

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

# **User Manual**

Issue 04

Date 2016-06-20



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## **About This Document**

## **Purpose**

This document describes the SUN2000-30KTL-A/33KTL/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.

The figures provided in this document are for reference only. The actual product prevails.

This document is subject to update and revision. You can log in to <a href="http://support.huawei.com/carrier">http://support.huawei.com/carrier</a>, and download the latest version.

## **Intended Audience**

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

# **Symbol Conventions**

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

Symbol	Description
<b>DANGER</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
<b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
<b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
<b>⚠</b> NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.
	NOTICE is used to address practices not related to personal injury.

Symbol	Description
□ NOTE	Calls attention to important information, best practices and tips.
	NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

# **Change History**

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

#### Issue 04 (2016-06-20)

Added SUN2000-30KTL-A.

## Issue 03 (2015-12-01)

Added Max. inverter backfeed current to the 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.

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# 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.
- Do not remove the warranty label from the inverter enclosure. Otherwise, product warranty will be forfeited.

#### 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 ℃ 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 as an example.

Figure 2-1 Model number description

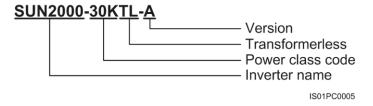


Table 2-1 lists all models of the SUN2000 and their rated output power.

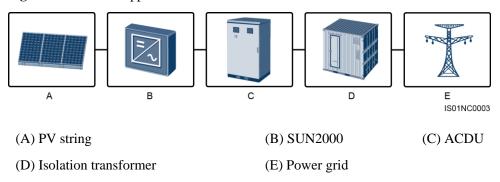
Table 2-1 SUN2000 models and rated output power

Model	Rated Output Power	
SUN2000-30KTL-A	30 kW	
SUN2000-33KTL	30 kW	
SUN2000-40KTL	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.

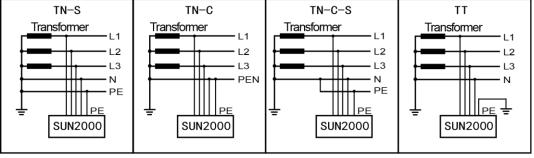
Figure 2-2 Network Application



## **Supported Power Grids**

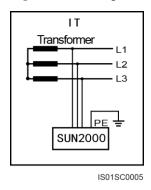
The SUN2000-33KTL supports the power grid modes TN-S, TN-C, TN-C-S, and TT, as shown in Figure 2-3. The SUN2000-30KTL-A and SUN2000-40KTL only support the power grid mode IT, as shown in Figure 2-4.

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



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



#### M NOTE

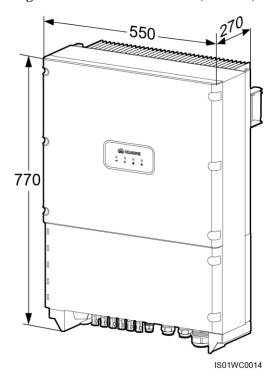
The SUN2000-30KTL-A and SUN2000-40KTL are mainly used for medium-voltage power grids. They deliver three-phase, three-wire output and then are fed to a medium-voltage power grid over a step-up transformer

# 2.2 Appearance

#### **Dimensions**

Figure 2-5 shows the SUN2000 dimensions.

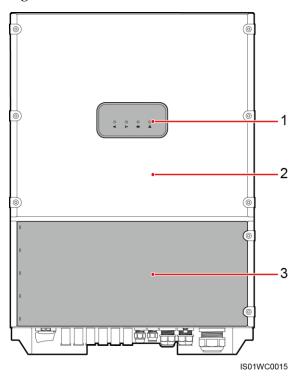
Figure 2-5 SUN2000 dimensions (unit: mm)



#### **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.
$\supset \sim$	Off	The SUN2000 is not grid-tied.
Communication indicator	Blinking green fast (on for 0.5s and off for 0.5s)	The inverter receives data over RS485/PLC communication.

Indicator	Status		Meaning
	Off		The inverter has not received data over RS485/PLC communication for 10 seconds.
Alarm/Maintenance indicator	Alarm state	Blinking red slowly (on for 1s and then off for 4s)	The SUN2000 has generated a warning.
		Blinking red fast (on for 0.5s and then off for 0.5s)	The SUN2000 has generated a minor alarm.
		Steady red	The SUN2000 has generated a critical alarm.
	Local maintenance state	Blinking green slowly (on for 1s and then off for 1s)	Local maintenance is in progress.
		Blinking green fast (on for 0.125s and off for 0.125s)	Local maintenance has failed.
		Steady green	Local maintenance is successful.

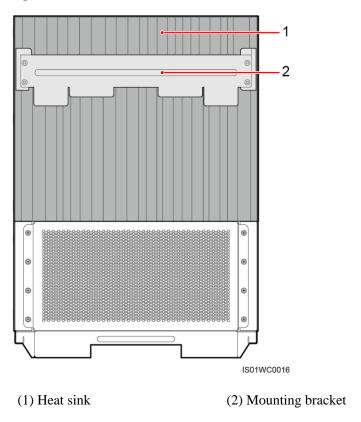
#### M NOTE

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

#### **Rear View**

Figure 2-7 shows the SUN2000 rear view.

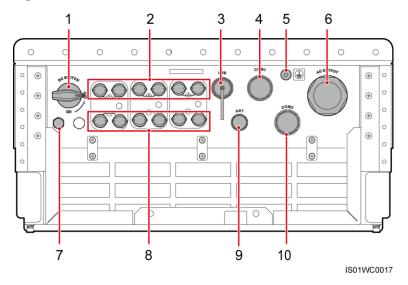
Figure 2-7 SUN2000 rear view



#### **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)	N/A
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
5 mins	Delay discharge	<ul> <li>There are high voltages when this SUN2000 is running. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000.</li> <li>There are residual</li> </ul>
		voltages in the SUN2000. It needs 5 minutes to finish discharge.
	Burn warning	The SUN2000 must not be touched when in operation because its enclosure and heat sinks are extremely hot.

Symbol	Symbol Label	
i	Refer to documentation	Remind operators to refer to the documentation shipped with the SUN2000.
	Grounding	Indicates the position for connecting the protection ground cable.
Do not disconnect under load! 禁止带负荷断开连接!	Operation warning	The DC input connector must not be removed when the SUN2000 is in operation.
WARRANTY VOID IF SEAL IS BROKEN	Warranty label	Never open the host panel of the SUN2000.
******	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 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.)

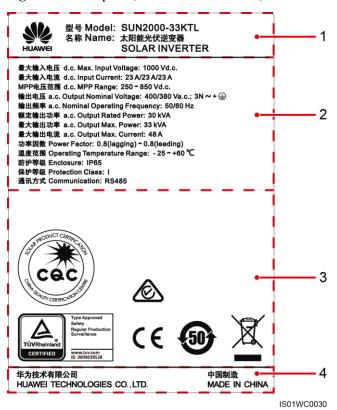


Figure 2-9 Nameplate (RS485 communication)

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

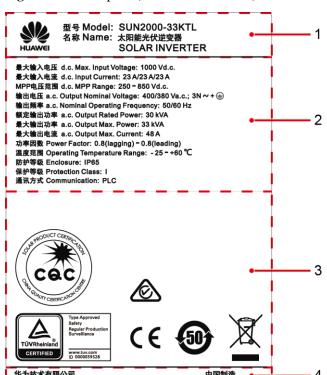


Figure 2-10 Nameplate (PLC communication)

- (1) Trademark, product name, and model number
- (2) Important technical specifications

(3) Compliance symbols

HUAWEI TECHNOLOGIES CO., LTD.

(4) Company name and country of manufacture

Table 2-4 describes the compliance symbols.

Table 2-4 Compliance symbols

Symbol	Name	Meaning
COC.	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.
TÜVRheinland CERTIFIED  TÜVRound Vertiffer ver	TÜVRheinland certification mark	The SUN2000 complies with TÜVRheinland certification standards.

MADE IN CHINA

IS01WC0034

Symbol	Name	Meaning
C€	CE certification mark	The SUN2000 complies with Conformit é Europ éenne (CE) certification standards.
<b>50</b>	Environmentally friendly use period (EFUP)	The SUN2000 is environmentally friendly for at least 50 years.
<b>X</b>	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. Figure 2-12 shows the circuit diagram for the SUN2000-30KTL-A and SUN2000-40KTL.

MPPT circuit Input Output EMI LCL EMI filter filter filter MPPT circuit 2 DC-AC Output converter AC SPD isolation relay MPPT circuit 3 Input current DC check circuit switch DC SPD

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

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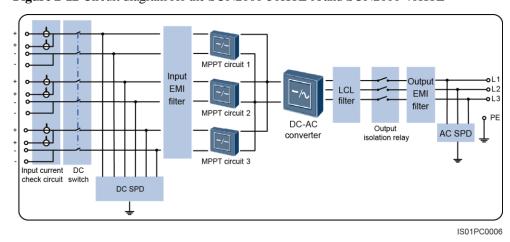
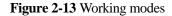


Figure 2-12 Circuit diagram for the SUN2000-30KTL-A and SUN2000-40KTL

## **Working Modes**

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



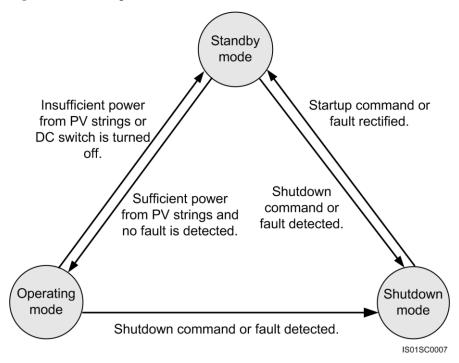


Figure 2-13 describes the operations shown in Table 2-5.

Table 2-5 Working mode description

Working Mode	Description
Standby	The SUN2000 enters the standby mode when the external environment does not meet the operating requirements of the SUN2000. In standby mode:
	• 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	In operating mode:
	The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid.
	The SUN2000 tracks the maximum power point to maximize the PV string output.
	The SUN2000 enters the shutdown mode if detecting a fault or a shutdown command, and enters the standby mode if detecting that the PV string output power does not meet the requirements for grid-tied electricity generation.
Shutdown	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  $-40 \,\mathrm{C}$  to  $+70 \,\mathrm{C}$  and the humidity at 5%-100% 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**

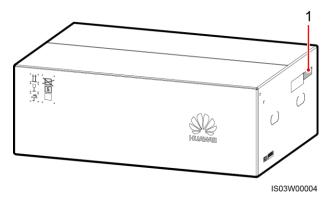
Do not install the SUN2000 in a place where personnel are easy to come into contact with its chassis and heat sinks, because these parts are extremely hot during operation.

# 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 require, do not unpack the package but contact the dealer as soon as possible.

Figure 4-1 Position of the inverter model label



(1) Position of the model label



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

#### **Deliverables**

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

oxdiv note

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

## **4.2 Tools**

Prepare tools required for installation and electrical connections.

Tool	Model	Function
Hammer drill	Drill bit: Φ14 mm, Φ16 mm	<ul> <li>Drill bit: Φ14 mm, used for drilling holes in the support.</li> <li>Drill bit: Φ16 mm, used for drilling holes in the wall.</li> </ul>
Adjustable wrench	<ul> <li>With a length of 200 mm</li> <li>With an open end of 24 mm</li> </ul>	Secures bolts.

Tool	Model	Function
Torque screwdriver	<ul> <li>Flat-head screwdriver: M3</li> <li>Phillips screwdriver: M4, M6</li> </ul>	Connects cables to a terminal block and secures ground screws.
Socket wrench	<ul> <li>With an open end of 10 mm (applicable to M6) or 13 mm (applicable to M8)</li> <li>With a height of 100 mm (adapted to the height distance between terminals and the cabinet frame)</li> <li>Wrench handle length (horizontal): &lt; 200 mm</li> <li>Torque: 0–8 N m</li> </ul>	Secures the ground screw and AC output terminals.
Diagonal pliers	N/A	Cut cable ties.
Wire stripper	N/A	Peels off cable jackets.
Rubber mallet	N/A	Hammers expansion bolts into holes.

Tool	Model	Function
Utility knife	N/A	Removes packages.
Cable cutter	N/A	Cuts power cables.
Crimping tool	H4TC0001 Manufacturer: AMPHENOL	Crimps metal terminals when preparing DC input power cables.
RJ45 crimping tool	N/A	Prepares RJ45 connectors for communications cables.
Removal tool	H4TW0001 Manufacturer: AMPHENOL	Removes DC connectors from the SUN2000.
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.
4		
Measuring tape	N/A	Measures distances.
Level	N/A	Levels hole positions.
<u></u>		
ESD gloves	N/A	Protect operators during
		installation.
Safety goggles	N/A	Protect operators when drilling holes.
		notes.

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**

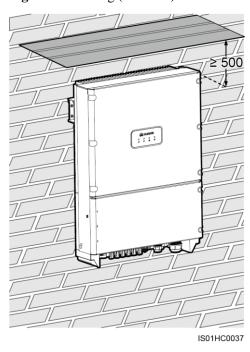
• The protection level of the SUN2000 is IP65. The SUN2000 can be installed indoors or outdoors.

- 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 ambient temperature must be below 50 °C which ensures optimal SUN2000 operation and extends the SUN2000's service life.
- The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation.
- The SUN2000 should be free from direct exposure to sunlight, rain, and snow to extend its service life. Based on the actual installation environment, the customer can determine whether to build an awning. Figure 4-2 describes the requirements for building an awning (if required).

Figure 4-2 Awning (unit: mm)



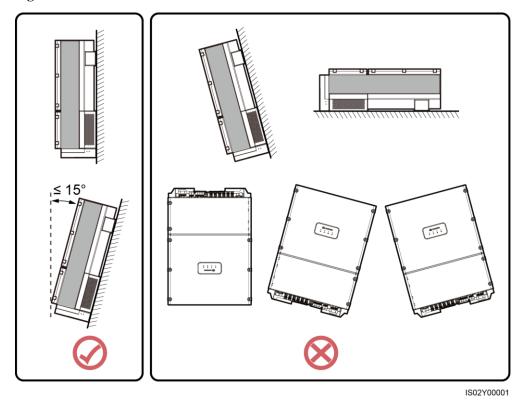
### **Carrier Requirements**

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- 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 4-3 Installation modes



## **Installation Space Requirements**

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

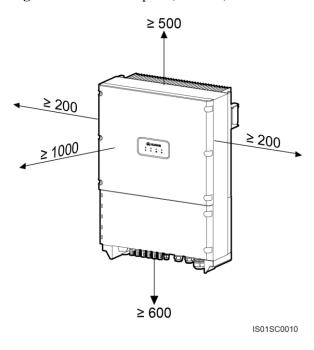


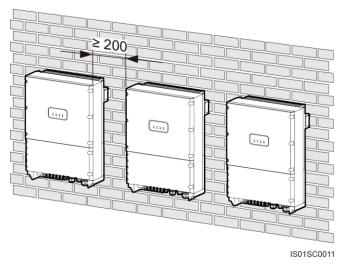
Figure 4-4 Installation space (unit: mm)

## $\square$ 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 4-5 Horizontal installation mode (recommended, unit: mm)



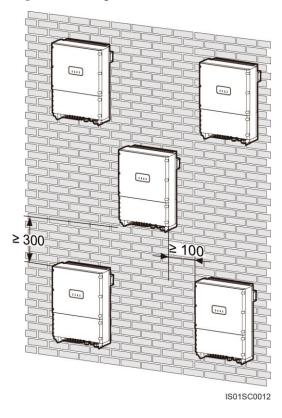
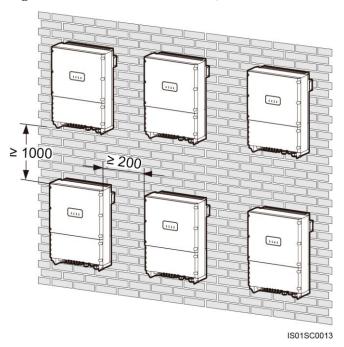


Figure 4-6 Triangle installation mode (recommended, unit: mm)

Figure 4-7 Stacked installation mode (not recommended, unit: mm)



## **4.3.2 Moving the SUN2000**

#### Context



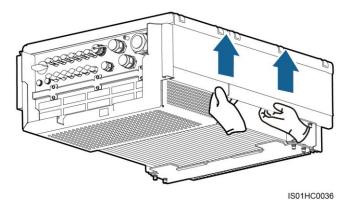
#### **CAUTION**

- 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 4-8.

Figure 4-8 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 4-9 shows the dimensions of the rear panel.

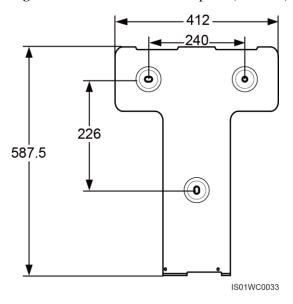


Figure 4-9 Dimensions of the rear panel (unit: mm)

#### Context

#### M NOTE

- The SUN2000-30KTL-A or SUN2000-33KTL 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 4-10) using the rear panel available in the packing case, level the hole positions using a level, and mark the hole positions using a marker.

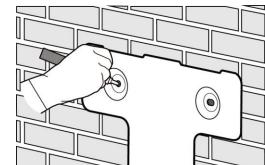


Figure 4-10 Determining hole positions

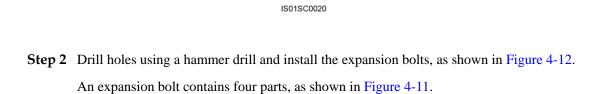
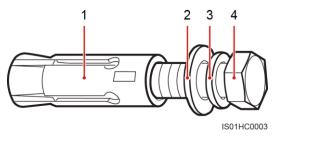


Figure 4-11 Expansion bolt composition



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

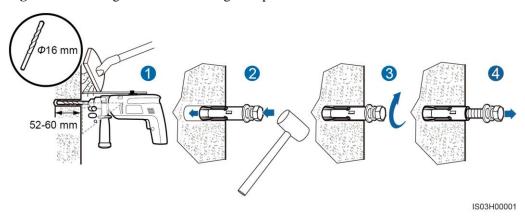


Figure 4-12 Drilling a hole and installing an expansion bolt



#### NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- 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 real 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 4-13.

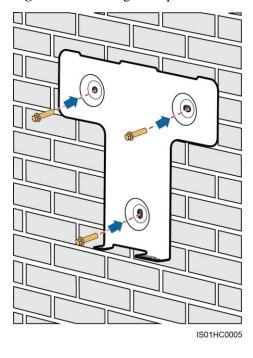


Figure 4-13 Securing a rear panel

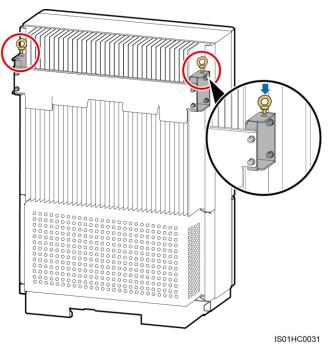
----End

# 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 4-14.





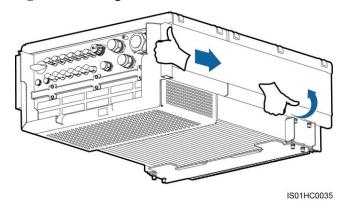
**Step 4** Ensure that two people lift the SUN2000 and turn it upright. Lift the SUN2000 by grasping the handle at the bottom of the SUN2000 with one hand and the handle at the top with the other, as shown in Figure 4-15.



## **CAUTION**

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

Figure 4-15 Lifting the SUN2000



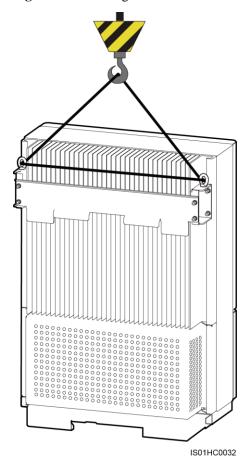
**Step 5** Route a rope that is able to bear the SUN2000 through the lifting eyes and hoist the SUN2000, as shown in Figure 4-16.



# **NOTICE**

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

Figure 4-16 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 4-17.

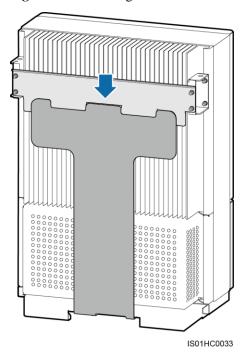


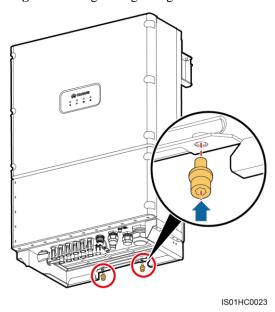
Figure 4-17 Mounting the SUN2000 on the rear panel

**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 4-18.

## ON NOTE

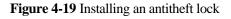
The hex key can be obtained from the fitting bag bound to the reinforcing rib at the chassis base.

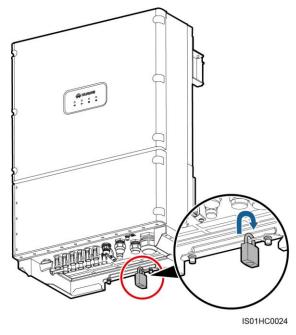
Figure 4-18 Tightening hexagon screws



**Step 8** (Optional) Install an antitheft lock, as shown in Figure 4-19.

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





----End

# 4.4 Support-mounting the SUN2000

# 4.4.1 Determining the Installation Position

#### **Basic Requirements**

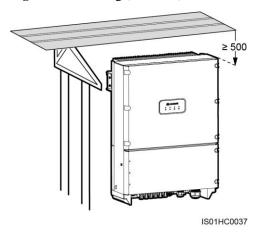
- The protection level of the SUN2000 is IP65. The SUN2000 can be installed indoors or outdoors.
- The installation method and position must be appropriate for the weight and dimensions of the SUN2000. For details, see 10 Technical Specifications.
- Do not install the SUN2000 in a place where personnel 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 ambient temperature must be below 50 °C which ensures optimal SUN2000 operation and extends the SUN2000's service life.
- The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation.
- The SUN2000 should be free from direct exposure to sunlight, rain, and snow to extend its service life. Based on the actual installation environment, the customer can determine

whether to build an awning. Figure 4-20 describes the requirements for building an awning (if required).

Figure 4-20 Awning (unit: mm)



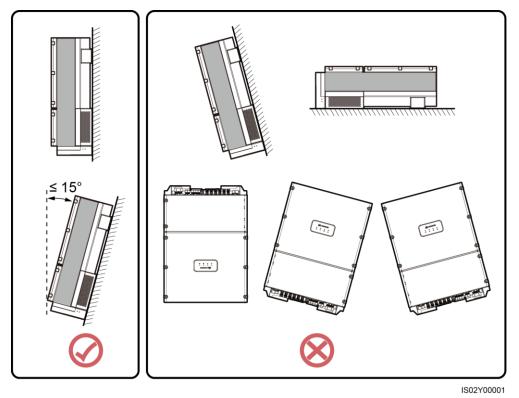
## **Carrier Requirements**

- The carrier where the SUN2000 is installed must be fire-proof.
- Do not install the SUN2000 on flammable building materials.
- 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 4-21 Installation modes



# **Installation Space Requirements**

- It is recommended that the SUN2000 be installed at eye level to facilitate operation and maintenance.
- Reserve enough clearance around the SUN2000 to ensure sufficient space for installation and heat dissipation, as shown in Figure 4-22.

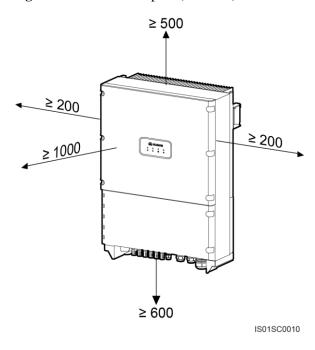


Figure 4-22 Installation space (unit: mm)

# 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 4-23 shows the dimensions of the rear panel.

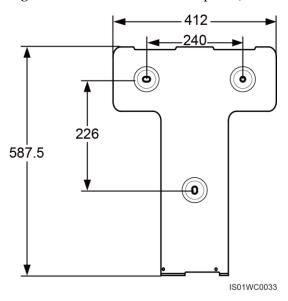
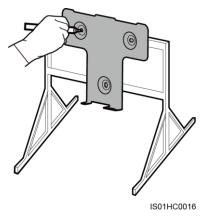


Figure 4-23 Dimensions of the rear panel (unit: mm)

#### **Procedure**

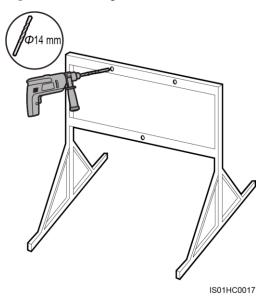
**Step 1** Determine the positions for drilling holes (as shown in Figure 4-24) using the rear panel available in the packing case, level the hole positions using a level, and mark the hole positions using a marker.

Figure 4-24 Determining hole positions



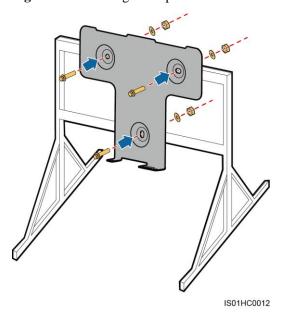
**Step 2** Drill holes using a hammer drill, as shown in Figure 4-25.

Figure 4-25 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 4-26.

Figure 4-26 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).

# 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 mm<sup>2</sup> or more (8 mm<sup>2</sup>, 10 mm<sup>2</sup>, 8 AWG, or 7 AWG recommended).
- OT terminal: M6

#### Context

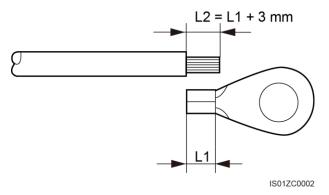
• Both the shell and maintenance compartment of the inverter provide a ground point. Select one of them for connecting the ground cable.

 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**

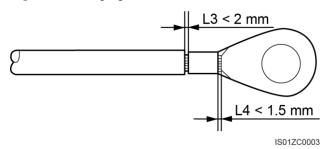
**Step 1** Strip an appropriate length of the insulation layer of the ground cable using a wire stripper, as shown in Figure 5-1.

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



## M 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.

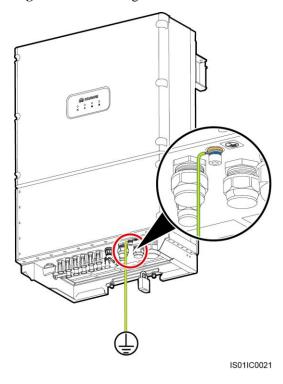


Figure 5-3 Connecting the PGND cable

M 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**



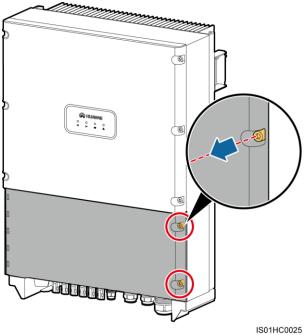
## **NOTICE**

- 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



# ■ NOTE

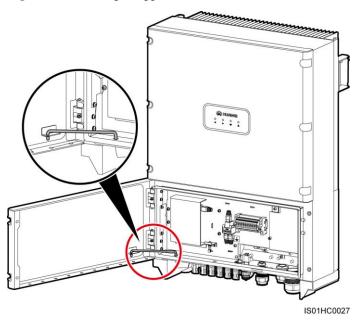
If the two screws are lost, obtain the reserved screws from the fitting bag bound to the reinforcing rib at the chassis base.

**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



----End

# 5.3 Installing AC Output Power Cables

#### **Prerequisites**

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



#### WARNING

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

#### Context

- To connect a ground cable to the ground point on the SUN2000-33KTL 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

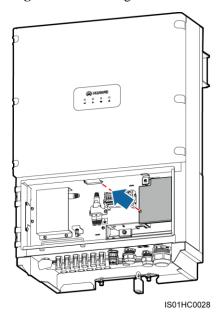
Inverter Model	Cross-sectional Area (mm²)		Cable Outer Diameter (mm)	
	Range	Recommend ed Value	Range	Recommen ded Value
SUN2000-33KTL	16–25 (or 6–3 AWG)	16 (or 6 AWG)	24–32	28
SUN2000-30KTL-A/ SUN2000-40KTL	16–35 (or 6–2 AWG)			

• You need to prepare OT terminals by yourself: The OT terminal corresponding to the SUN2000-33KTL 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



#### M NOTE

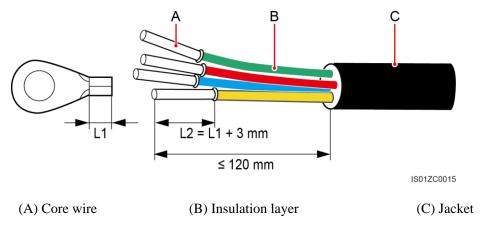
To highlight the involved area, the figure does not show the open maintenance compartment door.

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



Ensure that the jacket is in the maintenance compartment.

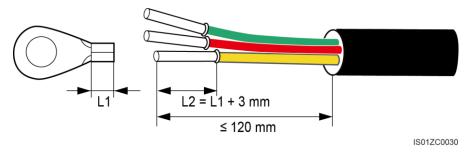
Figure 5-7 Stripping the SUN2000-33KTL AC output cable (excluding the ground cable)



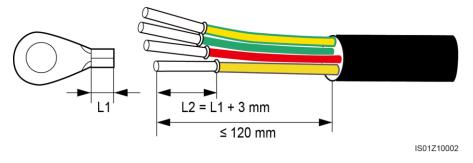
L2 = L1 + 3 mm ≤ 120 mm

**Figure 5-8** Stripping the SUN2000-33KTL 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 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.

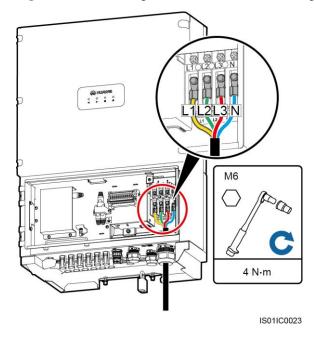
To connect a ground cable to the ground point in the maintenance compartment, tighten the ground screw to a torque of 4 N m using an M6 torque screwdriver.



#### **NOTICE**

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

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



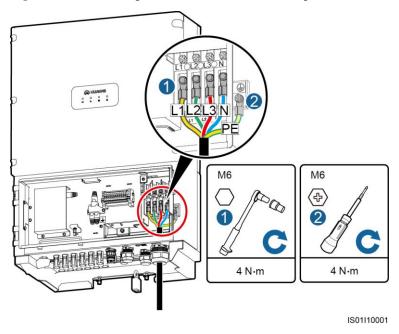
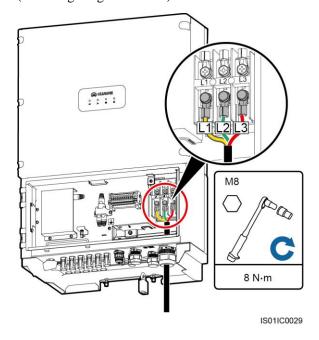
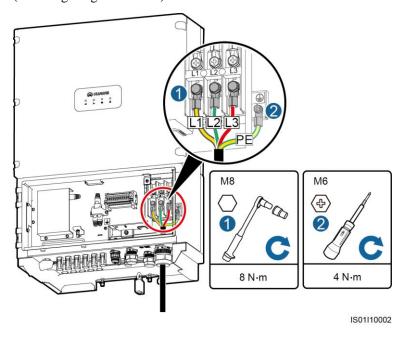


Figure 5-12 Connecting the SUN2000-33KTL AC output cable (including the ground cable)

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





**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 string is well insulated to the 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.



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

- Connect a three-phase isolation transformer on the output side, and ensure that the neutral wire of the isolation transformer is separate from the PGND cable.
- One isolation transformer must be installed only for one SUN2000. Do not connect two or more SUN2000s to the same isolation transformer. Otherwise, the SUN2000s may fail to work due to the loop current generated between them.
- Set **Isolation** to **Input grounded**, with **TF** on the SUN2000 APP, SmartLogger, or NMS.

#### Context

• DC terminal selection

Figure 5-15 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

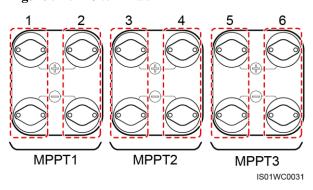


Table 5-2 DC terminal selection requirements

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 (mm²)		Cable Outer
	Range	Recommended Value	Diameter (mm)
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



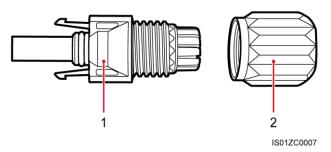
## NOTICE

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.

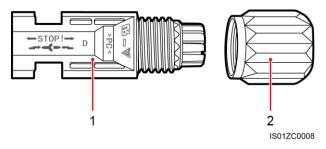
Figure 5-16 Positive connector composition



(1) Insulation shell

(2) Locking nut

Figure 5-17 Negative connector composition



(1) Insulation shell

(2) Locking nut



#### **CAUTION**

- Use the Amphenol HH4 DC input terminals delivered with the SUN2000. If the terminals are lost or damaged, prepare Amphenol HH4, Amphenol H4, or MC4 DC input terminals by yourself. You can also purchase Amphenol HH4 DC input terminals from Huawei.
- DC input terminals not of the previous models may be incompatible with the SUN2000, which may cause serious consequences. The caused equipment damage is beyond the warranty scope.

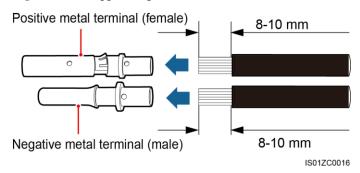


Positive and negative metal terminals are packed with positive and negative connectors respectively. After unpacking, keep the positive and negative ones separate to avoid confusion.

#### **Procedure**

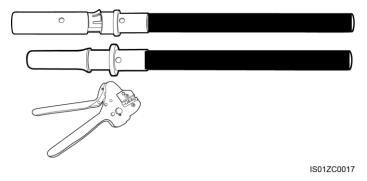
**Step 1** Remove an appropriate length of the insulation layer from the positive and negative power cables using a wire stripper, as shown in Figure 5-18.

Figure 5-18 Stripped length



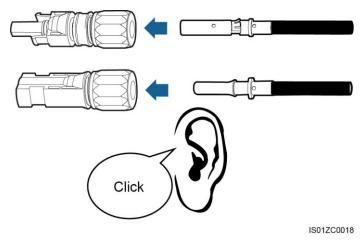
**Step 2** Insert the exposed area of the positive and negative power cables into the metal terminals of the positive and negative connectors respectively and crimp them using a crimping tool, as shown in Figure 5-19. Ensure that the cables are crimped tightly such that they cannot be pulled out by a force less than 400 N.

Figure 5-19 Crimping a metal terminal



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

Figure 5-20 Inserting positive and negative connectors



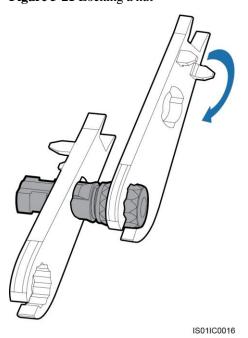


## **NOTICE**

Check that the cables are in position by slightly pulling them back.

**Step 4** Tighten the locking nuts on the positive and negative connectors. Secure the nuts using a removal wrench, as shown in Figure 5-21.

Figure 5-21 Locking a nut



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

**Step 6** 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.

| SO3H00014

Figure 5-22 Measuring the DC input voltage



# CAUTION

Before performing Step 7, ensure that the DC SWITCH is OFF.

**Step 7** 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 5-23.



## **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.

ISO1IC0022

Figure 5-23 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

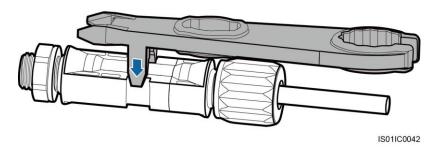
To remove the positive and negative connectors from the SUN2000, insert a removal wrench into the bayonet and press the wrench with an appropriate force, as shown in Figure 5-24.



## **WARNING**

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

Figure 5-24 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 5-25 shows the communication mode for a single SUN2000.

Figure 5-25 Communication mode for a single SUN2000

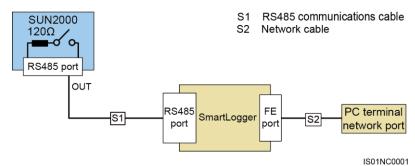


Figure 5-26 shows the communication mode for multiple SUN2000s.
 If multiple SUN2000s are used, connect all the SUN2000s in daisy chain mode over an RS485 communications cable.

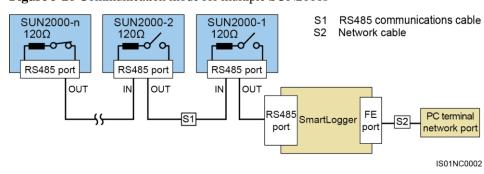


Figure 5-26 Communication mode for multiple SUN2000s

#### M 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**

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

#### MOTE

The built-in PLC module in the SUN2000 does not require cable connections.

# 5.5.2 Selecting a Communication Mode

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

- The inverters with a PLC support both PLC and RS485 communication modes. The RS485 and PLC communication modes are mutually exclusive.
  - When selecting the PLC communication mode, do not connect the RS485 communications cable.
  - When selecting the RS485 communication mode, do not connect the PLC CCO modules to the AC power cables.
- The inverters without PLC only support the RS485 communication mode.

# 5.5.3 Connecting RS485 Communications Cables

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

#### Context

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 mm<sup>2</sup> 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.



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 5-27 Terminal block

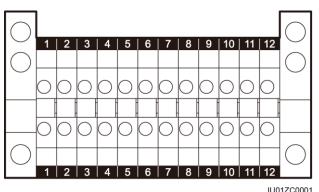


Table 5-4 describes the functions of the RS485 terminal block.

Table 5-4 Functions of the RS485 terminal block

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

• RJ45 connector pin definitions

Figure 5-28 RJ45 connector

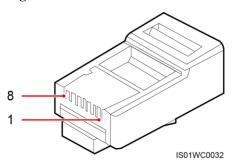


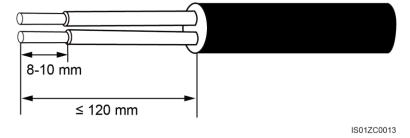
Table 5-5 RJ45 connector pin definitions

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 5-29.

Figure 5-29 Stripping an RS485 communications cable



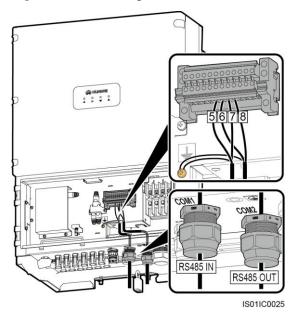
b. Remove the locking caps from the **COM1** and **COM2** waterproof cable connectors at the inverter bottom and remove the plugs from the locking caps.

- 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 5-30.

#### **□** NOTE

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

Figure 5-30 Connecting RS485 communications cables



(5) RS485A IN

(6) RS485A OUT

(7) RS485B IN

- (8) RS485B OUT
- e. Bind the communications cables after connecting them, as shown in Figure 5-31.

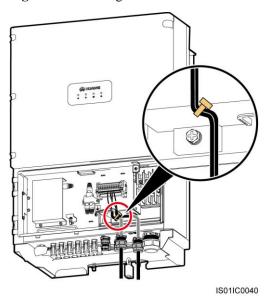
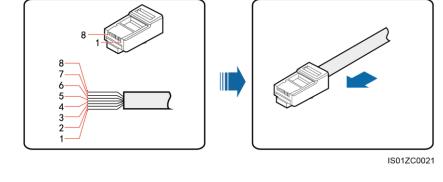


Figure 5-31 Binding communications cables

- 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 5-32.

Figure 5-32 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 5-33.

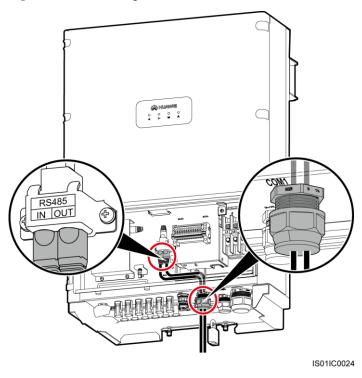
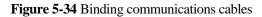
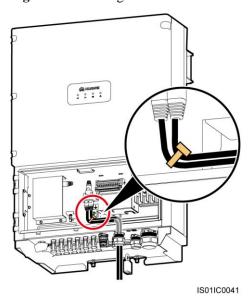


Figure 5-33 Connecting RS485 communications cables

f. Bind the communications cables after connecting them, as shown in Figure 5-34.





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 5-35.

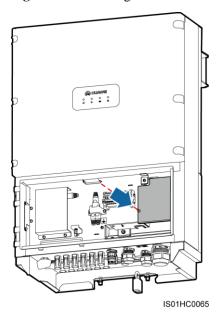
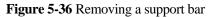
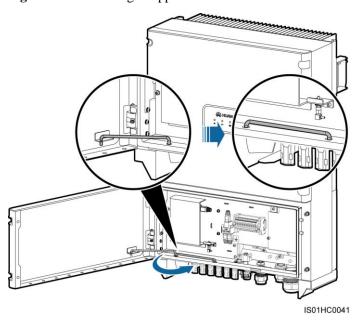


Figure 5-35 Installing the AC terminal cover

**Step 2** Remove the support bar, as shown in Figure 5-36.





**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 5-37.

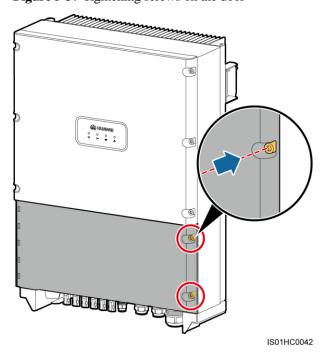


Figure 5-37 Tightening screws on the door

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

To check that the DC terminals are in good contact, check that the temperatures at the joints between DC terminals and connectors do not exceed 85 ℃ after the inverter has been running for a period of time.

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



#### **NOTICE**

- Mobile phone operating system: Android 4.0 or later, and iOS 7.0 or later. When the iOS is used, the app supports only Bluetooth connection.
- When you use a Bluetooth module to set up the connection, ensure that the mobile phone and inverter are at most 10 meters away from each other. Otherwise, the communication quality between them will deteriorate.
- The screen snapshots in this document correspond to app V200R001C00SPC020.

Figure 6-1 Bluetooth module connection mode

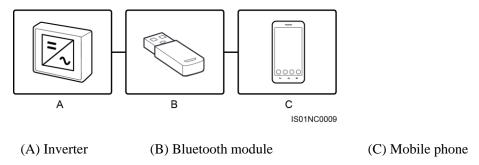


Figure 6-2 Data cable connection mode

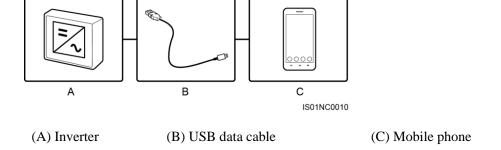


Figure 6-3 Login screen

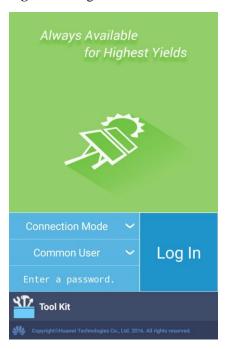


Figure 6-4 Selecting a connection mode

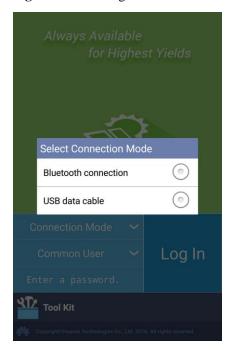


Figure 6-5 Bluetooth connection



Figure 6-6 Data cable connection

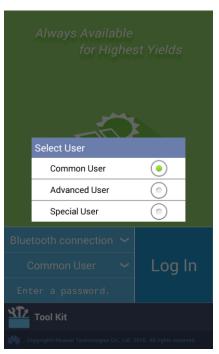


#### M NOTE

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

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





#### MOTE

- The login password is the same as that for the inverter connected to the app and is used only when
  the inverter connects to the app.
- The initial password for Common User, Advanced User, and Special User is 00000a (The initial
  password for SUN2000 V200R001C00SPC003 is 000001). Use the preset password upon initial
  login. To ensure account security, change the password immediately after login.
- During the login, if an incorrect password is entered for five consecutive times (the interval between two consecutive invalid password entries is less than 2 minutes), the account will be locked for 10 minutes. The password consists of six digits.
- **Step 6** Enter the password and tap **Log In**.
- Step 7 After the successful login, the Quick Settings screen or Function Menu screen is displayed.

#### MOTE

- If you log in to the app after the device connects to the app for the first time or factory defaults are restored, the Quick Settings screen will be displayed on which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. By default, the inverter can be grid-tied and you do not have to set parameters.
- You are advised to log in to the Quick Settings screen as an advanced user for parameter settings.

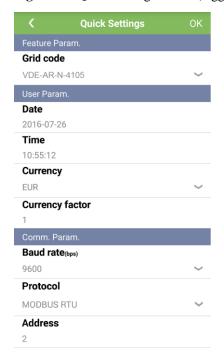


Figure 6-8 Quick Settings screen (logging in as an advanced user)

#### M NOTE

- Set the power grid code that applies to the country or region where the power station is located and the inverter model.
- Set user parameters based on the current date and time.
- Set Baud rate, 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 inverters communicate with the SmartLogger1000 or SmartLogger2000 over RS485, the addresses for all the inverters on each RS485 route must be within the address range set on the SmartLogger and cannot be duplicate. Otherwise, the communication will fail. In addition, the baud rates of all the inverters on each RS485 route must be consistent with the SmartLogger baud rate.

Alarm

Running Info
Energy Yield
Inverter Command Settings
Inverter Update
Device logs
About

Figure 6-9 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

## 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.

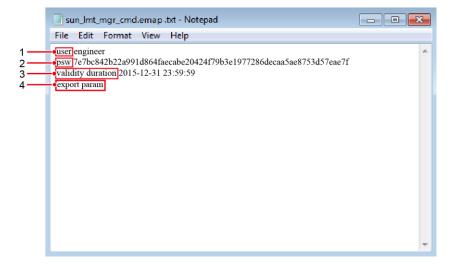
## 7.1.1 Exporting Configurations

#### **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 computer.

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

Figure 7-1 Boot script file



No.	Meaning	Remarks	
1	User name	<ul><li>Advanced user: engineer</li><li>Special user: admin</li></ul>	
2	Ciphertext	The ciphertext varies depending on the login password of the SUN2000 APP.	
3	Script validity period	The script validity period varies depending on the script export time.	
4	Command	<ul> <li>Different command settings can produce different commands.</li> <li>Configuration export command: export param.</li> <li>Configuration import command: import param.</li> <li>Data export command: export log.</li> <li>Upgrade command: upgrade.</li> </ul>	

- **Step 3** Import the boot script file to the root directory of a USB flash drive.
- **Step 4** Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.



#### **NOTICE**

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

Table 7-1 LED indicator description

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

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



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**

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

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



#### NOTICE

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

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



#### NOTICE

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

Table 7-2 LED indicator description

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

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

----End

#### 7.1.3 Exporting Data

#### **Procedure**

- **Step 1** 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 computer and check the exported data.

MOTE

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 Log in to http://support.huawei.com/carrier/ and browse or search for SUN2000 on the **Product Support** tab page. Download the required upgrade package (for example, SUN2000 V200R001C90SPCXXX) from the **Software** tab page.
- **Step 2** Decompress the upgrade package.

After obtaining the upgrade package **SUN2000V200R001C90SPC***XXX***\_package.zip**, decompress the package and copy the extracted files to the root directory of the USB flash drive. Ensure that the extracted files include:

- 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.

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.

Table 7-4 LED indicator description

**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.



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



#### **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	<ul> <li>Check periodically that the heat sinks are free from obstacles or dust.</li> <li>Maintain the DC SWITCH at night. Turn on the DC SWITCH and then turn it off. In this way, oxide on the switch is removed.</li> </ul>	Once six months to a year
System running status	<ul> <li>Check that the inverter is not damaged or deformed.</li> <li>Check that the running sound of the inverter is normal.</li> </ul>	Once six months
	• When the inverter is running, check that all inverter parameters are correctly set.	

Item	Check Method	Maintenance Interval
Cable connections	<ul> <li>Check that cables are securely connected.</li> <li>Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.</li> <li>Check that the idle COM and USB ports are locked by waterproof caps.</li> </ul>	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 secure 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> <li>Cause ID = 1         The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 1 and 2, and therefore the PV string open-circuit voltage exceeds the inverter maximum MPP voltage.     </li> <li>Cause ID = 2         The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 3 and 4, and therefore the PV string open-circuit voltage exceeds the inverter maximum MPP voltage.     </li> <li>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 inverter maximum MPP voltage. </li> </ul>	<ul> <li>Cause ID = 1 Reduce the number of PV modules connected in series to PV strings 1 and 2 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the inverter alarm disappears.</li> <li>Cause ID = 2 Reduce the number of PV modules connected in series to PV strings 3 and 4 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the inverter alarm disappears.</li> <li>Cause ID = 3 Reduce the number of PV modules connected in series to PV strings 5 and 6 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the inverter alarm disappears.</li> </ul>
106–1 11	Abnormal String 1–6	Warning	<ul> <li>Cause ID = 1</li> <li>The PV string is shielded from sunlight for a long time.</li> <li>The PV string deteriorates or is damaged.</li> </ul>	<ol> <li>Check whether the PV string current is obviously lower than the currents of other PV strings.</li> <li>If yes, check whether the PV string is shielded from sunlight.</li> <li>If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty.</li> </ol>

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> <li>Cause ID = 1         The PV string is reversely connected.     </li> <li>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.     </li> </ul>	<ul> <li>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.     </li> <li>Cause ID = 2         Check whether the number of PV modules connected in series to the inverter is small. If yes, increase the number.     </li> </ul>
200	Abnormal DC Circuit	Major	Abnormal external conditions trigger the protection for the DC circuit inside the inverter. The possible causes are as follows:  • 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.	<ol> <li>Cause ID = 3/10/11</li> <li>The inverter detects its external working conditions in real time. After the fault is rectified, the inverter automatically recovers.</li> <li>If the alarm occurs repeatedly, contact Huawei technical support.</li> <li>Cause ID = 12/15</li> <li>Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion		
202	Abnormal Major Invert Circuit	Invert conditions trigger the	Cause ID = 13/14/16  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.			
			drops dramatically or the power grid is short-circuited, which damages the internal voltage detection circuit  1. Check the inverter out short-circuits.  2. If the alarm occurs rep Huawei technical supp	Check the inverter output cable for		
			• 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.			
				The DC curr power grid e upper thresh	<ul> <li>Cause ID = 16 The DC current in the power grid exceeds the upper threshold.</li> <li>Cause ID = 20</li> </ul>	
			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.			

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
301	Abnormal Grid Voltage	Major	The power grid voltage is beyond the acceptable range. The possible causes are as follows:  • 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  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.	Cause ID = 4  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.  Cause ID = 16/19/26  1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator.  2. If you have confirmed that the grid-tied voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage and undervoltage protection thresholds.  3. Check whether the peak power grid voltage exceeds the upper threshold.  Cause ID = 28  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.  Cause ID = 29  1. Check the AC voltage.  2. Check the impedance of output phase wire A/B/C to the PE and locate the position with lower impedance and resolve the issue.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
305	Abnormal Grid Frequency	Major	<ul> <li>Cause ID = 2         The actual power grid frequency is higher than the standard requirement for the local power grid.     </li> <li>Cause ID = 4         The actual power grid frequency is lower than the standard requirement for the local power grid.     </li> <li>Cause ID = 5         The actual change rate of the power grid frequency does not meet the standard requirement for the local power grid.     </li> </ul>	<ol> <li>Cause ID = 2/4</li> <li>If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal.</li> <li>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.</li> <li>Cause ID = 5</li> <li>If the alarm occurs accidentally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal.</li> <li>If the alarm occurs frequently, check whether the power grid frequency is within the acceptable range. If no, contact the local power operator.</li> </ol>
313	Low Insulation Resistance	Major	<ul> <li>Cause ID = 1</li> <li>A short circuit occurs between the PV string and the PGND cable.</li> <li>The PV string is installed in a moist environment for a long time.</li> </ul>	<ol> <li>Check the impedance between the PV string and the PGND cable. If a short circuit occurs, rectify the fault.</li> <li>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.</li> </ol>
318	Abnormal Residual Current	Major	Cause ID = 1  The insulation resistance against the PGND cable at the input side decreases when the inverter is running, which causes an excessively high residual current.	<ol> <li>If the alarm occurs accidentally, the external circuit may be abnormal temporarily. The inverter automatically recovers after fault is rectified.</li> <li>If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low.</li> </ol>

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
321	Cabinet Overtempe rature	Major	<ul> <li>Cause ID = 1</li> <li>The inverter is installed in a place with poor ventilation.</li> <li>The ambient temperature exceeds the upper threshold.</li> <li>The internal fan works abnormally.</li> </ul>	<ol> <li>Check the ventilation and ambient temperature of the inverter installation position.</li> <li>If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation.</li> <li>If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.</li> </ol>
322	Abnormal SPI Communic ation	Major	Cause ID = 1 An unrecoverable fault occurs on a circuit inside the inverter.	Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.
326	Abnormal Grounding	Major	<ul> <li>Cause ID = 1</li> <li>The neutral wire or PGND cable does not connect to the inverter.</li> <li>When you are grounding the PV string, you do not connect an isolation transformer to the inverter output.</li> </ul>	<ol> <li>Check that the neutral wire or PGND cable properly connects to the inverter.</li> <li>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.</li> </ol>
400	System Fault	Major	Cause ID = 1/3/21/23/27 An unrecoverable fault occurs on a circuit inside the inverter.	Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.
410	Abnormal Auxiliary Power	Major	Cause ID = 4  The sampling control board has an abnormal voltage, which may be caused by the following:  The internal power chip of the sampling control board is faulty.  The detection circuit becomes faulty.	<ol> <li>When the alarm is generated, the inverter shuts down automatically.         When the fault is rectified, the inverter starts automatically.</li> <li>If the alarm occurs repeatedly, contact Huawei technical support.</li> </ol>
504	Software Version Unmatch	Minor	Cause ID = 1/2/3 During inverter software upgrade, the version of the software loaded is incorrect.	Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.

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	<ul> <li>Cause ID = 1</li> <li>The flash memory is insufficient.</li> <li>The flash memory has bad sectors.</li> </ul>	<ol> <li>Replace the monitoring board.</li> <li>If the monitoring board is built into the monitoring device, replace the monitoring device.</li> </ol>

#### ■ NOTE

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

# 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:

- 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 unavailable, put the SUN2000 inside a suitable hard carton 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	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
Max. efficiency	98.8%	98.6%	98.8%
Chinese efficiency	N/A	98.19%	98.44%
European efficiency	98.4%	98.3%	N/A

## Input

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
Max. input power $(\cos \varphi = 1)$	33800 W	33800 W	40800 W
Max. input voltage	1000 V		
Max. input current per MPPT route	23 A		
Max. short-circuit current per MPPT route	34.5 A		
Max. input current (three MPPT routes)	3 x 23 A		
Max. inverter backfeed current to the array	0 A		

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
Min. starting voltage	250 V		
MPP voltage range	250 V to 850 V		
Max. number of inputs	6		
Number of MPPT routes	3		

#### Output

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL	
Rated power (operating condition)	30000 W (480 V, 50 Hz)	30000 W (400 V, 50 Hz)	36000 W (480 V, 50 Hz)	
Max. apparent power	33000 VA	33000 VA	40000 VA	
Maximum AC output power (cos $\phi = 1$ ) <sup>a</sup>	30000 W	30000 W/33000 W	40000 W	
Rated output voltage	277 V/480 V, 3W+PE	220 V/380 V, 230 V/400 V, 240 V/415 V, 3W+N+PE or 3W+PE <sup>b</sup>	277 V/480 V, 3W+PE	
AC power frequency	50 Hz/60 Hz			
Max. output current	40 A	48 A	48 A	
Power factor	0.8 leading 0.8 lagging			
Max. total harmonic distortion	< 3%			

- Note a: The maximum output power of the SUN2000-33KTL varies depending on the chosen grid code, as described in A Power Grid Standard 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 without N line on the SUN2000 APP, SmartLogger, or NMS.

#### **Protection**

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
Input DC switch	Supported		
Anti-islanding protection	Supported		
Output overcurrent protection	Supported		
Input reverse-connection protection	Supported		
PV string fault detection	Supported		
DC surge protection	Type II		
AC surge protection	Type II		
Insulation resistance detection	Supported		
Residual current device (RCD) detection	Supported		
AC overvoltage and undervoltage protection	Supported		
AC overfrequency and underfrequency protection	Supported		

## **Display and Communication**

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL	
Display	LED indicator, Bluetooth + APP, USB data cable + APP			
RS485	Supported			

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
USB	Supported		
PLC	Optional		

#### **General Data**

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL			
Dimensions (W x H x D)	550 mm x 770 mm x 2	70 mm				
Weight	50 kg					
Operating temperature range	-25 ℃ to +60 ℃	-25 ℃ to +60 ℃				
Cooling	Natural convection					
Operating altitude	4000 m					
Relative humidity	0%-100% (non-condensing)					
Input terminal	Amphenol HH4					
Output terminal	Waterproof PG connector + OT terminal					
Protection level	IP65					
Self-consumption at night	< 1 W					
Topology	Transformerless					
Noise	< 33 dB					

## **Standards Compliance**

Technical Specifications	SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
Certification compliance	EN/IEC62109-1, EN/IEC62109-2, CE, IEC 61727, IEC 62116, IEC 61683, IEC 60068-2, UTE C 15-712-1, G59/3, PEA 2013, Resolution No. 07, NRS 097-2-1, RD661, RD1699, PO12.3	EN/IEC 61000-1, EN/IEC 61000-2, EN/IEC 61000-3, EN/IEC 61000-4, EN/IEC 62109-1, EN/IEC 62109-2, IEC 61727, IEC 62116, NB/T 32004-2013, VDE-AR-N-4105, VDE 0126-1-1, BDEW, G59/3, UTE C 15-712-1, EN 50438-Ireland, EN 50438-Turkey, AS 4777, PEA, MEA, Resolution No. 07, NRS 097-2-1	EN 61000-3, EN 61000-6, EN/IEC 62109-1, EN/IEC 62109-2, IEC 60529, CGC/GF 035-2013, GB/T 19964-2012, NB/T 32004-2013, IEC 61727, IEC 62116, EN 50438, PEA 2013, Resolution No. 07, IEC61683, IEC 60068-2



## **Power Grid Standard Codes**

#### **□** NOTE

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

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

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

No.	Power Grid Code	Description	Power Grid Voltage	Maximum Output Power
1	VDE-AR-N-4105	Germany low-voltage power grid	230 V/400 V	30 kW
2	BDEW-MV	Germany medium-voltage power grid	230 V/400 V	30 kW
3	NB/T 32004	China low-voltage power grid	220 V/380 V	33 kW
4	EN50438-NL	Netherlands low-voltage power grid	230 V/400 V	30 kW
5	UTE C 15-712-1 (A)	France low-voltage power grid	230 V/400 V	30 kW
6	UTE C 15-712-1 (B)	Islands of France 230 V 50 Hz	230 V/400 V	30 kW
7	UTE C 15-712-1 (C)	Islands of France 230 V 60 Hz	230 V/400 V	30 kW
8	VDE 0126-1-1-BU	Bulgaria low-voltage power grid	230 V/400 V	30 kW
9	G59-England	England 230 V power grid (I > 16 A)	230 V/400 V	30 kW
10	G59-Scotland	Scotland 240 V power grid (I > 16 A)	240 V/415 V	30 kW

No.	Power Grid Code	Description	Power Grid Voltage	Maximum Output Power
11	CEI0-21	Italian low-voltage power grid	230 V/400 V	30 kW
12	CEI0-16	Italian 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	Spanish low-voltage power grid (Pn < 100 kW)	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	IEC61727-60 Hz	IEC low-voltage power grid (60 Hz)	230 V/400 V	30 kW
27	Custom (50 Hz)	Reserved	230 V/400 V	30 kW
28	Custom (60 Hz)	Reserved	230 V/400 V	30 kW

Table A-2 lists the power grid standard codes which the SUN2000-30KTL-A and SUN2000-40KTL support.

Table A-2 Power grid standard codes (SUN2000-30KTL-A/SUN2000-40KTL)

No	Power Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power of SUN2000-30KTL-A	Maximum Output Power of SUN2000-40KTL
1	RD1699/661 -MV480	Spain medium-volta ge power grid (RD1699/661)	277 V/480 V	30 kW	40 kW
2	CHINA-MV 480	China medium-volta ge power grid (480 V)	277 V/480 V	30 kW	40 kW
3	CHINA-MV	China medium-volta ge power grid (380 V)	220 V/380 V	30 kW	40 kW
4	BDEW-MV 480	Germany medium-volta ge power grid	277 V/480 V	30 kW	40 kW
5	Custom-MV 480 (50 Hz)	Reserved	277 V/480 V	30 kW	40 kW
6	Custom-MV 480 (60 Hz)	Reserved	277 V/480 V	30 kW	40 kW
7	G59-Englan d-MV480	UK 480 V Medium-volta ge power grid (I > 16 A)	277 V/480 V	30 kW	40 kW
8	IEC61727- MV480	IEC medium-volta ge power grid (50 Hz)	277 V/480 V	30 kW	40 kW
9	UTE C 15-712-1-M V480	France medium-volta ge power grid	277 V/480 V	30 kW	40 kW
10	TAI-PEA-M V480	Thailand medium-volta ge power grid (PEA)	277 V/480 V	30 kW	40 kW
11	TAI-MEA- MV480	Thailand medium-volta ge power grid (MEA)	277 V/480 V	30 kW	40 kW
12	EN50438-D K-MV480	Denmark medium-volta ge power grid	277 V/480 V	30 kW	40 kW

No ·	Power Grid Code	Description	Rated Power Grid Voltage	Maximum Output Power of SUN2000-30KTL-A	Maximum Output Power of SUN2000-40KTL
13	Japan (50 Hz)	Japan power grid (50 Hz)	277 V/480 V	30 kW	40 kW
14	Japan standard (60 Hz)	Japan power grid (60 Hz)	277 V/480 V	30 kW	40 kW
15	EN50438-T R-MV480	Turkey medium-volta ge power grid	277 V/480 V	30 kW	40 kW
16	C11/C10-M V480	Belgium medium-volta ge power grid	277 V/480 V	30 kW	40 kW
17	Philippines- MV480	Philippines medium-volta ge power grid	277 V/480 V	30 kW	40 kW
18	AS4777-M V480	Australia medium-volta ge power grid	277 V/480 V	30 kW	40 kW
19	NRS-097-2- 1-MV480	South Africa medium-volta ge power grid	277 V/480 V	30 kW	40 kW
20	IEC61727-6 0 Hz-MV480	IEC medium-volta ge power grid (60 Hz)	277 V/480 V	30 kW	40 kW
21	ANRE-MV4 80	Romania medium-volta ge power grid	277 V/480 V	30 kW	40 kW
22	PO12.3-MV 480	Spain medium-volta ge power grid (PO12.3)	277 V/480 V	30 kW	40 kW
23	EN50438_I E-MV480	Ireland medium-volta ge power grid	277 V/480 V	30 kW	40 kW

## B Acronyms and Abbreviations

 $\mathbf{A}$ 

AC alternating current

**ACDU** AC distribution unit

 $\mathbf{C}$ 

**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
RCD residual current device

V

WEEE waste electrical and electronic equipment