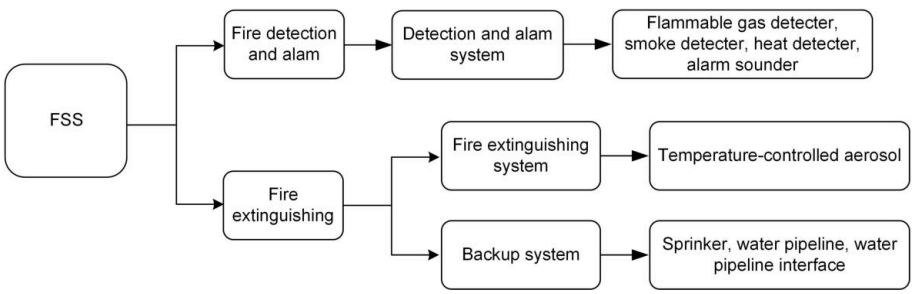


Figure 8-1 Fire Suppression System

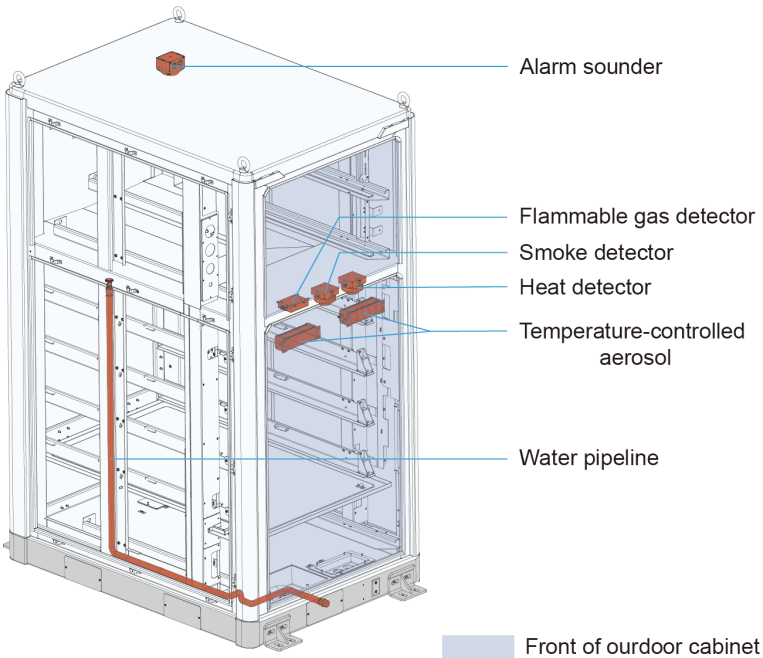


Figure 8-2 Structure of Fire Suppression System

Combustible Gas Detectors Test Requirements

To ensure the detection accuracy of the combustible gas detectors, perform a bump test at least twice a year. If the detector fails the bump test, check and if necessary, calibrate the detector.

Bump Test Requirements:

- Personal protective equipment: Safety goggles (recommended).
- Test gas: 4000 ppm hydrogen with nitrogen as the balance gas.
- Gas flow: Use a pressure-reducing valve to maintain a gas flow rate of ≥ 0.5 L/min.
- Gas pipe: Vinyl (recommended); maximum outer diameter of 5/16 inches (approximately 8 mm).

8.3 Fire Detection and Alarm System

The fire 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.

Each ESS cabinet is equipped with a fire detection and alarm system that is composed of a flammable gas detector, a smoke detector, a heat detector, and an alarm sounder.

- The flammable gas detector can detect the concentration of flammable gases such as hydrogen. Once the hydrogen concentration in the battery compartment reaches the set threshold (10% LEL), the flammable gas detector will send an alarm signal to the LC.

- The smoke detector can assess the smoke concentration based on the scattering of light in smoke. Once the smoke concentration in the battery compartment reaches the set threshold (0.15 dB/m), the smoke detector will send an alarm signal to the LC.
- The heat detector can sense the changes of temperature in the battery compartment. Once the temperature in the battery compartment reaches the set threshold (54°C), the heat detector will send an alarm signal to the LC.
- Upon receiving an alarm signal from the flammable gas detector, smoke detector, or heat detector, the LC will activate audible and visual alarms after signal coupling, reminding the personnel on-site of the abnormal situation with the equipment.

NOTICE

When the product leaves the factory, the alarm sounder is turned off by default. If required, it can be opened manually on site.

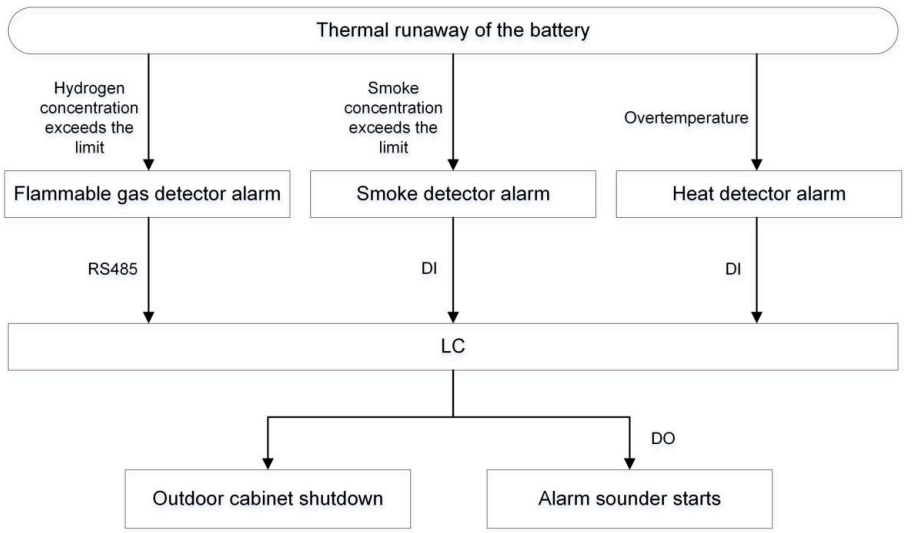


Figure 8-3 Control logic of Detection and Alarm System

8.4 Fire Extinguishing System

The FSS of the ESS cabinet contains a temperature—controlled aerosol with heat-sensing cable.

The fire extinguishing system is an aerosol fire extinguishing system, which includes fire extinguishing agent (temperature-controlled aerosol), fire extinguishing agent storage equipment, temperature sensor and signal feedback device. Each outdoor cabinet is provided with two fire extinguishing agent storage equipments containing aerosol, a temperature sensor and a signal feedback device.

Once the temperature sensor detects that the temperature inside the battery compartment reaches 170°C, the fire detection tube bursts. Subsequently, the aerosol is discharged into the battery compartment, and the pressure switch sends an extinguishant released signal to the LC. Then, the LC stops the operation of the ESS cabinet.

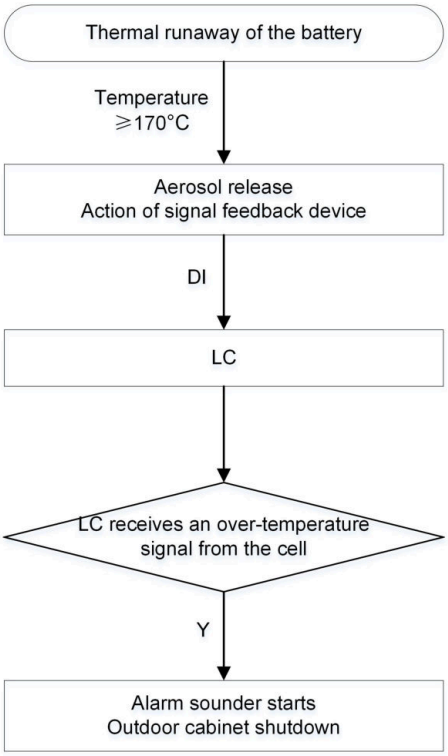


Figure 8-4 Control logic of Fire Extinguishing System

8.5 Backup Protection System

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

⚠ WARNING

The user needs to prepare a fire water pipe separately and connect it properly to the piping system inside the cabinet; otherwise, the backup protection system cannot function properly. The water pressure at the connection point reserved for the backup system should not be less than 0.08 MPa, and the total flow rate should not be less than 81.55 L/min.

In case the fire keeps spreading after the fire extinguishing system operates, the user can activate the backup protection system after the ESS cabinet is powered off, to extinguish the fire.

Once the temperature around the sprinkler reaches 93°C, the glass bulb inside the sprinkler bursts, triggering the sprinkler to activate. Water then flows through the external and internal piping into the battery compartment, immersing the PACKs, to cool the equipment down and extinguish the fire.

The water pipeline and reserved water pipe connector of the ESS cabinet are galvanized steel pipes, DN25 in size, and have been installed in the factory. The external pipeline should be designed and installed by the user separately and connected to the reserved connector on the ESS.

The external piping system can be designed according to the actual situation at the project site. Generally, there are two options: manual fire extinguishing and automatic fire extinguishing.

- Manual: Suitable for scenarios where fighting trucks or other movable equipment are available at the site. In this scenario, set up a water supply pipeline at the site in advance, with one side connected to the reserved connector of the ESS cabinet and the other side to the fire truck or other moveable equipment. In case of a fire, people need to manually let the water in to extinguish the flames.
  Automatic: Suitable for scenarios where fire water ponds are available at the site. In this scenario, the water pipeline is connected to the reserved connector of the ESS cabinet on one side and to the pond on the other side. In case of a fire, water from the pond will automatically flow into the water pipeline for fire extinguishing.

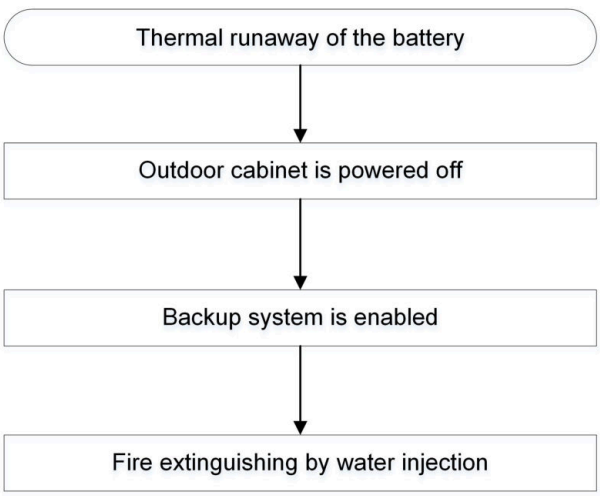


Figure 8-5 Control logic of Backup System

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 LC300 user manual first.

For more information, please refer to the below documents:

Document	QR Code
LC300 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.**

⚠ WARNING

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

NOTICE

In the event of heavy snowfall at the project site, please clear the snow from the top of the equipment and the surrounding area in a timely manner.

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

10.2 Maintenance Item and Interval

- This section 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.

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.

10.3 Maintenance of Liquid Cooling System

The following provides the recommended maintenance periods. The actual maintenance period shall be adjusted reasonably in consideration of the specific installation environment of the product.

Factors like the power plant scale, the location, and the site environment can affect the maintenance period of the product. It is necessary to shorten the maintenance period and increase the maintenance frequency in the event of heavy sandstorm or dust in the operation environment.

Item	Content	Check method	Maintenance tools
Fan	Check whether the fan blades cannot rotate or are damaged. If so, replace the fan.	1. The fan blade rotates smoothly without abnormal noise; 2. No damage to fan blade. Note: Check this item at least half a year. Blade damage inspection is not mandatory.	Screwdriver with long handle
Water pump	1. Check whether over 5% of the cooling air inlet hole of the water pump is blocked. If so, clear it with a brush; 2. Visually inspect the pump body (not the joint parts) and check whether there is obvious water dripping (except	1. The water pump runs smoothly without abnormal noise; 2. There is no obvious dripping on the pump body (except condensate).	Brush

Item	Content	Check method	Maintenance tools
	condensate). If so, replace the sealing ring of the pump.		
Water system	Check the high and low pressure of the water system through HMI. The high pressure should be 2.8bar and the low pressure should be 0.2 bar. 1. If the high pressure is higher than 2.8bar, check whether the filter of the water system is dirty and blocked; 2. If the low pressure is lower than 0.2 bar, replenish the water in the system.	High pressure < 2.8bar; Low pressure □ 0.2 bar	Slotted screwdriver, Phillips screwdriver, water pump, water pipe, clamp.

⚠ WARNING

If the BESS has a "communication failure or failure of the liquid-cooled unit", please contact the after-sales service personnel in time to ensure the functional integrity of the system.

10.4 Container Maintenance

10.4.1 Appearance Repair

Check if the protective paint sprayed on the enclosure of the product fell off or peeled off. If so, repair it timely.
Spray a special protective paint to the exterior of the product every 5 years.

Solutions

Select different repair solutions based on the damage conditions.

Conditions	Solutions
Surface dirt that can be wiped off	10.4.1.1 Detergent Cleaning
Finish paint falls off, and the primer is intact	10.4.1.2 Finish Paint Repair
Primer is damaged, and the base material is exposed	10.4.1.3 Double-Layer Paint Repair

10.4.1.1 Detergent Cleaning

Prerequisite

For dust or stains on the product surface, you can wipe them off using water and alcohol.

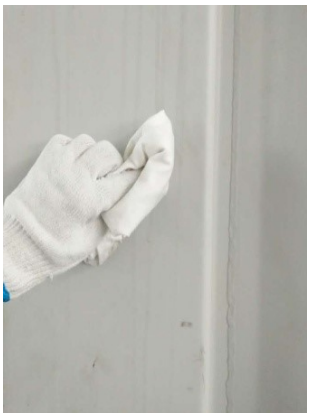
Prepared by Users

Table 10-1 Cleaning Tools

No.	Item
1	Cleaning cloth
2	Water
3	Alcohol or other non-corrosive detergents

Step 1 Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on the surface.

Step 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.)



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10.4.1.2 Finish Paint Repair

Prerequisite

For minor scratches or surface paint chalking, where the finish paint has peeled off, but the base material is not exposed, finish paint repair is needed to restore the product appearance.

Finish Paint Selection and Mixing

Table 10-2 Finish Paint Selection and Mixing

Brand and Model	Chemical Component	Mixing Ratio	Thinner	Drying Time (Minimum)
Jotun Finish Coat Hardtop XP or Hardtop XPL	Two-component chemically cured aliphatic	Main component : Hardener= 10:1 (Volume Ratio)	Jotun Thinner No.10	5℃ 24h 10℃ 12h 23℃ 5h 40℃ 3h
AkzoNobel Finish Paint Interthane 990	Two-component acrylic polyurethane paint	Main component : Hardener= 6:1 (Volume Ratio)	International GTA056	5℃ 24h 25℃ 6h 35℃ 4h

- Confirm with SUNGROW before using paints of other brands or models.
- When using a two-component paint, first thoroughly agitate each component individually, and then mix them in the specified proportions for stirring.
- Add the thinner only after the paint and hardener have been mixed.
- Do not use paint that has exceeded its shelf life.

Prepared by Users

Table 10-3 Cleaning Tools

No.	Item
1	400 mesh/600 abrasive paper
2	Cleaning cloth
3	Alcohol
4	Brush
5	Finish paint
6	Film thickness meter

Environment Requirements

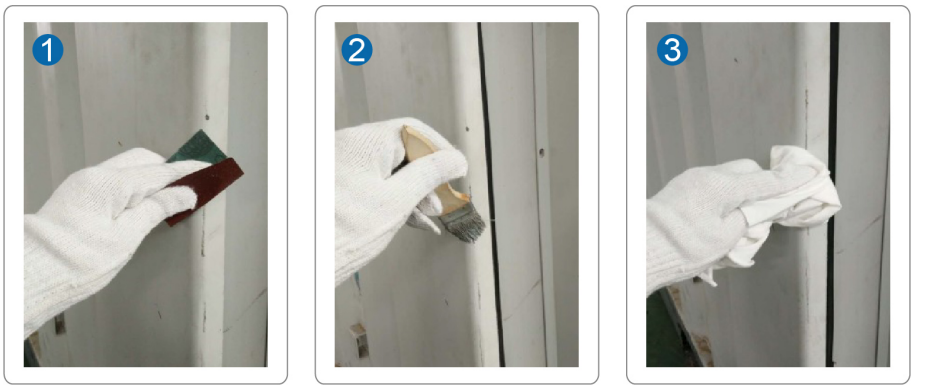
- Ambient temperature: 5℃–40℃
- Base material temperature: 5℃–60℃
- Relative humidity: 10%–85%RH

Repair Steps

Step 1 Polish the paint surface with blistering or scratches with an abrasive paper to expose the gray primer. Use a film thickness meter to measure the primer thickness, which must be at least 150μm.

Step 2 Use a clean brush to remove any residue from the surface.

Step 3 Use a piece of clean cloth dipped in alcohol or detergent to remove the surface powder.



Step 4 Repair the finish paint.

a. Prepare the finish paint with the same color as the appearance.

Common finish paint colors

RAL7035 (Streamer Grey)	RAL9003 (White)	RAL7016 (Dolphin Grey)

b. Mix the finish paint according to the paint model and the requirements of Table 10-2 Finish Paint Selection and Mixing.

c. Apply the finish paint using a brush in a crosshatch pattern. Once the paint fully dried, measure the film thickness using a film thickness meter. Ensure that the single coat thickness falls between 50μm–100μm.

d. When applying multiple layers of paint, wait for each layer to dry completely before applying the next. The total thickness of the primer and finish paint must be at least 240μm.

Step 5 Inspect the paint to ensure it has a uniform color, smooth transitions, and meets the required film thickness.

--End

10.4.1.3 Double-Layer Paint Repair

Prerequisite

If the rusted area is large, or there are deep scratches or dents that expose the base material, perform a double-layer paint repair, including both a primer and a finish paint.

Primer and Finish Paint Selection and Mixing

Table 10-4 Primer and Finish Paint Selection and Mixing

Brand and model	Chemical Component	Mixing Ratio	Thinner	Drying Time (Minimum)
Jotun Primer Jotamastic 90	Two-component epoxy paint	Main component : Hardener= 3.5:1 (Volume Ratio)	Jotun Thinner No.17	5℃ 30h 10℃ 10h 23℃ 3h 40℃ 1.5h
AkzoNobel Primer Interseal 670HS	Two-component epoxy paint	Main component : Hardener= 5.67:1 (Volume Ratio)	International GTA220	5℃ 36h 10℃ 16h 25℃ 10h 40℃ 4h
Jotun Finish Coat Hardtop XP or Hardtop XPL	Two-component chemically cured aliphatic	Main component : Hardener= 10:1 (Volume Ratio)	Jotun Thinner No.10	5℃ 24h 10℃ 12h 23℃ 5h 40℃ 3h
AkzoNobel Finish Paint Interthane 990	Two-component acrylic polyurethane paint	Main component : Hardener= 6:1 (Volume Ratio)	International GTA056	5℃ 24h 25℃ 6h 35℃ 4h

- Use primers and finish paints from the same manufacturer.
- Confirm with SUNGROW before using any paint from a different manufacturer.

- When using a two-component paint, first thoroughly agitate each component individually, and then mix them in the specified proportions for stirring.
- Add the thinner only after the paint and hardener have been mixed.
- Do not use paint that has exceeded its shelf life.

Prepared by users

Table 10-5 Cleaning Tools

No.	Item
1	400 mesh/600 mesh abrasive paper
2	Cleaning cloth
3	Alcohol
4	Brushes with different sizes
5	Grinder (conical and cylindrical polishing heads)
6	Wall putty
7	Finish coat
8	Primer
9	Film thickness meter

Environment Requirements

- Ambient temperature: 5℃–40℃
- Base material temperature: 5℃–60℃
- Relative humidity: 10%RH–85%RH

Repair Steps

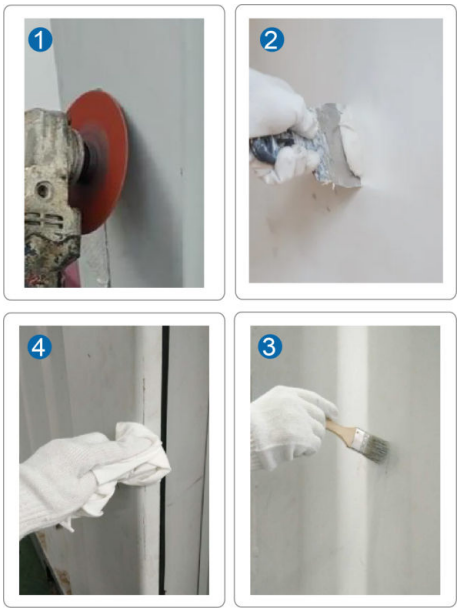
Step 1 Use a grinder or abrasive paper to smooth uneven areas on the surface, achieving a smooth finish with a metallic luster. Ensure a uniform transition from rusted areas to intact coating.

Uneven areas refer to burrs, metal fragments, slag, gaps, and sharp edges on the product.

Step 2 For deeper defects such as scratches or dents, repair them with wall putty to ensure a flat surface.

Step 3 Use a clean brush to remove any residue from the surface.

Step 4 Use a piece of clean cloth dipped in alcohol to remove the surface powder.



Step 5 Repair the primer.

a. Prepare the primer with the same color as the appearance.

Common finish paint colors

RAL7035 (Streamer Grey)	RAL9003 (White)	RAL7016 (Dolphin Grey)

b. Mix the primer according to the paint model and the requirements of Table 10-4 Primer and Finish Paint Selection and Mixing.

c. Apply a primer with a small brush, and use a film thickness meter to ensure the coating thickness in corners and gaps is between 70μm–80μm.

d. After the first layer dries, apply another layer of primer using a brush in a crosshatch pattern. Once it is dry, check that the dry film thickness is within 100μm–300μm.

Step 6 Refer to 10.4.1.2 Finish Paint Repair for finish paint repair.

Step 7 Inspect the paint to ensure it has a uniform color, smooth transitions, and meets the required film thickness.

--End

When using spray paint, follow these steps:

1. Carefully cover the area outside the damaged spot (extending 800mm outward) using masking paper.
2. Spray the exposed area with the paint. After the paint dries, check that the dry film thickness is within the range of 100μm–300μm.

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 Maintenance Precautions

⚠ WARNING

Do not allow the product to remain in a low voltage or low SOC condition for a long time. Capacity loss resulting from any of the following conditions is not covered by warranty:

- **The discharging cell voltage remains below 2.7 V for 120 consecutive hours.**
- **The SOC of any RACK remains at 0% for 120 consecutive hours.**
- **The discharging cell voltage is below 2 V.**

⚠ WARNING

Cell overvoltage and undervoltage fault/alarm (For details, see Communication Protocol > LC300 Info-3x table > CMU fault word/CMU alarm word).

- **Fault: “Cell overvoltage fault”, “Cell undervoltage fault”, “Total voltage overvoltage fault”, “Total voltage undervoltage fault”.**
- **Alarm: “Cell overvoltage alarm”, “Cell undervoltage alarm”, “Total voltage overvoltage alarm”, “Total voltage undervoltage alarm”.**

End users must prioritize resolving the above faults and alarms reported by the SUNGROW local controller. The relevant fault or alarm information will be shown on the user interface. In addition, users shall contact SUNGROW to resolve the problems promptly to prevent the battery from overdischarging or overcharging, which may void the warranty.

NOTICE

- **To avoid voiding the warranty, if a cell undervoltage or overvoltage fault occurs, users must contact SUNGROW's local team within 24 hours and follow their instructions.**
- **The active recharge function is enabled by default at the factory (if the system supports this function). If the SOC is too low, the system will automatically charge the batteries at a low current, until the SOC reaches the safe threshold (configurable). SUNGROW recommends keeping this function enabled to minimize the risk of voiding the warranty due to battery undervoltage.**

NOTICE

- **If the system remains inactive for 7 days or longer, it is suggested to raise the SOC lower limit protection value to above 10%. Besides, regularly monitor the system's SOC to prevent overdischarge, which may void the warranty.**
- **During maintenance or shutdown, if any RACK's SOC falls to 0%, charge it to at least 15% within 120 hours.**
- **During operation, if any RACK's SOC falls to 0%, charge it to at least 5% within 2 hours. Alternatively, when the SOC reaches 0%, switch the system to recharging mode via the upper computer EMS.**
- **If the system is stored without operation for six months or more, it must undergo at least one full charge to activate the batteries before being used for the first time.**

The user needs to calibrate the SOC when the battery system is in one of the following conditions during operation.

- During operation, if the SOC does not reach 1%–5% when discharging, and does not reach 97%–100% when charging, it is recommended that a SOC calibration be performed once every 1 month.
- During operation, when the SOC reaches 1%–5% when discharging, or the SOC reaches 97%–100% when charging, and the resting time is < 1h, it is recommended that a SOC calibration be performed once every 1 month.

  During operation, no additional calibration is required when the SOC reaches 1%–5% when discharging or 97%–100% when charging, and the resting time is ≥ 1h.

- A calibration is recommended for major changes in operating conditions, such as from energy shifting to frequency regulation application.

Steps to manually perform SOC calibration

1. Set SOC protection lower limit to 1%–5% and upper limit to 97%–100%.
2. Discharge the system until the SOC reaches the lower limit, and then let the system rest for 1 h without changing the power command.

3. Charge the system until the SOC reaches the upper limit, and then let the system rest for 1 h without changing the power command.
4. SOC calibration is complete. The system can be put back into operation.

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

1. Maintenance personnel must hold an electrician's license issued by the local safety supervision authority and successfully complete professional training before operation.
2. Observe related safety precautions, use necessary tools, and wear personal protective equipment.
3. Do not wear jewelry or metal accessories such as watches.
4. Do not touch the positive and negative high-voltage terminals of the ESS with hands at the same time.
5. Turn off all HV and LV switches before maintaining the ESS.
6. Do not clean the ESS with water directly. Use a vacuum cleaner if necessary.
7. Connect and disconnect cables by following the standard operation procedure. Do not connect or disconnect any cables forcefully or brutally.
8. Put away the tools and materials in time after maintenance. Check that no metal objects are left inside or on top of the equipment.
9. If there is any question about the operation and maintenance of the equipment, please contact SUNGROW Customer Service. Unauthorized operation is prohibited.

10.5.2 Maintenance

1. PACK 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 Battery Energy Storage System Container is not used in a long time, it should be charged once every 18 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 Battery Energy Storage System Container 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 Energy Storage System Container for pungent odor and high-voltage connections for burning odor.
10. Regularly check whether the voltage, temperature and other data of the check 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 Battery Energy Storage System Container are in good conditions and whether they work properly.
12. Regularly check whether the emergency stop button of the Battery Energy Storage System Container 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.**
- **The brand of coolant to be replaced is limited to Great Wall and Acwell, and it is recommended to use the same brand of coolant. If you choose to mix Great Wall and Acwell coolants, the mixing ratio of different coolants is limited to 9:1.**

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

Waste types	Disposal measures
	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.
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.

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 DC/AC power converter unit 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
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	ST225kWh-110kW-2h
DC Side	
Cell Type	LFP
System Battery Configuration	256S1P
Rated Battery Capacity	229kWh
Battery Voltage Range	691.2V–934.4V
AC Side (On-Grid)	
Nominal power	110kW
Nominal voltage	400 V
Voltage range	340V–440V
Nominal frequency	50Hz / 60Hz
Frequency range	45Hz–55Hz / 55Hz–65Hz
Max.THD of current	< 3 % (Nominal power)
DC component	< 0.5 % (Nominal power)
Power factor range	1.0 leading ~ 1.0 lagging
AC Side (Off-Grid)	
Nominal voltage	400 V
Nominal frequency	50 Hz / 60 Hz
Max.THD of voltage	< 3 %(Linear load)
Unbalance load capacity	100 %
System Parameters	
*Dimensions (Width * Height * Depth)	1150 mm * 2450 mm * 1610 mm
*Weight	Approx. 3100kg
Degree of protection	IP55
Auxiliary power supply	Internal power supply (Default)
Anti-corrosion degree	C5 (Default) / C3 (Optional)

Product Model	ST225kWh-110kW-2h
Operation humidity range	0 % ~ 100 %
Operation temperature range	-30 ℃ ~ 50 ℃ (> 45 ℃ derating)
Max. operating altitude	3000 m
Temperature control method	Intelligent liquid cooling
Noise	≤ 70 dB(A) @ 1m
Fire suppression system	Default: Flammable gas detector, Smoke detector, Heat detector, Alarm sounder, Aersol, Sprinkler Optional: FK5112
Communication interface	Ethernet
Communication protocol	Modbus TCP
Standard	IEC62619, IEC63056, IEC62040, IEC62477, IEC61000, IEC62933, UN38.3
Max.Parallel quantity (off-grid)	10
Transformer Cabinet Parameter	
Transformer capacity	250 kVA
Primary side voltage/Secondary side voltage	400 V / 400 V (Dyn11)
Nominal frequency	50 Hz / 60 Hz
*Dimensions (Width * Height * Depth)	1200 mm * 2000 mm * 1200 mm
*Weight	Approx. 1500 kg
Degree of protection	IP55
Anti-corrosion degree	C5 (Default) / C3 (Optional)
Operation humidity range	0 % ~ 100 %
Operation temperature range	-30 ℃ ~ 50 ℃ (> 45 ℃ derating)
Max. operating altitude	3000 m
Temperature control method	Air cooling

*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 Power Supply Co., Ltd.

www.sungrowpower.com

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