V1.7 2026-05-31

Residential All-In-One Energy Storage System

ESA 3-10kW

GW5.1-BAT-D-G20
GW8.3-BAT-D-G20
GW5.1-BAT-D-G21
GW8.3-BAT-D-G21
GW6.0-BAT-D-G20
GW9.0-BAT-D-G20

Solutions Manual

GOODWE

Copyright Statement

Copyright Statement

Trademark Licensing

GOODWEand other terms used in this manualGOODWEThe trademark is owned by GoodWe Technologies Co., Ltd. All other trademarks or registered trademarks mentioned in this manual belong to their respective owners.

NOTICE

Due to product version upgrades or other reasons, the content of the document will be updated periodically. Unless otherwise agreed, the content of the document cannot replace the Safety Precautions in the product label. All descriptions in the document are provided for guidance only.

About This Manual

Overview

The energy storage system consists of inverter, battery system, and smart meter. This manual describes the product information, installation, electrical connection, commissioning, troubleshooting and maintenance of the system. Read through this manual before installing and operating the products to understand product safety information and familiarize yourself with functions and features of the product. This manual is subject to update without notice. For more product details and latest documents, visit https://en.goodwe.com/.

Applicable Model

The energy storage system includes the following products:

Product Type	Product Information	Description
Inverter	GW3K-EHA-G20 GW3.6K-EHA-G20 GW5K-EHA-G20 GW6K-EHA-G20 GW8K-EHA-G20 GW9.999K-EHA-G20 GW10K-EHA-G20 GW3K-BHA-G20 GW3.6K-BHA-G20 GW5K-BHA-G20 GW6K-BHA-G20 GW8K-BHA-G20 GW9.999K-BHA-G20 GW10K-BHA-G20	Nominal output power: 3kW-10kW
	GW5.1-BAT-D-G20	Rated energy 5.12kWh

Product Type	Product Information	Description
Battery system	GW5.1-BAT-D-G21	
	GW8.3-BAT-D-G20	Rated energy 8.32kWh
	GW8.3-BAT-D-G21	
	GW6.0-BAT-D-G20	Rated energy 6kWh
	GW9.0-BAT-D-G20	Rated energy 9kWh
Meter	GMK110	Monitoring module in the energy storage system, capable of detecting operating voltage, current, and other information within the system.
	GM330	
smart dongle	WiFi/LAN Kit-20	Uploads system operating information to the monitoring platform via WiFi or LAN signal.
	4G Kit-CN-G20 (China only)	Uploads system operating information to the monitoring platform via 4G.

Symbol Definition

DANGER
Indicates a high-level hazard that, if not avoided, will result in death or serious injury.
⚠WARNING
Indicates a medium-level hazard that, if not avoided, could result in death or serious injury.
CAUTION
Indicates a low-level hazard that, if not avoided, could result in minor or moderate injury.
NOTICE

Highlights key information and supplements the texts. Or some skills and methods to solve product-related problems to save time.

Table of Contents

1 Safety Precautions

Please strictly follow these safety instructions in the user manual during the operation.

⚠WARNING

The products are designed and tested strictly to comply with related safety rules. Follow all the safety instructions and cautions before any operations. Improper operation might cause personal injury or property damage as the products are electrical equipment.

1.1 General Safety

NOTICE

- The information in this user manual is subject to change due to product updates or other reasons. This manual cannot replace the product safety labels unless otherwise specified. All descriptions in the manual are for guidance only.
- Before installations, read through the user manual to learn about the product and the precautions.
- All operations should be performed by trained and knowledgeable technicians who are familiar with local standards and safety regulations.
- Use insulating tools and wear personal protective equipment(PPE) when operating the equipment to ensure personal safety. Wear anti-static gloves, wrist strips, and cloths when touching electronic devices to protect the equipment from damage.
- Unauthorized dismantling or modification may damage the equipment, and the damage is not covered under the warranty.
- Strictly follow the installation, operation, and configuration instructions in this manual or the user manual. The manufacturer shall not be liable for equipment damage or personal injury if you do not follow the instructions. For more warranty details, please visit https://www.goodwe.com/warrantyrelated.html.

1.2 personnel requirements

NOTICE

To ensure the safety, compliance, and efficiency throughout the transportation, installation, wiring, operation, and maintenance of the equipment, the work must be carried out by professionals or qualified personnel.

1. Professionals or qualified personnel include:
   - Personnel who have mastered the equipment's working principles, system structure, and knowledge of relevant risks and hazards, and have received professional operation training or possess rich practical experience.
   - Personnel who have received relevant technical and safety training, have certain operational experience, can be aware of potential dangers that specific operations may pose to themselves, and are able to take protective measures to minimize risks to themselves and others.
   - Qualified electrical technicians who meet the regulatory requirements of the country/region where they are located.
   - Personnel who hold a degree in electrical engineering/an advanced diploma in an electrical discipline or equivalent qualification/a professional qualification in the electrical field, and have at least 2/3/4 years of experience in testing and supervising in accordance with electrical equipment safety standards.
2. Personnel engaged in special tasks such as electrical operations, working at heights, and operation of special equipment must hold valid qualification certificates as required by the location of the equipment.
3. Operation of medium-voltage equipment must be performed by certified high-voltage electricians.
4. Replacement of the equipment and its components is only permitted to be carried out by authorized personnel.

1.3 System Safety

DANGER

- Disconnect the upstream switches to power off the equipment before any electrical connections. Do not work with power on. Otherwise, an electric shock may occur.
- Install a breaker at the voltage input side of the equipment to prevent personal injury or equipment damage caused by energized electrical work.
- All operations such as transportation, storage, installation, use and maintenance shall comply with applicable laws, regulations, standards and specifications.
- Perform electrical connections in compliance with local laws, regulations, standards and specifications, including cables and component specifications.
- Use the connectors included in the package to connect cables. The manufacturer shall not be liable for the equipment damage if connectors of other models are used.
- Ensure all cables are connected correctly, tightly, and securely. Inappropriate wiring may cause poor connection and damage the equipment.
- The PE cables must be connected and secured properly.
- To protect the equipment and components from damage during transportation, ensure that the transportation personnel are professionally trained. All operations during the transportation have to be recorded. The equipment shall be kept in balance to avoid falling down.
- The equipment is heavy. Please equip the corresponding personnel according to its weight, so that the equipment does not exceed the maximum weight that the personnel can carry to avoid personnel injuries.
- Keep the equipment stable to avoid dumping, which can result in equipment damage and personal injuries.

⚠WARNING

- Do not apply mechanical load to terminals, otherwise the terminals may be damaged.
- If the cable bears too much tension, the connection may be poor. Reserve a certain length of the cable before connecting it to corresponding ports.
- Tie the cables of the same type together, and place cables of different types at least 30mm apart. Do not place the cables entangled or crossed.
- Place the cables at least 30mm away from the heating components or heat sources, otherwise the insulation layer of the cables may be aging or broken due to high temperature.

1.3.1 PV String Safety

⚠WARNING

- Ensure the PV module frames and the bracket system are securely grounded.
- Ensure the DC cables are connected tightly, securely and correctly. Inappropriate wiring may cause poor contacts or high impedances, and damage the inverter.
- Measure the positive and negative terminals of the DC cable using a multimeter to avoid reverse polarity connection. Also, the voltage should be within the permissible range.
- Measure the DC cable using the multimeter to avoid reverse polarity connection. Also, the voltage should be under the max DC input voltage. The manufacturer shall not be liable for the damage caused by reverse connection and extremely high voltage.
- The PV strings cannot be grounded. Ensure the minimum insulation resistance of PV string to the ground meets the minimum insulation resistance requirements before connecting the PV string to the inverter (R=maximum input voltage (V)/ 30mA).
- Do not connect the same PV string to multiple inverters at the same time. Otherwise, the inverters may be damaged.
- PV modules used with inverters must comply with IEC 61730 Class A standard.

1.3.2 Inverter Safety

⚠WARNING

- The voltage and frequency at the grid connecting point of the grid should meet the grid connecting requirements of the inverter.
- Additional protective devices like circuit breakers or fuses are recommended on the AC side. Specification of the protective device should be at least 1.25 times the maximum AC output current of the inverter.
- The arc fault alarms will be cleared automatically if the alarms are triggered less than 5 times in 24 hours. The inverter will shutdown for protection after the 5th electric arc fault. The inverter can operate normally after the fault is solved.
- BACK-UP is not recommended to use if the PV system is not configured with batteries. Otherwise, there may be a risk of system power outage.

1.3.3 Battery Safety

DANGER

- Keep Power Off before any operations to avoid danger of electric shock. Strictly follow all safety precautions outlined in this manual and safety labels on the equipment during the operation.
- Do not disassemble, modify, or replace any part of the battery without official authorization from the manufacturer. Otherwise, it will cause electrical shock or damages to the equipment, which shall not be borne by the manufacturer.
- Do not hit, pull, drag, squeeze or step on the equipment or put the battery into fire. Otherwise, the battery may explode.
- Do not place the battery in a high temperature environment. Make sure that there is no direct sunlight and no heat source near the battery. When the ambient temperature exceeds 60 ℃, it will cause fire.
- Do not use the battery if it is defective, broken, or damaged. Damaged battery may leak electrolyte.
- Do not move the battery system while it is working. Contact after-sales service if the battery shall be replaced or added.
- A short circuit in the battery may cause personal injury. The instantaneous high current caused by a short circuit can release a large amount of energy and may cause a fire.
- To protect the equipment and components from damage during transportation, ensure that the transportation personnel are professionally trained. All operations during the transportation have to be recorded. The equipment shall be kept in balance to avoid falling down.
- Battery The equipment is heavy. Please equip the corresponding personnel according to its weight, so that the equipment does not exceed the maximum weight that the personnel can carry to avoid personnel injuries.

⚠WARNING

- Factors such as temperature, humidity, weather conditions, etc. may limit the battery's current and affect its load-carrying ability.
- Contact after-sale service immediately if the battery is not able to be started. Otherwise, the battery might be damaged permanently.
- Inspect and maintain the battery regularly according to the maintenance requirements of the battery.
- Ensure that the battery system is not damaged during transportation and storage. Keep the equipment stable to avoid dumping, which can result in equipment damage and personal injuries.

Emergency Measures

- Battery Electrolyte Leakage
  If the battery module leaks electrolyte, avoid contact with the leaking liquid or gas. The electrolyte is corrosive. It will cause skin irritation or chemical burn to the operator. Anyone contact the leaked substance accidentally has to act/respond as following:
  - Breath in the leaked substance: Evacuate from the polluted area, and seek immediate medical assistance.
  - Eye contact: Rinse your eyes for at least 15 minutes with clean water and seek immediate medical assistance.
  - Skin contact: Thoroughly wash the touch area with soap and clean water, and seek immediate medical assistance.
  - Ingestion: Induce vomiting, and seek immediate medical assistance.
- Fire
  - The battery may burn when the ambient temperature exceeds 150℃. Poisonous and hazardous gas may be released if the battery is on fire.
  - In the event of a fire, please make sure that the carbon dioxide extinguisher or water extinguishing device is nearby.
  - The fire cannot be put out by ABC dry powder extinguisher. Firefighters are required to wear full protective clothing and self-contained breathing apparatus.
- Battery triggers fire protection
  For batteries with fire protection functions, perform the following operations after the fire protection function is triggered:
  - Immediately cut off the main power switch to ensure that no current passes through the battery system.
  - Conduct a preliminary inspection of the appearance of the battery to determine

if there is any damage, deformation, leakage, or odor. Check the battery casing, connectors, and cables.
- Use temperature sensors to detect the temperature of the battery and its environment, ensuring there is no risk of overheating.
- Isolate and label damaged batteries, and handle them properly in accordance with local regulations.

1.3.4 Smart Meter Safety

⚠WARNING

If the voltage of the grid fluctuates and exceed 265V, the meter may be damage by long-term overvoltage operation. It is recommended to add a fuse with a rated current of 0.5A on the voltage input side of the meter to protect it.

1.4 Safety Symbols and Certification Marks

DANGER

- All labels and warning marks should be visible after the installation. Do not cover, scrawl, or damage any label on the equipment.
- The following descriptions are for reference only. Please refer to the actual labeling of the equipment.

No.	Symbol	Descriptions
1		Potential risks exist. Wear proper PPE before any operations.
2		HIGH VOLTAGE HAZARD. High voltage exists. Disconnect all incoming power and turn off the product before working on it.
3		High-temperature hazard. Do not touch the product under operation to avoid being burnt.

No.	Symbol	Descriptions
4		Operate the equipment properly to avoid explosion.
5		Batteries contain flammable materials, beware of fire.
6		The equipment contains corrosive electrolytes. In case of a leak in the equipment, avoid contacting the leaked liquid or gas.
7		Delayed discharge. Wait 5 minutes after power off until the components are completely discharged.
8		Install the equipment away from fire sources.
9		Keep away from children.
10		Do not pour with water.
11		Read through the user manual before any operations.
12		Wear PPE during installation, operation and maintaining.
13		Do not dispose of the System as household waste. Deal with it in compliance with local laws and regulations, or send it back to the manufacturer.

No.	Symbol	Descriptions
14		Grounding point.
15		Recycle regeneration mark.
16		CE Mark.
17		TUV mark.
18		RCM mark.

1.5 EU Declaration of Conformity

1.5.1 Equipment with Wireless Communication Modules

The equipment with wireless communication modules sold in the European market meets the requirements of the following directives:

- Radio Equipment Directive 2014/53/EU (RED)
- Restrictions of Hazardous Substances Directive 2011/65/EU and (EU) 2015/863 (RoHS)
- Waste Electrical and Electronic Equipment 2012/19/EU
- Registration, Evaluation, Authorization and Restriction of Chemicals (EC) No 1907/2006 (REACH)

1.5.2 Equipment without Wireless Communication Modules (Except Battery)

The equipment without wireless communication modules sold in the European market meets the requirements of the following directives:

- Electromagnetic compatibility Directive 2014/30/EU (EMC)
- Electrical Apparatus Low Voltage Directive 2014/35/EU (LVD)
- Restrictions of Hazardous Substances Directive 2011/65/EU and (EU) 2015/863 (RoHS)
- Waste Electrical and Electronic Equipment 2012/19/EU
- Registration, Evaluation, Authorization and Restriction of Chemicals (EC) No 1907/2006 (REACH)

1.5.3 Battery

The batteries sold in the European market meets the requirements of the following directives:

- Electromagnetic compatibility Directive 2014/30/EU (EMC)
- Electrical Apparatus Low Voltage Directive 2014/35/EU (LVD)
- Battery Directive 2006/66/EC and Amending Directive 2013/56/EU
- Waste Electrical and Electronic Equipment 2012/19/EU
- Registration, Evaluation, Authorization and Restriction of Chemicals (EC) No 1907/2006 (REACH)

You can download the EU Declaration of Conformity from our official website.

2 System Introduction

2.1 System Overview

The all-in-one residential energy storage solution integrates devices such as an inverter, Battery, Smart Meter, and smart communication stick. In a photovoltaic system, it converts solar energy into electricity to meet household power demands. The energy IoT devices in the system manage power-consuming devices by identifying the overall power situation within the system, thereby achieving intelligent management of electricity for supplying loads, storing to the Battery, or exporting to the grid.

⚠WARNING

- The energy storage system is not suitable for connecting devices that rely on stable power supply, such as life-sustaining medical equipment, etc. Ensure that a system power failure does not lead to personal injury.
- If the residential storage all-in-one unit is in a high-temperature or BMS current-limiting condition, it may cause the battery charging power to be limited, leading to excessively high system voltage triggering overvoltage protection.
- In microgrid scenarios, the PV open-circuit voltage of the residential storage all-in-one unit is recommended to be <500V to prevent system voltage from becoming too high under harsh operating conditions and triggering overvoltage protection.
- In microgrid scenarios, ensure the over-frequency power reduction point of the grid-tied inverter matches that of the residential storage all-in-one unit.
- If output power limitation is required for the grid-tied inverter, please connect metering or CT devices separately.
- Ensure the over-frequency power reduction curve of the grid-tied inverter is set as follows:
  - Set the end power to 0% Pn
  - Set the response delay time to 0, and disable the hysteresis function
- In a system where the inverter operates completely off-grid, if the battery experiences prolonged low sunlight or rainy weather and cannot be replenished in time, it may lead to over-discharge, causing battery performance degradation or damage. To ensure long-term stable system operation, avoid completely

draining the battery. Recommended measures are as follows:

1. During off-grid operation, set the minimum SOC protection threshold. It is recommended to set the off-grid battery SOC lower limit to 30%.
2. When the SOC approaches the protection threshold, the system will automatically enter load limitation or protection mode.
3. If there are consecutive days of insufficient sunlight and the battery SOC is too low, promptly replenish the battery using an external energy source (such as a generator or grid-assisted charging).
4. Regularly check the battery status to ensure it operates within the safe working range.
5. It is recommended to perform a full charge and discharge cycle on the battery every six months to calibrate SOC accuracy.

- Due to product version upgrades or other reasons, document content is updated periodically. For the compatibility relationship between inverters and IoT products, please refer to: https://en.goodwe.com/Ftp/EN/Downloads/User%20Manual/GW_Compatibility-list-of-GoodWe-inverters-and-IoT-products-EN.pdf
- For detailed networking and wiring schemes for each scenario, please refer to: 5.2.Detailed System Wiring Diagram(Page 84).

When the energy storage system is in off-grid mode, it can normally supply the following loads:

Off-grid Load Capacity Description	
Inverter Model	ESA 3-10kW
Single Inductive Load Rated Power (kVA)	0.3*Pn
Total Inductive Load Rated Power (kVA)	0.3*Pn
Pure Capacitive Load (kVA)	0.33*Pn

Off-grid Load Capacity Description
Note: • Pn: Inverter rated output power. • If the total power of multiple inductive loads calculated based on the rated power is less than the rated power of a single inductive load, then the total rated power of multiple inductive loads equals the rated power of a single inductive load. • If inductive loads are required, it is recommended to use them in conjunction with a frequency converter. • For 2 or more units operating in parallel, the allowed total inductive load rated power = single inductive load rated power * number of parallel units * 80%.

General Scenario

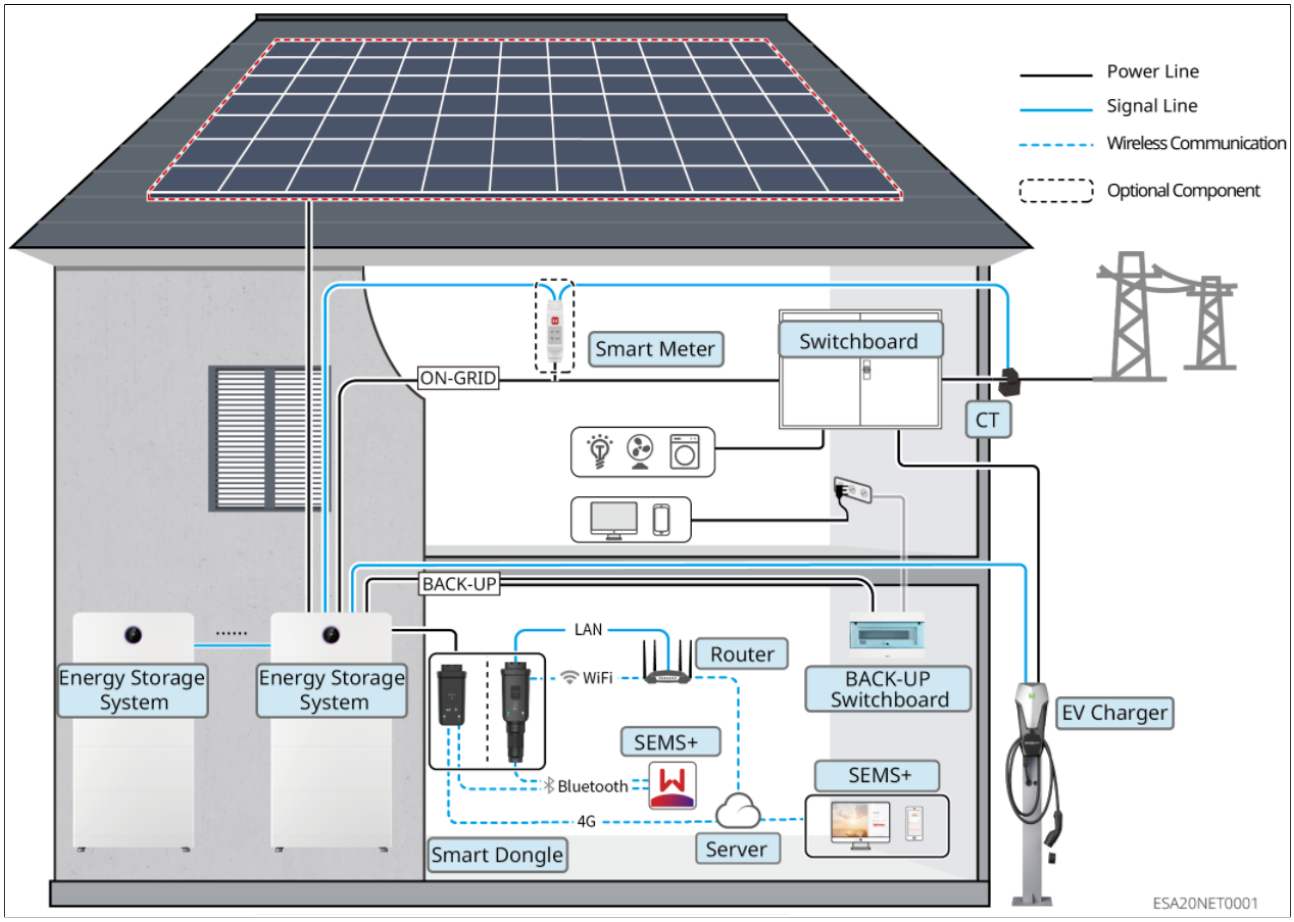


Figure1 General Scenario

Device Type	Model	Description
Hybrid inverter	GW3K-EHA-G20	• Can be connected to GoodWe AC charging piles. • Generator control and generator charging the battery are only supported in single-unit scenarios. • The system supports a maximum of 10 inverters to form a parallel system, supporting mixed parallel connection of inverters with different power ratings in on-grid/off-grid modes. • In a parallel system, when GW3K/3.6K/5K/6K models are mixed with GW8K/9.999K/10K models, please set the GW8K/9.999K/10K model as the master inverter. • If you need to connect a generator or set up a parallel network, please use the GMK110 or GM330 Smart Meter. If the number of parallel inverters exceeds two, please use the GM330 Smart Meter. • In a parallel system, each inverter needs to be installed with a WiFi/LAN Kit-20, and the software version must be V2.5 or above. • When setting up the system network, the following version requirements must be met: ◦ Inverter ARM software version must be 04.124 or above. ◦ Inverter DSP software version must be 05.5004 or above.
	GW3.6K-EHA-G20	
	GW5K-EHA-G20	
	GW6K-EHA-G20	
	GW8K-EHA-G20	
	GW9.999K-EHA-G20	
	GW10K-EHA-G20	
	GW3K-BHA-G20	
	GW3.6K-BHA-G20	
	GW5K-BHA-G20	
	GW6K-BHA-G20	
	GW8K-BHA-G20	
	GW9.999K-BHA-G20	
	GW10K-BHA-G20	

Device Type	Model	Description
Battery system	GW5.1-BAT-D-G20 GW5.1-BAT-D-G21 GW8.3-BAT-D-G20 GW8.3-BAT-D-G21 GW6.0-BAT-D-G20 GW9.0-BAT-D-G20	• Different models of battery modules support mixed use. • The system supports 5-108kWh, meeting the needs of different power and energy matching. • Battery heating film is optional. The "Battery Heating" function can only be enabled on models configured with the heating film. Batteries without the heating film should not be used in low-temperature environments, as this may cause the equipment to malfunction. • The battery heating function is unavailable when GW5.1-BAT-D-G20, GW8.3-BAT-D-G20, GW5.1-BAT-D-G21, GW8.3-BAT-D-G21, GW6.0-BAT-D-G20 , GW9.0-BAT-D-G20 are used together. • If the system requires mixed battery use or split-type expansion, please ensure the BMS software version is V06 or above and the DCDC version is V06 or above.
Smart Meter	Built-in meter (shipped with the inverter)	• Built-in meter: Please use the CT shipped with the unit to connect to the inverter. ◦ CT ratio is 120A:40mA. ◦ If the inverter's built-in meter is insufficient, contact your dealer to purchase a GMK110 or GM330 Smart Meter. • GMK110: CT cannot be replaced; CT ratio is 120A:40mA. • GM330: CT can be purchased from GoodWe or separately; CT ratio is nA:5A. • If the inverter needs to connect to a generator, please use the GMK110 or GM330 Smart Meter.
	GMK110 (purchased from GoodWe)	
	GM330 (purchased from GoodWe)	

Device Type	Model	Description
Smart dongle	WiFi/LAN Kit-20	• Suitable for single inverter networking and parallel inverter networking scenarios. • Uses Bluetooth signals for local configuration of device parameters and viewing device operation information. Uploads system operation information to the monitoring platform via WiFi or LAN. • To use features like one-click upgrade and operation log export on the inverter, ensure the WiFi/LAN Kit-20 software version is V2.3 or above.
	4G Kit-CN-G20 (China only)	• Only suitable for single inverter networking scenarios. • Uses Bluetooth signals for local configuration of device parameters and viewing device operation information. Uploads system operation information to the monitoring platform via 4G. • To use features like one-click upgrade and operation log export on the inverter, ensure the 4G Kit-CN-G20 version is version 05 or above.

Microgrid Scenario

When a grid-tied inverter is connected to the BACK-UP port of the energy storage inverter, it constitutes a Microgrid Scenario.

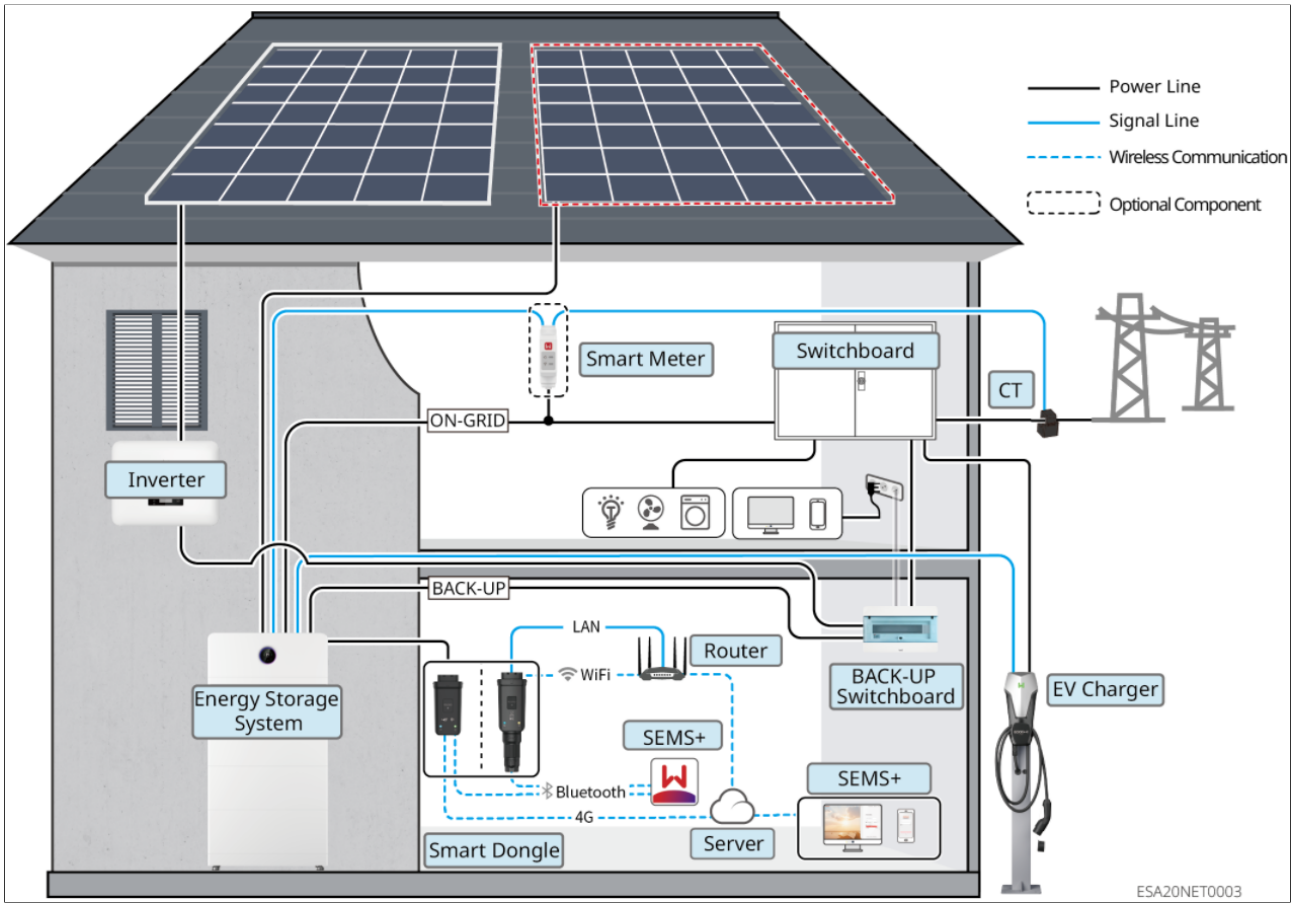


Figure2 Microgrid Scenario

Device Type	model	Description
hybrid inverter	GW3K-EHA-G20	• In a microgrid scenario, only one hybrid inverter is supported in the system. • In a microgrid scenario, connection to a generator is not supported. • The following version requirements must be met during system networking: ◦ Inverter ARM software version is 04.124 or above. ◦ Inverter DSP software version is 05.5004 or above.
	GW3.6K-EHA-G20	
	GW5K-EHA-G20	
	GW6K-EHA-G20	
	GW8K-EHA-G20	
	GW9.999K-EHA-G20	
	GW10K-EHA-G20	
	GW3K-BHA-G20	

Device Type	model	Description
	GW3.6K-BHA-G20	
	GW5K-BHA-G20	
	GW6K-BHA-G20	
	GW8K-BHA-G20	
	GW9.999K-BHA-G20	
	GW10K-BHA-G20	
Battery system	GW5.1-BAT-D-G20 GW5.1-BAT-D-G21 GW8.3-BAT-D-G20 GW8.3-BAT-D-G21 GW6.0-BAT-D-G20 GW9.0-BAT-D-G20	• Battery modules of different models can be mixed. • The system supports 5-108kWh, meeting the requirements for different power and energy matching. • Battery heating film is optional. The "Battery Heating" function can only be enabled for models configured with the heating film. Batteries without the heating film should not be used in low-temperature environments, as this may prevent the device from operating. • The battery heating function is unavailable when GW5.1-BAT-D-G20, GW8.3-BAT-D-G20, GW5.1-BAT-D-G21, GW8.3-BAT-D-G21, GW6.0-BAT-D-G20 , GW9.0-BAT-D-G20 are mixed. • If the system requires battery mixing and split-type expansion, ensure the BMS software version is V06 or above and the DCDC version is V06 or above.
Smart Meter	Built-in meter (shipped with the inverter)	

Device Type	model	Description
	GMK110 (purchased from GoodWe)	• Built-in meter: Please use the CT shipped with the inverter to connect it. ◦ CT ratio is 120A:40mA ◦ If the built-in meter of the inverter does not meet the requirements, contact the dealer to purchase a GMK110 or GM330 Smart Meter. • GMK110: CT cannot be replaced; CT ratio is 120A:40mA • GM330: CT can be purchased from GoodWe or separately; CT ratio is nA:5A
	GM330 (purchased from GoodWe)	
Smart dongle	WiFi/LAN Kit-20	• Suitable for single-inverter and multi-inverter networking scenarios. • Uses Bluetooth signals for local configuration of device parameters and viewing device operation information; uploads system operation information to the monitoring platform via WiFi or LAN. • To use features like one-click upgrade and operation log export on the inverter, ensure the WiFi/LAN Kit-20 software version is V2.3 or above.

Device Type	model	Description
	4G Kit-CN-G20 (China only)	• Suitable only for single-inverter networking scenarios. • Uses Bluetooth signals for local configuration of device parameters and viewing device operation information; uploads system operation information to the monitoring platform via 4G. • To use features like one-click upgrade and operation log export on the inverter, ensure the 4G Kit-CN-G20 version is version 05 or above.
grid-tied PV inverter	-	• It is recommended to use GoodWe brand grid-tied PV inverters; third-party grid-tied PV inverters are also supported. • In a microgrid scenario, ensure the rated output power of the grid-tied PV inverter ≤ the rated output power of the hybrid inverter. • When the microgrid system is in grid-connected mode, if power limitation is required, ensure: ◦ The hybrid inverter must be configured via the App's grid-connected power limitation interface; configure the grid-tied PV inverter according to the actual tool used. ◦ To ensure the grid-tied PV inverter can continue generating power, adjust the output power of the hybrid inverter via the App's microgrid mode interface. Note: The output power control accuracy varies among different grid-tied PV inverters. Set the grid-connected power limitation parameter value according to the actual situation.

Coupling Scenario

When a grid-tied inverter is connected to the ON-GRID port of the energy storage

inverter, it constitutes a Coupling Scenario.

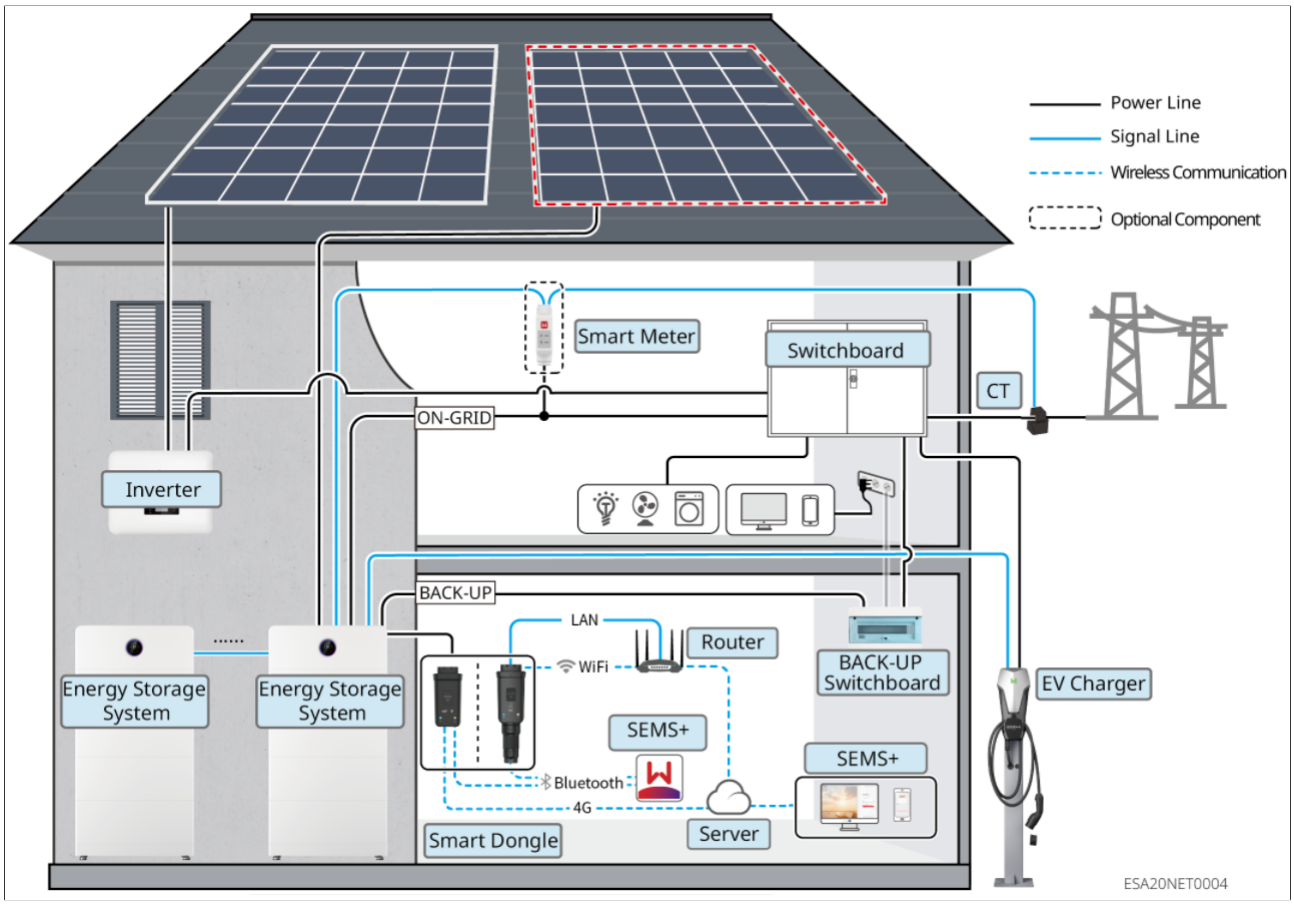


Figure3 Coupling Scenario

Device type	model	Description
hybrid inverter	GW3K-EHA-G20	
	GW3.6K-EHA-G20	
	GW5K-EHA-G20	
	GW6K-EHA-G20	
	GW8K-EHA-G20	
	GW9.999K-EHA-G20	
	GW10K-EHA-G20	

Device type	model	Description
	GW3K-BHA-G20	• Generator control is only supported in single-unit scenarios, where the generator charges the battery. • The system supports a maximum of 10 inverters to form a parallel system, allowing hybrid parallel connection of inverters with different power ratings in both on-grid and off-grid modes. • In a parallel system, if GW3K/3.6K/5K/6K models are mixed with GW8K/9.999K/10K models, please set the GW8K/9.999K/10K model as the master inverter. • To connect a generator or for parallel system networking, please use the GMK110 or GM330 Smart Meter. If the number of parallel inverters exceeds two, use the GM330 Smart Meter. • In a parallel system, each inverter must be installed with a WiFi/LAN Kit-20. The software version must be V2.5 or above. • The following version requirements must be met when setting up the system network: ◦ Inverter ARM software version must be 04.124 or above. ◦ Inverter DSP software version must be 05.5004 or above.
	GW3.6K-BHA-G20	
	GW5K-BHA-G20	
	GW6K-BHA-G20	
	GW8K-BHA-G20	
	GW9.999K-BHA-G20	
	GW10K-BHA-G20	

Device type	model	Description
Battery system	GW5.1-BAT-D-G20 GW5.1-BAT-D-G21 GW8.3-BAT-D-G20 GW8.3-BAT-D-G21 GW6.0-BAT-D-G20 GW9.0-BAT-D-G20	• Battery modules of different models can be mixed. • The system supports 5-108kWh, meeting usage requirements with different power and energy matching. • The battery heating pad is optional. The "Battery Heating" function can only be enabled on models configured with the heating pad. Batteries without the heating pad should not be used in low-temperature environments, as this may prevent the equipment from operating. • The battery heating function is unavailable when GW5.1-BAT-D-G20, GW8.3-BAT-D-G20, GW5.1-BAT-D-G21, GW8.3-BAT-D-G21, GW6.0-BAT-D-G20, and GW9.0-BAT-D-G20 are mixed. • If the system requires mixed battery use and split-type expansion, ensure the BMS software version is V06 or above and the DCDC version is V06 or above.
Smart Meter	Built-in meter (shipped with the inverter)	• Built-in meter: Please use the CT shipped with the inverter to connect it. ◦ CT ratio is 120A:40mA ◦ If the built-in meter of the inverter is insufficient, contact the dealer to purchase a GMK110 or GM330 Smart Meter. • GMK110: The CT cannot be replaced; CT ratio is 120A:40mA. • GM330: The CT can be purchased from GoodWe or separately; CT ratio is nA:5A. • To connect a generator to the inverter, please use the GMK110 or GM330 Smart Meter.
	GMK110 (purchased from GoodWe)	
	GM330 (purchased from GoodWe)	

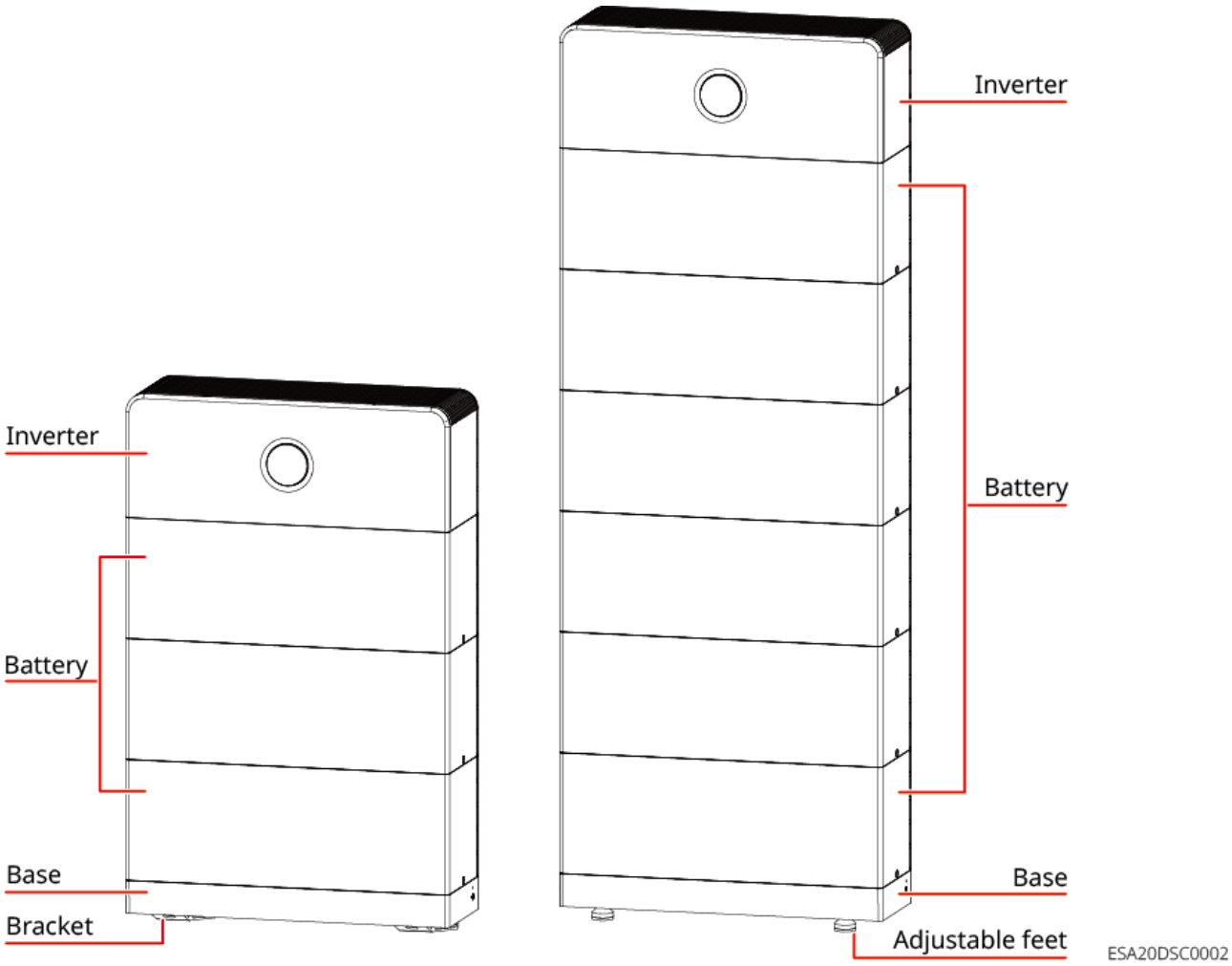
Device type	model	Description
Smart dongle	WiFi/LAN Kit-20	• Applicable for single inverter networking and parallel inverter networking scenarios. • Configure device parameters and view device operation information locally via Bluetooth signal; upload system operation information to the monitoring platform via WiFi or LAN. • To use features like one-click upgrade and operation log export on the inverter, ensure the WiFi/LAN Kit-20 software version is V2.3 or above.
	4G Kit-CN-G20 (China only)	• Only applicable for single inverter networking scenarios. • Configure device parameters and view device operation information locally via Bluetooth signal; upload system operation information to the monitoring platform via 4G. • To use features like one-click upgrade and operation log export on the inverter, ensure the 4G Kit-CN-G20 version is version 05 or above.

Device type	model	Description
grid-tied PV inverter	-	• GoodWe brand grid-tied inverters are recommended; third-party grid-tied inverters are supported. • In coupling scenarios, ensure the rated output power of the grid-tied inverter ≤ the rated output power of the hybrid inverter. • When the coupling system is in grid-connected state and power limitation is required, ensure: The hybrid inverter must be configured via the grid-connected power limitation interface in the App; configure the grid-tied inverter according to the actual tool used. Note: The output power control accuracy varies among different grid-tied inverters. Set the grid-connected power limitation parameter value according to the actual situation.

2.2 Product Overview

2.2.1 Household Single-Phase Integrated Unit

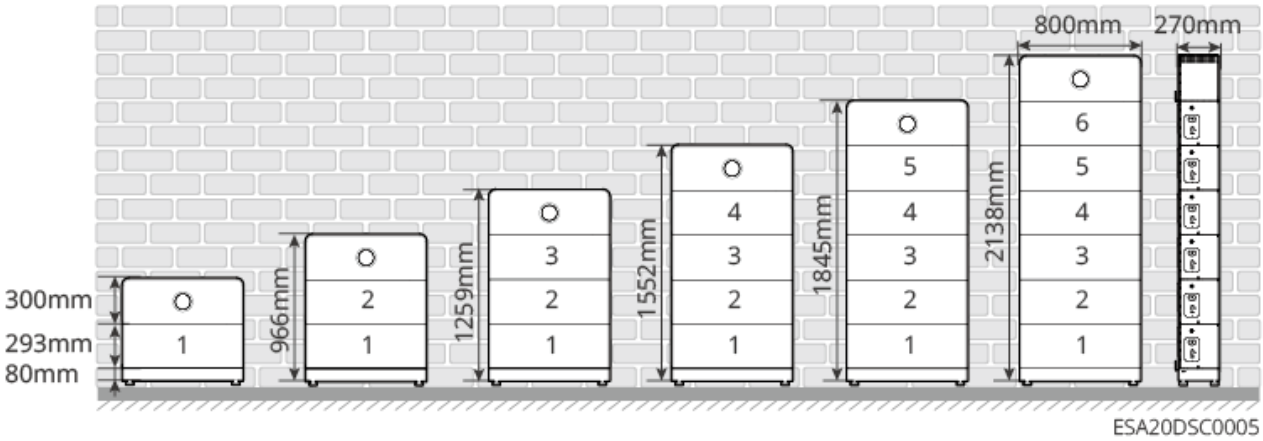
Household Single-Phase Integrated Unit:
The Household Single-Phase Integrated Unit, through modular design, integrates the Battery and Inverter, adopting a blind-plug stacking connection method.



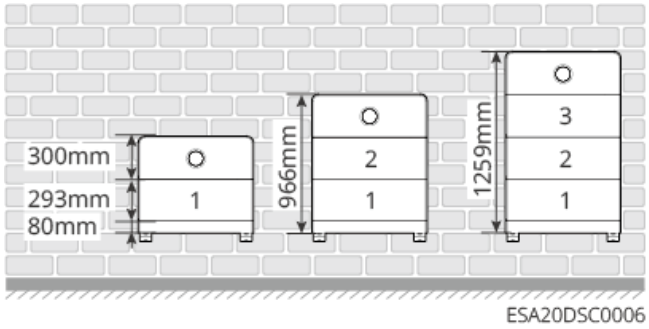
The energy storage system supports Battery capacity expansion. The total Battery capacity is determined by the number and specifications of Battery modules. Configuration must strictly adhere to the limitations specified in this section. Overall system configuration description:
A: GW5.1-BAT-D-G20, GW5.1-BAT-D-G21, GW6.0-BAT-D-G20
B: GW8.3-BAT-D-G20, GW8.3-BAT-D-G21, GW9.0-BAT-D-G20

Mounting Method	Expansion Groups	Single Group Stack	Total Batteries
Floor Installation	≤3 groups	≤6 units	≤12 units
Wall-mounted Installation (**A**)	≤3 groups	≤3 units	≤9 units
Wall-mounted Installation(**A/B/A+B**)	≤3 groups	≤2 units	≤6 units
Note: Expansion Groups × Single Group Stack Quantity ≤ Total System Battery Count			

Floor Installation

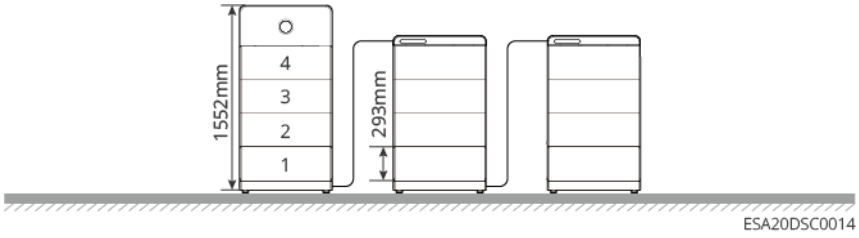


Wall-Mounted Installation

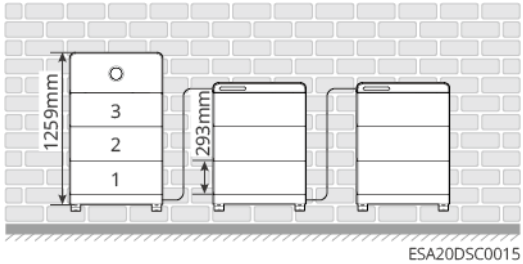


Cluster Expansion Installation

Floor Installation

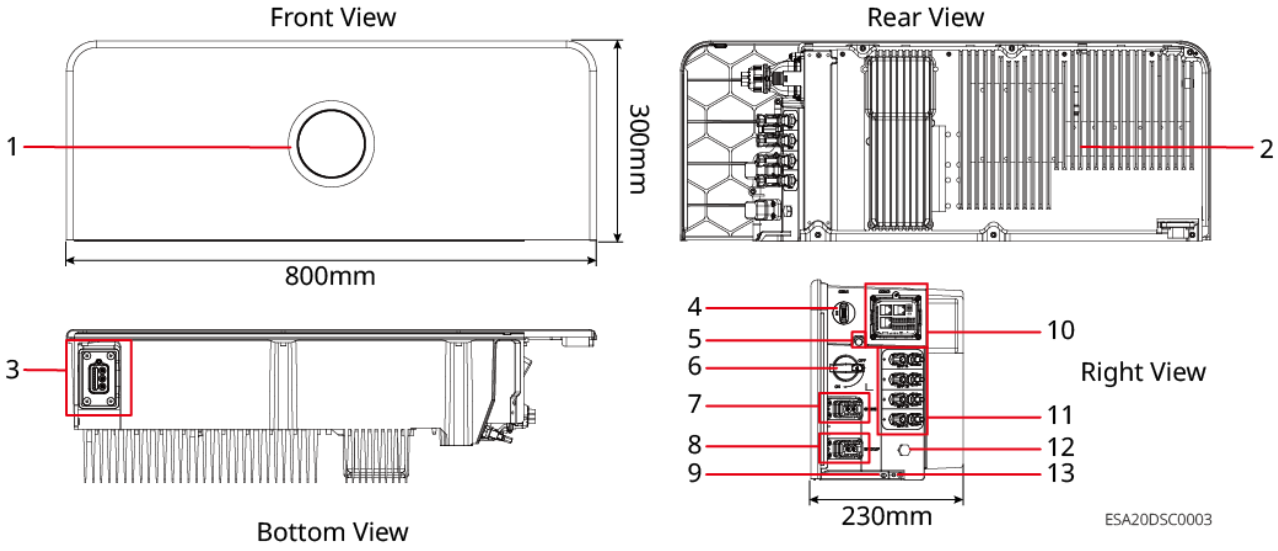


Wall-Mounted Installation



Inverter:

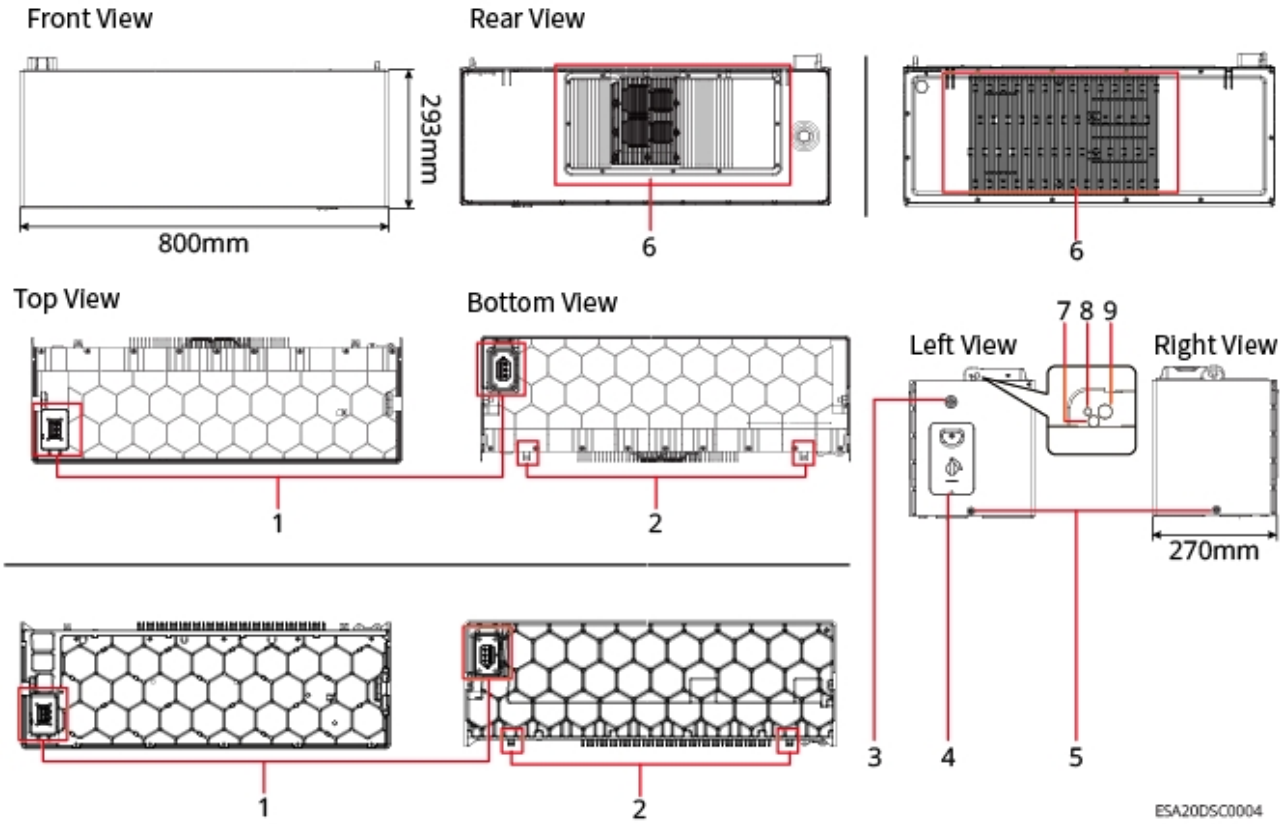
The Inverter in the photovoltaic system controls and optimizes energy flow through an integrated energy management system. It can supply power generated by the PV system to loads, store it in the Battery, or export it to the grid.



No.	Component/Label	Description
1	indicator	Indicates the working status of the inverter.
2	heat sink	Heat dissipation for the inverter.
3	Connector	Power and communication ports for connecting the inverter to the battery.
4	Smart Communication Stick Connection Port	• Can connect to smart communication sticks, such as WiFi/LAN Kit-20 and 4G Kit-CN-G20. Please select the module type according to actual requirements. • Supports connecting a USB flash drive for local inverter software version upgrades.
5	Lifting Handle Mounting Hole	Used for installing the lifting handle. Used when moving the inverter.
6	DC Switch	Only for EHA models. BHA models do not have a DC switch. Controls the connection or disconnection of DC input.
7	ON-GRID Port	Connects to the AC line to connect the inverter to the grid.

No.	Component/Label	Description
8	BACK-UP Port	Connects to the AC line to connect to critical loads or grid-tied inverters.
9	Battery Mounting Hole	Secures the inverter and the battery.
10	Communication Port	Can connect communication cables for load control, CT, RS485, Remote Shutdown/Rapid Shutdown, DRED (Australia)/RCR (Europe), etc.
11	PV Input Terminal	Only for EHA models. BHA models do not have PV input terminals. Can connect to DC input lines from PV modules. The number of PV input terminals is as follows: • GW3K-EHA-G20, GW3.6K-EHA-G20, GW5K-EHA-G20, GW6K-EHA-G20: 2 • GW8K-EHA-G20, GW9.999K-EHA-G20, GW10K-EHA-G20: 4
12	Ventilation valve	-
13	Grounding terminal	Connects to the chassis protective ground wire.

Battery:
The Battery system can store and release electrical energy according to the requirements of the photovoltaic energy storage system. Both the input and output ports of this energy storage system are high-voltage direct current.

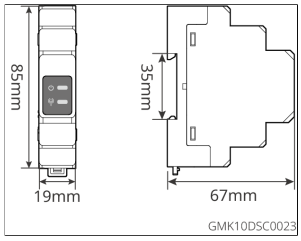
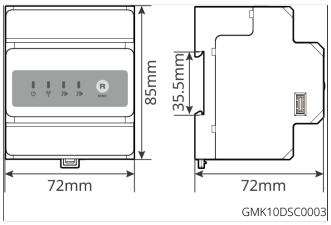
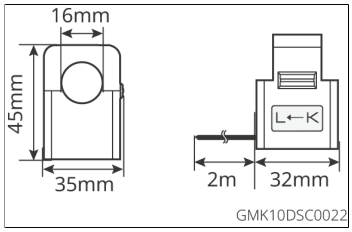


No.	Component	Description
1	Connector	Power and Communication Port for connecting battery to battery, and battery to inverter.
2	Anti-tip bracket fixing hole	Used for fixing the battery to the wall.

No.	Component	Description
3	Multifunction button indicator light	• Indicates the battery's working status. • Battery black start function: When there is no PV power generation in the photovoltaic system and the grid is abnormal, the inverter cannot operate normally. In this case, press and hold the multifunction button for 2 seconds to start the battery system, activate the inverter, and make the inverter enter off-grid operation mode, with the battery discharging to power the loads. • Battery power-off function: Press and hold the multifunction button for >5 seconds to power off the battery system.
4	Battery isolation switch	Battery power input/output switch.
5	Inter-battery fixing hole	Used for fixing between two batteries.
6	heat sink	Battery heat dissipation
7	Battery lifting hole	Used for lifting the battery. When stacking more than three batteries, lifting tools must be used for installation.
8	Battery or inverter fixing hole	Used for fixing between batteries or between the inverter and the battery.
9	Lifting bar mounting hole	Used for installing the lifting bar. Used for manual handling of the battery.

2.2.2 Smart Meter

The smart meter can measure and monitor the data in the photovoltaic energy storage system, such as voltage, current, frequency, power factor, and power, etc.

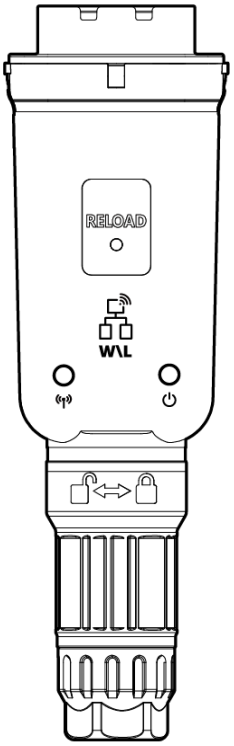
GMK110	GM330	CT
		

No.	Model	Applicable scenarios
1	GMK110	It is not supported to change the CT to other type, CT ratio: 120A: 40mA
2	GM330	Supports purchasing from GOODWE or third-party, CT ratio requirement: nA: 5A • nA: CT Primary side input current, the range of n is 200-5000 • 5A: CT Secondary side output voltage.

2.2.3 smart dongle

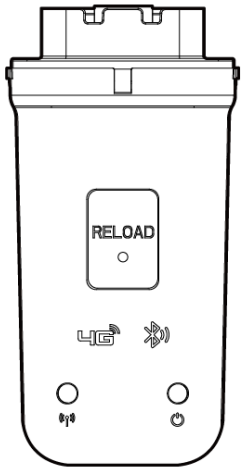
The smart dongle is mainly used for real-time transmission of various power generation data from the inverter to the remote monitoring platform, and for connecting via App to the smart dongle for local device debugging.

WiFi/LAN Kit-20



Smart dongle 0006

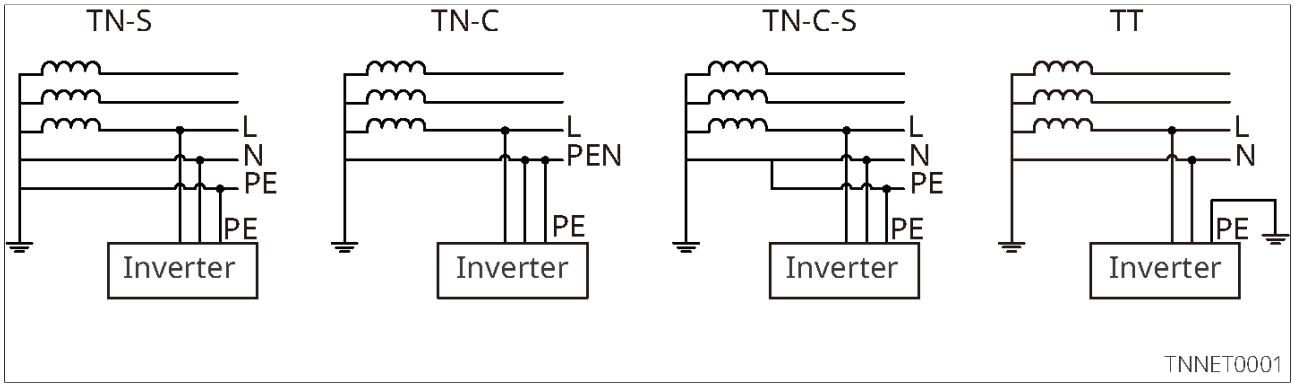
4G Kit-CN-G20



Smart dongle 0010

No.	model	Signal Type	Applicable Scenario
1	WiFi/LAN Kit-20	WiFi, LAN, Bluetooth	Inverter standalone, multi-unit scenario
2	4G Kit-CN-G20 (China only)	4G, Bluetooth	Inverter standalone scenario

2.3 Supported Grid Types



2.4 System Working Mode

Self-consumption

- The fundamental operating mode of the system.
- PV generation primarily supplies power to the loads. Excess power charges the battery, and any remaining power is sold to the grid. When PV generation cannot meet the load demand, the battery supplies power to the loads. If the battery power is also insufficient to meet the load demand, the grid supplies power to the loads.

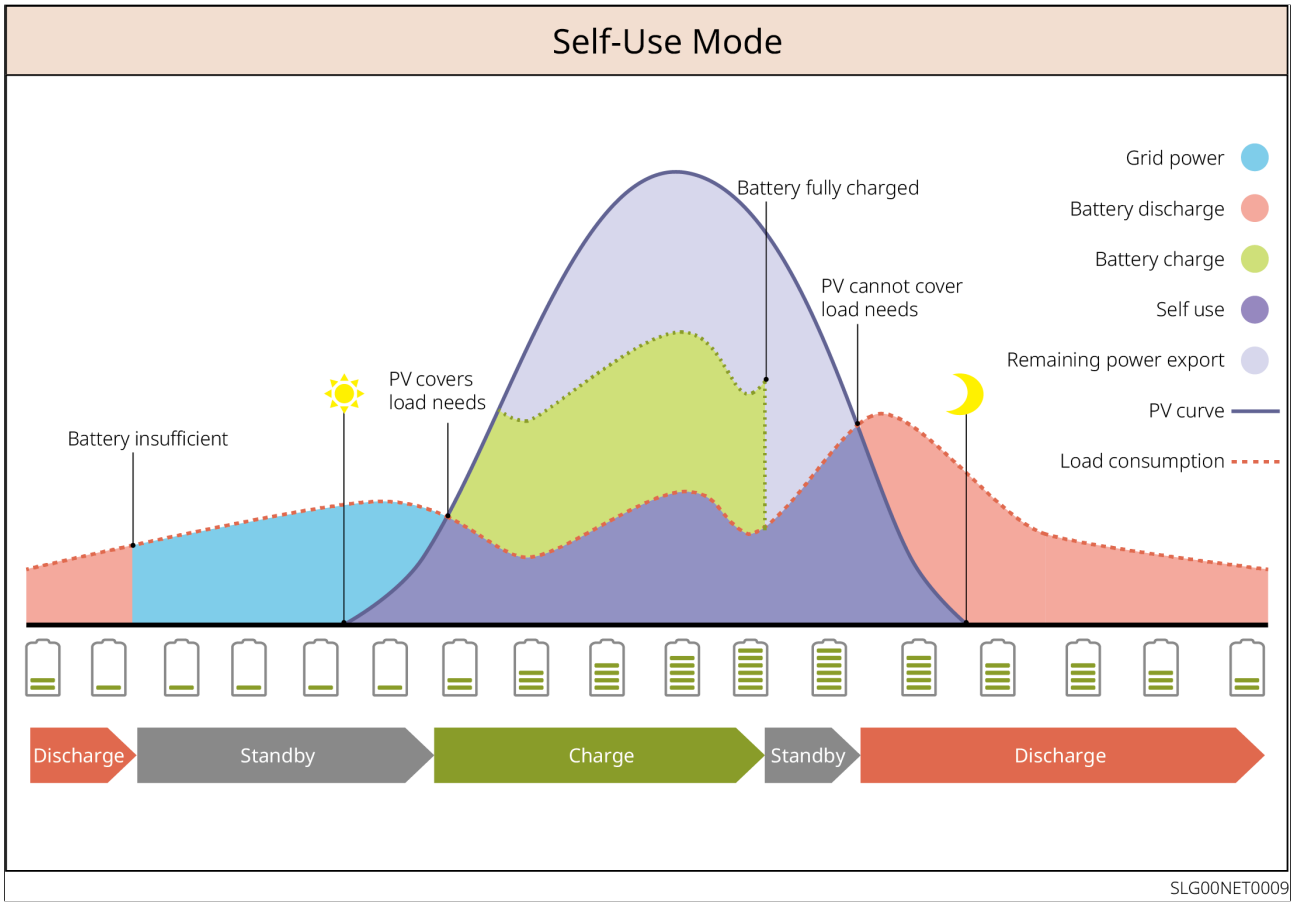


Figure4 Self-consumption

Backup Mode

- Recommended for use in areas with unstable grid power.
- When the grid fails, the inverter switches to off-grid operation mode, and the battery discharges to supply power to the loads, ensuring the BACK-UP Loads remain powered. When grid power is restored, the inverter switches its operation mode back to grid-tied.
- To ensure sufficient battery State of Charge (SOC) to maintain normal system operation during off-grid periods, the system will charge the battery using PV or by purchasing power from the grid to reach the backup power SOC during grid-tied operation. If purchasing power from the grid to charge the battery is required, please ensure compliance with local grid regulations and laws.

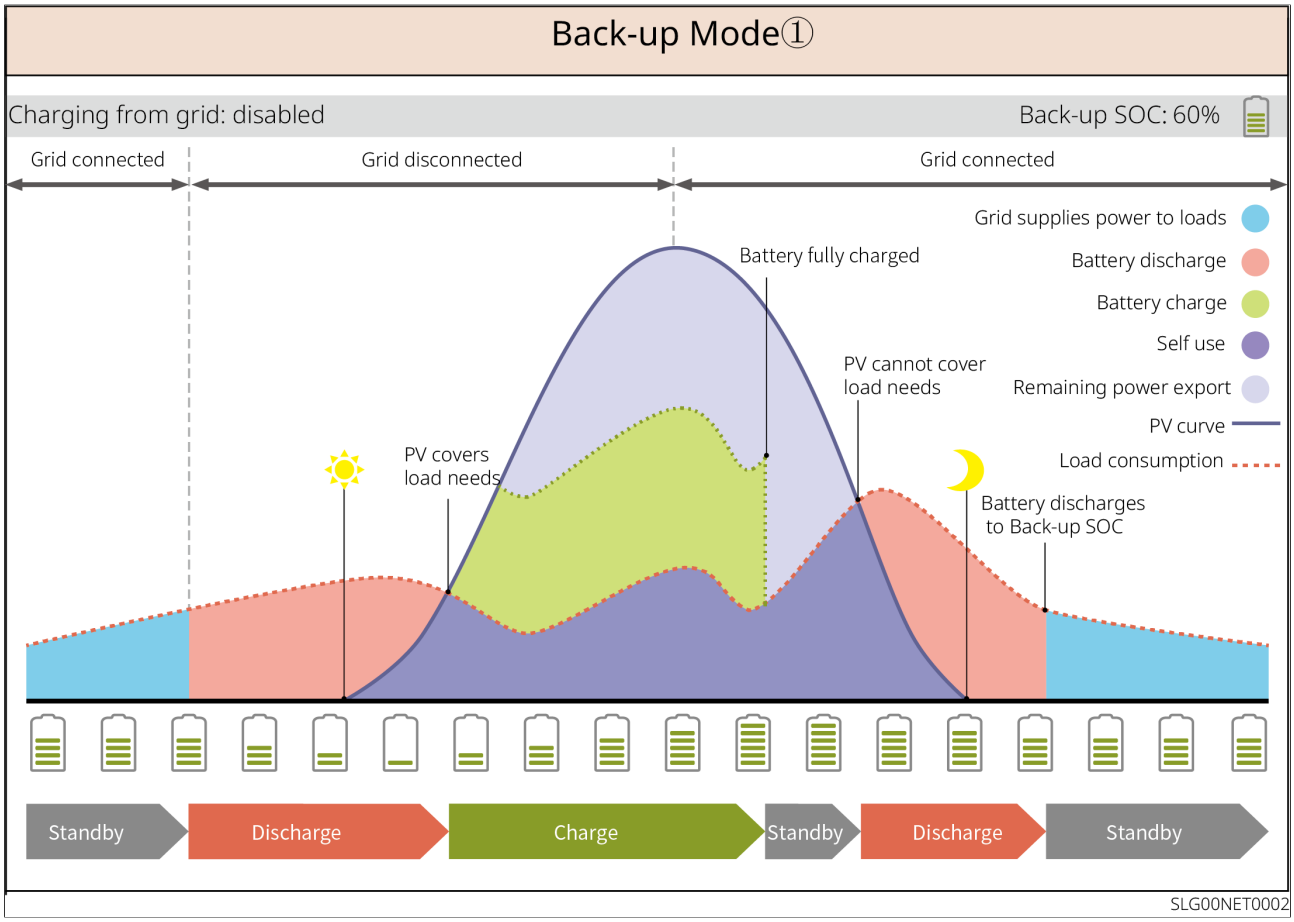


Figure5 Backup Mode 1

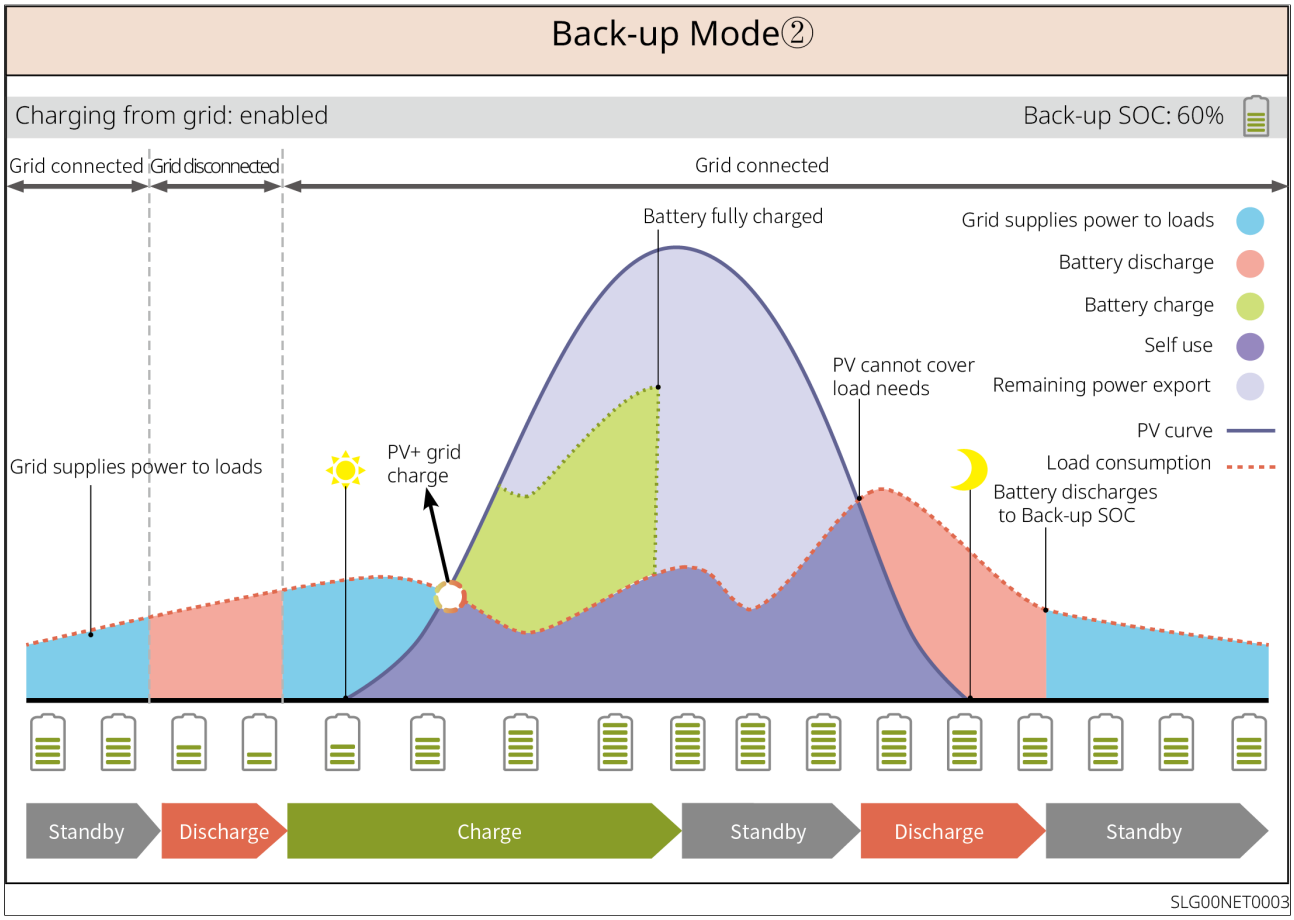


Figure6 Backup Mode 2

TOU Mode

In compliance with local laws and regulations, electricity purchase and sale are scheduled for different time periods based on the difference between peak and off-peak grid electricity prices.

For example: During off-peak price periods, set the battery to charging mode to purchase power from the grid for charging. During peak price periods, set the battery to discharging mode to supply power to the loads via the battery.

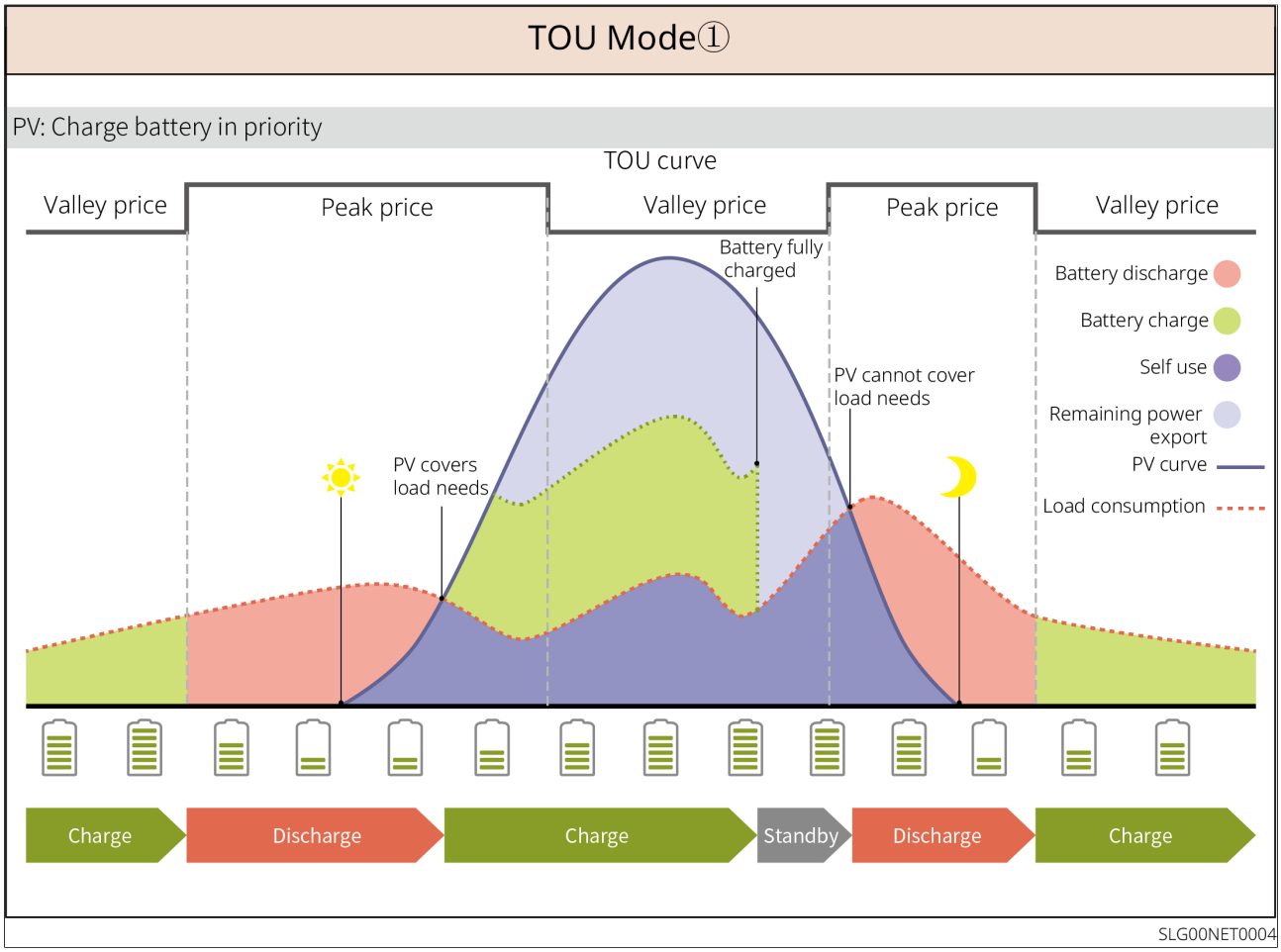


Figure7 TOU Mode 1

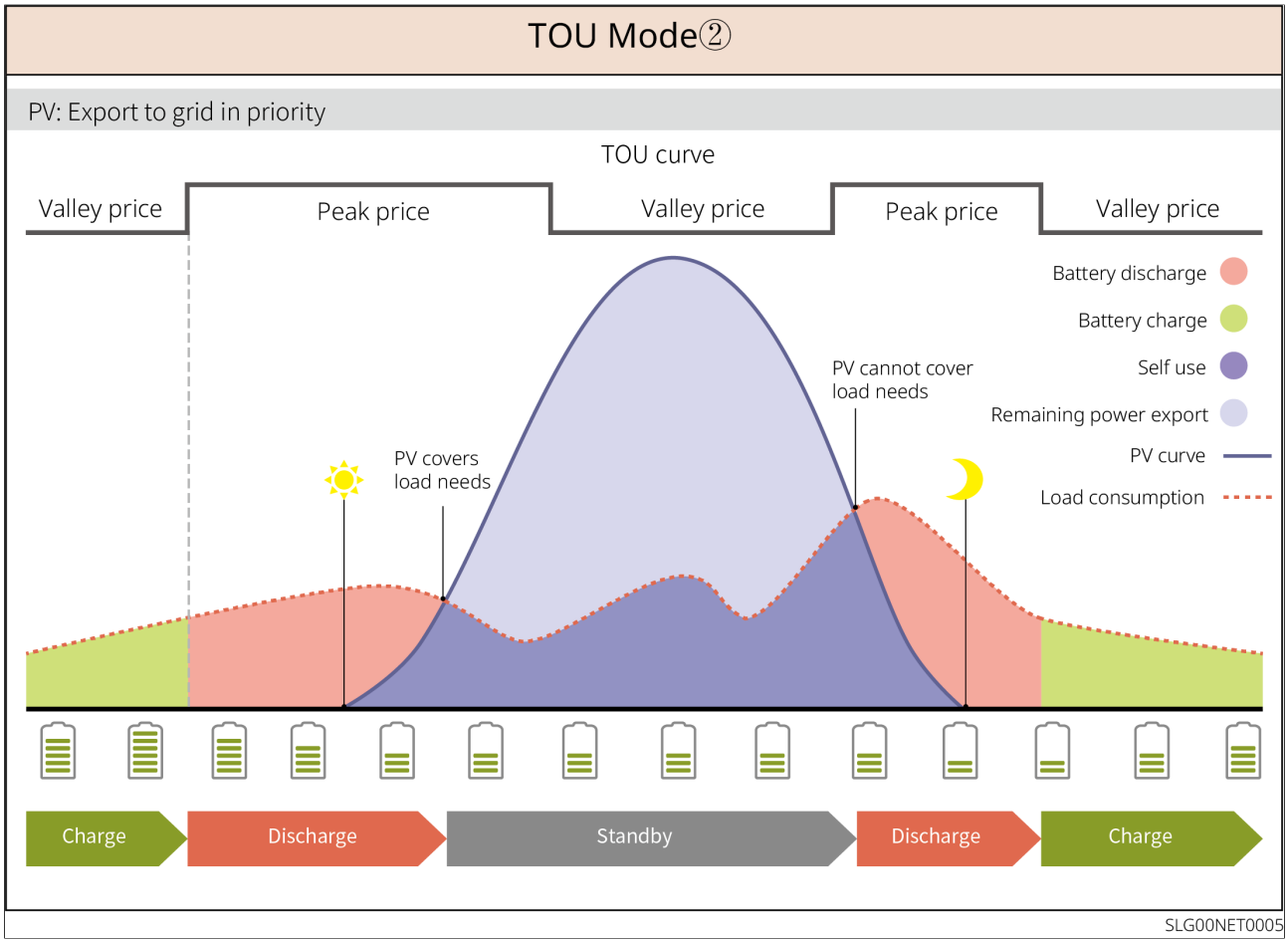


Figure8 TOU Mode 2

Delayed Charging Mode

- Suitable for areas with grid-tied power output limitations.
- Setting a peak power limit allows excess PV generation beyond the grid-tie limit to be used for charging the battery. Alternatively, setting a PV charging time period allows PV generation to be used for charging the battery during that period.

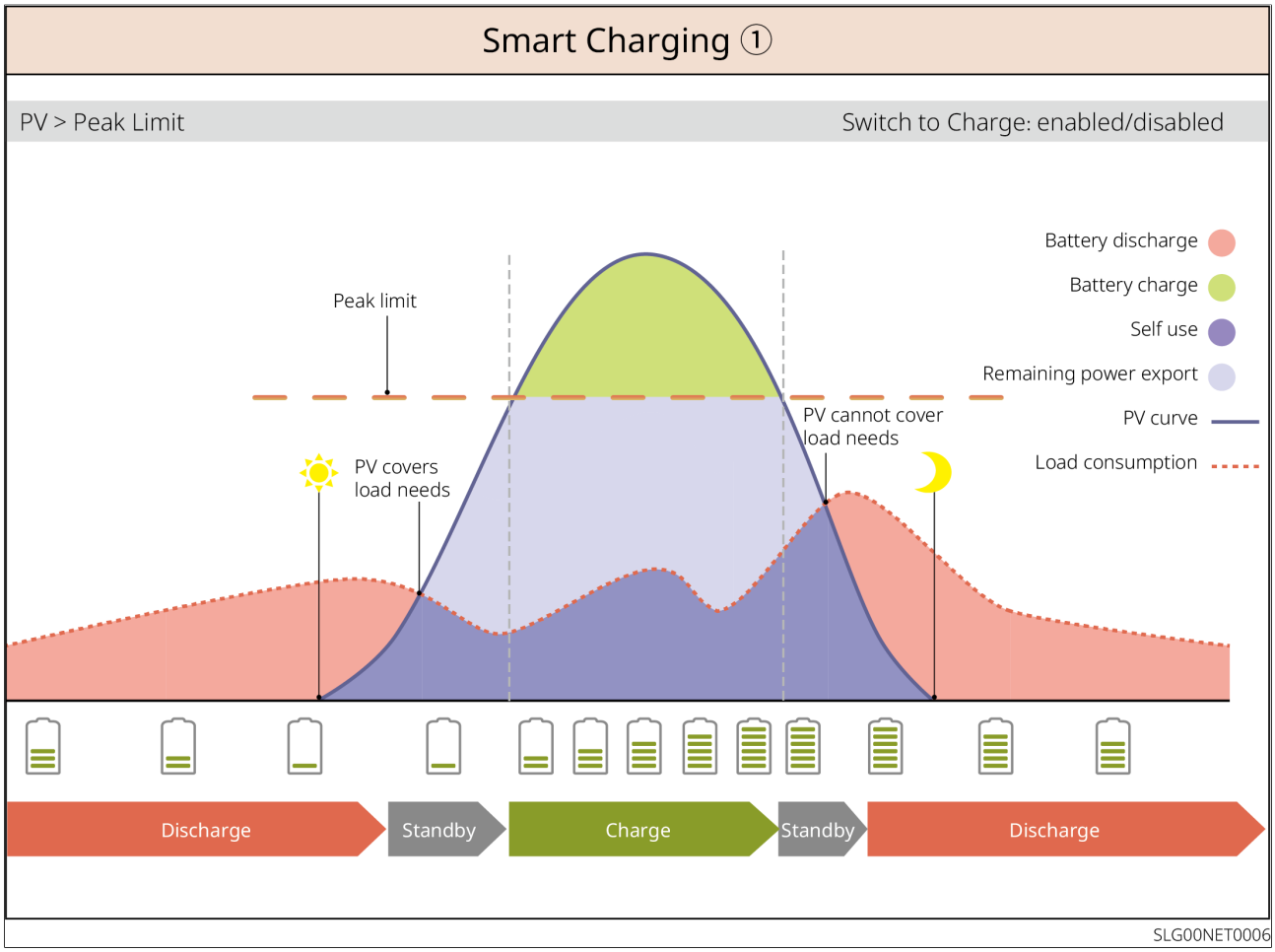


Figure9 Delayed Charging Mode 1

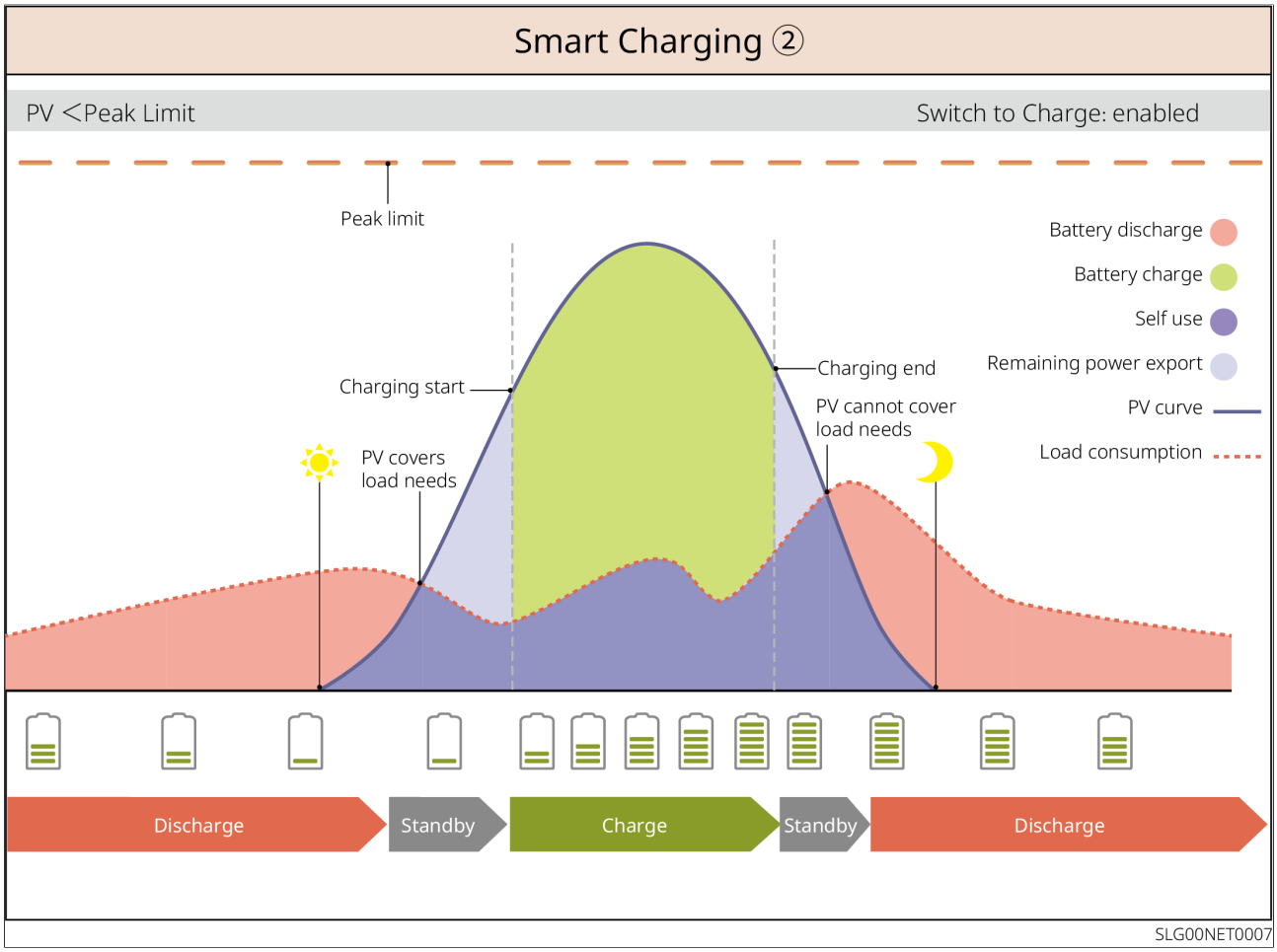


Figure10 Delayed Charging Mode 2

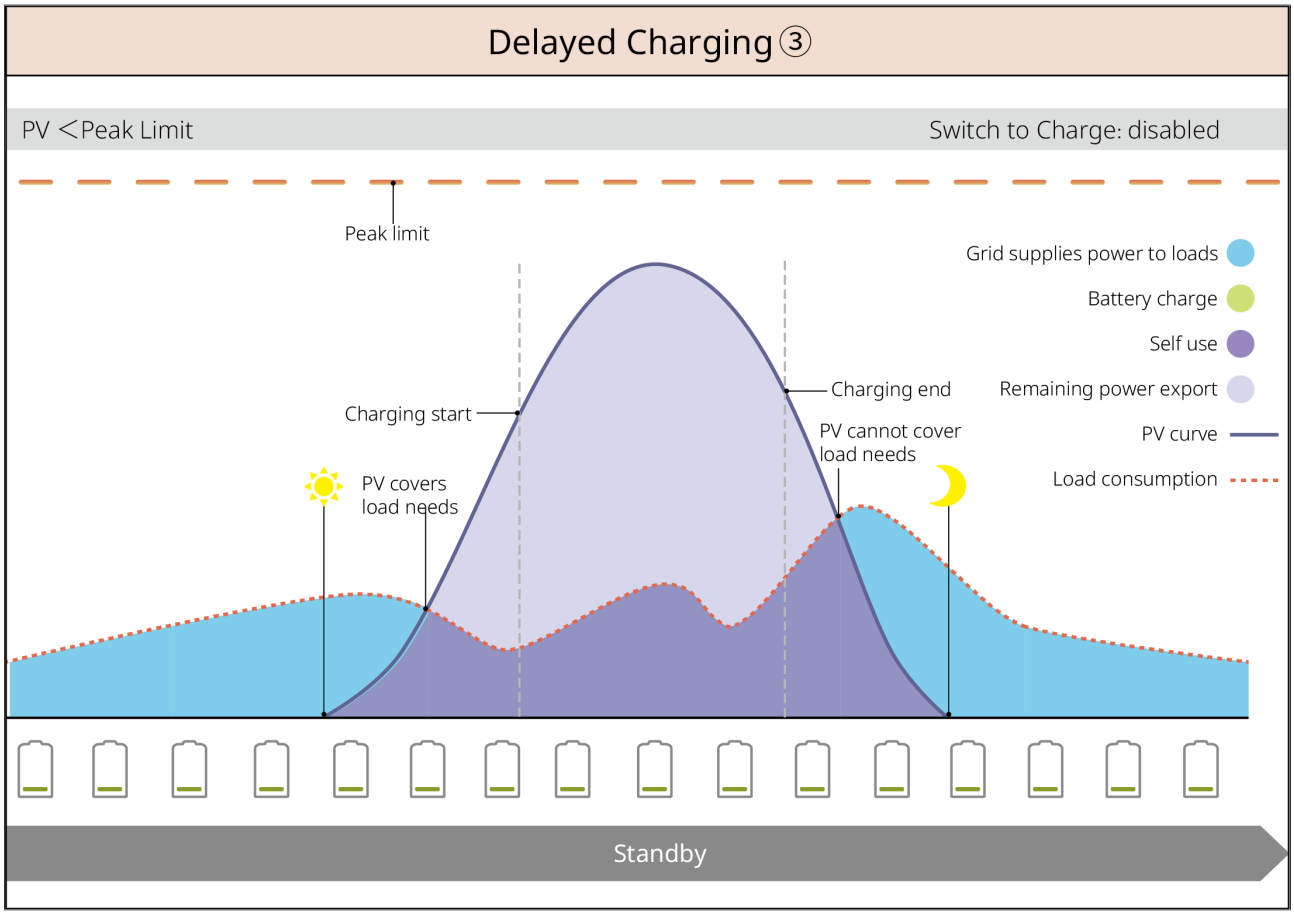


Figure11 Delayed Charging Mode 3

Peakshaving Mode

- Primarily applicable to commercial and industrial scenarios.
- When the total load power consumption exceeds the electricity quota within a short period, battery discharge can be utilized to reduce the portion of consumption exceeding the quota.
- When the battery SOC is lower than the reserved SOC for peak shaving, the system purchases power from the grid based on the time period, load power consumption, and the peak power purchase limit.

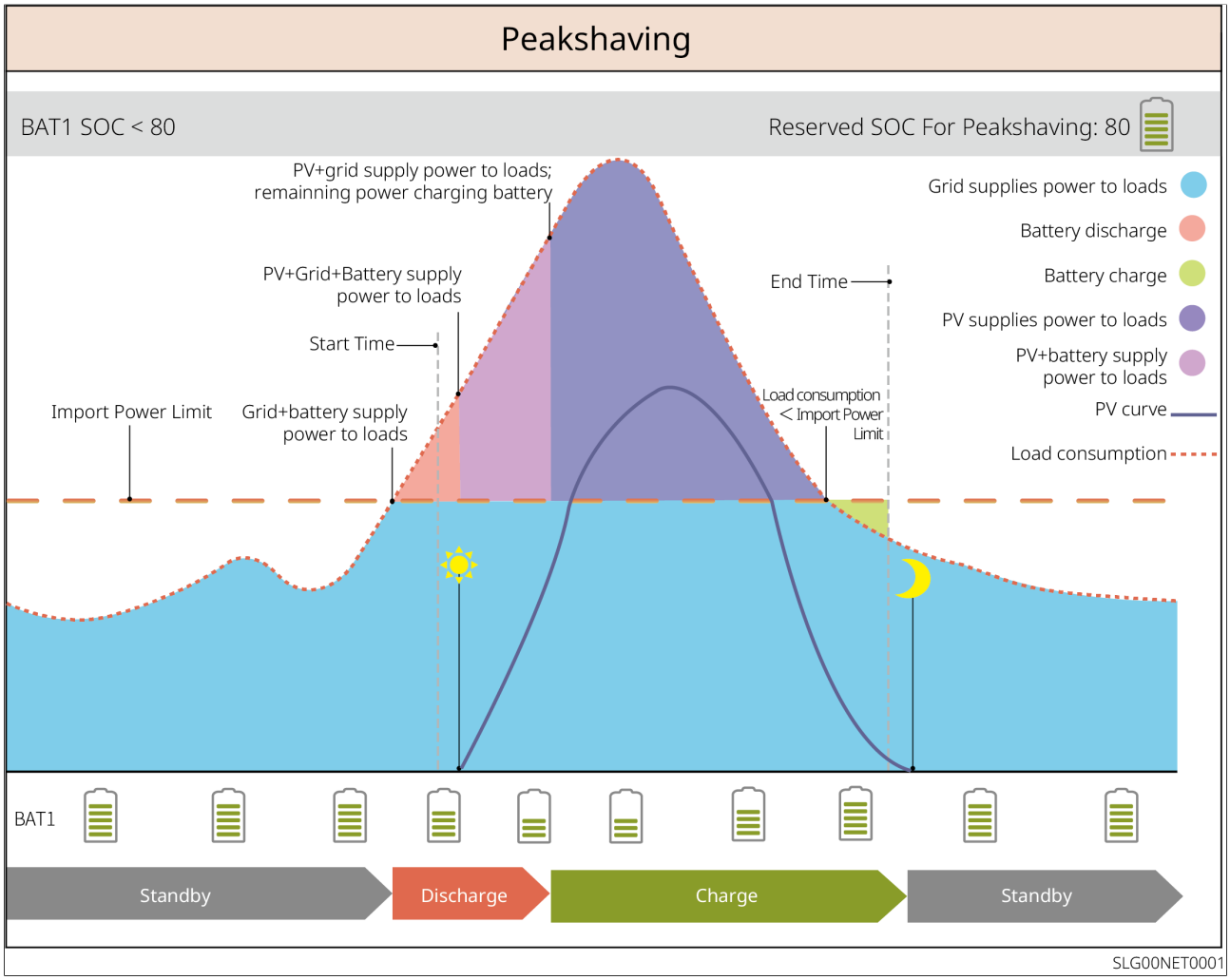


Figure12 Peakshaving Mode

Off-grid Mode

NOTICE
When the inverter is not connected to the battery system, do not operate in pure off-grid mode.

When the grid fails, the inverter switches to off-grid operation mode.

- During the day, PV generation primarily supplies power to the loads, with excess power charging the battery.
- At night, the battery discharges to supply power to the loads, ensuring the BACK-UP Loads remain powered.

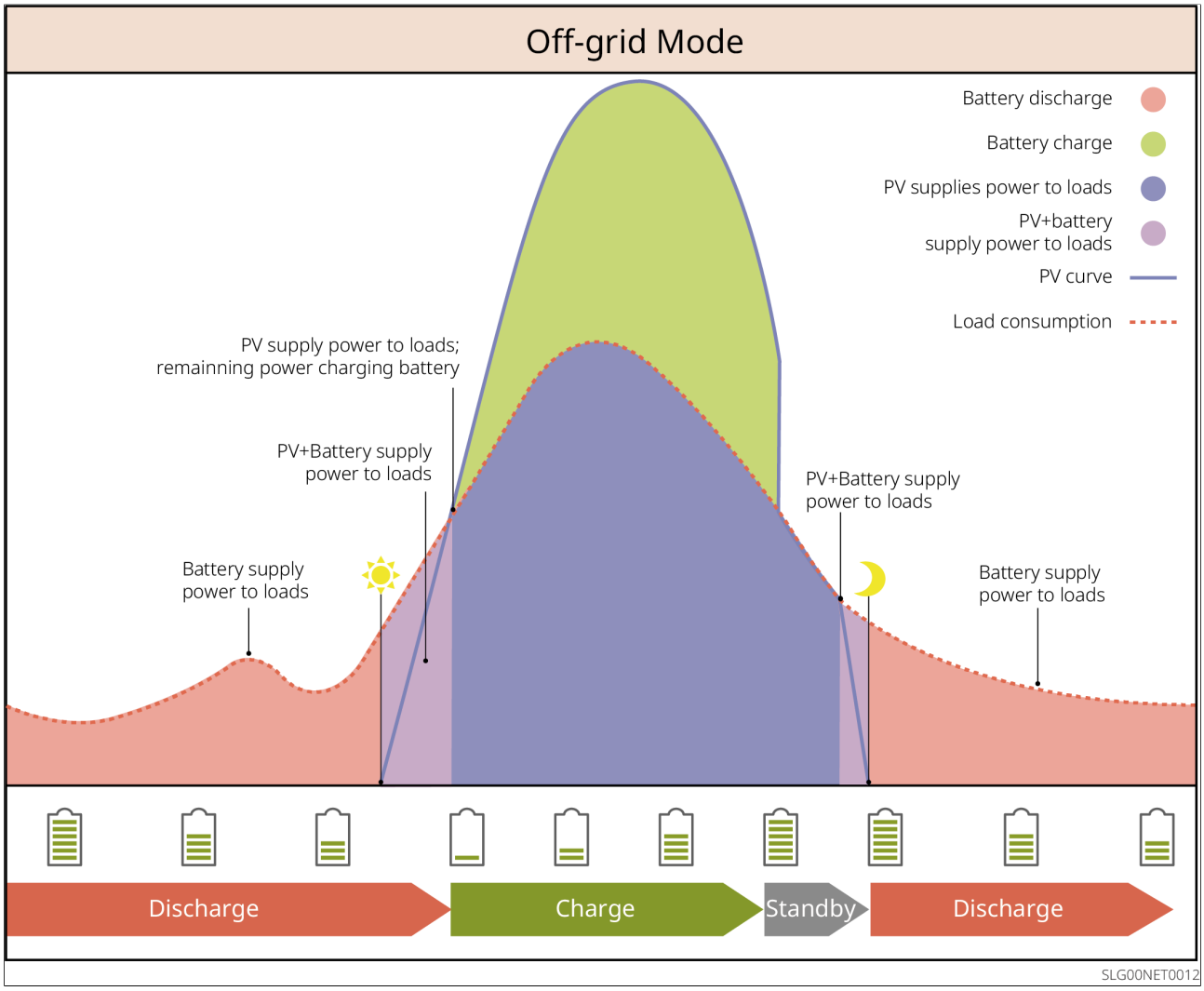


Figure13 Off-grid Mode

2.5 Features

NOTICE
Specific functional features are subject to the actual product configuration.

AFCI

The inverter integrates an AFCI circuit protection device to detect arc faults and quickly cut off the circuit when detected, thereby preventing electrical fires.

Causes of arc faults:

- Damage to connector connections in the PV system.

- Incorrect or damaged cable connections.
- Aging of connectors or cables.

Fault handling methods:

1. When the inverter detects an arc fault, the fault type can be viewed via the App.
2. If the inverter triggers the fault <5 times within 24 hours, it will automatically restore grid connection after a 5-minute wait. After the 5th arc fault, the inverter can only resume normal operation after the fault is cleared. For specific operations, please refer to the App user manual.

model	Label	Description
GW3K-EHA-G20 GW3.6K-EHA-G20 GW5K-EHA-G20 GW6K-EHA-G20	AFCI: F-I-AFPE-1-2-1	F: Full coverage I: Integrated AFPE: Detection and interruption capability provided 1: 1 monitored string per input port 2: 2 input ports per channel 1: 1 monitored channel
GW8K-EHA-G20 GW9.999K-EHA-G20 GW10K-EHA-G20	AFCI: F-I-AFPE-1-2/2-2	F: Full coverage I: Integrated AFPE: Detection and interruption capability provided 1: 1 monitored string per input port 2/2: 2/2 input ports per channel(AFD1: 2 , AFD2: 1) 2: 2 monitored channels

load control
The inverter's dry contact control port supports connecting an additional contactor to control the switching on or off of loads. Supports household loads, heat pumps, etc. Load control methods are as follows:

- Timer control: Set the time to switch loads on or off. The loads will automatically turn on or off within the set time period.

- Switch control: When the control mode is set to ON, the load will turn on; when set to OFF, the load will turn off.
- BACK-UP Loads control: The inverter has a built-in relay dry contact control port, which can control whether the load is switched off via the relay. In off-grid mode, if the BACK-UP terminal is detected to be overloaded and the battery SOC value is below the set off-grid protection value, the load connected to the relay port can be switched off.

Rapid Shutdown (RSD)

In a rapid shutdown system, the rapid shutdown transmitter and receiver work together to achieve system rapid shutdown. The receiver maintains module output by receiving signals from the transmitter. The transmitter can be external or built into the inverter. In an emergency, by enabling an external trigger device, the transmitter can be stopped, thereby shutting down the modules.

- External Transmitter
  - Transmitter models: GTP-F2L-20, GTP-F2M-20
    https://en.goodwe.com/Ftp/Installation-instructions/RSD2.0-transmitter.pdf
  - Receiver models: GR-B1F-20, GR-B2F-20
    https://en.goodwe.com/Ftp/EN/Downloads/User%20Manual/GW_RSD-20_Quick-Installation-Guide-POLY.pdf
- Built-in Transmitter
  - External trigger device: External switch
  - Receiver models: GR-B1F-20, GR-B2F-20
    https://en.goodwe.com/Ftp/EN/Downloads/User%20Manual/GW_RSD-20_Quick-Installation-Guide-POLY.pdf

3 Check and Storage

3.1 Check Before Receiving

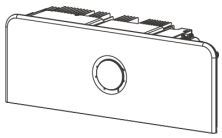
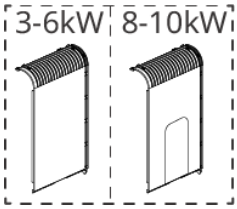
Check the following items before accept.

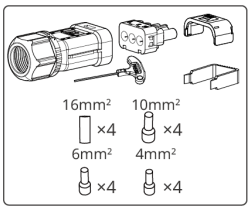
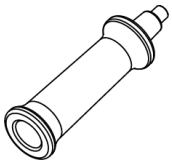
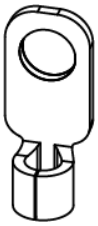
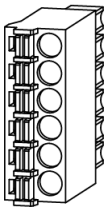
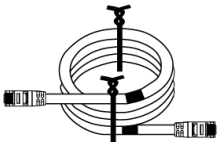
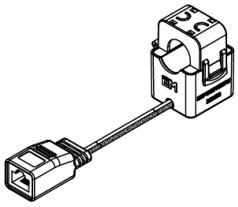
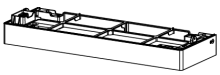
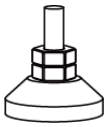
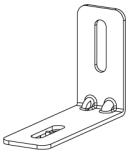
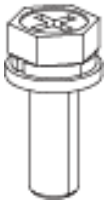
1. Check the outer packing box for damage, such as holes, cracks, deformation, and other signs of equipment damage. Do not unpack the package and contact the supplier as soon as possible if any damage is found.
2. Check the product model. If the product model is not what you requested, do not unpack the product and contact the supplier.

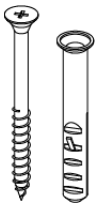
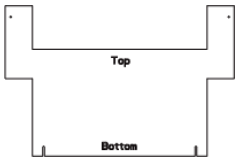
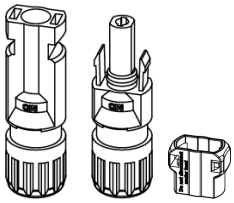
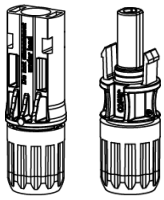
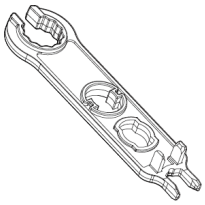
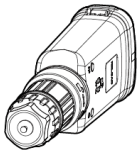
3.2 Deliverables

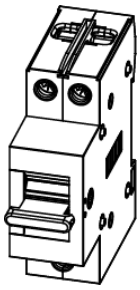
⚠WARNING
Check the deliverables for correct model, complete contents, and intact appearance. Contact the supplier as soon as possible if any damage is found.

3.2.1 Inverter Deliverables

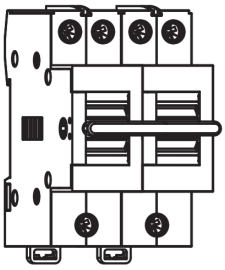
Part	Description	Part	Description
	Inverter x 1		Top decorative cover x 1
	Left decorative cover x 1		Right decorative cover x 1

Part	Description	Part	Description
	AC terminal kit x 2 • AC wiring terminal x 2 • Hexagon screwdriver x 1 • PIN terminal ◦ 4mm² x 4 ◦ 6mm² x 4 ◦ 10mm² x 4 ◦ 16mm² x 4		Handle x 2
	OT grounding terminal x 1		6PIN communication terminal x 2
	2PIN communication terminal x 2		PIN terminal x 16
	CT connection cable x 1		CT x 1
	Battery base x 1		Adjustable feet x 4
	Anti-tip bracket x 4		M5*16 screw x 9

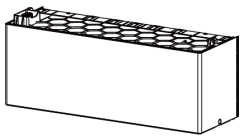
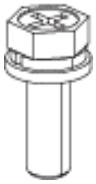
Part	Description	Part	Description
	M5*60 expansion screw x 4		Drilling mark paper x 2
 or 	PV terminal and PV terminal anti-tamper cover x N GW3K-EHA-G20、GW3.6K-EHA-G20、GW5K-EHA-G20、GW6K-EHA-G20：4 GW8K-EHA-G20、GW9.999K-EHA-G20、GW10K-EHA-G20：8 Note: No PV terminal anti-tamper cover in China region GW3K-BHA-G20、GW3.6K-BHA-G20、GW5K-BHA-G20、GW6K-BHA-G20、GW8K-BHA-G20、GW9.999K-BHA-G20、GW10K-BHA-G20：0		PV terminal unlocking tool x N N: China region x 0; other regions x 1.
		 or 	Smart dongle x 1

Part	Description	Part	Description
	Product documentation x 1		• (Australia only) Manual transfer switch x 1 Note: For single-unit scenarios only

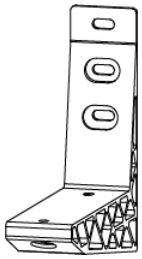
(Europe only) Manual transfer switch

Component	Description
	• Manual transfer switch x 1 Note: For use in standalone scenarios only. Contact the dealer for purchase if needed.

3.2.2 Batteries Deliverables

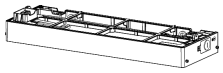
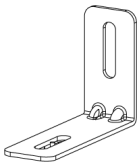
Component	Description	Component	Description
	Battery x 1		M5*16 screw x 2
	Silicone cap x 2	-	-

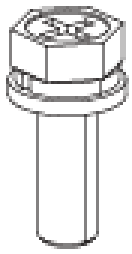
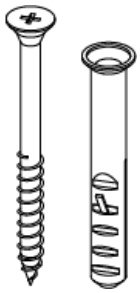
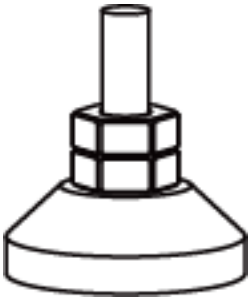
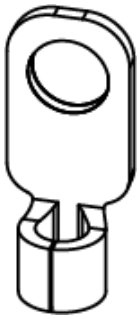
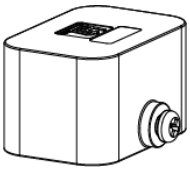
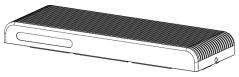
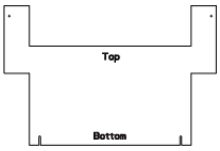
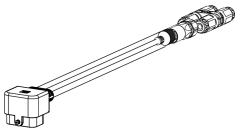
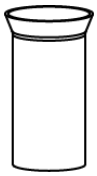
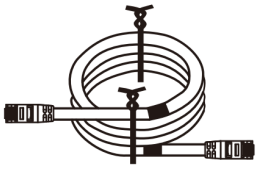
Battery Mount (Optional)

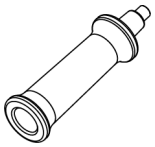
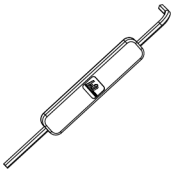
Component	Description	Component	Description
	Bracket x 2		M10 expansion bolt x 6
	M10 screw x 4	-	-

3.2.2.1 Battery Expansion Kit Deliverables (Optional)

NOTICE
The system supports 5-108kWh. A single stack can accommodate up to 6 batteries. For scenarios requiring more energy, needing to reduce the stacking height of a single column due to installation constraints, or other expansion needs, please contact GoodWe or a distributor to purchase a battery expansion kit.

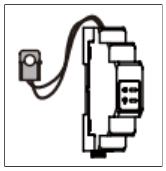
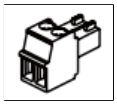
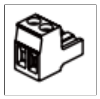
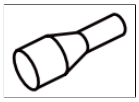
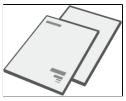
Part	Description	Part	Description
	Base x 1		locking bracket x 4

Part	Description	Part	Description
	M5 screws x 7		M6 expansion screws x 4
	Adjustable feet x 4		OT grounding terminal x 1
	Terminal resistor x 1		Battery decorative cover x 1
	Drilling mark paper x 2		Battery expansion cluster harness x 1
	PIN terminal x 8		Battery expansion cluster positive connection harness x 1
	Battery expansion cluster negative connection harness x 1		Battery expansion cluster network cable x 1

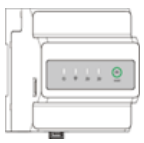
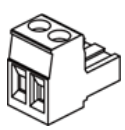
Part	Description	Part	Description
	Silicone cap x 2		Handle x 2
	Hex key x 1		Product documentation x 1

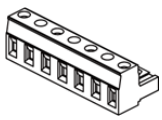
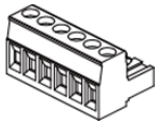
3.2.3 Smart Meter Deliverables

3.2.3.1 GMK110

Component	Description	Component	Description
	Smart Meter and CT x 1		RS485 communication terminals x 1
	Voltage input side terminal x 1		PIN terminal x 4
	Screw driver x 1		Documents x 1

3.2.3.2 GM330

Component	Description	Component	Description
	Smart meter and CT x1		2PIN communication terminal x1

Component	Description	Component	Description
	PIN terminal x 6		7PIN terminal x1
	Screwdriver x1		6PIN communication terminal x1
	2PIN terminal to RJ45 terminal adapter cable x 1		Product documentation x 1

3.3 Storage

- If the inverter has been stored for more than two years or has not been in operation for more than 6 months after installation, it is recommended to have it inspected and tested by professionals before putting it into use.
- To ensure the good electrical performance of the internal electronic components of the inverter, it is recommended to power it on every 6 months during storage. If it has not been powered on for more than 6 months, it is recommended to have it inspected and tested by professionals before putting it into use.
- To ensure battery performance and service life, it is recommended to avoid long-term idle storage. Prolonged storage may cause deep discharge of the battery, leading to irreversible chemical degradation, capacity衰减, or even complete failure, so timely use is advised. If the battery needs to be stored for a long period, please maintain it according to the following requirements:

NOTICE
[1] The storage time is calculated from the SN date on the battery's outer packaging. After exceeding the storage period, charge-discharge maintenance is required. (Battery maintenance time = SN date + charge-discharge maintenance cycle). For the method to view the SN date, refer to: 10.3.Battery SN Code Meaning(Page 268). [2] After the charge-discharge maintenance is qualified, if there is a Maintaining Label on the outer box, please update the maintenance information on the Maintaining Label. If there is no Maintaining Label, please record the maintenance time and battery SOC yourself and keep the data properly to facilitate the preservation of maintenance records.

Battery Model	Initial SOC Range for Battery Storage	Recommended Storage Temperature	Charge/Discharge Maintenance Cycle[1]	Battery Maintenance Method[2]
GW5.1-BAT-D-G20	30~40%	0~35°C	-20~35°C, 12 months 35~45°C, 6 months	For maintenance methods, please consult the distributor or after-sales service center.
GW8.3-BAT-D-G20				
GW5.1-BAT-D-G21				
GW8.3-BAT-D-G21				
GW6.0-BAT-D-G20	30~40%	0~35°C	-20~35°C, 12 months 35~45°C, 6 months 45~55°C, 1 month	
GW9.0-BAT-D-G20				

Packaging Requirements:
Ensure the outer packaging box is intact and the desiccant inside is not missing.
Environmental Requirements:

1. Ensure the device is stored in a cool place, avoiding direct sunlight.
2. Ensure the storage environment is clean, with appropriate temperature and humidity ranges, and no condensation. If condensation is observed on the device ports, do not install the device.
   - GW5.1-BAT-D-G20, GW8.3-BAT-D-G20, GW5.1-BAT-D-G21, GW8.3-BAT-D-G21 battery storage humidity range: 5%-95%.
   - GW6.0-BAT-D-G20, GW9.0-BAT-D-G20 battery storage humidity range: 4%-100%.
3. Ensure the device is stored away from flammable, explosive, corrosive, and other hazardous materials.
4. Stacking Requirements:
   - Ensure the stacking height and orientation of the device are arranged according to the instructions on the packaging box label.
   - Ensure there is no risk of toppling after the devices are stacked.

4 Installation

DANGER

Install and connect the equipment with the deliverables included in the package. Otherwise, the manufacturer shall not be liable for the damage.

4.1.1 Installation Environment Requirements

NOTICE

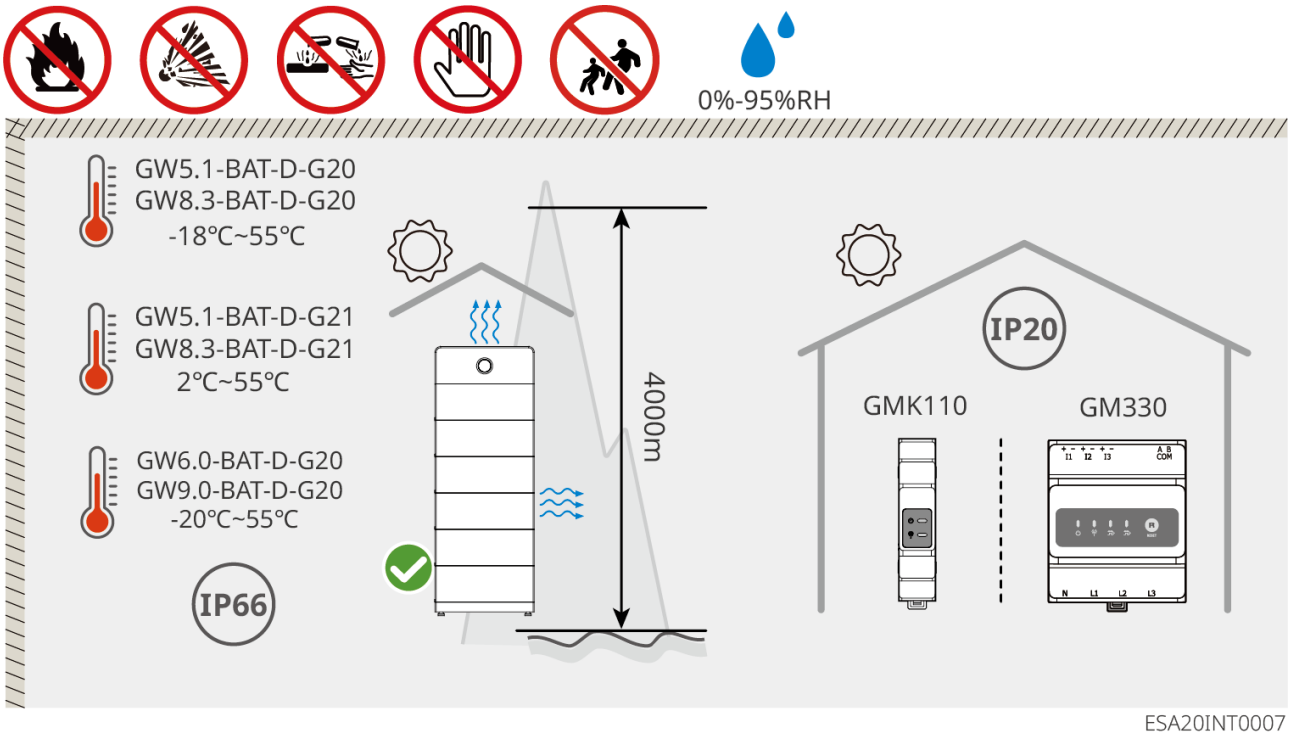
- Inverter operating temperature range: -35°C to 60°C.
- GW5.1-BAT-D-G20, GW8.3-BAT-D-G20: Charging temperature range: -18°C to 55°C; Discharging temperature range: -20°C to 55°C. If installed in an environment below -18°C, the battery will be unable to recharge and recover energy after being depleted, resulting in battery undervoltage protection.
- GW5.1-BAT-D-G21, GW8.3-BAT-D-G21: Charging temperature range: 2°C to 55°C; Discharging temperature range: -20°C to 55°C. If installed in an environment below 2°C, the battery will be unable to recharge and recover energy after being depleted, resulting in battery undervoltage protection.
- GW6.0-BAT-D-G20, GW9.0-BAT-D-G20: Charging temperature range: -20°C to 55°C; Discharging temperature range: -20°C to 55°C. If installed in an environment below -20°C, the battery will be unable to recharge and recover energy after being depleted, resulting in battery undervoltage protection.

1. The device must not be installed in flammable, explosive, corrosive, or similar environments.
2. The ambient temperature and humidity at the installation site must be within the suitable range.
3. The installation location must be out of reach of children and avoid places where it can be easily touched.
4. The device surface may become hot during operation to prevent burns.
5. The device should be installed away from direct sunlight, rain, snow accumulation, etc. It is recommended to install it in a sheltered location. If necessary, a sunshade canopy can be built.
6. The installation space must meet the device's ventilation, heat dissipation, and

operational space requirements.

7. The installation environment must meet the device's protection rating. The Inverter, battery, and smart communication stick are suitable for both indoor and outdoor installation; the meter is suitable for indoor installation only.
8. The installation height of the device should facilitate operation and maintenance, ensuring the device indicator lights, all labels are easy to view, and the wiring terminals are easy to operate.
9. The installation altitude of the device should be lower than the maximum operating altitude.
10. For outdoor installation in salt damage areas, please consult the device manufacturer. Salt damage areas mainly refer to regions within 500m of the coast. The affected area is related to sea wind, precipitation, terrain, and other conditions.
11. Keep away from strong magnetic field environments to avoid electromagnetic interference. If there are radio stations or wireless communication equipment below 30MHz near the installation location, install the device according to the following requirements:

- Inverter: Add a ferrite core with multiple windings at the DC input line or AC output line of the Inverter, or add a low-pass EMI filter; or maintain a distance of over 30m between the Inverter and the wireless electromagnetic interference equipment.
- Other devices: Maintain a distance of over 30m between the device and the wireless electromagnetic interference equipment.



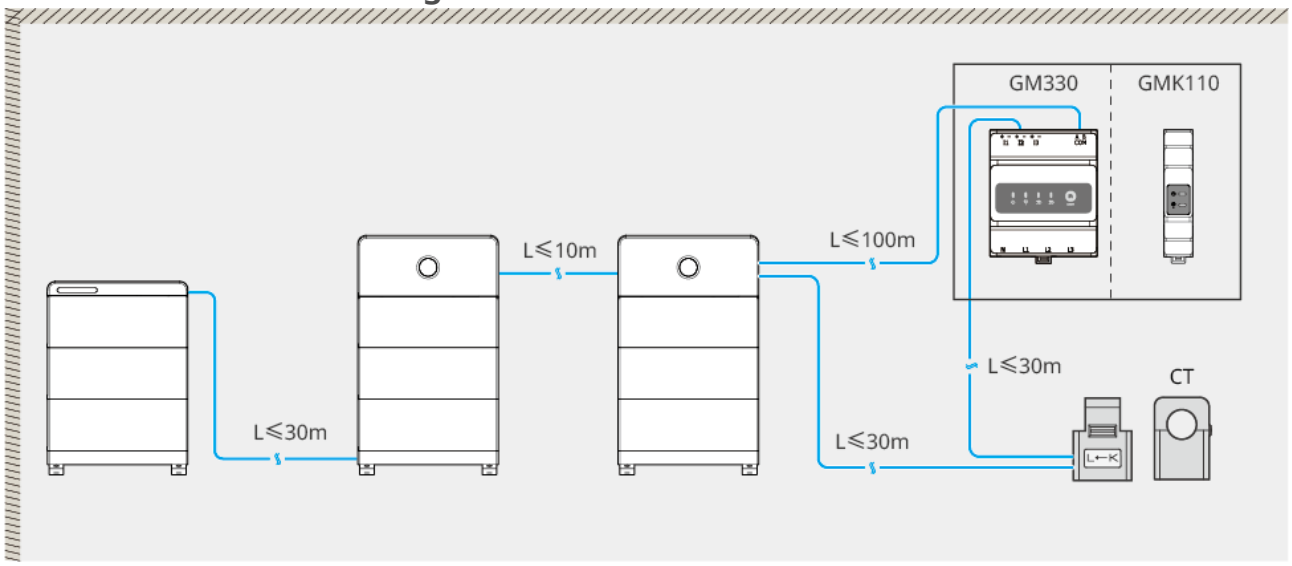
ESA20INT0007

4.1.2 Installation Space Requirements

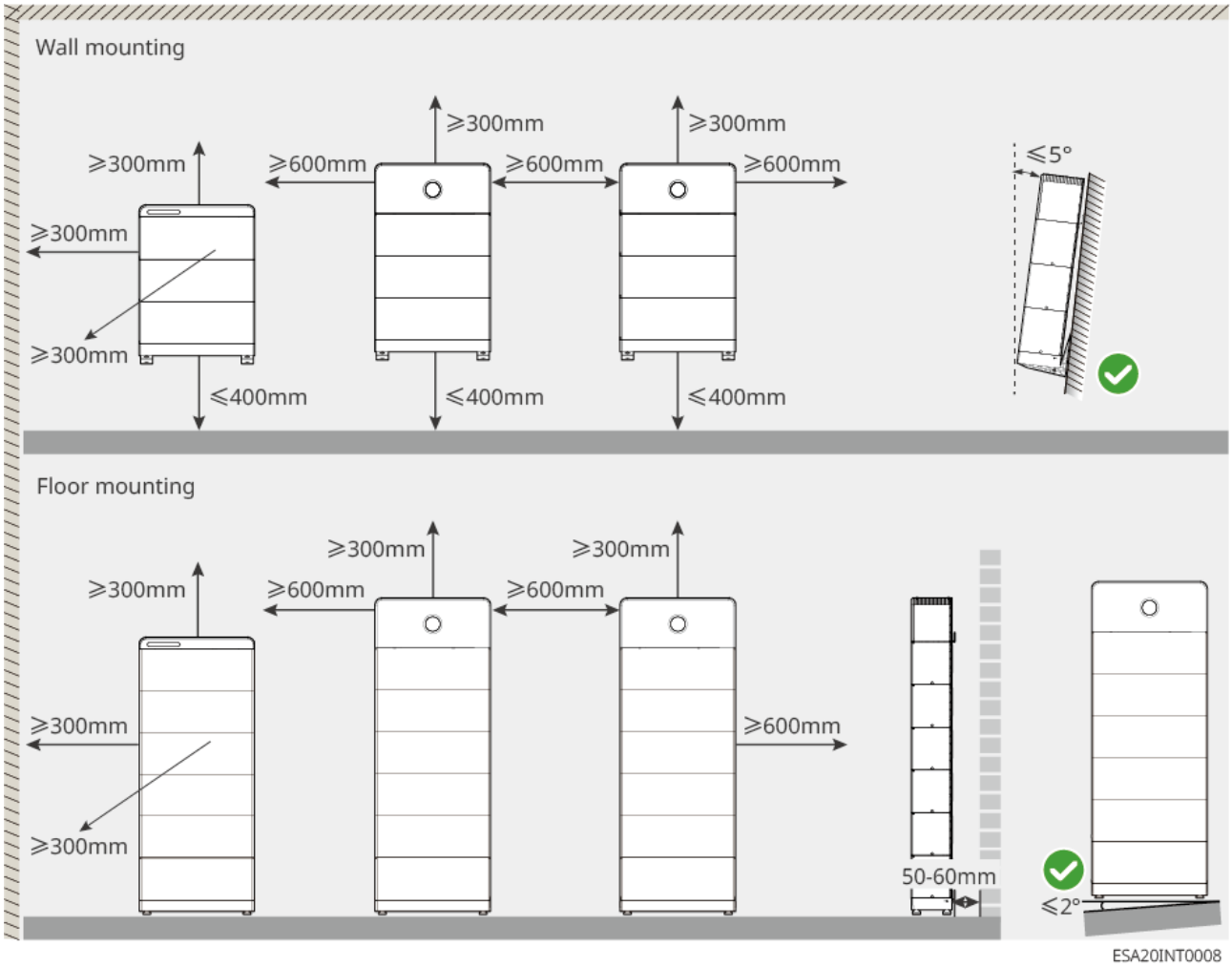
When installing devices in the system, sufficient space should be reserved around the devices to ensure adequate installation and heat dissipation space.

- When using CAT 7E communication cables between inverters, the cable distance should not exceed 10 meters; when using CAT 5E or CAT 6E communication cables, the cable distance should not exceed 5 meters. Do not exceed 10m for communication cables, otherwise communication abnormalities may occur.
- For CT installation, use shielded twisted-pair cables of CAT 5E or above, with a cable distance not exceeding 30 meters.
- The distance for the RS485 twisted-pair shielded cable used for communication between the inverter and the meter should not exceed 100 meters.

Communication Cable Length



Installation Space

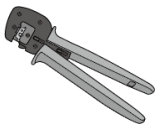
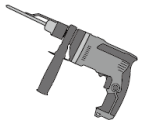
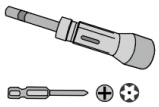
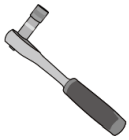
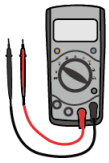
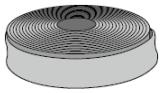
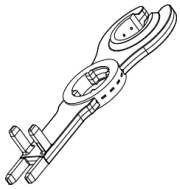


4.1.3 Tool Requirements

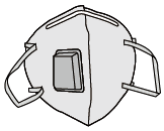
NOTICE
The following tools are recommended when installing the equipment. Use other auxiliary tools on site if necessary.

Installation Tools

Tool Type	Description	Tool Type	Description
	Diagonal pliers		RJ45 crimping tool

Tool Type	Description	Tool Type	Description
	Wire stripper		Level ruler
	Adjustable wrench		PV connector tool PV-CZM-61100
	Impact drill (drill bits Φ12mm)		Torque wrench M4, M5, M6, M10
	Rubber hammer		Socket wrench set
	Marker		Multimeter Range<=600V
	Heat shrink tube		Heat gun
	Cable tie		Vacuum cleaner
	(Only for China) PV Unlocking tool x1	-	-

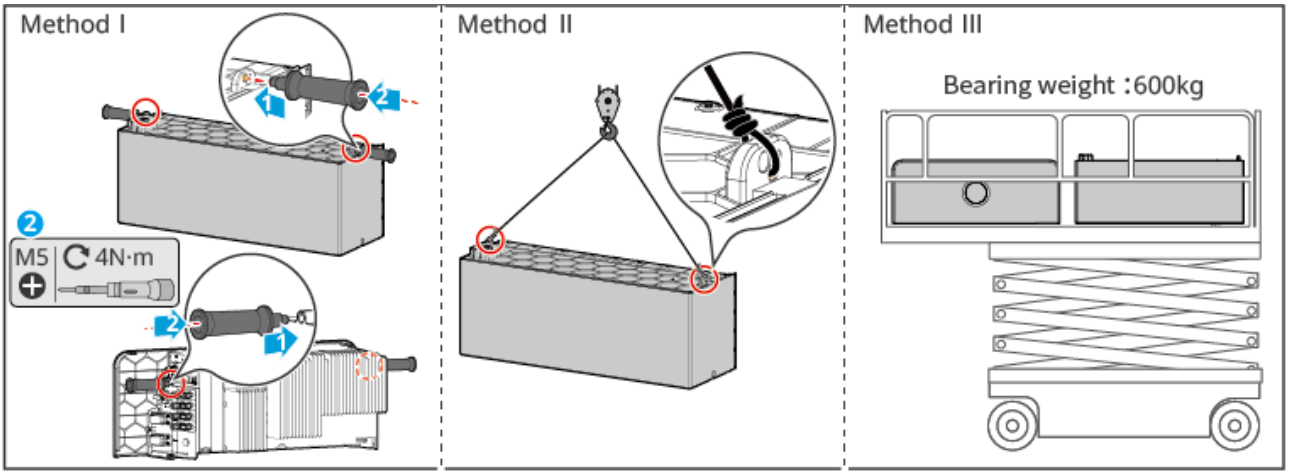
Personal Protective Equipment

Tool Type	Description	Tool Type	Description
	Insulating gloves, protective gloves		Dust mask
	Goggles		Safety shoes

4.2 Equipment Handling

⚠CAUTION

- During operations such as transportation, handling, installation, etc., the laws, regulations, and relevant standard requirements of the country and region must be met.
- Before installation, the equipment needs to be moved to the installation site. To avoid personal injury or equipment damage during the moving process, please note the following:
  1. Based on the equipment weight, assign a corresponding number of personnel to avoid the equipment exceeding the weight limit a person can carry, which may cause injury.
  2. Please wear safety gloves to prevent injury.
  3. Ensure the equipment remains balanced during movement to avoid falling.
  4. The battery system can be hoisted and transported to the installation site.
  5. When using hoisting to move the equipment, please use flexible slings or straps. The load-bearing capacity of a single strap must meet the following requirements:
     - GW5.1-BAT-D-G20, GW5.1-BAT-D-G21, GW6.0-BAT-D-G20 ≥185KG
     - GW8.3-BAT-D-G20, GW8.3-BAT-D-G21, GW9.0-BAT-D-G20 ≥240KG



ESA20INT0010

4.3 Installing the Device

⚠CAUTION

- When drilling holes, ensure the drilling location avoids water pipes, cables, etc., inside the wall to prevent hazards.
- When drilling, wear safety goggles and a dust mask to avoid inhaling dust into the respiratory tract or getting it into the eyes.
- The inverter is installed above the battery. Do not install the battery above the inverter.
- When installing the battery system, ensure it is level and secure. When placing the battery base, battery, and inverter, confirm that the holes on the upper and lower layers are aligned; the anti-tip bracket should be vertical and tightly attached to the ground, wall, or the surface of the battery system.
- When using an impact drill to make holes, use cardboard or other coverings to shield the battery system to prevent foreign objects from entering the equipment and causing damage.
- For wall-mounted installation, to ensure the safety of your life and property, be sure to assess the wall's load-bearing capacity.

NOTICE

- The battery must be installed on the Base, which can be floor-mounted or mounted on a bracket.
- When using the Base for installation, a maximum of 6 batteries can be stacked.
- The maximum stacking quantity for bracket installation is as follows:
  - Same energy stacking:
    - Same energy stacking:
      - GW5.1-BAT-D-G20，GW5.1-BAT-D-G21: Up to 3 units.
      - GW8.3-BAT-D-G20，GW8.3-BAT-D-G21: Up to 2 units.
      - GW6.0-BAT-D-G20: Up to 3 units.
      - GW9.0-BAT-D-G20: Up to 2 units.
  - Mixed energy stacking:
    - When GW5.1-BAT-D-G20, GW5.1-BAT-D-G21 are mixed with GW6.0-BAT-D-G20, the system supports up to 3 units per group.
    - GW8.3-BAT-D-G20, GW8.3-BAT-D-G21, GW9.0-BAT-D-G20 and models mixed with them, the system supports up to 2 units per group.
- The Base, bracket, and the top battery must be secured to the wall using an anti-tip bracket.
- When marking drilling positions for bracket installation, have one person hold the Base steady while another uses a marker to mark the drilling spots.
- When installing the battery and inverter, remove the protective cover from the blind-mate connector before stacking.

Wall Mounting

Step 1: Install the base onto the mounting bracket.

Step 2: Place the mounting bracket against the wall. Ensure the bracket is positioned securely and observe the spirit level in the center of the base.

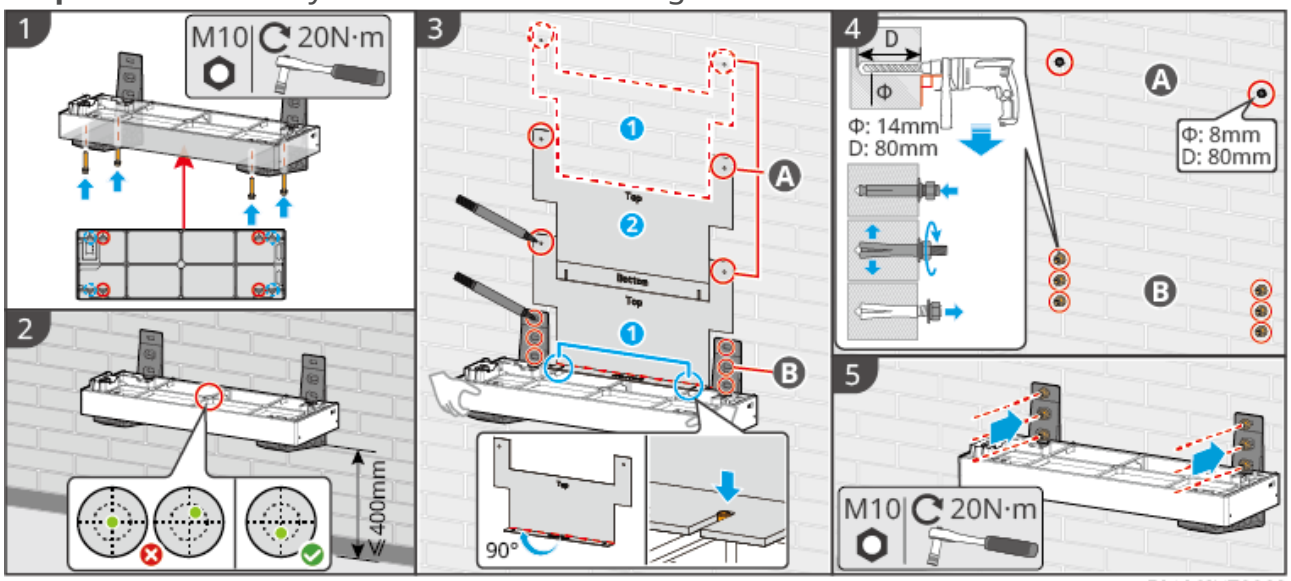
Step 3: After adjusting the position and level of the mounting bracket, use a marker to mark the drilling positions. Once marked, remove the bracket. (A: PACK fixing hole positions; B: Bracket fixing hole positions.)

Step 4: Drill holes and install expansion bolts.

1. Use a hammer drill to make the holes.
2. Clean the holes.
3. Use a rubber mallet to install the expansion bolts into the holes.

4. Use a hex key to tighten the nut clockwise, causing the bolt to expand.
5. Unscrew and remove the nut counterclockwise.
6. Use a torque screwdriver to secure the anti-tipping bracket to the wall.

Step 5: Use a hex key to secure the mounting bracket to the wall.



ESA20INT0003

Installing the Base

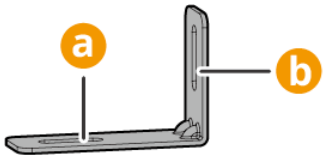
Step 1: Install the adjustable feet onto the bottom of the base, and secure the anti-tipping bracket to the base.

Step 2: Place the base 50-60mm away from the wall, keeping it parallel to the wall surface. Observe the spirit level in the center of the base. If the bubble is not centered, use the adjustable feet to level the base.

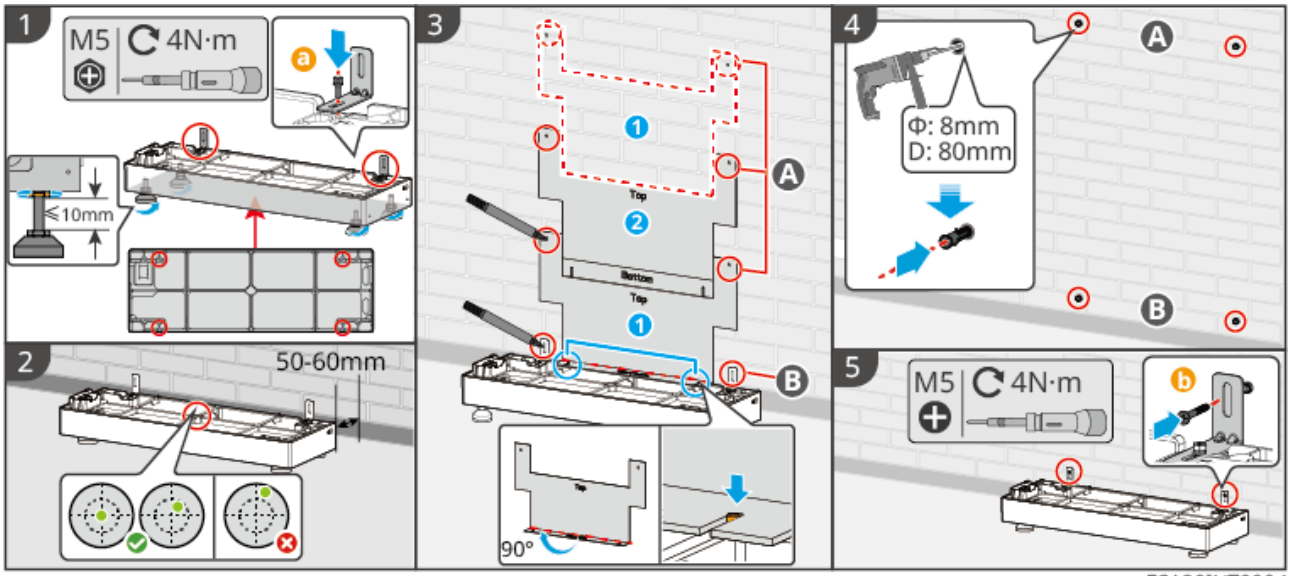
Step 3: After adjusting the position and level of the base, use drilling template paper to mark the drilling positions. Once marked, remove the base. (A: PACK fixing hole positions; B: Bracket fixing hole positions.)

Step 4: Use a hammer drill to make the holes and clean them.

Step 5: Use a Phillips-head screwdriver to secure the anti-tipping bracket to the wall.



a: Surface for fixing to the base; b: Surface for fixing to the wall.



ESA20INT0004

Installing the Battery and Inverter

Step 1: Remove the protective covers from the blind-mate connectors on the bottom of the inverter or battery.

Step 2: Install the handles (optional), and stack the battery onto the base.

If installing more than 3 batteries, use lifting tools.

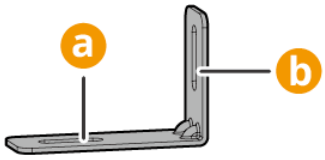
Step 3: Tighten the screws between the battery and the base, or between batteries.

If installing multiple batteries, repeat **Step1** and **Step2** to complete the installation of all batteries. The number of stacked batteries must follow the "2.2.1.System Overall Configuration Description(Page 35)".

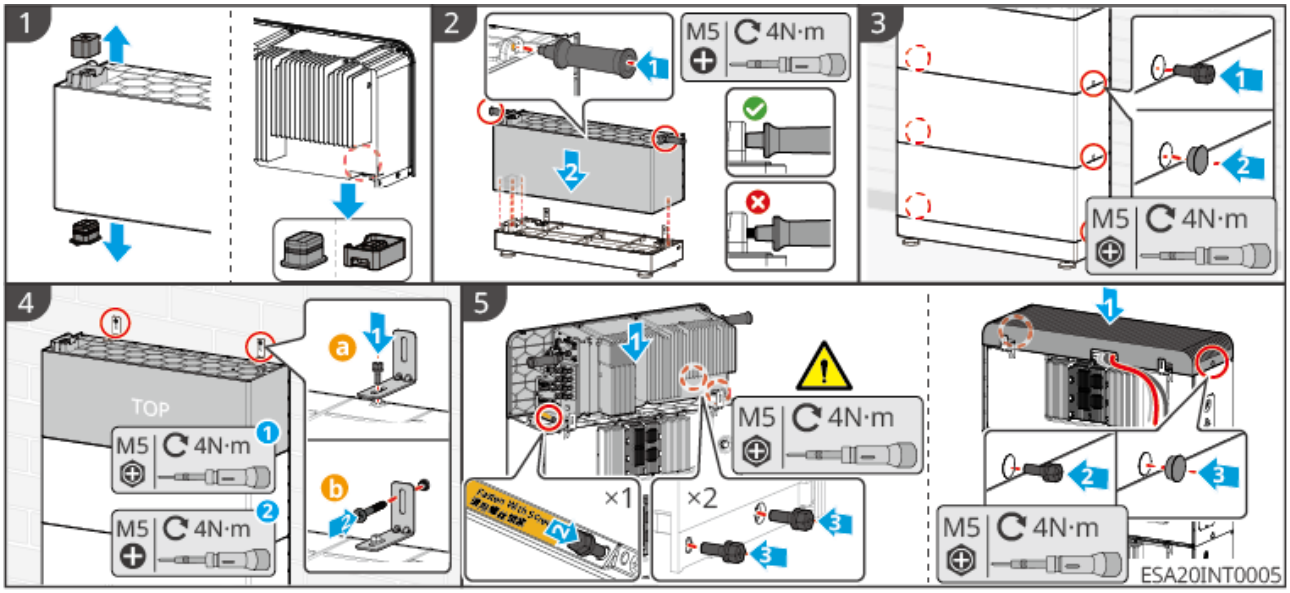
Step 4: Secure the topmost battery to the wall using the anti-tipping bracket.

Step 5: Install the inverter or battery protective cover.

- Integrated Installation: Lift the inverter, align it, and stack it on top of the battery. Tighten the screws between the inverter and the battery. If the system is an integrated configuration, the installation is now complete.
- Split-type Expansion: Repeat the battery installation steps. After completing the electrical connections, place the battery protective cover on top of the battery and tighten the side screws.



a: Surface for fixing to the PACK; b: Surface for fixing to the wall.

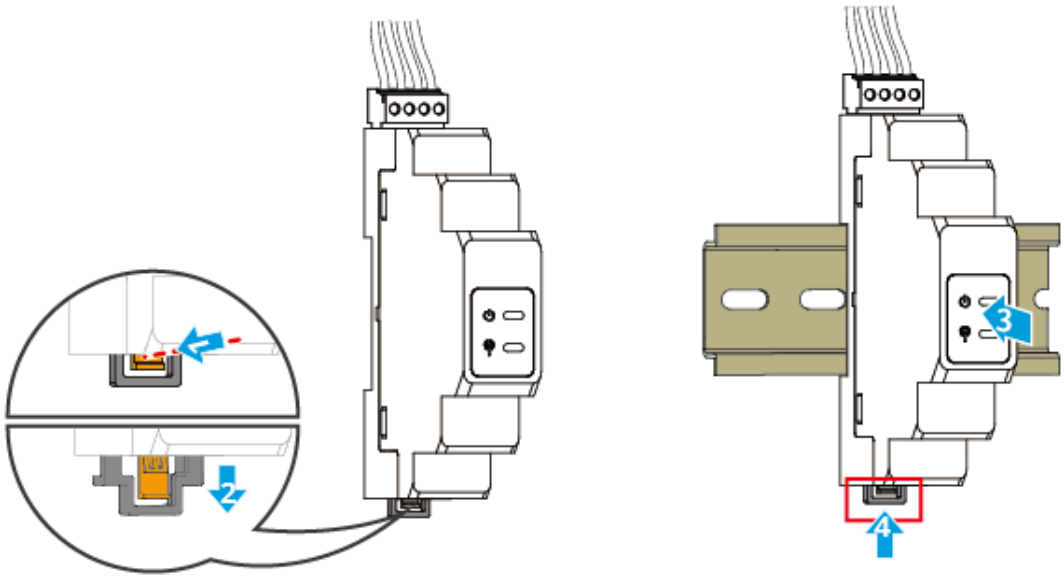


4.4 Installing the Smart Meter

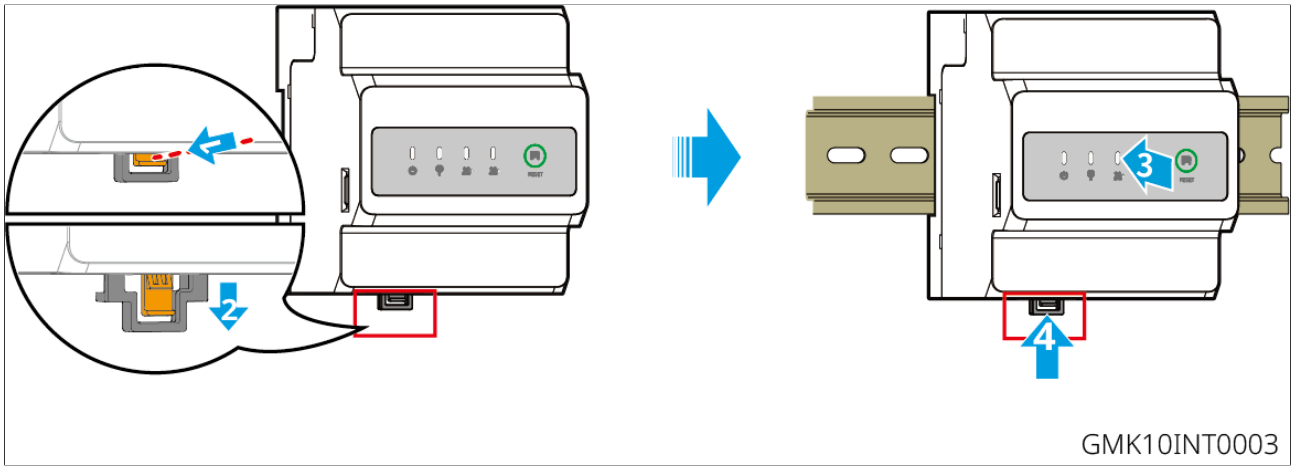
⚠WARNING

In areas at risk of lightning, if the meter cable exceeds 10m and the cables are not wired with grounded metal conduits, you are recommended to use an external lightning protection device.

GMK110



GM330


2
3
4
GMK10INT0003

5 System Wirings

⚠DANGER

- The installation, routing, and connection of cables must comply with local laws, regulations, and standard requirements.
- All operations during electrical connections, as well as the specifications of cables and components used, must comply with local laws and regulations.
- Before performing electrical connections, please disconnect the DC switch and AC output switch of the device to ensure it is powered off. Live operation is strictly prohibited, otherwise it may lead to DANGER such as electric shock.
- Cables of the same type should be bundled together and arranged separately from different types of cables. Intertwining or cross-arrangement is prohibited.
- If the cable is subjected to excessive tension, it may lead to poor connections. When wiring, please leave a certain length of cable before connecting to the inverter terminal ports.
- When crimping terminals, ensure that the conductor part of the cable is in full contact with the terminal. Do not crimp the cable insulation together with the terminal, otherwise it may cause the device to fail to operate, or after operation, due to unreliable connections leading to heating and other conditions that damage the inverter terminal block.
- The inverter is not tested to AS/NZS 4777.2:2020 for combinations and/or multiple phase inverter combinations so that combpinations should not be used.
- For unused cable holes and ports (including communication ports), please use the dedicated terminals or plugs provided in the accessory box to reliably seal them. Otherwise, it may cause the following risks:
  - DANGER of electric shock: Open electrical ports may cause direct contact with live parts, leading to electric shock accidents.
  - Failure of protection: Open ports may allow dust, moisture, or foreign objects to intrude, which may lead to short circuits, fires, or equipment failures.

NOTICE

- When performing electrical connections, wear personal protective equipment such as safety shoes, protective gloves, and insulated gloves as required.
- Only qualified personnel are permitted to perform electrical connection-related operations.
- The cable colors in the diagrams are for reference only; specific cable specifications must comply with local regulations.

5.1 System Wiring Electrical Block Diagram

NOTICE

- Depending on regional regulatory requirements, the wiring methods for the N and PE lines of the inverter's ON-GRID and BACK-UP ports differ. Please follow local regulations.
- The inverter has a built-in energy meter and can be directly connected to a CT for use. The CT network cable included in the shipment is 10 meters. For longer distances, shielded network cables of CAT5E or above can be used to extend up to 30 meters.
- CT accuracy will decrease when the connection length to the inverter exceeds 30m. For high-precision requirements, an external smart meter can be connected.
- The inverter's ON-GRID AC port has a built-in relay. When the inverter is in off-grid mode, the built-in ON-GRID relay is open; when the inverter is in grid-tied operation mode, the built-in ON-GRID relay is closed.
- When the inverter is powered on, the BACK-UP AC port is live. To perform maintenance on the BACK-UP Loads, please power down the inverter, otherwise electric shock may occur.
- In a whole-house backup power scenario, if the total power of connected loads exceeds the inverter's rated power, the inverter will stop output due to overload protection after a grid outage. In this case, please turn off some non-essential loads to ensure the total load power is less than the inverter's power.

The N and PE wires are connected together in the distribution box

NOTICE

- To maintain neutral integrity, the neutral wires of the grid-connected side and the off-grid side must be connected together; otherwise, the off-grid function will not operate normally.
- The diagram below is a schematic for grid systems in regions such as Australia and New Zealand:

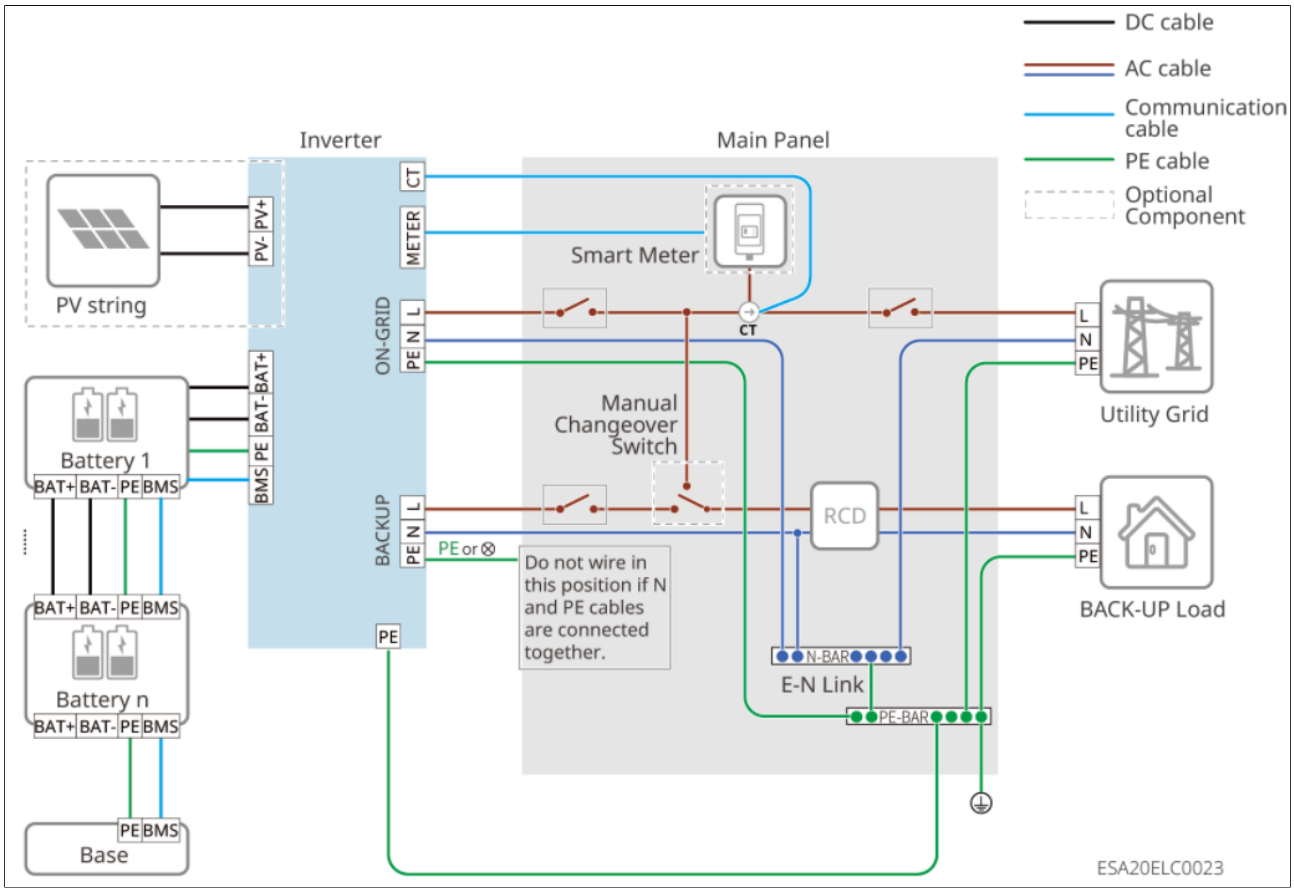


Figure14 Whole House Backup Power

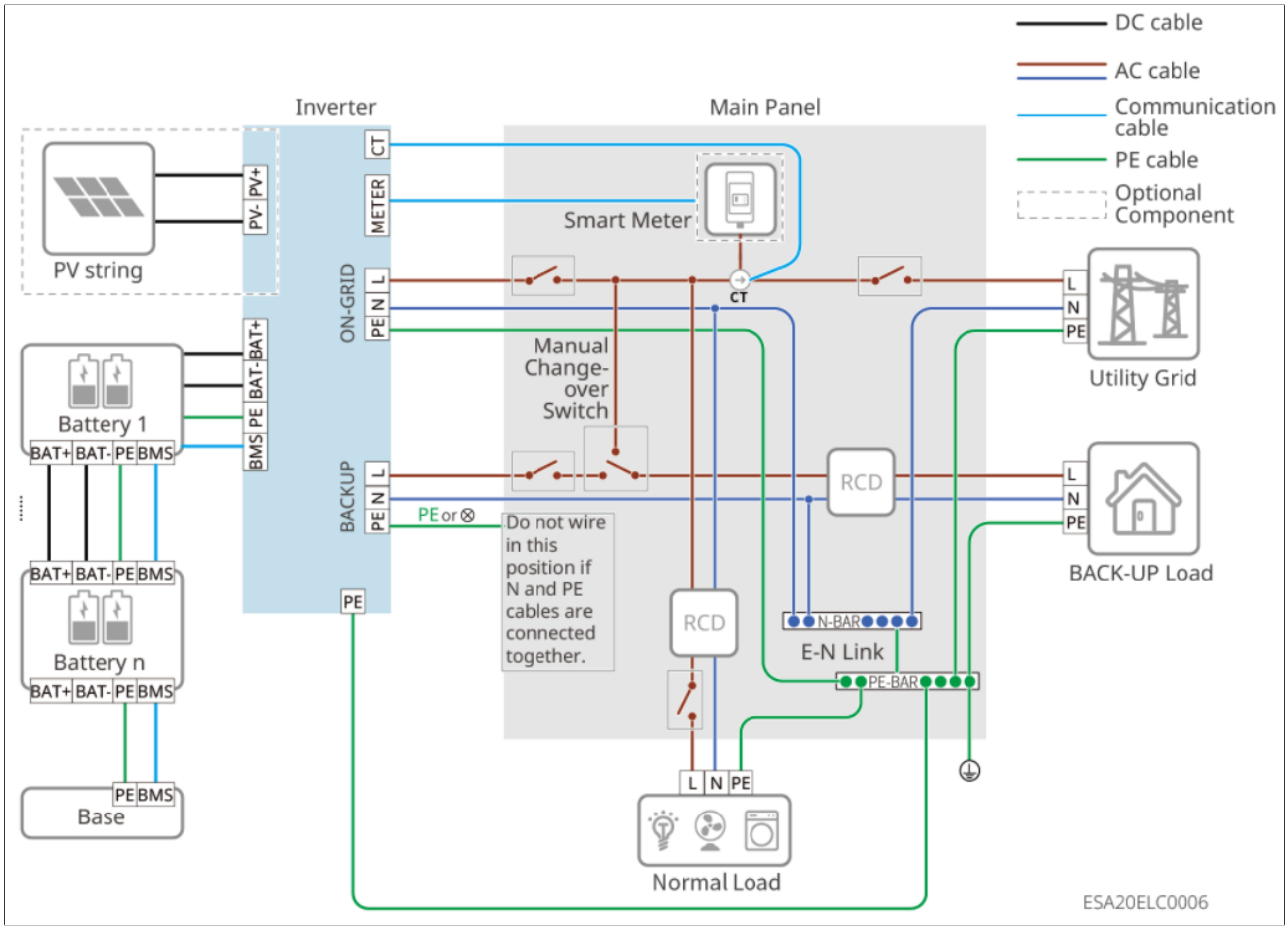


Figure15 Partial Backup Power

N and PE wires are wired separately in the distribution box

NOTICE

- Ensure the protective ground wire for BACK-UP is correctly and securely connected; otherwise, the BACK-UP function may operate abnormally in the event of a grid fault.
- In parallel systems, do not install Residual Current Devices (RCDs) on the grid-connection branch of each inverter. RCDs should be installed uniformly at the grid summary point.
- For regions other than Australia and New Zealand, the following wiring method applies:

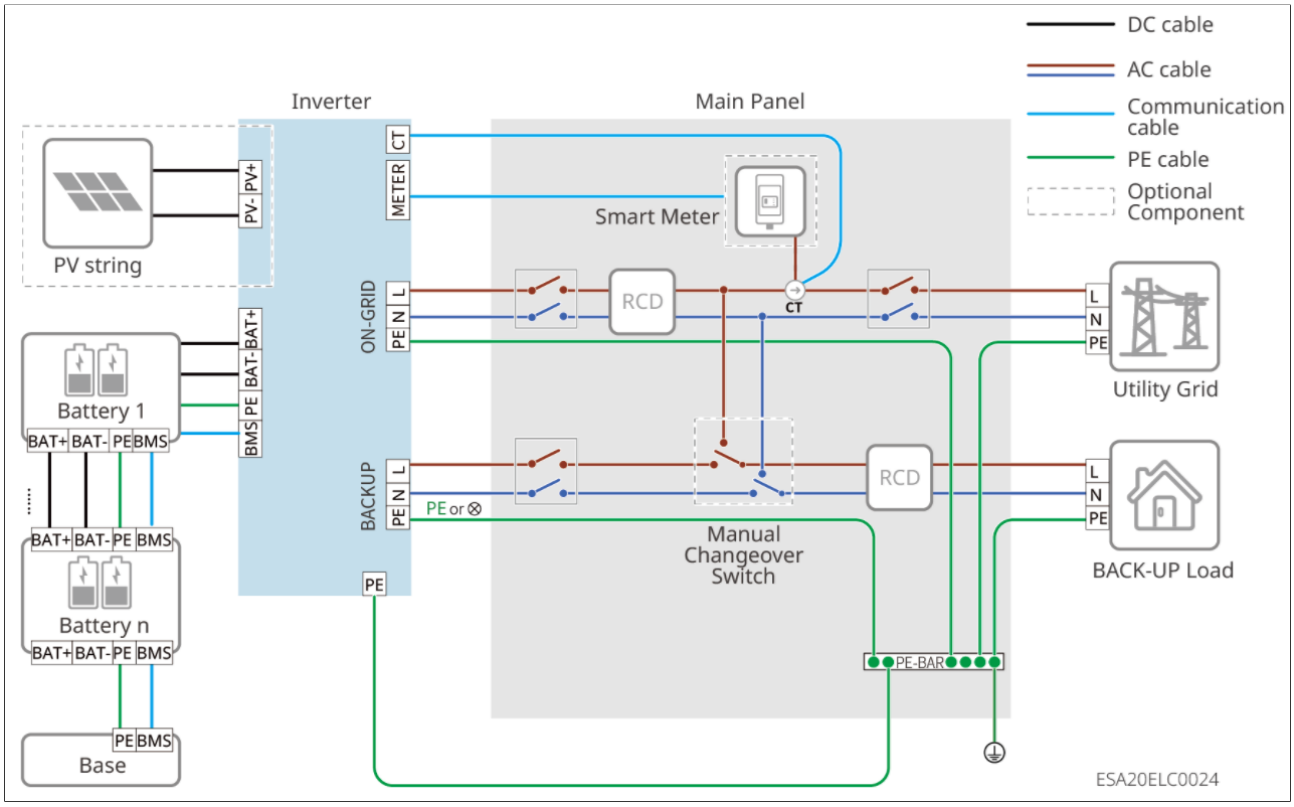


Figure16 Whole House Backup Power

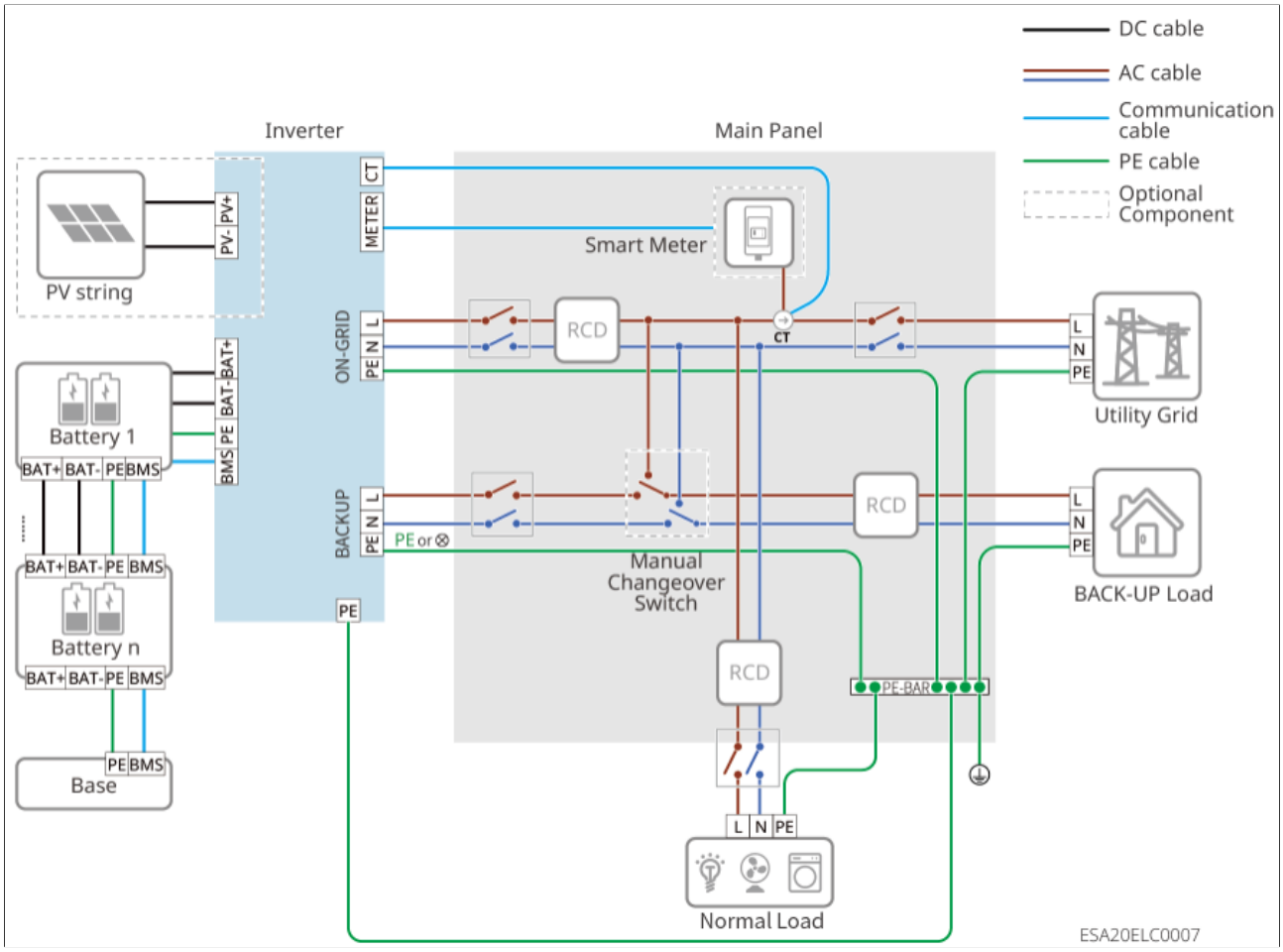


Figure17 Partial Backup Power

5.2 Detailed System Wiring Diagram

When all loads in the photovoltaic system cannot consume the electricity generated by the system, the surplus power will be fed into the grid. In this case, a smart meter or CT monitoring system can be used to monitor the system's power generation and control the amount of power fed into the grid.

- Connecting a smart meter enables output power limiting and load monitoring functions.
- After connecting the smart meter, please enable the "Export power limit" function via the App.

The Detailed System Wiring Diagram only shows wiring examples using some device models. Please refer to the corresponding wiring guide chapter based on the actual devices used for wiring.

⚠WARNING

The common contact of the manual transfer switch must be on the BACK-UP load side of the Inverter. Do not connect it to the GRID grid side. If connected to the GRID grid side, the Inverter will operate in both off-grid mode and bypass mode simultaneously. When the grid power fails, the distribution cabinet connected to the Inverter's GRID port may still have high voltage, posing a risk of electric shock.

Australia Region

NOTICE

In the Australia region, a 1-pole manual transfer switch is included in the product packaging. If required for use, please wire it according to the 1-pole manual transfer switch wiring method shown in the following wiring diagram.

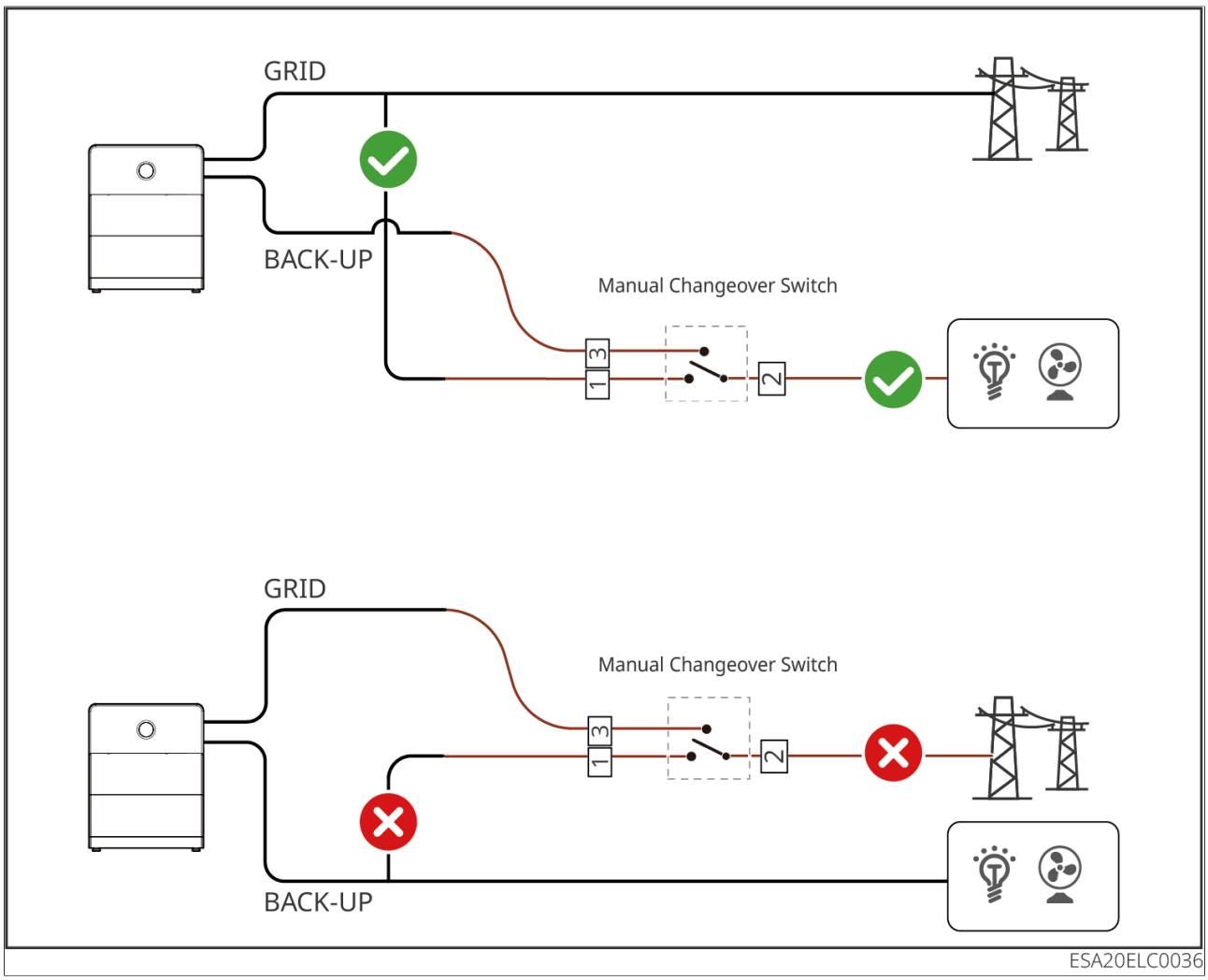


Figure18 Wiring Example for Australia Region

Europe Region

NOTICE
In Europe, if a manual transfer switch is required, please purchase a 2-pole manual transfer switch through a dealer or procure it yourself. After obtaining this switch, please wire it according to the 2-pole manual transfer switch wiring method shown in the wiring diagram below.

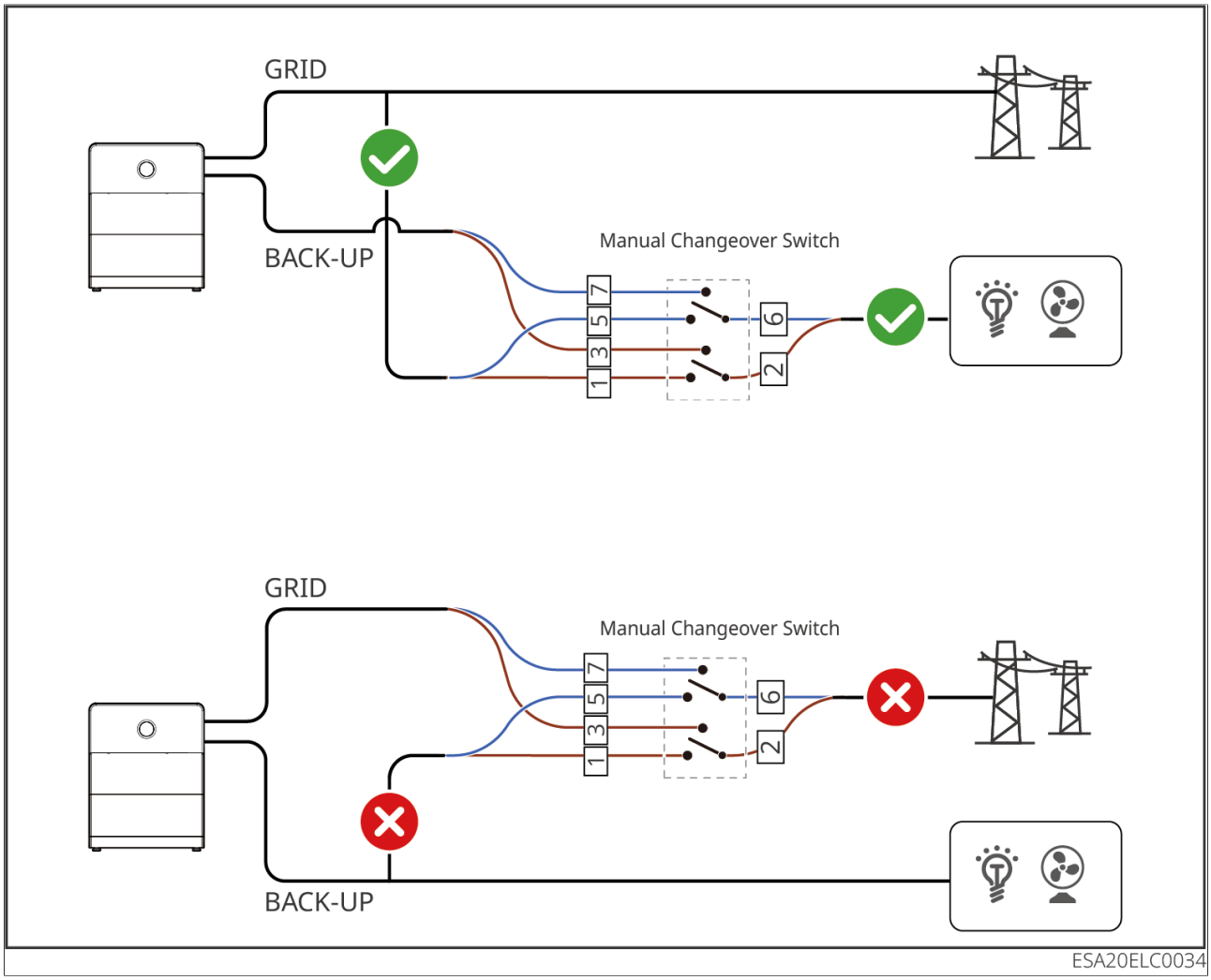


Figure19 Wiring Example for Europe Region

NOTICE

- For microgrid and coupling scenarios, to achieve grid-connected inverter power generation monitoring and load monitoring functions, a dual-meter network is required.
  - Meter 1 or the built-in meter is used to monitor the system's grid-connected power.
  - Meter 2 is used to monitor the grid-connected inverter's power generation.
  - By integrating data from Meter 1 and Meter 2, the monitoring platform can achieve real-time monitoring of load power consumption.
- Please connect the CT according to the meter's direction. If reversed, it may cause a CT reverse fault.
- Microgrid scenarios do not support parallel operation of energy storage inverters.
- If output power limitation is required for grid-connected inverters, please connect a meter or CT device separately.
- For microgrid and coupling scenarios with dual meters, the meter wiring methods are the same.
- When not using the inverter's built-in meter, do not connect the inverter's CT port.
- Manual transfer switches are only supported in single-unit scenarios. Please decide whether to install based on the actual usage scenario; if you have your own ATS or STS switch, this switch must have an interlock function.

Dual Meter Configuration Scenarios	
Meter 1 (Grid Side)	Meter 2 (Grid-tie Inverter AC Side)
Built-in Meter (Standalone Only)	GMK110
Built-in Meter (Standalone Only)	GM330
GMK110	GMK110
GM330	GM330
GMK110	GM330
GM330	GMK110

5.2.1 Detailed System Wiring Diagram for Single Inverter

General Scenario

The scenario with a built-in meter does not support connection to a generator.

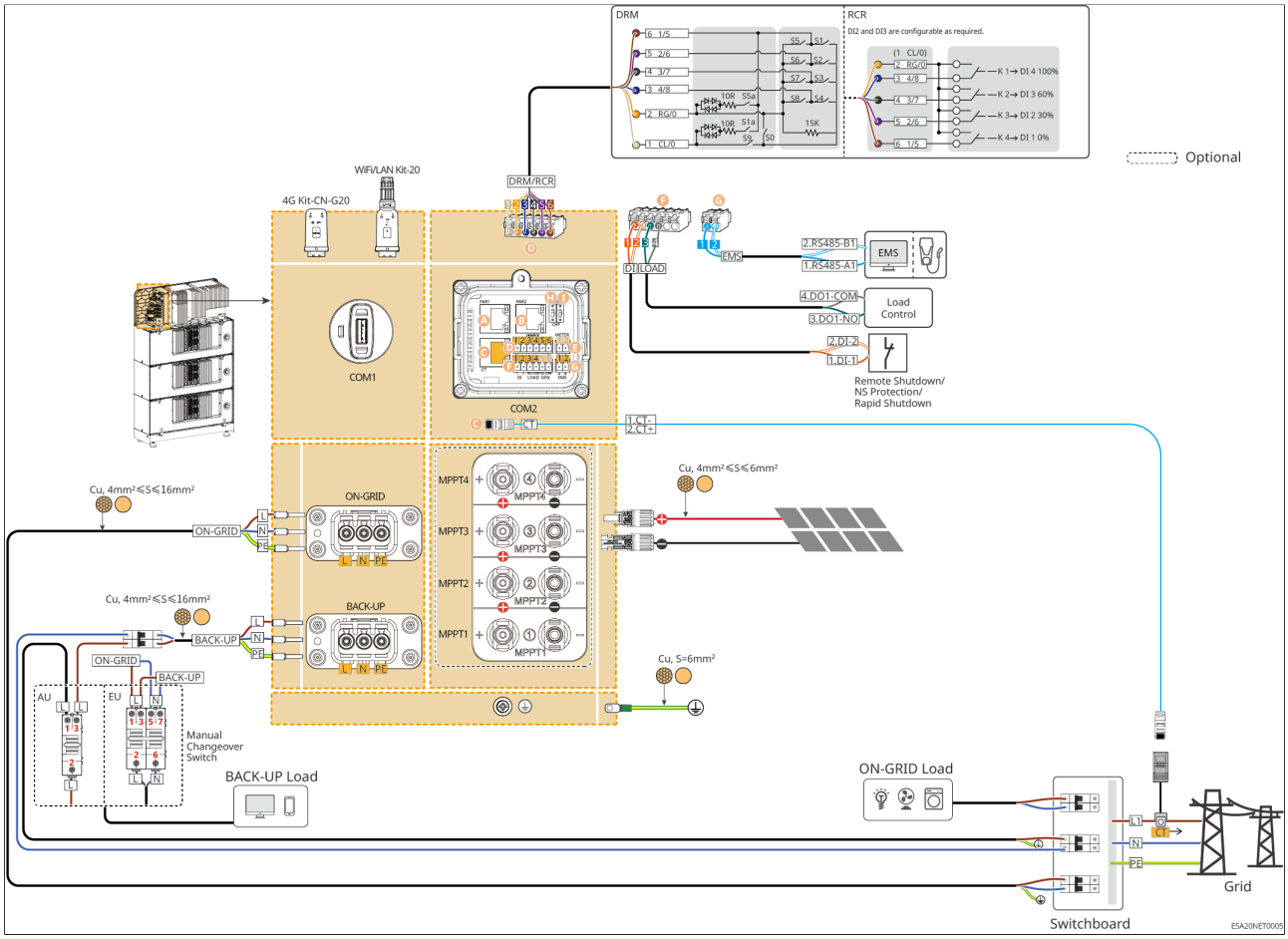


Figure20 Scenario with Built-in Meter

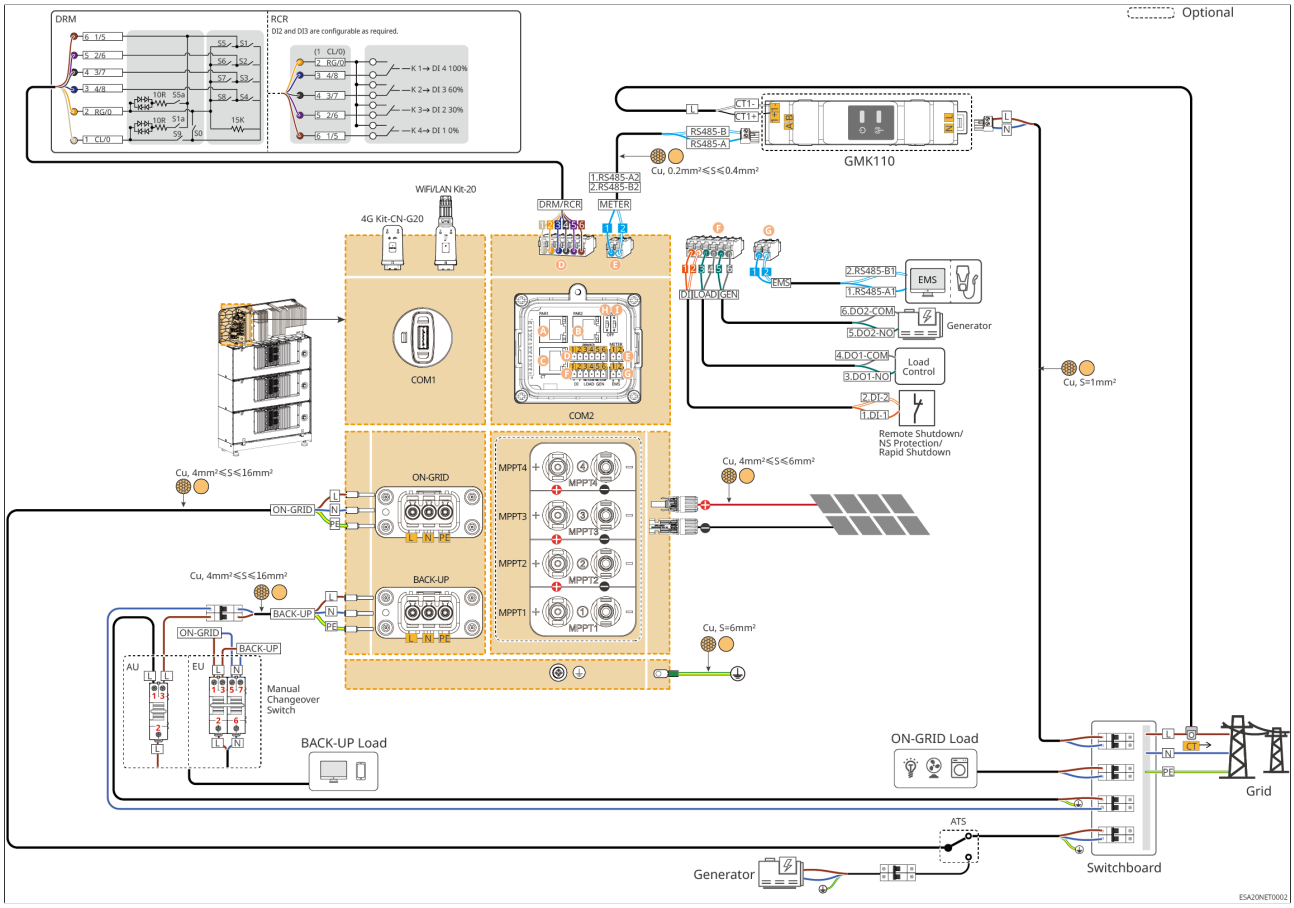


Figure21 Scenario with GMK110 Meter

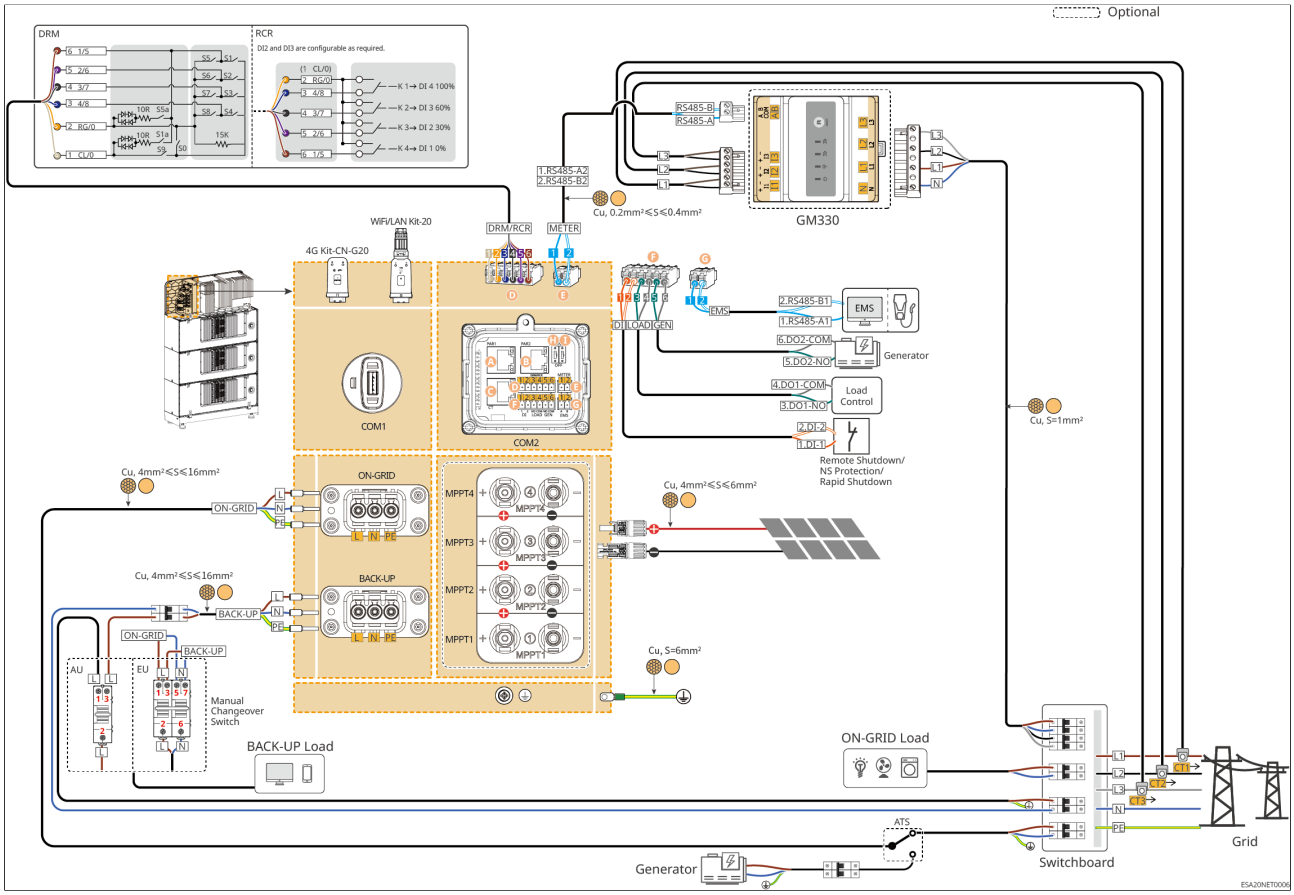


Figure22 Scenario with GM330 Meter

Microgrid Scenario Networking Diagram

- The Microgrid Scenario does not support connection to a generator.
- The manual transfer switch is optional. Please decide whether to install it based on the actual usage scenario.

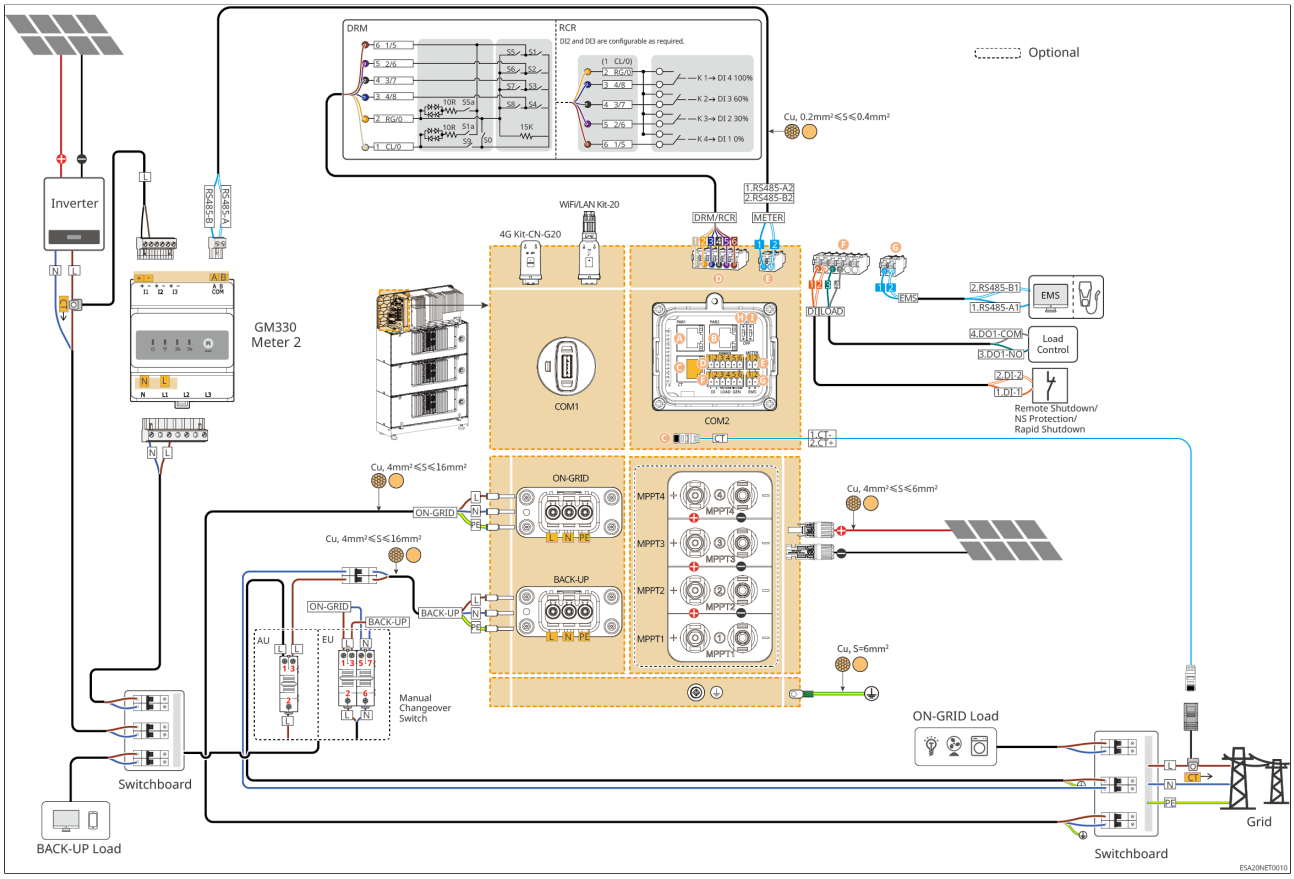


Figure23 Networking Diagram for Built-in Meter + GM330 Meter

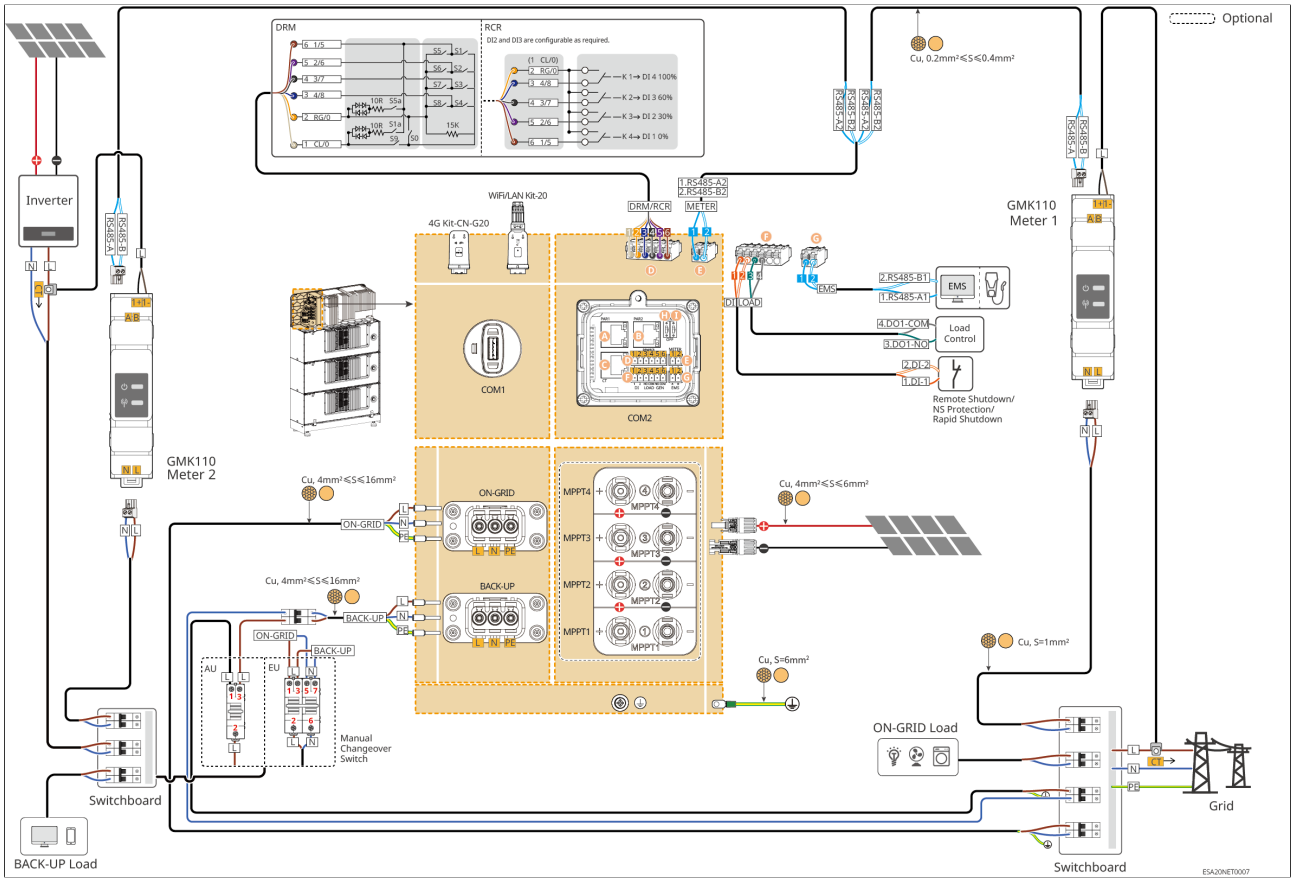


Figure24 Networking Diagram for GMK110 + GMK110

Microgrid Scenario, Grid-Tied Inverter Grid Power Limiting Networking Diagram

In the Microgrid Scenario, if the grid-tied inverter requires output power limiting, please connect a separate meter, CT, or other device.

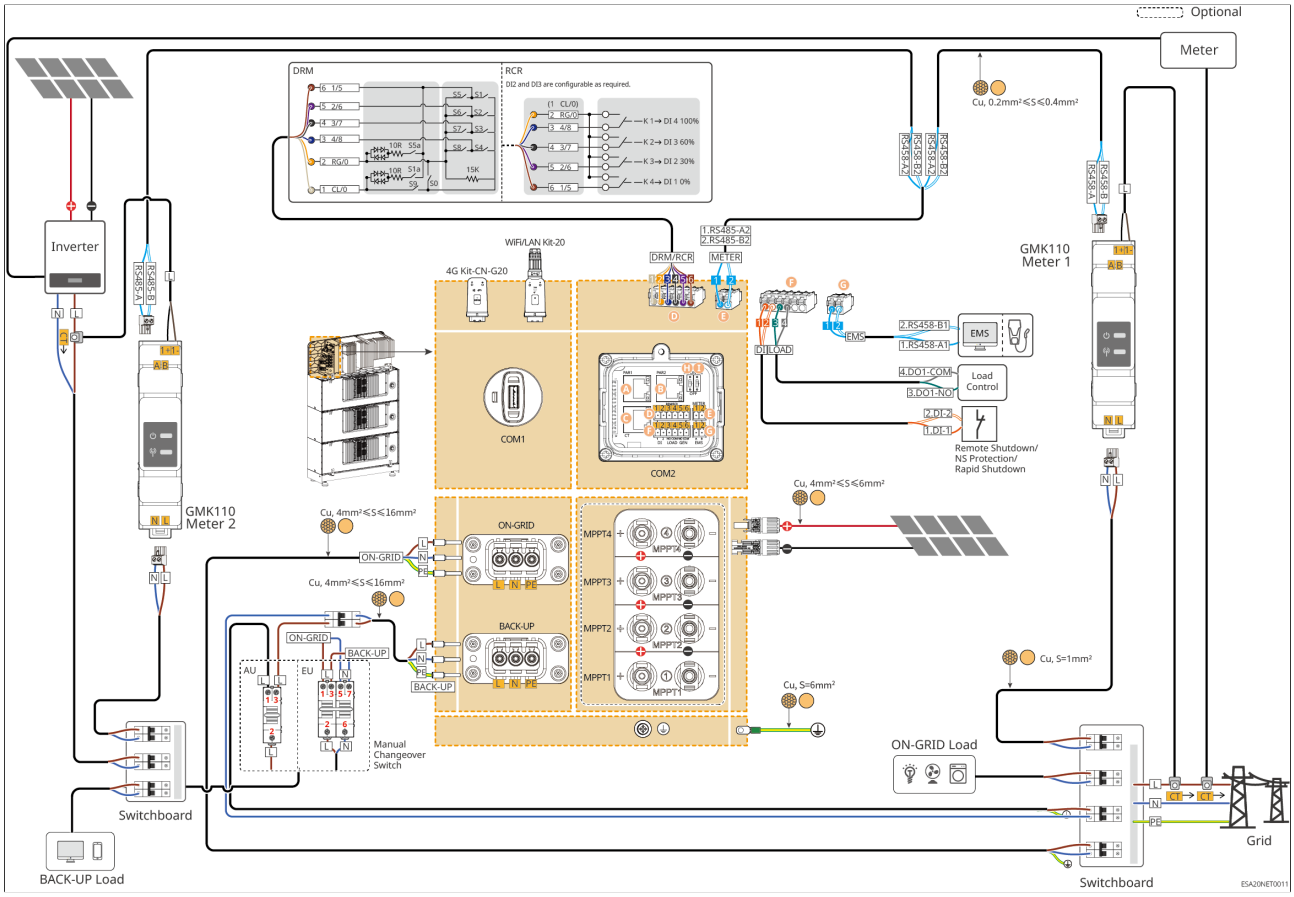


Figure25 Grid-Tied Inverter Grid Power Limiting Networking Diagram

Coupled Scenario Dual Meter Networking Diagram

- The manual transfer switch is optional. Please decide whether to install it based on the actual usage scenario.
- The scenario with a built-in meter does not support connection to a generator.

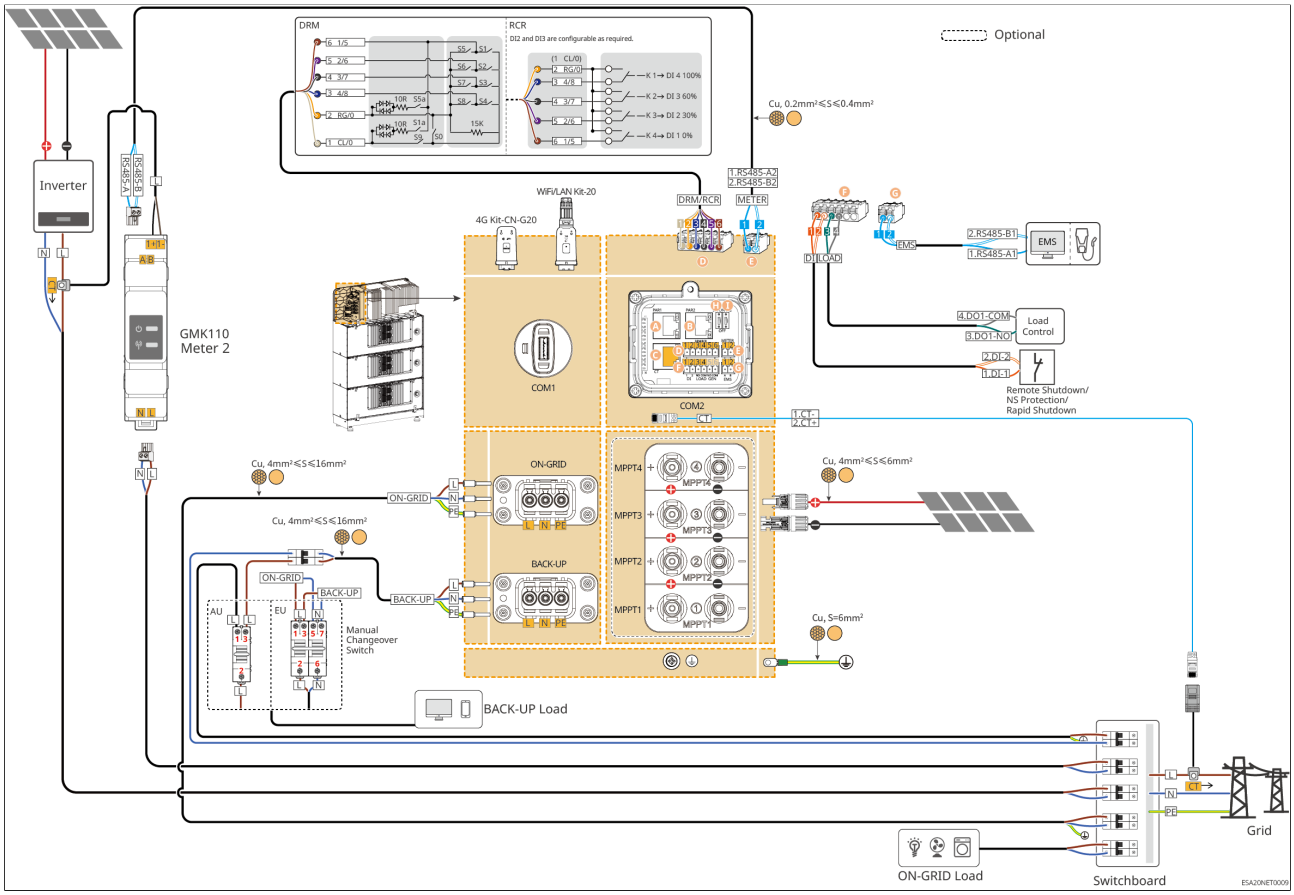


Figure26 Networking Diagram for Built-in Meter + GMK110 Meter

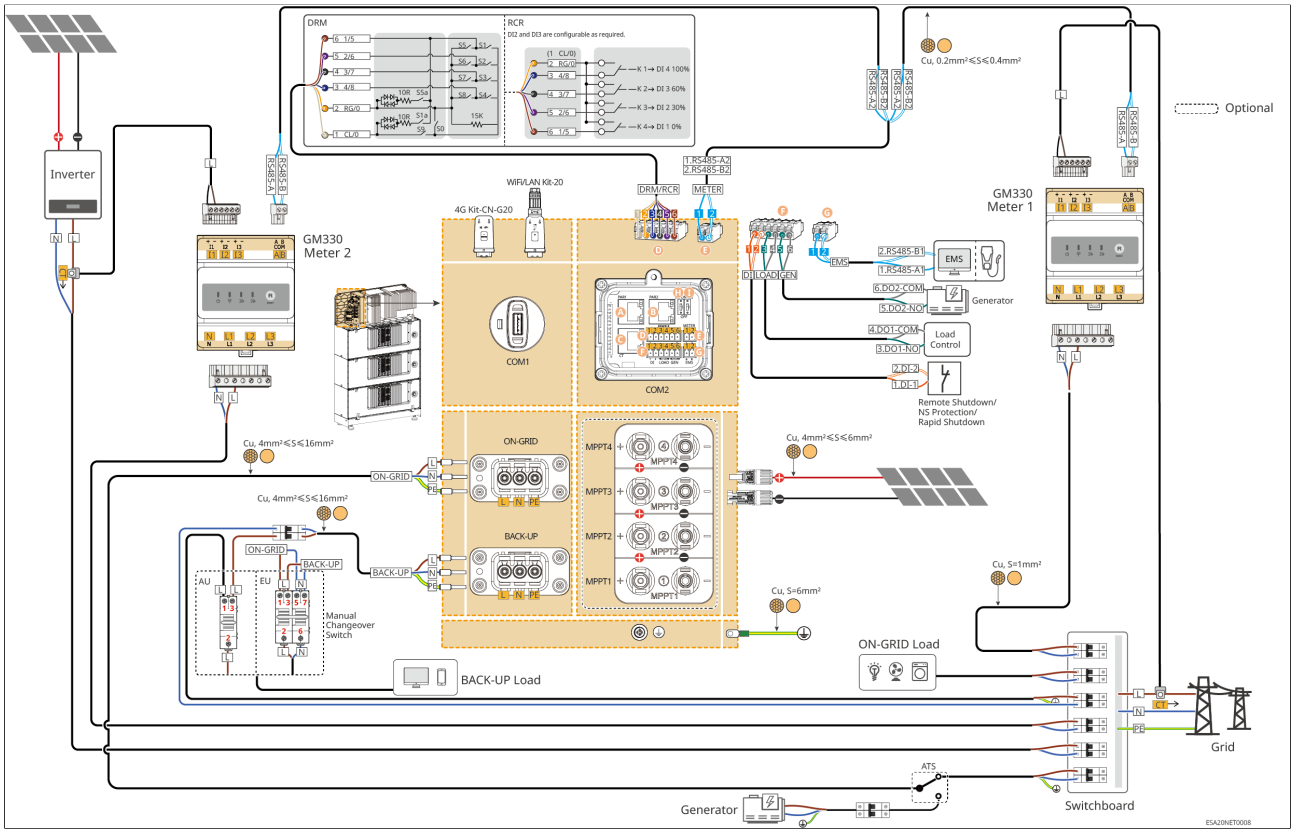


Figure27 Networking Diagram for GM330 + GM330

Coupled Scenario, Grid-Tied Inverter Grid Power Limiting Networking Diagram

In the Coupled Scenario, if the grid-tied inverter requires output power limiting, please connect a separate meter, CT, or other device.

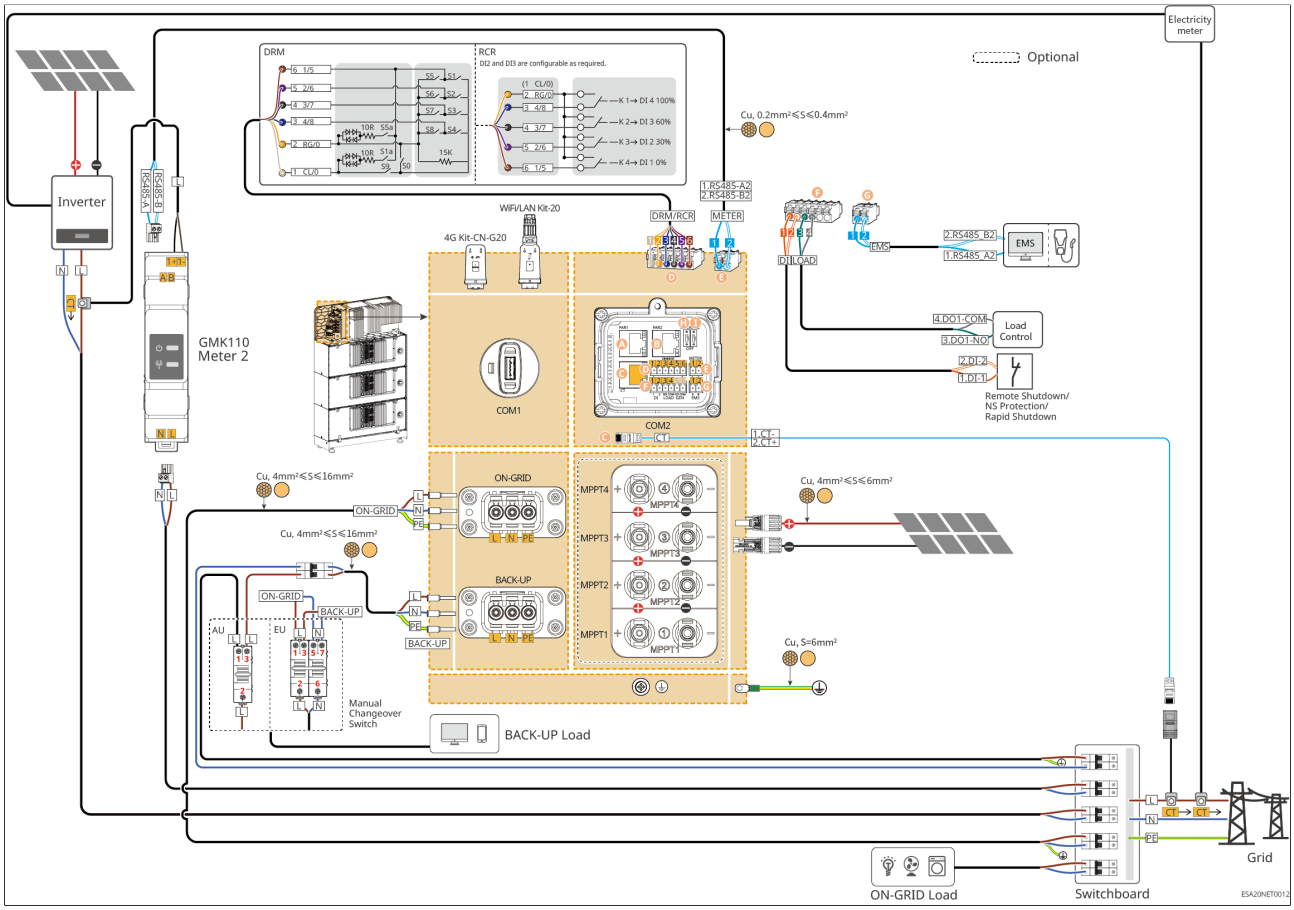


Figure28 Grid-Tied Inverter Grid Power Limiting Networking Diagram

5.2.2 Detailed System Wiring Diagram for Parallel System

NOTICE

- If the system needs to connect DRED devices, RCR devices, Remote Shutdown devices, NS Protection, SG Ready heat pumps, etc., please connect them to the master inverter.
- Remote Shutdown/NS Protection function: Please connect the communication cable to the master inverter. Quick Shutdown function: Please connect the communication cable to each inverter separately. If you need to use both Quick Shutdown and Remote Shutdown/NS Protection functions simultaneously, please contact the after-sales service center.
- For parallel systems with more than two inverters, please use the GM330 smart meter.
- Generator connection is not supported in parallel systems.
- In a parallel system, if you need to disconnect the circuit breaker for any port of an inverter, please simultaneously disconnect the circuit breakers for the other ports of that inverter; otherwise, it may cause abnormal system operation.
- In a parallel system, the DIP switches of the first and last inverters must be set to the ON position, and the DIP switches of other inverters must be set to the OFF position.
- The following diagrams focus on the wiring related to parallel connection. For wiring requirements of other ports, please refer to the single-unit system.

In a parallel system scenario, the inverter connected to the meter is the master inverter, and the others are slave inverters.
The master inverter must be set as the master via the "Set RS485 Parallel" option in the App. Slave inverters must also be set as slaves. For specific steps, please refer to the App User Manual.

General Scenario

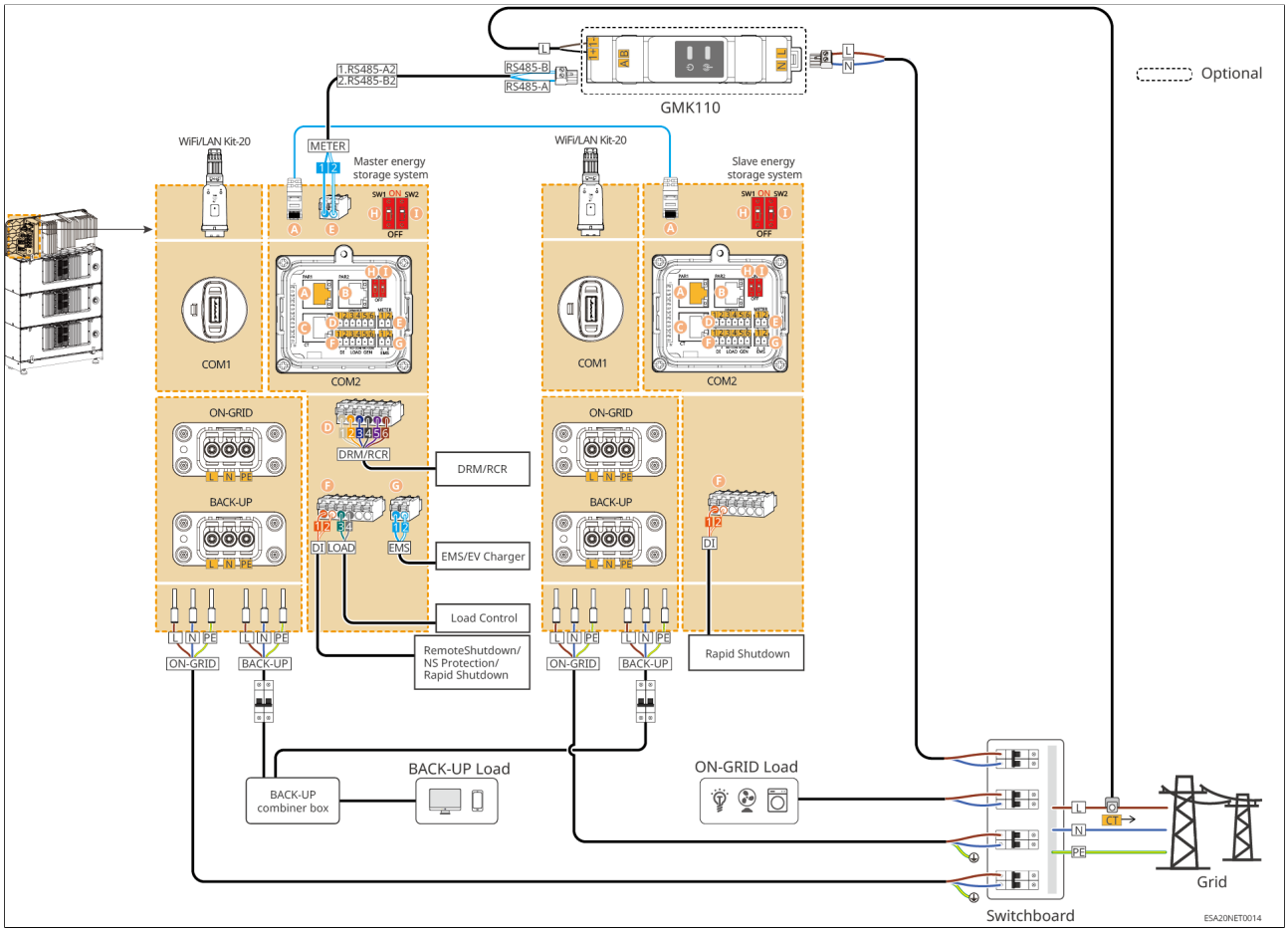


Figure29 Scenario with GMK110

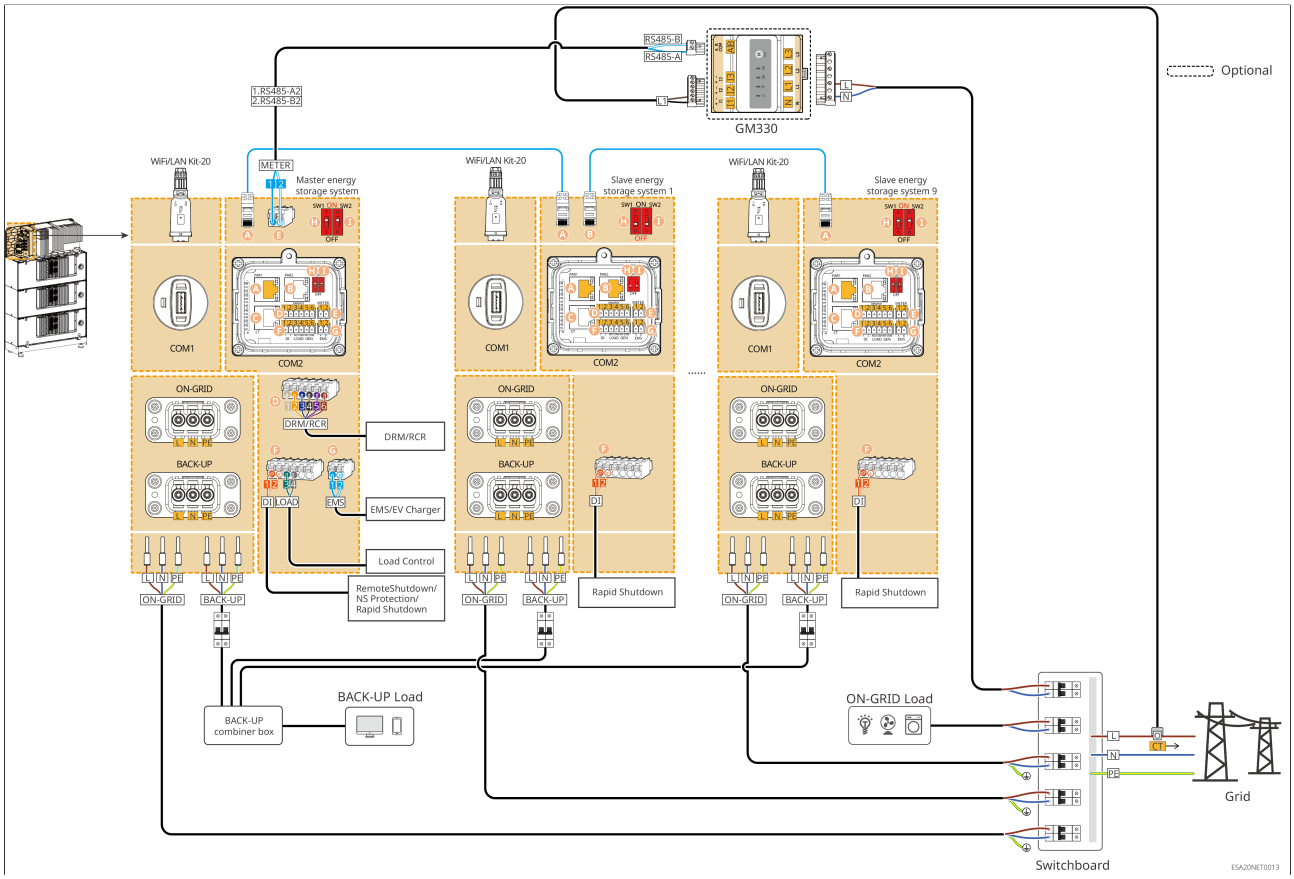


Figure30 Scenario with GM330

Coupling Scenario

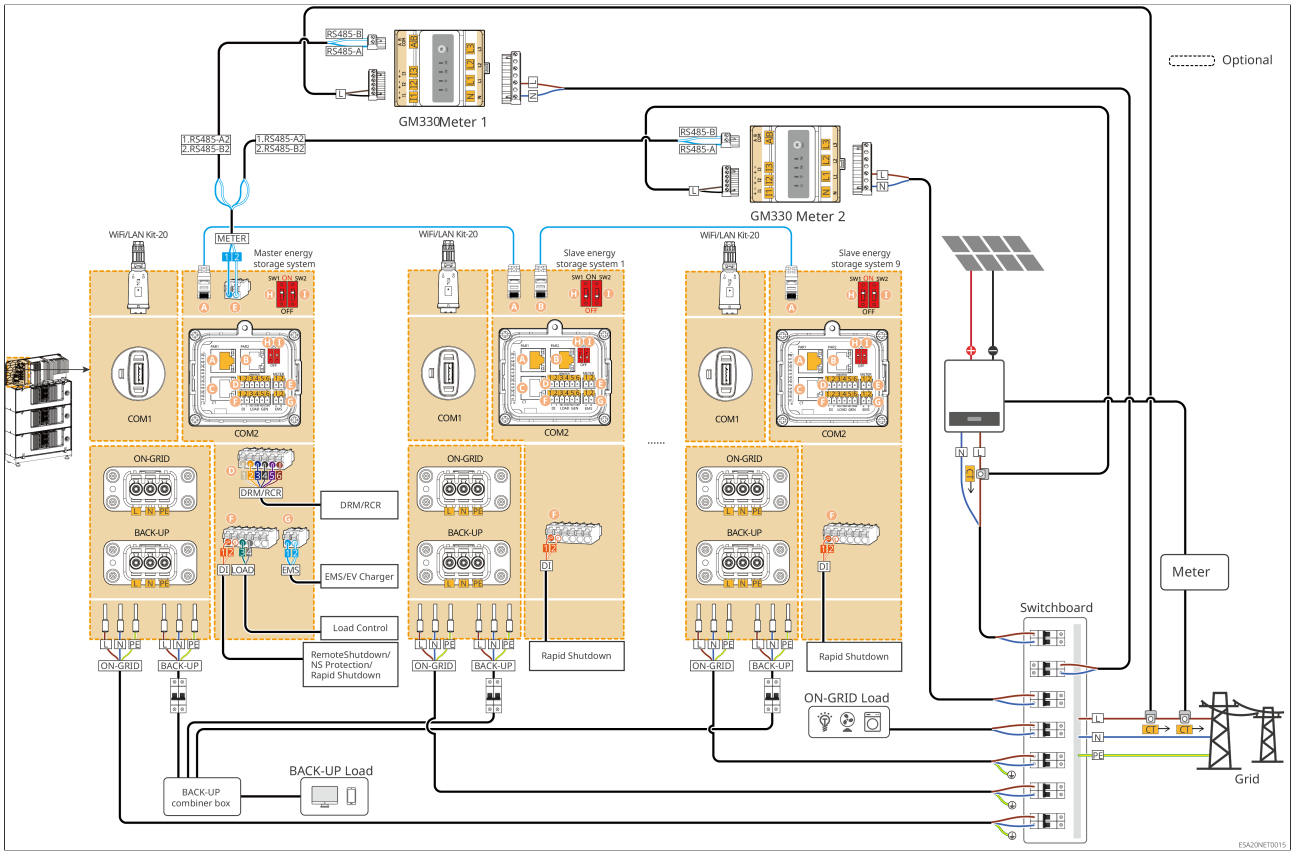


Figure31 GM330 + GM330 Networking

For the system coupling scenario in parallel connection with GMK110, the wiring method can refer to the scenario with GMK110 in the General Parallel Scenario. The wiring method for the grid-tied inverter can refer to the single-unit coupling scenario for connection.

5.3 Preparing Materials

⚠WARNING

- Do not connect loads between the inverter and the AC switch directly connected to the inverter.
- Install one AC output circuit breaker for each inverter. Multiple inverters cannot share one AC circuit breaker.
- An AC circuit breaker shall be installed on the AC side to make sure that the inverter can safely disconnect the grid when an exception happens. Select the appropriate AC circuit breaker in compliance with local laws and regulations.
- When the inverter is powered on, the BACK-UP AC port is charged. Power off the inverter first if maintenance is required on the BACK-UP loads. Otherwise, it may cause electric shock.
- For cables used in the same system, it is recommended that the conductor material, cross sectional area, length, etc. of the following cable should be consistent.
  - The AC cable for BACK-UP port of each inverter
  - The AC cable for ON-GRID port of each inverter
- In single inverter scenario, the inverter supports connection to a generator via an ATS switch, enabling switching between grid and generator power supply. The ATS switch is connected to the power grid by default.

5.3.1 Preparing Breakers

No.	breaker	Recommended Specifications	Acquisition Method	Remarks
1	ON-GRID breaker BACK-UP breaker	For partial backup scenarios, the recommendations are as follows: • Nominal Voltage≥230Vac • Rated Current requirements are as follows: ◦ GW3K-EHA-G20: 20A ◦ GW3.6K-EHA-G20: 20A ◦ GW5K-EHA-G20: 32A ◦ GW6K-EHA-G20: 40A	Customer-supplied	During actual selection, you can also choose a breaker that meets local installation regulations based on the actual operating current.

No.	breaker	Recommended Specifications	Acquisition Method	Remarks
		◦ GW8K-EHA-G20: 50A ◦ GW9.999K-EHA-G20: 63A ◦ GW10K-EHA-G20: 63A ◦ GW3K-BHA-G20: 20A ◦ GW3.6K-BHA-G20: 20A ◦ GW5K-BHA-G20: 32A ◦ GW6K-BHA-G20: 40A ◦ GW8K-BHA-G20: 50A ◦ GW9.999K-BHA-G20: 63A ◦ GW10K-BHA-G20: 63A For whole-house backup scenarios, the recommendations are as follows: • Nominal Voltage≥230Vac • Rated Current requirements are as follows: ◦ GW3K-EHA-G20: 63A ◦ GW3.6K-EHA-G20: 63A ◦ GW5K-EHA-G20: 63A ◦ GW6K-EHA-G20: 63A ◦ GW8K-EHA-G20: 63A ◦ GW9.999K-EHA-G20: 63A ◦ GW10K-EHA-G20: 63A ◦ GW3K-BHA-G20: 63A ◦ GW3.6K-BHA-G20: 63A ◦ GW5K-BHA-G20: 63A ◦ GW6K-BHA-G20: 63A		

No.	breaker	Recommended Specifications	Acquisition Method	Remarks
		◦ GW8K-BHA-G20: 63A ◦ GW9.999K-BHA-G20: 63A ◦ GW10K-BHA-G20: 63A Note: If the inverter BACK-UP port is not used, the ON-GRID breaker can be selected based on the maximum grid-connected current.		
2	ATS switch	The specifications of the ATS switch and ON-GRID breaker for the same model are consistent.	Customer-supplied	For single unit only
3	RCD (RCD)	RCD equipment installation and RCD specification selection: It is recommended to connect an A-type RCD with a residual current triggering level ≥300mA to the AC output side of the inverter (for inverter capacity <30kVA, select the residual current operating level as 300mA; for inverter capacity ≥30kVA, select the residual current operating level as 10mA/kVA). You can also choose the appropriate RCD specification based on local regulatory requirements.	Customer-supplied	-

No.	breaker	Recommended Specifications	Acquisition Method	Remarks
4	(Optional) Manual Transfer Switch	• Nominal Voltage≥230Vac • Rated Current: 63A	• Customer-supplied • Shipped with the inverter (Australia only)	For single unit only

5.3.2 Preparing Cables

No.	Cable	Recommended Specifications	Acquisition Method
1	Inverter Enclosure Protective Ground Wire	• Single-core outdoor copper cable • Conductor cross-sectional area: S=5.2mm²-6mm²	Self-provided
2	PV DC Cable	Only for EHA models: • Industry-standard outdoor photovoltaic cable • Conductor cross-sectional area: 4mm²-6mm² • Cable outer diameter: 5.9mm-8.8mm	Self-provided

No.	Cable	Recommended Specifications	Acquisition Method
3	AC Cable	• Inverter AC input/output cable (BACK UP/ON GRID): • Conductor cross-sectional area: 4mm²-16mm² ◦ GW3K-EHA-G20, GW3.6K-EHA-G20: 4mm²-16mm² ◦ GW5K-EHA-G20, GW6K-EHA-G20: 6mm²-16mm² ◦ GW8K-EHA-G20, GW9.999K-EHA-G20, GW10K-EHA-G20: 10mm²-16mm² ◦ GW3K-BHA-G20, GW3.6K-BHA-G20: 4mm²-16mm² ◦ GW5K-BHA-G20, GW6K-BHA-G20: 6mm²-16mm² ◦ GW8K-BHA-G20, GW9.999K-BHA-G20, GW10K-BHA-G20: 10mm²-16mm² • Multi-core outdoor copper cable outer diameter: 10mm-21mm Note: The above conductor cross-sectional area data is for reference only. During actual on-site installation and wiring, select appropriate cables that meet the requirements for safe current carrying capacity and voltage drop based on actual load current, cable length, installation environment, and heat dissipation conditions.	Self-provided
4	Smart Meter Power Cable	• Outdoor copper cable • Conductor cross-sectional area: 1mm²	Self-provided

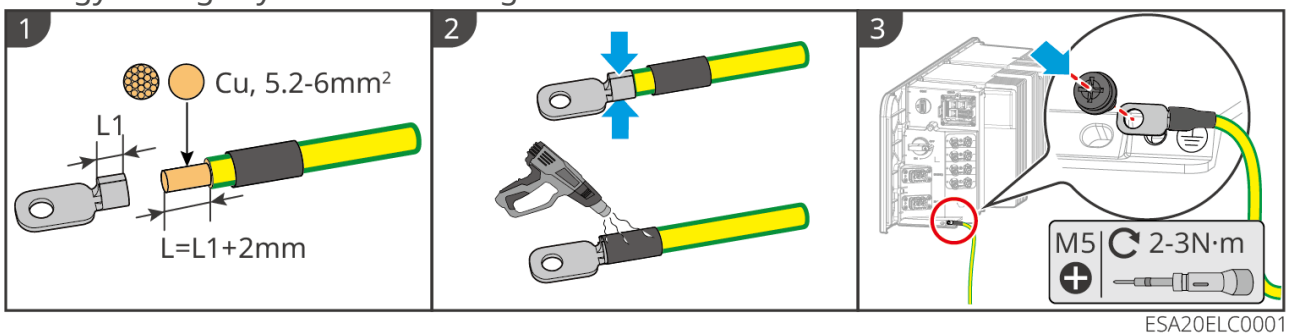
No.	Cable	Recommended Specifications	Acquisition Method
5	Meter RS485 Communication Cable	• Shielded twisted pair • Conductor cross-sectional area: 0.2mm²-0.4mm²	Self-provided
6	EMS or Charging Pile RS485 Communication Cable		
7	Remote Shutdown and NS Protection Communication Cable	• Shielded cable meeting local standards • Conductor cross-sectional area: 0.2mm²-0.4mm² • Cable outer diameter: 5mm-8mm	Self-provided
8	Load Control and Generator Control DO Communication Cable		
9	RCR/DRED Signal Cable		
10	CT Communication Cable	Standard network cable: CAT 5E or higher specification standard shielded network cable and RJ45 connector	Self-provided
11	Inverter Parallel Communication Cable	• RJ45 connector • CAT 5E or higher specification straight-through network cable ◦ CAT 5E or CAT 6E recommended length not exceeding 5 meters ◦ CAT 7E recommended length not exceeding 10 meters	Self-provided

5.4 Connecting the PE cable

⚠WARNING

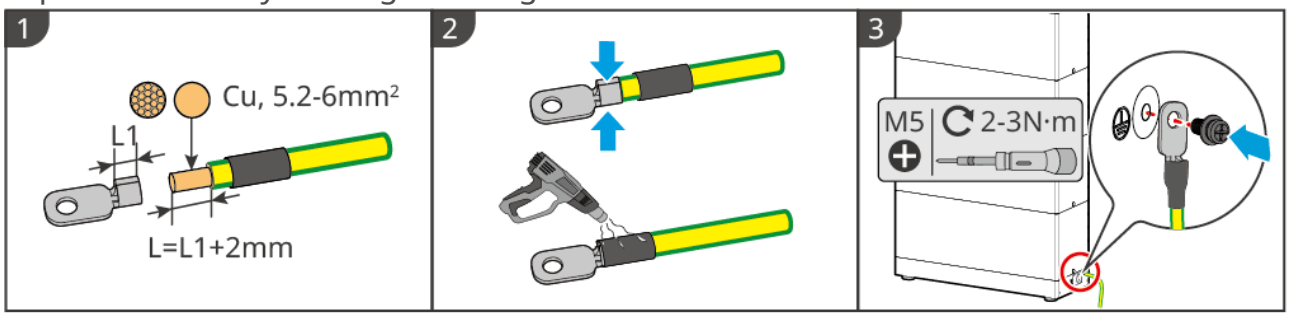
- The Protection grounding of the chassis enclosure cannot replace the PE cable of the AC output port. When wiring, ensure that the PE cable at both locations is reliably connected.
- To improve the corrosion resistance of terminal, it is recommended to apply silica gel or paint on the exterior of Grounding terminal for protection after completing the connection of Installation to PE cable.
- When Installation equipment, the PE cable must be Installation first; when dismantle equipment, the PE cable must be dismantle last.
- The grounding is integrated into the blind-mate connector and connected to the Inverter. The system is uniformly grounded through the Inverter, eliminating the need for separate grounding operations on the Battery during Installation. If there is a need for split-type capacity expansion, please separately ground the expanded Battery BANK.

energy storage system Grounding



ESA20ELC0001

Expansion Battery BANK grounding:



BAT20ELC0003

5.5 Connecting the PV Cable

⚠DANGER

- Do not connect the same PV string to multiple inverters, as this may cause inverter damage.
- Before connecting the PV string to the inverter, confirm the following information. Failure to do so may cause permanent inverter damage, and in severe cases, may lead to fire resulting in personal injury or property loss.
  1. Ensure the maximum short-circuit current and Max.Input Voltage for each MPPT are within the inverter's allowable range.
  2. Ensure the positive pole of the PV string is connected to the inverter's PV+, and the negative pole of the PV string is connected to the inverter's PV-.

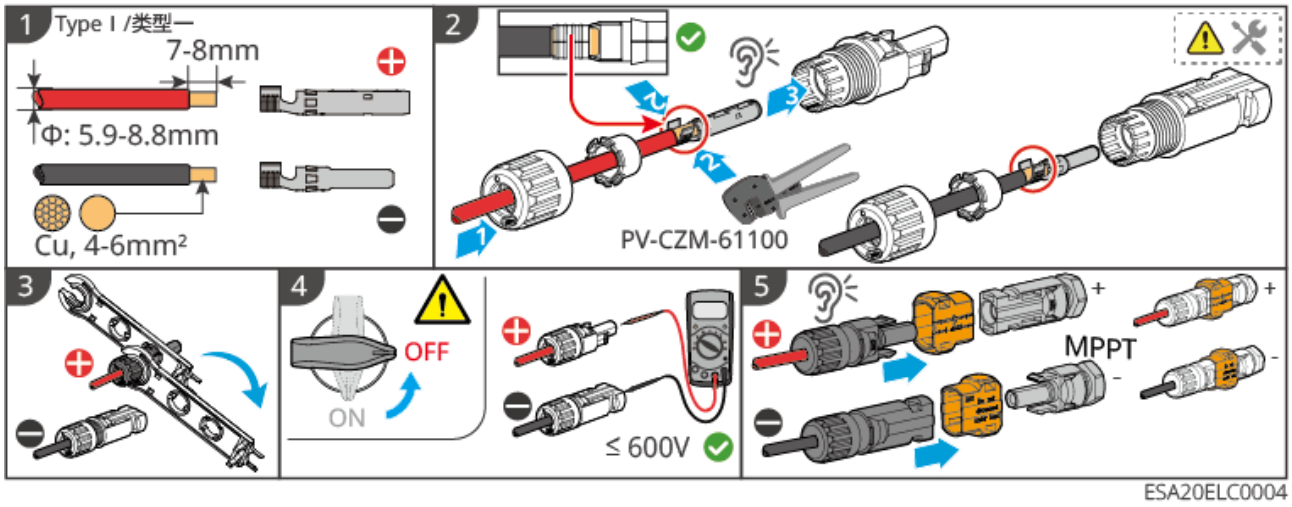
⚠WARNING

- PV string output does not support grounding. Before connecting the PV string to the inverter, ensure the minimum insulation resistance to ground of the PV string meets the minimum insulation impedance requirement (R=Max.Input Voltage/30mA).
- After completing the DC cable connection, ensure the cable connections are secure and not loose.
- Use a multimeter to measure the positive and negative poles of the DC cable to ensure correct polarity (no reverse connection) and that the voltage is within the allowable range.

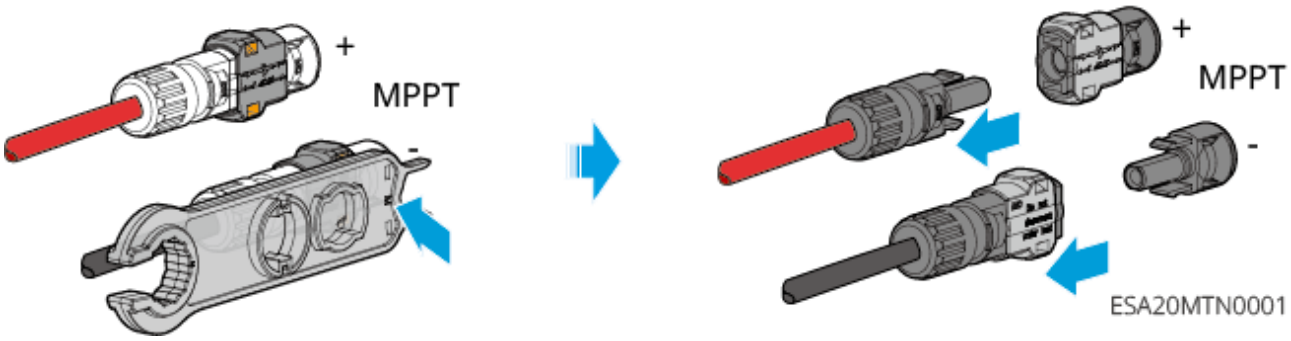
NOTICE

- The two PV strings within each MPPT must use the same model, the same number of panels, the same tilt angle, and the same azimuth angle to ensure maximum efficiency.
- Connecting PV cables applies only to EHA models; BHA models do not have PV connection ports.

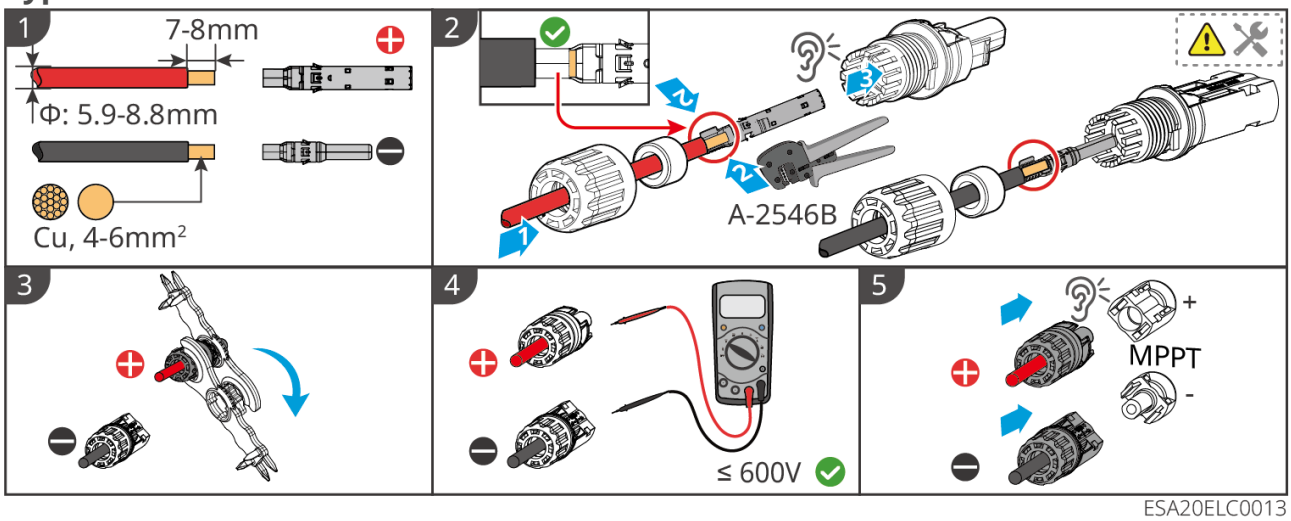
Type 1:



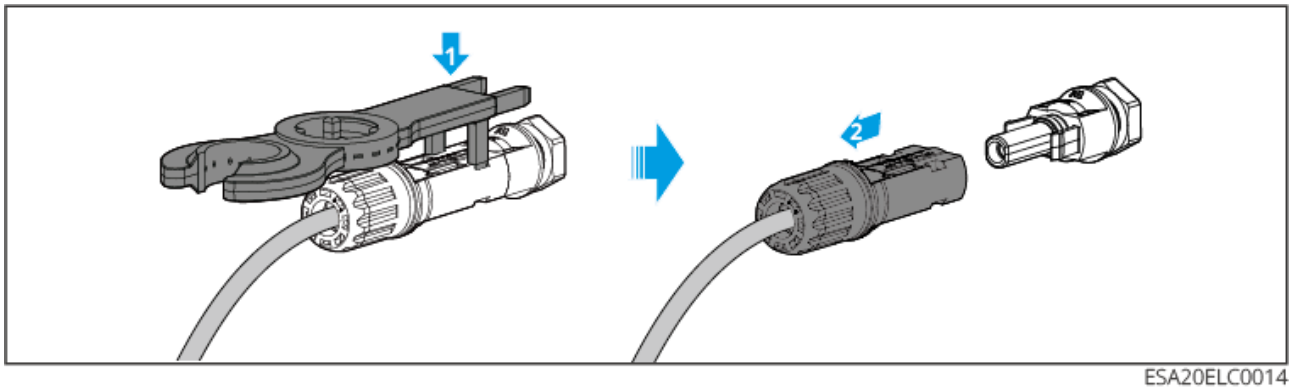
If you need to disassemble the PV terminal, please refer to the steps below:



Type 2:



If you need to disassemble the PV terminal, please refer to the steps below:



ESA20ELC0014

5.6 Expansion line for connecting Battery

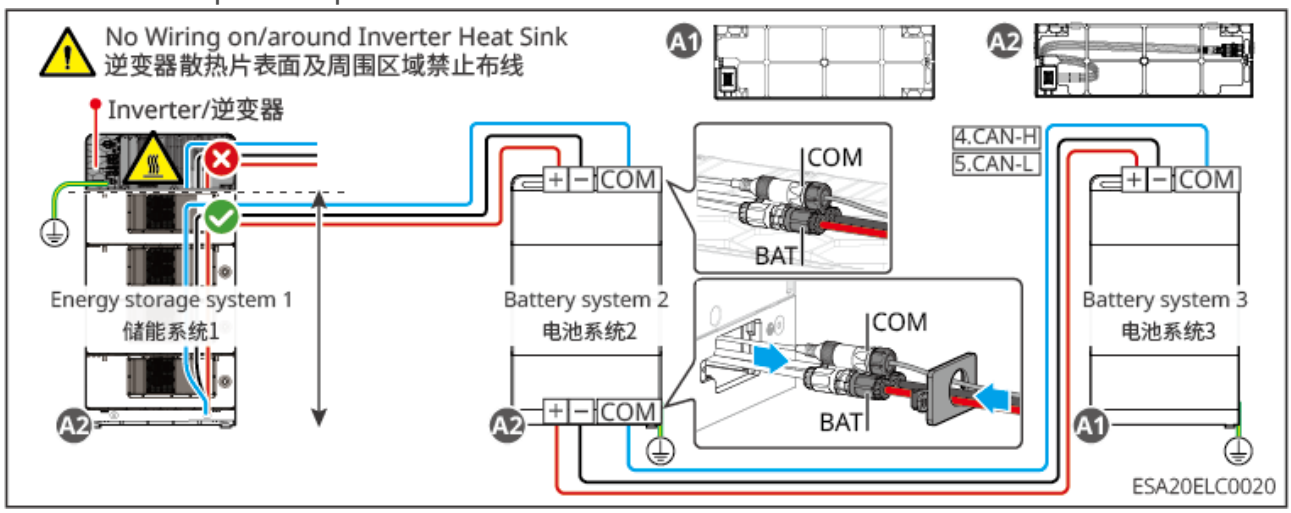
DANGER

- Do not connect any load between the Inverter and Battery.
- When Connecting the Battery Cable, use insulated tools to prevent accidental electric shock or Battery Short Circuit.
- Please ensure that Batteryopen-circuit voltage is within the allowable range of Inverter.
- Between Battery and Battery, please configure DC Switch according to local laws and regulations.
- Inverterheat sink surfaces and surrounding areas must remain free of wiring to prevent overheating damage to wire harnesses.

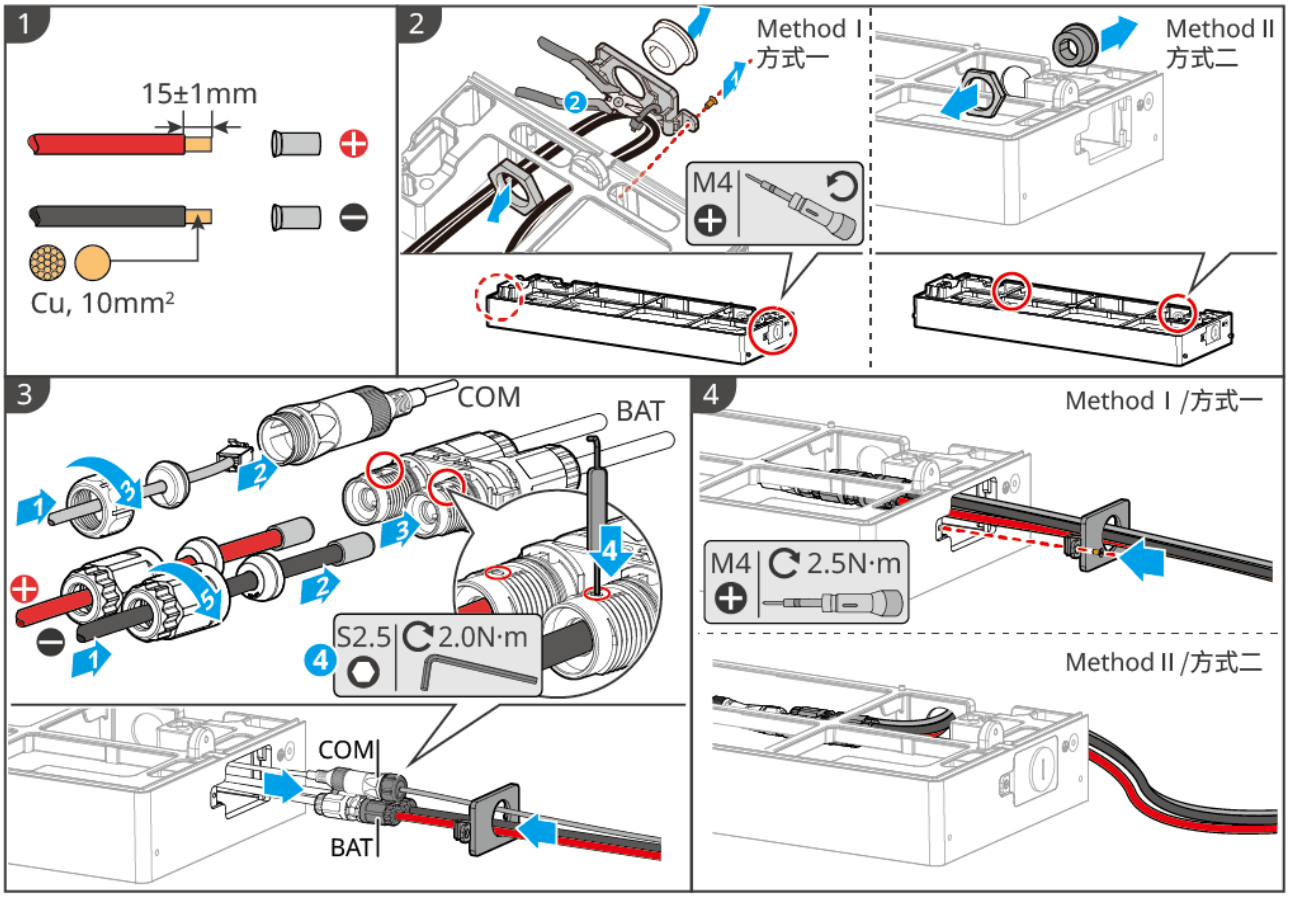
energy storage system Expansion Overview

A1: Base shipped with Inverter

A2: Base with parallel port in Installation



Battery system Expansion Harness Manufacturing Method

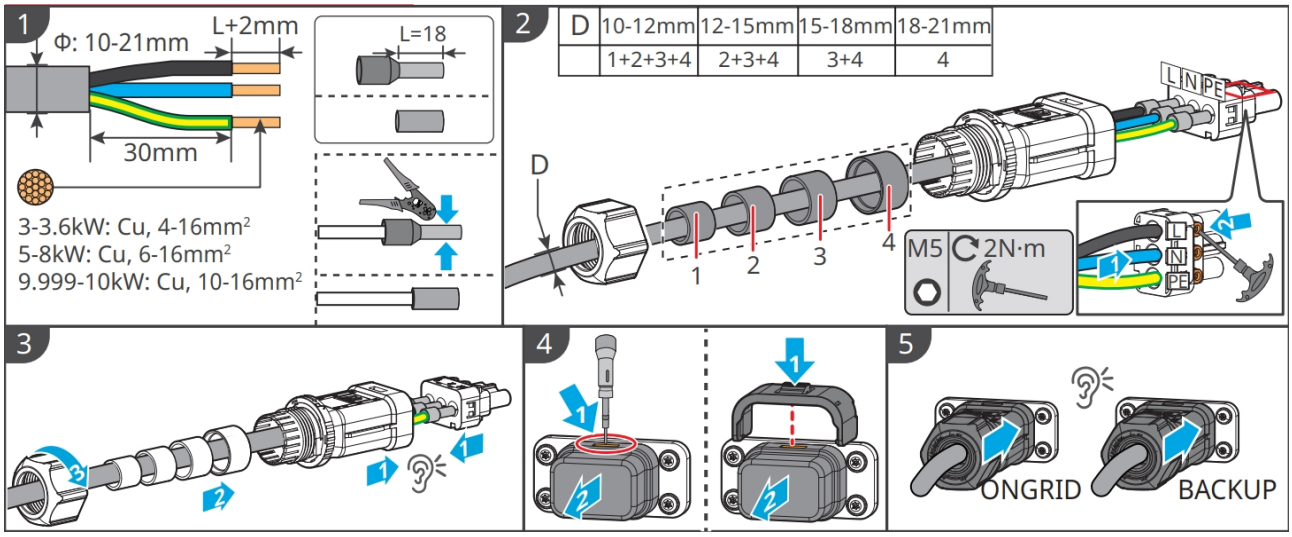


BAT20ELC0004

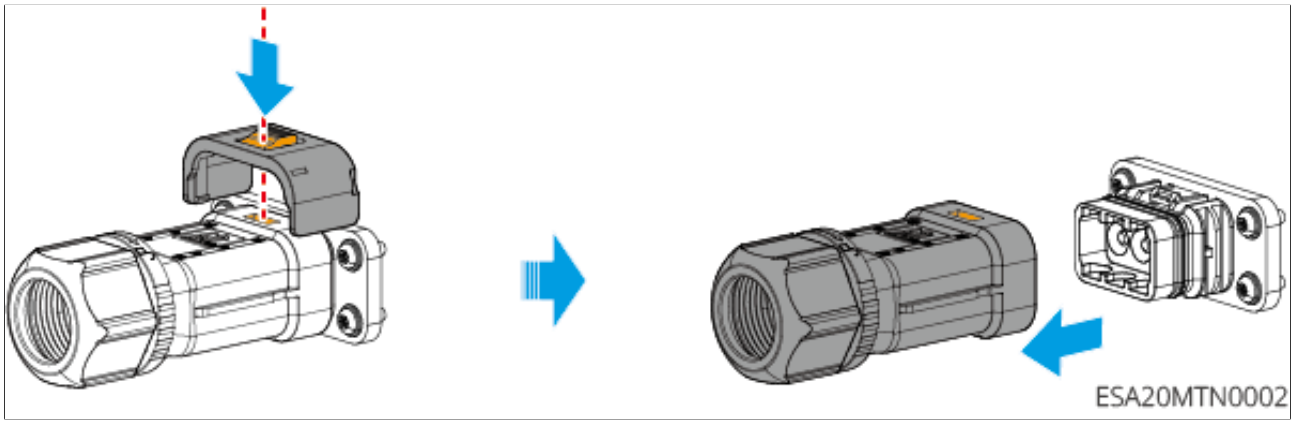
5.7 Connecting the AC Cable

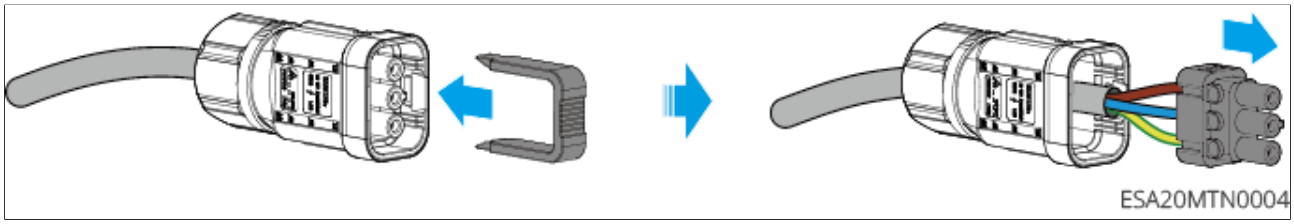
⚠WARNING

- The inverter integrates a Residual Current Monitoring Unit (RCMU) internally to prevent residual current from exceeding the specified value. When the inverter detects a leakage current greater than the allowable value, it will quickly disconnect from the grid.
- During wiring, ensure the AC wires completely match the "BACKUP" and "ON-GRID" grounding ports of the AC terminals. Incorrect cable connection will cause equipment damage.
- Ensure the wire cores are fully inserted into the terminal connection holes with no exposed parts.
- Ensure the insulation board at the AC terminal is securely fastened and not loose.
- Ensure all cable connections are tight. Otherwise, during equipment operation, overheating of the terminals may occur, leading to equipment damage.

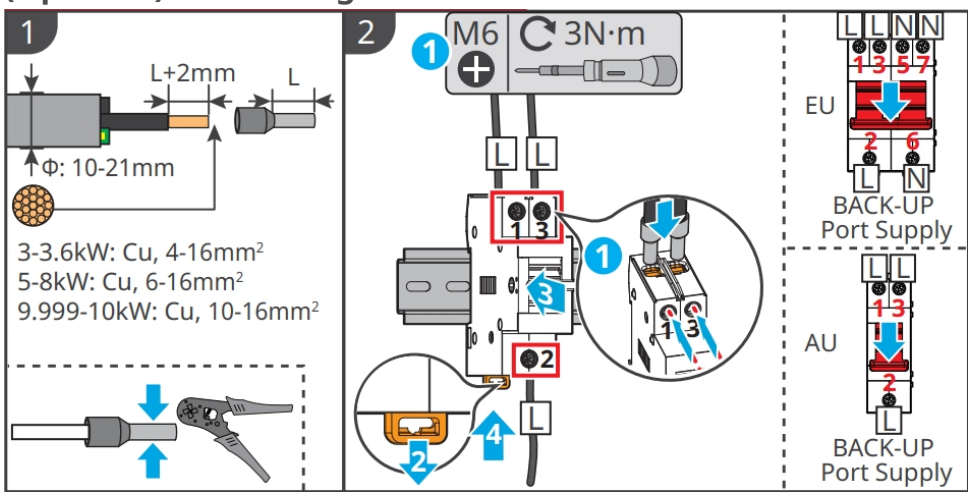


To disassemble the AC terminal, please refer to the following steps:





(Optional) Connecting the Manual Transfer Switch



5.8 Connecting the Meter Cable

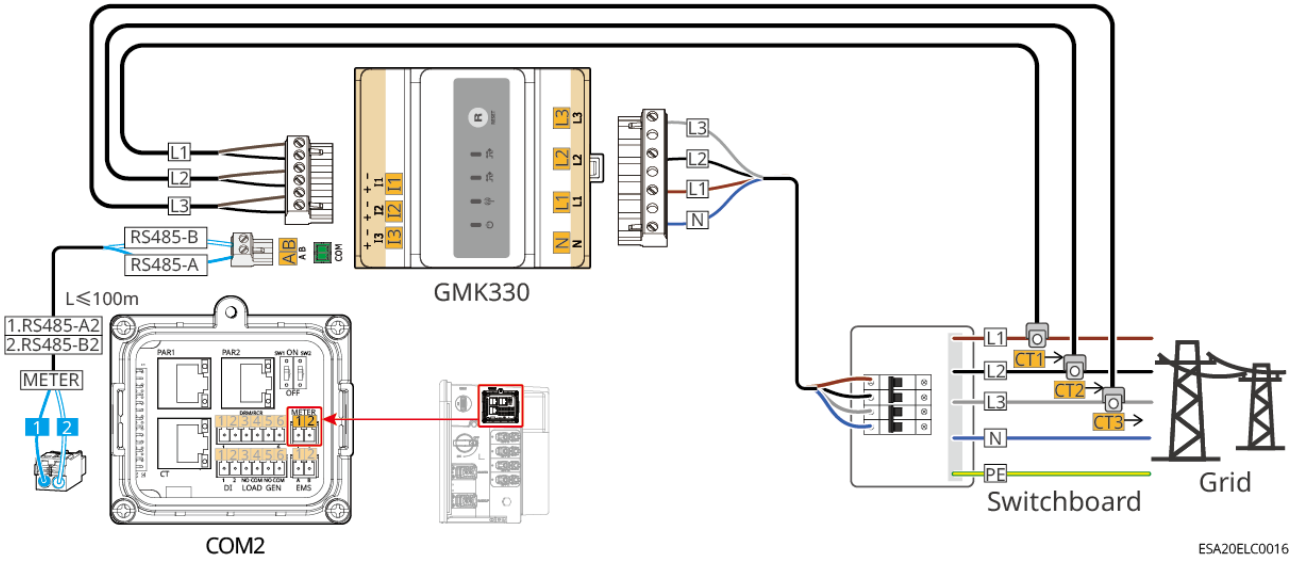
NOTICE

- If multiple InverterParallel Networking units are required, please consult the manufacturer to purchase the meter separately.
- Please ensure the CT connection direction is correct and the phase is accurate; otherwise, it may lead to incorrect monitoring data.
- Ensure all cable connections are correct, secure, and free from looseness. Improper wiring may cause poor contact or damage to the meter.
- In areas with lightning DANGER, if the meter cable length exceeds 10m and the cable is not laid with grounding Steel conduit, it is recommended to install external lightning protection devices.

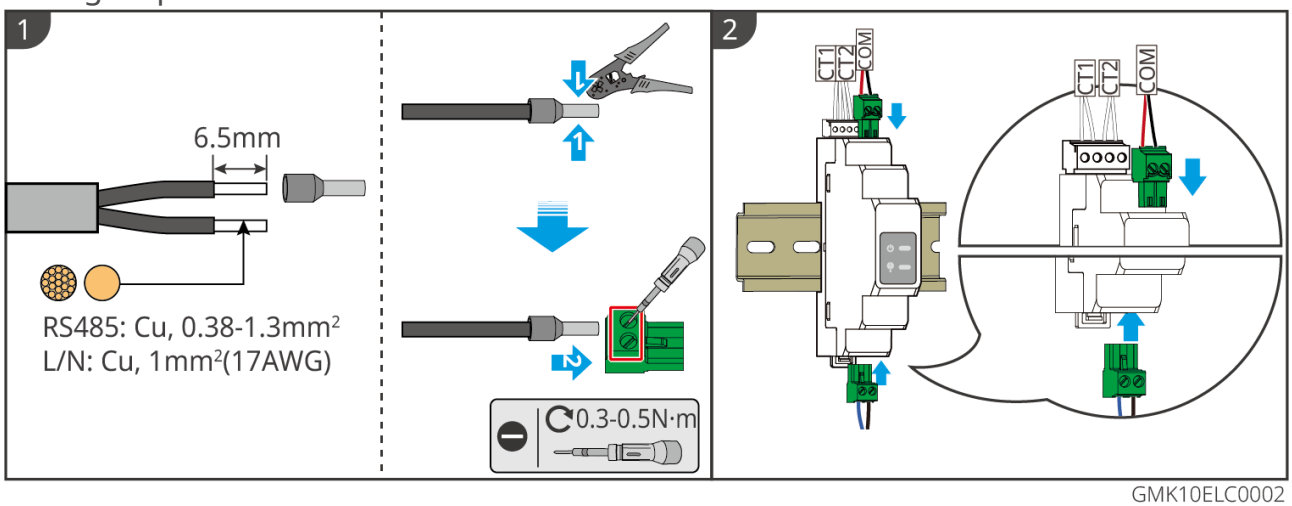
GMK110 meter wiring

NOTICE

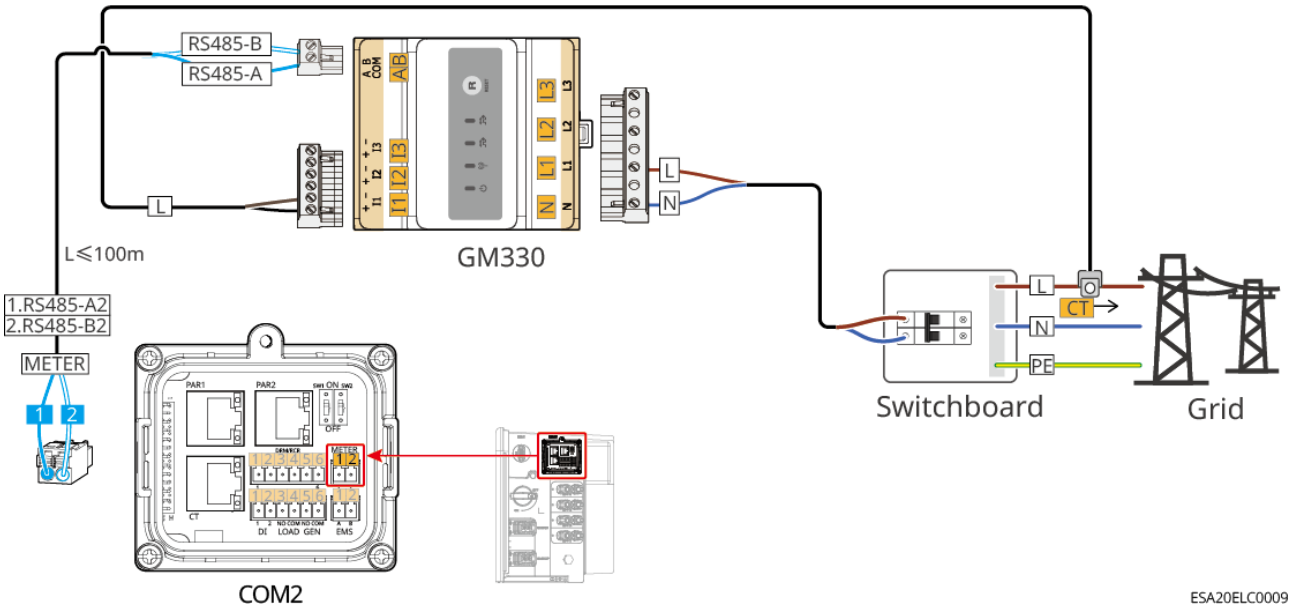
- The outer diameter of the AC power line must be smaller than the CT aperture to ensure the AC power line can pass through the CT.
- To ensure the current monitoring accuracy of the CT, the recommended length of the CT cable should not exceed 30 meters.
- Do not use network cables as CT cables, otherwise the meter may be damaged due to excessive current.
- The CTs provided by equipment manufacturers may vary slightly in size and appearance depending on the model, but the Installation wiring method remains consistent.



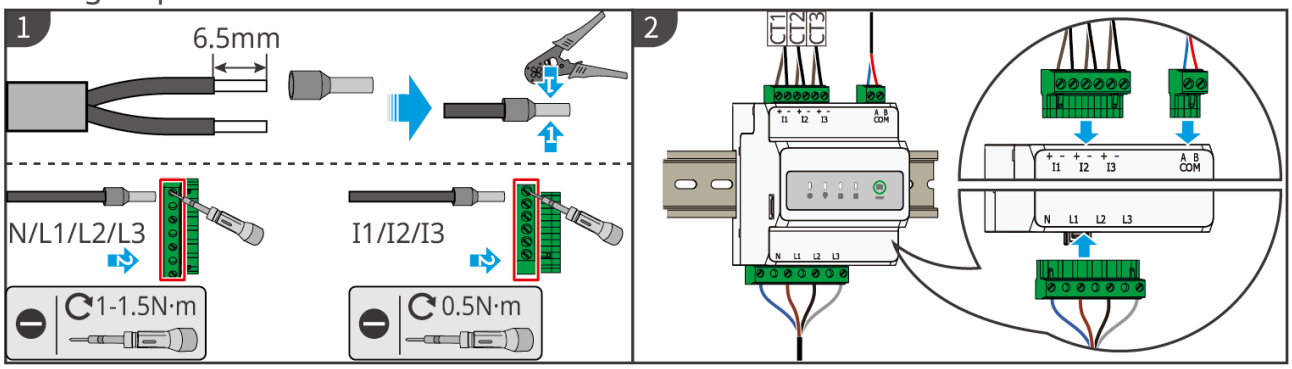
Wiring steps



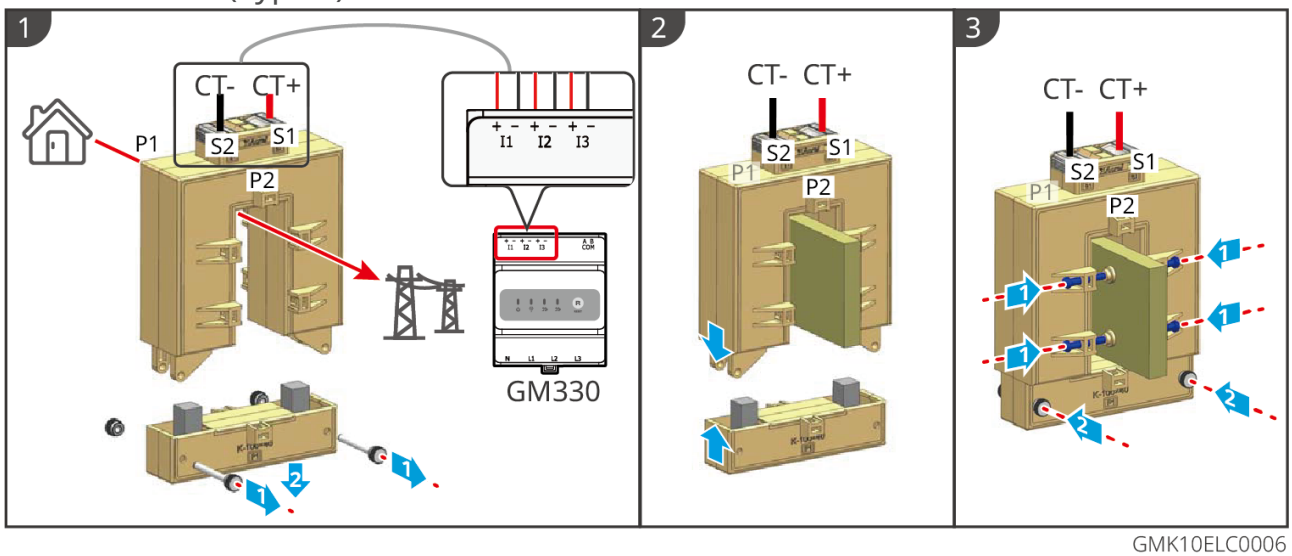
GM330 meter wiring



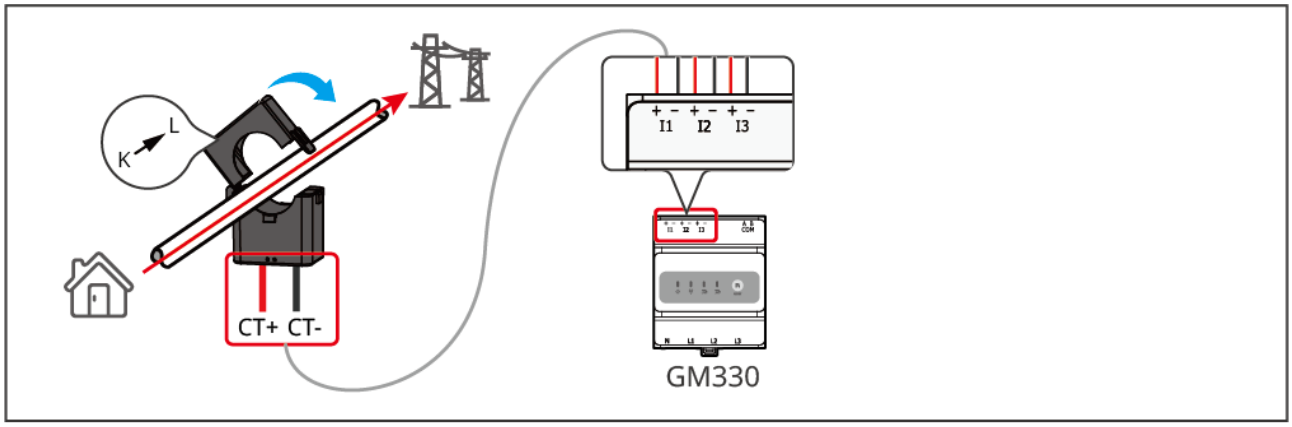
Wiring steps



Installation CT (Type 1)



Installation CT (Type II)



GMK10ELC0007

5.9 Connecting the Inverter Communication Cable

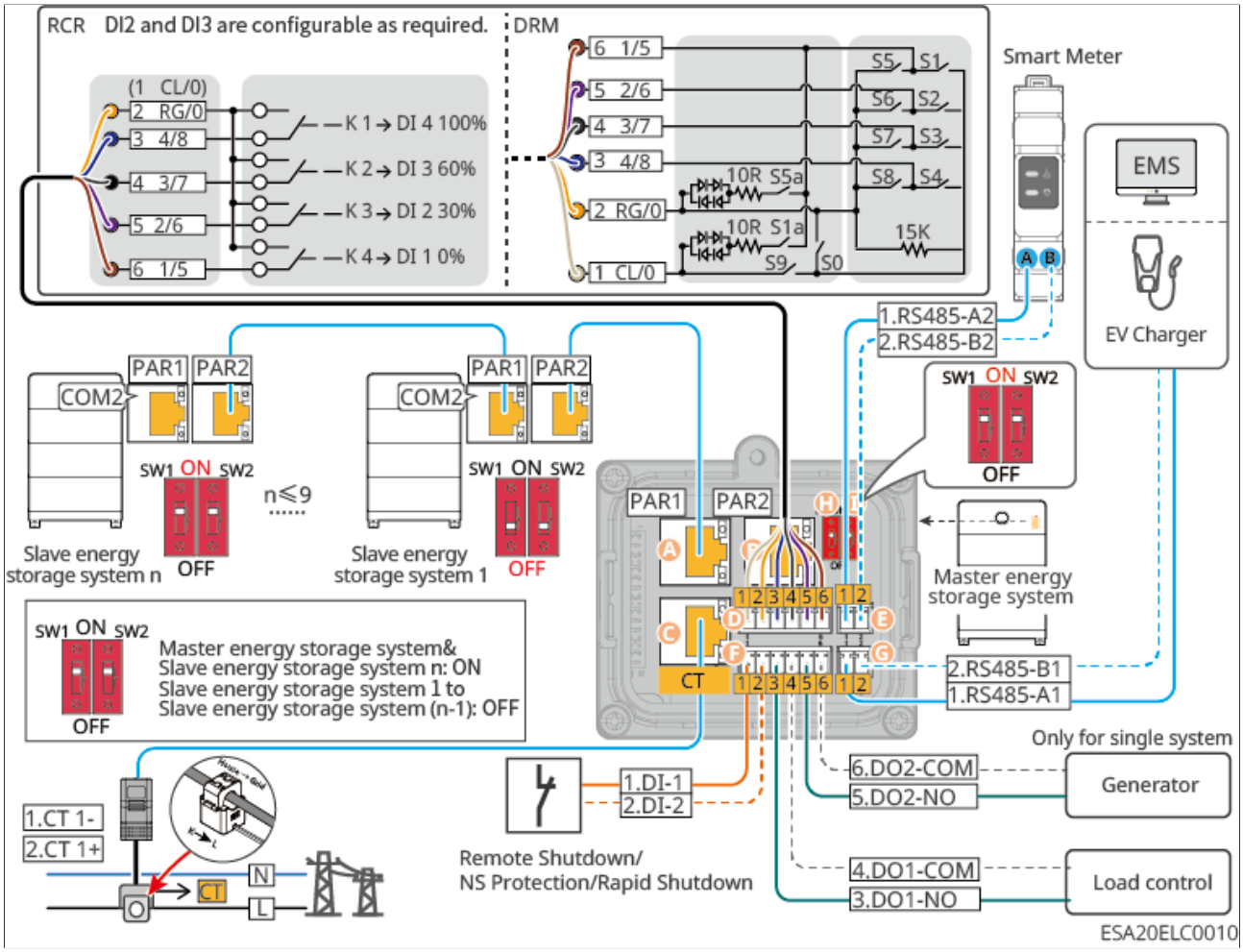
NOTICE

- When using the Inverter's built-in meter, please use the CT shipped with the unit.
- Please connect the CT according to the direction indicated on the meter. If connected in reverse, it may cause a CT reverse fault.
- If you need to use the DRED, RCR, or remote shutdown function, please enable this function in the App after wiring is completed.
- Do not enable this function in the App if the Inverter is not connected to a DRED device or a remote shutdown device, otherwise the Inverter will not be able to operate in grid-connected mode.
- In a parallel system, if DRED or RCR functionality is required, only connect the DRED/RCR communication cable to the master Inverter.
- To maintain the Inverter's waterproof rating, do not remove the waterproof plugs from unused communication ports on the Inverter.
- The Inverter's DO signal communication port can connect to a dry contact A signal with specifications: Max≤24Vdc, 1A.
- The Inverter's communication functions are optional. Please select according to the actual usage scenario.
- The Inverter supports connection to a mobile phone or WEB interface via 4G, Bluetooth, WiFi, or LAN communication methods to set device-related parameters, view device operation information and error messages, and stay informed of system status.
- In a single-unit system, installation of a WiFi/LAN Kit-20 or 4G Kit-CN-G20 smart communication stick is supported.

NOTICE

- In a parallel system, both the master and slave Inverters need to have a WiFi/LAN Kit-20 smart communication stick installed for networking.
- In a parallel system, set the DIP switches of the first and last Inverters to the ON position, and set the DIP switches of all other Inverters to the OFF position.
- When using the 4G Kit-CN-G20:
  - If parallel system networking is required, please contact GoodWe to purchase the WiFi/LAN Kit-20.
  - It comes standard with a Micro-SIM card for China region, with China Mobile as the carrier. Please ensure the device is installed in an area covered by the carrier's signal. If local China Mobile signal is not covered, please contact the carrier to optimize the signal.
  - Supports connection to third-party monitoring platforms via the MQTT communication protocol.
- The 4G Kit-CN-G20 is an LTE single-antenna device, suitable for application scenarios with lower data transmission rate requirements.

Communication Function Description

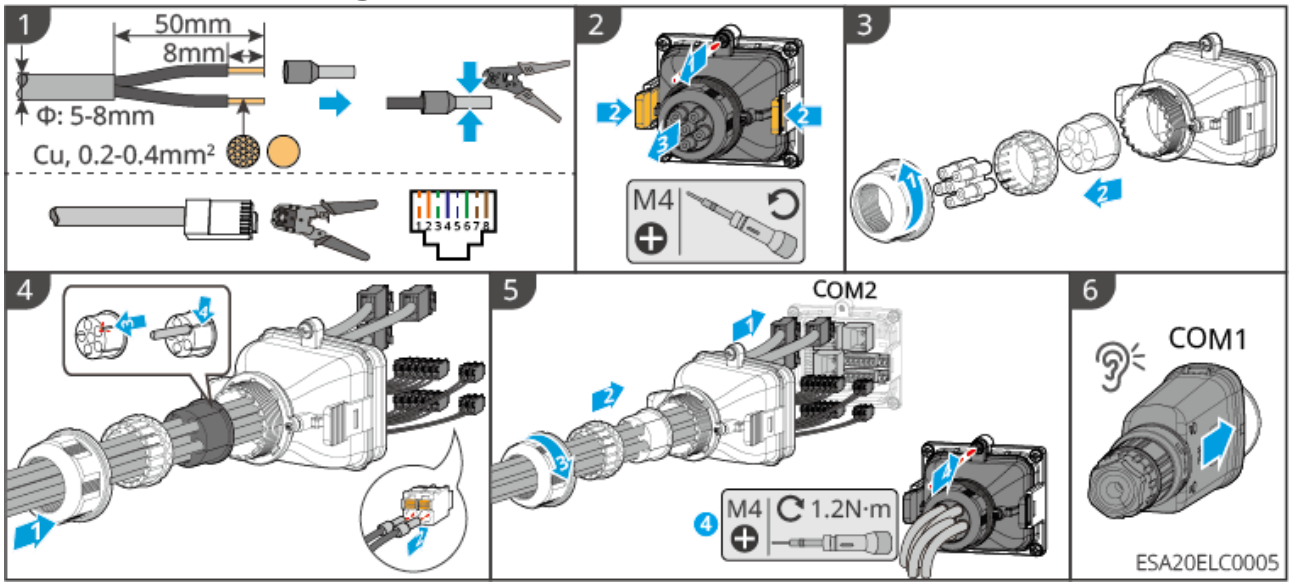


Port (Silkscreen)		Function	Description
A	PAR1	Parallel Communication Port 1	Parallel communication port. Please use CAT 5E or above standard network cable and RJ45 connector.
B	PAR2	Parallel Communication Port 2	
C	CT	CT Connection Port	Only when using the inverter's built-in meter, connect the CT communication cable.

Port (Silkscreen)		Function	Description
D	DRM/RCR	RCR, DRED or EnWG 14a Function Connection Port	• RCR (Ripple Control Receiver): Provides RCR signal control port to meet the grid dispatch requirements in Europe. • DRED (Demand Response Enabling Device): Provides DRED signal control port to meet DERD certification requirements in regions like Australia.
E	METER	Electric Meter Port	Use RS485 communication to connect external smart meter.
F	DI	Remote Shutdown/NS protection/Rapid Shutdown	• Connect external Remote Shutdown or local NS protection device, default is off. • In a Rapid Shutdown system, the rapid shutdown transmitter and receiver are used together to achieve system rapid shutdown. The receiver maintains component output by receiving signals from the transmitter. The transmitter can be external or built into the inverter. In case of emergency, by enabling an external trigger device, the transmitter stops working, thereby shutting down the components.
	LOAD	load control	• Supports connection to dry contact signals to achieve functions such as load control. DO contact capacity is 24V DC@1A, NO/COM normally open contacts. • Supports SG Ready heat pump access, controlling the heat pump via dry contact signals.
	GEN	Generator Control Port	Single unit networking supports接入 generator control signals to control generator start/stop. Microgrid scenarios do not support connecting generators.

Port (Silkscreen)		Function	Description
G	EMS	EMS/Charging Pile Communication Port	Connect third-party EMS devices for energy control or connect固德威 charging piles.
H	SW1	Parallel DIP Switch	In multi-unit parallel scenarios, set the parallel DIP switches of the first and last inverters to ON position, and other inverters to OFF position.
I	SW2		

Method for Connecting Communication Cable



6 System Commissioning

6.1 Check Before Power ON

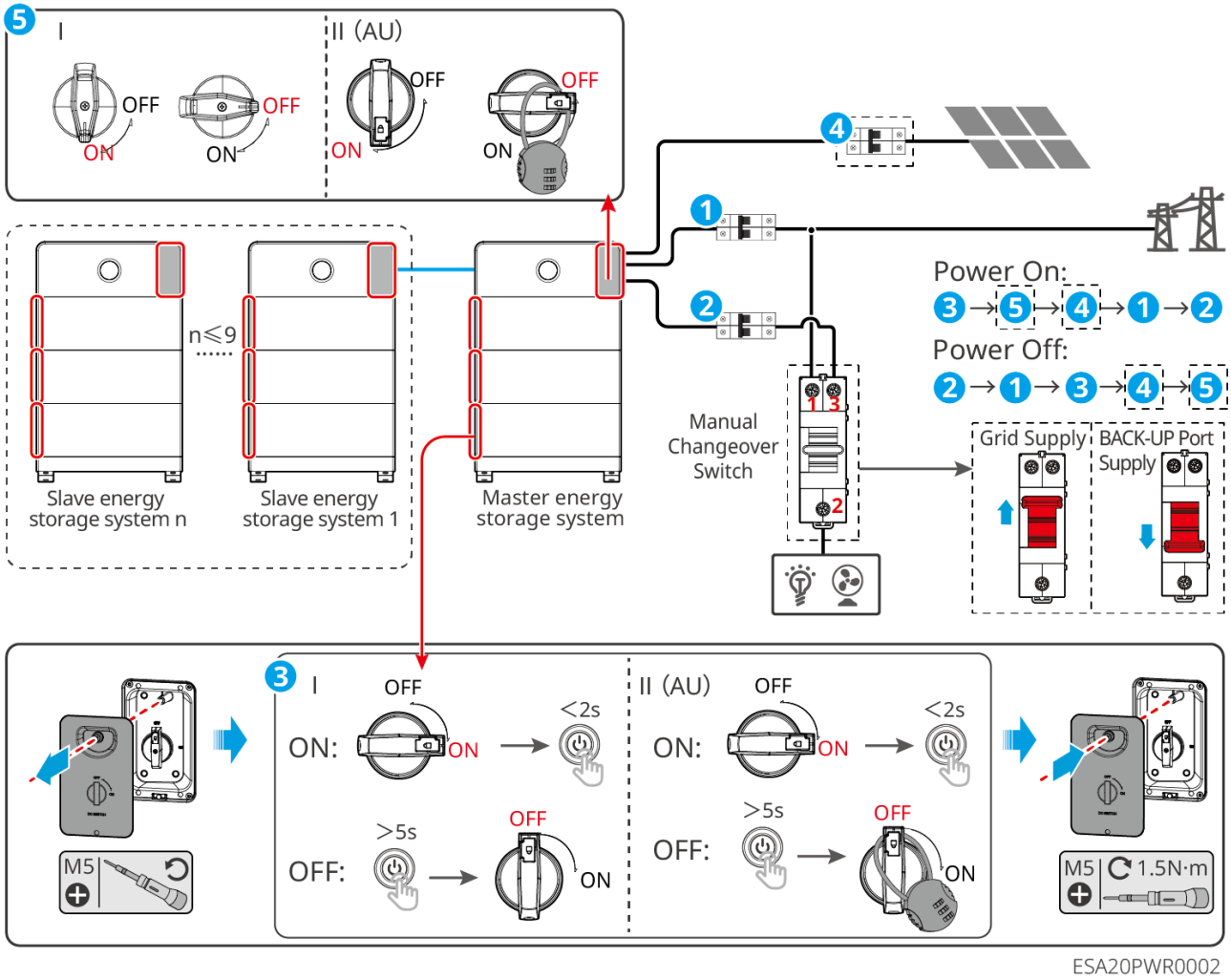
No.	Inspection Item
1	The equipment is installed securely. The installation location facilitates operation and maintenance, the installation space allows for ventilation and heat dissipation, and the installation environment is clean and tidy.
2	PE cable, DC cable, AC cable, and communication cable connections are correct and secure.
3	Cable bundling meets wiring requirements, is reasonably distributed, and shows no damage.
4	For unused cable entry holes and ports, ensure they are reliably connected using the terminals provided with the accessories and have been sealed.
5	Ensure that used cable entry holes have been sealed.
6	The voltage and frequency at the inverter grid connection point comply with grid connection requirements.

6.2 Power ON

⚠WARNING

- Battery black start: When there is no power generation from PV in the photovoltaic system and the grid is abnormal, if the inverter cannot work normally, the battery black start function can be used to force battery discharge to start the inverter. The inverter can then enter off-grid mode operation, supplying power to the load from the battery.
- After the battery system is started, please ensure that the communication between the inverter and the battery system is normal within 15 minutes. If the inverter and battery system cannot communicate normally, the battery system switch will automatically disconnect, cutting off power to the battery system.
- In a standalone scenario, when the inverter is working normally, please set the manual transfer switch to the BACK-UP position to engage, so that the inverter BACK-UP port supplies power to the load.
- PV string and "❺" are only applicable to the EHA series.

power on



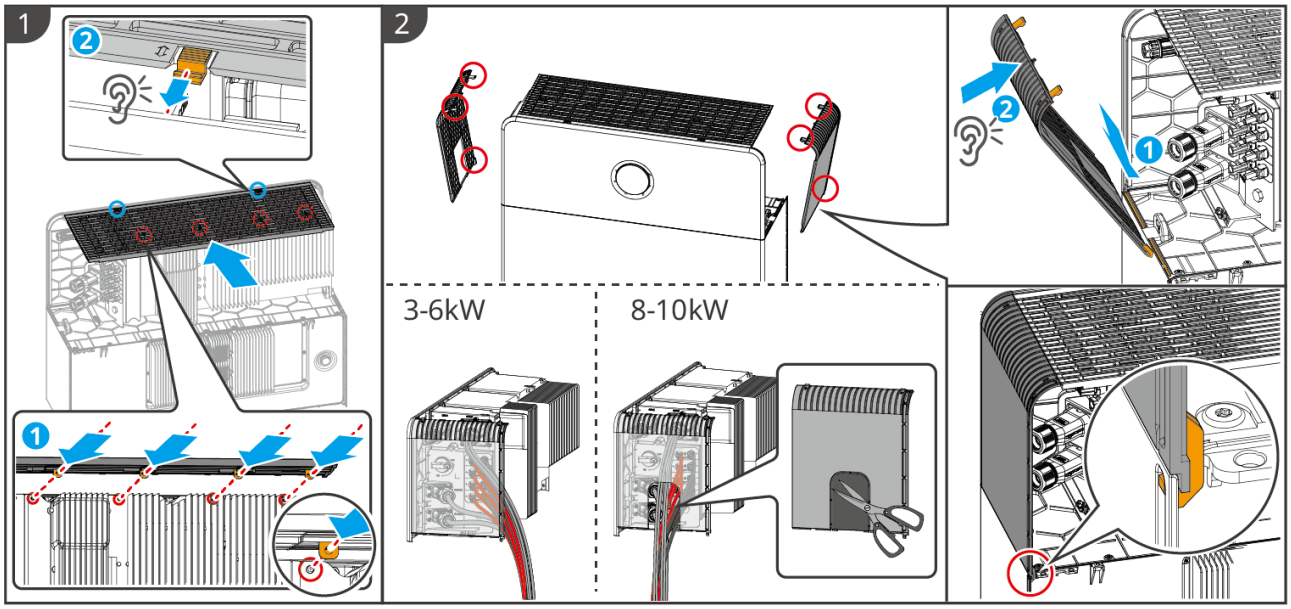
1. Close the battery power switch and briefly press the battery's multifunction button. When there are multiple batteries in the system, close the power switches of all batteries. Briefly press the multifunction button of any battery to start all batteries.
2. Close the inverter's DC switch.
3. (Optional) Close the circuit breaker between the PV components and the inverter.
4. Close the ON-GRID circuit breaker.
5. Close the BACK-UP circuit breaker. In a standalone scenario, before closing the BACK-UP circuit breaker, first set the manual transfer switch to the BACK-UP position to engage, so that the inverter's BACK-UP port supplies power to the load.

Battery Black Start

1. Close the battery power switch. When there are multiple batteries in the system, close the power switches of all batteries.
2. Close the inverter's DC switch.

3. (Optional) Close the circuit breaker between the PV components and the inverter.
4. Close the ON-GRID circuit breaker.
5. Close the BACK-UP circuit breaker.
6. After all batteries are powered on separately, wait for 15 seconds, press the multifunction button of any battery for 2 seconds, and the battery forces discharge to activate the inverter.

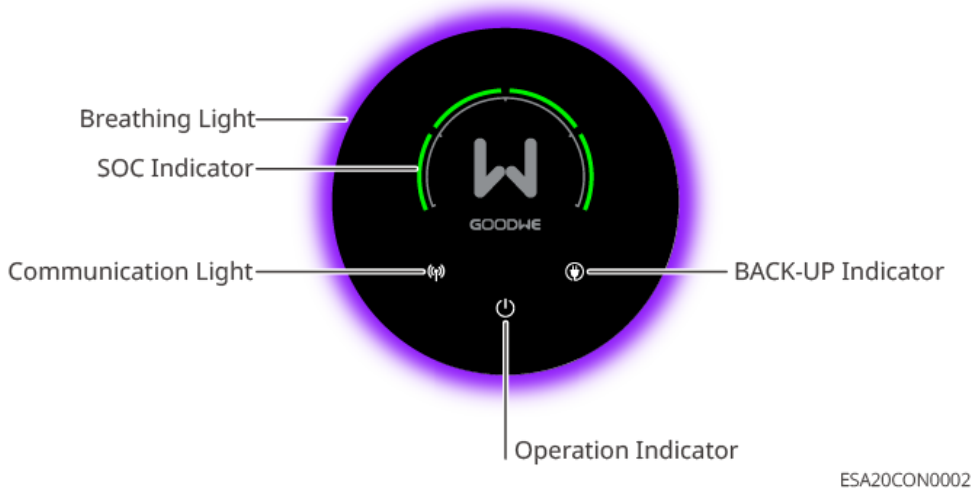
6.3 Installing Protective Cover



ESA20INT0006

6.4 Indicators

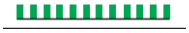
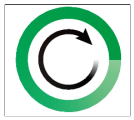
6.4.1 Inverter Indicators

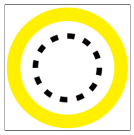
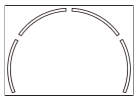
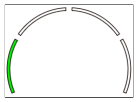
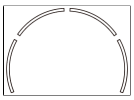
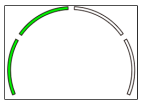
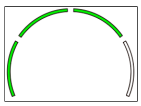
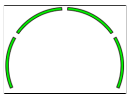


Breathing Light:

- When the system is upgrading: The breathing light is a green running light; the head of the running light is the brightest and the tail is the dimmest. The length of the running light and the upgrade percentage are affected by the SEMS+ App settings and the device's operating status.
- Except for inverter upgrades, system faults, and inverter power-off states, the breathing light status is affected by the App settings in the SEMS+ App. For setup, please refer to the SEMS+ App User Manual.

Indicator	Indicator Status	Breathing Light Status	Description
⏻		• 3min/Always on: Blue-purple running light stays on • Always off: Off	Inverter powered on, in standby mode
			Inverter starting up, in self-test mode
		• 3min: Blue-purple breathing for 3min then off • Always on in App: Blue-purple breathing stays on • Always off in App: Off	Inverter operating normally in grid-tied or off-grid mode

Indicator	Indicator Status	Breathing Light Status	Description
		Red flashing	System fault
		Off	Inverter powered off
		/	Inverter monitoring module resetting
			No connection established between inverter and communication terminal
			Communication fault between terminal and cloud server
			Inverter monitoring normal
			Inverter monitoring module not started
			Grid abnormal, inverter BACK-UP port power supply normal
			Grid normal, inverter BACK-UP port power supply normal
			BACK-UP port has no power supply
			System upgrade
			System fault

Indicator	Indicator Status	Breathing Light Status	Description
			System overload
			Battery has no power
			Steady on: Charge Flashing: Discharge Battery SOC: 0% < SOC ≤ 25%
			Steady on: Charge Flashing: Discharge Battery SOC: 25% < SOC ≤ 50%
			Steady on: Charge Flashing: Discharge Battery SOC: 50% < SOC ≤ 75%
			Steady on: Charge Flashing: Discharge Battery SOC: 75% < SOC ≤ 100%

6.4.2 Battery Indicators

Button Indicator Light

No.	Green Light	Red Light	Battery System Status	Description
1	Steady On	--	System Operating Normally	Run
2	Blink 1 time/S		System Ready	Standby
	Blink 3 times/S	--	PCS Communication Lost	--
3	Blink 1 time/2S	--	System Alarm	Includes Level 2 faults in the fault list, where under-voltage fault is steady on when at levels 2, 3, and 4
4	--	Steady On	System Fault	Level 3 and above faults in the fault list (steady on when under-voltage fault is level 5)

6.4.3 Smart Meter Indicator

GM330

Type	Status	Description
Power light	On	Power on, no RS485 communication.
	Blinks.	Power on, RS485 communication works properly.
	Off	The smart meter has been powered off.
Communication indicator	Off	Reserved
	Blinks.	Press the Reset button for more than 5 seconds, power light, buying or selling electricity indicator light flash: Reset the meter.
Importing or exporting indicator	On	Importing from the grid.
	Blinks.	Exporting to the grid.
	Off	Do not import from and export to the grid.

Type	Status	Description
	Reserved	

GMK110

Type	Status	Description
Power light 	On	The smart meter is power on.
	Off	The smart meter has been powered off.
Communication indicator 	Blinks.	Meter communication is normal.
	Off	Meter communication is abnormal or has no communication.

6.4.4 Smart Dongle Indicator

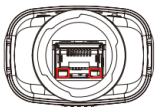
- **WiFi/LAN Kit-20**

NOTICE

- After double-clicking the Reload button to turn on Bluetooth, the communication indicator light will switch to a single flash state. Please connect to the App within 5 minutes, otherwise Bluetooth will automatically turn off.
- The single flash state of the communication indicator light only occurs after double-clicking the Reload button to turn on Bluetooth.

Indicator	Status	Description
Power Light 		Steady on: The smart communication stick is powered on.
		Off: The smart communication stick is not powered on.
Communication Light 		Steady on: Communication is normal in WiFi mode or LAN mode.
		Single blink: The smart communication stick's Bluetooth signal is enabled, waiting to connect to the App.

Indicator	Status	Description
		Two blinks: The smart communication stick is not connected to the router.
		Four blinks: The smart communication stick communicates normally with the router but is not connected to the server.
		Six blinks: The smart communication stick is identifying connected devices.
		Off: The smart communication stick is undergoing a software reset or is not powered on.

indicator	Color	Status	Description
LAN Port Communication Indicator 	Green	Steady	100Mbps wired network connection is normal.
		Off	• Network cable is not connected. • 100Mbps wired network connection is abnormal. • 10Mbps wired network connection is normal.
	Yellow	Steady	10/100Mbps wired network connection is normal, no data transmission/reception.
		Flashing	Communication data is being transmitted/received.
		Off	Network cable is not connected.

Button	Description
Reload	Hold for 0.5~3 seconds to reset the Smart Communication Stick.
	Hold for 6~20 seconds to restore the Smart Communication Stick to factory settings.
	Double-click quickly to enable Bluetooth signal (only lasts for 5 minutes).

- **4G Kit-CN-G20**

Indicator	Status	Description
		Steady on: The smart communication stick is powered on.
		Off: The smart communication stick is not powered on.
		Steady on: The smart communication stick is connected to the server, communication is normal.
		Double flash: The smart communication stick is not connected to the communication base station.
		Quadruple flash: The smart communication stick is connected to the communication base station but not to the server.
		Sextuple flash: Communication between the smart communication stick and the inverter is disconnected.
		Off: The smart communication stick is undergoing a software reset or is not powered on.

Button	Description
RELOAD	Hold for 0.5~3 seconds, the Smart Communication Stick will restart.
	Hold for 6~20 seconds, the Smart Communication Stick will restore factory settings.

7 System Debugging and Power Station Monitoring

7.1 Device Debugging and Power Plant Monitoring via SEMS+ App

SEMS+ App is a software for remote power plant monitoring or local device debugging. It supports installers or owners:

- Remotely monitor the operation of the power plant and set parameters for the power plant and devices.
- Locally connect to devices, view device operation status, and set device parameters.

Download and Install SEMS+ App
Mobile Phone Requirements:

- Mobile operating system requirements: Android 7.0 and above, iOS 15.1 and above.
- The mobile phone supports a web browser and connects to the Internet.
- The mobile phone supports WLAN/Bluetooth functionality.

Download Methods:
Method 1:
Search for SEMS+ in Google Play, App Store, Huawei, Honor, Xiaomi, OPPO, vivo app stores to download and install.

SEMS0163

Method 2:
Scan the QR code below to download and install.

SEMS0164

For detailed functions, please refer to the SEMS+ App User Manual. The user manual can be obtained from the official website or by scanning the QR code below.

7.2 Device commissioning and power plant monitoring via SEMS+ WEB

SEMS+ WEB is a monitoring platform that can communicate via WiFi or LAN. The following are the common functions of SEMS+ WEB:

1. Manage organization or user information, etc.
2. Add and monitor power plant information, etc.
3. Maintain devices.

For detailed functions, please refer to the SEMS+ WEB User Manual.

《SEMS+ WEB User Manual》

8 Maintenance

8.1 Power OFF the System

⚠DANGER

- When performing operation and maintenance on equipment within the system, please power down the system. Operating equipment while energized may cause equipment damage or electric shock hazard.
- After the equipment is powered off, internal components require a certain amount of time to discharge. Please wait according to the time specified on the label until the equipment is completely discharged.
- Restart the battery using the air switch power-on method.
- When shutting down the battery system, strictly adhere to the battery system power-off requirements to prevent damage to the battery system.

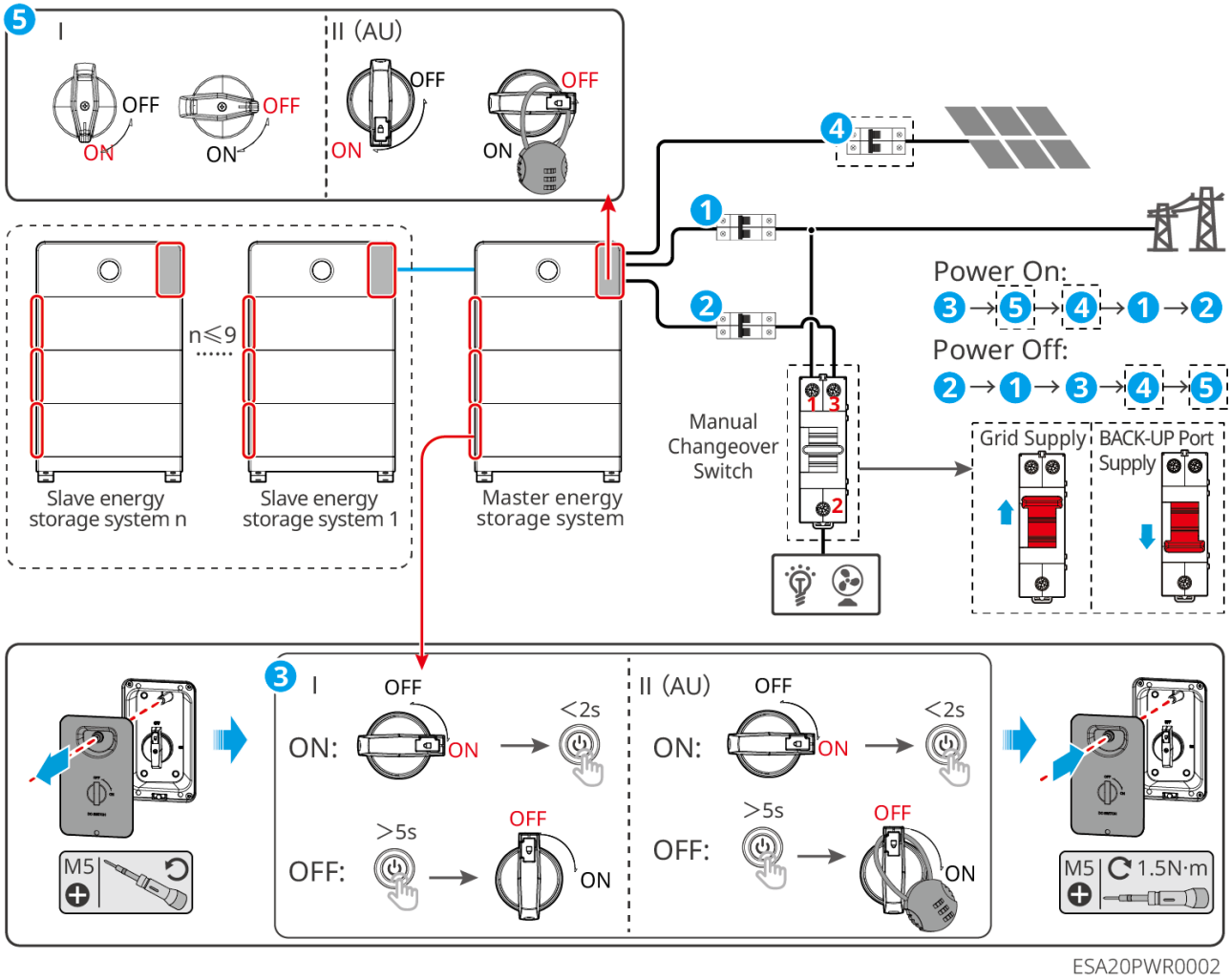
⚠WARNING

In a single-unit scenario, when the inverter is powered down for maintenance or due to a fault, to ensure the load operates normally, please switch the manual transfer switch to the grid side to engage, allowing the grid to supply power to the load.

NOTICE

- To ensure effective protection of the battery system, keep the cover plate of the battery system switch closed. If the battery system switch is not used for a long time, secure it with screws.
- PV string and "5" are only applicable to the EHA series.

power off



1. Turn OFF the BACK-UP circuit breaker.
2. Turn OFF the ON-GRID circuit breaker.
3. Press and hold any battery's multifunction button for 5 seconds to power off the battery system. If the system contains multiple batteries, this operation will power off all batteries, eliminating the need to operate them individually. Finally, rotate the battery system switch to the OFF position.
4. (Optional) Turn OFF the circuit breaker between the PV components and the inverter.
5. Turn OFF the inverter's DC switch. In a single-unit scenario, after the inverter's DC switch is turned off, manually switch the transfer switch to the grid side to engage, allowing the grid to supply power to the loads.

8.2 Removing the Equipment

DANGER

- Make sure that the equipment is powered off.
- Wear proper PPE during operations.
- Please use standard disassembly tools when removing wiring terminals to avoid damaging the terminals or equipment.
- Unless otherwise specified, the dismantling process of the equipment is in reverse order to the installation process, and it will not be further elaborated in this document.

1. Power off the System.
2. Label the cables connected in the system with tags indicating the cable type.
3. Disconnect the connecting cables of the inverter, battery, and smart meter in the system, such as DC cables, AC cables, communication cables, and PE cables.
4. Remove equipment such as the smart dongle, inverter, battery, and smart meter.
5. Properly store the equipment and ensure that the storage conditions meet the requirements if it needs to be put into use later.

8.3 Disposing of the Equipment

If the equipment cannot work anymore, dispose of it according to the local disposal requirements for electrical equipment waste. The equipment cannot be disposed of together with household waste.

8.4 Routine Maintenance

WARNING

- Contact after-sales service for help if you find any problems that may influence the battery or the hybrid inverter. Disassemble without permission is strictly forbidden.
- Contact after-sales service for help if the copper conductor is exposed. Do not touch or disassemble privately because high voltage danger exists.
- In case of other emergencies, contact the after-sales service as soon as possible. Operate following the instructions or wait for the after-sales service personnel.

Maintaining Item	Maintaining Method	Maintaining Period	Maintaining Purpose
System Cleaning	Check the heat sink, air intake, and air outlet for foreign matter or dust. Check whether the installation space meets requirements and whether there is any debris around the device.	Once 6 months	Prevent heat dissipation failures.
System installation	Check whether the equipment are installed securely and whether the screws are installed tightly. Check whether the equipment is damaged or deformed.	Once 6-12 months	Ensure that the equipment is installed securely.
Electrical connection	Check whether the cables are securely connected. Check whether the cables are broken or whether there is any exposed copper core.	Once 6-12 months	Confirm the reliability of electrical connections.
Sealing	Check whether all the terminals and ports are properly sealed. Reseal the cable hole if it is not sealed or too big.	Once a year	Confirm that the machine seal and waterproof performance are intact.

Maintaining Item	Maintaining Method	Maintaining Period	Maintaining Purpose
Battery maintenance	If the battery is not used for a long time or is not fully charged, it is recommended to charge the battery regularly.	Once/15 days	Protect the battery's lifespan.

8.5 fault

NOTICE
The manual fault content is updated irregularly and varies slightly between different models. Please refer to the device's real-time display for specifics.

8.5.1 Viewing Fault/Alarms Information

All detailed fault and alarm information for the energy storage system is displayed on the [SEMS+ App] and [SEMS+ WEB]. If your product is abnormal and you do not see related fault information in [SEMS+ App] or [SEMS+ WEB], please contact the after-sales service center.

- SEMS+ App

1. Open the SEMS+ App and log in with any account.
2. Go to [power station] > [Alarms] to view all power station fault information.
3. Click on a specific fault name to view details such as the time of occurrence, possible causes, and solutions.

SEMS+ WEB

- Open SEMS+ WEB and log in with any account.
- On the power station details interface, click [Alarms] to view all alarm information for the current power station.

8.5.2 Fault Information and Troubleshooting

Please perform troubleshooting according to the following methods. If the troubleshooting methods cannot help you, please contact the after-sales service center.

When contacting the after-sales service center, please collect the following information to facilitate a quick resolution.

1. Product information, such as: serial number, software version, device installation time, fault occurrence time, fault occurrence frequency, etc.
2. Device installation environment, such as: weather conditions, whether components are obstructed, have shadows, etc. It is recommended to provide photos, videos, and other files to assist in problem analysis.
3. Grid conditions.

If the system experiences a problem not listed, or if following the instructions still cannot prevent the problem or abnormality, immediately stop system operation and contact your dealer immediately.

No.	fault	Solution
1	Cannot search for the Smart Communication Stick wireless signal	1. Ensure no other device is connected to the Smart Communication Stick wireless signal. 2. Ensure the App is upgraded to the latest version. 3. Ensure the Smart Communication Stick is powered normally and the blue signal light is blinking or steadily on. 4. Ensure the smart device is within the communication range of the Smart Communication Stick. 5. Refresh the App device list again. 6. Restart the inverter.
2	Cannot connect to the Smart Communication Stick wireless signal	1. Ensure no other device is connected to the Smart Communication Stick wireless signal. 2. Restart the inverter or the Communication Stick, then try connecting to the Smart Communication Stick wireless signal again. 3. Ensure Bluetooth is successfully encrypted and paired.
3	Cannot find the router SSID	1. Place the router closer to the Smart Communication Stick, or add a WiFi repeater to enhance the WiFi signal. 2. Reduce the number of devices connected to the router.

No.	fault	Solution
4	After all configurations are completed, the Smart Communication Stick fails to connect to the router	1. Restart the inverter. 2. Check if the network name, encryption method, and password in the WiFi configuration are the same as those of the router. 3. Restart the router. 4. Place the router closer to the Smart Communication Stick, or add a WiFi repeater to enhance the WiFi signal.
5	After all configurations are completed, the Smart Communication Stick fails to connect to the server	Restart the router and the inverter.

8.5.2.1 Inverter Fault

8.5.2.1.1 Troubleshooting (Fault Code F01-F40)

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F01	Grid Power Outage	1. Grid power outage. 2. AC line or AC switch is disconnected.	1. The alarm will disappear automatically after grid power is restored. 2. Check if the AC line or AC switch is disconnected.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F02	Grid Overvoltage Protection	Grid voltage is higher than the allowable range, or the duration of high voltage exceeds the high voltage ride-through setting.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid voltage is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid overvoltage protection point after obtaining consent from the local grid operator. 3. If it cannot recover for a long time, check if the AC side circuit breaker and output cables are properly connected.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F03	Grid Undervoltage Protection	Grid voltage is lower than the allowable range, or the duration of low voltage exceeds the low voltage ride-through setting.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid voltage is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid undervoltage protection point after obtaining consent from the local grid operator. 3. If it cannot recover for a long time, check if the AC side circuit breaker and output cables are properly connected.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F04	Grid Rapid Overvoltage Protection	Abnormal grid voltage detection or ultra-high voltage triggers the fault.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid voltage is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid undervoltage protection point after obtaining consent from the local grid operator. 3. If it cannot recover for a long time, check if the AC side circuit breaker and output cables are properly connected.
F05	10min Overvoltage Protection	The moving average of grid voltage within 10min exceeds the range specified by safety regulations.	Check if the grid voltage has been operating at a high level for a long time. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid 10min overvoltage protection point after obtaining consent from the local grid operator.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F06	Grid Overfrequency	Grid abnormality: The actual grid frequency is higher than the local grid standard requirements.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid overfrequency protection point after obtaining consent from the local grid operator.
F07	Grid Underfrequency	Grid abnormality: The actual grid frequency is lower than the local grid standard requirements.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local grid operator. If it is, also modify the grid overfrequency protection point after obtaining consent from the local grid operator.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F08	Grid Frequency Instability	Grid abnormality: The rate of change of the actual grid frequency does not comply with local grid standards.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local grid operator.
F09	Anti-islanding Protection	The grid has been disconnected, but grid voltage is maintained due to the presence of loads. Grid connection is stopped according to safety regulation protection requirements.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local grid operator.
F10	LVRT Undervoltage	Grid abnormality: The duration of abnormal grid voltage exceeds the time specified for high/low voltage ride-through.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid voltage and frequency are within the allowable range and stable. If not, contact the local grid operator.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F11	HVRT Overvoltage	Grid abnormality: The duration of abnormal grid voltage exceeds the time specified for high/low voltage ride-through.	1. If it occurs occasionally, it may be a temporary grid abnormality. The inverter will resume normal operation after detecting a normal grid, requiring no manual intervention. 2. If it occurs frequently, check if the grid voltage and frequency are within the allowable range and stable. If not, contact the local grid operator.
F12	30mA GFCI Protection	The insulation impedance to ground of the input decreases during inverter operation.	1. If it occurs occasionally, it may be caused by temporary external line abnormalities. The inverter will resume normal operation after the fault is cleared, requiring no manual intervention. 2. If it occurs frequently or cannot recover for a long time, check if the PV string impedance to ground is too low.
F13	60mA GFCI Protection	The insulation impedance to ground of the input decreases during inverter operation.	1. If it occurs occasionally, it may be caused by temporary external line abnormalities. The inverter will resume normal operation after the fault is cleared, requiring no manual intervention. 2. If it occurs frequently or cannot recover for a long time, check if the PV string impedance to ground is too low.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F14	150mA GFCI Protection	The insulation impedance to ground of the input decreases during inverter operation.	1. If it occurs occasionally, it may be caused by temporary external line abnormalities. The inverter will resume normal operation after the fault is cleared, requiring no manual intervention. 2. If it occurs frequently or cannot recover for a long time, check if the PV string impedance to ground is too low.
F15	GFCI Gradual Change Protection	The insulation impedance to ground of the input decreases during inverter operation.	1. If it occurs occasionally, it may be caused by temporary external line abnormalities. The inverter will resume normal operation after the fault is cleared, requiring no manual intervention. 2. If it occurs frequently or cannot recover for a long time, check if the PV string impedance to ground is too low.
F16	DCI Level 1 Protection	The DC component of the inverter output current is higher than the safety regulation or the machine's default allowable range.	1. If it is caused by an external fault, the inverter will automatically resume normal operation after the fault disappears, requiring no manual intervention. 2. If this alarm occurs frequently and affects normal power generation of the power station, contact the dealer or after-sales service center.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F17	DCI Level 2 Protection	The DC component of the inverter output current is higher than the safety regulation or the machine's default allowable range.	1. If it is caused by an external fault, the inverter will automatically resume normal operation after the fault disappears, requiring no manual intervention. 2. If this alarm occurs frequently and affects normal power generation of the power station, contact the dealer or after-sales service center.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F18	Low Insulation Resistance	1. PV string short-circuited to protective earth. 2. The PV string installation environment is humid for a long time and the line has poor insulation to ground. 3. Low insulation impedance to ground of the battery port lines.	1. Check the impedance of the PV string/battery port to protective earth. A value greater than 80kΩ is normal. If the measured value is less than 80kΩ, locate and rectify the short-circuit point. 2. Check if the inverter's protective earth wire is correctly connected. 3. If it is confirmed that the impedance is indeed below the default value in rainy/overcast environments, please reset the inverter's "Insulation Resistance Protection Point" via the App. For inverters in the Australian and New Zealand markets, when an insulation resistance fault occurs, the alarm can also be indicated in the following ways: 1. The inverter is equipped with a buzzer. When a fault occurs, the buzzer sounds continuously for 1 minute; if the fault is not resolved, the buzzer sounds again every 30 minutes. 2. If the inverter is added to the monitoring platform and the alarm notification method is set, the alarm information can be sent to the customer via email.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F19	Grounding Abnormal	1. The inverter's protective earth wire is not connected. 2. When the PV string output is grounded, the inverter output side is not connected to an isolation transformer.	1. Please confirm if the inverter's protective earth wire is not properly connected. 2. In scenarios where the PV string output is grounded, please confirm if an isolation transformer is connected to the inverter output side.
F20	Hard Anti-backfeed Protection	Load abnormal fluctuation	1. If it is caused by an external fault, the inverter will automatically resume normal operation after the fault disappears, requiring no manual intervention. 2. If this alarm occurs frequently and affects normal power generation of the power station, contact the dealer or after-sales service center.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F21	Internal Comm Loss	Slave DSP1 communication timeout - Master DSP, Slave DSP2 communication timeout - Master DSP, Slave DSP2 communication timeout - Slave DSP1, Master DSP communication timeout - Slave DSP1, Master DSP communication timeout - Slave DSP2 or Slave DSP1 communication timeout - Slave DSP2: 1. Chip not powered on 2. Chip firmware version error	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
		Master DSP can module error, Slave DSP1 can module error or Slave DSP2 can module error: 1. Frame format error 2. Parity check error 3. can bus offline 4. Hardware CRC check error 5. Control bit is receive (transmit) during transmission (reception) 6. Transmission to a disallowed unit	
F22	Generator Waveform Detection Fault	1. This fault will be displayed continuously when the generator is not connected; 2. When the generator is operating, this fault will be triggered if it does not meet generator safety regulations.	1. Ignore this fault when the generator is not connected; 2. When this fault occurs due to a generator fault, it is normal. Wait for a period after the generator recovers, and the fault will clear automatically; 3. This fault does not affect the normal operation of off-grid mode. 4. When both the generator and grid are connected and meet safety regulation requirements, the grid has priority for grid connection, and the system will operate in grid-connected state.
F23	Generator Abnormal Connection		
F24	Generator Voltage Low		
F25	Generator Voltage High		
F26	Generator Frequency Low		

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F27	Generator Frequency High		
F28	Parallel Unit I/O Self-check Abnormal	Parallel communication cable is not securely connected or parallel IO chip is damaged	Check if the parallel communication cable is securely connected, then check if the IO chip is damaged. If yes, replace the IO chip.
F29	Paralell Grid Line Reversed	Some units' grid lines are reversed with others	Reconnect the grid lines
F30	AC HCT check Abnormal	AC sensor has sampling abnormality	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F31	GFCI HCT Check Abnormal	Leakage current sensor has sampling abnormality	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F32	Inverter Internal Failure	Inverter has a fault	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F33	Flash Read/Write Error	Possible causes: flash content changed; flash end of life;	1. Upgrade to the latest firmware 2. Contact the dealer or after-sales service center

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F34	AFCI Check Failure	During the arc fault self-check process, the arc fault module did not detect an arc fault as expected	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F35	Cabinet Overtemperature	Cabinet temperature is too high, possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature is too high. 3. Internal fan operation is abnormal.	1. Check if the ventilation at the inverter installation location is good and if the ambient temperature exceeds the maximum allowable ambient temperature range. 2. If it is not ventilated or the ambient temperature is too high, improve its ventilation and heat dissipation conditions. 3. If ventilation and ambient temperature are both normal, contact the dealer or after-sales service center.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F36	Bus Overvoltage	BUS overvoltage, possible causes: 1. PV voltage is too high; 2. Inverter BUS voltage sampling abnormality; 3. The isolation effect of the dual-split transformer at the inverter's rear end is poor, causing mutual interference when two inverters are connected to the grid, and one inverter reports DC overvoltage during grid connection;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F37	PV Input Overvoltage	PV input voltage is too high, possible cause: PV array configuration error, too many PV panels connected in series in a string, causing the string's open-circuit voltage to be higher than the inverter's maximum operating voltage	Check the series configuration of the corresponding PV array string to ensure the string's open-circuit voltage is not higher than the inverter's maximum operating voltage. After the PV array is correctly configured, the inverter alarm will disappear automatically.

Fault Code	Fault Name	Fault Cause	Troubleshooting Recommendation
F38	PV Continuous Hardware Overcurrent	1. Module configuration不合理 2. Hardware damage	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F39	PV Continuous Software Overcurrent	1. Module configuration不合理 2. Hardware damage	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F40, F98	String Reverse Connection(String 1-n) n: Determined based on the actual number of inverter strings	PV string reverse connection	Check if the string is reverse connected.

8.5.2.1.2 Troubleshooting (Fault Code F41-F80)

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F41	Generator Port Overload	1. Off-grid output exceeds specifications. 2. Short circuit on the off-grid side. 3. Off-grid terminal voltage is too low. 4. When used as a heavy load port, the heavy load exceeds specifications.	Confirm the off-grid side output voltage, current, power and other data to identify the cause.
F42	DC Arcing Failure (String 1-n) n: Determined by the actual number of inverter strings.	1. Loose DC side connection terminals. 2. Poor contact at DC side connection terminals. 3. Damaged or poor contact of DC cable cores.	1. After the machine reconnects to the grid, check if the voltage and current of each string abnormally decrease or become zero. 2. Check if the DC side terminals are securely connected.
F43	Grid Waveform Abnormal	Utility grid abnormality: Grid voltage detection anomaly triggers the fault.	1. If it occurs occasionally, it may be due to a short-term grid anomaly. The inverter will resume normal operation after detecting normal grid conditions, requiring no manual intervention. 2. If it occurs frequently, please check if the grid voltage and frequency are within the allowable range and stable. If not, contact the local power operator.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F44	Grid Phase Loss	Utility grid abnormality: Single-phase voltage drop in the grid.	1. If it occurs occasionally, it may be due to a short-term grid anomaly. The inverter will resume normal operation after detecting normal grid conditions, requiring no manual intervention. 2. If it occurs frequently, please check if the grid voltage and frequency are within the allowable range and stable. If not, contact the local power operator.
F45	Grid Voltage Imbalance	Excessive difference in grid phase voltages.	1. If it occurs occasionally, it may be due to a short-term grid anomaly. The inverter will resume normal operation after detecting normal grid conditions, requiring no manual intervention. 2. If it occurs frequently, please check if the grid voltage and frequency are within the allowable range and stable. If not, contact the local power operator.
F46	Grid Phase Sequence Failure	Inverter and grid wiring anomaly: Wiring is not in positive sequence.	1. Check if the inverter and grid wiring are in positive sequence. The fault will disappear automatically after correct wiring (e.g., swapping any two live wires). 2. If the fault persists despite correct wiring, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F47	Grid Rapid Shutdown Protection	Rapid shutdown of output after detecting a grid power outage condition.	The fault disappears automatically after grid power is restored.
F48	Grid Neutral Wire Loss (Split-phase Grid)	Neutral wire loss in a split-phase grid.	1. The alarm disappears automatically after grid power is restored. 2. Check if the AC circuit or AC switch is disconnected.
F49	L-PE Short Circuit	Low impedance or short circuit between output phase line and PE.	Measure the impedance between the output phase line and PE, locate the point of low impedance and repair it.
F50	DCV Level 1 Protection	Abnormal load fluctuation.	1. If caused by an external fault, the inverter will automatically resume normal operation after the fault disappears, requiring no manual intervention. 2. If this alarm occurs frequently, affecting normal power plant generation, contact the dealer or after-sales service center.
F51	DCV Level 2 Protection	Abnormal load fluctuation.	
F52	Leakage current (GFCI) Multiple Fault Shutdown	North American safety regulations require no automatic recovery after multiple faults; manual recovery or waiting 24h is required.	Please check if the PV string-to-ground impedance is too low.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F53	DC Arcing (AFCI) Multiple Fault Shutdown	North American safety regulations require no automatic recovery after multiple faults; manual recovery or waiting 24h is required.	1. After the machine reconnects to the grid, check if the voltage and current of each string abnormally decrease or become zero. 2. Check if the DC side terminals are securely connected.
F54	External Communication Link Failure	Inverter external device communication lost, possibly due to peripheral power supply issues, communication protocol mismatch, or not configured for the corresponding peripheral.	Determine based on the actual model and detection enable bits. Peripherals not supported by some models will not be detected.
F55	Back-up Port Overload Fault	Prevents the inverter from continuously overloading output.	Turn off some off-grid loads to reduce the inverter's off-grid output power.
F56	Back-up Port Overvoltage Fault	Prevents inverter output overvoltage from damaging loads.	1. If it occurs occasionally, it may be caused by load switching and requires no manual intervention. 2. If it occurs frequently, contact the dealer or after-sales service center.
F57	External Box Fault	Excessive wait time for Box relay switching during grid-to-off-grid transition.	1. Check if the Box is working normally. 2. Check if the Box communication wiring is correct.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F58	CT Loss Fault	CT connection wire disconnected (Japanese safety regulation requirement).	Check if the CT wiring is correct.
F59	Parallel Unit CAN Communication Abnormal	Parallel communication cable not securely connected or some units are offline.	Check if all units are powered on and if the parallel communication cables are securely connected.
F60	Parallel Unit Back-up Connection Reversed	Back-up wiring of some units is reversed with others.	Reconnect the back-up wiring.
F61	Inverter Soft Start Failure	Inverter soft start failure during off-grid cold start.	Check if the inverter module is damaged.
F62	AC HCT Failure	HCT sensor abnormality exists.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F63	GFCI HCT Failure	Leakage current sensor abnormality exists.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F64	Inverter Internal Failure	Inverter fault exists.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F65	AC Terminal Overtemperature	AC terminal temperature too high, possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature too high. 3. Internal fan working abnormally.	1. Check if the inverter installation location is well ventilated and if the ambient temperature exceeds the maximum allowable range. 2. If poorly ventilated or ambient temperature is too high, improve ventilation and heat dissipation conditions. 3. If ventilation and ambient temperature are normal, contact the dealer or after-sales service center.
F66	INV Module Overtemperature	Inverter module temperature too high, possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature too high. 3. Internal fan working abnormally.	1. Check if the inverter installation location is well ventilated and if the ambient temperature exceeds the maximum allowable range. 2. If poorly ventilated or ambient temperature is too high, improve ventilation and heat dissipation conditions. 3. If ventilation and ambient temperature are normal, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F67	Boost Module Overtemperature	Boost module temperature too high, possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature too high. 3. Internal fan working abnormally.	1. Check if the inverter installation location is well ventilated and if the ambient temperature exceeds the maximum allowable range. 2. If poorly ventilated or ambient temperature is too high, improve ventilation and heat dissipation conditions. 3. If ventilation and ambient temperature are normal, contact the dealer or after-sales service center.
F68	AC Capacitor Overtemperature	Output filter capacitor temperature too high, possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature too high. 3. Internal fan working abnormally.	1. Check if the inverter installation location is well ventilated and if the ambient temperature exceeds the maximum allowable range. 2. If poorly ventilated or ambient temperature is too high, improve ventilation and heat dissipation conditions. 3. If ventilation and ambient temperature are normal, contact the dealer or after-sales service center.
F69	PV IGBT Short Circuit Fault	Possible causes: 1. IGBT short circuit. 2. Inverter sampling circuit abnormality.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F70	PV IGBT Open Circuit Fault	1. Software issue causing no PWM generation. 2. Drive circuit abnormality. 3. IGBT open circuit.	
F71	NTC Abnormal	NTC temperature sensor abnormality.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F72	PWM Abnormal	PWM abnormal waveform detected.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F73	CPU Interrupt Abnormal	CPU interrupt abnormality.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F74	Microelectronics Fault	Functional safety detection detected an abnormality.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F75	PV HCT Fault	Boost current sensor abnormality.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Causes	Troubleshooting Suggestions
F76	1.5V Reference Abnormal	Reference circuit fault.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F77	0.3V Reference Abnormal	Reference circuit fault.	
F78	CPLD Version Identification Error	CPLD version identification error.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F79	CPLD Communication Fault	CPLD and DSP communication content error or timeout.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F80	Model Identification Fault	Fault regarding model identification error.	Disconnect the AC output side switch and DC input side switch, wait 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

8.5.2.1.3 Troubleshooting (Fault Codes F81-F121)

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F81	P-Bus Overvoltage	BUS Overvoltage, possible causes: 1. PV voltage too high; 2. Inverter BUS voltage sampling abnormal; 3. Poor isolation effect of the dual-split transformer at the inverter output, causing mutual interference when two inverters are grid-connected, with one inverter reporting DC overvoltage during grid connection;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F82	N-Bus Overvoltage		
F83	Bus Overvoltage (Sub CPU1)		Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F84	P-Bus Overvoltage (Sub CPU1)		

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F85	N-Bus Overvoltage (Sub CPU1)	BUS Overvoltage, possible causes: 1. PV voltage too high; 2. Inverter BUS voltage sampling abnormal; 3. Poor isolation effect of the dual-split transformer at the inverter output, causing mutual interference when two inverters are grid-connected, with one inverter reporting DC overvoltage during grid connection;	
F86	Bus Overvoltage (Sub CPU2)		Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F87	P-Bus Overvoltage (Sub CPU2)		

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F88	N-Bus Overvoltage (Sub CPU2)	BUS Overvoltage, possible causes: 1. PV voltage too high; 2. Inverter BUS voltage sampling abnormal; 3. Poor isolation effect of the dual-split transformer at the inverter output, causing mutual interference when two inverters are grid-connected, with one inverter reporting DC overvoltage during grid connection;	
F89	P-Bus Overvoltage (CPLD)		Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F90	N-Bus Overvoltage (CPLD)	BUS Overvoltage, possible causes: 1. PV voltage too high; 2. Inverter BUS voltage sampling abnormal; 3. Poor isolation effect of the dual-split transformer at the inverter output, causing mutual interference when two inverters are grid-connected, with one inverter reporting DC overvoltage during grid connection;	
F91	FlyCap Software Overvoltage	FlyCap overvoltage, possible causes: 1. PV voltage too high; 2. Inverter flycap voltage sampling abnormal;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F92	FlyCap Hardware Overvoltage		

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F93	FlyCap Undervoltage	FlyCap undervoltage, possible causes: 1. PV energy insufficient; 2. Inverter flycap voltage sampling abnormal;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center
F94	FlyCap Precharge Failure	FlyCap precharge failure, possible causes: 1. PV energy insufficient; 2. Inverter flycap voltage sampling abnormal;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center
F95	FlyCap Precharge Abnormal	1. Unreasonable control loop parameters 2. Hardware damage	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center
F96, F97	String Overcurrent (String 1-n) n: Determined by the actual number of inverter strings	Possible causes: 1. String overcurrent; 2. String current sensor abnormal	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F99, F100	String Loss (String 1-n) n: Determined by the actual number of inverter strings	String fuse open (if present)	Check if the fuse is open.
F101	Battery 1 Precharge fault	Battery 1 precharge circuit fault (precharge resistor burnt, etc.)	Check if the precharge circuit is good, and whether the battery voltage matches the bus voltage after only battery power-up. If not, contact the dealer or after-sales service center.
F102	Battery 1 Relay fault	Battery 1 relay cannot operate normally	After battery power-up, check if the battery relay is working, if a closing sound is heard. If not operating, contact the dealer or after-sales service center.
F103	Battery 1 Connection Overvoltage	Battery 1 connection voltage exceeds machine rated range	Confirm if the battery voltage is within the machine's rated range.
F104	Battery 2 Precharge fault	Battery 2 precharge circuit fault (precharge resistor burnt, etc.)	Check if the precharge circuit is good, and whether the battery voltage matches the bus voltage after only battery power-up. If not, contact the dealer or after-sales service center.
F105	Battery 2 Relay fault	Battery 2 relay cannot operate normally	After battery power-up, check if the battery relay is working, if a closing sound is heard. If not operating, contact the dealer or after-sales service center.
F106	Battery 2 Connection Overvoltage	Battery 2 connection voltage exceeds machine rated range	Confirm if the battery voltage is within the machine's rated range.

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F107	On-grid PWM Sync Failure	Abnormality occurred during carrier synchronization grid connection	1. Check if the sync line connection is normal 2. Check if the master/slave settings are normal; 3. Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F108	DSP Communication fault	-	-
F109	External STS fault	Abnormal cable connection between inverter and STS	Check if the wiring sequence of the harness between the inverter and STS corresponds one by one in order.
F110	Export Limit Protection	1. Inverter reports error and disconnects from grid 2. meter communication unstable 3. Reverse power flow condition occurs	1. Check if the inverter has other error messages. If yes, handle them accordingly; 2. Check if the meter connection is reliable; 3. If this alarm occurs frequently, affecting normal power plant generation, contact the dealer or after-sales service center.
F111	Bypass Overload	-	-
F112	Black Start Failure	-	-
F113	Offgrid AC Ins Volt High	-	-

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F114	Relay Failure 2	Relay abnormal, reasons: 1. Relay abnormal (relay short circuit) 2. Relay sampling circuit abnormal. 3. AC side wiring abnormal (possible loose connection or short circuit)	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F115	SVG Precharge Disabled	SVG precharge hardware failure	Contact the dealer or after-sales service center.
F116	Nighttime SVG PID Prevention fault	PID prevention hardware abnormal	
F117	DSP Version Identification Error	DSP software version identification error	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F118	MOS Sustained Overvoltage	1. Software issue causing inverter drive to turn off earlier than flyback drive: 2. Inverter drive circuit abnormal causing failure to turn on: 3. PV voltage too high; 4. Mos voltage sampling abnormal;	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F119	Bus Short Circuit fault	Hardware damage	If the inverter remains offline continuously after a BUS short circuit fault occurs, contact the dealer or after-sales service center.
F120	Bus Sampling Abnormal	1. BUS voltage sampling hardware fault	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F121	DC Side Sampling Abnormal	1. BUS voltage sampling hardware fault 2. Battery voltage sampling hardware fault 3. Dcrly relay fault	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.

Fault Code	Fault Name	Possible Cause	Troubleshooting Suggestion
F122	PV Access Mode Setting Error	PV Access Mode has three modes, taking four MPPT as an example: 1. Parallel mode: i.e., AAAA mode (same-source mode), PV1-PV4 same source, 4 strings connected to the same PV panel 2. Partial parallel mode: i.e., AACC mode, PV1 and PV2 same-source connected, PV3 and PV4 same-source connected 3. Independent mode: i.e., ABCD mode (non-same-source), PV1, PV2, PV3, PV4 independently connected, 4 strings each connected to one PV panel If the actual PV access mode does not match the device's set PV Access Mode, this fault will be reported	Check if the PV Access Mode is set correctly (ABCD, AACC, AAAA), reset the PV Access Mode correctly 1. Confirm that the actual connected PV strings are correctly connected; 2. If the PV strings are correctly connected, check via APP or screen whether the currently set "PV Access Mode" corresponds to the actual access mode; 3. If the currently set "PV Access Mode" does not match the actual access mode, use the APP or screen to set the "PV Access Mode" to the mode consistent with the actual situation. After setting, disconnect PV and AC power and restart; 4. After setting, if the current "PV Access Mode" matches the actual access mode but the fault still occurs, contact the dealer or after-sales service center.

8.5.2.1.4 Troubleshooting (Fault Codes F122-F163)

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F123	Multi-channel PV Phase Error	PV Input Mode Setting Error	Check if the PV Access Mode is correctly set (ABCD, AACC, AAAA). Reset the PV Access Mode correctly. 1. Confirm the actual connection of each PV channel is correct. 2. If the PV is correctly connected, check via APP or screen whether the currently set "PV Access Mode" corresponds to the actual connection mode. 3. If the currently set "PV Access Mode" does not match the actual connection mode, use the APP or screen to set the "PV Access Mode" to the mode consistent with the actual situation. After setting, disconnect and restart the PV and AC power supply. 4. After setting, if the current "PV Access Mode" matches the actual connection mode but this fault still occurs, contact the dealer or after-sales service center.
F124	Battery 1 Reverse Connection fault	Battery 1 Positive and Negative Poles Reversed	Check if the positive and negative polarities of the battery and the machine's terminals are consistent.

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F125	Battery 2 Reverse Connection fault	Battery 2 Positive and Negative Poles Reversed	Check if the positive and negative polarities of the battery and the machine's terminals are consistent.
F126	Abnormal Battery Connection	Abnormal Battery Connection	Check if the battery is working normally.
F127	BAT Overtemperature	Battery temperature is too high. Possible causes: 1. Inverter installation location is not ventilated. 2. Ambient temperature is too high. 3. Internal fan operation is abnormal.	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F128	Ref Voltage Abnormal	Reference circuit fault	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F129	Cabinet Under Temperature	Cabinet temperature is too low. Possible cause: Ambient temperature is too low.	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F130	AC Side SPD fault	AC Side Surge Protection Device Failure	Replace the AC side surge protection device.

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F131	DC Side SPD fault	DC Side Surge Protection Device Failure	Replace the DC side surge protection device.
F132	Internal Fan Abnormal	Internal fan abnormal. Possible causes: 1. Abnormal fan power supply; 2. Mechanical fault (stall); 3. Fan aging or damage.	Disconnect the AC output side switch and DC input side switch, wait for 5 minutes, then close the AC output side switch and DC input side switch. If the fault persists, contact the dealer or after-sales service center.
F133	External Fan Abnormal	External fan abnormal. Possible causes: 1. Abnormal fan power supply; 2. Mechanical fault (stall); 3. Fan aging or damage.	
F134	PID Diagnosis Abnormal	PID hardware fault or PV voltage too high causing PID pause	No action required for PID pause warning caused by high PV voltage. For PID hardware fault, clear the PID fault by turning the PID switch off and then on. Replace the PID device.

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F135	Trip-Switch Trip Warning	Possible causes: Tripped due to overcurrent or PV reverse connection;	Contact the dealer or after-sales service center; If the trip is due to PV short circuit or reverse connection, check for any historical PV short circuit warnings or historical PV reverse connection warnings. If present, maintenance personnel need to check the corresponding PV condition. After confirming no fault, manually close the trip switch and clear this warning via the APP interface's clear historical faults operation.
F136	Historical PV IGBT Short Circuit Warning	Possible causes: Tripped due to overcurrent;	Contact the dealer or after-sales service center; Maintenance personnel need to check the Boost hardware and external string for any fault based on the historical PV short circuit warning subcode. After confirming no fault, clear this warning via the APP interface's clear historical faults operation.
F137, F138	Historical PV Reverse Connection Warning (String 1-n) (n: determined by the actual number of inverter strings)	Possible causes: Tripped due to PV reverse connection;	Contact the dealer or after-sales service center; Maintenance personnel need to check the corresponding string for reverse connection based on the historical PV reverse connection warning subcode, and check for voltage differences in the PV panel configuration. After confirming no fault, clear this warning via the APP interface's clear historical faults operation.

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F139	Flash Read/Write Error Warning	Possible causes: 1. Flash content changed; 2. Flash lifespan exhausted;	1. Upgrade to the latest firmware; 2. Contact the dealer or after-sales service center.
F140	Meter Comm Loss	This warning may only occur after enabling anti-reverse power flow function. Possible causes: 1. Meter not connected; 2. Communication cable connection between meter and inverter is incorrect.	Check the meter wiring, connect the meter correctly. If the fault persists after checking, contact the dealer or after-sales service center.
F141	PV Panel Type Identification Failed	PV panel identification hardware abnormal	Contact the dealer or after-sales service center.
F142	PV String Mismatch	PV string mismatch, two strings under the same MPPT have different open-circuit voltage configurations	Check the open-circuit voltages of the two strings. Configure strings with the same open-circuit voltage under the same MPPT channel. Prolonged string mismatch poses safety risks.
F143	CT Not Connected	CT not connected	Check CT wiring.
F144	CT Reverse Connection	CT reverse connection	Check CT wiring.
F145	PE Loss	Ground wire not connected	Check the ground wire.

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F146	String Terminal High Temperature (String 1~8)	Bit set in register 37176 PV terminal temperature warning subcode 1	-
F147	String Terminal High Temperature (String 9~16)	Bit set in register 37177 PV terminal temperature warning subcode 2	-
F148	String Terminal High Temperature (String 17~20)	Bit set in register 37178 PV terminal temperature warning subcode 3	-
F149	Historical PV Reverse Connection Warning (String 33~48)	Possible causes: Tripped due to PV reverse connection;	Contact the dealer or after-sales service center; Maintenance personnel need to check the corresponding string for reverse connection based on the historical PV reverse connection warning subcode, and check for voltage differences in the PV panel configuration. After confirming no fault, clear this warning via the APP interface's clear historical faults operation.
F150	Battery 1 Low Voltage	Battery voltage below set value	-
F151	Battery 2 Low Voltage	Battery voltage below set value	-

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F152	Low Voltage of Battery Power	Battery in non-charging mode, voltage below shutdown voltage	-
F153	Battery 1 High Voltage	-	-
F154	Battery 2 High Voltage	-	-
F155	Online Low Insulation Resistance	1. Photovoltaic string shorted to protective earth. 2. The photovoltaic string is installed in a long-term humid environment and the line has poor insulation to ground.	1. Check the impedance of the photovoltaic string to protective earth. If a short circuit is found, rectify the short circuit point. 2. Check if the inverter's protective earth wire is correctly connected. 3. If it is confirmed that the impedance is indeed below the default value in rainy/cloudy environments, reset the "Insulation Resistance Protection Point".
F156	Micro-grid Overload Warning	backup terminal input current too high	Occasional occurrence requires no action; If this warning appears frequently, contact the dealer or after-sales service center.
F157	Manual Reset	-	-
F158	Generator Phase Sequence Abnormal	-	-

Fault Code	Fault Name	Fault Cause	Troubleshooting Suggestions
F159	Multiplexed Port Configuration Abnormal	Multiplexed (Generator) port configured for micro-grid or heavy load, but a generator is actually connected	Use the APP to change the multiplexed (generator) port configuration.
F160	EMS Forced Off-grid	EMS issued forced off-grid command, but off-grid function is not enabled	Enable the off-grid function.
F161	Passive Anti-islanding Protection	-	-
F162	Grid Type Fault	Actual grid type (two-phase or split-phase) does not match the set safety standard	Switch to the corresponding safety standard according to the actual grid type.
F163	Grid Phase Instability	Grid abnormal: Grid voltage phase change rate does not comply with local grid standards.	1. If it occurs occasionally, it may be due to temporary grid abnormality. The inverter will resume normal operation after detecting normal grid conditions, requiring no manual intervention. 2. If it occurs frequently, check if the grid frequency is within the allowable range. If not, contact the local power operator.

8.5.2.1.5 Fault Symptom Handling

Fault Name	Fault Cause	Troubleshooting Recommendation
Generator Failure	1. This fault will persist if no generator is connected. 2. This fault will be triggered if generator safety regulations are not met during generator operation.	1. If no generator is connected, ignore this fault. 2. If this fault appears when the generator malfunctions, it is normal. Wait for a period after the generator recovers, and the fault will clear automatically. 3. This fault does not affect the normal operation of off-grid mode. 4. When both the generator and grid are connected and meet safety requirements, grid priority applies for grid-tied operation, and the system will operate in grid-tied mode.
BMS Status Bit Error	BMS module failure	Disconnect the AC output side switch and DC input side switch. After 5 minutes, reconnect the AC output side switch and DC input side switch. If the fault persists, please contact the dealer or after-sales service center.
Ambient Overtemperature	1. Poor machine ventilation 2. Hot air flows back to the ambient temperature sampling point	Disconnect the AC output side switch and DC input side switch. After 5 minutes, reconnect the AC output side switch and DC input side switch. If the fault persists, please contact the dealer or after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
PV Terminal Overtemperature	PV terminal overtemperature. Possible causes: 1. Poor ventilation at the inverter installation location. 2. Ambient temperature is too high. 3. Internal fan operation is abnormal.	1. Check if the ventilation at the inverter installation location is adequate and if the ambient temperature exceeds the maximum allowable range. 2. If ventilation is poor or the ambient temperature is too high, please improve the ventilation and heat dissipation conditions. 3. If both ventilation and ambient temperature are normal, please contact the dealer or after-sales service center.
BAT Terminal Overtemperature	BAT terminal overtemperature. Possible causes: 1. Poor ventilation at the inverter installation location. 2. Ambient temperature is too high.	1. Check if the ventilation at the inverter installation location is adequate and if the ambient temperature exceeds the maximum allowable range. 2. If ventilation is poor or the ambient temperature is too high, please improve the ventilation and heat dissipation conditions. 3. If both ventilation and ambient temperature are normal, please contact the dealer or after-sales service center.
AC Terminal Overtemperature Warning	AC terminal overtemperature. Possible causes: 1. Poor ventilation at the inverter installation location. 2. Ambient temperature is too high. 3. Internal fan operation is abnormal.	

Fault Name	Fault Cause	Troubleshooting Recommendation
BAT Terminal Overtemperature Warning	BAT terminal overtemperature. Possible causes: 1. Poor ventilation at the inverter installation location. 2. Ambient temperature is too high.	1. Check if the ventilation at the inverter installation location is adequate and if the ambient temperature exceeds the maximum allowable range. 2. If ventilation is poor or the ambient temperature is too high, please improve the ventilation and heat dissipation conditions. 3. If both ventilation and ambient temperature are normal, please contact the dealer or after-sales service center.
Three-phase on-grid fault	Three-phase external wiring error	Re-wire the connections.
External STS Failure	Abnormal cable connection between inverter and STS	Check if the wiring sequence of the harness between the inverter and the STS corresponds one-to-one in order.

Fault Name	Fault Cause	Troubleshooting Recommendation
Parallel Comm Timeout Shutdown	In parallel operation, if a slave unit fails to communicate with the master unit for more than 400 seconds.	Check if the parallel communication harness is securely connected. Check if the slave unit addresses are duplicated.
Three-phase off-grid phase loss fault	Phase loss in a three-phase system group.	1. Check if all inverters are powered on. 2. Check if each phase of the three-phase group is connected to an inverter.

Fault Name	Fault Cause	Troubleshooting Recommendation
EPO	Externally triggered hardware EPO button or remotely triggered EPO command.	1. If it was actively triggered by remote shutdown, it can be ignored. 2. If not actively triggered, please contact the distributor or after-sales service center.
High Combustible Gas Concentration	Automatically triggered when the combustible gas device detects a concentration of 20% LEL or higher.	1. After the fault occurs, the machine will automatically open the air damper to exhaust and reduce the concentration. The fault will automatically clear after the concentration remains below 5% LEL for 15 minutes. 2. If a cluster-level fire protection fault is triggered after this fault occurs, the air damper will automatically close. Confirm the air damper status within 30s to ensure the cluster-level fire protection is executed in a sealed space. 3. Please contact the distributor or after-sales service center.
Combustible Gas Device Air Damper Open Signal Mismatch	Mismatch between the control signal to open the air damper and the feedback signal.	1. Check that the harness signal connection has no issues. 2. Please contact the distributor or after-sales service center.
One-Key Shutdown	Check via the App if the one-key shutdown function is enabled.	Disable the one-key shutdown.
Offline Shutdown	-	-

Fault Name	Fault Cause	Troubleshooting Recommendation
Remote Shutdown	-	-
On-Grid SPD Fault	-	1. Try restarting the machine and observe if the fault clears; 2. If the fault persists after restarting, please contact the distributor or after-sales service center.
Off-Grid SPD Fault	-	1. Try restarting the machine and observe if the fault clears; 2. If the fault persists after restarting, please contact the distributor or after-sales service center.
Child Node Communication Failure	Internal Comm Abnormal	1. Try restarting the machine and observe if the fault clears; 2. If the fault persists after restarting, please contact the distributor or after-sales service center.
Dehumidifier Communication Failure	Communication link abnormality between the dehumidifier and the LC control box.	1. Check the link communication harness and observe if the fault clears; 2. Try restarting the machine and observe if the fault clears; 3. If the fault persists after restarting, please contact the distributor or after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
Combustible Gas Detection Device Communication Failure	1. The combustible gas device was not properly configured with a 485 address of 2 during factory settings. 2. Communication link abnormality between the combustible gas device and the LC control box.	1. Check the link communication harness and observe if the fault clears; 2. Try restarting the machine and observe if the fault clears; 3. Use the method provided by the combustible gas device manufacturer to check if the device address is 2. If not, modify it. 4. If the fault persists after restarting, please contact the distributor or after-sales service center.
DG Communication Failure	Communication link abnormality between the control board and the diesel generator.	1. Check the link communication harness and observe if the fault clears; 2. Try restarting the machine and observe if the fault clears; 3. If the fault persists after restarting, please contact the distributor or after-sales service center.
Battery Over Voltage	1. Single cell voltage too high 2. Voltage sensing wire abnormality	Record the fault phenomenon, restart the battery, wait a few minutes, and confirm if the fault disappears. If the problem persists after restarting, please contact the after-sales service center.
	1. Total battery voltage too high 2. Voltage sensing wire abnormality	
Battery Undervoltage	1. Single cell voltage too low 2. Voltage sensing wire abnormality	

Fault Name	Fault Cause	Troubleshooting Recommendation
	1. Total battery voltage too low 2. Voltage sensing wire abnormality	
Battery Overcurrent	1. Charging current too high, battery current limiting abnormal: temperature and voltage values change abruptly. 2. Inverter response abnormal	
	Battery discharge current too high	
Battery Overtemperature	1. Ambient Overtemperature 2. Temperature sensor abnormal	
Battery Undertemperature	1. Ambient temperature too low 2. Temperature sensor abnormal	
Battery Terminal Overtemperature	Terminal temperature too high	

Fault Name	Fault Cause	Troubleshooting Recommendation
Battery Imbalance	1. Excessive temperature difference. At different stages, the battery will limit its power, i.e., limit charge/discharge current. Therefore, this issue is generally difficult to occur. 2. Cell capacity degradation leads to excessive internal resistance, causing large temperature rise during overcurrent and thus large temperature difference. 3. Poor welding of cell tabs leads to rapid cell temperature rise during overcurrent. 4. Temperature sampling issue; 5. Power cable connection loose	

Fault Name	Fault Cause	Troubleshooting Recommendation
	1. Inconsistent cell aging levels 2. Slave board chip issues can also cause excessive cell voltage difference; 3. Slave board balancing issues can also cause excessive cell voltage difference 4. Harness issues	
Insulation Resistance	Insulation resistance damaged	Check if the ground wire is properly connected, restart the battery. If the problem persists after restarting, please contact the after-sales service center.
Pre-charging Failure	Pre-charging Failure	Indicates that during pre-charging, the voltage across the pre-charge MOS always exceeds the specified threshold. Power off and restart, then observe if the fault persists. Check if the wiring is correct and if the pre-charge MOS is damaged.
Harness Fault	Battery sensing harness poor contact or disconnected	Check wiring, restart the battery. If the problem persists after restarting, please contact the after-sales service center.
	Cell voltage sensing harness poor contact or disconnected	Check wiring, restart the battery. If the problem persists after restarting, please contact the after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
	Cell temperature sensing harness poor contact or disconnected	
	Dual-channel current comparison error too large, or current sensing harness loop abnormal	
	Dual-channel voltage comparison error too large or MCU vs. AFE voltage comparison error too large, or voltage sensing harness loop abnormal	
	Temperature sensing harness loop abnormal or poor contact/disconnected	
	Overvoltage level 5 or overtemperature level 5, tripping the three-terminal fuse	The three-terminal fuse is blown. Contact the after-sales service center to replace the main control board.
Relay or MOS Overtemperature	Relay or MOS overtemperature	This fault indicates the MOSFET temperature exceeds the specified threshold. Power off and let it sit for 2 hours for temperature recovery.

Fault Name	Fault Cause	Troubleshooting Recommendation
Shunt Overtemperature	Shunt overtemperature	This fault indicates the shunt temperature exceeds the specified threshold. Power off and let it sit for 2 hours for temperature recovery.
BMS1 Other Fault 1 (Residential Storage)	Relay or MOS open circuit	1. Upgrade software, power off and let it sit for 5 minutes, restart and see if the fault persists; 2. If it persists, replace the battery pack.
	Relay or MOS short circuit	1. Upgrade software, power off and let it sit for 5 minutes, restart and see if the fault persists; 2. If it persists, replace the battery pack.
	Communication abnormality between main and slave clusters or cell inconsistency between clusters	1. Check the slave unit's battery information and software version, and if the communication cable connection to the master unit is normal. 2. Upgrade software.
	Battery system loop harness abnormal, causing the interlock signal not to form a loop.	Check if the terminal resistor is installed correctly.
	BMS and PCS communication abnormal	1. Confirm if the communication cable interface definitions between the inverter and the connected battery are correct; 2. Please contact the after-sales service center to check backend data and observe if the inverter and battery software are correctly matched.

Fault Name	Fault Cause	Troubleshooting Recommendation
	BMS master and slave control communication harness abnormal	1. Check wiring, restart the battery; 2. Upgrade the battery firmware. If the problem persists after restarting, please contact the after-sales service center.
	Main negative chip communication loss	
	Circuit breaker, shunt trip abnormal	1. Power off and let it sit for 5 minutes, restart and see if the fault persists; 2. Observe if the communication pins on the PACK and PCU bottom blind-mate connectors are loose or bent;
	MCU self-test failure	Upgrade software, restart the battery. If the problem persists after restarting, please contact the after-sales service center.
	1. Software version too low or BMS board damaged 2. Large number of inverters in parallel, causing excessive inrush current during battery pre-charging.	1. Upgrade software, observe if the fault persists. 2. If in parallel operation, start the battery in black start mode first, then start the inverters.
	MCU internal fault	Upgrade software, restart the battery. This usually indicates MCU or external component damage. If the problem persists after restarting, please contact the after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
	Total control current exceeds specified threshold	1. Power off and let it sit for 5 minutes, restart and see if the fault persists; 2. Check if the inverter is set to a power level that exceeds the bus load capacity;
	Inconsistent cells in parallel clusters	Confirm if the cells in the parallel battery clusters are consistent.
	Reverse polarity connection of parallel cluster batteries	Check if the positive and negative terminals of the parallel cluster batteries are connected reversely.
	Severe overtemperature/overvoltage etc. triggering the fire protection system	Contact the after-sales service center.
Air Conditioner Failure	Air conditioner abnormal failure	Try restarting the system. If the fault is not resolved, please contact the after-sales service center.
	Cabinet door not closed	Check if the cabinet door is properly closed.
	Supply voltage too high	Confirm if the supply voltage meets the air conditioner input voltage requirements. Confirm compliance, then power on again.
	Insufficient supply voltage	
	No voltage input	
	Unstable supply voltage	
	Compressor voltage unstable	

Fault Name	Fault Cause	Troubleshooting Recommendation
	Sensor poor contact or damaged	Try restarting the system. If the fault is not resolved, please contact the after-sales service center.
	Air conditioner fan abnormal	
BMS1 Other Fault 2 (Residential Storage)	DCDC internal voltage or current abnormal	Refer to specific DC fault content.
	DCDC overload or heatsink overtemperature, etc.	
	Cell acquisition abnormal or inconsistent aging levels	Please contact the after-sales service center.
	Fan action not executed normally	Please contact the after-sales service center.
	Output terminal screw loose or poor contact	1. Power off the battery, check wiring and output terminal screw condition. 2. After confirmation, restart the battery, observe if the fault persists. If it exists, please contact the after-sales service center.
	Battery used for too long or cells severely damaged	Please contact the after-sales service center to replace the pack.

Fault Name	Fault Cause	Troubleshooting Recommendation
	1. Software version too low or BMS board damaged 2. Large number of inverters in parallel, causing excessive inrush current during battery pre-charging.	1. Upgrade software, observe if the fault persists. 2. If in parallel operation, start the battery in black start mode first, then start the inverters.
	Heating film damaged	Please contact the after-sales service center.
	Heating film three-terminal fuse blown, heating function unavailable	Please contact the after-sales service center.
	Software model, Cell Type, hardware model mismatch	Check if the software model, SN, Cell Type, and hardware model are consistent. If not, please contact the after-sales service center.
	Thermal management board communication wire break	1. Power off and let it sit for 5 minutes, restart and see if the fault persists; 2. If the fault does not recover, contact after-sales to replace the pack.
	Pack fan fault signal triggered	
DCDC Fault	Output port voltage too high	Check the output port voltage. If the output port voltage is normal and the fault does not clear itself after restarting the battery, please contact the after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
	DCDC module detects battery voltage exceeding maximum charging voltage	Stop charging, discharge to below 90% SOC or let it sit for 2 hours. If ineffective and the fault persists after restarting, please contact the after-sales service center.
	Heatsink overtemperature	Let the battery sit for 1 hour for heatsink temperature to drop. If ineffective and the fault persists after restarting, please contact the after-sales service center.
	Battery discharge current too high	Check if the load exceeds the battery's discharge capability. Turn off the load or stop PCS operation for 60s. If ineffective and the fault persists after restarting, please contact the after-sales service center.
	Output port power harness positive/negative reversed with parallel cluster battery or PCS	Turn off the battery manual switch, check if the output port wiring is correct, restart the battery.
	Output power relay cannot close	Check if the output port wiring is correct and if there is a short circuit. If ineffective and the fault persists after restarting, please contact the after-sales service center.
	Power device overtemperature	Let the battery sit for 1 hour for internal power device temperature to drop. If ineffective and the fault persists after restarting, please contact the after-sales service center.
	Relay welded/stuck	If the fault persists after restarting, please contact the after-sales service center.

Fault Name	Fault Cause	Troubleshooting Recommendation
Battery Rack Circulating Current Failure	1. Cell imbalance 2. First power-on without full charge calibration	Record the fault phenomenon, restart the battery, wait a few minutes, and confirm if the fault disappears. If the problem persists after restarting, please contact the after-sales service center.
BMS1 Other Fault 3 (Large-scale Storage)	Communication abnormal with linux module	1. Check if the communication cable link is normal. 2. Upgrade software, restart the battery and observe if the fault persists. If it exists, please contact the after-sales service center.
	Cell temperature rise too fast	Cell abnormal, contact after-sales to replace the pack.
	SOC below 10%	Charge the battery.
	SN writing does not comply with rules	Check if the SN digit count is normal. If abnormal, please contact the after-sales service center.
	1. Daisy-chain communication abnormal within battery cluster 2. Inconsistent cell aging levels between battery clusters	1. Check the pack contact condition within a single battery cluster. 2. Confirm the usage status of each cluster battery, such as cumulative charge/discharge capacity, cycle count, etc. 3. Please contact the after-sales service center.
	High humidity inside pack	-
	Fuse blown	Contact after-sales to replace the pack.
	Battery low charge	Charge the battery.
BMS1 Other Fault 4 (Large-scale Storage)	Circuit breaker abnormal	Contact after-sales to replace the pack.

Fault Name	Fault Cause	Troubleshooting Recommendation
	External device abnormal	Contact after-sales to replace the pack.
Contactor Failure 1	-	-
Contactor Failure 2	-	-
Overload Protection (Ksic)	Sustained overload (exceeding 690KVA) for 10s	Please contact the after-sales service center.
Overload Protection (Smart Port)	Sustained overload (exceeding 690KVA) for 10s	Please contact the after-sales service center.
Overcurrent Protection (Ksic)	-	-
Overcurrent Protection (Smart Port)	-	-
Master AC On Meter Comm Error	1. Possibly the meter is not connected to the master unit. 2. Possibly the meter communication cable is loose.	1. Check if the meter is connected to the master unit. 2. Check if the meter communication cable is loose.
Parallel Slave Meter Error	Meter connected to slave unit	Set the machine with the meter connected as the master unit.

Fault Name	Fault Cause	Troubleshooting Recommendation
Slave AC On Timeout with Master	1. Slave address setting error 2. Slave communication cable loose	1. Check if the slave addresses are duplicated. 2. Check if the parallel communication cable is loose.

8.5.2.2 Battery Fault

No.	Fault Name	Fault Cause	Fault Handling Suggestion
1	BMS1 RACK1 Total Voltage Too High Warning /BMS1 RACK1 Total voltage is too high warning	1. Battery system voltage is too high 2. Voltage acquisition line abnormal	1. Discharge the battery to see if the fault persists; 2. If the fault is not resolved, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
2	BMS1 RACK1 Total Voltage Too Low Warning /BMS1 RACK1 Total voltage is too low warning	1. Battery system voltage is too low 2. Voltage acquisition line abnormal	1. Charge the battery and let it rest to see if the fault persists; 2. Check the inverter's working status to see if it is not charging the battery due to issues like working mode. Try charging the battery via the inverter and observe if the fault is resolved. 3. If the fault is not resolved, contact the after-sales service center.
3	BMS1 RACK1 Cell Voltage Too High Warning /BMS1 RACK1 Cell voltage is too high warning	1. Single cell voltage is too high 2. Voltage acquisition line abnormal	1. Discharge the battery and let it rest to see if the fault persists; 2. If the fault is not resolved, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
4	BMS1 RACK1 Cell Voltage Too Low Warning /BMS1 RACK1 Cell voltage is too low warning	1. Single cell voltage is too low 2. Voltage acquisition line abnormal	1. Charge the battery and let it rest to see if the fault persists; 2. Check the inverter's working status to see if it is not charging the battery due to issues like working mode. Try charging the battery via the inverter and observe if the fault is resolved. 3. If the fault is not resolved, contact after-sales.
5	BMS1 RACK1 Charging Temperature Too High Warning /BMS1 RACK1 Charging temperature is too high warning	1. Ambient Overtemperature 2. Temperature sensor abnormal	1. Stop charging/discharging, let it rest to see if the fault persists; 2. If the fault is not resolved, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
6	BMS1 RACK1 Discharging Temperature Too High Warning /BMS1 RACK1 Discharging temperature is too high warning	1. Ambient Overtemperature 2. Temperature sensor abnormal	1. Stop charging/discharging, let it rest to see if the fault persists; 2. If the fault is not resolved, contact after-sales.
7	BMS1 RACK1 Charging Temperature Too Low Warning /BMS1 RACK1 Charging temperature is too low warning	1. Ambient temperature too low 2. Temperature sensor abnormal	1. Check the cell temperature in the background. If the minimum temperature is above -20°C, set the battery to discharge to raise the cell temperature. 2. If the temperature is below -20°C, turn off the battery and place it in a warm environment. Use it after the cell temperature rises. 3. If none of the above works, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
8	BMS1 RACK1 Discharging Temperature Too Low Warning/ BMS1 RACK1 Discharging temperature is too low warning	1. Ambient temperature too low 2. Temperature sensor abnormal	1. Check the cell temperature in the background. If the minimum temperature is above -20°C, set the battery to discharge to raise the cell temperature. 2. If the temperature is below -20°C, turn off the battery and place it in a warm environment. Use it after the cell temperature rises. 3. If none of the above works, contact the after-sales service center.
9	BMS1 RACK1 Charge Overcurrent Warning/ BMS1 RACK1 Charge overcurrent warning	1. Charging current too high, battery current limiting abnormal: sudden temperature and voltage changes 2. Inverter response abnormal	1. Stop charging, let it rest to see if the fault persists; 2. Check if the inverter is set to too high a power, causing it to exceed the battery's rated operating current; 3. If overcurrent persists, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
10	BMS1 RACK1 Discharge Overcurrent Warning/ BMS1 RACK1 Discharge overcurrent warning	1. Discharge current too high, battery current limiting abnormal: sudden temperature and voltage changes 2. Inverter response abnormal	1. Stop discharging, let it rest to see if the fault persists; 2. Check if the inverter is set to too high a power, causing it to exceed the battery's rated operating current; 3. If overcurrent persists, contact the after-sales service center.
11	BMS1 RACK1 Insulation Resistance Too Low Warning/ BMS1 RACK1 Insulation resistance is too low warning	Insulation resistance damaged or contact abnormal	Check if the ground wire is properly connected, restart the battery. If the problem persists after restarting, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
12	BMS1 RACK1 Cell Excessive Temperature Differentials Warning/ BMS1 RACK1 Cell excessive temperature differentials warning	1. In different stages of excessive temperature difference, the battery will limit the battery power, i.e., limit the charge/discharge current. Therefore, this problem is generally difficult to occur. 2. Cell capacity degradation leads to excessive internal resistance, causing large temperature rise during overcurrent, resulting in a large temperature difference. 3. Poor welding of cell tabs leads to rapid cell temperature rise during overcurrent. 4. Temperature sampling issue; 5. Power line connection loose	Power off, restart the battery, wait for 2 hours. If the problem is not resolved, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
13	BMS1 RACK1 Post Temperature Too High Warning/ BMS1 RACK1 Post temperature is too high warning	Post temperature too high	1. Stop charging/discharging, let it rest to see if the fault persists; 2. If the fault is not resolved, contact the after-sales service center.
14	BMS1 RACK1 Cell Excessive Voltage Differentials Warning/ BMS1 RACK1 Cell excessive voltage differentials warning	1. Inconsistent cell aging 2. Slave board chip issues can also cause excessive cell voltage differentials; 3. Slave board balancing issues can also cause excessive cell voltage differentials 4. Caused by wiring harness issues	1. Stop charging/discharging, let it rest to see if the fault persists; 2. If the fault is not resolved, contact the after-sales service center.
15	BMS1 RACK1 PCS Communication Loss Warning/ BMS1 RACK1 PCS communication loss warning	BMS and PCS communication abnormal	Check if the communication cable connection between the battery and the inverter is intact
16	BMS1 RACK1 DCDC Warning/ BMS1 RACK1 DCDC warning	DCDC internal voltage or current abnormal	Upgrade the software, restart the battery. If the problem persists after restarting, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
17	BMS1 RACK1 Heat Film MOS Adhesion Warning/ BMS1 RACK1 Heat film MOS adhesion warning	Heating film MOS damaged	Please contact the after-sales service center.
18	BMS1 RACK1 Heat Film MOS Open Warning/ BMS1 RACK1 Heat film MOS open warning	Heating circuit abnormal	Please contact the after-sales service center.
19	BMS1 RACK1 Total Voltage Too High Fault/ BMS1 RACK1 Total voltage is too high fault	1. Battery system voltage too high 2. Voltage acquisition line abnormal	1. Discharge the battery to see if the fault persists; 2. If the fault is not resolved, please contact the after-sales service center.
20	BMS1 RACK1 Total Voltage Too Low Fault/ BMS1 RACK1 Total voltage is too low fault	1. Battery system voltage too low 2. Voltage acquisition line abnormal	1. Charge the battery and let it rest to see if the fault persists; 2. Check the inverter's working status to see if it is not charging the battery due to issues like working mode. Try charging the battery via the inverter and observe if the fault is resolved. 3. If the fault is not resolved, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
21	BMS1 RACK1 Cell Voltage Too High Fault/ BMS1 RACK1 Cell voltage is too high fault	1. Single cell voltage too high 2. Voltage acquisition line abnormal	1. Discharge the battery and let it rest to see if the fault persists; 2. If the fault is not resolved, please contact the after-sales service center.
22	BMS1 RACK1 Cell Voltage Too Low Fault/ BMS1 RACK1 Cell voltage is too low fault	1. Single cell voltage too low 2. Voltage acquisition line abnormal	1. Charge the battery and let it rest to see if the fault persists; 2. Check the inverter's working status to see if it is not charging the battery due to issues like working mode. Try charging the battery via the inverter and observe if the fault is resolved. 3. If the fault is not resolved, please contact the after-sales service center.
23	BMS1 RACK1 Charging Temperature Too High Fault/ BMS1 RACK1 Charging temperature is too high fault	1. Ambient Overtemperature 2. Temperature sensor abnormal	1. Place the battery in a cool place, let it rest powered off for 30 minutes, restart and see if the fault persists; 2. If the fault persists, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
24	BMS1 RACK1 Discharging Temperature Too High Fault/ BMS1 RACK1 Discharging temperature is too high fault	1. Ambient Overtemperature 2. Temperature sensor abnormal	1. Place the battery in a cool place, let it rest powered off for 30 minutes, restart and see if the fault persists; 2. If the fault persists, please contact the after-sales service center.
25	BMS1 RACK1 Charging Temperature Too Low Fault/ BMS1 RACK1 Charging temperature is too low fault	1. Ambient temperature too low 2. Temperature sensor abnormal	1. Check the cell temperature in the background. If the minimum temperature is above -20°C, set the battery to discharge to raise the cell temperature. 2. If the temperature is below -20°C, turn off the battery and place it in a warm environment. Use it after the cell temperature rises. 3. If none of the above works, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
26	BMS1 RACK1 Discharging Temperature Too Low Fault BMS1 RACK1 Discharging temperature is too low fault	1. Ambient temperature too low 2. Temperature sensor abnormal	1. Check the cell temperature in the background. If the minimum temperature is above -20°C, set the battery to discharge to raise the cell temperature. 2. If the temperature is below -20°C, turn off the battery and place it in a warm environment. Use it after the cell temperature rises. 3. If none of the above works, contact the after-sales service center.
27	BMS1 RACK1 Charge Overcurrent Fault/ BMS1 RACK1 Charge overcurrent fault	1. Charging current too high, battery current limiting abnormal: sudden temperature and voltage changes 2. Inverter response abnormal	1. Let it rest powered off for 5 minutes, restart and see if the fault persists; 2. Check if the inverter is set to too high a power, causing it to exceed the battery's rated operating current; 3. If overcurrent persists, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
28	BMS1 RACK1 Discharge Overcurrent Fault/ BMS1 RACK1 Discharge overcurrent fault	1. Discharge current too high, battery current limiting abnormal: sudden temperature and voltage changes 2. Inverter response abnormal	1. Let it rest powered off for 5 minutes, restart and see if the fault persists; 2. Check if the inverter is set to too high a power, causing it to exceed the battery's rated operating current; 3. If overcurrent persists, contact the after-sales service center.
29	BMS1 RACK1 Insulation Resistance Too Low Fault/ BMS1 RACK1 Insulation resistance is too low fault	Insulation resistance damaged or contact abnormal	1. Check if the ground wire is properly connected, restart the battery, 2. Upgrade the software. If the problem persists, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
30	BMS1 RACK1 Cell Excessive Temperature Differentials Fault/ BMS1 RACK1 Cell excessive temperature differentials fault	1. In different stages of excessive temperature difference, the battery will limit the battery power, i.e., limit the charge/discharge current. Therefore, this problem is generally difficult to occur. 2. Cell capacity degradation leads to excessive internal resistance, causing large temperature rise during overcurrent, resulting in a large temperature difference. 3. Poor welding of cell tabs leads to rapid cell temperature rise during overcurrent. 4. Temperature sampling issue; 5. Power line connection loose	Power off, restart the battery, wait for 2 hours. If the problem is not resolved, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
31	BMS1 RACK1 Post Temperature Too High Fault/ BMS1 RACK1 Post temperature is too high fault	Post temperature too high	1. Let it rest powered off for 30 minutes, restart and see if the fault persists; 2. If the fault persists, please contact the after-sales service center.
32	BMS1 RACK1 Cell Excessive Voltage Differentials Fault/ BMS1 RACK1 Cell excessive voltage differentials fault	1. Inconsistent cell aging 2. Slave board chip issues can also cause excessive cell voltage differentials; 3. Slave board balancing issues can also cause excessive cell voltage differentials 4. Caused by wiring harness issues	Power off, restart the battery, wait for 2 hours. If the problem is not resolved, contact the after-sales service center.
33	BMS1 RACK1 Relay or MOS Short-Circuit Fault/ BMS1 RACK1 Relay or MOS short-circuit fault	MOS short-circuit	1. Upgrade the software, let it rest powered off for 5 minutes, restart and see if the fault persists; 2. If it persists, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
34	BMS1 RACK1 Relay or MOS Open-Circuit Fault/ BMS1 RACK1 Relay or MOS open-circuit fault	MOS open-circuit	1. Upgrade the software, let it rest powered off for 5 minutes, restart and see if the fault persists; 2. If it persists, contact the after-sales service center.
35	BMS1 RACK1 The Precharge Failed Fault/ BMS1 RACK1 The precharge failed fault	The voltage across the precharge MOS always exceeds the specified threshold,	1. Upgrade the software, let it rest powered off for 5 minutes, restart and see if the fault persists; 2. If it persists, contact the after-sales service center.
36	BMS1 RACK1 Acquisition Line Fault/ BMS1 RACK1 Acquisition line fault	Battery acquisition line poor contact or disconnected	Power off, check wiring, restack the battery. If the problem persists after restarting, please contact the after-sales service center.
37	BMS1 RACK1 Relay or MOS Temperature Too High Fault/ BMS1 RACK1 Relay or MOS temperature is too high fault	Relay or MOS overtemperature	1. Upgrade the software, let it rest powered off for 30 minutes, restart and see if the fault persists; 2. If it persists, contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
38	BMS1 RACK1 Diverter Temperature Too High Fault/ BMS1 RACK1 Diverter temperature is too high fault	Diverter overtemperature	1. Upgrade the software, let it rest powered off for 30 minutes, restart and see if the fault persists; 2. If it persists, contact the after-sales service center.
39	BMS1 RACK1 Slave MCU Communication Fault/ BMS1 RACK1 Slave MCU communication fault	Communication loss between master and slave chips	1. Check wiring, restart the battery, 2. Upgrade the battery. If the problem persists after restarting, please contact the after-sales service center.
40	BMS1 RACK1 BMU Communication Fault/ BMS1 RACK1 BMU communication fault	BMS master and slave control communication wiring harness abnormal	1. Check wiring, restart the battery, 2. Upgrade the battery. If the problem persists after restarting, please contact the after-sales service center.
41	BMS1 RACK1 Micro-Electronics Fault/ BMS1 RACK1 Micro-electronics fault	MCU internal fault	Upgrade the software, restart the battery. If the problem persists after restarting, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
42	BMS1 RACK1 Hardware Overcurrent Fault/ BMS1 RACK1 Hardware overcurrent fault	1. Software version too low or BMS board damaged 2. Large number of parallel inverters, causing excessive impact during battery precharge	1. Upgrade the software, observe if the fault persists. 2. In case of parallel inverters, start the battery with a black start first, then start the inverter.
43	BMS1 RACK1 Application Software Fault/ BMS1 RACK1 Application software fault	MCU self-test failed	Upgrade the software, restart the battery. If the problem persists after restarting, please contact the after-sales service center.
44	BMS1 RACK1 Parallel RACK Fault/ BMS1 RACK1 Parallel RACK fault	Communication abnormal between master and slave RACKs or cell inconsistency between RACKs	1. Check the slave battery information, software version, and whether the communication cable connection to the master is normal 2. Upgrade the software
45	BMS1 RACK1 DCDC Fault/ BMS1 RACK1 DCDC fault	DCDC overload or heatsink temperature too high, etc.	Upgrade the software, restart the battery. If the problem persists after restarting, please contact the after-sales service center.

No.	Fault Name	Fault Cause	Fault Handling Suggestion
46	BMS1 RACK1 Inconsistent Cell Fault BMS1 RACK1 Inconsistent cell fault	1. Cell identification abnormal 2. Different types of cells stacked together	Check the cell type
47	BMS1 RACK1 The Output Port Over Temperature Fault/ BMS1 RACK1 The output port over temperature fault	Output port screws loose or poor contact	1. Power off the battery, check wiring and output port screw condition 2. After confirmation, restart the battery, observe if the fault persists. If it exists, contact the after-sales service center.
48	BMS1 RACK1 SOH Too Low Fault/ BMS1 RACK1 SOH too low fault	Battery used for too long or cells severely damaged	Replace the pack
49	BMS1 RACK1 Heating Film MOS Three-Terminal Fault/ BMS1 RACK1 Heating film MOS Three-terminal fault	Heating film MOS damaged	Please contact the after-sales service center.

9 Technical Parameters

9.1 Inverter Parameters

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Battery Side			
Battery Type	$LiFePO_4$	$LiFePO_4$	$LiFePO_4$
Nominal Battery Voltage (V)	380	380	380
Battery Voltage Range (V)	350~550	350~550	350~550
Start-up Voltage (V)*1	380	380	380
Number of Battery Input	1	1	1
Max. Continuous Charging Current (A)	11.9	14.3	19.8
Max. Continuous Discharging Current (A)	8.7	10.5	14.5
Max. Charging Power (kW)	4.5	5.4	7.5
Max. Discharging Power (kW)	3.3	3.96	5.5
PV Side			
Max. Input Power (kW)	6	7.2	10

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Max. Input Voltage (V)*2	600	600	600
MPPT Operating Voltage Range (V)*3	40~560	40~560	40~560
MPPT Voltage Range at Nominal Power (V)	150~500	150~500	170~500
Start-up Voltage (V)	50	50	50
Nominal Input Voltage (V)	400	400	400
Max. MPPT Current (A)	20	20	20
Max. MPPT Short Circuit Current (A)	26	26	26
Max. Backfeed Current to The Array (A)	0	0	0
Number of MPPTs	2	2	2
Number of Strings per MPPT	1/1	1/1	1/1
AC Side (On-grid)			
Nominal Power (kW)	3	3.6	5
Nominal Apparent Power to Grid (kVA)	3	3.6	5
Max. Apparent Power to Grid (kVA)	3	3.6	5

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Nominal Apparent Power from Grid (kVA)	3	3.6	5
Max. Apparent Power from Grid (kVA)*4	6	7.2	10
Nominal Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Voltage Range (V)	170~280	170~280	170~280
Nominal Frequency (Hz)	50/60	50/60	50/60
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Max. Current to Grid (A)	13.7 at 220V 13.1 at 230V 12.5 at 240V	16.4 at 220V 15.7 at 230V 15 at 240V	22.8 at 220V 21.8 at 230V 20.9 at 240V
Max. Current From Grid (A)*4	27.3 at 220V 26.1 at 230V 25 at 240V	32.8 at 220V 31.4 at 230V 30 at 240V	45.5 at 220V 43.5 at 230V 41.7 at 240V
Nominal Current From Grid (A)	13.7 at 220V 13.1 at 230V 12.5 at 240V	16.4 at 220V 15.7 at 230V 15 at 240V	22.8 at 220V 21.8 at 230V 20.9 at 240V
Max. Output Fault Current (Peak and Duration) (A)	96 at 3μs	96 at 3μs	96 at 3μs
Inrush Current (Peak and Duration) (A)	96 at 3μs	96 at 3μs	96 at 3μs

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Nominal Current (A)	13.7 at 220V 13.1 at 230V 12.5 at 240V	16.4 at 220V 15.7 at 230V 15 at 240V	22.8 at 220V 21.8 at 230V 20.9 at 240V
Power Factor	~1 (Adjustable from 0.8 leading to 0.8 lagging)	~1 (Adjustable from 0.8 leading to 0.8 lagging)	~1 (Adjustable from 0.8 leading to 0.8 lagging)
THDi	<3%	<3%	<3%
Maximum Output Overcurrent Protection (A)	96	96	96
Type of Voltage	a.c.	a.c.	a.c.
Back-up Side			
Nominal Output Apparent Power (kVA)	3	3.6	5
Max. Output Apparent Power (kVA)	3.0 (6.0, 10s)	3.6 (7.2, 10s)	5.0 (10.0, 10s)
Max. Output Apparent Power (Bypass) (kVA)	6	7.2	10
Nominal Output Current (A)	13.7 at 220V 13.1 at 230V 12.5 at 240V	16.4 at 220V 15.7 at 230V 15 at 240V	22.8 at 220V 21.8 at 230V 20.9 at 240V
Max. Output Current (A)*5	13.7 at 220V 13.1 at 230V 12.5 at 240V	16.4 at 220V 15.7 at 230V 15 at 240V	22.8 at 220V 21.8 at 230V 20.9 at 240V
Max. Output Current (Bypass) (A)*5	27.3	32.8	45.5

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Max. Fault Current (Peak and Duration) (A)	96 at 3μs	96 at 3μs	96 at 3μs
Inrush Current (Peak and Duration) (A)	96 at 3μs	96 at 3μs	96 at 3μs
Max. Output Overcurrent Protection (A)	96	96	96
Nominal Output Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Nominal Output Frequency (Hz)	50/60	50/60	50/60
THDv (@Linear Load)	<3%	<3%	<3%
Efficiency			
Max. Efficiency	97.6%	97.6%	97.6%
European Efficiency	96.5%	96.5%	96.8%
Max. Battery to AC Efficiency	98.0%	98.0%	98.0%
Protection			
PV String Current Monitoring	Integrated	Integrated	Integrated
PV Insulation Resistance Detection	Integrated	Integrated	Integrated
Residual Current Monitoring	Integrated	Integrated	Integrated

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
PV Reverse Polarity Protection	Integrated	Integrated	Integrated
Battery Reverse Polarity Protection	Integrated	Integrated	Integrated
Anti-islanding Protection	Integrated	Integrated	Integrated
AC Overcurrent Protection	Integrated	Integrated	Integrated
AC Short Circuit Protection	Integrated	Integrated	Integrated
AC Overvoltage Protection	Integrated	Integrated	Integrated
DC Surge Protection	Type II	Type II	Type II
AC Surge Protection	Type II	Type II	Type II
RSD	Optional	Optional	Optional
AFCI	Integrated	Integrated	Integrated
Remote Shutdown	Integrated	Integrated	Integrated
General Data			
Operating Temperature Range (℃)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)
Operating Environment	Outdoor	Outdoor	Outdoor
Relative Humidity	0~95%	0~95%	0~95%

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Max. Operating Altitude (m)	4000 (>2000 derating)	4000 (>2000 derating)	4000 (>2000 derating)
Cooling Method	Natural convection	Natural convection	Natural convection
User Interface	LED, WLAN+APP	LED, WLAN+APP	LED, WLAN+APP
Communication with BMS	CAN	CAN	CAN
Communication	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth
Communication Protocols	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP
Weight (kg)	24	24	24
Dimension (W×H×D mm)	800*300*270	800*300*270	800*300*270
Noise Emission (dB)	≤30	≤30	≤30
Topology	Non-isolated	Non-isolated	Non-isolated
Power Self-consumption at Night (W)	≤10	≤10	≤10
Ingress Protection Rating	IP66	IP66	IP66
DC Connector	MC4	MC4	MC4
AC Connector	plug & play terminal	plug & play terminal	plug & play terminal
Environmental Category	4K4H	4K4H	4K4H

Technical Data	GW3K-EHA-G20	GW3.6K-EHA-G20	GW5K-EHA-G20
Pollution Degree	III （Outside of the inverter）	III （Outside of the inverter）	III （Outside of the inverter）
Overvoltage Category	DC II / AC III	DC II / AC III	DC II / AC III
Protective Class	I	I	I
Storage Temperature (℃)	-40~+70	-40~+70	-40~+70
Decisive Voltage Class (DVC)	Battery: A PV: C AC: C Com: A	Battery: A PV: C AC: C Com: A	Battery: A PV: C AC: C Com: A
Mounting Method	Wall/Floor Mounted	Wall/Floor Mounted	Wall/Floor Mounted
Active Anti-islanding Method	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD
Country of Manufacture	China	China	China
Certification			
Grid Standard	IEC/EN 61000-6-1/-2/-3/-4, IEC/EN 62920, CISPR 11, EN 55011, AS/NZS 61000.6.3/.4, AS 61000.6.4		
Safety Regulation	IEC62109-1/-2, IEC 63037		
EMC	IEC/EN 61000-6-1/-2/-3/-4		

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Battery Side				
Battery Type	$LiFePO_4$	$LiFePO_4$	$LiFePO_4$	$LiFePO_4$

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Nominal Battery Voltage (V)	380	380	380	380
Battery Voltage Range (V)	350~550	350~550	350~550	350~550
Start-up Voltage (V)*1	380	380	380	380
Number of Battery Input	1	1	1	1
Max. Continuous Charging Current (A)	23.7	31.6	35.6	35.6
Max. Continuous Discharging Current (A)	17.4	23.2	29	29
Max. Charging Power (kW)	9	12	13.5	13.5
Max. Discharging Power (kW)	6.6	8.8	11	11
PV Side				
Max. Input Power (kW)	12	16	20	20
Max. Input Voltage (V)*2	600	600	600	600

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
MPPT Operating Voltage Range (V)*3	40~560	40~560	40~560	40~560
MPPT Voltage Range at Nominal Power (V)	210~500	170~500	190~500	190~500
Start-up Voltage (V)	50	50	50	50
Nominal Input Voltage (V)	400	400	400	400
Max. MPPT Current (A)	20	20	20	20
Max. MPPT Short Circuit Current (A)	26	26	26	26
Max. Backfeed Current to The Array (A)	0	0	0	0
Number of MPPTs	2	4	4	4
Number of Strings per MPPT	1/1	1/1/1/1	1/1/1/1	1/1/1/1
AC Side (On-grid)				
Nominal Power (kW)	6	8	9.999	10

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Nominal Apparent Power to Grid (kVA)	6	8	9.999	10
Max. Apparent Power to Grid (kVA)	6	8	9.999	10
Nominal Apparent Power from Grid (kVA)	6	8	9.999	10
Max. Apparent Power from Grid (kVA)*4	12	14.5	14.5	14.5
Nominal Voltage (V)	220/230/240, L/N/PE	220/230/240, L/N/PE	220/230/240, L/N/PE	220/230/240, L/N/PE
Voltage Range (V)	170~280	170~280	170~280	170~280
Nominal Frequency (Hz)	50/60	50/60	50/60	50/60
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Max. Current to Grid (A)	27.3 at 220V 26.1 at 230V 25 at 240V	36.4 at 220V 34.8 at 230V 33.4 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V
Max. Current From Grid (A)*4	50 at 220V 50 at 230V 50 at 240V	63 at 220V 63 at 230V 60.5 at 240V	63 at 220V 63 at 230V 60.5 at 240V	63 at 220V 63 at 230V 60.5 at 240V

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Nominal Current From Grid (A)	27.3 at 220V 26.1 at 230V 25 at 240V	36.4 at 220V 34.8 at 230V 33.4 at 240V	45.5 at 220V 43.5 at 230V 41.7 at 240V	45.5 at 220V 43.5 at 230V 41.7 at 240V
Max. Output Fault Current (Peak and Duration) (A)	96 at 3μs	120 at 3μs	120 at 3μs	120 at 3μs
Inrush Current (Peak and Duration) (A)	96 at 3μs	120 at 3μs	120 at 3μs	120 at 3μs
Nominal Current (A)	27.3 at 220V 26.1 at 230V 25 at 240V	36.4 at 220V 34.8 at 230V 33.4 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V
Power Factor	~1 (Adjustable from 0.8 leading to 0.8 lagging)	~1 (Adjustable from 0.8 leading to 0.8 lagging)	~1 (Adjustable from 0.8 leading to 0.8 lagging)	~1 (Adjustable from 0.8 leading to 0.8 lagging)
THDi	<3%	<3%	<3%	<3%
Maximum Output Overcurrent Protection (A)	96	120	120	120
Type of Voltage	a.c.	a.c.	a.c.	a.c.
Back-up Side				
Nominal Output Apparent Power (kVA)	6	8	10	10

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Max. Output Apparent Power (kVA)	6.0(12.0, 10s)	8.0(16.0, 10s)	10.0(20.0, 10s)	10.0(20.0, 10s)
Max. Output Apparent Power (Bypass) (kVA)	12	14.5	14.5	14.5
Nominal Output Current (A)	27.3 at 220V 26.1 at 230V 25 at 240V	36.4 at 220V 34.8 at 230V 33.4 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V
Max. Output Current (A)*5	27.3 at 220V 26.1 at 230V 25 at 240V	36.4 at 220V 34.8 at 230V 33.4 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V	43.5 at 220V 43.5 at 230V 41.7 at 240V
Max. Output Current (Bypass) (A)*5	50	63	63	63
Max. Fault Current (Peak and Duration) (A)	96 at 3μs	120 at 3μs	120 at 3μs	120 at 3μs
Inrush Current (Peak and Duration) (A)	96 at 3μs	120 at 3μs	120 at 3μs	120 at 3μs
Max. Output Overcurrent Protection (A)	96	120	120	120
Nominal Output Voltage (V)	220/230/240, L/N/PE	220/230/240, L/N/PE	220/230/240, L/N/PE	220/230/240, L/N/PE

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Nominal Output Frequency (Hz)	50/60	50/60	50/60	50/60
THDv (@Linear Load)	<3%	<3%	<3%	<3%
Efficiency				
Max. Efficiency	97.6%	97.5%	97.5%	97.5%
European Efficiency	97.0%	96.8%	96.8%	96.8%
Max. Battery to AC Efficiency	98.0%	97.8%	97.8%	97.8%
Protection				
PV String Current Monitoring	Integrated	Integrated	Integrated	Integrated
PV Insulation Resistance Detection	Integrated	Integrated	Integrated	Integrated
Residual Current Monitoring	Integrated	Integrated	Integrated	Integrated
PV Reverse Polarity Protection	Integrated	Integrated	Integrated	Integrated
Battery Reverse Polarity Protection	Integrated	Integrated	Integrated	Integrated

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Anti-islanding Protection	Integrated	Integrated	Integrated	Integrated
AC Overcurrent Protection	Integrated	Integrated	Integrated	Integrated
AC Short Circuit Protection	Integrated	Integrated	Integrated	Integrated
AC Overvoltage Protection	Integrated	Integrated	Integrated	Integrated
DC Surge Protection	Type II	Type II	Type II	Type II
AC Surge Protection	Type II	Type II	Type II	Type II
RSD	Optional	Optional	Optional	Optional
AFCI	Integrated	Integrated	Integrated	Integrated
Remote Shutdown	Integrated	Integrated	Integrated	Integrated
General Data				
Operating Temperature Range (℃)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)
Operating Environment	Outdoor	Outdoor	Outdoor	Outdoor
Relative Humidity	0~95%	0~95%	0~95%	0~95%

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Max. Operating Altitude (m)	4000 (>2000 derating)	4000 (>2000 derating)	4000 (>2000 derating)	4000 (>2000 derating)
Cooling Method	Natural convection	Natural convection	Natural convection	Natural convection
User Interface	LED, WLAN+APP	LED, WLAN+APP	LED, WLAN+APP	LED, WLAN+APP
Communication with BMS	CAN	CAN	CAN	CAN
Communication	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth
Communication Protocols	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP
Weight (kg)	24	26	26	26
Dimension (W×H×D mm)	800*300*270	800*300*270	800*300*270	800*300*270
Noise Emission (dB)	≤30	≤35	≤35	≤35
Topology	Non-isolated	Non-isolated	Non-isolated	Non-isolated
Power Self-consumption at Night (W)	≤10	≤10	≤10	≤10
Ingress Protection Rating	IP66	IP66	IP66	IP66
DC Connector	MC4	MC4	MC4	MC4

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
AC Connector	plug & play terminal	plug & play terminal	plug & play terminal	plug & play terminal
Environmental Category	4K4H	4K4H	4K4H	4K4H
Pollution Degree	III （Outside of the inverter）	III （Outside of the inverter）	III （Outside of the inverter）	III （Outside of the inverter）
Overvoltage Category	DC II / AC III	DC II / AC III	DC II / AC III	DC II / AC III
Protective Class	I	I	I	I
Storage Temperature (℃)	-40~+70	-40~+70	-40~+70	-40~+70
Decisive Voltage Class (DVC)	Battery: A PV: C AC: C Com: A	Battery: A PV: C AC: C Com: A	Battery: A PV: C AC: C Com: A	Battery: A PV: C AC: C Com: A
Mounting Method	Wall/Floor Mounted	Wall/Floor Mounted	Wall/Floor Mounted	Wall/Floor Mounted
Active Anti-islanding Method	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD
Country of Manufacture	China	China	China	China
Certification				
Grid Standard	IEC/EN 61000-6-1/-2/-3/-4, IEC/EN 62920, CISPR 11, EN 55011, AS/NZS 61000.6.3/.4, AS 61000.6.4			

Technical Data	GW6K-EHA-G20	GW8K-EHA-G20	GW9.999K-EHA-G20	GW10K-EHA-G20
Safety Regulation	IEC62109-1/-2, IEC 63037			
EMC	IEC/EN 61000-6-1/-2/-3/-4			

*1: If there's no PV, start-up voltage will be 380V.
*2: When the input voltage is 560V-600V, the inverter will enter standby mode, and the voltage returns to 560V to enter the normal operation state.
*3: Please refer to the user manual for the MPPT Voltage Range at Nominal Power.
*4: GOODWE ESA series has internal bypass 63A passthrough ability to supprt whole home backup solution. If the customer don't want to do any breaker upgrade, the main breaker size in GoodWe commissioning APP can be set as previous breaker size.
*5: If the Back-up port is not used, select an appropriate circuit breaker based on the AC Max. Output Current.

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Battery Side			
Battery Type	Li-ion	Li-ion	Li-ion
Nominal Voltage (V)	380	380	380
Voltage Range (V)	350~550	350~550	350~550
Start-up Voltage (V)	380	380	380
Number of Battery Inputs	1	1	1
Max. Continuous Charging Current (A)	7.9	9.5	13.2

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Max. Continuous Discharging Current (A)	8.7	10.5	14.5
Max. Charging Power (kW)	3	3.6	5
Max. Discharging Power (kW)	3.3	3.96	5.5
Short-time withstand current (A)	980	980	980
AC Side (On-grid)			
Rated Power (kW)	3	3.6	5
Max. Power (kW)	3	3.6	5
Rated Apparent Power from Grid (kVA)	3	3.6	5
Rated Apparent Power to Grid (kVA)	3	3.6	5
Max. Apparent Power to Grid (kVA)	3	3.6	5
Max. Apparent Power from Grid (kVA)	6	7.2	10
Nominal Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Voltage Range (V)	170~280	170~280	170~280
Nominal Frequency (Hz)	50/60	50/60	50/60

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Rated Current From Grid (A)	13.7 @220V 13.1 @230V 12.5 @240V	16.4 @220V 15.7 @230V 15 @240V	22.8 @220V 21.8 @230V 20.9 @240V
Rated Current to Grid (A)	13.7 @220V 13.1 @230V 12.5 @240V	16.4 @220V 15.7 @230V 15 @240V	22.8 @220V 21.8 @230V 20.9 @240V
Max. Current From Grid (A)*1	27.3 @220V 26.1 @230V 25 @240V	32.8 @220V 31.4 @230V 30 @240V	45.5 @220V 43.5 @230V 41.7 @240V
Max. Current to Grid (A)	13.7 @220V 13.1 @230V 12.5 @240V	16.4 @220V 15.7 @230V 15 @240V	22.8 @220V 21.8 @230V 20.9 @240V
Max. Output Fault Current (Peak and Duration) (A)	96A@3μs	96A@3μs	96A@3μs
Inrush Current (Peak and Duration) (A)	96A@3μs	96A@3μs	96A@3μs
Power Factor	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging
THDi	<3%	<3%	<3%
Maximum Output Overcurrent Protection (A)	96	96	96
Type of Voltage	a.c.	a.c.	a.c.
Back-up Side			

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Rated Apparent Power (kVA)	3	3.6	5
Max. Apparent Power (kVA)	Off-grid: 3.0 (6.0, 10s) On-grid: 6	Off-grid: 3.6 (7.2, 10s) On-grid: 7.2	Off-grid: 5.0 (10.0, 10s) On-grid: 10
Nominal Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Nominal Frequency (Hz)	50/60	50/60	50/60
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Rated Current (A)	13.7 @220V 13.1 @230V 12.5 @240V	16.4 @220V 15.7 @230V 15 @240V	22.8 @220V 21.8 @230V 20.9 @240V
Max. Current (A)*2	Off-grid: 13.7 @220V 13.1 @230V 12.5 @240V On-grid: 27.3	Off-grid: 6.4 @220V 15.7 @230V 15 @240V On-grid: 32.8	Off-grid: 22.8 @220V 21.8 @230V 20.9 @240V On-grid: 45.5
Max. Fault Current (Peak and Duration) (A)	96A@3μs	96A@3μs	96A@3μs
Inrush Current (Peak and Duration) (A)	96A@3μs	96A@3μs	96A@3μs
Maximum Output Overcurrent Protection (A)	96	96	96
THDv (@Linear Load)	<3%	<3%	<3%

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
On/Off-grid Switching Time（ms）	<10	<10	<10
Efficiency			
Max. Battery to AC Efficiency	98.0%	98.0%	98.0%
Protection			
Residual Current Monitoring	Integrated	Integrated	Integrated
Battery Reverse Polarity Protection	Integrated	Integrated	Integrated
Anti-islanding Protection	Integrated	Integrated	Integrated
AC Overcurrent Protection	Integrated	Integrated	Integrated
AC Short Circuit Protection	Integrated	Integrated	Integrated
AC Overvoltage Protection	Integrated	Integrated	Integrated
AC Surge Protection	Type II	Type II	Type II
Remote Shutdown	Integrated	Integrated	Integrated
General Data			
Operating Temperature Range (℃)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)
Operating Environment	Outdoor	Outdoor	Outdoor

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Relative Humidity	0~95%	0~95%	0~95%
Max. Operating Altitude (m)	4000 (>2000 derating)	4000 (>2000 derating)	4000 (>2000 derating)
Cooling Method	Natural convection	Natural convection	Natural convection
User Interface	LED, WLAN+APP	LED, WLAN+APP	LED, WLAN+APP
Communication with BMS	CAN	CAN	CAN
Communication	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth
Communication Protocols	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP
Weight (kg)	16.9	16.9	16.9
Dimension (W×H×D mm)	800*300*270	800*300*270	800*300*270
Noise Emission (dB)	≤30	≤30	≤30
Topology	Non-isolated	Non-isolated	Non-isolated
Power Self-consumption at Night (W)	≤10	≤10	≤10
Ingress Protection Rating	IP66	IP66	IP66
AC Connector	VACONN Terminal	VACONN Terminal	VACONN Terminal
Environmental Category	4K4H	4K4H	4K4H

Technical Data	GW3K-BHA-G20	GW3.6K-BHA-G20	GW5K-BHA-G20
Pollution Degree	IV （Outside of the inverter）	IV （Outside of the inverter）	IV （Outside of the inverter）
Overvoltage Category	DC II / AC III	DC II / AC III	DC II / AC III
Protective Class	I	I	I
Storage Temperature (℃)	-40~+70	-40~+70	-40~+70
Decisive Voltage Class (DVC)	Battery: A AC: C Com: A	Battery: A AC: C Com: A	Battery: A AC: C Com: A
Mounting Method	Wall/Floor Mounted	Wall/Floor Mounted	Wall/Floor Mounted
Active Anti-islanding Method	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD
Country of Manufacture	China	China	China
Certification			
Grid Standard	Please refer to the official website		
Safety Regulation			
EMC			

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Battery Side			
Battery Type	Li-ion	Li-ion	Li-ion

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Nominal Voltage (V)	380	380	380
Voltage Range (V)	350~550	350~550	350~550
Start-up Voltage (V)	380	380	380
Number of Battery Inputs	1	1	1
Max. Continuous Charging Current (A)	15.8	21.1	26.4
Max. Continuous Discharging Current (A)	17.4	23.2	29
Max. Charging Power (kW)	6	8	9.999
Max. Discharging Power (kW)	6.6	8.8	11
Short-time withstand current (A)	980	980	980
AC Side (On-grid)			
Rated Power (kW)	6	8	9.999
Max. Power (kW)	6	8	9.999
Rated Apparent Power from Grid (kVA)	6	8	9.999
Rated Apparent Power to Grid (kVA)	6	8	9.999

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Max. Apparent Power to Grid (kVA)	6	8	9.999
Max. Apparent Power from Grid (kVA)	12	14.5	14.5
Nominal Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Voltage Range (V)	170~280	170~280	170~280
Nominal Frequency (Hz)	50/60	50/60	50/60
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Rated Current From Grid (A)	27.3 @220V 26.1 @230V 25 @240V	36.4 @220V 34.8 @230V 33.4 @240V	45.5 @220V 43.5 @230V 41.7 @240V
Rated Current to Grid (A)	27.3 @220V 26.1 @230V 25 @240V	36.4 @220V 34.8 @230V 33.4 @240V	43.5 @220V 43.5 @230V 41.7 @240V
Max. Current From Grid (A)*1	50 @220V 50 @230V 50 @240V	63 @220V 63 @230V 60.5 @240V	63 @220V 63 @230V 60.5 @240V
Max. Current to Grid (A)	27.3 @220V 26.1 @230V 25 @240V	36.4 @220V 34.8 @230V 33.4 @240V	43.5 @220V 43.5 @230V 41.7 @240V
Max. Output Fault Current (Peak and Duration) (A)	96A@3μs	120A@3μs	120A@3μs

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Inrush Current (Peak and Duration) (A)	96A@3μs	120A@3μs	120A@3μs
Power Factor	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging	0.8 leading ... 0.8 lagging
THDi	<3%	<3%	<3%
Maximum Output Overcurrent Protection (A)	96	120	120
Type of Voltage	a.c.	a.c.	a.c.
Back-up Side			
Rated Apparent Power (kVA)	6	8	10
Max. Apparent Power (kVA)	Off-grid: 6.0 (12.0, 10s) On-grid: 12	Off-grid: 8.0 (16.0, 10s) On-grid: 14.5	Off-grid: 10.0 (20.0, 10s) On-grid: 14.5
Nominal Voltage (V)	220/230/240，L/N/PE	220/230/240，L/N/PE	220/230/240，L/N/PE
Nominal Frequency (Hz)	50/60	50/60	50/60
Frequency Range (Hz)	45~55 / 55~65	45~55 / 55~65	45~55 / 55~65
Rated Current (A)	27.3 @220V 26.1 @230V 25 @240V	36.4 @220V 34.8 @230V 33.4 @240V	43.5 @220V 43.5 @230V 41.7 @240V

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Max. Current (A)*2	Off-grid: 27.3 @220V 26.1 @230V 25 @240V On-grid: 50	Off-grid: 36.4 @220V 34.8 @230V 33.4 @240V On-grid: 63	Off-grid: 43.5 @220V 43.5 @230V 41.7 @240V On-grid: 63
Max. Fault Current (Peak and Duration) (A)	96A@3μs	120A@3μs	120A@3μs
Inrush Current (Peak and Duration) (A)	96A@3μs	120A@3μs	120A@3μs
Maximum Output Overcurrent Protection (A)	96	120	120
THDv (@Linear Load)	<3%	<3%	<3%
On/Off-grid Switching Time（ms）	<10	<10	<10
Efficiency			
Max. Battery to AC Efficiency	98.0%	97.8%	97.8%
Protection			
Residual Current Monitoring	Integrated	Integrated	Integrated
Battery Reverse Polarity Protection	Integrated	Integrated	Integrated

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Anti-islanding Protection	Integrated	Integrated	Integrated
AC Overcurrent Protection	Integrated	Integrated	Integrated
AC Short Circuit Protection	Integrated	Integrated	Integrated
AC Overvoltage Protection	Integrated	Integrated	Integrated
AC Surge Protection	Type II	Type II	Type II
Remote Shutdown	Integrated	Integrated	Integrated
General Data			
Operating Temperature Range (℃)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)	-35~+60 (Derating at +40)
Operating Environment	Outdoor	Outdoor	Outdoor
Relative Humidity	0~95%	0~95%	0~95%
Max. Operating Altitude (m)	4000 (>2000 derating)	4000 (>2000 derating)	4000 (>2000 derating)
Cooling Method	Natural convection	Natural convection	Natural convection
User Interface	LED, WLAN+APP	LED, WLAN+APP	LED, WLAN+APP
Communication with BMS	CAN	CAN	CAN
Communication	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth	RS485, WiFI+LAN+Bluetooth

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Communication Protocols	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP	Modbus-RTU, Modbus-TCP
Weight (kg)	16.9	17.7	17.7
Dimension (W×H×D mm)	800*300*270	800*300*270	800*300*270
Noise Emission (dB)	≤30	≤35	≤35
Topology	Non-isolated	Non-isolated	Non-isolated
Power Self-consumption at Night (W)	≤10	≤10	≤10
Ingress Protection Rating	IP66	IP66	IP66
AC Connector	VACONN Terminal	VACONN Terminal	VACONN Terminal
Environmental Category	4K4H	4K4H	4K4H
Pollution Degree	IV （Outside of the inverter）	IV （Outside of the inverter）	IV （Outside of the inverter）
Overvoltage Category	DC II / AC III	DC II / AC III	DC II / AC III
Protective Class	I	I	I
Storage Temperature (℃)	-40~+70	-40~+70	-40~+70

Technical Data	GW6K-BHA-G20	GW8K-BHA-G20	GW9.999K-BHA-G20
Decisive Voltage Class (DVC)	Battery: A AC: C Com: A	Battery: A AC: C Com: A	Battery: A AC: C Com: A
Mounting Method	Wall/Floor Mounted	Wall/Floor Mounted	Wall/Floor Mounted
Active Anti-islanding Method	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD	SMS(Slip-mode frequency) +AFD
Country of Manufacture	China	China	China
Certification			
Grid Standard	Please refer to the official website		
Safety Regulation			
EMC			

Technical Data	GW10K-BHA-G20
Battery Side	
Battery Type	Li-ion
Nominal Voltage (V)	380
Voltage Range (V)	350~550
Start-up Voltage (V)	380
Number of Battery Inputs	1
Max. Continuous Charging Current (A)	26.4
Max. Continuous Discharging Current (A)	29

Technical Data	GW10K-BHA-G20
Max. Charging Power (kW)	10
Max. Discharging Power (kW)	11
Short-time withstand current (A)	980
AC Side (On-grid)	
Rated Power (kW)	10
Max. Power (kW)	10
Rated Apparent Power from Grid (kVA)	10
Rated Apparent Power to Grid (kVA)	10
Max. Apparent Power to Grid (kVA)	10
Max. Apparent Power from Grid (kVA)	14.5
Nominal Voltage (V)	220/230/240，L/N/PE
Voltage Range (V)	170~280
Nominal Frequency (Hz)	50/60
Frequency Range (Hz)	45~55 / 55~65
Rated Current From Grid (A)	45.5 @220V 43.5 @230V 41.7 @240V
Rated Current to Grid (A)	43.5 @220V 43.5 @230V 41.7 @240V
Max. Current From Grid (A)*1	63 @220V 63 @230V 60.5 @240V

Technical Data	GW10K-BHA-G20
Max. Current to Grid (A)	43.5 @220V 43.5 @230V 41.7 @240V
Max. Output Fault Current (Peak and Duration) (A)	120A@3μs
Inrush Current (Peak and Duration) (A)	120A@3μs
Power Factor	0.8 leading ... 0.8 lagging
THDi	<3%
Maximum Output Overcurrent Protection (A)	120
Type of Voltage	a.c.
Back-up Side	
Rated Apparent Power (kVA)	10
Max. Apparent Power (kVA)	Off-grid: 10.0 (20.0, 10s) On-grid: 14.5
Nominal Voltage (V)	220/230/240，L/N/PE
Nominal Frequency (Hz)	50/60
Frequency Range (Hz)	45~55 / 55~65
Rated Current (A)	43.5 @220V 43.5 @230V 41.7 @240V
Max. Current (A)*2	Off-grid: 43.5 @220V 43.5 @230V 41.7 @240V On-grid: 63

Technical Data	GW10K-BHA-G20
Max. Fault Current (Peak and Duration) (A)	120A@3μs
Inrush Current (Peak and Duration) (A)	120A@3μs
Maximum Output Overcurrent Protection (A)	120
THDv (@Linear Load)	<3%
On/Off-grid Switching Time（ms）	<10
Efficiency	
Max. Battery to AC Efficiency	97.8%
Protection	
Residual Current Monitoring	Integrated
Battery Reverse Polarity Protection	Integrated
Anti-islanding Protection	Integrated
AC Overcurrent Protection	Integrated
AC Short Circuit Protection	Integrated
AC Overvoltage Protection	Integrated
AC Surge Protection	Type II
Remote Shutdown	Integrated
General Data	
Operating Temperature Range (℃)	-35~+60 (Derating at +40)
Operating Environment	Outdoor
Relative Humidity	0~95%

Technical Data	GW10K-BHA-G20
Max. Operating Altitude (m)	4000 (>2000 derating)
Cooling Method	Natural convection
User Interface	LED, WLAN+APP
Communication with BMS	CAN
Communication	RS485, WiFI+LAN+Bluetooth
Communication Protocols	Modbus-RTU, Modbus-TCP
Weight (kg)	17.7
Dimension (W×H×D mm)	800*300*270
Noise Emission (dB)	≤35
Topology	Non-isolated
Power Self-consumption at Night (W)	≤10
Ingress Protection Rating	IP66
AC Connector	VACONN Terminal
Environmental Category	4K4H
Pollution Degree	IV （Outside of the inverter）
Overvoltage Category	DC II / AC III
Protective Class	I
Storage Temperature (℃)	-40~+70
Decisive Voltage Class (DVC)	Battery: A AC: C Com: A

Technical Data	GW10K-BHA-G20
Mounting Method	Wall/Floor Mounted
Active Anti-islanding Method	SMS(Slip-mode frequency) +AFD
Country of Manufacture	China
Certification	
Grid Standard	Please refer to the official website
Safety Regulation	
EMC	

*1: GOODWE ESA series has internal bypass 63A passthrough ability to supprt whole home backup solution. If the customer don't want to do any breaker upgrade, the main breaker size in GoodWe commissioning APP can be set as previous breaker size.
*2: The Max. Output Current in off-grid operation accounts for a three-phase maximum 150% unbalanced capability.

9.2 Battery Technical Data

Technical Data	GW5.1-BAT-D-G20	GW8.3-BAT-D-G20	GW5.1-BAT-D-G21	GW8.3-BAT-D-G21
Rated Energy (kWh)	5.12	8.32	5.12	8.32
Usable Energy (kWh)*1	5	8	5	8
Battery Type	LFP ($LiFePO_4$)			
Operating Voltage Range (V) (single phase system)	350~550			
Operating Voltage Range (V) (three phase system)	700~950			

Technical Data	GW5.1-BAT-D-G20	GW8.3-BAT-D-G20	GW5.1-BAT-D-G21	GW8.3-BAT-D-G21
Max. Input Current (System) (A)	12	19	12	19
Max. Output Current (System) (A)	13.2	21	13.2	21
Max. Input Power (System) (kW)*2	5	8	5	8
Max. Output Power (System) (kW)*2	5	8	5	8
Peak.Output Power (System) (kW)*2	7.5 @10s	12 @10s	7.5 @10s	12 @10s
Charging Temperature Range (°C)	-18~55		2~55	
Discharging Temperature Range (°C)	-20~55		-20~55	
Relative Humidity	5-95%			
Max. Operating Altitude (m)	4000			
Noise Emission (dB)	≤29			
Communication	CAN			
Weight (kg)	57.5±1	79±1	57.5±1	79±1
Dimensions (W×H×D mm)	800*326*270			
Optional Function Configuration	heating		/	
Ingress Protection	IP66			
Storage Temperature (℃)	-20 ~55			

Technical Data		GW5.1-BAT-D-G20	GW8.3-BAT-D-G20	GW5.1-BAT-D-G21	GW8.3-BAT-D-G21
Max. Storage time		12 months (-20℃~35℃)			
		6 months (35℃~45℃)			
Scalability		6 pcs			
Mounting Method		Floor stacked / Wall-mounted			
Cycle Life		≥6000 (25±2℃, 0.5C, 90%DOD, 70%EOL)			
Country of Manufacture		China			
Standard and Certification	Safety	IEC62619, IEC60730, EN62477，IEC63056，IEC62040，CE, CEC, VDE2510			
	EMC	CE, RCM			
	Transportation	UN38.3 ADR			

Technical Data	GW6.0-BAT-D-G20	GW9.0-BAT-D-G20
Battery Type	LFP (LiFePO4)	
Rated Capacity (Ah)	314Ah	
Rated Energy (kWh)	6	9
Usable Energy (kWh)*1	5.9	8.85
Nominal Voltage(V) (Battery)	19.2	28.8
Voltage Range(V) (Battery)	16.2~21.9	24.3~32.8
Operating Voltage Range (V) (single phase system)	350~550	
Operating Voltage Range (V) (three phase system)	700~950	
Max. Input Current (System) (A)	7.1	10.7

Technical Data		GW6.0-BAT-D-G20	GW9.0-BAT-D-G20
Max. Output Current (System) (A)		7.9	11.8
Max. Input Power (System) (kW)*2		3	4.5
Max. Output Power (System) (kW)*2		3	4.5
Peak Output Power (System) (kW)*2		4.5 (10s)	6.75 (10s)
Charging Temperature Range(℃)		-20~55	
Discharging Temperature Range (℃)		-20~55	
Relative Humidity		4-100%	
Max. Operating Altitude (m)		4000	
Noise Emission (dB)		≤27	
Communication		CAN&485	
Weight (kg)		61±1kg	77±1kg
Useable Extinguishing Agent		CO2, H2O	
Crucial Material		LiFePO4, C, Cu, LiPF6, Al, (C3H6)n	
Ingress Protection		IP66	
Protective Class		Ⅰ	
Dimensions (W×H×D mm)		800*326*270	
Function Configuration		Heating (Integrated); Aerosol fire extinguishing (Integrated)	
Storage Temperature (℃)		-20 ~55	
Max. Storage time		12 months (-20℃~35℃) 6 months (35℃~45℃)	
Scalability*3		12P	
Mounting Method		Floor stacked / Wall-mounted / Grounded	
Cycle Life		≥6000 （25±2℃ 0.5C 90%DOD 70%EOL）	
Country of Manufacture		China	
	Safety	IEC62619, IEC60730, EN62477, IEC63056, IEC62040, CE, CEC, Regulation 2023/1542 , VDE2510-50	

Technical Data		GW6.0-BAT-D-G20	GW9.0-BAT-D-G20
Standard and Certification	EMC	CE, RCM	
	Transportation	UN38.3 ADR	

*1: Test conditions, 100% DOD (cell 2.85~3.6V voltage range), 0.2P charge & discharge at 25±2 °C for battery system at the beginning of life. Usable energy is defined by its initial design value. Actual available energy may vary depending on charge/discharge rate, environmental conditions (e.g. temperature), transport and storage factors.
*2: Max. Input Power /Max. Output Power/Peak.Output Power derating will occur related to Temperature and SOC.
*3 For single-column stacked installations, the maximum number of parallel units is 6.

9.3 Smart Meter Technical Data

9.3.1 GMK110

Technical Parameters			GMK110
	Application		Single phase
Input Data	Voltage	Nominal Voltage (V)	220
		Voltage Range (V)	85~288
		Nominal Voltage Frequency (Hz)	50/60
	Current	CT Ratio	120A/40mA
		CT Quantity	1
Communication			RS485
Communication Distance (m)			1000
User Interface			2LED
Accuracy	Voltage/Current		Class I
	Active Energy		Class I
	Reactive Energy		Class II
Power Consumption (w)			<5

Technical Parameters		GMK110
Mechanical Parameters	Dimension (W×H×D mm)	19*85*67
	Weight (g)	50
	Mounting Method	Rail Installation
Environmental Parameters	Ingress Protection Rating	IP20
	Operating Temperature Range (℃)	-30~ 60
	Storage Temperature Range (℃)	-30~ 60
	Relative Humidity (Non-Condensing)	0~95%
	Max. Operating Altitude (m)	3000

9.3.2 GM330

technical parameter		GM330
Measurement Range	Supported Grid Types	Three-phase, split-phase, single-phase
	Voltage Range L-L (Vac)	172~817
	Voltage Range L-N (Vac)	100~472
	Nominal Frequency (Hz)	50/60
	CT ratio	nA:5A
Communication Parameters	Communication Method	RS485
	Communication Distance (m/ft)	1000/3280
Accuracy Parameters	Voltage/Current	Class 0.5
	Active Energy	Class 0.5
	Reactive Energy	Class 1
General Parameters	Dimensions (WxHxD mm/in)	72x85x72/2.83x3.35×2.83
	Housing	4 modules
	Weight (g/Ib)	240/0.53
	Mounting Method	DIN rail
	User Interface	4 LEDs, Reset Button
	Power Consumption (W)	≤5
	IP Rating	IP20

technical parameter		GM330
Environmental Parameters	Operating Temperature Range (℃/°F)	-30~+70/-22~+158
	Storage Temperature Range (℃/°F)	-30~70/-22~+158
	Relative Humidity (no condensation)	0~95%
	Max. Operating Altitude (m/ft)	3000/9842
Certification Parameters	Certificates	UL1741/ANSI

9.4 Smart Dongle Technical Data

9.4.1 WiFi/LAN Kit-20

Technical Parameters		WiFi/LAN Kit-20
Output Voltage (V)		5
Power Consumption (W)		<=2
Communication Port		USB
Communication Parameters	Ethernet	10M/100Mbps Self-adaptation
	Wireless	IEEE 802.11 b/g/n @2.4 GHz
	Bluetooth	Bluetooth V4.2 BR/EDR and Bluetooth LE Standard
Mechanical Parameters	Dimension (W×H×D mm)	48.3*159.5*32.1
	Weight (g)	82
	Ingress Protection Rating	IP65
	Mounting Method	USB Port Plugging and Unplugging
Operating Temperature Range (℃)		-30~+60
Storage Temperature Range (℃)		-40~+70
Relative Humidity		0-95%
Max. Operating Altitude (m)		4000

9.4.2 4G Kit-CN-G20

Product Model	4G Kit-CN-G20
Device Management	
Maximum Supported Number of Inverters	1
Power Parameter	
Input Voltage (V)	5
Power Consumption (W)	<=4
Interface Method	USB
Communication Parameters	
4G/3G/2G	LTE-FDD : B1/B3/B5/B8 LTE-TDD : B34/B39/B40/B41
GNSS Location	/
Bluetooth	Bluetooth V5.0
Mechanical Parameters	
Dimension (W×H×D mm)	48.3*95.5*32.1
Weight (g)	87
Indicator	LED* 2
Mounting Method	Plug and Play (PnP)
SIM Dimension	Micro sim,15mm*12mm
Environment Parameters	
Operating Temperature Range (℃)	-30~+65
Storage Temperature (℃)	-40~+70
Relative Humidity	0-100%
IP Grade	IP66
Max. Operating Altitude (m)	4000
Safe Service Life (Year)	5

10 Appendix

10.1 FAQ

10.1.1 How to Conduct Auxiliary Detection for Smart Meters/CT?

Meter detection function, which can detect whether the CT of the meter is connected correctly and the current operation status of the meter and CT.

- Approach 1:

1. Access the detection page through **Home** > **Settings** > **Electricity Meter/ CT** Auxiliary Detection.
2. Click "Start Detection" and wait for the detection to complete. Then, view the detection results.

- Approach 2:

1. Access the detection page through > **[System Setup]** > **[Quick Setting]** > **[Meter/CT Assisted Test]**.
2. Click "Start Detection" and wait for the detection to complete. Then, view the detection results.

10.1.2 How to Upgrade the Device Version

Through the firmware information, you can view or upgrade the DSP version, ARM version, BMS version, and smart dongle software version of the inverter. Some smart dongles do not support software version upgrade via SolarGo App, and the actual situation shall prevail.

- **Upgrade prompt:**

When the user opens the APP, an upgrade prompt will pop up on the homepage, and the user can choose whether to upgrade or not. If you choose to upgrade, you can complete the upgrade by following the prompts on the interface.

- **Regular upgrade:**

Access the firmware information viewing interface through "Home" > "Settings"

> "Firmware Information"
Click "Check for Updates". If there is a new version, complete the upgrade according to the prompts on the interface.

- **Forced Upgrade:**

The APP will push upgrade information, and users need to upgrade according to the prompts to continue using the app. You can complete the upgrade by following the prompts on the interface.

Inverter Software Version Upgrade

- To connect USB flash drive for local software upgrading.
- Before upgrading the device using a USB flash drive, please contact the after-sales service center to obtain the software upgrade package and upgrade method.

10.2 Explanation of Terms

- **Overvoltage Category Definition**
  - **Category I**: applies to equipment connected to a circuit where measures have been taken to reduce transient overvoltage to a low level.
  - **Category II**: applies to fixed downstream equipment. For example, appliances, portable tools and other plug-connected equipment; Voltage category III is used if there are special requirements for the reliability and suitability of such equipment.
  - Category II**I:** applies to fixed downstream equipment, including the main distribution board. For example, switchgear and other equipment in an industrial installation
  - Category **IV**: applies to the upstream equipment in the power supply of the distribution device, including measuring instruments and upstream over-current protection devices.
- **Definition of Types of Damp Places**

Environmental Parameters	Level		
	3K3	4K2	4K4H
Temperature Range	0~+40℃	-33~+40℃	-33~+40℃
Humidity Range	5% to 85%	5% to 85%	4% to 100%

- **Definition of Environmental Category:**
  - **Outdoor Inverter**: The ambient air temperature range is -25 to +60℃, and it is suitable for environments with pollution degree 3.
  - **Indoor Type II Inverter:** The ambient air temperature range is -25 to +40℃, and it is suitable for environments with pollution degree 3.
  - **Indoor Type I Inverter:** The ambient air temperature range is 0 to +40℃, and it is suitable for environments with pollution degree 2.
- **Definition of Pollution Degree Categories:**
  - **Pollution Degree 1**: No pollution or only dry non-conductive pollution.
  - **Pollution Degree 2:** In general, there is only non-conductive pollution, but the transient conductive pollution caused by occasional condensation must be taken into account.
  - **Pollution Degree 3:** There is conductive pollution, or the non-conductive pollution becomes conductive pollution due to condensation.
  - **Pollution Degree 4:** Persistent conductive pollution, such as pollution caused by conductive dust or rain and snow.

10.3 Battery SN Code Meaning

Bits 11-14 of the product SN code are the production time code.
The above picture has a production date of 2023-08-08

- The 11th and 12th digits represent the last two digits of the year of manufacture, e.g., 2023 is represented by 23.
- The 13th digit is the month of production, e.g., August is represented by 8; as follows:

Month	1~9	10	11	12
Month	1~9	A	B	C

- The 14th digit is the date of production, e.g., the 8th day is indicated by 8; priority is given to the use of numerical representation, e.g., 1~9 indicates the 1st~9th day, A indicates the 10th day, and so on. The letters I and O are not used to avoid confusion. The details are as follows:

Production Date	1	2	3	4	5	6	7	8	9
Code	1	2	3	4	5	6	7	8	9

Production Date	10	11	12	13	14	15	16	17	18
Code	A	B	C	D	E	F	G	H	J

Production Date	21	22	23	24	25	26	27	28	29
Code	M	N	P	Q	R	S	T	U	V

10.4 Safety Regulation Countries

No.	Regulation Name	No.	Regulation Name
Europe			
1	IT-CEI 0-21	56	IE-LV-72A
2	IT-CEI 0-16	57	IE-ESB-C&D(< 110kV)
3	DE LV with PV	58	IE-EirGrid-110kV
4	DE LV without PV	59	PT-D
5	DE-MV	60	EE
6	ES-A	61	NO
7	ES-B	62	FI-A
8	ES-C	63	FI-B
9	ES-D	64	FI-C
10	ES-island	65	FI-D
11	BE	66	UA-A1
12	FR-LV	67	UA-A2
13	FR-island-50Hz	68	EN 50549-1

No.	Regulation Name	No.	Regulation Name
14	FR-island-60Hz	69	EN 50549-2
15	type A-PL_V.1.1	70	DK-West-B-MVHV
16	type B-LV-PL_V.1.1	71	DK-East-B-MVHV
17	type C-PL_V.1.1	72	DK-West-C-MVHV
18	type D-PL_V.1.1	73	DK-East-C-MVHV
19	NL-16/20A	74	DK-West-D-MVHV
20	NL-A	75	DK-East-D-MVHV
21	NL-B	76	FR-Reunion
22	NL-C	77	BE-LV（>30kVA）
23	NL-D	78	BE-HV
24	SE-A	79	CH-B
25	SE MV	80	NI-G99-A
26	SK-A	81	NI-G99-B
27	SK-B	82	NI-G99-C
28	SK-C	83	NI-G99-D
29	HU	84	IE-LV-170kVA
30	CH-A	85	IE-MV&HV-200kVA
31	CY	86	DE-HV
32	GR	87	FR-MV
33	DK-West-A	88	CZ-A1/A2-09
34	DK-East-A	89	DE-EHV
35	DK-West-B	90	IE-EirGrid-400KV
36	DK-East-B	91	IE-EirGrid-220KV
37	AT < 1kV	92	IE-EirGrid-66KV
38	AT > 1kV	93	IE-ESB-B
39	BG	94	IE-ESB-D(≥110kV)
40	Czech	95	type B-MV-PL_V.1.1

No.	Regulation Name	No.	Regulation Name
41	CZ-A1-09	96	GB-G99-A HV
42	CZ-A2-09	97	GB-G99-B LV
43	CZ-B1/B2-09	98	GB-G99-C LV
44	CZ-C	99	UA-B
45	CZ-D	100	UA-C
46	RO-A	101	UA-D
47	RO-B	102	UK-G98
48	RO-D	103	UK-G99-A LV
49	GB-G98	104	UK-G99-B LV
50	GB-G99-A LV	105	UK-G99-C LV
51	GB-G99-B HV	106	CZ-A1
52	GB-G99-C HV	107	UK-A-MV
53	GB-G99-D	108	UK-B-MV
54	NI-G98	109	UK-C-MV
55	IE-LV-16/25A	-	-
Global			
1	60Hz-Default	6	IEC 61727-60Hz
2	50Hz-Default	7	Warehouse
3	127Vac-60Hz-Default	8	IEC61727-480Vac-60Hz
4	127Vac-50Hz-Default	9	IEC61727-480Vac-50Hz
5	IEC 61727-50Hz		
Americas			
1	Argentina-220V-LV	38	LUMAPR-2024-220Vac-3P
2	US-208Vac	39	LUMAPR-2024-240Vac-3P
3	US-240Vac	40	Cayman

No.	Regulation Name	No.	Regulation Name
4	Mexico-220Vac	41	Brazil-220Vac
5	Mexico-440Vac	42	Brazil-208Vac
6	US-480Vac	43	Brazil-230Vac
7	US-208Vac-3P	44	Brazil-240Vac
8	US-220Vac-3P	45	Brazil-254Vac
9	US-240Vac-3P	46	Brazil-127Vac
10	US-CA-208Vac	47	Brazil-ONS
11	US-CA-240Vac	48	Barbados
12	US-CA-480Vac	49	Chile-BT
13	US-CA-208Vac-3P	50	Chile-MT-A
14	US-CA-220Vac-3P	51	Chile MT-B
15	US-CA-240Vac-3P	52	Colombia
16	US-HI-208Vac	53	Colombia<0.25MW-208Vac-1P
17	US-HI-240Vac	54	Colombia<0.25MW-120Vac-3P
18	US-HI-480Vac	55	IEEE 1547-208Vac
19	US-HI-208Vac-3P	56	IEEE 1547-220Vac
20	US-HI-220Vac-3P	57	IEEE 1547-240Vac
21	US-HI-240Vac-3P	58	IEEE 1547-230Vac
22	US-Kauai-208Vac	59	Colombia<0.25MW-127Vac-3P
23	US-Kauai-240Vac	60	Colombia>5MW
24	US-Kauai-480Vac	61	Mexico-127V
25	US-Kauai-208Vac-3P	62	Mexico-240V
26	US-Kauai-220Vac-3P	63	US-O&R-208Vac
27	US-Kauai-240Vac-3P	64	US-O&R-240Vac
28	US-ISO-NE-208Vac	65	US-O&R-480Vac
29	US-ISO-NE-240Vac	66	US-O&R-208Vac-3P
30	US-ISO-NE-480Vac	67	US-O&R-220Vac-3P

No.	Regulation Name	No.	Regulation Name
31	US-ISO-NE-208Vac-3P	68	US-O&R-240Vac-3P
32	US-ISO-NE-220Vac-3P	69	Brazil-277Vac
33	US-ISO-NE-240Vac-3P	70	Chile-BT ≤9MW
34	LUMAPR-2024-208Vac	71	Chile-MT ≤9MW
35	LUMAPR-2024-240Vac	72	Chile > 9MW
36	LUMAPR-2024-480Vac	73	Mexico-277Vac
37	LUMAPR-2024-208Vac-3P		
Oceania			
1	Australia-A	4	Newzealand
2	Australia-B	5	Newzealand:2015
3	Australia-C	6	NZ-GreenGrid
Asia			
1	China A	33	Israel-MV
2	China B	34	Israel-HV
3	China Higher Voltage	35	Vietnam
4	China Highest Voltage	36	Malaysia-LV
5	China Power Station	37	Malaysia-MV
6	China Shandong	38	DEWA-LV
7	China Hebei	39	DEWA-MV
8	China PCS	40	Saudi Arabia-220V-LV
9	Taiwan	41	JP-690Vac-50Hz
10	Hong Kong	42	JP-690Vac-60Hz
11	China Northeast	43	Srilanka-MV/HV
12	Thailand-MEA	44	IEC 61727-127Vac-50Hz
13	Thailand-PEA	45	IEC 61727-127Vac-60Hz
14	Mauritius	46	JP-550Vac-50Hz
15	Korea	47	JP-550Vac-60Hz

No.	Regulation Name	No.	Regulation Name
16	India	48	India-Higher
17	India-CEA	49	JP-220Vac-50Hz
18	Pakistan	50	JP-220Vac-60Hz
19	Philippines	51	Saudi Arabia-127V-LV
20	Philippines-127Vac	52	Srilanka-LV >1MW
21	JP-200Vac-50Hz	53	China-YN
22	JP-200Vac-60Hz	54	GB/T 29319-LV
23	JP-440Vac-50Hz	55	GB/T 29319-MV
24	JP-440Vac-60Hz	56	Philippines -277Vac
25	JP-420Vac-50Hz	57	JP-360Vac-50Hz
26	JP-420Vac-60Hz	58	JP-360Vac-60Hz
27	JP-480Vac-50Hz	59	JP-320Vac-50Hz
28	JP-480Vac-60Hz	60	JP-320Vac-60Hz
29	Srilanka-LV<1MW	61	JP-340Vac-50Hz
30	Singapore	62	JP-340Vac-60Hz
31	Israel-OG	63	JP-380Vac-50Hz
32	Israel-LV	64	JP-380Vac-60Hz
Africa			
1	Mauritius	5	Ghana-LV
2	South Africa-LV	6	Ghana-HV
3	South Africa-B-MV	7	South Africa-A3-LV
4	South Africa-C-MV	8	Nigeria

10.5 Australia Safety Regulations

For the Australian market, to comply with AS/NZS 4777.2:2020, please select from Australia A, Australia B, Australia C, or New Zealand. Please contact your local electricity grid operator on which Region to select.

Selecting a Region B should then automatically load all region B setpoints for volt-watt, volt-var, underfrequency, overfrequency, etc.

Volt–var response set-point values

Region	Default value	U1	U2	U3	U4
Australia A	Voltage	207V	220V	240V	258V
	Inverter reactive power level (Q) % of S_{rated}	44 % supplying	0%	0%	60 % absorbing
Australia B	Voltage	205V	220V	235V	255V
	Inverter reactive power level (Q) % of S_{rated}	30 % supplying	0%	0%	40 % absorbing
Australia C	Voltage	215V	230V	240V	255V
	Inverter reactive power level (Q) % of S_{rated}	44 % supplying	0%	0%	60 % absorbing
New Zealand	Voltage	207V	220V	235V	244 V
	Inverter reactive power level (Q) % of S_{rated}	60 % supplying	0%	0%	60 % absorbing
Allowed range	Voltage	180 to 230 V	180 to 230 V	230 to 265 V	230 to 265 V
	Inverter reactive power level (Q) % of S_{rated}	30 to 60 % supplying	0%	0%	30 to 60 % absorbing

NOTE 1: Inverters may operate at a reactive power level with a range up to 100 % supplying or absorbing.
NOTE 2: Australia C parameter set is intended for application in isolated or remote power systems.

Volt–watt response default set-point values

Region	Default value	U3	U4
Australia A	Voltage	253V	260V
	Inverter maximum active power output level (P) % of S_{rated}	100%	20%
Australia B	Voltage	250V	260V
	Inverter maximum active power output level (P) % of S_{rated}	100%	20%
Australia C	Voltage	253V	260V
	Inverter maximum active power output level (P) % of S_{rated}	100%	20%
New Zealand	Voltage	242 V	250V
	Inverter maximum active power output level (P) % of S_{rated}	100%	20%
Allowed range	Voltage	235 to 255 V	240 to 265 V
	Inverter maximum active power output level (P) % of S_{rated}	100%	20%

NOTE: Australia C parameter set is intended for application in isolated or remote power systems.

Passive anti-islanding voltage limit values

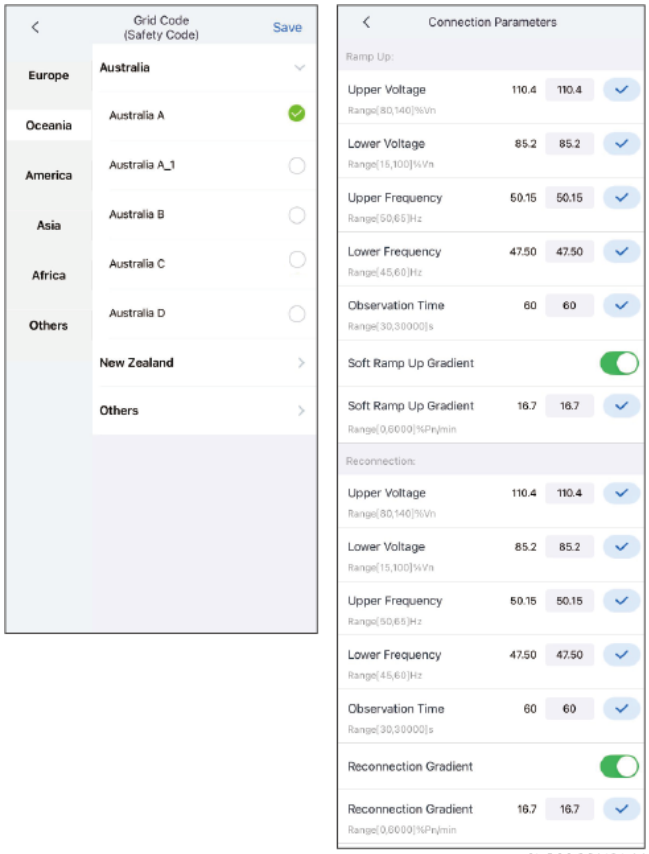
Protective function	Protective function limit	Trip delay time	Maximum disconnection time
Undervoltage 2 (V < <)	70 V	1 s	2 s
Undervoltage 1 (V <)	180 V	10 s	11 s

Protective function	Protective function limit	Trip delay time	Maximum disconnection time
Overvoltage 1 (V >)	265 V	1 s	2 s
Overvoltage 2 (V > >)	275V	-	0.2 s

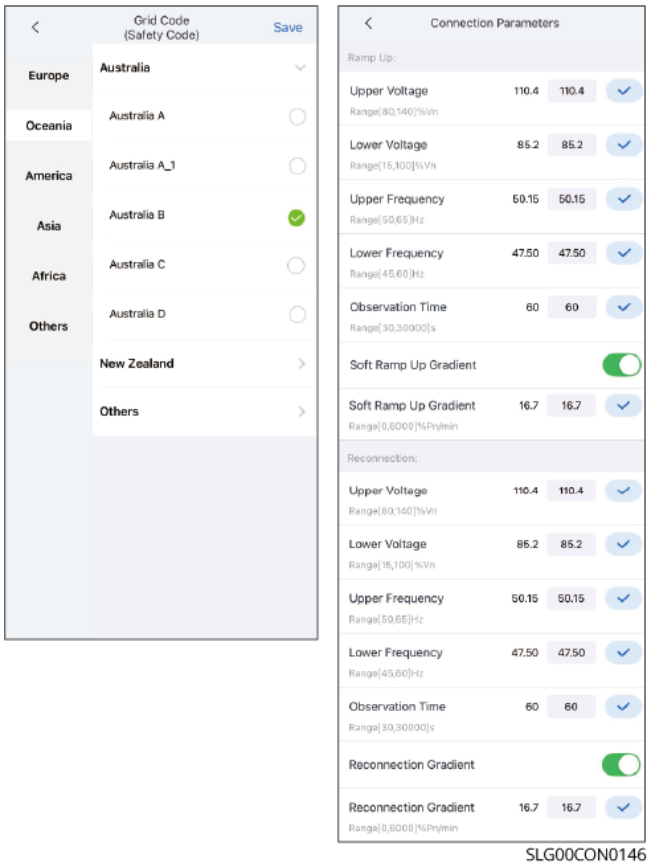
Upper connection and reconnection frequency (f_{URF})

Region	f_{URF}
Australia A	50.15 Hz
Australia B	50.15 Hz
Australia C	50.50 Hz
New Zealand	50.15 Hz

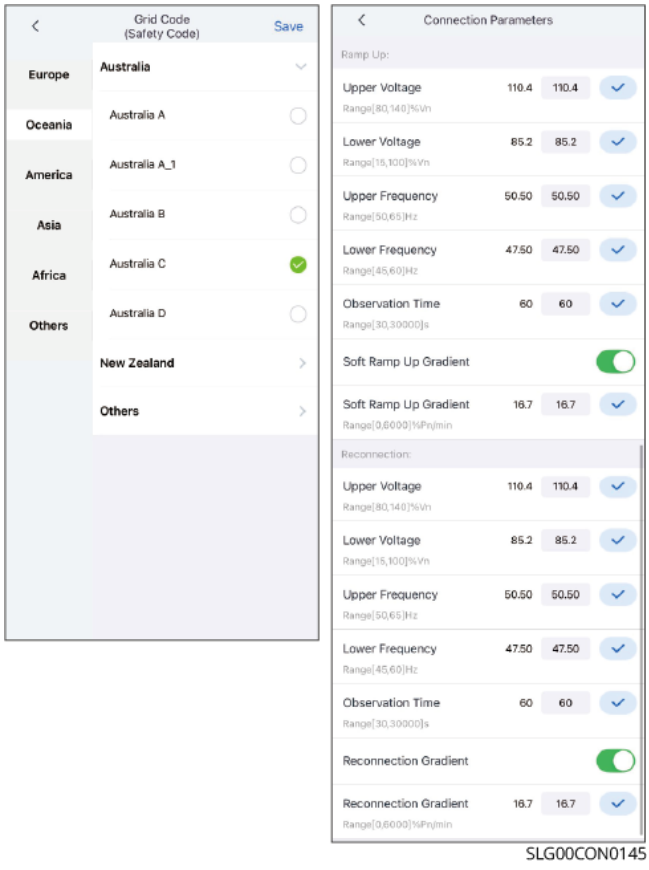
Setting steps:
Step 1: Set the safety code to Australia A/B/C/New Zealand on Quick Settigs page based on actual needs.
Step 2: Set the frequency parameters accordingly.



SLG00CON0144



SLG00CON0146



SLG00CON0145

Contact Information

GoodWe Technologies Co., Ltd.
No. 90 Zijin Road, High-tech Zone, Suzhou, China
400-998-1212
www.goodwe.com
service@goodwe.com