SUN2000-(33KTL-A, 36KTL, 42KTL)

User Manual

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About This Document

Purpose

This document describes the SUN2000-33KTL-A/36KTL/42KTL (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) plant personnel and qualified electrical technicians.

Symbol Conventions

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

Symbol	Description
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	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.
NOTE	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 07 (2018-05-04)

Updated 5.3 Connecting AC Output Power Cables.

Added the description about the metal stamping forming contact in 5.4 Connecting DC Input Power Cables.

Issue 06 (2017-11-29)

Updated 3 Inverter Storage.

Added the description about rubber fittings, and updated 5.3 Connecting AC Output Power Cables.

Updated A Grid Codes.

Issue 05 (2017-09-25)

Added the requirements for OT terminals in 5.3 Connecting AC Output Power Cables.

Issue 04 (2017-07-30)

Updated 2.3 Label Description.

Updated 5.2 Connecting the Ground Cable (PE).

Updated 10 Technical Specifications.

Issue 03 (2017-03-30)

Added description about the SUN2000-33KTL-A.

Issue 02 (2017-02-20)

Updated Installation Environment Requirements of 4.3 Wall-mounting the SUN2000.

Updated Installation Environment Requirements of 4.4 Support-mounting the SUN2000.

Added the description about the SUN2000-42KTL configured with 4-pin AC terminals in 5.3 Connecting AC Output Power Cables.

Updated 5.4 Connecting DC Input Power Cables.

Updated 8.1 Routine Maintenance.

Issue 01 (2016-07-30)

This issue is the first official release.

Contents

1 Safety Precautions

 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.

Disclaimer

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

Personnel Requirements

Only certified electricians 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.

Protect Labels

- Do not tamper with any warning labels on the inverter enclosure because these labels contain important information about safe operation.
- Do not tamper with the nameplate on the inverter enclosure because it contains important product information.

Installation

- Ensure that the inverter is not connected to a power supply and is not powered on before starting installation.
- Ensure that there are no objects within 300 mm, 200 mm, 500 mm, 600 mm, and 1000 mm of the left, right, top, bottom, and front of the inverter, respectively. This is to allow sufficient space for installation and heat dissipation. For ease of installation, ensure that the inverter bottom is at most 730 mm above the floor. If you have any questions about the distance, consult the local technical support engineers.
- Ensure that the inverter is installed in a well ventilated environment.
- Ensure that the inverter 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 the PE cable, AC power cables and communications cables.

Cable Connections

DANGER

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

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

Operation

DANGER

High voltages may cause electric shocks result in serious injury, death or serious property damage from inverter in operation. Strictly comply with the safety precautions in this document and associated documents when operating the inverter.

- Do not touch an energized inverter because the heat sink may be over 60ºC.
- Follow local laws and regulations when operating the equipment.

Maintenance and Replacement

⚠ **DANGER**

High voltages may cause electric shocks result in serious injury, death or serious property damage from inverter in operation. Prior to maintenance, power off the inverter and strictly comply with the safety precautions in this document and associated documents to operate the inverter.

- Maintain the inverter with sufficient knowledge of this document and proper tools and testing equipment.
- Before performing maintenance tasks, power off the inverter 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 inverter security performance before powering on the inverter again.
- Observe ESD precautions during the maintenance.
- For personal safety, wear insulation gloves and safety shoes.

2 Overview

2.1 Introduction

Function

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

Model

Figure 2-1 shows a model number of the SUN2000, using SUN2000-33KTL-A as an example.

Figure 2-1 Model number description
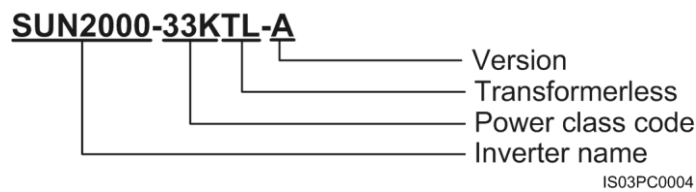
Table 2-1 shows the rated output power and voltage.

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

Model	Rated Output Power	Rated Output Voltage
SUN2000-33KTL-A	30 kW	400 V
SUN2000-36KTL	36 kW	380 V/400 V/480 V
SUN2000-42KTL	42 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 distribution units (ACDUs), and isolation transformer, as shown in Figure 2-2.

Figure 2-2 Network application
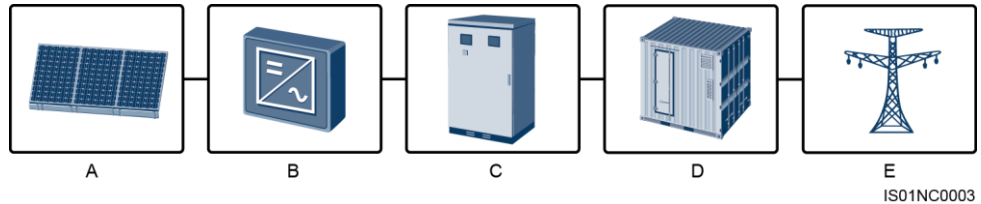
(A) PV string	(B) SUN2000
(C) ACDU	(D) Isolation transformer
(E) Power grid	

Supported Power Grids

The SUN2000-33KTL-A/36KTL supports the following power grid modes: TN-S, TN-C, TN-C-S, TT, and IT. The SUN2000-42KTL supports only IT grid mode.

Figure 2-3 Power grid modes
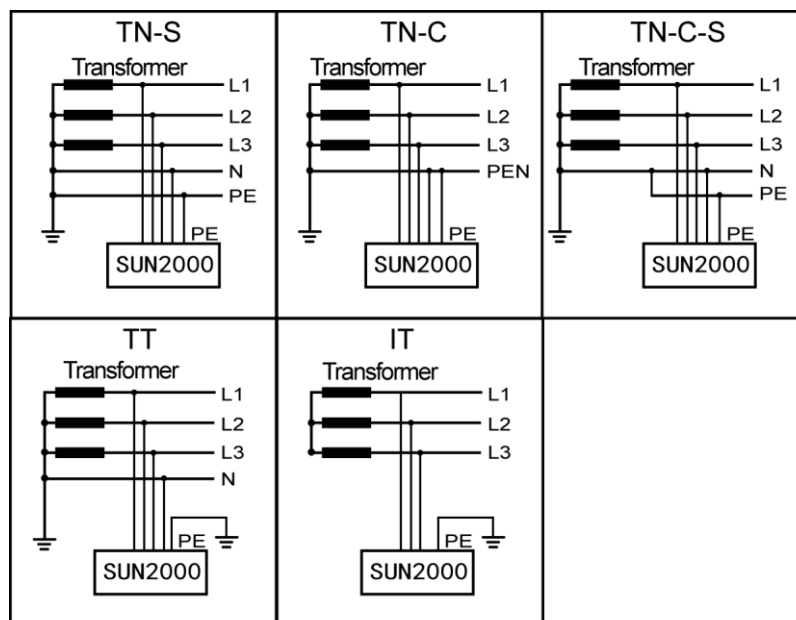
2.2 Appearance

SUN2000 Dimensions

Figure 2-4 shows the SUN2000 dimensions.

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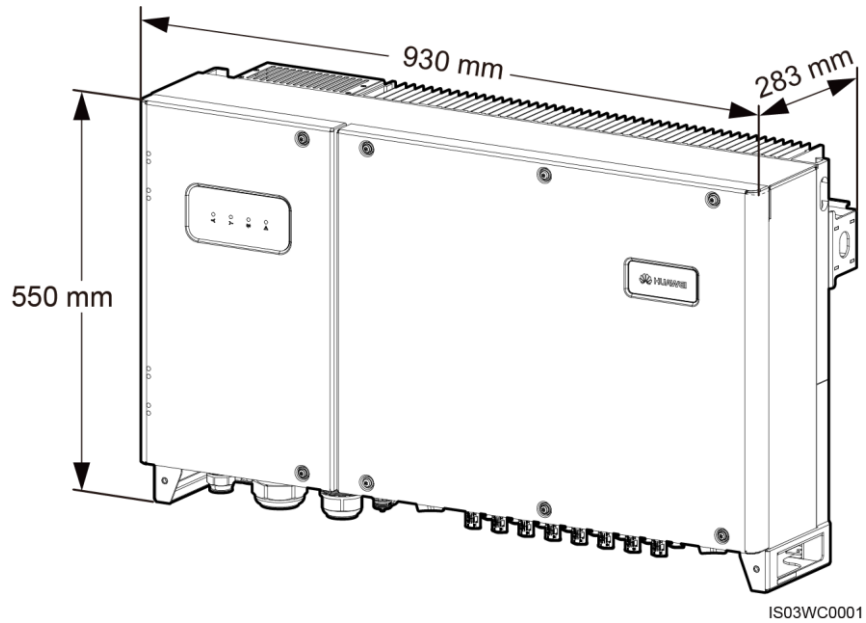
Front View

Figure 2-5 shows the SUN2000 front view.

Figure 2-5 SUN2000 front view

IS03WC0004
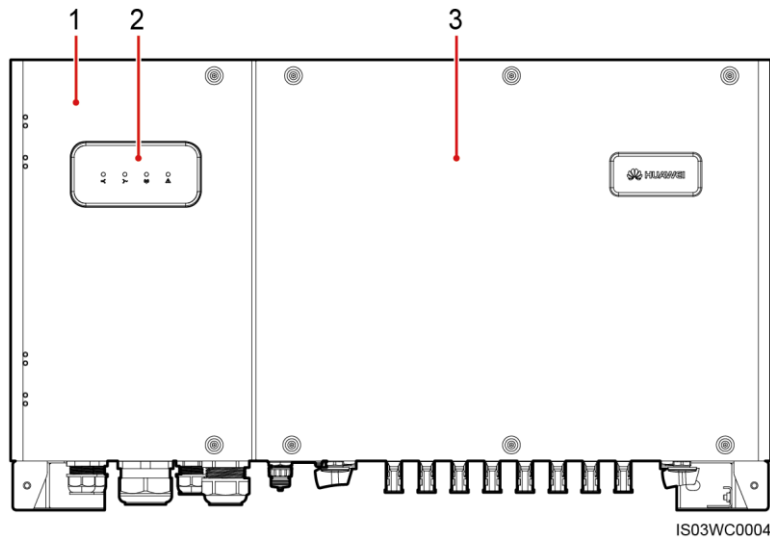
(1) Maintenance compartment door	(2) LED indicator	(3) Host panel

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/FE communication.
	Green off	The SUN2000 has not received data over RS485/PLC/FE communication for 10

Indicator	Status		Meaning
			seconds.
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 major 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
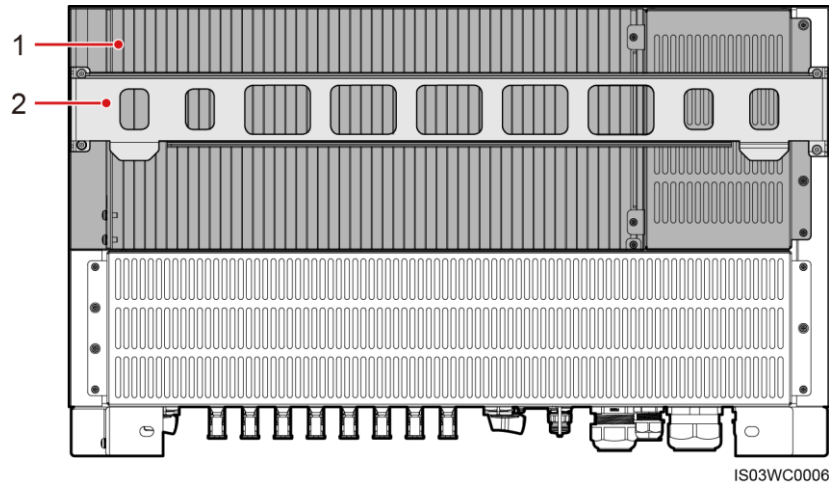
(1) Heat sink   (2) Mounting plate

SUN2000 bottom view

Figure 2-7 shows the SUN2000 bottom view.

Figure 2-7 SUN2000 bottom view
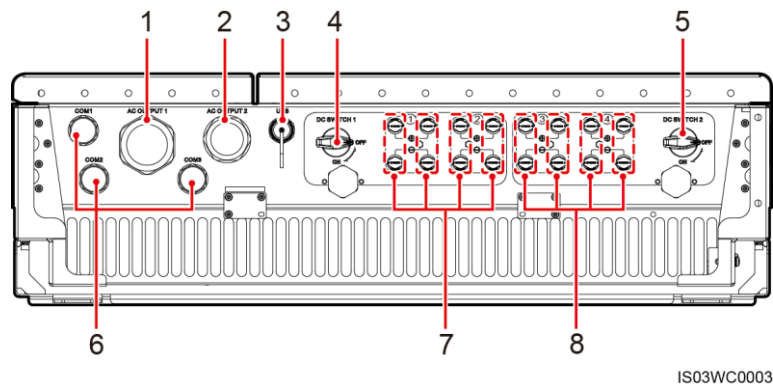
No.	Component	Silk Screen
1	Waterproof cable connector (inner diameter: 18–44 mm)	AC OUTPUT 1
2	Waterproof cable connector (inner diameter: 24–32 mm)	AC OUTPUT 2
3	USB port	USB
4	DC switch 1	DC SWITCH 1
5	DC switch 2	DC SWITCH 2

No.	Component	Silk Screen
6	Waterproof cable connectors (inner diameter: 14–18 mm)	COM1, COM2, COM3
7	DC input terminals (controlled by DC SWITCH 1)	+/–
8	DC input terminals (controlled by DC SWITCH 2)	+/–

 NOTE

- Waterproof cable connector is abbreviated as waterproof connector in the following text.
- Use the USB port only during maintenance (such as power-on setting, upgrade, and data export). Ensure that the USB cover is tightened when the USB port is not in use.

2.3 Label Description

Symbols

Table 2-3 describes the labels on the SUN2000 enclosure and their meanings.

Table 2-3 Label description

Symbol	Name	Meaning
	Running warning	Potential hazards exist after the SUN2000 is powered on. Take protective measures when operating the SUN2000.
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.
5 mins	Delay discharge	- High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. - Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.

Symbol	Name	Meaning
	Refer to documentation	Remind operators to refer to the documents shipped with the SUN2000.
	Grounding	Indicates the position for connecting the protection ground cable.
	Operation warning	Do not remove the DC input connector when the SUN2000 is running.
	DC terminal operation warning[a]	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: 1. Send a shutdown command. 2. Turn off the downstream AC switch. 3. Turn off the two DC switches at the bottom.
	SUN2000 serial number label	Indicates the SUN2000 serial number.
Note a: Fittings supplied with the SUN2000s of specific models contain the DC terminal operation warning label. You are advised to attach the label at the bottom of the SUN2000 front side, as shown in Figure 2-8. You can also select an appropriate place for attaching the label based on site requirements.		

Figure 2-8 Place for attaching

IS03WC0013
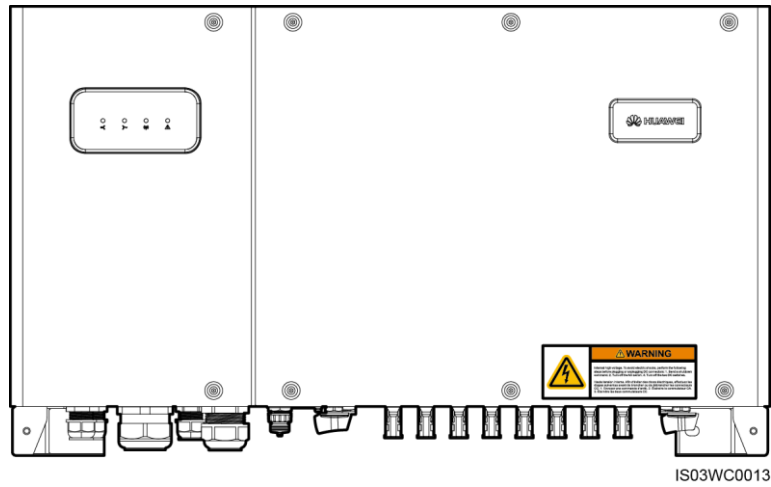
Nameplate

The SUN2000 is labeled with a nameplate on the side that contains the model information, technical specifications, and compliance symbols, as shown in Figure 2-9.

Figure 2-9 Nameplate of the SUN2000-42KTL

IS03W00007

(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 2-4 describes the compliance symbols.

Table 2-4 Compliance symbols

Symbol	Name	Meaning
CQC	CQC certification mark	The SUN2000 has been awarded the NB/T 32004 certification by China Quality Certification Center (CQC).
RCM	RCM certification mark	The SUN2000 complies with RCM certification standards.
TÜVRheinland CERTIFIED	TÜVRheinland certification mark	The SUN2000 complies with TÜVRheinland certification standards.
CE	CE certification mark	The SUN2000 complies with Conformité Européenne (CE) certification standards.
50	Environmentally friendly use period (EFUP) label	The SUN2000 does not pollute the environment during the specified period.
WEEE	EU waste electrical and electronic equipment (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 conceptual diagram for the SUN2000-33KTL-A/36KTL. Figure 2-11 shows the conceptual diagram for the SUN2000-42KTL.

Figure 2-10 Conceptual diagram for the SUN2000-33KTL-A/36KTL
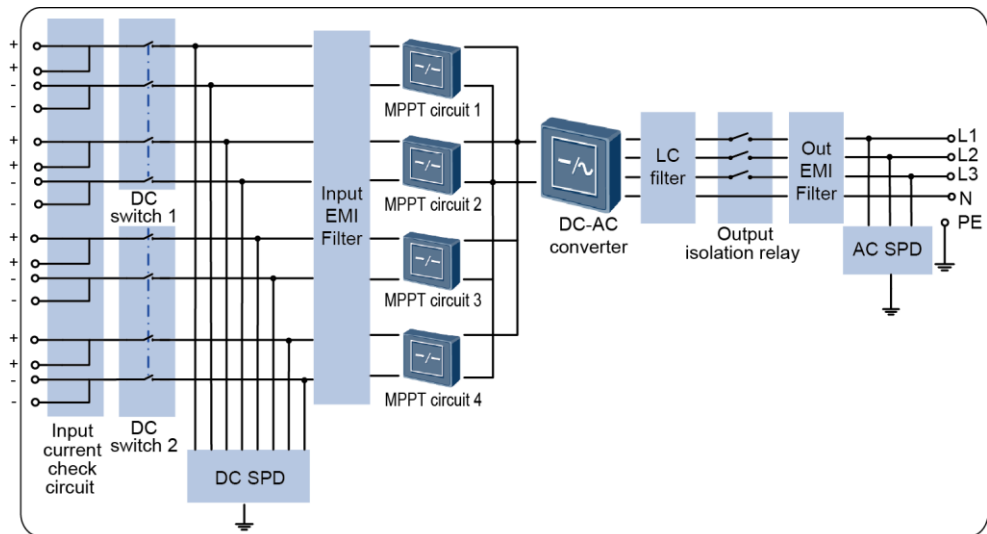
Figure 2-11 Conceptual diagram for the SUN2000-42KTL
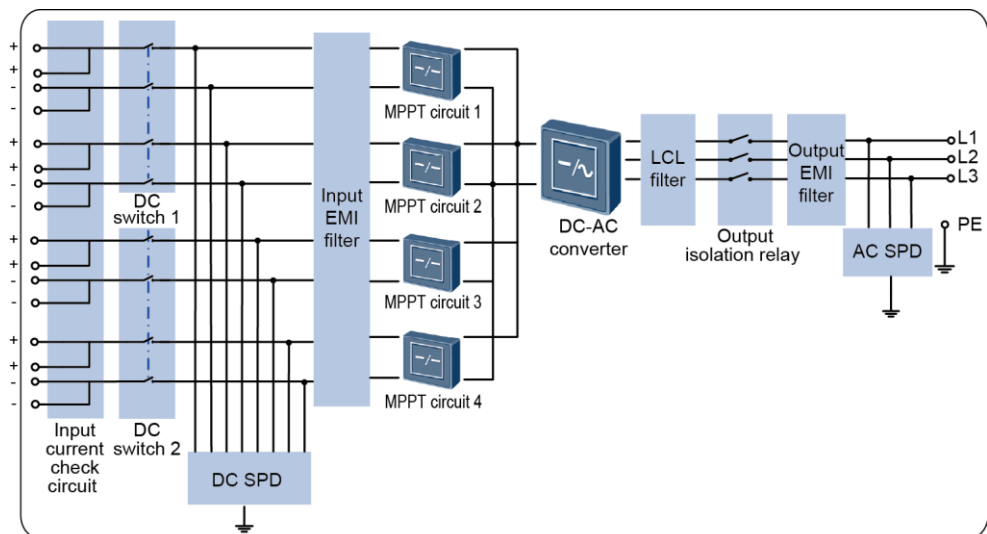
Working Modes

The SUN2000 can work in standby, operating, or shutdown mode. Figure 2-12 shows the relationship between the three working modes.

Figure 2-12 SUN2000 working modes
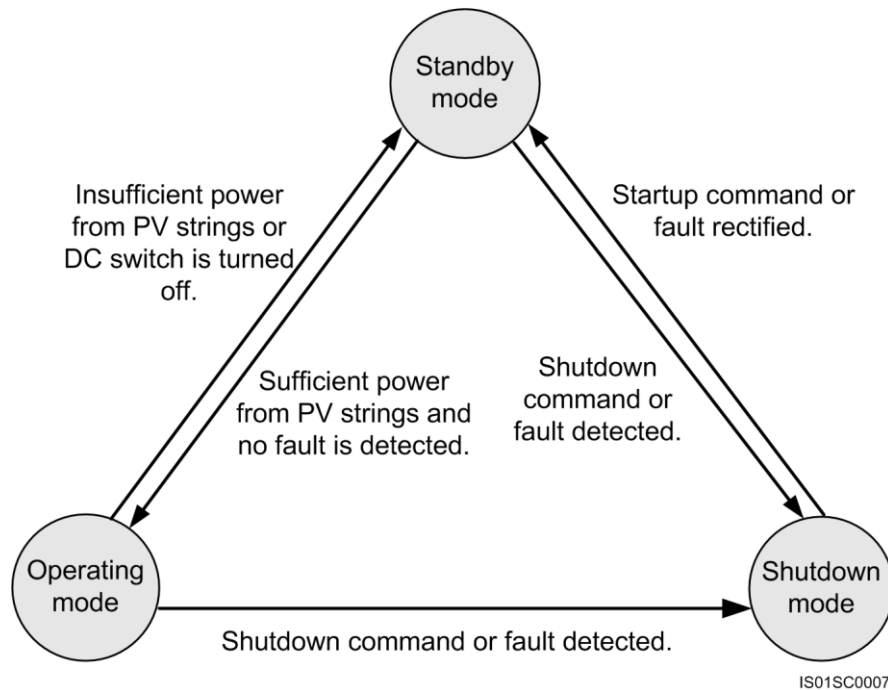
Table 2-5 describes the three working modes shown in Figure 2-12.

Table 2-5 Working mode description

Working Mode	Description
Standby	The SUN2000 enters the standby mode when the external environment does not meet the requirements for starting the SUN2000. In standby mode: • The SUN2000 continuously performs self-check and enters the operating mode once the operating requirements are met. • If the SUN2000 enters the shutdown mode after detecting a shutdown command or a fault after startup.
Operating	In operating mode: • The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. • The SUN2000 tracks the maximum power point to maximize the PV string output. • 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.
Shutdown	• In standby or operating mode, the SUN2000 enters the shutdown mode after detecting a fault or shutdown command. • In shutdown mode, the SUN2000 enters the standby mode after detecting a startup command or that a fault is rectified.

3 Inverter Storage

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

- Put the SUN2000 in the original package. Keep the desiccant and seal it using the adhesive tape.
- Keep the storage temperature at –40°C to +70°C and the humidity at 5%–95% RH.
- The inverter should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of five SUN2000s with the packing dimensions (W x H x D) of 1095 mm x 395 mm x 745 mm can be stacked. A maximum of six SUN2000s with the packing dimensions (W x H x D) of 1045 mm x 400 mm x 680 mm can be stacked. To avoid personal injury or device damage, stack SUN2000s with caution to prevent them from falling over.
- Periodic inspections are required during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the inverter 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

IS06W00018
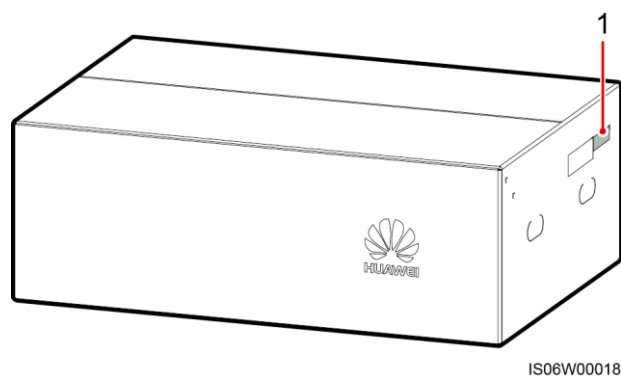
(1) Position of the model label

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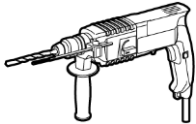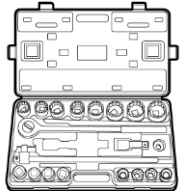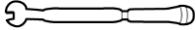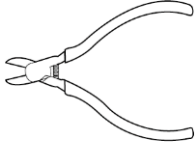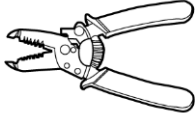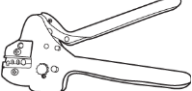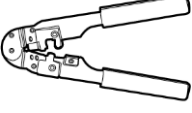
☐ NOTE
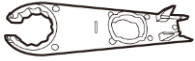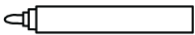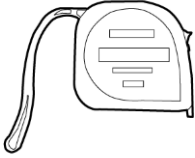
For details about the number of contents, see the *Packing List* in the packing case.
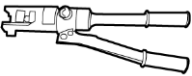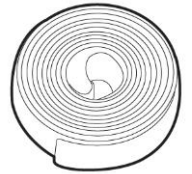
4.2 Tools

Prepare tools required for installation and cable connections.

Tool	Model	Function
Hammer drill	Drill bit: Φ14 mm and Φ16 mm	• Drill bit: Φ14 mm, used for drilling holes in the support. • Drill bit: Φ16 mm, used for drilling holes in the wall.
Adjustable wrench	• With a length of 200 mm • With an open end of 24 mm	Secures bolts.
Socket wrench	N/A	Secures bolts and AC output terminals.
Torque wrench	With an open end of 18 mm, 33 mm, 52 mm, or 65 mm	Secures bolts and locking caps.
Diagonal pliers	N/A	Cut cable ties.
Wire stripper	N/A	Peels cable jackets.

Tool	Model	Function
Flat-head screwdriver	Head: 0.6 mm x 3.5 mm	Connects cables to terminal bases.
Rubber mallet	N/A	Hammers expansion bolts into holes.
Utility knife	N/A	Removes packages.
Cable cutter	N/A	Cuts power cables.
Crimping tool	Model: H4TC0001 or H4TC0002 Manufacturer: Amphenol	Crimps metal contacts when preparing DC input power cables. **NOTE** • H4TC0001 (Amphenol) is used to crimp metal cold forming contacts. • H4TC0002 (Amphenol) is used to crimp metal stamping forming contacts.
RJ45 crimping tool	N/A	Prepares RJ45 connectors for communications cables.

Tool	Model	Function
Removal tool	H4TW0001 Manufacturer: Amphenol	Removes DC connectors from the SUN2000.
Vacuum cleaner	N/A	Cleans up dust after drilling holes.
Multimeter	DC voltage measurement range: ≥ 1100 V DC	Measures voltages.
Marker	Diameter: ≤ 10 mm	Marks signs.
Measuring tape	N/A	Measures distances.
Level	N/A	Levels hole positions.

Tool	Model	Function
Protective gloves	N/A	Protect your hands during installation.
Safety goggles	N/A	Protects the operator's eyes during hole drilling.
Anti-dust respirator	N/A	Protects an operator from dust inhalation 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.

4.3 Wall-mounting the SUN2000

4.3.1 Determining the Installation Position

Basic Requirements

- The SUN2000 is protected to IP65 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 enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install 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. Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Carrier Requirements

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

Installation Angle Requirements

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

Figure 4-2 Correct installation angles
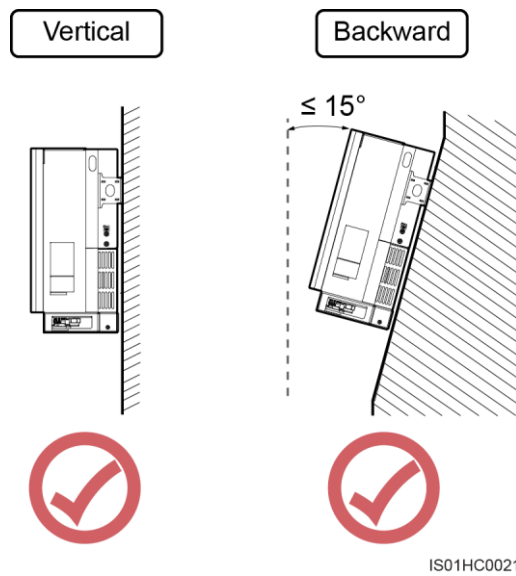
- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

Figure 4-3 Incorrect installation angles

Installation Space Requirements

- The SUN2000 dimensions (W x H x D, including the mounting bracket) are 930 mm x 550 mm x 283 mm. 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
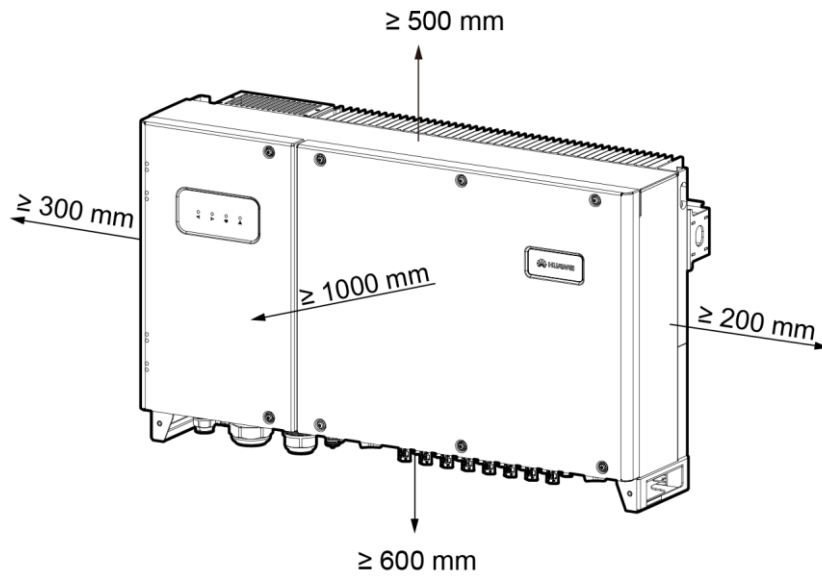
> **NOTE**
>
> For ease of installing the SUN2000 on the mounting bracket, connecting cables to the bottom of the SUN2000, and maintaining the SUN2000 in future, it is recommended that the bottom clearance be greater than or equal to 600 mm and less than or equal to 730 mm. If you have any questions 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. The stacked installation mode is not recommended.

Figure 4-5 Horizontal installation mode (recommended)
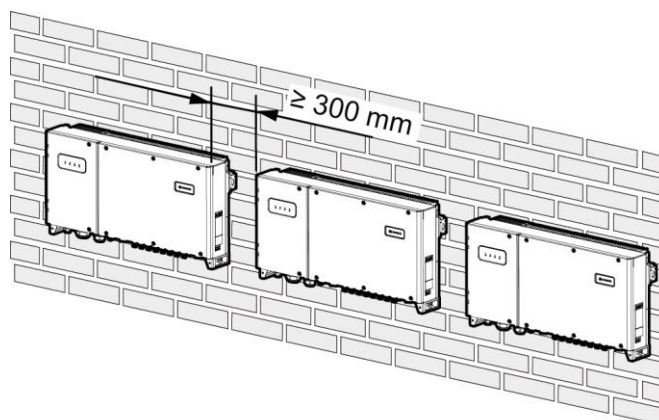
Figure 4-6 Triangle installation mode (recommended)

IS03SC0003
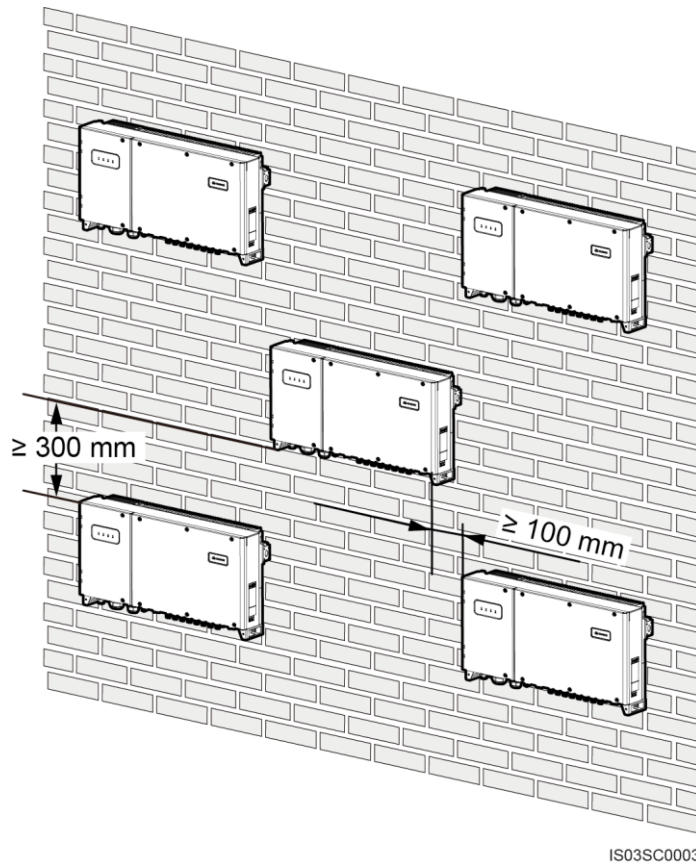
Figure 4-7 Stacked installation mode (not recommended)
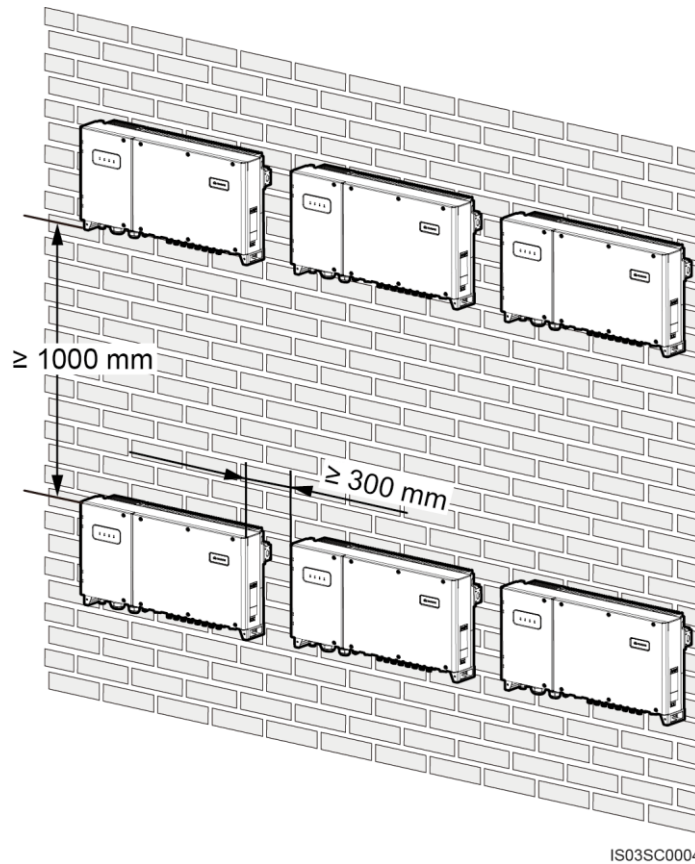
4.3.2 Moving the Inverter

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 Lifting the SUN2000
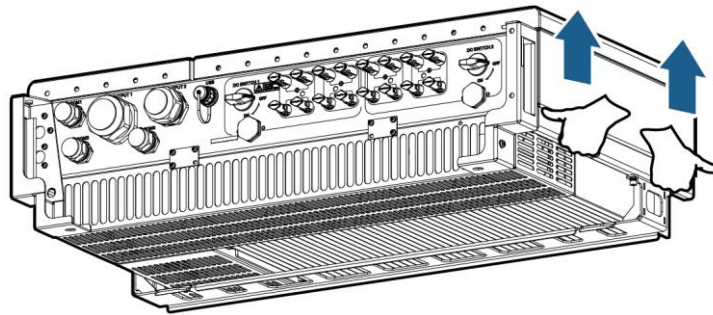
IS03HC0013

Step 2 Lift the SUN2000 from the packing case and move it to the installation position with the help of multiple persons.

----End

4.3.3 Installing the Mounting Bracket

Prerequisites

☐ NOTE
● When installing the SUN2000-33KTL-A/36KTL, you can use the expansion bolts delivered with the SUN2000 to install the mounting bracket.
● When installing the SUN2000-42KTL, you need to prepare the expansion bolts. M12x60 stainless expansion bolts are recommended.

Context

Figure 4-9 shows the SUN2000 mounting bracket dimensions.

Figure 4-9 Mounting bracket dimensions
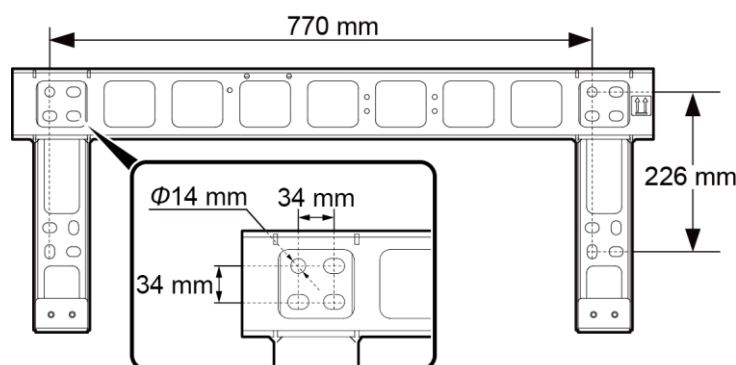
IS03W00006

☐ NOTE
The SUN2000 mounting bracket has 16 tapped holes in four groups. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred.

Procedure

Step 1 Remove the security torx wrench from the mounting bracket and set it aside.

Figure 4-10 Removing a security torx wrench
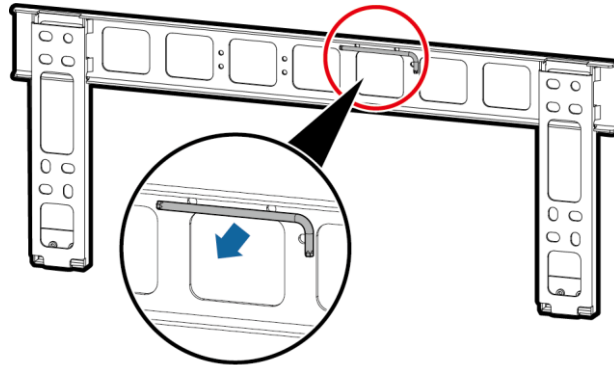
IS03H00013

Step 2 Determine the positions for drilling holes using the mounting bracket available in the packing case. Level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-11 Determining hole positions
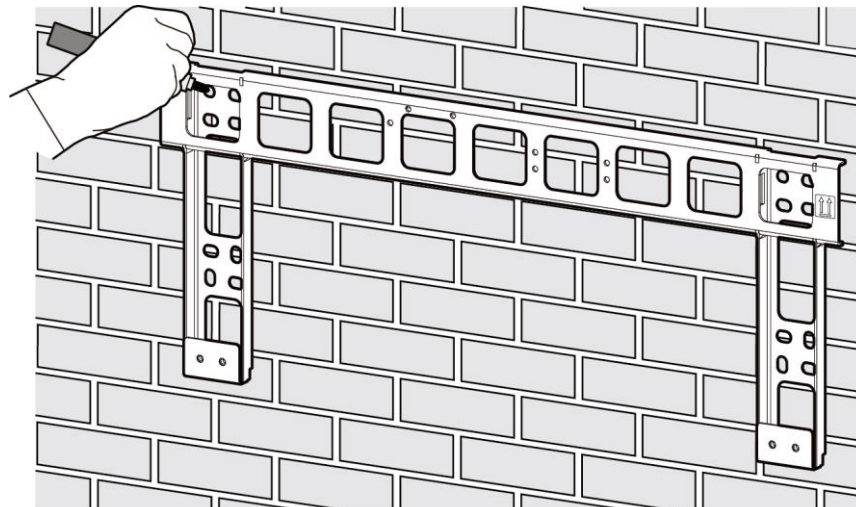
IS03SC0002

Step 3 Drill holes using a hammer drill and install 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 composition
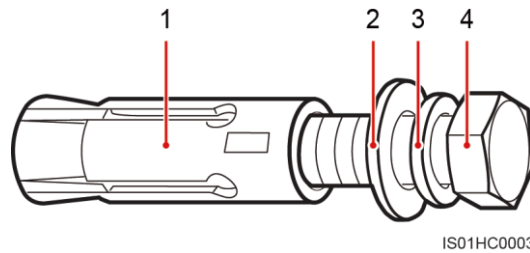
(1) Expansion sleeve	(2) Flat washer	(3) Spring washer	(4) Bolt

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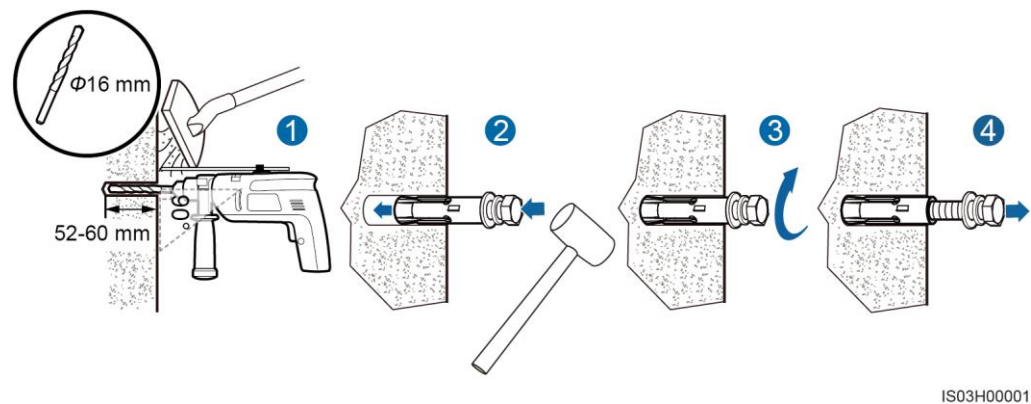
⚠ **NOTICE**

● 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 front 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. Put a hammer drill with a Φ16 mm drill bit on a marked hole position perpendicularly against the wall and drill holes to a depth of 52–60 mm.

2. Slightly tighten an expansion bolt, vertically insert it into the hole, and knock the expansion bolt completely into the hole by using a rubber mallet.

3. Partially tighten the expansion bolt.

4. Remove the bolt, spring washer, and flat washer by rotating them counterclockwise.

Step 4 Align the mounting bracket with the holes, insert expansion bolts into the holes through the mounting bracket, and tighten the expansion bolts to a torque of 45 N·m using an 18 mm socket wrench.

Figure 4-14 Securing a mounting bracket
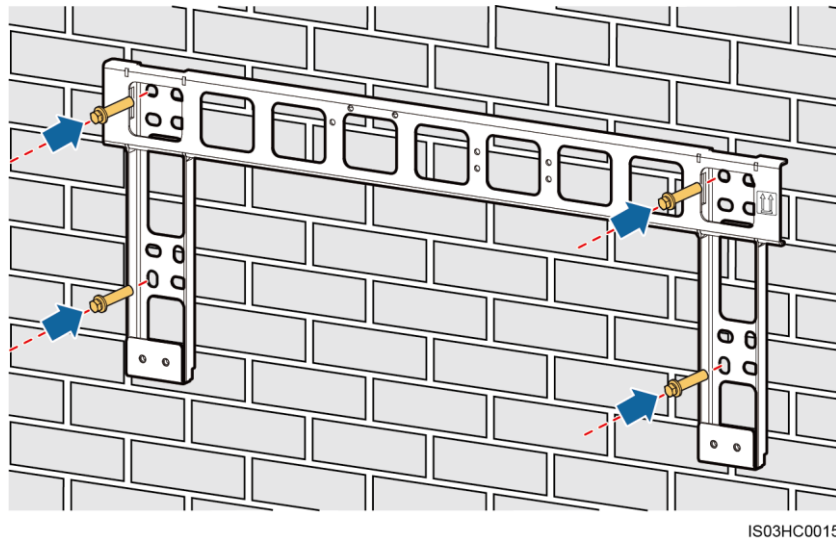
----End

4.3.4 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 4-15 Lifting a SUN2000
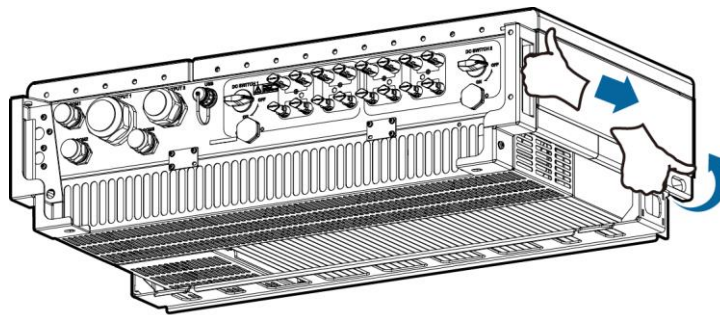
IS03HC0014

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 4-16 Hoisting a SUN2000

IS03HC0016
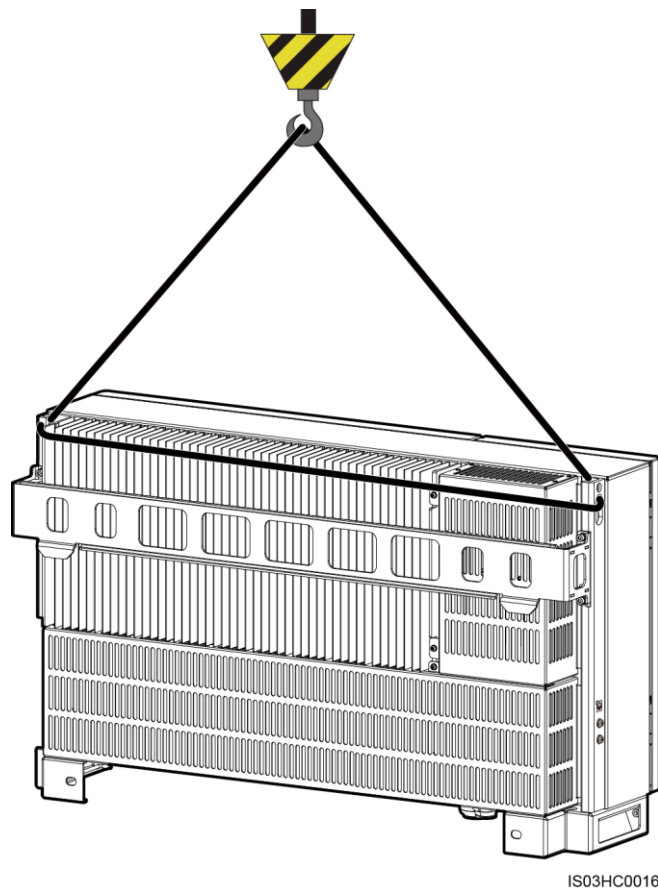
Step 5 Install the SUN2000 on the mounting bracket and level the SUN2000 chassis with the mounting bracket.

Figure 4-17 Mounting the SUN2000 onto the mounting bracket

IS03HC0003
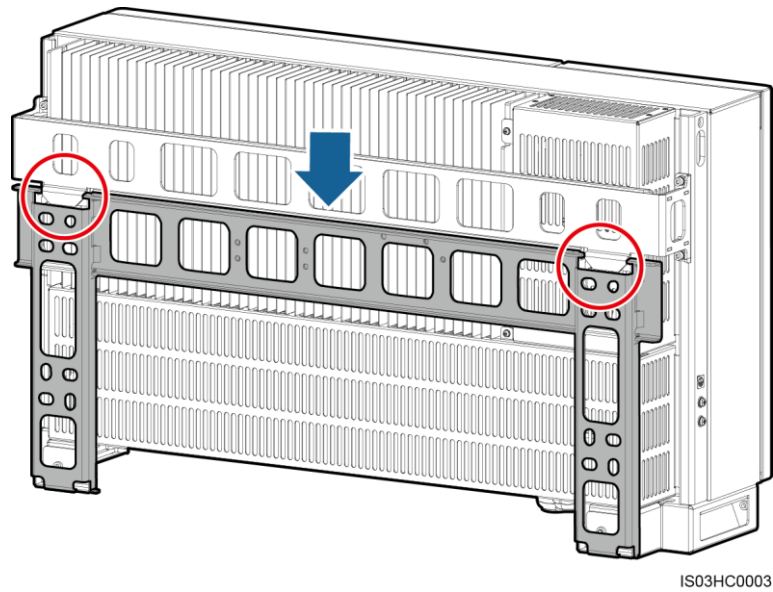
Step 6 Tighten the two security torx screws using a security torx wrench to a torque of 5 N·m.

Figure 4-18 Tightening security torx screws

IS03HC0005
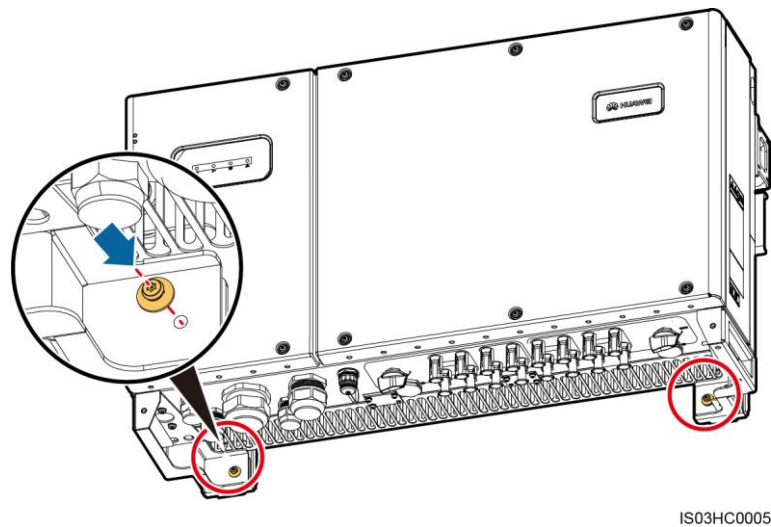
----End

4.4 Support-mounting the SUN2000

4.4.1 Determining the Installation Position

Basic Requirements

- The SUN2000 is protected to IP65 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 enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install 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. Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Carrier Requirements

- The carrier where the inverter is installed must be fire-proof.
- Do not install the inverter on flammable building materials.
- Ensure that the installation surface is solid enough to bear the weight load.

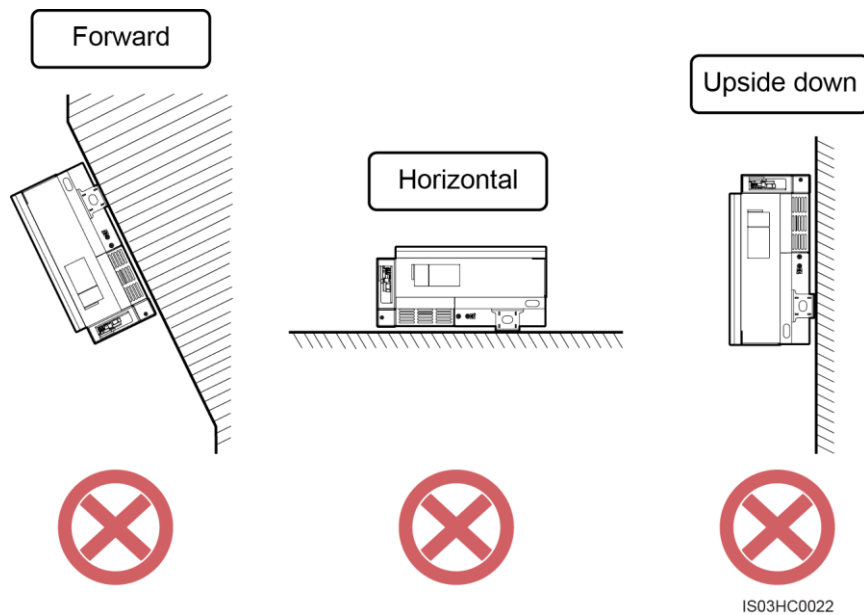### Installation Angle Requirements

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

Figure 4-19 Correct installation angles
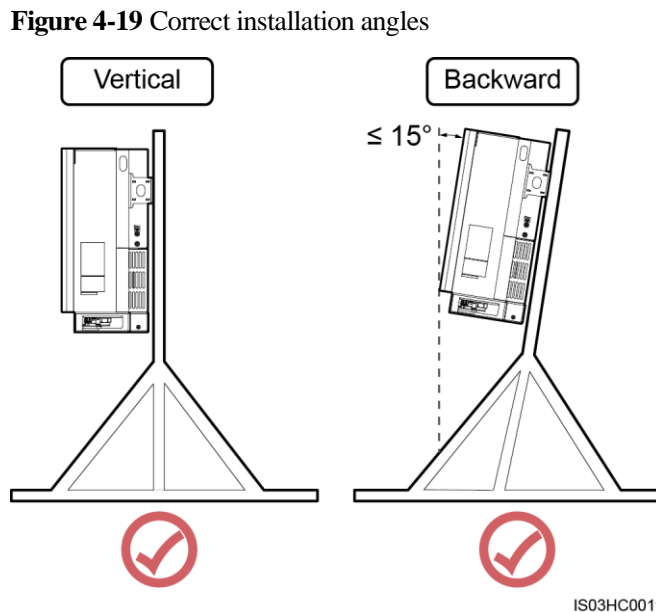
- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

Figure 4-20 Incorrect installation angles
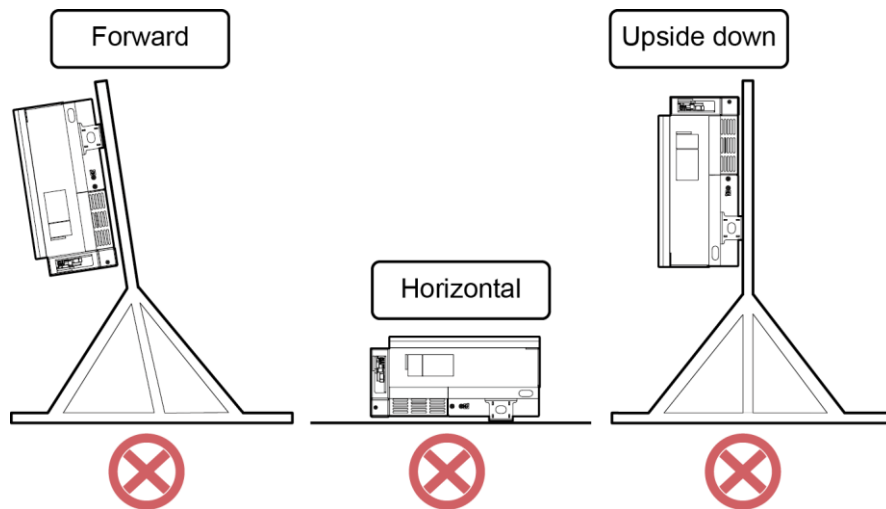
Installation Space Requirements

The SUN2000 dimensions (W x H x D, including the mounting bracket) are 930 mm x 550 mm x 283 mm. Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation, as shown in Figure 4-21.

**Figure 4-21** Installation space
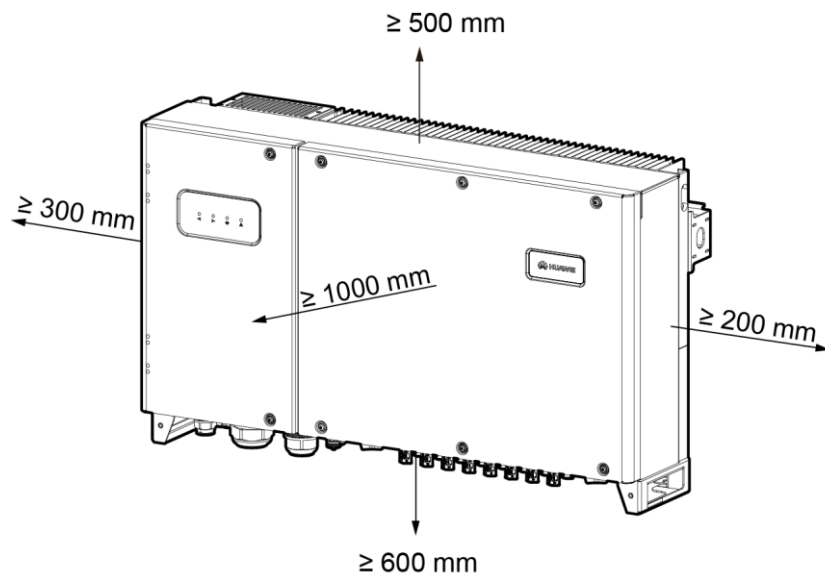
NOTE

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 greater than or equal to 600 mm and less than or equal to 730 mm. If you have any questions about the distance, consult the local technical support engineers.

4.4.2 Moving the Inverter

For details, see 4.3.2 Moving the Inverter.

4.4.3 Installing the Mounting Bracket

Context

Figure 4-22 shows the SUN2000 mounting bracket dimensions.

Figure 4-22 Mounting bracket dimensions
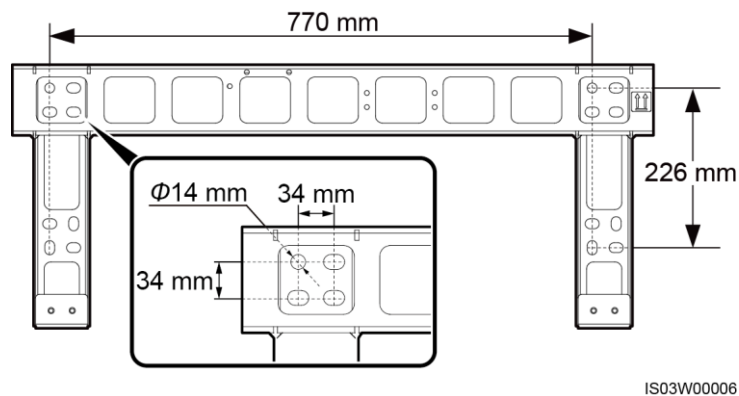
> 📖 **NOTE**
>
> The SUN2000 mounting bracket has 16 tapped holes in four groups. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred.

Procedure

Step 1 Remove the security torx wrench from the mounting bracket and set it aside.

Figure 4-23 Removing a security torx wrench
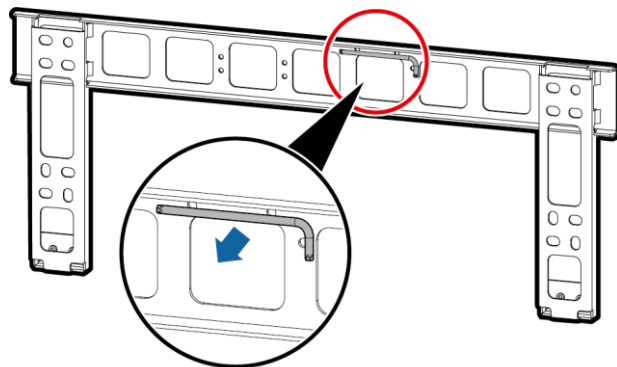
Step 2 Determine the positions for drilling holes using the mounting bracket. Level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-24 Determining hole positions

IS03HC0006
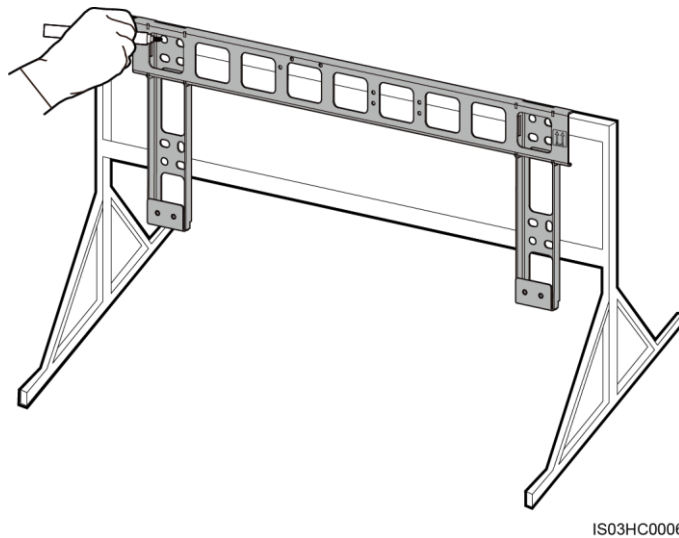
Step 3 Drill holes using a hammer drill.

📖 **NOTE**

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

Figure 4-25 Drilling holes

*Φ*14 mm

IS03HC0001
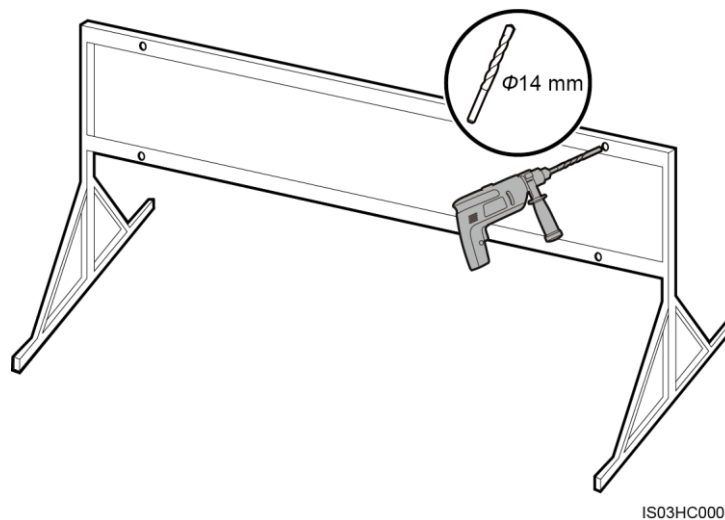
Step 4 Align the mounting bracket with the hole positions, insert bolt assemblies (flat washers, spring washers, and M12x40 bolts) into the holes through the mounting bracket, secure them using the shipped stainless steel nuts and flat washers, and tighten the bolts to a torque of 45 N·m using an 18 mm socket wrench.

📖 **NOTE**

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

Figure 4-26 Securing a mounting bracket

IS03HC0002
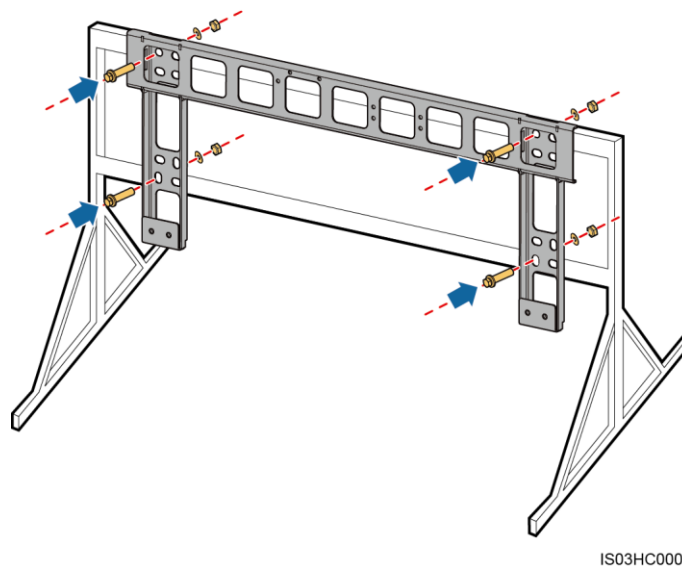
----End

4.4.4 Installing the SUN2000

For details, see 4.3.4 Installing the SUN2000.

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 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 5-1 Removing screws
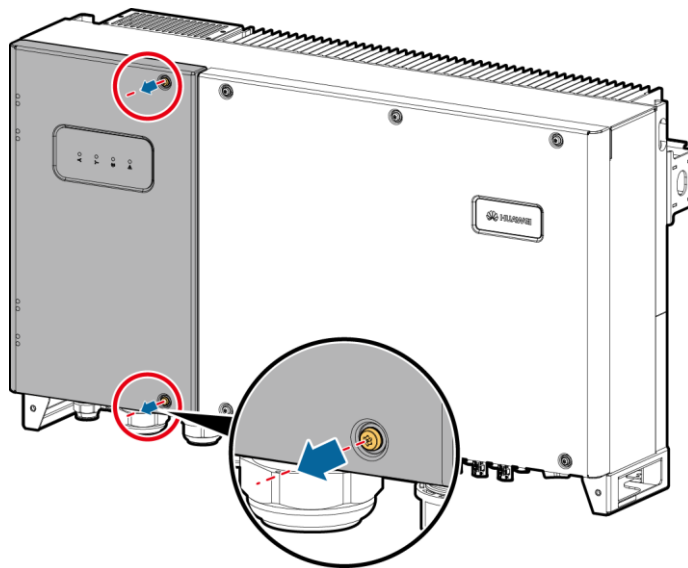
Step 2 Open the maintenance compartment door and install a support bar.

📖 **NOTE**

The support bar is bound to the chassis base.

Figure 5-2 Installing a support bar

IS03HC0017
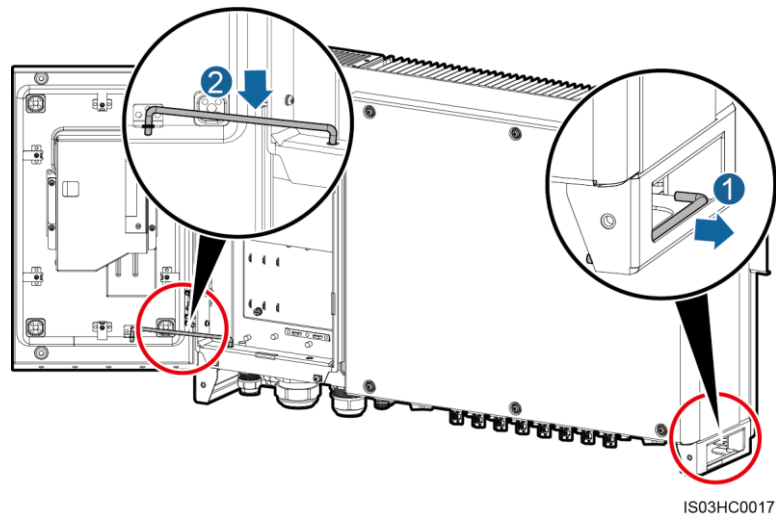
----End

5.2 Connecting the Ground Cable (PE)

Prerequisites

The ground cable and OT terminal are available.

- Ground cable: You are advised to use an outdoor copper cable with a conductor cross-sectional area greater than or equal to 16 mm^2, and the conductor cross-sectional area should be greater than or equal to half of the conductor cross-sectional area of the AC output power cable.

- OT terminal: M6

Context

- The ground point on the enclosure is preferred to connect to the PE cable for the SUN2000.

- The ground point in the maintenance compartment is used for connecting to the ground cable included in the multi-core AC power cable. For details, see 5.3 Connecting AC Output Power Cables.

- There are two ground points on the enclosure and one of them is standby.

- It is recommended that the ground cable be connected to a nearby ground point. For a system with multiple SUN2000s connected in parallel, connect the ground points of all SUN2000s to ensure equipotential connections to ground cables.

Procedure

Step 1 Strip an appropriate length of the insulation layer using a wire stripper, as shown in Figure 5-3.

Figure 5-3 Stripped length

L2 = L1 + 3 mm

L1

IS01ZC0002
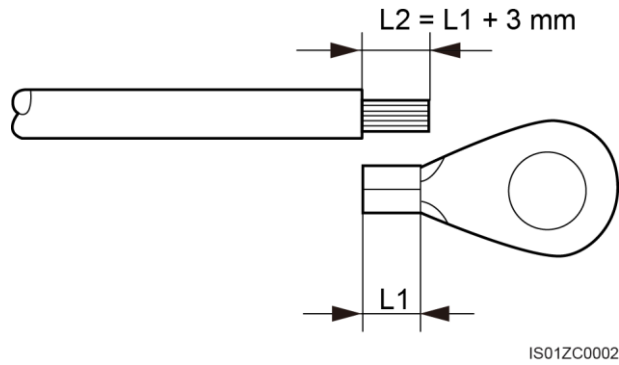
Step 2 Insert the exposed core wires into the crimping area of the OT terminal and crimp them using hydraulic pliers, as shown in Figure 5-4.

Figure 5-4 Crimping a cable

L3 < 2 mm

L4 < 1.5 mm

IS01ZC0003
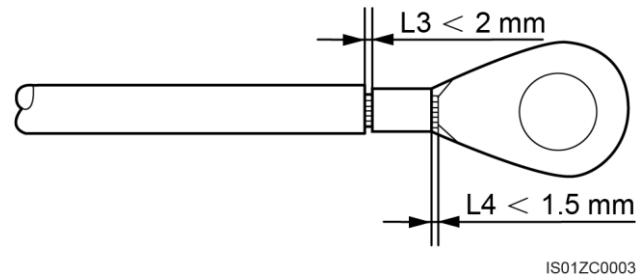
☐ NOTE

The cavity formed after the conductor crimp strip is crimped must wrap the core wires completely. The core wires must contact the terminal closely.

Step 3 Remove the ground screws from the ground points.

Step 4 Secure the ground cable using the ground screw and tighten the screw to a torque of 5 N•m using a security torx wrench.

Figure 5-5 Connecting a ground cable

IS03IC4001
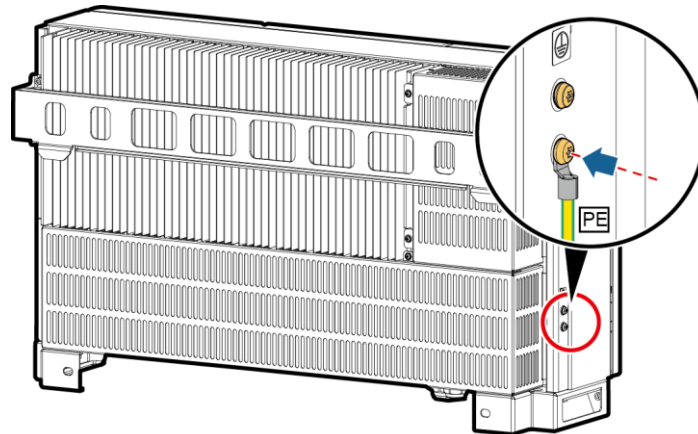
📖 **NOTE**

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

----End

5.3 Connecting AC Output Power Cables

Prerequisites

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

⚠️ **WARNING**

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

Context

- If you connect a ground cable to the ground point on the chassis shell in a scenario with no neutral wire, you are advised to use a three-core (L1, L2, and L3) outdoor cable as the AC output power cable for the SUN2000-33KTL-A/36KTL.

- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with no neutral wire, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable as the AC output power cable for the SUN2000-33KTL-A/36KTL.

- If you connect a ground cable to the ground point on the chassis shell in a scenario with a neutral wire, you are advised to use a four-core (L1, L2, L3, and N) outdoor cable as the AC output power cable for the SUN2000-33KTL-A/36KTL.

- If you connect a ground cable to the ground point in the maintenance compartment in a scenario with a neutral wire, you are advised to use a five-core (L1, L2, L3, N, and PE) outdoor cable as the AC output power cable for the SUN2000-33KTL-A/36KTL.

- If you connect a ground cable to the ground point on the chassis shell, you are advised to use a three-core (L1, L2, and L3) outdoor cable as the AC output power cable for the SUN2000-42KTL.

- If you connect a ground cable to the ground point in the maintenance compartment, you are advised to use a four-core (L1, L2, L3, and PE) outdoor cable as the AC output power cable for the SUN2000-42KTL.

Table 5-1 SUN2000-33KTL-A cable specifications

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area (mm^2)	Value range	16–70	25–70
	Recommended value	16	35
Cable outer diameter supported by AC OUTPUT 1 connector (mm)	Value range	18–44	

Table 5-2 SUN2000-36KTL/42KTL cable specifications

Cable Specifications		Copper-Core Cable	Copper-Clad Aluminum Cable or Aluminum Alloy Cable
Conductor cross-sectional area (mm^2)	Value range	16–70	25–70
	Recommended value	25	35
Cable outer diameter supported by AC OUTPUT 1 connector (mm)	Value range	18–44	

- You need to prepare M8 OT terminals by yourself.

📖 **NOTE**

If you connect a ground cable to the ground point in the maintenance compartment, prepare an M6 OT terminal by yourself.

Requirements for OT terminals:

- If a copper cable is used, use a copper wiring terminal.

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

⚠ **NOTICE**

- Directly connecting an aluminum wiring terminal to the AC terminal block will cause electro-chemical corrosion and weaken the cable connection reliability.
- The copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer must comply with IEC61238-1.
- Do not mix up the aluminum and copper sides of the copper to aluminum adapter washer. Ensure that the aluminum side of the washer contacts the aluminum wiring terminal, and the copper side contacts the AC terminal block.

Figure 5-6 Requirements for OT terminals
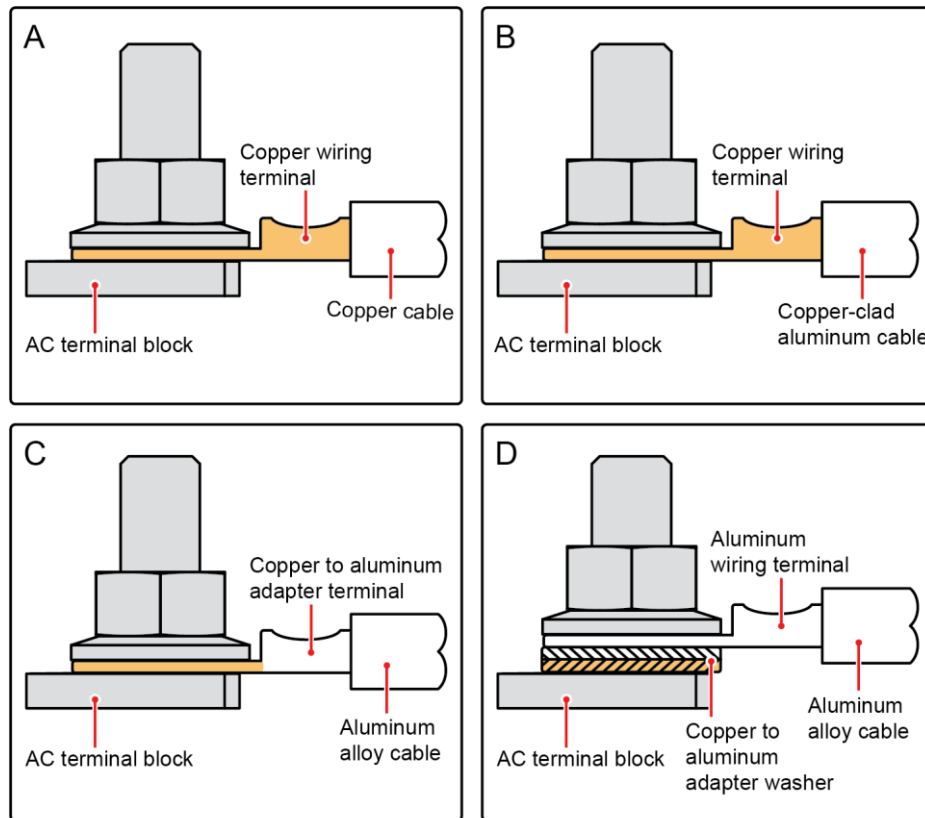
Procedure

Step 1 Remove the AC terminal cover, as shown in Figure 5-7.

Figure 5-7 Removing the AC terminal cover
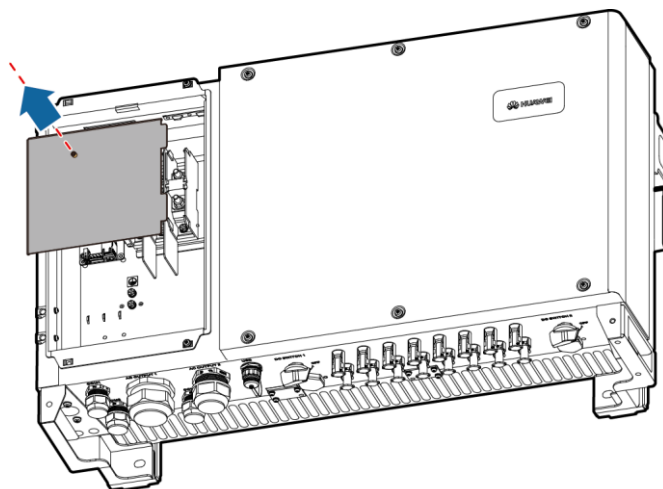
IS03HC0007

☐ NOTE

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

Step 2 Remove the locking cap from the AC OUTPUT 1 connector and then remove the plug.

Step 3 Choose whether to use rubber fittings based on the cable outer diameter and select one or more rubber fittings if required. Route the cable through the locking cap and then the rubber fitting.

⚠ **NOTICE**

- Mismatch between the cable outer diameter and the rubber fitting may degrade the Ingress Protection Rating of the device.
- To avoid damaging the rubber fitting, do not route a cable with a crimped OT terminal directly through the rubber fitting.
- Do not adjust the cable when the locking cap is tightened. Otherwise, the rubber fitting will shift, which affects the Ingress Protection Rating of the device.

Figure 5-8 Selecting the rubber fitting
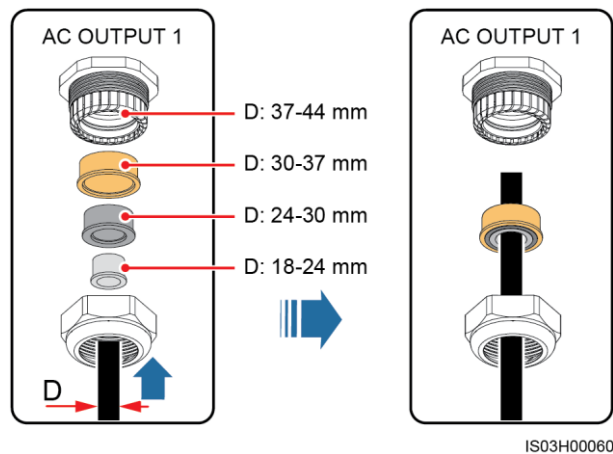
Step 4 Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.

⚠ **NOTICE**

Ensure that the jacket is in the maintenance compartment.

Figure 5-9 Three-core cable (excluding the ground cable and neutral wire)

| (A) Core wire | (B) Insulation layer | (C) Jacket |
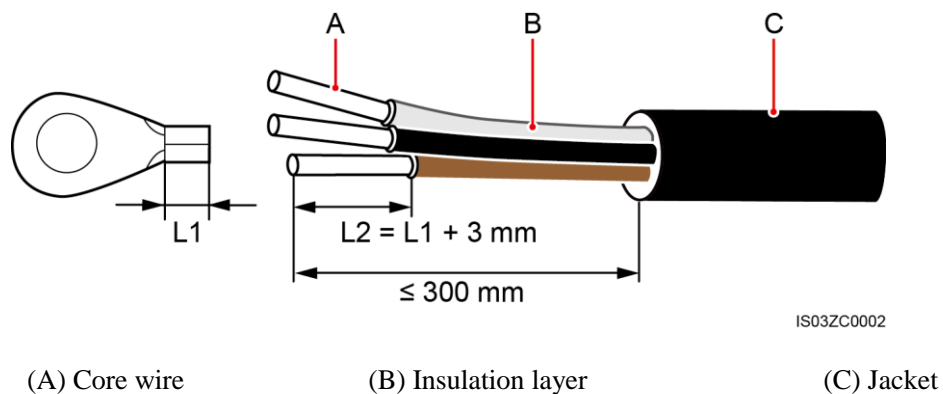
Figure 5-10 Four-core cable (including the ground cable but excluding the neutral wire)
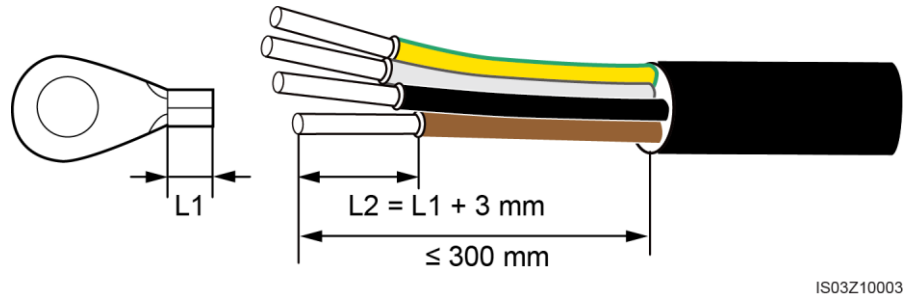
Figure 5-11 Four-core cable (excluding the ground cable but including the neutral wire)
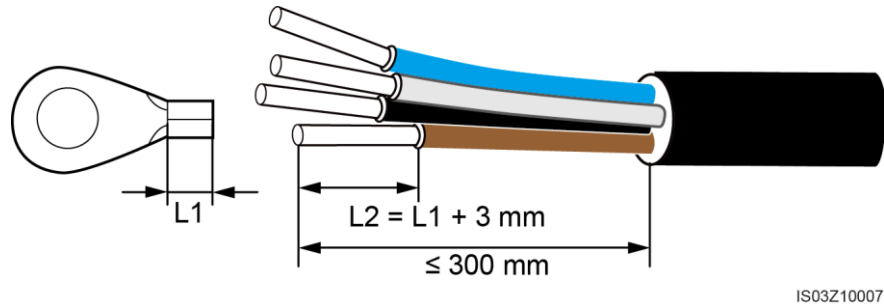
Figure 5-12 Five-core cable (including the ground cable and neutral wire)
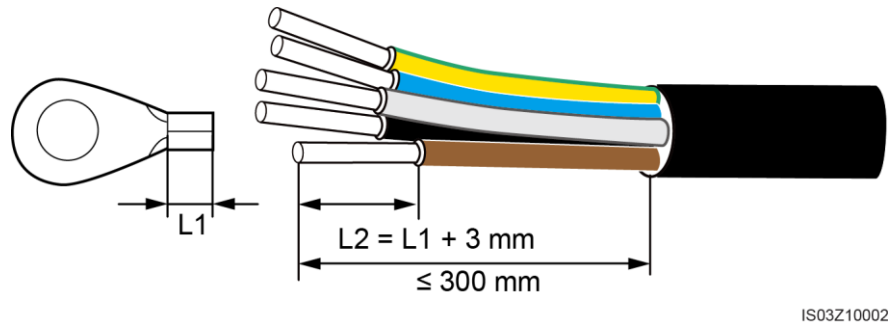
Step 5 Insert the exposed core wires into the crimping area of the OT terminal and crimp them using hydraulic pliers.

📖 **NOTE**

One core wire connects to one OT terminal.

Step 6 Wrap the wire crimping area with heat shrink tubing or PVC insulation tape.

📖 **NOTE**

If heat shrink tubing is used, put it through the power cable and then crimp the OT terminal.

Step 7 Route the AC output power cable through the AC OUTPUT 1 connector at the bottom of the chassis.

Step 8 Connect the AC output power cable to the AC terminal block, and then tighten the nut using a 13 mm socket wrench with an extension rod to a torque of 8 N·m. If you connect a ground cable to the ground point in the maintenance compartment, tighten the ground screw using a 10 mm socket wrench with an extension rod to a torque of 5 N·m.

> ⚠️ **NOTICE**
>
> ● Ensure that AC terminations are secured. Failure to do so may cause the SUN2000 to malfunction or cause damage to its terminal block from issues such as overheating.
> ● If the SUN2000 is insecurely installed and the AC output power cable bears the pulling force, ensure that the last cable bearing the force is the PE cable.

Figure 5-13 SUN2000-42KTL
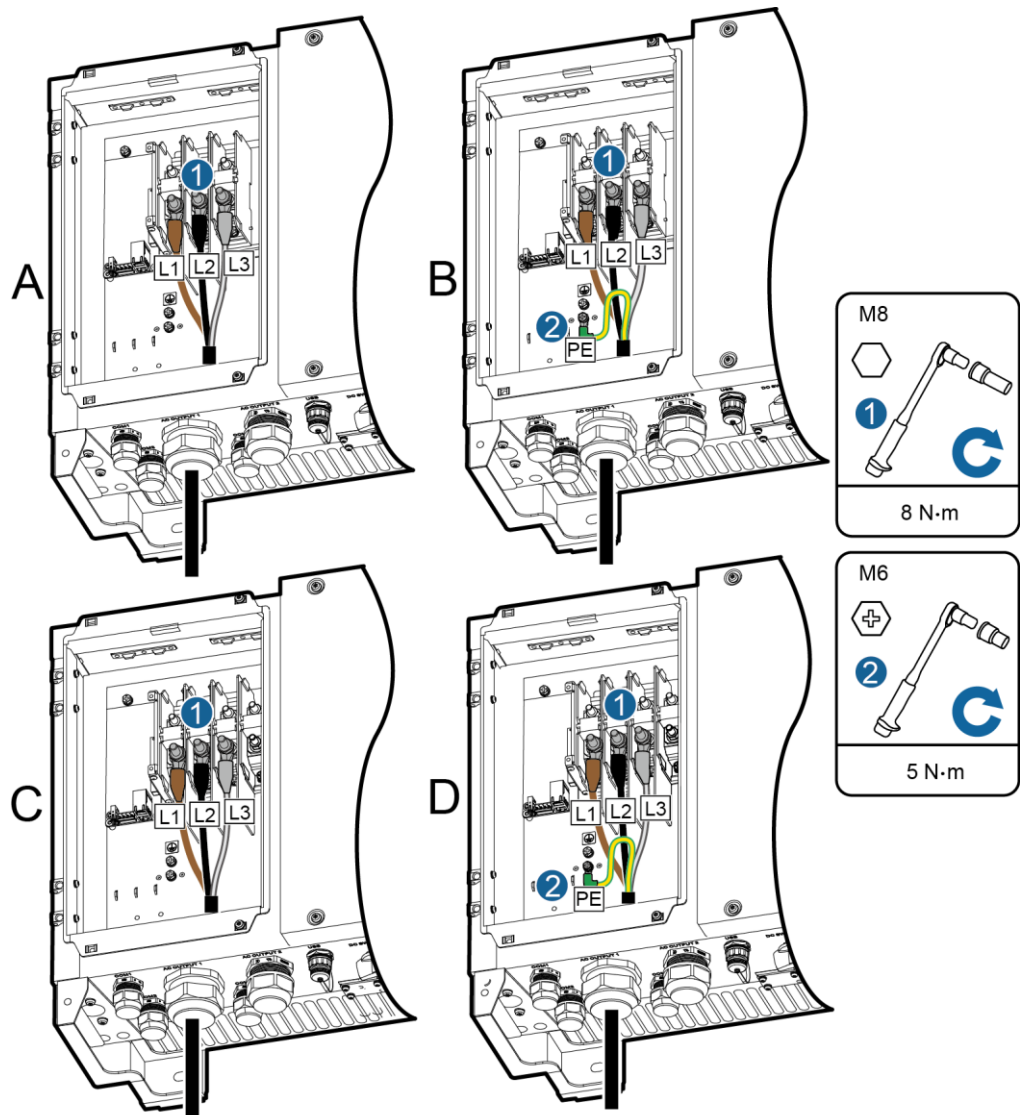
(A) 3-pin, excluding the ground cable   (B) 3-pin, including the ground cable

(C) 4-pin, excluding the ground cable and neutral wire

(D) 4-pin, including the ground cable but excluding the neutral wire

Figure 5-14 SUN2000-33KTL-A/36KTL

IS03I10018
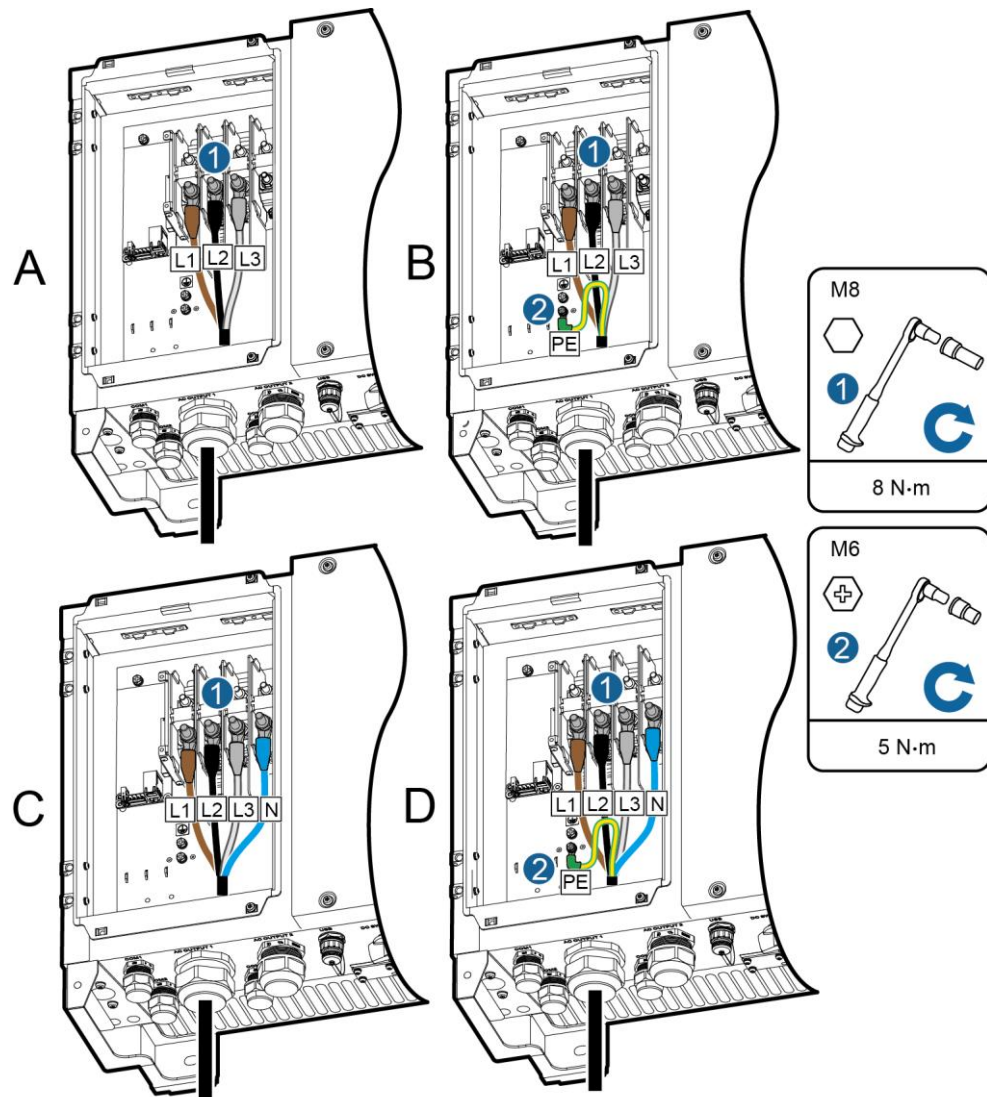
(A) Excluding the ground cable and neutral wire

(B) Including the ground cable but excluding the neutral wire

(C) Excluding the ground cable but including the neutral wire

(D) Including the ground cable and neutral wire

☐ NOTE

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

Step 9 Install the rubber fitting in the AC OUTPUT 1 connector at the bottom of the chassis. Use a torque wrench with an open end of 65 mm to tighten the locking cap to a torque of 7.5 N·m.

----End

Follow-up Procedure

Check that the cables are connected correctly and securely. Then seal the connectors.

5.4 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 open-circuit voltage of each PV string is always lower than or equal to 1100 V DC.

● The positive and negative terminals of a PV 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 icon]

⚠ **NOTICE**

● Ensure that the PV module output is well insulated to ground. If the SUN2000 directly connects to the power grid with the neutral wire connected to the PE cable (for example, a low-voltage power grid or a power grid with the neutral wire grounded), do not ground the positive and negative terminals of PV strings. The device may be damaged if you do not follow the instruction. This damage is not covered under any warranty or service agreement.

● 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 following requirements must be met if the positive or negative terminals of PV strings 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 5-15 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 the fourth routes of DC input terminals, while DC SWITCH 2 controls the fifth to the eighth routes of DC input terminals.

Figure 5-15 DC terminals
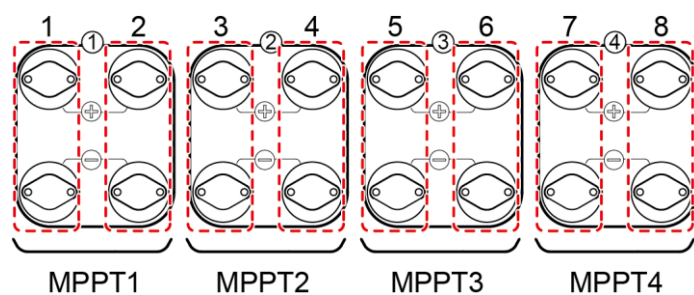
Table 5-3 DC terminal selection requirements

Number of Inputs	SUN2000
1	Connects to any route.
2	Connects to sets 1 and 5.

Number of Inputs	SUN2000
3	Connects to sets 1, 3, and 5.
4	Connects to sets 1, 3, 5, and 7.
5	Connects to sets 1, 2, 3, 5, and 7.
6	Connects to sets 1, 2, 3, 5, 6, and 7.
7	Connects to sets 1, 2, 3, 4, 5, 6, and 7.
8	Connects to sets 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 (mm²)		Cable Outer Diameter (mm)
	Range	Recommended Value	
Common PV cables in the industry (model: PV1-F)	4.0–6.0 (or 12–10 AWG)	4.0 (or 12 AWG)	4.5–7.8

⚠ **NOTICE**

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

- Positive and negative connectors

  DC input connectors are categorized into positive and negative connectors, as shown in Figure 5-16 and Figure 5-17.

Figure 5-16 Positive connector

IS01ZC0007
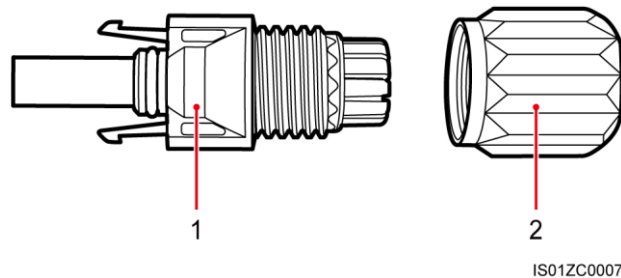
(1) Insulation shell   (2) Locking nut

Figure 5-17 Negative connector
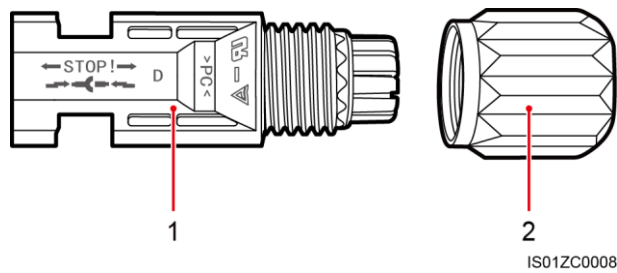
| (1) Insulation shell | (2) Locking nut |

⚠️ **CAUTION**

Use the positive and negative metal contacts and DC connectors supplied with the SUN2000. Using other models of positive and negative metal contacts and DC connectors may result in serious consequences. The caused device damage is not covered under any warranty or service agreement.

Procedure

Step 1 Prepare positive and negative connectors.

NOTICE

- The metal contacts supplied with the DC connectors are either cold forming contacts or stamping forming contacts. Choose the crimping tools that fit the metal contact types. Do not mix up the tools.
- Crimp the metal cold forming contacts using crimping tool H4TC0001 (Amphenol).
- Crimp the metal stamping forming contacts using crimping tool H4TC0002 (Amphenol, recommended), PV-CZM-22100 (Staubli), or PV-CZM-19100 (Staubli). When choosing PV-CZM-22100 or PV-CZM-19100, do not use the locator. Otherwise metal contacts would be damaged.

Figure 5-18 Crimping tool (H4TC0002)
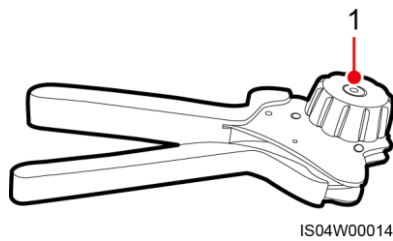
(1) Locator

Figure 5-19 Preparing positive and negative connectors (using metal cold forming contacts)
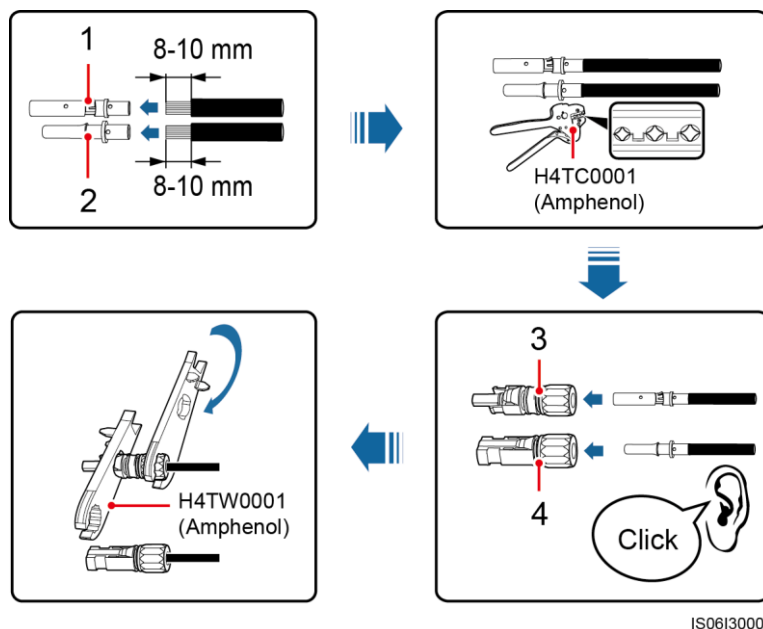
(1) Positive metal contact (cold forming)	(2) Negative metal contact (cold forming)
(3) Positive connector	(4) Negative connector

Figure 5-20 Preparing positive and negative connectors (using metal stamping forming contacts)
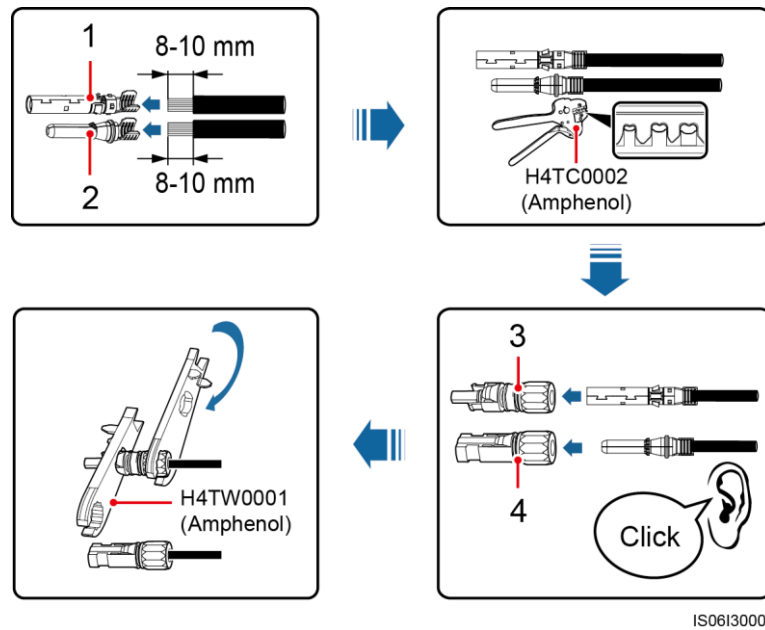
(1) Positive metal contact (stamping forming)	(2) Negative metal contact (stamping forming)
(3) Positive connector	(4) Negative connector

⚠ **NOTICE**

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

Step 2 Pull out the blue dustproof plugs from the ends of the DC input connectors.

Step 3 Ensure that the DC input voltage of each PV string does not exceed 1100 V DC using a multimeter and check that the polarities of the DC input power cables are correct.

Figure 5-21 Measuring the DC input voltage

IS03H00014
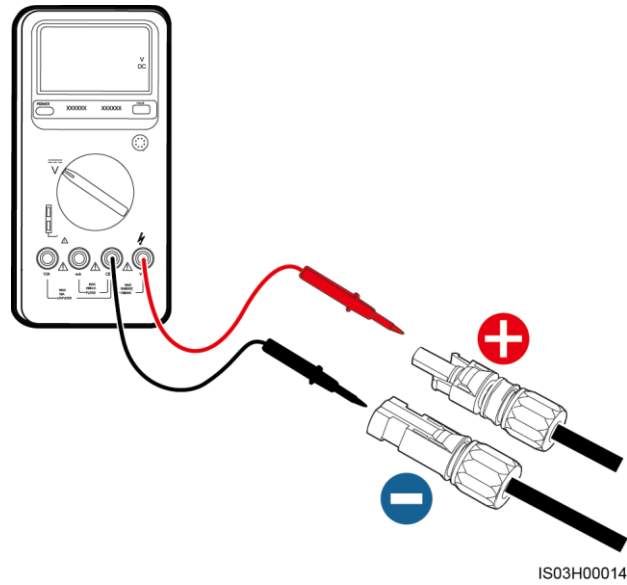
WARNING

Before performing Step 4, ensure that the two DC switches are OFF.

Step 4 Insert the positive and negative connectors into the corresponding positive and negative DC input terminals of the inverter until they snap into place, as shown in Figure 5-22.

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 5-22 Connecting DC input power cables

IS03I30001
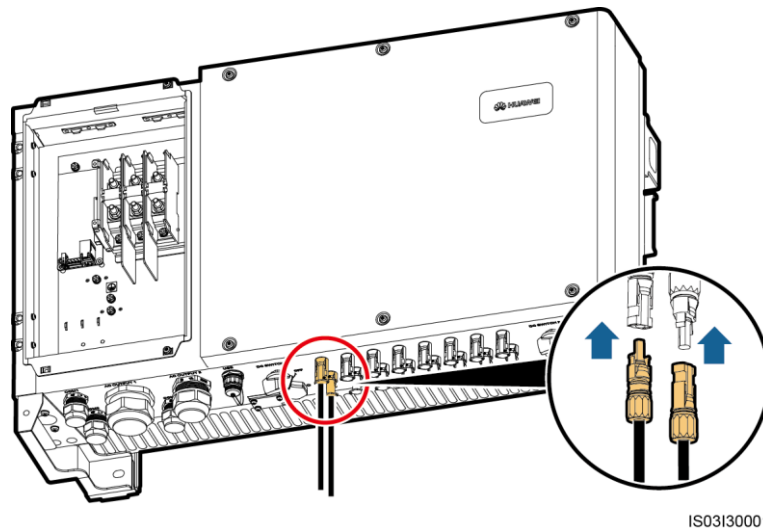
NOTICE

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 5-23.

Figure 5-23 Removing a DC input connector

IS01IC0042
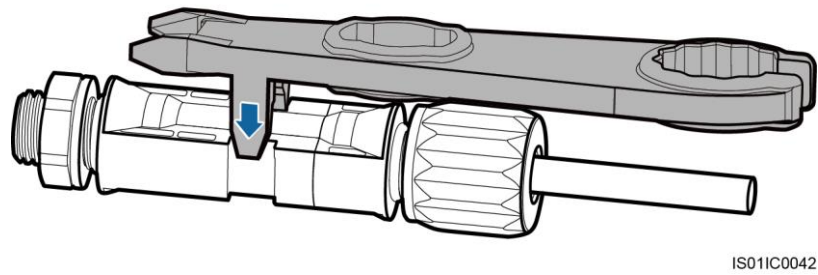
5.5 Connecting Communications Cables

5.5.1 Communication Mode Description

RS485 Communication

The SUN2000 can connect to the SmartLogger or to a PC through the SmartLogger to implement RS485 communication. You can use the SUN2000 APP, 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 5-24 shows the communication mode for a single SUN2000.

Figure 5-24 Communication mode for a single SUN2000

IS01NC0001
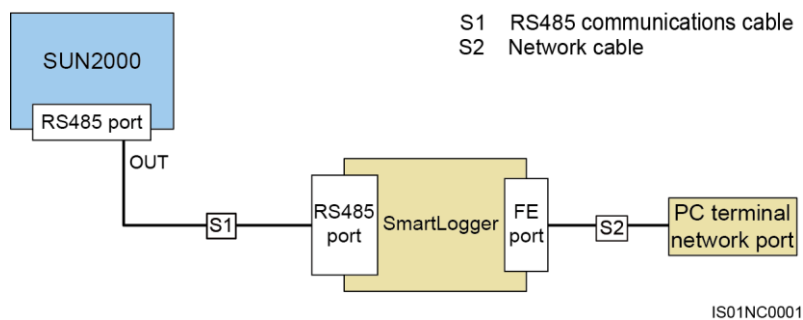
- Figure 5-25 shows the communication mode for multiple SUN2000s.

  If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

Figure 5-25 Communication mode for multiple SUN2000s
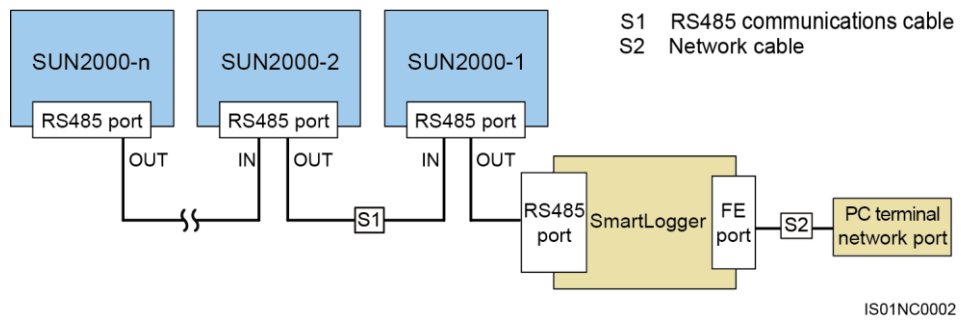
NOTE

- 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 SmartLogger1000, a maximum of three daisy chains can be configured.

- 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* or *SmartLogger2000 User Manual*.

NOTE

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

FE Communication (Optional)

FE communication is mainly used in distributed rooftop scenarios with a small number of inverters. The inverter can directly connect to the PC over the Ethernet to implement monitoring networking.

NOTE

- FE communication is optional for the SUN2000-36KTL.

- If the SUN2000-36KTL adopts FE communications mode, it supports only RS485 and FE communications modes, and does not support PLC communications mode.

- If FE communication is used, a maximum of 10 SUN2000s can be connected. In addition, the network management software (such as the NetEco) needs to be installed on the PC for monitoring networking.

If FE communication is used, set **Ethernet** and **Modbus TCP** for the SUN2000 on the SUN2000 APP. Perform the following steps:

1. Set **IP address**, **Subnet mask**, and **Gateway** based on the network plan.

   – If the SUN2000 and PC connect to the same router with the DHCP function, and **DHCP** is set to **Enable**, the **IP address**, **Subnet mask**, and **Gateway** for the SUN2000 are automatically allocated.

   – If **DHCP** is set to **Disable**, **IP address**, **Subnet mask**, and **Gateway** for the SUN2000 need to be set manually.

□ **NOTE**

- **DHCP** is set to **Disable** by default.
- Ensure that the IP addresses for the SUN2000s and PC are different values in the same network segment.

2. Set **Modbus TCP** to **Client**. Set **NetEco IP address**, **NetEco port number**, **SSL encryption**, and **Key password** based on site requirements.

□ **NOTE**

- For operations with the SUN2000 APP, see the *SUN2000 APP User Manual*.
- For operations with the NMS, see the *iManager NetEco 1000S User Manual* (iManager NetEco 1000S V100R002C20 and later).

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.

⚠ **NOTICE**

The PLC communication mode is only applicable to medium-voltage grid connection scenarios and non-low-voltage public grid connection scenarios (industrial environment).

- 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.

5.5.2 Connecting RS485 Communications Cables

Note

An RS485 communications cable can be connected in two ways:

- Terminal block connection

  You are recommended to use a DJYP2VP2-22 2x2x1 network cable or a communications cable with a conductor cross-sectional area of 1 mm^2 and cable outer diameter of 14–18 mm.

- RJ45 network port connection

  You are recommended to use a shielded RJ45 connector and a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm and internal resistance not greater than 1.5 ohms/10 m.

□ **NOTE**

Select either connection mode during installation. Connecting to a terminal block is recommended.

⚠ **NOTICE**

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

Terminal Block Functions

Figure 5-26 shows an RS485 terminal block.

Figure 5-26 Terminal block
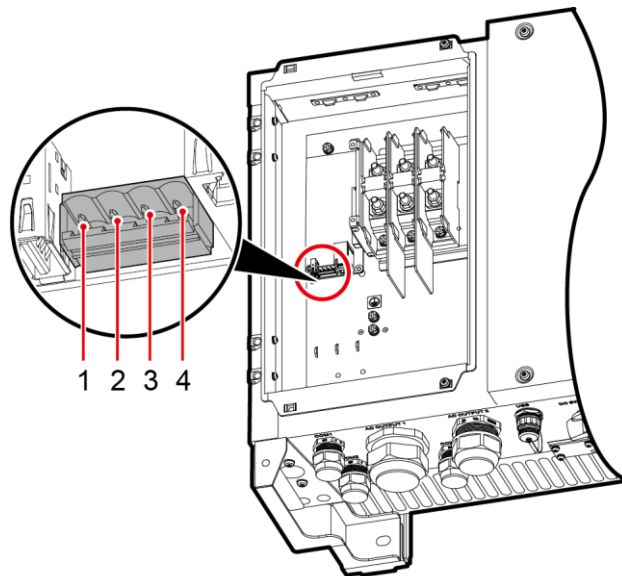
IS03W00015

Table 5-5 describes functions of the RS485 terminal block.

Table 5-5 Functions 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 −

Connecting Cables to the Terminal Block

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

Figure 5-27 Stripping an RS485 communications cable
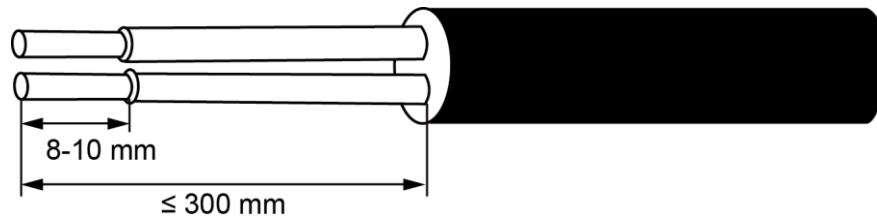
Step 2 Remove the locking caps from the COM1 and COM2 waterproof cable connectors at the SUN2000 bottom and remove the plugs from the locking caps.

Step 3 Route the communications cable through the locking caps, and then the COM1 (RS485 IN) and COM2 (RS485 OUT) connectors at the SUN2000 bottom.

Step 4 Remove the terminal base from the terminal block.

Step 5 Connect communications cables to the terminal base.

Figure 5-28 Connecting cables to a terminal base
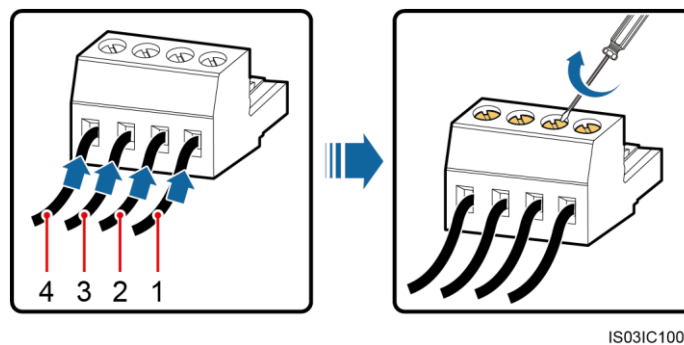
(1) RS485A IN	(2) RS485A OUT
(3) RS485B IN	(4) RS485B OUT

Step 6 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 5-29 Connecting communications cables
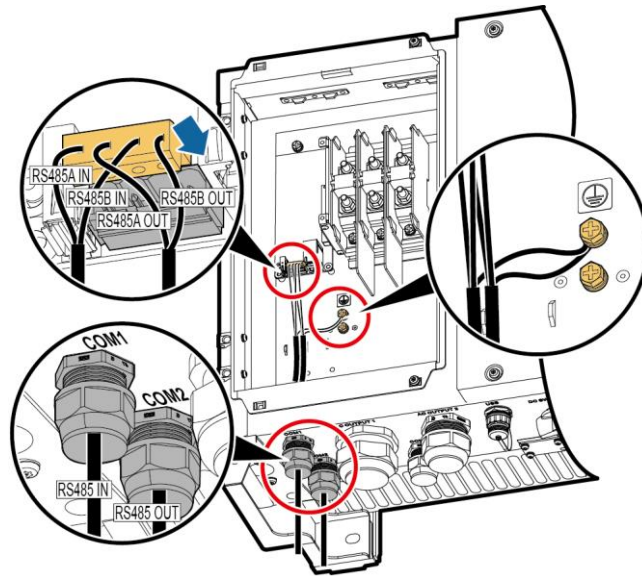
IS03I40017

Step 7 Bind communications cables after connecting them.

Figure 5-30 Binding communications cables
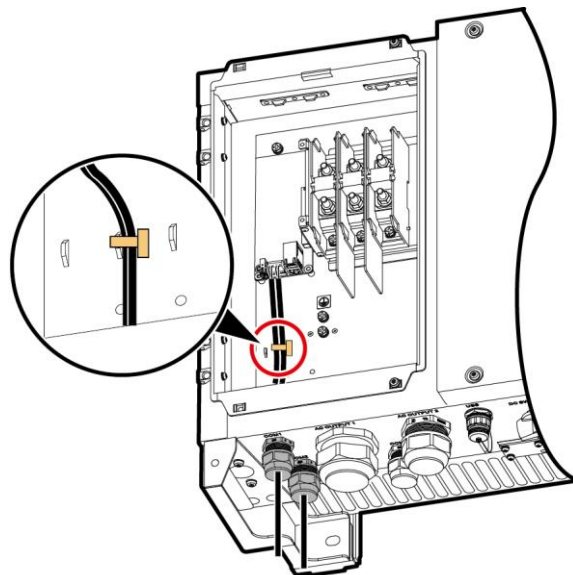
IS03H00057

Step 8 Use a torque wrench with an open end of 33 mm to tighten the locking cap to a torque of 7.5 N•m.

----End

RJ45 Connector Pin Definitions

Figure 5-31 shows an RJ45 connector.

Figure 5-31 RJ45 connector

IS01WC0032
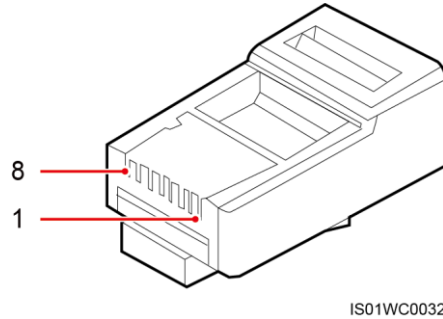
Table 5-6 lists the RJ45 connector pin definitions.

Table 5-6 RJ45 connector pin definitions

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

Connecting a Cable to the RJ45 Network Port

Step 1 Insert the wires of the network cable to the RJ45 connector in sequence, as shown in Figure 5-32.

Figure 5-32 Connecting wires to an RJ45 connector
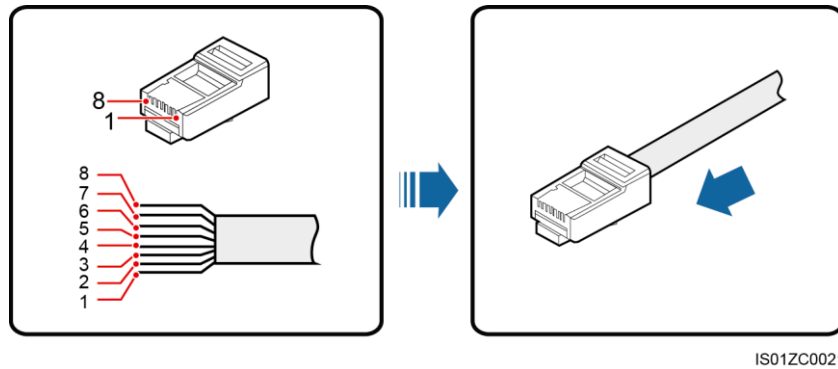
IS01ZC0021

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

Step 2 Crimp the RJ45 connector using a crimping tool.

Step 3 Remove the locking cap from the COM1 waterproof cable connector at the SUN2000 bottom and remove the plug from the locking cap.

Step 4 Route the cables through the locking caps and then the COM1 port at the SUN2000 bottom.

Step 5 Insert the RJ45 connector into the RJ45 network port in the SUN2000 maintenance compartment.

Figure 5-33 Connecting communications cables

IS03I40018
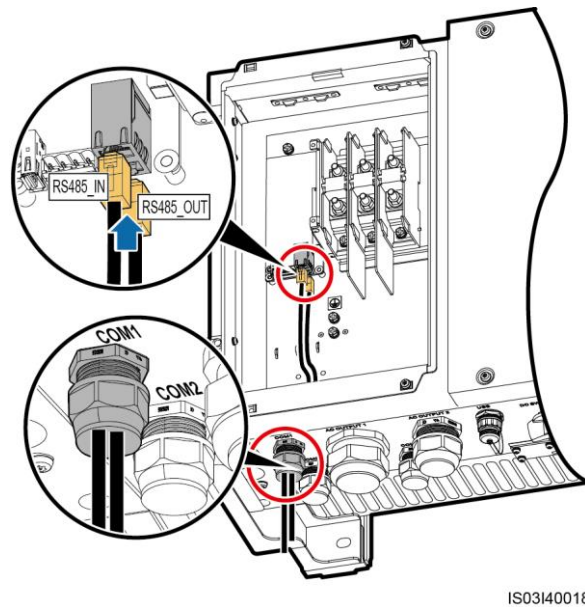
Step 6 Bind communications cables after connecting them.

Figure 5-34 Binding communications cables
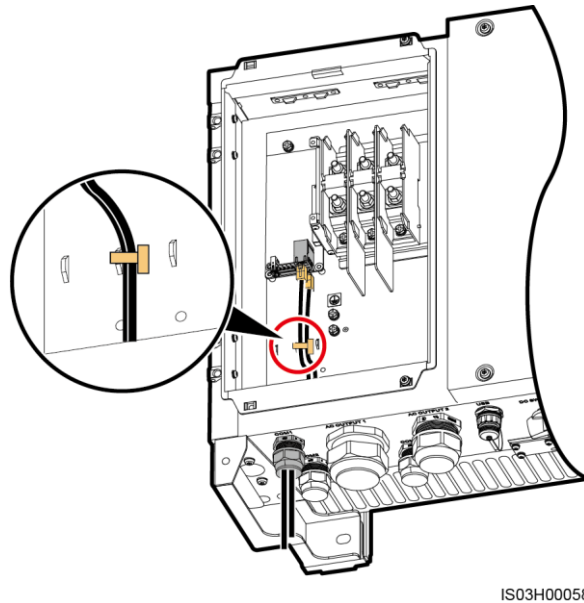
IS03H00058

Step 7 Use a torque wrench with an open end of 33 mm to tighten the locking cap to a torque of 7.5 N•m.

----End

Follow-up Procedure

Check that the cables are connected correctly and securely. Then seal the connectors.

5.5.3 (Optional) Connecting FE Communications Cables

Description

FE communication is mainly used in distributed rooftop scenarios with a small number of inverters. The inverter can directly connect to the PC over the Ethernet to implement monitoring networking.

☐ NOTE

FE communication is optional for the SUN2000-36KTL. To use FE communication, contact local technical support.

● Figure 5-35 shows the communication mode for a single SUN2000.

Figure 5-35 FE communication mode for a single SUN2000
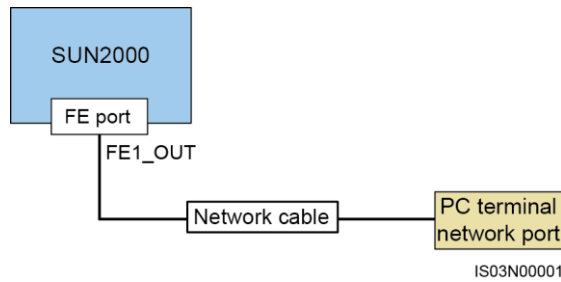
- Figure 5-36 shows the communication mode for multiple SUN2000s.

   If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over a network cable.

Figure 5-36 FE communication mode for multiple SUN2000s
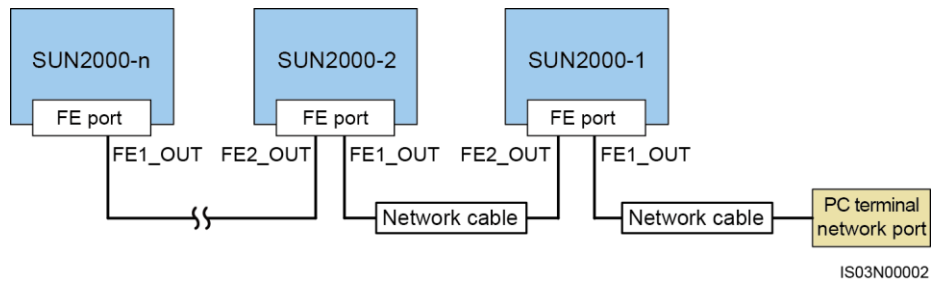
📖 NOTE

- The FE communication distance between two adjacent SUN2000s on the daisy chain cannot exceed 100 meters.
- A daisy chain supports a maximum of 10 SUN2000s to be connected for communication.

RJ45 Connector Pin Definitions

Figure 5-37 shows an RJ45 connector.

Figure 5-37 RJ45 connector
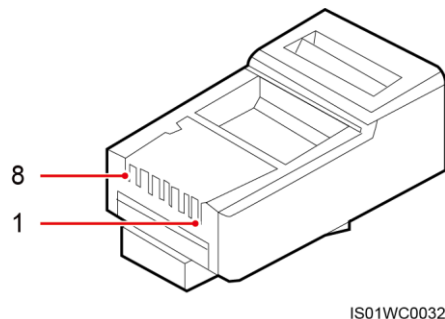
The FE communications cable is connected over standard network cables. A standard network cable can be 568A or 568B. The network cables used in the same PV grid-tied power

generation system should be prepared according to the same standard. Table 5-7 lists the 568A wire sequence standard. Table 5-8 lists the 568B wire sequence standard.

Table 5-7 568A standard

Pin	Color
1	White and green
2	Green
3	White and orange
4	Blue
5	White and blue
6	Orange
7	White and brown
8	Brown

Table 5-8 568B standard

Pin	Color
1	White and orange
2	Orange
3	White and green
4	Blue
5	White and blue
6	Green
7	White and brown
8	Brown

Connecting a Cable to the FE Network Port

Step 1 Insert the wires of the network cable to the RJ45 connector in sequence, as shown in Figure 5-38.

Figure 5-38 Connecting wires to an RJ45 connector
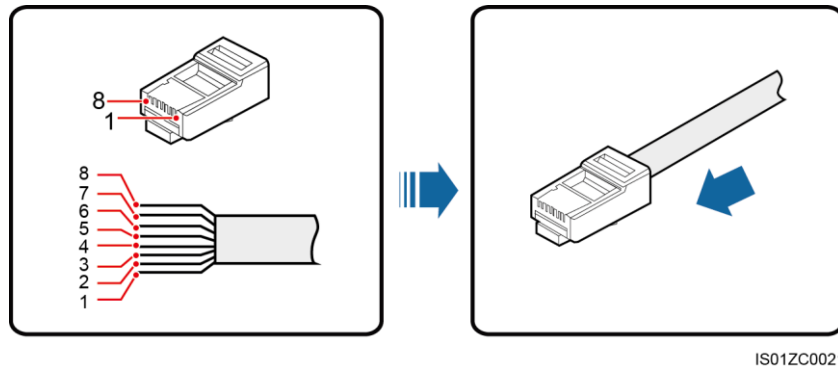
IS01ZC0021

Step 2 Crimp the RJ45 connector using a crimping tool.

Step 3 Remove the locking cap from the **COM1** waterproof cable connector at the SUN2000 bottom and remove the plug from the locking cap.

Step 4 Route the cables through the locking caps and then the **COM1** port at the SUN2000 bottom.

Step 5 Insert the RJ45 connector into the FE1_OUT and FE2_OUT ports in the SUN2000 maintenance compartment.

Figure 5-39 Connecting communications cables

IS03I40010
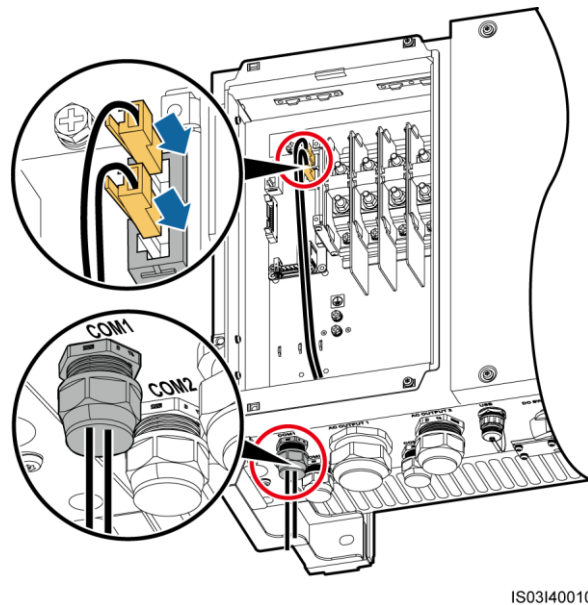
Step 6 Bind communications cables after connecting them.

Figure 5-40 Binding communications cables
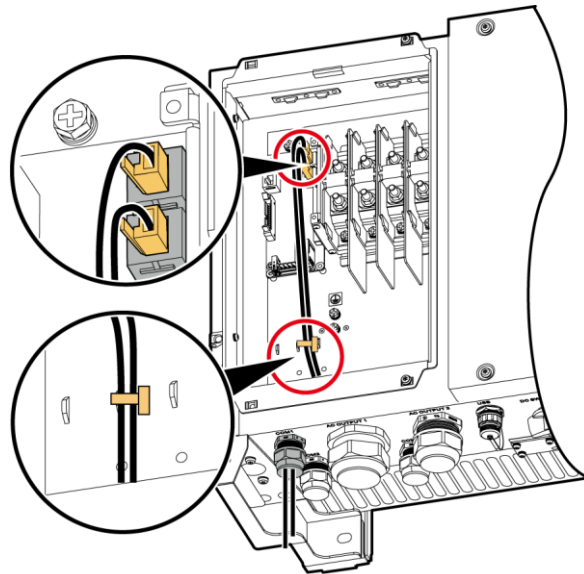
IS03I40011

Step 7 Use a torque wrench with an open end of 33 mm to tighten the locking caps to a torque of 7.5 N·m.

----End

5.6 Closing the Maintenance Compartment Door

Procedure

Step 1 Install the AC terminal cover.

Figure 5-41 Installing a cover
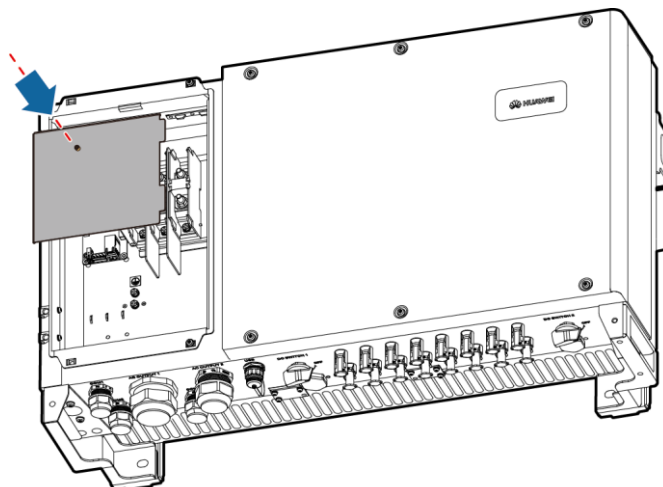
IS03HC0022

Step 2 Adjust the support bar.

Figure 5-42 Adjusting a support bar

IS03HC0018
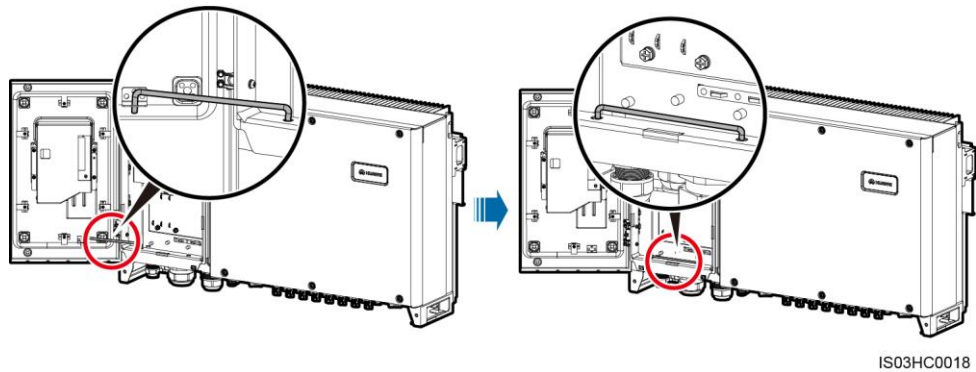
Step 3 Close the maintenance compartment door. Tighten the two screws on the maintenance compartment door using a security torx wrench to a torque of 5 N·m.

Figure 5-43 Tightening screws on the maintenance compartment door

IS03HC0019
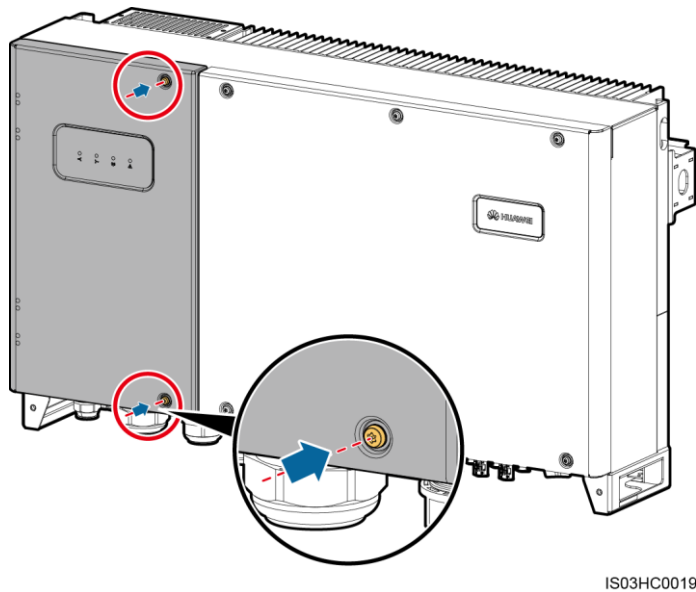
☐ NOTE

- 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 5-44.

Figure 5-44 Removing a standby floating nut
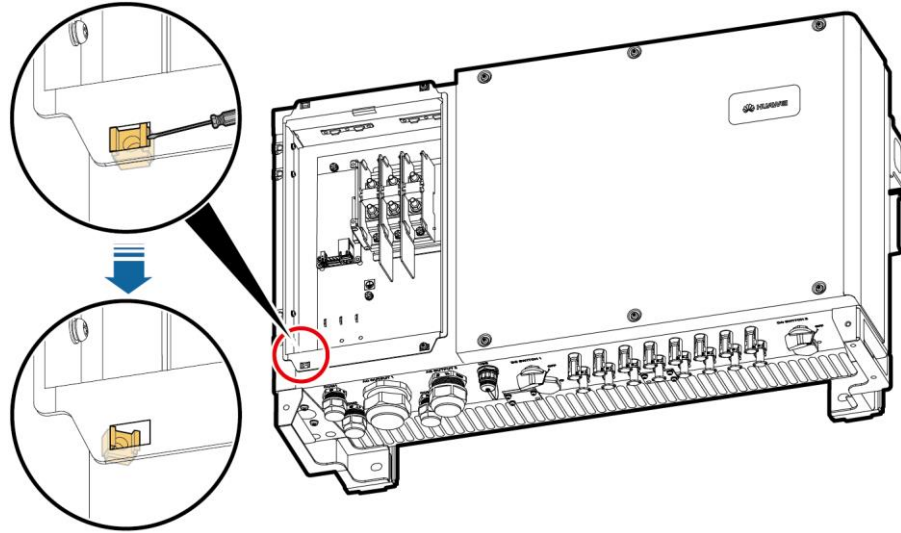
IS03H00059

----**End**

6 System Commissioning

6.1 Checking Before Power-On

1. The inverter is installed correctly and securely.
2. Check that the DC switches and downstream AC output switch are OFF.
3. Ground cables are connected securely, without open circuits or short circuits.
4. AC output power cables are connected correctly and securely, without open circuits or short circuits.
5. DC input power cables are connected correctly and securely, without open circuits or short circuits.
6. The communications cables are connected correctly and securely.
7. All the used connectors at the chassis bottom are sealed.
8. The AC terminal cover is reinstalled.
9. The maintenance compartment door is closed and the door screws are tightened.
10. Idle DC input terminals are sealed.
11. The idle USB port is plugged with a waterproof plug.
12. Idle AC OUTPUT and COM connectors are plugged and the locking caps are tightened.

6.2 Powering On the SUN2000

Prerequisites

Before turning on the AC switch between the inverter 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 inverter and the power grid.

![NOTICE warning triangle icon] **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 inverter 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.

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 warning triangle icon] **NOTICE**

- Mobile phone operating system: Android 4.0 or later, and 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 inverter are at most 5 meters away from each other. Otherwise, the communication quality between them will deteriorate.
- The screen snapshots in this document correspond to app V200R001C20SPC010.

Figure 6-1 Bluetooth module connection mode

IS01NC0009

(A) Inverter   (B) Bluetooth module   (C) Mobile phone
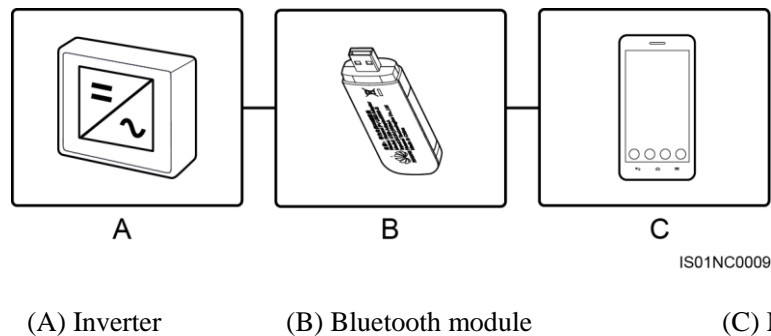
![NOTE icon] **NOTE**

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 mode

| (A) Inverter | (B) USB data cable | (C) Mobile phone |
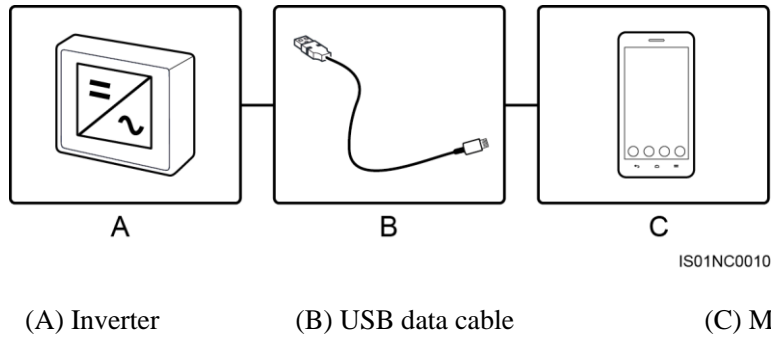
📖 **NOTE**

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.

Figure 6-3 Login screen
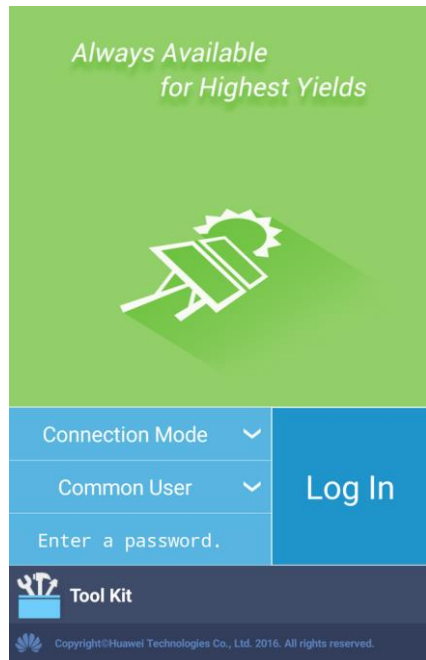
Figure 6-4 Selecting a connection mode
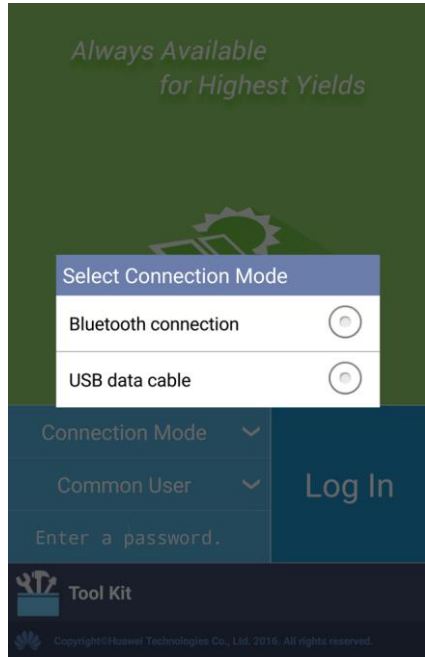
Figure 6-5 Bluetooth connection
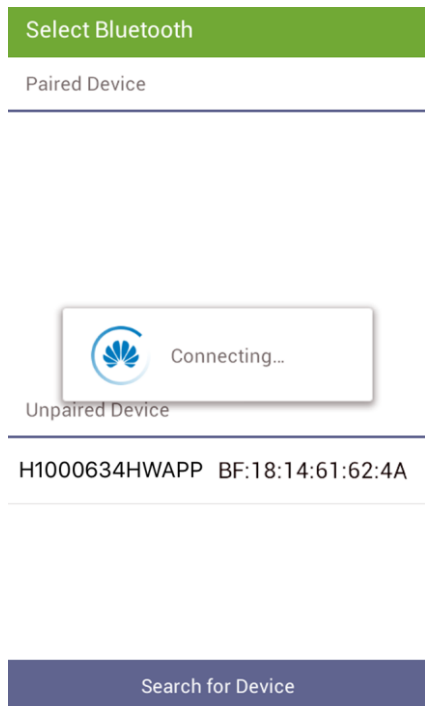
Figure 6-6 Data cable connection
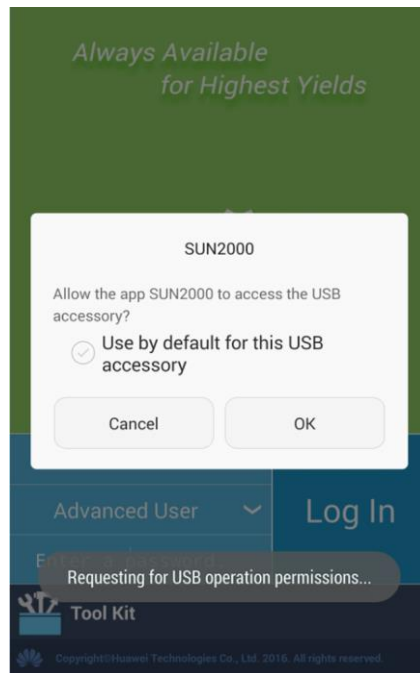
☐ **NOTE**

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

Step 5 Switch the user type (common user, advanced user, and special user) by tapping the user name bar.

Figure 6-7 Switching between users
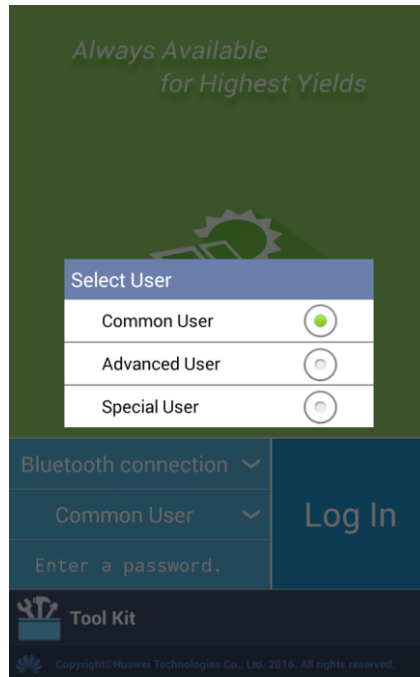
NOTE

- The login password is the same as that for the inverter connected to the app and is used only when the inverter connects to the app.

- The initial password for **Common User**, **Advanced User**, and **Special User** is **00000a**. Use the preset password upon initial 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 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 inverter 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)
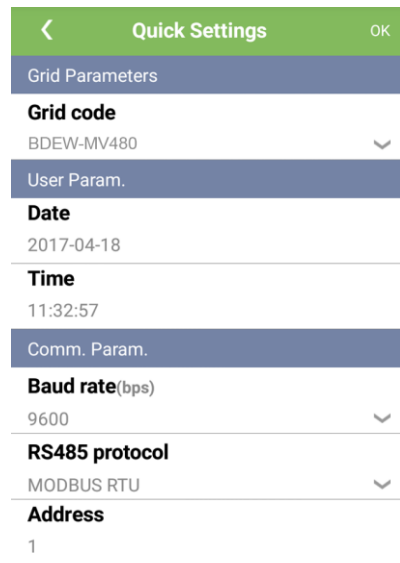
> **NOTE**
>
> - Set the power grid code that applies to the country or region where the power station is located and the inverter model.
>
> - Set user parameters based on the current date and time.
>
> - Set **Baud rate**, **RS485 protocol**, and **Address** based on site requirements. **Baud rate** 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 inverters communicate with the SmartLogger over RS485, the addresses for all the inverters 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 inverters on each RS485 route must be consistent with the SmartLogger baud rate.

Figure 6-9 Function Menu screen
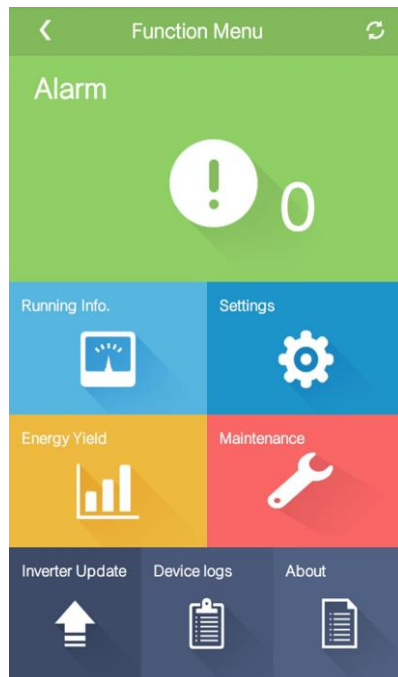
----End

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*, *SmartLogger1000 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.

----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 On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. 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
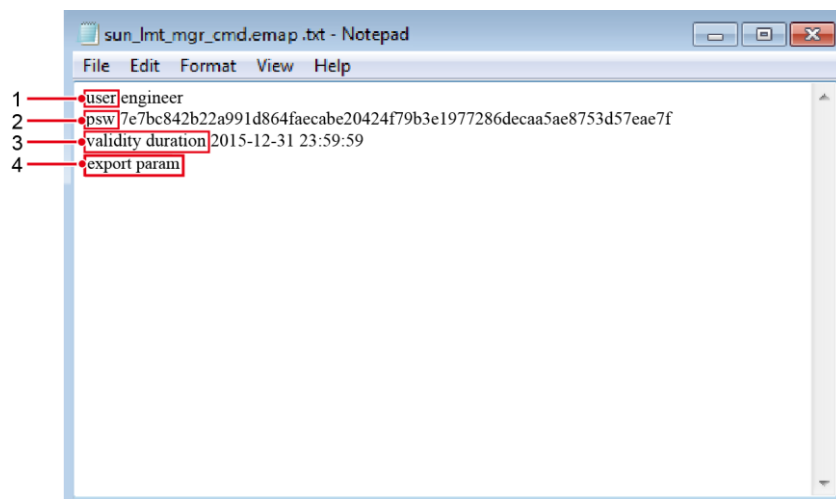
No.	Meaning	Remarks
1	User name	• Advanced user: engineer

No.	Meaning	Remarks
		• Special user: admin
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. • Configuration export command: **export param**. • Configuration import command: **import param**. • Data export command: **export log**. • Upgrade command: **upgrade**.

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 On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. 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 icon]

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 icon]

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.
	Steady green	An operation with a USB flash drive is successful.

----End

7.1.3 Exporting Data

Procedure

Step 1 On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. 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 light or unstable at dawn or dusk due to poor sunlight.

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

☉ NOTE

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

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

1. The monitoring component caches and loads the upgrade package.

2. Upgrade package activation starts when the following conditions are met.

Table 7-4 Conditions for starting delayed activation

Upgrade Method	Activation Start Condition
Local upgrade over a USB flash drive	• The CAN communication is normal. • The PV power supply is normal.
Local upgrade of the SUN2000 APP	The activation starts when either of the preceding two conditions is met.
Remote upgrade over the SmartLogger	• The PV input voltage is greater than 500 V. • The output power is greater than 1 kW.
Remote upgrade over the NMS	The activation starts when either of the preceding two conditions is met.

☉ NOTE

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

Procedure

Step 1 Obtain the required upgrade package from Huawei technical support website (for example, SUN2000 V200R002C00SPC*XXX*).

Step 2 Decompress the upgrade package.

After obtaining the upgrade package **SUN2000V200R002C00SPC*XXX*_package.zip**, decompress the package and ensure that the extracted files include:

● config.txt

● config_arm9.txt

● sun_lmt_mgr_cmd.emap (This is a boot script file.)

● SUN2000.bin

● SUN2000_CPLD.bin

● SUN2000_FE.bin

- SUN2000_Master_Release.bin
- SUN2000_Slave_Release.bin
- update.sh
- 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 On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.

Step 4 Import the boot script file to a PC.

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.

Step 7 Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

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

Table 7-5 LED indicator description

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

Step 8 (Optional) The system automatically restarts when the upgrade is completed. All LED indicators 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 *SmartLogger1000 User Manual* or *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 inverter 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	- Check that the inverter is not damaged or deformed. - Check that the running sound of the inverter is normal. - When the inverter is running, check that all inverter parameters are correctly set.	Once six months
Cable connections	- Check that cables are securely connected. - Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six

Item	Check Method	Maintenance Interval
	• Check that the idle COM, USB, and AC OUTPUT ports are locked by waterproof caps.	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	• 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. • 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. • Cause ID = 3 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 5 and 6,	• 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. • 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. • Cause ID = 3 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

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage. • Cause ID = 4 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.	maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 4 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.
106–113	Abnormal String 1–8	Warning	Cause ID = 1 • The PV string is shielded from sunlight for a long time. • The PV string deteriorates or is damaged.	1. Check whether the PV string current is obviously lower than the currents of other PV strings. 2. If yes, check whether the PV string is shielded from sunlight. 3. If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty.
120–127	String 1–8 Reversed	Cause ID = 1: Major Cause ID = 2: Warning	• Cause ID = 1 The PV string is reversely connected. • Cause ID = 2 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.	• Cause ID = 1 Check whether the PV string is reversely connected to the SUN2000. If yes, wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches and correct the PV string connection. • Cause ID = 2 Check whether the number of PV modules connected in series to the SUN2000 is small. If yes, increase the number.
200	Abnormal DC Circuit	Major	Abnormal external conditions trigger the protection for the DC circuit inside the SUN2000. The possible causes are as follows: • Cause ID = 3 The SUN2000 input is disconnected accidentally, or the PV string output power changes sharply because the PV string is shielded from sunlight. • Cause ID = 10	Cause ID = 3/10/11 1. The SUN2000 detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers. 2. If the alarm persists, contact Huawei technical support. Cause ID = 12/15 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,

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			The three phases of the power grid are seriously unbalanced, which triggers the protection for the internal control circuit of the SUN2000. • Cause ID = 11 The 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. • Cause ID = 12/15 An unrecoverable fault occurs on a circuit inside the SUN2000.	contact Huawei technical support.
202	Abnormal Invert Circuit	Major	Abnormal external conditions trigger the protection for the inverter circuit inside the SUN2000. The possible causes are as follows: • Cause ID = 13 The grid voltage drops dramatically or the power grid is short-circuited, which damages the internal voltage detection circuit in the SUN2000. • Cause ID = 14 The 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. • Cause ID = 16 The DC current in the power grid exceeds the upper threshold. • Cause ID = 20 The inverter output is short-circuited. As a result, the output current surges to a value above the upper limit,	Cause ID = 13/14/16 1. The inverter detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers. 2. If the alarm persists, contact Huawei technical support. Cause ID = 20 1. Check the inverter output cable for short-circuits. 2. If the alarm persists, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			and the inverter protection is triggered.	

301	Abnormal Grid Voltage	Major	The grid voltage is beyond the acceptable range. The possible causes are as follows:
			
			• Cause ID = 4
			
			  The grid voltage is below the specified lower threshold.
			
			• Cause ID = 16
			
			  The grid voltage exceeds the specified upper threshold.
			
			• Cause ID = 19
			
			  The grid voltage has exceeded the specified upper threshold for 10 minutes.
			
			• Cause ID = 26
			
			  The grid voltage exceeds the specified upper threshold.
			
			• Cause ID = 28
			
			  The three phases of the power grid differ greatly in voltage.
			
			• Cause ID = 29
			
			  1. The power grid experiences an outage.
			
			  2. The AC circuit is disconnected or AC switch is OFF.
			
			• Cause ID = 31/32/33
			
			  The impedance of the output phase wire A (cause ID = 31)/B (cause ID = 32)/C (cause ID = 33) to the PE cable is low or short-circuited.
				Cause ID = 4
				
				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.
				
				2. If the alarm occurs frequently, check whether the 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 grid overvoltage and undervoltage protection thresholds with the consent of the local power operator.
				
				3. If the fault persists for a long time, check the AC switch and AC output power cable.
				
				Cause ID = 16/19/26
				
				1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator.
				
				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.
				
				3. Check whether the peak grid voltage exceeds the upper threshold.
				
				Cause ID = 28
				
				1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the fault is rectified.
				
				2. If the alarm persists and affects the energy yield of the power station, contact the local power operator.
				
				Cause ID = 29
				
				1. Check the AC voltage.
				
				2. Check that the AC power cable is securely connected and that the

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
				AC switch is ON.
				Cause ID = 31/32/33
				Check the impedance of output phase wire A (cause ID = 31)/B (cause ID = 32)/C (cause ID = 33) to the PE cable and locate the position with lower impedance and resolve the issue.
305	Abnormal Grid Frequency	Major	• Cause ID = 2 The actual grid frequency is higher than the standard requirement for the local power grid. • Cause ID = 4 The actual grid frequency is lower than the standard requirement for the local power grid. • Cause ID = 5 The actual change rate of the grid frequency does not meet the standard requirement for the local power grid.	Cause ID = 2/4 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. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 app, SmartLogger, or NMS to modify the grid overfrequency and underfrequency protection thresholds with the consent of the local power operator. Cause ID = 5 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. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator.
313	Low Insulation Resistance	Major	Cause ID = 1 • A short circuit occurs between the PV string and the PGND cable. • The PV string is installed in a moist environment for a long time.	1. Check the impedance between the PV string and the PGND cable. If a short circuit occurs, rectify the fault. 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 **Insulation resistance protection**.
318	Abnormal	Major	Cause ID = 1	1. If the alarm occurs accidentally, the external circuit may be

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
	Residual Current		The insulation resistance against the PGND cable at the input side decreases when the SUN2000 is running, which causes an excessively high residual current.	abnormal temporarily. The SUN2000 automatically recovers after fault is rectified. 2. If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low.
321	Cabinet Overtemperature	Major	Cause ID = 1 • The SUN2000 is installed in a place with poor ventilation. • The ambient temperature exceeds the upper threshold. • The internal fan works abnormally.	1. Check the ventilation and ambient temperature of the SUN2000 installation position. 2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 3. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.
322	Abnormal SPI Communication	Major	Cause ID = 1 An unrecoverable fault occurs on a circuit inside the SUN2000.	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.
326	Abnormal Grounding	Major	Cause ID = 1 • The neutral wire or PGND cable does not connect to the SUN2000. • The SUN2000 output side does not connect to an isolation transformer when the PV string output is grounded.	1. Check that the neutral wire or PGND cable properly connects to the inverter. 2. If the PV string output is grounded, check that the SUN2000 output side connects to an isolation transformer.
400	System Fault	Major	Cause ID = 1/3/21/23/27 An unrecoverable fault occurs on a circuit inside the SUN2000.	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.
410	Abnormal Auxiliary Power	Major	Cause ID = 4 The sampling control board has an abnormal voltage, which may be caused by the following: • The internal power chip of the sampling control board is faulty. • The detection circuit becomes faulty.	1. When the alarm is generated, the SUN2000 shuts down automatically. When the fault is rectified, the SUN2000 starts automatically. 2. If the alarm persists, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
411	AFCI Self-Check Failure	Major	Cause ID = 1/2/3 AFCI check fails.	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. 2. Disable the AFCI function if you are sure not to use it.
412	DC Arc Fault	Major	Cause ID = 1/2/3/4 The PV string cable is in poor contact or with open circuits.	Check whether the PV string cable is in poor contact or with open circuits. If yes, reconnect the cable.
504	Software Version Unmatch	Minor	Cause ID = 1/2/3 During inverter software upgrade, the version of the software loaded is incorrect.	Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.
505	Upgrade Failed	Major	Cause ID = 1 The upgrade does not end normally.	Perform the upgrade again.
61440	Flash Fault	Minor	Cause ID = 1 • The flash memory is insufficient. • The flash memory has bad sectors.	1. Replace the monitoring board. 2. If the monitoring board is built into the monitoring device, replace the monitoring device.

☐ NOTE

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

9 Handling the SUN2000

9.1 Removing the SUN2000

⚠ **NOTICE**

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

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 PGND 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-A	SUN2000-36KTL		SUN2000-42KTL
Maximum conversion efficiency	98.6%	98.6% (380 V/400 V)	98.8% (480 V)	98.8%
European efficiency	98.4%	98.4% (380 V/400 V)	98.6% (480 V)	98.6%

Input

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Maximum input power ($\cos\varphi = 1$)	30,600 W	40,800 W	47,900 W
Maximum input voltage	1100 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		
Lowest operating/startup	200 V/250 V (200 V[a])		

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
voltage			
Highest operating voltage	1000 V		
MPPT voltage range	200–1000 V		
Full power MPPT voltage range	480–800 V	480–800 V (380 V/400 V)/580–850 V (480 V)	580–850 V
Rated input voltage	620 V	620 V (380 V/400 V)/720 V (480 V)	720 V
Number of inputs	8		
Number of MPP trackers	4		
Note a: The minimum startup voltage of the SUN2000-36KTL is 200 V under the NB/T 32004 grid code.			

Output

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Rated active power	30,000 W	36,000 W	42,000 W
Maximum apparent power	33,000 VA	40,000 VA	47,000 VA
Maximum active power[a] ($\cos\varphi = 1$)	30,000 W	40,000 W (can be set to 36,000 W)	47,000 W (can be set to 42,000 W)
Rated output voltage[b]	230 V/400 V, 3W+(N)[c]+PE	220 V/380 V, 230 V/400 V, 3W+(N)[c]+PE; 277 V/480 V, 3W+PE	277 V/480 V, 3W+PE
Adapted grid frequency	50 Hz/60 Hz		
Maximum output current	48 A (400 V)	60.8 A (380 V)/57.8 A (400 V)/48.2 A (480 V)	56.6 A (480 V)
Power factor	0.8 leading... 0.8 lagging		
Maximum total harmonic distortion (rated power)	< 3%		

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Note a: The maximum active power is determined by **PQ mode**, which can be set on the SUN2000 app, SmartLogger, or NetEco. If **PQ mode 1** is selected, the maximum active power equals the maximum apparent power. If **PQ mode 2** is selected, the maximum active power equals the rated active power.			
Note b: The rated output voltage depends on **Grid code**, which can be set on the SUN2000 app, SmartLogger, or NMS.			
Note c: Choose whether to connect the neutral wire to the SUN2000-33KTL-A and SUN2000-36KTL based on the application scenario. When they are used in the scenarios without the neutral wire, set **Output mode** to **Three-phase, three-wire**. When they are used in the scenarios with the neutral wire, set **Output mode** to **Three-phase, four-wire**.			

Protection

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Input DC switch	Supported		
Anti-islanding protection	Supported		
Output overcurrent protection	Supported		
Input reverse connection protection	Supported		
PV string fault detection	Supported		
DC surge protection	Type II		
AC surge protection	Type II		
Insulation resistance detection	Supported		
Residual current monitoring unit (RCMU)	Supported		
Arc fault protection (AFCI: arc fault circuit interrupter)	Not supported	Optional	Not supported

Communication

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Display	LED, Bluetooth module+app, USB data cable+app		
RS485	Supported		
PLC	Supported		
FE	Not supported	Optional[a]	Not supported
Note a: If the SUN2000-36KTL adopts the FE communication mode, it supports only the RS485 and FE communication modes, and does not support the PLC communication mode.			

Common Parameters

Item	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Dimensions (W x H x D)	930 mm x 550 mm x 283 mm (including the mounting plate)		
Weight	About 60 kg (excluding the mounting plate)/About 62 kg (including the mounting plate)		
Operating temperature	−25°C to +60°C		
Cooling mode	Natural convection		
Highest altitude	4000 m		
Humidity	0%−100% RH		
Input terminal	Amphenol Helios H4		
Output terminal	Waterproof cable connector+OT terminal		
Ingress Protection Rating	IP65		
Topology	Transformerless		

A Grid Codes

NOTE

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

Table A-1 lists the grid codes that the SUN2000-33KTL-A supports.

Table A-1 Grid codes (for the SUN2000-33KTL-A)

No.	Grid Code	Description	Power Grid Voltage
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V/400 V
2	UTE C 15-712-1(A)	France mainland low-voltage power grid	230 V/400 V
3	UTE C 15-712-1(B)	France islands 230 V 50 Hz	230 V/400 V
4	UTE C 15-712-1(C)	France islands 230 V 60 Hz	230 V/400 V
5	CEI0-21	Italy low-voltage power grid	230 V/400 V
6	RD1699/661	Spain low-voltage power grid	230 V/400 V
7	PO12.3	Spain low-voltage power grid	230 V/400 V
8	CEI0-16	Italy low-voltage power grid	230 V/400 V
9	EN50438-TR	Turkey low-voltage power grid	230 V/400 V

Table A-2 lists the grid codes that the SUN2000-36KTL supports.

Table A-2 Grid codes (for the SUN2000-36KTL)

No.	Grid Code	Description	Power Grid Voltage
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V/400 V
2	NB/T 32004	China low-voltage power grid	220 V/380 V
3	UTE C 15-712-1(A)	France mainland low-voltage	230 V/400 V

No.	Grid Code	Description	Power Grid Voltage
		power grid	
4	UTE C 15-712-1(B)	France islands 230 V 50 Hz	230 V/400 V
5	UTE C 15-712-1(C)	France islands 230 V 60 Hz	230 V/400 V
6	BDEW-MV	Germany medium-voltage power grid (BDEW-MV)	230 V/400 V
7	G59-England	England 230 V power grid (I > 16 A)	230 V/400 V
8	G59-Scotland	Scotland 240 V power grid (I > 16 A)	240 V/415 V
9	CEI0-21	Italy low-voltage power grid	230 V/400 V
10	EN50438-CZ	Czech Republic low-voltage power grid	230 V/400 V
11	RD1699/661	Spain low-voltage power grid	230 V/400 V
12	RD1699/661-MV480	Spain medium-voltage power grid	277 V/480 V
13	C10/11	Belgium low-voltage power grid	230 V/400 V
14	AS4777	Australia low-voltage power grid	230 V/400 V
15	IEC61727	IEC61727 low-voltage power grid (50 Hz)	230 V/400 V
16	CEI0-16	Italy low-voltage power grid	230 V/400 V
17	TAI-MEA	Thailand low-voltage power grid (MEA)	230 V/400 V
18	TAI-PEA	Thailand low-voltage power grid (PEA)	220 V/380 V
19	BDEW-MV480	Germany medium-voltage power grid (BDEW-MV480)	277 V/480 V
20	G59-England-MV480	England 480 V medium-voltage power grid (I > 16 A)	277 V/480 V
21	IEC61727-MV480	IEC61727 medium-voltage power grid (50 Hz)	277 V/480 V
22	UTE C 15-712-1-MV480	France medium-voltage power grid	277 V/480 V
23	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)	277 V/480 V
24	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)	277 V/480 V

No.	Grid Code	Description	Power Grid Voltage
25	EN50438-DK-MV480	Denmark medium-voltage power grid	277 V/480 V
26	EN50438-TR-MV480	Turkey medium-voltage power grid	277 V/480 V
27	EN50438-TR	Turkey low-voltage power grid	230 V/400 V
28	C11/C10-MV480	Belgium medium-voltage power grid	277 V/480 V
29	Philippines	Philippines low-voltage power grid	220 V/380 V
30	Philippines-MV480	Philippines medium-voltage power grid	277 V/480 V
31	EN50438-NL	Netherlands power grid	230 V/400 V
32	NRS-097-2-1	South Africa low-voltage power grid	230 V/400 V
33	NRS-097-2-1-MV480	South Africa medium-voltage power grid	277 V/480 V
34	KOREA	South Korea low-voltage power grid	220 V/380 V
35	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)	230 V/400 V
36	IEC61727-60Hz-MV480	IEC61727 medium-voltage power grid (60 Hz)	277 V/480 V
37	ANRE	Romania low-voltage power grid	230 V/400 V
38	ANRE-MV480	Romania medium-voltage power grid	277 V/480 V
39	PO12.3-MV480	Spain medium-voltage power grid	277 V/480 V
40	EN50438_IE-MV480	Ireland medium-voltage power grid (EN50438_IE)	277 V/480 V
41	EN50438_IE	Ireland low-voltage power grid (EN50438_IE)	230 V/400 V
42	INDIA	India low-voltage power grid	230 V/400 V
43	CEI0-16-MV480	Italy medium-voltage power grid (CEI0-16)	277 V/480 V
44	PO12.3	Spain low-voltage power grid	230 V/400 V
45	CEI0-21-MV480	Italy medium-voltage power grid (CEI0-21)	277 V/480 V

No.	Grid Code	Description	Power Grid Voltage
46	Egypt ETEC	Egypt low-voltage power grid	230 V/400 V
47	Egypt ETEC-MV480	Egypt medium-voltage power grid	277 V/480 V
48	CLC/TS50549_IE	Ireland low-voltage power grid (CLC/TS50549_IE)	230 V/400 V
49	CLC/TS50549_IE-MV480	Ireland medium-voltage power grid (CLC/TS50549_IE)	277 V/480 V
50	Jordan-Transmission	Jordan low-voltage power grid	230 V/400 V
51	Jordan-Transmission-MV480	Jordan medium-voltage power grid	277 V/480 V
52	NAMIBIA	Namibia power grid	230 V/400 V
53	ABNT NBR 16149	Brazil low-voltage power grid	220 V/380 V
54	SA_RPPs	South Africa low-voltage power grid	230 V/400 V
55	SA_RPPs-MV480	South Africa medium-voltage power grid	277 V/480 V
56	ZAMBIA	Zambia low-voltage power grid	220 V/380 V
57	Chile	Chile low-voltage power grid	220 V/380 V
58	Mexico-MV480	Mexico medium-voltage power grid	277 V/480 V
59	Malaysian	Malaysia low-voltage power grid	230 V/400 V
60	KENYA_ETHIOPIA	Kenya low-voltage and Ethiopia low-voltage power grid	230 V/400 V
61	NIGERIA	Nigeria low-voltage power grid	230 V/400 V
62	NIGERIA-MV480	Nigeria medium-voltage power grid	277 V/480 V
63	DUBAI	Dubai low-voltage power grid	230 V/400 V
64	DUBAI-MV480	Dubai medium-voltage power grid	277 V/480 V
65	Northern Ireland	Northern Ireland low-voltage power grid	230 V/400 V
66	Northern Ireland-MV480	Northern Ireland medium-voltage power grid	277 V/480 V
67	Cameroon	Cameroon low-voltage power grid	230 V/400 V
68	Cameroon-MV480	Cameroon medium-voltage	277 V/480 V

No.	Grid Code	Description	Power Grid Voltage
		power grid	
69	Jordan-Distribution	Jordan power distribution network low-voltage power grid	230 V/400 V
70	LEBANON	Lebanon low-voltage power grid	230 V/400 V
71	Jordan-Transmission-HV	Jordan high-voltage power grid	230 V/400 V
72	TUNISIA	Tunisia power grid	230 V/400 V
73	AUSTRALIA-NER	Australia NER standard power grid	230 V/400 V
74	SAUDI	Saudi Arabia power grid	230 V/400 V
75	Israel	Israel power grid	230 V/400 V
76	Chile-PMGD	Chile PMGD project power grid	230 V/400 V
77	VDE-AR-N4120_HV	VDE4120 standard power grid	230 V/400 V
78	VDE-AR-N4120_HV480	VDE4120 standard power grid (480 V)	277 V/480 V
79	Vietnam	Vietnam power grid	220 V/380 V
80	Custom(50Hz)	Reserved	230 V/400 V
81	Custom(60Hz)	Reserved	230 V/400 V
82	Custom-MV480(50Hz)	Reserved	277 V/480 V
83	Custom-MV480(60Hz)	Reserved	277 V/480 V

Table A-3 lists the grid codes that the SUN2000-42KTL supports.

Table A-3 Power grid codes (SUN2000-42KTL)

No.	Power Grid Code	Description	Power Grid Voltage
1	RD1699/661-MV480	Spain medium-voltage power grid	277 V/480 V
2	BDEW-MV480	Germany medium-voltage power grid (BDEW-MV480)	277 V/480 V
3	G59-England-MV480	England 480 V medium-voltage power grid (I > 16 A)	277 V/480 V
4	IEC61727-MV480	IEC61727 medium-voltage power grid (50 Hz)	277 V/480 V
5	UTE C 15-712-1-MV480	France island medium-voltage power grid	277 V/480 V

No.	Power Grid Code	Description	Power Grid Voltage
6	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)	277 V/480 V
7	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)	277 V/480 V
8	EN50438-DK-MV480	Denmark medium-voltage power grid	277 V/480 V
9	EN50438-TR-MV480	Turkey medium-voltage power grid	277 V/480 V
10	C11/C10-MV480	Belgium medium-voltage power grid	277 V/480 V
11	Philippines-MV480	Philippines medium-voltage power grid	277 V/480 V
12	AS4777-MV480	Australia medium-voltage power grid	277 V/480 V
13	ANRE-MV480	Romania medium-voltage power grid	277 V/480 V
14	NRS-097-2-1-MV480	South Africa medium-voltage power grid	277 V/480 V
15	IEC61727-60Hz-MV480	IEC61727 medium-voltage power grid (60 Hz)	277 V/480 V
16	PO12.3-MV480	Spain medium-voltage power grid	277 V/480 V
17	EN50438_IE-MV480	Ireland medium-voltage power grid (EN50438_IE)	277 V/480 V
18	KOREA-MV480	South Korea medium-voltage power grid	277 V/480 V
19	CEI0-16-MV480	Italy medium-voltage power grid (CEI0-16)	277 V/480 V
20	CEI0-21-MV480	Italy medium-voltage power grid (CEI0-21)	277 V/480 V
21	Egypt ETEC-MV480	Egypt medium-voltage power grid	277 V/480 V
22	CLC/TS50549_IE-MV480	Ireland medium-voltage power grid (CLC/TS50549_IE)	277 V/480 V
23	Jordan-Transmission-MV480	Jordan medium-voltage power grid	277 V/480 V
24	SA_RPPs-MV480	South Africa medium-voltage power grid	277 V/480 V

No.	Power Grid Code	Description	Power Grid Voltage
25	ZAMBIA-MV480	Zambia medium-voltage power grid	277 V/480 V
26	Chile-MV480	Chile medium-voltage power grid	277 V/480 V
27	Mexico-MV480	Mexico medium-voltage power grid	277 V/480 V
28	Malaysian-MV480	Malaysia medium-voltage power grid	277 V/480 V
29	KENYA_ETHIOPIA_MV480	Kenya medium-voltage and Ethiopia medium-voltage power grid	277 V/480 V
30	NIGERIA-MV480	Nigeria medium-voltage power grid	277 V/480 V
31	DUBAI-MV480	Dubai medium-voltage power grid	277 V/480 V
32	Northern Ireland-MV480	Northern Ireland medium-voltage power grid	277 V/480 V
33	Cameroon-MV480	Cameroon medium-voltage power grid	277 V/480 V
34	Jordan-Distribution-MV480	Jordan power distribution network medium-voltage power grid	277 V/480 V
35	NAMIBIA_MV480	Namibia power grid	277 V/480 V
36	LEBANON-MV480	Lebanon medium-voltage power grid	277 V/480 V
37	Jordan-Transmission-HV480	Jordan high-voltage power grid	277 V/480 V
38	TUNISIA-MV480	Tunisia medium-voltage power grid	277 V/480 V
39	AUSTRALIA-NER-MV480	Australia NER standard power grid	277 V/480 V
40	SAUDI-MV480	Saudi Arabia power grid	277 V/480 V
41	Ghana-MV480	Ghana medium-voltage power grid	277 V/480 V
42	Israel-MV480	Israel power grid	277 V/480 V
43	Chile-PMGD-MV480	Chile PMGD project power grid	277 V/480 V
44	VDE-AR-N4120_HV480	VDE4120 standard power grid (480 V)	277 V/480 V

No.	Power Grid Code	Description	Power Grid Voltage
45	Vietnam-MV480	Vietnam power grid	277 V/480 V
46	Custom-MV480(50Hz)	Reserved	277 V/480 V
47	Custom-MV480(60Hz)	Reserved	277 V/480 V

B Acronyms and Abbreviations

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

RCMU   residual current monitoring unit

T

THD   total harmonic distortion

W

WEEE   waste electrical and electronic equipment