EESOLAR-6/10KTL-M1 PV Inverter

User Manual

Issue 01

Date 2023-07-30

About This Document

Overview

This document describes the smart solar inverter in terms of their installation, electrical connections, commissioning, maintenance, and troubleshooting. Before installing and operating the smart solar inverter, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

Intended Audience

This document is applicable to:

- Installers
- Users

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could 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	Supplements the important information in the main text. 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 the changes made in earlier issues.

Issue 01 (2023-07-30)

This issue is used for first office application (FOA).

Contents

1 Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger**, **Warning**, **Caution**, and **Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **Entelar Group shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment shall be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. Entelar Group shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

Entelar Group shall not be liable for any of the following circumstances or their consequences:

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.
- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.

- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to Entelar Group.

1.1 Personal Safety

DANGER

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will generate electric arcs or sparks, which may cause a fire or personal injury.

DANGER

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

DANGER

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

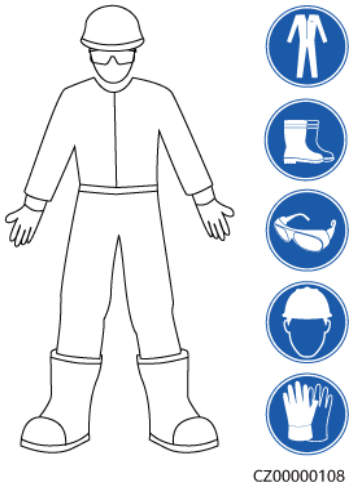
DANGER

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

WARNING

During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.

Figure 1-1 Personal protective equipment



General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not enter the affected building or equipment area under any circumstances.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
  - Professionals: personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, maintenance
  - Trained personnel: personnel who are trained in technology and safety, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Personnel who plan to install or maintain the equipment must receive adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.

- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will perform special tasks such as electrical operations, working at heights, and operations of special equipment must possess the required local qualifications.
- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

DANGER

Non-standard and improper operations may result in fire or electric shocks.

DANGER

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment damage, load power derating, power failure, or personal injury may occur.

WARNING

For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.

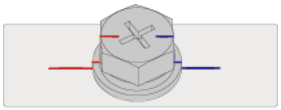
CAUTION

Do not route cables near the air intake or exhaust vents of the equipment.

General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.

- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.
- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all the tools to prevent them from being left inside the equipment.
- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt, and the torque error does not exceed 10% of the specified value.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks must cross the edges of the bolts.)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- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- Do not open equipment panels.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are away from each other without entanglement and overlapping.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

DANGER

Do not store any flammable or explosive materials in the equipment area.

DANGER

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheating may damage the equipment or cause a fire.

⚠ WARNING

Install the equipment in an area far away from liquids. Do not install it under areas prone to condensation, such as underwater pipes and air exhaust vents, or areas prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

⚠ WARNING

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well-ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel (recommended area: 3 m x 2.5 m).
- Do not install the equipment outdoors in salt-affected areas because it may be corroded. A salt-affected area refers to the region within 500 m of the coast or prone to sea breeze. Regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the top of the equipment to prevent foreign objects from falling into the equipment.

- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Mechanical Safety

⚠ WARNING

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

⚠ WARNING

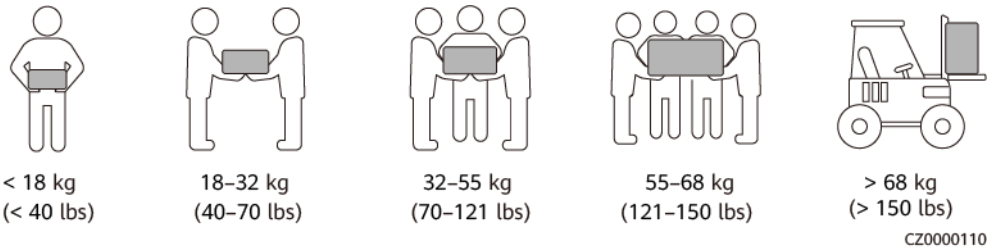
Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by Entelar Group.
- Do not install other devices on the top of the equipment without evaluation by Entelar Group.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.



- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.

- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gear such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose sea or roads in good conditions for transportation as transportation by railway or air is not supported. Avoid tilting or jolting during transportation.

Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Single ladders are not recommended.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the ladder is securely positioned and held firm.

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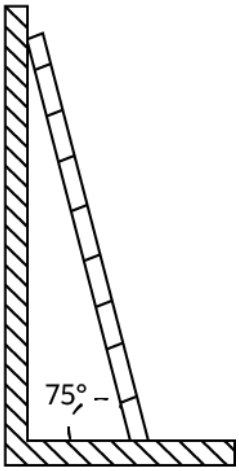
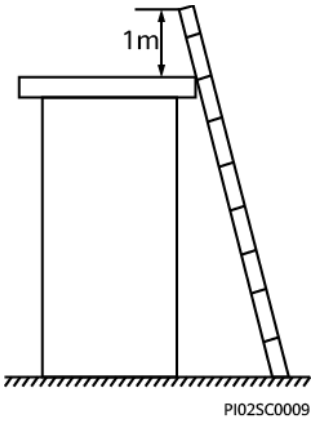
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.
- If a single ladder is used, the recommended angle for the ladder against the floor is 75 degrees, as shown in the following figure. A square can be used to measure the angle.

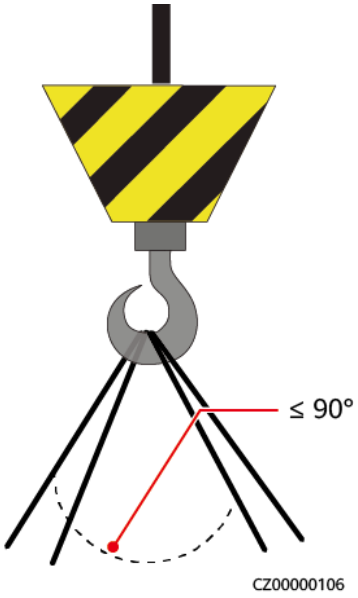


- If a single ladder is used, ensure that the wider end of the ladder is at the bottom, and take protective measures to prevent the ladder from sliding.
- If a single ladder is used, do not climb higher than the fourth rung of the ladder from the top.
- If you use a single ladder to climb up to a platform, ensure that the ladder is at least 1 m higher than the platform.



Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

2 Overview

2.1 Product Introduction

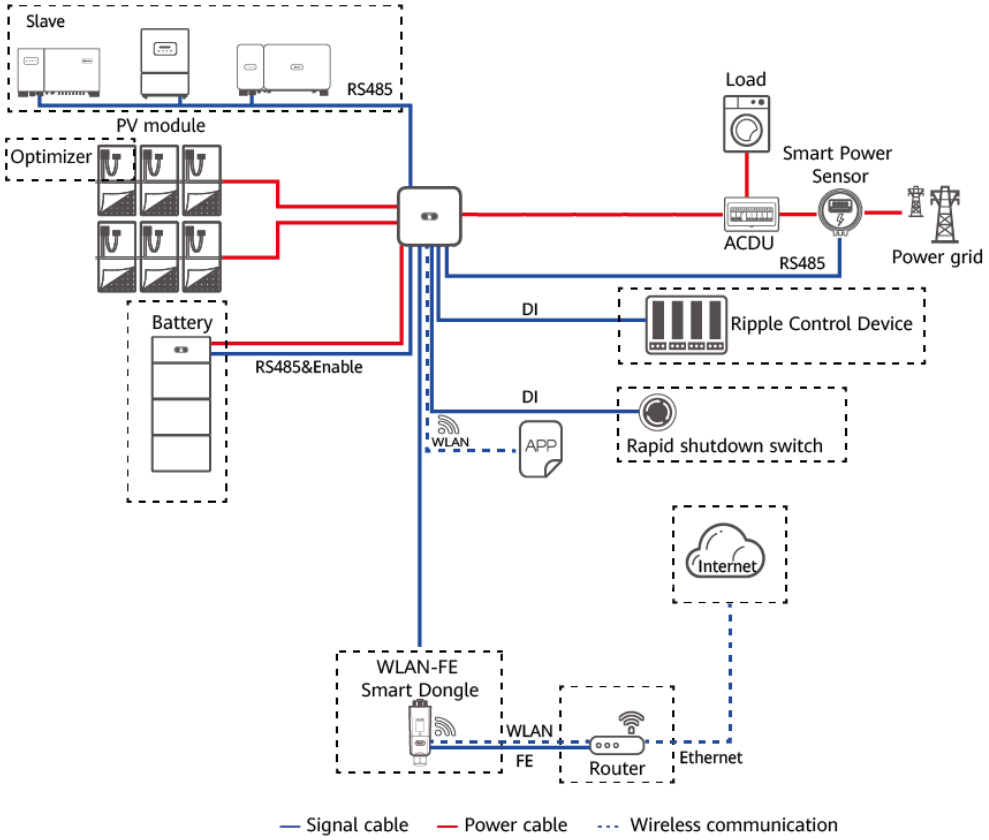
Functions

The inverter 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.

Networking Application

The inverter applies to residential rooftop grid-tied systems and small-sized ground PV plant grid-tied systems. Typically, a grid-tied system consists of PV strings, grid-tied inverters, AC switches, and power distribution units.

Figure 2-1 Networking application (dashed boxes indicate optional components)



NOTE

- If the built-in Wi-Fi module of the inverter connects to the app, only device commissioning can be performed.
- If inverters are cascaded without any battery, the main inverter can be 6KTL and 10KTL. The slave inverter can be 6KTL and 10KTL.
- If inverters are cascaded with a battery, the main inverter can be 6KTL and 10KTL. The slave inverter can be 6KTL and 10KTL.
- Contact your dealer for a list of compatible 3rd party Optimizers.

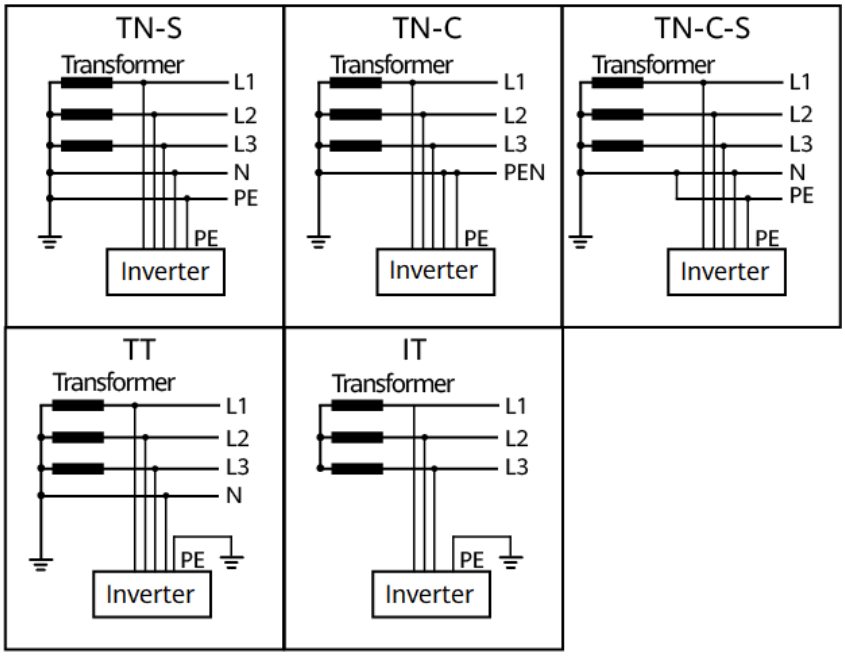
NOTE

- For a PV string connected to an MPPT circuit, the model, quantity, orientation, and tilt angle of PV modules in the PV string must be the same.
- The voltage of different MPPT circuits must be the same.
- The MPPT voltage must be greater than the lower threshold of the full-load MPPT range specified in the inverter technical data sheet. Otherwise, the inverter will be derated, causing the system yield loss.

Supported Power Grid Types

The inverter supports TN-S, TN-C, TN-C-S, TT, and IT power grids.

Figure 2-2 Power grid types

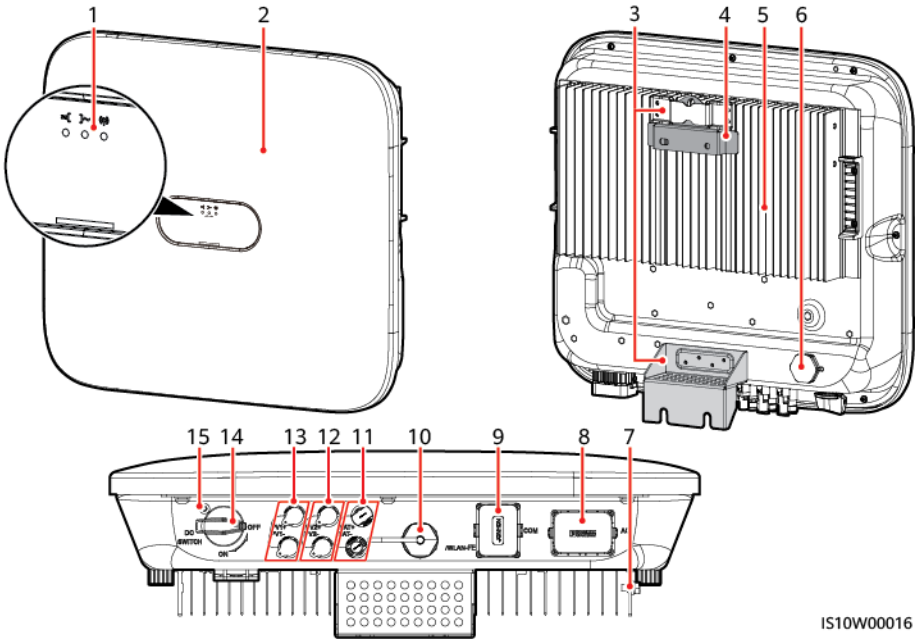


NOTE

- When the inverter is used in the TT power grid, the N-to-PE voltage must be less than 30 V.
- When the inverter is used in the IT power grid, set **Isolation** to **Input ungrounded, with TF**.

2.2 Appearance

Figure 2-3 Appearance



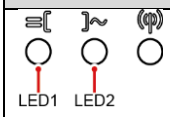
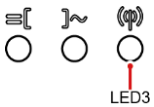
(1) LED indicator
(2) Front panel
(3) Hanging kit
(4) Mounting bracket
(5) Heat sink
(6) Ventilation valve
(7) Ground screw
(8) AC output port (AC)
(9) Communications port (COM)
(10) Smart Dongle port (WLAN-FE)
(11) Battery terminals (BAT+/BAT–)
(12) DC input terminals (PV2+/PV2–)
(13) DC input terminals (PV1+/PV1–)
(14) DC switch (DC SWITCH)
(15) Hole for the DC switch locking screw

NOTE

Two M6 screw holes are reserved on the left and right sides of the inverter for installing the awning.

Table 2-1 Indicator description

Category	Status		Description
Running indicator	**LED1**	**LED2**	-
	Steady green	Steady green	The inverter is operating in grid-tied mode.

Category	Status			Description
	Blinking green at long intervals (on for 1s and then off for 1s)	Off		The DC is on, and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)		Both the DC and AC are on, and the inverter is not supplying power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)		The DC is off, and the AC is on.
	Off	Off		Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	-		DC environment alarm. For example, the input voltage of the PV string is high, the PV string is reversely connected, or the insulation resistance is low.
	-	Blinking red at short intervals		AC environment alarm. For example, the power grid is undervoltage, overvoltage, overfrequency, or underfrequency.
	Steady red	Steady red		Fault
Communications indicator 	**LED3**			-
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)			Communication is in progress. (When a mobile phone is connected to the inverter, the indicator blinks green at long intervals, indicating that the phone is connected to the inverter.)
	Blinking green at long intervals (on for 1s and then off for 1s)			Mobile phone access
	Off			No communication
Device replacement indicator	**LED1**	**LED2**	**LED3**	–
	Steady red	Steady red	Steady red	The inverter hardware is faulty, and the inverter needs

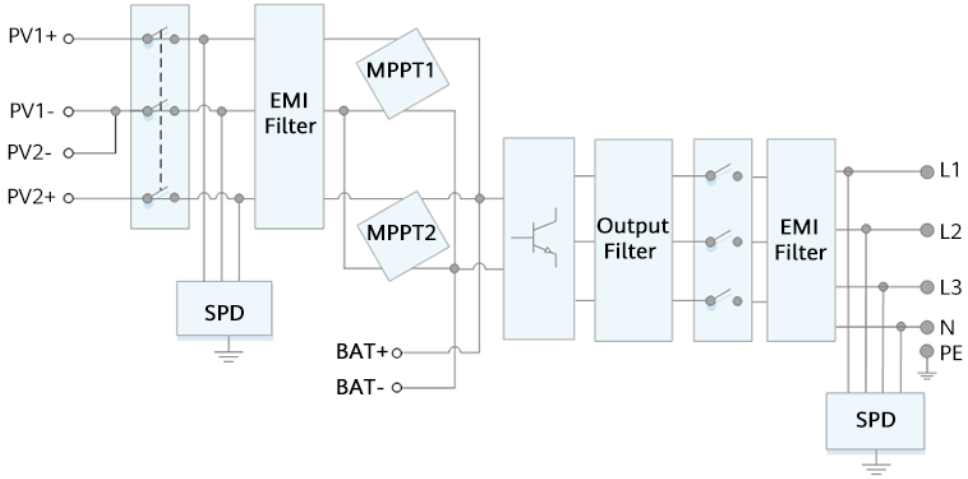
Category	Status			Description
				to be replaced.

2.3 Working Principles

2.3.1 Circuit Diagram

Two PV strings connect to the inverter, and their maximum power points are tracked by two maximum power point tracking (MPPT) circuits. The inverter converts DC power into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

Figure 2-4 inverter conceptual diagram



2.3.2 Working Modes

The inverter can work in Standby, Operating, or Shutdown mode.

Figure 2-5 Working modes

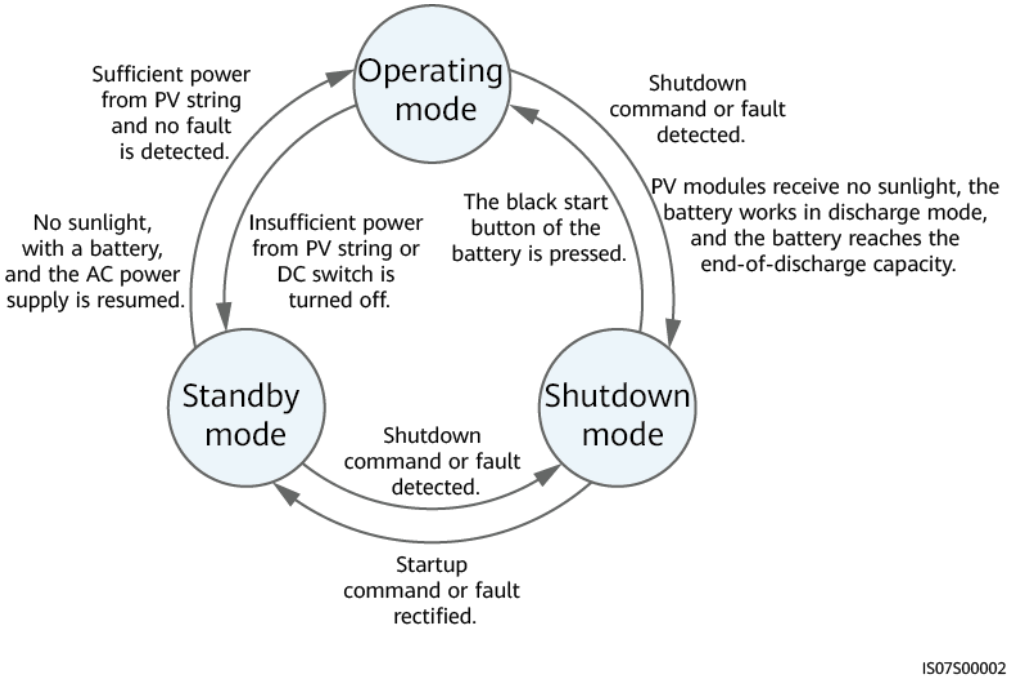


Table 2-2 Working mode description

Working Mode	Description
Standby	The inverter enters Standby mode when the external environment does not meet the operating requirements. In Standby mode: • The inverter continuously performs status check and enters the Operating mode once the operating requirements are met. • The inverter enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	In Operating mode: • The inverter converts DC power from PV strings into AC power and feeds the power to the power grid. • The inverter tracks the maximum power point to maximize the PV string output. • If the inverter detects a fault or a shutdown command, it enters the Shutdown mode. • The inverter enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid for generating power. • If the PV modules receive no sunlight, the battery works in discharge mode, and the battery reaches the end-of-discharge capacity, the inverter enters Shutdown mode.
Shutdown	• In Standby or Operating mode, the inverter enters Shutdown mode after detecting a fault or shutdown command.

Working Mode	Description
	• In Shutdown mode, the inverter enters Standby mode after detecting a startup command or that the fault is rectified. • In Shutdown mode, if the black start button of the battery is pressed, the inverter enters Operating mode.

3 Storage

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

- Do not unpack the inverter.
- Keep the storage temperature at –40°C to +70°C and the humidity at 5%–95% RH.
- The inverter should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of eight inverters can be stacked. To avoid personal injury or device damage, stack inverters with caution to prevent them from falling over.
- Periodic inspections are required during the storage. Replace the packing materials if necessary.
- If the inverter has been stored long-term, qualified personnel should conduct inspections and tests before it is put into use.

4 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.

NOTE

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

Package Contents

NOTICE

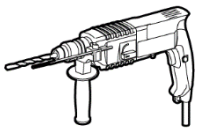
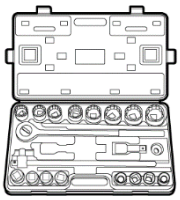
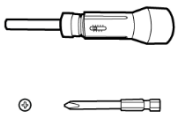
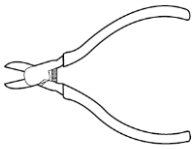
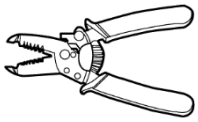
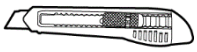
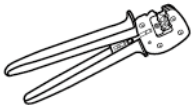
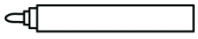
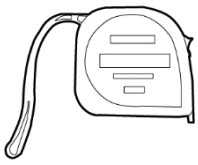
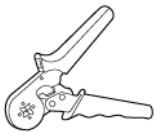
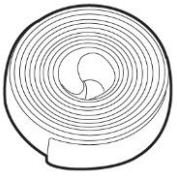
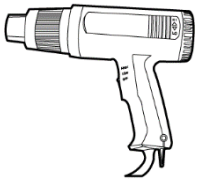
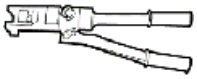
- After placing the equipment in the installation position, unpack it with care to prevent scratches. Keep the equipment stable during unpacking.

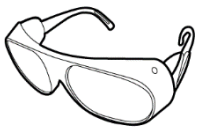
After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

NOTE

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

4.2 Tools

Type	Tool			
Installation Tools	 Hammer drill Drill bit: Φ8 mm and Φ6 mm	 Socket wrench set	 Torque screwdriver Phillips head: M3	 Diagonal pliers
	 Wire stripper	 Removal wrench Model: PV-MS-HZ Open-end Wrench; manufacturer: Staubli	 Rubber mallet	 Utility knife
	 Cable cutter	 Crimping tool Model: PV-CZM-22100/19100; manufacturer: Staubli	 Multimeter DC voltage measurement range ≥ 1100 V DC	 Vacuum cleaner
	 Marker	 Measuring tape	Bubble or digital level	 Cord end terminal crimper
	 Heat shrink tubing	 Heat gun	 Cable tie	 Hydraulic pliers

Type	Tool			
PPE	 Insulated gloves	 Protective gloves	 Dust mask	 Safety shoes
	 Safety goggles	-	-	-

4.3 Determining the Installation Position

4.3.1 Environment Requirements

Basic Requirements

- The inverter is protected to IP65 and can be installed indoors or outdoors.
- Do not install the inverter in a place where personnel are easy to come into contact with its enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install the inverter in areas with flammable or explosive materials.
- Do not install the inverter at a place within children's reach.
- Do not install the inverter outdoors in salt areas because it will be corroded there and may cause fire. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary depending on weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- The inverter must be installed in a well-ventilated environment to ensure good heat dissipation.
- Recommended: Install the inverter in a sheltered place or a place with an awning.

Mounting Structure Requirements

- The mounting structure where the inverter is installed must be fireproof.
- Do not install the inverter on flammable building materials.
- The inverter is heavy. Ensure that the installation surface is solid enough to bear the weight load.
- In residential areas, do not install the inverter on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the inverter is noticeable.

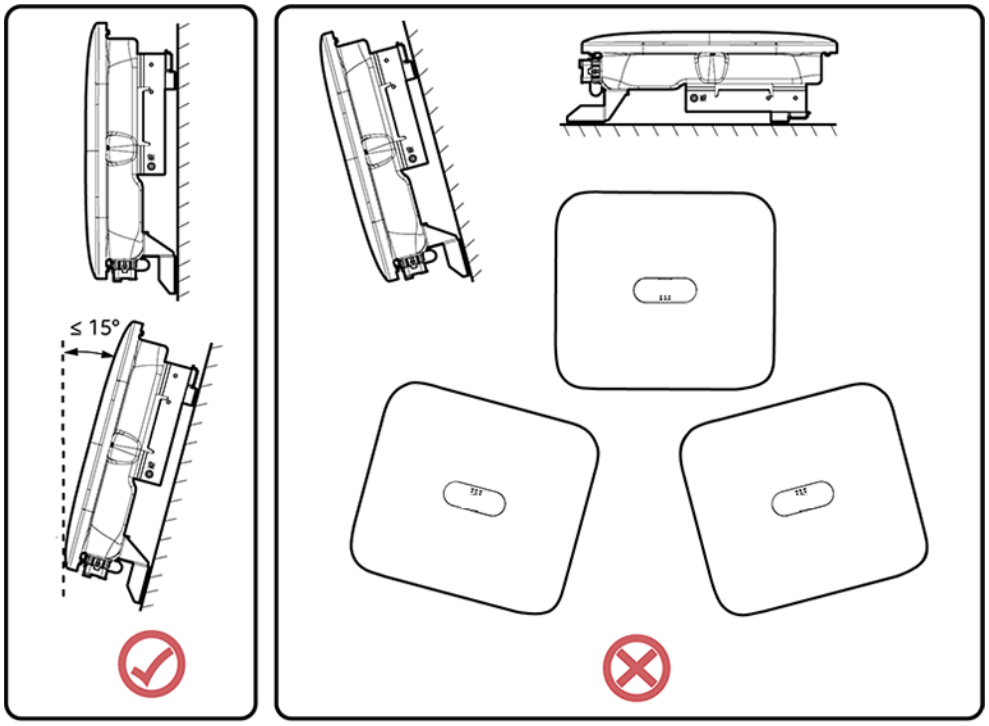
4.3.2 Space Requirements

Installation Angle Requirements

The inverter can be wall-mounted or pole-mounted. The installation angle requirements are as follows:

- Install the inverter vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the inverter at forward tilted, excessive back tilted, side tilted, horizontal, or upside-down positions.

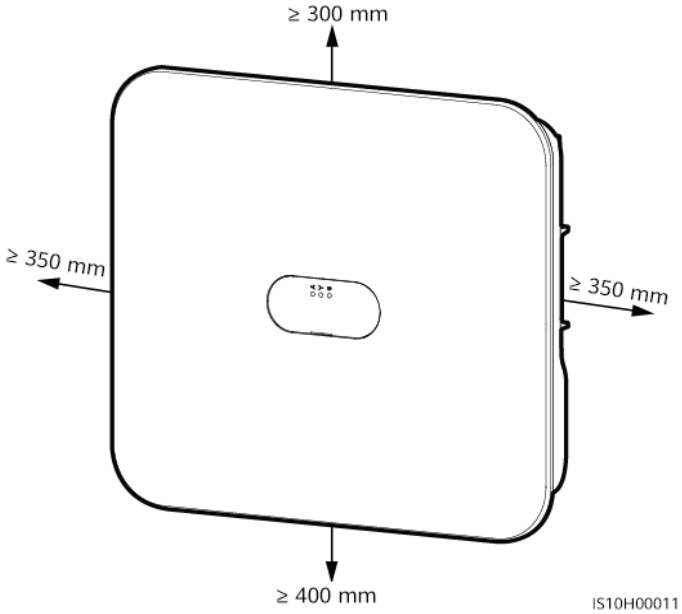
Figure 4-1 Installation tilts



Installation Space Requirements

- Reserve enough space around the inverter to ensure sufficient space for installation and heat dissipation.

Figure 4-2 Installation space



- When installing multiple inverters, 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.

Figure 4-3 Horizontal installation (recommended)

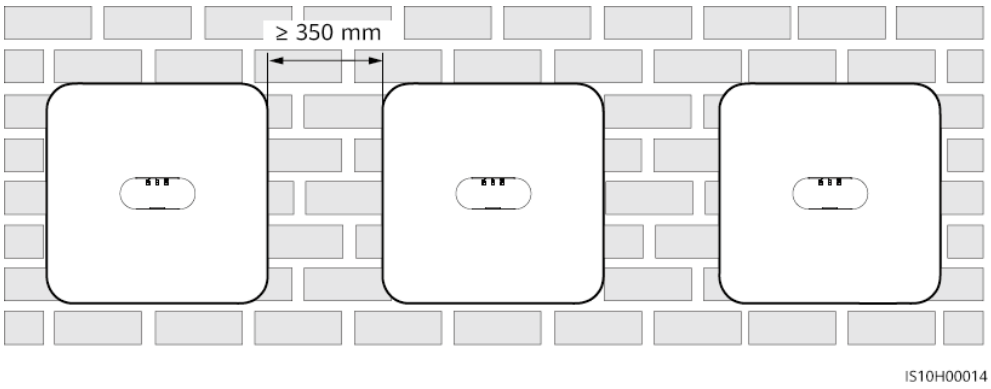


Figure 4-4 Staggered installation (recommended)

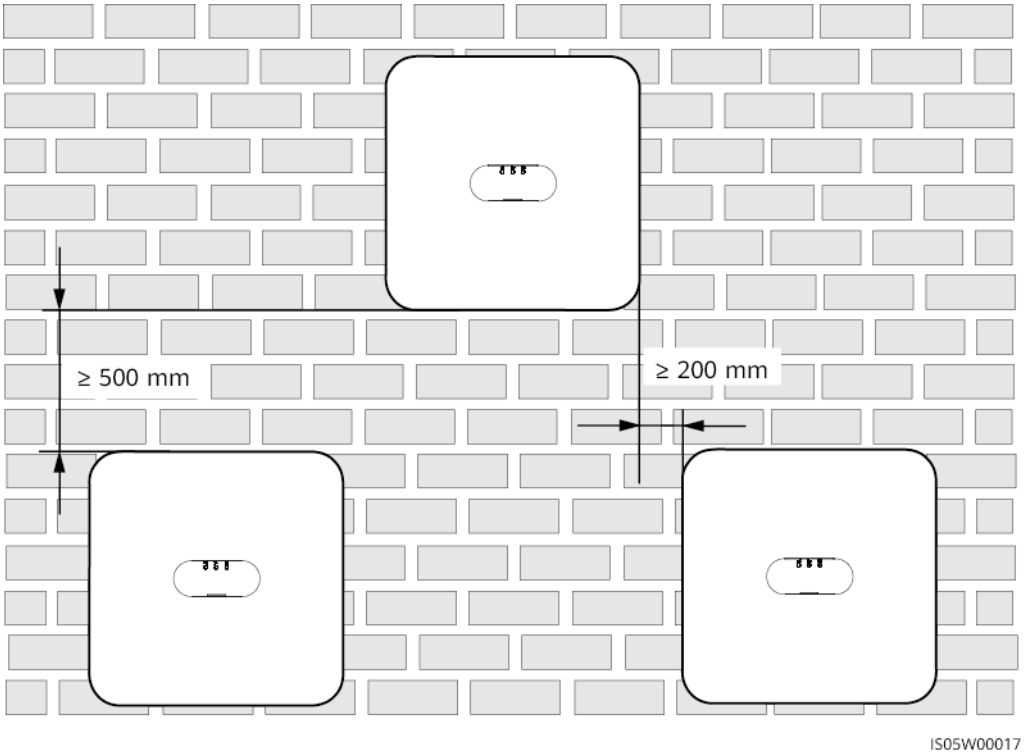
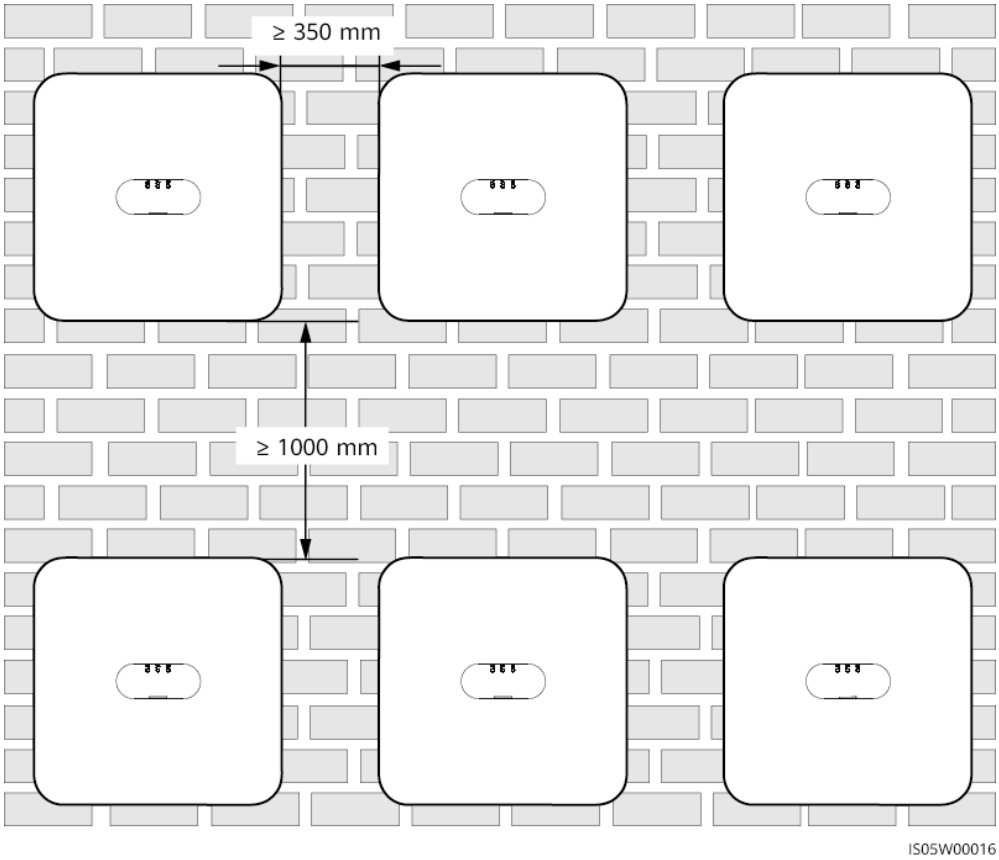


Figure 4-5 Stacked installation (not recommended)



4.4 Moving the Inverter

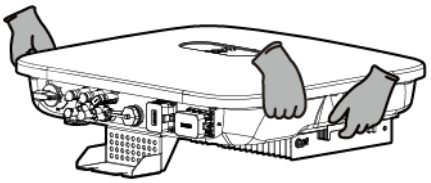
Procedure

Step 1 Two persons are required to move the inverter with one person on both sides. Lift the inverter from the packing case and move it to the specified installation position.

CAUTION

- Move the inverter with care to prevent device damage and personal injury.
- Do not use the wiring terminals and ports at the bottom to support any weight of the inverter.
- Place a foam pad or cardboard under the inverter to protect the inverter enclosure from damage.

Figure 4-6 Moving the inverter



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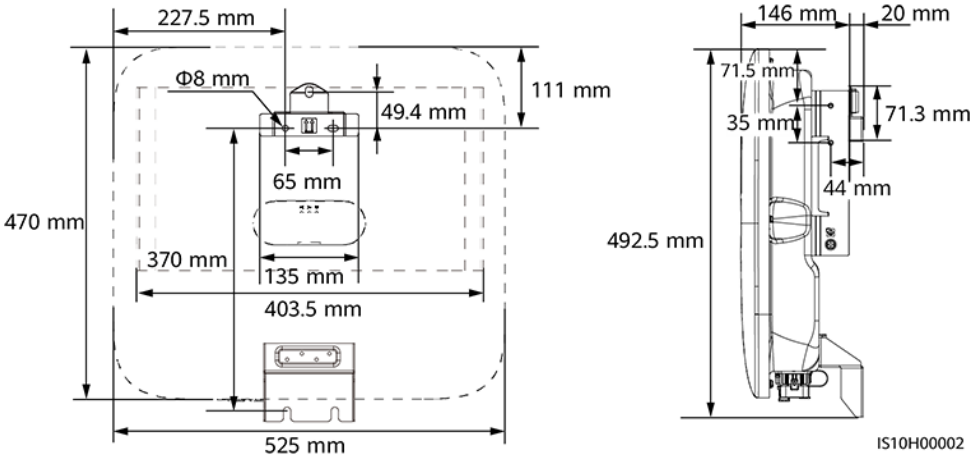
4.5 Installing the Mounting Bracket

Installation Precautions

Figure 4-7 shows the dimensions of installation holes on the inverter.

Figure 4-7 Mounting bracket dimensions



NOTE

Two M6 screw holes are reserved on both left and right sides of the enclosure for installing an awning.

4.5.1 Wall-mounted Installation

Procedure

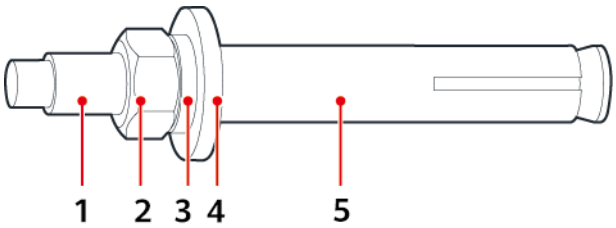
Step 1 Determine the positions for drilling holes and mark the positions using a marker.

Step 2 Secure the mounting bracket.

NOTE

- M6x60 expansion bolts are delivered with the inverter. If the length and number of the bolts do not meet installation requirements, prepare M6 stainless steel expansion bolts by yourself.
- The expansion bolts delivered with the inverter are used for solid concrete walls. For other types of walls, prepare bolts by yourself and ensure that the wall meets the load bearing requirements of the inverter.

Figure 4-8 Expansion bolt composition



(1) Bolt (2) Nut (3) Spring washer

(4) Flat washer (5) Expansion sleeve

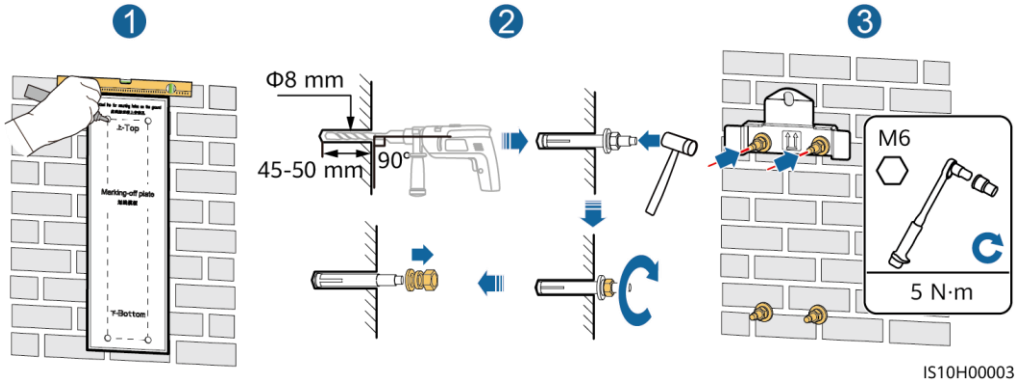
DANGER

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

NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and a dust mask when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If the holes are inaccurately positioned, drill holes again.
- Level the top of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.
- Loosen the nuts, flat washers, and spring washers of the two expansion bolts below.

Figure 4-9 Installing the mounting bracket

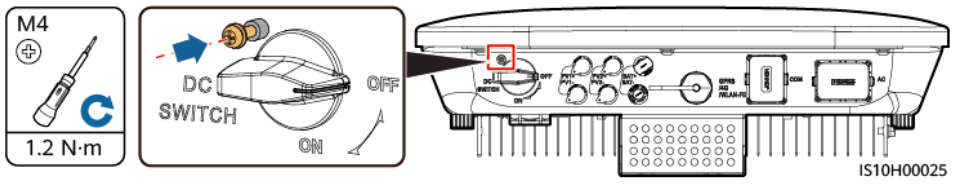


Step 3 (Optional) Install the locking screw for the DC switch.

NOTE

- The locking screw for the DC switch is delivered with the inverter. According to the Australian and New Zealand standard, the locking screw is used to secure the DC switch to prevent the inverter from being started by mistake.
- For the model used in Australia, perform this step based on the local standards.

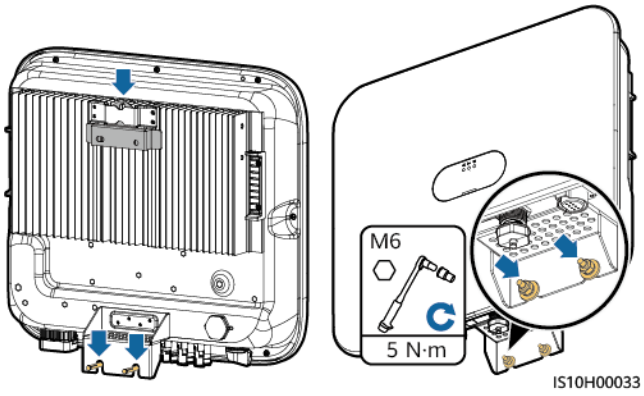
Figure 4-10 Installing the locking screw for the DC switch



Step 4 Install the inverter onto the mounting bracket.

Step 5 Tighten the nut.

Figure 4-11 Installing a inverter

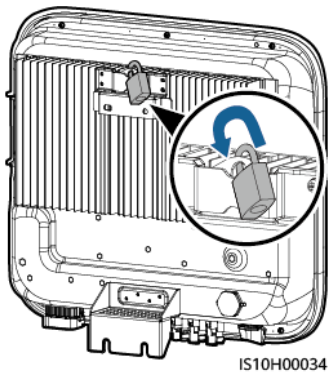


Step 6 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter (Φ8 mm) by yourself. Ensure that the lock can be installed successfully.
- Outdoor waterproof lock is recommended.
- Keep the key to the anti-theft lock properly.

Figure 4-12 Installing an anti-theft lock



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4.5.2 Support-mounted Installation

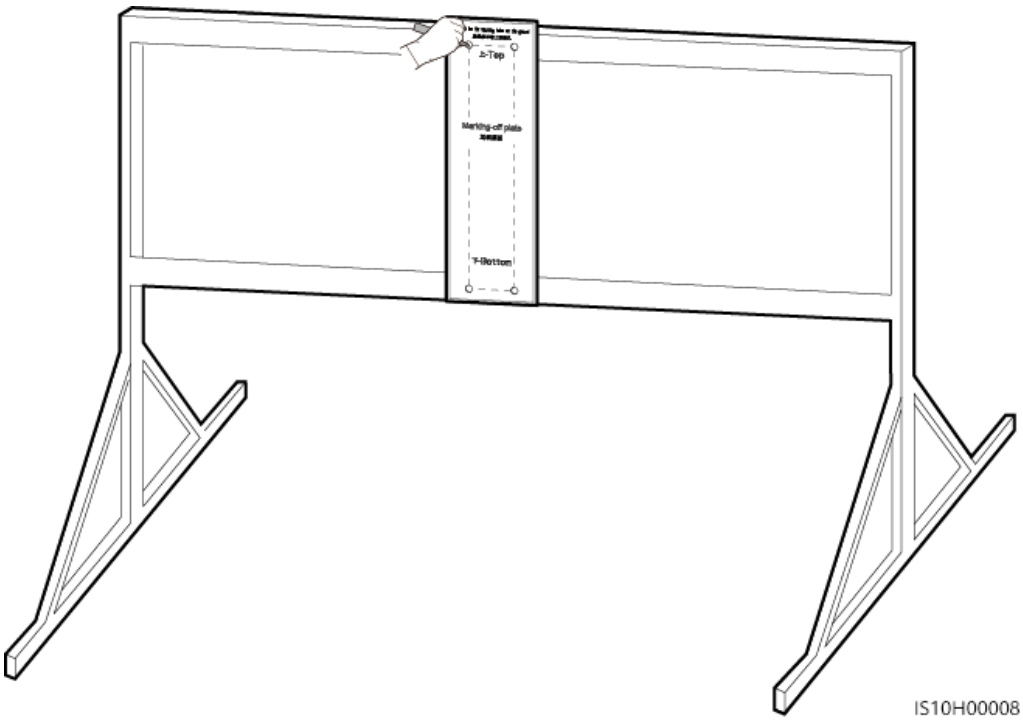
Prerequisites

Prepare M6 stainless bolt assemblies (including flat washers, spring washers, and M6 bolts) with appropriate lengths as well as matched flat washers and nuts based on the support specifications.

Procedure

Step 1 Determine the hole positions based on the marking-off template, and then mark the hole positions using a marker.

Figure 4-13 Determining the positions for drilling holes

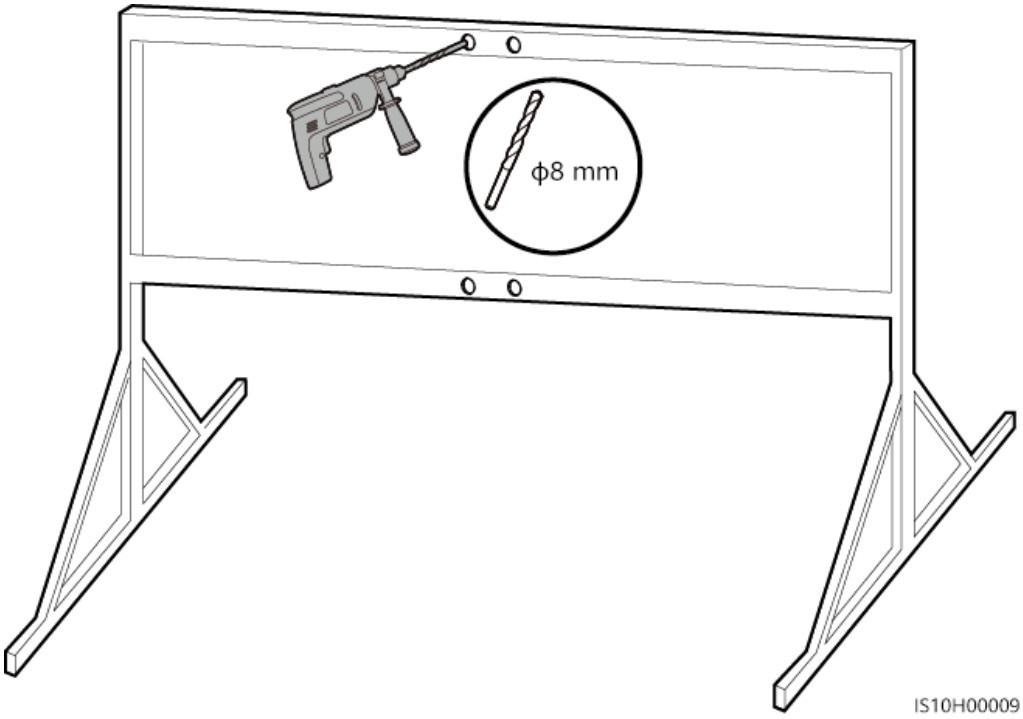


Step 2 Drill holes using a hammer drill.

NOTE

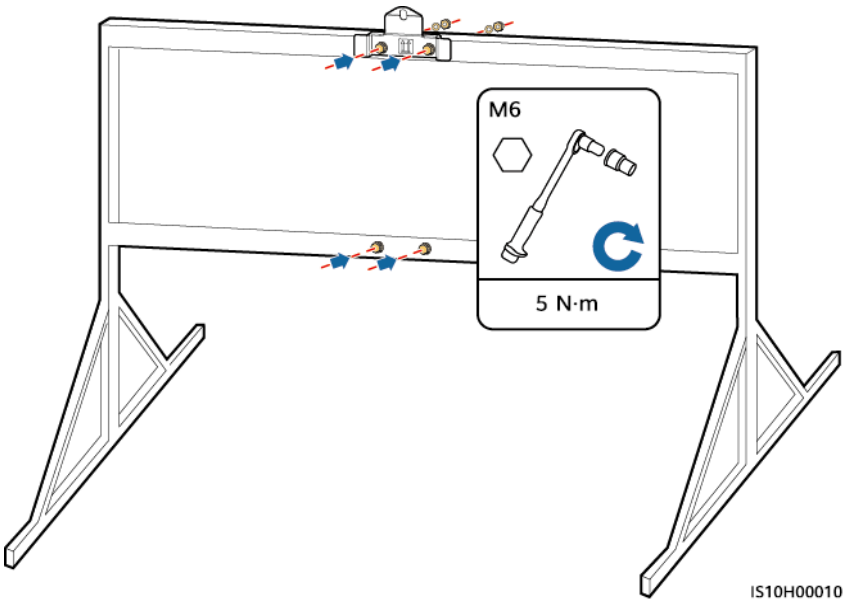
You are advised to apply anti-rust paint on the hole positions for protection.

Figure 4-14 Drilling holes



Step 3 Secure the mounting bracket.

Figure 4-15 Securing the mounting bracket

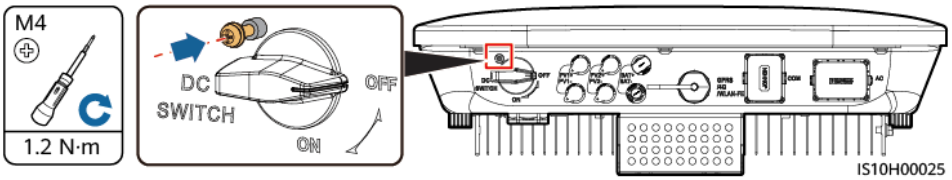


Step 4 (Optional) Install the locking screw for the DC switch.

NOTE

- The locking screw for the DC switch is delivered with the inverter. According to the Australian and New Zealand standard, the locking screw is used to secure the DC switch to prevent the inverter from being started by mistake.
- For the model used in Australia, perform this step based on the local standards.

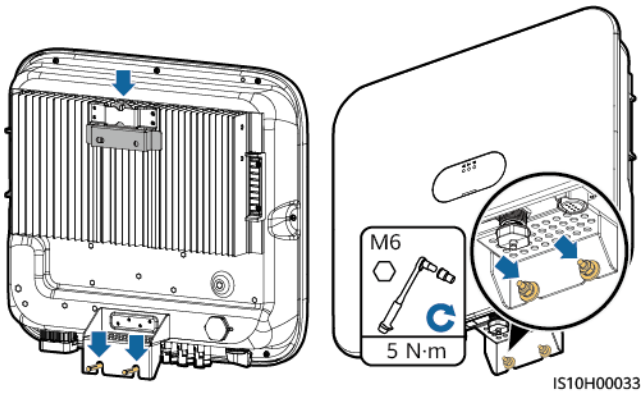
Figure 4-16 Installing the locking screw for the DC switch



Step 5 Install the inverter onto the mounting bracket.

Step 6 Tighten bolt assemblies.

Figure 4-17 Installing a inverter

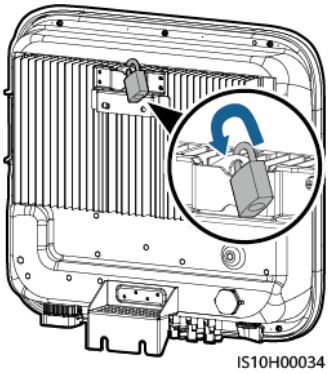


Step 7 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter (Φ8 mm) by yourself. Ensure that the lock can be installed successfully.
- Outdoor waterproof lock is recommended.
- Keep the key to the anti-theft lock properly.

Figure 4-18 Installing an anti-theft lock



----End

5 Electrical Connections

5.1 Precautions

DANGER

When exposed to sunlight, the PV arrays supply DC voltage to the inverter. Before connecting cables, ensure that all **DC SWITCH** on the inverter are OFF. Otherwise, the high voltage of the inverter may result in electric shocks.

DANGER

- The site must be equipped with qualified firefighting facilities, such as fire sand and carbon dioxide fire extinguishers.
- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- The equipment damage caused by incorrect cable connections is beyond the warranty scope.
- Only certified electricians can perform electrical terminations.
- Operation personnel must wear PPE when connecting cables.
- Before connecting cables to ports, leave enough slack to reduce the tension on the cables and prevent poor cable connections.

CAUTION

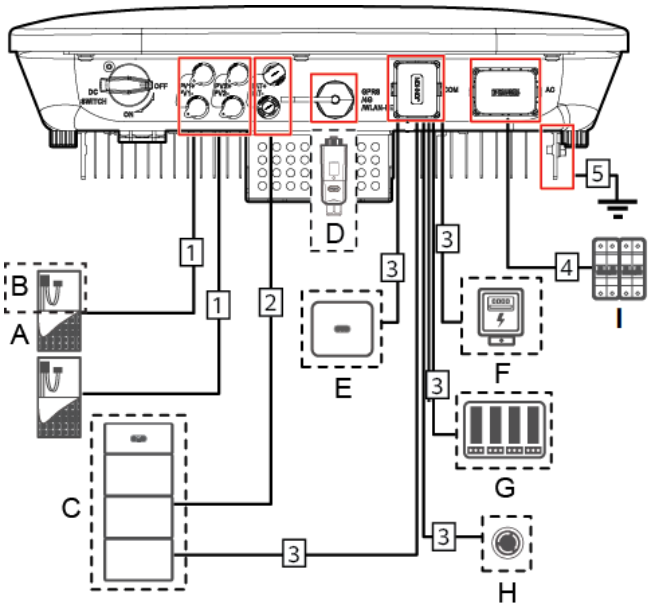
- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.
- When routing PV cables, it is recommended that the positive and negative PV string cables be routed in different pipes to prevent cable damage and short circuits caused by improper operations during construction.

NOTE

The cable colors shown in the electrical connection diagrams provided in this section are for reference only. Select cables in accordance with local cable specifications (green-and-yellow cables are only used for protective earthing).

5.2 Installation Preparation

Figure 5-1 inverter cable connections (dashed boxes indicate optional components)



NOTICE

If a Smart Dongle is configured, it is recommended that you install it before connecting the signal cable.

Table 5-1 Component description

No.	Component	Description	Source
A	PV module	• A PV string is composed of the PV modules connected in series. • The inverter supports the input	Prepared by users

No.	Component	Description	Source
		from two PV strings.	
B	(Optional) PV optimizer	The inverter supports compatible 3rd party PV optimizer. Please consult with your dealer or Entelar Energy for compatible models.	Purchased from provider
C	(Optional) Battery	The batteries can be connected to the inverter.	Purchased from provider
D	(Optional) Smart Dongle	Supported models: WLAN-FE Smart Dongle	Purchased from provider
E	Inverter	Select a proper model as required.	Purchased from provider
F	(Optional) Power meter	Recommended meter models: DTSU666-HW, and YDS60-80	Prepared by users
G	(Optional) Power grid scheduling device	Select the devices that meet the power grid scheduling requirements.	Provided by the local power grid company
H	(Optional) Rapid shutdown switch	Select a proper model as required.	Prepared by users
I	AC switch	To ensure that the inverter can be safely disconnected from the power grid when an exception occurs, connect an AC switch to the AC side of the inverter. Select an appropriate AC switch in accordance with local industry standards and regulations. The following switch specifications are recommended: Recommended: a three-phase AC circuit breaker with a rated voltage greater than or equal to 380 V AC and a rated current of: • 16 A (5KTL and 6KTL) • 25 A (10KTL)	Prepared by users

Table 5-2 Cable description

No.	Name	Type	Recommended Specifications
1	DC input power cable	Common outdoor PV cable in the industry (Recommended model: PV1-F)	• Conductor cross-sectional area: 4–6 mm² • Cable outer diameter:
2	(Optional) Battery cable		

No.	Name	Type	Recommended Specifications
			5.5–9 mm
3	(Optional) Signal cable[a]	Outdoor shielded twisted pair	• Conductor cross-sectional area: 0.2–1 mm^2 • Cable outer diameter: 4–11 mm
4	AC output power cable[b]	Outdoor copper cable	• Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 10–21 mm
5	PE cable	Single-core outdoor copper-core cable	Conductor cross-sectional area: ≥ 4 mm^2
Note a: When the smart power sensor and battery are connected to the inverter at the same time, use a cable core with a cross-sectional area of 0.2 mm^2 to 0.5 mm^2. Note b: The minimum cable diameter depends on the fuse rating on the AC side.			

NOTE

- The minimum cable diameter should comply with the local cable standard.
- Factors influencing cable selection are as follows: rated current, type of cable, routing method, ambient temperature, and maximum desired line losses.

5.3 Connecting the PE cable

Important Notes

DANGER

- Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.
- Do not connect the N wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.

NOTE

- The PE point at the AC output port is used only as a PE equipotential point, not a substitute for the PE point on the enclosure.
- It is recommended that silica gel or paint be applied around the ground terminal after the PE cable is connected.

Supplementary Notes

The inverter has the grounding detection function. This function is used to check whether the inverter is properly grounded before the inverter starts or check whether the inverter ground cable is disconnected when the inverter is running. This function is used to check whether the inverter is properly grounded under limited conditions. To ensure the safe operation of the inverter, properly ground the inverter according to the connection requirements of the ground cable. For some power grid types, if the output side of the inverter is connected to an isolation transformer, ensure that the inverter is properly grounded and set **Isolation** to **Input ungrounded, with TF** to enable the inverter to run properly.

- According to IEC 62109, to ensure the safe operation of the inverter in the case of ground cable damage or disconnection, properly connect the ground cable of the inverter and ensure that it meets at least one of the following requirements before the grounding detection function becomes invalid.
  - The ground cable is a single-core outdoor copper cable with a conductor cross-sectional area greater than or equal to 10 mm^2.
  - Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screw on the chassis.
- In some countries and regions, the inverter must have additional ground cables. Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screw on the chassis.

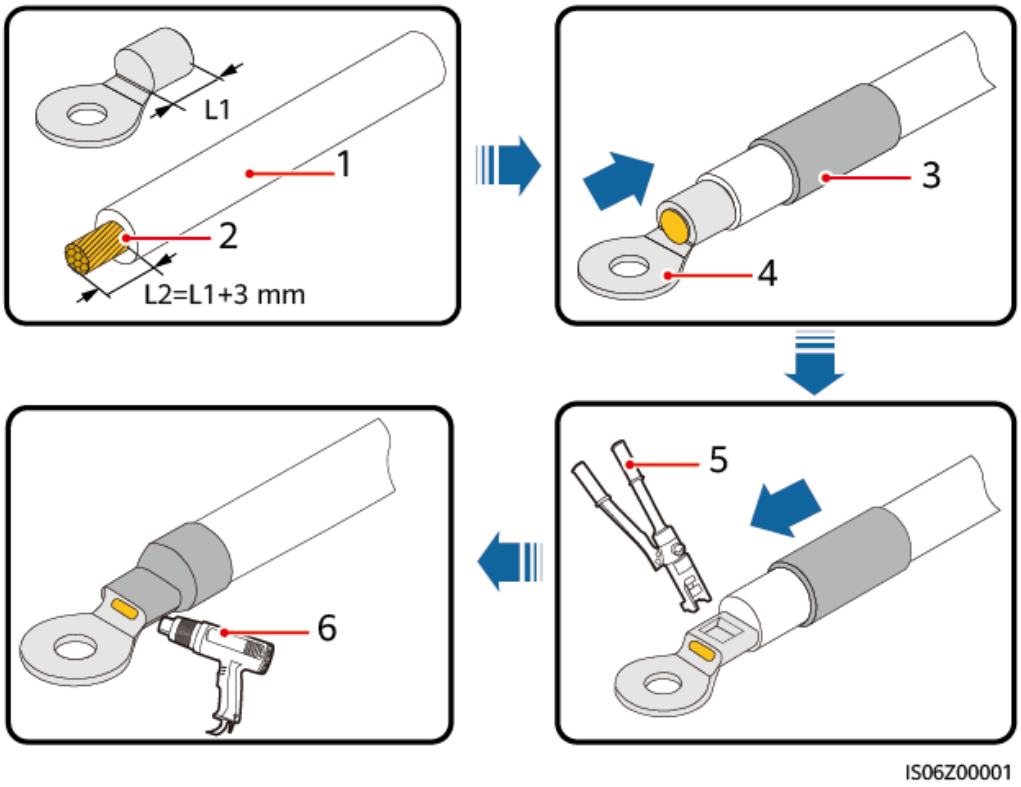
Procedure

Step 1 Crimp OT terminals.

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 heat shrink tubing is used as an example.
- When using a heat gun, protect devices from being scorched.

Figure 5-2 Crimping an OT terminal

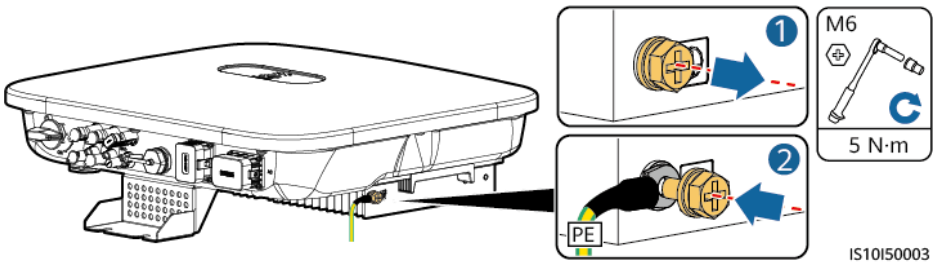


(1) Cable (2) Core (3) Heat shrink tubing

(4) OT terminal (5) Crimping tool (6) Heat gun

Step 2 Connect the PE cable.

Figure 5-3 Connecting the PE cable



----End

5.4 Connecting the AC Output Power Cable

Precautions

A three-phase AC switch needs to be installed on the AC side of the inverter. To ensure that the inverter can safely disconnect itself from the power grid when an exception occurs, select a proper overcurrent protection device in compliance with local power distribution regulations.

⚠ WARNING

- Do not connect loads between the inverter and the AC switch that directly connects to the inverter. Otherwise, the switch may trip by mistake.
- If an AC switch is used with specifications beyond local standards, regulations, or provider's recommendations, the switch may fail to turn off in a timely manner in case of exceptions, causing serious faults.

⚠ CAUTION

Each inverter must be equipped with an AC output switch. Multiple inverters cannot connect to the same AC output switch.

The inverter is integrated with a comprehensive residual current monitoring unit. Once detected that the residual current exceeds the threshold, the inverter immediately disconnects itself from the power grid.

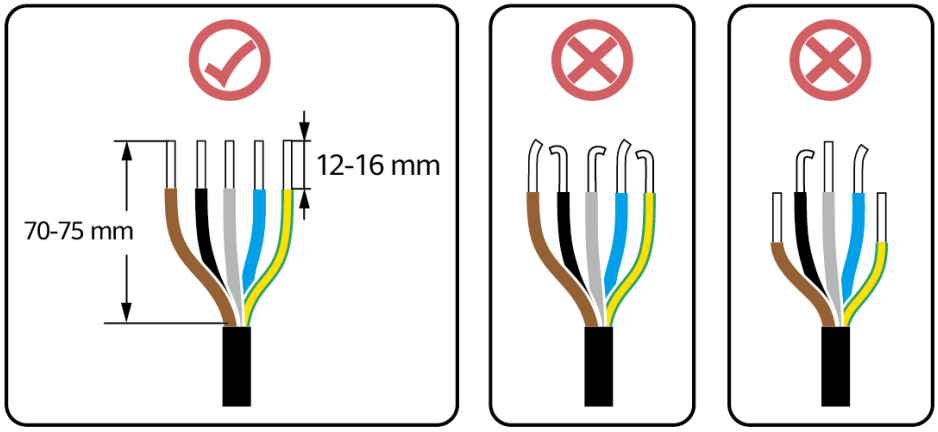
NOTICE

- If the external AC switch can perform earth leakage protection, the rated leakage action current should be greater than or equal to 100 mA.
- If multiple inverters connect to the general residual current device (RCD) through their respective external AC switches, the rated leakage action current of the general RCD should be greater than or equal to the number of inverters multiplied by 100 mA.
- A knife switch cannot be used as an AC switch.

Procedure

Step 1 Connect the AC output power cable to the AC connector.

Figure 5-4 Stripping requirements



NOTICE

- Ensure that the cable jacket is inside the connector.
- Ensure that the exposed core wire is totally inserted into the cable hole.
- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause inverter malfunction and damage to its AC connectors.
- Ensure that the cable is not twisted.

Figure 5-5 Three-core cable (L1, L2, and L3)

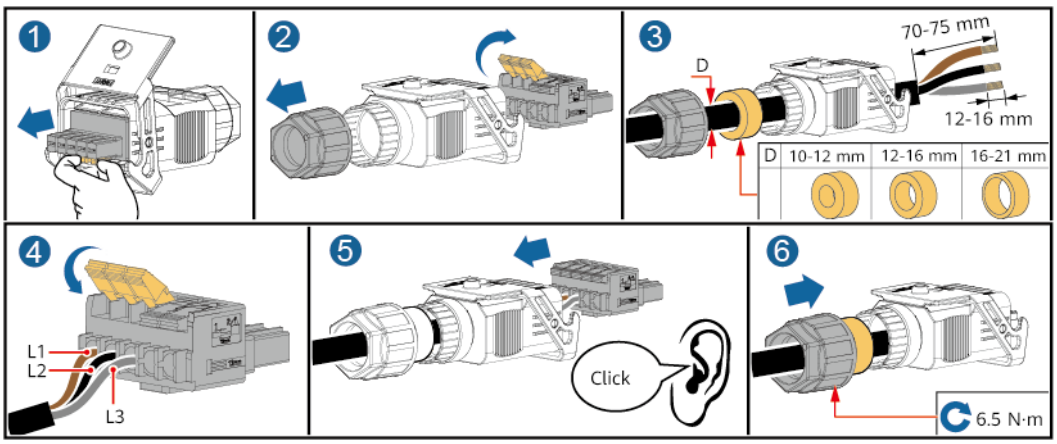


Figure 5-6 Four-core cable (L1, L2, L3, and PE)

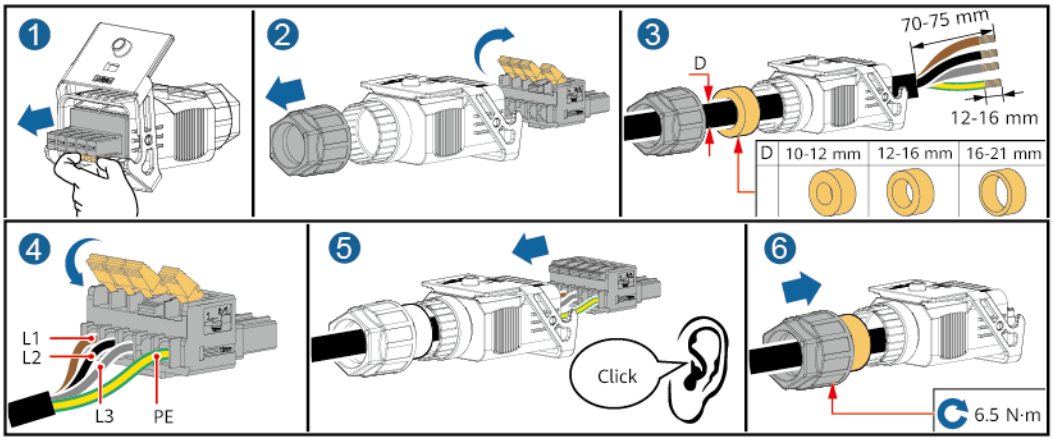


Figure 5-7 Four-core cable (L1, L2, L3, and N)

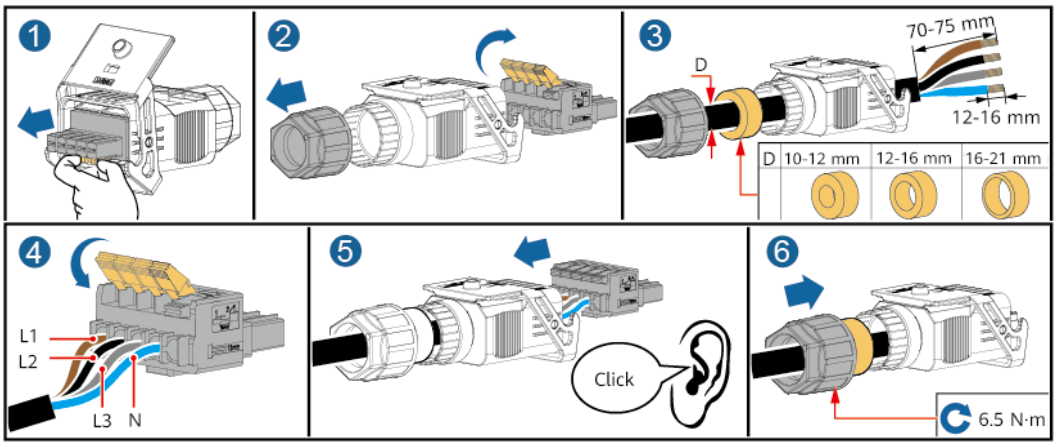
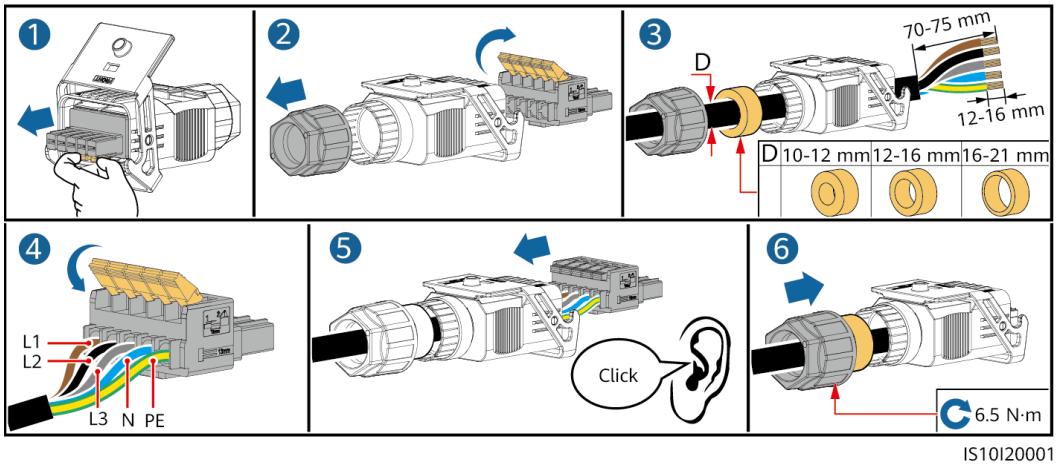


Figure 5-8 Five-core cable (L1, L2, L3, N, and PE)



NOTE

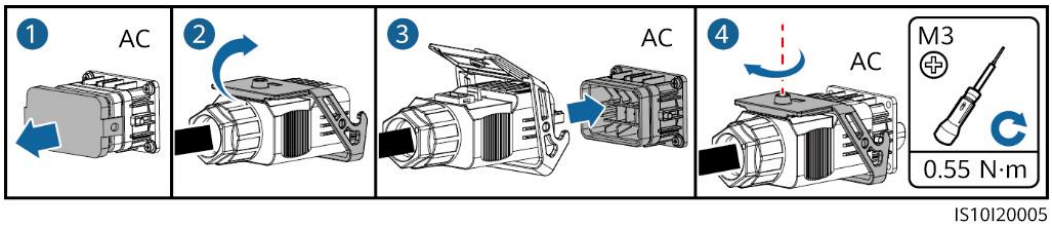
The cable colors shown in the figures are for reference only. Select an appropriate cable according to local standards.

Step 2 Connect the AC connector to the AC output port.

NOTICE

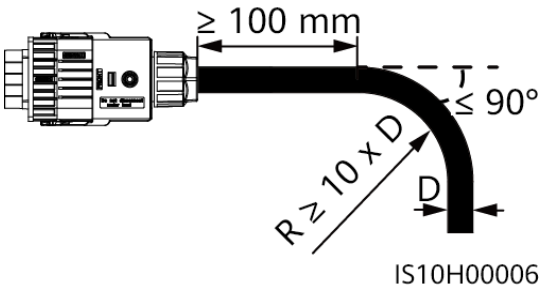
Ensure that the AC connector is connected securely.

Figure 5-9 Securing the AC connector



Step 3 Check the route of the AC output power cable.

Figure 5-10 Cable route



----End

Disconnection

Disconnection can be performed in reverse order.

5.5 Installing DC Input Power Cables

Important Notes

DANGER

- Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the DC switch on the inverter is OFF. Otherwise, electric shocks may occur.
- When the inverter is operating, it is not allowed to work on the DC input power cables, such as connecting or disconnecting a PV string or a PV module in a PV string. Otherwise, electric shocks may occur.
- If no PV string connects to a DC input terminal of the inverter, do not remove the watertight cap from the DC input terminals. Otherwise, the IP rating of the inverter will be affected.

WARNING

Ensure that the following conditions are met. Otherwise, the inverter may be damaged, or even fire could happen.

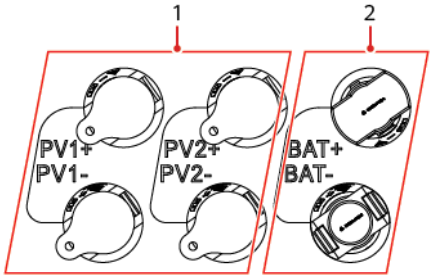
- PV modules connected in series in each PV string are of the same specifications.
- The open-circuit voltage of each PV string must always be 1100 V DC or lower.
- The maximum short-circuit current of each PV string must always be 15 A or lower.
- The polarities of electric connections are correct on the DC input side. The positive and negative terminals of a PV string connect to corresponding positive and negative DC input terminals of the inverter.
- If the polarity of the DC input power cable is reversed, do not turn off the DC switch immediately or remove positive and negative connectors. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the PV string polarity before reconnecting the PV string to the inverter.

NOTICE

- Since the output of the PV string connected to the inverter cannot be grounded, ensure that the PV module output is well insulated to ground.
- During the installation of PV strings and the inverter, the positive or negative terminals of PV strings may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the inverter. The caused device damage is not covered under any warranty.

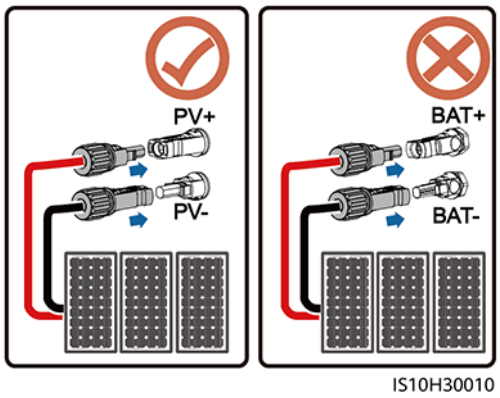
Terminal Description

Figure 5-11 Terminal



(1) DC input terminal (2) Battery terminal

Figure 5-12 Correct wiring terminals



Procedure

Step 1 Install the DC input power cables.

WARNING

Before inserting the positive and negative connectors into the positive and negative DC input terminals of the inverter, ensure that the DC switch is set to OFF.

CAUTION

Use the positive and negative Staubli MC4 metal terminals and DC connectors supplied with the inverter. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under warranty.

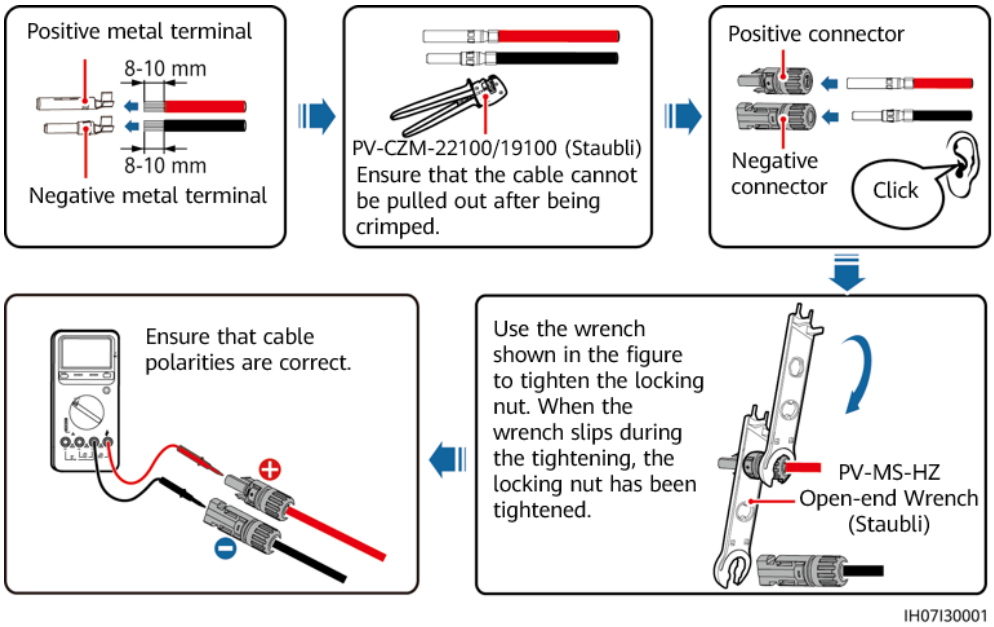
NOTICE

- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables, because poor contact may be caused by the bending of the cables.
- Before assembling DC connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal terminals, pull back the DC input power cables to ensure that they are securely connected.
- 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.
- If a DC input power cable is reversely connected and the DC switch is turned on, do not operate on the DC switch or the positive/negative connectors immediately. Otherwise, the device may be damaged. The caused device damage is not covered under any warranty. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the PV string polarity before reconnecting the PV string to the inverter.

NOTE

- The DC voltage measurement range of the multimeter must be at least 1100 V.
- If the voltage is a negative value, the DC input polarity is incorrect. Correct the polarity.
- If the voltage is greater than 1100 V DC, too many PV modules configured to the same string. Remove some PV modules.
- If the PV string is configured with an optimizer, check the cable polarity by referring to documentation provided by the PV optimizer supplier.

Figure 5-13 Installing DC input power cables



----End

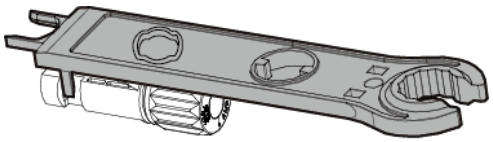
Removing DC Connectors

WARNING

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

To remove the positive and negative connectors from the inverter, insert an open-end wrench into the bayonet and press the wrench with force. Then remove the DC connectors with caution.

Figure 5-14 Removing DC connectors



IH07H00019

5.6 (Optional) Connecting Battery Cables

Prerequisites

DANGER

- Battery short-circuit may cause personal injury. The high transient current generated by a short-circuit may release a surge of energy and cause fire.
- Do not connect or disconnect the battery cables when the inverter is running. Otherwise, electric shocks may occur.
- Before connecting the battery cables, ensure that the DC switch on the inverter and all the switches connecting to the inverter are OFF, and the inverter has no residual electricity. Otherwise, the high voltage of the inverter and battery may result in electric shocks.
- If no battery connects to the inverter, do not remove the watertight caps from the battery terminals. Otherwise, the protection level of the inverter will be affected. If a battery connects to the inverter, set aside the watertight caps. Reinstall the watertight caps immediately after removing the connectors.

A battery switch can be configured between the inverter and the battery to ensure that the inverter can be safely disconnected from the battery.

WARNING

- Do not connect loads between the inverter and the battery.
- The battery cables should be connected correctly. That is, the positive and negative terminals of the battery connect to the positive and negative battery terminals on the inverter, respectively. Otherwise, the inverter may be damaged, or even fire could happen.

NOTICE

- During the installation of batteries and the inverter, the positive or negative terminals of batteries may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the inverter. The caused device damage is not covered under any warranty.
- The cabling distance between the battery and the inverter should be less than or equal to 10 meters (recommended: within 5 meters).

Procedure

Step 1 Assemble the positive and negative connectors by referring to 5.5 Installing DC Input Power Cables.

DANGER

- The battery voltage may result in serious injury. Use dedicated insulation tools when connecting cables.
- Ensure that cables are correctly connected between the battery terminal and the battery switch, and between the battery switch and the inverter battery terminal.

NOTICE

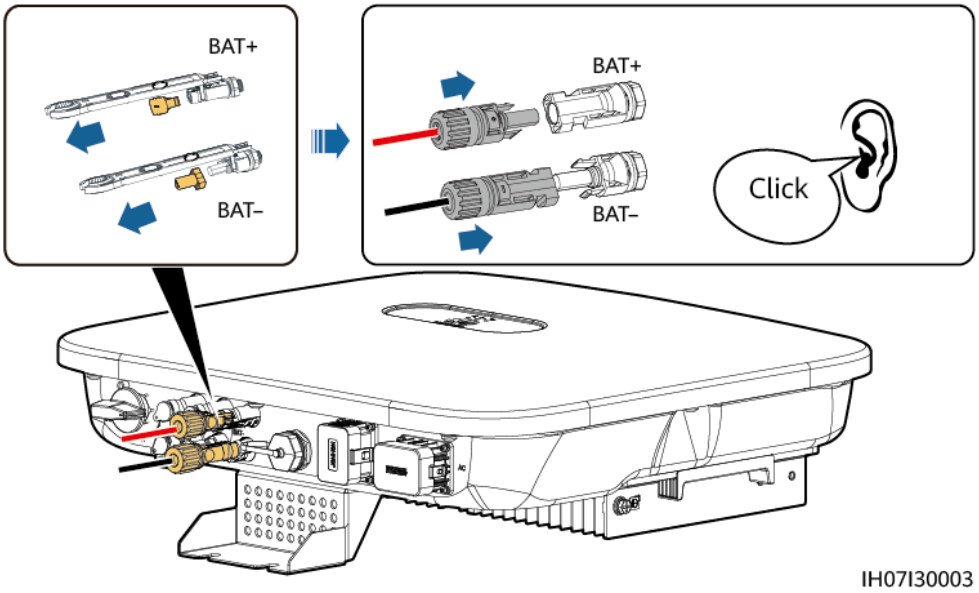
Cables with high rigidity, such as armored cables, are not recommended as battery cables, because poor contact may be caused by the bending of the cables.

Step 2 Insert the positive and negative connectors into corresponding battery terminals on the inverter.

NOTICE

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

Figure 5-15 Connecting battery cables



----End

5.7 Installing the Smart Dongle

Procedure

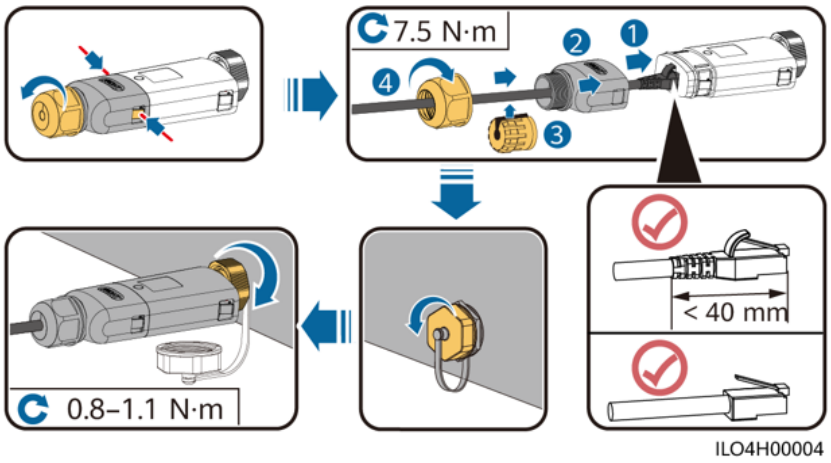
NOTE

If WLAN-FE communication is used, install the WLAN-FE Smart Dongle. The WLAN-FE Smart Dongle is delivered with the inverter.

WLAN-FE Smart Dongle (FE Communication)

You are advised to use a Cat 5e outdoor shielded network cable (outer diameter < 9 mm; internal resistance ≤ 1.5 ohms/10 m) and shielded RJ45 connectors.

Figure 5-16 Installing a WLAN-FE Smart Dongle (FE communication)



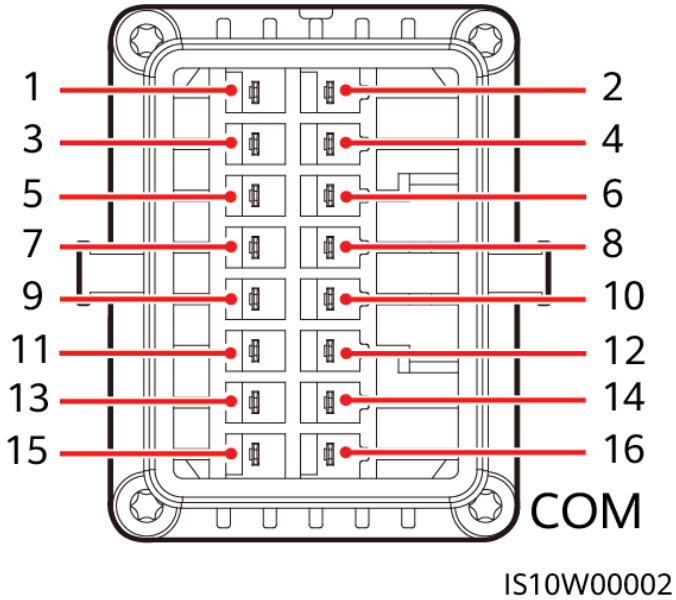
5.8 (Optional) Connecting the Signal Cable

COM Port Pin Definitions

NOTICE

- When laying out the signal cable, separate it from the power cable and keep it away from strong interference sources to avoid strong communication interference.
- Ensure that the protective layer of the cable is inside the connector, that excess core wires are cut off from the protection layer, that the exposed core wire is totally inserted into the cable hole, and that the cable is connected securely.

Figure 5-17 Pin definitions



NOTE

- If the RS485 communications cables of devices such as the smart power sensor and battery are connected to the inverter at the same time, the pins RS485A2 (pin 7), RS485B2 (pin 9), and PE (pin 5) are shared.
- If both the battery enable signal cable and rapid shutdown switch signal cable are connected to the inverter at the same time, the GND pin (pin 13) is shared.

Pin	Definition	Functions	Remarks	Pin	Definition	Functions	Remarks
1	485A1-1	RS485A, RS485 differential signal+	Used for inverter cascading	2	485A1-2	RS485A, RS485 differential signal+	Used for inverter cascading
3	485B1-1	RS485B, RS485 differential signal–		4	485B1-2	RS485B, RS485 differential signal–	
5	PE	Ground point on the shield layer	-	6	PE	Ground point on the shield layer	-
7	485A2	RS485A, RS485 differential signal+	Used to connect to the RS485 signal port on a power meter or battery	8	DIN1	Digital input signal 1+	Used to connect to dry contacts for grid scheduling.
9	485B2	RS485B, RS485 differential signal–		10	DIN2	Digital input signal 2+	Used to connect to dry contacts for grid scheduling
11	EN	Enable signal	Used to connect to the enable signal of the battery.	12	DIN3	Digital input signal 3+	
13	GND	GND	–	14	DIN4	Digital input signal 4+	
15	DIN5	Rapid shutdown	Used to connect to the rapid shutdown DI signal port or serve as a port for the signal cable of the NS protection.	16	GND	GND of DI1/DI2/DI3/DI4	Used to connect to the GND of DI1/DI2/DI3/DI4

Networking Modes

- Smart Dongle networking

Figure 5-18 Smart Dongle networking (the dashed box indicates optional components)

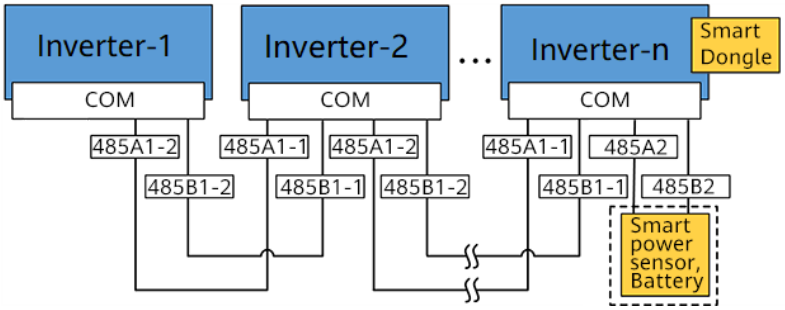


Table 5-3 Usage Restrictions

Smart Dongle	Usage Restrictions	Actual Connection	
	Maximum Number of Devices That Can Be Connected to the Smart Dongle	Number of inverters	Number of Other Devices[a]
WLAN-FE	10	n ≤ 10	≤ 10–n
Note a: If the power meter and battery are connected through the RS485A2 and RS485B2 ports, they are not included as cascaded devices.			

NOTE

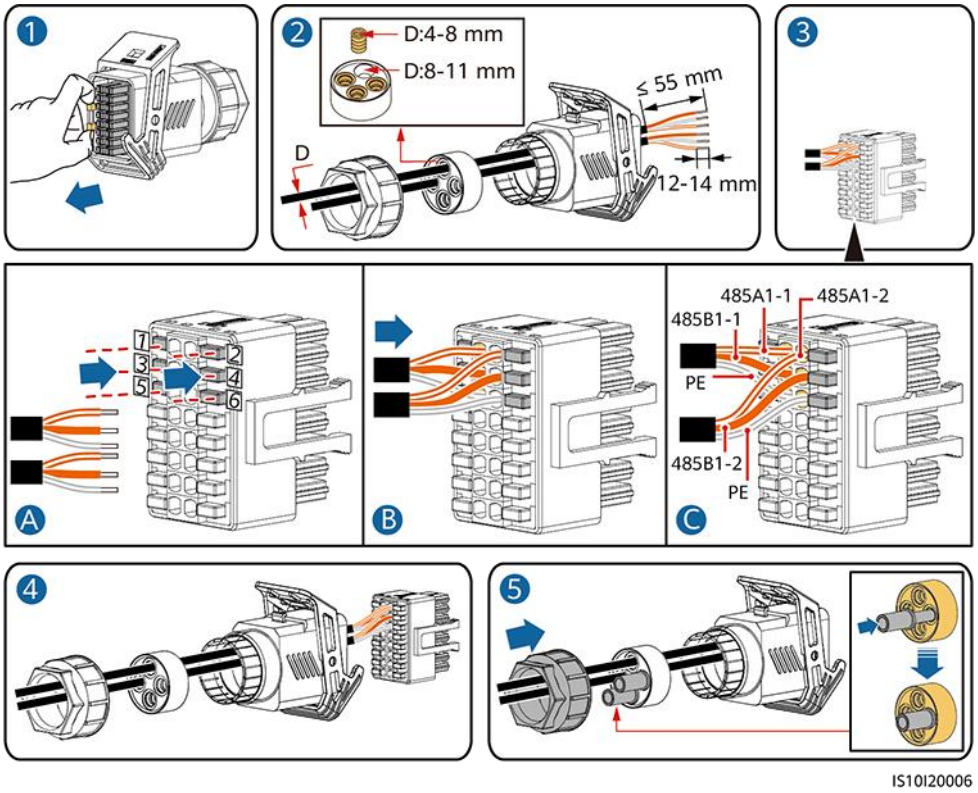
- If the inverter is networked with the Smart Dongle, it cannot connect to the SmartLogger.
- The Smart Power Sensor is necessary for export limitation. Select the Smart Power Sensor according to the actual project.
- The power meter and Smart Dongle must be connected to the same inverter.
- If a battery is connected, a maximum of three inverters can be cascaded. Any one of the inverters can be connected to the battery. (The inverter connected to the Smart Dongle must be connected to the battery.)

5.8.1 Connecting the RS485 Communications Cable (Inverter Cascading)

Procedure

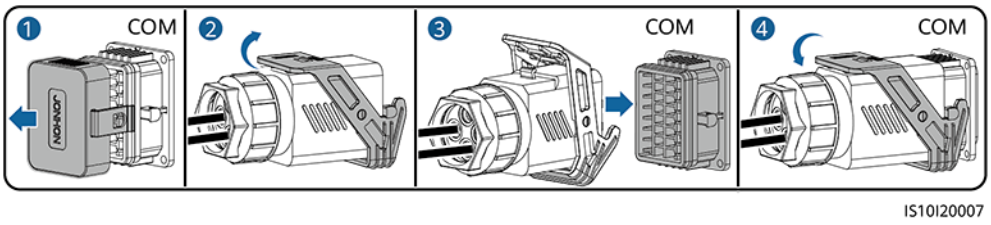
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-19 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-20 Securing the signal cable connector



----End

5.8.2 Connecting the RS485 Communications Cable (Smart Power Sensor)

Cable Connection

- The following figure shows the cable connections between the inverter and DTSU666-HW and YDS60-80 power meters.

Figure 5-21 Three-phase, three-wire direct connection (Smart Dongle networking)

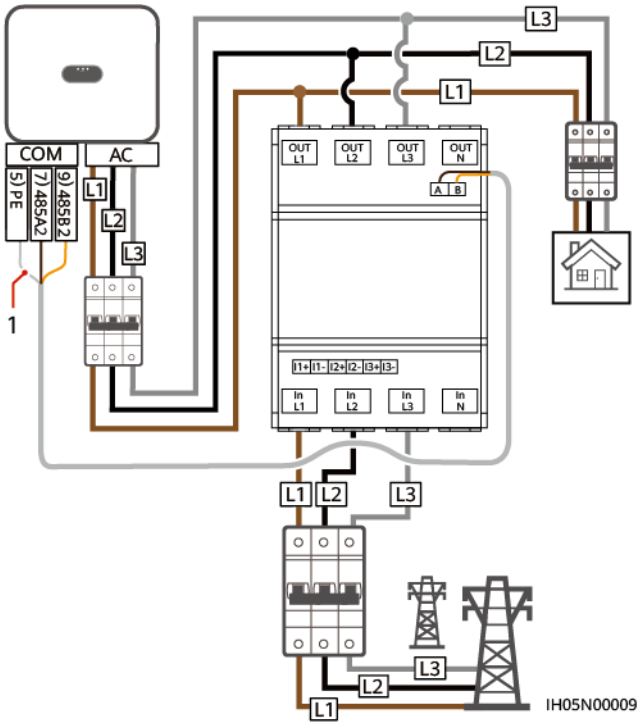
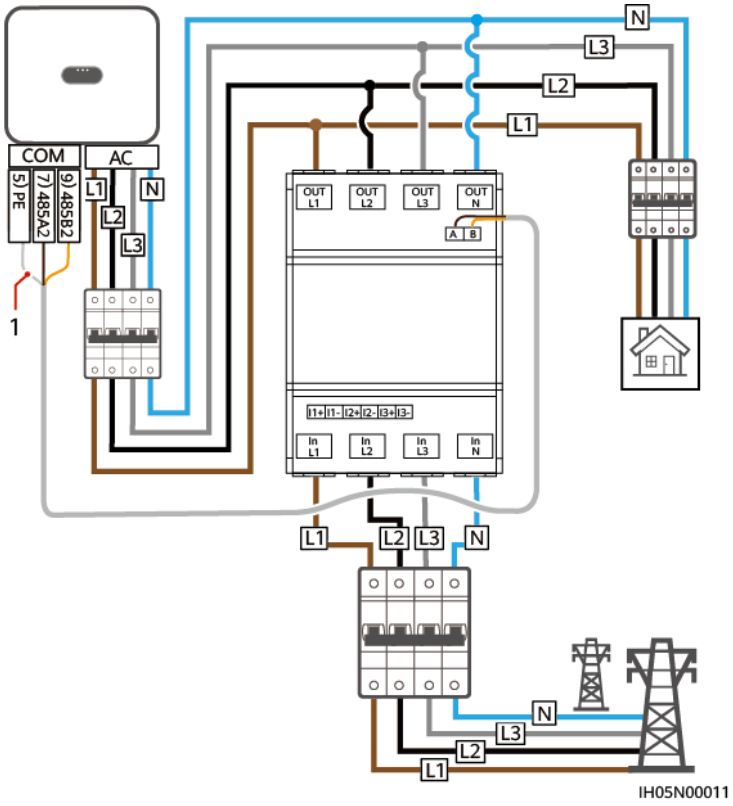


Figure 5-22 Three-phase, four-wire direct connection (Smart Dongle networking)



NOTE

- The DTSU666-HW and YDS60-80 power meters support a maximum current of 80 A.
- For a three-phase three-wire system, you need to set the cable connection mode. Otherwise, the displayed voltage is incorrect.

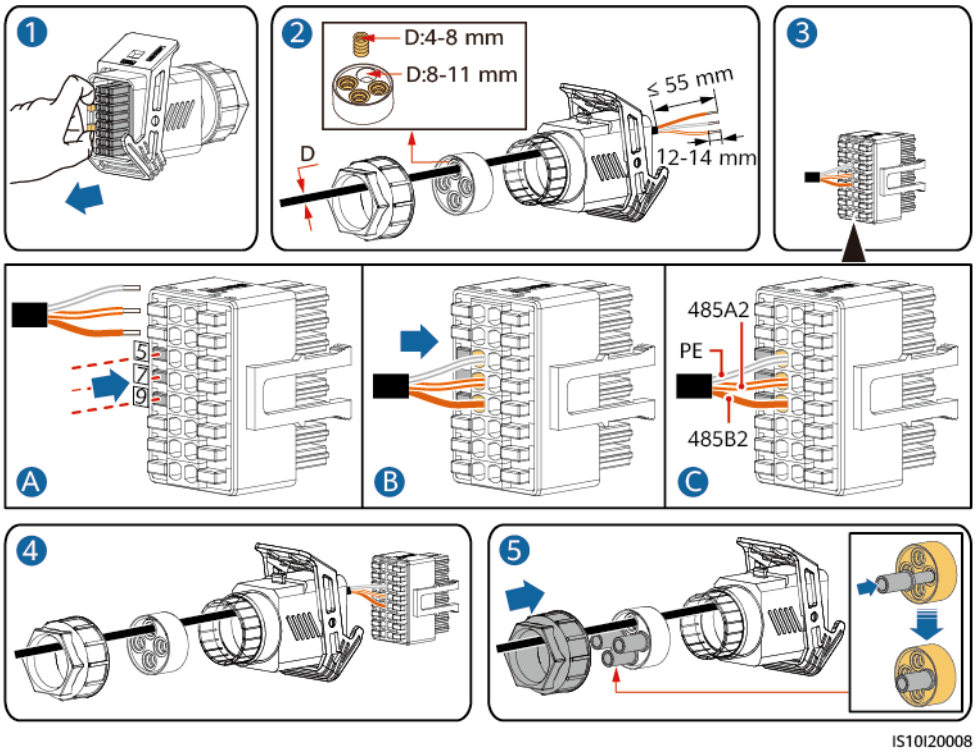
Table 5-4 Select the cable connection mode.

Parameter	Note
nEt	Select the cable connection mode: 0: n.34 indicates three-phase four-wire. 1: n.33 indicates three-phase three-wire.

Procedure

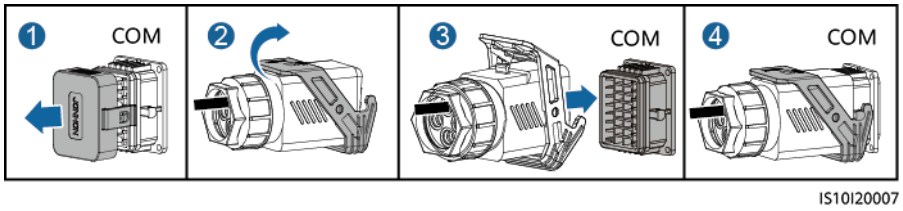
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-23 Installing the cable



Step 2 Connect the signal cable to the COM port.

Figure 5-24 Securing the signal cable connector



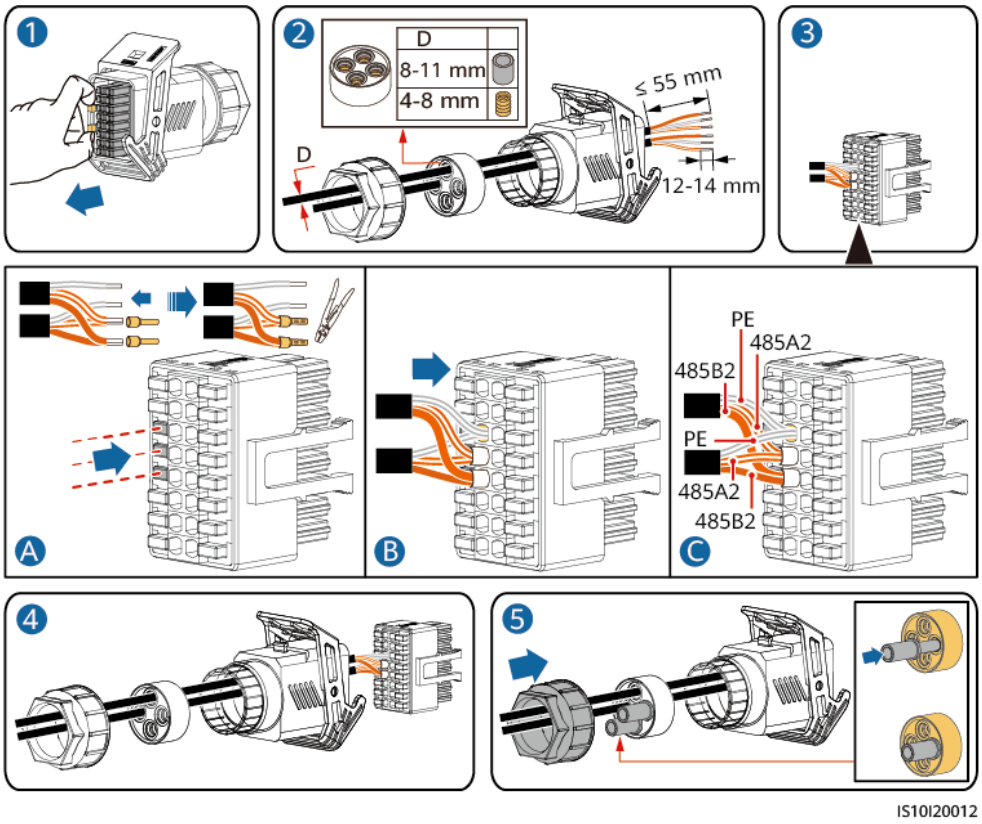
----End

5.8.3 Connecting an RS485 Communications Cable (Between a Power Meter and a Battery)

Procedure

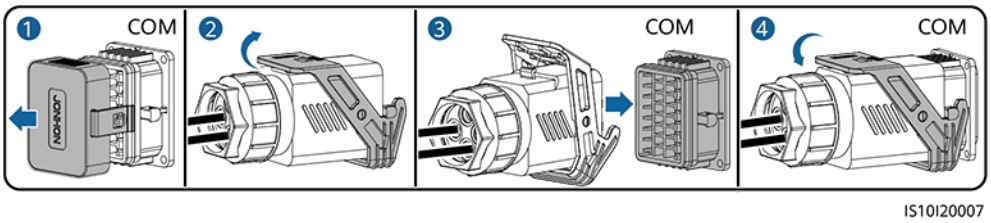
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-25 Installing the cable



Step 2 Connect the signal cable connector to the COM port.

Figure 5-26 Securing the signal cable connector



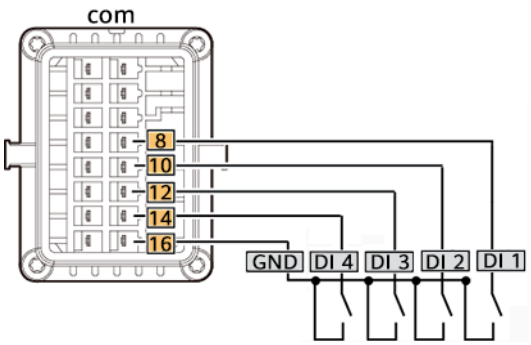
----End

5.8.4 Connecting the Power Grid Scheduling Signal Cable

Cable Connection

The following figure shows the cable connections between the inverter and the Ripple Control Device.

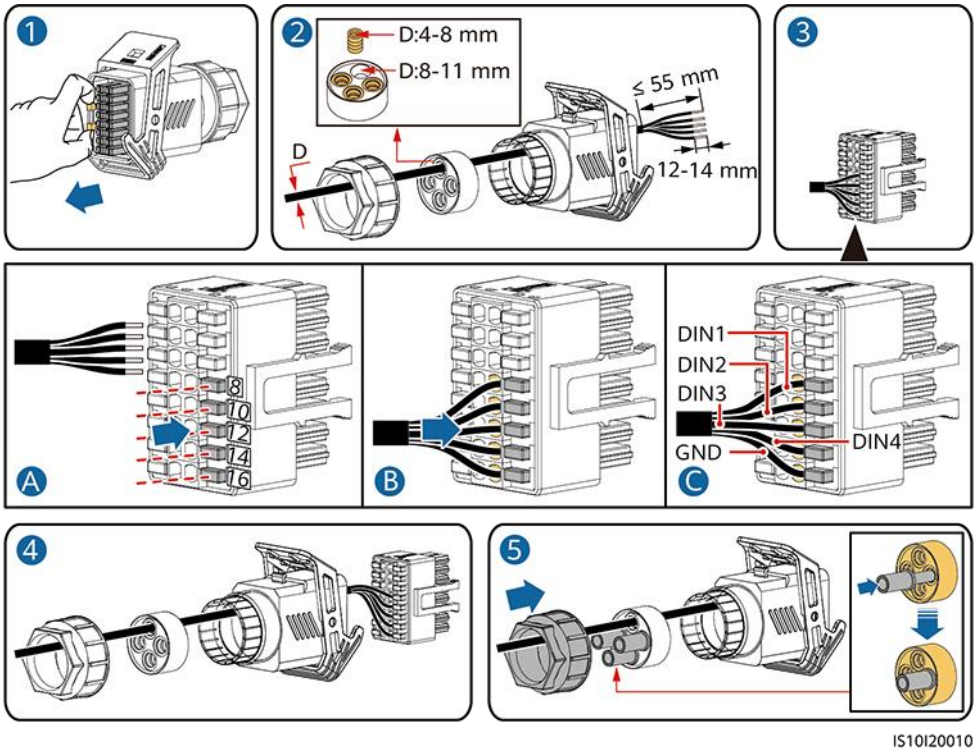
Figure 5-27 Cable connection



Procedure

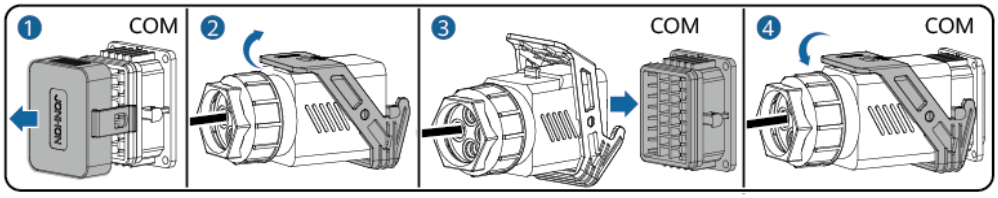
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-28 Installing the cable



Step 2 Connect the signal cable to the COM port.

Figure 5-29 Securing the signal cable connector



----End

5.8.5 Connecting the NS Protection Signal Cable

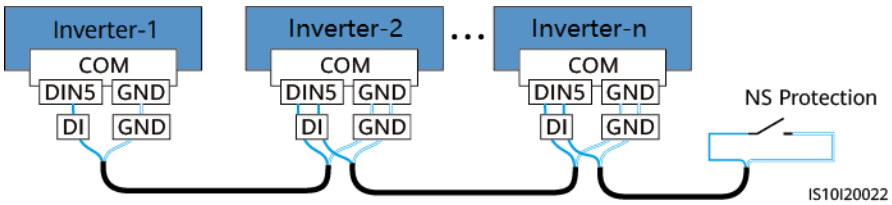
Connecting NS Protection Signal Cables to Inverters

NOTE

- The NS protection switch is connected to GND (pin 13) at one end and to DIN5 (pin 15) at the other end. The switch is turned off by default. When the switch is turned on, NS protection is triggered. Rapid shutdown and NS protection use the same pins, which are GND (pin 13) and DIN5 (pin 15). Therefore, you can use only one of the functions.
- The NS protection switch connection is the same for a single inverter and for cascaded inverters.

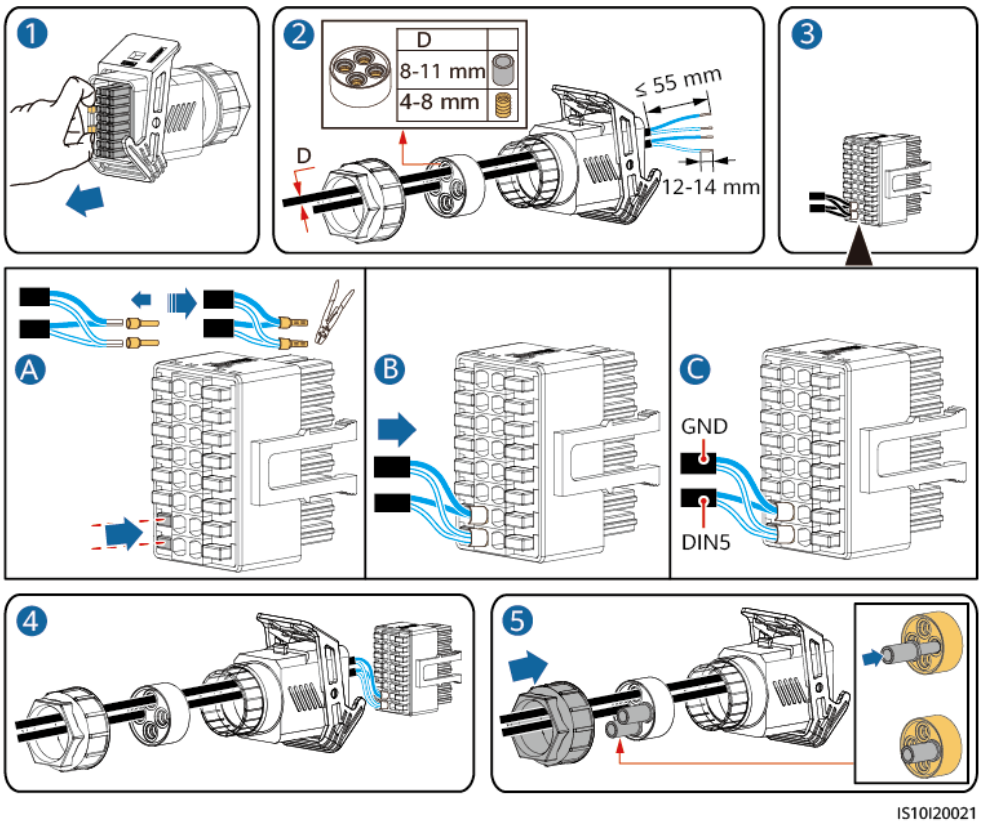
- Log in to the HiSolar app as an installer and connect to the WLAN hotspot of the inverter. Log in to the local commissioning system as an installer, choose **Set** > **Feature parameters** > **Dry contact function**, and set **Dry contact function** to **NS protection**.

Figure 5-30 Connecting cascaded inverters to the NS protection switch



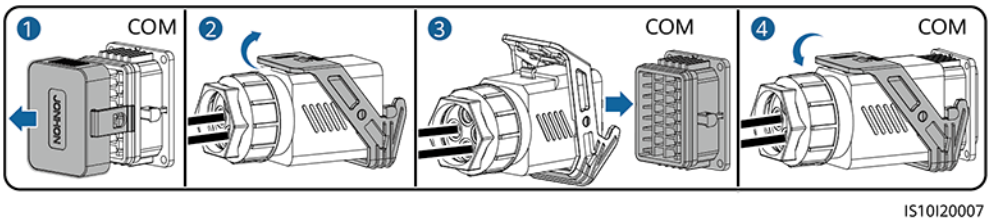
Step 1 Connect the signal cables of the cascaded inverters to the signal cable connectors.

Figure 5-31 Installing cables



Step 2 Connect the signal cable connectors to the COM ports.

Figure 5-32 Securing the signal cable connector



----End

6 Commissioning

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

6.1 Checking Before Power-On

Table 6-1 Checklist

No.	Item	Acceptance Criterion
1	inverter installation	The inverter is installed correctly and securely.
2	Smart Dongle	The Smart Dongle is installed correctly and securely.
3	Cable routing	The cables are routed properly as required by the customer.
4	Cable ties	Cable ties are secured evenly, and no burr exists.
5	Reliable grounding	The PE cable is connected correctly and securely.
6	Switch	DC switches and all the switches connecting to the inverter are OFF.
7	Cable connection	The AC output power cable, DC input power cables, battery cable, and signal cable are connected correctly and securely.
8	Unused terminals and ports	Unused terminals and ports are locked by watertight caps.
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy.

6.2 Inverter power-on

Important Notes

NOTICE

Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.

NOTICE

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

Procedure

Step 1 If a battery is connected, turn on the battery switch.

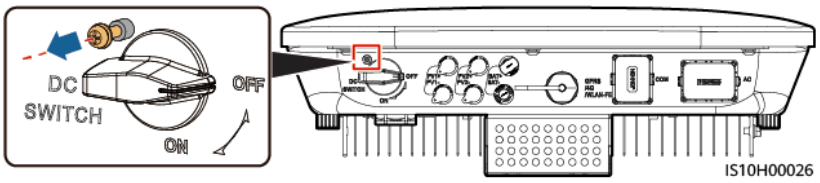
Step 2 Turn on the AC switch between the inverter and the power grid.

NOTICE

If the DC is on and the AC is off, the inverter reports a **Grid Failure** alarm. The inverter starts normally only after the fault is automatically rectified.

Step 3 (Optional) Remove the locking screw from the DC switch.

Figure 6-1 Removing the locking screw from a DC switch

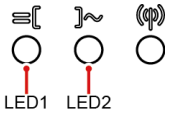
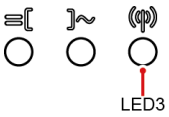


Step 4 Turn on the DC switch (if any) between the PV string and the inverter.

Step 5 Turn on the DC switch at the bottom of the inverter.

Step 6 Wait for about 1 minute and observe the LED indicators on the inverter to check its running status.

Table 6-2 LED indicator description

Category	Status			Meaning
Running indication 	**LED1**	**LED2**		N/A
	Steady green	Steady green		The inverter is operating in grid-tied mode.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off		The DC is on, and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)		The DC is on, the AC is on, and the inverter is not exporting power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)		The DC is off, and the AC is on.
	Off	Off		Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	N/A		There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.
	N/A	Blinking red at short intervals (on for 0.2s and then off for 0.2s)		There is an AC environmental alarm, such as an alarm indicating Grid Undervoltage, Grid Overvoltage, Grid Overfrequency, or Grid Underfrequency.
	Steady red	Steady red		Fault
Communication indication 	**LED3**			N/A
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)			Communication is in progress. (When a mobile phone is connected to the inverter, the indicator first indicates that the phone is connected to the inverter): blinks green at long intervals.)
	Blinking green at long intervals (on for 1s and then off for 1s)			The mobile phone is connected to the inverter.
	Off			There is no communication.
Device replacement indication	**LED1**	**LED2**	**LED3**	N/A
	Steady red	Steady red	Steady red	The inverter hardware is faulty. The inverter needs to be replaced.

Step 7 (Optional) Observe the LED indicator on the Smart Dongle to check its running status.

WLAN-FE Smart Dongle

Figure 6-2 WLAN-FE Smart Dongle

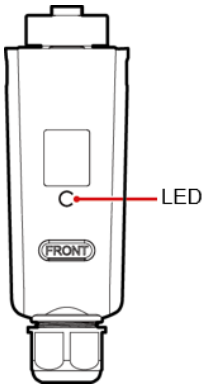


Table 6-3 Indicator description

Indicators	Status	Remarks	Description
-	Off	Normal	The Smart Dongle is not secured or not powered on.
Yellow (blinking green and red simultaneously)	Steady on		The Smart Dongle is secured and powered on.
Red	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The parameters for connecting to the router are not set.
Red	Steady on	Abnormal	The Smart Dongle is faulty. Replace the Smart Dongle.
Blinking red and green alternatively	Blinking at long intervals (on for 1s and then off for 1s)	Abnormal	No communication with the inverter • Remove and then insert the Smart Dongle. • Check whether the inverter matches the Smart Dongle. • Connect the Smart Dongle to another inverter. Check whether the Smart Dongle is faulty, or the USB port of the inverter is faulty.

Indicators	Status	Remarks	Description
Green	Blinking at long intervals (on for 0.5s on and then off for 0.5s)	Normal	Connecting to the router.
Green	Steady on		Connected to the management system.
Green	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The inverter communicates with the management system through the Smart Dongle.

----End

7 Man-Machine Interaction

7.1 App Commissioning

You can use the app to perform local maintenance operations, such as device commissioning, parameter setting, log export, and software upgrade.

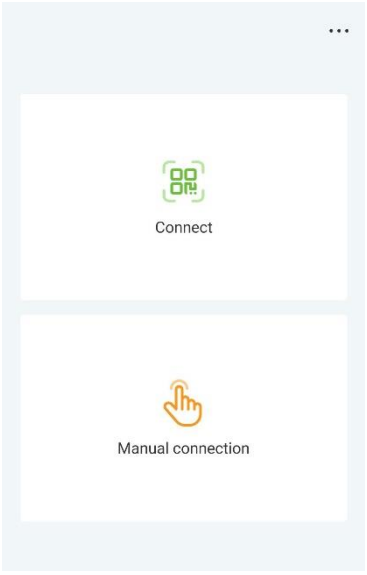
7.1.1 Downloading the HiSolar App

Search for **HiSolar** on Google Play and download the latest installation package.

7.1.2 Connecting to the Inverter

Step 1 You can connect to the inverter by scanning the QR code or choosing manual connection on the app.

- Scanning the QR code: Tap **Connect** and scan the QR code of the inverter to automatically connect to the inverter.
- Manual connection: Tap **Manual connection**, select **WLAN connection**, and connect to the corresponding WLAN hotspot in the WLAN list on the app. The initial name of the WLAN hotspot is the inverter SN, and the initial password is **Changeme**.



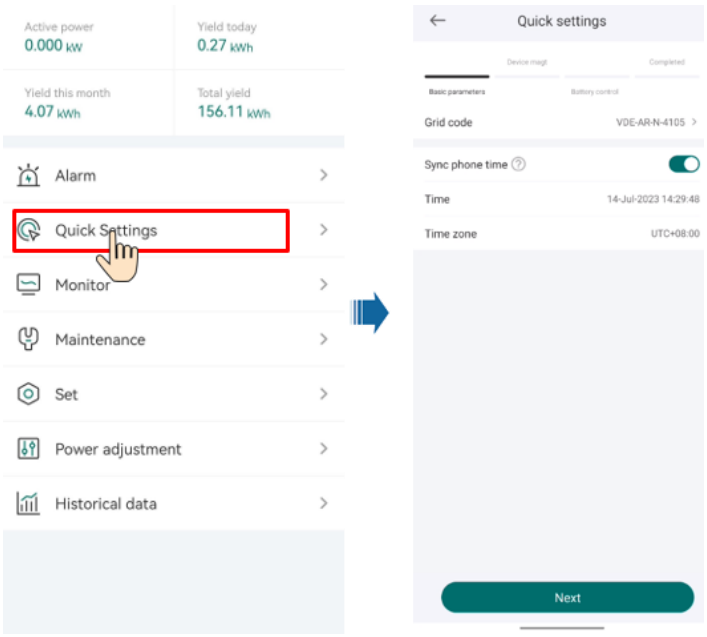
Step 2 Log in as an **Installer**. Set the login password upon the first login.

NOTICE

To ensure account security, protect the password by changing it periodically, and keep it secure.

7.1.3 Quick Settings

Set parameters as prompted on the **Quick settings** screen.



NOTE

The user interface (UI) varies with associated devices. The preceding UI screenshots are for reference only.

7.1.4 What Should I Do If the Device Is Disconnected from the App When I Switch the Local Commissioning Screen to the Background?

During local commissioning, you may need to switch the app to the background (for example, uploading an upgrade package, uploading a photo, or scanning a QR code for WLAN connection). When you switch back to the app screen, a message is displayed, indicating that the device is disconnected from the app, and you need to log in again.

Solution

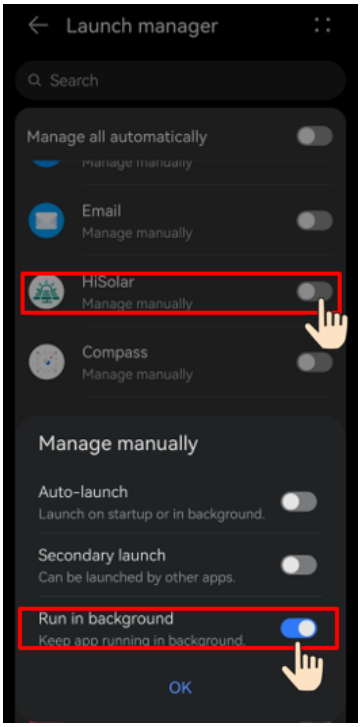
Step 1 On the home screen of your mobile phone, tap **Settings** > **WLAN** > **More settings**, and disable **WLAN+**.

NOTE

Step 1 applies only to Huawei mobile phones running Android 10 or later. For non-Huawei mobile phones, start from step 2.

Step 2 Tap **Settings** > **Apps & services** and choose **Launch manager**.

Step 3 Tap **Manage manually** > **Run in background** for the HiSolar app.



NOTE

The menu name may vary according to the mobile phone brand.

7.2 Parameters Settings

Set inverter parameters. For details about entering the device commissioning screen, see B Device Commissioning.

7.2.1 Energy Control

7.2.1.1 Grid-tied Point Control

Function

Limits or reduces the output power of the PV power system to ensure that the output power is within the power deviation limit.

Procedure

Step 1 On the home screen, choose **Power adjustment** > **Grid-tied point control**.

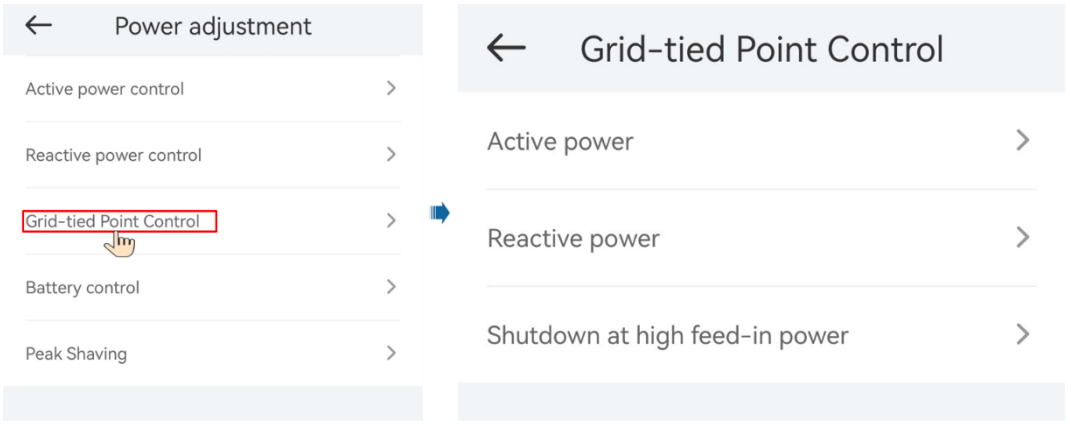


Table 7-1 Grid-tied point control

Parameter Name			Description
Active power	Unlimited	-	If this parameter is set to **Unlimited**, the output power of the inverter is not limited, and the inverter can connect to the power grid at the rated power.
	Grid connected with zero power	Closed-loop controller	• If multiple inverters are cascaded, set this parameter to **SDongle.** • If there is only one inverter, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		Power adjustment interval	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power raising threshold	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
		Active power threshold when communication	Specifies the derating value of the inverter active power by percentage. If

Parameter Name			Description
		fails	the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
	Limited feed-in (kW)	Closed-loop controller	• If multiple inverters are cascaded, set this parameter to **SDongle.** • If there is only one inverter, set this parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		Maximum grid feed-in power	Specifies the maximum active power transmitted from the grid-tied point to the power grid.
		Power adjustment interval	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power raising threshold	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
		Active power threshold when communication fails	Specifies the derating value of the inverter active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
	Power-limited grid connected (%)	Closed-loop controller	• If multiple inverters are cascaded, set this parameter to **SDongle**. • If there is only one inverter, set this

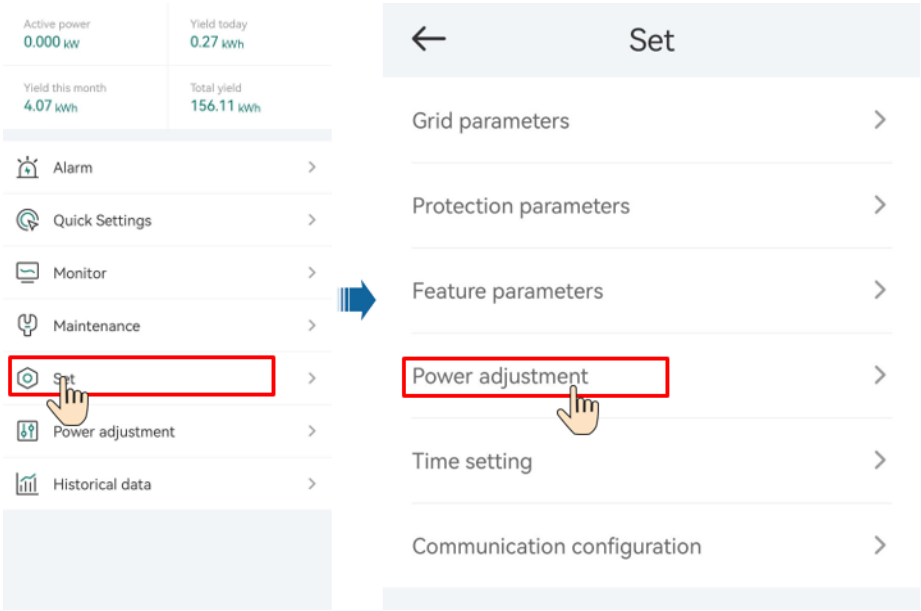
Parameter Name			Description
			parameter to **Inverter**.
		Limitation mode	**Total power** indicates export limitation of the total power at the grid-tied point.
		PV plant capacity	Specifies the total maximum active power in the inverter cascading scenario.
		Maximum grid feed-in power	Specifies the percentage of the maximum active power of the grid-tied point to the PV plant capacity.
		Power adjustment interval	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power raising threshold	Specifies the dead zone for adjusting the inverter output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Communication disconnection fail-safe	In the inverter anti-backfeeding scenario, if this parameter is set to **Enable**, the inverter will derate according to the active power derating percentage when the communication between the inverter and the Smart Dongle is disconnected for a period longer than **Communication disconnection detection time**.
		Communication disconnection detection time	Specifies the time for determining the communication disconnection between the inverter and the Dongle. This parameter is displayed when **Communication disconnection fail-safe** is set to **Enable**.
		Active power threshold when communication fails	Specifies the derating value of the inverter active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the inverter is disconnected, the Smart Dongle delivers the derating value of the inverter active power by percentage.
Shutdown at high feed-in power	Shutdown at high feed-in power		• The default value is **Disable**. • If this parameter is set to **Enable**, the inverter shuts down for protection when the grid-connection point power exceeds the threshold and remains in this condition for the specified time threshold.
	Upper feed-in power threshold for inverter shutdown (kW)		• The default value is **0**. This parameter specifies the power threshold of the

Parameter Name		Description
		grid-connection point for triggering inverter shutdown.
	High feed-in power duration threshold for triggering inverter shutdown (s)	The default value is **20**. This parameter specifies the duration threshold of high feed-in power for triggering inverter shutdown. • When **High feed-in power duration threshold for triggering inverter shutdown** is set to 5, **Shutdown at high feed-in power** takes precedence. • When **High feed-in power duration threshold for triggering inverter shutdown** is set to **20**, **Grid connection with limited power** takes precedence (when **Active power control** is set to **Grid connection with limited power**).

----End

7.2.1.2 Apparent Power Control on the Inverter Output Side

On the home screen, tap **Set > Power adjustment** to set inverter parameters.



Parameter	Description	Value Range
Maximum apparent power (kVA)	Specifies the output upper threshold for the maximum	[Maximum active power, S_{max}]

Parameter	Description	Value Range
	apparent power to adapt to the capacity requirements of standard and customized inverters.	
Maximum active power (kW)	Specifies the output upper threshold for the maximum active power to adapt to different market requirements.	[0.1, P_{max}]

NOTE

The lower threshold for the maximum apparent power is the maximum active power. To lower the maximum apparent power, lower the maximum active power first.

7.2.1.3 Battery Control

Prerequisites

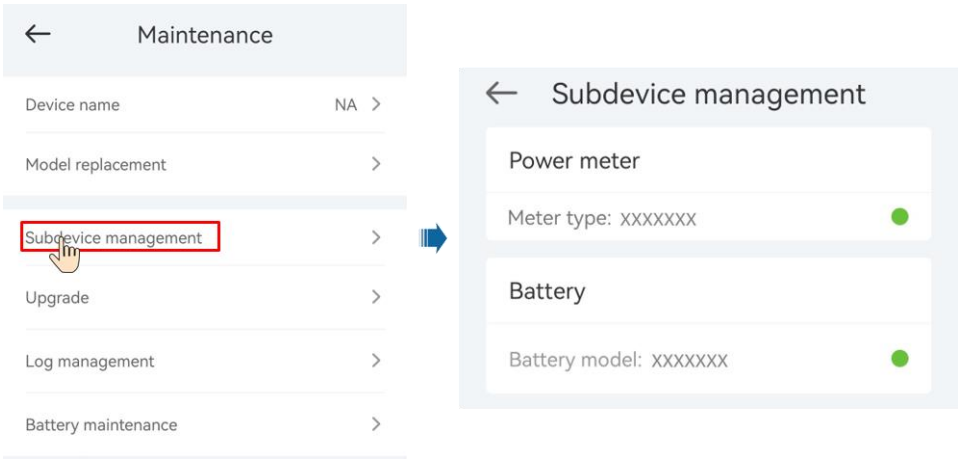
The screenshots in this chapter are taken in the HiSolar 1.0.0.4 App. The App is being updated. The actual screens may vary.

Function

When the inverter connects to a battery, add the battery, and set battery parameters.

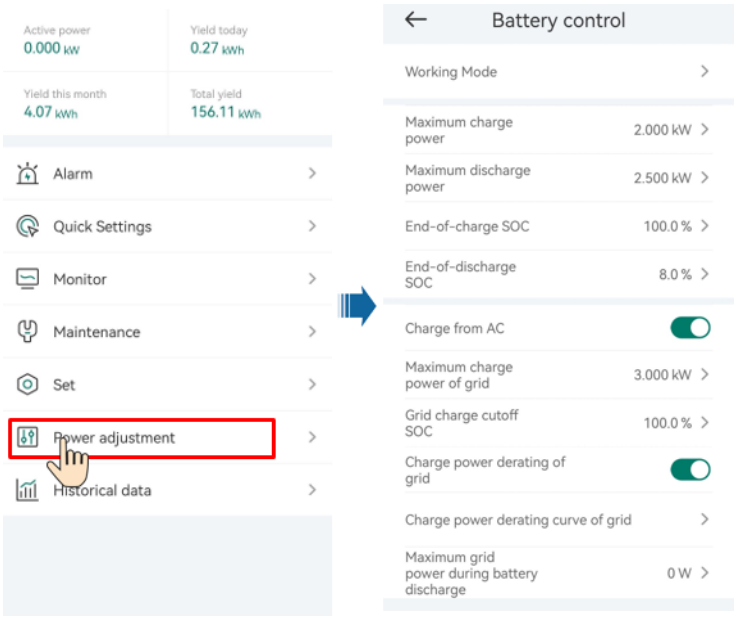
Adding a Battery

To add a battery, choose **Maintenance** > **Subdevice management** on the home screen.



Parameters Settings

On the home screen, choose **Power adjustment** > **Battery control**, and set the battery parameters and working mode.



Parameter	Description	Value Range
Working mode	For details, see the description on the App screen.	• Maximum self-consumption • TOU • Fully fed to grid
Maximum charge power (kW)	Retain this parameter to the maximum charge power. Additional configuration is not required.	• Charge: [0, Maximum charge power]
Maximum discharge power (kW)	Retain this parameter to the maximum discharge power. Additional configuration is not required.	• Discharge: [0, Maximum discharge power]
End-of-charge SOC	Set the charge cutoff capacity.	90%–100%
End-of-discharge SOC	Set the discharge cutoff capacity.	0%–20% (When no PV module is configured or the PV modules have no voltage for 24 hours, the minimum value is 15%.)
Charge from AC	If **Charge from AC** function is disabled by default, comply with the grid charge requirements stipulated in local laws and regulations when this function is enabled.	• Disable • Enable
Grid charge cutoff SOC	Set the grid charge cutoff SOC.	[20%, 100%]

7.2.1.4 Peak Shaving

Prerequisites

The screenshots in this section are captured from the HiSolar app 1.0.0.4. The actual screens may vary with app updates.

Description

If the inverter connects to an ESS and the ESS working mode is set to **Maximum self-consumption** or **TOU**, you can set capacity control parameters.

Table 7-2 Application Scenario

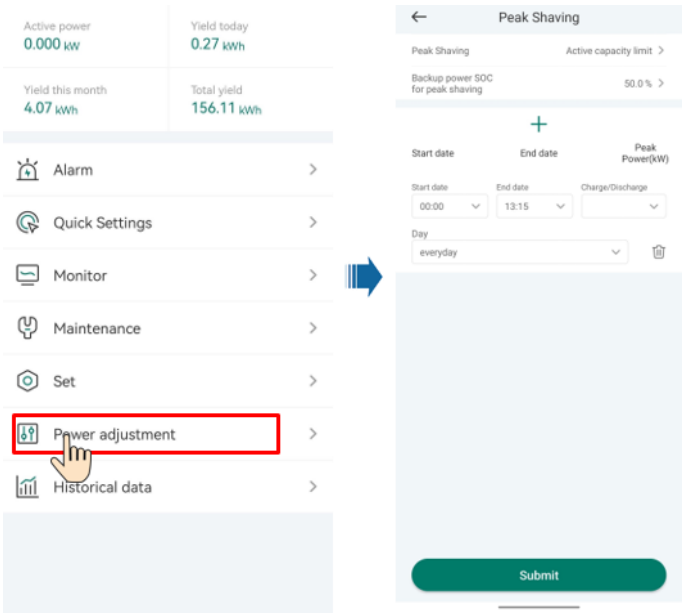
Applicable Model	Application Scenario
Single inverter	Single inverter + Smart Dongle (WLAN-FE) + Energy storage

Parameter Settings

On the home screen, choose **Power adjustment > Peak Shaving** and set peak shaving parameters.

NOTE

- The peak shaving function is unavailable when the energy storage working mode is set to **Fully fed to grid**.
- When peak shaving has been enabled, you must first disable peak shaving and then set the energy storage working mode to **Fully fed to grid**.



Parameter	Description	Range
Peak Shaving	1. Before enabling **Peak Shaving**, set **Charge from AC** to **Enable**.	• Disable

Parameter	Description	Range
	2. Before disabling **Charge from AC**, set **Peak Shaving** to **Disable**.	• Active capacity limit
Backup power SOC for peak shaving	The value of this parameter affects the peak shaving capability. A larger value indicates stronger peak shaving capability.	(8.0, 100.0] Backup power SOC for peak shaving > Backup power SOC (when Backup is enabled) > End-of-discharge SOC
Start date	• Set the peak power range based on the start time and end time. The peak power is configured based on electricity prices in different time segments. You are advised to set the peak power to a low value when the electricity price is high. • A maximum of 14-time segments are allowed.	-
End date		
Peak power (kW)		[0.000, 1000.000]

7.2.2 AFCI

Function

If PV modules or cables are not properly connected or damaged, electric arcs may occur, which may cause fire. Inverters provide unique arc detection in compliance with UL 1699B-2018 to ensure the safety of users' lives and property.

This function is enabled by default. The inverter automatically detects arc faults. To disable this function, log in to the HiSolar App, on the home screen, choose **Set** > **Feature parameters**, and disable **AFCI**.

NOTE

The AFCI function works only with ordinary PV modules but does not support intelligent PV modules.

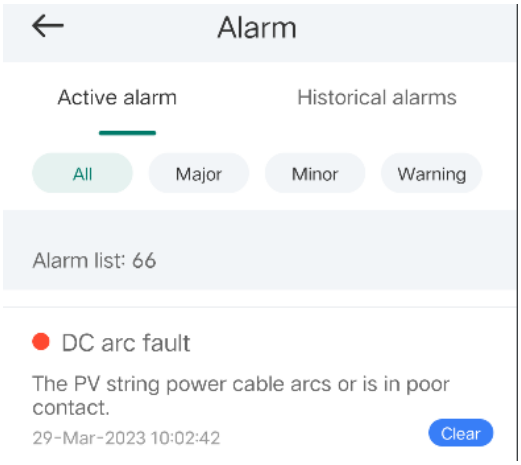
Clearing Alarms

The AFCI function involves the **DC arc fault** alarm.

The inverter has the AFCI alarm automatic clearance mechanism. If an alarm is triggered less than five times within 24 hours, the inverter automatically clears the alarm. If the alarm is triggered five times or more within 24 hours, the inverter locks for protection. You need to manually clear the alarm on the inverter so that it can work properly.

You can manually clear the alarm as follows:

Log in to the HiSolar App and on the home screen, connect and log in to the inverter that generates the AFCI alarm, tap **Alarm**, and tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.



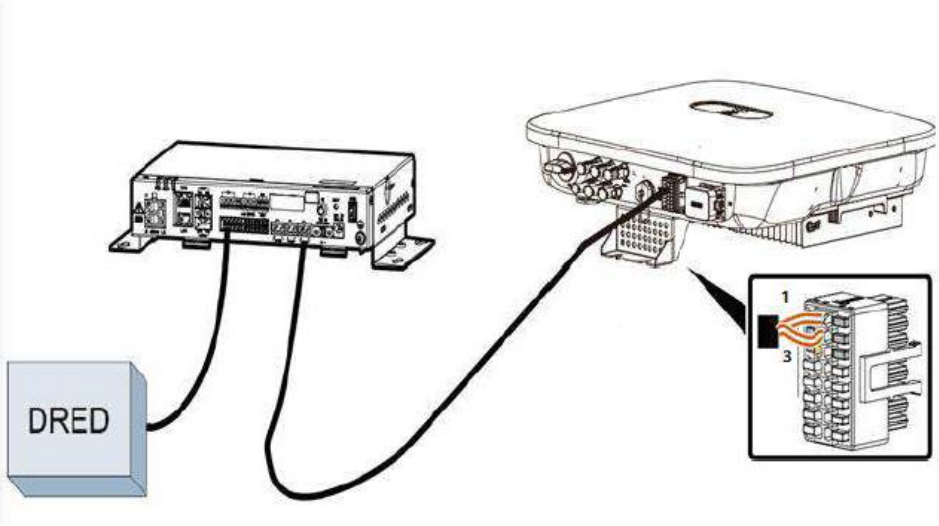
7.2.3 DRM

Function

According to AS/NZS 4777.2:2020+A1:2021, solar inverters need to support the function of demand response mode (DRM), and DRM0 is a mandatory requirement.

The inverter must be connected with an external device SmartLogger. The demand response enabling device directly connected to SmartLogger and inverter connected to SmartLogger via communication RS485.

This function is disabled by default.



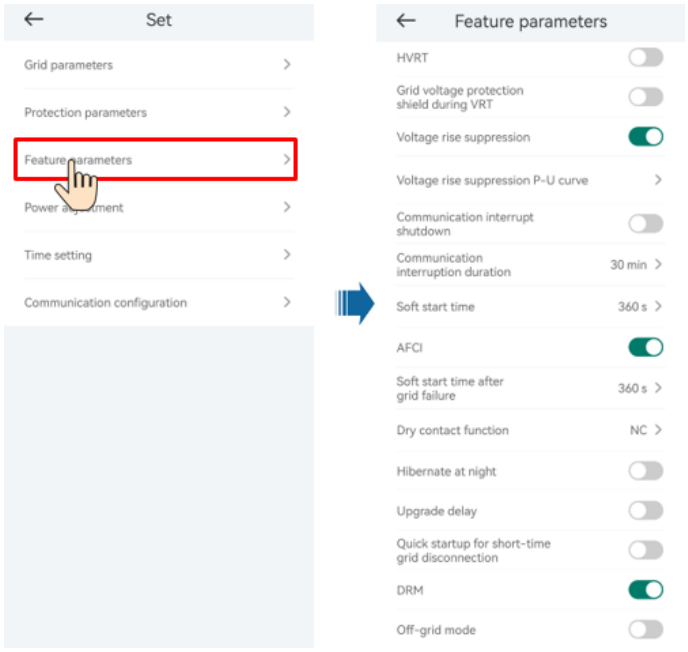
NOTE

The demand response enabling device (DRED) is a power grid dispatch device.

Procedure

Step 1 On the home page, choose **Set** > **Feature parameters**.

Step 2 Set **DRM** to .


Set
Grid parameters
Protection parameters
Feature parameters
Power adjustment
Time setting
Communication configuration
Feature parameters
HVRT
Grid voltage protection shield during VRT
Voltage rise suppression
Voltage rise suppression P-U curve
Communication interrupt shutdown
Communication interruption duration
30 min
Soft start time
360 s
AFCI
Soft start time after grid failure
360 s
Dry contact function
NC
Hibernate at night
Upgrade delay
Quick startup for short-time grid disconnection
DRM
Off-grid mode

----End

8 Maintenance

Prerequisites

DANGER

- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.

WARNING

- Before performing maintenance, power off the equipment, follow the instructions on the delayed discharge label, and wait for a period of time as specified to ensure that the equipment is not energized.

8.1 Inverter Power-Off

Important Notes

WARNING

- After the system is powered off, the inverter is still energized and hot, which may cause electric shocks or burns. Therefore, wait for 5 minutes after power-off and then put on insulated gloves to operate the inverter.
- Before maintaining the PV string, turn off the AC switch and DC switch. Otherwise, electric shocks may occur as the PV string is energized.

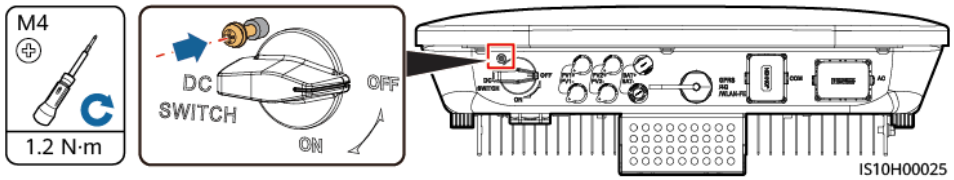
Procedure

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

Step 2 Turn off the DC switch at the bottom of the inverter.

Step 3 (Optional) Install the locking screw beside the DC switch.

Figure 8-1 Installing the locking screw for the DC switch



Step 4 If there is a DC switch between the inverter and PV string, turn off the DC switch.

Step 5 (Optional) Turn off the battery switch between the inverter and batteries.

----End

8.2 Routine Maintenance

To ensure that the inverter 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, connecting cables, and maintaining the grounding reliability, power off the system.

Table 8-1 Maintenance list

Check Detail	Check Method	Maintenance Interval
System cleanliness	Check the heat sink for foreign matter or the overall health of the inverter.	Annual or every time an abnormality is detected
System running status	Check the inverter for damage or deformation.	Annual
Electrical connections	• Cables are securely connected. • Cables are intact, in particular, the parts touching the metallic surface are not scratched.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.
Grounding reliability	Check whether the ground terminal and ground cable are securely connected.	Annual
Sealing	Check whether all terminals and ports are properly sealed.	Annual

8.3 Troubleshooting

Alarm severities are defined as follows:

- Major: The inverter is faulty. As a result, the output power decreases, or the grid-tied power generation is stopped.
- Minor: Some components are faulty without affecting the grid-tied power generation.
- Warning: The inverter works properly. The output power decreases, or some authorization functions fail due to external factors.

Table 8-2 Common fault alarm list

ID	Name	Severity	Cause	Solution
2001	High string input voltage	Major	The PV array is not properly configured. Excessive PV modules are connected in series to the PV string; therefore, the PV string open-circuit voltage exceeds the maximum inverter operating voltage. Cause ID 1 or 2: PV strings 1 and 2	Reduce the number of PV modules connected in series to the PV string until the PV string open-circuit voltage is less than or equal to the maximum inverter operating voltage. After the PV string configuration is corrected, the alarm disappears.
2002	DC arc fault	Major	The PV string power cables arc or are in poor contact. Cause ID 1 = PV1 and PV2 Cause ID 2 = PV3 and PV4	Check whether the PV string cables arc or are in poor contact.
2003	DC arc fault	Major	The PV string power cables arc or are in poor contact. • Cause ID 1 = PV1 • Cause ID 2 = PV2	Check whether the PV string cables arc or are in poor contact.
2011	String reverse connection	Major	The PV string polarity is reversed. • Cause ID 1 = PV1 • Cause ID 2 = PV2	Check whether the PV string is reversely connected to the inverter. If so, wait until the PV string current decreases to below 0.5 A. Then, turn off the DC switch and correct the PV string polarity.
2012	String current backfeed	Warning	The number of PV modules connected in series to the PV string is insufficient. As a result, the end voltage is lower than that of other strings. • Cause ID 1 = PV1 • Cause ID 2 = PV2	1. Check whether the number of PV modules connected in series to this PV string is less than that of the other PV strings connected in parallel. If so, wait until the PV string current decreases to below 0.5 A. Then, turn off the DC switch and adjust the number of PV modules in the PV string. 2. Check whether the PV string is shaded.

ID	Name	Severity	Cause	Solution
				3. Check whether the open-circuit voltage of the PV string is abnormal.
2021	AFCI self-check failure	Major	Cause ID = 1, 2 The AFCI self-check fails.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, contact your dealer or technical support.
2031	Phase wire short-circuited to PE	Major	Cause ID = 1 The impedance of the output phase wire to PE is low or the output phase wire is short-circuited to PE.	Check the impedance of the output phase wire to PE, locate the position with low impedance, and rectify the fault.
2032	Grid loss	Major	Cause ID = 1 • Power grid outage occurs. • The AC circuit is disconnected, or the AC switch is off.	1. The alarm is cleared automatically after the power grid recovers. 2. Check whether the AC circuit is disconnected, or the AC switch is off.
2033	Grid undervoltage	Major	Cause ID = 1 The grid voltage is below the lower threshold, or the low-voltage duration has lasted for more than the value specified by low voltage ride-through (LVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. If yes, modify the grid undervoltage protection threshold through the mobile App with the consent of the local power operator. 3. If the alarm persists for a long time, check the connection between the AC circuit breaker and the output power cable.
2034	Grid overvoltage	Major	Cause ID = 1 The grid voltage exceeds the upper threshold, or the high voltage duration has lasted for more than the value specified by high voltage ride-through (HVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. If yes, modify the grid overvoltage protection threshold

ID	Name	Severity	Cause	Solution
				through the mobile App with the consent of the local power operator. 3. Check whether the peak voltage of the power grid is too high. If the alarm persists and cannot be rectified for a long time, contact the power operator.
2035	Grid volt. Imbalance	Major	Cause ID = 1 The difference between grid phase voltages exceeds the upper threshold.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. 3. If the alarm lasts for a long time, check the AC output power cable connection. 4. If the AC output power cable is correctly connected, yet the alarm persists and affects the energy yield of the PV plant, contact the local power operator.
2036	Grid overfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is higher than the requirements for the local power grid code.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid frequency is within the acceptable range. If not, contact the local power operator. If yes, modify the grid overfrequency protection threshold through the App with the consent of the local power operator.
2037	Grid underfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is lower than the requirements for the local power grid code.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid

ID	Name	Severity	Cause	Solution
				frequency is within the acceptable range. If not, contact the local power operator. If yes, modify the grid underfrequency protection threshold through the App with the consent of the local power operator.
2038	Unstable grid frequency	Major	Cause ID = 1 Power grid exception: The actual change rate of the power grid frequency does not meet the requirements for the local power grid code.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The inverter automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid frequency is within the acceptable range. If not, contact the local power operator.
2039	Output overcurrent	Major	Cause ID = 1 The power grid voltage drops dramatically, or the power grid is short-circuited. As a result, the inverter transient output current exceeds the upper threshold, and protection is triggered.	1. The inverter monitors its external operating conditions in real time and automatically recovers after the fault is rectified. 2. If the alarm persists and affects the energy yield of the power plant, check whether the output is short-circuited. If the fault persists, contact your dealer or technical support.
2040	Output DC component overhigh	Major	Cause ID = 1 The DC component in the power grid current exceeds the upper threshold.	1. The inverter monitors its external operating conditions in real time and automatically recovers after the fault is rectified. 2. If the alarm persists, contact your dealer or technical support.
2051	Abnormal residual current	Major	Cause ID = 1 The input-to-ground insulation impedance has decreased during the inverter operation.	1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The inverter automatically recovers after the fault is rectified. 2. If the alarm persists or lasts a long time, check whether the impedance between the PV string and ground is too low.
2061	Abnormal grounding	Major	Cause ID = 1 • The neutral wire or PE cable of the inverter is not connected. • The output mode set for	Power off the inverter (turn off the AC output switch and DC input switch and wait for a period of time. For details about the wait time, see the description on the

ID	Name	Severity	Cause	Solution
			the inverter is inconsistent with the cable connection mode.	device safety warning label), and then perform the following operations: 1. Check whether the PE cable for the inverter is connected properly. 2. If the inverter is connected to a TN power grid, check whether the neutral wire is properly connected and whether the voltage of the neutral wire to ground is normal. 3. After the inverter is powered on, check whether the output mode set for the inverter is consistent with the output cable connection mode.
2062	Low Insulation Resistance	Major	Cause ID = 1 • A short circuit occurs between the PV array and the ground. The ambient air of the PV array is damp and the insulation between the PV array and the ground is poor.	1. Check the output impedance of the PV array to ground. If there is a short circuit or lack of insulation, rectify it. 2. Check that the PE cable of the inverter is correctly connected. 3. If you have confirmed that the impedance is lower than the specified protection threshold in a cloudy or rainy environment, log in to the App, and set the **Insulation resistance protection** threshold.
2063	Cabinet overtemperature	Minor	Cause ID = 1 • The inverter is installed in a place with poor ventilation. • The ambient temperature exceeds the upper threshold. • The inverter is not operating properly.	• Check the ventilation and ambient temperature at the inverter installation position. • If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. • If the ventilation and ambient temperature are normal, contact your dealer or technical support.
2064	Equipment fault	Major	Cause ID = 1–12 An unrecoverable fault occurs on a circuit inside the inverter.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, contact your dealer or technical support.
2065	Upgrade failed or version mismatch	Minor	Cause ID = 1–6 The upgrade is not completed normally.	1. Perform an upgrade again. 2. If the upgrade fails several times, contact your dealer or technical support.

ID	Name	Severity	Cause	Solution
2068	Battery Abnormal	Minor	The battery is faulty, disconnected, or the battery circuit breaker is OFF when the battery is running. Cause ID = 1–4 • 1: The battery communication is abnormal. • 2: The battery port experiences overcurrent. • 3. The battery enabling cable is not properly connected. • 4: The battery port voltage is abnormal.	1. If the battery fault indicator is steady on or blinking, contact the battery supplier. 2. Check that the battery enabling/power/communications cable is correctly installed, and that the communications parameters are the same as the inverter RS485 configurations. 3. Check that the auxiliary power switch on the battery is set to ON. 4. Send a shutdown command on the App. Turn off the AC output switch, DC input switch, and battery switch. Then turn on the battery switch, AC output switch, and DC input switch in sequence after 5 minutes. 5. If the fault persists, contact your dealer or technical support.
61440	Faulty monitoring unit	Minor	Cause ID = 1 • The flash memory is insufficient. • The flash memory has bad sectors.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, replace the monitoring board, or contact your dealer or technical support.
2072	Transient AC overvoltage	Major	Cause ID = 1 The inverter detects that the phase voltage exceeds the transient AC overvoltage protection threshold.	1. If the voltage at the grid connection point is too high, contact the local power operator. 2. If you have confirmed that the voltage at the grid connection point exceeds the upper threshold and obtained consent from the local power operator, modify the overvoltage protection thresholds. 3. Check whether the peak grid voltage exceeds the upper threshold.
2080	Abnormal PV module configuration	Major	• Cause ID = 1 The number of 3rd party optimizers connected to the inverter exceeds the upper threshold. • Cause ID = 2 The PV string power or the number of 3rd party	Check whether the total number of PV modules, number of PV modules in a PV string, and number of PV strings meet requirements and whether the PV module output is reversely connected. • Cause ID 1: Check whether the total number of 3rd party

ID	Name	Severity	Cause	Solution
			optimizers connected in series in a PV string exceeds the upper threshold. • Cause ID = 3 The number of 3rd party optimizers connected in series in a PV string is less than the lower threshold, the PV string output is reversely connected, or the output of some 3rd party optimizers in the PV string is reversely connected. • Cause ID = 4 The number of PV strings connected to the inverter exceeds the upper threshold. • Cause ID = 5 The PV string output is reversely connected, or the PV string output is short-circuited. • Cause ID = 6 Under the same MPPT, the number of 3rd party optimizers connected in series in PV strings connected in parallel is different, or the output of some 3rd party optimizers in PV strings is reversely connected. • Cause ID = 7 The 3rd party optimizer installation position is changed, or PV strings are combined or exchanged. • Cause ID = 8 The sunlight is weak or changes abnormally. • Cause ID = 9 In partial configuration scenarios, the PV string voltage exceeds the inverter input voltage	optimizers exceeds the upper threshold. • Cause ID 2: Check whether the PV string power or the number of PV strings connected in series exceeds the upper threshold. • Cause ID 3: 1. Check whether the number of 3rd party optimizers connected in series in the PV string is below the lower threshold. 2. Check whether the PV string output is reversely connected. 3. Check whether the PV string output is disconnected. 4. Check whether the 3rd party optimizer output extension cable is correct (positive connector at one end and negative connector at the other). • Cause ID 4: Check whether the number of PV strings exceeds the upper threshold. • Cause ID 5: Check whether the PV string output is reversely connected or short-circuited. • Cause ID 6: 1. Check whether the number of 3rd party optimizers connected in series in the PV strings connected in parallel under the same MPPT is the same. 2. Check whether the 3rd party optimizer output extension cable is correct (positive connector at one end and negative connector at the other). • Cause ID 7: When the sunlight is normal, perform the 3rd party optimizer search function again. • Cause ID 8: When the sunlight is normal, perform the 3rd party optimizer search function again.

ID	Name	Severity	Cause	Solution
			specifications.	• Cause ID 9: Calculate the PV string voltage based on the number of PV modules in the string and check whether the string voltage exceeds the upper threshold of the inverter input voltage.
2081	3rd party Optimizer fault	Warning	Cause ID = 1 The 3rd party optimizer is offline or faulty.	Selective compatible 3rd party optimizer with Inverter are able to report fault codes. Go to the optimizer information screen to view the fault details.

NOTE

Contact your dealer or Entelar Group's technical support if all troubleshooting procedures listed above are completed and the fault still exists.

Contact your dealer for a list of compatible 3rd party Optimizers.

9 Handling the Inverter

9.1 Removing the Inverter

NOTICE

Before removing the inverter, power off the AC and DC (batteries).

Perform the following operations to remove the inverter:

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

9.2 Packing the Inverter

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

9.3 Disposing of the Inverter

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

10 Technical Specifications

Efficiency

Technical Specifications	6KTL	10KTL
Maximum efficiency	98.6%	98.6%
European efficiency	97.7%	98.1%

Input

Technical Specifications	6KTL	10KTL
Maximum input voltage[a]	1100 V	
Maximum input current (per MPPT)	13.5 A	
Maximum short-circuit current (per MPPT)	19.5 A	
Minimum startup voltage	200 V	
MPP voltage range	140–980 V	
Full-load MPPT voltage range	285–850 V DC	470–850 V DC
Rated input voltage	600 V	
Maximum number of inputs	2	

Technical Specifications	6KTL	10KTL
Number of MPPTs	2	
Battery normal voltage	600 Vdc	
Battery maximum current	16.7 A	
Battery type	Li-ion	
Note a: The maximum input voltage is the maximum DC input voltage that the inverter can withstand. If the input voltage exceeds this value, the inverter may be damaged.		

Output (On Grid)

Technical Specifications	6KTL	10KTL
Rated output power	6000 W	10,000 W
Maximum apparent power	6600 VA	11,000 VA
Maximum active power (cosφ = 1)	6600 W	11,000 W
Rated output voltage	220 V/380 V, 230 V/400 V, 3W+N+PE	
Maximum output voltage at long-term operation	See standards about the local power grid.	
Rated output current	9.1 A (380 V)/ 8.7 A (400 V)	15.2 A (380 V)/ 14.5 A (400 V)
Maximum output current	10.1 A	16.9 A
Rated apparent power	6 kVA	10 kVA
Inrush current	10.1 A	16.9 A
Max output fault current	30.12 A	50.2 A
Max output overcurrent protection	31.8 A	31.8 A

Technical Specifications	6KTL	10KTL
Output voltage frequency	50 Hz/60 Hz	
Power factor	0.8 leading–0.8 lagging	
Maximum total harmonic distortion (THD) AC THDi	< 3% under rated conditions. Single harmonic meets the VDE4105 requirements.	

Protection

Technical Specifications	6KTL	10KTL
Overvoltage category	PV II/AC III	
Input DC switch	Supported	
Islanding protection	Supported	
Output overcurrent protection	Supported	
Input reverse connection protection	Supported	
PV string fault detection	Supported	
DC surge protection	DC common mode: 10 kA	
AC surge protection	Common mode: 5 kA; differential mode: 5 kA	
Insulation resistance detection	Supported	
Residual current monitoring (RCMU)	Supported	
AFCI	Supported	
PID repair	Supported	

Technical Specifications	6KTL	10KTL
Active anti-islanding method	AFD	
Protection class	I	
PV and AC port	DVCC	
Communication port	DVCA	

Display and Communication

Technical Specifications	6KTL	10KTL
Display	LED and WLAN+app	
RS485	Supported	
External expansion communication module	Supports WLAN.	
remote ripple control	Supported	

General Specifications

Technical Specifications	6KTL	10KTL
Dimensions (W x H x D, mm)	525 x 470 x 166 mm (including only the rear mounting kit of the inverter)	
Weight	17 kg (including only the rear mounting kit of the inverter)	
Noise	29 dB (A) (typical working condition)	
Operating temperature	–25°C to +60°C (derated when the temperature is higher than 45°C)	
Operating humidity	0–100% RH	
Cooling mode	Natural convection	
Maximum operating altitude	4000 m (derated when the altitude is greater than 3000 m)	

Technical Specifications	6KTL	10KTL
Storage temperature	–40°C to +70°C	
Storage humidity	5–95% RH (non-condensing)	
Input terminal	Staubli MC4	
Output terminal	Waterproof quick-connect terminal	
IP rating	IP65	
Topology	Non-Isolation	
Environmental protection requirements	RoHS 6	

WLAN

Technical Specification	Value Range
Frequency	2400 MHz–2483.5 MHz
Protocol standard	802.11b/g/n
Bandwidth	20M
Maximum transmit power	≤ 20 dBm EIRP

A Grid Code

NOTE

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

Table A-1 Grid Code

National/ Regional Grid Code	Description	5KTL	6KTL
AUSTRALIA-AS4777_NZ-LV230	New Zealand power grid connection standard (AS/NZS 4777.2:2020)	Supported	Supported
AUSTRALIA-AS4777_A-LV230	Australia power grid connection standard (AS/NZS 4777.2:2020)	Supported	Supported
AUSTRALIA-AS4777_B-LV230	Australia power grid connection standard (AS/NZS 4777.2:2020)	Supported	Supported
AUSTRALIA-AS4777_C-LV230	Australia power grid connection standard (AS/NZS 4777.2:2020)	Supported	Supported
AS4777	New Zealand and Australia power grid connection standard (AS/NZS 4777.2:2015)	Supported	Supported
Island-Grid	Off-grid grid code	Supported	Supported
N/A	-	-	-

B Device Commissioning

Step 1 Connect to the solar inverter WLAN and log in to the device commissioning screen as the **installer** user.

NOTICE

- If the mobile phone is directly connected to the inverter, the visible distance between the inverter and the mobile phone must be less than 3 m when a built-in antenna is used and less than 50 m when an external antenna is used to ensure the communication quality between the App and the inverter. The distances are for reference only and may vary with mobile phones and shielding conditions.
- When connecting the inverter to the WLAN over a router, ensure that the mobile phone and inverter are in the WLAN coverage of the router and the inverter is connected to the router.
- The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz) and the WLAN signal reaches the inverter.
- The WPA, WPA2, or WPA/WPA2 encryption mode is recommended for routers. Enterprise-level encryption is not supported (for example, public hotspots requiring authentication such as airport WLAN). WEP and WPA TKIP are not recommended because these two encryption modes have serious security defects. If the access fails in WEP mode, log in to the router and change the encryption mode of the router to WPA2 or WPA/WPA2.

NOTE

- Obtain the initial password for connecting to the solar inverter WLAN from the label on the side of the solar inverter.
- Set the password at the first login. To ensure account security, change the password periodically and keep the new password in mind. Not changing the initial password may cause password disclosure. A password left unchanged for a prolonged period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.
- When you access the **device commission** screen of the inverter for the first time, you need to manually set the login password because the inverter does not have an initial login password.

----End

C Resetting Password

Step 1 Ensure that the inverter connects to the AC and DC power supplies at the same time. Indicators and are steady green or blink at long intervals for more than 3 minutes.

Step 2 Perform the following operations within 4 minutes:

1. Turn off the AC switch and set the DC switch at the bottom of the inverter to OFF. If the inverter connects to batteries, turn off the battery switch. Wait until all the LED indicators on the inverter panel turn off.
2. Turn on the AC switch, set the DC switch to ON, and wait for about 90s. Ensure that the indicator is blinking green slowly.
3. Turn off the AC switch and set the DC switch to OFF. Wait until all LED indicators on the inverter panel are off.
4. Turn on the AC switch and set the DC switch to ON. Wait until all indicators on the solar inverter panel blink and turn off 30 seconds later.

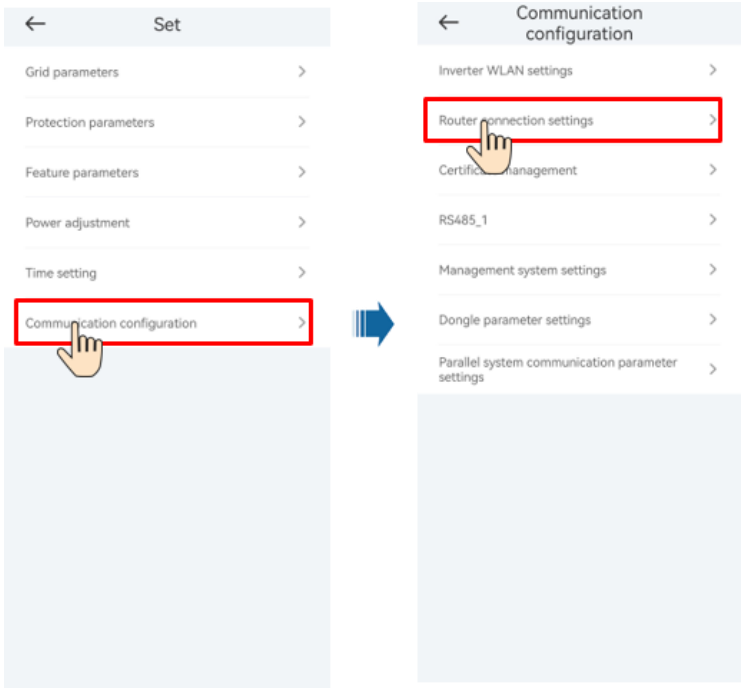
Step 3 Reset the password within 10 minutes. (If no operation is performed within 10 minutes, all inverter parameters remain unchanged.)

1. Wait until the indicator blinks green at long intervals.
2. Obtain the initial WLAN hotspot name (SSID) and initial password (PSW) from the label on the side of the inverter and connect to the App.
3. On the login screen, set a new login password and log in to the App.

Step 4 Set router parameters.

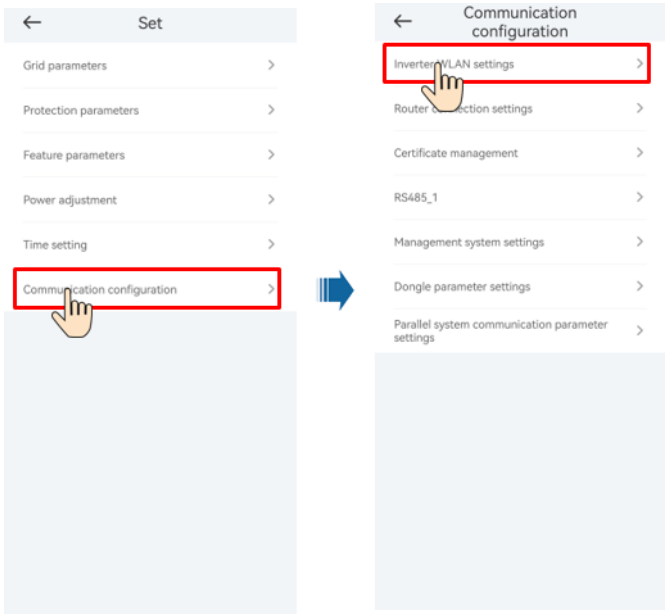
- Setting router parameters

  Log in to the HiSolar App, choose **Set** > **Communication configuration** > **Router connection settings**, and set router parameters.



- (Optional) Resetting the WLAN password

  Log in to the HiSolar App, choose **Set** > **Communication configuration** > **Inverter WLAN settings**, and reset the WLAN password.



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D Rapid Shutdown

When all PV modules connected to the solar inverter are configured with compatible 3rd party optimizers approved by Entelar Energy, the PV system shuts down quickly and reduces the output voltage of the PV string. If 3rd party optimizers are configured for some PV modules, the rapid shutdown function is not supported.

Perform the following step to trigger rapid shutdown:

- Method 1: Use the rapid shutdown function. Set **Dry contact function** to **DI Rapid Shutdown**. Connect the access switch to pins 7 and 5 of the inverter communications terminal. The switch is turned off by default. When the switch is turned on, rapid shutdown is triggered.
- Method 2: Turn off the AC switch between the solar inverter and the power grid. (If the inverter supports and enables the off-grid function, the rapid shutdown function is not supported.)
- Method 3: Turn off the DC switch at the bottom of the inverter. (If an extra DC switch is connected to the input side of the inverter, turning off this DC switch will not trigger rapid shutdown.)
- Method 4: If **AFCI** is enabled, the inverter automatically detects arc faults, triggering a rapid shutdown.

NOTE

Contact your dealer for a list of compatible 3rd party Optimizers.

E Locating Insulation Resistance Faults

If the ground resistance of a PV string connected to a solar inverter is too low, the solar inverter generates a **Low Insulation Resistance** alarm.

The possible causes are as follows:

- A short circuit occurs between the PV array and the ground.
- The ambient air of the PV array is damp and the insulation between the PV array and the ground is poor.

To locate the fault, connect each PV string to a solar inverter, power on and check the solar inverter, and locate the fault based on the alarm information reported by the HiSolar App. If a system is not configured with any 3rd party optimizer, skip the corresponding operations. Perform the following steps to locate an insulation resistance fault.

NOTICE

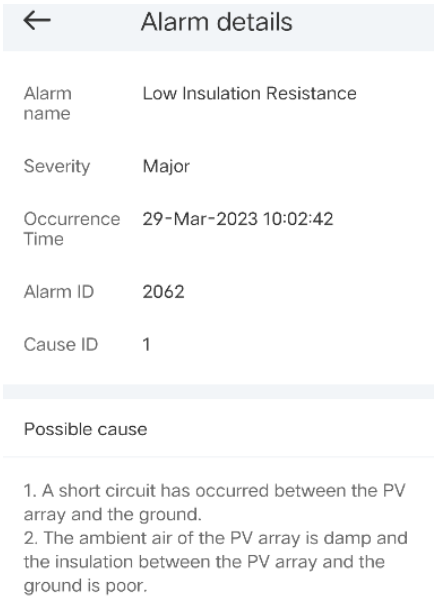
If two or more ground insulation faults occur in a single PV string, the following method cannot locate the fault. You need to check the PV modules one by one.

Step 1 The AC power supply is connected and set the DC switch at the bottom of the solar inverter to OFF. If the solar inverter connects to batteries, wait for 1 minute, and turn off the battery switch and then the auxiliary power switch of the battery.

Step 2 Connect each PV string to the solar inverter and set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF** on the App and send a startup command.

Step 3 Log in to the HiSolar App and on the device commissioning screen, connect and log in to the solar inverter, and access the **Alarm** screen. Check whether the **Low Insulation Resistance** alarm is reported.

- If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, choose **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Set the DC switch to OFF and go to Step 2 to connect another PV string to the solar inverter for a check.
- If a **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, check the percentage for possible short-circuit positions on the **Alarm details** page and go to Step 4.



NOTE

- The positive and negative terminals of a PV string are connected to the PV+ and PV– terminals of the solar inverter. The PV– terminal represents a possibility of 0% for the short-circuit position and the PV+ terminal represents a possibility of 100% for the short-circuit position. Other percentages indicate that the fault occurs on a PV module or cable in the PV string.
- Possible fault position = Total number of PV modules in a PV string x Percentage of possible short-circuit positions. For example, if a PV string consists of 14 PV modules and the percentage of the possible short-circuit position is 34%, the possible fault position is 4.76 (14 x 34%), indicating that the fault is located near PV module 4, including the previous and the next PV modules and the cables of PV module 4. The solar inverter has a detection precision of ±1 PV module.

Step 4 Set the DC switch to OFF and check whether the connector or DC cable between the possible faulty PV modules and the corresponding 3rd party optimizers, or those between the adjacent PV modules and the corresponding 3rd party optimizers are damaged.

- If yes, replace the damaged connector or DC cable, set the DC switch to ON, and view the alarm information.
  - If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the inspection on the PV string is complete. Choose **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Set the DC switch to OFF. Go to Step 2 to check other PV strings. Then go to Step 8.
  - If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, go to Step 5.
- If not, go to Step 5.

Step 5 Set the DC switch to OFF, disconnect the possible faulty PV modules and corresponding 3rd party optimizers from the PV string, and connect a DC extension cable with an MC4 connector to the adjacent PV modules or 3rd party optimizers. Set the DC switch to ON and view the alarm information.

- If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the fault occurs on the disconnected PV module and 3rd party optimizer. Choose **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command. Go to Step 7.

- If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, the fault does not occur on the disconnected PV module or 3rd party optimizer. Go to Step 6.

Step 6 Set the DC switch to OFF, reconnect the removed PV module and 3rd party optimizer, and repeat Step 5 to check the adjacent PV modules and 3rd party optimizers.

Step 7 Determine the position of the ground insulation fault.

1. Disconnect the possible faulty PV module from the 3rd party optimizer.
2. Set the DC switch to OFF.
3. Connect the possible faulty 3rd party optimizer to the PV string.
4. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF** on the App and send a startup command. Check whether the **Low Insulation Resistance** alarm is reported.
   - If the **Low Insulation Resistance** alarm is not reported one minute after the solar inverter is powered on, the PV module is faulty. Choose **Maintenance** > **Inverter ON/OFF** on the App and send a shutdown command.
   - If the **Low Insulation Resistance** alarm is still reported one minute after the solar inverter is powered on, the 3rd party optimizer is faulty.
5. Set the DC switch to OFF. Replace the faulty component to rectify the insulation resistance fault. Go to Step 2 to check other PV strings. Then go to Step 8.

Step 8 If the solar inverter connects to batteries, turn on the auxiliary power switch of the battery and then the battery switch. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Maintenance** > **Inverter ON/OFF** on the App and send a startup command.

NOTE

Contact your dealer for a list of compatible 3rd party Optimizers.

----End

F Acronyms and Abbreviations

L	
LED	light emitting diode
M	
MPP	maximum power point
MPPT	maximum power point tracking
P	
PV	photovoltaic