

SG3125HV_3400HV-20-SEN-Ver18-202001

SG3125HV-20/SG3400HV-20

Turnkey Station

System Manual

SUNGROW

Contents

1 About This Manual

1.1 Validity

This manual is intended for the following product:

- SG3125HV-20
- SG3400HV-20

1.2 Content

This manual contains the following information:

Content	Description
Safety instruction	Safety instructions on the installation, operation, maintenance, and troubleshooting of the Turnkey Station
Product Description	The appearance and internal components of the Turnkey Station
Delivery	Delivery and inspection after receiving the Turnkey Station
Installation	Mechanical transport, installation, and electrical connection of the Turnkey Station
Commissioning	Safety notices and commissioning process when the Turnkey Station is powered on for the first time
Start/Stop	Steps of starting and stopping the Turnkey Station internal devices during normal maintenance or troubleshooting
Operation on LCD Display	Function and use of the Turnkey Station user interface
Functions	Descriptions of the Turnkey Station main functions
Troubleshooting	Simple troubleshooting of the Turnkey Station
Daily operation	Instructions on and guides to the daily operation of the Turnkey Station

1.3 Target Group

This manual is for technical personnel who are responsible for the transport, installation and other operations on the Turnkey Station. Only qualified personnel can perform the installation, maintenance, and troubleshooting. Unauthorized persons should not

perform any operation on the Turnkey Station and should be away from the Turnkey Station to avoid potential hazards. Qualified personnel are:

- Equipped with certain electrical wiring and mechanical knowledge and familiar with electrical and mechanical principle diagram
- Familiar with the construction and working principle of the PV grid-connected power generation system
- Familiar with the construction and working principle of the Turnkey Station upstream and downstream equipment
- Trained especially in the installation and commissioning of electrical devices
- Capable of coping with the dangerous and emergency situations during the installation and commissioning
- Familiar with the country/regional standards and specifications
- Familiar with this manual

1.4 Symbols Explanation

This manual contains important safety and operational instructions that must be accurately understood and respected during the installation and maintenance of the equipment.

To ensure the optimum use of this manual, note the following explanations of the symbols used.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

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

The symbols below may be found on the electrical parts of the inverter. Make sure to read the following symbols and fully understand them before installing the equipment.

Symbol	Explanation
	Lethal voltage inside! Do not touch!
	Hot surface! Do not touch the hot surface of the device.
	Protective earth. Earthing securely to ensure personal safety.

1.5 How to Use this Manual

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

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

1.6 Terminology

Name	For short
Turnkey Station	Inverter
Module unit/ Inverter unit	Unit
Intelligent power distribution cabinet	Intelligent PMD or PMD

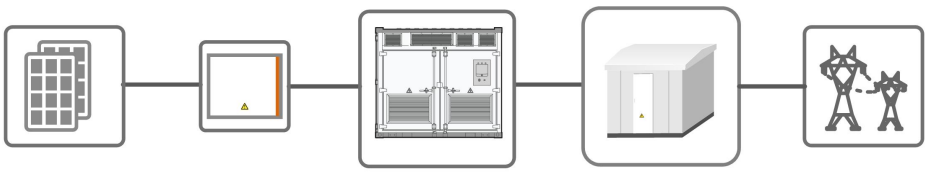
The foregoing devices are expressed in the abbreviation form in this document unless otherwise specified.

2 Safety Instructions

2.1 Intended Usage

The inverter, designed and manufactured by Sungrow, is mainly applied to large-and-medium PV power station. The inverter can meet the requirements of modular design and quick installation for large-and-medium PV power station and can ensure the long-term, reliable, and safe feed-in operation.

The PV power generation system with the inverter is shown in the following figure.



No.	Name
A	PV Array
B	PV Array Combiner Box
C	Inverter
D	Transformer
E	Utility Grid

⚠ WARNING

Installation of the inverter not in compliance with the description in this manual or installation or modification of the device without authorization from Sungrow may lead to personal injuries or device damages and may void pertinent warranty claims from Sungrow.

2.2 Important Safety Instructions

Read the safety instructions carefully before installing the inverter. Refer to corresponding manuals for the safety instructions on the internal devices.

2.2.1 General Safety Rules

DANGER

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

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

DANGER

Lethal voltages are present inside the device!

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

DANGER

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

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

WARNING

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

2.2.2 Manual Storage

Product manuals are an indispensable part of the product. Important information about the transport, installation, maintenance, and troubleshooting of the inverter is included in this manual. All the descriptions in this manual, especially those safety-related items, must be complied with. Read all the instructions thoroughly prior to performing any operation work on the inverter.

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

2.2.3 PV Arrays Hazards

⚠ DANGER

DC high voltage! Electric shock hazards!
When exposed to sunlight, PV array will produce voltage, which is very high in large-scale power station
Death from burning and electric shock due to touching the PV array.

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

- The inverter is disconnected from the PV array.
- Necessary warning signs are in place to prevent inadvertent reconnection.

2.2.4 Ground Fault Protection

⚠ DANGER

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

2.2.5 Live Line Measurement

⚠ DANGER

High voltages are present inside the device. Death can result from burning and electric shock due to touching the live components of the inverter. During live line measurement,

- **use suitable protective equipment, for example, dielectric gloves, and**
- **accompanied by other persons.**

2.2.6 Measuring Instrument

The instrument for measuring the electrical parameters should meet the following requirements:

⚠ WARNING

- **The instrument for measuring the electrical parameters should be a high-quality instrument with sufficient measuring range.**
- **Make sure the connection and use of the instrument are correct to avoid arc and other dangerous situations.**
- **Use suitable protective equipment, for example, dielectric gloves during live line measurement.**

2.2.7 Volt-free Operations

Perform operations on the inverter only when all devices inside the inverter are completely voltage-free.

- Avoid any inadvertent re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument.
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid inadvertent touch.
- Ensure sufficient escape room.
- After the inverter stops, wait at least 10 minutes before operating it.
- Ensure that the inverter is completely voltage-free.

2.2.8 ESD Protection

⚠ CAUTION

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

- **Avoid unnecessary touching of the PCB.**
- **Observe all the ESD-related safety instructions. Wear proper personal protective equipment (PPE) such as wrist strap.**

2.2.9 LCD Parameter Setting

Some settable parameters on the LCD are closely related to the operations of the inverter and internal devices. Thereforethese parameters can only be set with reliable evaluation of the system.

⚠ WARNING

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

2.2.10 Sand and Moisture Protection

Do not open doors of the inverter on sandstorm, thunderstorm, strong wind or hail days or when the ambient humidity is above 95%.

2.2.11 Symbols on the Device Body

Symbols on the device contain important information on safe operations of the inverter and its internal devices. Do not tear or damage them!

NOTICE

Do not damage or tear the symbols.

- **All symbols on the device body must be clearly legible.**
- **Replace the symbols once any damage or illegibility is detected.**

2.2.12 Safety Warning Signs

During transport, installation, maintenance, and troubleshooting of the inverter, keep unauthorized persons away.

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

2.2.13 Daily Operation and Maintenance

Make sure the doors of the inverter are closed and locked during daily operation to prevent internal devices from damages caused by rain or rodents.
Regularly check and maintain the inverter and internal devices to ensure long-term and reliable operation of the inverter.

⚠ WARNING

Take proper insulation protection measures during live line operation. At least two persons are required until the operation is performed.
Proper field rescue facilities are required since most PV stations are installed in places far away from the urban areas.

Take the followings into consideration during daily operation and maintenance:

- The nameplate is found on the inverter body. It contains important parameter information of the devices. Protect the nameplate during all operations.
- Heating components may exist inside the inverter. When the device stops, the heating components may be still hot. Wear proper gloves when working on them.
- Maintain the cooling fans inside the inverter only when the fans stop rotating.
- Wear proper PPE, such as safety glasses, safety footwear, and safety gloves, if necessary.
- Necessary auxiliary measures are recommended to ensure personal and device safety.

2.2.14 Disposal of Waste

When the inverter has come to the end of its service life, it cannot be disposed of together with household wastes. Some inside components can be recycled while some components can cause environmental pollution.

Contact the local authorized collection point.

2.2.15 Manual Description

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

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

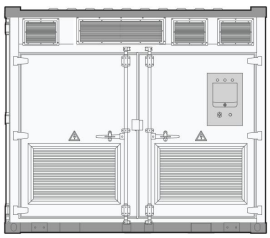
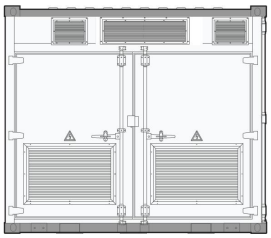
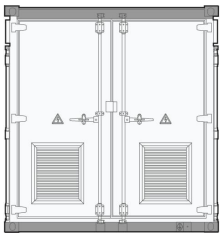
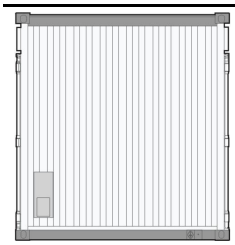
All the descriptions in this manual are based on the standard inverter, and the actual product you receive may differ. If necessary, specify your requirements when placing the order.

This manual may not cover all possible situations. Should a specific problem not explained in this manual occur, Contact Sungrow.

3 Product Description

3.1 Overall Design of the Inverter

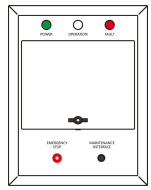
3.1.1 Inverter Views

View	Description
	Front view. Front of the inverter. A pair of doors are equipped.
	Back view. Back of the inverter. A pair of doors are equipped.
	Left view Left of the inverter. A pair of doors are equipped.
	Right view Right side of the inverter.

Control and Monitoring Window

The Control and Monitoring window is located on the front door of the inverter.

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



The LEDs at the upper side of the Control and Monitoring Window: POWER indicates the power-on state; OPERATION indicates the proper operation of the inverter; FAULT indicates a fault condition.

LED Indicators

The working status of the inverter can be acquired through these LEDs.

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

EMERGENCY STOP Button

When an emergency occurs, the DC and AC circuit breakers are disconnected automatically after pressing the emergency stop button.

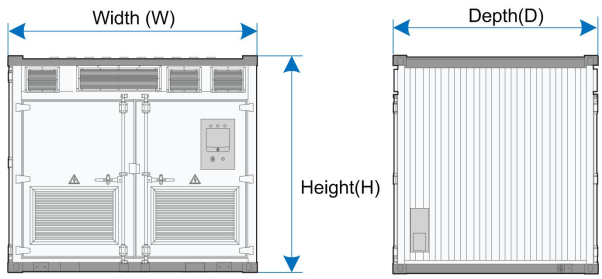
The MAINTENANCE INTERFACE

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

3.1.2 Mechanical Parameter

Dimensions

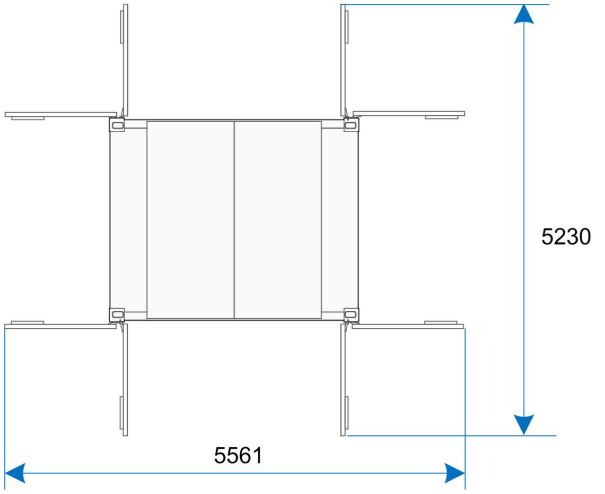
External dimensions are shown in the figure below.



Width	Height	Depth
2991mm	2591mm	2438mm

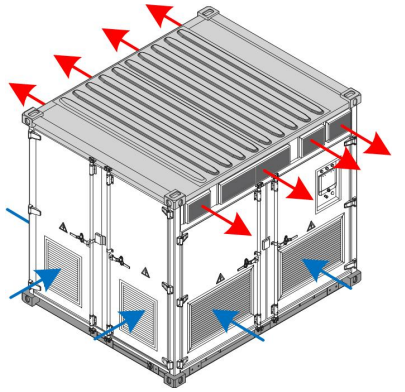
Clearance Spaces

The clearances around the inverter should be sufficient for the doors to be opened



3.1.3 Ventilation Design

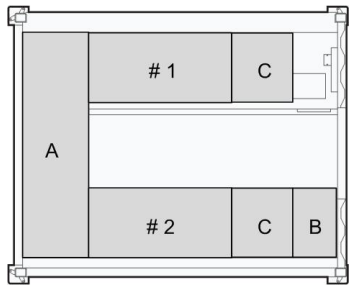
The ventilation system is designed as the cool air is drawn from the bottom of the inverter and hot air is exhausted from the top of the inverter.



3.2 Interior Design of the Inverter

3.2.1 Internal Components

The figure below shows the top view of the major electrical components inside the inverter:



No.	Device	Description
A	DC cabinet	That includes fuses and DC switches. Cooper bars at the bottom of the DC cabinet are used for DC-side cable connections.
# 1/ #2	# 1/ #2Module	It converts the DC current into the AC current.
B	Intelligent PMD	The upper part of the cabinet integrates monitor function and the lower part of the cabinet integrates AC power distribution function.
C	AC cabinet	That includes AC switch.

3.2.2 Cable Entry Design

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

All cables between the inverter and the external devices are routed through the bottom of the inverter. All cables coming into or out of the inverter should be protected properly, for example, using cable pipes to prevent damage from rodents. After cable connection, all cable entries except for cable glands should be sealed with fireproof mud or other appropriate materials.

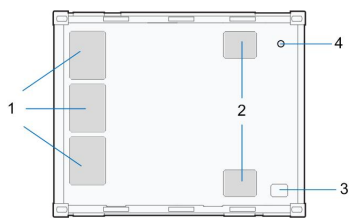
The AC side cable entries may be located at the bottom of the inverter or the top of the inverter. Specifically, refer to the actual product you purchase.

For bottom cable entry of AC side, refer to"3.2.2.1 AC Cable Entry on the Bottom"

For top cable entry of AC side, refer to"3.2.2.2 AC Cable Entry on the Top "

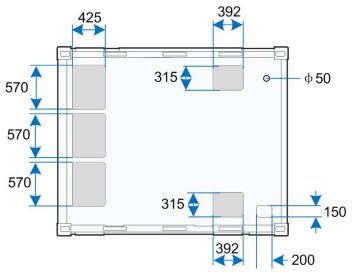
3.2.2.1 AC Cable Entry on the Bottom

The AC cable entry at the bottom of the inverter is shown below.



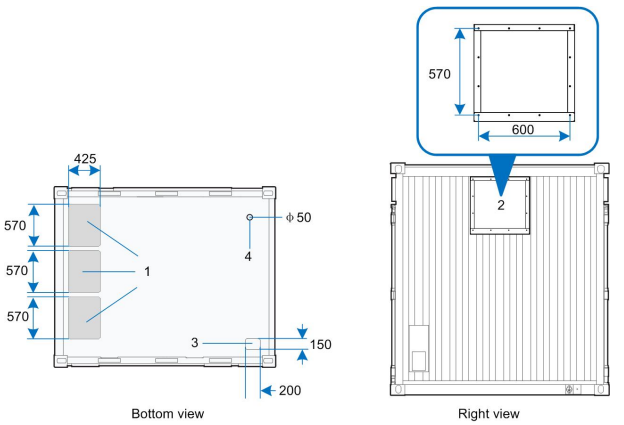
No.	Name	Note
1	DC cable inlets	DC cables are connected to the DC cabinet through these 3 holes.
2	AC cable inlets	AC cables are connected to the inverter through this hole.
3	Communication & power distribution cable entry	Communication & power distribution cables come inside the inverter through this hole.
4	Grounding cable entry	Grounding cables come inside the inverter through this hole.

Dimensions of the Holes(unit: mm)



3.2.2.2 AC Cable Entry on the Top

The AC cable entry is on the upper right side of the inverter.



The function of each opening is shown below:

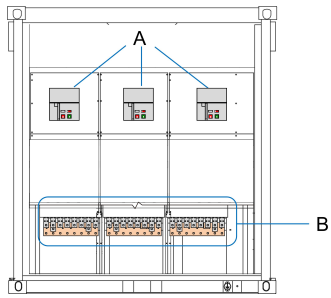
No.	Name	Note
1	DC cable inlets	DC cables are connected to the DC cabinet through these 3 holes.
2	AC cable outlet	AC cables are connected to the grid through this hole.

No.	Name	Note
3	Communication & power distribution cable entry	Communication & power distribution cables come inside the inverter through this hole.
4	Grounding cable entry	Grounding cables come inside the inverter through this hole.

3.2.3 Internal Devices of the Inverter

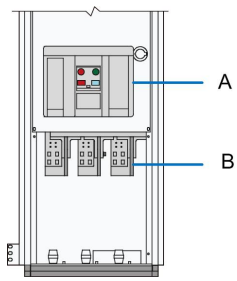
The inverter contains the DC cabinet, the module cabinet, the AC cabinet, and the PMD. The DC cabinet, the AC cabinet, and the PMD are all equipped with wiring terminals and operation switches

DC Cabinet



No.	Name	Description
A	DC switches	Control the connection/disconnection on the DC side of the inverter
B	DC connection area	The upper part of the copper bar is for positive cable connection area while the lower part is for negative cable connection

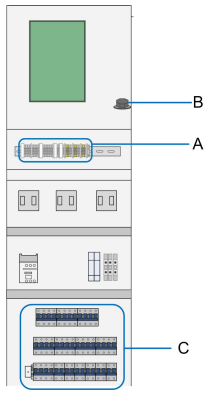
AC Cabinet



No.	Name	Description
A	AC switch	Controls the connection/disconnection on the AC side
B	AC connection area	AC cables can be connected to this area.

Intelligent PMD

The ports between the inverter and external devices are designed on this cabinet. The locations of the ports are shown in the following figure.

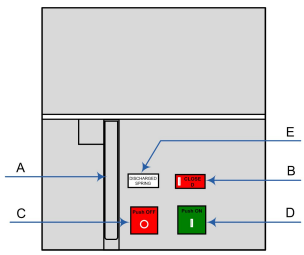


The above figure is for reference only, and the actual product may differ.

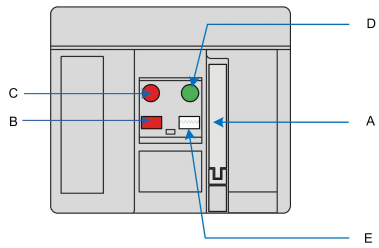
No.	Description
A	RS485 ports
B	Ethernet port
C	Power distribution area

3.2.4 Operations on the DC and AC Circuit Breakers

This inverter is equipped with electrically-controlled air circuit breakers on the DC and AC sides. The appearance of the circuit breaker panels are shown in the figure below.



DC side



AC side

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

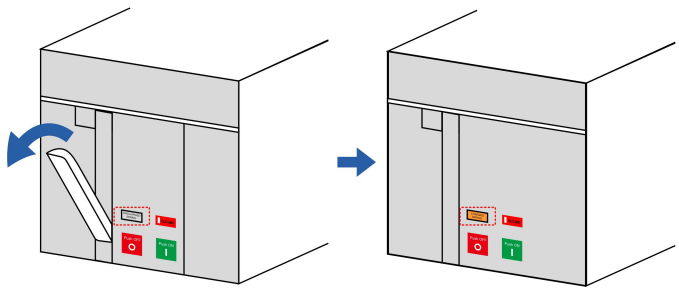
No.	Name	Description
D	Push ON button	The breaker is switched on when this button is pressed
E	Energy storage state indicator	Display the present energy storage state, CHARGED SPRING or DISCHARGE SPRING

The DC Switch can be used together with a micro-motor. When there is the power supply on the AC side of the inverter, the energy can be stored to the breaker through this motor. When there is no power supply on the AC side of the inverter, manually store the energy through the manual energy storage handle.

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

- Switch on

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



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

DANGER

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

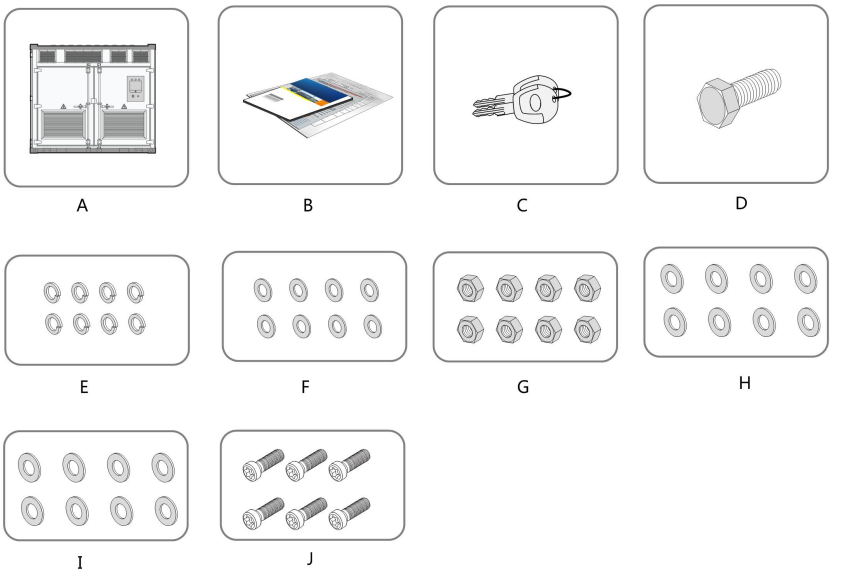
- Switch off

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

4 Delivery

4.1 Scope of Delivery

The scope of delivery of the inverter is shown in the following table:



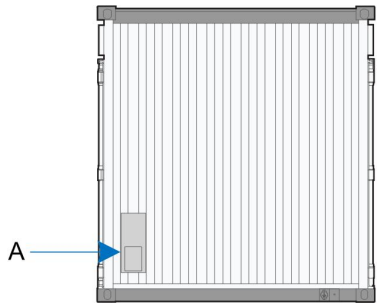
No.	Device	Quantity	Note
A	Inverter	1	-
B	Enclosed documents	1	System manual, delivery inspection report, certification, and warranty card
C	Door keys of inverter	1	-
	Keys to monitor window	1	-
D	Bolt	85	M16 × 55
		12	M8 × 25
E	Flat washer	170	φ16
F	Spring washer	85	M16
G	Nut	85	M16
		12	M8
		5	M6
H	Washer	24	M8
		10	M6

No.	Device	Quantity	Note
I	Disc springs	12	M8
J	Cross recessed hexagon bolt	10	M5 × 16
		60	M6 × 20
		12	M4 × 16

Note: The foregoing components and their quantities are based on the standard inverter, and those of the actual product may differ.

4.2 Identifying the Inverter

Identify the inverter via its nameplate(shown as A in the following figure). The nameplate contains the following information: inverter model, major technical parameters, marks of conformitys, origins, and serial number.



WARNING

Very important technical parameters and inverter-related parameters are displayed on the nameplate.
Protect the nameplate at all times!

4.3 Checking for Transport Damages

The inverter has been strictly inspected and tested before delivery. Despite robust packaging, the container or internal devices may be damaged during transport. Therefore, once receiving the inverter, perform a detailed inspection.
If any damage is found, contact the forwarding company or Sungrow immediately.

- Check the scope of delivery described in "4.1 Scope of Delivery"for completeness.
- Check that the inverter and inner devices match the models included in the original order.
- Check thoroughly the inverter and inner devices for any possible damages caused during transport.

⚠ WARNING

Install and commission the inverter only when it is technically faultless! Make sure before installing the inverter that

- **the inverter is intact without any damage; and**
- **all devices inside the inverter are intact without any damages.**

4.4 Storage of the Inverter

If the inverter is not to be installed immediately after delivery, store it appropriately:

- Store the inverter indoors, for example, large warehouse or workshop, to prevent possible condensation or damp. If the inverter has to be stored outdoors, elevate the inverter base according to the geological and ambient conditions. When the ambient temperature is too low, heat the inverter internal devices.
- Temperature: -40 ° C~+70 ° C. Relative humidity: 0 ~ 95%, and non-condensation.

  Store the inverter on a dry, clean, and solid ground with sufficient load-bearing capacity. The ground should be flat without water, bumps, or plantings.
- Lock the inverter internal devices and the inverter during storage.
- Take proper protective measures to prevent the water and dust penetrating into the inverter. Protect the inverter air inlets and outlets at least.
- Regularly, check the inverter and internal devices, at least once every half a month.

5 Mechanical Installation

⚠ WARNING

Respect all local standards and requirements during mechanical installation.

5.1 Transport

All devices are installed inside the inverter before delivery. The inverter should be transported as a whole. Transport the inverter by a crane with sufficient load capacity. The inverter is delivered to the user by the forwarding company. After unloading, the inverter will be transported to the installation site by the plant staff.

⚠ WARNING

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

- All the accessory appliances to be used during transport should be maintained beforehand.
- The inverter must be transported by qualified personnel. Qualified personnel are those who have been trained, especially in safety operation.

NOTICE

Keep in mind the dimensions and total weight of the inverter at all times!

Ensure that the following requirements are met:

- All the doors are locked.
- Choose the appropriate crane or hoist to transport the inverter. The crane or hoist must be sufficiently capable of bearing the inverter weight.
- An additional traction vehicle may be required for uphill/downhill road transport.
- Anything, which may hinder the transport, like trees, cables (or the like), should be removed.
- Transport the inverter on fine weather daysas far as reasonably possible.
- Warning signs or barriers must be posted near the transport areas to avoid accidental injuries.

Additionally, the following requirements should be met when the inverter is placed on the ground:

- Place the inverter carefully and gently. Do not pull or push the inverter on any surface.
- The place should be firm and flat with good drainage and no obstacles or outshoots. The inverter should be supported by the four feet.

5.2 Hoisting the Inverter

5.2.1 Safety Precautions

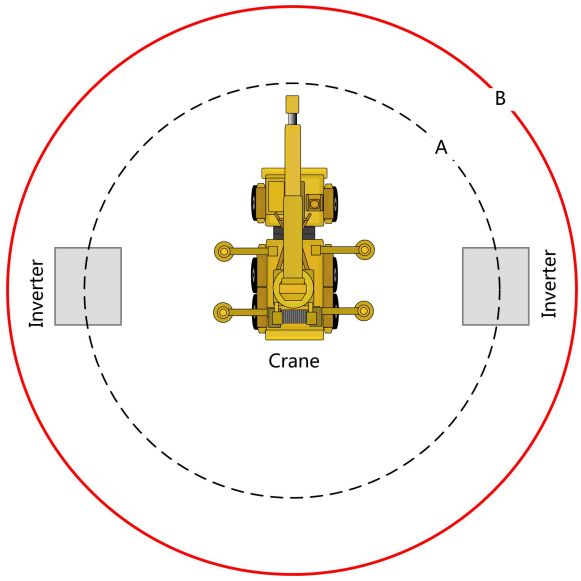
NOTICE

- **Observe the safety operating rules of the crane at all times.**
- **Standing within 5 to 10 meters away from the hoisting areas is strictly prohibited! Anybody standing under the boom or inverter is strictly prohibited in the whole hoisting process.**
- **The hoisting work must be stopped on violent weather days. For example, in strong wind, heavy rain, or thick fog conditions.**

Observe the following items:

- All safety requirements must be met.
- A professional instructor is required in the whole hoisting process.
- All the used slings must have the load-bearing capacity of at least 10t.
- The crane should have sufficient arm length and radius of gyration.
- All the connection point must be firmly connected.
- The length of the slings can be adjusted appropriately according to on-site conditions.
- Transport the inverter in a level, smooth, and steady way.
- Transport the inverter by connecting the four top corner fittings.
- Some accessories may be required to ensure the safety during hoisting.

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

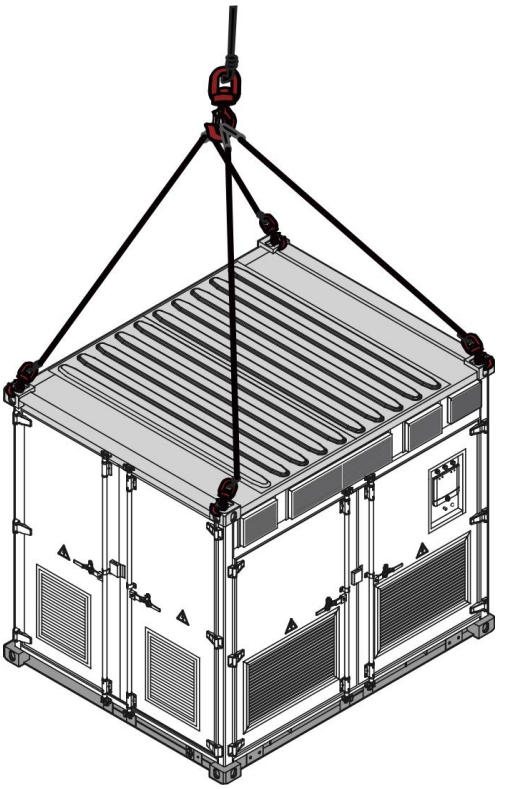


5.2.2 Hoisting

During the whole hoisting process, observe the following rules:

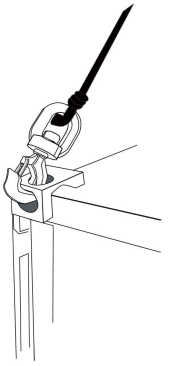
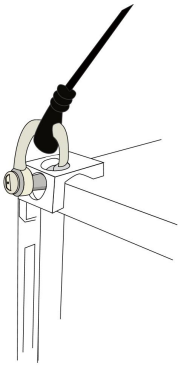
- Hoist the inverter in a vertical manner. Do not drag or drop the inverter on any surface.
- When the inverter has been hoisted for about 300mm away from the ground, stop to check if all the connections are still firm. After confirmation, continue hoisting the inverter.
- When transported to the final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

The inverter should be hoisted by using four top corner fittings as shown in the following figure



5.2.3 Fastening of Connectors

Use slings with hooks or U-hooks to hoist the inverter.
The lifting devices should be correctly connected to the inverter.

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

⚠ WARNING

National and local safety rules should be observed at all times.
Violating relevant safety rules may void pertinent warranty claims from Sungrow.

5.3 Foundation

5.3.1 Selection of Installation Site

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

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

5.3.2 Foundation Requirements

⚠ WARNING

Pay attention to the high weight of the inverter. Check thoroughly the conditions on the installation site (mainly the geographical and environmental conditions) before designing and constructing the foundation.

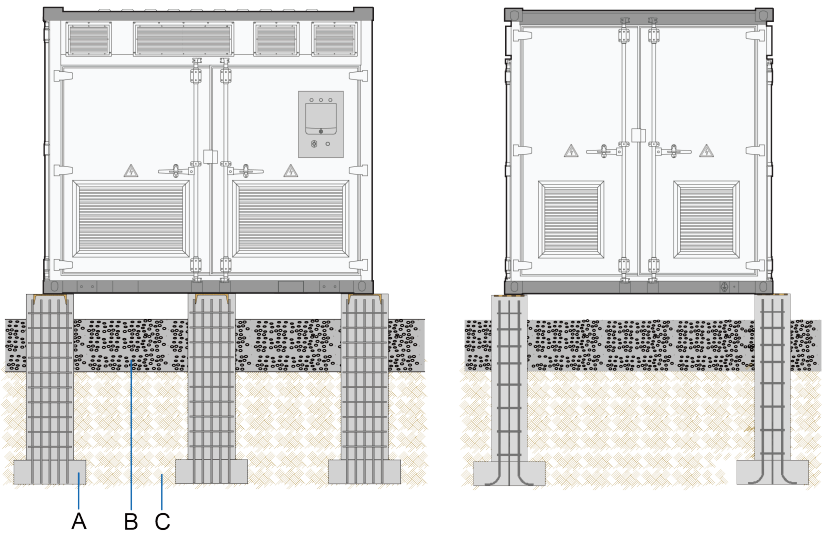
Improper foundation construction may affect the placement of the inverter, open & close of the door, and future maintenance. Therefore, the foundation must be designed and constructed according to the related standard. The dimensions and weight of the inverter, the cable route, and the future maintenance should be considered at all times.
The following conditions must be met:

- The bottom of the foundation should be firm enough.
- The foundation must be suitable for the weight of the inverter.
- The foundation should be at least 100mm higher than the pea gravel ground on site to prevent the rain from damaging the base or penetrating into the inverter.
- Sufficient cross-sectional area and depth of the foundation should be maintained. The depth is designed according to local soil conditions.
- Cable route should be taken into account.

- According to the cable design of inverter and for easy electrical connection, establish cable trenches on the bottom of the inverter, i.e. reserve the cable trenches inside the foundation and pre-bury the wire pipes.
- The dirt dug out should be cleared immediately.

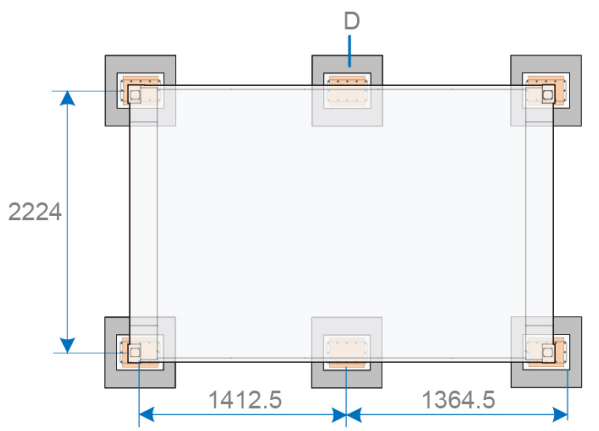
5.3.3 Recommended Foundation Construction Plan

Overall construction effect of Plan is shown below.



No	Name
A	Foundation
B	Pea gravel ground
C	Solid ground, e.g. gravel

Construct foundation according to the scheme shown in figure below.



No	Name
D	Embedded 30#-c steel channel

5.3.4 Other Precautions

After fixing, the inverter should be fully welded with the pre-embedded channel steel.

NOTICE

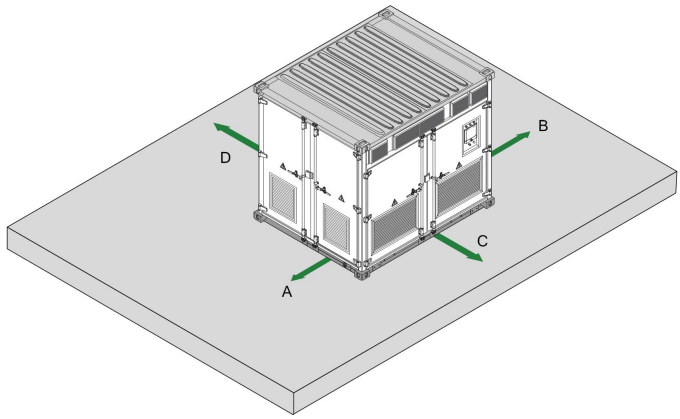
A drainage system should be designed on the installation site to prevent the inverter from being immersed in water during heavy rainfalls.

NOTICE

Do not plant any trees near the installation site to prevent the inverter from being damaged by tree leaves or stems.

5.4 Clearance Requirement

On site, if two inverters are placed side by side, the minimum reserved clearances around the inverters are shown in the following figure.



A*	B*	C*	D*
4000mm	4000mm	4000mm	4000mm

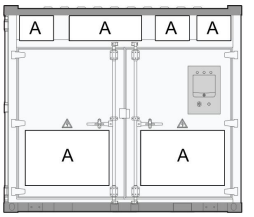
Note: A is the minimum distance away from the left doors.

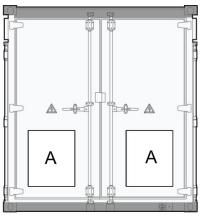
* The distance illustrated in this table is the minimum values. More space is recommended for better ventilation and higher conversion efficiency of the inverter.

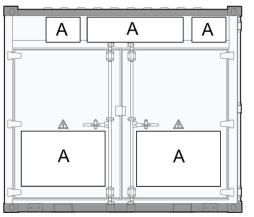
5.5 Removing Sealing Tapes

To prevent sea-water or moisture penetrating into the inverter during ship transport, the air inlets and outlets of the inverter are all sealed with sealing tapes.

The positions of the sealing tapes are shown by "A" in the following figure.







6 Electrical Installation

6.1 Safety Instructions

6.1.1 Generals Rules

DANGER

High voltage! Electrical shock hazards!

- Do not touch the live components of the device.
- Make sure the AC and DC sides are voltage-free before installation.
- Never put flammable materials in the vicinity of the module.

DANGER

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

WARNING

- Observe all the country-specific standards and regulations.
- Connect the module to public grid only after receiving authorization from the local network operator.

WARNING

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

WARNING

Disconnect all AC and DC Switches before electrical connection.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the inverter!

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

Only professional electricians can perform the electrical connection.
Professional electricians should meet the related requirements listed in2 Safety Instructions in this manual. Sungrow shall not be held liable for any personal injury or property loss caused by ignorance of the safety instructions.

⚠ WARNING

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

⚠ WARNING

Strictly follow all the instructions when connecting the cables.

NOTICE

- The installation and design of the inverter must fulfill national and local standards and regulations.
- Sungrow shall not be held liable for the inverter or system fault caused by ignorance of the description in this manual.

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

Five Safety Rules

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

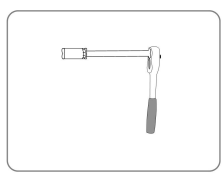
- Disconnect all the external connections and disconnect the inverter internal power supply.
- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate measurement instrument.
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid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

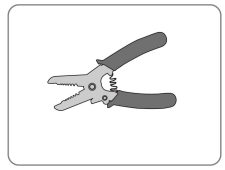
6.2 Preparation before Electrical Connections

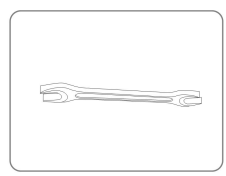
Electrical connections between devices inside the inverter have been performed before delivery. On site, the connections between the inverter and external devices need to be performed, including DC connection, AC connection and communication connection.

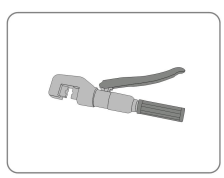
6.2.1 Installation Tools

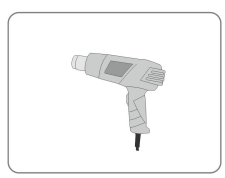
Installation tools include but are not limited to the following recommended ones, and other auxiliary tools or components can be used on site when necessary.

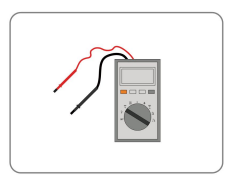

Torque wrench

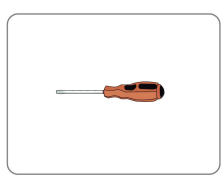

Wire stripper


Allen wrench
for terminal fixing


Terminal crimper


Heat blower

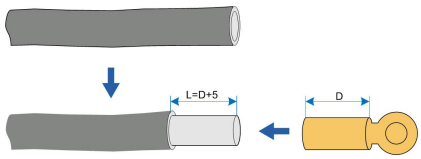

Megger and multimeter


Screwdriver

6.2.2 Cable Crimping

Proceed as follows to connect the DC cables:

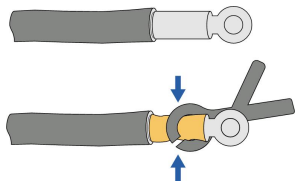
step 1 Strip off the insulation cover of the cable with the tripped length of 5mm longer than the depth of the cable lug.



step 2 Crimp the cable lug.

1 Insert the stripped cable into the cable lug.

2 Tighten the cable lug with relevant tools. Crimp it at least twice.

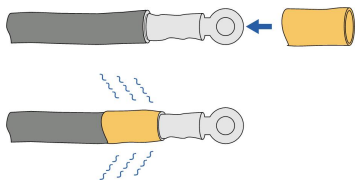


step 3 Wrap the heat-shrink tubing.

1 A tubing with length 2cm longer than the depth of the cable lug is recommended.

2 Wrap the cable lug with the heat-shrink tubing.

3 Shrink the tubing with hot air blower.



- - End

Cable protectors are advisable in the cable crosses if the multi-core cables are used.

6.2.3 Parts for Cabling

WARNING

Incorrect connection of power cables will cause fires. Follow the sequence when connecting the power cables.
Ensure the fastness of the connection parts. Poor contact or oxidation of the contact surface may cause fire.

NOTICE

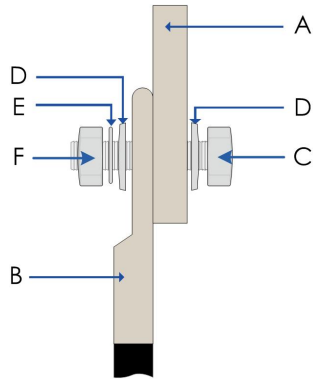
- **Long bolts may affect the insulation and may cause short circuit.**
- **Remove the heat-shrink tubing between the cable lug and the copper bar if necessary. Poor contact or over-heating may follow if otherwise.**

Clean the connection terminals before cable connection. Do not touch the terminal after cleaning.

Spare parts required for power cables connection like the screws are within the scope of delivery. Rrespect the description in this chapter during connection.

Copper Wire Connection

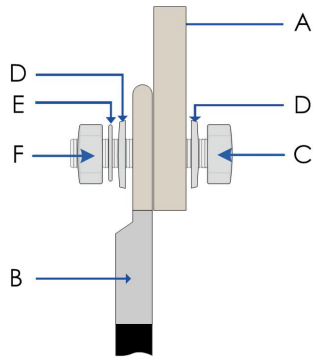
If copper wires are used, connect the spare parts as described below:



No.	Name	No.	Name
A	Copper Bus	D	Flat washer
B	Cable Lug	E	Spring washer
C	Bolt	F	Nut

Aluminum Wire Connection

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



No.	Name	No.	Name
A	Copper Bus	D	Flat washer
B	Copper-aluminum adapter terminal	E	Spring washer
C	Bolt	F	Nut

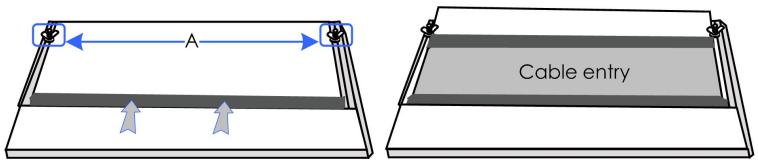
6.2.4 Opening the Inverter Door

All the inverter doors are standard container doors. Open the doors before cable connection.

6.2.5 Opening the Cable Entries

The cables come inside the inverter through the bottom of the inverter. All cable connections with the external devices are through the device bottom.
Proceed as follows to open the cable entries.

step 1 Unscrew the screws (shown by A in the figure below) on the bottom cover plate.



step 2 Remove the bottom cover plate.

- - End

6.2.6 Checking the Cables

⚠ WARNING

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

6.2.7 During Connection

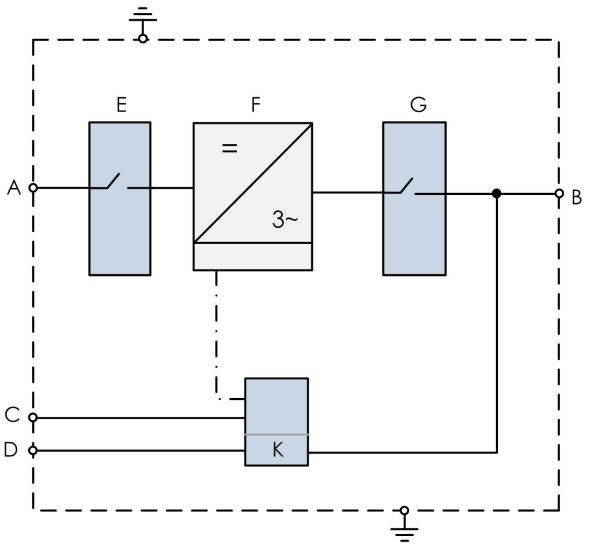
⚠ WARNING

Make sure the DC cables are correctly routed before connection.

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

6.3 Circuit Diagram and Cable Connection

6.3.1 Circuit Diagram



Devices in the above figure are:

No.	Name
A	DC input
B	AC output
C	External communication port
D*	External 3-phase power supply port
E	DC cabinet
F	Module cabinet
G	AC cabinet
K	Intelligent PMD

Note: D* is optional.

6.3.2 Cable Specifications

Choose cables according to the rules below:

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

⚠ WARNING

Overloading operation of cables is strictly forbidden.

6.4 DC Connection

6.4.1 Checking before Connection

Check the following items before cable connections.

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

⚠ WARNING

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

⚠ WARNING

Strictly follow all the instructions when connecting the cables.

⚠ WARNING

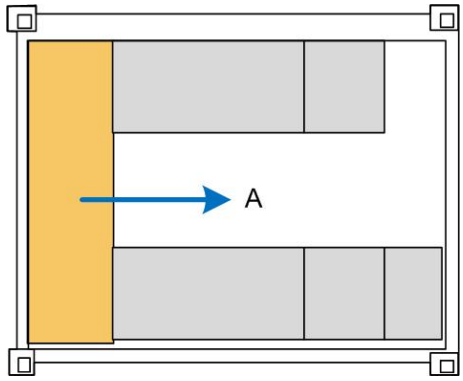
Observe all the safety rules specified by the PV array manufacture.

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

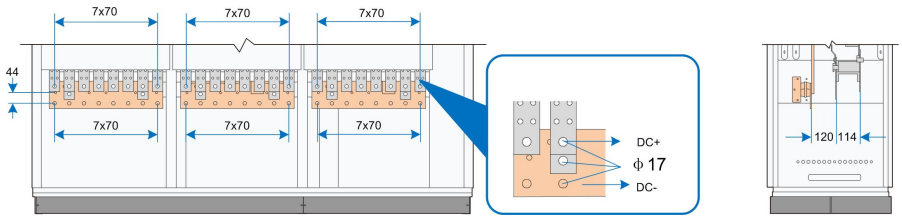
6.4.2 DC Cable Connection

Overview

DC wiring terminals are located at the bottom of the DC cabinet (shown by A).



AC Connection Area



No.	Description
DC+	DC positive cable connection area
DC-	DC negative cable connection area

Cable Requirements

- The maximum cross-sectional area of the aluminum/copper cable is 400mm².
- Fasten the wiring terminal with the bolts in the scope of delivery. And the torques are shown in following table.

Bolt	Torque(N.m)
M16×55	119~140

Cable Connection Steps

Proceed as follows to connect the DC cables:

step 1 Make sure the switch upstream of the combiner box is in the OFF position.

step 2 Strip off the insulation cover of the cable with the tripped length of 5mm longer than the depth of the cable lug.

step 3 Crimp the cable lug. It is advisable to select DT-×× (×× is the cable cross-sectional area) cable lug.

1 Put the stripped cable inside the cable lug.

2 Tighten the cable lug with relevant tools. Crimp it at least twice.

step 4 Wrap the heat-shrink tubing.

1 A tubing with length 2cm longer than the depth of the cable lug is recommended.

2 Wrap the cable lug with the heat-shrink tubing.

3 Shrink the tubing with hot air blower.

Cable protectors are advisable in the cable crosses if the multi-core cables are used.

step 5 Connect the cable.

1 Select bolts matching with the cable lug, .

2 Attach the cable lug to the DC connection copper bar

3 Fasten the bolts with screwdriver or spanner

WARNING

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

NOTICE

- Long bolts may affect the insulation and may cause short circuit.
- Remove the heat-shrink tubing between the cable lug and the copper bar if necessary. Poor contact or over-heating may follow if otherwise.

step 6 Confirm that all cable connections are secure.

Finish the DC cable connection of all modules according to the above steps.

- - End

6.5 AC Connection

6.5.1 Safety Notices

WARNING

Incorrect AC connection may cause damages to the module.

WARNING

Electrical shock hazards!

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

WARNING

Strictly follow all the instructions when connecting.

Strictly follow all device internal instructions when closing/opening the AC switches.

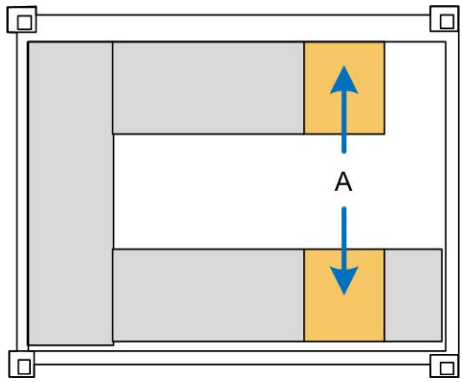
6.5.2 AC Cable Connection

6.5.2.1 AC Connection Area on the Bottom

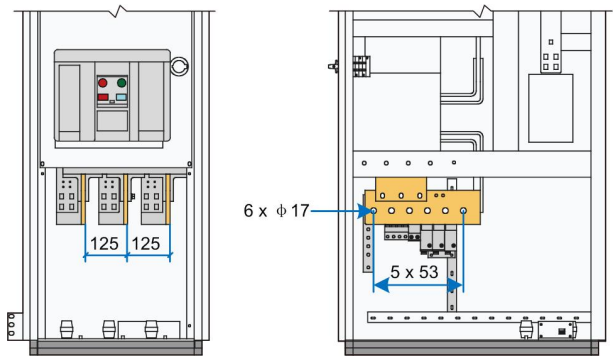
Proceed as this section to connect the cable when the AC connection area are at the bottom of the inverter.

Overview

AC wiring terminals are located at the bottoms of the two AC cabinets (shown by A). The two AC cabinets are the same in design.



AC Conection Area



The AC terminals of the inverter can be connected either in the copper bar connection manner or the cable connection manner, which is specifically determined according to onsite conditions.

On site, connect external AC cables to the two AC cabinets.

Cable Requirements

- The maximum cross-sectional area of the aluminum/copper cable is 400mm².
- Fasten the wiring terminal with the bolts in the scope of delivery. And the torques are shown in following table.

Bolt	Torque(N.m)
M16×55	119~140

Connection Steps

step 1 Identify the phases (L1, L2, and L3) of the AC copper bar.

step 2 Strip off the insulation cover of the cable with a stripped length of 5mm longer than the depth of the cable lug. Use cable lug based on the cable specification.

step 3 Crimp the copper cable lug.

1 Insert the stripped cables into the cable lug.

2 Tighten the cable lug with proper tools. The crimping number should be more than two.

step 4 Install the heat-shrinkable tubing.

step 5 Connect the cable.

1 Select bolts matching with the cable lug.

2 Crimp the cable lug into the AC copper bar.

3 Fasten the bolts with screwdriver or spanner

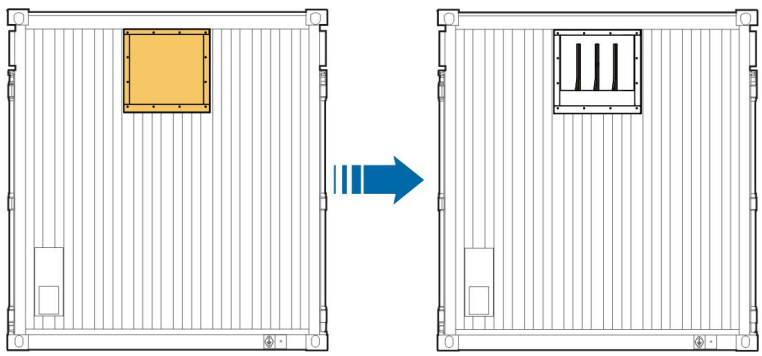
- - End

6.5.2.2 AC Connection Area on the Top

Proceed as this section to connect the cable when the AC cable entry is at the upper right side of the inverter.

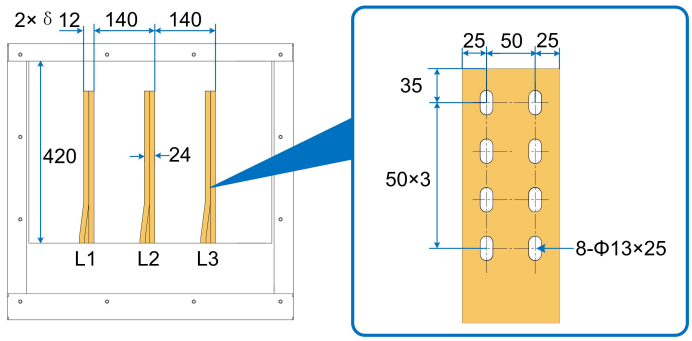
Overview

The AC connection area is on the upper right side of the Turnkey Station. Remove the sealing plate to find the AC connection area.



AC Connection Area

Dimensions of the copper bar are shown in the figure below.



Cable requirements

- Three-phase copper bar can be connected to the AC side
- Fasten the wiring terminal with the bolts of M12 × 80 in the scope of delivery
- The fastening torque is 60~70N m

Cable Connection Steps

step 1 Disconnect the downstream AC switches.

step 2 Ensure the phase sequence of the AC connection cable is correct.

step 3 Connect the output copper bus bar L1 to the L1/U/A side of the downstream device; connect L2 to the L2/V/B of the downstream device; and connect L3 to the L3/W/C of the downstream device.

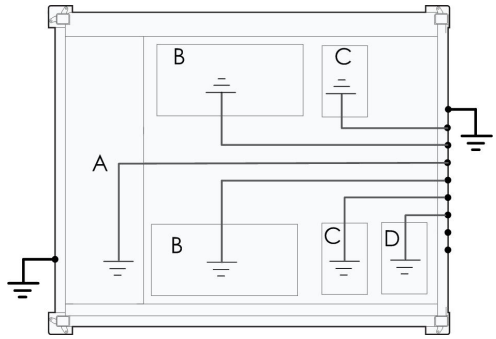
step 4 Fasten the foregoing terminals by using bolts in the scope of delivery.

- - End

6.6 Ground Connection

Overview

Generally, the ground connection includes equipotential connection of internal devices and external grounding.

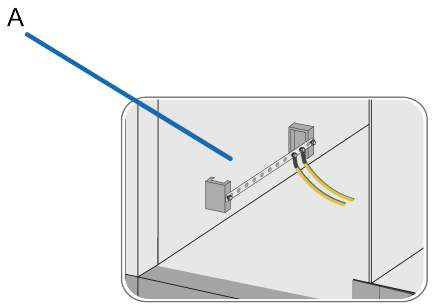


No.	Description
A	DC cabinet
B	Module cabinet

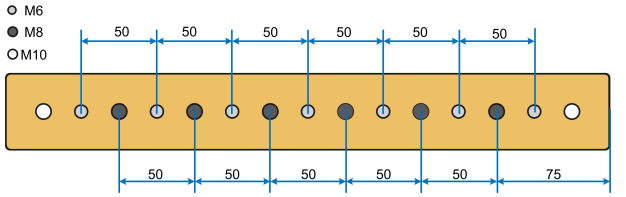
No.	Description
C	AC cabinet
D	Intelligent PMD

Equipotential Connection of Inverter Internal Devices

The grounding copper bar inside the inverter is located at the right side of the inverter, as shown in the following figure A.



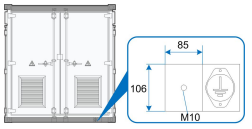
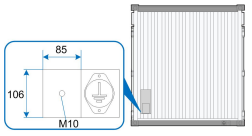
Dimensions of the copper bar is shown in the following figure.



The main internal electrical devices have been connected to the ground copper bar before delivery.

External Grounding

Two external grounding points are located at the bottoms on the left side and right side of the inverter.

Illustrations	Description
	Left-side view of the inverter. The external grounding point is shown in the left figure.
	Right-side view of the inverter. The external grounding point is shown in the left figure.

The external grounding points of the inverter can be grounded in the following two manners:

- Connect the grounding cable to the external grounding points with M10 bolts, where the recommended cable is of 50 mm² to 95 mm².

- Weld the grounding steel flat onto the external grounding point, after which anti-corrosion processing needs to be performed.

It is recommended that two points of the inverter should be connected to the ground system of the PV plant.

The inverter needs to be grounded on site. The following operations should also be conducted on site:

Measure the electrical conductivity between the device ground terminals and the total equipotential connection copper bar to ensure the effectiveness of the internal ground connection.

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

The grounding resistance should be no more than 4Ω.

The grounding resistance should be determined according to local standards and regulations.

WARNING

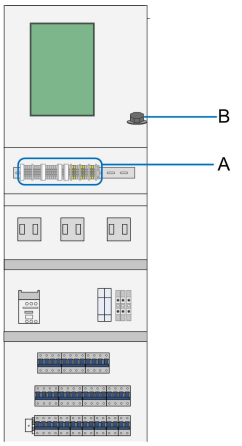
Observe the country-specific regulations and standards at all times!

WARNING

If you have any problems in relation to during the ground cable connection, contact the related technical personnel in time. Any installations not following the standards or the installation and alternation without permission may lead to safety incidents or damage to the devices. Sungrow shall hold no liability for the damages caused.

6.7 Communication Connection

The cable connection areas inside the intelligent power distribution cabinet are shown in the figure below.



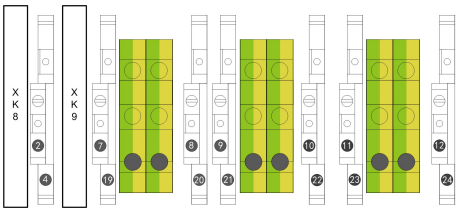
Note: This figure is for standard power distribution cabinet, and the actual product may differ.

No.	Description
A	RS485 communication port
B	Ethernet port

On site, perform cable connection according to internal terminal markings.

RS485 Ports Defination

RS485 communication ports are as follows:



Connected device	Terminal definition
Transformer oil temperature alarm(IN)	Connected to the transformer oil temperature alarm signal node
Program computer RS485(client)	7:RS485-A
	19: RS485-B
	GND: Shielding layer
PV combiner box	GND: Shielding layer
	8: RS485-A
	20: RS485-B
Environment data monitor RS485	9: RS485-A
	21: RS485-B
	GND: Shielding layer
Electrical parameter meter RS485	GND: Shielding layer
	10:RS485-A

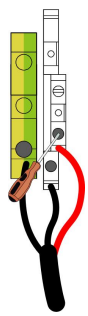
Connected device	Terminal definition
	22: RS485-B
Isolation transformer RS485	11:RS485-A
	23:RS485-B
	GND: Shielding layer
Reserved RS485	GND: Shielding layer
	12: RS485-A
	24: RS485-B

The foregoing terminal sequence is based on the standard version. Actual terminal sequence of the device purchased may slightly differ.

The foregoing terminal identifiers are recommended definitions and may be adjusted according to onsite conditions.

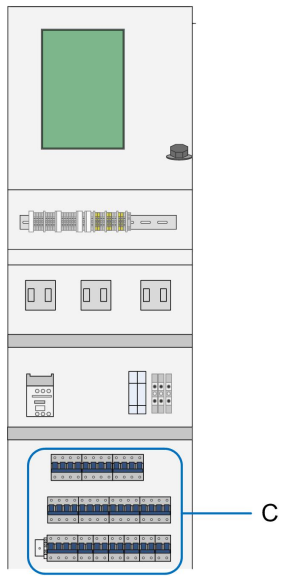
Cable Connection Method

The method for communication cable connection is briefly described in this chapter by using PV combiner box as an example.



6.8 External Power Supply Connection

The location of external power supply port of the Turnkey Station is shown in the following figure. On site, perform cable connection according to port definition.



No.	Description	Recommended Specifications
C	External power supply micro breaker and the corresponding terminals	10mm² or 8AWG

NOTICE

The inverter will activate protection function to disconnect external loads from power supply in case the grid voltages get abnormal.

6.9 Finishing Electrical Connection

⚠ WARNING

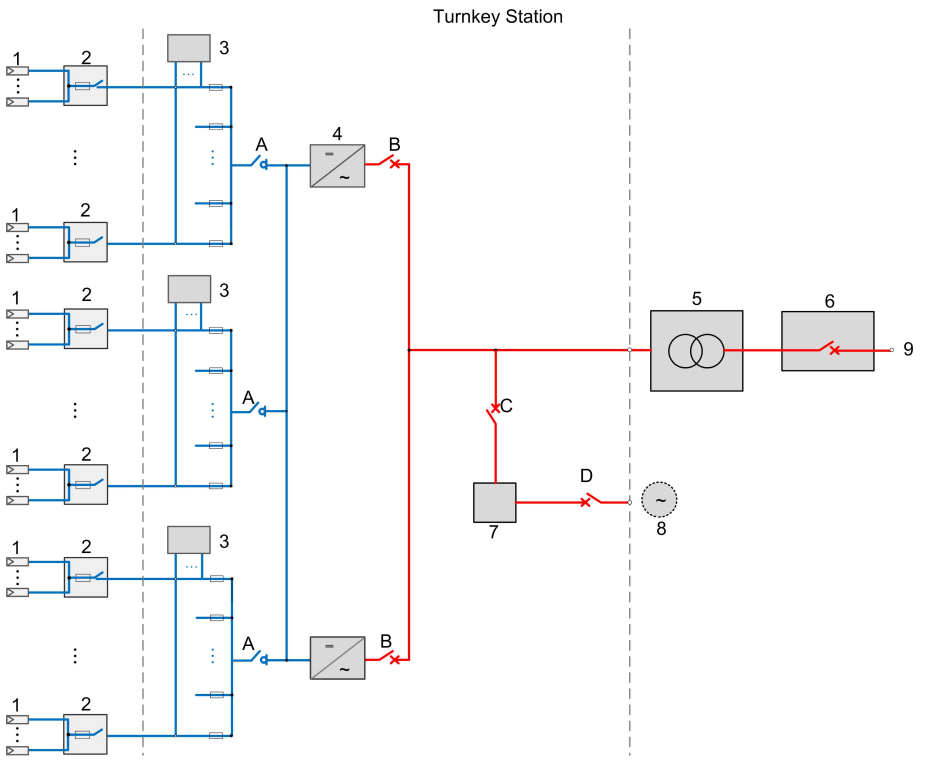
After the electrical connection, check the connection of all cables for correctness and firmness.

After ensuring that all connections are correct and firm,

- Check the bottom of the inverter and seal the gaps between the cables with fireproof mud. If cable glands are used, make sure they are tightened. Seal the unused terminal.
- Reassemble the protective grid removed.
- Apply water-proofing on the foundation of the inverter.

7 Disconnecting and Reconnecting the System

7.1 Power Connection Point Overview

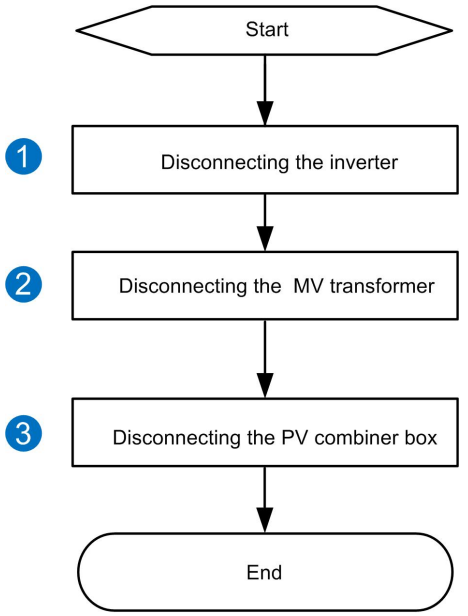


No.	Device	No.	Switch
1	PV array	A	Load Switch
2	PV combiner box	B	AC breaker
3	Branch board	C	Control switch
4	Inverter	D	Control switch
5	MV transformer	-	-
6	MV switchgear	-	-
7	Intelligent PMD	-	-
8*	External Power Supply	-	-
9	Grid	-	-

Note: * is optional.

7.2 Disconnecting the System

The following figure shows the steps of disconnecting the system.

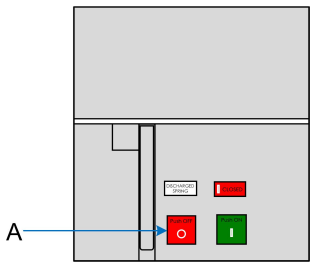


No.	Step	Reference
1	Disconnecting the inverter	"7.2.1 Disconnecting the Inverter"
2	Disconnecting the MV transformer	"7.2.2 Disconnecting the MV Transformer"
3	Disconnecting the PV combiner box	"7.2.3 Disconnecting the PV Combiner Box"

7.2.1 Disconnecting the Inverter

7.2.1.1 Disconnect DC Side of the Inverter

step 1 Disconnect all the load switches （figure A）of the inverters.



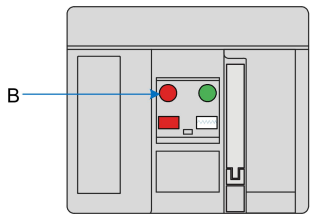
step 2 Ensure that the DC side of the inverters are voltage-free.

step 3 Ensure that the DC wiring terminals and other to-be-operated areas of the inverters are voltage-free with a multimeter.

- - End

7.2.1.2 Disconnect AC Side of the Inverter

step 1 Disconnect the AC breakers （figure B）of the inverters.



step 2 Ensure that the AC side of the inverters are voltage-free.

step 3 Ensure that the AC wiring terminals and other to-be-operated areas of the inverters are voltage-free with a multimeter.

- - End

7.2.1.3 Disconnect Power Supply of the Inverter

step 1 Disconnect the internal power supply control switch **Q1** of the inverters.

step 2 Disconnect the external power supply control switch **Q2** of the inverters if there any.

step 3 Ensure that the power supply wiring terminal of the inverter is voltage-free with a multimeter.

- - End

7.2.2 Disconnecting the MV Transformer

step 1 Refer to "7.2.1 Disconnecting the Inverter" to disconnect the inverters.

step 2 Wait 10 minutes to have the internal capacitors discharge completely, and then open the doors of the MV Station.

step 3 Perform the following operations on circuit breakers inside the MV Switchgear, where reference can be made to the manual of the Switchgear.

1 Disconnect the circuit breaker.

2 Disconnect the switch disconnector.

3 Connect the earthing-switch.

- - End

7.2.3 Disconnecting the PV Combiner Box

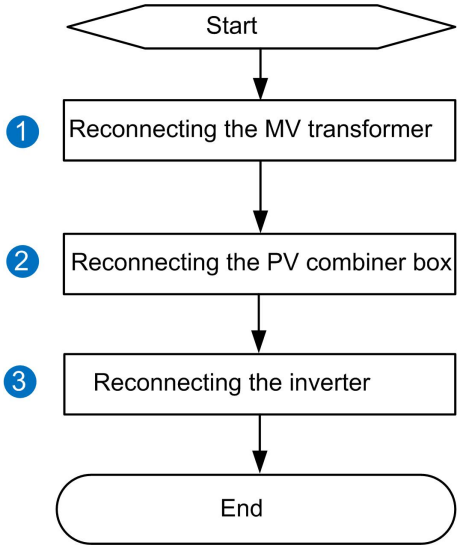
step 1 Refer to "7.2.1 Disconnecting the Inverter"to disconnect the inverters.

step 2 Disconnect the all the DC switches of the upstream PV combiner boxes connected to the inverter.

- - End

7.3 Reconnecting the System

The following figure shows the steps of reconnecting the system.



No.	Step	Reference
1	Reconnect the MV transformer	"7.3.1 Reconnecting the MV Transformer"
2	Reconnecting the PV combiner box	"7.3.2 Reconnecting the PV Combiner Box"
3	Reconnect the inverter	"7.3.3 Reconnecting the Inverter"

7.3.1 Reconnecting the MV Transformer

Perform the following operations on the circuit breaker cabinet inside the MV Switchgear, where reference can be made to the manual of the Switchgear.

step 1 Disconnect the earthing switch.

step 2 Connect the switch disconnector.

step 3 Connect the circuit breaker.

- - End

7.3.2 Reconnecting the PV Combiner Box

Connect DC switches of all upstream combiner boxes of the inverter.

7.3.3 Reconnecting the Inverter

Proceed as follows to reconnect the inverter: reconnecting the AC side of the inverter, reconnecting the DC side of the inverter and restarting the inverter.

7.3.3.1 Reconnecting the AC side of the Inverter

step 1 Connect the external power supply control circuit breaker **Q1** of the inverter.

step 2 Connect the AC breakers of the inverters.

- - End

7.3.3.2 Reconnecting the DC side of the Inverter

step 1 Connect the DC switches of the PV combiner boxes.

step 2 Connect the load switches of the inverters.

- - End

7.3.3.3 Restarting the Inverter

Start the inverters in either of the following manners:

step 1 Rotate the Start/Stop button to the "START" position.

step 2 Tap "Start/Stop" - > "Start" on the LCD screen to start the inverters.

- - End

8 Commissioning

8.1 Safety Instructions

⚠ DANGER

High voltage! Electric shock!

- Wear proper protection equipment before all operations on the device.
- Do not touch the live terminals or conductors.
- Respect all safety instructions attached on the device and described in this manual.
- Respect all safety instructions prescribed by the manufacturer of devices connected to the inverter.

⚠ WARNING

Grid-connection of the inverter can be performed only after receiving approval from the local utility grid company and by qualified personnel.

⚠ WARNING

When the inverter is operating, make sure there are no flammable materials within at least 5m around the installation site.
Local/national standards about the min. electric clearance around the inverter should be respected.

⚠ CAUTION

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

NOTICE

Close the doors of the inverter and the internal devices if the commissioning process is stopped.

8.2 Requirements of Commissioning

Before commissioning, installation of the DC cabinet and AC cabinet inside the inverter should be checked thoroughly.

- Ensure all the cables are connected securely and all bolts are fixed properly.
- Ensure DC side voltage meets module requirements and the polarity is correct.
- Ensure AC side voltage meets module requirements.
- Ensure all cable connections meets related standards and requirements.
- Ensure the system is properly groundeded and the ground resistance is less than 4Ω.

NOTICE

All commissioning operations during commissioning must be performed by qualified personnel only.

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

8.3 Checking before Commissioning

8.3.1 Checking the Cable Connection

- Check cables for any possible damages or cracks.
- Check that all cables are connected securely according to the cable connection diagram. Adjust the cable connection if necessary.
- Ensure all cable connections are firmly enough. Fix the bolts if necessary.
- Check the PE equipotential connection. Ensure PE ground point of the internal devices has been connected to the equipotential connection point in the inverter and properly grounded. The ground resistance should be no more than 4Ω.

8.3.2 Checking the Inverter Switches

- Ensure that all DC, AC, and micro switches in the inverter are in the "OFF" position.
- Ensure that the emergency stop button is released.
- Check whether the electric switches and buttons of the inverter and its upstream and downstream devices can be operated flexibly.

8.3.3 Checking PV Array

WARNING

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

⚠ WARNING

DC side voltage should be no more than max. DC input voltage of the inverter. Too high DC voltage may damage the inverter even cause safety incident.

To ensure the system reliability and device operation, PV cells on the DC side of the inverter should be from the same manufacturer andnumbers of PV cells in each string should be the same.

Check the PV arrays before grid-connection. The voltage of each DC main cable should be the same and no more than the max. permissible DC voltage. Check carefully the polarity of each DC main cable. Once the polarity in one DC main cable is incorrect, the PV arrays may be damaged.

Make sure the environmental condition is stable since the voltage of PV array may change with the solar radiation and the temperature of the PV cells. Record the PV array status via the U-I curve. Commission the device when the PV array output status is stable.

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

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

8.3.4 Checking Grid Voltage

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

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

- Measure and record the grid frequency. Measured data should not exceed the grid permissible frequency.
- Measure the THD and check the curve if possible. The inverter will stop running if the THD is serious.
- Record accurately all the measured data.

8.4 Preparation before Starting

- Place the disassembled protection grills to their original positions and ensure the connection is secure.
- Clean the device site. Make sure the position is clean without flammable or explosive materials.
- Ensure the ventilation of the installation place.
- Recheck to ensure the inverter and switches upstream and downstream meet the requirements and are flexible enough.

8.5 Starting the Device

If all tests and measurements have been performed, and all measured values lie within the acceptable range, the device can be switched on for the first time. Proceed as follows to start the inverter:

step 1 Close the upstream and downstream switches of the inverter.

step 2 Manually close the auxiliary power supply switch inside the inverter and wait the touch screen to power on.

step 3 Stop the inverter through the touch screen.

step 4 Turn off "Trip Enable" and "Door-protect enable" through the touch screen.

step 5 Manually close all DC switches inside the DC cabinet.

step 6 Perform the start operation through the touch screen, and the inverter starts grid-connected operation.

- - End

To ensure the inverter operates normally for the first time, measure the DC input voltage beforehand. When the DC side voltage meets the start-up requirement, i.e., the DC voltage is steadily higher than the DC start-up voltage, start the inverter for the first time.

8.6 LCD Parameter Setting

When the LCD is on, set the LCD display language, date and time, communication parameters, and active power limitation etc. according to Chapter 9: LCD Operation in this manual. You can also view the inverter running information and perform pertinent operation.

8.7 Completing Commissioning

If all the start-up procedures have been performed, check the operating condition of the inverter.

- Check whether there are anomalies of the inverter: abnormal noise, overheating, smoking, or unusual odor.
- Check the inverter grid-connected voltage, current, and THD are stable.
- Check the grounding of the inverter enclosure.
- Check the functionality of the LCD display.
- Record accurately the inverter operation data during commissioning.

The duration of commissioning depends on the plant scale, plant location, onsite environmental conditions, and the like. Usually, if on-site condition is stable, the commissioning can last for 1 week, i.e. 168 hours.
The commissioning of the inverter is completed. The inverter operates normally.
After successful commissioning, the inverter will be put into operation.

⚠ WARNING

When the inverter is operating, make sure there are no flammable materials or other materials within at least 5 meters around the installation site.
Local/national standards about the min. electric clearance around the inverter should be respected.

NOTICE

The inverter needs no manual control in daily operation. Open the cabinet door only for maintenance or troubleshooting and by qualified personnel only.
Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.

9 Starting/Stopping

9.1 Starting

9.1.1 Inspection before starting

After the maintenance or service work, inspect the following items, and then start inverter:

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

⚠ WARNING

If the inverter has been stored for more than half a year in the required storage environment, a thorough and careful inspection is necessary before the inverter is powered on.

9.1.2 Start Steps

When the foregoing conditions are met, proceed as follows to start the inverter:

step 1 Close the upstream and downstream switches of the inverter.

step 2 Manually close the auxiliary power supply switch inside the inverter and wait the touchscreen to be powered on.

step 3 Stop the inverter through the touchscreen.

step 4 Turn off "Trip Enable" and "Door-protect enable" through the touchscreen.

step 5 Manually close all DC switches inside the inverter.

step 6 Perform the start operation through the touchscreen, and the inverter starts grid-connected operation.

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

- - End

⚠ WARNING

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

9.2 Stopping

Stop the inverter when maintenance and service work is required or a fault occurs.

9.2.1 Normal Stop

Proceed as follows to stop the inverter during normal maintenance and service work:

step 1 Stop the inverter through the stop instruction n on the LCD panel.

step 2 Disconnect the DC side and auxiliary power supply switches.

step 3 Disconnect the inverter downstream switches.

step 4 Disconnect the inverter upstream switches.

step 5 The inverter stops running.

- - End

⚠ WARNING

Never disconnect the AC or DC switch during normal operation. Otherwise, the inverter as well as the switch may be damaged.

9.2.2 Stop in Case of Fault

Proceed as follows to stop the inverter when a fault or an emergency occurs:

step 1 Press the emergency stop button.

step 2 Disconnect the auxiliary power supply switches.

step 3 Disconnect the inverter downstream switches.

step 4 Disconnect the inverter upstream switches.

step 5 The inverter stops running.

- - End

⚠ WARNING

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

⚠ WARNING

Press emergency stop button only when an emergency or a fault occurs. Under normal conditions, stop the inverter via the stop instruction on the LCD panel. Press the emergency stop button immediately in case of emergency to make to ensure a timely response.

10 LCD Menu Operation

10.1 LCD TouchScreen

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

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

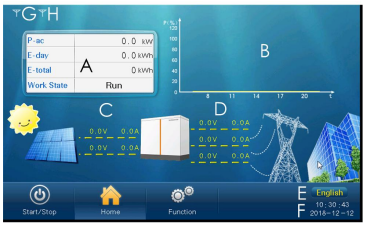
If the time shown on the LCD panel is different from the actual local time after time calibration, check the button cells on the back of the LCD panel and replace them if necessary.

10.2 Default Screen

10.2.1 Initialization

The LCD is initialized and then enters into the starting menu. The initialization screen appears every time the inverter is powered on. After initialization, the default screen follows.

10.2.2 Default Screen Introduction



No.	Description
A	Yield data. The first line on the top indicates the present active power; and the work state is the transient state of the inverter.
B	Today’s active power curve indicating the power percentage (power value/the inverter nominal power value).
C	DC side voltage and current of the inverter
D	AC side line-to-line voltage and phase current

No.	Description
E	Language selection button. Click it to change languages among English, Chinese and the like.
F	Present date and time
G	The success rate of the inverter internal communication
H	The success rate of communication between the inverter and PC

Enter the following submenus from the default menu.

⚠ WARNING

LCD screen contains lots of parameters pertinent to the inverter operation. All parameters must be set by appointed personnel. Do not modify any parameters without full understanding of the relevant action or without consulting Sungrow Customer Support.

10.2.3 Backlight and Screensaver

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

10.3 Overview of LCD Menu and Icon

10.3.1 Overview of Submenu and Icon

There are three buttons on the lower left side of the touch panel:for the user to operate "Start/Stop" 

, "Home", 

, "Function" 

. The user can perform related operations via these buttons. The logical structures of these menus are shown below:

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

Main Menu	First sub-menu	Second sub-menu	Third sub-menu
		His-alarm	-
	Start/Stop	Start	-
		Stop	-
	Set-parameter	Sys-parameter	Language & Firmware Ver.
			Time
			Remote/Local control
			Load default
		Run-parameter	-
		Pro-parameter	-
		Com-parameter	Serial port param.
			Network param.

10.3.2 Layout of the submenus

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

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

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

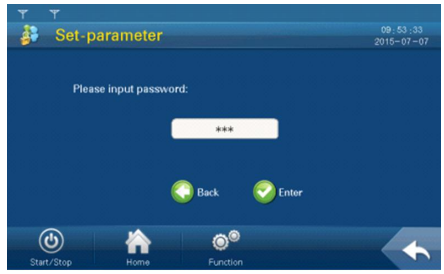
menu will be referred to as “Set-parameter”.

10.4 Entering Password

Inverter parameters are protected by password. User can enter into the "Set-parameter" sub-menu only after entering the correct password. Proceed as follows to enter the password:

step 1 Tap "Function" from the default menu.

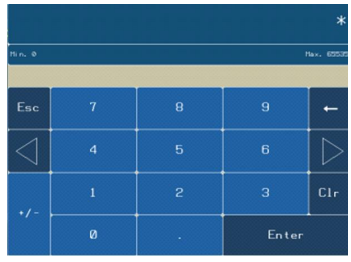
step 2 Tap "Set-parameter" and the password entering window pops up.



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

step 4 Enter the password 1111 through the keypad.

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



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

step 5 Press "Enter" to confirm the password input.

step 6 If the password is incorrect, an "Error password" window will appear. Tap "Enter" and re-enter the password.

- - End

10.5 Language Setting

10.5.1 Conventional Way

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Language & Firmware Ver." and enter into the language and firmware version sub-menu.

The figure is indicative only and actual interface may differ.

step 5 Select the desired language.

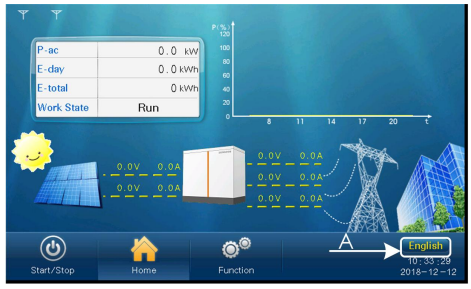
- - End

10.5.2 Shortcut

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

By tapping the button, the language will switch among English, Chinese and the like.

The language displayed on the button is the present display language.



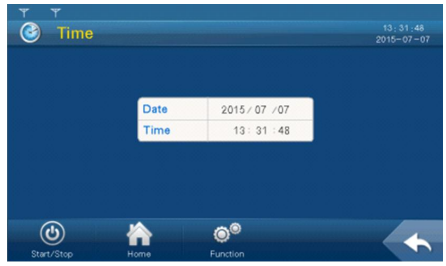
10.6 Setting Date and Time

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Time" and enter into the date and time setting sub-menu.



step 5 Set the "Year", "Month", "Date", "Hour", "Minute" and "Second". Tap the corresponding field and the keypad will appear.

step 6 Set the time and date by tapping the keypad and confirm setting by tapping "Enter".

-- End

10.7 Checking Running Information

Running information related to the operation of the inverter:

Real-time data

The real time running information of the 4 modules can be checked.

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

Power curve

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

E-histogram

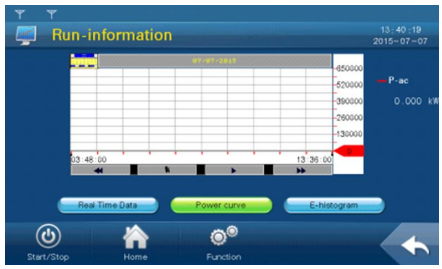
The histogram shows the present day in histogram.

Proceed as follow to view the running information:

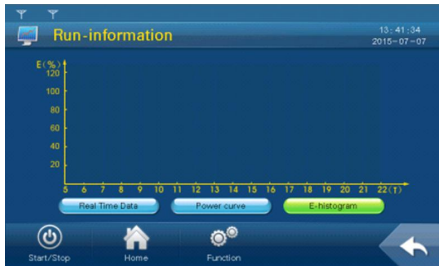
step 1 Tap "Function" from the default menu.

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

step 3 Tap "Power curve" and enter into the power curve sub-menu.



step 4 Tap "E-histogram" and enter into the electricity histogram sub-menu.



- - End

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

10.8 Checking History Information

10.8.1 Checking History Event

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-event" and enter into the history event sub-menu.

A maximum of 200 history events can be viewed via this sub-menu, and a maximum of 5 records can be shown in one page. The upper left side of the event table is the total number of the current event records. Tap "Prev" or "Next" to turn pages up or down.

- - End

10.8.2 Checking History Data

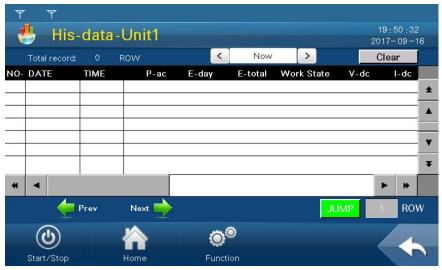
System can record the inverter running information for the latest 90 days with the records updated every 15 minutes per day.

History data displays the data related to the power yields and the electric quantity of the inverter. Proceed as follows to check the history information:

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-data" and enter into the history data sub-menu.



Tap "Prev" or "Next" to turn pages up or down.

- - End

10.8.3 Checking History Fault

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

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "His-fault" and enter into the history fault sub-menu.

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

- - End

10.8.4 Checking History Alarm

Proceed as follows to check the history warn information:

step 1 Tap "Function" from the default menu.

step 2 Tap "History-information" and enter into the history information sub-menu.

step 3 Tap "his-alarm" and enter into the history alarm sub-menu.

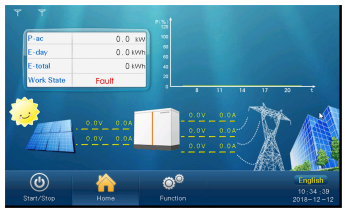
History alarms can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total numbers of the current warn records. Tap "Prev" or "Next" to turn pages up or down.

- - End

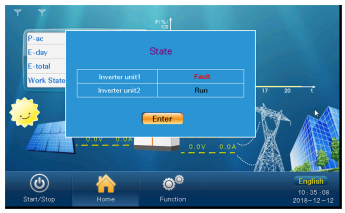
10.9 Checking Present Fault Information

The module cabinet inside the inverter includes two module units(inverter unit).

There may be one or more faults occur in the inverter units inside the inverter at the same time, and the fault can be viewed on the LCD screen. Follow the description in this chapter to view the fault information when the faults occur.



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



The state column of the module unit that has fault will display “Fault". As shown in the left figure, a fault occurs to inverter unit 1. Tap the fault cell of inverter unit 1 to check the present fault.

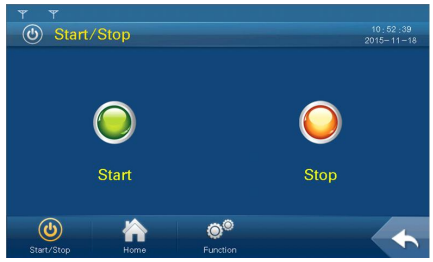
The fault interface of inverter unit 1 will appear with the fault item in red.

10.10 Starting/Stopping

Usually, the inverter will start automatically when the grid-connected requirements are met.

Start/stop the inverter through the LCD screen in either of the following manners:

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



Start or stop the inverter by tapping the start/stop button on the screen.

A confirm operation interface will appear after tapping the corresponding buttons. The instruction takes effect after confirmation; or the user can cancel the operation by tapping “Cancel”.

10.11 Loading Default

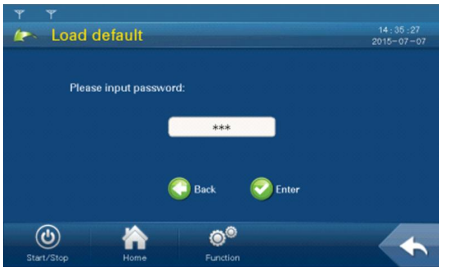
Proceed as follows to restore factory defaults:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Load default" and the password inputting window appears.



Tap "Load default" and the password entering window appears.

- - End

10.12 Checking Firmware Version

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

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Sys-parameter" after entering the correct password.

step 4 Tap "Language & Firmware Ver." and enter into the language and firmware version sub-menu.

The figure is indicative only and actual interface may differ.

step 5 The firmware versions of LCD and DSP are shown at the bottom of the page.

- - End

10.13 Parameters of LCD

10.13.1 Communication Parameters

⚠ WARNING

Improper communication parameter configuration may lead to communication failure!
Follow strictly the instructions of the plant staff in configuring the communication parameters.

There are the RS485 communication and Network communication. User can set the communication address and protocol through the LCD screen when the hardware connection is complete and the device is energized.

Proceed as follows to set the communication parameters:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Com-parameter" after entering the correct password.

- Set parameter from the Serial Port Parameter interface for RS485 serial communication;
- Set parameter from the Network Parameter interface for Network communication

- - End

Serial Port Parameter Setting

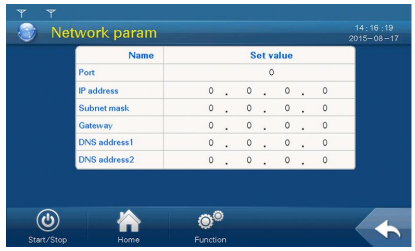
Click "Serial port param" to enter the following interface.

Two parameters pertinent to RS485 serial port communication can be set according to the parameter range shown on the display.

"Address" is prescribed by the plant staff and the address for each device must be unique when there is more than one device. "Baud" is selected according to the communication method adopted on-site.

Network Parameter Setting

Click Network Parameter to enter the following interface.



Six parameters pertinent to the Network communication can be set. DNS address 1 and DNS address 2 can be set to the default value. Other parameters are assigned by plant staff.

Set parameter with the aid of the pop-up keypad.

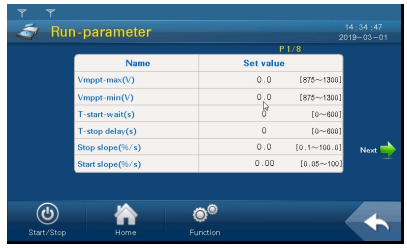
10.13.2 Running Parameters

Setting Running Parameters

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Run-parameter" after entering the correct password.



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

- - End

table 10-1 Description of Running Parameters

Parameter	Description
Vmppt-max (V)	Maximum MPPT voltage
Vmppt-min (V)	Minimum MPPT voltage
T-start-wait (s)	Time interval between the moment at which the AC/DC parameters meet the grid-connection requirements and the moment at which the MV Station begins to generate power

Parameter	Description
T-stop-delay (s)	Time interval between the moment at which the stop command is sent via the LCD display or the PC and the moment at which the MV Station executes the stop command
Stop slope (%/s)	Active power decline rate over the time from the moment at which the MV Station executes stop command to the moment at which the MV Station stops
Start slope (%/s)	Active power rise rate over the time from the moment at which the MV Station executes the start command to the moment at which the MV Station starts
Limit Power (%)	Percentage of the active power output to the nominal output power (%)
Pf	cos φ
Q-limit (%)	Percentage of the reactive power rise to the nominal power (%)
Q-adjust switch	-
Power-off saved (Pf)	If the power factor setting can be saved when the LCD screen is powered off
Power-off saved (P-limited)	If the limit power(%) setting can be saved when the LCD screen is powered off
SVG switch	If the reactive power compensation is activated or deactivated
T-recover (s)	Automatic recovery time when fault occurs
P-rise rate (%/s)	Rate of rise of the active power
P-decline rate (%/s)	Rate of decline of the active power
Q-rise rate (%/s)	Rate of rise of the reactive power
Q-decline rate (%/s)	Rate of decline of the reactive power
Trip Enable	Trip the DC main switches of the MV Station
FW func enable	To enable/Disable the FW function
FW output change base	The standard of active power change caused by frequency change
OF decrease start(Hz)	Refer to f1i in "figure 10-1 The relation curve between the active power and the frequency".
OF decrease end(Hz)	Refer to f2i in "figure 10-1 The relation curve between the active power and the frequency"
OF power recover frq (Hz)	When the grid frequency is lower than the overfrequency recovery frequency, the active power returns to the power before derating.

Parameter	Description
OF decrease slope	Refer to K1 in "figure 10-1 The relation curve between the active power and the frequency"
OF decrease limit (%)	Refer to ΔP1 in "figure 10-1 The relation curve between the active power and the frequency"
FW input type	The input frequency type of the FW function. The max./min value of the real-time frequency or during frequency change
FW enable power(%)	After the FW function is enabled, the FW function is started when the percentage of the actual output active power is greater than the set value
UF increase start(Hz)	Refer to f1s in "figure 10-1 The relation curve between the active power and the frequency"
UF increase end(Hz)	Refer to f2s in "figure 10-1 The relation curve between the active power and the frequency"
UF power recover frq(Hz)	When the grid frequency is higher than the value, the inverter resumes normal operation
UF increase slope	Refer to K2: in "figure 10-1 The relation curve between the active power and the frequency"
UF increase limit(%)	Refer to ΔP2 in "figure 10-1 The relation curve between the active power and the frequency"
QU enable power(%)	In QU mode, the QU function will be enabled when the actual output active power percentage is greater than the set value
QU operation mode	In QU reactive power mode, the method to set the reactive power value
QU input type	QU function input voltage type; the max./min value of the real-time grid voltage or during grid voltage change
QU ind var limit (%)	Refer to Q1 in "figure 10-2 The relation curve between the reactive power and the voltage"
QU cap var limit (%)	Refer to Q2 in "figure 10-2 The relation curve between the reactive power and the voltage"
QU PF start(%)	Refer to the power factor corresponding to Q3 in"figure 10-2 The relation curve between the reactive power and the voltage"
QU PF end(%)	Refer to the power factor corresponding to Q1 or Q2 in"figure 10-2 The relation curve between the reactive power and the voltage"

Parameter	Description
QU volt rise start(%)	Refer to U1i in "figure 10-2 The relation curve between the reactive power and the voltage"
QU volt rise end(%)	Refer to U2i in "figure 10-1 The relation curve between the active power and the frequency"
QU volt drop start(%)	Refer to U1s in "figure 10-2 The relation curve between the reactive power and the voltage"
QU volt drop end(%)	Refer to U2s in "figure 10-2 The relation curve between the reactive power and the voltage"
V auto-adj ref(%)	When the reactive regulation switch is V auto-adj, the grid regulation reference is set according to the percentage of nominal voltage
V auto-adj hysteresis(%)	When the reactive regulation switch is V auto-adj, the permissible plus or minus error of the regulation voltage and it is set according to the percentage of nominal voltage
Q(P) upper PF	Power factor of point P1 in "figure 10-3 Q(P) mode curve "
Q(P) lower PF	Power factor of point P2 in "figure 10-3 Q(P) mode curve "
Q(P) upper power(%)	Output power of point P2 in "figure 10-3 Q(P) mode curve "
Q(P) lower power(%)	Output power of point P1 in "figure 10-3 Q(P) mode curve "
P-closed-loopswitch	The active power regulation switch of the inverter can be set to enabled or disabled state. When it is enabled, the output active power of the inverter will be regulated according to actual situation; and when it is disabled, the output active power will not be regulated.
Q-closed-loopswitch	The reactive power regulation switch of the inverter can be set to enabled or disabled state. When it is enabled, the output reactive power of the inverter will be regulated according to actual situation; and when it is disabled, the output reactive power will not be regulated.

The relation curve between the active power and the frequency is shown in the figure below.

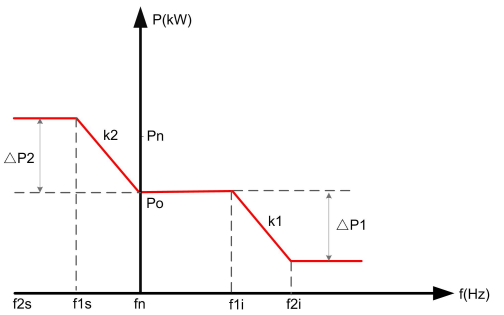


figure 10-1 The relation curve between the active power and the frequency

The relation curve between the reactive power and the voltage is shown in the figure below.

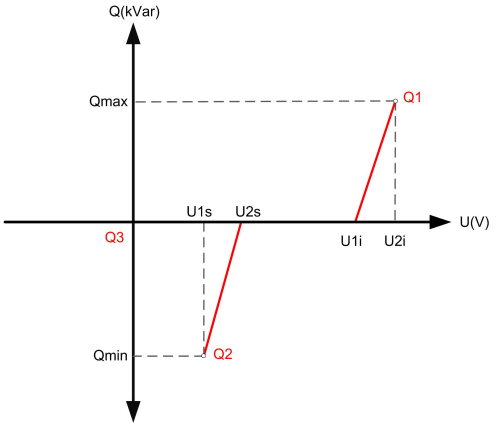


figure 10-2 The relation curve between the reactive power and the voltage

Q(P) mode curve is shown in following figure.

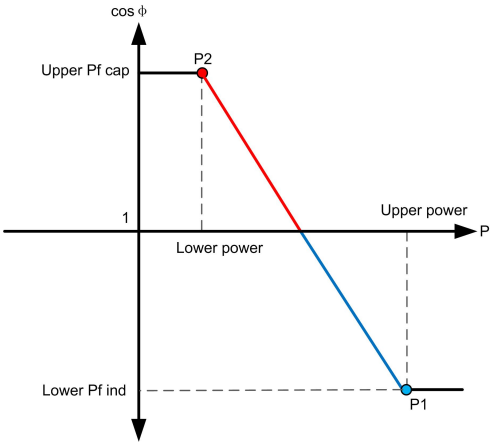


figure 10-3 Q(P) mode curve

Running parameter range and default value are shown in the following table.

table 10-2 Running parameter range and default value

Parameter	Range	Default
Vmppt-max (V)	875~1300	1300
Vmppt-min (V)	875~1300	875
T-start-wait (s)	0~600	60
T-stop-delay (s)	0~600	0
Stop slope (%/s)	0.1~100	100
Start slope (%/s)	0.05~100	10
Limit Power (%)	0~115	110
Pf	-0.8~-1/0.8~1	1
Q-adjust switch	Close/Pf/Q-limit/QU mode/ V auto-adj/QP mode	Pf
Q-limit (%)	-104.5~104.5	0
Power-off saved (Pf)	Save/Not save	Save
Power-off saved (P-limited)	Save/Not save	Not save
SVG switch*	Enable/Disable	Disable
T-recover (s)	20~600	60
P-rise rate (%/s)	0.01~100	10
P-decline rate (%/s)	0.01~100	10
Q-rise rate (%/s)	0.01~100	10
Q-decline rate (%/s)	0.01~100	10
Trip Enable	Enable/Disable	Disable
FW func enable	Enable/Disable	Disable
FW output change base	Rated-P/Pre-derate-P	Rated-P
OF decrease start(Hz)	50~55/60~65	Country-specific
OF decrease end(Hz)	50~55/60~65	Country-specific
OF power recover frq(Hz)	50~55/60~65	Country-specific
OF decrease slope	0~2	Country-specific
OF decrease limit (%)	0~115	Country-specific
FW input type	RT-freq/Record- freq	Country-specific
FW enable power(%)	0~115	0
UF increase start(Hz)	45~50/55~60	Country-specific
UF increase end(Hz)	45~50/55~60	Country-specific
UF power recover frq(Hz)	45~50/55~60	Country-specific
UF increase slope	0~2	Country-specific

Parameter	Range	Default
UF increase limit(%)	0~115	Country-specific
QU enable power(%)	0~115	0
QU operation mode	Var PCT adj/ TanPhi adj/ CosPhi.adj	Var PCT adj
QU input type	RT volt/Record volt	RT volt
QU ind var limit (%)	0~100	50
QU cap var limit (%)	0~100	50
QU PF start (%)	0.8~1	Country-specific
QU PF end (%)	0.8~1	Country-specific
QU volt rise start(%)	100~110	Country-specific
QU volt rise end(%)	100~110	Country-specific
QU volt drop start(%)	90~100	Country-specific
QU volt drop end(%)	90~100	Country-specific
V auto-adj ref(%)	90~110	100
V auto-adj hysteresis(%)	0~10	1
Q(P) upper PF	0.9~1	1
Q(P) lower PF	0.9~1	0.9
Q(P) upper power(%)	50~100	100
Q(P) lower power(%)	0~50	50
P-closed-loop-switch	Enable/Disable	Enable
Q-closed-loop-switch	Enable/Disable	Enable

* at night when the MV Station enters standby mode (but does not enter the deeper standby mode with lower power consumption), the SVG function needs to be activated. First, stop the MV Station via the button on the LCD, then start it, and set the SVG switch to "Enable".

The SVG is an optional function of this MV Station.

Specific setting ranges of these parameters are displayed on the LCD.

Contact SUNGROW to obtain specific value of the parameter country-specific.

10.13.3 Protection Parameter

Setting Protection Parameter

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Pro-parameter" after entering the correct password.

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

- - End

Description of Protection Parameters

Parameter	Description
I _Vgrid-max(%)	Set the grid over-voltage protection I value. Protection is activated when voltage exceeds this value.
II _Vgrid-max(%)	Set the grid over-voltage protection II value. Protection is activated when voltage exceeds this value.
III _Vgrid-max(%)	Set the grid over-voltage protection III value. Protection is activated when voltage exceeds this value.
IV _Vgrid-max(%)	Set the grid over-voltage protection IV value. Protection is activated when voltage exceeds this value.
V _Vgrid-max(%)	Set the grid over-voltage protection V value. Protection is activated when voltage exceeds this value.
Recover_Vgrid-max(%)	The MV Station recovers normal operation when grid voltage is below this value
I _T-Vhigh trip(ms)	Grid over-voltage protection I trip time
II _T-Vhigh trip(ms)	Grid over-voltage protection II trip time
III _T-Vhigh trip(ms)	Grid over-voltage protection III trip time
IV _T-Vhigh trip(ms)	Grid over-voltage protection IV trip time
V _T-Vhigh trip(ms)	Grid over-voltage protection V trip time
I _Vgrid-min(%)	Set the grid under-voltage protection I value. Protection is activated when voltage is below this value.
II _Vgrid-min(%)	Set the grid under-voltage protection II value. Protection is activated when voltage is below this value.
III _Vgrid-min(%)	Set the grid under-voltage protection III value. Protection is activated when voltage is below this value.

Parameter	Description
Ⅳ_Vgrid-min(%)	Set the grid under-voltage protection Ⅳ value. Protection is activated when voltage is below this value.
Ⅴ_Vgrid-min(%)	Set the grid under-voltage protection Ⅴ value. Protection is activated when voltage is below this value.
Recover_Vgrid-min(%)	The MV Station recovers normal operation when grid voltage is above this value
Ⅰ_T-Vlow trip(ms)	Grid under-voltage protection Ⅰ trip time
Ⅱ_T- Vlow trip(ms)	Grid under-voltage protection Ⅱ trip time
Ⅲ_T- Vlow trip(ms)	Grid under-voltage protection Ⅲ trip time
Ⅳ_T- Vlow trip(ms)	Grid under-voltage protection Ⅳ trip time
Ⅴ_T- Vlow trip(ms)	Grid under-voltage protection Ⅴ trip time
Ⅰ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅰ value. Protection is activated when frequency exceeds this value
Ⅱ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅱ value. Protection is activated when frequency exceeds this value
Ⅲ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅲ value. Protection is activated when frequency exceeds this value
Ⅳ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅳ value. Protection is activated when frequency exceeds this value
Ⅴ_Fgrid-max(Hz)	Set the grid over-frequency protection Ⅴ value. Protection is activated when frequency exceeds this value
Recover_Fgrid-max(Hz)	The MV Station recovers normal operation when grid frequency is below this value
Ⅰ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅰ tripping time
Ⅱ_T-Fhigh trip (ms)	Set the grid over-frequency Ⅱ tripping time
Ⅲ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅲ tripping time
Ⅳ_T-Fhigh trip (ms)	Set the grid over-frequency Ⅳ tripping time
Ⅴ_T-Fhigh trip(ms)	Set the grid over-frequency Ⅴ tripping time
Ⅰ_Fgrid-min(Hz)	Set the grid under-frequency protection Ⅰ value. Protection is activated when frequency exceeds this value

Parameter	Description
II _Fgrid-min(Hz)	Set the grid under-frequency protection II value. Protection is activated when frequency exceeds this value
III _Fgrid-min(Hz)	Set the grid under-frequency protection III value. Protection is activated when frequency exceeds this value
IV _Fgrid-min(Hz)	Set the grid under-frequency protection IV value. Protection is activated when frequency exceeds this value
V _Fgrid-min(Hz)	Set the grid under-frequency protection V value. Protection is activated when frequency exceeds this value
Recover_Fgrid-min(Hz)	The MV Station recovers normal operation when grid frequency is above this value
I _T-Flow trip(ms)	Set the grid under-frequency I tripping time
II _T-Flow trip (ms)	Set the grid under-frequency II tripping time
III _T-Flow trip(ms)	Set the grid under-frequency III tripping time
IV _T-Flow trip (ms)	Set the grid under-frequency IV tripping time
V _T-Flow trip (ms)	Set the grid under-frequency V tripping time
LVRT switch	Enable or disable the LVRT switch
LVRT T1(ms)	Parameters related to the LVRT.
LVRT T2(ms)	
LVRT T3(ms)	
LVRT T4(ms)	
LVRT T5(ms)	
LVRT voltage1(%)	
LVRT voltage2(%)	
LVRT voltage3(%)	
LVRT voltage4(%)	
LVRT voltage5(%)	
LVRT dynamic Var Kf factor	Ratio of reactive power compensation and voltage dropping depth during LVRT
HVRT switch	Enable or disable the HVRT switch
HVRT T1(ms)	Parameters related to the HVRT.
HVRT T2(ms)	
HVRT T3(ms)	
HVRT T4(ms)	

Parameter	Description
HVRT T5(ms)	
HVRT voltage1(%)	
HVRT voltage2(%)	
HVRT voltage3(%)	
HVRT voltage4(%)	
HVRT voltage5(%)	
Recover T-grid(ms)	The grid under-/over-voltage and under-/over-frequency protection is enabled. When the grid turns normal and the set time is reached, the fault will be removed.
Active Islanding	Enable or disable the islanding protection function
I leakage-pro(A)	Leakage current protection setting value
Door-protect enable	Enable or disable the door control protection
Fault manual restart	Manual fault restart. If this function is enabled, the MV Station can reconnect to the grid only after the fault is removed manually.
Negative Vgrid protect value(V)	Protection value of negative voltage to ground
Grid_V-unbalanced protect value(%)	3-phase grid voltage unbalance protection threshold value
Grid_V-unbalanced protect time(S)	3-phase grid voltage unbalance time reaches to the set value. Protection is activated
Anti-PID mode	If Anti-PID mode is enabled, you may set the Anti-PID mode (Invalid, Suppression and Repair)
Ins monitor measure time (S)	Insulation monitoring time
Ins monitor protect threshold(K)	Insulation monitoring protection threshold value
Ins monitor Vdc-start(V)	Insulation monitoring startup voltage. When the DC voltage reaches to this set value, the insulation monitoring enables.

Parameter	Description
Ins fault enable	Insulation fault enabling. • When it is enabled, the inverter will display fault information once the negative/positive insulation resistance to earth is lower than the "Insulation monitoring protection threshold". • When it is disabled, the inverter will display alarm information once the negative/positive insulation resistance to earth is lower than the "Insulation monitoring protection threshold", and display fault information once the negative/positive insulation resistance to earth is lower than 10KΩ. (Note: The foregoing alarm/fault information can be viewed on the LCD display by tapping "Home"-"Work state")
Floating mode	Floating mode. • When it is enabled, the negative to earth contactor of the inverter will be disconnected. • When it is disabled, the negative to earth contactor of the inverter will not be disconnected.

table 10-3 Protection parameters and default value

Parameter	Range	Default
Ⅰ_Vgrid-max(%)	105~150	Country-specific
Ⅱ_Vgrid-max(%)	105~150	Country-specific
Ⅲ_Vgrid-max(%)	105~150	Country-specific
Ⅳ_Vgrid-max(%)	105~150	Country-specific
Ⅴ_Vgrid-max(%)	105~150	Country-specific
Recover_Vgrid-max(%)	105~150	Country-specific
Ⅰ_T-Vhigh trip(ms)	40~36000000	Country-specific
Ⅱ_T-Vhigh trip(ms)	40~36000000	Country-specific
Ⅲ_T-Vhigh trip(ms)	40~36000000	Country-specific
Ⅳ_T-Vhigh trip(ms)	40~36000000	Country-specific
Ⅴ_T-Vhigh trip(ms)	40~36000000	Country-specific
Ⅰ_Vgrid-min(%)	10~95	Country-specific
Ⅱ_Vgrid-min(%)	10~95	Country-specific
Ⅲ_Vgrid-min(%)	10~95	Country-specific
Ⅳ_Vgrid-min(%)	10~95	Country-specific
Ⅴ_Vgrid-min(%)	10~95	Country-specific

Parameter	Range	Default
Recover_Vgrid-min(%)	10~95	Country-specific
Ⅰ_T-Vlow trip(ms)	40~36000000	Country-specific
Ⅱ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅲ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅳ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅴ_T- Vlow trip(ms)	40~36000000	Country-specific
Ⅰ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅱ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅲ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅳ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅴ_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Recover_Fgrid-max(Hz)	50.2~55/60.2~65	Country-specific
Ⅰ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅱ_T-Fhigh trip (ms)	40~36000000	Country-specific
Ⅲ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅳ_T-Fhigh trip (ms)	40~36000000	Country-specific
Ⅴ_T-Fhigh trip(ms)	40~36000000	Country-specific
Ⅰ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅱ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅲ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅳ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅴ_Fgrid-min(Hz)	45~50/55~60	Country-specific
Recover_Fgrid-min(Hz)	45~50/55~60	Country-specific
Ⅰ_T-Flow trip(ms)	40~36000000	Country-specific
Ⅱ_T-Flow trip (ms)	40~36000000	Country-specific
Ⅲ_T-Flow trip(ms)	40~36000000	Country-specific
Ⅳ_T-Flow trip (ms)	40~36000000	Country-specific
Ⅴ_T-Flow trip (ms)	40~36000000	Country-specific
LVRT switch	Enable/Disable	Country-specific
LVRT T1(ms)	40~36000000	Country-specific
LVRT T2(ms)	40~36000000	Country-specific
LVRT T3(ms)	40~36000000	Country-specific
LVRT T4(ms)	40~36000000	Country-specific
LVRT T5(ms)	40~36000000	Country-specific
LVRT voltage1(%)	5~90	Country-specific
LVRT voltage2(%)	5~90	Country-specific

Parameter	Range	Default
LVRT voltage3(%)	5~90	Country-specific
LVRT voltage4(%)	5~90	Country-specific
LVRT voltage5(%)	5~90	Country-specific
LVRT dynamic Var Kf factor	0~4	Country-specific
HVRT switch	Enable/Disable	Enable
HVRT T1(ms)	40~36000000	Country-specific
HVRT T2(ms)	40~36000000	Country-specific
HVRT T3(ms)	40~36000000	Country-specific
HVRT T4(ms)	40~36000000	Country-specific
HVRT T5(ms)	40~36000000	Country-specific
HVRT voltage1(%)	110~140	110
HVRT voltage2(%)	110~140	Country-specific
HVRT voltage3(%)	110~140	130
HVRT voltage4(%)	110~140	130
HVRT voltage5(%)	110~140	130
HVRT dynamic Var kf factor	0~4	Country-specific
Recover T-grid(ms)	1000~36000000	10000
Temperature settings(℃)	−5~10	0
Humidity settings(%RH)	70~100	80
Active Islanding	Enable/Disable	Disable
I leakage-pro(A)	1~10	5
Door-protect enable	Enable/Disable	Disable
Fault manual restart	Enable/Disable	Disable
Negative Vgrid protect value(V)	20~200	50
Grid_V-unbalanced protect value(%)	3~20	5
Grid_V-unbalanced protect time(S)	0.1~600	60
Anti-PID mode	Invalid/Suppression/ Repair	Invalid
PID Repair	Enter(Enable) / Cancel(Disable)	—
Ins monitor measure time (S)	30/150/300/600	150

Parameter	Range	Default
Ins monitor protect threshold(K)	15~100	50
Ins monitor Vdc-start(V)	220~780	220
Ins fault enable	Enable/Disable	Enable
Floating mode	Enable/Disable	Disable
Ins monitor manual	Enter(Enable) / Cancel(Disable)	—

Contact SUNGROW to obtain specific value of the parameter Country-specific.

WARNING

Improper parameter configuration may affect the normal operation of the MV Station!
Only authorized personnel can configure these parameters.
If there is any question or doubt, contact Sungrow.

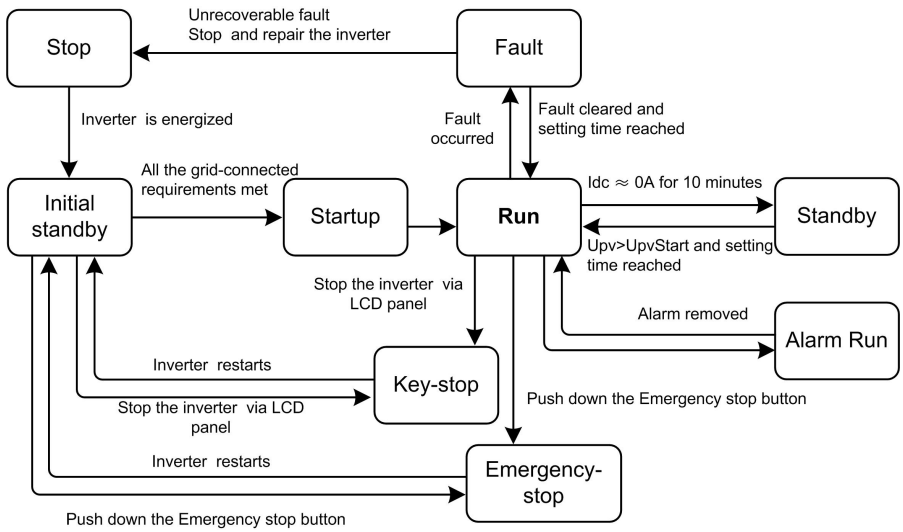
Refer to the LCD screen for the specific setting ranges of these parameters.

11 Main Functions

11.1 Operation Mode

11.1.1 Mode Change

After being energized, the inverter will switch among different modes as shown in the figure below.



Upv is the DC input voltage of the inverter.

UpvStart is the DC side startup voltage of the inverter.

11.1.2 Operation Mode Description

Stop

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

Initial Standby

When switches of the upstream and downstream devices are closed and the AC & DC switches of the inverter are in the "ON" position, the inverter turns to the **Initial Standby** mode.

The inverter will continuously check if the PV array and the grid meet the grid-connection requirements. If the inverter DC input voltage is higher than the inverter startup voltage, the startup time is reached, and the requirements for the grid side

parameter are satisfied, the inverter will turn from the **Initial Standby** mode into the **Startup** mode.

Startup

This is the transient process between the **Initial Standby** mode and the **Run** mode. Once the **Startup** mode is activated, the inverter will start feeding power to the grid.

Run

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

The inverter tracks the PV arrays' maximum power point (MPP) to maximize the output energy.

Standby

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

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

Fault

If a fault occurs during operation, the inverter will enter the **Fault** mode. LCD panel will display the fault type with the "Fault" indicator on until the fault is removed After the fault is removed, the inverter reverts to **Run** mode.

If the fault is unrecoverable, stop the inverter and perform maintenance work. It will automatically check if the fault is recoverable.

⚠ WARNING

When a DSP fault or a module fault occurs, never restart the inverter through the LCD. Perform apower-off check before reenergizing the inverter. Otherwise, the machine may be damaged.

Otherwise, the module may be damaged.

Emergency-stop

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

The emergency stop button is used to disconnect the AC switch, the DC switch, and the auxiliary switch. Release the emergency stop button with the corresponding key.

Key-stop

When maintenance or service work is required, the inverter turns from the **Run** mode to the **Key-stop** mode after the user sends a stop instruction via the LCD panel.

Alarm Run

In **Alarm Run** mode, the inverter can keep running but send alarm signal. The user can check the present alarm information through the Working state on the LCD default

screen or check the latest 200 entries of history alarm information through Function/ History information/his alarm. The inverter automatically turns to the **Run** mode when the alarm is removed.

11.2 Active Power Limitation

11.2.1 Introduction to Active Power Limitation

Cases in which power limitation is required are as follows:

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

11.2.2 How to Realize Power Limitation

⚠ WARNING

Improper parameter configuration may affect the normal operation of the inverter!
Only authorized personnel can configure these parameters.
If there is any question or doubt, contact Sungrow.

User can adjust the inverter active power output through the LCD display:

step 1 Tap "Function" from the default menu.

step 2 Tap "Set-parameter".

step 3 Tap "Run-parameter" after entering the correct password.

step 4 Set the "Limit Power (%)" parameter by tapping the pop-up keypad.

step 5 Tap "Enter" to confirm setting.

- - End

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

11.3 Reactive Power Adjustment

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

step 1 Tap “Function” on the default menu.

step 2 Tap “Set-parameter”.

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

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

- Close: reactive power cannot be adjusted
- Pf: adjust the reactive power by setting power factor
- Q-limit: adjust the reactive power by setting reactive power percentage
- QU mode: the reactive power changes with the grid voltage
- V auto-adjust: Voltage automatic adjusting: by setting the voltage adjusting benchmark and hysteresis, reactive power can be dynamically adjusted and the actual voltage tracking setting benchmark can be controlled.
- QP mode: the PF changes with the output power of the inverter

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

- if “Q-limit” is selected, the “Q-limit (%)” can be set in the “Run-information” sub-menu.
- if "QU mode" is selected, QU-related parameter can be set on the running parameter interface, where the parameter name begins with "QU", for example, QU operation mode.
- if "V auto-adjust" is selected, the "voltage automatic adjusting benchmark" and "-voltage automatic adjusting hysteresis" can be set on the running paramter interface.

- - End

⚠ WARNING

Improper parameter configuration may affect the normal operation of the inverter!
Only authorized personnel can configure these parameters.
Should any question or doubt occurs, contact Sungrow.

11.4 Low Voltage Ride Through (LVRT)

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

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

Active Power Recovery

If the power station still connects to the grid during power system failure, the active power will recover on the moment the fault is removed at the speed of at least 30% of nominal power/second.

Dynamic Reactive Current Support

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

Zero Voltage Ride Through

When the grid-connection point voltage drops to zero, the power station can operate normally for 1 second.

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

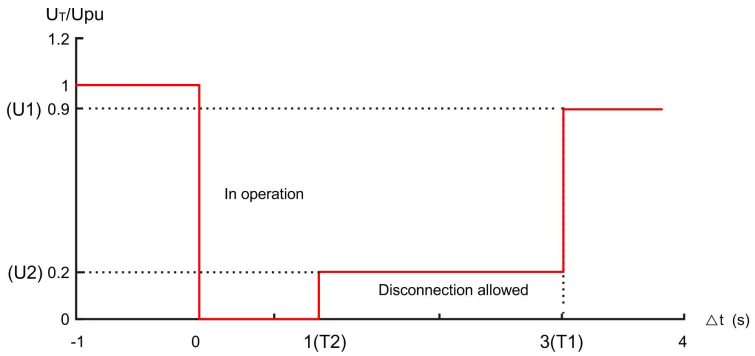


figure 11-1 Low voltage withstand requirements

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

Sungrow's inverter meets the abovementioned requirements.

11.5 High Voltage Ride Through (HVRT)

Technical Requirements for Connecting Photovoltaic Power Station to Power System requires that the PV plant can operate as required within certain voltage range.

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

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

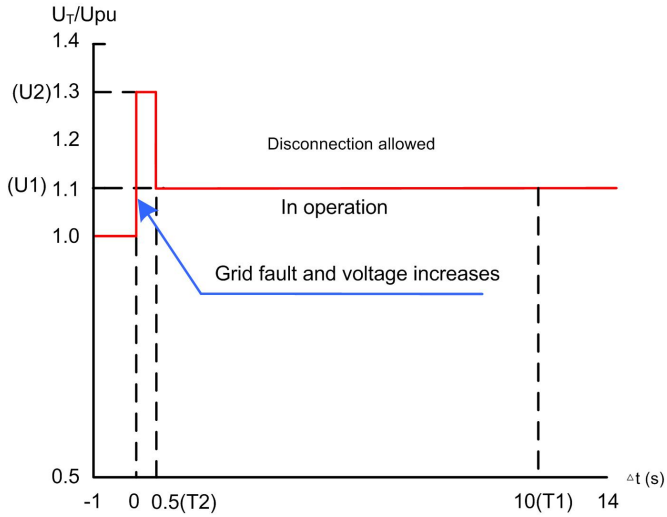
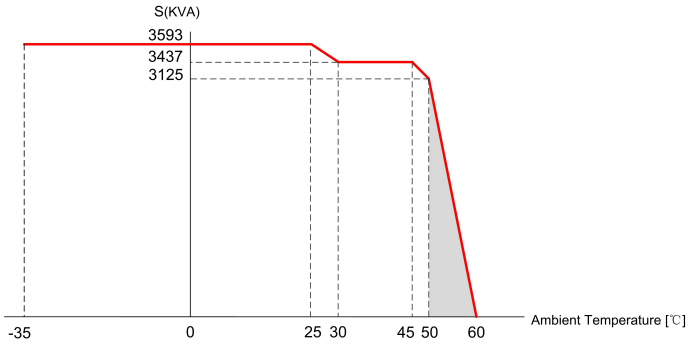


figure 11-2 High voltage withstand requirements

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

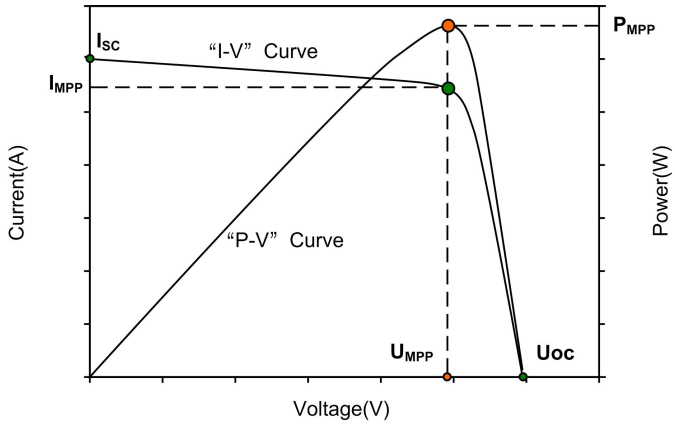
Sungrow's inverter meets the abovementioned requirements.

11.6 Temperature Derating



11.7 MPPT

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



11.8 Intelligent Temperature-Control Technology

The inverter will continuously detect the IGBT temperature and adjust the fan speed accordingly. When the module temperature is low, the inverter will decrease the fan speed to lower the device noise and decrease the device operation consumption. As the module temperature increases, the inverter will increase the fan speed for better heat dissipation.

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

11.9 Insulation Monitoring Function

11.9.1 Introduction

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

11.9.2 Simple Troubleshooting

Regardless of the inverter setting, when the insulation resistance is below the threshold (can be set on the LCD display), the inverter will send alarm signal and the Operation LED will turn to yellow. After receiving the "low insulation resistance" alarm signal, the user should stop the device and check the specific insulation resistance via the LCD screen "Function/Run-information/Real time data".

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

11.10 Protection Function

The inverter has complete protection functions to protect itself when input voltage or grid is abnormal. After the anomaly is removed, the inverter can operate normally.

11.10.1 DC Over-voltage Protection

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

11.10.2 AC Over/under-voltage Protection

When the inverter AC output voltage exceeds the permissible range, the inverter will stop feeding the grid, send warning signal, and display the fault type on the LCD screen.
The inverter can detect the abnormal voltage and respond quickly.

11.10.3 Frequency Anomaly Protection

When the grid frequency exceeds the permissible range, the inverter will stop feeding the grid, send warning signal, and display the fault type on the LCD screen.
The inverter can detect the abnormal frequency and respond quickly.

11.10.4 Islanding Protection

Islanding is a case that can occur if the utility grid is disconnected while the inverter is operating and the local load of the inverter is similar to the present output power.

"Islanding" is a potential threaten to devices and operators.

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

The inverter is equipped with anti-islanding protection function.

DANGER

In anti-islanding protection state, high voltage is still present. Disconnect the main switch and wait the device to discharge completely before testing or maintenance.

11.10.5 Overload Protection

When the PV array output power exceeds the inverter permissible maximum input power, the inverter will limit the power yield at maximum AC power point. If the temperature exceeds the permissible value, the inverter will automatically stop operating unless the temperature recovers to normal levels.

11.10.6 Ground Protection

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

11.10.7 Module Over-temperature Protection

IGBT modules inside the inverter use a high-precision thermal sensor to monitor the real-time module temperature. Once high module temperature is detected, DSP will send instruction to stop the inverter.

11.10.8 Internal Over-temperature Protection

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

12 Troubleshooting

12.1 Safety Instructions

DANGER

Lethal voltages are present inside the inverter when a fault occurs.

- Only qualified personnel can perform the troubleshooting described in this chapter. Qualified personnel are those who have been trained, especially in safety operation.
- Do not perform any troubleshooting other than that specified in this manual.
- Respect all safety instructions during troubleshooting.

WARNING

The electrical components inside the inverter must be replaced by components from the same manufacturer and with the same model number.
The model number can be acquired from the marking of the inverter or the component itself. If otherwise,contact Sungrow.

WARNING

If the components need to be replaced with products from other manufacturers or of different model on site, a prior analysis and confirmation by Sungrow is required.
Failure to follow this procedure may lead to physical injury or death and void all warranty from Sungrow.

WARNING

Disconnect all AC and DC Switches before troubleshooting.

12.2 Checking Fault

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

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

If there is any questions or doubts that are not covered by this manual, contact us.
With the following information provided, Sungrow shall diagnose and solve the problem more easily:

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

12.3 Fault and Troubleshooting on the Inverter

The fault information of the inverter can be viewed on the home page of the LCD screen. Specifically, refer to the "10.9 Checking Present Fault Information ".
Fault severities of the inverter are defined as follows:

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

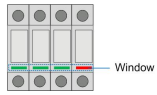
The fault severity of fault names and their corresponding solutions are shown in the following table.

Fault name	Explanation	Fault severity	Measures
PDP-pro	The drive board is faulty or hardware overcurrent occurs.	Major	1. Check whether the AC/DC side of the module is short-circuited. 2. Check whether the grid is normal. 3. Check whether the appearances of modules inside the inverter are normal.
Cntr-flt	The contactor is faulty.	Major	Disconnect the AC and DC switches of the module, allow the module capacitors to discharge completely, and then check whether the appearance of the AC contactor is normal.
Mism-lac	The AC current is unbalanced.	Major	Check whether the grid is normal or whether phase loss occurs.

Fault name	Explanation	Fault severity	Measures
L over-temp	The reactor temperature is excessively high.	Major	1. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the inverter and inverter are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.
Temp control cabinet flt	Faults occur due to excessively high temperature inside the control cabinet.	Major	1. Check the grid voltage, and inspect whether the grid voltage harmonic is normal. 2. Check whether the fans operate normally. 3. Check the AC filtering system, and inspect whether the AC filter capacitor is damaged, for example, cracked. Check whether the 3-phase current of the capacitor is in balance when necessary.
Vdc-Low	The DC input voltage is excessively low.	Major	1. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured. 2. In the event of inconsistency, check whether the circuits on the DC side are short-circuited or connected incorrectly.
Bus undervo-ltage	The DC bus voltage is excessively low.	Major	Refer to the measures for "Vdc-Low".

Fault name	Explanation	Fault severity	Measures
V-midpoint offset	Neutral point potential shifting occurs on the DC side of the module.	Major	1. Check whether the DC side of the module is short-circuited, the input voltage falls beyond the permissible range, and the grid voltage is normal. 2. Check the history fault screen of the LCD to ensure whether faults such as DC overvoltage/undervoltage, PDP, and AC overcurrent exist at the same time. If so, refer to the corresponding measures.
Temp-flt	The fault occurs when the temperature at the air inlet is higher than the protective threshold.	Major	1. Ensure the ambient temperature. Check, with a thermodetector, whether the present ambient temperature is within the permissible range of the module. 2. Check that the air inlets of the inverter and inverter are not obstructed. Replace the filters when necessary. 3. Check, in the **Stop** mode, whether fans inside the module are clogged by foreign materials.
DC cabinet over-temp	The temperature in the DC cabinet is excessively high.	Major	Refer to the measures for "Temp-flt".
Vac-high	The grid voltage is higher than the set protective threshold.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the protection parameter is in compliance with the local standards and regulations. 2. Disconnect the AC switches, and check whether the actual grid voltage is within the normal range. 3. Check, in the **Stop** mode, whether the grid voltage displayed on the LCD is consistent with the voltage actually measured.

Fault name	Explanation	Fault severity	Measures
Vac-low	The grid voltage is lower than the set protective threshold.	Major	Refer to the measures for "Vac-high".
F-fault	The grid frequency is abnormal.	Major	1. Tap "Set-parameters" -> "Pro-parameters" on the LCD to check whether the Protection parameter is in compliance with the local standards and regulations. 2. Check, in the **Stop** mode, whether the grid frequency displayed on the LCD is consistent with the actual grid frequency.
Island/ No grid	Grid blackout occurs or AC transient voltage exceeds the protective threshold.	Major	1. Check whether the grid is normal. 2. Check whether power outage occurs on the AC side. 3. Check whether the AC circuit breakers of the module are connected.
Ctrol power supply flt	The control power supply is abnormal.	Major	1. Check whether the control switches of both the internal and external power supply are in the ON or OFF positions. If all switches are in the ON position, disconnect a switch. If all switches are in the OFF position, connect a switch. 2. Check whether the internal and external power supply terminals are loose or poorly contacted. Fasten the terminals when necessary.
Vdc-samp-flt	The fault of DC voltage sampling occurs.	Major	Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.
Soft start-flt	Failed to start the inverter.	Major	Check whether the grid is normal, for example, whether the grid harmonic and grid voltage are balanced.

Fault name	Explanation	Fault severity	Measures
DC-SPD flt	The SPD on the DC side of the module is faulty.	Major	The state window of the SPD is as follows:  1. When the window colour is turned red from green, it indicates that the SPD is damaged (perhaps, due to thunderstorms). In this case, measure the AC and DC parameters, including positive and negative pole voltages to ground, and replace the SPD when the parameters recover to normal value. 2. When the window is in normal colour, the fault may be caused by poor contact between the SPD and its base. In this case, reinstall the SPD to ensure good contact.
AC SPD flt	The SPD on the AC side of the module is faulty.	Major	1. Refer to the measure for "DC-SPD flt". 2. Check whether the micro circuit breaker connected in series to the SPD is disconnected. 3. If the micro circuit breaker is disconnected, measure the AC and DC parameters. If the values measured are normal, reconnect the micro circuit breaker.
Vdc-high	The DC voltage of the module exceeds the protective threshold.	Major	1. Disconnect the DC switches of the module, and check whether the open-circuit voltage of the PV array is normal. If it is abnormal, the alarm may result from PV array configuration. 2. Ensure that the LV side of the transformer is connected in the Y type, and the neutral point is not grounded. 3. Check, in the **Stop** mode, whether the DC voltage displayed on the LCD is consistent with the voltage actually measured.

Fault name	Explanation	Fault severity	Measures
PV pol-rev	Polarity on the DC input side is reserved.	Major	Check whether the polarity on the DC of the module is correct.
Hardwa-re-flt	Interior hardware of the module is faulty.	Major	Measure the DC voltage of the inverter, to check whether short circuit occurs inside the inverter.
Iac-high	AC current of the inverter is excessively high.	Major	1. Check whether the AC and DC cables of the inverter are firmly in place. 2. Check the insulation of the cables for intactness. 3. Check whether the wiring terminals are short-circuited to ground.
Overloa-d-pro	Output overload occurs.	Major	Refer to the measures for "Iac-high".
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.
PM-high	The temperature of modules inside the module room is excessively high.	Major	1. Check the air inlets. 2. Check whether the air outlets of the inverter are obstructed by foreign materials. Replace the filters when necessary. 3. Check whether the fans function normally during the operation of the inverter.
Fan1-flt/ Fan2-flt	Fan 1 or fan 2 inside the inverter is faulty.	Major	1. Check whether the grid voltage is normal. Measure the grid voltage with a multimeter, and check whether phase loss occurs. 2. Check whether the fans are normally supplied with power. Measure the three-phase power source with a multimeter to ensure the nominal input voltage is 400 Vac.

Fault name	Explanation	Fault severity	Measures
Gnd-flt	Grounding fault.	Major	1. Check the DC cables. Check whether positive DC cables connected to the ground are damaged. Check whether the impedance to ground of the DC cable is normal. 2. Check the AC cables. Check whether voltages to ground of all the three phases are the same. In addition, check whether SPDs on the inverter side and transformer side are damaged.
AC Switch flt/ AC breaker flt	The AC switches are faulty.	Major	1. Check whether AC switches have tripped. 2. Check whether AC switches are damaged. 3. Check whether AC switches are connected/disconnected normally. 4. Check AC switches for conductivity with a multimeter.
Radiator over temp	The temperature of the heat sink inside the inverter is excessively high.	Major	Check whether the fans are normal. If the fans are normal, check whether the air ducts are obstructed.
DC fuse flt	DC fuses are abnormal.	Major	Refer to the measures for "DC fuse-abnomal".
GFDI pro	DC grounding protection is abnormal.	Major	1. The negative pole of the inverter is not securely grounded. 2. Check whether the negative grounding fuses blow.
AC fuse flt	AC fuses are abnormal.	Major	Check the AC fuses.
Grid_V_ unbalan-ced	Grid voltage is unbalanced.	Major	Measure the grid voltage, and check whether grid voltage unbalance exists.

Fault name	Explanation	Fault severity	Measures
Current2 Unbalanced/ Current3 Unbalanced	AC current unbalance	Major	Measure the grid voltage, to check whether phase loss occurs.
AC switch breaking	AC switch is disconnected.	Major	Connect the AC switch, after which the alarm is cleared.
AC cabinet overtemp	The temperature in the AC cabinet exceeds the protective threshold.	Major	1. Check whether fans in the AC cabinet function normally. 2. Check whether air inlets of the AC cabinet are obstructed. 3. Check whether filters at the air inlets of the AC cabinet are dusty. Replace the filters when necessary.
Anti-PID power fit	Anti-PID power supply is abnormal.	Minor	1. Check the insulation of AC cables. 2. Check AC SPD. 3. Check the neutral point on the LV side of the transformer and ensure it is not grounded.
External power supply	External power supply of the inverter is abnormal.	Minor	Measure the external power supply voltage with a multimeter to check whether the voltage is within the normal range.
Branch breaker flt	Circuit breakers on DC branch circuits are abnormal.	Minor	Check whether all the branch circuit breakers are closed, and check whether the circuit breaker state displayed on the Run-Information screen of the LCD is " ON/Closed ".
CT Unbalanced	The three-phase grid current is unbalanced.	Minor	Check, via the LCD, whether the AC three-phase current is in balance.

Fault name	Explanation	Fault severity	Measures
Ground Fuse flt	Grounding fuse is abnormal.	Minor	Wait the inverter capacitor to discharge completely, and then remove the negative grounding fuse. Check whether the fuse has blown. If so, check whether the neutral point of the transformer is unconnected, and whether the neutral point of the PT/CT on the LV side of the transformer is grounded.
Meter-com-flt	Communication of the energy meter is abnormal.	Minor	1. Check whether communication cables connected to the energy meter and metering board are damaged. 2. Check whether communication terminals of the energy meter and metering board are securely fastened.
DC fuse-abnorm-al	DC fuses of the inverter are abnormal.	Minor	Check whether the DC fuse have blown. If so, contact Sungrow and replace the fuses.
Branch Fuse flt	Branch fuses of the inverter are abnormal.	Minor	Refer to the measures for "DC fuse-abnomal".
RISO flt	The insulation resistance is excessively low.	Minor	1. Check whether insulation layers of positive and negative DC cables to ground are damaged. 2. Check the insulation resistance to ground of AC three phases. 3. Check the connection of the neutral point on LV side of the transformer to ensure the neutral point is not grounded.
Freq shift Watt adj	The active power of the inverter is adjusted according to the change of grid frequency.	Warning	Check, via the LCD, whether the overfrequency derating function is enabled. If the function is enabled, it indicates overfrequency occurs during the operation.

Fault name	Explanation	Fault severity	Measures
Volt shift Var adj	The reactive power of the inverter is adjusted according to the change of grid voltage.	Warning	Tap "Set-parameters" -> "Running parameter" -> "Q-adjust switch" on the LCD, to check whether the "Q-adjust switch" is in the "QU mode".
GFRT Run	When a grid fault occurs, the inverter can ride through the time interval.	Warning	Check whether the grid voltage exceeds the HVRT or LVRT threshold.
DC breaker flt/ DC switch abnorm-al	DC switches of the inverter are abnormal.	Minor	Refer to the measures for "Branch breaker flt". Check whether the DC switch is connected.
I leakage-pro	The sampling value of the AC leakage currents exceeds the protective threshold.	Major	1. Check whether the AC cables are damaged. 2. If the LV side of the transformer is connected in the Y type, ensure that the neutral point is unconnected.

If the fault still exists, contact Sungrow Service.

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

Fault name	Explanation	Fault severity	Measures
Carrier synch flt	The transmission of carrier communication signals is abnormal.	Major	Contact Sungrow.
Drive board fault	Interior drive board of the inverter is faulty.	Major	Contact Sungrow.

Fault name	Explanation	Fault severity	Measures
Com-Failure	Internal communication of the inverter is abnormal	Major	Contact Sungrow.
Encoding repeat	Addresses of the interior modules are repeated.	Major	Contact Sungrow.
Backfeed Supply fault	Reverse charging device is out of service.	Major	Contact Sungrow.
IDM-com-flt	The communication of the tributary board inside the inverter is abnormal.	Minor	Contact Sungrow.
DC Sensor-err	DC sensors of the inverter are abnormal.	Minor	Contact Sungrow.
Branch fwd-Idc-high	Branch forward current is excessively high.	Minor	Contact Sungrow.
Branch rev-Idc-high	Branch reverse current is excessively high.	Minor	Contact Sungrow.
T&H-com-flt	The communication of the temperature & humidity board is abnormal.	Minor	Contact Sungrow.
DSP-com-flt	The communication between control board and metering board inside the inverter is abnormal.	Minor	Contact Sungrow.

12.4 Other Fault and Troubleshooting

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

13 Routine Maintenance

13.1 Safety Instructions

Due to ambient temperature, humidity, dust, and vibration, the inverter and the internal components will age and wear. To ensure the system safety and maintain the efficiency of the inverter, it is necessary to carry out routine and periodic maintenance.
All measures, which can help the inverter work in good conditions, are within the maintenance scope.

⚠ WARNING

Lethal voltage inside the inverter!
After the inverter stops, wait at least 10 minutes before opening the cabinet door. Make sure the internal device is completely voltage-free before performing any work on the inverter.

⚠ WARNING

Only qualified personnel can perform the work described in this chapter.
Do not leave any screws, washers, or other metallic parts inside the inverter to avoid damages to the inverter.

⚠ WARNING

Sand and moisture penetration may affect the performance of electric devices inside the inverter!

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

⚠ WARNING

Voltages may still be present on cable connection terminals inside the AC and DC cabinets even though the AC & DC switches are disconnected. To avoid electric shock hazard, perform the following operations before starting maintenance work,

- **Disconnect the AC & DC switches;**
- **Disconnect the upstream and downstream switches of the inverter.**

Five Safety Rules

Respect the following five rules in maintaining or servicing the inverter to ensure the safety of the maintainer.

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

13.2 Maintenance

13.2.1 Introduction

With IP54 protection degree, the inverter can be installed outdoors. Harsh environmental condition or long-time operation, however, may cause aging and damage to the inverter. Check and maintain the inverter periodically and replace the aged components, which can effectively prolong the service life and improve the performance of the devices inside the inverter.

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

13.2.2 Maintenance Interval

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

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

If the inverter is installed in the desert areas, it is recommended to check the inverter thoroughly and clean it carefully after sand storm.

WARNING

Check the module fans inside the inverter and the fans on top of the cabinet periodically for abnormal operation and abnormal noise due to dust penetration. Stop the inverter and clean the dust if necessary.

Wait at least 10 minutes after the inverter discharge completely. Before cleaning, make sure, with the multimeter, the inverter internal is discharged completely to avoid electric shock.

WARNING

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

WARNING

Repair immediately any anomalies found during routine maintenance. If there are any doubts, contact Sungrow.

Maintenance (once every two years)

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

Maintenance (once every year)

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

Check item	Check method
Grounding and equipotential connections	• Check whether the grounding connection is performed properly and the grounding resistance is less than 4Ω. • Check whether the equipotential connections inside the inverter are performed properly. • Check whether the equipotential connection of the oil tray is performed properly.
Fan	• Check the running status of the fans. • Checkwhether the fan blades have cracks. • Check whether the fan makes abnormal noise during running.
Screws	Check all screws inside the inverter.

Maintenance (once every 6 months to a year)

Check item	Check method
Safety function	• Check the stop functions of the emergency stop button and the LCD. • Simulate shutdown. • Check the warning labels and other device symbols for completeness and legibility, and replace them in time if necessary.
Software maintenance	Inspect all parameter settings.
Module cleanness	• Check whether the circuit board and components are clean. • Check the temperature and cleanness of the radiator. If necessary, clean the radiator with a vacuum. • If necessary, replace the filter. Note: Check the ventilation performance of the air inlet. Otherwise, a fault may occur in the module due to overheat caused by poor ventilation.

Check item	Check method
LCD time display	• Check whether the time displayed on the LCD is correct. • After calibration, if the time is still incorrect, replace the button cell on the back of the LCD.
Component maintenance	• Regularly check whether the metal components are corroded (once every 6 months). • Annually check the contactors (auxiliary switch and micro switch) to ensure normal operation. • Check the running parameters (especially the voltage and insulation).

Note: * indicates optional.

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

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

13.3 Cleaning the Inverter

13.3.1 Introduction

The cleaning of the inverter surrounding areas and the inverter interior is important for the maintenance of the inverter.

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

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

13.3.2 Cleaning Interval

The cleaning interval of the inverter depends on the operation conditions of the inverter, for example, the weather condition and etc. It is necessary to make sure the inverter exterior and interior areas are clean. If the operation conditions are severe, in desert area for instance, the cleaning interval shall be shorter. The cleaning of the inverter inside devices and the air inlet and outlet shall be more frequent.

13.3.3 Cleaning the Internal Dust

Use a vacuum cleaner instead of a broom to clean the dust inside the inverter.

The vacuum cleaner can get power supply from the backup socket inside the intelligent power distribution cabinet. For the marking of the backup socket, refer to the circuit diagram inside the cabinet door of the intelligent power distribution cabinet.

13.3.4 Cleaning the Foundation

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

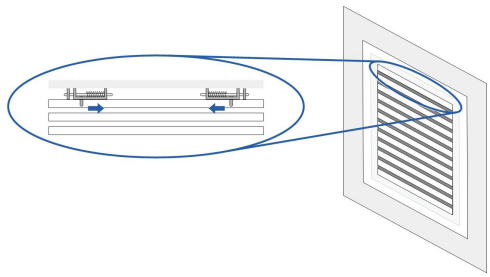
13.3.5 Checking and Cleaning the Filter

The maintenance interval should be shortened if the dust deposition is heavy.

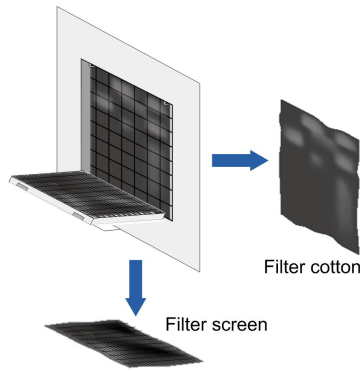
The air inlets located on the front and back sides of the inverter are entrances of cool air. Periodically clean and replace the filter cotton and filter screen to ensure the air circulation and proper temperature inside the inverter.

Clean and replace the air inlet window outside the inverter:

step 1 Push the two spring lock catches toward the middle of the air inlet window to open the outside shutters of air inlet window.



step 2 Remove the air filter cotton inside the air inlet window , and shake the dust off.



step 3 Clean the filter screen with warm water and degreaser and then dry it in the air if necessary.

step 4 If the filter is broken, replace it. Put a proper new one when the old filter is removed.

step 5 When the filter cotton and screen are clean and dry, reassemble them in reverse order.

- - End

> Do not pull hard during cleaning and replacing of the filter cotton and filter screen. The cotton and the screen may be damaged if otherwise.
> Contact Sungrow to order the filter. You can cut proper filters out of the larger filter.

13.3.6 Cleaning the Surface of the Inverter

If there is corrosion on the surface of the inverter, clean it with abrasive paper or brush. If the dust deposition is serious on the surface of the inverter, use mop or big rag to clean the surface of the inverter. It is recommended to clean the top before cleaning the side. Alternatively, clean it with or without water.

13.3.7 Checking the Lock and Hinge

Check the functionality and state of the lock and hinge of the inverter after the cleaning work. Lubricate the lock and hinge if necessary.

13.3.8 Checking the Sealing Strip

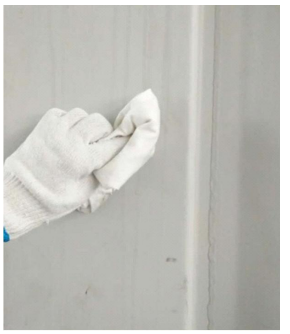
The sealing strip is used to prevent the water penetrating insider the inverter. Check it carefully for damage. Replace the faulty sealing strip in time.

13.4 Painting Make-up Measures

Check for the damages of the inverter appearance:
Situation 1: smudginess on the surface caused by water and dust that can be cleaned
Situation 2: smudginess on the surface & damage to the finishing coat that cannot be cleaned
Situation 3: the undercoat is damaged and the primer is revealed

Maintenance and operation steps for situation 1:
Materials:

- Rag
- Water
- Alcohol or other non-corrosiveness detergent

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

Maintenance and operation steps for situation 2:

Materials:

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

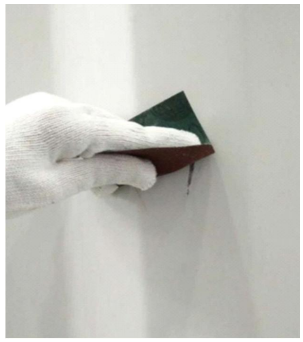
Figure	Step
	1. Polish the rough paint surface or the scratched parts by abrasive paper until the surface is smooth
	2. Clean the target parts by rag with water or use 97% alcohol
	3. When the surface is clean and dry, paint the scratched parts of the paint by banister brush and make sure the painting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

Maintenance and operation steps for situation 3:

Materials:

- Abrasive paper
- Rag
- Water
- Alcohol
- Zinc primer
- Hairbrush

- Paint RAL7035 / Munsell color JN-82 N8.2

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

Check the protective paint on the module surface for peeling off. Re-paint the inverter surface if necessary.

Re-spray the protective paint every 5 years to the inverter surface.

13.5 Replacing the Electrical Components

⚠ WARNING

The electrical components inside the inverter must be replaced by the same components from the same manufacturer and of the same model.
The model can be found on the marking of the inverter or the component itself.
If otherwise, contact Sungrow.

⚠ WARNING

If the components needs to be replaced with products from other manufacturers or of different model on site, a prior analysis and confirmation by Sungrow is required.
Failure to follow this procedure may lead to physical injury or death and void all warranty from Sungrow.

13.5.1 Safety Instructions

⚠ WARNING

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

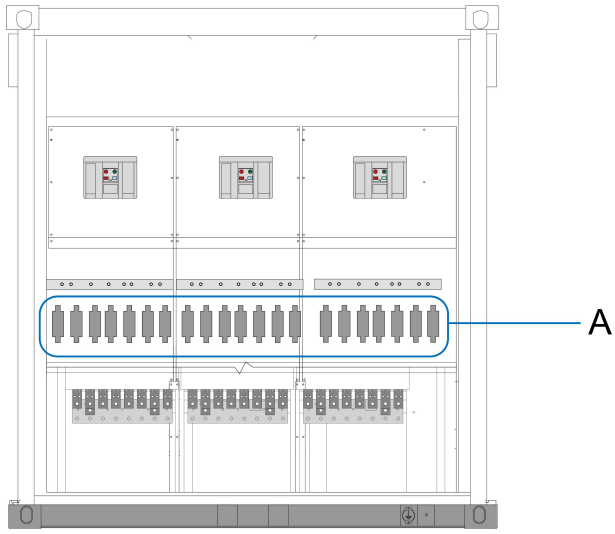
⚠ WARNING

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

13.5.2 Replacing DC Fuses

DC Fuse Area

The DC cabinet inside the inverter is equipped with DC fuses. The DC fuse area is shown in the following figure A.



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

Operations before Replacement

Follow the procedure below to replace the fault fuse.

step 1 Stop the inverter via the stop instruction on the LCD screen.

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

step 3 Disconnect the DC and AC side switches of the inverter and auxiliary power supply switches, and perform Step 4 about 5 minutes later when the capacitor inside the machine discharges completely.

step 4 Use a multimeter with a measuring range of 1500Vdc to check whether voltages of the connection terminal on the DC side of the inverter are zeros, where the voltages include the voltage between the positive and negative poles, the positive to ground voltage, and the negative to ground voltage.

step 5 Open the left door with the key and remove the protective grid in the DC fuses area.

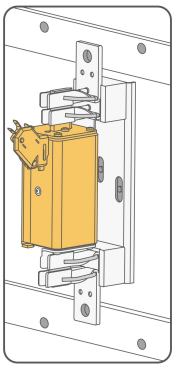
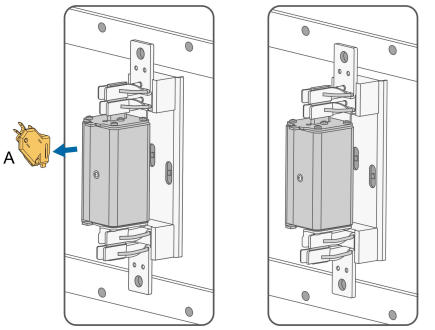
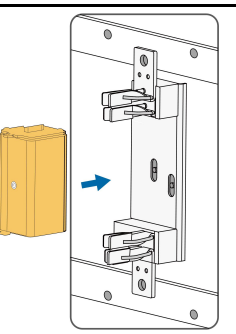
step 6 Measure each DC input voltage by using the multimeter, and perform the next step after ensuring the wiring terminal is completely voltage-free.

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

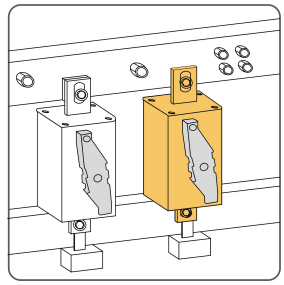
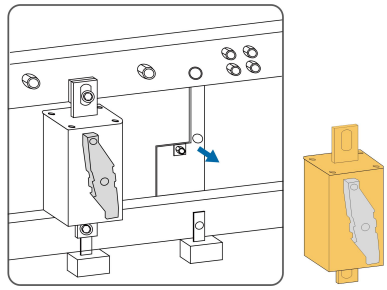
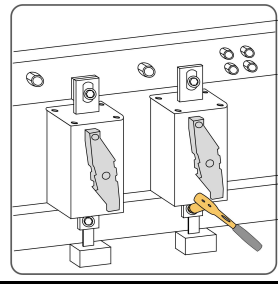
- - End

On site, replace the fuse according to the fuse model. Two replacement schemes are recommended:

Scheme 1: For the Holder Type

Descriptions	Figure
1. As shown in the right figure, identify the faulty fuse.	
2. Remove the micro-switch (A in the figure) attached to the fuse and use the fuse extractor (not in the scope of delivery) to remove the fuse.	
3. Mount the new fuse.	

Scheme 2: For the Bolt-fastening Type

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

14 Appendix

14.1 System Parameters

Input (DC)	SG3125HV-20	SG3400HV-20
Max. PV input voltage	1500V	
Min. PV input voltage	875 V	
Startup input voltage	915 V	
MPP voltage range for nominal power	875 – 1300 V	
No. of independent MPP inputs	1	
No. of DC inputs	21 (optional: 24 negative grounding or floating; 28 negative grounding)	
Max. PV input current	4178A	
Output (AC)		
AC output power at PF=1	3593 kVA@ 25˚C 3437 kVA@ 45˚C 3125 kVA@ 50˚C	3593 kVA@ 25˚C 3437 kVA@ 45˚C
Max. AC output current	3458 A	
Nominal AC voltage	600 V	
AC voltage range	480 V ~ 690 V	
Nominal grid frequency	50 Hz / 60 Hz	
Grid frequency range	45 – 55 Hz/ 55 – 65 Hz	
THD	< 3 % (at nominal power)	
DC current injection	< 0.5 % In	
Power factor at nominal power	0.99	
Adjustable power factor	0.8 leading – 0.8 lagging	
Feed-in phases	3	
Connection phases	3	
Efficiency		
Max. efficiency	99.0 %	
Euro. efficiency	98.7 %	
Protections & Functions		

DC input protection	Load break switch + fuse	
AC output protection	Circuit breaker	
Overvoltage protection	DC Type I + II / AC Type II	
Grid monitoring	Yes	
Ground fault monitoring	Yes	
Insulation monitoring	Yes	
Overheat protection	Yes	
Q at night	Optional	
Anti-PID function	Optional	
General Data		
Dimensions (W x H x D)	2991 x 2591 x 2438 mm	
Weight	6500 kg	
Isolation method	Transformerless	
Degree of protection	IP55	
Auxiliary power supply	415 Vac, 15 kVA (Optional: max:40kVA)	
Operating ambient temperature range	-35 to 60 ℃ (> 50 ℃ derating)	-35 to 60 ℃ (> 45 ℃ derating)
Allowable relative humidity range	0 – 95 %(non-condensing)	
Cooling method	Temperature controlled forced air cooling	
Max. operating altitude	4000 m (> 3000 m derating)	4000 m (> 2300 m derating)
Display	Touch screen	
Communication	Standard: RS485, Ethernet; Optional: optical fiber	
Compliance	CE, IEC 62109, IEC 62116, IEC 61727	
Grid support	Q at night(optional), L/HVRT, active & reactive power control and power ramp rate control	

14.2 Tightening Torques

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

Screw	Torque (N · m)	Screw	Torque (N · m)
M3	0.7~1	M8	18~23
M4	1.8~2.4	M10	34~40
M5	4~4.8	M12	60~70
M6	7~8	M16	119~140

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

14.3 Exclusion of Liability

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- Install or operate the product without observing relevant safety regulations in the deployment location
- Ignore the safety warnings or instructions contained in all documents relevant to the product
- Install or operate the product under incorrect safety or protection conditions
- Alter the product or supplied software without authority
- Product malfunctions due to operation attached or neighboring devices running out of the allowed limit values
- Unforeseen calamity or force majeure

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

14.4 Contact Information

We need the following information to provide you the best assistance:

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

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