SmartACU2000A Smart Array Controller

User Manual (Without a PID module, with 800 V AC)

Issue 02

Date 2023-09-22

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About This Document

Purpose

This document describes the SmartACU2000A-D-PLC smart array control cabinet, that is, the smart array control unit (smart array controller for short) in terms of its installation, cable connections, commissioning, and maintenance. Get familiar with the controller features, functions, and safety precautions provided in this document before installing and operating the smart array controller.

Keep the hard copy of this document in good condition for future reference.

Figures used in this document are for reference only.

Intended Audience

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

Symbol Conventions

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

Symbol	Description
DANGER	Indicates 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 degradation, or other 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 updates made in previous issues.

Issue 02 (2023-09-22)

Updated 1 Safety Information.

Updated 4.2 Tools.

Issue 01 (2017-08-22)

This issue is the first official release.

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; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "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. **The Company 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 should 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. The Company 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.

The Company 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 the Company.

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.

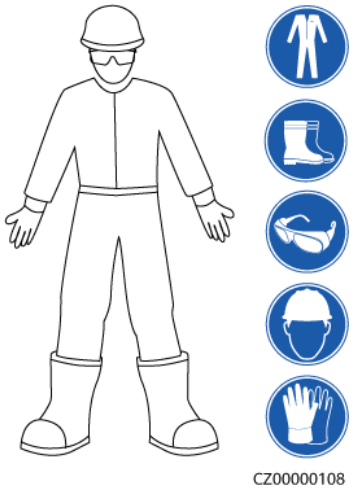
DANGER

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.

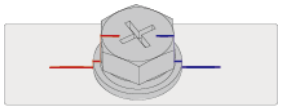
CAUTION

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 of 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 should cross the edges of the bolts.)



- 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.
- 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.

- For the equipment that uses a three-pin socket, ensure that the ground terminal in the socket is connected to the protective ground point.

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.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.
- 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 the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
  - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
  - Cables stored at subzero temperatures must be stored at room temperature for at least 24 hours before they are laid out.
- Do not perform any improper operations, for example, dropping cables directly from a vehicle. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

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. Overheat 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 under water 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

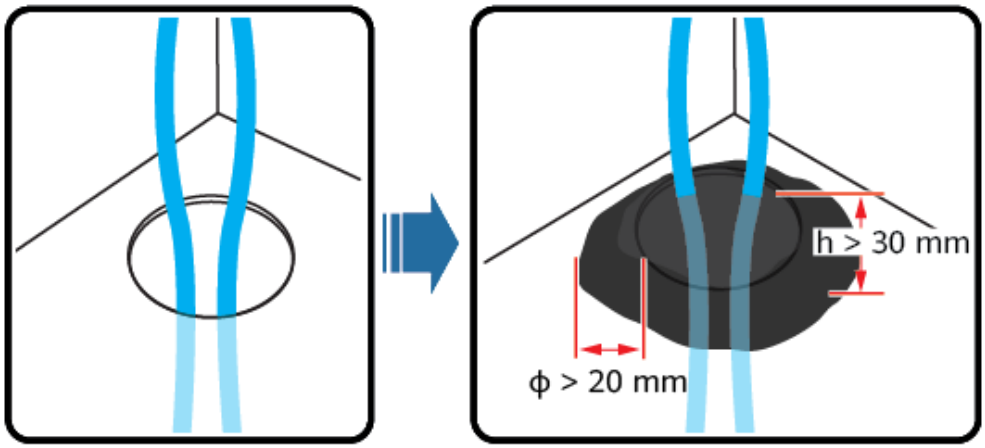
To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

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 the 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.
- 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.
- Ensure that the equipment room provides good heat insulation, and that the walls and floor are dampproof.
- Install rodent guards at the door of the equipment room to prevent rodents and insects from entering the room.
- All cable holes should be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



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- 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

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

WARNING

When pulling equipment out of a cabinet, be aware of unstable or heavy objects in the cabinet to prevent injury.

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

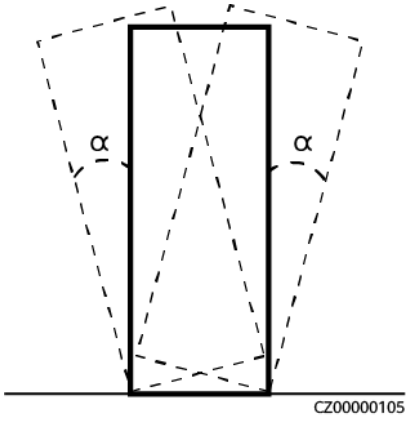
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- 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 gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to 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.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.

- 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 tilt or jolt during transportation.
- Ensure that tilt angle of the cabinet meets the requirements shown in the figure. The tilt angle α of a cabinet with packaging must be less than or equal to 15°. After the cabinet is unpacked, its tilt angle α must be less than or equal to 10°.



Using Ladders

- Use wooden or insulated ladders when you need to perform live-line working at heights.
- Platform ladders with protective rails are preferred. Do not use single ladders.
- 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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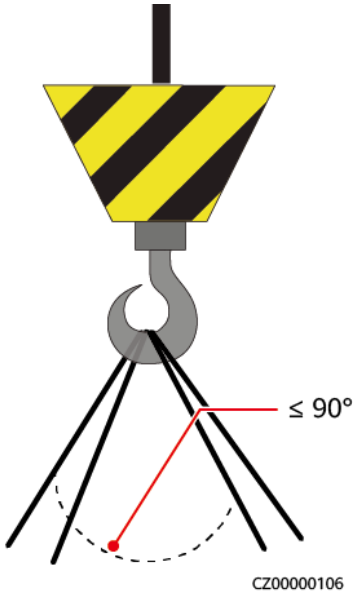
- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.

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 on 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 the 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.



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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

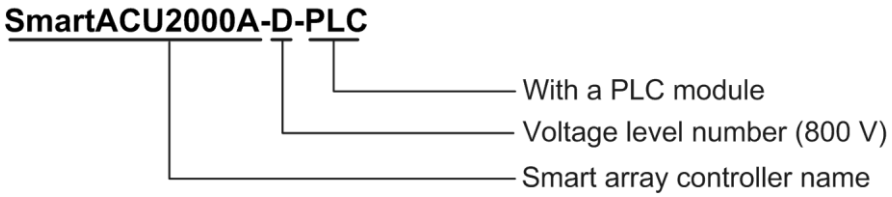
Features

The smart array controller is an outdoor cabinet that can house the SmartLogger2000 (SmartLogger for short), access terminal box (ATB), power over Ethernet (POE) module, and POE SPD to control the communication of PV arrays in a PV plant.

The smart array controller can be installed on a wall, support, or pole. The front door can be opened for maintenance, which facilitates installation, cable connection, and future maintenance.

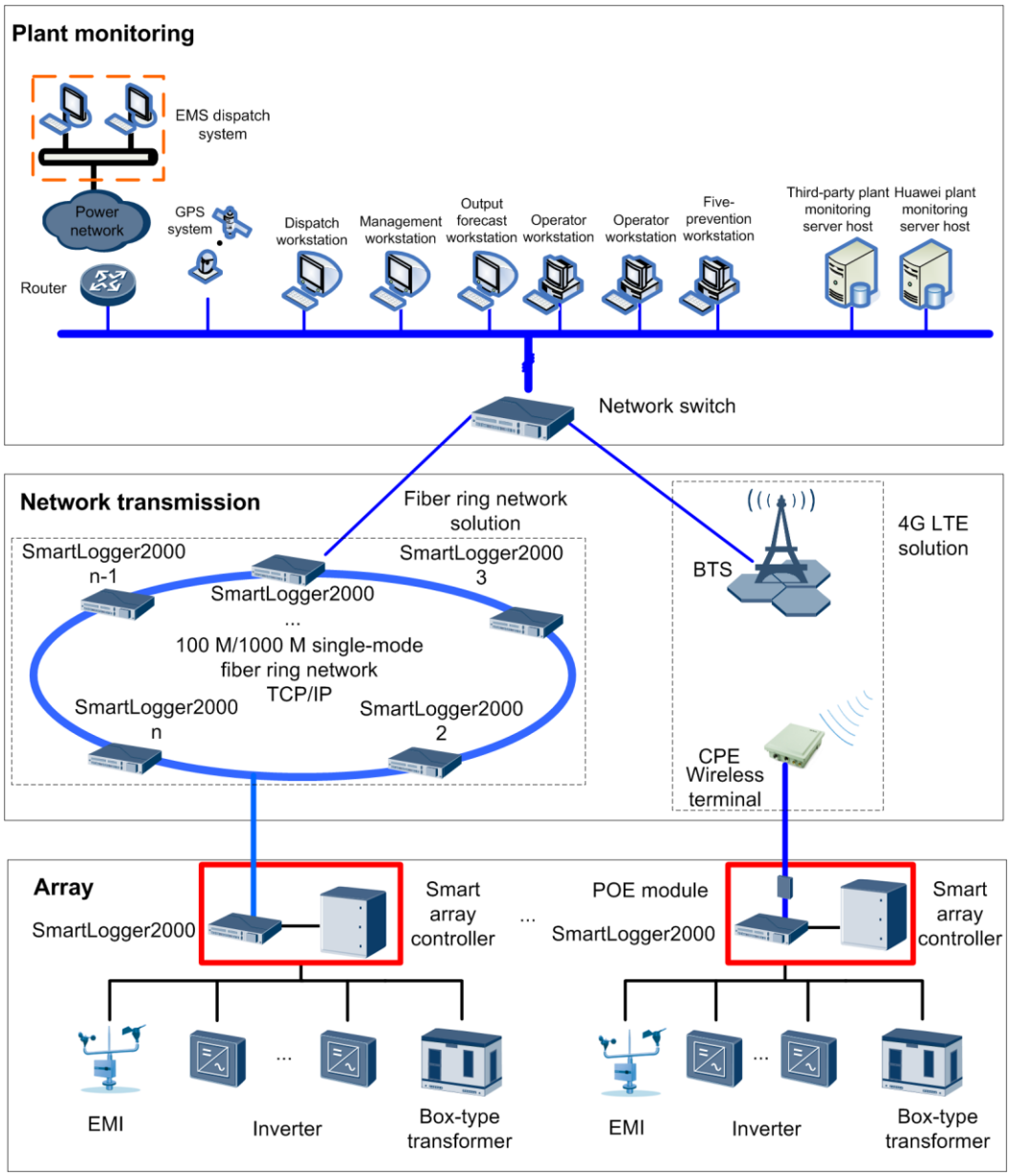
Model number description

Figure 2-1 Model number description



Networking

Figure 2-2 Position of a smart array controller in a PV solution



NOTE

- The SmartLogger and POE module are installed inside the smart array controller cabinet.
- A base station can communicate with multiple pieces of customer premises equipment (CPE).
- The position of the environment monitoring instrument (EMI) shown in the figure is for reference only.

2.2 Product Composition

The smart array controller is configured with certain components before delivery. Table 2-1 describes the components. You can install other devices (such as the POE module and POE SPD) onsite as required. For details, see 2.5 Configuration Scenarios.

Figure 2-3 Components configured for the smart array controller before delivery

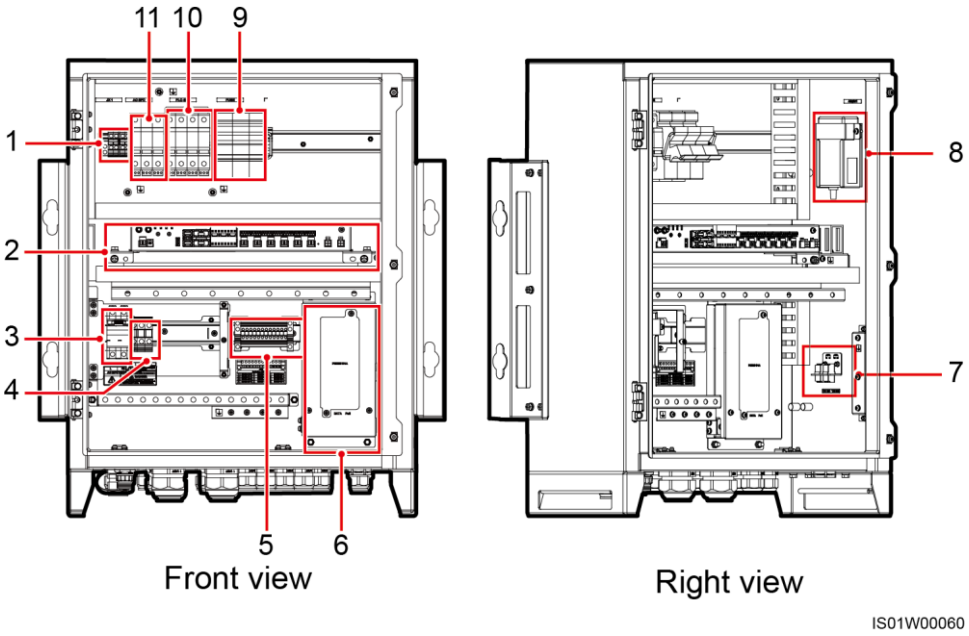


Table 2-1 Description of components configured before delivery

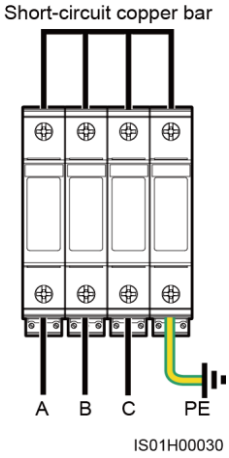
No.	Component	Specifications/Model	Quantity	Label	Description
1	Transfer terminal block for single-phase power supply	4P/support 0.2–10 mm^2 (or 24–8 AWG) cable connection	1	JX1	Adapts to 100–240 V AC input power for connecting the external single-phase power supply to the SmartLogger and POE module.
2	SmartLogger	SmartLogger 2000-10-C[a]	1	N/A	N/A
3	Single-phase power switch	2-pole 32 A circuit breaker	1	L, N(L) AC INPUT(MCB)	• Connects the external single-phase power supply. • Controls AC power connection and disconnection.

No.	Component	Specifications/Model	Quantity	Label	Description
4	Transfer terminal block for three-phase power supply	3P/support 1.5–16 mm^2 (or 16–6 AWG) cable connection	1	L1, L2, L3 PLC INPUT(JX0)	PLC three-phase power input.
5	Terminal block for the RS485 communications port	12P/support 1–2.5 mm^2 (or 18–14 AWG) cable connection	1	JX2	Connects the RS485 communications cable of an external device.
6	ATB (with the POE module mounting panel)	N/A	1	N/A	• Connects optical jumpers and optical cables. • Provides the position for installing a POE module.
7	Fiber adapter	2LC/PC-2LC/PC-4	2	TX1 RX1 TX2 RX2	Connects optical jumpers.
8	SmartLogger power adapter	Input: 100–240 V, 1.5 A, 50/60 Hz; output: 12 V/5 A	1	Adaptor1	Connect AC power from the transfer terminal block for single-phase power supply to the SmartLogger.
9	Knife fuse switch	Ue = 1000 V AC Ie = 25 A/3 P Icu = 25 kA	1	FUSE	Provide fuse protection for the PLC module.
10	Three-phase SPD	Uc = 680 V AC 20 kA/40 kA, 8/20 μs	4	PLC-SPD	The three-phase AC input SPD is deployed for the PLC module in the SmartLogger. The SPD uses 3+1 connection[b].
11	Single-phase SPD	Uc = 385 V AC 30 kA/60 kA, 8/20 μs	3	AC SPD	The AC SPD is deployed for the SmartLogger and POE module. The SPD uses Y connection[c].

No.	Component	Specifications/Model	Quantity	Label	Description
a: The SmartLogger2000 communicates with the SUN2000 app over the embedded Bluetooth module to upgrade devices or export data. For details, see the *SUN2000 APP User Manual*. When the SmartLogger2000 is communicating with the SUN2000 app, keep the SUN2000 app less than 1 m (39.37 in.) away from the front of the cabinet to ensure proper communication. b: Figure 2-4 shows the 3+1 connection method for the SPD. c: Figure 2-5 shows the Y connection method for the SPD.					

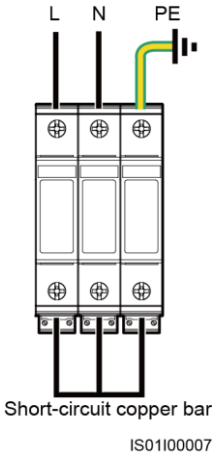
b: 3+1 connection method for the SPD

Figure 2-4 3+1 connection method for the SPD



c: Y connection method for the SPD

Figure 2-5 Y connection method for the SPD

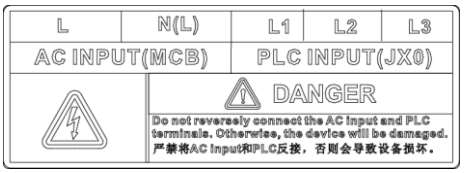
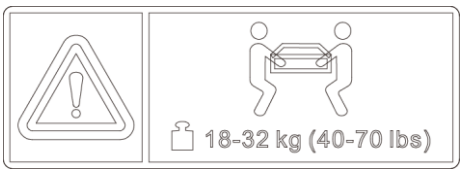


NOTE

For simplicity purposes, the preceding table lists only the configured components on which operations need to be performed.

2.3 Label Conventions

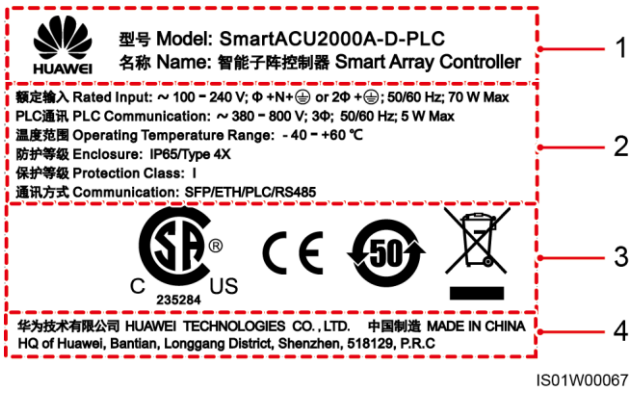
Labels

Symbol	Name	Meaning
	Wiring instruction label	Do not reversely connect the single-phase power cable and PLC three-phase input power cable. Otherwise, the device will be damaged.
	Multi-power warning label	The device has multiple power inputs. Therefore, when powering off the device, you must disconnect all power inputs.
	Weight warning label	The device is heavy and needs to be carried by two persons.

Nameplate

The smart array controller is labeled with a nameplate that contains the model information, technical specifications, and compliance symbols.

Figure 2-6 Nameplate



(1) Trademark, product name, and model number

(2) Important technical specifications

(3) Compliance symbols

(4) Company name and country of manufacture

Table 2-2 Compliance symbols

Symbol	Name	Meaning
	CSA certification of America and Canada	The device complies with CSA certification standards.
	CE certification mark	The device complies with Conformité Européenne (CE) certification standards.
	Environmentally friendly use period (EFUP)	The device is environmentally friendly for the specified period.
	EU WEEE mark	The device must not be disposed of as domestic waste.

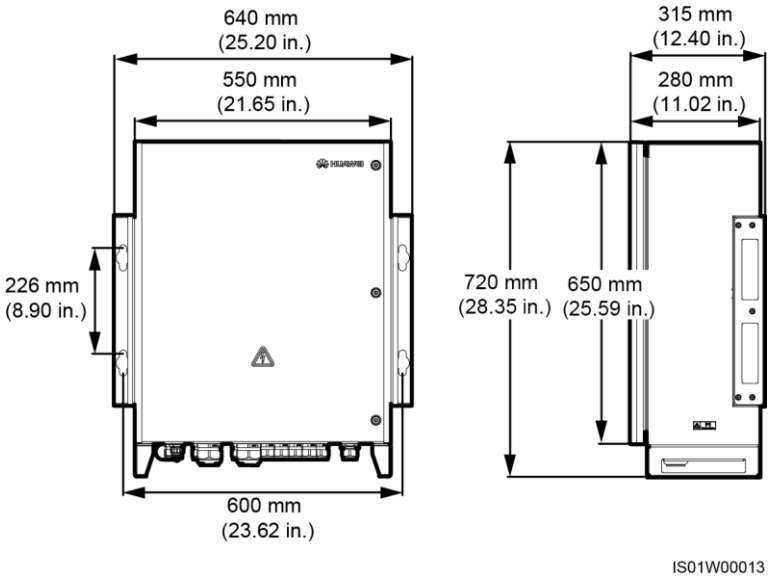
NOTE

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

2.4 Appearance

Cabinet Dimensions

Figure 2-7 Appearance and dimensions of the smart array controller



Cabinet Bottom

Figure 2-8 Bottom of the smart array controller

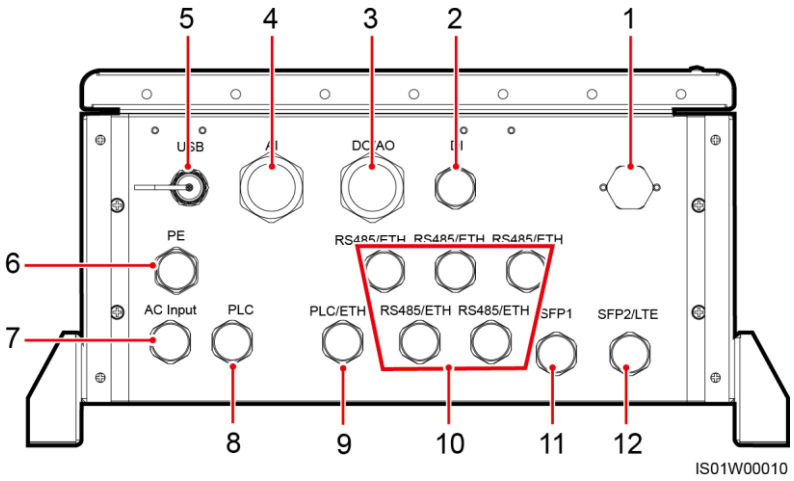


Table 2-3 Bottom description

No.	Silk Screen	Description	Waterproof Cable Connector Specifications	Waterproof Cable Connector Diameter Range
1	N/A	Vent valve	N/A	N/A
2	DI	Hole for the cable connecting to the DI port	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
3	DO/AO	Hole for the cable connecting to the DO/AO port	5/4 in.	20 mm (0.79 in.) to 32 mm (1.26 in.)
4	AI	Hole for the cable connecting to the AI port	5/4 in.	20 mm (0.79 in.) to 32 mm (1.26 in.)
5	USB	Port[a] for connecting to a USB flash drive	N/A	N/A
6	PE	Hole for the protective earth (PE) cable	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
7	AC Input	Hole for the single-phase power cable of the smart array controller	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
8	PLC	Hole for AC power cables	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
9	PLC/ETH	Hole for AC power cables or network cables	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
10	RS485/ETH	Hole for external device RS485 communications cables or network cables	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
11	SFP1	Hole for optical cables	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
12	SFP2/LTE	Hole for optical cables or network cables	3/4 in.	13 mm (0.51 in.) to 18 mm (0.71 in.)
a: Inside the cabinet, the USB port has been connected to the USB port on the SmartLogger2000 before delivery.				

2.5 Configuration Scenarios

Smart array controller configurations in typical scenarios:

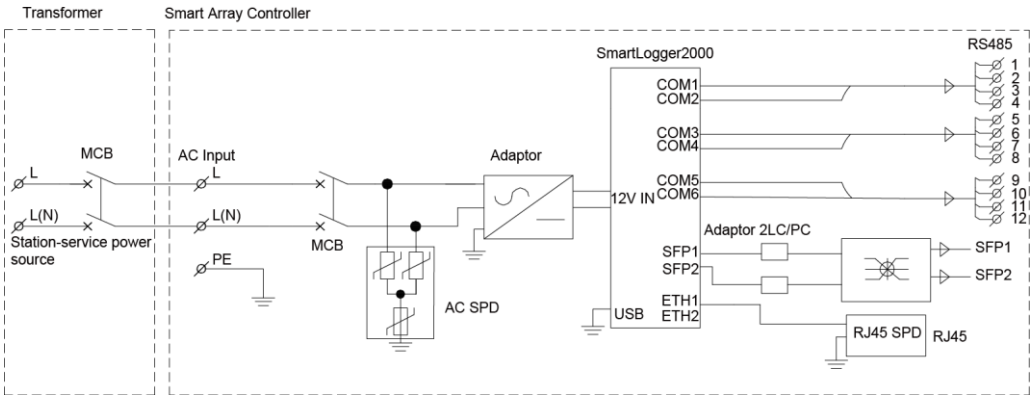
- Scenario 1: RS485+SmartLogger2000+fiber ring network
- Scenario 2: PLC+SmartLogger2000+fiber ring network
- Scenario 3: RS485+SmartLogger2000+4G LTE
- Scenario 4: PLC+SmartLogger2000+4G LTE

2.5.1 Scenario 1: RS485+SmartLogger2000+Fiber Ring Network

Working Principle

The following figure shows the working principle after components are installed for the smart array controller.

Figure 2-9 Working principle



The smart array controller communicates with the box-type transformer and inverter over RS485 and communicates with the central control room over a fiber ring network.

- Intra-array communication:

  Devices such as the box-type transformer and inverter communicate with the SmartLogger over RS485.

- Communication between the array and the central control room

  The SmartLogger connects to the central control room by optical fiber communication through an ATB.

Networking

Figure 2-10 Network diagram

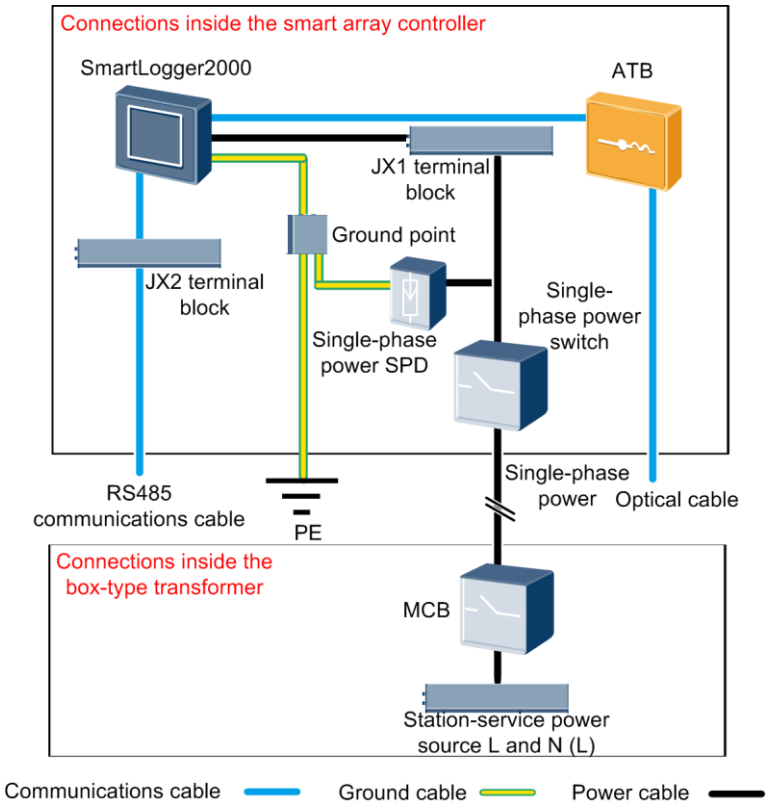


Table 2-4 Components required in this scenario

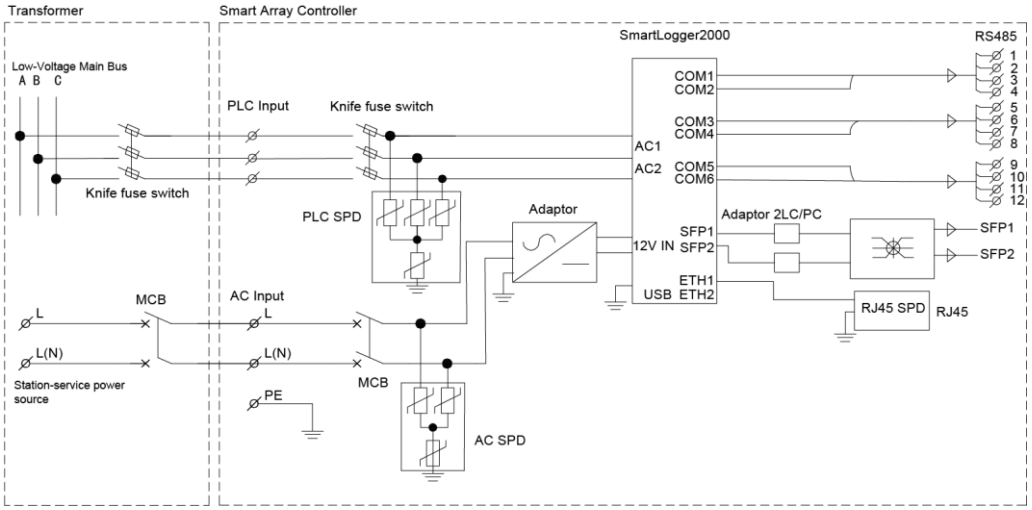
Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Smart array controller	Fitting bag for fiber ring switching	Low-speed optical module	FTLF1323P1BTR-HW	Purchased from Huawei	2
		Optical jumper	PLCLC5S-ST3P302-HW, LC-LC-S2-L2, 3ECA1031LCLC002-01-F, or LP-LP-2S-P-SM-002	Purchased from Huawei	8
Box-type transformer	Miniature circuit breaker (MCB)		Rated current: 32 A; number of poles: 2	Prepared by the customer	1

2.5.2 Scenario 2: PLC+SmartLogger2000+Fiber Ring Network

Working Principle

The following figure shows the conceptual diagram for the smart array controller equipped with components.

Figure 2-11 Conceptual diagram



The smart array controller communicates with the inverter over PLC and communicates with the central control room over a fiber ring network.

- Intra-array communication:

  The inverter communicates with the SmartLogger over PLC.

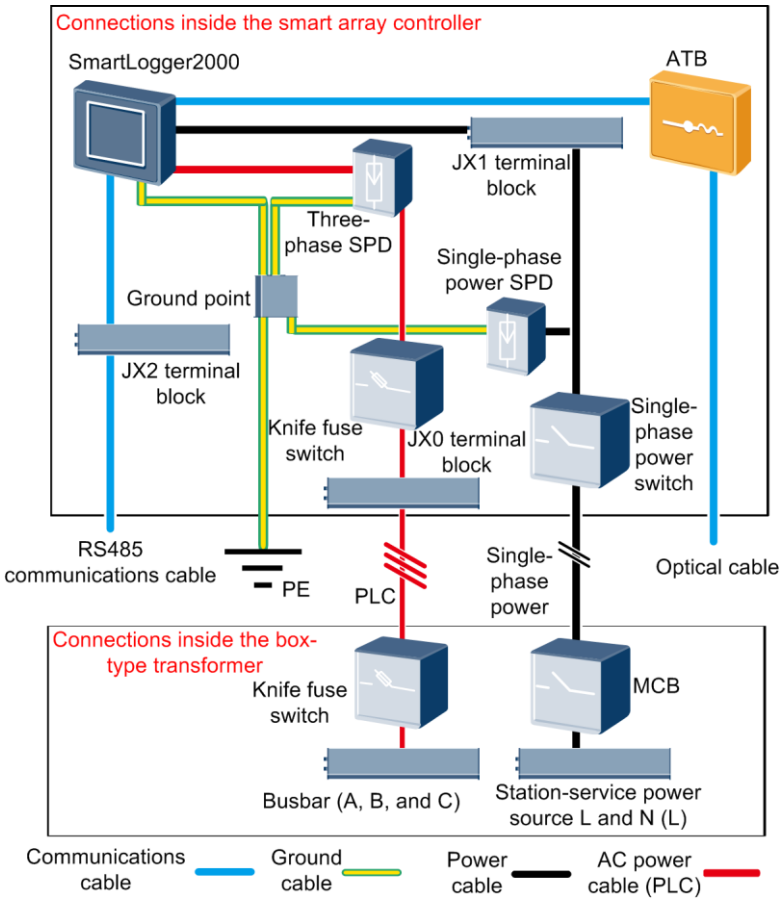
  Third-party devices such as the box-type transformer communicate with the SmartLogger over RS485.

- Communication between the array and the central control room

  The SmartLogger connects to the central control room by optical fiber communication through an ATB.

Networking

Figure 2-12 Network diagram



NOTE

If the PLC communication mode is used, the circuit breaker output power cable in the middle of the transformer busbar must connect to the three-phase power supply of the smart array controller through a knife fuse switch.

Table 2-5 Components required in this scenario

Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Smart array controller	Fitting bag for fiber ring switching	Low-speed optical module	FTLF1323P1BTR-HW	Purchased from Huawei	2
		Optical jumper	PLCLC5S-ST3P302-HW, LC-LC-S2-L2, 3ECA1031LCLC002-01-F, or LP-LP-2S-P-SM-002	Purchased from Huawei	8

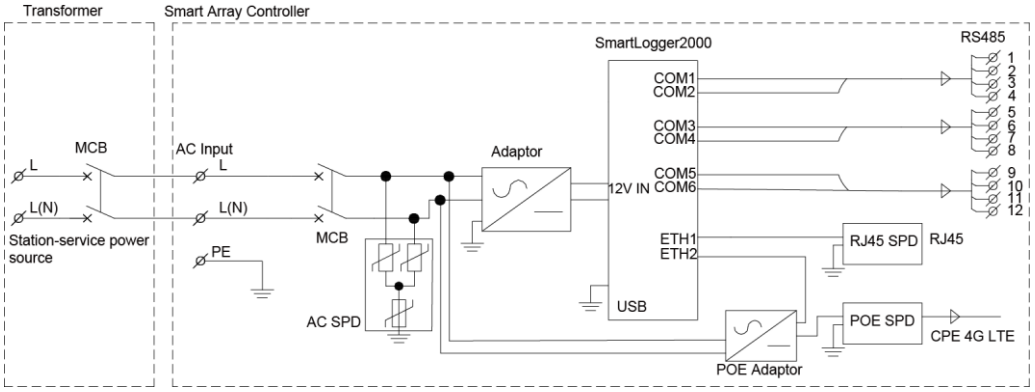
Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Box-type transformer	MCB		Rated current: 32 A: number of poles: 2	Prepared by the customer	1
	Knife fuse switch	Fuse	Rated voltage ≥ 800 V; rated current: 32 A	Prepared by the customer	3
		Knife fuse switch box	Rated voltage ≥ 800 V; rated current ≥ 32 A; number of poles: 3	Prepared by the customer	1

2.5.3 Scenario 3: RS485+SmartLogger2000+4G LTE

Working Principle

The following figure shows the conceptual diagram for the smart array controller equipped with components.

Figure 2-13 Conceptual diagram



The smart array controller communicates with the box-type transformer and inverter over RS485 and communicates with the central control room over 4G LTE.

- Intra-array communication

  Devices such as the box-type transformer and inverter communicate with the SmartLogger2000 over RS485.
- Communication between the array and the central control room

  The SmartLogger2000 communicates with the central control room over 4G LTE.

Networking

Figure 2-14 Network diagram

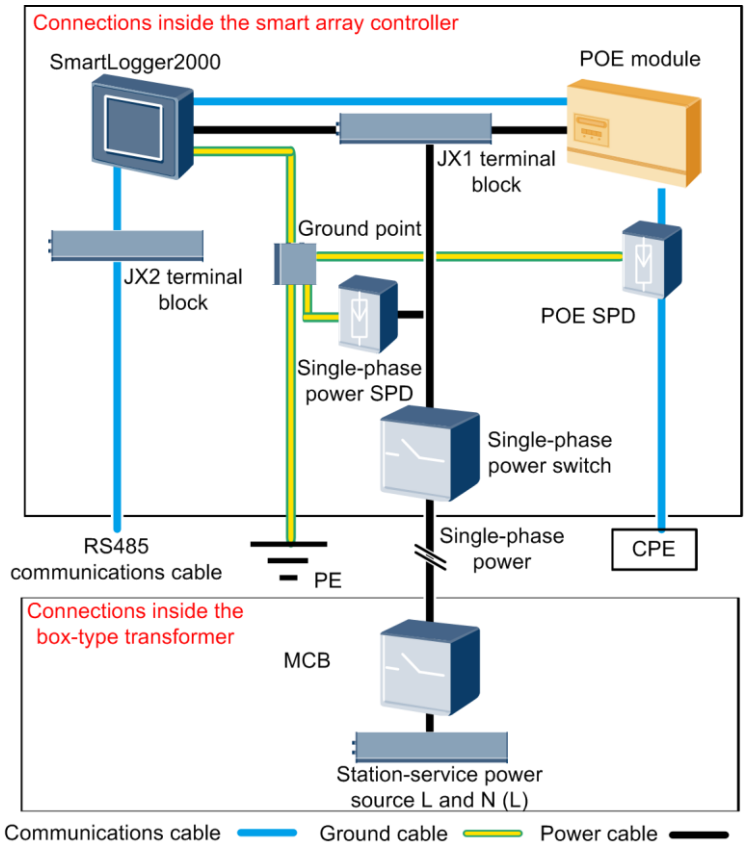


Table 2-6 Components required in this scenario

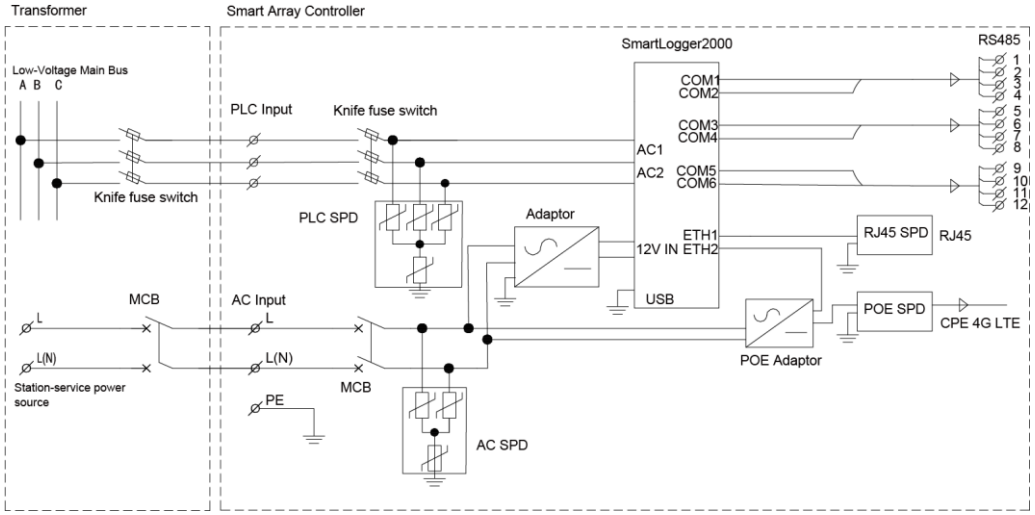
Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Smart array controller	POE and CPE fitting bag	POE module	N/A	Purchased from Huawei	1
		POE SPD	N/A	Purchased from Huawei	1
Outside the smart array controller and box-type transformer		CPE	N/A	Purchased from Huawei	1
Box-type transformer	MCB		Rated current: 32 A: number of poles: 2	Prepared by the customer	1

2.5.4 Scenario 4: PLC+SmartLogger2000+4G LTE

Working Principle

The following figure shows the conceptual diagram for the smart array controller equipped with components.

Figure 2-15 Conceptual diagram



The smart array controller communicates with the inverter over PLC and communicates with the central control room over 4G LTE.

- Intra-array communication:

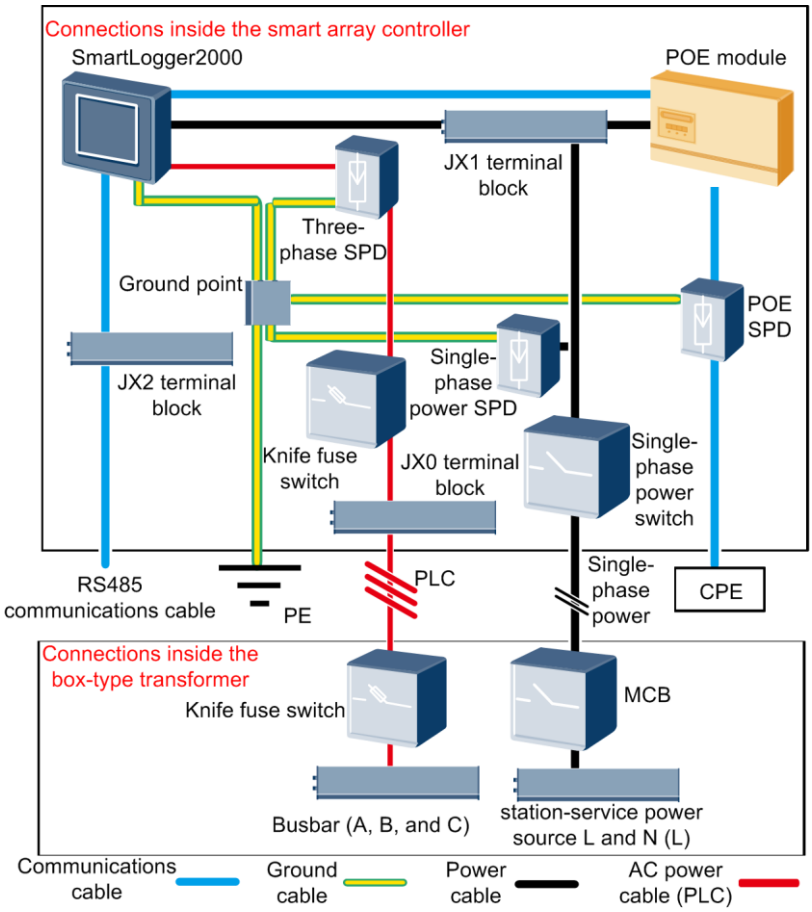
  The inverter communicates with the SmartLogger over PLC.

  Third-party devices such as the box-type transformer communicate with the SmartLogger over RS485.
- Communication between the array and the central control room

  The SmartLogger2000 communicates with the central control room over 4G LTE.

Networking

Figure 2-16 Network diagram



NOTE

If the PLC communication mode is used, the circuit breaker output power cable in the middle of the transformer busbar must connect to the three-phase power supply of the smart array controller through a knife fuse switch.

Table 2-7 Components required in this scenario

Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Smart array controller	POE and CPE fitting bag	POE module	N/A	Purchased from Huawei	1
		POE SPD	N/A	Purchased from Huawei	1

Position	Component		Recommended Model/Specifications	Source of Component	Quantity
Outside the smart array controller and box-type transformer		CPE	N/A	Purchased from Huawei	1
Box-type transformer	MCB		Rated current: 32 A: number of poles: 2	Prepared by the customer	1
	Knife fuse switch	Fuse	Rated voltage ≥ 800 V; rated current: 32 A	Prepared by the customer	3
		Knife fuse switch box	Rated voltage ≥ 800 V; rated current ≥ 32 A; number of poles: 3	Prepared by the customer	1

3 Storage

If the smart array controller will not be used immediately, store it according to the following requirements:

- Do not unpack the smart array controller.
- Keep the storage temperature at –40°C to +70°C (–40°F to +158°F) and the humidity at 4%–100% RH.
- Store the cabinet in a clean and dry place and protect it from dust and water vapor corrosion.
- A maximum of six smart array controllers can be stacked.
- Perform periodic inspections during the storage. If any rodent bites are found, replace the packing materials immediately.
- If the smart array controller has been long-term stored, inspections and tests should be conducted by professionals before it is put into use.

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

4 Installation

4.1 Checking Before Installation

Checking the Outer Packaging

Before unpacking the smart array controller, check the outer packaging for damage, such as holes and cracks, and check the models of the smart array controller and its components. If any damage is found or the model is not what you require, do not unpack the package but contact the dealer as soon as possible.

NOTE

You are advised to remove the outer packaging within 24 hours before installing the smart array controller and its components.

Checking the Appearance

After unpacking, check the smart array controller and its components for damage. If any damage is found, do not use the damaged component but contact the dealer as soon as possible.

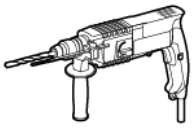
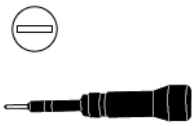
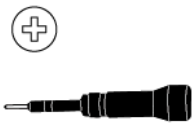
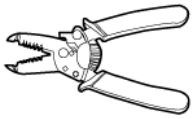
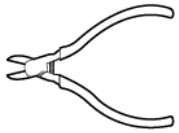
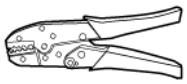
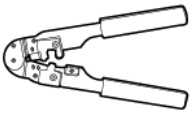
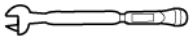
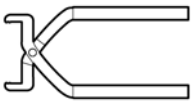
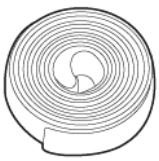
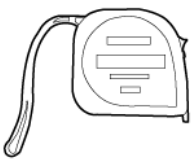
Checking the Cabinet and Fittings

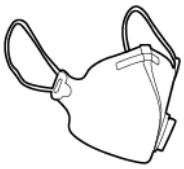
After unpacking the smart array controller, check whether the cabinet and fittings are intact and complete. If any damage is found or any component is missing, contact the dealer.

NOTE

For the number of delivered fittings, see the packing list in the packing case.

4.2 Tools

Category	Tool			
Installation	 Hammer drill	 Drill bit Φ14 mm, Φ16 mm	 Flat-head insulated torque screwdriver	 Phillips insulated torque screwdriver
	 Adjustable wrench (32 mm)	 Insulated torque socket wrench	 Wire stripper	 Diagonal pliers
	 Rubber mallet	 Crimping tool	 Cable cutter	 Utility knife
	 RJ45 crimping tool	 Adjustable torque wrench	 Multimeter	 SPD extracting tool
	 Heat shrink tubing	 Heat gun	 Vacuum cleaner	 Marker
				

Category	Tool			
	Steel measuring tape	Level	Cable tie	
Personal protective equipment (PPE)	 Insulated gloves	 Protective gloves	 Goggles	 Dust mask
	 Safety helmet	 Reflective vest	 Insulated shoes	-

4.3 Installing the Cabinet

4.3.1 Determining the Installation Position

Basic Requirements

- The smart array controller is protected to IP65/Type 4X and can be installed outdoors.
- The installation method and position must match the dimensions of the smart array controller. For details about its dimensions, see 2.4 Appearance.
- Do not install the smart array controller in the areas where flammable or explosive materials are stored.

Installation Environment Requirements

- A highest ambient temperature below 50°C (122°F) is recommended to ensure optimal operation of the smart array controller and extend its service life.
- The smart array controller must be installed in a well ventilated environment to ensure good heat dissipation.

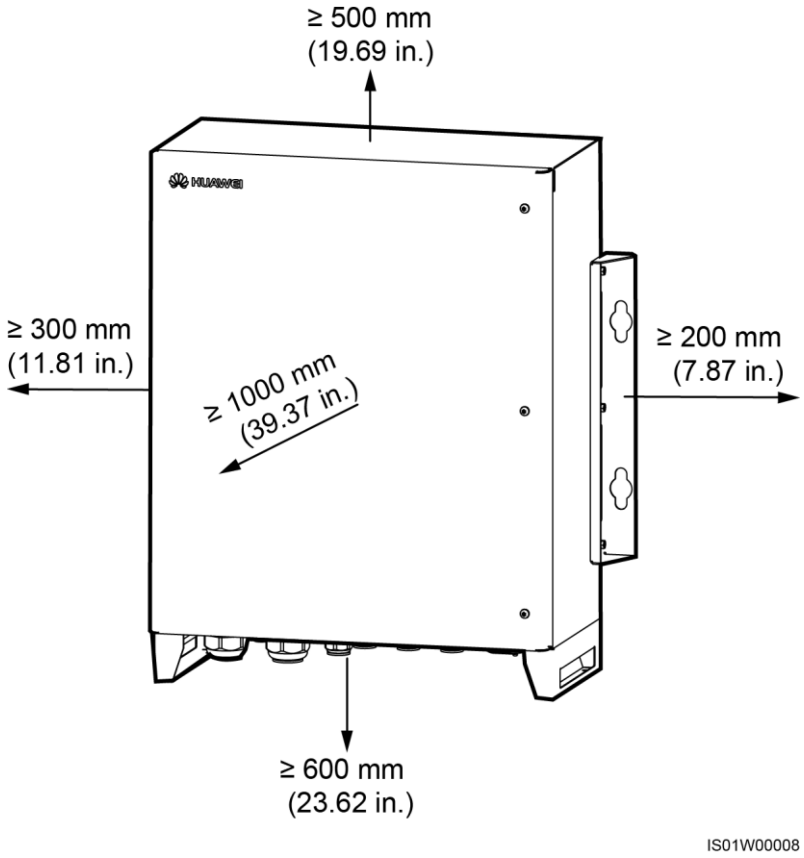
Carrier Requirements

- The carrier where the smart array controller is installed must be fire-proof.
- Do not install the smart array controller on flammable building materials.
- Ensure that the surface on which the smart array controller is to be installed is strong enough to bear the weight of the smart array controller.

Installation Space Requirements

- When installing the smart array controller on a wall, support, or pole, you are advised to install it in a position at eye level to facilitate O&M.
- Reserve enough clearance around the smart array controller to ensure sufficient space for installation and heat dissipation.

Figure 4-1 Installation space



4.3.2 Wall-mounted Installation

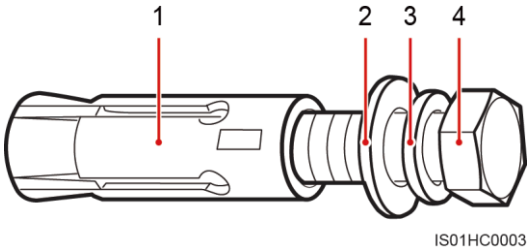
Prerequisites

The smart array controller has been moved to the specified installation position.

Context

An expansion bolt contains four parts.

Figure 4-2 Expansion bolt

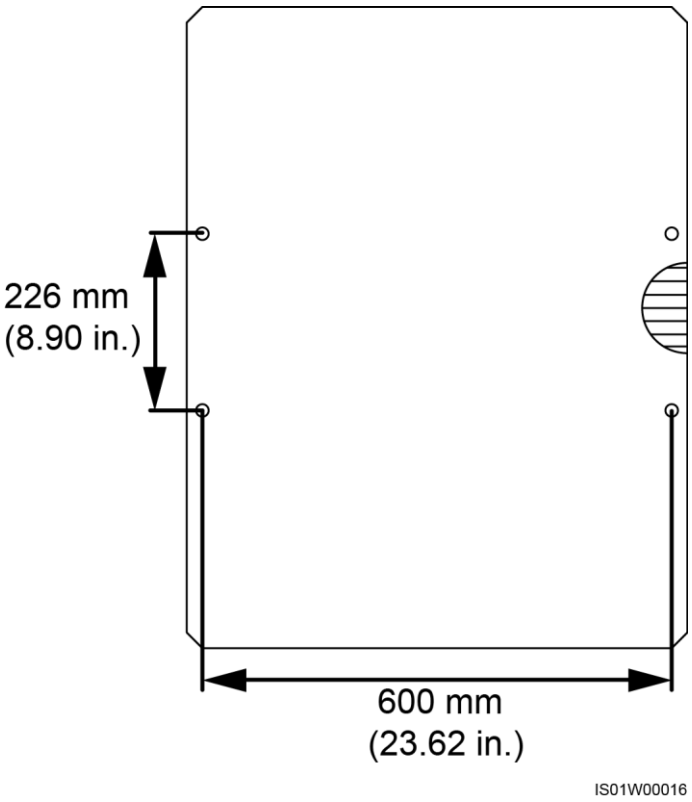


(1) Expansion sleeve (2) Flat washer (3) Spring washer (4) M12x60 bolt

Procedure

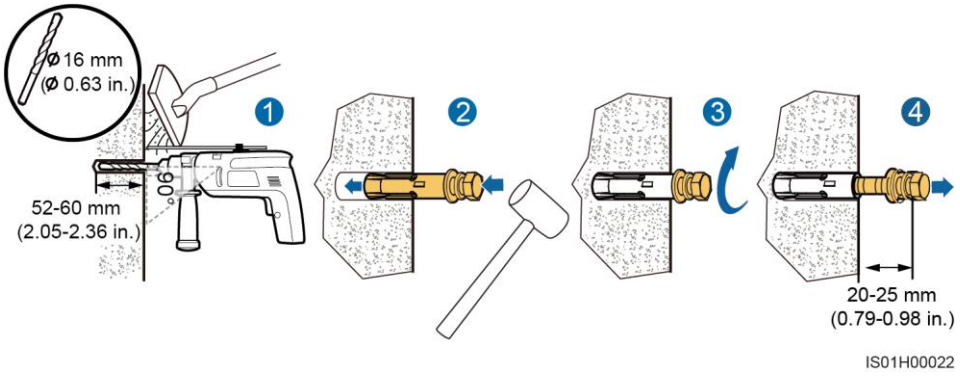
Step 1 Determine the positions for drilling holes into the wall based on the delivered marking-off template. Level the marking-off template using a level, and mark mounting holes using a marker.

Figure 4-3 Marking-off template



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

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



NOTICE

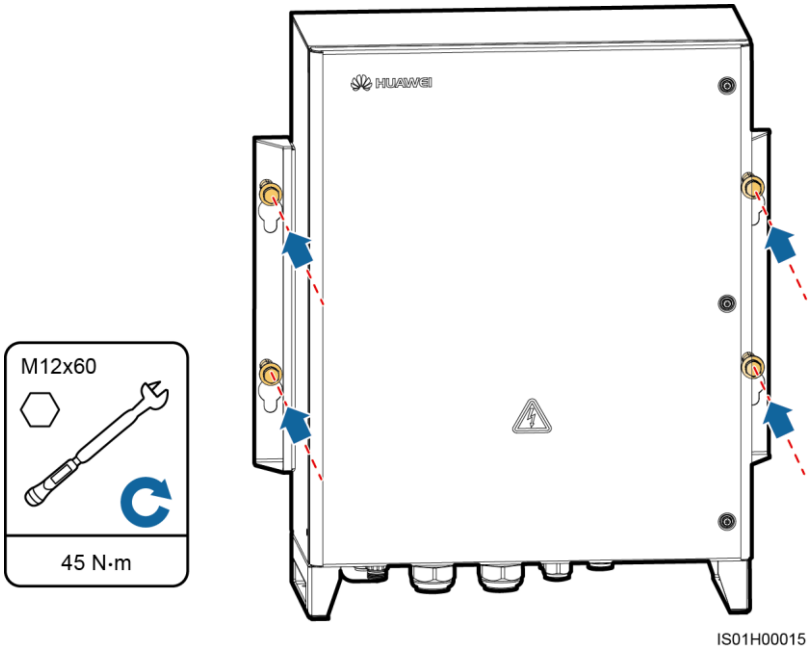
- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust respirator when drilling holes.
- Wipe away any dust in or around the holes and measure the hole distances. If the holes are inaccurately positioned, position again and drill new holes.
- Verify that the front of the expansion sleeve is flush with the wall. Otherwise, the mounting bracket will not be securely installed on the wall.

1. Put a hammer drill with an appropriate drill bit on the marked hole positions perpendicularly against the wall and drill holes.
2. Slightly tighten an expansion bolt, place it vertically into the hole, and use a rubber mallet to knock it until the expansion sleeve completely enters the hole.
3. Partially tighten the expansion bolt.
4. Loosen the M12x60 bolt.

Step 3 Assign two persons to lift the cabinet and mount it onto the expansion bolts, and assign another person to assist.

Step 4 Tighten the expansion bolts using a torque wrench with an open end of 18 mm (0.71 in.).

Figure 4-5 Installing a cabinet



----End

4.3.3 Support-mounted Installation

Prerequisites

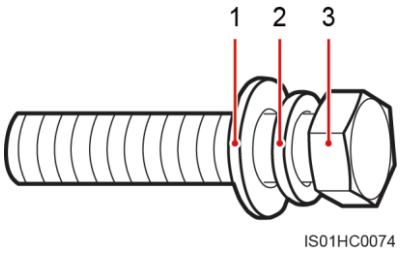
The smart array controller has been moved to the specified installation position.

Context

NOTE

The bolt used for securing the mounting ear and support is an expansion bolt with only a flat washer and a spring washer.

Figure 4-6 Securing bolts

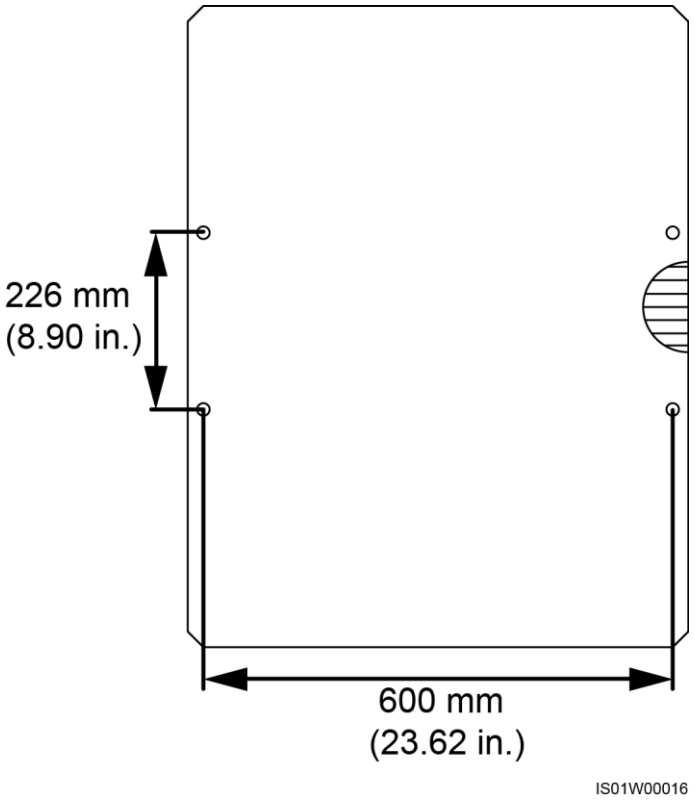


(1) Flat washer (2) Spring washer (3) M12x60 bolt

Procedure

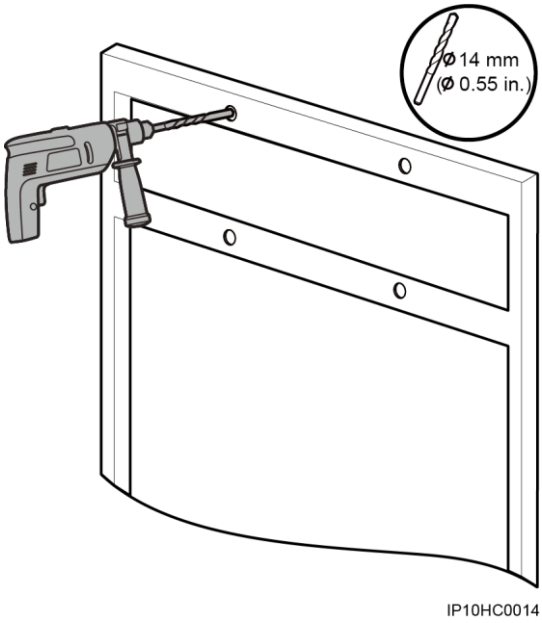
Step 1 Determine the positions for drilling holes into the support based on the delivered marking-off template. Level the marking-off template using a level, and mark mounting holes using a marker.

Figure 4-7 Marking-off template



Step 2 Drill holes using a hammer drill.

Figure 4-8 Drilling a hole

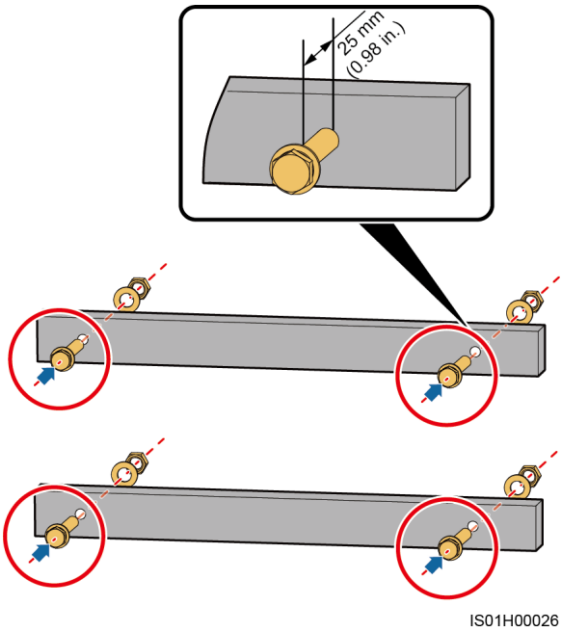


Step 3 Insert the M12x60 bolts (expansion bolts with only flat washers and spring washers) into the holes, and secure them using the delivered nuts and flat washers.

NOTE

Do not fully tighten the bolts.

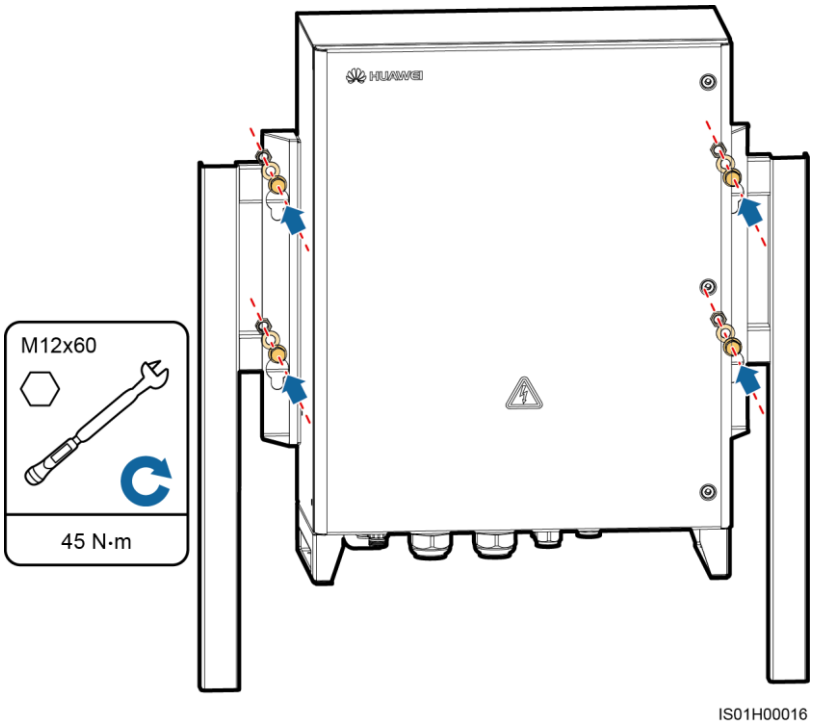
Figure 4-9 Securing bolts



Step 4 Assign two persons to lift the cabinet and mount it onto the bolts, and assign another person to assist.

Step 5 Tighten the bolts using a torque wrench with an open end of 18 mm (0.71 in.).

Figure 4-10 Installing a cabinet



----End

4.3.4 Pole-mounted Installation

Prerequisites

- The smart array controller has been moved to the specified installation position.
- To pole-mount the smart array controller, you need to prepare pole-mounting brackets by yourself based on the controller dimensions. For details about the dimensions, see 2.4 Appearance.
- You are advised to use M12 U-shaped bolts to secure the pole-mounting brackets.

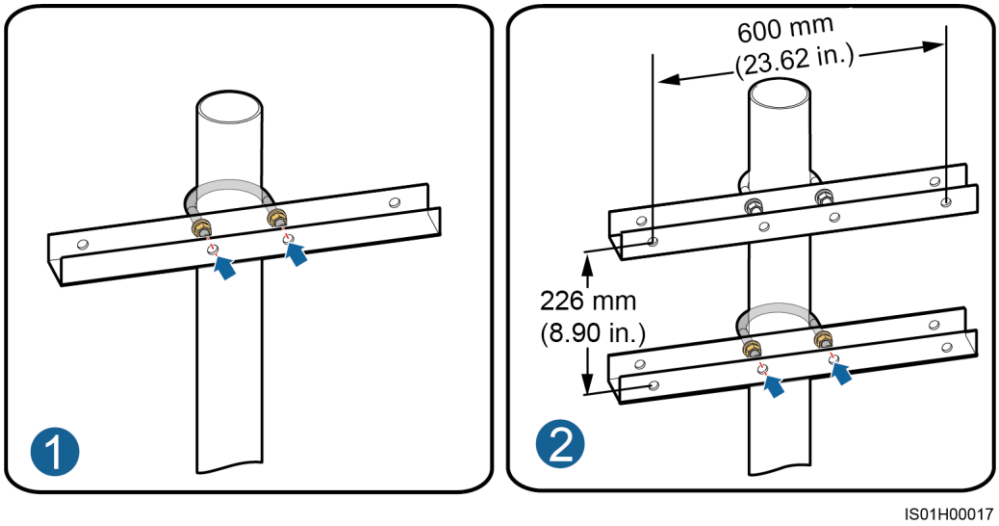
NOTE

Figures provided in this section are for reference only. The actual pole and pole-mounting brackets prevail.

Procedure

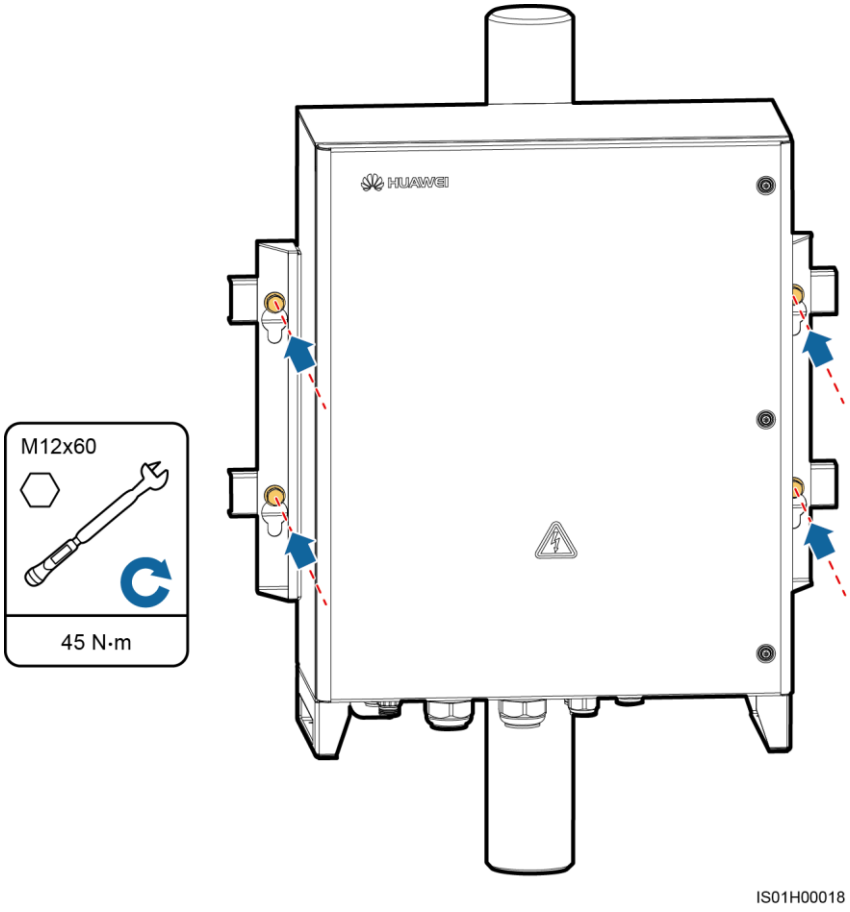
Step 1 Secure pole-mounting brackets to the pole and tighten U-shaped bolts to a torque of 45 N·m using a torque wrench with an open end of 18 mm (0.71 in.).

Figure 4-11 Securing pole-mounting brackets



Step 2 Secure the smart array controller to the pole-mounting brackets. For details, see 4.3.3 Support-mounted Installation.

Figure 4-12 Securing a cabinet



----End

4.4 Opening the Cabinet Door

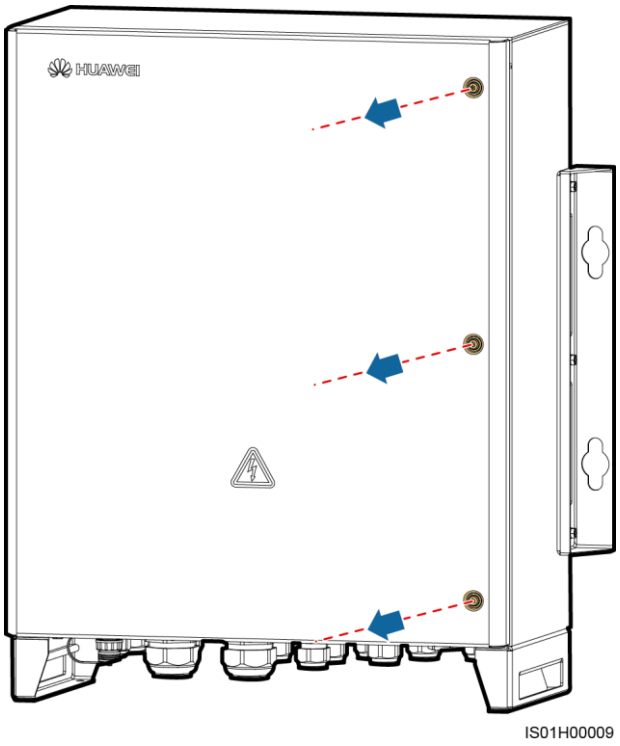
Procedure

Step 1 Loosen the screws on the cabinet door using the delivered security torx wrench, and then open the cabinet door.

NOTICE

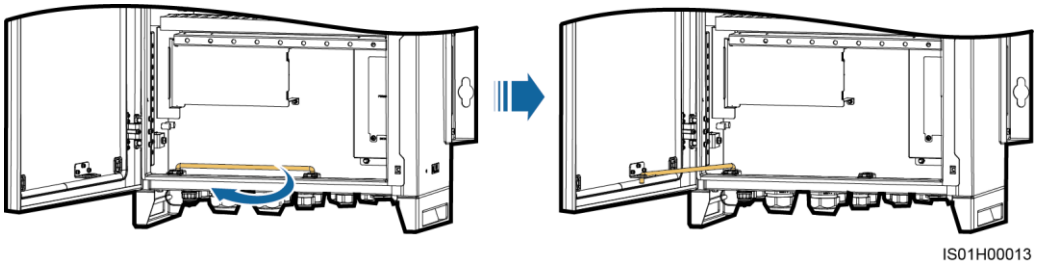
Put away the removed screws.

Figure 4-13 Removing screws



Step 2 Adjust the support bar.

Figure 4-14 Adjusting the support bar



----End

4.5 Installing Components

4.5.1 Installing a POE Module

Context

Figure 4-15 Installation position silk screen for the POE module

Procedure

Step 1 Take out the POE module from the package.

Step 2 Remove the two screws at the installation position for the POE module.

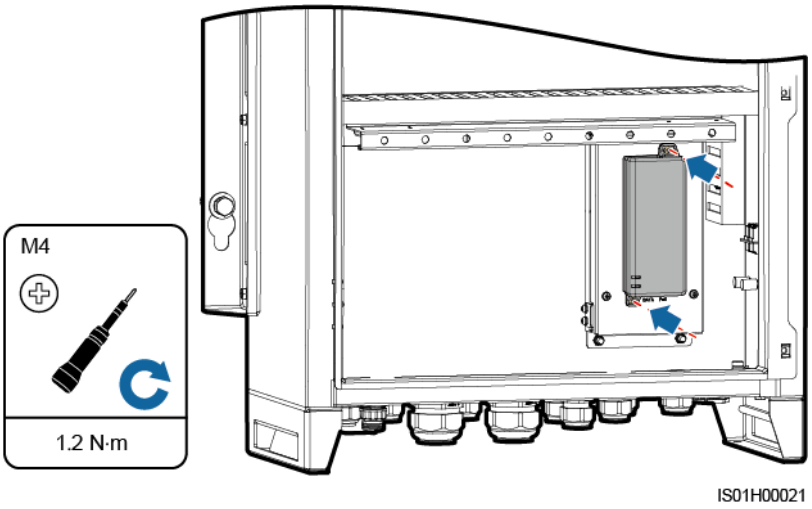
Step 3 Place the POE module at the installation position and align the mounting holes.

NOTE

Indicators should be in the lower left corner.

Step 4 Install the removed screws at the mounting holes to secure the POE module.

Figure 4-16 Securing the POE module



----End

4.5.2 Installing the POE SPD

Prerequisites

The ground cable and mounting kit delivered with the POE SPD are available.

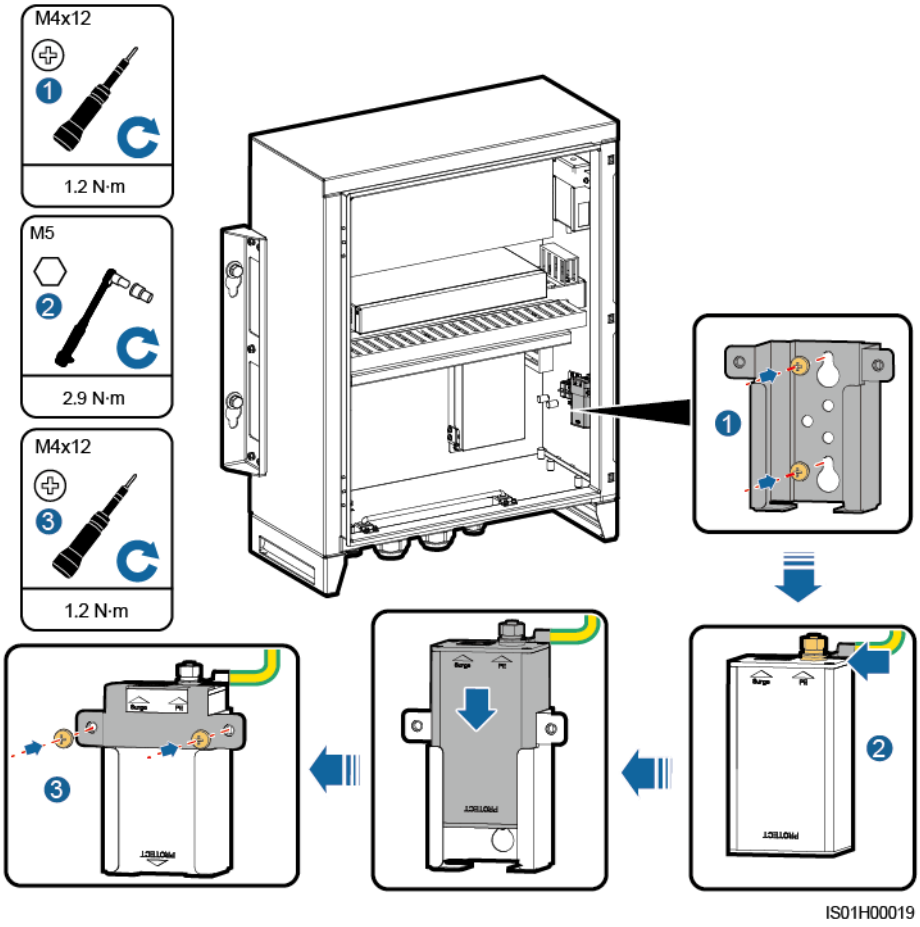
Procedure

Step 1 Take out the POE SPD and its mounting kit from the package.

Step 2 Take down the screws from the POE SPD installation position on the right panel of the cabinet, secure the mounting kit, and install the POE SPD.

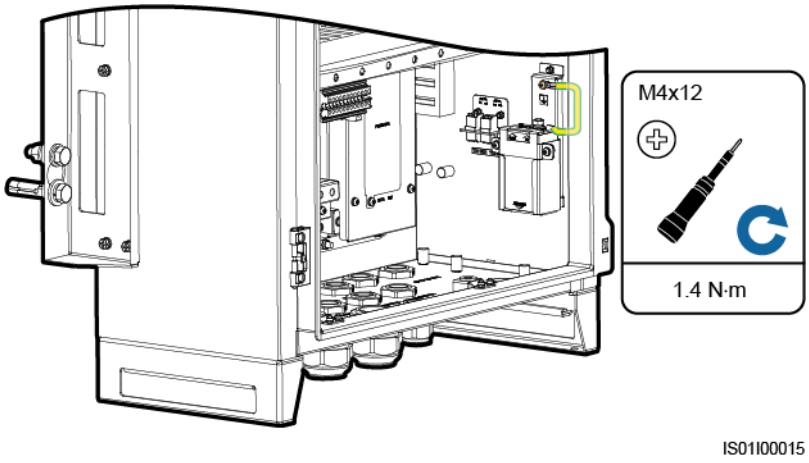
1. Remove the screws from the POE SPD installation position on the right panel of the cabinet, and place and secure the mounting kit.
2. Connect one end of the ground cable to the PE point on the POE SPD and tighten the the ground nut using an 8 mm (0.31 in.) socket wrench.
3. Place the POE SPD in the mounting kit. Ensure that the PE point faces upwards and the surface marked **PE** faces outwards.
4. Secure the POE SPD fastener and mounting kit.

Figure 4-17 Installing the POE SPD



Step 3 Connect the other end of the ground cable to the ground point on the cabinet.

Figure 4-18 Connecting the ground cable



----End

5 Connecting Cables

5.1 Cable Installation Precautions

NOTICE

- The cable colors shown in cable connection schematic diagrams are for reference only. Select cables according to local cable specifications.
- Cable routes provided in this chapter are for reference only.
- Cables described in this chapter are those that need to be connected by the customer.

5.2 Common Operations

External devices can connect to the smart array controller in common mode or through a pipe.

Connection Method	Procedure
Common connection	1. Remove the locking cap from the waterproof cable connector (waterproof connector for short) at the bottom of the smart array controller and remove the plug from the locking cap. 2. Route the cable through the locking cap and then the waterproof connector. 3. Secure the cable. 4. Check that the cable is connected correctly and securely, and then seal the waterproof connector and cable hole with firestop putty.
Connection through a pipe	1. Remove the waterproof cable connector at the bottom of the smart array controller. 2. Route the cable through the cable routing pipe and then the cable hole. 3. Secure the cable. 4. Check that the cable is connected correctly and securely, secure the cable routing pipe, and seal the cable hole with firestop putty.

NOTICE

For the external cable connected to the smart array controller, it is recommended that the cable be bent inside the cabinet and then connected to the appropriate port. This is to prevent poor cable connection due to overstress caused by ground subsidence.

5.3 Cables to Be Prepared by the Customer

Common Connection Method

Table 5-1 Fiber ring network

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
PE cable for the smart array controller	Outdoor armored copper cable	6–16 mm^2 (or 10–6 AWG)	16 mm^2 (or 6 AWG)
RS485 communications cable for an external device	Outdoor computer cable or armored shielded twisted pair	• Computer cable: DJYP2VP2-22 2x2x1 • Armored shielded twisted pair: 0.5–1 mm^2 (or 20–18 AWG)	N/A
Optical cable	Supports the four-core or eight-core single-mode armored cable with the transmission wavelength of 1310 nm. Optical cable outer diameter ≤ 18 mm (0.71 in.)	N/A	N/A
PLC three-phase power cable[a]	Three-core (L1, L2, and L3) outdoor armored copper cable, operating voltage to the ground ≥ 1000 V	Each core: 8–10 mm^2 (or 8 AWG)	Each core: 10 mm^2 (or 8 AWG)

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
Single-phase power cable	Two-core (L and N [L]) outdoor armored copper cable, operating voltage to the ground ≥ 300 V	Each core: 4–6 mm^2 (or 12–10 AWG)	Each core: 4 mm^2 (or 12 AWG)
a: Prepare this cable in the PLC networking scenario.			

Table 5-2 4G LTE

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
PE cable for the smart array controller	Outdoor armored copper cable	6–16 mm^2 (or 10–6 AWG)	16 mm^2 (or 6 AWG)
RS485 communications cable for an external device	Outdoor computer cable or armored shielded twisted pair	• Computer cable: DJYP2VP2-22 2x2x1 • Armored shielded twisted pair: 0.5–1 mm^2 (or 20–18 AWG)	N/A

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
Communications cable from the POE SPD to the CPE	A 20 m (65.62 ft) long network cable is delivered with the Huawei CPE. If a network cable longer than 20 m (65.62 ft) is needed, the customer needs to prepare it. It is recommended that a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm (0.35 in.), internal resistance no greater than 1.5 ohms/10 m (1.5 Ω/393.70 in.), and a shielded RJ45 connector be used.	N/A	N/A
PLC three-phase power cable[a]	Three-core (L1, L2, and L3) outdoor armored copper cable, operating voltage to the ground ≥ 1000 V	Each core: 8–10 mm^2 (or 8 AWG)	Each core: 10 mm^2 (or 8 AWG)
Single-phase power cable	Two-core (L and N [L]) outdoor armored copper cable, operating voltage to the ground ≥ 300 V	Each core: 4–6 mm^2 (or 12–10 AWG)	Each core: 4 mm^2 (or 12 AWG)
a: Prepare this cable in the PLC networking scenario.			

Connection Through a Pipe

Table 5-3 Fiber ring network

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
PE cable for the smart array controller	Outdoor armored copper cable	10–6 AWG	6 AWG
RS485 communications cable for an external device	Outdoor dual-core dual-shielding flame-retarding communications cable	N/A	Each core: 18 AWG
Optical cable	Supports the four-core or eight-core single-mode armored cable with the transmission wavelength of 1310 nm. Optical cable outer diameter ≤ 18 mm (0.71 in.)	N/A	N/A
PLC three-phase power cable[a]	Three-core (L1, L2, and L3) outdoor armored copper cable, operating voltage to the ground ≥ 1000 V	N/A	Each core: 8 AWG
Single-phase power cable	Single-core outdoor copper cable, operating voltage to the ground ≥ 300 V	12–10 AWG	12 AWG
a: Prepare this cable in the PLC networking scenario.			

Table 5-4 4G LTE

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
PE cable for the smart array controller	Outdoor armored copper cable	10–6 AWG	6 AWG

Cable	Cable Name/Specifications	Cable Cross-sectional Area Range	Recommended Cable Cross-sectional Area
RS485 communications cable for an external device	Outdoor dual-core dual-shielding flame-retarding communications cable	N/A	Each core: 18 AWG
Communications cable from the POE SPD to the CPE	A 20 m (65.62 ft) long network cable is delivered with the Huawei CPE. If a network cable longer than 20 m (65.62 ft) is needed, the customer needs to prepare it. It is recommended that a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm (0.35 in.), internal resistance no greater than 1.5 ohms/10 m (1.5 Ω/393.70 in.), and a shielded RJ45 connector be used.	N/A	N/A
PLC three-phase power cable[a]	Three-core (L1, L2, and L3) outdoor armored copper cable, operating voltage to the ground ≥ 1000 V	N/A	Each core: 8 AWG
Single-phase power cable	Single-core outdoor copper cable, operating voltage to the ground ≥ 300 V	12–10 AWG	12 AWG
a: Prepare this cable in the PLC networking scenario.			

5.4 Connecting a PE cable

The PE cable can be connected in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

A PE cable and an OT terminal have been prepared by the customer.

- The PE cable should be prepared by the customer. You are advised to use an outdoor armored copper cable with the cross-sectional area of 16 mm^2 (or 6 AWG).
- The OT terminal should be prepared by the customer. OT-M6 is recommended.

If you need to route cables through a pipe, prepare a pipe with a recommended outer diameter of 26.92 mm (1.05 in.).

Procedure

Step 1 Prepare an OT terminal.

Figure 5-1 Stripped length

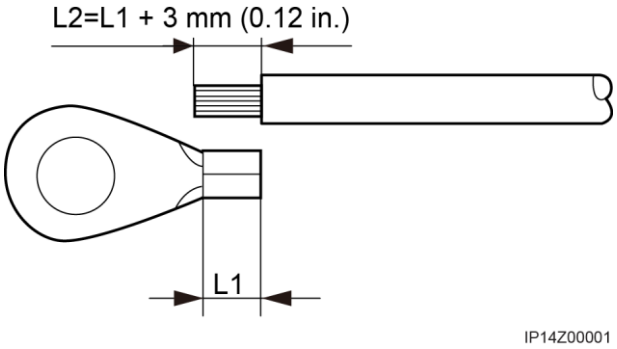
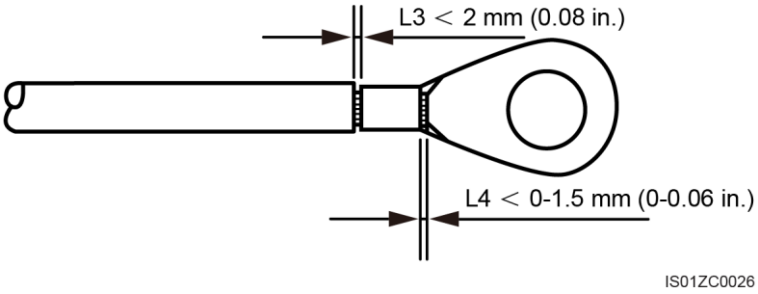


Figure 5-2 Crimping a cable



Step 2 Route the cable through the PE cable hole at the bottom of the cabinet, and secure it to the ground point using a socket wrench with the diagonal size of 13 mm (0.51 in.).

Figure 5-3 Connecting a PE cable (common connection)

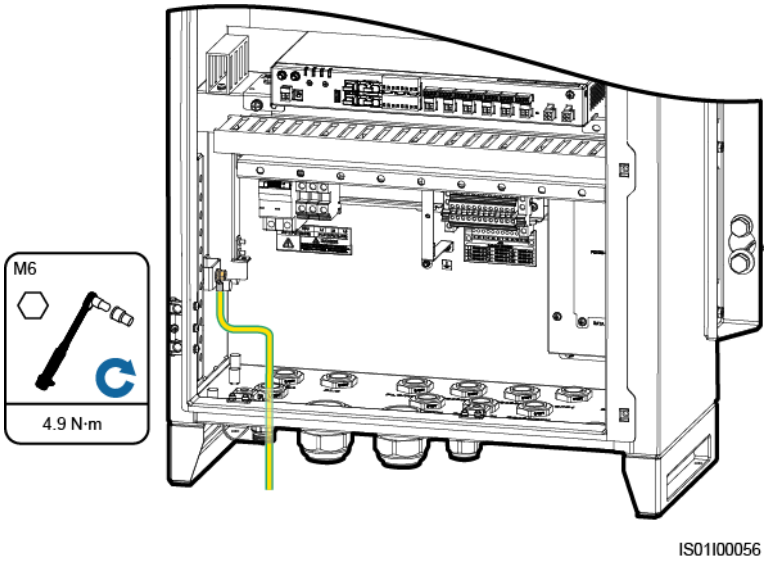
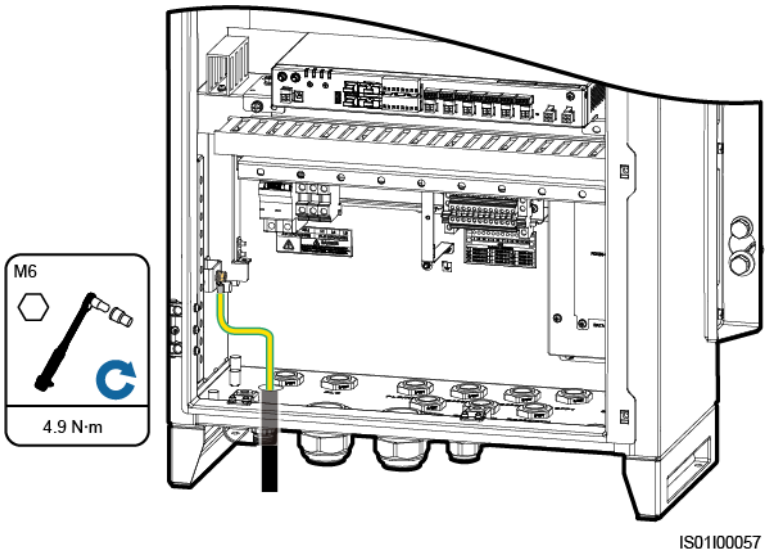


Figure 5-4 Connecting a PE cable (through a pipe)



----End

NOTE

- Connect the PE cable to the nearest ground terminal or the ground bar in the box-type transformer.
- To enhance the anti-corrosion performance of the ground terminal, apply silica gel or paint on it after connecting the PE cable.

5.5 Fiber Ring Network

5.5.1 Connecting the SmartLogger2000 to the ATB

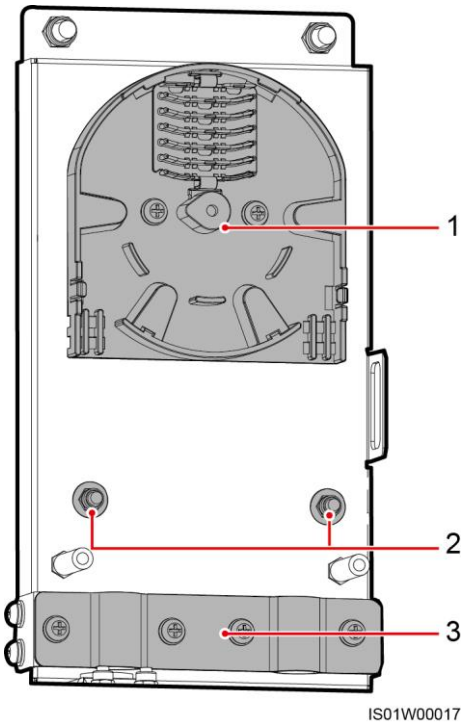
Prerequisites

The fitting bag for optical ring switching purchased from Huawei is available. The bag contains the low-speed optical module and optical jumpers.

Context

The following figure shows the interior of the ATB.

Figure 5-5 Interior

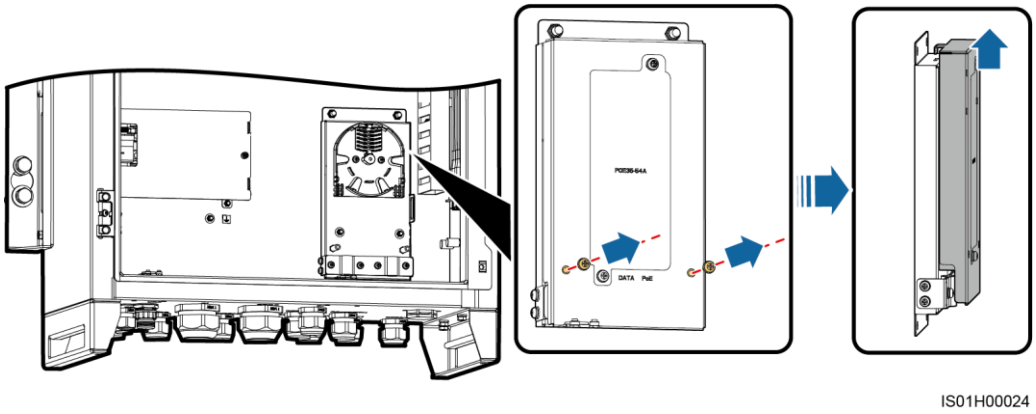


(1) Fiber spool (2) Fixing points for internal steel wires of optical cables (3) Cable clip

Procedure

Step 1 Remove the cover from the ATB.

Figure 5-6 Removing the cover



Step 2 Connect the low-speed optical module to the SFP1 and SFP2 ports on the SmartLogger2000.

Step 3 Connect the pre-installed optical jumper to the low-speed optical module.

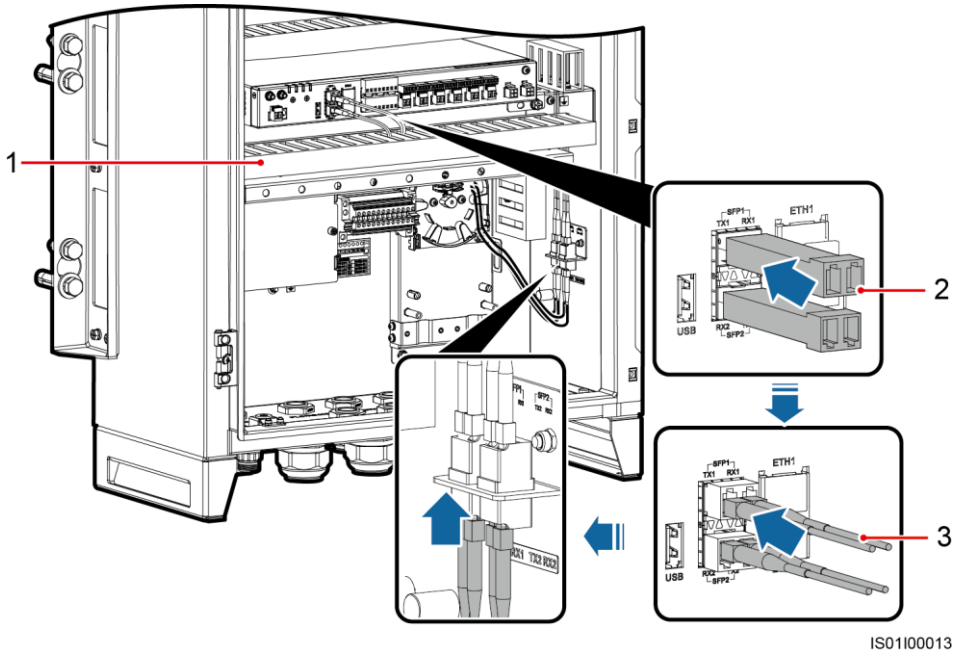
Step 4 Connect one end of the optical jumper available in the fitting bag to the optical fiber adapter on the right panel of the smart array controller.

Step 5 Connect the other end of the optical jumper to the ATB.

NOTICE

The optical jumper should be spliced in the ATB with the optical cable from the external device. Splicing should be performed by professionals. For details about how to connect optical cables, see 5.5.2 Connecting an Optical Cable.

Figure 5-7 Connecting cables



(1) Cable trough for the factory-installed optical jumpers

(2) Low-speed optical module

(3) Optical jumper

----End

5.5.2 Connecting an Optical Cable

An optical cable can be connected in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

- An optical cable has been prepared by yourself. You are advised to use a 4-core or 8-core single-mode armored optical cable with the transmission wavelength of 1310 nm. Optical cable outer diameter ≤ 18 mm (0.71 in.)
- The cover of the ATB has been removed.
- The optical jumper from the ATB to the SmartLogger2000 is connected. For details, see 5.5.1 Connecting the SmartLogger2000 to the ATB.

If you need to route cables through a pipe, prepare a pipe with a recommended outer diameter of 26.92 mm (1.05 in.).

Context

NOTE

Connect two optical cables in a ring optical network, and connect one optical cable in a star optical network.

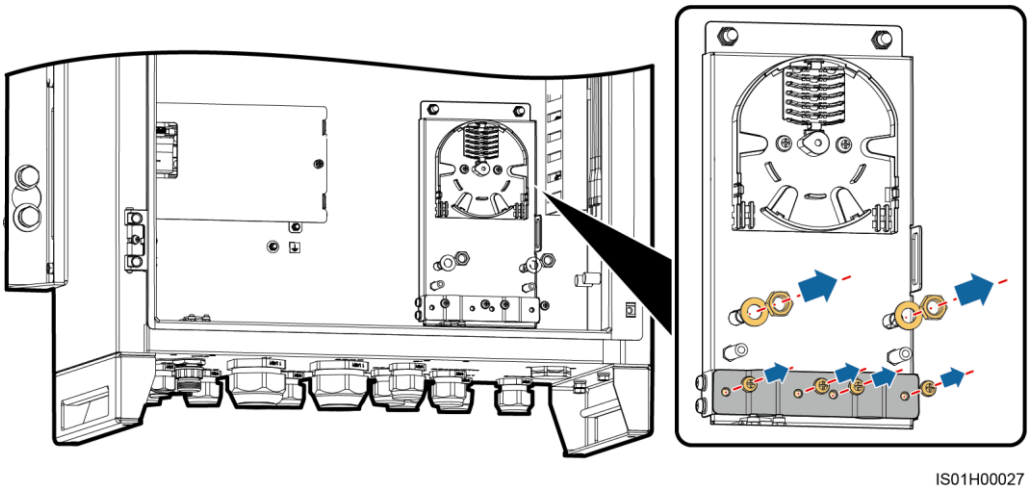
NOTICE

- As optical cables are hard, route the cables into the smart array controller after preparing them.
- Optical cables must be connected by professional personnel.

Procedure

Step 1 Remove the optical cable fastener.

Figure 5-8 Removing the fastener



Step 2 Route the optical cables through the SFP cable hole at the bottom of the cabinet, connect them to the ATB, and splice the optical fibers with the optical jumpers.

NOTE

After splicing optical fibers, wind the cable around the fiber spool of the ATB.

Figure 5-9 Connecting optical cables (common connection)

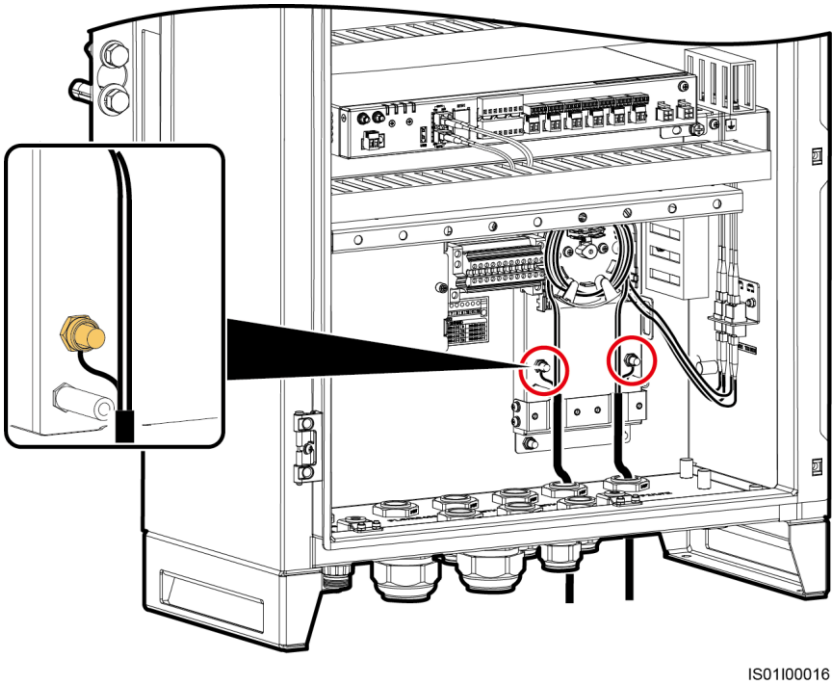
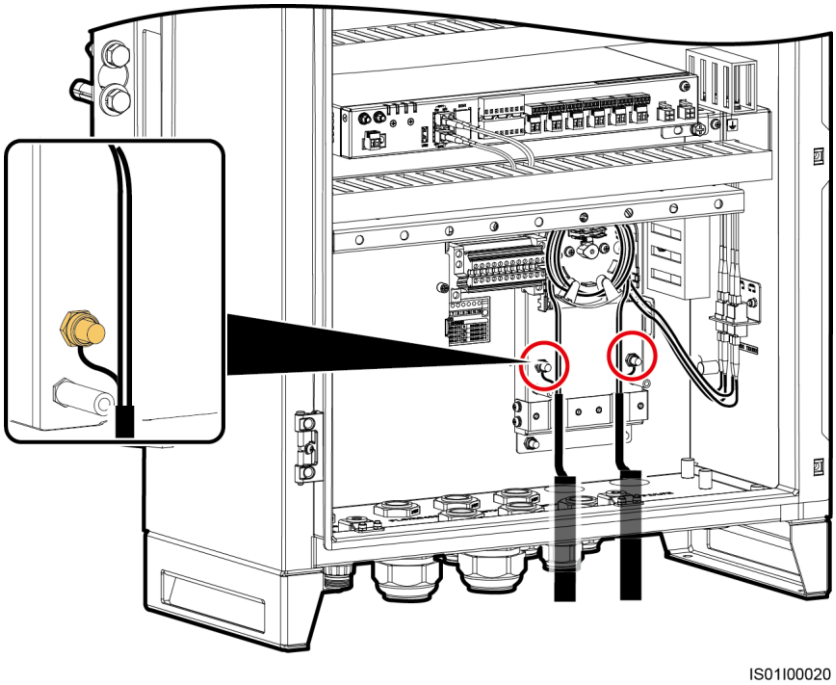


Figure 5-10 Connecting optical cables (through a pipe)



----End

NOTE

Check that the cables are connected correctly and securely, and then reinstall the optical cable fastener and ATB cover.

5.6 4G LTE

5.6.1 Connecting the POE SPD to the POE Module

Prerequisites

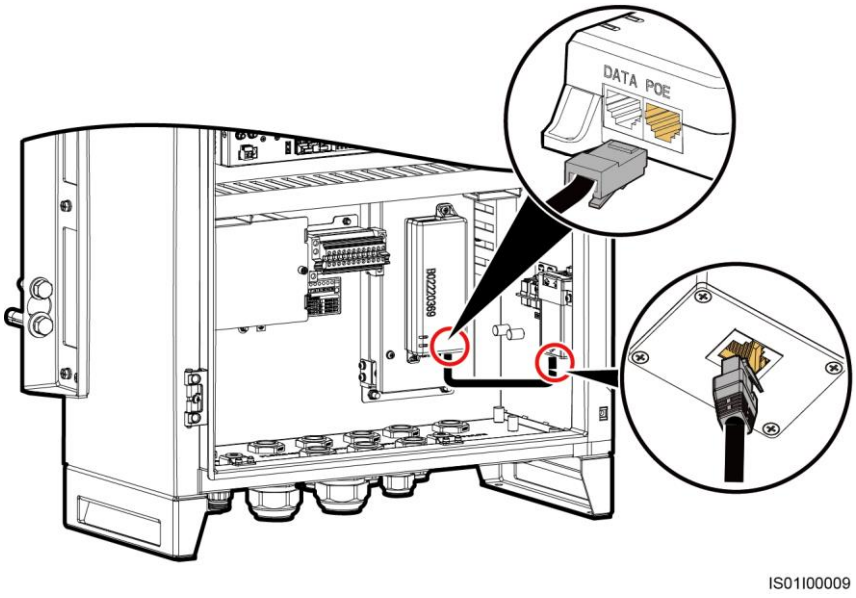
A communications cable delivered with the POE SPD is available.

Procedure

Step 1 Connect one end of the communications cable to the PROTECT port on the POE SPD.

Step 2 Connect the other end of the communications cable to the POE port on the POE module.

Figure 5-11 Connecting a cable from the POE SPD to the POE module



----End

5.6.2 Connecting the SmartLogger2000 to the POE Module

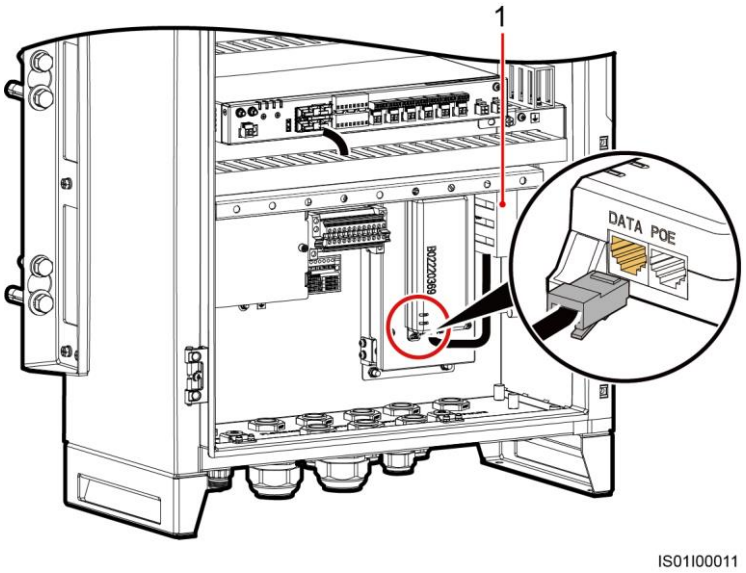
Context

The network cable on the SmartLogger2000 is preinstalled. You need only to connect the other end of the cable to the POE module.

Procedure

Step 1 Take down the preinstalled cable from the cable trough and connect it to the DATA port on the POE module.

Figure 5-12 Connecting the SmartLogger2000 to the POE module



(1) Cable trough for network cables

----End

5.6.3 Connecting the POE Module to a Power Source

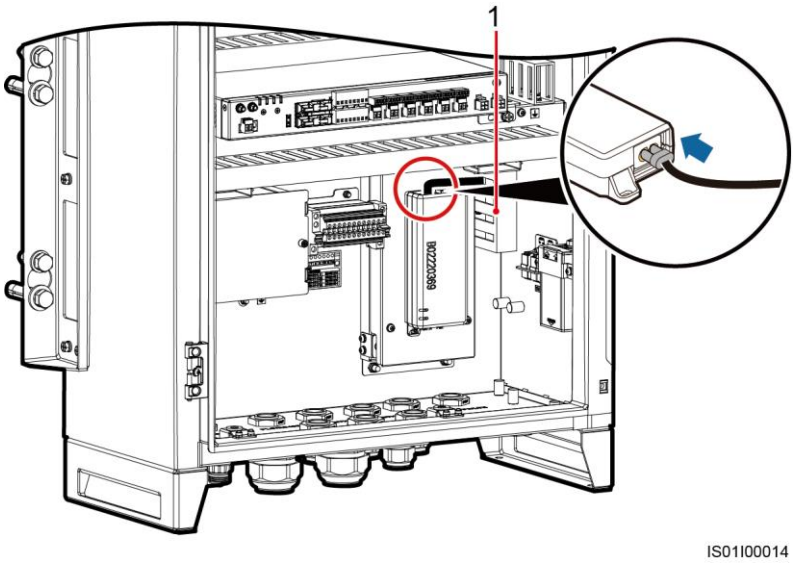
Prerequisites

The power cable is preinstalled before delivery. You need only to connect the other end of the cable to the POE module.

Procedure

Step 1 Take down the preinstalled cable from the cable trough and connect it to the POE module.

Figure 5-13 Connecting the POE module power cable



(1) Cable trough for power cables

----End

5.6.4 Connecting the POE SPD to the CPE

The POE SPD can be connected to the CPE in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

The 20 m (787.40 in.) long network cable delivered with Huawei CPE is available. If a network cable longer than 20 m (787.40 in.) is required, prepare it by yourself. It is recommended that a CAT 5E outdoor shielded network cable with an outer diameter less than 9 mm (0.35 in.), internal resistance not greater than 1.5 ohms/10 m (1.5 ohms/393.70 in.), and a shielded RJ45 connector be used.

If you need to route cables through a pipe, prepare a pipe with a recommended outer diameter of 26.92 mm (1.05 in.).

Procedure

Step 1 Connect one end of the communications cable to the CPE.

Step 2 Route the other end of the communications cable through the LTE cable hole at the bottom of the cabinet, and connect the cable to the Surge port on the POE SPD.

Figure 5-14 Connecting a POE SPD to a CPE (common mode)

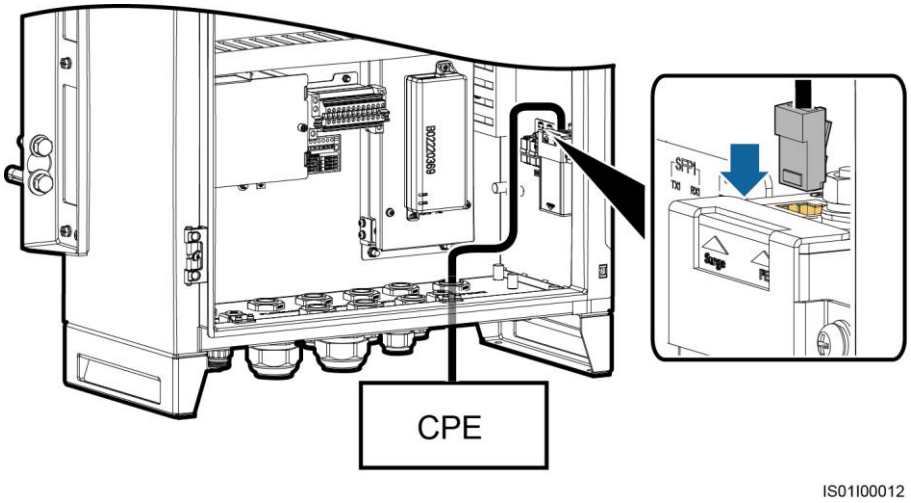
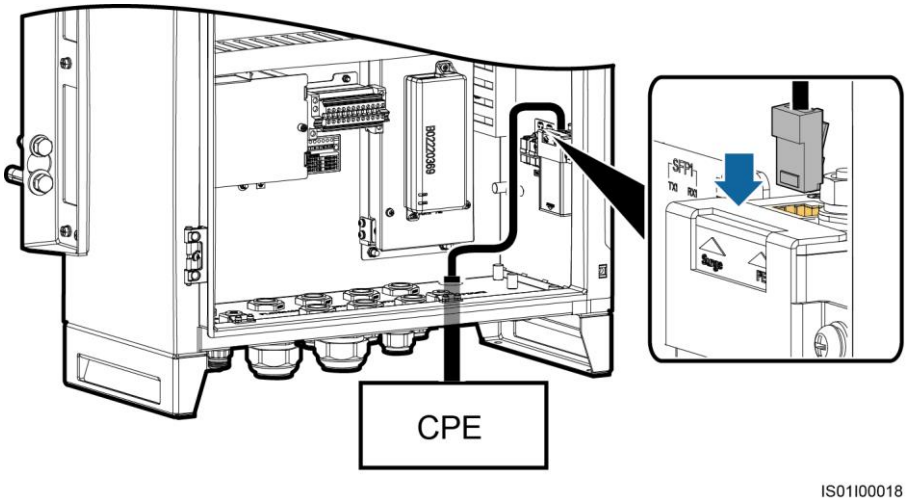


Figure 5-15 Connecting a POE SPD to a CPE (through a pipe)



----End

5.7 RS485: Connecting External Device RS485 Communications Cables to the Smart Array Controller

An RS485 communications cable can be connected in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

Common connection:

- You need to prepare the RS485 communications cables. You are advised to use the DJYP2VP2-22 2x2x1 computer cable or armored shielded twisted pair with the conductor cross-sectional area of 0.5–1 mm^2 (or 20–18 AWG).
- M4 OT terminal

NOTE

The OT terminal is used to ground the shielded layer.

Connection through a pipe:

- The RS485 communications cables have been prepared by the customer. You are advised to use the dual-core dual-shielding flame-retarding communications cable with the cross-sectional area of 18 AWG for each core.
- M4 OT terminal

NOTE

The OT terminal is used to ground the shielded layer.

- Prepare the pipe by yourself. The recommended outer diameter of the pipe is 26.92 mm (1.05 in.).

Context

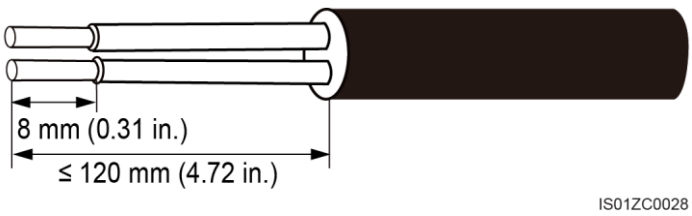
Table 5-5 RS485 communications cable connections (using one RS485 communications cable as an example)

RS485 Communications Cable	Cable Core Description	Port on the JX2 Terminal Block
Core 1	RS485A, RS485 differential signal+	RS485-1 (+)
Core 2	RS485B, RS485 differential signal–	RS485-1 (–)

Procedure

Step 1 Prepare communications cables.

Figure 5-16 Stripping an RS485 communications cable



NOTICE

The shield layer of the RS485 communications cable connects to the cabinet ground point. In this document, two RS485 communications cables are used as an example.

Step 2 Route RS485 communications cables through the RS485 cable hole and then to the JX2 terminal block.

Figure 5-17 Connecting RS485 communications cables (common mode)

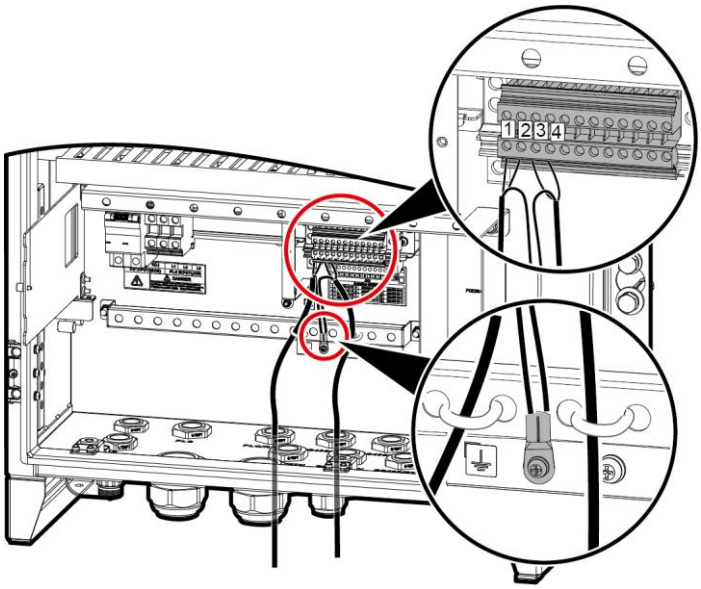
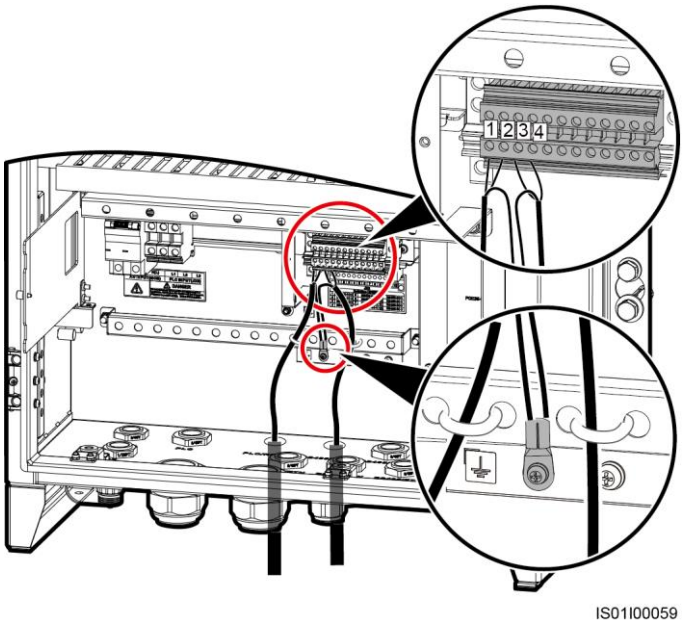


Figure 5-18 Connecting RS485 communications cables (through a pipe)



NOTE

Bind cables after connecting them.

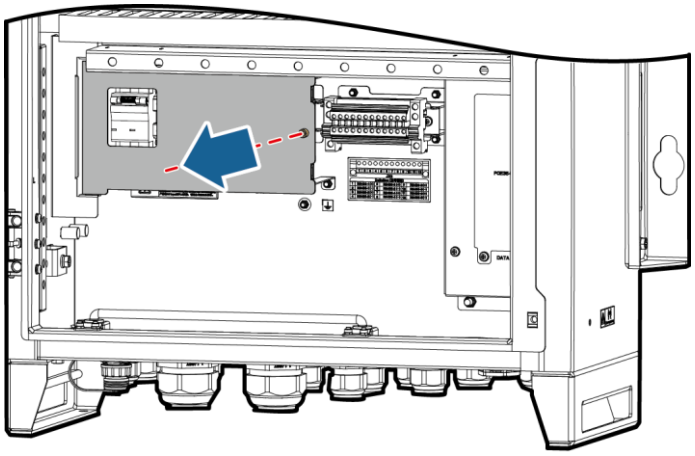
----End

5.8 Opening the Panel

Procedure

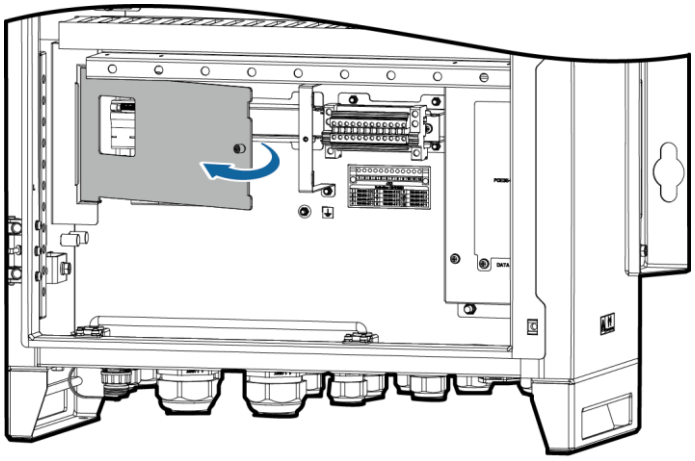
Step 1 Loosen the captive screws on the panel.

Figure 5-19 Loosening screws



Step 2 Open the panel.

Figure 5-20 Opening the panel



----End

5.9 PLC: Connecting the PLC Three-Phase Input Power Cable to the PLC Input Terminal

The PLC three-phase input power cable can be connected in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

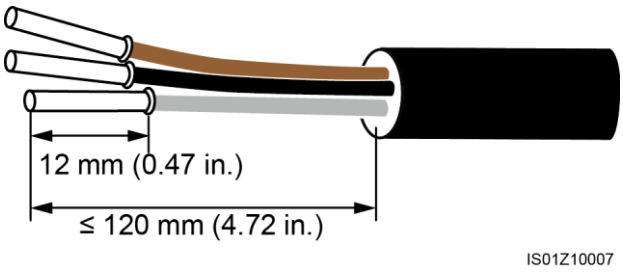
An AC power cable has been prepared by yourself. You are advised to use a three-core (L1, L2, and L3) outdoor armored copper cable with an operating voltage of greater than or equal to 1000 V and a cross-sectional area of 10 mm^2 or 8 AWG for each core wire.

If you need to route cables through a pipe, prepare a pipe with a recommended outer diameter of 26.92 mm (1.05 in.).

Procedure (Common Connection)

Step 1 Prepare the cable.

Figure 5-21 Stripped length

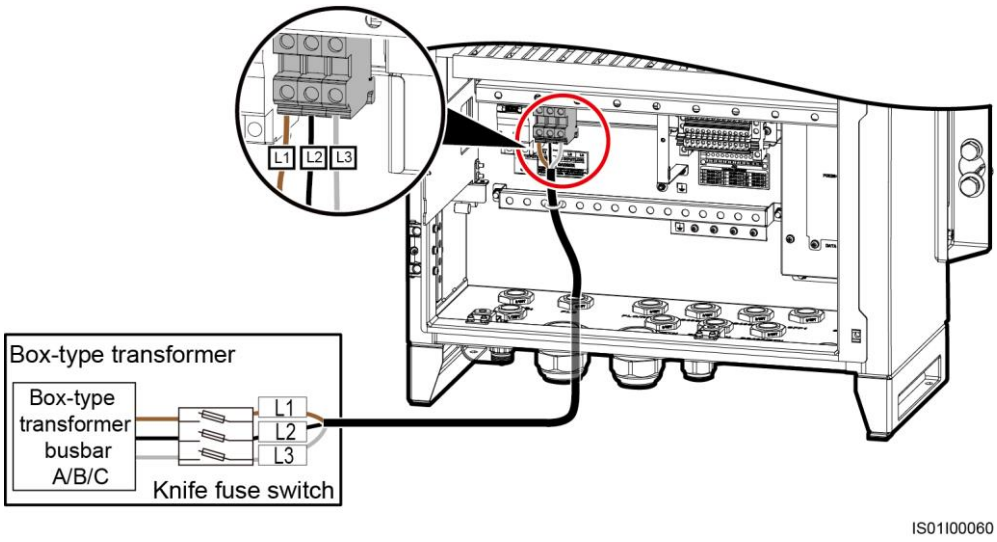


Step 2 Route the AC power cable through the PLC waterproof connector and then to the three-phase input transfer terminal block.

NOTICE

- Connect wires L1, L2, and L3 to A, B, and C on the busbar in the box-type transformer through the knife fuse switch.
- Bind cables after connecting them.

Figure 5-22 Connecting the cable

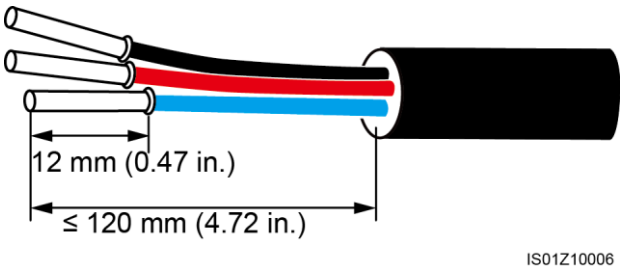


----End

Procedure (Through a Pipe)

Step 1 Prepare the cable.

Figure 5-23 Stripped length

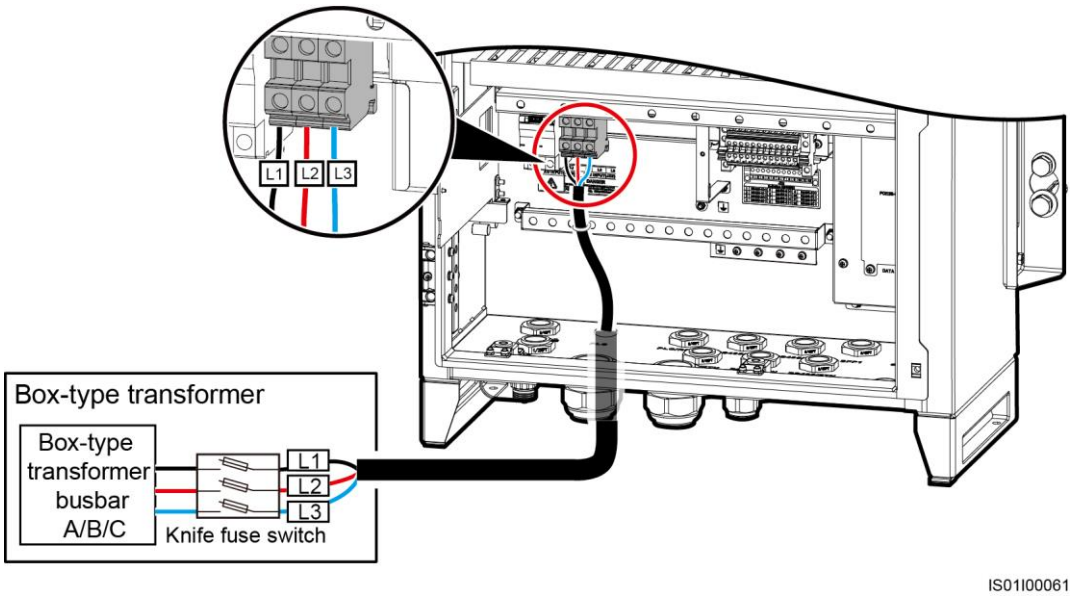


Step 2 Route the AC power cable through the pipe and then PLC hole, and connect it to the three-phase input transfer terminal block.

NOTICE

- Connect wires L1, L2, and L3 to A, B, and C on the busbar in the box-type transformer through the knife fuse switch.
- Bind cables after connecting them.

Figure 5-24 Connecting the cable



----End

5.10 Connecting the Single-Phase Input Power Cable to the Single-Phase Power Switch

The single-phase input power cable can be connected in the common way or through a pipe. For details about how to handle the bottom waterproof connector in these two methods, see 5.2 Common Operations.

Prerequisites

Common connection:

The power cable has been prepared by yourself. You are advised to use a dual-core (L and N [L]) outdoor armored copper cable with the operating voltage of greater than or equal to 300 V and the cross-sectional area of 4 mm^2 or 12 AWG for each core wire.

Connection through a pipe:

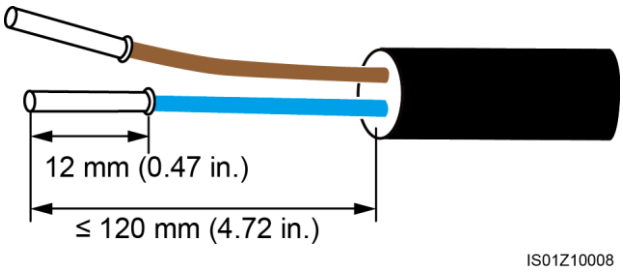
- The power cable has been prepared by yourself. You are advised to use a single-core outdoor copper cable with the operating voltage of greater than or equal to 300 V and the core cross-sectional area of 12 AWG.

- Prepare the pipe by yourself. The recommended outer diameter of the pipe is 26.92 mm (1.05 in.).

Procedure (Common Connection)

Step 1 Prepare the cable.

Figure 5-25 Stripped length

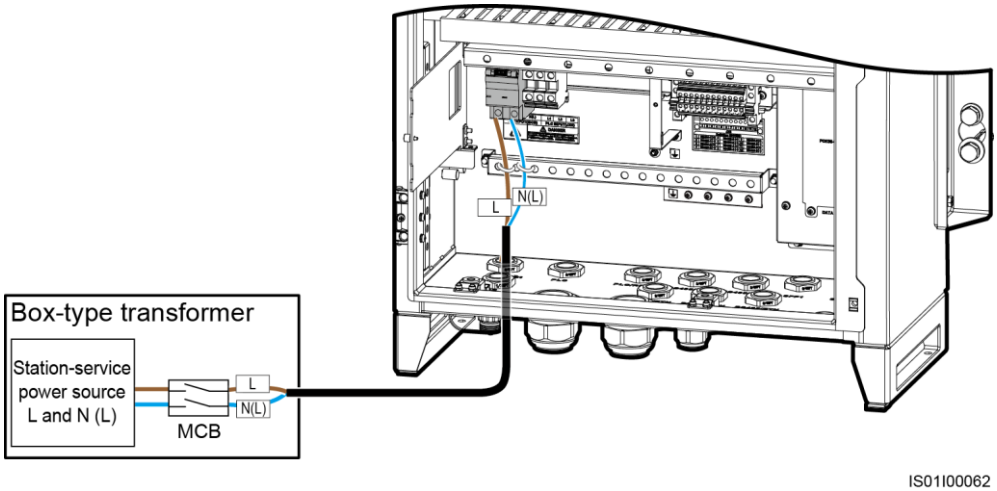


Step 2 Route the power cable through the AC Input waterproof connector and connect it to the single-phase power switch.

NOTICE

- The L and N(L) wires should be connected to the site power terminals L and N(L) of the box-type transformer through an MCB.
- Bind cables after connecting them.

Figure 5-26 Connecting the cable

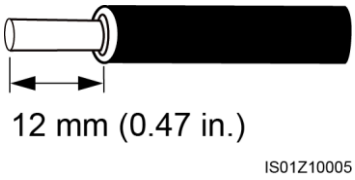


----End

Procedure (Through a Pipe)

Step 1 Prepare the cable.

Figure 5-27 Stripped length

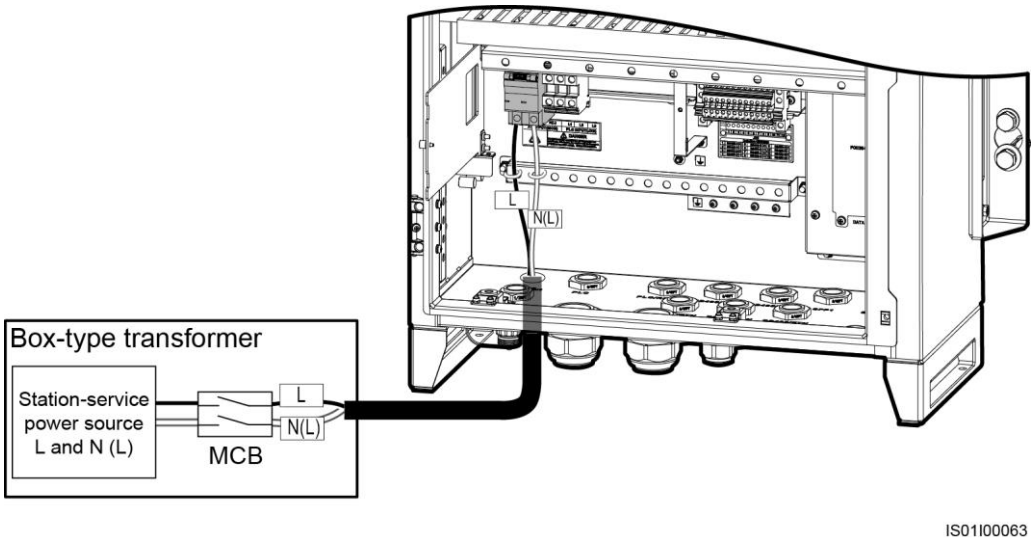


Step 2 Route the power cable through the pipe and then the AC Input hole, and connect it to the single-phase power switch.

NOTICE

- The L and N(L) wires should be connected to the site power terminals L and N(L) of the box-type transformer through an MCB.
- Bind cables after connecting them.

Figure 5-28 Connecting the single-phase power cable



----End

6 System Operation

6.1 Check Before Power-On

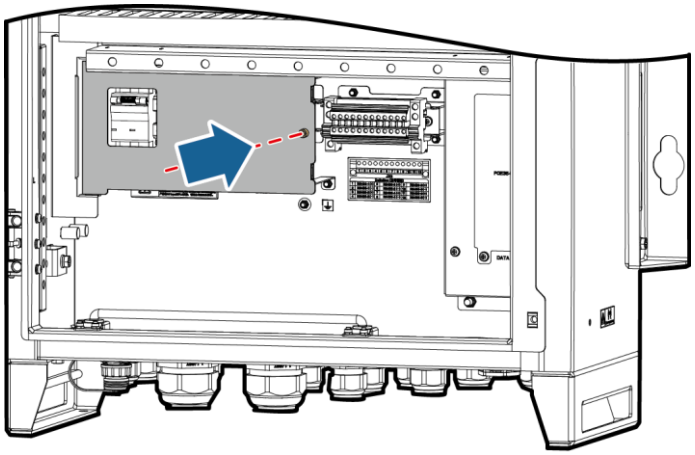
Before powering on the smart array controller, check that:

1. The cabinet and components are installed properly.
2. All cables are correctly connected and secured.
3. No metal part of any cable is exposed.
4. Cables are bound neatly, and cable ties are secured evenly and properly in the same direction.
5. There is no unnecessary adhesive tape or cable ties on cables.
6. Routing for the power cable and signal cable meets the requirements for routing strong-current and weak-current cables and complies with the cable routing plan.
7. Locking caps are tightened on all the cable holes that are in use at the bottom of the cabinet, and firestop putty is applied to these holes or the cable routing pipes are secured to the cabinet.
8. Plugs are inserted and locking caps are tightened for the unused cable holes at the cabinet bottom.
9. The cable to the USB port at the bottom of the cabinet is secured.

NOTE

After the check, reinstall the panel in the cabinet.

Figure 6-1 Installing a panel



6.2 System Power-On

Prerequisites

- You have completed the power-on check.
- The smart array controller cabinet is reliably grounded.
- The operating voltage of the single-phase power switch on the smart array controller matches the single-phase power voltage of the box-type transformer.
- The operating voltage of the PLC three-phase power switch that controls the power supply from the box-type transformer to the smart array controller is consistent with the voltage at the low-voltage AC side of the inverter.

DANGER

Put on insulation gloves with an operating voltage greater than or equal to 2 kV before powering on the system.

Procedure

Step 1 Check that the single-phase power switch on the smart array controller is OFF.

Step 2 Turn off the knife fuse switch on the smart array controller.

Step 3 Turn on the single-phase power switch that controls the power supply from the remote box-type transformer to the smart array controller.

Step 4 Turn on the PLC three-phase power switch that controls the power supply from the remote box-type transformer to the smart array controller.

Step 5 Use a multimeter to measure the operating voltage at the lower part of the single-phase power switch, and ensure that the voltage matches the single-phase power voltage of the box-type transformer.

Step 6 Use a multimeter to check that the voltage of the PLC input terminal in the smart array controller is consistent with the voltage at the low-voltage side of the box-type transformer.

Step 7 Turn on the single-phase power switch on the smart array controller.

Step 8 Turn on the knife fuse switch on the smart array controller.

NOTE

For details about the status of each component after power-on, see the corresponding user manuals.

----End

6.3 Closing the Cabinet Door

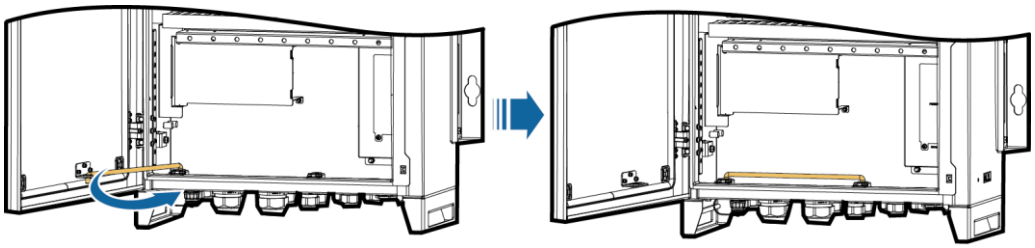
Prerequisites

All components are running properly.

Procedure

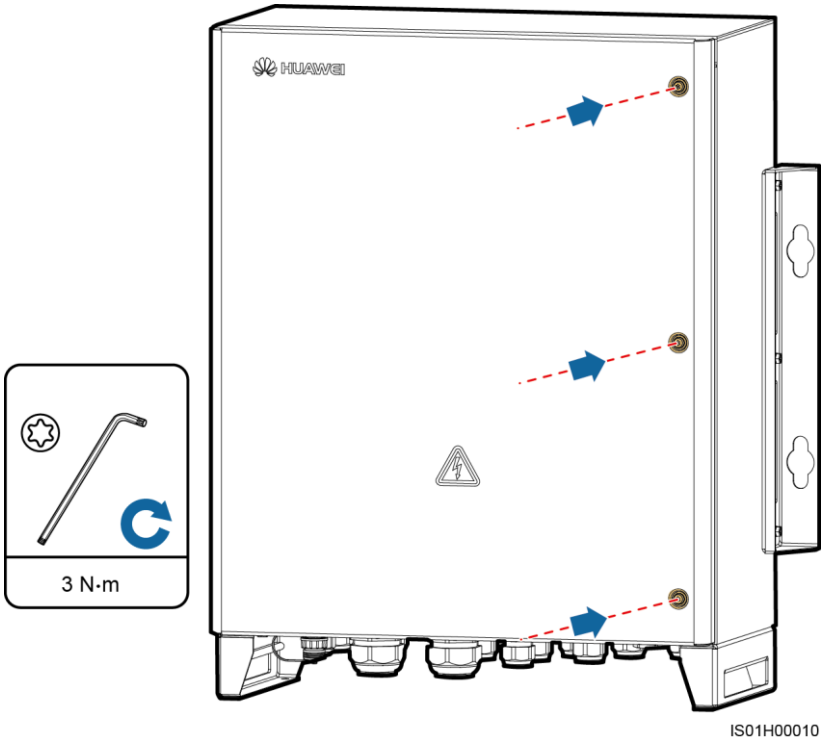
Step 1 Adjust the support bar.

Figure 6-2 Adjusting the support bar



Step 2 Close the cabinet door and tighten the screws.

Figure 6-3 Tightening screws



----End

7 System Power-Off

Prerequisites

DANGER

Put on insulation gloves with an operating voltage greater than or equal to 2 kV before powering off the system.

Procedure

Step 1 Turn off the single-phase power switch that controls the power supply from the remote box-type transformer to the smart array controller.

Step 2 Turn off the PLC three-phase power switch that controls the power supply from the remote box-type transformer to the smart array controller.

Step 3 Turn off the single-phase power switch on the smart array controller.

Step 4 Turn off the knife fuse switch in the smart array controller.

----End

8 Routine Maintenance

DANGER

- Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system (see 7 System Power-Off for details) to ensure that the smart array controller is de-energized and will not cause personal injury.
- If you need to open the cabinet door on rainy or snowy days, take protective measures to prevent rain or snow entering the cabinet. If it is impossible to take protective measures, do not open the cabinet door on rainy or snowy days.

Table 8-1 Maintenance list

Check Item	Check Method	Maintenance Interval
Cabinet	• Check that the exterior of the smart array controller is not damaged or deformed. • Check that there is no dust or dirt in the smart array controller.	Once every 12 months
System running status	• Check that all devices in the smart array controller are running properly. • Check that the SPD works properly.	Once every six months
Electrical connections	• Check that cables are secured. • Check that cables are intact and especially the parts touching the metallic surface are not scratched. • Check that the idle RS485 and POE network cable ports are locked by waterproof caps.	Once every 12 months
Grounding reliability	Check that the PE cable and power input ground cable are securely connected.	Once every 12 months

9 System Maintenance

9.1 Precautions

- Before replacing a component, power off the smart array controller by following the instructions in 7 System Power-Off to ensure that the smart array controller is de-energized and will not cause personal injury.
- After disconnecting the power supply, wait at least 3 minutes before replacing a component.
- After replacing a component, power on the smart array controller by following the instructions in 6.2 System Power-On.
- For the component positions, see 2.2 Product Composition.

9.2 Replacing a Single-Phase or Three-Phase SPD

Prerequisites

- The SPD is faulty.
- Spare SPDs of the same model are available and functional.

NOTE

If the SPD is damaged or the status window is red, the SPD has failed and needs to be replaced.

Context

NOTE

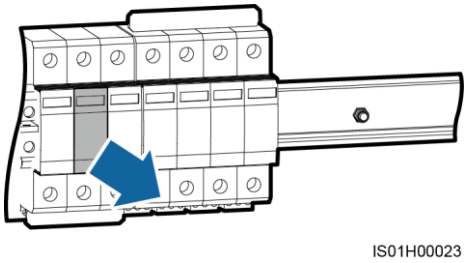
The single-phase SPD is installed in the same way as the three-phase SPD. The following describes how to replace the single-phase SPD.

An SPD consists of a surge protection module and a base.

Procedure

Step 1 Remove the faulty surge protection module from the SPD.

Figure 9-1 Removing the faulty surge protection module



Step 2 Install the new surge protection module.

----End

9.3 Replacing a Knife Fuse Switch

Prerequisites

- The output fuse is faulty.
- A spare output fuse of the same model is available and functional.

Context

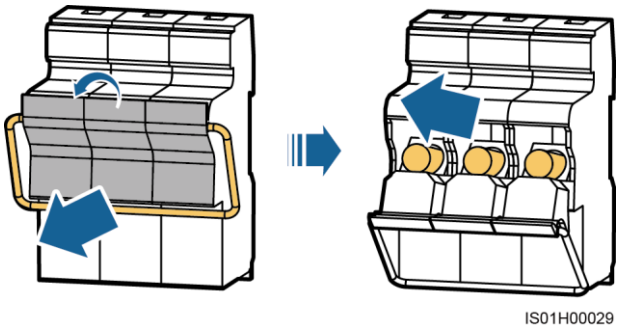
The knife fuse switch consists of the knife fuse switch box and fuse.

Procedure

Step 1 Open the knife fuse switch box.

Step 2 Remove the faulty fuse.

Figure 9-2 Removing a faulty fuse



Step 3 Install the new fuse and close the knife fuse switch box.

----End

9.4 Replacing the Single-Phase Power Switch

Prerequisites

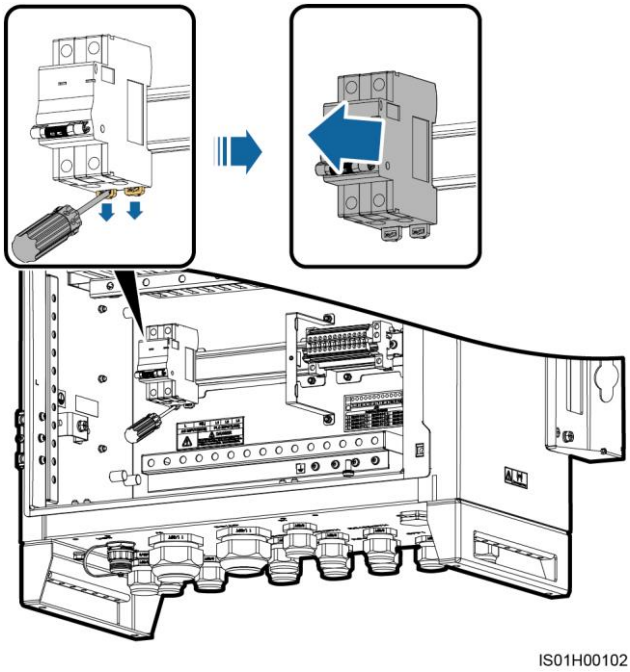
- The single-phase power switch cannot be used.
- A spare single-phase power switch of the same model is available and functional.

Procedure

Step 1 Disconnect cables from the faulty single-phase power switch, and label the cables.

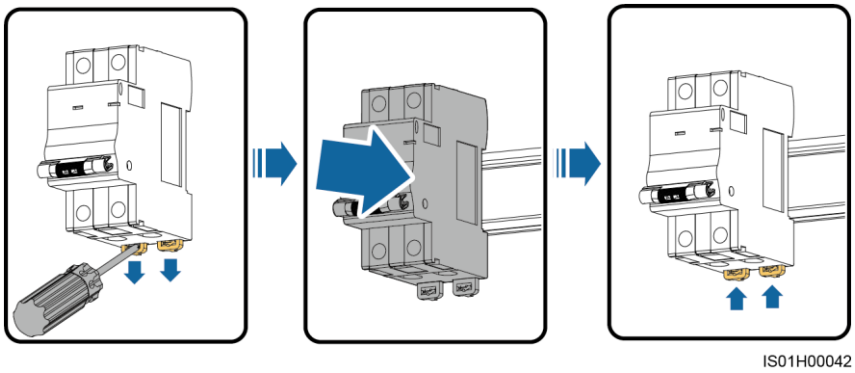
Step 2 Remove the faulty single-phase power switch.

Figure 9-3 Removing a single-phase power switch



Step 3 Install the new single-phase power switch.

Figure 9-4 Installing a single-phase power switch



Step 4 Reconnect the cables to the single-phase power switch based on the cable labels.

----End

9.5 Replacing a SmartLogger2000

Prerequisites

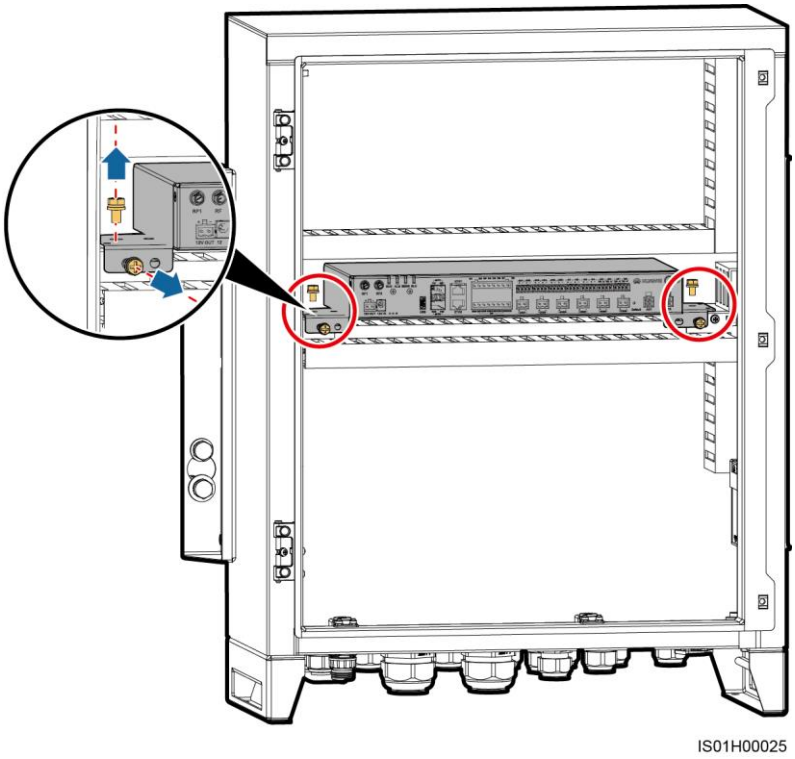
- The SmartLogger2000 is faulty.
- A spare SmartLogger2000 of the same model is available and functional.

Procedure

Step 1 Remove cables from the faulty SmartLogger2000 and label the cables.

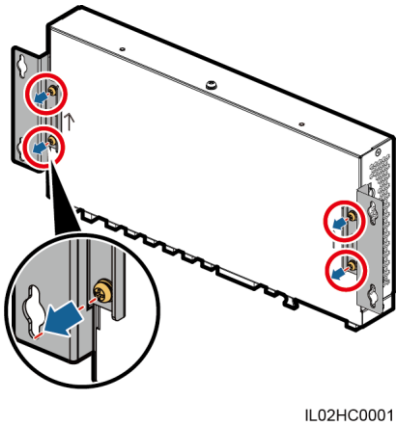
Step 2 Loosen the four M4x12 screw assemblies and remove the faulty SmartLogger2000.

Figure 9-5 Removing the faulty SmartLogger2000



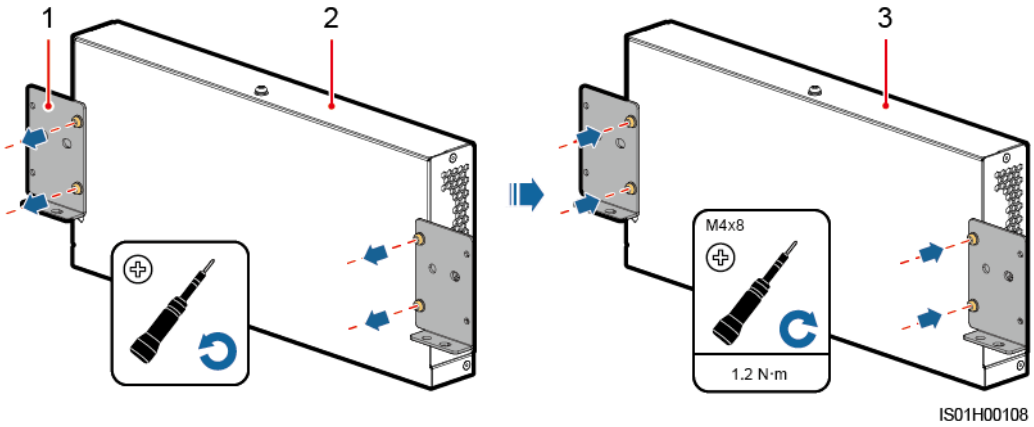
Step 3 Remove mounting ears from the new SmartLogger2000.

Figure 9-6 Removing mounting ears



Step 4 Remove the mounting bracket from the faulty SmartLogger2000 and install it on the new SmartLogger2000.

Figure 9-7 Installing a mounting bracket



(1) Mounting bracket (2) Faulty SmartLogger2000 (3) New SmartLogger2000

Step 5 Install the new SmartLogger2000 in the smart array controller.

NOTE

The tightening torque for the M4x12 screw assemblies is 1.2 N·m.

Step 6 Connect the cables to the SmartLogger2000 based on the cable labels.

----End

Follow-up Procedure

After replacing the SmartLogger2000 and powering it on, log in to the WebUI and configure the DI8 port of the new SmartLogger2000. For details, see A Configuring the DI8 Port. After the configuration, you can query the alarm on the WebUI if the single-phase SPD or three-phase SPD experiences a fault.

9.6 Replacing the SmartLogger2000 Power Adapter

Prerequisites

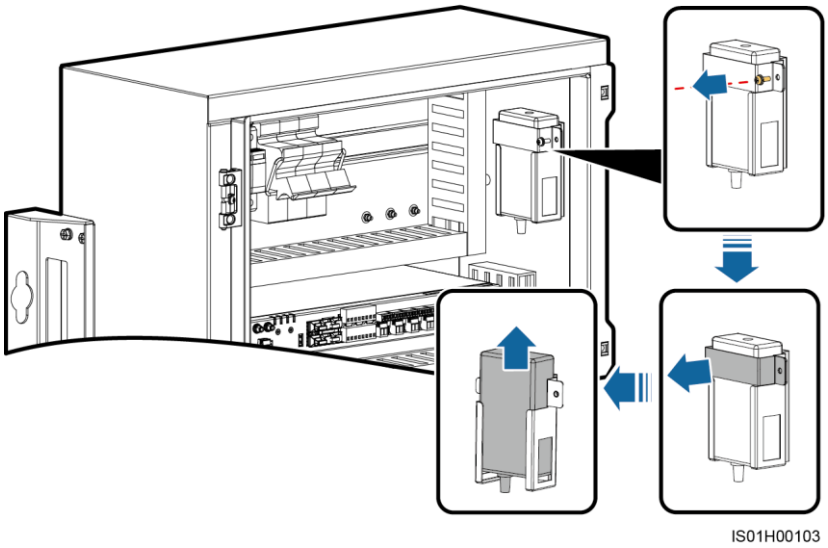
- The SmartLogger2000 power adapter cannot be used.
- A spare power adapter of the same model is available and functional.

Procedure

Step 1 Disconnect cables from the power adapter.

Step 2 Remove the faulty power adapter.

Figure 9-8 Removing a power adapter



Step 3 Install the new power adapter.

Step 4 Reconnect the cables to the new power adapter based on the cable labels.

----End

10 Technical Specifications

Technical Specifications		SmartACU2000A-D-PLC
Communications mode		SFP/ETH/RS485/PLC
PLC input voltage (AC)		380–800 V; three-phase
Operating voltage		100–240 V; single-phase+N+PE or dual–live wire+PE
Voltage frequency		50 Hz/60 Hz
Cabling mode		Routed in and out from the bottom
O&M direction		Operated and maintained from the front
Natural environment		Indoor, outdoor
Altitude		0–4000 m (0–13123.36 ft)
Installation mode		Installed on a wall, support, or pole
Dimensions (W x H x D)	Including the mounting ears and base	640 mm (25.20in.) x 720 mm (28.35 in.) x 315 mm (12.40 in.)
	Excluding the mounting ears and base	550 mm (21.65 in.) x 650 mm (25.59 in.) x 280 mm (11.02 in.)
Weight		26 kg (57.32 lb)
Enclosure protection level		IP65/Type 4X
Class of protection		Class I
Operating ambient temperature		–40°C to +60°C (–40°F to +140°F)
Operating humidity		4%–100% RH

A Configuring the DI8 Port

Procedure

Step 1 Enter **https://*XX.XX.XX.XX*** in the address box of the browser to enter the WebUI login page. Because of the permission restriction, log in as **Special User**.

NOTE

- *XX.XX.XX.XX* indicates the IP address for the SmartLogger2000. The default IP address is 192.168.0.10.
- If the WebUI page is not displayed, specify security settings for the browser. For details, see **Preparations for Login** in the *SmartLogger2000 User Manual*.
- The initial password is **Changeme**.
- You are advised to change the password immediately after the first login to ensure the account security.

Step 2 Choose **Settings** > **DI** to enter the page for configuring the DI8 port.

Table A-1 DI8 port parameter settings

Parameter	Value	Parameter	Value
Activation Status	Activated	Alarm Severity	Major
Alarm Generation	Enable	Alarm Name	AC SPD fault

----End

B Acronyms and Abbreviations

C	
COM	communication
CPE	customer premises equipment
P	
PE	protective earthing
PID	potential induced degradation
PLC	power line communication
POE	power over Ethernet
PV	photovoltaic