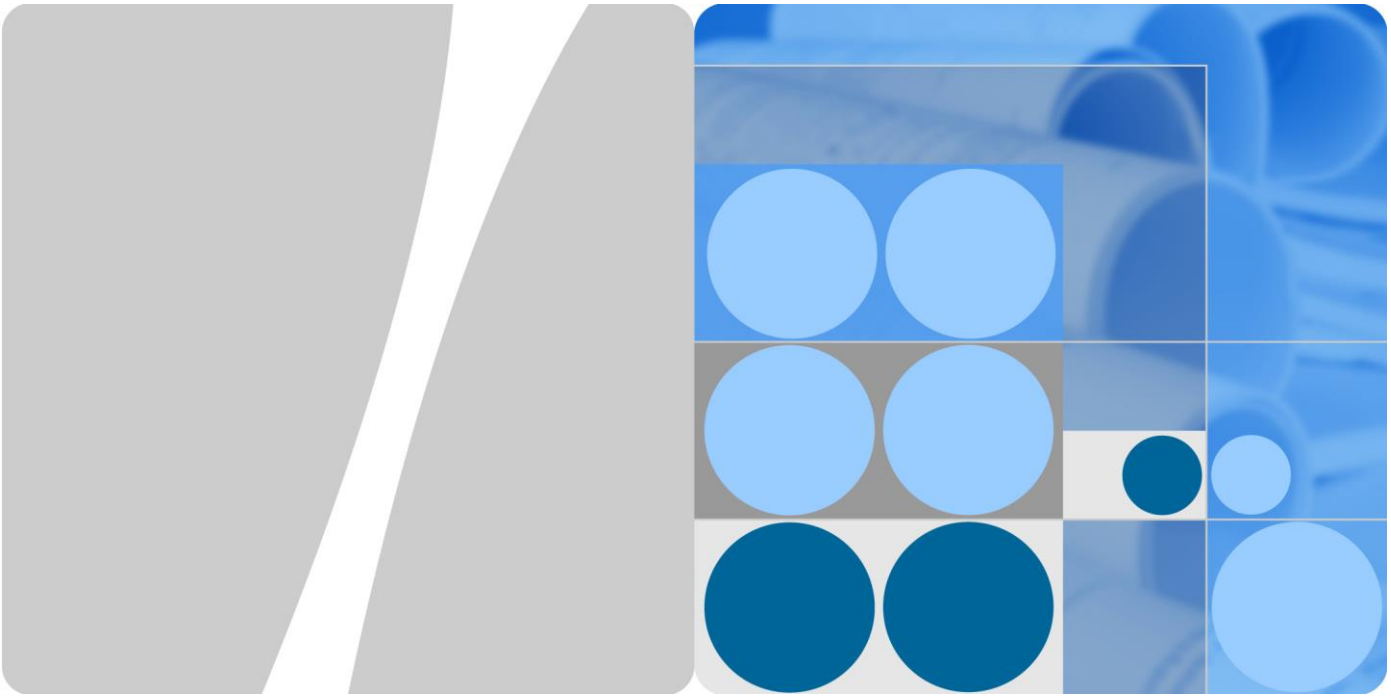

SUN2000-(33KTL, 36KTL, 40KTL)-US

User Manual

Issue 04

Date 2017-11-06

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About This Document

Purpose

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

Intended Audience

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

Symbol Conventions

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

Symbol	Description
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

Issue 04 (2017-11-06)

Updated 5.4 Connecting AC Output Power Cables.

Issue 03 (2017-07-15)

Updated 5.2.1 Grounding the SUN2000 over a PE Point.

Updated 10 Technical Specifications.

Issue 02 (2017-06-09)

Added the description of supplying the mounting bracket separately to 4.5 Installing the Mounting Bracket.

Added the description of preparing MC4 DC terminals to 5.5 Connecting DC Input Power Cables.

Issue 01 (2017-04-01)

This issue is the first official release.

Contents

1 Safety Precautions

NOTICE

Before performing operations, read through this manual and follow all the precautions to prevent accidents. The safety precautions provided in this document do not cover all the safety precautions. Huawei shall not be liable for any consequence caused by the violation of the safety operation regulations and design, production, and usage standards.

Declare

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

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

Important Safety Instructions

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

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

Personnel Requirements

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

- Operation personnel should receive professional training.

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

Sign Protection

- Do not tamper with any warning signs on the SUN2000 chassis because these signs contain important information about safe operation.
- Do not tamper with the nameplate on the SUN2000 chassis because it contains important product information.

Installation

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

Cable Connections

DANGER

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

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

Operation

DANGER

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

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

Maintenance and Replacement

DANGER

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

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

2 Overview

2.1 Product Overview

Function

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

Model

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

Figure 2-1 Model number description

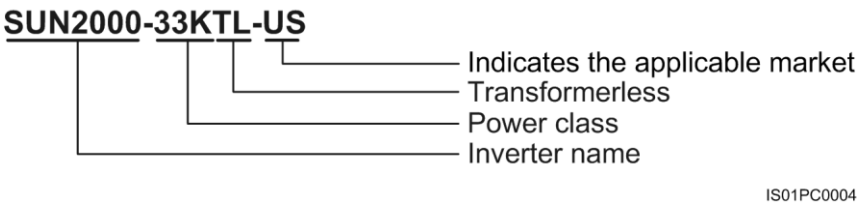


Table 2-1 describes the rated output power and voltage of all models of SUN2000s.

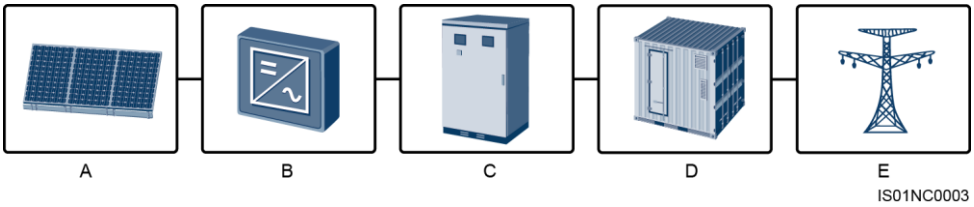
Table 2-1 SUN2000 models and corresponding rated output power and voltage

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

Network Application

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

Figure 2-2 Network application



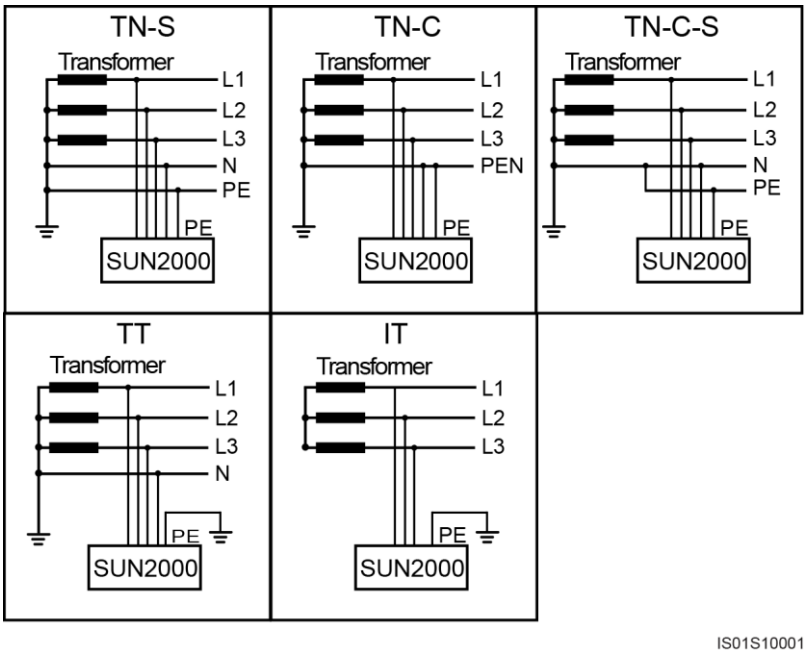
(A) PV string (B) SUN2000 (C) ACDU

(D) Isolation transformer (E) Power grid

Power Grid Types

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

Figure 2-3 Power grid types

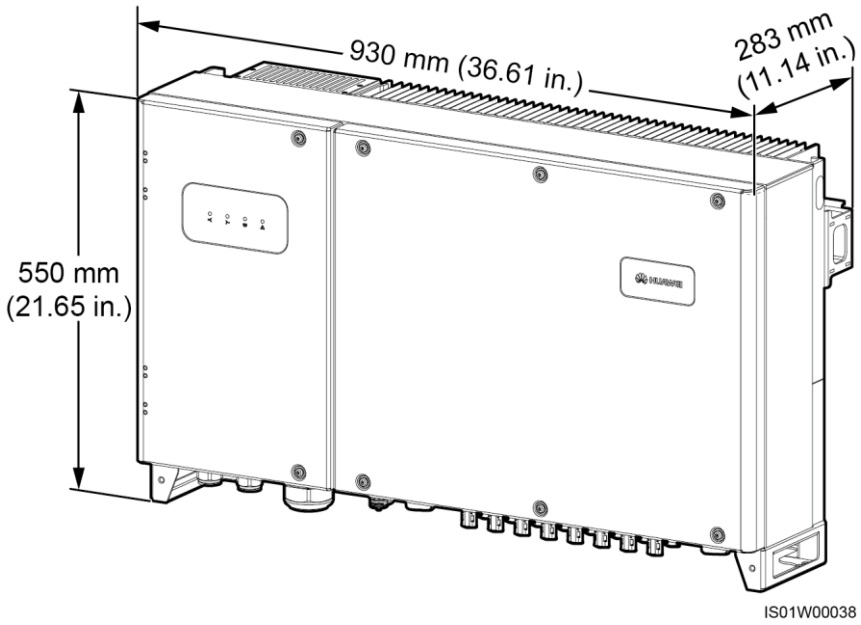


2.2 Appearance

SUN2000 Dimensions

Figure 2-4 shows the SUN2000 dimensions.

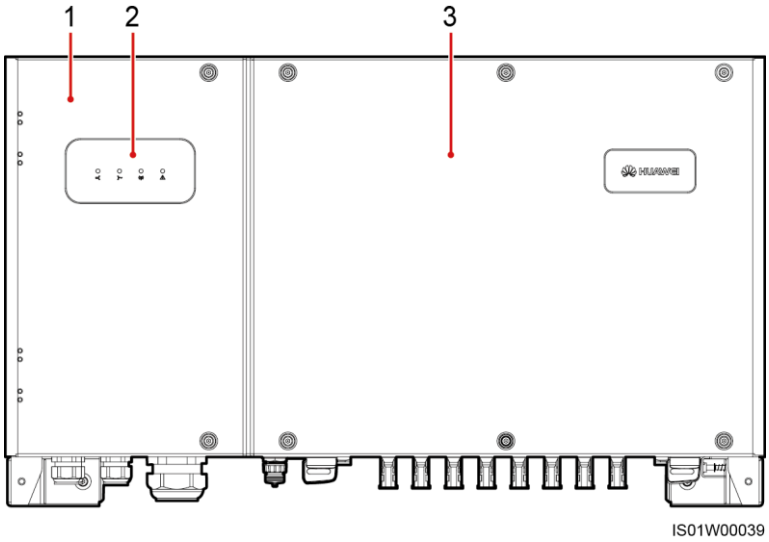
Figure 2-4 SUN2000 dimensions (including the mounting plate)



Front View

Figure 2-5 shows the SUN2000 front view.

Figure 2-5 SUN2000 front view



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

Table 2-2 describes the LED indicators.

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

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

Indicator	Status		Meaning
	Green off		The SUN2000 has not received data over RS485/PLC communication for 10 seconds.
Alarm/Maintenance indicator	Alarm status	Blinking red at long intervals (on for 1s and then off for 4s)	A warning alarm is generated.
		Blinking red at short intervals (on for 0.5s and then off for 0.5s)	A minor alarm is generated.
		Steady red	A major alarm is generated.
	Local maintenance status	Blinking green at long intervals (on for 1s and then off for 1s)	Local maintenance is in progress.
		Blinking green at short intervals (on for 0.125s and then off for 0.125s)	Local maintenance fails.
		Steady green	Local maintenance succeeds.

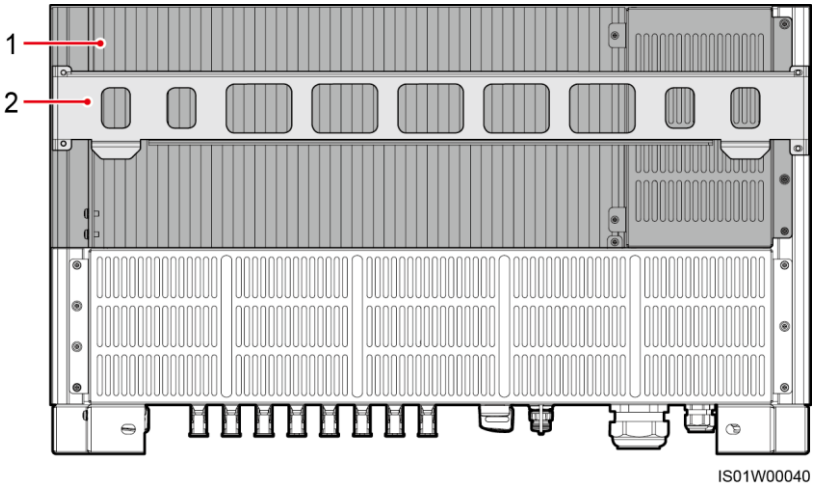
NOTE

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

SUN2000 Rear View

Figure 2-6 shows the SUN2000 rear view.

Figure 2-6 SUN2000 rear view

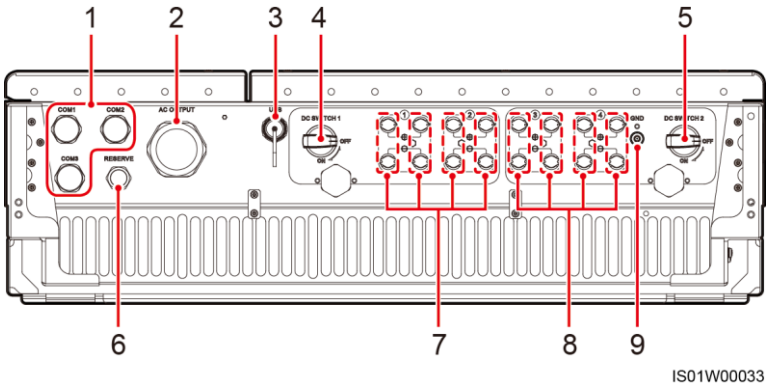


(1) Heat sink (2) Mounting plate

SUN2000 bottom view

Figure 2-7 shows the SUN2000 bottom view.

Figure 2-7 SUN2000 bottom view



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

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

NOTE

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

2.3 Label Description

Warning Signs

Warning signs are available on the SUN2000 side, as described in Table 2-3.

Table 2-3 Warning signs

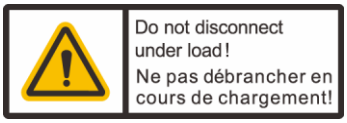
Symbol	Name	Meaning
	Electric shock	• Lethal voltages 1000 V DC. Keep out. • No user serviceable parts inside. Only trained service personnel are allowed access. • Both AC and DC voltage sources are terminated inside this equipment. Each circuit must be disconnected before servicing. • When the photovoltaic array is exposed to light, it supplies DC voltage to this equipment. • The DC conductors of this photovoltaic system are ungrounded and may be energized. • The DC conductors of this photovoltaic system are normally ungrounded but will become intermittently grounded without indication when the SUN2000 measures the PV array isolation.
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.

Symbol	Name	Meaning
	Delay discharge	• High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. • Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.
	Transformerless inverter	The SUN2000 output does not pass through an isolation transformer.

Symbols

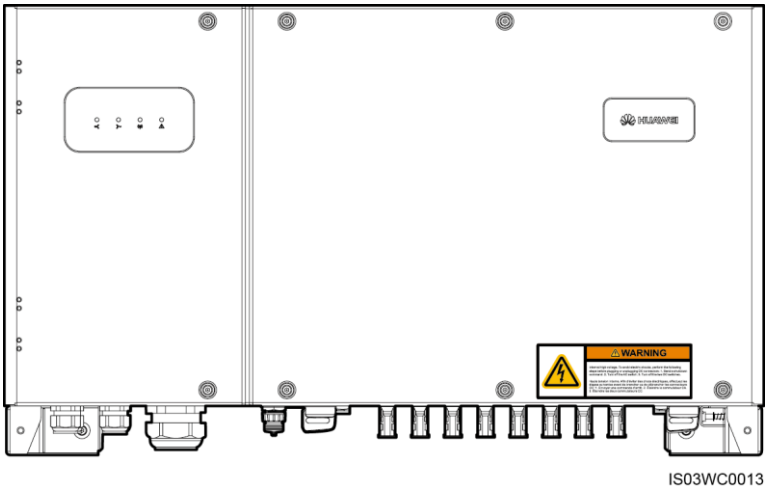
Table 2-4 describes the labels on the SUN2000 chassis and their meanings.

Table 2-4 Label description

Symbol	Name	Meaning
	PE point	Indicates the position for connecting the PE cable.
	Operation warning	Do not remove the DC input connector when the SUN2000 is running.
	DC terminal operation warning[a]	High voltage exists after the SUN2000 is powered on. To avoid electric shocks, perform the following system power-off operations before plugging or unplugging DC input connectors of the SUN2000: 1. Send a shutdown command. 2. Turn off the downstream AC switch. 3. Turn off the two DC switches at the bottom.
	SUN2000 serial number label	Indicates the SUN2000 serial number.

Symbol	Name	Meaning
Note a: Fittings delivered with the SUN2000 contain the label of DC terminal operation warning. You are advised to attach the label at the bottom of the SUN2000 front side, as shown in Figure 2-8. You can also select an appropriate place for attaching the label based on site requirements.		

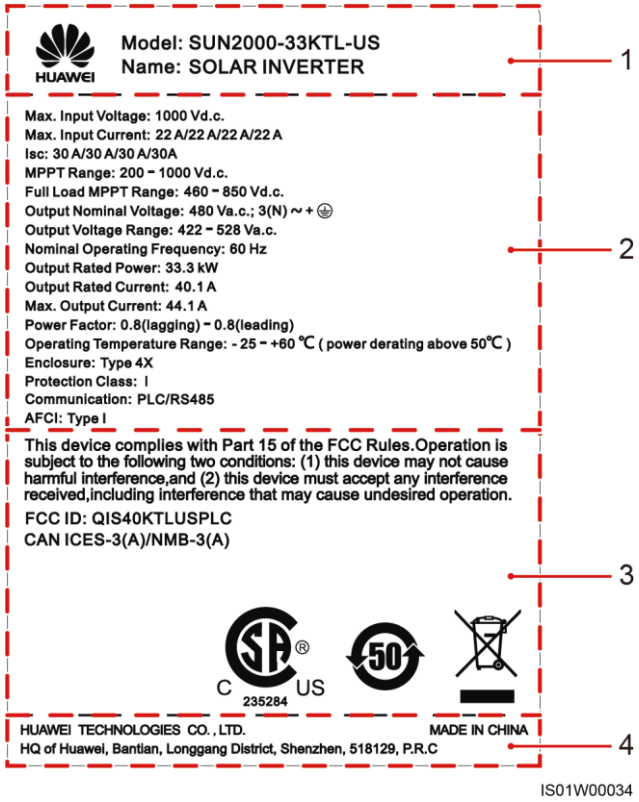
Figure 2-8 Place for attaching



Nameplate

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

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



(1) Trademark and product model (2) Important technical specifications

(3) Compliance symbols (4) Company name and country of manufacture

NOTE

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

Table 2-5 describes the compliance symbols.

Table 2-5 Compliance symbols

Symbol	Name	Meaning
This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions: (1) this device may not cause harmful interference,and (2) this device must accept any interference received,including interference that may cause undesired operation.	American FCC Part 15B certification	The SUN2000 complies with FCC Part 15B certification standards.
FCC ID: QIS40KTLUSPLC	American FCC Part 15G certification	The SUN2000 complies with FCC Part 15G certification standards.
CAN ICES-3(A)/NMB-3(A)	Canadian IC certification	The SUN2000 complies with ICES certification standards.

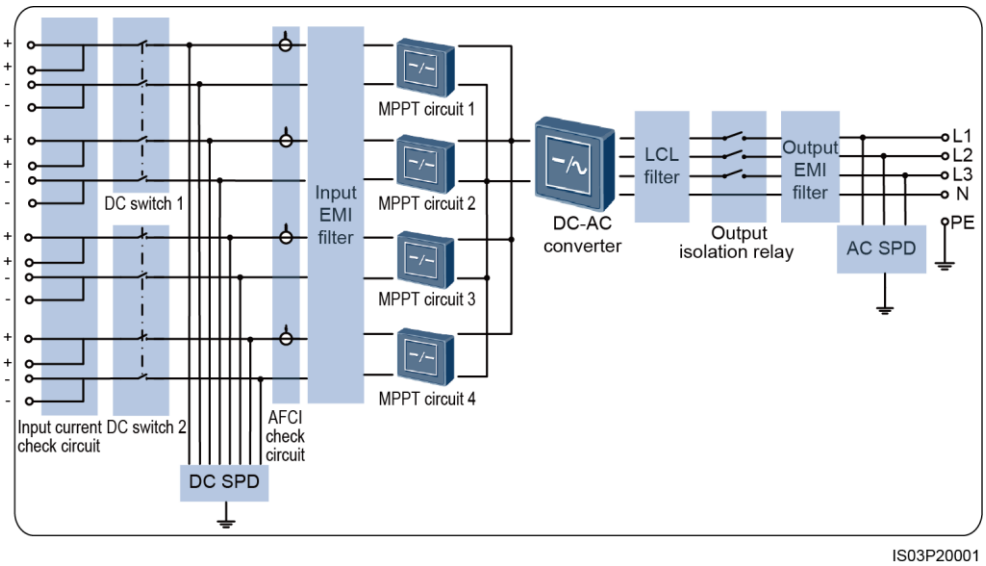
Symbol	Name	Meaning
	CSA certification of America and Canada	The SUN2000 complies with CSA certification standards.
	EFUP label	The SUN2000 does not pollute the environment during the specified period.
	WEEE label	Do not dispose of the SUN2000 as household garbage.

2.4 Working Principle

Conceptual Diagram

The SUN2000 receives inputs from eight PV strings. Then the inputs are grouped into four MPPT routes inside the SUN2000 to track the maximum power point of the PV strings. The DC power is then converted into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides. Figure 2-10 shows the SUN2000 conceptual diagram.

Figure 2-10 SUN2000 conceptual diagram



Working Modes

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

Figure 2-11 SUN2000 working modes

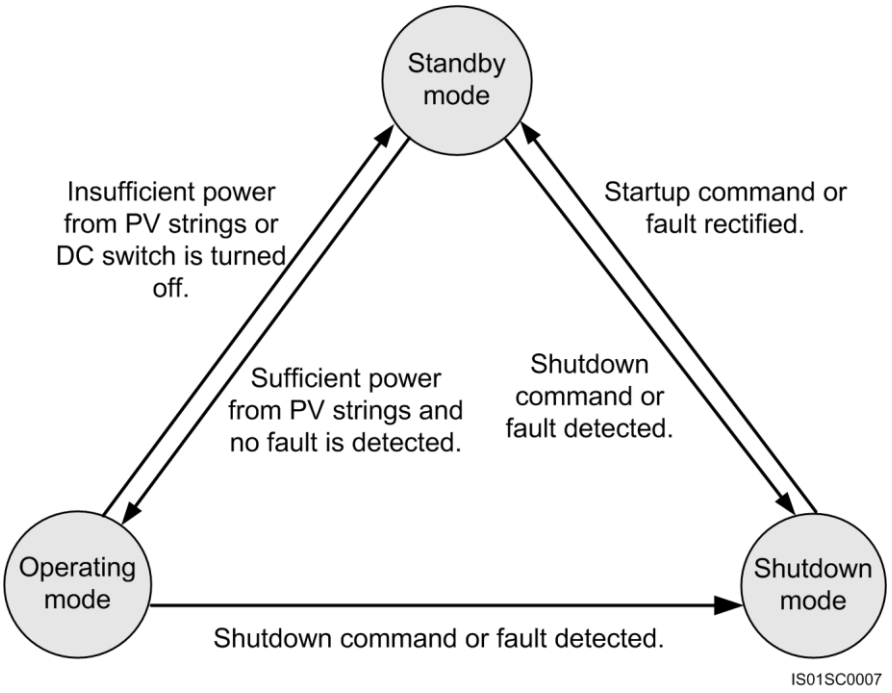


Table 2-6 describes the three working modes shown in Figure 2-11.

Table 2-6 Working mode description

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

Working Mode	Description
Shutdown	• In standby or operating mode, the SUN2000 enters the shutdown mode after detecting a fault or shutdown command. • In shutdown mode, the SUN2000 enters the standby mode after detecting a startup command or that a fault is rectified.

3 SUN2000 Storage

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

- Put the SUN2000 in the original package. Keep the desiccant and seal it using the adhesive tape.
- Keep the storage temperature at –40°C to +70°C (–40°F to +158°F) and the humidity at 5%–95% RH.
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of five SUN2000s can be stacked.
- Periodic inspections are required during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

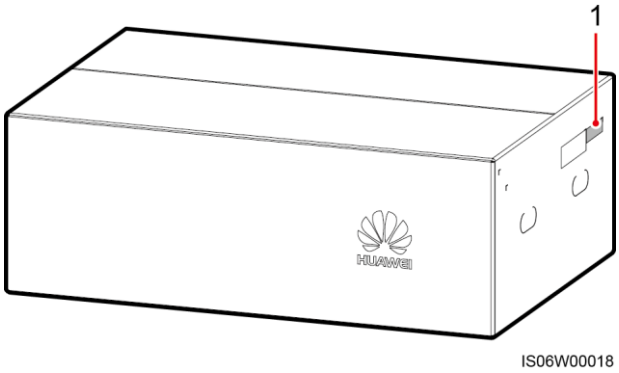
4 System Installation

4.1 Checking Before Installation

Outer Packing Materials

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

Figure 4-1 Position of the inverter model label



(1) Position of the model label

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

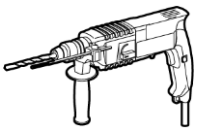
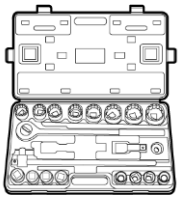
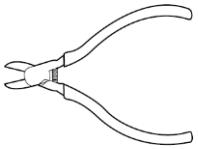
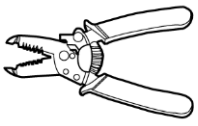
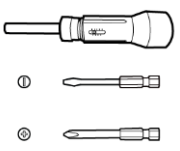
Package Contents

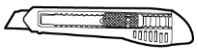
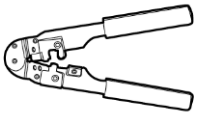
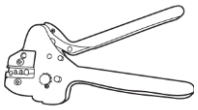
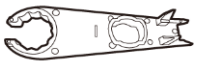
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

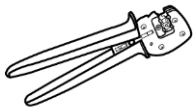
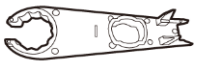
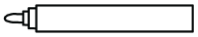
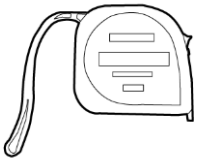
NOTE
For details about the number of contents, see the *Packing List* in the packing case.

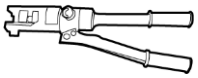
4.2 Tools

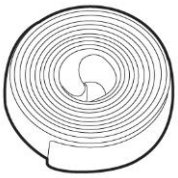
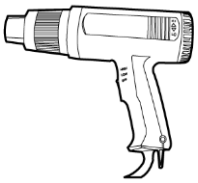
Prepare tools required for installation and cable connections.

Tool	Model	Function
Hammer drill 	Drill bit: Φ14 mm (0.54 in.) and Φ16 mm (0.63 in.)	• Φ14 mm (0.54 in.) drill bit: Drills holes in supports. • Φ16 mm (0.63 in.) drill bit: Drills holes in walls.
Socket wrench set 	Works with a torque wrench.	Secures bolts and AC output terminals.
Torque wrench 	N/A	Secures bolts and AC output terminals.
Diagonal pliers 	N/A	Cut cable ties.
Wire stripper 	N/A	Peels cable jackets.
Torque screwdriver 	• Flat head: M3 • Phillips head: M4	• Connects cables to the terminal block. • Secure the AC filter.

Tool	Model	Function
Rubber mallet 	N/A	Hammers expansion bolts into holes.
Utility knife 	N/A	Removes packages.
Cable cutter 	N/A	Cuts power cables.
RJ45 crimping tool 	N/A	Prepares RJ45 connectors for communications cables.
Amphenol Helios H4 crimping tool 	H4TC0001 Manufacturer: AMPHENOL	Crimps Amphenol Helios H4 metal terminals when preparing DC input power cables.
Amphenol Helios H4 open-end spanner 	H4TW0001 Manufacturer: AMPHENOL	Removes Amphenol Helios H4 DC connectors from the SUN2000.

Tool	Model	Function
MC4 crimping tool 	PV-CZM-19100	Crimps MC4 metal terminals when preparing DC input power cables.
MC4 open-end spanner 	PV-MS open-end spanner	Removes MC4 DC connectors from the SUN2000.
Vacuum cleaner 	N/A	Cleans up dust after drilling holes.
Multimeter 	DC voltage measurement range ≥ 1000 V DC	Measures voltages.
Marker 	N/A	Marks signs.
Measuring tape 	N/A	Measures distances.

Tool	Model	Function
Level 	N/A	Levels hole positions.
Protective gloves 	N/A	Protect your hands during installation.
Insulation gloves 	Operating voltage ≥ 2000 V	Protect you from electric shocks.
Safety goggles 	N/A	Protect your eyes during hole drilling.
Anti-dust respirator 	N/A	Protects you from dust during hole drilling.
Hydraulic pliers 	N/A	Crimp OT terminals.

Tool	Model	Function
Heat shrink tubing 	N/A	Wraps the cable crimping area of an OT terminal.
Heat gun 	N/A	Heat-shrinks a tube.
Cable tie 	N/A	Binds cables.

NOTICE

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

4.3 Determining the Installation Position

Basic Requirements

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

Installation Environment Requirements

The SUN2000 must be installed in a well ventilated environment to ensure good heat dissipation. When installed under direct sunlight, performance de-rate may be initiated due to additional temperature rise. Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Carrier Requirements

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

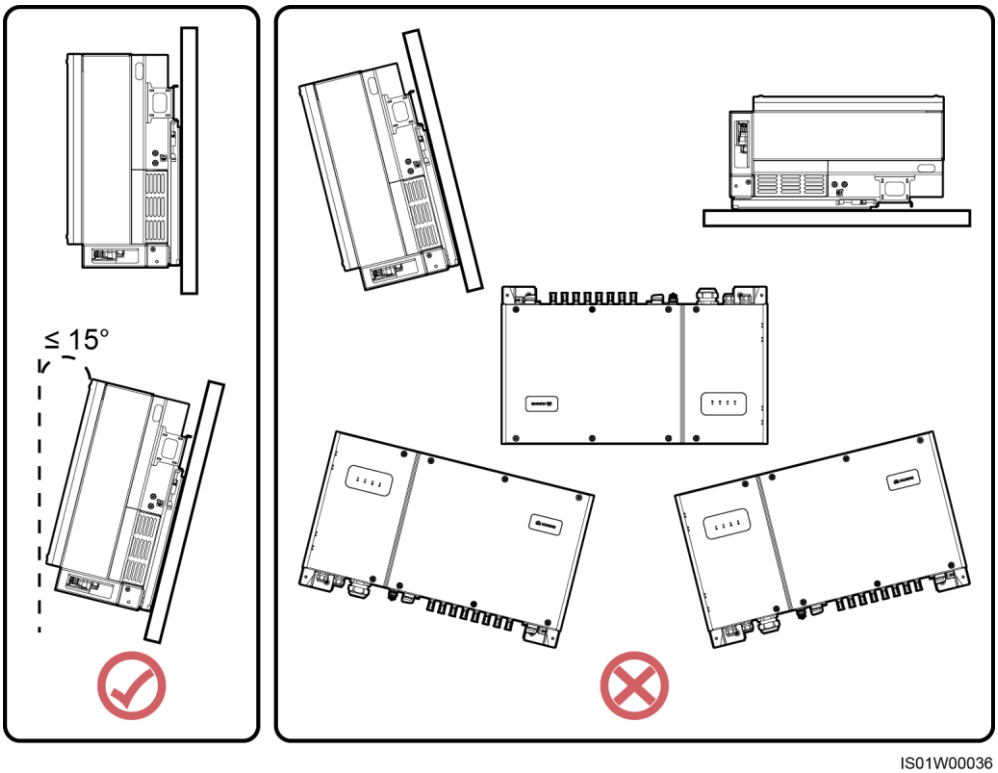
Installation Angle Requirements

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

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

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

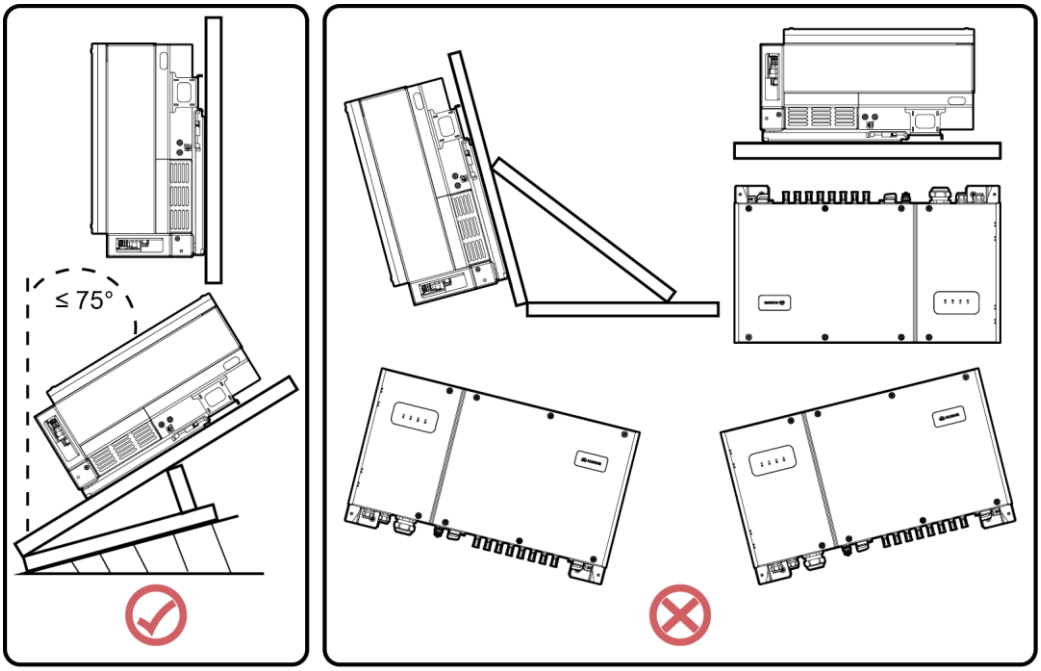
Figure 4-2 Wall-mounted installation and normal support-mounted installation



Tilt requirements for installing a SUN2000 on a tilted support:

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

Figure 4-3 Tilted support-mounted installation



NOTE

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

Installation Space Requirements

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

Figure 4-4 Installation space requirements (non-back-to-back installation)

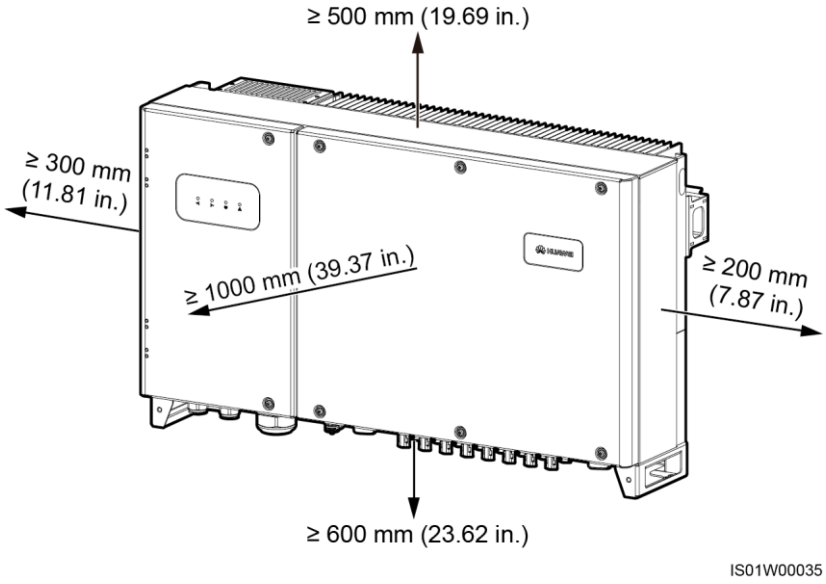
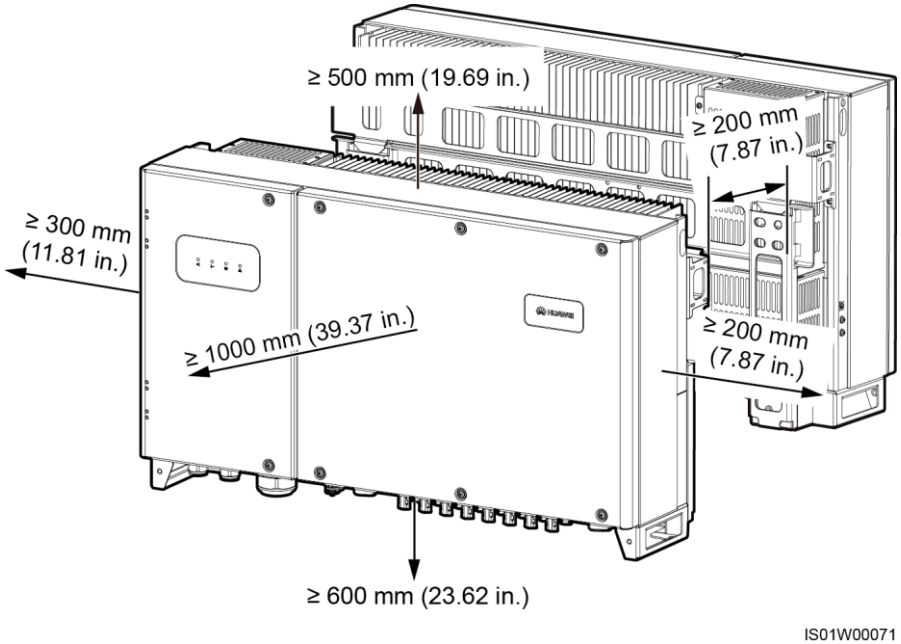


Figure 4-5 Installation space requirements (back-to-back installation)



NOTE

For ease of installing the SUN2000 on the mounting bracket, connecting cables to the bottom of the SUN2000, and maintaining the SUN2000 in future, it is recommended that the bottom clearance be between 600 mm (23.62 in.) and 730 mm (28.74 in.). If you have any questions about the distance, consult the local technical support engineers.

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

Figure 4-6 Horizontal installation mode (recommended)

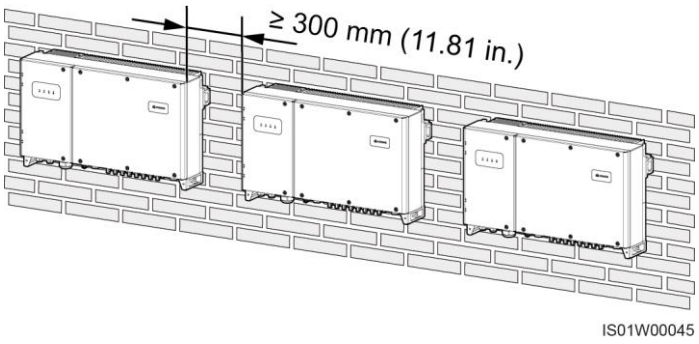


Figure 4-7 Triangle installation mode (recommended)

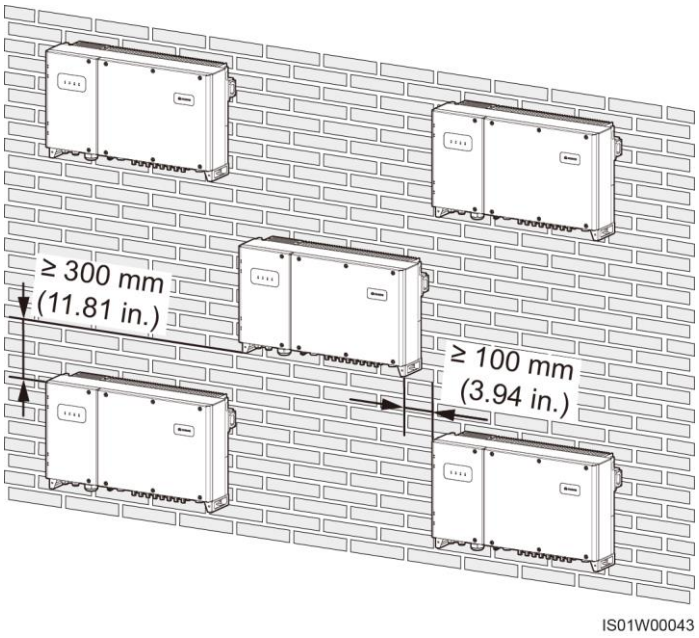
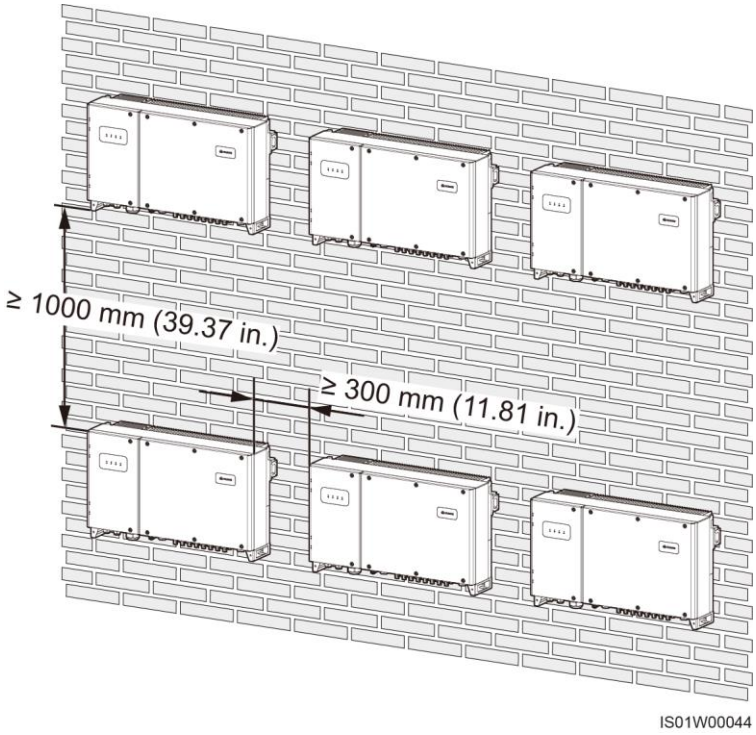


Figure 4-8 Stacked installation mode (not recommended)



4.4 Moving the Inverter

Context

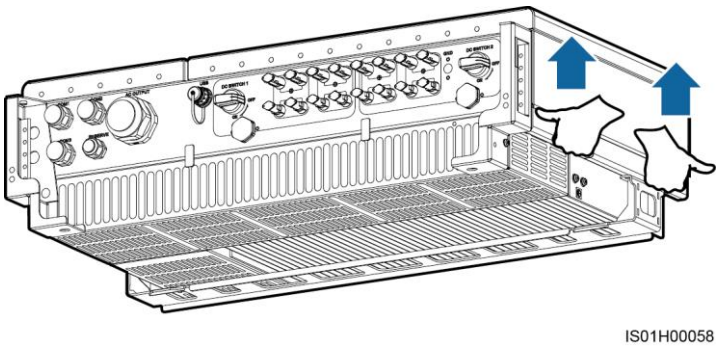
CAUTION

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

Procedure

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

Figure 4-9 Lifting the SUN2000



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

----End

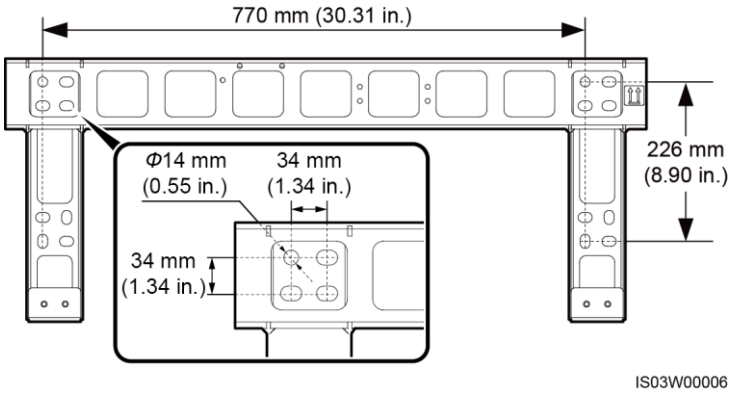
4.5 Installing the Mounting Bracket

The mounting bracket is supplied with the SUN2000 or separately.

NOTICE

The mounting bracket has four groups of tapped holes, each group containing four tapped holes. Mark any hole in each group based on site requirements and mark four holes in total. Two round holes are preferred.

Figure 4-10 Mounting bracket dimensions

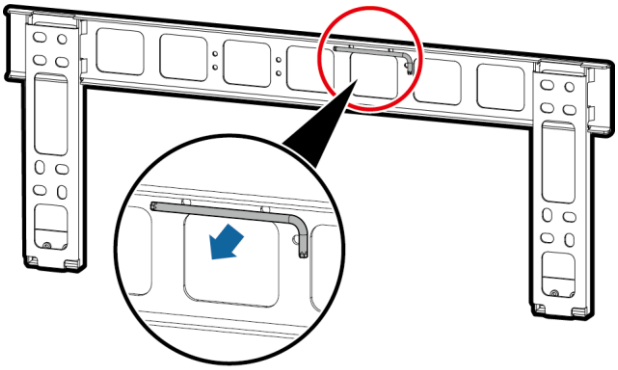


Before installing the mounting bracket, check whether there is a security torx wrench on the mounting bracket.

- If yes, remove the security torx wrench from the mounting bracket and save it for later use. Figure 4-11 shows the position for storing the security torx wrench.

- If no, obtain a security torx wrench from the SUN2000 fitting bag.

Figure 4-11 Position for storing a security torx wrench

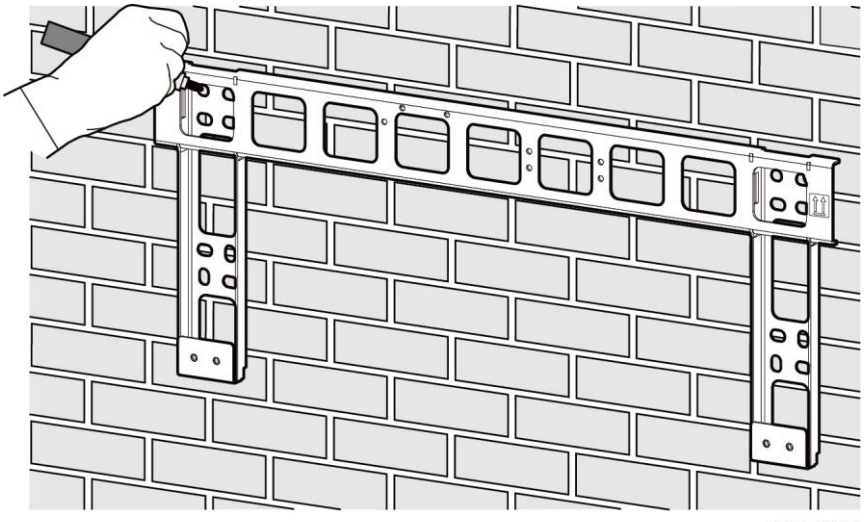


4.5.1 Wall-mounted Installation

Procedure

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

Figure 4-12 Determining hole positions



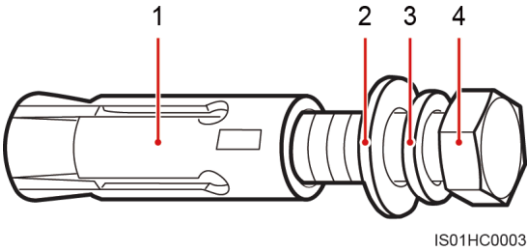
Step 2 Drill holes using a hammer drill and install the supplied expansion bolts.

DANGER

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

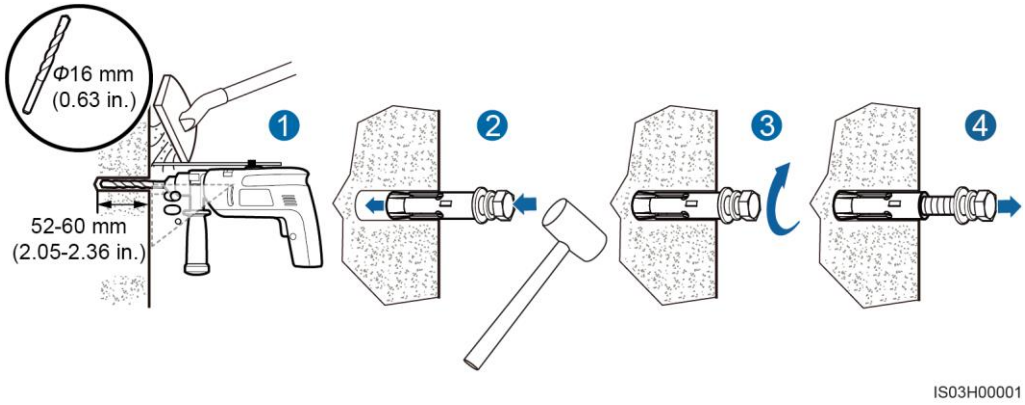
An expansion bolt contains four parts, as shown in Figure 4-13.

Figure 4-13 Expansion bolt components



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

Figure 4-14 Drilling a hole and installing an expansion bolt



NOTICE

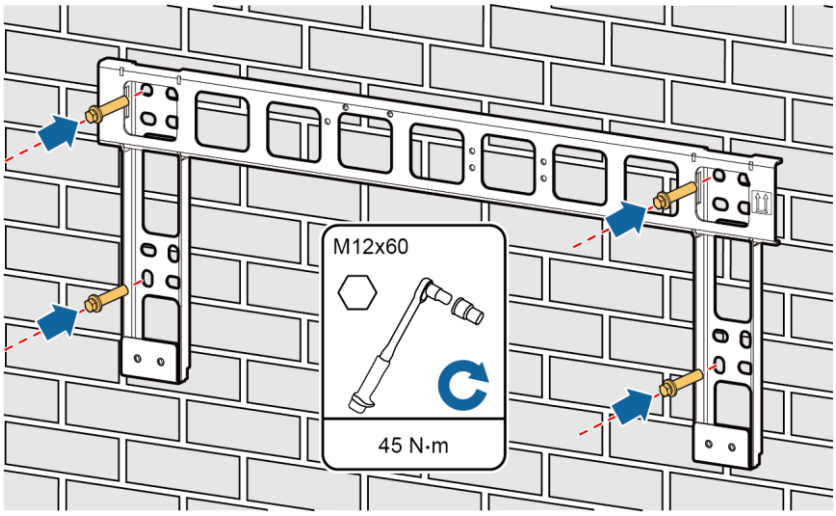
- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Wipe away any dust in or around the holes and measure the hole distance. If the holes are inaccurately positioned, drill holes again.
- Level the head of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.

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

4. Remove the nut, spring washer, and flat washer.

Step 3 Align the mounting bracket holes with the drilled holes, insert expansion bolts into the holes through the mounting bracket, and then tighten the expansion bolts.

Figure 4-15 Securing a mounting bracket



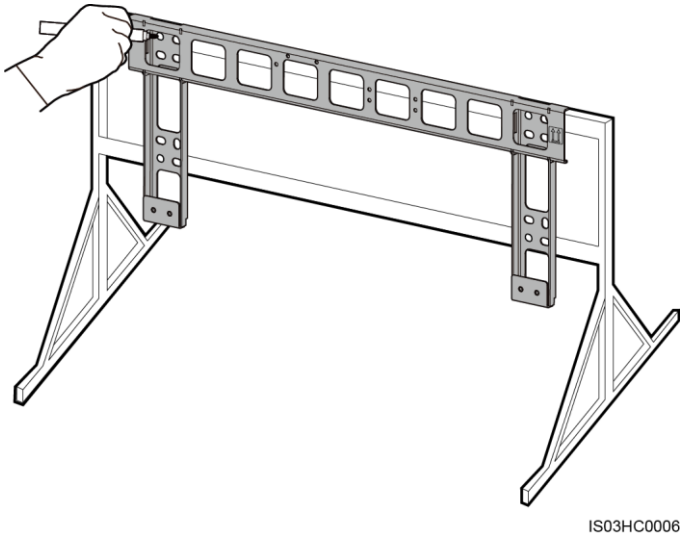
----End

4.5.2 Common Support-mounted Installation

Procedure

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

Figure 4-16 Determining hole positions

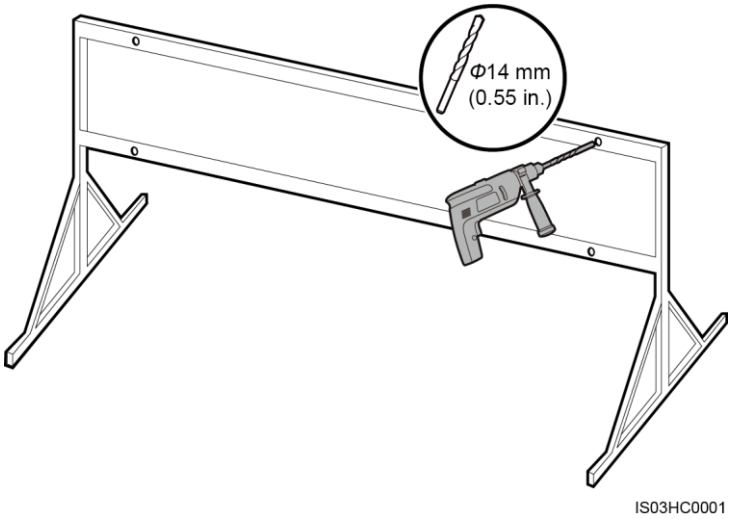


Step 2 Drill holes using a hammer drill.

NOTE

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

Figure 4-17 Drilling holes

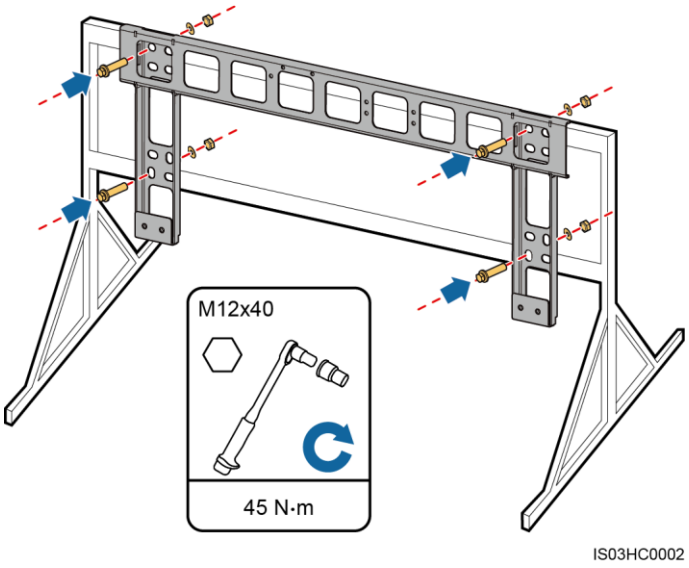


Step 3 Align the mounting bracket holes with the drilled holes, insert supplied bolt assemblies (flat washers, spring washers, and bolts) into the holes through the mounting bracket, and secure them using stainless steel nuts and flat washers.

NOTE

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

Figure 4-18 Securing a mounting bracket



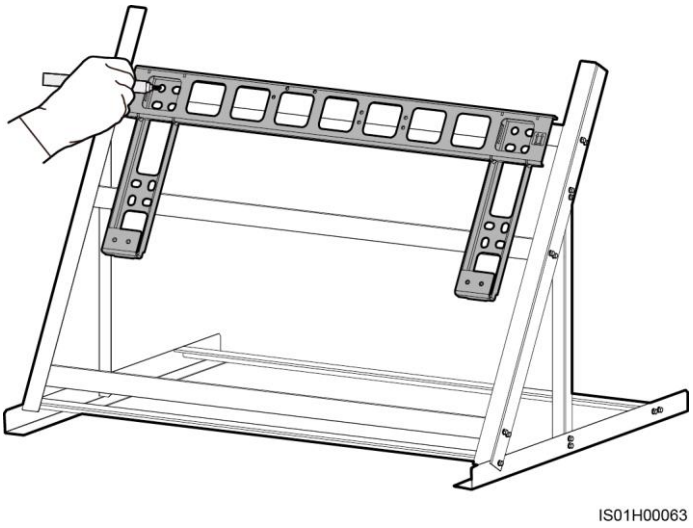
----End

4.5.3 Tilted Support-mounted Installation

Procedure

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

Figure 4-19 Determining hole positions

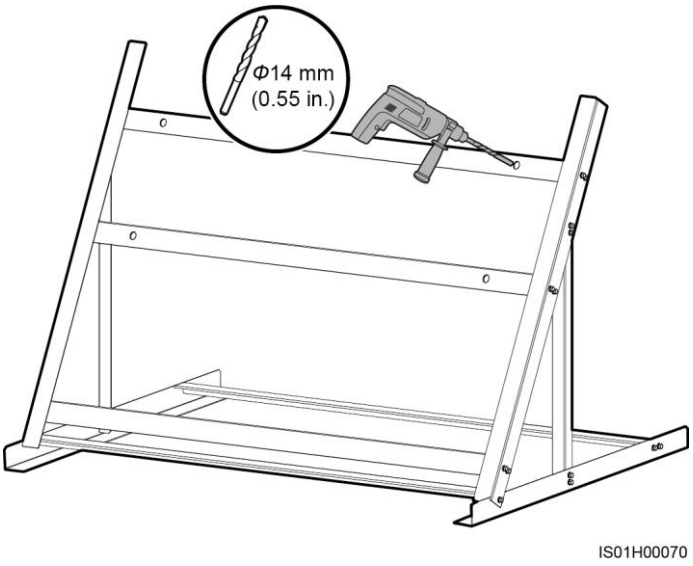


Step 2 Drill holes using a hammer drill.

NOTE

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

Figure 4-20 Drilling holes

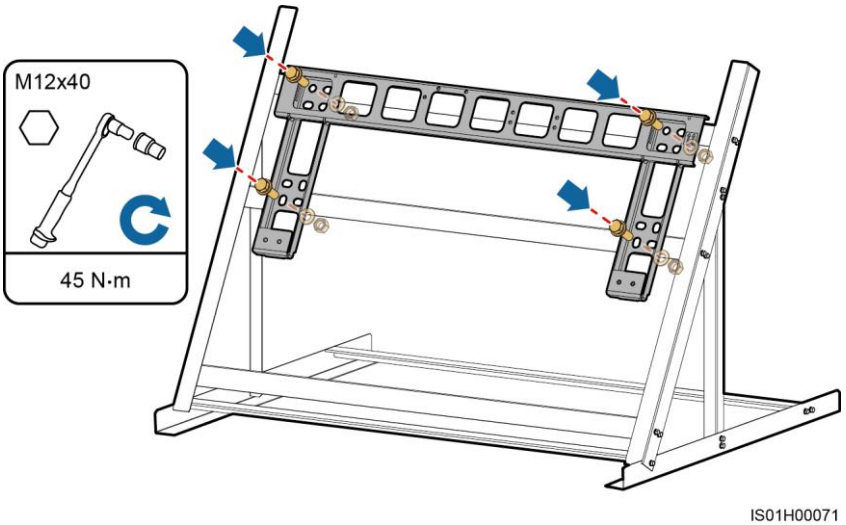


Step 3 Align the mounting bracket holes with the drilled holes, insert supplied bolt assemblies (flat washers, spring washers, and bolts) into the holes through the mounting bracket, and secure them using stainless steel nuts and flat washers.

NOTE

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

Figure 4-21 Securing a mounting bracket



----End

4.6 Installing the SUN2000

Procedure

Step 1 If the installation position is low and you can mount the SUN2000 onto the mounting bracket, go to Step 3 and then Step 5.

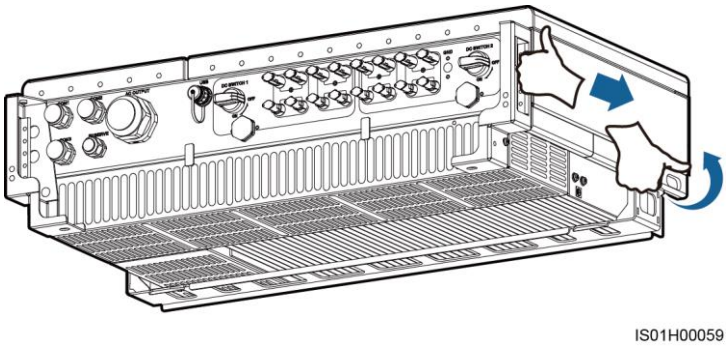
Step 2 If the installation position is high and you cannot mount the SUN2000 onto the mounting bracket, perform Step 3 to Step 6.

Step 3 Ensure that two people lift the SUN2000 and turn it upright. Lift the SUN2000 by grasping the handle at the bottom of the SUN2000 with one hand and the handle at the top with the other.

CAUTION

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

Figure 4-22 Lifting a SUN2000

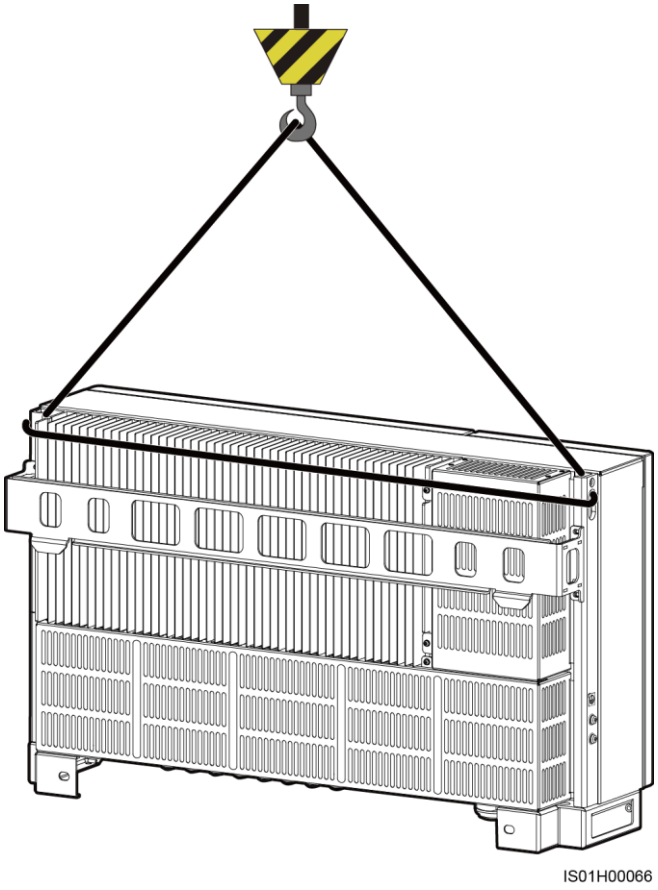


Step 4 Run a rope that is strong enough to bear the SUN2000 through the lifting eyes and hoist the SUN2000.

NOTICE

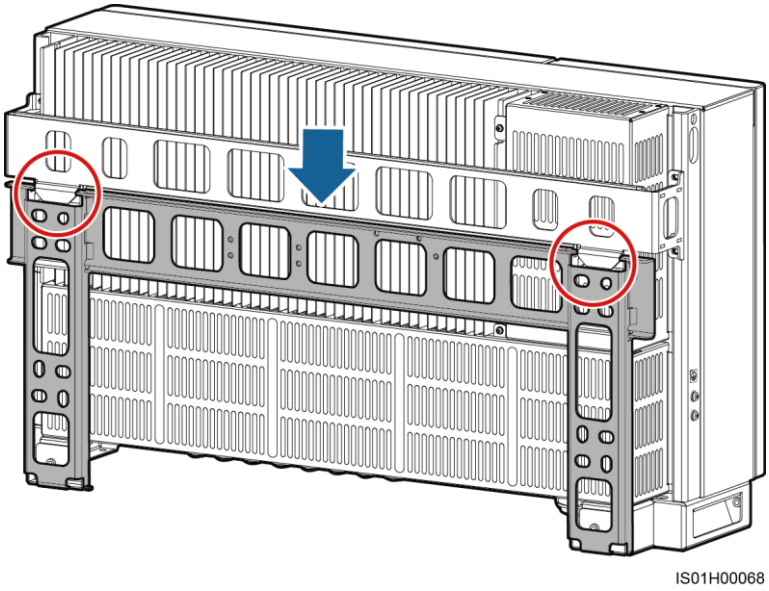
When hoisting the SUN2000, keep balance to protect the SUN2000 from colliding with the wall or other objects.

Figure 4-23 Hoisting a SUN2000



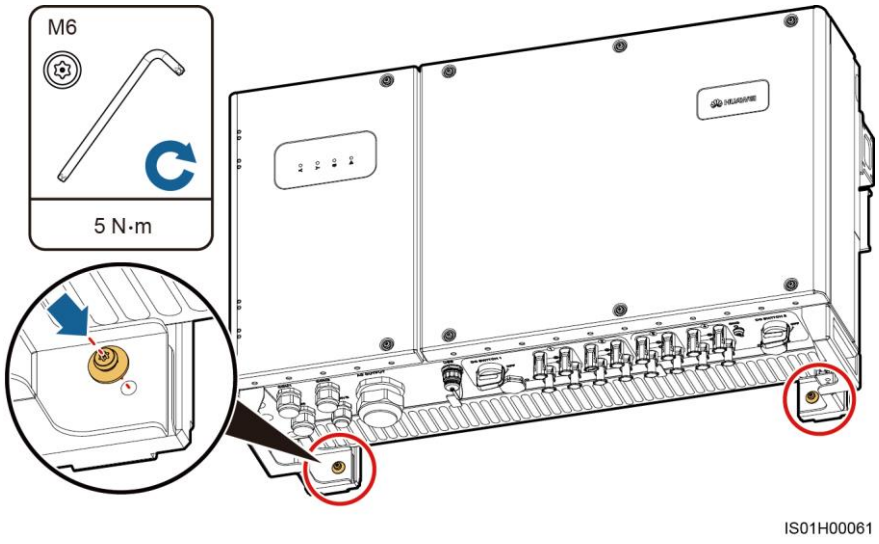
Step 5 Install the SUN2000 on the mounting bracket and level the SUN2000 chassis with the mounting bracket.

Figure 4-24 Mounting the SUN2000 onto the mounting bracket



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

Figure 4-25 Tightening security torx screws



----End

4.7 (Optional) Installing the DC Protection Shroud

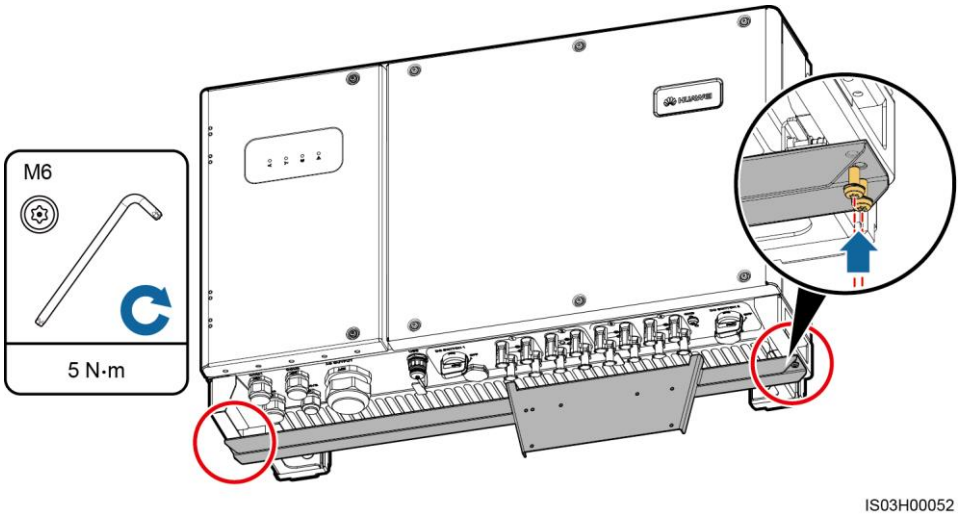
Context

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

Procedure

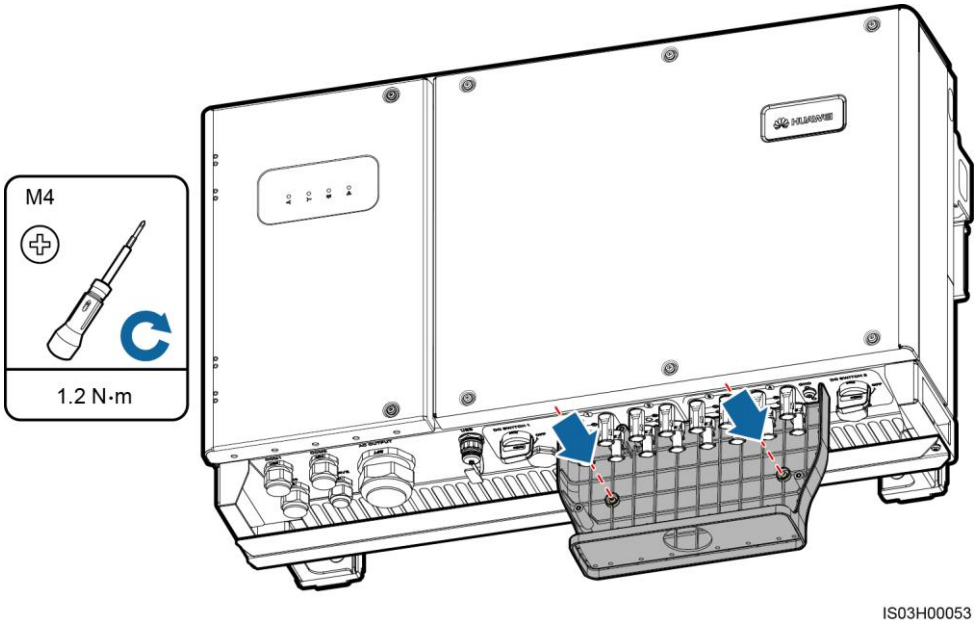
Step 1 Install the protection shroud bracket.

Figure 4-26 Installing a bracket



Step 2 Install the protection shroud rear panel.

Figure 4-27 Installing a rear panel



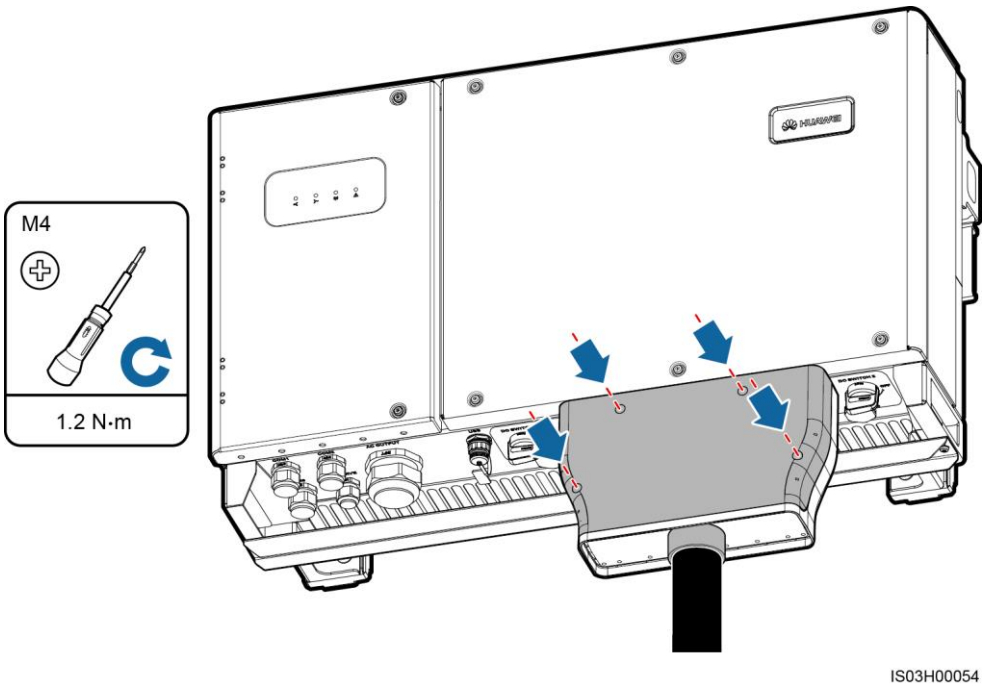
----End

Follow-up Procedure

Before connecting cables, prepare a 2-inch pipe and perform the following operations. Failing to do so may cause reworking.

1. Secure the pipe fitting to the enclosure using the nut delivered with the pipe.
2. Route the ground cable that needs to connect to the ground point on the PV side and the DC input power cable through the conduit and then fittings.
3. Connect the ground cable to the ground point on the PV side (see 5.2.2 PV Side Grounding).
4. Connect the DC input power cable by following the instructions in 5.5 Connecting DC Input Power Cables.
5. Connect the conduit and fitting of the pipe.
6. Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fitting are secured reliably, and seal the cable hole.
7. Clear foreign matter from the protection shroud.
8. Install the front cover of the protection shroud.

Figure 4-28 Installing a front cover



5 Connecting Cables

Precautions

DANGER

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

NOTE

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

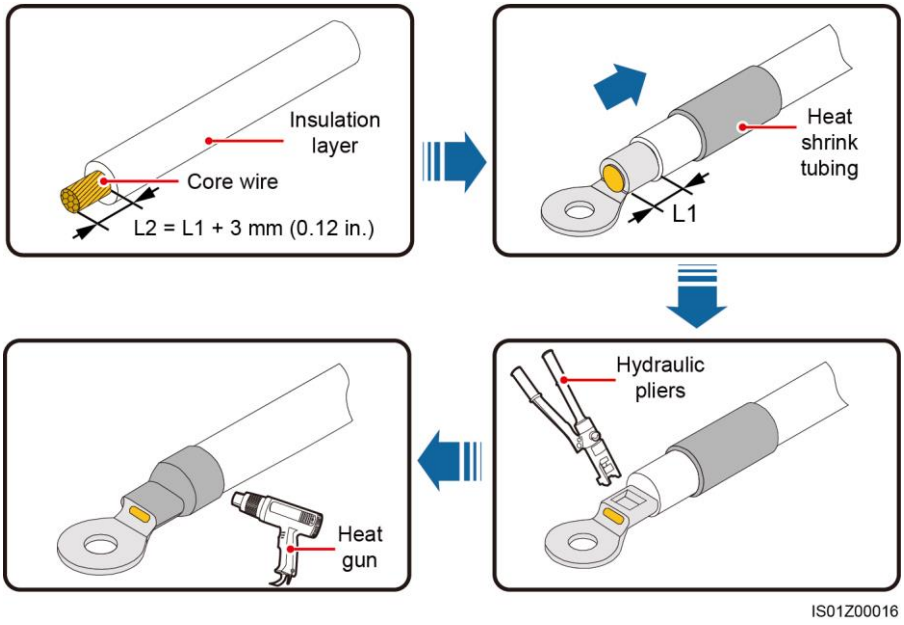
5.1 Preparing OT Terminals

Figure 5-1 shows how to prepare an OT terminal.

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing or PVC insulation tape. The following figure uses heat shrink tubing as an example.
- When using the heat gun, protect devices from being scorched.

Figure 5-1 Preparing an OT terminal



5.2 Connecting the Ground Cable

NOTICE

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

5.2.1 Grounding the SUN2000 over a PE Point

Prerequisites

The ground point on the enclosure is preferred to connect to the PE cable for the SUN2000. The ground point in the maintenance compartment is mainly used for connecting to the ground cable included in the multi-core AC power cable.

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

Context

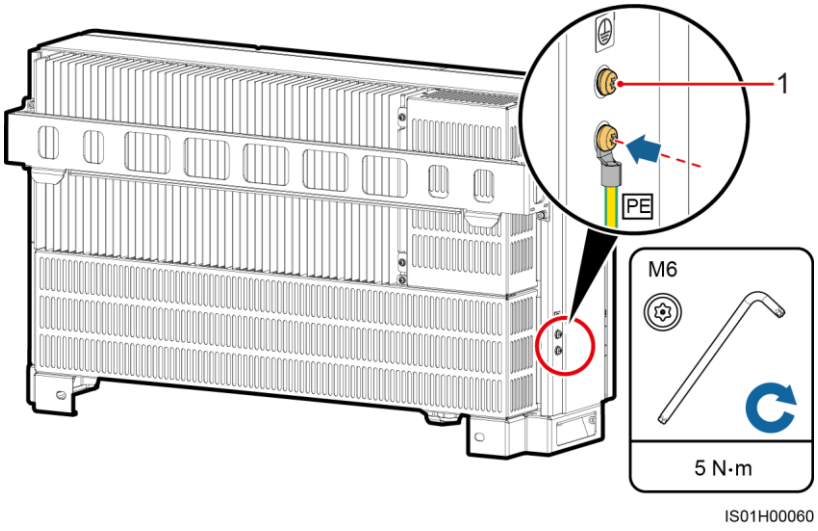
There are two ground points on the enclosure and one of them is standby.

Procedure

Step 1 Prepare the OT terminal.

Step 2 Secure the ground cable using the ground screw.

Figure 5-2 Connecting a ground cable



(1) Reserved PE point

----End

Follow-up Procedure

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

5.2.2 PV Side Grounding

Prerequisites

A ground cable and an OT terminal are available.

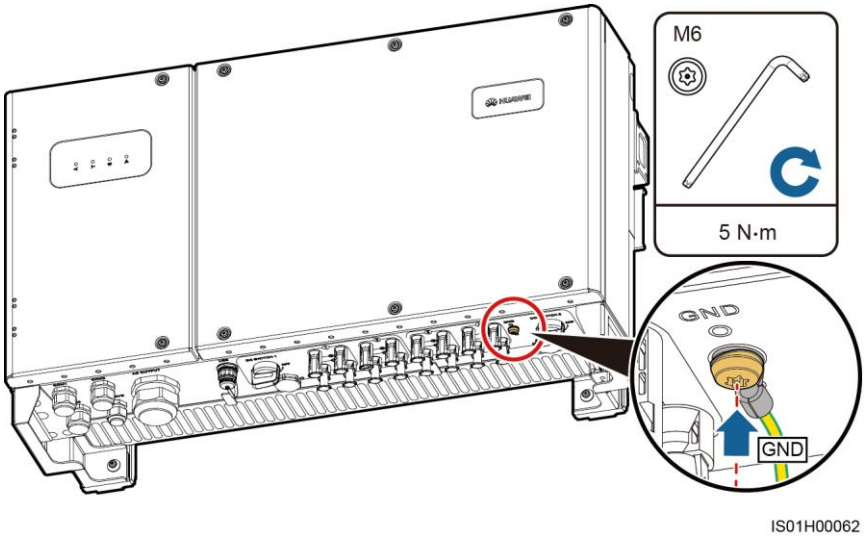
- Recommended ground cable: an outdoor copper-core cable with a cross-sectional area of 6 AWG or more
- OT terminal: M6

Procedure

Step 1 Prepare the OT terminal.

Step 2 Secure the ground cable using the ground screw.

Figure 5-3 Connecting a ground cable



----End

Follow-up Procedure

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

5.3 Opening the Maintenance Compartment Door

Prerequisites

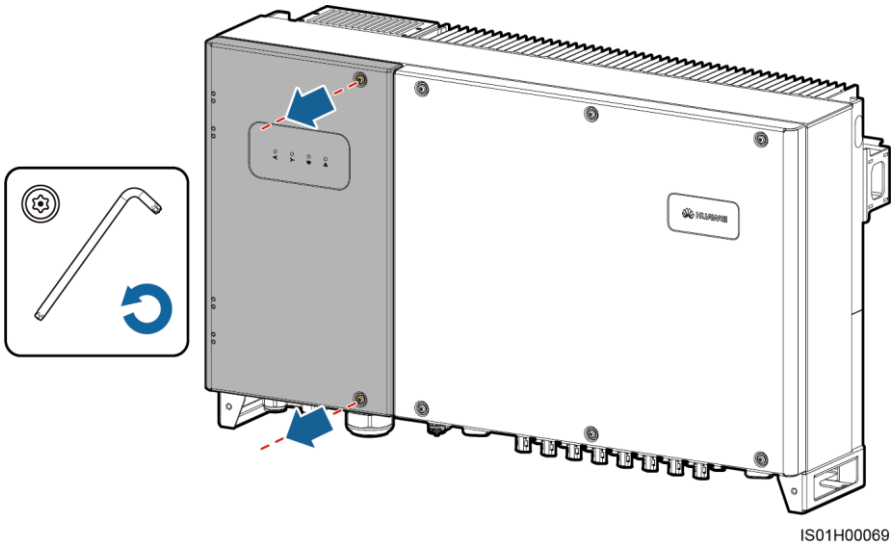
CAUTION

- Never open the host panel of the SUN2000.
- Before opening the maintenance compartment door, disconnect the AC and DC power supplies. For processes of disconnecting the power supplies, see 6.3 Powering Off the SUN2000. After powering off the SUN2000, wait at least 5 minutes before performing operations on it.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.
- Do not leave unused screws in the maintenance compartment.

Procedure

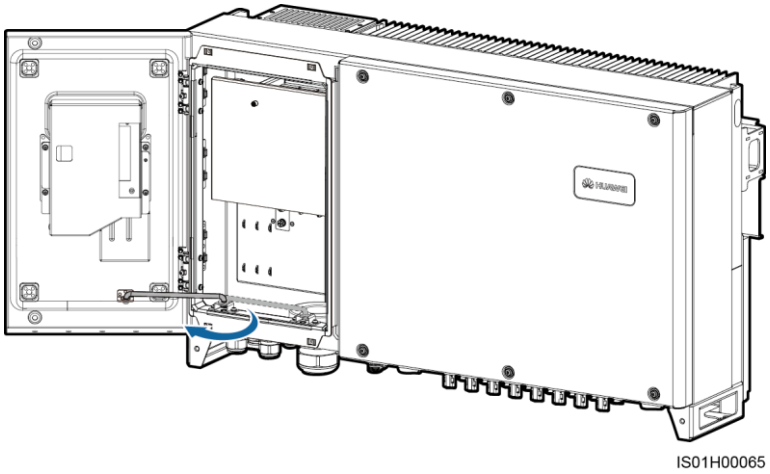
Step 1 Remove the two screws from the maintenance compartment door using a security torx wrench and set them aside.

Figure 5-4 Removing screws



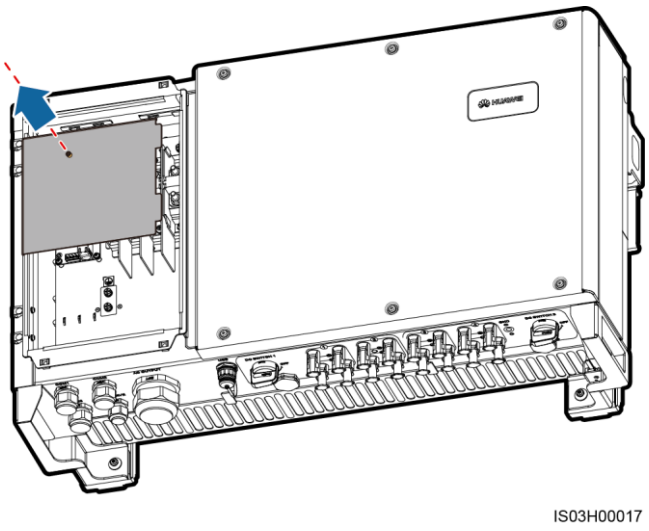
Step 2 Open the maintenance compartment door and adjust the support bar.

Figure 5-5 Adjusting a support bar



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

Figure 5-6 Removing an AC terminal cover



NOTE

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

----End

5.4 Connecting AC Output Power Cables

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

WARNING

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

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

5.4.1 Connection Through a Pipe

Prerequisites

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

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

  Table 5-1 describes the cable specifications.

Table 5-1 Cable specifications

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

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

Requirements for OT terminals:

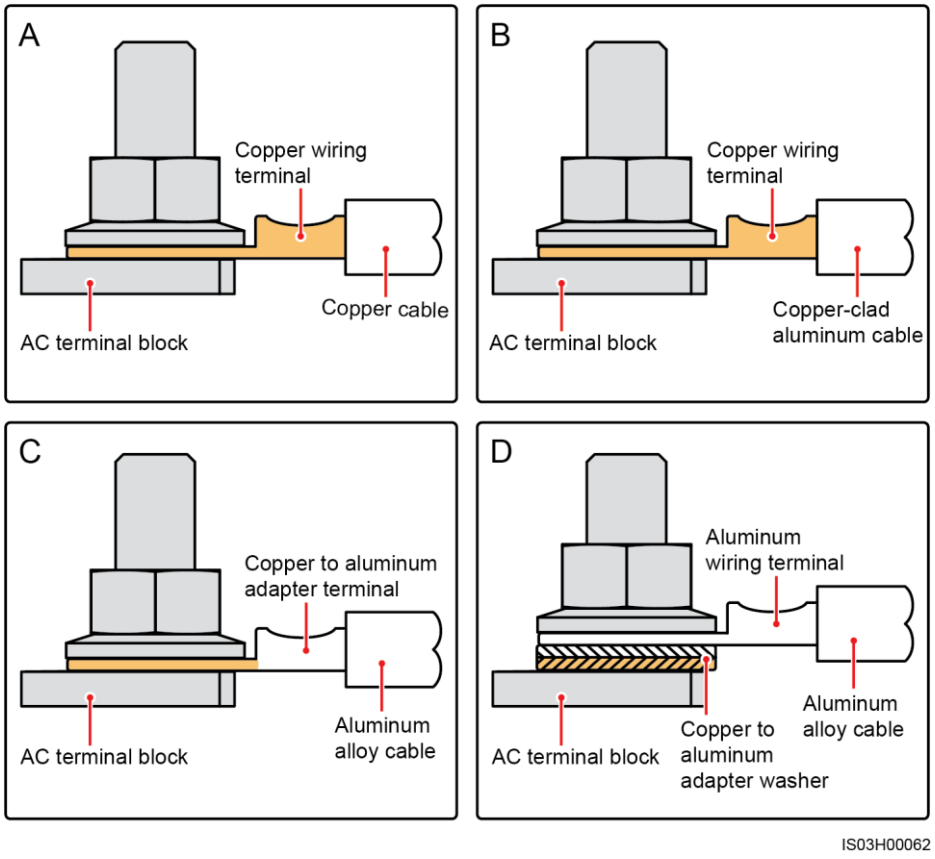
- If a copper cable is used, use a copper wiring terminal.
- If a copper-clad aluminum cable is used, use a copper wiring terminal.

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

NOTICE

- Directly connecting an aluminum wiring terminal to the AC terminal block will cause electro-chemical corrosion and weaken the cable connection reliability.
- The copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer must comply with UL486-A and UL486-B.
- Do not mix up the aluminum and copper sides of the copper to aluminum adapter washer. Ensure that the aluminum side of the washer contacts the aluminum wiring terminal, and the copper side contacts the AC terminal block.

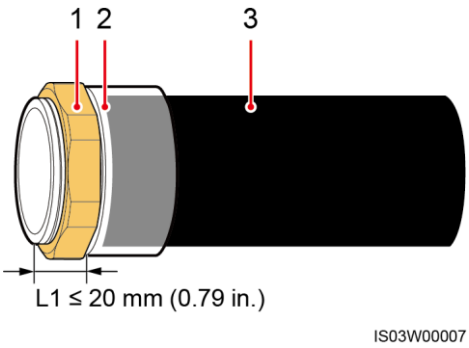
Figure 5-7 Requirements for OT terminals



Context

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

Figure 5-8 Pipe



(1) Nut (2) Fitting (3) Conduit

NOTE

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

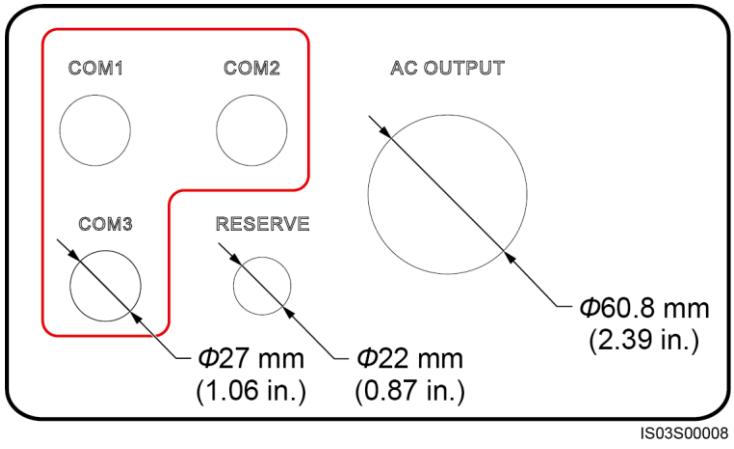
Figure 5-9 shows the diameters of the cable holes at the bottom of the chassis after the waterproof connectors are removed.

NOTE

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

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

Figure 5-9 Diameters of the bottom cable holes



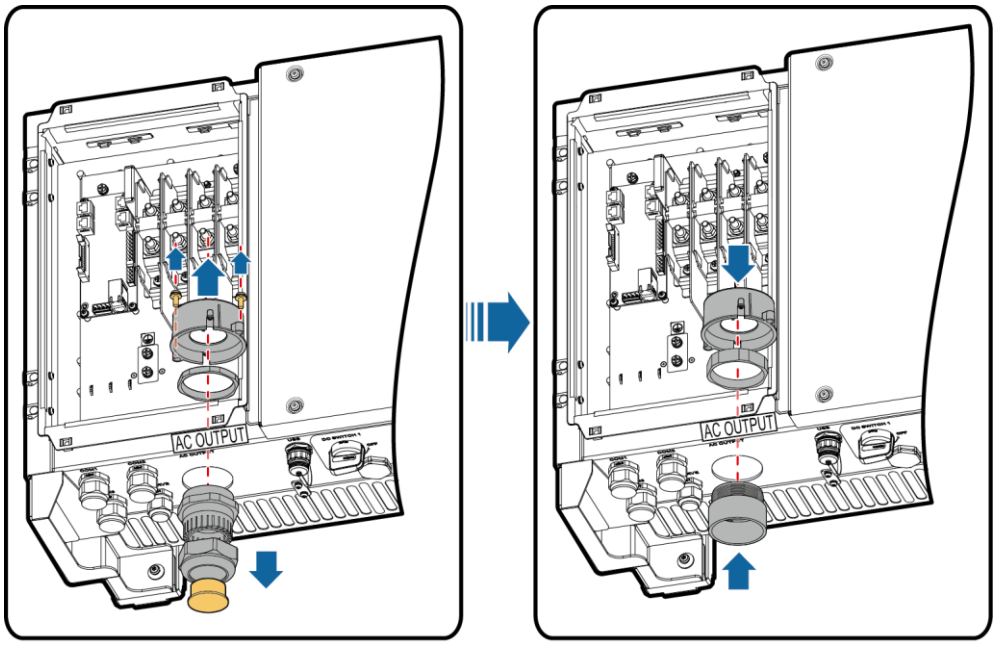
Procedure

Step 1 Install the pipe fittings.

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

4. Place the AC filter.

Figure 5-10 Installing pipe fittings



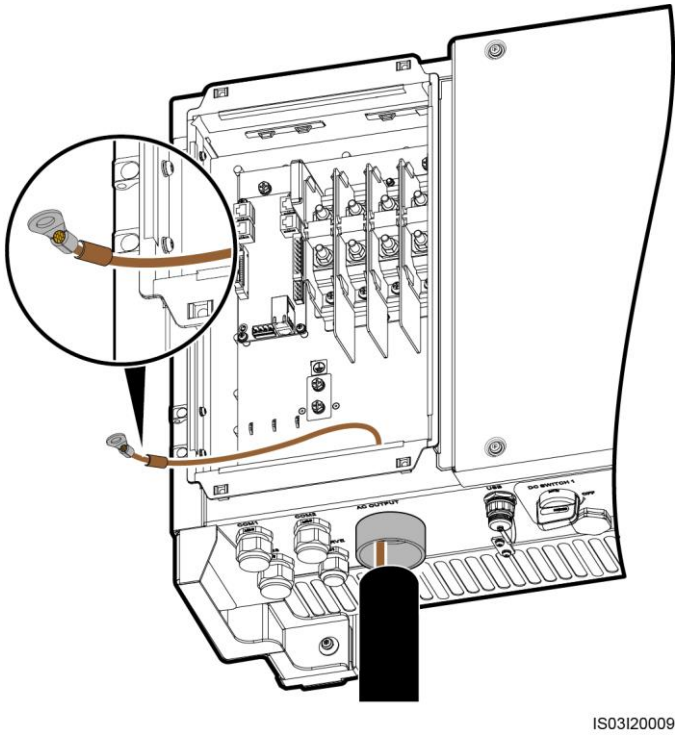
Step 2 Route the AC output power cable through the conduit and fittings of the pipe, and then the AC filter.

Step 3 Prepare the OT terminal.

NOTICE

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

Figure 5-11 OT terminal direction (using one cable as an example)



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

NOTICE

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

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

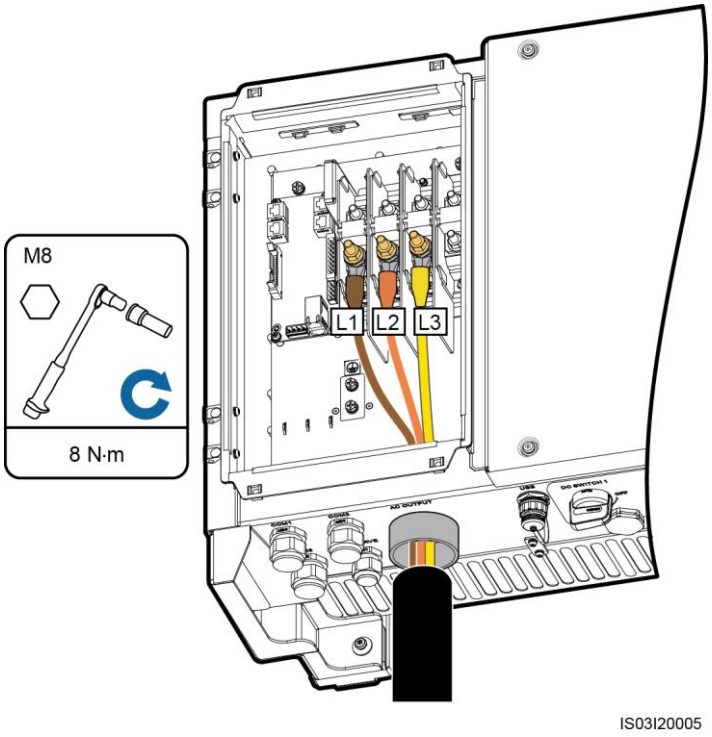


Figure 5-13 Connecting the AC output power cable (including the ground cable but excluding the neutral wire)

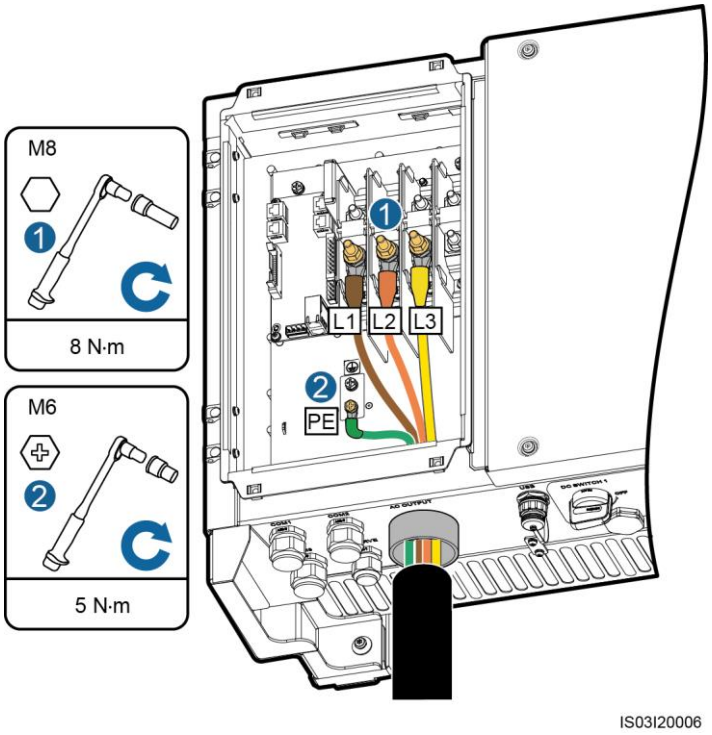


Figure 5-14 Connecting the AC output power cable (excluding the ground cable but including the neutral wire)

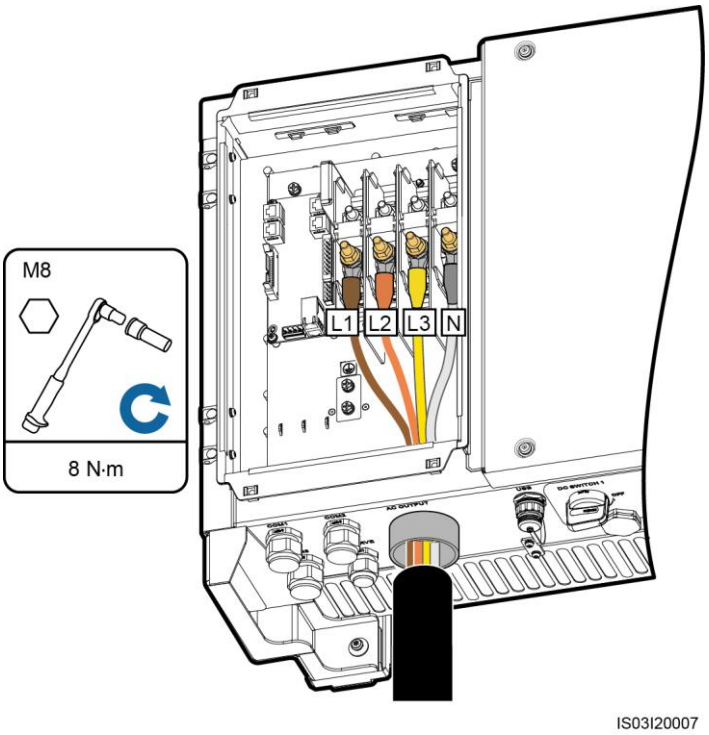
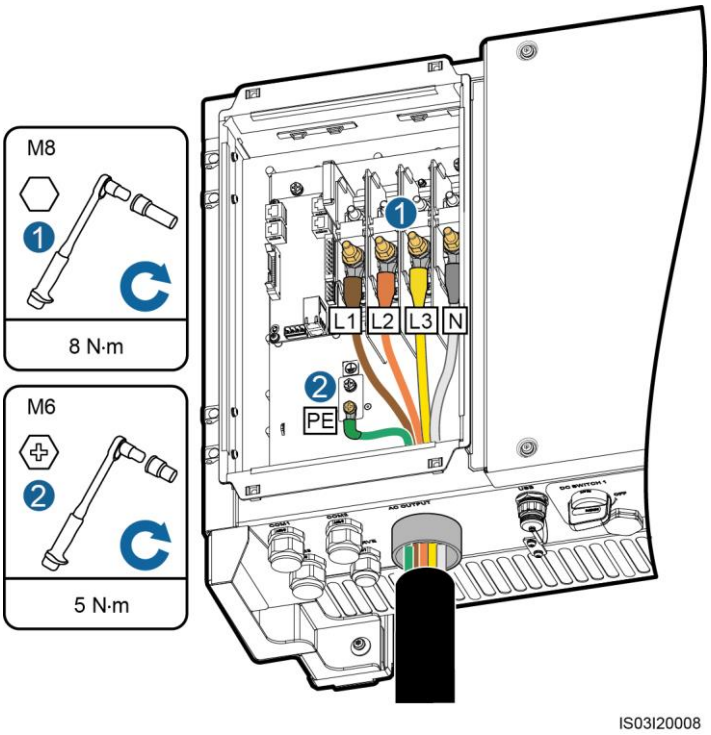


Figure 5-15 Connecting the AC output power cable (including the ground cable and neutral wire)



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

Step 5 Connect the conduit and fittings of the pipe.

Step 6 Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fittings are secured reliably, and seal the cable holes.

Step 7 Secure the AC filter using screws.

Step 8 Clear foreign matter from the maintenance compartment.

----End

5.4.2 Common Connection

Prerequisites

The AC output power cable and OT terminal are available.

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

  Table 5-2 describes the cable specifications.

Table 5-2 Cable specifications

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

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

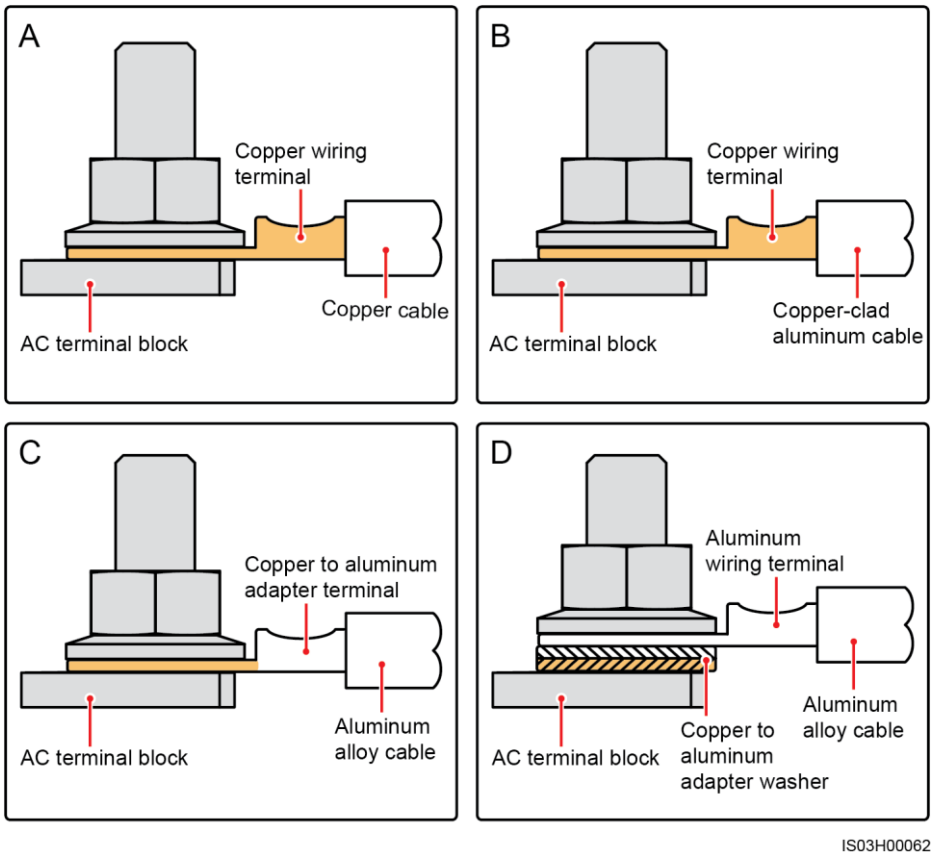
Requirements for OT terminals:

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

NOTICE

- Directly connecting an aluminum wiring terminal to the AC terminal block will cause electro-chemical corrosion and weaken the cable connection reliability.
- The copper to aluminum adapter terminal or an aluminum wiring terminal with a copper to aluminum adapter washer must comply with UL486-A and UL486-B.
- Do not mix up the aluminum and copper sides of the copper to aluminum adapter washer. Ensure that the aluminum side of the washer contacts the aluminum wiring terminal, and the copper side contacts the AC terminal block.

Figure 5-16 Requirements for OT terminals



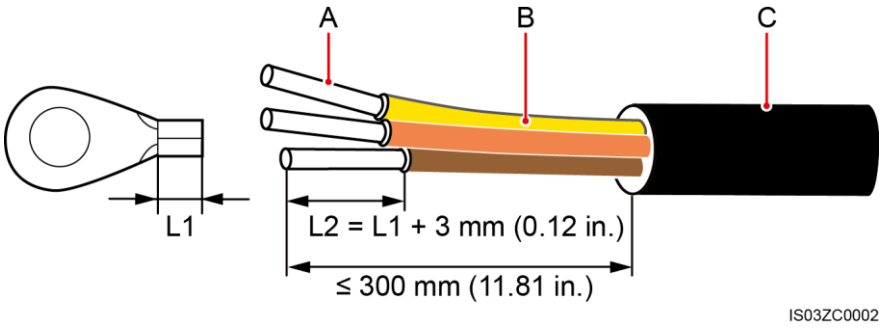
Procedure

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

NOTICE

Ensure that the jacket is in the maintenance compartment.

Figure 5-17 Three-core cable (excluding the ground cable and neutral wire)



(A) Core wire (B) Insulation layer (C) Jacket

Figure 5-18 Four-core cable (including the ground cable but excluding the neutral wire)

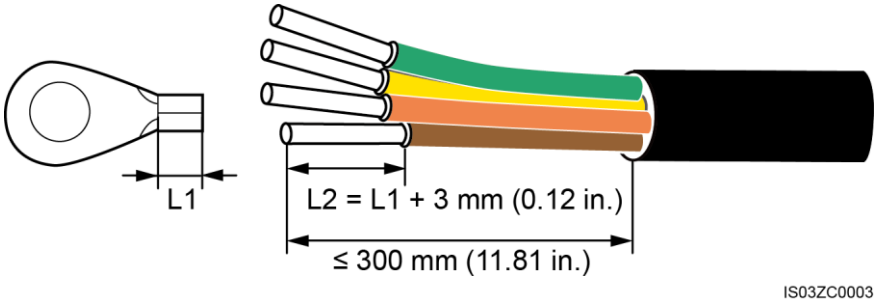


Figure 5-19 Four-core cable (excluding the ground cable but including the neutral wire)

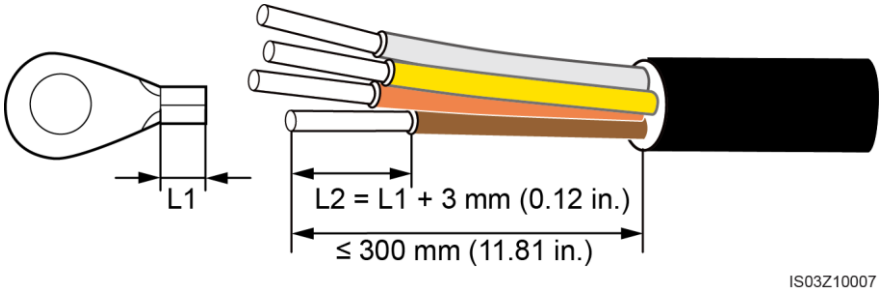
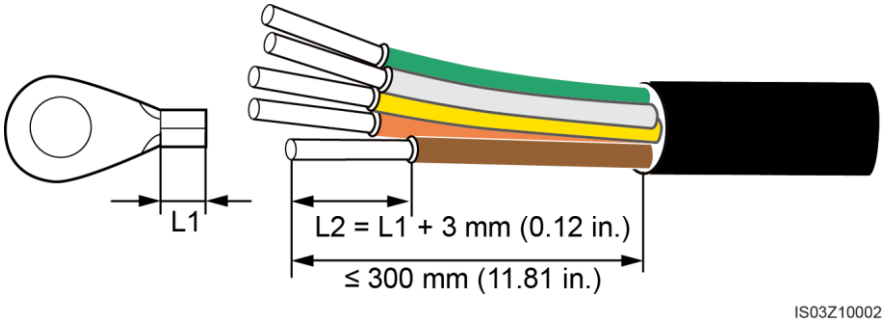


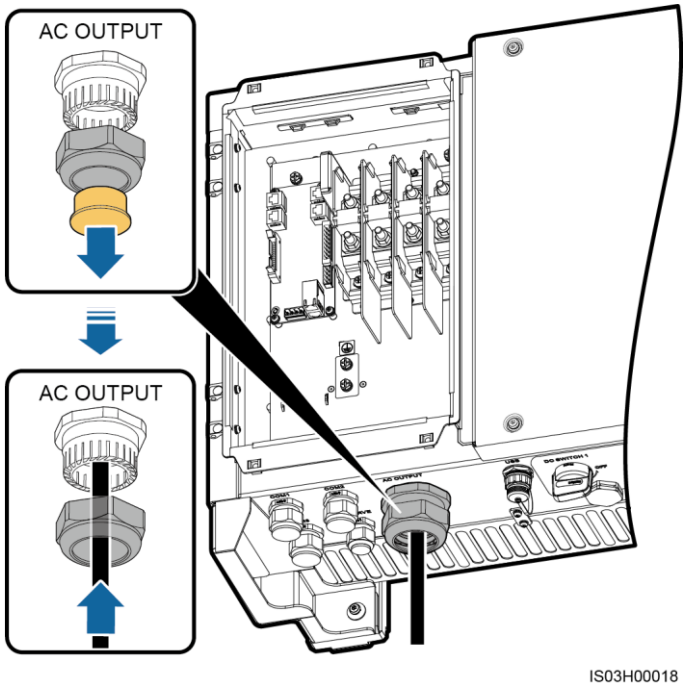
Figure 5-20 Five-core cable (including the ground cable and neutral wire)



Step 2 Prepare the OT terminal.

Step 3 Route the cable through the waterproof connector.

Figure 5-21 Routing cables



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

NOTICE

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

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

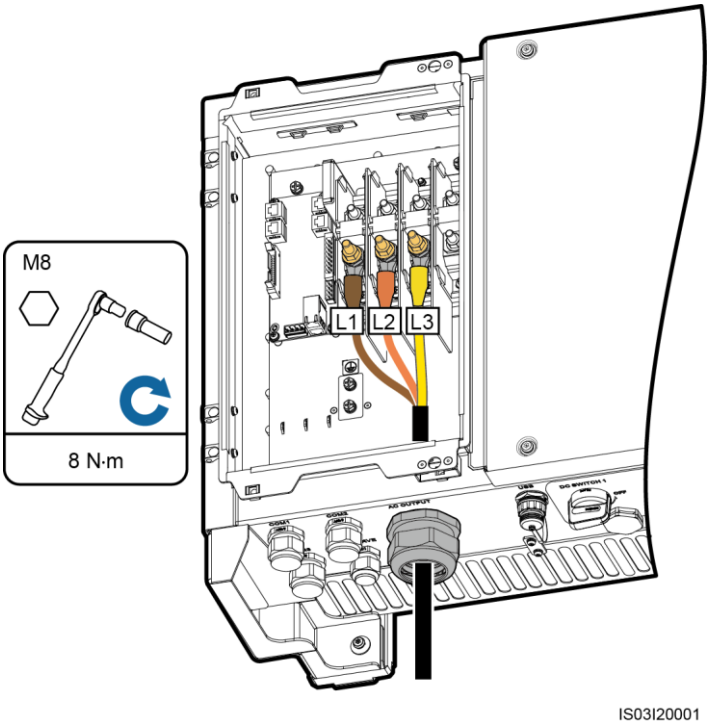


Figure 5-23 Connecting the AC output power cable (including the ground cable but excluding the neutral wire)

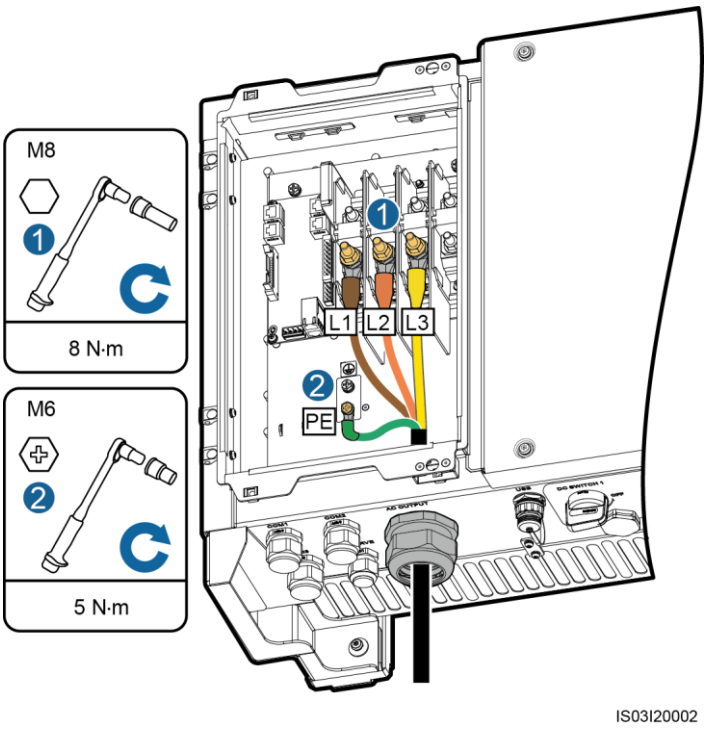


Figure 5-24 Connecting the AC output power cable (excluding the ground cable but including the neutral wire)

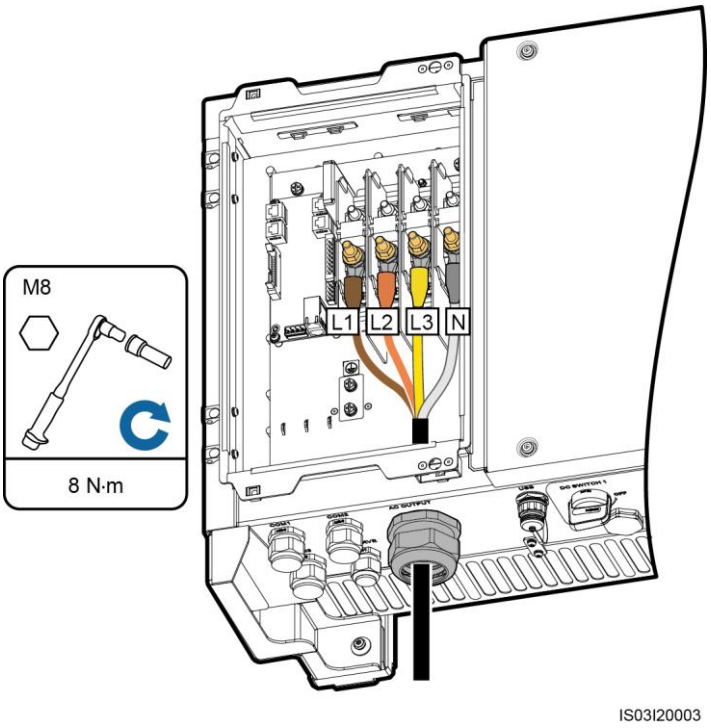
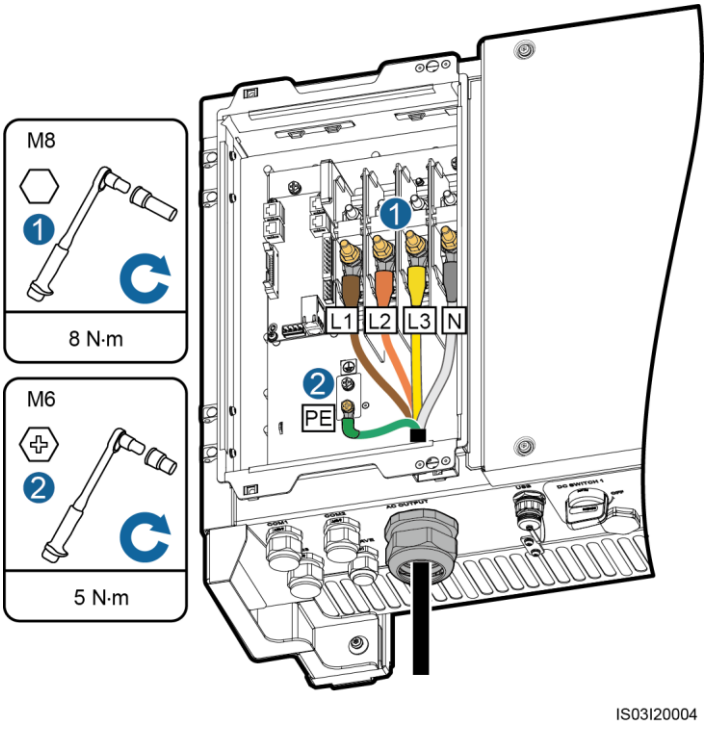


Figure 5-25 Connecting the AC output power cable (including the ground cable and neutral wire)



NOTE

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

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

----End

Follow-up Procedure

Check that the cables are connected correctly and securely. Then seal the waterproof connectors and cable holes, and clear foreign matter from the maintenance compartment.

5.5 Connecting DC Input Power Cables

Prerequisites

DANGER

- Before connecting DC input power cables, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the two DC switches on the SUN2000 are OFF. Otherwise, the high voltage may result in electric shocks.
- When the SUN2000 is grid-tied, it is not allowed to maintain DC input power cables, such as connect or disconnect a string or a module in a string. Otherwise, electric shocks may occur.

WARNING

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

- The highest open-circuit voltage of each PV string is always lower than or equal to 1000 V DC.
- The positive and negative terminals of a PV module connect to the positive and negative DC input terminals of the SUN2000 respectively.
- If the DC input power cable is reversely connected, do not operate the DC switches and positive and negative connectors immediately. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches, remove the positive and negative connectors, and correct the polarity of the DC input power cable.

NOTICE

- Ensure that the PV module output is well insulated to ground. If the SUN2000 directly connects to the power grid with the neutral wire connected to the PE cable (for example, a low-voltage power grid or a power grid with the neutral wire grounded), do not ground the positive and negative terminals of PV strings. The device may be damaged if you do not follow the instruction. This damage is not covered under any warranty or service agreement.
- During the installation of PV strings and SUN2000, the positive or negative terminals of PV strings may be grounded if power cables are not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused equipment damage is beyond the warranty scope.

NOTE

The following requirements must be met if the positive or negative terminals of PV strings need to be grounded:

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

Context

- DC terminal selection

  Figure 5-26 shows the DC terminals at the bottom of the SUN2000. Table 5-3 describes the requirements for DC terminal selection.

NOTE

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

Figure 5-26 DC terminals

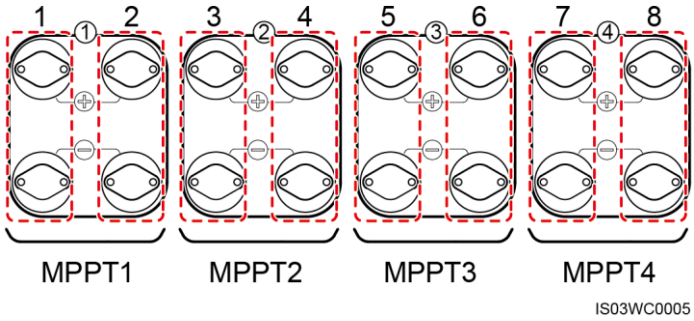


Table 5-3 DC terminal selection requirements

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

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

- DC input power cable specifications
  Table 5-4 lists the recommended DC input power cable specifications.

Table 5-4 Recommended DC input power cable specifications

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

NOTICE

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

Procedure

Step 1 Prepare positive and negative connectors.

CAUTION

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

NOTICE

- After crimping the positive and negative metal terminals, pull the DC input power cables back to ensure that they are connected securely.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.

Figure 5-27 Preparing an Amphenol Helios H4 connector

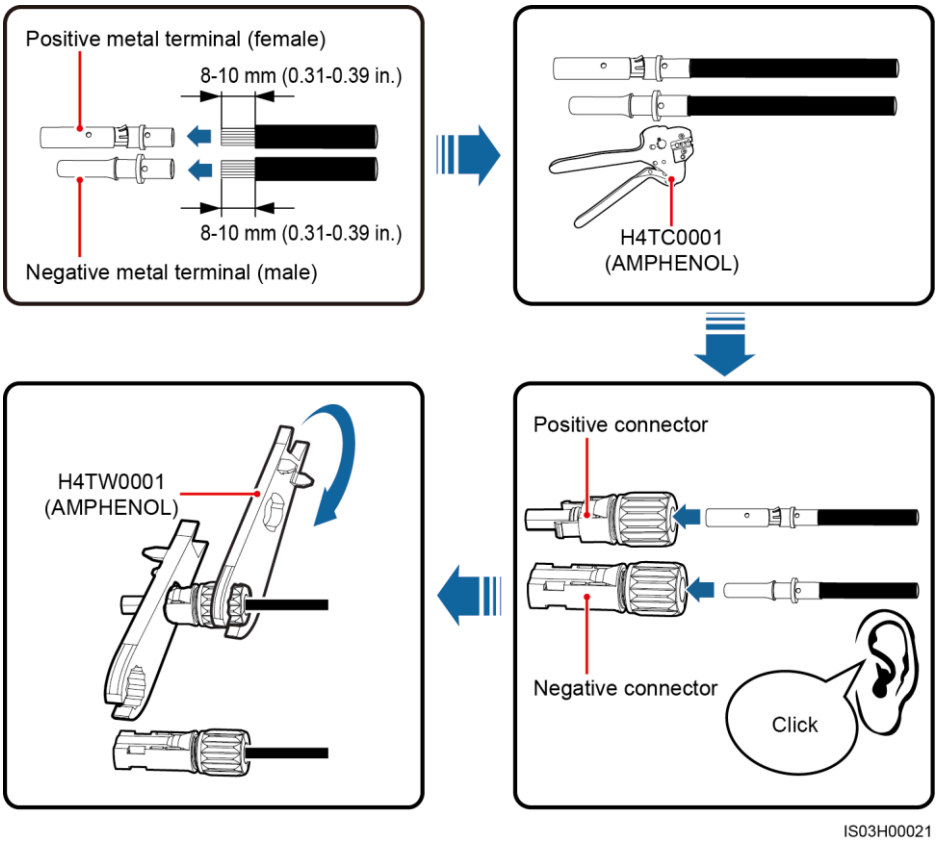
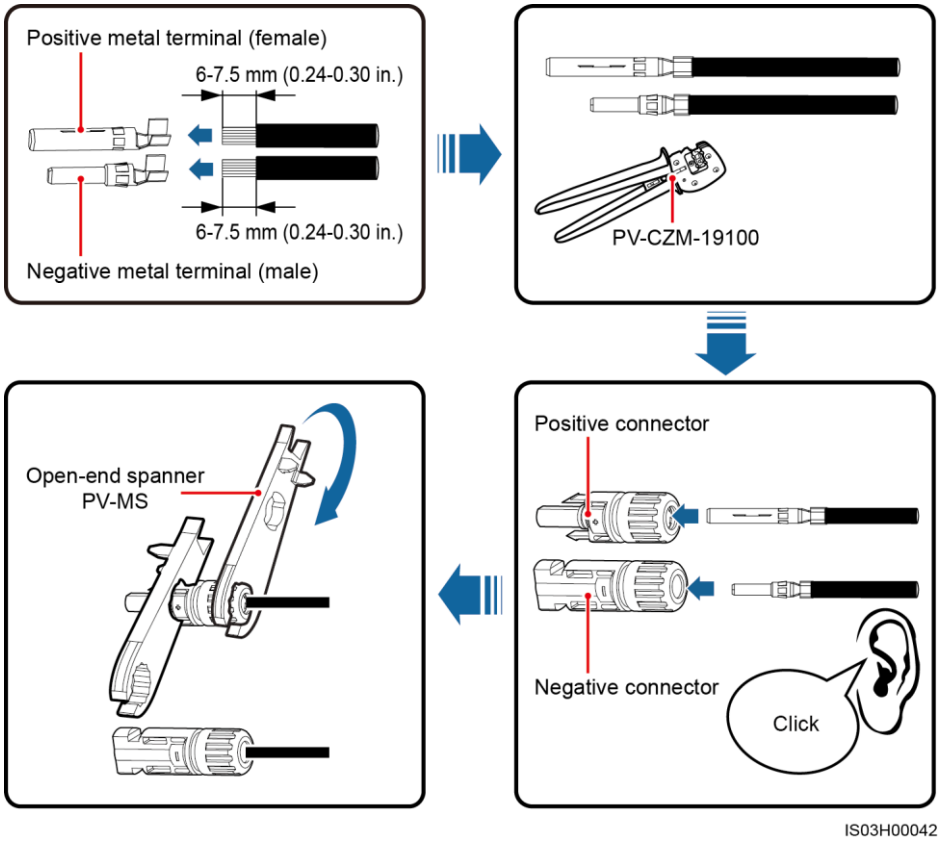


Figure 5-28 Preparing an MC4 connector



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

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

Figure 5-29 Measuring the DC input voltage (Amphenol Helios H4)

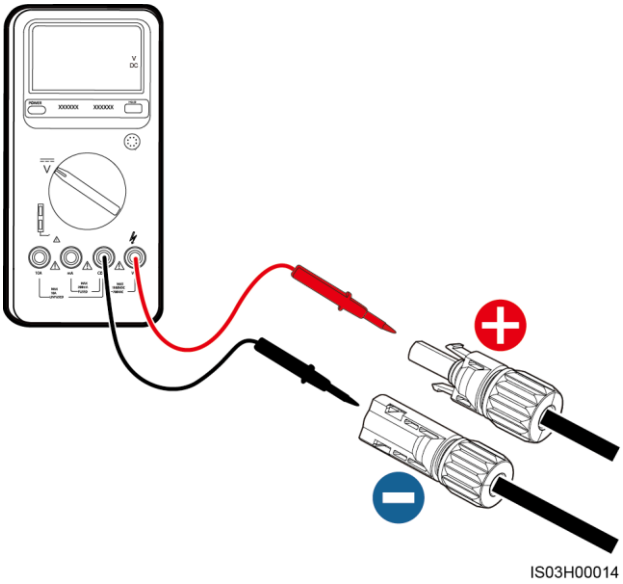
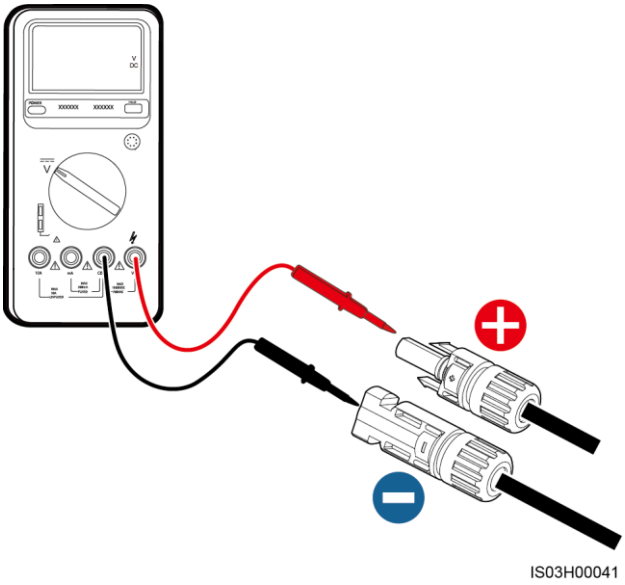


Figure 5-30 Measuring the DC input voltage (MC4)



WARNING

Before performing Step 3, ensure that the two DC switches are OFF.

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

NOTICE

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

Figure 5-31 Connecting the DC input power cable (Amphenol Helios H4)

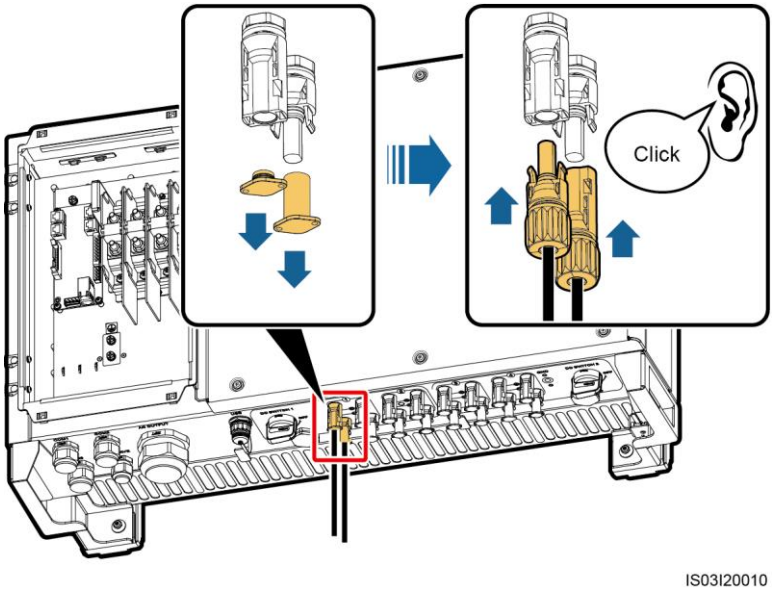
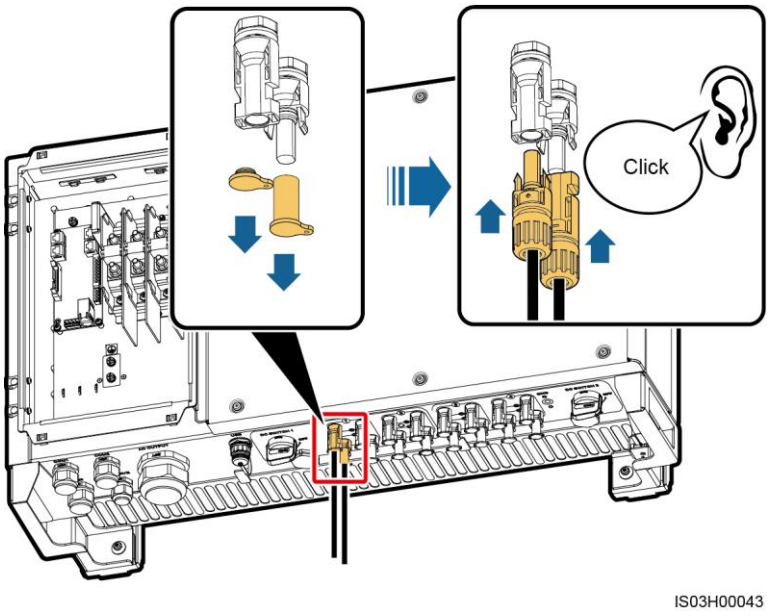


Figure 5-32 Connecting the DC input power cable (MC4)



NOTICE

If the DC input power cable is reversely connected, do not operate the DC switches and positive and negative connectors immediately. Otherwise, the SUN2000 will be damaged. The caused equipment damage is beyond the warranty scope. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches, remove the positive and negative connectors, and correct the polarity of the DC input power cable.

----End

Follow-up Procedure

WARNING

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

To remove the positive and negative connectors from the SUN2000, insert an open-end wrench into the notch and press the wrench with an appropriate force.

Figure 5-33 Removing a DC input connector (Amphenol Helios H4)

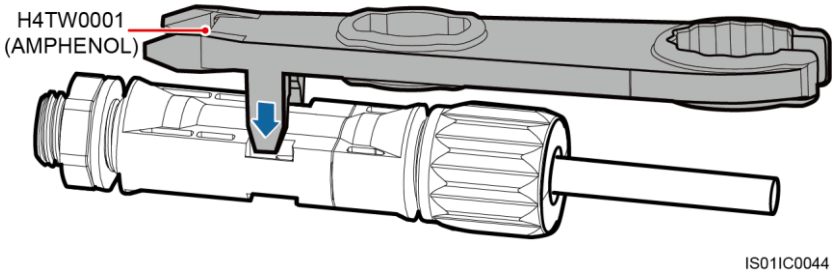
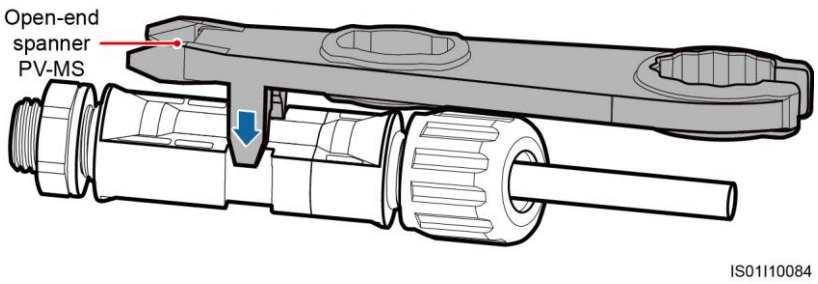


Figure 5-34 Removing a DC input connector (MC4)



If you replace the SUN2000 that uses the Amphenol Helios H4 DC terminal with the SUN2000 that uses the MC4 DC terminal, you are advised to replace the DC input connector on the cable with the supplied MC4 DC input connector.

5.6 Connecting Communications Cables

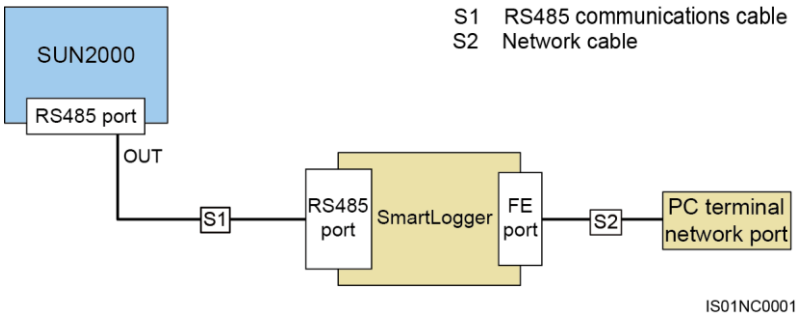
5.6.1 Communication Mode Description

RS485 Communication

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

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

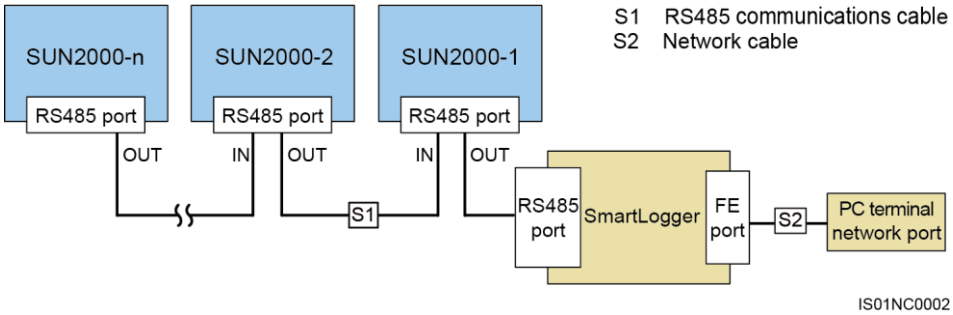
Figure 5-35 Communication mode for a single SUN2000



- Figure 5-36 shows the communication mode for multiple SUN2000s.

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

Figure 5-36 Communication mode for multiple SUN2000s



NOTE

- The RS485 communication distance between the SUN2000 at the end of the daisy chain and the SmartLogger cannot exceed 1000 meters.

- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger1000, a maximum of three daisy chains can be configured.
- If multiple SUN2000s need to communicate with one another and are connected to a PC over the SmartLogger2000, a maximum of six daisy chains can be configured.
- To ensure the system response speed, it is recommended that the number of devices on each daisy chain be less than 30.

PLC Communication

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

NOTE

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

Selecting a Communication Mode

The RS485 and PLC communication modes are mutually exclusive.

- If the PLC communication mode is selected, do not connect the RS485 communications cable. In addition, you need to set **PLC communication** to **Enable**.
- If the RS485 communication mode is selected, do not connect the PLC CCO module to the AC power cable. In addition, you are advised to set **PLC communication** to **Disable**.

NOTE

- **PLC communication** is set to **Enable** by default.
- You can set a single SUN2000 over the SUN2000 app or set multiple SUN2000s in batches over the SmartLogger.

5.6.2 Selecting a Mode for Connecting RS485 Communications Cables

Description

- An RS485 communications cable can be connected in two ways:
  - Terminal block connection

    Recommended: outdoor communications cable with a conductor cross-sectional area of 18 AWG and an outer diameter range of 14 mm to 18 mm (0.55 in. to 0.71 in.)
  - RJ45 network port connection

    Recommended: a CAT 5E outdoor shielded network cable with an outer diameter of less than 9 mm (0.35 in.) and internal resistance of less than or equal to 1.5 ohms/10 m (1.5 ohms/393.70 in.), as well as a shielded RJ45 connector

NOTE

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

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

NOTE

Before installation, prepare materials based on the connection mode.

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

NOTICE

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

Terminal Block Pin Definitions

Figure 5-37 shows an RS485 terminal block.

Figure 5-37 Terminal block

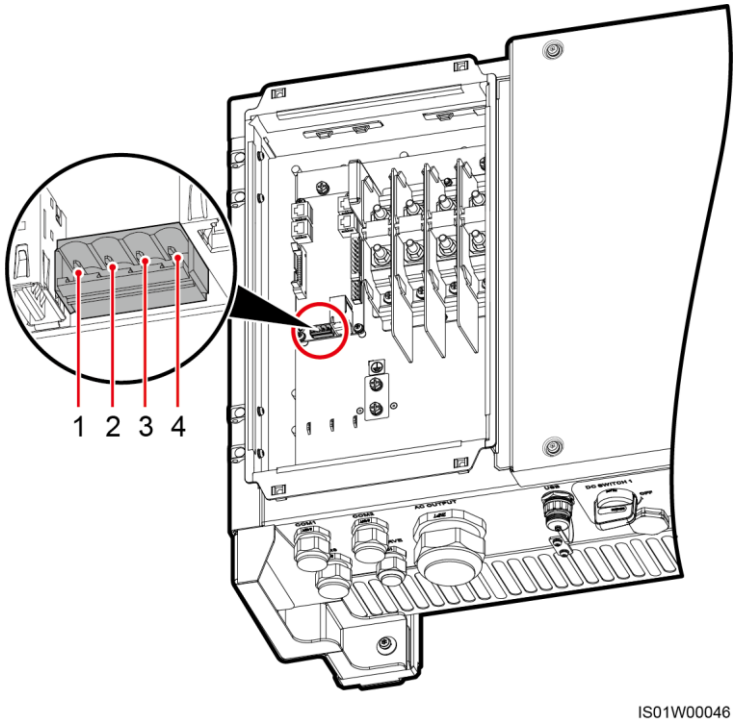


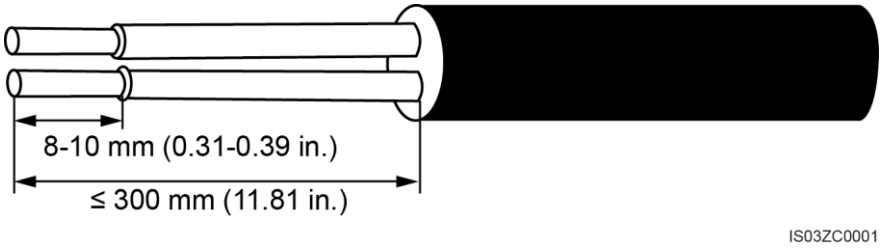
Table 5-5 describes pin definitions of the RS485 terminal block.

Table 5-5 Pin definitions of the RS485 terminal block

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

Figure 5-38 shows how to prepare an RS485 communications cable.

Figure 5-38 Stripping an RS485 communications cable



RJ45 Connector Pin Definitions

Figure 5-39 shows an RJ45 connector.

Figure 5-39 RJ45 connector

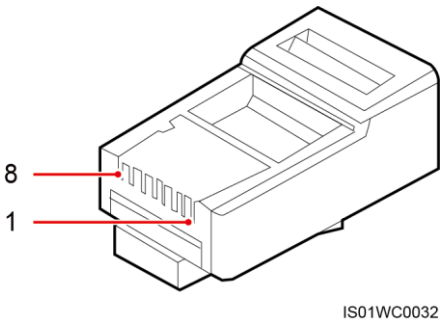


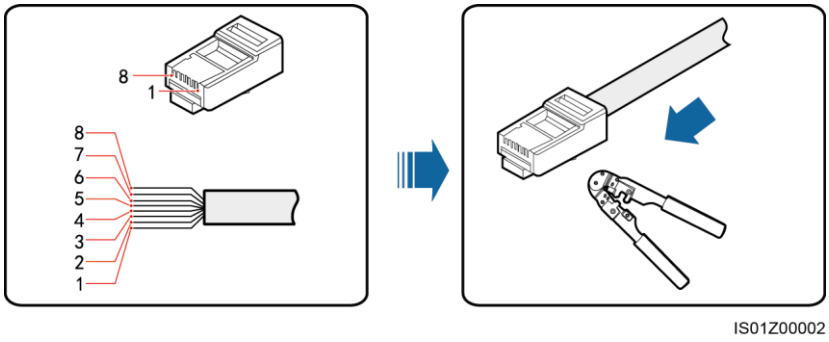
Table 5-6 lists the RJ45 connector pin definitions.

Table 5-6 RJ45 connector pin definitions

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

Figure 5-40 shows how to prepare an RS485 communications cable.

Figure 5-40 Connecting wires to an RJ45 connector



(1) White-and-orange (2) Orange (3) White-and-green (4) Blue

(5) White-and-blue (6) Green (7) White-and-brown (8) Brown

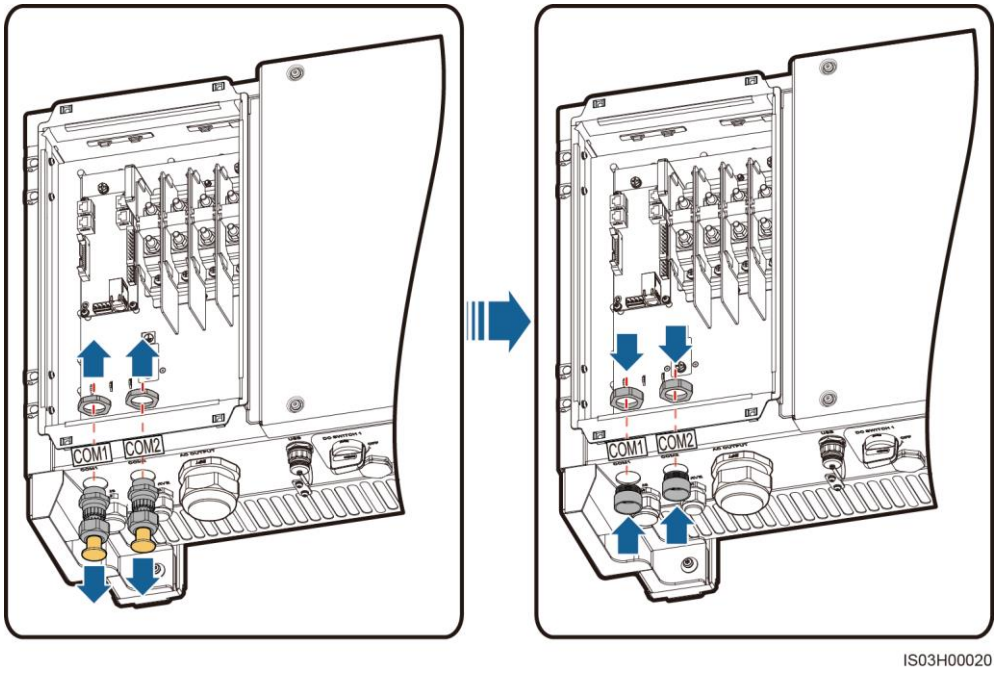
5.6.3 Connecting RS485 Communications Cables Through a Pipe

Connecting Cables to the Terminal Block

Step 1 Install the pipe fittings.

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

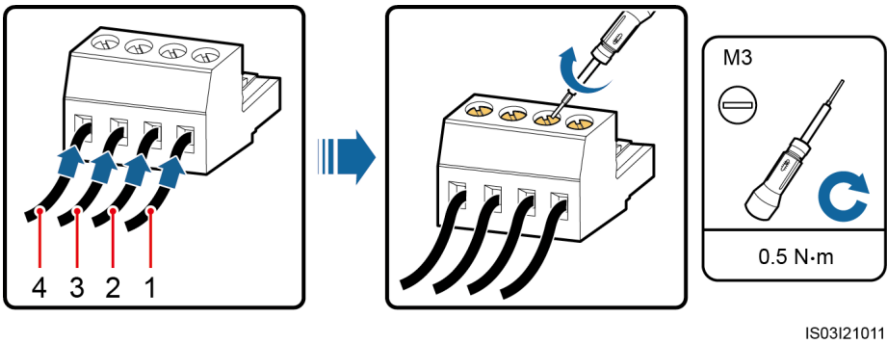
Figure 5-41 Installing pipe fittings



Step 2 Route the communications cable through the conduit and then fittings of the pipe.

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

Figure 5-42 Connecting cables to a terminal base



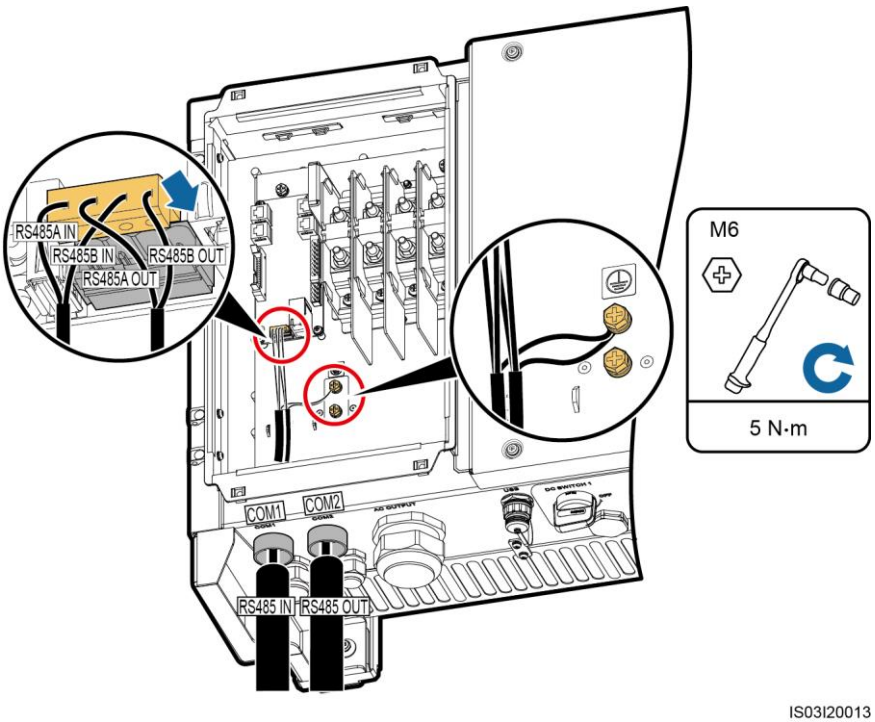
(1) RS485A IN (2) RS485A OUT

(3) RS485B IN (4) RS485B OUT

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

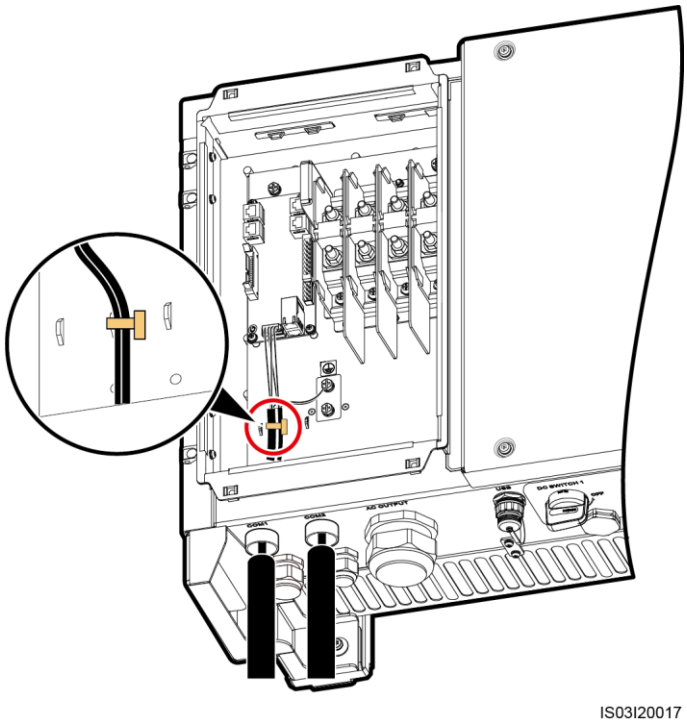
NOTE
When connecting the shielded cables, choose whether to crimp the OT terminal based on site requirements.

Figure 5-43 Connecting communications cables



Step 5 Bind communications cables after connecting them.

Figure 5-44 Binding communications cables



Step 6 Connect the conduit and fittings of the pipe.

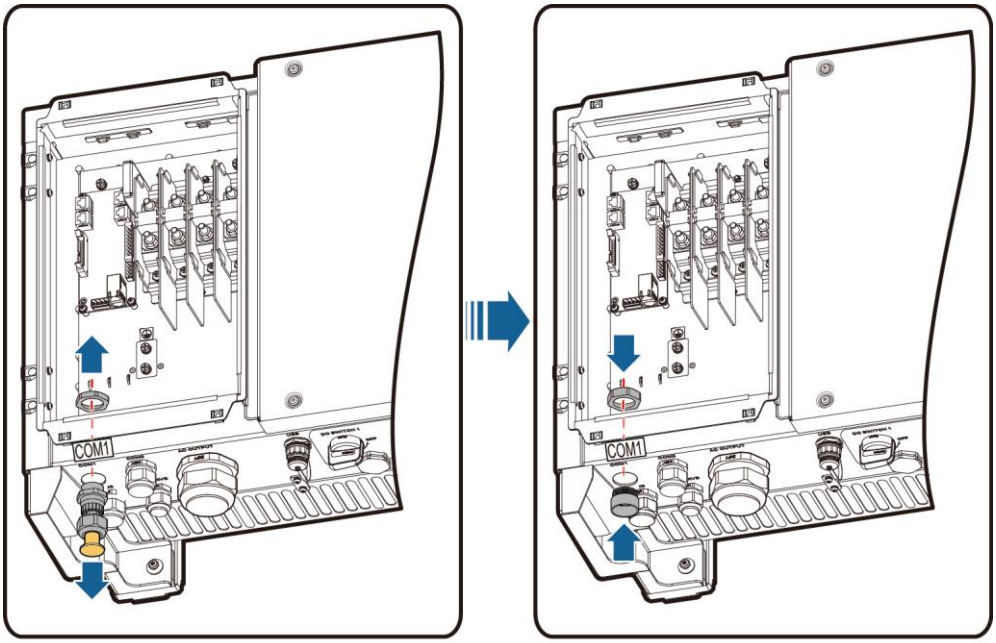
----End

Connecting a Cable to the RJ45 Network Port

Step 1 Install the pipe fittings.

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

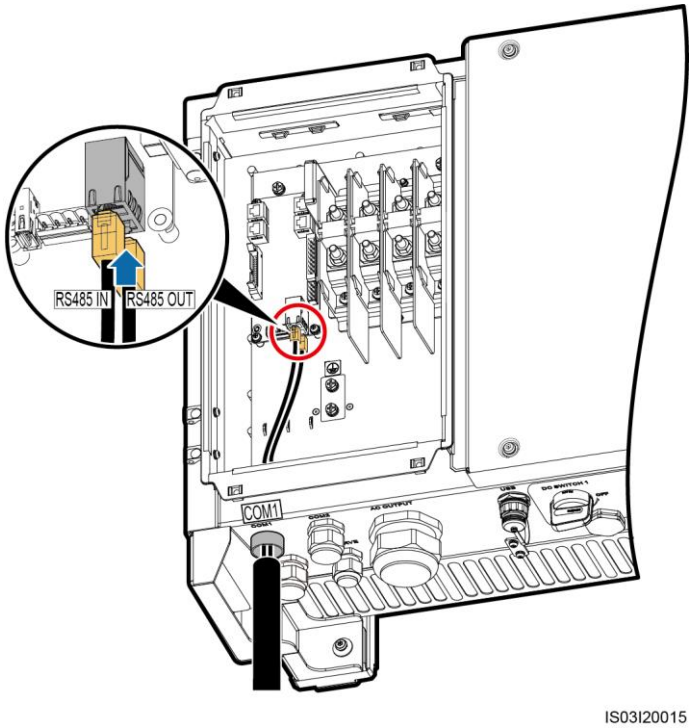
Figure 5-45 Installing pipe fittings



Step 2 Route the communications cable through the conduit and then fittings of the pipe.

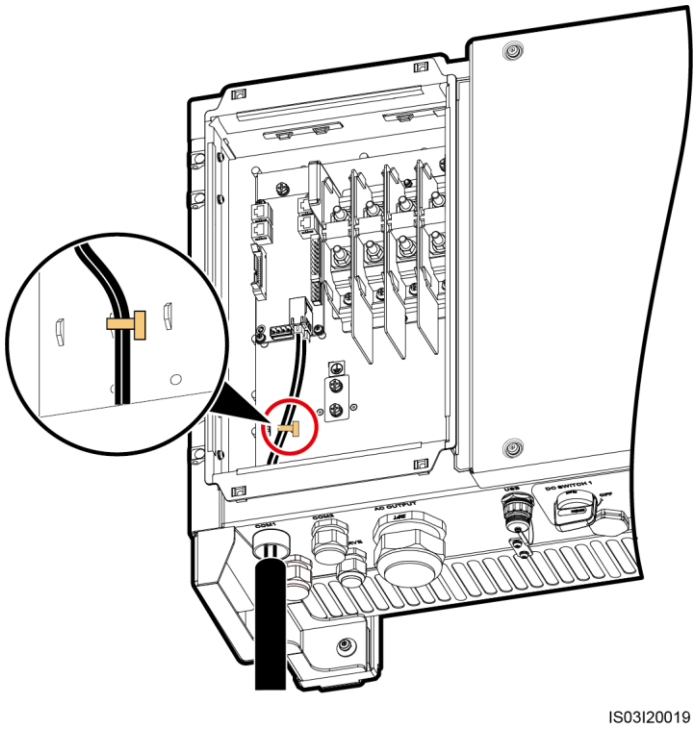
Step 3 Insert the RJ45 connectors into the RJ45 network ports in the SUN2000 maintenance compartment.

Figure 5-46 Connecting communications cables



Step 4 Bind communications cables after connecting them.

Figure 5-47 Binding communications cables



Step 5 Connect the conduit and fittings of the pipe.

----End

Follow-up Procedure

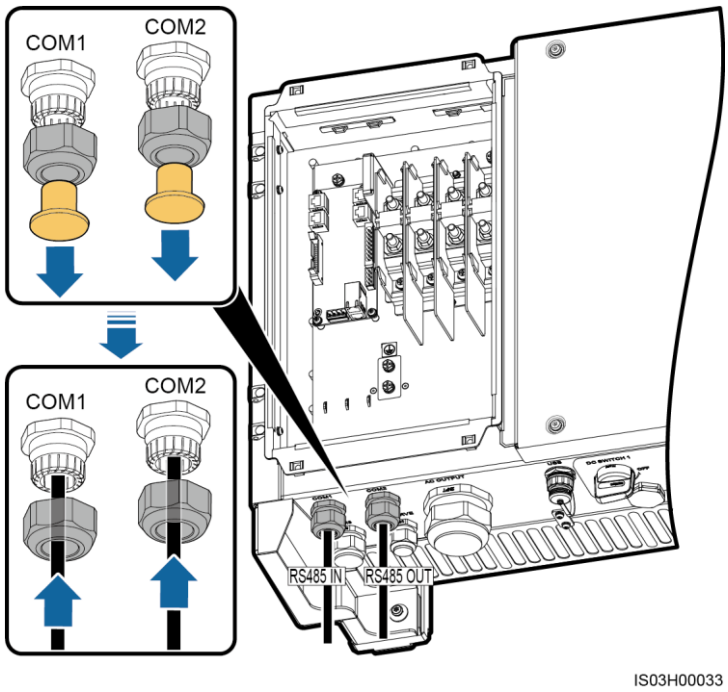
Check that the cables are connected correctly and securely. Then take appropriate measures to ensure that the pipe conduit and fittings are secured reliably, and seal the cable holes. Clear foreign matter from the maintenance compartment.

5.6.4 Connecting the RS485 Communications Cable in a Common Way

Connecting Cables to the Terminal Block

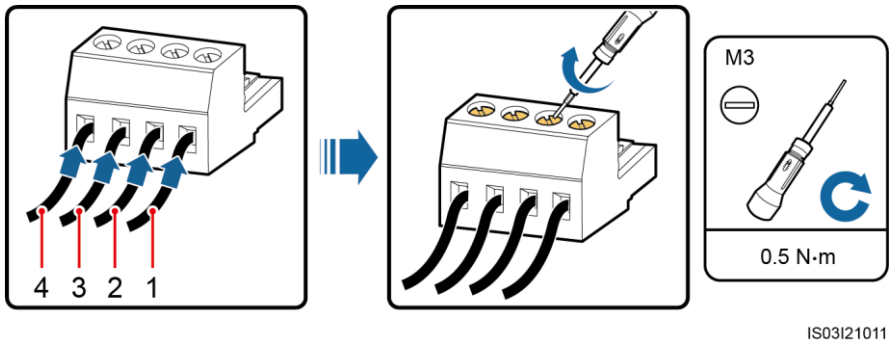
Step 1 Route the communications cables through the waterproof connectors.

Figure 5-48 Routing cables



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

Figure 5-49 Connecting cables to a terminal base



(1) RS485A IN (2) RS485A OUT

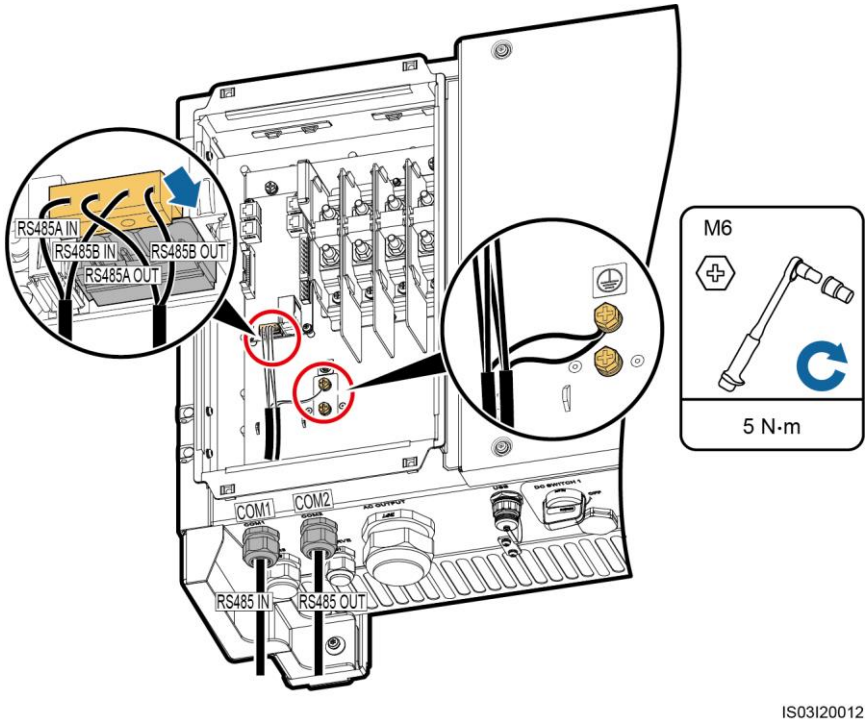
(3) RS485B IN (4) RS485B OUT

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

NOTE

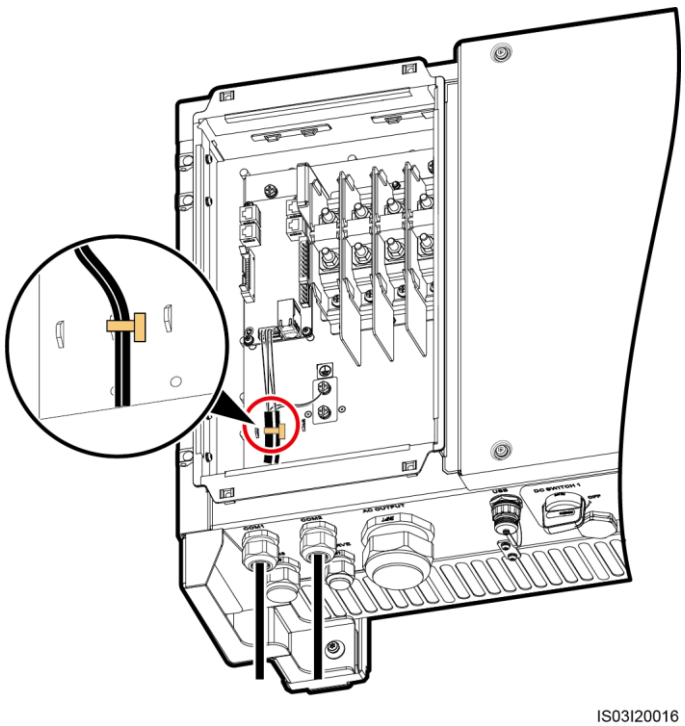
When connecting the shielded cables, choose whether to crimp the OT terminal based on site requirements.

Figure 5-50 Connecting communications cables



Step 4 Bind communications cables after connecting them.

Figure 5-51 Binding communications cables



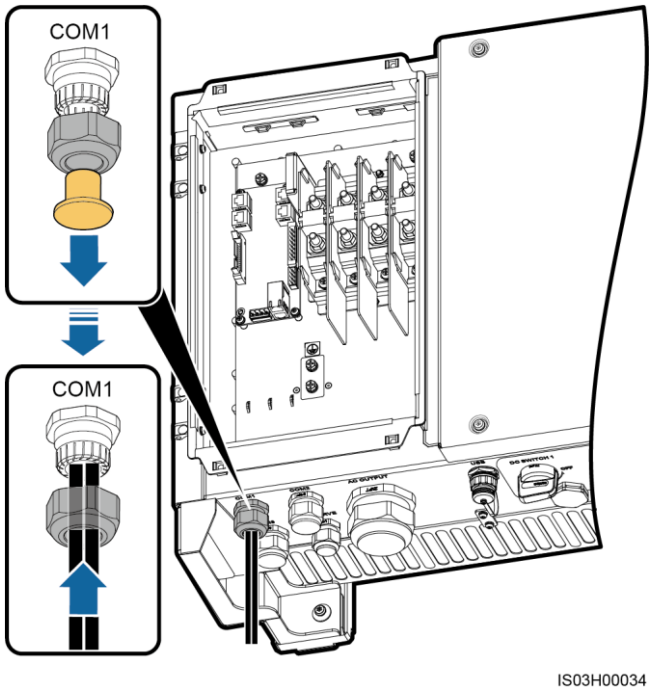
Step 5 Tighten the waterproof connectors to a torque of 7.5 N•m.

----End

Connecting Cables to the RJ45 Network Port

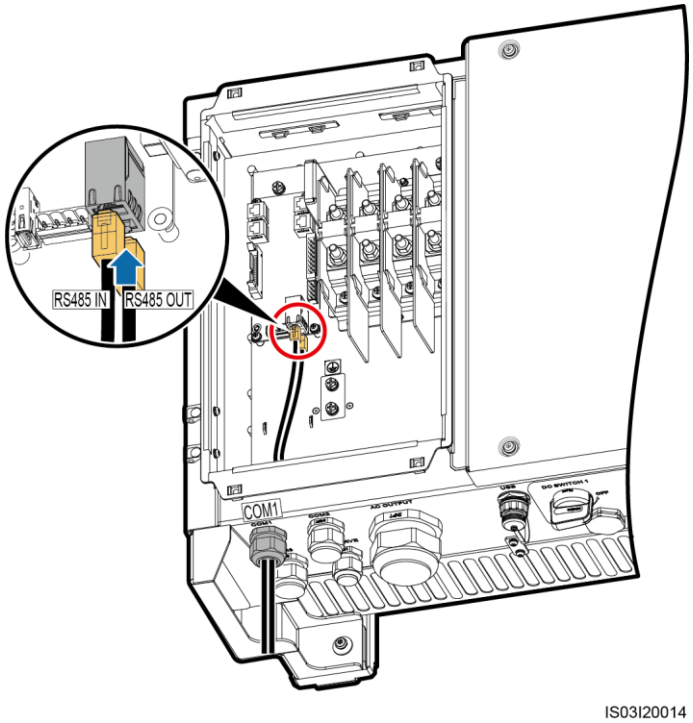
Step 1 Route the communications cables through the waterproof connector.

Figure 5-52 Routing cables



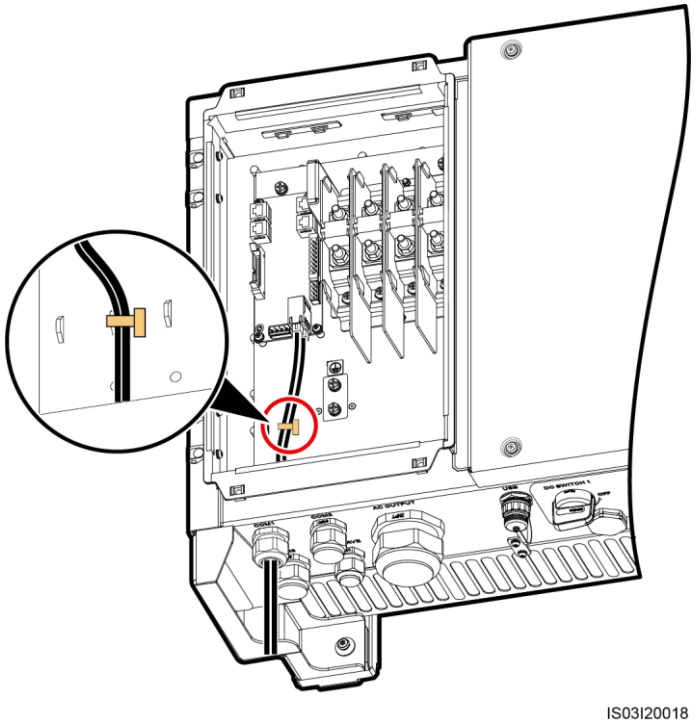
Step 2 Insert the RJ45 connectors into the RJ45 network ports in the SUN2000 maintenance compartment.

Figure 5-53 Connecting communications cables



Step 3 Bind communications cables after connecting them.

Figure 5-54 Binding communications cables



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

----End

Follow-up Procedure

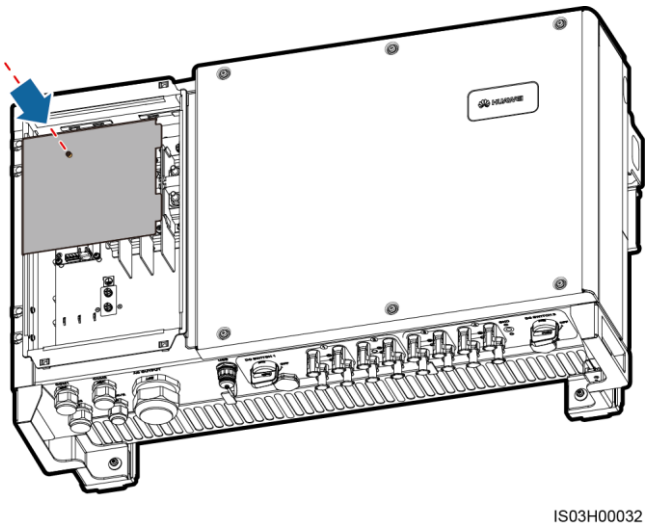
Check that the cables are connected correctly and securely. Then seal the waterproof connectors and cable holes, and clear foreign matter from the maintenance compartment.

5.7 Closing the Maintenance Compartment Door

Procedure

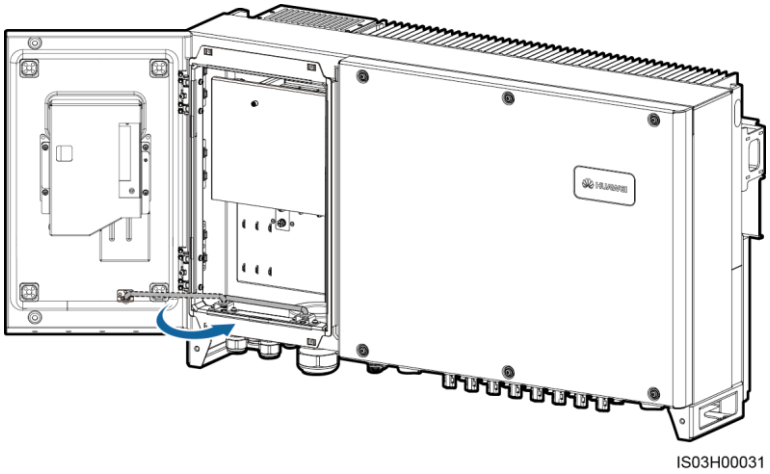
Step 1 Install the AC terminal cover.

Figure 5-55 Installing a cover



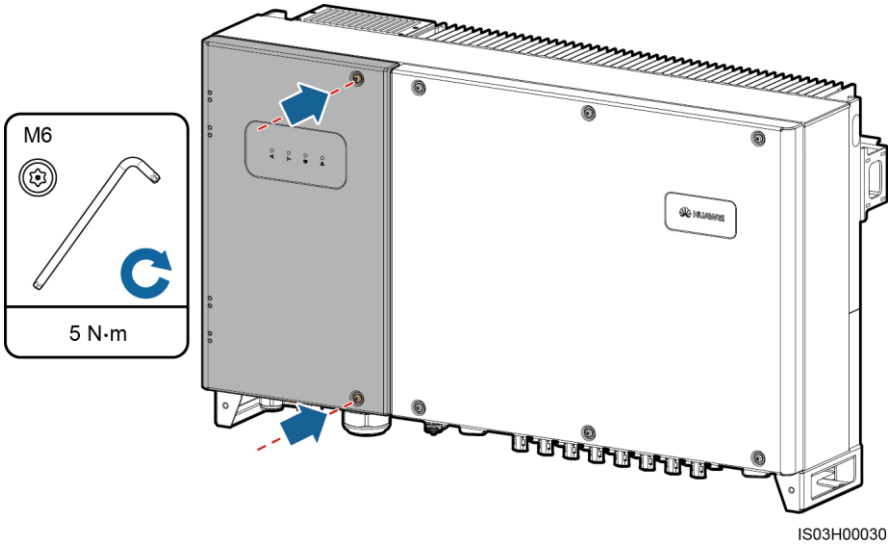
Step 2 Adjust the support bar.

Figure 5-56 Adjusting a support bar



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

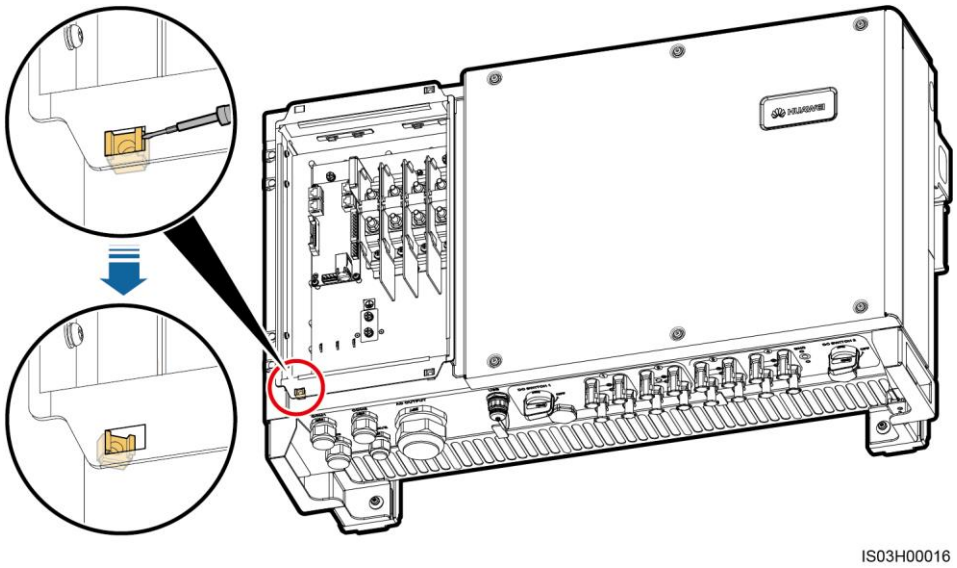
Figure 5-57 Tightening screws on the maintenance compartment door



NOTE

- If a screw on the maintenance compartment door is missing, use the unused ground screw on the chassis shell as a standby screw.
- If the floating nut used for securing the maintenance compartment door is missing, use the standby floating nut shown in Figure 5-58.

Figure 5-58 Removing a standby floating nut



----End

6 System Commissioning

6.1 Checking Before Power-On

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

6.2 Powering On the SUN2000

Prerequisites

Before turning on the AC switch between the SUN2000 and the power grid, use a multimeter to check that the AC voltage is within the specified range.

Procedure

Step 1 Turn on the AC switch between the SUN2000 and the power grid.

NOTICE

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

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

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

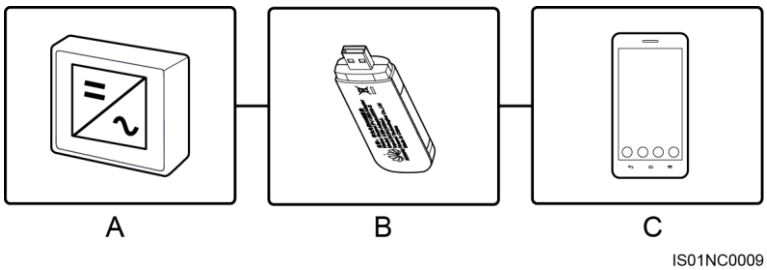
To ensure that the DC terminals are in good contact, check the temperatures at the joints between DC terminals and connectors after the SUN2000 has been running for a period of time. Ensure that the temperature rise does not exceed 40°C (104°F).

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

NOTICE

- Mobile phone operating system: Android 4.0 or later, iOS 7.0 or later. When the iOS is used, the app supports only Bluetooth connection.
- When you use a Bluetooth module to set up the connection, ensure that the mobile phone and SUN2000 are at most 5 meters (196.85 inches) away from each other. Otherwise, the communication quality between them will deteriorate.
- The screen snapshots in this document correspond to app V200R001C20SPC010 (Android).

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



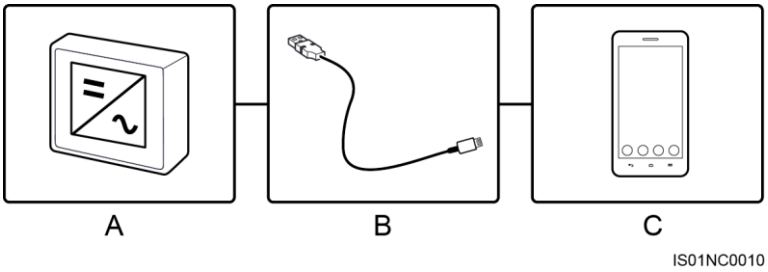
(A) Inverter (B) Bluetooth module (C) Mobile phone

NOTE

Purchase the Bluetooth module bundled with the SUN2000. A Bluetooth module purchased from any other source may not support communication between the SUN2000 and the app.

- The Android system supports the Bluetooth module USB-Adapter2000-B and BF4030.
- The iOS system supports the Bluetooth module USB-Adapter2000-B.

Figure 6-2 Data cable connection (Android)



(A) Inverter (B) USB data cable (C) Mobile phone

NOTE

Use the USB data cable delivered with the mobile phone.

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

Figure 6-3 Login screen

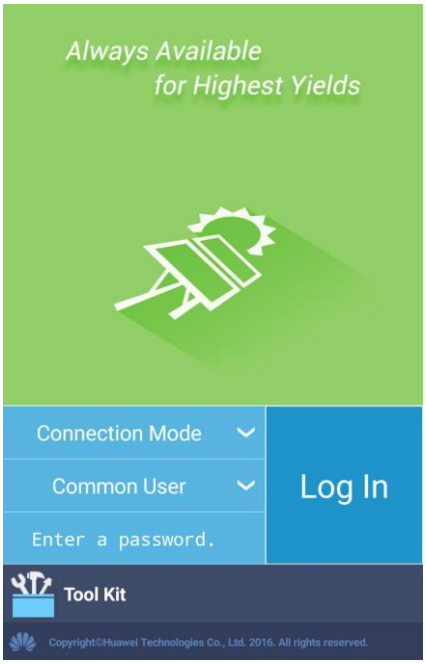


Figure 6-4 Selecting a connection mode

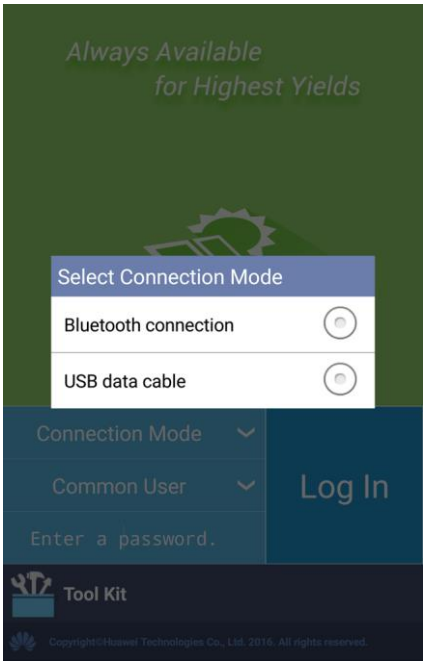


Figure 6-5 Bluetooth connection

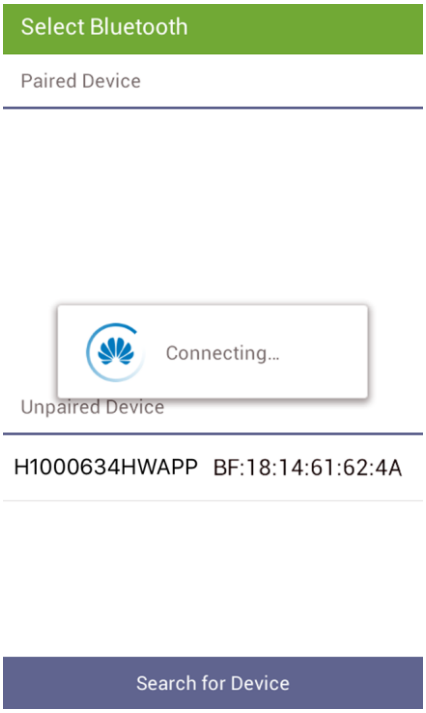
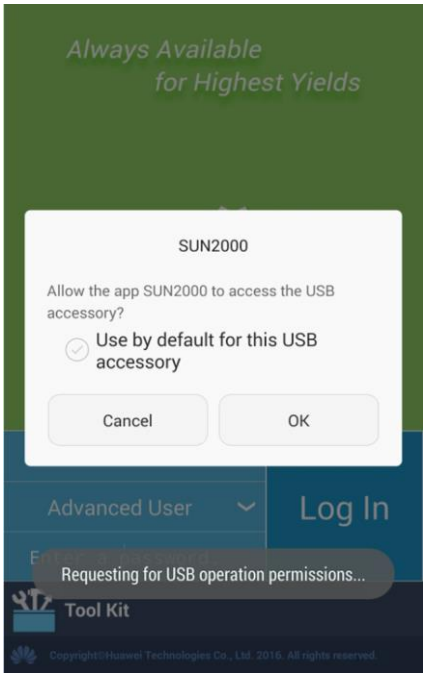


Figure 6-6 Data cable connection

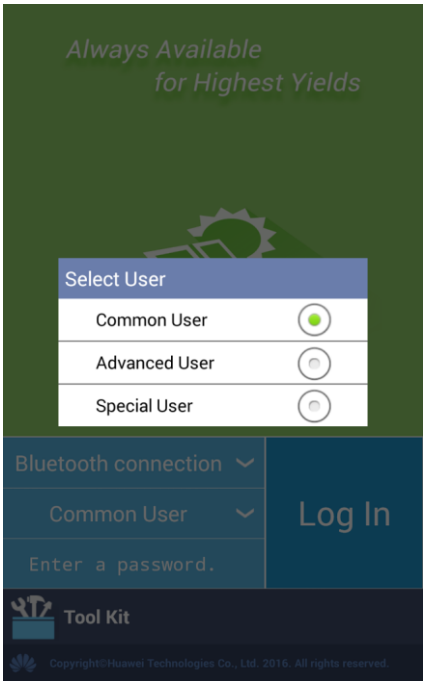


NOTE

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

Step 5 Tap the user name area to switch between the common user, advanced user, and special user.

Figure 6-7 Switching between users



NOTE

- The login password is the same as that for the SUN2000 connected to the app and is used only when the SUN2000 connects to the app.
- The initial passwords for **Common User**, **Advanced User**, and **Special User** are all **00000a**. Use the initial password upon first login. To ensure account security, change the password immediately after login.
- During the login, if an incorrect password is entered for five consecutive times (the interval between two consecutive invalid password entries is less than 2 minutes), the account will be locked for 10 minutes. The password consists of six digits.

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

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

NOTE

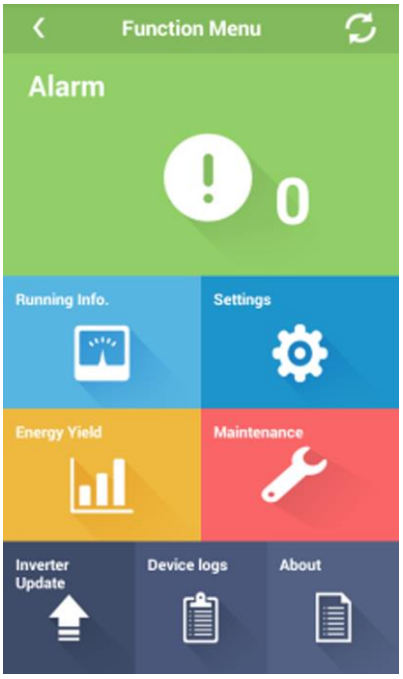
- If you log in to the app after the device connects to the app for the first time or factory defaults are restored, the Quick Settings screen will be displayed on which you can set basic parameters. After the settings take effect, you can enter the main menu screen and modify the parameters on the **Settings** screen. By default, the SUN2000 can be grid-tied and you do not have to set parameters.
- You are advised to log in to the **Quick Settings** screen as an advanced user for parameter settings.

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

NOTE

- Set the power grid code that applies to the country or region where the power station is located and the inverter model.
- Set user parameters based on the current date and time.
- Set **Baud rate**, **RS485 protocol**, and **Address** based on site requirements. **Baud rate** can be set to **4800**, **9600**, or **19200**. **RS485 protocol** can be set to **MODBUS RTU**, and **Address** can be set to any value in the range of 1 to 247.
- When multiple SUN2000s communicate with the SmartLogger over RS485, the addresses for all the SUN2000s on each RS485 route must be within the address range set on the SmartLogger and cannot be duplicate. Otherwise, the communication will fail. In addition, the baud rates of all the SUN2000s on each RS485 route must be consistent with the SmartLogger baud rate.

Figure 6-9 Function Menu screen



----End

6.3 Powering Off the SUN2000

Context

WARNING

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

Procedure

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

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

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

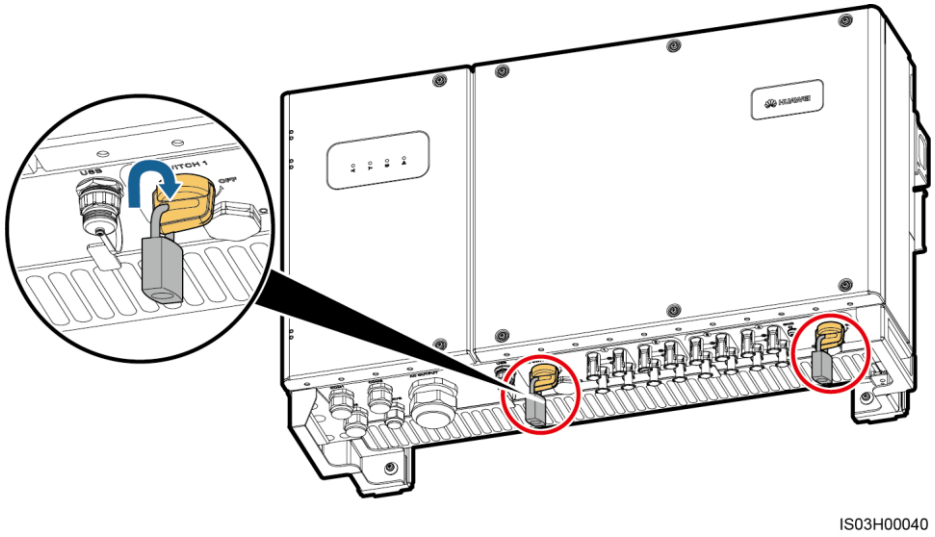
Step 3 Set the two DC switches to OFF.

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

NOTE

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

Figure 6-10 Installing locks



----End

7 Man-Machine Interactions

7.1 Operations with a USB Flash Drive

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

7.1.1 Exporting Configurations

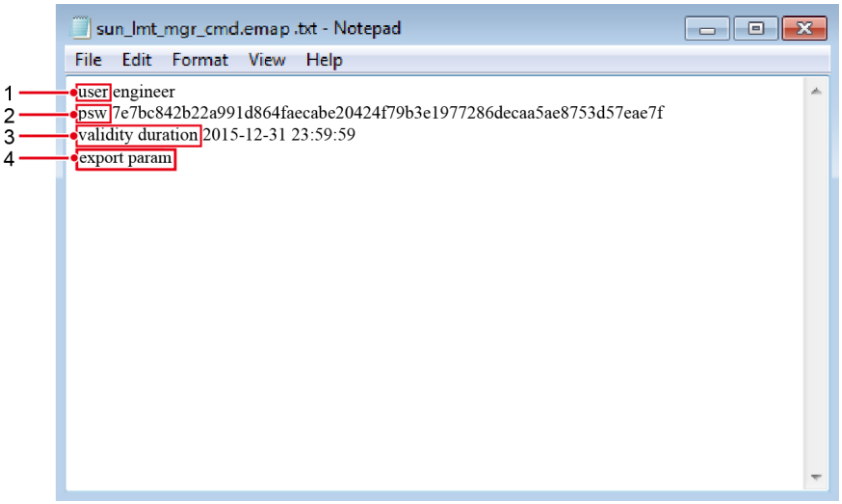
Procedure

Step 1 Generate a boot script file by choosing **Tool Kit** > **Local maintenance script** > **Inverter maint script** > **Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

Step 2 Import the boot script file to a PC.

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

Figure 7-1 Boot script file



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

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

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

NOTICE

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

Table 7-1 LED indicator description

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

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

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

----End

7.1.2 Importing Configurations

Prerequisites

A complete configuration file has been exported.

Procedure

Step 1 Generate a boot script file by choosing **Tool Kit** > **Local maintenance script** > **Inverter maint script** > **Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

Step 2 Import the boot script file to a PC.

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

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

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

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

Table 7-2 LED indicator description

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

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

----End

7.1.3 Exporting Data

Procedure

Step 1 Generate a boot script file by choosing **Tool Kit** > **Local maintenance script** > **Inverter maint script** > **Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

Step 2 Import the boot script file to the root directory of a USB flash drive.

Step 3 Connect the USB flash drive to the USB port. The system automatically identifies the USB flash drive and executes all commands specified in the boot script file. View the LED indicator to determine the operating status.

NOTICE

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

Table 7-3 LED indicator description

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

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

NOTE

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

----End

7.1.4 Upgrading

Context

Upgrade delay is mainly used in the upgrade scenarios where the PV power supply is disconnected at night due to no solar radiation or unstable at dawn or dusk due to poor solar radiation.

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

NOTE

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

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

1. The monitoring component caches and loads the upgrade package.
2. Upgrade package activation starts when the following conditions are met.

Table 7-4 Conditions for starting delayed activation

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

NOTE

- When upgrading the SUN2000 remotely, do not perform local operations for the SUN2000.
- If the SUN2000 needs to be upgraded when the PV power supply is unavailable at night due to no solar radiation or unstable at dawn or dusk due to poor solar radiation, ensure that the SUN2000 AC output connects to the power grid.

Procedure

Step 1 Log in to http://support.huawei.com/carrier/ and browse or search for SUN2000 on the **Product Support** tab page. Download the required upgrade package (for example, SUN2000 V200R002C20SPC*XXX*) from the **Software** tab page.

Step 2 Decompress the upgrade package.

After obtaining the upgrade package **SUN2000V200R002C20SPC***XXX*_package.zip, decompress it and ensure that the extracted files include:

- config.txt
- sun_lmt_mgr_cmd.emap (This is a boot script file.)
- SUN2000.bin
- SUN2000_CPLD.bin
- SUN2000_FLT_Release.bin
- SUN2000_Master_Release.bin
- SUN2000_Slave_Release.bin
- vercfg.xml

NOTICE

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

Step 3 Generate a boot script file by choosing **Tool Kit** > **Local maintenance script** > **Inverter maint script** > **Inverter Command Settings** on the SUN2000 app. For details, see the *SUN2000 APP User Manual*.

Step 4 Import the boot script file to a computer.

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

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

NOTE
Ensure that all upgrade files are copied to the root directory of the USB flash drive.

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

NOTICE

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

Table 7-5 LED indicator description

LED Indicator	Status	Meaning
	Green off	There is no operation with a USB flash drive.
	Blinking green at long intervals (on	There is an operation with

LED Indicator	Status	Meaning
	for 1s and then off for 1s)	a USB flash drive.
	Blinking green at short intervals (on for 0.125s and then off for 0.125s)	An operation with a USB flash drive has failed.
	Steady green	An operation with a USB flash drive is successful.

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

NOTE

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

----End

7.2 Operations with a SmartLogger

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

7.3 Operations with the NMS

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

7.4 Operations with the SUN2000 APP

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

8 Maintenance

8.1 Routine Maintenance

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

CAUTION

- Before cleaning the system, and maintaining the cable connections and grounding reliability, power off the system (see 6.3 Powering Off the SUN2000) and ensure that the two DC switches on the SUN2000 are OFF.
- If you need to open the maintenance compartment door in rainy or snowy days, take protective measures to prevent rain and snow entering the maintenance compartment. If it is impossible to take protective measures, do not open the maintenance compartment door in rainy or snowy days.

Table 8-1 Maintenance list

Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles or dust.	Once six months to a year
System running status	• Check that the SUN2000 is not damaged or deformed. • Check that the running sound of the SUN2000 is normal. • When the SUN2000 is running, check that all SUN2000 parameters are correctly set.	Once six months
Cable connections	• Check that cables are securely connected. • Check that cables are intact, in particular, the parts touching the metallic surface are not scratched.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six

Item	Check Method	Maintenance Interval
	• Check that the cover on the USB port is tightened. • Check that idle RESERVE and COM waterproof connectors are plugged and the locking caps are tightened.	months to a year.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is half a year after the initial commissioning. From then on, perform the inspection once six months to a year.

8.2 Troubleshooting

Alarm severities are defined as follows:

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

Table 8-2 Common alarms and troubleshooting measures

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
103	High DC Input Voltage	Major	• Cause ID = 1 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 1 and 2, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage. • Cause ID = 2 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 3 and 4, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage. • Cause ID = 3	• Cause ID = 1 Reduce the number of PV modules connected in series to PV strings 1 and 2 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 2 Reduce the number of PV modules connected in series to PV strings 3 and 4 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 3

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 5 and 6, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage. • Cause ID = 4 The PV array is not properly configured. Excessive PV modules are connected in series to PV strings 7 and 8, and therefore the PV string open-circuit voltage exceeds the maximum value of the inverter MPPT voltage.	Reduce the number of PV modules connected in series to PV strings 5 and 6 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears. • Cause ID = 4 Reduce the number of PV modules connected in series to PV strings 7 and 8 until the open-circuit voltage is less than or equal to the maximum inverter input voltage. After the PV array configuration is corrected, the SUN2000 alarm disappears.
106–113	Abnormal String 1–8	Warning	Cause ID = 1 • The PV string is shielded from sunlight for a long time. • The PV string deteriorates or is damaged.	1. Check whether the PV string current is obviously lower than the currents of other PV strings. 2. If yes, check whether the PV string is shielded from sunlight. 3. If the PV string is clean and not shielded from sunlight, check whether any PV module is faulty.
120–127	String 1–8 Reversed	Cause ID = 1: Major Cause ID = 2: Warning	• Cause ID = 1 The PV string is reversely connected. • Cause ID = 2 Only a few PV modules are connected in series to the PV string, and therefore the end voltage is lower than that of other PV strings.	• Cause ID = 1 Check whether the PV string is reversely connected to the SUN2000. If yes, wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A. Then, turn off the two DC switches and correct the PV string connection. • Cause ID = 2 Check whether the number of PV modules connected in series to the SUN2000 is small. If yes, increase the number.
200	Abnormal DC Circuit	Major	Abnormal external conditions trigger the protection for the DC circuit inside the SUN2000. The possible causes are as follows: • Cause ID = 3 The SUN2000 input is disconnected accidentally, or the PV string output power changes sharply because the	Cause ID = 3/10/11 1. The SUN2000 detects its external working conditions in real time. After the fault is rectified, the SUN2000 automatically recovers. 2. If the alarm persists, contact Huawei technical support. Cause ID = 12/15

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

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			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.	
301	Abnormal Grid Voltage	Major	The grid voltage is beyond the acceptable range. The possible causes are as follows: • Cause ID = 4 The grid voltage is below the specified lower threshold. • Cause ID = 16 The grid voltage exceeds the specified upper threshold. • Cause ID = 19 The grid voltage has exceeded the specified upper threshold for 10 minutes. • Cause ID = 26 The grid voltage exceeds the specified upper threshold. • Cause ID = 28 The three phases of the power grid differ greatly in voltage. • Cause ID = 29 1. The power grid experiences an outage. 2. The AC circuit is disconnected or AC switch is OFF. • Cause ID = 31/32/33 The impedance of the output phase wire A (cause ID = 31)/B (cause ID = 32)/C (cause ID = 33) to the PE cable is low or short-circuited.	Cause ID = 4 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid voltage is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 app, SmartLogger, or NMS to modify the grid overvoltage and undervoltage protection thresholds with the consent of the local power operator. 3. If the fault persists for a long time, check the AC switch and AC output power cable. Cause ID = 16/19/26 1. Check whether the grid-tied voltage exceeds the upper threshold. If yes, contact the local power operator. 2. If you have confirmed that the grid-tied voltage exceeds the upper threshold and obtained the consent of the local power operator, modify the overvoltage and undervoltage protection thresholds. 3. Check whether the peak grid voltage exceeds the upper threshold. Cause ID = 28 1. If the exception is caused by an external fault, the SUN2000 automatically recovers after the fault is rectified. 2. If the alarm persists and affects the energy yield of the power station, contact the local power operator.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
				Cause ID = 29 1. Check the AC voltage. 2. Check that the AC power cable is securely connected and that the AC switch is ON. Cause ID = 31/32/33 Check the impedance of output phase wire A (cause ID = 31)/B (cause ID = 32)/C (cause ID = 33) to the PE cable and locate the position with lower impedance and resolve the issue.
305	Abnormal Grid Frequency	Major	• Cause ID = 2 The actual grid frequency is higher than the standard requirement for the local power grid. • Cause ID = 4 The actual grid frequency is lower than the standard requirement for the local power grid. • Cause ID = 5 The actual change rate of the grid frequency does not meet the standard requirement for the local power grid.	Cause ID = 2/4 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator. If yes, log in to the SUN2000 app, SmartLogger, or NMS to modify the grid overfrequency and underfrequency protection thresholds with the consent of the local power operator. Cause ID = 5 1. If the alarm occurs accidentally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the grid frequency is within the acceptable range. If no, contact the local power operator.
313	Low Insulation Resistance	Major	Cause ID = 1 • A short circuit occurs between the PV string and the PGND cable. • The PV string is installed in a moist environment for a long	1. Check the impedance between the PV string and the PGND cable. If a short circuit occurs, rectify the fault. 2. If you are sure that the impedance is less than the default value in a cloudy or rainy environment, log

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			time.	in to the SUN2000 app, SmartLogger, or NMS and set **Insulation resistance protection**.
318	Abnormal Residual Current	Major	Cause ID = 1 The insulation resistance against the PGND cable at the input side decreases when the SUN2000 is running, which causes an excessively high residual current.	1. If the alarm occurs accidentally, the external circuit may be abnormal temporarily. The SUN2000 automatically recovers after fault is rectified. 2. If the alarm occurs repeatedly or persists, check whether the impedance between the PV string and the ground is excessively low.
321	Cabinet Overtemperature	Major	Cause ID = 1 • The SUN2000 is installed in a place with poor ventilation. • The ambient temperature exceeds the upper threshold. • The internal fan works abnormally.	1. Check the ventilation and ambient temperature of the SUN2000 installation position. 2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 3. If the ventilation and ambient temperature both meet requirements, contact Huawei technical support.
322	Abnormal SPI Communication	Major	Cause ID = 1 An unrecoverable fault occurs on a circuit inside the SUN2000.	Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.
326	Abnormal Grounding	Major	Cause ID = 1 • The neutral wire or PGND cable does not connect to the SUN2000. • The SUN2000 output side does not connect to an isolation transformer when the PV string output is grounded.	1. Check that the neutral wire or PGND cable properly connects to the inverter. 2. If the PV string output is grounded, check that the SUN2000 output side connects to an isolation transformer.
400	System Fault	Major	Cause ID = 1/3/21/23/27 An unrecoverable fault occurs on a circuit inside the SUN2000.	Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support.
410	Abnormal Auxiliary Power	Major	Cause ID = 4 The sampling control board has an abnormal voltage, which may be caused by the following: • The internal power chip of	1. When the alarm is generated, the SUN2000 shuts down automatically. When the fault is rectified, the SUN2000 starts automatically. 2. If the alarm persists, contact

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
			the sampling control board is faulty. • The detection circuit becomes faulty.	Huawei technical support.
411	AFCI Self-Check Failure	Major	Cause ID = 1/2/3 AFCI check fails.	1. Turn off the AC output switch and DC input switch. Then turn on the AC output switch and DC input switch after 5 minutes. If the fault persists, contact Huawei technical support. 2. Disable the AFCI function if you are sure not to use it.
412	DC Arc Fault	Major	Cause ID = 1/2/3/4 The PV string cable is in poor contact or with open circuits.	Check whether the PV string cable is in poor contact or with open circuits. If yes, reconnect the cable.
504	Software Version Unmatch	Minor	Cause ID = 1/2/3 During inverter software upgrade, the version of the software loaded is incorrect.	Check whether you have performed a software upgrade recently. If yes, upgrade the software to the correct version again.
505	Upgrade Failed	Major	Cause ID = 1 The upgrade does not end normally.	Perform the upgrade again.
61440	Flash Fault	Minor	Cause ID = 1 • The flash memory is insufficient. • The flash memory has bad sectors.	1. Replace the monitoring board. 2. If the monitoring board is built into the monitoring device, replace the monitoring device.

NOTE

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

9 Handling the SUN2000

9.1 Removing the SUN2000

NOTICE

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

Perform the following operations to remove the SUN2000:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and ground cables.
2. Remove the SUN2000 from the mounting bracket.
3. Remove the mounting bracket.

9.2 Packing the SUN2000

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

9.3 Disposing of the SUN2000

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

10 Technical Specifications

Efficiency

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Maximum conversion efficiency	98.9%		
CEC efficiency	98.5%		

Input

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Maximum input power	37,500 W	41,000 W	45,100 W
Maximum input voltage	1000 V		
Maximum input current (per MPPT)	22 A		
Maximum short-circuit current (per MPPT)	30 A		
Maximum inverter backfeed current to the PV array	0 A		
Lowest operating/startup voltage	200 V/250 V		
MPPT voltage range at full load	460–850 V	490–850 V	530–850 V

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

Output

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

Protection

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Anti-islanding protection	Supported		
Input DC switch	Supported		

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Output overcurrent protection	Supported		
Input reverse connection protection	Supported		
PV string fault detection	Supported		
DC surge protection	Type II		
AC surge protection	Type II		
Insulation resistance detection	Supported		
Residual current monitoring unit (RCMU)	Supported		
AFCI	Supported (UL 1699B, Type I)		

Communication

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

Common Parameters

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Dimensions (W x H x D)	Including the mounting plate: 930 mm x 550 mm x 283 mm (36.61 in. x 21.65 in. x 11.14 in.)		
Weight	Excluding the mounting plate: about 60 kg (132.28 lb)/Including the mounting plate: about 62 kg (136.69 lb)		
Operating temperature	–25°C to +60°C (–13°F to +140°F)		
Cooling mode	Natural convection		
Humidity	0%–100% RH		

Item	SUN2000-33KTL-US	SUN2000-36KTL-US	SUN2000-40KTL-US
Input terminal	Amphenol Helios H4 or MC4		
Output terminal	Waterproof cable connector+OT terminal		
Ingress Protection Rating	Type 4X		
Topology	Transformerless		

A Grid Codes

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

Table A-1 Grid codes

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

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

B Acronyms and Abbreviations

A	
ACDU	AC distribution unit
AFCI	arc-fault circuit interrupter
C	
CCO	central controller
CEC	California Energy Commission
E	
EFUP	environmentally friendly use period
L	
LED	light emitting diode
M	
MPP	maximum power point
MPPT	maximum power point tracking
N	
NMS	network management system
P	
PID	potential induced degradation
PLC	power line communication

PV	photovoltaic
R	
RCMU	residual current monitoring unit
T	
THD	total harmonic distortion
W	
WEEE	waste electrical and electronic equipment