SUNGROW
Clean power for all

PV Grid-Connected Inverter
User Manual
SG250HX-US

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About This Manual

The manual mainly contains the product information, as well as guidelines for installation, operation, and maintenance. The manual does not include complete information about the photovoltaic (PV) system. Readers can get additional information at **www.sungrowpower.com** or on the webpage of the respective component manufacturer.

Validity

This manual is valid for the following model of low-power grid-connected PV string inverters:

- SG250HX-US

It will be referred to as "inverter" hereinafter unless otherwise specified.

Target Group

This manual is intended for professional technicians who are responsible for installation, operation, and maintenance of inverters, and users who need to check inverter parameters.

The inverter must only be installed by professional technicians. The professional technician is required to meet the following requirements:

- Know electronic, electrical wiring and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Have received professional training related to the installation and commissioning of electrical equipment.
- Be able to quickly respond to hazards or emergencies that occur during installation and commissioning.
- Be familiar with local standards and relevant safety regulations of electrical systems.
- Read this manual thoroughly and understand the safety instructions related to operations.

How to Use This Manual

Please read this manual carefully before using the product and keep it properly at a place for easy access.

Contents of this manual may be periodically updated or revised, and the actual product purchased shall prevail. Users can obtain the latest manual from **support.sungrowpower.com** or sales channels.

Symbols

This manual contains important safety instructions, which are highlighted with the following symbols, to ensure personal and property safety during usage, or to help optimize the product performance in an efficient way.

Please carefully understand the meaning of these warning symbols to better use the manual.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

Indicates low-risk potential hazards that, if not avoided, may lead to minor or moderate injury.

NOTICE

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

“NOTE” indicates additional information, emphasized contents or tips that may be helpful, e.g., to help you solve problems or save time.

Contents

1 Safety

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

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

- The safety instructions in this manual are only supplements and cannot cover all the precautions that should be followed. Perform operations considering actual onsite conditions.
- SUNGROW shall not be held liable for any damage caused by violation of general safety operation requirements, general safety standards, or any safety instruction in this manual.
- When installing, operating, and maintaining the product, comply with local laws and regulations. The safety precautions in this manual are only supplements to local laws and regulations.

1.1 Unpacking and Inspection

⚠ WARNING

Check all safety signs, warning labels and nameplates on devices.
Ensure that the safety signs, warning labels and nameplates must be clearly visible and cannot be removed or covered before the device is decommissioned.

NOTICE

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

1.2 Installation Safety

⚠ DANGER

Make sure there is no electrical connection before installation.
Before drilling, avoid the water and electricity wiring in the wall.

⚠ CAUTION

Improper installation may cause personal injury!

- **If the product supports hoisting transport and is hoisted by hoisting tools, no one is allowed to stay under the product.**
- **When moving the product, be aware of the product weight and keep the balance to prevent it from tilting or falling.**

NOTICE

Before operating the product, must check and ensure that tools to be used have been maintained regularly.

1.3 Electrical Connection Safety

⚠ DANGER

Before electrical connections, please make sure that the inverter is not damaged, otherwise it may cause danger!

Before electrical connections, please make sure that the inverter switch and all switches connected to the inverter are set to "OFF", otherwise electric shock may occur!

⚠ DANGER

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

- **Operators must wear proper personal protective equipment during electrical connections.**
- **Must ensure that cables are voltage-free with a measuring instrument before touching DC cables.**
- **Respect all safety instructions listed in relevant documents about PV strings.**
- **The inverter must not be connected to a PV string that requires positive or negative grounding.**

⚠ DANGER

Danger to life due to a high voltage inside the inverter!

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

⚠ WARNING

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

- **Electrical connection must be performed by professionals.**
- **All cables used in the PV generation system must be firmly attached, properly insulated, and adequately dimensioned.**

⚠ WARNING

Check the positive and negative polarity of the PV strings, and connect the PV connectors to corresponding terminals only after ensuring polarity correctness. During the installation and operation of the inverter, please ensure that the positive or negative poles of PV strings do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in equipment damage. The damage caused by this is not covered by the warranty.

NOTICE

Comply with the safety instructions related to PV strings and the regulations related to the local grid.

1.4 Operation Safety

⚠ DANGER

- **When the inverter is running, do not touch its enclosure.**
- **When the inverter is running, it is strictly forbidden to plug and unplug any connector on the inverter.**
- **When the inverter is running, do not touch any wiring terminal of the inverter. Otherwise, electric shock may occur.**
- **When the inverter is running, do not disassemble any parts of the inverter. Otherwise, electric shock may occur.**
- **When the inverter is running, it is strictly forbidden to touch any hot parts of the inverter (such as the heat sink). Otherwise, it may cause burns.**
- **If the inverter is equipped with a DC switch, do not operate it when the inverter is running. Otherwise, device damage or personal injury may occur.**

1.5 Maintenance Safety

DANGER

Risk of inverter damage or personal injury due to incorrect service!

- **Before any service work, first disconnect the grid-side AC circuit breaker and check the inverter status. If the inverter indicator is off, please wait until night to disconnect the DC switch. If the inverter indicator is on, directly disconnect the DC switch.**
- **After the inverter is powered off for 5 minutes, measure the voltage and current with professional instrument. Only when there is no voltage nor current can operators who wear protective equipment operate and maintain the inverter.**
- **Even if the inverter is shut down, it may still be hot and cause burns. Wear protective gloves before operating the inverter after it cools down.**

DANGER

Touching the power grid or the contact points and terminals on the inverter connected to the power grid may lead to electric shock!

- **The power grid side may generate voltage. Always use a standard voltmeter to ensure that there is no voltage before touching.**

CAUTION

To prevent misuse or accidents caused by unrelated personnel: Post prominent warning signs or demarcate safety warning areas around the inverter to prevent accidents caused by misuse.

NOTICE

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

1.6 Disposal Safety

WARNING

Please scrap the inverter in accordance with relevant local regulations and standards to avoid property losses or casualties.

2 Product Description

2.1 System Introduction

The inverter is a transformerless 3-phase PV grid-connected inverter. As an integral component in the PV power system, the inverter is designed to convert the direct current power generated from the PV modules into grid-compatible AC current and to feed the AC current into the utility grid.

The intended usage of the inverter is illustrated in the following figure.

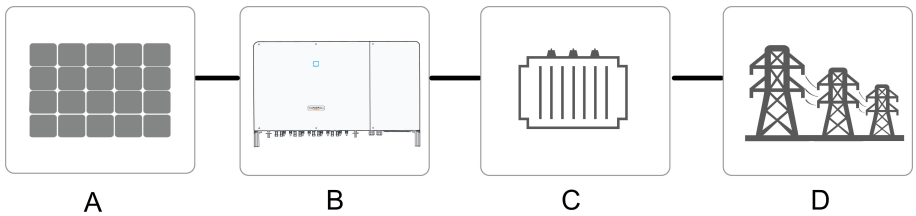


figure 2-1 Inverter Application in PV Power System

⚠ WARNING

The inverter must not be connected to a PV string that requires positive or negative grounding.

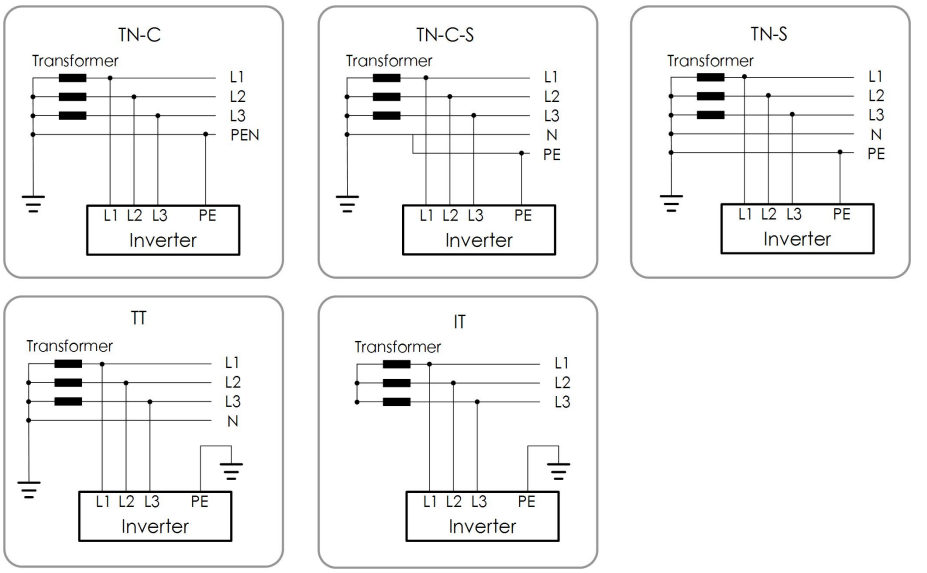
Do not connect any local load between the inverter and the AC circuit breaker except for the tracking axis.

NOTICE

The inverter applies only to the scenarios described in this manual.

Item	Description	Note
A	PV strings	Monocrystalline silicon, polycrystalline silicon and thin-film without grounding.
B	Inverter	SG250HX
C	Transformer	Boost the low voltage from the inverter to grid-compatible medium voltage.
D	Utility grid	TN-C, TN-S, TN-C-S, TT, IT.

The following figure shows the common grid configurations.

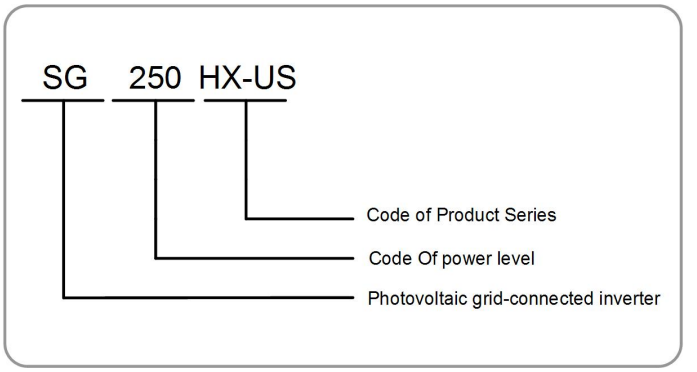


Make sure the inverter is applied to an IT system before enabling the Anti-PID function.

2.2 Product Introduction

Model Description

The model description is as follows :



Appearance

The following figure shows the dimensions of the inverter. The image shown here is for reference only. The actual product received may differ.

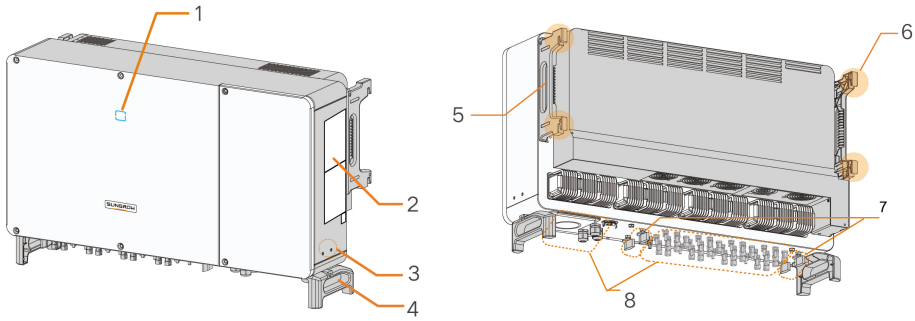


figure 2-2 Inverter Appearance

No.	Name	Description
1	LED indicator	To indicate the current working state of the inverter.
2	Labels	Warning symbols, nameplate, and QR code.
3	External grounding terminals	2, use to ground the inverter.
4	Bottom handles	2, used to move the inverter.
5	Side handles	2, used to move the inverter.
6	Mounting ears	4, used to hang the inverter onto the mounting-bracket.
7	DC Switch	To safely disconnect the DC circuit whenever necessary.
8	Wiring area	DC terminals, and communication terminals. For details, refer to “Terminal Description”

Dimensions

The following figure shows the dimensions of the inverter.

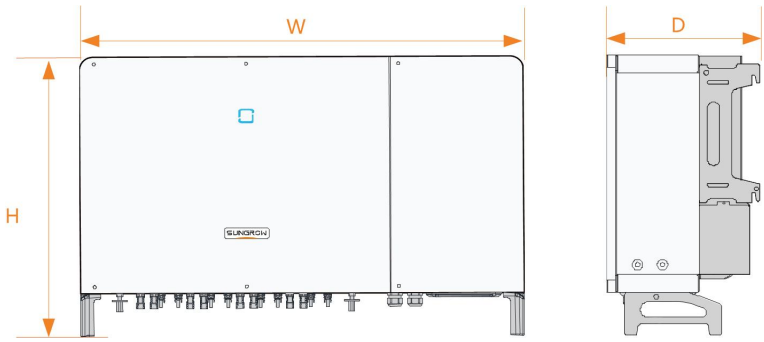


figure 2-3 Dimensions of the Inverter(in mm)

*The image shown here is for reference only. The actual product you receive may differ.

2.3 Symbols on the Product

Symbol	Explanation
	Do not dispose of the inverter together with household waste.
	CSA mark of conformity.
	CE mark of conformity. EU/EEA Importer.
	Danger to life due to high voltages! Only qualified personnel can open and service the inverter.
	Disconnect the inverter from all the external power sources before maintenance!
	Burn danger due to the hot surface that may exceed 60°C.
	Do not touch live parts for 5 minutes after disconnection from the power sources.
	Read the user manual before maintenance!

* The table shown here is for reference only. The actual product received may differ.

2.4 LED Indicator

The LED indicator on the front of the inverter indicates the working state of the inverter.

table 2-1 State description of the LED indicator

LED color	State	Definition
 Blue	On	The device is connected to the grid and operating normally.
	Fast blink (Period: 0.2s) 	The Bluetooth communication is connected and there is data communication. No system fault occurs.
	Slow blink (Period: 2s) 	The device is in standby or startup state (not feeding power into the grid).

LED color	State	Definition
	Slow blink once, fast blink three times	The inverter is performing PID recovery.
Red	On	A fault occurs and the device cannot connect to the grid.
	Twinkling	The Bluetooth connection is established, data communication in process, and a system fault occurs.
Gray	OFF	Both the AC and DC sides are powered down.

WARNING

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

2.5 Circuit Diagram

The following figure shows the main circuit of the inverter.

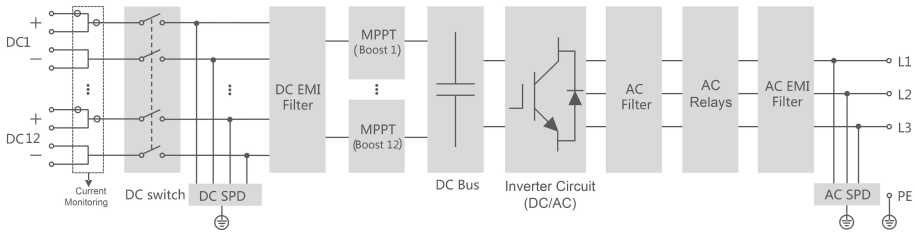


figure 2-4 Circuit Diagram

- DC switches can safely disconnect the PV input when necessary to ensure the safe operation of the inverter and the safety of personnel.
- The DC SPD provides a discharge circuit for the DC side over-voltage power to prevent it from damaging the internal circuits of the inverter.
- EMI filters can filter out the electromagnetic interference inside the inverter to ensure that the inverter meets the requirements of electromagnetic compatibility standards.
- The MPPT is utilized for DC input to ensure the maximum power from the PV array at different PV input conditions.

- The inverter circuit converts the DC power into grid-compliant AC power and feeds it into the grid.
- The AC filter filters the output AC component of high frequency to ensure that the output current meets the grid requirements.
- The AC relay isolates the AC output of the inverter from the grid, making the inverter safe from the grid in case of inverter failure or grid failure.
- The AC SPD provides a discharge circuit for the AC side over-voltage power to prevent it from damaging the internal circuits of the inverter.

2.6 Function Description

The inverter is equipped with the following functions:

Conversion Function

The inverter converts the DC into grid-compatible AC and feeds the AC into the grid.

Data Storage and Display

The inverter logs system information like running information, error records, etc.

Parameter Configuration

The inverter provides various parameter configurations. Users can set parameters via the App to meet different needs and optimize the inverter performance.

Communication Interface

The inverter is designed with standard RS485 communication interfaces.

The standard RS485 communication interfaces are used to establish communication with monitoring devices and to upload monitoring data to a monitoring background through communication cables.

When communication is established between the inverter and the communication devices, users can view inverter information or set inverter parameters, such as running parameter and protection parameter, through the iSolarCloud.

Protection Function

The inverter is equipped with anti-island protection, LVRT/HVRT, DC reversed polarity protection, AC short circuit protection, leakage current protection, DC over-voltage/over-current protection, etc.

Potential Induced Degradation (PID)

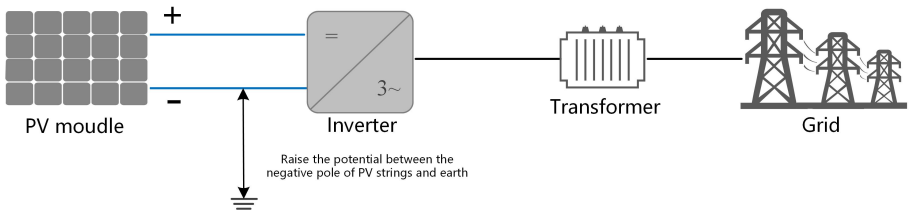
The PID effect (Potential Induced Degradation) of PV modules will cause serious damage to PV yield. Anti-PID function applies to the grid-connected operation of the inverter during the day or the reactive power generation at night while the PID repair function applies to the off-grid operation of the inverter at night.

Anti-PID function and PID repair function works differently when applied to P-type and N-type panels.

- P-type panel

When the anti-PID function is enabled, the inverter rises the potential of the negative pole of PV array of P-type panels to close to the ground potential through PID module to suppress PID effect.

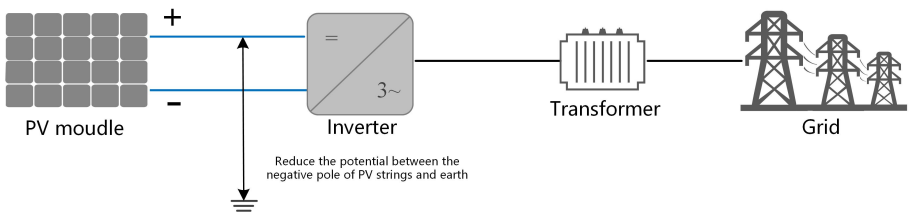
When the PID repair function is enabled, the inverter rises the potential between the negative pole of PV array of P-type panels and the ground to 500Vdc through PID module, to repair the PID effect.



- N-type panel

When the anti-PID function is enabled, the inverter decreases the potential of the positive pole of PV array of N-type panels to close to the ground potential through PID module to suppress PID effect.

When the PID repair function is enabled, the inverter decreases the potential between the positive pole of PV array of N-type panels and the ground to –500Vdc through PID module, to repair the PID effect.



- Make sure the inverter is applied to an IT system before enabling the anti-PID function.
- PID repair and reactive power generation at night cannot be enabled at the same time. In IT system, anti-PID and reactive power generation at night can be performed simultaneously.
- When the PID repair function is enabled, it works only at night.
- After the PID recovery function is enabled, the voltage of the PV string to ground is 500Vdc by default.

NOTICE

- **Before enabling anti-PID function or PID repair function, make sure the voltage polarity of the PV modules to ground meets requirements. If there are any questions, contact the PV module manufacturer or refer to the corresponding user manual.**
- **If the voltage scheme for the anti-PID function or the PID repair function does not meet requirements of corresponding PV modules, the PID will not work as expected or even damage the PV modules.**

3 Unpacking and Storage

3.1 Unpacking and Inspection

The product is thoroughly tested and strictly inspected before delivery. Nonetheless, damage may still occur during shipping. For this reason, please conduct a thorough inspection after receiving the product.

- Check the packing case for any visible damage.
- Check the scope of delivery for completeness according to the packing list.
- Check the inner contents for damage after unpacking.

Contact SUNGROW or the transport company in case of any damage or incompleteness, and provide photos to facilitate services.
Do not dispose of the original packing case. It is recommended to store the device in the original packing case when the product is decommissioned.

NOTICE

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

3.2 Inverter Storage

Proper storage is required if the inverter is not installed immediately.

- Store the inverter in the original packing case with the desiccant inside.
- The storage temperature must be always between -40℃ and +70℃, and the storage relative humidity must be always between 0 and 95 %, non-condensing.
- In case of stacking storage, the number of stacking layers should never exceed the limit marked on the outer side of the packing case.
- The packing case should be upright.
- If the inverter needs to be transported again, pack it strictly before loading and transporting it.
- Do not store the inverter in places susceptible to direct sunlight, rain, and strong electric field.

- Do not place the inverter in places with items that may affect or damage the inverter.
- Store the inverter in a clean and dry place to prevent dust and water vapor from eroding.
- Do not store the inverter in places with corrosive substances or susceptible to rodents and insects.
- Carry out periodic inspections. Inspection shall be conducted at least once every six months. If any insect or rodent bites are found, replace the packaging materials in time.
- If the inverter has been stored for more than a year, inspection and testing by professionals are required before it can be put into operation.

NOTICE

Please store the inverter according to the storage requirements. Product damage caused by failure to meet the storage requirements is not covered by the warranty.

4 Mechanical Mounting

⚠ WARNING

Respect all local standards and requirements during mechanical installation.

4.1 Safety during Mounting

⚠ DANGER

Make sure there is no electrical connection before installation.

Before drilling, avoid the water and electricity wiring in the wall.

⚠ WARNING

Poor installation environment will affect system performance!

- **Install the inverter in a well-ventilated place.**
- **Ensure that the heat dissipation system or vent is not blocked.**
- **Do not install the inverter in an environment with flammable and explosive objects or smoke.**

⚠ CAUTION

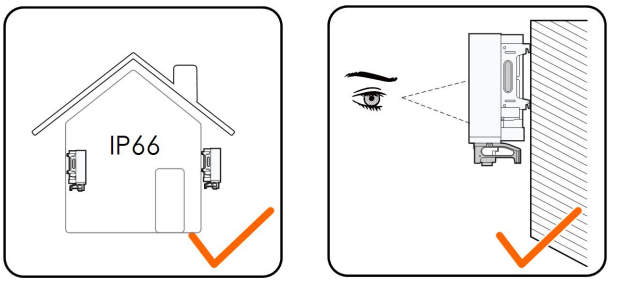
Improper handling may cause personal injury!

- **When moving the inverter, be aware of its weight and keep the balance to prevent it from tilting or falling.**
- **Wear proper protective equipment before performing operations on the inverter.**
- **The bottom terminals and interfaces of the inverter cannot directly contact the ground or other supports. The inverter cannot be directly placed on the ground.**

4.2 Location Requirements

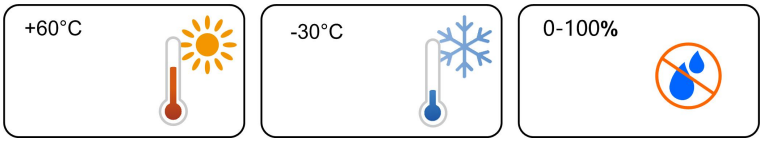
Select an optimal mounting location for safe operation, long service life and expected performance.

- The inverter with protection rating IP66 can be installed both indoors and outdoors.
- Install the inverter at a place convenient for electrical connection, operation, and maintenance.



4.2.1 Environment Requirements

- The installation environment must be free of inflammable or explosive materials.
- The location should be not accessible to children.
- The ambient temperature and relative humidity must meet the following requirements.



- Please consult SUNGROW before installing inverters outdoors in salt stress areas. Salt stress areas mainly refer to coastal areas that are within 500 meters from the coast. The deposition of salt fog varies largely with nearby seawater characteristics, sea wind, precipitation, relative humidity, terrain, and forest coverage.
- Inverters free from direct sunlight, direct rain and snow have longer service life. Consider sheltered places as the installation location.
- The inverter should be well ventilated. Ensure air circulation.
- The inverter generates noise during operation and is not recommended to be installed in living areas.

4.2.2 Carrier Requirements

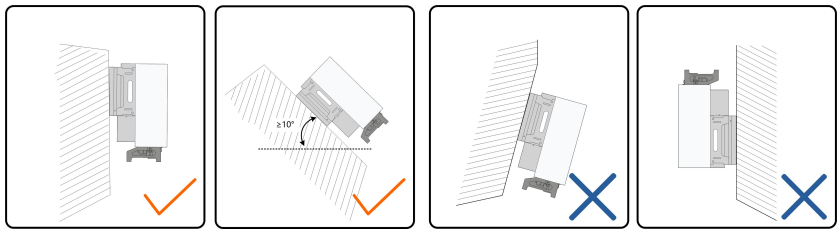
The installation carrier should be capable of withstanding a force of four times the weight of the inverter and be suitable for the dimensions of the inverter.

The surface of the installation carrier must be fire resistant.

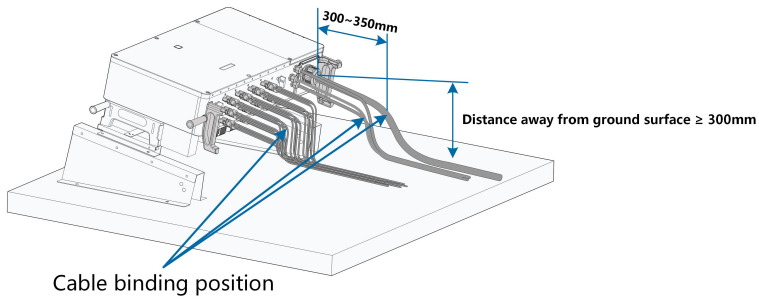
4.2.3 Angle Requirements

Install the inverter vertically or at the maximum allowable rear tilt angle. Do not install the inverter horizontally, forward, excessively backward, sideways, or upside down.

Please consult SUNGROW before tilting backwards the inverter and install it in floating power plants.



In case the installation site is a level surface, mount the inverter to the bracket to meet the mounting angle requirements, as shown in the figure below.



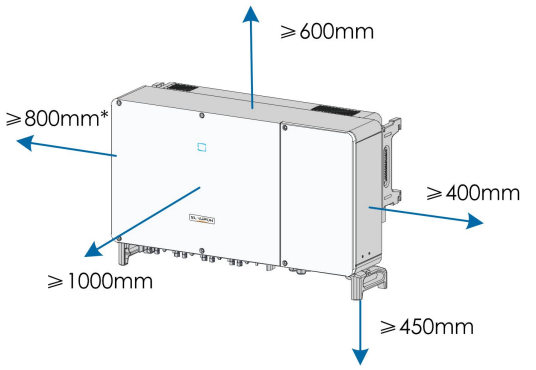
Take the following items into account when designing the bracket scheme:

- Consider onsite climate conditions and take anti-snow and anti-rain measures if necessary.
- Ensure that the waterproof connectors are at least 300mm higher than the ground surface.
- Bind the cables at the positions 300~350mm away from the DC connector, AC waterproof terminal, and communication waterproof terminal.
- The various waterproof terminals should be tightened in accordance with the torque requirements in this manual to ensure that they are tight and sealed.

Contact SUNGORW if you have any question.

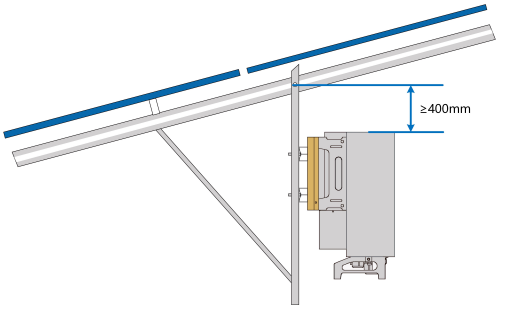
4.2.4 Clearance Requirements

Reserve enough clearance around the inverter to ensure sufficient space for heat dissipation.

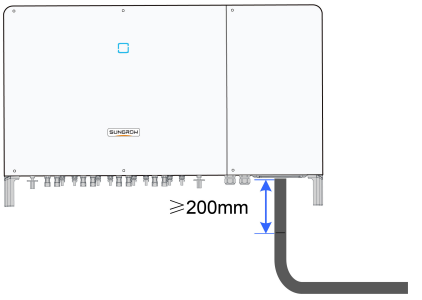


* In case this distance is less than the distance in the diagram, move the inverter from the mounting-bracket or wall before maintaining fans.

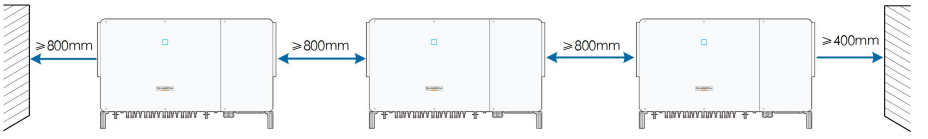
When the inverter is installed under the PV module whose supporting bracket is fixed, the distance between the top of the inverter and the top of the bracket can be reduced to 400mm.



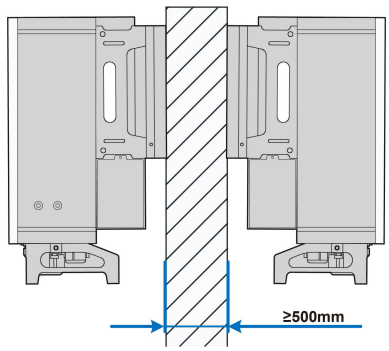
- The AC cable should be led into the inverter vertically with a vertical length of no less than 200mm.



In case of multiple inverters, reserve specific clearance between the inverters.



In case of back-to-back installation, reserve specific clearance between the two inverters.

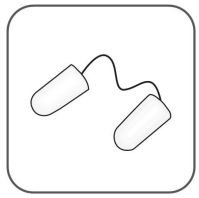
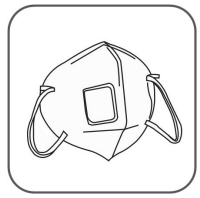
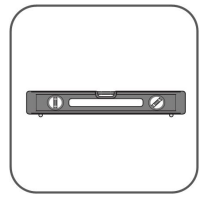


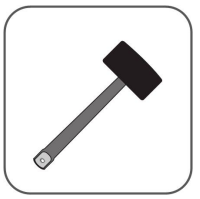
Install the inverter at an appropriate height for ease of viewing LED indicator and operating switch(es).

4.3 Installation Tools

Installation tools include but are not limited to the following recommended ones. If necessary, use other auxiliary tools on site.

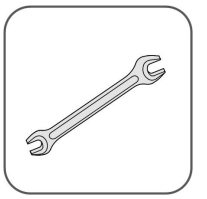
table 4-1 Tool specification

 Goggles	 Earplugs	 Dust mask	 Protective gloves
 Insulated shoes	 Utility knife	 Slotted screwdriver (M2, M6)	 Phillips screwdriver (M4, M6, M8)
 Hammer drill (φ12, φ14)	 Pliers	 Marker	 Level

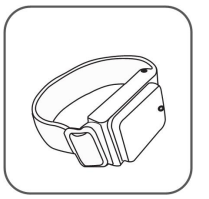


Rubber mallet

Socket wrench set (16mm)



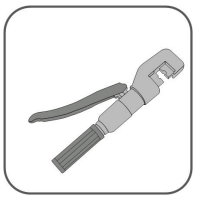
Wrench (13 mm, 16 mm)



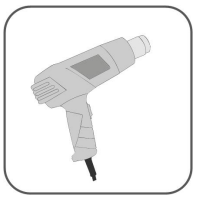
Wrist strap

Wire cutter

Wire stripper

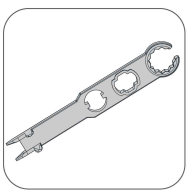


Hydraulic plier

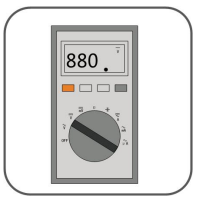


Heat gun

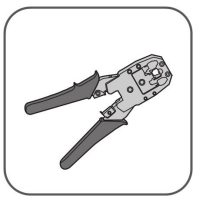
MC4–Evo2 terminal crimping pliers 4–6mm²



MC4–Evo2 terminal wrench



Multimeter ≥ 1500 Vdc



RJ45 crimping tool

Vacuum cleaner

4.4 Moving the Inverter

Move the inverters by carrying them manually or using a hoisting tool based on site conditions.

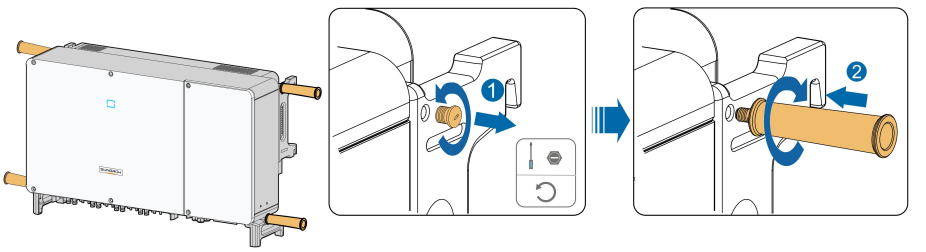
CAUTION

Improper handling may cause personal injury!

- **Arrange an appropriate number of personnel to carry the inverter according to its weight, and installation personnel should wear protective equipment such as anti-impact shoes and gloves.**
- **Attention must be paid to the center of gravity of the inverter to avoid tilting during handling.**
- **Placing the inverter directly on a hard ground may cause damage to its metal enclosure. Protective materials such as sponge pad or foam cushion should be placed underneath the inverter.**
- **Move the inverter by holding the handles on it. Do not move the inverter by holding the terminals.**

4.4.1 Manual Transport

step 1 Release the sealing screws on the mounting ears with a flat-head screwdriver and store them properly. Anchor the four supplied screw-in handles to the mounting ears and base of the inverter.



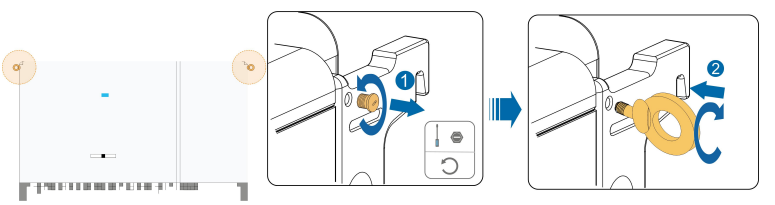
step 2 Lift and move the inverter to the destination by using the side and bottom handles as well as the four installed handles.

step 3 Remove the screw-in handles and reassemble the sealing screws released in Step 1.

- - End

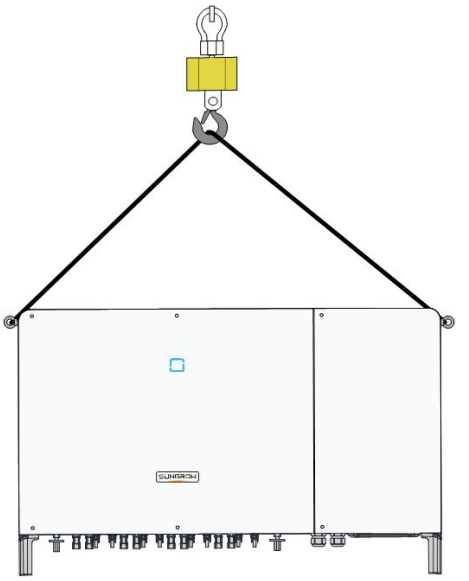
4.4.2 Hoisting Transport

step 1 Release the sealing screws on the mounting ears and store them properly. Anchor two M12 thread lifting rings to the hangers of the inverter.



step 2 Lead the sling through the two lifting rings and fasten the tie-down strap.

step 3 Hoist the inverter, and stop to check for safety when the inverter is 100mm above the ground. Continue hoisting the device to the destination after ensuring the safety.



step 4 Remove the lifting rings and reassemble the sealing screws released in Step 1.

⚠ CAUTION

Keep the inverter balanced throughout the hoisting process and avoid collisions with walls or other objects.

Stop hoisting in the event of severe weather, such as heavy rain, thick fog, or strong wind.

The lifting rings and the sling are not within the delivery scope.

- - End

4.5 Installing the mounting-bracket

Inverter is installed on the wall and bracket by means of mounting bracket.

The expansion plug set shown below is recommended for the installation.

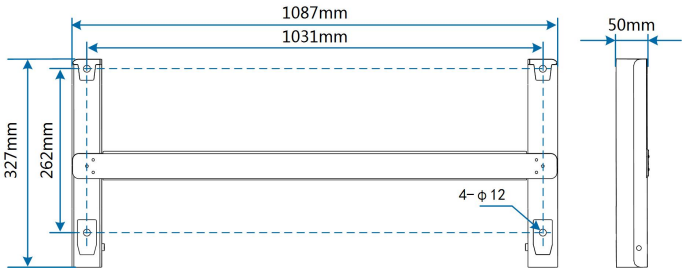
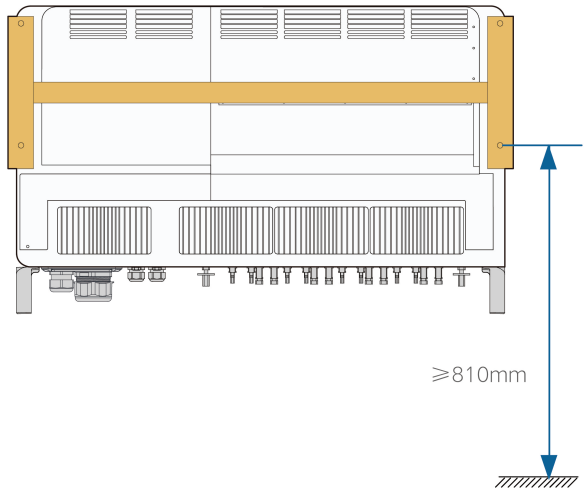


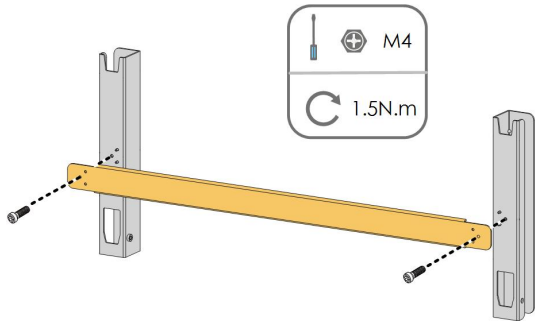
figure 4-1 Dimensions of mounting-bracket

Install the inverter to the mounting-bracket, and dimensions after installation are as follows.

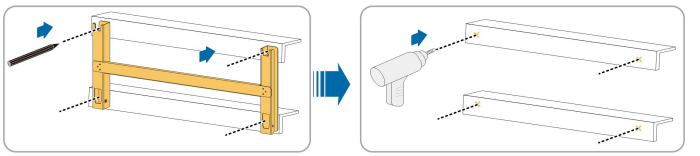


4.5.1 PV Bracket-Mounted Installation

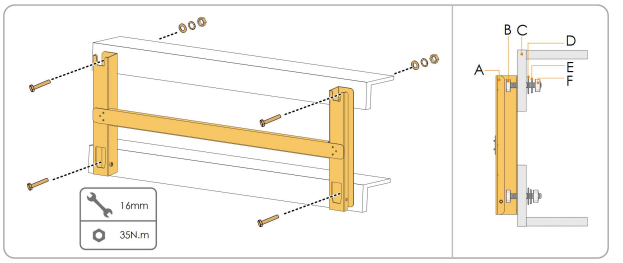
step 1 Assemble the mounting-bracket by using the connecting bar.



step 2 Level the assembled mounting-bracket by using the level, and mark the positions for drilling holes on the PV bracket. Drill the holes by using a hammer drill.



step 3 Secure the mounting-bracket with bolts.

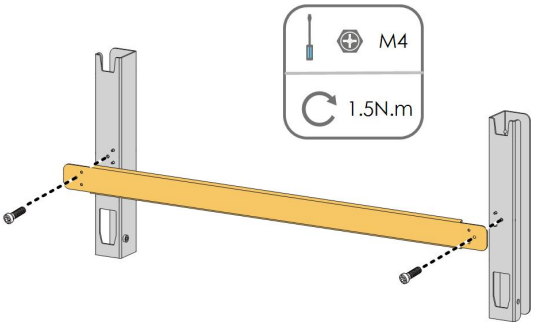


No.	Components	Description
A	Mounting-bracket	–
B	Full threaded bolt	M10*45
C	Metal bracket	–
D	Flat washer	–
E	Spring washer	–
F	Hex nuts	M10

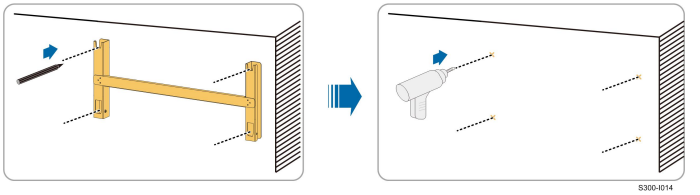
- - End

4.5.2 Wall-Mounted Installation

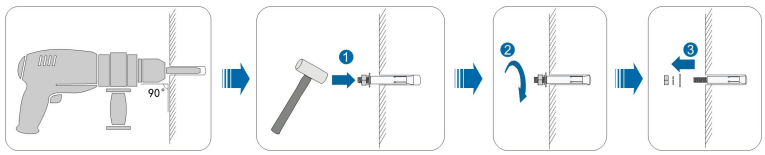
step 1 Assemble the mounting-bracket by using the connecting bar.



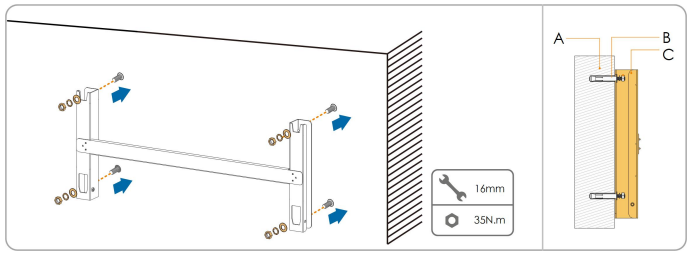
step 2 Level the assembled mounting-bracket by using the level, and mark the positions for drilling holes on the installation site.



step 3 Insert the expansion bolts into the holes and secure them with a rubber hammer. Fasten the nut with a wrench to expand the bolt. Remove the nut, spring washer, and flat washer, and store them properly.



step 4 Fix the mounting-bracket with the expansion bolts.



No.	Components	Description
A	Wall	–
B	Expansion bolt	Fastening the bolt in the sequence of nut, spring washer, slat washer
C	Mounting-bracket	–

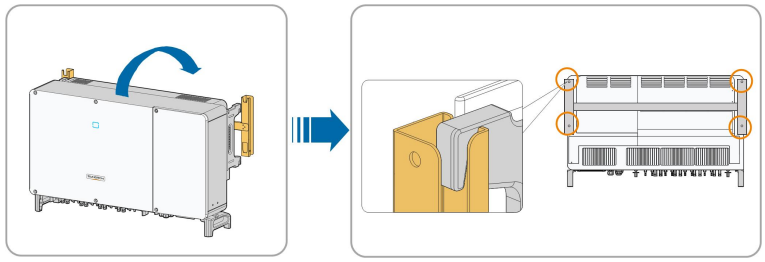
- - End

4.6 Installing the Inverter

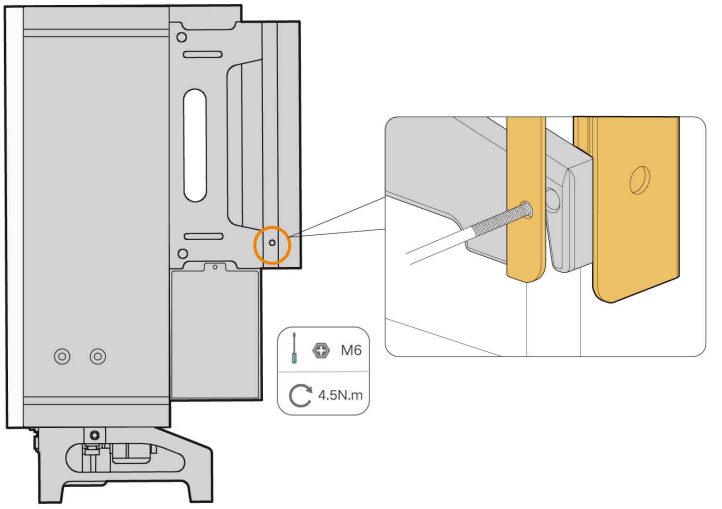
step 1 Take out the inverter from the packing case.

step 2 Hoist the inverter to the installation position when necessary (refer to "4.4.2 Hoisting Transport"). If the installation position is not high enough, skip performing this step.

step 3 Hang the inverter to the mounting-bracket and ensure that the mounting ears perfectly engage with the mounting-bracket.



step 4 Fix the inverter with screws.



- - End

5 Electrical Connection

5.1 Safety Instructions

DANGER

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

- **Operators must wear proper personal protective equipment during electrical connections.**
- **Must ensure that cables are voltage-free with a measuring instrument before touching DC cables.**
- **Respect all safety instructions listed in relevant documents about PV strings.**

DANGER

- **Before electrical connections, please make sure that the inverter switch and all switches connected to the inverter are set to "OFF", otherwise electric shock may occur!**
- **Ensure that the inverter is undamaged and all cables are voltage free before performing electrical work.**
- **Do not close the AC circuit breaker until the electrical connection is complete.**

WARNING

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

- **Electrical connection must be performed by professionals.**
- **Operators must wear proper personal protective equipment during electrical connections.**
- **All cables used in the PV generation system must be firmly attached, properly insulated, and adequately dimensioned.**

NOTICE

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

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

NOTICE

- **All vacant terminals must be covered with waterproof covers to prevent affecting the protection rating.**
- **When the wiring is completed, seal the gap of cable inlet and outlet holes with fireproof / waterproof materials such as fireproof mud to prevent foreign matter or moisture from entering and affecting the long-term normal operation of the inverter.**
- **Comply with the safety instructions related to PV strings and the regulations related to the utility grid.**

The cable colors in figures in this manual are for reference only. Please select cables according to local cable standards.

5.2 Terminal Description

Wiring terminals are at the bottom of the inverter, as shown in the figure below.

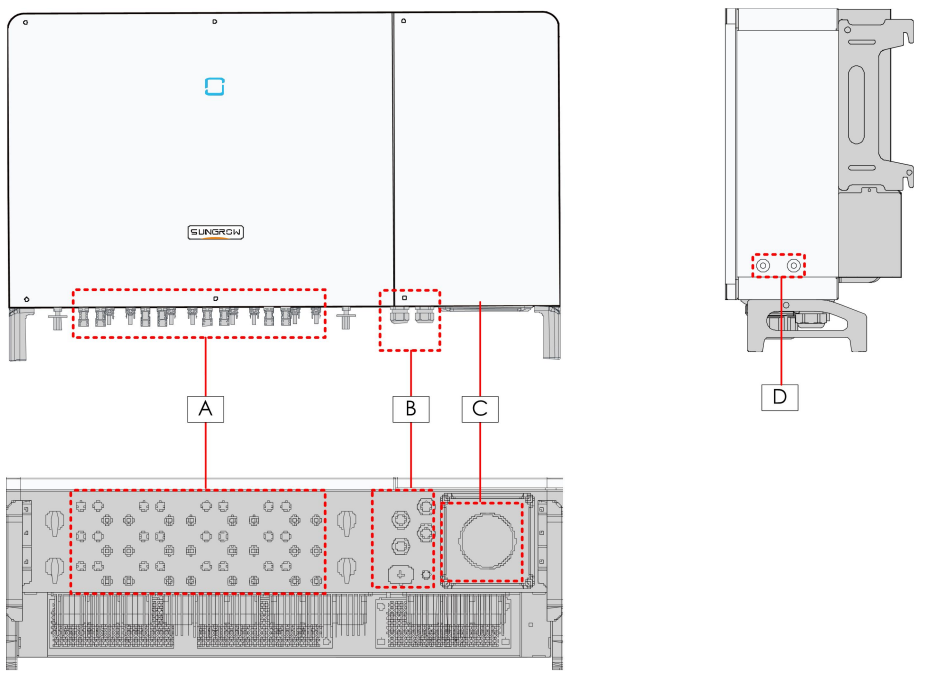
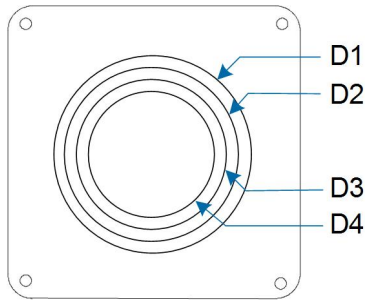


figure 5-1 Wiring terminals

* The image shown here is for reference only. The actual product received may differ.

Item	Terminal	Mark	Note
A	PV terminals	+ / -	24, PV connector
B	Communication terminal	COM1	RS485 communication, digital input/output DI/DO, and power supply of tracking system.
		COM2	
		COM3	
		COM4	
		COM5	Reserved
C*	Conduit hole	AC	Opening for AC cable connection with a hole size of 106mm/4.17inches, suitable for conduits of 3–1/2
D	External grounding terminal	⏚	For reliable grounding of the inverter

*The original sealing plate is suitable for conduits of 3–1/2. In case of conduits of other specifications, install the provided spare sealing plate. Marks, D1–D4, on the spare sealing plate correspond to four specifications, as shown in the figure below.

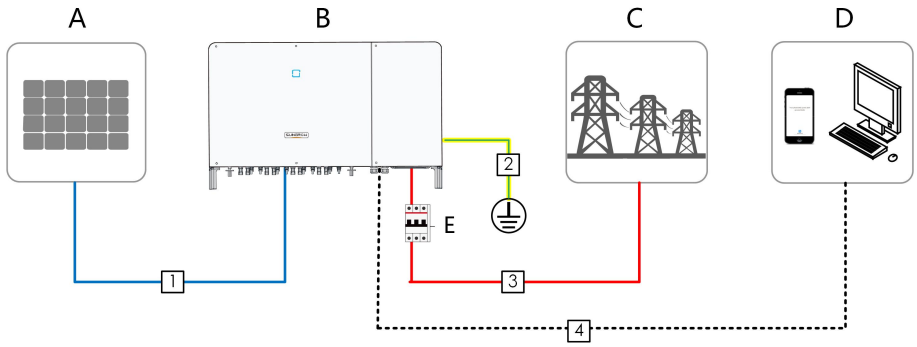


Spare sealing plate

Item	Specification	Trade Size of Conduit
D1	119mm	4
D2	106mm	3–1/2
D3	92mm	3
D4	76mm	2–1/2

5.3 Electrical Connection Overview

The electrical connection should be realized as follows:



(A) PV string (B) Inverter (C) Grid

(D) Monitoring device (E) AC circuit breaker

table 5-1 Cable Requirements

No.	Cable	Type	Specification	
			Cable Diameter(mm)	Cross-sectional Area (mm^2)
1	DC cable	PV cable complying with 1,500V standard	4.7~6.4	4~6
2	External grounding cable	Outdoor single-core copper wire cable	/	The same as that of the PE wire in the AC cable
3	AC cable	Four-core copper or aluminum cable*	Depends on the size of pipe conduit	L1,L2,L3 wire: 70~240 PE wire: refer to "table 5-2 PE wire requirements"
4	Communication cable	Shielded twisted pair	4.5~18	1~1.5

* A copper to aluminum adapter terminal is required when an aluminum cable is used. For details, refer to " Aluminium Cable Requirements".

table 5-2 PE wire requirements

PE wire cross section	Note
S/2 (S: Phase wire cross-section S)	The specifications are valid only when the phase wire and PE wire use the same material. If otherwise, ensure that the cross section of the PE wire produces a conductance equivalent to that of the wire specified in the table.

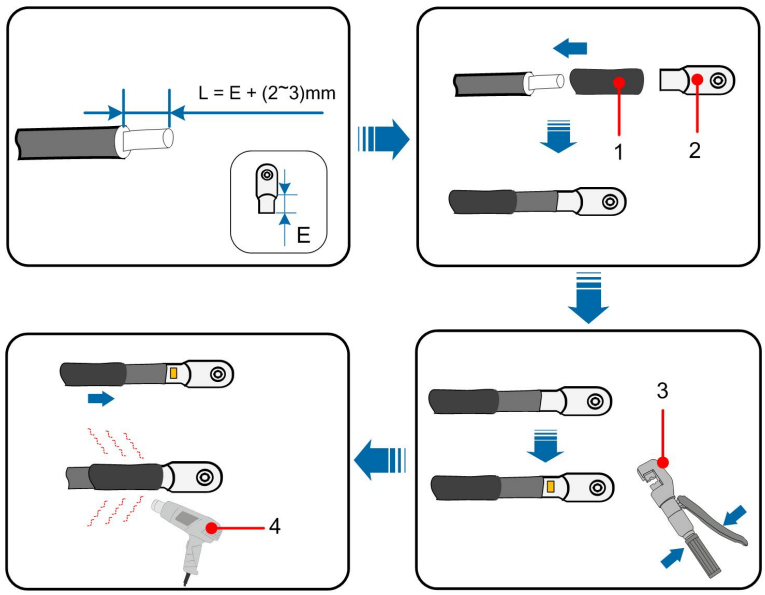
table 5-3 Power Cable for Tracking System

Cable	Type	Specification		
		Cable Diameter (mm)	Recommended Cross-sectional Area (mm^2)	Voltage Level
Power cable for tracking system	Double-core outdoor copper cable	4.5~18	4~6*	Consistent with selected AC cable

* Only when the cable cross-sectional area ranges between 4 mm^2 and 6 mm^2, the supplied OT terminals can be used. If otherwise, users should prepare M12 OT terminals by themselves, and ensure that the cable cross-sectional area is within the range of 0.5~10 mm^2.

5.4 Crimp OT / DT terminal

Crimp OT / DT terminal



1. Heat shrink tubing
2. OT DT terminal
3. Hydraulic pliers
4. Heat gun

Aluminium Cable Requirements

If an aluminium cable is selected, use a copper to aluminium adapter terminal to avoid direct contact between the copper bar and the aluminium cable.

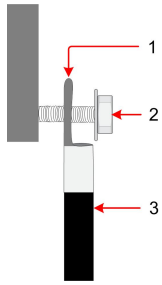


figure 5-2 Aluminium cable terminal connection sequence

1. Copper to Aluminium adapter terminal 2. Flange nut 3. Aluminium cable

NOTICE

Ensure that the selected terminal can directly contact with the copper bar. If there are any problems, contact the terminal manufacturer.
Ensure that the copper bar is not in direct contact with the aluminum wire. Otherwise, electrochemical corrosion may occur, impairing the reliability of electrical connection.

5.5 External Grounding Connection

DANGER

Electric shock!

- **Make sure that the ground cable is connected reliably. Otherwise, it may cause electric shock.**

WARNING

- **Since the inverter is not equipped with a transformer, neither the negative electrode nor the positive electrode of the PV string can be grounded. Otherwise, the inverter will not operate normally.**
- **Connect the grounding terminal to the protective grounding point before AC cable connection, PV string connection, and communication cable connection.**
- **It is recommended that both the external grounding terminal and the AC side grounding terminal be grounded reliably. A single grounding connection is also acceptable if it is enough to meet the requirements of local standards and related safety regulations. Otherwise, SUNGROW shall not be held liable for any damage caused by the violation.**

5.5.1 External Grounding Requirements

All non-current carrying metal parts and device enclosures in the PV power system should be grounded, for example, brackets of PV modules and inverter enclosure.

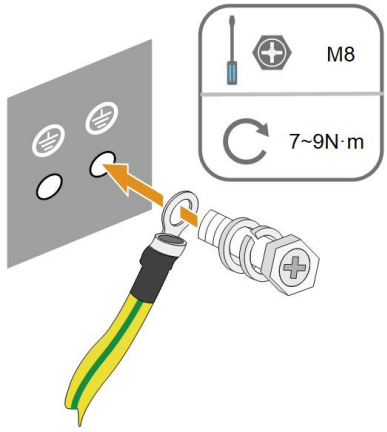
When there is only one inverter in the PV system, connect the external grounding cable to a nearby grounding point.

When there are multiple inverters in the PV system, connect grounding points of all inverters and the PV array frames to the equipotential cable (according to the onsite conditions) to implement an equipotential connection.

5.5.2 Connection Procedure

step 1 Prepare the cable and OT / DT terminal, refer to " Crimp OT / DT terminal".

step 2 Remove the screw on the grounding terminal and fasten the cable with a screwdriver.



step 3 Apply paint to the grounding terminal to ensure corrosion resistance.

The grounding screws have been anchored to the side of the inverter before delivery, and do not need to be prepared.

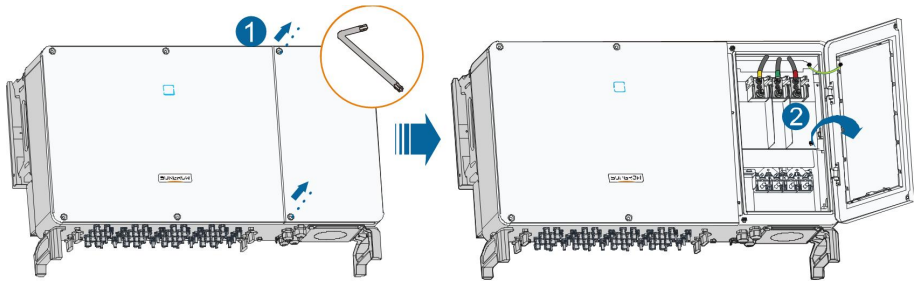
There are two grounding terminals. Use one of them to ground the inverter.

- - End

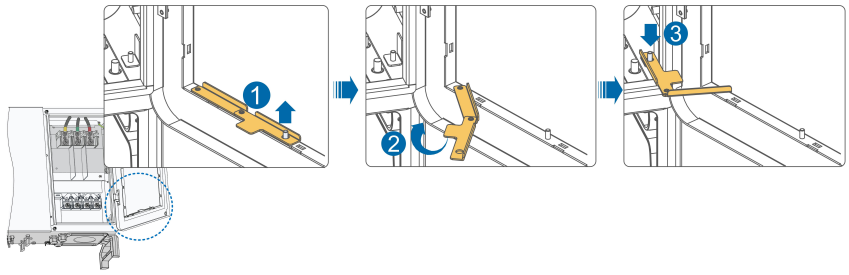
5.6 Opening the Wiring Compartment

step 1 Release two screws on the front cover of the wiring compartment with supplied Allen wrench.

step 2 Open the wiring compartment.



step 3 Keep the wiring compartment open during wiring through the limit lever attached to the cover.



- - End

Close the wiring compartment in reverse order after completing wiring operations.

5.7 AC Cable Connection

5.7.1 AC-Side Requirements

Only with the permission of the local grid department, the inverter can be connected to the grid.

Before connecting the inverter to the grid, ensure the grid voltage and frequency comply with requirements, for which, refer to **"Technical Date"**. Otherwise, contact the electric power company for help.

AC circuit breaker

WARNING

Over-current protection devices, such as AC circuit breakers and fuses, must be installed on the AC side of the inverter and the grid side to ensure safe disconnection between the inverter and the grid..

- **Do not connect any local load between the inverter and the AC circuit breaker except for the tracking axis.**
- **Multiple inverters cannot share one AC circuit breaker.**

table 5-4 Recommended specifications of AC circuit breaker

Recommended rated voltage	Recommended rated current
800V	250A

Requirements for multiple inverters in parallel connection

A maximum of 15 inverters can be connected in parallel to a winding of a box-type transformer when multiple inverters are connected to the grid in parallel. Please contact SUNGORW to confirm the technical solution if otherwise required.

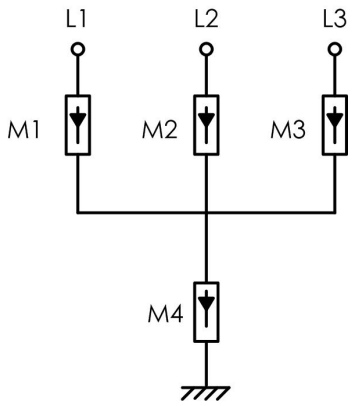
MV transformer

The MV transformer used together with the inverter should meet the following requirements:

- The transformer may be a distribution transformer, and it must be designed for the typical cyclical loads of a PV system (load in the day and no load at night).
- The transformer may be of the liquid-immersed type or dry type, and shield winding is not necessary.
- The line-to-line voltage on the LV side of the transformer should endure the AC side output voltage of the inverter. When the transformer is connected to to the IT grid, to-ground withstanding voltage of the LV winding of the boosting transformer, the AC cables, and the secondary equipment (including the relay protection device, detection & measuring device, and other related auxiliary devices) should not be lower than 1500Vdc.
- Two double split windings in the same phase of the transformer should be able to endure a system voltage of no less than 1500Vdc.
- The line-to-line voltage on the HV side of transformer should comply with local grid voltage.
- A transformer with a tap changer on the HV side is recommended in order to keep the voltage consistent with the grid voltage.
- The running capacity of the transformer must meet the inverter's output requirements. At an ambient temperature of 30℃, the transformer should be able to run for long when the load is 1.1 times the rated load.
- When the transformer capacity is 3.15MVA, it is recommended to use a transformer with a short-circuit impedance of 7% (permissible tolerance: ±10%).

- The voltage drop of the system cable should be no more than 3%.
- The DC component that the transformer can withstand is 1% of the fundamental current at rated power.
- For thermal rating, the load curve of the inverter and environment conditions should be taken into account.
- The apparent power of the inverter should never exceed the power of the transformer. The maximum AC current of all inverters connected in parallel must be taken into account. If more than 15 inverters are connected to the grid, contact SUNGROW.
- The transformer must be protected against overloading and short circuit.
- The transformer is an important part of grid-connected PV generation system. The fault tolerance capacity of the transformer should be taken into account at all times. The faults include: system short circuit, grounding fault, voltage drop, etc.
- Take ambient temperature, relative humidity, altitude, air quality, and other environmental conditions into account when selecting and installing the transformer.
- The overall technical requirements of the box-type LV cabinet are as follows:
  - The breaking capacity of the branch molded case circuit breaker (MCCB) and air circuit breaker (ACB) of the box-type LV cabinet should be greater than the short circuit current at the LV side of the transformer. For example, the LV side short-circuit current of a boost transformer with a rated capacity of 3150kVA and a short-circuit resistance of 7% can be calculated in the following way: I=3150*1.1/0.8/1.732/0.07=35.73kA. Thus the MCCB Icu of the LV cabinet branch circuit should be no less than 35.73kA at 880Vac.
  - The temperature and altitude derating should be taken into account when a circuit breaker is working, and a LV cabinet temperature rise test report is required.
  - When designing a LV cabinet, must pay attention to the impact of the diffused MCCB electric arc on the cabinet and other branch circuit MCCBs, thus the interior of the cabinet needs to be insulated. A third-party test report of the circuit-breaking performance of the whole machine in an event of a short-circuit on the LV side is also required. It is recommended to adopt graduated protection to ensure that in an event of a single short-circuit fault on the LV side of the box, the corresponding branch MCCB trips normally while the general ACB does not trip.
  - When PLC communication is adopted, the box-type LV power distribution room needs to be equipped with a fuse switch disconnector or a circuit breaker. The recommended specification of the cable connecting to the COM100A is 4mm^2 - 10mm^2, the cable voltage specification is 1.8/3kV, and the cable distance from the COM100A to the box's LV bus should be no more than 30m.
- When PID protection is enabled, the AC output common mode voltage of the inverter is 906Vac, and the following requirements should be met:
  - The effective to-ground withstanding voltage of the LV side winding of the transformer, AC cables, and secondary devices (including protective relay, detection and measurement instruments, and related auxiliary devices) should be no less than 906Vac.
  - If the LV side winding is in Y shape, neutral point grounding is prohibited.

– Surge protective devices (SPD) for the AC combiner box and on the LV side of the transformer are recommended to be connected in the "3 +1" manner, as shown in the figure below. The Min. continuous operating voltages of M1 - M4 are 680VAC.



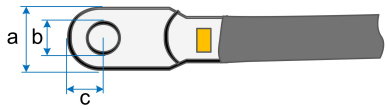
- The string serial communication box COM100 requires an external power supply of 220Vac, so a power supply port and an input port (including switches) should be reserved in the LV power distribution room of the boost transformer.

5.7.2 Requirements for OT/DT Terminal

OT/DT terminals (not included in the delivery scope) are required for fixing AC cables to the terminal block. Purchase the OT/DT terminals according to the following requirements.

OT/DT Terminals of Phase Wire

- Specification: M12;
- Dimensions: a≤46 mm / 13 mm≤b≤15.5 mm / c≤22 mm



OT/DT Terminal of PE Wire

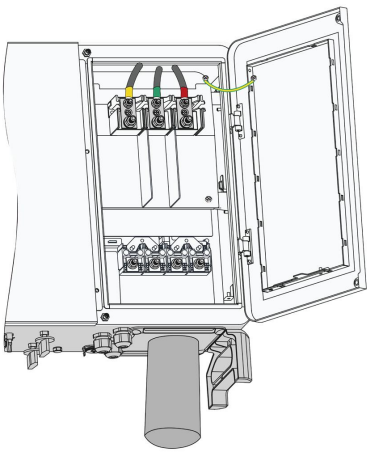
- Specification: M8 / M10.

5.7.3 Connection Procedure

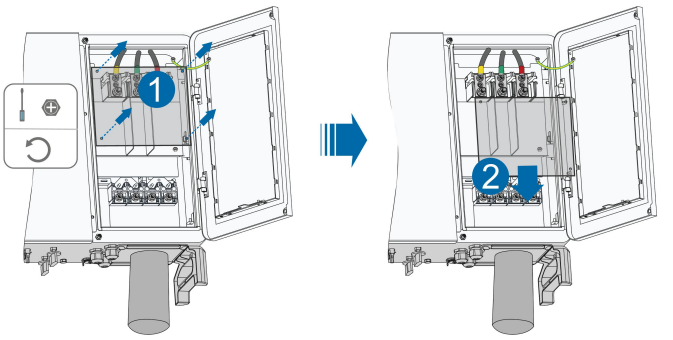
step 1 Open the wiring compartment. For details, refer to "5.6 Opening the Wiring Compartment".

step 2 Disconnect the AC-side circuit breaker and prevent it from inadvertent reconnection.

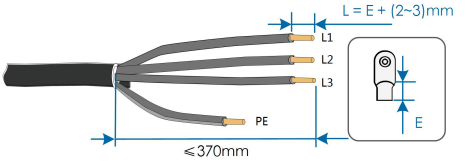
step 3 Install an appropriate conduit, and lead the cable into the cabinet through the conduit.



step 4 Remove the protection cover and store the released screws properly.



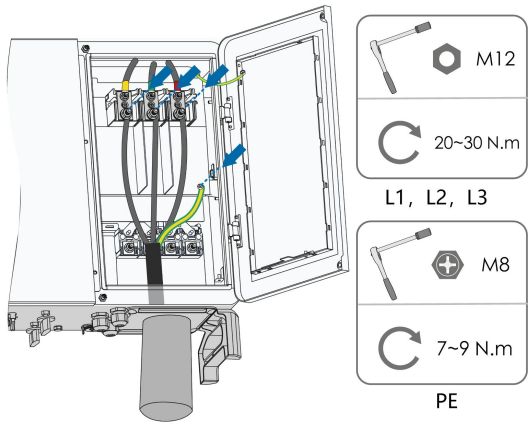
step 5 Strip the protection layer and insulation layer by specific length, as described in the figure below.



step 6 If wiring of tracking system power cable is required, refer to "5.9 Wiring of Tracking System Power Cable (Optional)". Otherwise, skip performing this step.

step 7 Make the cable and crimp OT/DT terminal.

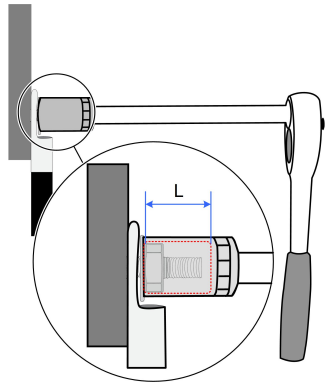
step 8 Secure the wires to corresponding terminals.



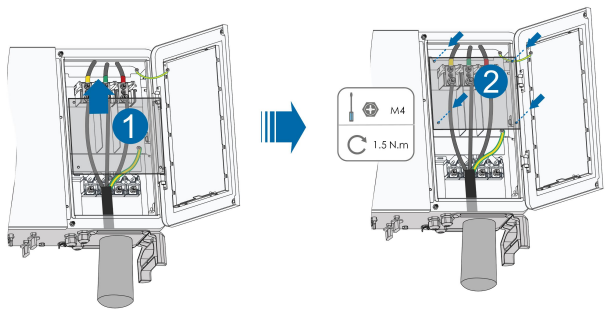
NOTICE

Note the terminal positions of PE wire and N wire. If a phase wire is connected to the PE terminal or N terminal, unrecoverable damage may be caused to the inverter.

Ensure that the depth L of the socket used is not less than 28mm.



step 9 Install the protection cover.



- - End

5.8 DC Cable Connection

DANGER

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

- **Respect all safety instructions listed in relevant documents about PV strings.**

WARNING

- **Make sure the PV array is well insulated to ground before connecting it to the inverter.**
- **Make sure the maximum DC voltage and the maximum short circuit current of any string never exceed inverter permitted values specified in "Technical Data".**
- **Check the positive and negative polarity of the PV strings, and connect the PV connectors to corresponding terminals only after ensuring polarity correctness.**
- **During the installation and operation of the inverter, please ensure that the positive or negative electrodes of PV strings do not short-circuit to the ground. Otherwise, an AC or DC short-circuit may occur, resulting in equipment damage. The damage caused by this is not covered by the warranty.**
- **Electric arc or contactor over-temperature may occur if the PV connectors are not firmly in place, and SUNGROW shall not be held liable for any damage caused.**
- **If the DC input cables are reversely connected and the DC switch has been rotated to "ON", do not operate immediately. Otherwise, the inverter may be damaged. Please turn the DC switch to "OFF" and remove the DC connector to adjust the polarity of the strings when the string current is lower than 0.5 A.**

NOTICE

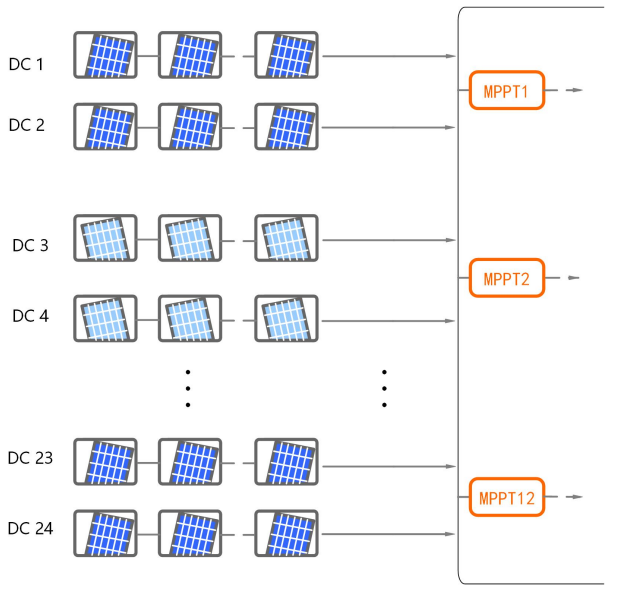
The following requirements about PV string connection must be met. Otherwise, it may cause irreversible damage to the inverter, which is not covered by the warranty.

- **Mixed use of different brand or model of PV modules in one MPPT circuit, or PV modules of different orientation or angles in a string may not damage inverter but will cause system bad performance!**

5.8.1 PV Input Configuration

- As shown in the figure below, the inverter is provided with multiple PV inputs: PV inputs 1~12; and each PV input is designed with an MPP tracker.
- Each PV input operates independently and has its own MPPT. In this way, string structures of each PV input may differ from each other, including PV module type, number of PV modules in each string, angle of tilt, and installation orientation.

- Each PV input area includes two DC inputs. For the best use of DC power, DC1 and DC2 should be the same in PV string structure, including the type, number, tilt, and orientation of the PV modules.



Prior to connecting the inverter to PV inputs, the specifications in the following table should be met:

Open-circuit Voltage Limit	Max. current for input connector
1,500V	30A

5.8.2 Assembling the PV Connectors

DANGER

High voltage may be present in the inverter!

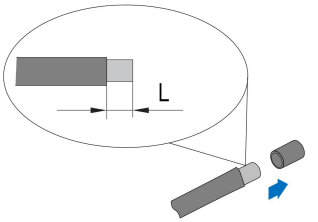
- **Ensure all cables are voltage-free before performing electrical operations.**
- **Do not connect the AC circuit breaker before finishing electrical connection.**

NOTICE

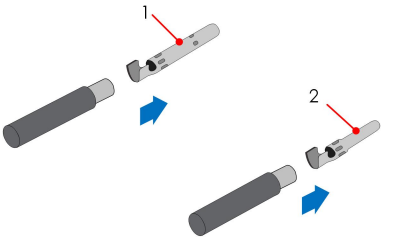
Please use the DC terminal within the scope of delivery or purchase the PV connector according to the recommended model below. Equipment damage caused by the use of unmatched terminals is not covered by the warranty.

- **If the cross-sectional area of the DC cable is 4/6mm², use the PV connector within the scope of delivery. The recommended model of the female cable connector is PV-KST4-EVO 2 / 6I-UR (Stäubli), and the recommended male cable connector is PV-KBT4-EVO 2 / 6I-UR (Stäubli).**
- **If the cross-sectional area of the DC cable is 10mm², users need to prepare the PV connector by themselves or order it from SUNGROW. The recommended model of the female cable connector is PV-KBT4-EVO 2 / 10II-UR (Stäubli), and the recommended male cable connector is PV-KST4-EVO 2 / 10II-UR (Stäubli).**

step 1 Strip the insulation from each DC cable by 8 mm~10 mm.

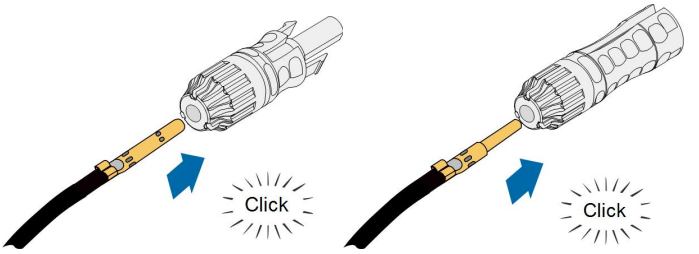


step 2 Assemble the cable ends with the crimping pliers.

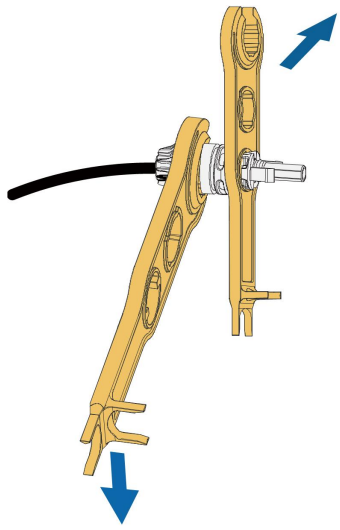


1: Positive crimp contact 2：Negative crimp contact

step 3 Lead the cable through cable gland, and insert the crimp contact into the insulator until it snaps into place. Gently pull the cable backward to ensure firm connection.



step 4 Tighten the cable gland and the insulator.



Cross-sectional area (mm²)	Tightening torque (N·m)
4	4.0
6	3.5

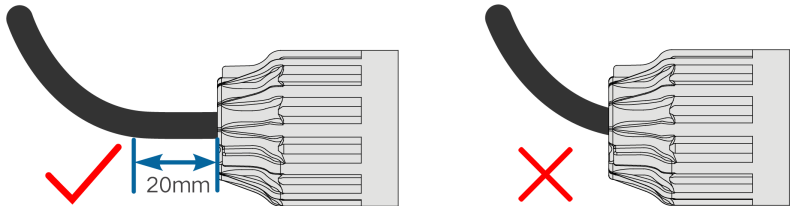
step 5 Check for polarity correctness.

NOTICE

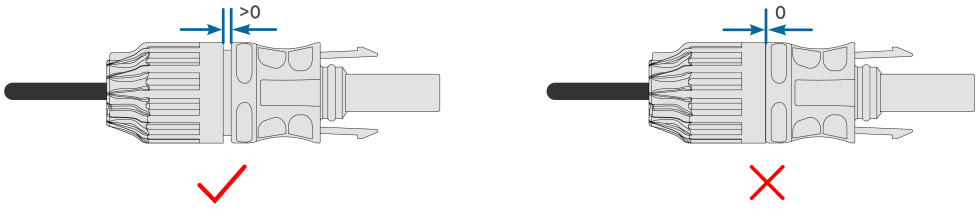
If the PV polarity is reversed, the inverter will be in a fault or alarm state and will not operate normally.

- - End

Observe the specifications of the cable manufacturer with regard to the permitted bending radius. Make sure that the bending radius of the cable is at least 20 mm.

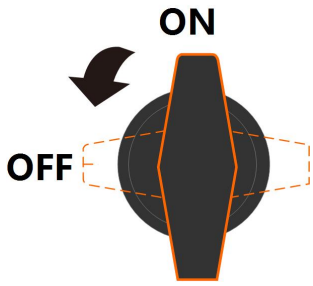


Do not bottom out the capnut.

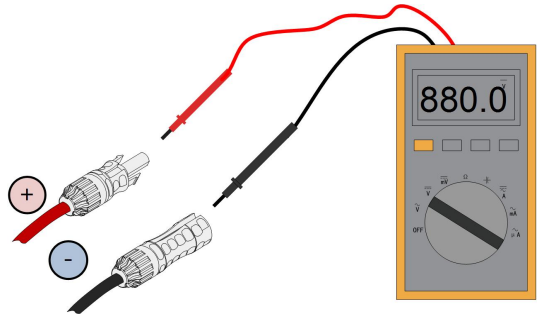


5.8.3 Installing the PV Connector

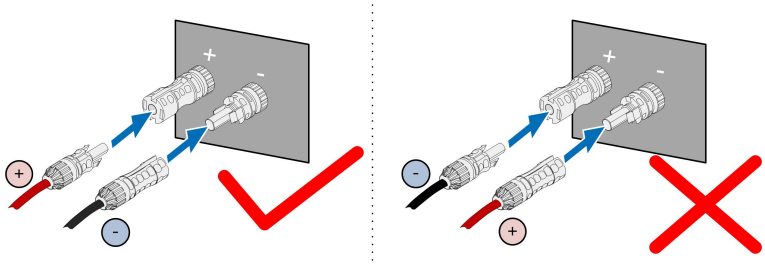
step 1 Ensure that the DC switch is in "OFF" position. Otherwise, manually turn it to "OFF".



step 2 Check the cable connection of the PV string for polarity correctness and ensure that the open circuit voltage in any case does not exceed the inverter input limit of 1,500V.



step 3 Connect the PV connectors to corresponding terminals until there is an audible click.



step 4 Follow the foregoing steps to connect PV connectors of other PV strings.

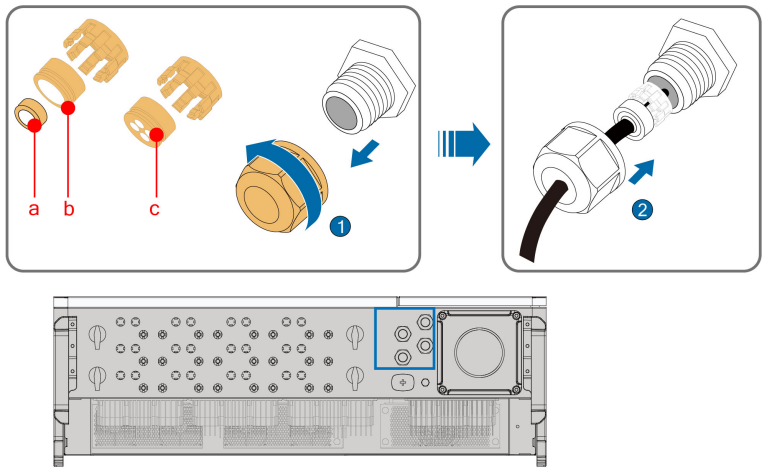
step 5 Seal any unused PV terminal with a terminal cap.

- - End

5.9 Wiring of Tracking System Power Cable (Optional)

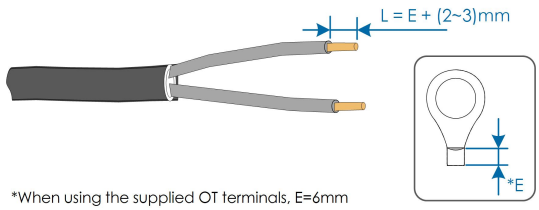
step 1 Lead the AC cable into the wiring compartment according to Step 1 to Step 4 described in "5.7.3 Connection Procedure".

step 2 Loosen the swivel nut of the communication terminal and select an appropriate seal according to cable outer diameter. Lead the cable through the swivel nut and seal successively.



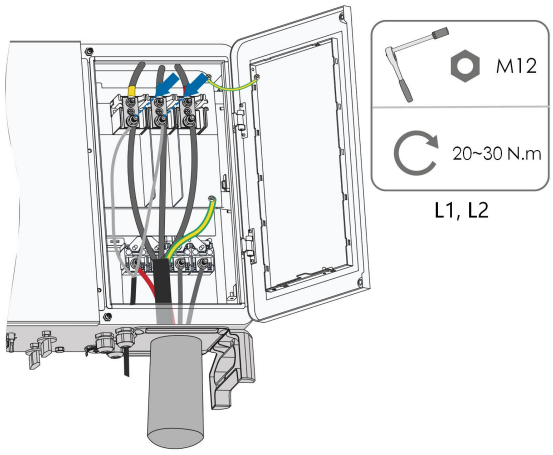
Outer diameter D(mm)	Seal
4.5 ~ 6	c
6 ~ 12	a + b
12 ~ 18	b

step 3 Strip the protection layer and insulation layer by specific length, as described in the figure below.



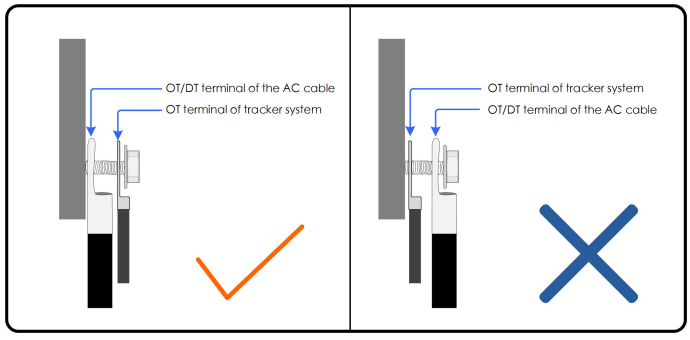
step 4 Install the OT terminal and press it tight.

step 5 Stack the OT terminals on the OT/DT terminal of the AC cables, and fix the cables to corresponding terminals.

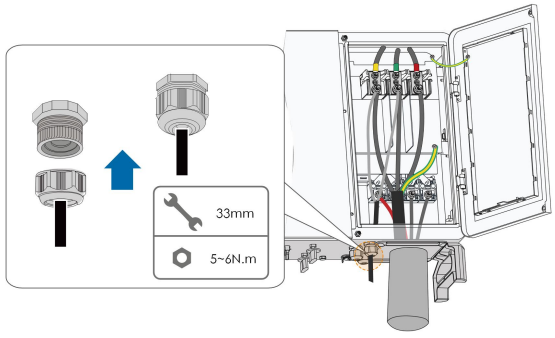


DANGER

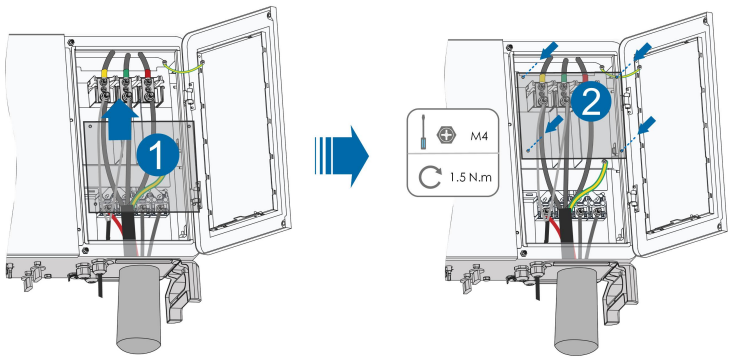
Ensure that OT terminals of the power cable are installed on the OT/DT terminals of the AC cable. Otherwise, it will cause over heat or even burn.



step 6 Gently pull the cable backwards to ensure firm connection, and fasten the swivel nut clockwise.



step 7 Install the protection cover.



- - End

There are four communication terminals COM1, COM2, COM3 and COM4 on the bottom of the inverter. Select the communication terminal according to onsite conditions.

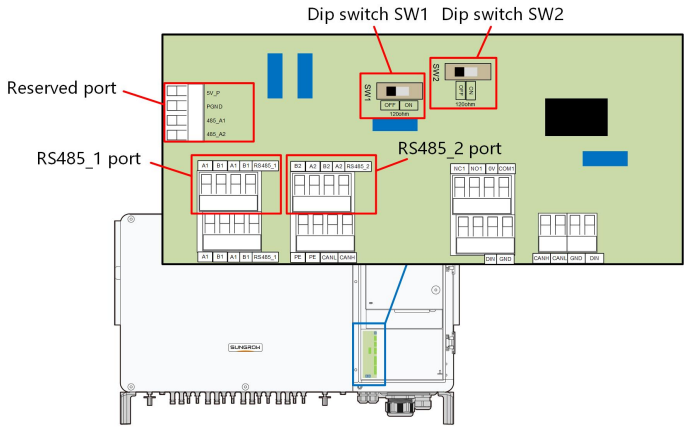
Disconnector (≥ 800Vac) and fuse (16A, gM) should be installed between the inverter and the tracking system control cabinet.

Length of the cable connecting the internal wiring terminal of the inverter and the fuse should be less than 2.5m.

5.10 RS485 Connection

5.10.1 Interface Description

The following figure shows the position of the communication wiring board in the inverter as well as the terminals equipped for the wiring board.



*The reserved port is not available for the time being.

The inverter is equipped with two sets of RS485 communication terminals: RS485_1 port and RS485_2 port.

The port RS485_1 is used to connect Logger, so as to implement data exchange with PC or other monitoring devices.

The port RS485_2 is used to connect communication device of the tracking system, so as to implement data exchange with the tracking system. Terminal definitions of the two ports are as follows:

table 5-5 RS485_1 port terminal definition

No.	Definition
A1	RS485 A IN, RS485A differential signal+
B1	RS485 B IN, RS485B differential signal-
A1	RS485 A OUT, RS485A differential signal+
B1	RS485 B OUT, RS485B differential signal-

table 5-6 RS485_2 port terminal definition

No.	Definition
B2	RS485 B OUT, RS485B differential signal-
A2	RS485 A OUT, RS485A differential signal+
B2	RS485 B IN, RS485B differential signal-
A2	RS485 A IN, RS485A differential signal+

When multiple inverters (≥15) are connected in a daisy chain, a dip switch can be used to connect a resistor of 120Ω in parallel between A and B pins to ensure communication quality.

NOTICE

The silk print of the Dip switch corresponding to the RS485_1 port is SW2.
The silk print of the DIP switch corresponding to the RS485_2 port is SW1.

5.10.2 RS485 Communication System

Single-inverter Communication System

In case of a single inverter, communication cable connection requires only one RS485 cable.

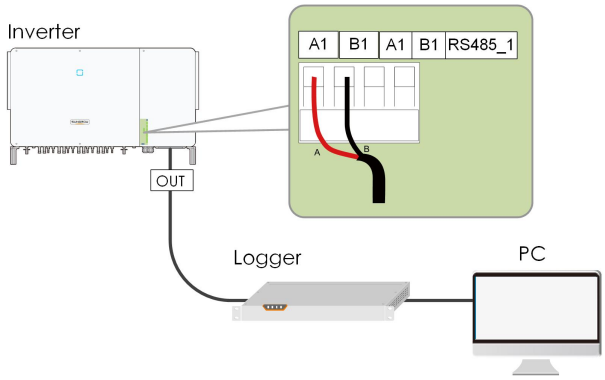


figure 5-3 Single-inverter Connection

Multi-inverter Communication System

In case of multiple inverters, all the inverters can be connected via RS485 cables in the daisy chain manner. The communication cable of the tracking system can be connected to the port RS485_2 of any inverter in the daisy chain.

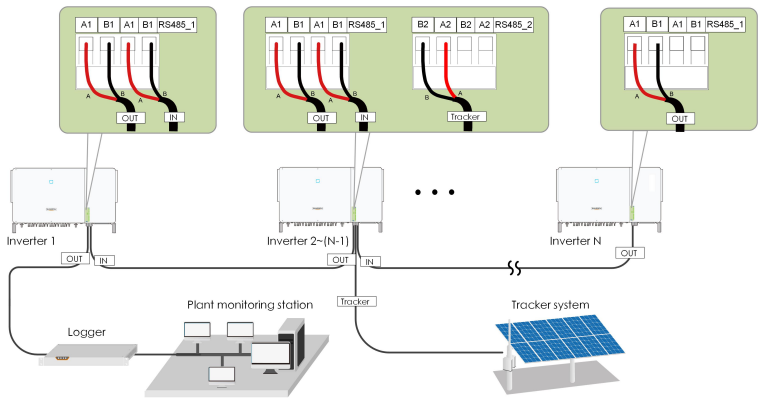


figure 5-4 Multi-inverter Connection

When more than 15 inverters are connected on the same daisy chain, in order to ensure the communication quality, the Logger at the first end of the daisy chain needs to be equipped with a terminal resistor of 120Ω, the inverter at the last end needs to be equipped with a RS485-dip switch (SW2),and the shielding layer of the communication cable should be single-point grounded.

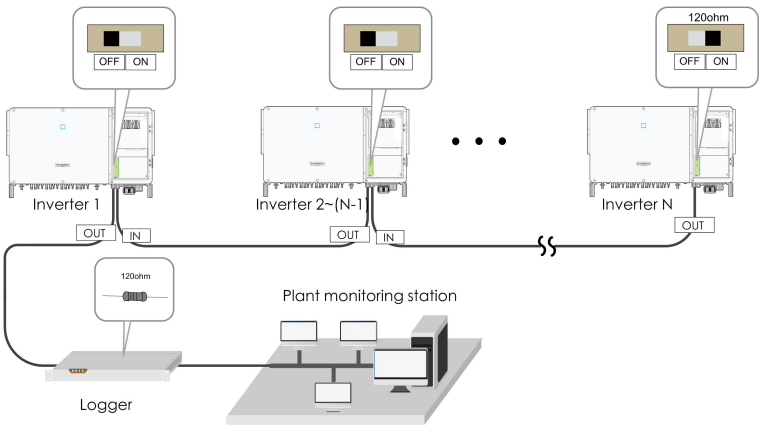


figure 5-5 Configuration of Dip Switch (N≥15)

The length of the RS485 cable and twisted pair cable should be no longer than 1,200m.

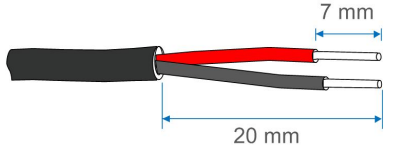
If multiple inverters are connected to the data collectorLogger3000, the number of permissible daisy chains and the number of devices allowed to be connected should meet the requirements (refer to the user manual for the Logger3000).

5.10.3 Connection Procedure(Terminal Block)

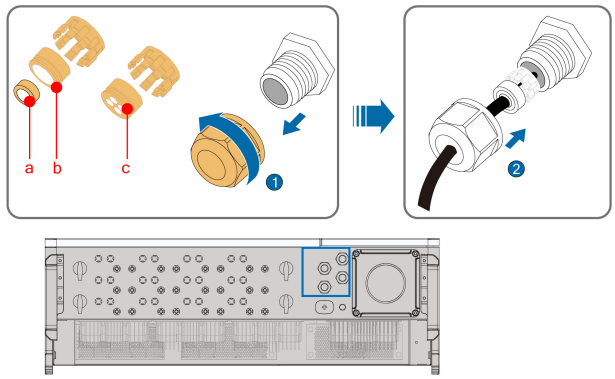
RS485 communication cables should be shielded twisted pair cables or shielded twisted pair Ethernet cables.

There are four RS485 communication terminals COM1, COM2, COM3and COM4 on the bottom of the inverter. Please choose according to the actual situation.

step 1 Strip the protection layer and insulation layer by appropriate length.

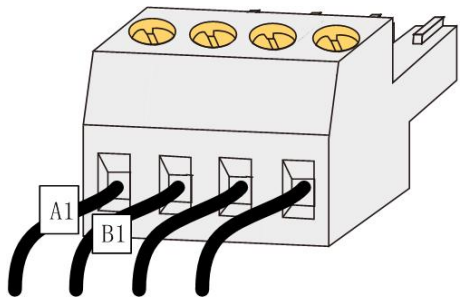


step 2 Loosen the swivel nut of the communication terminal and select an appropriate seal according to cable outer diameter. Lead the cable through the swivel nut and seal successively.



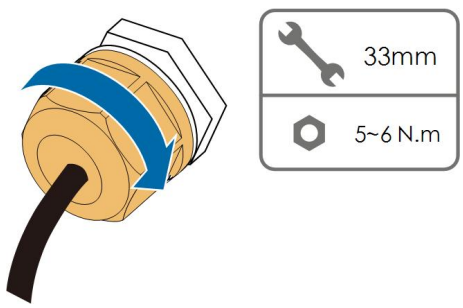
Outer Diameter D(mm)	Seal
4.5~6	c
6~12	a+b
12~18	b

step 3 Secure the cable to the terminal base.



step 4 Insert the terminal base into the corresponding terminal.

step 5 Pull the cable gently to make sure it is secured, tighten the swivel nut clockwise.



- - End

5.11 PLC Communication Connection

With a built-in PLC communication module, the inverter can communicate with the COM100A/EMU200A (communication acquisition equipment) provided by SUNGROW. For specific wiring method, please refer to the COM100A/EMU200A user manual.

- In case of PLC communication, the AC cable must be a multi-core cable instead of multiple single-core cables.
- The communication acquisition equipment conducts data communication through the AC output cable of the inverter and thus saves the trouble to lay and maintain the special communication cables. The RS-485 port of the communication acquisition equipment supports the transparent transmission of MODBUS-RTU protocol and is completely compatible with the monitoring devices and software corresponding to the original RS-485 communication.

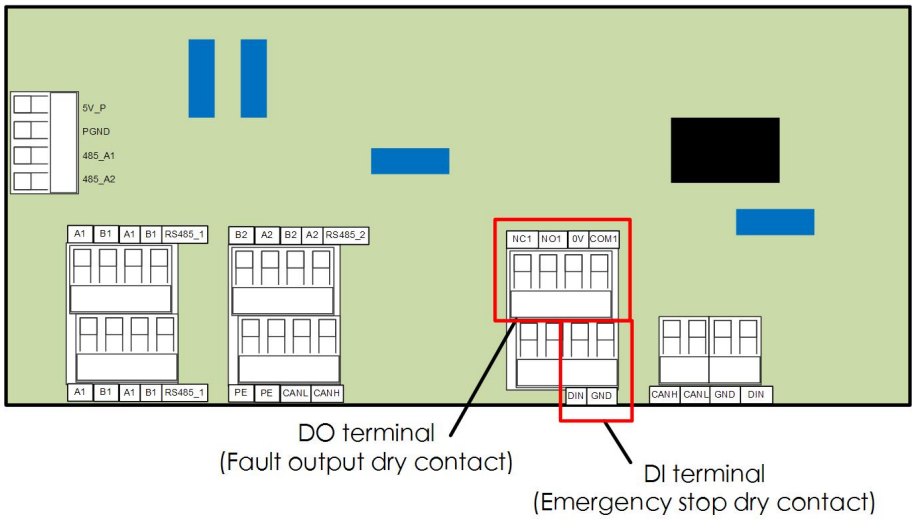
5.12 Dry Contact Connection

NOTICE

Dry contact cables require a cross section of 1 mm² to 1.5 mm².
The connection procedure of the dry contact is the same as that of the RS485 terminal block.

5.12.1 Dry Contact Function

The configuration circuit board is provided with fault output dry contact and emergency stop dry contact, as shown in the figure below.
Connection method of the dry contacts is similar to that of the RS485 terminal block.



DO terminal (fault output dry contact):the relay can be set to fault alarm output, and user can configure it to be a normal open contact (COM & NO) or a normal close contact (COM & NC).

The relay is initially at the NC terminal, and it will trip to another contact when a fault occurs. Use LED indicators or other equipment to indicate whether the inverter is in the faulty state. The following figures show the typical applications of normal open contact and normal close contact:

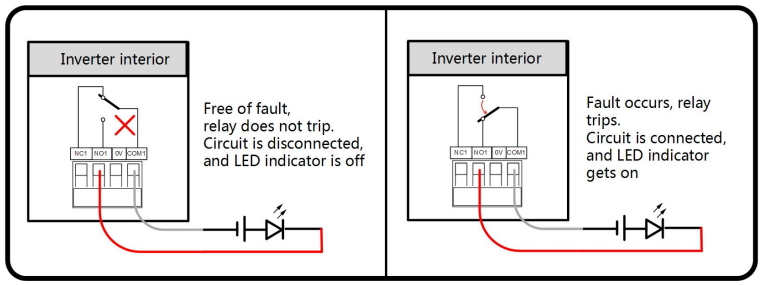


figure 5-6 Normal Open Contact

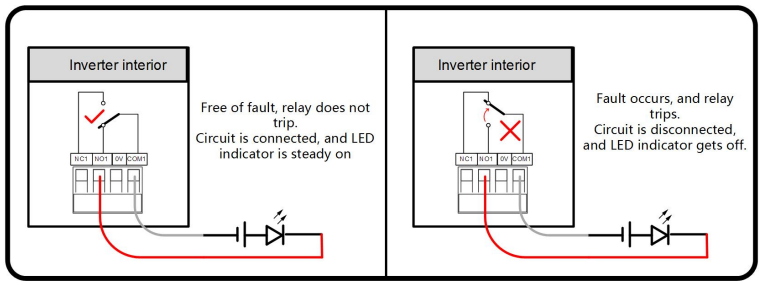


figure 5-7 Normal Close Contact

Devices connected to the relay should comply with related requirements:

AC-Side Requirements	DC-Side Requirements
Max. voltage: 250Vac	Max. voltage: 30Vdc
Max. current: 5A	Max. current: 5A

DI terminal (emergency stop dry contact): the dry contact can be configured to be an emergency stop contact.

When the DI contact and GND contact are shorted by external controlled switch, the inverter will immediately stop.

The dry contacts only support passive switch signal input.

The following figure shows the typical application of local stop dry contact.

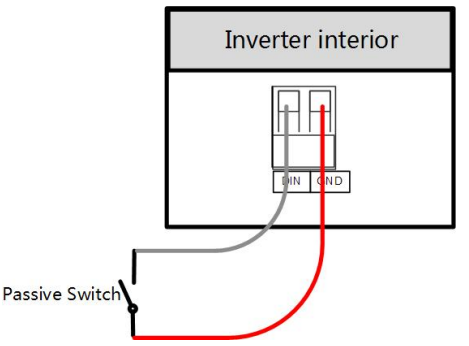


figure 5-8 Local Stop Contact

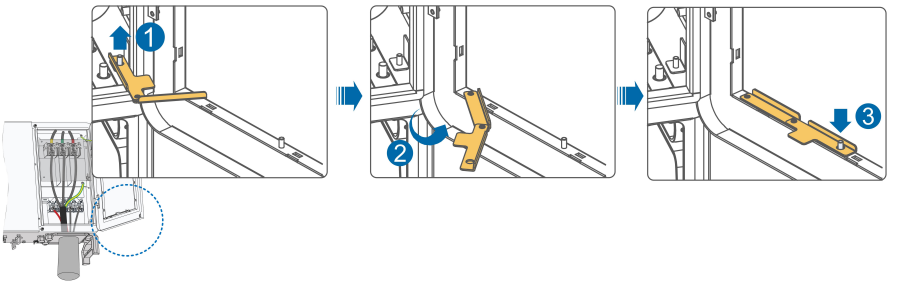
When wiring DI dry contacts, ensure that the maximum wiring distance meet the requirements in "10.2 Wring Distance of DI Dry Contact".

5.12.2 Wiring Procedure

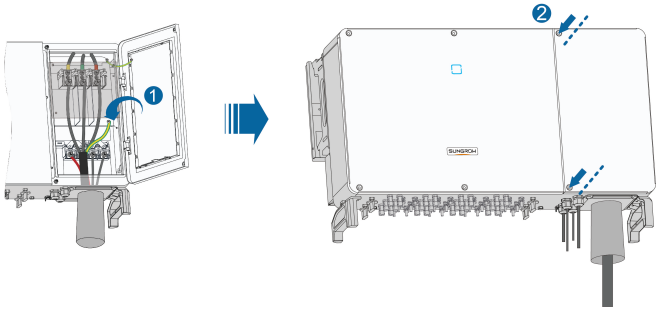
Refer to the wiring of terminal block described in chapter "5.10.3 Connection Procedure(Terminal Block)".

5.13 Closing the Wiring Compartment

step 1 Release the limit lever.



step 2 Close the wiring compartment and tighten the two screws on its front cover with supplied Allen wrench.



- - End

6 Commissioning

6.1 Inspection before Commissioning

Check the following items before starting the inverter:

- All equipment has been reliably installed.
- DC switch(es) and AC circuit breaker are in the "OFF" position.
- The ground cable is properly and reliably connected.
- The AC cable is properly and reliably connected.
- The DC cable is properly and reliably connected.
- The communication cable is properly and reliably connected.
- The vacant terminals are sealed.
- No foreign items, such as tools, are left on the top of the machine or in the junction box (if there is).
- The AC circuit breaker is selected in accordance with the requirements of this manual and local standards.
- All warning signs & labels are intact and legible.

6.2 Commissioning Procedure

If all of the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

step 1 Rotate one DC switch of the inverter to the "ON" position. When the indicator blinks blue slowly, turn the other DC switches to the “ON” position.

NOTICE

The indicator is red if there is no power supply from the grid. Report the grid power failure (the fault information can be viewed on the iSolarCloud App, see"7.7 Records" for details). The fault is automatically cleared when the AC circuit breaker between the inverter and the grid is closed.

step 2 Close the AC circuit breaker between the inverter and the grid.

step 3 Install the iSolarCloud App, see "7.2 Installing the App" for details.

step 4 Set initial protection parameters via the iSolarCloud App when the inverter is connected to the grid for the first time (see Step 4 in"7.4.2 Login Procedure" for details). If the irradiation and grid conditions meet requirements, the inverter normally operates.

step 5 The home page is automatically displayed when the initialization is completed. The indicator is steady blue, and the inverter is in grid-connected operation.

- - End

7 iSolarCloud App

7.1 Brief Introduction

The iSolarCloud App can establish communication connection to the inverter via the Bluetooth, thereby achieving near-end maintenance on the inverter. Users can use the App to view basic information, alarms, and events, set parameters, or download logs, etc.

*In case the communication module Eye, WiFi or WiNet-S is available, the iSolarCloud App can also establish communication connection to the inverter via the mobile data or WiFi, thereby achieving remote maintenance on the inverter.

- This manual describes only how to achieve near-end maintenance via the Bluetooth connection. For remote maintenance through the Eye, WiFi or WiNet-S, refer to the related manuals in the delivery scope.
- Screenshots in this manual are based on the Android system V2.1.6 , and the actual interfaces may differ.

7.2 Installing the App

Method 1

Download and install the App through the following application stores:

- MyApp (Android, mainland China users)
- Google Play (Android, users other than mainland China ones)
- App Store (iOS)

Method 2

Scan the following QR code to download and install the App according to the prompt information.

The App icon appears on the home screen after installation.

7.3 Function Overview

The App provides parameter viewing and setting functions, as shown in the following figure.

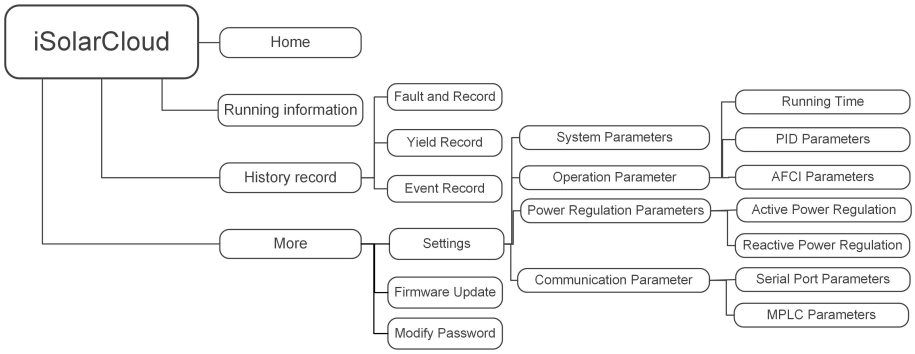


figure 7-1 App function tree map

7.4 Login

7.4.1 Requirements

The following requirements should be met:

- The AC or DC side of the inverter is powered-on.
- The mobile phone is within 5 meters away from the inverter and there are no obstructions in between.
- The Bluetooth function of the mobile phone is enabled.

The inverter can only pair with one phone at a time through Bluetooth.

7.4.2 Login Procedure

step 1 Open the App to enter the login page, tap **Local Access** at the bottom of the page to go to the next page.

step 2 Scan the QR code on the side of the inverter for Bluetooth connection. Or tap **MANUAL CONNECTION**at the bottom of the interface and select **Others**, the Bluetooth search interface will automatically appear. Select the inverter to be connected according to the serial

number on the nameplate on the side of the inverter, or tap to scan the QR code on the side of the inverter for Bluetooth connection. The connection is successfully established if the LED indicator blinks blue.

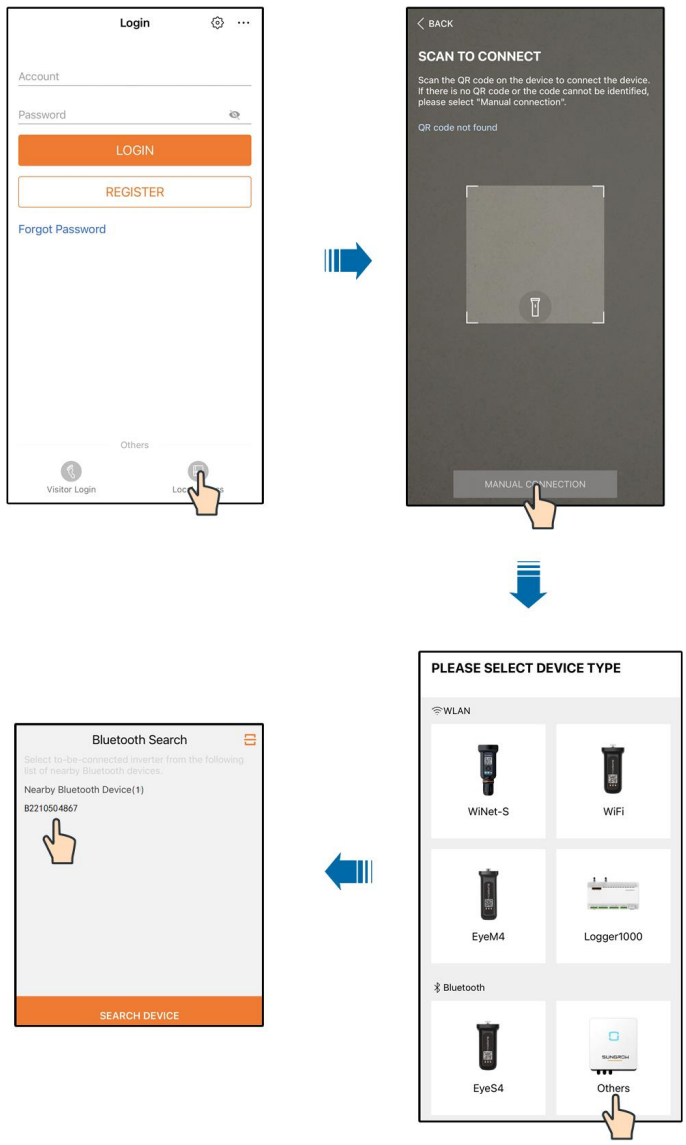


figure 7-2 Bluetooth Connection

step 3 Enter the identity verification screen after the Bluetooth connection is established.

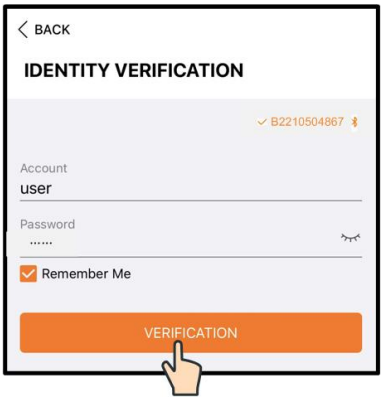


figure 7-3 Login

The Account is “user”，and the initial password is "pw1111" or "111111" which should be changed for the consideration of account security.

To set inverter parameters related to grid protection and grid support, contact SUNGROW to obtain the advanced account and corresponding password.

step 4 If the inverter is not initialized, you will enter the quick setting screen of initializing protection parameter.

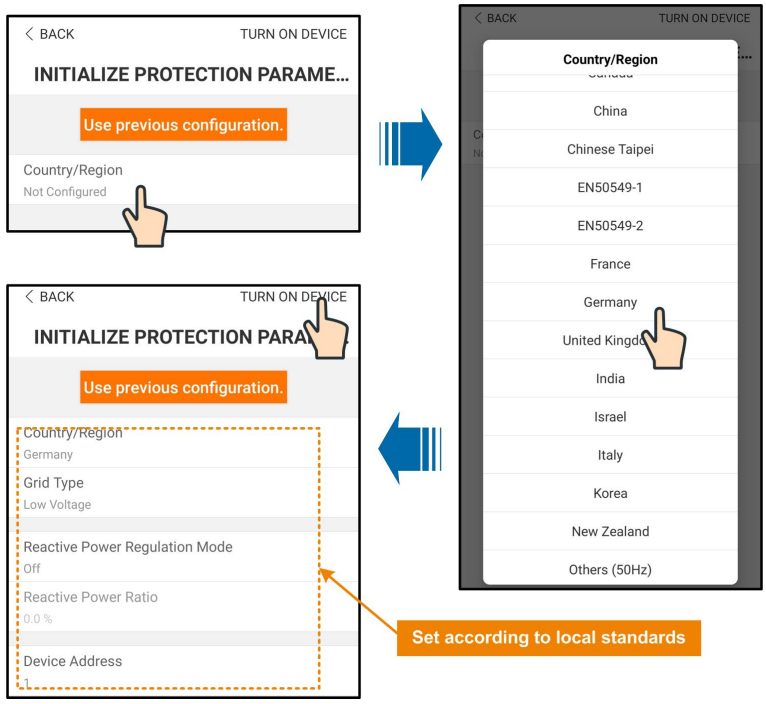


figure 7-4 Initialization Protection Parameter

NOTICE

The Country/Region must be set to the country where the inverter is installed at. Otherwise, the inverter may report errors.

step 5 After finishing the settings, tap **TUNR ON DEVICE** at the upper right corner and the device will be initialized. The App will send start instructions and the device will start and operate.

step 6 If the inverter is initialized, the App automatically turns to its home page.

- - End

7.5 Home page

After login, the home page is as follows:

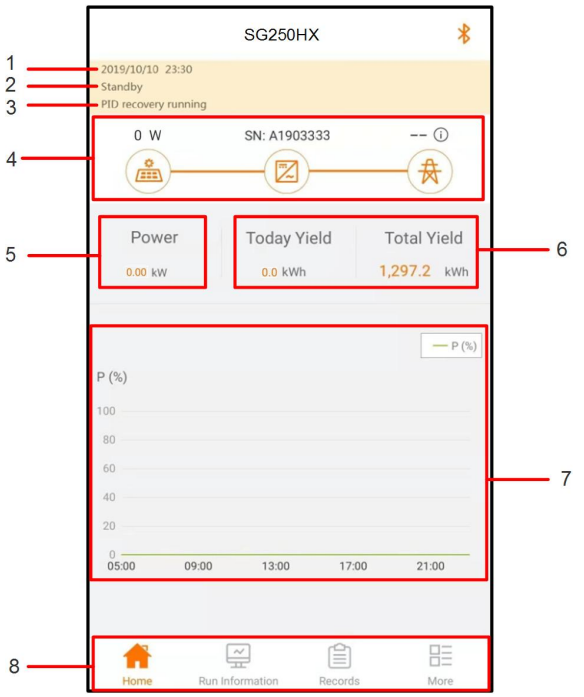


figure 7-5 Home page

table 7-1 Home Page Description

No.	Designation	Description
1	Date and time	System date and time of the inverter
2	Inverter state	Present operation state of the inverter For details, refer to "table 7-2 Description of Inverter State".
3	PID function state	Present state of the PID function For details, refer to "table 7-3 Description of PID Function State"
4	Power flow chart	Display the PV power generation power, feed-in power, etc. The line with an arrow indicates energy flow between connected devices, and the arrow pointing indicates energy flow direction.
5	Power generation	Today power yield and accumulative power yield of the inverter
6	Real-time power	Output power of the inverter
7	Power curve	Curve showing change of power between 5 am and 23 pm every day (Each point on the curve represents the percentage of present inverter power to rated power)
8	Navigation bar	Including "Home", "Run-info", "His-record", and "More"

table 7-2 Description of Inverter State

State	Description
Run	After being energized, inverter tracks the PV arrays' maximum power point (MPP) and converts the DC power into AC power. This is the normal operation mode.
Stop	Inverter is stopped.
Key-stop	Inverter will stop operation by manually "stop" via app. In this way, inverter internal DSP stops. To restart the inverter, manually start via app.
Standby	Inverter enters standby mode when DC side input is insufficient. In this mode inverter will wait within the standby duration.
Initial standby	The inverter is in the initial power-on standby state.
Starting	The inverter is initializing and synchronizing with the grid.
Warning	Warning information is detected.
Derating running	The inverter derates actively due to environmental factors such as temperature or altitude
Scheduling running	The inverter runs according to the scheduling instructions received from the monitoring background
Fault	If a fault occurs, inverter will automatically stop operation, and disconnect the AC relay. The fault information will be displayed in the app. Once the fault is removed in recovery time, inverter will automatically resume running.

table 7-3 Description of PID Function State

State	Description
PID recovery running	The inverters perform PID recovery actively.
PID abnormity	It is detected that the ISO impedance is abnormal or the PID function cannot work normally after the PID function enabled.

If the inverter is running abnormally, the alarm or fault icon will be displayed in the lower right corner of the inverter icon in power flow chart. The user can tap this icon to enter the alarm or fault screen to view detailed information and corrective measures.

7.6 Run Information

Tap **Run Information** on the navigation bar to enter the screen showing running information, slide the screen upwards to view all detailed information.

table 7-4 Run information

Classification	Parameter	Description
PV Information	String n Voltage	The input voltage of the n^{th} string
	String n current	The input current of the n^{th} string
Inverter Information	Total On-grid Running Time	/
	Daily On-grid Running Time	/
	Negative Voltage to Ground	Inverter DC side negative to ground voltage value
	Bus Voltage	Voltage between the positive and negative poles of the DC side of the inverter
	Internal Air Temperature	/
	Array Insulation Resistance	Insulation resistance value of the input side to the protection ground
	Country Information	/
	Power Limitation Mode	/
	Reactive Power Mode	/
Input	Total DC Power	DC side total input power
	MPPT x Voltage	The input voltage of the x^{th} MPPT
	MPPT x Current	The input current of the x^{th} MPPT
Output	Daily Yield	/
	Monthly Yield	/
	Annual Yield	/
	Total Active Power	Current active power value of the inverter
	Total Reactive Power	Current reactive power value of the inverter
	Total Apparent Power	Current apparent power value of the inverter
	Total Power Factor	Power factor of the AC side of the inverter
	Gird Frenquency	Frequency of the AC side of the inverter
	A-B Line Voltage	Line Voltage
	B-C Line Voltage	
	C-A Line Voltage	
	Phase A Current	Phase Current
	Phase B Current	

Classification	Parameter	Description
	Phase C Current	

7.7 Records

Tap **Records** on the navigation bar to enter the screen showing event records, as shown in the following figure.

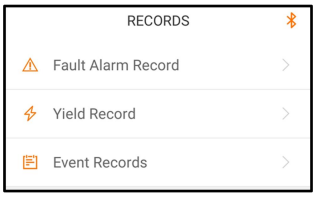


figure 7-6 Records

Fault Alarm Record

Tap **Fault Alarm Record** to enter the screen, as shown in the following figure.

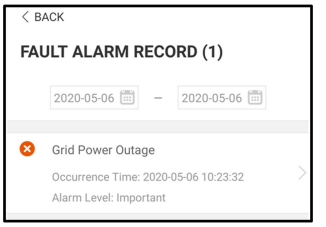


figure 7-7 Fault Alarm Record

Click to select a time segment and view corresponding records.

The inverter can record up to 400 latest entries.

Select one of the records in the list and click the record, to view the detailed fault info as shown in following figure.

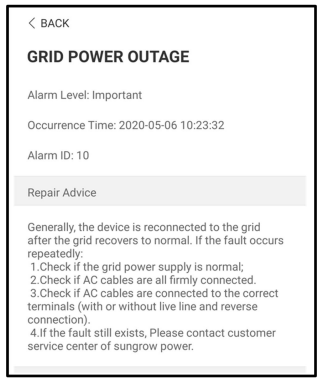


figure 7-8 Detailed Fault Alarm Information

Yield Record

Tap **Yield Record** to enter the screen showing daily power generation , as shown in the following figure.

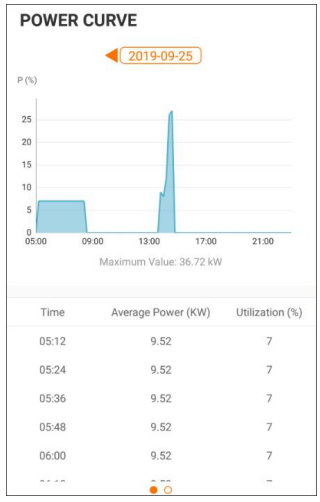


figure 7-9 Power Curve

The App displays power generation records in a variety of forms, including daily power generation graph, monthly power generation histogram, annual power generation histogram and total power generation histogram.

table 7-5 Explanation of power yields records

Parameter	Description
Power curve	Show the power output from 5 am to 11 pm in a single day. Each point in the curve is the percentage of present power and nominal power.
Daily energy histogram	Shows the power output every day in the present month.

Parameter	Description
Monthly energy histogram	Shows the power output every month in a year.
Annual energy histogram	Shows the power output every year.

Tap the time baron the top of the screen to select a time segment and view the corresponding power curve.
Swipe left to check the power yields histogram.

Event Record

Tap **Event Record** to view event record list.

Click to select a time segment and view corresponding records.
The inverter can at most record the latest 400 events.

7.8 More

Tap **More** on the navigation bar to enter the corresponding screen, as shown in the following figure.

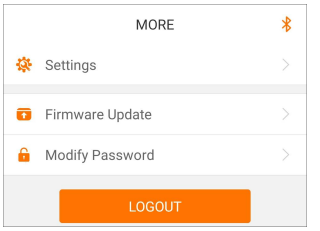


figure 7-10 More

7.8.1 System Parameters

Tap **Settings→System Parameters** to enter the corresponding screen, as shown in the following figure.

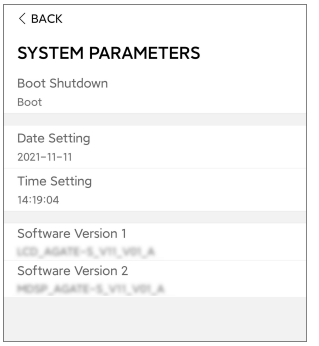


figure 7-11 System Parameters

* The image shown here is for reference only.

Boot/Shutdown

Tap **Boot/Shutdown** to send the boot/shutdown instruction to the inverter.

Date Setting/Time Setting

The correct system time is very important. Wrong system time will directly affect the data logging and power generation value. The clock is in 24-hour format.

Software Version

Version information of the current firmware.

7.8.2 Operation Parameters

Running Time

Tap **Settings→Operation Parameters→Running Time** to enter the corresponding screen, on which you can set "Running Time".

figure 7-12 Running Time

PID Parameters

Tap **Settings→Operation Parameters→PID Parameters** to enter the corresponding screen, on which you can set "PID Parameters".

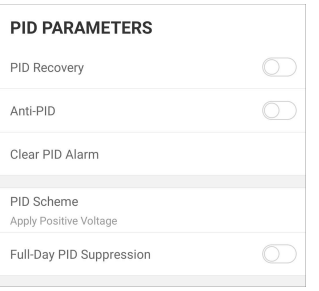


figure 7-13 PID Setting

table 7-6 PID Parameter Description

Parameter	Description
PID repair	Set enabling/disabling of the PID night recovery function. PID night recovery functions between 22:00 pm and 5:00 am by default.
PID protection	Enable this function of the inverter to protect PV modules from PID effect during the daytime
Clear PID alarm	If ISO impedance abnormality or PID function exception is detected during running of the PID function, the inverter reports a PID false alarm and reminds the user to take corresponding measures. After processing, clear the alarm via this parameter.
PID Scheme	Apply negative or positive voltage.
Full-Day PID Suppression	Enable this function to enable both PID repair and PID protection.

AFCI Parameters

Tap **Settings→Operation Parameters→AFCI Parameters** to enter the corresponding screen, on which you can set "AFCI Parameters".

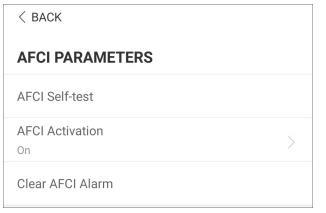


figure 7-14 AFCI Setting

7.8.3 Power Regulation Parameters

Active Power Regulation

Tap **Settings→Power Regulation Parameters→Active Power Regulation** to enter the screen, as shown in the following figure.

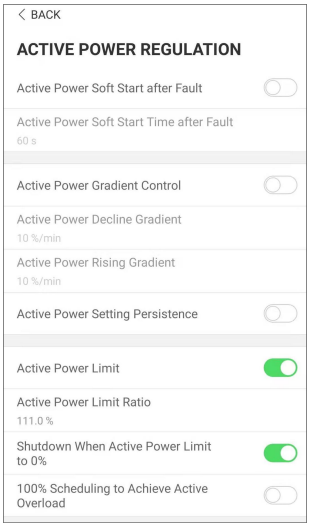


figure 7-15 Active Power Regulation

table 7-7 Active Power Regulation

Parameter	Definition/Setting Description	Range
Active power soft start after fault	The switch for enabling/disabling the soft start function after a fault occurs.	Enable/Disable
Active power soft start time after fault	Time that the soft start takes to raise the power from 0 to 100% rated power.	1s~1200s
Active power gradient control	Switch for enabling/disabling the active power rate settable function.	Enable/Disable
Active power decline gradient	The decline rate of inverter active power per minute.	3%/min~6000%/min
Active power rising gradient	The rise rate of inverter active power per minute.	3%/min~6000%/min
Active power setting persistence	Switch for enabling/disabling the function of saving output limited power.	Enable/Disable
Active power limit	The switch for limiting output power.	Enable/Disable

Parameter	Definition/Setting Description	Range
Active power limit ratio	The ratio of limiting output power to rated power in percentage.	0%~100%
Shutdown when active power limit to 0%	Switch used to determine whether the inverter is in stop state when the limited power reaches 0.	Enable/Disable

Reactive Power Regulation

Tap **Settings→Power Regulation Parameters→Reactive Power Regulation** to enter the screen, as shown in the following figure.

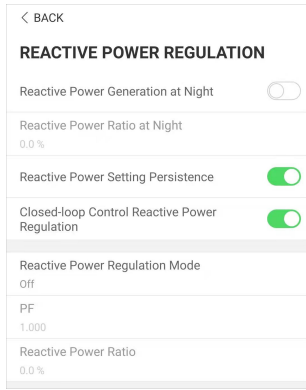


figure 7-16 Reactive Power Regulation

table 7-8 Reactive Power Regulation

Parameter	Definition/Setting Description	Range
Reactive power generation at night	Switch for enabling/disabling night SVG function.	Enable/Disable
Reactive power ratio at night	Reactive power ratio set for the night SVG function.	-100%~0%/ 0%~100%
Reactive power setting persistence	Switch for enabling/disabling the power-off function during reactive power.	Enable/Disable
Reactive power regulation mode	—	Off/PF/Qt/Q(P)/Q(U)
Reactive power regulation	Switch for enabling/disabling reactive response function.	Enable/Disable

Parameter	Definition/Setting Description	Range
Reactive power regulation time	Ends time of reactive response.	0.1s~600.0s
Q(P)Curve	Select the corresponding curve according to local regulations	Curve A/Curve B/Curve C*
QP_P1	Output power at P1 on the Q (P) mode curve (in percentage)	0.0%~100.0%
QP_P2	Output power at P2 on the Q (P) mode curve (in percentage)	20.0%~100.0%
QP_P3	Output power at P3 on the Q (P) mode curve (in percentage)	20.0%~100.0%
QP_K1	Power factor at P1 on the Q(P) mode curve	Curve A/Curve C:0.800~1.000 Curve B: [-0.600~0.600]*Active Overload Rate/1000
QP_K2	Power factor at P2 on the Q(P) mode curve	Curve A/Curve C: 0.800~1.000 Curve B: [-0.600~0.600]*Active Overload Rate/1000
QP_K3	Power factor at P3 on the Q(P) mode curve	Curve A/Curve C: 0.800~1.000 Curve B: [-0.600~0.600]*Active Overload Rate/1000
QP_EnterVoltage	Voltage percentage for Q(P) function activation	100.0%~110.0%
QP_ExitVoltage	Voltage percentage for Q(P) function deactivation	90.0%~100.0%
QP_EXitPower	Power percentage for Q(P) function deactivation	1.0%-20.0%
QP_EnableMode	Unconditional activation/deactivation of Q(P) function	Yes/No

Parameter	Definition/Setting Description	Range
Q(U)Curve	Select the corresponding curve according to local regulations	Curve A/Curve B/Curve C*
QU_V1	Pre-set grid voltage U1 that is reactive according to the grid voltage	80.0%~100.0%
QU_Q1	Pre-set proportion of reactive power according to the grid voltage U1	[-60.0%-0]* Overload Rate/ 1000
QU_V2	Pre-set grid voltage U2 that is reactive according to the grid voltage.	80.0%~100.0%
QU_Q2	Pre-set proportion of reactive power according to the grid voltage U2.	[-60.0%-60.0%]* Overload Rate/1000
QU_V3	Pre-set grid voltage U3 that is reactive according to the grid voltage.	100.0%~120.0%
QU_Q3	Pre-set proportion of reactive power according to the grid voltage U3.	[-60.0%-60.0%]* Overload Rate/1000
QU_V4	Pre-set grid voltage U4 that is reactive according to the grid voltage.	100.0%~120.0%
QU_Q4	Pre-set proportion of reactive power according to the grid voltage U4.	[0-60.0%]* Overload Rate/ 1000
QU_EnterPower	Active power for Q(U) function activation	20.0%~100.0%
QU_EXitPower	Active power for Q(U) function deactivation	1.0%~20.0%
QU_EnableMode	Unconditional activation/deactivation of Q(U) function	Yes/No/Yes,Limited by PF
QU_Limited PF Value	—	0-1

**Curve C is reserved and consistent with Curve A currently.

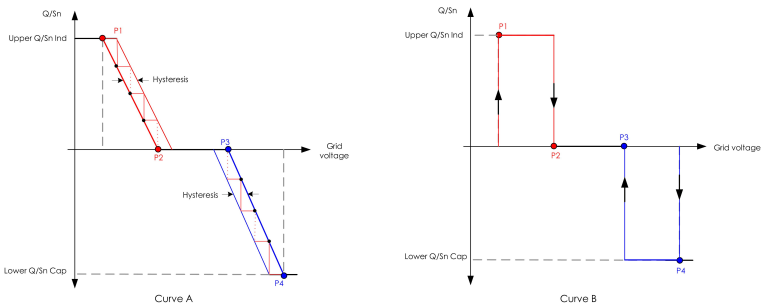


figure 7-17 Q(U) Curve

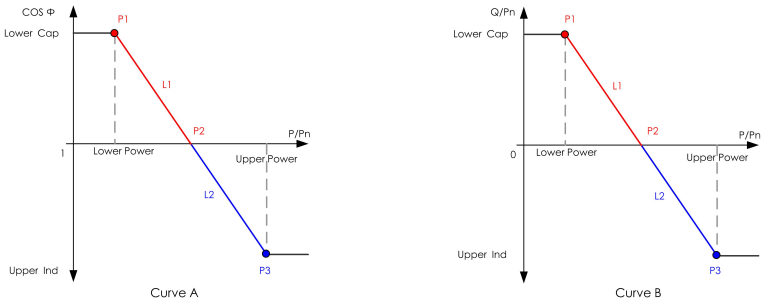


figure 7-18 Q(P) Curve

7.8.4 Communication Parameters

Tap **Settings→Communication Parameters→Serial Port Parameters** to enter the corresponding interface, as shown in the following figure.

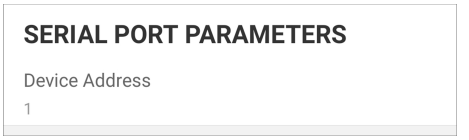


figure 7-19 Serial Port Parameters

table 7-9 Serial Port Parameters

Parameter	Range
Device Address	1–246

MPLC Parameters

Tap **Settings→Communication Parameters→MPLC Parameters** to enter the corresponding interface, as shown in the following figure.

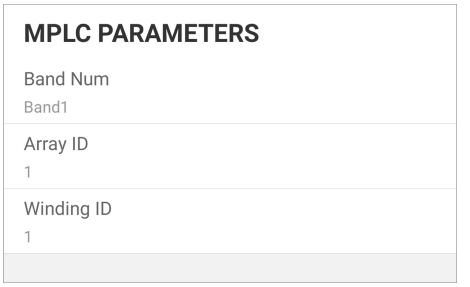


figure 7-20 MPLC Parameters

table 7-10 MPLC Parameters

Parameter	Range
Band Num	Band1, Band2
Array ID	1–255
Winding ID	1–10

7.8.5 Firmware Update

To avoid download failure due to poor on-site network signal, it is recommended to download the firmware package to the mobile device in advance.
Upgrade when the irradiance is strong to prevent upgrade failure.

step 1 Enable the "Mobile data" of the mobile device.

step 2 Open the App, tap ⚙ at the upper right corner and select **Firmware Download**.

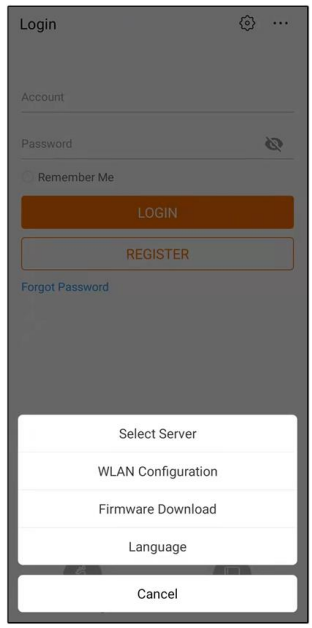


figure 7-21 Firmware Download

step 3 Select the firmware from the file list and download. Tap **Downloaded** to view successfully downloaded firmware package.

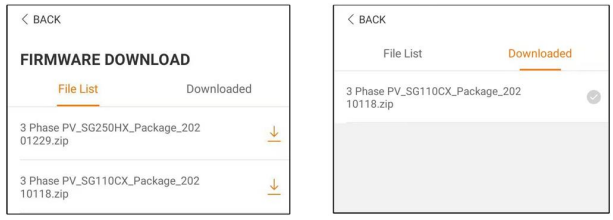


figure 7-22 Downloading Firmware Package

step 4 Login the App via local access mode. Refer to "7.4 Login".

step 5 Tap **More** on the App home screen and then tab **Firmware Upgrade**. Select the desired upgrade package to upgrade the firmware.

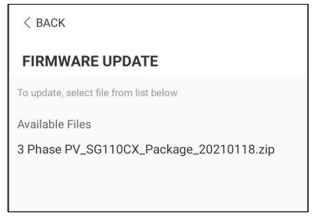


figure 7-23 Updating Firmware

- - End

7.8.6 Password Changing

Tap **Modify Password** to enter the modify password screen, as shown in the following figure.

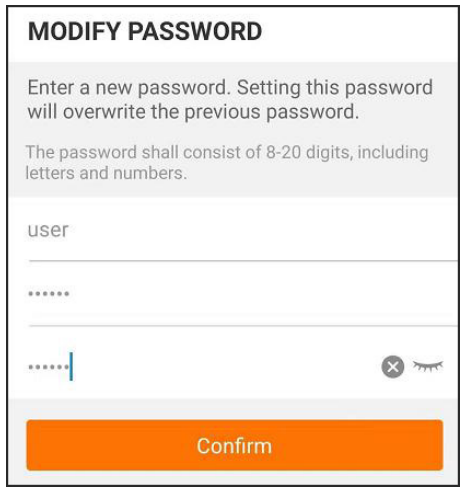


figure 7-24 Change Password

The password shall consisit of 8–20 digits, including letters and numbers.

8 System Decommissioning

8.1 Disconnecting the Inverter

⚠ CAUTION

Danger of burns!

Even if the inverter is shut down, it may still be hot and cause burns. Wear protective gloves before operating the inverter after it cools down.

For maintenance or other service work, the inverter must be switched off.

Proceed as follows to disconnect the inverter from the AC and DC power sources. Lethal voltages or damage to the inverter will follow if otherwise.

step 1 Disconnect the external AC circuit breaker and secure it against reconnection.

step 2 Rotate the DC switch to the "OFF" position for disconnecting all of the PV string inputs.

step 3 Wait about 5 minutes until the capacitors inside the inverter completely discharge.

step 4 Ensure that the DC cable is current-free via a current clamp.

- - End

8.2 Dismantling the Inverter

⚠ CAUTION

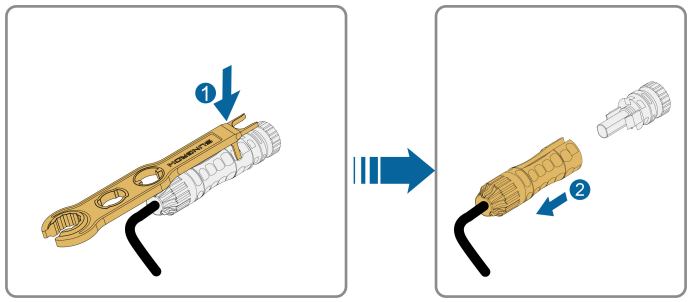
Risk of burn injuries and electric shock!

After the inverter is powered off for 5 minutes, measure the voltage and current with professional instrument. Only when there is no voltage nor current can operators who wear protective equipment operate and maintain the inverter.

Before dismantling the inverter, disconnect both AC and DC connections.

If there are more than two layers of inverter DC terminals, dismantle the outer DC connectors before dismantling the inner ones.

step 1 Refer to "5 Electrical Connection", for the inverter disconnection of all cables in reverse steps. In particular, when removing the DC connector, use an MC4-Evo2 wrench to loosen the locking parts and install waterproof plugs.



step 2 Refer to"4 Mechanical Mounting", to dismantle the inverter in reverse steps.

step 3 If necessary, remove the wall-mounting bracket from the wall.

step 4 If the inverter will be used again in the future, please refer to "3.2 Inverter Storage" for a proper conservation.

- - End

8.3 Disposal of the Inverter

Users take the responsibility for the disposal of the inverter.

⚠ WARNING

Please scrap the inverter in accordance with relevant local regulations and standards to avoid property losses or casualties.

NOTICE

Some parts of the inverter may cause environmental pollution. Please dispose of them in accordance with the disposal regulations for electronic waste applicable at the installation site.

9 Troubleshooting and Maintenance

9.1 Troubleshooting

Once the inverter fails, the fault information can be displayed on the App interface. If the inverter is equipped with an LCD screen, the fault information can be viewed on it.
The fault codes and troubleshooting methods of all PV inverters are detailed in the table below. The device you purchase may only contain some of the fault information, and when the inverter fails, you can check the corresponding information through the fault codes from the mobile app.

Fault code	Fault name	Corrective measures
2, 3, 14, 15	Grid Overvoltage	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Measure the actual grid voltage, and contact the local electric power company for solutions if the grid voltage is higher than the set value. 2. Check whether the protection parameters are appropriately set via the App or the LCD. Modify the overvoltage protection values with the consent of the local electric power operator. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
4, 5	Grid Undervoltage	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Measure the actual grid voltage, and contact the local electric power company for solutions if the grid voltage is lower than the set value. 2. Check whether the protection parameters are appropriately set via the App or the LCD. 3. Check whether the AC cable is firmly in place. 4. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.

Fault code	Fault name	Corrective measures
8	Grid Overfrequency	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Measure the actual grid frequency, and contact the local electric power company for solutions if the grid frequency is beyond the set range. 2. Check whether the protection parameters are appropriately set via the App or the LCD. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
9	Grid Underfrequency	
10	Grid Power Outage	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Check whether the grid supplies power reliably. 2. Check whether the AC cable is firmly in place. 3. Check whether the AC cable is connected to the correct terminal (whether the live wire and the N wire are correctly in place). 4. Check whether the AC circuit breaker is connected. 5. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
12	Excess Leakage Current	1. The fault can be caused by poor sunlight or damp environment, and generally the inverter will be reconnected to the grid after the environment is improved. 2. If the environment is normal, check whether the AC and DC cables are well insulated. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
13	Grid Abnormal	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Measure the actual grid, and contact the local electric power company for solutions if the grid parameter exceeds the set range. 2. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.

Fault code	Fault name	Corrective measures
17	Grid Voltage Imbalance	Generally, the inverter will be reconnected to the grid after the grid returns to normal. If the fault occurs repeatedly: 1. Measure the actual grid voltage. If grid phase voltages differ greatly, contact the electric power company for solutions. 2. If the voltage difference between phases is within the permissible range of the local power company, modify the grid voltage imbalance parameter through the App or the LCD. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
28, 29, 208, 212, 448-479	PV Reserve Connection Fault	1. Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the string current drops below 0.5 A. 2. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists. *The code 28 to code 29 are corresponding to PV1 to PV2 respectively. *The code 448 to code 479 are corresponding to string 1 to string 32 respectively.
532-547, 564-579	PV Reverse Connection Alarm	1. Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the string current drops below 0.5 A. 2. Contact Sungrow Customer Service if the preceding causes are ruled out and the alarm persists. *The code 532 to code 547 are corresponding to string 1 to string 16 respectively. *The code 564 to code 579 are corresponding to string 17 to string 32 respectively.

Fault code	Fault name	Corrective measures
548-563, 580-595	PV Abnormal Alarm	Check whether the voltage and current of the inverter is abnormal to determine the cause of the alarm. 1. Check whether the corresponding module is sheltered. If so, remove the shelter and ensure module cleanness. 2. Check whether the battery board wiring is loose, if so, make it reliably connected. 3. Check if the DC fuse is damaged. If so, replace the fuse. 4. Contact Sungrow Customer Service if the preceding causes are ruled out and the alarm persists. *The code 548 to code 563 are corresponding to string 1 to string 16 respectively. *The code 580 to code 595 are corresponding to string 17 to string 32 respectively.
37	Excessively High Ambient Temperature	Generally, the inverter will resume operation when the internal or module temperature returns to normal. If the fault persists: 1. Check whether the ambient temperature of the inverter is too high; 2. Check whether the inverter is in a well-ventilated place; 3. Check whether the inverter is exposed to direct sunlight. Shield it if so; 4. Check whether the fan is running properly. Replace the fan if not; 5. Contact Sungrow Power Customer Service if the fault is due to other causes and the fault persists.
43	Excessively Low Ambient Temperature	Stop and disconnect the inverter. Restart the inverter when the ambient temperature rises within the operation temperature range.

Fault code	Fault name	Corrective measures
39	Low System Insulation Resistance	Wait for the inverter to return to normal. If the fault occurs repeatedly: 1. Check whether the ISO resistance protection value is excessively high via the app or the LCD, and ensure that it complies with the local regulations. 2. Check the resistance to ground of the string and DC cable. Take corrective measures in case of short circuit or damaged insulation layer. 3. If the cable is normal and the fault occurs on rainy days, check it again when the weather turns fine. 4. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
106	Grounding Cable Fault	1. Check whether the AC cable is correctly connected. 2. Check whether the insulation between the ground cable and the live wire is normal. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
88	Electric Arc Fault	1. Disconnect the DC power supply, and check whether any DC cable is damaged, the connection terminal or fuse is loose or there is a weak contact. If so, replace the damaged cable, fasten the terminal or fuse, and replace the burnt component. 2. After performing step 1, reconnect the DC power supply, and clear the electric arc fault via the App or the LCD, after that the inverter will return to normal. 3. Contact Sungrow Customer Service if the fault persists.
84	Reverse Connection Alarm of the Meter/CT	1. Check if the meter is wrongly connected. 2. Check if the input and output wiring of the meter is reversed. 3. If the existing system is enabled, please check if the rated power setting of the existing inverter is correct.

Fault code	Fault name	Corrective measures
514	Meter Communication Abnormal Alarm	1. Check whether the communication cable and the terminals are abnormal. If so, correct them to ensure reliable connection. 2. Reconnect the communication cable of the meter. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the alarm persists.
323	Grid Confrontation	1. Check whether the output port is connected to actual grid. Disconnect it from the grid if so. 2. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists.
75	Inverter Parallel Communication Alarm	1. Check whether the communication cable and the terminals are abnormal. If so, correct them to ensure reliable connection. 2. Reconnect the communication cable of the meter. 3. Contact Sungrow Customer Service if the preceding causes are ruled out and the alarm persists.
7, 11, 16, 19–25, 30–34, 36, 38, 40–42, 44–50, 52–58, 60–69, 85, 87, 92, 93, 100–105, 107–114, 116–124, 200–211, 248–255, 300–322, 324–328, 401–412, 600–603, 605, 608, 612, 616, 620, 622–624, 800, 802, 804, 807, 1096–1122	System Fault	Wait for the inverter to return to normal. Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the fault still exists, contact Sungrow Customer Service.

Fault code	Fault name	Corrective measures
59, 70–74, 76, 82, 83, 89, 77–81, 216–218, 220–232, 432–434, 500–513, 515–518, 635–638, 900, 901, 910, 911, 996	System Alarm	1. The inverter can continue running. 2. Check whether the related wiring and terminal are abnormal, check whether there are any foreign materials or other environmental abnormalities, and take corresponding corrective measures when necessary. If the fault persists, please contact Sungrow Power Customer Service.
264-283	MPPT Reverse Connection	1. Check whether the corresponding string is of reverse polarity. If so, disconnect the DC switch and adjust the polarity when the string current drops below 0.5 A. 2. Contact Sungrow Customer Service if the preceding causes are ruled out and the fault persists. *The code 264 to code 279 are corresponding to string 1 to string 20 respectively.
332-363	Boost Capacitor Overvoltage Alarm	1. The inverter can continue running. 2. Check whether the related wiring and terminals are abnormal, check whether there are any foreign materials or other environmental abnormalities, and take corresponding corrective measures when necessary. If the fault persists, please contact Sungrow Power Customer Service.
364-395	Boost Capacitor Overvoltage Fault	Disconnect the AC and DC switches, and reconnect the AC and DC switches 15 minutes later to restart the inverter. If the fault still exists, contact Sungrow Customer Service.

Fault code	Fault name	Corrective measures
1548-1579	String Current Reflux	1. Check whether the number of PV modules of the corresponding string is less than other strings. If so, disconnect the DC switch and adjust the PV module configuration when the string current drops below 0.5 A. 2. Check whether the PV module is shaded; 3. Disconnect the DC switch to check whether the open circuit voltage is normal when the string current drops below 0.5 A. If so, check the wiring and configuration of the PV module, 4. Check whether the orientation of the PV module is abnormal.
1600 - 1615, 1632 - 1655	PV Grounding Fault	1. When the fault occurs, it is forbidden to directly disconnect the DC switch and unplug PV terminals when the direct current is greater than 0.5A; 2. Wait until the direct current of the inverter falls below 0.5A, then disconnect the DC switch and unplug the faulty strings; 3. Do not reinsert the faulty strings before the grounding fault is cleared;4. If the fault is not caused by the foregoing reasons and still exists, contact Sungrow Customer Service.
1616	System Hardware Fault	1. It is prohibited to disconnect the DC switch when the DC current is greater than 0.5A when the fault occurs. 2. Disconnect the DC switch only when the inverter DC side current drops below 0.5A. 3. It is prohibited to power up the inverter again. Please contact Sungrow Customer Service.

9.2 Maintenance

9.2.1 Maintenance Notices

DANGER

Risk of inverter damage or personal injury due to incorrect service!

- **Be sure to use special insulation tools when perform high-voltage operations.**
- **Before any service work, first disconnect the grid-side AC circuit breaker and check the inverter status. If the inverter indicator is off, please wait until night to disconnect the DC switch. If the inverter indicator is on, directly disconnect the DC switch.**
- **After the inverter is powered off for 5 minutes, measure the voltage and current with professional instrument. Only when there is no voltage nor current can operators who wear protective equipment operate and maintain the inverter**
- **Even if the inverter is shut down, it may still be hot and cause burns. Wear protective gloves before operating the inverter after it cools down.**

CAUTION

To prevent misuse or accidents caused by unrelated personnel: Post prominent warning signs or demarcate safety warning areas around the inverter to prevent accidents caused by misuse.

NOTICE

Restart the inverter only after removing the fault that impairs safety performance.
As the inverter contains no component parts that can be maintained, never open the enclosure, or replace any internal components.
To avoid the risk of electric shock, do not perform any other maintenance operations beyond this manual. If necessary, contact SUNGROW for maintenance. Otherwise, the losses caused is not covered by the warranty.

NOTICE

Touching the PCB or other static sensitive components may cause damage to the device.

- **Do not touch the circuit board unnecessarily.**
- **Observe the regulations to protect against electrostatic and wear an anti-static wrist strap.**

9.2.2 Routine Maintenance

Item	Method	Period
System clean	Check the temperature and dust of the inverter. Clean the inverter enclosure if necessary. Check if the air inlet and outlet are normal. Clean the air inlet and outlet, if necessary.	Six months to a year (depend on the dust contents in air.)
Fans	Check whether there is fan warning using App. Check whether there is any abnormal noise when the fan is turning. Clean or replace the fans if necessary (see the following section).	Once a year
Cable entry	Check whether the cable entry is insufficiently sealed or the gap is excessively large, and reseal the entry when necessary.	Once a year
Electrical Connection	Check whether all cable are firmly connected in place. Check whether a cable is damaged, especially the part contacting the metal enclosure.	Six months to a year

9.2.3 Cleaning Air Inlet and Outlet

A significant amount of heat is generated when the inverter is working.
In order to maintain good ventilation, please check to make sure the air inlet and outlet are not blocked.
Clean the air inlet and outlet with soft brush or vacuum cleaner if necessary.

9.2.4 Fan Maintenance

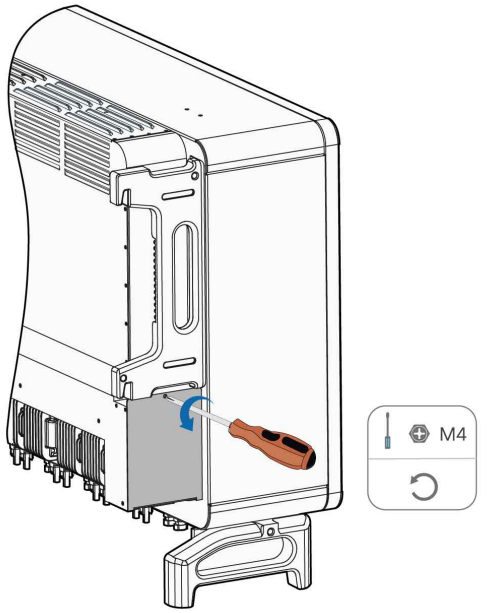
⚠DANGER

- **Stop the inverter and disconnect it from all power supplies before maintenance.**
- **Lethal voltage still exists in the inverter. Please wait for at least 5 minutes and then perform maintenance work.**
- **Only qualified electricians can maintain the fans.**

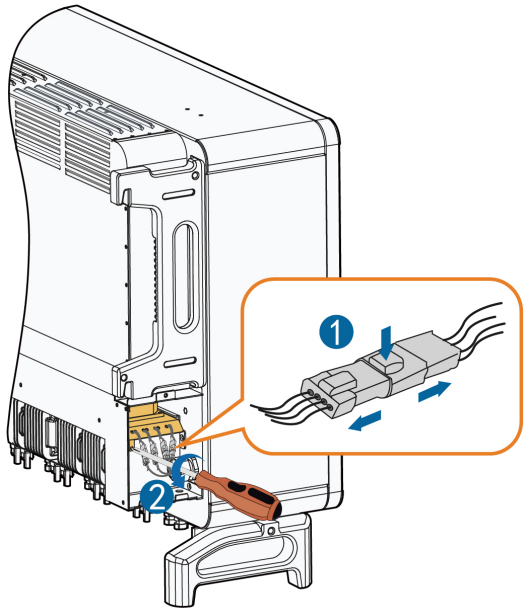
Fans inside the inverter are used to cool the inverter during operation. If the fans do not operate normally, the inverter may not be cooled down and inverter efficiency may decrease. Therefore, it is necessary to clean dirty fans and replace the broken fans in a timely manner. The operation procedure is as follows:

step 1 Stop the inverter (see "8.1 Disconnecting the Inverter").

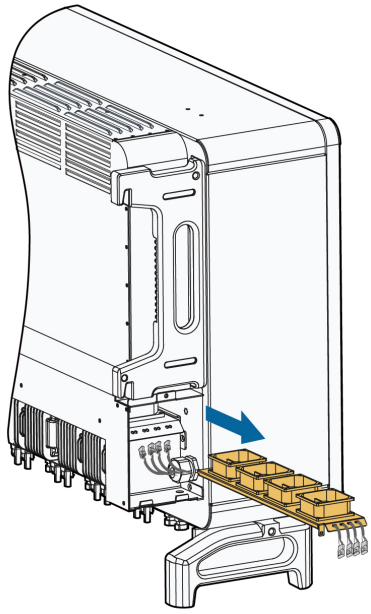
step 2 Loosen the screw on the sealing plate of the fan module.



step 3 Press the tab of the latch hook, unplug the cable connection joint outwards, and loosen the screw on the fan holder.



step 4 Pull out the fans, four on the left side and one on the right side. Clean them with a soft brush or vacuum cleaner, and replace them when necessary.



step 5 Reinstall the fan back to the inverter in reverse order and restart the inverter.

- - End

10 Appendix

10.1 Technical Data

Parameters	SG250HX-US
Input (DC)	
Max. PV input voltage	1500V
Min.PV input voltage/Startup input voltage	500V / 500V
Nominal input voltage	1080V
MPP voltage range	500V~1500V
MPP voltage range for nominal power	860V~1300V
No. of independent MPP inputs	12
Max. PV input current	30 A * 12
Max. current for input connector	30A
Max.DC Short-circuit current	50 A * 12
Output (AC)	
AC output power	250 kVA @ 30 ℃ / 225 kVA @ 40 ℃ / 200 kVA @ 50℃
Max. AC output current	180.5 A
Nominal AC voltage	3 / PE, 800 V
AC voltage range	680 – 880V
Nominal grid frequency/Grid frequency range	60Hz / 55~65Hz
Total harmonic distortion (THD)	< 3 % (at nominal power)
DC current injection	<0.5%In
Power factor at nominal power / Adjustable power factor	> 0.99 / 0.8 leading – 0.8 lagging
Feed-in phases / Connection phases	3/3
Efficiency	
Max. efficiency / European efficiency	99.0% / 98.5%
Protection	
DC reverse connection protection	Yes

Parameters	SG250HX-US
AC short-circuit protection	Yes
Leakage current protection	Yes
Grid monitoring	Yes
Ground fault monitoring	Yes
DC switch	Yes
AC switch	No
Arc fault circuit interrupter (AFCI)	Yes
PV string current monitoring	Yes
Reactive power at night function	Yes
PID protection	Anti-PID or PID recovery
Overvoltage protection	DC Type II and AC Type II
General Data	
Dimensions (W*H*D)	1051*660*363 mm (41.4" * 26" * 14.3")
Weight	99 kg (218.25 lbs)
Isolation method	Transformerless
Degree of protection	NEMA 4X
Night power consumption	< 2 W
Operating ambient temperature range	-30 to 60 ℃(' -22 to 140 ℉)
Allowable relative humidity range (non-condensing)	0 - 100%
Cooling method	Smart forced air cooling
Max. operating altitude	4000 m (> 3000 m derating) 13123 ft (> 9843 ft derating)
Display	LED, Bluetooth+APP
Communication	RS485
DC connection type	MC4-Evo2 (Max. 10AWG，Optional 8AWG)
AC connection type	OT/DT terminal (Max.300 mm² 600Kcmil)
Grid Support	Reactive power at night function, LVRT, HVRT, active & reactive power control and power ramp rate control, Volt/Watt, Frequency/Watt

*The parameters here are for reference only. The actual parameters may be different and shall prevail.

10.2 Wring Distance of DI Dry Contact

The maximum wiring distance of DC dry contact must meet the requirements in the Table below. The wiring distance L is the total length of all DI signal cables.

$$L = 2\sum_{k=1}^{n} L_k$$

L_K refers to the cable length in one direction between the DI dry contact terminal of the k^{th} inverter and the corresponding terminal of the $(k-1)^{th}$ inverter.

table 10-1 Correspondence between number of inverters and maximum wiring distance

Number of inverter	Maximum wiring distance(unit:m)	
	16AWG / 1.31mm²	17AWG / 1.026mm²
1	13030	10552
2	6515	5276
3	4343	3517
4	3258	2638
5	2606	2110
6	2172	1759
7	1861	1507
8	1629	1319
9	1448	1172
10	1303	1055
11	1185	959
12	1086	879
13	1002	812
14	931	754
15	869	703
16	814	660
17	766	621
18	724	586
19	686	555
20	652	528
21	620	502
22	592	480
23	567	459
24	543	440
25	521	422

NOTICE

In case the specification of the cable used is not included in the Table above, when there is only one inverter, ensure that the line impedance of the input node is less than 300Ω; and when there are multiple inverters connected in the daisy chain, ensure that the impedance is less than 300Ω/number of inverter.

10.3 Quality Assurance

When product faults occur during the warranty period, SUNGROW will provide free service or replace the product with a new one.

Evidence

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

Conditions

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

Exclusion of Liability

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

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

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

10.4 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**.