

SUN2000-(30KTL-A, 33KTL, 33KTL-E001, 40KTL)

User Manual

Issue **10**
Date **2019-06-30**

Copyright © Huawei Technologies Co., Ltd. 2019. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

Trademarks and Permissions



HUAWEI and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd.

All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://e.huawei.com>

About This Document

Purpose





This document describes the SUN2000-30KTL-A/33KTL/33KTL-E001/40KTL (SUN2000 for short) in terms of its installation, electrical connections, commissioning, maintenance, and troubleshooting. Understand the safety information and get familiar with the SUN2000 functions and features before installing and operating the SUN2000.


Intended Audience

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

Symbol Conventions

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

Symbol	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
	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	<p>Calls attention to important information, best practices and tips.</p> <p>NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.</p>

Change History

Changes between document issues are cumulative. Therefore, the latest document issue contains all updates made in previous issues.

Issue 10 (2019-06-30)

Updated [4.2 Tools](#).

Updated [5.4 Connecting DC Input Power Cables](#).

Updated [5.5 Connecting Communications Cables](#).

Updated [6.1 Powering On the SUN2000](#).

Issue 09 (2018-05-20)

Updated [5.3 Installing AC Output Power Cables](#).

Added the description about the metal stamping forming contact in [5.4 Connecting DC Input Power Cables](#).

Issue 08 (2017-11-14)

Updated [1 Safety Precautions](#).

Issue 07 (2017-07-30)

Updated [5.1 Connecting PGND Cables](#).

Updated [10 Technical Specifications](#).

Issue 06 (2017-04-15)

Added SUN2000-33KTL-E001.

Issue 05 (2017-02-20)

Updated [Installation Environment Requirements](#) of [4.3 Wall-mounting the SUN2000](#).

Updated [Installation Environment Requirements](#) of [4.4 Support-mounting the SUN2000](#).

Updated [8.1 Routine Maintenance](#).

Issue 04 (2016-06-20)

Added SUN2000-30KTL-A.

Issue 03 (2015-12-01)

Added **Maximum inverter backfeed current to the PV array** to chapter [10 Technical Specifications](#).

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

About This Document	ii
1 Safety Precautions	1
2 Overview	3
2.1 Introduction	3
2.2 Appearance	5
2.3 Label Conventions	9
2.4 Working Process	13
3 Inverter Storage	16
4 Installation	17
4.1 Checking Before Installation.....	17
4.2 Tools.....	18
4.3 Wall-mounting the SUN2000.....	22
4.3.1 Determining the Installation Position	22
4.3.2 Moving the SUN2000.....	27
4.3.3 Installing a Rear Panel.....	28
4.3.4 Installing the SUN2000	31
4.4 Support-mounting the SUN2000	35
4.4.1 Determining the Installation Position	35
4.4.2 Moving the SUN2000.....	37
4.4.3 Installing a Rear Panel.....	37
4.4.4 Installing the SUN2000	39
5 Electrical Connections.....	40
5.1 Connecting PGND Cables.....	40
5.2 Opening the Maintenance Compartment Door.....	42
5.3 Installing AC Output Power Cables.....	44
5.4 Connecting DC Input Power Cables	49
5.5 Connecting Communications Cables.....	57
5.5.1 Communication Mode Description	57
5.5.2 Selecting a Communication Mode	58
5.5.3 Connecting RS485 Communications Cables	59
5.6 Installation Verification	64

5.7 Closing the Maintenance Compartment Door	64
6 System Commissioning	67
6.1 Powering On the SUN2000	67
6.2 Powering Off the SUN2000	71
7 Man-Machine Interactions	73
7.1 Operations with a USB Flash Drive	73
7.1.1 Exporting Configurations	73
7.1.2 Importing Configurations	75
7.1.3 Exporting Data	76
7.1.4 Upgrading	76
7.2 Operations with a SmartLogger	78
7.3 Operations with the NMS	78
7.4 Operations with the SUN2000 APP	78
8 System Maintenance	79
8.1 Routine Maintenance	79
8.2 Troubleshooting	80
9 Handling the Inverter	88
9.1 Removing the SUN2000	88
9.2 Packing the SUN2000	88
9.3 Disposing of the SUN2000	88
10 Technical Specifications	89
A Grid Codes	93
B Acronyms and Abbreviations	98

1 Safety Precautions

Personnel Requirements

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

NOTICE

Read this document thoroughly before operations. Huawei shall not be liable for any consequence caused by violation of the storage, transportation, installation, and operation regulations specified in this document.

Sign Protection

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

Installation

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

Cable Connections

⚠ DANGER

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

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

Operation

⚠ DANGER

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

-
- Do not touch an operating inverter because the heat sinks may have a temperature of greater than 60°C and may cause burns when the inverter is operating.
 - Follow local laws and regulations when operating the equipment.

Maintenance and Replacement

⚠ DANGER

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

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

2 Overview

2.1 Introduction

Function

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

Models

Figure 2-1 shows a model number of the SUN2000, using SUN2000-30KTL-A and SUN2000-33KTL-E001 as an example.

Figure 2-1 Model number description

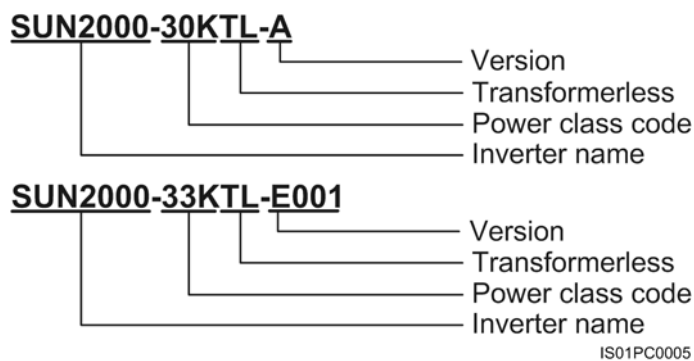


Table 2-1 lists all models of the SUN2000 and their rated output power.

Table 2-1 SUN2000 models and rated output power

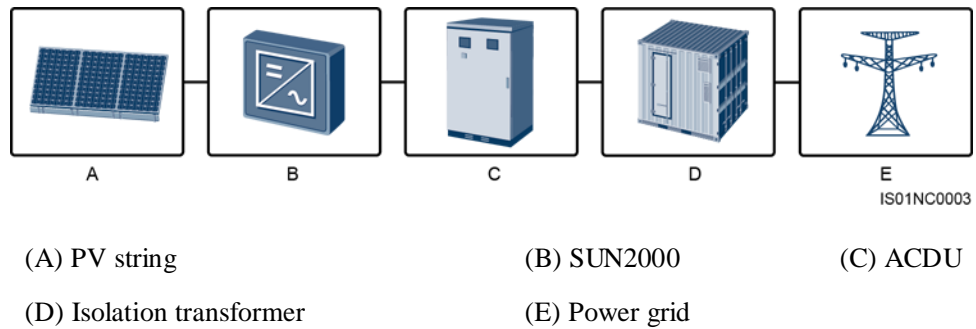
Model	Rated Output Power
SUN2000-30KTL-A	30 kW
SUN2000-33KTL	30 kW
SUN2000-33KTL-E001	30 kW

Model	Rated Output Power
SUN2000-40KTL	36 kW

Network Application

The SUN2000 applies to grid-tied PV power systems for commercial rooftops and large power stations. Typically, a grid-tied PV power system consists of PV strings, grid-tied inverters, AC distribution units (ACDUs), and isolation transformer, as shown in Figure 2-2.

Figure 2-2 Network Application



Supported Power Grids

The SUN2000-33KTL and SUN2000-33KTL-E001 support the power grid modes TN-S, TN-C, TN-C-S, and TT, as shown in Figure 2-3. The SUN2000-30KTL-A and SUN2000-40KTL only support the power grid mode IT, as shown in Figure 2-4.

Figure 2-3 Power grid modes supported by the SUN2000-33KTL and SUN2000-33KTL-E001

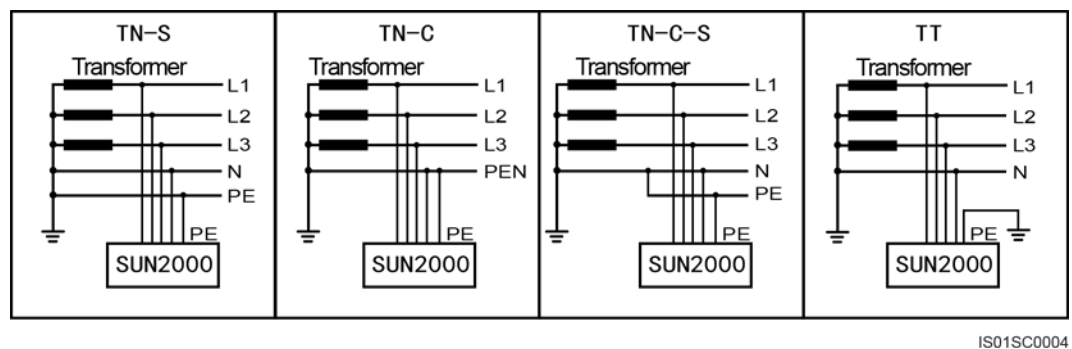
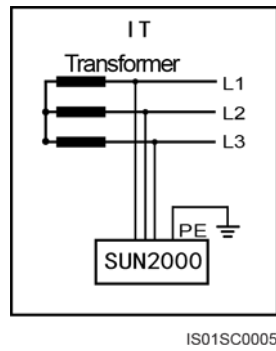


Figure 2-4 Power grid modes supported by the SUN2000-30KTL-A and SUN2000-40KTL



NOTE

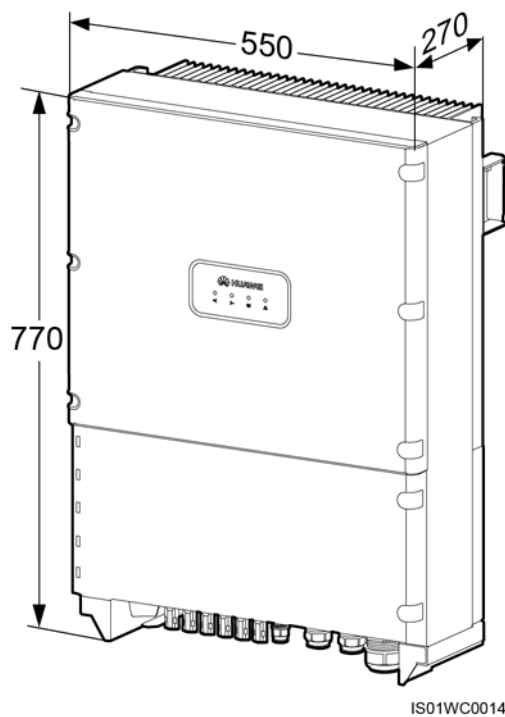
The SUN2000-30KTL-A and SUN2000-40KTL are mainly used for medium-voltage power grids. They deliver three-phase, three-wire output and then are fed to a medium-voltage power grid over a step-up transformer.

2.2 Appearance

Dimensions

Figure 2-5 shows the SUN2000 dimensions.

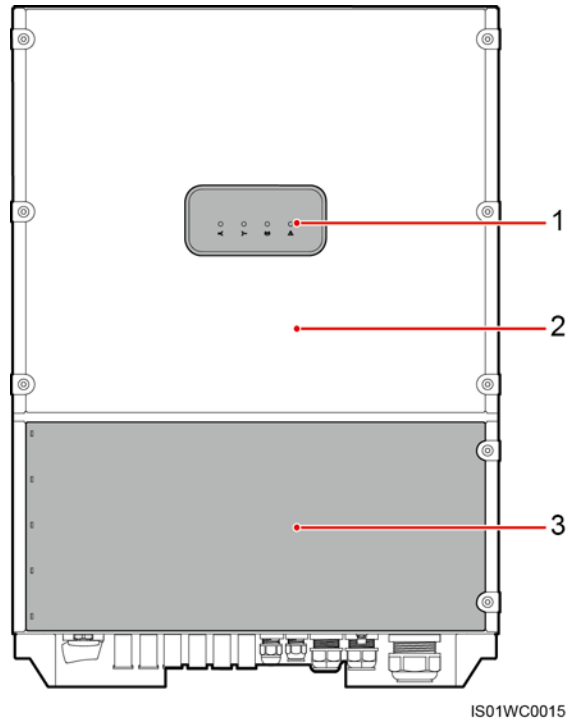
Figure 2-5 SUN2000 dimensions (unit: mm)



Front view

Figure 2-6 shows the SUN2000 front view.



Figure 2-6 SUN2000 front view





- (1) Indicators (2) Host panel (3) Maintenance compartment door

Table 2-2 describes the LED 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 input voltage of the corresponding MPPT circuit is higher than or equal to 200 V.
	Off	The inverter disconnects from all PV strings, or the DC input voltage of each MPPT circuit is less than 200 V.
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 receives communications data normally.

Indicator	Status	Meaning	
	Off	The SUN2000 receives no communications data for 10s.	
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 major 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.



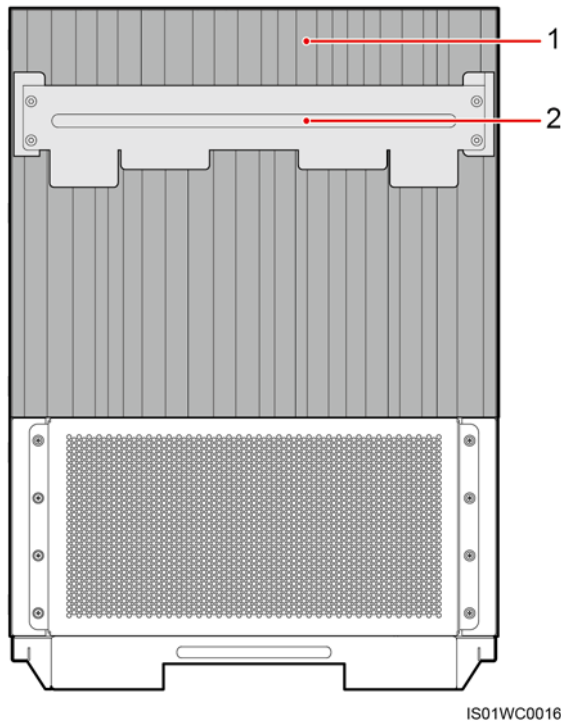
NOTE

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

Rear View

Figure 2-7 shows the SUN2000 rear view.

Figure 2-7 SUN2000 rear view



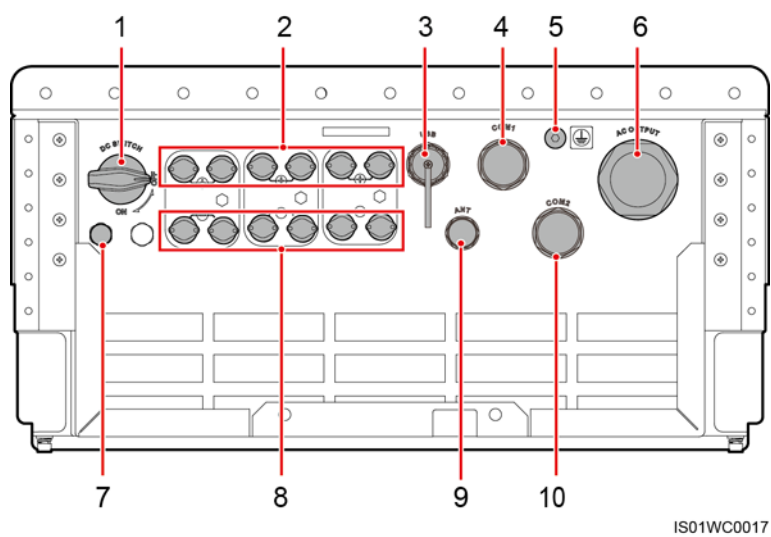
(1) Heat sink

(2) Mounting bracket

Bottom view

Figure 2-8 shows the SUN2000 bottom view.

Figure 2-8 SUN2000 bottom view




No.	Component Name (Silk Screen)	Description
1	DC switch (DC SWITCH)	N/A
2	Positive DC input terminal (+)	Six routes
3	USB port (USB)	Use the USB port only during maintenance (such as power-on setting, upgrade, and data export). Ensure that the USB cover is tightened when the USB port is not in use.
4	RS485 port (COM1)	The inner diameter ranges from 14 mm to 18 mm
5	Protection ground screw	N/A
6	AC output port (AC OUTPUT)	The inner diameter ranges from 24 mm to 32 mm
7	Vent valve	2 PCS
8	Negative DC input terminal (-)	Six routes
9	Antenna (ANT)	Reserved WiFi port
10	RS485 port (COM2)	The inner diameter ranges from 14 mm to 18 mm






2.3 Label Conventions

Symbols

Table 2-3 describes all symbols on the SUN2000.

Table 2-3 Symbols

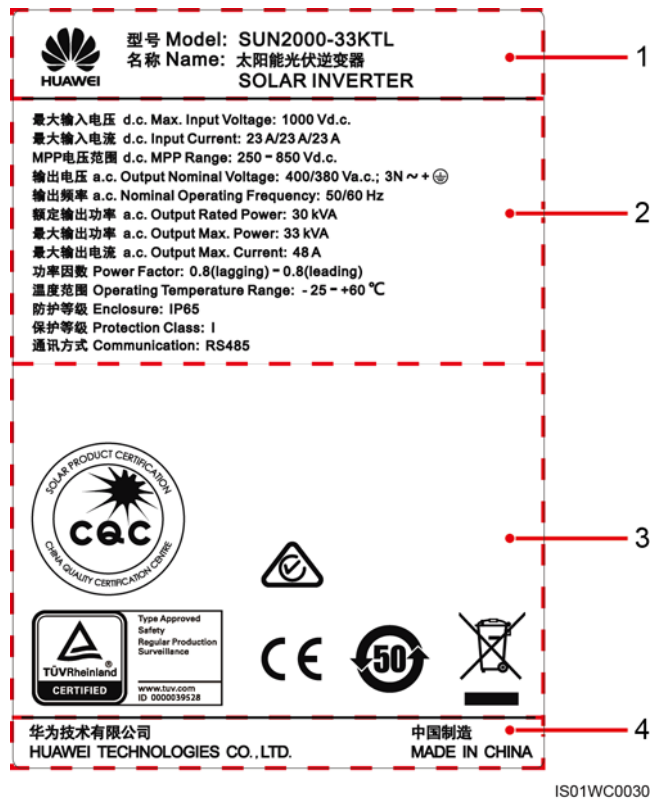
Symbol	Label	Meaning
	Delay discharge	<ul style="list-style-type: none"> There are high voltages when this SUN2000 is running. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. There are residual voltages in the SUN2000. It needs 5 minutes to finish discharge.

Symbol	Label	Meaning
	Burn warning	The SUN2000 must not be touched when in operation because its enclosure and heat sinks are extremely hot.
	Refer to documentation	Remind operators to refer to the documentation shipped with the SUN2000.
	Grounding	Indicates the position for connecting the protection ground cable.
	Operation warning	The DC input connector must not be removed when the SUN2000 is in operation.
	SUN2000 serial number label	Indicates the SUN2000 serial number.

Nameplate

The SUN2000 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 2-9](#). If the SUN2000 uses PLC (MBUS) and RS485 for communication, the value of Communication on the nameplate is PLC, as shown in [Figure 2-10](#). (SUN2000-33KTL is used as an example.)

Figure 2-9 Nameplate (RS485 communication)



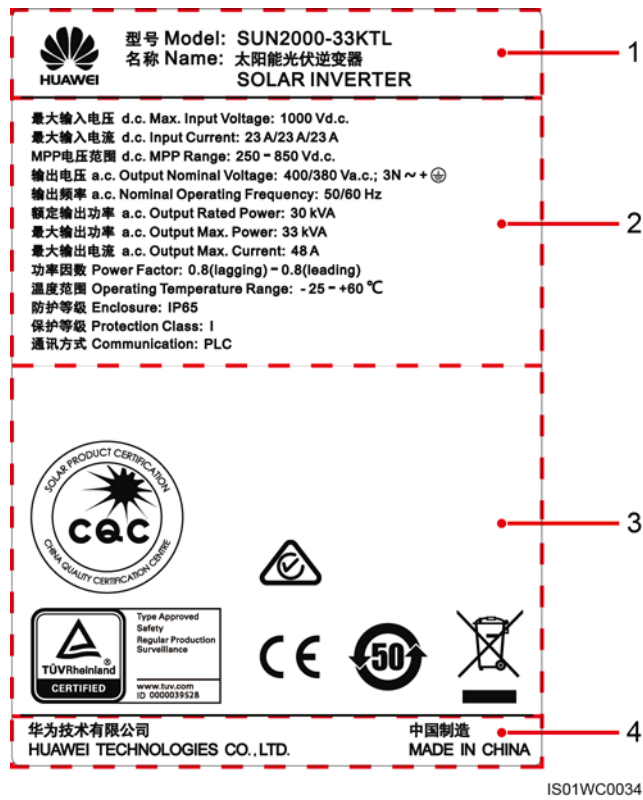
(1) Trademark, product name, and model number

(2) Important technical specifications

(3) Compliance symbols

(4) Company name and country of manufacture

Figure 2-10 Nameplate (PLC communication)



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





NOTE

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

Table 2-4 describes the compliance symbols.

Table 2-4 Compliance symbols

Symbol	Name	Meaning
	CQC certification mark	The SUN2000 has been awarded the NB/T 32004 certification by China Quality Certification Center (CQC).
	RCM certification mark	The SUN2000 complies with RCM certification standards.

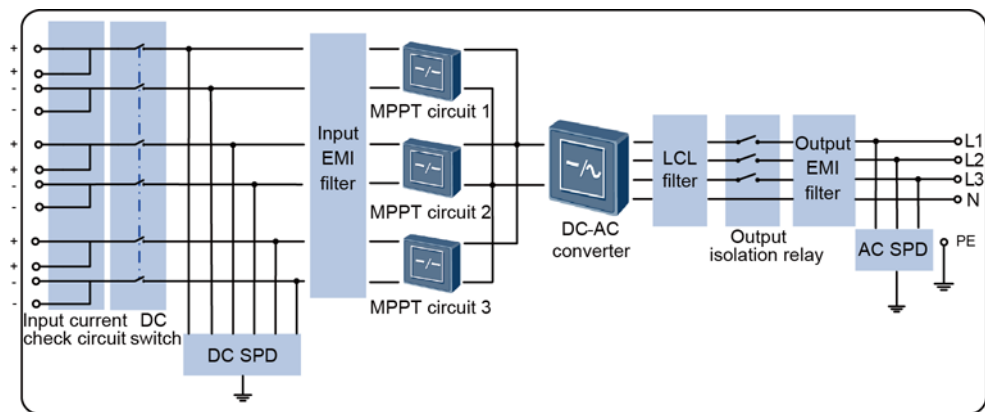
Symbol	Name	Meaning
	TÜVRheinland certification mark	The SUN2000 complies with TÜVRheinland certification standards.
	CE certification mark	The SUN2000 complies with Conformité Européenne (CE) certification standards.
	Environmentally friendly use period (EFUP)	The SUN2000 is environmentally friendly for at least 50 years.
	EU WEEE mark	The SUN2000 must not be disposed of as domestic waste. For details about how to dispose of the SUN2000, see 9 Handling the Inverter .

2.4 Working Process

Circuit Diagrams

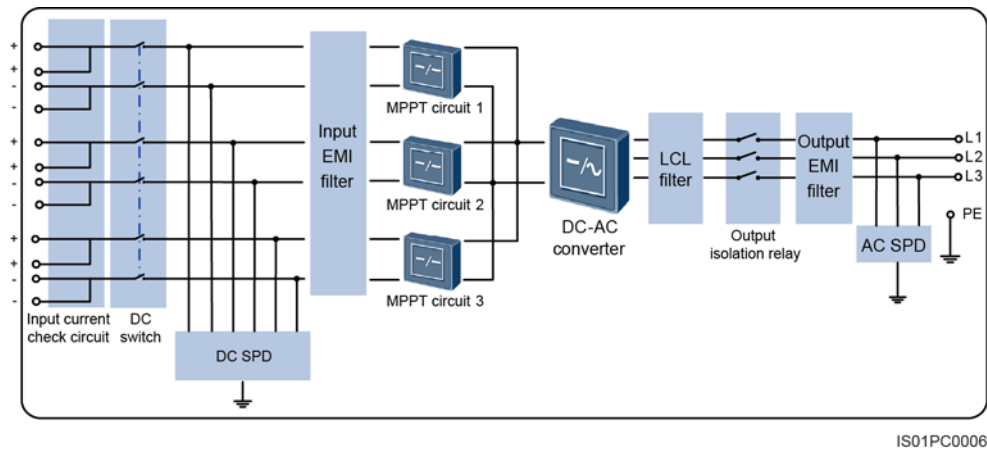
The SUN2000 receives inputs from six PV strings. Then the inputs are grouped into three MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through a converter circuit. Surge protection is supported on both the DC and AC sides. [Figure 2-11](#) shows the circuit diagram for the SUN2000-33KTL and SUN2000-33KTL-E001. [Figure 2-12](#) shows the circuit diagram for the SUN2000-30KTL-A and SUN2000-40KTL.

Figure 2-11 Circuit diagram for the SUN2000-33KTL and SUN2000-33KTL-E001



IS01PC0004

Figure 2-12 Circuit diagram for the SUN2000-30KTL-A and SUN2000-40KTL



Working Modes

Figure 2-13 shows the conditions for the SUN2000 to switch between working modes.

Figure 2-13 Working modes

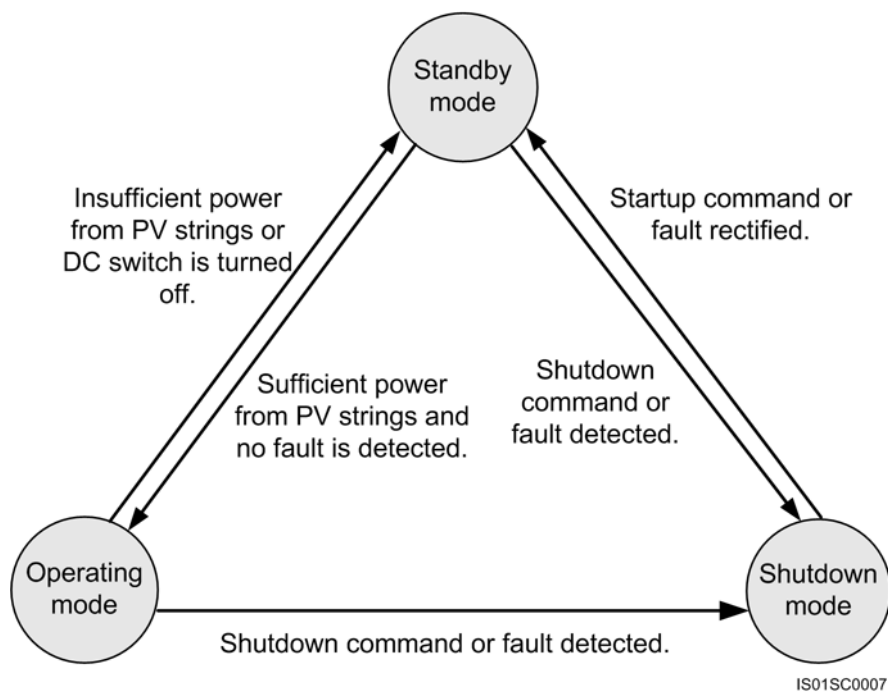


Figure 2-13 describes the operations shown in Table 2-5.

Table 2-5 Working mode description

Working Mode	Description
Standby	<p>The SUN2000 enters the standby mode when the external environment does not meet the operating requirements of the SUN2000. In standby mode:</p> <ul style="list-style-type: none">• The SUN2000 continuously performs self-check and enters the operating mode once the operating requirements are met.• The SUN2000 enters the shutdown mode when detecting a shutdown command or a fault after startup.
Operating	<p>In operating mode:</p> <ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• In standby or operating mode, the SUN2000 enters the shutdown mode after detecting a fault or a shutdown command.• In shutdown mode, the SUN2000 enters the standby mode after detecting a startup command or that the fault is cleared.

3 Inverter Storage

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

- Do not unpack the inverter.
- Keep the storage temperature at -40°C to $+70^{\circ}\text{C}$ and the humidity at 5%–95% RH.
- The inverter should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of four inverters can be stacked.
- Periodic inspections are required during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the inverter has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

4 Installation

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.

CAUTION

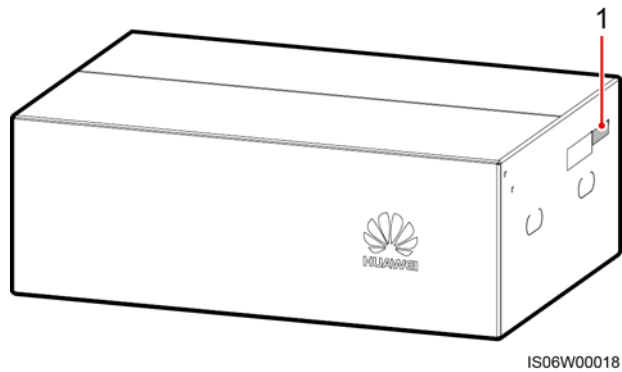
Do not install the SUN2000 in a place where personnel are easy to come into contact with its chassis and heat sinks, because these parts are extremely hot during operation.

4.1 Checking Before Installation

Outer Packing Materials

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

Figure 4-1 Position of the inverter model label



(1) Position of the model label



NOTE

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

Package Contents

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

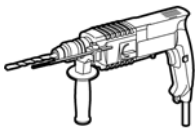



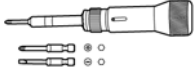
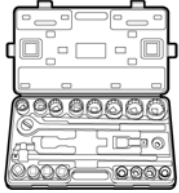
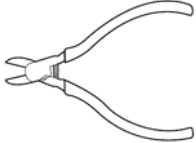
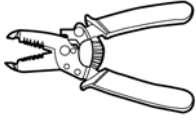

NOTE




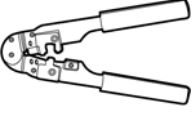
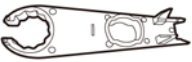

For details about the number of contents, see the *Packing List* in the packing case.


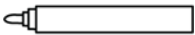
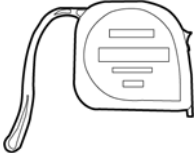

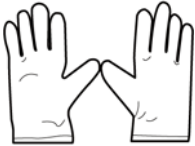

4.2 Tools


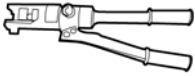



Prepare tools required for installation and electrical connections.

Tool	Model	Function
	Drill bit: $\Phi 14$ mm, $\Phi 16$ mm	<ul style="list-style-type: none"> • Drill bit: $\Phi 14$ mm, used for drilling holes in the support. • Drill bit: $\Phi 16$ mm, used for drilling holes in the wall.
	<ul style="list-style-type: none"> • With a length of 200 mm • With an open end of 24 mm 	Secures bolts.

Tool	Model	Function
<p>Torque screwdriver</p> 	<ul style="list-style-type: none"> • Flat-head screwdriver: M3 • Phillips screwdriver: M4, M6 	<p>Connects cables to a terminal block and secures ground screws.</p>
<p>Socket wrench</p> 	<ul style="list-style-type: none"> • 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 	<p>Secures the ground screw and AC output terminals.</p>
<p>Diagonal pliers</p> 	<p>N/A</p>	<p>Cut cable ties.</p>
<p>Wire stripper</p> 	<p>N/A</p>	<p>Peels off cable jackets.</p>
<p>Rubber mallet</p> 	<p>N/A</p>	<p>Hammers expansion bolts into holes.</p>

Tool	Model	Function
Utility knife 	N/A	Removes packages.
Cable cutter 	N/A	Cuts power cables.
Crimping tool 	Model: UTXTC0005 or H4TC0003 Manufacturer: Amphenol	Crimps metal terminals when preparing DC input power cables. NOTE <ul style="list-style-type: none"> • UTXTC0005 (Amphenol) is used to crimp metal cold forming contacts. • H4TC0003 (Amphenol) is used to crimp metal stamping forming contacts.
RJ45 crimping tool 	N/A	Prepares RJ45 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.

Tool	Model	Function
Multimeter 	DC voltage measurement range: ≥ 1000 V DC	Measures voltages.
Marker 	Diameter: ≤ 10 mm	Marks signs.
Measuring tape 	N/A	Measures distances.
Level 	N/A	Levels hole positions.
ESD gloves 	N/A	Protect operators during installation.
Safety goggles 	N/A	Protect operators when drilling holes.

Tool	Model	Function
Anti-dust respirator 	N/A	Protects operators during hole drilling.
Hydraulic pliers 	N/A	Crimp OT terminals.
Heat shrink tubing 	N/A	Wraps the cable crimping area of an OT terminal.
Heat gun 	N/A	Heat-shrinks a tube.
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

Basic Requirements

- The protection level of the SUN2000 is IP65. The SUN2000 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 easy to come into contact with its chassis 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 SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation. When installed under direct sunlight, performance de-rate may be initiated due to additional temperature rise.
- To ensure the optimal operating status, the ambient temperature should be lower than 40°C.

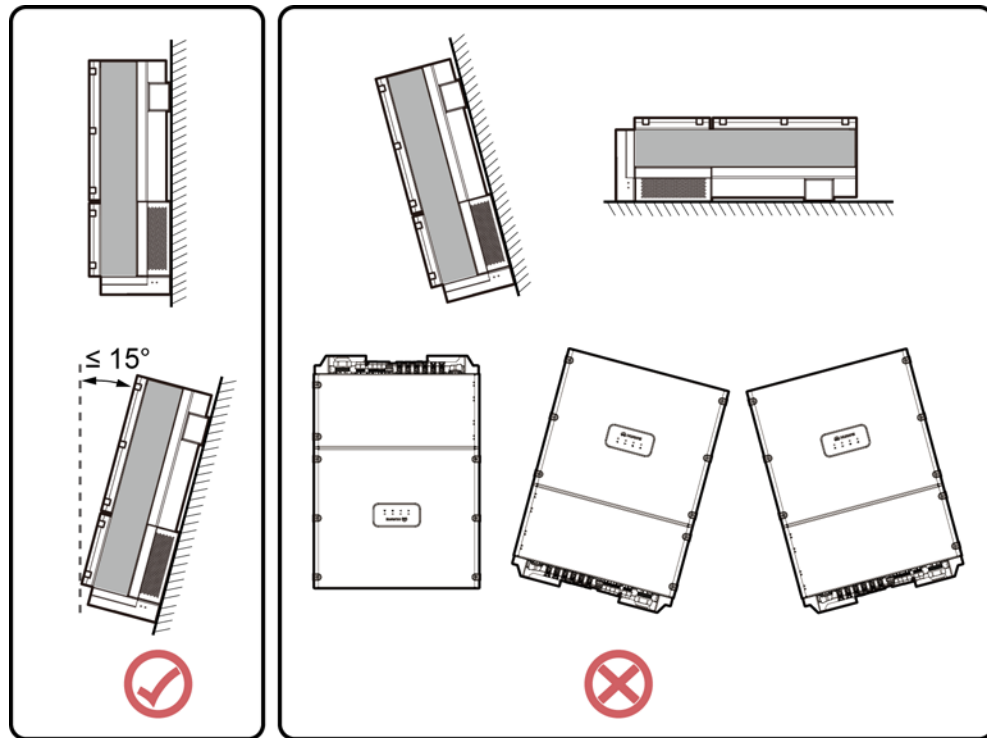
Carrier Requirements

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- Ensure that installation surface is solid enough to bear 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 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

Figure 4-2 Installation modes

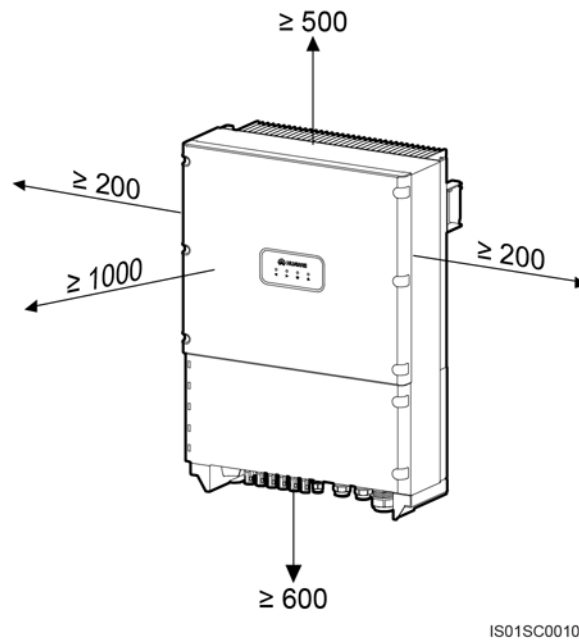


IS02Y00001

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 4-3](#).

Figure 4-3 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 in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. The stacked installation mode is not recommended.

Figure 4-4 Horizontal installation mode (recommended, unit: mm)

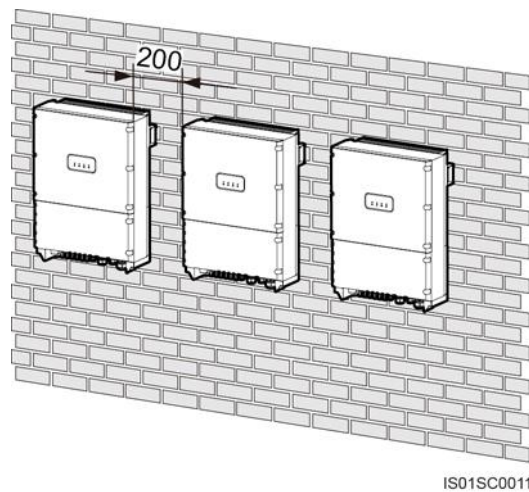
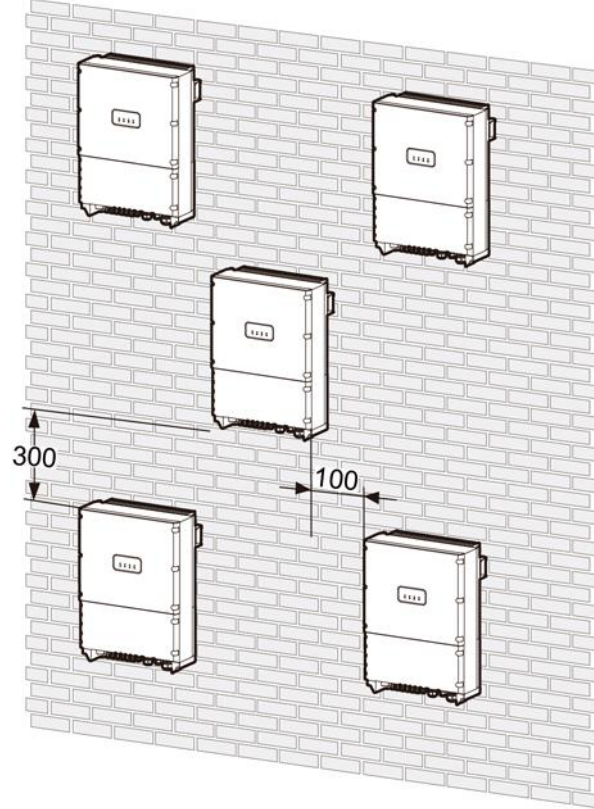
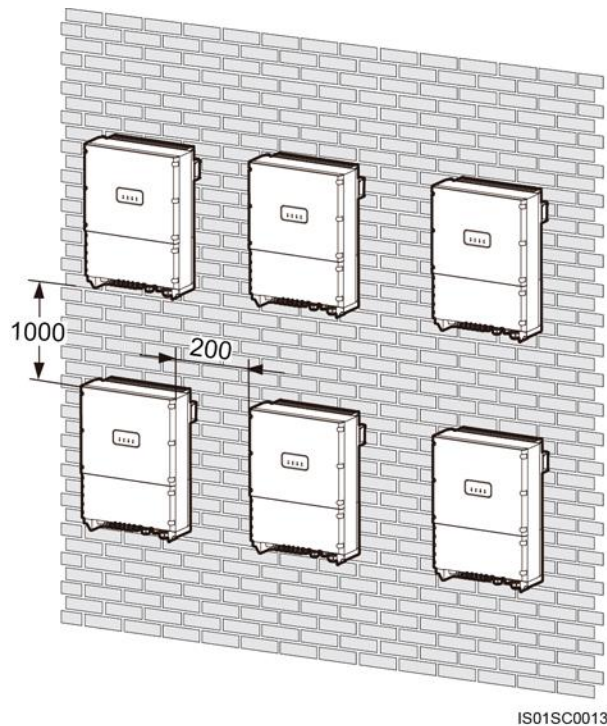


Figure 4-5 Triangle installation mode (recommended, unit: mm)



IS01SC0012

Figure 4-6 Stacked installation mode (not recommended, unit: mm)



4.3.2 Moving the SUN2000

Context

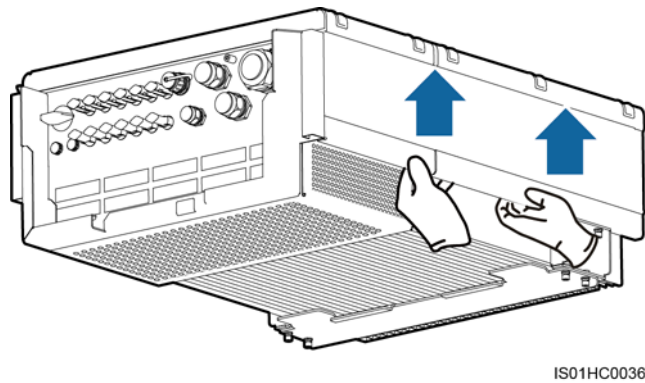
CAUTION

- To prevent device damage and personal injury, keep balance when transporting 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.
-

Procedure

- Step 1** Arrange two people to hold the handles on both sides of the SUN2000, as shown in [Figure 4-7](#).

Figure 4-7 Moving the SUN2000



Step 2 Lift the SUN2000 from the packing case and transport it to the installation position.

---End

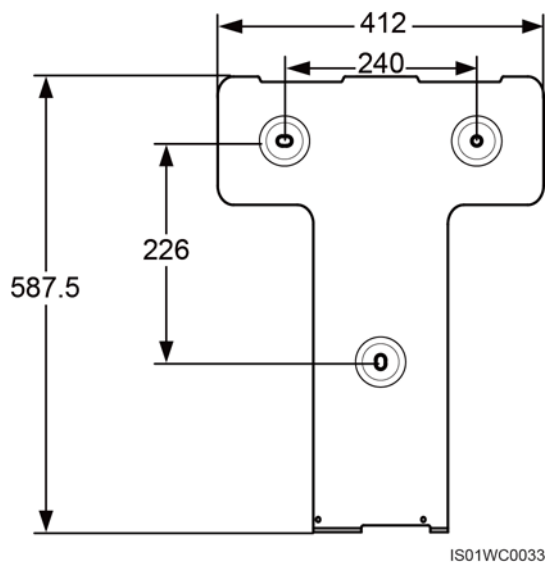
4.3.3 Installing a Rear Panel

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

Prerequisites

Figure 4-8 shows the dimensions of the rear panel.

Figure 4-8 Dimensions of the rear panel (unit: mm)



Context

 **NOTE**

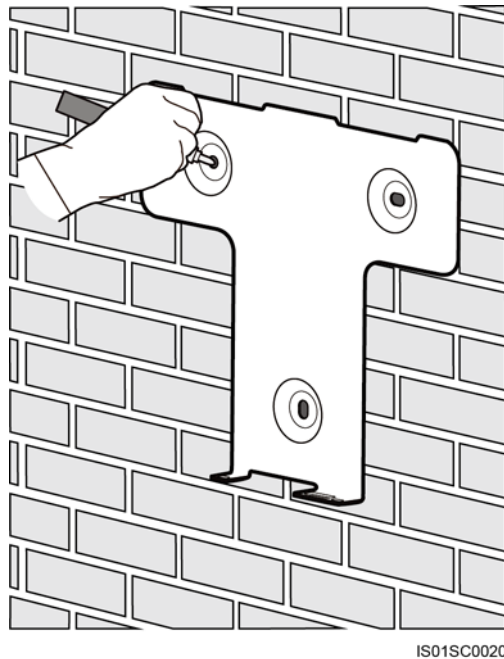
- The SUN2000-30KTL-A, SUN2000-33KTL, or SUN2000-33KTL-E001 provides expansion bolts for installing the rear panel.

- The SUN2000-40KTL does not provide expansion bolts. You need to prepare expansion bolts by yourself. M12x60 stainless expansion bolts are recommended.

Procedure

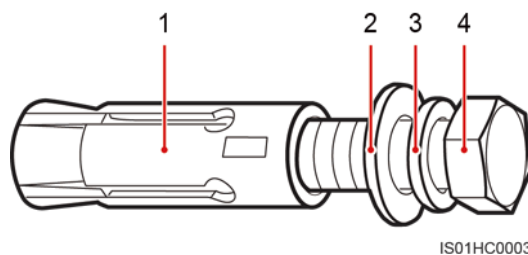
- Step 1** Determine the positions for drilling holes (as shown in [Figure 4-9](#)) using the rear panel available in the packing case, level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-9 Determining hole positions



- Step 2** Drill holes using a hammer drill and install the expansion bolts, as shown in [Figure 4-11](#). An expansion bolt contains four parts, as shown in [Figure 4-10](#).

Figure 4-10 Expansion bolt composition



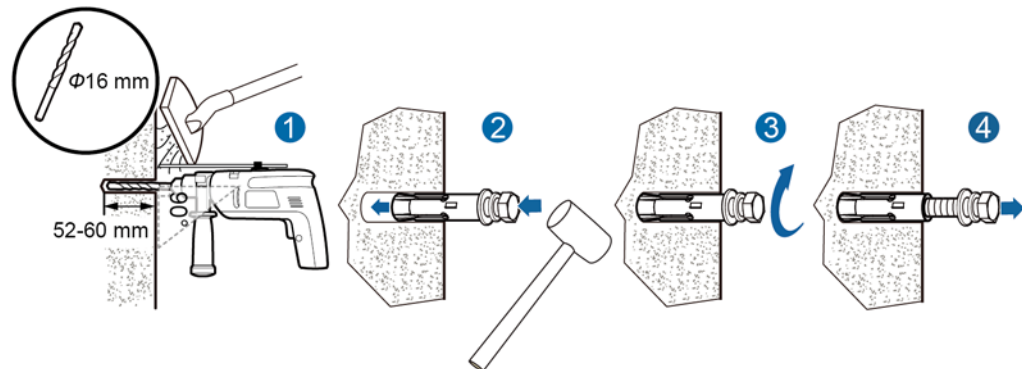
(1) Expansion sleeve

(2) Flat washer

(3) Spring washer

(4) Bolt

Figure 4-11 Drilling a hole and installing an expansion bolt



IS03H00001

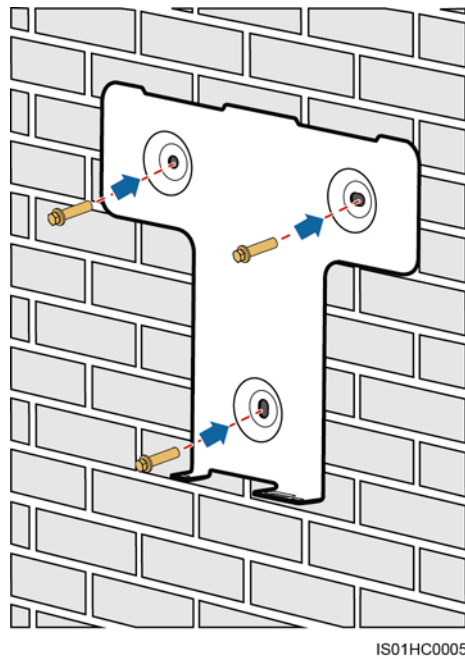
NOTICE

- 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.
- Level the top 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 wall.

1. Drill a hole in a marked position to a depth of 52–60 mm using a hammer drill with a $\Phi 16$ 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. Partially tighten the expansion bolt.
4. Remove the bolt, spring washer, and flat washer by rotating them counterclockwise.

Step 3 Align the rear panel with the holes, insert expansion bolts into the holes through the rear panel, and tighten the expansion bolts to a torque of 45 N·m using a torque wrench with an 18 mm open end, as shown in [Figure 4-12](#).

Figure 4-12 Securing a rear panel



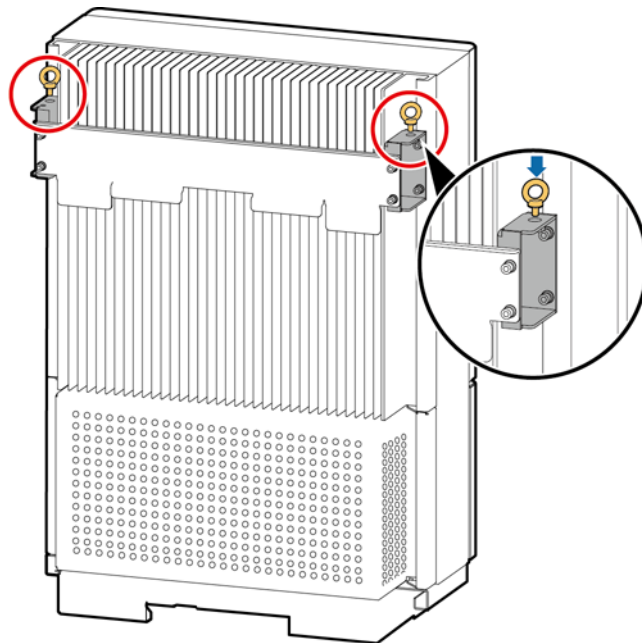
----End

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 4-13](#).

Figure 4-13 Installing lifting eyes



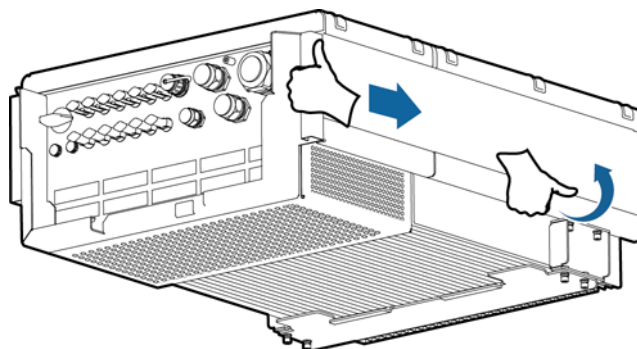
IS01HC0031

Step 4 Ensure that two people lift the SUN2000 and turn it upright. Lift the SUN2000 by grasping the handle at the bottom of the SUN2000 with one hand and the handle at the top with the other, as shown in [Figure 4-14](#).

CAUTION

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

Figure 4-14 Lifting the SUN2000



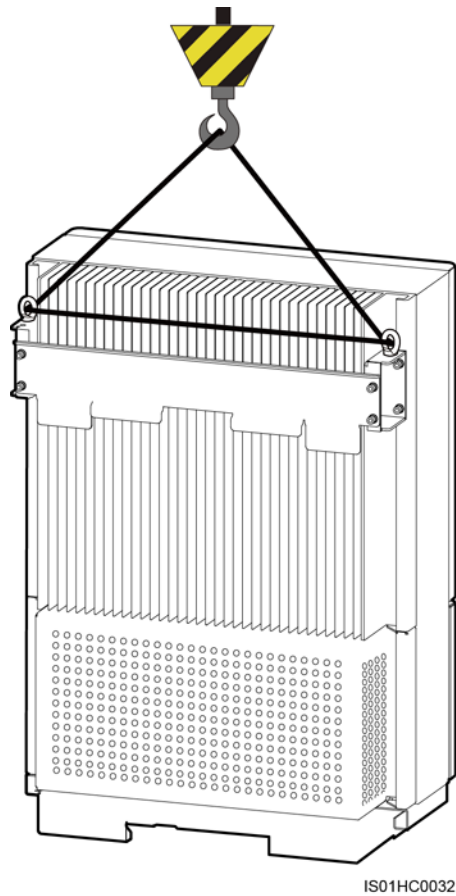
IS01HC0035

Step 5 Route a rope that is able to bear the SUN2000 through the lifting eyes and hoist the SUN2000, as shown in [Figure 4-15](#).

NOTICE

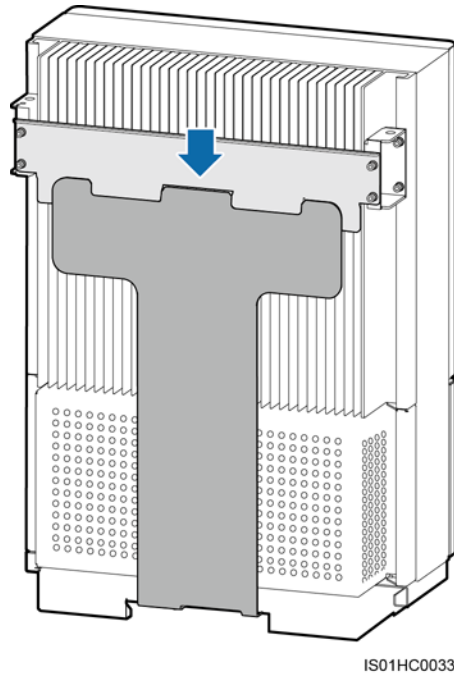
When hoisting the SUN2000, keep balance to protect the SUN2000 from colliding with the wall or other objects.

Figure 4-15 Hoisting the SUN2000



Step 6 Mount the SUN2000 on the rear panel and level the SUN2000 chassis with the rear panel, as shown in [Figure 4-16](#).

Figure 4-16 Mounting the SUN2000 on the rear panel

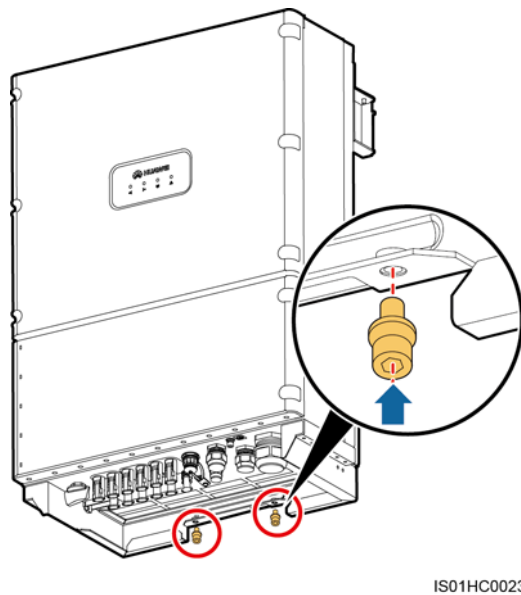


Step 7 Use a hex key to tighten the two hexagon screws at the bottom of the SUN2000 to a torque of 5 N·m, as shown in [Figure 4-17](#).

NOTE

The hex key can be obtained from the fitting bag bound to the reinforcing rib at the chassis base.

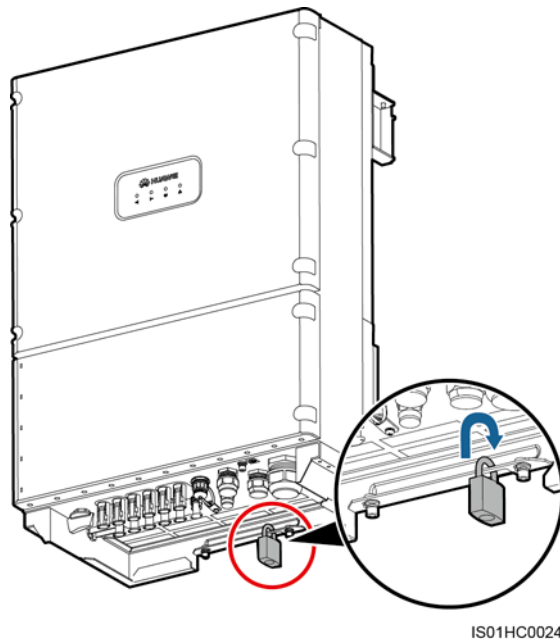
Figure 4-17 Tightening hexagon screws



Step 8 (Optional) Install an antitheft lock, as shown in [Figure 4-18](#).

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

Figure 4-18 Installing an antitheft lock



----End

4.4 Support-mounting the SUN2000

4.4.1 Determining the Installation Position

Basic Requirements

- The protection level of the SUN2000 is IP65. The SUN2000 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 easy to come into contact with its chassis 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 SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation. When installed under direct sunlight, performance de-rate may be initiated due to additional temperature rise.
- To ensure the optimal operating status, the ambient temperature should be lower than 40°C.

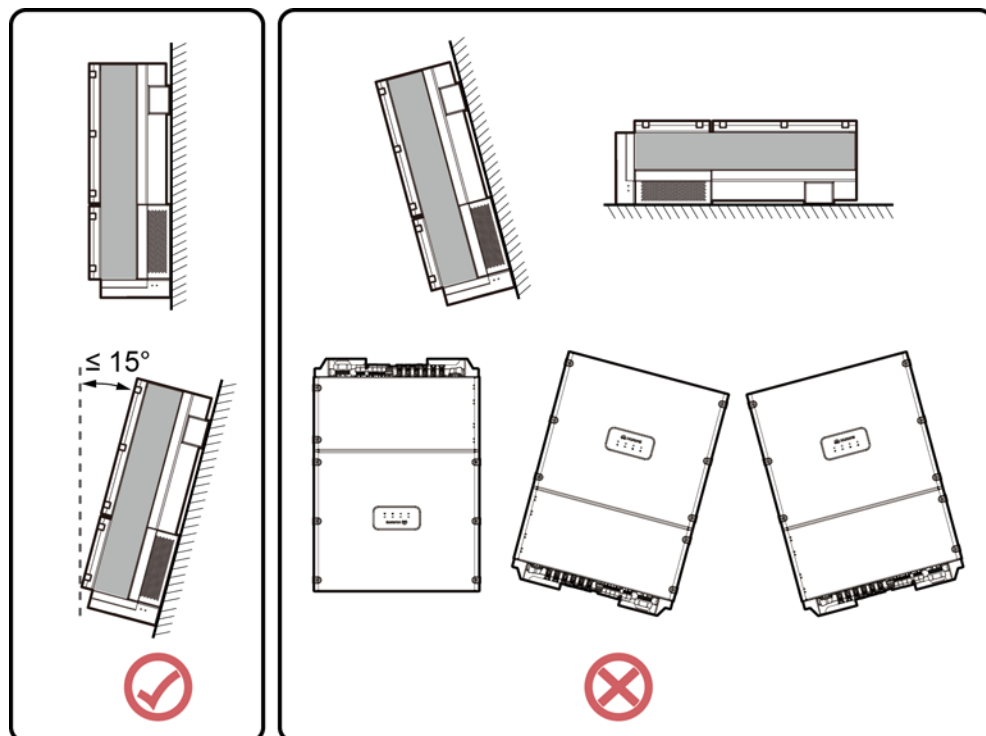
Carrier Requirements

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- Ensure that installation surface is solid enough to bear the SUN2000.

Installation Mode Requirements

- Install the SUN2000 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at a front tilt, excessive back tilt, side tilt, horizontally, or upside down.

Figure 4-19 Installation modes

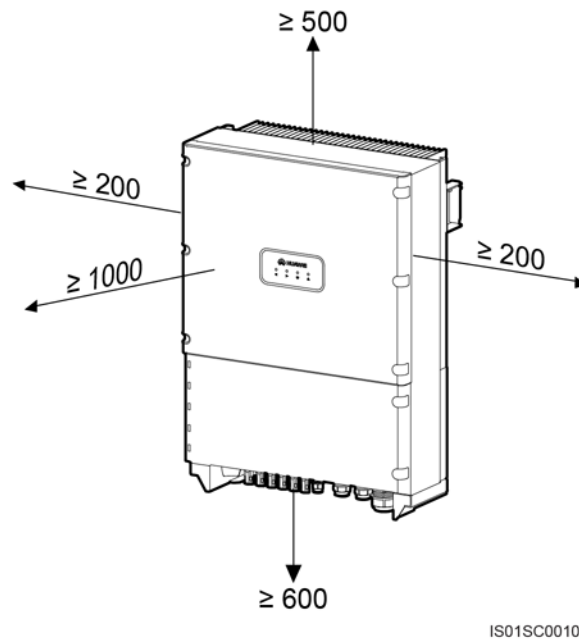


IS02Y00001

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 4-20](#).

Figure 4-20 Installation space (unit: mm)



4.4.2 Moving the SUN2000

For details, see [4.3.2 Moving the SUN2000](#).

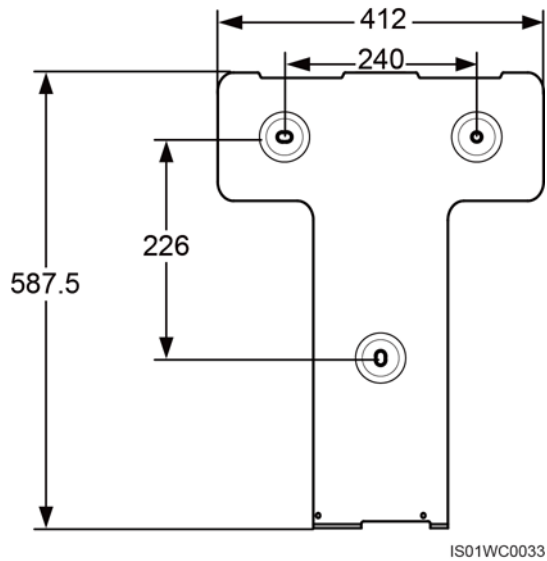
4.4.3 Installing a Rear Panel

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

Prerequisites

[Figure 4-21](#) shows the dimensions of the rear panel.

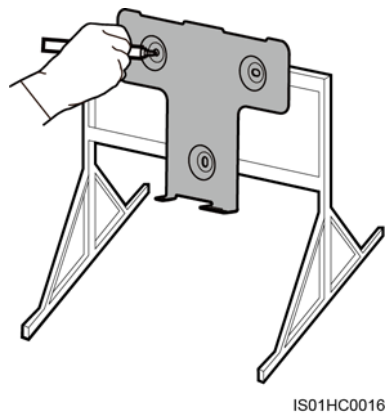
Figure 4-21 Dimensions of the rear panel (unit: mm)



Procedure

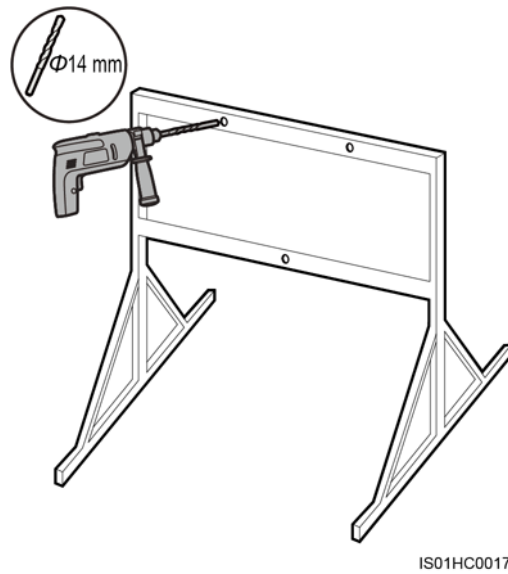
- Step 1** Determine the positions for drilling holes (as shown in [Figure 4-22](#)) using the rear panel available in the packing case, level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-22 Determining hole positions



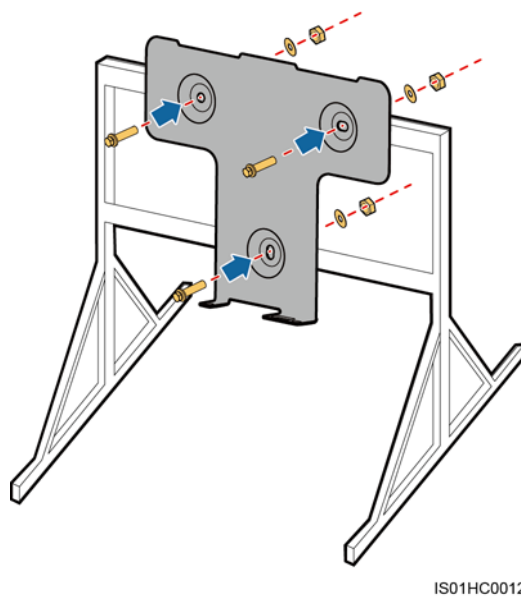
- Step 2** Drill holes using a hammer drill, as shown in [Figure 4-23](#).

Figure 4-23 Drilling holes



Step 3 Align the rear panel with the hole positions, insert the screw assembly (flat washer, spring washer, and M12x40 bolts) 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 with an 18 mm open end, as shown in [Figure 4-24](#).

Figure 4-24 Securing a rear panel



----End

4.4.4 Installing the SUN2000

For details about how to install the SUN000, see [4.3.4 Installing the SUN2000](#).

5 Electrical Connections

Context

DANGER

Before performing any electrical connection, ensure that the DC SWITCH is OFF. Otherwise, the high voltage of the inverter may result in electric shocks.

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).
- To prevent poor cable connection due to overstress, it is recommended that the cables be bent and reserved, and then connected to the appropriate ports.

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 are available.

- Ground cable: Use an outdoor copper-core cable with a cross-sectional area of 8 mm² or more (8 mm², 10 mm², 8 AWG, or 7 AWG recommended).
- OT terminal: M6

Context

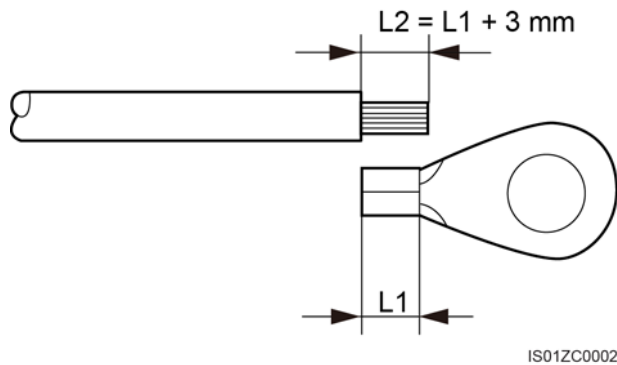
- The ground point on the enclosure is preferred to connect to the PE cable for the SUN2000.

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

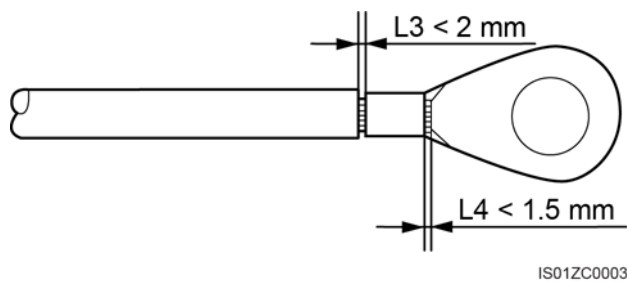
- Step 1** Strip an appropriate length of the insulation layer of the ground cable using a wire stripper, as shown in [Figure 5-1](#).

Figure 5-1 Stripped length



- 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

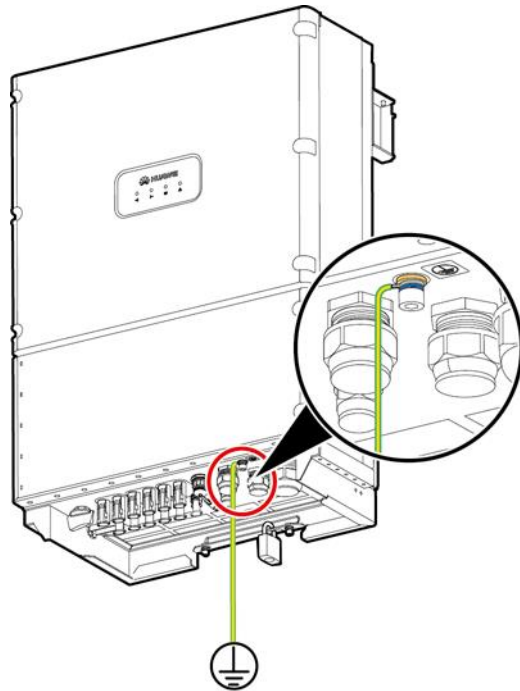


NOTE

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 screw from the ground point.
- Step 4** Secure the ground cable using the ground screw and tighten the screw to a torque of 5 N·m using a hex key.

Figure 5-3 Connecting the PGND cable



IS011C0021



NOTE

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

----End

5.2 Opening the Maintenance Compartment Door

Prerequisites

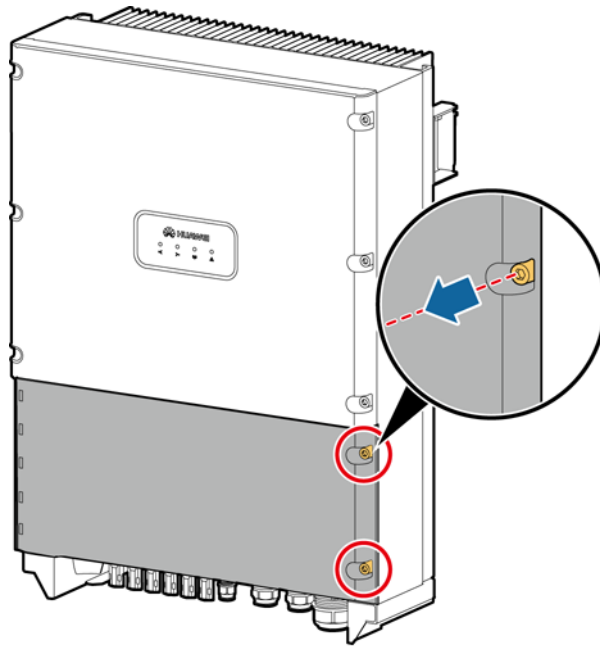
NOTICE

- Do not open the host panel of the inverter.
 - Before opening the maintenance compartment door, ensure that the AC and DC power supplies are disconnected. For details about how to disconnect the power supplies, see [6.2 Powering Off the SUN2000](#).
 - Do not leave unused screws in the chassis.
-

Procedure

- Step 1** Remove the two screws on the maintenance compartment door using a hex key, as shown in [Figure 5-4](#), and set them aside.

Figure 5-4 Removing screws



IS01HC0025



NOTE

If the two screws are lost, obtain the reserved screws from the fitting bag bound to the reinforcing rib at the chassis base.

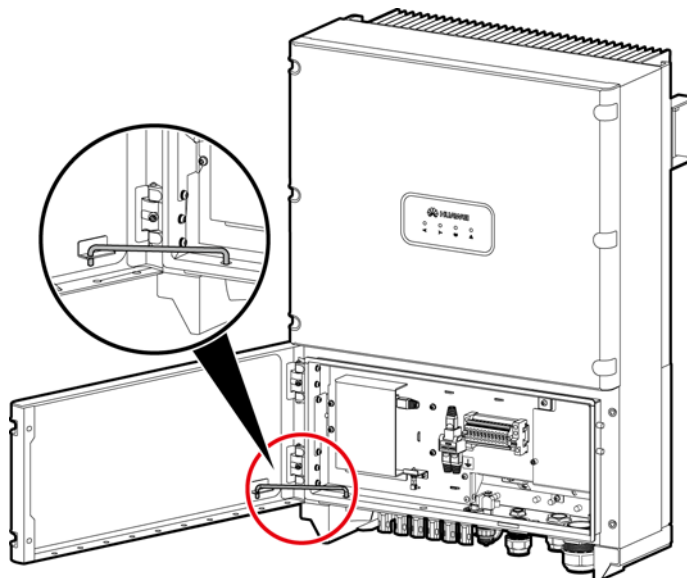
Step 2 Open the maintenance compartment door and install a support bar, as shown in [Figure 5-5](#).



NOTE

The support bar can be obtained from the fitting bag bound to the reinforcing rib at the chassis base.

Figure 5-5 Installing a support bar



IS01HC0027

----End

5.3 Installing AC Output Power Cables

Prerequisites

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



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

Context

- To connect a ground cable to the ground point on the SUN2000-33KTL and SUN2000-33KTL-E001 chassis shell, use a four-core (L1, L2, L3, and N) outdoor copper-core cable. To connect a ground cable to the ground point in the maintenance compartment, use a five-core (L1, L2, L3, N, and PE) outdoor copper-core cable.
- To connect a ground cable to the ground point on the SUN2000-30KTL-A or SUN2000-40KTL chassis shell, use a three-core (L1, L2, and L3) outdoor copper-core cable. To connect a ground cable to the ground point in the maintenance compartment, use a four-core (L1, L2, L3, and PE) outdoor copper-core cable.
- Outdoor copper-core cables are recommended. [Table 5-1](#) describes the specifications.

Table 5-1 AC output cable specifications

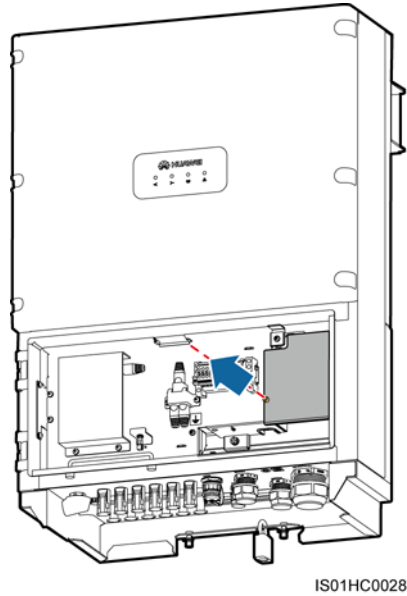
Inverter Model	Cross-sectional Area (mm ²)		Cable Outer Diameter (mm)	
	Range	Recommended Value	Range	Recommended Value
SUN2000-33KTL/S UN2000-33KTL-E001	16–25 (or 6–3 AWG)	16 (or 6 AWG)	24–32	28
SUN2000-30KTL-A/ SUN2000-40KTL	16–35 (or 6–2 AWG)			

- You need to prepare OT terminals by yourself: The OT terminal corresponding to the SUN2000-33KTL and SUN2000-33KTL-E001 AC output power cable is of M6 model and matches a cable with the maximum cross-sectional area of 25 mm². The OT terminal corresponding to the SUN2000-30KTL-A and SUN2000-40KTL AC output power cables is of M8 model and matches a cable with the maximum cross-sectional area of 35 mm². The OT terminal corresponding to the ground cable is of M6 model and matches a cable with the maximum cross-sectional area of 25 mm².

Procedure

Step 1 Remove the AC terminal cover, as shown in [Figure 5-6](#).

Figure 5-6 Removing the AC terminal cover



NOTE

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

Step 2 Remove an appropriate length of the jacket and insulation layer from the AC output power cable using a wire stripper.

NOTICE

Ensure that the jacket is in the maintenance compartment.

Figure 5-7 Stripping the SUN2000-33KTL/SUN2000-33KTL-E001 AC output cable (excluding the ground cable)

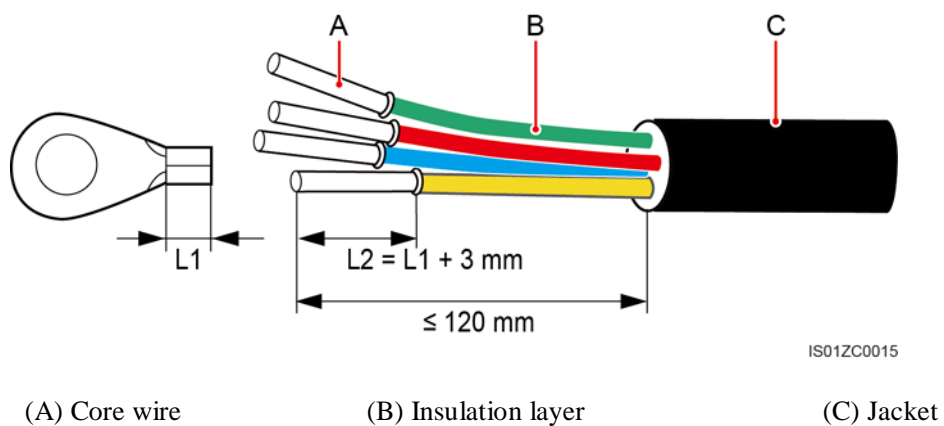


Figure 5-8 Stripping the SUN2000-33KTL/SUN2000-33KTL-E001 AC output cable (including the ground cable)

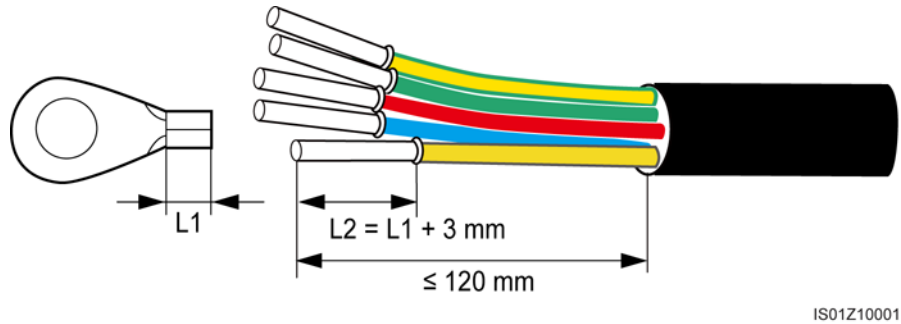


Figure 5-9 Stripping the SUN2000-30KTL-A or SUN2000-40KTL AC output cable (excluding the ground cable)

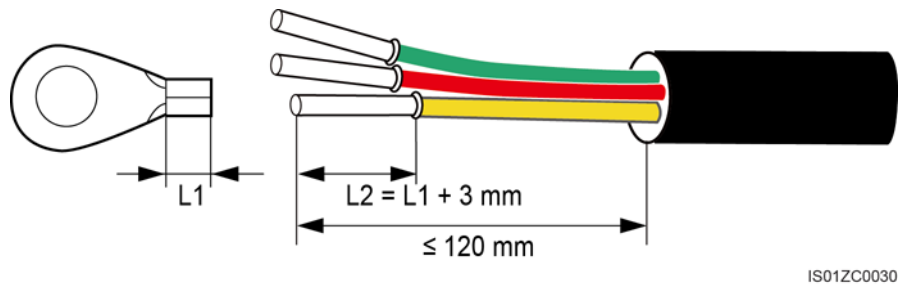
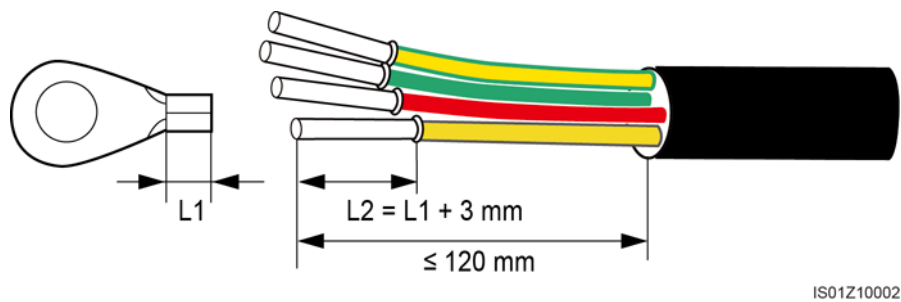


Figure 5-10 Stripping the SUN2000-30KTL-A or SUN2000-40KTL AC output cable (including the ground cable)



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 through the locking cap and then the **AC OUTPUT** connector at the inverter bottom.

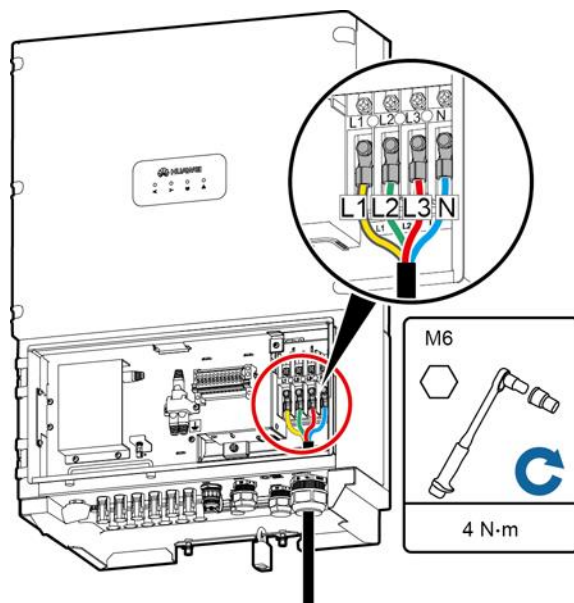
Step 7 Connect the SUN2000-33KTL/SUN2000-33KTL-E001 AC output wires to pins L1, L2, L3, and N of the AC terminal block and tighten the screws to a torque of 4 N·m using a 10 mm socket wrench. Connect the SUN2000-30KTL-A or SUN2000-40KTL AC output wires to pins L1, L2, and L3 of the AC terminal block and tighten the screws to a torque of 8 N·m using a 13 mm socket wrench.

To connect a ground cable to the ground point in the maintenance compartment, tighten the ground screw to a torque of 4 N·m using an M6 torque screwdriver.

NOTICE

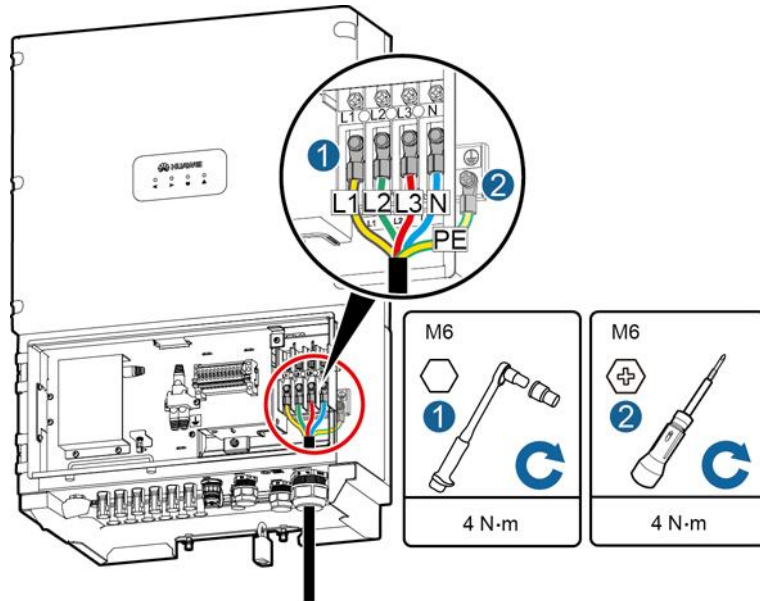
- Ensure that AC terminations are secured. Failure to do so may cause the SUN2000 to malfunction or cause damage to its terminal block from issues such as overheating.
- Sufficient slack should be provided in the PE cable to ensure that the last cable bearing the force is the PE cable when the AC output power cable bears pulling force due to force majeure.

Figure 5-11 Connecting the SUN2000-33KTL/SUN2000-33KTL-E001 AC output cable (excluding the ground cable)



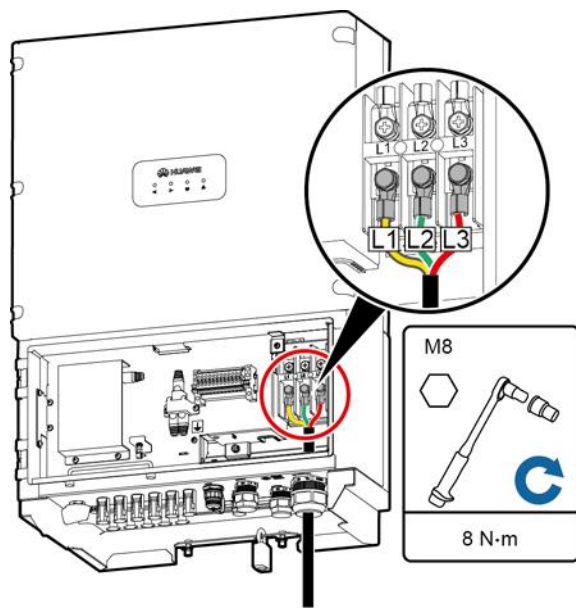
IS011C0023

Figure 5-12 Connecting the SUN2000-33KTL/SUN2000-33KTL-E001 AC output cable (including the ground cable)



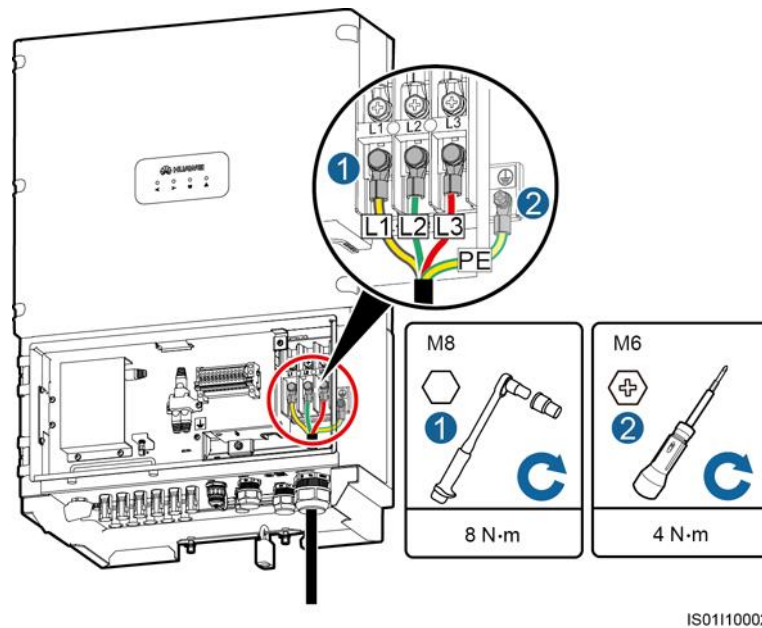
IS01110001

Figure 5-13 Connecting the SUN2000-30KTL-A or SUN2000-40KTL AC output cable (excluding the ground cable)



IS011C0029

Figure 5-14 Connecting the SUN2000-30KTL-A or SUN2000-40KTL AC output cable (including the ground cable)



Step 8 Use a torque wrench with an open end of 52 mm to tighten the locking cap to a torque of 7.5 N·m.

----End

Follow-up Procedure

Check that the cables are connected correctly and securely, and then seal the cable holes with firestop putty.

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 perform operations on the DC input power cables, such as connecting or disconnecting a string or a module in a string. Otherwise, electric shocks may occur.

⚠ WARNING

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

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

NOTICE

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



NOTE

The following requirements must be met if the positive or negative terminals of PV strings 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 5-15](#) shows the DC terminals at the bottom of the SUN2000. [Table 5-2](#) describes the requirements for DC terminal selection.

Figure 5-15 DC terminals

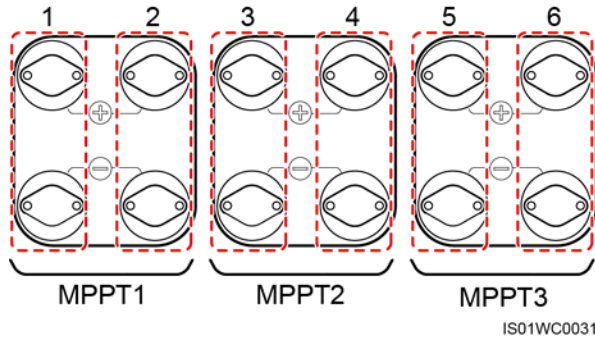


Table 5-2 DC terminal selection requirements

Number of Inputs	SUN2000
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

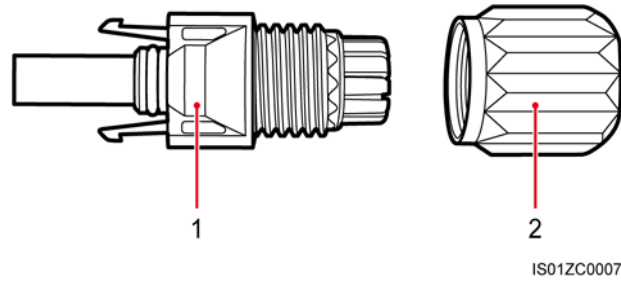
Cable Type	Cross-sectional Area (mm ²)		Cable Outer Diameter (mm)
	Range	Recommended Value	
Common PV cables in the industry (model: PV1-F)	4.0–6.0 (or 12–10 AWG)	4.0 (or 12 AWG)	4.5–7.8

NOTICE

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

- Positive and negative connectors
 DC input connectors are categorized into positive and negative connectors, as shown in [Figure 5-16](#) and [Figure 5-17](#).

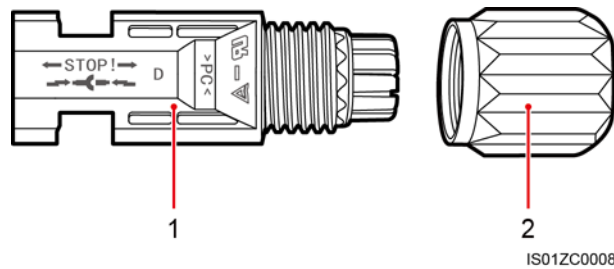
Figure 5-16 Positive connector composition



(1) Insulation shell

(2) Locking nut

Figure 5-17 Negative connector composition



(1) Insulation shell

(2) Locking nut

CAUTION

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

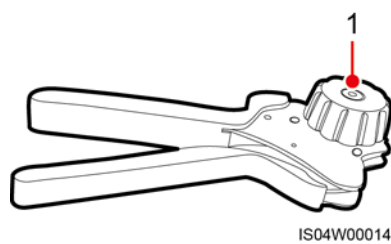
Procedure

Step 1 Prepare positive and negative connectors.

NOTICE

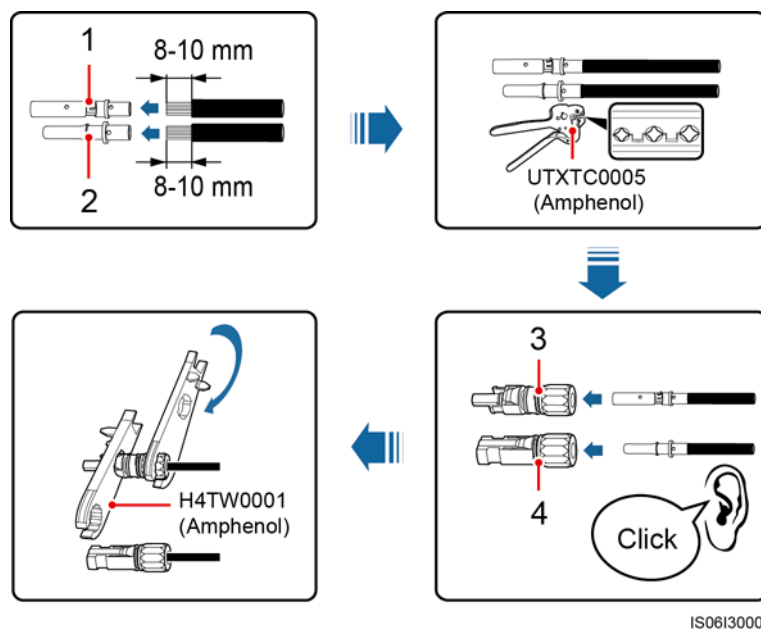
- The metal contacts supplied with the DC connectors are either cold forming contacts or stamping forming contacts. Choose the crimping tools that fit the metal contact types. Do not mix up the tools.
- Crimp the metal cold forming contacts using crimping tool UTXTC0005 (Amphenol, recommended) or H4TC0001 (Amphenol).
- Crimp the metal stamping forming contacts using crimping tool H4TC0003 (Amphenol, recommended), H4TC0002 (Amphenol), PV-CZM-22100 (Staubli), or PV-CZM-19100 (Staubli). When choosing PV-CZM-22100 or PV-CZM-19100, do not use the locator. Otherwise, metal contacts would be damaged.

Figure 5-18 Crimping tool (H4TC0003)



(1) Locator

Figure 5-19 Preparing positive and negative connectors (using metal cold forming contacts)



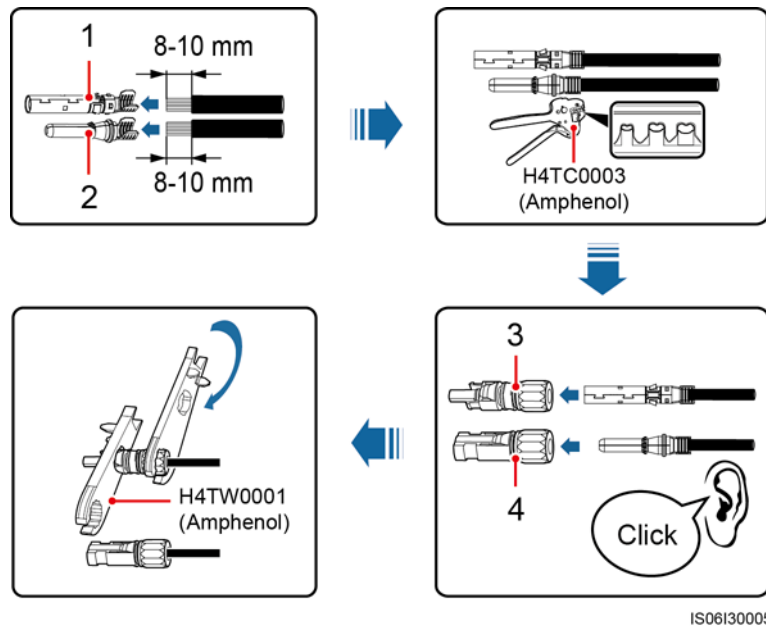
(1) Positive metal contact (cold forming)

(2) Negative metal contact (cold forming)

(3) Positive connector

(4) Negative connector

Figure 5-20 Preparing positive and negative connectors (using metal stamping forming contacts)



(1) Positive metal contact (stamping forming)

(2) Negative metal contact (stamping forming)

(3) Positive connector

(4) Negative connector

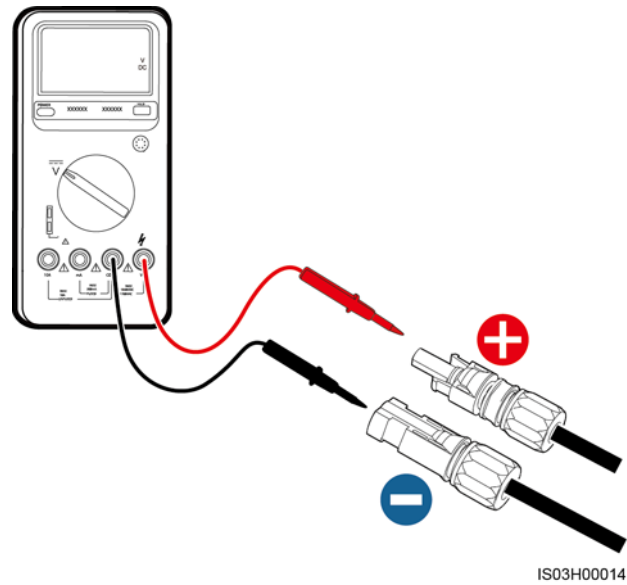
NOTICE

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

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

Step 3 Ensure that the DC input voltage of each PV string does not exceed 1000 V DC using a multimeter and check that the polarities of the DC input power cables are correct.

Figure 5-21 Measuring the DC input voltage



CAUTION

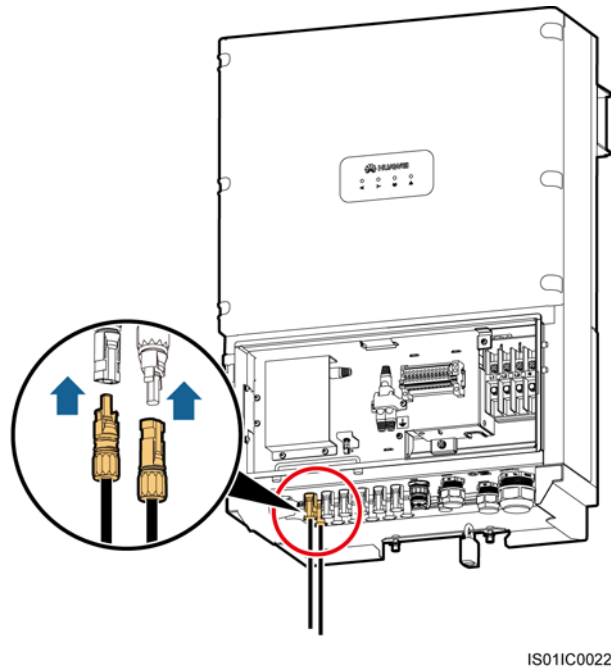
Before performing [Step 4](#), ensure that the DC SWITCH is OFF.

- Step 4** 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 5-22](#).

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.

Figure 5-22 Installing DC input power cables



NOTICE

If the DC input power cable is reversely connected and the DC SWITCH is ON, do not turn off the DC SWITCH immediately. Otherwise, the inverter may be damaged. The damage caused by reverse connection of the DC input power cable is beyond the warranty scope. Wait until the PV string voltage reduces to the safe range (below 60 V DC). Then, turn off the DC SWITCH, remove the positive and negative connectors, and rectify the connection.

----End

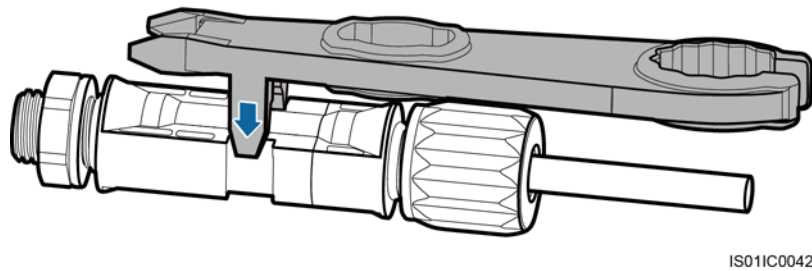
Follow-up Procedure

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 5-23](#).

WARNING

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

Figure 5-23 Removing a DC input connector



5.5 Connecting Communications Cables

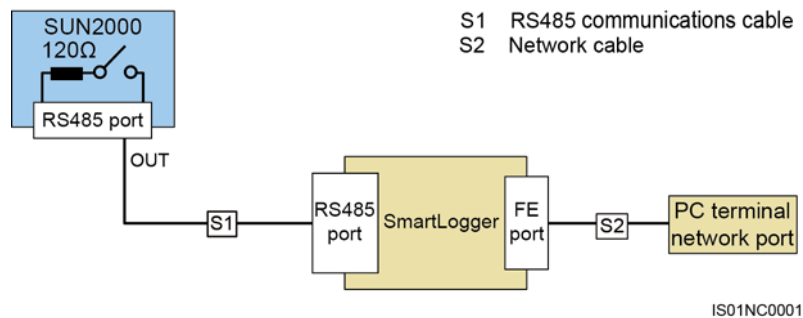
5.5.1 Communication Mode Description

RS485

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

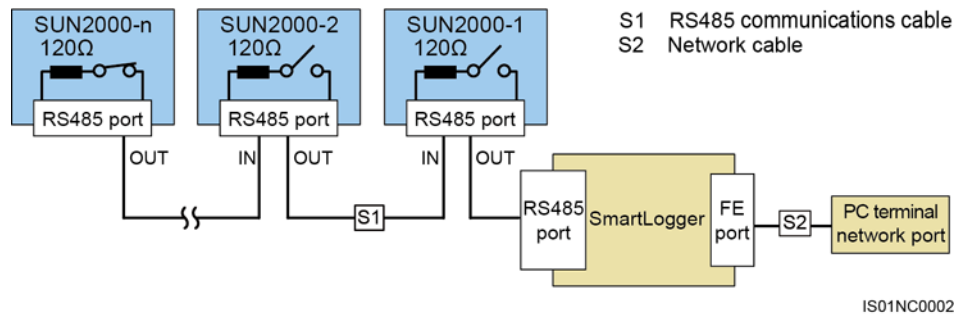
- [Figure 5-24](#) shows the communication mode for a single SUN2000.

Figure 5-24 Communication mode for a single SUN2000



- [Figure 5-25](#) shows the communication mode for multiple SUN2000s. If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

Figure 5-25 Communication mode for multiple SUN2000s



NOTE

- For the SUN2000 at the end of the chain, on the **Comm. Param.** screen of the SUN2000 APP, 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 RS485 communication distance between the SUN2000 at the end of the daisy chain and the SmartLogger cannot exceed 1000 meters.
- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger1000, a maximum of three daisy chains can be configured to support up to 80 devices. It is recommended that the number of devices on each daisy chain be less than 30.
- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger2000, a maximum of six daisy chains can be configured to support up to 200 devices. To ensure the system response speed, it is recommended that the number of devices on each daisy chain be less than 30. Each SmartLogger2000 can connect to a maximum of 80 SUN2000s.

PLC (MBUS)

The PLC (MBUS) communication board loads communication signals onto power cables for transmission.

NOTE

- The PLC (MBUS) communication mode is only applicable to medium-voltage grid connection scenarios and non-low-voltage public grid connection scenarios (industrial environment).
- The built-in PLC (MBUS) module in the SUN2000 does not require cable connections.

5.5.2 Selecting a Communication Mode

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

- The inverters with a PLC (MBUS) support both PLC (MBUS) and RS485 communication modes. The RS485 and PLC communication modes are mutually exclusive.

NOTICE

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

- The inverters without PLC (MBUS) 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

- Connecting an RS485 communications cable

An RS485 communications cable can be connected in two ways:

- Terminal block connection

You are recommended to use a DJYP2VP2-22 2x2x1 network cable or a communications cable with a conductor cross-sectional area of 1 mm² and cable outer diameter of 14–18 mm.

- RJ45 port connection

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



NOTE

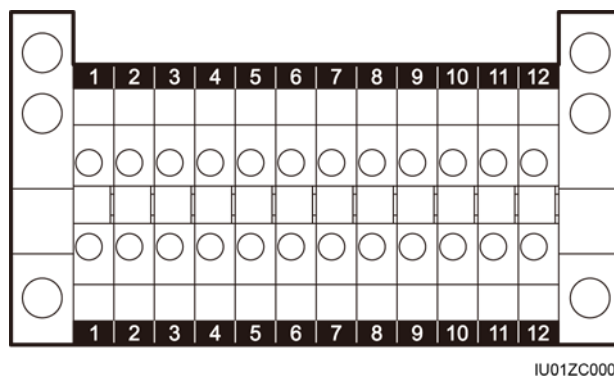
Select either connection mode during installation. Connecting to a terminal block is recommended.

NOTICE

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

- Functions of the RS485 terminal block

Figure 5-26 Terminal block



IU01ZC0001

Table 5-4 describes the functions of the RS485 terminal block.

Table 5-4 Functions of the RS485 terminal block

No.	Function	No.	Function
5	RS485A IN	6	RS485A OUT

No.	Function	No.	Function
7	RS485B IN	8	RS485B OUT

- RJ45 connector pin definitions

Figure 5-27 RJ45 connector

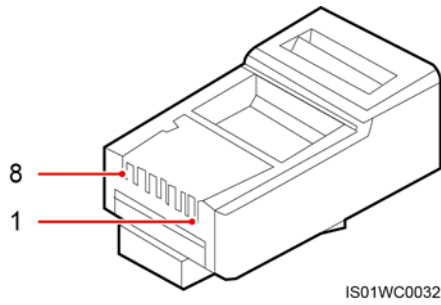


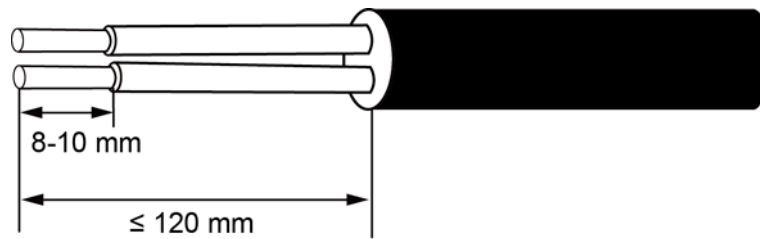
Table 5-5 RJ45 connector pin definitions

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

Procedure

- Method 1: Connecting to a terminal block (recommended)
 - a. Remove an appropriate length of the jacket and core wire insulation layer from the communications cable using a wire stripper, as shown in [Figure 5-28](#).

Figure 5-28 Stripping an RS485 communications cable



IS012C0013

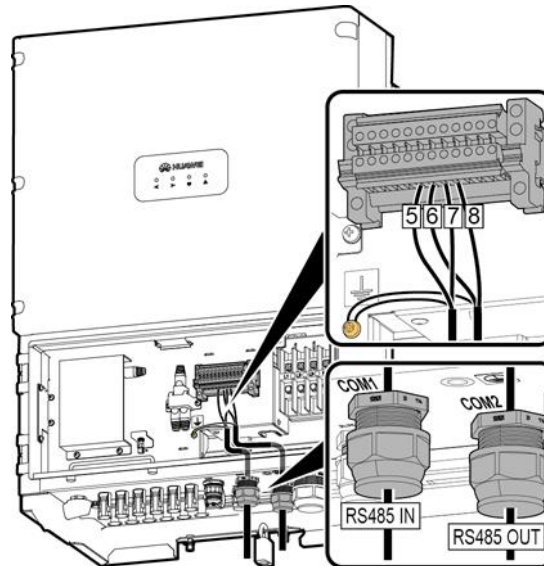
- b. Remove the locking caps from the **COM1** and **COM2** waterproof cable connectors at the inverter bottom and remove the plugs from the locking caps.
- c. Route the communications cables through the locking caps, and then the **COM1** (RS485 IN) and **COM2** (RS485 OUT) connectors at the SUN2000 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. Tighten the terminals using an M3 flat-head screwdriver to a torque of 0.5 N·m. Connect the shield layer to the ground point and tighten the screw using an M4 Phillips torque screwdriver to a torque of 1.2 N·m, as shown in [Figure 5-29](#).



NOTE

When connecting the shielded cables, choose whether to crimp the M4 OT terminal based on site requirements.

Figure 5-29 Connecting RS485 communications cables



IS011C0025

(5) RS485A IN

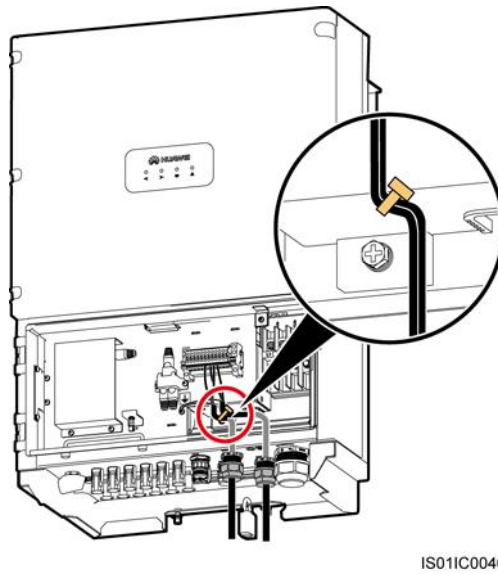
(6) RS485A OUT

(7) RS485B IN

(8) RS485B OUT

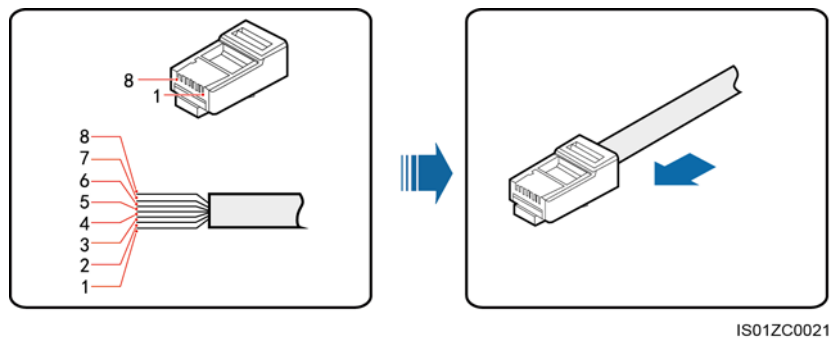
- e. Bind the communications cables after connecting them, as shown in [Figure 5-30](#).

Figure 5-30 Binding communications cables



- f. Use a torque wrench with an open end of 33 mm 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 5-31.

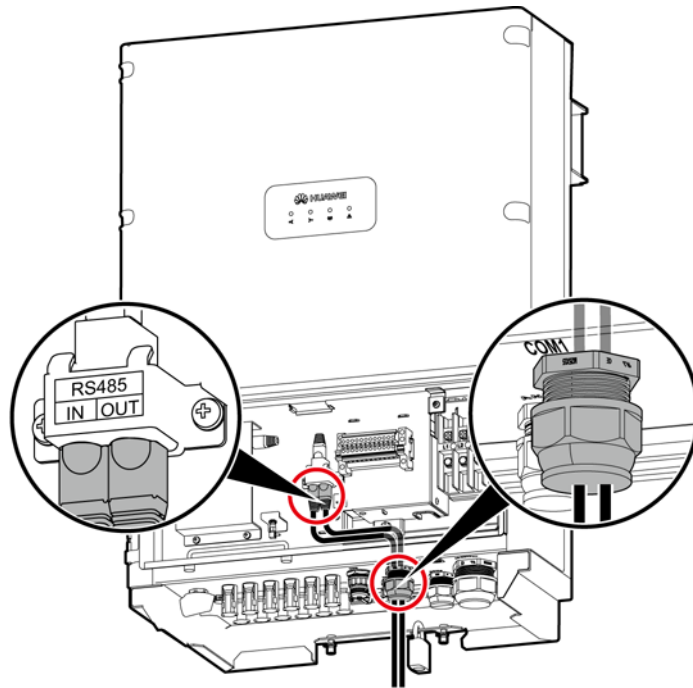
Figure 5-31 Connecting wires to the RJ45 connector



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

- b. Crimp the connectors using a crimping tool.
- c. Remove the locking cap from the **COM1** waterproof cable connector at the inverter bottom and remove the plugs from the locking cap.
- d. Route the cables through the locking cap and the **COM1** connector 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 5-32.

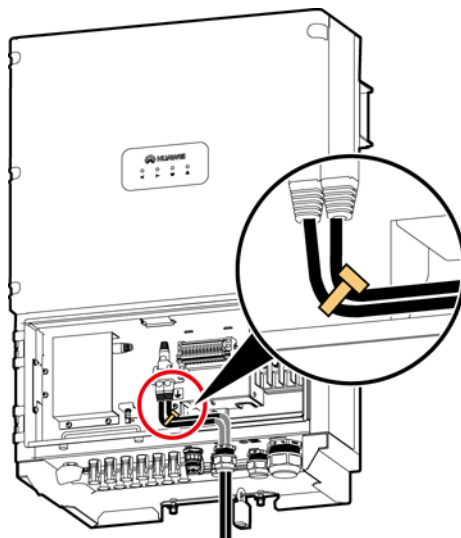
Figure 5-32 Connecting RS485 communications cables



IS01IC0024

- f. Bind the communications cables after connecting them, as shown in [Figure 5-33](#).

Figure 5-33 Binding communications cables



IS01IC0041

- g. Use a torque wrench with an open end of 33 mm to tighten the locking cap to a torque of 7.5 N·m.

----End

Follow-up Procedure

Check that the cables are connected correctly and securely, and then seal the cable holes with firestop putty.

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:

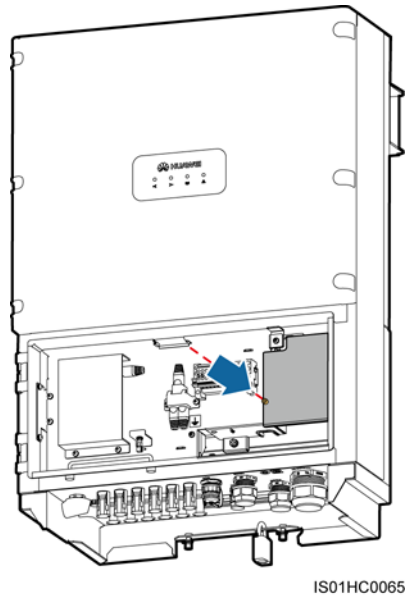
1. The SUN2000 is installed correctly and securely.
2. All screws, especially the screws used for electrical connections, are tightened.
3. Ground cables are connected correctly and securely, with no open circuit or short-circuit.
4. AC output power cables are connected correctly and securely, with no 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. The idle USB port and waterproof cable connectors are blocked with waterproof plugs.

5.7 Closing the Maintenance Compartment Door

Procedure

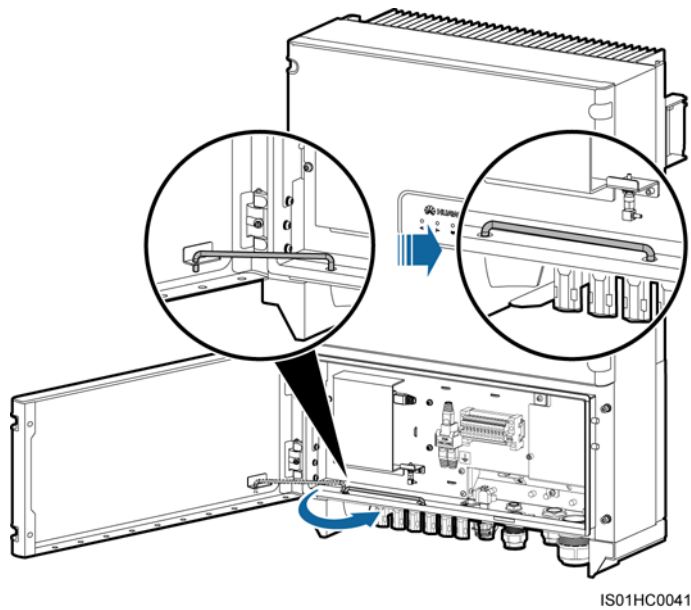
- Step 1** Install the AC terminal cover, as shown in [Figure 5-34](#).

Figure 5-34 Installing the AC terminal cover



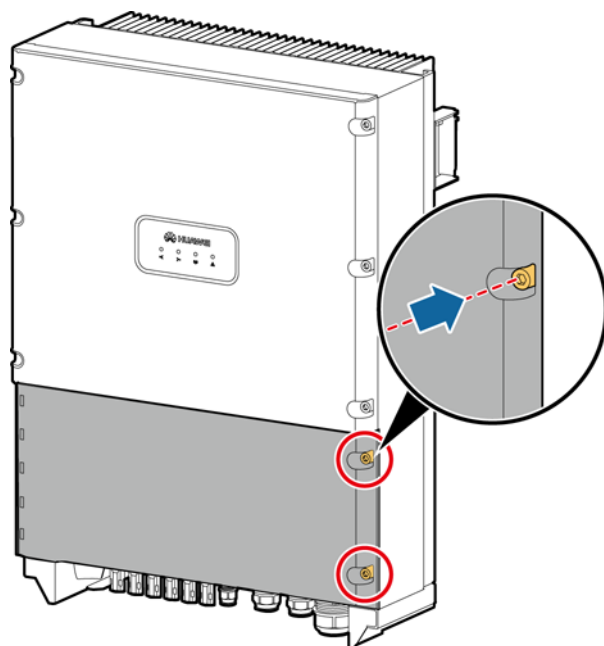
Step 2 Remove the support bar, as shown in [Figure 5-35](#).

Figure 5-35 Removing a support bar



Step 3 Close the maintenance compartment door and tighten the screws on the door using a hex key to a torque of 4 N·m, as shown in [Figure 5-36](#).

Figure 5-36 Tightening screws on the door



IS01HC0042



NOTE

If the two screws are lost, obtain the reserved screws from the fitting bag bound to the reinforcing rib at the chassis base.

----End

6 System Commissioning

6.1 Powering On the SUN2000

Prerequisites

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

Procedure

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

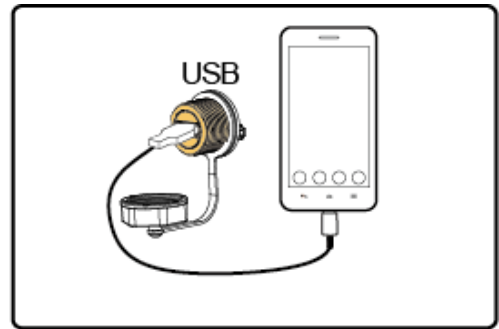
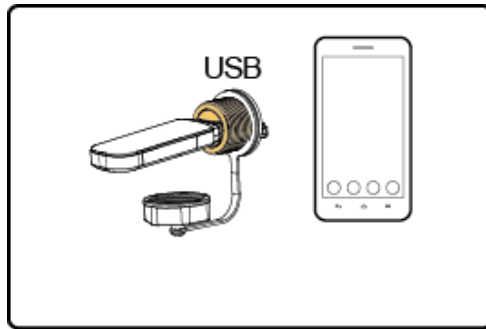
NOTICE

If you perform [Step 2](#) before [Step 1](#), the SUN2000 reports a fault about abnormal shutdown. The SUN2000 can start normally after the fault is automatically rectified. The default alarm clearance time is 1 minute. You can modify the time over the NMS software installed on the PC that connects to the SUN2000.

Step 2 Turn on the DC SWITCH at the bottom of the inverter chassis.

Step 3 Connect a mobile phone that runs the SUN2000 app to the inverter using a Bluetooth module, a WLAN module, or a USB data cable.

Figure 6-1 Connection mode



IL01H00003



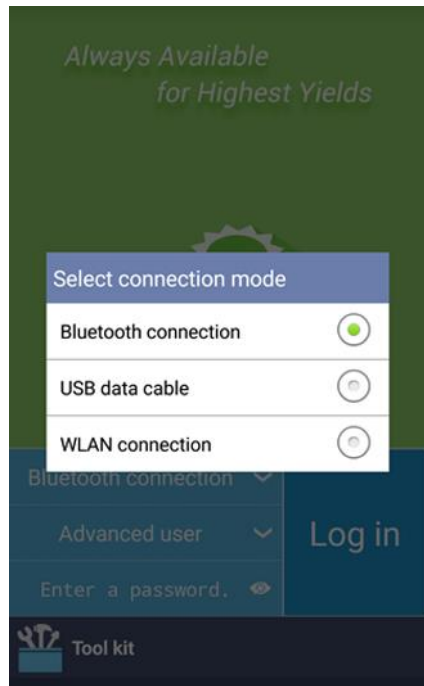
NOTE

- Purchase a Bluetooth module or a WLAN module bundled with the inverter. A Bluetooth module or a WLAN module purchased from any other source may not support communication between the inverter and the SUN2000 app.
- Use the USB data cable delivered with the mobile phone. The port type is USB 2.0.
- The screen snapshots in this document correspond to app 3.2.00.001.

Figure 6-2 Login screen

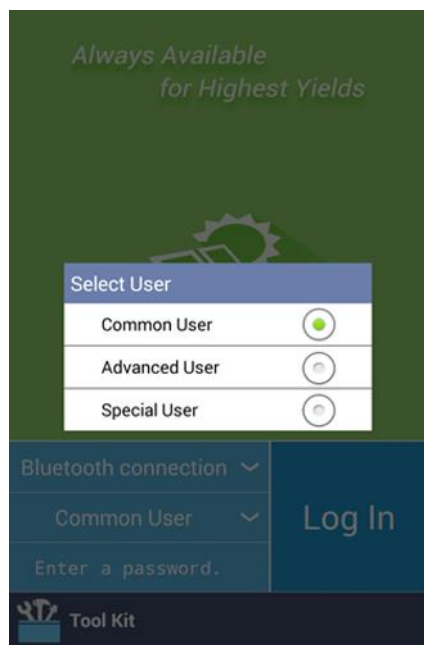


Figure 6-3 Selecting a connection mode



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

Figure 6-4 Switching the user



NOTE

- The login password is the same as that for the SUN2000 connected to the app and is used only for the SUN2000 to connect to the app.

- When the WLAN connection is used, the initial name of the WLAN hotspot is **Adapter-WLAN module SN**, and the initial password is **Changeme**.
- The initial passwords for **Common User**, **Advanced User**, and **Special User** are all **00000a**.
- Use the initial password upon first power-on and change it immediately after login. To ensure account security, change the password periodically and keep the new password in mind. Not changing the initial password may cause password disclosure. A password left unchanged for a long period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.
- During login, if five consecutive invalid password attempts are made (the interval between two consecutive attempts is less than 2 minutes), the account will be locked for 10 minutes. The password should consist of 6 characters.

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

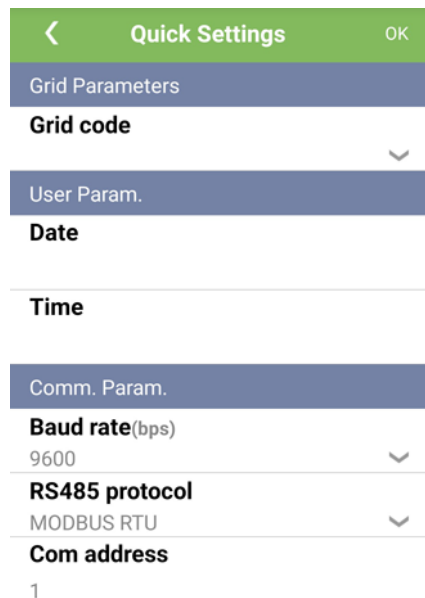
Step 6 After the successful login, the **Quick Settings** screen or **Function Menu** screen is displayed.



NOTE

- If you log in to the SUN2000 app after the device connects to the app for the first time or factory defaults are restored, the quick settings screen will be displayed, on which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. If the AC switch between the inverter and the power grid is turned on but all DC switches on the inverter are not in the ON position, **Grid code** is not displayed on the quick settings screen.
- You are advised to log in to the **Quick Settings** screen as **Advanced User** for parameter settings.
- Set the correct grid code based on the application region and scenario of the SUN2000.

Figure 6-5 Quick Settings screen (advanced user)

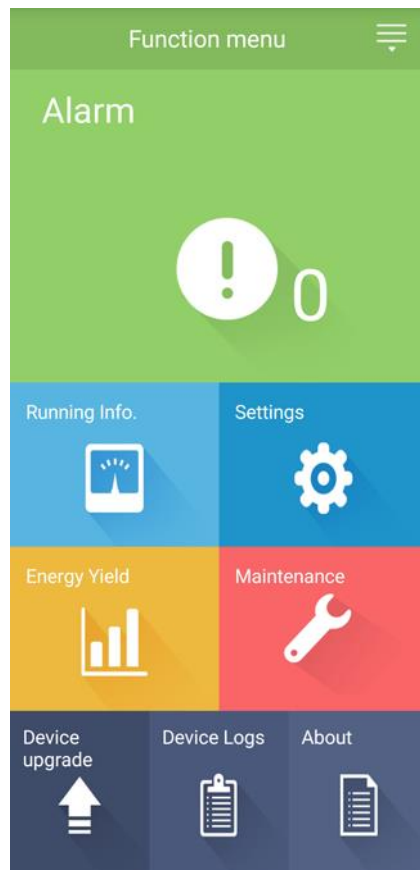


NOTE

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

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

Figure 6-6 Function menu screen



----End

6.2 Powering Off the SUN2000

Context

 **WARNING**

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

Procedure

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

For details, see the *SUN2000 APP User Manual*, *SmartLogger1000 User Manual*, *SmartLogger2000 User Manual*, or *iManager NetEco 1000S User Manual*.

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

Step 3 Set the DC SWITCH to OFF.

----End

7 Man-Machine Interactions

7.1 Operations with a USB Flash Drive

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

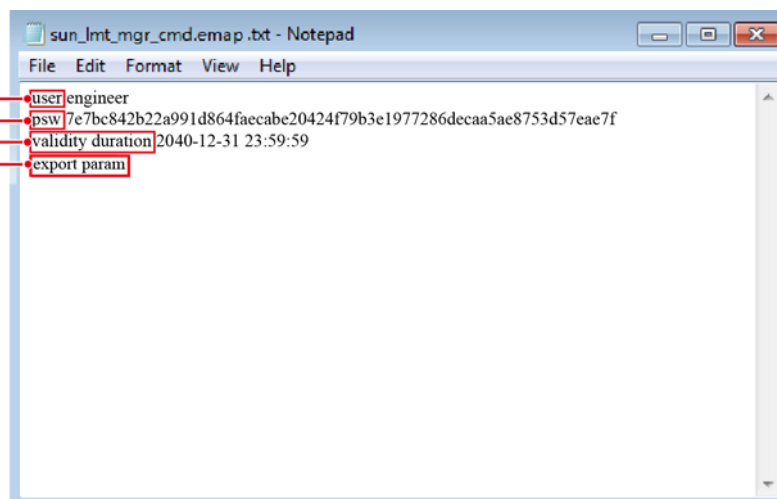
7.1.1 Exporting Configurations

Procedure

- Step 1** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 2** Import the boot script file to a PC.

(Optional) The boot script file can be opened as a .txt file, as shown in [Figure 7-1](#).

Figure 7-1 Boot script file



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


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

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

NOTICE

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

Table 7-1 LED indicator description

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

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



NOTE

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

----End

7.1.2 Importing Configurations

Prerequisites

A complete configuration file has been exported.

Procedure

- Step 1** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 2** Import the boot script file to a PC.
- Step 3** Replace the exported boot script file in the root directory of the USB flash drive with the imported one.

NOTICE


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

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

NOTICE

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

Table 7-2 LED indicator description

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

----End

7.1.3 Exporting Data


Procedure

- Step 1** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 2** Import the boot script file to the root directory of a USB flash drive.
- Step 3** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

NOTICE

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

Table 7-3 LED indicator description

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

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



NOTE

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

----End

7.1.4 Upgrading

Procedure

- Step 1** Obtain the required upgrade package from Huawei technical support website (for example, SUN2000 V200R001C90SPCXXX).
- Step 2** Decompress the upgrade package.

After obtaining the upgrade package **SUN2000V200R001C90SPCXXX_package.zip**, decompress the package and ensure that the extracted files include:

- config.txt
- sun_lmt_mgr_cmd.emap (This is a boot script file.)
- SUN2000.bin
- SUN2000_CPLD.bin
- SUN2000_Master_Release.bin
- SUN2000_Slave_Release.bin
- vercfg.xml

NOTICE


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

- Step 3** On the SUN2000 APP, tap **Inverter Command Settings** to generate a boot script file. For details, see the *SUN2000 APP User Manual*.
- Step 4** Import the boot script file to a computer.
- Step 5** Replace the boot script file in the upgrade package with the one generated by the SUN2000 APP.
- Step 6** Copy the extracted files to the root directory of the USB flash drive.
- Step 7** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

NOTICE

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

Table 7-4 LED indicator description

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

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

Step 8 (Optional) The system automatically restarts when the upgrade is completed. All LED indicators turn off during the restart. After the restart, the green indicator is blinking at long intervals (on for 1s and then off for 1s) for 1 minute until it becomes steady on, which indicates that the upgrade is successful.



NOTE

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

----End

7.2 Operations with a SmartLogger

For operations with a SmartLogger, see the *SmartLogger1000 User Manual* or *SmartLogger2000 User Manual*.

7.3 Operations with the NMS

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

7.4 Operations with the SUN2000 APP

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

8 System Maintenance

8.1 Routine Maintenance

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

CAUTION

- Before cleaning the system, and maintaining the cable connections and grounding reliability, power off the system (see [6.2 Powering Off the SUN2000](#)) and ensure that the DC SWITCH on the inverter is OFF.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.

Table 8-1 Maintenance list

Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles or dust.	Once six months to a year
System running status	<ul style="list-style-type: none">• Check that the inverter is not damaged or deformed.• Check that the running sound of the inverter is normal.• When the inverter is running, check that all inverter parameters are correctly set.	Once six months

Item	Check Method	Maintenance Interval
Cable connections	<ul style="list-style-type: none">• Check that cables are securely connected.• Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.• Check that the idle COM and USB ports are locked by waterproof caps.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.

8.2 Troubleshooting

Alarm severities are defined as follows:

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

Table 8-2 Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
103	High DC Input Voltage	Major	<ul style="list-style-type: none"> • Cause ID = 1 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 1 and 2, and therefore the PV string open-circuit voltage exceeds the maximum operating voltage of the SUN2000. • Cause ID = 2 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 3 and 4, and therefore the PV string open-circuit voltage exceeds the maximum operating voltage of the SUN2000. • Cause ID = 3 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 5 and 6, and therefore the PV string open-circuit voltage exceeds the maximum operating voltage of the SUN2000. 	<ul style="list-style-type: none"> • Cause ID = 1 Reduce the number of PV modules connected in series to PV strings 1 and 2 until the PV string open-circuit voltage is less than or equal to the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 2 Reduce the number of PV modules connected in series to PV strings 3 and 4 until the PV string open-circuit voltage is less than or equal to the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 3 Reduce the number of PV modules connected in series to PV strings 5 and 6 until the PV string open-circuit voltage is less than or equal to the maximum operating voltage of the SUN2000. After the PV array configuration is corrected, the SUN2000 alarm disappears.
106-11	Abnormal String 1-6	Warning	<p>Cause ID = 1</p> <ul style="list-style-type: none"> • The PV string is shielded from sunlight for a long time. • The PV string deteriorates or is damaged. 	<ol style="list-style-type: none"> 1. Check whether the PV string current is obviously lower than the currents of other PV strings. 2. If yes, check whether the PV string is shielded from sunlight. 3. If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
120-1 25	String 1-6 Reversed	Cause ID = 1: Major Cause ID = 2: Warning	<ul style="list-style-type: none"> • Cause ID = 1 The PV string is reversely connected. • Cause ID = 2 Only a few PV modules are connected in series to the PV string, and therefore the end voltage is lower than that of other PV strings. 	<ul style="list-style-type: none"> • Cause ID = 1 Check whether the PV string is reversely connected to the inverter. If yes, turn off the two DC switches after the PV string voltage drops within the safe voltage range (lower than 60 V DC), and then correct the PV string connection. • Cause ID = 2 Check whether the number of PV modules connected in series to the inverter is small. If yes, increase the number.
200	Abnormal DC Circuit	Major	<p>Abnormal external conditions trigger the protection for the DC circuit inside the inverter. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 3 The inverter input is disconnected accidentally, or the PV string output power changes sharply because the PV string is shielded from sunlight. • Cause ID = 10 The three phases of the power grid are seriously unbalanced, which triggers the protection for the internal control circuit of the inverter. • Cause ID = 11 The power grid voltage changes sharply and the inverter input power fails to discharge in a short time, which increases the internal voltage and triggers overvoltage protection. • Cause ID = 12/15 An unrecoverable fault occurs on a circuit inside the inverter. 	<p>Cause ID = 3/10/11</p> <ol style="list-style-type: none"> 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the alarm occurs repeatedly, contact Huawei technical support. <p>Cause ID = 12/15</p> <p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
202	Abnormal Invert Circuit	Major	<p>Abnormal external conditions trigger the protection for the inverter circuit inside the inverter. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 13 The power grid voltage drops dramatically or the power grid is short-circuited, which damages the internal voltage detection circuit in the inverter. • Cause ID = 14 The power grid voltage drops dramatically or the power grid is short-circuited. As a result, the inverter transient output current exceeds the upper threshold and therefore the inverter protection is triggered. • Cause ID = 16 The DC current in the power grid exceeds the upper threshold. • Cause ID = 20 The inverter output is short-circuited. As a result, the output current surges to a value above the upper limit, and the inverter protection is triggered. 	<p>Cause ID = 13/14/16</p> <ol style="list-style-type: none"> 1. The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers. 2. If the alarm occurs repeatedly, contact Huawei technical support. <p>Cause ID = 20</p> <ol style="list-style-type: none"> 1. Check the inverter output cable for short-circuits. 2. If the alarm occurs repeatedly, contact Huawei technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
301	Abnormal Grid Voltage	Major	<p>The power grid voltage is beyond the acceptable range. The possible causes are as follows:</p> <ul style="list-style-type: none"> • Cause ID = 4 The power grid voltage is below the specified lower threshold. • Cause ID = 16 The power grid voltage exceeds the specified upper threshold. • Cause ID = 19 The power grid voltage has exceeded the specified upper threshold for 10 minutes. • Cause ID = 26 The power grid voltage exceeds the specified upper threshold. • Cause ID = 28 The three phases of the power grid differ greatly in voltage. • Cause ID = 29 <ol style="list-style-type: none"> 1. The power grid experiences an outage. 2. The AC circuit is disconnected or AC circuit breaker is off. • Cause ID = 31–33 The impedance of the output phase wire A/B/C to the PE is low or short-circuited. 	<p>Cause ID = 4</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 APP, SmartLogger, or NMS to modify the power grid overvoltage and undervoltage protection thresholds with the consent of the local power operator. 3. If the fault persists for a long time, check the AC circuit breaker and AC output power cable. <p>Cause ID = 16/19/26</p> <ol style="list-style-type: none"> 1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator. 2. If you have confirmed that the grid-tied voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage and undervoltage protection thresholds. 3. Check whether the peak power grid voltage exceeds the upper threshold. <p>Cause ID = 28</p> <ol style="list-style-type: none"> 1. If the exception is caused by an external fault, the inverter automatically recovers after the fault is rectified. 2. If the alarm persists and affects the energy yield of the power station, contact the local power operator. <p>Cause ID = 29</p> <ol style="list-style-type: none"> 1. Check the AC voltage. 2. Check that the AC power cable is securely connected and that the circuit breaker is ON. <p>Cause ID = 31–33</p> <p>Check the impedance of output phase wire A/B/C to the PE and locate the position with lower impedance and resolve the issue.</p>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
305	Abnormal Grid Frequency	Major	<ul style="list-style-type: none"> • Cause ID = 2 The actual power grid frequency is higher than the standard requirement for the local power grid. • Cause ID = 4 The actual power grid frequency is lower than the standard requirement for the local power grid. • Cause ID = 5 The actual change rate of the power grid frequency does not meet the standard requirement for the local power grid. 	<p>Cause ID = 2/4</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 APP, SmartLogger, or NMS to modify the power grid overfrequency and underfrequency protection thresholds with the consent of the local power operator. <p>Cause ID = 5</p> <ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator.
313	Low Insulation Resistance	Major	<p>Cause ID = 1</p> <ul style="list-style-type: none"> • A short circuit occurs between the PV string and the PGND cable. • The PV string is installed in a moist environment for a long time. 	<ol style="list-style-type: none"> 1. Check the impedance between the PV string and the PGND cable. If a short circuit occurs, rectify the fault. 2. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, log in to the SUN2000 APP, SmartLogger, or NMS and set Insulation resistance protection.
318	Abnormal Residual Current	Major	<p>Cause ID = 1</p> <p>The insulation resistance against the PGND cable at the input side decreases when the inverter is running, which causes an excessively high residual current.</p>	<ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the external circuit may be abnormal temporarily. The inverter automatically recovers after fault is rectified. 2. If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
321	Cabinet Overtemperature	Major	<p>Cause ID = 1</p> <ul style="list-style-type: none"> The inverter is installed in a place with poor ventilation. The ambient temperature exceeds the upper threshold. The internal fan works abnormally. 	<ol style="list-style-type: none"> Check the ventilation and ambient temperature of the inverter installation position. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.
322	Abnormal SPI Communication	Major	<p>Cause ID = 1</p> <p>An unrecoverable fault occurs on a circuit inside the inverter.</p>	<p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p>
326	Abnormal Grounding	Major	<p>Cause ID = 1</p> <ul style="list-style-type: none"> The neutral wire or PGND cable does not connect to the inverter. When you are grounding the PV string, you do not connect an isolation transformer to the inverter output. 	<ol style="list-style-type: none"> Check that the neutral wire or PGND cable properly connects to the inverter. If the PV string is grounded, check whether the inverter output needs to connect to an isolation transformer. If yes, connect the transformer to the inverter.
400	System Fault	Major	<p>Cause ID = 1/3/21/23/27</p> <p>An unrecoverable fault occurs on a circuit inside the inverter.</p>	<p>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</p>
410	Abnormal Auxiliary Power	Major	<p>Cause ID = 4</p> <p>The sampling control board has an abnormal voltage, which may be caused by the following:</p> <ul style="list-style-type: none"> The internal power chip of the sampling control board is faulty. The detection circuit becomes faulty. 	<ol style="list-style-type: none"> When the alarm is generated, the inverter shuts down automatically. When the fault is rectified, the inverter starts automatically. If the alarm occurs repeatedly, contact Huawei technical support.
504	Software Version Unmatch	Minor	<p>Cause ID = 1/2/3</p> <p>During inverter software upgrade, the version of the software loaded is incorrect.</p>	<p>Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.</p>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
505	Upgrade Failed	Major	Cause ID = 1 The upgrade does not end normally.	Perform the upgrade again.
61440	Flash Fault	Minor	Cause ID = 1 <ul style="list-style-type: none">The flash memory is insufficient.The flash memory has bad sectors.	<ol style="list-style-type: none">Replace the monitoring board.If the monitoring board is built into the monitoring device, replace the monitoring device.



NOTE

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

9 Handling the Inverter

9.1 Removing the SUN2000

NOTICE

Before removing the SUN2000, disconnect both the AC and DC power supplies. For processes of disconnecting the power supplies, see [6.2 Powering Off the SUN2000](#). After powering off the SUN2000, wait at least 5 minutes before performing operations on it.

Perform the following operations to remove the SUN2000:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and PGND cables.
2. (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 Packing the SUN2000

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

9.3 Disposing of the SUN2000

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

10 Technical Specifications

Efficiency

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Maximum efficiency	98.6%	98.6%	98.6%	98.8%
Chinese efficiency	N/A	98.2%	N/A	98.4%
European efficiency	98.3%	98.3%	98.3%	N/A

Input

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Maximum input power	30,600 W	30,600 W	30,600 W	40,800 W
Maximum input voltage	1000 V			
Maximum input current (per MPPT)	23 A			
Maximum short-circuit current (per MPPT)	34.5 A			
Highest operating voltage	1000 V			

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Lowest operating/startup voltage	200 V/250 V			
Max. inverter backfeed current to the array	0 A			
Full power MPPT voltage range	580–850 V	480–800 V	480–800 V	580–850 V
Maximum number of inputs	6			
Number of MPP trackers	3			

Output

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Rated active power	30,000 W (480 V, 50 Hz)	30,000 W (400 V, 50 Hz)	30,000 W (400 V, 50 Hz)	36,000 W (480 V, 50 Hz)
Maximum apparent power	33,000 VA	33,000 VA	33,000 VA	40,000 VA
Maximum active power (cosφ = 1) ^a	30,000 W	30,000 W	30,000 W	40,000 W
Rated output voltage	277 V/480 V, 3W+PE	220 V/380 V, 230 V/400 V, 3W+N+PE or 3W+PE ^b	230 V/400 V, 3W+N+PE	277 V/480 V, 3W+PE
Adapted grid frequency	50 Hz/60 Hz			
Maximum output current	40 A	48 A	48 A	48 A
Power factor	0.8 leading ... 0.8 lagging			

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Maximum total harmonic distortion (rated power)	< 3%			
<ul style="list-style-type: none"> Note a: The maximum output power of the SUN2000-33KTL varies depending on the chosen grid code, as described in A Grid Codes. Note b: The SUN2000-33KTL allows the neutral wire not to be connected in some countries or areas. When it is used in a system without a neutral wire, set Output mode to Three-phase three-wire on the SUN2000 app, SmartLogger, or NMS. 				

Protection

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Input DC switch	Supported			
Anti-islanding protection	Supported			
Output overcurrent protection	Supported			
Input reverse polarity protection	Supported			
PV string fault detection	Supported			
DC surge protection	Type II			
AC surge protection	Type II			
Insulation resistance detection	Supported			
Residual current monitoring unit (RCMU)	Supported			

Display and Communication

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Display	LED, Bluetooth module+app, WLAN module+app, USB data cable+app			
RS485	Supported			
PLC (MBUS)	Optional			

General Data

Technical Specifications	SUN2000-30K TL-A	SUN2000-33K TL	SUN2000-33K TL-E001	SUN2000-40K TL
Dimensions (W x H x D)	550 mm x 770 mm x 281 mm (including the mounting plate)			
Net weight	About 54 kg (excluding the mounting plate)/About 56 kg (including the mounting plate)			
Operating temperature range	-25°C to +60°C			
Cooling	Natural convection			
Highest altitude	4000 m			
Humidity	0%–100% RH			
Input terminal	Amphenol Helios H4			
Output terminal	Waterproof cable connector+OT terminal			
Ingress Protection Rating	IP65			
Topology	Transformerless			

A Grid Codes



NOTE

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

Table A-1 lists the grid codes that the SUN2000-33KTL/SUN2000-33KTL-E001 supports.

Table A-1 Grid codes (for the SUN2000-33KTL/SUN2000-33KTL-E001)

No.	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 (400 V AC)	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
10	G59-Scotland	Scotland 240 V power grid (I > 16 A)	240 V/415 V	30 kW

No.	Grid Code	Description	Power Grid Voltage	Maximum Output Power
11	CEI0-21	Italy low-voltage power grid	230 V/400 V	30 kW
12	CEI0-16	Italy medium-voltage power grid	230 V/400 V	30 kW
13	EN50438-CZ	Czech Republic low-voltage power grid	230 V/400 V	30 kW
14	VDE 0126-1-1-GR(A)	Mainland of Greece low-voltage power grid	230 V/400 V	30 kW
15	VDE 0126-1-1-GR(B)	Islands of Greece low-voltage power grid	230 V/400 V	30 kW
16	RD1699/661	Spain low-voltage power grid (RD1699/661)	230 V/400 V	30 kW
17	AS4777	Australia low-voltage power grid	230 V/400 V	30 kW
18	C10/11	Belgium low-voltage power grid	230 V/400 V	30 kW
19	IEC61727	IEC low-voltage power grid (50 Hz)	230 V/400 V	30 kW
20	TAI-PEA	Thailand low-voltage power grid (PEA)	220 V/380 V	30 kW
21	TAI-MEA	Thailand low-voltage power grid (MEA)	230 V/400 V	30 kW
22	EN50438-TR	Turkey low-voltage power grid	230 V/400 V	30 kW
23	Philippines	Philippines low-voltage power grid	220 V/380 V	30 kW
24	NRS-097-2-1	South Africa low-voltage power grid	230 V/400 V	30 kW
25	KOREA	Korea low-voltage power grid	220 V/380 V	30 kW
26	IEC61727-60Hz	IEC low-voltage power grid (60 Hz)	230 V/400 V	30 kW
27	G83-England	England 230 V power grid (I < 16 A)	230 V/400 V	30 kW
28	G83-Scotland	Scotland 240 V power grid (I < 16 A)	240 V/415 V	30 kW
29	ANRE	Romania low-voltage power grid	230 V/400 V	30 kW

No.	Grid Code	Description	Power Grid Voltage	Maximum Output Power
30	EN50438_IE	Ireland low-voltage power grid	230 V/400 V	30 kW
31	PO12.3	Spain low-voltage power grid (PO12.3)	230 V/400 V	30 kW
32	Custom (50 Hz)	Reserved	230 V/400 V	30 kW
33	Custom (60 Hz)	Reserved	230 V/400 V	30 kW

Table A-2 lists the grid codes that the SUN2000-30KTL-A/SUN2000-40KTL supports.

Table A-2 Grid codes (for the SUN2000-30KTL-A/SUN2000-40KTL)

No.	Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power of the SUN2000-30KTL-A	Maximum Output Power of the SUN2000-40KTL
1	RD1699/661-MV480	Spain medium-voltage power grid (RD1699/661)	277 V/480 V	30 kW	40 kW
2	CHINA-MV480	China medium-voltage power grid (480 V)	277 V/480 V	30 kW	40 kW
3	BDEW-MV480	Germany medium-voltage power grid (400 V AC)	277 V/480 V	30 kW	40 kW
4	Custom-MV480 (50 Hz)	Reserved	277 V/480 V	30 kW	40 kW
5	Custom-MV480 (60 Hz)	Reserved	277 V/480 V	30 kW	40 kW
6	G59-England-MV480	UK 480 V medium-voltage power grid (I > 16 A)	277 V/480 V	30 kW	40 kW
7	IEC61727-MV480	IEC medium-voltage power grid (50 Hz)	277 V/480 V	30 kW	40 kW
8	UTE C 15-712-1-MV480	France medium-voltage power grid	277 V/480 V	30 kW	40 kW

No.	Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power of the SUN2000-30KTL-A	Maximum Output Power of the SUN2000-40KTL
9	TAI-PEA-MV480	Thailand medium-voltage power grid (PEA)	277 V/480 V	30 kW	40 kW
10	TAI-MEA-MV480	Thailand medium-voltage power grid (MEA)	277 V/480 V	30 kW	40 kW
11	EN50438-DK-MV480	Denmark medium-voltage power grid	277 V/480 V	30 kW	40 kW
12	Japan (50 Hz)	Japan power grid (50 Hz)	277 V/480 V	30 kW	40 kW
13	Japan (50 Hz)	Japan power grid (60 Hz)	277 V/480 V	30 kW	40 kW
14	EN50438-TR-MV480	Turkey medium-voltage power grid	277 V/480 V	30 kW	40 kW
15	C11/C10-MV480	Belgium medium-voltage power grid	277 V/480 V	30 kW	40 kW
16	Philippines-MV480	Philippines medium-voltage power grid	277 V/480 V	30 kW	40 kW
17	AS4777-MV480	Australia medium-voltage power grid	277 V/480 V	30 kW	40 kW
18	NRS-097-2-1-MV480	South Africa medium-voltage power grid	277 V/480 V	30 kW	40 kW
19	IEC61727-60Hz-MV480	IEC medium-voltage power grid (60 Hz)	277 V/480 V	30 kW	40 kW
20	ANRE-MV480	Romania medium-voltage power grid	277 V/480 V	30 kW	40 kW
21	PO12.3-MV480	Spain medium-voltage power grid (PO12.3)	277 V/480 V	30 kW	40 kW

No.	Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power of the SUN2000-30KT L-A	Maximum Output Power of the SUN2000-40KT L
22	EN50438_IE-MV 480	Ireland medium-voltage power grid	277 V/480 V	30 kW	40 kW

B Acronyms and Abbreviations

A	
AC	alternating current
ACDU	AC distribution unit
C	
CCO	central controller
D	
DC	direct current
E	
EFUP	environmentally friendly use period
L	
LED	light emitting diode
N	
NMS	network management system
M	
MPP	maximum power point
MPPT	maximum power point tracking
P	

PDC	power distribution cabinet
PLC	power line communication
PV	Photovoltaic
R	
RCMU	Residual current monitoring unit
W	
WEEE	waste electrical and electronic equipment