

User Manual

Seamless On/Off-grid Switching Cabinet

ATS250



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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
	<p>A medical facility should be set up nearby.</p>
	<p>If it gets in your eyes, flush your eyes immediately with running water or saline, and seek medical advice in time.</p>
	<p>Protective earthing (PE) terminal. This terminal should be connected for reliable grounding, to ensure the safety of the operator.</p>
	<p>Read the instructions before performing any operation on the product.</p>
	<p>Wear safety goggles.</p>

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 Hoisting and Transportation

⚠ WARNING

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

1.4 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.

1.5 Operation and Maintenance

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

- **To ensure fire safety at all times, replacement of internal components must only be performed by qualified personnel.**

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.**

1.6 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 ATS250 is a product designed for seamless power switchover. It can be used in conjunction with the ST200CS ESS cabinet. Then, in case of a grid power outage, the ESS will quickly switch to the off-grid mode and supply power to the loads to ensure they can work uninterruptedly. Meanwhile, it enables the ESS to work as a backup power source that can substitute diesel generators, thus reducing the use of diesel generators.

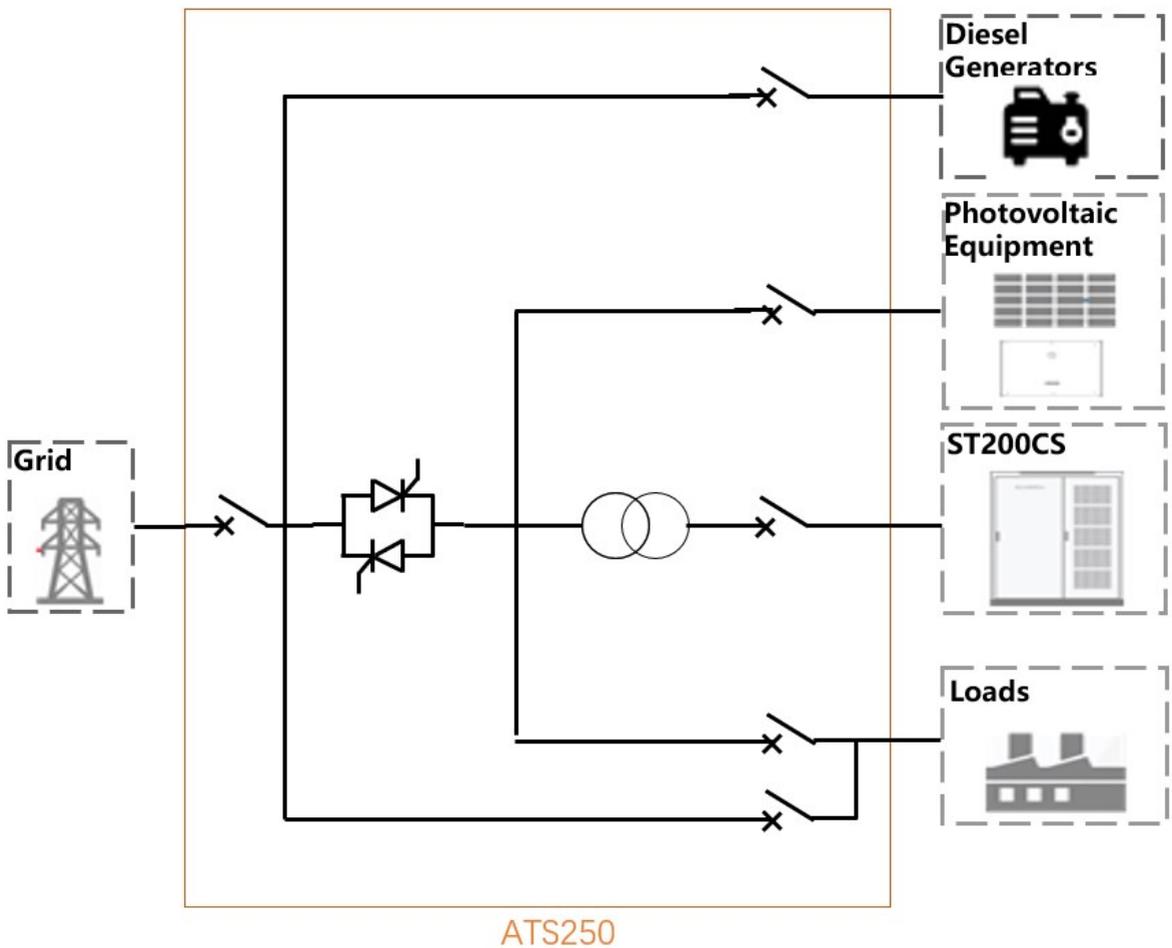


Figure 2-1 Typical Application of ATS

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

NOTICE

- **Based on the maximum operating power of the ATS, it is recommended that the upstream grid-side transformer selected by the customer have a capacity of $\geq 500\text{kVA}$.**
- **The ATS can switch from the off-grid operation mode to the grid-connected operation mode only when the grid voltage is within the range of 350V to 430V. This ensures the stable operation of user-end loads, considering the uncertainty of the local power grid.**

2.2 External Design

2.2.1 ATS External Design

The external design of the ATS cabinet is shown in the figure below.

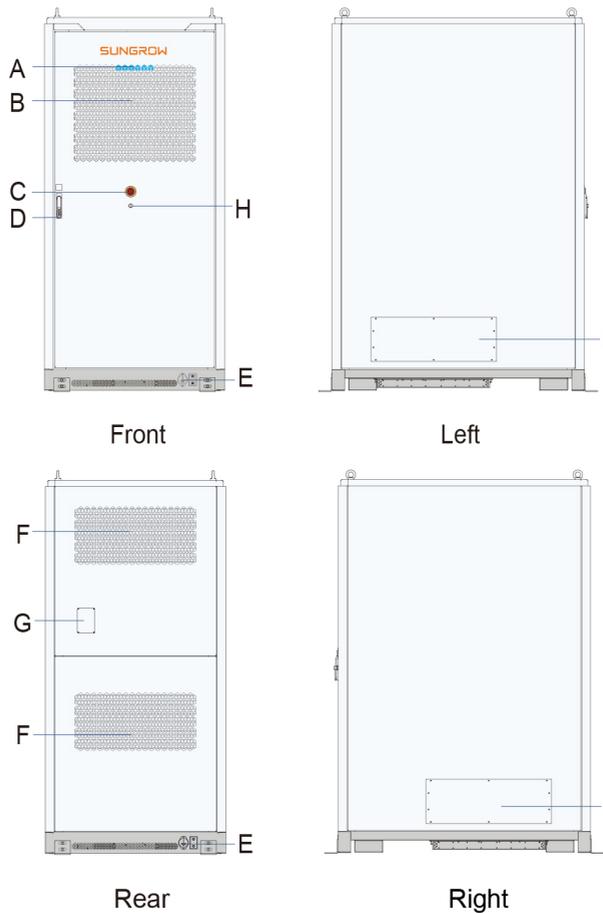


Figure 2-2 ATS External Design

*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
H	Remote/local selector switch*

No.	Name
I	Access panel for bottom fan maintenance



*The on/off-grid switching function of the ATS operates properly only in Remote mode. Local mode is intended solely for maintenance purposes.

NOTICE

The nameplate contains critical parameter information related to the ATS 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 ATS cabinet. The description of the LED indicator status is shown below.

Table 2-1 LED Indicator Status

Status	Description
 Steady blue	Running on-grid
 Blink blue	Running off-grid
 Steady red	Running in bypass mode
Off	Stop

Remote/local Selector Switch

The remote/local selector switch controls the power supply to the circuit breakers QF1 (GRID) and QF2 (Diesel Generator). It can prevent the circuit breakers from accidentally closing in response to a control system command during on-site maintenance, thereby ensuring the safety of O&M personnel.

Table 2-2 Remote/local Selector Switch Status

Status	Description
<p>LOCAL REMOTE</p>  <p>Remote mode</p>	<p>The control power to circuit breakers QF1 and QF2 are turned on. In this mode, QF1 and QF2 operate as intended in response to remote closing/opening commands, and the on/off-grid switching function of the ATS operates normally.</p>

Status	Description
<p>LOCAL REMOTE</p>  <p>Local mode</p>	<p>The control power to circuit breakers and QF2 are turned off. In this mode, QF1 and QF2 do not respond to remote closing/opening commands, and the on/off-grid switching function of the ATS is deactivated.</p>

The remote/local selector switch is equipped with a mechanical lock. After maintenance is completed, the switch must be locked mechanically, as illustrated in the following figure.



NOTICE

To be operated by qualified personnel only!

2.2.2 Mechanical Parameters

Dimensions

The dimensions of the ATS cabinet are shown in the figure below.

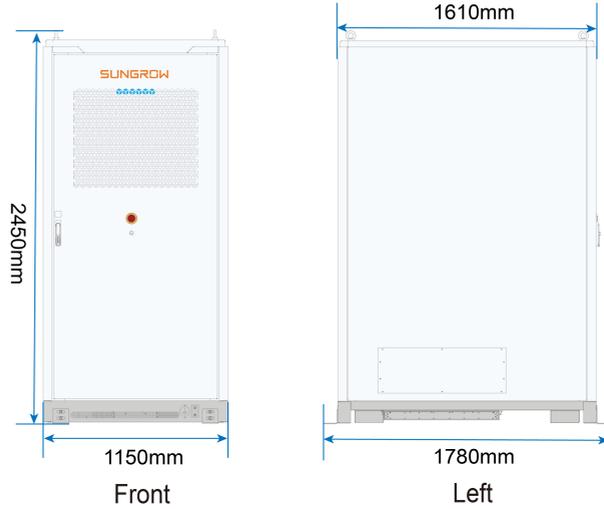
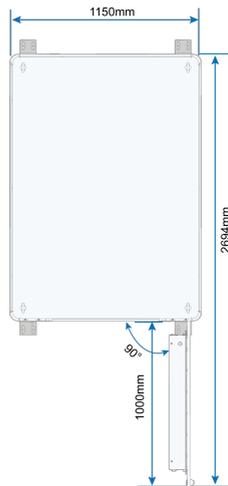


Figure 2-3 Dimensions of ATS



i The distances shown in the figure of "Maximum Dimensions of ATS with Its Door Open" do not indicate the space required for installation.

Figure 2-4 Maximum Dimensions of ATS with Its Door Open

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

2.2.3 Ventilation Design

Air flows into the ATS cabinet from the front and gets out from the rear, as shown in the figure below.



Air inlets at front and bottom

Air outlets at rear

Figure 2-5 Air Inlets and Outlets

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

2.3 Internal Design

2.3.1 Internal Structure

Main electrical equipment inside the ATS cabinet is shown in the figure below.

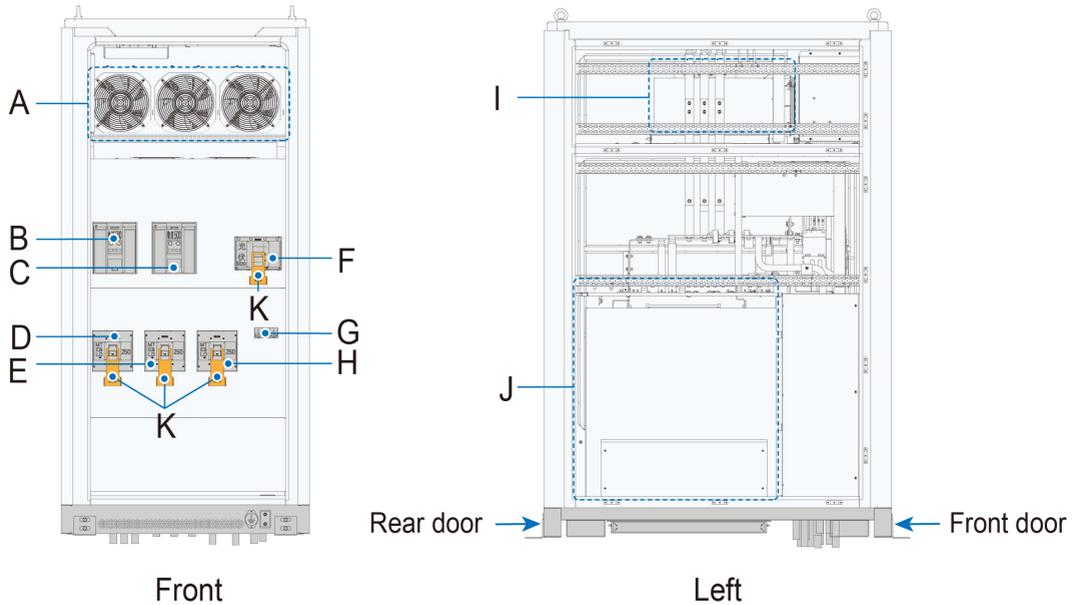


Figure 2-6 ATS Internal Structure

No.	Name
A	Thyristor cooling fan
B	Grid circuit breaker QF1 (GRID)
C	Diesel generator circuit breaker QF2 (GEN□)
D	Maintenance circuit breaker QF3 (MAINTAINCE)
E	ESS circuit breaker QF6 (BESS)
F	PV circuit breaker QF5 (PV)
G	Miniature circuit breaker Q1(AC FAN)\Q2(SMPS)\Q3(AC 230V)
H	Load circuit breaker QF4 (LOAD)
I	Thyristor
J	Transformer compartment
K	mechanical locks

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

⚠ WARNING

- **The molded-case circuit breaker have mechanical locks. Lock out the circuit breaker after switching it off to prevent electric shocks due to operation by mistake.**
- **Do not switch on QF1 and QF2 at the same time during manual operation.**
- **Make sure the circuit breaker QF1 is off during grid maintenance.**

2.3.2 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:

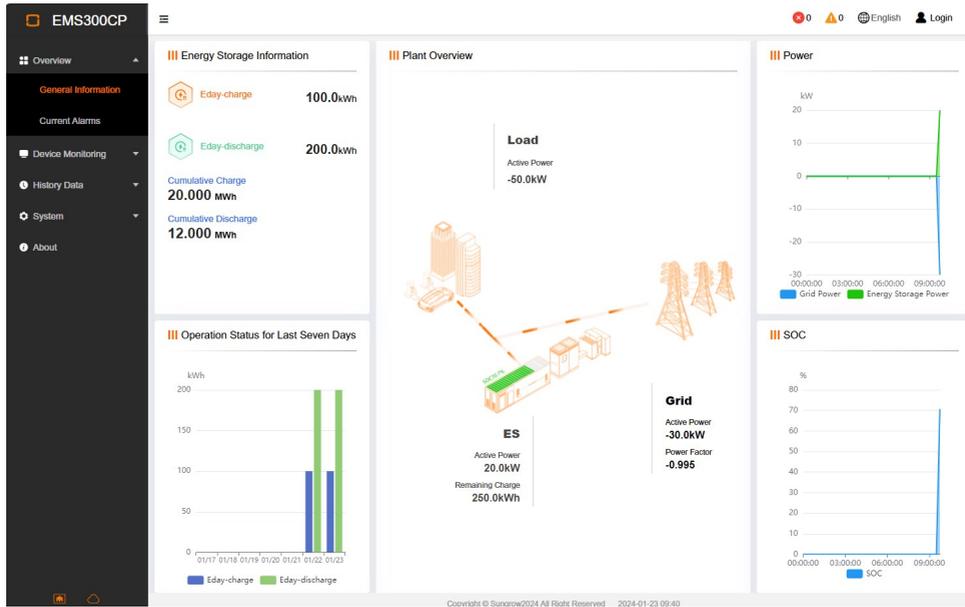


Figure 2-7 EMS300CP Web Homepage

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 2-8 EMS300CP iSolarCloud Homepage

3 Transport and Storage

3.1 Precautions

CAUTION

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

3.2 Transport Methods

The ATS 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 ATS by air, and no relevant guide for rail transport is applicable.

The ATS can be transported by truck within the country.

NOTICE

In most cases, the total weight of the truck that carries the ATS 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 Transportation Requirements

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

WARNING

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

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



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

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

- The door of the ATS is 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 ATS.
- Extra traction may be required to move the ATS along a slope.
- Remove all obstacles that exist or may exist along the route, such as tree branches and cables.
- Transport or move the ATS in good weather, whenever possible.
- Be sure to set up warning signs or fence off warning zones to prevent irrelevant personnel from entering the operating area, thus avoiding accidents.
- Do not put the ATS upside down, nor stack them up, during transport.
- If the ATS is transported by land, be sure to fix the lifting rings at the top of the ATS to the transport vehicle with ropes, to prevent it from getting overly tilted during transport.

3.4 Storage Requirements

- The ATS base must be elevated off the ground to a certain height, to avoid condensation inside the ATS and prevent the ATS 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 ATS on a dry, flat, and solid platform that has a sufficient load capacity and is not covered by any vegetation. The surface where the ATS is stored must be flat, without bumps or rolls-and-swells. It should have an unevenness of $\leq 5\text{mm}$ and be free of water accumulation.
- Before storage, ensure that the doors of the ATS and its internal components are all locked.
- Ambient temperature for storage: -30°C to $+50^{\circ}\text{C}$.
- Relative ambient humidity for storage: 0% to 95%, non-condensing.
- Take effective measures to protect the air inlets and outlets of the ATS and prevent the ingress of rain water, sand, and dust into the ATS.
- 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 it immediately if the packaging gets damaged. Inspect the ATS cabinet and its internal components for damages.
- Before installing an ATS that has been stored for more than six months, open the door and conduct a visual inspection first. Make sure the ATS 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 it before installation.
- The place where the ATS is stored 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 ATS caused by severe environmental conditions such as sudden temperature changes or collisions.
- The packing crate cannot be tilted or turned upside down.

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 that the equipment you have received matches the order you have placed.
- Inspect the equipment and its internal components, and make sure there is no damage. 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 equipment is in good condition, without any damage.**
- **All the components inside the equipment 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 $\pm 5\text{mm}$.
- 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.



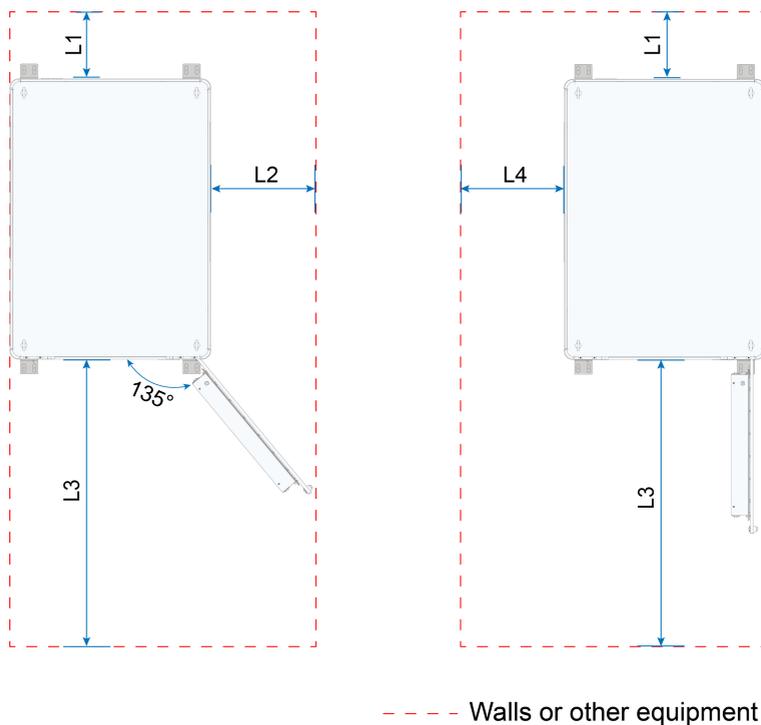
Pre-bury the grounding unit according to the applicable standards of the country/region where the project is located.

4.2.3 Installation Space Requirements

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

NOTICE

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

Installation of One ATS**Figure 4-1** Space Required for One ATS

$L1 \geq 300\text{mm}$, $L2 \geq 600\text{mm}$, $L3 \geq 1700\text{mm}$, $L4 \geq 600\text{mm}$

Installation of ATS and ESS Cabinets

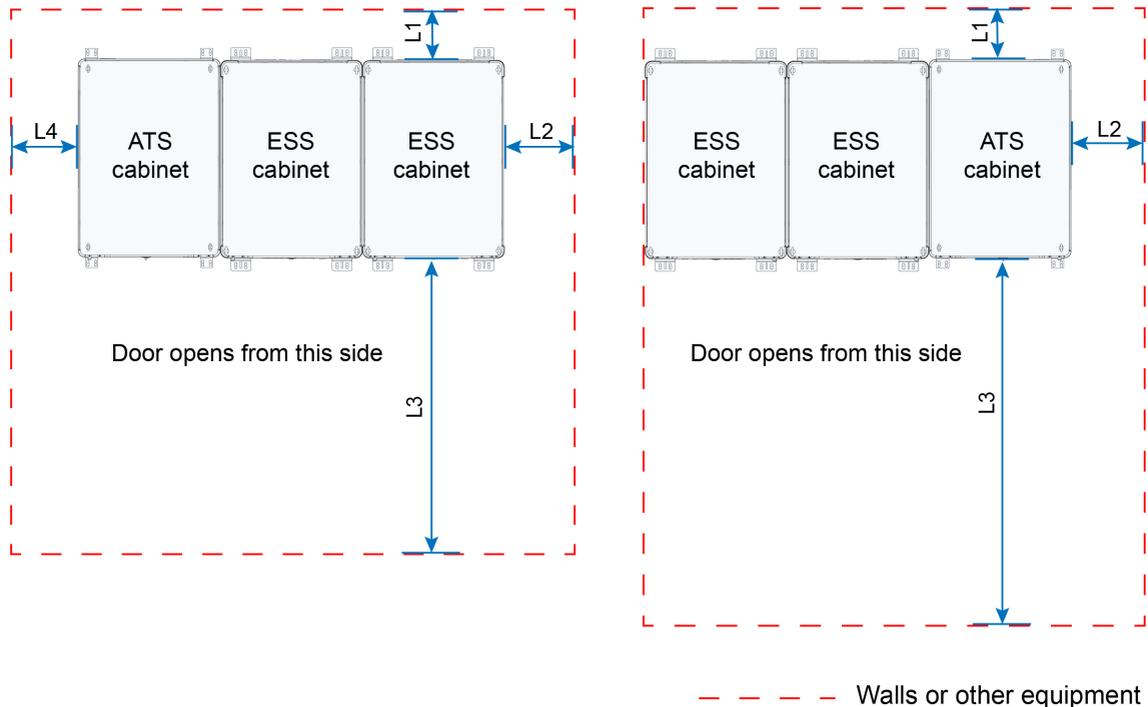


Figure 4-2 Space Requirements When Used With ESS Cabinets

If the ATS cabinet is put on the left: $L1 \geq 300\text{mm}$, $L2 \geq 630\text{mm}$, $L3 \geq 2000\text{mm}$, and $L4 \geq 600\text{mm}$.

If the ATS cabinet is put on the right: $L1 \geq 300\text{mm}$, $L2 \geq 600\text{mm}$, and $L3 \geq 2500\text{mm}$.

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

NOTICE

Sufficient ventilation equipment is required when installing the ATS cabinet indoors. To ensure better heat dissipation, maintain a space of $\geq 800\text{mm}$ (in height) above the ATS.

4.3 Handle with Forklift

You can move the ATS using a forklift if the ground on the installation site is flat. Forklift pockets are provided at the bottom of the ATS for the insertion of forklift forks.

To move the ATS using a forklift, make sure the below requirements are met:

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

The forks should be inserted into the forklift pockets at the bottom of the ATS (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.

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

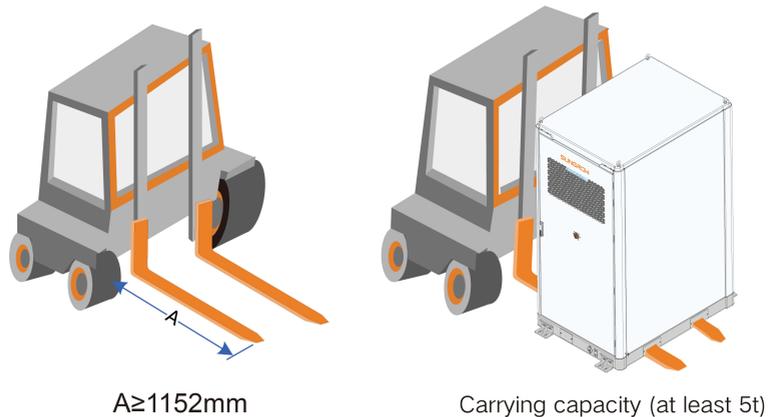


Figure 4-3 Handle with Forklift

⚠ WARNING

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



The ATS 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 for Hoisting

⚠ WARNING

- Perform operation in strict accordance with the safety 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.

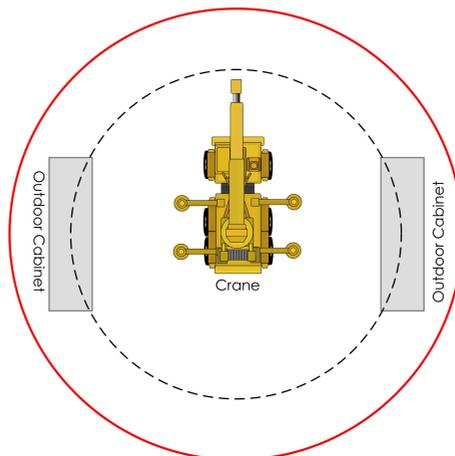


Figure 4-4 Crane Operation

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 ATS. The lifting devices should be connected to the ATS properly.
- Considering on-site conditions, lift the ATS by its four lifting rings, with non-vertical forces applied.

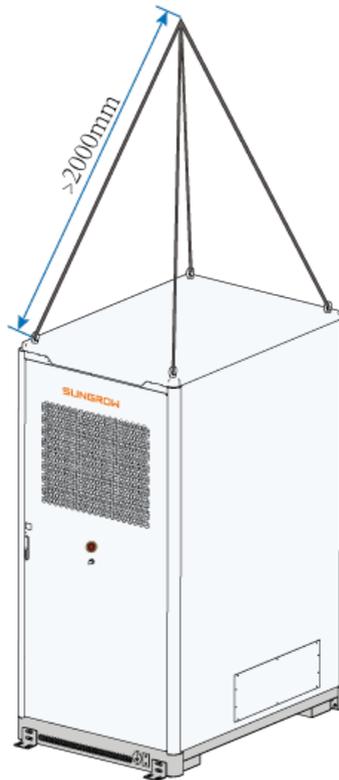


Figure 4-5 ATS Hoisting

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

4.5 ATS Fixing

After moving the ATS 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 ATS 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 ATS.

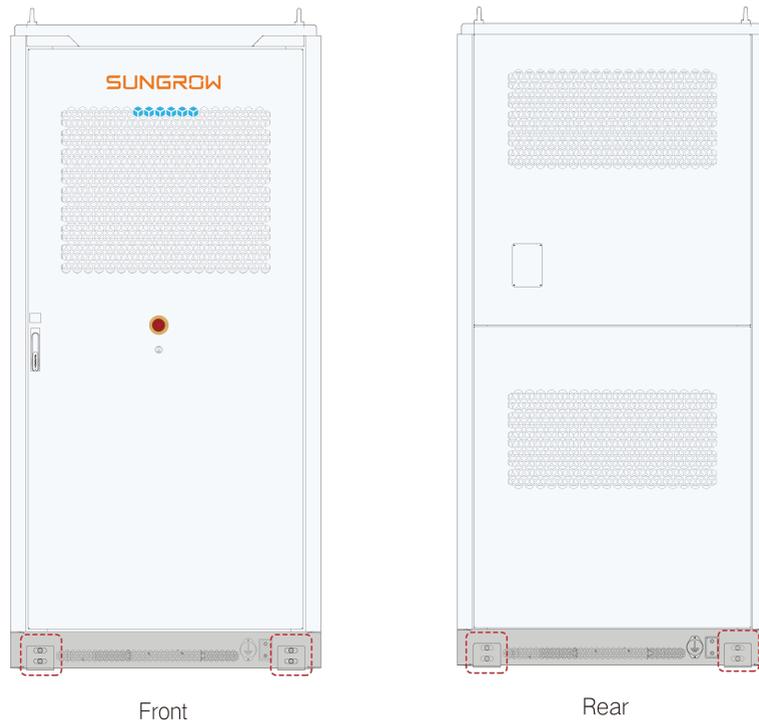


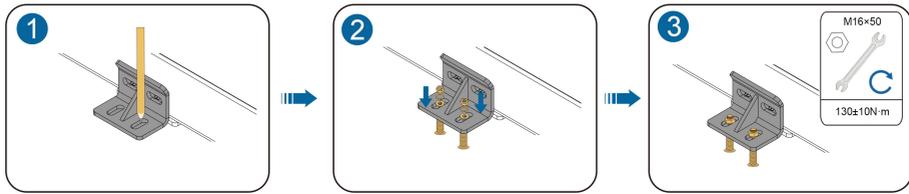
Figure 4-6 L-shaped Angle Steels

Installation Tools

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

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

Installation Method



5 Electrical Connection

5.1 Safety Precautions

⚠ DANGER

High voltages! Danger of electric shocks!

- Do not touch any live part!
- Before installation, ensure that the AC and DC sides are voltage-free.
- Do not place the equipment on the surface of flammable materials.

⚠ WARNING

Ingress of sand and moisture may damage the electrical components inside the equipment, or affect its performance.

- Avoid performing electrical connections on windy and sandy days or when the relative humidity in the surrounding environment is greater than 95%.
- Perform electrical connection in fairly sunny and dry weather, without strong wind and sand.

⚠ 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 diminish 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 that the connection is correct and secure.

5.2 Electrical Connection Overview

5.2.1 Wiring Diagram

The wiring diagram of the ATS is shown below:

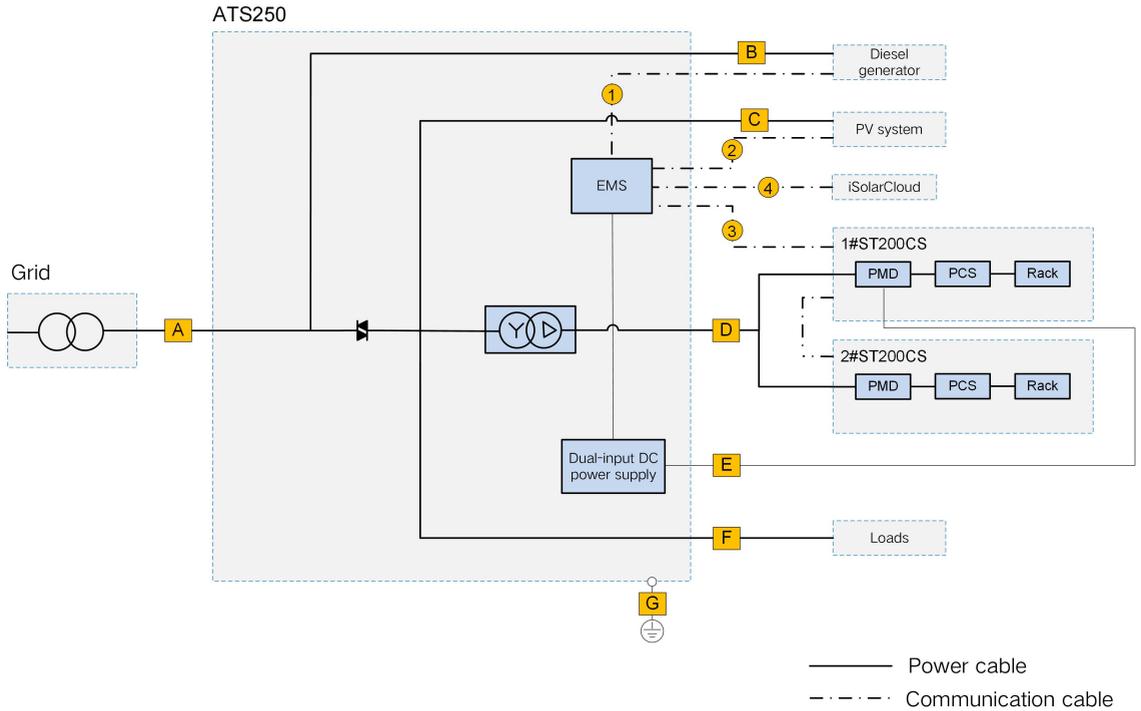


Figure 5-1 Wiring Diagram

Table 5-1 Port Description

No.	Description	*Recommended cable specifications
A	Port for wiring to grid	2×240mm ² /copper wire
B	Port for wiring to diesel generator	2×240mm ² /copper wire
C	Port for wiring to the PV system	2×240mm ² /copper wire
D	Port for wiring to the battery	95mm ² /copper wire
E	Port for 24V DC power supply	2.5mm ² /copper wire
F	Port for wiring to critical loads	240mm ² /copper wire
G	Grounding point	70mm ² –95mm ² yellow-green cable or flat steel

No.	Description	*Recommended cable specifications
1/2/3/4	Communication ports	S/FTP or CAT6A network cable

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

⚠ WARNING

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

⚠ WARNING

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

NOTICE

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

5.2.2 Wiring Distance

To ensure the stability of data, signal, and power transmissions in different application scenarios, the maximum distance for wiring is specified for the relevant equipment, as listed in the table below.

Table 5-2 Wiring Distance

Connected Equipment	Connection	Transmission distance*	Note
	Ethernet	<100m	CAT6a shielded network cable
ATS-ATS (connected in parallel)	CAN	<10m	Use a shielded two-core cable. Field test shows that data packet loss may occur during transmission when the distance exceeds 10m (the customer should add a termination resistor at the end

Connected Equipment	Connection	Transmission distance*	Note
			of the shielded cable when wiring).
	(Active) dry contact	<100m	Eliminate the impact of voltage drop and ensure proper conduction between the contacts.
	Ethernet	<100m	CAT6a shielded network cable
ATS-200CS	DC 24V power supply cable	<40m	When 24V power supply has a load of 116W, the current is approximately 4.8A. If a 15AWG (1.5mm ²) cable is used, to ensure the 24V load can operate properly, the voltage should be above 22V. The cable length should be less than 40m.
	Ethernet	<100m	CAT6a shielded network cable
200CS-200CS	CAN	<10m	Use a shielded two-core cable. Field test shows that data packet loss may occur during transmission when the distance exceeds 10m (the customer should add a 120Ω termination resistor at the end of the line when wiring).
ATS-Diesel generator	RS485	<1000m	Shielded two-core cable
ATS-PV	Ethernet	<100m	CAT6a shielded network cable

*Theoretical value, for reference only.

5.2.3 Voltage Limits for External Connections

According to the IEC 62477-1 standard, the ATS cabinet has a maximum voltage limit for each external connection. The details are shown in the table below.

Table 5-3 Maximum Voltage Limit

Connection	Max. Voltage
Grid-side/Diesel generator-side circuit breaker	Rated 415V
PV-side circuit breaker	Rated 415V
Load/ESS circuit breaker	(Rated 690V) 415V
RS485 port	MAX: 6V
CAN port	$V(\text{CAN-L})+V(\text{CAN-H})=5\text{V}$ (twisted-pair)
Ethernet port	Non-POE network port; 3.3V communication power supply only
DO port	24V
External power supply 24V	24V

*Theoretical value, for reference only.

5.3 Preparation Before Wiring

5.3.1 Prepare Installation Tools

Item	Name and Graphics		
			
	Torque screwdriver	Wire stripper	Hydraulic pliers
Installation tool			
	Heat gun	Multimeter	Screwdriver
		Torque wrench	

Item	Name and Graphics		
	 Safety gloves	 Goggles	 Safety shoes
Protective tools	 Protective clothing		

5.3.2 Open Cabinet Door

Open the cabinet door before wiring.

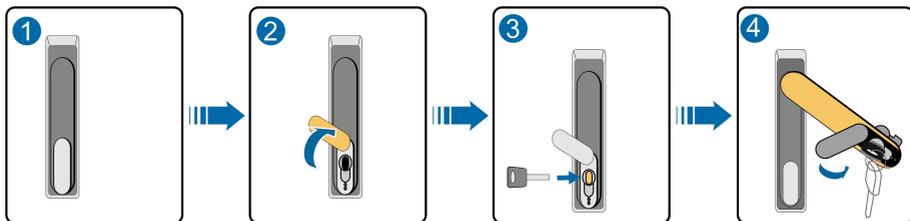


Figure 5-2 Open the Front Door

Step	Notes
1	Door locked.
2	Move the cover above the lock hole.
3	Insert the door key and turn it clockwise.
4	Rotate the handle anticlockwise 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:

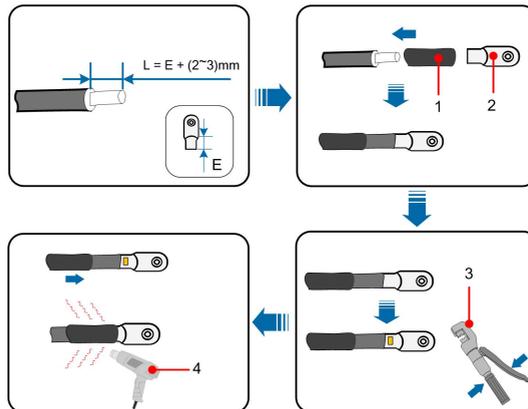
- The current carrying capacity of the cable meets requirements. Factors affecting the current carrying capacity of a conductor include but are not limited to:
 - Environmental conditions;
 - Type of the insulation material of the conductor;
 - Cabling method;
 - Material and cross-sectional area of 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.

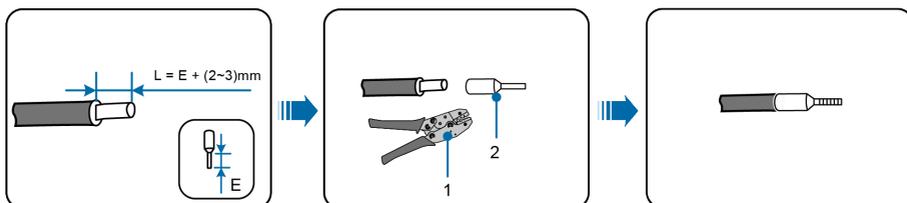


No.	Name	No.	Name
1	Heat shrink tubing	2	OT/DT terminal
3	Hydraulic pliers	4	Heat gun

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 Copper Wire Connection

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

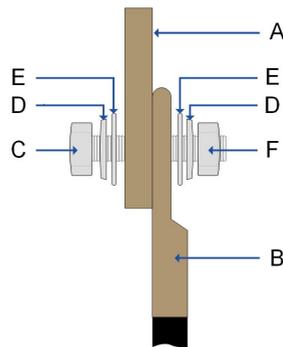


Figure 5-3 Copper cable terminal connection sequence

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

NOTICE

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

5.3.5 Aluminum Wire Connection

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

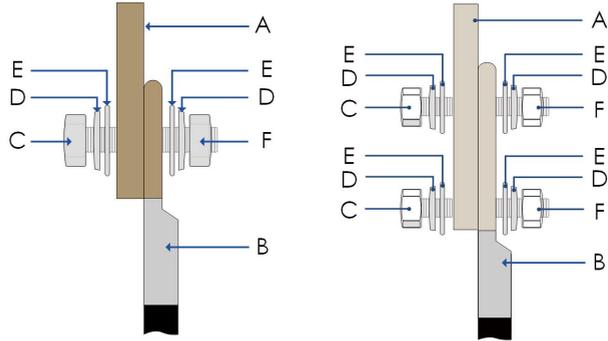


Figure 5-4 Copper-to-aluminum adapter terminal connection

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

NOTICE

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

5.3.6 Cable Inlet Design

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

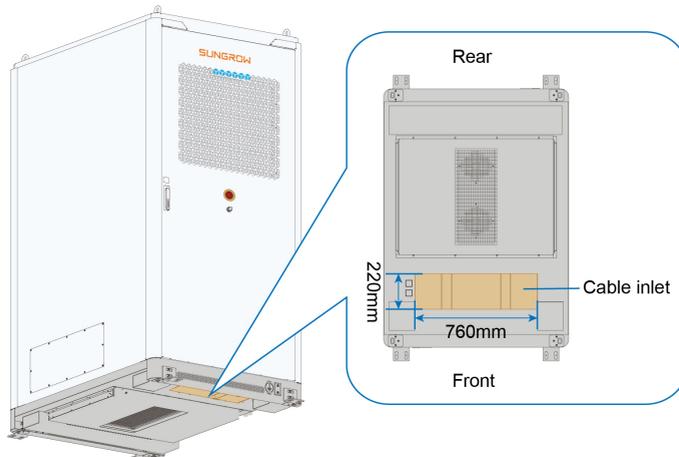
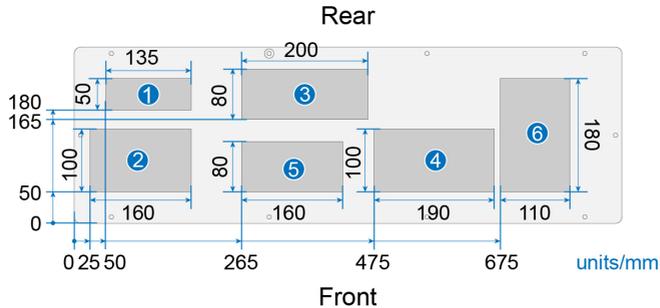


Figure 5-5 Cable Inlet Area

Before proceeding with wiring, create openings for cable inlets on the bottom sealing plate. The positions and sizes of the openings recommended by SUNGROW, based on actual usage requirements, are shown as follows.



- ① For wiring to common N (neutral) block
- ② For wiring to grid circuit breaker QF1 (GRID) (Phases U11, V11, and W11)
- ③ For wiring to diesel generator circuit breaker QF2 (GEN) (Phases U12, V12, and W12)
- ④ For wiring to load circuit breaker QF4 (LOAD) (Phases U13, V13, and W13)
- ⑤ For wiring to ESS circuit breaker QF6 (BESS) (Phases U14, V14, and W14)
- ⑥ For wiring to PV circuit breaker QF5 (PV) (Phases U15, V15, and W15)

Figure 5-6 Cable Inlets

NOTICE

Smooth the cut edges after creating the openings to prevent any damage to the cables.
 Determine the positions of the cable inlet openings according to the actual wiring needs. After completing the wiring, seal off the openings with fire-/water-stop materials.

5.4 Customer Wiring

5.4.1 Safety Precautions

⚠ WARNING

Accidentally touching the live terminals can lead to fatal electric shocks!

- Ensure that the switches on the ATS cabinet are in the open state and that the wiring terminals are voltage-free.
- Connection to the grid must be approved by the relevant department and conducted in compliance with all grid-related safety instructions and specifications.

⚠ WARNING

- When connecting to the AC grid, switch off the upstream AC-side circuit breaker and ensure that there is no voltage at the contact terminals.
- Connection to the grid can only be done with approval from the utility grid and in compliance with all relevant safety instructions.
- The AC output is not grounded inside the equipment.
- The DC and AC circuits are isolated from the enclosure. If required by the relevant national electrical codes, request the installer to perform the system connection.

5.4.2 Wiring Steps

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

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

Step 3 Make sure the cables are connected following the correct phase sequence.

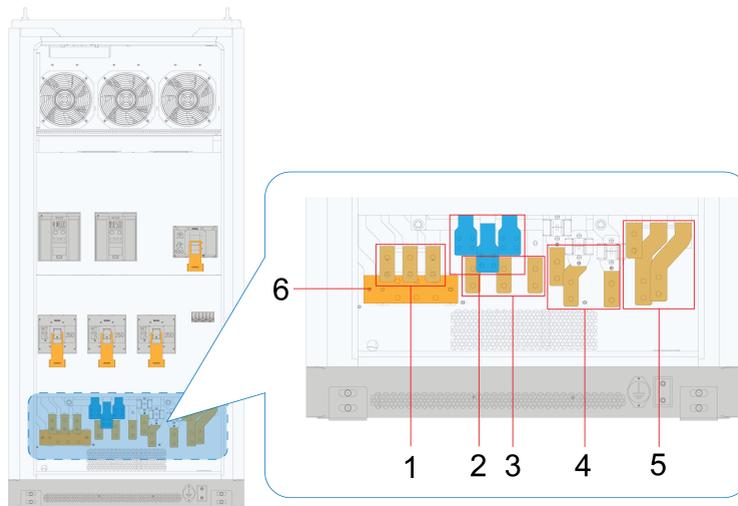


Figure 5-7 Wiring Area

Table 5-4 Port Description

Port No.	Circuit Breaker Name
1	Grid circuit breaker QF1 (GRID)
2	ESS circuit breaker QF6 (BESS)
3	Diesel generator circuit breaker QF2 (GEN□)
4	Load circuit breaker QF4 (LOAD)

Port No.	Circuit Breaker Name
5	PV circuit breaker QF5 (PV)
6	Common N (neutral) block

NOTICE

The N wire on the diesel generator side does not need to be connected to the system.



The wiring copper bars of MCCBs QF1–QF5 belong to Phases U, V, and W from left to right.

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

Step 5 Crimp the OT terminals. For details, see [5.3.3 Prepare Cables](#).

Step 6 Secure the OT terminals to the wiring holes with bolts (for detailed wiring instructions, please refer to [5.3.4 Copper Wire Connection](#) and [5.3.5 Aluminum Wire Connection](#)).

- M12×45 bolts are used for the wiring copper bars of the grid circuit breaker(1#wiring copper bar), diesel generator circuit breaker(3#wiring copper bar), load circuit breaker(4#wiring copper bar), and PV circuit breaker(5#wiring copper bar), and the tightening torque is 60–70 N·m.
- M10×30 bolts are used for the wiring copper bar of the ESS circuit breaker(2#wiring copper bar), and the tightening torque is 34–40 N·m.

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

NOTICE

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

--End

5.5 Maintenance Wiring

The maintenance circuit breaker enables switchover between different AC powers for the critical loads.

Prerequisite

If the thyristor cannot function properly due to a fault in the internal control system of the ATS, users can switch on the maintenance circuit breaker to get the grid or diesel generator to supply the loads.



The wiring of the maintenance circuit breaker in the equipment has already been done. Be careful and observe the electrical safety code when operating the maintenance circuit breaker.

Ports on the Circuit breaker

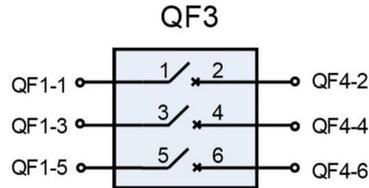


Figure 5-8 Ports on the Circuit breaker

Table 5-5 Port Description

Port	Description
QF3-1	
QF3-3	Connected to the common terminal of the outputs of the grid circuit breaker and diesel generator circuit breaker.
QF3-5	
QF3-2	
QF3-4	Connected to the circuit breaker for load control circuit.
QF3-6	

⚠ WARNING

- **When the maintenance circuit breaker is closed, the thyristor does not work and the system is in bypass mode.**
- **In bypass mode, the system will not automatically restart after recovering from a system fault.**

5.6 24Vdc Power Supply Port Connection

The 24Vdc power supply interface is XD2 of the cabinet.

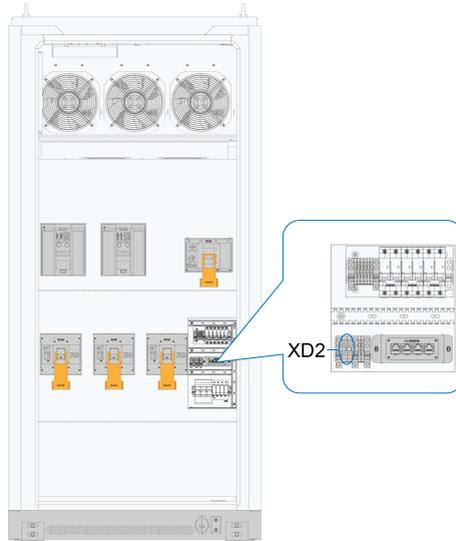


Figure 5-9 24Vdc power supply Interfaces

Mark	Description	Recommended specification
XD2-1(24V+/D C)	Connected to 1#ST225CS-2H-CONN2	2.5mm ² /copper wire
XD2-2(0V/DC)	Connected to 1#ST225CS-2H-CONN2	

5.7 Communication Wiring

External switch communication interface, EMS communication interface, DO communication interface, and RS485 communication interface are provided inside the ATS cabinet for external communications.

The positions of the communication interfaces are shown in the figure below.

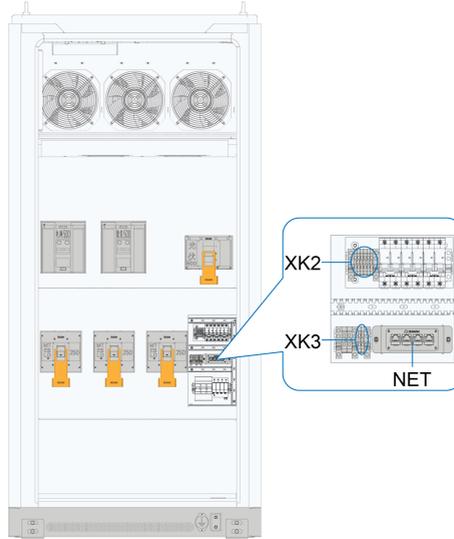


Figure 5-10 Communication Interfaces

Table 5-6 Interface Introduction

Interface	Description	Recommended Cable Specifications*
NET1	Connected to 1#ST225CS-2H-NET2	
NET2	Connected to PV-NET	CAT6A network cable
NET3	Connected to iSolarCloud	
XK2-1	Connected to 1#ST225CS-2H DI interface	
XK2-2	Connected to 1#ST225CS-2H DI interface	
XK2-3	Connected to 2#ST225CS-2H DI interface	
XK2-4	Connected to 2#ST225CS-2H DI interface	STP network cable
XK2-5	Reserved	
XK2-6	Reserved	
XK3-1	Connected to diesel generator 485A	
XK3-2	Connected to diesel generator 485B	

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

5.8 Ground Connection

NOTICE

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

Overview

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

Grounding Flat Steel (Recommended)

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

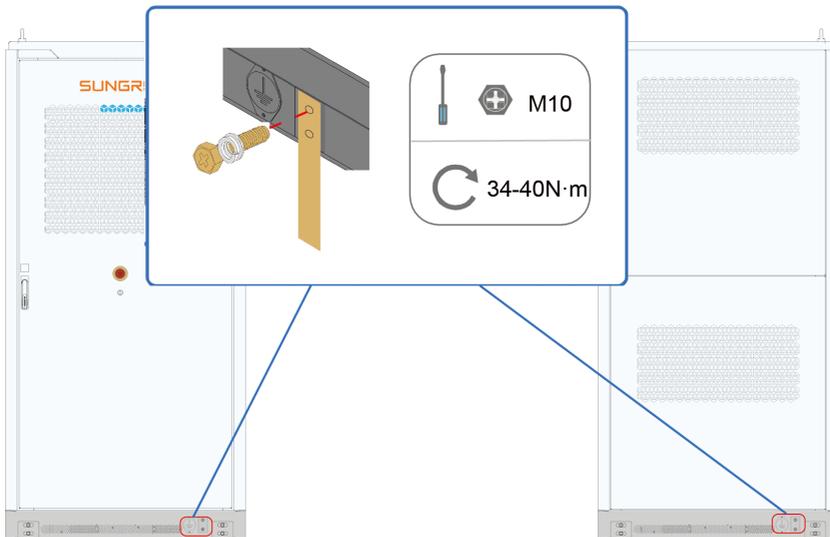


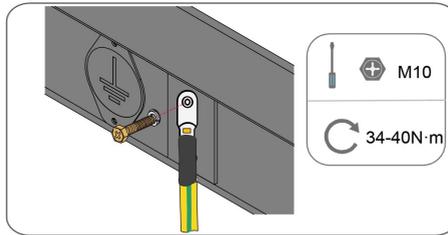
Figure 5-11 Grounding Diagram

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

Grounding Cable

Use a 70 mm²–95 mm² copper grounding cable to connect the target grounding point to the grounding point on the cabinet 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.

NOTICE

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

NOTICE

The product must be double grounded, with both grounding points reliably grounded.
Grounding must be completed by strictly following the applicable local standards and regulations.

5.9 Post-wiring Operation

Prerequisite

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

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

⚠ WARNING

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

Lock the Cabinet Door

- Step 1** Mount back the protective cover for the wiring area, by completing the steps for removal (see "Open Cabinet Door") in reverse.
- Step 2** Lock the cabinet door and pull out the key.
- End

NOTICE

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

6 Powering up and Shutdown

6.1 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.

6.1.1 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.

6.1.2 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.

Step 1 Switch on the grid-side circuit breaker QF1 (GRID) or diesel-generator-side circuit breaker QF2 (GEN), and the load-side circuit breaker QF4 (LOAD), PV-side circuit breaker QF5 (PV), and ESS-side circuit breaker QF6 (BESS) .

Step 2 Switch on the circuit breakers for control circuits, Q1 (AC FAN), Q2 (SMPS), and Q3 (AC 230V).



- a. For the grid-side circuit breaker QF1 and diesel-generator-side circuit breaker QF2, only one of them can be closed. You may decide which one to close based on the working mode of the system on site.
- b. Normally, the maintenance circuit breaker QF3 is not allowed to be closed. It needs to be closed manually only in the event of faults in the system control circuit and thyristor.
- c. When the system is working in the off-grid mode, the grid-side circuit breaker QF1 and diesel-generator-side circuit breaker QF2 should both be in the open state.

--End

6.2 Shutdown

6.2.1 Planned Shutdown

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

Prerequisite



Before powering the equipment off, make sure that:

1. The critical loads have stopped working;
2. The thyristor inside the equipment is in the open state;
3. The PV inverter has stopped working (if there is an inverter in the system and it has been put into operation);
4. The PCS has stopped working;
5. The diesel generator has stopped working (if there is a diesel generator in the system and it has been put into operation).

Step 1 Switch off the ESS-side circuit breaker QF6 (BESS).

Step 2 Switch off the PV-side circuit breaker QF5 (PV).

Step 3 Switch off the miniature circuit breakers Q1 (AC FAN), Q2 (SMPS), and then Q3 (AC 230V) one by one.

Step 4 Switch off the load-side circuit breaker QF4 (LOAD).

Step 5 Switch off the maintenance circuit breaker QF3 (MAINTENANCE) (if it has been put into use before powering-off).

Step 6 Switch off the diesel-generator-side frame circuit breaker QF2 (GEN) or grid-side circuit breaker QF1 (GRID).



Choose to switch off the circuit breaker QF2 or QF1, according to the working mode of the system (started up with diesel generator or grid as the power source) before powering off.

--End

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

6.2.2 Emergency Shutdown

Contact the local fire department in case of an emergency.

7 Troubleshooting

In case of anything abnormal with the ATS, you can check the fault information and troubleshooting methods via iSolarCloud.

Statu s	Fault/Alarm	Cause	Suggestion
Fault	Grid voltage phase sequence incorrect	The three-phase cables of the grid are not connected in the correct phase sequence.	<ul style="list-style-type: none"> • Check the input wiring of the grid circuit breaker on the ATS and see if the phase sequence is wrong; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Load voltage phase sequence incorrect	The three-phase cables of the load are not connected in the correct phase sequence.	<ul style="list-style-type: none"> • Check the input wiring of the grid circuit breaker on the ATS and see if the phase sequence is wrong. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	ATS port voltage phase sequence incorrect	The three-phase cables of the thyristor are not connected in the correct phase sequence.	<ul style="list-style-type: none"> • Check the input wiring of the grid circuit breaker on the ATS and see if the phase sequence is wrong. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Grid circuit breaker fault	The status feedback does not consistently align with the opening or closing of the grid circuit breaker.	<ul style="list-style-type: none"> • Check the control wiring of the grid circuit breaker for anything abnormal; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.

Status	Fault/Alarm	Cause	Suggestion
	Diesel generator circuit breaker fault	The status feedback does not consistently align with the opening or closing of the diesel generator circuit breaker.	<ul style="list-style-type: none"> • Check the control wiring of the diesel generator circuit breaker for anything abnormal; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Load circuit breaker fault	The status feedback does not consistently align with the opening or closing of the load circuit breaker.	<ul style="list-style-type: none"> • Check the control wiring of the load circuit breaker for anything abnormal; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Maintenance circuit breaker fault	The status feedback does not consistently align with the opening or closing of the maintenance circuit breaker.	<ul style="list-style-type: none"> • Check the control wiring of the circuit breaker for anything abnormal; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Circuit breaker interlock failed	The interlock of grid and diesel generator circuit breakers failed.	<ul style="list-style-type: none"> • Check the control wiring of the grid and diesel generator circuit breakers for anything abnormal; • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	ADC initialization failed	ATS ADC sampling calibration failed.	<ul style="list-style-type: none"> • Cut off the ATS auxiliary power supply and restart; • If the fault cannot be reset, contact SUNGROW Customer Service.
	Thyristor turn-off timed out	The turn-off time of the thyristor exceeds the set value.	<ul style="list-style-type: none"> • Cut off the ATS auxiliary power supply and restart;

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> If the fault cannot be reset, contact SUNGROW Customer Service.
	Thyristor overtemperature	The thyristor temperature exceeds the set value.	<ul style="list-style-type: none"> Check the ATS air ducts for blockage and obstruction; Cut off the ATS auxiliary power supply and restart; If the fault occurs repeatedly, please contact SUNGROW Customer Service.
	Thyristor overcurrent	The thyristor current exceeds the set value.	<ul style="list-style-type: none"> Cut off the ATS auxiliary power supply and restart; If the fault occurs repeatedly, please contact SUNGROW Customer Service.
	CAN communication fault	The CAN communication delay exceeds the set value.	<ul style="list-style-type: none"> Check the CAN communication wiring for disconnection; If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS overload	Thyristor current/power overload.	<ul style="list-style-type: none"> Log in to the EMS system and check if the ATS is running on power overload; If the ATS is overloaded, reduce the load power and ensure the ATS operates within the rated power limits; If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS port overvoltage	ATS port overvoltage.	<ul style="list-style-type: none"> Inspect the CAN communication wiring for disconnection;

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> If the fault cannot be reset, contact SUNGROW Customer Service.
	Power supply to thyristor cooling fan is abnormal	The fan speed is not consistent with the speed adjustment value.	<ul style="list-style-type: none"> Check the power supply to the fan for anything abnormal; If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS port voltage abnormal	The ATS port voltage exceeds the allowable value by the thyristor.	<ul style="list-style-type: none"> Check whether the thyristor port voltage is in normal range; Check whether the voltage protection threshold set for the thyristor on the App is normal; If the fault cannot be reset, contact SUNGROW Customer Service.
	Thyristor closing timed out	The closing time of the thyristor exceeds the set value.	<ul style="list-style-type: none"> Cut off the ATS auxiliary power supply and restart; If the fault occurs repeatedly, please contact SUNGROW Customer Service.
	AC SPD fault	AC SPD fault.	<ul style="list-style-type: none"> Check the AC SPD for the breakdown fault; In case of the fault, contact SUNGROW Customer Service.
	DC SPD fault	DC SPD fault.	<ul style="list-style-type: none"> Check the DC SPD for the breakdown fault; In case of the fault, contact SUNGROW Customer Service.
	Electrical compartment	The temperature in the electrical compartment	<ul style="list-style-type: none"> Cut off the ATS auxiliary power supply and restart;

Statu s	Fault/Alarm	Cause	Suggestion
	overtemperatur e	exceeds the protection threshold.	<ul style="list-style-type: none"> If the fault occurs repeatedly, please contact SUNGROW Customer Service.
	Transformer overtemperatur e	The temperature of the transformer exceeds the protection threshold.	<ul style="list-style-type: none"> Check whether the transformer ventilation is normal and see if there is any blockage or obstruction; If the fault cannot be reset, contact SUNGROW Customer Service.
	Emergency stop fault	The emergency stop button is pressed.	<ul style="list-style-type: none"> Check whether the emergency stop button is pressed. If the fault cannot be reset, contact SUNGROW Customer Service.
	Communication fault	NA	NA
	Grid-side Circuit Breakers of Host and Client ATs Not in Same Status	The statuses of the grid-side circuit breakers of the host and client ATs are not consistent.	<ul style="list-style-type: none"> Check the circuit breaker's control cable and see if the connection is normal. Check the communication cable between the host and client ATs and see if the connection is normal. Check whether the host-client settings are correct. If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Diesel Generator Circuit Breakers of Host and Client ATs Not in Same Status	The statuses of the diesel generator circuit breakers of the host and client ATs are not consistent.	<ul style="list-style-type: none"> Check the circuit breaker's control cable and see if the connection is normal. Check the communication cable between the host and client ATs and see if the connection is normal.

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> • Check whether the host-client settings are correct. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Bypass Circuit Breakers of Host and Client ATSS Not in Same Status	The statuses of the bypass circuit breakers of the host and client ATSS are not consistent.	<ul style="list-style-type: none"> • Check the circuit breaker's control cable and see if the connection is normal. • Check the communication cable between the host and client ATSS and see if the connection is normal. • Check whether the host-client settings are correct. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	PV Circuit Breakers of Host and Client ATSS Not in Same Status	The statuses of the PV circuit breakers of the host and client ATSS are not consistent.	<ul style="list-style-type: none"> • Check the circuit breaker's control cable and see if the connection is normal. • Check the communication cable between the host and client ATSS and see if the connection is normal. • Check whether the host-client settings are correct. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	ATS Host/Client Load Differential Current Protection	Host and client ATS load differential current protection.	<ul style="list-style-type: none"> • Check the circuit breaker's control cable and see if the connection is normal. • Check the communication cable between the host and client ATSS and see if the connection is normal.

Statu s	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> • Check whether the host-client settings are correct. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	ATS Thyristor Differential Current Protection	ATS thyristor differential current protection.	<ul style="list-style-type: none"> • Check the circuit breaker's control cable and see if the connection is normal. • Check the communication cable between the host and client ATSs and see if the connection is normal. • Check whether the host-client settings are correct. • If the fault does not arise for the above reason, contact SUNGROW Customer Service.
	Client ATS Fault	The host ATS detects a fault in the client ATS.	NA
Alar m	Diesel generator voltage abnormal	Diesel generator overvoltage or undervoltage.	<ul style="list-style-type: none"> • Check the voltage at the diesel generator port; • Check the voltage protection threshold set for diesel generator port on the App; • If the fault cannot be reset, contact SUNGROW Customer Service.
	Diesel generator frequency abnormal	Diesel generator overfrequency or underfrequency.	<ul style="list-style-type: none"> • Check the frequency at the diesel generator port; • Check the frequency protection threshold set for diesel generator port on the App;

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> If the fault cannot be reset, contact SUNGROW Customer Service.
	Microgrid voltage abnormal	Microgrid overvoltage or undervoltage.	<ul style="list-style-type: none"> Check the voltage at the load port; Check the voltage protection threshold set for load port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Microgrid frequency abnormal	Microgrid underfrequency or overfrequency.	<ul style="list-style-type: none"> Check the frequency at the load port; Check the frequency protection threshold set for load port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Grid voltage abnormal	Grid overvoltage or undervoltage.	<ul style="list-style-type: none"> Check the voltage at the grid port; Check the voltage protection threshold set for grid port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Grid frequency abnormal	Grid underfrequency or overfrequency.	<ul style="list-style-type: none"> Check the frequency at the grid port; Check the frequency protection threshold set for grid port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Diesel generator & ST200CS sync check failed	The sync check of diesel generator and ST200CS has timed out.	<ul style="list-style-type: none"> Check the timeout protection threshold set for diesel generator-ST200CS sync check on the App;

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none"> If the fault cannot be reset, contact SUNGROW Customer Service.
	Grid & ST200CS sync check failed	The sync check of grid and ST200CS has timed out.	<ul style="list-style-type: none"> Check the timeout protection threshold set for grid-ST200CS sync check on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	PCS not operating properly	The PCS does not respond to operations normally.	<ul style="list-style-type: none"> Check the communication between PCS and LC; Check the communication between LC and EMS; If the fault cannot be reset, contact SUNGROW Customer Service.
	Grid current unbalance	The grid current unbalance exceeds the allowable range.	<ul style="list-style-type: none"> Check the voltage at the grid port; Check the voltage unbalance protection threshold set for grid port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Load current unbalance	The load current unbalance exceeds the allowable range.	<ul style="list-style-type: none"> Check the currents at the load port; Check the current unbalance protection threshold set for load port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS port current unbalance	The ATS port current unbalance exceeds the allowable range.	<ul style="list-style-type: none"> Check the currents at the ATS port; Check the current unbalance protection

Statu s	Fault/Alarm	Cause	Suggestion
			<p>threshold set for ATS port on the App;</p> <ul style="list-style-type: none"> If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS overload	ATS power/current overload.	<ul style="list-style-type: none"> Check the power at the thyristor port; If the fault cannot be reset, contact SUNGROW Customer Service.
	Load-side overload	Overload on load side.	<ul style="list-style-type: none"> Check the power at the load port; If the fault cannot be reset, contact SUNGROW Customer Service.
	Grid voltage unbalance	Grid voltage unbalance.	<ul style="list-style-type: none"> Check the voltage at the grid port; Check the voltage protection threshold set for diesel generator port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	ATS port voltage unbalance	ATS port voltage unbalance.	<ul style="list-style-type: none"> Check the voltage at thyristor port; Check the voltage unbalance protection threshold set for thyristor port on the App; If the fault cannot be reset, contact SUNGROW Customer Service.
	Load voltage unbalance	The load voltage unbalance exceeds the protection threshold.	<ul style="list-style-type: none"> Check the voltage at the load port; Check the load voltage unbalance protection threshold set on the App;

Status	Fault/Alarm	Cause	Suggestion
			<ul style="list-style-type: none">• If the fault cannot be reset, contact SUNGROW Customer Service.

If you cannot resolve the problem with the help of this document or still have other questions, please contact SUNGROW. It would be helpful if you could provide the below information:

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

8 Routine Maintenance

8.1 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.

8.2 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.

8.2.1 First Grid Connection

Inspection Item	Inspection Method
Electrical connection	<p>Check the following items. If any item does not meet the requirements, take corrective measures immediately:</p> <ul style="list-style-type: none"> • 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.

8.2.2 Once a Month

Inspection Item	Inspection Method
ESS cabinet	<ul style="list-style-type: none"> • Check the cabinet for oxidation and rust. • Check the cabinet and its internal components for deformation and damage. • Check whether there are flammables on the top of the cabinet. • Check whether the welding points between the cabinet and the foundation steel plate are firm and secure, and whether there is rust or corrosion. • Check whether the lock of the cabinet door can operate smoothly and properly, • Check whether the sealing strip is fixed properly. • Check whether there are foreign matters, fallen screws, dust, dirt, or condensation inside the cabinet.
Air inlet and outlet	Check whether the air inlet and outlet of the ESS cabinet are blocked.
Cables	Check the cables for damages.
System status	<ul style="list-style-type: none"> • Check whether the internal devices make abnormal noises during operation. • Check whether the temperature inside the ESS cabinet is too high. • Check whether the humidity inside the ESS cabinet is within the normal range.

8.2.3 Once Every Six Months

Inspection Item	Inspection Method
Safety function	<ul style="list-style-type: none"> • Check whether the emergency stop button can function properly.

Inspection Item	Inspection Method
	<ul style="list-style-type: none"> • Simulate a shutdown. • Check whether the warning signs and other marks on the ESS are all legible and free from dirt. Replace them in time if the signs or marks are indistinct or damaged.
Internal components	<ul style="list-style-type: none"> • Check the cleanliness of the circuit board and other elements and components. • Check whether the fans can operate normally and whether there is abnormal noise during operation. • Check the temperature of the heat sink and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary. • Replace the air filter screen at the air inlets/outlets if necessary.
Component maintenance	<ul style="list-style-type: none"> • Inspect all metal components for rust and corrosion regularly (once every six months). • Perform annual inspection on contactors (auxiliary switches and miniature circuit breakers) to ensure they can operate properly. • Check the operation parameters (especially voltage and insulation). • Check whether there is a UPS that is not running. A UPS in rest needs to be charged once every six months.*

NOTICE

UPS recharge plan:

When the grid is restored, the ATS cabinet adopts the bypass mode. Close the QF3, QF4, and QF6 switches manually to charge the ESS cabinet. The UPS will charge too when the ESS cabinet is powered.

8.2.4 Once a Year

Inspection Item	Inspection Method
Grounding of the cable shielding layer	Check whether the cable shielding layer is in good contact with the insulating bushing, and whether the grounding copper bar is firmly fixed.
SPD and fuse	Check whether the SPD and fuse are firmly secured.
Wiring and cable arrangement	<ul style="list-style-type: none"> • Check whether the cables are laid and arranged properly, and whether there is a short circuit or other abnormal symptoms.

Inspection Item	Inspection Method
	<p>In case of anything abnormal, take corrective measures immediately.</p> <ul style="list-style-type: none"> • Check whether the cable inlet and outlet holes of the ESS cabinet are all sealed off properly. • Check if the power cables are loose. If so, fasten the cable at the specified torque. • Check the power cables and control cables for damage. In particular, check the area where the cable comes in contact with the metal surface for signs of cuts. • Check whether the insulating tapes wrapped around the power cable wiring terminals have peeled off.
Grounding and equipotential bonding	<ul style="list-style-type: none"> • Check whether the ground connection has been completed properly. Make sure the ground resistance does not exceed 4Ω. • Check whether the equipotential bonding inside the ESS has been properly completed.

8.3 Container Maintenance

8.3.1 Cleaning Container Appearance

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

Check the container appearance:

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

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

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

Maintenance Steps for Case 1:

Material:

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

Graphics	Description
	<ol style="list-style-type: none"> 1. Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on surface. <hr/> <ol style="list-style-type: none"> 2. If the dirt cannot be cleaned with water, scrub with 97% alcohol till the surface is acceptable. (Or try to use non-corrosive detergents that are generally used locally)

Maintenance Steps for Case 2:

Material:

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

Graphics	Description
	<ol style="list-style-type: none"> 1. Polish the paint surface with blistering or scratches with an abrasive paper for a smooth surface.

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

Maintenance Steps for Case 3:

Material:

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

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



Check whether the protective paint sprayed on casing of the product is fallen off or peeled off; if so, repair it timely.
Spray a special protective paint to the exterior of the product every 3 to 5 years.

8.3.2 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.

8.3.3 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.

9 Appendix

9.1 Abbreviations

Abbreviations	Complete designation
B	
BCP	Battery Connection Panel
BSP	Battery Supply Panel
BM (also referred to as PACK)	Battery Module
BC (also referred to as RACK)	Battery Cluster
BSC	Battery System Controller
D	
DCDC	DCDC Converter
E	
ESE	Electric Safety Equipment
L	
LC	Local Controller
P	
PCS	Power Conversion System
PPE	Personal Protective Equipment
R	
RMU	Ring Main Unit
S	
SCADA	Supervisory Control And Data Acquisition
S/G	Switch Gear
SOC	State Of Charge

Abbreviations	Complete designation
SOH	State Of Health

*Unless otherwise specified, devices in this manual are referred to as the abbreviations above.

9.2 System Parameter

Product Model	ATS250
Rated operating voltage	400V
Rated operating frequency	50Hz
Rated grid power	500 kVA
Rated load power	250 kVA
Rated ESS power	250 kVA
Rated diesel generator power	500 kVA
Rated PV power	500 kVA
IP rating	IP55
Operating temperature	-30 to 50 °C
Weight	1985 kg
Dimensions (width * height * depth)	1150mm*2450mm*1610mm

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

9.3 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

Bolt	Torque(N·m)	Bolt	Torque(N·m)
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.

9.4 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.

9.5 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>

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