SG2000/2500
Turnkey Station
System Manual
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1 About This Manual

1.1 Foreword

Thank you for purchasing the 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 Turnkey Station.

- SG2000
- SG2500

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 module 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**

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

⚠️ **WARNING**

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

⚠️ **CAUTION**

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

**NOTICE**

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

🔍 **NOTE**

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. 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>⚡️⚠️</td>
<td>Lethal voltage inside! Do not touch!</td>
</tr>
<tr>
<td>🚨🔥</td>
<td>Hot surface! Do not touch the hot surface of the device.</td>
</tr>
<tr>
<td>⚡️💧</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.

1.7 Terminology

In this manual, the Turnkey Station will be referred to as “inverter” and the central PV grid-connected module will be referred to as “module” 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 station. By adopting outdoor standard container design, the inverter integrates the PV modules, monitoring units, power distribution units, firefighting system, lighting devices and security & protection system to meet the modular design and quick installation requirement of the large-and-medium PV power station as well as ensure the long-time, reliable and safe grid-connected power generation.

The output of the inverter can match MV grid with different grid level via different external transformer. The PV power generation system with inverter is shown in the following figure.

<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>Transformer</td>
</tr>
<tr>
<td>E</td>
<td>Utility Grid</td>
</tr>
</tbody>
</table>

![Fig. 2-1 Application of Inverter to the PV Power System](image)

**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, ensure:

- 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 module 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 5 minutes after the module stops completely to operate the module.

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.

⚠️ WARNING
- 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:

- Nameplates are pasted on the inverter internal devices, like the module, intelligent PMD and etc. They contain very important parameter information about the devices. Protect the nameplates 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.
• The modules and cooling fans inside the inverter may emit acoustic noise during operation. Wear noise abatement earplug when entering into the inverter.
• 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.
# 3 Product Description

## 3.1 External Design of Inverter

### 3.1.1 Inverter Views

<table>
<thead>
<tr>
<th>View</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front view</td>
<td>Front of the inverter; a pair of doors is equipped</td>
</tr>
<tr>
<td>Back view</td>
<td>Back of the inverter; a pair of doors is equipped</td>
</tr>
<tr>
<td>Left view</td>
<td>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>
<tr>
<td>Right view</td>
<td>The AC output of the inverter is routed out from the right side. Remove the AC plate, then the AC power connections can be started. The inverter external grounding point is located on the lower right side.</td>
</tr>
</tbody>
</table>
3.1.2 Mechanical Parameter

**Dimensions**

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

![Fig. 3-1 Appearance and dimensions of the inverter](image)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2991mm</td>
<td>2591mm</td>
<td>2438mm</td>
</tr>
</tbody>
</table>

3.1.3 Ventilation Design

Cooling air comes into the inverter from the bottom and hot air goes out of the inverter from the top. The schematic diagram is shown in the figure below.

![Ventilation Diagram](image)

3.2 Internal Design of Inverter

3.2.1 Internal Components

Figure below shows the top view of the major electrical components inside the inverter:
Device 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>Intelligent PMD</td>
<td>The upper part of the cabinet integrates monitoring function and the lower part of the cabinet integrates AC power distribution function</td>
</tr>
<tr>
<td>#1</td>
<td>Module 1</td>
<td>Hereinafter the four modules will be referred to as #1, #2, #3 and #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>
</tbody>
</table>

### 3.2.2 Cable Entry Design

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

The DC cables get inside through the bottom of the inverter while the AC connections get inside through the right side 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 should be sealed by fireproof mud or other appropriate materials.

The inverter bottom cable entries are shown below.

Function of each opening is shown below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC cable inlet</td>
<td>DC cables connect to the module DC side through cable glands</td>
</tr>
<tr>
<td>2</td>
<td>AC cable outlet</td>
<td>Connect to the downstream transformer through this hole</td>
</tr>
<tr>
<td>Item</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Communication &amp; power distribution cable entry</td>
<td>Communication &amp; power distribution cables come inside the inverter through this hole</td>
</tr>
</tbody>
</table>

Hole dimensions (in mm)

3.3 Module Design

3.3.1 Appearance of the Modules

Four modules are inside of each inverter. 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>DC Cabinet</td>
<td>DC cable connection terminals are on the lower part of the cabinet</td>
</tr>
</tbody>
</table>
3.3.2 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. 3-5 Electrical connections area of the module(The picture is indicative for 6 inputs)](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-</td>
</tr>
</tbody>
</table>

3.4 Intelligent PMD

3.4.1 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.

3.4.2 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.

### 3.4.3 Electrical 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.

<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

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Quantity</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Turnkey Station</td>
<td>1pcs</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>1set</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>70</td>
<td>M12×40 / M16×45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>M16×55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>M6×16</td>
</tr>
<tr>
<td>G</td>
<td>Flat washer</td>
<td>140</td>
<td>Φ12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>Φ16</td>
</tr>
<tr>
<td>H</td>
<td>Spring washer</td>
<td>70</td>
<td>M12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>M16</td>
</tr>
<tr>
<td>I</td>
<td>Nut</td>
<td>70</td>
<td>M12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>M16</td>
</tr>
<tr>
<td>J</td>
<td>Bolt kit</td>
<td>50</td>
<td>M5×16</td>
</tr>
<tr>
<td>K</td>
<td>Large flat washer</td>
<td>50</td>
<td>M5</td>
</tr>
</tbody>
</table>

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

Identify the inverter from the nameplate located on the lower left side of inverter left side (identified by “A” 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.

![Fig. 4-1 Location of the inverter nameplate](image)

**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 the scope of delivery described in 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 Inverter Storage

If the inverter is not installed immediately after reception, store the inverter as described in this chapter.

- Store the inverter indoors such as in a large warehouse or a workshop to prevent condensation inside the inverter, or the seepage of rainwater into the inverter.
- Raise the base of the inverter, with the specific height reasonably determined based on the geological and meteorological condition on site, if the inverter must be stored outdoors due to on-site conditions. Moreover, provide heating and other measures for internal devices of the inverter when the ambient temperature is too low.
- Temperature of storage environment: -40°C - +70°C; relative humidity of storage environment: 0 - 95%, no condensation.
- Store the inverter on dry, flat and solid ground with sufficient load capacity and no vegetation. The ground should be flat, without accumulated water or unevenness
- Ensure all doors of the inverter and internal devices are locked during storage.
- Take effective measures to prevent penetration of rain and dust. Effectively protect the air inlets and outlets of the inverter at least.
- Inspect the device regularly. Inspect the inverter for damages once every half month at least.
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 can be transported as a whole. If necessary, transport the inverter by fork lift truck 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 10t.
- The crane should have sufficient arm length and radius of gyration.
- All the connection point must be firmly connected.
- The length of the slings can be adjusted appropriately according to on-site conditions.
- Transport the inverter in a level, smooth and steady way.
- Transport the inverter by connecting the four top corner fittings.
- Some accessories may be 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.

![Fig. 5-1 Hoisting the Inverter](image)
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.
### Lifting device

<table>
<thead>
<tr>
<th>Hook</th>
<th>U-hook</th>
</tr>
</thead>
</table>

#### Connections

- Insert the hook from inside to outside.
- Lateral pin of the U-hook should be tightened.

---

**WARNING**

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

---

### 5.3 Transport with Forklift

If the installation site is flat, forklifts can be used to transport the inverter. Standard fork pockets are designed at the bottom of the inverter for handling with forklifts.

During transport, the fork pockets must be used.

When a forklift is used to transport the inverter, the following conditions must be met:

- The forklift used must have sufficient carrying capacity (at least 10 tons).
- The prong of the forklift used should be at least 2991mm long.
- Insert the prong into the fork pockets at the bottom of the inverter. The position of the fork pockets is shown below. The prong should be at least 2991mm long to carry the inverter.
- During handling, please handle the unit slowly and steadily. Be sure to perform trial handling first.
- The place should be firm and flat, with good drainage and no obstacles or humps. The inverter should be placed and supported by the four bottom fittings.
Transport the inverter with forklift

**WARNING**

- The fork pockets must be used to handle the inverter.
- Under no circumstance should the inverter be handled by directly inserting the prong below the bottom of the inverter.

The slots and the inverter interior have already been sealed properly. There is no need to seal the slots after the field installation.

### 5.4 Foundation

#### 5.4.1 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 and 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.

#### 5.4.2 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 820mm 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.

5.4.3 Recommended foundation construction method

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. 5-4 Inverter foundation and wiring (recommended)](image)

- A maintenance platform should be built for the convenient maintenance and repair work.
• According to the position and size of the cable inlets/outlets at the bottom of the inverter, cables must thread through the bottom of the inverter. During the foundation construction, reserve the trough for connections and pre-bury the wire pipes.
  − Recommended cable trench size (W×D): 800mm×800mm.
  − The specifications and quantity of wire pipes should be determined by the models and quantity of cables used.
• The steel is pre-embedded before and after the foundation surface so that foundation of inverter welded with the foundation upon 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.
• Catch pits should be designed at the bottom of the foundation and drain pipes should be provided.
• Please leave an entrance with special covers for the staff during foundation construction.
• Pre-bury 50mm×5mm hot galvanized steel plates diagonally at the foundation as the grounding units. The recommended depth is 0.8m. Weld one end of the hot galvanized steel plates with the main grounding network of the power inverter and the other end with the pre-buried steel plates. Make sure the welding is firm and reliable.
• It is recommended to build steps at the front and back door of the inverter to facilitate entry of personnel. Recommended step height: 150mm; depth: 200mm. The step width and the number of steps should be determined by the actual situations on site.
• The two ends of all pre-buried pipes must be sealed temporarily to prevent entry of foreign objects so as to facilitate future wire implementation.
• After electrical connections, cable outlet/inlet and gaps in-between should be sealed with fireproof mud to prevent entry of rodents.
• For other recommended sizes, please refer to the above figure and drawings.

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.

Hoist the inverter onto the foundation after the foundation is dry enough.
Weld the four corners on the bottom of the inverter to the pre-buried steel channel on the front and rear edges of the foundation bottom firmly. 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.
### 5.5 Flashings Installation

#### 5.5.1 Brief Introduction

It is recommended to install the flashings after the inverter is installed and fixed. The flashings can also be installed before the inverter 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 inverter 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.

#### 5.5.2 Preparation before Installation

Before delivery, the front and back of the Turnkey Station are equipped with sealing plates. Locations of the sealing plate is shown as A in the following figure.

Remove these sealing plates before installing the flashings.
5.5.3 Installation Steps

**NOTICE**
Seal the gaps between the flashings and the inverter enclosure with material withstanding high temperature of at least 70℃, to prevent penetration of wind or rain.

5.5.4 Installation Steps

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="#" 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="#" 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="#" alt="Figure" /></td>
<td>Install the flashing. Install the flashing to the pre-set position. Screw all the seven tightening screws that connect the flashing to the inverter.</td>
</tr>
<tr>
<td>4</td>
<td><img src="#" 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 inverter using the waterproof glue in the scope of delivery.</td>
</tr>
</tbody>
</table>
### 5.6 Remove Attached Film

Films are attached to the inverter air inlets before delivery, and the locations are shown by A in the following figure. Remove these films before commissioning.
6 Electrical Installation

6.1 Safety Instructions

⚠️ 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 module.

⚠️ 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 module to public grid only after receiving authorization from the local network operator.

⚠️ WARNING
Only professional electricians can perform the operations described in this chapter.
Observe all the instructions 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.
If the star connection is used for the winding of the low voltage side of a dual split transformer and N terminals are used, the N terminals cannot be connected or grounded.

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.

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.

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.

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.

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.

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

- Disconnect all the external connections and disconnect the inverter internal power supply.
- Avoid any accidental re-connections.
- Verify that no voltage or current is present with appropriate 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:

![Copper Wire Terminal Connection Sequence](image)

---

6.2.2 Aluminum Wire Connection

When the aluminum wire is selected, a copper-aluminum bi-metallic lug is needed as shown below:
A

B

C

D

E

F

Fig. 6-2 Albronze filter connection

| A | Copper Bus | B | copper-aluminum bi-metallic lug | C | Bolt | D | Spring washer | E | Flat washer | F | Nut |

Beware the direction of the albronze filter, i.e. the copper side must be closely attached to the copper bus and the aluminum side must be closely attached to the aluminum connection terminal.

Copper side
(to copper bar)

Aluminum side
(to aluminum terminal)

Fig. 6-3 Albronze filter connection direction

When the busbar has several connection terminals, an intact albronze filter is required as shown in the following figure.

Inverter copper bar

Albronze filter

Terminal

Fig. 6-4 Intact albronze filter connection direction

6.3 Preparation before Electrical Connections

Cables inside the inverter have been connection before delivery. The electrical connection in this chapter is mainly the power cable, communication cable and power supply cable related to the module. If the intelligent PMD has inverter power supply connection, it is also included inside the electrical 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 multimeter
- 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.

![Fig. 6-5 Open the front door](image)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Front door is locked</td>
</tr>
<tr>
<td>(2)</td>
<td>Reveal the keyhole by moving the keyhole cover up</td>
</tr>
<tr>
<td>(3)</td>
<td>Insert the key and turn it clockwise</td>
</tr>
<tr>
<td>(4)</td>
<td>Turn the handle counterclockwise and open the front door</td>
</tr>
</tbody>
</table>

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 Removing the AC plate

The AC output copper bars are routed out from the right side of the inverter. Remove the AC plate.

6.3.6 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.

6.3.7 During Connection

⚠️ WARNING

- Make sure the DC cables are correctly routed before connection.
- Do not pull the cables hard during connection.
- Make sure there is enough wire bending space for all connection cables.
- Take proper 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

<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>K</td>
<td>Intelligent PMD</td>
</tr>
<tr>
<td>H</td>
<td>Other devices inside the inverter</td>
</tr>
<tr>
<td>A</td>
<td>DC input</td>
</tr>
<tr>
<td>B</td>
<td>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>
</tbody>
</table>
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 module.
- 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 cable of 70 mm²</td>
</tr>
<tr>
<td>B</td>
<td>AC output</td>
<td>Three-phase, cable of 240mm² at most in case of connection via cable</td>
</tr>
<tr>
<td>C</td>
<td>External communication interface</td>
<td>RS485 and Ethernet interface for standard version; Optional RS232/RS485, Ethernet, IEC61850, DNP3.0, 101,103,104 and other standard communication interfaces</td>
</tr>
<tr>
<td>D</td>
<td>External 3-phase power supply</td>
<td>External power supply is connected to supply power to the devices inside the inverter for ensuring normal operation Recommend 10mm² anti-flaming cables</td>
</tr>
</tbody>
</table>

Power supply modes of the inverter include:
- External power supply mode: power supplied by the external 3-phase power supply
- Internal power supply mode: power supplied by the AC output of the modules

The external power supply mode is not the mandatory option. Alternatively, the switch between the two modes can be provided to improve power supply reliability.

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

**WARNING**

The country-specific regulations and standards must be observed at all times!

Grounding connection can be divided into two parts, equipotential connection of inverter internal devices and external grounding.

**Equipotential connection of station internal devices**

The inverter internal parts that need to ground have already finished equipotential connection.

**External grounding**

User needs to connect the plant external ground cable to the internal ground copper bar during on-site connection. The ground terminal is also reserved on the side of the cabinet exterior for redundant selection to connect, as shown in the figures below.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Left side" /></td>
<td>Left side</td>
</tr>
<tr>
<td><img src="image2" alt="Right side" /></td>
<td>Right side</td>
</tr>
</tbody>
</table>

Note: The unit is in mm.

Two schemes are recommended below to securely grounding the inverter:

- Weld the grounding flat steel to the external grounding point of the inverter according to the foregoing dimensions. After welding, take anti-corrosion measures for the welding point.
- Use M10 bolts to fix the grounding cable and the external grounding point of the inverter.

Conduct the ground connection to the inverter external according to the actual situation on site and the instructions of the plant staff.

Measure to make sure the ground resistance does not exceed 4Ω after ground connection.

You can also connect the ground cable to the inverter internal ground copper bar if required.
6.6 DC Connection

6.6.1 Checking before Connection

Check the following items before cable connections.

- Check the open-circuit voltage of the PV array to ensure the open-circuit voltage is within the max. DC voltage of the module.
- 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 module. The module may be damaged if otherwise.
- If the ground fault is found, it must be removed before any DC connection.

**WARNING**

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

6.6.2 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.

![Diagram of cable lug installation]

**Step 3** Crimp the cable lug. It is advisable to select DT-xx (xx 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 Cable Connection Parts".
3. Fasten the bolts with screwdriver or spanner.

<table>
<thead>
<tr>
<th>DC Inputs</th>
<th>Breaker</th>
<th>Connection holes</th>
<th>Bolt</th>
<th>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>M16×45</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>
</tbody>
</table>

**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.

Finish the DC cable connection of all four modules according to the above steps.
6.7 AC Connection

6.7.1 Safety Notices

**WARNING**

Incorrect AC connection may cause damages to the module.

**WARNING**

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

**WARNING**

Strictly follow all the instructions when connecting.

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

6.7.2 AC Connection

**Step 1** Disconnect the grid-side switches downstream of the inverter.

**Step 2** Remove the AC plate, then the three AC output copper bars can be seen, as shown in the following figure.

![Diagram](image)

**Step 3** Check for the AC connection sequence.

**Step 4** Connect the output copper bus bar L1 to the L1/U/A side of the downstream device; connect L2 to the L2/V/B of the downstream device; and connect L3 to the L3/W/C of the downstream device.

**Step 5** Fasten the foregoing terminals by using M16×55 bolts in the scope of delivery. The fastening torque is 119-140 N·m.

**Step 6** Check to ensure the connections are secure.
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>Circuit breaker</th>
<th>Function</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Control the internal power supply mode; close Q1 in internal power supply mode</td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>Control the external power supply mode; close Q2 in external power supply mode</td>
<td></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 Connection

The cable connection areas inside the intelligent power distribution cabinet are shown in the figure below.
On site, perform cable connection according to internal terminal markings.

<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>

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

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 of the circuit diagram inside the cabinet door for the mark of the circuit breaker.

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,

- Close the cable entries on the bottom of the module by following the reversed procedure in opening the cable entries.
- The gap at the cable inlet/outlet at the bottom and right of the inverter should be sealed with fireproof mud.
- Water-proof treatment should be done on the foundation of the inverter.
7 Commissioning

7.1 Safety Instructions

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Electric shock!</td>
</tr>
<tr>
<td>• Wear proper protection equipment before all operations on the device.</td>
</tr>
<tr>
<td>• Do not touch the live terminals or conductors.</td>
</tr>
<tr>
<td>• Respect all safety instructions inside the device and in this manual.</td>
</tr>
<tr>
<td>• Respect all safety instructions prescribed by the manufacturer of devices connected to the inverter.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-connection of the inverter can be done only after receiving approval from the local utility grid company and by qualified personnel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the inverter is operating, make sure there are no flammable materials at least 5 meters around the installation site.</td>
</tr>
<tr>
<td>Local/national standards about the min. electric clearance around the inverter should be respected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure the installation is correct and no spare parts or tools are left inside the device.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close the doors of the inverter and the internal devices if the commissioning process is stopped.</td>
</tr>
</tbody>
</table>

7.2 Requirements of Commissioning

Before commissioning, installation of the four modules and the intelligent PMD 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 module requirements and the polarity is correct.
• Ensure AC side voltage meets module requirements.
• Ensure all cable connections meets related standards and requirements.
• Ensure the system is properly grounded. Ground resistance is important for the whole system so that before commissioning, make sure the ground resistance is less than 4Ω.

**WARNING**

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

**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 module AC side PE ground copper bar has connected to the equipotential connection point in the electrical room and properly grounded. The ground resistance should be no more than 4Ω.

#### 7.3.2 Checking the Module

• Ensure that the DC and AC switches are in the “OFF” position.
• Check and ensure module 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 module max. input DC voltage. Too high DC voltage may damage the module even cause safety incident.
To ensure the system reliability and device operation, one module 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.

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

- 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. Module 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 module 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** Connect the input 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** Measure if the AC side voltage of #1 module is normal; if yes, connect the AC switch of #1 module.
- **Step 5** Check if the communication, AC voltage amplitude and frequency of #1 module are normal from the LCD. If yes, connect one DC switch.
- **Step 6** 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 7** Perform the above steps to #2 module, #3 module and #4 module.
- **Step 8** Perform the stop operation from the LCD.
- **Step 9** 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 module normal operation for the first time, please measure the module 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 module 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 module 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 module: abnormal noise, overheating, smoking or unusual odor.
- Check the module grid-connected voltage, current and THD for unstableness.
- Check the grounding of the module enclosure.
- Check the functionality of the LCD display.
- Record accurately the module operation data during commissioning.

The duration of commissioning depends on the plant scale, plant location, on-site environmental conditions and so on. Usually, if the in-site condition is good, the commissioning can last for 1 week, i.e. 168 hours.
The commissioning of the module is completed. Module operates normally. After commissioning, plant starts power generation and enters daily maintenance process.

⚠️ **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.

---

**NOTICE**

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 module 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.
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.
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 as shown in the following figure. User can check or set related data by touching the icons on the LCD display.

![LCD Display](image)

**Fig. 9-1 Location and Appearance of the LCD Display**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Running state indicator, it is red when powered on and turns to green during normal operation</td>
</tr>
<tr>
<td>B</td>
<td>Data display and operation area</td>
</tr>
</tbody>
</table>

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 when the intelligent PMD is power on and then enters into the starting menu.

Initialization

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 four modules respectively</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.

**WARNING**

LCD screen contains lots of parameters pertinent to the inverter operation. All parameter configurations must be done by appointed personnel. Do not modify any parameters before you fully understand this manual or consult the staff from Sungrow.

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></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></td>
<td></td>
<td>History-information</td>
<td>His-event</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>His-fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>His-data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>His-alarm</td>
</tr>
</tbody>
</table>
9 LCD Menu Operation

<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>Set-parameter</td>
<td>Sys-parameter</td>
<td>Language &amp; Firmware Ver.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>E-total adjust*</td>
<td>Remote/Local control*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Load default</td>
</tr>
<tr>
<td>Run-parameter</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro-parameter</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Com-parameter</td>
<td>Serial port param.</td>
<td></td>
<td>Network param.</td>
</tr>
</tbody>
</table>

Note: *is optional

9.3.2 Layout of the submenus

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

![Menu Layout](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Title bar&lt;br&gt;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.</td>
</tr>
<tr>
<td>B</td>
<td>Data display or parameter configuration.</td>
</tr>
<tr>
<td>C</td>
<td>From left to right: the three main icons; the return button to return to the previous menu by tapping it.</td>
</tr>
</tbody>
</table>

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 digitals 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 4 modules can be checked.

The output power, DC voltage & current, power factor, reactive power, efficiency, daily/monthly/annual power yields, internal temperature, positive/negative insulation resistance to the ground, running time, amount of 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”;

**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.
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 one or more than one 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 4. Tap the fault cell of module unit 4 to check the present fault.

The fault interface of module unit 4 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.

By tapping the start/stop button on the screen, all the four modules will start or stop at the same time. 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 Energy Output Deviation Adjustment

Energy output deviation adjustment is useful when the total power output displayed in LCD (E-total) is different from the reading value of the external power measuring device. 

(\text{Energy-adj value}) = (\text{Real measured value}) - (E\text{-tot reading value}).

To adjust the date or time, proceed as follow:

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

**Step 2** Tap “Set-parameter”;

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

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

![E-total adjust](image)

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

**Step 5** Tap “Enter” to confirm the setting.

9.12 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;

![Load default](image)

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

9.13 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.

## 9.14 Parameters of LCD

### 9.14.1 Communication Parameters

**WARNING**

Improper communication parameter configuration may lead to communication failure!

Follow strictly the instructions of the 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.

9.14.2 Running Parameters

Setting Running Parameters

Step 1 Tap “Function” from the default menu;

Step 2 Tap “Set-parameter”;

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

Step 4 Set the running parameter by tapping the pop-up keypad and tap ENTER to confirm setting. Tap “Prev” or “Next” to turn pages up or down.
9.14.3

Table 9-1 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 inverter 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 inverter performs the stop command</td>
</tr>
<tr>
<td>Stop slope (%)</td>
<td>Active power decline rate from inverter performs stop command to inverter stops</td>
</tr>
<tr>
<td>P-rise rate (%)</td>
<td>Percentage that the active power rise per second accounted for the nominal power (%)</td>
</tr>
<tr>
<td>P-decline rate (%)</td>
<td>Percentage that the active power decline per second accounted for the nominal power (%)</td>
</tr>
<tr>
<td>Limit Power (%)</td>
<td>Percentage that the active power output accounted for the nominal output power (%)</td>
</tr>
<tr>
<td>Pf</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 &quot;10.4 Reactive Power Adjustment&quot;</td>
</tr>
<tr>
<td>Power-off saved (Pf)</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 four modules</td>
</tr>
</tbody>
</table>

Table 9-2 Setting ranges and default values of the running parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vmppt-max (V)</td>
<td>SG2000 460~850</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>SG2500 520~850</td>
<td>850</td>
</tr>
<tr>
<td>Vmppt-min (V)</td>
<td>SG2000 460~850</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td>SG2500 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 (%)</td>
<td>0.1~100</td>
<td>100</td>
</tr>
<tr>
<td>P-rise rate (%)</td>
<td>0.01~10</td>
<td>10</td>
</tr>
<tr>
<td>P-decline rate (%)</td>
<td>0.01~10</td>
<td>10</td>
</tr>
<tr>
<td>Limit Power (%)</td>
<td>0~110</td>
<td>110</td>
</tr>
<tr>
<td>Pf</td>
<td>-0.8<del>1/0.8</del>1</td>
<td>1</td>
</tr>
<tr>
<td>Q-limit (%)</td>
<td>-100~100</td>
<td>0</td>
</tr>
<tr>
<td>Q-adjust switch</td>
<td>Close/Pf/Q-limit</td>
<td>Pf can be adjusted</td>
</tr>
<tr>
<td>Power-off saved (Pf)</td>
<td>Save/Not Save</td>
<td>Save</td>
</tr>
<tr>
<td>Power-off saved (P-limited)</td>
<td>Save/Not Save</td>
<td>Not Save</td>
</tr>
<tr>
<td>SVG switch**</td>
<td>Enable/Disable</td>
<td>Disable</td>
</tr>
<tr>
<td>T-recover (s)</td>
<td>20~600</td>
<td>60</td>
</tr>
<tr>
<td>Trip Enable</td>
<td>Enable/Disable</td>
<td>Disable</td>
</tr>
</tbody>
</table>

Note: * non-settable

** at night when the inverter enters standby mode, 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.
Please refer to the LCD screen for the specific setting ranges of these parameters.

9.14.4 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.

Table 9-3 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>Module 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>Inverter recovers normal operation when grid voltage exceeds this value</td>
</tr>
<tr>
<td>I _Fgrid-max(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(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(Hz)</td>
<td>Inverter recovers normal operation when grid frequency is below this value</td>
</tr>
<tr>
<td>I _Fgrid-min(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(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>
</tbody>
</table>
**Parameter** | **Description**
--- | ---
Ⅱ T-Flow trip (ms) | Set the grid under-frequency II tripping time
Recover_Fgrid-min(Hz) | Inverter recovers normal operation when grid frequency exceeds this value
LVRT switch | Enable or disable the LVRT switch
LVRT normal vol min(V) | Refer to Fig. 10-2Lower voltage withstand requirements, U1 Unavailable
LVRT tolera vol min(V) | Refer to Fig. 10-2Lower voltage withstand requirements, U2 Unavailable
LVRT T1(ms) | Refer to Fig. 10-2Lower voltage withstand requirements, T1
LVRT T2(ms) | Refer to Fig. 10-2Lower voltage withstand requirements, T2
LVRT dynamic Kf factor | Ratio of reactive power compensation and voltage dropping depth during LVRT
HVRT switch | Enable or disable the HVRT switch
HVRT normal vol max (%) | Refer to Fig. 10-3High voltage withstand requirements, U2 Unavailable
HVRT tolera vol max (%) | Refer to Fig. 10-3High voltage withstand requirements, U1 Unavailable
Tmax-HVRT normal(ms) | Refer to Fig. 10-3High voltage withstand requirements, T2
Tmax-HVRT tolera(ms) | Refer to Fig. 10-3High voltage withstand requirements, T1
Active Islanding | Enable or disable the Anti-islanding function
I leakage-pro(A) | Set the current leakage protection value
Anti-PID mode | If Anti-PID mode is enabled, you may set the Anti-PID mode (Invalid, Suppression and Repair)
Ins monitor measure time (S) | Set the insulation monitor measure time
Ins monitor protect threshold(KΩ) | Set the threshold value of the insulation monitor resistance
PID repair | Enable the PID repair function manually
Fault manual restart | In grid-connection state if user select the “Enable” option, module will be on fault locked state and cannot restart automatically if a fault occurs. To restart the module, either of the following two methods can be selected: 1) perform key stop from the LCD and then start the device; 2) disconnect the module upstream and downstream power supply; connect the upstream and downstream power supply when the device is disconnected completely.
Ins monitor Vdc - start(V) | Set DC voltage required for activation of insulation monitoring mode.
Ins monitor manual | Manually turn on insulation monitoring mode switch.
Temperature settings(℃) | Set the temperature for the temperature and humidity controller (optional function)
Humidity settings(%RH) | Set the humidity for the temperature and humidity controller (optional function)
Ins fault enable | Enable/disable the insulation fault

**Table 9-4 Setting ranges and default values of the protection parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ⅰ Vgrid-max(V)</td>
<td>SG2000 346.5~472.5 362</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 396~540 414</td>
<td></td>
</tr>
<tr>
<td>Ⅱ Vgrid-max(V)</td>
<td>SG2000 346.5~472.5 409.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 396~540 468</td>
<td></td>
</tr>
<tr>
<td>Ⅰ T-Vhigh trip(ms)</td>
<td>40~600000 2000</td>
<td></td>
</tr>
<tr>
<td>Ⅱ T-Vhigh trip (ms)</td>
<td>40~600000 100</td>
<td></td>
</tr>
<tr>
<td>Recover Vgrid-max(V)</td>
<td>SG2000 346.5~472.5 346.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 396~540 396</td>
<td></td>
</tr>
<tr>
<td>Ⅰ Vgrid-min(V)</td>
<td>SG2000 31.5~283.5 252</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 36~324 288</td>
<td></td>
</tr>
<tr>
<td>Ⅱ Vgrid-min(V)</td>
<td>SG2000 31.5~283.5 157.5</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Range</td>
<td>Default</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------</td>
<td>----------</td>
</tr>
<tr>
<td>I-T-Vlow trip(ms)</td>
<td>40~60000</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>SG2000 31.5~283.5</td>
<td>283.5</td>
</tr>
<tr>
<td></td>
<td>SG2500 36~324</td>
<td>324</td>
</tr>
<tr>
<td>I-Fgrid-max(Hz)</td>
<td>50 - 55/60 - 65</td>
<td>50.5/60.5</td>
</tr>
<tr>
<td>II-Fgrid-max(Hz)</td>
<td>50 - 55/60 - 65</td>
<td>50.5/60.5</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>49.5/59.5</td>
</tr>
<tr>
<td>II-Fgrid-min(Hz)</td>
<td>45 - 50/55 - 60</td>
<td>49.5/59.5</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>LVRT switch</td>
<td>Enable/Disable</td>
<td>Disable</td>
</tr>
<tr>
<td>LVRT normal vol min(V)*</td>
<td>SG2000 270-283.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 308-324</td>
<td></td>
</tr>
<tr>
<td>LVRT tolera vol min(V)*</td>
<td>SG2000 15.7-126</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SG2500 18-144</td>
<td></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>Disable</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 disabled)/ Suppression (mode enabled)</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>
<tr>
<td>Ins monitor Vdc - start(V)</td>
<td>50-500</td>
<td>200</td>
</tr>
<tr>
<td>Temperature settings(℃)</td>
<td>5~10</td>
<td>0</td>
</tr>
<tr>
<td>Humidity settings(%RH)</td>
<td>70-100</td>
<td>80</td>
</tr>
<tr>
<td>Ins fault enable</td>
<td>Disable/Enable</td>
<td>Enable</td>
</tr>
</tbody>
</table>

Note: * non-settable

**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 four modules switch among different modes as shown in the figure below.

**Fig. 10-1 Operation modes change**

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

10.1.2 Operation Mode Description

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

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

Module will continuously check if the PV array and the grid meet the grid-connection requirements. If the module DC input voltage is higher than the module startup voltage and the startup time is reached, whilst the requirements of the grid side parameter are satisfied, module will turn from the Initial Standby mode into the Startup mode.
Startup
This is the transient process between the Initial Standby mode and the Run mode. Once the Startup mode is complete, module will start powering the grid.

Run
In this mode, module converts the DC energy into AC energy and feeds it to the grid by way of MPPT.
Module tracks the PV arrays’ maximum power point (MPP) to maximum the output energy.

Standby
In Run mode, module will enter into the Standby mode if the DC side current is as low as 0A for a while.
Module will continuously check if the PV array meets the grid-connection requirements. If the module DC startup voltage and the startup time are reached, module will turn into the Run mode.

Fault
If a fault occurs during operation, module will enter into the Fault mode. LCD panel will display the fault type with the “Fault” indicator on until the fault is removed and module turns into the Run mode.
During this period, if you want to start the module manually, first confirm the stop clear protection program from the LCD panel and then start the module.
If the fault is unrecoverable, module must be stopped to perform maintenance work. Module will automatically check if the fault is recoverable.

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

Emergency-stop
Stop the module by pressing the emergency stop button inside the monitoring window when a fault or emergency occurs.
If the module is stopped by the emergency stop button, the AC switches of the four modules trip off immediately and the modules will disconnect from the grid. To restart the modules, release the emergency stop button, push the AC switches to the OFF position, and then operate according to the normal start process.

Key-stop
In Run mode, module 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, module can keep running but send alarm signal. User can check the present alarm information through the Working state on the LCD default screen or check the latest 200 history alarm information through Function/History information/his alarm. Module automatically turns to Run mode when the alarm is removed.
10.2 Complete Control Strategy (Optional)

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

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

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

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

**Step 2** Tap “Set-parameter”;

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

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

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

10.3 Active Power Limitation

10.3.1 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

10.3.2 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.

10.4 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 (%/s)” 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.

10.5 LVRT

*Technical Requirements for Connecting Photovoltaic Power Station to Power System* requires medium-and-large PV plant should be equipped with Low Voltage Ride Through (LVRT) ability.
LVRT requires: PV plant can operate normally within certain voltage drop range and duration when the voltage of the grid-connected point drops due to the power system failure or disturbance; PV plant can provide the dynamic reactive power support during the period.

**Active power recovery**

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

**Dynamic reactive current support**

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

**Zero voltage ride through**

When the grid-connection point voltage drops to zero, power station 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.

### 10.6 High Voltage Ride Through (HVRT)

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

<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.
1.0
(s)
0.5(T1) 10(T2)
0.5
1.2
1.3
1.4
14
U1
U2
-1
U/UPu
U1
Power station disconnects from the grid
Power station operates normally
Grid fault and voltage increases

Fig. 10-3 High voltage withstand requirements

Sungrow's inverter meets the abovementioned requirements.

10.7 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.

Note: Pn is the nominal power.

Fig. 10-4 Inverter temperature derating function

<table>
<thead>
<tr>
<th>Ambient temp. T</th>
<th>Module operation situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;35°C</td>
<td>Inverter starts with the aid of auxiliary heater</td>
</tr>
<tr>
<td>-35°C&lt;T≤45°C</td>
<td>Operate for a long time at 110% of the overload condition</td>
</tr>
<tr>
<td>45°C&lt;T≤50°C</td>
<td>Operate with derating at 2%Pn/°C</td>
</tr>
<tr>
<td>50°C&lt;T≤60°C</td>
<td>Operate with derating at 10%Pn/°C</td>
</tr>
<tr>
<td>T&gt;60°C</td>
<td>Enter protection mode; Automatically restart when temperature drops below 50°C</td>
</tr>
</tbody>
</table>
10.8 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.

![Fig. 10-5 MPPT](image)

10.9 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.

10.10 Anti-PID Effect Function (Optional)

10.10.1 Introduction to PID Effect

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

This inverter is equipped with optional anti-PID function to effectively prevent the PID at the inverter side.
10.10.2 Anti-PID Function Setting

**WARNING**

For inverter with optional anti-PID function, the enable and disable of this function can only be performed by personnel from Sungrow. Please contact Sungrow if you need to switch this function.

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

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

**Step 2** Tap “Set-parameter”;

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

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

Select according to the on-site situation.

10.10.3 PID Repair

**WARNING**

Please make sure the “Anti-PID mode” in the protection parameter of the inverter is “Repair” when enabling the PID repair function.

If the inverter is in deep standby state or the repair process is interrupted, user can enable the repair function manually from the LCD as follows:

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

**Step 2** Tap “Set-parameter”;

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

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

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

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

10.11.1 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.

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

- **Automatic mode**: Upon first power-on, the equipment will be in negative pole grounding mode. After transfer from operating mode to standby mode, in the morning of the second day, when DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report “insulation resistance” fault, and monitoring of resistance will continue till it becomes normal. If monitored resistance is normal, the equipment will exit insulation monitoring mode and negative pole grounding mode will be restored.

- **Manual mode**: Without shutdown conditions of the equipment, on the touch screen parameters setup interface, enable “manual insulation monitoring”. If current DC voltage exceeds insulation monitoring starting voltage, the equipment will exit negative pole grounding mode and enter insulation monitoring mode. If abnormal resistance is monitored, the equipment will report “insulation resistance” fault. If monitored resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again. Upon pressing of shutdown key during manual monitoring, if current resistance is normal, the equipment will exit insulation monitoring mode and enter negative pole grounding mode again.

10.11.2 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 is fault is in the DC side or in the AC side, a thorough checking and troubleshooting after the system is power down is necessary.

10.12 Emergency Stop Button functions

The emergency stop button is located inside the monitoring window.

In emergency situation, open the monitoring window, press down the emergency stop button to stop all the four modules inside the inverter immediately.
This operation also can trip the switch inside the medium voltage switchgear, to disconnect the connection between high voltage side of transformer and switchgear.

10.13 Tripping Functions of the DC Main Switches

There are two selections (Enable/Disable) for the parameter ‘Trip Enable’ in the running parameter of the LCD touch screen. If the ‘Enable’ options is chosen, all DC main switches of four modules will trip immediately. If required, observed the following steps.

Step 1 Tap “Function” from the default menu.
Step 2 Tap “Set-parameter”.
Step 3 Tap “Run-parameter” after entering the correct password.
Step 4 Click Next to find the page with “Trip Enable” and select ‘Enable’ by the drop-down list.

Before the inverter is put into operation again, please set the parameter ‘Trip Enable’ as ‘Disable’ first, then close all the DC main switches of four modules.

10.14 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.

10.14.1 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.

10.14.2 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.

10.14.3 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.

10.14.4 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 threat to devices and operators.

- If the module 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.

10.14.5 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.

10.14.6 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.

10.14.7 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 module and display the fault type on the LCD screen.

10.14.8 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.

10.14.9 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 module or derate the power output.

10.15 Firefighting

10.15.1 General Introduction

Respect the national and local firefighting rules and regulations.

Periodically check and maintain the firefighting devices.

10.15.2 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.

10.15.3 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 inverter when a fault occurs.

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

⚠️ WARNING

The electrical components inside the 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.

⚠️ 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 inverter and internal devices
- Manufacturer, model and configuration of the PV arrays and upstream & downstream combiner devices connected to the inverter
- Module 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>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vdc-high</td>
<td>DC voltage exceeds the max. DC voltage</td>
</tr>
<tr>
<td></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>Possible reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vac-high</td>
<td>The grid voltage is above the max. grid voltage</td>
</tr>
<tr>
<td></td>
<td>Check the grid voltage (or if the grid-connected wire is too thin)</td>
</tr>
<tr>
<td>Remark</td>
<td>Module automatically reconnects to the grid once the grid voltage recovers normal</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible reason</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></td>
<td>Check the DC connection to for reverse connection after module voltage-free</td>
</tr>
<tr>
<td>Remark</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-fault</td>
<td>The grid frequency is outside the permitted range</td>
</tr>
<tr>
<td></td>
<td>Check grid frequency</td>
</tr>
<tr>
<td></td>
<td>Check if the AC cables are securely connected</td>
</tr>
<tr>
<td>Remark</td>
<td>Module automatically reconnects to the grid once the grid voltage recovers normal</td>
</tr>
</tbody>
</table>

---

This page contains important information about fault diagnosis and troubleshooting for Sungrow inverter systems. If you encounter any issues not addressed here, please contact Sungrow support for assistance.
<table>
<thead>
<tr>
<th><strong>Fault</strong></th>
<th><strong>Gnd-flt</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible reason</strong></td>
<td>Module AC side leakage current to the ground exceeds the set value (default: 6.3A)</td>
</tr>
<tr>
<td><strong>Measure</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Remark</strong></td>
<td>Module automatically reconnects to the grid once the leakage current recovers</td>
</tr>
</tbody>
</table>

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

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

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

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

<table>
<thead>
<tr>
<th><strong>Fault</strong></th>
<th><strong>PDP-pro</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible reason</strong></td>
<td>Internal fault</td>
</tr>
<tr>
<td><strong>Measure</strong></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><strong>Remark</strong></td>
<td>Stop the module if this fault occurs 5 times per day</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th><strong>Fault</strong></th>
<th><strong>Fan-flt</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Possible reason</strong></td>
<td>Module internal fan fault</td>
</tr>
<tr>
<td><strong>Measure</strong></td>
<td>Check the functionality of fan after the device is voltage-free</td>
</tr>
<tr>
<td><strong>Remark</strong></td>
<td>Contact Sungrow</td>
</tr>
<tr>
<td>Fault</td>
<td>Description</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>Possible</td>
<td>Reason</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>Ctrl power supply-flt</td>
<td>CPS (Control power supply) inside the module cannot work normally</td>
</tr>
<tr>
<td>Ctrl cabt. Temp-flt</td>
<td>Module control cabinet fans fault</td>
</tr>
<tr>
<td>Encoding repeat</td>
<td>Different modules have the same address</td>
</tr>
<tr>
<td>RISO-flt</td>
<td>Abnormal system DC side or AC side resistance to ground may be due to</td>
</tr>
<tr>
<td></td>
<td>damaged cable sheath, abnormal combiner box, or abnormal box transformer</td>
</tr>
<tr>
<td></td>
<td>lightning arrester.</td>
</tr>
</tbody>
</table>

| Measure                          | Replace the SPD with the same model after the device is voltage-free       |
| Measure                          | Replace the sensor with the same model after the device is voltage-free    |
| Measure                          | Module enters into anti-islanding protection state automatically            |
| Measure                          | -                                                                          |
| Remark                           | Contact Sungrow                                                           |
| Remark                           | Contact Sungrow                                                           |
| Remark                           | Module automatically reconnects to the grid once the grid becomes normal   |
| Remark                           | Module automatically reconnects to the grid once the CPS reverts to normal and the grid-connection requirements are fulfilled |
| Remark                           | Contact Sungrow                                                           |
| Remark                           | Contact Sungrow                                                           |
| Remark                           | After insulation resistance becomes normal, grid synchronization of the equipment can be restored. |
11.4 LCD Display Alarm Information and Troubleshooting

During alarm running state, module 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 200 history alarm information. Module 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT-Unbalanced</td>
<td>Current transformer (CT) on the module control cabinet is abnormal</td>
<td>Check and service the CT on the measuring board when module is voltage-free</td>
<td>Operation LED will keep green when this alarm occurs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISO-low</td>
<td>Module DC side insulation resistance is lower than the set value.</td>
<td>Check the PV panel insulation to the ground when module is voltage-free</td>
<td>Only alarm display. Module can operate normally.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Sensor-err</td>
<td>Module DC sensor abnormal</td>
<td>Check and service the DC sensor when module is voltage-free</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-PID power flt</td>
<td>For module with optional anti-PID function, the power supply of the PID function module is abnormal</td>
<td>Check the PID power supply when module is voltage-free</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan abnormal</td>
<td>Functionality of the device internal cooling fan abnormal</td>
<td>Check the fan when module is voltage-free</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDM-com-flt</td>
<td>Module internal communication abnormal</td>
<td>Check the IDM when module is voltage-free</td>
<td>-</td>
</tr>
</tbody>
</table>
### 11 Troubleshooting

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm rev-ldc-high</td>
<td>The reverse current of the branch on the DC side is detected to exceed the permissible range</td>
<td>Check the abnormal branch when module is voltage-free</td>
<td>Before device stops, the non-abnormal branches can work normally and module can operate in grid-connection normally</td>
</tr>
<tr>
<td>Alarm fwd-ldc-high</td>
<td>The forward current of the branch on the DC side is detected to exceed the permissible range</td>
<td>Check the abnormal branch when module is voltage-free</td>
<td>Before device stops, the non-abnormal branches can work normally and module can operate in grid-connection normally</td>
</tr>
<tr>
<td>Alarm branch breaker flt</td>
<td>Circuit breaker of the branch on the DC side is abnormal and this branch cannot work normally</td>
<td>Check the abnormal circuit breaker when module is voltage-free</td>
<td>Before device stops, the non-abnormal branches can work normally and module can operate in grid-connection normally</td>
</tr>
<tr>
<td>Alarm AC breaker fkt</td>
<td>AC side circuit breaker is abnormal</td>
<td>Check the AC circuit breaker when module is voltage-free</td>
<td>Before device stops, module can operate in grid-connection normally</td>
</tr>
</tbody>
</table>

### 11.5 Other Faults

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module shuts down shortly after start-up</td>
<td>DC input voltage just reaches the module start-up voltage. Voltage will decrease and module will stop when it is under load.</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>
<td>-</td>
</tr>
<tr>
<td>LCD Display Cannot Start or Stop Module</td>
<td>Communication malfunction between the LCD display and the DSP; LCD power supply malfunction</td>
<td>Check the connection between the LCD display and the DSP when module is voltage-free</td>
<td>-</td>
</tr>
</tbody>
</table>
## Troubleshooting

### Communication Failure with PC

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible reason</th>
<th>Measure</th>
<th>Remark</th>
</tr>
</thead>
</table>
| Fault | Possible reasons are various. Please refer to the Measure for troubleshooting | • 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 | 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.

The minimum maintenance distance around the inverter should be reserved at all times. The front and back side of the inverter, where the relevant doors will open, the minimum distance should be at least 6m; while the left side, where the monitoring window is installed, the minimum distance should be at least 2m.

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 module to avoid damages to the module.

⚠️ 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 module.
12.1.2 Five Safety Rules

Respect the following five rules during maintenance or service on the module to ensure the safety of the maintainer.

- Disconnect the module from all the external connections and internal power supplies.
- Ensure that the module will not be started accidentally.
- Verify that the module interior is discharged completely with a multimeter.
- 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 module. Stop the module and clean the dust.

Wait at least 5 minutes after the module discharge completely. Before cleaning, make sure, with multimeter, the module 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 reassembly 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.

### Maintenance (once every two years)

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

### Maintenance (once every year)

<table>
<thead>
<tr>
<th>Check item</th>
<th>Check method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container exterior</td>
<td>Check the following items and make corrections if necessary:</td>
</tr>
<tr>
<td></td>
<td>• Check whether there are any inflammable or combustible materials and other threats around or on the top of the inverter that may affect the normal operation.</td>
</tr>
<tr>
<td></td>
<td>• Check whether the inverter and the steel plate are firmly welded, and whether there is any corrosion.</td>
</tr>
<tr>
<td></td>
<td>• Check whether any mechanical damage, painting damage, oxidation, or the like occurs on the enclosure of the inverter.</td>
</tr>
<tr>
<td></td>
<td>• Check whether the monitoring window and the doors close and open flexibly.</td>
</tr>
<tr>
<td></td>
<td>• Check whether the sealing strip is firmly in place.</td>
</tr>
<tr>
<td>Container interior</td>
<td>Check whether there is any dust, foreign objects, dirt, or condensation inside the container.</td>
</tr>
<tr>
<td>Air inlet/outlet</td>
<td>Check whether the air inlet filters and ventilation ducts of the inverter and its internal devices are normal, and clean or replace the filters if necessary.</td>
</tr>
<tr>
<td>Cable connection and routing</td>
<td>Check the inverter when the internal devices are completely voltage-free! Make corresponding corrections once any anomaly is founded.</td>
</tr>
<tr>
<td></td>
<td>• Check whether all cables and wires are properly routed and without short circuit. Make corrections if case of any anomaly.</td>
</tr>
<tr>
<td></td>
<td>• Check whether all cable entries are sealed properly.</td>
</tr>
</tbody>
</table>
### 12 Routine Maintenance

#### Check item | Check method
--- | ---
**Check item** | **Check method**
Routine Maintenance System Manual

<table>
<thead>
<tr>
<th>Check item</th>
<th>Check method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check whether there is water leakage inside the inverter.</td>
<td></td>
</tr>
<tr>
<td>Check whether the power cable is firmly connected. If necessary, refasten the cable with the torque specified in this manual.</td>
<td></td>
</tr>
<tr>
<td>Check whether the power cable and control cable are damaged, especially if the surface contacting the metal is cut.</td>
<td></td>
</tr>
<tr>
<td>Check if the insulation tape on the power cable terminal is damaged or invalid.</td>
<td></td>
</tr>
<tr>
<td><strong>Grounding and equipotential connections</strong></td>
<td></td>
</tr>
<tr>
<td>Check whether the grounding connection is performed properly and the grounding resistance is less than 4Ω.</td>
<td></td>
</tr>
<tr>
<td>Check whether the equipotential connections inside the inverter are performed properly.</td>
<td></td>
</tr>
<tr>
<td>Check whether the equipotential connection of the oil tray is performed properly.</td>
<td></td>
</tr>
<tr>
<td><strong>Fan</strong></td>
<td></td>
</tr>
<tr>
<td>Check the running status of the fans.</td>
<td></td>
</tr>
<tr>
<td>Check whether the fan blades have cracks.</td>
<td></td>
</tr>
<tr>
<td>Check whether the fan makes abnormal noise during running.</td>
<td></td>
</tr>
<tr>
<td><strong>Screws</strong></td>
<td>Check all screws inside the inverter.</td>
</tr>
</tbody>
</table>

#### Maintenance (once every 6 months to a year)

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

Note: * indicates optional setting.
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 necessary to make sure the inverter exterior and interior areas are clean. If the operation conditions are severe, in desert area for instance, the cleaning interval shall be adjusted. 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 cleanliness of the foundation periodically. Use a vacuum cleaner to clean the foundation if necessary.

12.3.5 Filter checking and cleaning

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

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

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 insider 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
<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 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="image2.png" alt="Figure 2" /></td>
<td>Clean the target parts by rag with water or use 97% alcohol</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 scratched parts of the oil paint by banister brush and make sure the painting is as uniform as possible</td>
</tr>
</tbody>
</table>

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

**Materials:**
- Abrasive paper
- Rag
- Water
- Alcohol
- zinc primer
- Hairbrush
- Oil paint
<table>
<thead>
<tr>
<th>Step</th>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></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></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></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></td>
<td>Paint the scratched parts by banister brush when the primer is dry, and make sure the painting is as uniform as possible</td>
</tr>
</tbody>
</table>
Check the protective paint on the module 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 Appendix

13.1 System Parameter

<table>
<thead>
<tr>
<th>Item</th>
<th>SG2500</th>
<th>SG2000</th>
</tr>
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<tbody>
<tr>
<td><strong>Input (DC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. input voltage</td>
<td>1000V</td>
<td>500V</td>
</tr>
<tr>
<td>Startup voltage</td>
<td>540V</td>
<td>500V</td>
</tr>
<tr>
<td>Min. operating voltage</td>
<td>520V</td>
<td>460V</td>
</tr>
<tr>
<td>MPPT voltage range at full load</td>
<td>520V~850V</td>
<td>460V~850V</td>
</tr>
<tr>
<td>No. of MPPT inputs</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>No. of DC inputs</td>
<td>24~32</td>
<td></td>
</tr>
<tr>
<td>Max. input current</td>
<td>4×1356A</td>
<td>4×1220A</td>
</tr>
<tr>
<td><strong>Output (AC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal output power</td>
<td>4×630KW</td>
<td>4×500KW</td>
</tr>
<tr>
<td>Max. output power</td>
<td>2772kW</td>
<td>2200kW</td>
</tr>
<tr>
<td>Max. apparent output power</td>
<td>4×693kVA</td>
<td>4×550kVA</td>
</tr>
<tr>
<td>Max. output current</td>
<td>4×1111A</td>
<td>4×1008A</td>
</tr>
<tr>
<td>Nominal grid voltage</td>
<td>360V</td>
<td>315V</td>
</tr>
<tr>
<td>Grid voltage range</td>
<td>288~414V</td>
<td>252~362V</td>
</tr>
<tr>
<td>Nominal grid frequency</td>
<td>50Hz/60Hz</td>
<td></td>
</tr>
<tr>
<td>Grid frequency range</td>
<td>45<del>55Hz/55</del>65Hz (settable)</td>
<td></td>
</tr>
<tr>
<td>THD</td>
<td>&lt;3% (at nominal power)</td>
<td></td>
</tr>
<tr>
<td>DC current injection</td>
<td>&lt;0.5% of nominal output current</td>
<td></td>
</tr>
<tr>
<td>Power factor (at nominal power)</td>
<td>&gt;0.99</td>
<td></td>
</tr>
<tr>
<td>Adjustable power factor</td>
<td>0.8 (leading)-0.8 (lagging)</td>
<td></td>
</tr>
<tr>
<td>Feed-in phases/Output phases</td>
<td>3/3</td>
<td></td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. efficiency</td>
<td>99.00%</td>
<td></td>
</tr>
<tr>
<td>Euro. efficiency</td>
<td>98.7%</td>
<td></td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC overvoltage protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>DC reverse connection protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>DC short circuit protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Grid monitoring</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>GFDI</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Insulation monitoring</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Overtemperature protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Other functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-PID function</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>SVG function</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Night sleep mode</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Direct AC parallel connection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Soft start/Stop</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Auto switching between internal and external power</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (width x height x depth)</td>
<td>2991mmx2591mmx2438mm</td>
<td></td>
</tr>
<tr>
<td>Weight*</td>
<td>6000kg</td>
<td></td>
</tr>
<tr>
<td>Ingress of protection</td>
<td>IP54</td>
<td></td>
</tr>
<tr>
<td>Cooling method</td>
<td>Forced air cooling</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-35~+60°C (&gt; 50°C derating)</td>
<td></td>
</tr>
<tr>
<td>Operating humidity range</td>
<td>0~95%, non-condensation</td>
<td></td>
</tr>
<tr>
<td>Max. operating altitude</td>
<td>6000m (derating, &gt;3,000m)</td>
<td></td>
</tr>
<tr>
<td>Communication interface</td>
<td>RS485, and Ethernet</td>
<td></td>
</tr>
<tr>
<td>Compliance</td>
<td>ModbusRTU, ModbusTCP, IEC104</td>
<td></td>
</tr>
</tbody>
</table>

Note: * If the parameters are inconsistent with the nameplate parameters, please refer to the nameplate.

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

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

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

13.4 Contact Information

We need the following information to provide you the best assistance:
• Type of the product
• Serial number of the product
• Fault code/name
• Brief description of the problem

<table>
<thead>
<tr>
<th>Country</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>China (HQ)</td>
<td>Hefei</td>
</tr>
<tr>
<td></td>
<td>+86 551 65327834</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service@sungrowpower.com">service@sungrowpower.com</a></td>
</tr>
<tr>
<td>Australia</td>
<td>NSW</td>
</tr>
<tr>
<td></td>
<td>+61 2 9922 1522</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service@sungrowpower.com.au">service@sungrowpower.com.au</a></td>
</tr>
<tr>
<td>Brazil</td>
<td>Sao Paulo</td>
</tr>
<tr>
<td></td>
<td>+55 015 9 98197824</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:kaue.oliveira@sa.sungrowpower.com">kaue.oliveira@sa.sungrowpower.com</a></td>
</tr>
<tr>
<td>France</td>
<td>Paris</td>
</tr>
<tr>
<td></td>
<td>+33 762899888</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service.france@sungrow.co">service.france@sungrow.co</a></td>
</tr>
<tr>
<td>Germany</td>
<td>München</td>
</tr>
<tr>
<td></td>
<td>+49(0)89 324914761</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service.germany@sungrow.co">service.germany@sungrow.co</a></td>
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<tr>
<td>Greece</td>
<td></td>
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<tr>
<td></td>
<td>Service Partner – Survey Digital</td>
</tr>
<tr>
<td></td>
<td>+30 2106044212</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service.greece@sungrow.co">service.greece@sungrow.co</a></td>
</tr>
<tr>
<td>Italy</td>
<td>Milano</td>
</tr>
<tr>
<td></td>
<td>+39 3391096413</td>
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<tr>
<td></td>
<td><a href="mailto:service.italy@sungrow.co">service.italy@sungrow.co</a></td>
</tr>
<tr>
<td>Japan</td>
<td>Tokyo</td>
</tr>
<tr>
<td></td>
<td>+81362629918</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:japanservice@jp.sungrowpower.com">japanservice@jp.sungrowpower.com</a></td>
</tr>
<tr>
<td>Korea</td>
<td>Seoul</td>
</tr>
<tr>
<td></td>
<td>+827077191889</td>
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<tr>
<td></td>
<td><a href="mailto:service@kr.sungrowpower.com">service@kr.sungrowpower.com</a></td>
</tr>
<tr>
<td>Malaysia</td>
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<tr>
<td></td>
<td>SUNGROW SEA</td>
</tr>
<tr>
<td></td>
<td>+6019897 3360</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service@my.sungrowpower.com">service@my.sungrowpower.com</a></td>
</tr>
<tr>
<td>Country</td>
<td>Company Name</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Philippines</td>
<td>SUNGROW POWER SUPPLY Co., Ltd</td>
</tr>
<tr>
<td>Thailand</td>
<td>SUNGROW Power (Hong Kong) Co., Ltd</td>
</tr>
<tr>
<td>Spain</td>
<td>SUNGROW Ibérica S.L.U.</td>
</tr>
<tr>
<td>Romania</td>
<td>Service Partner - Elerex</td>
</tr>
<tr>
<td>Turkey</td>
<td>SUNGROW Deutschland GmbH Turkey</td>
</tr>
<tr>
<td>UK</td>
<td>SUNGROW Power UK Ltd.</td>
</tr>
<tr>
<td>U.S.A, Mexico</td>
<td>SUNGROW USA</td>
</tr>
</tbody>
</table>