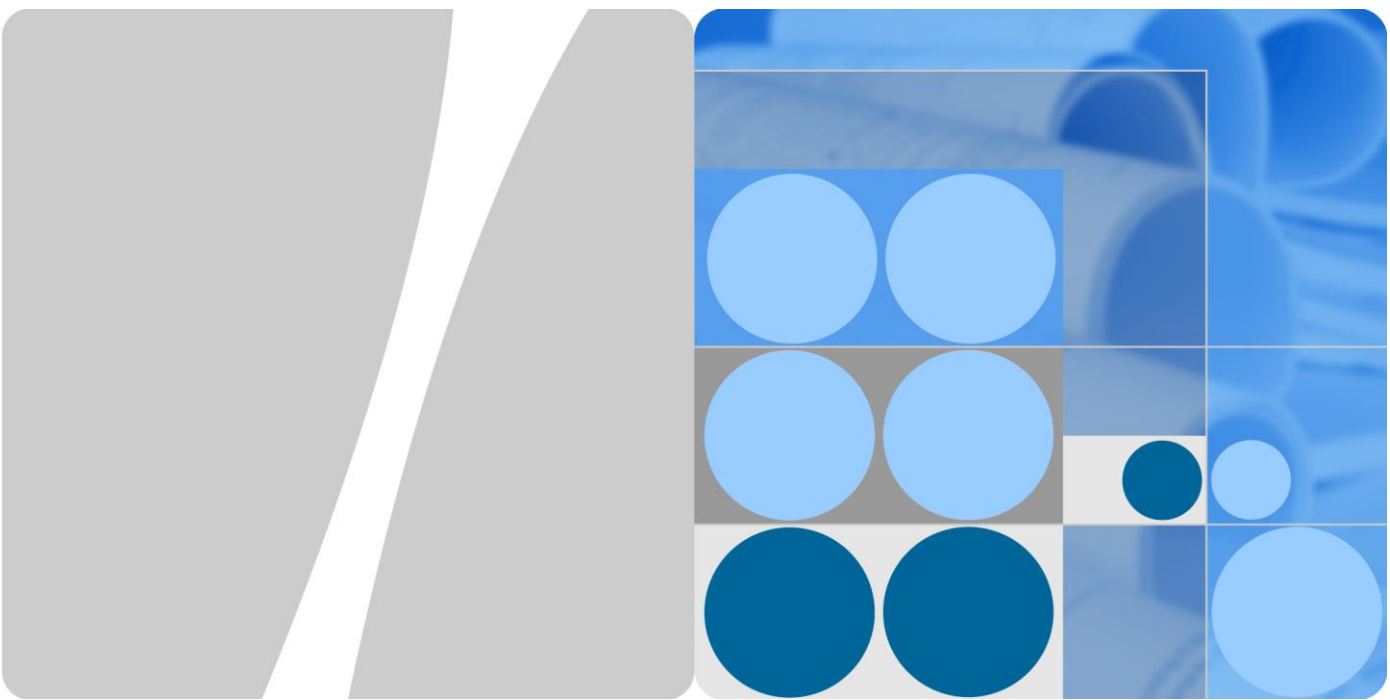




**SUN2000-60KTL-M0**

# **User Manual (Europe Edition)**

**Issue**      **01**  
**Date**      **2018-02-28**

**HUAWEI TECHNOLOGIES CO., LTD.**



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# About This Document

## Purpose

This document describes the SUN2000-60KTL-M0 (SUN2000 for short) in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. Before installing and operating the SUN2000, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

## Intended Audience

This document is intended for photovoltaic (PV) plant personnel and electrical technicians.

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

| Symbol                                                                                             | Description                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>DANGER</b>  | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.                                                                                                                                  |
|  <b>WARNING</b> | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.                                                                                                                                 |
|  <b>CAUTION</b> | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.                                                                                                                                  |
|  <b>NOTICE</b>  | Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.<br>NOTICE is used to address practices not related to personal injury. |
|  <b>NOTE</b>    | Calls attention to important information, best practices and tips.<br>NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.                                                  |

## Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

### Issue 01 (2018-02-28)

This issue is used for first office application (FOA).

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# 1 Safety Precautions

## General Safety



### NOTICE

- Before performing operations, read through this manual and follow all the precautions to prevent accidents. The "DANGER", "WARNING", "CAUTION", and "NOTICE" marks in this document do not represent all the safety instructions. They are only supplements to the safety instructions.
- The personnel responsible for installing, connecting cables for, commissioning, maintaining, and troubleshooting Huawei products should be qualified and trained to master the correct operation methods and the knowledge of safety precautions.

When operating Huawei equipment, in addition to following the general precautions in this document, follow the specific safety instructions given by Huawei. The safety precautions provided in this document do not cover all the safety precautions. Huawei shall not be liable for any consequence caused by the violation of the safety operation regulations and design, production, and usage standards.

## Disclaimer

Huawei shall not be liable for any consequence caused by any of the following events:

- Transportation damage
- Violation of the storage requirements specified in this document
- Incorrect storage, installation, or use
- Installation or use by unqualified personnel
- Failure to obey the operation instructions and safety precautions in this document
- Operation in extreme environments which are not covered in this document
- Operation beyond specified ranges
- Unauthorized modifications to the product or software code or removal of the product
- Device damage due to force majeure (such as lightning, earthquake, fire, and storm)
- The warranty expires and the warranty service is not extended.

- Installation or use in environments which are not specified in related international standards

## Personnel Requirements

Only certified electricians are allowed to install, connect cables for, commission, maintain, troubleshoot, and replace the SUN2000. Operation personnel must meet the following requirements:

- Receive professional training.
- Read through this document and follow all the precautions.
- Be familiar with the safety specifications about the electrical system.
- Understand the components and functioning of a grid-tied PV system, and be familiar with relevant local standards.
- Wear proper personal protective equipment (PPE) during any operation on the SUN2000.

## Protect Labels

- Do not scrawl, damage, or block the labels on the SUN2000 enclosure.
- Do not scrawl, damage, or block the nameplate on the side of the SUN2000 enclosure.

## Installation



### **DANGER**

Never work under power during installation.

- 
- Ensure that the SUN2000 is not connected to a power supply or powered on before finishing installation.
  - Ensure that the SUN2000 is installed in a well-ventilated environment.
  - Ensure that the SUN2000 heat sinks are free from blockage.
  - Never open the host panel cover of the SUN2000.
  - Never remove the terminals and cable glands at the bottom of the SUN2000.

## Electrical Connections



### **DANGER**

Before connecting cables to the SUN2000, ensure that the SUN2000 is secured in position and not damaged in any way. Otherwise, electric shocks or fire may occur.

- 
- Ensure that all electrical connections comply with local electrical standards.
  - Obtain approval from the local electric utility before using the SUN2000 to generate electricity in grid-tied mode.
  - Ensure that the cables used in a grid-tied PV system are properly connected and insulated and meet all specification requirements.

## Operation



### **DANGER**

High voltage may cause an electric shock, which results in serious injury, death or serious property damage from the SUN2000 in operation. Strictly comply with the safety precautions in this document and associated documents to operate the SUN2000.

- Do not touch an energized SUN2000 because the heat sink has a high temperature.
- Follow local laws and regulations when operating the SUN2000.

## Maintenance and Replacement



### **DANGER**

High voltage may cause an electric shock, which results in serious injury, death or serious property damage from the SUN2000 in operation. Prior to maintenance, power off the SUN2000 and strictly comply with the safety precautions in this document and associated documents to operate the SUN2000.

- Maintain the SUN2000 with sufficient knowledge of this document, proper tools, and testing equipment.
- Before performing maintenance tasks, power off the SUN2000 and wait at least 15 minutes.
- Temporary warning labels or fences must be placed to prevent unauthorized people entering the site.
- Rectify any faults that may compromise the SUN2000 security performance before powering on the SUN2000 again.
- Observe electrostatic discharge (ESD) precautions during maintenance.

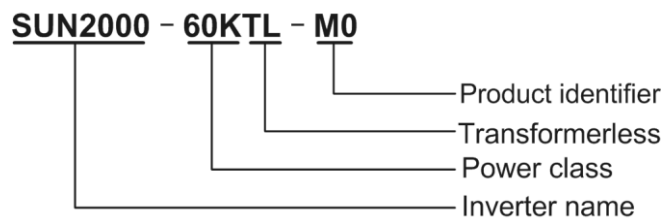
# 2 Overview

## 2.1 Introduction

### Function

The SUN2000 is a three-phase grid-tied PV string inverter that converts the DC power generated by PV strings into AC power and feeds the power to the power grid.

### Models



| Model            | Rated Output Power | Rated Output Voltage |
|------------------|--------------------|----------------------|
| SUN2000-60KTL-M0 | 60 kW              | 400 V/480 V          |

### Networking Application

The SUN2000 applies to grid-tied PV systems for commercial rooftops and large PV plants. Typically, a grid-tied PV system consists of the PV string, SUN2000, alternating current distribution unit (ACDU), and isolation transformer.

A sequence of five components connected by lines, representing a power system flow: A (PV array), B (inverter), C (battery storage), D (transformer), and E (distribution lines).

ISO1NC0003

(C) ACDU

(E) Power grid

The SUN2000-60KTL-M0 supports the following power grid modes: TN-S, TN-C, TN-C-S, TT, and IT.

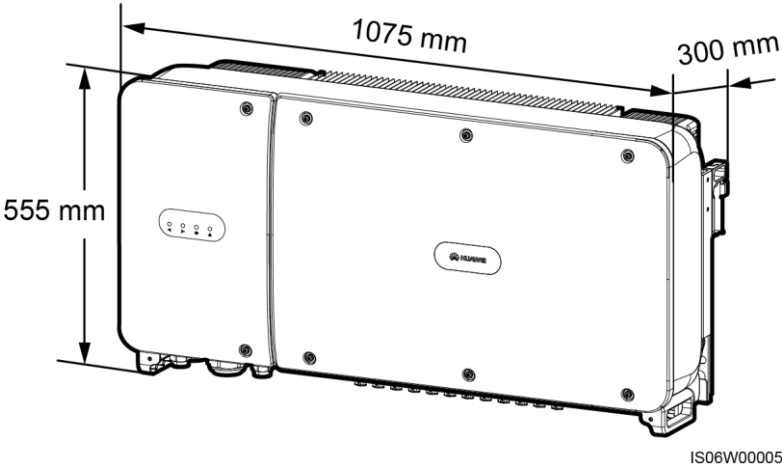
The diagram illustrates five different power distribution system configurations for a SUN2000 inverter:

- TN-S:** The transformer has four output lines: L1, L2, L3, and N. The PE line is grounded at the transformer and runs parallel to the other lines. The SUN2000 inverter is connected to L1, L2, L3, and the PE line.
- TN-C:** The transformer has four output lines: L1, L2, L3, and PEN. The PEN line is grounded at the transformer and runs parallel to the other lines. The SUN2000 inverter is connected to L1, L2, L3, and the PEN line.
- TN-C-S:** The transformer has four output lines: L1, L2, L3, and N. The PE line is grounded at the transformer and runs parallel to the other lines. The SUN2000 inverter is connected to L1, L2, L3, and the PE line.
- TT:** The transformer has four output lines: L1, L2, L3, and N. The N line is grounded at the transformer. The PE line is grounded at a separate point. The SUN2000 inverter is connected to L1, L2, L3, and the PE line.
- IT:** The transformer has four output lines: L1, L2, L3, and N. The N line is grounded at the transformer. The PE line is grounded at a separate point. The SUN2000 inverter is connected to L1, L2, L3, and the PE line.

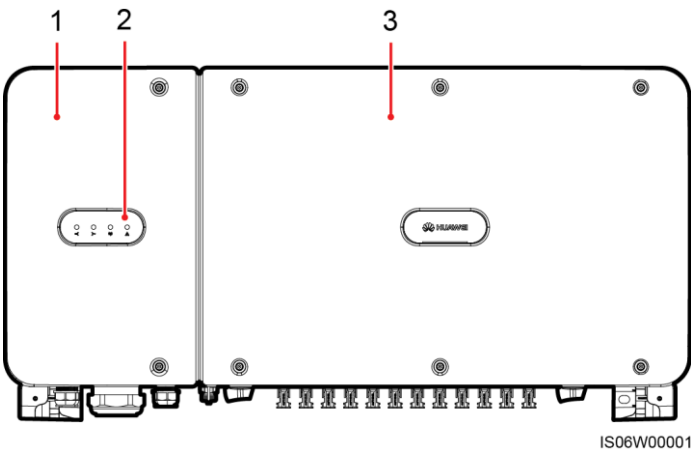
IS01S10001

## 2.2 Appearance

### Dimensions



### Front View



(1) Maintenance compartment door      (2) LED      (3) Host panel cover

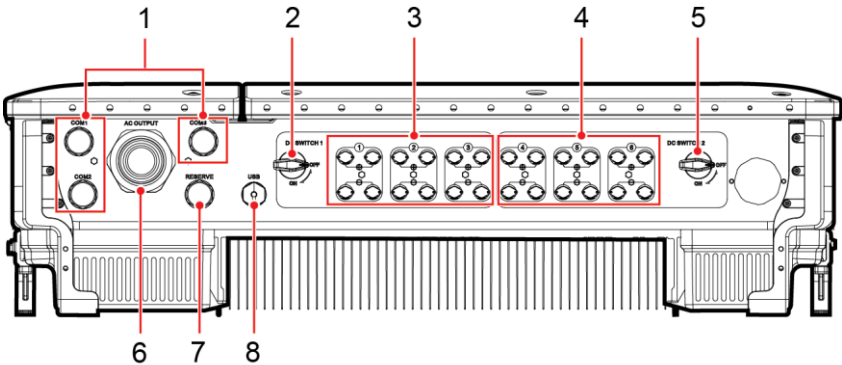
| LED                   | Status       | Meaning                                                                                                                                    |
|-----------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| PV connection LED<br> | Steady green | At least one PV string is properly connected, and the DC input voltage of the corresponding MPPT circuit is higher than or equal to 200 V. |
|                       | Off          | The SUN2000 disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 200 V.                              |
| Grid-tied LED<br>     | Steady green | The SUN2000 is exporting power to the power grid.                                                                                          |
|                       | Off          | The SUN2000 is not exporting power to the power grid.                                                                                      |

| LED                                                                                                        | Status                                             |                                                                           | Meaning                                                                           |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Communication LED<br>     | Blinking green (on for 0.2s and then off for 0.2s) |                                                                           | The SUN2000 receives data over RS485 or PLC communication.                        |
|                                                                                                            | Off                                                |                                                                           | The SUN2000 has not received data over RS485 or PLC communication for 10 seconds. |
| Alarm/Maintenance LED<br> | Alarm status                                       | Blinking red at long intervals (on for 1s and then off for 4s)            | The SUN2000 is generating a warning alarm.                                        |
|                                                                                                            |                                                    | Blinking red at short intervals (on for 0.5s and then off for 0.5s)       | The SUN2000 is generating a minor alarm.                                          |
|                                                                                                            |                                                    | Steady red                                                                | The SUN2000 is generating a major alarm.                                          |
|                                                                                                            | Local maintenance status                           | Blinking green at long intervals (on for 1s and then off for 1s)          | Local maintenance is in progress.                                                 |
|                                                                                                            |                                                    | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | Local maintenance fails.                                                          |
|                                                                                                            |                                                    | Steady green                                                              | Local maintenance is successful.                                                  |

 **NOTE**

- Local maintenance refers to operations performed after a USB flash drive, Bluetooth module, or USB data cable is inserted into the USB port of the SUN2000. For example, local maintenance includes configuration import and export using a USB flash drive, and maintenance operations on the SUN2000 app installed on a device connected to the SUN2000 by a Bluetooth module or USB data cable.
- If an alarm occurs during local maintenance, the Alarm/Maintenance LED shows the local maintenance status first. After the USB flash drive, Bluetooth module, or USB data cable is removed, the LED shows the alarm status.

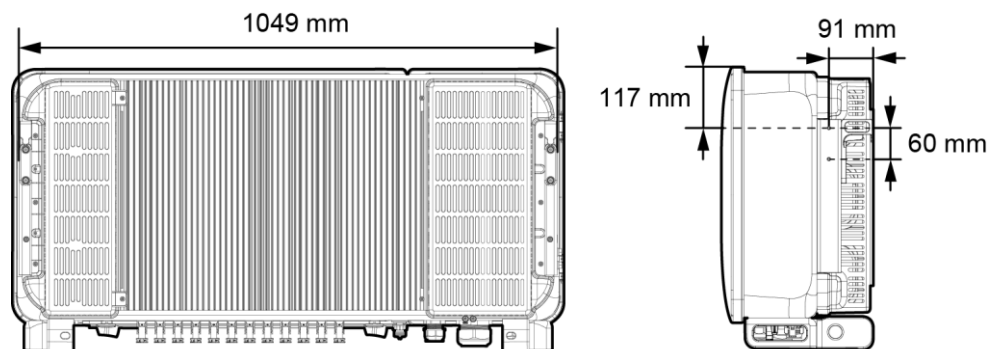
**Bottom View**



IS08W00004

| No. | Component          | Silk Screen          | Description               |
|-----|--------------------|----------------------|---------------------------|
| 1   | Cable gland        | COM1, COM2, and COM3 | Inner diameter: 14–18 mm  |
| 2   | DC switch 1        | DC SWITCH 1          | N/A                       |
| 3   | DC input terminals | +/-                  | Controlled by DC SWITCH 1 |
| 4   | DC input terminals | +/-                  | Controlled by DC SWITCH 2 |
| 5   | DC switch 2        | DC SWITCH 2          | N/A                       |
| 6   | Cable gland        | AC OUTPUT            | Inner diameter: 24–57 mm  |
| 7   | Cable gland        | RESERVE              | Inner diameter: 14–18 mm  |
| 8   | USB port           | USB                  | N/A                       |

## Holes Reserved at the Side of the Enclosure



IS06W00022



### NOTE

There are two M6 tapped holes reserved on both sides of the enclosures, which are used for installing an awning.

## 2.3 Label Description

### 2.3.1 Enclosure Labels

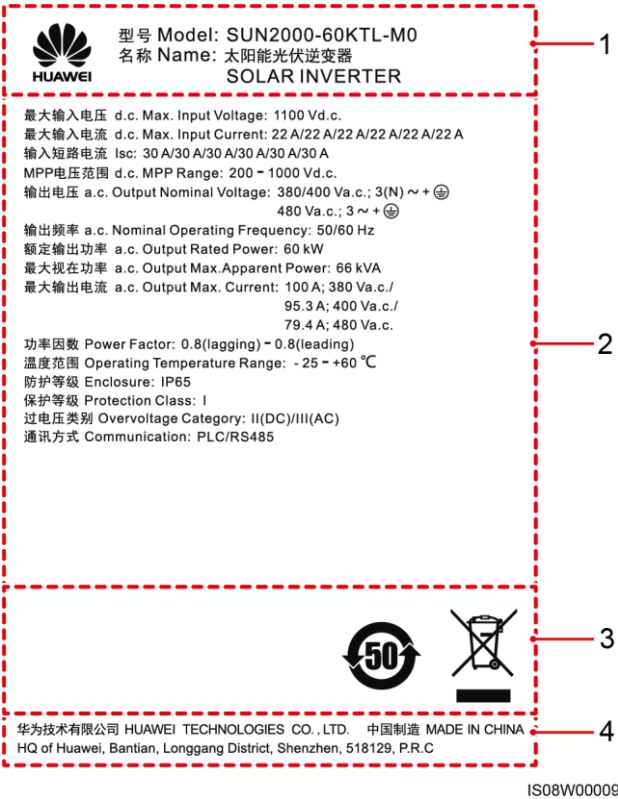
| Label                                                                               | Name            | Meaning                                                                                                       |
|-------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------|
|  | Running warning | Potential hazards exist after the SUN2000 is powered on. Take protective measures when operating the SUN2000. |

| Label                                                                                                                                                                                                                                                                                                                                                                           | Name                          | Meaning                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                | Burn warning                  | Do not touch a running SUN2000 because it generates high temperatures on the shell.                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                | Delay discharge               | <ul style="list-style-type: none"> <li>High voltage exists after the SUN2000 is powered on. Only certified electricians are allowed to perform operations on the SUN2000.</li> <li>Residual voltage exists after the SUN2000 is powered off. It takes 15 minutes for the SUN2000 to discharge to the safe voltage.</li> </ul>                                                                  |
|                                                                                                                                                                                                                                                                                                | Refer to documentation        | Reminds operators to refer to the documents provided with the SUN2000.                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                              | Grounding                     | Indicates the position for connecting the PE cable.                                                                                                                                                                                                                                                                                                                                            |
|  Do not disconnect under load!<br>禁止带负荷断开连接!                                                                                                                                                                                                                                                 | Operation warning             | Do not remove the DC input connector when the SUN2000 is running.                                                                                                                                                                                                                                                                                                                              |
|  <b>WARNING</b><br>Internal high voltage. To avoid electric shocks, perform the following steps before plugging or unplugging DC connectors: 1. Send a shutdown command. 2. Turn off the AC switch. 3. Turn off the two DC switches.<br>内部高压，连接或断开端子前，请按如下步骤操作：发送关机指令→断开交流侧开关→断开两个直流开关，避免触电！ | DC terminal operation warning | <p>High voltage exists after the SUN2000 is powered on. To avoid electric shocks, perform the following system power-off operations before plugging or unplugging DC input connectors of the SUN2000:</p> <ol style="list-style-type: none"> <li>1. Send a shutdown command.</li> <li>2. Turn off the downstream AC switch.</li> <li>3. Turn off the two DC switches at the bottom.</li> </ol> |

| Label                                                                             | Name                             | Meaning                                                                 |
|-----------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------|
|  | SUN2000 serial number (SN) label | Indicates the SUN2000 SN.                                               |
|  | Weight label                     | The SUN2000 needs to be carried by four people or using a pallet truck. |

2.3.2 Product Nameplate

Figure 2-3 Nameplate



- (1) Trademark, product name, and model number
- (2) Important technical specifications
- (3) Compliance symbols
- (4) Company name and place of production

 **NOTE**  
The nameplate figure is for reference only.

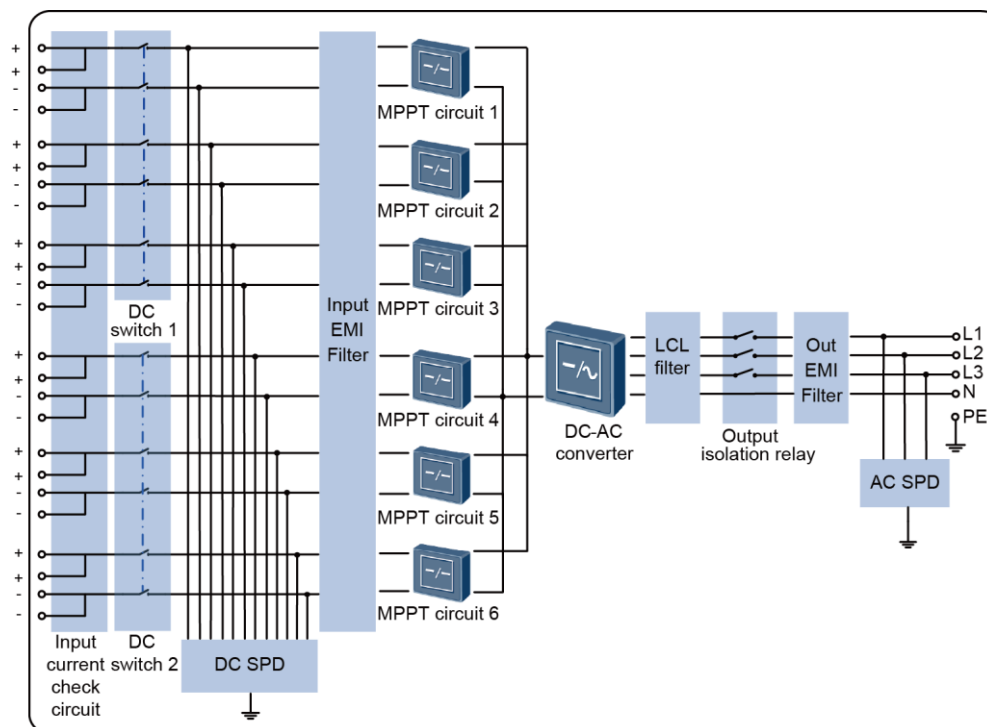
| Label                                                                             | Name                                                                 | Meaning                                                         |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------|
|  | China Environmentally friendly use period (EFUP)                     | This product is environmentally friendly for at least 50 years. |
|  | European Union (EU) waste electrical and electronic equipment (WEEE) | This product must not be disposed of as domestic waste.         |

## 2.4 Working Principles

### 2.4.1 Conceptual Diagram

The SUN2000 receives inputs from 12 PV strings. Then the inputs are grouped into six MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

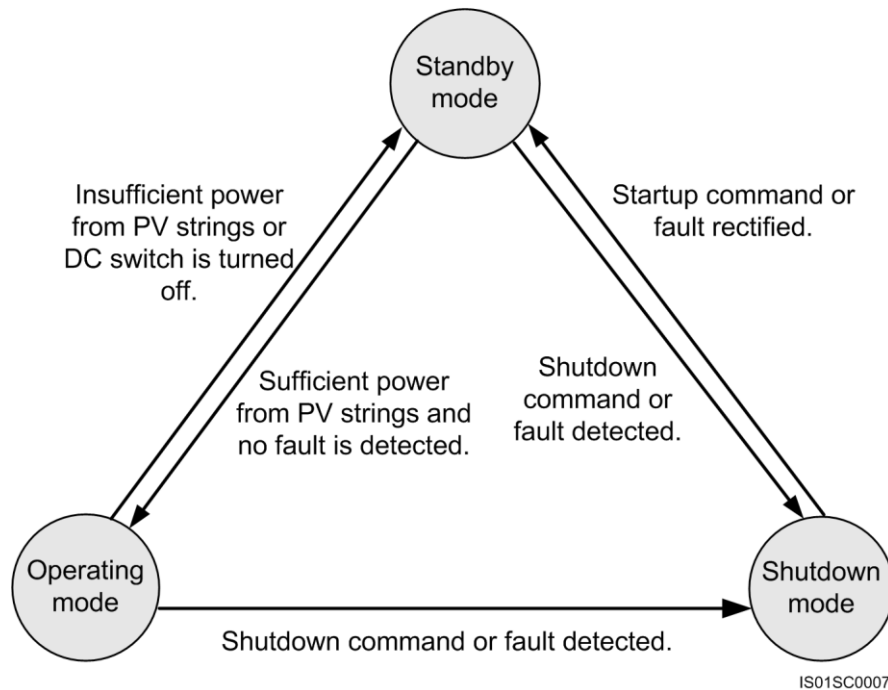
Figure 2-4 SUN2000 conceptual diagram



### 2.4.2 Working Modes

The SUN2000 can work in Standby, Operating, or Shutdown mode.

**Figure 2-5** SUN2000 working modes



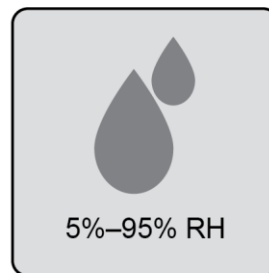
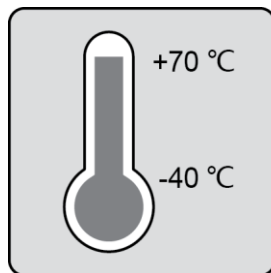
**Table 2-1** Working mode description

| Working Mode | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standby      | <p>The SUN2000 enters Standby mode when the external environment does not meet the requirements for starting the SUN2000. In Standby mode:</p> <ul style="list-style-type: none"> <li>The SUN2000 continuously performs self-check and enters Operating mode once the operating requirements are met.</li> <li>The SUN2000 enters Shutdown mode after detecting a shutdown command or a fault after startup.</li> </ul>                                                                                     |
| Operating    | <p>In Operating mode:</p> <ul style="list-style-type: none"> <li>The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid.</li> <li>The SUN2000 tracks the maximum power point to maximize the PV string output.</li> <li>The SUN2000 enters Shutdown mode after detecting a fault or a shutdown command, and enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid and producing power.</li> </ul> |
| Shutdown     | <ul style="list-style-type: none"> <li>In Standby or Operating mode, the SUN2000 enters Shutdown mode after detecting a fault or shutdown command.</li> <li>In Shutdown mode, the SUN2000 enters Standby mode after detecting a startup command or that the fault is rectified.</li> </ul>                                                                                                                                                                                                                  |

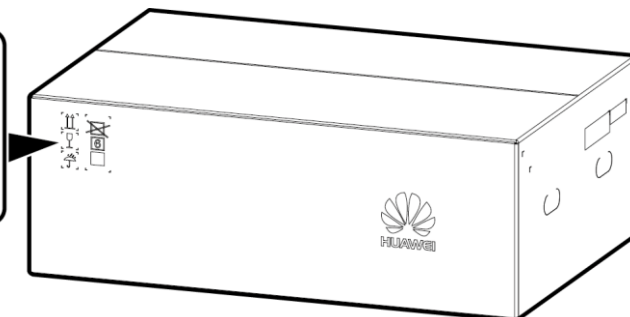
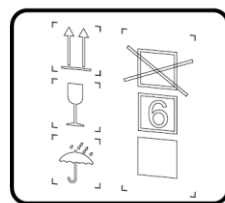
# 3 Storage

The following requirements should be met when the SUN2000 needs to be stored prior to installation:

- Put the SUN2000 in the original package. Keep the desiccant and seal it using the adhesive tape.
- Keep the proper storage temperature and humidity.



- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- The number of stacked SUN2000s should meet requirements.



IS06W00019

- Regular inspection is required during the storage. Replace the packing materials when necessary.
- After long-term storage, an inspection and test conducted by qualified persons are necessary before the SUN2000 is put into use.

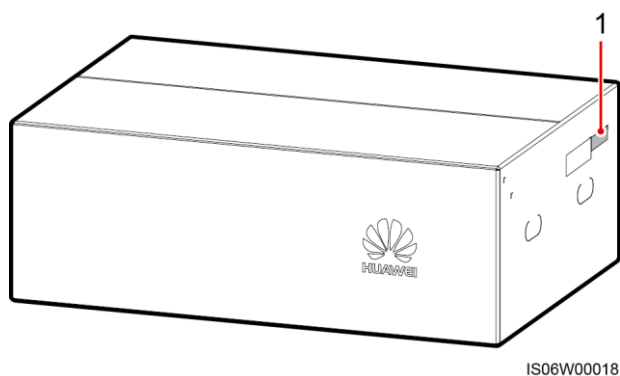
# 4 Installation

## 4.1 Checking Before Installation

### Outer Packing Materials

Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.

**Figure 4-1** Position of the inverter model label



(1) Position of the model label



**NOTE**

You are advised to remove the packing materials within 24 hours before installing the inverter.

### Package Contents

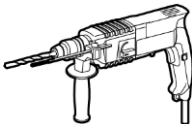
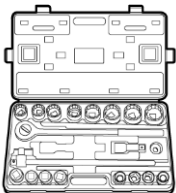
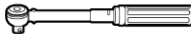
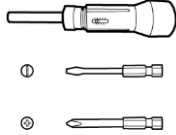
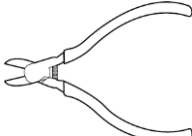
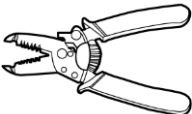
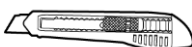
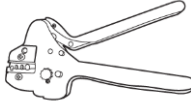
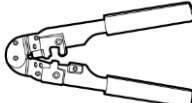
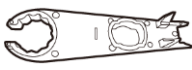
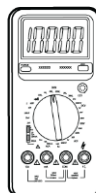
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

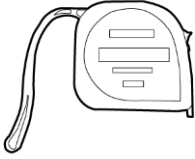
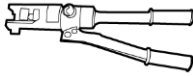
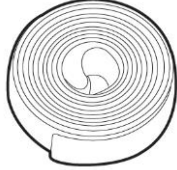
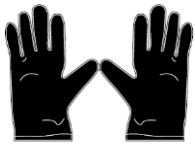


**NOTE**

For details about the number of contents, see the *Packing List* in the packing case.

## 4.2 Tools

| Type               | Tool                                                                                                                                                |                                                                                                       |                                                                                                                                                                 |                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Installation tools | <br>Hammer drill<br>Drill bit: $\Phi 14$ mm and $\Phi 16$ mm       | <br>Socket wrench    | <br>Torque wrench                                                             | <br>Torque screwdriver<br>(Phillips head: M4; flat head: M4) |
|                    | <br>Diagonal pliers                                                | <br>Wire stripper    | <br>Flat-head screwdriver<br>Head: 0.6 mm x 3.5 mm                            | <br>Rubber mallet                                            |
|                    | <br>Utility knife                                                | <br>Cable cutter   | <br>Crimping tool<br>Model: H4TC0001 or H4TC0002;<br>manufacturer: Amphenol | <br>RJ45 crimping tool                                     |
|                    | <br>Removal wrench<br>Model: H4TW0001;<br>manufacturer: Amphenol | <br>Vacuum cleaner | <br>Multimeter<br>DC voltage measurement range $\geq 1100$ V DC             | <br>Marker                                                 |
|                    |                                                                                                                                                     |                                                                                                       |                                                                                                                                                                 |                                                                                                                                                 |

| Type | Tool                                                                              |                                                                                   |                                                                                    |                                                                                     |
|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|      |  |  |  |  |
|      | Measuring tape                                                                    | Digital or bubble level                                                           | Hydraulic pliers                                                                   | Heat shrink tubing                                                                  |
|      |  |  | N/A                                                                                | N/A                                                                                 |
|      | Heat gun                                                                          | Cable tie                                                                         | N/A                                                                                | N/A                                                                                 |
| PPE  |  |  |  |  |
|      | Safety gloves                                                                     | Safety goggles                                                                    | Anti-dust respirator                                                               | Safety shoes                                                                        |



#### NOTE

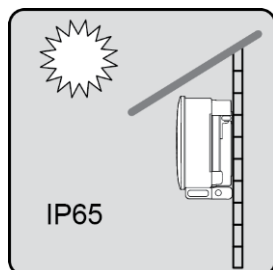
H4TC0001 is used to crimp metal cold forming contacts, while H4TC0002 is used to crimp metal stamping forming contacts.

## 4.3 Determining the Installation Position

### 4.3.1 Environment Requirements

#### Basic Requirements

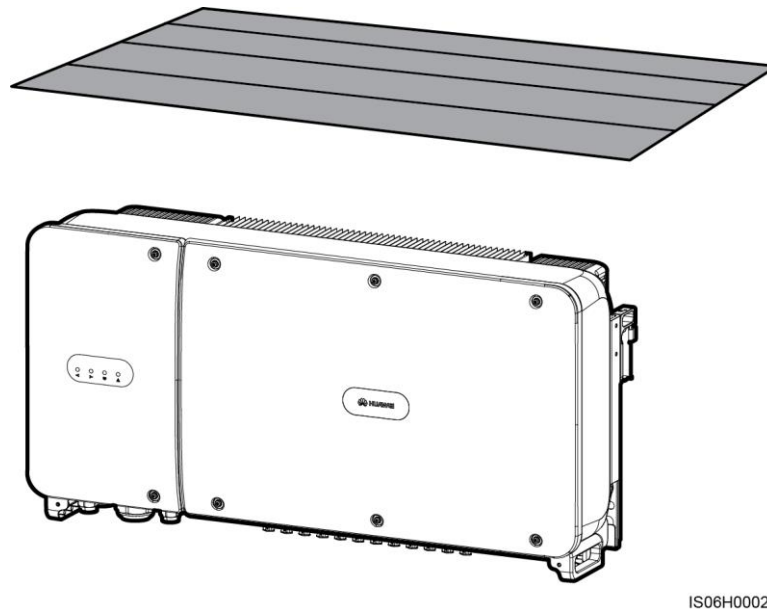
- The SUN2000 can be installed indoors or outdoors.



- Do not install the SUN2000 in a place where personnel are easy to come into contact with its enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install the SUN2000 in areas with flammable or explosive materials.

- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.
- Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

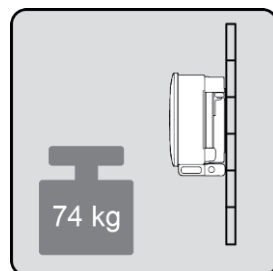
**Figure 4-2** Awning



IS06H00020

## Mounting Structure Requirements

- The mounting structure where the SUN2000 is installed must be fireproof.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 is heavy. Ensure that the installation surface is solid enough to bear the weight load.

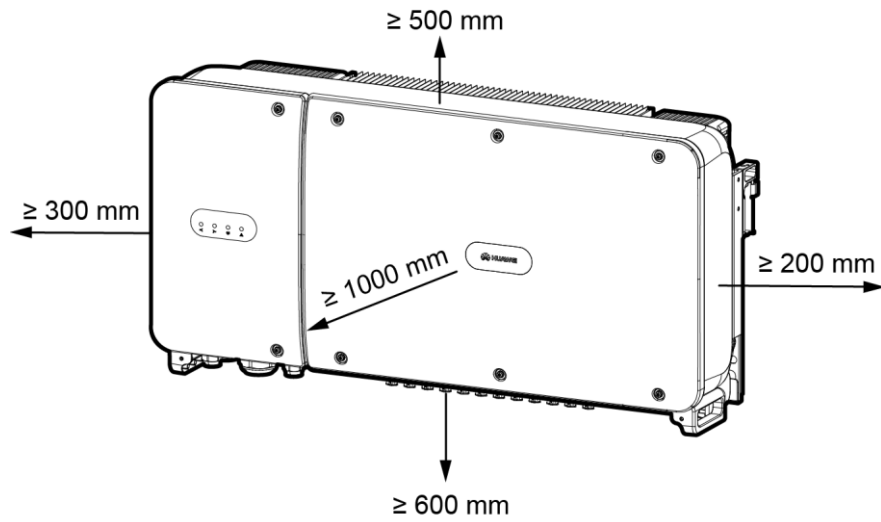


- In residential areas, do not install the SUN2000 on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the SUN2000 is noticeable.

## 4.3.2 Space Requirements

- Reserve enough clearance around the SUN2000 and determine an appropriate installation tilt to ensure sufficient space for installation and heat dissipation.

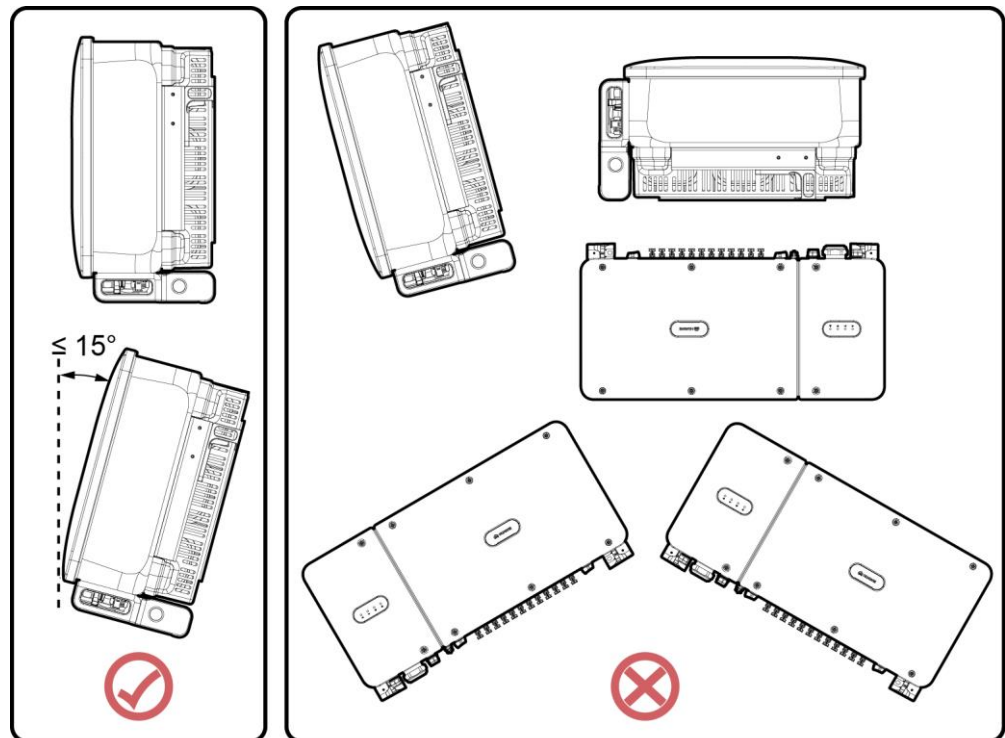
**Figure 4-3** Installation space requirements



**NOTE**

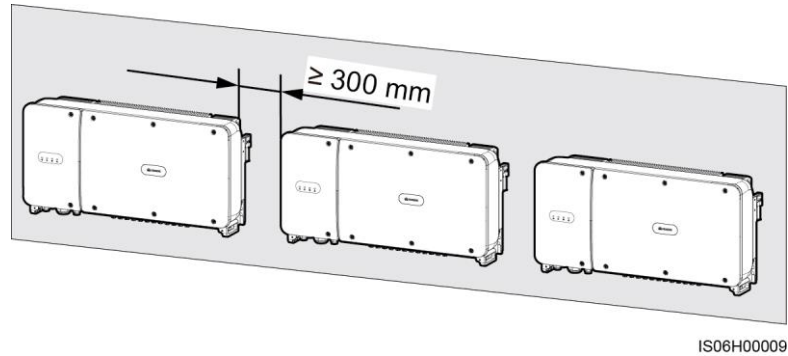
For ease of installing the SUN2000 on the mounting bracket, connecting cables to the bottom of the SUN2000, and maintaining the SUN2000 in future, it is recommended that the bottom clearance be in the range of 600 mm to 730 mm. If you have any questions about the clearances, consult the local technical support engineers.

**Figure 4-4** Installation tilts

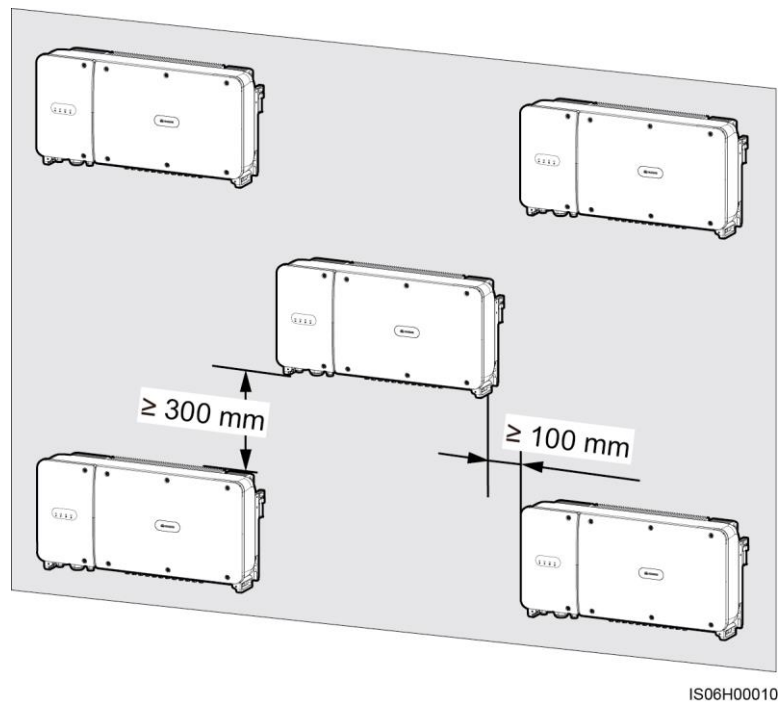


- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

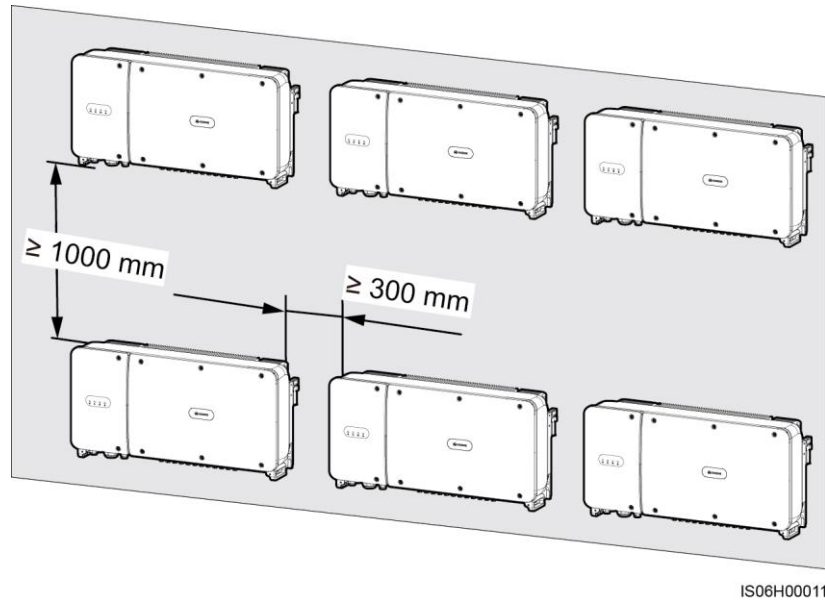
**Figure 4-5** Horizontal installation mode (recommended)



**Figure 4-6** Triangle installation mode (recommended)



**Figure 4-7** Stacked installation mode (not recommended)

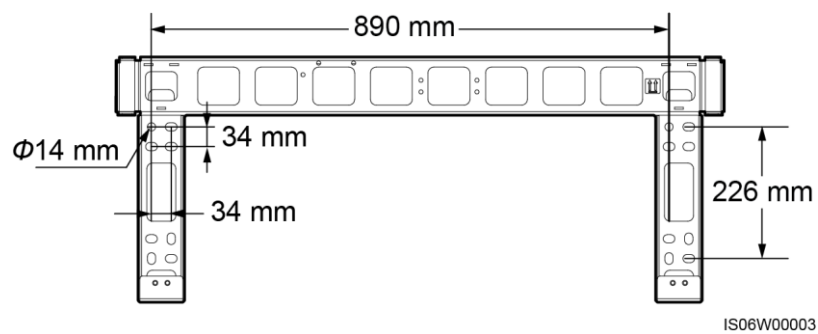


## 4.4 Installing the Mounting Bracket

### Installation Precautions

Figure 4-8 shows the SUN2000 mounting bracket dimensions.

**Figure 4-8** Mounting bracket dimensions

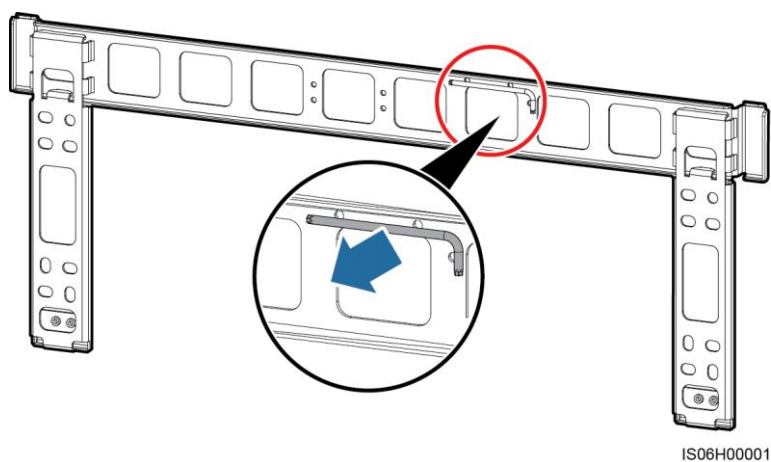


#### NOTE

The SUN2000 mounting bracket has four groups of tapped holes, each group containing four tapped holes. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred.

Before installing the mounting bracket, remove the security torx wrench from the mounting bracket and save it for later use.

**Figure 4-9** Removing a security torx wrench

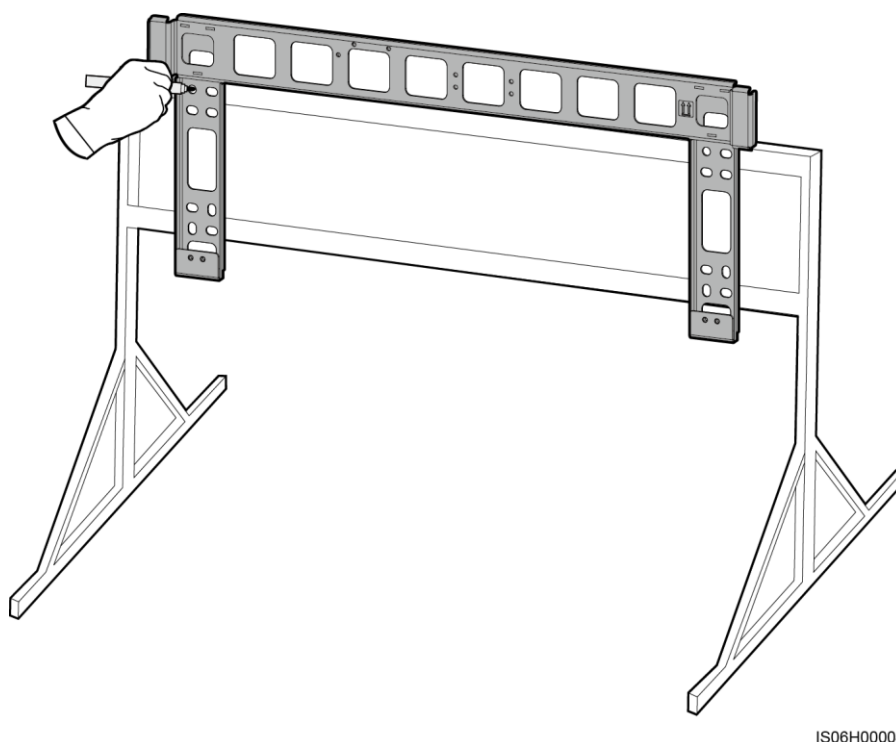


## 4.4.1 Support-mounted Installation

### Support-mounted Installation

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the positions of mounting holes using a bubble or digital level, and mark the positions with a marker.

**Figure 4-10** Determining hole positions



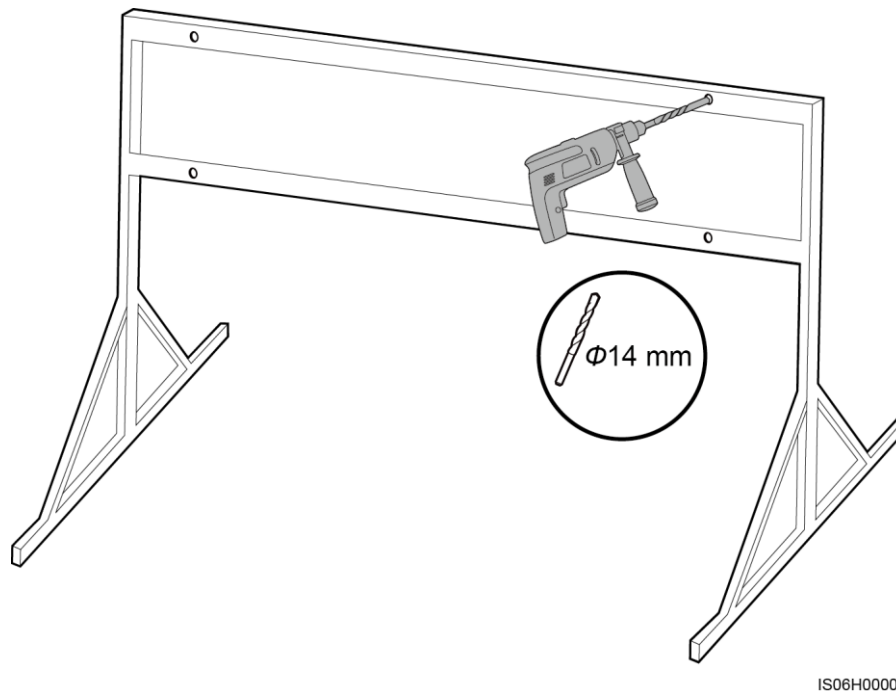
- Step 2** Drill holes using a hammer drill.



**NOTE**

You are advised to apply anti-rust paint on the hole positions for protection.

**Figure 4-11** Drilling a hole



IS06H00005

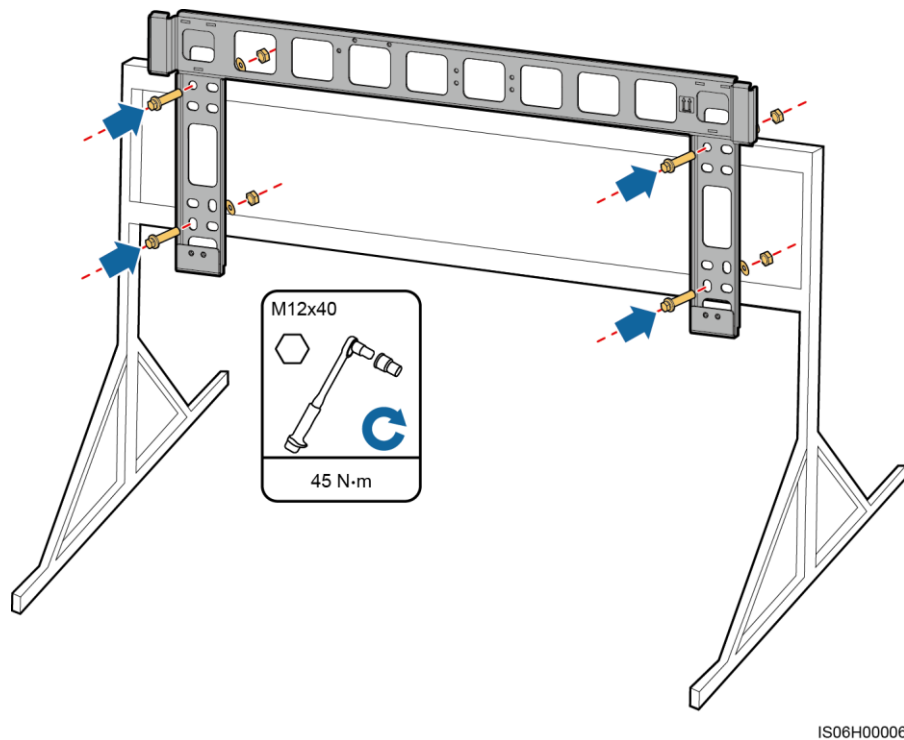
**Step 3** Align the mounting bracket holes with the drilled holes, insert bolt assemblies (flat washers, spring washers, and M12x40 bolts) into the holes through the mounting bracket, and secure them using the supplied stainless steel nuts and flat washers.



**NOTE**

M12x40 bolt assemblies are provided with the SUN2000. If the bolt length does not meet the installation requirements, prepare M12 bolt assemblies by yourself and use them together with the provided M12 nuts.

**Figure 4-12** Securing a mounting bracket



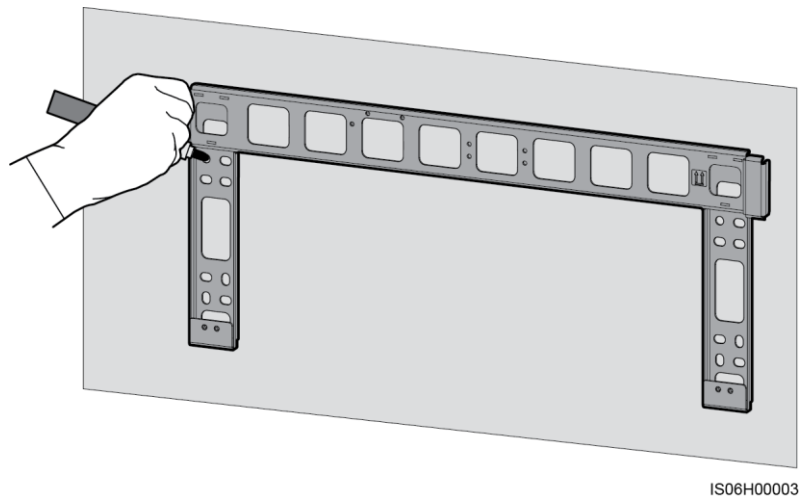
----End

## 4.4.2 Wall-mounted Installation

### Wall-mounted Installation

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the positions of mounting holes using a bubble or digital level, and mark the positions with a marker.

**Figure 4-13** Determining hole positions



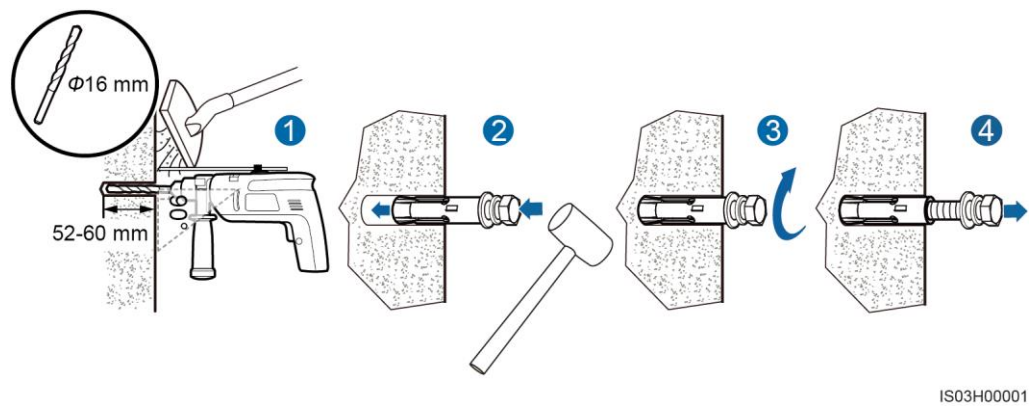
**Step 2** Drill holes using a hammer drill and install expansion bolts.



**NOTE**

You need to prepare expansion bolts. M12x60 stainless steel expansion bolts are recommended.

**Figure 4-14** Drilling a hole and installing an expansion bolt



**WARNING**

Avoid drilling holes in the utility pipes and/or cables attached to back of the wall.

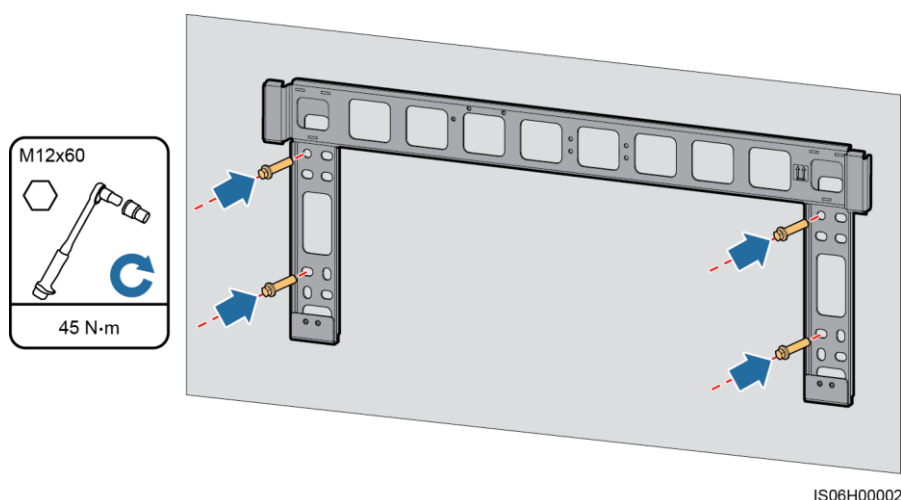


## NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If the holes are inaccurately positioned, drill a new set of holes.
- Level the head of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.

**Step 3** Align the mounting bracket holes with the drilled holes, insert expansion bolts into the holes through the mounting bracket, and then tighten the expansion bolts.

**Figure 4-15** Securing a mounting bracket



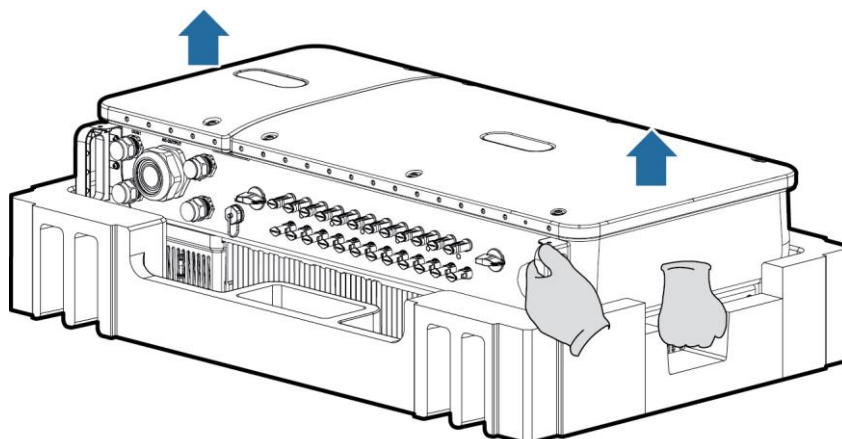
----End

## 4.5 Installing the SUN2000

### Installation Precautions

Before installing the SUN2000, take it out from the packing case and move it to the installation position.

**Figure 4-16** Taking out a SUN2000



IS08H00015



### CAUTION

To prevent device damage and personal injury, keep balance when moving the SUN2000 because it is heavy.



### NOTICE

- Move the SUN2000 with the help of other three persons or using an appropriate transportation tool.
- Do not use the ports and wiring terminals at the bottom to support any weight of the SUN2000.
- When you need to temporarily place the SUN2000 on the ground, use foam, paper, or other protection material to prevent damage to its enclosure.

## Procedure

- Step 1** If you can mount the SUN2000 onto the mounting bracket directly, go to [Step 3](#) and then [Step 5](#).
- Step 2** If you cannot mount the SUN2000 onto the mounting bracket directly, go to [Step 3](#) and then [Step 6](#).
- Step 3** Lift the SUN2000 and turn it upright.



### CAUTION

To prevent device damage and personal injury, keep balance when raising the SUN2000 because it is heavy.

**Step 4** Run a lifting sling through the lifting eyes of the SUN2000.

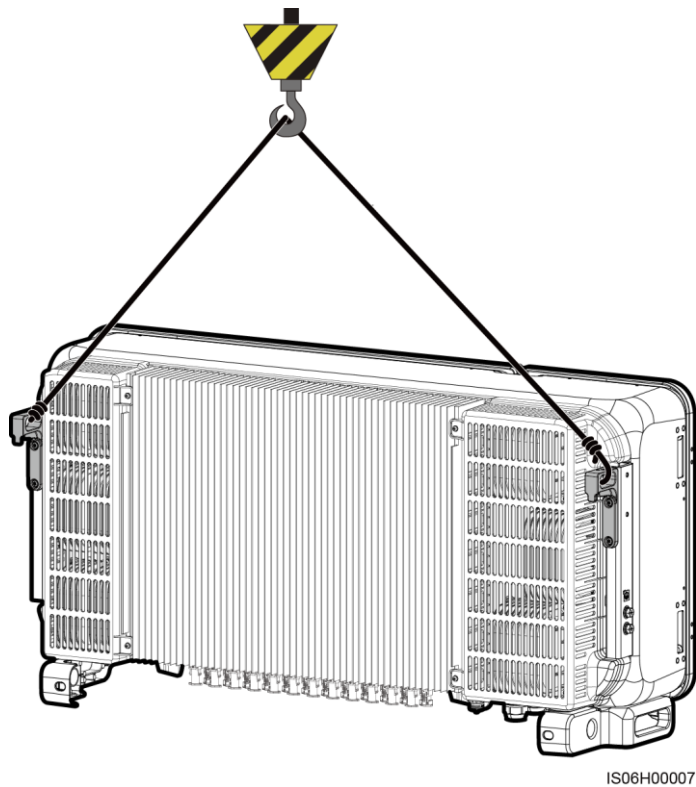


## CAUTION

When lifting the SUN2000, keep balance to prevent the SUN2000 impacting with a wall or other objects.

---

**Figure 4-17** Lifting a SUN2000

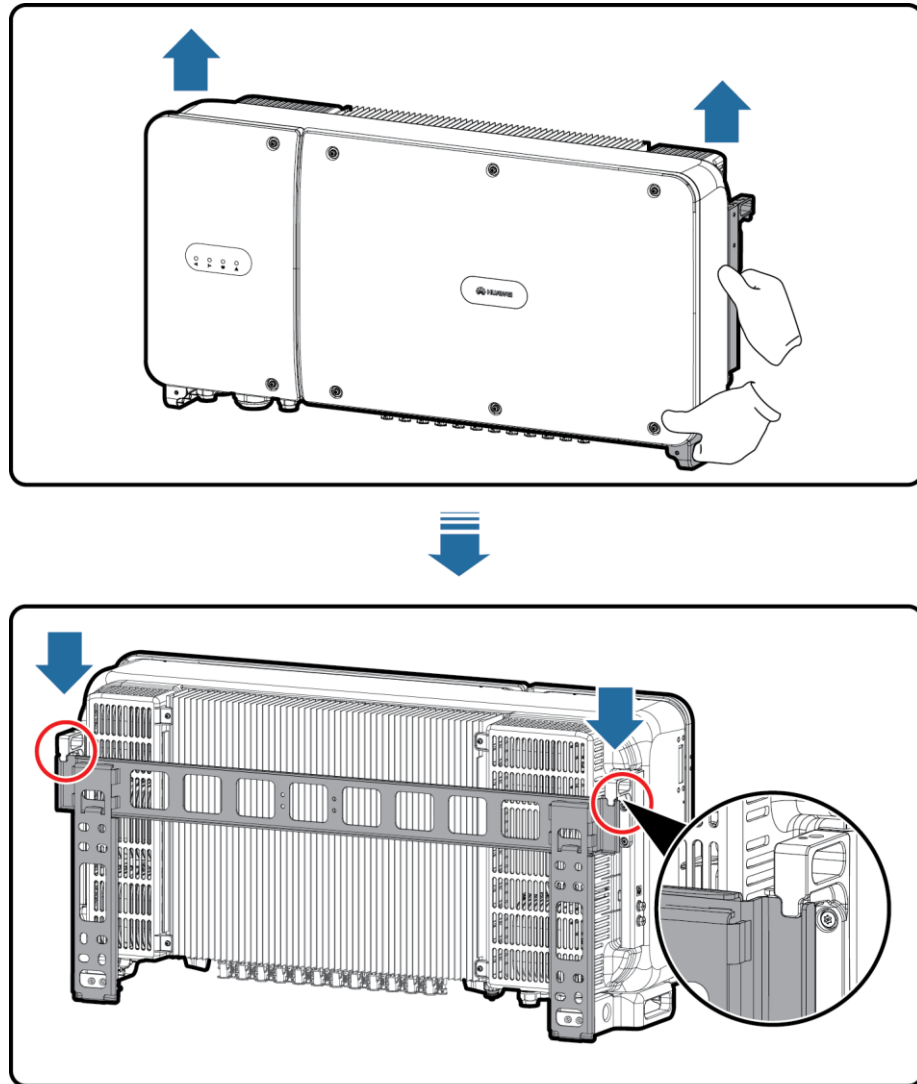


## NOTE

The figure is for reference only.

**Step 5** Install the SUN2000 on the mounting bracket.

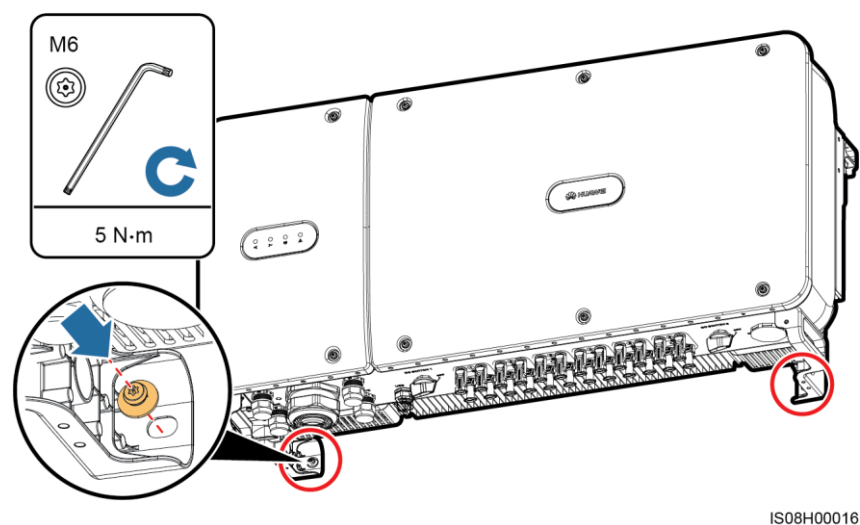
**Figure 4-18** Mounting the SUN2000 onto a mounting bracket



IS06H00008

**Step 6** Tighten the two antitheft screws using a security torx wrench.

**Figure 4-19** Tightening antitheft screws



IS08H00016

----End

# 5 Electrical Connections

## 5.1 Precautions



### DANGER

Before connecting cables, ensure that the two DC switches on the SUN2000 are OFF. Otherwise, the high voltage of the SUN2000 may result in electric shocks.



### WARNING

- The equipment damage caused by incorrect cable connections is beyond the warranty scope.
- Only certified electrician can perform electrical terminations.
- Wear proper PPE at all time when terminating cables.



### NOTE

The cable colors shown in the electrical connection diagrams provided in this chapter are for reference only. Select cables in accordance with local cable specifications (green-and-yellow cables are only used for grounding).

## 5.2 Crimping the OT Terminal

### Requirements for the OT Terminal

- If a copper cable is used, use a copper wiring terminal.
- If a copper-clad aluminum cable is used, use a copper wiring terminal.
- If an aluminum alloy cable is used, use a copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer.

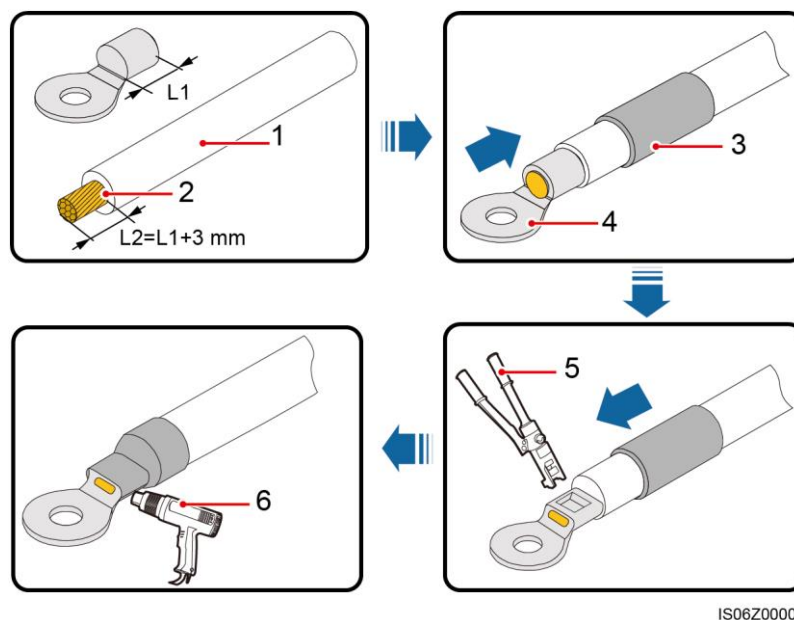
## Crimping the OT terminal



### NOTICE

- Pay attention not to damage the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing or PVC insulation tape. The following figure uses heat shrink tubing as an example.
- When using the heat gun, protect devices from being scorched.

**Figure 5-1** Crimping the OT Terminal



(1) Cable

(2) Core wire

(3) Heat shrink tubing

(4) OT terminal

(5) Hydraulic pliers

(6) Heat gun

## 5.3 Opening the Maintenance Compartment Door

### Precautions



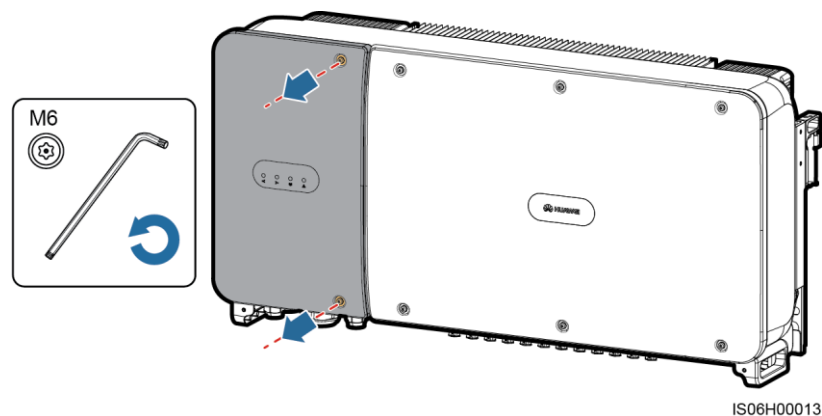
## CAUTION

- Never open the host panel cover of the SUN2000.
- Before opening the maintenance compartment door, ensure that neither of the AC and DC connections to the SUN2000 is connected.
- Do not open the maintenance compartment door in rainy or snowy days. If unavoidable, take protective measures to prevent rain or snow from entering the maintenance compartment.
- Do not leave extra hardware in the maintenance compartment.

## Procedure

**Step 1** Partially loosen the two screws on the maintenance compartment door.

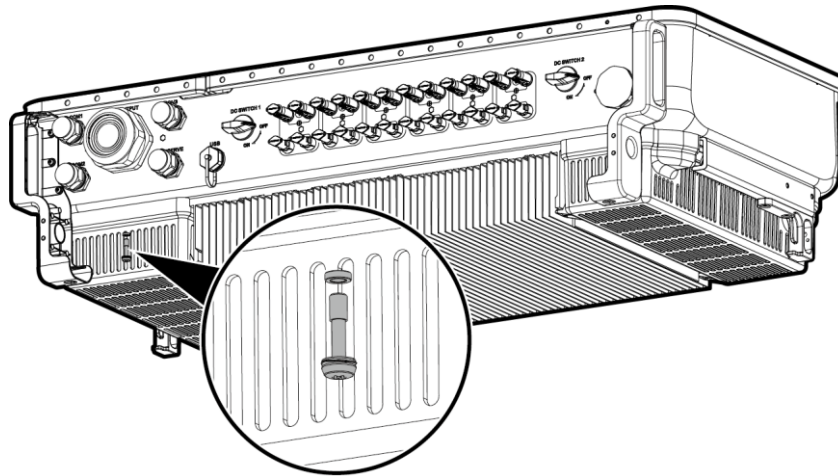
**Figure 5-2** Loosening screws



## NOTE

If the screws on the enclosure door are lost, obtain spare screws from the fitting bag bound to the inductor cover at the bottom of the enclosure.

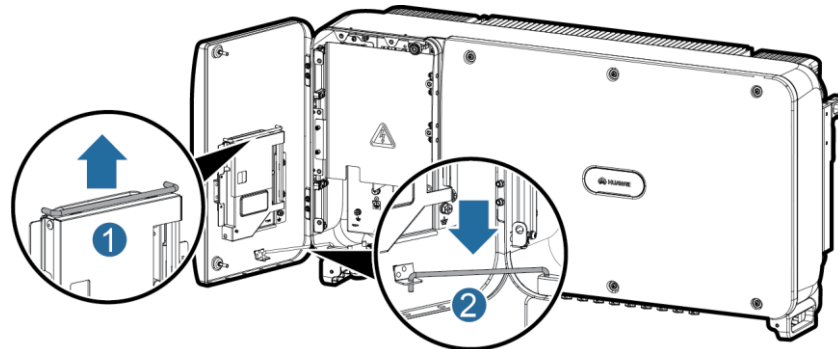
**Figure 5-3** Position for spare screws



IS08W00011

**Step 2** Open the maintenance compartment door and keep it open with the support bar.

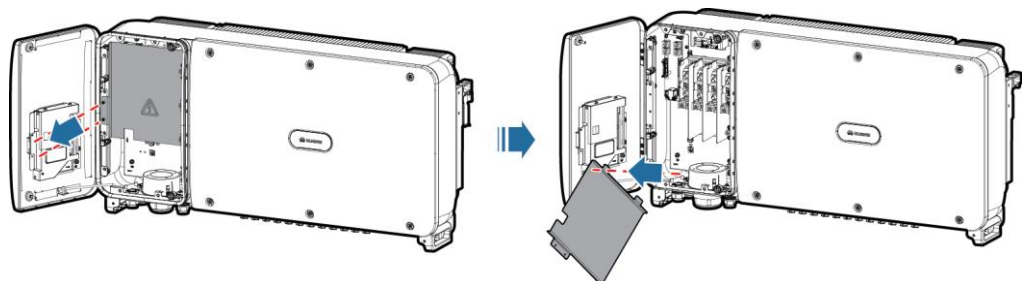
**Figure 5-4** Keeping the door open with a support bar



IS08H00068

**Step 3** Remove the cover and hang it on the hook of the door.

**Figure 5-5** Removing a cover



IS08H00093

----End

## 5.4 Installing the AC Output Power Cable

### Precautions

A three-phase AC switch needs to be configured outside the AC side of the SUN2000. To ensure that the SUN2000 can safely disconnect from the power grid under abnormal conditions, select an appropriate overcurrent protection device according to local power distribution regulations.

| Model            | Recommended Overcurrent Protection Device Specifications |
|------------------|----------------------------------------------------------|
| SUN2000-60KTL-M0 | 125 A                                                    |



### WARNING

Do not connect loads between the SUN2000 and the AC switch.

The SUN2000 is integrated with a comprehensive residual current monitoring unit (RCMU) to distinguish fault current from residual current. Upon detecting that the residual current exceeds the threshold, the SUN2000 immediately disconnects from the power grid.



### NOTE

If an AC switch that can detect residual current is installed outside the SUN2000-60KTL-M0, the residual current value to trigger the switch should be greater than 660 mA.

### Wiring Precautions

- The ground point on the enclosure is preferred to connect to the PE cable for the SUN2000.
- The ground point in the maintenance compartment is mainly used for connecting to the ground cable included in the multi-core AC power cable.
- There are two ground points on the enclosure and you only need either of them.
- It is recommended that the ground cable be connected to a nearby ground point. For a system with multiple SUN2000s connected in parallel, connect the ground points of all SUN2000s to ensure equipotential connections to ground cables.

### Cable Specifications

- If you connect a ground cable to the ground point on the enclosure shell in a scenario with no neutral wire, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with no neutral wire, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable.
- If you connect a ground cable to the ground point on the enclosure shell in a scenario with a neutral wire, you are advised to use a four-core (L1, L2, L3, and N) outdoor cable.
- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with a neutral wire, you are advised to use a five-core (L1, L2, L3, N, and PE) outdoor cable.

**Table 5-1** AC Power Cable Specifications

| Cable Specifications                              |                   | Copper-Core Cable | Copper-Clad Aluminum Cable or Aluminum Alloy Cable |
|---------------------------------------------------|-------------------|-------------------|----------------------------------------------------|
| Conductor cross-sectional area (mm <sup>2</sup> ) | Range             | 25–120            | 25–120                                             |
|                                                   | Recommended value | 35                | 70                                                 |

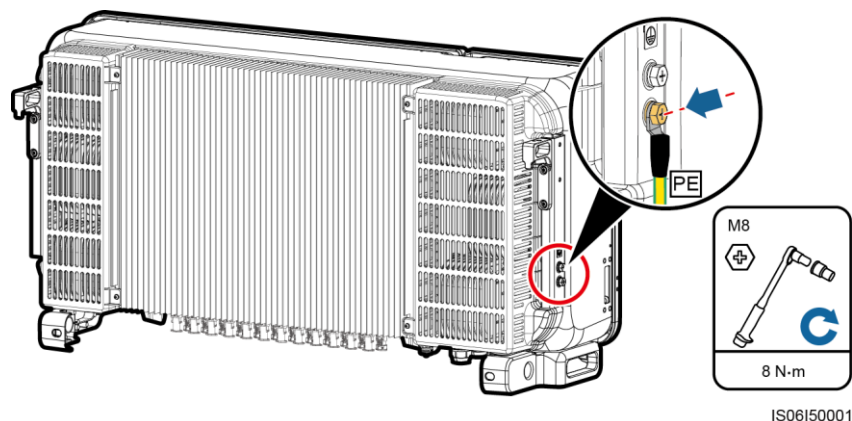
**Table 5-2** Ground cable specifications

| Cross-Sectional Area S (mm <sup>2</sup> ) of the AC Power Cable Conductor                                                                                                                                                                                                                                           | Cross-Sectional Area S <sub>P</sub> (mm <sup>2</sup> ) of the PE Cable Conductor |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| $16 < S \leq 35$                                                                                                                                                                                                                                                                                                    | $S_P = 16$                                                                       |
| $35 < S$                                                                                                                                                                                                                                                                                                            | $S_P = S/2$                                                                      |
| The values in this table are valid only if the PE cable and AC power cable use the same conductor material. If this is not so, the cross-sectional area of the PE cable conductor is to be determined in a manner which produces a conductance equivalent to that which results from the application of this table. |                                                                                  |

## Installing the PE Cable

- Step 1** Crimp an OT terminal.
- Step 2** Secure the PE cable using the ground screw.

**Figure 5-6** Connecting a PE cable



- Step 3** (Optional) To enhance the corrosion resistance of a ground terminal, apply silica gel or paint around the terminal.

----End

## Installing the AC Output Power Cable

**Step 1** Remove the locking cap from the AC OUTPUT cable gland and then remove the plug.

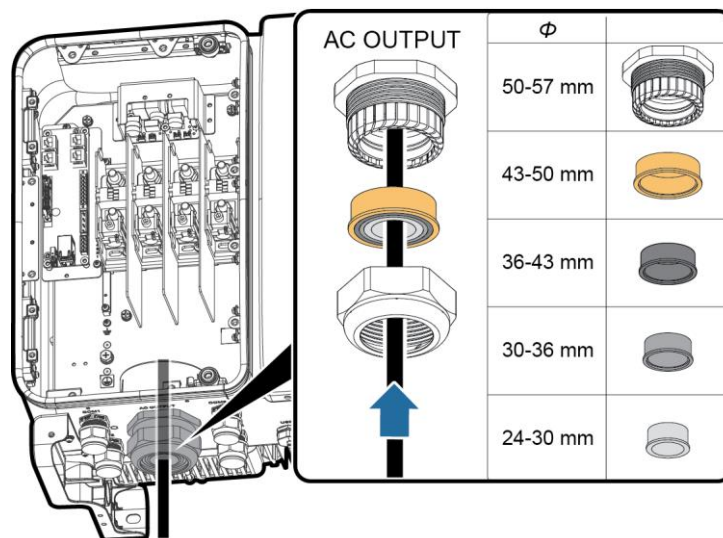
**Step 2** Route the cable through the cable gland.



### NOTICE

1. Select appropriate rubber fittings based on the outer diameter of the AC power cable to ensure proper sealing.
2. To avoid damaging the rubber fitting, do not route a cable with a crimped OT terminal directly through the rubber fitting.
3. Adjusting a cable when the thread-lock sealing nut is tightened will shift the rubber fitting, which will affect the Ingress Protection Rating of the device.

Figure 5-7 Routing a cable



IS08H00065

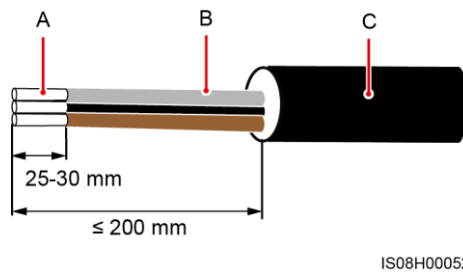
**Step 3** Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.



### NOTICE

Ensure that the jacket is in the maintenance compartment.

**Figure 5-8** Three-core cable (excluding the ground cable and neutral wire)

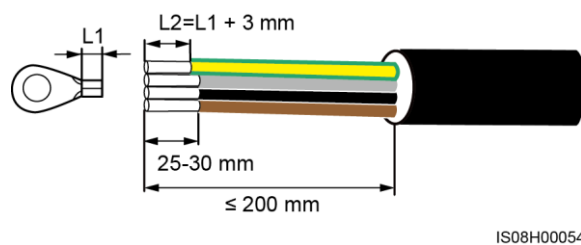


(A) Core wire

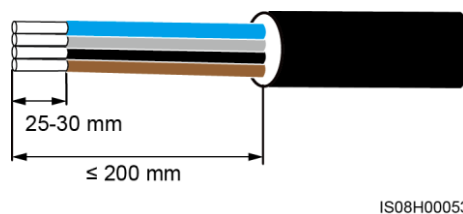
(B) Insulation layer

(C) Jacket

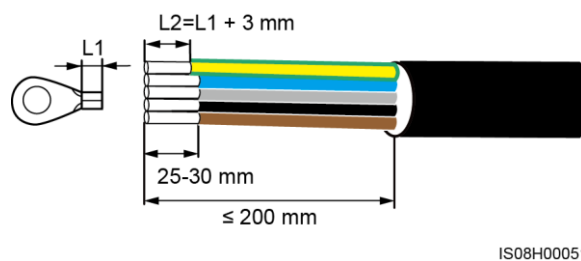
**Figure 5-9** Four-core cable (including the ground cable but excluding the neutral wire)



**Figure 5-10** Four-core cable (excluding the ground cable but including the neutral wire)



**Figure 5-11** Five-core cable (including the ground cable and neutral wire)



**Step 4** (Optional) Crimp an OT terminal on the PE cable.



**NOTE**

Perform this step is the AC output power cable includes the ground cable.

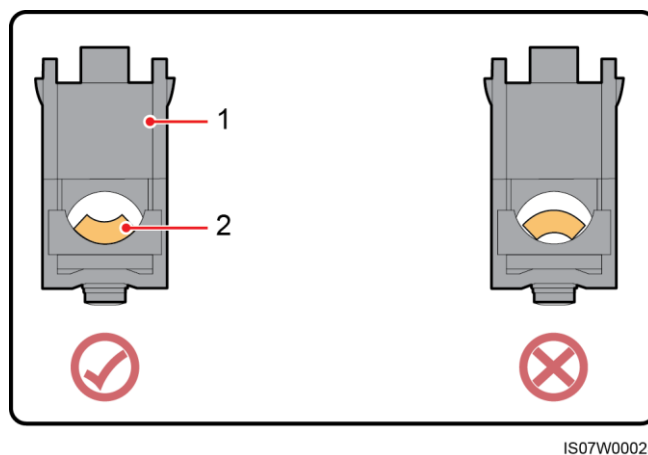
**Step 5** Connect the AC output cable.



## NOTICE

- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its terminal block, even starting thermal events. Any SUN2000 damaged due to weak termination will result in revocation of product warranty.
- When connecting a PE cable, secure the screws using a socket wrench with an extension wrench longer than 200 mm.
- If the AC output power cables are subject to a pulling force because the inverter is not installed stably, ensure that the last cable that bears the stress is the PE cable.
- Ensure that the AC output power cable and terminal clamp are in good contact.

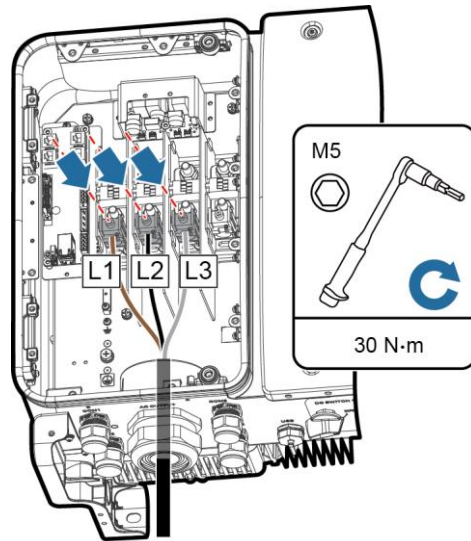
**Figure 5-12** Installation requirements for the AC output power cable



(1) Terminal clamp

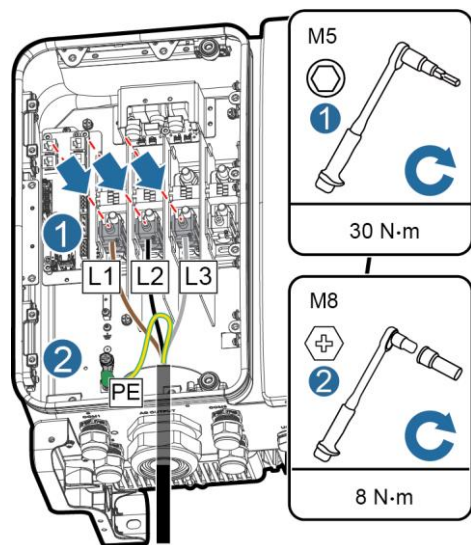
(2) AC output power cable

**Figure 5-13** Three-core cable (excluding the ground cable and neutral wire)



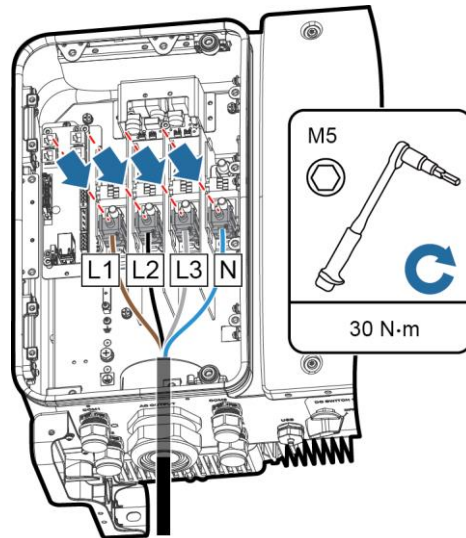
IS08I20024

**Figure 5-14** Four-core cable (including the ground cable but excluding the neutral wire)



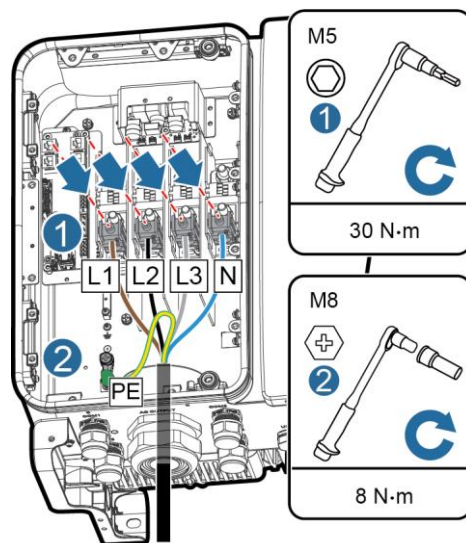
IS08I20025

**Figure 5-15** Four-core cable (excluding the ground cable but including the neutral wire)



IS08I20027

**Figure 5-16** Five-core cable (including the ground cable and neutral wire)



IS08I20026

**NOTE**

The cable colors shown in figures are for reference only. Select an appropriate cable according to the local standards.

**Step 6** Tighten the cable gland.

**Step 7** Clear debris from the maintenance compartment.



### CAUTION

Ensure that there are no cable residues, scraps, or conductive dusts in the maintenance compartment.

---

----End

## 5.5 Installing DC Input Power Cables

### Precautions



### DANGER

- Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the two DC switches on the SUN2000 are OFF. Failing to do so may result in electric shocks.
  - When the SUN2000 is grid-tied, it is not allowed to work on DC circuit, such as connecting or disconnecting a PV string or a PV module in a PV string. Failing to do so may cause electric shocks or arcing (which may further cause fire).
- 



### WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000 will be damaged, or even become a fire hazard.

- The open-circuit voltage of each PV string is always lower than or equal to 1100 V DC.
  - The positive and negative terminals of a PV string are connected to corresponding positive and negative DC input terminals of the SUN2000.
-

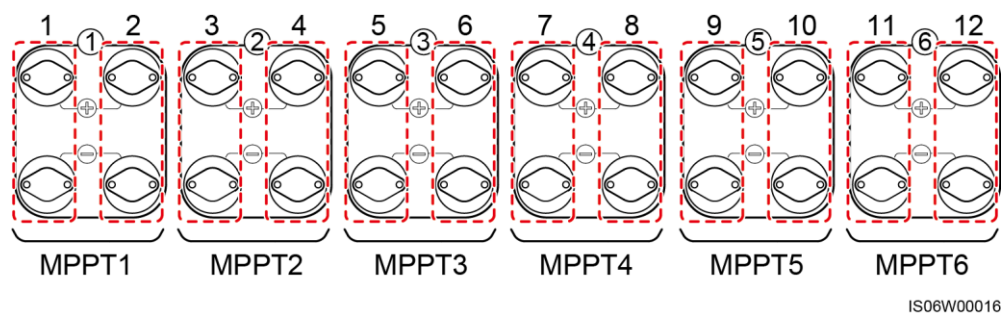
 **NOTICE**

- Ensure that the PV module output is well insulated to ground.
- The PV strings connecting to the same MPPT circuit should contain the same number of identical PV modules.
- During the installation of PV strings and SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused equipment damage is beyond the warranty scope.

**Terminal Description**

The SUN2000 provides 12 DC input terminals, among which terminals 1 to 6 are controlled by DC switch 1 and terminals 7 to 12 are controlled by DC switch 2.

**Figure 5-17** DC terminals



Select DC input terminals according to the following rules:

1. Evenly distribute DC input power cables on the DC input terminals controlled by the two DC switches.
2. Maximize the number of connected MPPT circuits.

**Cable Specifications**

| Cable Type                              | Conductor Cross-Sectional Area (mm <sup>2</sup> ) |                   | Cable Outer Diameter (mm) |
|-----------------------------------------|---------------------------------------------------|-------------------|---------------------------|
|                                         | Range                                             | Recommended value |                           |
| PV cable that meets the 1100 V standard | 4.0–6.0 (12–10 AWG)                               | 4.0 (12 AWG)      | 4.5–7.8                   |



## NOTICE

Cables with high rigidity, such as armored cables, are not recommended, because poor contact may be caused by the bending of the cables.

## Procedure

**Step 1** Prepare the positive and negative connectors.



## CAUTION

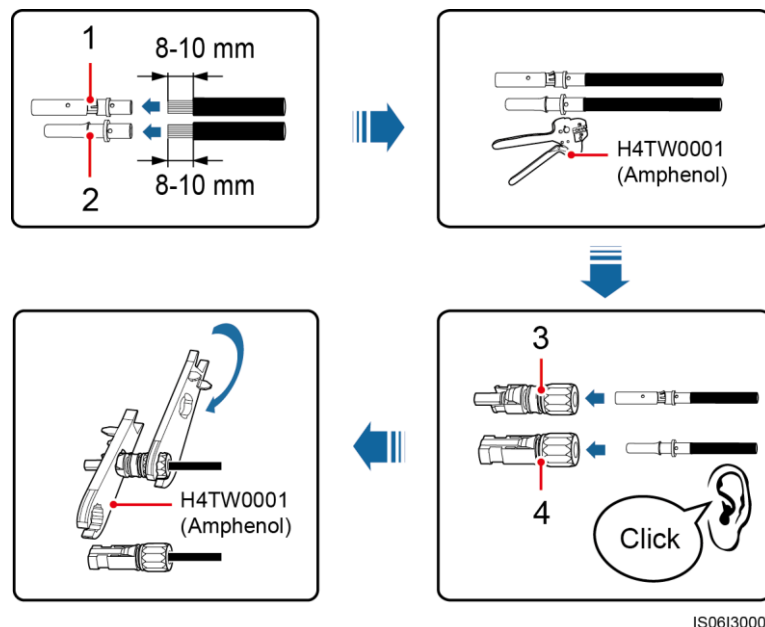
Use the Amphenol Helios H4 PV connectors provided with the SUN2000. If the terminals are lost or damaged, purchase the PV connectors of the same model. The device damaged caused by incompatible PV connectors is not covered under any warranty or service agreement.



## NOTICE

The metal terminals supplied with the Amphenol Helios H4 solar connectors are either cold forming or stamping forming contacts.

**Figure 5-18** Preparing positive and negative connectors (Cold Forming Metal Contact)



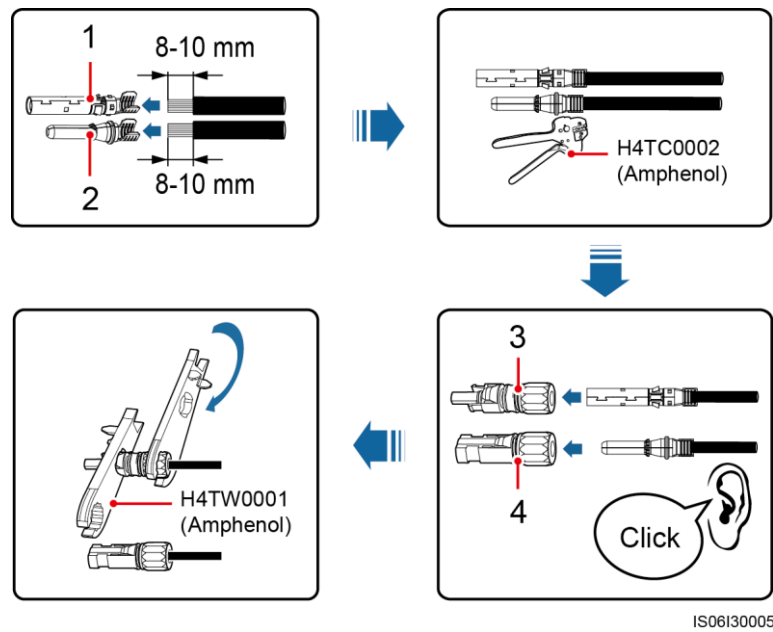
(1) Positive metal terminal (Cold Forming Metal Contact)

(2) Negative metal terminal (Cold Forming Metal Contact)

(3) Positive connector

(4) Negative connector

**Figure 5-19** Preparing positive and negative connectors (Stamping Forming Metal Contact)



(1) Positive metal terminal (Stamping Forming Metal Contact)

(2) Negative metal terminal (Stamping Forming Metal Contact)

(3) Positive connector

(4) Negative connector



### NOTICE

After the positive and negative metal terminals snap into place, pull the DC input power cables back to ensure that they are connected securely.

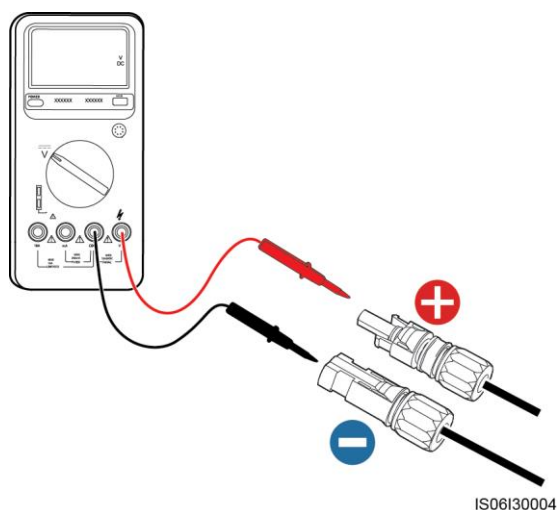
**Step 2** Use a multimeter to measure the DC voltage between the positive and negative of the PV string and confirm the string polarity.



### NOTICE

The DC voltage measurement range of the multimeter must be at least 1100 V.

**Figure 5-20** Measuring voltage



### NOTICE

- If the voltage is a negative value, the PV string is of reversed polarity. Correct before connecting this string to the SUN2000.
- If the voltage is greater than 1100 V, too many PV modules are configured to the same string. Remove some PV modules.

**Step 3** Pull out the blue dustproof plugs from the ends of the DC input connectors.



### WARNING

Before performing [Step 4](#), ensure that the two DC switches are OFF.

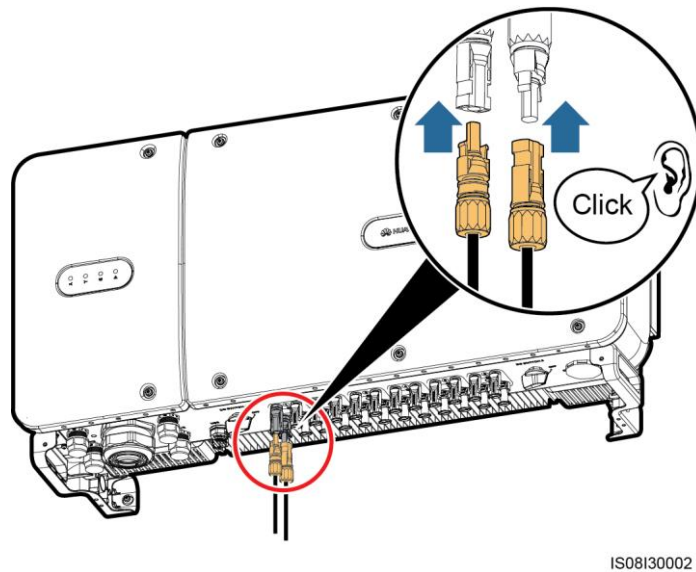
**Step 4** Insert the positive and negative connectors into the corresponding positive and negative DC input terminals of the SUN2000 until they snap into place.



### NOTICE

After the positive and negative connectors snap into place, pull test to the DC input power cable is recommended.

**Figure 5-21** Connecting DC input power cables



#### NOTICE

If polarity of the DC input power cable is reversed and the DC switch is ON, do not turn off the DC switch immediately or unplug positive and negative connectors. The device may be damaged if you do not follow the instruction. The caused equipment damage is beyond the warranty scope. Wait until the solar irradiance declines and the PV string current reduces to below 0.5 A, and then turn off the two DC switches and remove the positive and negative connectors. Correct the string polarity before reconnecting the string to the SUN2000.

----End

## 5.6 Installing the Communications Cable

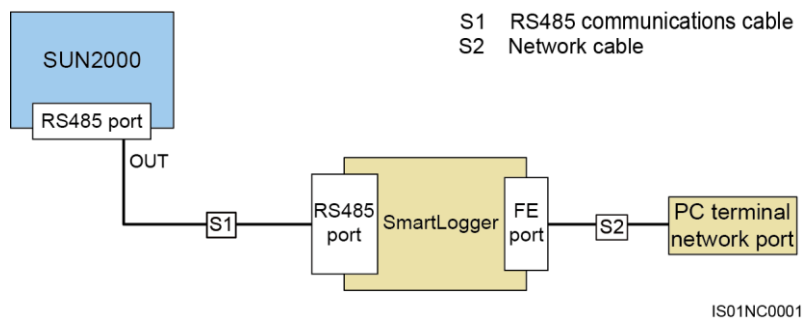
### 5.6.1 Communication Mode Description

#### RS485 Communication

The SUN2000 can connect to the SmartLogger over RS485 and to a PC through the SmartLogger to establish communication. You can use the SUN2000 app, embedded WebUI of the SmartLogger, or the network management software (such as the NetEco) on the PC to query information about the SUN2000, such as energy yields, alarms, and running status.

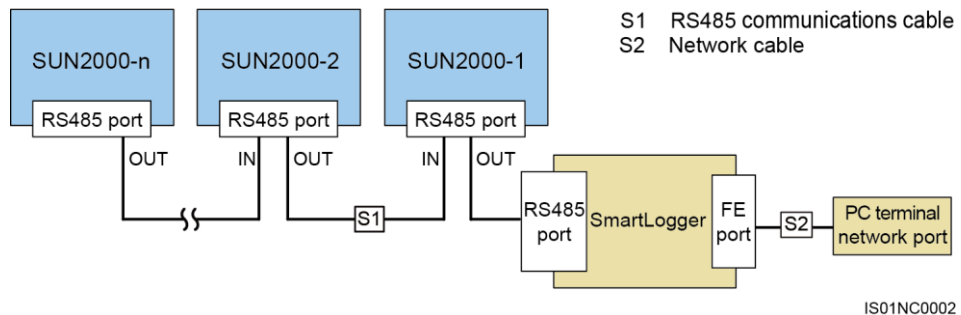
- [Figure 5-22](#) shows the communication mode for a single SUN2000.

**Figure 5-22** Communication mode for a single SUN2000



- [Figure 5-23](#) shows the communication mode for multiple SUN2000s.  
If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

**Figure 5-23** Communication mode for multiple SUN2000s



**NOTE**

- The RS485 communication distance between the SUN2000 at the end of the daisy chain and the SmartLogger cannot exceed 1000 meters.
- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger, a maximum of six daisy chains can be configured.
- To ensure the system response speed, it is recommended that the number of devices on each daisy chain be less than 30.

## PLC Communication

The PLC communication board loads communication signals onto power cables for transmission. For details about how to install the PLC module, see the *PLC CCO01A User Manual* or *SmartLogger2000 User Manual*.



**NOTE**

The built-in PLC module in the SUN2000 does not need to be connected with additional cables.

## Selecting a Communication Mode

The RS485 and PLC communication modes are mutually exclusive.

- If the PLC communication mode is selected, do not connect the RS485 communications cable. In addition, you need to set **PLC Communication** to **Enable** on the SUN2000 app.
- If the RS485 communication mode is selected, do not connect the PLC CCO module to the AC power cable. In addition, you are advised to set **PLC Communication** to **Disable** on the SUN2000 app.



**NOTE**

**PLC Communication** is set to **Enable** by default.

## 5.6.2 Installing the RS485 Communications Cable

### Selecting an Installation Mode

An RS485 communications cable can be connected in two ways:

- Terminal block connection  
Recommended: Communications cable with a conductor cross-sectional area of 1 mm<sup>2</sup> and a cable outer diameter of 14–18 mm.
- RJ45 network port connection  
Recommended: CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm and internal resistance no greater than 1.5 ohms/10 m, with a shielded RJ45 connector.



**NOTE**

Select only one installation mode in practice. Terminal block connection is recommended.



**NOTICE**

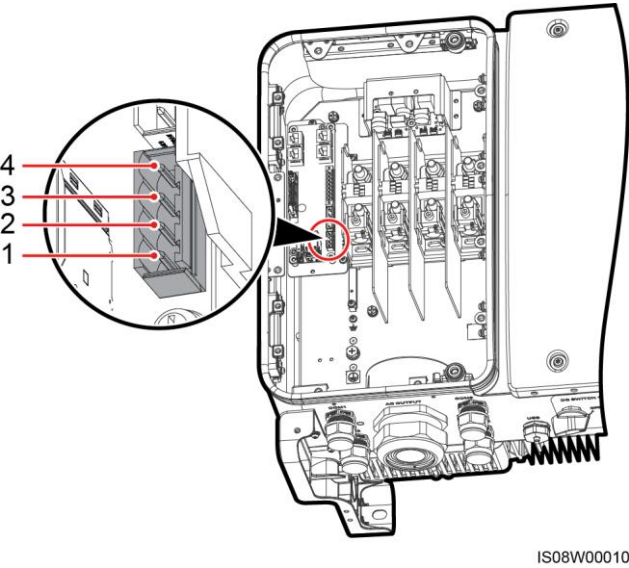
When laying out communications cables, separate them from power cables to avoid strong signal interference sources.

### 5.6.2.1 Terminal Block Connection

#### Terminal Block Port Definitions

[Figure 5-24](#) shows an RS485 terminal block.

Figure 5-24 Terminal block



IS08W00010

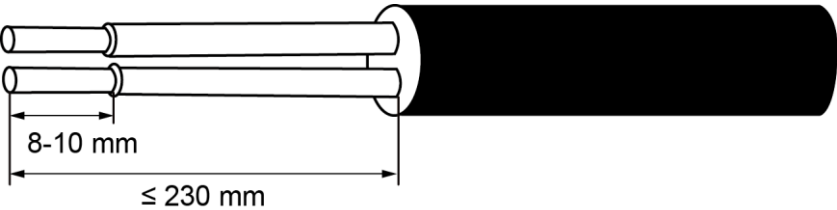
Table 5-3 Port definitions of the RS485 terminal block

| No. | Port Definition | Description                  |
|-----|-----------------|------------------------------|
| 1   | RS485A IN       | RS485A, differential signal+ |
| 2   | RS485A OUT      | RS485A, differential signal+ |
| 3   | RS485B IN       | RS485B, differential signal– |
| 4   | RS485B OUT      | RS485B, differential signal– |

Connecting Cables to the Terminal Block

**Step 1** Remove an appropriate length of the jacket and core wire insulation layer from the communications cable using a wire stripper.

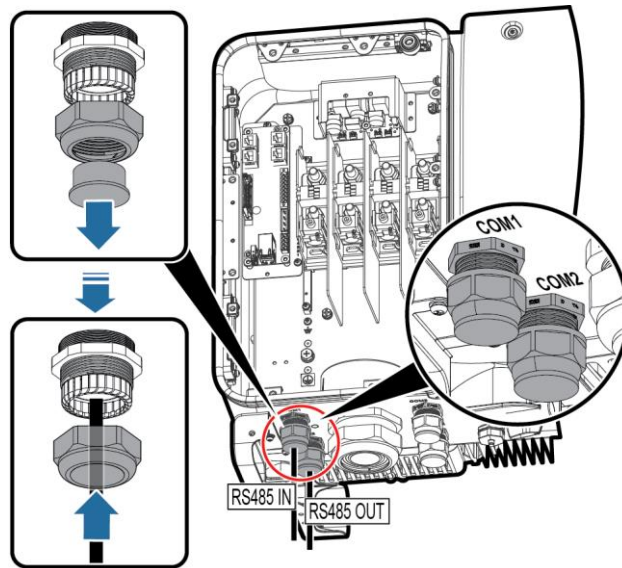
Figure 5-25 Stripping an RS485 communications cable



IS06H00037

**Step 2** Route the communications cable through the cable gland.

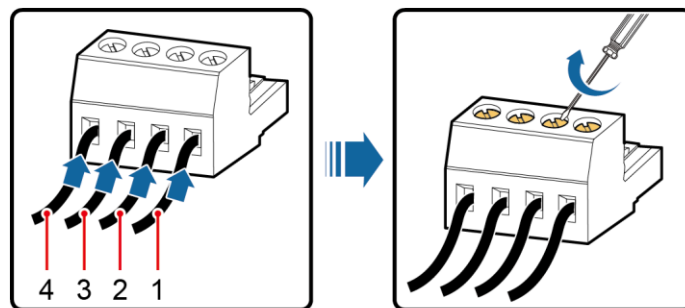
**Figure 5-26** Routing a cable



IS08H00066

**Step 3** Remove the cable terminal base from the terminal block, and connect the communications cable to the terminal base.

**Figure 5-27** Connecting cables to a terminal base



IS03IC1004

(1) RS485A IN

(2) RS485A OUT

(3) RS485B IN

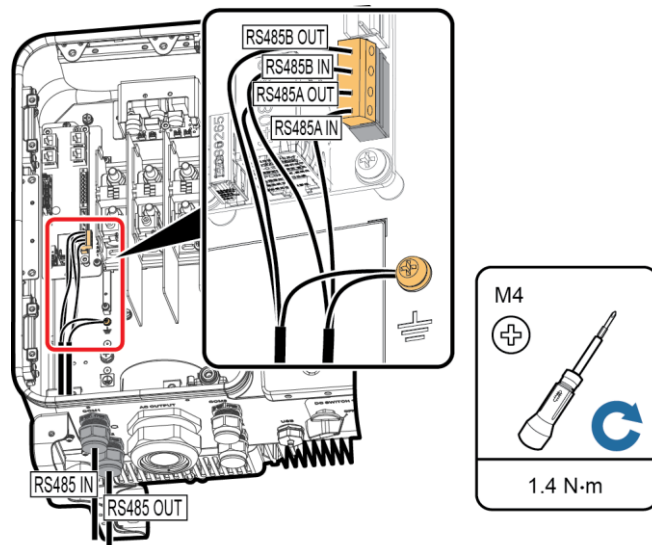
(4) RS485B OUT

**Step 4** Land the cables in the terminal block, and bond the shield layer to the ground point.

**NOTE**

When connecting the shielded cable, crimp the OT terminal if required.

**Figure 5-28** Connecting communications cables



IS08I40011

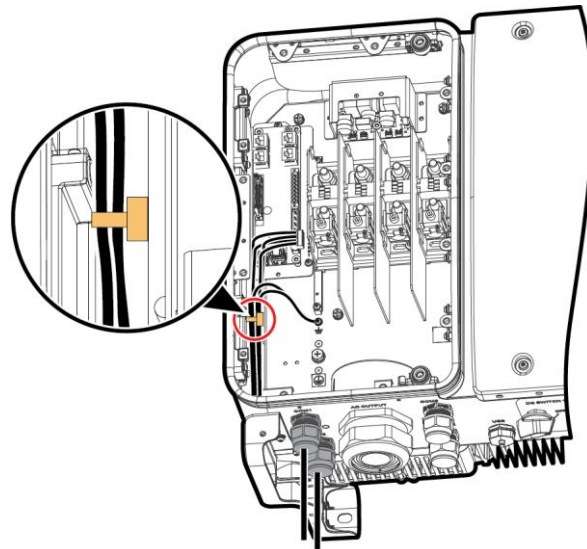
**Step 5** Bundle communications cables after connecting them.



**NOTE**

Tie the communication cables with the cables on internal side of the maintenance compartment.

**Figure 5-29** Bundling communications cables



IS08H00067

**Step 6** Tighten the thread-lock sealing nut and seal the cable gland.

----End

5.6.2.2 Connecting Cables to the RJ45 Network Port

RJ45 Connector Pin Definitions

Figure 5-30 shows an RJ45 connector.

Figure 5-30 RJ45 connector

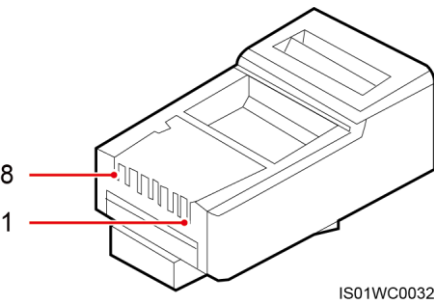


Table 5-4 lists the RJ45 connector pin definitions.

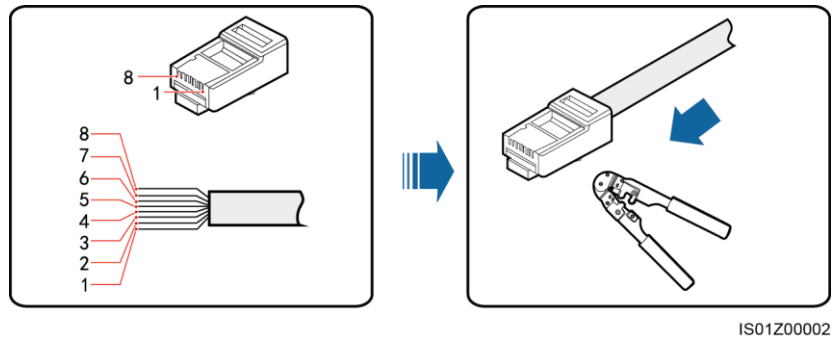
Table 5-4 RJ45 connector pin definitions

| Pin | Color            | Function                     |
|-----|------------------|------------------------------|
| 1   | White-and-orange | RS485A, differential signal+ |
| 2   | Orange           | RS485B, differential signal– |
| 3   | White-and-green  | N/A                          |
| 4   | Blue             | RS485A, differential signal+ |
| 5   | White-and-blue   | RS485B, differential signal– |
| 6   | Green            | N/A                          |
| 7   | White-and-brown  | N/A                          |
| 8   | Brown            | N/A                          |

Connecting Cables to the RJ45 Network Port

Step 1 Prepare an RJ45 connector.

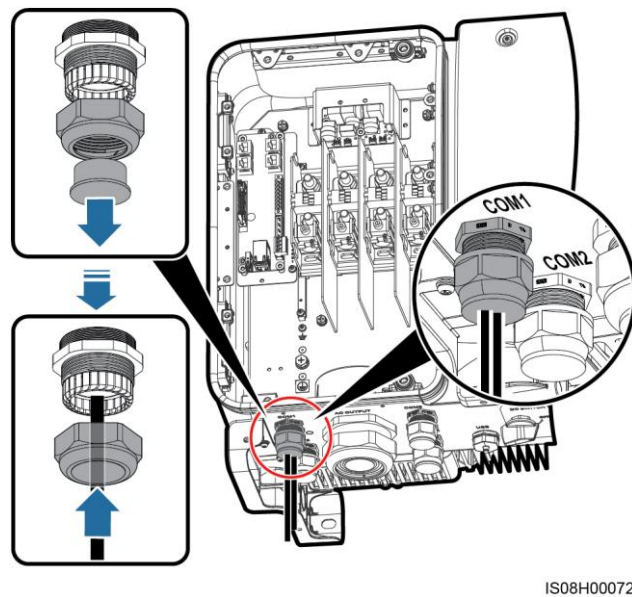
**Figure 5-31** Preparing an RJ45 connector



- |                      |            |                     |           |
|----------------------|------------|---------------------|-----------|
| (1) White-and-orange | (2) Orange | (3) White-and-green | (4) Blue  |
| (5) White-and-blue   | (6) Green  | (7) White-and-brown | (8) Brown |

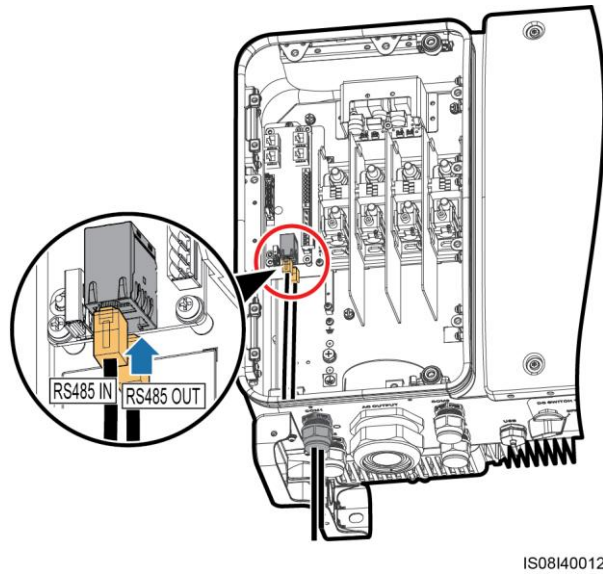
**Step 2** Route the communications cable through the cable gland.

**Figure 5-32** Routing a cable



**Step 3** Insert the RJ45 connector into the RJ45 network port in the SUN2000 maintenance compartment.

**Figure 5-33** Connecting communications cables



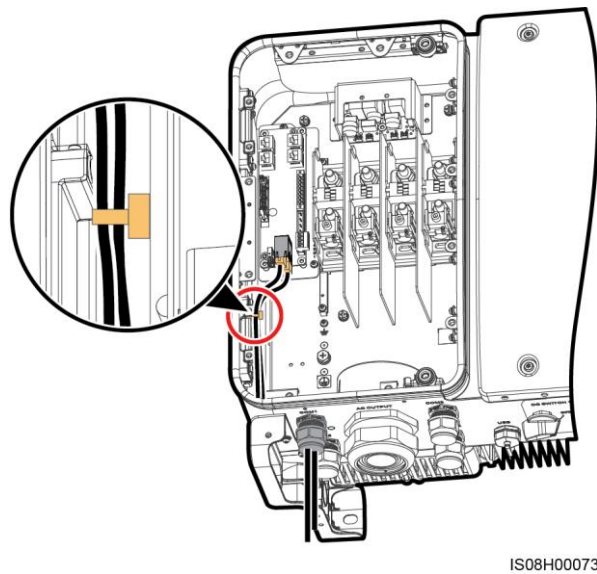
**Step 4** Bundle communications cables after connecting them.



**NOTE**

Tie the communication cables with the cables on internal side of the maintenance compartment.

**Figure 5-34** Bundling communications cables



**Step 5** Tighten the thread-lock sealing nut and seal the cable gland.

----End

## 5.6.3 (Optional) Installing the Solar Tracker Power Cable

### Precautions



#### NOTICE

- A switch-disconnector-fuse or fuse-switch-disconnector with a voltage of no less than 500 V, current of 16 A, and protection type of gM needs to be installed between the SUN2000 and the tracker controller for protection.
  - The cable between the wiring terminal on the power cable and the switch-disconnector-fuse or fuse-switch-disconnector should be less than or equal to 2.5 meters.
- 

### Cable Specifications

Recommended: dual-layer three-core outdoor copper cable with a conductor cross-sectional area of 4 mm<sup>2</sup>.



#### WARNING

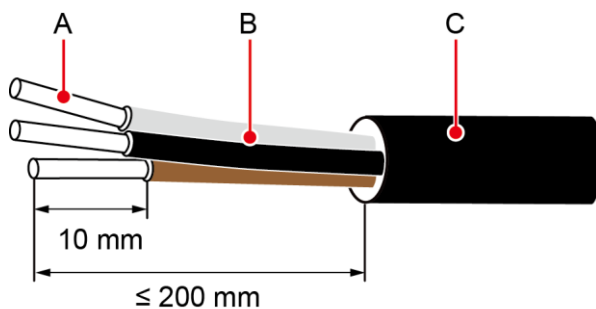
Do not place flammable materials around the cable.

---

### Procedure

- Step 1** Remove an appropriate length of the jacket and insulation layer from the tracking power cable using a wire stripper. (Ensure that the jacket is in the maintenance compartment.)

**Figure 5-35** Stripping a cable



IS06H00056

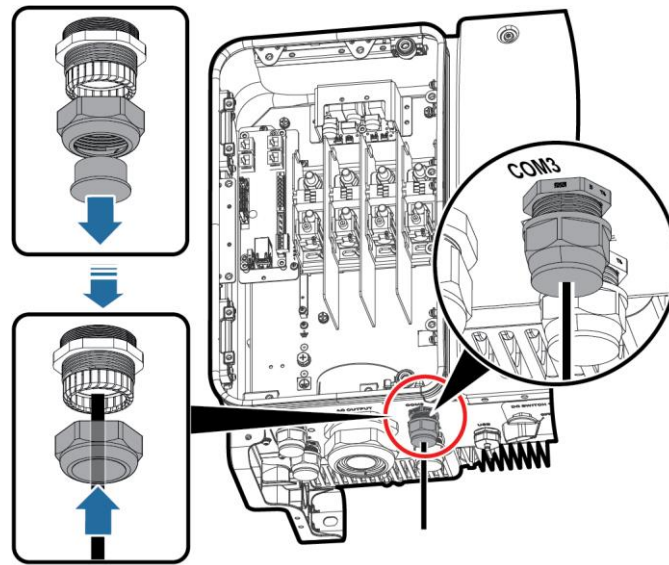
(A) Core wire

(B) Insulation layer

(C) Jacket

- Step 2** Route the cable through the cable gland.

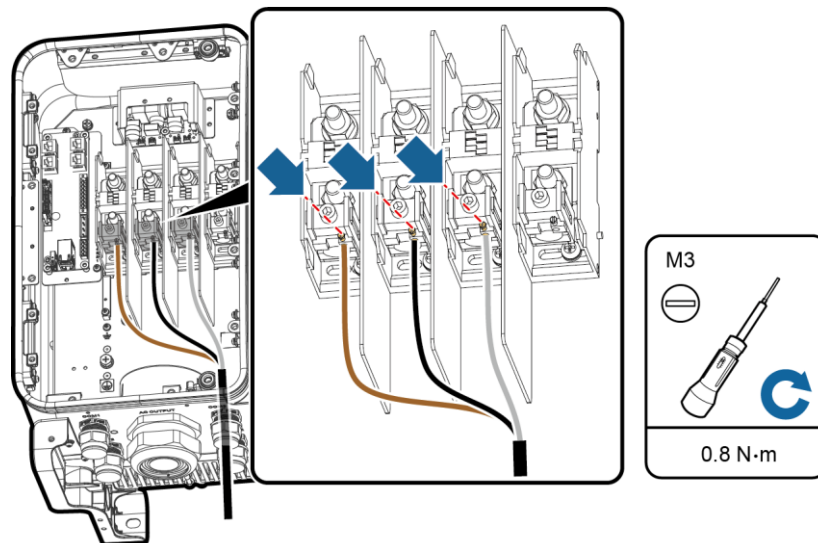
**Figure 5-36** Routing a cable



IS08H00074

**Step 3** Loosen the minus screw on the cable connector, and connect the solar tracker power cable.

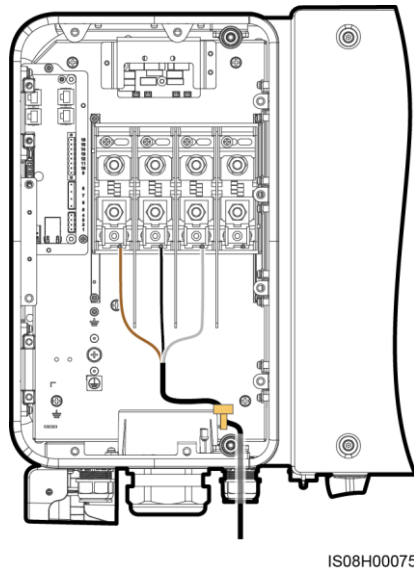
**Figure 5-37** Connecting a solar tracker power cable



IS08I20028

**Step 4** Bind the solar tracker power cable.

**Figure 5-38** Binding a solar tracker power cable



**Step 5** Tighten the thread-lock sealing nut and seal the cable gland.

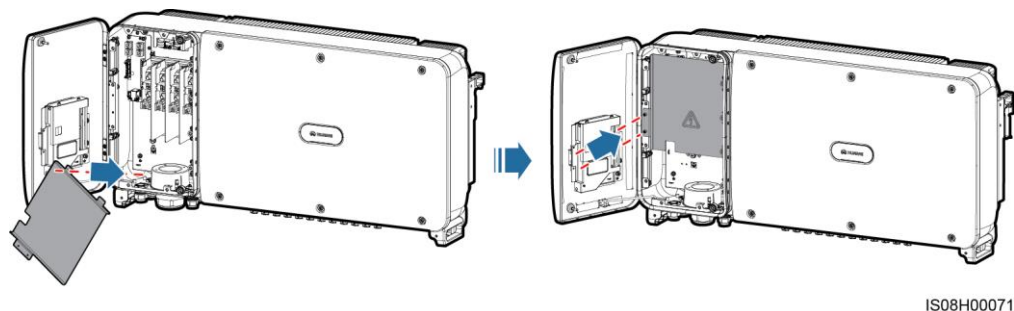
----End

## 5.7 Closing the Maintenance Compartment Door

### Procedure

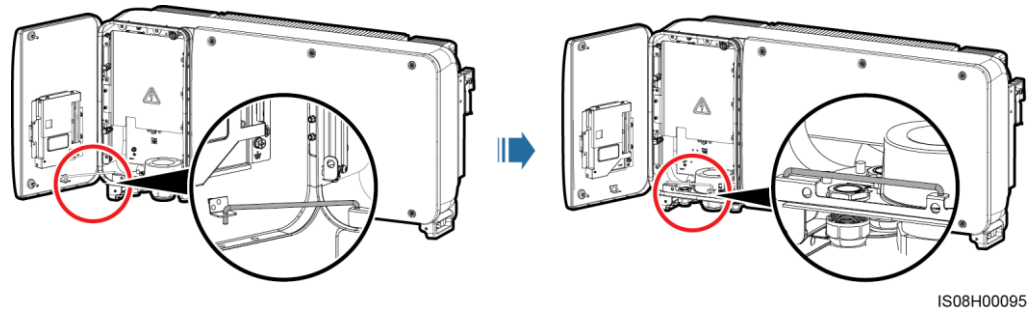
**Step 1** Install the AC terminal cover.

**Figure 5-39** Installing a cover



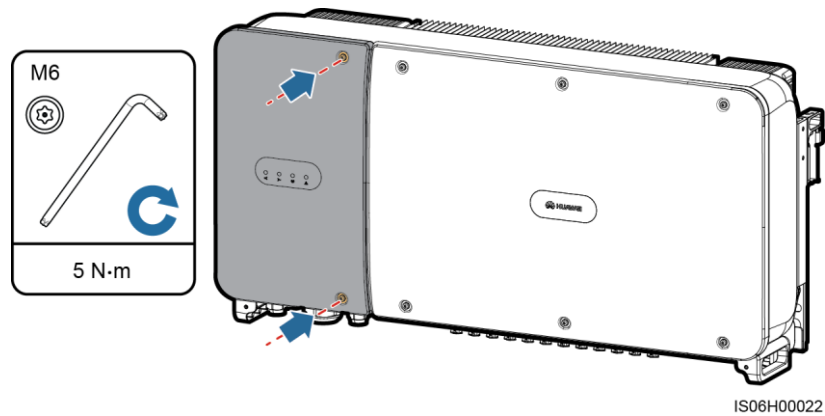
**Step 2** Retrieve the support bar.

**Figure 5-40** Retrieving a support bar



**Step 3** Close the maintenance compartment door and tighten the two screws on the door.

**Figure 5-41** Tightening screws



----End

# 6 Commissioning

## 6.1 Checking Before Power-On

1. Check that the SUN2000 is installed correctly and securely.
2. Check that the DC switch and downstream AC output switch are OFF.
3. Check that all ground cables are connected correctly and securely.
4. Check that all AC output power cables are connected correctly and securely, without open circuits or short circuits.
5. Check that all DC input power cables are connected correctly and securely, without open circuits or short circuits.
6. Check that the communications cable is connected correctly and securely.
7. Check that all used cable glands at the bottom of the enclosure are sealed, and that the thread-lock sealing nut is tightened.
8. Check that the AC terminal cover is reinstalled.
9. Check that the maintenance compartment interior is clean and tidy, without foreign matter.
10. Check that the maintenance compartment door is closed and the door screws are tightened.
11. Check that unused DC input terminals are sealed.
12. Check that unused USB port is plugged with watertight cap.
13. Check that unused cable glands are plugged and the thread-lock sealing nuts are tightened.

## 6.2 Powering On the SUN2000

### Precautions



## NOTICE

Before turning on the AC switch between the SUN2000 and the power grid, use a multimeter to check that the AC voltage is within the specified range.

## Procedure

**Step 1** Turn on the AC switch between the SUN2000 and the power grid.



## NOTICE

If you perform [Step 2](#) before [Step 1](#), the SUN2000 reports a fault about abnormal shutdown. You can start the SUN2000 only after the fault is automatically rectified.

**Step 2** Turn on the DC switch at the bottom of the SUN2000.

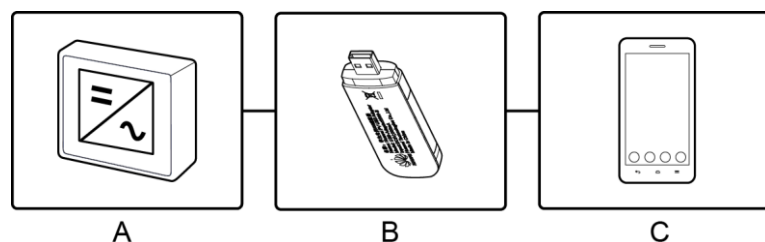
**Step 3** Connect the SUN2000 to the mobile phone that runs SUN2000 app through a Bluetooth module or USB data cable.



## NOTICE

- Mobile phone operating system: Android 4.0 or later, iOS 7.0 or later. When the iOS is used, the app supports only Bluetooth connection.
- The screenshots in this document correspond to SUN2000 app 2.2.00.010.

**Figure 6-1** Bluetooth module connection



IS01NC0009

(A) SUN2000

(B) Bluetooth module

(C) Mobile phone

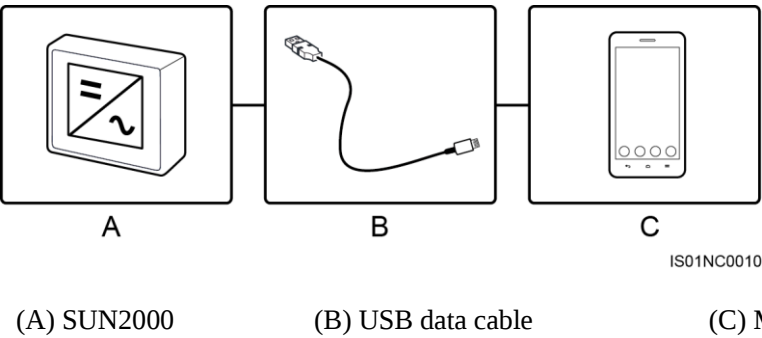


## NOTE

Purchase the Bluetooth module bundled with the SUN2000. A Bluetooth module purchased from any other source may not support communication between the SUN2000 and the app.

- The Android system supports the Bluetooth module USB-Adapter2000-B and BF4030.
- The iOS system supports the Bluetooth module USB-Adapter2000-B.

Figure 6-2 Data cable connection



**NOTE**  
The port type of the USB data cable connecting to the SUN2000 is USB 2.0. Use the USB data cable delivered with the mobile phone.

Figure 6-3 Login screen

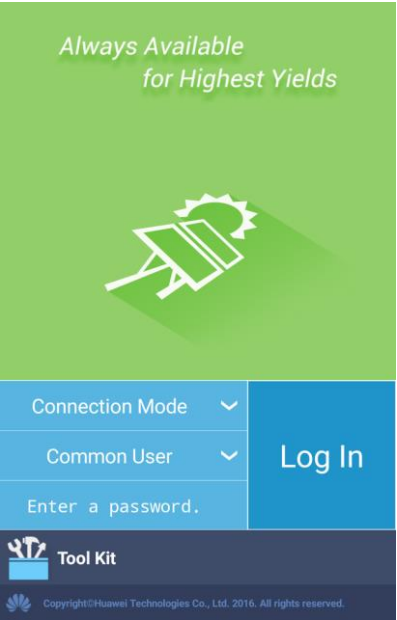


Figure 6-4 Selecting a connection mode

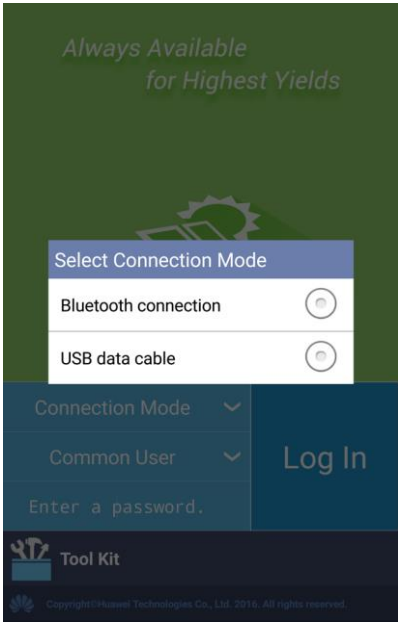
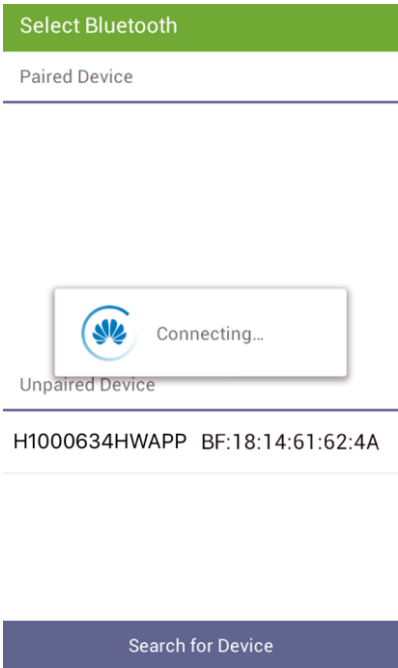
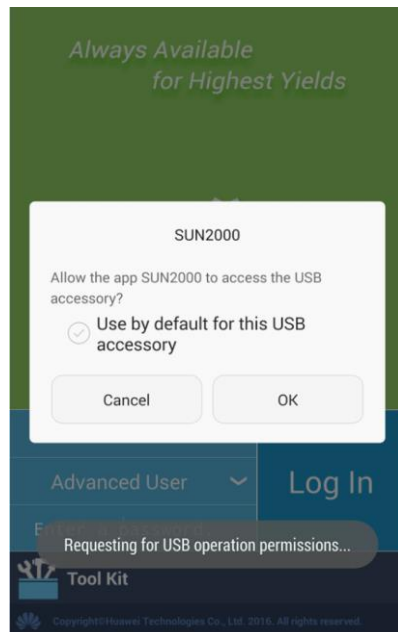


Figure 6-5 Bluetooth connection



**Figure 6-6** Data cable connection

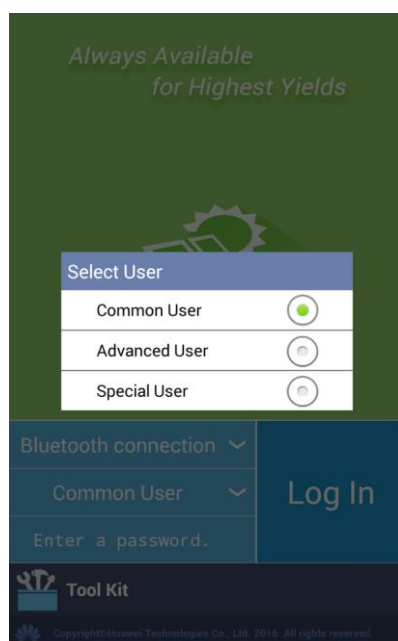


**NOTE**

After you select **Use by default for this USB accessory**, the message that asks you whether the SUN2000 app is allowed to access the USB will not appear if you reconnect the app without disconnecting the USB data cable.

- Step 4** Tap the user name area on the SUN2000 app to switch between **Common User**, **Advanced User**, and **Special User**.

**Figure 6-7** Switching between users





**NOTE**

- The login password is the same as that for the SUN2000 connected to the app and is used only for the SUN2000 to connect to the app.
- The initial passwords for **Common User**, **Advanced User**, and **Special User** are all **00000a**. Use the initial password upon first login. To ensure account security, change the password immediately after login.
- During login, if five consecutive invalid password attempts are made (the interval between two consecutive attempts is less than 2 minutes), the account will be locked for 10 minutes. The password should consist of 6 characters.

**Step 5** Enter the password and tap **Log In**.

**Step 6** After successful login, the quick settings screen or main menu screen is displayed.



**NOTE**

- If you log in to the SUN2000 app after the device connects to the app for the first time or factory defaults are restored, the quick settings screen will be displayed. On the quick settings screen, you can set basic parameters. After settings, you can modify the parameters by tapping **Settings** on the main menu screen. If the AC switch between the SUN2000 and the power grid is turned on but both of **DC SWITCH** on the SUN2000 and the power grid is not in the **ON** position, no option is available for **Grid code** on the quick settings screen.
- You are advised to log in to the **Quick Settings** screen as **Advanced User** for parameter settings.
- Set the correct grid code based on the application region and scenario of the SUN2000.

**Figure 6-8** Quick Settings screen (advanced user)

< Quick Settings OK

Grid Parameters

**Grid code**  
VDE-AR-N-4105

User Param.

**Date**  
2017-08-28

**Time**  
16:40:38

Comm. Param.

**Baud rate(bps)**  
9600

**RS485 protocol**  
MODBUS RTU

**Com address**  
1

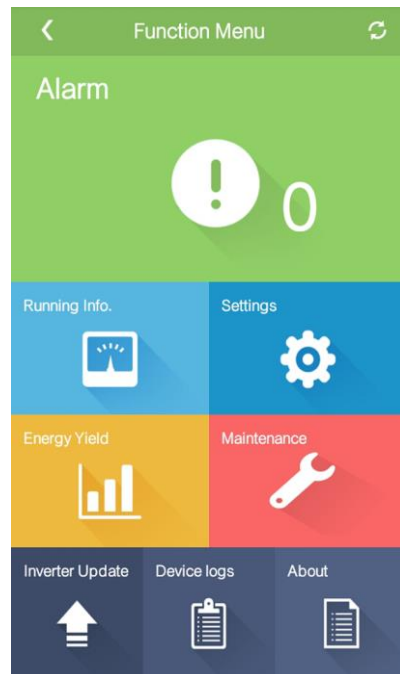


**NOTE**

- Set the grid code that applies to the country or region where the PV plant is located and the SUN2000 model.
- Set user parameters based on the current date and time.
- Set **Baud rate**, **Protocol**, and **Address** based on site requirements. **Baud rate** can be set to **4800**, **9600**, or **19200**. **Protocol** can be set to **MODBUS RTU**, and **Address** can be set to any value in the range of 1 to 247.

- When multiple SUN2000s communicate with the SmartLogger over RS485, the RS485 addresses for all the SUN2000s on each RS485 route must be within the address range set on the SmartLogger and cannot be duplicate. Otherwise, the communication will fail. In addition, the baud rates of all the SUN2000s on each RS485 route must be consistent with the SmartLogger baud rate.

**Figure 6-9** Main menu screen



----End

## 6.3 Powering Off the System

### Precautions



#### **WARNING**

- If two SUN2000s share the same AC switch on the AC side, power off the two SUN2000s.
- After the SUN2000 powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on personal protective equipment (PPE) and begin servicing the SUN2000 fifteen minutes after power-off.

### Procedure

**Step 1** Run a shutdown command on the SUN2000 app, SmartLogger, or NMS.

For details, see the *SUN2000 App User Manual*, *SmartLogger2000 User Manual*, or *iManager NetEco 1000S User Manual*.

**Step 2** Turn off the AC switch between the SUN2000 and the power grid.

**Step 3** Turn off both DC switches.

----**End**

# 7 Man-Machine Interactions

## 7.1 Operations with a USB Flash Drive

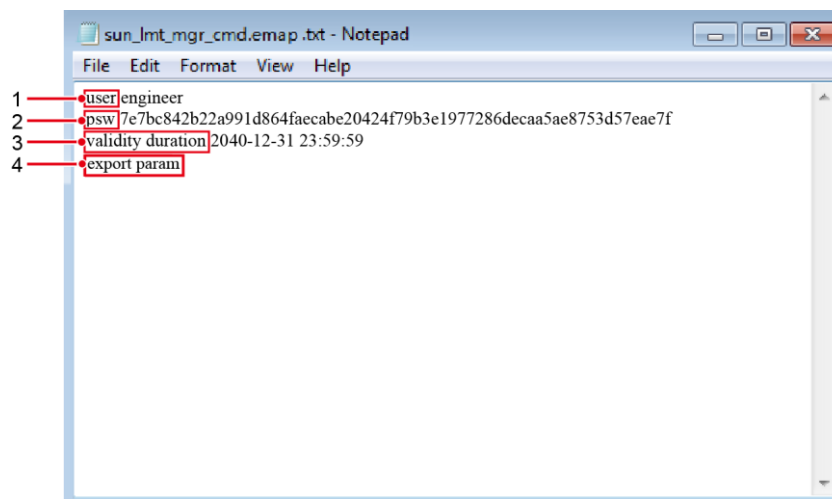
USB flash drives of SanDisk, Netac, and Kingston are recommended. Other brands may be incompatible.

### 7.1.1 Exporting Configurations

#### Procedure

- Step 1** Choose **Tool Kit > Local maint script > Inverter Command Settings** on the SUN2000 app to generate a boot script file.
- Step 2** Import the boot script file to a PC.
- (Optional) The boot script file can be opened as a .txt file, as shown in [Figure 7-1](#).

**Figure 7-1** Boot script file



| No. | Meaning                | Remarks                                                                                                                                                                                                                                                                                                                |
|-----|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | User name              | <ul style="list-style-type: none"> <li>Advanced user: engineer</li> <li>Special user: admin</li> </ul>                                                                                                                                                                                                                 |
| 2   | Ciphertext             | The ciphertext varies depending on the login password of the SUN2000 APP.                                                                                                                                                                                                                                              |
| 3   | Script validity period | -                                                                                                                                                                                                                                                                                                                      |
| 4   | Command                | Different command settings can produce different commands. <ul style="list-style-type: none"> <li>Configuration export command: <b>export param.</b></li> <li>Configuration import command: <b>import param.</b></li> <li>Data export command: <b>export log.</b></li> <li>Upgrade command: <b>upgrade.</b></li> </ul> |

**Step 3** Import the boot script file to the root directory of a USB flash drive.

**Step 4** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



## NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

**Table 7-1** LED indicator description

| LED Indicator | Status                                                                    | Meaning                                            |
|---------------|---------------------------------------------------------------------------|----------------------------------------------------|
|               | Green off                                                                 | There is no operation with a USB flash drive.      |
|               | Blinking green at long intervals (on for 1s and then off for 1s)          | There is an operation with a USB flash drive.      |
|               | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed.    |
|               | Steady green                                                              | An operation with a USB flash drive is successful. |

**Step 5** Insert the USB flash drive into a computer and check the exported data.



**NOTE**

When the configuration export is complete, the boot script file and exported file are in the root directory of the USB flash drive.

----End

## 7.1.2 Importing Configurations

### Prerequisites

A complete configuration file has been exported.

### Procedure

- Step 1** Choose **Tool Kit > Local maint script > Inverter Command Settings** on the SUN2000 app to generate a boot script file.
- Step 2** Import the boot script file to a PC.
- Step 3** Replace the exported boot script file in the root directory of the USB flash drive with the imported one.



**NOTICE**

Replace the boot script file only and keep the exported files.

- Step 4** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



**NOTICE**

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

**Table 7-2** LED indicator description

| LED Indicator | Status                                                                    | Meaning                                         |
|---------------|---------------------------------------------------------------------------|-------------------------------------------------|
|               | Green off                                                                 | There is no operation with a USB flash drive.   |
|               | Blinking green at long intervals (on for 1s and then off for 1s)          | There is an operation with a USB flash drive.   |
|               | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed. |

| LED Indicator | Status       | Meaning                                            |
|---------------|--------------|----------------------------------------------------|
|               | Steady green | An operation with a USB flash drive is successful. |

----End

## 7.1.3 Exporting Data

### Procedure

- Step 1** Choose **Tool Kit > Local maint script > Inverter Command Settings** on the SUN2000 app to generate a boot script file.
- Step 2** Import the boot script file to the root directory of a USB flash drive.
- Step 3** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



### NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

**Table 7-3** LED indicator description

| LED Indicator | Status                                                                    | Meaning                                            |
|---------------|---------------------------------------------------------------------------|----------------------------------------------------|
|               | Green off                                                                 | There is no operation with a USB flash drive.      |
|               | Blinking green at long intervals (on for 1s and then off for 1s)          | There is an operation with a USB flash drive.      |
|               | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed.    |
|               | Steady green                                                              | An operation with a USB flash drive is successful. |

- Step 4** Insert the USB flash drive into a PC and check the exported data.



### NOTE

After the data is exported, the boot script file and exported file are in the root directory of the USB flash drive.

----End

## 7.1.4 Upgrading

### Context

**Upgrade delay** is mainly used in the upgrade scenarios where the PV power supply is disconnected at night due to no sunlight or unstable at dawn or dusk due to poor sunlight.

After the SUN2000 upgrade starts, if **Upgrade delay** is set to **Enable**, the upgrade package is loaded first. After the PV power supply recovers and the activation conditions are met, the SUN2000 automatically activates the upgrade.



#### NOTE

**Upgrade delay** is set to **Enable** by default, which means that the upgrade can take place at day or night.

After enabling **Upgrade delay**, start the SUN2000 upgrade over a USB flash drive, SmartLogger, or NMS. The SUN2000 upgrade process contains the following two stages:

1. The monitoring component caches and loads the upgrade package.
2. Upgrade package activation starts when the following conditions are met.

**Table 7-4** Conditions for starting delayed activation

| Upgrade Method                       | Activation Start Condition                                                                                                                     |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Local upgrade over a USB flash drive | <ul style="list-style-type: none"><li>• The CAN communication is normal.</li><li>• The PV power supply is normal.</li></ul>                    |
| Local upgrade of the SUN2000 app     | The activation starts when either of the preceding two conditions is met.                                                                      |
| Remote upgrade over the SmartLogger  | <ul style="list-style-type: none"><li>• The PV input voltage is greater than 500 V.</li><li>• The output power is greater than 1 kW.</li></ul> |
| Remote upgrade over the NMS          | The activation starts when either of the preceding two conditions is met.                                                                      |



#### NOTE

When upgrading the SUN2000 remotely, do not perform local operations for the SUN2000.

### Procedure

**Step 1** Download the required software upgrade package from the technical support website.

**Step 2** Decompress the upgrade package.



## NOTICE

- When the login password of the SUN2000 app is the initial password (**00000a**), there is no need to perform [Step 3–Step 5](#).
- When the login password of the SUN2000 app is not the initial password, perform [Step 3–Step 7](#).

- Step 3** Choose **Tool Kit > Local maint script > Inverter Command Settings** on the SUN2000 app to generate a boot script file.
- Step 4** Import the boot script file to a PC.
- Step 5** Replace the boot script file in the upgrade package (sun\_lmt\_mgr\_cmd.emap) with the one generated by the SUN2000 app.
- Step 6** Copy the extracted files to the root directory of the USB flash drive.
- Step 7** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



## NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 app. If they do not match and you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

**Table 7-5** LED indicator description

| LED Indicator | Status                                                                    | Meaning                                            |
|---------------|---------------------------------------------------------------------------|----------------------------------------------------|
|               | Green off                                                                 | There is no operation with a USB flash drive.      |
|               | Blinking green at long intervals (on for 1s and then off for 1s)          | There is an operation with a USB flash drive.      |
|               | Blinking green at short intervals (on for 0.125s and then off for 0.125s) | An operation with a USB flash drive has failed.    |
|               | Steady green                                                              | An operation with a USB flash drive is successful. |

- Step 8** (Optional) The system automatically restarts when the upgrade is completed. All LED indicators are off during the restart. After the restart, the preceding indicator is blinking green slowly (on for 1s and then off for 1s) for 1 minute until becoming steady on, which indicates that the upgrade is successful.



## NOTE

The SUN2000 can also be locally upgraded through the **Inverter Upgrade** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

----End

## 7.2 Operations with the SUN2000 App



### NOTICE

When you use the SUN2000 app to set parameters for the SUN2000, setting items on certain parameter setting screens are not displayed if the AC switch between the SUN2000 and the power grid is turned on but both of **DC SWITCH** on the SUN2000 are not in the **ON** position. Switch both of **DC SWITCH** to the **ON** position and then reset relevant parameters again.



### NOTE

- The app version is 2.2.00.010.
- Configurable parameters vary depending on the grid code. The actual display prevails.
- The parameter names, value ranges, and default values are subject to change. The actual display prevails.

### 7.2.1 Operations Related to the Advanced User

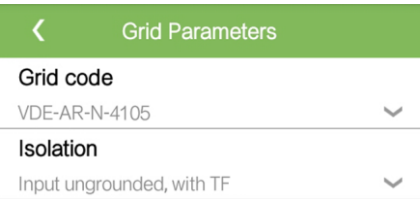
If you log in to the app as **Advanced User**, you can set grid parameters, protection parameters, and feature parameters for the SUN2000.

#### 7.2.1.1 Setting Grid Parameters

##### Procedure

**Step 1** Tap **Function Menu > Settings > Grid Parameters** to access the parameters setting screen.

**Figure 7-2** Grid parameters (advanced user)



----End

##### Parameter List

| No. | Parameter | Description                                                                                                                        | Value Range |
|-----|-----------|------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1   | Grid code | Set this parameter based on the grid code of the country or region where the SUN2000 is used and the SUN2000 application scenario. | N/A         |

| No. | Parameter | Description                                                                                                                       | Value Range                                                                                                                                        |
|-----|-----------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2   | Isolation | Specifies the working mode of the SUN2000 according to the grounding status at the DC side and the connection status to the grid. | <ul style="list-style-type: none"> <li>Input grounded, with TF</li> <li>Input ungrounded, without TF</li> <li>Input ungrounded, with TF</li> </ul> |

## 7.2.1.2 Setting Protection Parameters

### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Protection Parameters** to access the settings screen.

**Figure 7-3** Protection parameters (advanced user)



----End

### Parameter List

| No. | Parameter                        | Description                                                                                                                                                                                                                                         | Unit | Default Value | Value Range    |
|-----|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|----------------|
| 1   | Insulation resistance protection | To ensure device safety, the SUN2000 detects the insulation resistance between the input side and the ground when it starts a self-check. If the detected value is less than the preset value, the SUN2000 does not export power to the power grid. | MΩ   | 0.050         | [0.033, 1.500] |

## 7.2.1.3 Setting Feature Parameters

### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Feature Parameters** to access the settings screen.

**Figure 7-4** Feature parameters (advanced user)

<
Feature Parameters

MPPT multi-peak scanning
☐

RCD enhancing
☐

Reactive power output at night
☐

PID protection at night
☒

Power quality optimization mode
☒

PV module type
v

String connection mode
v

Communication interrupt shutdown
☐

Communication interruption duration<sub>(min)</sub>
30

----End

## Parameter List

| No. | Parameter                         | Description                                                                                                                                                                                      | Unit | Default Value | Value Range                                                               | Remarks                                                                                         |
|-----|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1   | MPPT multi-peak scanning          | When the SUN2000 is used in scenarios where PV strings are obviously shaded, enable this function. Then the SUN2000 will perform MPPT scanning at regular intervals to locate the maximum power. | N/A  | Disable       | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | The scanning interval is set by <b>MPPT multi-peak scanning interval</b> .                      |
| 2   | MPPT multi-peak scanning interval | Specifies the MPPT multi-peak scanning interval.                                                                                                                                                 | min  | 15            | [5, 30]                                                                   | This parameter is displayed only when <b>MPPT multi-peak scanning</b> is set to <b>Enable</b> . |

| No. | Parameter                      | Description                                                                                                                                                                                                                                                                                                                                                                                             | Unit | Default Value | Value Range                                                                   | Remarks                                                                                                           |
|-----|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 3   | RCD enhancing                  | RCD refers to the residual current of the SUN2000 to the ground. To ensure device security and personal safety, RCD should comply with the standard. If an AC switch with a residual current detection function is installed outside the SUN2000, this function should be enabled to reduce the residual current generated during SUN2000 running, thereby preventing the AC switch from misoperations. | N/A  | Disable       | <ul style="list-style-type: none"> <li>• Disable</li> <li>• Enable</li> </ul> | N/A                                                                                                               |
| 4   | Reactive power output at night | In some specific application scenarios, a power grid company requires that the SUN2000 can perform reactive power compensation at night to ensure that the power factor of the local power grid meets requirements.                                                                                                                                                                                     | N/A  | Disable       | <ul style="list-style-type: none"> <li>• Disable</li> <li>• Enable</li> </ul> | This parameter is configurable only when <b>Isolation</b> is set to <b>Input ungrounded, with a transformer</b> . |

| No. | Parameter                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Unit | Default Value | Value Range                                                               | Remarks |
|-----|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|---------|
| 5   | PID protection at night         | <ul style="list-style-type: none"> <li>When <b>PID protection at night</b> is set to <b>Enable</b>, the SUN2000 will shut down automatically if it detects abnormality in PID voltage compensation during the reactive power compensation at night.</li> <li>When <b>PID protection at night</b> is set to <b>Disable</b>, the SUN2000 will operate in grid-tied mode if it detects abnormality in PID voltage compensation during the reactive power compensation at night.</li> </ul> | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A     |
| 6   | Power quality optimization mode | If <b>Power quality optimization mode</b> is set to <b>Enable</b> , the inverter output current harmonics will be optimized.                                                                                                                                                                                                                                                                                                                                                            | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A     |

| No. | Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                | Unit | Default Value       | Value Range                                                                                                       | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | PV module type | This parameter is used to set different types of PV modules and the shutdown time of the concentration PV modules. If the concentration PV modules are shaded, the power drops drastically to 0 and the SUN2000 shuts down. The energy yield would be affected since it takes too long for the power to resume and SUN2000 to restart. The parameter does not need to be set for crystalline silicon and filmy PV modules. | N/A  | Crystalline silicon | <ul style="list-style-type: none"> <li>Crystalline silicon</li> <li>Film</li> <li>CPV 1</li> <li>CPV 2</li> </ul> | <ul style="list-style-type: none"> <li>If <b>PV module type</b> is set to <b>Crystalline silicon</b> or <b>Film</b>, the SUN2000 automatically detects the power of PV modules when they are shaded and shuts down if the power is too low.</li> <li>If <b>PV module type</b> is set to <b>CPV 1</b>, the SUN2000 can operate for 60 minutes if the power of PV modules drops drastically due to shading. It can also quickly output power when the power resumes.</li> <li>If <b>PV module type</b> is set to <b>CPV 2</b>, the SUN2000 can operate for 10 minutes if the power of PV modules drops drastically due to shading. It can also quickly output power when the power resumes.</li> </ul> |

| No. | Parameter                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unit | Default Value       | Value Range                                                                                                                               | Remarks                                                                                                                                                                                                                                    |
|-----|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8   | String connection mode           | <p>Specifies the connection mode of PV strings.</p> <ul style="list-style-type: none"> <li>When the PV strings connect to the inverter separately (fully separate connection), there is no need to set this parameter. The inverter can automatically detect the connection mode of the PV strings.</li> <li>When the PV strings connect to one another in parallel outside the inverter and then connect to the inverter independently (fully parallel connection), set this parameter to <b>All PV strings connected</b>.</li> </ul> | N/A  | Automatic detection | <ul style="list-style-type: none"> <li>Automatic detection</li> <li>All PV strings separated</li> <li>All PV strings connected</li> </ul> | N/A                                                                                                                                                                                                                                        |
| 9   | Communication interrupt shutdown | The standards of certain countries and regions require that the SUN2000 must shut down after the communication is interrupted for a certain time.                                                                                                                                                                                                                                                                                                                                                                                      | N/A  | Disable             | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul>                                                                 | If <b>Communication interrupt shutdown</b> is set to <b>Enable</b> and the SUN2000 communication has been interrupted for a specified time (set by <b>Communication interruption duration</b> ), the SUN2000 will automatically shut down. |

| No. | Parameter                           | Description                                                                                                                                                                                        | Unit | Default Value | Value Range                                                               | Remarks |
|-----|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|---------|
| 10  | Communication resumed startup       | If this parameter is enabled, the SUN2000 automatically starts after communication recovers. If this parameter is disabled, the SUN2000 needs to be started manually after communication recovers. | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A     |
| 11  | Communication interruption duration | Specifies the duration for determining communication interruption, and is used for automatic shutdown for protection in case of communication interruption.                                        | min  | 30            | [1, 120]                                                                  | N/A     |
| 12  | Soft start time                     | Specifies the duration for the power to gradually increase when the SUN2000 starts.                                                                                                                | s    | 20            | [20, 1800]                                                                | N/A     |
| 13  | Hibernate at night                  | The SUN2000 monitors PV strings at night. If <b>Hibernate at night</b> is set to <b>Enable</b> , the monitoring function of the SUN2000 will hibernate at night, reducing power consumption.       | N/A  | Disable       | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A     |
| 14  | PLC communication                   | For SUN2000 models that support both RS485 and PLC communication, when RS485 communication is used, you are advised to set <b>PLC communication</b> to <b>Disable</b> to reduce power consumption. | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A     |

| No. | Parameter                                         | Description                                                                                                                                                                                                                                              | Unit | Default Value | Value Range                                                               | Remarks                                                                                                                                                                                                                                             |
|-----|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15  | Upgrade delay                                     | <b>Upgrade delay</b> is mainly used in the upgrade scenarios where the PV power supply is disconnected at night due to no sunlight or unstable at dawn or dusk due to poor sunlight.                                                                     | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | After the SUN2000 upgrade starts, if <b>Upgrade delay</b> is set to <b>Enable</b> , the upgrade package is loaded first. After the PV power supply recovers and the activation conditions are met, the SUN2000 automatically activates the upgrade. |
| 16  | String monitor                                    | The SUN2000 monitors PV strings in real time. If any PV string is abnormal (such as the PV string is shaded or the energy yield decreases), the SUN2000 generates an alarm to remind maintenance personnel to maintain the PV string in a timely manner. | N/A  | Disable       | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | If PV strings are easily shaded, you are advised to set <b>String monitor</b> to <b>Disable</b> to prevent false alarms.                                                                                                                            |
| 17  | String detection reference asymmetric coefficient | Specifies the threshold for determining PV string exception. The false alarms caused by fixed shadow shading can be controlled by changing this parameter.                                                                                               | N/A  | 20            | [5, 100]                                                                  | This parameter is displayed when <b>String monitor</b> is set to <b>Enable</b> .                                                                                                                                                                    |
| 18  | String detection starting power percentage        | Specifies the threshold for starting PV string exception detection. The false alarms caused by fixed shadow shading can be controlled by changing this parameter.                                                                                        | %    | 20            | [1, 100]                                                                  |                                                                                                                                                                                                                                                     |

| No. | Parameter                                              | Description                                                                                                                                                                                                                                                  | Unit | Default Value          | Value Range                                                                                              | Remarks |
|-----|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------|----------------------------------------------------------------------------------------------------------|---------|
| 19  | Tracking system controller                             | Selects a controller vendor.                                                                                                                                                                                                                                 | N/A  | No tracking controller | <ul style="list-style-type: none"> <li>No tracking controller</li> <li>Each controller vendor</li> </ul> | N/A     |
| 20  | Duration for determining short-time grid disconnection | The standards of certain countries and regions require that the SUN2000 should not disconnect from the power grid if the power grid experiences a short-time failure. The SUN2000 output power should be recovered immediately after the fault is rectified. | ms   | 3000                   | [500, 20000]                                                                                             | N/A     |

## 7.2.2 Operations Related to the Special User

If you log in to the app as **Special User**, you can set grid parameters, protection parameters, feature parameters, and grid adjustment parameters for the SUN2000.

### 7.2.2.1 Setting Grid Parameters

#### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Grid Parameters** to access the settings screen.

**Figure 7-5** Grid parameters (special user)

< Grid Parameters

Grid code  
VDE-AR-N-4105

Auto start upon grid recovery ☒

On-grid recovery time(s)  
60

Grid reconnection voltage upper limit(V)  
253.0

Grid reconnection voltage lower limit(V)  
195.5

Grid reconnection frequency upper limit(Hz)  
50.05

Grid reconnection frequency lower limit(Hz)  
47.50

Reactive power compensation (cosψ-P) trigger voltage(%)

----End

## Parameter List



### NOTE

Vn represents the rated voltage and Fn represents the rated frequency.

| No. | Parameter   | Description                                                                                                                                                                                           | Unit | Default Value          | Value Range                                                                                               |
|-----|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------|-----------------------------------------------------------------------------------------------------------|
| 1   | Grid code   | Set this parameter based on the grid code of the country or region where the SUN2000 is used and the SUN2000 application scenario.                                                                    | N/A  | VDE-AR-N-4105          | N/A                                                                                                       |
| 2   | Output mode | Indicates whether the SUN2000 output has a neutral wire.                                                                                                                                              | N/A  | Three-phase, four-wire | <ul style="list-style-type: none"> <li>Three-phase, three-wire</li> <li>Three-phase, four-wire</li> </ul> |
| 3   | PQ mode     | If this parameter is set to <b>PQ mode 1</b> , the maximum active power equals the maximum apparent power. If it is set to <b>PQ mode 2</b> , the maximum active power equals the rated active power. | N/A  | PQ mode 2              | <ul style="list-style-type: none"> <li>PQ mode 1</li> <li>PQ mode 2</li> </ul>                            |

| No. | Parameter                                          | Description                                                                                                                                                                                                                                                     | Unit | Default Value      | Value Range                                                                   |
|-----|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|-------------------------------------------------------------------------------|
| 4   | Auto start upon grid recovery                      | Specifies whether to allow the SUN2000 to automatically start after the power grid recovers.                                                                                                                                                                    | N/A  | Enable             | <ul style="list-style-type: none"> <li>• Disable</li> <li>• Enable</li> </ul> |
| 5   | Grid connection duration after power grid recovery | Specifies the waiting time for SUN2000 restart after the power grid recovers.                                                                                                                                                                                   | s    | 60                 | [0, 900]                                                                      |
| 6   | Grid reconnection voltage upper limit              | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage exceeds the value of <b>Grid reconnection voltage upper limit</b> after the SUN2000 shuts down due to a fault.      | V    | $1.1 \times V_n$   | $[1 \times V_n, 1.36 \times V_n]$                                             |
| 7   | Grid reconnection voltage lower limit              | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid voltage is below the value of <b>Grid reconnection voltage lower limit</b> after the SUN2000 shuts down due to a fault.     | V    | $0.95 \times V_n$  | $[0.45 \times V_n, 0.95 \times V_n]$                                          |
| 8   | Grid reconnection frequency upper limit            | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency exceeds the value of <b>Grid reconnection frequency upper limit</b> after the SUN2000 shuts down due to a fault.  | Hz   | $1.004 \times F_n$ | $[1 \times F_n, 1.12 \times F_n]$                                             |
| 9   | Grid reconnection frequency lower limit            | The standards of certain countries and regions require that the SUN2000 must not export power to the power grid again when the grid frequency is below the value of <b>Grid reconnection frequency lower limit</b> after the SUN2000 shuts down due to a fault. | Hz   | $0.95 \times F_n$  | $[0.85 \times F_n, 1 \times F_n]$                                             |

| No. | Parameter                                            | Description                                                                                           | Unit | Default Value | Value Range |
|-----|------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------|---------------|-------------|
| 10  | Reactive power compensation (cosφ-P) trigger voltage | Specifies the voltage threshold for triggering reactive power compensation based on the cosφ-P curve. | %    | 105           | [100, 110]  |
| 11  | Reactive power compensation (cosφ-P) exit voltage    | Specifies the voltage threshold for exiting reactive power compensation based on the cosφ-P curve.    | %    | 98            | [90, 100]   |

## 7.2.2.2 Setting Protection Parameters

### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Protection Parameters** to access the settings screen.

**Figure 7-6** Protection parameters (special user)

< Protect Parameters

Unbalance voltage protection(%)  
50.0

Phase angle offset protection ☐

10 minute OV protection(V)  
257.6

10 minute OV protection time(ms)  
200

Level-1 OV protection(V)  
264.5

Level-1 OV protection time(ms)  
200

Level-1 UV protection(V)  
184.0

Level-1 UV protection time(ms)  
200

Level-1 OF protection(Hz)  
51.50

Level-1 OF protection time(ms)

----End

### Parameter List



**NOTE**

V<sub>n</sub> represents the rated voltage and F<sub>n</sub> represents the rated frequency.

| No. | Parameter                     | Description                                                                                                                                                                | Unit | Value Range                                                                   |
|-----|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------|
| 1   | Unbalance voltage protection  | Specifies the SUN2000 protection threshold in the case of unbalanced power grid voltage.                                                                                   | %    | [0.0, 50.0]                                                                   |
| 2   | Phase angle offset protection | The standards of certain countries and regions require that the SUN2000 needs to be protected when the three-phase angle offset of the power grid exceeds a certain value. | N/A  | <ul style="list-style-type: none"> <li>• Disable</li> <li>• Enable</li> </ul> |
| 3   | 10 minute OV protection       | Specifies the 10-minute overvoltage protection threshold.                                                                                                                  | V    | [1 x Vn, 1.4 x Vn]                                                            |
| 4   | 10 minute OV protection time  | Specifies the 10-minute overvoltage protection duration.                                                                                                                   | ms   | [50, 7200000]                                                                 |
| 5   | Level-1 OV protection         | Specifies the level-1 overvoltage protection threshold.                                                                                                                    | V    | [1 x Vn, 1.4 x Vn]                                                            |
| 6   | Level-1 OV protection time    | Specifies the level-1 overvoltage protection duration.                                                                                                                     | ms   | [50, 7200000]                                                                 |
| 7   | Level-1 UV protection         | Specifies the level-1 undervoltage protection threshold.                                                                                                                   | V    | [0.15 x Vn, 1 x Vn]                                                           |
| 8   | Level-1 UV protection time    | Specifies the level-1 undervoltage protection duration.                                                                                                                    | ms   | [50, 7200000]                                                                 |
| 9   | Level-1 OF protection         | Specifies the level-1 overfrequency protection threshold.                                                                                                                  | Hz   | [1 x Fn, 1.15 x Fn]                                                           |
| 10  | Level-1 OF protection time    | Specifies the level-1 overfrequency protection duration.                                                                                                                   | ms   | [50, 7200000]                                                                 |
| 11  | Level-1 UF protection         | Specifies the level-1 underfrequency protection threshold.                                                                                                                 | Hz   | [0.85 x Fn, 1 x Fn]                                                           |
| 12  | Level-1 UF protection time    | Specifies the level-1 underfrequency protection duration.                                                                                                                  | ms   | [50, 7200000]                                                                 |

### 7.2.2.3 Setting Feature Parameters

#### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Feature Parameters** to access the settings screen.

**Figure 7-7** Feature parameters (special user)

<
Feature Parameters

**LVRT**

---

**LVRT threshold(V)**

400.0

---

**LVRT undervoltage protection shield**

---

**LVRT reactive power compensation power factor**

2.0

---

**HVRT**

---

**Active islanding**

---

**Voltage rise suppression**

---

**Soft start time after grid failure(s)**

600

---

----End

## Parameter List

| No. | Parameter                           | Description                                                                                                                                                                       | Unit | Default Value | Value Range                                                               | Remarks                          |
|-----|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|----------------------------------|
| 1   | LVRT                                | When the power grid voltage is abnormally low for a short time, the SUN2000 cannot disconnect from the power grid immediately and has to work for some time. This is called LVRT. | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                              |
| 2   | LVRT threshold                      | Specifies the threshold for triggering LVRT.                                                                                                                                      | V    | 0.8 x Vn      | [0.5 x Vn, 0.92 x Vn]                                                     | Vn represents the rated voltage. |
| 3   | LVRT undervoltage protection shield | Specifies whether to shield the undervoltage protection function during LVRT.                                                                                                     | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                              |

| No. | Parameter                                          | Description                                                                                                                                                                                                                   | Unit | Default Value | Value Range                                                               | Remarks                                                                                                                                                                                                        |
|-----|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4   | LVRT reactive power compensation power factor      | During LVRT, the SUN2000 needs to generate reactive power to support the power grid. This parameter is used to set the reactive power generated by the SUN2000.                                                               | N/A  | 2             | [0, 3]                                                                    | For example, if you set <b>LVRT reactive power compensation power factor</b> to <b>2</b> , the reactive power generated by the SUN2000 is 20% of the rated power when the AC voltage drops by 10% during LVRT. |
| 5   | HVRT                                               | When the power grid voltage is abnormally high for a short time, the SUN2000 cannot disconnect from the power grid immediately and has to work for some time. This is called high voltage ride-through (HVRT).                | N/A  | Disable       | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                                                                                                                                                                                                            |
| 6   | Active islanding                                   | Specifies whether to enable the active islanding protection function.                                                                                                                                                         | N/A  | Enable        | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                                                                                                                                                                                                            |
| 7   | Voltage rise suppression                           | The standards of certain countries and regions require that the SUN2000 should prevent the grid voltage from rising by delivering reactive power and decreasing active power when the output voltage exceeds a certain value. | N/A  | Disable       | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                                                                                                                                                                                                            |
| 8   | Voltage rise suppression reactive adjustment point | The standards of certain countries and regions require that the SUN2000 must generate a certain amount of reactive power when the output voltage exceeds a certain value.                                                     | %    | 110           | [100, 115]                                                                | <ul style="list-style-type: none"> <li>This parameter is displayed when <b>Voltage rise suppression</b> is set to <b>Enable</b>.</li> <li>The value of <b>Voltage rise suppression</b></li> </ul>              |

| No. | Parameter                                      | Description                                                                                                                                                                             | Unit | Default Value | Value Range | Remarks                                                                                                               |
|-----|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------|-------------|-----------------------------------------------------------------------------------------------------------------------|
| 9   | Voltage rise suppression active derating point | The standards of certain countries and regions require that the active power of the SUN2000 be derated according to a certain gradient when the output voltage exceeds a certain value. | %    | 112.5         | [100, 115]  | <b>active derating point</b> must be greater than that of <b>Voltage rise suppression reactive adjustment point</b> . |
| 10  | Soft start time after grid failure             | Specifies the time for the power to gradually increase when the SUN2000 restarts after the power grid recovers.                                                                         | s    | 600           | [20, 800]   | N/A                                                                                                                   |

## 7.2.2.4 Setting Power Adjustment Parameters

### Procedure

**Step 1** Choose **Function Menu** > **Settings** > **Power Adjustment** to access the settings screen.

**Figure 7-8** Power adjustment parameters (special user)

< Power Adjustment

Remote power schedule ☒

Schedule instruction valid duration(s)  
0

Maximum active power(kW)  
66.000

Shutdown at 0% power limit ☐

Active power change gradient(%/s)  
125.000

Fixed active power derating(kW)  
66.0

Active power percentage derating(%)  
100.0

Power factor((-1.000,-0.800] U [0.800,1.000))  
1.000

Reactive power compensation (Q/S)  
0.000

----End

## Parameter List

**Table 7-6** Parameter description

| No. | Parameter                           | Description                                                                                                                                                                                                                            | Unit | Value Range                                                               | Remarks                                                                                                       |
|-----|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 1   | Remote power schedule               | If this parameter is set to <b>Enable</b> , the SUN2000 responds to the remote power scheduling instruction. If this parameter is set to <b>Disable</b> , the SUN2000 does not respond to the remote power scheduling instruction.     | N/A  | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                                                                                                           |
| 2   | Schedule instruction valid duration | Specifies the duration within which the scheduling instruction is valid.                                                                                                                                                               | s    | [0, 86400]                                                                | If the value is less than 60 seconds, the scheduling instruction is valid permanently.                        |
| 3   | Maximum active power                | Specifies the output upper threshold for the maximum active power to adapt to various market requirements.                                                                                                                             | kW   | [0.1, Pmax_limit]                                                         | N/A                                                                                                           |
| 4   | Shutdown at 0% power limit          | If this parameter is set to <b>Enable</b> , the SUN2000 shuts down after receiving the 0% power limit command. If this parameter is set to <b>Disable</b> , the SUN2000 does not shut down after receiving the 0% power limit command. | N/A  | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul> | N/A                                                                                                           |
| 5   | Active power change gradient        | Adjusts the change speed of the SUN2000 active power.                                                                                                                                                                                  | %/s  | [0.1, 1000]                                                               | Adjust the active power based on the percentage of the rated apparent power.                                  |
| 6   | Fixed active power derated          | Adjusts the active power output of the SUN2000 to a fixed value.                                                                                                                                                                       | kW   | [0, Pmax_limit]                                                           | N/A                                                                                                           |
| 7   | Active power percentage derating    | Adjusts the active power output of the SUN2000 to a percentage.                                                                                                                                                                        | %    | [0, 100]                                                                  | If this parameter is set to <b>100</b> , the SUN2000 delivers power output based on the maximum output power. |

| No. | Parameter                                    | Description                                                                                                                                                                                 | Unit  | Value Range                                                                                                                                                                                              | Remarks                            |
|-----|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 8   | Power factor                                 | Adjusts the SUN2000 power factor.                                                                                                                                                           | N/A   | (-1.000, -0.800]U[0.800, 1.000]                                                                                                                                                                          | N/A                                |
| 9   | Reactive power compensation (Q/S)            | Adjusts the SUN2000 output reactive power.                                                                                                                                                  | N/A   | (-1, 1]                                                                                                                                                                                                  | N/A                                |
| 10  | Reactive power compensation at night (Q/S)   | If <b>Reactive power output at night</b> is set to <b>Enable</b> , no PV input exists, and no remote scheduling instruction is delivered, the SUN2000 responds to this command.             | N/A   | (-1, 1]                                                                                                                                                                                                  | N/A                                |
| 11  | Trigger frequency of over frequency derating | The standards of certain countries and regions require that the output active power of the SUN2000 be derated when the grid frequency exceeds a certain value.                              | Hz    | <ul style="list-style-type: none"> <li>When the output frequency is 50 Hz, the value range is 45.00–55.00 Hz.</li> <li>When the output frequency is 60 Hz, the value range is 55.00–65.00 Hz.</li> </ul> | Fn represents the rated frequency. |
| 12  | Quit frequency of over frequency derating    | Specifies the frequency threshold for exiting overfrequency derating.                                                                                                                       | Hz    | <ul style="list-style-type: none"> <li>When the output frequency is 50 Hz, the value range is 45.00–55.00 Hz.</li> <li>When the output frequency is 60 Hz, the value range is 55.00–65.00 Hz.</li> </ul> |                                    |
| 13  | Recovery gradient of over frequency derating | Specifies the power recovery gradient for overfrequency derating.                                                                                                                           | %/min | [5, 20]                                                                                                                                                                                                  | N/A                                |
| 14  | Overfrequency derating                       | If this parameter is enabled, the active power of the inverter will be derated according to a certain slope when the grid frequency exceeds the value that triggers overfrequency derating. | N/A   | <ul style="list-style-type: none"> <li>Disable</li> <li>Enable</li> </ul>                                                                                                                                | N/A                                |

| No. | Parameter                                  | Description                                                               | Unit | Value Range    | Remarks |
|-----|--------------------------------------------|---------------------------------------------------------------------------|------|----------------|---------|
| 15  | Cutoff frequency of overfrequency derating | Specifies the frequency threshold for cutting off overfrequency derating. | Hz   | [55.00, 65.00] | N/A     |
| 16  | Cutoff power of overfrequency derating     | Specifies the power threshold for cutting off overfrequency derating.     | %    | [5, 20]        | N/A     |

# 8 Maintenance

## 8.1 Routine Maintenance

To ensure that the SUN2000 can operate properly for a long term, you are advised to perform routine maintenance on it as described in this chapter.



### CAUTION

- Before cleaning the system and maintaining the cable connections and grounding reliability, power off the system (see [6.3 Powering Off the System](#) for details) and ensure that the two DC switches on the SUN2000 are OFF.
- If you need to open the maintenance compartment door on rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door on rainy or snowy days.

**Table 8-1** Maintenance checklist

| Item                  | Check Method                                                                                                                                                                                                                                                      | Maintenance Frequency           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| System cleanliness    | Periodically check that the heat sinks are free from obstacles or dust.                                                                                                                                                                                           | Once every six to twelve months |
| System running status | <ul style="list-style-type: none"><li>• Check that the SUN2000 is not damaged or deformed.</li><li>• Check that the running sound of the SUN2000 is normal.</li><li>• When the SUN2000 is running, check that all SUN2000 parameters are correctly set.</li></ul> | Once every six months           |

| Item                   | Check Method                                                                                                                                                                                                                                                                                              | Maintenance Frequency                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Electrical connections | <ul style="list-style-type: none"><li>• Check that cables are securely connected.</li><li>• Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.</li><li>• Check that the unused COM, USB, and RESERVE ports are covered by watertight caps.</li></ul> | The first inspection is six months after the initial commissioning. From then on, the interval can be six or twelve months. |
| Grounding reliability  | Check that ground cables are securely connected.                                                                                                                                                                                                                                                          | The first inspection is six months after the initial commissioning. From then on, the interval can be six or twelve months. |

## 8.2 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000 enters Shutdown mode and stops exporting power to the power grid due to a fault.
- Minor: Some components are faulty but the SUN2000 can still export power to the power grid.
- Warning: The SUN2000 output power decreases due to external factors.

**Table 8-2** Common alarms and troubleshooting measures

| Alarm ID | Alarm Name                | Alarm Severity | Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Measures                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|---------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2001     | High string input voltage | Major          | <p>The PV array is incorrectly configured. Excessive PV modules are connected in series to the PV string, and hence the PV string open-circuit voltage exceeds the maximum operating voltage of the SUN2000.</p> <ul style="list-style-type: none"> <li>• Cause ID 1 corresponds to PV strings 1 and 2.</li> <li>• Cause ID 2 corresponds to PV strings 3 and 4.</li> <li>• Cause ID 3 corresponds to PV strings 5 and 6.</li> <li>• Cause ID 4 corresponds to PV strings 7 and 8.</li> <li>• Cause ID 5 corresponds to PV strings 9 and 10.</li> <li>• Cause ID 6 corresponds to PV strings 11 and 12.</li> </ul> | <p>Reduce the number of PV modules connected in series to the PV string until the PV string open-circuit voltage is less than or equal to the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the alarm stops.</p>                                                                                                                                        |
| 2011     | String Reverse Connection | Major          | <p>The PV string is reversely connected. Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>Check whether the PV string is reversely connected to the SUN2000. If yes, wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches and correct the PV string connection.</p>                                                                                                                                     |
| 2012     | String current backfeed   | Warning        | <ol style="list-style-type: none"> <li>1. Only a few PV modules are connected in series to the PV string, and hence the end voltage is lower than that of other PV strings.</li> <li>2. The PV string is shaded.</li> </ol> <p>Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p>                                                                                                                                                                                                                                                                                                                | <ol style="list-style-type: none"> <li>1. Check whether the number of PV modules connected in series to this PV string is less than the number of PV modules connected in series to the other PV strings. If yes, connect more PV modules in series to this PV string.</li> <li>2. Check the open-circuit voltage of the PV string.</li> <li>3. Check that the PV string is not shaded.</li> </ol> |

| Alarm ID | Alarm Name                       | Alarm Severity | Cause                                                                                                                                                                                                                          | Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|----------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2013     | Abnormal String Power            | Warning        | <ol style="list-style-type: none"> <li>1. The PV string has been shaded for a long time.</li> <li>2. The PV string deteriorates abnormally.</li> </ol> <p>Cause IDs 1 to 12 respectively correspond to PV strings 1 to 12.</p> | <ol style="list-style-type: none"> <li>1. Check whether the current of the abnormal PV string is lower than the current of other PV strings. If yes, check that the abnormal PV string is not shaded and the actual number of PV strings is the same as the configured number.</li> <li>2. If the abnormal PV string is clean and not shaded, check whether the PV string is damaged.</li> </ol>                                                                                                                                                                                                             |
| 2031     | Phase Wire Short-Circuited to PE | Major          | The impedance of the output phase wire to PE is low or the output phase wire is short-circuited to PE.                                                                                                                         | Check the impedance of the output phase wire to PE, locate the position with lower impedance, and rectify the fault.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2032     | Grid Loss                        | Major          | <ol style="list-style-type: none"> <li>1. The power grid experiences an outage.</li> <li>2. The AC circuit is disconnected or AC switch is off.</li> </ol>                                                                     | <ol style="list-style-type: none"> <li>1. The alarm disappears automatically after the power grid recovers.</li> <li>2. Check that the AC power cable is connected and that the AC switch is ON.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2033     | Grid Undervoltage                | Major          | The grid voltage is below the lower threshold or the low voltage duration has lasted for more than the value specified by LVRT.                                                                                                | <ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the power grid voltage is within the acceptable range. If no, contact the local power operator. If yes, modify the power grid undervoltage protection threshold with the consent of the local power operator.</li> <li>3. If the fault persists for a long time, check the AC circuit breaker and AC output power cable.</li> </ol> |

| Alarm ID | Alarm Name             | Alarm Severity | Cause                                                                                                                            | Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2034     | Grid Overvoltage       | Major          | The grid voltage exceeds the higher threshold or the high voltage duration has lasted for more than the value specified by HVRT. | <ol style="list-style-type: none"> <li>1. Check whether the grid connection voltage exceeds the upper threshold. If yes, contact the local power operator.</li> <li>2. If you have confirmed that the grid connection voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the undervoltage protection threshold.</li> <li>3. Check that the peak grid voltage does not exceed the upper threshold.</li> </ol>                                     |
| 2035     | Grid Voltage Imbalance | Major          | The difference between grid phase voltages exceeds the upper threshold.                                                          | <ol style="list-style-type: none"> <li>1. Check that the grid voltage is within the normal range.</li> <li>2. Check the connection of the AC output power cable. If the cable connection is proper but the alarm occurs frequently and affects the power production of the PV plant, contact the local power operator.</li> </ol>                                                                                                                                                              |
| 2036     | Grid Overfrequency     | Major          | Power grid exception: The actual grid frequency is higher than the requirement of the local power grid standard.                 | <ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, modify the power grid overfrequency protection threshold with the consent of the local power operator.</li> </ol> |

| Alarm ID | Alarm Name                   | Alarm Severity | Cause                                                                                                                                                                                                              | Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2037     | Grid Underfrequency          | Major          | Power grid exception: The actual power grid frequency is lower than the standard requirement for the local power grid.                                                                                             | <ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, modify the power grid underfrequency protection threshold with the consent of the local power operator.</li> </ol> |
| 2038     | Unstable Grid Frequency      | Major          | Power grid exception: The actual grid frequency change rate does not comply with the local power grid standard.                                                                                                    | <ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.</li> <li>2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator.</li> </ol>                                                                                                                 |
| 2039     | Output Overcurrent           | Major          | The power grid voltage drops dramatically or the power grid is short-circuited. As a result, the inverter transient output current exceeds the upper threshold and therefore the inverter protection is triggered. | <ol style="list-style-type: none"> <li>1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers.</li> <li>2. If the alarm occurs frequently and affects the power production of the PV plant, check whether the output is short-circuited. If the fault persists, contact Huawei technical support.</li> </ol>                                                                                                   |
| 2040     | Output DC Component Overhigh | Major          | The DC component of the SUN2000 output current exceeds the specified upper threshold.                                                                                                                              | <ol style="list-style-type: none"> <li>1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the fault is rectified.</li> <li>2. If the alarm occurs frequently and affects the power production of the PV plant, contact Huawei technical support.</li> </ol>                                                                                                                                                                                           |

| Alarm ID | Alarm Name                | Alarm Severity | Cause                                                                                                                                                                                                                             | Measures                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|---------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2051     | Abnormal Residual Current | Major          | The insulation impedance of the input side to PE decreases when the SUN2000 is operating.                                                                                                                                         | <ol style="list-style-type: none"> <li>1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The SUN2000 automatically recovers after the fault is rectified.</li> <li>2. If the alarm occurs frequently or persists, check that the impedance between the PV string and ground is not below the lower threshold.</li> </ol>                                         |
| 2061     | Abnormal Grounding        | Major          | <ol style="list-style-type: none"> <li>1. The PE cable for the SUN2000 is not connected.</li> <li>2. The SUN2000 output side does not connect to an isolation transformer when the PV string output is grounded.</li> </ol>       | <ol style="list-style-type: none"> <li>1. Check that the PE cable for the SUN2000 is connected properly.</li> <li>2. If the PV string output is grounded, check that the SUN2000 output side connects to an isolation transformer.</li> </ol>                                                                                                                                                             |
| 2062     | Low Insulation Resistance | Major          | <ol style="list-style-type: none"> <li>1. The PV string is short-circuited to PE.</li> <li>2. The PV string has been in a moist environment for a long time and the power cable is not well insulated to ground.</li> </ol>       | <ol style="list-style-type: none"> <li>1. Check the impedance between the PV string and the PE cable. If a short circuit occurs, rectify the fault.</li> <li>2. Check that the PE cable for the SUN2000 is correctly connected.</li> <li>3. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, reset <b>Insulation resistance protection</b>.</li> </ol> |
| 2063     | Cabinet Overtemperature   | Major          | <ol style="list-style-type: none"> <li>1. The SUN2000 is installed in a place with poor ventilation.</li> <li>2. The ambient temperature exceeds the upper threshold.</li> <li>3. The SUN2000 is not working properly.</li> </ol> | <ol style="list-style-type: none"> <li>1. Check the ventilation and ambient temperature at the SUN2000 installation position. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation.</li> <li>2. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.</li> </ol>                |
| 2064     | Device Fault              | Major          | An unrecoverable fault occurs on a circuit inside the SUN2000.                                                                                                                                                                    | Turn off the AC output switch and DC input switch, and then turn them on after 15 minutes. If the fault persists, contact Huawei technical support.                                                                                                                                                                                                                                                       |

| Alarm ID | Alarm Name             | Alarm Severity | Cause                                                                                                                                                                | Measures                                                                                                                                                                            |
|----------|------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2065     | Upgrade Failed         | Minor          | The upgrade ends abnormally.                                                                                                                                         | <ol style="list-style-type: none"> <li>1. Perform an upgrade again.</li> <li>2. If the upgrade fails several times, contact your dealer.</li> </ol>                                 |
| 2066     | License Expired        | Warning        | <ol style="list-style-type: none"> <li>1. The privilege certificate has entered the grace period.</li> <li>2. The privilege feature will be invalid soon.</li> </ol> | <ol style="list-style-type: none"> <li>1. Apply for a new certificate.</li> <li>2. Load the new certificate.</li> </ol>                                                             |
| 61440    | Faulty Monitoring Unit | Minor          | <ol style="list-style-type: none"> <li>1. The flash memory is insufficient.</li> <li>2. The flash memory has bad sectors.</li> </ol>                                 | Turn off the AC output switch and DC input switch, and then turn them on after 15 minutes. If the fault persists, replace the monitoring board or contact Huawei technical support. |



**NOTE**

Contact Huawei technical support if all failure analysis procedures listed above are completed and the fault still exists.

# 9 Handling the Inverter

## 9.1 Removing the SUN2000



### NOTICE

Before removing the SUN2000, disconnect both the AC and DC power supplies. For details about the power-off process, see [6.3 Powering Off the System](#). After powering off the SUN2000, wait at least 15 minutes before performing operations on it.

To remove the SUN2000, perform the following steps:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and PE cables.
2. Remove the SUN2000 from the mounting bracket.
3. Remove the mounting bracket.

## 9.2 Packing the SUN2000

- If the original packing materials are available, put the SUN2000 inside them and then seal them by using adhesive tape.
- If the original packing materials are not available, put the SUN2000 inside a suitable cardboard box and seal it properly.

## 9.3 Disposing of the SUN2000

If the SUN2000 service life expires, dispose of it according to the local disposal rules for electrical equipment waste.

# 10 Technical Specifications

## Efficiency

| Item                | SUN2000-60KTL-M0 |                |
|---------------------|------------------|----------------|
| Maximum efficiency  | 98.70% (400 V)   | 98.90% (480 V) |
| European efficiency | 98.50% (400 V)   | 98.70% (480 V) |

## Input

| Item                                             | SUN2000-60KTL-M0                                  |
|--------------------------------------------------|---------------------------------------------------|
| Maximum input power                              | 67,400 W                                          |
| Maximum input voltage                            | 1100 V                                            |
| Maximum input current (per MPPT)                 | 22 A                                              |
| Maximum input current (per string)               | 18 A                                              |
| Maximum short-circuit current (per MPPT)         | 30 A                                              |
| Maximum SUN2000 backfeed current to the PV array | 0 A                                               |
| Minimum startup voltage                          | 200 V                                             |
| Operating voltage range                          | 200–1000 V                                        |
| Full power MPPT voltage range                    | 520–800 V <sup>a</sup> (400 V), 600–850 V (480 V) |
| Rated input voltage                              | 600 V (400 V), 720 V (480 V)                      |
| Number of inputs                                 | 12                                                |
| Number of MPP trackers                           | 6                                                 |

| Item                                                                                                                               | SUN2000-60KTL-M0 |
|------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Note a: The SUN2000 supports a maximum input voltage of 700 V at full load without deration when the ambient temperature is 40 °C. |                  |

## Output

| Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SUN2000-60KTL-M0                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Rated active power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 60 kW                                             |
| Maximum apparent power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 66 kVA                                            |
| Maximum active power <sup>b</sup> (cosφ = 1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 66 kW                                             |
| Rated output voltage <sup>c</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 230 V/400 V, 277 V/480 V, 3W+(N) <sup>d</sup> +PE |
| Rated output current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 86.7 A (400 V), 72.2 A (480 V)                    |
| Adapted grid frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 50 Hz/60 Hz                                       |
| Maximum output current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 95.3 A (400 V), 79.4 A (480 V)                    |
| Power factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.8 leading ... 0.8 lagging                       |
| Maximum total harmonic distortion (rated power)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | < 3%                                              |
| <p>Note b: The maximum active power is determined by <b>PQ mode</b>, which can be set on the SUN2000 app, SmartLogger, or NetEco. If this parameter is set to <b>PQ mode 1</b>, the maximum active power equals the maximum apparent power. If it is set to <b>PQ mode 2</b>, the maximum active power equals the rated active power.</p> <p>Note c: The rated output voltage is determined by <b>Grid code</b>, which can be set on the SUN2000 app, SmartLogger, or NetEco.</p> <p>Note d: Choose whether to connect the neutral wire to the SUN2000 based on the application scenario. When it is used in the scenarios without neutral wires, set <b>Output mode</b> to <b>Three-phase, three-wire</b>. When it is used in the scenarios with neutral wires, set <b>Output mode</b> to <b>Three-phase, four-wire</b>.</p> |                                                   |

## Protection

| Item                              | SUN2000-60KTL-M0 |
|-----------------------------------|------------------|
| Input DC switch                   | Supported        |
| Anti-islanding protection         | Supported        |
| Output overcurrent protection     | Supported        |
| Input reverse polarity protection | Supported        |
| PV string fault detection         | Supported        |

| Item                                    | SUN2000-60KTL-M0 |
|-----------------------------------------|------------------|
| DC surge protection                     | Type II          |
| AC surge protection                     | Type II          |
| Insulation resistance detection         | Supported        |
| Residual current monitoring unit (RCMU) | Supported        |
| Overvoltage category                    | PV II/AC III     |

## Display and Communication

| Item                          | SUN2000-60KTL-M0                              |
|-------------------------------|-----------------------------------------------|
| Display                       | LED, Bluetooth module+app, USB data cable+app |
| Communication networking mode | PLC/RS485                                     |

## Common Parameters

| Item                       | SUN2000-60KTL-M0           |
|----------------------------|----------------------------|
| Dimensions (W x H x D)     | 1075 mm x 555 mm x 300 mm  |
| Weight                     | 74 kg±1 kg                 |
| Operating temperature      | –25 ℃ to +60 ℃             |
| Cooling mode               | Natural convection         |
| Highest operating altitude | 4000 m                     |
| Humidity                   | 0%–100% RH                 |
| Input terminal             | Amphenol Helios H4         |
| Output terminal            | Cable gland+terminal clamp |
| Ingress Protection Rating  | IP65                       |
| Topology                   | Transformerless            |

# A Grid Codes



## NOTE

Grid codes are subject to change. The listed codes are for your reference only.

**Table A-1** Grid codes

| No. | Grid Code          | Description                             |
|-----|--------------------|-----------------------------------------|
| 1   | VDE-AR-N-4105      | Germany low-voltage power grid          |
| 2   | UTE C 15-712-1(A)  | France mainland low-voltage power grid  |
| 3   | UTE C 15-712-1(B)  | France islands                          |
| 4   | UTE C 15-712-1(C)  | France islands                          |
| 5   | VDE 0126-1-1-BU    | Bulgaria power grid                     |
| 6   | VDE 0126-1-1-GR(A) | Greece mainland power grid              |
| 7   | VDE 0126-1-1-GR(B) | Greece Island Grid                      |
| 8   | BDEW-MV            | Germany medium-voltage power grid       |
| 9   | G59-England        | England 230 V power grid ( $I > 16$ A)  |
| 10  | G59-Scotland       | Scotland 240 V power grid ( $I > 16$ A) |
| 11  | G83-England        | England 230 V power grid ( $I < 16$ A)  |
| 12  | G83-Scotland       | Scotland 240 V power grid ( $I < 16$ A) |
| 13  | CEI0-21            | Italy low-voltage power grid            |
| 14  | EN50438-CZ         | Czech Republic low-voltage power grid   |
| 15  | RD1699/661         | Spain low-voltage power grid            |
| 16  | RD1699/661-MV480   | Spain medium-voltage power grid         |
| 17  | EN50438-NL         | Netherlands power grid                  |
| 18  | C10/11             | Belgium low-voltage power grid          |

| No. | Grid Code            | Description                                        |
|-----|----------------------|----------------------------------------------------|
| 19  | IEC61727             | IEC61727 low-voltage power grid (50 Hz)            |
| 20  | Custom(50Hz)         | Reserved                                           |
| 21  | Custom(60Hz)         | Reserved                                           |
| 22  | CEI0-16              | Italy low-voltage power grid                       |
| 23  | BDEW-MV480           | Germany medium-voltage power grid                  |
| 24  | Custom-MV480(50Hz)   | Reserved                                           |
| 25  | Custom-MV480(60Hz)   | Reserved                                           |
| 26  | G59-England-MV480    | England 480 V medium-voltage power grid (I > 16 A) |
| 27  | IEC61727-MV480       | IEC61727 medium-voltage power grid (50 Hz)         |
| 28  | UTE C 15-712-1-MV480 | France Island medium-voltage power grid            |
| 29  | EN50438-DK-MV480     | Denmark medium-voltage power grid                  |
| 30  | EN50438-TR-MV480     | Turkey medium-voltage power grid                   |
| 31  | EN50438-TR           | Turkey low-voltage power grid                      |
| 32  | C11/C10-MV480        | Belgium medium-voltage power grid                  |
| 33  | IEC61727-60Hz        | IEC61727 low-voltage power grid (60 Hz)            |
| 34  | IEC61727-60Hz-MV480  | IEC61727 medium-voltage power grid (60 Hz)         |
| 35  | ANRE                 | Romania low-voltage power grid                     |
| 36  | ANRE-MV480           | Romania medium-voltage power grid                  |
| 37  | PO12.3-MV480         | Spain medium-voltage power grid                    |
| 38  | EN50438_IE-MV480     | Ireland medium-voltage power grid                  |
| 39  | EN50438_IE           | Ireland low-voltage power grid                     |
| 40  | CEI0-16-MV480        | Italy medium-voltage power grid                    |
| 41  | PO12.3               | Spain low-voltage power grid                       |
| 42  | CEI0-21-MV480        | Italy medium-voltage power grid                    |
| 43  | CLC/TS50549_IE       | Ireland low-voltage power grid                     |
| 44  | CLC/TS50549_IE-MV480 | Ireland medium-voltage power grid                  |
| 45  | Northern Ireland     | Northern Ireland low-voltage power grid            |

| No. | Grid Code              | Description                                |
|-----|------------------------|--------------------------------------------|
| 46  | Northern Ireland-MV480 | Northern Ireland medium-voltage power grid |
| 47  | VDE-AR-N4120_HV        | VDE4120 standard power grid                |
| 48  | VDE-AR-N4120_HV480     | VDE4120 standard power grid (480 V)        |

# B

## Acronyms and Abbreviations

---

### C

**CCO** central controller

### H

**HVRT** high voltage ride-through

### L

**LED** light emitting diode

**LVRT** low voltage ride-through

### M

**MPP** maximum power point

**MPPT** maximum power point tracking

### P

**PID** potential induced degradation

**PLC** power line communication

**PV** photovoltaic

### R

**RCD** residual current device

**W**

**WEEE**

waste electrical and  
electronic equipment