SUN2000-(33KTL, 40KTL)

User Manual

HUAWEI TECHNOLOGIES CO., LTD.

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About This Document

Purpose

This document describes the SUN2000 inverter in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. This document describes the SUN2000 inverter in terms of its installation, electrical connections, and commissioning. Readers should be familiar with the SUN2000 features and functions and safety precautions provided in this document before installing and operating the SUN2000.

This document is subject to update and revision. The latest version can be downloaded from http://support.huawei.com/carrier.

Intended Audience

This document is intended for photovoltaic (PV) power station 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 death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ 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.

Symbol	Description
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. Therefore, the latest document issue contains all updates made in previous issues.

Issue 02 (2015-08-10)

This issue is the second official release.

Issue 01 (2015-02-10)

This issue is the first official release.

Contents

1 Safety Precautions

Strictly follow all the safety precautions in this document to prevent personal injury or death.

Personnel Requirements

- Only qualified and trained electrical technicians are allowed to install and operate the SUN2000.
- Operators should understand the components and functioning of a grid-tied PV power system, and they should be familiar with relevant local standards.

Label Protection

- Do not tamper with any warning signs on the SUN2000 enclosure because these signs contain important information about safe operation.
- Do not remove or damage the nameplate on the SUN2000 enclosure because it contains important product information.
- Do not remove the anti-dismantle label on the SUN2000 enclosure because it is the basis for product warranty.

Installation

⚠ **NOTICE**

Read this document before installation. Huawei shall not be liable for any consequence caused by violation of the regulations specified in this document.

- Ensure that the SUN2000 is not connected to a power supply and is not powered on before starting installation.
- Ensure that there are no objects within 200 mm of both sides of the SUN2000, and no objects within 500 mm, 600 mm, and 1000 mm of the top, bottom, and front, respectively. This is to allow sufficient space for installation and heat dissipation. If you have any questions about the distance, consult the local technical support engineers.
- Install the SUN2000 in an environment with good ventilation to ensure efficient and long-term system performance.
- Ensure that the SUN2000 heat sinks are free from blockage.

- Open the door on the lower side of the chassis before cable connection. Do not touch any other components inside the chassis when connecting AC power cables and communications cables.

Electrical Connection

DANGER

Before connecting cables to the SUN2000, ensure that the SUN2000 is securely positioned and not damaged in any way. Otherwise, electrical shock or fire may occur.

- Shield the PV modules with opaque cloth before connecting cables to the SUN2000.
- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local power supply department before using the SUN2000 to generate electricity in grid-tied mode.
- Ensure that the cables to the solar power system are properly connected and insulated and meet specifications.

Operation

DANGER

High voltage may cause electrical shock and death during operation. Strictly comply with the safety precautions in this document and associated documents when operating the SUN2000.

- Do not touch parts of the SUN2000 because the enclosure and heat sinks are extremely hot when the SUN2000 is in operation and touching these parts can cause severe burns and personal injury.
- Follow local laws and regulations when operating the SUN2000.

Maintenance and Replacement

DANGER

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

- Before performing maintenance tasks, power off the SUN2000 based on the description in 6.2 Powering Off the SUN2000 and wait for at least 5 minutes.
- Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
- Rectify any faults that may compromise the SUN2000 security performance before restarting the SUN2000.

- Maintain the SUN2000 with sufficient knowledge of this document and proper tools and testing equipment.
- When maintaining the SUN2000, comply with ESD precautions.
- For personal safety, wear insulation gloves and protective shoes.

2 Overview

This chapter introduces the SUN2000 and describes its appearance, label conventions, monitoring panel, and functioning.

2.1 Introduction

This section describes the functions, models, and network application of the SUN2000.
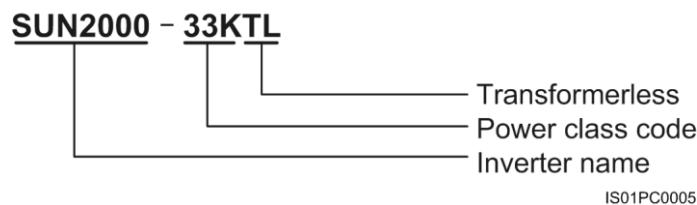
Function

The SUN2000-33KTL/40KTL 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.

Models

Figure 2-1 shows a model number of the SUN2000-33KTL/40KTL, using SUN2000-33KTL as an example.

Figure 2-1 Model number description

SUN2000 – 33KTL

Transformerless
Power class code
Inverter name

IS01PC0005

Table 2-1 lists all models of the SUN2000-33KTL/40KTL and their rated output power.
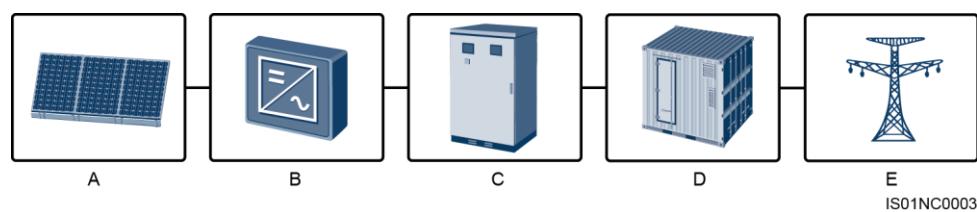
Table 2-1 SUN2000 models and rated output power

Model	Rated Output Power
SUN2000-33KTL	30 kW
SUN2000-40KTL	36 kW

Network Application

The SUN2000-33KTL/40KTL 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) SUN2000-33KTL/40KTL
(C) ACDU	(D) Isolation transformer
(E) Power grid	

Supported Power Grids

The SUN2000-33KTL supports the power grid modes TN-S, TN-C, TN-C-S, and TT, as shown in Figure 2-3. The SUN2000-40KTL only supports the power grid mode IT, as shown in Figure 2-4.

Figure 2-3 Power grids supported by the SUN2000-33KTL
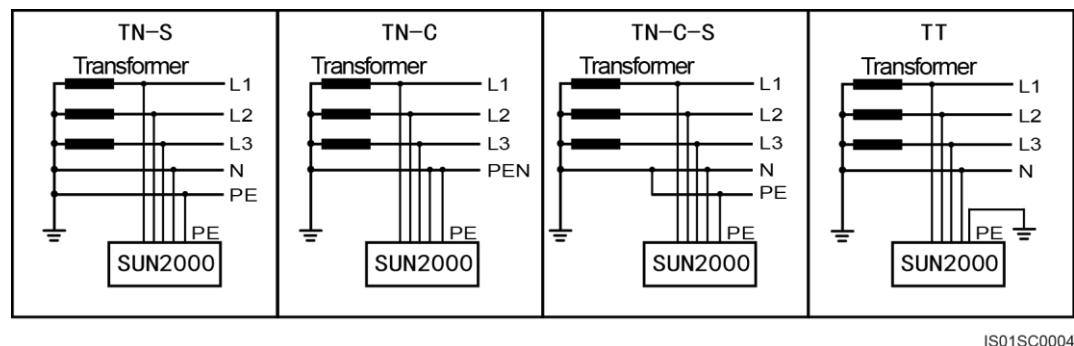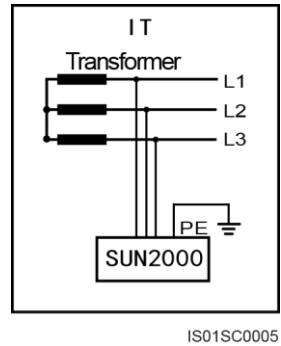
Figure 2-4 Power grid modes supported by the SUN2000-40KTL

IS01SC0005

📖 **NOTE**

The SUN2000-40KTL mainly applies to medium-voltage power grids. Output power from multiple inverters connected in parallel is adjusted by a step-up transformer and then fed to a medium-voltage power grid with three-phase, three-wire output.
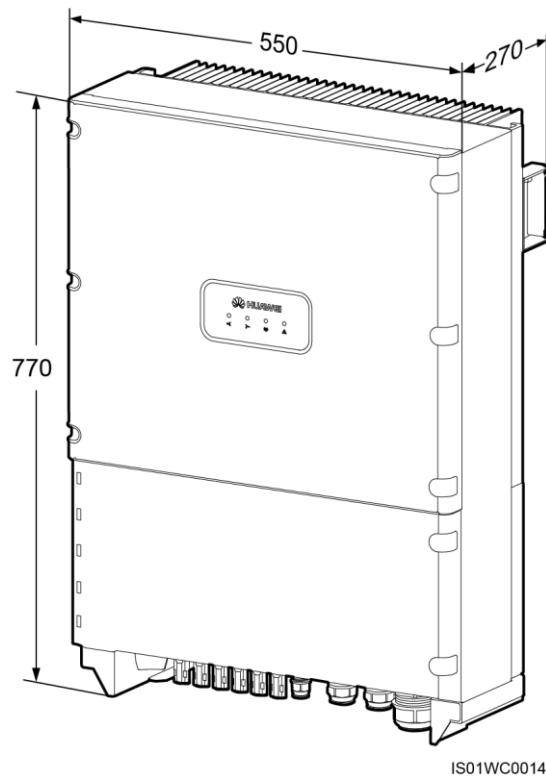
2.2 Appearance

This section describes the appearance and specifications of the SUN2000.

Dimensions

Figure 2-5 shows the SUN2000 dimensions.
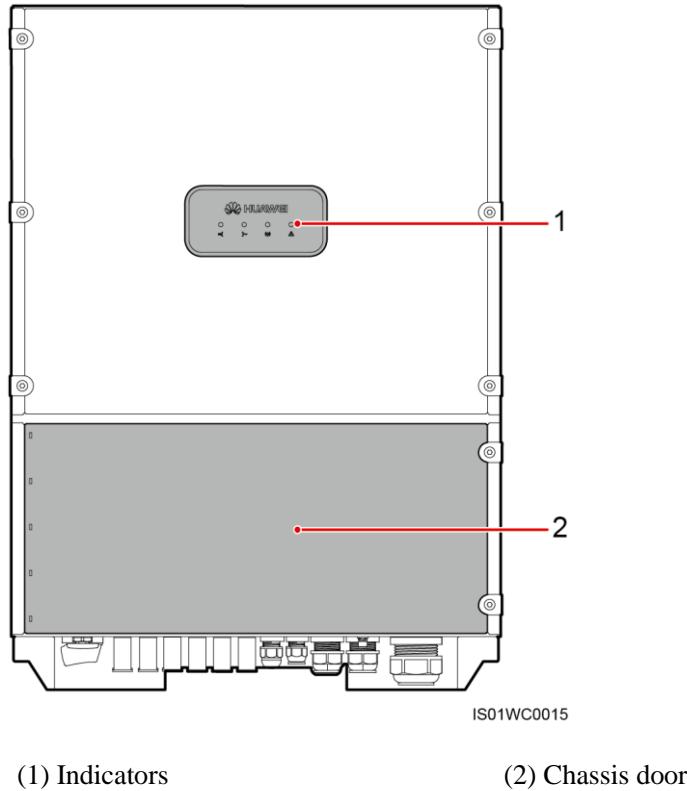
Figure 2-5 SUN2000 dimensions (unit: mm)

SUN2000 front view

shows the SUN2000 front view.

Figure 2-6 SUN2000 front view

IS01WC0015

(1) Indicators   (2) Chassis door

Table 2-2 describes the indicators.

Table 2-2 Description of indicators from left to right

Indicator	Status	Meaning
PV connection indicator ⊫[	Steady green	At least one PV string is properly connected, and the DC voltage exceeds 200 V.
	Off	The SUN2000 is disconnected from all PV strings.
Grid-tie indicator]∼	Steady green	The SUN2000 is grid-tied.
	Off	The SUN2000 is not grid-tied.
Communication indicator (((•)))	Blinking green fast (on for 0.5s and off for 0.5s)	The SUN2000 is communicating properly.
	Off	The SUN2000 has failed to communicate.

Indicator	Status		Meaning
Alarm/Maintenance indicator ⚠	Alarm state	Blinking red slowly (on for 1s and then off for 4s)	The SUN2000 has generated a warning.
		Blinking red fast (on for 0.5s and then off for 0.5s)	The SUN2000 has generated a minor alarm.
		Steady red	The SUN2000 has generated a critical alarm.
	Local maintenance state	Blinking green slowly (on for 1s and then off for 1s)	Local maintenance is in progress.
		Blinking green fast (on for 0.125s and off for 0.125s)	Local maintenance has failed.
		Steady green	Local maintenance is successful.
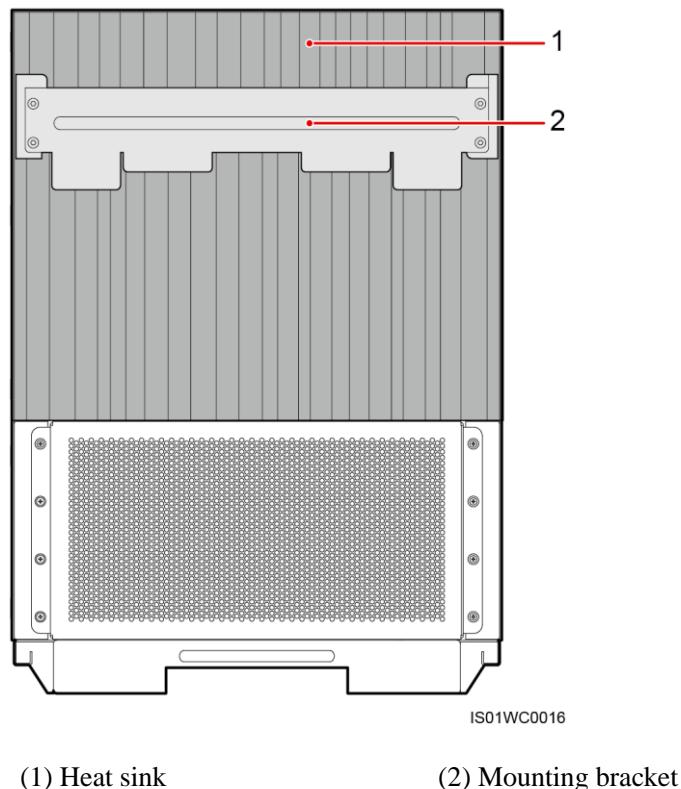
☐ NOTE

- Local maintenance refers to operations with a USB flash drive or Bluetooth module.
- If alarming and local maintenance happen concurrently, the alarm/maintenance indicator shows the local maintenance state first. After the USB flash drive or Bluetooth module is removed, the indicator shows the alarm state.

Rear View

Figure 2-7 shows the SUN2000 rear view.

Figure 2-7 SUN2000 rear view

IS01WC0016
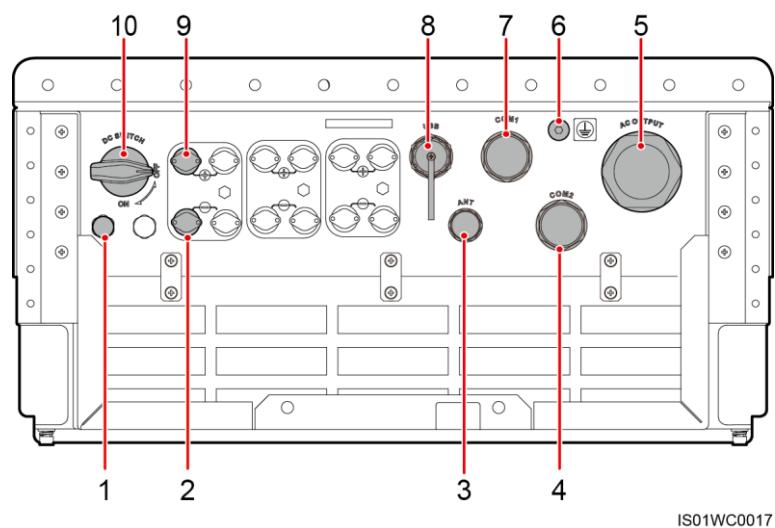
(1) Heat sink   (2) Mounting bracket

Bottom View

Figure 2-8 shows the SUN2000 bottom view.

Figure 2-8 SUN2000 bottom view

IS01WC0017
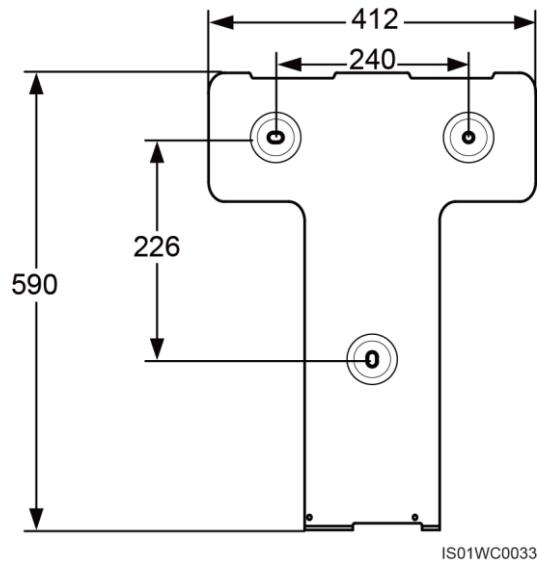
No.	Component Name (Silk Screen)	Description
1	Vent valve	2 PCS
2	Negative DC input terminal (-)	Six routes
3	Antenna (ANT)	Reserved WiFi port
4	RS485 port (COM2)	N/A
5	AC output port (AC OUTPUT)	N/A
6	Protective earthing (PE) bolt	N/A
7	RS485 (COM1)	N/A
8	USB port (USB)	N/A
9	Positive DC input terminal (+)	Six routes
10	DC switch (DC SWITCH)	N/A

Real Panel Dimensions

Figure 2-9 shows the dimensions of the real panel.

Figure 2-9 Rear panel dimensions (unit: mm)

2.3 Label Conventions

This section describes the symbols and nameplate on the SUN2000-33KTL/40KTL.

Symbols

Table 2-3 describes all symbols on the SUN2000-33KTL/40KTL.

Table 2-3 Symbols
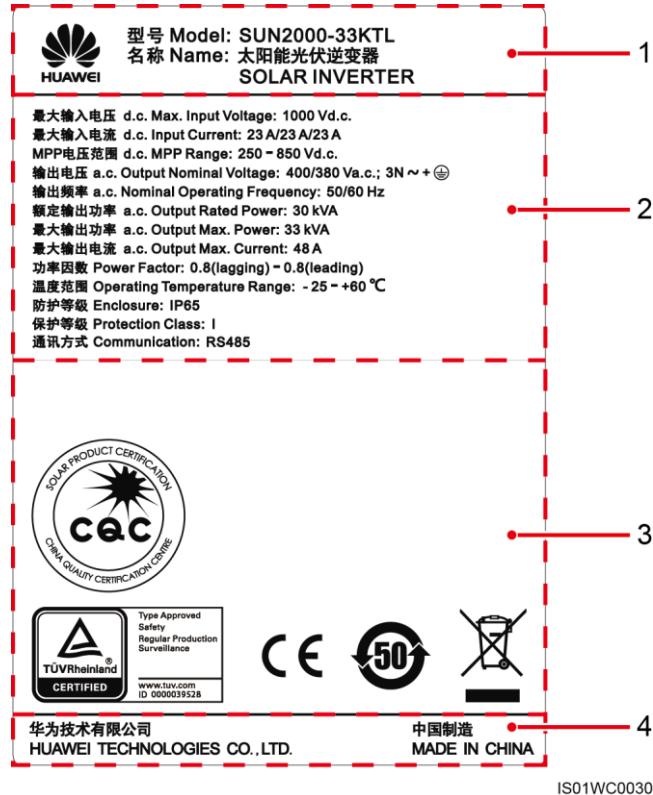
Symbol	Label	Meaning
(high voltage warning triangle + 5 mins clock symbol)	Delay discharge	• There are high voltages when this SUN2000 is running. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • There are residual voltages in the SUN2000. It needs 5 minutes to finish discharge.
(hot surface warning triangle)	Burn warning	The SUN2000 must not be touched when in operation because its enclosure and heat sinks are extremely hot.
(refer to documentation symbol)	Refer to documentation	Remind operators to refer to the documentation shipped with the SUN2000.
(grounding symbol)	Grounding	Indicates the position for connecting the protection ground cable.
Do not disconnect under load! 禁止带负荷断开连接!	Operation warning	The DC input connector must not be removed when the SUN2000 is in operation.
WARRANTY VOID IF SEAL IS BROKEN	Anti-demolition	The door on the upper side of the SUN2000 must not be opened.
(barcode) xxxxxxxxxxxxxxxxxxxxxxx	SUN2000 ESN label	SUN2000 manufacture information.

Nameplate

The SUN2000-33KTL/40KTL is labeled with a nameplate that contains the model information, technical specifications, and compliance symbols. If the SUN2000 only uses RS485 for communication, the value of Communication on the nameplate is RS485, as shown

in Figure 2-10. If the SUN2000 uses PLC and RE485 for communication, the value of Communication on the nameplate is PLC, as shown in Figure 2-11. (SUN2000-33KTL is used as an example.)

Figure 2-10 Nameplate (RS485 communication)
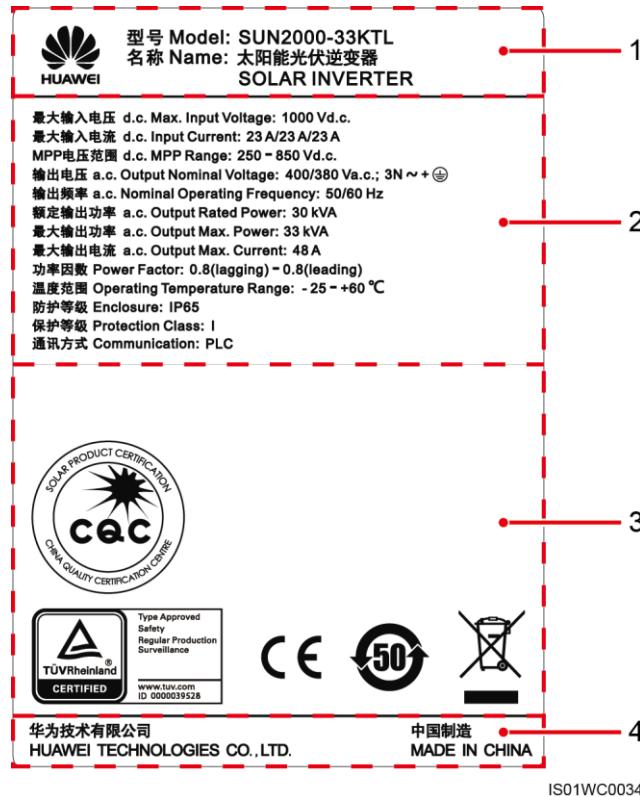
(1) Trademark, product name, and model number

(2) Important technical specifications

(3) Compliance symbols

(4) Company name and country of manufacture

Figure 2-11 Nameplate (PLC communication)

(1) Trademark, product name, and model number

(2) Important technical specifications

(3) Compliance symbols

(4) Company name and country of manufacture

Table 2-4 describes the compliance symbols.

Table 2-4 Compliance symbols

Symbol	Name	Meaning
	CQC certification mark	The SUN2000 has been awarded the NB32004 certification by China Quality Certification Center (CQC).
	TUV Rheiland certification mark	The SUN2000 complies with TUV Rheiland certification standards.
	CE certification mark	The SUN2000 complies with Conformite Europeenne (CE) certification standards.

Symbol	Name	Meaning
![EFUP symbol]	Environmentally friendly use period (EFUP)	The SUN2000 is environmentally friendly for at least 50 years.
![WEEE symbol]	EU WEEE mark	The SUN2000 must not be disposed of as domestic waste. For details about how to dispose of the SUN2000, see 9 SUN2000 Handling.
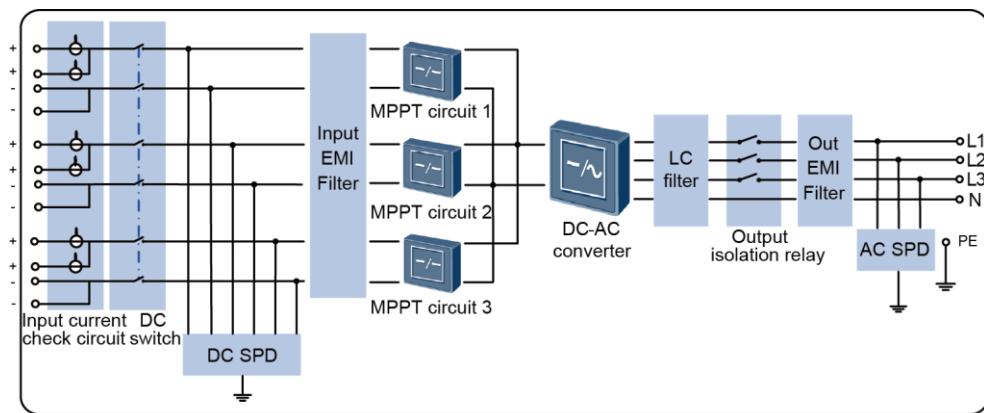
2.4 Working Process

This section describes the SUN2000 working process.

Circuit Diagrams
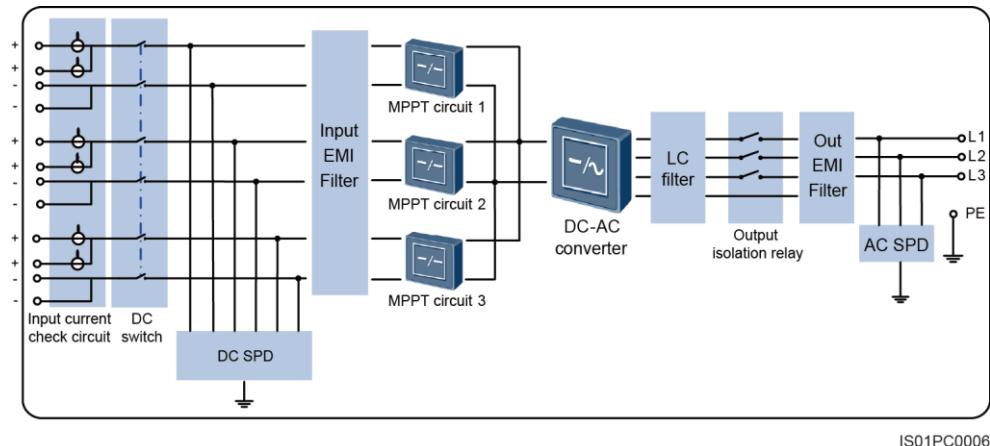
The SUN2000-33KTL/40KTL receives inputs from six PV strings. Then the inputs are grouped into three MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through a converter circuit. Surge protection is supported on both the DC and AC sides. The SUN2000-40KTL has three-phase, three-wire (L1, L2, and L3) output without a neutral wire. Figure 2-12 shows the circuit diagram for the SUN2000-33KTL. Figure 2-13 shows the circuit diagram for the SUN2000-40KTL.

Figure 2-12 Circuit diagram for the SUN2000-33KTL

Figure 2-13 Circuit diagram for the SUN2000-40KTL

Working Modes

Figure 2-14 shows the conditions for the SUN2000 to switch between working modes.

Figure 2-14 Working modes
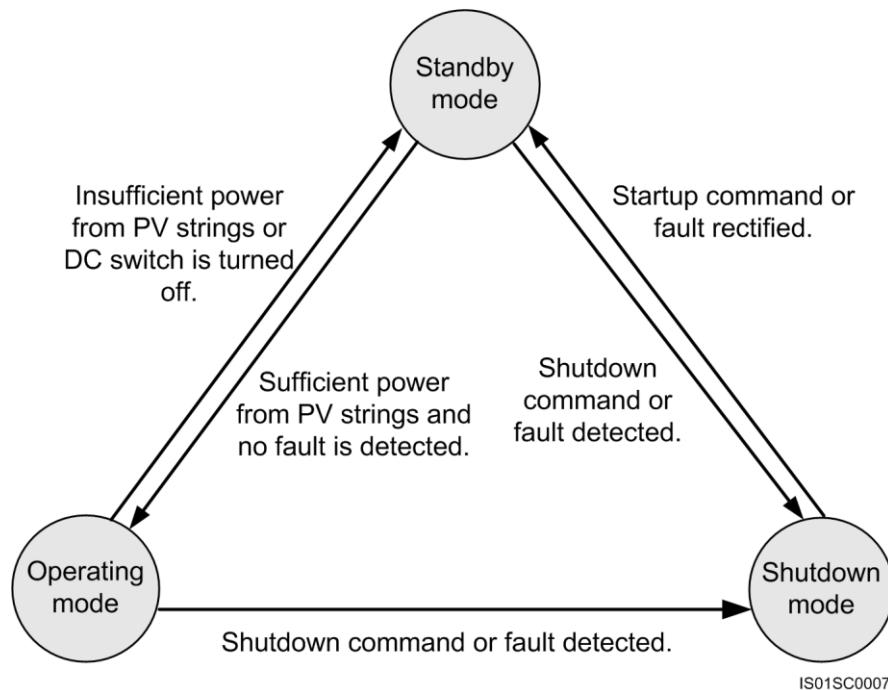
Table 2-5 describes the working modes shown in Figure 2-14.

Table 2-5 Working mode description

Working Mode	Description

Working Mode	Description
Standby	The SUN2000 enters the standby mode when the external environment does not meet the SUN2000 operation requirements. In standby mode, the SUN2000 continuously performs self-check and enters the operating mode once the operation requirements are met. The SUN2000 switches from standby mode to shutdown mode if it detects a shutdown command or a fault.
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 if detecting a fault or a shutdown command, and enters the standby mode if detecting that the PV string output power does not meet the requirements for grid-tied electricity generation.
Shutdown	The SUN2000 switches from standby or operating mode to shutdown mode if detecting a fault or a shutdown command. The SUN2000 switches from shutdown mode to standby mode if receiving a startup command or detecting that a fault is rectified.

3 SUN2000 Storage

This chapter describes SUN2000 storage requirements.

The following storage instructions apply if the SUN2000 will not be deployed immediately:

- Do not unpack the SUN2000.
- Store the SUN2000 at a temperature range of -40 ℃ to +70 ℃ and with the relative humidity of 5% to 100%.
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of four layers of inverters can be stacked.
- Conduct periodic inspection during storage. Replace the packing materials immediately if any rodent bites are found.
- Ensure that qualified personnel inspect and test the SUN2000 before use if it has been stored for a long time.

4 Installation

This chapter describes how to install the SUN2000.

Context

> **⚠ DANGER**
> - Do not install the SUN2000 on flammable building materials.
> - Do not install the SUN2000 in an area that stores flammable or explosive materials.

> **⚠ WARNING**
> Do not install the SUN2000 in a place where personnel are likely to come into contact with its enclosure and heat sinks. These parts are extremely hot during operation.

4.1 Checking Before Installation

Before unpacking, check that the packing materials are intact. After unpacking, check that the deliverables are complete and intact.

Checking the Outer Packing

Before unpacking the SUN2000, examine the outer packing for damage such as holes and cracks. If any such damage is found, do not unpack the SUN2000 and contact the dealer immediately.
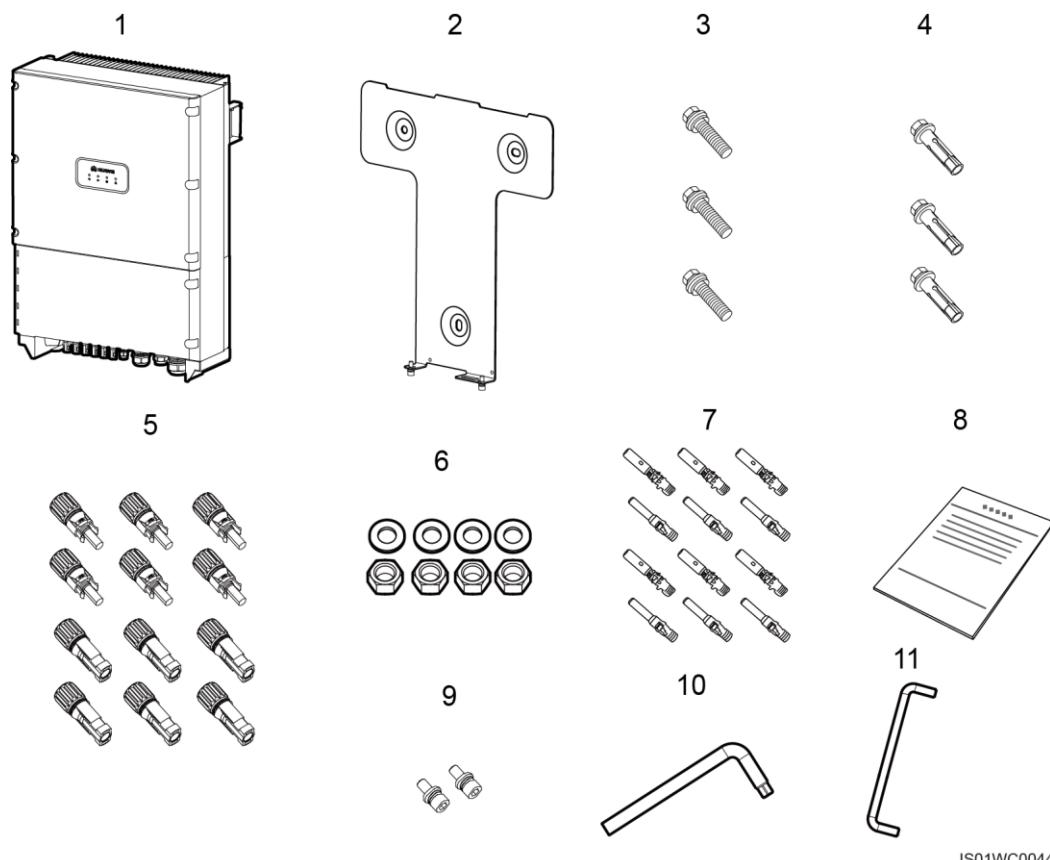
> **☐ NOTE**
> Remove the outer packing only 24 hours before installation.

Checking the Product and Accessories

After unpacking the SUN2000, check the product and accessories. If any damage is found or any component is missing, contact the dealer.

Check whether the packing case of the SUN2000-33KTL contains the deliverables listed in Figure 4-1.

Figure 4-1 SUN2000-33KTL deliverables

No.	Name	Quantity	Description
1	SUN2000-33KTL	1	N/A
2	Rear panel	1	N/A
3	Screw assembly (flat washer, spring washer, and M12x40 bolts)	3	Used together with a stainless nut and flat washer to secure a rear mounting panel to the support.
4	Expansion bolt	3	Secures the rear panel to a wall.
5	DC input connector	12 (six positive connectors	Connects to a DC input power cable.
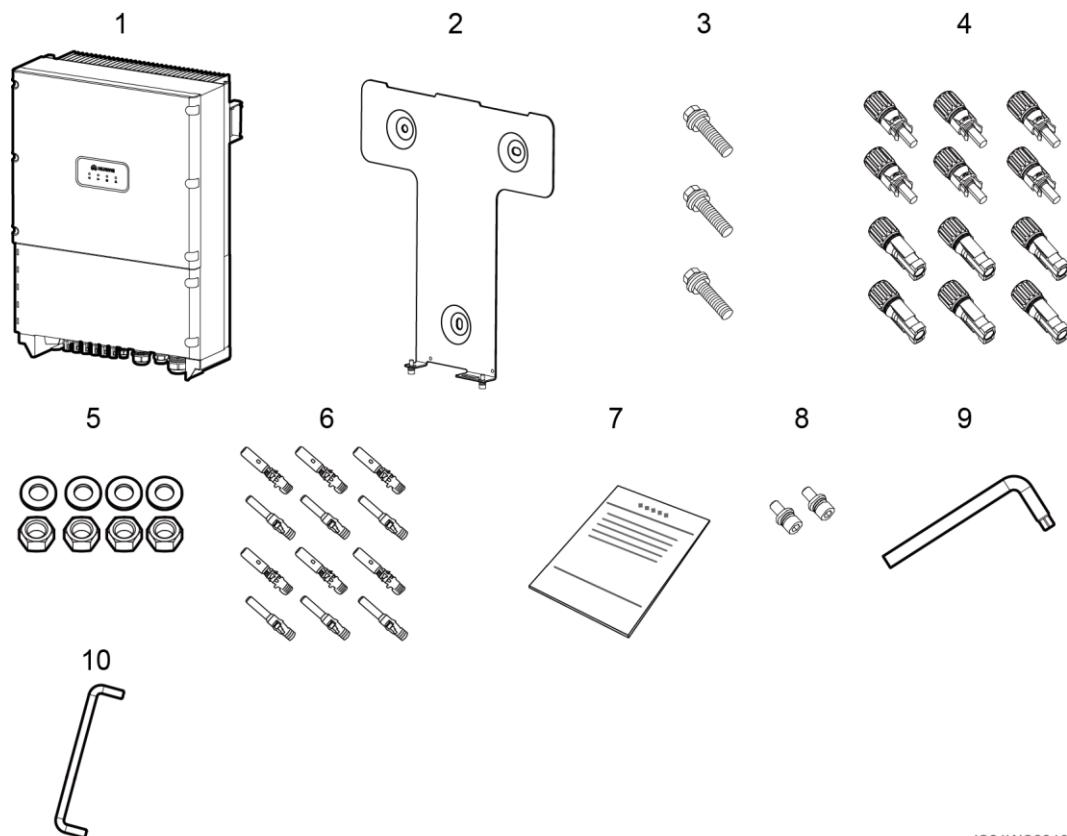
No.	Name	Quantity	Description
		and six negative connectors)	
6	M12 stainless nut and flat washer	4	Used together with a screw assembly to secure a rear mounting panel to the support.
7	Metal terminal	12 (six positive metal terminals and six negative metal terminals)	Secures a connector to a DC input power cable. **NOTE** Positive and negative metal terminals are packed with positive and negative connectors respectively. After unpacking, keep the positive and negative ones separate to avoid confusion.
8	Documentation	1	Includes the quick installation guide in paper copies.
9	Screw reserved for the chassis door	2	N/A
10	5# hex key	1	N/A
11	Support bar for the chassis door	1	N/A

📖 **NOTE**

Items 1 to 8 are placed in the packing case, and items 9 to 11 are bound to the reinforcing rib for the inverter base.

Check whether the packing case of the SUN2000-40KTL contains the deliverables listed in Figure 4-2.

Figure 4-2 SUN2000-40KTL deliverables

IS01WC0019

No.	Name	Quantity	Description
1	SUN2000-40KTL	1	N/A
2	Rear panel	1	N/A
3	Screw assembly (flat washer, spring washer, and M12x40 bolts)	3	Used together with a stainless nut and flat washer to secure a rear mounting panel to the support.
4	DC input connector	12 (six positive connectors and six negative connectors)	Connects to a DC input power cable.
5	M12 stainless nut and flat washer	4	Used together with a screw assembly to secure a rear mounting panel to the support.
6	Metal terminal	12 (six positive metal terminals,	DC input power cable crimp terminals. **NOTICE** Positive and negative metal terminals are packed with positive and negative connectors
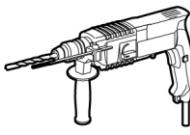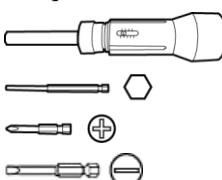
| No.	Name	Quantity	Description
		six negative metal terminals)	respectively. After unpacking, keep the positive and negative ones separate to avoid confusion.
7	Documentation	1	Includes the quick installation guide in paper copies.
8	Spare M6x16 hexagon screw assemblies for chassis doors	2	N/A
9	5# hex key	1	N/A
10	Support bar for the chassis door	1	N/A
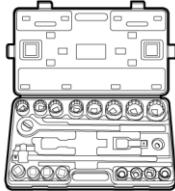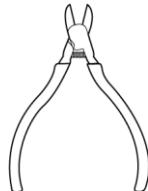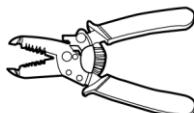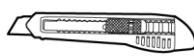
□ NOTE
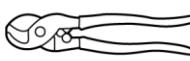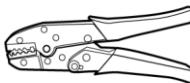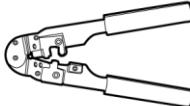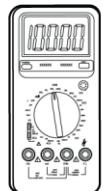
Items 1 to 7 are placed in the packing case, and items 8 to 10 are bound to the reinforcing rib for the inverter base.
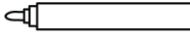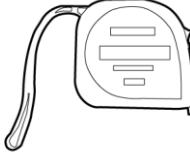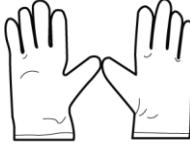
4.2 Tools
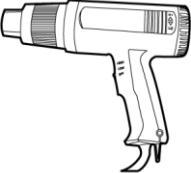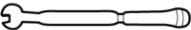
Prepare tools required for installation and electrical connections.

Tool	Model	Function
Hammer drill	With a drill bit of φ14	Drills holes on the wall or a support.
Adjustable wrench	• With a length of 200 mm • With an open end of 24 mm	Secures bolts.
Torque screwdriver	• Hexagon socket head: 5 mm • Flat head: M6 • Phillips head: M6, M8	Secures screws to mechanical parts.

Tool	Model	Function
Socket wrench	• With an open end of 10 mm (applicable to M6) or 13 mm (applicable to M8) • With a height of 100 mm (adapted to the height distance between terminals and the cabinet frame) • Wrench handle length (horizontal): < 200 mm • Torque: 0–8 N·m	Secures ground bolts and AC output terminals.
Diagonal pliers	N/A	Cuts cable ties.
Wire stripper	N/A	Peels off cable jackets.
Rubber mallet	N/A	Hammers expansion bolts into holes.
Guarded blade utility knife	N/A	Removes packing materials.

Tool	Model	Function
Cable cutter	N/A	Cuts power cables.
Crimping tool	H4TC0001 Manufacturer: AMPHENOL	Crimps metal terminals during DC input cable preparation.
RJ11 crimping tool	N/A	Prepares RJ11 connectors for communications cables.
Removal tool	H4TW0001 Manufacturer: AMPHENOL	Removes DC connectors from the SUN2000.
Vacuum cleaner	N/A	Cleans up dusts after drilling holes.
Multimeter	N/A	Measures voltage.

Tool	Model	Function
Marker	Diameter: 10 mm	Marks signs.
Measuring tape	N/A	Measures distances.
Level	N/A	Checks the levelness of the rear panel.
ESD gloves	N/A	Protects operators during installation.
Safety goggles	N/A	Protect operators when drilling holes.
Anti-dust respirator	N/A	Protects operators during hole drilling.

Tool	Model	Function
Hydraulic pliers	N/A	Crimps OT terminals.
Heat shrink tubing	N/A	Insulates electrical devices.
Heat gun	N/A	Heat-shrinks a tube.
Torque wrench	With an open end of 18 mm, 33 mm, or 52 mm	Secures bolts and locking caps.

4.3 Wall-mounting the SUN2000

4.3.1 Determining the Installation Position

Determine an appropriate position for installing the SUN2000.

Basic Requirements

- The SUN2000 is protected to IP65 and can be installed indoors or outdoors.
- The installation method and position must be appropriate for the weight and dimensions of the SUN2000. For details, see 10 Technical Specifications.
- Do not install the SUN2000 in a place where personnel are likely to come into contact with its enclosure and heat sinks because these parts are extremely hot during operation.
- Do not install the SUN2000 in an area that stores flammable or explosive materials.

Installation Environment Requirements

- The ambient temperature must be below 50 ℃ which ensures optimal SUN2000 operation and extends the SUN2000's service life.
- The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation.
- The SUN2000 must be free from direct exposure to sunlight, rain, and snow to extend its service life. It is recommended that the SUN2000 be installed in a sheltered place. If no shelter is available, build an awning, as shown in Figure 4-3.

Figure 4-3 Awning (unit: mm)
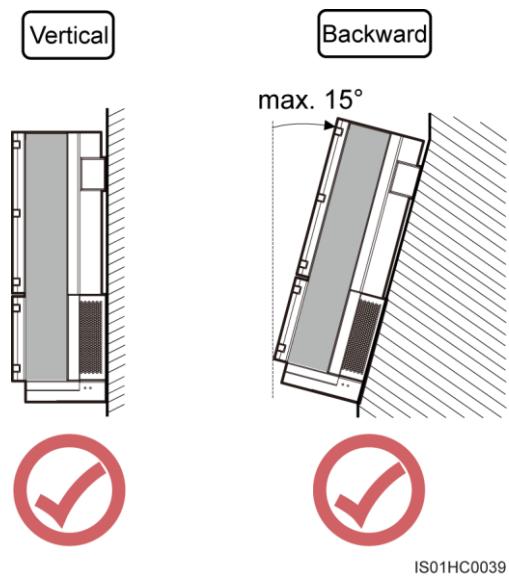
IS01HC0037

Carrier Requirements

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- The wall must be solid enough to bear the weight of the SUN2000.
- Do not install the SUN2000 on a wall made of gypsum boards or similar materials with weak sound insulation to avoid noise disturbance in a residential area.

Installation Mode Requirements

- Install the SUN2000 upright or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
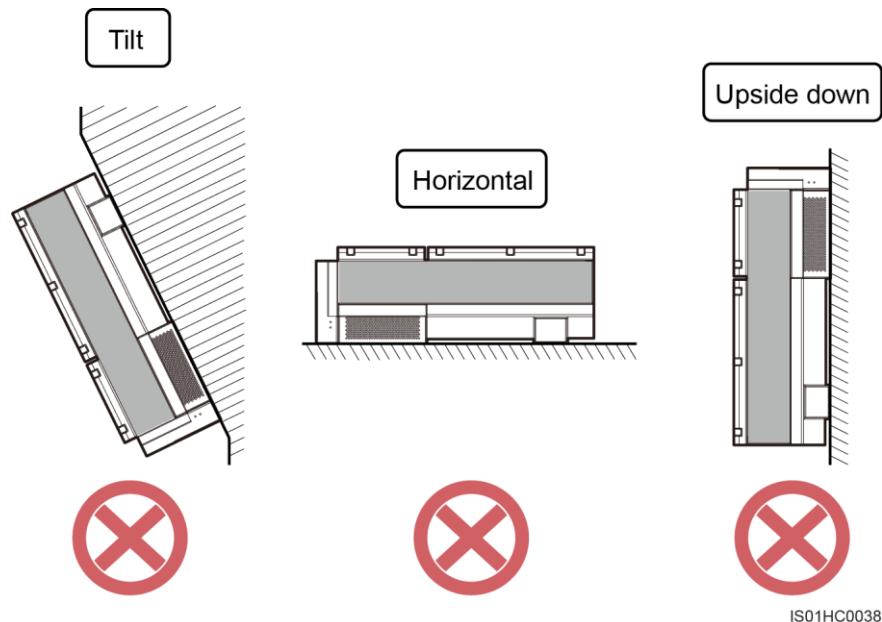
Figure 4-4 Correct installation modes

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

Figure 4-5 Incorrect installation modes
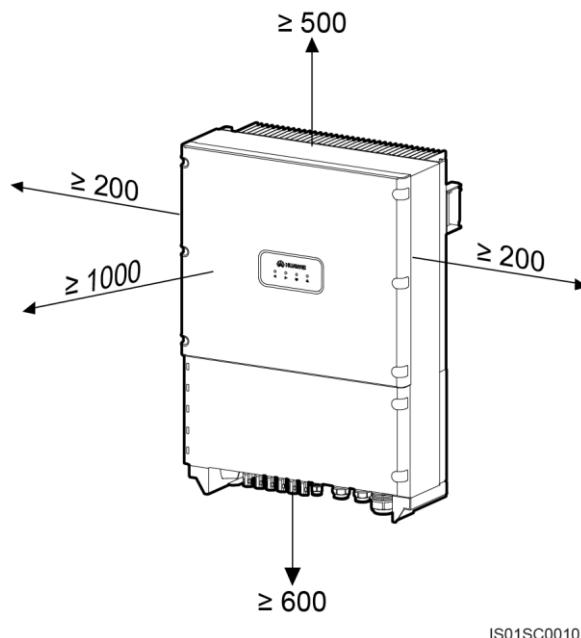
Installation Space Requirements

- It is recommended that the SUN2000 be installed at eye level to facilitate operation and maintenance.
- Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation, as shown in Figure 4-6.

Figure 4-6 Installation space (unit: mm)
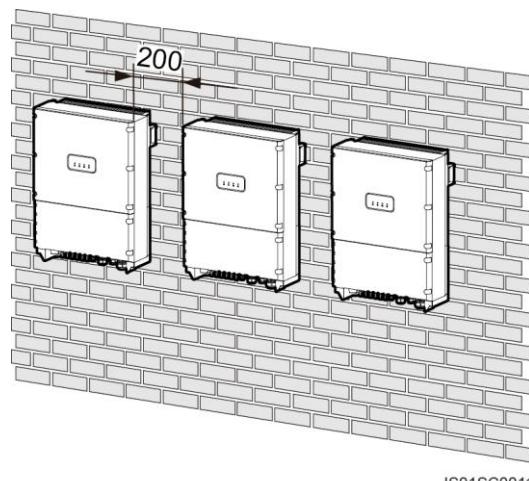
⊞ NOTE

    If you have any questions about the distance, consult the local technical support engineers.
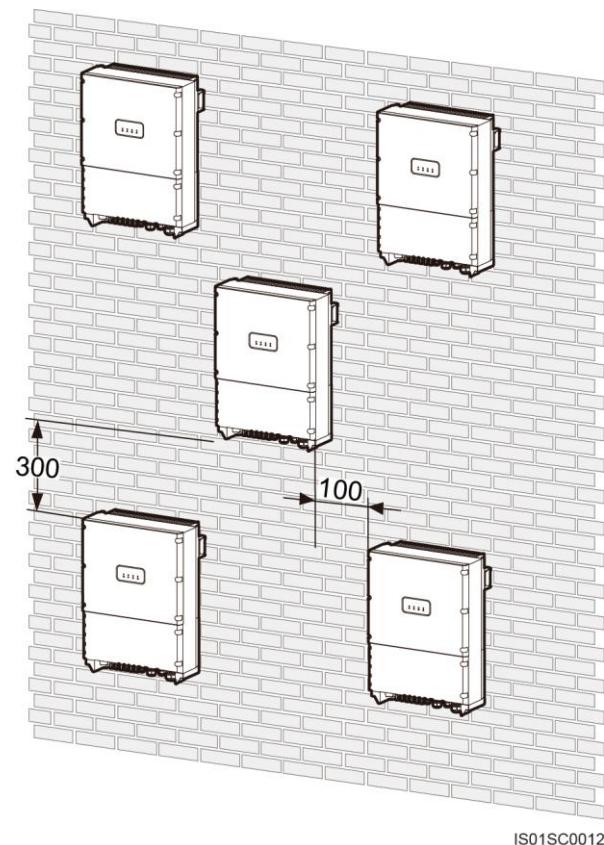
- When installing multiple SUN2000s, install them along the same line (as shown in Figure 4-7) if sufficient space is available, and install them in triangle mode (as shown in Figure 4-8) or in stacked mode (as shown in Figure 4-9) if no sufficient space is available. The installation modes ensure sufficient space for installation and heat dissipation.

Figure 4-7 Horizontal installation mode (if the space is sufficient, unit: mm)
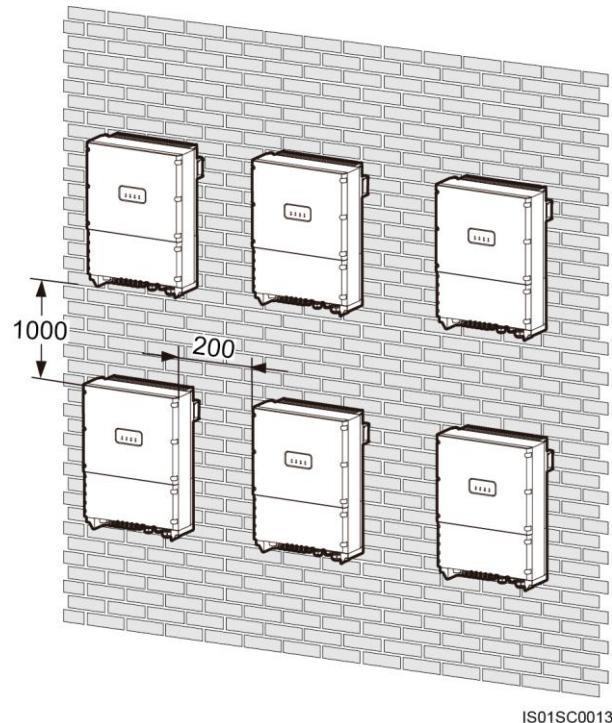
Figure 4-8 Triangle installation mode (if the space is insufficient, unit: mm)

Figure 4-9 Stacked installation mode (if the space is insufficient, unit: mm)

IS01SC0013

⚠ **NOTICE**

The clearance between multiple SUN2000s must be increased to ensure proper heat dissipation when they are installed in a hot area.
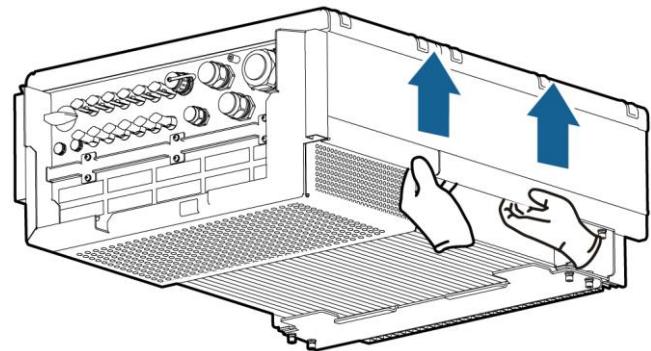
4.3.2 Moving the SUN2000

Move the SUN2000 to the installation position horizontally.

Procedure

Step 1 Arrange two people to hold the handles on both sides of the SUN2000, as shown in Figure 4-10.

Figure 4-10 Moving the SUN2000

IS01HC0036

Step 2 Carry the SUN2000 out of the packing case and move it to the installation position.

⚠ **CAUTION**

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

----End

4.3.3 Installing a Rear Panel

Before installing the SUN2000, secure the shipped rear panel to a wall.

Context
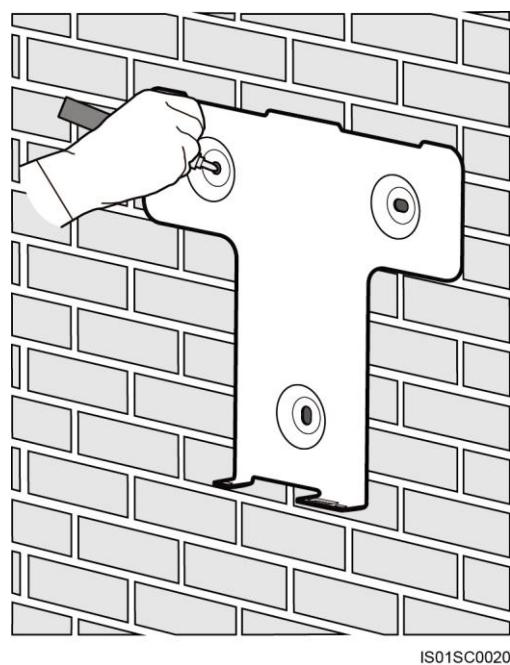
📖 NOTE

- When installing the SUN2000-33KTL, you can use the expansion bolts delivered with the SUN2000 to install the rear panel.
- When installing the SUN2000-40KTL, you need to prepare the expansion bolts. M12x60 stainless expansion bolts are recommended.

Procedure

Step 1 Determine the positions for drilling holes (as shown in Figure 4-11) using the rear panel 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
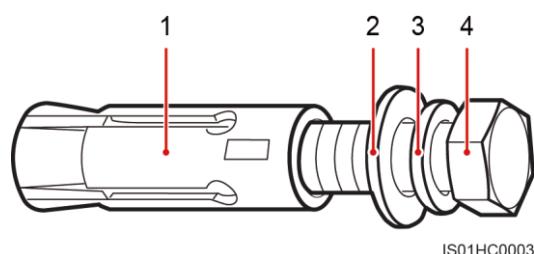
Step 2   Drill holes using a hammer drill and install expansion bolts, as shown in Figure 4-13.

An expansion bolt is composed of four parts, as shown in Figure 4-12.
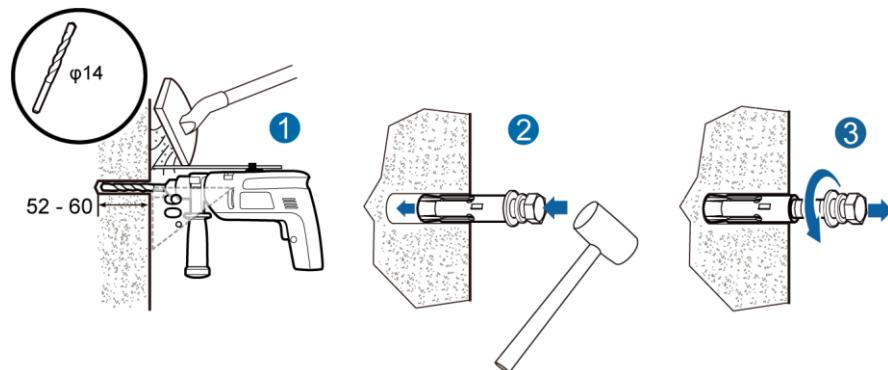
Figure 4-12 Expansion bolt composition

(1) Expansion sleeve   (2) Flat washer   (3) Spring washer   (4) Bolt

Figure 4-13 Drilling a hole and installing an expansion bolt (unit: mm)

NOTICE

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

1. Drill a hole in a marked position to a depth of 52–60 mm using a hammer drill with a Φ14 mm bit.
2. Partially tighten an expansion bolt, vertically insert it into the hole, and knock the expansion bolt completely into the hole using a rubber mallet.
3. Remove the bolt, spring washer, and flat washer by rotating them counterclockwise.
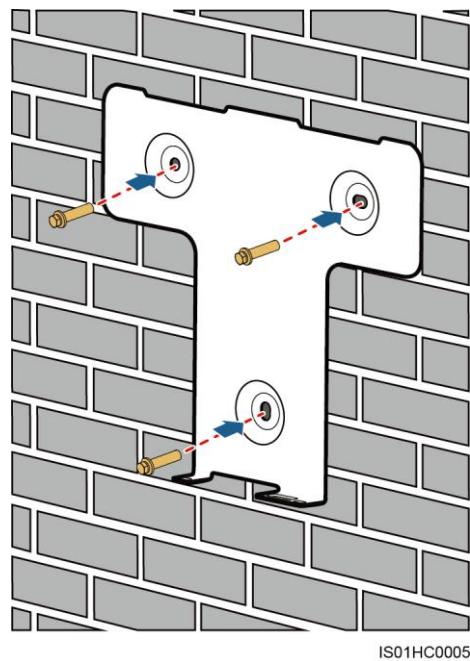
NOTICE

Level the front of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the rear panel will not be securely installed on the concrete wall.

Step 3 Align the rear panel with the holes, insert expansion bolts into the holes through the real panel, and tighten the expansion bolts to a torque of 45 N·m using a torque wrench with a 18 mm open end, as shown in .

Figure 4-14 Securing a rear panel
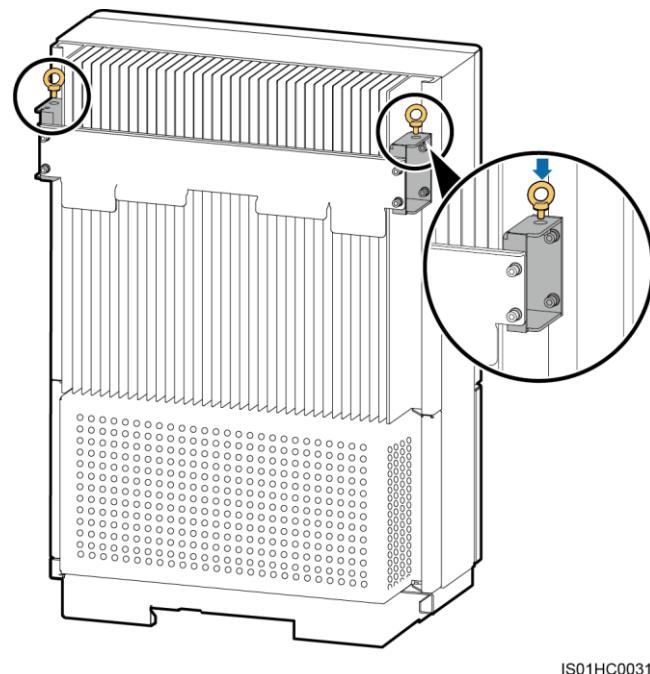
----End

4.3.4 Installing the SUN2000

Procedure

Step 1 If the installation position is low and you can mount the SUN2000 on the rear panel, go to Step 6 after performing Step 4.

Step 2 If the installation position is high and you cannot mount the SUN2000 on the rear panel, perform Step 3 to Step 7.

Step 3 Mount the M10 screw lifting eyes (provided by the customer) into the lifting holes and tighten the lifting eyes, as shown in Figure 4-15.

Figure 4-15 Installing lifting eyes

IS01HC0031
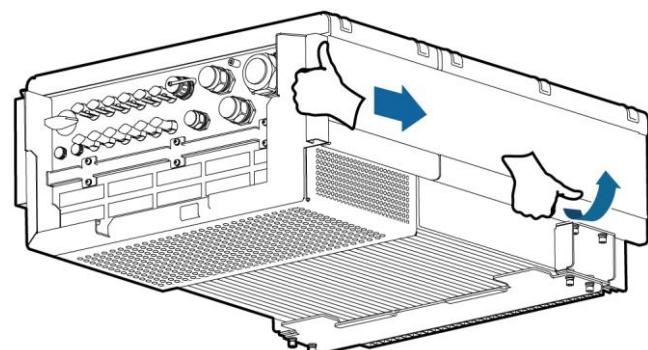
Step 4 Arrange two people to hold the handle at the bottom of the SUN2000 with one hand and hold the handle near the top of the SUN2000 with the other hand, and then stand the SUN2000, as shown in Figure 4-16.

![CAUTION icon]

CAUTION

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

Figure 4-16 Lifting the SUN2000

IS01HC0035
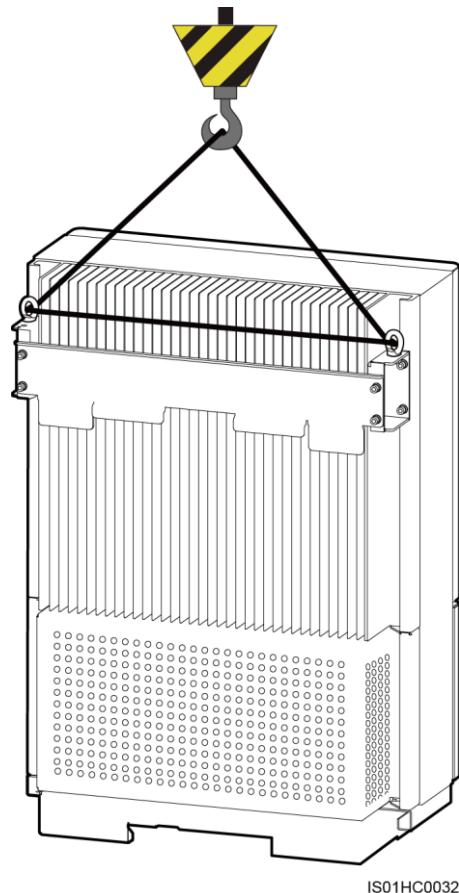
Step 5 Route a rope that is able to bear the SUN2000 through the lifting eyes and hoist the SUN2000, as shown in Figure 4-17.

![NOTICE icon] **NOTICE**
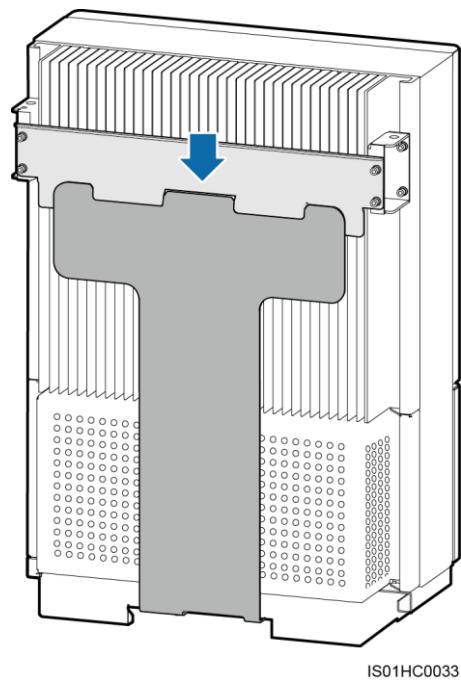
When hoisting the SUN2000, keep balance to protect the SUN2000 from colliding with the wall or other objects.

Figure 4-17 Hoisting the SUN2000

IS01HC0032
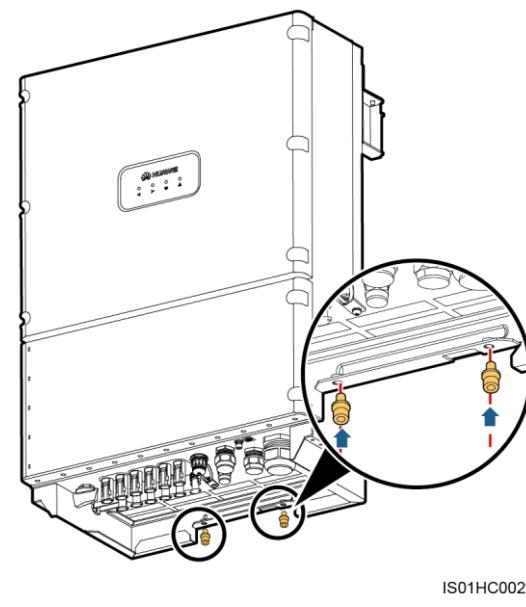
Step 6 Mount the SUN2000 on the rear panel and keep them aligned with each other, as shown in Figure 4-18.

Figure 4-18 Mounting the SUN2000 on the rear panel

Step 7 Tighten the two hexagon screws at the bottom of the SUN2000 to a torque of 5 N·m, as shown in Figure 4-19.
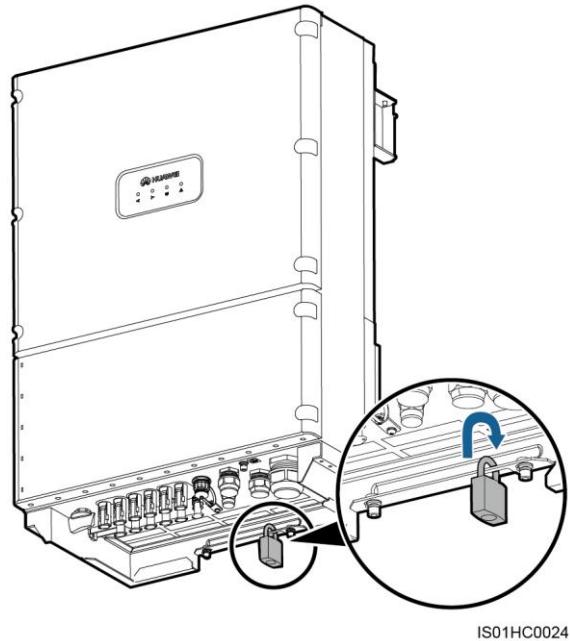
Figure 4-19 Tightening hexagon screws

Step 8 (Optional) Install an antitheft lock, as shown in Figure 4-20.

The antitheft lock secures the SUN2000 to the rear panel to prevent theft.

Figure 4-20 Installing an antitheft lock

IS01HC0024

----End

4.4 Support-mounting the SUN2000

4.4.1 Determining the Installation Position

Determine an appropriate position for installing the SUN2000.

Basic Requirements

- The SUN2000 is protected to IP65 and can be installed indoors or outdoors.
- The installation method and position must be appropriate for the weight and dimensions of the SUN2000. For details, see 10 Technical Specifications.
- Do not install the SUN2000 in a place where personnel are likely to come into contact with its enclosure and heat sinks because these parts are extremely hot during operation.
- Do not install the SUN2000 in an area that stores flammable or explosive materials.

Installation Environment Requirements

- The ambient temperature must be below 50 °C which ensures optimal SUN2000 operation and extends the SUN2000's service life.
- The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation.
- The SUN2000 must be free from direct exposure to sunlight, rain, and snow to extend its service life. It is recommended that the SUN2000 be installed in a sheltered place. If no shelter is available, build an awning, as shown in Figure 4-21.

Figure 4-21 Awning (unit: mm)
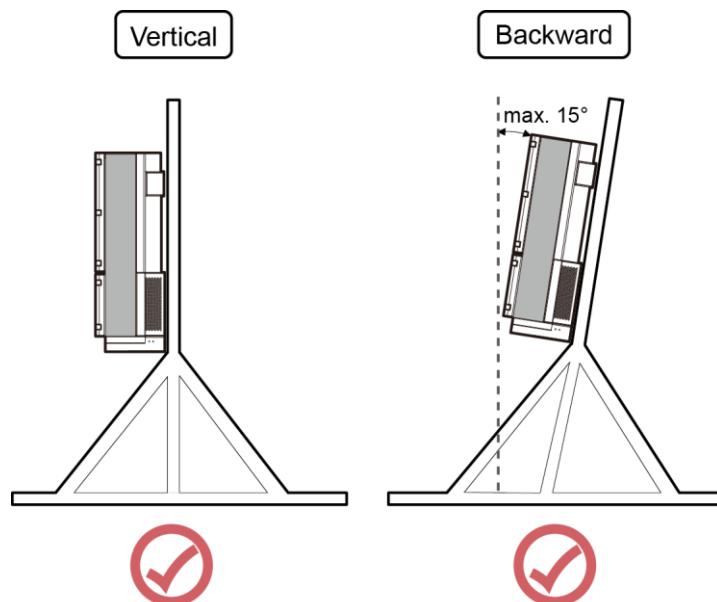
Carrier Requirements

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- The wall must be solid enough to bear the weight of the SUN2000.

Installation Mode Requirements

- Install the SUN2000 upright or at a maximum front or back tilt of 15 degrees to facilitate heat dissipation.
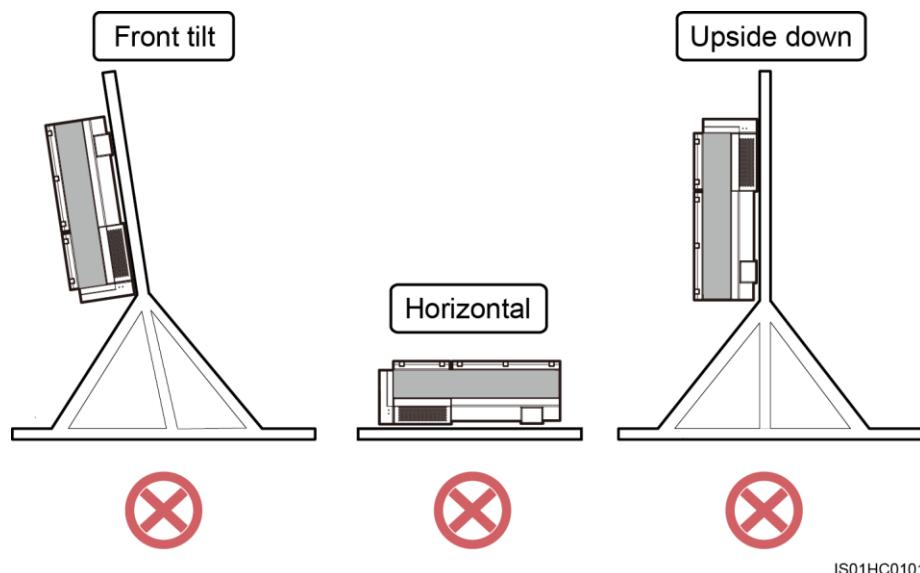
Figure 4-22 Correct installation modes

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

Figure 4-23 Incorrect installation modes
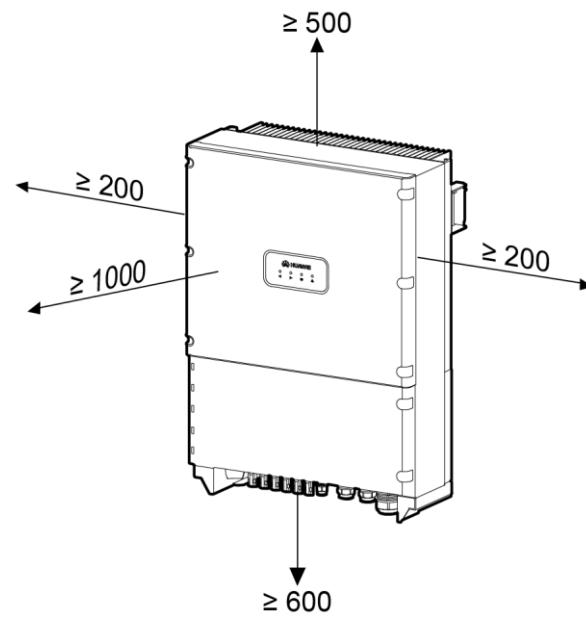
Installation Space Requirements

- It is recommended that the SUN2000 be installed at eye level to facilitate operation and maintenance.
- Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation, as shown in Figure 4-24.

Figure 4-24 Installation space (unit: mm)

4.4.2 Moving the SUN2000

For details, see 4.3.2 Moving the SUN2000.
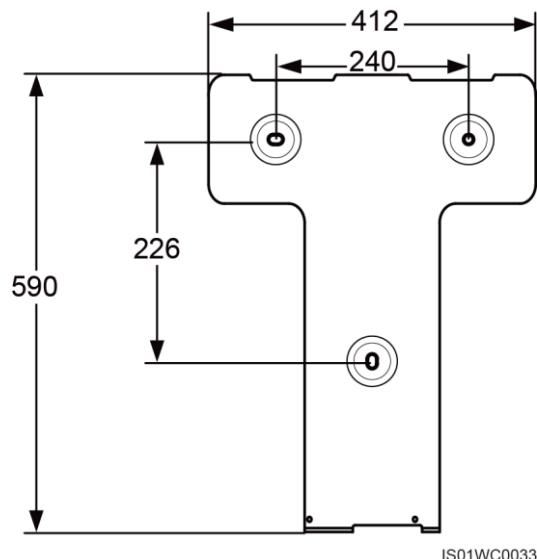
4.4.3 Installing a Rear Panel

Before installing the SUN2000, secure the shipped rear panel to a support.

Prerequisites

Figure 4-25 shows the dimensions of the rear panel.
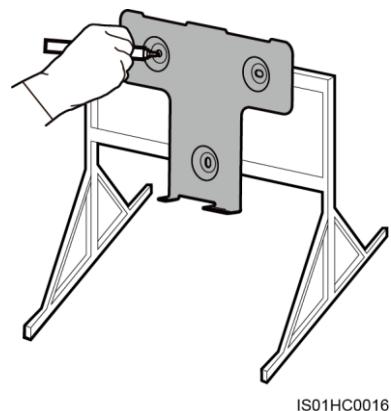
Figure 4-25 Dimensions of the rear panel (unit: mm)

IS01WC0033

Procedure
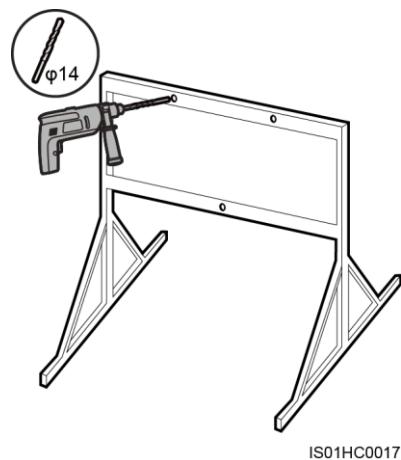
Step 1 Determine the positions for drilling holes (as shown in Figure 4-26) using the rear panel available in the packing case, level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-26 Determining hole positions

IS01HC0016
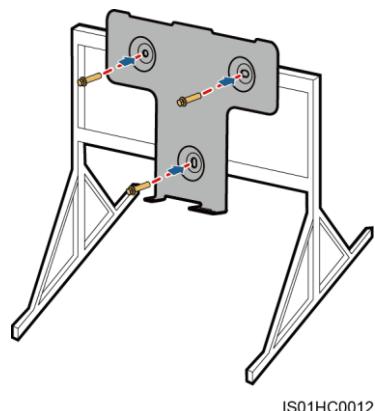
Step 2 Drill holes using a hammer drill, as shown in Figure 4-27.

Figure 4-27 Drilling holes (Unit: mm)

IS01HC0017

Step 3 Align the rear panel with the hole positions, insert M12x40 bolts (expansion bolts without expansion sleeves) into the holes through the rear panel, secure them using the shipped stainless steel nuts and flat washers, and tighten the bolts to a torque of 45 N m using a torque wrench, as shown in Figure 4-28.

Figure 4-28 Securing a rear panel

IS01HC0012

----End

4.4.4 Installing the SUN2000

For details, see 4.3.4 Installing the SUN2000.

5 Electrical Connections

This chapter describes the SUN2000 electrical connections. Read this chapter before connecting protection ground (PGND) cables, DC input power cables, AC output power cables, and communications cables for the SUN2000.

Context

> ⚠️ **DANGER**
>
> Before performing any electrical connection, ensure that the DC SWITCH is OFF. Otherwise, the high voltage can result in fatal injury.

> ⚠️ **NOTICE**
>
> 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 (yellow-green wires are only used for grounding).

5.1 Connecting PGND Cables

Connect the SUN2000 to a ground bar over a protection ground (PGND) cable for grounding purposes.

Prerequisites

The ground cable and OT terminals have been prepared.

- Ground cable: outdoor copper-core cables with a cross sectional area of 8 mm^2 (8 AWG) or more are recommended.
- OT terminal: M6
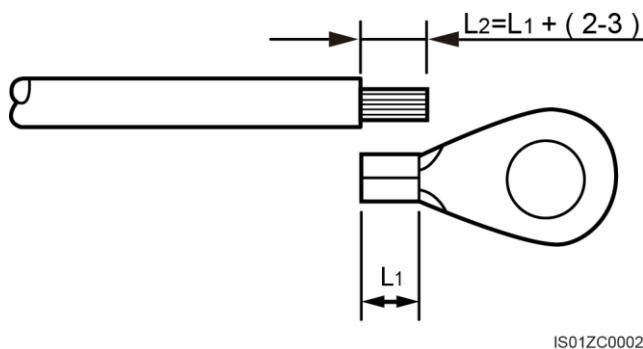
Context

- Good grounding for the SUN2000 helps resist the impact of surge voltage and improve the EMI performance. Connect the PGND cable before connecting the AC power cables, DC power cables, and communications cables.

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

Procedure

Step 1 Remove an appropriate length of the insulation layer from the PGND cable using a wire stripper, as shown in Figure 5-1.
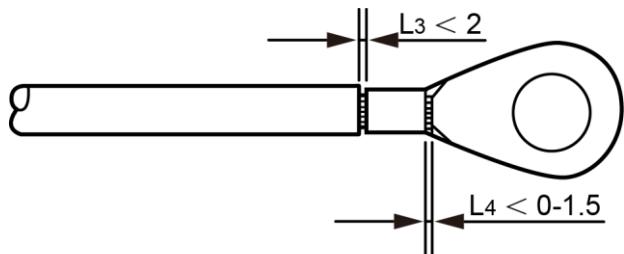
Figure 5-1 Stripped length (unit: mm)

$L_2 = L_1 + (2\text{-}3)$

L_1

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 5-2.

Figure 5-2 Crimping a cable (unit: mm)

$L_3 < 2$

$L_4 < 0\text{-}1.5$

IS01ZC0003
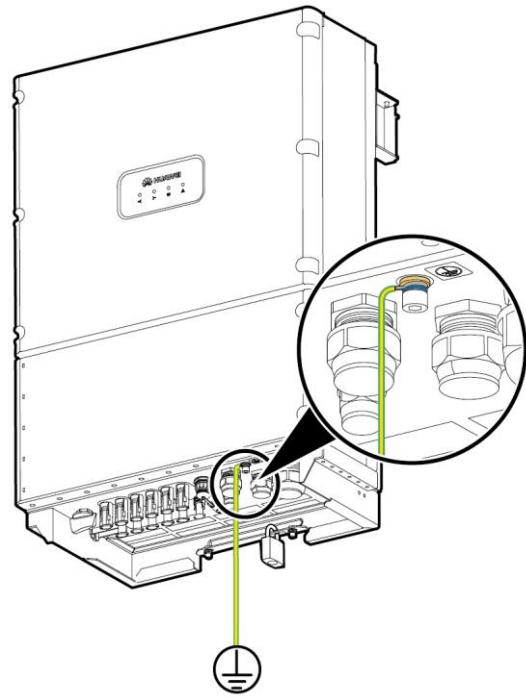
📖 **NOTE**

The crimping must result in full containment of the cable conductors and complete contact between the cable conductors and the terminal.

Step 3 Remove the ground screws from the ground points.

Step 4 Secure the PGND cable using the ground screw and tighten the screw to a torque of 5 N·m using a socket wrench.

Figure 5-3 Connecting the PGND cable

IS01IC0021

📖 **NOTE**

To prevent corrosion, apply silica gel to the ground terminal after connecting the PGND cable.

----End

5.2 Opening the Chassis Door

Prerequisites
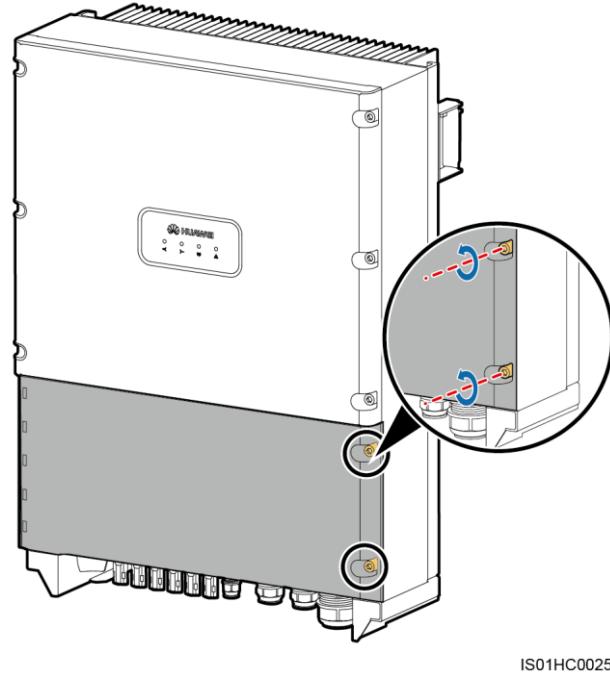
⚠️ **NOTICE**

● Do not open the door on the upper side of the SUN2000.

● Before opening the chassis door, ensure that the AC and DC power supplies are disconnected. For processes of disconnecting the power supplies, see 6.2 Powering Off the SUN2000.

● Do not leave unused screws in the chassis.

Procedure

Step 1 Loosen the two screws on the chassis door, as shown in Figure 5-4. Set the screws aside for future use.

Figure 5-4 Removing screws
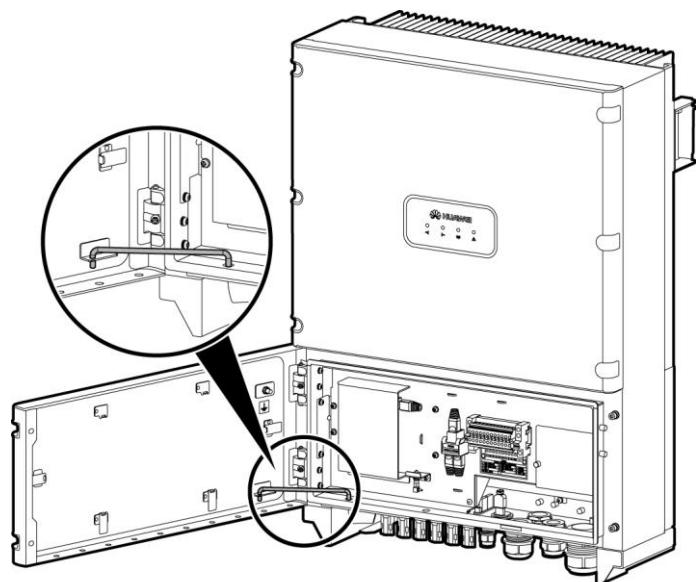
IS01HC0025

📖 **NOTE**

If the two screws on the door are lost, use the standby screws available in the fitting bag that is bound to the reinforcing rib at the base of the chassis.

Step 2 Open the door and install a support bar, as shown in Figure 5-5. The support bar is located in the fitting bag bound to the reinforcing rib at the base of the chassis.

Figure 5-5 Installing a support bar

IS01HC0027

----End

5.3 Installing AC Output Power Cables

Connect the SUN2000 to the AC power distribution frame (PDF) or power grid using AC output power cables.

Prerequisites

An independent three-phase circuit breaker must be installed on the AC side of each SUN2000 to ensure that the SUN2000s can be safely disconnected from the power grid. See 10 Technical Specifications to select the circuit breaker of the appropriate specifications.

⚠ **WARNING**
- Do not install a single circuit breaker for several SUN2000s.
- Do not connect loads between the SUN2000 and circuit breaker.

Context

- Outdoor copper-core cables are recommended. Table 5-1 describes the specifications.

Table 5-1 AC output cable specifications
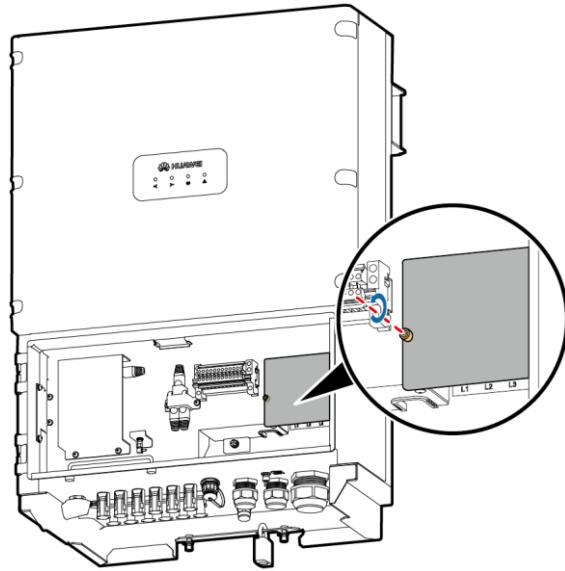
Inverter Model	Cable Type	Cross-sectional Area (mm²)		Cable Outer Diameter (mm)	
		Range	Recommended Value	Range	Recommended Value
SUN2000-33KTL	4-core outdoor cable (L1, L2, L3, and N)	16–25 (6–3 AWG)	16 (6 AWG)	24–32	28
SUN2000-40KTL	3-core outdoor cable (L1, L2, and L3)	16–35 (6–2 AWG)			

- The customer needs to prepare OT terminals. The SUN2000-33KTL requires M6 OT terminals and a cable with the maximum cross-sectional area of 25 mm^2 can be connected. The SUN2000-40KTL requires M8 OT terminals and a cable with the maximum cross-sectional area of 35 mm^2 can be connected.

Procedure

Step 1 Remove the AC terminal cover, as shown in Figure 5-6.

Figure 5-6 Removing the AC terminal cover

IS01HC0028
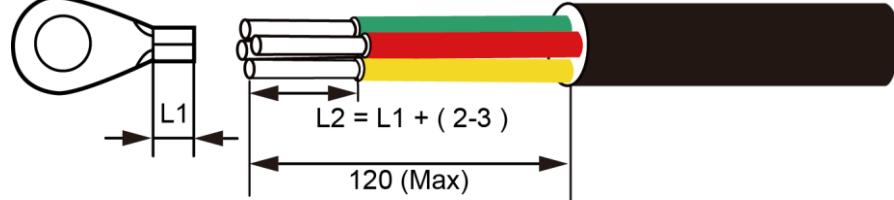
📖 **NOTE**

To highlight the involved area, the figure does not show the open door.
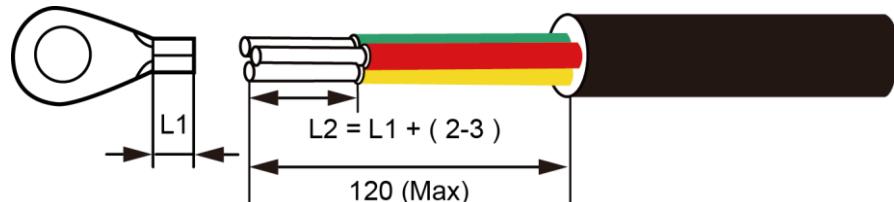
Step 2 Remove an appropriate length of the jacket and insulation layer from the AC output cable using a wire stripper.

Figure 5-7 Stripped length for the SUN2000-33KTL (unit: mm)

$$L2 = L1 + (2\text{-}3)$$

120 (Max)

IS01ZC0015

Figure 5-8 Stripped length for the SUN2000-40KTL (unit: mm)

$$L2 = L1 + (2\text{-}3)$$

120 (Max)

IS01ZC0019

Step 3 Insert the exposed core wires into the crimp area of the OT terminal and crimp them using hydraulic pliers.

Step 4 Wrap the wire crimp 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 5 Remove the locking cap from the **AC OUTPUT** waterproof cable connector at the inverter bottom and remove the plug from the locking cap.

Step 6 Route the AC output power cable into the locking cap and the **AC OUTPUT** connector at the inverter bottom.
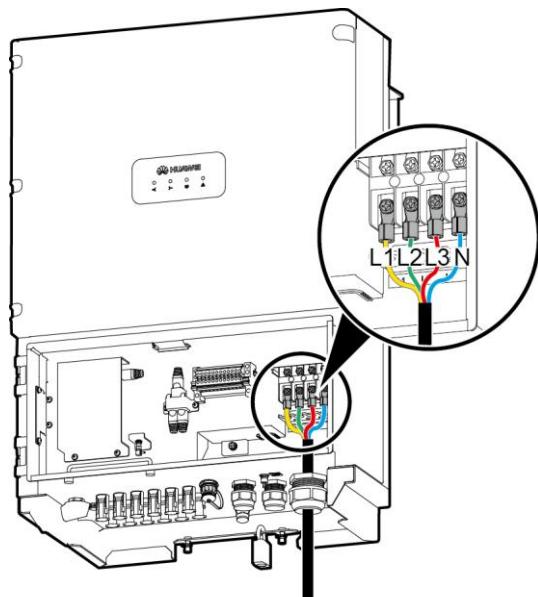
Step 7 Connect the wires of the AC output cable for the SUN2000-33KTL to L1, L2, L3, and N on the AC terminal block, as shown in Figure 5-9. The required torque is 4 N·m. Connect the wires of the AC output cable for the SUN2000-40KTL to L1, L2, and L3 on the AC terminal block, as shown in Figure 5-10. The required torque is 8 N·m.

⚠️ **NOTICE**
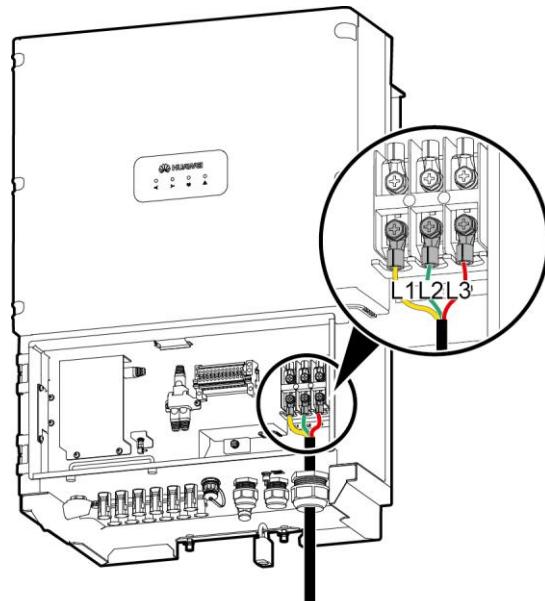
Ensure that the AC output power cable is securely connected. Otherwise, the inverter may fail to run or the terminal block may be damaged after the device operates.

Figure 5-9 Connecting AC output cables for the SUN2000-33KTL

Figure 5-10 Connecting AC output cables for the SUN2000-40KTL

Step 8 Use a torque wrench to tighten the locking cap to a torque of 7.5 N·m.

----End

5.4 Connecting DC Input Power Cables

Connect the SUN2000 to PV strings over DC input power cables.

Prerequisites

> ⚠ **DANGER**
> ● PV modules generate electric energy when exposed to sunlight and can create an electrical shock hazard. Therefore, when connecting DC input power cables, shield the PV modules with opaque cloth.
> ● Before connecting DC input power cables, ensure that the voltage on the DC side is within the safe range (lower than 60 V DC) and that the DC SWITCH on the SUN2000 is OFF. Otherwise, high voltage may result in electric shock.
> ● 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, it may result in electric shock.

⚠ **WARNING**

To avoid a fire, ensure that the following conditions are met.

- PV modules connected in series in each PV string must be of the same specifications.
- The maximum open-circuit voltage of each PV string must be always lower than or equal to 1000 V DC.
- The maximum short-circuit current of each PV string must be always lower than or equal to 34.5 A.
- The positive and negative terminals of PV modules must be connected to the positive and negative DC input terminals of the SUN2000 respectively.

⚠ **NOTICE**

- If the SUN2000 is directly connected to the power grid with the neutral wire connected to the PGND 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. Otherwise, the SUN2000 will fail to work.
- 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.

⚠ **NOTICE**

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

- Connect a three-phase isolation transformer on the output side, and ensure that the neutral wire of the isolation transformer is separate from the PGND cable.
- 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 5-11 shows the DC terminals at the bottom of the SUN2000. Table 5-2 describes the requirements for DC terminal selection.

Figure 5-11 DC terminals

IS01WC0031
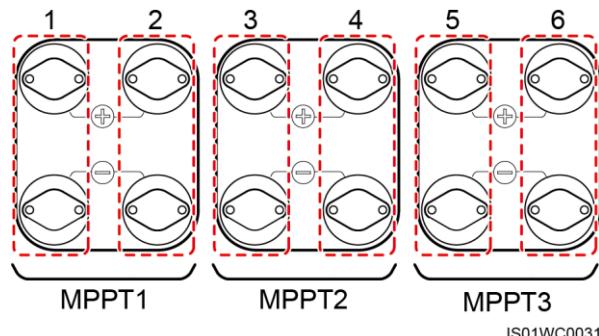
Table 5-2 DC terminal selection requirements

Number of Inputs	SUN2000-33KTL/40KTL
1	Connected to any one route
2	Connected to routes 1 and 3
3	Connected to routes 1, 3, and 5
4	Connected to routes 1, 2, 3, and 5
5	Connected to routes 1, 2, 3, 4, and 5
6	Connected to routes 1, 2, 3, 4, 5, and 6

- DC input cable specifications

  Table 5-3 lists the recommended DC input cable specifications.

Table 5-3 Recommended DC input cable specifications

Cable Type	Cross-sectional Area (mm²)		Cable Outer Diameter (mm)
	Range	Recommended Value	
Common PV cables in the industry (model: PV1-F)	4.0–6.0 (12 AWG–10 AWG)	4.0 (12 AWG)	4.5–7.8
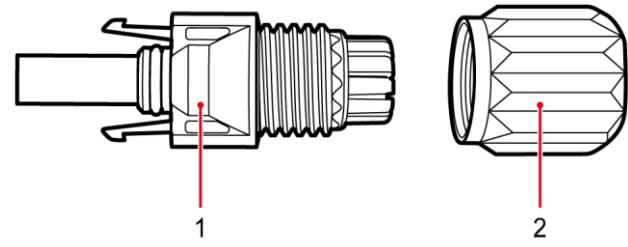
⚠ **NOTICE**

Highly rigid cables, such as armored cables, are not recommended because bending may cause poor contact.

- Positive and negative connectors

Positive and negative DC input connectors are used, as shown in Figure 5-12 and Figure 5-13.

Figure 5-12 Positive connector composition
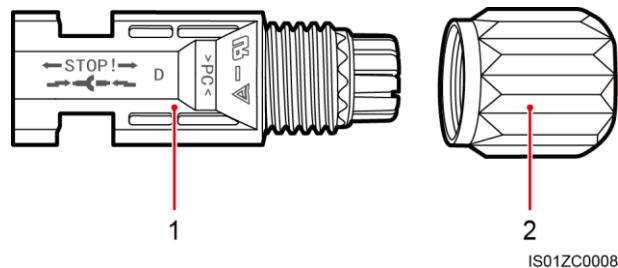
IS01ZC0007

(1) Insulation housing   (2) Locking nut

Figure 5-13 Negative connector composition
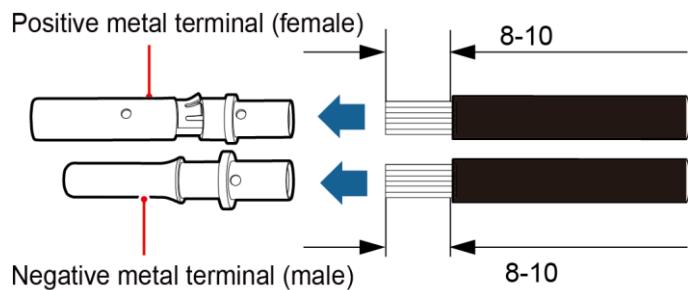
IS01ZC0008

(1) Insulation housing   (2) Locking nut

📖 **NOTE**

Positive and negative metal terminals are packed with positive and negative connectors respectively. After unpacking, keep the positive and negative ones separate to avoid confusion.

Procedure

Step 1 Remove an appropriate length of the insulation layer from the positive and negative power cables using a wire stripper, as shown in Figure 5-14.
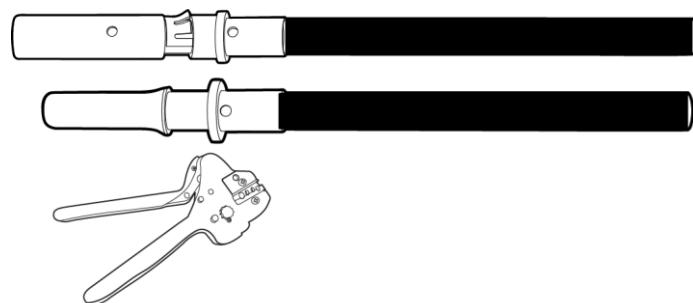
Figure 5-14 Stripped length (unit: mm)

Step 2 Insert the exposed area of the positive and negative power cables into the metal terminals of the positive and negative connectors respectively and crimp them using a crimping tool, as shown in Figure 5-15. Ensure that the cables are crimped tightly such that they cannot be pulled out by a force less than 400 N.
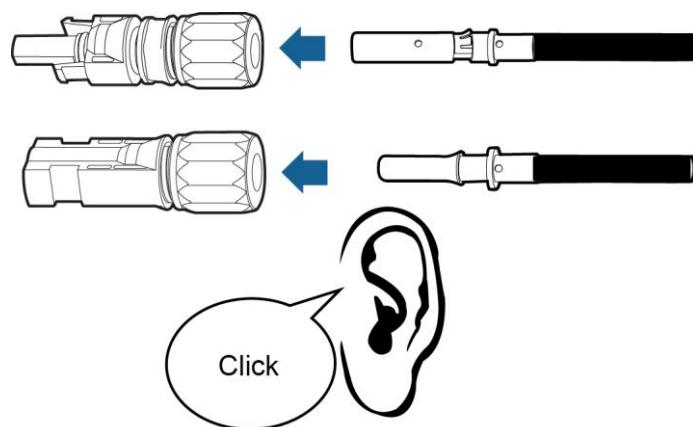
Figure 5-15 Crimping a metal terminal

Step 3 Insert the crimped positive and negative power cables into the corresponding positive and negative connectors until a "click" sound is heard.

Figure 5-16 Inserting positive and negative connectors
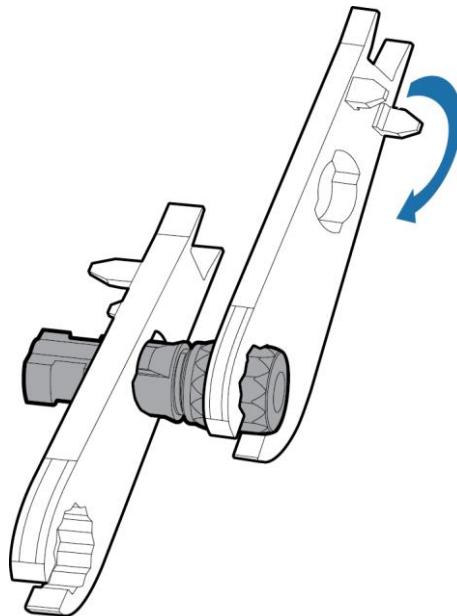
NOTICE

After inserting the crimped positive and negative power cables into the corresponding insulation housings, ensure that the cables are in position by checking for resistance when a slight pull is applied.

Step 4 Tighten the locking nuts on the positive and negative connectors.

Secure the nuts using a removal wrench, as shown in Figure 5-17.

Figure 5-17 Locking a nut

IS01IC0016

Step 5 Pull out the blue dustproof plugs from the ends of the DC input connectors.
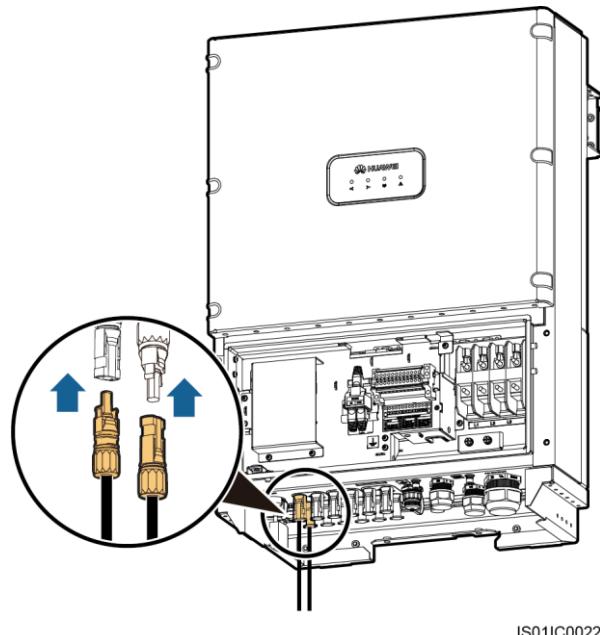
NOTICE

Before performing Step 6, measure the voltage of the DC input strings using a multimeter. Ensure that the voltage of each string is within the specified range (the voltage range varies depending on the actual situation) and check that the polarities of the DC input power cables are correct.

Before performing Step 6, ensure that the DC SWITCH is OFF.

Step 6 Insert the positive and negative connectors into the corresponding DC input terminals of the SUN2000 until a "click" sound is heard, as shown in Figure 5-18.

Figure 5-18 Installing DC input power cables

IS01IC0022

![NOTICE icon] **NOTICE**

After the positive and negative connectors are in position, the clearance between the DC terminals and connectors should be less than or equal to 0.8 mm and the DC input cables cannot be pulled out.

----End

Follow-up Procedure
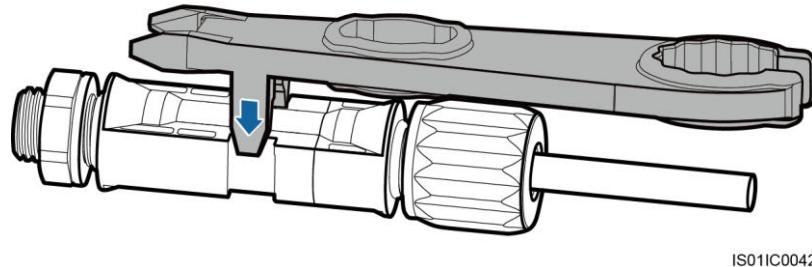
To remove the positive and negative connectors from the SUN2000, insert a removal wrench into the bayonet and press the wrench with an appropriate force, as shown in Figure 5-19.

![WARNING icon] **WARNING**

Before removing the positive and negative connectors, ensure that the DC SWITCH is OFF.

Figure 5-19 Removing a DC input connector

5.5 Connecting Communications Cables
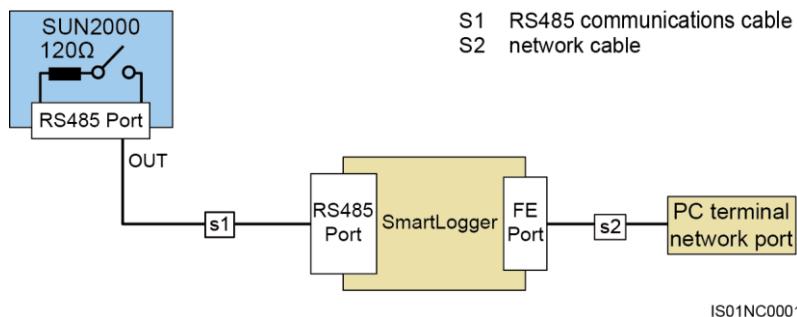
5.5.1 Communication Mode Description

RS485

The SUN2000-33KTL/40KTL can connect to the SmartLogger or to a PC through the SmartLogger to implement RS485 communication. You can use the SmartLogger LCD, embedded WebUI, or the network management software (such as the NetEco) on the PC to query information about the SUN2000-33KTL/40KTL, such as electric energy yield, alarms, and running status.
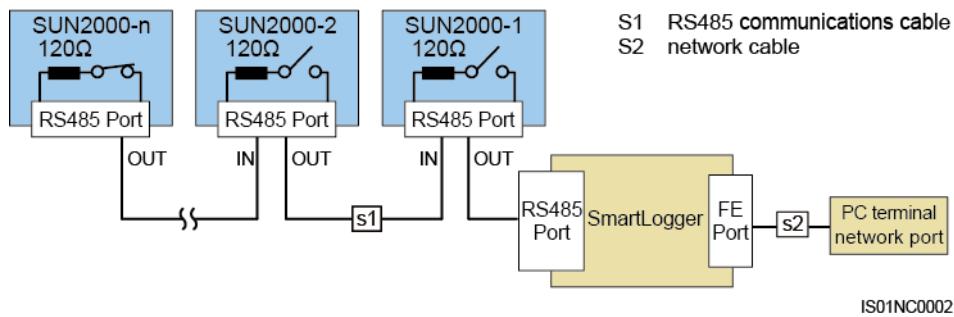
● Figure 5-20 shows the communication mode for a single SUN2000-33KTL/40KTL.

Figure 5-20 Communication mode for a single SUN2000

● Figure 5-21 shows the communication mode for multiple SUN2000-33KTL/40KTLs.

If multiple SUN2000-33KTL/40KTLs are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

Figure 5-21 Communication mode for multiple SUN2000s

NOTE

- For the SUN2000 on the end of the chain, on the **Comm. Param.** screen of the SUN2000 application, set **Match Resistance** to **Connect** to turn on the switch of the build-out resistor so that the build-out resistor is enabled (see the *SUN2000 APP User Manual* for details).

- The appropriate length of the communications cable is less than 1000 m.

- If multiple SUN2000-33KTL/40KTLs need to communicate with one another and are connected to a PC over the SmartLogger, a maximum of three daisy chains can be configured to support up to 80 devices. It is recommended that the number of devices on each daisy chain be less than 30.

PLC

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*.

NOTE

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

5.5.2 Selecting a Communication Mode

Communication modes for the inverters with PLC and those without PLC are different. Select an appropriate communication mode based on the actual situation.

- The inverters with PLC support both PLC and RS485 communication modes.

NOTE

The RS485 and PLC communication modes cannot be used at the same time. You can select only one mode.

- When selecting the PLC communication mode, do not connect the RS485 communications cable.

- When selecting the RS485 communication mode, do not connect the PLC CCO modules to the AC power cables.

- The inverters without PLC only support the RS485 communication mode.

5.5.3 Connecting RS485 Communications Cables

Connect the SUN2000 to communications equipment (such as the SmartLogger and PC) using RS485 communications cables.

Context

- Connect an RS485 communications cable.

  RS485 communications cables can be connected in two ways:

  – Terminal block connection

The DJYP2VP2-22 2*2*1 network cable or a communications cable with a cross sectional area of 1 mm^2 and external diameter of 14–18 mm is recommended.

– RJ45 network port connection

You are advised to use a CAT 5E outdoor shielded network cable with a diameter less than 9 mm and internal resistance no greater than 1.5 ohm/10 m.

📕 **NOTE**

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

⚠ **NOTICE**

When routing communications cables, ensure that communications cables are separated from power cables and away from interfering source to prevent communication from being affected.

● RS485 terminal block definitions

Figure 5-22 Terminal block

IU01ZC0001
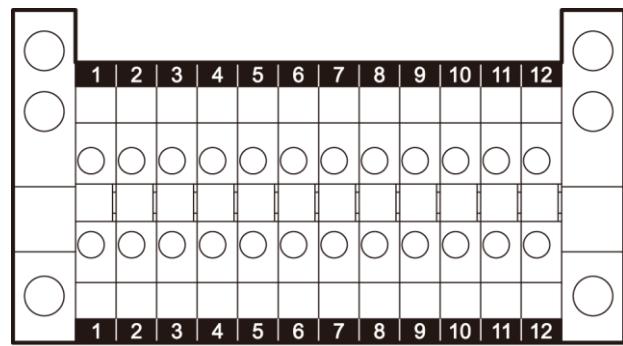
Table 5-4 defines the RS485 terminal block.

Table 5-4 RS485 terminal block definitions

No.	Function	No.	Function
5	RS485A (IN)	6	RS485A (OUT)
7	RS485B (IN)	8	RS485B (OUT)

● RJ45 connector pin definitions

Figure 5-23 RJ45 connector
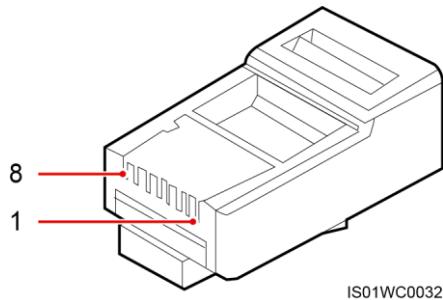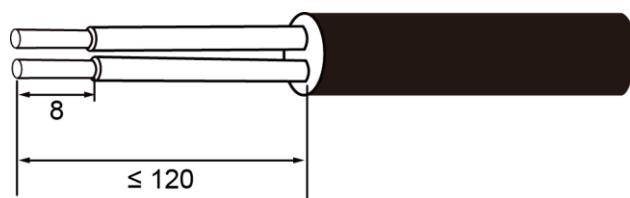
Table 5-5 RJ45 connector pin definitions

Pin	Function
1	RS485A, RS485 differential signal +
2	RS485B, RS485 differential signal –
3	PGND
4	RS485A, RS485 differential signal +
5	RS485B, RS485 differential signal –
6	PGND
7	PGND
8	PGND

Procedure

- Method 1: Connecting to the Terminal Block (Recommended)

  a. Remove an appropriate length of the insulation layer from the cable using a wire stripper, as shown in Figure 5-24.
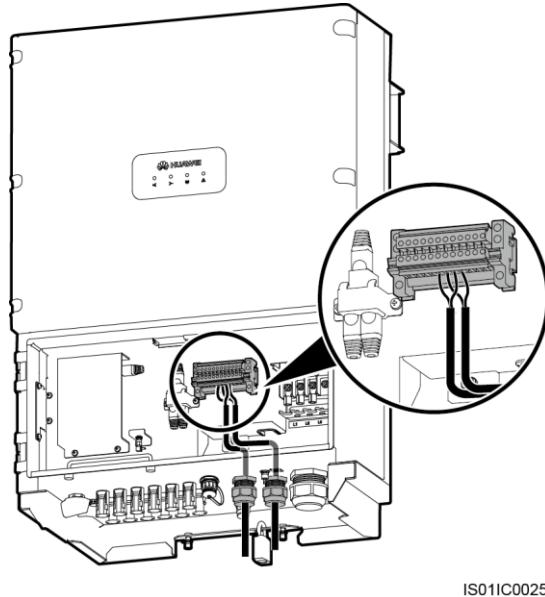
  Figure 5-24 Stripping an RS485 communications cable (unit: mm)

  b. Remove the locking caps from the **COM1** and **COM2** waterproof cable connectors at the inverter bottom and remove the plugs from the locking caps.

  c. Route the cables through the locking caps and the **COM1** and **COM2** connectors at the inverter bottom.

      d.   Connect the input end to terminals 5 and 7 on the terminal block and connect the output end to terminals 6 and 8 on the terminal block, as shown in Figure 5-25.
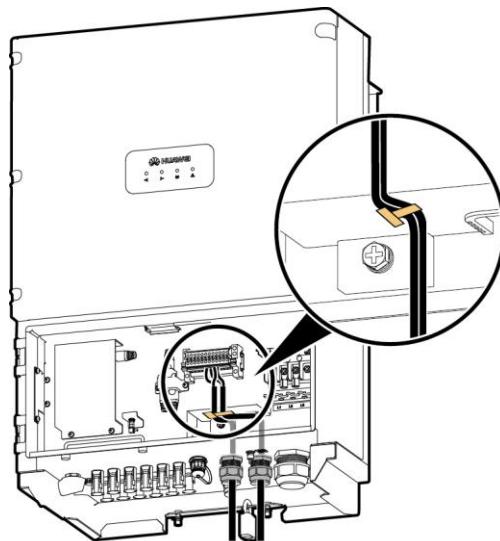
Figure 5-25 Connecting RS485 communications cables

IS01IC0025

      e.   Bind the communications cables after connecting them, as shown in Figure 5-26.

Figure 5-26 Binding communications cables
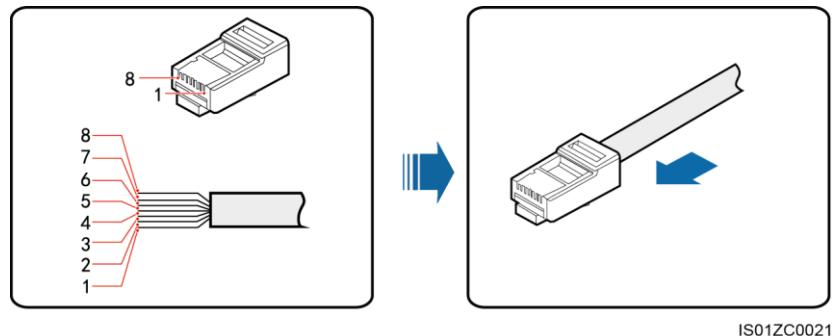
IS01IC0040

      f.   Use a torque wrench to tighten the locking caps to a torque of 7.5 N·m.
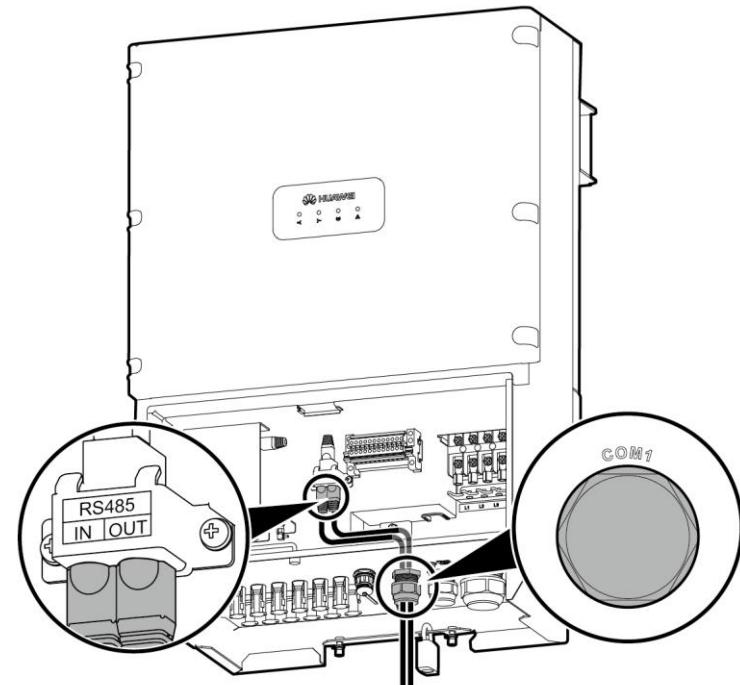
- Method 2: Connecting to RJ45 Ports
  a. Insert the wires of the network cable to the RJ45 connector in sequence, as shown in Figure 5-27.

Figure 5-27 Connecting wires to RJ45 connectors

IS01ZC0021
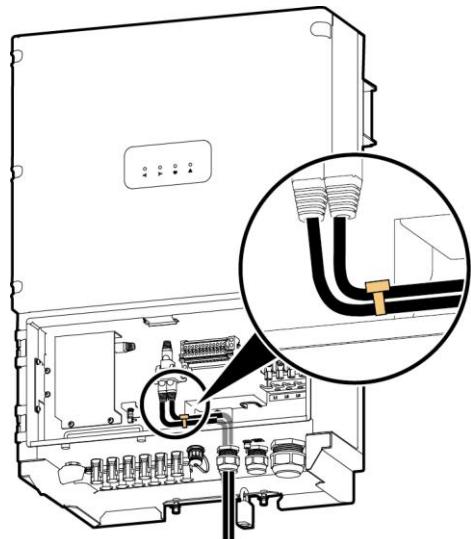
b. Crimp the connectors using a crimping tool.

c. Remove the locking caps from the **COM1** waterproof cable connectors at the inverter bottom and remove the plugs from the locking caps.

d. Route the cables through the locking caps and the **COM1** connectors at the inverter bottom.

e. Connect the RJ45 connectors to the **RS485 IN** and **RS485 OUT** ports in the SUN2000 maintenance area, as shown in Figure 5-28.

Figure 5-28 Connecting RS485 communications cables

IS01IC0024

f. Bind the communications cables after connecting them, as shown in Figure 5-29.

Figure 5-29 Binding communications cables

IS01IC0041

> g. Use a torque wrench to tighten the locking caps to a torque of 7.5 N·m.

----End

5.6 Installation Verification

To ensure that the SUN2000 runs normally, check the SUN2000 after installation.

Check the following items after the SUN2000 is installed:
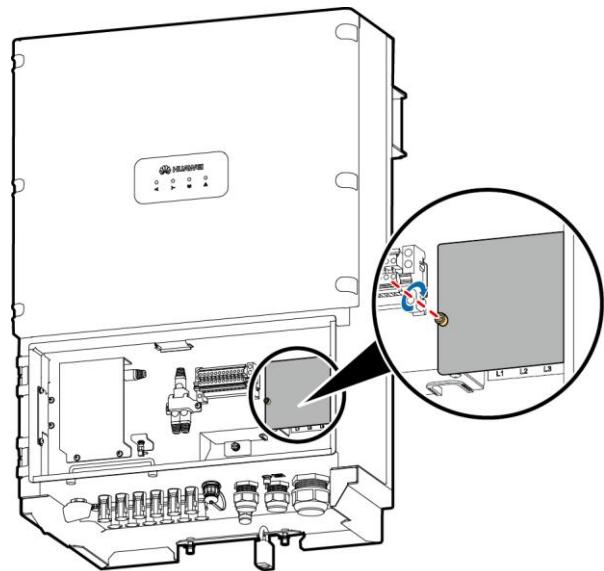
1. The SUN2000 is installed correctly and securely.
2. All screws, especially the screws used for electrical connections, are tightened.
3. Ground cables are connected correctly and securely, with no open circuit or short-circuit.
4. AC output power cables are connected correctly and securely, with no open circuit or short-circuit.
5. DC input power cables are connected correctly and securely, with no open circuit or short-circuit.
6. The DC input voltage is not higher than 1000 V and meets the local voltage range requirements.
7. RS485 communications cables are connected correctly and securely, with no open circuit or short-circuit.
8. Idle DC input terminals are sealed.
9. Idle USB and RS485 ports and waterproof connectors are plugged with waterproof plugs.

5.7 Closing the Chassis Door

Procedure

Step 1 Install the AC terminal cover, as shown in Figure 5-30.
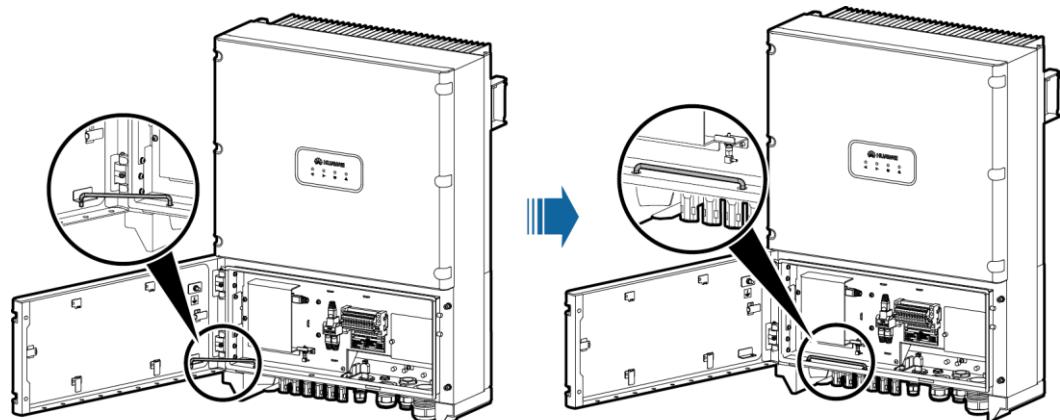
Figure 5-30 Installing the AC terminal cover

IS01HC0065

Step 2 Remove the support bar, as shown in Figure 5-31.
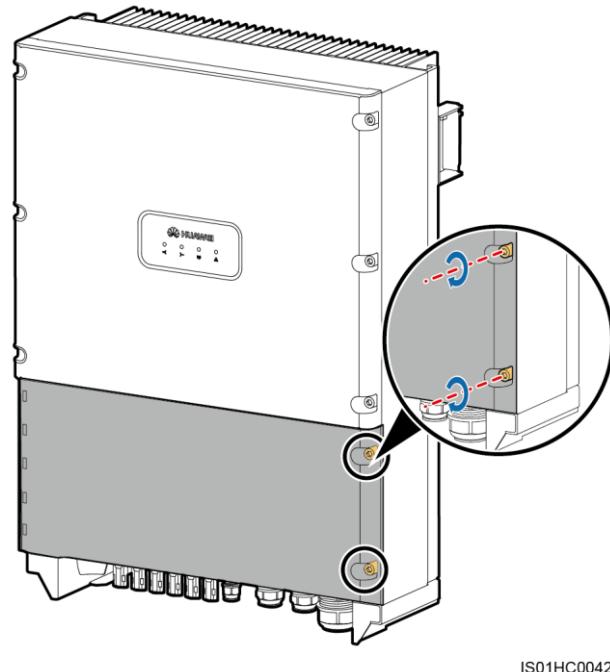
Figure 5-31 Removing a support bar

IS01HC0041

Step 3 Close the chassis door and tighten the two screws on the door to a torque of 4 N·m, as shown in Figure 5-32.

Figure 5-32 Tightening screws on the door

IS01HC0042

📖 **NOTE**

If the two screws on the door are lost, use the standby screws available in the fitting bag that is bound to the reinforcing rib at the base of the chassis.

----End

6 System Operation

This chapter describes how to check the SUN2000 before powering it on and how to power on and power off the SUN2000.

6.1 Powering On the SUN2000

Power on the SUN2000 after electrical connections are completed.

Procedure

Step 1 Switch on the AC circuit breaker between the SUN2000 and the power grid.

> ⚠ **NOTICE**
>
> If you perform Step 2 before Step 1, the SUN2000 reports a fault about abnormal shutdown. You can start the SUN2000 only after the fault is automatically rectified. The default clearance time is 1 minutes. You can modify the time over the network management software running on a PC connected to the SUN2000.

Step 2 Set the DC SWITCH at the bottom of the SUN2000 to ON.

Step 3 (Optional) Measure the temperature at the DC terminal connection point using a point-test thermometer.

Check whether the DC terminal is securely connected, after the SUN2000 works for some time.

----End

6.2 Powering Off the SUN2000

Comply with the safety precautions and operation procedure specified in this section when powering off the SUN2000.

Context

![WARNING icon] **WARNING**

After the SUN2000 powers off, the remaining electricity and heat may still cause electrical shock and body burns. Therefore, only 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 *SUN2000 APP User Manual*, *SmartLogger1000 User Manual*, or *NetEco1000S V100R001C00 User Manual*.

Step 2 Switch off the circuit breaker between the SUN2000 and the power grid.

Step 3 Set the DC SWITCH to OFF.

----End

7 User Interface

The man-machine interaction can be performed through the USB, SmartLogger, NMS, and SUN2000 APP.

7.1 Operations with a USB Flash Drive

7.1.1 Exporting Configurations

Export the inverter configurations through a USB flash drive.
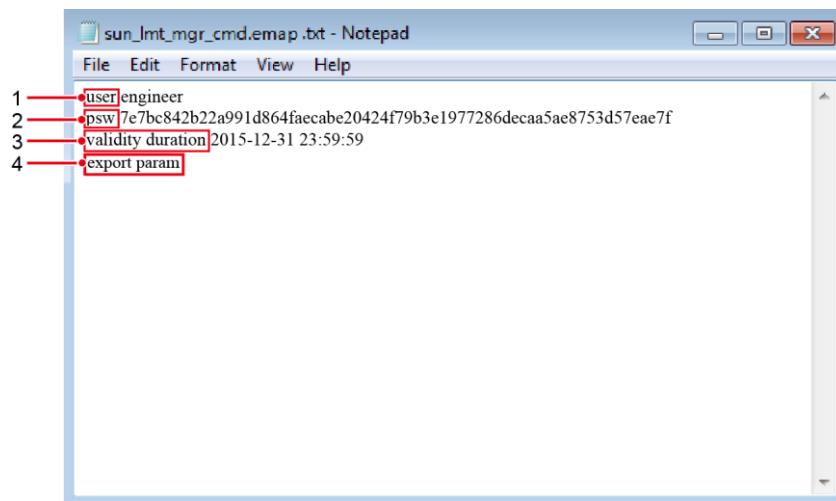
Context

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

Procedure

Step 1 On the SUN2000 APP, click **Inverter Command Settings** to generate a boot script file. For details, see *SUN2000 APP User Manual*.

Step 2 Import the boot script file to a computer.

(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. • 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. Otherwise, after you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-1 Indicator status

Indicator	Status	Meaning
⚠	Off	There is no operation with a USB flash drive.
	Blinking green slowly (on for 1s and then off for 1s)	There is an operation with a USB flash drive.
	Blinking green fast (on for 0.125s and 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 completed, there are three files in the root directory of the USB flash drive: one boot script file and two exported files.

----End

7.1.2 Importing Configurations

Import the inverter configurations through a USB flash drive.

Prerequisites

You have exported configurations, and the exported files are complete.

Context

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

Procedure

Step 1 On the SUN2000 APP, click **Inverter Command Settings** to generate a boot script file. For details, see *SUN2000 APP User Manual*.

Step 2 Import the boot script file to a computer.

Step 3 Replace the exported boot script file in the root directory of the USB flash drive with the imported one.

⚠ **NOTICE**

Replace the boot script file and keep the exported files.

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

 NOTICE

Verify that the ciphertext in the boot script file matches the login password of the SUN2000 APP. Otherwise, after you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-2 Indicator status

Indicator	Status	Meaning
	Off	There is no operation with a USB flash drive.
	Blinking green slowly (on for 1s and then off for 1s)	There is an operation with a USB flash drive.
	Blinking green fast (on for 0.125s and 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

Export the inverter data through a USB flash drive.

Context

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

Procedure

Step 1 On the SUN2000 APP, click **Inverter Command Settings** to generate a boot script file. For details, see *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. Otherwise, after you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-3 Indicator status

| Indicator	Status	Meaning
	Off	There is no operation with a USB flash drive.
	Blinking green slowly (on for 1s and then off for 1s)	There is an operation with a USB flash drive.
	Blinking green fast (on for 0.125s and 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

7.1.4 Upgrading

Context

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

Procedure

Step 1 Log in to http://support.huawei.com/carrier/ and browse or search for SUN2000 on the **Product Support** tab page. Download the required upgrade package (for example, SUN2000 V200R001C00SPCXXX) on the **Software** tab page.

Step 2 Decompress the upgrade package.

After obtaining the upgrade package SUN2000V200R001C00SPCxxx_package.zip, decompress the package and copy the extracted files to the root directory of the USB flash drive. Ensure that the extracted files include:

- SUN2000.bin
- SUN2000_CPLD.bin
- SUN2000_Master_Release.bin
- SUN2000_Slave_Release.bin
- sun_lmt_mgr_cmd.emap

 NOTE

This is a boot script file.

- config.txt
- vercfg.xml

⚠ **NOTICE**

- When the login password of the SUN2000 APP is the initial password (**000001** or **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 5.

Step 3 On the SUN2000 APP, click **Inverter Command Settings** to generate a boot script file. For details, see *SUN2000 APP User Manual*.

Step 4 Import the boot script file to a computer.

Step 5 Replace the boot script file in the upgrade package with the one generated by the SUN2000 local commissioning tool.

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; otherwise, after you insert the USB flash drive for five consecutive times, the user account will be locked for 10 minutes.

Table 7-4 Indicator status

Indicator	Status	Meaning
⚠	Off	There is no operation with a USB flash drive.
	Blinking green slowly (on for 1s and then off for 1s)	There is an operation with a USB flash drive.
	Blinking green fast (on for 0.125s and 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 indicators are off during the restart. After the restart, the preceding indicator is blinking green slowly (on

for 1s and then off for 1s) for 1 minute until it becomes steady on, which indicates that the upgrade is successful.

☐ NOTE

The upgrade of the SUN2000 can also be completed through the **Inverter Upgrade** in the SUN2000 APP. For details, see *SUN2000 APP User Manual*.

----End

7.2 Operations with a SmartLogger

For operations with a SmartLogger, see *SmartLogger1000 User Manual*.

7.3 Operations with the NMS

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

7.4 Operations with the SUN2000 APP

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

8 Maintenance

This chapter describes routine maintenance and troubleshooting practices that ensure optimal performance of the SUN2000.

8.1 Routine Maintenance

This section describes the maintenance routine and intervals for the SUN2000.

Table 8-1 Maintenance checklist

Check Item	Check Method	Maintenance Interval
System cleaning	• Check periodically that the heat sink is free from dust and blockage. • Turn off the DC switch and then turn it on at night to clean the oxide off the switch.	Semiannually to annually.
System running status	• Check that the SUN2000 is not damaged or deformed. • Check for normal sound emitted during operation of the SUN2000. • Check that all SUN2000 parameter settings are correctly set during operation.	Semiannually.
Electrical Connections	• Check that cables are securely connected. • Check that cables are intact and the parts in contact with a metallic surface are not scratched. • Check that the idle RS485 and USB ports are covered by waterproof caps.	Half a year after the initial commissioning, and semiannually to annually afterwards.
Grounding reliability	Check that PGND cables are securely connected.	Half a year after the initial commissioning, and semiannually to annually afterwards.

⬜ NOTE

Before wiping the heat sink clean, switch off the circuit breaker between the SUN2000 and the power grid, set the DC SWITCH to OFF, and wait at least 5 minutes after the SUN2000 is powered off.

8.2 Troubleshooting

This section describes the troubleshooting measures for common fault alarms in the SUN2000.

The alarm severity is defined as follows:

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

Table 8-2 lists the troubleshooting measures for common fault alarms in the SUN2000.

Table 8-2 Troubleshooting

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures
103	DC Over Voltage	Major	Too many PV modules connected in series lead to excessively high output voltage of PV strings, making the open circuit voltage of the PV strings greater than the maximum input voltage of the SUN2000.	Check whether a large number of PV modules connected in series makes the open circuit voltage of the PV strings greater than the maximum input voltage of the SUN2000. If yes, adjust the number of PV modules connected in series to decrease the output voltage of PV strings to meet the voltage requirements for the SUN2000. After the adjustment, ensure that the SUN2000 works properly. If no, contact Huawei technical support.
106 to 111	String 1-6 Abnormal	Warning	• PV strings have been shielded for a long time. • PV strings are deteriorating.	1. Check whether the output current of a PV string is obviously less than the output current of other PV strings. 2. If yes, check whether the PV string is shielded. 3. If the PV string is clean and not shielded, check whether the PV modules are faulty.
120 to 125	String 1-6 Reverse	Warning	The cables of PV strings are connected reversely during SUN2000 installation.	Check whether the cables of PV strings are correctly connected. If they are connected reversely, reconnect the cables.

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures

200	DC Bus Voltage Fault	Major	Abnormal external conditions have triggered the protection for the DC circuits inside the SUN2000. The possible causes are as follows:
			
			• Reason ID = 3
			
			  The SUN2000 input is suddenly disconnected, or the PV strings shielded result in a sharp change in output power.
			
			• Reason ID = 9 or 11
			
			  The input energy of the SUN2000 cannot be vented quickly due to the sharp change of grid voltage. As a result, the internal voltage increases.
			
			• Reason ID = 10
			
			  The internal control circuit of the SUN2000 has failed to keep pace with changes due to grid phase imbalance.
				1. The SUN2000 monitors its external working conditions in real time and automatically recovers to the normal operating status after the fault is rectified.
				2. If the alarm occurs repeatedly, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures

202	Invert Module Fault	Major	Abnormal external conditions have triggered the protection for the converter circuit inside the SUN2000. The possible causes are as follows:
			
			• Reason ID = 4
			
			  The grid voltage sharply drops or short-circuits, resulting in high output current of the SUN2000.
			
			• Reason ID = 13
			
			  The grid voltage sharply drops or short-circuits, resulting in a fault in the voltage check circuit of the SUN2000.
			
			• Reason ID = 14
			
			  The grid voltage sharply drops or short-circuits, resulting in instantaneous high output current of the SUN2000.
			
			• Reason ID = 16
			
			  The DC current of grid current exceeds the allowable range.
			
			• Reason ID = 17
			
			  The grid voltage or frequency is abnormal.
			
			• Reason ID = 20
			
			  The SUN2000 output short-circuit leads to a sharp increase in output current.
				Reason ID = 4, 13, 14, 16, or 17
				
				1. The SUN2000 monitors its external working conditions in real time and automatically recovers to the normal operating status after the fault is rectified.
				2. If the alarm occurs repeatedly, contact Huawei technical support.
				
				Reason ID = 20
				
				1. Check whether the SUN2000 output cables are short-circuited. Rectify any fault.
				2. If the alarm occurs repeatedly, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures
301	Grid Voltage Abnormal	Major	The grid voltage is beyond the allowable range. The possible causes are as follows: • Reason ID = 1 to 6 The grid A, B, or C phase voltage is less than the allowable range. • Reason ID = 13 to 18 The grid A, B, or C phase voltage is higher than the allowable range. • Reason ID = 26 The grid voltage is higher than the allowable range. • Reason ID = 27 or 28 The grid voltage difference of the three phases is large. • Reason ID = 29 The grid has a power outage, or the AC line or the AC circuit breaker is disconnected.	Reason ID = 1 to 6 1. If the alarm occurs accidentally, possibly the power grid is abnormal accidentally. The SUN2000 automatically recovers to the normal operating status after the fault is rectified. 2. If the alarm occurs repeatedly, check whether the grid voltage is within the allowable range. If no, contact the local power operator. If yes, change the grid overvoltage and undervoltage protection points on the SUN2000 APP, data collector, or NMS after obtaining approval from the local power operator. 3. If the alarm persists for a long time, check the AC circuit breaker and output cables of the SUN2000. Reason ID = 13 to 18, or 26 1. Check whether the grid-tie point voltage is too high. If it is, contact your local power operator. 2. If the grid-tie point voltage is higher than the allowable range, change the overvoltage and undervoltage protection points after obtaining approval from the local power operator. 3. Check whether the grid voltage peak is too high. Reason ID = 27 or 28 1. The SUN2000 monitors its external working conditions in real time and automatically recovers to the normal operating status after the fault is rectified. 2. If the alarm occurs repeatedly and affects the normal power generation of the power station, contact the local power operator. Reason ID = 29 1. Check whether the AC voltage is normal. 2. Check whether the AC line or circuit breaker is disconnected.

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures
305	Frequency Abnormal	Major	The actual frequency of the grid is higher than or less than the required value for the local grid.	1. If the alarm occurs accidentally, possibly the power grid is abnormal accidentally. The SUN2000 automatically recovers to the normal operating status after the fault is rectified. 2. If the alarm occurs repeatedly, check whether the grid frequency is within the allowable range. If no, contact the local power operator. If yes, change the grid overfrequency and underfrequency protection points on the SUN2000 APP, data collector, or NMS after obtaining approval from the local power operator.
313	Low Array Insulation Resistance	Major	The insulation resistance against the ground for PV strings is less than the minimum value. The possible causes are as follows: • A short circuit exists between PV strings and protection ground. • PV strings are installed in a permanently moist environment.	1. Check the insulation resistance against the ground for the PV strings. If a short circuit has occurred, rectify the fault. 2. If the insulation resistance against the ground is less than the default value in a rainy environment, set **Insulation resistance protection** on the SUN2000 APP, data collector, or NMS.
318	Residual Current Abnormal	Major	The insulation resistance against the ground at the input side decreases during SUN2000 operation, which causes excessively high residual current.	1. If the alarm occurs accidentally, possibly the external circuits are abnormal accidentally. The SUN2000 automatically recovers to the normal operating status after the fault is rectified. 2. If the alarm occurs repeatedly or lasts a long time, check whether the insulation resistance against the ground of PC strings is too low.
321	Cabinet Over-Temp	Major	• The SUN2000 is installed in a place with poor ventilation. • The ambient temperature is too high. • The internal fan is not working.	Check whether the ambient temperature of the SUNS2000 exceeds the upper limit. If yes, improve ventilation to decrease the temperature.

Alarm ID	Alarm Name	Alarm Severity	Causes	Measures
326	Electrical Grounding Fault	Major	• The neutral wire or PGND cable is not connected to the SUN2000. • The isolation transformer is not connected to the SUN2000 at the output side if the PV strings are grounded.	1. Check that the neutral wire and PGND cable are properly connected. 2. Check that an isolation transformer is connected to the SUN2000 at the output side if the PV strings are grounded.
400	System Fault	Major	An unrecoverable fault has occurred on a circuit inside the SUN2000.	Flip the DC SWITCH on the SUN2000 to OFF, wait 5 minutes, and flip the DC SWITCH to ON. Check whether the fault is rectified. If the fault persists, contact Huawei technical support.
502	Internal Communication Fault	Minor	• The communication circuit of the SUN2000 is disturbed. • The communication circuit is damaged. • The internal communication address is incorrectly set.	1. If the fault is caused by a short circuit of the communication circuit inside the SUN2000, the SUN2000 automatically recovers to the normal operating status after the fault is rectified. 2. If the fault persists for a long time, contact Huawei technical support.
504	Version Mismatch	Minor	During SUN2000 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	Firmware Upgrade Failed	Major	Upgrade is not properly completed.	Upgrade again.
61440	Flash Fault	Minor	• The flash space is insufficient. • The flash drive has bad blocks or is faulty.	1. Replace the monitoring board. 2. If the monitoring board is built in the monitoring device, replace the monitoring device.

📖 **NOTE**

If a fault cannot be rectified by the measures listed in Table 8-2, contact Huawei technical support.

9 SUN2000 Handling

This chapter describes how to remove, pack, and dispose of the SUN2000.

9.1 Removing the SUN2000

This section describes how to remove the SUN2000.

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. (Optional) Open the anti-theft lock at the bottom of the SUN2000.
3. Remove the SUN2000 from the rear panel.
4. Remove the rear panel.

9.2 SUN2000 Packing

This section describes how to pack the SUN2000.

- If the original packing case is available, place the SUN2000 inside the packing case and seal it with adhesive tape.
- If the original packing case is unavailable, place the SUN2000 inside a suitable hard carton and seal it properly.

9.3 SUN2000 Disposal

This section describes how to dispose of the SUN2000.

If the SUN2000 service life has expired, dispose of the SUN2000 in accordance with local rules for disposal of electrical equipment waste, or return the SUN2000 to Huawei.

10 Technical Specifications

This chapter lists the technical specifications for all SUN2000 models.

Efficiency

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Max. efficiency	98.6%	98.8%
European efficiency	98.3%	98.4%

Input

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Max. input power (cos φ = 1)	33800 W	40800 W
Max. input voltage	1000 V	
Max. input current per MPPT route	23 A	
Max. short-circuit current per MPPT route	34.5 A	
Max. input current (three MPPT routes)	3 x 23 A	
Min. starting voltage	200 V	
Full load MPP voltage range	480 V to 800 V	580 V to 800 V
Max. number of inputs	6	
Number of MPPT routes	3	

Output

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Rated power (230 V, 50 Hz)	30000 W	36000 W
Max. apparent power	33000 VA	36000 VA
Maximum AC output power (cos φ = 1) [a]	300000 W/33000 W	40000 W
Rated output voltage	220 V/380 V, 230 V/410 V, 240 V/415 V, 3W+N+PE	277 V/480 V, 3W+PE
AC power frequency	50 Hz/60 Hz	
Max. output current	48 A	
Power factor	0.8 overexcited, 0.8 underexcited	
Max. total harmonic distortion	< 3%	

Note a: The maximum output power of the SUN2000-33KTL varies depending on the chosen grid code, as described in A Power Grid Codes.

Protection

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Input DC switch	Supported	
Anti-islanding protection	Supported	
Output over current protection	Supported	
Input reverse-connection protection	Supported	
PV string fault detection	Supported	
DC surge protection	Class II	
AC surge protection	Class II	
Insulation resistance detection	Supported	
Residual current detection	Supported	
AC overvoltage and undervoltage protection	Supported	

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
AC overfrequency and underfrequency protection	Supported	

Display and Communication

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
RS485	Supported	
USB	Supported	
PLC	Optional	

General Data

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Dimensions (W x H x D)	550 mm x 770 mm x 270 mm	
Weight	50 kg	
Operating temperature range	−25 ℃ to +60 ℃	
Cooling	Natural convection	
Operating altitude	4000 m	
Relative humidity	0%−100% (non-condensing)	
Input terminal	Amphenol HH4	
Output terminal	Waterproof PG connector + OT terminal	
Protection level	IP65	
Self-consumption at night	1 W	
Topology	Transformerless	
Noise	≤ 33 dB	

Standards Compliance

Technical Specifications	SUN2000-33KTL	SUN2000-40KTL
Certification compliance	VDE-AR-N4105, VDE0126-1-1, BDEW 2008, G59/3, NB/T 32004-2013, UTE C 15-712-1, C10/11, IEC 61727, IEC 62116, EN 50438, MEA, PEA, GB/T 19964-2012	

A Power Grid Codes

Set the power grid code that applies to the country or region where the power station is located.

NOTE

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

Table A-1 lists the power grid standard codes which the SUN2000-33KTL supports.

Table A-1 Power grid codes (SUN2000-33KTL)

No.	Power Grid Code	Description	Power Grid Voltage	Maximum Output Power
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V/400 V	30 kW
2	BDEW-MV	Germany medium-voltage power grid	230 V/400 V	30 kW
3	NB/T 32004	China low-voltage power grid	220 V/380 V	33 kW
4	EN50438-NL	Netherlands low-voltage power grid	230 V/400 V	30 kW
5	UTE C 15-712-1(A)	France low-voltage power grid	230 V/400 V	30 kW
6	UTE C 15-712-1(B)	Islands of France 230 V 50 Hz	230 V/400 V	30 kW
7	UTE C 15-712-1(C)	Islands of France 230 V 60 Hz	230 V/ 400 V	30 kW
8	VDE 0126-1-1-BU	Bulgaria low-voltage power grid	230 V/400 V	30 kW
9	G59-England	England 230 V power grid (I > 16 A)	230 V/400 V	30 kW

No.	Power Grid Code	Description	Power Grid Voltage	Maximum Output Power
10	G59-Scotland	Scotland 240 V power grid (I > 16 A)	240 V/415 V	30 kW
11	G83-England	England 230 V power grid (I < 16 A)	230 V/400 V	30 kW
12	G83-Scotland	Scotland 240 V power grid (I < 16 A)	240 V/415 V	30 kW
13	CEI0-21	Italian low-voltage power grid	230 V/400 V	30 kW
14	CEI0-16	Italian medium-voltage power grid	230 V/400 V	30 kW
15	EN50438-CZ	Czech Republic low-voltage power grid	230 V/400 V	30 kW
16	VDE 0126-1-1-GR(A)	Mainland of Greece low-voltage power grid	230 V/400 V	30 kW
17	VDE 0126-1-1-GR(B)	Islands of Greece low-voltage power grid	230 V/400 V	30 kW
18	RD1699	Spanish low-voltage power grid (Pn < 100 kW)	230 V/400 V	30 kW
19	RD661	Spanish low-voltage power grid (Pn > 100 kW)	230 V/400 V	30 kW
20	AS4777	Australia low-voltage power grid	230 V/400 V	30 kW
21	C10/11	Belgium low-voltage power grid	230 V/400 V	30 kW
22	IEC61727	IEC low-voltage power grid (50 Hz)	230 V/400 V	30 kW
23	TAI-PEA	Thailand low-voltage power grid (PEA)	220 V/380 V	30 kW
24	TAI-MEA	Thailand low-voltage power grid (MEA)	230 V/400 V	30 kW
25	EN50438-TR	Turkey low-voltage power grid	230 V/400 V	30 kW
26	Philippines	Philippines low-voltage power grid	220 V/380 V	30 kW
27	NRS-097-2-1	South Africa low-voltage power grid	230 V/400 V	30 kW

No.	Power Grid Code	Description	Power Grid Voltage	Maximum Output Power
28	KOREA	Korea low-voltage power grid	220 V/380 V	30 kW
29	IEC61727-60Hz	IEC low-voltage power grid (60 Hz)	230 V/400 V	30 kW
30	Custom(50Hz)	Reserved	230 V/400 V	30 kW
31	Custom(60Hz)	Reserved	230 V/400 V	30 kW

Table A-2 lists the power grid standard codes which the SUN2000-40KTL supports.

Table A-2 Power grid codes (SUN2000-40KTL)

No.	Power Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power
1	BDEW-MV480	Germany medium-voltage power grid	277 V/480 V	40 kW
2	CHINA-MV480	China medium-voltage power grid	277 V/480 V	40 kW
3	G59-England-MV480	UK 480 V Medium-voltage power grid (I > 16 A)	277 V/480 V	40 kW
4	IEC61727-MV480	IEC medium-voltage power grid (50 Hz)	277 V/480 V	40 kW
5	UTE C 15-712-1-MV480	France medium-voltage power grid	277 V/480 V	40 kW
6	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)	277 V/480 V	40 kW
7	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)	277 V/480 V	40 kW
8	EN50438-DK-MV480	Denmark medium-voltage power grid	277 V/480 V	40 kW
9	Japan(50Hz)	Japan power grid (50 Hz)	277 V/480 V	40 kW

No.	Power Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power
10	Japan(50Hz)	Japan power grid (60 Hz)	277 V/480 V	40 kW
11	EN50438-TR-MV480	Turkey medium-voltage power grid	277 V/480 V	40 kW
12	C11/C10-MV480	Belgium medium-voltage power grid	277 V/480 V	40 kW
13	Philippines-MV480	Philippines medium-voltage power grid	277 V/480 V	40 kW
14	AS4777-MV480	Australia medium-voltage power grid	277 V/480 V	40 kW
15	NRS-097-2-1-MV480	South Africa medium-voltage power grid	277 V/480 V	40 kW
16	IEC61727-60Hz-MV480	IEC medium-voltage power grid (60 Hz)	277 V/480 V	40 kW
17	Custom-MV480(50 Hz)	Reserved	277 V/480 V	40 kW
18	Custom-MV480(60 Hz)	Reserved	277 V/480 V	40 kW

B Acronyms and Abbreviations

A

ACDU   AC distribution unit

E

EMC   electromagnetic compatibility

EMI   electromagnetic interference

EMS   element management system

ESD   electrostatic discharge

L

LCD   liquid crystal display

LED   light emitting diode

M

MMP   maximum power point

MPPT   maximum power point tracking

P

PE   protective earthing

PGND   protection ground

PV   photovoltaic

S

SPD   surge protective device