

SmartGuard-63A-(T0, AUT0)

User Manual

Edition 03
Date 30-10-2024



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About this document

Aim

This document describes the safety precautions, presentation, installation, electrical connections, power-up, commissioning, maintenance, and technical specifications of the SmartGuard-63A-T0 and SmartGuard-63A-AUT0 devices. Read this document carefully before installing and using the SmartGuard.

Recipients

This document is addressed to the following people:

- I Sales Engineers
- I Systems engineers
- I Technical Support Engineers

Symbolism

The symbols that can be found in this manual are defined below.

Symbol	Description
 PELIGRO	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 ADVERTENCIA	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 ATENCIÓN	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 AVISO	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, loss of data, decreased performance, or unexpected results. The word NOTICE is used to refer to practices not related to bodily injury.

Symbol	Description
 NOTA	Complements the important information in the main text. The word NOTE is used to refer to information not related to bodily injury, equipment damage, or environmental damage.

Change History

Changes made to document versions are cumulative. The most recent version of the document includes all changes made to previous versions.

Version 03 (10/30/2024)

- | The “**2.2 Networking**”.
- | The “**5.1 Cable preparation**”.

Version 02 (6/7/2024)

- | The “**2 Product Description**”. The “**5 Electrical connections**”.
- | The “**6 Commissioning the system**”. The “**7 System Maintenance**”.

Version 01 (6/5/2024)

This version is the first official publication.

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1 Safety information

Statement

Before transporting, storing, installing, operating, using, or maintaining the equipment, read this document, strictly follow the instructions provided here, and follow all safety instructions on the equipment and in this document. In this document, the word "equipment" refers to products, software, components, spare parts, or services related to this document; the phrase "the company" refers to the manufacturer (producer), seller, or service provider of the equipment; the word "you" refers to the entity that transports, stores, installs, operates, operates, or maintains the equipment.

The statements that bear the titles **Danger**, **Warning**, **Caution** and **Warning** This document does not describe all safety precautions. Relevant international, national, or regional standards, as well as industry practices, must also be followed. **The company shall not be liable for any consequences of failure to comply with safety requirements or standards related to the design, production, and use of the equipment.**

The equipment must be used in an environment that meets the design specifications. Otherwise, it may cause malfunction, damage, or failure, which is not covered by the warranty. The company will not be liable for any property loss, injury, or death resulting from such noncompliance.

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

Do not reverse engineer, decompile, disassemble, adapt, implement, or perform any other derivative operations on the Equipment Software. Do not study the internal implementation logic of the Equipment Software, do not obtain the source code of the Equipment Software, do not infringe intellectual property rights, and do not disclose the results of any performance tests of the Equipment Software.

The company will not be responsible for any of the following circumstances or any resulting consequences:

- I Equipment damaged due to force majeure, such as earthquakes, floods, volcanic eruptions, landslides, atmospheric discharges, fires,

wars, armed conflicts, typhoons, hurricanes, tornadoes and other extreme weather conditions.

- | Operations performed on the equipment under conditions other than those specified in this document.
- | Equipment installed or used in environments that do not meet international, national or regional standards.
- | Installation or use of the equipment by unqualified personnel.
- | Failure to comply with the operating instructions and safety precautions indicated on the product and in this document.
- | Removal or modification of the product, or modification of the software code without authorization.
- | Damage caused to the equipment by you or a third party authorized by you during transportation.
- | Damage to equipment caused by storage conditions that do not meet the requirements specified in the product documentation.
- | Materials and tools that comply with local laws and regulations or related standards are not prepared.
- | Equipment damaged due to negligence, intentional breach, gross negligence, or improper operation by you or a third party, or due to other reasons unrelated to the company.

1.1 Personal safety

DANGER

Ensure equipment is turned off during installation. Do not install or remove cables while equipment is powered on. Transient contact between a cable's core and the conductor will generate arcing or sparks, which could start a fire or cause injury.

DANGER

Non-standard or improper operation of powered equipment can cause fire, electric shock, or explosion, which may result in property damage, injury, or even death.

DANGER

Before operations, remove all conductive objects, such as watches, bracelets, bangles, rings, and necklaces, to avoid electric shock.

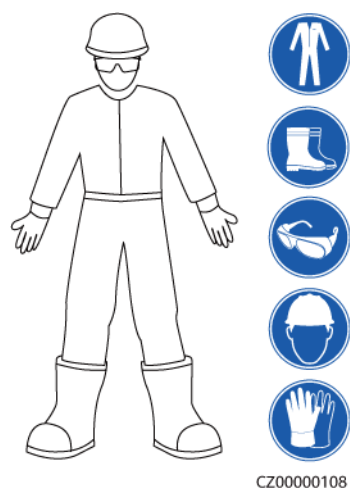
⚠ DANGER

During operations, use specific insulated tools to avoid electric shock or short circuits. The dielectric withstand voltage level must comply with local laws, regulations, standards, and specifications.

⚠ WARNING

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

Figure 1-1 Personal protective equipment



General requirements

- | Do not disable protective devices. Heed the warnings, precautions, and precautionary measures indicated in this document and on the equipment.
- | If there is a risk of injury or equipment damage during operations, stop immediately, report the incident to your supervisor, and take appropriate protective measures.
- | Do not turn on the equipment before installation or before receiving confirmation from professionals.
- | Do not touch power equipment directly or with conductors such as wet objects. Before touching a terminal or the surface of any conductor, measure the voltage at the point of contact and ensure there is no risk of electric shock.
- | Do not touch any equipment that is in operation, as the chassis is hot.
- | Do not touch a running fan with your bare hands, components, screws, tools, or boards. Doing so could result in injury or damage to the equipment.
- | In case of fire, leave the building or equipment area immediately and activate the fire alarm or call emergency services. Do not enter the building or the affected equipment area under any circumstances.

Requirements for staff

- I Only professionals and trained personnel are allowed to perform operations on the equipment.
 - Professionals: Personnel who are familiar with the operating principles and structure of the equipment, who have training or experience in operating the equipment, and who are familiar with the origins and severity of the various potential hazards associated with the installation, operation, and maintenance of the equipment.
 - Trained personnel: Personnel trained in technology and safety, who have the required experience, are aware of the hazards they may be exposed to when performing certain operations, and can take protective measures to minimize the hazards to which they or others may be exposed.
- I Personnel planning to install or repair equipment must be adequately trained, capable of performing all operations correctly, and understand all necessary safety precautions and relevant local regulations.
- I Only trained personnel or qualified professionals are permitted to install, operate, and maintain the equipment.
- I Only qualified professionals may remove safety elements and inspect equipment.
- I Personnel performing special tasks, such as electrical operations, working at heights, and operating special equipment, must possess the required local qualifications.
- I Only authorized professionals are permitted to replace equipment or its components (including software).
- I Only personnel who must work with the equipment are allowed access to it.

1.2 Electrical safety

DANGER

Before connecting cables, make sure the equipment is intact. Otherwise, electric shock or fire may occur.

DANGER

Non-standard and improper operations may cause fire or electric shock.

DANGER

Prevent foreign objects from entering the equipment during operation. Failure to do so may result in equipment damage or short circuits, reduced load power, power failure, or personal injury.

 WARNING

For equipment that requires grounding, install the ground wire first during equipment installation and remove it last during equipment removal.

 WARNING

During installation of the PV strings and the inverter, the positive or negative terminals of the strings can short to ground if the power cables are not properly installed or routed. In this case, an AC or DC short circuit could occur, which could, in turn, damage the inverter. Damage to the device caused by this cause is not covered by any warranty.

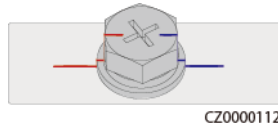
 ATTENTION

Do not install cables near the air inlets or outlets of the equipment.

General requirements

- | Follow the procedures described in the document for installation, operation, and maintenance. Do not rebuild or alter the equipment, add components, or change the order of installation steps without permission.
- | Obtain approval from your national or local electricity company before connecting equipment to the power grid.
- | Comply with power plant safety regulations, such as those related to operating mechanisms and worksheets.
- | Install temporary fencing or warning tape and hang “No Trespassing” signs around the operations area to keep unauthorized personnel away.

- | Before installing or removing power cables, turn off the equipment switches and the corresponding upstream and downstream switches.
- | Before performing operations on the equipment, check that all tools meet the applicable requirements and record them. Once operations are completed, collect all tools to prevent them from remaining inside the equipment.
- | Before installing the power cables, check that the corresponding labels are correct and that the cable terminals are insulated.
- | When installing the equipment, use a torque tool with an appropriate measuring range to tighten the bolts. When using a wrench to tighten the bolts, ensure that the wrench does not tilt and that the torque error does not exceed 10% of the specified value.
- | Ensure the bolts are tightened using a torque tool and marked in red and blue after a second check. Installation personnel should mark the tightened bolts in blue. Quality inspection personnel should confirm that the bolts are tight and then mark them in red. (The marks should cross the edges of the bolts.)



- | If the equipment has multiple inputs, disconnect all of them before performing operations on them.
- | Before performing maintenance on a downstream power or electrical distribution device, turn off the output breaker of the power equipment.
- | During equipment maintenance, place "Do Not Turn On" labels near upstream and downstream switches or circuit breakers, as well as warning signs, to prevent accidental power-up. Equipment may be turned on only after the problems have been resolved.
- | Do not open the equipment panels.
- | Periodically check equipment connections and ensure all screws are securely tightened.
- | Only qualified professionals should replace a damaged cable.
- | Do not write on, damage, or cover up labels or identification plates on equipment. Replace damaged labels immediately.
- | Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside the equipment.

Grounding

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

Wiring Requirements

- | When selecting, installing and routing cables, follow local safety rules and regulations.
- | When routing power cables, make sure they are not twisted or kinked. Do not splice or solder power cables. If necessary, use a longer cable.
- | Ensure all cables are properly connected and insulated, and that they meet the corresponding specifications.
- | Ensure that the slots and holes for cable routing have no sharp edges, and that the positions where cables pass through tubes or cable holes have protective padding to prevent the cables from being damaged by sharp edges or burrs.
- | Make sure cables of the same type are bundled neatly and straight, and that the cable jackets are intact. When installing cables of different types, make sure they are separated from each other, free of tangles and overlap.

- I Secure buried cables using cable supports and clamps. Ensure cables in an embankment area are in close contact with the ground to prevent deformation or damage during embankment work.
- I If external conditions (such as cable design or ambient temperature) change, verify the use of the cables in accordance with the IEC-60364-5-52 standard or local laws and regulations. For example, check that the current-carrying capacity meets applicable requirements.
- I When installing cables, leave a space of at least 30 mm between the cables and heat-generating areas or components. This prevents deterioration or damage to the cable insulation.

1.3 Environment requirements

DANGER

Do not expose the equipment to smoke or flammable or explosive gases. Do not operate the equipment in such environments.

DANGER

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

DANGER

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

WARNING

Install the equipment in an area away from liquids. Do not install it under areas prone to condensation, such as under water pipes and air vents, or under areas prone to water leaks, such as air conditioning vents, ventilation outlets, or cable glands in the equipment room. Ensure that no liquids enter the equipment to prevent malfunctions or short circuits.

WARNING

To prevent damage or fire due to high temperatures, ensure that the ventilation holes or heat dissipation systems are not obstructed or covered by other objects while the equipment is in operation.

General requirements

- | Store equipment according to storage requirements. Equipment damage caused by improper storage conditions is not covered by the warranty.
- | Keep the equipment installation and operating environments within the permissible ranges. Otherwise, equipment performance and safety will be compromised.
- | The operating temperature range indicated in the technical specifications of the equipment refers to the ambient temperatures in the equipment installation environment.
- | Do not install, use, or handle outdoor cables or equipment (including, but not limited to, moving equipment, performing operations on equipment or cables, inserting or removing connectors into or from signal ports connected to outdoor installations, working at heights, performing outdoor installations, and opening doors) during adverse weather conditions (for example, lightning, rain, snow, or winds of level 6 or higher).
- | Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared radiation and other radiation, organic solvents, or salt air.
- | Do not install the equipment in an environment with conductive or magnetic metal dust.
- | Do not install the equipment in an area that is prone to the growth of microorganisms such as fungi or mold.
- | Do not install the equipment in an area with strong vibrations, noise or electromagnetic interference.
- | Ensure that the site complies with local laws and regulations, as well as related standards.
- | Ensure that the ground in the installation area is solid, free of spongy or soft soil, and not prone to subsidence. The site should not be located on low-lying ground prone to water or snow accumulation, and the horizontal level of the site should be above the highest historical water level in that area.
- | Do not install the equipment in a location where it may be submerged in water.
- | If the equipment is installed in a heavily vegetated area, in addition to routine weeding, firm the ground beneath the equipment using cement or gravel (the surface area should be greater than or equal to 3 m × 2.5 m).
- | Do not install equipment outdoors in salt-affected areas, as they may corrode. The term "salt-affected area" refers to a region located up to 500 m from the coast or exposed to sea breezes. Areas exposed to sea breezes vary depending on weather conditions (such as typhoons and monsoons) or terrain (such as dikes and hills).
- | Before installation, operation and maintenance, remove water, ice, snow and other foreign objects from the top of the equipment.
- | When installing the equipment, ensure that the installation surface is solid enough to support the weight of the equipment.
- | After installing the equipment, remove all packaging materials (such as cardboard boxes, foam, plastic, and cable ties) from the relevant area.

1.4 Mechanical safety

WARNING

Make sure all necessary tools are ready and inspected by a professional organization. Do not use tools that show signs of scratches, that have not passed the inspection, or whose inspection validity period has expired. Make sure tools are secure and not overloaded.

WARNING

Do not drill holes in the equipment. This may compromise the equipment's watertightness and electromagnetic tightness, as well as damage internal components or cables. Metal shavings from drilling holes can short out the circuit boards inside the equipment.

General requirements

- I Promptly repaint any scratches caused during transport or installation of the equipment. Scratched equipment should not be exposed to prolonged exposure.
- I Do not perform operations such as arc welding or cutting on equipment without company evaluation.
- I Do not install other devices on top of the equipment without the company's evaluation.
- I When operating above equipment, take measures to protect it from damage.
- I Choose the right tools and use them correctly.

Moving heavy objects

Be careful to avoid injury when moving heavy objects.



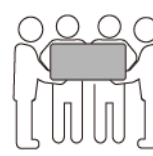
< 18 kg
(< 40 lbs)



18–32 kg
(40–70 lbs)



32–55 kg
(70–121 lbs)



55–68 kg
(121–150 lbs)



> 68 kg
(> 150 lbs)

CZ0000110

- I If several people are required to move a heavy object, determine the labor required and the division of labor, taking into account height and other factors to ensure the weight is distributed evenly.
- I If two or more people are moving a heavy object, make sure the object is lifted and supported simultaneously, and that it is moved at a uniform pace under the supervision of one person.

- | Wear personal protective equipment, such as protective footwear and gloves, when moving equipment manually.
- | To move an object by hand, approach the object, squat down, and then lift it smoothly and steadily, using your legs instead of your back. Don't lift the object suddenly and don't twist your body.
- | Don't quickly lift a heavy object above your waist. Place the object on a work surface midway between waist height and the floor or another appropriate location, adjust your palm positions, and then lift it.
- | Move heavy objects steadily, with balanced force and at a constant, low speed. Lower the object steadily and slowly to avoid scratching the surface of the equipment or damaging components and cables due to a bump or fall.
- | When moving a heavy object, consider work surfaces, inclines, stairs, and slippery areas. When moving a heavy object through a doorway, make sure the door is wide enough to allow the object to pass through without causing impact or injury.
- | When moving a heavy object, swing your feet instead of twisting your waist. When lifting and moving a heavy object, make sure your feet point in the desired direction of movement.
- | When transporting equipment using a lift or forklift, ensure the forks are properly positioned to prevent the equipment from falling. Before moving the equipment, secure it with ropes to the lift or forklift. Designate specific personnel to care for the equipment during transport.
- | Choose sea routes, roads in good condition, or airplanes for transport. Do not transport equipment by rail. Avoid tilting or shaking the equipment during transport.

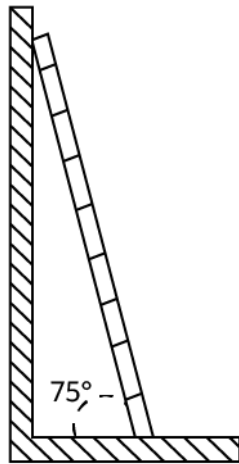
Use of stairs

- | Use wooden or insulated ladders when working at height on live lines.
- | Platform ladders with guardrails are preferred. Single ladders are not recommended.
- | Before using a ladder, check that it is intact and confirm its load-bearing capacity. Do not overload it.
- | Make sure the ladder is positioned securely and firmly.



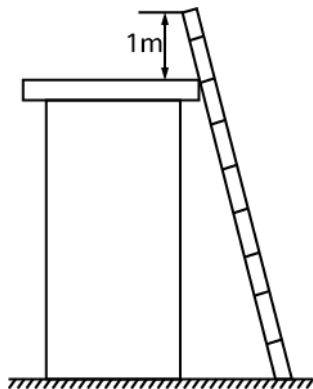
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- | When climbing a ladder, keep your body stable and your center of gravity between the side rails, and do not stretch your body beyond the sides.
- | When using a stepladder, make sure the pull cords are secure.
- | If using a simple ladder, the recommended angle for support on the ground is 75 degrees, as shown in the following figure. A set square can be used to measure the angle.



PI02SC0008

- | If using a single ladder, make sure the wider end of the ladder is at the bottom and take protective measures to prevent the ladder from slipping.
- | If you are using a single ladder, do not climb more than the fourth step from the top.
- | If you use a single ladder to climb onto a platform, make sure the ladder is at least 1 m higher than the platform.

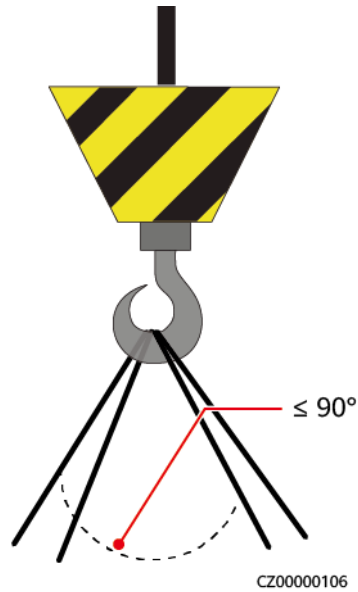


PI02SC0009

Elevation

- | Only qualified and trained personnel are permitted to perform equipment lifting operations.
- | Install warning signs or temporary fencing to isolate the lifting area.
- | Make sure the base where the lift is being used meets the load capacity requirements.
- | Before lifting objects, ensure that lifting tools are securely attached to fixed objects or walls that meet the load capacity requirements.

- I During lifting, do not stand or walk under the crane or any elevated objects.
- I Do not drag wire ropes or lifting tools, and do not hit lifted objects against hard objects during lifting operations.
- I Make sure the angle between two lifting ropes is no more than 90 degrees, as shown in the following figure.



Drilling holes

- I Obtain client and contractor consent before drilling holes.
- I When drilling holes, wear protective equipment such as safety glasses and protective gloves.
- I To avoid short circuits or other hazards, do not drill holes in pipes or embedded cables.
- I When drilling holes, protect equipment from chips. After drilling, clean up any debris.

2 Product description

Functions

- I SmartGuard can perform grid-connected and islanded mode switching, as well as load management. Its main function is to switch the inverter between grid-connected and islanded mode. When the grid is available, the inverter operates in grid-connected mode, with the grid and inverter ensuring power supply for both backup and non-backup loads. When the grid fails, the inverter quickly switches to islanded mode, supplying power only to the backup loads. If the power plant is equipped with a generator, when the SOC of the energy storage system (ESS) is lower than **ESS SOC threshold for generator start**, the generator starts and supplies power to the backup and non-backup loads. In turn, the excess power generated by the generator can be used to charge the ESS. When the SOC of the ESS reaches the **ESS SOC threshold for generator shutdown**, the generator shuts down, and the ESS supplies power only to the backup loads. Once the grid has recovered, the inverter will automatically switch to grid-connected mode.
- I The SmartGuard seamless switching feature must be enabled manually. If this feature is enabled, a system with a MAP0 inverter installed will switch to island mode within 20 ms of a power failure or anomaly, ensuring uninterrupted power supply to IT equipment, such as computers connected to the backup loads port. For details, see the section [6.4.3 Whole Home Power Backup Settings \(Seamless Switching\)](#).
- I The SmartGuard features an integrated EMMA, which can be connected to the PV system, ESS, and smart chargers and loads. In addition to unified home energy planning, the EMMA can be connected to smart loads, such as chargers, SG Ready heat pumps, and smart switches. Users can reserve a schedule in advance to charge vehicles and heat water at a specified time. Additionally, users can prioritize PV energy use for devices as needed to maximize their energy use.

2.1 Model Number Description

This document refers to the following product models:

- | SmartGuard-63A-T0
- | SmartGuard-63A-AUT0

Figure 2-1 Model number

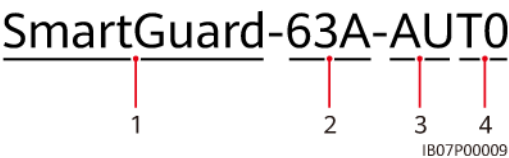


Table 2-1 Model Number Description

No.	Concept	Description
1	Product family name	SmartGuard: Whole Home Backup
2	Maximum current	63 A: The total load current is less than or equal to 63 A. The maximum current of the power grid port is 63 A.
3	Region	AU: Australia/New Zealand/South Africa
4	Product code	T0: Whole house three-phase backup system

2.2 Networking

Classification of loads connected to the SmartGuard

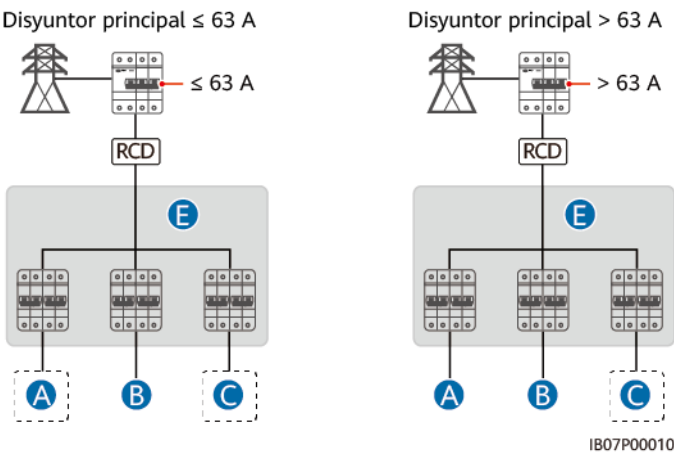
 **ATTENTION**

If the power of the backed-up loads exceeds the maximum island mode power of the system, the inverter may shut down due to an overload. In this case, it is necessary to turn off some loads. Alternatively, connect lower-priority loads to the non-backup load port.

If the generator installed in the power plant operates in island mode and the power of the loads exceed the generator's capacity, the generator may shut down due to overload. It is recommended to turn off some loads.

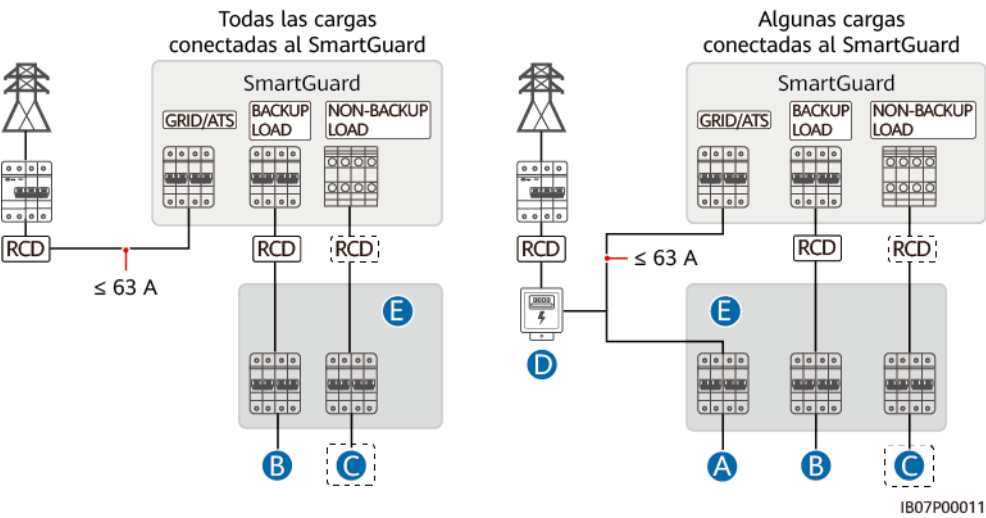
If the rated current of the main circuit breaker is 63A or less, they can be connected all or some of the loads to the SmartGuard. However, if the rated current is greater than 63 A, only some of the loads can be connected to the SmartGuard.

Step 1 Residential Load Classification (small striped boxes show optional components)



Main circuit breaker	Connecting all loads to the SmartGuard	Connection of some loads to the SmartGuard
$\leq 63\text{ A}$	It is admitted	It is admitted
$> 63\text{ A}$	Not allowed	It is admitted

Step 2 Classification of loads connected to the SmartGuard (small striped boxes indicate optional components)



- (A) Load not connected to SmartGuard
- (B) Backed load
- (C) Load without backrest
- (D) Power meter
- (E) AC power distribution box

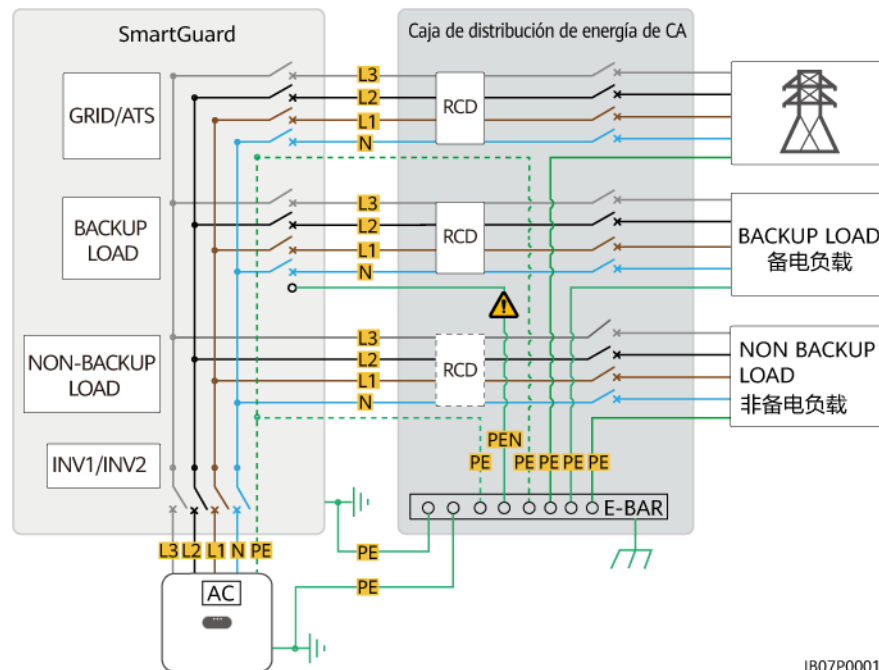
---- End

Residential Wiring Diagrams

NOTE

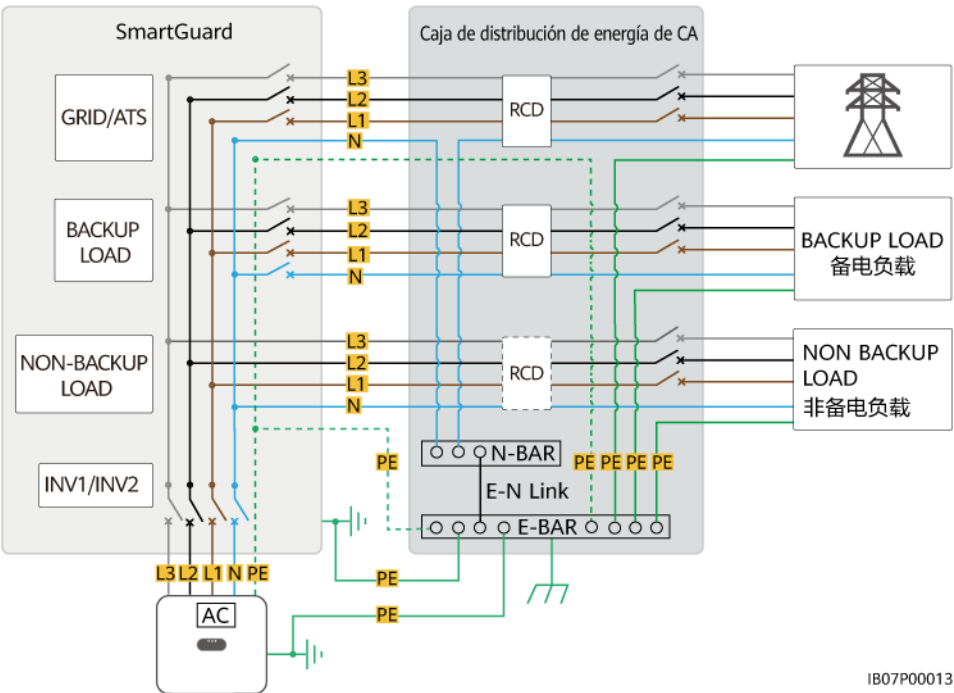
- I Ensure that the neutral conductors of the backup load, utility grid, non-backup load, and inverter are not connected outside of the SmartGuard.
- I The PEN cable with the icon  must be connected to the ground bar of the AC power distribution box.

Figure 2-2 SmartGuard-63A-T0 Residential Wiring Diagram (small dashed lines show optional cable connections)



IB07P00012

Figure 2-3SmartGuard-63A-AUT0 Residential Wiring Diagram (small dashed lines show optional cable connections)



Networking

The SmartGuard is used in a residential rooftop system, both on and off the grid. The system consists of PV strings, an ESS, an inverter, a SmartGuard, the grid, a generator, and loads.

Figure 2-4Networking with all loads connected to the SmartGuard (small striped boxes indicate optional components)

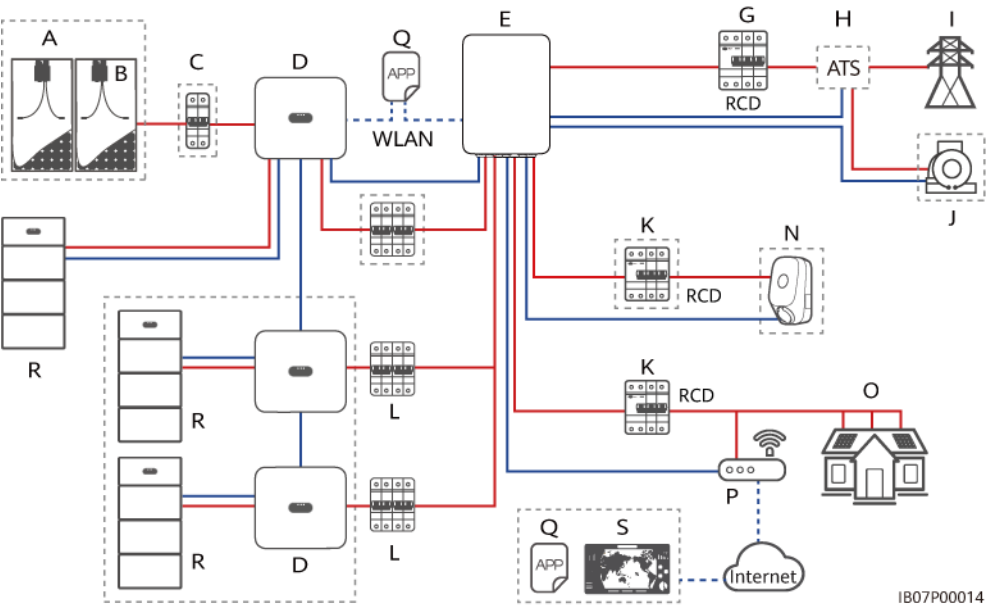
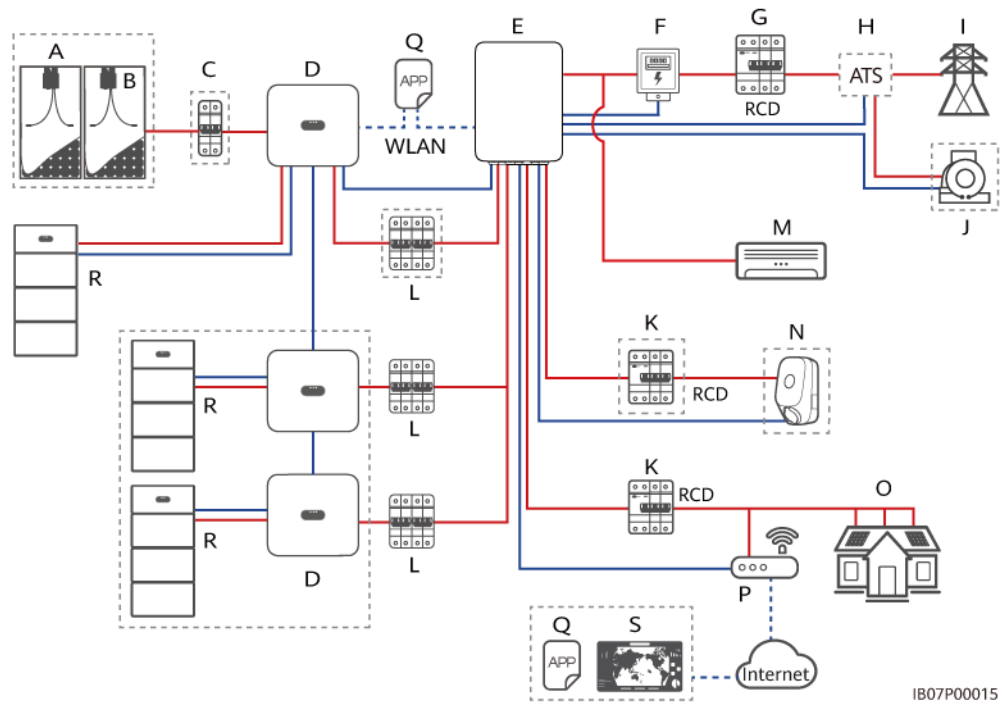


Figure 2-5Networking with some loads connected to the SmartGuard (small striped boxes indicate optional components)



IB07P00015

- | | | |
|--|--|-------------------------------------|
| (A) String FV | (B) Smart PV Optimizer | (C) DC switch |
| (D) Investor | (E) SmartGuard | (F) Power meter |
| (G) Main circuit breaker | (H) ATS | (I) Power grid |
| (J) Generator | (K) Residual differential device (RDD) | (L) Inverter AC switch device (RDD) |
| (M) Load not connected to SmartGuard | (N) Load without backrest | (O) Backup load |
| (P) Router | (Q) FusionSolar Application | (R) Battery |
| (S) FusionSolar Smart PV Management System (SmartPVMS) | | |



DANGER

- IA DDR must be installed for backup charging. During operation without mains, the main circuit breaker does not provide protection. Electrical leakage from the loads may cause electric shock. The rated voltage of the DDR must be at least 415 VAC. Its rated residual operating current must be $\geq$ the number of M1 or MAP0 inverters $\times$ 100 mA or $\geq$ the number of MB0 inverters $\times$ 300 mA.
- IA main circuit breaker with leakage protection function must be installed. Its rated voltage must be at least 415 VAC. Its rated residual operating current must be $\geq$ number of M1 or MAP0 inverters $\times$ 100 mA or $\geq$ number of MB0 inverters $\times$ 300 mA.
- IA maximum of three MAP0 inverters can be connected in parallel. If necessary, to connect two MAP0 inverters to the same port, first connect them in parallel.



NOTE

- | — indicates a power cable, — indicates a signal cable and - - - indicates communication wireless.
- | Only the MAP0 inverter can be connected to a generator.
- | The SmartGuard seamless switching feature must be enabled manually. If this feature is enabled, a system with a MAP0 inverter installed will enter island mode within 20 ms of a power failure or anomaly, ensuring an uninterrupted power supply to IT equipment, such as computers connected to the port for backup loads. For details, see the "[6.4.3 Whole Home Power Backup Settings \(Seamless Switching\)](#)".
- | If a charger is configured, it must be installed in a port for non-backup charging.
- | The SmartGuard has an integrated EMMA. The EMMA can connect to the router via FE or WLAN. If WLAN is used, the router must be close to the SmartGuard.
- | A charger can be connected to the EMMA via FE or to the router via FE or WLAN. Two chargers must only be connected to the router via FE or WLAN. Do not connect one charger to the EMMA and the other to the router at the same time.
- | When the SG Ready heat pump provides 12 V power, the EMMA controls the heat pump directly. When the SG Ready heat pump cannot provide 12 V power, the EMMA controls the heat pump via an external relay.
- | The EMMA supports smart switching devices (including smart plugs, circuit breakers, and relays). Smart switching devices connect to the router connected to the EMMA via FE or WLAN. For details, see the [Residential Smart PV Solution User Manual \(EMMA and SmartGuard Grid Connection\)](#).

System power in island mode

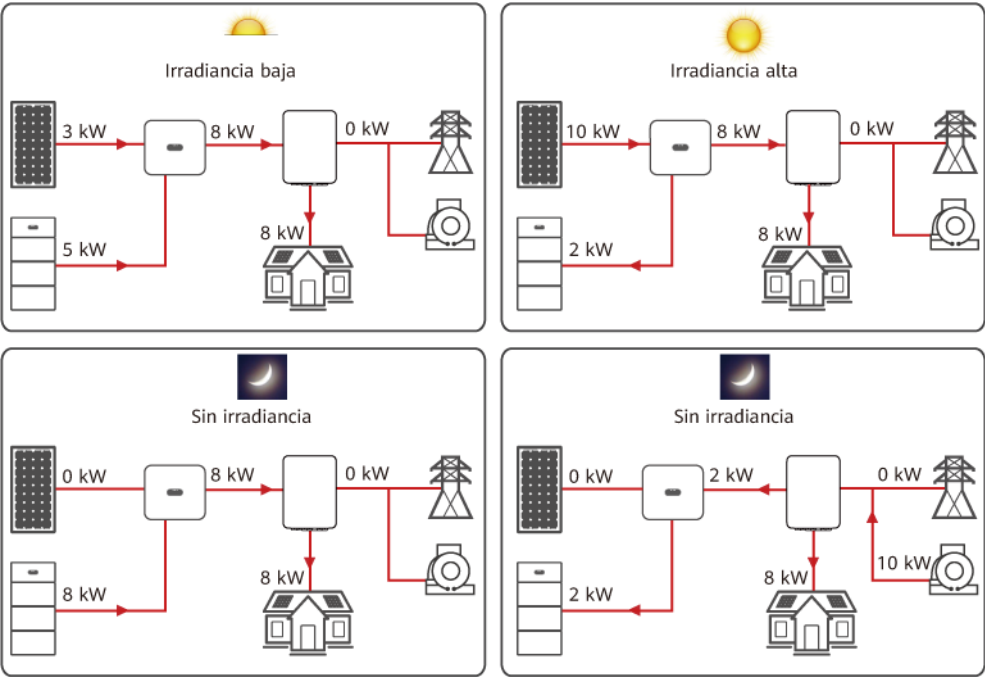
1. The maximum system power in island mode depends on the capacity of the ESS and the off-grid power of the inverter. The maximum system power in island mode is described below using an inverter with an off-grid power of 8 kW and an ESS with a capacity of 21 kWh as an example.

WARNING

Island mode feed priority: PV power generation > Discharge
ESS > Generator Power Generation

The ESS models of the same power plant must be identical. To know
For details on ESS capacity configuration, see the [LUNA2000-\(5-30\)-S0 User Manual](#) and the [LUNA2000-\(7, 14, 21\)-S1 User Manual](#).

Figure 2-6 Illustration of maximum power in island mode



IB07P00016

2. Off-grid power of inverters

Table 2-2SUN2000-(3KTL-12KTL)-M1

Parameter	SUN2000-3 KTL-M1	SUN2000-5 KTL-M1	SUN2000-6 KTL-M1	SUN2000-8 KTL-M1	SUN2000-1 0KTL-M1	SUN2000-1 2KTL-M1
Power without connection to the power grid	3000 W	3300 W	3300 W	3300 W	3300 W	3300 W

Table 2-3SUN2000-(12K-25K)-MB0

Parameter	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
Power without connection to the power grid	8300 W	8300 W	8300 W	8300 W	8300 W

Table 2-4SUN5000-(17K, 25K)-MB0

Parameter	SUN5000-17K-MB0	SUN5000-25K-MB0
Power without connection to the power grid	8300 W	8300 W

Table 2-5SUN2000-(5K-12K)-MAP0

Parameter	SUN2000-5K-MAP0	SUN2000-6K-MAP0	SUN2000-8K-MAP0	SUN2000-10K-MAP0	SUN2000-12K-MAP0
Power without connection to the power grid	5000 W	6000 W	8000 W	10,000 W	12,000 W

Table 2-6SUN5000-(8K, 12K)-MAP0

Parameter	SUN5000-8K-MAP0	SUN5000-12K-MAP0
Power without connection to the power grid	8000 W	12,000 W

Functions of residential charges

1. When the inverter is in island mode, the maximum current and duration of the loads must not exceed the inverter's island mode operating capacity. Stable system operation is affected by both the continuous power of the loads and the inrush current during load startup.
2. To ensure that loads can start and operate properly, do not turn on or start the following typical devices at the same time, or reduce the number of typical devices connected.

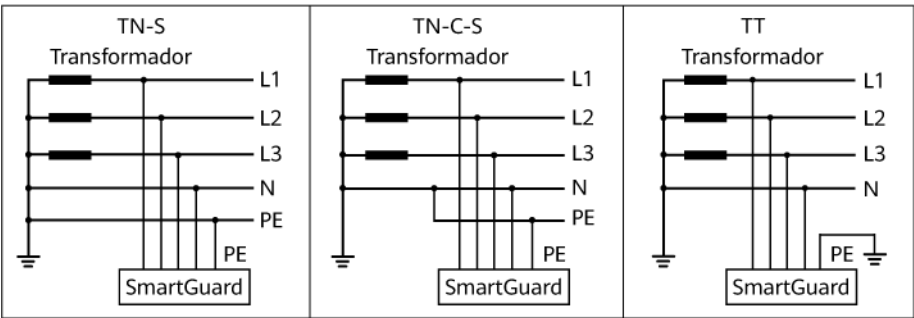
Table 2-7Characteristics of residential loads

Feature of the load	Loads	Cause
Current of high start (engine)	Air conditioned, electric saws and bombs	Starting the load requires a high starting current, which may exceed the inverter's maximum output current. Even if the load power is within the system's island-mode operating power range, the loads may not be able to start.
Dynamic power	Washing machines, milk machines soybeans, rice cookers and electric ovens	When the system is operating correctly, the power of adjacent loads that are in operation fluctuates.
Harmonic current high	Kitchens of induction and hair dryers	Non-sinusoidal current can cause total harmonic distortion of the output voltage (THDv).
Overcurrent high transient	Charger computers laptops, purifier of water, projector, etc	When a device containing a switching power supply is connected to the power source, the device's energy storage component receives a high turn-on surge current.

Supported grounding systems

The SmartGuard supports TN-S, TN-CS, and TT systems. In the TT power grid, the voltage from N to PE must be less than 30 V.

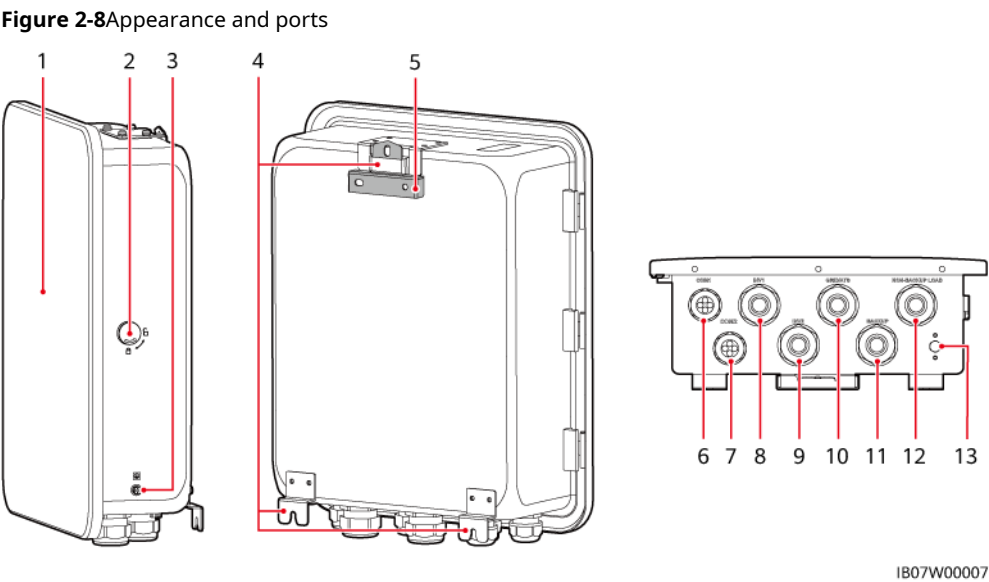
Figure 2-7Grounding systems



IB07P00017

2.3 Appearance

Appearance and ports



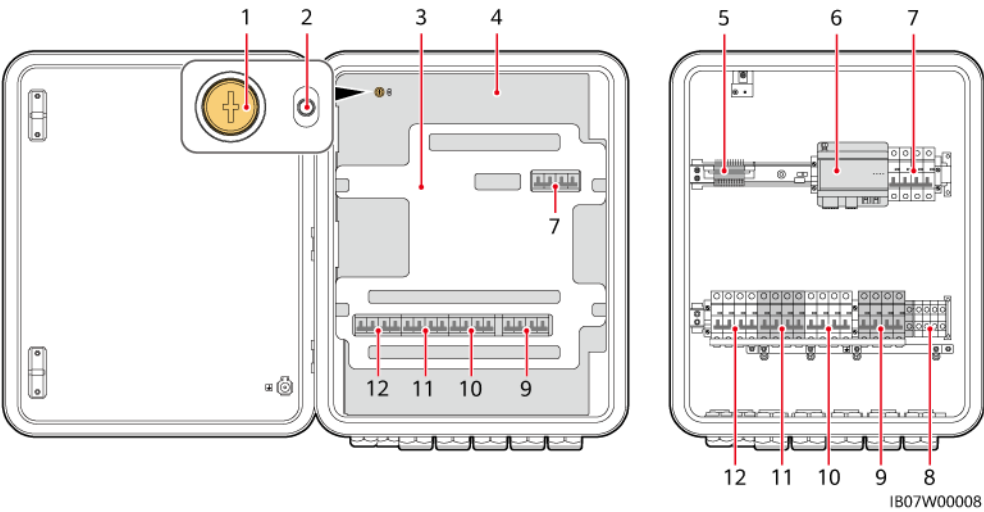
- | | |
|--|---------------------------------------|
| (1) Maintenance compartment door | (2) Lock |
| (3) Ground screw | (4) Mounting kits |
| (5) Mounting bracket | (6) Communications port (COM1) |
| (7) Communications port (COM2) | (8) Inverter AC input port (INV1 63A) |
| (9) Inverter AC input port (INV2 32A) | (10) Grid AC output port (GRID/ATS) |
| (11) Port for backup loads (BACKUP LOAD) | (12) Non-backup load port |
| (13) Vent valve | |

NOTE

Note (a): Before opening the maintenance compartment door, turn off the main circuit breaker, turn off the inverter, and turn off the DC switches of the inverter and battery.

Maintenance compartment and wiring terminals

Figure 2-9Maintenance compartment and wiring terminals



- (1) Maintenance compartment cover screw

(2) LED indicator

(3) Cushioning material

(4) Maintenance compartment cover

(5) SmartGuard signal cable terminal

(6) EMMA

(7) Bypass switch

(8) Terminal for non-backup loads (NON-BACKUP LOAD)

(9) Terminal for backup loads (BACKUP LOAD)

(10) Grid AC output terminal (GRID/ATS)

(11) Inverter AC input terminal 2 (INV2)

(12) Inverter AC input terminal 1 (INV1)

 WARNING

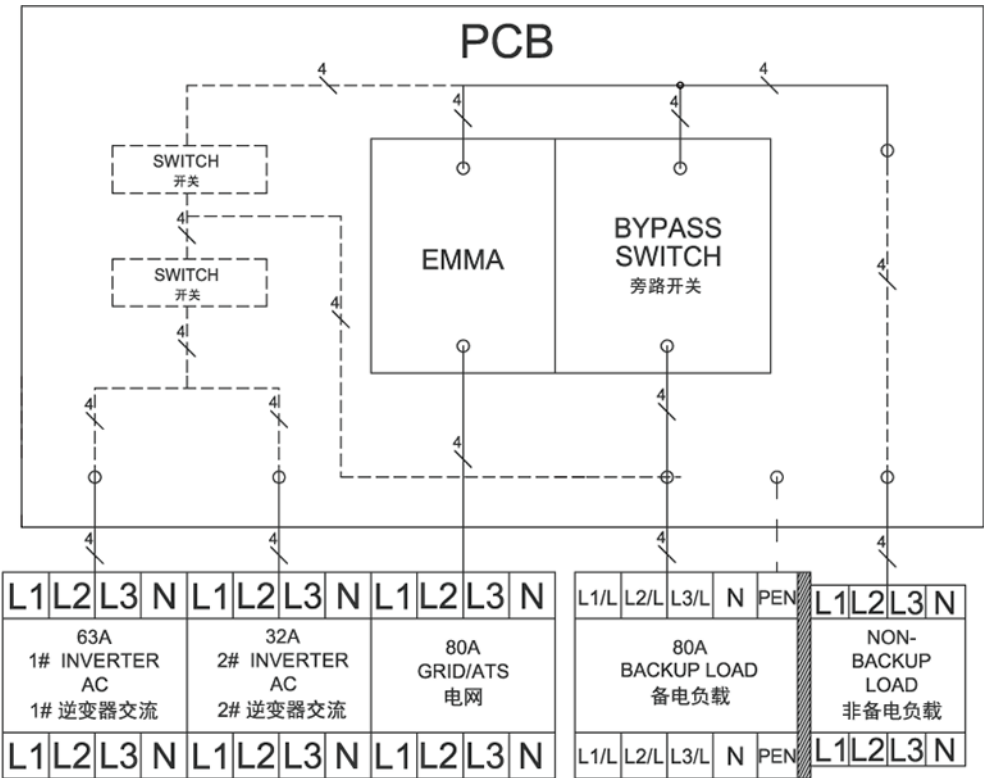
- Note (a): Only authorized personnel may open the maintenance compartment cover to make electrical connections.
- Note (b): During normal use, do not perform operations with the bypass switch and ensure it is turned off.

 NOTE

- Note (c): Dispose of removed cushioning materials according to waste sorting regulations.

2.4 Operating principles

Figure 2-10SmartGuard electrical diagram



2.5 Operating modes

- l The SmartGuard can operate in three modes: grid-connected, island mode, and island mode with a generator.
- l Power supply priority: grid-connected > island mode > island mode with generator

Figure 2-11Operating modes

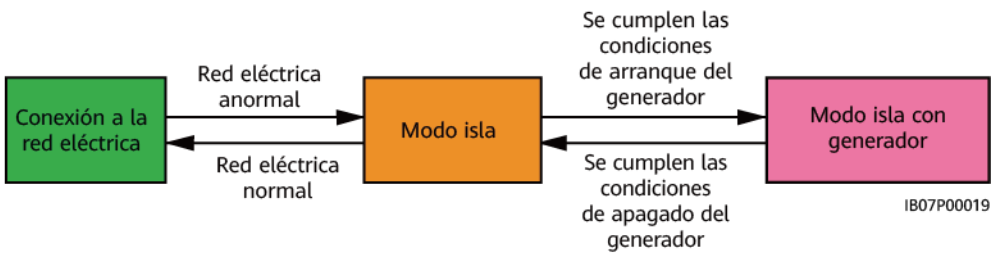


Table 2-8Changing the operating mode

Mode of commutation	Description
Commutation automatic	The SmartGuard automatically switches between modes operation according to actual and operating conditions. Seamless switching from connected mode to Grid island mode can be enabled or disabled. For details, see the “6.4.3 Whole Home Power Backup Settings (Seamless Switching)”.
Commutation forced	If pressedChangewhen the system is connected to the network power supply, it will be forced into island mode. If the system fails or has been manually returned to grid-connected mode, it will automatically exit forced switchover mode. If pressedChangeWhen the system is in island mode, this It will attempt to switch to grid-connected mode and will automatically exit hard-switch mode. For details, see the “6.5.2 Switching forced”.

2.6 Description of the labels

Chassis labels

Table 2-9Description of chassis labels

Label	Name	Description
	Warning of discharge electric	Only authorized personnel may open the fuel compartment cover. maintenance.
	See the documentation	Reminder for operators to read the SmartGuard user manual.

Label	Name	Description
	Warning of operation	During normal use, do not perform operations with the bypass switch and make sure it is off. If the SmartGuard has anomalies and can't work, please consult customer service staff and refer to the "7.4 Operations with the SmartGuard Bypass Switch". Incorrect operations may cause electric shock.
	Warning of discharge electric	Turn off the power supply and remove metal objects (such as watches and rings) before carrying out the maintenance.
	Discharge deferred	After the ignition of the SmartGuard, high voltage present. Only technicians Suitable and qualified electricians are allowed to install the SmartGuard and perform operations with it. After the shutdown of the SmartGuard, there is residual voltage present. Wait 5 minutes for the SmartGuard to discharge to a safe voltage.
	Warning of burn	Do not touch the SmartGuard, as the chassis becomes hot when in operation.
	Warning of grounding	Ground the SmartGuard before turning it on.
	Label of discharge electrostatics	Do not touch the SmartGuard cards.
	QR Code for the connection WLAN	Scan the QR code to connect to the SmartGuard WLAN.

Label	Name	Description
	Grounding	Indicates the connection position of the ground wire.

Product identification plate

Figure 2-12Identification plate (SmartGuard-63A-T0 device used as an example)



- (1) Make and model
- (2) QR code to access product documentation
- (3) Key technical specifications
- (4) Symbols of accordance
- (5) Company name and country of origin

NOTE

The nameplate figure is included for reference only.

3

Storage requirements

If the SmartGuard is not put into use immediately, the following requirements must be met when storing it:

- | Do not unpack the SmartGuard.
- | Maintain storage temperature between -40°C and +70°C, and relative humidity between 5% and 95%.
- | Store the SmartGuard in a clean, dry place and protect it from dust and moisture.
- | The SmartGuard can be stacked up to six levels high. To avoid personal injury or damage to devices, stack SmartGuards carefully to prevent them from falling.
- | During storage, check the SmartGuard periodically (recommended: once every three months). Replace packaging materials damaged by insects or rodents promptly.
- | If the SmartGuard has been stored for more than two years, it should be inspected and tested by a professional before use.

4System Installation

4.1 Installation modes

The SmartGuard can be installed on a wall.

Table 4-1Installation modes

Installation mode	Screw specifications	Description
Wall mounting	M6×60 Stainless Steel Expansion Screw	Delivered with the product

4.2 Installation position

4.2.1 Site selection requirements

Basic requirements

- | The SmartGuard has an IP55 protection level and can be installed indoors or outdoors.
- | Do not install the SmartGuard where it is easy to touch, as the chassis temperature is high when the equipment is in operation.
- | Do not install the SmartGuard near flammable or explosive materials. Keep the SmartGuard out of reach of children.
- | The SmartGuard corrodes in salt-affected areas, and salt corrosion can cause fires. Do not install the SmartGuard outdoors in salt-affected areas. The term “salt-affected area” refers to a region located up to 500 m from the coast or exposed to sea breezes. Areas exposed to sea breezes vary depending on weather conditions (such as typhoons and monsoons) or terrain (such as seawalls and hills).
- | Install the SmartGuard in a well-ventilated location to ensure good heat dissipation.

- | It is recommended to install the SmartGuard in a covered area or with a protective awning.
- | Do not install the SmartGuard in a location exposed to direct sunlight. Otherwise, its performance may be reduced or overheating protection may be activated.
- | It is recommended that the SmartGuard be installed next to the AC power distribution box and away from the sleeping area. When the SmartGuard switches between grid connection and island mode, it makes a clicking sound.

Mounting structure requirements

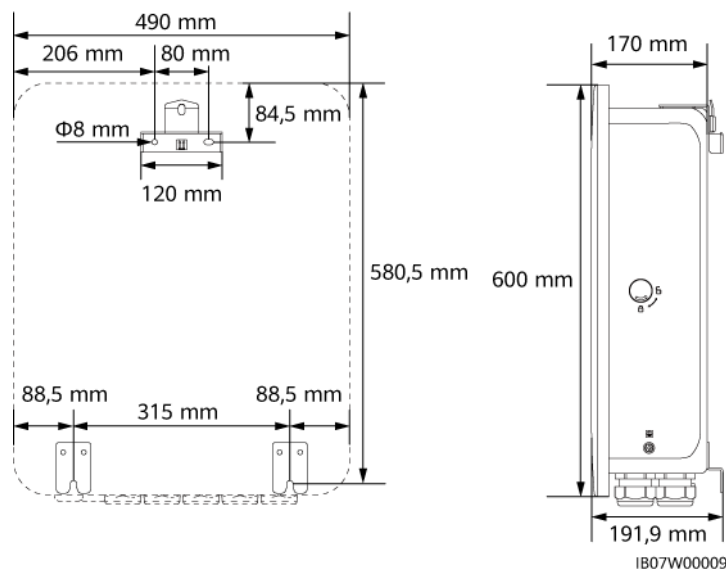
- | Ensure the structure where the SmartGuard is installed is fire-resistant. Do not install the SmartGuard over flammable building materials.
- | Make sure the surface on which the SmartGuard is installed is solid enough to support its weight.
- | In residential areas, to avoid disturbing residents, do not install the SmartGuard on plasterboard walls or walls made of similar materials that have poor sound insulation.

4.2.2 Spacing Requirements

Installation spacing requirements

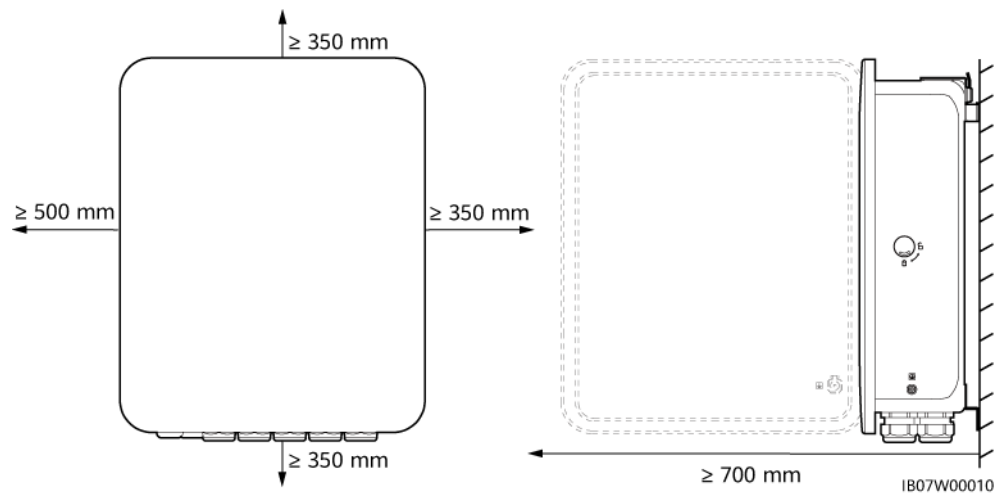
Mounting hole dimensions for the SmartGuard

Figure 4-1 Mounting bracket dimensions



- | Allow sufficient space around the device for installation, opening and closing of doors, and heat dissipation.

Figure 4-2Free spaces

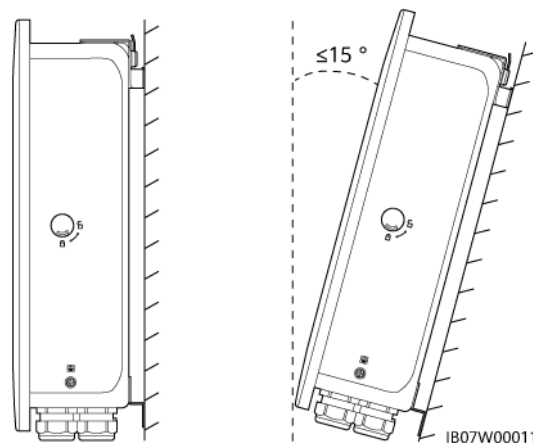


4.2.3 Angle Requirements

The installation angle requirements are as follows:

- I Install the SmartGuard vertically or with a maximum backward tilt of 15 degrees to facilitate heat dissipation.
- I Do not install the SmartGuard with a forward tilt, an excessive backward tilt, a sideways tilt, horizontally, or upside down.

Figure 4-3Installation angle



4.3 Preparing the tools

Table 4-2Personal protective equipment (PPE)

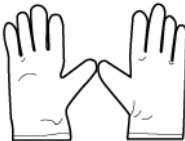
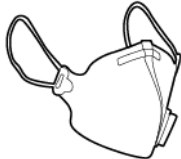
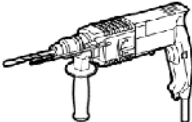
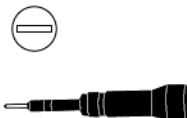
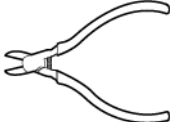
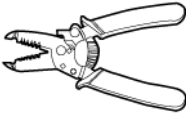
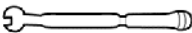
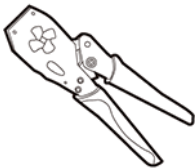
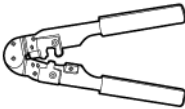
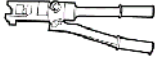
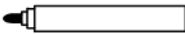
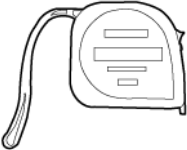
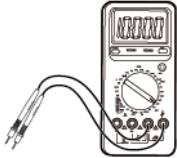
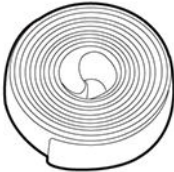
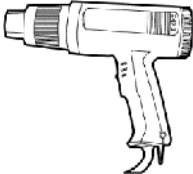
 Safety helmet	 Goggles	 Reflective vest	 Insulating footwear
 Gloves antistatic (protection against discharge electrostatics)	 Insulating gloves	 Protective gloves	 Dust mask

Table 4-3Installation tools

 Hammer drill Drill bit: $\Phi 8$ mm, $\Phi 6$ mm	 Screwdriver dynamometric isolated head flat	 Screwdriver dynamometric Phillips insulated	 Adjustment wrench dynamometric isolated
 Cable cutter	 Cutting pliers	 Wire strippers	 Key dynamometric

 Tool crimping machine cables of feeding	 Tool crimping tool for RJ45	 Hydraulic pliers	 Tool of ejection
 Cutter	 Marker	 Tape measure steel	 Clamp for cables
 Multimeter	 Level	 Macaroon heat shrinkable	 Air gun hot
 Rubber mallet	 Vacuum cleaner	-	-

4.4 Pre-installation check

Checking the external packaging

Before unpacking the product, check the outer packaging for damage (such as holes or tears) and check the product model. If damage is detected or if the model is not the one you ordered, do not unpack the product and contact your supplier as soon as possible.

WARNING

It is recommended that packaging materials be removed up to 24 hours prior to product installation.

Checking the delivered products

After unpacking the SmartGuard, check that the delivered products are intact and complete, and that there is no obvious damage. If any items are missing or damaged, please contact your supplier.

 NOTE

For details on the quantity of products delivered, please refer to the *packing list* which is located inside the equipment box.

4.5 Moving the SmartGuard

Place your hands on both sides of the SmartGuard, remove it from the packaging, and move it to the installation position.

 ATTENTION

! Carry the SmartGuard carefully to avoid damage to the device and injuries to the people.

! Do not use the ports or wiring terminals located on the bottom as support for any part of the SmartGuard's weight.

! When you need to temporarily put the SmartGuard on the floor, use foam rubber, cardboard or other protective material to prevent damage to the computer chassis.

4.6 Wall mounting

Procedure

Step 1 Determine the hole drilling positions using the marking template, level the holes using a level, and mark the positions using a marker.

Step 2 Secure the mounting bracket.

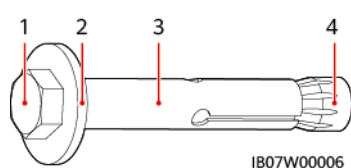
 DANGER

Avoid drilling holes in water pipes or power cables housed in the wall.

NOTE

- I The product comes with M6×60 expansion screws. If the length and quantity of the screws do not meet the installation requirements, please prepare M6 stainless steel expansion screws yourself.
- I The expansion bolts supplied with the product are used for solid brick and concrete walls. If installing on other types of walls, ensure the load-bearing capacity requirements are met and the appropriate bolts are selected.
- I To prevent expansion bolt installation from being hampered by excessive hole deviation in brick/concrete walls, it is recommended to use small drill bits or other installation hardware, such as plastic anchor bolts, to ensure a reliable installation. The service life of the installation hardware should be at least 10 years.

Figure 4-4 Components of expansion screws



(1) Screw
hexagonal

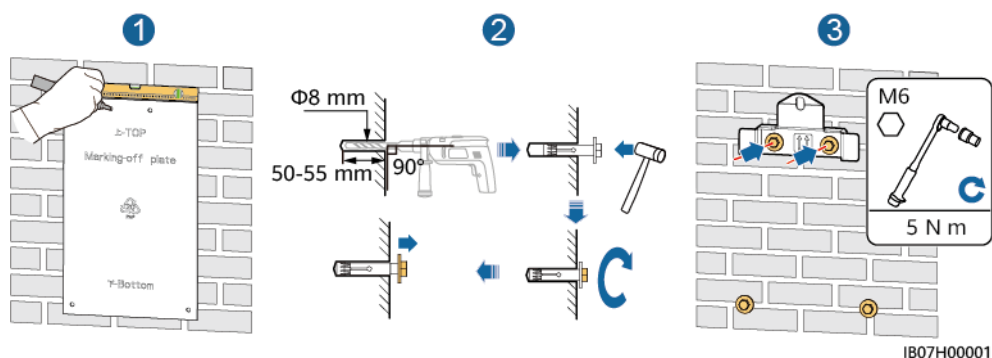
(2) Flat washer (3) Plug

(4) Conical nut

WARNING

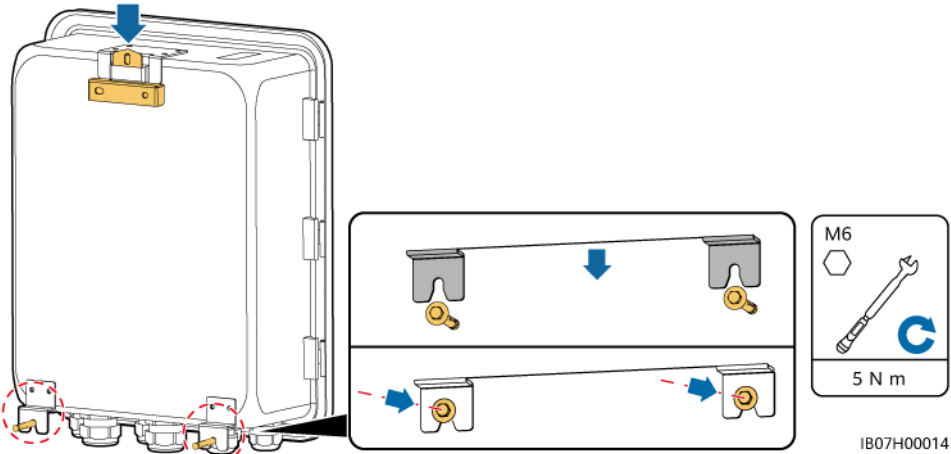
- I To avoid inhaling dust or getting it into your eyes, wear protective glasses and a dust mask when drilling the holes.
- I Use a vacuum cleaner to clean any dust left in and around the holes, and Measure the space. If the hole positions are incorrect, drill them again.
- I Partially tighten the expansion screws and then remove the hex screws and the flat washers from the two upper expansion screws. Loosen the hex screws and flat washers from the two lower expansion screws.

Figure 4-5 Installing the expansion screws



Step 3 Install the SmartGuard onto the mounting bracket and tighten the nuts.

Figure 4-6Installing the SmartGuard



---- End

5 Electrical connections

Precautions

DANGER

Before connecting cables, make sure that the SmartGuard circuit breaker and all connected external switches are in the off state. **OFF**(off). Otherwise, high voltage may cause electric shock.

DANGER

The site must be equipped with fire extinguishing equipment suitable, such as refractory sand and carbon dioxide fire extinguishers.
Use personal protective equipment and specific insulated tools to avoid electric shocks or short circuits.

ATTENTION

To prevent debris from entering the equipment, stay away from it while preparing the cables. Cable debris can cause sparks and cause equipment damage, as well as personal injury.

WARNING

Damage to the device caused by incorrect cable connections is not covered by the product warranty.
Only qualified electrical technicians are allowed to connect the cables.
Operating personnel must wear personal protective equipment (PPE) suitable for connecting cables.
Before connecting cables to ports, leave enough slack to reduce strain of the cables and avoid bad connections.

NOTE

The wire colors shown in the electrical connection diagrams included in this section are for reference only. Select wires according to local wire specifications (green and yellow wires are used only for protective grounding).

5.1 Cable preparation

Figure 5-1Cable connections (small striped boxes show optional configuration)

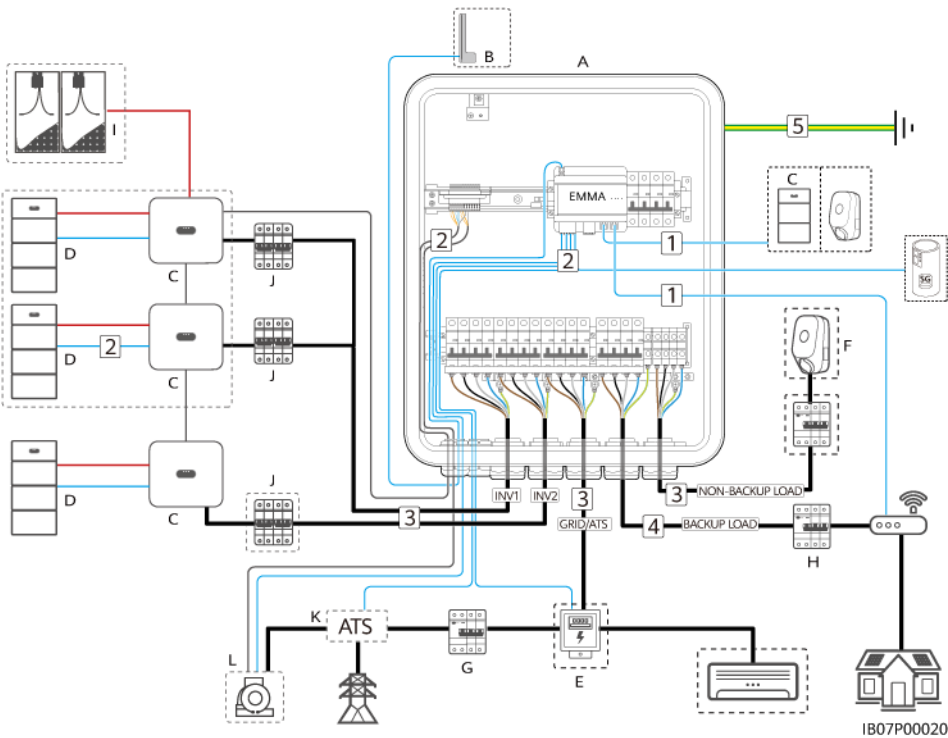


Table 5-1Description of components

No.	Component	Description	Origin
T0	SmartGuard	SmartGuard three-phase: If the SmartGuard is used with inverters of the series MAP0, its backup load port, can be connected to single-phase and three-phase loads. If the SmartGuard is used with inverters of the series M1 and MB0, their backup load ports, can only be connected to single-phase loads. Three-phase loads must be connected to the non-backup load ports.	It is purchased at Huawei

No.	Component	Description	Origin
B	WLAN antenna external	If you do not want to use a FE network cable and the quality of the signal is poor, an external antenna can be installed to improve WLAN signals. IPart number: 27014721	It is purchased at Huawei
C	Investor	I SUN2000-(3KTL-12KTL)-M1 I SUN2000-(12K-25K)-MB0 I SUN5000-(17K, 25K)-MB0 I SUN2000-(5K-12K)-MAP0 I SUN5000-(8K, 12K)-MAP0	It is purchased at Huawei
D	ESS	I LUNA2000-(5-30)-S0 I LUNA2000-(7, 14, 21)-S1	It is purchased at Huawei
AND	Meter of power	Recommended power meter models are DTSU666-H, DTSU666-H 250 A/50 mA, DTSU666-HW, YDS60-80, DTSU71, DHSU1079-CT and YDS60-C24.	It is purchased at Huawei
F	Charger	I SCharger-22KT-S0 I SCharger-7KS-S0	It is purchased at Huawei
G	Circuit breaker major	The main circuit breaker must have leakage protection function, and its rated voltage must be at least 415 VAC. IIIts rated residual operating current $\geq$ amount of M1 or MAP0 $\times$ 100 mA inverters IIIts rated residual operating current $\geq$ amount of MB0 $\times$ 300 mA inverters	Preparation to customer charge
H	DDR	A DDR must be installed before backup charging, and its nominal voltage must be at least 415 VAC. IIIts rated residual operating current $\geq$ amount of M1 or MAP0 $\times$ 100 mA inverters IIIts rated residual operating current $\geq$ amount of MB0 $\times$ 300 mA inverters	Preparation to customer charge
Yo	String FV	A PV string is made up of PV modules connected in series and works with optimizers.	Preparation to customer charge

No.	Component	Description	Origin
J	AC switch of the investor	Use an AC input cable for the SmartGuard of the inverter that meets the recommended specifications in order to reduce the number of AC breakers required. For details, see the "Table 5-3". If an AC input cable is used with the recommended specifications for an inverter, and the current ratings of the AC breakers for the SmartGuard and the inverter do not match, install an AC breaker that meets the inverter's requirements to ensure that the inverter can be safely disconnected from the SmartGuard in the event of an exception.	Preparation to customer charge
K	ATS	In the grid + generator scenario, an ATS must be installed. Select an ATS based on the SmartGuard requirements. For details, see the "D ATS Parameter Requirements" .	Preparation to customer charge
L	Generator	Select a generator based on SmartGuard requirements and the power of your home's loads. For details, see the "E Generator Parameter Requirements" .	Preparation to customer charge

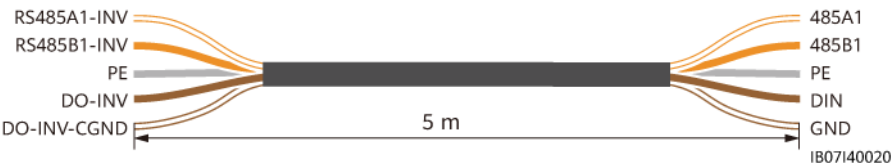
Table 5-2Cable description

No.	Wire	Guy	Specs recommended	Origin
1	Cable of communications FAITH (EMMA)	Recommended: CAT 5E outdoor shielded network cable (resistant internal ≤ 1.5 ohms/10 m) and shielded RJ45 connector	Driver's section: 0.12-0.2 mm² External diameter of the cable: 4-8 mm	Preparation to customer charge
2	Control signal cable heat pump	Two-conductor twisted pair cable for exteriors	Driver's section: 0.2-1 mm² External diameter of the cable: 4-8 mm	Preparation to customer charge
	Meter signal cable power			
	Sign of notification of position in case connection to the electrical grid			

No.	Wire	Guy	Specs recommended	Origin
	Generator signal cable	Outdoor multi-strand shielded twisted pair cable		
	Inverter signal cableto	Outdoor multi-strand shielded twisted pair cable	Driver's section: 0.2-1 mm2 External diameter of the cable: 4-8 mm	Preparation to charge of the customer It is purchased at Huawei (5m)
3	Input cable of AC of the inverter (INV1)	Without using the period equipotential bonding Protective earth (PE) at AC output port: four-wire copper wire conductors (L1, L2, L3 and N) for outdoors Using the point of equipotential bonding PE at AC output port: five-wire copper wire conductors (L1, L2, L3, N and PE) for outdoors	Driver's section: - M1 (3KTL-12KTL): 4-6 mm2 - MAP0 (5K-12K): 4-6 mm2 - MB0 (12K-25K): 10-16 mm2 External diameter of the cable: 10-32 mm	Preparation to customer charge
	Input cable of AC of the investor (INV2)			
	AC mains output cable electric	Without using the period equipotential bonding Protective earth (PE) at AC output port: four-wire copper wire conductors (L1, L2, L3 and N) for outdoors Using the point of equipotential bonding PE at AC output port: five-wire copper wire conductors (L1, L2, L3, N and PE) for outdoors	Driver's section: 4-16 mm2 External diameter of the cable: 10-32 mm	
	AC output cable for backup charging			
4	AC output cable for charging with backrestb	SmartGuard-63A-T0: Five-conductor outdoor copper cable (L1, L2, L3, N, and PEN)	Driver's section: 4-16 mm2 External diameter of the cable: 10-32 mm	Preparation to customer charge

No.	Wire	Guy	Specs recommended	Origin
		SmartGuard-63A-AUT0: four-strand outdoor copper cable conductors (L1, L2, L3 and N)		
5	Ground wire	Single-core copper cable for outdoor use and OT M6 terminal	Conductor section: 16 mm2	Preparation to customer charge
Note (a): The SmartGuard connects to the inverter via a signal cable purchased from Huawei (part number: 04072551), as shown in the following figure. Note (b): The PEN of the SmartGuard-63A-T0 backup upload port must be connected, but the PEN of the SmartGuard-63A-AUT0 backup upload port does not need to be connected.				

Figure 5-2Signal cable (purchased from Huawei) that connects the SmartGuard to the inverter



NOTE

- | The minimum cable cross-section must comply with local regulations.
- | Factors to consider when selecting cables include rated current, cable type, installation method, ambient temperature, and maximum acceptable line loss.
- | For details on how to connect the ESS to the inverter, refer to the inverter user manual.

5.2 Connecting a ground wire

Precautions

 **DANGER**

Make sure the ground wire is securely connected. Otherwise, electric shocks may occur.

Do not connect the neutral conductor to the chassis as a ground wire. Otherwise, electric shocks may occur.

NOTE

- I The AC output port ground point is used only as an equipotential grounding connection point; it cannot replace the chassis ground point.
- I It is recommended to apply silicone grease or paint around the ground terminal once the ground wire is connected.

Procedure

Step 1 Crimp an OT terminal.

WARNING

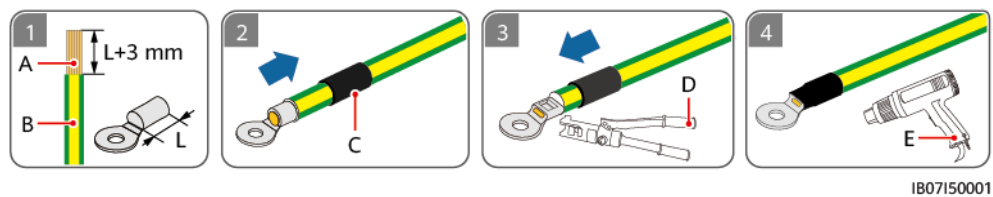
I Avoid scratching the wire core while stripping a wire.

I The cavity formed after crimping the conductor crimping area of the terminal OT must completely envelop the wire core. The wire core must make close contact with the OT terminal.

I Wrap the wire crimping area with heat shrink tubing or tape insulator. Heat-shrinkable macaroni is used as an example.

I Use the heat gun carefully to prevent damage to the equipment due to heat.

Figure 5-3 Crimping an OT terminal



(A) Wire core

(B) Insulation layer

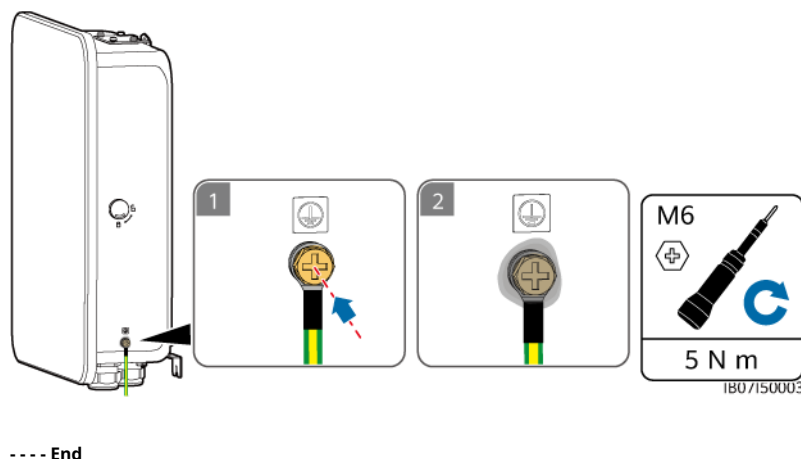
(C) Heat-shrinkable macaroni

(D) Hydraulic pliers

(E) Hot air gun

Step 2 Connect the ground wire.

Figure 5-4 Ground wire connection



5.3 Opening the maintenance compartment

Precautions

⚠ DANGER

- Before opening the maintenance compartment door, turn off the circuit breaker. main, turn off the inverter and turn off the DC switches of the inverter and battery.
- Before opening the maintenance compartment cover, turn off the circuit breaker. backup loads, the utility AC breaker, and the two inverter AC breakers inside the SmartGuard. Make sure the bypass breaker is off.
- During normal use, do not perform operations with the bypass switch and make sure that it is turned off.

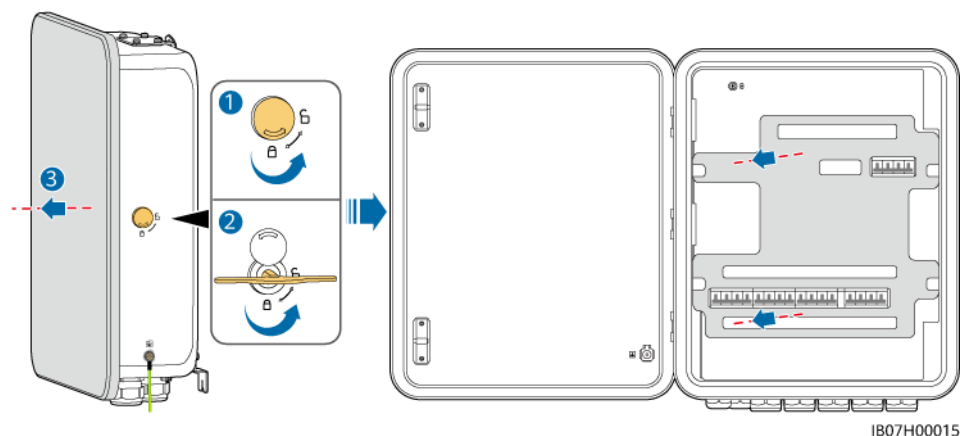
⚠ ATTENTION

- If it is necessary to open the maintenance compartment door on rainy days or snow, take protective measures to prevent rain or snow from entering the compartment. If protective measures are not possible, do not open the maintenance compartment door on rainy or snowy days.
- Do not leave unused screws in the maintenance compartment.

Procedure

- Step 1** Unlock and open the maintenance compartment door with the key provided and remove the cushioning materials.

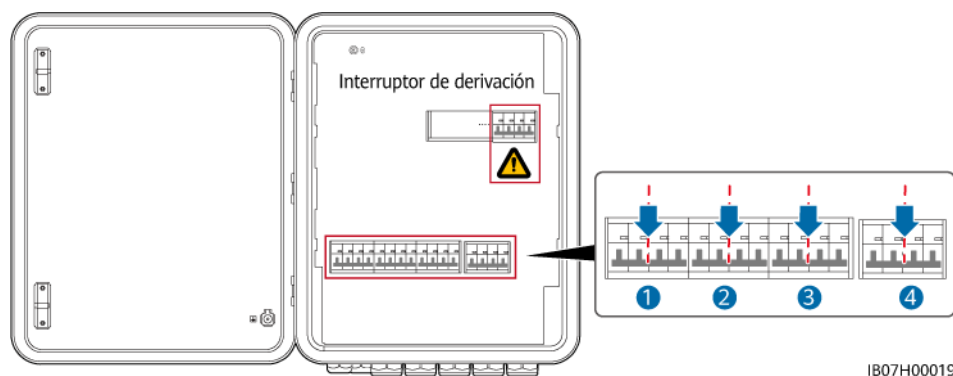
Figure 5-5 Opening the maintenance compartment door



NOTE

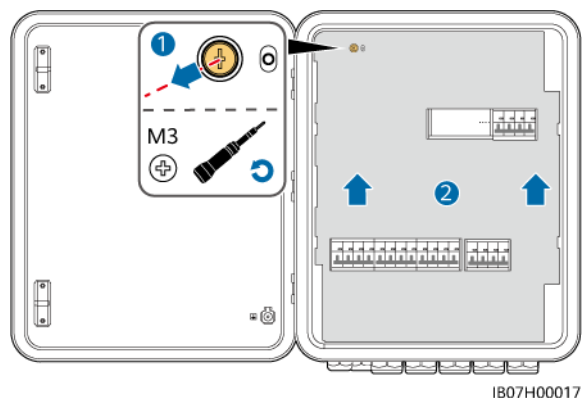
Dispose of removed cushioning materials according to waste sorting regulations.

Step 2 Turn off the four switches shown in the figure.



Step 3 Remove the screw from the maintenance compartment cover and open it.

Figure 5-6 Opening the maintenance compartment cover



---- End

5.4 Installing the AC mains output cable

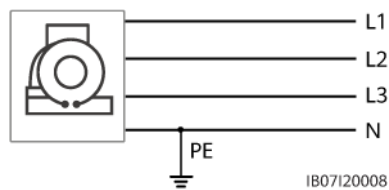
Precautions

- I A main circuit breaker with leakage protection function must be installed. Its rated voltage must be at least 415 VAC. Its rated residual operating current must be $\geq$ the number of M1 or MAP0 inverters $\times$ 100 mA or $\geq$ the number of MB0 inverters $\times$ 300 mA.
- I Ensure that the neutral conductors of the backup load, utility grid, non-backup load, and inverter are not connected outside of the SmartGuard.
- I Make sure all L1, L2, L3, and N cables are connected in the correct phase sequence. Do not connect the L cable to the N cable port. Otherwise, the loads may be damaged.

Procedure

- Step 1** If a generator is installed, its neutral conductor must be grounded. Otherwise, the SmartGuard will report a generator grounding exception alarm.

Figure 5-7 Grounding the generator's neutral conductor

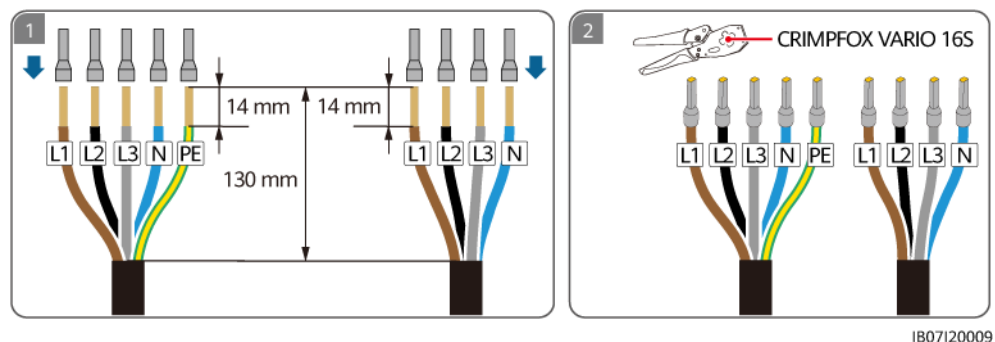


- Step 2** Crimping the end terminals of AC conductors. In a four- or five-conductor cable, the end terminals of AC conductors can be crimped.

NOTE

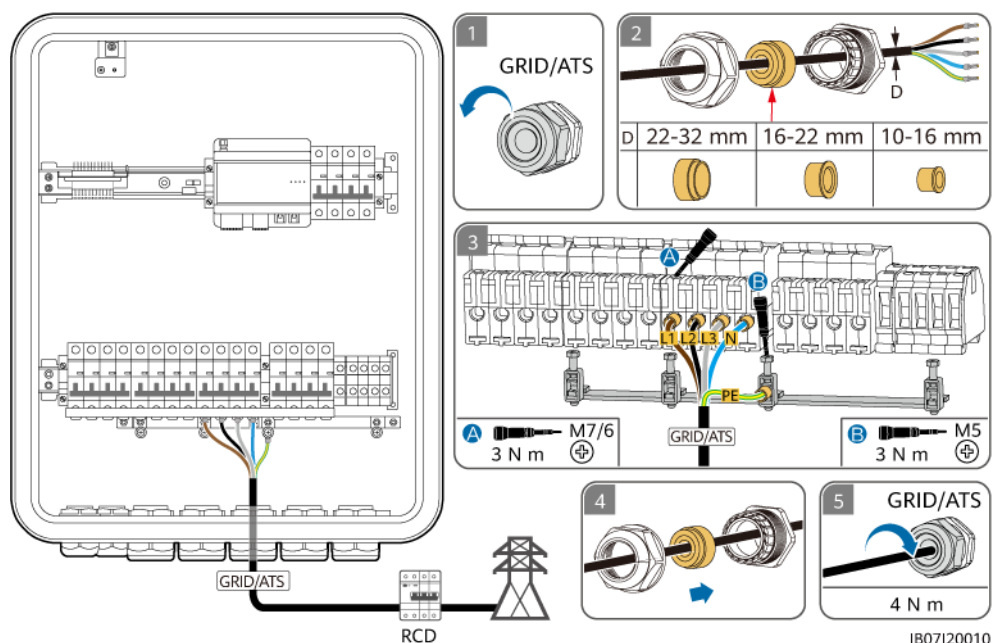
The AC conductor end terminals delivered with the product are mainly used for cables with a section of 16 mm². If cables with a cross section less than 16 mm are used, select AC conductor end terminals that meet the requirements of the case.

Figure 5-8 Crimping AC conductor end terminals



- Step 3** Connect the AC output cable to the mains power supply.

Figure 5-9 Connecting the AC output cable to the mains power supply



WARNING

- IFour-conductor cable and five-conductor cable connect in the same way, except that the PE is not connected in the case of the four-conductor cable.
- IThe grounding point of the AC output port is used only as a grounding point. equipotential grounding connection; it cannot replace the chassis grounding point.
- IMake sure the cable cover is inside the connector. IFully insert the exposed wire cores into the holes.
- IContact the AC output cable securely. Otherwise, the device may not work properly or the AC connector may be damaged.
- IMake sure the cables are not twisted.

NOTE

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

--- End

5.5 Installing the inverter AC input cable

Precautions

- I Turn off the inverter and turn off the DC switches of the inverter and ESS.
- I If an AC input cable with the recommended specifications for an inverter is used, and the current ratings of the AC breakers for the SmartGuard and the inverter do not match, install an AC breaker.

that meets the inverter requirements to ensure that the inverter can be safely disconnected from the SmartGuard in the event of an exception.

- | SUN2000-(5K-12K)-MAP0 and SUN5000-(8K, 12K)-MAP0 inverters cannot be connected together in a parallel system.
- | Ensure that the neutral conductors of the backup load, utility grid, non-backup load, and inverter are not connected outside of the SmartGuard.
- | Make sure all L1, L2, L3, and N cables are connected in the correct phase sequence. Do not connect the L cable to the N cable port.

Procedure

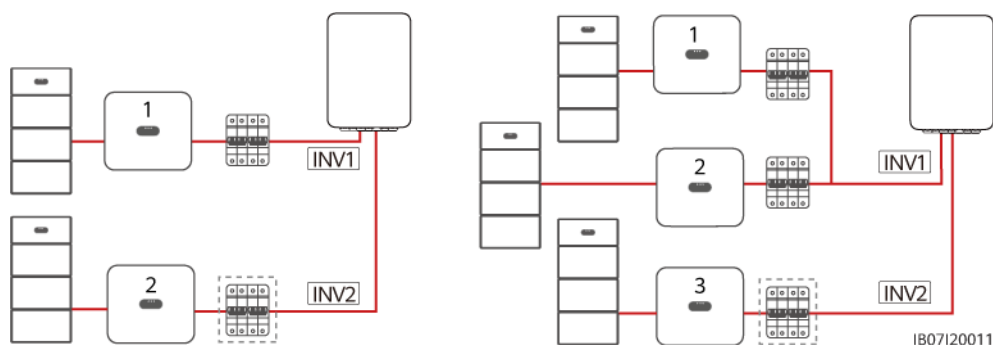
- Step 1** Connect the inverters to the SmartGuard according to the port requirements. Only the MAP0 model supports three or fewer inverters connected in parallel.

Table 5-3 SmartGuard Port Requirements

Investor	Amount of investors	Amount of investors connected to the port of the SmartGuard		Switch External AC	Specification it's from the cable	Specification is from switches from AC external
SUN2000-(1 2K-25K)-MB0	1	INV1 63A	1	Not required	Section of the driver: 10-16 mm2	If a switch is required External AC, select a switch Suitable AC of agreement with the standards and the local regulations of the sector. It recommends using a circuit breaker Three-phase AC with a voltage nominal greater than or equal to at 415 VAC and a stream nominal of: 15K and 6K: 16 TO 8K: 25 A 10K and 12K: 32 A
SUN5000-(1 7K, 25K)-MB0	1	INV1 63A	1	Not required	Diameter external of the cable: 10-32 mm	
SUN2000-(3 KTL-12KTL) - M1	1	INV2 32A	1	Not required	Section of the driver: 4-6 mm2	
SUN2000-(5 K-12K)-MAP0	1	INV2 32A	1	Not required	Diameter external of the cable: 10-32 mm	
	2	INV1 63A	1	It is required		
		INV2 32A	1	Not required		
	3	INV1 63A	2	It is required		
		INV2 32A	1	Not required		
SUN5000-(8 K, 12K)-MAP0	1	INV2 32A	1	Not required		
	2	INV1 63A	1	It is required		
		INV2 32A	1	Not required		
	3	INV1 63A	2	It is required		
		INV2 32A	1	Not required		

Step 2(Optional) Connect two or three MAP0 inverters in parallel.

Figure 5-10MAP0 inverters connected in parallel (small striped boxes indicate optional components)

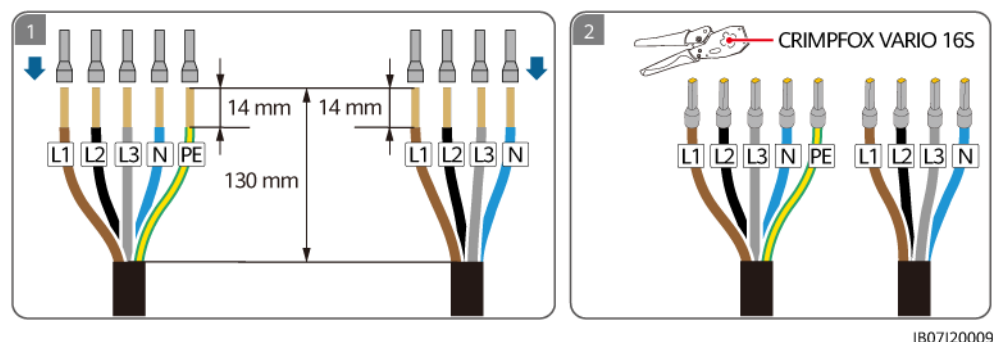


Step 3 Crimping the end terminals of AC conductors. In a four- or five-conductor cable, the end terminals of AC conductors can be crimped.

NOTE

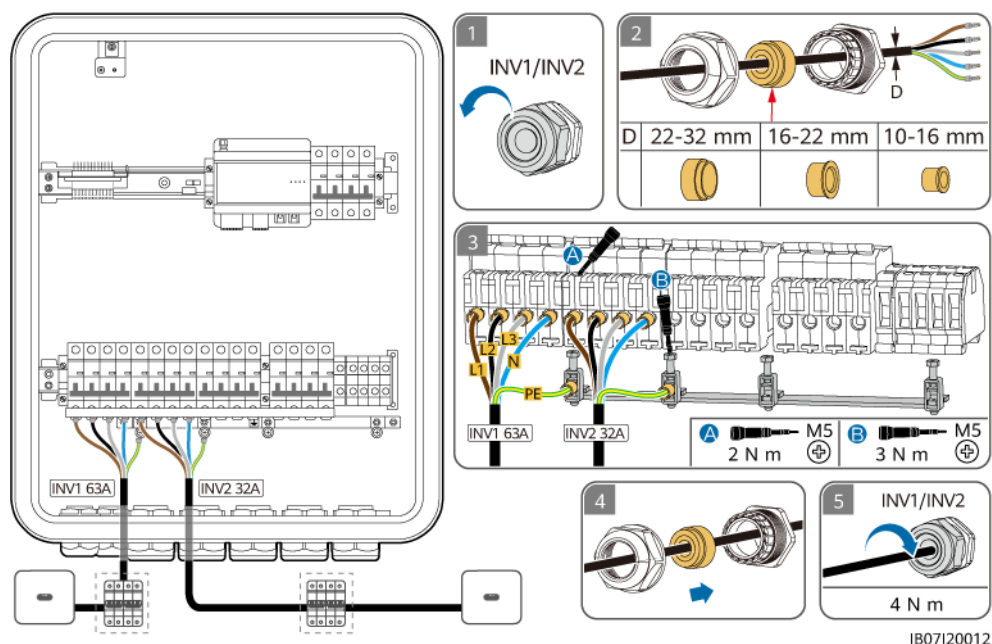
The AC conductor end terminals delivered with the product are mainly used for cables with a section of 16 mm². If cables with a cross section less than 16 mm are used, select AC conductor end terminals that meet the requirements of the case.

Figure 5-11Crimping AC conductor end terminals



Step 4Connect the AC input cables of the inverter.

Figure 5-12 Connecting the inverter's AC input cables (small striped boxes indicate optional components)



WARNING

- ! Four-conductor cable and five-conductor cable connect in the same way, except that the PE is not connected in the case of the four-conductor cable.
- ! The grounding point of the AC output port is used only as a grounding point, equipotential grounding connection; it cannot replace the chassis grounding point.
- ! Make sure the cable cover is inside the connector. Fully insert the exposed wire cores into the holes.
- ! Connect the AC output cable securely. Otherwise, the device may not work properly or the AC connector may be damaged.
- ! Make sure the cables are not twisted.

NOTE

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

--- End

5.6 Installing the output power cable for backup loads

Precautions

- ! A DDR must be installed for backup charging. During operation without connection to the mains, the main circuit breaker does not provide protection. The leakage

Electrical shocks from the loads may result. The rated voltage of the DDR must be at least 415 VAC. Its rated residual operating current must be $\geq$ the number of M1 or MAP0 inverters $\times$ 100 mA or $\geq$ the number of MB0 inverters $\times$ 300 mA.

- I If the power of the backed-up loads exceeds the system's maximum island power, the inverter may shut down due to overload. In this case, it's necessary to turn off some loads. Alternatively, connect lower-priority loads to the non-backed-up load port.
- I When used with MAP0 series inverters, the SmartGuard's load backup port can be connected to single-phase and three-phase loads.
- I If the SmartGuard is used with M1 and MB0 series inverters, its backup load port can only be connected to single-phase loads. Three-phase loads must be connected to the non-backup load ports.
- I Ensure that the neutral conductors of the backup load, utility grid, non-backup load, and inverter are not connected outside of the SmartGuard.
- I Make sure all L1, L2, L3, and N cables are connected in the correct phase sequence. Do not connect the L cable to the N cable port. Otherwise, the loads may be damaged.

Procedure

Step 1 Crimp the end terminals of AC conductors.

NOTE

The AC conductor end terminals delivered with the product are mainly used for cables with a section of 16 mm². If cables with a cross section less than 16 mm are used, select AC conductor end terminals that meet the requirements of the case.

Figure 5-13 Crimping AC conductor end terminals for the SmartGuard-63A-T0

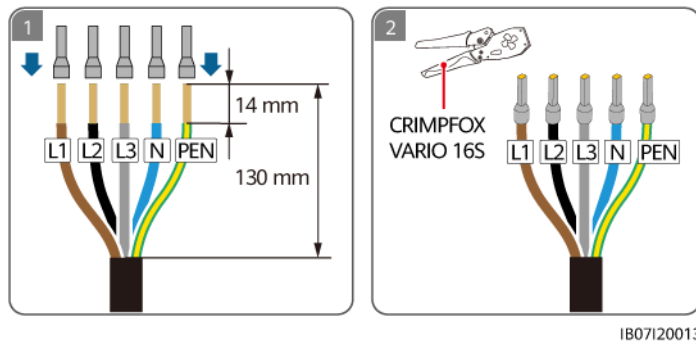
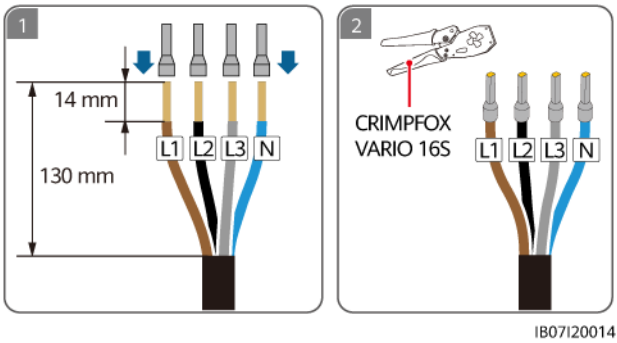


Figure 5-14Crimping AC conductor end terminals for the SmartGuard-63A-AUTO



Step 2 Connect the output power cable to the backup load. Check the load to be connected according to the backup load requirements.

Table 5-4Requirements for backed loads

Load with back	MAP0	M1	MB0
Single-phase load	It is admitted	It is admitted	It is admitted
Three-phase load	It is admitted	Not allowed	Not allowed

Figure 5-15Connecting the output power cable for the SmartGuard-63A-T0 backed-up loads

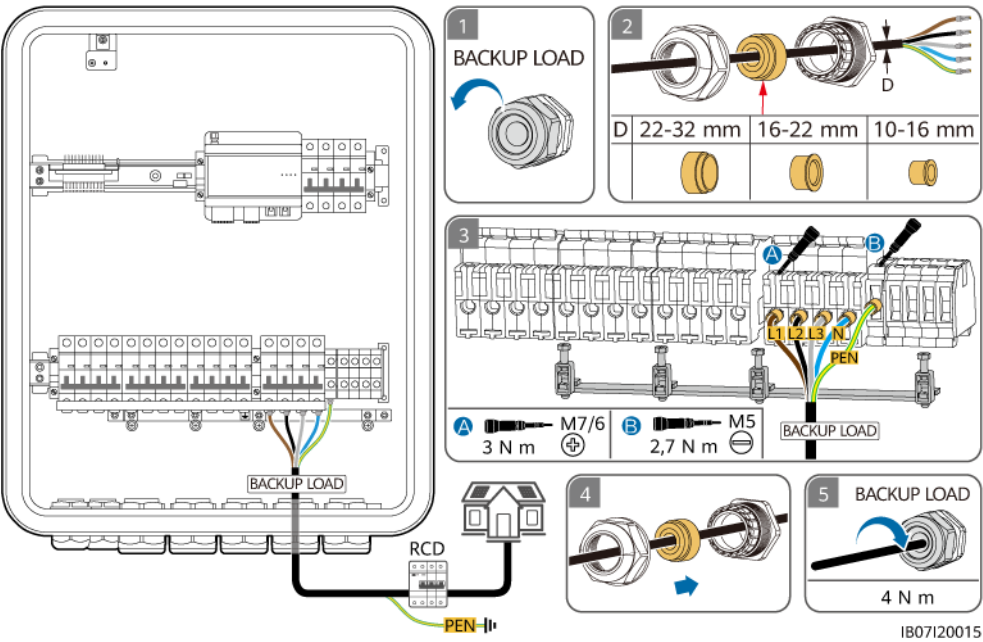
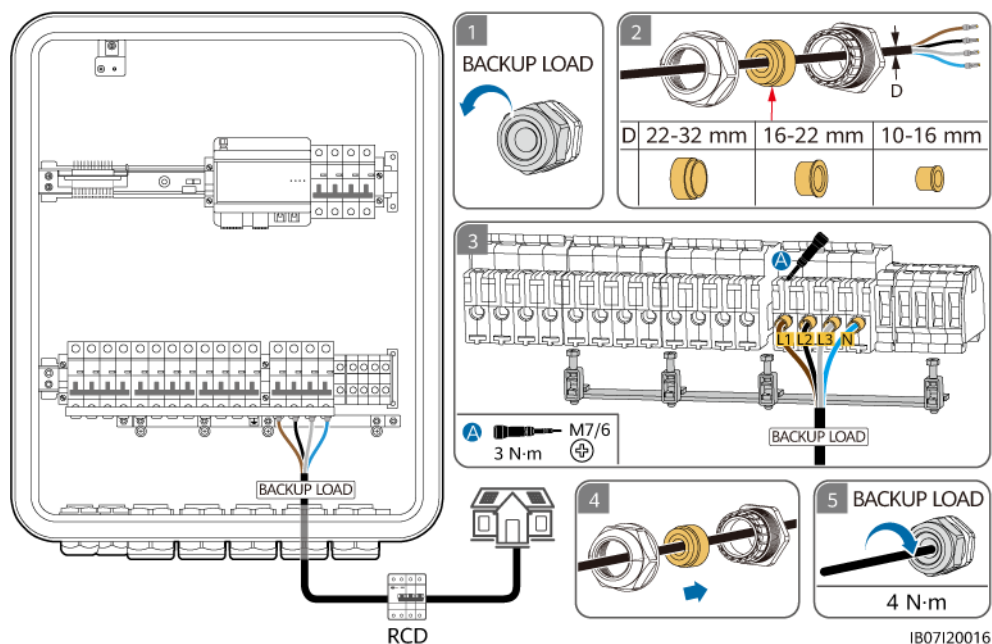


Figure 5-16 Connecting the output power cable for the SmartGuard-63A-AUTO backup loads



WARNING

If four-conductor cable and five-conductor cable connect in the same way, except that the four-conductor cable does not connect to the PEN.

If the grounding point of the AC output port is used only as a grounding point. equipotential grounding connection; it cannot replace the chassis grounding point.

If make sure the cable cover is inside the connector. If fully insert the exposed wire cores into the holes.

If connect the AC output cable securely. Otherwise, the device may not work properly or the AC connector may be damaged.

If make sure the cables are not twisted.

NOTE

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

---- End

5.7 Installing the output power cable for unbacked loads

Precautions

- | Ensure that the neutral conductors of the backup load, utility grid, non-backup load, and inverter are not connected outside of the SmartGuard.
- | Make sure all L1, L2, L3, and N cables are connected in the correct phase sequence. Do not connect the L cable to the N cable port. Otherwise, the loads may be damaged.

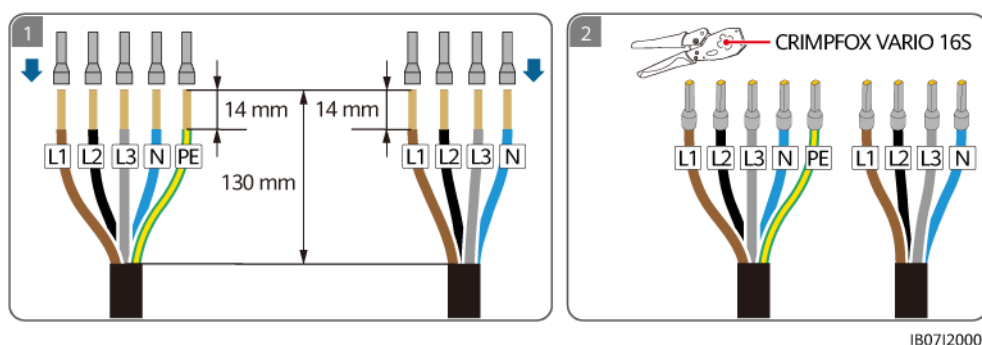
Procedure

- Step 1** Crimping the end terminals of AC conductors. In a four- or five-conductor cable, the end terminals of AC conductors can be crimped.

NOTE

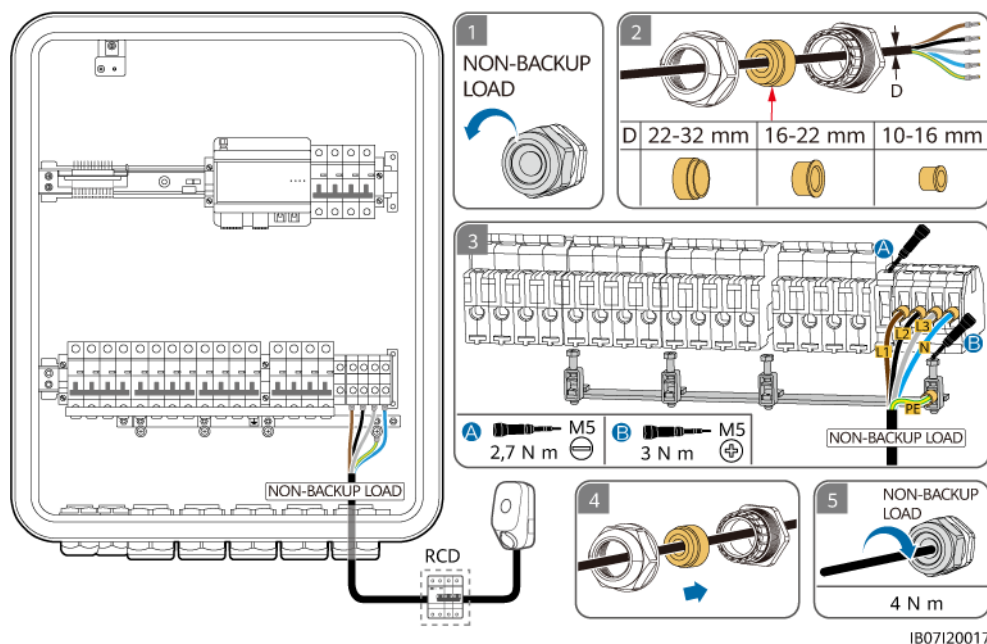
The AC conductor end terminals delivered with the product are mainly used for cables with a section of 16 mm². If cables with a cross section less than 16 mm are used, select AC conductor end terminals that meet the requirements of the case.

Figure 5-17 Crimping AC conductor end terminals



- Step 2** Connect the output power cable of the unbacked loads.

Figure 5-18 Connecting the output power cable for unbacked loads (the small striped box indicates an optional component)



WARNING

- IFour-conductor cable and five-conductor cable connect in the same way, except that the PE is not connected in the case of the four-conductor cable.
- IThe port for unbacked loads can be connected to both single-phase and three-phase loads.
- IThe grounding point of the AC output port is used only as a grounding point, equipotential grounding connection; it cannot replace the chassis grounding point.
- IMake sure the cable cover is inside the connector. IFully insert the exposed wire cores into the holes.
- IContact the AC output cable securely. Otherwise, the device may not work properly or the AC connector may be damaged.
- IMake sure the cables are not twisted.

NOTE

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

--- End

5.8 Installing the SmartGuard signal cables

Precautions

When installing signal cables, separate them from power cables and keep them away from sources of strong interference to prevent communication interruptions.

Procedure

- Step 1** Crimp the signal cable terminals. Only MAP0 inverters require parallel connection of the signal cables.

Figure 5-19Crimping the conductor end terminals corresponding to the signal cable (the small dashed box indicates an optional component)

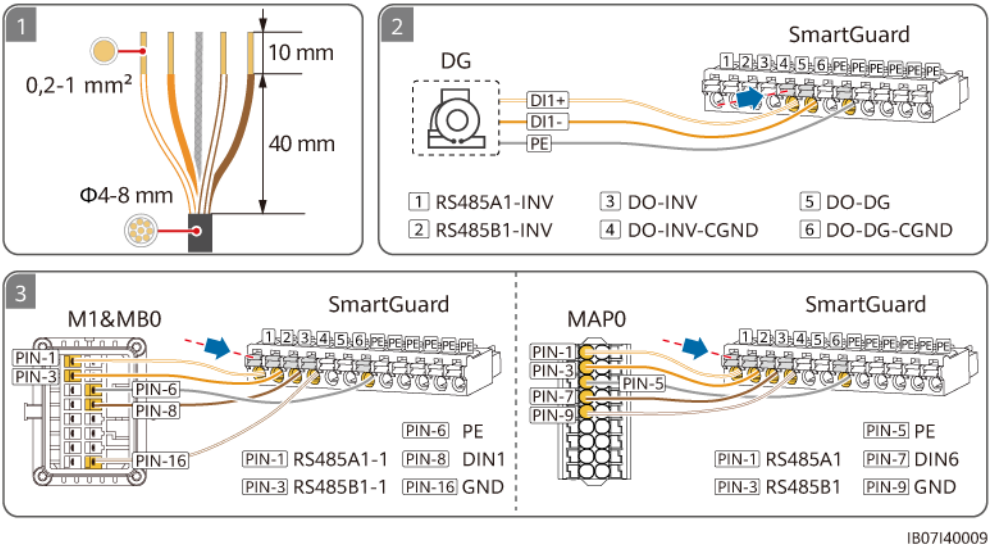


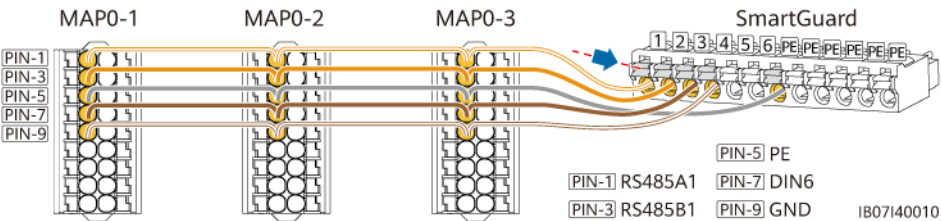
Table 5-5SmartGuard COM Ports

No.	Definition	Function	Description
1	COM-1 RS485A1_INV	RS485A, positive sign RS485 differential signal	Connects to the RS485 signal ports of the inverter.
2	COM-2 RS485B1_INV	RS485B, negative sign RS485 differential signal	
3	COM-3 DO_INV	Positive sign digital output signal	Connects to the inverter's grid-connected/off-grid control signal ports.
4	COM-4 DO_INV_CGND	CGND	
5	COM-5 DO_DG	Positive sign digital output signal	Connect to the generator control signal port.

No.	Definition	Function	Description
6	COM-6 DO_DG_CGND	CGND	
PE	PE	Grounding the protective layer	Grounds the protective layer of a communications cable.

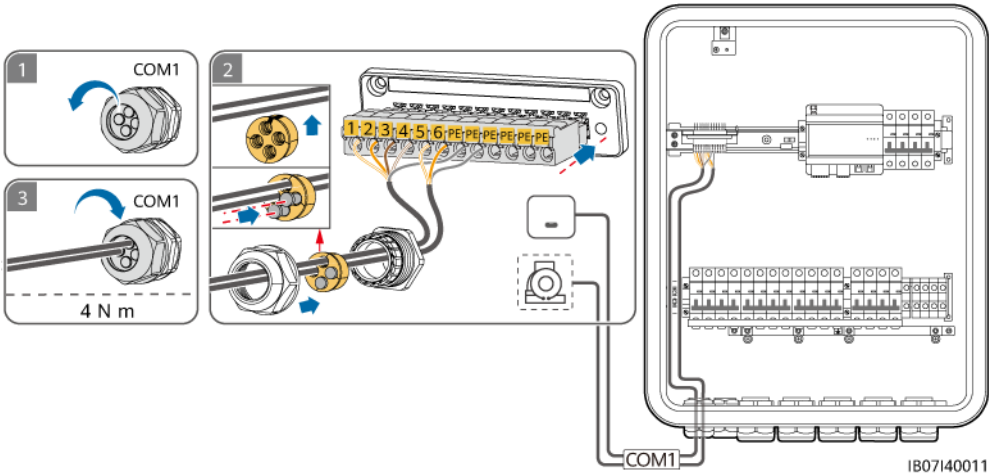
Step 2(Optional) Connect the corresponding signal cables in parallel to the MAP0 inverters.

Figure 5-20Parallel connection of signal cables (using three inverters connected in parallel as an example)



Step 3Connect the SmartGuard signal cables.

Figure 5-21Connecting the SmartGuard signal cables (the small striped box indicates an optional component)



---- End

5.9 Installing the SmartGuard (EMMA) signal cables

Precautions

When installing signal cables, separate them from the power cables and keep them away from sources of strong interference to prevent communication interruptions.

- | Ensure that the signal cable shielding layer is inside the connector, that excess wire cores are removed from the shielding layer, that exposed wire cores are fully inserted into the wire holes, and that the cable is securely connected.
- | The EMMA supports smart switching devices (including smart plugs, circuit breakers, and relays). Smart switching devices connect to the router connected to the EMMA via FE or WLAN. For details, see the[Residential Smart PV Solution User Manual \(EMMA and SmartGuard Grid Connection\)](#).

Port definitions

1. FE port definitions

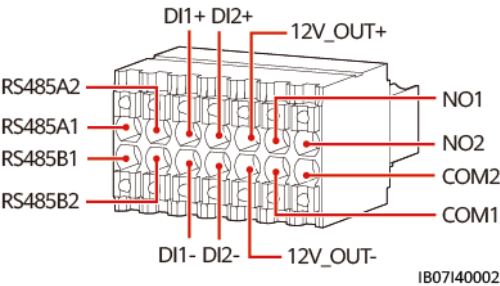
Figure 5-22Port definitions



Definition	Function	Description
10 PIN	-	Connects inside the SmartGuard.
LAN	RJ45 network port	Connects to a charger or ESS.
WAN	RJ45 network port	Connects to a router so that the SmartGuard can connect to the FusionSolar SmartPVMS.

2. Definitions of the 14 pins

Figure 5-23Pin definitions



Definition	Function	Description
485A1	RS485B, positive sign RS485 differential signal	Not connected
485B1	RS485A, negative sign RS485 differential signal	

Definition	Function	Description
485A2	RS485B, positive sign RS485 differential signal	Connects to the RS485 port of the power meter if some loads are connected to the SmartGuard.
485B2	RS485A, negative sign RS485 differential signal	
DI1+	Digital input signal 1 with positive sign	Connects to the ATS port for position notification signaling after connection to the grid. The ATS is only used in the grid + generator scenario.
DI1-	Digital input signal 1 with negative sign	
DI2+	Digital input signal 2 with positive sign	(Optional) Connects to the generator's alarm signal port.
DI2-	Digital input signal 2 with negative sign	
12V_OUT+	Positive 12V power output	Optional. EMMA's 12V power output ports support a 100mA load, a 9.5 to 13.2V output voltage, and a 12V @ 30mA capacity to drive the external relay coil. The external relay works with NO1 and COM1 to control the SG Ready heat pump.
12V_OUT-	Negative 12V power output	
NO1	Digital output signal	Optional. SG Ready heat pump control signal ports, supporting a maximum signal voltage of 12 V and a maximum contact output capacity of 12 VDC at 1 A. The NO and COM contacts are normally open, and COM is a common point.
COM1	Digital output signal	
NO2	Digital output signal	Reserved
COM2	Digital output signal	

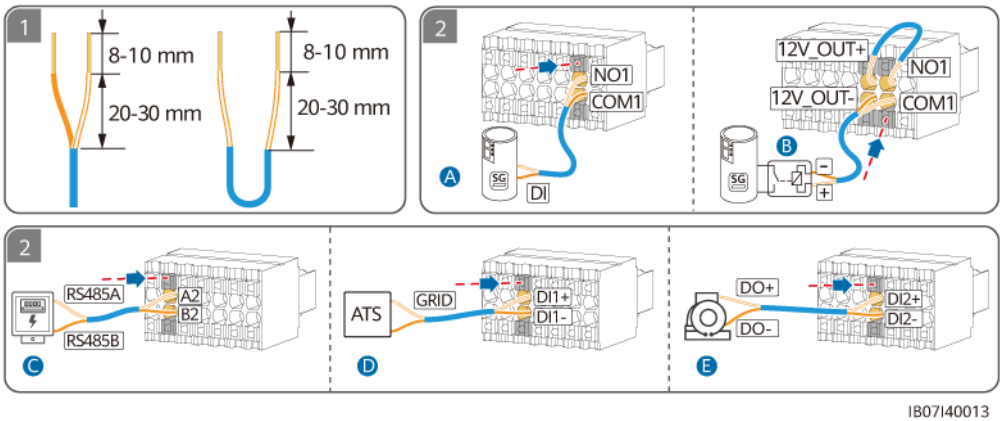
Procedure

Step 1(Optional) Connect the signal cable to the 14-pin terminal.

NOTE

When the SG Ready heat pump provides 12 V power, the EMMA controls the heat pump directly. When the SG Ready heat pump cannot provide 12 V power, the EMMA controls the heat pump via an external relay.

Figure 5-24Connecting the signal cable to the 14-pin terminal

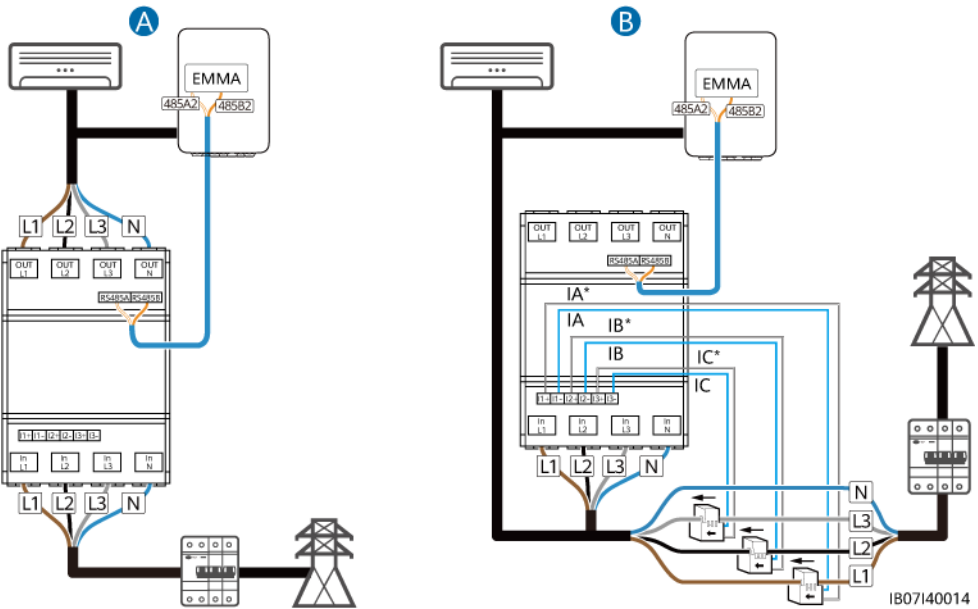


IB07140013

- (A) Direct connection between the EMMA and the heat pump
- (B) Heat pump control by an external relay
- (C) RS485 signal from the power meter
- (D) Position notification signal in case of connection to the electrical grid
- (E) Generator alarm signal

Step 2 (Optional) If any loads are connected to the SmartGuard, connect the power meter communications cable.

Figure 5-25Connecting the power meter communications cable



IB07140014

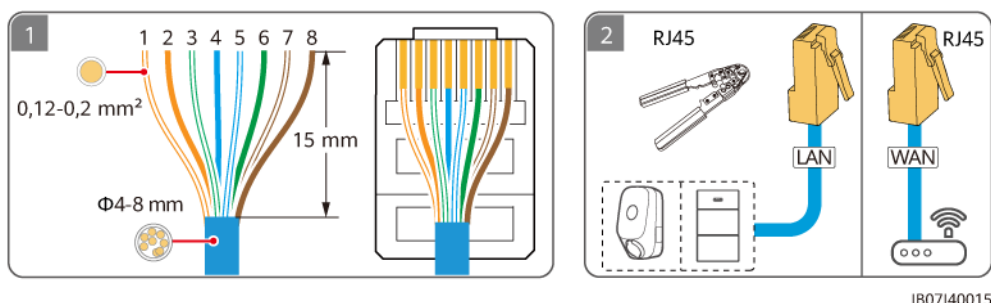
- (A) Direct connection of the cables
- (B) Connecting the cables through the CT

Step 3(Optional) Connect the FE communications cable.

NOTE

- | A charger can be connected to the EMMA via FE or to the router via FE or WLAN. Two chargers must only be connected to the router via FE or WLAN. Do not connect one charger to the EMMA and the other to the router at the same time.
- | The LAN port can be used to connect a charger or ESS to the EMMA via FE.
- | The EMMA can connect to the router via FE or WLAN. If using WLAN, the router must be close to the SmartGuard.
- | The EMMA can be equipped with an external WLAN antenna. If you don't want to use an FE network cable and the signal quality is poor, an external antenna can be installed to improve WLAN signals. For details on how to set up an external WLAN antenna, see the "[6.4.5 \(Optional\) Configuring the external WLAN antenna](#)".

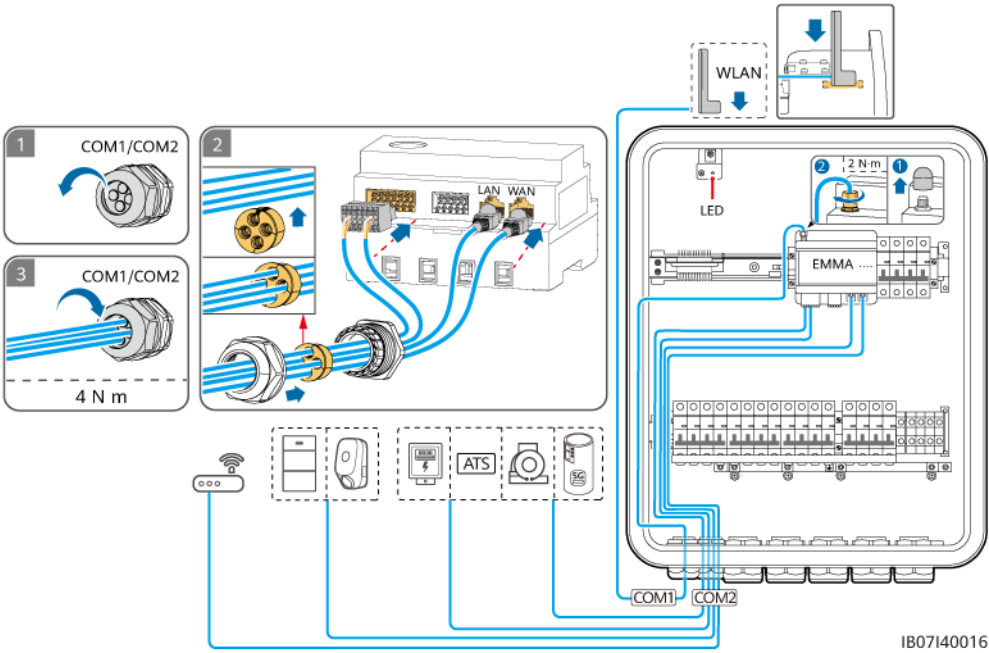
Figure 5-26FE Communications Cable (small striped boxes indicate optional components)



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

Step 4 Connect the EMMA signal cables. If an external antenna is required, attach it to the marked area on the top left corner of the SmartGuard using a magnet.

Figure 5-27Connecting the EMMA signal cables (small striped boxes indicate optional components)



---- End

6 Commissioning the system

6.1 Check before switching on



WARNING

Check if the SmartGuard terminals are connected correctly according to the document.

Table 6-1 Checklist

No.	Testing	Acceptance criteria
1	SmartGuard	The SmartGuard must be installed correctly and securely.
3	Cable routing	Cables must be properly installed according to the customer's instructions.
4	Cable ties	Cable ties should be evenly distributed and free of burrs.
5	Reliable grounding	The ground wire must be connected correctly, safely and reliably.
6	Switches	The device switches and all switches connected to the device must be in the ON state. OFF (off).
7	Connecting the cables	All cables must be connected correctly and securely.
8	Unused terminals and ports	Unused terminals and ports must be covered with water-resistant cable glands.
9	Connection positions of the cables in the compartment maintenance	Once the cable connections are complete, foreign particles such as talcum powder loosened from multi-core cables, stripped cable sheathing, and metal particles must be removed from the maintenance compartment.

No.	Testing	Acceptance criteria
10	Installation environment	The installation space should be adequate, and the installation environment should be clean and tidy.

6.2 (Optional) Power on in grid-connected mode or by starting the generator

Precautions

⚠ DANGER

Use personal protective equipment and specific insulated tools to avoid electric shocks or short circuits.

WARNING

Before operating the equipment for the first time, ensure that a professional configures the parameters correctly. Incorrect parameter settings may result in non-compliance with local power connection requirements and affect the equipment's normal operation.

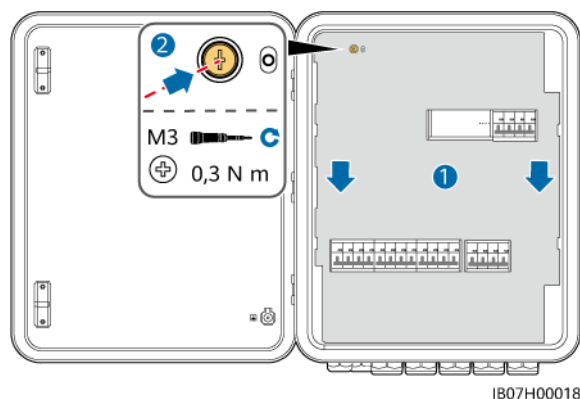
6.2.1 Closing the maintenance compartment

NOTE

- Before closing the maintenance compartment, remove any unused tools and screws that may be there.
- Properly store the keys provided for future use.

Step 1 Install the maintenance compartment cover and tighten the corresponding screw.

Figure 6-1Closing the lid

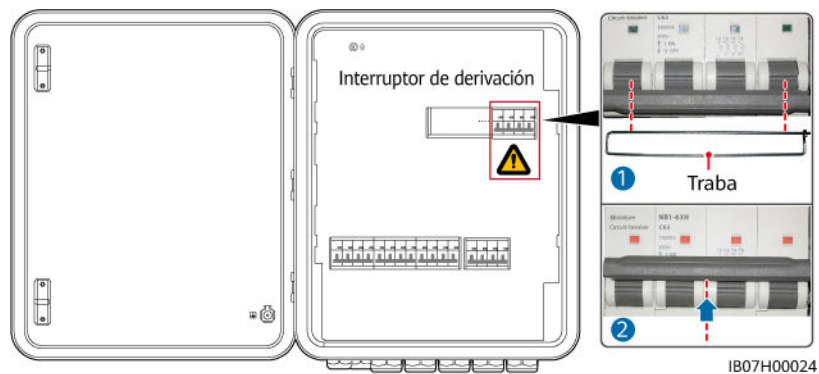


Step 2 Remove the bypass switch lock and turn the bypass switch on.

WARNING

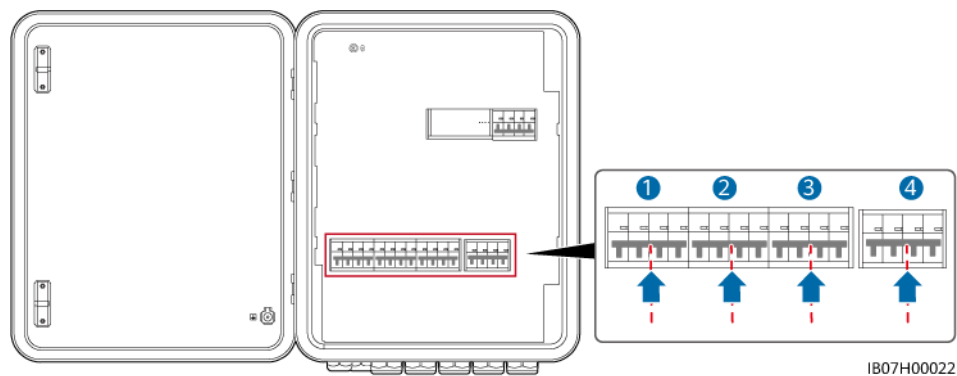
Store the bypass switch lock properly. Reinstall it after completing startup and commissioning.

Figure 6-2 Turning on the bypass switch



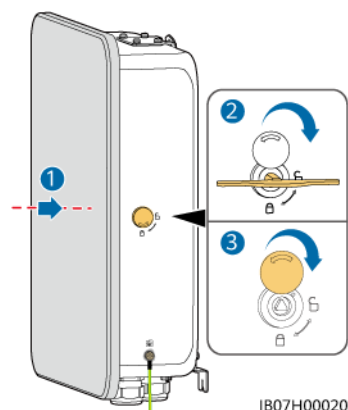
Step 3 Turn on the four switches shown in the following figure (where the connection to the three parallel MAP0 inverters is used as an example).

Figure 6-3 Turning on the switches



Step 4 Close the maintenance compartment door and lock the SmartGuard.

Figure 6-4Closing the maintenance compartment



--- End

6.2.2 Turning on SmartGuard

WARNING

If a charger configured for the plant is connected to the port for unbacked loads, Select grid-connected power-up mode for device commissioning when the plant is first powered up. If you select island-based power-up mode, the charger cannot be detected during commissioning because it is not powered on.

If the PV strings are equipped with optimizers or do not receive solar irradiance, Turn on the system in grid-tied mode or by starting the generator.

During power-up and commissioning, ignore the alarm indicating that the switch is open. bypass is on.

Method 1: Power on in grid-connected mode

Step 1 Use a multimeter to check that the AC voltage of the power distribution box is within the allowable range and that the wires are connected correctly.

Step 2 Turn on the main circuit breaker.

Step 3 Turn on the ESS switch.

1. (Optional) Remove the fixing screw corresponding to the **DC SWITCH** of the ESS.
2. Put the **DC SWITCH** of the ESS in the ON position.

Step 4 Turn on the inverter.

1. (Optional) Turn on the DC switch (if any) located between the PV strings and the inverter.
2. (Optional) Remove the fixing screw from the **DC SWITCH** of the investor.
3. Put the **DC SWITCH** of the inverter in the ON position.

Step 5 Verify that the SmartGuard is operating when connected to the mains power supply. Monitor the LED indicators on the inverter, ESS, EMMA, and SmartGuard to verify their operating status.

---- End

Method 2: Starting by starting the generator

- Step 1** At the generator control panel, start the generator manually. Use a multimeter to verify that the AC voltage at the power distribution box is within the permitted range and that the cables are properly connected.
- Step 2** Turn on the main circuit breaker.
- Step 3** Turn on the ESS switch.
1. (Optional) Remove the fixing screw corresponding to the **DC SWITCH** of the ESS.
 2. Put the **DC SWITCH** of the ESS in the ON position.
- Step 4** Turn on the inverter.
1. (Optional) Turn on the DC switch (if any) located between the PV strings and the inverter.
 2. (Optional) Remove the fixing screw from the **DC SWITCH** of the investor.
 3. Put the **DC SWITCH** of the inverter in the ON position.
- Step 5** Verify that the SmartGuard is operating when connected to the mains power supply. Monitor the LED indicators on the inverter, ESS, EMMA, and SmartGuard to verify their operating status.

---- End

EMMA and SmartGuard LED indicators

Table 6-2Description of the EMMA indicators

Indicator	State	Description
	Off	The system is not turned on.
	Green without blinking	The system is up and running.
	Off	No alarm has been generated.
	Flashing red with slow flashing (on for 1 s and off for 4 s)	The system has generated a warning.

Indicator	State	Description
	Flashing red with Fast flashing (on for 0.5 s and off for 0.5 s)	The system has generated a minor alarm.
	Red without blinking	The system has generated an urgent/serious alarm.
	Off	The IP address of the management system server is not configured. (The indicator will be off when the EMMA is not connected to the SmartPVMS).
	Flashing green with slow flashing (on for 1 s, then off for 1 s)	Communication with the management system is normal.
	Flashing green with Fast flashing (on for 0.125 s and off for 0.125 s)	Communication with the management system is interrupted.

Table 6-3SmartGuard Indicators

Indicator	State	Description
	Green without blinking	The SmartGuard is in grid-connected mode.
	Flashing green with slow blinking	The SmartGuard is in island mode with generator.
	Orange without blinking	The SmartGuard is in island mode with inverter.
	Red without blinking	A hardware alarm has been generated on the SmartGuard.
	Flashing red with slow blinking	An environmental alarm has been generated in the SmartGuard.

6.2.3 Switching on the loads

- Step 1** Check that the inverter, ESS, EMMA, and SmartGuard are operating correctly in grid-connected mode.
- Step 2** (Optional) Turn off the breakers on high-power appliances to avoid overloading the generator.
- Step 3** After verifying that the residential load circuit is not shorted, turn on the switches for the backup and non-backup loads. Otherwise, the SmartGuard may be damaged.
- Step 4** (Optional) Configure the charger router parameters.
- Step 5** Perform device commissioning. For details, see the "[6.4 Commissioning the device](#)".
- Step 6** Once commissioning is complete, turn off the bypass switch. Otherwise, the system will not operate properly. For details, see the "[6.2.4 Turning off the bypass switch](#)".

--- End

6.2.4 Turning off the bypass switch



DANGER

! During normal use, do not perform operations with the bypass switch and make sure that it is turned off.

! Do not turn on the bypass switch when the power is on. Otherwise, High voltage could cause electric shock and damage equipment.

! Failure to install the bypass switch lock may result in Incorrect operations may cause high voltage electric shock and equipment damage.



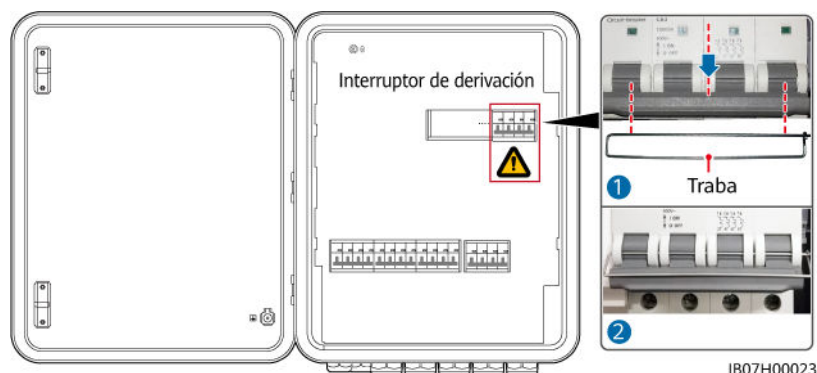
ATTENTION

! The power and current of the backed-up loads cannot exceed the power and current maximum current in system island mode. It is recommended to turn off high-power loads and unnecessary loads connected to the backup load port.

! If the SOC of the batteries is lower than **End of discharge SOC**, charge the ESS with PV string energy or enable **Charging the ESS battery with the generator** and wait until the ESS is loaded **End of discharge SOC** plus 10% or higher.

- Step 1** Turn off the system and open the maintenance compartment door.
- Step 2** Turn off the bypass switch and install the bypass switch lock.

Figure 6-5Turning off the bypass switch



Step 3 Close the maintenance compartment door and turn on the system.

---- End

6.3 (Optional) Powering up the system in island mode

Precautions

DANGER

Use personal protective equipment and specific insulated tools to avoid electric shocks or short circuits.

WARNING

Before operating the equipment for the first time, ensure that a professional configures the parameters correctly. Incorrect parameter settings may result in non-compliance with local power connection requirements and affect the equipment's normal operation.

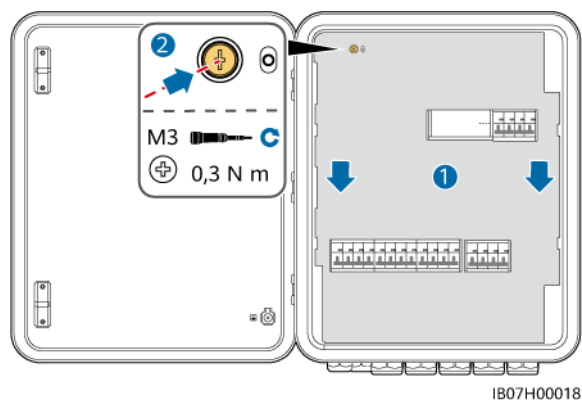
6.3.1 Closing the maintenance compartment

NOTE

- Before closing the maintenance compartment, remove any unused tools and screws that may be there.
- Properly store the keys provided for future use.

Step 1 Install the maintenance compartment cover and tighten the corresponding screw.

Figure 6-6Closing the lid



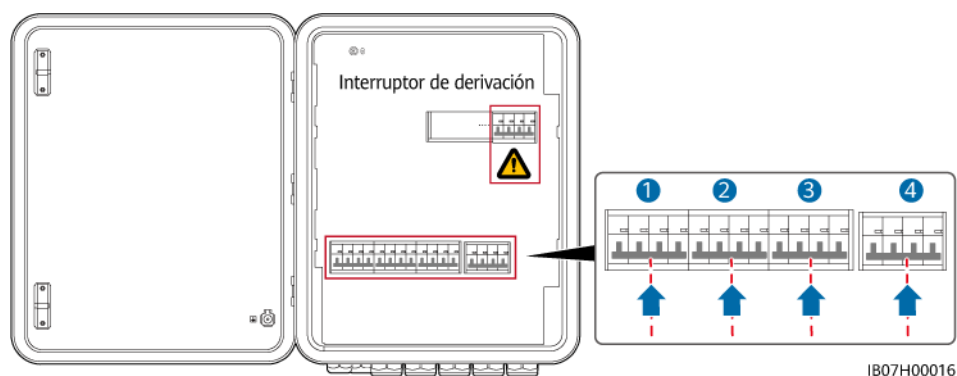
Step 2 Before closing the maintenance compartment door, turn on the four switches shown in the following figure (where the connection to the three parallel MAP0 inverters is used as an example).

⚠ DANGER

I Bypass Switch: When mains power is available, but the SmartGuard cannot supply power to the loads due to exceptions, see the “[7.4 Operations with the SmartGuard Bypass Switch](#)”. Incorrect operations may cause electric shock.

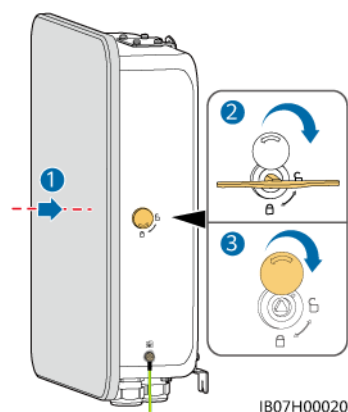
IDuring island mode power-up, do not perform operations with the bypass switch. and make sure it is turned off.

Figure 6-7Turning on the switches



Step 3Close the maintenance compartment door and lock the SmartGuard.

Figure 6-8 Closing the maintenance compartment



--- End

6.3.2 Turning on SmartGuard

WARNING

If a charger configured for the plant is connected to the port for unbacked loads, Select grid-connected power-up mode for device commissioning when the plant is first powered up. If you select island-based power-up mode, the charger cannot be detected during commissioning because it is not powered on.

If the PV strings are equipped with optimizers or do not receive solar irradiance, they are not supports island mode power-up.

Island mode switching (with PV strings)

- Step 1** Keep the main circuit breaker off.
- Step 2** Turn on the inverter.
1. (Optional) Turn on the DC switch (if any) located between the PV strings and the inverter.
 2. (Optional) Remove the fixing screw with knob corresponding to the **DC SWITCH** of the investor.
 3. Put the **DC SWITCH** of the inverter in the ON position.
- Step 3** Turn on the ESS switch.
1. (Optional) Remove the fixing screw corresponding to the **DC SWITCH** of the ESS.
 2. Put the **DC SWITCH** of the ESS in the ON position.
 3. Press and hold the black start button for 5 s.
- Step 4** Connect to the inverter following the instructions in the "[A Connection to the inverter in the application](#)", set the grid code for the inverter, and then set the island mode and SmartGuard model for the inverter. For details, see the "[Method 2: Setting Island Mode and SmartGuard Model for the Inverter](#)".

- Step 5** (Optional) Connect to the inverter as instructed in the "[A Connection to the inverter in the application](#)". Update the M1 and MB0 inverters to the latest version. Otherwise, SmartGuard may not be able to identify the inverters. For details, see the "[B Investor Update](#)".
- Step 6** Verify that the SmartGuard is operating in island mode. Monitor the LED indicators on the inverter, ESS, EMMA, and SmartGuard to verify the operating status.

--- End

EMMA and SmartGuard LED indicators

Table 6-4Description of the EMMA indicators

Indicator	State	Description
Operating status indicator 	Off	The system is not turned on.
	Green without blinking	The system is up and running.
Alarm indicator 	Off	No alarm has been generated.
	Flashing red with slow flashing (on for 1 s and off for 4 s)	The system has generated a warning.
	Flashing red with Fast flashing (on for 0.5 s and off for 0.5 s)	The system has generated a minor alarm.
	Red without blinking	The system has generated an urgent/serious alarm.
Communication status indicator 	Off	The IP address of the management system server is not configured. (The indicator will be off when the EMMA is not connected to the SmartPVMS).
	Flashing green with slow flashing (on for 1 s, then off for 1 s)	Communication with the management system is normal.
	Flashing green with Fast flashing (on for 0.125 s and off for 0.125 s)	Communication with the management system is interrupted.

Table 6-5SmartGuard Indicators

Indicator	State	Description
	Green without blinking	The SmartGuard is in grid-connected mode.
	Flashing green with slow blinking	The SmartGuard is in island mode with generator.
	Orange without blinking	The SmartGuard is in island mode with inverter.
	Red without blinking	A hardware alarm has been generated on the SmartGuard.
	Flashing red with slow blinking	An environmental alarm has been generated in the SmartGuard.

6.3.3 Switching on the loads

 ATTENTION

The power and current of the backed-up loads cannot exceed the power and current maximum current in system island mode. It is recommended to turn off high-power loads and unnecessary loads connected to the backup load port.

If the batteries SOC is lower than the end-of-discharge SOC, charge the ESS with energy from the PV strings until the ESS is fully charged**End of discharge SOC** plus 10% or higher.

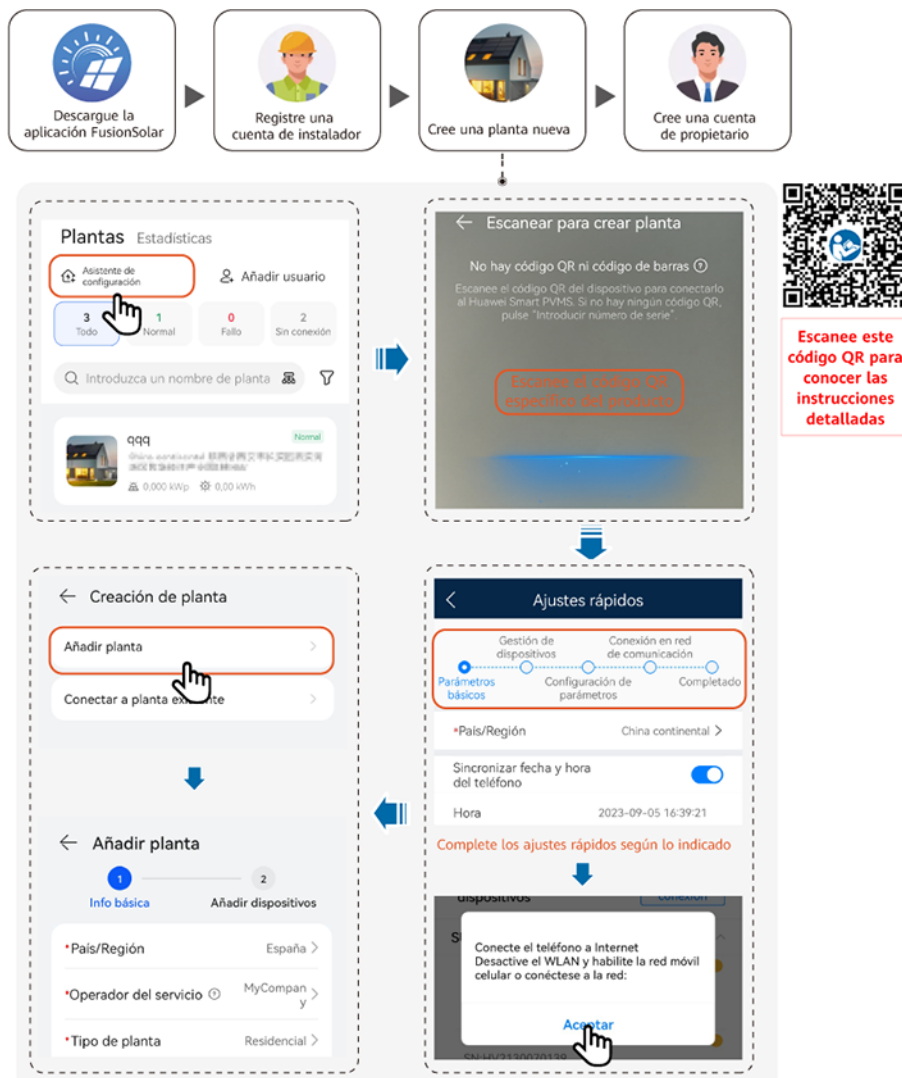
- Step 1** Check that the inverter, ESS, EMMA, and SmartGuard are operating correctly in island mode.
- Step 2** Ensure that the power of residential backup loads does not exceed the system's island operating power.
- Step 3** After checking that the residential load circuit is not shorted, turn on the switches for the backup and non-backup loads.

--- End

6.4 Commissioning the device

6.4.1 Deployment of a new plant

Deployment of a new plant



NOTE

- I For more information on deploying a new plant and refurbishing an existing plant, please refer to the document [FusionSolar Application Quick Start Guide \(EMMA\)](#) or scan the QR code.
- I In the retrofit scenario of an existing plant, the SmartGuard and the Dongle cannot be used at the same time. The Dongle must be removed from the inverter. The SmartGuard has an integrated power meter. If all loads are connected to the SmartGuard, the original power meter must be removed directly from the power plant. If some loads are connected to the SmartGuard, a power meter of the recommended model must be used, and the corresponding cables must be reconnected. For details on cable connections, see the section [5.9 Installing the SmartGuard \(EMMA\) signal cables](#).
- I For details on how to configure ESS parameters, inverter parameters, and the physical layout of optimizers, refer to the document [Quick Start Guide to the Residential Smart PV Solution \(Three-phase PV+ESS Grid Connection + SmartGuard\)](#).
- I Before commissioning the device, make sure the router is powered on.

Connection test

The**Connection test**It is supported in Quick Setup. This step can be performed to check if the cable connections are correct, avoiding site visits for rectification.

Press**Connection test**and wait until the test is complete. If the test is not successful, rectify the fault in a timely manner.



6.4.2 Commissioning of functions

Perform commissioning of the following functions as required:

Table 6-6Commissioning of functions

Function	Stage description	Procedure
Incorporation of teams electrical smart	Smart home appliances (such as SG Ready heat pumps and smart switch-controlled electrical devices) can be added to the FusionSolar app for management.	For details, see the document FusionSolar App Quick Start Guide (EMMA) or scan the QR code to download the quick guide.
Limitation of energy exported to the grid	If excess PV power is exported to the grid, the grid-exported power limitation parameter can be set to ensure that the power exported to the grid is within the range specified by the grid company.	

Function	Stage description	Procedure
Planning to through port DI	It is applicable to scenarios where the power grid company performs remote planning through specific centralized remote control receivers. The power grid company remotely sends a control command. planning (%) to the plant with a wireless transmission device. A The wireless receiver then receives the scheduling command and converts it into a DI signal. The EMMA controls the inverter to generate the corresponding power.	
Leveling of voltage spikes	It is applicable to areas with peak demand charges. The capacity control function allows peak power drawn from the grid to be reduced in peak self-consumption mode or TOU mode during peak hours, thereby reducing electricity rates.	
Configuration of the parameters from the antenna External WLAN	By default, the EMMA has a built-in WLAN antenna. If the signal quality from the power distribution box is poor, install an external antenna to improve WLAN signals. If using an external antenna, configure it accordingly in the built-in WLAN settings.	

For details on operations with the application, see the document [FusionSolar App User Manual](#).

6.4.3 Whole Home Power Backup Settings (Seamless Switching)

Make the connection to EMMA. On the main screen, choose **Set up>Whole-Home Power Backup Settings**, enable **Seamless failover** and configure other parameters.

 ATTENTION

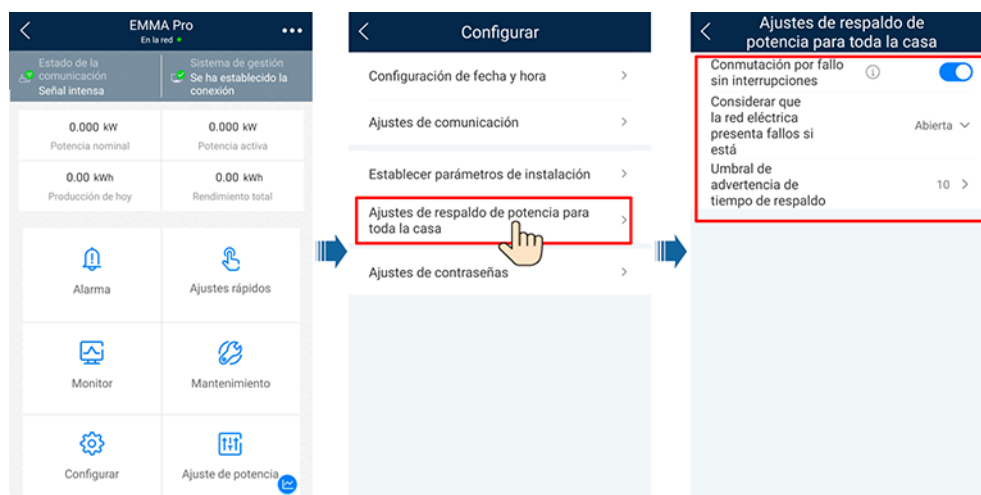
- !The SmartGuard seamless switching feature must be enabled Manually. If this feature is enabled, the system with a MAP0 inverter installed will enter island mode within 20 ms of a power failure or anomaly, ensuring uninterrupted power supply to IT equipment, such as computers connected to the port for backup loads. Other devices may disconnect, shut down, or restart intermittently.
- !The SmartGuard's seamless switching feature can be used to switch from grid-connected mode to island mode or from island mode with generator to island mode with inverter.

Table 6-7Parameters for whole house power backup settings

Parameter	Range of values	Description
Commutation due to failure without interruptions	Disable (value predetermined)	!When the power grid fails, loads are They turn off for a short period while switching between grid connection and island mode is performed. !The SmartGuard slowly transitions into mode island.
	Enable	!When the power grid fails or has anomalies, the system where a MAP0 inverter is installed goes into island mode within a period of up to 20 ms. !When the power grid fails or has anomalies, the system where an M1 or MB0 inverter is installed goes into island mode within a period of up to 100 ms. !The continuity of supply function in the event of voltage drop (LVRT) it has no effect.

Parameter	Range of values	Description
Consider that the network electric presents failures if it is (optional)	- Open (value predetermined) - Closed	This parameter can be configured only if an ATS is installed. Open: When the power grid is connected, the position notification signal circuit sent when the power is connected to the grid has a low impedance. When the grid is disconnected, this circuit has a high impedance. Closed: When the power grid is connected, the position notification signal circuit sent when the power is connected to the grid has a high impedance. When the grid is disconnected, this circuit has a low impedance.
Threshold of warning of time of back (min)	5-60	Battery backup time warning in island mode scenarios.

Figure 6-9 Whole-Home Power Backup Settings



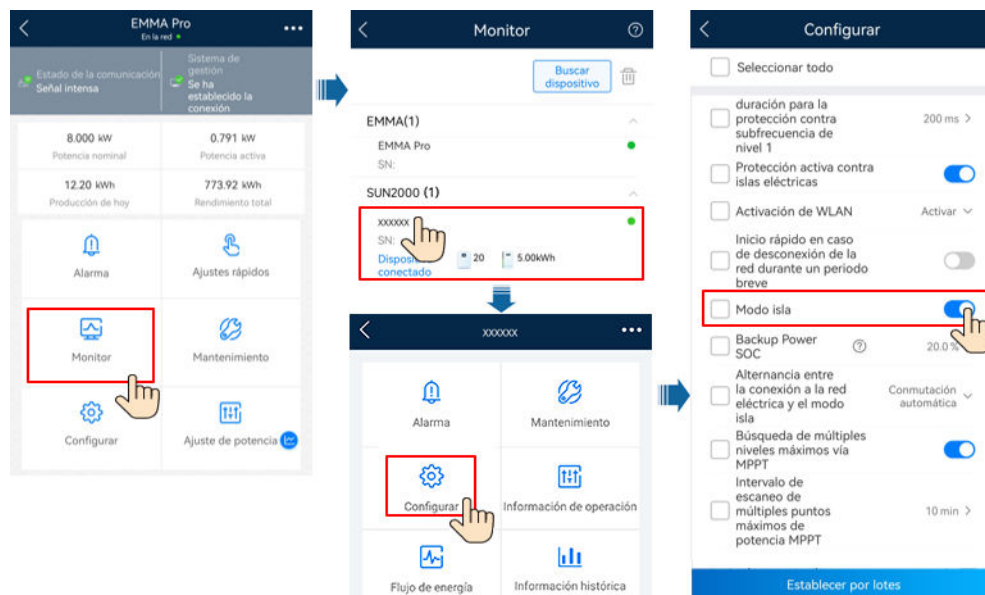
6.4.4 Setting island mode for the inverter

Once the island mode is set, the inverter will support island mode operation.

Method 1: Setting up island mode for the inverter using SmartGuard

Make the connection to EMMA. On the main screen, choose **Monitor** > **SUN2000**, press **Set up** and enable the **Island mode**.

Figure 6-10 Setting Island Mode



Method 2: Setting Island Mode and SmartGuard Model for the Inverter

Connect to the inverter according to the instructions in the section “**A Connection to the inverter in the application**”. On the main screen, choose **Set up** > **Function parameters** and enable the **Island mode**. SmartGuard must be selected when the system is first powered up in island mode. Otherwise, the system will not function.

Figure 6-11Setting Island Mode

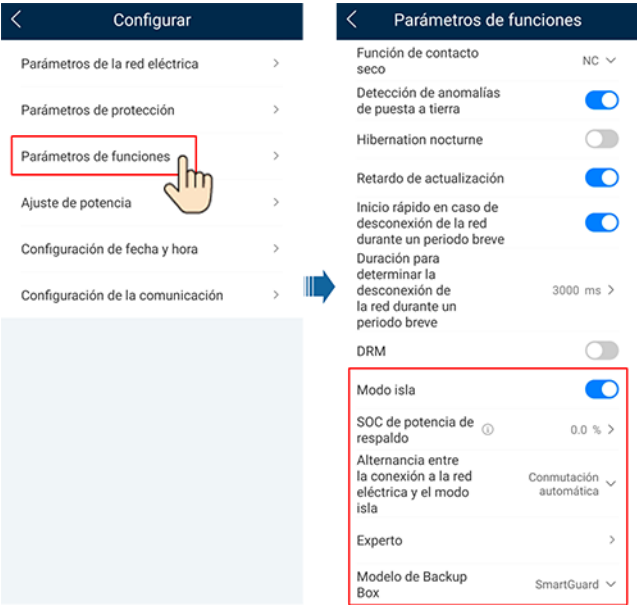


Table 6-8Parameter settings for grid/off-grid modes

Parameter	Description	Range of values
Island mode	If this parameter is enabled, the inverter goes into island mode via the SmartGuard when the power grid fails.	Enable Disable
SOC of power of back	Allows you to configure the backup power SOC. In grid-connected mode, the ESS does not discharge when discharged to the backup power SOC. When the grid fails, the loads are powered in backup mode.	[0, 100%]
Model of Backup Box	SmartGuard must be selected when the system is powered on in island mode. Otherwise, the system will not function.	BackupBox-(B0,B1) Third-party compatible BackupBox SmartGuard Without BackupBox

6.4.5 (Optional) Configuring the external WLAN antenna



An external WLAN antenna must be purchased from Huawei. To use the external WLAN antenna, configure**Selected antenna**as**External signal**.

Make the connection to EMMA. On the main screen, choose**Set up> Communication settings>Inverter WLAN Settings**and configure**Selected antenna** as **External**.

Figure 6-12External antenna setup



6.4.6 Generator Settings

Setting the generator control mode

Make the connection to EMMA. On the main screen, choose**Monitor> Generator> Maintenance**and set the generator control mode as**Automatic**.

Figure 6-13Setting the generator control mode

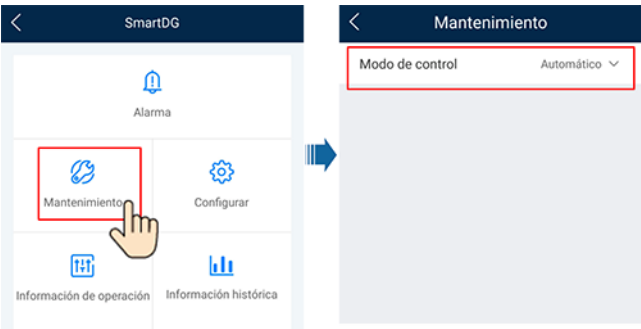


Table 6-9Generator control parameters

Parameter	Worth	Description
Mode of control	Manual	Off
		On

Parameter	Worth	Description
	Automatic	The upper and lower battery SOC thresholds can be set. When the battery SOC reaches the specified upper or lower threshold, the generator automatically shuts down or starts.

Setting the generator parameters

Make the connection to EMMA. On the main screen, choose**Monitor>Generator>Set up**and configure the generator parameters.

Figure 6-14Setting the generator parameters

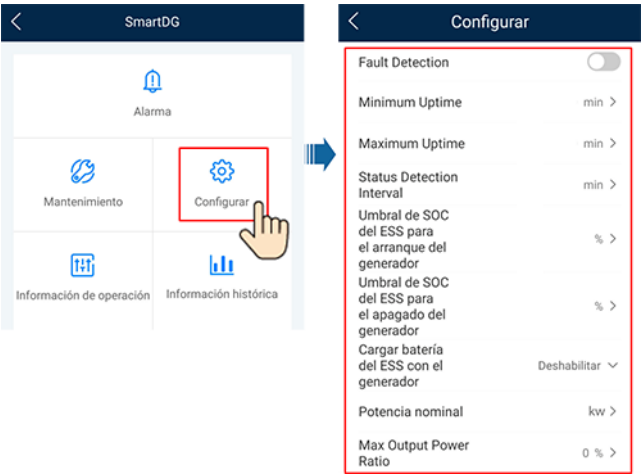


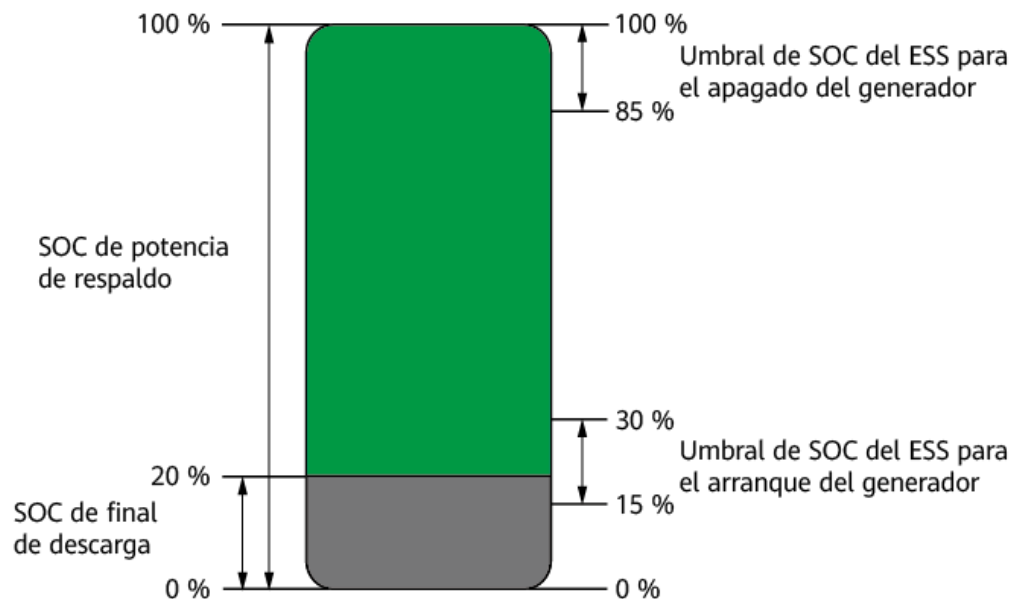
Table 6-10Generator parameters

Parameter	Range of values	Description
Detection of failures	Enable Disable (worth predetermines do)	Once enabled, Fault detection , it is necessary to configure the Fault detection mode .

Parameter	Range of values	Description
Mode of detection of failures	- Failure by sign of on (worth predetermines do) - Failure by sign of off	Ignition signal failure: When the generator is not working, the corresponding alarm signal circuit has a low impedance. When the generator is working normally, the corresponding alarm signal circuit has a high impedance. Failure due to shutdown signal: When the generator is not working, the corresponding alarm signal circuit has a high impedance. When the generator is working normally, the corresponding alarm signal circuit has a low impedance.
Time of activity minimum (min)	0-60	In automatic control mode, the generator cannot be automatically shut down if the specified minimum run time has not been reached.
Time of activity maximum (min)	60-2880	In automatic control mode, the generator automatically shuts down when the specified maximum run time is reached.
Interval of detection of status (min)	1-10	Once the generator start or stop command is sent, if the generator cannot start or stop within the State detection interval , a generator start or shutdown failure alarm is generated and this alarm is reported.
Threshold of SOC of the ESS for the start of the generator (%)	15-30	When the battery SOC is lower than ESS SOC threshold for generator start, the generator starts. ESS SOC threshold for startup generator $\geq$ End of discharge SOC + 10% (for example, if the End of discharge SOC is 15%, configure that the ESS SOC threshold for generator start be 25% or more). If the generator cannot start, the loads will turn off once the ESS is discharged to the End of discharge SOC. For details on how to configure the parameter End of discharge SOC for the ESS, see the section 6.4.2 Configuring ESS parameters from the ESS user manual.

Parameter	Range of values	Description
Threshold of SOC of the ESS for shutdown from the generator (%)	85-100	When the battery SOC is higher than ESS SOC threshold for generator shutdown , the generator shuts down.
Charge battery of the ESS with the generator	Disable (worth predetermines do) Enable	Once this feature is enabled, the generator will be allowed to charge the ESS.
Power nominal (kW)	1-500	Indicates the nominal power of the generator.
Maximum ratio of power of exit (%)	0-100	Indicates the maximum output power ratio of the generator.

Figure 6-15 Battery SOC



6.5 Switching between grid-connected mode and island mode

6.5.1 Verifying switching between grid connection and island mode

After turning on the system for the first time, verify the switching between mains power and island mode. Make sure the bypass switch is off.

Method 1: Verifying operation with connection to the power grid

- Step 1** Check that mains power is available and that the SmartGuard is operating while connected to the mains power supply.
- Step 2** If the plant is equipped with a generator, set the generator control mode to **Automatic**. For details, see the "[Setting the generator control mode](#)".
- Step 3** (Optional) Enable the **Island mode** for the investor. For details, see method 2 in the "[6.4.4 Setting island mode for the inverter](#)".
- Step 4** Ensure that the power of residential backup loads does not exceed the system's island operating power.
- Step 5** Switch to island mode according to the instructions in the section "[6.5.2 Forced switching](#)". Check if island mode operation is normal and if the SmartGuard indicator is solid orange.
- Step 6** Switch to mains power mode as per the instructions in the section "[6.5.2 Forced switching](#)". If the SmartGuard indicator is solid green, this indicates that the inverter is connected to the power grid.
- Step 7** If the plant is equipped with a generator, set the generator operating mode to remote control.
- Step 8** (Optional) Use the owner account to set up smart devices. For details, see the "[F Use of smart devices \(owner\)](#)".

---- End

Method 2: Verifying island mode operation

- Step 1** Keep the main circuit breaker off.
- Step 2** Ensure the SmartGuard indicator is solid orange when the SmartGuard is in island mode due to a power failure.
- Step 3** Once grid power is restored, check that the system is operating correctly in grid-connected mode and that the SmartGuard indicator is solid green.
- Step 4** Turn on the main circuit breaker.
- Step 5** (Optional) Use the owner account to set up smart devices. For details, see the "[F Use of smart devices \(owner\)](#)".

---- End

Method 3: Verifying the generator's operation

- Step 1** (Optional) If the power grid fails, the PV strings are not generating power, and the batteries' SOC is insufficient, enable **Charging the ESS battery with the generator** and wait until the ESS is loaded **End of discharge SOC** plus 10% or higher.
- Step 2** Set the generator operating mode to remote control.
- Step 3** (Optional) Press **On** in the FusionSolar app to start the generator. For details, see the "[Setting the generator control mode](#)".
- Step 4** (Optional) Press **Off** in the FusionSolar app to turn off the generator. For details, see the "[Setting the generator control mode](#)".
- Step 5** Set the generator control mode to **Automatic**. For details, see the "[Setting the generator control mode](#)".

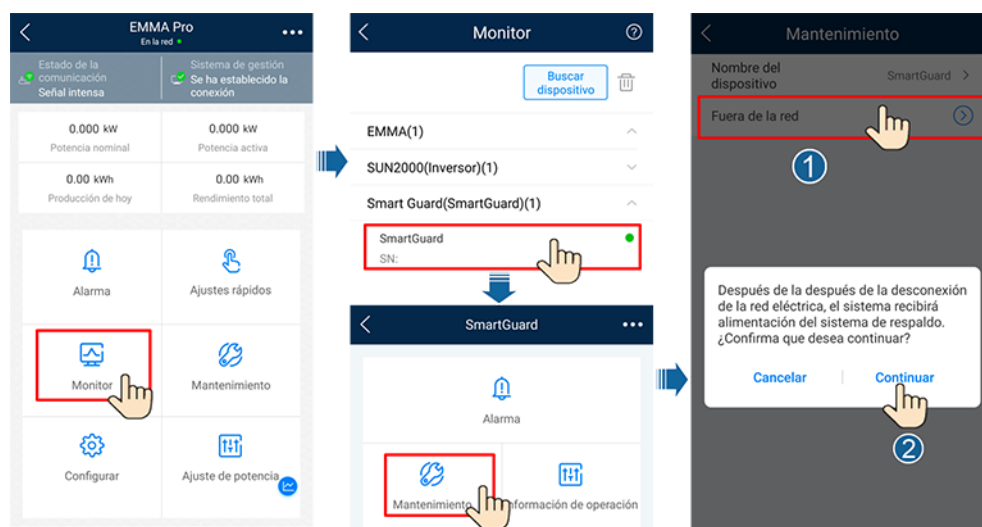
---- End

6.5.2 Forced switching

Make the connection to EMMA. On the home screen, select **Monitor** > **SmartGuard** > **Maintenance** and make the switching according to the actual status.

- I If pressed **Change** When the system is connected to the power grid, it is forced into island mode. If the system experiences a fault or has been manually returned to grid-connected mode, it will automatically exit forced switchover mode.
- I If pressed **Change** When the system is in island mode, it will attempt to switch to grid-connected mode and will automatically exit hard-to-switch mode.

Figure 6-16 Configuring switching between grid-connected mode and island mode



 NOTE

- I If switching to grid-connected mode fails, the grid may not be operating normally or the grid connection conditions may not be met. Please check and try again.
- I If switching to island mode fails, the load power may be too high or the backup load may not be operating normally. Check and try again.

7 System maintenance

7.1 Shutting down the system

Precautions



WARNING

Before opening the maintenance compartment door, turn off the circuit breaker. main power supply, then turn off the breakers for the residential loads with and without backup. Turn off the inverter and turn off the DC breakers for the inverter and ESS.

Only authorized personnel may open the maintenance compartment cover to make electrical connections.

Before opening the maintenance compartment cover, turn off the circuit breaker. backup loads, the utility AC breaker, and the two inverter AC breakers inside the SmartGuard. Make sure the bypass breaker is off.

Once the SmartGuard is turned off, residual electricity and heat from the equipment may continue to cause electric shocks and burns. Therefore, wait at least 5 minutes and put on insulated gloves before working with the SmartGuard.

Procedure

Step 1 (Optional) At the generator control panel, manually turn off the generator.

Step 2 Turn off the main circuit breaker.

Step 3 Turn off the inverter.

1. Send a shutdown command to the inverter in the app.
2. Put the **DC SWITCH** of the investor in the position **OFF**(off).
3. (Optional) Install the corresponding fixing screw to the **DC SWITCH**.
4. (Optional) Turn off the DC breaker located between the inverter and the PV strings.

- Step 4** Turn off the ESS.
- 1. Put the **DC SWITCH** of the ESS in position **OFF** (off).
 - 2. (Optional) Install the corresponding fixing screw to the **DC SWITCH** of the ESS.
- Step 5** Turn off the breakers for residential loads with and without backup.
- End

7.2 Routine maintenance

To ensure that the system operates properly for a long time, it is recommended that routine maintenance be performed as described in this section.



Before cleaning the system, connecting cables, and checking the reliability of the grounding, turn off the system.

Table 7-1 Maintenance Checklist

Testing	Verification method	Frequency of maintenance
Cleaning the system	Periodically check that the SmartGuard is free of obstacles and dust.	Once every 6 to 12 months
State of the system	ICheck that the SmartGuard is not damaged or deformed. ICheck that the SmartGuard does not generate abnormal sounds when in operation. ICheck if the parameters of the SmartGuard are configured correctly when the device is running.	Once every six months
Connections electric	ICheck if the cables are securely connected. ICheck the cables for damage, especially the coating of cables that are in contact with a metal surface. IAC input ports, the COM ports and SmartGuard water-resistant covers that are not in use must be covered.	6 months after the first laying in service and once every 6 to 12 months with after that

Testing	Verification method	Frequency of maintenance
Reliability of the grounding	Check if the ground wire is securely connected.	6 months after the first laying in service and once every 6 to 12 months with after that

7.3 Alarm Reference

For more information about alarms, see the [SmartGuard Alarm Reference](#).

7.4 Operations with the SmartGuard Bypass Switch

Precautions

DANGER

During normal use, do not perform operations with the bypass switch and make sure that it is turned off.

Do not turn on the bypass switch when the power is on. Otherwise, High voltage could cause electric shock and damage equipment.

When the power grid is available, but the SmartGuard is not working normally and does not can supply power to the loads, check and clear the SmartGuard alarm. If the fault persists, consult customer service personnel and then perform operations using the bypass switch. Incorrect operations may result in electric shock.

WARNING

In bypass switch mode, ignore the alarm indicating that the bypass switch is open. is on.

Before opening the maintenance compartment door, turn off the circuit breaker. main power supply, then turn off the breakers for the residential loads with and without backup. Turn off the inverter and turn off the DC breakers for the inverter and ESS.

Only authorized personnel may open the maintenance compartment cover to make electrical connections.

Once the SmartGuard is turned off, residual electricity and heat from the equipment may continue to cause electric shocks and burns. Therefore, wait at least 5 minutes and put on insulated gloves before working with the SmartGuard.

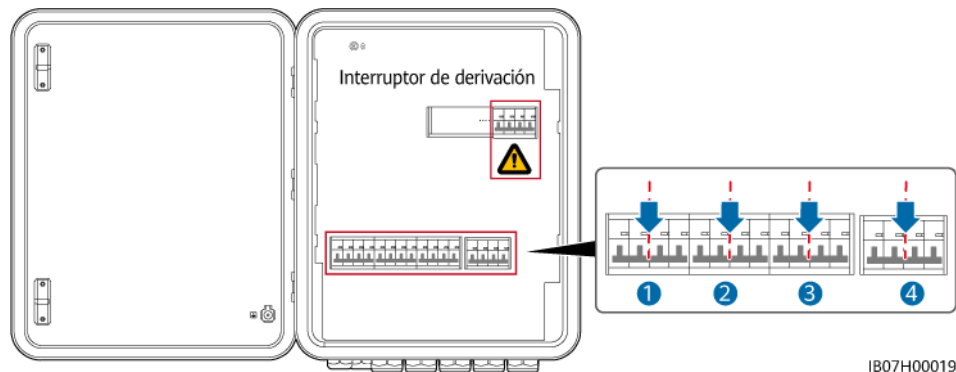
Procedure

Step 1 Confirm that the system alarm cannot be cleared when grid power is available and that the SmartGuard is not operating normally and cannot supply power to the loads.

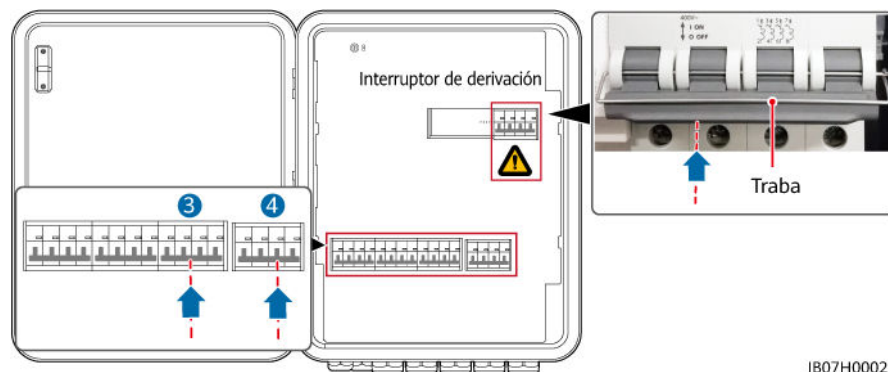
Step 2 Turn off the system. For details, see the “7.1 Shutting down the system”.

Step 3 Perform operations using the SmartGuard bypass switch.

1. Open the maintenance compartment door and turn off the four switches shown in the figure.



2. Remove the lock from the bypass switch, turn it on, and then turn on the switches and shown in the figure.



3. Close the maintenance compartment door.

Step 4 Turn on the main breaker, then turn on the breakers for the residential loads with and without backup.

---- End

7.5 Replacing the SmartGuard

Precautions

DANGER

Use personal protective equipment and specific insulated tools to avoid electric shocks or short circuits.



WARNING

- Before performing maintenance, turn off the equipment, follow the instructions in the delayed download label and wait the specified time to ensure that the equipment is not powered.
- Before opening the maintenance compartment door, turn off the circuit breaker. main power supply, then turn off the breakers for the residential loads with and without backup. Turn off the inverter and turn off the DC breakers for the inverter and ESS.
- Only authorized personnel may open the maintenance compartment cover to make electrical connections.
- Before opening the maintenance compartment cover, turn off the load breaker. backup, the grid AC breaker and the two inverter AC breakers inside the SmartGuard.
- Once the SmartGuard is turned off, residual electricity and heat from the equipment may continue to cause electric shocks and burns. Therefore, wait at least 5 minutes and put on insulated gloves before working with the SmartGuard.

Procedure

- Step 1** Turn off the system. For details, see the section [7.1 Shutting down the system](#).
- Step 2** Open the maintenance compartment door and turn off the backup load breaker, the utility AC breaker, and the two inverter AC breakers located inside the SmartGuard.
- Step 3** Remove all electrical connections from the SmartGuard.
- Step 4** Unscrew the SmartGuard from the mounting bracket.
- Step 5** Install a new SmartGuard. For details, see the section [4 Installing the system](#).
- Step 6** Make the electrical connections. For details, see the section [5 Electrical connections](#).
- Step 7** Perform SmartGuard commissioning. For details, see the section [6 Commissioning the system](#).

---- End

8 Technical specifications

Technical specifications

Concept	SmartGuard-63A-T0	SmartGuard-63A-AUT0
Inverter port current	60 A	
Shore power for backup charging	63 A	
Shore power for unbacked loads	63 A	
Power grid port current	63 A	
Nominal AC voltage	380/400/415V, 220/230/240V, L1/L2/L3/N+PE	
Boot mode	Start on the grid/generator side or on the inverter side	
Operating modes	Grid-connected, island-based, and with generator	
LVRT	It is admitted	
Controlling switching between grid connection and island mode	Automatic or forced	
Switching time between the connection to the power grid and island mode (switching without interruptions)	I <20 ms (MAP0) I < 100 ms (M1, MB0)	
EMMA (residential energy management system)	Available	
Remote generator start	Automatic or manual	

Concept	SmartGuard-63A-T0	SmartGuard-63A-AUT0
Generator DO port	1-100 mA, ≤24 V	
Bypass mode	Manual	

Visualization and communication

Concept	SmartGuard-63A-T0	SmartGuard-63A-AUT0
Display	LED indicators; WLAN + app	
RS485	It is admitted	
Integrated WLAN	It is admitted	

General specifications

Concept	SmartGuard-63A-T0	SmartGuard-63A-AUT0
Weight	≤17 kg	
Dimensions (width × height × depth)	490 mm × 600 mm × 170 mm	
Noise	<29 dB	
Cooling mode	Natural cooling	
Operating altitude maximum	4000 m (electrical capacity decreases when the altitude is higher than 2000 m)	
Temperature of operation	From -25 °C to +50 °C	
IP protection rating	IP55	

NOTE

- Grid-tied mode: The ambient temperature ranges from -25°C to +30°C, and the long-term steady-state current does not decrease. When the temperature ranges from 30°C to 40°C, the current decreases linearly from 63 A to 53 A. When the temperature ranges from 40°C to 50°C, the current decreases linearly from 53 A to 43 A (three-phase balanced load and PF = 1).
- Island mode (MAP0): When the ambient temperature ranges from -25°C to +30°C, the long-term steady-state current does not decrease. When the temperature ranges from 40°C to 50°C, the current decreases linearly from 60 A to 50 A (non-three-phase balanced load and PF ≥ 0.8).
- Island mode (M1 and MB0): When the ambient temperature ranges from -25°C to +40°C, the long-term steady-state current does not decrease.

Wireless Communication Specifications

Concept	WLAN
Frequency	2400-2483.5 MHz
Protocol standard	WLAN 802.11b/g/n
Bandwidth	≤20 MHz
Maximum transmission power	≤20 dBm EIRP

External WLAN Antenna Specifications

Concept	WLAN
Frequency	2400-2483.5 MHz
Revenue	≤4 dBi
Port	RP-SMA-J reverse polarity male connector (with internal threads and internal holes)
Mounting mode	By magnet
Cable length	2 m

T0 Connecting to the inverter in the app

Step 1 Access the screen **Commissioning the device**.

Figure A-1 Method 1: Before login (without internet connection)

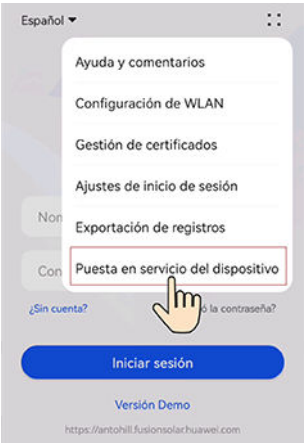
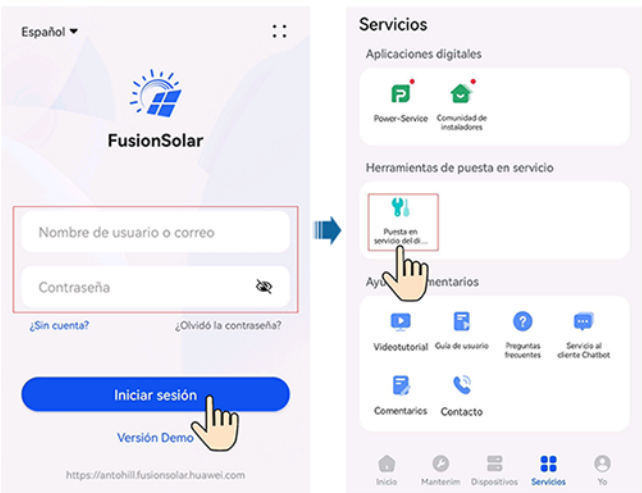


Figure A-2 Method 2: After login (with Internet connection)



Step 2 Connect to the inverter's WLAN network, log in as **Installer** and access the device commissioning screen.



WARNING

- When you directly connect the phone to a device, make sure that the phone is within WLAN coverage of the device.
- When connecting the device to the router via WLAN, make sure that the device is within the router's WLAN coverage and the signal is stable and good.

The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz), and the WLAN signal reaches the inverter.

WPA, WPA2 or WPA/WPA2 encryption modes are recommended for routers. WPA2 supports enterprise mode (e.g., airport Wi-Fi or other public Wi-Fi hotspots that require authentication). WEP and WPA TKIP are not recommended because they have serious security vulnerabilities. If access fails in WEP mode, log in to the router and change the router's encryption mode to WPA2 or WPA/WPA2.

NOTE

- The last six digits of the product's WLAN name are the same as the last six digits of the product's serial number (SN).
- For the first connection, log in using the initial password. The initial password can be obtained by checking the device label.
- To ensure account security, protect your password by changing it regularly and safeguard it. Someone could steal or crack your password if you don't change it for a long time. If your password is lost, your devices will be inaccessible. In such cases, the company will not be liable for any losses.
- If the login screen doesn't appear after scanning the QR code, check if your phone is properly connected to the device's Wi-Fi. If not, select it manually and connect to the Wi-Fi.
- If the message appears on the screen **This WLAN network doesn't have internet access. Connect anyway?** When connecting to the integrated WLAN, press **CONNECT**. Otherwise, you won't be able to log in to the system. The actual user interface and messages may vary depending on your device.

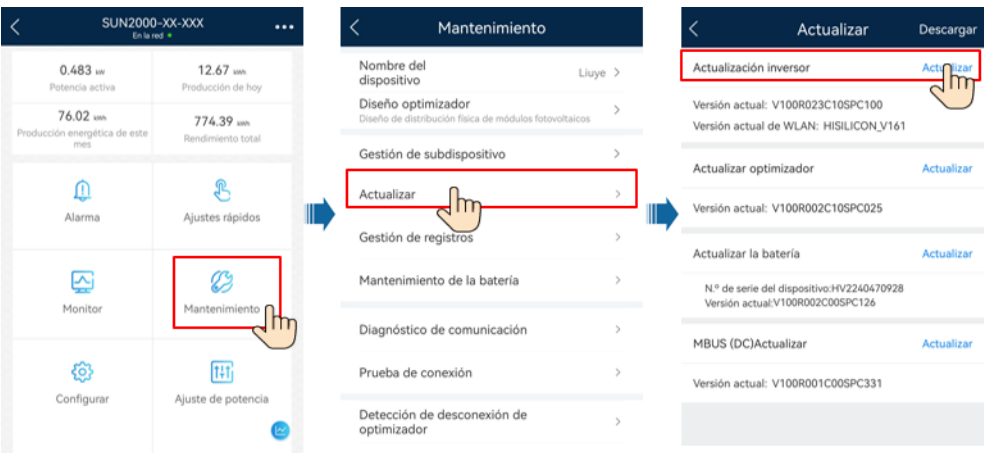
--- End

B Investor Update

 NOTE

If the phone is not connected to a network, prepare the update package before updating the inverter.

Connect to the inverter, choose **Maintenance>Upgrade** on the main screen and select the corresponding version of the inverter.



C Connecting to EMMA in the app

Step 1 Access the screen **Commissioning the device**.

Figure C-1 Method 1: Before login (without internet connection)

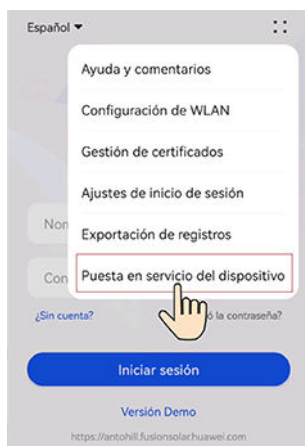
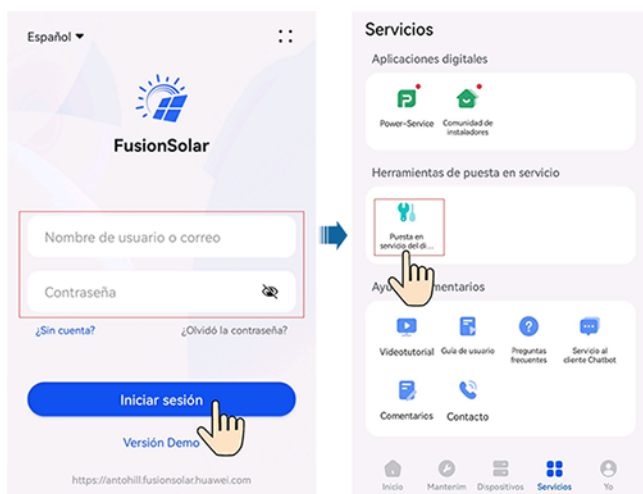


Figure C-2 Method 2: After login (with Internet connection)



Step 2 Connect to the EMMA WLAN network, log in as **Installer** and access the device commissioning screen.



WARNING

- When you directly connect the phone to a device, make sure that the phone is within WLAN coverage of the device.
- When connecting the device to the router via WLAN, make sure that the device is within the router's WLAN coverage and the signal is stable and good.

The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz), and the WLAN signal reaches the investor.

WPA, WPA2 or WPA/WPA2 encryption modes are recommended for routers. supports enterprise mode (e.g., airport Wi-Fi or other public Wi-Fi hotspots that require authentication). WEP and WPA TKIP are not recommended because they have serious security vulnerabilities. If access fails in WEP mode, log in to the router and change the router's encryption mode to WPA2 or WPA/WPA2.

NOTE

- The last six digits of the product's WLAN name are the same as the last six digits of the product's serial number (SN).
- For the first connection, log in using the initial password. The initial password can be obtained by checking the device label.
- To ensure account security, protect your password by changing it regularly and safeguard it. Someone could steal or crack your password if you don't change it for a long time. If your password is lost, your devices will be inaccessible. In such cases, the company will not be liable for any losses.
- If the login screen doesn't appear after scanning the QR code, check if your phone is properly connected to the device's Wi-Fi. If not, select it manually and connect to the Wi-Fi.
- If the message appears on the screen **This WLAN network doesn't have internet access. Connect anyway?** When connecting to the integrated WLAN, press **CONNECT** otherwise, you won't be able to log in to the system. The actual user interface and messages may vary depending on your device.

--- End

D

ATS Parameter Requirements

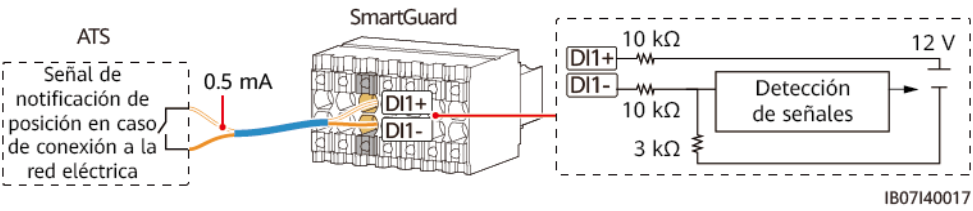
 NOTE

When the ATS is in operation, it consumes electrical energy that the EMMA cannot measure. As a result, the accuracy of the energy limiting output to the grid is compromised.

Concept	Specs	Description
Amount of ATS poles	- SmartGuard-63A-T0: 4 poles - SmartGuard-63A-AUTO: 3/4 poles	If the SmartGuard-63A-AUTO uses a 4-pole ATS, an external wire connection is required to ensure that the neutral conductor does not disconnect or that the ATS does not disconnect the neutral conductor.
Mode of commutation	Automatic	The ATS automatically switches between the utility grid and the generator as needed.
Mode of operation	- Automatic - Manual	SmartGuard requires the ATS to operate in automatic mode. The ATS operates in manual mode only for system maintenance.
Current nominal	When the rated current of the generator is greater than the main breaker current, the ATS rated current is greater than or equal to the generator rated current. When the rated current of the generator is lower than the main breaker current, the ATS rated current is greater than or equal to the main breaker current.	Select cables based on actual current.
Voltage of operation	380/400/415 V, 220/230/240 V	The operating voltage range of the ATS can affect the system's undervoltage and HVRT protection functions.

Concept	Specs	Description
Time of commutation	If the function is enabled seamless switching of SmartGuard, the time of ATS switching must be greater than or equal to 500 ms If the function is disabled seamless switching of SmartGuard, the time of ATS switching must be greater than or equal to 5 s.	The switching time between the generator and the grid must not fall below the lower limit; otherwise, system devices will be affected.
Delay of start	Recommended value: ≤ 1 min	The time from the moment the generator receives the start signal until the moment the generator AC output stabilizes plus the successful switching time of the ATS must be less than 5 min (this is the default value; the actual value may be higher).
State of off	Keep	When the ATS is shut down, the AC circuit and the ATS's on-position notification signal must remain active before the power failure. Otherwise, the system's LVRT function will be impaired.
Sign of notification of position in case connection to the electrical grid	IThe ATS port corresponding to The position notification signal sent when connected to the power grid must be a passive port that works with an external circuit and can operate at a current less than or equal to 0.7 mA@12 V. IThe low impedance of the circuit corresponding to the position notification signal when connected to the power grid is less than or equal to 100 ohms. IThe delay between the signal of Position notification upon connection to the power grid and the connection to the power grid is within ± 100 ms.	1. When the power grid is connected, the position notification signal circuit sent at the time of connection to the power grid has a low impedance. When the power grid is disconnected, this circuit has a High impedance. The grid availability status for high and low impedance can be configured in the app. FusionSolar. For details on how to configure the grid exception detection mode, see the section Table 6-7. 2. The port corresponding to the position notification signal when connected to the power grid must be a passive port. Using an active port may damage the SmartGuard, which is not covered by the warranty. 3. Enhanced isolation design is required between the ATS signal port and the AC circuit.

Figure D-1Position notification signal in case of connection to the power grid



AND

Requirements for the parameters of the generator

Concept	Specs	Description
Mode of operation	- Remotely - Manual	SmartGuard requires the generator to be operated remotely. The generator's manual mode is only used when the generator is first started.
Voltage of operation	380/400/415V, 220/230/240V, L1/L2/L3/N, 50Hz/60Hz	Both unbalanced three-phase loads and single-phase loads can be connected.
Delay of start	Recommended value: ≤4 min	The time from the moment the generator receives the start signal until the moment the generator AC output stabilizes plus the successful switching time of the ATS must be less than 5 min (this is the default value; the actual value may be higher).
Grounding from the generator	-	The generator's neutral conductor must be grounded. Otherwise, the SmartGuard will report a generator ground exception alarm.
Control signal from the generator	The generator-side port must be an active port. Once the port is connected to the SmartGuard signal circuit, the circuit current ranges from 1 mA to 100 mA, and the voltage is less than or equal to 24 V.	- The SmartGuard can remotely start or stop the generator through the port on the generator side. - The SmartGuard-side port must be a passive port. When the circuit impedance is low, the generator starts. When the circuit impedance is high, the generator shuts down. - If the generator-side port voltage or circuit current is too high, the SmartGuard may be damaged, which is not covered by the warranty. If the current is too low, the SmartGuard's internal circuitry may malfunction. - Enhanced insulation design is required between the generator side port and the generator AC circuit.

Concept	Specs	Description
Alarm signal from the generator (optional)	The port on the side of the generator must be a passive port that work with an external circuit and can operate at a current less than or equal to 0.7 mA@12 V. Low impedance for that the generator alarm signal is triggered is less than or equal to 100 ohms.	1. If the generator is not operating, the corresponding alarm signal circuit has a low impedance by default. When the generator is operating normally, the corresponding alarm signal circuit has a high impedance. In the FusionSolar app, you can configure the high and low impedance corresponding to the generator states (faulty and normal). For details on how to configure the fault detection mode, see the section. Table 6-10. 2. The generator-side port must be a passive port. If an active port is used, the SmartGuard may be damaged, which is not covered by the warranty. 3. Enhanced insulation design is required between the generator side port and the generator AC circuit.

Figure E-1Generator control signal

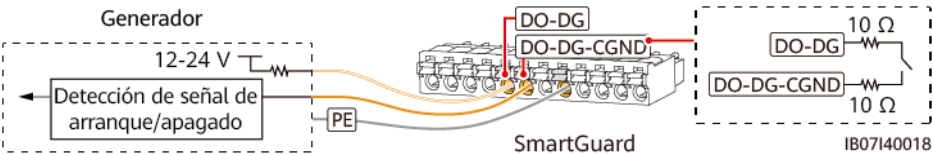
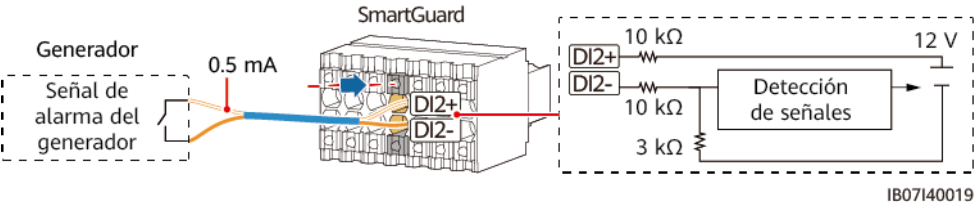


Figure E-2Generator alarm signal

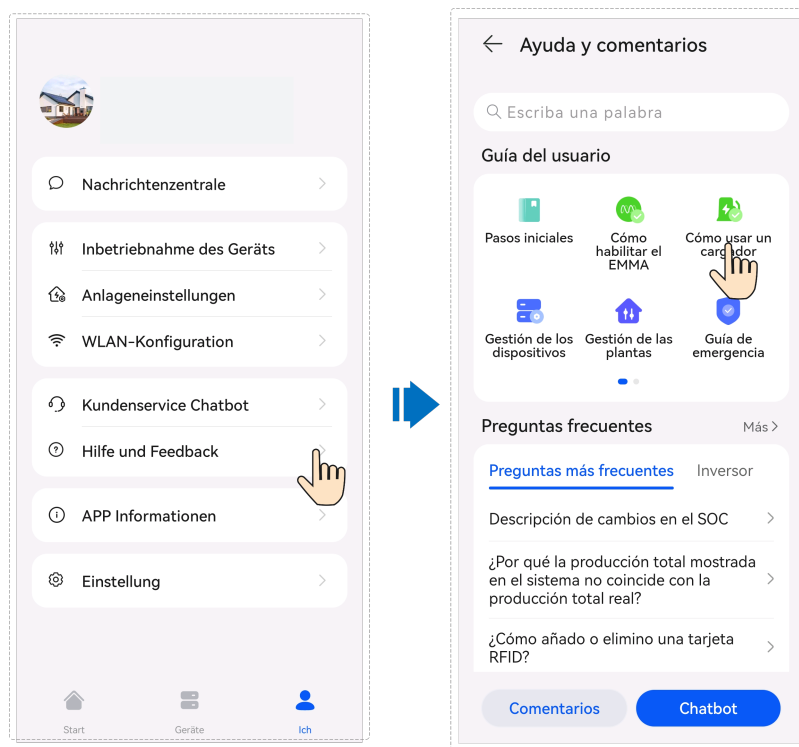


F Use of smart devices

(owner)

F.1 Commissioning the charger

Log in to the FusionSolar app as an owner, tap the charger on the screen **Start** and configure the charger parameters. For details on how to use the charger, go to **Help and comments**.



F.2 Commissioning of smart switches

 NOTE

If functions related to PV power control are involved, such as priority PV power, it is recommended to configure smart devices with a rated power greater than 100 W.

 NOTE

The EMMA V100R023C10 (V100R023C10SPCXX) only supports the Shelly versions listed in the table below. To check the Shelly version, follow these steps:

1. Turn on the Shelly and connect to your WLAN.
2. Enter the Shelly's connection IP address in your browser's address box to check the device's firmware version. For details, see the Shelly user manual.

Table F-1Supported Shelly versions

Guy	Model	Version
Plug intelligent	Shelly Plus Plug S	0.12.99-plugsprod1, 0.14.4, 1.0.8, 1.1.0-beta3
Smart Relay	Shelly Plus 2 PM	0.10.2-beta4, 1.0.8, 1.1.0-beta3
Circuit breaker intelligent	Shelly Pro 2PM	0.10.2-beta1, 1.0.3, 1.0.8, 1.1.0-beta3

Device settings

 NOTE

- I Smart switches can only function properly when there are stable WLAN signals. If the signals are unstable, the switches may not connect to the WLAN or may disconnect frequently. Different brands of smart switches may have different WLAN requirements. For details, refer to the product manuals or contact your supplier.
- I Before installation, ensure that the residential router can cover the smart switch location with a stable network connection, and perform commissioning and verification.

1. Connect a smart switch to the same router as the EMMA. For details, see the quick start guide that came with your smart switch.
2. Open the FusionSolar app, choose **Device>Teams**, add the smart switch and configure parameters such as PV power and power consumption priorities.

 NOTE

In the SmartGuard networking scenario, the **Island mode load control**It has no effect on smart devices connected to non-backup power ports.

Connecting to multiple smart switches

To avoid confusion when powering on multiple smart switches at the same time, power them on and perform commissioning one by one.

For example, if two smart breakers (Shelly Pro 2PM) are installed in the living room, follow these steps:

- 1. When installing smart circuit breakers, record their positions by taking photos and notes, and number them.

Table F-2Registering the names of smart switches

Shelly Pro 2PM	Shelly Pro 2PM
Living room 1	Living room 2

- 2. Turn on the “Living Room 1” smart switch, search for it in the Shelly app, and connect it to the router.
- 3. Log in to the FusionSolar app as an owner, search for and rename it. Associate it with the corresponding load based on the actual cable connection.



- 4. Repeat steps 2 and 3 to turn on and commission the “Living Room 2” smart breaker.

NOTE

If multiple smart switches have been turned on without prior registration, they can be turned on or off in the Shelly app to distinguish between them.

F.3 Generator settings

Log in to the FusionSolar app using an owner account. On the screen **Start**, choose **PV+ESS devices>Device>Generator**and set the parameters in**Generator control** and**Parameter settings**.

Figure F-1Generator control settings

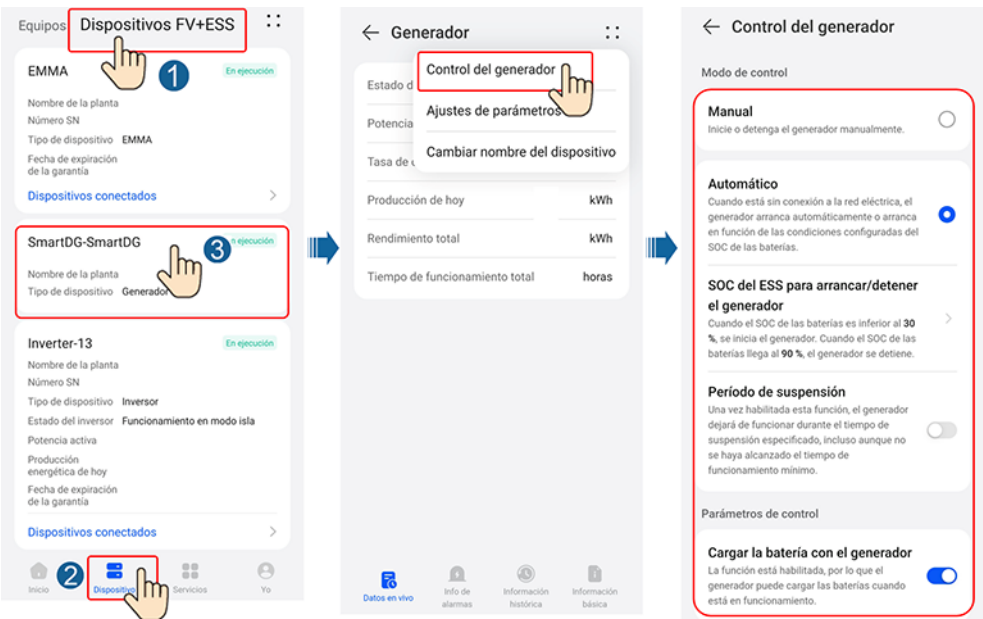


Table F-3Generator control parameters

Parameter	Range of values		Description
Mode of control	Manual		Off On
	Automatic	SOC of the ESS to start/stop the generator	The upper and lower thresholds for the battery SOC can be set. When the battery SOC reaches the specified upper or lower threshold, the generator automatically shuts down or starts.
		Period of suspension	Once this feature is enabled, the generator will stop running during the specified shutdown time, even if the minimum run time has not been reached.
Load the battery with the generator	Disable (value predetermined) Enable		Once this feature is enabled, the generator will be allowed to charge the ESS.

Figure F-2Generator parameter settings

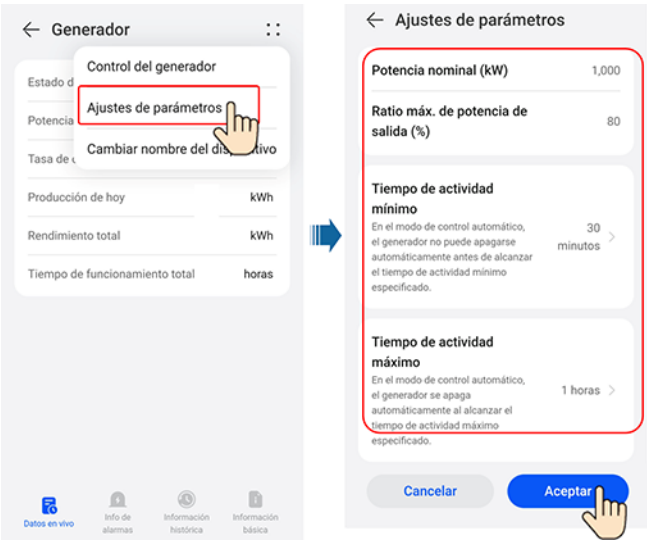


Table F-4Generator parameters

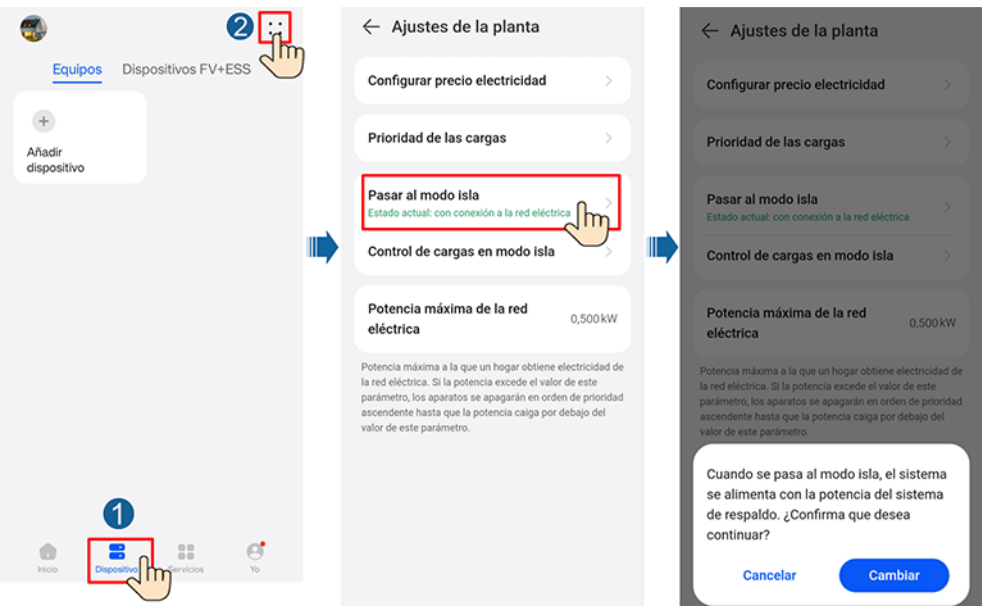
Parameter	Range of values	Description
Nominal power (kW)	1-500	Indicates the nominal power of the generator.
Max output power ratio (%)	0-100	Indicates the maximum output power ratio of the generator.
Uptime minimum (min)	0-60	In automatic control mode, the generator cannot be shut down automatically if the specified minimum uptime has not been reached.
Uptime maximum (min)	60-2880	In automatic control mode, the generator automatically shuts down when the specified maximum run time is reached.

F.4 Forced switching in the SmartGuard

Log in to the FusionSolar app using an owner account. On the screen **Start**, choose **Device>Plant settings** and change the operating mode as required.

- I If pressed **Change** When the system is connected to the power grid, it is forced into island mode. If the system experiences a fault or has been manually returned to grid-connected mode, it will automatically exit forced switchover mode.
- I If pressed **Change** When the system is in island mode, it will attempt to switch to grid-connected mode and will automatically exit hard-to-switch mode.

Figure F-3 Forced commutation



G Contact information

If you have any questions regarding this product, please contact us.



<https://digitalpower.huawei.com>

Route: **About us** > **Contact us** > **Service hotlines**

To ensure faster and better service, we ask that you kindly provide us with the following information:

- | Model
- | Serial Number (SN)
- | Software Version
- | Alarm name or ID
- | Brief description of the fault symptom

 NOTE

EU Representative Information: Huawei Technologies Hungary Kft.
Address: HU-1133 Budapest, Váci út 116-118., 1. Building, 6. floor. Email:
hungary.reception@huawei.com

H Smart Energy Customer Service

digital



<https://digitalpower.huawei.com/robotchat/>

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Disclaimer regarding the risks of initial certificates

Huawei's initial certificates are mandatory identity credentials for Huawei devices prior to delivery. The disclaimers regarding the use of these certificates are as follows:

1. Huawei's initial certificates are used only during the deployment phase to establish initial security channels between devices and the customer network. Huawei does not promise or guarantee that the initial certificates are secure.
2. Customers shall bear the consequences of all security risks and incidents arising from the use of Huawei's initial certificates as service certificates.
3. Huawei's initial certificates are valid from the date of manufacture until December 29, 2099.
4. Services using an initial certificate will be discontinued when the certificate expires.
5. It is recommended that customers adopt a PKI system to issue certificates for devices and network software in service, and to manage the certificate lifecycle. To ensure security, it is recommended to use certificates with short validity periods.

NOTE

The validity period of an initial certificate can be checked in the network management system.

J Acronyms and abbreviations

TO	
AC	alternating current (AC)
APP	application
ATS	auto transfer switching automatic transfer)
C	
COM	communication (communication)
D	
DI	digital input
DO	digital output
AND	
ETH	Ethernet
G	

GE	Gigabit Ethernet
L	
LAN	local area network
LED	light-emitting diode
N	
NC	normally closed (normally closed)
NO	normally open
P	
POE	Power over Ethernet (Power over Ethernet)
PE	protective earthing
R	
RST	reset
RH	relative humidity
S	
SOC	state of charge
SOH	state of health

SN	serial number (SN)
W	
WAN	wide area network