SG2500-MV
MV Turnkey Station
System Manual

SG2500-MV_V13-SEN-Ver12-201805
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1 About This Manual

1.1 Foreword

Thank you for purchasing the MV Turnkey Station from Sungrow Power Supply Co., Ltd.. We hope that the device will meet your satisfaction. Your commands and feedbacks on the performance and function of the device are very important for our further improvement.

1.2 Validity

This manual is applicable to the MV Turnkey Station product of SG2500-MV (hereinafter it will be referred to as “inverter” unless otherwise specified).

1.3 Content

This manual contains the following information:

<table>
<thead>
<tr>
<th>Content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety instruction</td>
<td>Safety instructions concerning the installation, operation, maintenance and troubleshooting of the inverter</td>
</tr>
<tr>
<td>Product Description</td>
<td>The appearance and internal components of the inverter</td>
</tr>
<tr>
<td>Delivery</td>
<td>Delivery and inspection after receiving the inverter</td>
</tr>
<tr>
<td>Installation</td>
<td>Mechanical transport, installation, and electrical connection of the inverter</td>
</tr>
<tr>
<td>Commissioning</td>
<td>Safety notices and commissioning process when the inverter is powered on for the first time</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>Steps to start and stop the inverter internal devices during normal maintenance or troubleshooting</td>
</tr>
<tr>
<td>Operation of LCD Display</td>
<td>Function and use of the inverter HMI</td>
</tr>
<tr>
<td>Functions</td>
<td>Descriptions of the inverter main functions</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>Simple troubleshooting of the inverter</td>
</tr>
<tr>
<td>Daily operation</td>
<td>Instructions and guide of the daily operation of the inverter</td>
</tr>
</tbody>
</table>

1.4 Target Group

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

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

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

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

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

**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 pasted on the electrical parts of the inverter or its inside device. Make sure to read the following symbols and fully understand them before installing the equipment.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Lethal voltage inside! Do not touch!" /></td>
<td>Lethal voltage inside! Do not touch!</td>
</tr>
<tr>
<td><img src="image" alt="Hot surface! Do not touch the hot surface of the device." /></td>
<td>Hot surface! Do not touch the hot surface of the device.</td>
</tr>
<tr>
<td><img src="image" alt="Protective earth. Earthing securely to ensure personal safety." /></td>
<td>Protective earth. Earthing securely to ensure personal safety.</td>
</tr>
</tbody>
</table>
1.6 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.

All rights reserved including the pictures, markings and symbols used. Any reproduction or disclosure, even partially, of the contents of this manual is strictly forbidden without prior written authorization of Sungrow.

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. The latest manual can be acquired via visiting the web site at www.sungrowpower.com.

Please read over this manual and other related manuals before installation and operation of the devices inside the inverter.

1.7 Terminology

<table>
<thead>
<tr>
<th>Name</th>
<th>For short</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV Turnkey Station</td>
<td>Inverter</td>
</tr>
<tr>
<td>Module unit/ Inverter unit</td>
<td>Unit</td>
</tr>
<tr>
<td>Intelligent power distribution cabinet</td>
<td>Intelligent PMD or PMD</td>
</tr>
</tbody>
</table>

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

2.1 Intended Usage

The inverter, R & D and manufactured by Sungrow, is mainly applied to large-and-medium PV power inverter. The inverter integrates PV modules, transformer, and monitoring & power distribution units, and security & protection system to meet the modular design and quick installation requirement of the large-and-medium PV power inverter as well as ensure the long-time, reliable and safe grid-connected power generation.

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

![Diagram of PV power generation system with inverter](image)

**Fig. 2-1 Application of Inverter to the PV Power System**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>PV Array</td>
</tr>
<tr>
<td>B</td>
<td>PV Array Combiner Box</td>
</tr>
<tr>
<td>C</td>
<td>Inverter</td>
</tr>
<tr>
<td>D</td>
<td>Utility Grid</td>
</tr>
</tbody>
</table>

**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 of the terminals or contactors connected to the grid may lead to electric shock hazards!
- Do not touch the terminals or conductors connected to the grid.
- Respect all safety instructions on the grid connection.

**DANGER**

Lethal voltages are present inside the device!
- Pay attention and follow the warning signs on the device.
- Respect all safety instructions in this manual and other pertinent documents.

**DANGER**

Electric shock or fire may occur due to the device damage or system fault.
- Visual inspect for device damages or other hazards.
- Check if the external devices and circuit connections are safe.
- Only operate the device when it is safe to do so.

**WARNING**

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

2.2.2 Manual Storage

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

- Transport, install, maintain and service the inverter by strictly following the descriptions in this manual. Device damage, personal injury or property loss may follow 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 inverter.

Death resulting from burning and electric shock upon touching the PV array.

During installation, maintenance and troubleshooting of the device, please ensure:
2 Safety Instructions

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

2.2.4 Ground Fault Protection

**DANGER**

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

2.2.5 Live Line Measurement

**DANGER**

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

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

2.2.6 Measuring Instrument

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

**WARNING**

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

2.2.7 Volt-free Operations

Perform operations on the inverter only when all devices inside the inverter, esp. the four modules are completely voltage free.

- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate testing devices.
- Ground and short-circuit whenever necessary.
- Cover possible live parts to avoid accidental contact.
- Ensure sufficient escape room.
- Wait at least 10 minutes after the four module stops completely to operate the inverter inside. Ensure that the four modules are both 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. Take proper personal protective equipment (PPE), like wear wrist strap.

2.2.9 LCD Parameter Setting

Certain LCD settable parameters are closely related to the inverter and internal devices operation, therefore these parameters can only be set after reliable evaluation of the system.

**WARNING**

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

2.2.10 Sand and Moisture Protection

Do not open the inverter door in sand storm, 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 devices body contain important information on the safe operation 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 visible.
- Replace the symbols once any damaged or uncleanness is detected.

2.2.12 Safety Warning Signs

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

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

2.2.13 Daily Operation and Maintenance

Make sure the inverter doors are closed and locked during daily operation to prevent internal devices from damages by rain or rodents.

Routine check and maintain the inverter and internal devices to ensure long and reliable operation of the inverter.
Make proper insulation protection during live line operation. At least two persons are required until the operation is done.
Proper field rescue facilities are necessary since the location of most PV inverter is far away from the urban areas.

Take the followings into consideration during daily operation and maintenance:

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

2.2.14 Disposal of Waste

When the inverter or internal devices is end of life, it cannot be disposed of together with household wastes. Some components inside can be recycling and some components can cause environment pollution.

Please contact the local authorized collection point.

2.2.15 Manual Description

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

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

All the descriptions in this manual are for the standard inverter. Please inform us in the purchase order if you have specific requirements. The actual product you receive may differ.

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

2.3 Safety Instructions of Each Working Area

The station can be divided into module room, and transformer room. To make sure the device safety and efficient operation, the above mentioned two parts are designed relatively independently. Please follow corresponding safety instructions when working in the two areas.
2.3.1 Safe Operation of the Module room

**WARNING**

Perform the operations in this section before any operation on the module room. Physical injury or device damage may follow if otherwise.

**Step 1** Identify the module and read the safety instructions on the module cabinet carefully.

**Step 2** Disconnect all power supplies from the module, including module upstream and downstream devices and other connected power supplies. Also place warning signals to prevent accidental reconnection.

1. Stop the module. Wait at least 10 minutes after the module is stopped. Open the cabinet door after all the internal capacitor is discharged completely.
2. Disconnect the transformer downstream switch. Disconnect other power supplies connected to the station, for example the grid and sub-stations in parallel connection, etc.
3. Disconnect all DC power supply to the module. Disconnect the output circuit breakers of the station upstream combiner box.

**Step 3** Make sure all operation areas are voltage-free. Measure the module AC and DC connection terminals and other operational areas using multimeter to make sure they are all voltage-free.

**Step 4** Temporarily ground the AC and DC sides of the modules by using proper temporary grounding devices.

2.3.2 Safe Operation of the Transformer Room

**WARNING**

Perform the operations in this section before any operation on the transformer room. Physical injury or device damage may follow if otherwise.

**Step 1** Identify the transformer and read the safety instructions on the transformer cabinet carefully.

**Step 2** Disconnect all power supplies from the transformer, including transformer upstream and downstream devices and other connected power supplies. Also place warning signals to prevent accidental reconnection.

1. Stop the module.
2. Disconnect the transformer downstream switch. Disconnect other power supplies connected to the transformer, for example the grid and sub-stations in parallel connection, etc.

**Step 3** Make sure all operation areas are voltage-free.

**Step 4** Make sure the transformer is voltage-free. High voltage side connection terminals, low voltage side connection terminals and all possible auxiliaries are voltage-free.

**Step 5** Measure the high voltage terminal with proper high voltage tester to make sure the high voltage side is voltage free; measure the low voltage side terminal with proper test probe to make sure the low voltage side is voltage free.

Ground the module. Temporarily ground the AC side of the modules by using proper temporary grounding devices. Turn the earthing switch to the earthed position.
3 Product Description

3.1 Brief Introduction

The inverter mainly applies to medium and large-scale PV generation systems. Based on standard-sized outdoor container, the inverter integrates the PV grid-connected inverters, transformer, power distribution unit, monitoring unit, security system and firefighting equipment to meet with the requirements of modular design and fast installation of the PV systems.

The inverter converts DC current generated from the PV array into grid-compatible AC current, which can be directly fed into the medium voltage grid.

3.2 Inverter Internal Construction

The inverter is made up of the following two parts:

![Front view of the inverter](image)

**Fig. 3-1 Inverter internal construction**

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room1</td>
<td>Module room</td>
<td>Integrate intelligent power distribution cabinet, modules, and etc. Convert the DC current generated from the PV array into AC current.</td>
</tr>
<tr>
<td>Room2</td>
<td>Transformer room</td>
<td>Integrate one transformer. Convert the module output low-voltage AC current into grid-compatible medium-voltage level.</td>
</tr>
</tbody>
</table>
### 3.3 Inverter Design

#### 3.3.1 Inverter Views

<table>
<thead>
<tr>
<th>View</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image-front.png" alt="Front View" /></td>
<td>Front view. Front of the inverter. The front doors of the module room and the transformer room are located on the side of the inverter front door.</td>
</tr>
<tr>
<td><img src="image-back.png" alt="Back View" /></td>
<td>Back view. Back of the inverter. The back doors of the module room and the transformer room are located on the side of the inverter back door.</td>
</tr>
<tr>
<td><img src="image-left.png" alt="Left View" /></td>
<td>Left view. A monitoring window with LCD display internally contained; the emergency stop button is also here. In emergency situation, open the monitoring window, press down the emergency stop button to stop all the four modules inside the inverter immediately, and to trip the AC medium voltage switch instantaneously. The inverter external grounding point is located on the lower right side.</td>
</tr>
</tbody>
</table>
3.3.2 Mechanical Parameter

**Dimensions**

External dimensions (without the flashings) are shown in figure below.

![Diagram showing dimensions](image_url)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>6058mm</td>
<td>2896mm</td>
<td>2438mm</td>
</tr>
</tbody>
</table>

**Clearance Spaces**

The clearance spaces around the inverter should be sufficient for at least the doors when they are all open, unit: mm.
3.3.3 Internal Components

Figure below shows the top view of the major electrical components inside the station:

![Diagram of the required space when the door is opened for 90° and 180°](image)

**Fig. 3-3** The diagram of the required space when the door is opened for 90° and 180°

Devices in the above figure are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Monitoring power distribution cabinet</td>
<td>The upper part of the cabinet is the monitoring system and the lower part of the cabinet is the power supply system.</td>
</tr>
<tr>
<td>#1</td>
<td>module 1</td>
<td>Here in after the four modules will be referred to as #1 ~ #4 respectively</td>
</tr>
<tr>
<td>#2</td>
<td>module 2</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>module 3</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>module 4</td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>Transformer</td>
<td>Convert the module output voltage to medium voltage level</td>
</tr>
</tbody>
</table>

The monitoring function of the Monitoring power distribution cabinet is an optional function. There can be an AC power distribution cabinet only with power distribution function or a wall-mounted AC power distribution cabinet in the position K. Please refer to the actual project configuration.
3.3.4 Ventilation Design

Cooling air comes into the inverter from the bottom and hot air goes out of the inverter from the top.

![Ventilation Design Diagram]

3.3.5 Cable Entry Design

For convenient cable connection in the field, all cables among the inverter internal devices are connected before delivery.

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

![Cable Entry Design Diagram]

Fig. 3-5 Cable entries of the inverter

Functions of each opening is shown below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DC cables connect to the DC side of the inverter through this hole</td>
</tr>
<tr>
<td>B</td>
<td>The monitoring system cable or fiber optic and external auxiliary power cable comes inside the cabinet through this hole</td>
</tr>
<tr>
<td>C*</td>
<td>AC cables connect to the AC side of the inverter through this hole</td>
</tr>
</tbody>
</table>

Note:*C is different via the requirement.
3.4 Module Design

3.4.1 Appearance of the Modules

Four modules are inside the module room. Modules are core devices inside the inverter that can convert the DC power to AC power. The appearance of the module is shown below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DC connection areas are on the lower part of the cabinet</td>
</tr>
</tbody>
</table>
3.4.2 Electrical Connections Area

All the electrical connection areas are in the lower part of the module front side with specific markings.

Please observe the connection markings to perform the electrical connection work.

![Fig. 3-7 Electrical connections area of the module](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Descriptions</th>
<th>Markings on the Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DC connection areas</td>
<td>DC+, DC- (6-input for standard configuration module, the input numbers can be customized)</td>
</tr>
</tbody>
</table>

3.5 Intelligent PMD

3.5.1 Brief Introduction

The intelligent PMD integrates the function of monitoring and power distribution.

The upper part, integrating monitoring function, can summarize and upload the information of devices inside the inverter; the lower part, with power distribution function integrated, can supply power to the lighting device, security devices inside the inverter.

Multi-input micro-switch is also reversed in the power distribution area for user to use according to the on-site situation.

3.5.2 Appearance

The intelligent PMD is shown in the following figure.
The nameplate, containing the information of the device model, serial number and parameters, is located on the upper corner of the inside of the cabinet door. Please protect the nameplate from tearing or damaging.

The cable inlet and outlet is located on the bottom of the cabinet. Seal the in-betweens of the cable inlet and outlet by proper materials after cable connection.

### 3.5.3 Connections Area

**WARNING**

Please strictly follow all the markings inside the device when connecting the cables.

All cables that need the user to connect on-site can be connected after opening the cabinet front door. See the following figure for the areas of communication cables connection and AC power distribution.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>RS485 interface</td>
</tr>
<tr>
<td>B</td>
<td>Ethernet interface (Insert the network cable after removing the dust cover)</td>
</tr>
</tbody>
</table>
## 4 Delivery

### 4.1 Scope of Delivery

Scope of delivery for the inverter is shown in the following table:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Quantity</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Inverter</td>
<td>1 pcs</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>Flashings</td>
<td>6 set</td>
<td>Installed in the air outlets</td>
</tr>
<tr>
<td>C</td>
<td>Related documents</td>
<td>1 set</td>
<td>Including FQC test report, Quality Certificate, Warranty card, Manual, etc.</td>
</tr>
<tr>
<td>D</td>
<td>Door keys</td>
<td>1 bunch</td>
<td>Open the inverter cabinet door</td>
</tr>
<tr>
<td>E</td>
<td>Salant</td>
<td>4 box</td>
<td>Seal air outlets</td>
</tr>
<tr>
<td>F</td>
<td>Screw</td>
<td>80°*/60**</td>
<td>M12×40*/ M16×45**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>M6×16</td>
</tr>
<tr>
<td>G</td>
<td>Flat washer</td>
<td>160</td>
<td>Φ12</td>
</tr>
<tr>
<td>H</td>
<td>Spring washer</td>
<td>160</td>
<td>Φ12</td>
</tr>
<tr>
<td>I</td>
<td>Nut</td>
<td>80</td>
<td>M12</td>
</tr>
<tr>
<td>J</td>
<td>Bolt kit</td>
<td>60</td>
<td>M5×16</td>
</tr>
<tr>
<td>K</td>
<td>Large flat washer</td>
<td>60</td>
<td>M5</td>
</tr>
</tbody>
</table>

Note 1: The foregoing components and their quantities are based on the standard inverter, and those of the actual product may differ.

Note 2: * is for the version with 6 DC inputs; and ** is for the version with 8 DC inputs.
4.2 Identifying the Inverter

Identify the inverter from the nameplate located on the lower left side of inverter (identified by “Nameplate” in figure below). The nameplate contains the following information: inverter model, major technical parameters, marks of certification institutes, origins, and serial number which are available and recognized by Sungrow.

![Nameplate](Left view)

Fig. 4-1 Location of the station nameplate

⚠️ WARNING

Very important technical parameters and inverter related parameters are contained in 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 inside devices may be damaged during transport. Therefore, once you receive the inverter, a detailed inspection is necessary.

If any damage is detected, contact the shipping company or Sungrow immediately. A relevant photo is preferred. We will provide you with the fast and best service.

- Examine the contents of the shipment to check if there is anything missing according to 4.1 Scope of Delivery.
- Check to make sure the inverter and inner devices are the models placed in your order;
- Check thoroughly the inverter and inner devices for any possible damages during transport.

⚠️ WARNING

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

- inverter is intact without any damage;
- all devices inside the inverter are intact without any damages.
4.4 Storage of the Inverter

If it is not to be installed immediately after delivery, store the inverter 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 field geological and ambient conditions. And when the ambient temperature is too low, heat the inverter internal devices.

- Temperature: -40°C~+70°C;
  
  Relative humidity: 0 … 95%, non-condensation
  
  Store the inverter in a dry, clean and solid ground with sufficient load capacity. The ground should be flat without water, bumps or plantings.

- Lock the inverter internal devices and the inverter during storage.

- Take proper protection method to prevent the water and dust penetrating inside the inverter internal. At least protect the inverter air inlets and outlets.

Routine 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 crane with sufficient load capacity.

The inverter is delivered to the user by a forwarding company. After unloading, the inverter will be transported to the installation site by the plant staff.

⚠️ WARNING
Local standards and regulations on the container transport and loading & unloading, especially those safety instructions, should be observed at all times.
- All the accessory appliances used during transport should be maintained beforehand.
- The transport of the inverter must be done by qualified personnel. Qualified means the operators must have relevant training experience, especially those safety-related ones.

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 appropriate crane or hoist to transport the inverter. The crane or hoist must be sufficient to bear the weight of the inverter.
- An additional traction vehicle may be needed when the road has a gradient.
- Anything, which may hinder the transport, like trees, cables (or similar), should be removed.
- If possible, choose fine weather days to transport the inverter.
- Warning signs or barriers must be posted near the transport areas to avoid accidental injuries.

Additionally, the following 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, has good drainage and has no obstacles or outshoots. The inverter should be placed and supported by the four feet.
5.2 Hoisting the Inverter

5.2.1 Safety Precautions

**WARNING**

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

Please carefully observe the following items:

- All safety requirements must be met.
- A professional instructor is needed in the whole hoisting process.
- All the slings used must have the load-bearing capacity of at least 20t.
- 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 needed to ensure the hoisting safety.

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

In the whole hoisting process, please observe 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 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 four top corner fittings as shown in the following figure.

![Hoisting from top fittings](image)

5.2.3 Fastening of Connectors

Use slings with hooks or U-hooks to hoist the inverter.

The lifting devices should be connected correctly to the inverter.
5.3 Foundation

5.3.1 Selection of Installation Site

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

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

5.3.2 Foundation Requirements

**WARNING**

Pay attention to the heavy weight of the inverter. Check thoroughly the conditions of the installation site (mainly the geographical and environmental conditions). Then design and construct the foundation.

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

The following conditions must be fulfilled:

- The bottom of foundation should be firm enough.
• The foundation should be at least 300mm higher than the ground level on site to avoid the rain damaging the base or the inside of 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, please establish cable trenches on bottom of the inverter, i.e. reserve the cable trenches inside the foundation and pre-bury the wire pipes.
  - The material dug out should be cleared immediately.

5.3.3 Recommended foundation construction plan

The foundation construction plan includes concrete foundation plan and strip foundation plan.

Plan 1: Concrete foundation

**NOTICE**

The foundation plan described in this chapter is for reference only; please consult on-site professional project personnel before project construction.

This section clearly specifies the foundation construction plan for reference as shown below (unit: mm). Please refer to the ultimate civil drawing issued by the design institute in detail.

![Fig. 5-3 Inverter foundation and wiring (recommended)](image)

The recommended foundation construction plan is described as follows:

• The maintenance platform is constructed around the foundation to bring convenience to maintenance in the late period.

• According to the position and overall dimension of inlet and outlet wire holes in the foundation of the inverter, the cables enter and exit from the bottom of inverter. In the construction of foundation, an adequate space is reserved for AC/DC side cable trench and perforating pipes are pre-embedded.
  - Recommended dimension of cable trench (Width X Depth): 600mm×800mm.
  - The specification and quantity of perforating pipe are confirmed according to the cable model and inlet and outlet wire quantity.
• 20# channel steel is pre-embedded on the front and back side of the foundation surface so that the foundation of station can be welded with the foundation after the mechanical installation. The pre-embedded channel steel must be horizontal with the rest part of foundation upper surface; the front and back channel steels maintain a levelness of less than 5mm. The pre-embedded steel sheet must be firm and reliable.

• According to the on-site actual conditions, water discharge system is designed and constructed at the bottom of foundation to avoid steeper.

• In the construction of foundation, the grounding body is pre-embedded; The recommended embedment depth is 0.8m. One end of the grounding body is welded with the main grounding network of power plant while the other end is welded with the pre-embedded channel steel in the foundation to assure firm welding quality. The embedded grounding pole must be in accordance with the installation codes.

• The maintenance entry is designed for the foundation; if needed, the working personnel can enter into the foundation for required operation.

• It is recommended to build up steps at the inlet of station for convenient access. The step width and level are reasonably selected according to the on-site actual conditions.

• For convenient late maintenance and repair work, a proper maintenance area is constructed around the foundation according to the on-site actual conditions. The maintenance area enjoys an adequate bearing capacity and levelness and conforms to the local standard/code.

• Both ends of all the pre-embedded pipes are temporarily sealed to prevent impurities; otherwise, it is inconvenient for laying cables in the late period.

• Upon connection of all the electrical cables, the cable inlet and outlet and joint are sealed by refractory mud or other appropriate materials to prevent entrance of rodents.

• Please refer to the said drawing and other related drawings for the rest recommended dimensions.

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

Fixing the Inverter

Check to ensure that the foundation construction has met all the local standards and other relevant requirements. Install the station to its installation place only after the foundation is dry, firm and smooth enough.

![Fig. 5-4 Hoisting position]
A
Maintenance platform

B
Bottom base of the inverter

Weld the four corners of inverter base to the pre-buried channel steel. Anti-rust treatment for the inverter and foundation should also be done.

Plan 2: Concrete pillar

The following conditions must be fulfilled:

- The bottom of the foundation should be firm enough.
- The foundations 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.
- Each foundation has the following width: 500mm to 600mm.
- The length of each foundation must be at least 200 mm longer than the width of inverter on each side.
- 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.

Overall construction effect of Plan 2 is shown below.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Foundation</td>
</tr>
<tr>
<td>B</td>
<td>Pea gravel ground</td>
</tr>
<tr>
<td>C</td>
<td>Solid ground, e.g. gravel</td>
</tr>
</tbody>
</table>

Foundation

The distances between the Turnkey Station support points (item P) are shown in following figure.
Refer to the above distances to construct the foundation.

### Item | Name | Note
---|---|---
A | Foundation | -
B | Pea gravel ground | -
C | Pre-embedded 20# channel steel | H*W*S=200*75*90mm

### 5.3.4 Other Precautions

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

**NOTICE**
Do not plant any trees near the inverter installation site to prevent the damage of inverter by tree leaves or stems.
5.4 Flashings Installation

5.4.1 Brief Introduction

It is recommended to install the flashings after the station is installed and fixed. The flashings can also be installed before the station is fixed. You can also install according to the actual situations on site.

⚠️ WARNING
After the flashings are installed, the joint between the flashings and the station must be well sealed.

⚠️ NOTICE
The cover plate and the flashings are heavy; therefore, please make sure this procedure is performed by at least two persons.

5.4.2 Preparation before installation

Sealing plates have been attached to the air outlets before delivery, and the locations are shown by A in the following figure. Remove these sealing tapes before installing the flashings.

5.4.3 Installation Steps

⚠️ NOTICE
Joints between the flashings and station must be sealed to prevent air or water leakage. The sealing materials used must be able to withstand temperature of at least 70℃.
Proceed as follows to install the flashing.

<table>
<thead>
<tr>
<th>Step</th>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1.png" alt="Figure" /></td>
<td>Remove the sealing plate. Remove the sealing plate before installing the flashing. Unscrew the fastening screws around the plate to remove the plate.</td>
</tr>
<tr>
<td>2</td>
<td><img src="image2.png" alt="Figure" /></td>
<td>Figure in the left is the view after the plate is removed.</td>
</tr>
<tr>
<td>3</td>
<td><img src="image3.png" alt="Figure" /></td>
<td>Install the flashing. Install the flashing to the pre-set position. Screw all the tightening screws that connect the flashing to the station.</td>
</tr>
<tr>
<td>4</td>
<td><img src="image4.png" alt="Figure" /></td>
<td>Seal the flashing. Seal the gaps in-between the flashing and the inverter properly. Seal the left, right and top side in-between the flashing and the station using the waterproof glue in the scope of delivery.</td>
</tr>
<tr>
<td>5</td>
<td><img src="image5.png" alt="Figure" /></td>
<td>Installation completes. Figure in the left is the front view of the product after the flashing is installed.</td>
</tr>
</tbody>
</table>

5.5 Removing Sealing Tapes and Sealing Plates

Before commissioning of the inverter, make sure all the sealing tapes and sealing plates are removed away. There may not be sufficient fresh air for the normal operation of the devices inside the inverter if otherwise.

The locations of sealing tapes and sealing plates are marked as A and B in the following figure respectively.
Additional information

Loosen the bolt kit to remove the sealing plates (marked as B in above figure).

After removing the sealing plate, seal the threaded holes by using waterproof washers (in the scope of delivery) as well as the bolt kit.
6 Electrical Installation

6.1 Safety Instructions

6.1.1 Generals rules

**DANGER**

High voltage! Electrical 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 inverter.

**DANGER**

If a ground fault occurs to the PV system, some parts that were voltage-free before may contain 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 inverter 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 to connect the wires.

**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!
Fix the bolts by strictly following 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, please follow the related requirements of the fiber manufacturer about the min. allowable bending radius.

**WARNING**

Only professional electricians can perform the electrical connection. Professional electricians should meet the related requirements listed in 2 Safety Instructions in this manual. Sungrow should hold no liability for any personal injury or property loss caused by ignorance of the safety instructions.

**WARNING**

Ensure the electrical insulation is satisfied 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 should hold no liability 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.

### 6.1.2 Five Safety Rules

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

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

6.2 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-shrinkable 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. Please respect the description in this chapter during connection.

6.2.1 Copper Wire Connection
If copper wires are used, connect the spare parts as described below:

Fig. 6-1 Copper wire terminal connection sequence of single-hole cable connection
6.2.2 Aluminum Wire Connection

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

---

**Fig. 6-2** Copper wire terminal connection sequence of double-hole cable connection

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Copper Bus</td>
<td>Cable Lug</td>
<td>Bolt</td>
<td>Spring washer</td>
<td>Flat washer</td>
<td>Nut</td>
</tr>
</tbody>
</table>

---

**Fig. 6-3** Copper-aluminum composite terminal of single-hole cable connection

---

**Fig. 6-4** Copper-aluminum composite terminal of double-hole cable connection

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Copper Bus</td>
<td>copper-aluminum composite</td>
<td>Bolt</td>
<td>Spring washer</td>
<td>Flat washer</td>
<td>Nut</td>
</tr>
</tbody>
</table>
6.3 Preparation before Electrical Connections

Cables inside the inverter have been connected before delivery. You need to connect the cables from the inverter to the external devices, i.e. the DC input cable connection, the AC output copper bus connection, the communication connection and the communication cabinet cable connection.

6.3.1 Installation Tools

Prepare the following tools before installation:

- Torque wrench
- Screwdriver
- Wire stripper
- Terminal crimping device
- Alcohol blast burner (or hot air blower)
- Allen wrench
- Meg-ohmmeter or multi-meter
- Other auxiliary tools or spare parts

6.3.2 Opening the Module Front Door

Before electrical connection, user needs to open the module front door. Cabinet door keys are needed to open or close the front door. Proceed as follows to open the front door.

1. Front door is locked
2. Reveal the keyhole by moving the keyhole cover up
3. Insert the key and turn it clockwise
4. Turn the handle counterclockwise and open the front door

6.3.3 Removal of the Protective Grid

The module is equipped with protective grid inside to maintain safe operation. Remove the grid prior to electrical connections.

**NOTICE**

All external cables connect to the connection terminal through the cable entries on the bottom of the module.

The protective grid is located on the lower part of the module cabinet.

**Step 1** Open the door and find the protective grid.

**Step 2** Unscrew the bolts on sides of the protective grid, and then remove the protective grids.

Store properly the tightening screws. Reassemble the protective grid after the cable connection.
6.3.4 Removing Sealing Tapes of Cable Inlet holes

To prevent sea-water or moisture penetrated inside the inverter during ship transport, all the cable inlet holes (except for cable glands) of the inverter are equipped with sealing tapes.

Please remove these sealing tapes before electrical connections.

6.3.5 Checking the Cables

⚠️ WARNING

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

6.3.6 During Connection

⚠️ WARNING

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

6.4 Inverter Circuit Diagram and Cable Connection

6.4.1 Circuit Diagram

Fig. 6-6 Inverter main circuit diagram
Devices in the above figure are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1~#4</td>
<td>Module 1~ module 4</td>
</tr>
<tr>
<td>A</td>
<td>Inverter DC input</td>
</tr>
<tr>
<td>B</td>
<td>Inverter AC output</td>
</tr>
<tr>
<td>C</td>
<td>External communication interface</td>
</tr>
<tr>
<td>D*</td>
<td>External 3-phase power supply</td>
</tr>
<tr>
<td>K</td>
<td>Intelligent power distribution cabinet</td>
</tr>
<tr>
<td>H</td>
<td>Other devices inside the inverter</td>
</tr>
</tbody>
</table>

Note: *is optional.

6.4.2 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 and cross-sectional areas and etc.
- All the cables must be chosen according to the maximum current of the inverter.
- Cables for one polarity or phase should be of the same type and specification.
- Flame retardant and fire resistant cables are recommended.

**WARNING**

Overloading operation of cables is strictly forbidden.

Recommended cable specifications are listed below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Recommended cable spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DC input</td>
<td>Copper wire of 240mm² at most</td>
</tr>
<tr>
<td>B</td>
<td>AC output</td>
<td>70mm²~240mm² copper wire</td>
</tr>
<tr>
<td>C</td>
<td>External communication interface</td>
<td>RS485 and Ethernet interface for standard version;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>External 3-phase power supply</td>
<td>Connect to inverter power supply to supply power to devices inside the inverter; Recommend 10mm² anti-flaming cables</td>
</tr>
</tbody>
</table>

The external 3-phase power supply is not a mandatory option. The inverter AC output can be used to supply power to the monitoring power distribution cabinet and then supply power to other devices inside the inverter; or used together with inverter power supply to provide active/standby switch for the power supply to ensure high reliability of the power supply.

For details, please refer to the actual configuration of relevant projects.

Cable sizes in this section are only for copper cables. If aluminum cables are used on site, please choose cable with appropriate cross sectional areas.
6.5 DC Connection

6.5.1 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 within the max. DC voltage of the inverter.
- Mark the negative and positive polarity of the cable.
- Check the PV modules for possible ground fault.

**WARNING**

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

**WARNING**

Strictly follow all the instructions when connecting the cables.

**WARNING**

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

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

6.5.2 DC Cable Connection

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 a tripped length of 5mm longer than the depth of the cable lug;

![Cable Lug Diagram]

**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. The crimping number should be more than two.

**Step 4** Insert the heat-shrinkable tubing;

1. A tubing with length 2cm longer than the depth of the cable lug is recommended;
2. Insert the heat-shrinkable tubing into the cable lug;
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 following the sequence in "6.2 Parts for Cabling";
3. Fasten the bolts with screwdriver or spanner.

<table>
<thead>
<tr>
<th>No of DC inputs</th>
<th>Circuit breaker</th>
<th>Connection holes</th>
<th>Bolts</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>315A</td>
<td>Φ17</td>
<td>M16×45</td>
<td>119~140 N·m</td>
</tr>
<tr>
<td></td>
<td>400A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>200A</td>
<td>Φ13</td>
<td>M12×40</td>
<td>60~70 N·m</td>
</tr>
<tr>
<td></td>
<td>250A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Figures in the foregoing table are based on typical inverter, and the actual product may differ.

**WARNING**
- Incorrect connection sequence may cause fire. Please 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-shrinkable 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.

6.6 AC Connection

6.6.1 Safety Notices

**WARNING**
- Incorrect AC connection may cause damages to the inverter.
6.6.2 AC Cable Connection

Perform the AC cable connections according to the switchgear manual. If the switchgear is not chosen, please refer to the transformer manual.

6.7 Ground Connection

6.7.1 Brief Introduction

6.7.2 Equipotential connection of inverter internal devices

All electrical devices inside the inverter should be connected equipotentially through the total equipotential connection copper bar inside the module room, i.e. the grounding terminal of all the main electrical devices should connect to the total equipotential connection copper bar. The total equipotential connection copper bar is located near by the intelligent power distribution cabinet.

The connection of the internal main electrical devices to the ground copper bar has been finished before delivery. Please perform the following operation 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;
- Ground the shielding layers and protection layers of the cables connected to the inverter outside.
6.7.3 External grounding

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

<table>
<thead>
<tr>
<th>Illustrations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Left-side view of the inverter. The external grounding point is shown in the left figure." /></td>
<td>Left-side view of the inverter. The external grounding point is shown in the left figure.</td>
</tr>
<tr>
<td><img src="image2" alt="Right-side view of the inverter. The external grounding point is shown in the left figure." /></td>
<td>Right-side view of the inverter. The external grounding point is shown in the left figure.</td>
</tr>
</tbody>
</table>

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

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

Perform the external grounding according to the on-site situation and the instructions of the plant staff. The grounding resistance should be no more than 4Ω.

The grounding resistance should be obtained from local standards and regulations.
6.8 Module Power Supply Mode

**WARNING**

*Respect all internal connection marks and instructions.*

The module provides two kinds of power supply modes: internal power supply mode (default mode) and external power supply mode.

![Fig. 6-7 Terminals to set the power supply mode](image)

<table>
<thead>
<tr>
<th>Breaker</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Control the internal power supply mode; close Q1 in internal power supply mode</td>
</tr>
<tr>
<td>Q2</td>
<td>Control the external power supply mode; close Q2 in external power supply mode</td>
</tr>
</tbody>
</table>

Identify the internal and external power supply switch according to the markings.

- For standard configuration module, user needs to change the power supply mode manually. This chapter describes the operation method of manual change. User can select the required power supply mode following the description in this chapter.
- Sungrow also provides optional automatic change of power supply mode. Please specify in your order if you need this function.

6.9 Communication Connections

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>RS485 communication port</td>
</tr>
<tr>
<td>B</td>
<td>Ethernet port</td>
</tr>
</tbody>
</table>

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

### 6.10 External 3-phase Power Supply (Optional)

If there is external power supply connected, please connect the external power supply to the micro-circuit breaker. For more details, please refer to the wiring diagram in the intelligent PMD.

### 6.11 Finishing Electrical Connection

**WARNING**

> After the electrical connection, check the connection of all cables. Make sure all connections are correct and firm.

After checking that all connections are correct and firm,

- check the bottom of the inverter and seal the gaps between the cables with fireproof mud. If the cable glands are used, make sure they are tightened. Seal the unused terminal.
- recover the protective grid removed.
- water-proof treatment should be done on the foundation of the inverter.
**7 Commissioning**

### 7.1 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 inside the device and 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 done only after receiving approval from the local utility grid company and by qualified personnel.

**WARNING**

After the inverter is operating, make sure there are no flammable materials at least 5 meters around the installation site.
Local/national standards about the min. electric clearance around the 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.

### 7.2 Requirements of Commissioning

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

- Ensure all the cable connections are secure and all bolts are fixed properly.
- Ensure DC side voltage meets the inverter requirements and the polarity is correct.
- Ensure AC side voltage meets the inverter requirements.
- Ensure all cable connections meets related standards and requirements.
• Ensure the system is properly grounded. Ground resistance is important for the whole system so that before commissioning, make sure the ground resistance is less than 4Ω

NOTICE
All operation 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.

7.3 Checking before Commissioning

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

7.3.2 Checking the Inverter Switches
• Ensure that the DC and AC switches are in the “OFF” position.
• Check and ensure the inverter and switches upstream and downstream meet the requirements and flexible enough.

7.3.3 Checking PV Array

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

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

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

Check the PV arrays before grid-connection. The voltage of each DC main cables should be the same and no more than the max. allowable 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. Use the U-I curve to record the PV array situation. Commission the device when the PV array output situation is stable.

![Notice]

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% at stable environmental conditions.

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

### 7.3.4 Checking Grid Voltage

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

  ![Notice]

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

- 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.

### 7.4 Preparation before Starting

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

### 7.5 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 four modules inside the inverter:

**Step 1** Make sure all the AC and DC switches of the module are disconnected.

**Step 2** Close the inverter upstream and downstream switches.

**Step 3** Close the switchgear relevant switches according to the switchgear manual.
Step 4 Connect the input micro-switches inside the intelligent power distribution cabinet and the LCD inside the monitoring window is on.

Step 5 Perform the stop operation from the LCD.

Step 6 Measure if the AC side voltage of #1 module is normal; if yes, connect the AC switch of #1 module.

Step 7 Check if the communication, AC voltage amplitude and frequency of #1 module are normal from the LCD. If yes, connect one DC switch.

Step 8 Check if the DC voltage of #1 module is normal from the LCD. If yes, perform the start operation to #1 module for commissioning.

Step 9 Perform the above steps to #2 module, #3 module and #4 module.

Step 10 Perform the stop operation from the LCD.

Step 11 Connect all the other DC switches of #1 module, #2 module, #3 module and #4 module; perform start operation to the modules from the LCD.

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

7.6 LCD Parameter Setting

When the LCD is on, set the LCD display language, data 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.

7.7 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 for unstableness.
- 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, on-site environmental conditions and so on. Usually, if the in-site condition is good, the commissioning can last for 1 week, i.e. 168 hours.

The commissioning of the inverter is completed. The inverter operates normally.

After commissioning, plant starts power generation and enters daily maintenance process.
After the inverter is operating, make sure there are no flammable materials at least 5 meters around the installation site. Local/national standards about the min. electric clearance around the inverter should be respected.

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

8.1 Starting

8.1.1 Inspection before starting

After the maintenance or service work, you may start the inverter. Inspect the following requirement before starting the inverter:

- All connections are done by strictly following the installation manual and circuit diagram.
- The coverings of the internal devices are fixed and secured.
- The cabinet door is closed.
- The emergency stop button is released and the Start/Stop switch is in the “Stop” position.
- Make sure, via suitable instruments, that there is no ground fault of the PV modules.
- Measure the DC and AC current with multimeter to check if they fulfill the inverter startup conditions and there is no overvoltage hazard.

**WARNING**

After longtime storage, a thorough and professional test is necessary before starting the inverter.

8.1.2 Steps to Start

When the abovementioned conditions are fulfilled, proceed as follows to start the inverter:

**Step 1** Make sure all the AC and DC switches of the module are disconnected.

**Step 2** Connect all micro-switches inside the intelligent power distribution cabinet and the LCD inside the monitoring window is on.

**Step 3** Perform the stop operation from the LCD.

**Step 4** Connect all the AC and DC switches of the modules (if the actual connected DC input numbers are less than the total input numbers of the module, connect all the branch switches in turns).

**Step 5** Perform the start operation to the modules from the LCD and the modules connect to the grid.

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

**WARNING**

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

Inverter stops during normal maintenance and service work or when a fault occurs.

8.2.1 Normal Stop

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

**Step 1** Stop each module through the stop instruction sent by the LCD. The inverter stops.

**Step 2** Disconnect all AC switches of the modules in turns.

**Step 3** Disconnect all DC switches of the modules in turns.

**Step 4** Disconnect the upstream switches connected to the DC and AC side of the modules. For the AC side, if there is a switch in the transformer low voltage side connected to the module, disconnect the transformer low voltage side switch; otherwise, disconnect the high voltage side switch. (Note: if there is a ring main unit, disconnect all the switches inside the ring main unit).

**Step 5** Disconnect all micro-switches inside the intelligent power distribution cabinet.

**Step 6** Wait for the module DC side voltage drops below the safety voltage.

⚠️ **WARNING**

During normal operation, disconnection of AC or DC switch is strictly forbidden. Otherwise, the switch can be damaged and the module may also be damaged.

8.2.2 Inverter Stops when A Fault Occurs

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

**Step 1** Press down the emergency stop button inside the monitoring window and each module AC switch will trip off and the modules will stop immediately.

**Step 2** Disconnect all AC switches of the modules in turns.

**Step 3** Disconnect all DC switches of the modules in turns.

**Step 4** Disconnect the upstream switches connected to the DC and AC side of the modules. For the AC side, if there is a switch in the transformer low voltage side connected to the module, disconnect the transformer low voltage side switch; otherwise, disconnect the high voltage side switch. (Note: if there is a ring main unit, disconnect all the switches inside the ring main unit).

**Step 5** Disconnect all micro-switches inside the intelligent power distribution cabinet.

**Step 6** Wait for the module DC side voltage drops below the safety voltage.

⚠️ **WARNING**

- Use the emergency stop button only when emergency or a fault occurs. Under normal conditions, stop the inverter by perform the stop command in the LCD panel.
- Press the emergency stop button directly in times of crisis to ensure timely response.
9 LCD Menu Operation

9.1 LCD Touch Screen

The LCD touch screen, located at the eye-level inside the monitoring window on the left side of the inverter is used for user to view the data and set related parameters.

The LCD consists of two parts as shown in the following figure. The LEDs indicate the present working state. User can check or set related data by touching the icons on the LCD display.

For user’s convenience, there are a large number of pictures about the LCD interface 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, please check and replace the button cells on the back of the LCD panel.

9.2 Default Screen

9.2.1 Initialization

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

9.2.2 Default Screen Introduction

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yield data. The first line from the top is the present active power; work state is the transient state of the inverter.</td>
</tr>
<tr>
<td>B</td>
<td>Today’s active power curve to indicate the power percentage (power value divides the inverter nominal power value).</td>
</tr>
<tr>
<td>C</td>
<td>DC side voltage and current of the inverter</td>
</tr>
<tr>
<td>D</td>
<td>AC side line-to-line voltage and phase current</td>
</tr>
<tr>
<td>E</td>
<td>Language selection button. Click to change among English, Chinese, French and Italian.</td>
</tr>
<tr>
<td>F</td>
<td>Present date and time</td>
</tr>
<tr>
<td>G</td>
<td>Success rate of the inverter internal communication</td>
</tr>
<tr>
<td>H</td>
<td>Success rate of communication between the inverter and PC</td>
</tr>
</tbody>
</table>

Accessing to submenus mentioned below starts from the default menu.
9.2.3 Backlight and Screensaver

If there is no operation to the screen for more than 5 minutes, the backlight will be off. Activate the backlight by tapping the display and the display will return to the menu operated previously.

9.3 Overview of LCD Menu and Icon

9.3.1 Overview of Submenu and Icon

There are three buttons on the lower left side of the touch panel for user to operate “Start/Stop”, “Home”, “Function”. The logical structures of these menus are shown below:

<table>
<thead>
<tr>
<th>Main Menu</th>
<th>First sub-menu</th>
<th>Second sub-menu</th>
<th>Third sub-menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start/Stop</td>
<td>Start</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Stop</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Home</td>
<td>-</td>
<td>Real Time Data</td>
<td>-</td>
</tr>
<tr>
<td>Function</td>
<td>Run-information</td>
<td>Power curve</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E-histogram</td>
<td>-</td>
</tr>
<tr>
<td>History-information</td>
<td>His-event</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>His-fault</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>His-data</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>His-alarm</td>
<td>-</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>Start</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Stop</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Set-parameter</td>
<td>Sys-parameter</td>
<td>Language &amp; Firmware Ver.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Load default</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run-parameter</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pro-parameter</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Com-parameter</td>
<td>Serial port param.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Network param.</td>
</tr>
</tbody>
</table>

9.3.2 Layout of the submenus

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | Title bar  
The first line from the top is the present success rate of communication.  
The left side of the second line is the name of the present page, while the right side is the present date and time. |
| B    | Data display or parameter configuration. |
| C    | From left to right: the three main icons; the return button to return to the previous menu by tapping it. |

For convenience’s sake, the operations on the menus are referred to as the menu name with quotation marks. For example, the "Set-parameter" menu will be referred to as “Set-parameter”.

### 9.4 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 out;

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

**Step 4** Enter the password through the keypad.
<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>←</td>
<td>backspace key, delete the digit input</td>
</tr>
<tr>
<td>Clr</td>
<td>clear the digits input</td>
</tr>
<tr>
<td>Esc</td>
<td>escape and close the keypad</td>
</tr>
<tr>
<td>Enter</td>
<td>confirm the password input</td>
</tr>
<tr>
<td>Max./Min.</td>
<td>the maximum and minimum value can be input; digital outside this range is invalid</td>
</tr>
</tbody>
</table>

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

**Step 5** Press “Enter” to confirm the password input.

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

### 9.5 Language Setting

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

**9.5.1 Conventional Way**

**Step 1** Tap “Function” from the default menu;

**Step 2** Tap “Set-parameter”;

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

**Step 4** Tap “Language & Firmware Ver.” and enter into the language and firmware version sub-menu;
Step 5 Select the target language.

9.5.2 Shortcut

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

By tapping the button, the language will switch among English, Chinese, French and Italian. Language on the button is the present display language of the display.

9.6 Date and Time Setting

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 cell
and the keypad will appear;

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

### 9.7 Running Information Checking

Running information contains all data pertinent to the inverter operation:

**Real-time data**

The real-time running information of the 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 CO₂ 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 are updated every several seconds and the total diagram data will be cleared at the beginning of a new day.

**E-histogram**

The power yields of 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”;

![Run information screenshot](image)

**Step 3** Tap “Power curve” and enter into the power curve sub-menu;
Step 4 Tap “E-histogram” and enter into the electricity histogram sub-menu.

The display value is directive only and must not be used as a basis for invoicing.

9.8 History Information Checking

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

9.8.1 History Event Checking

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.

Up to 200 history events can be viewed from this sub-menu, with up to 5 records can be shown in one page. The upper left side of the event table is the total number of the current event records. Tap “Prev” or “Next” to turn pages up or down.
9.8.2 History Data Checking

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.

9.8.3 History Fault Checking

When a fault occurs to the inverter, user can view the present fault via the LCD screen and the history fault records 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.

Up to 200 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.

9.8.4 History Alarm Checking

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.
Up to 200 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.

9.9 Present Fault Information Checking

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

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

The state column of the module that has fault will display "Fault. As shown in the left figure, a fault occurs to module unit 3. Tap the fault cell of  module unit 3 to check the present fault.

The fault interface of module unit 3 will appear with the fault item in red.
9.10 Starting/Stopping

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

Follow either of the two ways below to start/stop the inverter through the LCD screen:

- Tap “Start/Stop” from 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 is effective after confirmation; cancel the operation by tapping “Cancel”.

9.11 Load Default

Proceed as follows to perform the load default:

**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;

The password is “1111”. The system will be reset after entering the password.

9.12 Firmware Version Checking

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

**Step 1** Tap “Function” from the default menu;

**Step 2** Tap “Set-parameter”;
**Step 3** Tap “Sys-parameter” after entering the correct password;

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

**Step 5** The firmware version of LCD and DSP is shown at the bottom of the page.

### 9.13 Parameters of LCD

#### 9.13.1 Communication Parameters

**WARNING**

Improper communication parameter configuration may lead to communication failure!

Follow strictly the instructions of the plant staff to configure 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
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.

9.13.2 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.

### Description of Running Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vmppt-max (V)</td>
<td>Maximum MPPT voltage</td>
</tr>
<tr>
<td>Vmppt-min (V)</td>
<td>Minimum MPPT voltage</td>
</tr>
<tr>
<td>T-start-wait (s)</td>
<td>The time from the AC/DC parameters meet the grid-connection conditions to the station begins to generate power.</td>
</tr>
<tr>
<td>T-stop-delay (s)</td>
<td>The time from the LCD display or upper computer sends stop command to station performs the stop command</td>
</tr>
<tr>
<td>stop slope (%/s)</td>
<td>Active power decline rate from station performs stop command to station stops</td>
</tr>
<tr>
<td>P-rise rate (%/s)</td>
<td>Percentage that the active power rise per second accounted for the nominal power (%/s)</td>
</tr>
<tr>
<td>P-decline rate (%/s)</td>
<td>Percentage that the active power decline per second accounted for the nominal power (%/s)</td>
</tr>
<tr>
<td>Limit Power (%)</td>
<td>Percentage that the active power output accounted for the nominal output power (%)</td>
</tr>
<tr>
<td>PI</td>
<td>cosφ</td>
</tr>
<tr>
<td>Q-limit (%)</td>
<td>Percentage that the reactive power rise accounted for the nominal power (%)</td>
</tr>
<tr>
<td>Q-adjust switch</td>
<td>Refer to 10.3</td>
</tr>
<tr>
<td>Power-off saved (PI)</td>
<td>If the power factor setting can be saved when the LCD screen is powered off</td>
</tr>
<tr>
<td>Power-off saved (P-limited)</td>
<td>If the limit power(%) setting can be saved when the LCD screen is powered off</td>
</tr>
<tr>
<td>SVG switch**</td>
<td>If the reactive power compensation is activated or deactivated</td>
</tr>
<tr>
<td>T-recover (s)</td>
<td>Automatic recovery time when fault occurs</td>
</tr>
<tr>
<td>Trip Enable</td>
<td>Trip the DC main switches of the modules</td>
</tr>
</tbody>
</table>

** at night when the inverter enters standby mode (but not enters the deeper standby mode with lower power consumption), the SVG function needs to be activated; first stop the inverter by the LCD button and then start; set the SVG switch to “Enable”. The SVG is an optional function for this inverter.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vmppt-max (V)</td>
<td>520~850</td>
<td>850</td>
</tr>
<tr>
<td>Vmppt-min (V)</td>
<td>520~850</td>
<td>520</td>
</tr>
<tr>
<td>T-start-wait (s)</td>
<td>0 - 600</td>
<td>60</td>
</tr>
<tr>
<td>T-stop-delay (s)</td>
<td>0 - 600</td>
<td>0</td>
</tr>
<tr>
<td>stop slope (%/s)</td>
<td>0.1 - 100</td>
<td>100</td>
</tr>
<tr>
<td>P-rise rate (%/s)</td>
<td>0.01 - 10</td>
<td>10</td>
</tr>
<tr>
<td>P-decline rate (%/s)</td>
<td>0.01 - 10</td>
<td>10</td>
</tr>
<tr>
<td>Limit Power (%)</td>
<td>0 - 110</td>
<td>110</td>
</tr>
</tbody>
</table>
9.13.3 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.

**Description of Protection Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_Vgrid-max(V)</td>
<td>Set the grid over-voltage protection I value. Protection is activated when voltage exceeds this value.</td>
</tr>
<tr>
<td>II_Vgrid-max(V)</td>
<td>Set the grid over-voltage protection II value. Protection is activated when voltage exceeds this value.</td>
</tr>
<tr>
<td>I_T-Vhigh trip(ms)</td>
<td>Set the protection time of grid over-voltage protection I</td>
</tr>
<tr>
<td>II_T-Vhigh trip (ms)</td>
<td>Set the protection time of grid over-voltage protection II</td>
</tr>
<tr>
<td>Recover_Vgrid-max(V)</td>
<td>Inverter recovers normal operation when grid voltage is below this value</td>
</tr>
<tr>
<td>I_Vgrid-min(V)</td>
<td>Set the grid under-voltage protection I value. Protection is activated when voltage is below this value.</td>
</tr>
<tr>
<td>II_Vgrid-min(V)</td>
<td>Set the grid under-voltage protection II value. Protection is activated when voltage is below this value.</td>
</tr>
<tr>
<td>I_T-Vlow trip(ms)</td>
<td>Set the grid under-voltage I tripping protection time</td>
</tr>
<tr>
<td>II_T-Vlow trip (ms)</td>
<td>Set the grid under-voltage II tripping protection time</td>
</tr>
<tr>
<td>Recover_Vgrid-min(V)</td>
<td>Station recovers normal operation when grid voltage exceeds this value</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>I_Fgrid-max(\text{Hz})</td>
<td>Set the grid over-frequency protection I value. Protection is activated when frequency exceeds this value.</td>
</tr>
<tr>
<td>II_Fgrid-max(\text{Hz})</td>
<td>Set the grid over-frequency protection II value. Protection is activated when frequency exceeds this value.</td>
</tr>
<tr>
<td>I_T-Fhigh trip(ms)</td>
<td>Set the grid over-frequency I tripping time.</td>
</tr>
<tr>
<td>II_T-Fhigh trip (ms)</td>
<td>Set the grid over-frequency II tripping time.</td>
</tr>
<tr>
<td>Recover_Fgrid-max(\text{Hz})</td>
<td>Station recovers normal operation when grid frequency is below this value.</td>
</tr>
<tr>
<td>I_Fgrid-min(\text{Hz})</td>
<td>Set the grid under-frequency protection I value. Protection is activated when frequency exceeds this value.</td>
</tr>
<tr>
<td>II_Fgrid-min(\text{Hz})</td>
<td>Set the grid under-frequency protection II value. Protection is activated when frequency exceeds this value.</td>
</tr>
<tr>
<td>I_T-Flow trip(ms)</td>
<td>Set the grid under-frequency I tripping time.</td>
</tr>
<tr>
<td>II_T-Flow trip (ms)</td>
<td>Set the grid under-frequency II tripping time.</td>
</tr>
<tr>
<td>Recover_Fgrid-min(\text{Hz})</td>
<td>Station recovers normal operation when grid frequency exceeds this value.</td>
</tr>
<tr>
<td>LVRT switch</td>
<td>Enable or disable the LVRT switch.</td>
</tr>
<tr>
<td>LVRT normal vol min(V)</td>
<td>Refer to Fig. 10-2 Lower voltage withstand requirements, U1 Unavailable.</td>
</tr>
<tr>
<td>LVRT tolera vol min(V)</td>
<td>Refer to Fig. 10-2 Lower voltage withstand requirements, U2 Unavailable.</td>
</tr>
<tr>
<td>LVRT T1(ms)</td>
<td>Refer to Fig. 10-2 Lower voltage withstand requirements, T1.</td>
</tr>
<tr>
<td>LVRT T2(ms)</td>
<td>Refer to Fig. 10-2 Lower voltage withstand requirements, T2.</td>
</tr>
<tr>
<td>LVRT dynamic Kf factor</td>
<td>Ratio of reactive power compensation and voltage dropping depth during LVRT.</td>
</tr>
<tr>
<td>HVRT switch</td>
<td>Enable or disable the HVRT switch.</td>
</tr>
<tr>
<td>HVRT normal vol max (%)</td>
<td>Refer to Fig. 10-3 High voltage withstand requirements, U2 Unavailable.</td>
</tr>
<tr>
<td>HVRT tolera vol max (%)</td>
<td>Refer to Fig. 10-3 High voltage withstand requirements, U1 Unavailable.</td>
</tr>
<tr>
<td>Tmax-HVRT normal(ms)</td>
<td>Refer to Fig. 10-3 High voltage withstand requirements, T2.</td>
</tr>
<tr>
<td>Tmax-HVRT tolera(ms)</td>
<td>Refer to Fig. 10-3 High voltage withstand requirements, T1.</td>
</tr>
<tr>
<td>Active Islanding</td>
<td>Enable or disable the Anti-islanding function.</td>
</tr>
<tr>
<td>I leakage-pro(A)</td>
<td>Set the current leakage protection value.</td>
</tr>
<tr>
<td>Anti-PID mode</td>
<td>If Anti-PID mode is enabled, you may set the Anti-PID mode (Invalid, Suppression and Repair).</td>
</tr>
<tr>
<td>Ins monitor measure time (S)</td>
<td>Set the insulation monitor measure time.</td>
</tr>
<tr>
<td>Ins monitor protect threshold(K\Omega)</td>
<td>Set the threshold value of the insulation monitor resistance.</td>
</tr>
<tr>
<td>PID repair</td>
<td>Enable the PID repair function manually.</td>
</tr>
<tr>
<td>Fault manual restart</td>
<td>In grid-connection state if user select the “Enable” option, inverter will be on fault locked state and cannot restart automatically if a fault occurs. To restart the inverter, either of the following two methods can be selected: 1) perform key stop from the LCD and then start the device; 2) disconnect the inverter upstream and downstream power supply; connect the upstream and downstream power supply when the device is disconnected completely.</td>
</tr>
</tbody>
</table>
Protection parameter range and default value are shown in the following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>I _Vgrid-max(V)</td>
<td>396~540</td>
<td>414</td>
</tr>
<tr>
<td>II_Vgrid-max(V)</td>
<td>396~540</td>
<td>468</td>
</tr>
<tr>
<td>I_T-Vhigh trip(ms)</td>
<td>40 - 600000</td>
<td>2000</td>
</tr>
<tr>
<td>II_T-Vhigh trip (ms)</td>
<td>40 - 600000</td>
<td>100</td>
</tr>
<tr>
<td>Recover_Vgrid-max(V)</td>
<td>396~540</td>
<td>396</td>
</tr>
<tr>
<td>I_Vgrid-min(V)</td>
<td>36~324</td>
<td>288</td>
</tr>
<tr>
<td>II_Vgrid-min(V)</td>
<td>36~324</td>
<td>180</td>
</tr>
<tr>
<td>I_T-Vlow trip(ms)</td>
<td>40 - 600000</td>
<td>2000</td>
</tr>
<tr>
<td>II_T-Vlow trip (ms)</td>
<td>40 - 600000</td>
<td>100</td>
</tr>
<tr>
<td>Recover_Vgrid-min(V)</td>
<td>36 - 324</td>
<td>324</td>
</tr>
<tr>
<td>I_Fgrid-max(Hz)</td>
<td>50 - 55/60 - 65</td>
<td>50.5/61.5</td>
</tr>
<tr>
<td>II_Fgrid-max(Hz)</td>
<td>50 - 55/60 - 65</td>
<td>50.5/62</td>
</tr>
<tr>
<td>I_T-Fhigh trip(ms)</td>
<td>40 - 600000</td>
<td>160</td>
</tr>
<tr>
<td>II_T-Fhigh trip (ms)</td>
<td>40 - 600000</td>
<td>160</td>
</tr>
<tr>
<td>Recover_Fgrid-max(Hz)</td>
<td>50 - 55/60 - 65</td>
<td>50.2/60.2</td>
</tr>
<tr>
<td>I_Fgrid-min(Hz)</td>
<td>45 - 50/55 - 60</td>
<td>47.5/57.5</td>
</tr>
<tr>
<td>II_Fgrid-min(Hz)</td>
<td>45 - 50/55 - 60</td>
<td>47.5/57.5</td>
</tr>
<tr>
<td>I_T-Flow trip(ms)</td>
<td>40 - 600000</td>
<td>160</td>
</tr>
<tr>
<td>II_T-Flow trip (ms)</td>
<td>40 - 600000</td>
<td>160</td>
</tr>
<tr>
<td>Recover_Fgrid-min(Hz)</td>
<td>45 - 50/55 - 60</td>
<td>49.5/59.9</td>
</tr>
<tr>
<td>LVRT switch</td>
<td>Enable/Disable</td>
<td>Enable</td>
</tr>
<tr>
<td>LVRT normal vol min(V)*</td>
<td>308 - 324</td>
<td>324</td>
</tr>
<tr>
<td>LVRT tolera vol min(V)*</td>
<td>18 - 144</td>
<td>72</td>
</tr>
<tr>
<td>LVRT T1(ms)</td>
<td>500 - 1500</td>
<td>1000</td>
</tr>
<tr>
<td>LVRT T2(ms)</td>
<td>2500 - 3500</td>
<td>3000</td>
</tr>
<tr>
<td>LVRT dynamic Kf factor</td>
<td>0 - 3</td>
<td>1.5</td>
</tr>
<tr>
<td>HVRT switch</td>
<td>Enable/Disable</td>
<td>Enable</td>
</tr>
<tr>
<td>HVRT normal vol max(%)*</td>
<td>110 - 120</td>
<td>110</td>
</tr>
<tr>
<td>HVRT tolera vol max (%)*</td>
<td>120 - 140</td>
<td>130</td>
</tr>
<tr>
<td>Tmax-HVRT normal(ms)</td>
<td>100 - 20000</td>
<td>10000</td>
</tr>
<tr>
<td>Tmax-HVRT tolera(ms)</td>
<td>100 - 5000</td>
<td>500</td>
</tr>
<tr>
<td>Active Islanding</td>
<td>Enable/Disable</td>
<td>Disable</td>
</tr>
<tr>
<td>I leakage-pro(A)</td>
<td>1 - 8</td>
<td>6.3</td>
</tr>
<tr>
<td>Anti-PID mode</td>
<td>Invalid/Suppression/Repair</td>
<td>Invalid (mode close)/Suppression (mode open)</td>
</tr>
<tr>
<td>Ins monitor measure time (S)</td>
<td>30/150/300/600</td>
<td>150</td>
</tr>
<tr>
<td>Ins monitor protect threshold (K)</td>
<td>15 - 100</td>
<td>37</td>
</tr>
<tr>
<td>Fault manual restart</td>
<td>Disable/Enable</td>
<td>Disable</td>
</tr>
</tbody>
</table>

**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, please contact Sungrow.
10 Inverter Functions

10.1 Operation Mode

10.1.1 Mode Change

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

![Operation modes change diagram](image)

Fig. 10-1 Operation modes change

Upv is the DC input voltage of the inverter.
UpvStart is the inverter DC side startup voltage.

10.1.2 Operation Mode Description

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

Initial Standby
When the inverter upstream and downstream connections are connected and the AC & DC switches 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 and the startup time is reached, whilst the requirements of the grid side parameter are satisfied, 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 complete, the inverter will start powering 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 maximum the output energy.

Standby
In Run mode, the inverter will enter into 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 inverter DC startup voltage and the startup time are reached, it will turn into the Run mode.

Fault
If a fault occurs during operation, the relevant module will enter into the Fault mode. LCD panel will display the fault type with the “Fault” indicator on until the fault is removed and the module turns into the Run mode.
If the fault is unrecoverable, the inverter must be stopped to perform maintenance work. It will automatically check if the fault is recoverable.

⚠️ WARNING
When there is a DSP fault or module fault, restart of the inverter through the LCD is strictly forbidden. A power-off check is required before reenergizing the inverter. Otherwise, the machine may be damaged.

Emergency-stop
Stop the inverter by pressing the emergency stop button inside the monitoring window when a fault or emergency occurs.
The emergency stop button is used to disconnect the AC switch and the DC switch. To release the emergency stop state, please remove the emergency stop instruction by the special key.

Key-stop
In Run mode, the inverter will enter into the Key-stop mode by sending stop instruction via the LCD panel if user needs to conduct maintenance or service work.

Alarm Run
In Alarm Run mode, the inverter can keep running but send alarm signal. User can check the present alarm information through the Working state on the LCD default screen or check the latest 100 history alarm information through Function/History information/his alarm. The inverter automatically turns to Run mode when the alarm is removed.
10.2  Active Power Limitation

10.2.1  Introduction to Active Power Limitation

Situations, call for power limitation, are listed below:

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

10.2.2  How to Realize Power Limitation

**WARNING**

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

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

10.3  Reactive Power Adjustment

Inverter can provide reactive power output. User can open or close the reactive power adjustment switch and set the reactive power output through the LCD screen.

Reactive power limitation is performed through the running information sub-menu as follows:

**Step 1** Tap “Function” from the default menu;

**Step 2** Tap “Set-parameter”;

**Step 3** Tap “Run-parameter” after entering the correct password;
Step 4 Turn the page down to select the “Q-adjust switch”. Tap the pull-down list and 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

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.

**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, please contact Sungrow.

10.4 LVRT

Technical Requirements for Connecting Photovoltaic Power Inverter 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 inverter still connects to the grid during power system failure, the active power will recover from the moment the fault is removed at the speed of at least 30% nominal power/second.

**Dynamic reactive current support**

During LVRT, power inverter should feed reactive current to the power system as per requirements. For a inverter whose 500kV or 750kV voltage is stepped up from the 220kV or 330kV voltage and then connects to the power inverter 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, power inverter can operation normally for 0.15 second.
Note: $U_T$ is the grid-connection point voltage; $U_{pu}$ is the grid-connection point nominal voltage.

Sungrow’s inverter meets the abovementioned requirements.

10.5 High Voltage Ride Through (HVRT)

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

<table>
<thead>
<tr>
<th>Grid-connection pint voltage</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.1U_{pu} &lt; U_T &lt; 1.2U_{pu}$</td>
<td>Operate for at least 10s</td>
</tr>
<tr>
<td>$1.2U_{pu} \leq U_T \leq 1.3U_{pu}$</td>
<td>Operate for at least 0.5s</td>
</tr>
</tbody>
</table>

Note: $U_T$ is the grid-connection point voltage; $U_{pu}$ is the grid-connection point nominal voltage.

Sungrow’s inverter meets the abovementioned requirements.
10.6 Temperature Derating

When the ambient temperature is below 45°C, the inverter can operate at 110% of the overload condition. When the temperature reaches 50°C, inverter can keep the nominal power output. When the temperature is above 60°C, inverter enters into protection mode.

![Temperature Derating Diagram]

Note: $P_n$ is the nominal power.

**Fig. 10-4 Inverter temperature derating function**

<table>
<thead>
<tr>
<th>Ambient temp. $T$</th>
<th>Inverter operation situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T&lt; 35^\circ C$</td>
<td>The inverter starts with the aid of auxiliary heater</td>
</tr>
<tr>
<td>$-35^\circ C &lt; T \leq 45^\circ C$</td>
<td>Operate for a long time at 110% of the overload condition</td>
</tr>
<tr>
<td>$45^\circ C &lt; T \leq 50^\circ C$</td>
<td>Operate with derating at 2% $P_n$/°C</td>
</tr>
<tr>
<td>$50^\circ C &lt; T \leq 60^\circ C$</td>
<td>Operate with derating at 10% $P_n$/°C</td>
</tr>
<tr>
<td>$T &gt; 60^\circ C$</td>
<td>Enter protection mode; Automatically restart when temperature drops below 55°C</td>
</tr>
</tbody>
</table>

10.7 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.
10.8 Intelligent Temperature-Control Technology

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

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

10.9 Insulation Monitoring Function

10.9.1 Introduction

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

10.9.2 Simple Troubleshooting

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

• If the insulation resistance recovers to normal, the fault loop is in the AC side.
• If the insulation resistance is still low, the fault loop is in the DC side.
• No matter if fault is in the DC side or in the AC side, a thorough checking and troubleshooting after the system is power down is necessary.
10.10 GFDI Function

The DC Cabinet is equipped with the GFDI (Ground Fault Detection and Interruption) function. The GFDI fuse, with a certain cutoff limit, is installed on the negative pole of DC input side.

10.11 Protection Function

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

10.11.1 DC over-voltage protection

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

Inverter can detect the abnormal voltage and respond quickly.

10.11.2 AC over/under-voltage protection

When the inverter AC output voltage exceeds the allowable range, inverter will stop feeding the grid, send warning signal and display the fault type on the LCD screen.

Inverter can detect the abnormal voltage and respond quickly.

10.11.3 Frequency anomaly protection

When the grid frequency exceeds the allowable range, inverter will stop feeding the grid, send warning signal and display the fault type on the LCD screen.

Inverter can detect the abnormal frequency and respond quickly.

10.11.4 Islanding protection

Islanding is a condition 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.

− If the inverter continues power supply after the grid is out of power supply, death or injury may occur to the maintainers during maintenance.
− When power grid fails, the inverter continues power supply. Once the grid resumes, a surge current may occur and damage devices.

Inverter is equipped with anti-islanding protection function.

⚠️ DANGER

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

10.11.5 Reverse polarity protection

When the PV array inputs' polarities are connected reversely, inverter will stop and protect itself against damage and resume normal operation after the connection is corrected.

10.11.6 Overload protection

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

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

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

10.11.9 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, DSP will help to
maintain the safe operation of the inverter by sending instruction to stop the inverter or
derate the power output.

10.12 Firefighting

10.12.1 General Introduction
Respect the national and local firefighting rules and regulations.
Periodically check and maintain the firefighting devices.

10.12.2 Smoke Detector
Smoke detector, located on roof of the inverter, is a device that detects smoke, typically as
an indicator of fire. When smoke is detected, detector will issue a local audible or visual
alarm and a warning signal. The installation of smoke detector can protect the electrical
devices and maintainers and operators.
The warning signal can connect to the fire alarm system of the PV system directly.

10.12.3 Fire Emergency Lights
Fire emergency lights, an external power supply-backed lighting device, will come on
automatically when the inverter experiences a power outage, convenient for the personnel
to check or maintain the inverter.
11 Troubleshooting

11.1 Safety Instructions

⚠️ DANGER
Lethal voltages are present inside the station when a fault occurs.
- Only qualified personnel can perform the troubleshooting described in this chapter. Qualified means that the operator has received professional training on devices troubleshooting.
- Do not perform any troubleshooting other than that specified in this manual.
- Respect all safety instructions during troubleshooting.

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

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

⚠️ WARNING
Disconnect all AC and DC Switches before troubleshooting.

11.2 Fault Checking

If any power output anomaly is observed, you may check the following items before contacting Sungrow.
- Open-circuit voltage of the PV arrays
- State of the emergency stop button
- Power limitation state
Should any questions or doubts arise that are not covered by this manual, please contact us.

If you provide our customer service assistant the following information, it will be of great help for us to diagnose and solve the problem in your system:
- Type and serial number of the station and internal devices
- Manufacturer, model and configuration of the PV arrays and upstream & downstream combiner devices connected to the station
- Inverter communication solution
- Fault and brief description of the fault phenomenon
- A picture of the fault if necessary

### 11.3 Fault and Troubleshooting on the LCD screen

This section is dedicated to the faults shown on the LCD, possible reasons and troubleshooting. In case the fault cannot be removed following the instructions in this section, please contact Sungrow.

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vdc-high</td>
<td>DC voltage exceeds the max. DC voltage</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the configuration of the PV array and reduce the open-circuit voltage of the PV array</td>
</tr>
<tr>
<td>Remark</td>
<td>Please contact the installers of the PV arrays</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vac-high</td>
<td>The grid voltage is above the max. grid voltage</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the grid voltage (or if the grid-connected wire is too thin)</td>
</tr>
<tr>
<td>Remark</td>
<td>Inverter automatically reconnects to the grid once the grid voltage recovers normal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vac-low</td>
<td>The grid voltage is below the min. grid voltage</td>
</tr>
</tbody>
</table>
| Measure | Check the grid voltage  
Check if the AC cables are securely connected. |
| Remark  | Inverter automatically reconnects to the grid once the grid voltage recovers normal |

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV pol-rev</td>
<td>The positive and negative polarities of the DC side are connected reversely.</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the DC connection to for reverse connection after inverter voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-fault</td>
<td>The grid frequency is outside the permitted range</td>
</tr>
</tbody>
</table>
| Measure | Check grid frequency  
Check if the AC cables are securely connected. |
<p>| Remark  | Inverter automatically reconnects to the grid once the grid voltage recovers normal |</p>
<table>
<thead>
<tr>
<th>Fault</th>
<th>Gnd-flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Inverter AC side leakage current to the ground exceeds the set value (default: 6.3A)</td>
</tr>
<tr>
<td>Measure</td>
<td>-</td>
</tr>
<tr>
<td>Remark</td>
<td>Inverter automatically reconnects to the grid once the leakage current recovers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Iac-high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Internal short-circuit or internal components damages</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the AC side cable connection and the control circuit board.</td>
</tr>
<tr>
<td>Remark</td>
<td>Contact Sungrow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Temp-flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Inverter internal temperature exceeds the permitted value</td>
</tr>
<tr>
<td>Measure</td>
<td>Check functionality of fan after the device is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Stop the inverter if this fault occurs 10 times per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>PM-high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Module temperature exceeds the permitted value</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the module and ventilation after the device is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Stop the device if this fault occurs 5 times per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>L over-temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Reactor temperature exceeds the permitted value</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the reactor after the device is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>PDP-pro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Internal fault</td>
</tr>
<tr>
<td>Measure</td>
<td>Wait 5 minutes for device auto-reconnection or disconnect first and then connect the AC main switch Contact Sungrow if the fault insists</td>
</tr>
<tr>
<td>Remark</td>
<td>Stop the inverter if this fault occurs 5 times per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cntr-flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Contactor connected to the grid failure</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the contactor after the device is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Stop the inverter if this fault occurs 5 times per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Fan-flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Inverter internal fan fault</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the functionality of fan after the device is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Contact Sungrow</td>
</tr>
<tr>
<td>Fault</td>
<td>Possible reason</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>DC SPD flt</td>
<td>DC SPD tripping, over-voltage protection</td>
</tr>
<tr>
<td>AC SPD flt</td>
<td>AC SPD tripping, over-voltage protection</td>
</tr>
<tr>
<td>Mism-ac</td>
<td>Sensor is damaged</td>
</tr>
<tr>
<td>Island</td>
<td>Islanding detected</td>
</tr>
<tr>
<td>Ctl power supply-flt</td>
<td>CPS (Control power supply) inside the inverter cannot work normally</td>
</tr>
<tr>
<td>Ctl cabt. Temp-flt</td>
<td>Inverter control cabinet fans fault</td>
</tr>
<tr>
<td>Encoding repeat</td>
<td>Different inverters have the same address</td>
</tr>
</tbody>
</table>
11.4 LCD Display Alarm Information and Troubleshooting

During alarm running state, inverter can operate normally and send warn signal. User can check the alarm information through the Work state on the default menu or through the Function->History-information->His-alarm interface to check the latest 100 history alarm information. Inverter will recover normal operation once the alarm is removed.

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVRT Run</td>
<td>Grid voltage is below 0.9Un and the LVRT function is enabled</td>
<td>Alarm will disappear automatically when grid voltage recover normal</td>
<td></td>
</tr>
<tr>
<td>CT-Unbalanced</td>
<td>Current transformer (CT) on the inverter control cabinet is abnormal</td>
<td>Check and service the CT on the measuring board when inverter is voltage-free</td>
<td>Operation LED will keep green when this alarm occurs</td>
</tr>
<tr>
<td>RISO-low</td>
<td>Inverter DC side insulation resistance is lower than the set value.</td>
<td>Check the PV panel insulation to the ground when inverter is voltage-free</td>
<td>Only alarm display. Inverter can operate normally.</td>
</tr>
<tr>
<td>DC Sensor-err</td>
<td>Inverter DC sensor abnormal</td>
<td>Check and service the DC sensor when inverter is voltage-free</td>
<td></td>
</tr>
<tr>
<td>Anti-PID power flt</td>
<td>For inverter with optional anti-PID function, the power supply of the PID function module is abnormal</td>
<td>Check the PID power supply when inverter is voltage-free</td>
<td></td>
</tr>
<tr>
<td>Fan abnormal</td>
<td>Functionality of the device internal cooling fan abnormal</td>
<td>Check the fan when inverter is voltage-free</td>
<td></td>
</tr>
<tr>
<td>IDM-com-flt</td>
<td>Inverter internal communication abnormal</td>
<td>Check the IDM when inverter is voltage-free</td>
<td></td>
</tr>
</tbody>
</table>
### 11 Troubleshooting

#### Alarm

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Branch rev-ldc-high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>The reverse current of the branch on the DC side is detected to exceed the permissible range</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the abnormal branch when inverter is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Before device stops, the non-abnormal branches can work normally and inverter can operate in grid-connection normally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Branch fwd-ldc-high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>The forward current of the branch on the DC side is detected to exceed the permissible range</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the abnormal branch when inverter is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Before device stops, the non-abnormal branches can work normally and inverter can operate in grid-connection normally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Branch breaker flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Circuit breaker of the branch on the DC side is abnormal and this branch cannot work normally</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the abnormal circuit breaker when inverter is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Before device stops, the non-abnormal branches can work normally and inverter can operate in grid-connection normally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>AC breaker fkt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>AC side circuit breaker is abnormal</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the AC circuit breaker when inverter is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>Before device stops, inverter can operate in grid-connection normally</td>
</tr>
</tbody>
</table>

#### 11.5 Other Faults

<table>
<thead>
<tr>
<th>Fault</th>
<th>Inverter shuts down shortly after start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>DC input voltage just reaches the inverter start-up voltage. Voltage will decrease and inverter will stop when it is under load.</td>
</tr>
<tr>
<td>Measure</td>
<td>Design the serial and parallel connection in accordance with the open circuit voltage; increase the input DC voltage; avoid adopting the critical voltage</td>
</tr>
<tr>
<td>Remark</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>LCD Display Cannot Start or Stop Inverter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible reason</td>
<td>Communication malfunction between the LCD display and the DSP; LCD power supply malfunction</td>
</tr>
<tr>
<td>Measure</td>
<td>Check the connection between the LCD display and the DSP when inverter is voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>-</td>
</tr>
</tbody>
</table>
## Fault
Communication Failure with PC

### Possible reason
Possible reasons are various. Please refer to the Measure for troubleshooting

### Measure
- Check if the address and the Baud rate of the LCD are the same with that 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 disk is installed incorrectly. It is recommended to reinstall the disk
- If all the above-mentioned items are correct and this fault continues, please replace the PC communication module on the LCD display

### Remark
The monitor disk might be incompatible with the antivirus software and thus cannot be installed correctly. You are recommended to disable the antivirus software and then install the monitor software. If the fault still occurs, please contact Sungrow
12 Routine Maintenance

12.1 Safety Instructions

Due to the effect of ambient temperature, humidity, dust and vibration, the inverter and the inner components will be aging and worn out. 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 in good working conditions, are within the maintenance scope.

12.1.1 Safety Instructions

**WARNING**

Lethal voltage inside the inverter!
Wait at least 5 minutes after inverter stops before opening the cabinet door. Make sure the device internal is completely voltage free before 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 at fine weather days.

**WARNING**

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

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

12.1.2 Five Safety Rules

Respect the following five rules during maintenance or service on 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 accidentally.
• Verify that the inverter interior is discharged completely with a multimeter.
• Necessary ground and short circuit connect.
• Cover the adjacent electrical components with insulation cloth during operation.

12.2 Maintenance

12.2.1 Introduction

With IP54 protection degree, the inverter can be installed outdoors. Harsh environment condition or long-time operation, however, may cause age and damage of the inverter. Check and maintain the inverter periodically and replace the aged components can effectively enlarge the service life and increase the device performance inside the inverter.

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

12.2.2 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 places, for example desert arrears, the maintenance interval shall be shortened. Esp. the cleaning of the inverter outside and anti-corrosion & anti-rust work should be more frequent.

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

**WARNING**

Check the module fans inside the inverter periodically and the fans on top of the cabinet for abnormal operation and abnormal noise. If so, there may be dust penetrating inside the inverter. Stop the inverter and clean the dust.

Wait at least 5 minutes after the inverter discharge completely. Before cleaning, make sure, with multimeter, the inverter internal is discharged completely to avoid electric shock.

**WARNING**

Almost all maintenance work needs to remove the internal protective grid during maintenance. Make sure to reassemble the grid and fasten all the screws after the maintenance work.

Make sure all bolts are securely fixed.

**WARNING**

Once any unconformity is found during routine maintenance of the inverter and internal devices please make correction immediately. If any doubts arise, please contact Sungrow.
## Routine Maintenance

### System Manual

<table>
<thead>
<tr>
<th>Item</th>
<th>Method</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External checking</strong></td>
<td>Make correction immediately once the following items are found:</td>
<td>Every quarter</td>
</tr>
<tr>
<td></td>
<td>• Check if there is flammable materials on top of and around the inverter; and if there are other factors that may impair the system operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the inverter and the foundation are firmly connected and if there is rust</td>
<td></td>
</tr>
<tr>
<td><strong>System states and cleaning</strong></td>
<td>• Check the inverter and internal devices for deformation and damages</td>
<td>Once a month</td>
</tr>
<tr>
<td></td>
<td>• Check the inverter and internal devices for abnormal noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the inverter internal and device enclosure temperature is too high</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the inverter internal humidity and dust deposition are too heavy. Clean the inverter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the air inlet and outlet are blocked;</td>
<td></td>
</tr>
<tr>
<td><strong>Module cleaning</strong></td>
<td>• Check if the circuit board and the component are clean;</td>
<td>From every six months to annually depending on the dust deposits.</td>
</tr>
<tr>
<td></td>
<td>• Check the temperature and dust of the heat-sink. Use vacuum cleaner to clean the module if necessary;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Replace the air filter if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Notice! Check the air inlet and outlet. The device may be damaged by overheating.</td>
<td></td>
</tr>
<tr>
<td><strong>Warning labels</strong></td>
<td>• Check if the warning labels are clearly visible. Replace them if necessary</td>
<td>Once per year</td>
</tr>
<tr>
<td><strong>Cable connection</strong></td>
<td>Check the cable connection after the inverter and internal devices are voltage free. Make correction once unconformity is found;</td>
<td>Once per year</td>
</tr>
<tr>
<td></td>
<td>• Check if all cable entries are sealed properly;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if there is water leakage inside the inverter; check if inverter windows and doors can close and open flexibly; check if the sealing strip is sealed properly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the power cable connections are loose. Retighten them with the torque specified in the manual if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the power cables and control cables, especially the surface in contact with the metal are damaged;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check if the wrap belt of the connection terminals is strip-off</td>
<td></td>
</tr>
<tr>
<td><strong>Air inlet/outlet</strong></td>
<td>Check if the air inlet filter and ventilation ducts of the inverter and internal devices are normal</td>
<td>Every six months or maintain according to real situation</td>
</tr>
<tr>
<td></td>
<td>Clean or replace the filter</td>
<td></td>
</tr>
<tr>
<td><strong>Fan</strong></td>
<td>Check the running state of the fan inside the inverter;</td>
<td>Every six months or maintain according to real situation</td>
</tr>
<tr>
<td></td>
<td>Check if there is crack in the fan blade</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check if there is abnormal noise during the running of the fan;</td>
<td></td>
</tr>
</tbody>
</table>
### Device maintenance

- Routine check the corrosion of the metal components (once six months)
- Annually check the contactors (auxiliary switches and micro-switches) to ensure the optimal operation
- Check the running parameters (esp., voltage and insulation)

From every six months to annually

### Safety function

- Check the emergency stop button and the LCD stop function;
- Simulation shutdown
- Check the warning labels and other markings for damage or unclearness. Replace them if necessary

From every six months to annually

### Software maintenance

- Optimize software
- Check each parameter setting

From every six months to annually

### LCD time display

- Check if the time displayed on the LCD display is correct;
- Replace the button cells on the back of the LCD panel if time is incorrect after calibration.

From every six months to annually

### Firefighting device

- Check the functionality of the firefighting devices

Follow related regulation where the project is located

### Other devices

- Replace the damaged lighting devices in time

When necessary

---

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.

### 12.3 Cleaning the Inverter

#### 12.3.1 Introduction

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

Due to the effect of 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. There may be potential faults of the inverter internal devices and the service life of the internal devices as well as the power yields may be affected.

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

#### 12.3.2 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 recommended to check every one or two months 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 every half a month or even shorter. The cleaning of the inverter inside devices and the air inlet and outlet shall be more frequent.
12.3.3 Cleaning the Internal Dust

For the inverter internal dust cleaning, please use a vacuum cleaner instead of broom.

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

12.3.4 Cleaning the Foundation

The foundation is designed with maintenance entry. You should enter inside the foundation to check the cleanness of the foundation periodically. Use a vacuum cleaner to clean the foundation if necessary.

12.3.5 Filter checking and cleaning

- It is recommended to check and clean the inverter filter at least every six months.
- The maintenance interval should be shortened to once every three months or shorter 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.

Cleaning and replacing operation are performed on 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.

- 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.

12.3.6 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 inverter top first and then clean the inverter side. You can clean it directly or wash with water.

12.3.7 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.

12.3.8 Checking the Sealing Strip

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

12.4 On-site 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

<table>
<thead>
<tr>
<th>Step</th>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Clean the smudginess on the surface by rag (or other cleaning tool) with water</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>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)</td>
</tr>
</tbody>
</table>
**Maintenance and operation steps for situation 2:**

Materials:
- Abrasive paper
- Rag
- Water
- Alcohol
- Hairbrush
- Oil paint RAL7035

<table>
<thead>
<tr>
<th>Step</th>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image" alt="Image" /></td>
<td>Polish the rough oil paint surface or the scratched parts by abrasive paper until the surface is smooth</td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="Image" /></td>
<td>Clean the target parts by rag with water or use 97% alcohol</td>
</tr>
<tr>
<td>3</td>
<td><img src="image" alt="Image" /></td>
<td>When the surface is clean and dry, paint the scratched parts of the oil paint by banister brush and make sure the painting is as uniform as possible (color of the oil paint is RAL7035)</td>
</tr>
</tbody>
</table>

**Maintenance and operation steps for situation 3:**

Materials:
- Abrasive paper
- Rag
- Water
- Alcohol
- zinc primer
- Hairbrush
- Oil paint RAL7035

<table>
<thead>
<tr>
<th>Step</th>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1.png" alt="Figure 1" /></td>
<td>Polish the damaged parts of the oil paint to remove the surface rust or other roughness</td>
</tr>
<tr>
<td>2</td>
<td><img src="image2.png" alt="Figure 2" /></td>
<td>Clean the target parts by rag with water or use 97% alcohol to clean the surface dust and dirty</td>
</tr>
<tr>
<td>3</td>
<td><img src="image3.png" alt="Figure 3" /></td>
<td>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</td>
</tr>
<tr>
<td>4</td>
<td><img src="image4.png" alt="Figure 4" /></td>
<td>Paint the scratched parts by banister brush when the primer is dry, and make sure the painting is as uniform as possible (color of the oil paint is RAL7035)</td>
</tr>
</tbody>
</table>
Check the protective paint on the inverter surface for peeling off. Please re-paint the inverter surface if necessary. Re-spray the protective paint every 3-5 years to the inverter surface.

12.5 Replacement of the electrical components

⚠️ WARNING
The electrical components inside the inverter must be replaced by the same 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, please contact Sungrow.

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

**Input (DC)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. PV input voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>Min. PV input voltage / Startup input voltage</td>
<td>520 V / 540 V</td>
</tr>
<tr>
<td>MPP voltage range for nominal power</td>
<td>520 – 850 V</td>
</tr>
<tr>
<td>No. of independent MPP inputs</td>
<td>1 or 4</td>
</tr>
<tr>
<td>No. of DC inputs</td>
<td>16 – 32</td>
</tr>
<tr>
<td>Max. PV input current</td>
<td>5424 A</td>
</tr>
<tr>
<td>Max. DC short-circuit current</td>
<td>6780 A</td>
</tr>
</tbody>
</table>

**Output (AC)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC output power</td>
<td>2772 kVA @ 45 °C / 2520 kVA @ 50 °C</td>
</tr>
<tr>
<td>Max. inverter output current</td>
<td>4444 A</td>
</tr>
<tr>
<td>AC voltage range</td>
<td>6 – 40.5 kV</td>
</tr>
<tr>
<td>Nominal grid frequency / Grid frequency</td>
<td>50 Hz / 45 – 55 Hz, 60 Hz / 55 – 65 Hz</td>
</tr>
<tr>
<td>THD</td>
<td>&lt; 3 % (at nominal power)</td>
</tr>
<tr>
<td>DC current injection</td>
<td>&lt; 0.5 % In</td>
</tr>
<tr>
<td>Power factor at nominal power / Adjustable</td>
<td>&gt; 0.99 / 0.8 leading – 0.8 lagging</td>
</tr>
<tr>
<td>power factor</td>
<td></td>
</tr>
<tr>
<td>Feed-in phases / Connection phases</td>
<td>3 / 3</td>
</tr>
</tbody>
</table>

**Efficiency**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter max. efficiency / Inverter Euro efficiency</td>
<td>99.0 % / 98.7 %</td>
</tr>
</tbody>
</table>

**Transformer**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer rated power</td>
<td>2500 kVA</td>
</tr>
<tr>
<td>Transformer Max. power</td>
<td>2750 kVA</td>
</tr>
<tr>
<td>LV / MV voltage</td>
<td>0.360 kV / 6 – 40.5 kV</td>
</tr>
<tr>
<td>Transformer Vector</td>
<td>Dy11</td>
</tr>
<tr>
<td>Oil type</td>
<td>Mineral oil (PCB free) or degradable oil on request</td>
</tr>
</tbody>
</table>

**Protection**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC reverse connection protection</td>
<td>Yes</td>
</tr>
<tr>
<td>DC input protection</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>Inverter output protection</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td>AC output protection</td>
<td>Load switch + fuse</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>DC Type II / AC Type II</td>
</tr>
<tr>
<td>Grid monitoring / Ground fault monitoring</td>
<td>Yes / Yes</td>
</tr>
<tr>
<td>Insulation monitoring</td>
<td>Yes</td>
</tr>
<tr>
<td>Overheat protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Anti-PID function</td>
<td>Optional</td>
</tr>
</tbody>
</table>

**General Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W×H×D)</td>
<td>6058×2896×2438 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>18 T</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Auxiliary power supply</td>
<td>220 Vac, 2 kVA / Optional: 415 Vac, up to 40 kVA</td>
</tr>
</tbody>
</table>
### 13.2 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:

<table>
<thead>
<tr>
<th>Screw size</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque (N·m)</td>
<td>0.7–1</td>
<td>1.8–2.4</td>
<td>4–4.8</td>
<td>7–8</td>
<td>18–23</td>
<td>34–40</td>
<td>60–70</td>
<td>119–140</td>
</tr>
</tbody>
</table>

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

### 13.3 Exclusion of Liability

The content of these documents is periodically checked and revised where necessary. Please call us or check our website www.sungrowpower.com for the latest information. No guarantee is made for the completeness of these documents. Please contact our company or distributors for the latest version.

Guarantee or liability claims for damages of any kind are excluded if they are caused

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

The use of supplied software produced by Sungrow Power Supply Co., Ltd. is subject to the following conditions:

- Sungrow Power Supply Co., Ltd. assumes no liability for direct or indirect damages arising from the use of software. This also applies to the provision or non-provision of support activities.
- Software used for commercial purposes is prohibited.
• Decompiling, decoding or destroying the original program, including software and the embedded software, is prohibited.

13.4 Contact Information

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

• Type of the inverter
• Serial number of the inverter
• Fault code/name
• Brief description of the problem

China (HQ)       Australia
SUNGROW POWER SUPPLY Co., Ltd  SUNGROW Australia Group Pty. Ltd.
Hefei          NSW
+86 551 65327834  +61 2 9922 1522
service@sungrowpower.com  service@sungrowpower.com.au

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Sao Paulo          Paris
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kaue.oliveira@sa.sungrowpower.com  service.france@sungrow.co

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service.germany@sungrow.co

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+827077191889  +6019897 3360
service@kr.sungrowpower.com  service@my.sungrowpower.com
<table>
<thead>
<tr>
<th>Country</th>
<th>Company Name</th>
<th>City</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippines</td>
<td>SUNGROW POWER SUPPLY Co., Ltd</td>
<td>Mandaluyong City</td>
<td>+639173022769</td>
</tr>
<tr>
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