SG1250UD/SG1500UD
Outdoor Central Inverter
Installation Manual
1 About This Manual ................................................................. 1
  1.1 Preface ........................................................................ 1
  1.2 Validity ........................................................................ 1
  1.3 Brief Introduction ........................................................... 1
  1.4 Target Group .................................................................. 2
  1.5 How to Use This Manual ................................................... 2
  1.6 Symbol Explanation .......................................................... 2

2 Safety Instructions ................................................................. 4
  2.1 Intended Use .................................................................... 4
  2.2 Safety Use Description ...................................................... 4
    2.2.1 Manual Storage ............................................................ 5
    2.2.2 Staff Requirements ...................................................... 5
    2.2.3 Labels on the Inverter ................................................... 5
    2.2.4 Warning Label Setting ................................................. 5
    2.2.5 Emergency Escape Route ............................................ 6
    2.2.6 PV Array Protection ................................................... 6
    2.2.7 Electrical Connection .................................................. 6
    2.2.8 Measuring Instrument .................................................. 6
    2.2.9 Voltage-free Operation ................................................. 7
    2.2.10 ESD Protection ......................................................... 7
    2.2.11 Moisture Protection .................................................... 7
    2.2.12 Disposal of Waste ....................................................... 8
    2.2.13 Others ..................................................................... 8

3 Identify and Store the Inverter .................................................. 9
  3.1 Nameplate Identification .................................................... 9
  3.2 Inverter Storage ............................................................... 9

4 Product Description ............................................................... 10
  4.1 Exterior Description .......................................................... 10
    4.1.2 Inverter Appearance ................................................... 11
    4.1.3 Ventilation Design ....................................................... 11
    4.1.4 Cable In/Out Design .................................................... 12
  4.2 Main Circuit Diagram ......................................................... 13
5 Installation Design ................................................................. 14
  5.1 Basic Requirements ......................................................... 14
  5.2 Installation Environment Design ........................................ 14
    5.2.1 Irradiation Requirement ............................................. 14
    5.2.2 Air Requirement .................................................... 14
    5.2.3 Foundation requirements .......................................... 15
    5.2.4 Space Requirement ................................................ 16
    5.2.5 Cable Trench Design .............................................. 17
    5.2.6 Ventilation Requirements .......................................... 17
    5.2.7 Others ..................................................................... 18
  5.3 Cable Routing Requirement ................................................ 18
  5.4 Cable Fastening and Protection ......................................... 19
    5.4.1 Cable Fastening ...................................................... 19
    5.4.2 Cable Protection .................................................... 19
6 Mechanical Installation ....................................................... 20
  6.1 Transport ........................................................................ 20
    6.1.1 Precautions ............................................................ 20
    6.1.2 Transport ............................................................... 21
  6.2 Installation ....................................................................... 22
7 Electrical Connection ............................................................ 24
  7.1 Safety Instructions ............................................................ 24
    7.1.1 General Safety Rules ................................................ 24
    7.1.2 Five safety Rules ....................................................... 24
  7.2 Installation Tools and Spare Parts ....................................... 25
  7.3 Cable Connection Parts ..................................................... 25
    7.3.1 Copper Cable Connection ......................................... 25
    7.3.2 Aluminium Cable Connection ...................................... 26
  7.4 Preparation Before Electrical Connection ............................ 26
    7.4.1 Opening the Front Door ............................................. 26
    7.4.2 Removing the Protective Grid ..................................... 27
    7.4.3 Check Connection Cable .......................................... 27
    7.4.4 Cable Connection Precautions .................................... 27
  7.5 Cable Inlet & Outlet Holes ................................................ 27
  7.6 Overview of the Connection Area ....................................... 28
  7.7 Cable Requirements ......................................................... 29
  7.8 DC Side Cable Connection ................................................ 30
    7.8.1 Cable Check ............................................................ 30
1 About This Manual

1.1 Preface

Dear customers, thank you for using the outdoor central inverter developed and manufactured by Sungrow Power Supply Co. Ltd. We sincerely hope that this product can meet your needs and welcome any comments on the performance and functions of the product. Your feedback helps us continue to improve the quality of our products.

1.2 Validity

This manual is valid for the following device types:

- SG1250UD
- SG1500UD

For ease of description, the foregoing products are referred to as "the inverter" hereinafter.

1.3 Brief Introduction

This manual is valid for the outdoor central inverters SG1250UD/SG1500UD (referred to as the inverter hereinafter) and contains the following information:

- Safety instructions
  Describes the safety precautions on the installation of the inverter.
- System introduction
  Introduces the scope of delivery, identification method, storage method, inverter structure, and electrical features and principles.
- Installation design
  Introduces the system configuration design, installation environment design, cable routing design, and installation procedure of the inverter.
- Installation process and inspection
  Describes mechanical installation, electrical installation, communication connection, and inspection method after installation.
- Commissioning guides
  Introduces precautions during inverter commissioning and operation processing of the commissioning.
- Others
  Introduces the technical data of the inverter, exclusion of liability, and contact information.
1.4 Target Group

This manual is intended for persons who perform installation and other operations on the inverter. The readers should have some professional knowledge of electronics, electrical wiring, and machinery, and are familiar with electrical and mechanical schematic diagrams.

1.5 How to Use This Manual

Read this manual carefully before installing the device. Keep this manual and other product component information together to ensure ease of access. In addition to this manual, the following documentations are provided:

- Inverter operation manual (in the scope of delivery)

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1.6 Symbol Explanation

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

To ensure optimum use of this manual, note the following explanations of 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.
Always beware of the warning symbols on the device, including:

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Risk of electric shock!]</td>
<td>Risk of electric shock!</td>
</tr>
<tr>
<td>![Hot surface!]</td>
<td>Hot surface!</td>
</tr>
<tr>
<td>![Connection point for earth conductor]</td>
<td>Connection point for earth conductor</td>
</tr>
<tr>
<td></td>
<td>Protective conductor terminal</td>
</tr>
</tbody>
</table>
2 Safety Instructions

2.1 Intended Use

The outdoor central inverter developed and manufactured by Sungrow converters the DC current from the PV array into the AC current. The AC current can be fed into the MV grid after processed by external boosting transformer. With the ingress of protection IP54, the inverter can be installed outdoors.

The external transformer boosts the voltage output from the inverter to the grid-compatible voltage, so that the inverter is connected to the grid. For specific transformer technical requirements, refer to the Connection Requirements for Medium-voltage Transformers.

An example of intended usage of the inverter is shown below.

![Fig. 2-1 PV grid-connected power generation system](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>PV array</td>
</tr>
<tr>
<td>B</td>
<td>Combiner box</td>
</tr>
<tr>
<td>C</td>
<td>Inverter</td>
</tr>
<tr>
<td>D</td>
<td>Boosting transformer</td>
</tr>
<tr>
<td>E</td>
<td>Utility grid</td>
</tr>
</tbody>
</table>

2.2 Safety Use Description

This section introduces the safety precautions during inverter installation and commissioning. Read this manual carefully especially the safety instructions. For the detailed safety notices, please refer to the corresponding installation and commissioning chapter.

⚠️ DANGER

Shock Hazard!
Death resulting from burns and electric shock upon touching the inverter live components.

- Do not touch the live components of the inverter or the utility grid.
- Observe all safety regulations.
2.2.1 Manual Storage

Manuals are indispensable parts of the product. Important information on transportation and installation of the inverter is included in this manual. Read this manual carefully before performing any operation on this inverter.

- Transport and install the inverter strictly following the description in this manual. Otherwise, device damage, personal injury or death, and property loss can be caused.
- Keep this manual properly to ensure that it is available at all times. After installation, no manual or paper should be left inside the inverter cabinet.

2.2.2 Staff Requirements

- Only professional electricians or personnel with professional knowledge can transport and install the product.
- The operators should be familiar with the whole PV power generation system and operating principles.
- The operators should be familiar with the Installation Manual and Operation Manual of the product.
- The operators should be familiar with the national/local standards and regulations.

2.2.3 Labels on the Inverter

- Warning symbols on the inverter enclosure and in its interior contain important safety information. Do not tear or damage them!
- Nameplates located in the back panel and inner side of the front door include important parameter information on the product. Do not tear or damage them!

2.2.4 Warning Label Setting

To avoid accidents caused by unauthorized persons, respect the followings during
installation, routine maintenance or troubleshooting of the inverter:

- Place eye-catching warning labels on upstream and downstream switches of the inverter to avoid accidents due to inadvertent reconnection.
- Place warning boards or safety warning tape around the installation area.
- Remove the keys and keep them properly after installation.

2.2.5 Emergency Escape Route

To ensure personal safety in case of accidents, respect the following requirements:

- Ensure that the escape route is freely accessible throughout the installation process.
- Never block or lock the emergency route.

2.2.6 PV Array Protection

Voltage is present between positive and negative polarities once the PV arrays are exposed to sunlight. The voltage is extremely high for a large scale PV plant. Electrical shock or even death can result from inadvertent touching.

⚠️ DANGER

High voltages are present between the positive and negative polarities of the PV arrays!

- Ensure the inverter has been disconnected from the PV array.
- Place an eye-catching warning label at the disconnection point, to avoid inadvertent reconnection.

2.2.7 Electrical Connection

Electrical connection must be in accordance with the circuit diagram and the description in this manual.

⚠️ WARNING

- Configuration of the PV arrays and technical parameters such as grid level and frequency must conform to technical data of the inverter.
- Connect the inverter to the grid only after an approval is received from the local power supply company and technical persons have finished the installation.
- All electrical connections must comply with national/local standards.

⚠️ WARNING

Perform cable connections strictly according to the wiring identifications inside the device.

2.2.8 Measuring Instrument

During electrical connection, commissioning, or the like, use related electrical measuring instrument to ensure that the electrical parameters meet requirements.
Use quality measuring instruments with sufficient measuring range. Do not use a
conventional multimeter.
- Ensure that the measuring instrument is correctly connected and used to avoid
  the electrical arc and other hazards.
- Take protective measures (such as wearing insulated gloves) during live line
  measurement.

2.2.9 Voltage-free Operation

Perform operations on the inverter only after ensuring it is completely voltage-free.
- Ensure that the inverter cannot be powered on accidentally.
- Ensure that the inverter interior is completely voltage-free.
- Perform necessary grounding and short circuit connection.
- Use the insulation clothing to cover and insulate the possible live components adjacent
to the operation area.
- Ensure that the emergency escape route is freely-accessible throughout the operation
  process.
- Wait at least 15 minutes after the inverter stops to perform operations on the inverter.

Cable connection terminal corresponding to the self-powered circuit breaker Q1
of the inverter still carry voltages when the AC side of the inverter is connected to
the grid and the following operations are performed:
- Press down the emergency stop button
- Disconnect the AC circuit breaker of the inverter

Disconnect the switch of the boosting transformer during troubleshooting to
ensure personal safety.

2.2.10 ESD Protection

The components can be damaged due to touching the PCB or other components
sensitive to ESD or performing incorrect operations.
- Avoid unnecessary touch to the PCB.
- Respect the ESD protection standards, for example, wear a wrist strap.

2.2.11 Moisture Protection

The inverter can be damaged due to moisture penetration.
- Do not open the inverter door when the relative humidity is above 95%.
- Do not install the inverter on rainy days.
2.2.12 Disposal of Waste

When the inverter is on the end of its service life, it cannot be disposed of as household wastes. Please contact the local authorized collection point.

2.2.13 Others

Wear suitable protective equipment (for example safety goggles, earplugs, dielectric gloves, insulating shoes) when transporting or installing the device.

The inverter is generally installed in places far away from the urban, and therefore, take corresponding emergency aid measures according to requirements.

Take necessary auxiliary measures to ensure personal and device safety.

- The inverter described in this manual is of standard configuration. If necessary, specify your requirements when placing an order. For product details, refer to the actually received device.

- This manual cannot cover all possible conditions during transportation, installation, and commissioning. For any problems not described in this manual, please contact Sugrow promptly.

For user convenience, a large number of pictures are provided in this manual. These pictures are indicative only. For details, please refer to the actual product.
3 Identify and Store the Inverter

3.1 Nameplate Identification

The user can identify the inverter via the nameplate. The nameplate is attached to the upper left corner of the inverter back panel, and the nameplate includes information such as the model, serial number, main technical parameters, logo of certification authority, and place of origin.

⚠️ WARNING
The nameplate includes important parameter information on the inverter, and it should be protected during transport, installation, maintenance, troubleshooting, and other operations. Do not damage or tear it!

3.2 Inverter Storage

If the inverter is not to be installed or commissioned immediately upon reception, it should be stored as described in this chapter. The inverter should be packed and stored in a well-ventilated, dry, and tidy room. In addition, observe the following requirements:

- Place the inverter in its original package with the desiccant inside.
- The ground is flat and suitable for the weight of the packed inverter.
- The storage environment should be well-ventilated, dry, and without any poundings.
- Ambient temperature: -40°C to +70°C; and relative humidity: 0~95% without condensation.
- Take precautions to protect the device against damage due to harsh environment such as shock cooling, shock heating, and collision.
- Inspect the inverter regularly, at least once a week generally. Check the package for completeness and replace it immediately when necessary.
- Unpack and check the inverter in powered on state if it has been stored more than half a year.

⚠️ WARNING
The inverter must be packed during storage!
No outdoor storage or storage with direct sunlight!
No tilting or stacking!

Open the cabinet door and check the inverter thoroughly to ensure the completeness and intactness before installing an inverter stored for a long time. Install the inverter only after it has been tested by qualified personnel.
4 Product Description

4.1 Exterior Description

Mechanical dimensions

![Mechanical dimensions of the inverter]

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>Height (H)</th>
<th>Depth (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,280mm</td>
<td>2,080mm</td>
<td>850mm</td>
</tr>
</tbody>
</table>

Weight

The inverter weights about 2,200kg.
4.1.2 Inverter Appearance

The face and main external components of the inverter are shown in the figure below.

![Fig. 4-2 Appearance of the inverter](image)

Note: The figure takes the standard inverter appearance as an example, and the actual product may differ.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>LED indicator</td>
<td>Separately, power indicator &quot;POWER&quot;, operation indicator &quot;OPERATION&quot;, and fault indicator &quot;FAULT&quot;</td>
</tr>
<tr>
<td>B</td>
<td>LCD touchscreen</td>
<td>Displays the data and execute control commands</td>
</tr>
<tr>
<td>C</td>
<td>Emergency stop button</td>
<td>Can be used to disconnect the AC side power supply immediately in case of emergency</td>
</tr>
<tr>
<td>D</td>
<td>Start/Stop button</td>
<td>Used to start/stop the inverter</td>
</tr>
<tr>
<td>E</td>
<td>Lock</td>
<td>A total of three, used to open and close the front doors of the inverter</td>
</tr>
</tbody>
</table>

4.1.3 Ventilation Design

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

Air inlet design

The cooling air comes into the inverter from the air inlet windows (shown by A in the figure below) on the back of the inverter. The inlet volume is 5,500m³/h.

Each air inlet window is equipped with air filters which can be disassembled, cleaned, and replaced easily. Check the filters regularly for cleanness.

**WARNING**

The DC and AC switches are only used for starting/stopping the inverters. Otherwise, caused damages may void the warranty.
Heat exchanger

The heat exchanger shown by B in the figure above is designed at the bottom of the inverter back for heat exchanging. The cooling air comes inside through the bottom and hot air gets outside through the top. The average air volume of the air inlet and outlet is 1100m³/h.

Air outlet design

The hot air gets out of the inverter through the air outlet on the top of the inverter marked by D and E in the figure below. The air volume exhausted from the inverter top is 4,400m³/h. At least 5,500m³/h fresh air should be supplied to ensure normal operation of a single inverter.

4.1.4 Cable In/Out Design

Cable inlet & outlet on the bottom

For standard inverter, all electrical cables come into or go out of the inverter from the bottom.

Positions and specifications of the cable inlet/outlet holes are shown in the figure below (in mm).
4.2 Main Circuit Diagram

PV array converts the solar energy into DC energy and then sends it to the inverter DC input side after upstream combining. The DC energy is converted to AC energy through the inverter. Main circuit diagram inside the inverter is shown in the figure below by using 16 inputs as the example.
5 Installation Design

5.1 Basic Requirements

The following requirements should be met in order to ensure the normal operation of the inverter.

- With ingress of protection IP54, the inverter can be installed outdoors, but as an electrical device, it cannot be placed in an environment with high humidity for a long time.
- Direct exposing to sunlight should be avoided. Otherwise, excessively high temperature may impair power generation. It is recommended to install the inverter in a cool place or install a shading device.
- The installation environment is well-ventilated and free of corrosive gas and inflammable gas.
- The installation environment is clean.
- The inverter should be installed in a place far away from residential areas as far as possible for it produces noise during operation.
- The installation ground should be solid and suitable for the inverter weight.
- The inverter should be installed in a place where you can view the LED indicator or LCD screen easily.
- Ambient temperature ranges from -35°C to +60°C (> 50°C, derating).
- Clearances around the inverter should be maintained for ventilation, installation, maintenance, and escape route.

5.2 Installation Environment Design

The inverter can be installed outdoors when the following requirements are met.

5.2.1 Irradiation Requirement

The inverter can steadily operate when the ambient temperature is within –35°C to 50°C. When the temperature is higher than 50°C, the inverter can operate with output power lowered to protect the device.

Considering the outdoor installation, it is recommended to install the inverter in a place where the irradiation intensity is 1100W/m² and ambient temperature is not higher than 45°C. It is recommended to install the inverter in a cool place or install a shading device.

5.2.2 Air Requirement

The inverter should be installed in an environment where fresh air volume should meet the requirement described in charter 4.1.3 Ventilation Design, and the fresh air needs to conform to 4S2 classification criterion.
5.2.3 Foundation requirements

The inverter should be installed on a flat concrete foundation whose surface is made of fire-resistant materials, and the foundation must meet the following requirements:

- The degree of unbalance is <0.25% without any sinking.
- The compression ratio should be 98%.
- Soil stress needs to be 150kN/m².
- The foundation has a certain bearing capacity suitable for the weight of the inverter.
- The foundation should be made of fire-resistant materials.
- The foundation should be slightly higher than the ground surface to avoid stagnant water after rains or snow melting.

During foundation construction, cable trenches should be designed according to overall plant design and cable routing on the bottom of the inverter.

Holes need to be designed on the foundation, and hole dimensions should be consistent with those of the location holes on the inverter bottom, so that the inverter can be firmly connected to the foundation.

Eight kidney-shaped location holes of 16mm×25mm are designed on the inverter bottom, which is shown in the figure below (in mm). It is recommended to firmly connect inverter bottom to the foundation with bolts of M12.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Kidney-shaped location holes</td>
</tr>
<tr>
<td>B</td>
<td>Cable inlet/outlet holes</td>
</tr>
</tbody>
</table>
5.2.4 Space Requirement

During installation, appropriate space around the inverter should be maintained for maintenance, escape route, ventilation, and other requirements.

The minimum space for normal operation is described in this section. It is recommended to maintain larger space if possible, to ensure reliable and efficient running.

![Diagram of inverter setup](image)

**Fig. 5-1 Requirement for space around the inverter**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000mm</td>
<td>800mm</td>
<td>800mm</td>
<td>800mm</td>
<td>800mm</td>
</tr>
</tbody>
</table>

*These values in the table indicate minimum clearances around the inverter on the service platform.

If multiple inverters are installed together, the clearance requirements are as follows:
5.2.5 Cable Trench Design

Cables go into and out of the inverter from its bottom. For ease of installation and maintenance, it is recommended to route the cables connecting the inverter and external devices via the cable trench.

Generally, cable trenches are generally dimensioned and designed and constructed by construction party with device weight and dimensions considered.

Sound electrical connections among the cable trenches and between cable trenches and grounding electrodes are required.

Cable trench section is shown below. The number of support arms can be determined according to requirements. Communication cable, control cable, and power cable should be routed separately; and DC loop and AC loop should be laid separately. This facilities installation and maintenance, and reduces interference from power loop on communication and control signals.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cable trench</td>
</tr>
<tr>
<td>B</td>
<td>Cable support arms</td>
</tr>
</tbody>
</table>

5.2.6 Ventilation Requirements

Massive heat is generated by the inverter during operation, and excessively high temperature impairs electrical performance or even damages the device. Therefore, heat dissipation should be taken into consideration during installation design.

Ventilation environment

The installation environment should meet the following ventilation requirements:

- The inverter should be installed in well-ventilated place with large air volume.
- The air inlet holes should be supplied with sufficient fresh air.
- The air ducts should be cleaned regularly if the inverter is installed outdoors, to avoid blocking.

Ventilating Device

To ensure efficient and reliable operation, the operating temperature needs to be controlled with the permissible range. Therefore, adequate ventilation is required.

- Exhaust heat goes out of the inverter from the top air ducts. Therefore, the corresponding ventilation openings must be unblocked and clean.
- When the inverter is exposed to sunlight, interior temperature rises rapidly and power yield is reduced consequently. It is recommended to install a shading system or install the inverter in cool place.
- Directions of air outlets should be determined according to actual local wind direction.
Ventilation ducts of the entire inverter are shown in the following figure.

Fig. 5-2 Ventilation ducts of the entire inverter

5.2.7 Others

With the ingress of protection IP54, the inverter can be installed outdoors. According to EMC requirements and noise level, the inverter should be installed in industrial environment or outdoors.

After cable connection, gaps around the inverter bottom should be sealed by fireproofing mud. Fasten the waterproof terminals of communication cables and the like, and unoccupied waterproof terminals should be blocked by appropriate plugs, so to meet waterproof and windproof requirements.

NOTICE
Avoid direct exposing to sunlight. Otherwise, excessively high temperature may impair power generation.

5.3 Cable Routing Requirement

Cables used in this system generally include power cables and data cables.

The communication cable needs to be routed away from the power cable, and the cables need to form a right angle at the intersection. The communication cable needs to be as short as possible and keeps a distance from the power cable.

Power cables and data cables should be routed in different cable trenches to avoid long-distance parallel cable routing of power cables and other cables, thereby reducing electromagnetic interference due to output voltage transient.

The distance between the power cable and data cable should be greater than 200mm. When the cables meet with each other, the cross angle should be 90°, and the distance should be reduced as far as possible.

The following table shows the recommended minimum distances between parallel shielded data cables and power cables in terms of different length.
<table>
<thead>
<tr>
<th>Parallel cable length (m)</th>
<th>Min. distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>0.3</td>
</tr>
<tr>
<td>300</td>
<td>0.5</td>
</tr>
<tr>
<td>500</td>
<td>1.2</td>
</tr>
</tbody>
</table>

The data cables should be routed close to the ground surface or supports, such as support beam, steel channel or metal rail, as far as possible.

### 5.4 Cable Fastening and Protection

#### 5.4.1 Cable Fastening

To avoid overheating or even fires caused by poor contact or increased contact resistance due to cable lug loosening from stress, the following torque requirements need to be met when the screws of the cable lug are fastened.

<table>
<thead>
<tr>
<th>Screw specification</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>

To reduce the stress applied to the cable lug, the cables need to be fixed at appropriate locations.

#### 5.4.2 Cable Protection

The cable protection includes protection of the communication cables and power cables. The protection measures include:

- **Communication cable protection**

  The communication cable is relatively thin, and it is easy to be broken or disconnected from the cable connection terminals under stress during cable routing. Therefore, it is recommended to connect the power cables before connecting the communication cables. The cables should be laid in the cable trenches as far as possible or fastened with cable ties in places without cable trenches. Cable routing should be away from the heating element and loop cables with strong electric field.

- **Power cable protection**

  Strong electric currents are present in the power cables. Therefore, the insulation layer of the cables should be protected from damages during installation and connection to avoid short circuit. The power cables need to be tightened up if necessary.
6 Mechanical Installation

6.1 Transport

6.1.1 Precautions

⚠️ WARNING
The inverter should be transported and installed as an integrated unit. Never disassemble it without the permission of Sungrow. Transport the inverter by strictly following descriptions in this chapter.

⚠️ WARNING
Always keep in mind the non-central center of gravity of the inverter and gravity mark on the inverter package. Please take the heavy weight of the inverter into consideration during shipping and moving.

⚠️ WARNING
Always keep the inverter upright!
The inclination angle is <5°. If the inclination angle is greater than 5°, the inverter may tip over. Since the device is heavy and big, beware of personal injury or device damage. Avoid sudden force when moving or transporting the device.

⚠️ WARNING
Do not transport the inverter in raining or other harsh environment. Take proper protection measures if the inverter has to be transported in harsh days.

⚠️ WARNING
Only qualified personnel with professional authorization can transport and move the inverter.

NOTICE
Please take necessary auxiliary measures to transport the inverter to the final installation site safely.
6.1.2 Transport

It is recommended to lay the DC input cables and AC output cables before moving the inverter cabinet to the predetermined site. Since these cables are thick, cable routing will be difficult and the cables are more likely to be damaged once the inverter cabinet is installed.

The inverter can be transported without package nearby its installation site. The unpacked inverter can be transported by means of forklift, crane, slide rail, or the like.

- Forklift

  Strictly observe Safety Operation Rules of Forklift during transport.

  Fork, put down, and move the inverter slowly and steadily. Place the inverter only on solid and flat ground.
  - Remove the front and back cover plate at the bottom of the inverter and have the center of gravity fall in the middle of two forks before starting transport.

  The removed cover plates and screws should be properly kept. The cover plates should be reassembled after mechanical installation, for which, refer to "Figure 6-3 Cover plate reassembly".

- Pallet truck

  Alternatively, use the pallet truck to transport the inverter. In this case, have the center of gravity of the inverter fall in the middle of two forks of the pallet truck and perform a test fork.

  Fork, put down, and move the inverter slowly and steadily. Place the inverter only on solid and flat ground.

  Observe corresponding safety operation rules during transport.

- Crane

  The center of the hook should be vertical to the center of the inverter and test hoisting should be performed. Tilting transport is strictly prohibited. Strictly observe Safety Operation Rules of Crane during transport.

  Hoist, put down, and move the inverter slowly and steadily. Place the inverter only on solid and flat ground.
No matter which transportation tool is used, make sure:
- Keep the center of gravity in mind at all time.
- Keep the heavy weight of inverter in mind at all time.
- Take proper auxiliary measures to ensure the safety of transport personnel.
- Take necessary auxiliary measures to ensure the device can be moved to the final installation site safely.

6.2 Installation

Unpack the inverter.

If the inverter is not to be installed immediately, store it in the package with the shielding materials and desiccant inside.

Fastening

**NOTICE**

*It is not recommended to fix the inverter by means of welding.*

Proceed as follows to fasten the inverter to the steel channel or the ground:

**Step 1** Remove the front and back cover plates on the bottom of the cabinet.

**Step 2** Connect the inverter to the steel channel or the ground by using M12 bolts.
The sequence of connecting the inverter bottom to channel steels is shown in the figure below.

### Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Nut</td>
</tr>
<tr>
<td>B</td>
<td>Spring washer</td>
</tr>
<tr>
<td>C</td>
<td>Flat washer</td>
</tr>
<tr>
<td>D</td>
<td>Bottom of the inverter</td>
</tr>
<tr>
<td>E</td>
<td>Channel steel</td>
</tr>
<tr>
<td>F</td>
<td>Bolt</td>
</tr>
</tbody>
</table>

**Step 3** Reassemble the front and back cover plates, as shown in the figure below.
7 Electrical Connection

7.1 Safety Instructions

For personal and device safety during electrical connection, observe the safety instructions described in this manual, especially in this chapter, and respect the national/local standards and regulations.

7.1.1 General Safety Rules

⚠️ DANGER
High voltage! Electrical shock!
- Do not touch the live component!
- Ensure that both the AC and DC side are voltage-free before starting installation.
- Never put inflammable materials in the vicinity of the inverter.
- Do not use a conventional multimeter to measure the DC voltage. A multimeter with voltage withstanding of at least 1500V is recommended. Otherwise, serious damage may follow.

⚠️ WARNING
- All electrical connections must comply with national/local standards.
- Connect the inverter to the grid only after an approval is received from the local power supply company and technical persons have finished the installation.

⚠️ WARNING
- Only professional electricians and qualified personnel can perform electrical connections.
- Perform cable connections strictly according to the wiring identifications inside the device.

7.1.2 Five safety Rules

During the whole electrical connection process or other operations on the inverter, respect the following five safety rules:
- Disconnect all external connections and internal power supply connections to the inverter.
- Ensure that the inverter cannot be powered on accidentally.
- Ensure that the interior of the inverter is completely voltage-free by using a multimeter.
- Perform necessary grounding and short circuit connection.
- Use the insulation clothing to cover and insulate the possible live components adjacent to the operation area.
7.2 Installation Tools and Spare Parts

Prepare the following tools and spare parts before installation:

- Torque wrench
- Screwdriver
- Wire stripper
- Terminal crimper
- Alcohol blast burner (or hot air blower)
- Allen wrench for terminal fixing
- Megger and multimeter
- Other auxiliary tools and spare parts

7.3 Cable Connection Parts

**WARNING**

Incorrect cable connection sequence may cause fires. Connect the parts in correct order.
Ensure connection firmness. Poor connection or oxidation of the contact surface may cause overheating and fires.

Before electrical connections, it is recommended to clean the cable connection terminals. Do not directly touch the cleaned terminals.

Spare parts, such as the bolts, used for connecting the power cables of the inverter have been packed in a dedicated bag before delivery. Connect the cables strictly observing the description in this chapter.

7.3.1 Copper Cable Connection

When copper cables are selected, the connection sequence of wiring parts is shown in the following figure.

![Copper cable terminal connection sequence diagram]

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>Copper bar</td>
<td>Copper connection terminal</td>
<td>Bolt</td>
<td>Spring washer</td>
<td>Flat washer</td>
<td>Nut</td>
</tr>
</tbody>
</table>

**Fig. 7-1 Copper cable terminal connection sequence**
7.3.2 Aluminium Cable Connection

If an aluminium cable is selected, the copper-aluminium cable connection terminal is needed, and the connection sequence is shown in the following figure.

![Aluminium cable terminal connection sequence](image1)

**Fig. 7-2 Aluminium cable terminal connection sequence**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper bus bar</td>
<td>Cable lug (aluminium)</td>
<td>Bolt</td>
<td>Spring washer</td>
<td>Flat washer</td>
<td>Nut</td>
</tr>
</tbody>
</table>

Beware of the connection direction of the albronze filter during cable connection. The copper side should be attached to the copper bus bar while the other side is attached to the aluminium connection terminal. Schematic diagram is shown below:

![Albronze filter connection direction](image2)

**Fig. 7-3 Albronze filter connection direction**

When the bus bar has several connection terminals, an intact albronze filter can be used.

![Albronze filter connection](image3)

**Fig. 7-4 Albronze filter connection**

7.4 Preparation Before Electrical Connection

7.4.1 Opening the Front Door

Before cable connections, the user needs to open the front door of the inverter. Open and close the front door by using the key. The opening steps are shown by the following figure:
After finishing the installation, remove the key and keep it properly.

### 7.4.2 Removing the Protective Grid

Before electrical connections, remove the protective grid installed for safety consideration in the connection area inside the inverter.

**NOTICE**

All external cables are connected to the connection terminal through the cable entries on the bottom of the inverter.

The protective grid is located at the lower part of the inverter cabinet.

**Step 1** Open the door and find the protective grid of the connection area.

**Step 2** Loosen the screws at the edge of the protective grid to remove the grid.

For DC side cable connection, remove both the protective grid and the insulation protective grid.

### 7.4.3 Check Connection Cable

**WARNING**

Before electrical connections, check all cables for insulation and intactness. Poor insulated or partially bare cables or cables with other damages may be a serious safety risk, and need to be replaced immediately.

### 7.4.4 Cable Connection Precautions

**WARNING**

- Before cable connections, make sure the polarities of the DC cables are correct and the connection sequences of the AC cables are consistent.
- During electrical connection, do not forcibly pull any wires or cables, as this may compromise the insulation performance.
- All cables and wires should be bent to some extent.
- Take necessary auxiliary measures to reduce the stress applied to the cables or wires.
- After completing each step, carefully check the connection for correctness and firmness.

### 7.5 Cable Inlet & Outlet Holes

The DC and AC cables come inside and out of the inverter through the bottom of the device.

Cover plates for cable inlet & outlet holes are designed on the bottom of the inverter. Holes need to be drilled on site according to requirements.
The following three hole drilling schemes are recommended.

Scheme A  
Fireproof mud

Scheme B

Scheme C

Seal the gaps with waterproof and fireproof materials after the cable connection. Otherwise, the electrical components inside the inverter unit cannot operate normally.

7.6 Overview of the Connection Area

All cable connection terminals are at the lower part of the inverter with specific markings. Please observe the markings to perform cable connection.

Fig. 7-5 Overview of the connection area
Terminal description is shown in the following table:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Markings on the device</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DC cable connection area</td>
<td>DC+, DC-</td>
</tr>
<tr>
<td>B</td>
<td>AC cable connection area</td>
<td>L1, L2, L3</td>
</tr>
<tr>
<td>C</td>
<td>Ground connection area</td>
<td></td>
</tr>
</tbody>
</table>

For a standard inverter, there are 16 DC inputs. With special requirements, specify them when placing an order.

7.7 Cable Requirements

Select cables according to the following requirements:

- All the cables must have sufficient ampacity. The ampacity of the conductor is related to environmental conditions, conductor insulation materials, laying, wire materials, cross-sectional areas, and the like.
- The cross-sectional area of each cable must be selected according to the maximum DC current of the inverter with margin reserved.
- Cables on the same side should be of the same specification and same type.
- Use the flame retardant and fire resistant cables.

Recommended cable specifications are listed below.

<table>
<thead>
<tr>
<th>Cable</th>
<th>Requirements (mm²)</th>
<th>Connection holes</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+</td>
<td>Positive and negative side each: 70mm²×16</td>
<td>Positive and negative side each: 16</td>
<td>Φ13</td>
</tr>
<tr>
<td>DC-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid phase L1</td>
<td>6 outputs for each phase, and 240mm²</td>
<td>8 for each phase</td>
<td>Φ17</td>
</tr>
<tr>
<td></td>
<td>for each output, or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid phase L2</td>
<td>8 outputs for each phase, and 185mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>for each output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid phase L3</td>
<td>The green-and-yellow ground cable of at</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>least 70mm² is connected to the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>grounding copper bus bar; or select</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>according to the related electrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>connection and ground connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounding cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication cable</td>
<td>2×0.75mm², shielding layer is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>recommended</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power cable</td>
<td>4-core 2.5mm² or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-core 4mm² cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WARNING**

Overload on the cables is strictly prohibited!
7.8 DC Side Cable Connection

7.8.1 Cable Check

Check the following items carefully before cable connections:

• Measure the open-circuit voltage of the PV array to ensure that the open circuit voltage does not exceed the maximum DC voltage of the inverter.
• Identify cable negative and positive poles and mark them.
• Check the PV modules for grounding faults.

**WARNING**

• The open-circuit voltage of the PV array cannot exceed the maximum DC input voltage. Otherwise, the inverter may be damaged.
• When finding a grounding fault of the PV module, remove the fault before performing DC cable connection.

**WARNING**

Perform cable connections strictly according to the wiring identifications inside the device.

**WARNING**

Observe all safety rules required by the PV module manufactures.

Start the DC side cable connection only after all checking and measurement meet the requirements.

7.8.2 Cable Connection Area

The output of the PV array can be directly input to the DC input side of the inverter via the combiner box.

There are 16 input circuit breakers on the DC side of the inverter (the input number can be customized according to requirements), and each circuit breaker can be connected to an inverter DC+ and DC-. There are 16 round holes on the inverter DC+ and DC- respectively with cross-sectional area of Φ13. It is recommended to connect 16 cables with cross-sectional areas of 70mm² to each of DC+ and DC-.

DC cable connection area is shown in the figure below.
7.8.3 DC Side Cable Connection

Proceed as follows to connect the DC side cables.

**Step 1** Ensure that output circuit breakers of all upstream combiner boxes of the inverter have been disconnected.

**Step 2** Strip off the insulation on the end of the cable. The stripped length should be about 5 mm longer than the depth of the cable lug.

**Step 3** Crimp the cable lug. It is recommended to use a DT-70 cable lug considering the selected cable specification.
   1. Insert the stripped copper cable into the cable lug.
   2. Crimp the cable lug by using the crimper. Crimping number should be more than 2.

**Step 4** Insert the heat-shrinkable tubing.
   1. Select an appropriate heat-shrinkable tubing according to the cable specification, where the heat-shrinkable tubing should be 2 cm longer than the depth of the cable lug.
   2. Insert the cable lug into the heat-shrinkable tubing to completely cover the crimping hole on the cable lug.
   3. Shrink the tubing with a hot air blower.

**Step 5** Connect the cables.
   1. Select bolts matching the cable lug, with M12×40 recommended.
   2. Attach the cable lug to the DC copper bus bar.
   3. Fasten the bolts by using the screwdriver or the spanner with torque of 60 to 70N·m.

Cable protectors are recommended in the cable crosses if multi-core cables are used.
Considering the design of the copper bus bar, it is recommended to connect the cables from inside to outside.

**WARNING**
- Incorrect cable connection sequence may cause fires. Connect the parts in correct order.
- Ensure connection firmness. Poor connection or oxidation of the contact surface may cause overheating and fires.

**NOTICE**
- The selected bolts should be of appropriate length, a little bit longer than the depth of installation hole. Otherwise, the insulation performance may be impaired or a short circuit may be caused.
- Check if any heat-shrinkable tubing is caught between the cable lug and the copper bus bar, and remove it immediately if so. Otherwise, poor contact or even device damage may be caused.

**Step 6** Ensure that the connection is correct and firm.

### 7.9 AC Side Cable Connection

#### 7.9.1 Safety Precautions

**WARNING**
Incorrect cable connections on the AC side can cause abnormal operation or even damage to the inverter!

**WARNING**
Lethal electrical shock from inadvertent touching on the live components!
- Ensure the AC switches are disconnected and the terminals are voltage-free.
- The connection to the grid must be approved by the related department and comply with the grid-related safety regulations.

**WARNING**
There are two inverter versions: supporting AC parallel connection and not supporting AC parallel connection. If the purchased device does not support the AC parallel connection, do not directly connect the AC outputs of the inverter in parallel.

**WARNING**
Perform cable connections strictly according to the wiring identifications inside the device.
Open/Close the AC switches strictly according to the internal identifications.

### 7.9.2 Cable Routing

AC cables should be routed in groups to avoid three-phase current unbalance from cable routing. Each group includes three cables corresponding to three phases respectively. The distance between groups should be at least twice of the cable cross-sectional area.

Schematic diagram is shown below:

![Cable Routing Diagram](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cable cross-section</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Distance between cable groups</td>
<td>B≥2A</td>
</tr>
</tbody>
</table>

### 7.9.3 Cable Connection

There are 8 round holes with cross-sectional area of Φ17 for each of the three phases. 6 cables with cross-sectional area of 240mm² or 8 cables with cross-sectional area of 185mm² for each of the three phases are recommended. The cable connection area is shown by A in the figure below.

![Cable Connection Diagram](image)

**AC output of the inverter is fed to the grid via medium-voltage transformer. Proceed as follows to connect the AC cables to the MV transformer:**
Step 1. Disconnect the downstream AC switches.

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

Step 3. Strip off the insulation on the end of the cable. The stripped length should be about 5 mm longer than the depth of the cable lug. It is recommended to use a DT-70 cable lug considering the selected cable specification.

Step 4. Crimp the cable lug.
   1. Insert the stripped copper cable into the cable lug.
   2. Crimp the cable lug with crimping device for more than two times.

Step 5. Insert the heat-shrinkable tubing.
   1. Select an appropriate heat-shrinkable tubing according to the cable specification, where the heat-shrinkable tubing should be 2 cm longer than the depth of the cable lug.
   2. Insert the cable lug into the heat-shrinkable tubing to completely cover the crimping hole on the cable lug.
   3. Shrink the tubing with a hot air blower.

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

Step 6. Connect the "L1" cable to the "L1", i.e. phase A(U) on the transformer low-voltage side.
   1. Select bolts matching the cable lug, with M16×45 recommended.
   2. Attach the cable lug to the AC copper bus bar.
   3. Fasten the bolts by using the screwdriver or the spanner with torque of 119~140N·m.

   **WARNING**
   - Incorrect cable connection sequence may cause fires. Connect the parts in correct order.
   - Ensure connection firmness. Poor connection or oxidation of the contact surface may cause overheating and fires.

   **NOTICE**
   - Select screws of appropriate length. The screws should just slightly protrude from the mounting holes. Excessively long screws may affect the insulation performance of the device, or even cause a short circuit.
   - Inspect the connections between the copper lug and the copper bus bar after installation. If any heat-shrinkable tubing is caught between these two components, remove them immediately. Otherwise, poor contact or even device damage can be caused.

Step 7. Connect the AC output "L2" cable to the "L2" of the grid, i.e. phase B(V), and connect the AC output "L3" cable to the "L3" of the grid, i.e. phase C(W) following the procedure in step 6.

   Heat-shrinkable tubing of yellow, green and red is applied to L1, L2 and L3 cables respectively to distinguish them from each other.

Step 8. Ensure that the connection is secure.
Supplementary description

Two connection holes of Φ8 are reserved on the AC output copper bus bar of the inverter. If the inverter is equipped with a control transformer whose capacity is less than 20kVA, the AC copper bus bar of the inverter can supply power for the transformer.

7.10 Grounding Connection

⚠️ WARNING

The grounding cable must be grounded well! Otherwise,
• Lethal electrical shock can be caused when a fault occurs!
• The device may be damaged by lightning!
• The device may operate abnormally!

NOTICE

During grounding, note that:
• All grounding connections must comply with national/local standards and regulations.
• Grounding connection between the device and the grounding electrode must be reliably secured.
• Measure the grounding resistance after grounding connection to ensure the resistance is no more than 4 Ω.

⚠️ WARNING

Perform cable connections strictly according to the wiring identifications inside the device.
7.10.1 Description of Grounding Terminal

Two grounding copper bus bars are provided for the inverter, as shown in the figure below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Recommended specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Armour cable grounding of upstream combiner box</td>
<td>70mm²</td>
</tr>
</tbody>
</table>

The inverter enclosure and the internal components (such as surge protection device) that need to be grounded have been firmly connected to the grounding terminal at the bottom of the cabinet before delivery.

Connect the PE grounding terminal and the equipotential bonding equipment on the installation site by using grounding cable; or perform selection according to the related electrical connection and grounding connection specifications.

Then connect it to earth or grounding network through the equipotential bonding device. The grounding resistance should be no more than 4Ω.

7.10.2 Grounding of the Shielding Layer of Communication Cable

The standard inverter adopts RS485 communication mode, and shielded twisted-pair cables are used. Ground the shielded layer to reduce communication interference and ensure communication quality.

RS485 cables are used in the whole system, and the shielded layers must be connected securely and single grounded. Usually, the grounding point is on the exterior enclosure of the cabinet and it can be selected according to onsite conditions.

7.11 Communication Cable Connection

⚠️ WARNING

Perform cable connections strictly according to the wiring identifications inside the device.
7.11.1 Introduction

The inverter supports both RS485 serial port communication and RJ45 port communication. RS485 cable connection terminals and Ethernet interfaces are reversed inside the inverter.

This section will introduce the cable connection location and method of the two solutions.

7.11.2 RS485 Communication Solution

RS485 connection terminals are shown below:

![Fig. 7-9 Location of RS485 terminals](image)

One inverter communication

Figure below shows the communication for a single inverter. Connect the communication port A1 and B1 to RS485/RS232 converter and then to the monitoring PC.

![Fig. 7-10 RS 485 communication for single inverter](image)
Multiple-inverter communication

There are several communication connection methods for multiple inverters. The following monitoring system solution is optional.

Logger, a data collection device, is recommended for the sake of better and quicker communication, longer communication distance of RS485 bus, fewer errors, and more types of communication interfaces.

- Logger is an optional device. Users can order it from Sungrow. For more information on Logger, download related documentations at www.sungrowpower.com.
- When there is more than one inverter room in the PV plant, each monitoring system of the inverter room should be equipped with a Logger. The monitored data will then be transferred to the central monitoring room.

PC can monitor the devices via Insight, which can be downloaded at www.sungrowpower.com.

Fig. 7-11 RS485 communication for multiple inverters
Connection procedure

**Step 1** Strip off the two cables connected to the same connection terminal.

**Step 2** Insert the stripped copper into the bootlace ferrule and tighten it with crimping pliers.

**Step 3** Connect the bootlace ferrule to the communication terminal.

**Step 4** Twist the shielding layers of the two cables into one, cover it with heat-shrinkable tubing, and insert it into the bootlace ferrule.

![Fig. 7-12 Terminal crimping](image_url)

**NOTICE**

RS232 communication distance should be within 15 meters and RS485 communication distance should be within 1,200 meters. Communication beyond this distance should adopt optical fiber LAN. Electricity-optics change device and the optical cables should be designed in accordance with the reality or adopt the available LAN system. Sungrow can provide professional solutions.

- RS485 cable should be shielded twisted-pair for communication quality (RVVP-2*1.0 shielded twisted-pair cable is recommended).
- Shielding layer of RS485 cable should be single-point grounded in the site of monitor terminal.

### 7.11.3 Ethernet Communication Solution

The RJ45 port is located at the intelligent power distribution cabinet unit on the back of the inverter, as shown in the figure below.
One inverter communication

Connect the RJ45 port of the inverter and the PC by using the cable (EIA/TIA568B).

Multiple-inverter communication

Ethernet switch is required for multiple inverters communication. The following system monitoring solution can be adopted.

The PC can monitor the devices via Insight. Latest manuals and monitoring software can be downloaded at www.sungrowpower.com.
7.12 Supply Modes

7.12.1 Introduction

⚠️ WARNING
Perform cable connections strictly according to the wiring identifications inside the device.

The inverter integrates the power distribution function. You can connect the external device to the power distribution output terminal and socket.

If no external power supply is connected, the inverter will choose the internal power supply mode by default.

![Terminals for setting power supply modes](image)

<table>
<thead>
<tr>
<th>Circuit breaker</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Control the internal power supply mode</td>
</tr>
<tr>
<td>Q2</td>
<td>Control the external power supply mode</td>
</tr>
</tbody>
</table>

ℹ️ Distinguish between the circuit breakers for controlling the internal and external power supply modes according to the device markings.

The user can select the desired power supply mode according to the following settings.

7.12.2 Internal Power Supply

⚠️ NOTICE
The internal power supply mode has been set before delivery, and it can be used directly without any modification.

Proceed as follows to set the internal power supply mode:

Step 1 Disconnect the Q2.

Step 2 Connect the Q1.
7.12.3 External Power Supply (Optional)

**WARNING**
- Live line operation can cause lethal electrical shock!
- Disconnect all devices before connecting to external power supply.

The external power supply mode should be three-phase AC power. Proceed as follows to set the external power supply mode:

**Step 1** Connect Q2.

**Step 2** Connect the three-phase AC380V cables to Q2.

**Step 3** Disconnect Q1.

The function of automatic switching between internal and external power supply modes is optional.

7.13 Close of the Cable Entrance

Conduct a thorough inspection after all electrical connections.

Perform the following operations after ensuring correct and firm cable connections.

Conduct a thorough inspection after all electrical connection.

- After drilling holes on the bottom plate of the inverter, the burring treatment must conduct for effective protection (waterproof terminal is optional) and for preventing the cables from scratch or abrasion.

- Seal the gaps of the cable entries and around the cover plate by waterproof and fireproof materials.

- If there are communication and power distribution cable entries on the bottom of the inverter, seal the gaps by fireproof mud.

- The sealing by fireproof mud should meet the waterproof and dustproof requirement.

- Reassemble the insulation covers and protective covers removed before cable connection.

The cable entries of the inverter are equipped with aluminum cover plate. Please do not use cover plate of other material to seal the cable entries. Please consult Sungrow for details.
### 7.14 Installation Checklist

Thoroughly check the mechanical and electrical installations of the inverter by at least two persons according to the following checklist.

Keep check records and take corresponding measures when necessary.

<table>
<thead>
<tr>
<th>Mechanical Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ No damages or scratches on the inverter</td>
</tr>
<tr>
<td>□ The inverter has been fixed properly to the floor</td>
</tr>
<tr>
<td>□ The clearance around the inverter is sufficient</td>
</tr>
<tr>
<td>□ The ambient temperature, humidity, and ventilation meet requirements</td>
</tr>
<tr>
<td>□ The Cooling air circulates smoothly</td>
</tr>
<tr>
<td>□ The protective enclosure seal is intact and reliable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ The inverter is grounded properly</td>
</tr>
<tr>
<td>□ The grid voltage matches the nominal output voltage of the inverter</td>
</tr>
<tr>
<td>□ Phase sequences on the grid side are consistent, and fastening torque meets requirement</td>
</tr>
<tr>
<td>□ The polarity on the DC side is correct, and fastening torque meets requirement</td>
</tr>
<tr>
<td>□ The communication cable is connected correctly and kept at a distance from other cables</td>
</tr>
<tr>
<td>□ Cable markings are correct and clear</td>
</tr>
<tr>
<td>□ The insulation protective cover is intact and reliable, and the warning labels are clear and firmly attached</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ All the unused cables are tightened by using insulation belts</td>
</tr>
<tr>
<td>□ No tools, foreign objects or dust are left inside the inverter</td>
</tr>
<tr>
<td>□ No condensation or ice is in the cabinet</td>
</tr>
</tbody>
</table>
8 Commissioning

8.1 Commissioning Requirements

Before commissioning, all installations should be checked thoroughly again.

- Ensure all the cable connections are secure and all bolts are fixed properly.
- Ensure DC side voltage meets inverter requirements and the polarity is correct.
- Ensure AC side voltage meets inverter requirements.
- Ensure all cable connections meet related standards and requirements.
- Ensure the system is properly grounded. The grounding resistance is important for the whole system. Therefore, before commissioning, make sure the grounding resistance meets requirement (no more than 4Ω).

**NOTICE**

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

**NOTICE**

Disconnect the AC and DC switch before commissioning.

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

8.2 Check Before Commissioning

8.2.1 Cable Connection Check

- Check all cables for damages or cracks.
- Check whether all cables are connected correctly according to the cable connection diagram. Adjust the cable connection if necessary.
- Ensure all cable are firmly connected. Fix the bolts if necessary.
- Check the PE equipotential connection. Ensure the inverter AC side PE ground copper bar has connected to the equipotential connection point in the electrical room and properly grounded. The grounding resistance should be no more than 4Ω.

8.2.2 Inverter Check

Before the inverter is powered on, check the inverter:

- Ensure that the DC and AC switches are in the "OFF" position.
- Ensure the Start/Stop button is in "STOP" position.
- Ensure the emergency button is released and works normally.
• Check and ensure inverter and switches upstream and downstream meet the requirements and flexible enough.

8.2.3 PV Array Check

**WARNING**

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

**WARNING**

The DC side voltage cannot exceed the maximum input DC voltage of the inverter. Excessively high DC voltage can damage the inverter or even cause safety accidents.

To ensure system reliability and device operation, one inverter should employ PV cells from the same manufacturer and the number 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.

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

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

8.2.4 Grid Voltage Check

• 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 balanced.

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

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

When all the foregoing items are inspected and comply with the requirements, prepare to start the device.

- 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 inflammable or explosive materials.
- Ensure the ventilation of the installation place.
- Recheck and ensure inverter and switches upstream and downstream meet the requirements and flexible enough.

8.4 Starting

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

**Step 1** Open the inverter Ac cabinet door; turn the AC switches to "ON" position; and lock the AC cabinet door.

**Step 2** Close the switches of all inverter upstream combiner boxes.

**Step 3** Open the DC cabinet door; turn the DC switches to "ON" position; and lock the DC cabinet door (close all the 16 DC switches even if there are less than 16 DC inputs) and wait about 1 minute.

**Step 4** Turn the Start/Stop switch to the "START" position to start the inverter.

**Step 5** It will take about 1 minute for the auto-initialization of both the power conversion circuit and the LCD panel. The POWER LED indicator is on.

**Step 6** If the DC voltage falls below the DC start-up voltage, the state in the LCD display will be in Start-up.

**Step 7** If the DC voltage exceeds the DC start-up voltage for about 1 minute, the inverter will automatically change to "RUN" mode. The OPERATION indicator will be on, and the inverter starts running.

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

8.5 LCD Parameter Setting

When the LCD is on, set the display language, data and time, communication parameters, active power limitation, etc. according to the Operation Manual. You can also view the inverter running information and perform related operation via the LCD.
8.6 Commissioning Completion

After the inverter is successfully connected to the grid, the following tests need to be performed:

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

- Check whether there are anomalies: abnormal noise, overheating, smoking or unusual smell.
- Check the grid-connected voltage, current and THD for unstableness.
- Check the grounding of the inverter enclosure.
- Check the functionality of the LCD display.

If several inverters are commissioning at the same time, operate as per inverters connect to the grid gradually. During commissioning, record accurately the running data of each inverter.

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

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

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The inverter needs no manual control in daily operation. Open the cabinet door only for maintenance or troubleshooting and by qualified personnel only.</td>
</tr>
<tr>
<td>Keep the door closed and locked and store the keys of the door by appointed personnel during normal operation.</td>
</tr>
</tbody>
</table>
## 9 Appendix

### 9.1 Technical Parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>SG1250UD</th>
<th>SG1500UD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input (DC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. input voltage</td>
<td>1100V</td>
<td>1100V</td>
</tr>
<tr>
<td>Start-up voltage</td>
<td>540V</td>
<td>600V</td>
</tr>
<tr>
<td>Min. operating voltage</td>
<td>520V</td>
<td>580V</td>
</tr>
<tr>
<td>MPP voltage range</td>
<td>520~1000V</td>
<td>580~1000V</td>
</tr>
<tr>
<td>MPP voltage range for full load</td>
<td>520~850V</td>
<td>580~850V</td>
</tr>
<tr>
<td>No. of MPPT</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No. of DC inputs</td>
<td>16 (12~20 optional)</td>
<td></td>
</tr>
<tr>
<td>Max. input current</td>
<td>2x1356A</td>
<td>2x1448A</td>
</tr>
<tr>
<td><strong>Output (AC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal output power</td>
<td>1260kW</td>
<td>1500kW</td>
</tr>
<tr>
<td>Max. output power</td>
<td>1386kW</td>
<td>1650kW</td>
</tr>
<tr>
<td>Max. output apparent power</td>
<td>1386kVA</td>
<td>1650kVA</td>
</tr>
<tr>
<td>Max. output current</td>
<td>2222A</td>
<td>2381A</td>
</tr>
<tr>
<td>Nominal grid voltage</td>
<td>360V</td>
<td>400V</td>
</tr>
<tr>
<td>Grid voltage range</td>
<td>288~414V (optional)</td>
<td>320~460V (optional)</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 (optional)</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% (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/Connection 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>European efficiency</td>
<td>98.7%</td>
<td></td>
</tr>
</tbody>
</table>
### Protection

<table>
<thead>
<tr>
<th>Protection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC overvoltage protection</td>
<td>Yes</td>
</tr>
<tr>
<td>DC reverse connection protection</td>
<td>Yes</td>
</tr>
<tr>
<td>DC short-circuit protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Grid monitoring</td>
<td>Yes</td>
</tr>
<tr>
<td>GFDI</td>
<td>Yes</td>
</tr>
<tr>
<td>Insulation monitoring</td>
<td>Yes</td>
</tr>
<tr>
<td>Over-temperature protection</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Other functions

<table>
<thead>
<tr>
<th>Function</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PID protection and recovery</td>
<td>Optional</td>
</tr>
<tr>
<td>SVG function</td>
<td>Yes</td>
</tr>
<tr>
<td>Night sleep mode</td>
<td>Yes</td>
</tr>
<tr>
<td>AC parallel connection</td>
<td>Yes</td>
</tr>
<tr>
<td>Soft start and stop</td>
<td>Yes</td>
</tr>
<tr>
<td>Auto switch between power</td>
<td>Optional</td>
</tr>
<tr>
<td>supply modes</td>
<td></td>
</tr>
</tbody>
</table>

### General parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W×H×D)</td>
<td>2280×2080×850mm</td>
</tr>
<tr>
<td>Weight</td>
<td>2,200Kg</td>
</tr>
<tr>
<td>Ingress of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>The standby consumption*</td>
<td>&lt;40W</td>
</tr>
<tr>
<td>Auxiliary power supply</td>
<td>3~380V/5A</td>
</tr>
<tr>
<td>Cooling method</td>
<td>Forced air cooling</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-35~+60°C ( &gt; 50°C derating)</td>
</tr>
<tr>
<td>Operating humidity</td>
<td>0~95% (Non-condensing)</td>
</tr>
<tr>
<td>Max. operating altitude</td>
<td>4,500m (&gt; 3,000m derating)</td>
</tr>
<tr>
<td>Communication interface</td>
<td>RS485 and Ethernet</td>
</tr>
<tr>
<td>Communication protocol</td>
<td>Modbus RTU, Modbus TCP, IEC104</td>
</tr>
</tbody>
</table>

Note: *The standby consumption is power consumption of the inverter in deep standby mode. For details, refer to chapter "8.13" of operation manual in the scope of delivery.
9.2 Exclusion of Liability

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

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

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

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

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

9.3 About Us

Sungrow power supply is a Chinese leading manufacturer of various power electronics products for renewable energy generation systems. Our products include converters, inverters, battery chargers and other power supplies for distributable generation systems in both grid-connected and stand-alone applications. The power rating of SUNGROW products covers a range from several hundred watts to large mega-watt systems.

The pursuit of SUNGROW is to help our customers acquire stable and clean power with minimum cost, maximum reliability and enhanced safety.
9.4 Contact Information

Should you have any questions or queries about this product, please contact us through the following information. We will be more than happy to assist you!

<table>
<thead>
<tr>
<th><strong>Company:</strong></th>
<th>Sungrow Power Supply Co., Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Website:</strong></td>
<td><a href="http://www.sungrowpower.com">www.sungrowpower.com</a></td>
</tr>
<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:Info@sungrow.cn">Info@sungrow.cn</a>; <a href="mailto:service@sungrow.cn">service@sungrow.cn</a>.</td>
</tr>
<tr>
<td><strong>Address:</strong></td>
<td>No.1699 Xiyou Rd., New &amp; High Technology Industrial Development Zone, Hefei, P. R. China.</td>
</tr>
<tr>
<td><strong>Zip:</strong></td>
<td>230088</td>
</tr>
<tr>
<td><strong>Telephone:</strong></td>
<td>+86 551 6532 7834, +86 551 6532 7845</td>
</tr>
<tr>
<td><strong>Fax:</strong></td>
<td>+86 551 6532 7856</td>
</tr>
</tbody>
</table>