

**SUN2000-(33KTL, 36KTL, 40KTL)-US**

# **User Manual**

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# About This Document

## Purpose

This document describes the SUN2000-33KTL-US/36KTL-US/40KTL-US (SUN2000 for short) in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. Understand the safety information and get familiar with the SUN2000 functions and features before installing and operating the SUN2000.

## Intended Audience

This document is intended for photovoltaic (PV) power plant personnel and qualified 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 serious injury or death.
 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
 <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. NOTICE is used to address practices not related to personal injury.
 <b>NOTE</b>	Calls attention to important information, best practices and tips. 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 (2017-04-01)

This issue is the first official release.

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# 1 Safety Precautions

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## NOTICE

Before performing operations, read through this manual and follow all the precautions to prevent accidents. 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.

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## Declare

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

- Transportation
- The storage conditions do not meet the requirements specified in this document.
- Violate the operation instructions and safety precautions in this document for installation, cable connecting, and maintenance.
- Operation in extreme environments which are not covered in this document
- Unauthorized modifications to the product or software code
- Installation or use in environments which are not specified in related international standards

## Important Safety Instructions

**Save These Instructions:** This manual contains important instructions for the SUN2000-33KTL-US/36KTL-US/40KTL-US that shall be followed during installation and maintenance of the SUN2000.

**Caution:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## Personnel Requirements

Only qualified electrical technicians are allowed to install and operate the SUN2000.

- Operation personnel should receive professional training.

- Operation personnel should read through this document and follow all the precautions.
- Operation personnel should be familiar with the safety specifications about the electrical system.
- Operation personnel should understand the composition and working principles of the grid-tied PV power system and local regulations.

## Sign Protection

- Do not tamper with any warning signs on the SUN2000 chassis because these signs contain important information about safe operation.
- Do not tamper with the nameplate on the SUN2000 chassis because it contains important product information.
- Do not remove the warranty label from the SUN2000 chassis. Otherwise, product warranty will be forfeited.

## Installation

- Ensure that the SUN2000 is not connected to a power supply and is not powered on before starting installation.
- Ensure that there are no objects within 300 mm (11.81 in.), 200 mm (7.87 in.), 500 mm (19.69 in.), 600 mm (23.62 in.), and 1000 mm (39.37 in.) of the left, right, top, bottom, and front of the SUN2000, respectively. This is to allow sufficient space for installation and heat dissipation. For ease of installation, ensure that the SUN2000 bottom is at most 730 mm (28.74 in.) from the ground. If you have any questions about the distance, consult the local technical support engineers.
- Ensure that the SUN2000 is installed in a well ventilated environment.
- Ensure that the SUN2000 heat sinks are free from blockage.
- Open the maintenance compartment door of the chassis before connecting cables. Do not perform any operation on other components inside the chassis except connecting AC power cables and communications cables.

## Cable Connections



### **DANGER**

Before connecting cables, ensure that the SUN2000 is securely positioned 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 power supply department before using the SUN2000 to generate electricity in grid-tied mode.
  - Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

## Operation



## **DANGER**

High voltages may cause electric shocks and serious injuries during SUN2000 operating. Strictly comply with the safety precautions in this document and associated documents when operating the SUN2000.

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- Do not touch an operating SUN2000 because the heat sinks may have a temperature over 60 °C (140 °F) and may cause burns when the SUN2000 is operating.
- Follow local laws and regulations when operating the equipment.

## **Maintenance and Replacement**

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## **DANGER**

High voltages may cause electric shocks and serious injuries during SUN2000 operating. Therefore, before maintenance, power off the SUN2000 and strictly comply with the safety precautions in this document and associated documents to operate the SUN2000.

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- Maintain the SUN2000 with sufficient knowledge of this document and proper tools and testing equipment.
- Before performing maintenance tasks, power off the SUN2000 and wait at least 5 minutes.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
- Rectify any faults that may compromise the SUN2000 security performance before powering on the SUN2000 again.
- Observe ESD precautions during the maintenance.
- For personal safety, wear insulation gloves and protective shoes.

# 2 Overview

## 2.1 Product Overview

### 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 into the power grid.

### Model

Figure 2-1 describes the model number of the SUN2000-33KTL-US.

Figure 2-1 Model number description



IS01PC0004

Table 2-1 describes the rated output power and voltage of all models of SUN2000s.

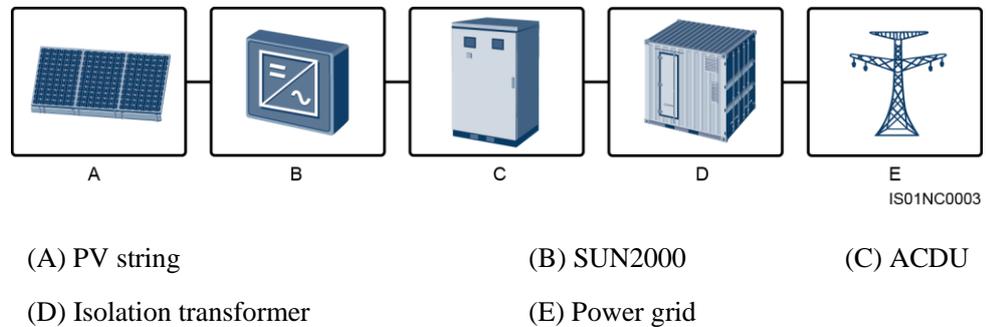
Table 2-1 SUN2000 models and corresponding rated output power and voltage

Model	Rated Output Power	Rated Output Voltage
SUN2000-33KTL-US	33.3 kW	480 V
SUN2000-36KTL-US	36 kW	480 V
SUN2000-40KTL-US	40 kW	480 V

## Network Application

The SUN2000 applies to grid-tied PV power systems for commercial rooftops and large power stations. Typically, a grid-tied PV power system consists of PV strings, grid-tied inverters, AC power distribution units, and isolation transformers.

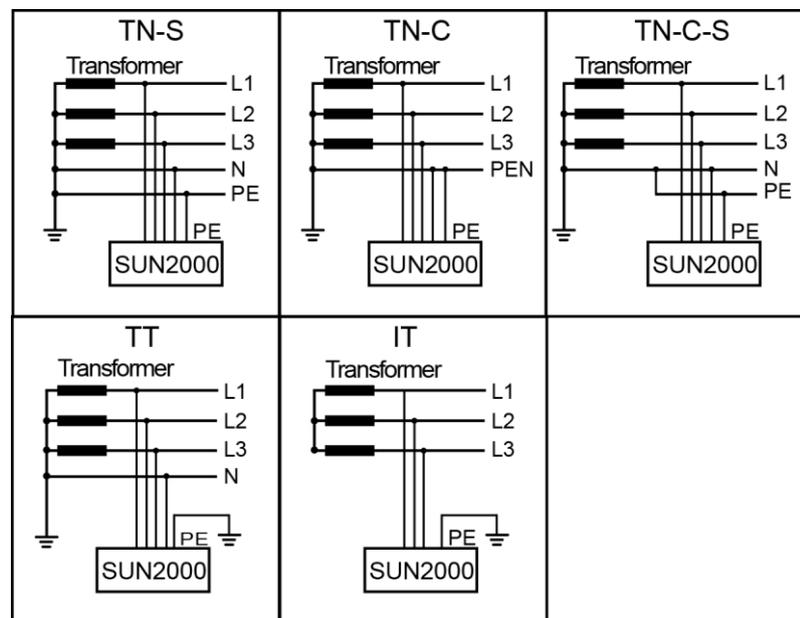
**Figure 2-2** Network application



## Power Grid Types

Power grid types supported by the SUN2000 include TN-S, TN-C, TN-C-S, TT, and IT.

**Figure 2-3** Power grid types

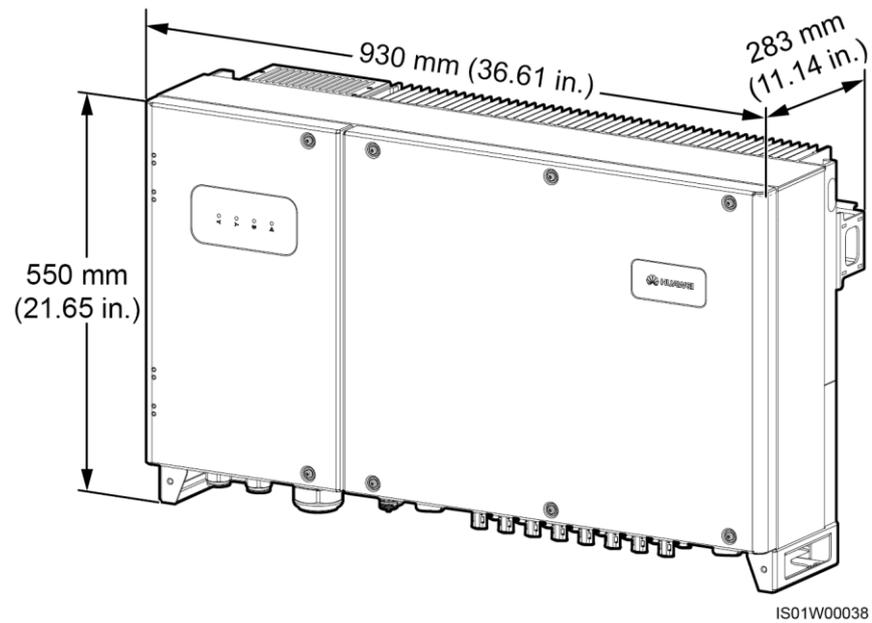


## 2.2 Appearance

### SUN2000 Dimensions

Figure 2-4 shows the SUN2000 dimensions.

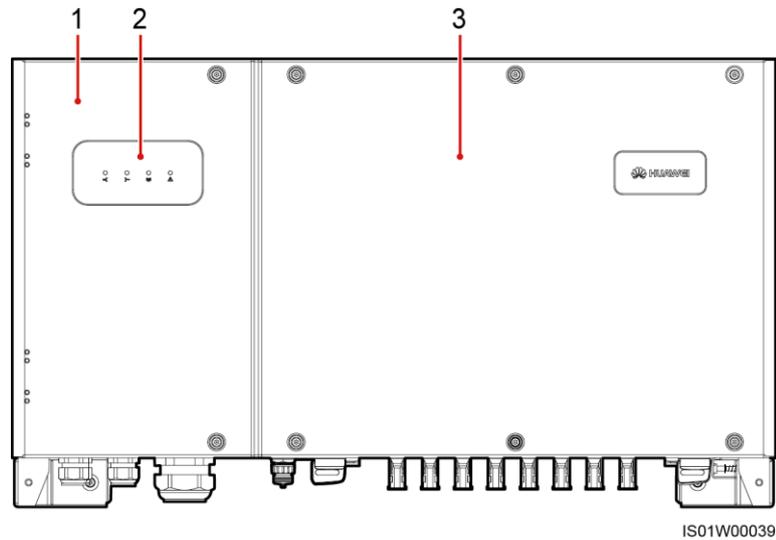
Figure 2-4 SUN2000 dimensions (including the mounting plate)



### Front View

Figure 2-5 shows the SUN2000 front view.

**Figure 2-5** SUN2000 front view



- (1) Maintenance compartment door      (2) LED indicator      (3) Host panel

Table 2-2 describes the LED indicators.

**Table 2-2** LED indicator description (from left to right)

Indicator	Status	Meaning
PV connection indicator 	Green on	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.
	Green off	The SUN2000 disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 200 V.
Grid-tied indicator 	Green on	The SUN2000 connects to the power grid.
	Green off	The SUN2000 does not connect to the power grid.
Communications indicator 	Blinking green at short intervals (on for 0.5s and then off for 0.5s)	The SUN2000 receives data over RS485/PLC communication.
	Green off	The SUN2000 has not received data over RS485/PLC communication for 10 seconds.

Indicator	Status		Meaning
Alarm/Maintenance indicator 	Alarm status	Blinking red at long intervals (on for 1s and then off for 4s)	A warning alarm is generated.
		Blinking red at short intervals (on for 0.5s and then off for 0.5s)	A minor alarm is generated.
		Steady red	A critical alarm is generated.
	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 succeeds.

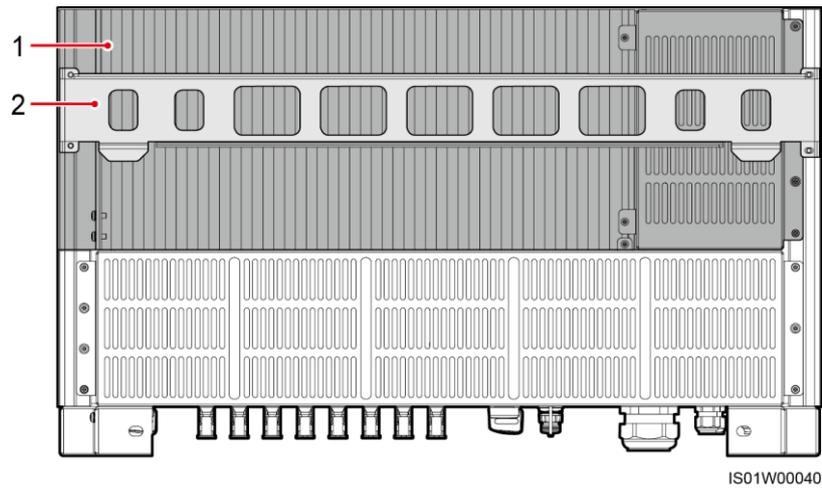
 **NOTE**

- Local maintenance refers to operations performed after a universal serial bus (USB) flash drive, Bluetooth module, or USB data cable is inserted into the USB port of the SUN2000. For example, local maintenance includes data import and export using a USB flash drive and connecting to the SUN2000 APP over a Bluetooth module or USB data cable.
- If alarming and local maintenance happen concurrently, the alarm/maintenance indicator shows the local maintenance state first. After the USB flash drive, Bluetooth module, or USB data cable is removed, the indicator shows the alarm state.

## SUN2000 Rear View

Figure 2-6 shows the SUN2000 rear view.

**Figure 2-6** SUN2000 rear view



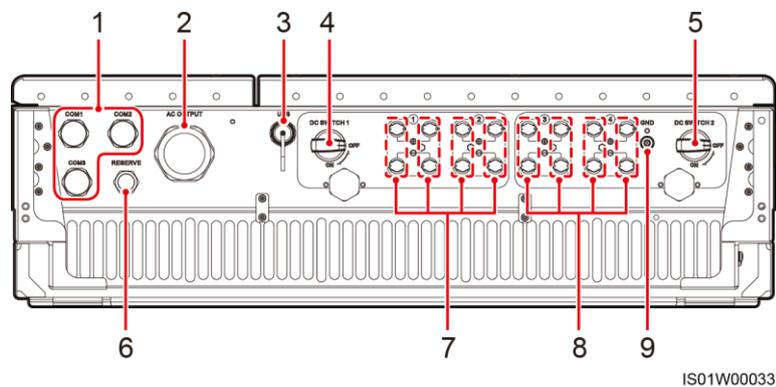
(1) Heat sink

(2) Mounting plate

## SUN2000 bottom view

Figure 2-7 shows the SUN2000 bottom view.

**Figure 2-7** SUN2000 bottom view



No.	Component	Description	Silk Screen
1	3/4-inch waterproof cable connector	Inner diameter: 14–18 mm (0.55–0.71 in.)	COM1, COM2, COM3
2	2-inch waterproof cable connector	Inner diameter: 37–44 mm (1.46–1.73 in.)	AC OUTPUT
3	USB port	N/A	USB
4	DC switch 1	N/A	DC SWITCH 1
5	DC switch 2	N/A	DC SWITCH 2

No.	Component	Description	Silk Screen
6	1/2-inch waterproof cable connector	Inner diameter: 6–12 mm (0.24–0.47 in.)	RESERVE
7	DC input terminal	Controlled by DC SWITCH 1	+/-
8	DC input terminal	Controlled by DC SWITCH 2	+/-
9	PV side ground point	N/A	GND



**NOTE**

Waterproof cable connector is abbreviated as waterproof connector in the following text.

## 2.3 Label Description

### Warning Signs

Warning signs are available on the SUN2000 side, as described in [Table 2-3](#).

**Table 2-3** Warning signs

Symbol	Name	Meaning
	Electric shock	<ul style="list-style-type: none"> <li>Lethal voltages 1000 V DC. Keep out.</li> <li>No user serviceable parts inside. Only trained service personnel are allowed access.</li> <li>Both AC and DC voltage sources are terminated inside this equipment. Each circuit must be disconnected before servicing.</li> <li>When the photovoltaic array is exposed to light, it supplies DC voltage to this equipment.</li> <li>The DC conductors of this photovoltaic system are ungrounded and may be energized.</li> <li>The DC conductors of this photovoltaic system are normally ungrounded but will become intermittently grounded without indication when the SUN2000 measures the PV array isolation.</li> </ul>
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.

Symbol	Name	Meaning
	Delay discharge	<ul style="list-style-type: none"> <li>High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000.</li> <li>Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.</li> </ul>
	Transformerless inverter	The SUN2000 output does not pass through an isolation transformer.

## Symbols

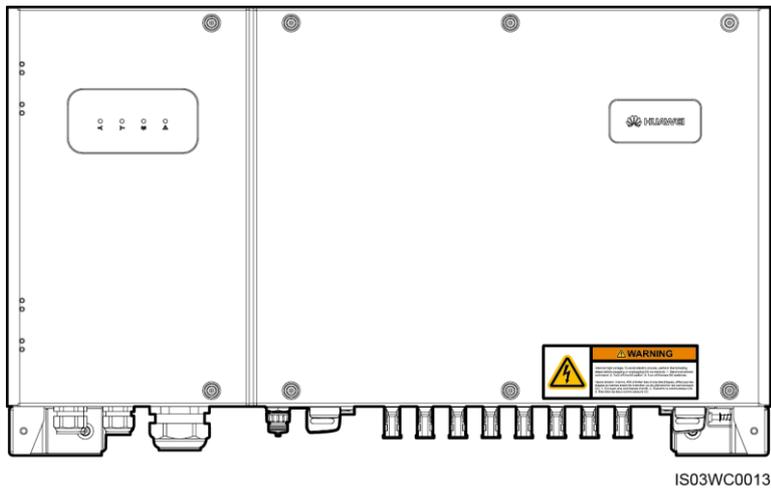
Table 2-4 describes the labels on the SUN2000 chassis and their meanings.

Table 2-4 Label description

Symbol	Name	Meaning
	PE point	Indicates the position for connecting the PE cable.
 Do not disconnect under load! Ne pas débrancher en cours de chargement!	Operation warning	Do not remove the DC input connector when the SUN2000 is running.
	DC terminal operation warning <sup>a</sup>	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: <ol style="list-style-type: none"> <li>Send a shutdown command.</li> <li>Turn off the downstream AC switch.</li> <li>Turn off the two DC switches at the bottom.</li> </ol>
	Warranty label	Never open the host panel of the SUN2000.

Symbol	Name	Meaning
	SUN2000 serial number label	Indicates the SUN2000 serial number.
	Weight label	The SUN2000 is heavy and needs to be carried by multiple persons.
<p>Note a: Fittings delivered with the SUN2000 contain the label of DC terminal operation warning. You are advised to attach the label at the bottom of the SUN2000 front side, as shown in <a href="#">Figure 2-8</a>. You can also select an appropriate place for attaching the label based on site requirements.</p>		

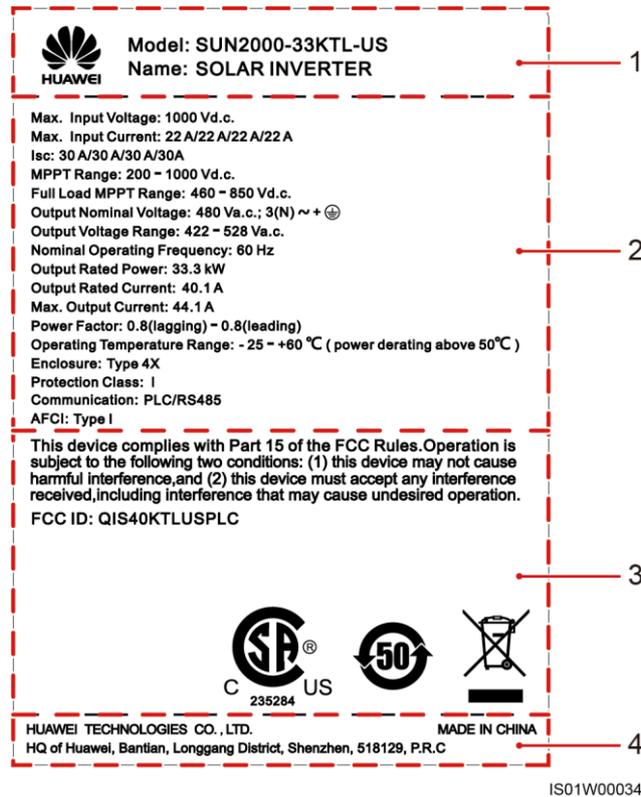
**Figure 2-8** Place for attaching



## Nameplate

On the side of the SUN2000, there is a nameplate that contains the model information, technical specifications, and compliance symbols, as shown in [Figure 2-9](#).

**Figure 2-9** Nameplate of the SUN2000-33KTL-US



- (1) Trademark and product model
- (2) Important technical specifications
- (3) Compliance symbols
- (4) Company name and country of manufacture

**NOTE**

The nameplate figure is for reference only. The actual nameplate prevails.

Table 2-5 describes the compliance symbols.

**Table 2-5** Compliance symbols

Symbol	Name	Meaning
This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions: (1) this device may not cause harmful interference,and (2) this device must accept any interference received,including interference that may cause undesired operation.	American FCC Part 15B certification	The SUN2000 complies with FCC Part 15B certification standards.
FCC ID: QIS40KTLUSPLC	American FCC Part 15G certification	The SUN2000 complies with FCC Part 15G certification standards.
	CSA certification of America and Canada	The SUN2000 complies with CSA certification standards.
	EFUP label	The SUN2000 does not pollute the environment

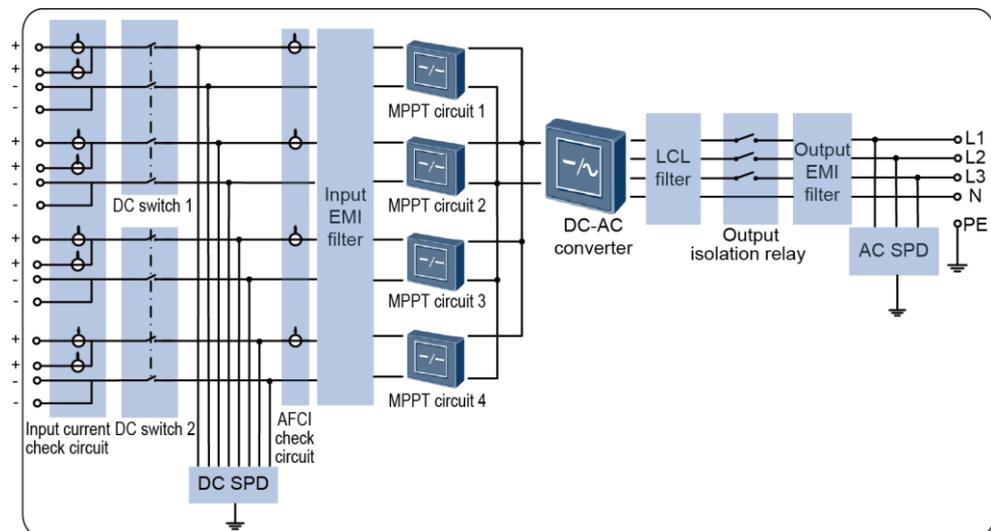
Symbol	Name	Meaning
		during the specified period.
	WEEE label	Do not dispose of the SUN2000 as household garbage.

## 2.4 Working Principle

### Conceptual Diagram

The SUN2000 receives inputs from eight PV strings. Then the inputs are grouped into four 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 2-10](#) shows the SUN2000 conceptual diagram.

**Figure 2-10** SUN2000 conceptual diagram



IS03P20001

### Working Modes

The SUN2000 can work in standby, operating, or shutdown mode. [Figure 2-11](#) shows the relationship between the three working modes.

**Figure 2-11** SUN2000 working modes

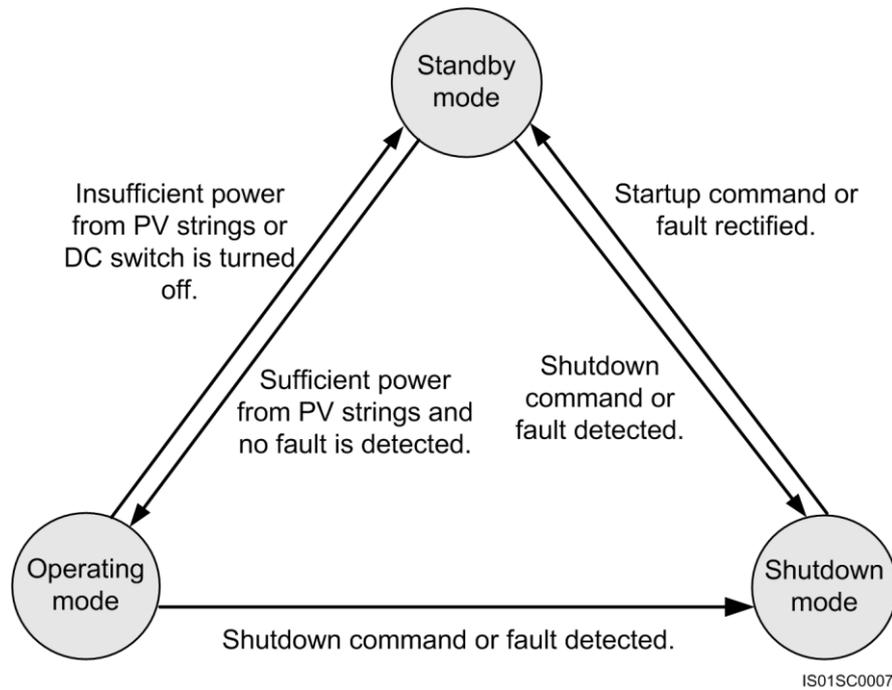


Table 2-6 describes the three working modes shown in Figure 2-11.

**Table 2-6** Working mode description

Working Mode	Description
Standby	<p>The SUN2000 enters the 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 the operating mode once the operating requirements are met.</li> <li>If the SUN2000 enters the 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 the shutdown mode after detecting a fault or a shutdown command, and enters the standby mode after detecting that the PV string output power does not meet the requirements for grid-tied electricity generation.</li> </ul>
Shutdown	<ul style="list-style-type: none"> <li>In standby or operating mode, the SUN2000 enters the shutdown mode after detecting a fault or shutdown command.</li> <li>In shutdown mode, the SUN2000 enters the standby mode after detecting a startup command or that a fault is rectified.</li> </ul>

# 3 SUN2000 Storage

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The following requirements should be met if the SUN2000 is not put into use directly:

- Do not unpack the SUN2000.
- Keep the storage temperature at  $-40\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+158\text{ }^{\circ}\text{F}$ ) and the humidity at 5%–100% RH.
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of five SUN2000s can be stacked.
- Periodic inspections are required during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

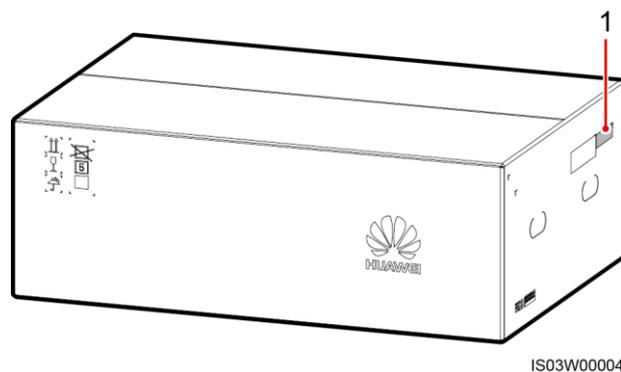
# 4 System Installation

## 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.

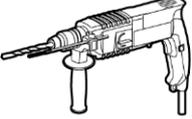
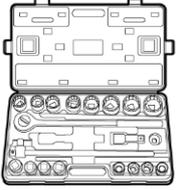
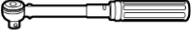
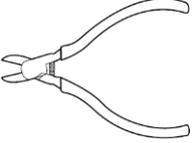
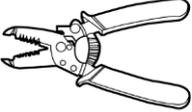
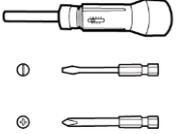


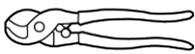
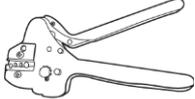
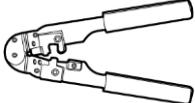
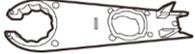
**NOTE**

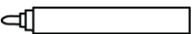
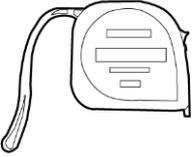
For details about the number of contents, see the *Packing List* in the packing case.

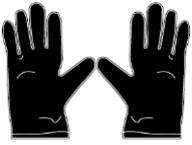
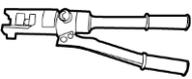
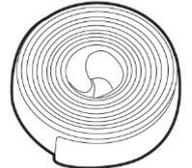
## 4.2 Tools

Prepare tools required for installation and cable connections.

Tool	Model	Function
 <p>Hammer drill</p>	<p>Drill bit: <math>\Phi 14</math> mm (0.54 in.) and <math>\Phi 16</math> mm (0.63 in.)</p>	<ul style="list-style-type: none"> <li><math>\Phi 14</math> mm (0.54 in.) drill bit: Drills holes in supports.</li> <li><math>\Phi 16</math> mm (0.63 in.) drill bit: Drills holes in walls.</li> </ul>
 <p>Socket wrench set</p>	<p>Works with a torque wrench.</p>	<p>Secures bolts and AC output terminals.</p>
 <p>Torque wrench</p>	<p>N/A</p>	<p>Secures bolts and AC output terminals.</p>
 <p>Diagonal pliers</p>	<p>N/A</p>	<p>Cut cable ties.</p>
 <p>Wire stripper</p>	<p>N/A</p>	<p>Peels cable jackets.</p>
 <p>Torque screwdriver</p>	<ul style="list-style-type: none"> <li>Flat head: M3</li> <li>Phillips head: M4</li> </ul>	<ul style="list-style-type: none"> <li>Connects cables to the terminal block.</li> <li>Secure the AC filter.</li> </ul>

Tool	Model	Function
Rubber mallet 	N/A	Hammers expansion bolts into holes.
Utility knife 	N/A	Removes packages.
Cable cutter 	N/A	Cuts power cables.
Crimping tool 	H4TC0001 Manufacturer: AMPHENOL	Crimps metal terminals when preparing DC input power cables.
RJ45 crimping tool 	N/A	Prepares RJ45 connectors for communications cables.
Removal tool 	H4TW0001 Manufacturer: AMPHENOL	Removes DC connectors from the SUN2000.

Tool	Model	Function
Vacuum cleaner 	N/A	Cleans up dust after drilling holes.
Multimeter 	DC voltage measurement range $\geq 1000$ V DC	Measures voltages.
Marker 	N/A	Marks signs.
Measuring tape 	N/A	Measures distances.
Level 	N/A	Levels hole positions.
Protective gloves 	N/A	Protect your hands during installation.

Tool	Model	Function
Insulation gloves 	Operating voltage $\geq 2000$ V	Protect you from electric shocks.
Safety goggles 	N/A	Protect your eyes during hole drilling.
Anti-dust respirator 	N/A	Protects you from dust during hole drilling.
Hydraulic pliers 	N/A	Crimp OT terminals.
Heat shrink tubing 	N/A	Wraps the cable crimping area of an OT terminal.
Heat gun 	N/A	Heat-shrinks a tube.

Tool	Model	Function
Cable tie 	N/A	Binds cables.



### NOTICE

Install devices in accordance with the installation laws and regulations of the country or region where the project is located.

## 4.3 Determining the Installation Position

### Basic Requirements

- The SUN2000 is protected to Type 4X and can be installed indoors or outdoors.
- Do not install the SUN2000 in a place where personnel are easy to come into contact with its chassis and heat sinks, because these parts are extremely hot during operation.
- Do not store the SUN2000 in areas with flammable or explosive materials.

### Installation Environment Requirements

The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation. When installed under direct sunlight, performance de-rate may be initiated due to additional temperature rise.

### Carrier Requirements

- The carrier where the SUN2000 is installed must be fireproof.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 weighs 55 kg (121.25 lb). Ensure that installation surface is solid enough to bear the SUN2000.
- In residential areas, do not install the SUN2000 on gypsum boards or walls made of similar materials which have a weak sound insulation performance because the noises generated by the SUN2000 disturb residents.

### Installation Angle Requirements

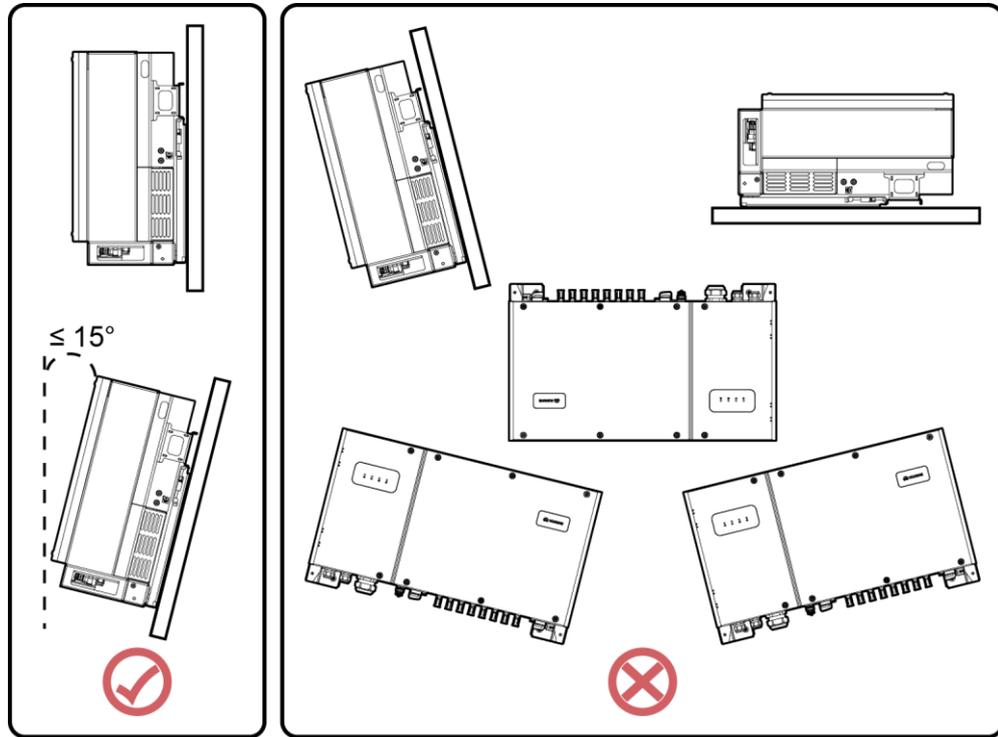
The SUN2000 can be installed on a wall, normal support, and tilted support.

Tilt requirements for installing a SUN2000 on a wall and normal support:

- Install the SUN2000 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.

- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

**Figure 4-2** Wall-mounted installation and normal support-mounted installation

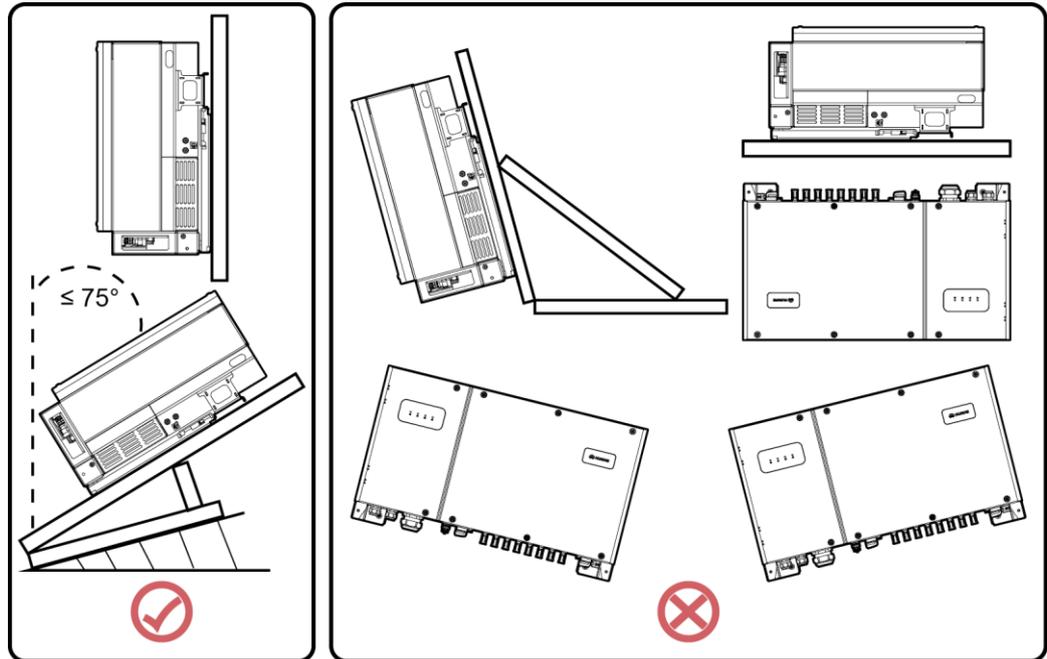


IS01W00036

Tilt requirements for installing a SUN2000 on a tilted support:

- Install the SUN2000 vertically or at a maximum back tilt of 75 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

**Figure 4-3** Tilted support-mounted installation



IS01W00037

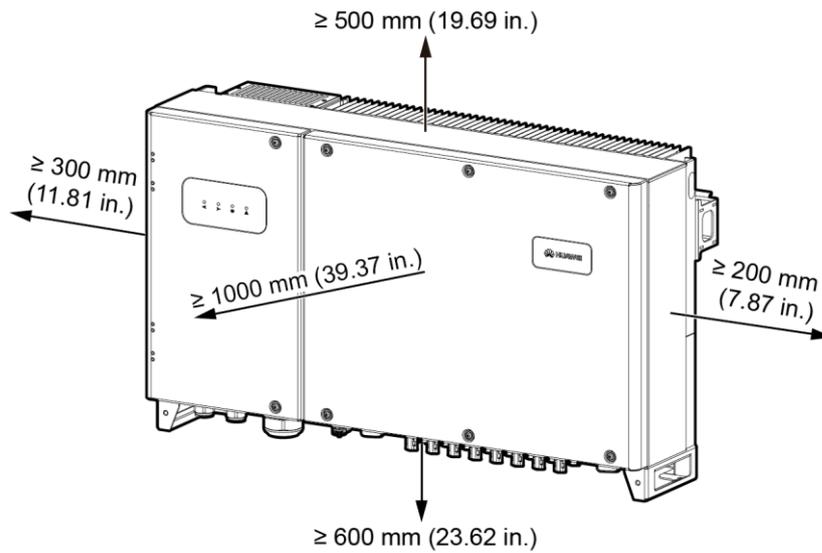
 **NOTE**

The SUN2000 may operate with power derating if installed with a tilt.

## Installation Space Requirements

- The SUN2000 dimensions (W x H x D, including the mounting plate) are 930 mm x 550 mm x 283 mm (36.61 in. x 21.65 in. x 11.14 in.). Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation, as shown in [Figure 4-4](#).

**Figure 4-4** Installation space requirements



IS01W00035

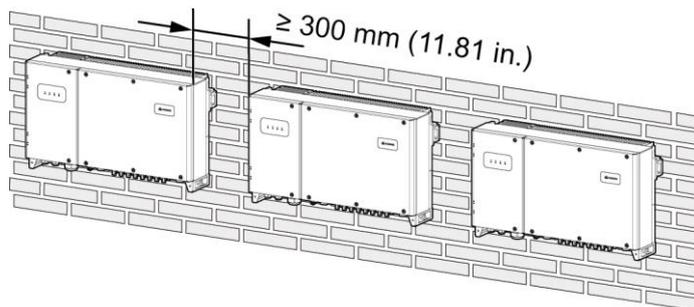


**NOTE**

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 between 600 mm (23.62 in.) and 730 mm (28.74 in.). If you have any questions about the distance, consult the local technical support engineers.

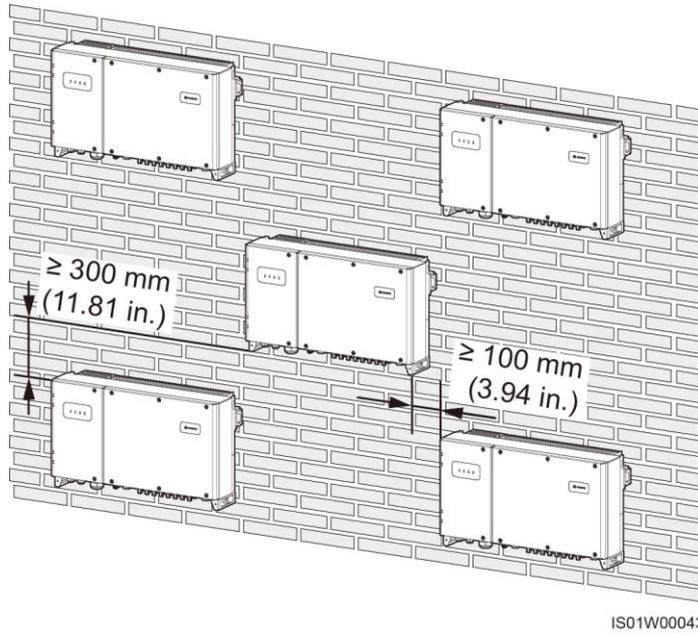
- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended. The following figures show the wall-mounted installation modes and provide reference for other installation modes.

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

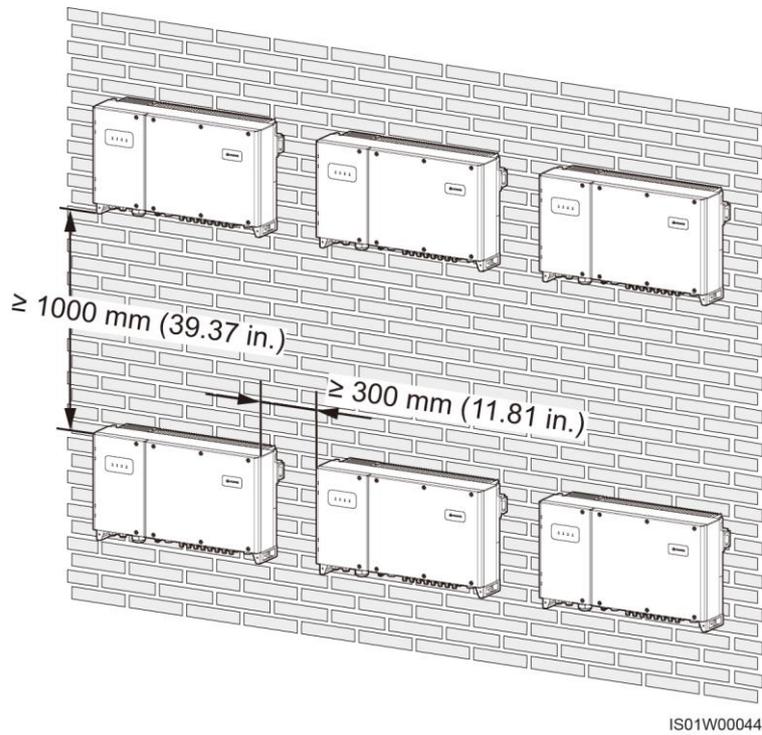


IS01W00045

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



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



## 4.4 Moving the Inverter

### Context



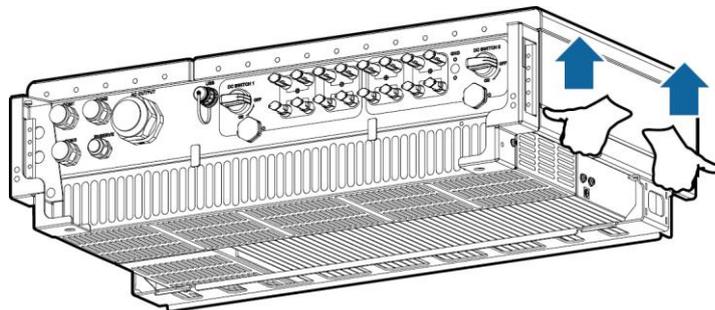
#### CAUTION

- To prevent device damage and personal injury, keep balance when moving the SUN2000 because the SUN2000 is heavy.
- Do not place the SUN2000 with its wiring terminals at the bottom contacting the floor or any other object because the terminals are not designed to support the weight of the SUN2000.
- When placing the SUN2000 on the floor, put foam or paper under the SUN2000 to protect its cover.

### Procedure

- Step 1** Arrange two persons to hold the handles on both sides of the SUN2000.

**Figure 4-8** Moving the SUN2000



IS01H00058

- Step 2** Lift the SUN2000 from the packing case and move it to the installation position.

----End

## 4.5 Installing the Mounting Plate

Figure 4-9 shows the SUN2000 mounting plate dimensions. Figure 4-10 shows the position for saving the security torx wrench.



## NOTICE

- The mounting plate 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 plate, remove the security torx wrench from the mounting plate and set it aside.

Figure 4-9 Mounting plate dimensions

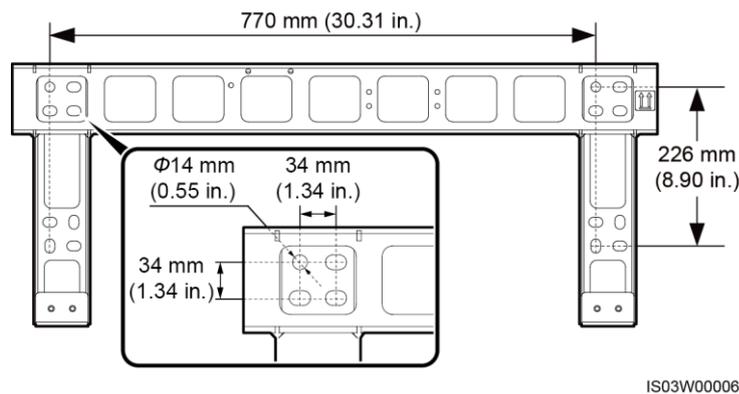
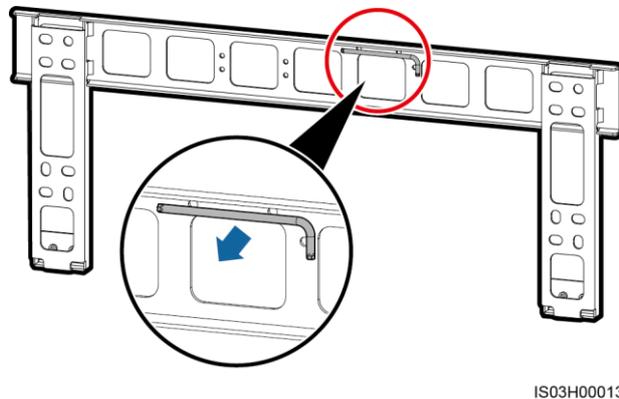


Figure 4-10 Position for saving a security torx wrench

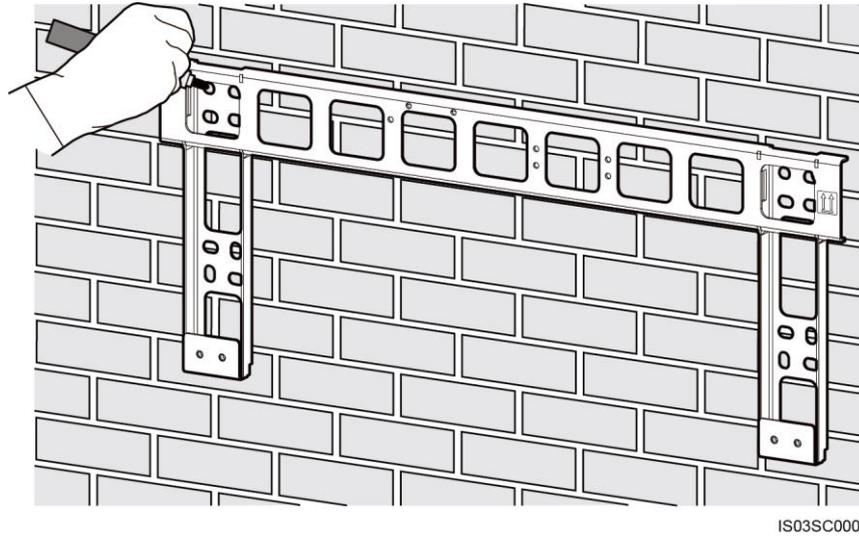


## 4.5.1 Wall-mounted Installation

### Procedure

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the hole positions using a level, and mark the hole positions using a marker.

**Figure 4-11** Determining hole positions



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

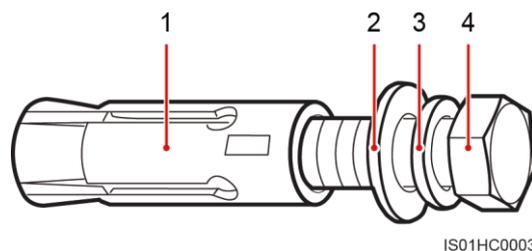


**DANGER**

Avoid drilling holes in the water pipes and power cables buried in the wall.

An expansion bolt contains four parts, as shown in [Figure 4-12](#).

**Figure 4-12** Expansion bolt components



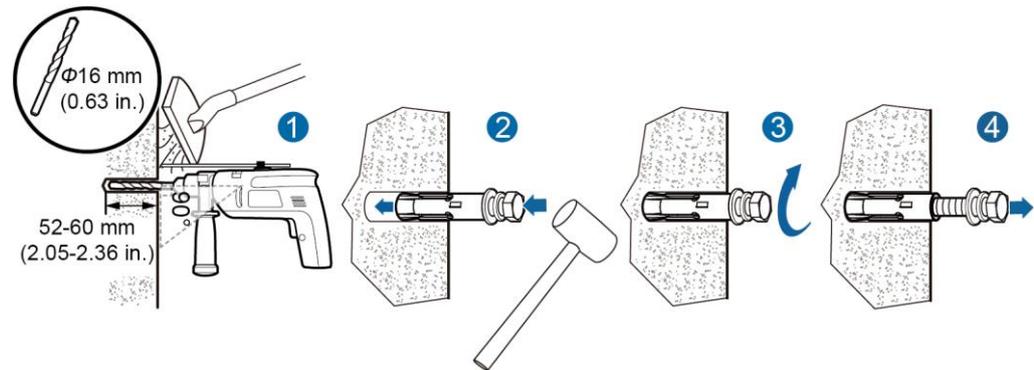
(1) Expansion sleeve

(2) Flat washer

(3) Spring washer

(4) Bolt

**Figure 4-13** Drilling a hole and installing an expansion bolt



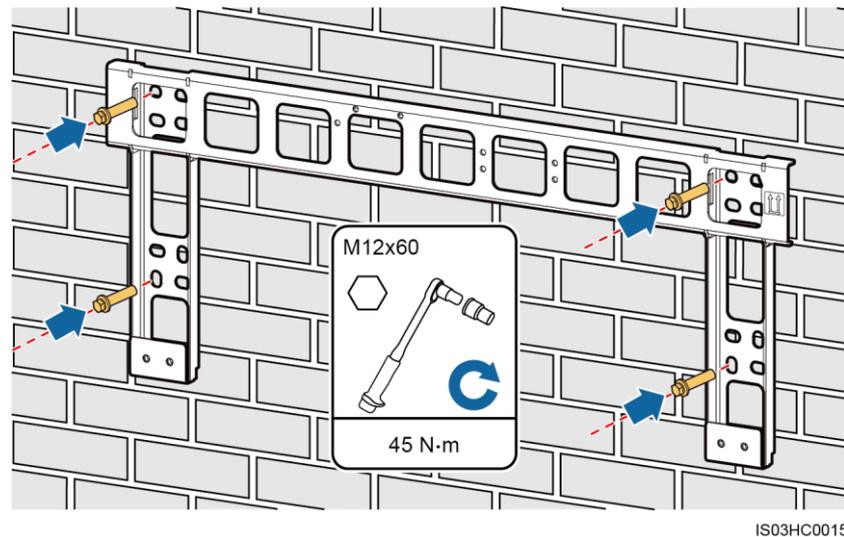
### NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Wipe away any dust in or around the holes and measure the hole distance. If the holes are inaccurately positioned, drill holes again.
- 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.

1. Drill a hole at a marked hole position in the wall using a hammer drill.
2. Slightly tighten an expansion bolt, vertically insert an expansion bolt into a hole, and knock the expansion bolt completely into the hole by using a rubber mallet.
3. Partially tighten the expansion bolt.
4. Remove the nut, spring washer, and flat washer.

**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 4-14** Securing a mounting bracket



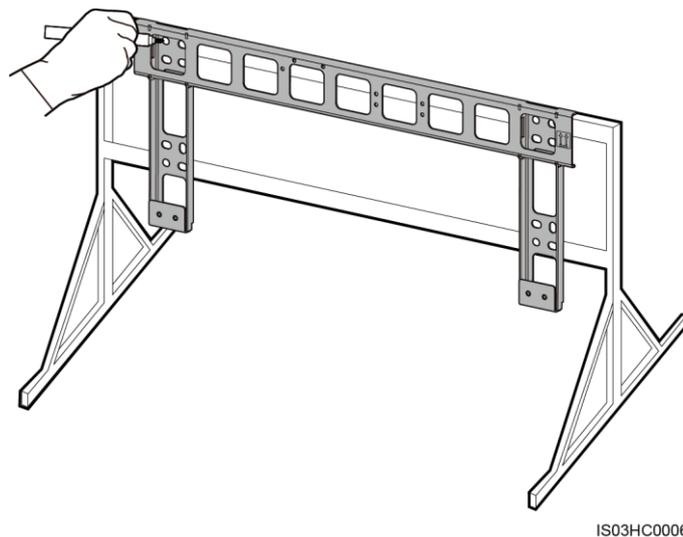
----End

## 4.5.2 Common Support-mounted Installation

### Procedure

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the hole positions using a level, and mark the hole positions using a marker.

**Figure 4-15** Determining hole positions

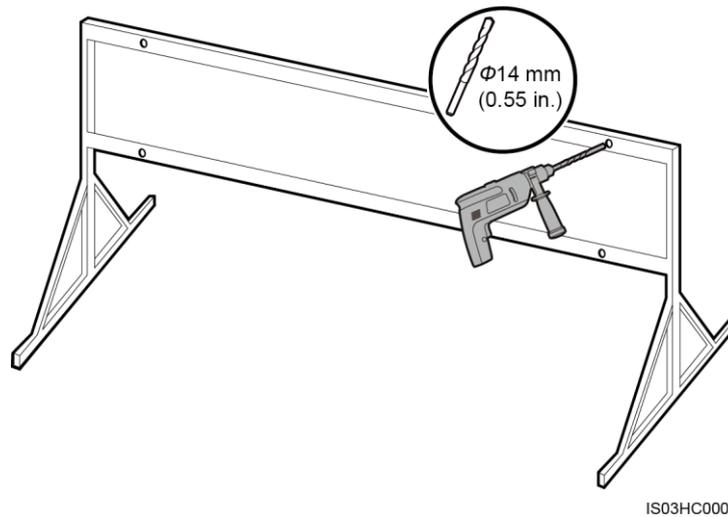


- Step 2** Drill holes using a hammer drill.

 **NOTE**

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

**Figure 4-16** Drilling holes

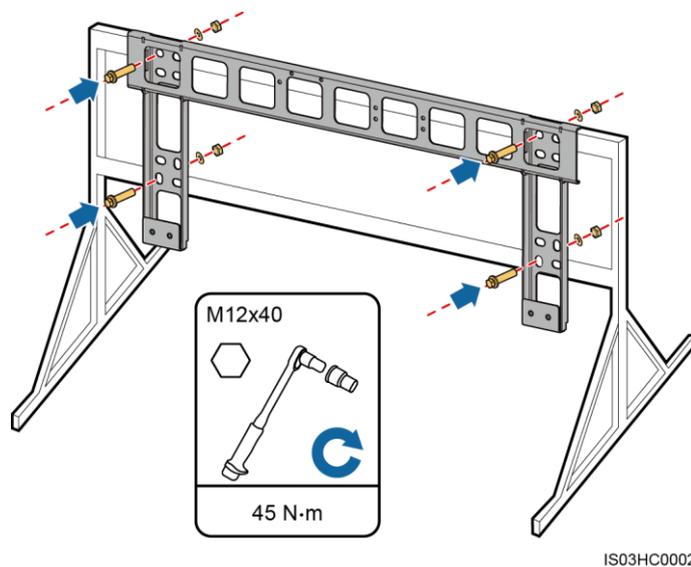


**Step 3** Align the mounting bracket holes with the drilled holes, insert the delivered bolt assemblies (flat washers, spring washers, and bolts) into the holes through the mounting bracket, and secure them using the stainless steel nuts and flat washers.

 **NOTE**

If the screw length does not meet the installation requirements, prepare M12 bolt assemblies by yourself.

**Figure 4-17** Securing a mounting bracket



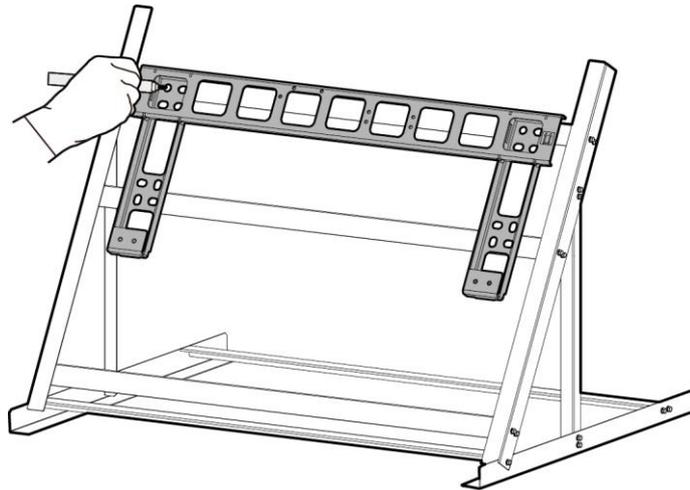
**----End**

## 4.5.3 Tilted Support-mounted Installation

### Procedure

- Step 1** Determine the positions for drilling holes using the mounting bracket. Level the hole positions using a level, and mark the hole positions using a marker.

**Figure 4-18** Determining hole positions



IS01H00063

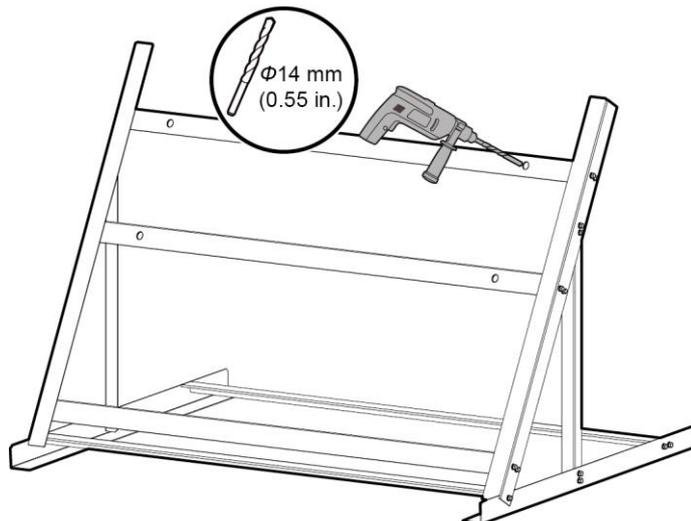
- Step 2** Drill holes using a hammer drill.



**NOTE**

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

**Figure 4-19** Drilling holes



IS01H00070

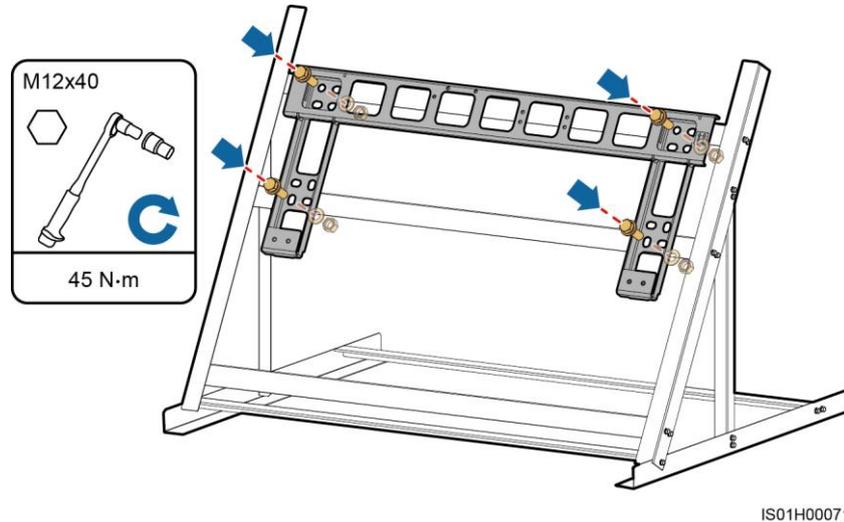
- Step 3** Align the mounting bracket holes with the drilled holes, insert the delivered bolt assemblies (flat washers, spring washers, and bolts) into the holes through the mounting bracket, and secure them using the stainless steel nuts and flat washers.



**NOTE**

If the screw length does not meet the installation requirements, prepare M12 bolt assemblies by yourself.

**Figure 4-20** Securing a mounting bracket



----End

## 4.6 Installing the SUN2000

### Procedure

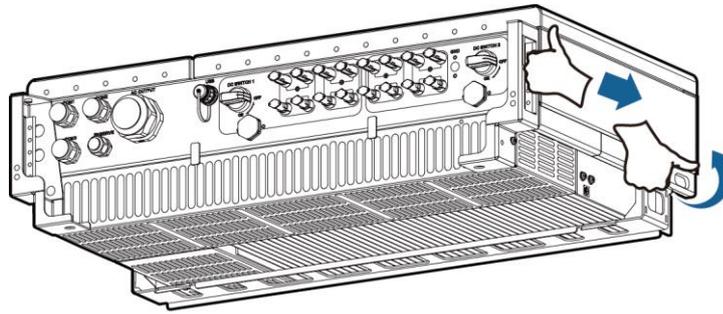
- Step 1** If the installation position is low and you can mount the SUN2000 onto the mounting bracket, go to [Step 3](#) and then [Step 5](#).
- Step 2** If the installation position is high and you cannot mount the SUN2000 onto the mounting bracket, perform [Step 3](#) to [Step 6](#).
- Step 3** Ensure that two people lift the SUN2000 and turn it upright. Lift the SUN2000 by grasping the handle at the bottom of the SUN2000 with one hand and the handle at the top with the other.



### CAUTION

To prevent personal injury caused by a falling SUN2000, keep balance when lifting the SUN2000 because it is heavy.

**Figure 4-21** Lifting a SUN2000



IS01H00059

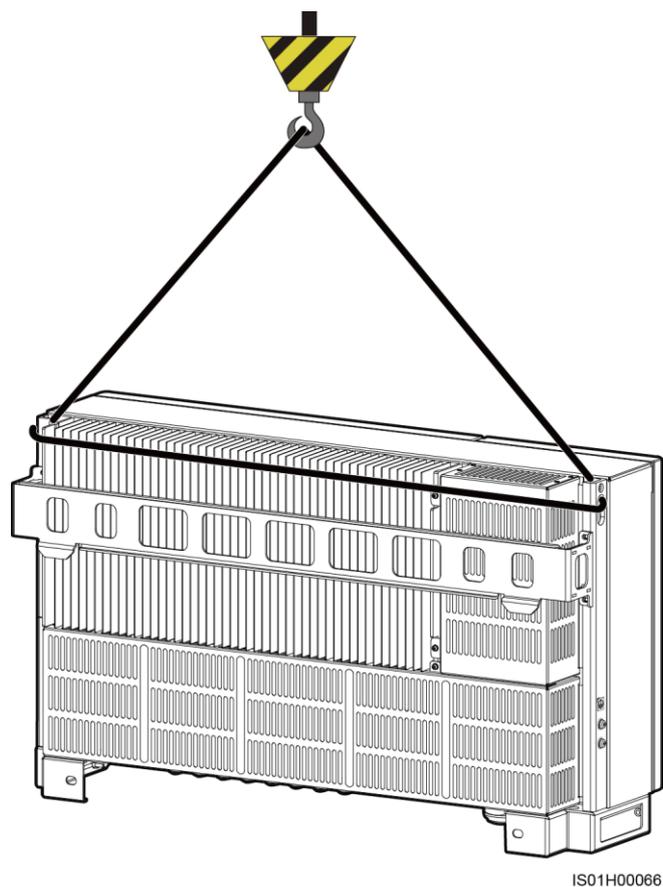
- Step 4** Run a rope that is strong enough to bear the SUN2000 through the lifting eyes and hoist the SUN2000.



**NOTICE**

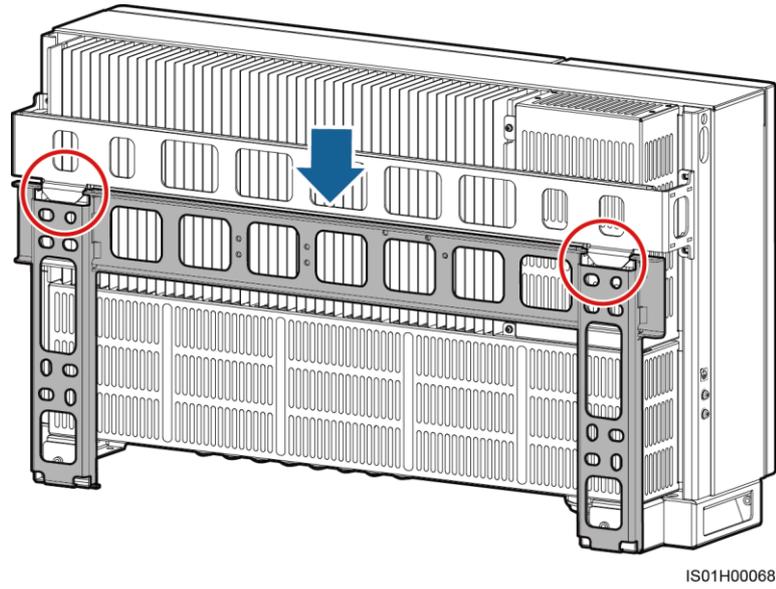
When hoisting the SUN2000, keep balance to protect the SUN2000 from colliding with the wall or other objects.

**Figure 4-22** Hoisting a SUN2000



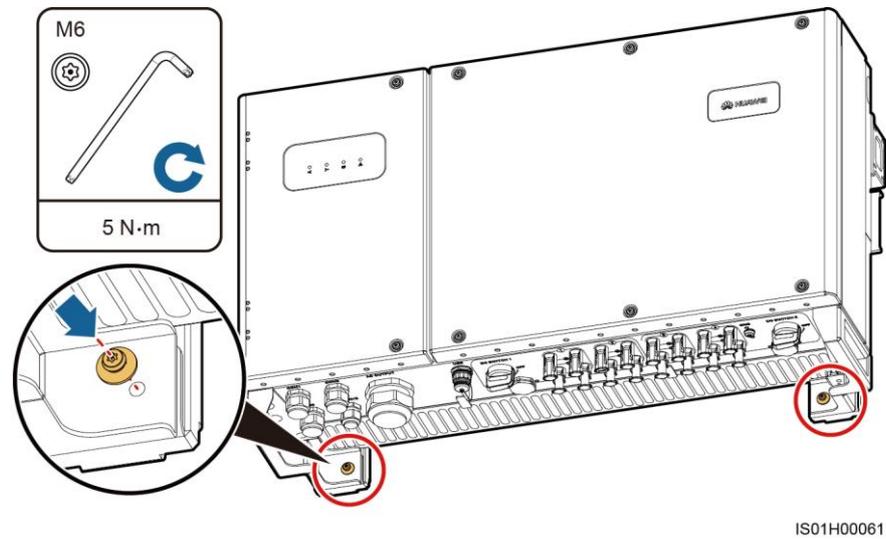
**Step 5** Install the SUN2000 on the mounting bracket and level the SUN2000 chassis with the mounting bracket.

**Figure 4-23** Mounting the SUN2000 onto the mounting bracket



**Step 6** Tighten the two security torx screws using a security torx wrench to a torque of 5 N·m.

**Figure 4-24** Tightening security torx screws



----End

---

# 5 Connecting Cables

---

## Precautions



### DANGER

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



### NOTE

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

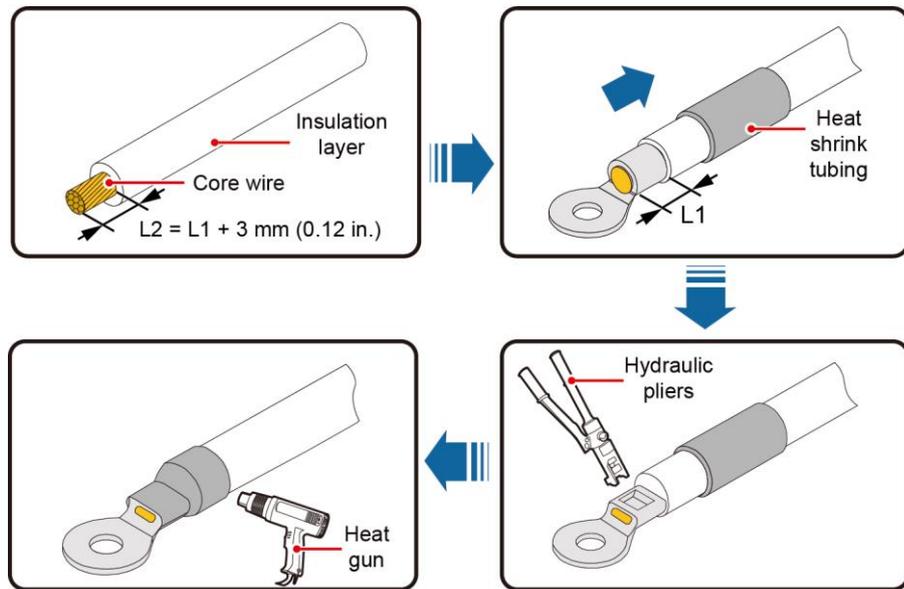
## 5.1 Preparing OT Terminals

[Figure 5-1](#) shows how to prepare an OT terminal.

 **NOTICE**

- Avoid scratching 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 Preparing an OT terminal



IS01Z00016

## 5.2 Connecting the Ground Cable



## NOTICE

- Proper grounding is helpful for resisting the impact of surge voltage and improving the electromagnetic interference (EMI) performance. Before connecting the AC power cable, DC power cable, and communications cable, connect ground cables to the PE point and PV side ground point.
- It is recommended that the ground cable be connected to a nearby ground point. Connect the ground points of all SUN2000s in the same PV array to ensure equipotential connections to ground cables.

## 5.2.1 Grounding the SUN2000 over a PE Point

### Prerequisites

Both the shell and maintenance compartment of the SUN2000 provide a PE point. Select either for connecting the ground cable.

- If you connect a ground cable to the PE point on the shell, ensure that the ground cable and OT terminal are available.
  - Recommended ground cable: an outdoor copper-core cable with a cross-sectional area of 6 AWG or more
  - OT terminal: M6
- If you connect a ground cable to the PE point in the maintenance compartment, prepare the AC output power cable together with the ground cable. For details, see [5.4 Connecting AC Output Power Cables](#).

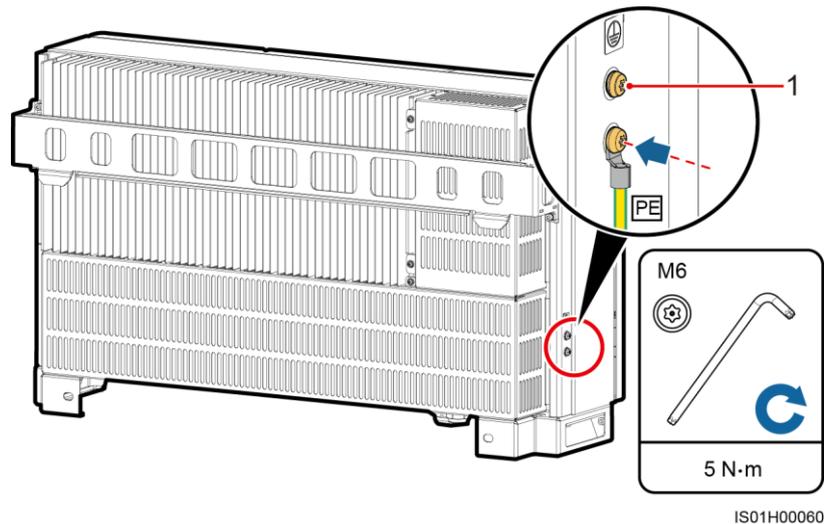
### Context

There are two PE points on the chassis shell and one of them is standby.

### Procedure

- Step 1** Prepare the OT terminal.
- Step 2** Secure the ground cable using the ground screw.

**Figure 5-2** Connecting a ground cable



(1) Reserved PE point

----End

## Follow-up Procedure

To enhance the corrosion resistance of the ground terminal, apply silica gel or paint on the ground terminal after connecting the ground cable.

## 5.2.2 PV Side Grounding

### Prerequisites

A ground cable and an OT terminal are available.

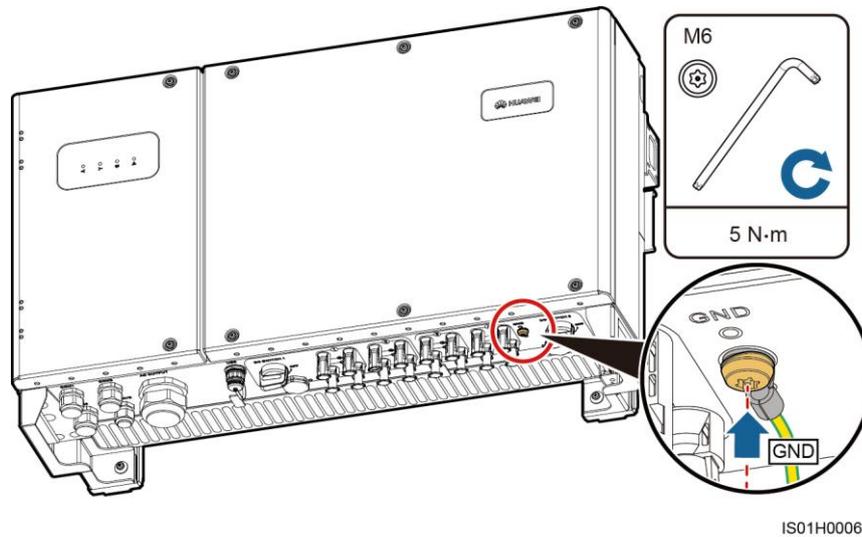
- Recommended ground cable: an outdoor copper-core cable with a cross-sectional area of 6 AWG or more
- OT terminal: M6

### Procedure

**Step 1** Prepare the OT terminal.

**Step 2** Secure the ground cable using the ground screw.

**Figure 5-3** Connecting a ground cable



----End

## Follow-up Procedure

To enhance the corrosion resistance of the ground terminal, apply silica gel or paint on the ground terminal after connecting the ground cable.

## 5.3 Opening the Maintenance Compartment Door

### Prerequisites



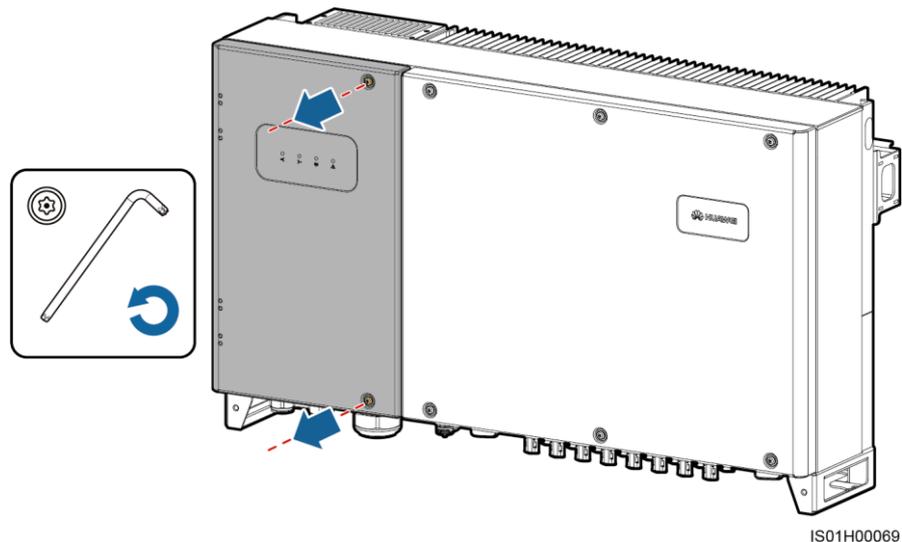
## CAUTION

- Never open the host panel of the SUN2000.
- Before opening the maintenance compartment door, disconnect the AC and DC power supplies. For processes of disconnecting the power supplies, see [6.3 Powering Off the SUN2000](#). After powering off the SUN2000, wait at least 5 minutes before performing operations on it.
- If you need to open the maintenance compartment door in 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 in rainy or snowy days.
- Do not leave unused screws in the maintenance compartment.

## Procedure

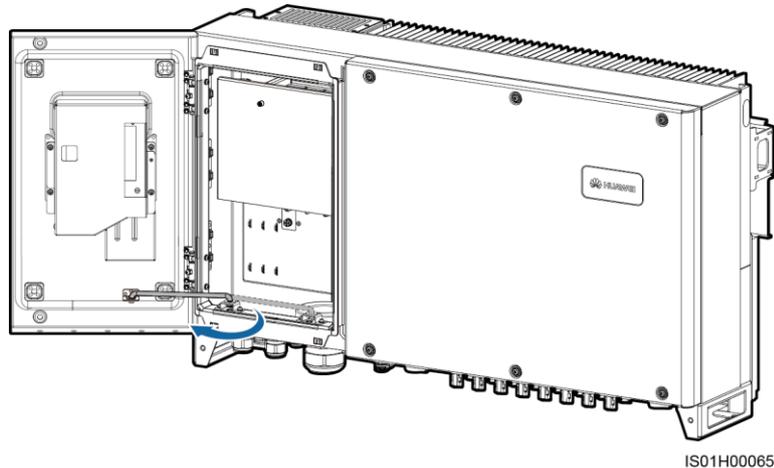
- Step 1** Remove the two screws from the maintenance compartment door using a security torx wrench and set them aside.

**Figure 5-4** Removing screws



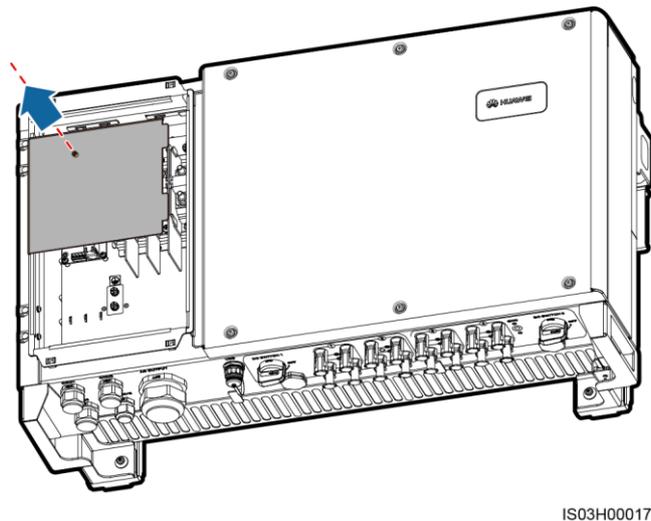
- Step 2** Open the maintenance compartment door and adjust the support bar.

**Figure 5-5** Adjusting a support bar



**Step 3** Remove the AC terminal cover and set it aside.

**Figure 5-6** Removing an AC terminal cover



**NOTE**

To highlight the involved area, the figure does not show the open door.

----End

## 5.4 Connecting AC Output Power Cables

An AC switch must be installed on the AC side of the SUN2000 to ensure that the SUN2000 can be safely disconnected from the power grid. See [10 Technical Specifications](#) to select AC switches of the appropriate specifications.



## WARNING

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

- Connect AC output power cables according to the requirements specified by local power grid operators.
- The AC output power cable can be connected in a common way or through a pipe.

## 5.4.1 Connection Through a Pipe

### Prerequisites

The AC output power cable, OT terminal, and pipe are available.

- Use cables that can withstand 90 °C (194 °F) or 105 °C (221 °F). The cable that can withstand 105 °C (221 °F) is recommended. To facilitate installation, use flexible cables.
- If you connect a ground cable to the PE point on the chassis shell in the scenario with no neutral wire, you are advised to use three (L1, L2, and L3) single-core outdoor cables.
- If you connect a ground cable to the PE point in the maintenance compartment in the scenario with no neutral wire, you are advised to use four (L1, L2, L3, and PE) single-core outdoor cables.
- If you connect a ground cable to the PE point on the chassis shell in the scenario with a neutral wire, you are advised to use four (L1, L2, L3, and N) single-core outdoor cables.
- If you connect a ground cable to the PE point in the maintenance compartment in the scenario with a neutral wire, you are advised to use five (L1, L2, L3, N, and PE) single-core outdoor cables.

[Table 5-1](#) describes the cable specifications.

**Table 5-1** Cable specifications

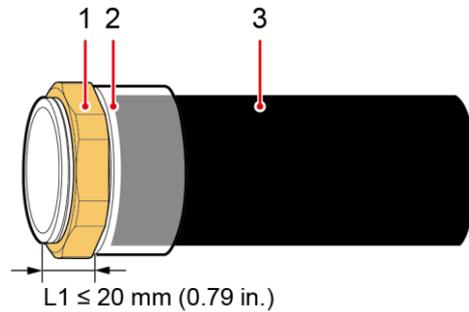
Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area	Value range	6–2/0 AWG	4–2/0 AWG
	Recommended value	4 AWG	2 AWG
Cable outer diameter		6.3–12.1 mm (0.25–0.48 in.)	

- OT terminal: M8 (L1, L2, L3, and N) and M6 (PE)
- Pipe: 2-inch pipe

## Context

The pipe specifications should comply with the waterproof connector specifications. For example, for a 2-inch waterproof connector, prepare a 2-inch pipe.

**Figure 5-7** Pipe



IS03W00007

(1) Nut

(2) Fitting

(3) Conduit



**NOTE**

The pipe appearance is for reference only. The actual pipe prevails.

Figure 5-8 shows the diameters of the cable holes at the bottom of the chassis after the waterproof connectors are removed.

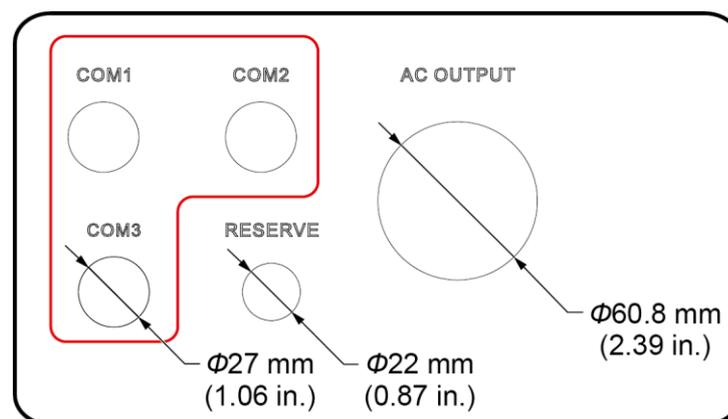


**NOTE**

Following are the reference torque values for the waterproof connector and pipe. Observe the requirements of the specific manufacturer, if any.

- AC OUTPUT and COM ports: 7.5 N m (plastic) or 10 N m (metal)
- RESERVE port: 3.75 N m (plastic) or 6.25 N m (metal)

**Figure 5-8** Diameters of the bottom cable holes



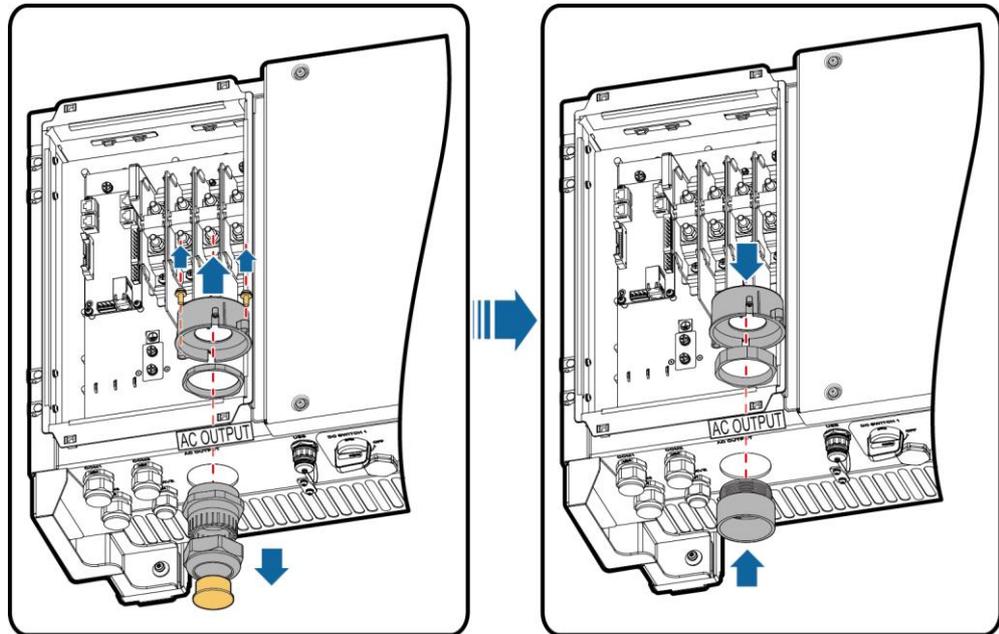
IS03S00008

## Procedure

**Step 1** Install the pipe fitting.

1. Remove the AC filter and keep the screws aside.
2. Remove the locking cap and plug from the waterproof connector, and then remove the waterproof connector.
3. Secure the pipe fitting to the chassis using the nut delivered with the pipe.
4. Place the AC filter.

**Figure 5-9** Installing pipe fitting



IS03H00019

**Step 2** Route the AC output power cable through the conduit and fitting of the pipe, and then the AC filter.

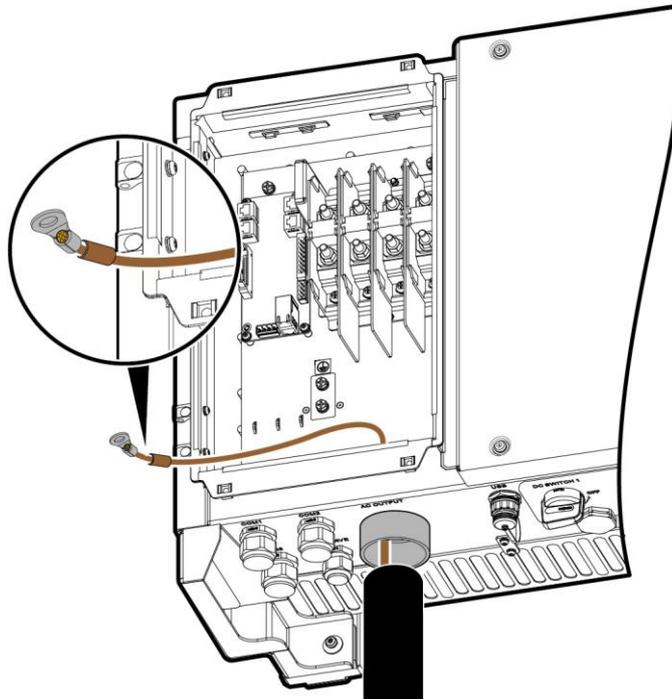
**Step 3** Prepare the OT terminal.



## NOTICE

Pay attention to the OT terminal and ensure that it can successfully connect to the AC terminal block.

**Figure 5-10** OT terminal direction (using one cable as an example)



IS03120009

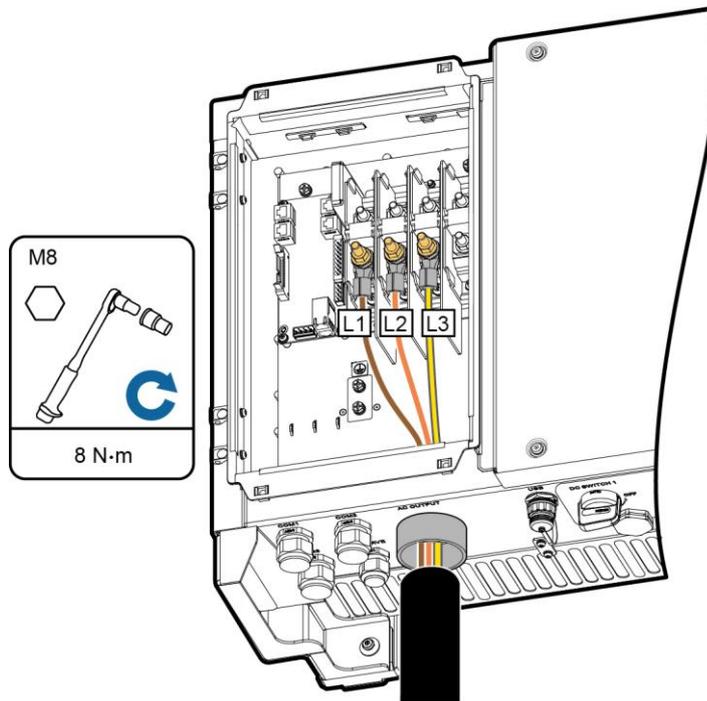
**Step 4** Connect the AC output power cable and secure it using a socket wrench with an extension rod.



### NOTICE

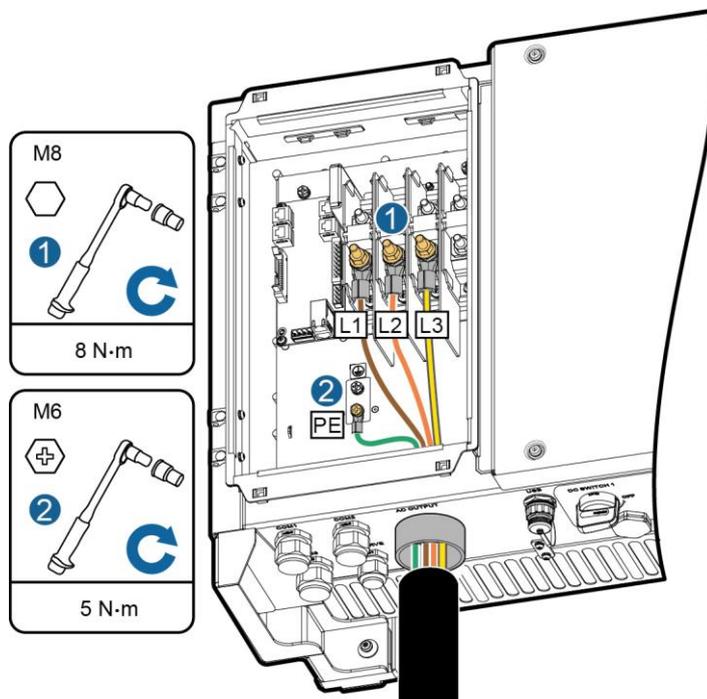
Verify that the AC output power cable is connected securely. Otherwise, the SUN2000 may fail to operate or experience any fault that will cause the damage of the terminal block. For example, the SUN2000 may generate heat during operating due to unreliable connection.

**Figure 5-11** Connecting the AC output power cable (excluding the ground cable and neutral wire)



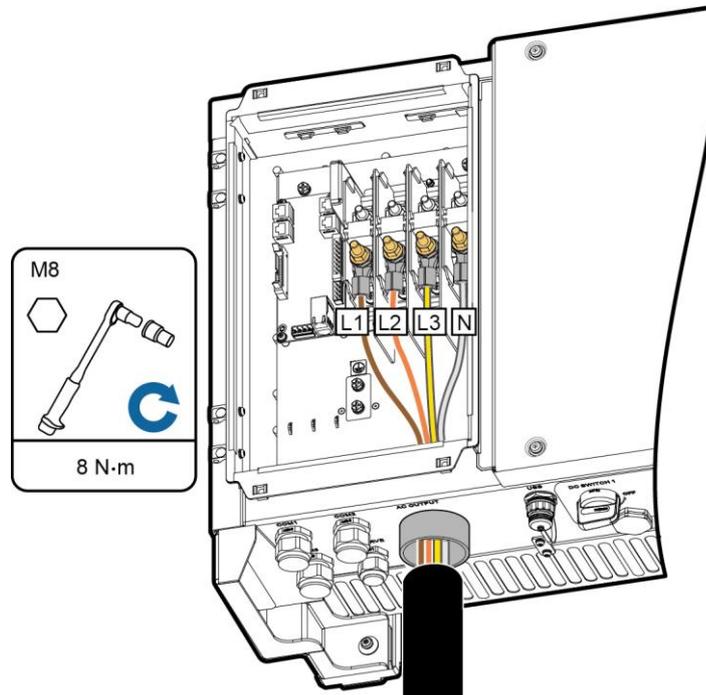
IS03120005

**Figure 5-12** Connecting the AC output power cable (including the ground cable but excluding the neutral wire)



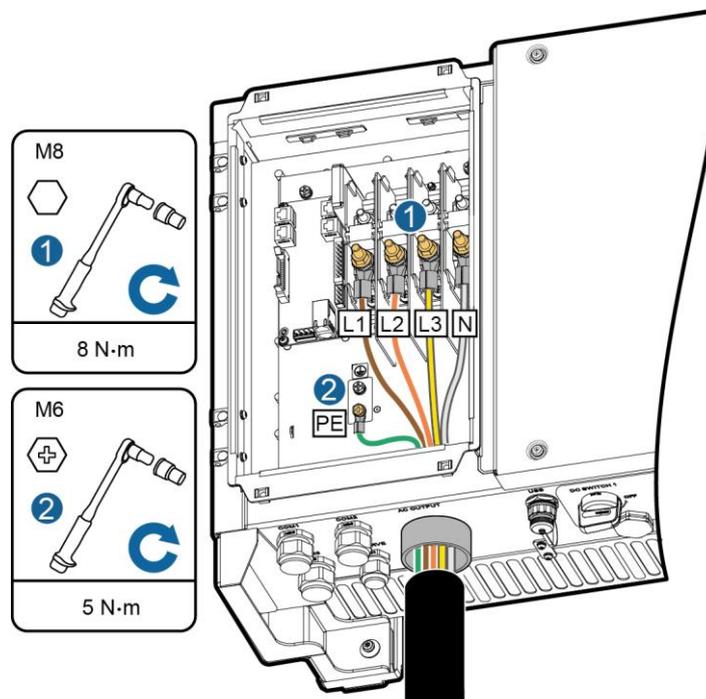
IS03120006

**Figure 5-13** Connecting the AC output power cable (excluding the ground cable but including the neutral wire)



IS03120007

**Figure 5-14** Connecting the AC output power cable (including the ground cable and neutral wire)



IS03120008



**NOTE**

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

**Step 5** Connect the conduit and fitting of the pipe.

**Step 6** Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fitting are secured reliably, and seal the cable hole using firestop putty.

**Step 7** Secure the AC filter using screws.

**Step 8** Clear foreign matter from the maintenance compartment.

----End

## 5.4.2 Common Connection

### Prerequisites

The AC output power cable and OT terminal are available.

- Use cables that can withstand 90 °C (194 °F) or 105 °C (221 °F). The cable that can withstand 105 °C (221 °F) is recommended. To facilitate installation, use flexible cables.
- If you connect a ground cable to the PE point on the chassis shell in the scenario without the neutral wire, you are advised to use a three-core (L1, L2, and L3) outdoor cable.
- If you connect a ground cable to the PE point in the maintenance compartment in the scenario without the 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 PE point on the chassis shell in the scenario with the 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 PE point in the maintenance compartment in the scenario with the neutral wire, you are advised to use a five-core (L1, L2, L3, N, and PE) outdoor cable.

Table 5-2 describes the cable specifications.

**Table 5-2** Cable specifications

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area	Range	6–2/0 AWG	4–2/0 AWG
	Recommended value	4 AWG	2 AWG
Cable outer diameter range supported by the AC OUTPUT waterproof connector		37–44 mm (1.46–1.73 in.)	

- OT terminal: M8 (L1, L2, L3, and N) and M6 (PE)

## Procedure

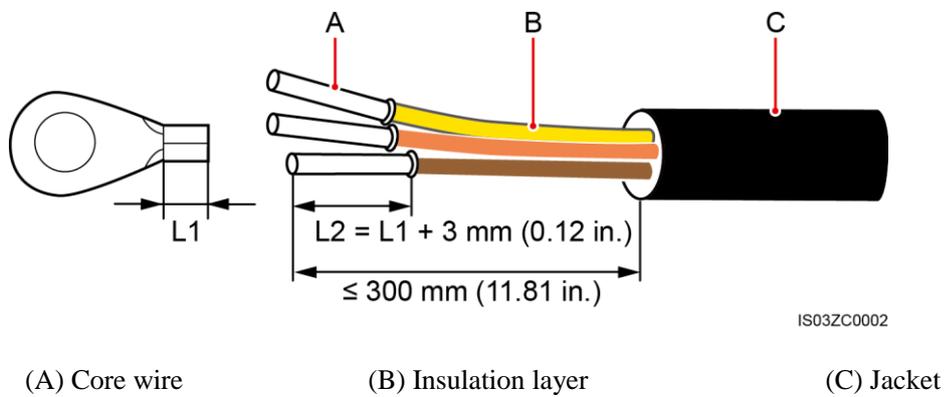
**Step 1** Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.



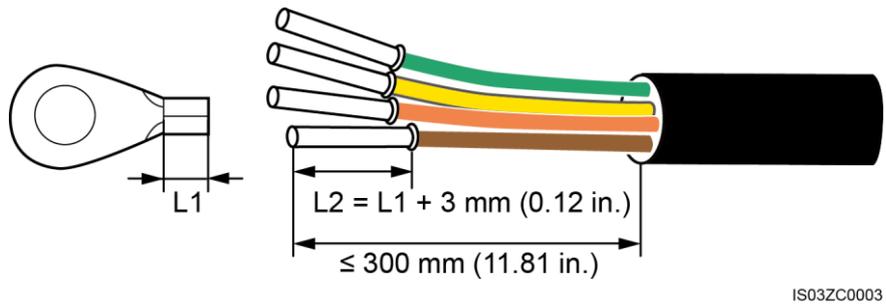
### NOTICE

Ensure that the jacket is in the maintenance compartment.

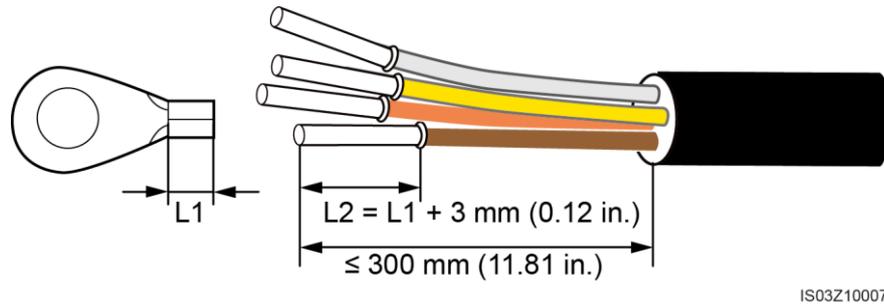
**Figure 5-15** Three-core cable (excluding the ground cable and neutral wire)



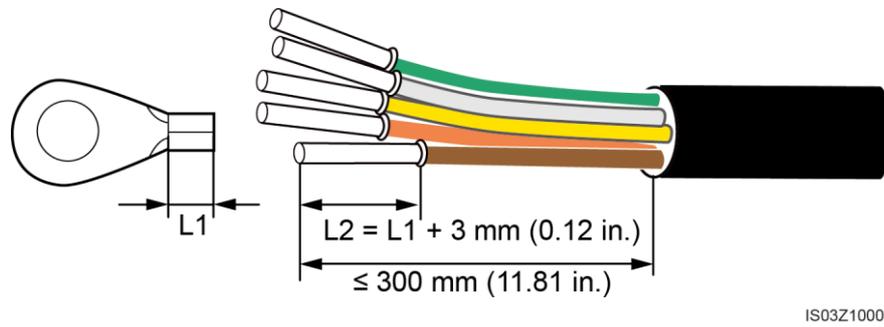
**Figure 5-16** Four-core cable (including the ground cable but excluding the neutral wire)



**Figure 5-17** Four-core cable (excluding the ground cable but including the neutral wire)



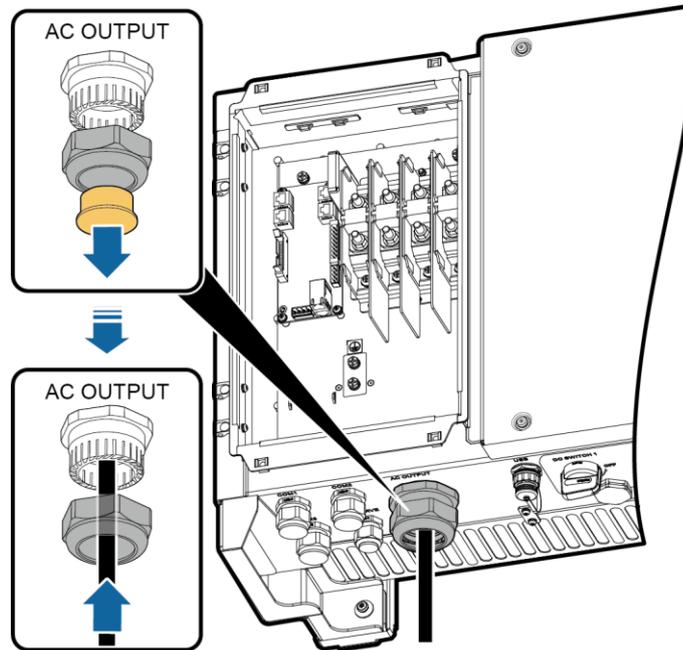
**Figure 5-18** Five-core cable (including the ground cable and neutral wire)



**Step 2** Prepare the OT terminal.

**Step 3** Route the cable through the waterproof connector.

**Figure 5-19** Routing cables



IS03H00018

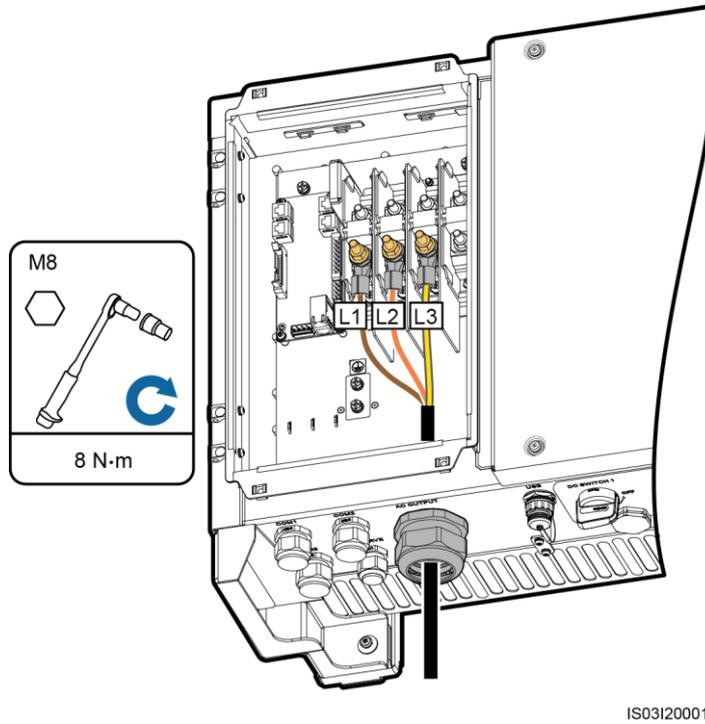
**Step 4** Connect the AC output power cable and secure it using a socket wrench with an extension rod.



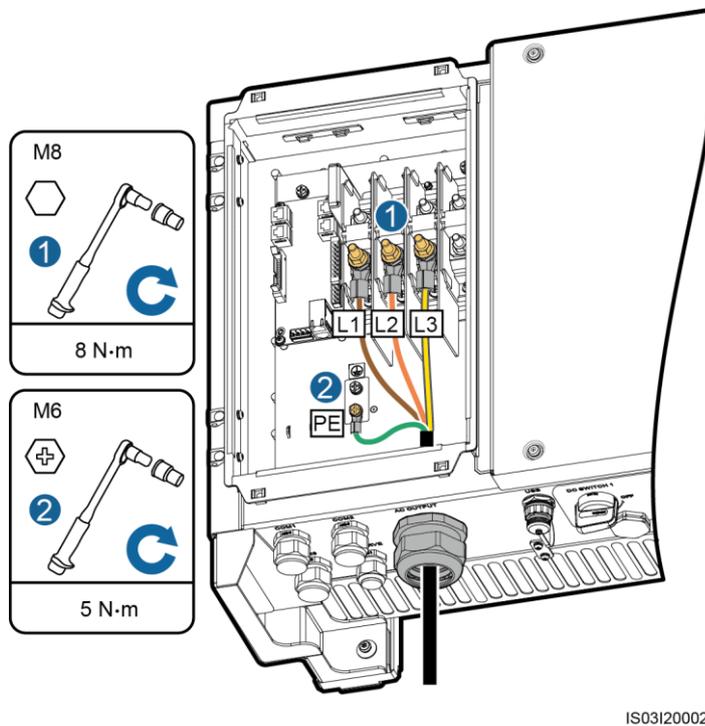
### NOTICE

Verify that the AC output power cable is connected securely. Otherwise, the SUN2000 may fail to operate or experience any fault that will cause the damage of the terminal block. For example, the SUN2000 may generate heat during operating due to unreliable connection.

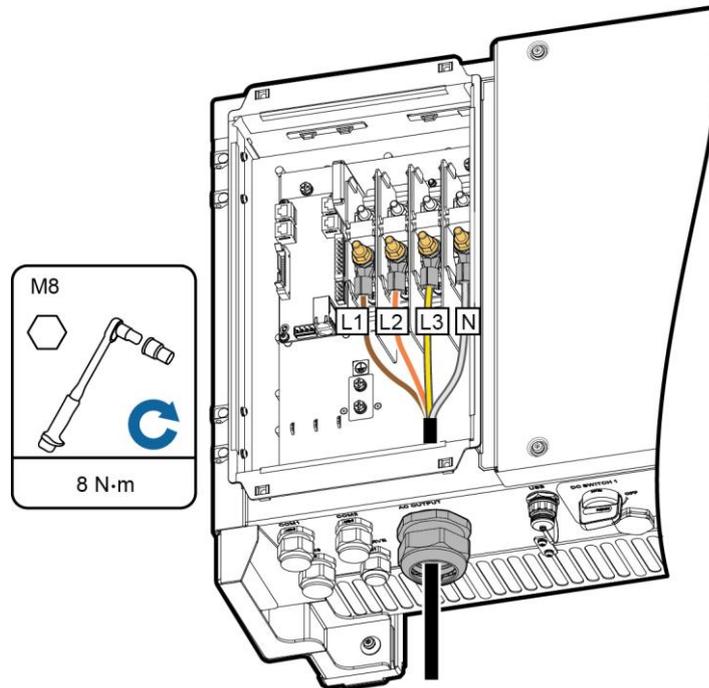
**Figure 5-20** Connecting the AC output power cable (excluding the ground cable and neutral wire)



**Figure 5-21** Connecting the AC output power cable (including the ground cable but excluding the neutral wire)

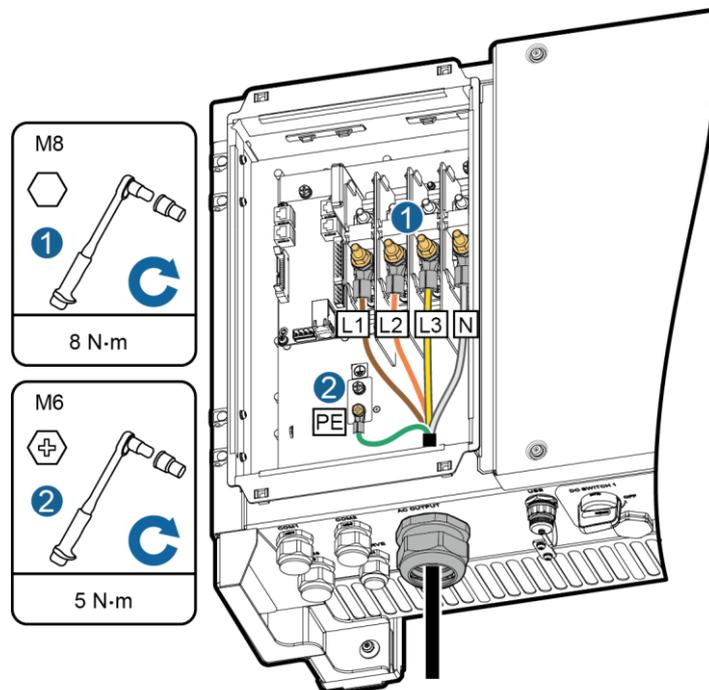


**Figure 5-22** Connecting the AC output power cable (excluding the ground cable but including the neutral wire)



IS03120003

**Figure 5-23** Connecting the AC output power cable (including the ground cable and neutral wire)



IS03120004



**NOTE**

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

**Step 5** Tighten the waterproof connector to a torque of 7.5 N•m.

----End

## Follow-up Procedure

Check that the cables are connected correctly and securely. Then apply firestop putty to the waterproof connectors and cable holes. Clear foreign matter from the maintenance compartment.

## 5.5 (Optional) Installing the DC Protection Shroud

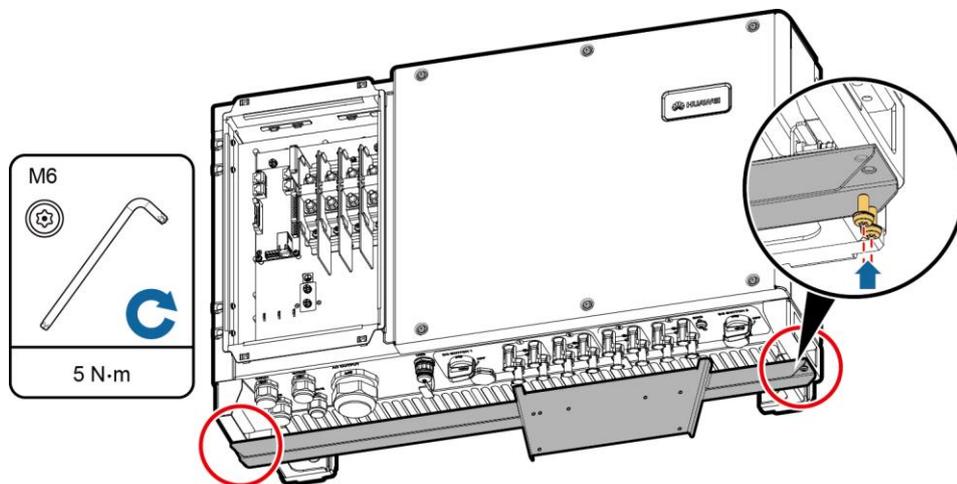
### Context

To avoid electric shocks, you are advised to install a DC protection shroud in a rooftop PV plant.

### Procedure

**Step 1** Install the protection shroud bracket.

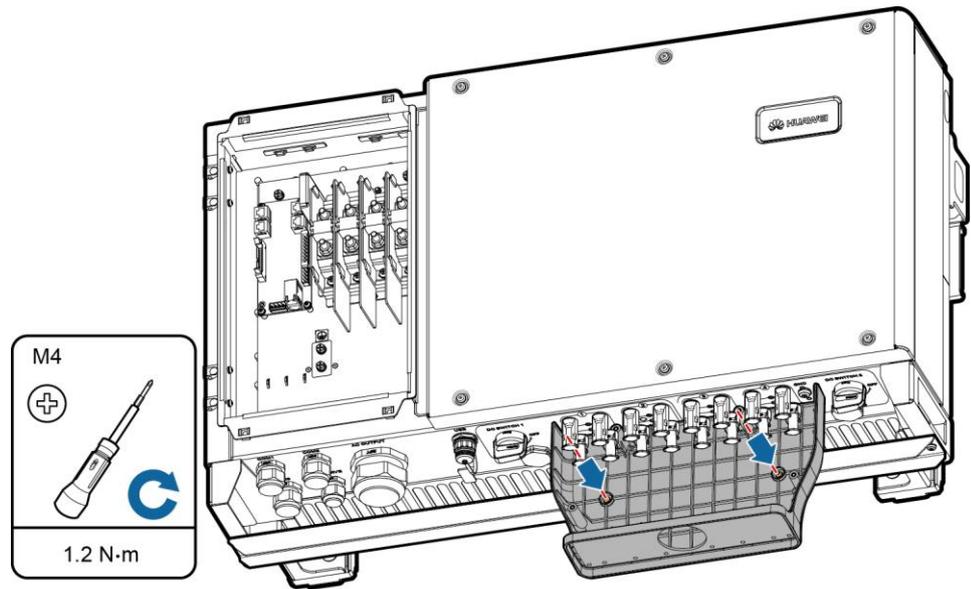
**Figure 5-24** Installing a bracket



IS03H00036

**Step 2** Install the protection shroud rear panel.

**Figure 5-25** Installing a rear panel



IS03H00037

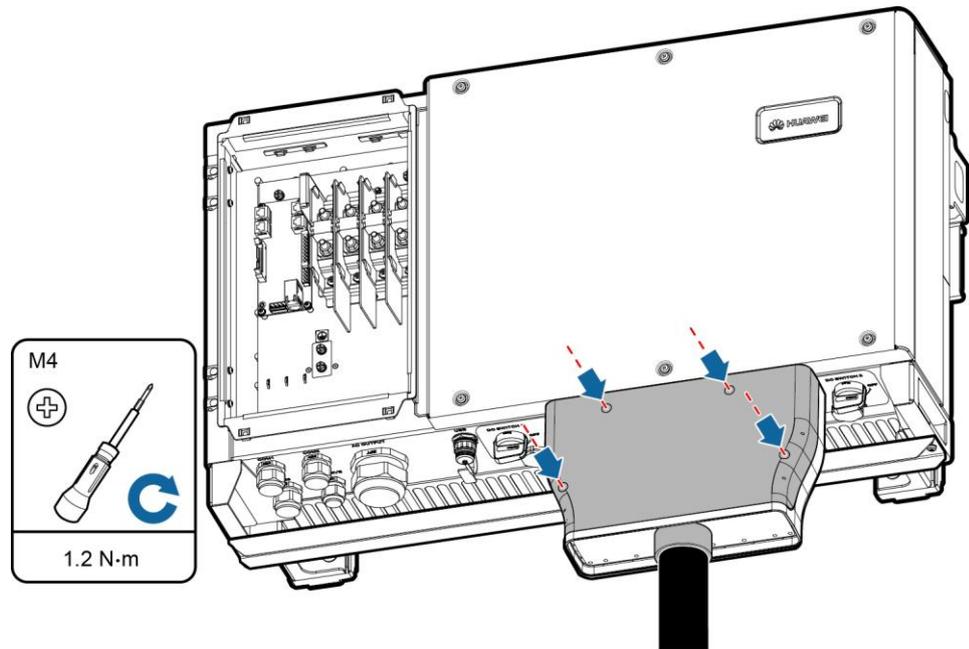
----End

## Follow-up Procedure

After finishing the preceding steps and preparing a 2-inch pipe, perform the following steps. Otherwise, you may need to rework.

1. Secure the pipe fitting to the chassis using the nut delivered with the pipe.
2. Route the DC input power cable through the conduit and then fitting of the pipe.
3. Connect the DC input power cable by following the instructions in [5.6 Connecting DC Input Power Cables](#).
4. Connect the conduit and fitting of the pipe.
5. Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fitting are secured reliably, and seal the cable hole using firestop putty.
6. Clear foreign matter from the protection shroud.
7. Install the front cover of the protection shroud.

**Figure 5-26** Installing a front cover



IS03H00038

## 5.6 Connecting DC Input Power Cables

### Prerequisites



#### **DANGER**

- Before connecting DC input power cables, 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. Otherwise, the high voltage may result in electric shocks.
- When the SUN2000 is grid-tied, it is not allowed to maintain DC input power cables, such as connect or disconnect a string or a module in a string. Otherwise, electric shocks may occur.



#### **WARNING**

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

- The highest open-circuit voltage of each PV string is always lower than or equal to 1000 V DC.
- The positive and negative terminals of a PV module connect to the positive and negative DC input terminals of the SUN2000 respectively.
- If the DC input power cable is reversely connected, do not operate the DC switches and positive and negative connectors immediately. 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, remove the positive and negative connectors, and correct the polarity of the DC input power cable.



## NOTICE

- Ensure that the PV string is well insulated to the ground. If the SUN2000 is directly connected to the power grid with a neutral wire connected to the PGND cable (for example, a low-voltage power grid or a power grid with a neutral wire grounded), do not ground the positive and negative terminals of PV strings. Otherwise, the SUN2000 may be damaged. The caused equipment damage is beyond the warranty scope.
- During the installation of PV strings and SUN2000, the positive or negative terminals of PV strings may be grounded 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.



## NOTE

The PV strings must meet the following requirements if they need to be grounded:

- A three-phase isolation transformer is installed on the output side.
- One isolation transformer must be installed only for one SUN2000. Do not connect two or more SUN2000s to the same isolation transformer. Otherwise, the SUN2000s may fail to work due to the loop current generated between them.
- Set **Isolation** to **Input grounded, with TF** on the SUN2000 APP, SmartLogger, or NMS.

## Context

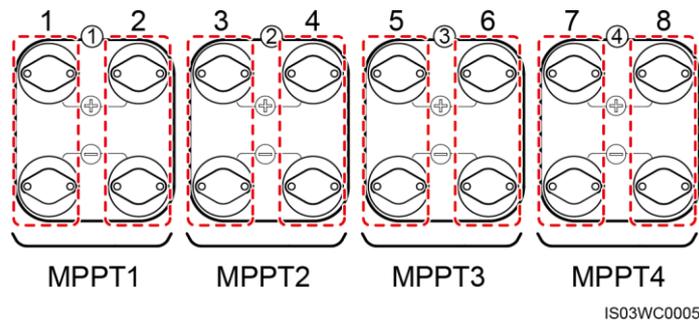
- DC terminal selection  
[Figure 5-27](#) shows the DC terminals at the bottom of the SUN2000. [Table 5-3](#) describes the requirements for DC terminal selection.



## NOTE

The SUN2000 provides two DC switches, namely, DC SWITCH 1 and DC SWITCH 2. DC SWITCH 1 controls the first to fourth routes of DC input terminals, whereas DC SWITCH 2 controls the fifth to eighth routes of DC input terminals.

**Figure 5-27** DC terminals



**Table 5-3** DC terminal selection requirements

Number of Inputs	SUN2000
1	Connects to any route.
2	Connects to routes 1 and 5.
3	Connects to routes 1, 3, and 5.
4	Connects to routes 1, 3, 5, and 7.
5	Connects to routes 1, 2, 3, 5, and 7.
6	Connects to routes 1, 2, 3, 5, 6, and 7.
7	Connects to routes 1, 2, 3, 4, 5, 6, and 7.
8	Connects to routes 1, 2, 3, 4, 5, 6, 7, and 8.

- DC input power cable specifications  
[Table 5-4](#) lists the recommended DC input power cable specifications.

**Table 5-4** Recommended DC input power cable specifications

Cable Type	Conductor Cross-Sectional Area		Cable Outer Diameter
	Range	Recommended Value	
Common PV cables in the industry (model: PV1-F)	12–10 AWG	12 AWG	4.5–7.8 mm (0.18–0.31 in.)



**NOTICE**

Rigid cables, such as armored cables, are not recommended, because poor contact may be caused by the bending of the cables.

## Procedure

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



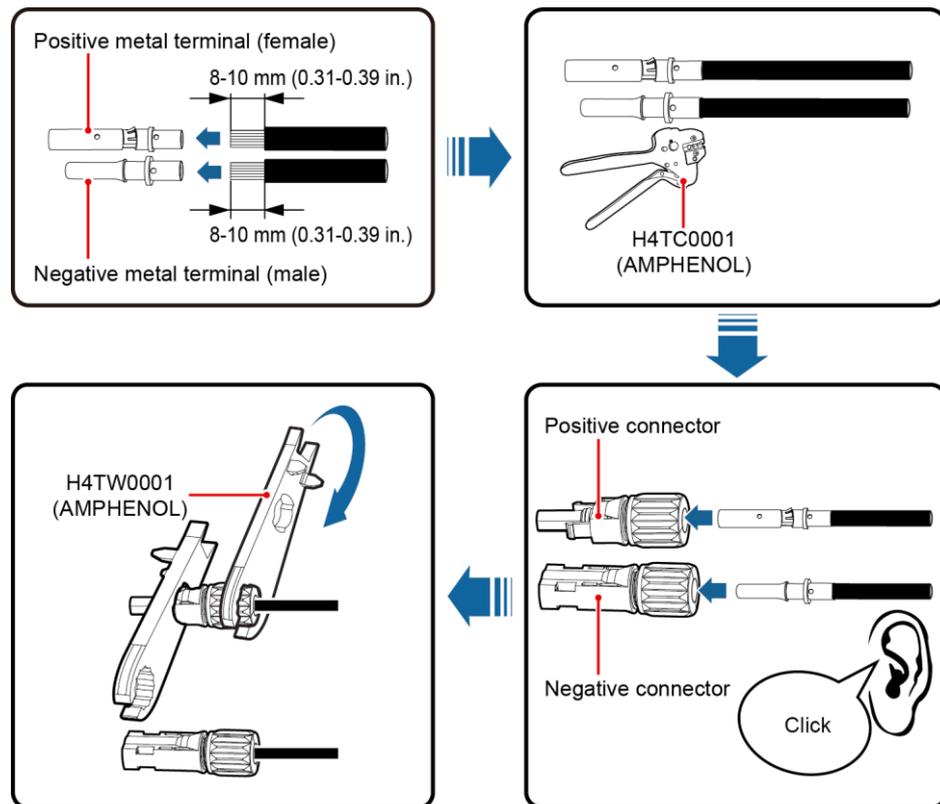
### CAUTION

- Use the DC input terminals provided with the SUN2000. If the terminals are lost or damaged, purchase DC input terminals of the appropriate model from Huawei or MC4, Amphenol HH4, or Amphenol H4 DC input terminals from other vendors.
  - DC input terminals not of the previous models may be incompatible with the SUN2000, which may cause serious consequences. The caused equipment damage is beyond the warranty scope.
-

 **NOTICE**

- After crimping the positive and negative metal terminals, ensure that the cables are crimped tightly such that they cannot be pulled out by a force less than 400 N.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.

**Figure 5-28** Preparing a connector

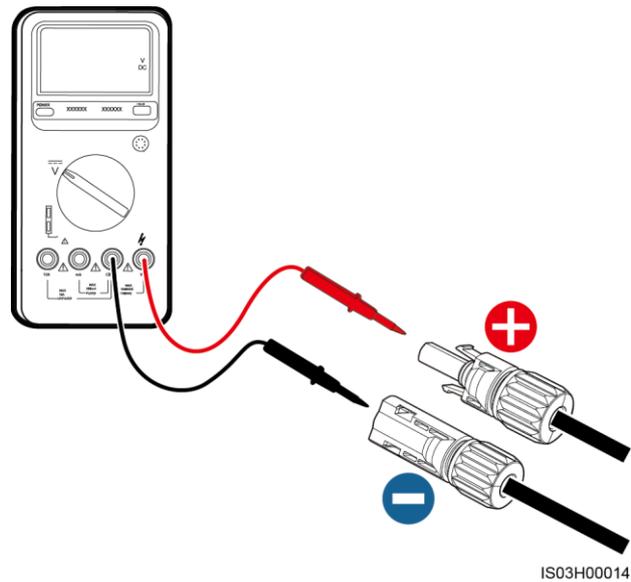


IS03H00021

**Step 2** Ensure that the DC input voltage of each PV string does not exceed 1000 V DC using a multimeter and check that the polarities of the DC input power cable are correct.

- If the voltage is a negative value, the PV string is reversely connected. Correct the polarity.
- If the voltage is greater than 1000 V DC, too many PV modules are configured. Remove some PV modules.

**Figure 5-29** Measuring the DC input voltage



---

 **WARNING**

Before performing [Step 3](#), ensure that the two DC switches are OFF.

---

- Step 3** Remove the dustproof cap, and insert the positive and negative connectors into the corresponding positive and negative DC input terminals of the SUN2000 until they snap into place.

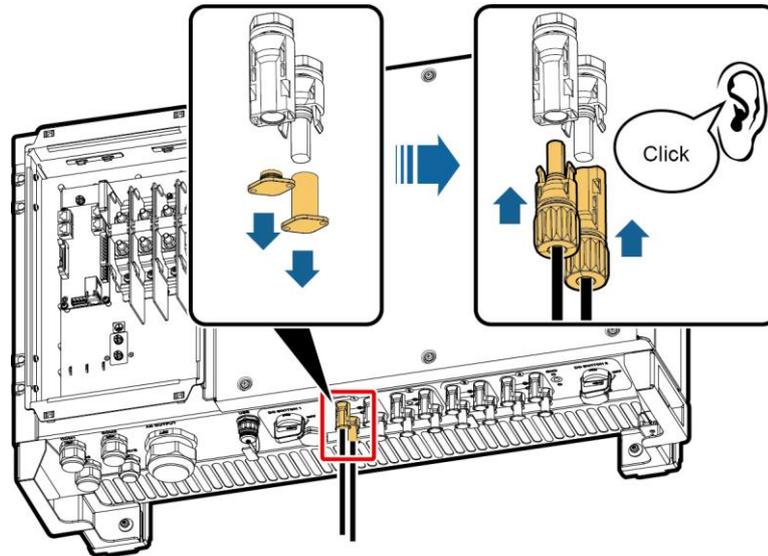
---

 **NOTICE**

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

---

Figure 5-30 Connecting DC input power cables



IS03120010



### NOTICE

If the DC input power cable is reversely connected, do not operate the DC switches and positive and negative connectors immediately. Otherwise, the SUN2000 will be damaged. The caused equipment damage is beyond the warranty scope. 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, remove the positive and negative connectors, and correct the polarity of the DC input power cable.

----End

## Follow-up Procedure

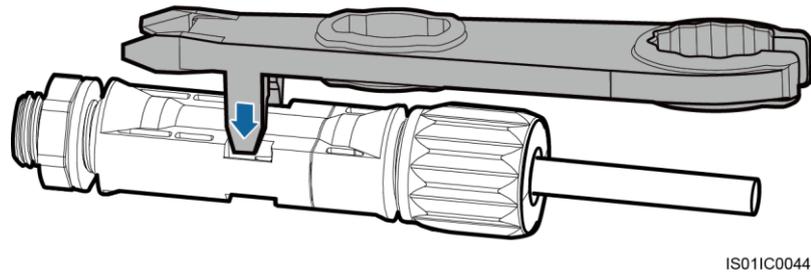


### WARNING

Before removing the positive and negative connectors, ensure that the two DC switches are OFF.

To remove the positive and negative connectors from the SUN2000, insert a removal wrench into the notch and press the wrench with an appropriate force, as shown in [Figure 5-31](#).

**Figure 5-31** Removing a DC input connector



## 5.7 Connecting Communications Cables

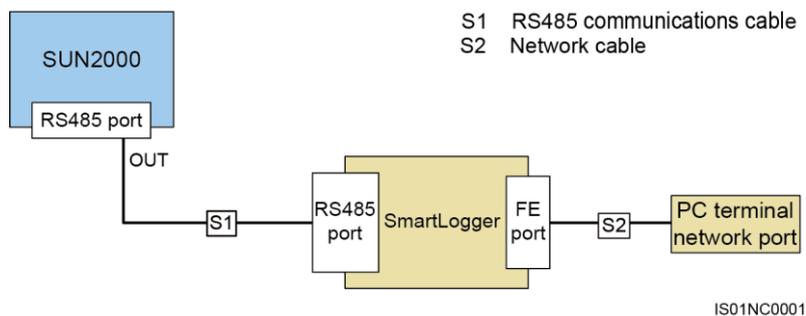
### 5.7.1 Communication Mode Description

#### RS485 Communication

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

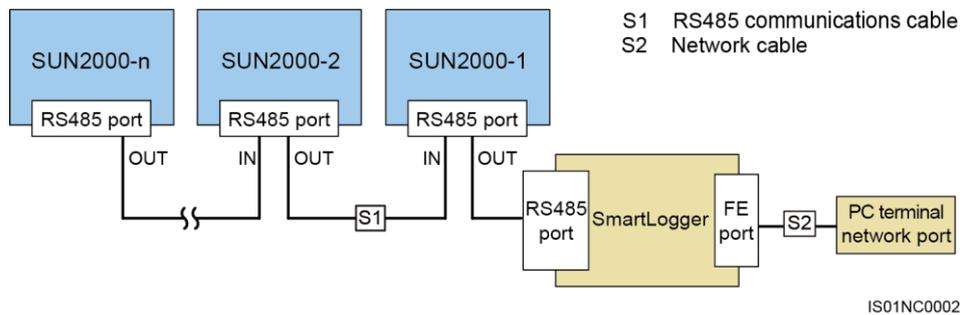
- [Figure 5-32](#) shows the communication mode for a single SUN2000.

**Figure 5-32** Communication mode for a single SUN2000



- [Figure 5-33](#) shows the communication between multiple SUN2000s. If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

**Figure 5-33** 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 SmartLogger2000, 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, see the *PLC CCO01A User Manual* and *SmartLogger2000 User Manual*.

**NOTE**

The built-in PLC module in the SUN2000 does not need to be connected with 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 recommended to set **PLC communication** to **Disable** on the SUN2000 APP.

**NOTE**

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

## 5.7.2 Selecting a Mode for Connecting RS485 Communications Cables

### Description

- RRS485 communications cables can be connected in two ways:
  - Terminal block connectionYou are advised to use the DJYP2VP2-22 2x2x1 computer cable or a communications cable with a conductor cross-sectional area of 18 AWG and an outer diameter of 14–18 mm (0.55–0.71 in.).

- RJ45 network port connection

You are advised to use a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm (0.35 in.) and internal resistance not greater than 1.5 ohms/10 m (1.5 ohms/393.70 in.), as well as a shielded RJ45 connector.

 **NOTE**

Select either connection way in practice. Connecting to a terminal block is recommended.

- The RS485 communications cable can be connected in a common way or through a pipe.

 **NOTE**

Before installation, prepare materials based on the connection mode.

- If you choose connection through a pipe, ensure that the RS485 communications cable and 3/4-inch pipe are available.
- If you choose common connection, ensure that the RS485 communications cable is available.



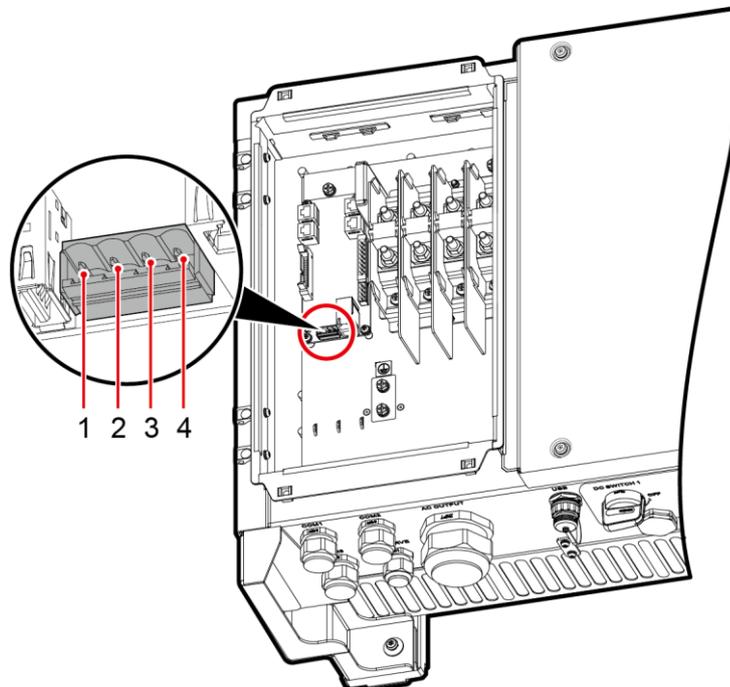
**NOTICE**

When laying out communications cables, separate them from power cables and avoid large signal interference sources to protect communication from being affected.

## Terminal Block Pin Definitions

Figure 5-34 shows an RS485 terminal block.

**Figure 5-34** Terminal block



IS01W00046

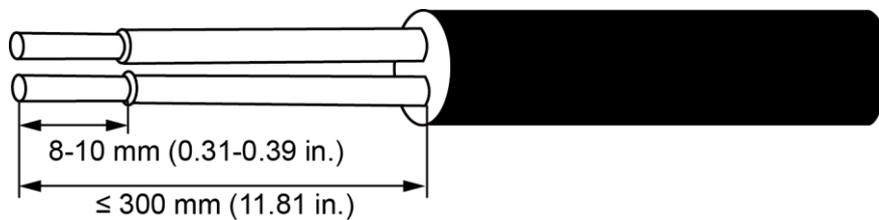
Table 5-5 describes pin definitions of the RS485 terminal block.

**Table 5-5** Pin definitions of the RS485 terminal block

No.	Port Definition	Description
1	RS485A IN	RS485A, RS485 differential signal +
2	RS485A OUT	RS485A, RS485 differential signal +
3	RS485B IN	RS485B, RS485 differential signal –
4	RS485B OUT	RS485B, RS485 differential signal –

Figure 5-35 shows how to prepare an RS485 communications cable.

**Figure 5-35** Stripping an RS485 communications cable

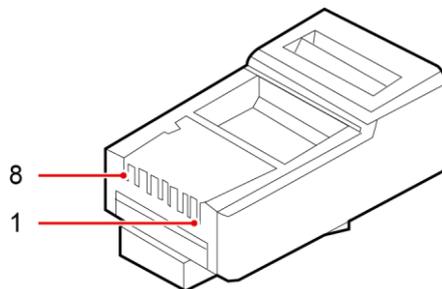


IS03ZC0001

## RJ45 Connector Pin Definitions

Figure 5-36 shows an RJ45 connector.

**Figure 5-36** RJ45 connector



IS01WC0032

Table 5-6 lists the RJ45 connector pin definitions.

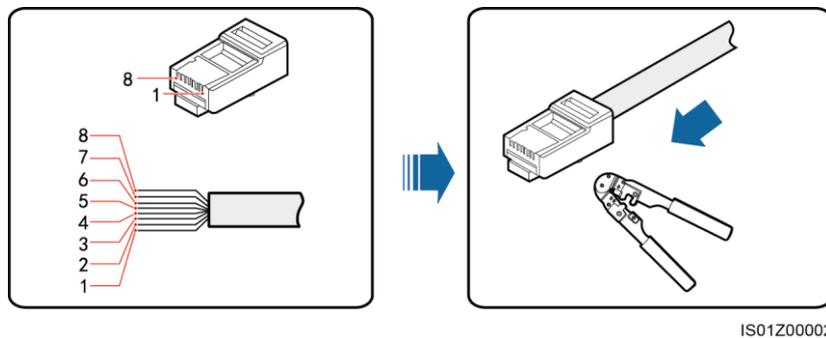
**Table 5-6** RJ45 connector pin definitions

Pin	Color	Function
1	White-and-orange	RS485A, RS485 differential signal +
2	Orange	RS485B, RS485 differential signal –
3	White-and-green	N/A

Pin	Color	Function
4	Blue	RS485A, RS485 differential signal +
5	White-and-blue	RS485B, RS485 differential signal –
6	Green	N/A
7	White-and-brown	N/A
8	Brown	N/A

Figure 5-37 shows how to prepare an RS485 communications cable.

Figure 5-37 Connecting wires to 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 |

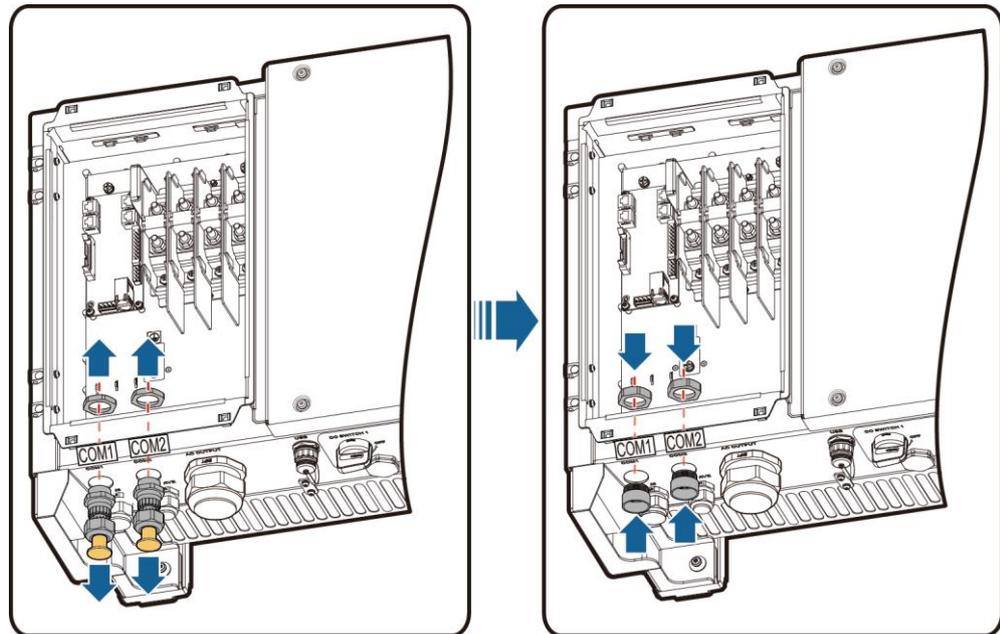
## 5.7.3 Connecting RS485 Communications Cables Through a Pipe

### Connecting Cables to the Terminal Block

**Step 1** Install the pipe fittings.

1. Remove the locking caps and plugs from the waterproof connectors, and then remove the waterproof connectors.
2. Secure the pipe fittings to the chassis using the nuts delivered with the pipes.

**Figure 5-38** Installing pipe fittings

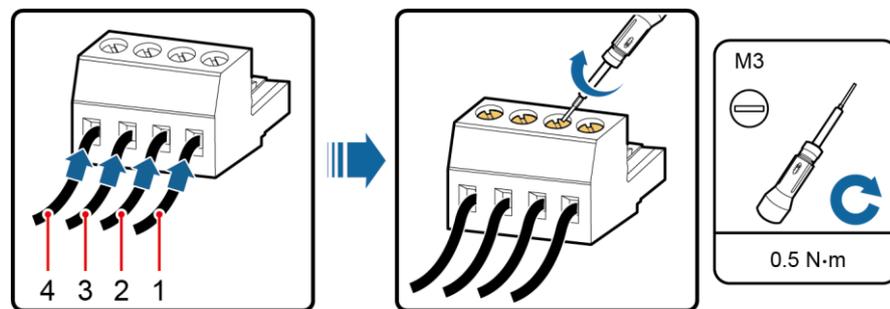


IS03H00020

**Step 2** Route the communications cables through the conduits and then fittings of the pipes.

**Step 3** Remove the cable terminal base from the terminal block. Connect the communications cables to the terminal base.

**Figure 5-39** Connecting cables to a terminal base



IS03I21011

(1) RS485A IN

(2) RS485A OUT

(3) RS485B IN

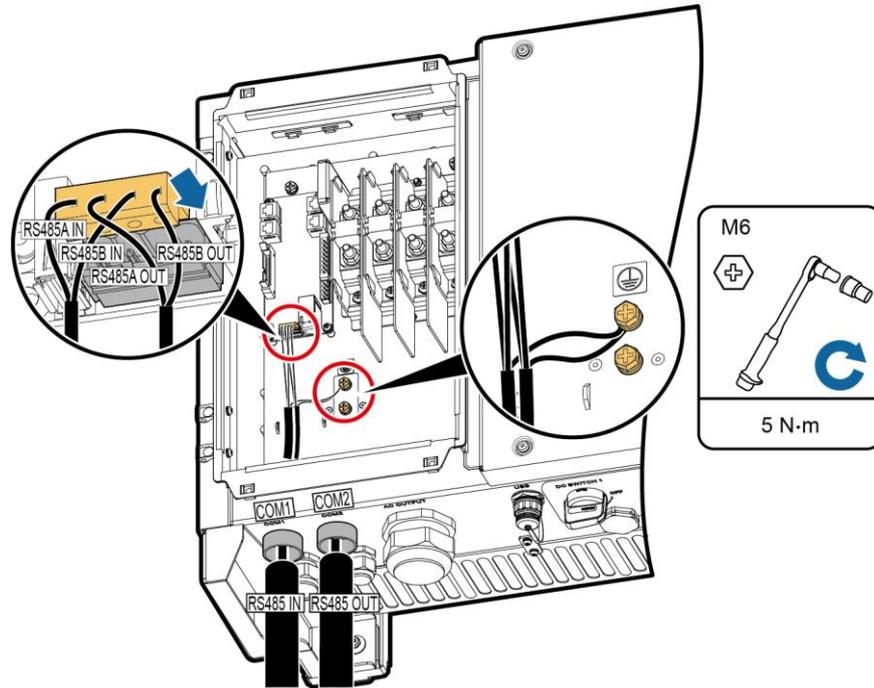
(4) RS485B OUT

**Step 4** Install the terminal base on the terminal block, and connect the shield layers to the ground point.

**NOTE**

When connecting the shielded cables, choose whether to crimp the OT terminal based on site requirements.

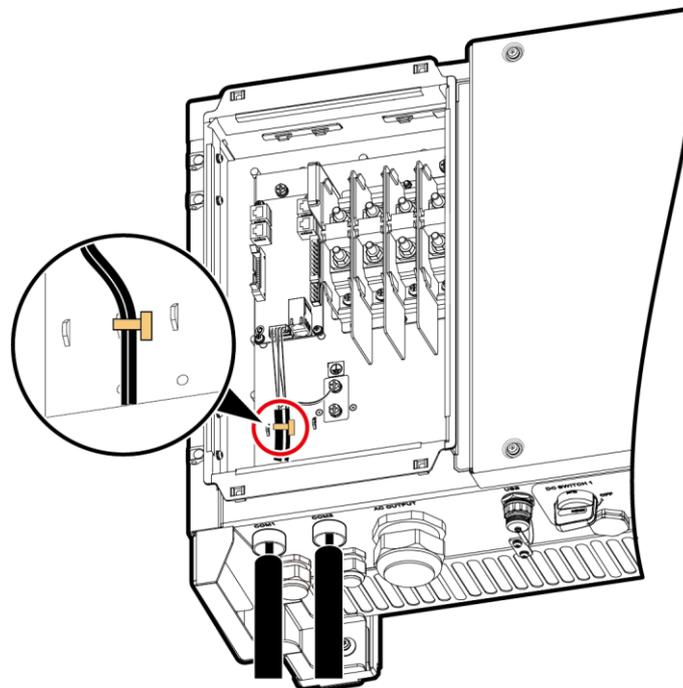
Figure 5-40 Connecting communications cables



IS03120013

Step 5 Bind communications cables after connecting them.

Figure 5-41 Binding communications cables



IS03120017

**Step 6** Connect the conduits and fittings of the pipes.

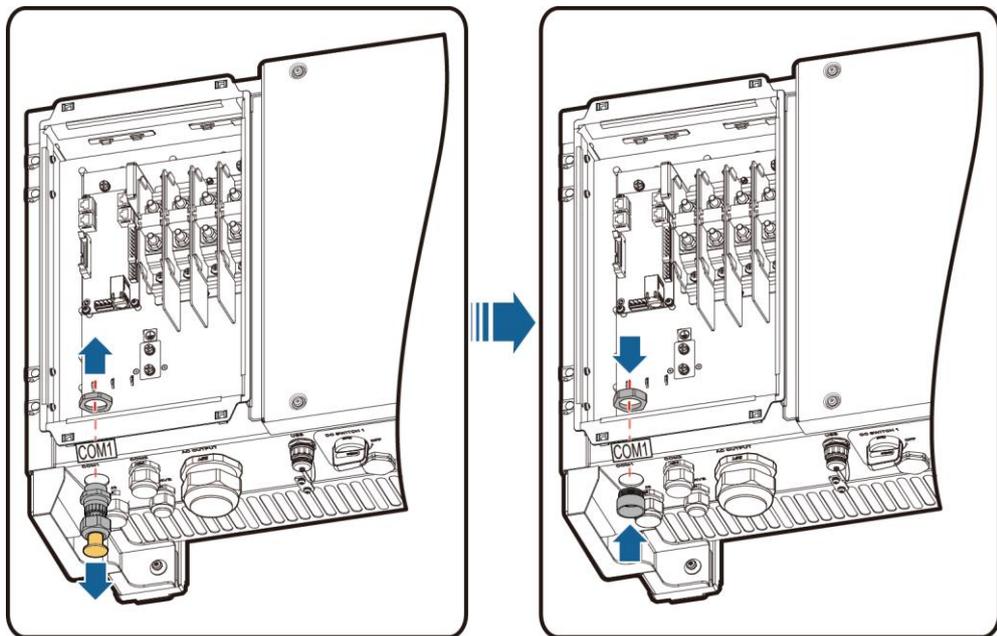
----End

## Connecting Cables to the RJ45 Network Port

**Step 1** Install the pipe fitting.

1. Remove the locking cap and plug from the waterproof connector, and then remove the waterproof connector.
2. Secure the pipe fitting to the chassis using the nut delivered with the pipe.

**Figure 5-42** Installing pipe fitting

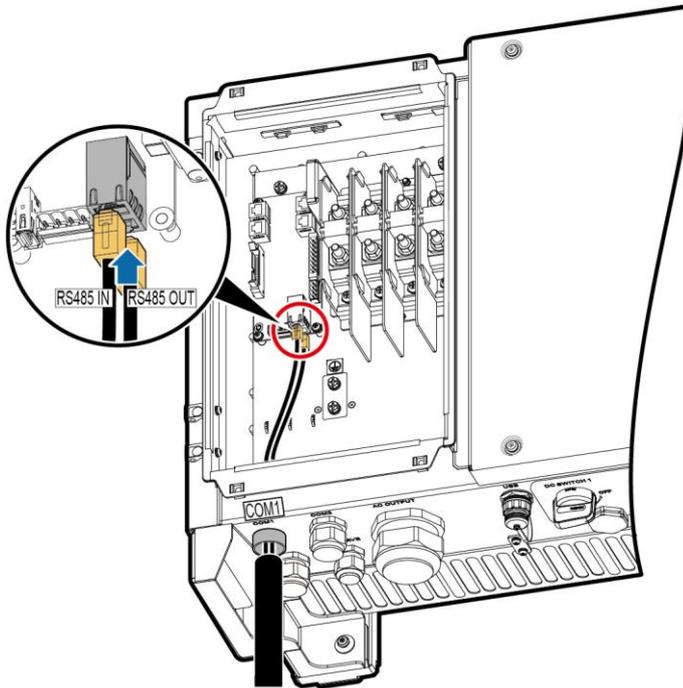


IS03H00023

**Step 2** Route the communications cables through the conduit and then fitting of the pipe.

**Step 3** Insert the RJ45 connectors into the RJ45 network ports in the SUN2000 maintenance compartment.

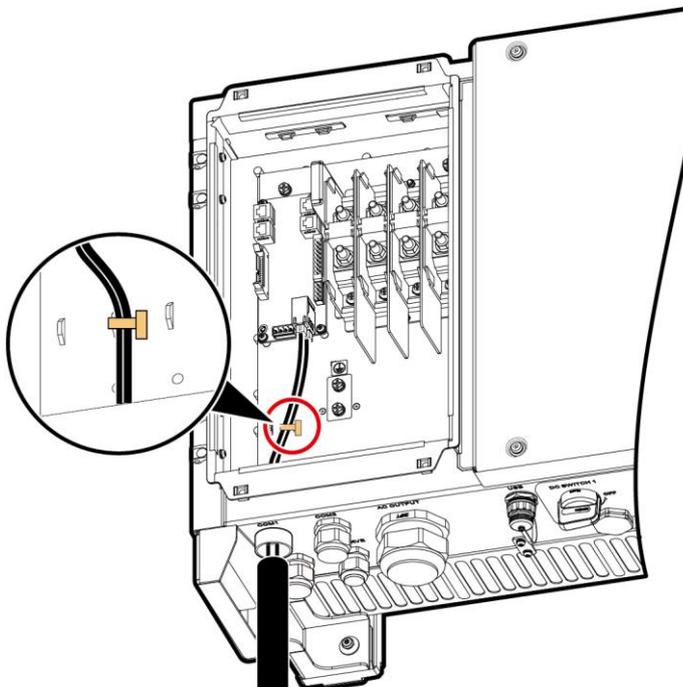
**Figure 5-43** Connecting communications cables



IS03I20015

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

**Figure 5-44** Binding communications cables



IS03I20019

**Step 5** Connect the conduit and fitting of the pipe.

----End

## Follow-up Procedure

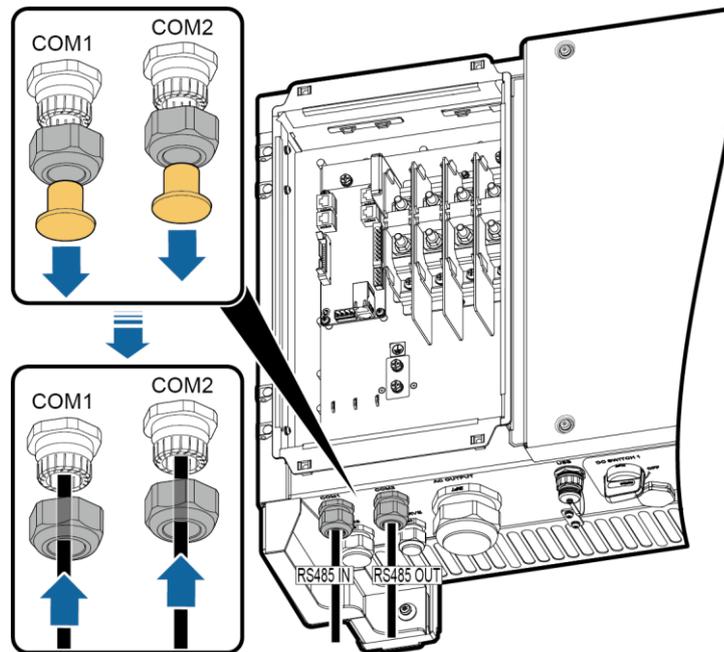
Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fitting are secured reliably, and seal the cable hole using firestop putty. Clear foreign matter from the maintenance compartment.

## 5.7.4 Connecting the RS485 Communications Cable in a Common Way

### Connecting Cables to the Terminal Block

**Step 1** Route the communications cables through the waterproof connectors.

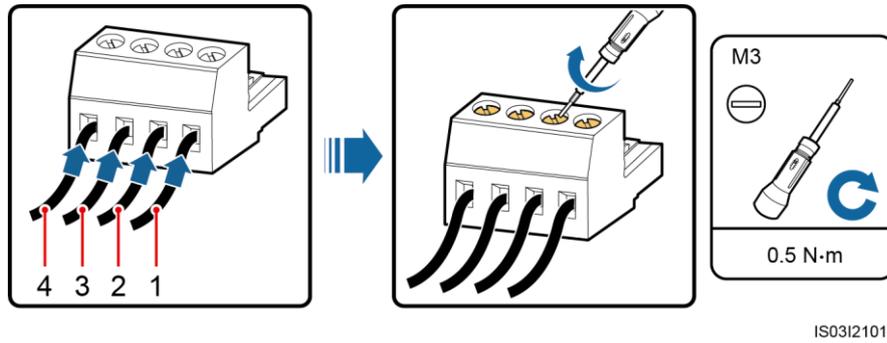
**Figure 5-45** Routing cables



IS03H00033

**Step 2** Remove the cable terminal base from the terminal block. Connect the communications cables to the terminal base.

**Figure 5-46** Connecting cables to a terminal base



IS03121011

(1) RS485A IN

(2) RS485A OUT

(3) RS485B IN

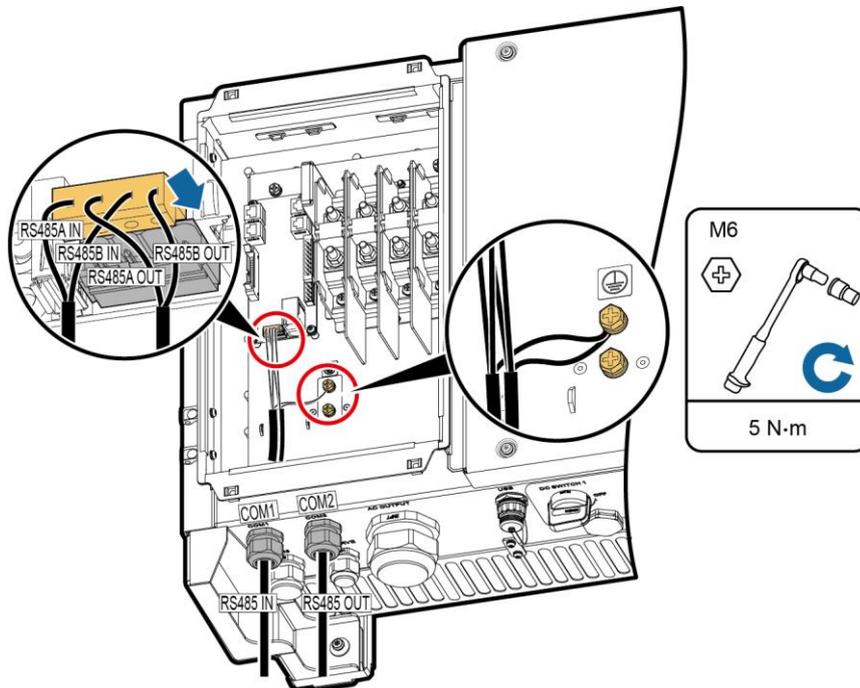
(4) RS485B OUT

**Step 3** Install the terminal base on the terminal block, and connect the shield layers to the ground point.

**NOTE**

When connecting the shielded cables, choose whether to crimp the OT terminal based on site requirements.

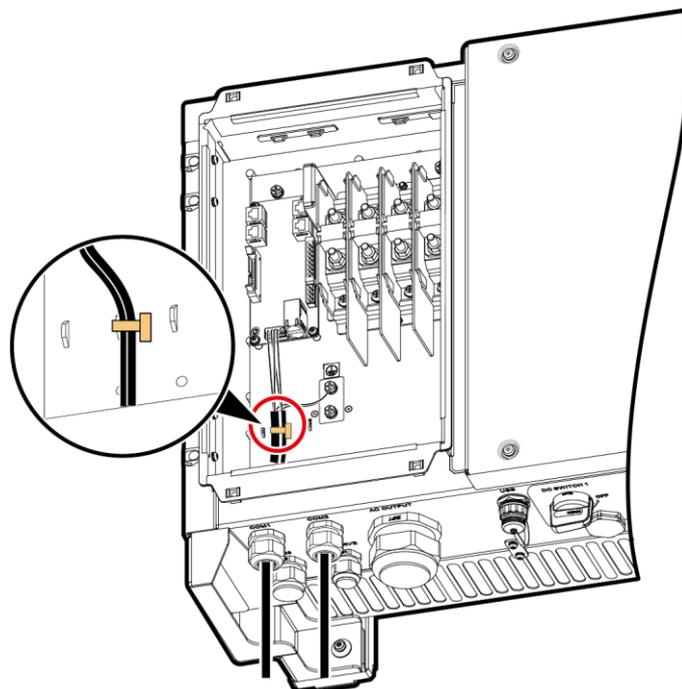
**Figure 5-47** Connecting communications cables



IS03120012

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

**Figure 5-48** Binding communications cables



IS03I20016

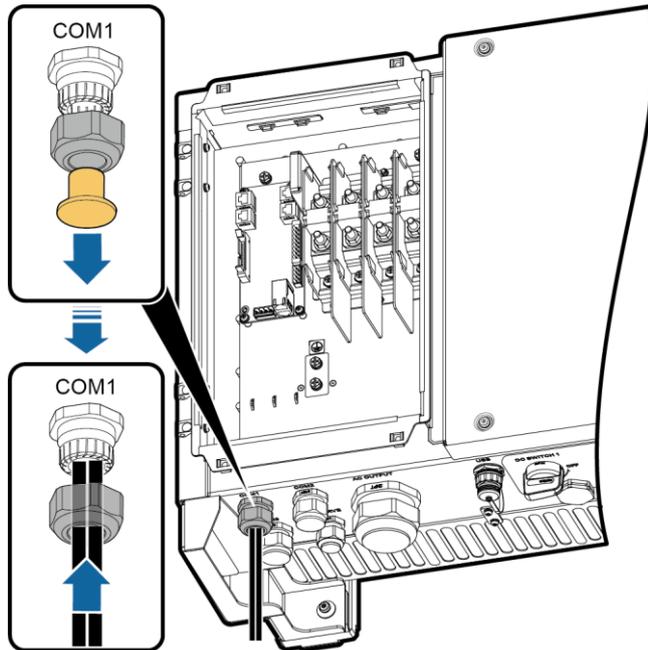
**Step 5** Tighten the waterproof connectors to a torque of 7.5 N•m.

----End

## Connecting Cables to the RJ45 Network Port

**Step 1** Route the communications cables through the waterproof connector.

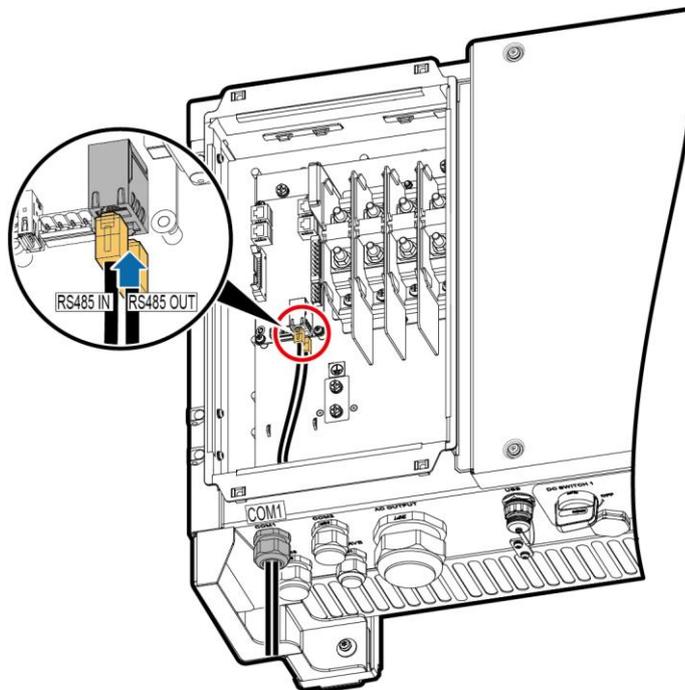
**Figure 5-49** Routing cables



IS03H00034

**Step 2** Insert the RJ45 connectors into the RJ45 network ports in the SUN2000 maintenance compartment.

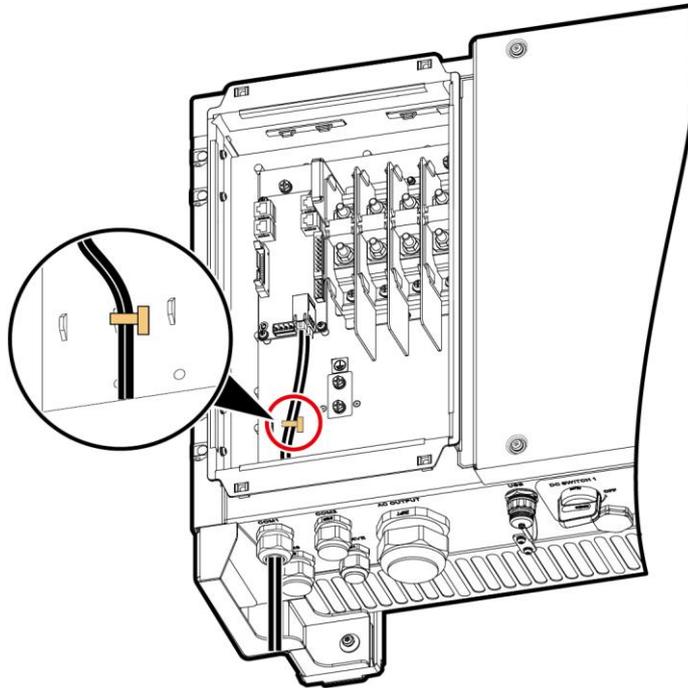
**Figure 5-50** Connecting communications cables



IS03I20014

**Step 3** Bind communications cables after connecting them.

**Figure 5-51** Binding communications cables



IS03120018

**Step 4** Tighten the waterproof connector to a torque of 7.5 N•m.

----End

## Follow-up Procedure

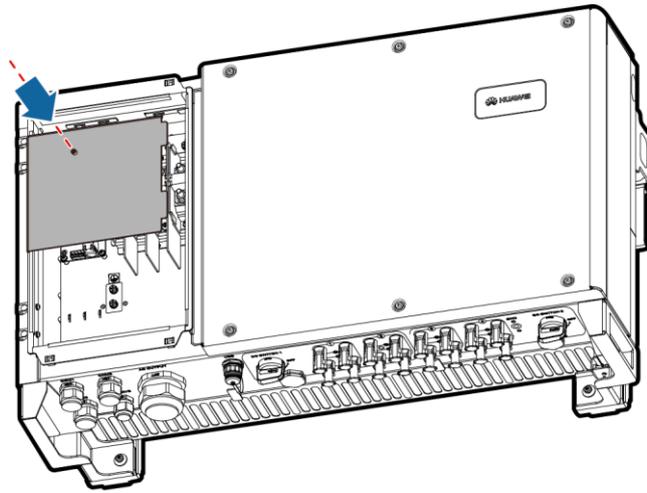
Check that the cables are connected correctly and securely. Then apply firestop putty to the waterproof connectors and cable holes. Clear foreign matter from the maintenance compartment.

## 5.8 Closing the Maintenance Compartment Door

### Procedure

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

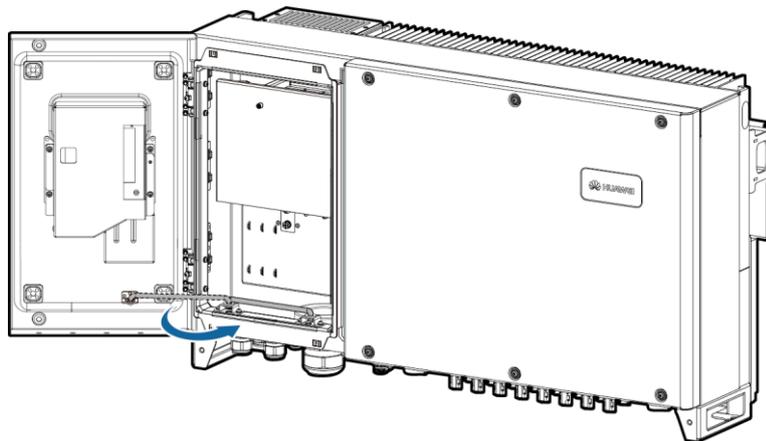
**Figure 5-52** Installing a cover



IS03H00032

**Step 2** Adjust the support bar.

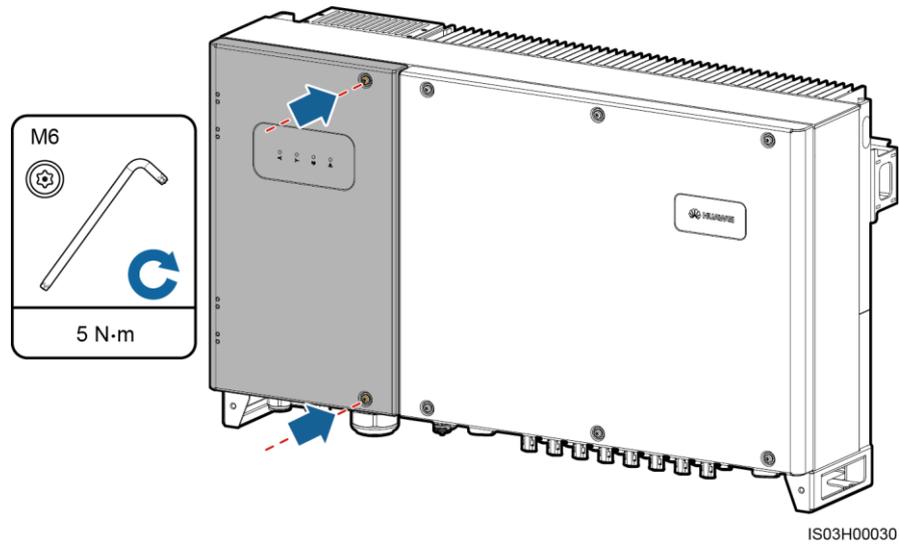
**Figure 5-53** Adjusting a support bar



IS03H00031

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

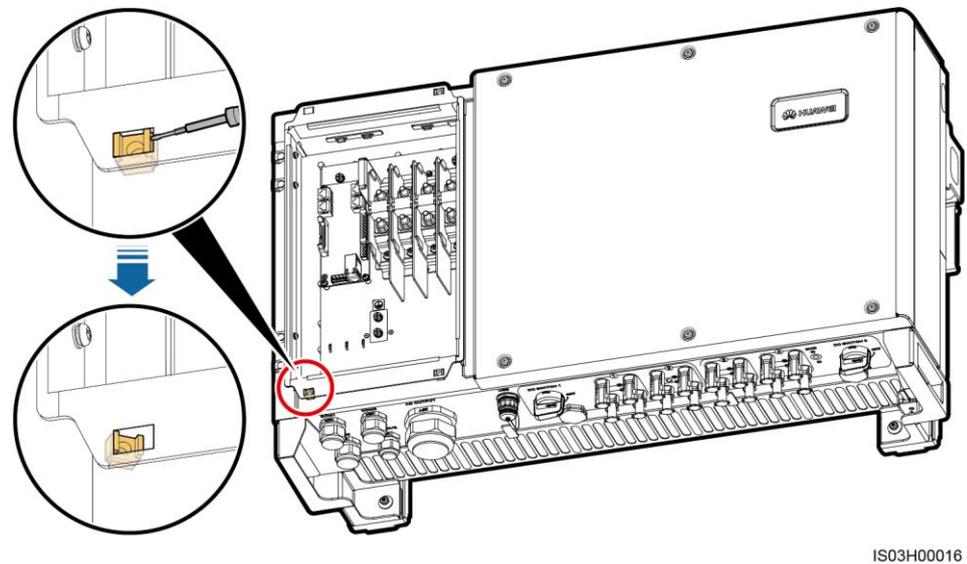
**Figure 5-54** Tightening screws on the maintenance compartment door



**NOTE**

- If a screw on the maintenance compartment door is missing, use the unused ground screw on the chassis shell as a standby screw.
- If the floating nut used for securing the maintenance compartment door is missing, use the standby floating nut shown in [Figure 5-55](#).

**Figure 5-55** Removing a standby floating nut



----End

# 6 System Commissioning

---

## 6.1 Checking Before Power-On

1. The SUN2000 is installed correctly and securely.
2. Check that the two DC switches at the bottom of the SUN2000 and the downstream AC output switch are OFF.
3. No connected cable is damaged.
4. Ground cables are connected securely, without open circuits or short circuits.
5. AC output power cables are connected correctly and securely, without open circuits or short circuits.
6. DC input power cables are connected correctly and securely, without open circuits or short circuits.
7. The communications cables are connected correctly and securely.
8. All pipes or used waterproof connectors at the chassis bottom are applied with firestop putty.
9. The AC terminal cover is reinstalled.
10. Check that the maintenance compartment is clean and tidy, without foreign matter.
11. The maintenance compartment door is closed and the door screws are tightened.
12. Idle DC input terminals are sealed.
13. The idle USB port is plugged with cover.
14. Idle RESERVE and COM waterproof connectors are plugged and the locking caps are tightened.

## 6.2 Powering On the SUN2000

### Prerequisites

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. The SUN2000 can start normally after the fault is automatically rectified. The default alarm clearance time is 1 minute. You can modify the time over the NMS software installed on the PC that connects to the SUN2000.

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

**Step 3** (Optional) Measure the temperatures at the joints between DC terminals and connectors using a point-test thermometer.

To ensure that the DC terminals are in good contact, check the temperatures at the joints between DC terminals and connectors after the SUN2000 has been running for a period of time. Ensure that the temperature rise does not exceed 40 °C (104 °F).

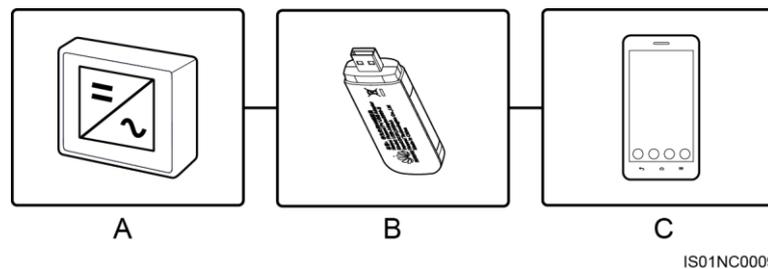
**Step 4** Connect the SUN2000 to the mobile phone that runs SUN2000 app (app for short) through a Bluetooth module or USB data cable.



## 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.
- When you use a Bluetooth module to set up the connection, ensure that the mobile phone and SUN2000 are at most 5 meters (196.85 inches) away from each other. Otherwise, the communication quality between them will deteriorate.
- The screen snapshots in this document correspond to app V200R001C20SPC010 (Android).

**Figure 6-1** Bluetooth module connection (Android and iOS)



(A) Inverter

(B) Bluetooth module

(C) Mobile phone

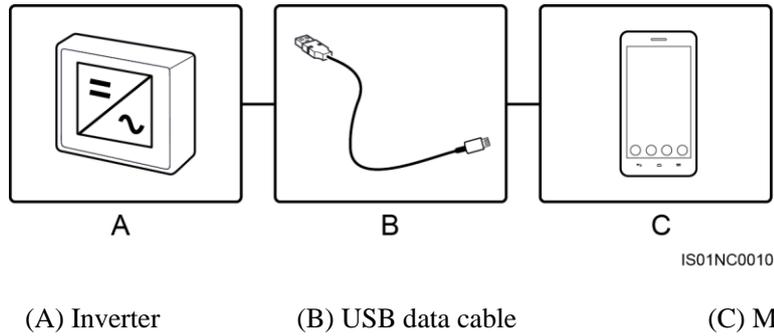


## NOTE

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 (Android)

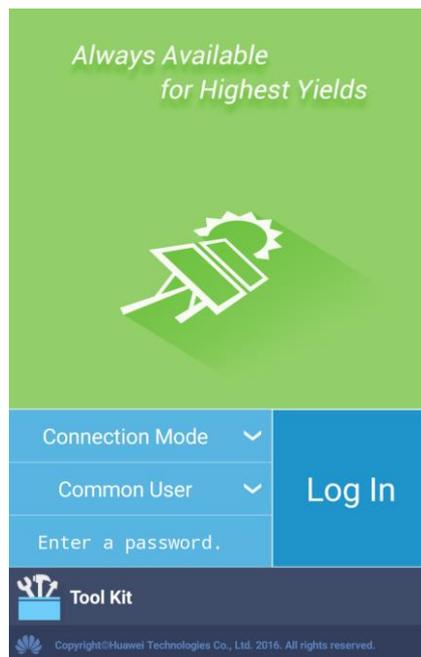


 **NOTE**

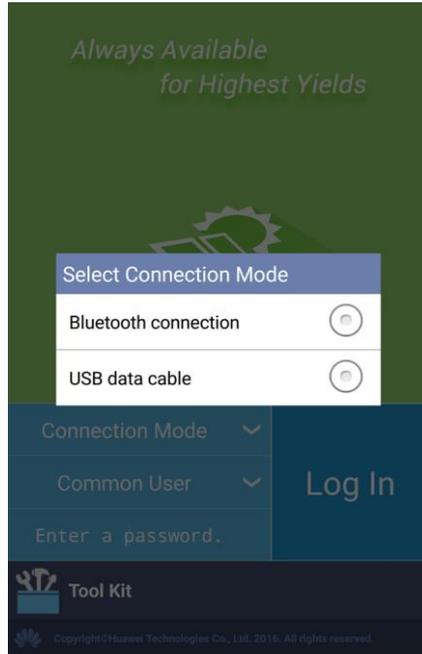
Use the USB data cable delivered with the mobile phone.

- The port type of the USB data cable connected to the SUN2000 is USB 2.0.
- If the mobile phone provides a USB Type-C port, prepare a USB Type C to USB 2.0 adapter cable.

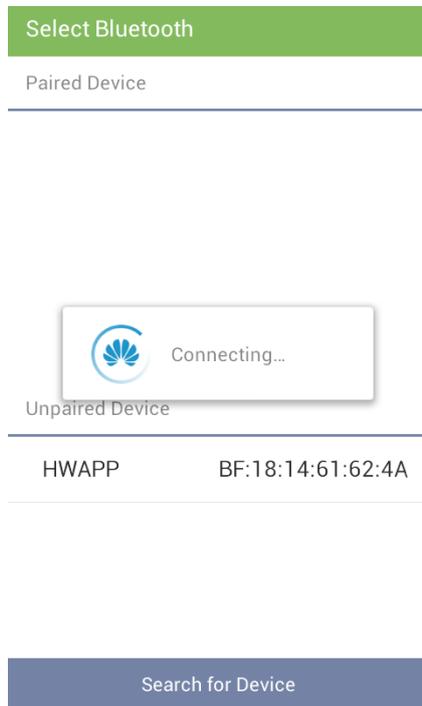
**Figure 6-3** Login screen



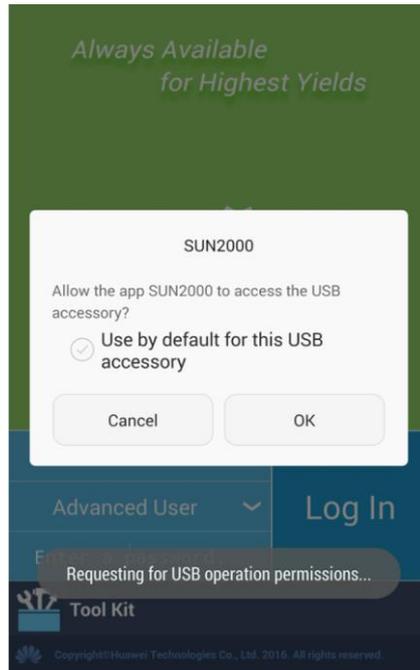
**Figure 6-4** Selecting a connection mode



**Figure 6-5** Bluetooth connection



**Figure 6-6** Data cable connection

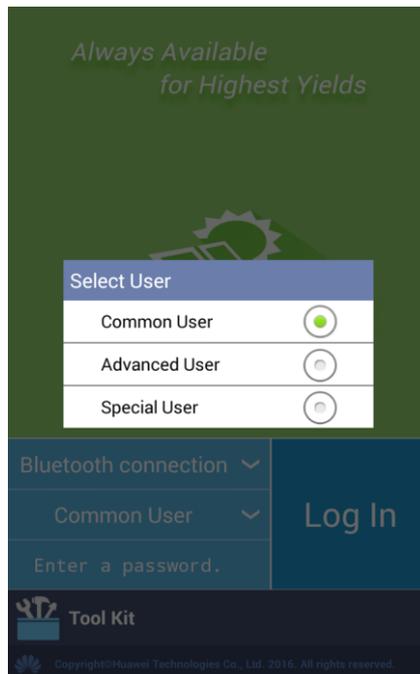


**NOTE**

After you select **Use by default for this USB accessory**, the message will not appear if you connect the app to the SUN2000 again without removing the USB data cable.

**Step 5** Tap the user name area to switch between the 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 when the SUN2000 connects 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 the login, if an incorrect password is entered for five consecutive times (the interval between two consecutive invalid password entries is less than 2 minutes), the account will be locked for 10 minutes. The password consists of six digits.

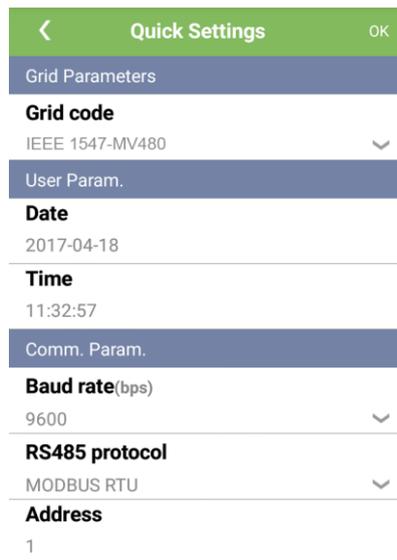
**Step 6** Enter the password and tap **Log In**.

**Step 7** After the successful login, the **Quick Settings** screen or **Function Menu** screen is displayed.

 **NOTE**

- If you log in to the 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 which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. By default, the SUN2000 can be grid-tied and you do not have to set parameters.
- You are advised to log in to the **Quick Settings** screen as an advanced user for parameter settings.

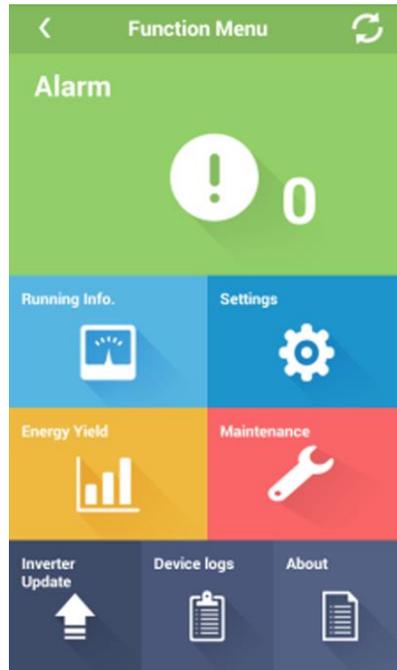
**Figure 6-8** Quick Settings screen (logging in as an advanced user)



 **NOTE**

- Set the power grid code that applies to the country or region where the power station is located and the inverter model.
- Set user parameters based on the current date and time.
- Set **Baud rate**, **RS485 protocol**, and **Address** based on site requirements. **Baud rate** can be set to **4800**, **9600**, or **19200**. **RS485 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 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** Function Menu screen



----End

## 6.3 Powering Off the SUN2000

### Context



### 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 protective gloves and begin servicing the SUN2000 five minutes after the 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** Set the two DC switches to OFF.

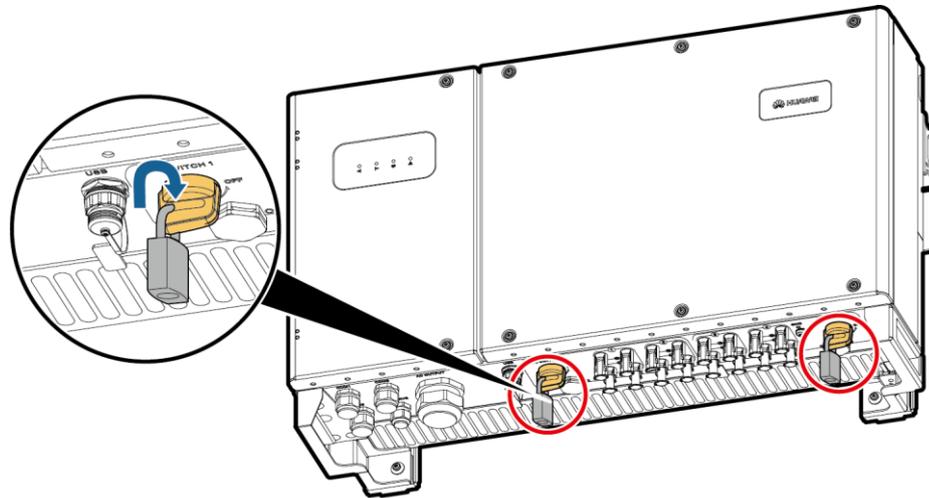
**Step 4** (Optional) Install locks on the DC switches.



**NOTE**

Turn off the DC switches. To prevent turning on the switches by mistake, you are advised to lock the DC switches.

**Figure 6-10** Installing locks



IS03H00040

----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.

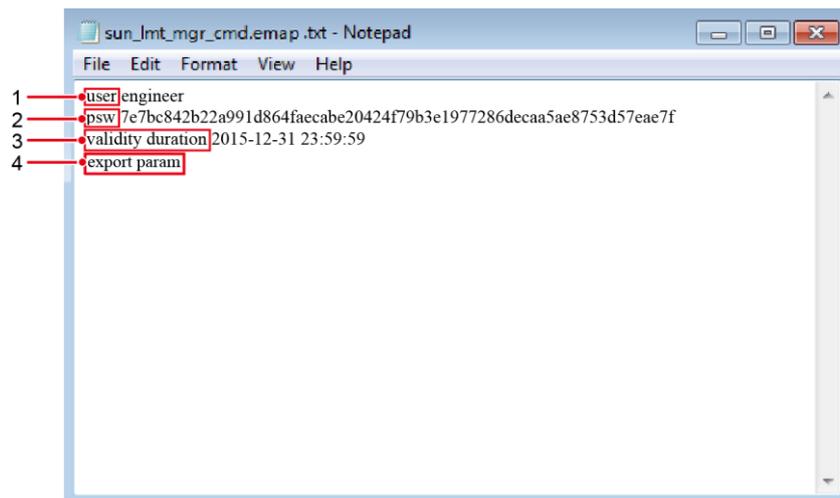
### 7.1.1 Exporting Configurations

#### Procedure

- Step 1** Generate a boot script file by choosing **Tool Kit > Local maintenance script > Inverter maint script > Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.
- 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	The script validity period varies depending on the script export time.
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** Generate a boot script file by choosing **Tool Kit > Local maintenance script > Inverter maint script > Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.
- 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** Generate a boot script file by choosing **Tool Kit > Local maintenance script > Inverter maint script > Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.
- 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 solar radiation or unstable at dawn or dusk due to poor solar radiation.

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 the USB, 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.
- If the SUN2000 needs to be upgraded when the PV power supply is unavailable at night due to no solar radiation or unstable at dawn or dusk due to poor solar radiation, ensure that the SUN2000 AC output connects to the power grid.

### Procedure

**Step 1** Log in to <http://support.huawei.com/carrier/> and browse or search for **SUN2000** on the **Product Support** tab page. Download the required upgrade package (for example, SUN2000 V200R002C20SPCXXX) from the **Software** tab page.

**Step 2** Decompress the upgrade package.

After obtaining the upgrade package **SUN2000V200R002C20SPCXXX\_package.zip**, decompress it and ensure that the extracted files include:

- config.txt
- sun\_lmt\_mgr\_cmd.emap (This is a boot script file.)
- SUN2000.bin
- SUN2000\_CPLD.bin
- SUN2000\_FLT\_Release.bin
- SUN2000\_Master\_Release.bin
- SUN2000\_Slave\_Release.bin
- vercfg.xml



### 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** Generate a boot script file by choosing **Tool Kit > Local maintenance script > Inverter maint script > Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

**Step 4** Import the boot script file to a computer.

**Step 5** Replace the boot script file in the upgrade package with the one generated by the SUN2000 APP.

**Step 6** Copy the extracted files to the root directory of the USB flash drive.



### NOTE

Ensure that all upgrade files are copied 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	There is an operation with

LED Indicator	Status	Meaning
	for 1s and then off for 1s)	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 turn off during the restart. After the restart, the green indicator is blinking at long intervals (on for 1s and then off for 1s) for 1 minute until it becomes steady on, which indicates that the upgrade is successful.



**NOTE**

The SUN2000 can also be upgraded through the **Inverter Update** in the SUN2000 APP. For details, see the *SUN2000 APP User Manual*.

----End

## 7.2 Operations with a SmartLogger

For operations with a SmartLogger, see the *SmartLogger2000 User Manual*.

## 7.3 Operations with the NMS

For operations with the NMS, see the *iManager NetEco 1000S User Manual*.

## 7.4 Operations with the SUN2000 APP

For operations with the SUN2000 APP, see the *SUN2000 APP User Manual*.

# 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 SUN2000](#)) and ensure that the two DC switches on the SUN2000 are OFF.
- If you need to open the maintenance compartment door in 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 in rainy or snowy days.

**Table 8-1** Maintenance list

Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles or dust.	Once six months to a year
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 six months
Cable 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> </ul>	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six

Item	Check Method	Maintenance Interval
	<ul style="list-style-type: none"> <li>Check that the cover on the USB port is tightened.</li> <li>Check that idle RESERVE and COM waterproof connectors are plugged and the locking caps are tightened.</li> </ul>	months to a year.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.

## 8.2 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000 enters the shutdown mode and disconnects from the power grid to stop generating electricity after a fault occurs.
- Minor: Some components are faulty but the SUN2000 can still generate electricity.
- Warning: The SUN2000 output power decreases due to external factors.

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

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
103	High DC Input Voltage	Major	<ul style="list-style-type: none"> <li>• Cause ID = 1 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 1 and 2, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage.</li> <li>• Cause ID = 2 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 3 and 4, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage.</li> <li>• Cause ID = 3</li> </ul>	<ul style="list-style-type: none"> <li>• Cause ID = 1 Reduce the number of PV modules connected in series to PV strings 1 and 2 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears.</li> <li>• Cause ID = 2 Reduce the number of PV modules connected in series to PV strings 3 and 4 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears.</li> <li>• Cause ID = 3</li> </ul>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			<p>The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 5 and 6, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage.</p> <ul style="list-style-type: none"> <li>• Cause ID = 4</li> </ul> <p>The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 7 and 8, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage.</p>	<p>Reduce the number of PV modules connected in series to PV strings 5 and 6 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears.</p> <ul style="list-style-type: none"> <li>• Cause ID = 4</li> </ul> <p>Reduce the number of PV modules connected in series to PV strings 7 and 8 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears.</p>
106–113	Abnormal String 1–8	Warning	<p>Cause ID = 1</p> <ul style="list-style-type: none"> <li>• The PV string is shielded from sunlight for a long time.</li> <li>• The PV string deteriorates or is damaged.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check whether the PV string current is obviously lower than the currents of other PV strings.</li> <li>2. If yes, check whether the PV string is shielded from sunlight.</li> <li>3. If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty.</li> </ol>
120–127	String 1–8 Reversed	<p>Cause ID = 1: Major</p> <p>Cause ID = 2: Warning</p>	<ul style="list-style-type: none"> <li>• Cause ID = 1</li> </ul> <p>The PV string is reversely connected.</p> <ul style="list-style-type: none"> <li>• Cause ID = 2</li> </ul> <p>Only a few PV modules are connected in series to the PV string, and therefore the end voltage is lower than that of other PV strings.</p>	<ul style="list-style-type: none"> <li>• Cause ID = 1</li> </ul> <p>Check whether the PV string is reversely connected to the SUN2000. If yes, turn off the two DC switches after the PV string voltage drops within the safe voltage range (lower than 60 V DC), and then correct the PV string connection.</p> <ul style="list-style-type: none"> <li>• Cause ID = 2</li> </ul> <p>Check whether the number of PV modules connected in series to the SUN2000 is small. If yes, increase the number.</p>
200	Abnormal DC Circuit	Major	<p>Abnormal external conditions trigger the protection for the DC circuit inside the SUN2000. The possible causes are as follows:</p> <ul style="list-style-type: none"> <li>• Cause ID = 3</li> </ul> <p>The SUN2000 input is disconnected accidentally, or the PV string output</p>	<p>Cause ID = 3/10/11</p> <ol style="list-style-type: none"> <li>1. The SUN2000 detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers.</li> <li>2. If the alarm persists, contact Huawei technical support.</li> </ol> <p>Cause ID = 12/15</p>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			<p>power changes sharply because the PV string is shielded from sunlight.</p> <ul style="list-style-type: none"> <li>• Cause ID = 10 The three phases of the power grid are seriously unbalanced, which triggers the protection for the internal control circuit of the SUN2000.</li> <li>• Cause ID = 11 The power grid voltage changes sharply and the SUN2000 input power fails to discharge in a short time, which increases the internal voltage and triggers overvoltage protection.</li> <li>• Cause ID = 12/15 An unrecoverable fault occurs on a circuit inside the SUN2000.</li> </ul>	<p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p>
202	Abnormal Invert Circuit	Major	<p>Abnormal external conditions trigger the protection for the inverter circuit inside the SUN2000. The possible causes are as follows:</p> <ul style="list-style-type: none"> <li>• Cause ID = 13 The power grid voltage drops dramatically or the power grid is short-circuited, which damages the internal voltage detection circuit in the SUN2000.</li> <li>• Cause ID = 14 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.</li> <li>• Cause ID = 16 The DC current in the power grid exceeds the upper</li> </ul>	<p>Cause ID = 13/14/16</p> <ol style="list-style-type: none"> <li>1. The inverter detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers.</li> <li>2. If the alarm persists, contact Huawei technical support.</li> </ol> <p>Cause ID = 20</p> <ol style="list-style-type: none"> <li>1. Check the inverter output cable for short-circuits.</li> <li>2. If the alarm persists, contact Huawei technical support.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			<p>threshold.</p> <ul style="list-style-type: none"> <li>• Cause ID = 20</li> </ul> <p>The inverter output is short-circuited. As a result, the output current surges to a value above the upper limit, and the inverter protection is triggered.</p>	
301	Abnormal Grid Voltage	Major	<p>The power grid voltage is beyond the acceptable range. The possible causes are as follows:</p> <ul style="list-style-type: none"> <li>• Cause ID = 4</li> </ul> <p>The power grid voltage is below the specified lower threshold.</p> <ul style="list-style-type: none"> <li>• Cause ID = 16</li> </ul> <p>The power grid voltage exceeds the specified upper threshold.</p> <ul style="list-style-type: none"> <li>• Cause ID = 19</li> </ul> <p>The power grid voltage has exceeded the specified upper threshold for 10 minutes.</p> <ul style="list-style-type: none"> <li>• Cause ID = 26</li> </ul> <p>The power grid voltage exceeds the specified upper threshold.</p> <ul style="list-style-type: none"> <li>• Cause ID = 28</li> </ul> <p>The three phases of the power grid differ greatly in voltage.</p> <ul style="list-style-type: none"> <li>• Cause ID = 29</li> </ul> <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> <ul style="list-style-type: none"> <li>• Cause ID = 31/32/33</li> </ul> <p>The impedance of the output phase wire A (Cause ID = 31)/B (Cause ID = 32)/C (Cause ID = 33) to the PE is low or short-circuited.</p>	<p>Cause ID = 4</p> <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, log in to the SUN2000 APP, SmartLogger, or NMS to modify the power grid overvoltage and undervoltage protection thresholds with the consent of the local power operator.</li> <li>3. If the fault persists for a long time, check the AC switch and AC output power cable.</li> </ol> <p>Cause ID = 16/19/26</p> <ol style="list-style-type: none"> <li>1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator.</li> <li>2. If you have confirmed that the grid-tied voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage and undervoltage protection thresholds.</li> <li>3. Check whether the peak power grid voltage exceeds the upper threshold.</li> </ol> <p>Cause ID = 28</p> <ol style="list-style-type: none"> <li>1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
				<p>fault is rectified.</p> <p>2. If the alarm persists and affects the energy yield of the power station, contact the local power operator.</p> <p>Cause ID = 29</p> <p>1. Check the AC voltage.</p> <p>2. Check that the AC power cable is securely connected and that the AC switch is ON.</p> <p>Cause ID = 31/32/33</p> <p>Check the impedance of output phase wire A (Cause ID = 31)/B (Cause ID = 32)/C (Cause ID = 33) to the PE and locate the position with lower impedance and resolve the issue.</p>
305	Abnormal Grid Frequency	Major	<ul style="list-style-type: none"> <li>• Cause ID = 2 The actual power grid frequency is higher than the standard requirement for the local power grid.</li> <li>• Cause ID = 4 The actual power grid frequency is lower than the standard requirement for the local power grid.</li> <li>• Cause ID = 5 The actual change rate of the power grid frequency does not meet the standard requirement for the local power grid.</li> </ul>	<p>Cause ID = 2/4</p> <p>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.</p> <p>2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 APP, SmartLogger, or NMS to modify the power grid overfrequency and underfrequency protection thresholds with the consent of the local power operator.</p> <p>Cause ID = 5</p> <p>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.</p> <p>2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator.</p>
313	Low	Major	Cause ID = 1	1. Check the impedance between

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
	Insulation Resistance		<ul style="list-style-type: none"> <li>A short circuit occurs between the PV string and the PGND cable.</li> <li>The PV string is installed in a moist environment for a long time.</li> </ul>	<p>the PV string and the PGND cable. If a short circuit occurs, rectify the fault.</p> <p>2. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, log in to the SUN2000 APP, SmartLogger, or NMS and set <b>Insulation resistance protection</b>.</p>
318	Abnormal Residual Current	Major	<p>Cause ID = 1</p> <p>The insulation resistance against the PGND cable at the input side decreases when the SUN2000 is running, which causes an excessively high residual current.</p>	<p>1. If the alarm occurs accidentally, the external circuit may be abnormal temporarily. The SUN2000 automatically recovers after fault is rectified.</p> <p>2. If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low.</p>
321	Cabinet Overtemperature	Major	<p>Cause ID = 1</p> <ul style="list-style-type: none"> <li>The SUN2000 is installed in a place with poor ventilation.</li> <li>The ambient temperature exceeds the upper threshold.</li> <li>The internal fan works abnormally.</li> </ul>	<p>1. Check the ventilation and ambient temperature of the SUN2000 installation position.</p> <p>2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation.</p> <p>3. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.</p>
322	Abnormal SPI Communication	Major	<p>Cause ID = 1</p> <p>An unrecoverable fault occurs on a circuit inside the SUN2000.</p>	<p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p>
326	Abnormal Grounding	Major	<p>Cause ID = 1</p> <ul style="list-style-type: none"> <li>The neutral wire or PGND cable does not connect to the SUN2000.</li> <li>When you are grounding the PV string, you do not connect an isolation transformer to the inverter output.</li> </ul>	<p>1. Check that the neutral wire or PGND cable properly connects to the inverter.</p> <p>2. If the PV string is grounded, check whether the inverter output needs to connect to an isolation transformer. If yes, connect the transformer to the SUN2000.</p>
400	System Fault	Major	<p>Cause ID = 1/3/21/23/27</p> <p>An unrecoverable fault occurs</p>	<p>Turn off the AC output switch and DC input switch. Then turn on the</p>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			on a circuit inside the SUN2000.	AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.
410	Abnormal Auxiliary Power	Major	<p>Cause ID = 4</p> <p>The sampling control board has an abnormal voltage, which may be caused by the following:</p> <ul style="list-style-type: none"> <li>• The internal power chip of the sampling control board is faulty.</li> <li>• The detection circuit becomes faulty.</li> </ul>	<ol style="list-style-type: none"> <li>1. When the alarm is generated, the SUN2000 shuts down automatically. When the fault is rectified, the SUN2000 starts automatically.</li> <li>2. If the alarm persists, contact Huawei technical support.</li> </ol>
411	AFCI Self-Check Failure	Major	<p>Cause ID = 1/2/3</p> <p>AFCI check fails.</p>	<ol style="list-style-type: none"> <li>1. Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</li> <li>2. Disable the AFCI function if you are sure not to use it.</li> </ol>
412	DC Arc Fault	Major	<p>Cause ID = 1/2/3/4</p> <p>The PV string cable is in poor contact or with open circuits.</p>	Check whether the PV string cable is in poor contact or with open circuits. If yes, reconnect the cable.
504	Software Version Unmatch	Minor	<p>Cause ID = 1/2/3</p> <p>During inverter software upgrade, the version of the software loaded is incorrect.</p>	Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.
505	Upgrade Failed	Major	<p>Cause ID = 1</p> <p>The upgrade does not end normally.</p>	Perform the upgrade again.
61440	Flash Fault	Minor	<p>Cause ID = 1</p> <ul style="list-style-type: none"> <li>• The flash memory is insufficient.</li> <li>• The flash memory has bad sectors.</li> </ul>	<ol style="list-style-type: none"> <li>1. Replace the monitoring board.</li> <li>2. If the monitoring board is built into the monitoring device, replace the monitoring device.</li> </ol>



**NOTE**

If you cannot rectify faults with the measures listed in the preceding table, contact Huawei technical support.

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# 9 Handling the SUN2000

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## 9.1 Removing the SUN2000



### NOTICE

Before removing the SUN2000, disconnect both the AC and DC power supplies. For processes of disconnecting the power supplies, see [6.3 Powering Off the SUN2000](#). After powering off the SUN2000, wait at least 5 minutes before performing operations on it.

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Perform the following operations to remove the SUN2000:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and ground 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	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Maximum conversion efficiency	98.9%		
CEC efficiency	98.5%		

## Input

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Maximum input power	37,500 W	41,000 W	45,100 W
Maximum input voltage	1000 V		
Maximum input current (per MPPT)	22 A		
Maximum short-circuit current (per MPPT)	30 A		
Maximum inverter backfeed current to the PV array	0 A		
Minimum startup voltage	250 V		
MPPT voltage range at full load	460–850 V	490–850 V	530–850 V

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
MPPT voltage range	200–1000 V		
Rated input voltage	720 V		
Number of inputs	8		
Number of MPPT circuits	4		

## Output

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Rated output power	33,300 W	36,000 W	40,000 W
Maximum apparent power	36,600 VA	40,000 VA	44,000 VA
Maximum AC output power (cosφ = 1)	36,600 W	40,000 W	44,000 W
Rated output voltage	277 V/480 V, 3W+PE/3W+N <sup>a</sup> +PE		
Rated output current	40.1 A	43.4 A	48.2 A
Maximum output current	44.1 A	48.2 A	53 A
Adapted power grid frequency	60 Hz		
Power factor	0.8 lagging ... 0.8 leading		
Total harmonic distortion (THD)	< 3%		
<p>Note a: Choose whether to connect the neutral wire based on the application scenario. When the SUN2000 is used in a scenario with the neutral wire, you need to set <b>Output mode</b> to <b>Three-phase, four-wire</b> on the SUN2000 APP, SmartLogger, or NMS.</p>			

## Protection

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Standalone operating detection (anti-islanding protection)	Supported		

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Input DC switch	Supported		
Output overcurrent protection	Supported		
Input reverse connection protection	Supported		
PV string fault detection	Supported		
DC surge protection	Category C		
AC surge protection	Category C		
Insulation resistance detection	Supported		
Residual current device (RCD) detection	Supported		

## Communication

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Display	LED indicator, Bluetooth + APP, USB data cable + APP		
RS485	Supported		
USB	Supported		
PLC	Supported		

## Common Parameters

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Dimensions (W x H x D)	930 mm x 550 mm x 260 mm (36.61 in. x 21.65 in. x 10.24 in.)		
Weight	55 kg (121.25 lb)		
Operating temperature	-25 °C to +60 °C (-13 °F to +140 °F)		
Cooling mode	Natural convection		

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Altitude	5000 m (16404.20 ft, derated when the altitude is greater than 4000 m [13123.36 ft])		
Humidity	0%–100% RH		
Input terminal	Amphenol HH4 or MC4		
Output terminal	Waterproof PG connector + OT terminal		
Protection level	Type 4X		
Topology	Transformerless		

## Standards Compliance

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Criterion	UL 1741, UL 1699B, UL 1998, CSA C22.2 #107.1-01, FCC Part 15, IEEE 1547, IEEE 1547.1		

# A Grid Codes

Set the grid code that applies to the country or region where the PV plant is located.

**Table A-1** Grid codes

No.	Grid Code	Description
1	IEEE 1547-MV480	US medium-voltage power grid
2	IEEE 1547a-MV480	2016 US medium-voltage power grid
3	PRC_024_ERCOT-MV480	Texas medium-voltage power grid
4	PRC_024_Eastern-MV480	Eastern US medium-voltage power grid
5	PRC_024_Western-MV480	Western US medium-voltage power grid
6	PRC_024_Quebec-MV480	Quebec medium-voltage power grid
7	ELECTRIC RULE NO.21-MV480	California medium-voltage power grid
8	HECO-MV480	Hawaii medium-voltage power grid



**NOTE**

The grid codes are subject to change. The listed codes are for reference only.

# B Acronyms and Abbreviations

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## A

**ACDU** AC distribution unit

## C

**CCO** central controller

## E

**EFUP** environmentally friendly use period

## L

**LED** light emitting diode

## M

**MPP** maximum power point

**MPPT** maximum power point tracking

## N

**NMS** network management system

## P

**PID** potential induced degradation

**PLC** power line communication

**PV** photovoltaic

**R**

**RCD**

residual current device

**T**

**THD**

total harmonic distortion

**W**

**WEEE**

waste electrical and electronic equipment