SUNGROW
Clean power for all

User Manual

MV Grid-connected PV Inverter

SG3000HV-MV-30/SG3125HV-MV-30/SG3400HV-MV-30

SG3000_3125_3400HV-MV-30-UEN-Ver27-202510

Contents

1 About This Manual

1.1 Validity

This manual is intended for the following product

- SG3000HV-MV-30
- SG3125HV-MV-30
- SG3400HV-MV-30

Hereinafter it will be referred to as " MV Grid-connected PV Inverter"" unless otherwise specified.
MV is short for “Medium Voltage”.
PV is short for “Photovoltaic”.

1.2 Content

This manual contains the following information:

Content	Description
Safety instruction	Safety instructions concerning the installation, operation, maintenance and troubleshooting of the MV Grid-connected PV Inverter.
Product Description	The appearance and internal components of the MV Grid-connected PV Inverter.
Delivery	Delivery and inspection after receiving the MV Grid-connected PV Inverter.
Installation	Mechanical transport, installation, and electrical connection of the MV Grid-connected PV Inverter.
Commissioning	Safety notices and commissioning process when the MV Grid-connected PV Inverteris powered on for the first time.
Start/Stop	Steps to start and stop the MV Grid-connected PV Inverter internal devices during normal maintenance or troubleshooting.
Operation of LCD Display	Function and use of the MV Grid-connected PV Inverter HMI.
Functions	Descriptions of the MV Grid-connected PV Inverter main functions.
Troubleshooting	Simple troubleshooting of the MV Grid-connected PV Inverter.
Daily operation	Instructions and guide of the daily operation of the MV Grid-connected PV Inverter.

1.3 Target Group

This manual is for technical personnel who are responsible for the transport, installation and other operations of the MV Grid-connected PV Inverter. Only qualified personnel can perform the installation, maintenance and troubleshooting of the MV Gridconnected PV Inverter. Unauthorized persons should not perform any operation on the MV Grid-connected PV Inverter and should be away from the MV Grid-connected PV Inverter to avoid potential hazards. Qualified personnel are:

- Equipped with certain electrical, electrical wiring and mechanical knowledge and familiar with electrical and mechanical principle diagram.
- Familiar with the construction and working principle of the PV grid-connected power generation system.
- Familiar with the construction and working principle of the MV Grid-connected PV Inverter upstream and downstream equipment.
- Trained specifically for electrical device installation and commissioning.
- Equipped with the ability to cope with the dangerous and emergency situations during installation and commissioning.
- Familiar with the country/regional standards and specifications.
- Familiar with this manual.

1.4 Symbols Explanation

This manual contains important safety and operational instructions that must be accurately understood and respected during the installation and maintenance of the equipment.
To ensure the optimum use of this manual, note the following explanations of the symbols used.

⚠ DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTICE
NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.

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

The symbols below may be found on the electrical parts of the MV Grid-connected PV Inverter. Make sure to read the following symbols and fully understand them before installing the equipment.

Symbol	Explanation
	Lethal voltage inside! Do not touch!
	Hot surface! Do not touch the hot surface of the device.
	After the inverter is disconnected, you need to wait 20 minutes before touching the internal conductive devices.
	Protective earth(ground). Earthing(grounding) securely to ensure personal safety.
	When working on the device, wear hearing protection.

1.5 How to Use this Manual

Read this manual and other related documents before transporting and installing the inverter. Documents must be stored at hand and available at all times.

The contents of the manual will be periodically updated or revised due to the product development. It is probably that there are changes of manual in the subsequent module edition.

2 Safety Instructions

2.1 Intended Usage

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 largescale PV power plants, and can ensure long-term, reliable, and safe feed-in operation.

⚠ WARNING

Installation of the MV Grid-connected PV Inverter not in compliance with the description in this manual or installation or modification of the device without authorization from SUNGROW may lead to personal injuries or device damages and may void pertinent warranty claims from SUNGROW.

2.2 Important Safety Instructions

Read the safety instructions carefully before installing the MV Grid-connected PV Inverter. Refer to corresponding manuals for the safety instructions on the internal devices.

2.2.1 General Safety Rules

⚠ DANGER

Touching of the terminals or contactors connected to the grid may lead to electric shock hazards!

- **Do not touch the terminals or conductors connected to the grid.**
- **Respect all safety instructions on the grid connection.**

⚠ DANGER

Lethal voltages are present inside the device!

- **Pay attention and follow the warning signs on the device.**
- **Respect all safety instructions in this manual and other pertinent documents.**

DANGER

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

- **Visual inspect for device damages or other hazards**
- **Check if the external devices and circuit connections are safe.**
- **Only operate the device when it is safe to do so.**

WARNING

All installations and operations on the Station must be in full accordance to the national and local regulations and standards.

2.2.2 Manual Storage

Product manuals are indispensable part of the product. Very important information about the transport, installation, maintenance and troubleshooting of the MV Grid-connected PV Inverteris included in this manual. All the descriptions in this manual, especially those safety-related items, must be complied with. Read all the instructions thoroughly prior to any operation work on the MV Gridconnected PV Inverter.

- Transport, install, maintain and service the MV Grid-connected PV Inverterby strictly following the descriptions in this manual. Device damage, personal injury, or property loss may be caused if otherwise
- This manual and relevant documents should be available for relevant persons at all times.

2.2.3 PV Arrays Hazards

DANGER

DC high voltage! Electric shock hazards!

When exposed to sunlight, PV array will produce voltage, which is very high in large-scale power stations.

Death from burning and electric shock due to touching the PV array

During installation, maintenance and troubleshooting of the device, ensure:

- MV Grid-connected PV Inverter is disconnected from the PV array.
- Necessary warning signs are in place to prevent accidental reconnection.Necessary warning signs are in place to prevent accidental reconnection.

2.2.4 Ground Fault Protection

DANGER

If a ground fault occurs in the MV Grid-connected PV Inverter, some parts that are supposedly voltage-free may carry lethal voltage. Accidental touch may cause serious damage. Make sure there is no system ground fault before operation and take proper protection measures.

2.2.5 Live Line Measurement

DANGER

High voltages are present inside the device. Death resulting from burning and electric shock upon touching the live components of the MV Gridconnected PV Inverter. During live line measurement,

- **Wear proper PPE, for example, safety gloves, and protective suits with an arc rating that meets product requirements.**
- **Accompany by other persons.**

2.2.6 Measuring Instrument

Instrument for measurement of the electrical parameters should meet the requirements listed below:

WARNING

- **Instrument for measurement of the electrical parameters should be high quality instrument with sufficient measuring range.**
- **Make sure the connection and use of the instrument are correct to avoid arc and other dangerous situations.**
- **Wear proper PPE if live line measurement is required, for example, safety gloves, and protective suits with an arc rating that meets the product requirements.**

2.2.7 Volt-free Operations

Perform operations on the MV Grid-connected PV Inverter only when all devices inside the MV Grid-connected PV Inverter, esp. the MV Grid-connected PV Inverter is completely voltage free.

- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid accidental contact.
- Ensure sufficient escape room.

- Wait at least 20 minutes to have the capacitors discharge completely before performing operations on internal components.

2.2.8 Danger from Electric Arc

DANGER

To avoid personal injury or device damage, perform operations on the Station as described in this manual. Incorrect operations may cause electric arcs or even fires, explosion, and other dangers. SUNGROW shall not be held liable for such damage due to violations of warning labels or description in this manual.

The following improper operations may result in the electric arc, fire, explosion, or other dangers. Once the faults occur, only qualified personnel can perform related operations for improper operation may worsen the situation.

- Plug/Unplug live HV fuse on the MV Grid-connected PV Inverter DC side
- Touch possibly live cable end on which insulation processing is not performed
- Touch copper bars, terminals, or other internal components that may carry voltage
- The power cable is not securely connected
- Spare parts, such as screws, are left inside the power module
- Improper operations performed by untrained or unqualified personnel

Evaluate in advance whether the electric arc is likely to occur in the operation area before performing operations on the device. If there is the risk, it is required that:

- The operator must have received related safety training
- When working in areas with electric shock hazards, wear protective suits with an arc rating that meets the product requirements.
- Wear protective equipment that meets the requirement before performing operations in the area

Electric Arc Risk on the MV Side

⚠ WARNING

- **Electric arcs can be caused by fault in the switchgear during operation. This electric arc may cause personal injury**
- **If arc faults occur in the switchgear, the (SF6) gas evacuates under the compartment of the switchgear.**
- **Only perform operation on the switchgear when it is voltage-free.**
- **Keep a safe distance from the switchgear when performing switching operations on the switchgear.**
- **Wear proper PPE with an arc rating that meets the product requirements.**
- **Ensure the escape route inside the switchgear room is freely accessible at all times without any blocks or obstructions. Remove the blocks or obstructions if necessary.**

2.2.9 ESD Protection

⚠ CAUTION

Devices may be damaged irreversibly by electrostatic discharge (ESD).

- **Avoid unnecessary touching of the PCB.**
- **Observe all the ESD-related safety instructions. Wear proper PPE with an arc rating that meets the product requirements, such as wrist strap.**

2.2.10 LCD Parameter Setting

Some settable parameters on the LCD are closely related to the operations of the MV Gridconnected PV Inverter and internal devices. Therefore these parameters can only be set after reliable evaluation of the system.

⚠ WARNING

- **Improper parameter setting may affect the functionality of the device.**
- **Only qualified personnel can set the parameters.**

2.2.11 Sand and Moisture Protection

Do not open the Station door in sand storm, thunderstorm, strong wind or hail days or when the ambient humidity is above 95%.

2.2.12 Symbols on the Device Body

Symbols on the devices body contain important information on the safe operation of the Station and its internal devices. Do not tear or damage them!

NOTICE

Do not damage or tear the symbols.

- **All symbols on the device body must be clearly visible.**
- **Replace the symbols once any damaged or unclearness is detected.**

2.2.13 Safety Warning Signs

During transport, installation, maintenance and troubleshooting of the Station, keep non-related persons away.

- Post warning signs near the Station upstream and downstream switches to prevent accidental connection.
- Place necessary warning signs or barriers near the on-site operation areas.

2.2.14 Daily Operation and Maintenance

Make sure the MV Gridconnected PV Inverter doors are closed and locked during daily operation to prevent internal devices from damages by rain or rodents.
Routine check and maintain the MV Gridconnected PV Inverter and internal devices to ensure long and reliable operation of the MV Gridconnected PV Inverter.

⚠ WARNING

During live line operation, take proper insulation protection measures and wear proper PPE with an arc rating that meets the product requirements. At least two persons are required until the operation is completed.
Proper field rescue facilities are required since most PV stations are installed in places far away from the urban areas.

NOTICE

The pressure relief valve of the transformer must be open before the running of switchgear.

Take the followings into consideration during daily operation and maintenance:

- The nameplate is pasted on the MV Gridconnected PV Inverter body. It contains very important parameter information about the devices. Protect the nameplate during all operations.
- Heating components may exist inside the MV Gridconnected PV Inverter. When the device stops, the heating components may still be hot. Wear proper glove when working on them.

- Wear proper PPE with an arc rating that meets the product requirements if necessary, for example, protective suits, goggles, safety gloves, safety shoes. Use all necessary auxiliary measures to ensure personnel and equipment safety.
- Necessary auxiliary measures are recommended to ensure personal and device safety.

2.2.15 Disposal of Waste

When the MV Grid-connected PV Inverter or internal devices is end of life, it cannot be disposed of together with household wastes. Some components inside can be recycling and some components can cause environment pollution.
Contact the local authorized collection point.

2.2.16 Manual Description

For user's convenience, there are a large number of pictures in this manual. These pictures are indicative only. For details about the device, refer to the actual product you receive.

Keep this manual at a convenience place near the device for future reference during installation, operation, maintenance and troubleshooting of the device.

All the descriptions in this manual are based on the standard MV Gridconnected PV Inverter, and the actual product you receive may differ. If necessary, specify your requirements when placing the order.

This manual may not cover all possible situations. Should a specific problem occur that is not explained in this manual, contact SUNGROW.

3 Product Description

3.1 Brief Introduction

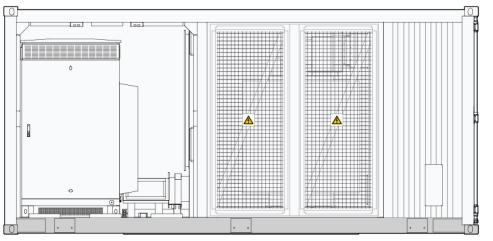
The MV Grid-connected PV Inverter mainly applies to medium and large-scale PV power plants, which can be directly fed into the medium voltage grid. The MV Grid-connected PV Inverter integrates inverter units, transformer, power distribution cabinet and monitoring unit to ensure modular design and fast installation. The inverter units convert DC current generated from the PV arrays into low-voltage AC current, and the transformer converts the low-voltage AC current output by inverter units into medium-voltage AC current.

3.2 External Design of the MV Gridconnected PV Inverter

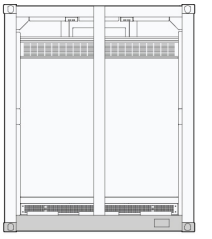
3.2.1 MV Grid-connected PV Inverter Views

Four views of the MV Grid-connected PV Inverter are as follows:

Verson 1



Front



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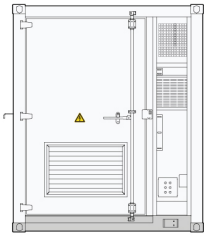

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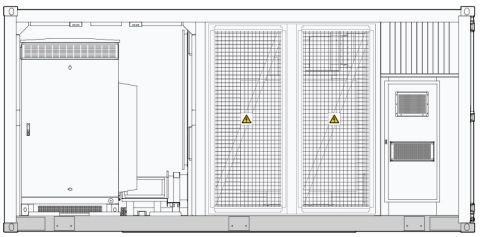
Verson 2



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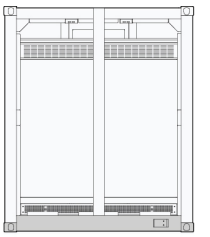

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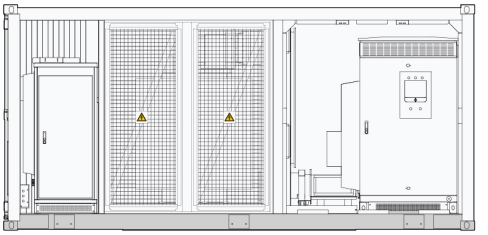
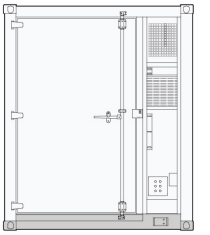
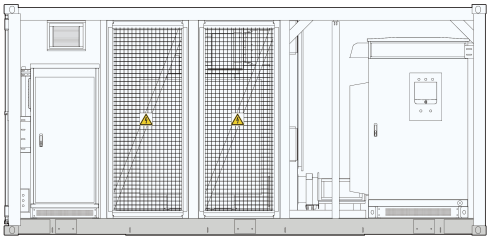


Back

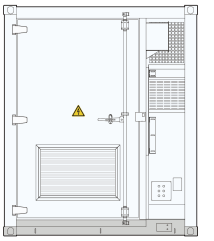


Right

Verson 3



Front



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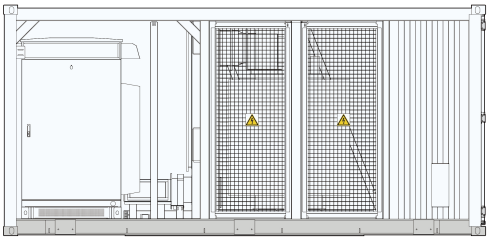

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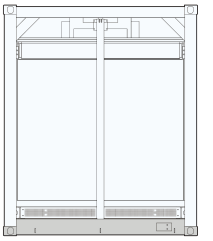


Right

Unless otherwise specified, the device referred to hereinafter is Version 1.

Control and Monitoring Window

The Control and Monitoring window is located on the back side of the inverter unit.

As shown in the figure below, the LED indicators are at the upper part, the color liquid crystal (LCD) screen is at the middle part, and the emergency stop button is at the lower part.

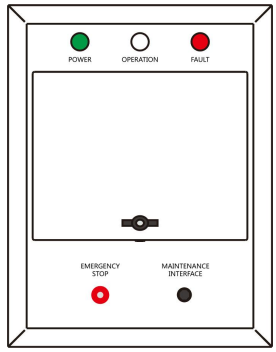


Figure 3-1 Control and Monitoring window

The LEDs at the upper side of the Control and Monitoring Window: POWER indicates power-on state; OPERATION indicates normal operation; and FAULT indicates the occurrence of faults.

The working status of the MV Gridconnected PV Inverter can be acquired through these LEDs.

LED	Color	Description
POWER	Green	The control circuit power supply is supplying power.
OPERATIO-N	White	MV Grid-connected PV Inverter is in stop mode.
	Green	MV Grid-connected PV Inverter is in grid-connected run mode.
	Yellow	MV Grid-connected PV Inverter is in alarm run mode.
FAULT	Red	A fault occurs and has not been removed. The indicator will be off when the fault is cleared.

The EMERGENCY STOP Button

When an emergency occurs, press the emergency stop button to disconnect the DC and AC circuit breakers immediately.

The MAINTENANCE INTERFACE

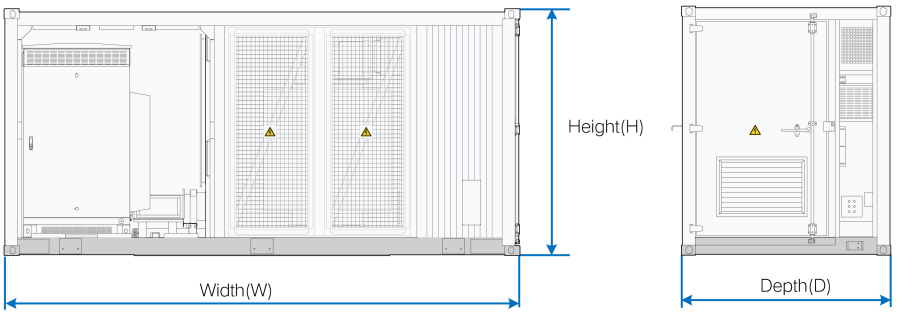
The cover plate of the LCD can only be opened with the key. Remove the key and store it properly after use.

The cover plate of the LCD can only be opened with the key. Remove the key and store it properly after use.

3.2.2 Mechanical Parameter

Dimensions

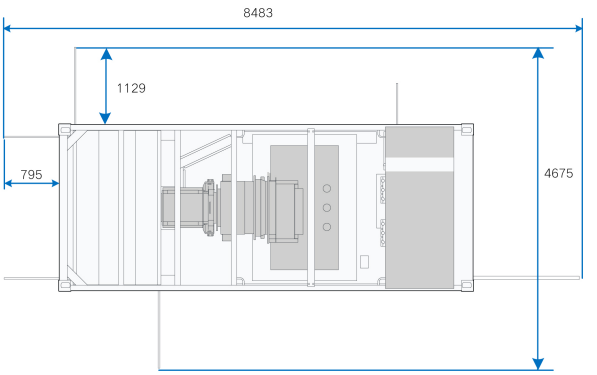
External dimensions are shown in figure below.



Width	Height	Depth
6,058 mm	2,896 mm	2,438 mm

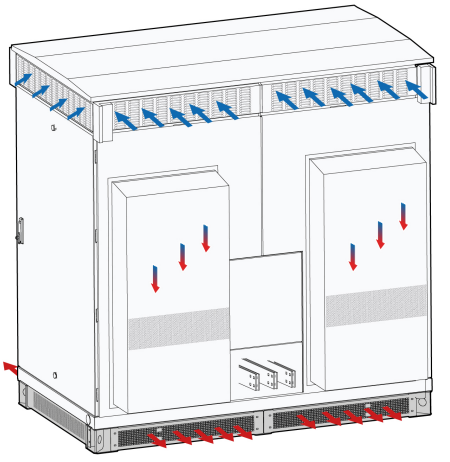
Clearance Spaces

The clearances around the MV Grid-connected PV Inverter should be sufficient for the doors to be opened



3.2.3 Ventilation Design

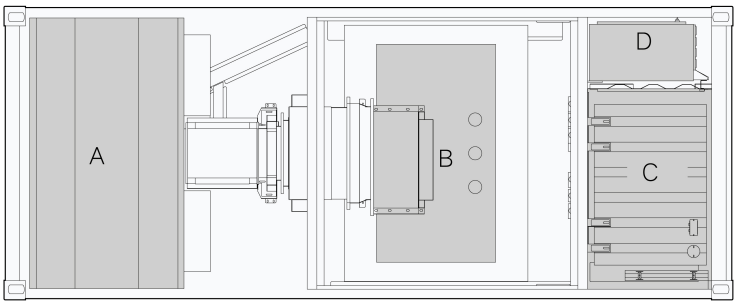
The ventilation system is designed as the cool air comes inside from the top of the inverter unit and hot air gets outside from the bottom of the inverter.



3.3 Internal Design of the MV Gridconnected PV Inverter

3.3.1 Internal Components

Figure below shows the top view of the major electrical components inside the MV Gridconnected PV Inverter:



No.	Device	Description
A	Inverter unit	Convert the DC current generated from the PV arrays into low-voltage AC current
B	Transformer	Convert the low-voltage AC current output by inverter units into medium-voltage AC current.
C	Switchgear	This is connection point of the MV Grid-connected PV Inverter and grid and also the main protection device for the connection and disconnection between the MV Grid-connected PV Inverter and the grid.
D	Power distribution cabinet	-

3.3.2 Cable Entry Design

For easier onsite cable connection, all cables between the internal devices have been connected before delivery.

All cables between the MV Grid-connected PV Inverter and the external are routed through the bottom of the MV Grid-connected PV Inverter. All cables coming into or out of the MV Grid-connected PV Inverter should be protected properly, for example, use cable pipe to prevent damage by rodents. After cable connection, all cable entries should be sealed by fireproof mud or other appropriate materials.

The MV Grid-connected PV Inverter bottom cable entries are shown below.

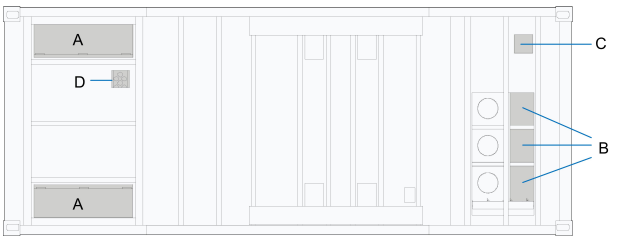


Figure 3-2 Top view

Function of each opening is shown below:

No.	Name	Description
A	DC cable inlet	DC cables connect to the inverter unit through these holes.
B	AC cable outlet	AC cables connect to the switchgear through these holes.
C	Communication, power distribution, and grounding cable entry	Communication, power distribution, and grounding cables of the power distribution cabinet come inside the MV Grid-connected PV Inverter through this hole.
D	Communication cable entry	Communication cables of the inverter come inside the MV Grid-connected PV Inverter through this hole.

3.3.3 Internal Devices of the Inverter Unit

The inverter unit contains the DC cabinet, the IGBT modules and the AC cabinet. DC and AC cabinets are all equipped with wiring terminals and switches.

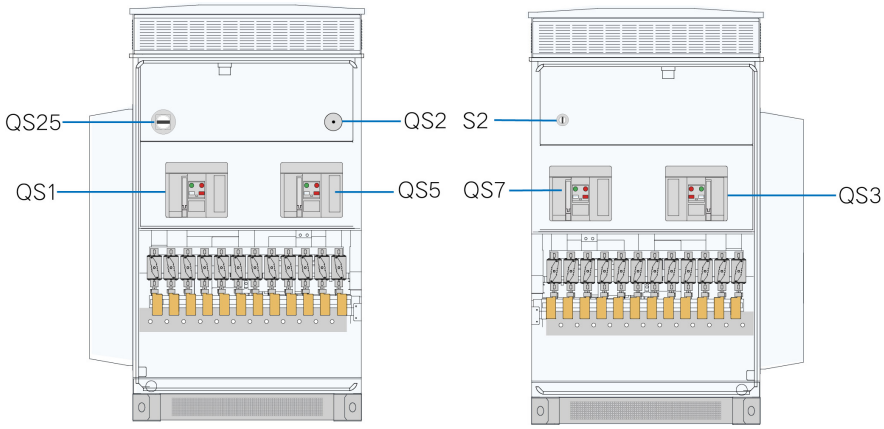


Figure 3-3 DC Cabinet

No.	Name	Description
QS25	AC maintenance switch	Disconnect the switch before maintaining AC cabinet components.
QS1 QS3	DC load switch	Connect/disconnect the DC side of the inverter unit.
QS2	DC maintenance switch	Disconnect the switch before maintaining DC cabinet components.
QS7* QS5*	Energy storage device switch	Connect/disconnect the energy storage device.
S2 *	Inverter interlock switch S2	Used for interlock between inverter and its upstream device.

* is optional.

**The figure above is indicative only.

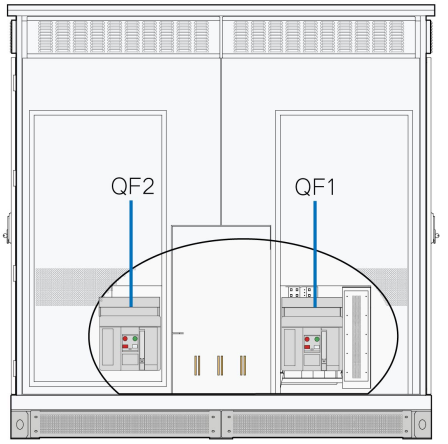


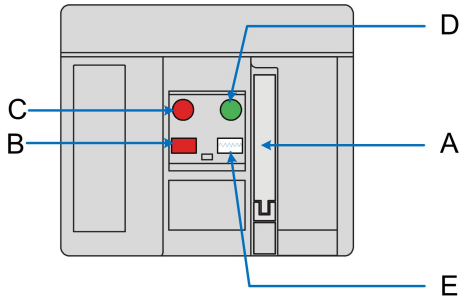
Figure 3-4 AC Cabinet

Remark	Name	Description
QF1 QF2	AC circuit breaker	Connect/disconnect the AC side of the inverter unit.

*The figure above is indicative only.

3.3.4 Operations on the DC and AC Side

DC load switches and AC circuit breakers are provided on inverter unit.



No.	Name	Description
A	Manual energy storage handle	When the DC load switch/AC circuit breaker has no energy, manually store energy through this button.
B	State indicator	Display the present state of DC load switch/ AC circuit breaker, OPEN or CLOSED.
C	Push OFF button	The DC load switch/AC circuit breaker is switched off when this button is pressed

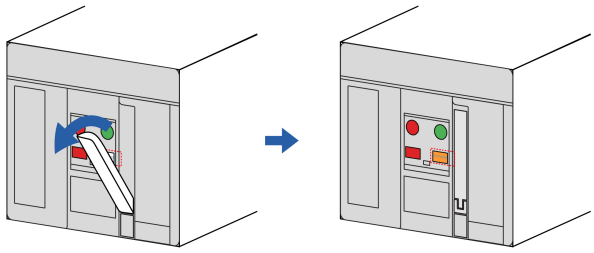
No.	Name	Description
D	Push ON button	The DC load switch/AC circuit breaker is turned on when this button is pressed
E	Energy storage state indicator	Display the present energy storage state, CHARGED SPRING or DISCHARGE SPRING

The DC load switches/AC circuit breakers can be used together with a motorized kit. When there is the power supply on the AC side of the inverter unit, the energy can be stored to the switches through this motor. When there is no power supply on the AC side of the inverter unit, manually store the energy through the manual energy storage handle.

The operation steps are briefly described by taking the DC load switches as an example.

- Switch on

Press the Push ON button on the panel to switch on.
Before switching on, check if the energy storage state displayed on the panel is CHARGED SPRING. If the state is DISCHARGED SPRING, store the energy manually by turning the manual energy storage handle downwards multiple times until the switch panel displays CHARGED SPRING.



After the breaker is switched on, the breaker panel displays CLOSED.

DANGER

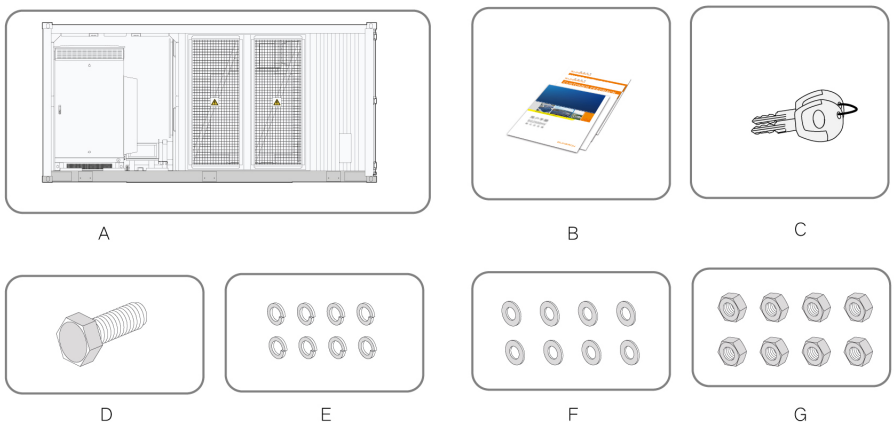
Never manually connect the AC circuit breaker when the AC side carries voltage.

- Switch off

Press the Push OFF button on the breaker panel to switch off the breaker.
After the DC load switch is switched off, the DC load switch panel displays OPEN

4 Delivery

4.1 Scope of Delivery



No.	Device	Note
A	MV Gridconnected PV Inverter	-
B	Enclosed documents	User manual, delivery inspection report, certification, and warranty card
C	Door keys of MV Gridconnected PV Inverter	-
	Keys to monitor window	-
	Keys to the emergency stop button	-
D	Bolt	M16×55
		M6×20
		M5×16
E	Spring washer	M16
F	Flat washer	M16
G	Nut	M16

The foregoing components are based on the standard MV Grid-connected PV Inverter, and those of the actual product may differ. Specifically, refer to the enclosed packing list.

4.2 Identifying the MV Grid-connected PV Inverter

Identify the MV Grid-connected PV Inverter via its nameplate. The nameplate contains the following information: MV Grid-connected PV Inverter, major technical parameters, marks of conformity, origins, and serial number which are available and recognized by SUNGROW.

⚠ WARNING

Very important technical parameters and MV Grid-connected PV Inverter related parameters are contained in the nameplate.

Protect the nameplate at all times!

4.3 Checking for Transport Damages

The MV Grid-connected PV Inverter has been strictly inspected and tested before delivery. Despite robust packaging, the MV Grid-connected PV Inverter or inside devices may be damaged during transport. Therefore, once receiving the MV Grid-connected PV Inverter, perform a detailed inspection

If any damage is found, contact the shipping company or SUNGROW immediately.

- Check the scope of delivery described in "4.1 Scope of Delivery"for completeness.
- Check that the MV Grid-connected PV Inverter and internal devices match the models included in the original order.
- Check thoroughly the MV Grid-connected PV Inverter and internal devices for any possible damages caused during transport.

⚠ WARNING

Install and commission the MV Grid-connected PV Inverter only when it is technically faultless! Make sure before installing the MV Grid-connected PV Inverter that

- **MV Grid-connected PV Inverter is intact without any damage;**
- **All devices inside the MV Grid-connected PV Inverter are intact without any damages.**

4.4 Storage Requirements

4.4.1 Storage Environment

- The MV Grid-connected PV Inverter should be stored in an environment with a temperature ranging from -40° C to 70° C. f the ambient temperature is too low, take necessary heating measures for the inverter's internal devices.
- The 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 inverter units requires 4 bags of desiccant, at least 200g per bag. Before grid connection, take the desiccants out of the 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 the 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 the 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 the 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 power plants (chemical gas class: 1C1, solid particle level: 1S2). Avoid storing 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.
- Do not store the MV Grid-connected PV Inverter in environments with flammables and explosives.
- To prevent the 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.

4.4.2 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 inverter stressed with heavy weights. The containers should not be stacked in more than four layers, and heavy weights are not allowed on the top of the inverter, power distribution cabinet, transformer, and protective cover for low-voltage copper bars.

4.4.3 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 dehumidifcation and dedusting mesaures 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 Installation

⚠ WARNING

Respect all local standards and requirements during mechanical installation.

5.1 Transport

All devices are installed inside the MV Grid-connected PV Inverterbefore delivery. The MV Grid-connected PV Invertershould be transported as a whole. Transport the MV Grid-connected PV Inverterby crane with sufficient load capacity.

The MV Grid-connected PV Inverteris delivered to the user by a forwarding company. After unloading, the MV Grid-connected PV Inverterwill be transported to the installation site by the PV power plant staff.

⚠ WARNING

Local standards and regulations on the container transport and loading & unloading, especially those safety instructions, should be observed at all times.

- **All the accessory appliances to be used during transport should be maintained beforehand.**
- **The transport of the MV Grid-connected PV Invertermust be performed by qualified personnel. Qualified personnel are those who have been trained, especially in safety operation.**

NOTICE

Keep in mind the dimensions and total weight of the MV Grid-connected PV Inverterat all times!

Ensure that the following requirements are met:

- All the doors are locked.
- Choose appropriate crane or hoist to transport the Station. The crane or hoist must be sufficient to bear the weight of the Station.
- An additional traction vehicle may be required for uphill/downhill road transport.
- Anything, which may hinder the transport, like trees, cables (or similar), should be removed.
- Transport the MV Grid-connected PV Inverter on fine weather days as far as reasonably possible.

- Warning signs or barriers must be posted near the transport areas to avoid accidental injuries.

Additionally, the following should be met when the MV Grid-connected PV Inverteris placed on the ground:

- Place the MV Grid-connected PV Invertercarefully and gently. Do not pull or push the MV Grid-connected PV Inverteron any surface.
- The place should be firm and flat, has good drainage and has no obstacles or outshoots. The MV Grid-connected PV Invertershould be placed and supported by the four feet.

5.2 Hoisting the MV Gridconnected PV Inverter

5.2.1 Safety Precautions

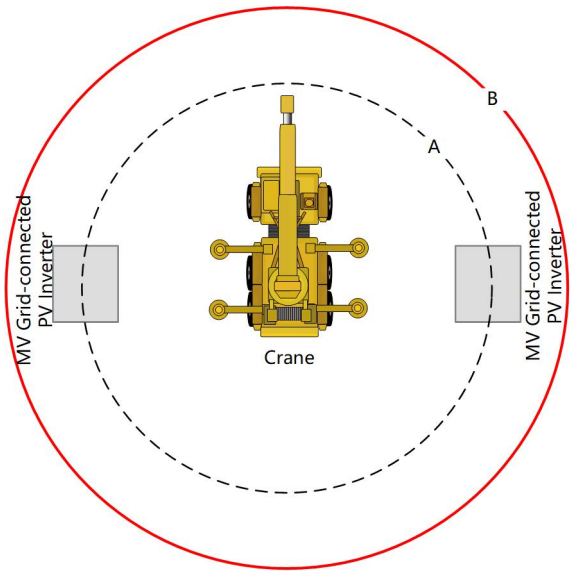
⚠ WARNING

- **Observe the safety operating rules of the crane at all times.**
- **Standing within 10 meters of the hoisting areas is strictly forbidden! Anybody standing under the boom or Station is strictly forbidden in the whole hoisting process.**
- **The hoisting work must be stopped in violent weather days. For example, in strong wind, heavy rain, or thick fog conditions.**

Carefully observe the following items:

- All safety requirements must be met.
- A professional instructor is needed in the whole hoisting process.
- All the slings used must have the load-bearing capacity of at least 50t.
- The crane should have sufficient arm length and radius of gyration.
- All the connection point must be firmly connected.
- The length of the slings can be adjusted appropriately according to on-site conditions.
- Transport the MV Grid-connected PV Inverterin a level, smooth and steady way.
- Transport the MV Grid-connected PV Inverterby connecting the four top corner fittings.
- Some accessories may be needed to ensure the hoisting safety.

The following figure illustrates the hoisting operations. Circle A indicates the work areas of the crane. Anybody standing inside the circle B is forbidden for safety considerations.

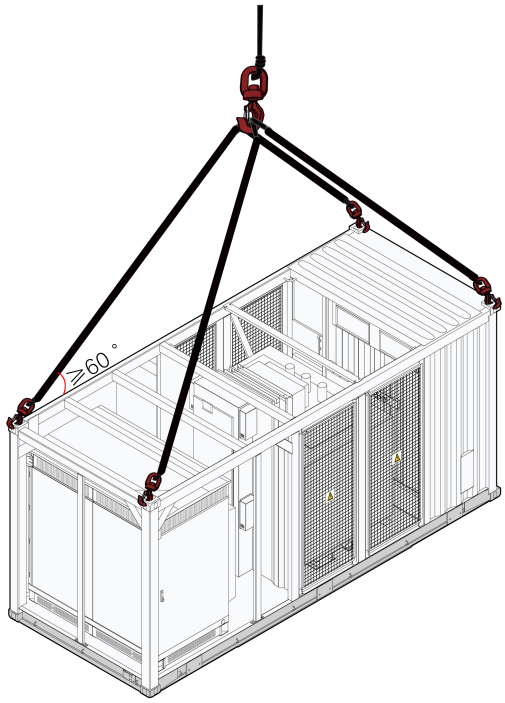


5.2.2 Hoisting

In the whole hoisting process, observe following rules:

- Hoist the MV Grid-connected PV Inverter in a vertical manner. Do not drag or drop the MV Gridconnected PV Inverter on any surface.
- When the MV Grid-connected PV Inverter has been hoisted for about 300mm from the ground, stop to check if all the connections are still firm. After confirmation, continue hoisting the MV Grid-connected PV Inverter.
- When transported to the final location, the MV Grid-connected PV Inverter should be put down slowly and steadily.
- The final location should be firm, level, and well-drained. The MV Grid-connected PV Inverter is supported by four bottom fittings on the ground.

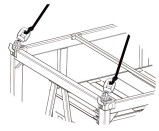
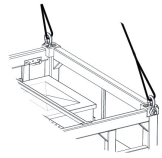
The MV Gridconnected PV Inverter should be hoisted by using four top corner fittings.



5.2.3 Fastening of Connectors

Use slings with hooks or U-hooks to hoist the MV Gridconnected PV Inverter.

The lifting devices should be connected correctly to the MV Gridconnected PV Inverter.

Lifting device	Hook	U-hook
Connections		
Notice	Insert the hook from inside to outside.	Lateral pin of the U-hook should be tightened.

*The figure above is indicative only.

WARNING

- **National and local safety rules should be observed at all times.**
- **Regardless of relevant safety rules may void pertinent warranty claims from SUNGROW.**

5.3 Foundation

5.3.1 Selection of Installation Site

When selecting the installation site, consider at least the following requirements:

- Ambient and geological conditions, such as stress wave emissions, the level of underground water table, etc. should be taken into account.
- The ambient environment should be dry, well ventilated, and far away from inflammable materials.
- The ground at the installation site must be compacted enough. Relative compaction of the ground should be equal or greater than 98%.Take proper methods to strengthen the ground if otherwise.

5.3.2 Foundation Requirements

⚠ WARNING

Pay attention to the heavy weight of the MV Grid-connected PV Inverter. Check thoroughly the conditions of the installation site (mainly the geographical and environmental conditions). Then design and construct the foundation.

Improper foundation construction may affect the place of the MV Grid-connected PV Inverter, open & close of the door and later maintenance of the MV Grid-connected PV Inverter. Therefore, the foundation must be designed and constructed according to related standard. The dimensions, weight of the MV Grid-connected PV Inverter, the cable route and later maintenance should be considered at all times.

The following conditions must be fulfilled:

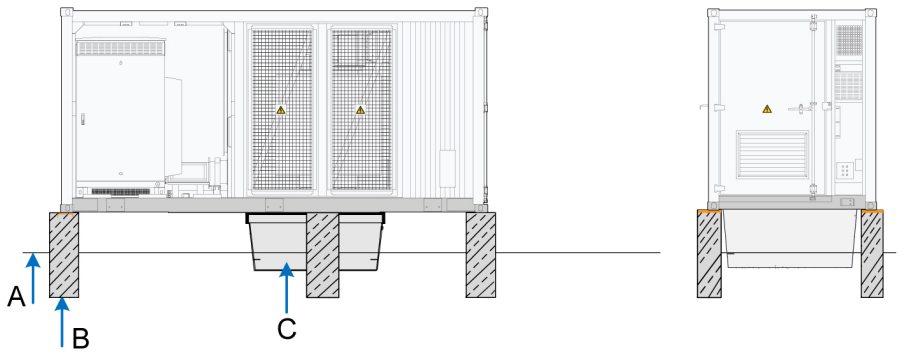
- The bottom of foundation should be firm enough.
- The foundations must be suitable for the weight of the MV Grid-connected PV Inverter.
- The foundation should be higher than the solid ground on site to avoid the rain damaging the base or the inside of the MV Grid-connected PV Inverter.
- In foundation construction, take appropriate drainage measures according to local geological conditions.
- Sufficient cross-sectional area and depth of the foundation should be maintained. The depth is designed according to local soil conditions.
- Cable route should be taken into account.

According to the cable design of MV Grid-connected PV Inverter and for easy electrical connection, establish cable trenches on bottom of the MV Grid-connected PV Inverter, i.e. reserve the cable trenches inside the foundation and pre-bury the wire pipes.

The material dug out should be cleared immediately.

5.3.3 Recommended Foundation Construction Method

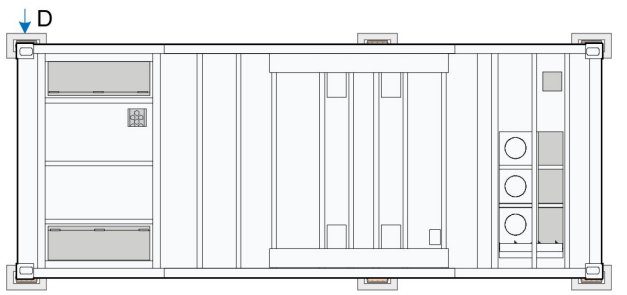
The overall diagram is shown in the following figure.



No.	Name
A	Pea gravel ground
B	Foundation
C	Oil tray

Constructing the Foundation

It is recommended to construct the foundation as the following solution.



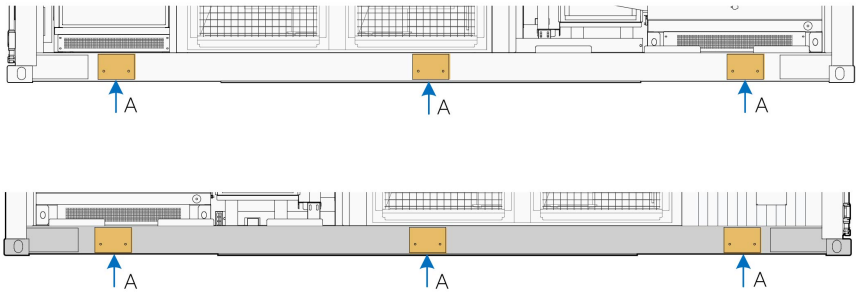
No.	Name
D	Embedded channel steel

Fixing the MV Gridconnected PV Inverter

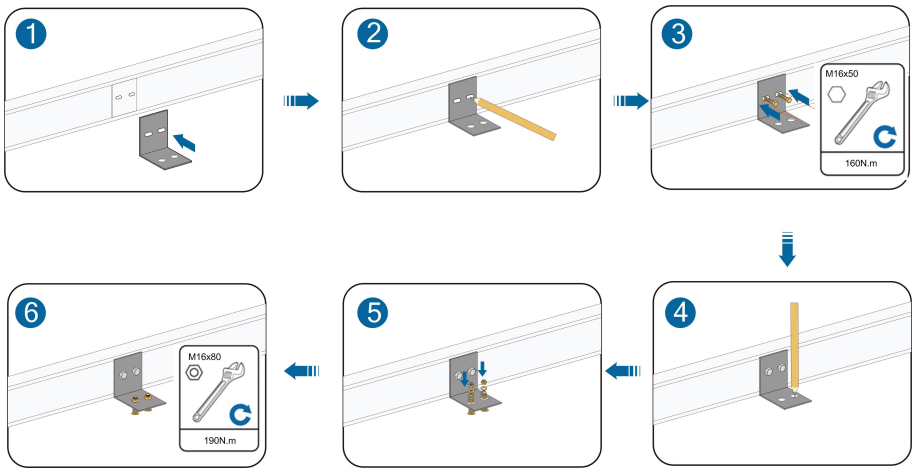
Hoisting the MV Grid-connected PV Inverter to the desired location and welded.
After completion, anti-corrosion treatment should be done on the welding position.

5.3.4 Fixing the MV Gridconnected PV Inverter

If the foundation is constructed as the above plan, the MV Grid-connected PV Inverter needs to be hoisted to the desired location and welded. If the foundation is not constructed as the above plan, it is necessary to fix the fixing point at the bottom of the MV Grid-connected PV Inverter (shown as A below) with the existing operating platform using L mounting parts.



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



5.4 Removing Sealing Tapes and Support Beams and Fixing Brackets

Support beams and fixing brackets are installed on the exterior of the MV Grid-connected PV Inverter to protect it against damage due to shaking or collision during transportation. Additionally, the MV Grid-connected PV Inverter is sealed with sealing tapes to prevent seawater or moisture damage during transportation.

WARNING

- **If a ladder (not included in the scope of delivery) is used, before installation, ensure that the ladder is stable, undamaged, and at a suitable height.**
- **The ladder needs to be placed on a flat, solid, and non slip ground to ensure stability and avoid shaking, and to avoid using the ladder on smooth, soft, or unstable ground.**

Sealing tapes (indicated as A in the figure below) must be removed before putting the equipment into operation.

A total of four support beams (indicated as B) and two fixing brackets (indicated as C) are added to ensure stability during transportation. These beams and brackets will not affect the normal operation of the equipment and can be removed as needed.

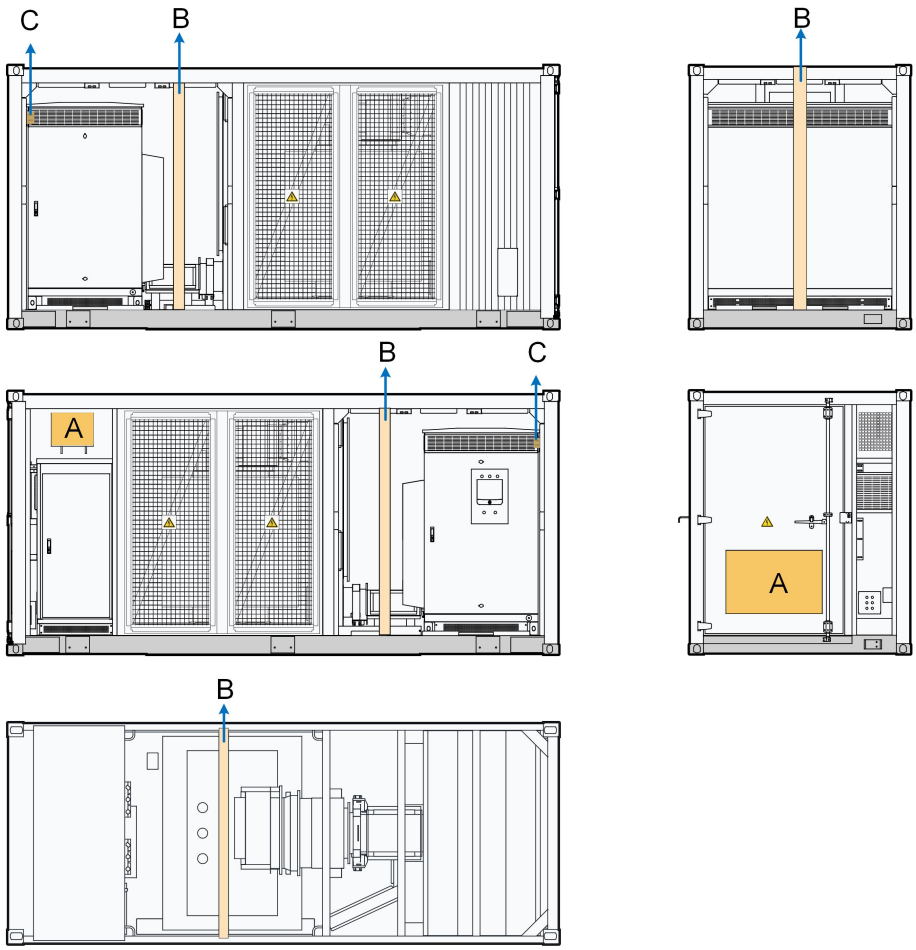


Figure 5-1 Removing Sealing Tapes, Support Beams and Fixing Brackets

*The figure above is indicative only. The actual product shall prevail.

5.5 Performance Requirements for Firestop Sealant Materials

- Apparent density ≤ 1.6 × 10³ kg/m³
- When immersed in tap water at 20 °C ± 5 °C, the material must maintain integrity for ≥ 3 days without swelling or cracking.
- When immersed in a 3% ammonia solution at 20 °C ± 5 °C, the material must maintain integrity for ≥ 3 days without swelling or cracking.
- When immersed in a 3% hydrochloric acid solution at 20 °C ± 5 °C, the material must maintain integrity for ≥ 3 days without swelling or cracking.

- When placed in an environment with relative humidity 90 % ± 5 % and temperature 45 °C ± 5 °C, the material must maintain integrity for ≥ 360 h without cracking or powdering.
- When subjected to freeze-thaw cycles consisting of immersion in water at 23 °C ± 2 °C for 18 h, freezing at -20 °C ± 2 °C (starting the 3-hour period once the material reaches -18 °C), and subsequent exposure to 50 °C ± 2 °C for 3 h, the material must withstand ≥ 15 cycles without cracking or powdering.
- The material must meet B2 grade requirements for combustion performance according to GB 8624.
- The material must limit toxic gas emissions to meet at least ZA2 grade according to GB/T 20285.
- The material must have air permeability ≤ 3.5 $m^3/(m^2 \cdot h)$.
- For overseas firewall versions, the material must maintain fire resistance integrity (Fr) ≥ 3.0 h; the backing cotton pad must not ignite, flame duration must not exceed 10 s, and probe must not penetrate any gaps.
- The material must maintain fire insulation (Fr) ≥ 3.0 h. Temperature rise at any point on the unexposed side and frame surface must not exceed 180 °C.
- After fire resistance testing, the material must not develop any holes that allow water flow on the unexposed side during water spray testing.
- In addition to complying with the national standards of the country of use, foam sealants and fireproof mud must not release corrosive gases such as chlorine, ammonia , or sulfur under operating temperatures of -40 to 85℃. Halogen-free and environmentally friendly sealing materials must be used.

6 Electrical Installation

6.1 Safety Instructions

6.1.1 Generals Rules

DANGER

High voltage! Electrical shock hazards!

- **Do not touch the live components of the device.**
- **Make sure the AC and DC sides are voltage-free before installation.**
- **Never put flammable materials in the vicinity of the MV Grid-connected PV Inverter.**

DANGER

If a ground fault occurs in the MV Grid-connected PV Inverter, some parts that are supposedly voltage-free may carry lethal voltage. Accidental touch may cause serious damage. Make sure there is no system ground fault before operation and take proper protective measures.

WARNING

- **Observe all the country-specific standards and regulations.**
- **Connect the MV Grid-connected PV Inverter to grid only after receiving authorization from the local network operator.**

WARNING

Only professional electricians can perform the operations described in this chapter.
Observe all the instructions during electrical connection.

WARNING

Disconnect all AC and DC switches before electrical connection.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the MV Grid-connected PV Inverter!

- **Do not perform electrical connection in sandy season or when the ambient relative humidity is above 95%.**
- **Perform electrical connection at fine weather days.**

⚠ WARNING

Improper torque used may cause fire to the connection point!
Strictly observe the torque requirements in this manual during electrical connection.

⚠ WARNING

Too small bending radius or excessive intertwine may damage the fiber!
When selecting fiber as the communication cable, follow the related requirements of the fiber manufacturer about the min. permissible bending radius.

⚠ WARNING

Only professional electricians can perform the electrical connection. Professional electricians should meet the related requirements listed in "2 Safety Instructions"in this manual. SUNGROW shall not be held liable for any personal injury or property loss caused by ignorance of the safety instructions.

⚠ WARNING

Ensure the electrical insulation meets requirements before laying the cables. Follow the EMC regulation and lay the power cable and communication cable in different layers. Provide support and protection to the cables to reduce the stress of the cables when necessary.

⚠ WARNING

Strictly follow all the instructions when connecting the cables.

⚠ WARNING

- **The installation and design of the MV Grid-connected PV Inverter must fulfill national and local standards and regulations.**
- **SUNGROW shall not be held liable for the MV Grid-connected PV Inverter or system fault caused by ignorance of the description in this manual.**

Select optical fibers as the external communication cable to lower the signal interference.

6.1.2 Five Safety Rules

During electrical connections and other operations on the inside device, observe the following Five Safety Rules:

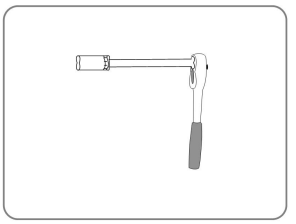
- Disconnect all the external connections and disconnect the MV Grid-connected PV Inverter internal power supply.
- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument.
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid accidental contact.

6.2 Preparation before Electrical Connections

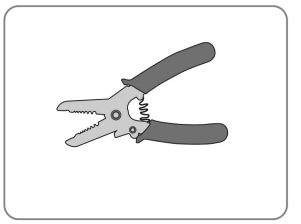
Electrical connections between devices inside the MV Grid-connected PV Inverter have been performed before delivery. On site, the connections between the MV Grid-connected PV Inverter and external devices need to be performed, including DC connection, AC connection and communication connection.

6.2.1 Installation Tools

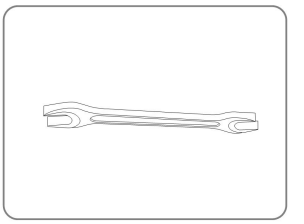
Installation tools include but are not limited to the following recommended ones, and other auxiliary tools or components can be used on site when necessary.



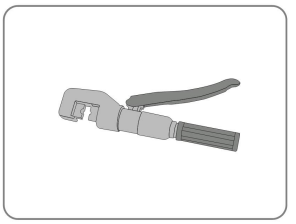
Torque wrench



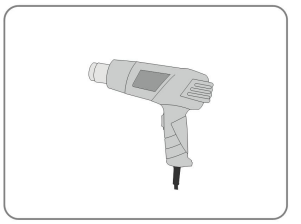
Wire stripper



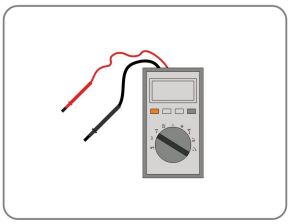
Allen wrench
for terminal fixing



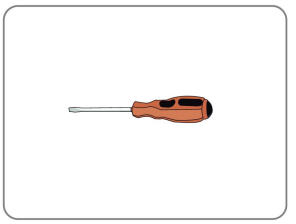
Terminal crimper



Heat blower



Megger and multimeter



Screwdriver

6.2.2 Checking the Cables

⚠ WARNING

Check to ensure the intactness and insulation of all cables before electrical connection. Poor insulation or damages in the cables may cause hazards. Replace them if necessary.

6.2.3 During Connection

⚠ WARNING

- **Make sure the DC cables are correctly routed before connection.**
- **Do not pull the cables hard during connection.**
- **Make sure there is enough wire bending space for all connection cables.**
- **Take proper methods to reduce the stress of cables.**
- **Check carefully to ensure the correctness and fastness of the connections.**

6.3 Circuit Diagram and Cable Connection

6.3.1 Circuit Diagram

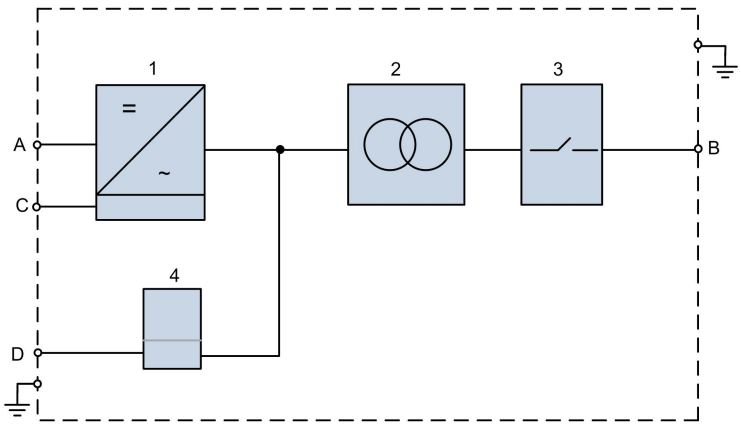


Figure 6-1 Wiring scheme 1

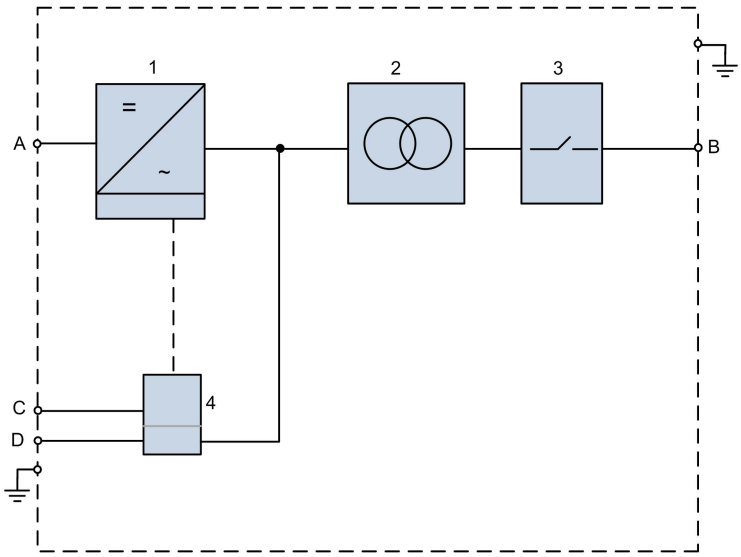


Figure 6-2 Wiring scheme 2

Table 6-1 Ports in the figure above

No.	Name
A	DC input
B	AC output
C	External communication port
D*	External 3-pahse power supply

* is optional.

Table 6-2 Devices in the figure above

No.	Name
1	PV Inverter
2	Transformer
3	Switchgear
4	Power distribution cabinet

6.3.2 Cable Specifications

Choose cables according to the rules below:

- All the cables must have sufficient ampacity. The ampacity of the conductor can at least be influenced by environmental conditions, conductor insulation materials, laying, wire materials, cross-sectional areas, etc.
- All the cables must be chosen according to the maximum current of the inverter unit.
- Cables for one polarity or phase should be of the same type and specification.
- Flame retardant and fire resistant cables are recommended.

⚠ WARNING

Overloading operation of cables is strictly forbidden.

6.4 Ground Connection

Brief Introduction

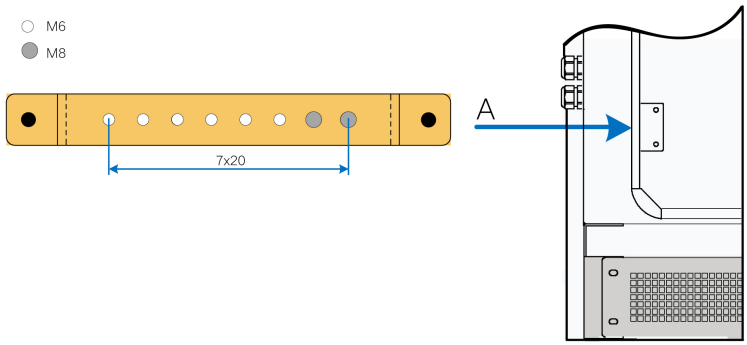
⚠ WARNING

Observe the country-specific regulations and standards at all times!

Generally, the ground connection can be divided into three parts, equipotential connection of MV Grid-connected PV Inverter internal devices, MV Grid-connected PV Inverter external grounding.

Equipotential Connection of MV Grid-connected PV Inverter Internal Devices

All electrical devices inside the MV Grid-connected PV Inverter should be connected equipotentially through the total equipotential connection copper bar.



The connection of the internal main electrical devices to the ground copper bar has been finished before delivery.

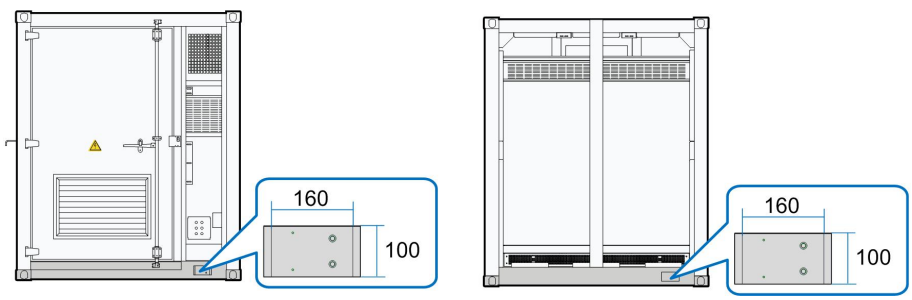
On site, if grounding connection is required, the 16mm^2 cable is recommended.

External Grounding

For ease of onsite cable connection, two grounding points are designed at the exterior of the MV Grid-connected PV Inverter, as shown in the figure below. On site, reliably connect both or either of the two grounding points according to actual conditions.

NOTICE

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



The external grounding points of the MV Grid-connected PV Inverter can be grounded in the following two manners:

- Connect the grounding cable to the external grounding points with M10 bolts, where the recommended cable is of 50 mm^2 to 95 mm^2.
- Weld the grounding steel flat onto the external grounding point, after which anti-corrosion processing needs to be performed.

Perform the external grounding according to the on-site situation and the instructions of the PV power plant staff.

- The grounding resistance must meet the requirements of local standards and regulations.
- It is recommended that two points of the MV Grid-connected PV Inverter should be connected to the ground system of the PV plant.

WARNING

If you have any problems in relation to the ground cable connection, contact the related technical personnel in time. Any installations not following the standards or the installation and alternation without permission may lead to safety incidents or damage to the devices. SUNGROW shall not be held liable for the damages caused.

6.5 AC Connection

6.5.1 Safety Instructions

WARNING

Electrical shock hazards!

- **Do not touch the live components.**
- **Disconnect the AC switches and ensure all terminals are voltage-free.**
- **The connections to the downstream devices must be carried out only after receiving approval from the distribution utility as required by national and state interconnection regulations.**

WARNING

Strictly follow all the instructions when connecting.

6.5.2 AC Cable Connection

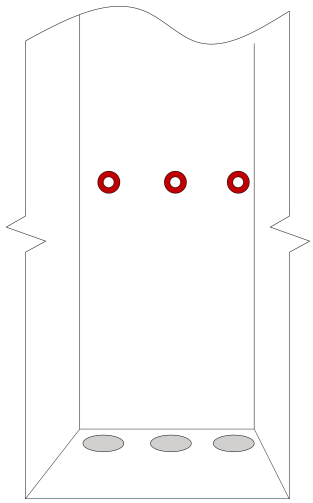
Prerequisites

- Check and ensure that AC circuit breaker of the inverter is disconnected.
- Use the dedicated operation bar to connect the grounding switch in the load switch cabinet of the switchgear and disconnect the load switch.

Preparation before Wiring

- Open the cable compartment at the bottom of the load switch cabinet.
- Check and ensure that wiring terminals are free of damage, deformation, or cracks.

Wiring Area



Wiring Steps

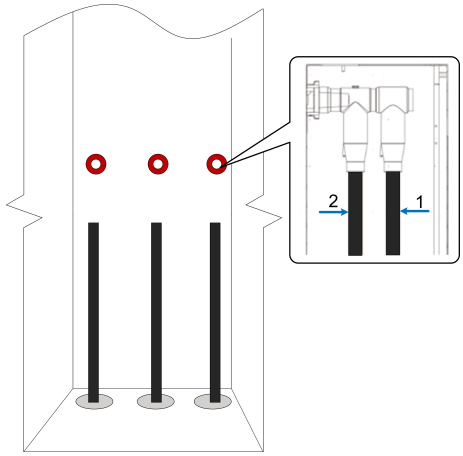
Step 1 Lead the cable from external device through the cable entry on the bottom of the cable compartment.

Step 2 Prepare the terminals and install them tightly, where reference can be made to the cable connector installation manual.

The wiring terminal can be connected with either copper cable or aluminium cable.

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

The HV wiring terminal can be connected to a maximum of two cables, corresponding to the right-side terminal (Figure 1) and left-side terminal (Figure 2). Select the terminal as needed.



- - End

Further Operations

Seal the bottom cable entries with fire-proof mud, clear sundries inside the cabinet, and reassemble the sealing plate of the cabinet.

Should there be any unused wiring terminals, block them with insulating caps.

When connecting the AC cable, do not use the hole on the pressure relief plate as a substitute for the AC cable inlet.

6.6 DC Connection

6.6.1 Checking before Connection

Check the following items before cable connections.

- Check the open-circuit voltage of the PV array to ensure the open-circuit voltage is less than the max. DC voltage of the inverter unit.
- Mark the negative and positive polarity of the cable.
- Check the PV modules for possible ground fault.

WARNING

- **Open-circuit voltage of the PV array should not exceed the max. DC voltage of the inverter unit. The module may be damaged if otherwise.**
- **If a ground fault is detected, remove it before performing any DC connection.**

WARNING

Strictly follow all the instructions when connecting the cables.

WARNING

Observe all the safety rules specified by the PV array manufacture.

Start DC connection only when all checks and measurements meet requirements.

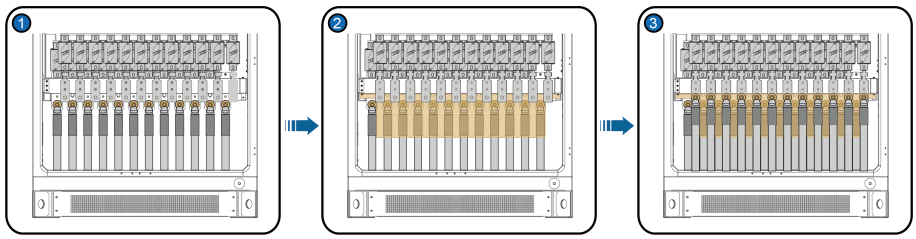
6.6.2 Installing PC Board before Connection (Optional)

Installing PC board before cable connections.

Step 1 Install the negative DC cable.

Step 2 Fix the PC board to the bracket.

Step 3 Install the positive DC cable.



- - End

6.6.3 Cable Inlet Preparation

6.6.4 DC Cable Connection

DC Connection Area

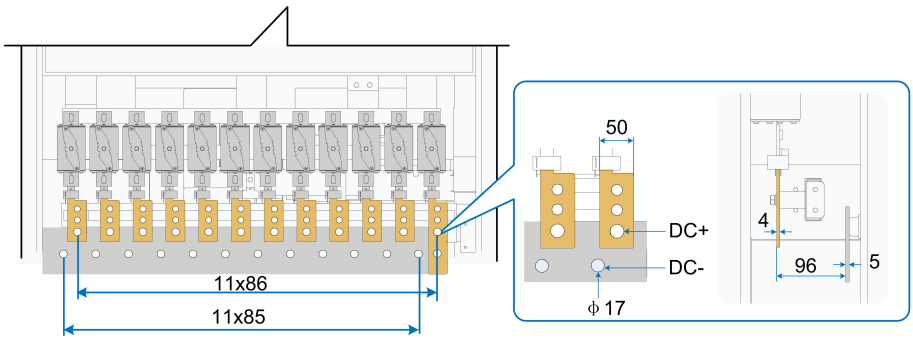


Figure 6-3 Negative grounding

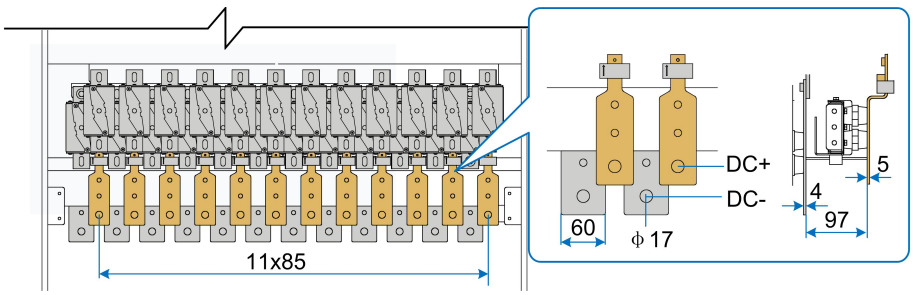


Figure 6-4 Floating grounding

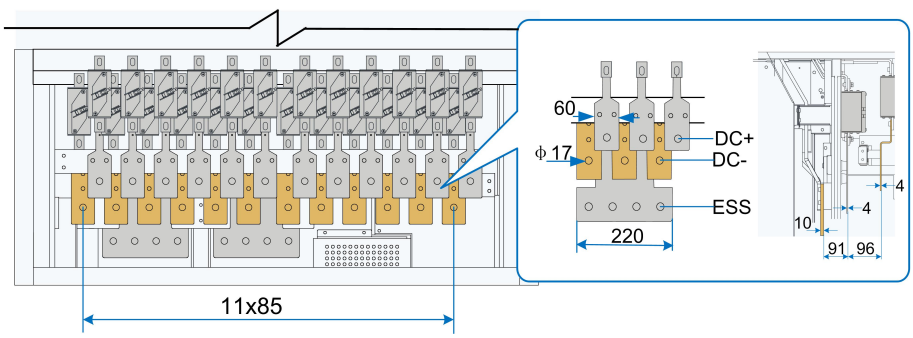


Figure 6-5 Floating grounding with energy storage system ports

Remark	Defination
DC+	DC positive cable connection area
DC-	DC negative cable connection area
ESS	Energy storage system connection area

Cable Requirements

- Use a cooper-core/an aluminium-core cable. For the cable specification, please select according to the width of the copper bar and the size of the wiring hole, as well as local regulations.
- Fasten the wiring terminal with the M16 x 55 bolts in the scope of delivery.

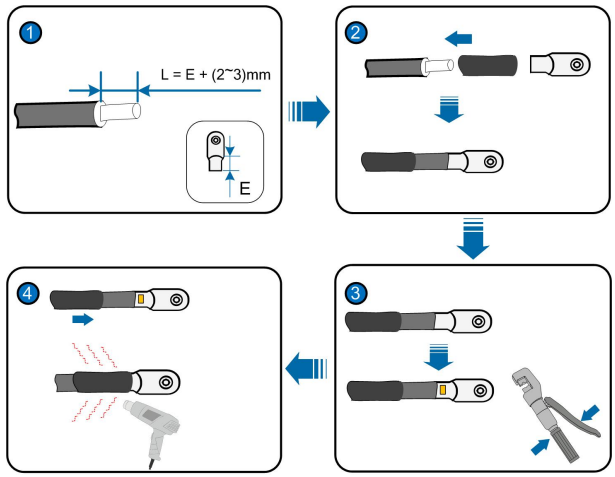
Cable Connection Steps

Proceed as follows to connect the DC cables:

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.



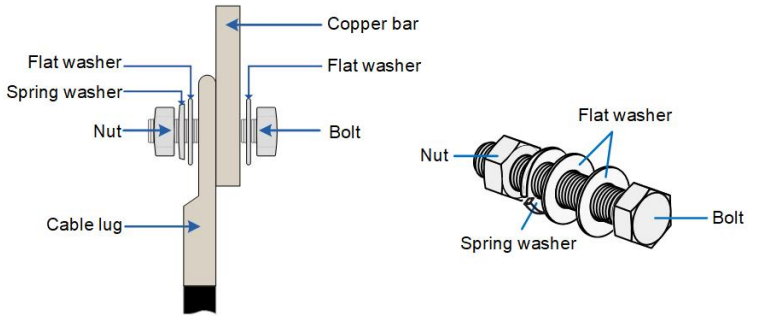
If the two-core or multi-core cable is used as the DC input cable, split the cable cores into wires outside the inverter first, before leading the cable into the inverter.

Step 4 Connect the cable.

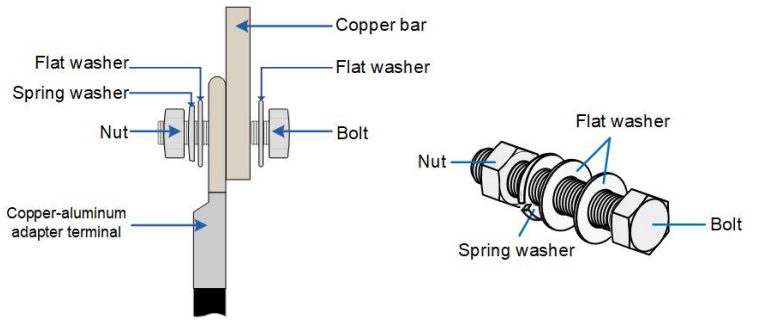
1 Select bolts matching with the cable lug.

2 Attach the cable lug to the DC connection copper bar.

If copper wires are used, connect the spare parts as described below:



When the aluminum wire is selected, a copper-aluminum adapter terminal is required, as shown below:



3 Fasten the bolts with screwdriver or spanner.

Step 5 Confirm that all cable connections are secure.

- - End

⚠ WARNING

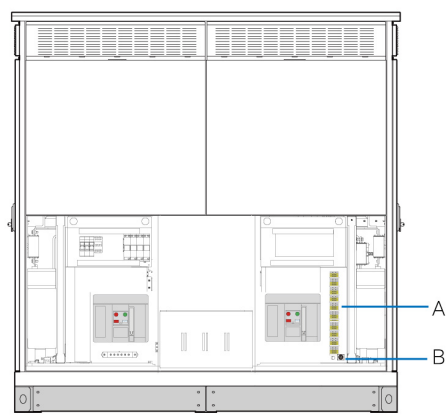
- **Incorrect connection sequence may cause fire. Pay maximum attention to the connection sequence.**
- **Ensure the firmness of the cable connection. Poor connection or oxidation of the surface may cause over-heating or fire.**

NOTICE

- **Long bolts may affect the insulation and may cause short circuit.**
- **Remove the heat-shrink tubing between the cable lug and the copper bar if necessary. Poor contact or over-heating may follow if otherwise.**
- **For the standard inverter unit, it is not allowed to connect cables to both the front and back of a DC wiring copper bar, as this may damage the equipment. If you require an inverter unit that supports double-sided wiring, contact SUNGROW and provide information such as the sizes of cables and specifications of wiring terminals to be used. SUNGROW will evaluate the feasibility of customizing a product tailored to your needs.**
- **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.**

6.7 Communication Connection on the Inverter

RS485 ports and Ethernet port are reserved on the inverter unit, which are shown as A and B respectively.



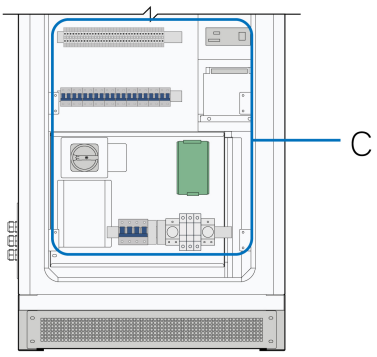
Communication Area on the Power Distribution Cabinet (optional)

The communication terminal is located in the upper side of the power distribution cabinet. The specific location is subject to the actual product.

Select the corresponding ports for wiring according to actual needs.

6.8 External Equipment Connection

The lower part of the power distribution cabinet is the power distribution terminal and wiring area, as shown in figure C below. Select the corresponding ports for wiring according to actual needs.



*The figure above is indicative only,and the actual product shall prevail.

6.9 Finishing Electrical Connection

⚠ WARNING

After the electrical connection, check the connections of all cables for correctness and firmness.

After checking that all connections are correct and firm,

- Close the cable entries on the bottom of the MV Grid-connected PV Inverter by following the reversed procedure in opening the cable entries.
- The gap at the cable inlet/outlet at the bottom and right of the MV Grid-connected PV Inverter should be sealed with fireproof mud.
- Water-proof treatment should be performed on the foundation of the MV Gridconnected PV Inverter.

7 Commissioning

7.1 Safety Instructions

DANGER

High voltage! Electric shock!

- **Wear proper PPE with an arc rating that meets the product requirements before all operations on the device.**
- **Do not touch the live terminals or conductors.**
- **Respect all safety instructions attached on the device and described in this manual.**
- **Respect all safety instructions prescribed by the manufacturer of devices connected to the MV Grid-connected PV Inverter.**

WARNING

Grid-connection of the
MV Grid-connected PV Inverter
can be performed only after receiving approval from the local grid company and by qualified personnel.

WARNING

After the MV Grid-connected PV Inverter is operating, make sure there are no flammable materials at least 5 meters around the installation site.
Local/national standards about the min. electric clearance around the MV Grid-connected PV Inverter should be respected.

CAUTION

Make sure the installation is correct and no spare parts or tools are left inside the device.

NOTICE

Close the doors of the MV Grid-connected PV Inverter and the internal devices if the commissioning process is stopped.

7.2 Requirements of Commissioning

Before commissioning, installation of all the devices inside the MV Grid-connected PV Inverter should be checked thoroughly.

- Ensure all cables are connected securely and all bolts are fixed properly.
- Ensure DC side voltage meets module requirements and the polarity is correct.
- Ensure AC side voltage meets module requirements.
- Ensure all cable connections meets related standards and requirements.
- Ensure the system is properly grounded. Ground resistance is important to the whole system. Therefore, before commissioning, make sure the ground resistance meets the requirements of local standards and regulations.

⚠ WARNING

Make sure the emergency stop button inside the monitoring window is released, all AC & DC switches are disconnected and all micro circuit breakers inside the power distribution cabinet are disconnected before commissioning.

NOTICE

All commissioning operations must be performed only by qualified personnel.

Commission the device when it is sunny and the environmental conditions are stable to ensure the successful commissioning.

7.3 Checking before Commissioning

7.3.1 Checking the Cable Connection

- Check cables for any possible damages or cracks.
- Check that all cables are connected securely according to the cable connection diagram. Adjust the cable connection if necessary.
- Ensure all cable connections are firmly enough. Fix the bolts if necessary.
- Check the PE equipotential connection. Ensure the module AC side PE ground copper bar has connected to the equipotential connection point in the electrical room and properly grounded. The grounding resistance must meet the requirements of local standards and regulations.

7.3.2 Checking the Module

- Ensure that the DC and AC switches are in the “OFF” position.
- Check whether the electric switches and buttons of the MV Electrical connections between and its upstream and downstream devices can be operated flexibly.

7.3.3 Checking PV Array

WARNING

Ensure the measuring devices are connected and used correctly. Otherwise, there will be electric arc.

WARNING

DC side voltage should be no more than the max. DC input voltage of the MV Gridconnected PV Inverter.
Too high DC voltage may damage the module even cause safety incident.

To ensure system reliability and device operation, PV modules on the DC side of the MV Grid-connected PV Inverter should be from the same manufacturer and the number of PV modules in each string should be the same.

Check the PV arrays before grid-connection. The voltage of each DC main cables should be the same and no more than the max. permissible DC voltage. Check carefully the polarity of each DC main cable. Once the polarity in one DC main cable is incorrect, the PV arrays may be damaged.
Make sure the environmental condition is stable since the voltage of PV array may change with the solar radiation and the temperature of the PV modules. Record the PV array status via the I-V curve. Commission the device when the PV array output situation is stable.

The PV field circuit fault (module fault or module numbers deviation in certain array), cable damages or connection looseness may cause the voltage deviation exceeding 3% under stable environmental conditions.

- Record the environmental parameters (temperature, radiation, etc.).
- Measure the resistance of cables (between the terminal box and the module).
- Record accurately all the measured datas.

7.3.4 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 serious.

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

- Measure the THD and check the curve if possible. Module will stop running if the THD is serious.
- Record accurately all the measured datas.

7.4 Preparation before Starting

- Place the disassembled protection grills to their original positions and ensure the connection is secure.
- Close and lock the cabinet door.
- Clean the device site. Make sure the position is clean without flammable or explosive materials.
- Ensure the ventilation of the installation place.
- Recheck and ensure whether module and switches upstream and downstream can meet the requirements flexiblely .

7.5 Installing the Breather

Ensure the breather is properly installed before powering on the MV Grid-Connected PV Inverter. For detailed installation instructions, please refer to the guidelines provided by the breather manufacturer.

Installation Conditions

Install the breather in a relatively dry outdoor environment.

Installation steps

Step 1 Identify the breather mounting position. Remove the four M12 bolts from the flange cover and take off the cover.

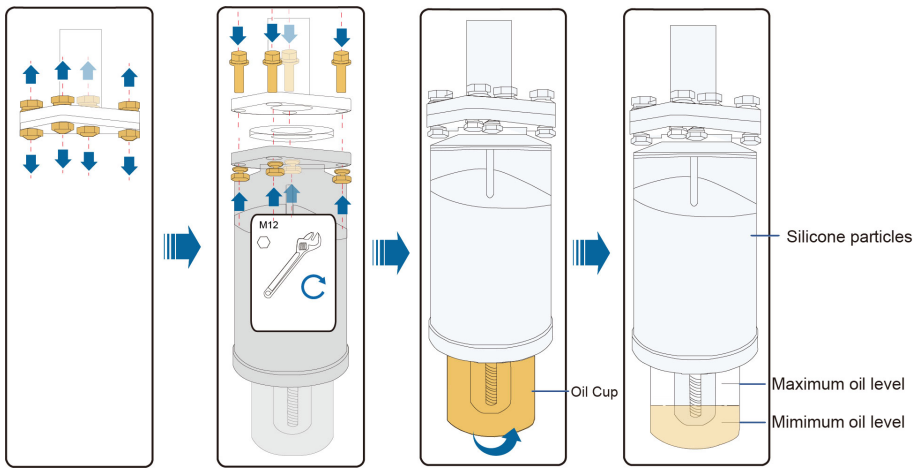
Step 2 Peel off the sealing warning label on the breather. Place the provided rubber gasket onto the flange. Mount the breather onto the flange using the same four M12 bolts in step 1, and tighten securely.

Make sure the gasket is compressed to one-fourth of its original thickness to ensure a proper seal.

Step 3 Remove the oil cup from the bottom of the breather.

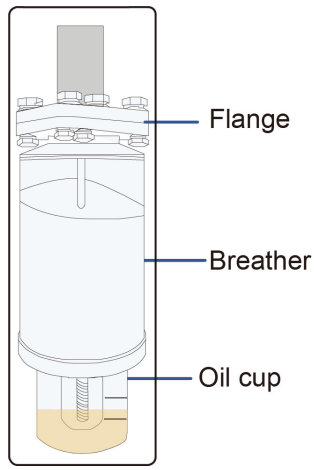
Step 4 Slowly open the oil injection valve and fill the oil cup until the oil level is between the two calibration marks. The upper mark indicates the maximum oil level, and the lower mark indicates the minimum. The oil level must fall within this range.

Step 5 Reinstall the oil cup onto the breather.



- - End

Once installed, the breather should appear as shown below:



7.6 LCD Parameter Setting

When the LCD is on, set the display language, date and time, communication parameters, active power limitation, etc. According to Chapter "9 LCD Menu Operation"in this manual; and view the running information and perform related operation.

7.7 Completing Commissioning

If all the start-up procedures have been performed, check the operating condition of the MV Gridconnected PV Inverter.

- Check whether there are anomalies of the module: abnormal noise, overheating, smoking or unusual odor.

- Check that the grid-connected voltage, current, and THD of the MV Gridconnected PV Inverter are stable.
- Check the grounding of the module enclosure.
- Check the functionality of the LCD screen.
- Record accurately the module operation data during commissioning.

The duration of commissioning depends on the plant scale, plant location, on-site environmental conditions and so on. Usually, if the in-site condition is good, the commissioning can last for 1 week, i.e. 168 hours.

The commissioning of the module is completed. Module operates normally.

The duration of commissioning depends on the plant scale, plant location, on-site environmental conditions and the like. Usually, if the on-site conditions are favorable, the commissioning can last for 1 week, i.e. 168 hours.

⚠ WARNING

After successful commissioning, the MV Grid-connected PV Inverter will be put into operation.

Local/national standards about the min. electric clearance around the MV Grid-connected PV Inverter should be respected.

NOTICE

MV Grid-connected PV Inverter needs no manual control in daily operation. Open the cabinet door only for maintenance or troubleshooting and by qualified personnel only.

Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.

8 Starting/Stopping

8.1 Starting

8.1.1 Inspection before Starting

After the maintenance or service work, inspect the following items, and then start the MV Gridconnected PV Inverter,

- All connections are performed by strictly following the installation manual and circuit diagram.
- The coverings of the internal devices are fixed and secured.
- The cabinet door is closed.
- The emergency stop button is released.
- Make sure, by using suitable instruments, that there is no ground fault in the PV array.
- Measure the DC and AC voltages with a multi-meter to check if the start-up conditions are met, and ensure no overvoltage hazard.

> ⚠ WARNING
>
> **After longtime storage, a thorough and professional test is necessary before starting the MV Gridconnected PV Inverter.**

8.1.2 Start Steps

When the foregoing conditions are met, proceed as follows to start the MV Grid-connected PV Inverter:

Step 1 Close the upstream smart PV combiner boxes and downstream MV load switch of the MV Gridconnected PV Inverter.

Step 2 (Optional) Turn the inverter unit interlock switch S2 to open.

Step 3 Close the QS25 AC maintenance switch, and QS2 DC maintenance switch, and Isolateswitch in power distribution cabinet.

Step 4 Stop the inverter unit through the LCD screen.

Step 5 (Optional) Turn off " Trip" and "Door-protect enable" through the LCD screen.

Step 6 Manually close QS1 and QS3 DC load switches inside the inverter unit. If the inverter unit was equipped with energy storage ports,close QS5 and QS7 as well.

Step 7 Perform the start operation through the LCD screen, and the MV Grid-connected PV Inverter starts grid-connected operation.

After startup, the MV Grid-connected PV Inverter will automatically check if parameters of the DC and AC side meet the grid-connection requirements. If the requirements are met, and the set time has been reached, the MV Grid-connected PV Inverter will turn to the OPERATION mode and feed the generated AC current to the grid.

- - End

Specific switch position，refer to"Figure 3-3 DC Cabinet"

WARNING

The MV Grid-connected PV Inverter needs no manual control in daily operation.
Only qualified personnel are allowed to open the cabinet door for maintenance or troubleshooting.
Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.

8.2 Stopping

Stop the MV Gridconnected PV Inverter when maintenance and service work is required or a fault occurs.

8.2.1 Normal Stop

Proceed as follows to stop the MV Grid-connected PV Inverter during normal maintenance and service work:

Step 1 Stop the MV Grid-connected PV Inverter through the stop instruction on the LCD screen.

Step 2 Disconnect the QS1 and QS3 DC load switches. If the inverter unit was equipped with energy storage ports, make sure the QS5 and QS7 are disconnected as well.

Step 3 Disconnect the AC maintenance switch QS25, and DC maintenance switch QS2, and Isolate-switch in power distribution cabinet.

Step 4 Check to make sure the AC circuit breakers QF1 and QF2 are disconnected.

Step 5 Disconnect the MV load switch.

Step 6 (Optional) Turn the Inverter interlock switch S2 in the inverter to close.

Step 7 Disconnect the switches of the smart PV combiner boxes.

Step 8 The MV Grid-connected PV Inverter stops running.

- - End

Specific switch position，refer to"Figure 3-3 DC Cabinet" and"Figure 3-4 AC Cabinet" .

WARNING

Never disconnect the AC or DC switch during normal operation. Otherwise, the MV Grid-connected PV Inverter as well as the switch may be damaged.

8.2.2 Stop in Case of Fault

Proceed as follows to stop the MV Grid-connected PV Inverter when a fault or an emergency occurs:

Step 1 Press the emergency stop button.

Step 2 Check to make sure the QS1 and QS3 DC load switches are disconnected. If the inverter unit was equipped with energy storage ports, make sure the QS5 and QS7 are disconnected as well.

Step 3 Disconnect the AC maintenance switch QS25, and DC maintenance switch QS2, and Isolate-switch in power distribution cabinet.

Step 4 Check to make sure the QF1 and QF2 AC circuit breakers are disconnected.

Step 5 Disconnect the MV load switch.

Step 6 (Optional) Turn the inverter interlock switch S2 to close.

Step 7 Disconnect the switches of the smart PV combiner boxes.

Step 8 The MV Grid-connected PV Inverter stops running.

- - End

Specific switch position，refer to"Figure 3-3 DC Cabinet" and "Figure 3-4 AC Cabinet".

WARNING

The emergency stop button will stay in lock state once you press it. Release it with the key.

WARNING

Press emergency stop button only when an emergency or a fault occurs. Under normal conditions, stop the MV Grid-connected PV Inverter via the stop instruction on the LCD screen.
Press the emergency stop button immediately in case of emergency to make to ensure a timely response.

9 LCD Menu Operation

9.1 LCD Screen

The eye-level LCD screen inside the monitoring window on the front side of the inverter unit is used to view data and set parameters.

User can check or set related data by touching the icons on the LCD screen.

For user convenience, a large number of pictures of the LCD interface are provided in this chapter. The parameters and other details in those pictures are indicative only. The actual product you receive may differ.

If the time shown on the LCD screen is different from the actual local time after time calibration, check and replace the button cells on the back of the LCD screen.

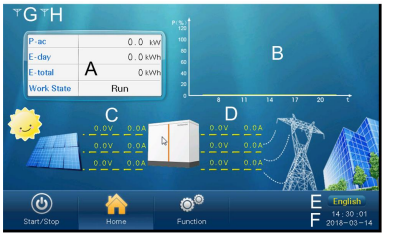
9.2 Default Screen

9.2.1 Initialization

The LCD is initialized when the power distribution cabinet is power on and then enters into the starting menu.

Appears every time the MV Grid-connected PV Inverter is energized. After initialization, the default screen follows.

9.2.2 Default Screen Introduction



No.	Description
A	Yield data. The first line on the top indicates the present active power; work state is the transient state of the MV Grid-connected PV Inverter.
B	Today's active power curve to indicate the power percentage (power value divides the MV Grid-connected PV Inverter nominal power value).
C	DC side voltage and current of the MV Grid-connected PV Inverter respectively.

No.	Description
D	AC side line-to-line voltage and phase current.
E	Language selection button.
F	Present date and time.
G	Success rate of the MV Grid-connected PV Inverter internal communication.
H	Success rate of communication between the MV Grid-connected PV Inverter and laptop.

Enter the following submenus from the default menu.

WARNING

LCD screen contains lots of parameters pertinent to the MV Gridconnected PV Inverter operation. All parameter configurations must be performed by appointed personnel. Do not modify any parameters without full understanding of the relevant action or without consulting SUNGROW Customer Support.

9.2.3 Backlight and Screensaver

If no operation has been performed on the screen for more than 5 minutes, the backlight will go off. Tap the screen to activate the backlight so that the latest interface reappears.

9.3 Overview of LCD Menu and Icon

9.3.1 Overview of Submenu and Icon

There are three buttons on the lower left side of the touch panel: "**Start/Stop**" 

, "**Home** 

" , "**Function**" 

. The user can perform related operations via these buttons.

Main Menu	First sub-menu	Second sub-menu	Third sub-menu
Start/Stop	Start	—	—
	Stop	—	—
Home	—	—	—
Function	Run-information	Real Time Data	—
		Power curve	—
		E-histogram	—
	History-information	His-event	—
		His-fault	—
		His-data	—
		His-alarm	—
	Start/Stop	Start	—
		Stop	—

Main Menu	First sub-menu	Second sub-menu	Third sub-menu
	Set-parameter	Sys-parameter	Language & Firmware Ver.
			Time
			Remote/Local control
			E-adjust
			Load default
		Run-parameter	—
		Pro-parameter	—
		Com-parameter	Address
			Serial port param.
			Network param.

9.3.2 Layout of the submenus

The layout of submenus is the same as that shown below except for the default menu.

No.	Description
A	Title bar The first line from the top is the present success rate of communication. The left side of the second line is the name of the present page, while the right side is the present date and time.
B	Data display or parameter configuration.
C	From left to right, there are three main icons and a return button which is used to return to the previous menu.

For convenience's sake, the operations on the menus are referred to as the menu name with quotation marks. For example, the 

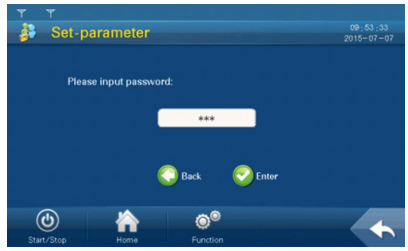
menu will be referred to as "Set-parameter".

9.4 Entering Password

MV Grid-connected PV Inverterparameters are protected by password. User can enter into the "Set-parameter" sub-menu only after entering the correct password. Proceed as follows to enter the password:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter” and the password entering window pops up.

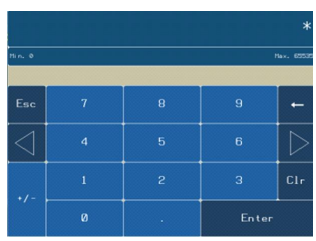


Step 3 Tap the white edit box and a keypad pops up.

Step 4 Enter the password 1111 through the keypad.

If the entered password is correct, the parameter setting page pops up, and the user can set system parameters, running parameters, protection parameters, and communication parameters.

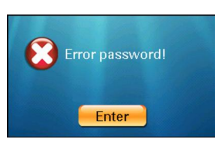
Button	Function
←	Backspace key, delete the digit input
Clr	Clear the digitals input
Esc	Escape and close the keypad
Enter	Confirm the password entered
Max./Min.	The maximum and minimum value can be input; digital outside this range is invalid



If the input password is 1111, user can enter into the normal parameter setting page and set the system parameters, running parameters, protection parameters and communication parameters.

Step 5 Press “Enter” to confirm the password entered.

Step 6 If the password is incorrect, an “Error password” window will appear. Tap “Enter” and re-enter the password.



- - End

9.5 Setting Language

User can set the language by either of the following two ways:

9.5.1 Conventional Way

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Sys-parameter” after entering the correct password.

Step 4 Tap “Language & Firmware Ver.” and enter into the language and firmware version sub-menu.

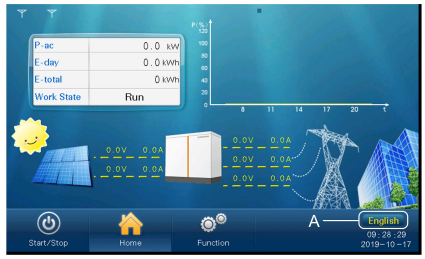
Step 5 Select the desired language.

- - End

9.5.2 Shortcut

The language setting shortcut (shown by A) is in the lower right corner of the Home menu. Select either language by tapping the language button.

Language on the button is the present display language of the display.



9.6 Setting Date and Time

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Sys-parameter” after entering the correct password.

Step 4 Tap “Time” and enter into the date and time setting sub-menu.

Step 5 Set the “Year”, “Month”, “Date”, “Hour”, “Minute” and “Second”. Tap the corresponding field and the keypad will appear.

Step 6 Set the time and date by tapping the keypad and confirm setting by tapping “Enter”.

- - End

9.7 Energy Output Deviation Adjustment

Energy output deviation adjustment is useful when the total power output displayed in LCD (E-total) is different from the reading value of the external power measuring device.
(Energy-adj value)= (Real measured value)-(E-tot reading value).
To adjust the date or time, proceed as follow:

Step 1 Tap “Function” from the default menu;

Step 2 Tap “Set-parameter”;

Step 3 Tap “Sys-parameter” after entering the correct password;

Step 4 Tap “E-total adjust” and enter into the energy output deviation adjustment sub-menu;

Tap the cell below the “Compensation” and the keypad appears. Enter the energy compensation by tapping the keypad;

Step 5 Tap “Enter” to confirm the setting.

- - End

9.8 Checking Running Information

Running information contains all data related to the operation of the MV Gridconnected PV Inverter:

Real-time Data

The real time running information of the inverter units can be checked.
The output power, DC voltage & current, power factor, reactive power, efficiency, daily/monthly/annual power yields, internal temperature, positive/negative insulation resistance to the ground, running time, amount of CO_2 reduction, grid frequency, AC phase/line voltage, module temperature, AC & DC switches states, bypass switches/fuse state, power supply mode are included.

Power Curve

The output power curve shows the power yield on that particular day in percentage of the nominal power. The data is updated every several seconds and all the diagram data will be cleared at the beginning of a new day.

E-histogram

The histogram shows the power yields of the present day.
Proceed as follow to view the running information:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Run-information” and switch among “Real Time Data”, “Power curve” and “E-histogram”. The default display is “Real Time Data”.

Step 3 Tap “Power curve” and enter into the power curve sub-menu.

Step 4 Tap “E-histogram” and enter into the electricity histogram sub-menu.

The value displayed is indicative only and cannot be used as a basis for billing.

- - End

9.9 Checking History Information

There are four kinds of history information: history event, history fault, history data and history alarm.

9.9.1 Checking History Event

Step 1 Tap “Function” from the default menu.

Step 2 Tap “History-information” and enter into the history information sub-menu.

Step 3 Tap “His-event” and enter into the history event sub-menu.

History events can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total number of the current event records. Tap “Prev” or “Next” to turn pages up or down.

- - End

9.9.2 Checking History Data

System can record the MV Grid-connected PV Inverterrunning information for the latest 90 days with the records updated every 15 minutes per day.
History data displays the data related to the power yields and the electric quantity of the MV Gridconnected PV Inverter. Proceed as follows to check the history information:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “History-information” and enter into the history information sub-menu.

Step 3 Tap “His-data” and enter into the history data sub-menu.

Tap “Prev” or “Next” to turn pages up or down.

- - End

9.9.3 Checking History Fault

When a fault occurs, the user can view the fault and the history fault records via the LCD screen, and the steps are as follows:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “History-information” and enter into the history information sub-menu.

Step 3 Tap “His-fault” and enter into the history fault sub-menu.

History faults can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total number of the current fault records. Tap “Prev” or “Next” to turn pages up or down.

- - End

9.9.4 Checking History Alarm

Proceed as follows to check the history warn information:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “History-information” and enter into the history information sub-menu.

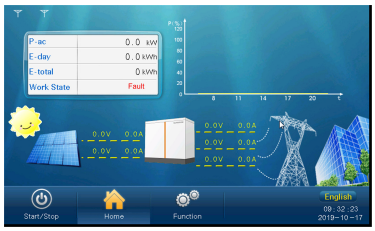
Step 3 Tap “his-alarm” and enter into the history alarm sub-menu.

History alarms can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total numbers of the current warn records. Tap “Prev” or “Next” to turn pages up or down.

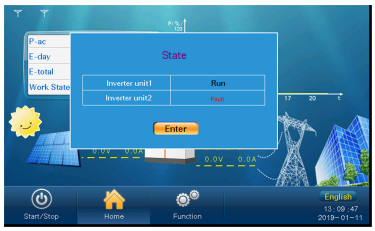
- - End

9.10 Checking Present Fault Information

There may be one or more than one fault occurs to one or more than one module inside the MV Grid-connected PV Inverterat the same time which can be viewed through the LCD screen. Follow the description in this chapter to view the fault information when faults occur.



If there is a fault, the “Work State” will show “Fault”. Tap the “Fault” cell.



The state column of the module that has fault will display “Fault. As shown in the left figure, a fault occurs to inverter unit 2. Tap the fault cell of inverter unit 2 to check the present fault.

The fault interface of inverter unit 2 will appear with the fault item in red.

9.11 Starting/Stopping

Usually, the MV Grid-connected PV Inverterwill start automatically when the grid-connected requirements are met.

Start/stop the MV Grid-connected PV Inverterthrough the LCD screen in either of the following manners:

- Tap “Start/Stop” from the default menu.
- Tap “Start/Stop” from the Function menu.

By tapping the start/stop button on the screen, all the MV Grid-connected PV Inverterwill start or stop at the same time. A confirm operation interface will appear after tapping the corresponding buttons. The instruction takes effect after confirmation; or the user can cancel the operation by tapping “Cancel”.

9.12 Load Default

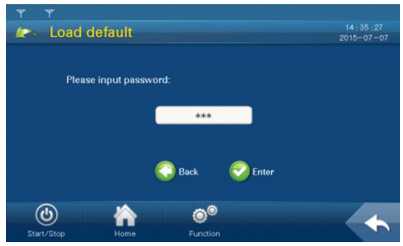
Proceed as follows to restore factory defaults:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Sys-parameter” after entering the correct password.

Step 4 Tap “Load default” and the password inputting window appears.



Tap “Load default” and the password inputting window appears;

- - End

9.13 Checking Firmware Version

User can view the firmware version of LCD and DSP as follows:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Sys-parameter” after entering the correct password.

Step 4 Tap “Language & Firmware Ver.” and enter into the language and firmware version sub-menu.

Step 5 The firmware versions of LCD and DSP are displayed at the bottom of the page.

- - End

9.14 Parameters of LCD

9.14.1 Communication Parameters

⚠ WARNING

Improper communication parameter configuration may lead to communication failure!

Follow strictly the instructions of the PV power plant staff in configuring the communication parameters.

Proceed as follows to set the communication parameters:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Com-parameter” after entering the correct password.

- Set parameter from the Address interface for setting the address.
- Set parameter from the Serial Port Parameter interface for baud.
- Set parameter from the Network Parameter interface for IP address, subnet mask,etc.

- - End

9.14.2 Running Parameters

Setting Running Parameters

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Run-parameter” after entering the correct password.

Step 4 Set the running parameter by tapping the pop-up keypad and tap ENTER to confirm setting. Tap “Prev” or “Next” to turn pages up or down.

- - End

9.14.3 Protection Parameter

Setting Protection Parameter

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Pro-parameter” after entering the correct password.

Step 4 Set the protection parameter by tapping the pop-up keypad and tap ENTER to confirm setting. Tap “Prev” or “Next” to turn pages up or down.

- - End

10 Main Functions

10.1 Operation Mode

10.1.1 Mode Change

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

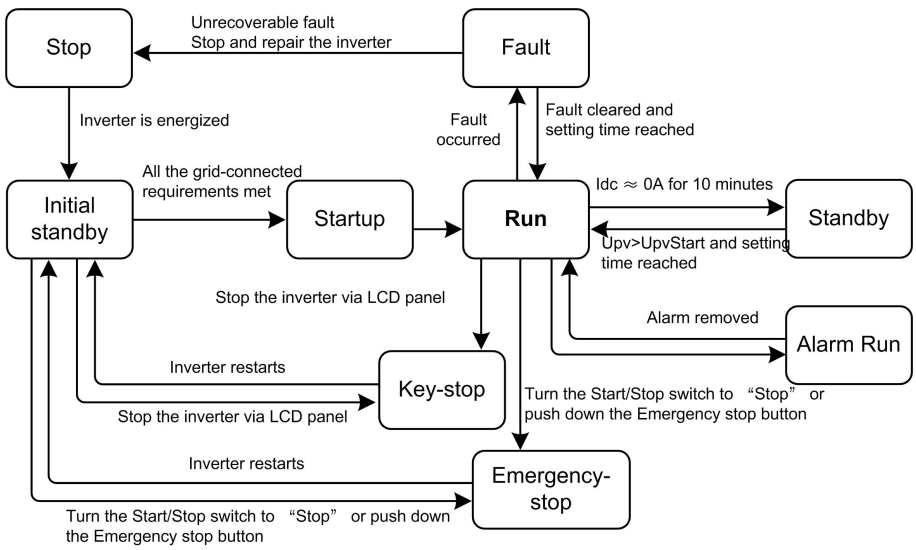


Figure 10-1 Operation modes change

$U_{pv}$is the DC input voltage of the module.

U_{pv}Start is the module DC side startup voltage.

10.1.2 Operation Mode Description

Stop

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

Initial Standby

When the module upstream and downstream connections are connected and the DC switches are in the "ON" position, the module turns to the **Initial Standby** mode.

Module will continuously check if the PV array and the grid meet the grid-connection requirements. If the module DC input voltage is higher than the module startup voltage and the startup time is reached, whilst the requirements of the grid side parameter are satisfied, module 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, module will start powering the grid.

Run

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

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

Standby

In **Run** mode, module will enter into the **Standby** mode if the DC side current is as low as 0A for a while.

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

Fault

If a fault occurs during operation, module will enter into the **Fault** mode. LCD screen will display the fault type with the "Fault" indicator on until the fault is removed. After the fault is removed, the MV Gridconnected PV Inverter reverts to **Run** mode.

During this period, if you want to start the module manually, first confirm the stop clear protection program from the LCD screen and then start the module.

If the fault is unrecoverable, stop the MV Gridconnected PV Inverter and perform maintenance work. Module will automatically check if the fault is recoverable.

⚠ WARNING

When a DSP fault or a module fault occurs, never restart the MV Gridconnected PV Inverter through the LCD. Perform a power-off check before reenergizing the MV Gridconnected PV Inverter.

Otherwise, the module may be damaged.

Emergency-stop

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

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

Key-stop

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

Alarm Run

In **Alarm Run** mode, module can keep running but send alarm signal. User can check the present alarm information through the Working state on the LCD default screen or check the latest history alarm information through “Function”->”History information”->”his alarm”. Module automatically turns to **Run** mode when the alarm is removed.

10.2 Complete Control Strategy(Optional)

The following three control strategies are provided for user to perform control functions and configure relevant parameters.

- “Remote”: The control codes can be sent only by the remote control machine.
- “Local”: The control codes can be sent only by the LCD screen.
- “Remote/Local”: Both “Remote” and “Local” codes are effective.

Proceed to set the control strategy on the LCD screen as follows:

Step 1 Tap “Function” from the default menu;

Step 2 Tap “Set-parameter”;

Step 3 Tap “Sys-parameter” after entering the correct password.

Step 4 Tap “Remote/Local control” and enter into the Remote/Local control sub-menu.

Step 5 Select the control method through the pull-down list.

- - End

10.3 Active Power Limitation

10.3.1 Introduction to Active Power Limitation

Cases in which power limitation is required are as follows:

- Potential threatens to the MV Grid-connected PV Inverter safety operation
- Over-load of the grid branch connected to the MV Grid-connected PV Inverter
- Islanding
- Factors affecting the stability of the stable grid status and dynamic grid status
- Frequency rising affects the system stability
- Grid maintenance
- Grid management

10.3.2 How to Realize Power Limitation

WARNING

Improper parameter configuration may affect the normal operation of the MV Gridconnected PV Inverter!
Only authorized personnel can configure these parameters.
Should any questions or doubt occur, contact SUNGROW.

User can adjust the MV Grid-connected PV Inverter active power output through the LCD screen:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Run-parameter” after entering the correct password.

Step 4 Set the “Limit Power (%)” parameter by tapping the pop-up keypad.

Step 5 Tap “Enter” to confirm setting.

- - End

Parameters related to power limitation “P-rise rate (%/s)” and “P-decline rate (%/s)” are also included in the running parameter setting sub-menu and can be set accordingly.

10.4 Reactive Power Adjustment

MV User can adjust can provide reactive power output. User can open or close the reactive power adjustment switch and set the reactive power output through the LCD screen.
Reactive power limitation is performed through the running information sub-menu as follows:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Run-parameter” after entering the correct password.

Step 4 Turn the page down to select the “Q-adjust switch”. Tap the pull-down list and the options:

- Close: reactive power cannot be adjusted
- Pf: adjust the reactive power by setting power factor
- Q-limit: adjust the reactive power by setting reactive power percentage
- QU mode: the reactive power changes with the grid voltage
- QP mode: the PF changes with the output power of the inverter
- V-auto-adj: reserved.

Step 5 If Pf is selected, the power factor can be set in the “Run-information” sub-menu;

- if “Q-limit” is selected, the “Q-limit (%)” can be set in the “Run-information” sub-menu.
- if "QU mode" is selected, QU-related parameter can be set on the running parameter interface, where the parameter name begins with "QU", for example, QU operation mode.

- - End

⚠ WARNING

Improper parameter configuration may affect the normal operation of the MV Gridconnected PV Inverter!
Only authorized personnel can configure these parameters.
Should any question or doubt occurs, contact SUNGROW.

10.5 Low Voltage Ride Through (LVRT)

Technical Requirements for Connecting Photovoltaic Power Station to Power System requires medium-and-large PV plant should be equipped with Low Voltage Ride Through (-LVRT) ability.

LVRT requires: PV power plant can operate normally within certain voltage drop range and duration when the voltage of the grid-connected point drops due to the power system failure or disturbance; PV power plant can provide the dynamic reactive power support during the period.

Active Power Recovery

If the MV Grid-connected PV Inverter still connects to the grid during power system failure, the active power will recover from the moment the fault is removed at the speed of at least 30% nominal power/per second.

Dynamic Reactive Current Support

During LVRT, MV Grid-connected PV Inverter should feed reactive current to the power system as per requirements. For a station whose 500kV or 750kV voltage is stepped up from the 220kV or 330kV voltage and then connects to the power station group, it should feed reactive current to the grid when a short-circuit occurs and the voltage drops.

Zero Voltage Ride Through

When the grid-connection point voltage drops to zero, MV Grid-connected PV Inverter can operation normally for 0.25 second.

Note: U_T is the grid-connection point voltage; Upu is the grid-connection point nominal voltage.

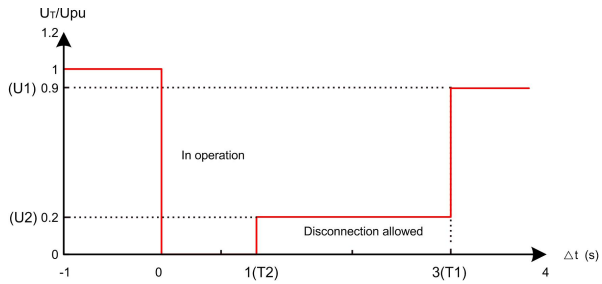


Figure 10-2 Lower voltage withstand requirements

Note: T1, T2, U1, and U2 are all settable parameters.

SUNGROW's MV Grid-connected PV Inverter meets the abovementioned requirements.

10.6 High Voltage Ride Through (HVRT)

Technical Requirements for Connecting Photovoltaic Power Station to Power System requires PV plant should be able to operate as required within certain voltage range.

Grid-connection pint voltage	Requirements
$1.1U_{pu}<U_T<1.2U_{pu}$	Operate for at least 10s
$1.2U_{pu}\leq U_T\leq 1.3U_{pu}$	Operate for at least 0.5s

Note: U_T is the grid-connection point voltage;

U_{pu} is the grid-connection point nominal voltage.

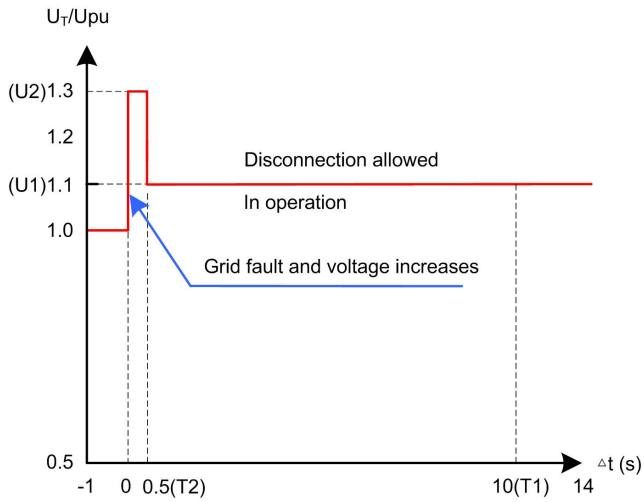


Figure 10-3 High voltage withstand requirements

Note: T1, T2, U1, and U2 are all settable parameters.

SUNGROW's MV Grid-connected PV Inverter meets the abovementioned requirements.

10.7 MPPT

Maximum Power Point Tracking (MPPT) is a technique that the MV Grid-connected PV Inverter uses to get the maximum power from the PV arrays. PV arrays have a complex relationship between solar irradiation, temperature and total resistance that produces a non-linear output efficiency known as the I-V curve.

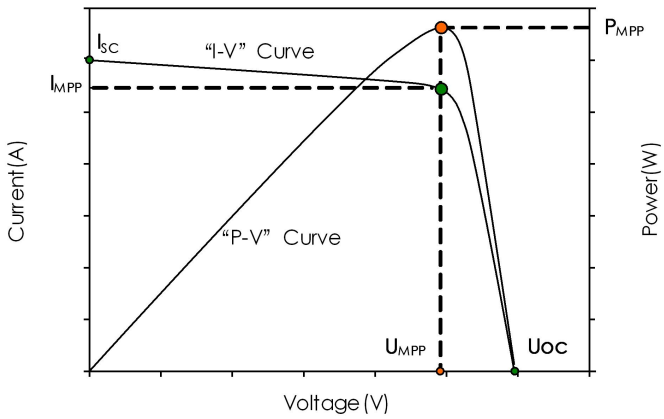


Figure 10-4 MPPT

10.8 Intelligent Temperature-Control Technology

MV Grid-connected PV Inverter will continuously detect the IGBT module temperature and adjust the fan speed accordingly. When the IGBT module temperature is low, MV Gridconnected PV Inverter will decrease the fan speed to lower the device noise and decrease the device operation consumption. As the IGBT module temperature increases, the MV Grid-connected PV Inverter will increase the fan speed for better heat dissipation.

The intelligent temperature-control technology can synchronize the speed of fan and temperature of the IGBT module and thus optimize the module temperature and other conditions.

10.9 Anti-PID Effect Function (Optional)

10.9.1 Introduction to PID Effect

Potential Induced Degradation (PID) of the solar module is a performance degradation caused by high negative voltage. The PID effect can occur with all crystalline silicon solar cells that are embedded in glass-foil modules, leakage currents can result under unfavorable conditions (accelerated by high humidity and temperature) where the inverter unit joins with the frame and causes short-circuits that lower the overall performance of the system.

This MV Grid-connected PV Inverter is equipped with optional anti-PID function to effectively prevent the PID.

10.9.2 Anti-PID Function Setting

WARNING

For MV Grid-connected PV Inverter with optional anti-PID function, the enable and disable of this function can only be performed by personnel from SUNGROW. Contact SUNGROW if you need to switch this function.

Proceed as follows to set the mode if the Anti-PID mode is enabled:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Pro-parameter” after entering the correct password.

Step 4 Click Next to find the page with “Anti-PID mode” and select the mode by the drop-down list (Suppression/Repair).

Select according to the on-site situation.

- - End

10.9.3 PID Repair

WARNING

Make sure the “Anti-PID mode” in the protection parameter of the MV Grid-connected PV Inverter is “Repair” when enabling the PID repair function.

If theMV Grid-connected PV Inverter is in deep standby state or the repair process is interrupted, user can enable the repair function manually from the LCD as follows:

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Pro-parameter” after entering the correct password.

Step 4 Click Next to find the page with “PID repair” and click to enable the manual repair.

If this function is enabled, the Work state in the main screen will show “Repair PV”. User may find the “Negative Vgnd” is about 500V from “Function->Run-information->Real Time Data”.

- - End

If there is Key stop or Emergency stop or a device fault during the repair process, the repair process will automatically stop.

10.10 Insulation Monitoring Function

10.10.1 Introduction

Insulation resistance is a parameter important for safety operation. If the insulation resistance is low, the direct contact protection and indirect contact protection may be failed; meanwhile the fault current against the ground and the short circuit caused by low insulation resistance may lead to electric fire, device damage or even physical hazards. SUNGROW's MV Grid-connected PV Inverter is equipped with insulation resistance monitoring function to detect the system insulation resistance in real time. If the resistance is detected to be low, it will send alarm at the first time to remind the user and prevent potential hazards.

Insulation monitoring can be enabled by two modes, described below:

- Automatic mode: Upon first power-on, the equipment will be in negative pole grounding mode. After transfer from operating mode to standby mode, in the morning of the second day, when DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report "insulation resistance" fault, and monitoring of resistance will continue till it becomes normal. If monitored resistance is normal, the equipment will exit insulation monitoring mode and negative pole grounding mode will be restored.
- Manual mode: Without shutdown conditions of the equipment, on the LCD screen parameters setup interface, enable "manual insulation monitoring". If current DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report "insulation resistance" fault. If monitored resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again. Upon pressing of shutdown key during manual monitoring, if current resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again.

10.10.2 Simple Troubleshooting

Regardless of the MV Grid-connected PV Inverter setting, when the insulation resistance is below the threshold (settable from the LCD screen), MV Grid-connected PV Inverter will send alarm signal and the Operation LED will turn to yellow. After receiving the "low insulation resistance" alarm signal, user should stop the device and check the specific insulation resistance from the LCD screen "Function"–>"Run-information"->"Real time data".

- If the insulation resistance recovers to normal, the fault loop is in the AC side.
- If the insulation resistance is still low, the fault loop is in the DC side.
- Whether the fault is on the DC side or AC side, switch off the system and perform a thorough checking and troubleshooting.

10.11 Emergency Stop Button functions

The emergency stop button is located inside the monitoring window.

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

10.12 Tripping Functions of the DC Main Switches

There are two selections (Enable/Disable) for the parameter “Trip” in the running parameter of the LCD screen. If the “Enable” options is chosen, all DC load switches of MV Gridconnected PV Inverter will trip immediately. If required, observed the following steps.

Step 1 Tap “Function” from the default menu.

Step 2 Tap “Set-parameter”.

Step 3 Tap “Run-parameter” after entering the correct password.

Step 4 Click Next to find the page with “Trip” and select “Enable” .

Before the MV Grid-connected PV Inverter is put into operation again, set the parameter “Trip” as “Disable” first, then close all the DC load switches of the MV Grid-connected PV Inverter.

- - End

10.13 Protection Function

MV Grid-connected PV Inverter has complete protection functions to protect itself when input voltage or grid is abnormal until the anomaly is removed and the MV Grid-connected PV Inverter can operate normally.

10.13.1 DC Over-voltage Protection

When the DC voltage of the PV array exceeds the max. DC voltage, MV Grid-connected PV Inverter will stop operating, send warning signal and display the fault type on the LCD screen.
MV Grid-connected PV Inverter can detect the abnormal voltage and respond quickly.

10.13.2 AC Over/under-voltage Protection

When the MV Grid-connected PV Inverter AC output voltage exceeds the permissible range, MV Grid-connected PV Inverter will stop feeding the grid, send warning signal and display the fault type on the LCD screen.
MV Grid-connected PV Inverter can detect the abnormal voltage and respond quickly.

10.13.3 Frequency Anomaly Protection

When the grid frequency exceeds the permissible range, MV Grid-connected PV Inverter will stop feeding the grid, send warning signal and display the fault type on the LCD screen.
MV Grid-connected PV Inverter can detect the abnormal frequency and respond quickly.

10.13.4 Islanding Protection

Islanding is a condition that can occur if the grid is disconnected while the MV Grid-connected PV Inverter is operating and the local load of the MV Grid-connected PV Inverter is similar to the present output power.

“Islanding” is a potential threaten to devices and operators.

- In the event of grid outage, if the MV Grid-connected PV Inverter still feeds power to the public grid, death or injury may occur to the maintainers during maintenance.
- In the event of grid fault, if the MV Grid-connected PV Inverter still feeds power to the public grid, a surge current may occur and damage devices once the grid resumes.

MV Grid-connected PV Inverter is equipped with anti-islanding protection function.

⚠ WARNING

In islanding protection state, high voltage is still present. Disconnect all AC and DC switches, and wait the device to discharge completely before testing or maintenance.

10.13.5 Overload Protection

When the PV array output power exceeds the MV Grid-connected PV Inverter permissible maximum input power, MV Grid-connected PV Inverter will limit the power yield at maximum AC power point. If the temperature exceeds the permissible value, MV Grid-connected PV Inverter will automatically stop operating unless the condition resumes normal.

10.13.6 Ground Protection

The grounding cables are equipped with the leakage current sensor. When the leakage current is detected to exceed the setting value, system will send instruction to stop the module and display the fault type on the LCD screen.

10.13.7 Module Over-temperature Protection

IGBT modules inside the inverter unit use thermal sensor with high-precision to monitor the real-time module temperature. Once the module temperature is detected to be high, DSP will send direction to stop the inverter unit or derate the output.

10.13.8 Internal Over-temperature Protection

The MV Gridconnected PV Inverter is equipped with high-precision thermal sensor to monitor the internal temperature of the MV Gridconnected PV Inverter. Once the over-temperature is detected, the DSP will send an instruction to stop the MV Gridconnected PV Inverter and keep safe operation.

11 Troubleshooting

11.1 Safety Instructions

DANGER

Lethal voltages are present inside the MV Grid-connected PV Inverter when a fault occurs.

- **Only qualified personnel can perform the troubleshooting described in this chapter. Qualified means that the operator has received professional training on devices troubleshooting.**
- **Do not perform any troubleshooting other than that specified in this manual.**
- **Respect all safety instructions during troubleshooting.**

WARNING

The electrical components inside the MV Grid-connected PV Inverter must be replaced by components from the same manufacturer.
The model number can be acquired from the marking of the MV Grid-connected PV Inverter or the component itself. If otherwise, contact SUNGROW.

WARNING

If the field work needs to replace the components with products from other manufacturer or with different model number, a prior analysis and confirmation by SUNGROW is needed.
Failure to follow this procedure may lead to physical injury or death and void all warranty from SUNGROW.

WARNING

Disconnect all AC and DC Switches before troubleshooting.

11.2 Checking Fault

If any power output anomaly is detected, check the following items before contacting SUNGROW.

- Open-circuit voltage of the PV arrays
- State of the emergency stop button

- Power limitation state

If there is any questions or doubts that are not covered by this manual, contact us.

With the following information provided, SUNGROW shall diagnose and solve the problem more easily:

- Type and serial number of the MV Grid-connected PV Inverter and internal devices
- Manufacturer, model, and configuration of the PV arrays and upstream & downstream combiner devices connected to the MV Gridconnected PV Inverter
- MV Grid-connected PV Inverter communication solution
- Fault and brief description of the fault phenomenon
- A picture of the fault if necessary

11.3 Fault and Troubleshooting on the Inverter

The fault information of the inverter can be viewed on the home page of the LCD screen. Specifically, refer to the chapter "9.10 Checking Present Fault Information ".

Fault severities of the inverter are defined as follows:

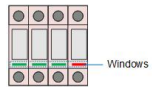
- Major: The MV Grid-connected PV Inverter shuts down and stops feeding power into the grid.
- Minor: Some components are faulty, but the MV Grid-connected PV Inverter can still feed power to the grid.
- Warning: Functions of the MV Grid-connected PV Inverter are normal, but the output power drops due to external factors.

The fault severity of fault names and their corresponding solutions are shown in the following table.

Fault name	Explanation	Fault severity	Measures
Module Fault	The drive board is faulty or hardware overcurrent occurs.	Major	1. Check whether the AC/DC side of the IGBT module is short-circuited. 2. Check whether the grid is normal. 3. Check whether the appearances of modules inside the inverter are normal. NOTICE **The inverter has a protection logic that in case of failure of 5 attemps to perform self-tests, it enters in a non-self-recovery 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 the inverter, instead, contact SUNGROW personnel for the support.**
Cntr-flt	The contactor is faulty.	Major	Disconnect the AC and DC switches of the module, allow the module capacitors to discharge completely, and then check whether the appearance of the AC contactor is normal.
Mism-Iac	The AC current is unbalanced.	Major	Check whether the grid is normal or whether phase loss occurs.
L over-temp	The reactor temperature is excessively high.	Major	1. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the MV Gridconnected PV Inverter are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.

Fault name	Explanation	Fault severity	Measures
Temp control cabinet flt	Faults occur due to excessively high temperature inside the control cabinet.	Major	1. Check the grid voltage, and inspect whether the grid voltage harmonic is normal. 2. Check whether the fans operate normally. 3. Check the AC filtering system, and inspect whether the AC filter capacitor is damaged, for example, cracked. Check whether the 3-phase current of the capacitor is in balance when necessary.
Vdc-Low	The DC input voltage is excessively low.	Major	1. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured. 2. In the event of inconsistency, check whether the circuits on the DC side are short-circuited or connected incorrectly.
Bus underv-oltage	The DC bus voltage is excessively low.	Major	Refer to the measures for "Vdc-Low".
V-midpoint offset	Neutral point potential shifting occurs on the DC side of the module.	Major	1. Check whether the DC side of the module is short-circuited, the input voltage falls beyond the permissible range, and the grid voltage is normal. 2. Check the history fault screen of the LCD to ensure whether faults such as DC overvoltage/ undervoltage, PDP, and AC overcurrent exist at the same time. If so, refer to the corresponding measures.
Temp-flt	The fault occurs when the temperature at the air inlet is higher than the protective threshold.	Major	1. Ensure the ambient temperature. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the MV Gridconnected PV Inverter are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.

Fault name	Explanation	Fault severity	Measures
DC cabinet over-temp	The temperature in the DC cabinet is excessively high.	Major	Refer to the measures for "Temp-flt".
Vac-high	The grid voltage is higher than the set protective threshold.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the protection parameter is in compliance with the local standards and regulations. 2. Disconnect the AC switches, and check whether the actual grid voltage is within the normal range. 3. Check, in the **Stop** mode, whether the grid voltage displayed on the LCD is consistent with the voltage actually measured.
Vac-low	The grid voltage is lower than the set protective threshold.	Major	Refer to the measures for "Vac-high".
F-fault	The grid frequency is abnormal.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the Protection parameter is in compliance with the local standards and regulations. 2. Check, in the **Stop** mode, whether the grid frequency displayed on the LCD is consistent with the actual grid frequency.
Island/ No grid	Grid blackout occurs or AC transient voltage exceeds the protective threshold.	Major	1. Check whether the grid is normal. 2. Check whether power outage occurs on the AC side. 3. Check whether the AC circuit breakers of the module are connected.

Fault name	Explanation	Fault severity	Measures
Ctrol power supply flt	The control power supply is abnormal.	Major	1. Check whether the control switches of both the internal and external power supply are in the ON or OFF positions. If all switches are in the ON position, disconnect a switch. If all switches are in the OFF position, connect a switch. 2. Check whether the internal and external power supply terminals are loose or poorly contacted. Fasten the terminals when necessary.
Vdc-samp-flt	The fault of DC voltage sampling occurs.	Major	Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.
Soft start-flt	Failed to start the inverter.	Major	Check whether the grid is normal, for example, whether the grid harmonic and grid voltage are balanced.
DC-SPD flt	The SPD on the DC side of the module is faulty.	Major	The state window of the SPD is as follows:  1. When the window colour is turned red from green, it indicates that the SPD is damaged (-perhaps, due to thunderstorms). In this case, measure the AC and DC parameters, including positive and negative pole voltages to ground, and replace the SPD when the parameters recover to normal value. 2. When the window is in normal colour, the fault may be caused by poor contact between the SPD and its base. In this case, reinstall the SPD to ensure good contact.

Fault name	Explanation	Fault severity	Measures
AC SPD flt	The SPD on the AC side of the module is faulty.	Major	1. Refer to the measure for "DC-SPD flt". 2. Check whether the micro circuit breaker connected in series to the SPD is disconnected. 3. If the micro circuit breaker is disconnected, measure the AC and DC parameters. If the values measured are normal, reconnect the micro circuit breaker.
Vdc-high	The DC voltage of the module exceeds the protective threshold.	Major	1. Disconnect the DC switches of the module, and check whether the open-circuit voltage of the PV array is normal. If it is abnormal, the alarm may result from PV array configuration. 2. Ensure that the LV side of the transformer is connected in the Y type, and the neutral point is not grounded. 3. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.
PV pol-rev	Polarity on the DC input side is reserved.	Major	Check whether the polarity on the DC of the module is correct.
Hardwa-re-flt	Interior hardware of the module is faulty.	Major	Measure the DC voltage of the MV Grid-connected PV Inverter , to check whether short circuit occurs inside the MV Gridconnected PV Inverter.
Iac-high	AC current of the inverter is excessively high.	Major	1. Check whether the AC and DC cables of the inverter are firmly in place. 2. Check the insulation of the cables for intactness. 3. Check whether the wiring terminals are short-circuited to ground.
Overloa-d-pro	Output overload occurs.	Major	Refer to the measures for "Iac-high".

Fault name	Explanation	Fault severity	Measures
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.
PM-high	The temperature of modules inside the module room is excessively high.	Major	1. Check the air inlets. 2. Check whether the air outlets of the MV Gridconnected PV Inverter are obstructed by foreign materials. Replace the filters when necessary. 3. Check whether the fans function normally during the operation of the MV Gridconnected PV Inverter.
Fan1-flt/ Fan2-flt	Fan 1 or fan 2 inside the inverter is faulty.	Major	1. Check whether the grid voltage is normal. Measure the grid voltage with a multimeter, and check whether phase loss occurs. 2. Check whether the fans are normally supplied with power. Measure the three-phase power source with a multimeter to ensure the nominal input voltage is 400 Vac.
Gnd-flt	Grounding fault.	Major	1. Check the DC cables. Check whether positive DC cables connected to the ground are damaged. Check whether the impedance to ground of the DC cable is normal. 2. Check the AC cables. Check whether voltages to ground of all the three phases are the same. In addition, check whether SPDs on the inverter side and transformer side are damaged.

Fault name	Explanation	Fault severity	Measures
AC Switch flt/ AC breaker flt	The AC switches are faulty.	Major	1. Check whether AC switches have tripped. 2. Check whether AC switches are damaged. 3. Check whether AC switches are connected/ disconnected normally. 4. Check AC switches for conductivity with a multimeter.
Radiator over temp	The temperature of the heat sink inside the inverter is excessively high.	Major	Check whether the fans are normal. If the fans are normal, check whether the air ducts are obstructed.
DC fuse flt	DC fuses are abnormal.	Major	Refer to the measures for "DC fuse-abnomal".
GFDI pro	DC grounding protection is abnormal.	Major	1. The negative pole of the MV Grid-connected PV Inverter is not securely grounded. 2. Check whether the negative grounding fuses blow.
AC fuse flt	AC fuses are abnormal.	Major	Check the AC fuses.
Grid_V_ unbalan-ced	Grid voltage is unbalanced.	Major	Measure the grid voltage, and check whether grid voltage unbalance exists.
Current2 Unbala-nced/ Current3 Unbala-nced	AC current unbalance	Major	Measure the grid voltage, to check whether phase loss occurs.
AC switch breaking	AC switch is disconnected.	Major	Connect the AC switch, after which the alarm is cleared.

Fault name	Explanation	Fault severity	Measures
AC cabinet over-temp	The temperature in the AC cabinet exceeds the protective threshold.	Major	1. Check whether fans in the AC cabinet function normally. 2. Check whether air inlets of the AC cabinet are obstructed. 3. Check whether filters at the air inlets of the AC cabinet are dusty. Replace the filters when necessary.
Anti-PID power fit	Anti-PID power supply is abnormal.	Minor	1. Check the insulation of AC cables. 2. Check AC SPD. 3. Check the neutral point on the LV side of the transformer and ensure it is not grounded.
External power supply	External power supply of the MV Gridconnected PV Inverter is abnormal.	Minor	Measure the external power supply voltage with a multimeter to check whether the voltage is within the normal range.
Branch breaker flt	Circuit breakers on DC branch circuits are abnormal.	Minor	Check whether all the branch circuit breakers are closed, and check whether the circuit breaker state displayed on the Run-Information screen of the LCD is " ON/Closed ".
CT Unbala-nced	The three-phase grid current is unbalanced.	Minor	Check, via the LCD, whether the AC three-phase current is in balance.
Ground Fuse flt	Grounding fuse is abnormal.	Minor	Wait the capacitor to discharge completely, and then remove the negative grounding fuse. Check whether the fuse has blown. If so, check whether the neutral point of the transformer is unconnected, and whether the neutral point of the PT/CT on the LV side of the transformer is grounded.
Meter-com-flt	Communication of the energy meter is abnormal.	Minor	1. Check whether communication cables connected to the energy meter and metering board are damaged. 2. Check whether communication terminals of the energy meter and metering board are securely fastened.

Fault name	Explanation	Fault severity	Measures
DC fuse-abnorm-al	DC fuses of the inverter are abnormal.	Minor	Check whether the DC fuse have blown. If so, contact SUNGROW and replace the fuses.
Branch Fuse flt	Branch fuses of the inverter are abnormal.	Minor	Refer to the measures for "DC fuse-abnomal".
RISO flt	The insulation resistance is excessively low.	Minor	1. Check whether insulation layers of positive and negative DC cables to ground are damaged. 2. Check the insulation resistance to ground of AC three phases. 3. Check the connection of the neutral point on LV side of the transformer to ensure the neutral point is not grounded.
Freq shift Watt adj	The active power of the inverter is adjusted according to the change of grid frequency.	Warning	Check, via the LCD, whether the overfrequency derating function is enabled. If the function is enabled, it indicates overfrequency occurs during the operation.
Volt shift Var adj	The reactive power of the inverter is adjusted according to the change of grid voltage.	Warning	Tap "Set-parameters" -> "Running parameter" -> "Q-adjust switch" on the LCD, to check whether the "Q-adjust switch" is in the "QU mode".
GFRT Run	When a grid fault occurs, the inverter can ride through the time interval.	Warning	Check whether the grid voltage exceeds the HVRT or LVRT threshold.

Fault name	Explanation	Fault severity	Measures
DC breaker flt/ DC switch abnorm-al	DC switches of the inverter are abnormal.	Minor	Refer to the measures for "Branch breaker flt". Check whether the DC switch is connected.
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.

If the fault still exists, contact SUNGROW Service.

If the following fault occurs, immediately contact SUNGROW Service. (referred to as "-SUNGROW" hereinafter).

Fault name	Explanation	Fault severity	Measures
Carrier synch flt	The transmission of carrier communication signals is abnormal.	Major	Contact SUNGROW.
Drive board fault	Interior drive board of the inverter is faulty.	Major	Contact SUNGROW.
Com-Failure	Internal communication of the inverter is abnormal	Major	Contact SUNGROW.
Encoding repeat	Addresses of the interior inverter units are repeated.	Major	Contact SUNGROW.
Backfeed Supply fault	Reverse charging device is out of service.	Major	Contact SUNGROW.
IDM-com-flt	The communication of the tributary board inside the inverter is abnormal.	Minor	Contact SUNGROW.

Fault name	Explanation	Fault severity	Measures
DC Sensor-err	DC sensors of the inverter are abnormal.	Minor	Contact SUNGROW.
Branch fwd-Idc-high	Branch forward current is excessively high.	Minor	Contact SUNGROW.
Branch rev-Idc-high	Branch reverse current is excessively high.	Minor	Contact SUNGROW.
T&H-com-flt	The communication of the temperature & humidity board is abnormal.	Minor	Contact SUNGROW.
DSP-com-flt	The communication between control board and metering board inside the inverter is abnormal.	Minor	Contact SUNGROW.

11.4 Fault and Troubleshooting on the MV Transformer

Successively tap "Function" - > "Real time Data"- > "Overall" on the LCD screen to view the fault information of the MV transformer.

Fault name	Explanation	Fault severity	Measures
Trans-oil-T trip	The temperature in the oil tank of the transformer is abnormal, and tripping occurs.	Major	Contact SUNGROW.
Pressure release valve trip	The pressure relief valve of the transformer is faulty.	Major	Contact SUNGROW.
Low oil level trip	The oil level of the transformer is excessively low, and tripping occurs.	Major	Contact SUNGROW.
Heavy gas trip	The gas is excessively high, and tripping occurs.	Major	Contact SUNGROW.

Fault name	Explanation	Fault severity	Measures
Trans-oil-T-alarm	The temperature in the oil tank of the transformer is abnormal, and an alarm is triggered.	Minor	Contact SUNGROW.
Heavy gas alarm	The gas is excessively high, and an alarm is triggered.	Minor	Contact SUNGROW.
Pressure release valve alarm	The pressure relief valve of the transformer sends alarm signals.	Minor	Contact SUNGROW.
Low oil level alarm	The oil level of the transformer is excessively low, and an alarm is triggered.	Minor	Contact SUNGROW.

Note: For more troubleshooting information of the MV transformer, refer to the enclosed manual.

11.5 Other Fault and Troubleshooting

Fault	Possible Reason	Measures
The MV Grid-connected PV Inverter shuts down shortly after start-up.	DC input voltage just reaches the MV Grid-connected PV Inverter start-up voltage. Voltage will decrease and the MV Grid-connected PV Inverter will stop when it is under load.	Design the serial and parallel connection in accordance with the open circuit voltage; increase the input DC voltage; avoid adopting the critical voltage
Failure to start or stop the MV Grid-connected PV Inverter via the LCD.	Communication malfunction between the LCD screen and the DSP; LCD power supply malfunction	Check the connection between the LCD screen and the DSP when the MV Grid-connected PV Inverter is voltage-free
Failure to communicate with PC.	Possible reasons are various. Refer to the "Measures".	Check if the address and the Baud rate of the LCD are the same as those of PC. Check to ensure the circuits are properly connected and if the RS485 communication is adopted, the A and B ports are connected correctly. Check if the communication converters are matched. Communicate again after replacing the converter. The monitor software is installed incorrectly. It is recommended to reinstall the software. If all the above-mentioned items are correct and this fault continues, contact SUNGROW.

12 Routine Maintenance

12.1 Overview

NOTICE

For maintenance items beyond this manual, please confirm with SUNGROW or contact SUNGROW for maintenance, and unauthorized operation is strictly prohibited.

12.2 Safety Instructions

Due to the effect of ambient temperature, humidity, dust and vibration, the MV Grid-connected PV Inverter and the internal components will age and wear. To ensure the system safety and maintain the efficiency of the MV Grid-connected PV Inverter,, it is necessary to carry out routine and periodic maintenance.

All measures, which can help the MV Grid-connected PV Inverter in good working conditions, are within the maintenance scope.

The minimum maintenance distance around the MV Grid-connected PV Inverter should be reserved at all times.

12.2.1 General Safety Rules

⚠ WARNING

Lethal voltage inside the MV Gridconnected PV Inverter!

Wait at least 20 minutes after MV Grid-connected PV Inverter stops before opening the cabinet door. Make sure the device internal is completely voltage free before any work on the MV Gridconnected PV Inverter.

⚠ WARNING

Only qualified personnel can perform the work described in this chapter.

Do not leave any screws, washers or other metallic parts inside the module to avoid damages to the module.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the MV Gridconnected PV Inverter!

- **Do not perform electrical connection in sandy season or when the ambient relative humidity is above 95%.**
- **Perform electrical connection at fine weather days.**

⚠ WARNING

Disconnection of the AC & DC switches in no way implies that there is no voltage of the cable connection terminals inside the AC and DC cabinet. To avoid the risk of electric shock before maintenance work,

- **Disconnect the DC switches;**
- **Ensure the AC switches are in OFF position;**
- **Disconnect the upstream and downstream switches of the module.**

12.2.2 Five Safety Rules

Respect the following five rules in maintaining or servicing the MV Gridconnected PV Inverter.

- Disconnect the module from all the external connections and internal power supplies.
- Ensure that the module will not be started accidentally.
- Verify that the module interior is discharged completely with a multimeter.
- Perform necessary ground and short circuit connection.
- Cover the adjacent electrical components with insulation cloth during operation.

12.3 Maintenance

12.3.1 Introduction

The MV Grid-connected PV Inverter can be installed outdoors. Harsh environment condition or long-time operation, however, may cause age and damage of the MV Grid-connected PV Inverter. Check and maintain the MV Grid-connected PV Inverter periodically and replace the aged components can effectively enlarge the service life and increase the device performance inside the MV Gridconnected PV Inverter.

Unscheduld maintenance is also required, esp., when the system performance is poor.

12.3.2 Maintenance Interval

Maintain the Station and internal electric devices periodically to ensure the good performance of the Station.

The maintenance interval described in this chapter is indicative only. The actual interval depends on the on-site environment condition. If the Station is located in harsh environment places, for example desert arrears, the maintenance interval shall be shortened. Particularly, cleaning and anti-corrosion processing should be performed more frequently.

If the Station is located in desert areas, it is advisable to check thoroughly the Station inside and outside and clean completely after the sand storm.

⚠ WARNING

Check the module fans inside the Station periodically and the fans on top of the cabinet for abnormal operation and abnormal noise. If so, there may be dust penetrating inside the module. Stop the module and clean the dust.
Wait at least 20 minutes after the module discharge completely. Before cleaning, make sure, with multimeter, the module internal is discharged completely to avoid electric shock.

⚠ WARNING

Before performing maintenance, remove the internal protective grid. Make sure to reassembly the grid and fasten all the screws after the maintenance work.
Make sure all bolts are securely fixed.

⚠ WARNING

Repair immediately any anomalies found during routine maintenance. If any doubts arise, contact SUNGROW.

Maintenance (once every three years)

Check item	Check method
Transformer monitoring protection devices	• Oil thermometer: alarm and tripping temperature • Pressure relief device contact check • Oil level device: Oil level is filled to the normal level • Pressure gauge: Pressure gauge are at the normal level.
Transformer Leakage check	• Off-load tap-changer • Pressure relief device • Pressure gauge • Oil level device • Temperature pocket • Bushings • Drain valve and oil sample • Welding seams

Maintenance (once every two years)

Check item	Check method
System status and cleaning	Check the following items and make corrections if necessary: • Check whether the Station and its internal devices are damaged or deformed. • Check whether the device makes abnormal noise or sound during operation. • Check whether the interior temperature or enclosure temperature of the Station is excessively high. • Check whether the humidity and dust inside the Station are within normal ranges, and dust the Station if necessary. • Check whether the air inlet and outlet are blocked.
Warning labels and marks	Check whether the warning labels and marks are firmly attached and clearly legible. Replace them if necessary.
Shield ground wires	Check whether the shield ground wires are in good contact with the insulating sleeves and ground copper bars.
Connection between splice box and Ethernet switch*	Check whether the splice box and the Ethernet switch are correctly connected.
Lightning proof device and fuses	Check whether the lightning proof device and fuses are in good status and can be used.
Corrosion	Check whether the interior of the Station is corroded or oxidized.

Maintenance (once every year)

Check item	Check method
Container exterior	Check the following items and make corrections if necessary: • Check whether there are any inflammable or combustible materials and other threats around or on the top of the Station that may affect the normal operation. • Check whether the Station and the steel plate are firmly welded, and whether there is any corrosion. • Check whether any mechanical damage, painting damage, oxidation, or the like occurs on the enclosure of the Station. • Check whether the monitoring window and the doors close and open flexibly. • Check whether the sealing strip is firmly in place.
Container interior	Check whether there is any dust, foreign objects, dirt, or condensation inside the container.
Air inlet/outlet	Check whether the air inlet filters and ventilation ducts of the Station and its internal devices are normal, and clean or replace the filters if necessary.
Cable connection and routing	• Check the Station when the internal devices are completely voltage-free! Make corresponding corrections once any anomaly is founded. • Check whether all cables and wires are properly routed and without short circuit. Make corrections if case of any anomaly. • Check whether all cable entries are sealed properly. • Check whether there is water leakage inside the Station. • Check whether the power cable is firmly connected. If necessary, refasten the cable with the torque specified in this manual. • Check whether the power cable and control cable are damaged, especially if the surface contacting the metal is cut. • Check if the insulation tape on the power cable terminal is damaged or invalid

Check item	Check method
Grounding and equipotential connections	• Check whether the ground resistance meets the requirements of local standards and regulations. • Check whether the equipotential connections inside the Station are performed properly. • Check whether the equipotential connection of the oil tray is performed properly.
Fan	• Check the running status of the fans. • Check whether the fan blades have cracks. • Check whether the fan makes abnormal noise during running.
Screws	Check all screws inside the Station.

Maintenance (once every 6 months to a year)

Check item	Check method
Safety function	• Check the stop functions of the emergency stop button and the LCD. • Simulate shutdown • Check the warning labels and other device symbols for completeness and legibility, and replace them in time if necessary.
Software maintenance	Inspect all parameter settings.
Inverter unit cleanness	• Check the temperature and cleanness of the radiator. If necessary, clean the radiator with a vacuum. • If necessary, replace the filter. • Note: Check the ventilation performance of the air inlet. Otherwise, a fault may occur in the module due to overheat caused by poor ventilation.
LCD time display	• Check whether the time displayed on the LCD is correct. • After calibration, if the time is still incorrect, replace the button cell on the back of the LCD.
Component maintenance	• Regularly check whether the metal components are corroded (once every 6 months). • Annually check the contactors (auxiliary switch and micro circuit breaker) to ensure normal operation. • Check the running parameters (especially the voltage and insulation)

Note: * indicates optional.

The frequency of maintenance operations could be increased according to the environmental conditions of the place where the Station is suited, plant capacity and on-site situations.

The maintenance interval should be shortened if the sand or dust deposition around the operation site is serious.

12.4 Cleaning the MV Gridconnected PV Inverter

12.4.1 Introduction

The cleaning of surrounding areas and internal space is important for the maintenance of the MV Grid-connected PV Inverter.

Due to ambient temperature, humidity, dust and vibration, there may be dust deposition inside the MV Gridconnected PV Inverter blocking the air entries and penetrating inside the MV Gridconnected PV Inverter internal devices. This may cause damage to the internal devices of the MV Gridconnected PV Inverter, shorten the service life, and reduce power yields.

During device normal operation, check and clean the device periodically to make sure the internal devices are in a comparatively good condition to a certain degree.

12.4.2 Cleaning Interval

The cleaning interval depends on the operation conditions of the MV Gridconnected PV Inverter, for example, the weather condition and etc. it is necessary make sure the MV Gridconnected PV Inverter exterior and interior areas are clean. If the operation conditions are severe, in desert area for instance, the cleaning interval shall be every half a month or even shorter. The cleaning of the MV Gridconnected PV Inverter inside devices and the air inlet and outlet shall be more frequent.

12.4.3 Cleaning the Internal Dust

Use a vacuum cleaner instead of a broom to clean the dust inside the MV Gridconnected PV Inverter.

12.4.4 Cleaning the Foundation

The foundation is designed with maintenance entry. Enter the foundation to check the cleanness periodically. Use a vacuum cleaner to clean the foundation if necessary.

12.4.5 Checking and Cleaning the Filter

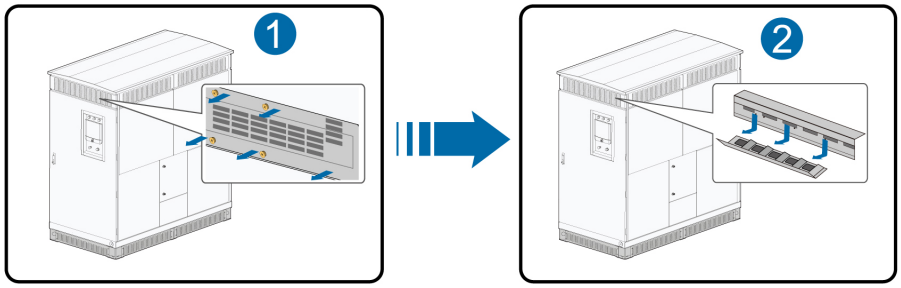
12.4.5.1 Filter Screen at Air Inlet

Brief Introduction

The air inlet is located at the top of the inverter. It is recommended to clean the air inlet regularly, to avoid blocking. There are two types of air inlet design and the steps to clean them are different. Please choose based on the product model.

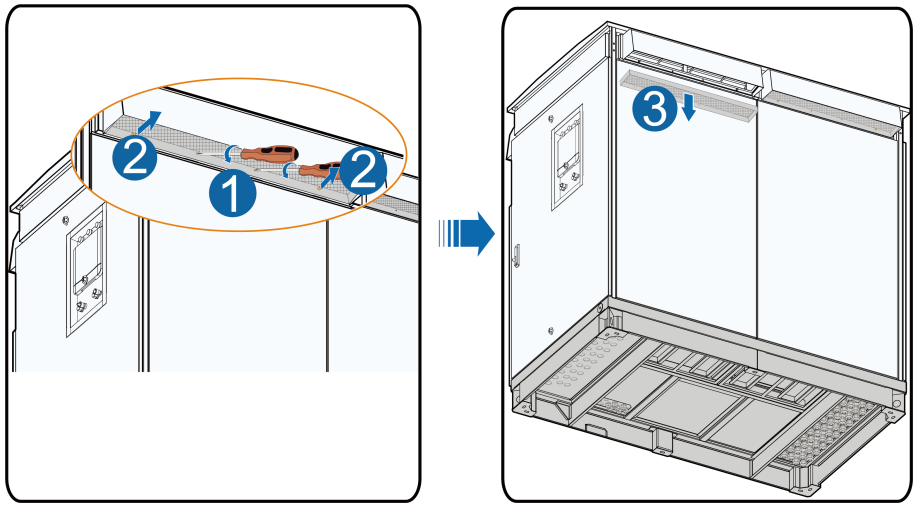
Air Inlet Design 1

Unscrew the bolts fastening the top cover plate to remove the plate, the filter screen and clean them with a vacuum.



Air Inlet Design 2

Unscrew the two M5 fixing bolts at the air inlet, and pull out the spring plungers at both ends. Then, take down the filter screen and clean it.

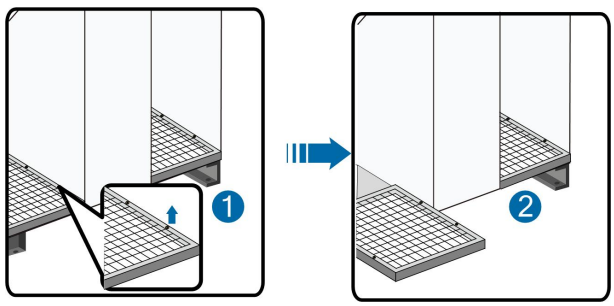


The M5 bolts removed when cleaning the filter screen for the first time do not need to be fit back.

12.4.5.2 Bottom Air Outlet

Brief Introduction

The lower air outlet is located at the lower part of the inverter. It is recommended to clean the filter screen of the air outlet regularly.



Procedure

Unscrew the bolts at the bottom of the inverter, to remove the bottom plate. Remove the filter screen, clean them, and reassemble them when they are dry. Replace the filter screen if there is any damage.

Further Processing

After cleaning and replacement, reinstall the bottom plate and secure it with bolts.

12.4.6 Cleaning the Surface of the MV Gridconnected PV Inverter

If there is corrosion on the surface of the MV Gridconnected PV Inverter, clean it with abrasive paper or brush.

If the dust deposition is serious on the surface of the MV Gridconnected PV Inverter, use mop or big rag to clean the surface of the MV Gridconnected PV Inverter. It is recommended to clean the top before cleaning the side. Alternatively, clean it with or without water.

12.4.7 Checking the Lock and Hinge

Check the functionality and state of the lock and hinge of the MV Grid-connected PV Inverter after the cleaning work. Lubricate the lock and hinge if necessary.

12.4.8 Checking the Sealing Strip

The sealing strip is used to prevent the water penetrating insider the MV Gridconnected PV Inverter. Check it carefully for damage. Replace the faulty lighting devices in time.

12.5 Painting Make-up Measures

Check for the damages of the MV Grid-connected PV Inverter appearance:

Situation 1: smudginess on the surface caused by water and dust that can be cleaned

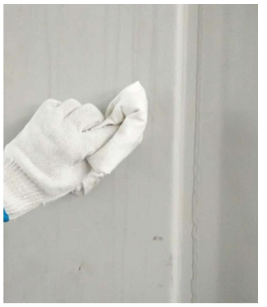
Situation 2: smudginess on the surface & damage to the finishing coat that cannot be cleaned

Situation 3: the undercoat is damaged and the primer is revealed

Maintenance and Operation Steps for Situation 1:

Materials:

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

Figure	Step
	1. Clean the smudginess on the surface by using a cleaning cloth (or other cleaning tool) with water. 2. If the smudginess cannot be cleaned by water, use 97% alcohol until the surface is clean enough to accept. (Or try other local frequently-used non-corrosiveness detergent)

Maintenance and Operation Steps for Situation 2:

Materials:

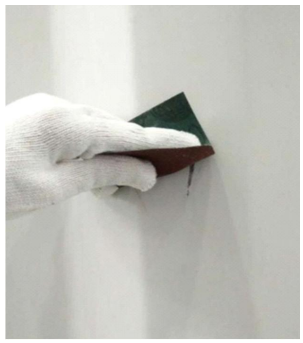
- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Hairbrush
- Paint RAL7035 / Munsell color JN-82 N8.2

Figure	Step
	1. Polish the rough paint surface or the scratched parts by abrasive paper until the surface is smooth.
	2. Clean the target parts by cleaning cloth with water or use 97% alcohol.
	3. When the surface is clean and dry, paint the scratched parts of the paint by banister brush and make sure the painting is as uniform as possible

Maintenance and Operation Steps for Situation 3:

Materials:

- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Zinc primer
- Hairbrush
- Paint RAL7035 / Munsell color JN-82 N8.2

Figure	Step
	1. Polish the damaged parts of the paint to remove the surface rust or other roughness.
	2. Clean the target parts by cleaning cloth with water or use 97% alcohol to clean the surface dust and dirty.
	3. When the surface is clean and dry, paint the base material revealed parts with zinc primer (or other local primers with the same function) for protection. The paints should cover the revealed primer completely.
	4. Paint the scratched parts by banister brush when the primer is dry, and make sure the painting is as uniform as possible.

Check the protective paint on the module surface for peeling off. re-paint the MV Grid-connected PV Inverter surface if necessary.

Re-spray the protective paint every 5 years to the MV Grid-connected PV Inverter surface.

12.6 Replacement of the Electrical Components

12.6.1 Safety Instructions

⚠ WARNING

The electrical components inside the MV Grid-connected PV Inverter must be replaced by components from the same manufacturer.
The model number can be acquired from the marking of the MV Grid-connected PV Inverter or the component itself. If otherwise, contact SUNGROW.

⚠ WARNING

If the field work needs to replace the components with products from other manufacturer or with different model number, a prior analysis and confirmation by SUNGROW is needed.
Failure to follow this procedure may lead to physical injury or death and void all warranty from SUNGROW.

12.6.2 Replacing DC Fuses

⚠ WARNING

Strictly observe the instructions in this chapter to replace the fuse.
Any personal injury or property damage caused by the disobedience of this chapter may void pertinent warranty claims from SUNGROW.

⚠ WARNING

Only qualified technical persons who have fully understood the description in this chapter can perform the operations in this chapter.

⚠ WARNING

The fuse must be replaced with one of the same model and from the same manufacturer.
Obtain the model from the marking on the fuse. Contact us if otherwise.

⚠ WARNING

Without our confirmation, do not replace the fuse with the one from another manufacturers or of a different model.
Otherwise, SUNGROW shall not be responsible for any possible personal injury or property damage.

DC Fuse Area

The DC cabinet inside the inverter unit unit is equipped with DC fuses.

Before replacing the fuses, remove protective grid installed at the DC fuse area at the bottom of the DC cabinet.

Operations before Replacement

Follow the procedure below to replace the fault fuse.

Step 1 Stop the inverter unit unit via the stop instruction on the LCD screen.

Step 2 Disconnect DC output switches of all PV array combiner boxes upstream.

Step 3 Disconnect the QS1 and QS3 DC load switch. If the inverter unit unit was equipped with energy storage ports, make sure the QS5 and QS7 are disconnected as well.

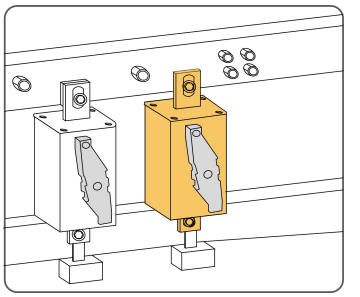
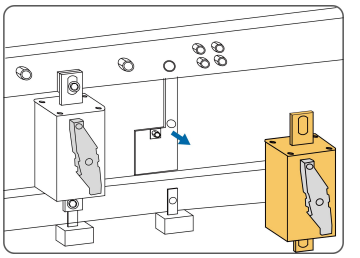
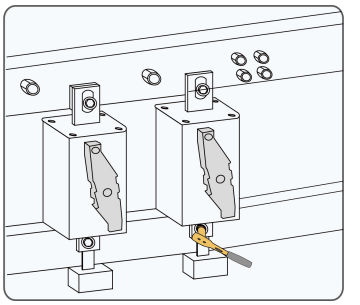
Step 4 Disconnect the QS25 AC maintenance switch and the QS2 DC maintenance switch. and perform Step 5 about 20 minutes later when the capacitor inside the machine discharges completely.

Step 5 Use a multimeter with a measuring range of 1500Vdc to check whether voltages of the connection terminal on the DC side of the inverter unit unit are zeros, where the voltages include the voltage between the positive and negative poles, the positive to ground voltage, and the negative to ground voltage.

Step 6 Open the door with the key and remove the protective grid in the DC fuses area.

Step 7 Measure each DC input voltage by using the multimeter, and perform the next step after ensuring the wiring terminal is completely voltage-free.

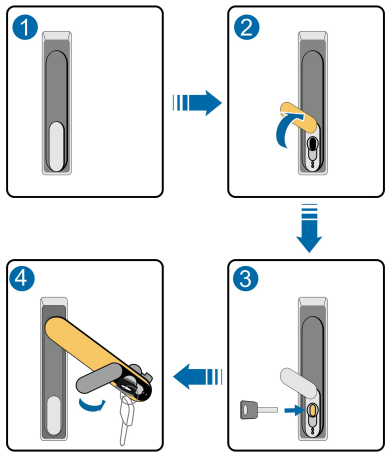
- - End

Descriptions	Figure
1. Unscrew fastening bolt of the to-be-replaced fuse with a socket spanner.	
2. Remove the fuse.	
3. Use M8×30 bolt to fasten new fuse with a socket spanner. Fastening torque:18~23N.m.	

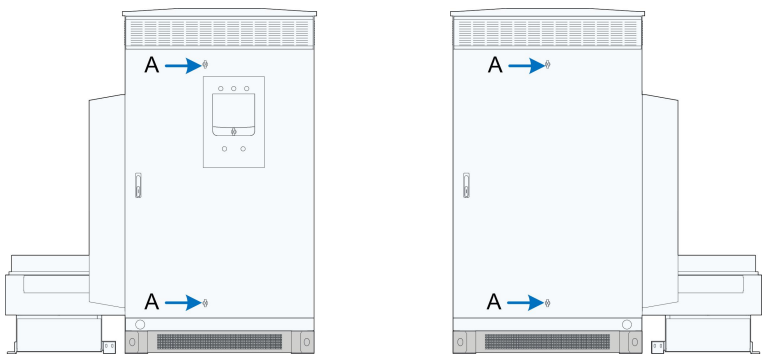
13 Periodic Actions

13.1 Opening the Inverter Unit Door

Opening the Door Lock

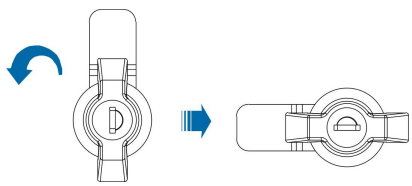


Opening the Enclosure



1 Insert the key.

2 Turn the handle counterclockwise to unlock the door.

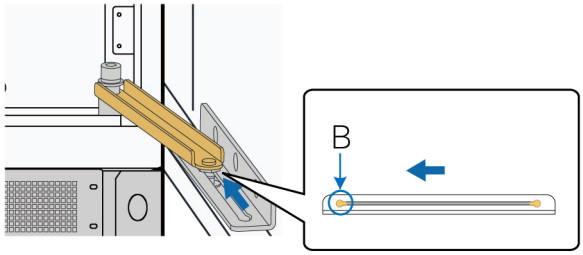


Keyhole configuration is optional.

Fixing the Enclosure

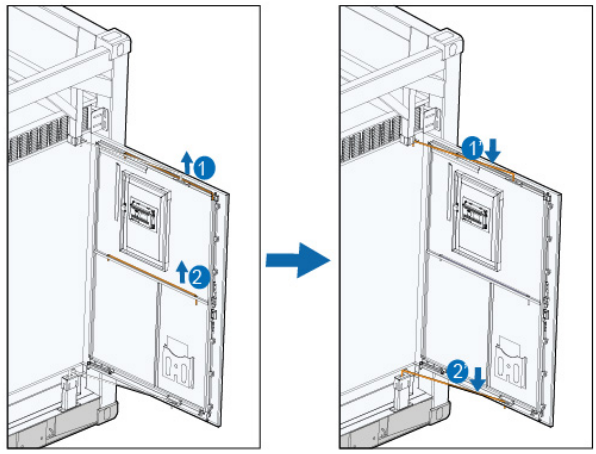
Version 1:

When the cabinet door is opened, the studs slide naturally. When the stud slides to the gourd hole (Figure B), the limit rod is automatically fixed.



Version 2:

When the cabinet door is opened,there are two limit rods at position 1 and position 2 behind the door as shown below.Place the two limit rods at 1' and 2' as shown to fix the door.



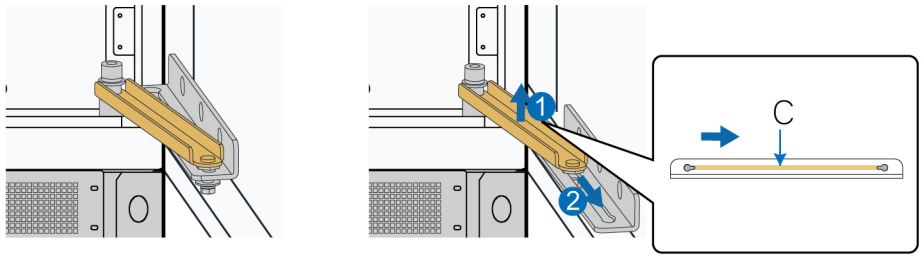
The two ends of the limit rod are divided into the long side and the short side.The long side of the limit rod at position 1 is connected with the container body, but the long side of the limit rod at position 2 is connected with the cabinet door.

After the connection is completed, Using the M8 nut to tighten the connection port.

13.2 Closing the Inverter Door

Version 1:

Step 1 Lift the limit rod and close the cabinet door when the stud leaves the gourd hole(shown as C).



NOTICE

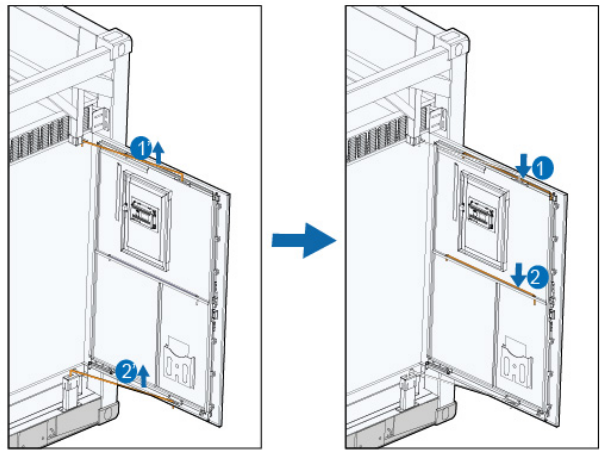
It is strictly forbidden to close the door forcefully without lifting the limit rod.

Step 2 Lock the door lock and pull out the key. (The method of operation is opposite to the method of opening the cabinet door).

- - End

Version 2:

Before closing the door, put the limit rods back in place. as shown below.(The method of operation is opposite to the method of opening the cabinet door).



14 Appendix

14.1 System Parameter

SG3000HV-MV-30

Input (DC)	SG3000HV-MV-30
Max. PV input voltage	1500V
Min. PV input voltage	875 V
Startup input voltage	915 V
MPP voltage range	875 ~ 1300 V
No. of independent MPP inputs	2
No. of DC inputs	18 / 20 / 22 / 24
Max. PV input current	3500 A
Max. DC short-circuit current	10000 A
PV array configuration	Negative grounding or floating
Output (AC)	
AC output power	3000 kVA @ 50 ℃, 3300 kVA @ 45 ℃
Max. inverter output current	2887 A
Rated voltage range	20 kV – 35 kV
Nominal grid frequency	50 Hz / 45 – 55 Hz
Grid frequency range	60 Hz / 55 – 65 Hz
THD	< 3 % (at nominal power)
DC current injection	< 0.5 % In
Power factor at nominal power	>0.99
Adjustable power factor	0.8 leading ~0.8 lagging
Feed-in phases	3
AC connection	3-PE
Efficiency	
Inverter Max. efficiency	99.0 %
Inverter Euro. efficiency	98.7 %
Transformer	
Transformer rated power	3000 kVA
Transformer max. power	3000 kVA
LV / MV voltage	0.6 kV / 10 ~40.5 kV
Transformer vector	Dy11
Transformer cooling type	ONAN (Oil-natural, air-natural)

Input (DC)	SG3000HV-MV-30
Oil type	Mineral oil (PCB free) or degradable oil on request
Protections & Functions	
DC input protection	Load break switch + fuse
Inverter output protection	Circuit breaker
AC MV output protection	Circuit breaker
Surge protection	DC Type I + II / AC Type II
Grid monitoring / Ground fault monitoring	Yes / Yes
Insulation monitoring	Yes
Overheat protection	Yes
Q at night function	Optional
General Data	
Dimensions (W x H x D)	6058 × 2896 × 2438 mm
Weight	15 T
Degree of protection	Inverter: IP55 (optional: IP65) / Others: IP54
Auxiliary power supply	5 kVA (optional: max. 40 kVA)
Operating ambient temperature range**	-35 to +60˚C (> 50 ˚C derating)
Allowable relative humidity range	0 ~100 %
Cooling method	Temperature controlled forced air cooling
Max. operating altitude	1000 m (standard) / > 1000 m (optional)
Display	LCD screen
Communication	Standard: RS485, Ethernet; Optional: optical fiber
Grid support	Q at night fuction(Optional), L/HVRT, active & reactive power control and power ramp rate control

** The ambient temperature is determined as the average temperature obtained from 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 from airflow, thermal radiation, and rapid temperature fluctuations to prevent display inaccuracies.

SG3125HV-MV-30/SG3400HV-MV-30

Input (DC)	SG3125HV-MV-30	SG3400HV-MV-30
Max. PV input voltage	1500V	
Min. PV input voltage	875 V	
Startup input voltage	915 V	
MPP voltage range for nominal power	875 ~ 1300 V	
No. of independent MPP inputs	2	

Input (DC)	SG3125HV-MV-30	SG3400HV-MV-30
Output (AC)		
AC output power	3125 kVA @ 50 ℃	3437 kVA @ 45 ℃
Rated voltage range	20 – 35 kV	
Nominal grid frequency	50 Hz / 60 Hz	
Grid frequency range	45 ~55 Hz / 55 ~ 65 Hz	
THD	< 3 % (at nominal power)	
DC current injection	< 0.5 % In	
Power factor at nominal power	0.99	
Adjustable power factor	0.8 leading ~0.8 lagging	
Feed-in phases	3	
Connection phases	3	
Efficiency		
Inverter Max. efficiency	99.0 %	
Inverter Euro. efficiency	98.7 %	
Transformer		
Transformer rated power	3125 kVA	3437 kVA
Transformer max. power	3437 kVA	
LV / MV voltage	0.6 kV / 10 ~40.5 kV	
Transformer vector	Dy11	
Transformer cooling type	ONAN (Oil-natural, air-natural)	
Oil type	Mineral oil (PCB free) or degradable oil on request	
Protections & Functions		
DC input protection	Load break switch + fuse	
Inverter output protection	Circuit breaker	
AC MV output protection	Circuit breaker	
Surge protection	DC Type I + II / AC Type II	
Grid monitoring / Ground fault monitoring	Yes / Yes	
Insulation monitoring	Yes	
Overheat protection	Yes	
Q at night function	Optional	
General Data		
Dimensions (W x H x D)	6058 × 2896 × 2438 mm	
Weight	15 T	
Degree of protection	Inverter: IP65 (optional: IP55) / Others: IP54	
Auxiliary power supply	5 kVA (optional: max. 40 kVA)	
Operating ambient temperature range**	-35 to +60˚C (> 50 ˚C derating)	-35 to +60 ℃(> 45 ℃ derating)
Permissible relative humidity range	0 ~100 % (non-condensing)	

Input (DC)	SG3125HV-MV-30	SG3400HV-MV-30
Cooling method	Temperature controlled forced air cooling	
Max. operating altitude	1000 m (standard) / > 1000 m (optional)	
Display	LCD screen	
Communication	Standard: RS485, Ethernet; Optional: optical fiber	
Grid support	Q at night (Optional), L/HVRT, active & reactive power control and power ramp rate control	

*Parameters may vary subject to specific project requirement.

** The ambient temperature is determined as the average temperature obtained from 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 from 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)	Screw	Torque (N·m)
M3	0.7~1	M8	18~23
M4	1.8~2.4	M10	34~40
M5	4~4.8	M12	60~70
M6	7~8	M16	119~140

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

14.3 Exclusion of Liability

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- Install or operate the product in unintended environment
- Install or operate the product without observing relevant safety regulations in the deployment location
- Ignore the safety warnings or instructions contained in all documents relevant to the product
- Install or operate the product under incorrect safety or protection conditions

- Alter the product or supplied software without authority
- Product malfunctions due to operation attached or neighboring devices running out of the allowed limit values
- Unforeseen calamity or force majeure

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- Software used for commercial purposes is prohibited.
- Decompiling, decoding or destroying the original program, including Software and the embedded software, is prohibited.

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**

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