SUNGROW
Clean power for all

User Manual

MV Grid-connected PV Inverter

SG3150UD-MV-US/SG4400UD-MV-US

SG3150_4400UD-MV-US-UEN-Ver23-202509

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Contents

1 About This Manual

This manual describes the transportation and storage, mechanical installation, electrical connection, power up and shutdown, web operation, troubleshooting, and maintenance of the MV Grid-connected PV Inverter.

1.1 Validity

This manual applies to the following models:

- SG3150UD-MV-US
- SG4400UD-MV-US

MV is short for “Medium Voltage”.
PV is short for “Photovoltaic”.
This manual briefly introduce the installation and operation methods of the product.

1.2 Target Group

This manual is intended for professional technicians who are responsible for the installation, operation, and maintenance of MV Grid-connected PV Inverter. The professional technician is required to meet the following requirements:

- Know electronic, electrical wiring, and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Should be familiar with the composition and working principles of the MV Grid-connected PV Inverter and its front- and rear-level equipment.
- Have received professional training related to the installation and commissioning of electrical equipment.
- Be able to quickly respond to hazards or emergencies that occur during installation and commissioning.
- Be familiar with the relevant standards and specifications of the country/region where the project is located.

1.3 How to Use This Manual

Please read through this manual carefully before using the product and keep it properly in an easy-to-reach place, to avoid equipment damage or safety incidents caused by operation not in line with the safety instructions specified in the manual.
A large number of pictures are provided to help users better understand and use this manual. These pictures are used for illustration only and may not be an exact representation of

the real product. The figures are for reference only, and the actual product received shall prevail.

The products and product manuals are always in the process of improvement and upgrade. If the manual received is slightly inconsistent with the product, it may be a result of a product version upgrade, and the actual product shall prevail. For any questions, please contact SUNGROW Customer Service.

1.4 Symbol Explanations

To ensure the safety of the users and their properties when they use the product and to make sure that the product is used optimally and efficiently, this manual provides users with the relevant safety information which is marked by the following symbols. The symbols that may be used in this manual are listed below. Please read carefully to make better use of this manual.

DANGER

DANGER indicates high-risk potential hazards that, if not avoided, may lead to death or serious injury.

WARNING

WARNING indicates moderate-risk potential hazards that, if not avoided, may lead to death or serious injury.

CAUTION

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

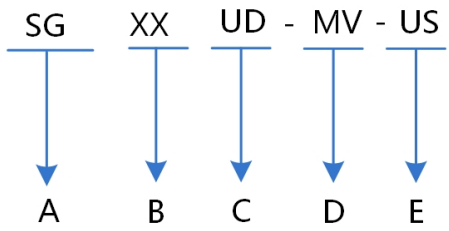
NOTICE

NOTICE indicates potential risks that, if not avoided, may lead to device malfunctions or financial losses.

NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

1.5 Model Description

Description of the MV Grid-connected PV Inverter model is as follows:



Each letter means:

- A: Integrated solution featuring a built-in MV Grid-connected PV Inverter;
- B: Rated power output;
- C: Product family; outdoor-type product;
- D: Medium Voltage (MV) system solution;
- E: Target market: United States.

2 Safety Instructions

When installing, commissioning, operating, and maintaining the product, strictly observe the labels on the product and the safety requirements in the manual. Incorrect operation or work may cause:

- Injury or death to the operator or a third party.
- Damage to the product and other properties.

⚠ WARNING

- **Do not perform any operation on the product (including but not limited to, handling, installing, powering on, or maintaining the product, performing electrical connection, and working at heights) in harsh weather conditions, such as thunder and lightning, rain, snow, and Level 6 or stronger winds. SUNGROW shall not be held liable for any damage to the device due to force majeure, such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weathers.**
- **In case of fire, evacuate from the building or product area and call the fire alarm. Re-entry into the burning area is strictly prohibited under any circumstances.**

NOTICE

Please operate the product under the condition that you are familiar with and understand the content of this manual, and have appropriate tools.

NOTICE

- **Tighten the screws with the specified torque using tools when fastening the product and terminals. Otherwise, the product may be damaged. And the damage caused is not covered by the warranty.**
- **Learn how to use tools correctly before using them to avoid hurting people or damaging the device.**
- **Maintain the device with sufficient knowledge of this manual and use proper tools.**

- The safety instructions in this manual are only supplements and cannot cover all the precautions that should be followed. Perform operations considering actual on-site conditions.
- SUNGROW shall not be held liable for any damage caused by violation of general safety operation requirements, general safety standards, or any safety instruction in this manual.
- When installing, operating, and maintaining the product, comply with local laws and regulations. The safety precautions in this manual are only supplements to local laws and regulations.
- During the product transport, installation, wiring, maintenance, etc., the materials and tools prepared by users must meet the requirements of applicable local laws and regulations, safety standards, and other specifications. SUNGROW shall not be held liable for any damage to the product caused by the adoption of materials and tools that fail to meet the above-mentioned requirements.
- Operations on the product, including but not limited to, handling, installing, wiring, powering on, maintenance, and use of the product, must not be performed by unqualified personnel. SUNGROW shall not be held liable for any damage to the product resulting from operations done by unqualified personnel.
- Where the transport of the product is arranged by users, SUNGROW shall not be held liable for any damage to the product that is caused by users themselves or the third-party transport service providers designated by the users.
- SUNGROW shall not be held liable for any damage to the product caused by the negligence, intent, fault, improper operation, and other behaviors of users or third-party organizations.
- SUNGROW shall not be held liable for any damage to the product arising from reasons unrelated to SUNGROW.

2.1 Unpacking and Inspection

⚠ WARNING

Check all safety signs, warning labels, and nameplates on products.

Ensure that the safety signs, warning labels, and nameplates are clearly visible and not removed or covered before the product is decommissioned.

NOTICE

After receiving the product, check whether the appearance and structural parts of the product are damaged, whether the transformer leaks oil, and whether the packing list is consistent with the actual ordered product. If there are problems with the above inspection items, do not install the product and contact SUNGROW in time.

2.2 Hoisting and Transportation

⚠ WARNING

Risk of personal injury or device damage due to incorrect operation!

- **Follow the procedure of work of heights when walking on the top of the MV Grid-Connected PV Inverter.**
- **All hoisting and transportation must comply with the relevant codes and regulations of the nation/region where the project is located.**

NOTICE

All equipment and tools used during operation must have been regularly maintained.

⚠ CAUTION

Improper hoisting may cause personal injury!

- **It is strictly prohibited to stand within 10m outside the operating area (i. e., under the boom and the hoisted machine) to avoid casualties.**
- **The product must be hoisted and moved by professional personnel. Before the operation, be sure to wear proper PPE with an arc rating that meets the product requirements.**
- **Stop hoisting in the event of severe weather, such as heavy rain, thick fog, or strong wind.**
- **When hoisting and moving the product, be aware of its size and weight and keep the balance to prevent it from turning over or falling.**

2.3 Electrical Connection

⚠ DANGER

Before electrical connections, please make sure that the product is not damaged. Otherwise, it may cause danger!

Before electrical connections, please make sure that the product switch and all switches connected to the product are set to "OFF", and use measuring equipment to ensure that there is no voltage at the connection. Otherwise, an electric shock may occur!

DANGER

PV modules will generate lethal high voltage when exposed to sunlight.

- **Operators must wear proper personal protective equipment during electrical connections.**
- **Before performing an electrical connection, be sure to disconnect the PV combiner box and use measuring equipment to ensure that cables are voltage-free.**
- **Respect the protection requirements and precautions of PV modules.**

DANGER

Danger to life due to a high voltage inside the MV Grid-connected PV Inverter!

- **Be sure to use special insulation tools during cable connections.**
- **Note and observe the warning labels on the product, and perform operations strictly following the safety instructions.**
- **Respect all safety precautions listed in this manual and other pertinent documents.**

WARNING

Damage to the device caused by incorrect wiring is not covered by the warranty.

- **Perform wiring in the proper order as specified in the user manual, otherwise, it may cause fires.**
- **Electrical connection must be performed by professional personnel who wear personal protective equipment.**
- **All cables used in the MV Grid-connected PV Inverter must be firmly attached, properly insulated, and adequately dimensioned.**
- **Installation not performed in compliance with the installation specifications, or unauthorized installation or alteration, may result in safety incidents or equipment damage.**

WARNING

Before connecting the PV module to this product, check and confirm the polarity correctness of the PV module, and then connect it to the corresponding position of this product.

During the installation and operation of the product, please ensure that the positive or negative polarities of PV strings do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in product damage. The damage caused by this is not covered by the warranty.

NOTICE

Comply with the regulations related to the local grid during wiring.

2.4 Operation

DANGER

When the product is working:

- **It is strictly forbidden to touch the live parts of the product. Otherwise, an electric shock may occur.**
- **It is strictly prohibited to disassemble any parts of the product. Otherwise, an electric shock may occur.**
- **It is strictly prohibited to touch any hot parts of the product (such as the heat sink). Otherwise, it may cause burns.**

2.5 Operation and Maintenance

DANGER

Risk of MV Grid-connected PV Inverter damage or personal injury due to incorrect service!

- **Before maintaining the product, be sure to disconnect the output switch of the PV combiner box and the MV load switch.**
- **After MV Grid-connected PV Inverter is powered off for 5 minutes, measure the voltage and current with measuring equipment. Only when there is no voltage nor current can operators who wear protective equipment operate and maintain MV Grid-connected PV Inverter.**
- **During maintenance, be sure to check the warning labels in the product and comply with the requirements on them.**
- **Even if MV Grid-connected PV Inverter is shut down, it may still be hot and cause burns. Operating MV Grid-connected PV Inverter with protective gloves after it cools down.**

DANGER

The devices inside MV Grid-connected PV Inverter carry high voltage. Touching these devices may lead to fatal electric shock.

- **Live line measurement can only be performed by professional personnel who know the MV Grid-connected PV Inverter well. Before measurement, be sure to take proper protection methods (e.g., wear insulating gloves, etc.);**
- **During live line measurement, the operator must be accompanied by others to ensure personal safety.**

DANGER

Electric shock or fire may occur due to device damage or system fault.

- **Visually inspect for device damages or other hazards before the operation**
- **Check whether other external devices or circuit connections are in a safe state.**
- **Make sure the device is in a safe state before operating.**

DANGER

Do not perform any work on the control cable while the product or the external control circuit is powered. The externally powered control circuit may generate hazardous voltages inside the product even after the power is disconnected.

DANGER

If only the DC switch is turned off, the cable connection terminals in the AC and DC cabinets of the inverter unit will still carry voltage.

WARNING

In daily operation, the doors of the product and its internal components must all be closed and locked. Besides, the keys should be pulled out and properly kept by the designated personnel. This prevents accidents caused by unauthorized entries and protects the internal components against rain water or damage by animals.

WARNING

Do not open the cabinet door of any component of MV Grid-connected PV Inverter on sandy and windy days or when the relative humidity exceeds 95%.

WARNING

If some devices need to be replaced during operation and maintenance, please contact SUNGROW.

⚠ WARNING

Wait at least 5 minutes after the product stops running and ensure that the voltage has dropped to within the safe voltage range, the low-voltage cabinet is connected with the grounding cable, the transfer switch, if any, is in the grounding position, the grounding switch, if any, is closed, and the MV load switch, if any, is open. After confirming that all inspection items meet the requirements, maintain or repair the product following the warning labels inside the product.

⚠ WARNING

Only qualified and authorized personnel are allowed to perform maintenance or other operations on MV Grid-connected PV Inverter.

⚠ CAUTION

To prevent misuse or accidents caused by unrelated personnel, post prominent warning signs or demarcate safety warning areas around the device to prevent accidents caused by misuse.

NOTICE

To avoid the risk of electric shock, do not perform any other maintenance operations beyond those described in this manual. If necessary, contact SUNGROW for maintenance. Otherwise, the losses caused are not covered by the warranty.

NOTICE

If work is carried out while the device is live, insulation protection is necessary and at least two personnel should be present at the site at the same time.
The PV power plants where MV Grid-connected PV Inverter is located are usually located in off-city fields, and appropriate field rescue facilities should be prepared for use in need.

2.6 Disposal

Do not dispose of MV Grid-connected PV Inverter or any of its internal components as regular waste. Please contact a specialized, authorized recycling agency in the local area to properly dispose of MV Grid-connected PV Inverter or its components.

⚠ WARNING

Please scrap MV Grid-connected PV Inverter in accordance with relevant local regulations and standards to avoid property losses or casualties.

3 Product Description

3.1 Product Introduction

The MV Grid-connected PV Inverter, designed and manufactured by SUNGROW, is mainly applied to medium and large-scale PV power plants. The MV Grid-connected PV Inverter can meet the requirements of modular design and quick installation for medium and large-scale PV power plants, and can ensure long-term, reliable, and safe feed-in operation.

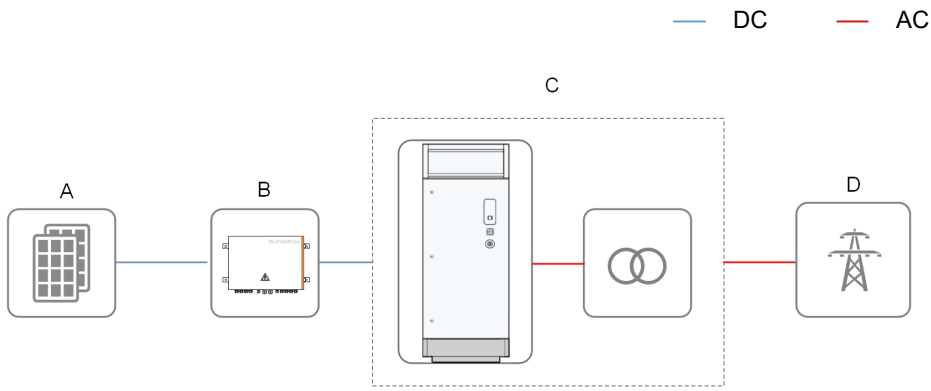


Figure 3-1 Introduction of the product

No.	Name	Description
A	PV array	Monocrystalline silicon, polycrystalline silicon, and thin film without grounding.
B	PV combiner box	Combine the current of multiple PV strings and output.
C	MV Grid-connected PV Inverter	Include the inverter units that convert the DC current from the PV arrays into low-voltage AC current. Include a transformer that converts the low-voltage AC current output by the inverter units into medium-voltage AC current. The inverter units and transformer operate in coordination to convert the DC power from the PV array into AC power, step it up, and feed it into the MV grid.
D	Grid	-

3.2 Product Composition

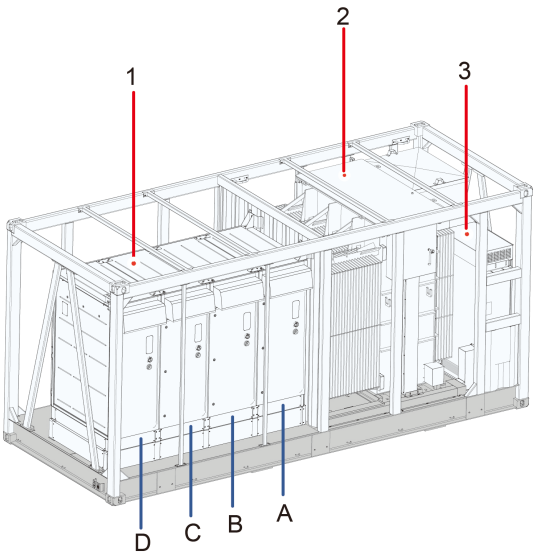


Figure 3-2 Main parts of the MV Grid-connected PV Inverter

*The diagonal beams may differ from the actual product. The actual product shall prevail.

No.	Name		Description
1	Inverter units	A - Unit1 B - Unit2 C - Unit3 D - Unit4	Convert the DC power generated by PV modules into AC power.
2	Transformer		Convert the low-voltage AC power output by inverter unit into medium-voltage AC power.
3	Power distribution cabinet		For communication and power distribution.

3.3 Main Internal Equipment

3.3.1 Appearance of the Inverter Unit

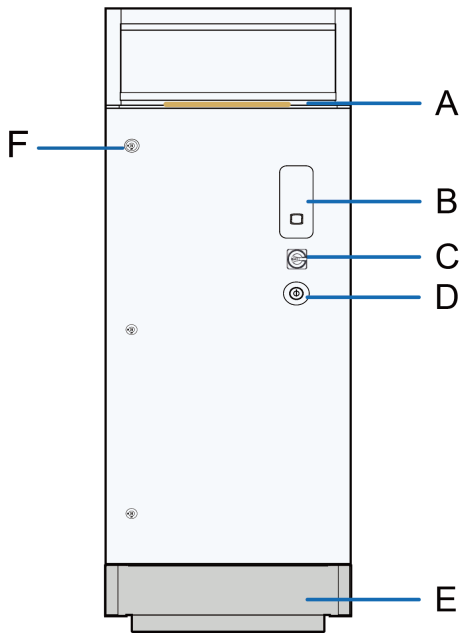


Figure 3-3 Main parts of the inverter unit

No.	Name
A	Top air inlet
B	Indicator panel
C	DC knob switch. Disconnect the DC load switch.
D	Emergency stop button. In case of emergency, press this button to disconnect the AC circuit breaker and DC load switch.
E	Base
F	Lock

LED Indicator

Color	Status	Description
Blue	Steady on	The inverter unit is in grid-connected operation.
	Slow blinking (interval: 0.5s)	The inverter unit is in a deep standby state.
	Glowing and fading (interval: 2s)	The DC and AC side are powered on, or the AC side is powered on, the inverter unit is in a standby or is starting (not connected to the grid).

Color	Status	Description
 Red	Steady on	A fault occurred and the system cannot be connected to the grid for power generation.
 Grey	Off	The AC and DC power are disconnected.

⚠ WARNING

Voltage may still be present in DC side circuits after the indicator is off. Pay attention to the electrical safety during operating.

3.3.2 Internal Structure of the Inverter Unit

Open the front door of the inverter unit cabinet to see the DC cabinet, as shown in the left figure below. Open the back door of the inverter unit cabinet to see the AC cabinet, as shown in the right figure below.

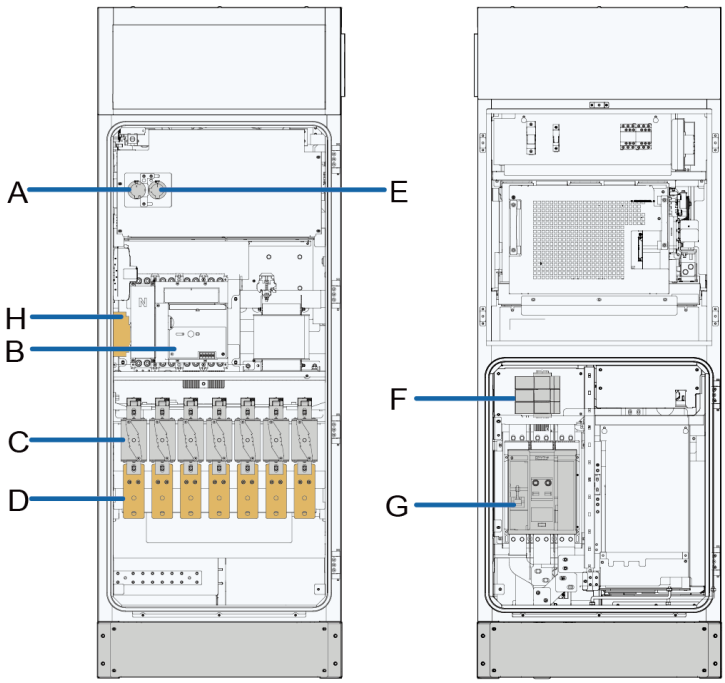


Figure 3-4 Main patrs of the inverter unit

No.	Name	Description
A	Maintenance switch QS2	Disconnect it before maintenance and repair.
B	DC load switch QS1	Control the on/off of the DC side circuits of the inverter unit.
C	DC branch fuse	-
D	DC wiring copper bar	-
E[1)]	Off-grid commissioning power supply switch QS5	Turn on this switch in the off-grid commissioning mode.
F[2)]	Fuse	-
G	AC circuit breaker QF1	Control the on/off of the AC side circuits of the inverter unit.
H[3)]	DC SPD Fuse	-

1) The off-grid commissioning power supply switch QS5 is optional

2) In certain product versions, point F indicates the AC SPD fuses (FU25, FU26, and FU27). In other versions, it refers to the off-grid commissioning fuses (FU101, FU102, and FU103). This distinction depends on the product version. If point F refers to the off-grid

commissioning fuses in your case, see section "11.5.4 Replacing AC SPD Fuse " for the location of the AC SPD fuses.

3) In certain versions, the DC SPD fuses are located in the upper right corner of the inverter unit's DC section, labeled FU23 and FU24.

Maintenance switch QS2 could also be located at the bottom left corner of the AC side. The real product may differ.

The QS5 and QS2 switches are mechanically interlocked, with a lock tab between them, and hence cannot be turned on at the same time.

Ensure the QS5 switch is in the OFF state during the grid-connection process.

The voltage protection level of the AC and DC SPDs is rated as Type I + II, and the energy rating is 10 kA/20 kA.

3.3.3 Main Parts of Transformer

The transformer is equipped with multiple protective devices such as the oil level gauge, the pressure relief valve and the oil thermostat.

Graphics	Name	Description
	Oil level indicator*	Indicate the level of stored oil in the transformer.
	Off-load tap-changer	Adjust the output voltage of the transformer.
	Drain valve	Drain the oil from the transformer into a container through a clean hose.
	Pressure relief valve*	In the event of a fault inside the transformer oil tank, gas will be generated, causing a sharp rise in internal pressure. Once the pressure reaches the preset threshold, the pressure relief valve will automatically open to release the gas, while simultaneously signaling the MV load switch to trip.

Graphics	Name	Description
	Pressure relief valve (with manual pull ring)	Pull the ring to relieve the pressure if the pressure inside the oil tank is high.
	Oil filling valve	Replenish the transformer with oil through a clean hose and oil filling equipment.
	Vacuum pressure gauge	Read the pressure value inside the oil tank.
	Oil thermostat*	The alarm threshold is 100 ℃. An alarm sig+ +**nal is sent if the oil temperature reaches 100 ℃. The tripping threshold is 105 ℃. A tripping signal is sent if the oil temperature reaches 105 ℃.
	MV load switch	The MV load switch to control the on/off of the circuits between the AC side of the MV Grid-connected PV Inverter and the gird. Use a special lever to operate this load switch.

Note: The oil level gauge, pressure relief valve, and oil thermostat do not independently trigger system shutdown. Shutdown commands are issued by the SCU (Smart Communication Unit), which receives signals from these components and transmits fault information to the plant monitoring system.

Transformers are strictly prohibited from operating load switches during power generation.

3.3.4 Power Distribution Cabinet

The power distribution cabinet integrates both communication and power distribution functions. It is available in two versions, each offering 5 kVA and 40 kVA capacity options.

Power Distribution Cabinet (Version 1)

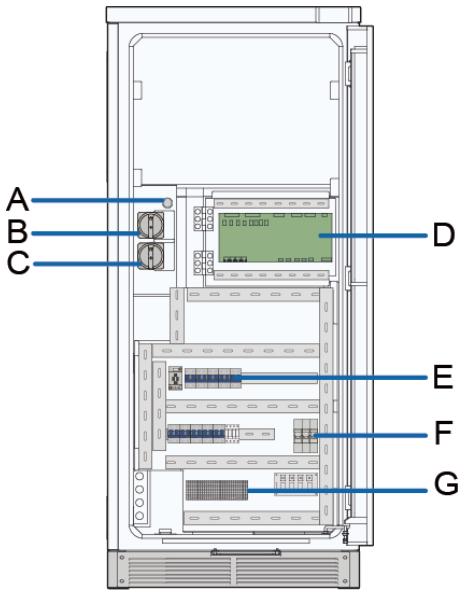


Figure 3-5 Main parts of 5kVA power distribution cabinet

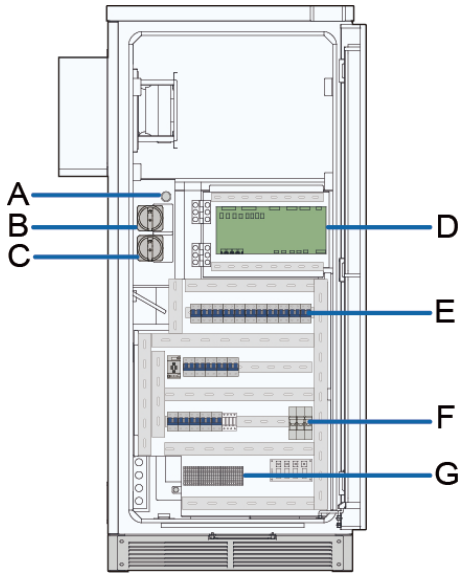


Figure 3-6 Main parts of 40kVA power distribution cabinet

No.	Description
A	Ethernet port
B	Off-grid commissioning power distribution switch QS8
C	Control switch for auxiliary transformer QS9
D	Smart communication unit (SCU)
E	Circuit breaker switches QF3 – QF12 for 5kVA power distribution cabinet
	Circuit breaker switches QF3 – QF20 for 40kVA power distribution cabinet

No.	Description
F	Fuse of power distribution cabinet SPD: FU104
G	Wiring terminal block

Power Distribution Cabinet (Version 2)

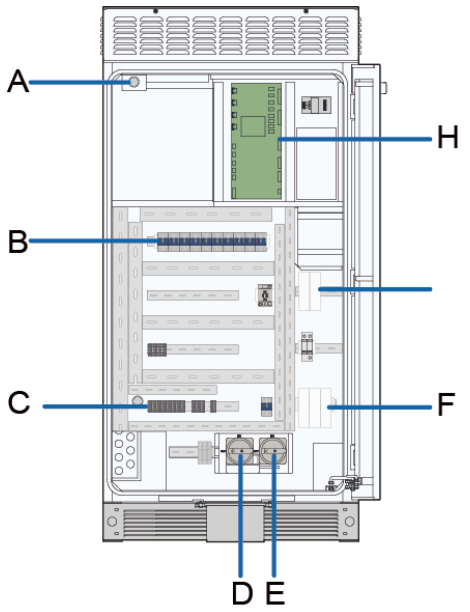


Figure 3-7 Main parts of 5kVA power distribution cabinet

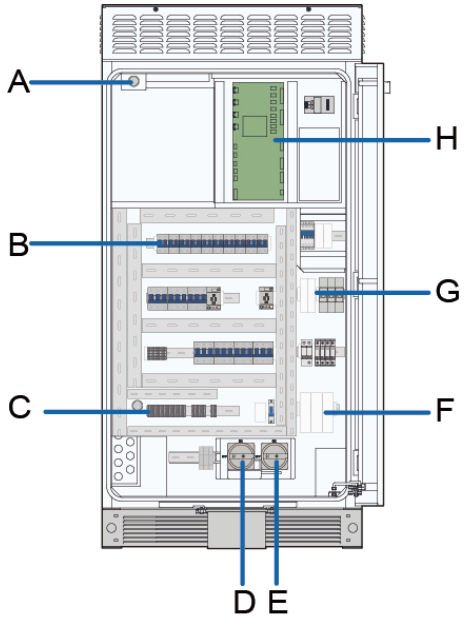


Figure 3-8 Main parts of 40kVA power distribution cabinet

No.	Description
A	Ethernet port
B	Circuit breaker switches QF3 – QF12 for 5kVA power distribution cabinet
	Circuit breaker switches QF3 – QF20 for 40kVA power distribution cabinet
C	Wiring terminal block

No.	Description
D	Off-grid commissioning power distribution switch QS8
E	Control switch for auxiliary transformer QS9
F	Auxiliary transformer protection fuse: FU103 for 5kVA
	Auxiliary transformer protection fuses: FU105、FU106、FU107 for 40kVA
G	Fuse of power distribution cabinet SPD: FU104
H	Smart communication unit (SCU)

The SCU is assembled in the power distribution cabinet. For detailed SCU guidelines, refer to the SCU1100 User Manual.

3.4 Symbols on Product

Marks	Explanation
	Comply with UL certification.
	High voltage inside! Risk of electric shock by touching it!
	The temperature here is beyond the acceptable range for the human body, please do not touch it arbitrarily to avoid personal injury.
	Firmly ground the protective ground terminal to ensure the safety of operators.
5min	The inverter unit can only be maintained and overhauled after being powered off for 5 minutes.
	It is recommended to wear noise-cancellation earplugs since the product may generate noise during operation.
Prohibit to touch the fan blades while running !	It is strictly forbidden to touch the fan blades when the fan is rotating.
	Read this manual carefully before any operation on the product.
	Do not dispose of this product as household waste.

⚠ WARNING

SUNGROW shall not be held liable for any equipment damage or safety incident caused by failure to observe the warning signs.

⚠ WARNING

Do not tear or damage the warning signs, and replace them immediately if they are blurry or damaged.

4 Transport and Storage

4.1 Precautions

⚠ CAUTION

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

4.2 Transportation Requirements

⚠ WARNING

In the whole process of loading, unloading, and transport, follow strictly the applicable safe operating procedure in the country/region where the project is located.

Tool and Personnel Requirements

- Choose appropriate means of transportation according to the size and weight of the product.
- All the tools used on the product, or during operation, must have undergone proper maintenance.
- The tool used for transport must have a sufficient load capacity.
- Extra traction may be required to move the equipment along a slope.
- Personnel engaged in loading, unloading, and anchoring operations should all have received relevant training, especially in safety.
- Transport the product in accordance with relevant local regulations and standards.

Safety Requirements

- The product must stand upright during transport.
- Do not put the products in stacks.
- During transportation, the product is placed horizontally with a tilt angle of ≤ 15 °.
- Avoid collision or strong shock during transport.
- Wear proper PPE with an arc rating that meets the product requirements when operating the product.

Transport Route Requirements

- Before transport, inspect the transport route in advance, particularly for obstructions, to ensure the vehicle can travel safely and smoothly along the route.

Pre-transport route inspection should cover the following items: road conditions, height limits, actual heights, width limits, actual widths, weight limits, traffic restrictions, and potential obstructions.

- In most cases, the total weight of a truck that carries the product will exceed the general weight limit on the road. Therefore, to transport the product in a truck, an overweight permit from the relevant local agency in that area may be required.
- To transport the product by water, ensure the waterway meets the requirements for the vessel to sail fully-loaded.

4.3 Storage Requirements

4.3.1 Storage Environment

- MV Grid-connected PV Inverter should be stored in an environment with a temperature ranging from -40°C to 70°C. If the ambient temperature is too low, take necessary heating measures for MV Grid-connected PV Inverter's internal devices.
- MV Grid-connected PV Inverter should be stored in a warehouse with a humidity of less than 55%. If the average ambient humidity is lower than 55%, it is suggested to change the desiccants every three months; if the humidity is higher than 55%, change the desiccants every month. The montmorillonite desiccant should be used. Each the inverter unit requires 8 bags of desiccant, at least 200g per bag (place the desiccant bag on the base plate beneath the DC input side). Before grid connection, take the desiccants out of MV Grid-connected PV Inverter.
- Keep the product on a dry, flat, and solid ground that has sufficient bearing capacity and is not covered by vegetation. The ground where the product is kept should be flat, with a horizontal error of less than 0.25%, and have an overall slope of less than 5 degree.
- Avoid storing MV Grid-connected PV Inverter in places where it may come in touch with rainwater, or in low-lying places, to prevent the accumulated rainwater from getting into it. If MV Grid-connected PV Inverter must be stored outdoors due to restrictions on site, elevate its base off the ground to a certain height. The height should be decided according to the geological, meteorological, and other conditions on site.
- Avoid storing MV Grid-connected PV Inverter in places where corrosive gas or dust may be produced or accumulated, or in places within 30 km (20 miles) of saline-alkaline land or pollution-generating industrial complex such as chemical plants and PV power plants (chemical gas class: 1C1, solid particle level: 1S2). Avoid storing MV Grid-connected PV Inverter in environments contaminated with halogen and sulfur pollutants.
- Do not install MV Grid-connected PV Inverter in places with vibration or a magnetic field strength of over 30A/m.
- Do not store MV Grid-connected PV Inverter in environments with flammables and explosives.
- To prevent MV Grid-connected PV Inverter from being stored for an overly long period of time, please apply the "first-in, first-out" method to product storage.

4.3.2 Protection During Storage

- During the process of product handling and storage, impacts or collisions to the product must be avoided.
- Before storage, make sure the doors of the product and its internal devices are all locked. During storage, avoid opening the doors, unless it is necessary.
- Seal off the product's air inlet/outlet and the DC cable inlet area. During the period of storage, make sure the protective films on the air inlet/outlet are intact. Meanwhile, take effective measures to prevent the ingress of rainwater, dust, and sand into the product.
- Do not have the MV Grid-connected PV Inverter stressed with heavy weights. The MV Grid-connected PV Inverter should not be stacked in more than four layers, and heavy weights are not allowed on the top of the MV Grid-connected PV Inverter, power distribution cabinet, transformer, and protective cover for low-voltage copper bars.

4.3.3 Routine Inspection for Long-term Storage

- Perform regular inspection, at least once every half a month. Check whether the dust cover is damaged and whether the product and its internal devices are intact.
- It is suggested that units that have not been put into operation (from the date of receipt by the customer) and the units shut down temporarily (from the date of shutdown) should not be stored for more than three months. If stored for a long period of time, sealing measures and necessary tests and inspections are required for the product. For products shut down temporarily, put desiccants inside them. It is needed to open the door and visually inspect the product and its internal devices for damage first.
- For a product shut down/stored for over six months, inspect its electrical components (IGBT module, DC fuses, fans, etc.), and take dehumidification and dedusting measures for the whole product. For detailed operation, please contact SUNGROW.
- The UPS and their batteries must be charged once every six months after leaving the factory (EXW Date).

5 Mechanical Mounting

WARNING

Respect all local standards and requirements during mechanical installation.

5.1 Safety Precautions

WARNING

- **Personnel engaged in loading, unloading, and anchoring operations should all have received relevant training, especially in safety.**
- **Only install the product when it is complete and intact.**
- **Before installation, ensure that the product and all internal equipment are intact, without any damage.**

WARNING

Risk of personal injury or device damage due to incorrect operation!

- **Follow the procedure of work of heights when walking on the top of the MV Grid-connected PV Inverter.**
- **All hoisting and transportation must comply with the relevant codes and regulations of the nation/region where the project is located.**

WARNING

The escape routes must be kept clear off any obstruction.

NOTICE

- **If any tool is used for unpacking, be careful not to damage the product.**
- **After receiving the product, check whether the appearance and structural parts of the product are damaged, whether the transformer leaked oil, and whether the packing list is consistent with the actual ordered product. If there are problems with the above inspection items, do not install the product and contact SUNGROW in time.**

CAUTION

Improper hoisting may cause personal injury!

- **It is strictly prohibited to stand within 10m outside the operating area (i. e., under the boom and the hoisted machine) to avoid casualties.**
- **Only professional personnel can operate the product, and be sure to wear personal protective equipment when operating.**
- **Stop hoisting in the event of severe weather, such as heavy rain, thick fog, or strong wind.**
- **Be sure to hoist the product smoothly and evenly to avoid collision and vibration. Do not turn the product upside down, nor hoist it for a long time.**
- **When hoisting and moving the product, be aware of its size and weight and keep the balance to prevent it from turning over or falling.**

5.2 Inspection Before Installation

5.2.1 Scope of Delivery

Accessories delivered with the product are listed below:

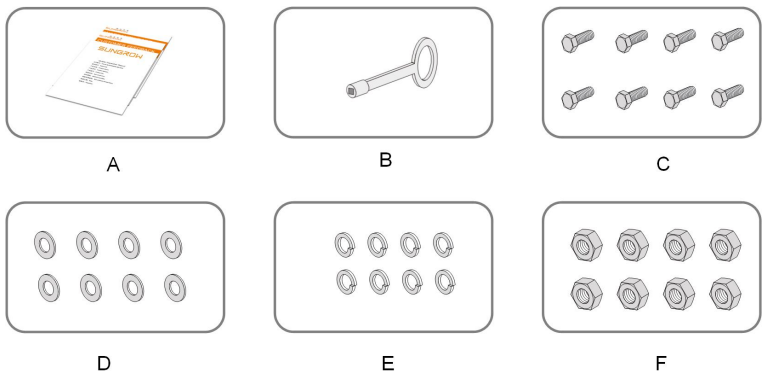


Figure 5-1 Shipment item list

No.	Name
A	Relevant documents (the certificate of quality, warranty card, delivery inspection report, etc.)
B	Key
C	M12 x 45 bolt
D	M12 flat washer
E	M12 spring washer
F	M12 nut

The accessories shown in above figures are for reference only. The product received may differ.

5.2.2 Product Inspection

- Check whether the product received is the ordered one.
- Check that the scope of delivery is consistent with the contract against the packing list.
- Visually check the product for any damage.

If any problems are found or there is any question, please contact the forwarding company or SUNGROW.

⚠ WARNING

Only install the product when it is complete and intact.

Before installation, ensure that:

- **The product is in good condition, without any damage.**
- **The product and all internal equipments are intact, without any damage.**

5.3 Installation Environment Requirements

5.3.1 Installation Site

- 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 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.
- There are no underground facilities on site.
- The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive, and corrosive materials.
- Do not install the MV Grid-connected PV Inverter in places where corrosive gas or dust may be produced or accumulated, or in places within 30 km (20 miles) of saline-alkaline land or pollution-generating industrial complex such as chemical plants and PV power plants (chemical gas class: 1C1, solid particle level: 1S2).
- Do not install the MV Grid-connected PV Inverter in environments contaminated with halogen and sulfur pollutants.
- Do not install the MV Grid-connected PV Inverter in places with vibration or a magnetic field strength of over 30A/m.
- The installation site should be far away from residential areas to avoid noise.

5.3.2 Foundation

Given that the installation site has been decided and the foundation has been set up before the arrival of the product, details on these two items will not be included in this manual.

- The soil at the installation site should be compact. It is recommended that the relative density of soil at the installation site be no less than 98%. Take relevant measures to ensure a stable foundation in case of loose soil.
- If the MV Grid-connected PV Inverter is installed in a place with dense vegetation, in addition to regular weeding, harden the ground underneath the MV Grid-connected PV Inverter to stop weeds from growing.
- The foundation pit must be compacted and filled to provide sufficient and effective support for the product.
- The foundation should be higher than the horizontal ground to prevent the product base and the interior from rain erosion.
- The cross-sectional area and height of the foundation should meet the requirements.
- Cabling should be considered when building the foundation.
- Pre-bury the threading pipe at the bottom of the foundation according to the location of the cable inlet holes at the bottom of the product.
- A drainage system is necessary to prevent the bottom or internal equipment of the product from being soaked in water during the rainy season or during heavy rainfall.
- The dregs excavated during foundation construction should be removed immediately to avoid the latter impact on hoisting.
- Pre-bury the channel steel.
- According to the IEC 61936 standard, if mineral oil is used as the insulating liquid, an oil tray is necessarily required, to prevent the insulating liquid from leaking and thus contaminating the underground water or soil.

5.3.3 Installation Spacing

To ensure better heat dissipation and facilitate later maintenance, reserve enough space around the installation site.

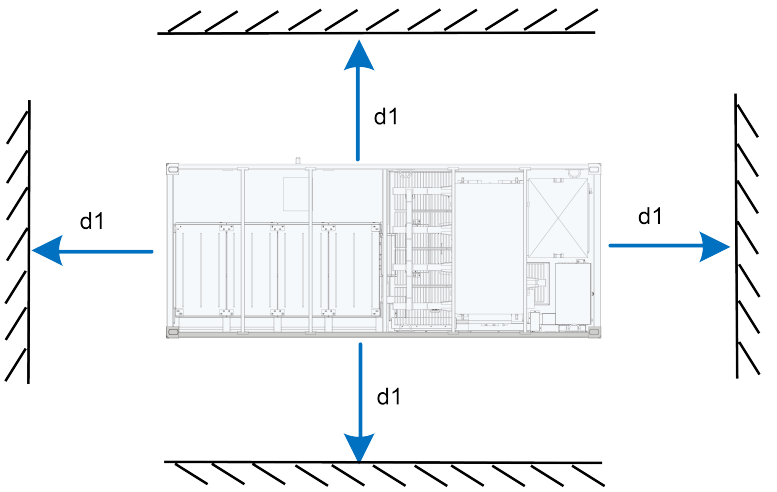


Figure 5-2 Surrounded by obstructions or heat sources

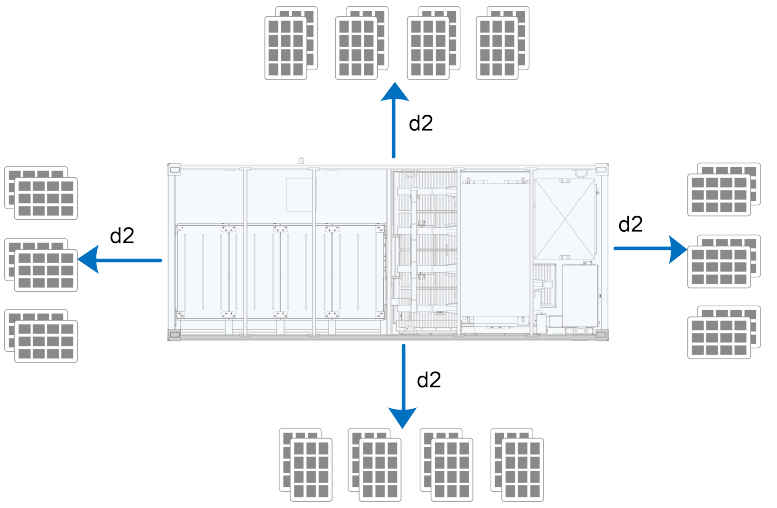


Figure 5-3 Surrounded by PV arrays

Model	Required Distance d1	Required Distance d2
SG3150UD-MV-US	≥10m	≥5m
SG4400UD-MV-US		

If there is any other device within 10m of MV Grid-connected PV Inverter, please consult with SUNGROW.

5.4 Hoisting and Fixing

5.4.1 Safety Precautions

Safety instructions

⚠ WARNING

Perform operations in strict accordance with the local safe operating procedures relevant to the country or region, including but not limited to:

- **Stop hoisting immediately in severe weather conditions, such as heavy rain, fog, or strong winds.**
- **Set up warning signages or fence off a warning zone to prevent irrelevant personnel from entering the operating area, thus avoiding personal injury or death.**
- **Ensure that all personnel engaged in hoisting, loading, unloading, and anchoring operations have received relevant training, especially in safety.**
- **Do not stand directly beneath or within 10 meters of any moving equipment to avoid personal injuries or fatalities.**
- **Conduct all work under the guidance of qualified technical personnel on site.**
- **Ensure that all tools and equipment used during the operation have undergone proper maintenance.**
- **Hoist and lower the product gently, avoiding any dragging or collisions.**
- **Do not proceed with hoisting in low light conditions or when vision is not clear.**
- **Do not proceed with hoisting if there is any person or moving or movable objects on top of the equipment.**

Requirements for hoisting

- Qualifications:
  - Engage a qualified specialized hoisting service provider to perform the hoisting.
- Foundation:
  - Ensure sufficient space is reserved in the cable trench, and the cable conduit is embedded in advance.
  - Clearly mark the designated area for the equipment on the foundation with lines.
  - Prior to hoisting, recheck the flatness of the foundation. The flatness deviation must not exceed 10 mm, and the slope must not exceed 5°.
  - Correct any excessive deviations in flatness or slope, or prepare in advance an adequate number of metal washers that match the sizes of the load-bearing points.
- Safety
  - Post prominent warning signs or demarcate safety warning areas on site.

  - Verify that all equipment and hoisting devices have undergone inspections, and that cabinet doors are securely closed and locked.
  - Make sure the cabinet doors of the product are all locked.
- Familiarity with equipment arrangement:
  - Properly determine the order of trailer arrivals at the site based on the project's equipment layout. Vehicles carrying hoisting devices have priority for entry.
  - Determine the positions and orientations of all equipment.

Selection of cranes

The load capacity of the crane should be determined based on the weight of the load to be hoisted, the crane's operating zone (operating radius and range of motion) and design parameters, the foundation conditions, and the specific hoisting requirements.

⚠ WARNING

Before hoisting, select an appropriate crane with sufficient load capacity based on an evaluation by a qualified hoisting service provider to ensure operation safety. SUNGROW shall not be held liable for any damages resulting from the use of inappropriate cranes.

Hoisting device requirements

Prepare hoisting devices in strict accordance with the relevant performance requirements specified in "5.4.2 Hoisting Schematic".

5.4.2 Hoisting Schematic

⚠ WARNING

During hoisting, it is necessary to ensure that:

- **Ensure safe and reliable connections of all slings.**
- **Ensure the connections of slings are all secure and reliable.**
- **The product should be hoisted vertically. Never drag the product on the ground or the top of the lower product, and never pull and push it on any surface.**
- **When the product is in place, place it lightly and smoothly. It is strictly forbidden to throw it to places outside the vertical landing place.**
- **Implement all necessary auxiliary measures to ensure the safe and smooth hoisting of the product.**
- **Avoid scratching the product during hoisting.**

Hoisting schematic

Shackles or hoisting hooks can be selected for hoisting, depending on the actual site conditions.

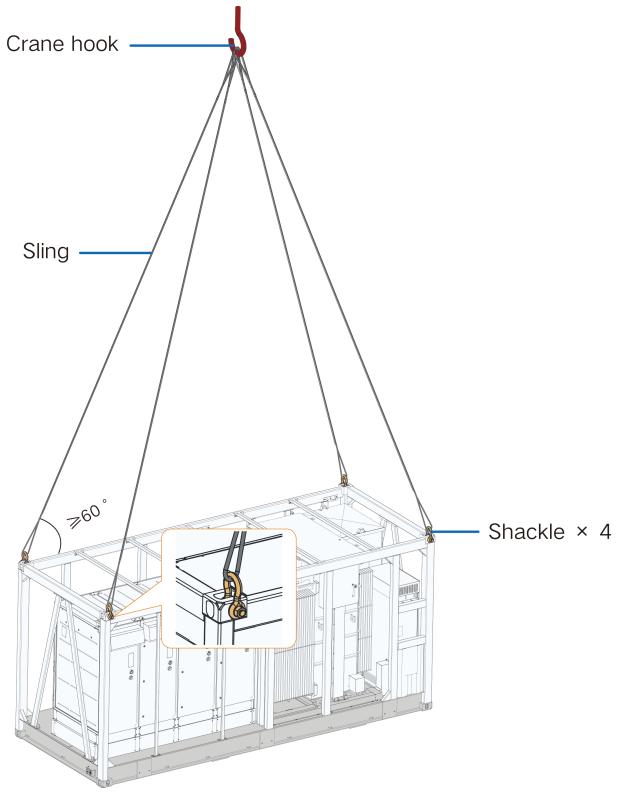


Figure 5-4 Shackle schematic

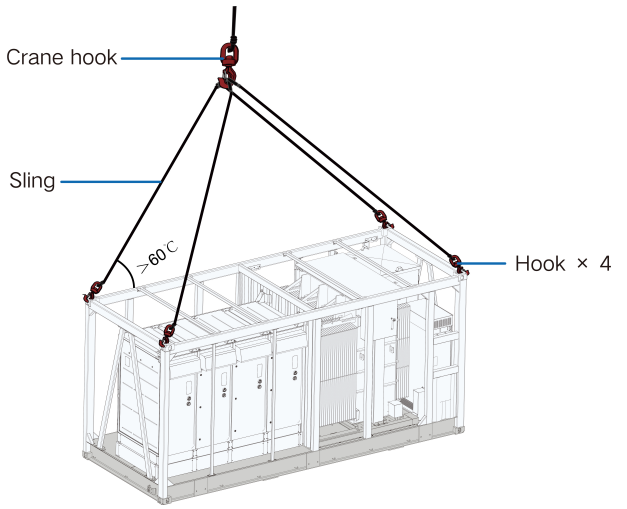


Figure 5-5 Hook schematic

Hoisting devices

The hook, slings, and shackles shown in the figure above should be prepared separately by the customer. The specifications of the hoisting devices must meet the following requirements:

Item	Specification	Quantity
Hoisting rope	1 The hoisting rope can be rope or nylon bag, the tensile strength of the rope shall not be less than 1670 MPa, and the line diameter shall not be less than 32 mm. 2 Hoisting rope length shall not be less than 2.5 m. 3 Load of a single hoisting rope is not less than 10 T.	4
Hoisting angle	>60°	-
Shackle *	Bow-shaped, single shackle load ≥ 20t	4
Hook *	Single hook load ≥ 20t	4

* Select the device based on the actual site conditions.

- Ensure their specifications meet the requirements listed above. and request the hoisting service provider to conduct a thorough evaluation before proceeding with the hoisting.
- After hoisting, store the hoisting devices properly for future use.

5.4.3 Hoisting Procedure

Step 1 Secure the hoisting devices.

1 Thread each of the 4 shackles into each of the 4 Slings.

2 Attach each of the 4 shackles to the 4 lugs on top of the product.

3 Sleeve the 4 slings into the hook of the crane and the hoisting devices are ready.

Step 2 Hoist the product smoothly and stably.

Suspend hoisting when the product is hoisted 300 mm off the supporting surface. Then, check the connections between the slings and the product.

Step 3 Lay the product down steadily in the designated area on the foundation.

Step 4 Check and adjust the load-bearing points.

1 Verify that the product doors open and close normally, that the product frame shows no signs of deformation, and that the product rests securely and evenly on the supporting surface.

2 If any deformation is detected, hoist the product slowly and add washers at the load-bearing points. Then, lower the product again gradually, until it is fully seated with each load-bearing point completely bearing the weight.

Step 5 Remove the hoisting devices, and store it properly for future use.

- - End

5.4.4 Fixing

Hoist the product to the intended location and fix it.

Fixed by Welding

Secure the bottom of the product to the foundation by welding. Take proper measures to prevent the welding point from corrosion after welding.

Fixing by L mounting parts

Fix the fixing point at the bottom of MV Grid-connected PV Inverter (shown as A below) with the existing operating platform using L mounting parts.

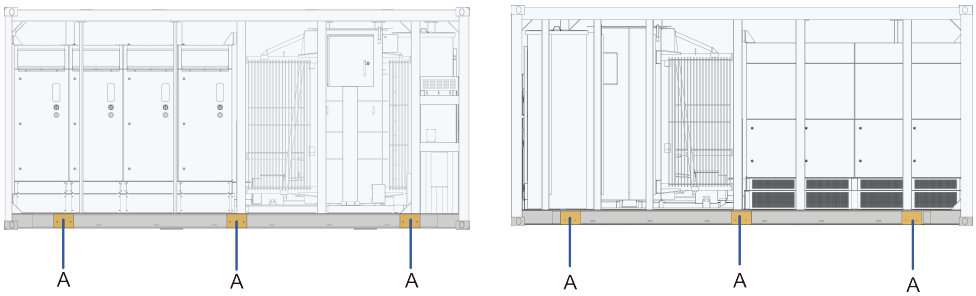


Figure 5-6 Location of L mounting parts

The steps to fixing the L mounting parts is shown in the following figure.

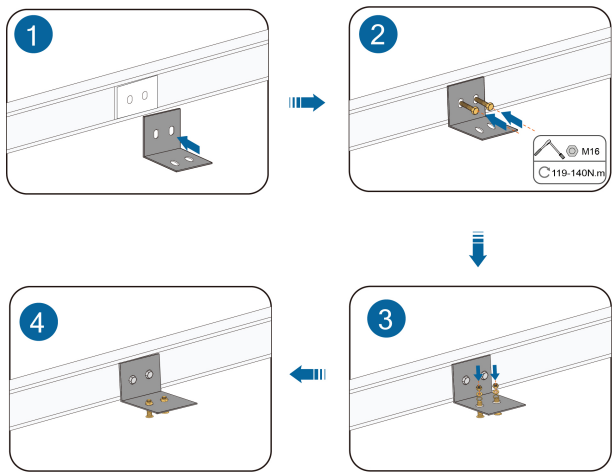


Figure 5-7 Fixing procedure

5.5 Installing Brackets

The product is equipped with three brackets, as highlighted in the figure below, which can be used for the installation of SCADA, weather station, and Ethernet switch, etc.

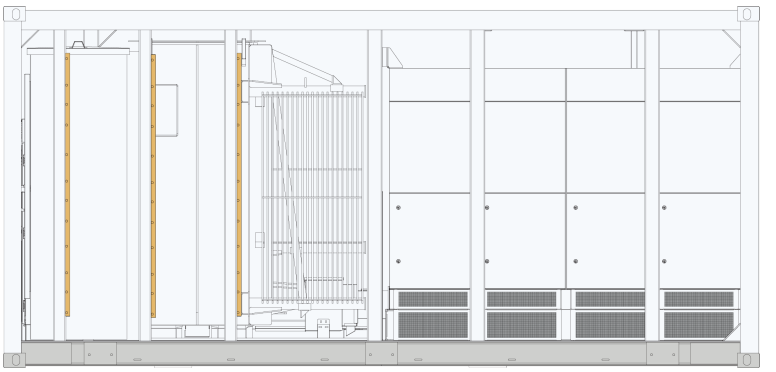


Figure 5-8 Brackets location

5.6 Installing the Drain Valve/Oil-Water Separator

There are two design schemes at the bottom of MV Grid-connected PV Inverter. Drain valve or oil-water separator can be installed according to customized requirements.

NOTICE

For ease of installation, it is recommended to install the drain valve or oil-water separator before hoisting the MV Grid-connected PV Inverter to the installation position.

NOTICE

During the installation of the oil-water separator, first remove the two plastic plugs of the equipment. Then, install the oil-water separator on one of the ports, and seal the other port with a stainless steel plug.

5.6.1 Installing the Drain Valve(Optional)

Overview

The installation positions of the drain valve are reserved at the bottom of the MV Grid-connected PV Inverter, located on the backside of the MV Grid-connected PV Inverter, as shown in figure A below.

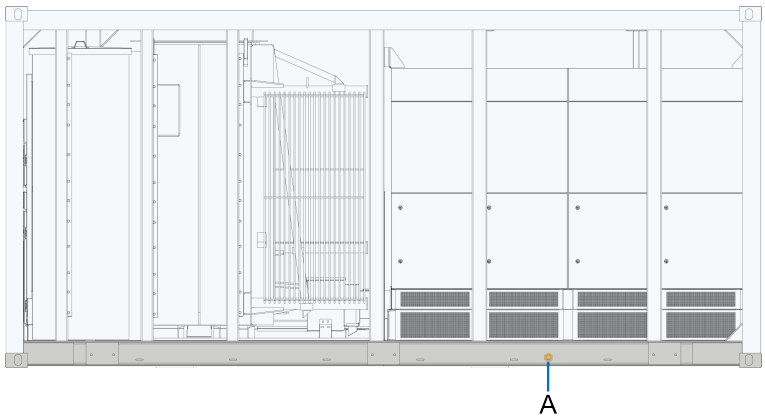


Figure 5-9 Drain valve location

Installation Parts

Before installing the drain valve, the required parts:

- Connector(in the scope of delivery)
- Drain valve(in the scope of delivery)
- Oil pipe (beyond the scope of delivery)

Installation Methods

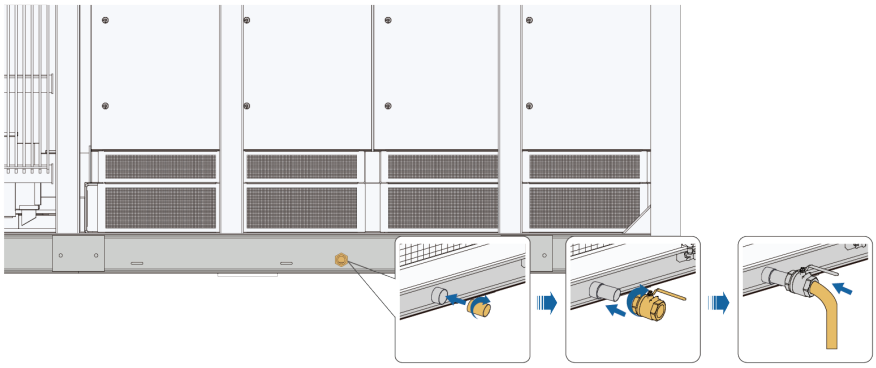


Figure 5-10 Installation procedure

Step 1 Screw the connector into the mounting hole at the bottom of the MV Grid-connected PV Inverter.

Step 2 Install the drain valve on the connector.

Step 3 (Optional operation) Connect the oil pipe to the drain valve.

- - End

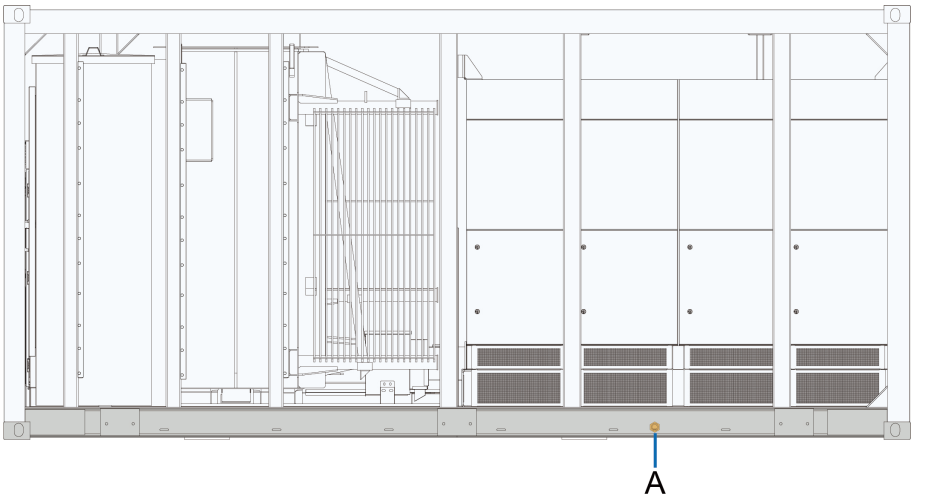
Precautions

- If the oil pipe is connected, the drain valve needs to be opened.
- If the oil pipe is not connected, the drain valve needs to be closed.

5.6.2 Installating Oil-Water Separator (Optional)

Overview

The MV Grid-connected PV Inverter has two oil drainage holes, located on the front and rear sides of its base, as shown in the figure below.



SUNGROW provides an oil-water separator assembly and a seal plug assembly. After securing the MV Grid-connected PV Inverter onto the foundation, install the oil-water separator and seal plug at the two oil drainage holes, respectively. Determine their installation positions based on the actual on-site requirements (i.e., which drainage hole to use).

Procedure

Step 1 Install the oil-water separator.

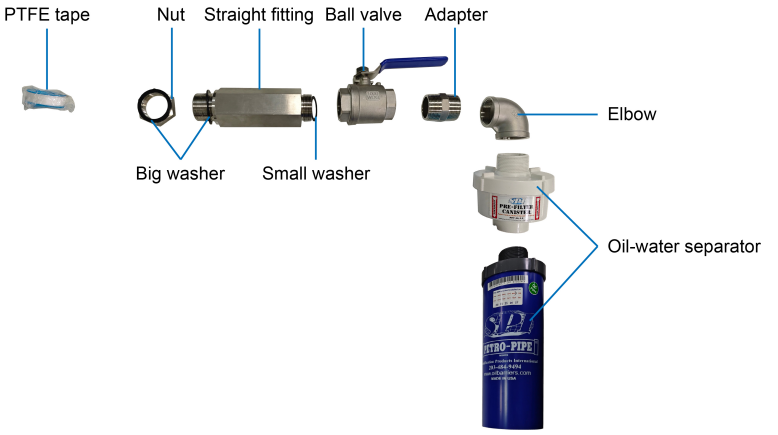


Table 5-1 Part List

Item	Parts	Source
Oil-water separator assembly	Oil-water separator	Included in the scope of supply
	Elbow	

Item	Parts	Source
	Adapter	
	Ball valve	
Straight fitting assembly	Small washer	Included in the scope of supply
	Straight fitting	
	Big washer*2	
	Nut	
Others	PTFE tape (thread seal tape)	Included in the scope of supply

1 Remove the rubber plug from the oil drainage hole.

2 Connect the straight fitting to the oil tray: Insert the long threaded end of the fitting (with an outer diameter of 48 mm) through the nut into the oil drainage hole, then tighten the nut to secure the fitting to the oil tray. You can monitor the process through the inspection window near the hole.

NOTICE

Pay attention to the positions of the flat washers.

Install the flat washers correctly by referring to the figure. Ensure they are tightly against the nut and the straight fitting.

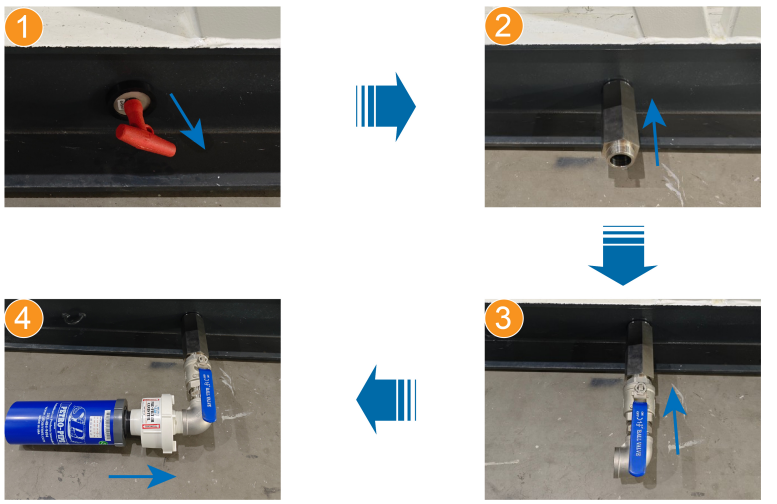
3 Connect the ball valve to the straight fitting (G1 1/2 screw thread): Wrap PTFE tape clockwise around the short threaded end of the fitting for 5–6 turns, ensuring the threads are completely covered. Then, tighten the ball valve onto the straight fitting.

4 Connect the elbow to the ball valve using an adapter. Wrap PTFE tape clockwise around both ends of the adapter, ensuring that the threads are fully covered.

5 Attach the oil-water separator to the elbow. Wrap PTFE tape clockwise around the threaded ends of the parts, ensuring that the threads are fully covered.

NOTICE

- **To ensure the device is well-sealed, install the appropriate washer first before fastening the fitting with the nut or attaching the ball valve to the fitting.**
- **To prevent leakage, please wrap seal tape around the connection points on the fitting and the elbow, etc.**



Step 2 Install the seal plug.

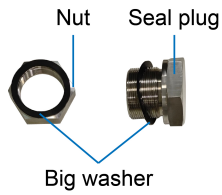


Table 5-2 Part List

Item	Parts	Source
Seal plug assembly	Seal plug	Included in the scope of supply
	Big washer*2	
	Nut	

1 Remove the rubber plug from the oil drainage hole.

2 Insert the threaded end of the seal plug through the nut into the oil drainage hole, and then tighten the nut to secure the plug. You can monitor the process through the inspection window near the hole.

Step 3 Earth filling.

After the oil-water separator is installed, complete electrical wiring for the MV Grid-connected PV Inverter in compliance with the relevant wiring instructions. After completing the electrical wiring, fill the space under and around the oil tray with earth.

- - End

6 Electrical Connection

6.1 Precautions

DANGER

- **Before electrical connections, please make sure that MV Grid-connected PV Inverter is not damaged, otherwise, it may cause danger!**
- **Before making electrical connections, check and confirm 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.**
- **Before electrical connections, please make sure that the product switch and all switches connected to the product are set to "OFF", and use measuring equipment to ensure that there is no voltage at the connection. Otherwise, electric shock may occur!**
- **All switches cannot be closed until the electrical connection is completed.**

DANGER

PV modules will generate lethal high voltage when exposed to sunlight.

- **Operators must wear proper personal protective equipment during electrical connections.**
- **Before performing an electrical connection, be sure to disconnect the PV combiner box and use measuring equipment to ensure that cables are voltage-free.**
- **Respect the protection requirements and precautions of PV modules.**

DANGER

Danger to life due to a high voltage inside the MV Grid-connected PV Inverter!

- **Be sure to use special insulation tools during cable connections.**
- **Note and observe the warnings on the product.**
- **Respect all safety precautions listed in this manual and other pertinent documents.**

⚠ WARNING

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

- **Avoid electrical connections during sandstorms or when the relative humidity in the surrounding environment is greater than 95%.**
- **Carry out the electrical connection of the product on fine days with no wind and sand.**
- **Do not perform electrical connections in harsh weather conditions, such as thunder and lightning, rain, snow, and Level 6 or stronger wind.**

⚠ WARNING

Damage to the device caused by incorrect wiring is not covered by the warranty.

- **Perform wiring by strictly following the wiring identifications inside the equipment.**
- **After completing each connection, carefully check that the connection is correct and secure.**
- **Electrical connection must be performed by professional personnel who wear personal protective equipment.**
- **The cables used in the PV generation system must be firmly connected, in good condition, and well insulated to appropriate sizes.**

⚠ WARNING

- **Check and confirm the polarity correctness of the PV string, and then connect it to the corresponding position of this product.**
- **When installing and operating the product, make sure that the positive or negative polarities of PV strings do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in product damage. The damage caused by this is not covered by the warranty.**

⚠ WARNING

Use the dedicated operating lever to switch off the MV load switch, by referring to the manual for the transformer.

NOTICE

Be sure to check the insulation of the PV arrays set according to the instructions provided by the manufacturer. The PV arrays set must be disconnected from MV Grid-connected PV Inverter during the insulation check.

NOTICE

- **Whenever necessary, wear proper protective equipment such as goggles, insulating gloves, and insulating shoes, and take all necessary auxiliary protective measures to ensure the safety of the personnel and the equipment.**
- **Before operating the product, check and ensure that the tools to be used have undergone regular maintenance.**
- **The inverter units of the MV Grid-connected PV Inverter have all been tested for insulation between the main circuit and the enclosure before the MV Grid-connected PV Inverter leaves the factory. Do not perform insulation and withstand voltage tests on any part of the MV Grid-connected PV Inverter (using a withstand voltage tester or megohmmeter).**

NOTICE

- **Comply with the safety instructions related to PV strings and the regulations related to the local grid.**
- **During electrical connection, 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.**
- **Keep a sufficient distance between the cable and the heating device to avoid aging and damage of the insulation layer of the cable caused by high temperature.**
- **For the potentially live parts near the area where the operation is performed, cover them with insulated cloth for insulation shielding.**

NOTICE

All electrical connections must comply with local and national/regional electrical standards.

- **Cables used by the user shall comply with the requirements of local laws and regulations.**
- **Only with the permission of the national/regional grid department, the MV Grid-connected PV Inverter can be connected to the grid.**

6.2 Wiring Overview

—— Power cable – · – Communication cable

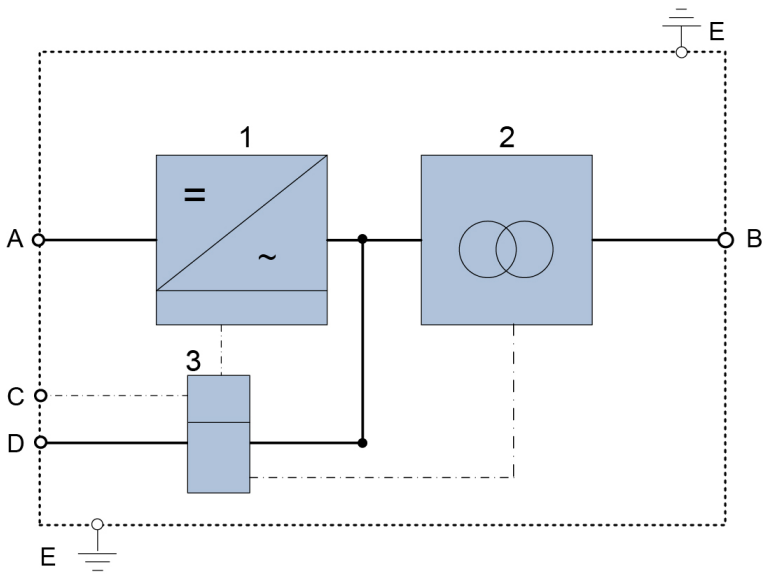


Figure 6-1 Wiring diagram

1 – Inverter Unit 2 — Transformer 3 — Power Distribution Cabinet

No.	Description	Recommended Cable Specifications	Screw	Torque (N·m)
A	DC input port	750MCM (400 mm ^{2}) at most	M12	60~70
B	AC output port	2/0 AWG — 1250 MCM (70 mm ^{2} — 630 mm ^{2})	M12	60~70
C	Communication port	2 x 20 AWG (2 x 0.75 mm ^{2}) shielded twisted pair cable	—	—
D	External power supply port	—	—	—
E	Grounding	2.36 inch x 3.94 inch (60mm x 100mm)hot-dip galvanized flat steel	M10	34~40
		1 AWG — 3/0 AWG (50 mm ^{2} — 95 mm ^{2}) grounding cable	M10	34~40

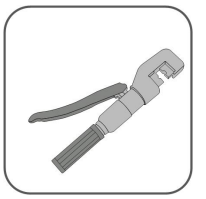
6.3 Preparation Before Wiring

6.3.1 Installation Tools

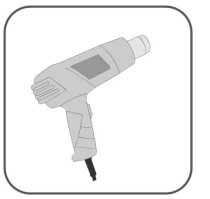
Installation tools include but are not limited to the following recommended ones. Use other auxiliary tools on site as needed.

Torque screwdriver

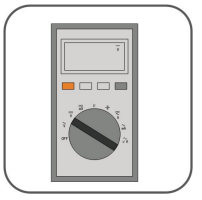
Wire stripper



Hydraulic clamp



Heat gun



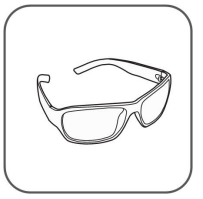
Multimeter

Screwdriver

Electric drill

Torque wrench

Protective gloves



Goggles

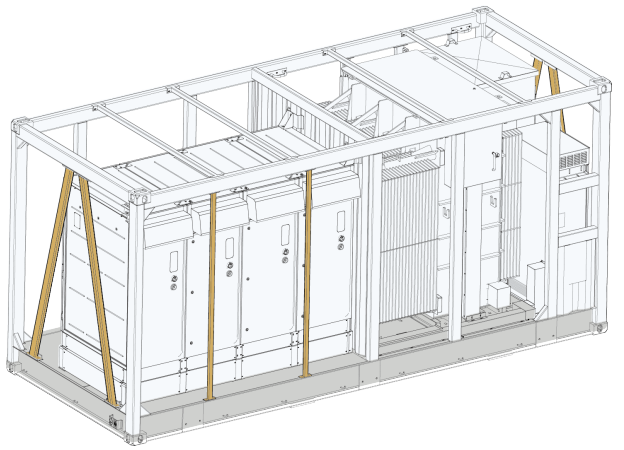
Insulated shoes

Protective clothing

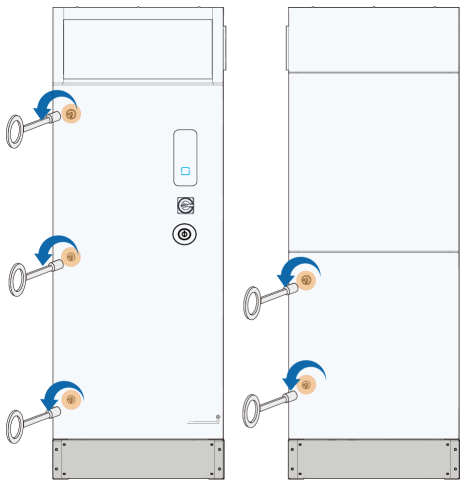
Hard hat

6.3.2 Open Product Door

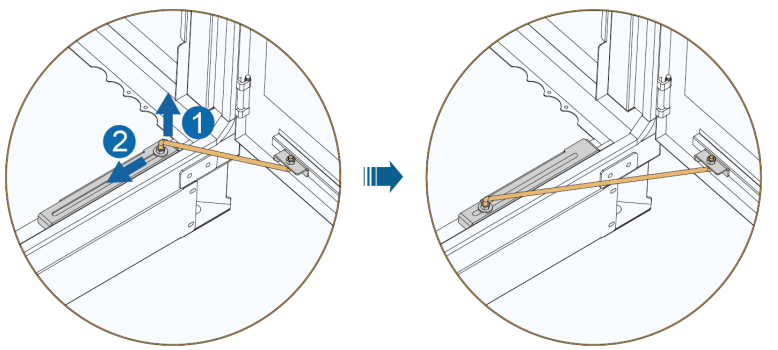
Step 1 Remove the M16 bolts from both the upper and lower ends of the diagonal beams, and the M12 bolts from both the upper and lower ends of the vertical beams on the product. Refer to "14.2 Tightening Torques" for detailed torque information.



Step 2 Open the cabinet door and then pull out the key.



Step 3 Fix the doors of the inverter unit cabinet and power distribution cabinet.



Step 4 Remove the protective cover of the wiring area.

- - End

6.3.3 Cables

The cables must meet the following requirements:

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

NOTICE

Cables used shall comply with the requirements of local laws and regulations. The cable colors in figures in this manual are for reference only. Please select cables according to local cable standards.

6.3.4 Position of Cable Inlet

For easy wiring, cables between external devices and the product are routed into the product through the bottom cable inlet.

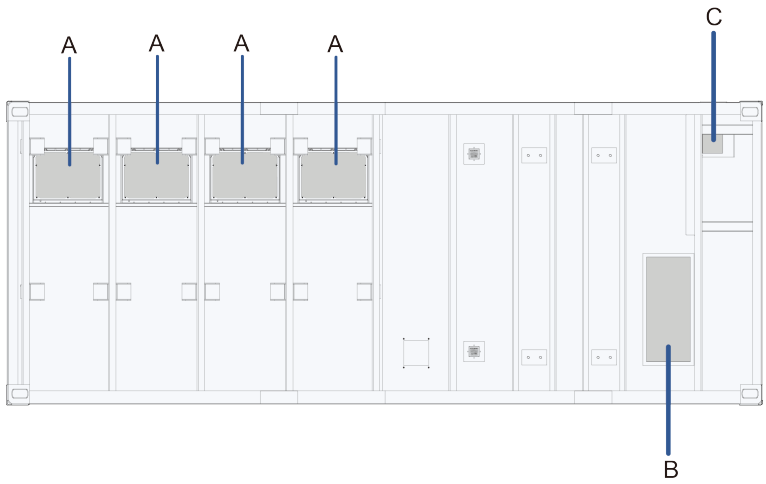


Figure 6-2 Bottom view

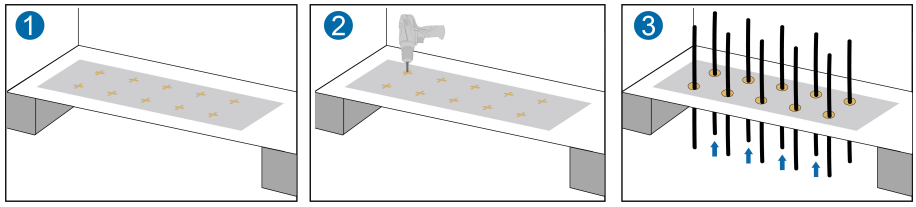
No.	Description
A	DC input cable inlet
B	AC output cable inlet
C	External power supply and communication cable inlet

6.3.4.1 Cable Inlet Preparation

Step 1 Identify the positioning marks on the bottom.

Step 2 Drill holes at the positioning marks.

Step 3 Lead cables through holes into the cabinet.



WARNING

When the wiring is completed, seal the gap between cables and holes with fire-proof/waterproof materials such as fireproof mud to prevent foreign matter or moisture from entering and affecting the long-term normal operation of the product!

- - End

6.4 Ground Connection

DANGER

Products must be reliably grounded!

- **The grounding cable must be reliably grounded, otherwise, it may cause a fatal electric shock to the operator.**
- **The grounding cable must be reliably grounded, otherwise, equipment may be damaged if struck by lightning.**
- **The grounding cable must be reliably grounded, otherwise, equipment may not operate normally.**

WARNING

- **Connect the grounding terminal to the protective grounding point before connecting AC cables, DC cables, and communication cables.**
- **Both grounding terminals on the side of the product must be connected to the protective grounding points reliably. SUNGROW shall not be held liable for any damage caused by the violation.**

NOTICE

- **Make necessary grounding and short-circuiting connections.**
- **Before connecting the grounding cable, remove the protective film at the grounding terminal first.**

NOTICE

Note the following during ground connection:

- **Observe specific codes and regulations of the country/region where the project is located to perform ground connections.**
- **All grounding connections inside the MV Grid-connected PV Inverter must be secure and reliable.**
- **The grounding resistance must meet the requirements of local standards and regulations.**

6.4.1 Overview

There are two grounding methods: fixing by welding with grounding flat steel and fixing with grounding cable.

⚠ WARNING

Before proceeding with the ground connection, tear off the protective film on grounding point.

NOTICE

After grounding is completed, whether made by using the flat steel or grounding cable, the exposed metal surface, except the fixing point of grounding connection, needs to go through anti-corrosion treatment.

6.4.2 Grounding Flat Steel

Weld 2.36 inch × 3.94 inch (60mm × 100mm) hot-dip galvanized flat steel to the grounding point. Tighten M10 bolts to a torque of 34-40 N·m.

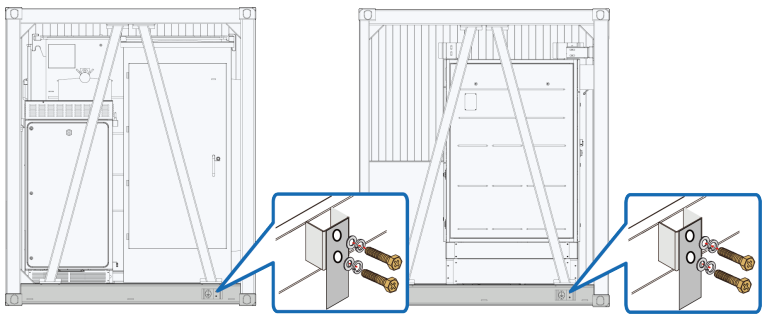
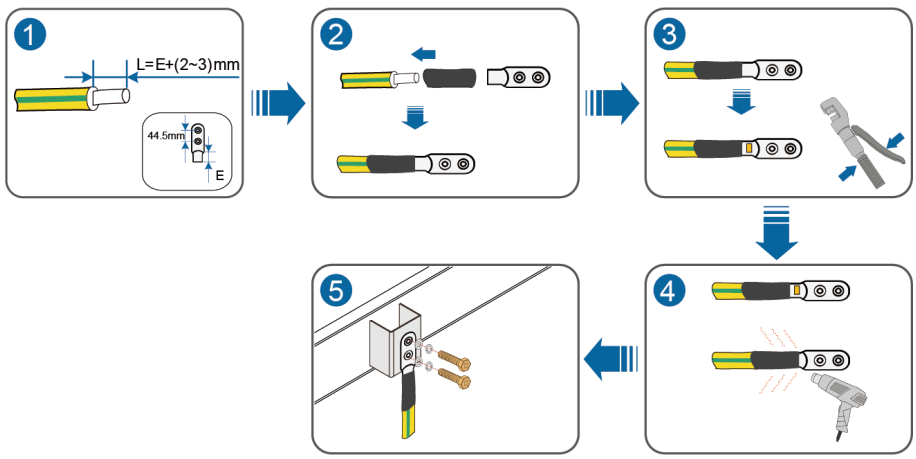


Figure 6-3 Side view

6.4.3 Grounding Cable

Use 1AWG ~3/0 AWG (50 mm^2 ~ 95mm^2) grounding cables to reliably connect the two grounding terminals to the grounding points of the system. Tighten M10 bolts to a torque of 34-40 N·m.



1: Heat shrink tubing 2: OT/DT terminal

6.5 DC Input Connection

DANGER

The PV arrays will generate lethal high voltage when exposed to sunlight.

Respect all safety instructions listed in relevant documents about PV arrays.

WARNING

- **Make sure the PV array is well insulated to the ground before connecting it to the MV Grid-connected PV Inverter.**
- **Make sure the maximum DC voltage and the maximum short circuit current of any string never exceed the MV Grid-connected PV Inverter permitted values specified in "Technical Parameters".**
- **Check and confirm the polarity correctness of the PV string, and then connect it to the corresponding position of this product.**
- **When installing and operating the product, make sure that the positive or negative polarities of PV strings do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in product damage. The damage caused by this is not covered by the warranty.**

WARNING

- **Observe all safety instructions specified by the manufacturer for the PV modules at the site.**
- **To ensure the stable and efficient operation of the whole system, it is recommended that the PV modules attached to the same MV Grid-connected PV Inverter be identical in manufacturer and model, and the number of PV modules connected in series in each input should be the same.**
- **The open-circuit voltage of the PV array should not exceed the maximum DC input voltage of the MV Grid-connected PV Inverter. Overly high open-circuit voltage of the PV array may damage MV Grid-connected PV Inverter.**
- **If a ground fault has been found in the PV module, before proceeding with the DC input wiring, remove the fault first.**

6.5.1 Overview

The wiring terminals for the DC input of the inverter unit are shown in the figure below.

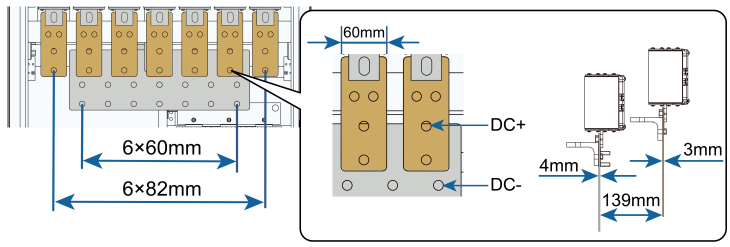


Figure 6-4 DC input

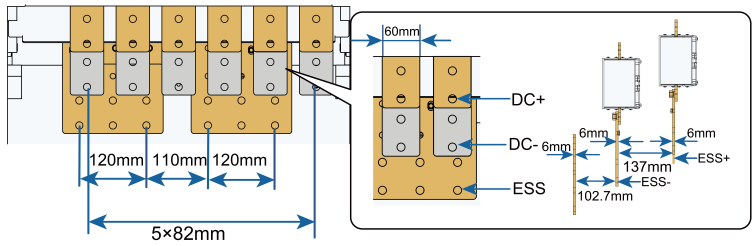


Figure 6-5 DC connection area with energy storage system ports

No.	Description	Screw	Torque(N·m)
DC+	DC positive cable connection area	M12	60~70
DC-	DC negative cable connection area	M12	60~70
ESS	Energy storage system port	M12	60~70

Secure the DC branch fuse with M10×30 bolts with a tightening torque of 20N.m.

Illustrations in the manual are for the product with configuration of 7 DC inputs only.

- For the product with 6 DC inputs, in its DC wiring area, the first fuse and copper bar on the right in the illustration are removed.
- For the product with 5 DC inputs, in its DC wiring area, the first fuse and copper bar on the left and right in the illustration are removed.

All shown in the figures are 7 DC input, when DC Input is 6, remove the rightmost DC fuse and DC wiring copper bar; when the DC input is 5, remove one DC fuse and DC wiring copper bar from each end on the left and right.

The number of PV strings connected to the each the inverter unit should be as balanced as possible.

6.5.2 Removing Insulation Board Before Connection

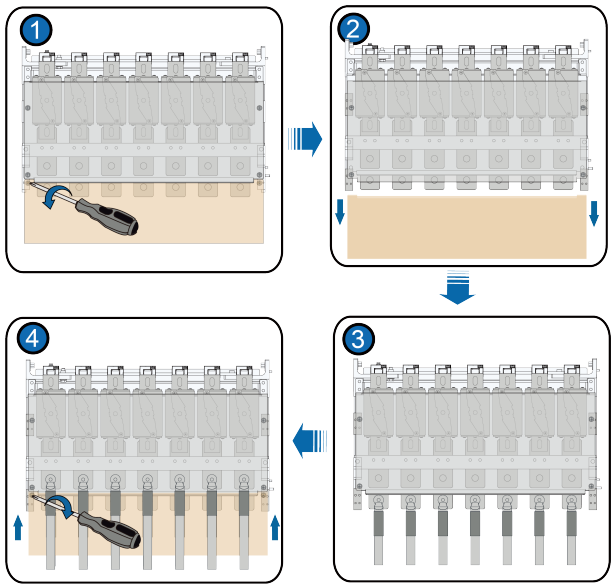
Removing insulation board before cable connections.

Step 1 Remove the two fixing screws on the insulation board with a screwdriver.

Step 2 Move insulation board down onto the bottom plate, and make sure it is placed between the positive and negative cables.

Step 3 Install the negative DC cables.

Step 4 Move the insulation board upward to its original position and install the two fixing screws.



Step 5 Finally, install the positive DC cables.

- - End

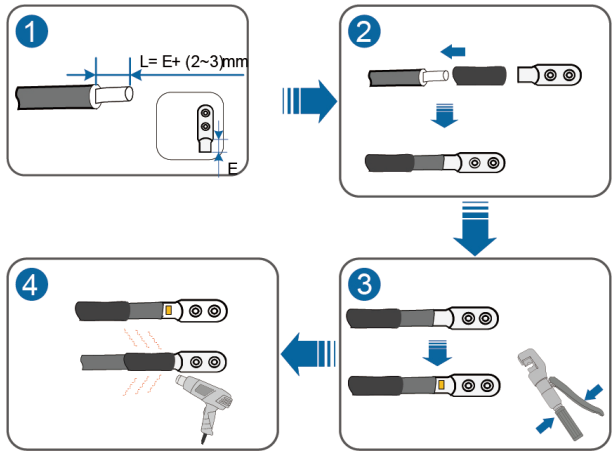
* The figure is for reference only. The product received may differ.

6.5.3 Procedure

Step 1 Lead the cable into the wiring area through the inlet hole, and mark the cable polarity.

Step 2 Strip the protective layer of the cable to expose the copper core of the wire with strippers.

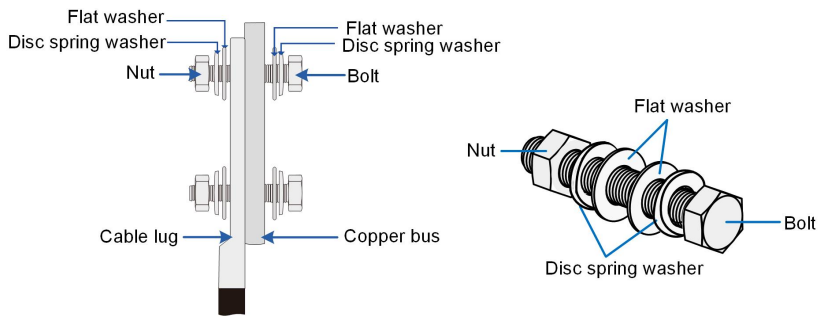
Step 3 Install the OT/DT terminal to the wire and crimp them with a crimping tool. Install a heat shrink tubing to the terminal and heat it with a heat gun.



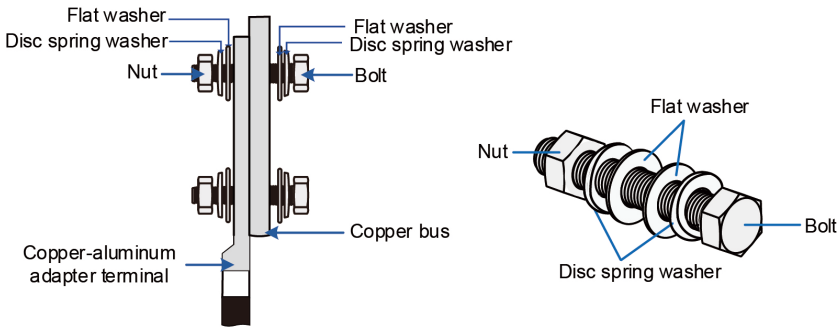
If the two-core or multi-core cable is used as the DC input cable, split the cable cores into wires outside MV Grid-connected PV Inverter first, before leading the cable into MV Grid-connected PV Inverter.

Step 4 Secure the OT/DT terminal to the copper bar by M12 x 45 bolts with a tightening torque of 60- 70 N.m.

- If copper wires are used, fasten the bolt assembly as shown below.



- If aluminum wires are used, fasten the bolt assembly as shown below.



Step 5 Pull the cable back slightly after wiring to ensure that the cable is long enough.

NOTICE

- **Ensure that the selected terminal can directly contact the copper bar. If there are any problems, contact the terminal manufacturer.**
- **Ensure that the copper bar is not in direct contact with the aluminum wire. Otherwise, electrochemical corrosion may occur, impairing the reliability of the electrical connections.**
- **If the two-core or multi-core cable is used as the DC input cable, split the cable cores into wires outside MV Grid-connected PV Inverter first, before leading the cable into MV Grid-connected PV Inverter.**

NOTICE

In addition to complying with the national standards of the country of use, foam sealants and fireproof mud must be halogen-free and environmentally friendly. They must not release corrosive substances such as chlorine, ammonia, or sulfur at operating temperatures ranging from −40 °C to 85 °C, to prevent damage to equipment.

- The amount of input power to the product shall be distributed evenly on the 4 the inverter units.
- Please ensure the upper and lower copper bars are kept in the same plane with a deviation of less than 10mm while performing DC wiring.
- Fix the cable after wiring, and reserve a certain length to avoid damage caused by excessive force on the wiring copper bar due to foundation sinking and other problems.
- DC cables must be suitable for temperatures of no less than 90℃ and must be in accordance with the local standards and directives.

- - End

6.6 AC Side Connection

6.6.1 Inspection Before Wiring

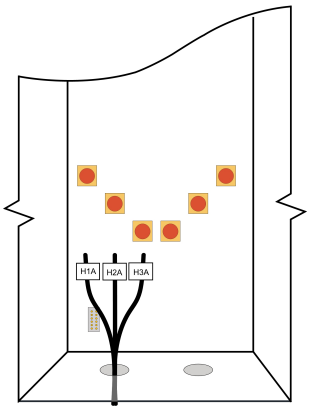
- Check and ensure that the AC side of the inverter unit is disconnected.
- Refer to the transformer manual and use the special lever to disconnect the MV load switch.
- Check and ensure that the sleeves and copper bars in the wiring area in the MV compartment are free from damage, deformation, and fracture.

6.6.2 Procedure

Step 1 Drill holes on the bottom sealing plate of the HV cabinet according to local standards and regulations.

Step 2 Lead external cables inside through the bottom cable entries.

Each of the three-phase (phase H1A, phase H2A, and phase H3A) cables is led inside through the same cable entry.



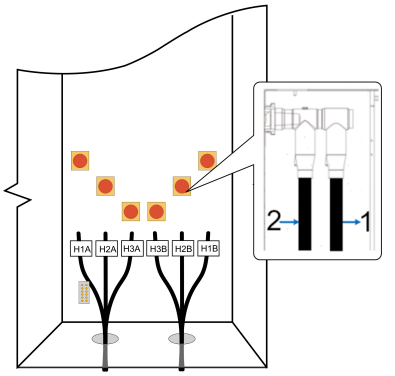
Step 3 Prepare the terminals and install them tightly, where reference can be made to the installation manual of the cable connector.

Both cooper-core cable and aluminium-core cable are applicable.

In case of copper-core cables, use copper wiring terminals.

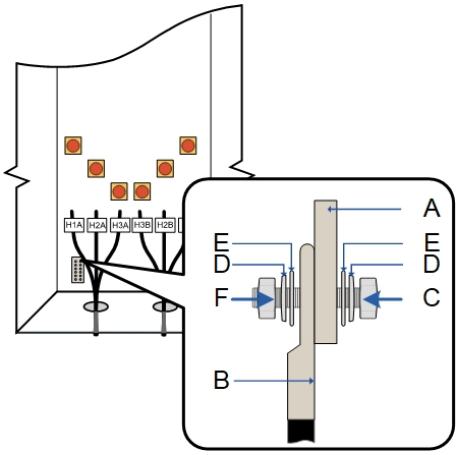
In case of aluminium cables, use copper-to-aluminium adapter terminals.

A maximum of 2x2 output cables can be connected to the HV wiring copper bars, i.e., the outer copper bar (shown by 1), and the inner copper bar (shown by 2).



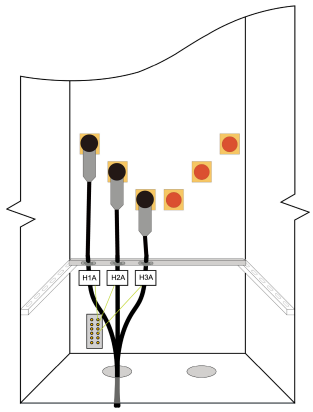
On site, determine the number of output cables and the wiring scheme according to actual situation.

After wiring, reliably connect the cable connector to the grounding copper bar inside the high-voltage room according to local standards and regulations, where the fastening torque is 60~70N.m.



A	B	C	D	E	F
Copper bus	Cable lug	Bolt(M12)	Disc spring washer	Flat washer	Nut

Further Operations



After completing wiring, fix the cable on the beam (not included in the scope of supply) to avoid excessive stress on the cable.

Seal the bottom cable entries with fireproof mud (foaming materials), remove debris in the HV cabinet, close and lock the cabinet door.

Remove the key to the HV cabinet door, and store it in the operation box.

AC cables must be suitable for temperatures of no less than 90℃ and must be in accordance with the local standards and directives.

Step 4 Install the EVT (Optional)

The EVT (Electronic Voltage Transformers) should be installed at the rear of the HV input T-type cable connectors H1A, H2A and H3A. After installing the T-type cable connectors, remove the insulating plug. Check the EVT adapter and nut dimensions to ensure compatibility with the cable connector. Clean the T-type cable connector and apply silicone grease to the inner wall of the connector and the surface of the EVT. Secure the EVT to the T-type cable connector, and rotate it clockwise until it cannot turn further.

Once the main connections are complete, connect the provided shielded cable to the aviation connector on the bottom cover of the EVT. Then, securely connect the yellow-green grounding cable of the EVT to a designated grounding point inside the HV room.

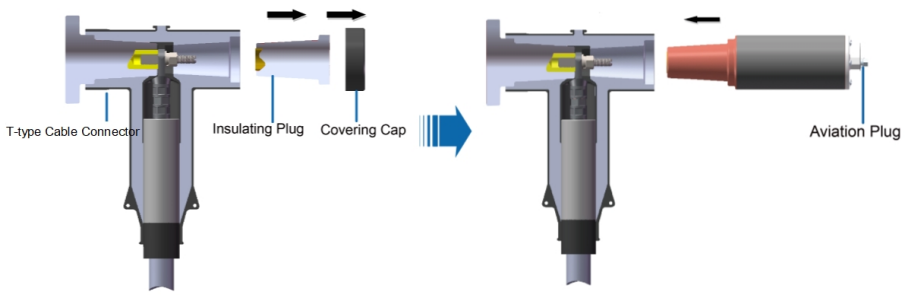


Figure 6-6 EVT layout

Skip this step if the EVT is not included in your configuration.

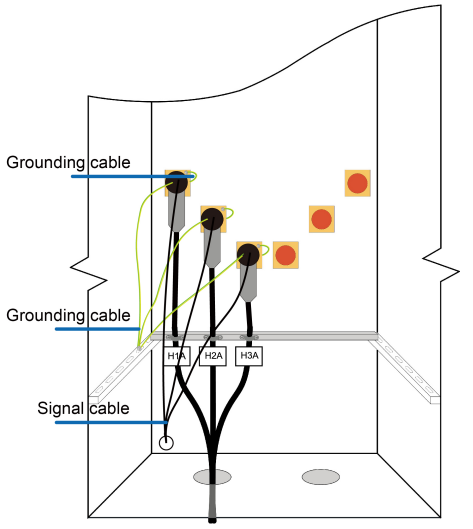


Figure 6-7 Cable connection diagram

The yellow cable is the grounding cable, which should be connected to a valid grounding point inside the HV room. The black shielded cable is a signal cable, connected to the I/O port on the PD sampling board in the power distribution cabinet.

- - End

6.7 DC Coupling Wiring (Optional)

If the product supports DC coupling, it is necessary to supply power to equipment such as auxiliary power transfer cabinet through the power interface for energy storage equipment power distribution. Complete the wiring by following the steps below.

WARNING

- **All the plugs need to be sealed and well stored before installation.**
- **Before installing the plug, check the plating of the socket for damage and corrosion. In case any damage or corrosion is found, stop the installation and replace the socket with a new one.**

Introduction

An aviation connector consists of a plug connector and a socket connector. The product will be delivered as shown in the figure below.

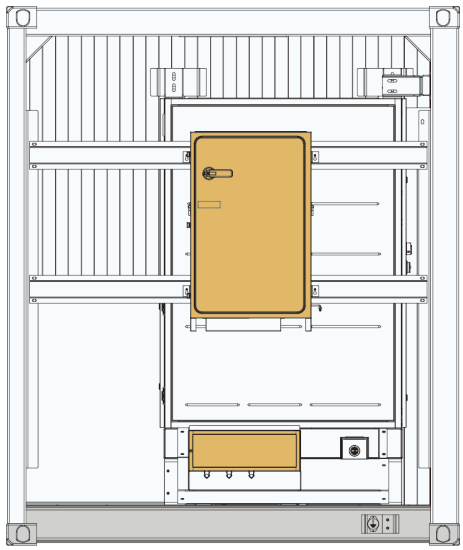


Figure 6-8 DC coupling location

WARNING

- **All the plugs need to be sealed and stored.**
- **Before installing the plug, check the plating of the socket for damage and corrosion. In case any damage or corrosion is found, stop the installation and replace the socket with a new one.**

Please complete the wiring by following the steps below.

1 Before wiring, remove the sealing plate from the aviation connectors. Then, remove the pre-cut knockouts from the sealing plate according to the marks to create openings for the cables to pass through.

2 Remove the caps from the socket connectors.

3 Install aviation connectors.

- Fetch the aviation connectors from the accessories. Crimp the cables onto the plug connectors.
- Connect the plug connector to the socket connector. The other end of the cable should be connected to the auxiliary power transfer cabinet.
- Secure the cables properly using cable clamp.

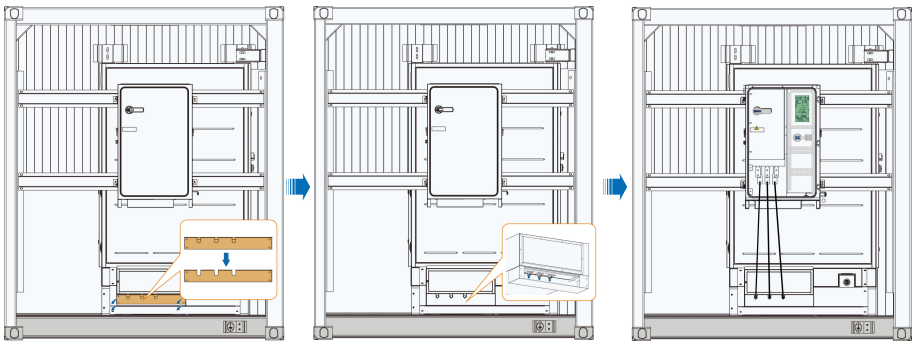


Figure 6-9 DC coupling wiring

6.8 Communication Connection

6.8.1 RS485 Communication

Overview

There is an RS485 communication terminal block inside the power distribution cabinet.

Table 6-1 Port mark and definition (example)

Marks	Plug-compatible Devices
Reserved RS485	PV combiner box, meteo station, electricity meter, transformer, etc.

Procedure

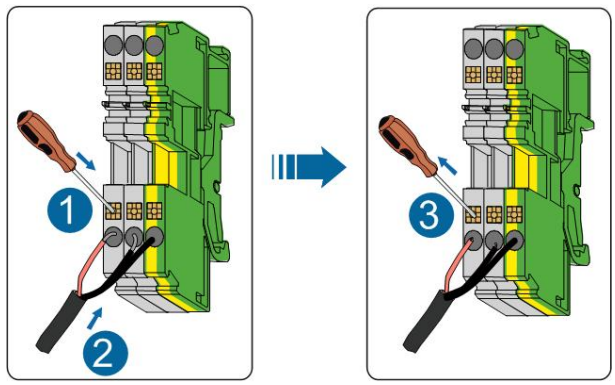
Take one cable as an example.

Step 1 Use a wire stripper to strip off the RS485 shielded twisted pair.

Step 2 Press the metal plate above the terminal with a screwdriver.

Step 3 Insert the cable into the corresponding wiring hole.

Step 4 Loosen the screwdriver, the metal plate returns and compresses the cable.



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

- - End

6.8.2 Ethernet Communication

The Ethernet communication port in the power distribution cabinet is shown in figure A below.

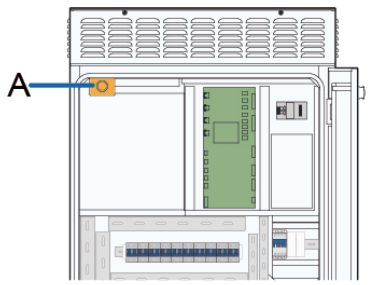


Figure 6-10 Network port location

Connect external monitoring devices to the Ethernet port by a CAT-5e cable.

6.9 Power Supply Connection

The power distribution cabinet is available in two versions, with capacity options of 5 kVA and 40 kVA respectively. The actual MV Grid-connected PV Inverter received may be equipped with one of these versions, and the specific agreement shall prevail.

⚠ WARNING

A voltage of 645V may be present in the MV Grid-connected PV Inverter if the MV load switch is not open.

6.9.1 Power Distribution Cabinet Layout

Version 1

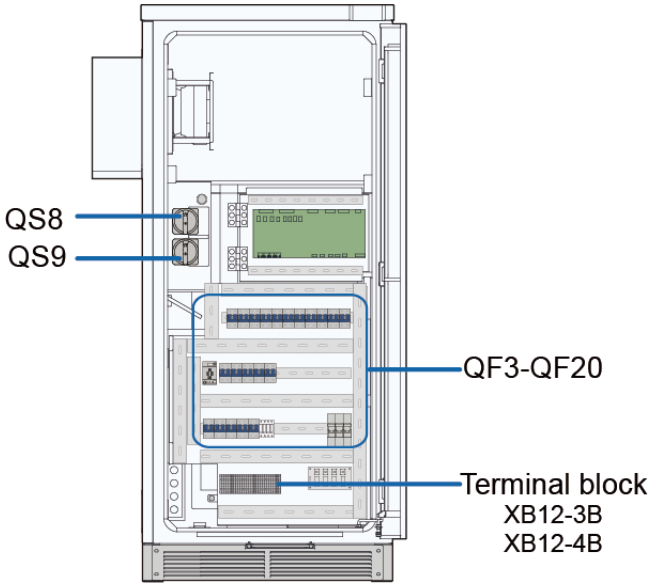
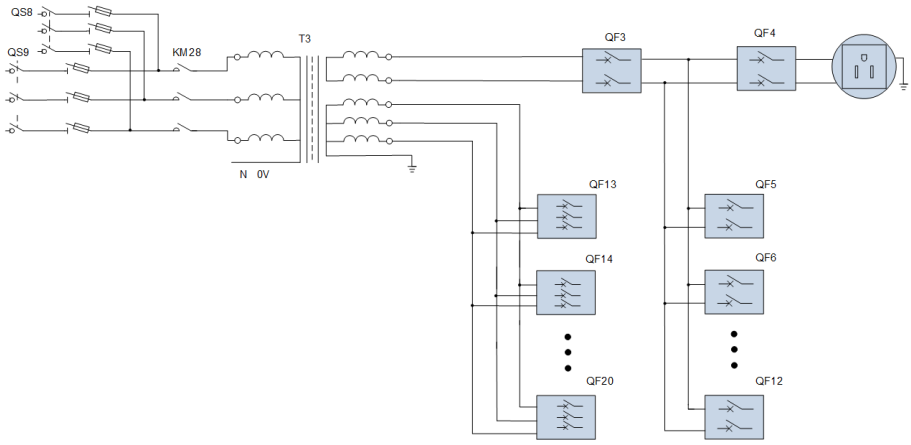


Figure 6-11 Terminal layout

No.	Name	Cable Size (AWG)
QS8	Off-grid commissioning power distribution switch	
QS9	Control switch for auxiliary transformer	6
QF3	Control switch for 120Vac power supply	6
QF4	Control switch for power socket	6
QF5-QF7	Reserved for 120Vac power supply	8
QF8	Reserved for 120Vac power supply	6
QF9-QF12	Reserved for 120Vac power supply	8
QF13-QF20 (Only for 40kVA)	Reserved for 480Vac power supply	8
XB12-3B	External dry contact terminal	18
XB12-4B	External dry contact terminal	18

Wiring Diagram

The external power supply wiring diagram for the 40kVA power distribution cabinet is shown below. Perform cable connection according to this diagram.



External Dry Contact Terminal

Terminal Introduction

The external dry contact is located at the terminal block XB12-3B and XB12-4B. The contact is externally connected to an external emergency stop cable, and internally connected with the SCU inside the auxiliary power distribution cabinet.

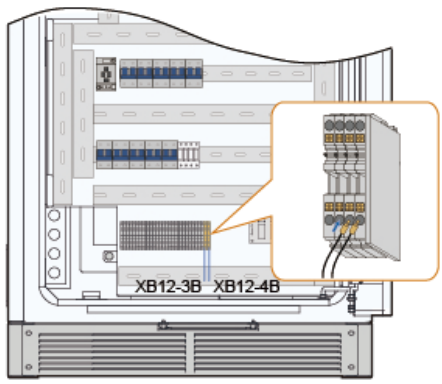
The dry contact is normal opening/abnormal closing , the logic cannot be modified. When the contact is closed, the transmission time of the signal is 200ms, and the breaking time of the breaker is 200ms.

Wiring procedure

1 Disconnect all the AC and DC side switch of the inverter unit, wait 5 minutes until the inverter unit is not live.

2 Open the door of the power distribution cabinet, and find the terminal block at the bottom.

3 Connect the wires to the lower holes of XB12-3B and XB12-4B, and then lead out the wires.



4 Close the cabinet door.

5 Finish the wiring.

Version 2

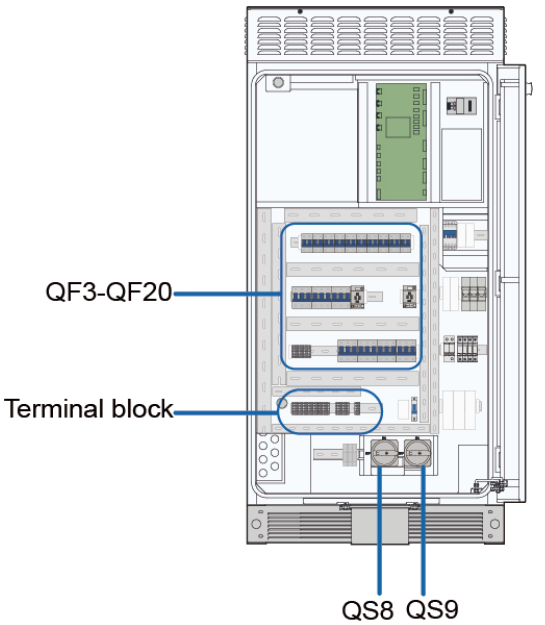
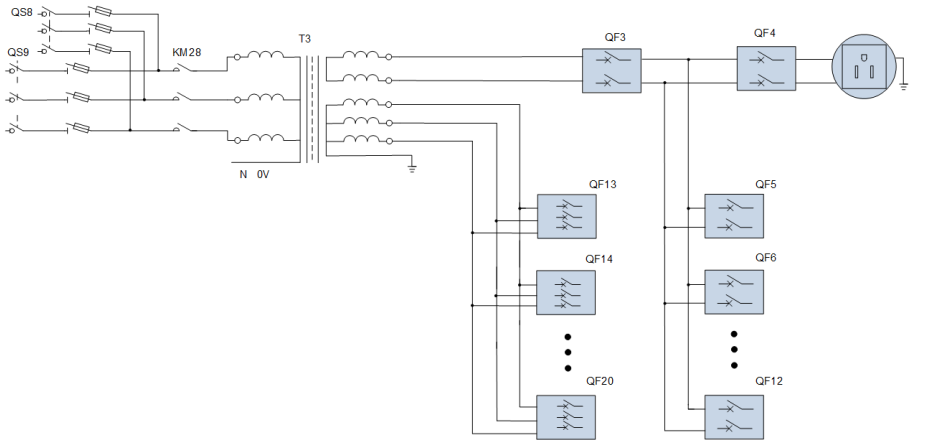


Figure 6-12 Terminal layout

No.	Name	Cable Size (AWG)
QS8	Off-grid commissioning power distribution switch	
QS9	Control switch for auxiliary transformer	6
QF3	Control switch for 120Vac power supply	6
QF4	Control switch for power socket	6
QF5-QF8	Reserved for 120Vac power supply	6
QF9-QF12	Reserved for 120Vac power supply	8
QF13-QF16 (Only for 40kVA)	Reserved for 120Vac power supply	6
QF17-QF20 (Only for 40kVA)	Reserved for 480Vac power supply	8

Wiring Diagram

The external power supply wiring diagram for the 40kVA power distribution cabinet is shown below. Perform cable connection according to this diagram.



6.9.2 Recommended Cables Installation

The Ethernet and terminal block cables in the power distribution cabinet are recommended to be wired as shown in the highlighted part of the following figure. Please refer to "6.3.4.1 Cable Inlet Preparation" for cable inlet preparation.

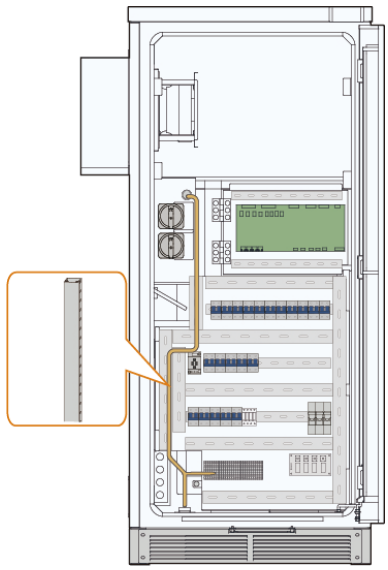
Step 1 Open the cover of the cable tray for the Ethernet and terminal block cables inside the power distribution cabinet.

Step 2 Press the Ethernet and terminal block cables into the cable tray.

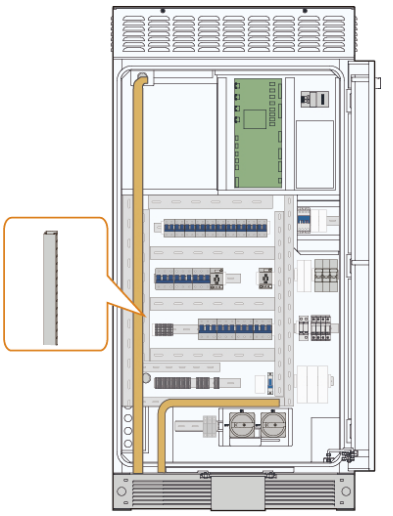
Step 3 Close the cable tray cover.

- - End

Version 1



Version 2



6.10 Check After Wiring

6.10.1 Inspection

Check the wiring thoroughly and carefully when all electrical connections have been completed.

- Seal the gap between cables and the wiring holes with fireproof and waterproof materials.
- Put all protective covers back in place firmly.

⚠ WARNING

When the wiring is completed, check for the wiring correctness and then seal the gap between cables and inlet and outlet holes with fireproof/waterproof materials such as fireproof mud to prevent foreign matter or moisture from entering and affecting the long-term normal operation of the MV Grid-connected PV Inverter.

⚠ WARNING

Put up highly visible warning signs near the product's upstream and downstream switches, to prevent safety incidents caused by accidental switching on.

6.10.2 Locking Cabinet Door

Step 1 Release the fixing doors of the inverter unit cabinet and the power distribution cabinet. Unfix in reverse of the fixing method，refer to "6.3.2 Open Product Door".

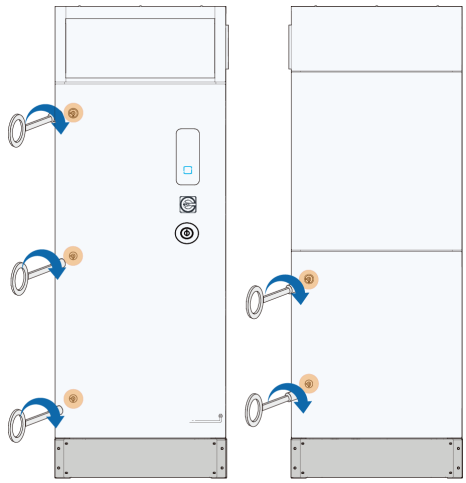
NOTICE

It is forbidden to close the door forcibly when the door is fixed.

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

NOTICE

Ensure all doors are closed and locked. Failure to do so may increase the risk of equipment damage due to dust and water ingress.



DANGER

Electric shock hazard!

Be sure to lock the cabinet door. Otherwise, non-professionals may be exposed to the running machine, and it may cause casualties.

- - End

6.10.3 Fixing Cable

There is no cable fixing point inside the product, and the cable needs to be fixed within 500 mm under the AC and DC side inlet covers.

Fix the cable with the cable clamp inside the product, as shown below.

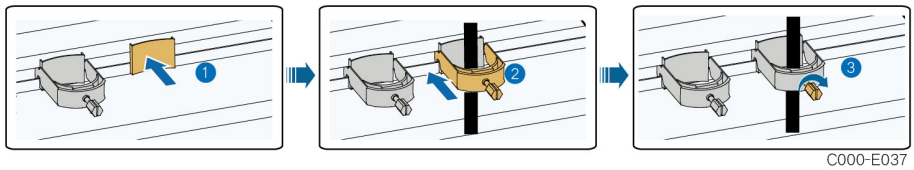


Figure 6-13 Cable clamp installation

Note: The cable clamp is an optional accessory.

7 Powering Up and Powering Down

7.1 Safety Instructions

DANGER

When the product is working:

- **It is strictly forbidden to touch the live parts of the product. Otherwise, an electric shock may occur.**
- **It is strictly prohibited to disassemble any parts of the product. Otherwise, an electric shock may occur.**
- **It is strictly prohibited to touch any hot parts of the product (such as the heat sink). Otherwise, it may cause burns.**

DANGER

Even if the MV Grid-connected PV Inverter is shut down, it may still be hot and cause burns. Operating the MV Grid-connected PV Inverter with protective gloves after it cools down.

WARNING

Press the emergency stop button only when the product fails or an emergency occurs to ensure that the product responds quickly.

WARNING

The product can only be put into operation after confirmed by a professional and approved by the local power department.

WARNING

For the product with a long shutdown time, it must be checked thoroughly and carefully to ensure all indexes are acceptable before being powered on.

7.2 Powering Up Operations

7.2.1 Removing Security Labels

Security labels are attached to the MV Grid-connected PV Inverter on the following locations: the AC-side and DC-side doors (on the closing/opening side) and the transformer door

(where the door meets the door frame), as highlighted in the figures below. Remove the security labels before putting the MV Grid-connected PV Inverter into operation.

NOTICE

If any sealing strip is missing or damaged, inspect the exterior of the equipment for integrity and signs of deformation. Additionally, check if any DC copper bars, AC copper bars, or switches are missing, and if any screws are loose or missing. In case of any uncertainties, contact SUNGROW for confirmation and provide a photo for reference.

NOTICE

Do not remove the security labels randomly before the equipment is put into operation.

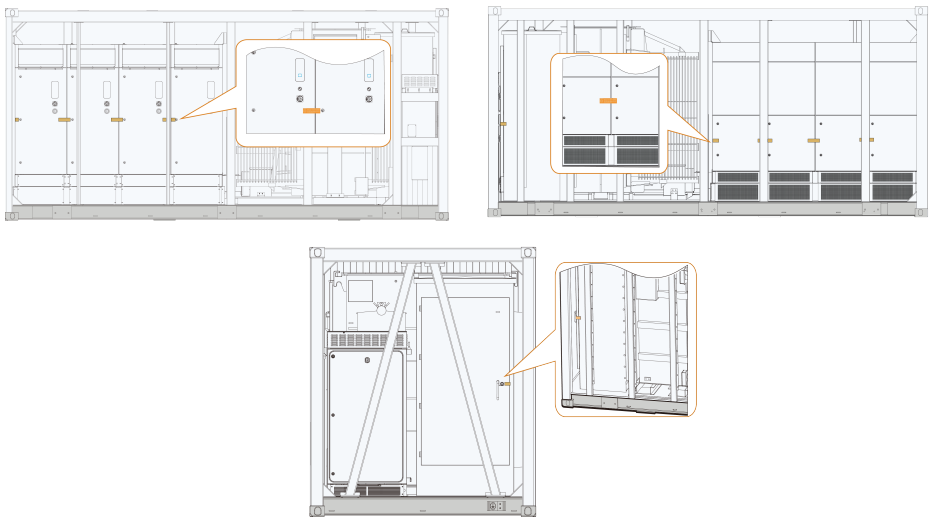


Figure 7-1 Security labels location

After removing the security labels, use alcohol or adhesive remover to wipe off any residual adhesive on the enclosure of the MV Grid-connected PV Inverter.

7.2.2 Removing Film on Product

The highlighted parts of the product in the figures below are covered with films. Be sure to remove the films before the product is officially put into operation.

Films Distribution Area of the Inverter Unit

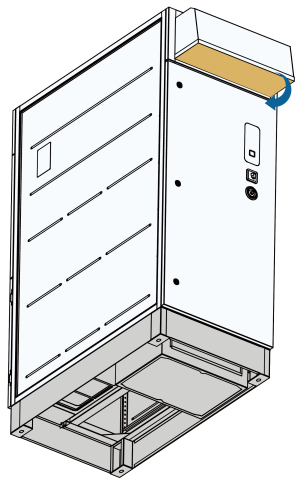


Figure 7-2 Remove film at air inlet of inverter unit

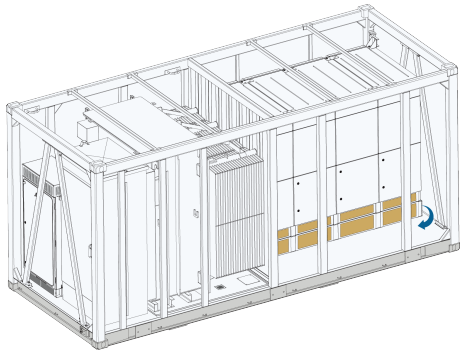


Figure 7-3 Remove film at air outlet of MV Grid-connected PV Inverter

Films Distribution Area of Power Distribution Cabinet

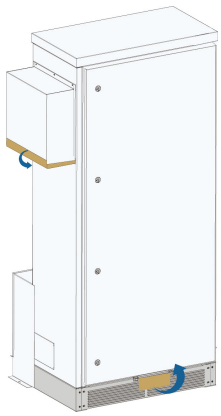


Figure 7-4 Remove film at air inlet and outlet of power distribution cabinet (version 1)

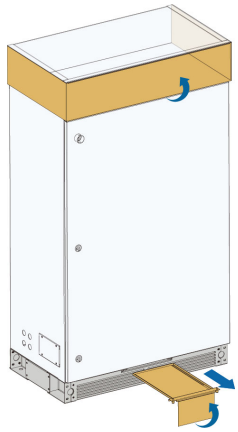


Figure 7-5 Remove film at air inlet and outlet of power distribution cabinet (version 2)

7.2.3 Removing Pressure Relief Screw

Be sure to remove the pressure relief screws (marked as A in the figure below) before the product is officially put into operation.

A label is affixed above the pressure relief screws: "Remove the pressure relief screws on the bottom of this panel before grid connection."

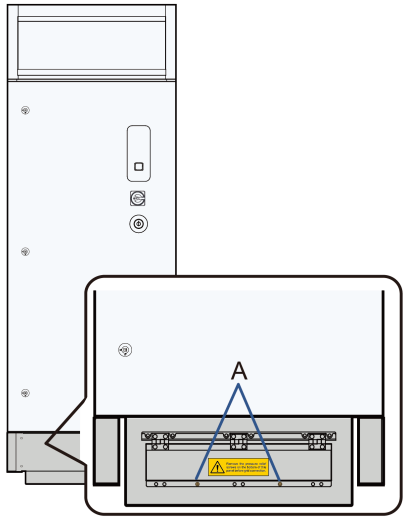


Figure 7-6 Pressure relief screw location

For certain versions, if no pressure relief screws are present, skip this step.

7.2.4 Adjusting Off-Load Tap Changer

Adjust the output voltage of the transformer. When operating the off-load tap changer, ensure that the transformer is in a non-excitation state, that is, the high and low voltage sides of the transformer are uncharged.

When the voltage on the LV side remains unchanged, the output voltage on the HV side under different gears is:

Gear	Output Voltage
1	Standard voltage x 1.05
2	Standard voltage x 1.025
3	Standard voltage x 1.0
4	Standard voltage x 0.975
5	Standard voltage x 0.95

Operate the off-load tap changer as follows.

1 Loosen the locating pin bolt.

2 Adjust the off-load tap changer to the corresponding gear according to the voltage requirements

3 Tighten the locating pin bolt.

7.2.5 Opening Pressure Relief Valve

The structural design of pressure relief valves may vary across manufacturers, leading to differences in their unlocking mechanisms. The valve can generally be unlocked using one of the following two methods, depending on the specific product:

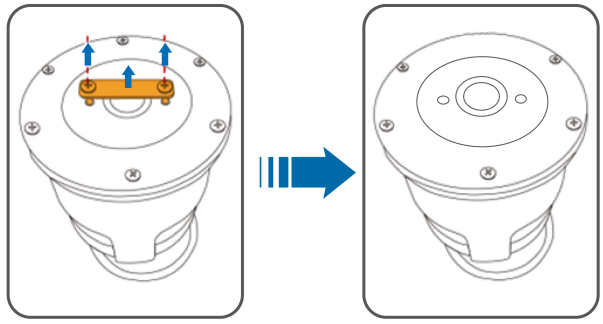


Figure 7-7 Remove the locking device

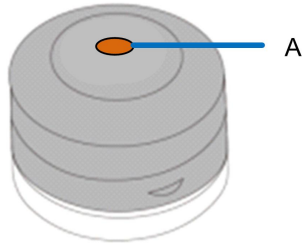


Figure 7-8 Open the cap A

7.2.6 Removing Foam Part from Oil Thermostat

Remove the protective cover on the oil thermostat and remove the foam parts in the protective cover before the MV Grid-connected PV Inverter is officially put into operation.

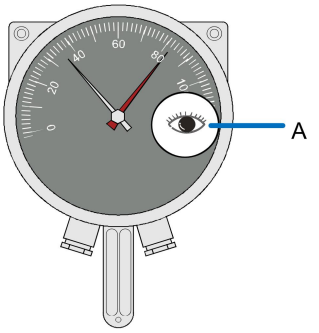


Figure 7-9 Foam part from oil thermostat

After removal, re-install the protective cover.

7.2.7 Draining Oil from Transformer

If it is necessary to drain the transformer oil due to a failure of components inside the oil tank, follow the steps below:

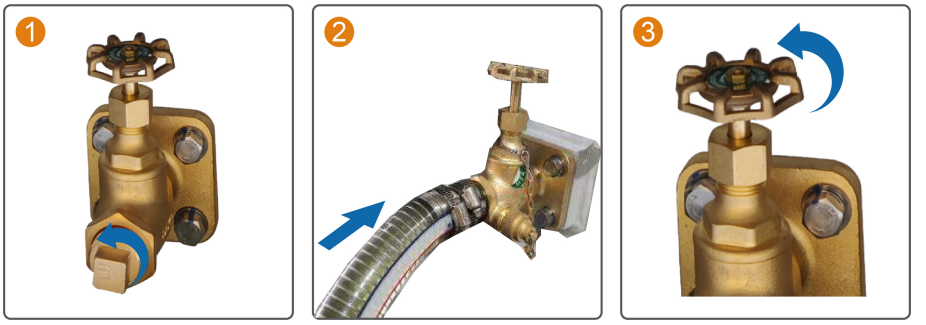
Before draining the oil, open the pressure relief valve (with manual pull ring) to release the internal pressure from the oil tank.

No.	Device	Source
1	Clean hoses and oil tank	Not included in the scope of supply
2	Cleaning cloth	
3	Wrench	
4	Adjustable wrench	
5	Hose connector	
6	Oil barrel	
7	Oil extractor pump	

Step 1 Use a wrench to remove the cap from the oil drain valve.

Step 2 Connect one end of the drain hose to the position of the valve cap.

Step 3 Open the oil drain valve to allow the oil to be discharged through it later.



Step 4 Connect the other end of the drain hose to a small oil extractor pump, and place the oil outlet into the oil barrel.

Step 5 Power on the oil extractor pump to pump out the oil from the transformer.

Step 6 When the oil level reaches the specified position, power off the oil extractor pump and close the oil drain valve.

Step 7 Remove the drain hose and reattach the cap to the oil drain valve.

- - End

7.3 Inspection Before Powering Up

7.3.1 Inverter Unit

- Ensure that the AC and DC switches and all internal micro circuit breakers are disconnected.
- Check and ensure that the emergency stop button is released .
- Check various upstream and downstream electrical switches and buttons, as well as those on the inverter unit, to make sure that they can be operated flexibly and meet the requirements.
- Check whether the film at the air inlet and outlet are removed.
- Check whether the pressure relief screw has been removed.
- Check whether the fuse is installed in the AC SPD.

7.3.2 PV Array

The DC side voltage shall not exceed the maximum DC voltage allowed for the MV Grid-connected PV Inverter. Otherwise, the MV Grid-connected PV Inverter may be damaged and even cause safety accidents.

To ensure the stable and efficient operation of the whole system, it is recommended that batteries connected to an the MV Grid-connected PV Inverter should be of the same type and from the same manufacturer, and the number of batteries connected in series should be the same.

7.3.3 Checking Grid Voltage

- Measure accurately the grid 3-phase line-to-line voltages: L1-L2, L1-L3, and L2-L3.The voltages should not exceed the grid permissible voltage and the three phases are in balance.

Adjust the transfer ratio of the transformer by qualified personnel if the grid voltage deviation is large.

- Measure and record the grid frequency. Measured data should not exceed the grid permissible frequency.

- Measure the THD and check the curve if possible. MV Grid-connected PV Inverter will stop running if the THD is serious.
- Record accurately all the measured data.

7.3.4 Transformer

- Ensure that there are no oil leaks on the transformer surface.
- Check and ensure that the pointer of the oil level gauge is in the normal range.
- Check whether the safety tab of the pressure relief valve has been removed.
- Check and ensure that the temperature measurement circuit is complete.
- Check and ensure that the SPD is firmly and reliably installed.
- Check and ensure that the foam in the oil temperature dial is removed.
- Check and ensure that the oil leakage port of the transformer room is not clogged.
- Check the external air-insulated gap distance, and whether the air-insulated distance between the bushings of different voltage levels and the ground meets the relevant standards.

7.4 Powering Up Steps

Step 1 Turn on the maintenance switch QS2 of all the inverter units, and close the door.

Step 2 Turn on the external power supply equipment switch (which is, the QS9 switch inside the power distribution cabinet), and close the door.

Step 3 Turn on the MV load switch, and close the door.

Step 4 Send a shutdown command through the WEB to shut down MV Grid-connected PV Inverter.

Step 5 Check and ensure that the **"Access Protection Enabling"** switch is off on the WEB page.

Step 6 Turn on the output switch of the upstream PV combiner box/trunk bus.

Step 7 Set the DC knob switch to the "**ON**" position.

Step 8 Turn on the DC load switch QS1 inside all the inverter units.

Step 9 Start up MV Grid-connected PV Inverter on the WEB page, and MV Grid-connected PV Inverter begins to work in the grid-connected state.

For the position of the above switches, please see "3.3.2 Internal Structure of the Inverter Unit" and "3.3.4 Power Distribution Cabinet"。

- - End

7.5 Powering Down Operations

7.5.1 Planned Powering Down

> **WARNING**
>
> **After the equipment stops running, wait at least 5 minutes, and then check and ensure that the voltage is within a safe range. Then, perform maintenance or overhaul by following the instructions on the warning signs on the equipment.**

Step 1 Send a shutdown command through the WEB to shut down MV Grid-connected PV Inverter.

Step 2 Turn the DC knob switch to the "**OFF**" position.

Step 3 Turn off the output switch of the upstream PV combiner box/trunk bus.

Step 4 Turn off the MV load switch.

Step 5 Check and ensure that the DC load switches QS1 of all the inverter units are turned off.

Step 6 Turn off the maintenance switches QS2 of all the inverter units.

Step 7 Check and ensure that the AC circuit breakers QF1 of all the inverter units are open.

Step 8 Open the power distribution cabinet, and turn off the external power supply equipment switch (which is, the QS9 switch inside the power distribution cabinet).

> For the position of the above switches, please see "3.3.2 Internal Structure of the Inverter Unit" and "3.3.4 Power Distribution Cabinet"。

- - End

7.5.2 Unplanned (Emergency) Powering Down

Step 1 Press the emergency stop button on the DC side.

> **DANGER**
>
> **Upon pressing the emergency stop button, only the AC circuit breaker and DC load switch will open. The internal auxiliary power supply and PCB board will still carry voltage. Do not touch them!**

Step 2 Turn the DC knob switch to the **"OFF"** position.

Step 3 Turn off the output switch of the upstream PV combiner box/trunk bus.

Step 4 Turn off the MV load switch.

Step 5 Check and ensure that the DC load switches QS1 of all the inverter units are turned off.

Step 6 Check and ensure that the maintenance switches QS2 of all the inverter units are turned off.

Step 7 Check and ensure that the AC circuit breakers QF1 of all the inverter units are open.

Step 8 Turn off the external power supply equipment switch (which is, the QS9 switch inside the power distribution cabinet).

For the position of the above switches, please see "3.3.2 Internal Structure of the Inverter Unit" and "3.3.4 Power Distribution Cabinet"。

⚠ WARNING

- **In case of an emergency, be sure to press the emergency stop button directly to make the equipment stop immediately.**
- **After the emergency stop button is pressed, the AC circuit breaker and the DC load switch will switch off. However, the internal auxiliary power supply and the PCB board will still carry voltage. Do not touch!**
- **The emergency stop button will be locked once it is pressed. It can be unlocked using the dedicated key.**

- - End

8 O&M on WEB

It is recommended to perform O&M on the WEB interface after the device is powered on.

8.1 Communications Diagram

The wiring between the internal devices of MV Grid-connected PV Inverter has been completed before delivery. Connect the Laptop with the switch (not included in the supply scope) inside the power distribution cabinet with the CAT-5e cable on site. After that, the WEB interface can be accessed on a Laptop.

— Power cable - - - Communication cable

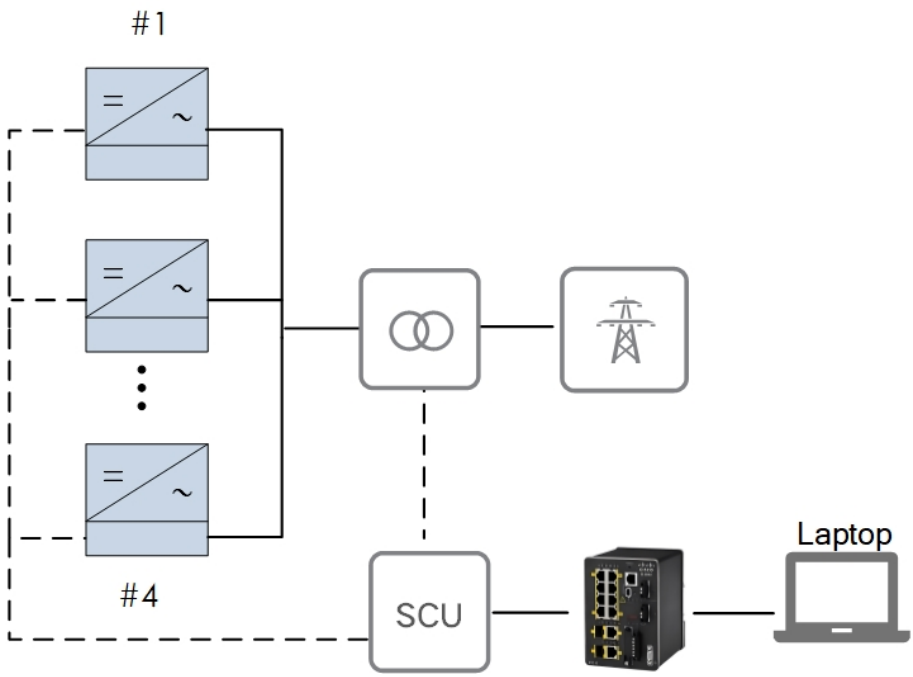


Figure 8-1 Wired Communication Diagram

To facilitate initial on-site commissioning, some previous product versions were temporarily equipped with a local Wi-Fi module. This module is disabled by default at the factory and is intended solely for initial on-site commissioning. After commissioning, this module can be removed or disabled as needed.

8.2 Login (Laptop)

Step 1 To connect the laptop to the product, connect the network cable to the network port of the power distribution cabinet switch.

Step 2 Configure the IP address of the laptop. Set the IP address of the laptop to the same network segment as the default IP address.

> Default IP address of the NET1 port: 12.12.12.12.
>
> Default IP address of the NET2 port: 14.14.14.14.

Step 3 Enter the server address to enter the homepage as a visitor by default.

Step 4 Click and select the desired language in the upper right corner of the interface.

Step 5 Click to enter the login interface.

Step 6 Enter the password and click **Login** to enter the interface as a general user.

> After the initial login, please change the password in a timely manner to avoid pop-up modify password prompts.

- - End

8.3 Interface Introduction

8.3.1 Homepage

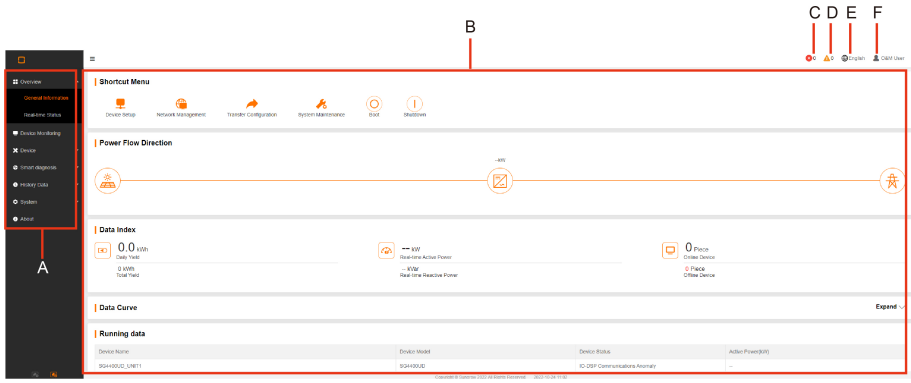


Figure 8-2 Web Interface

No.	Description
A	Navigation bar
B	Function display area
C	Fault number
D	Alarm number

No.	Description
E	Language switching options
F	User center

8.3.2 Viewing Fault Information

Step 1 Click **"Overview"** → **"General Information"** on the left navigation bar to enter the homepage.

Step 2 Click  in the upper-right corner of the interface to view information such as the name and time of the fault.

- - End

8.3.3 Viewing Alarm Information

Step 1 Click **"Overview"** → **"General Information"** on the left navigation bar to enter the homepage.

Step 2 Click  in the upper-right corner of the interface to view information such as the name and time of the alarm.

- - End

8.3.4 Boot/Shutdown

> **WARNING**
>
> **Do not restart the equipment through the WEB system if there is a Module fault. In such cases, perform an inspection after powering off the equipment, ensure there is nothing abnormal, and then power it on again. Otherwise, the equipment may be damaged.**

Step 1 Click **"Overview"** → **"General Information"** on the left navigation bar to enter the homepage.

Step 2 Click **Boot** or **Shutdown** in the **Shortcut Menu**,

- If one inverter unit needs to be started, e.g., Unit 1, check **SG4400UD_UNIT1** and click **Save** to turn on the unit. If the whole MV Grid-connected PV Inverter needs to be started, check MV Grid-connected PV Inverter model, e.g., **SG4400UD** and click **Save** to turn on MV Grid-connected PV Inverter.
- If one inverter unit needs to be shut down, e.g., Unit 1, check **SG4400UD_UNIT1** and click **Save** to shut down the unit. If the whole MV Grid-connected PV Inverter needs to be shut down, check MV Grid-connected PV Inverter model, e.g., **SG4400UD** and click **Save** to shut down MV Grid-connected PV Inverter.

- - End

8.3.5 Setting Initial Parameters

Step 1 Click **"Device Monitoring"** in the left navigation bar.

Step 2 Pull down **"Country /Region"** to set according to the product location, and pull down **"Machine Choose"** to set according to the actual product model. Click **"Settings"** to complete the initial parameter setting.

> The above parameters have been configured before the product leaves the factory.

- - End

8.3.6 Setting Operation Parameters

Step 1 Click **"Device Monitoring"** in the left navigation bar.

Step 2 Select a device in the left device list in the function display area. Click **"Operation Parameters"** on the right. enter a value in **"Current Value"**, and then click **"Settings"**

> Click **"Configure Synchronization"**to synchronize the settings to other devices of the same type.

- - End

8.3.7 Setting System Parameters

Step 1 Click **"Device Monitoring"** in the left navigation bar.

Step 2 Select a device in the left device list in the function display area. Click **"System Parameters"** on the right. enter a value in **"Current Value"**, and then click **"Settings"**

> Click **"Configure Synchronization"**to synchronize the settings to other devices of the same type.

- - End

8.3.8 Setting Protection Parameters

Step 1 Click **"Monitoring"** in the left navigation bar.

Step 2 Select a device in the left device list in the function display area. Click **"Protection Parameters"** on the right. enter a value in **"Current Value"**, and then click **"Settings"**

> Click **"Configure Synchronization"**to synchronize the settings to other devices of the same type

- - End

8.4 Modifying Password

Laptop

Click in the upper-right corner of the interface, select **Modify Password**, enter the original password and new password, and click **Save**.

- Please change the initial password upon first login.
- Passwords should be 12– 32 character long and contain at least uppercase letters, lowercase letters, and numbers. The new password cannot be the same as the old one.
- Please contact the Super Administrator if you forgot your password. Password cannot be changed with verification code.

8.5 User Management

The administrator can assign different accounts and permissions to different users, which thus boosts the system's security, improves operation efficiency for users, and lowers management costs.

Table 8-1 User type

User type	Permissions
Super Administrator	Add/delete a user, modify user information, empty users, login management, enable or disable R&D debugging, distribute certificates.
O&M user	Operations mentioned in this manual.
General user	Granted access to monitoring and general settings. For instance, **Overview**, **Device Monitoring**, and some of the **History Data**.
Developer Account	Authorized by the Super Administrator for complex troubleshooting.

Table 8-2 Default User Type

User type	Username	Password
Super Administrator	administrator	pw@111111
General user	user	pw8888

User type	Username	Password
O&M user	maintain	pw1111
Developer Account	develop	Obtain the SN through customer authorization and generate a dynamic password.

Please change the initial password upon first login. For specific operations, refer to"8.4 Modifying Password".

8.6 Logout

To protect the account security, it is recommended to log out in time after the operation is completed.

Exit Method

Click and select **Logout** in the upper right corner of any interface.

9 Main Function

9.1 Operation Mode

9.1.1 Mode Change

After being energized, MV Grid-connected PV Inverter switch among different modes as shown in the figure below.

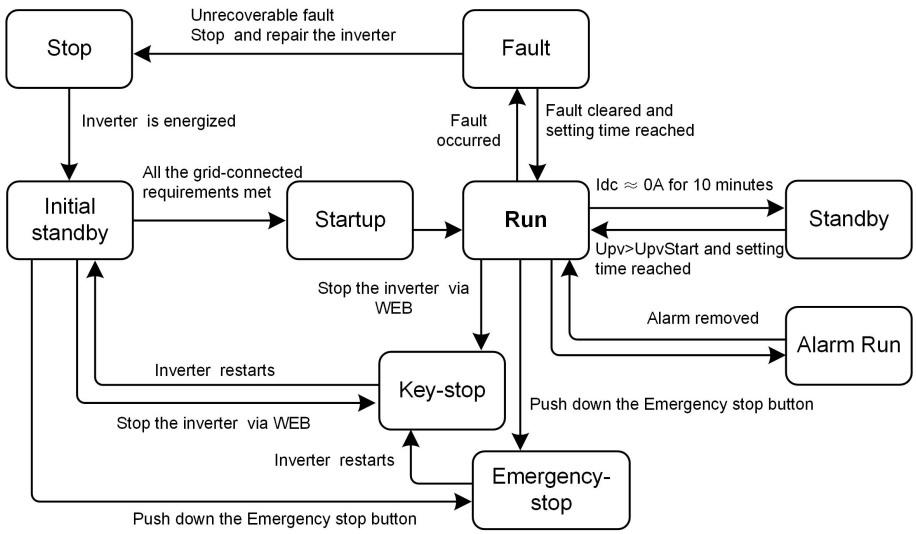


Figure 9-1 Operation modes change

U_{pv} is the DC input voltage of the PV array.

U_{pv} Start is MV Grid-connected PV Inverter DC side startup voltage.

9.1.2 Operation Mode Description

Stop

This is the initial state of the inverter unit. The inverter unit DC and AC switches are in the “OFF” position; the upstream and downstream connections are disconnected. The inverter unit is therefore electricity-free.

Initial Standby

When the inverter unit upstream and downstream connections are connected and the DC switches are in the “ON” position, the inverter unit turns to the **Initial Standby** mode.

Inverter unit will continuously check if the PV array and the grid meet the grid-connection requirements. If the inverter unit DC input voltage is higher than the inverter unit startup voltage and the startup time is reached, whilst the requirements of the grid side parameter are satisfied, inverter unit will turn from the **Initial Standby** mode into the **Startup** mode.

Startup

This is the transient process between the **Initial Standby** mode and the **Run** mode. Once the **Startup** mode is complete, inverter unit will start powering the grid.

Run

In this mode, inverter unit converts the DC energy into AC energy and feeds it to the grid by way of MPPT.

Inverter unit tracks the PV arrays' maximum power point (MPP) to maximum the output energy.

Standby

In **Run** mode, inverter unit will enter into the **Standby** mode if the DC side current is as low as OA for a while.

Inverter unit will continuously check if the PV array meets the grid-connection requirements. If the inverter unit DC startup voltage and the startup time are reached, inverter unit will turn into the **Run** mode.

Fault

If a fault occurs during operation, inverter unit will enter into the **Fault** mode. WEB will display the fault type with the "Fault" indicator on until the fault is removed. After the fault is removed, MV Grid-connected PV Inverter reverts to **Run** mode.

During this period, if you want to start the inverter unit manually, first confirm the stop clear protection program from the WEB and then start the inverter unit.

If the fault is unrecoverable, stop MV Grid-connected PV Inverter and perform maintenance work. Inverter unit will automatically check if the fault is recoverable.

⚠ WARNING

When a DSP fault or a inverter unit fault occurs, never restart MV Grid-connected PV Inverter through the WEB. Perform a power-off check before reenergizing MV Grid-connected PV Inverter.

Otherwise, the inverter unit may be damaged.

Emergency-stop

Stop the inverter unit by pressing the emergency stop button when a fault or emergency occurs.

If the inverter unit is stopped by the emergency stop button, the DC load break switches and the AC circuit breakers trip off immediately and the inverter units will disconnect from the grid. To restart the inverter units, release the emergency stop button, push the DC load break switches to the ON position, and then operate according to the normal start process.

Key-stop

When maintenance or service work is required, MV Grid-connected PV Inverter turns from the **Run** mode to the **Key-stop** mode after the user sends a stop instruction via the WEB.

Alarm Run

In **Alarm Run** mode, inverter unit can keep running but send alarm signal. User can check the latest history alarm information through “Function”->”History information”->”his alarm”. Inverter unit automatically turns to **Run** mode when the alarm is removed.

9.2 Emergency Stop Button Functions

The emergency stop button is located on the inverter unit.

In emergency situation, press down the emergency stop button to stop the inverter units inside the MV Grid-connected PV Inverter immediately.

9.3 IGBT Modules Over-temperature Protection

IGBT modules inside the inverter unit use thermal sensors with highprecision to monitor the real-time module temperature. Once the module temperature is detected to be high, the inverter unit will derate the output power or shut down.

9.4 Overtemperature Protection of Reactors

The MV Grid-connected PV Inverter use thermal sensors with high-precision to monitor the real-time reactor temperature. Once the reactor temperature exceeds the preset threshold, overtemperature protection will be triggered, and the MV Grid-connected PV Inverter will shut down.

9.5 Tripping Functions of DC Load Switches and MV Load Switch

There are two selections (Enable/Disable) for the parameter **“Release Enabling”** in the running parameter on the WEB. If the **“Enable”** options is chosen, all DC load switches of MV Grid-connected PV Inverter will trip immediately. If required, observed the following steps.

Step 1 Log in to the WEB interface.

Step 2 Click on **“Device Monitoring”** in the navigation bar to select the target inverter unit.

Step 3 Click **"Operation Parameters"** → **"Release Enabling"** to select **"Enable"**.

Before the MV Grid-connected PV Inverter is put into operation again, set the parameter **"Release Enabling"**as **"Disable"**first, then close all the DC load switches of the MV Grid-connected PV Inverter.

When the MV load switch is equipped with electric control (optional), the MV grid-connected PV inverter can be disconnected from the grid through the SCU, ensuring safer and easier maintenance.

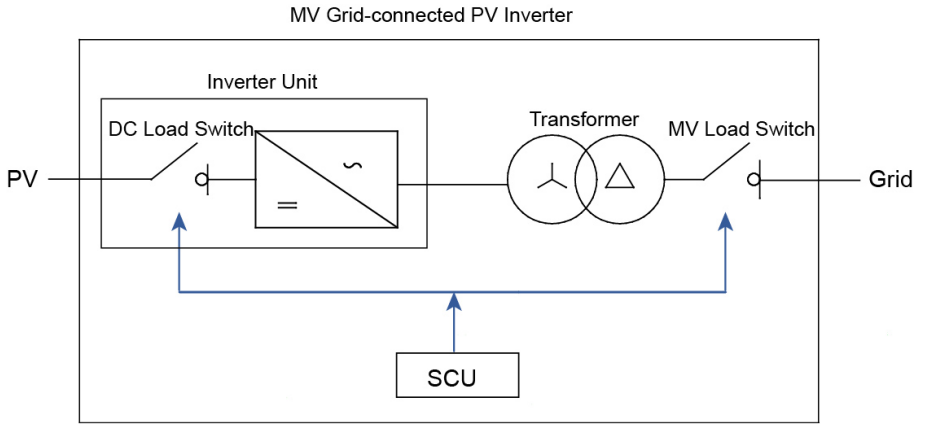


Figure 9-2 Principle of control

- - End

9.6 MV Metering Function

If the MV Grid-connected PV Inverter is not equipped with a potential transformer on the HV side, the SCU can collect and analyze real-time data to obtain information such as current, voltage, and power on the HV side. This real-time data will be displayed on the web interface and can be uploaded to the plant monitoring system.

If the MV Grid-connected PV Inverter is equipped with an EVT, HV side voltage can be measured directly. By detecting the MV side voltage signal, the control board assists in grid control for the MV Grid-Connected PV inverter, enabling more precise reactive power regulation during fault ride-through and facilitating faster grid recovery. The system also enables MV side over/under-voltage protection and voltage waveform recording for better fault diagnosis. SCU displays MV side voltage on the web interface and uploads the data to the plant monitoring system.

9.7 MV Protection and Coordinated Control

The transformer is equipped with protective devices such as a pressure relief valve and oil level gauge to monitor internal oil pressure and oil level in real time. These devices output status signals, which are collected by the SCU of the MV Grid-connected PV Inverter. When

any signal exceeds its threshold, the SCU triggers a protective shutdown of the MV Grid-Connected PV Inverter.

The SCU also continuously monitors oil temperature via the built-in oil thermostat. If the temperature exceeds 95°C but remains below the shutdown threshold, the SCU commands the MV Grid-Connected PV Inverter to operate at reduced power according to a predefined derating curve. Once the oil temperature returns to a normal range, the MV Grid-connected PV Inverter resumes normal operation. If the oil temperature exceeds the protection threshold, the SCU triggers an protective shutdown of the MV Grid-connected PV Inverter.

9.8 MVD630 Nighttime Disconnection Switchgear(Optional)

Collector lines of the PV power plant can be equipped with MVD630 nighttime disconnection switchgear (optional) to disconnect the MV Grid-connected PV Inverter from the grid at night, reducing nighttime no-load losses.

- Tripping:
  1 Upon receiving the standby signal from the last MV Grid-connected PV Inverter in the collector line.
  2 The control unit in the MVD630 nighttime disconnection switchgear trips circuit breaker QF1.
- Closing:
  1 When the first MV Grid-connected PV Inverter in the collector line meets its startup conditions, the control unit within the MVD630 nighttime disconnection switchgear will receive the grid connection request.
  2 Then the control unit in the MVD630 nighttime disconnection switchgear send the grid frequency and amplitude data collected by PT1 to the inverter, and After that, the inverter initiates a soft-start.
  3 Once the amplitude and phase values from PT1 and PT2 are consistent, the control unit closes the circuit breaker QF1, ensuring a smooth grid connection with no inrush currents.

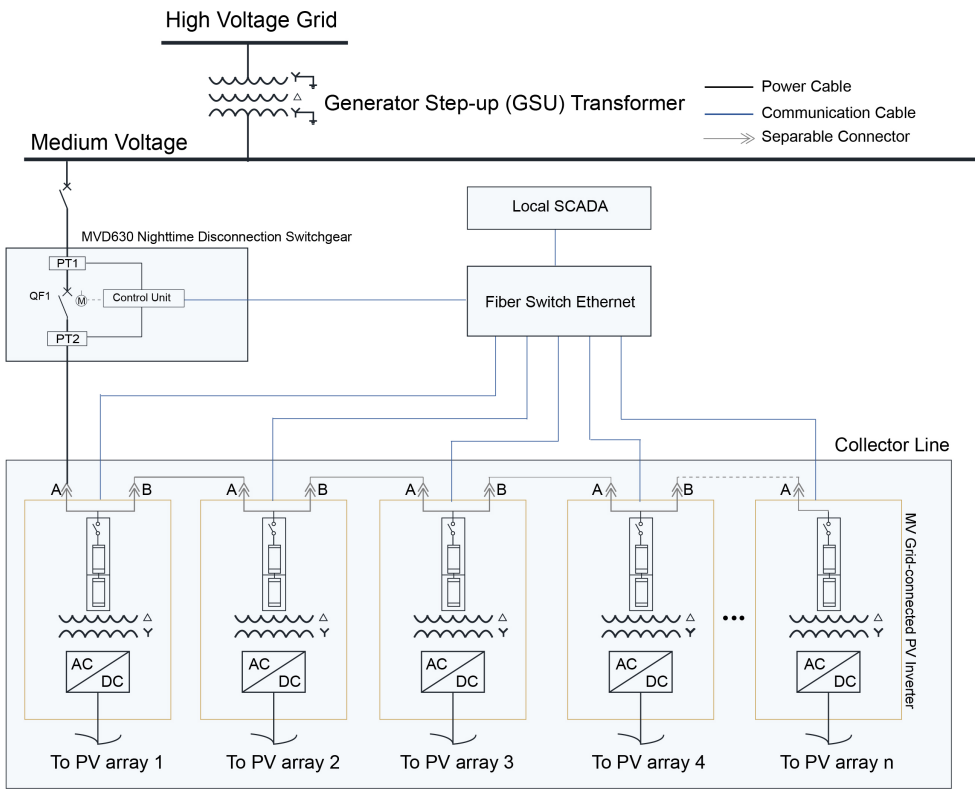


Figure 9-3 Principle of control

10 Troubleshooting

If MV Grid-connected PV Inverter fails to output as expected or the power yield changes abnormally, check the following items before consulting SUNGROW:

- The open-circuit voltage of PV arrays
- Whether the emergency stop button is pressed
- Whether MV Grid-connected PV Inverter limits the output of active power

If the problem still persists or there are any other questions, please contact SUNGROW. It would be helpful if the following information is provided during a call:

- Model and S/N of MV Grid-connected PV Inverter and internal equipment
- Manufacturer and model of the upstream PV combiner box and PV modules that connected to MV Grid-connected PV Inverter
- Communication and connection scheme of MV Grid-connected PV Inverter
- Fault information and a brief description of the fault
- Pictures of the fault occurrence site (if on-site conditions permit)

10.1 MV Grid-connected PV Inverter Troubleshooting

10.1.1 Viewing Fault/Alarm Information

View the fault and alarm information referring to "8.3.2 Viewing Fault Information" and "8.3.3 Viewing Alarm Information".

10.1.2 Check Method

There are three levels of anomalies:

- Important fault: MV Grid-connected PV Inverter fails, shuts down, and stops grid-connected power generation.
- Secondary fault: Some parts of MV Grid-connected PV Inverter fail, but MV Grid-connected PV Inverter can still generate power in a grid-connected state.
- Prompt for fault: MV Grid-connected PV Inverter works normally, but its output power decreases due to external factors.

Fault Name	Fault Cause	Fault Level	Corrective Method
Module fault	The drive board generates a fault signal or a hardware over-current occurs.	Important	1. Check whether a short circuit occurs on the AC or DC sides of MV Grid-connected PV Inverter. 2. Check the grid for any exceptions. 3. Check whether the appearance of the IGBT module is normal. **NOTICE** **MV Grid-connected PV Inverter has a protection logic that in case of failure of 5 attemps to perform self-tests, it enters in a non-selfrecovery state (it is recommended to wait for 15 minutes for this purpose; meanwhile the power is not cut off on control boards). In this case, do not attempt to power it off and try to restore MV Grid-connected PV Inverter, instead, contact SUNGROW personnel for the support.**
AC current imbalance fault	AC current is unbalanced.	Important	Check the grid for anomalies. Check if there is a phase loss.

Fault Name	Fault Cause	Fault Level	Corrective Method
Reactor over-temperature	The temperature of the reactor is excessively high.	Important	1. Use a thermometer to check whether the current ambient temperature is within the temperature range advertised by MV Grid-connected PV Inverter. 2. Check whether the air inlet of MV Grid-connected PV Inverter and inverter unit is normal. Make sure that the air inlet is not blocked, and replace the filter screen if necessary. 3. In the shutdown state, check whether the internal cooling fan of MV Grid-connected PV Inverter is stopped by foreign objects.
Control cabinet temperature fault	The temperature inside the control cabinet is excessively high	Important	1. Check whether the grid voltage is normal. 2. Check whether the control fan is normal. 3. Check the AC filter system. Check whether there are abnormalities on the surface of the AC filter capacitor, such as cracking. If necessary, check whether the three-phase current of the capacitor is balanced.
DC under-voltage	DC input voltage is excessively low.	Important	1. In the shutdown state, check whether the DC voltage displayed on MV Grid-connected PV Inverter is consistent with the measured value. 2. If not, check whether the DC side cables are shorted or wrongly connected.
DC (Bus) under-voltage	DC bus voltage is excessively low.	Important	Please refer to the troubleshooting method of “DC under-voltage”.

Fault Name	Fault Cause	Fault Level	Corrective Method
Neutral point shift	Voltage exists between the positive and negative poles of the DC side of MV Grid-connected PV Inverter and the neutral point potential.	Important	1. Check whether the DC side voltage of MV Grid-connected PV Inverter is short-circuited, whether the input voltage exceeds the allowable range, and whether the grid voltage is abnormal. 2. Check whether DC over-voltage, DC under-voltage, module fault, AC over-current, and other faults exist at the same time in the historical fault interface. If so, refer to the troubleshooting methods of related faults.
Abnormal temperature	If the temperature at MV Grid-connected PV Inverter inlet exceeds the protection threshold, this fault is triggered.	Important	1. Check whether the ambient temperature is normal; Use a thermometer to check whether the current ambient temperature is within the temperature range advertised by MV Grid-connected PV Inverter. 2. Check whether the air inlet of MV Grid-connected PV Inverter and inverter unit is normal; Make sure that the air inlet is not blocked, and replace the filter screen if necessary. 3. In the shutdown state, check whether the cooling fan inside MV Grid-connected PV Inverter/inverter unit is stopped by foreign objects.
DC cabinet over-temperature	The temperature inside the DC cabinet is excessively high	Important	Refer to the troubleshooting method of “Abnormal Temperature”.

Fault Name	Fault Cause	Fault Level	Corrective Method
Grid over-voltage	The grid voltage is higher than the set protection value.	Important	1 Check whether the protection parameters in **Parameter Settings** -> **Protection Parameters** meet the grid standards of the location where MV Grid-connected PV Inverter is installed. 2 Disconnect the AC circuit breaker and measure whether the low-voltage side of transformer is within the normal range. 3 In the shutdown state, check whether the low-voltage side of transformer is consistent with the measured value.
Grid under-voltage	The grid voltage is lower than the set protection value.	Important	Refer to the troubleshooting method of "Grid over-voltage”.
Frequency fault	The grid frequency is abnormal.	Important	1 Check whether the protection parameters on the interface meet the grid standards of the location where MV Grid-connected PV Inverter is installed. 2 In the shutdown state, check whether the grid frequency displayed on MV Grid-connected PV Inverter is consistent with the actual value.
Islanding protection	The grid fails or the AC instantaneous voltage exceeds the protection threshold.	Important	1. Check the grid for any exceptions. 2. Check whether a short circuit occurs on the AC side of MV Grid-connected PV Inverter. 3. Check whether the AC circuit breaker of MV Grid-connected PV Inverters is disconnected.

Fault Name	Fault Cause	Fault Level	Corrective Method
Control power exception	The control power is abnormal.	Important	1 Check whether the internal and external power supply control switches of MV Grid-connected PV Inverter are closed or disconnected at the same time. If they are closed at the same time, please disconnect one of the switches. If they are disconnected at the same time, please close one of the switches. 2 Check whether the internal and external power supply terminals are loose or poorly contacted. Tighten them if necessary.
DC voltage sampling fault	The DC voltage sampling is abnormal.	Important	In the shutdown state, check whether the DC voltage displayed on MV Grid-connected PV Inverter is consistent with the measured value.
Soft start fault	MV Grid-connected PV Inverter fails to start.	Important	Check whether the grid is abnormal, such as harmonics and voltage balance.
DC SPD fault	The DC side SPD of MV Grid-connected PV Inverter fails.	Important	Check the status indicator of the SPD. 1. If the indicator changes from green to red, the SPD is damaged. It may be caused by local thunderstorms. Measure the AC and DC voltage and current. If voltages between the positive and negative poles to the ground are normal, replace the SPD. 2. If the indicator is normal, the SPD may be in poor contact with its holder. Replug the SPD and tighten it.

Fault Name	Fault Cause	Fault Level	Corrective Method
AC SPD fault	The AC side SPD of MV Grid-connected PV Inverter fails.	Important	1. Refer to the troubleshooting method of "DC SPD fault" to conduct preliminary troubleshooting. 2. Check whether the micro circuit breaker is connected in series with the SPD trips. 3. If not, measure the AC and DC voltage and current. Ensure that there is no exception, and close the micro circuit breaker again.
DC overvoltage	The DC side voltage of MV Grid-connected PV Inverter exceeds the protection threshold.	Important	Disconnect the DC switch of MV Grid-connected PV Inverter and check whether the open-circuit voltage of the PV arrays is normal; If not, the PV array configuration may be faulty. 2. Check if the low-voltage side of the transformer is connected in a Y-shaped manner. If it is Y-shaped, ensure that the neutral point N cannot be grounded. 3. In the shutdown state, check whether the DC voltage displayed on MV Grid-connected PV Inverter is consistent with the measured value.
PV polarity reversal	The polarity of the positive and negative poles of the PV strings is reversed.	Important	Check whether the DC side cables of MV Grid-connected PV Inverter are connected reversely.
Hardware fault	MV Grid-connected PV Inverter internal hardware fault	Important	Measure the DC voltage of MV Grid-connected PV Inverter and check whether a short circuit occurs in MV Grid-connected PV Inverter.

Fault Name	Fault Cause	Fault Level	Corrective Method
AC over-current	AC side current of MV Grid-connected PV Inverter is excessively high.	Important	1. Check whether cables on the AC and DC sides of MV Grid-connected PV Inverter are loose. 2. Check whether the insulation layer of cables is damaged. 3. Check whether terminals are short-circuited and grounded.
Overload protection	The output of MV Grid-connected PV Inverter exceeds the load limit.	Important	Refer to the troubleshooting method of "AC over-current”.
AC leakage current protection	The leakage current sampling value on the AC side of MV Grid-connected PV Inverter exceeds the protection threshold.	Important	Check whether the AC cable is damaged.
Module over-temperature	The temperature of modules inside inverter unit is excessively high.	Important	1. Check the air inlet. 2. Check whether the air outlet of inverter unit is blocked. Replace the air filter screen if necessary. 3. Check whether the cooling fan is running during the operation of inverter unit.
Fan/ Fan 2 exception	Fan/fan 2 inside MV Grid-connected PV Inverter fails.	Important	1. Fan inspection 2. Check whether the grid voltage is normal. 3. Check whether the fan power supply is normal 4. Check the fan power supply channel.

Fault Name	Fault Cause	Fault Level	Corrective Method
Grounding fault	A grounding fault occurs.	Important	1 Check the DC cables. Check whether the positive grounding cable of each DC branch is damaged. Check whether the DC cable resistance to the ground is normal. 2 Check AC cables. Measure the three-phase voltage to ground and observe whether the voltage value is the same. Check inverter unit AC side SPD for damage.
AC switch fault	AC switch fails.	Important	1. Check whether the AC circuit breaker trips. 2. Check whether the appearance of the switch is normal. 3. Check whether the AC circuit breaker can be normally closed/disconnected. 4. Use a multimeter to measure whether the AC circuit breaker normally controls the on/off of the circuit.
Heat sink over-temperature	The temperature of the heat sink inside inverter unit is excessively high.	Important	Check whether the cooling fan is normal. If so, check the air duct for blockage.
GFDI-pro	The DC grounding protection fails.	Important	1. The negative terminal of MV Grid-connected PV Inverter is not reliably grounded. 2. Check whether the negative grounding fuse is blown.
AC fuse fault	The fuse on the AC side of MV Grid-connected PV Inverter fails.	Important	Check whether the AC fuse is normal.
Grid voltage imbalance	Grid voltage is unbalanced.	Important	Measure the grid voltage and check for any imbalance.

Fault Name	Fault Cause	Fault Level	Corrective Method
Current Imbalance 2/ Current Imbalance 3	The alternating current is unbalanced.	Important	Measure the grid voltage and check for phase loss.
AC cabinet overtemperature	The temperature of the AC cabinet exceeds the protection threshold.	Important	1. Check whether the fans inside the AC cabinet work normally. 2. Check whether the air inlet of the AC cabinet is blocked. 3. Check whether there is dust in the air inlet of the AC cabinet. Clean it if necessary.
DC fuse anomaly	The fuse on the DC side of MV Grid-connected PV Inverter fails.	Secondary	Check whether the DC fuse is blown. If so, please contact SUNGROW to replace the fuse.
Current Unbalance 3	The three-phase grid current is out of balance.	Secondary	Check whether the three-phase AC current is balanced on the interface.
DC fuse fault	The fuse on the DC side of inverter unit fails.	Secondary	Check whether the DC fuse is blown. If so, please contact SUNGROW to replace the fuse.
Branch fuse abnormal	The branch fuse of inverter unit is abnormal.	Secondary	Please refer to the troubleshooting method of “DC fuse fault”.
Low insulation resistance	The insulation resistance is low.	Secondary	Please refer to the troubleshooting method of “Insulation resistance”.
DC switch anomaly	The DC load switch of MV Grid-connected PV Inverter is abnormal.	Secondary	Check the DC switch auxiliary switch is functioning properly.
Frequency deviation active power regulation	The active power of MV Grid-connected PV Inverter is regulated according to the change of the grid frequency.	Prompt	Check whether the power reduction at over-frequency is enabled on the interface. If so, it indicates that over-frequency occurs during operation.

Fault Name	Fault Cause	Fault Level	Corrective Method
Voltage deviation reactive power regulation	The reactive power of MV Grid-connected PV Inverter is regulated according to the change of the grid voltage.	Prompt	Check whether the reactive power regulation is set to **QU Mode** on the interface.
GFRT operation	MV Grid-connected PV Inverter runs through high voltage and low voltage.	Prompt	Check whether the grid voltage exceeds the set threshold of HVRT or LVRT.

If the fault/alarm cannot be cleared following the above corrective methods and still persists, please contact SUNGROW directly.

Fault Name	Fault Cause	Fault Level	Corrective Method
AC switch off	The AC switch is disconnected.	Important	Please contact SUNGROW.
Carrier sync flt	The carrier signal transmission is abnormal.	Important	Please contact SUNGROW.
Drive board fault	The drive board inside MV Grid-connected PV Inverter fails.	Important	Please contact SUNGROW.
Parallel machine communication failure	The communication inside MV Grid-connected PV Inverter is abnormal.	Important	Please contact SUNGROW.
Machine code repetition fault	The addresses of inverter units inside MV Grid-connected PV Inverter are the same.	Important	Please contact SUNGROW.
Oil temperature alarm	The transformer oil temperature alarm.	Important	Please contact SUNGROW.
Oil temperature trip	The transformer oil temperature trip.	Important	Please contact SUNGROW.
Low oil level trip	The transformer low oil level trip.	Important	Please contact SUNGROW.
Low oil level alarm	The transformer low oil level alarm.	Important	Please contact SUNGROW.
Pressure relief trip	The transformer pressure relief trip.	Important	Please contact SUNGROW.

Fault Name	Fault Cause	Fault Level	Corrective Method
Temperature and humidity board communication abnormal	The communication of the temperature and humidity board is abnormal.	Secondary	Please contact SUNGROW.
Branch reverse over-current	The branch reverse current is excessively large.	Secondary	Please contact SUNGROW.
DSP communication exception	The communication between MV Grid-connected PV Inverter internal control board and smart unit board is abnormal.	Secondary	Please contact SUNGROW.

10.2 Other Faults

Fault Detail	Possible Cause	Corrective Method
MV Grid-connected PV Inverter shuts down shortly after startup	The DC input voltage is just enough to start MV Grid-connected PV Inverter. If MV Grid-connected PV Inverter is connected to loads, and the voltage cannot meet the requirements, causing MV Grid-connected PV Inverter to shut down.	Design and connect the pv module based on the recommended open-circuit voltage, increase the DC voltage input, and avoid applying the critical voltage value.
Upper computer communication failure	There are many possible reasons, please check one by one according to the description of "Corrective Method".	Check whether the local address, baud rate, and other parameters on the interface are consistent with those on the host computer. Check whether all wiring is good. If RS485 communication is adopted, check whether the A and B terminals are connected reversely. Replace the communication adapter and try again if the communication adapter does not match. If the fault is not caused by the foregoing reasons and still persists, please contact SUNGROW as soon as possible.

Fault Detail	Possible Cause	Corrective Method
Failed is displayed on the operation or protection parameter setting interfaces	There are many possible reasons, please check one by one according to the description of "Corrective Method".	1. Check whether an inverter unit cannot work normally. 2. Check whether inverter unit that works normally can normally accept instructions. 3. Please refer to the troubleshooting method of “DSP communication fault”. If the fault is not caused by the foregoing reasons and still persists, please contact SUNGROW as soon as possible.
Fail to export measuring point logs in batches	The amount of data exported at a single time is too large.	1. Export data in batches multiple times. 2. The time interval for exporting data shall not exceed 7 days.

11 Routine Maintenance

11.1 Safety Instructions

DANGER

Risk of MV Grid-connected PV Inverter damage or personal injury due to incorrect service!

- **Disconnect the switches between the product and all power supplies before maintenance.**
- **After MV Grid-connected PV Inverter is powered off for 5 minutes, measure the voltage and current with measuring equipment. Only when there is no voltage nor current can operators who wear protective equipment operate and maintain MV Grid-connected PV Inverter.**

DANGER

The devices inside MV Grid-connected PV Inverter carry high voltage. Touching these devices may lead to fatal electric shock.

Therefore,

- **Live line measurement can only be performed by professional personnel who know the MV Grid-connected PV Inverter well. Before measurement, be sure to take proper protection methods (e.g., wear insulating gloves, etc.).**
- **During live line measurement, the operator must be accompanied by others to ensure personal safety.**

DANGER

Electric shock or fire may occur due to device damage or system fault.

- **Visually inspect for device damages or other hazards before the operation**
- **Check whether other external devices or circuit connections are in a safe state.**
- **Make sure the device is in a safe state before operating.**

⚠ WARNING

If some devices need to be replaced during operation and maintenance, please contact SUNGROW.

Do not open the door to maintain the product on rainy, humid, or windy days. SUNGROW shall not be held liable for any damage caused by a violation of the notice.

For products with long downtime, a comprehensive and detailed inspection of the products must be carried out before powering up the product. First, the product and internal equipment as well as the film at the air inlet and outlet need to be checked for intactness. Then the product should be checked and tested by professionals before commissioning.

⚠ WARNING

Do not open the door to maintain the product on rainy, humid, or windy days. SUNGROW shall not be held liable for any damage caused by a violation of the notice.

⚠ WARNING

Wait for at least 5 minutes after shutdown and then open the cabinet door. Make sure that the inside of the product is completely uncharged before maintaining the product.

NOTICE

Do not leave screws, washers, or other metal parts in MV Grid-connected PV Inverter after the maintenance work. Otherwise, damage may be caused to the product!

NOTICE

To avoid the risk of electric shock, do not perform any other maintenance operations beyond those described in this manual. If necessary, contact SUNGROW for maintenance. Otherwise, the losses caused are not covered by the warranty.

⚠ CAUTION

To prevent misuse or accidents caused by unrelated personnel, post prominent warning signs or demarcate safety warning areas around the device to prevent accidents caused by misuse.

11.2 Inspection After Power Off

While the product is operating, do not turn off any AC- or DC-side switches directly. Otherwise, an electrical arc may occur, which may then damage the switch or even MV Grid-connected PV Inverter.

During the installation and operation of the product, ensure the positive or negative of the PV string is not short-circuited to ground. Otherwise, an AC or DC short-circuit may occur, hence damaging the product. The damage caused therefrom will not be covered by warranty.

Even after the product has stopped running, it may still be hot and cause burns. Wait for it to cool down, then, perform operations on it wearing safety gloves.

Some components of the product (mainly inverter units) may contain heat-generating parts that remain hot even after the components have stopped operating. Be sure to wear burn-proof gloves or other protective equipment when working on such parts.

- After the equipment is powered off, wait at least 5 minutes before opening its cabinet door.
- Put up highly visible warning signs near the switches that have been switched off, to prevent accidental switching-on.
- Check the insulation.
  1. Disconnect all external connections to MV Grid-connected PV Inverter and the connections to the internal power supplies.
  2. Make sure the points of disconnection will not be reconnected to power accidentally.
  3. Test using a multimeter and make sure the equipment is completely voltage-free inside.
  4. Make necessary grounding and short-circuiting connections.
  5. For the potentially live parts near the area where the operation is performed, cover them with insulated cloth for insulation shielding.
- Do not leave any screw, washer, or other metal part in MV Grid-connected PV Inverter during maintenance. Otherwise, MV Grid-connected PV Inverter may be damaged.
- In most cases, the protective covers inside the equipment need to be removed before the maintenance work. After completing the maintenance work, mount back all protective covers in their original positions, and make sure the screws are all tightened properly.

11.3 Maintenance Period

11.3.1 Maintenance (Every Three Years)

Item	Check method
Monitoring and protective equipment of the transformer	•Oil thermostat: Alarm temperature and tripping temperature. •Pressure relief valve contact check. •Oil level gauge: Oil level is filled to the normal level. •Vacuum pressure gauge: Pressure gauge are at the normal level.
Transformer oil leakage	Check these components for oil leakage: •De-energized tap-changer •Oil level gauge •Vacuum pressure gauge •Oil thermostat •Sleeve • Pressure relief valve and sample oil •Sealing part

11.3.2 Maintenance (Every Two Years)

Item	Check method
System status and cleaning	Check the following items, and correct immediately those failing to meet the relevant requirements: • Check whether there is any damage or deformation of the MV Grid-connected PV Inverter and internal equipment. • Check if there is abnormal noise during the operation of internal equipment. • Check whether the temperature inside the MV Grid-connected PV Inverter is excessively high. • Check whether the humidity and the amount of dust inside MV Grid-connected PV Inverter are within the normal range. Clean it if necessary. • Check whether the air inlet and outlet of MV Grid-connected PV Inverter are blocked.
Warning marks	Check whether the warning labels and marks are clearly visible and free of stains and damage. Replace them if necessary.

Item	Check method
Ground of the shielded layer of cables	Check whether the cable shielding layer is in good contact with the insulation sleeve and whether the copper bus bar is firmly fixed.
Wiring between the terminal box and switch *	Check whether the terminal box and the switch are connected correctly.
SPD and fuse	Check whether the SPD and fuse are properly fastened.
Corrosion	Check whether there is oxidation or rust inside MV Grid-connected PV Inverter.

Note: * means optional.

11.3.3 Maintenance (Every Year)

Item	Check method
Exterior of MV Grid-connected PV Inverter	Check the following items, and correct immediately those failing to meet relevant requirements: • Check whether there are flammable objects on the top of MV Grid-connected PV Inverter. • Check whether the welding points between MV Grid-connected PV Inverter and foundation steel plate are firm and if there is corrosion. • Check whether the enclosure of MV Grid-connected PV Inverter is damaged, painted, or oxidized. • Check whether the cabinet door can be opened flexibly. • Check whether the sealing strip is fixed properly.
Interior of MV Grid-connected PV Inverter	Check whether there are foreign objects, dust, dirt, and condensed water inside MV Grid-connected PV Inverter.

Item	Check method
Wiring and cable layout	Start to inspect after completely powering down the internal devices of MV Grid-connected PV Inverter. For any non-conformances found during the inspection, correct them immediately. • Check whether the cable layout is normal and whether there is a short circuit. For any non-conformances found during the inspection, correct them immediately. • Check whether all inlet and outlet holes of MV Grid-connected PV Inverter are well sealed. • Check whether water leaks into MV Grid-connected PV Inverter. • Check whether the power cables are loose, and fasten them again by the torque specified previously. • Check whether the power cables and control cables are damaged, especially the part in contact with the metal enclosure. • Check whether the insulation tapes on the power cable terminals fell off.
Ground connection and equipotential connection	• Check whether the ground connection is correct and the grounding resistance meet the requirements of local standards and regulations. • Check whether the internal equipotential connection is correct.
Fan	• Check the running status of fans. • Check whether the fan blade rotates smoothly. • Check whether there is abnormal noise during the operation of the fans.
Screw	Check whether internal screws fell off.

Item	Check method
Exterior of MV Grid-connected PV Inverter	Check the following items, and correct immediately those failing to meet relevant requirements: • Check whether there are flammable objects on the top of MV Grid-connected PV Inverter. • Check whether the welding points between MV Grid-connected PV Inverter and foundation steel plate are firm and if there is corrosion. • Check whether the enclosure of MV Grid-connected PV Inverter is damaged, painted, or oxidized. • Check whether the cabinet door can be opened flexibly. • Check whether the sealing strip is fixed properly.
Interior of the transformer	Sample the internal oil at the oil leakage port to analyze the operation status of the transformer.

11.3.4 Maintenance (Every Six Months to One Year)

Item	Check method
Safety function	• Check the e-stop button work normally. • Simulate shutdown. • Check the warning marks and other device marks, and replace them timely if they are fuzzy or damaged.
Internal components inspection	• Check whether all PCB boards and other components are clean. • Replace the air filter screen if necessary. Note! Be sure to check the ventilation of the air inlet. Otherwise, the fault may be caused due to overheating if the IGBT module cannot be cooled effectively.
Air inlet and outlet	Check whether the air inlet and outlet of the MV Grid-Connected PV Inverter are blocked, and monitor the temperature via the WEB interface. Note! Use a standard vacuum cleaner to clean the air inlet and outlet of the MV Grid-Connected PV Inverter. For internal circuit boards, use an anti-static vacuum cleaner.
Device maintenance	• Carry out regular inspection for corrosion of all metal components. • Check the operation parameters (especially voltage and insulation).

The recommended routine maintenance periods in the table are only for reference. The actual maintenance period shall be determined reasonably in consideration of the specific installation environment of the product.

PV power plant scale, location, site environment, and other factors also affect the maintenance period of the product. It is necessary to shorten the maintenance period and increase the maintenance frequency in the event of a heavy sandstorm or dust in the operating environment.

11.4 Common Maintenance Items

It is recommended to clean the MV Grid-connected PV Inverter every six months. If the MV Grid-connected PV Inverter works in harsh environments, such as desert areas, the maintenance cycle should be shortened.

DANGER

Maintenance work on any part of MV Grid-connected PV Inverter must only be performed when the whole system is voltage-free. Failure to do so may result in electrical shocks!

11.4.1 Cleaning Air Inlet of Inverter Unit

Overview

The following figure shows the heat dissipation mode of the inverter unit. The air inlet is located at the higher parts of the DC cabinet while the air outlet is located at the lower parts of the AC cabinet.

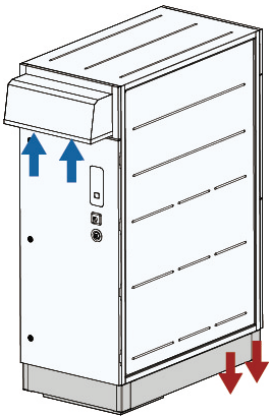


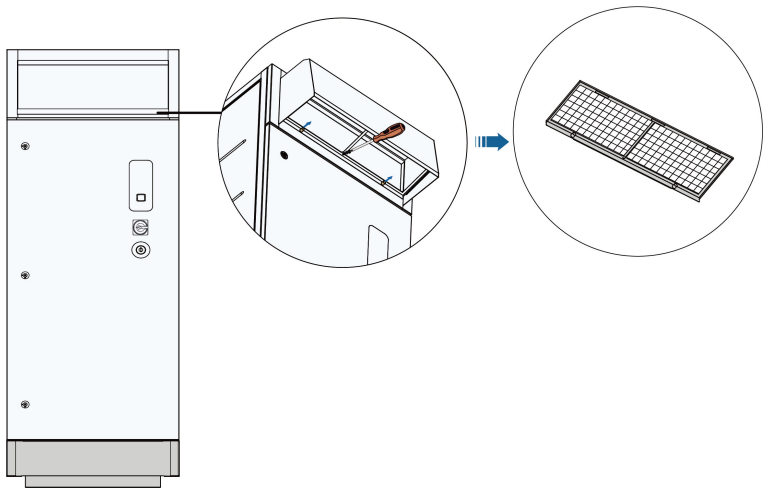
Figure 11-1 Air inlet and outlet locations

Procedure

Step 1 Use a screwdriver to remove the M5 fixing screws for the first maintenance.

Step 2 Pull the spring plunger at both ends of the filter at the air inlet outward and tilt the filter downward to remove it.

Step 3 Clean and install the filter.



The M5 fixing screw does not need to be reinstalled.

- - End

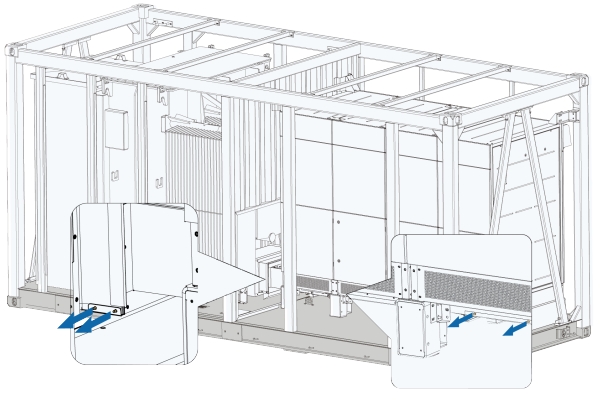
11.4.2 Cleaning Air Outlet of MV Grid-connected PV Inverter

There are multiple air outlets in this product, which are located between MV Grid-connected PV Inverter and the transformer and at the bottom of the AC side of each MV Grid-connected PV Inverter, as shown in the following figure. Take cleaning the air outlet between MV Grid-connected PV Inverter and transformer as an example.

Procedure

Step 1 Remove the M5 bolts on the sealing plate between MV Grid-connected PV Inverter and the transformer, and remove the sealing plate.

Step 2 Pull out the spring plunger on the filter at the air outlet, take out the air outlet filter, and clean it.



Step 3 After cleaning, install the filter in reverse steps.

- - End

11.4.3 Cleaning Air Inlet of Power Distribution Cabinet

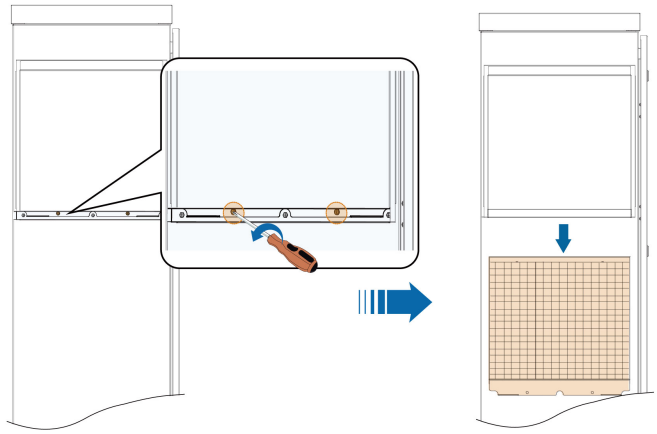
The cleaning methods for power distribution cabinets vary due to differences in their external versions. Choose an appropriate cleaning method based on the specific power distribution cabinet you have received.

Version 1

1 Remove the screws from the upper air inlet of the power distribution cabinet using a screwdriver.

2 Move the filter cotton at the air inlet downward, take out the filter cotton and clean it.

3 Reinstall the filter cotton in reverse steps.



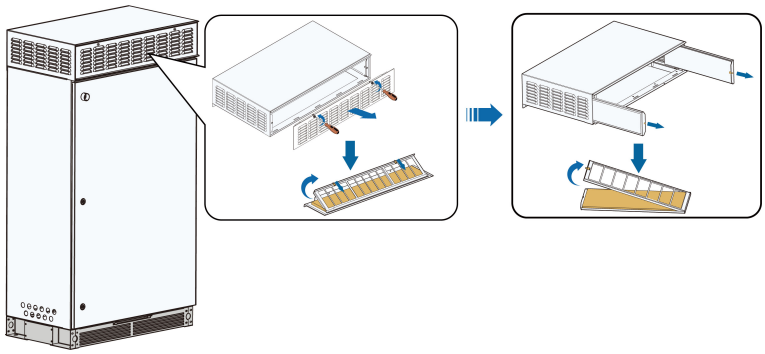
Version 2

1 Unscrew the two M5 bolts on the mesh cover for the front air inlet, then take the mesh cover down.

2 Pull outward the two spring plungers on the mesh cover for the front air inlet, and open the cotton filter press plate. Then, take out the cotton filter and clean it.

3 Pull out the mesh covers for the air inlets on the two sides. Then, pull outward the spring plungers on the mesh covers, and open the cotton filter press plates. Next, take out the cotton filters and clean them.

4 Put back the cotton filters and mount back the mesh covers following the above steps in reverse order.

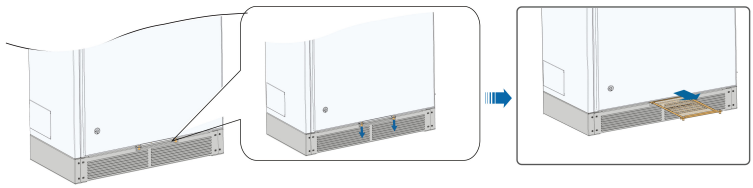


11.4.4 Cleaning Air Outlet of Power Distribution Cabinet

Step 1 Pull downward the spring plunger on the air outlet at the bottom of the power distribution cabinet.

Step 2 Pull out the filter at the air outlet and clean it.

Step 3 Reinstall the filter in reverse steps.



- - End

11.4.5 Cleaning the Floor Drain and Oil Drainage Hole

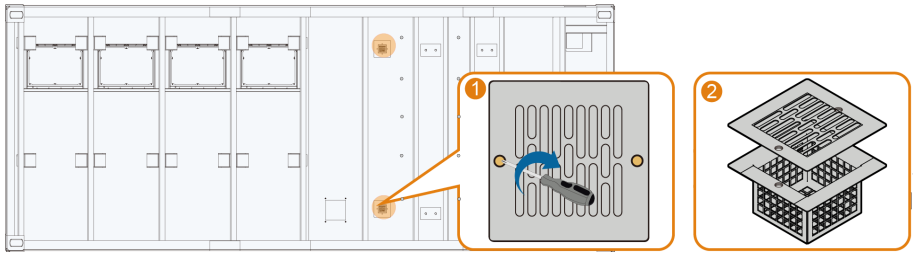
It is recommended to clean the floor drain and oil drainage holes every six months.

Clean the Floor Drains

Step 1 Remove the four fixing bolts on the floor drain.

Step 2 Take out the floor drain. Then, open its cover, and clean the dirt and debris inside.

Step 3 Close the cover, put the floor drain back, and tighten the fixing bolts.



- - End

NOTICE

- **Do not tap the floor drain with sharp heavy objects during cleaning, to prevent it from falling from a height.**
- **Protect the floor drain from collisions with the container or other objects during cleaning, as this may result in deformation or paint peeling off.**

Clean Oil Drainage Holes

Besides the floor drain, the equipment also has a oil drainage hole. To ensure proper equipment operation, regularly check the oil drainage hole for blockages. If any clogging is found, promptly clear and clean it.

Figure 11-2 Oil drainage hole location

11.4.6 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.

Table 11-1 Different repair solutions

Conditions	Solutions
Surface dirt that can be wiped off	"11.4.6.1 Detergent Cleaning"
Finish paint falls off, and the primer is intact	"11.4.6.2 Finish Paint Repair"
Primer is damaged, and the base material is exposed	"11.4.6.3 Double-Layer Paint Repair"

11.4.6.1 Detergent Cleaning

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

Prepared by Users

Table 11-2 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.)

- - End

11.4.6.2 Finish Paint Repair

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 11-3 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 polyur-ethane 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 11-4 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

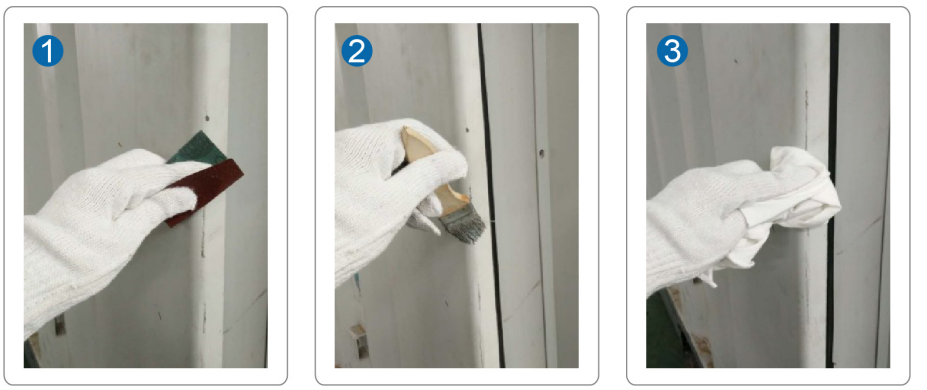
- Ambient temperature: 5℃–40℃
- Base material temperature: 5℃–60℃
- Relative humidity: 10%–85%RH

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.

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

Common finish paint colors

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

2 Mix the finish paint according to the paint model and the requirements of "Table 11-3 Finish paint selection and mixing".

3 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.

4 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

11.4.6.3 Double-Layer Paint Repair

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 11-5 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 11-6 Cleaning tools

No.	Item
1	400 mesh/600 mesh abrasive paper
2	Cleaning cloth
3	Alcohol

No.	Item
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

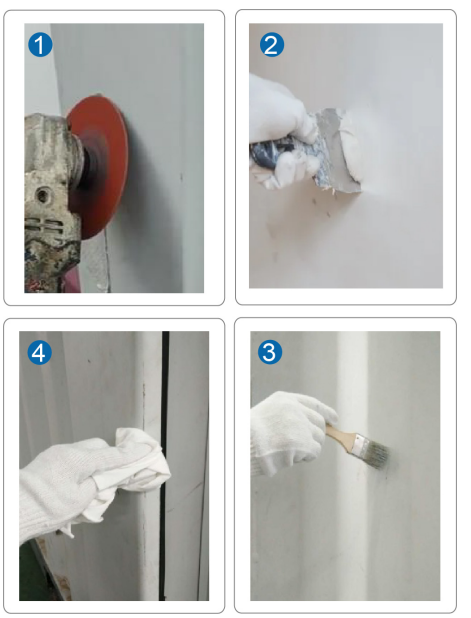
Step 1 Use a grinder or abrasive paper to smooth uneven areas on the surface, achieving a smooth finish with a metallic luster. Ensure a uniform transition from rusted areas to intact coating.

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.

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

Common finish paint colors

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

2 Mix the primer according to the paint model and the requirements of "Table 11-5 Primer and finish paint selection and mixing".

3 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.

4 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 "11.4.6.2 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.

11.4.7 Checking Door Locks and Hinges

Check if the door locks and hinges of the MV Grid-connected PV Inverter can be used normally after cleaning. Lubricate the door lock holes and hinges properly if necessary.

11.4.8 Checking Sealing Strips

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

11.5 Replacing Fuse

Before replacing the fuse, ensure that the product is de-energized.

11.5.1 Replacing DC Branch Fuse

Step 1 Power off the product according to the normal shutdown steps, refer to"7.5.1 Planned Powering Down".

DANGER

Make sure the PV combiner box is disconnected from the inverter unit.

Step 2 Wait for 5 minutes for the internal capacitors to be completely discharged.

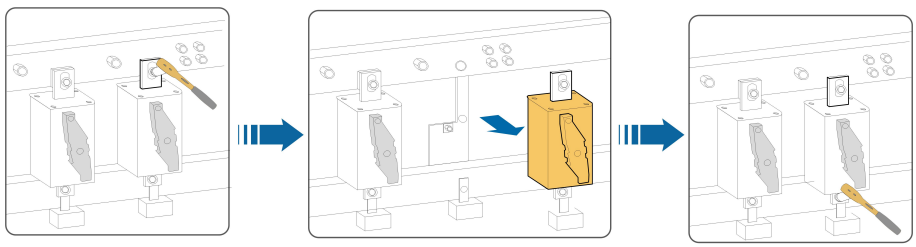
Step 3 Unlock the DC cabinet door and remove the protective cover on the DC fuse.

Step 4 Use a multimeter with a range of 1500 Vdc to measure the DC side voltage of MV Grid-connected PV Inverter. Check and ensure that the positive voltage, negative voltage, positive to ground voltage, and negative to ground voltage are all zero.

Step 5 Use a multimeter to measure each DC input voltage and ensure that the terminals are uncharged before performing the next operation.

Step 6 Identify the faulty fuse,use a socket wrench to unscrew the fastening bolt of the fuse to be replaced,and remove the faulty fuse.

Step 7 Secure the new fuse with M10×30 bolts with a tightening torque of 20N.m.

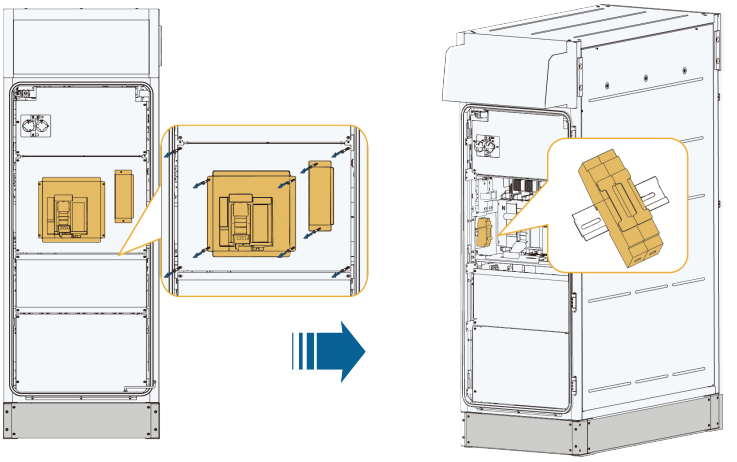


- - End

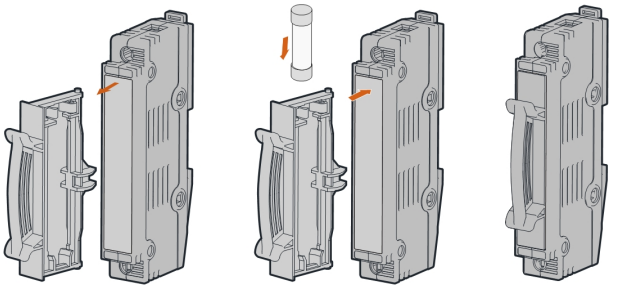
11.5.2 Replacing DC SPD Fuse

Step 1 Open the front door of the inverter unit. Remove the six M4 screws from the two Polycarbonate plates first, and then the four M5 screws from the sheet metal sealing plate. Take down the Polycarbonate plates and the sealing plate respectively.

Step 2 Locate the DC SPD fuse FU23 and FU24 at the lower left or upper right corner of the inverter unit's DC side. (see "3.3.2 Internal Structure of the Inverter Unit"for its location).



Step 3 Open the fuse holder. Remove the old fuse and install a new one. The specifications of the new fuse should be the same as those of the old fuse.



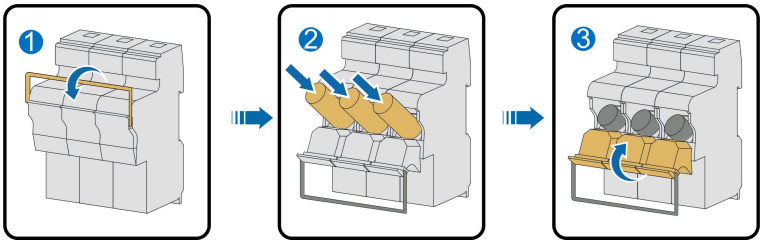
Step 4 Reinstall the cover of the fuse holder and the baffle.

- - End

11.5.3 Replacing Off-grid Commissioning Fuse

Step 1 Open the lower cabinet door at the rear of the inverter unit. Find and open the off-grid commissioning fuse block (see "3.3.2 Internal Structure of the Inverter Unit" for its location).

Step 2 Remove the old fuse and install a new one. The specifications of the new fuse should be the same as those of the old fuse.



Step 3 Close the fuse block.

- - End

11.5.4 Replacing AC SPD Fuse

The fuse is located at the bottom of MV Grid-connected PV Inverter that near the transformer, and the location is highlighted in the figure.

Preparation Work

1 Ensure that MV Grid-connected PV Inverter is in a shutdown state.

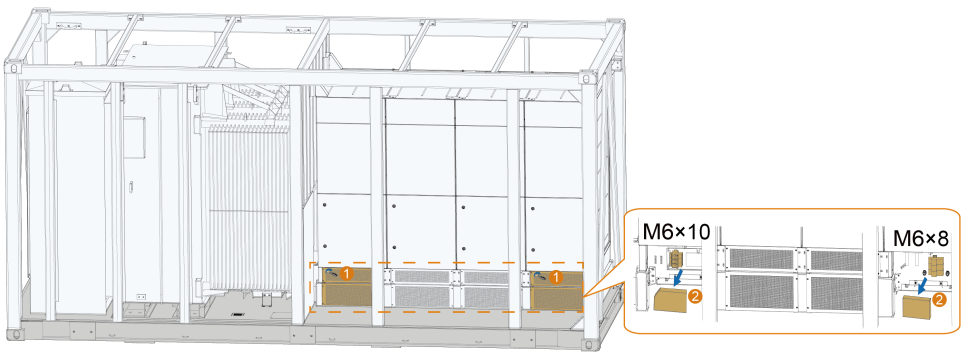
2 Disconnect the MV load switch of MV Grid-connected PV Inverter.

3 Set the 1000Vac multimeter to AC voltage mode and use it to check that the low-voltage AC voltage of transformer is 0.(The multimeter should be capable of measuring DC voltage up to 1500V and AC voltage up to 1000V.)

Procedure

Step 1 Remove the four M6 screws from the baffle of the air outlet on both sides of the bottom of MV Grid-connected PV Inverter near the transformer, and remove the baffle.

Step 2 Unscrew the 10 and 8 M6 screws on the left and right fuse holders, remove the fuse cover, remove the old fuse, and install the new fuse.(Please see "11.5.3 Replacing Off-grid Commissioning Fuse" for how to install fuses.)



Step 3 Reinstall the cover of the fuse holder and the baffle.

- - End

11.5.5 Replacing Fuse Inside Power Distribution Cabinet

The location of the fuses in the power distribution cabinet is highlighted in the following figure(marked as A,B in the figure below). Fuse quantity and placement may vary depending on the version. For details, refer to section "3.3.4 Power Distribution Cabinet". For fuse replacement instructions, see step 6 in section "11.5.4 Replacing AC SPD Fuse ".

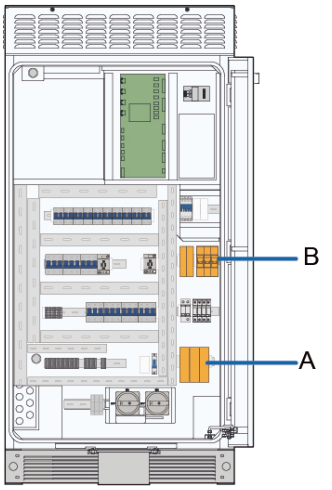


Figure 11-3 Internal fuse location

11.6 Replacing Fans

Overview

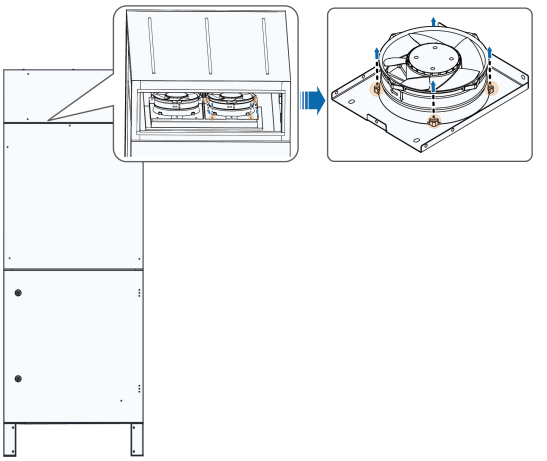
This section describes how to replace fans with an example of replacing the fan at the top right end of the AC side of inverter unit as an example.

Procedure

Step 1 Remove the bolts from the top door on the AC cabinet and open the cabinet door.

Step 2 Remove the M5 bolts between the fan fixing plate and the bottom platform and take down the fan.

Step 3 Remove the four M5 bolts connecting the fan and the fixing plate, and remove the fan.



Step 4 Install a new fan in reverse steps.

- - End

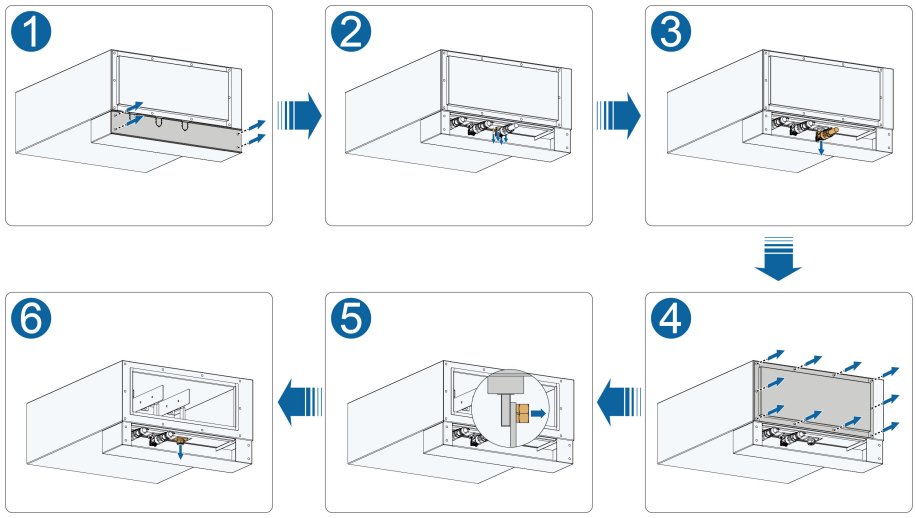
11.7 Replacing Aviation Connector (Optional)

If the aviation connector is damaged, replace it in time to ensure the product can operate properly.

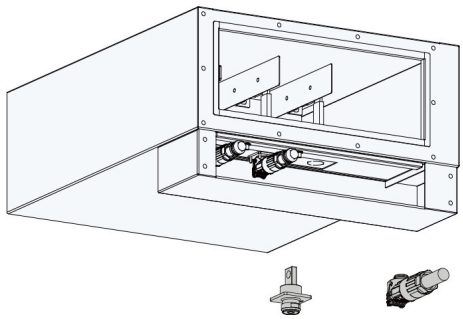
⚠ WARNING

After powering down the whole system, verify that there is no voltage within the whole system before proceeding.

Step 1 Remove the damaged aviation connector, by referring to the figure below (This section provides instructions for replacing one connector. These instructions also apply to aviation connectors in other positions).



After disassembly, it is shown in the following figure.



Step 2 Install the new connector, by completing the above steps in the reverse order.

- - End

12 Cyber Security Protocol

12.1 Password Change Requirements

⚠ WARNING

After initial login, change the HMI password (pw8888) to a site-unique password with 6 to 32 uppercase letters, lowercase letters, numbers and special characters.

⚠ WARNING

If you forget the password or you want to restore factory settings, contact SUNGROW.

12.2 Port Protection and Isolation

⚠ WARNING

Ensure that MV Grid-connected PV Inverters are installed such that the network zone has ingress protection and minimized port exposure. The network should have an independent subnet that is physically isolated.

⚠ WARNING

Ensure that network security protections are in place to ensure physical isolation of the Firewall and Ports.

⚠ WARNING

If a DNS service is used, ensure that MV Grid-connected PV Inverter has access to this site-specific DNS server. Change the DEFAULT DNS server to local DNS service provider.

12.3 Network Cables and Tamper Evident Seals Inspection

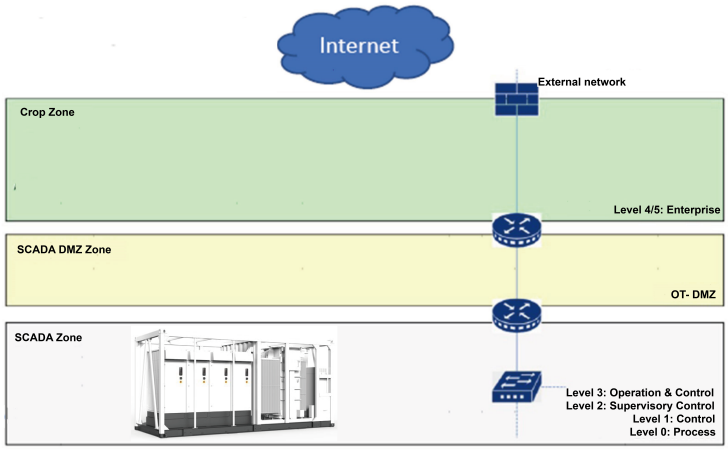
⚠ WARNING

When tamper evident seals are broken, ensure that these are removed and replaced.

⚠ WARNING

Ensure that all RS-485 data cables are inspected periodically for damage, wear and tear.

13 Cybersecurity Best Practice



NOTICE

It's important to locate MV Grid-connected PV Inverter in a secure network zone (e. g., SCADA network or PCN), that is blocked from direct communication with the Internet and/or Corporate IT networks by network security devices (e.g., firewalls). This network isolation concept is a best practice recommendation based on the Purdue Reference Model (PRM), an industry leading Industrial Control System (ICS) cybersecurity model adopted by standards and frameworks such as the ISA 62443, NIST, Cybersecurity Framework, and NERC CIP.

NOTICE

For more information, please reference "Secure Network and Firewall Deployment Recommendations for SCADA Systems" by the Cybersecurity and Infrastructure Security Agency (CISA) https://www.cisa.gov/resources-tools/resources/ics-recommended-practices . cisa.gov/ics/Abstract-Firewall-Deployment-ICS-Networks-RP

14 Appendix

14.1 Technical Parameters

Model	SG3150UD-MV-US	SG4400UD-MV-US
Input (DC)		
Max. PV input voltage	1500 V	
Min. PV input voltage / Start-up input voltage	875 V / 915 V	915 V / 955 V
Available DC fuse sizes	250 A - 630 A	
MPP voltage range	875 – 1500 V	915 – 1500 V
Full power MPP voltage range @ 40 ℃ 1)	875 – 1300 V	915–1337 V
No. of independent MPP inputs	3	4
No. of DC inputs	21 inputs negative grounding (optional: 18 inputs floating)	28 inputs negative grounding (optional: 24 inputs floating)
Max. PV input current	3 × 1226 A	4 × 1226 A
Max. DC short-circuit current	3 × 3528 A	4 × 3528 A
PV array configuration	Negative grounding or floating	
Output (AC)		
AC output power	3150 kVA @ 40 ℃(104 ℉)	4400 kVA @ 40 ℃ (104 ℉) (Optional: 4400 kVA @ 45 ℃(113 ℉))
Max. AC output current 2)	151A	73A
Nominal grid frequency / Grid frequency range	60 Hz / 57 Hz – 63 Hz	
THD	< 3 % (at nominal power)	
Power factor at nominal power / Ajustable power factor	> 0.99 / 0.8 leading - 0.8 lagging	
Nominal AC voltage	12 kV– 35 kV 3)	34.5 kV
Efficiency		
Max. inverter unit efficiency	98.9 %	
CEC inverter unit efficiency	98.5 %	
Max. efficiency (including transformer)	98.2 %	

Model	SG3150UD-MV-US	SG4400UD-MV-US
CEC efficiency (including transformer)	97.5 %	
Protection		
DC protection	DC load switch + fuse	
AC protection	MV Load switch + fuse	
Surge protection	DC Type II / AC Type II	
Grid monitoring / Ground fault monitoring	Yes / Yes	
Insulation monitoring	Yes	
Overheat protection	Yes	
General Data		
Dimensions (W×H×D)	6058 × 2896 × 2438 mm 238.5" × 114.0" × 96.0"	
Weight	≤ 31967 lbs	≤ 36376 lbs
Transformer Vector	Dy1 (Optional: Dy11, Yny0, YNd1)	
Degree of protection	NEMA 4X(Electronic enclosure) / NEMA 3R(Others)	
Auxiliary power supply	5 kVA, 120 Vac; Optional: 35 KVA 480 Vac + 5 KVA 120 Vac	
Operating ambient temperature range [4)]	-35 ℃ - 60 ℃ / optional: -40 ℃ - 60 ℃ -31 ℉ - 140 ℉/ optional: -40 ℉ - 140 ℉	-35 ℃ - 60 ℃ / optional: -40 ℃ - 60 ℃ -31 ℉ - 140 ℉ / optional: -40 ℉ - 140 ℉
Allowable relative humidity range	0% - 100 %	
Cooling method	Forced air cooling + KNAN (Optional: ONAN)	
Max. operating altitude	1000 m (Standard) / > 1000 m (Customized) (3280.8 ft (Standard) / > 3280.8 ft (Customized))	
Display	LED Indicators , Ethernet + WebHMI	
Night reactive power function	Yes	
DC-coupled storage interface	Optional	
Charging power from the grid	Optional	
Communication	Standard: RS485, Ethernet	
Compliance	UL1741, UL62109-1,CSA C22.2 No.107.1-16, IEEE1547-2018, IEEE1547.1-2020, UL1741 SA/SB, California Rule21, HECO SRD V2.0, NEC 2023,PRC-024	

1) Full power MPP range is temperature dependent, check the characteristic curve of the inverter for more information.

2) Calculated based on the minimum nominal AC voltage.

3) For detailed AC voltage ratings, refer to the product configuration table provided by SUNGROW.

4) The ambient temperature is determined as the average temperature obtained f rom at least four evenly distributed temperature monitoring points located at a distance of 1 meter from the equipment, at a height halfway up the machine. The temperature sensors must be shielded f rom airflow, thermal radiation, and rapid temperature fluctuations to prevent display inaccuracies.

14.2 Tightening Torques

Tighten the cable with proper torque shown below to prevent the poor contact, high contact resistance, or fire caused by the looseness of cable lugs:

Screw	Torque(N·m)	Torque(lbf.inch)
M3	0.7~1	6.195~8.85
M4	1.8~2.4	15.93~21.24
M5	4~4.8	35.4~42.48
M6	7~8	61.95~70.8
M8	18~23	159.3~203.55
M10	34~40	300.9~354
M12	60~70	531~619.5
M16	119~140	1053.15~1239

Secure the cable in proper place to reduce pressure of cable lug.

It is recommended to avoid using the impact driver when tightening and loosening bolts as this may cause damage to the bolt threads.

"Tightening Torques" provides general reference values only. For specific torque requirements, please follow the operation procedures described in the manual.

14.3 Quality Assurance

When product faults occur during the warranty period, 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.

Product data such as product dimensions are subject to change without prior notice. The latest documentation from SUNGROW should take precedence in case of any deviation.

14.4 Contact Information

In case of questions about this product, please contact us. We need the following information to provide you the best assistance:

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

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

SUNGROW

Sungrow Power Supply Co., Ltd.

www.sungrowpower.com

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