

INSTALLATION, OPERATION &
MAINTENANCE MANUAL

***E3.68KS-D22 / E5KS-D22/
E6KS-D22 Series***

ENERGY STORAGE SYSTEM

Table of Contents

1 ABOUT THIS MANUAL	6
1.1 Purpose.....	6
1.2 Intended Audience	6
1.3 Conventions	7
1.4 Change History	7
2 SAFETY INSTRUCTIONS.....	8
2.1 Limitation of Liability.....	8
2.2 Safety Symbols and certification Marks	9
2.3 Battery Safety.....	10
2.4 Before Installation	13
2.5 Installation Safety	15
2.6 Operation Safety	17
2.7 Maintenance Safety	19
2.8 Disposal Safety	20
3 SYSTEM INTRODUCTION.....	21
3.1 Product Overview.....	21
3.2 Model	23
3.3 System Topology	23
3.4 Operating Modes	25
3.5 Supported Grid Types.....	28
4 PRODUCT APPEARANCE	29
4.1 Inverter Appearance	29
4.2 Battery Pack Appearance	31
4.3 LED Indicators	32
4.4 Packing List.....	33
4.5 Storage Requirements	34
5 MECHANICAL INSTALLATION	37
5.1 Location Requirements	37
5.2 Installation Tools & Required Cables.....	39
5.3 Handling of Equipment.....	40
5.4 Installation equipment.....	42
6 SYSTEM WIRINGS	50
6.1 Electrical Connection	51
6.2 PE Cable Connection	53
6.3 DC (MPPT) connection.....	55

6.4 Hybrid Inverter Expansion Overview	57
6.5 AC Connection (Grid & EPS).....	59
6.6 CT/Meter Connection.....	60
6.7 DRM Connection	63
7 SYSTEM COMMISSIONING	64
7.1 Pre-power Check	64
7.2 Power ON Procedure.....	65
7.3 Install Protective Covers	66
7.4 App Commissioning	67
7.5 Download APP	68
7.6 Registration and Login	68
7.7 Binding End User - Operator User Account	69
7.8 Create Power Station.....	71
7.9 Add Device.....	72
7.10 Power Station.....	79
7.11 Alarms.....	88
7.12 Finding Third-party binding code	88
7.13 Preference Settings	89
7.14 Bind Distributor	89
7.15 System Operation	90
8 OPERATION & MAINTENANCE	98
8.1 Inspection Checklist for Users	98
8.2 Inspection Checklist for Professional Personnel.....	99
8.3 Troubleshooting	99
9 TECHNICAL DATA.....	110
9.1 Hybrid Inverter.....	110
9.2 Battery Terminal Input /Output	111
9.3 PV Input.....	111
9.4 Grid Terminal Input / Output	112
9.5 EPS Load Terminal Output	112
9.6 Battery Pack	113
10 QUALITY ASSURANCE	114
11 ABBREVIATIONS	115
12 APPENDIX: DEFINITION OF DVC	116

Legal Statement

© Shenzhen KSTAR New Energy Company Limited. 2024. All rights reserved.

All material appearing on this manual (“content”) is the property of Shenzhen KSTAR New Energy Company Limited (“KSTAR New Energy”). Distributing, copying, or forwarding any content to a third party or uploading any content to third-party platforms (such as publicly accessible websites) without prior permission of KSTAR New Energy is expressly prohibited.

Trademarks and Permissions

KSTAR and other KSTAR trademarks used in this manual are owned by Shenzhen KSTAR New Energy Company Limited.

All other trademarks or registered trademarks are the property of their respective owners.

Software License

KSTAR New Energy reserves all rights to the firmware and software. You may not use any of the data in the firmware or software for commercial purposes in any way.

Reverse engineering, decompiling, disassembling, adapting, implanting, or other derivative operations on the equipment are prohibited, as are researching the design and implementation of the equipment, obtaining the source code, infringing on intellectual property rights in any way, and disclosing the results of any performance tests.

Disclaimer

Before transporting, storing, installing, using, and/or maintaining the equipment, read this manual, adhere strictly to its prescriptions, and pay attention to the labels on the equipment. In this manual,

- “Equipment” refers to the hardware products, firmware, software, components, spare parts, and/or services to which this manual relates.
- “You” or “your” refers to an individual or a legal entity transporting, storing, installing, using, and/or maintaining the equipment.

In addition to paying proper attention to content in this manual labelled DANGER, WARNING, CAUTION, and NOTICE, you shall comply with relevant international, national, or regional standards, and industry practices. KSTAR New Energy shall not be liable for any damages resulting from violations of safety requirements or safety standards for the design, manufacturing, and use of the equipment.

KSTAR New Energy is not responsible for damage, personal injuries, death, and/or loss of or damage to property caused by use outside the scope of the conditions, technical specifications, or instructions provided in this manual.

Transport, storage, installation, use, maintenance, and all other operations shall comply with applicable laws and regulations, standards, and specifications.

KSTAR New Energy shall bear no liability in any of the following circumstances:

- The equipment is damaged due to earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars or armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, or other force majeure events.
- The equipment is used outside the scope of the conditions, technical specifications, or instructions provided in this manual.
- Installation and/or use do not comply with relevant international, national, or regional standards or regulations.
- The equipment is installed or operated by unqualified personnel.
- The equipment is operated in a manner not in accordance with the prescriptions of the instruction manual and safety labels.
- The equipment and/or software code is disassembled and/or modified without the permission of KSTAR New Energy.
- The equipment is damaged while being transported by you or a third party commissioned by you.
- The equipment is stored in conditions that do not meet the standards specified in this manual.
- In the course of operating or maintaining the equipment, you use your own materials and tools that do not meet the requirements of local laws, regulations, and standards.
- Damage is caused by you or a third party through negligence, willful misconduct, gross negligence, or mishandling, or for other reasons not attributable to KSTAR New Energy.

1 About This Manual

This manual contains important information on the transport, storage, installation, use, and maintenance of the equipment. Read this manual carefully before operation. You must use the equipment strictly in accordance with the instructions in this manual to prevent damage or loss to the equipment, persons, and/or property. Keep this manual for future reference.

1.1 Purpose

This manual is intended as:

- An introduction to a single -phase hybrid inverter (the E3.68KS-D22/E5KS-D22/ E6KS-D22), and the BP48100P (F)1A-G2 lithium-ion battery pack.
- An installation and maintenance guide for qualified personnel and technicians working with the hybrid inverters.
- An operating guide for qualified personnel, technicians, and users of the energy management system (EMS) integrated in the hybrid inverter.

This manual does not include information on all the components in a photovoltaic system. For more information, visit www.KSTAR.com or the websites of the component manufacturers.

1.2 Intended Audience

The intended audience of this manual is:

- The qualified professional personnel and technicians who install, operate, and maintain residential photovoltaic Hybrid Inverter that include an E3.68KS-D22/E5KS-D22/ E6KS-D22 hybrid inverter, and/or the BP48100P (F)A-G2 battery pack.
- Users who need to view inverter parameters.
- System integration solution providers.

1.3 Conventions

The following symbols are used in this manual to highlight important information.

 DANGER	Indicates a hazardous situation that, if not avoided, will result in death or severe injury.
 WARNING	Indicates a hazardous situation that, if not avoided, could result in death or severe injury.
 CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information that is considered important but is not hazard related, typically used for activities that result in property damage, but no personal injury.
	Indicates an important tip that leads to the best results, but not safety or damage related.

1.4 Change History

Here is the change history of this manual.

Version	Date	Changes
1.0	2026-04	• Initial release.
1.1	2026-05	• Update system installation procedures and data logger interface instructions
1.2	2026-06	• Add dual-tower installation solution and battery capacity expansion information

2 Safety Instructions

All the safety instructions in this section help you transport, store, install, use, and maintain the equipment safely, so be sure to read and follow them. In addition to these safety instructions, you must comply with the requirements of international, national, or regional standards and regulations, and you are encouraged to follow industry best practices.

The equipment must be transported, installed, and maintained by trained professionals who fully understand how the equipment works, have sufficient training and experience in operating the equipment, and know the possible dangers and their levels. Trained personnel are those who have received relevant technical and safety training and have relevant experience. They know the possible dangers they may face when operating the equipment and how to take steps to minimize the dangers to themselves and others.

2.1 Limitation of Liability

KSTAR New Energy is not responsible, directly or indirectly, for any damage to the equipment or loss of property caused by the following:

- Disassembling and/or modifying the equipment, replacing parts, or modifying the software code without the permission of the manufacturer.
- Altering, repairing, and erasing serial numbers or seals by technicians not certified by the manufacturer.
- Installation and/or operation of the equipment by unqualified personnel.
- Installing the inverter in any way that does not comply with standards or regulations.
- Failure to comply with local safety regulations. For example, in Germany, equipment must comply with VDE certification and in Australia it must comply with SAA certification.
- Operation of the equipment in an environment with insufficient ventilation.
- Use not in accordance with the instruction manual, technical specifications, and/or any other instruction provided.
- Use of your own materials and tools that do not meet the requirements of local laws, regulations, and standards.
- Failure to follow standard maintenance procedures.
- Earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, or other force majeure events.

Additionally, KSTAR New Energy is not responsible, directly or indirectly, for:

- Damage sustained during transportation, including paint scratches caused by friction inside the package during transportation, and damage sustained while being transported by you or a third party commissioned by you. You must file claims with the shipping or insurance company when the container and/or the package is unloaded and the damage is confirmed.
- Any other damage caused by you or a third party through negligence, willful misconduct, or mishandling, or for other reasons not attributable to KSTAR New Energy.

2.2 Safety Symbols and certification Marks

The warning signs and nameplates attached to the equipment contain important information to guide you in safe use of the equipment. DO NOT remove, obscure, or damage these signs. Make sure that these signs are always intact and fixed in their correct positions. If a warning sign is damaged, contact the manufacturer and have it replaced immediately by certified technicians.

You can see these warning signs attached to the equipment.

	Indicates a hazardous situation that, if not avoided, can result in death or severe injury!
	Indicates that the inverter should NOT be touched or used for at least five minutes after it is turned off or disconnected, in order to prevent electric shock or personal injury.
	Indicates a hot surface. Contact can cause burns.
	Indicates that you should read the user manual for instructions.
	Operate the equipment properly to avoid explosion
	Batteries contain flammable materials, beware of fire.
	Grounding point
	Keep away from children
	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.
	CE Mark
	TUV Mark
	RCM Mark

WARNING

After the equipment is unpacked,

- Check all the warning signs and nameplates on the equipment.
- If you find any damages to the warning signs and/or nameplates on the equipment, contact the manufacturer immediately and **DO NOT** install the equipment.

WARNING

Before disposal, make sure that all warning signs and nameplates are clearly visible and are not removed or obscured.

WARNING

When you instruct others in use of the equipment, and maintain and/or repair the equipment, follow these instructions to prevent inappropriate use or accidents caused by uninvolved persons:

- Place clear signs at the front and rear-level switches to prevent accidents caused by inappropriate switching.
- Place a warning sign or safety caution tape around the operating area.

2.3 Battery Safety

A rechargeable lithium-ion phosphate battery is used in the equipment. The battery complies with the provisions of “United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Part III, Section 38.3”.

KSTAR New Energy shall not be responsible for:

- Damages to the battery caused by earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, or other force majeure events.
- Direct damage caused by operation of the equipment in environments other than the intended operating environment. Indicators of inappropriate environments include, but are not limited to, excessively high or low operating temperatures, instability of the power grid, and frequent power outages.
- Damage, leakage, and/or rupture caused by inappropriate operation or failure to connect the battery pack in accordance with requirements.
- Damage caused by over-discharge of the battery due to the failure of operating personnel to promptly power up the battery after it has been connected to the system.
- Damage caused by your failure to accept the battery in time after installation.
- Damage caused by inappropriate parameters that you set.
- Accelerated battery capacity degradation caused by mixing of batteries, including, but not limited to, the mixing of batteries of different brands and mixing of batteries with different rated capacities.
- Battery damage caused by storing the battery in an unintended environment,

such as in a humid, rain-prone environment.

- Loss of capacity or irreversible damage to the battery caused over-storage without recharging the battery in a timely manner.
- Damage caused by your or a third party's failure to follow the requirements specified by the manufacturer, including, but not limited to, unauthorized relocation and installation of the battery packs.

KSTAR New Energy shall not be responsible for damage caused by:

- Frequent over-discharge of batteries caused by your inappropriate maintenance, on-site expansion, or long-term failure to fully charge.
- Lack of appropriate maintenance in accordance with the operating manual. Such battery maintenance should include, but is not limited to, regular checks of the battery terminal screws to verify tightness.
- Changing the battery usage scenario without the approval of the manufacturer.
- Unapproved connection of additional loads to the battery.
- Batteries exceeding the maximum storage life.
- Batteries exceeding the warranty period. Such batteries can pose hazards and it is not recommended that you continue to use them.

2.3.1 General Instructions

The chemical substances inside the battery are well sealed, so there is no physical danger of fire or explosion or chemical danger of hazardous material leakage at normal temperatures and pressure levels during handling. If the battery pack is exposed to fire, mechanical shock, decomposition, or increased electrical stress due to misuse, then leakage, release of harmful substances, and/or explosion can occur. The released substances can irritate the eyes, skin, and throat.

 DANGER

- Only trained professionals are permitted to handle leaking batteries.
 - When handling leaking batteries, personnel must wear goggles, rubber gloves, gas masks, and protective clothing.
 - When handling leaking batteries, personnel must first disconnect the equipment and then remove the leaking batteries.
 - Batteries should be protected from the following:
 - Short circuit caused by live line maintenance or by shorting the positive and negative terminals of the battery.
 - Exposure to high temperature or heating equipment, such as direct sunlight, ignition sources, transformers, or heaters.
 - Squeezing by an external force or immersion in water or other liquids.
 - Over-charging or forced over-discharging.
 - Exposing battery terminals to other metal objects.
 - The use of incorrect battery types.
-



WARNING

- Batteries should be protected from the following:
 - Malfunctions or short circuits caused by liquid entering the battery. Therefore, DO NOT install the battery pack under air conditioning outlets, ventilation vents, machine room outlet windows, water pipes, and other locations prone to water leakage.
 - Inverted, sideways, tilted, or stacked placement.
 - False connection of fastening screws of the copper row and/or the cable, which can cause excessive voltage drop or the generation of a large amount of heat at higher current, which could burn the battery.
-

2.3.2 Maintenance of Battery Packs



DANGER

- DO NOT perform live line maintenance on the batteries to prevent short circuit.
 - Use the specified type of battery during replacement.
-



WARNING

- Do a regular check on the fastening screws of copper rows and/or cables. Make sure that they are tightened and free of rust, corrosion, or other foreign objects. If they are not, clean them.

2.3.3 Disposal of Battery Packs



WARNING

- Before disposal, completely discharge the battery and consume the lithium metal inside the battery.
 - DO NOT treat unwanted batteries as ordinary waste.
 - DO NOT throw the battery pack into fire or place them in high temperature.
 - DO NOT dissect, pierce, or crush the batteries.
 - If a battery pack is deformed, broken, or leaking, discard it immediately regardless of how long it has been in storage.
-

2.4 Before Installation



DANGER

- Follow the safety instructions in this manual to prevent personal injury and/or property damage.
- During transportation, a certified ABC fire extinguisher with a capacity of at least 2 kg must be with the equipment.
- Smoking is not permitted on or near the vehicle while loading or unloading.
- Before installation, make sure that the equipment is free of any electrical connections.
- Make sure that no water pipes are inside the wall on which the system is to be mounted.
- To prevent possible electric shock, make sure that the inverter is not damaged and that the inverter and all switches connected to it are set to the “OFF” position.
- Before installation, use a properly calibrated voltage meter to test the inverter to prevent personal injury or damage caused by a life-threatening voltage.
- The PV string exposed to sunlight can generate high voltage. Do these to prevent personal injury:
 - The operator must wear personal protective equipment before electrical connection.
 - Before touching DC cables, use a measuring device to make sure that the cables are not energized.
 - Read the safety instructions attached to the PV string and its manuals.
 - DO NOT connect the inverter to a PV string that requires positive or negative grounding.



WARNING

- DO NOT transport equipment in severe weather such as lightning, rain, snow, or winds of force 6 or higher.
- If there is a fire, evacuate the building or equipment area and ring the fire alarm. DO NOT enter a burning building or equipment area.
- Choose an appropriate and safe place to install the equipment. This place must meet these requirements:
 - Temperature: For the inverter and battery pack. See Specifications.
 - Relative humidity: 0–95% (No condensation).
 - NO flammable or explosive materials.
 - NOT accessible to children.
 - NO salt hazards.
 - Sheltered from direct sunlight or severe weather.
 - NOT subject to strong vibration or electromagnetic fields.
 - Well ventilated
 - NOT a living area.
- A distance of at least 30 mm must be maintained between the cable and a heat generating device or the periphery of a heat source area to prevent deterioration and/or breakage of the cable insulation caused by high temperature.
- DO NOT install the equipment that is infiltrated by moisture.
- DO NOT install the equipment with damaged enclosure and exposed to moisture.



CAUTION

- Only qualified personnel are permitted to transport the equipment.
- Loading, unloading, installation, removal, and transportation of inverters and battery packs must be accomplished by two or more persons to prevent personal injury caused by accidental falling equipment.
- If lifting tools are used to lift the equipment, make sure that no one passes or stays under the equipment.

NOTICE

- Before installation, do a regular check and maintenance on the tools.
-

2.5 Installation Safety

DANGER

- To avoid personal injury caused by the high voltage inside the equipment:
 - Use special insulated tools for wiring.
 - Read the warning signs on the equipment and follow their instructions.
 - Follow the safety instructions in this manual and other documents provided.
 - Only trained professionals are permitted to install the equipment.
 - Only qualified personnel are permitted to disassemble the safety features and to service the equipment.
 - Only the personnel who have the special operation qualification required by national or local authorities are permitted to work in special scenarios such as electrical operation, work at heights, and operation of special equipment.
 - Only KSTAR-approved professional personnel are permitted to replace the equipment or spare parts (including software).
 - DO NOT power up the equipment before the installation is completed and confirmed by trained professionals.
 - Avoid direct contact with the power supply equipment, as well as indirect contact through wet objects. Prevent other conductors from coming into contact with the power supply equipment. Measure the voltage at the point of contact before you touch any conductor surface or terminal, so as to avoid electric shock.
 - Use appropriate measuring tools to make sure that the electrical parameters of the equipment meet the requirements. To prevent electric arcs or shocks, make sure that the connection and use of the equipment comply with the specifications.
-



WARNING

- DO NOT install equipment in severe weather such as lightning, rain, snow, or winds of force 6 or higher.
- If there is a fire, evacuate the building or equipment area and ring the fire alarm, or call the emergency services. DO NOT enter a burning building or equipment area.
- It is recommended that you install the inverter vertically, not inverted, horizontal, tilted forward or backward, excessively tilted, or tilted sideways.
- When tightening screws or bolts on products or terminals with tools, tighten to the specified torque to prevent damage to the equipment. The manufacturer shall not be responsible for such damage.
- DO NOT touch the equipment surface when the equipment is in operation. The housing gets hot, and touching it can result in burns.
- The cables used in the PV system must be of the right size, firmly connected, and well insulated.
- Before connecting the DC connector to the inverter, check the positive and negative terminals of the PV string and make sure that no error occurs before inserting the DC connector into the DC terminal.
- During the installation of the inverter, make sure that neither the positive nor the negative terminal of the PV string is shorted to ground, to prevent damage caused by AC/DC short circuit of the inverter.



CAUTION

- To prevent uninvolved persons from approaching the equipment, place highly visible warning signs or set up safety caution tape around the equipment.
- DO NOT remove the equipment protection.
- DO NOT ignore the danger, warning, caution, and notice text in the manuals and on the equipment.

NOTICE

- The wiring process must follow the regulations of the local grid and the safety instructions for the PV string.
-

2.6 Operation Safety



DANGER

- Follow the safety instructions in this manual to prevent personal injury and/or property damage.
- The person who operates the equipment must have necessary knowledge of the equipment, including the equipment components and how they work.
- The person who operates the equipment must have necessary knowledge of this manual.
- Only qualified personnel are permitted to disassemble the safety features and to service the equipment.
- Keep persons other than those operating the equipment away from the equipment.
- DO NOT operate the equipment in an environment where explosions can occur, or where the relative humidity is high.
- When the equipment is in operation,
 - DO NOT open the inverter and the battery packs.
 - DO NOT wipe the equipment with a wet cloth.
 - DO NOT touch the housing of the equipment.
 - DO NOT plug or unplug connectors on the inverter.
 - To avoid electric shock, DO NOT touch any terminals of the inverter.
 - To avoid electric shock, DO NOT disassemble any parts of the inverter.
 - To avoid burns, DO NOT touch any hot parts of the inverter, such as radiator.
 - To avoid electric shock, DO NOT connect or disconnect PV string or a component of a PV string.
- To avoid fatal electric shock, DO NOT touch the DC conductors or energized electrical parts of the inverter. When PV arrays are exposed to sunlight, they can generate life-threatening DC voltage. This voltage can be present in DC conductors and in the energized electrical parts of the inverter.
- To avoid electric shocks and burns caused by possible arcs, DO NOT disconnect the DC connector from the inverter under load.
- Before operating the inverter or the battery packs, disconnect the inverter from all voltage sources as described in this manual.
- DO NOT touch uninsulated cable ends.

-
- To prevent chemical burns caused by leakage of electrolyte or toxic gases from a damaged battery, operate the battery packs in accordance with the standard procedure. When the battery packs are operated in a standard manner, no leakage of electrolyte or generation of toxic gases can occur. However, if the battery packs are damaged or malfunction, it can leak electrolyte or generate toxic gases.
-



WARNING

- DO NOT operate equipment in severe weather such as lightning, rain, snow, or winds of force 6 or higher.
 - DO NOT touch the equipment with wet hands.
 - DO NOT put any heavy objects on the top of the equipment.
 - DO NOT damage the equipment with sharp objects.
-



WARNING

External protective earthing terminal shall meet at least one of the following requirements:

- When the cross-sectional area of the earthing cable is $\geq 10\text{mm}^2$ (copper) or $\geq 16\text{mm}^2$ (aluminum), it is recommended that both the external protective earthing terminal and the AC side earthing terminal are grounded.
- When the cross-sectional area of the earthing cable is $< 10\text{mm}^2$ (copper) or $< 16\text{mm}^2$ (aluminum), ****ensure that**** both the external protective earthing terminal and the AC side earthing terminal are grounded.

If alternative earthing methods comply with local standards and relevant safety regulations, the connection may be performed according to such standards and regulations. Our company shall not be held liable for any consequences that may arise therefrom.



CAUTION

- To prevent uninvolved persons from approaching the equipment, place highly visible warning signs or set up safety caution tape around the equipment.
- DO NOT move the inverter when it is connected to the battery packs.
- Secure the inverter to prevent tilting.
- During the operation of the equipment, if any risks are found that may lead to personal injury or equipment damage, stop the operation immediately, report to the person in charge, and take effective steps.
- During the operation of the inverter, make sure that neither the positive nor the negative terminal of the PV string is shorted to ground, to prevent damage caused by AC/DC short circuit of the inverter.

NOTICE

- In the event of exposure to the electrolyte, immediately flush the affected area with water and seek immediate medical attention.

2.7 Maintenance Safety



DANGER

- Follow the safety instructions in this manual to prevent personal injury and/or property damage.
- Only trained professionals are permitted to maintain the equipment.
- Only qualified personnel are permitted to disassemble the safety features and to service the equipment.
- Keep persons other than those operating the equipment away from the equipment.
- Wear personal protective equipment (PPE), including protective gloves and protective shoes.
- DO NOT begin maintenance work on the equipment until it is turned off and fully discharged.
- Before maintenance, disconnect the AC circuit breaker from the grid and check the inverter status. If all the inverter indicator lights are off, do nothing and disconnect the DC switch at night. If the inverter indicator is on, disconnect the DC switch directly.
- After the inverter is powered down for five minutes, use testing equipment to check the voltage of the bus capacitor and of the capacitors in the battery terminal input and make sure that there is no voltage.
- To avoid burns, DO NOT operate the equipment immediately after shutdown. After the equipment cools down, wear protective gloves to operate the equipment.



WARNING

- DO NOT maintain equipment in severe weather such as lightning, rain, snow, or winds of force 6 or higher.
 - To avoid electric shock, DO NOT touch the power grid or the contacts and terminals inside the equipment that are connected to the grid.
 - Use a standard voltmeter to check the grid. DO NOT touch the grid before you make sure that there is not voltage.
 - To prevent or to minimize potential damage caused by moisture, DO NOT repair or maintain the equipment in a wet environment.
-



CAUTION

- To prevent uninvolved persons from approaching the equipment, place highly visible warning signs or set up safety caution tape around the equipment.
-

NOTICE

- If the paint on the inverter housing falls off or rust appears, repair it in a timely manner. Otherwise, the use of the inverter may be affected.
 - To avoid damaging the inverter, DO NOT use cleaning agents to clean the inverter. The manufacturer shall not be responsible for such damages.
 - DO NOT open the inverter (excluding the cable box) and replace the components inside without the permission of the manufacturer.
-

2.8 Disposal Safety



DANGER

- Only trained professionals are permitted to discard the equipment.
-



WARNING

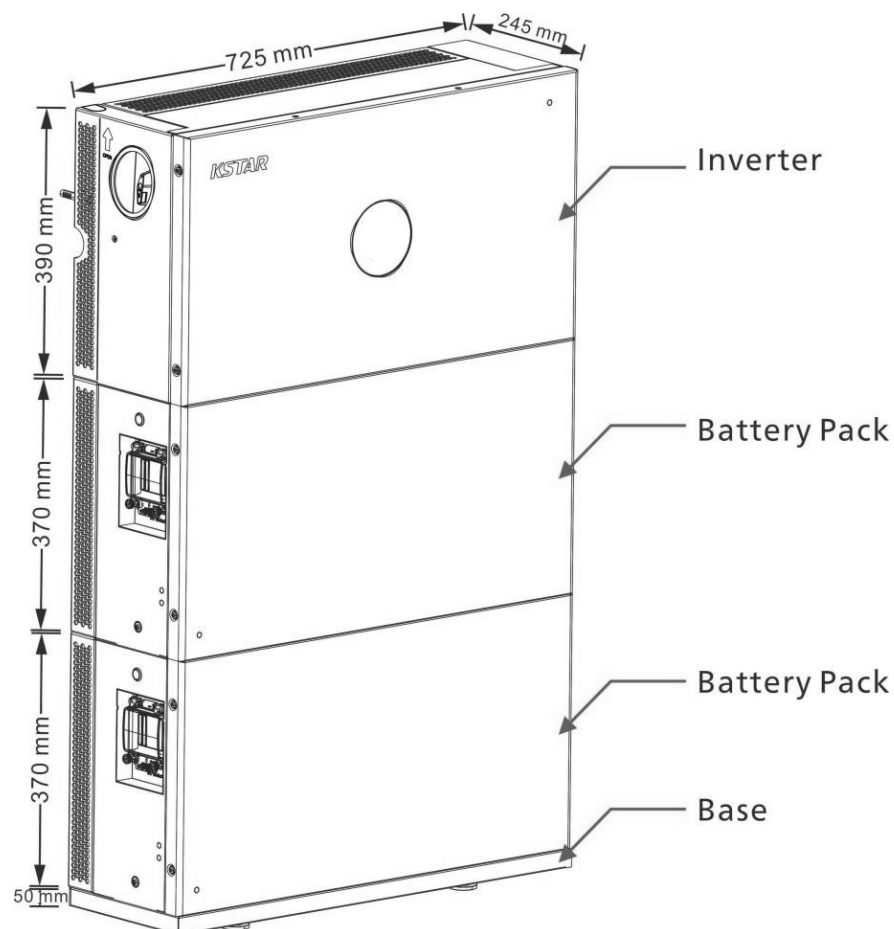
- Before disposal, make sure that all warning signs and nameplates are clearly visible and have not been removed or obscured.
 - To prevent property damage and personal injury, dispose of equipment in accordance with local regulations and standards.
-

3 System Introduction

3.1 Product Overview

The integrated residential storage solution combines Inverter, Battery, Smart Meter, and smart dongle to convert solar energy into electricity within a photovoltaic system, meeting household power demands. Energy IoT devices in the system monitor overall power conditions and manage electrical loads, enabling intelligent control of electricity for direct use, storage in Battery, or export to Utility grid.

1. Space-saving: The vertical stack design occupies less floor space compared to traditional equipment. It can be mounted close to the wall, making full use of corners or narrow aisles, saving approximately 20%-30% of floor space compared to conventional all-in-one units.
2. Modular expansion: Users can start with a basic capacity configuration based on current power needs, just like building with blocks. In the future, when additional loads are added to the household, the capacity can be linearly increased by simply adding stacked battery modules—without replacing the entire system. This effectively reduces initial investment and upgrade costs.
3. Easy installation: Standardized interfaces between modules enable plug-and-play operation, eliminating complex external wiring. This makes the installation process very fast, significantly reducing installation difficulty and labor costs.



Battery Capacity Description

The ESS supports capacity expansion. A maximum of eight Energy Storage Modules can be installed.

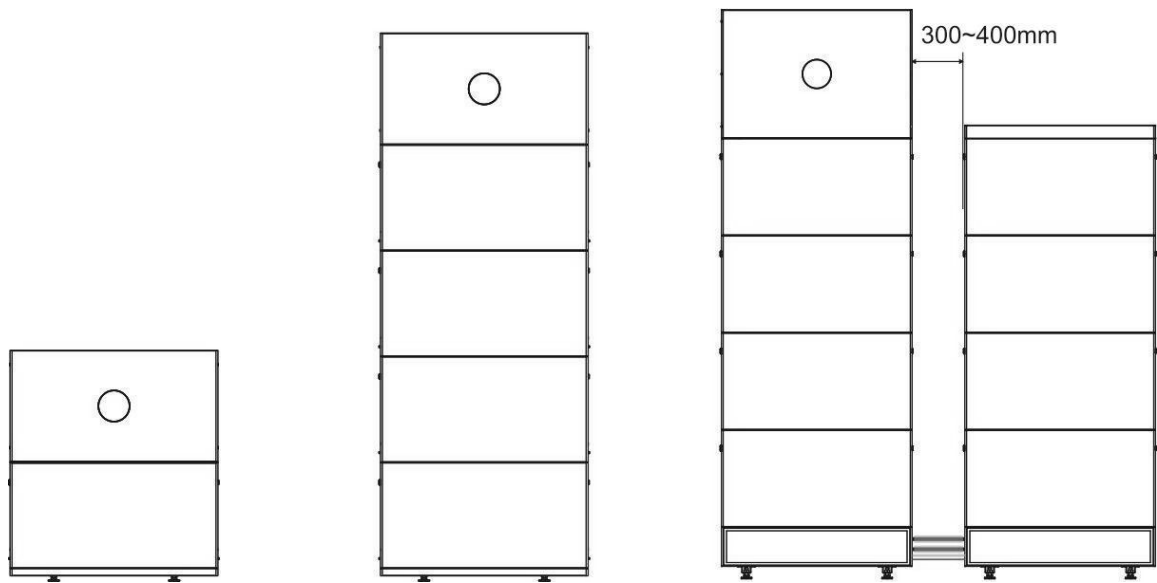


Figure 3-2 Capacity expansion with Energy Storage Modules

3.2 Model

3.2.1 Inverter Model

The hybrid inverter model is E3.68KS-D22/E5KS-D22/ E6KS-D22

E xK S - D 2 2

1 2 3 4 5 6

- 1 “E” means “Hybrid Inverter”.
- 2 “xK” indicates the rated output of the system. “3.68K” means 3.68 kW, “5K” means 5 kW.
- 3 “S” means “single-phase inverter”.
- 4 “D” means “Per MPPT current $\geq 20A$ ”
- 5 “2” means “2 MPPT”
- 6 “2” means “Generation 2”

3.2.2 Battery Pack Model

BP 48 100 P F 1A -G2

1 2 3 4 5 6 7

- 1 “BP” means the label “BATTERY PACK”.
- 2 “48” means the voltage of the battery pack 48V.
- 3 “100” means the battery capacity is 100Ah.
- 4 “P” means the battery packs are connected in parallel for multiple battery packs.
- 5 “F” means with a heating film.
- 6 “1A” means with EVE 3U cells, “2A” means with CATL 3U cells. , “3A” means with CATL 4.3U cells.
- 7 “G2” means the 2nd generation residential battery pack of KSTAR.

3.3 System Topology

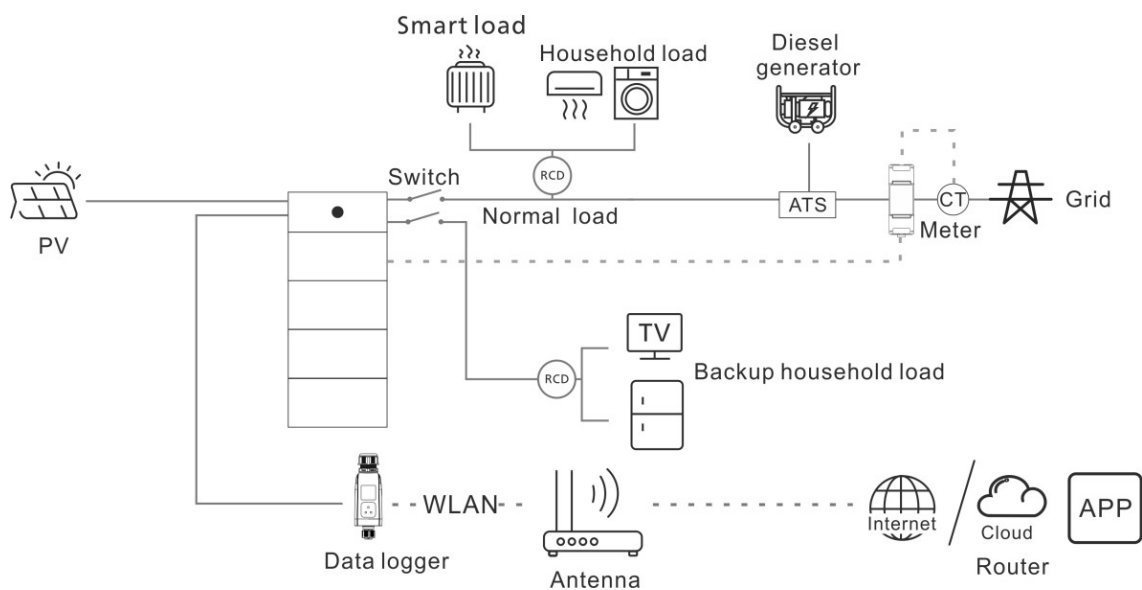
BlueSpark Series can be used for Home Hybrid Inverter. The Home energy Hybrid Inverter consists of photovoltaic panels[1], inverters, battery packs, switches, loads, power grids, etc.

The main function of Home Hybrid Inverter is to store the direct current generated by photovoltaic panels into battery packs. Or alternatively, the electricity in the photovoltaic system and the battery pack can be converted into alternating current for use by the load or incorporated into the grid.



[1]: PV panels with functional grounding cable connected cannot be used.

Under backup power networking, the duration of off-grid operation of the backup power load is related to the power supply capacity of the PV storage system. If there is an abnormality in the power supply of the PV storage system during off-grid operation (including but not limited to abnormal PV power generation, insufficient battery power, and abnormal power supplies to the diesel generator), the backup power load will still be unable to operate.



-No more than 8 battery pack units can be cascaded.

-If backup household loads and normal loads experiences leakage, it may pose a risk of electric shock. in order to avoid this hazard, a residual current device (RCD) must be installed between the PCS and the backup household loads.

-As a backup energy source for long-term off-grid applications, the diesel generator can work in tandem with the ATS to provide a smooth transition between PV, storage and diesel power generation.

-All the power equipment in the owner's home can be connected as smart loads, To ensure that this product maximizes the benefits to users, it is recommended that the high-power equipment be connected as smart loads (heat pumps, pool heaters, clothes dryers, immersion heaters, etc.), which can be cut off when the Hybrid Inverter has low power. Other low-power equipment are connected as home loads (lights, routers, etc.)

3.4 Operating Modes

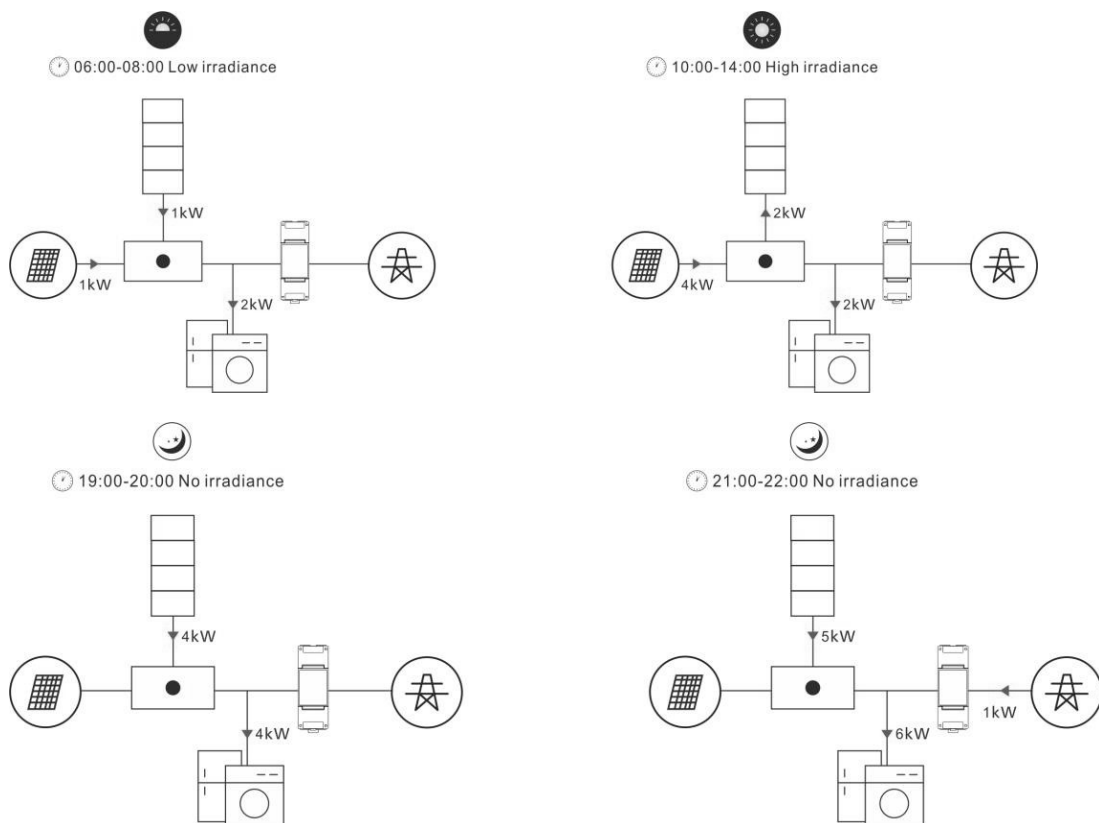
Self-Consumption mode

- Self-Consumption mode is the basic working mode of the system.
- The power generated by the PV system supply the loads in priority; the excess power will charge the batteries, and then the remaining power will be sold to the utility grid. When the power generated in the PV system is insufficient, the battery will supply the loads in priority. If the battery power is insufficient, the load will be powered by the utility grid.

Example:

System configuration: one 5kW inverter, equipped with the 20.48 kWh ESS. The ESS works in the self-consumption mode.

- PV energy usage priority: Powering loads > charging the ESS > Fed to grid
- Load power supply priority: PV power > ESS discharging > Grid



Peak-shift

- This mode applies to scenarios where the price difference is large between peak and off-peak hours. When the electricity price is low during off-peak hours, the grid supplies power to charge the ESS. When the electricity price is high during peak hours, the ESS discharges to supply power to household loads.

- In some countries, the grid is not allowed to charge the ESS. In such case, this mode cannot be used.
- In this mode, at least one charge time segment or one discharge time segment is required. During the charge time segment, the grid is allowed to charge the ESS. During the discharge time segment, the ESS can supply power to the loads. In other time segments that are not set, the ESS does not discharge, and the PV system and grid supply power to the loads. (in on/off.grid mode, if the grid fails, the ESS can discharge at any time.)

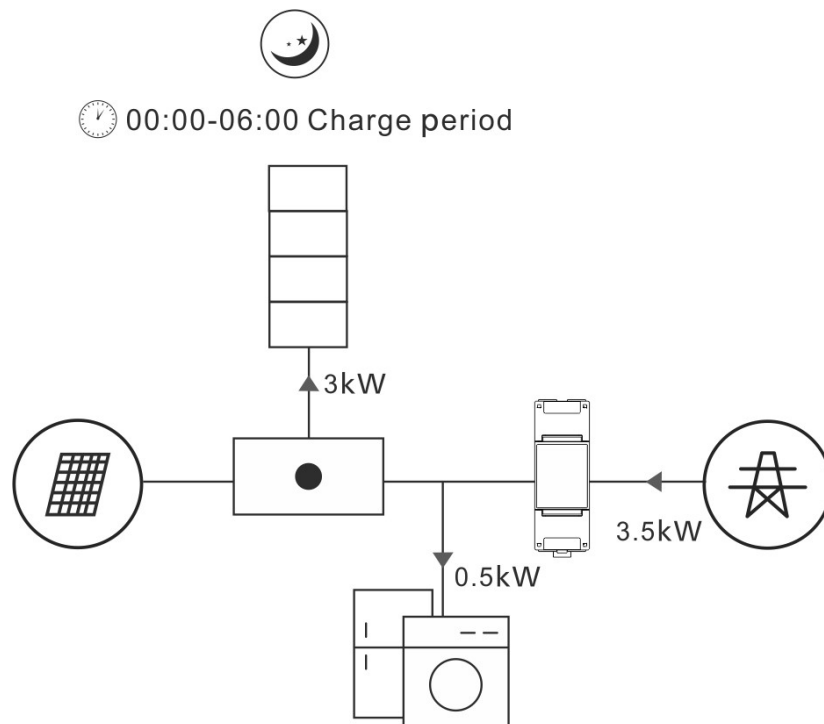
Example:

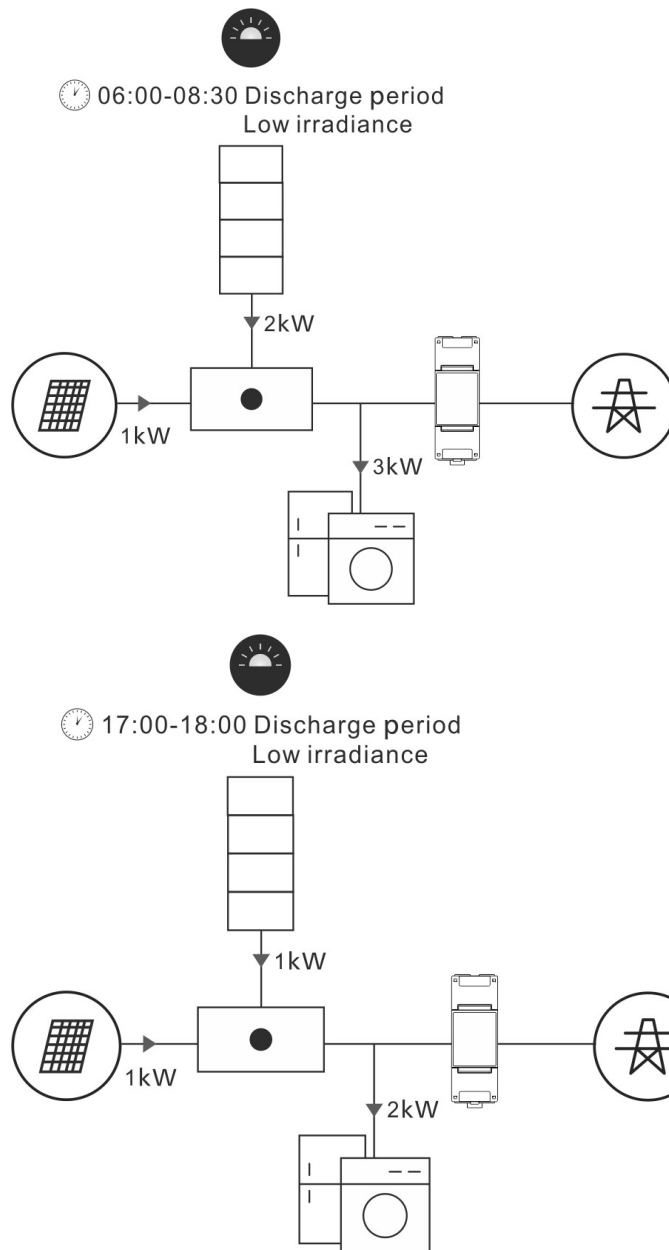
00:00-06:00 is the low-price period, and 06:00-24:00 is the high-price period. Households usually use electricity in the high-price period.

System configuration: one 5KW inverter, equipped with the 20.48 kWh ESS. Set the ESS working mode to Peak-shift mode.

Set parameters as follows: Set 00:00-06:00 as the charge time segment and 06:00-24:00 as the discharge time segment.

- PV energy usage priority: Powering loads > Charging the ESS > Fed to grid
- Load power supply priority: PV power > ESS discharging > Grid.



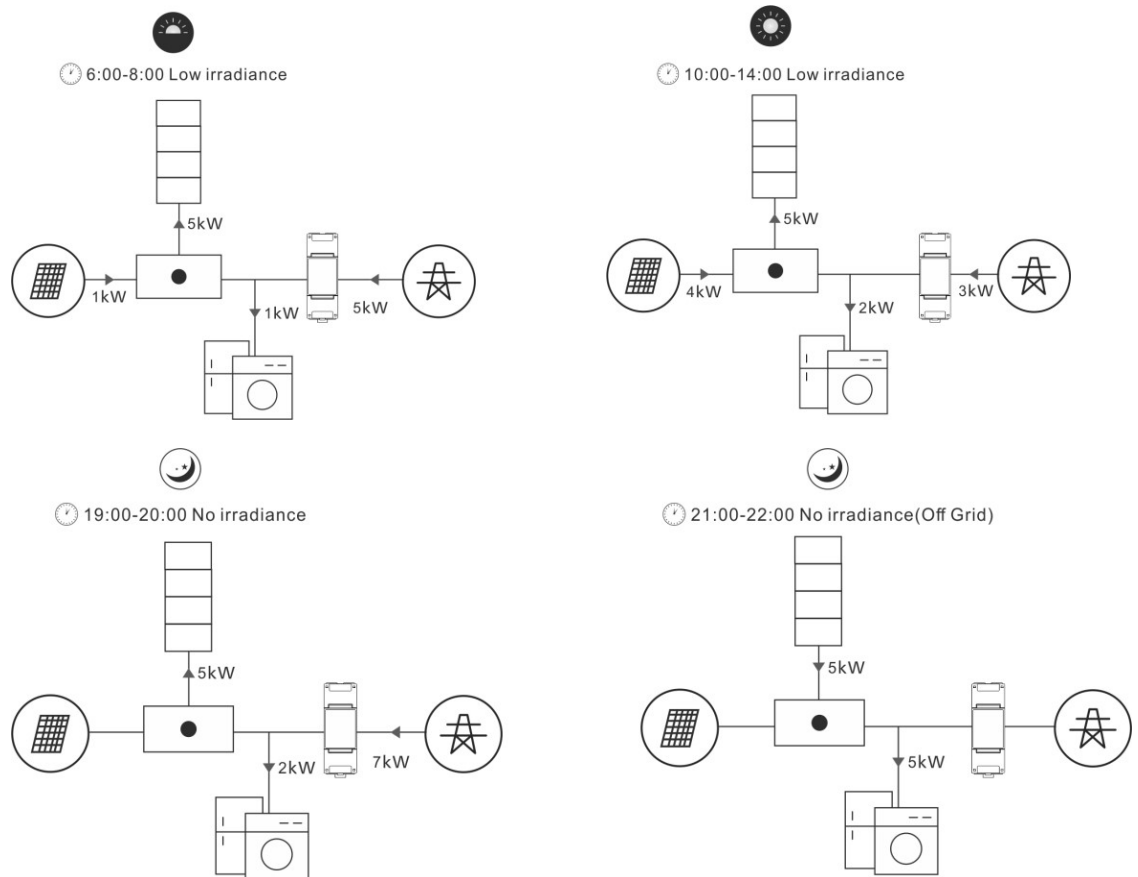


Bat Priority mode:

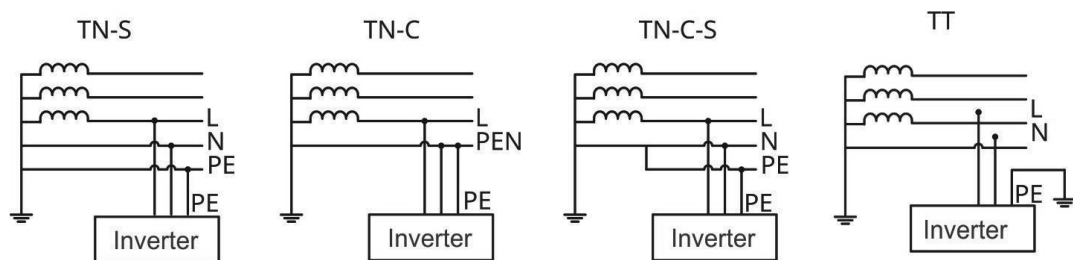
- The Bat Priority mode is mainly applied to the scenario where the grid is unstable.
- When the grid is disconnected, the inverter turns to off-grid mode and the battery will supply power to the EPS loads; when the grid is restored, the inverter switches to on-grid mode.
- To ensure that the battery SOC is sufficient to maintain normal operation of the system when it is off grid, the battery will be charged to the backup power SOC using PV or grid power during on-grid operation. If you need to purchase electricity from the power grid to charge the battery, please confirm compliance with local power grid laws and regulations.

Example:

- System configuration: one 5KW inverter, equipped with the 20.48 kWh ESS. The ESS works in the Bat Priority mode.
- PV energy usage priority: charging the ESS > Powering loads > Fed to grid
- Load power supply priority: PV power > Grid > ESS discharging



3.5 Supported Grid Types

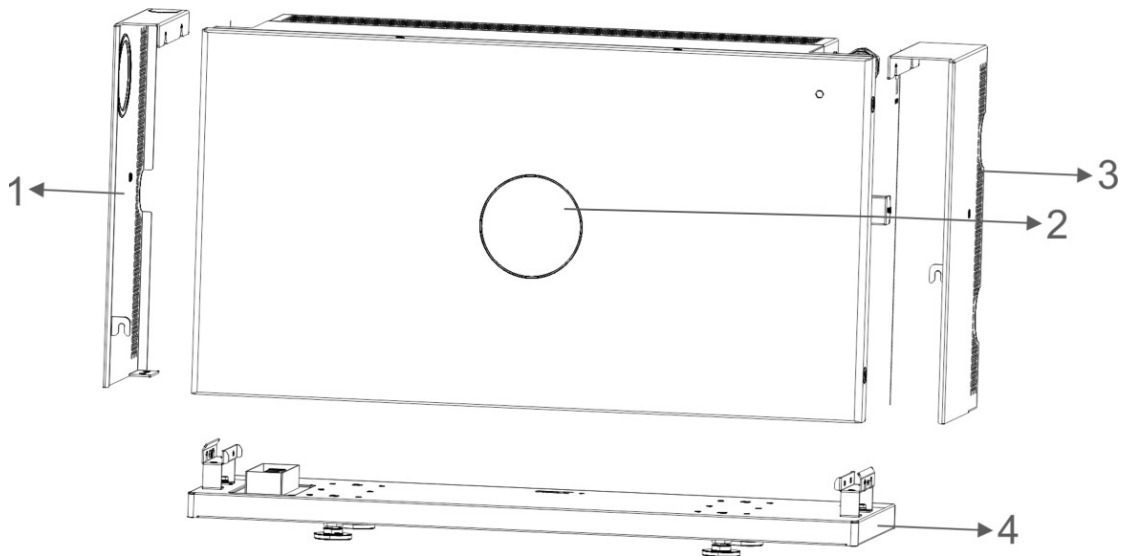


The grid supply methods supported include TN-S, TN-C, TN-C-S, and TT

When TT is used as the power supply technique for the power grid, the voltage between N and PE is required to be < 10 V.

4 Product Appearance

4.1 Inverter Appearance



Item	Describe	Item	Describe
1	Left decorative panel	2	LED display panel
3	Right decorative panel	4	Floor stand support

Figure 4-1 the main components exploded diagram in the inverter packaging box

4.1.1 Inverter port information

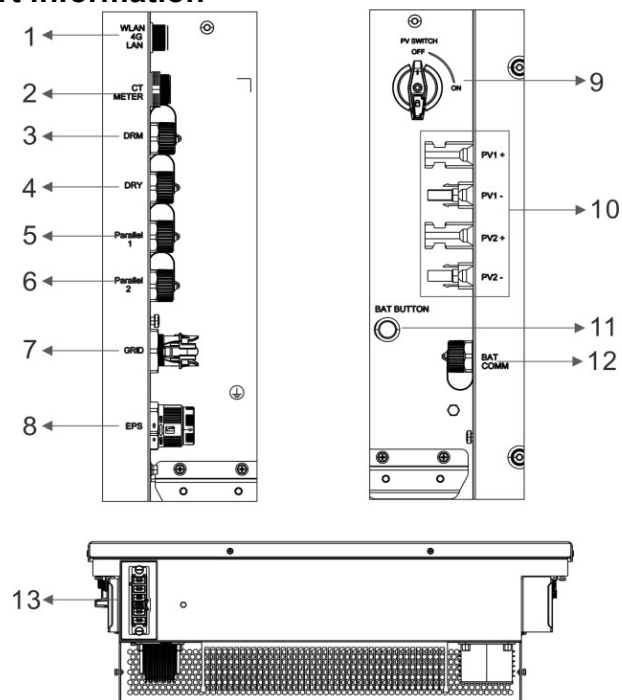


Figure 4-2 External Interface

Item	Describe	Item	Describe
1	WLAN/4G/LAN (DVC A)	2	CT/METER (DVC A)
3	DRM (DVC A)	4	DRY contact (DVC A)
5	Parallel1 (DVC A)	6	Parallel2 (DVC A)
7	GRID (DVC C)	8	EPS (DVC C)
9	PV SWITCH (DVC C)	10	PV1/PV2 (DVC C)
11	BAT BUTTON (DVC A)	12	BAT CAN (DVC A)
13	BAT connect (DVC C)		



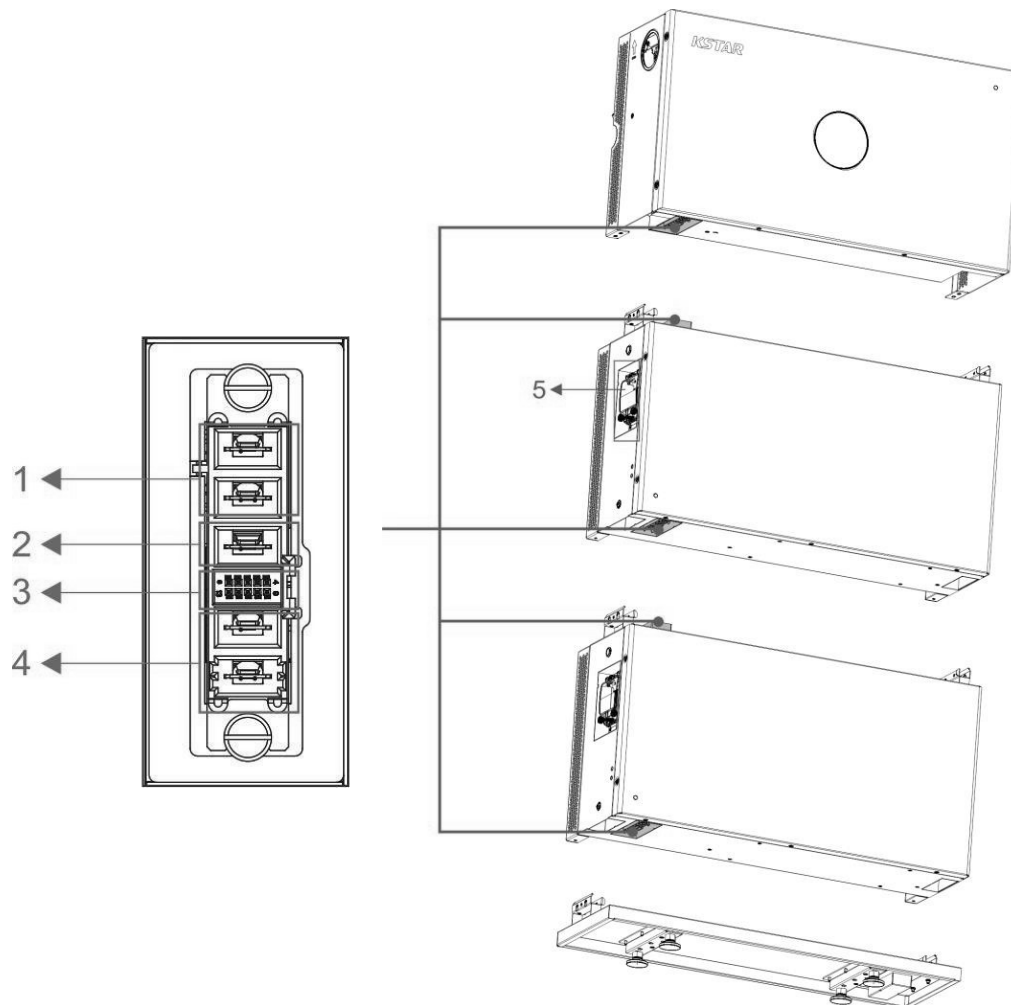
Decisive voltage classification (DVC) identifies the minimum necessary level of protection for the circuit. For more information on the DVC of each port, see Appendix: Definition of DVC.

4.2 Battery Pack Appearance

BP48100PF1A-G2:

Battery system can store and release electrical energy according to the requirements of the photovoltaic Hybrid Inverter. The input and output port of this Hybrid Inverter are both low-voltage direct current.

4.2.1 Battery port information



The battery power and signal connectors are in blind-inserted mode, so the communication was automatically connected after the battery packs and the inverter were assemble. BMS communication between Battery and Inverter through CANH & CANL terminals which integrated below interface.

Code	Describe
1	Battery-
2	Chassis ground
3	Communication interface
4	Battery+
5	Battery switch

4.3 LED Indicators



The inverter can be in six states shown in Table 4-3.

Table 4-3 Inverter States

Icons	Implication	Color	Status	Describe
	PV Indicator	Green	On	PV operating normally
			Flashing	PV connected but not operating
			Off	PV not connected
	Communication Indicator	Green	On	Monitoring backend connected and communication normal
			Off	Monitoring module not connected or communication abnormal
	Grid Indicator	Green	On	System in On-grid operation mode
			Flashing	System in bypass mode
			Off	System in initialization, standby, off-grid, fault, commissioning, or upgrade mode
	Off-Grid Indicator	Green	On	System in off-grid PV charging mode
			Off	PV off-grid charging not in progress
	Fault Indicator	Red	On	System fault
			Off	
	Battery Indicator	Green	On	Battery operating normally
			Flashing	Battery abnormal (alarm or BMS communication abnormal)
			Off	Battery shutdown or battery disconnected
	Battery SOC Indicator (Flashing during charging)	Green		≥80%
				≥60%
				≥40%
				≥20%
				≥5%
				<5%

4.4 Packing List

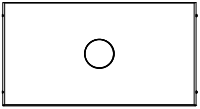
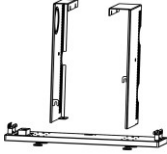
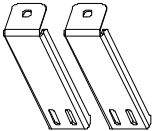
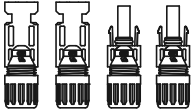
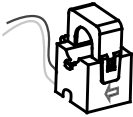
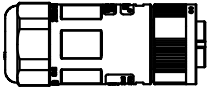
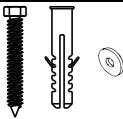
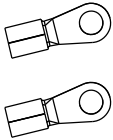
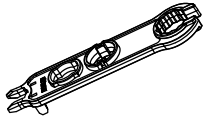
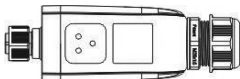
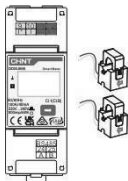
Checking Deliverables

After unpacking the ESS, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your vendor.

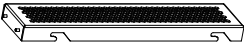
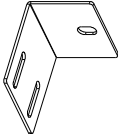
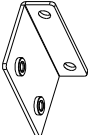
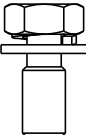
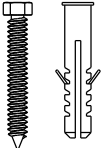
NOTICE

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

4.4.1 Inverter Deliverables

 Inverter (packed and assembled with base)	 Base and Decorative Covers	 Mounting bracket	 PV terminals: 2x positive, 2x negative
 M4x12 Bolt (6 sets)	 CT Cable (5m)	 AC EPS connector	 AC grid connector
 WiFi Connector	 2 screws, 2 rubber sleeves, 2 gasket (base and wall bracket)	 RJ45 Connector	 OT terminals
 PV connector tool	 Quick Installation Guide SDS Report	 Positional Punch card	 CT/Meter Connector
 Data Logger (WiFi + Ethernet)	 DDSU666-Smart Power Meter (Optional)	 1×RS485 Communication Cable (10 m)	

4.4.2 Batteries Deliverables

 1×Battery pack	 2×Mechanical cover	 2×M6 Gasket	 2×M4*12
 2×Wall Mounting Kit	 2×Battery Mounting Kit	 8×M5*12	 2×ST6.3*50 2×D10*50

4.5 Storage Requirements

4.5.1 Storage Environment Requirements

It is recommended that you begin using the battery soon after delivery rather than store the battery pack for a long time. The maximum storage life of a battery pack is three years.

The intended storage environment of the battery pack should meet these requirements:

- Ambient temperature: 0°C to 35°C.
- Recommended storage temperature: 20°C to 30°C.
- Relative humidity: 0–95% (No condensation).
- Dry, ventilated, and clean area.
- No contact with corrosive organic solvents, gases, and other substances.
- No direct sunlight.
- More than two meters from any heat source.

WARNING

When storing a battery in its packaging, make sure that the packaging box is intact and that the battery is appropriately placed and stacked, and the above mentioned requirements are met.

4.5.2 Interval for Recharging Batteries

While in storage, batteries must be recharged at specified intervals.

Table 4.4 Recharge Batteries at Specified Intervals during Storage

Actual Storage Temperature	Interval
$-10^{\circ}\text{C} \leq T \leq 30^{\circ}\text{C}$	12 months
$30^{\circ}\text{C} < T \leq 45^{\circ}\text{C}$	8 months

For example, whether the battery is recharged every 8 months or every 12 months, it can only be recharged a maximum of three times within three years. If the battery has not been recharged within three years, it is recommended that the battery pack be discarded.

Lithium-ion batteries lose capacity during storage. After 12 months of storage at the intended storage temperature, the capacity generally falls irreversibly by 3–10%. Batteries with less than 100% capacity after storage cannot pass the discharge testing and acceptance testing.

4.5.3 Recharging a Battery

If a battery has not been charged for two weeks or more after a deep discharge, or the SOC of a battery is less than 50% after a long period of storage, the battery must be charged to 50%.

WARNING

Before charging the battery, check it for deformation, case damage, or leakage, and if you find any of these things, do not charge the battery.



If the SOC of a battery pack is not less than 50% after more than 12 months of storage, it is not necessary to recharge the battery.



Prepare a cross screwdriver and insulated rubber gloves.

CAUTION

When you connect the power wires, wear insulated rubber gloves.

PROCEDURE

Step 1. Connect power cables to the battery charger correctly. The maximum number of battery pack connected parallel is 4.

Step 2. Press the battery “start key” for 1~3 seconds to start the battery pack. Check the LED on the battery “start key” is on.

Step 3. Turn on the battery charger.

Step 4. Set charging parameter on the battery charger.

Case #1, One battery pack is charged. Set the charge limited voltage 57.6V; Set the charge limited current 50A;

Case #2, Two ~ Four battery packs are charged. Set the charge limited voltage 57.6V; Set the charge limited current 100A;

Step 5. After the battery is charged, switch off the battery charger and press the battery “start key” for 1~3 seconds to switch off the battery pack.

5 Mechanical Installation

WARNING

Respect all local standards and requirements during mechanical installation.

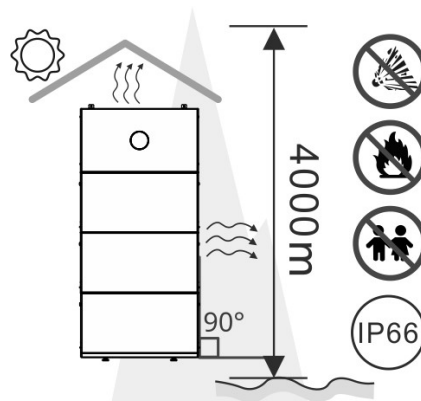
5.1 Location Requirements

5.1.1 Installation Environment Requirements

1. Do not install the equipment in a place near flammable, explosive, or corrosive materials.
2. The temperature and humidity at the installation site should be kept within the appropriate range.
3. Keep away from children.
4. High temperatures may exist on the surface of the equipment during operation to prevent burns.
5. Install the equipment in a sheltered place to avoid direct sunlight, rain, and snow.

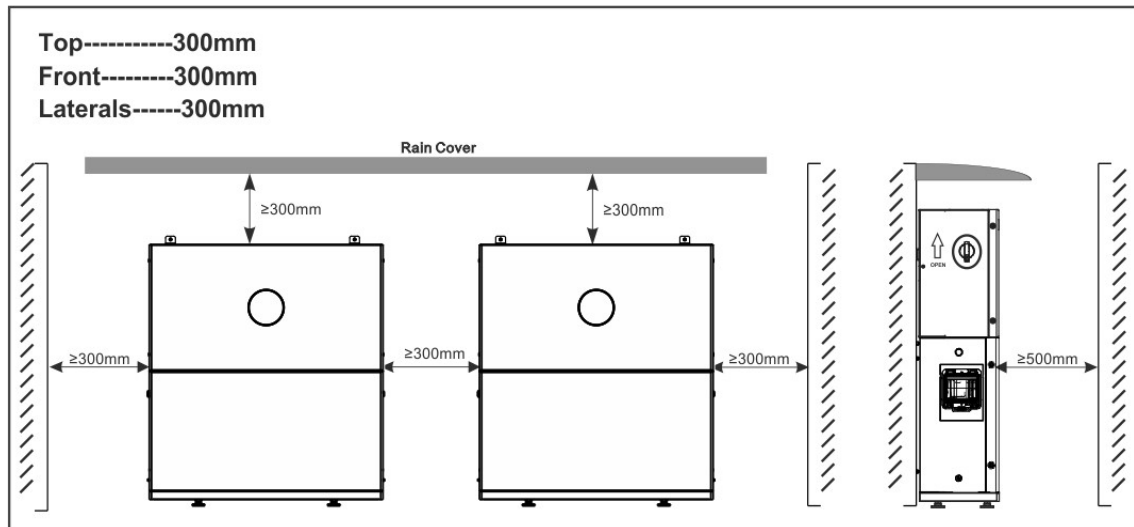
Build a sunshade if it is needed.

6. The place to install the equipment shall be well-ventilated for heat radiation and large enough for operations.
7. Check the protection rating of the equipment and ensure that the installation environment meets the requirements. The inverter, battery system, and smart dongle can be installed both indoors and outdoors, but the smart meter can only be installed indoors.
8. Install the equipment at a height that is convenient for operation and maintenance, electrical connections, and checking indicators and labels.
9. The altitude to install the inverter shall be lower than the maximum working altitude of the system.



5.1.2 Installation Clearance Requirements

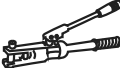
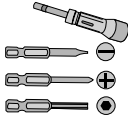
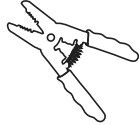
During installation, ensure that there is no other equipment (except related KSTAR equipment and awnings) or flammable or explosive materials around the ESS. Reserve sufficient space for heat dissipation and safety isolation.



5.2 Installation Tools & Required Cables



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

					
Protective Goggles	Protective Gloves Protective Shoes &	Protective Mask	Wire Clamp	Torque wrench (M2/M3/ M4/M5/ M6)	Leveling Instrument
					
Cable Crimper	Φ10mm Power Drill	Φ 8mm Flat-head Screwdriver	Multi-meter	Rubber Mallet	Tape Measure
					
Marker Pen	Wire Stripper	M4(D ≥ 40mm) Cross Screwdriver	Torque wrench	PV Wire (4 mm ² , max. Voltage 1,000 V)	PE Cable (Cross section: 4 ~ 6 mm ²)
					
EPS Wire (4 mm ²)	ON GRID Wire (6 mm ²)				

5.3 Handling of Equipment

CAUTION

Operations such as transportation, turnover, installation and so on must meet the requirements of the laws and regulations of the country or region where inverters are installed.

Move the equipment to the site before installation. Follow the instructions below to avoid personal injury or equipment damage.

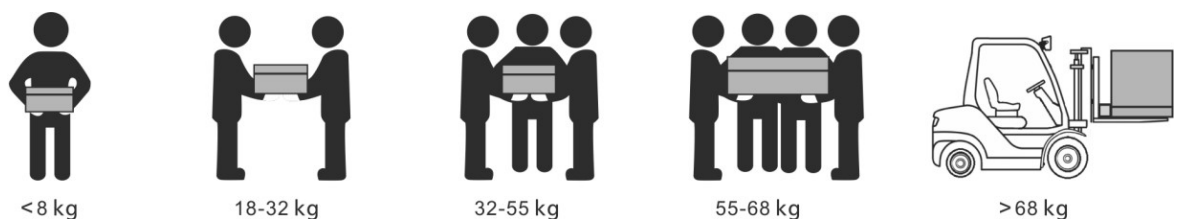
1. Consider the weight of the equipment before moving it. Assign enough personnel to move the equipment to avoid personal injury.
2. Wear safety gloves to avoid personal injury.
3. Keep balance to avoid falling down when moving the equipment.
4. The battery system can be transported to the installation site by crane.
5. When moving equipment using a hoisting method, please use flexible slings or straps. The load-bearing capacity of a single strap must meet the following requirements:

(E3.68KS-D22/E5KS-D22/ E6KS-D22) $\geq$ 26KG;

(BP48100PF1A-G2) $\geq$ 52KG;

5.3.1 Moving Heavy objects

Be cautious to prevent injury when moving heavy objects.



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

2 If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.

3 Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.

4 To move an object by hand, approach to the object, squat down, and then lift the

object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.

5 Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.

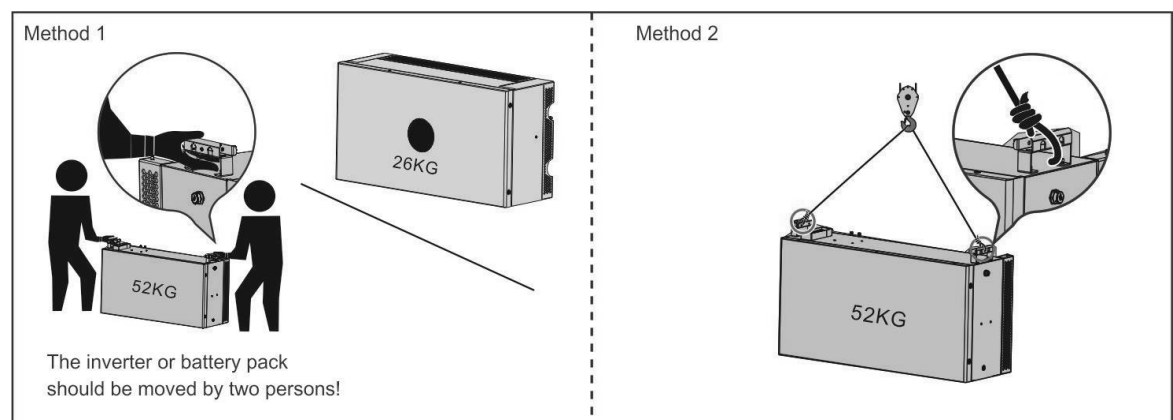
6 Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.

7 When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.

8 When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.

9 When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.

10 Choose sea or roads in good conditions for transportation. Do not transport the equipment by railway or air. Avoid tilt or jolt during transportation.



5.4 Installation equipment

DANGER

When drilling, ensure the hole position avoids water pipes, cables, etc. inside the wall to prevent DANGER.

When drilling, wear goggle and a dust mask to prevent dust from inhalation entering the respiratory tract or falling into the eyes.

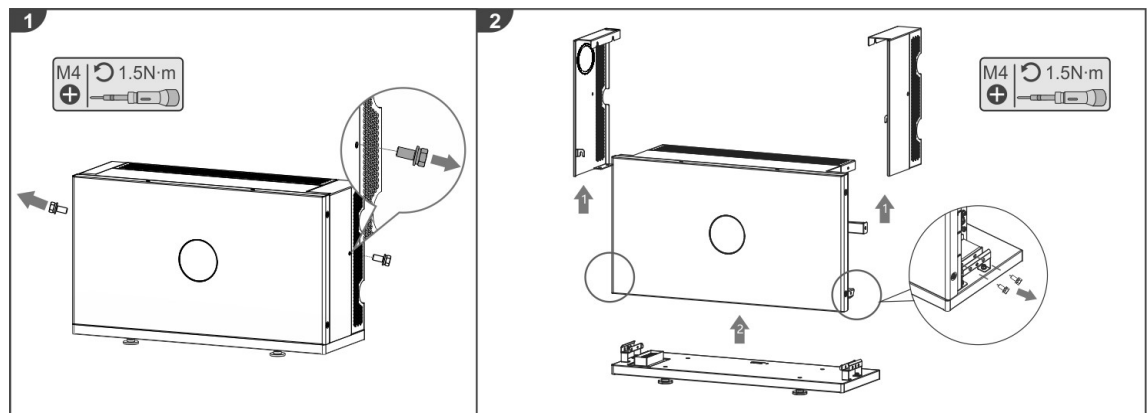
Inverter is located above Battery. Do not place Battery Installation above Inverter. When Battery system Installation, ensure the Installation is level and secure.

When placing the Battery Base, Battery, and Inverter, confirm that the holes on the upper and lower layers are aligned. The locking bracket should be vertically flush with the ground, wall, or Battery system surface.

When using hammer drill for punching, do not remove the dust-proof film on the connector above the battery pack first, to prevent foreign objects from entering the device and causing damage.

When mounting on a wall Installation, ensure the wall's load-bearing capacity is assessed to protect your life and property.

5.4.1 Remove the Base and Covers



1、 Use a Phillips screwdriver to remove the screws on the decorative covers on both sides of the inverter.

2、 Lift upward to remove the decorative covers on both sides of the inverter, then use a Phillips screwdriver to remove the screws securing the inverter to the base. Lift the inverter upward to separate it from the base, and lay the inverter flat on the ground.

5.4.2 Install the Battery Pack

1、 Lay the battery flat on the ground. In this step, only remove the dust film on the bottom of each battery pack, leaving the dust film on the top intact.

2、 Place the base horizontally on the ground at the pre-installation location. Position a level in the center of the base and check whether the bubble inside the level is centered. If not, use a flathead screwdriver to adjust the screws on

top of the base.

3、Lift the battery pack and stack it onto the base. Pay attention to the stacking direction between the base and the battery pack: the end with the protruding connector on the base must align with the end with the protruding connector on the top of the battery pack.

4、Use M4 hex socket screws to secure the base and the battery pack at the lower sides of the battery pack, then install two battery brackets on the back of the battery pack.

5、Position the battery pack 0–20 mm away from the wall. The distance from the wall can be adjusted according to the actual flatness of the wall.

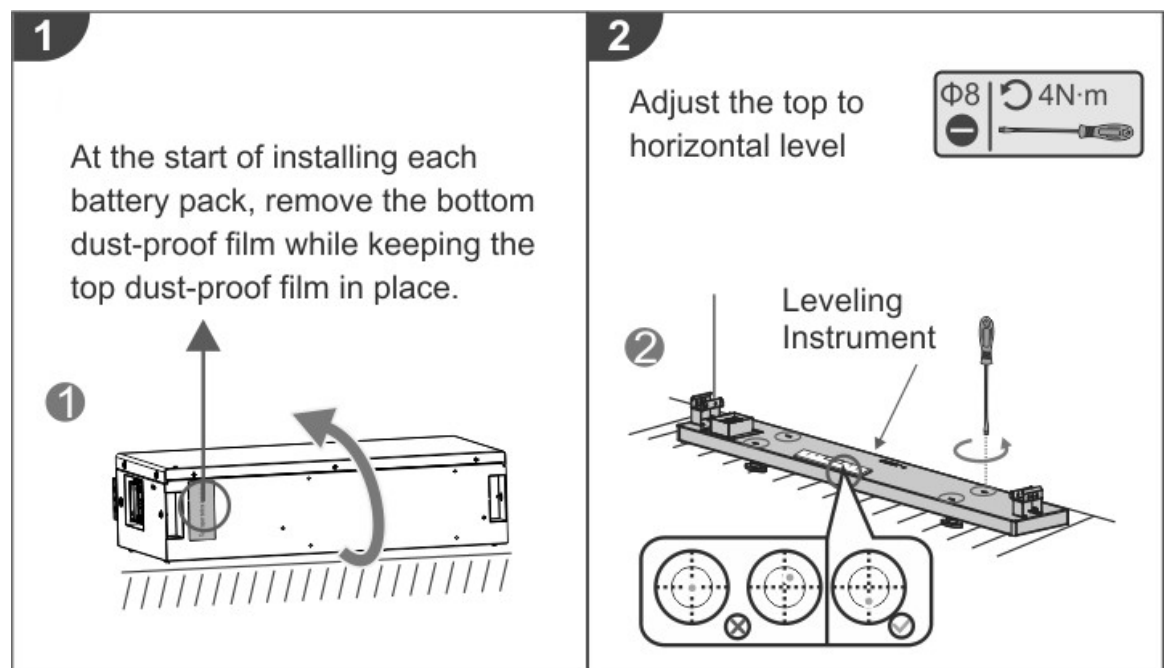
6、Place the wall-mounting bracket onto the battery bracket. After ensuring the center holes of the two brackets are aligned, horizontally adjust the wall-mounting bracket toward the wall. Use a marker to mark the center hole of the wall-mounting bracket, then remove the bracket.

7、Use a power drill to drill a hole at the marked point. After cleaning the dust from the hole, use a hammer to tap an expansion tube into the hole.

8、Install the decorative covers on both sides of the battery pack.

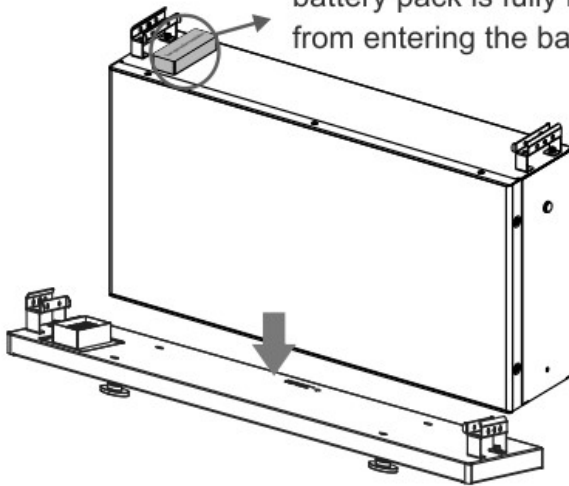
9、Secure the wall-mounting bracket to the battery bracket with screws, then use a Phillips screwdriver to fix the wall-mounting bracket to the wall. Finally, remove the dust film from the top of the battery pack.

10、Before stacking the next battery pack, remove the dust film from the bottom of the battery pack, then repeat steps 6–9.



3

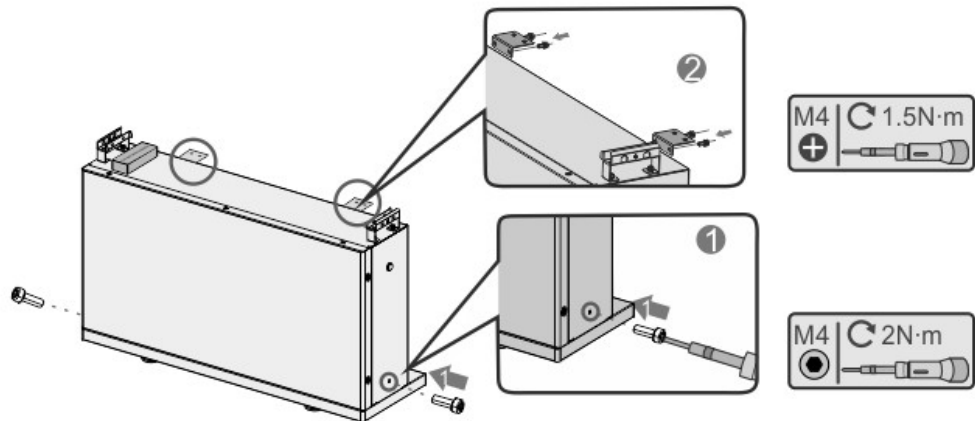
Remove the top dust-proof film only after each battery pack is fully installed. This prevents dust from entering the battery connector.

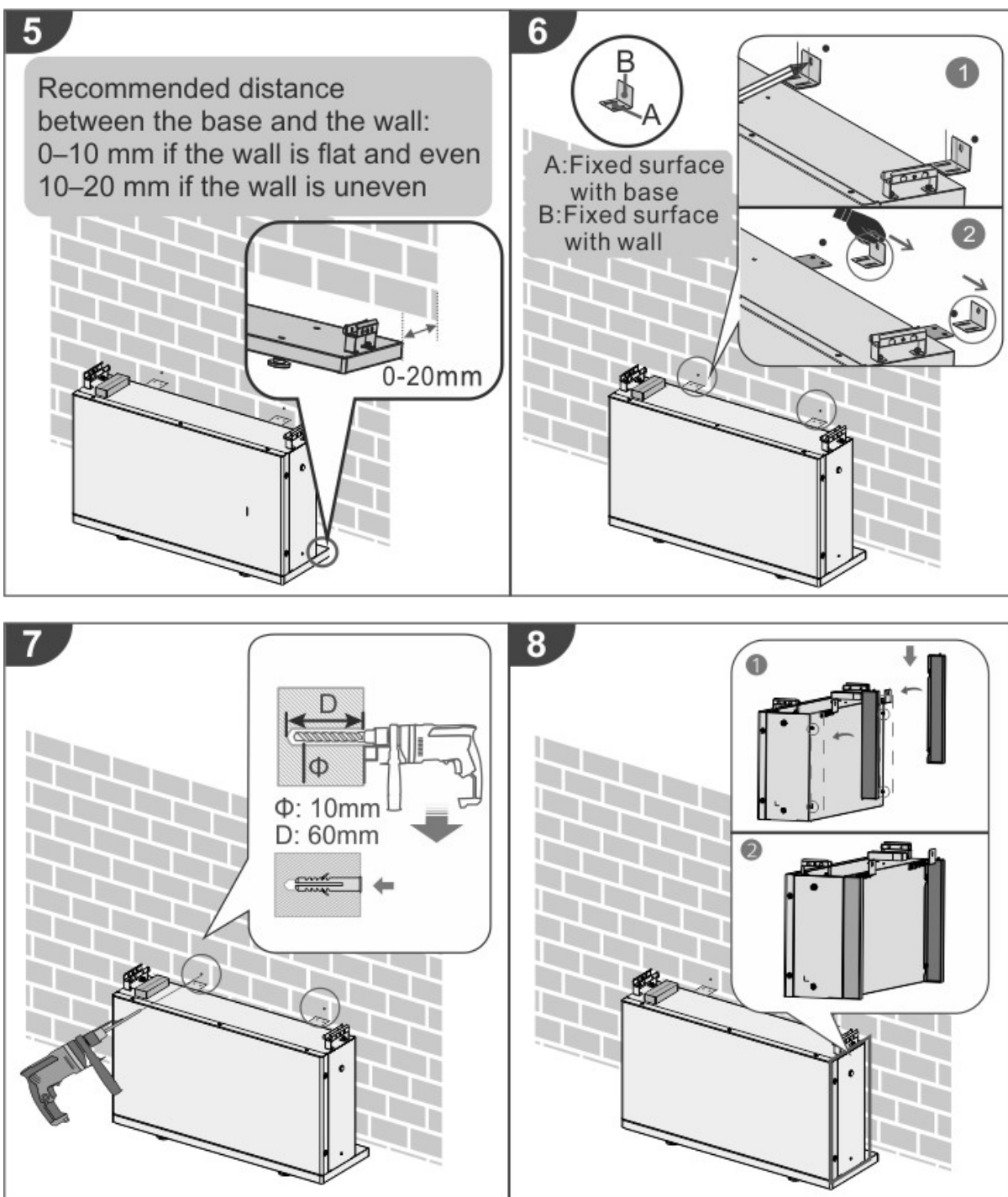


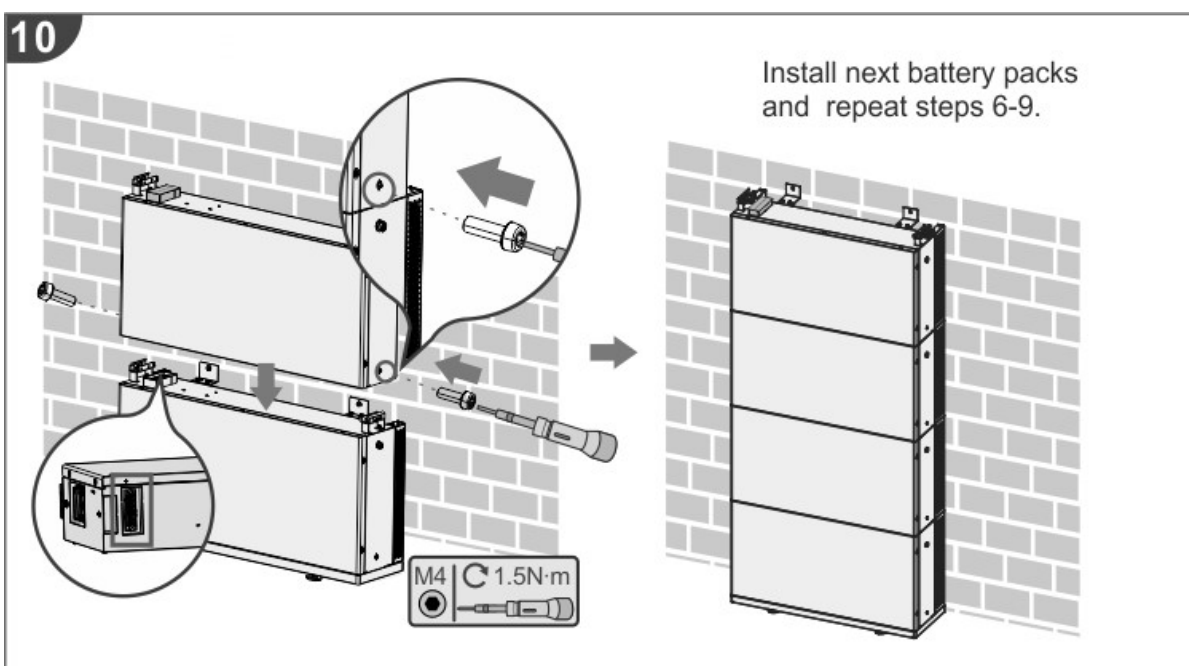
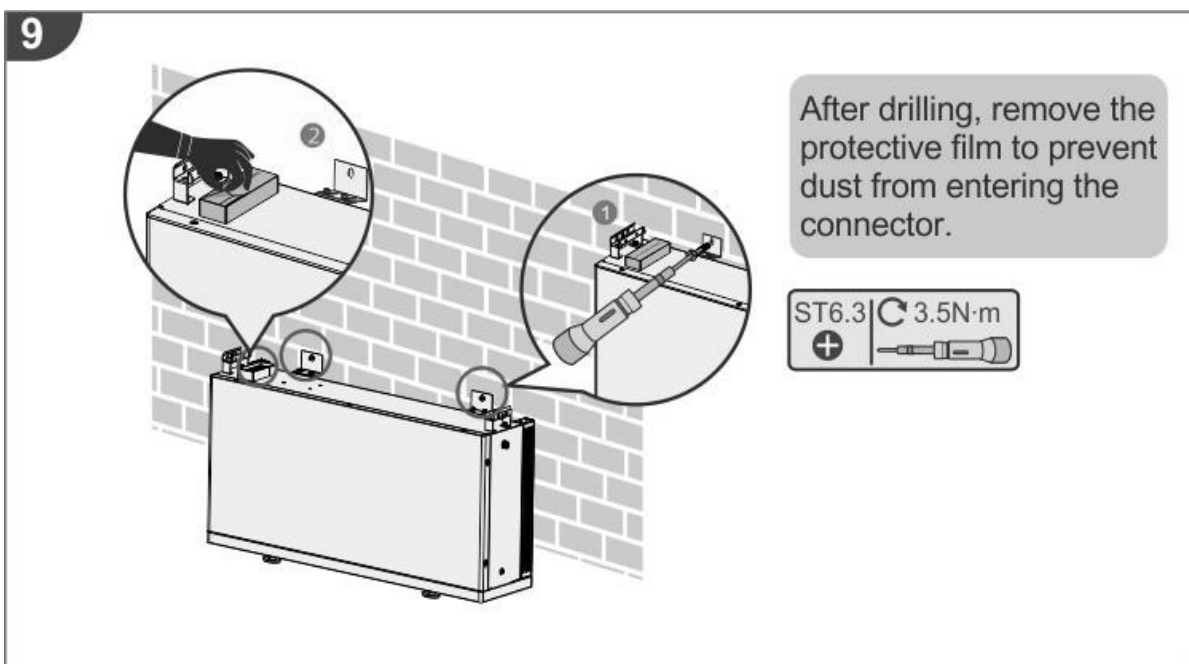
⚠ DANGER

Failure to install the base may result in electric shock hazard. Operation without the base is strictly prohibited.

4







5.4.3 Install the Hybrid Inverter

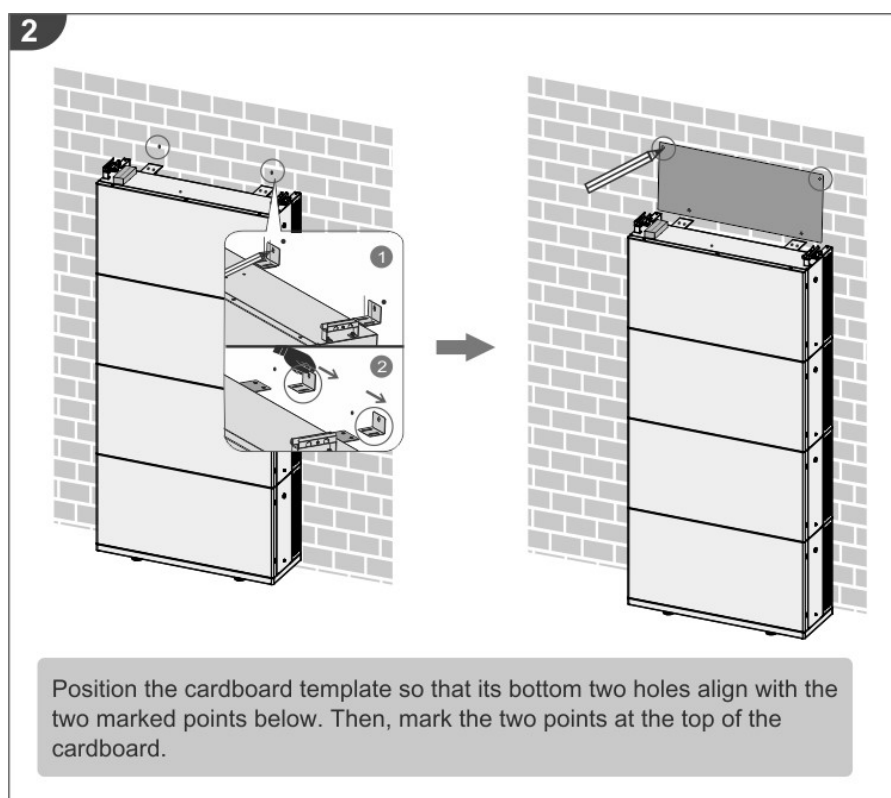
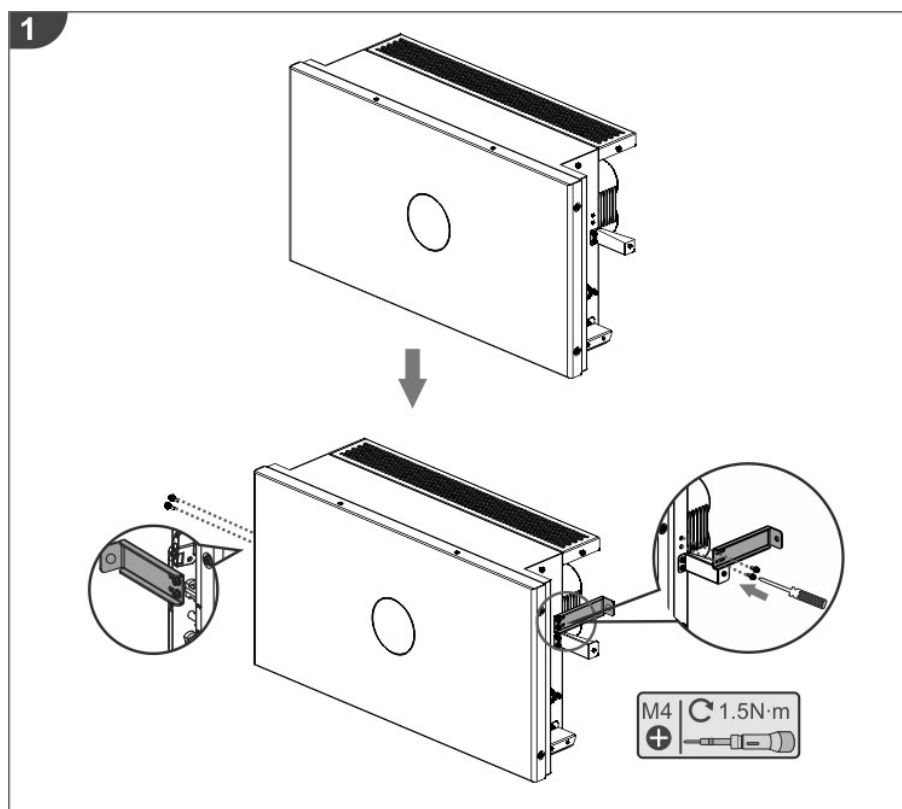
1. Install the brackets on both sides of the inverter.

2. Place the wall-mounting bracket onto the battery bracket. After ensuring the center holes of the two brackets are aligned, horizontally adjust the wall-mounting bracket toward the wall. Use a marker to mark the center hole of the wall-mounting bracket, then remove the bracket.

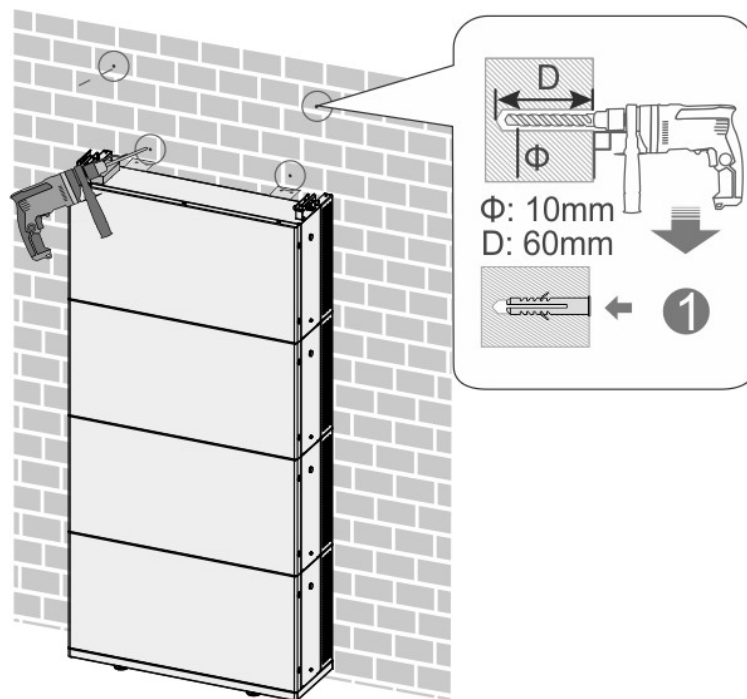
3. Align the two lower holes of the positioning paper card with the marked points, then use the marker to mark the positions of the two upper holes. After that, use a power drill to drill holes at these four points.

4. First, secure the wall-mounting bracket to the battery bracket using M4 screws, then fix the wall-mounting bracket to the wall using self-tapping screws.

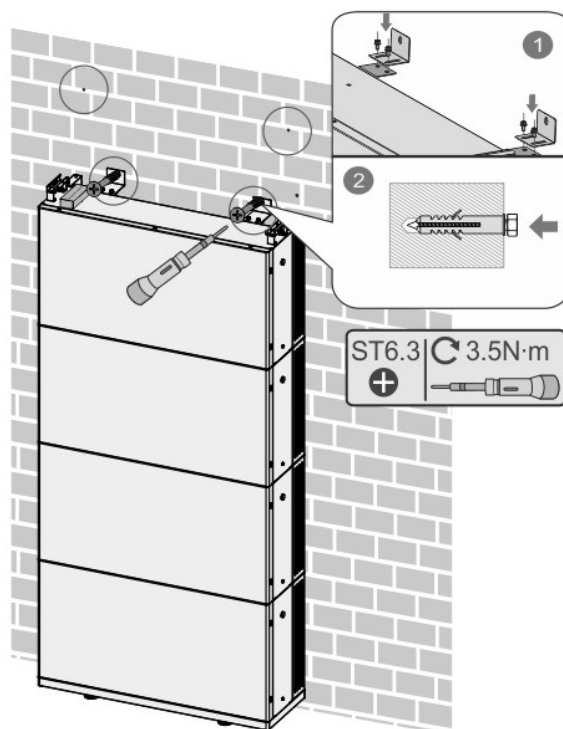
5. First, remove the dust film from the top of the battery pack, then stack the inverter onto the battery pack. Use a torque socket wrench to secure the inverter mounting brackets to the wall with self-tapping screws.



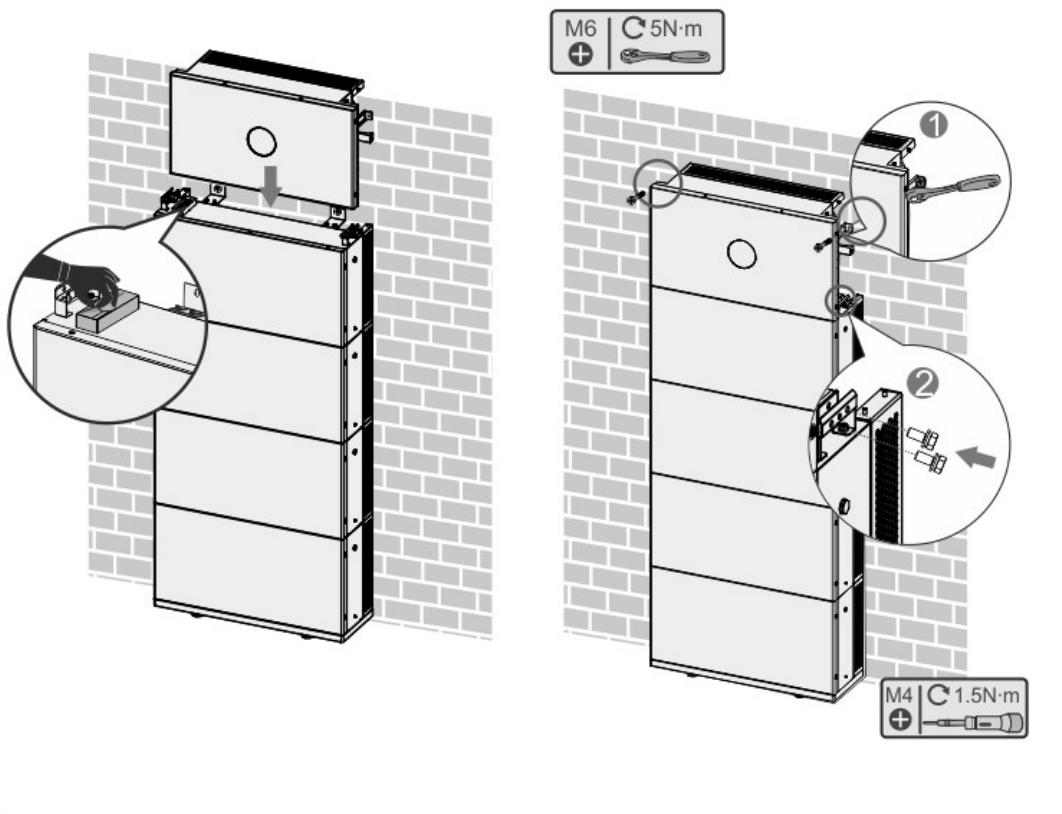
3



4



5



WARNING

- 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.
- This inverter has not been tested to Section 5 of AS/NZS 4777.2:2020 for multiple inverter combinations and/or multiple phase inverter combinations. Therefore, such combinations should not be used unless external devices are applied in accordance with AS/NZS 4777.1.
- 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.



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.

6.1 Electrical Connection

NOTICE

- Depending on regional regulatory requirements, the wiring methods for the N and PE lines at the inverter's ON-GRID and EPS ports differ. Please follow local regulations.
- The inverter has a built-in meter and can be directly connected to a CT for use. The CT network cable included in the shipment is 5 meters.
- CT accuracy will decrease when the connection length to the inverter exceeds 20m. For higher accuracy 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 EPS AC port is live. If maintenance is required on the EPS Loads, please power down the inverter to avoid electric shock.
- In a whole-house backup 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.



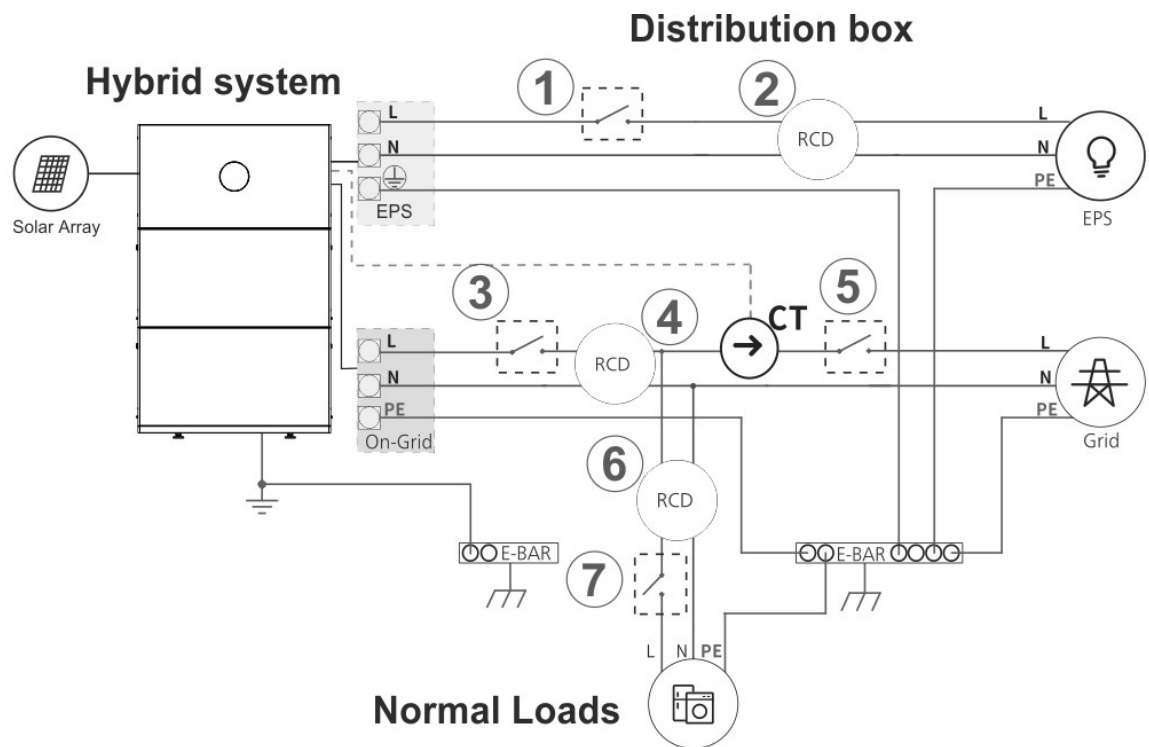
- The type A or B RCD (≥ 300 mA) must be installed on the EPS port of the system according to local regulations.
- The type A or B RCD (≥ 300 mA) is supposed to be installed on the ON-Grid port of the system accordingly based on the local regulations.

N and PE wires are separated in the distribution box.

NOTICE

Ensure the protective grounding wire for the EPS is correctly and securely connected. Otherwise, the EPS function may malfunction in the event of a grid fault.

The following wiring method applies to regions other than Australia, New Zealand, etc.



① ⑦	Depends on loads.
② ⑥	300 mA RCD (in compliance with local regulations)
③ *	40–63 A / 230 V Type B AC breaker
④	300 mA RCD (in compliance with local regulations)
⑤	Depends on household loads and inverter capacity.

***Note:** Type B is recommended, while Type C is also compatible. Select an MCB with an appropriate rated current based on actual requirements, including the overall wiring scheme, number of loads, and the inverter's load-carrying capacity.

Note: The values in the table are for reference only and may be adjusted according to actual conditions.

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 EPS AC port is charged. Power off the inverter first if maintenance is required on the EPS 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 EPS 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.

6.2 PE Cable Connection

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.

EARTH FUALT INTRODUCTION

Earth faults caused by insulation failure or accidental contact between live parts and ground that creates a low-resistance path for current to flow to earth, represent significant risks that require proper understanding and protective measures to mitigate their potentially dangerous effects.

EARTH FUALT ALARM

In the event of an earth fault, the inverter will display a fault code and push an alarm notification via the KSTAR Sync App.

6.2.1 Procedure

Step 1 Crimp an OT terminal.



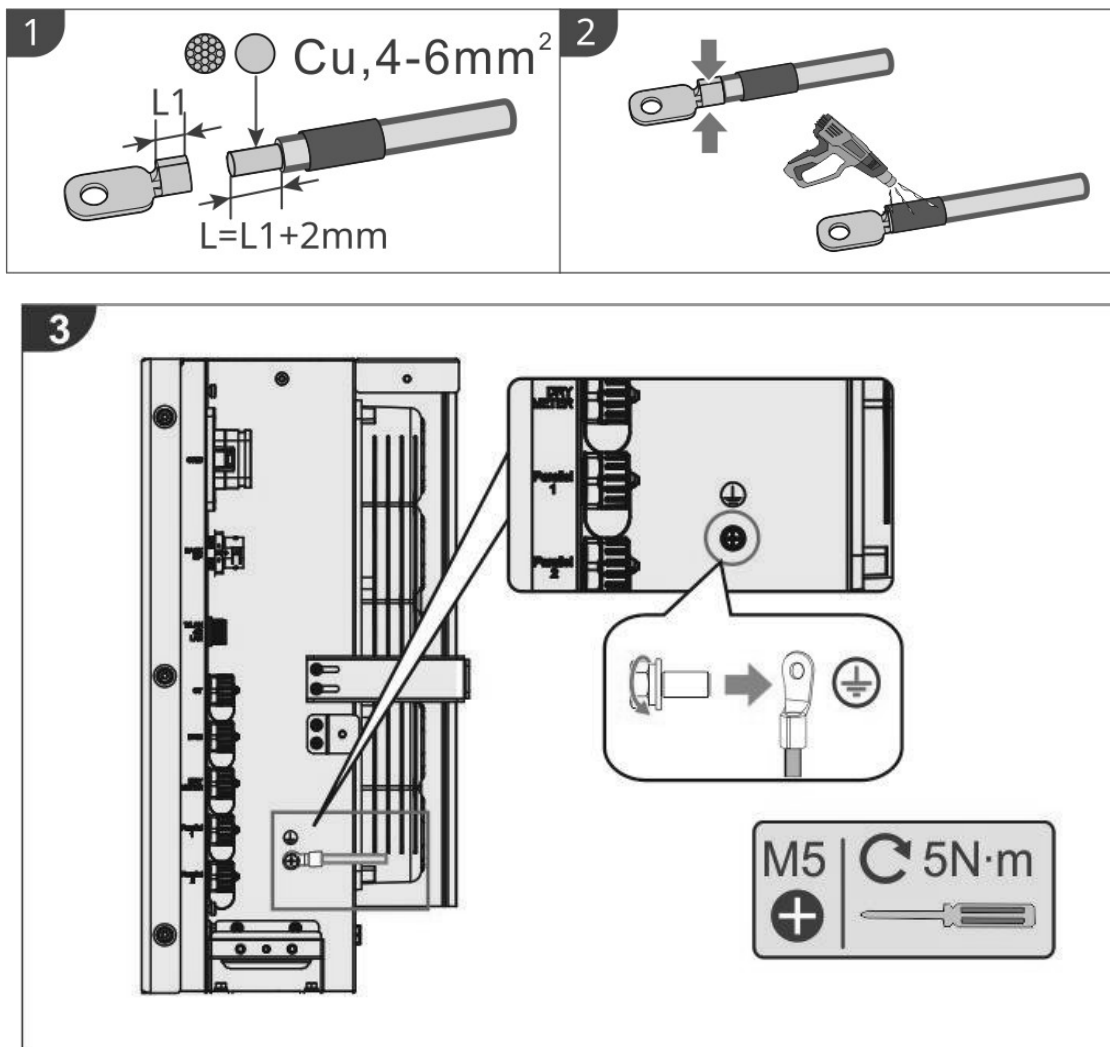
Avoid scratching the core wire when stripping a cable.

The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wire completely. The core wire must make close contact with the OT terminal.

Wrap the wire crimping area with heat shrink tubing or insulation tape. The heat shrink tubing is used as an example.

Use a heat gun carefully to avoid heat damage to the equipment.

Step 2 Connect the ground point of the Energy Storage Control Unit to the external ground point.



6.3 DC (MPPT) connection

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-.

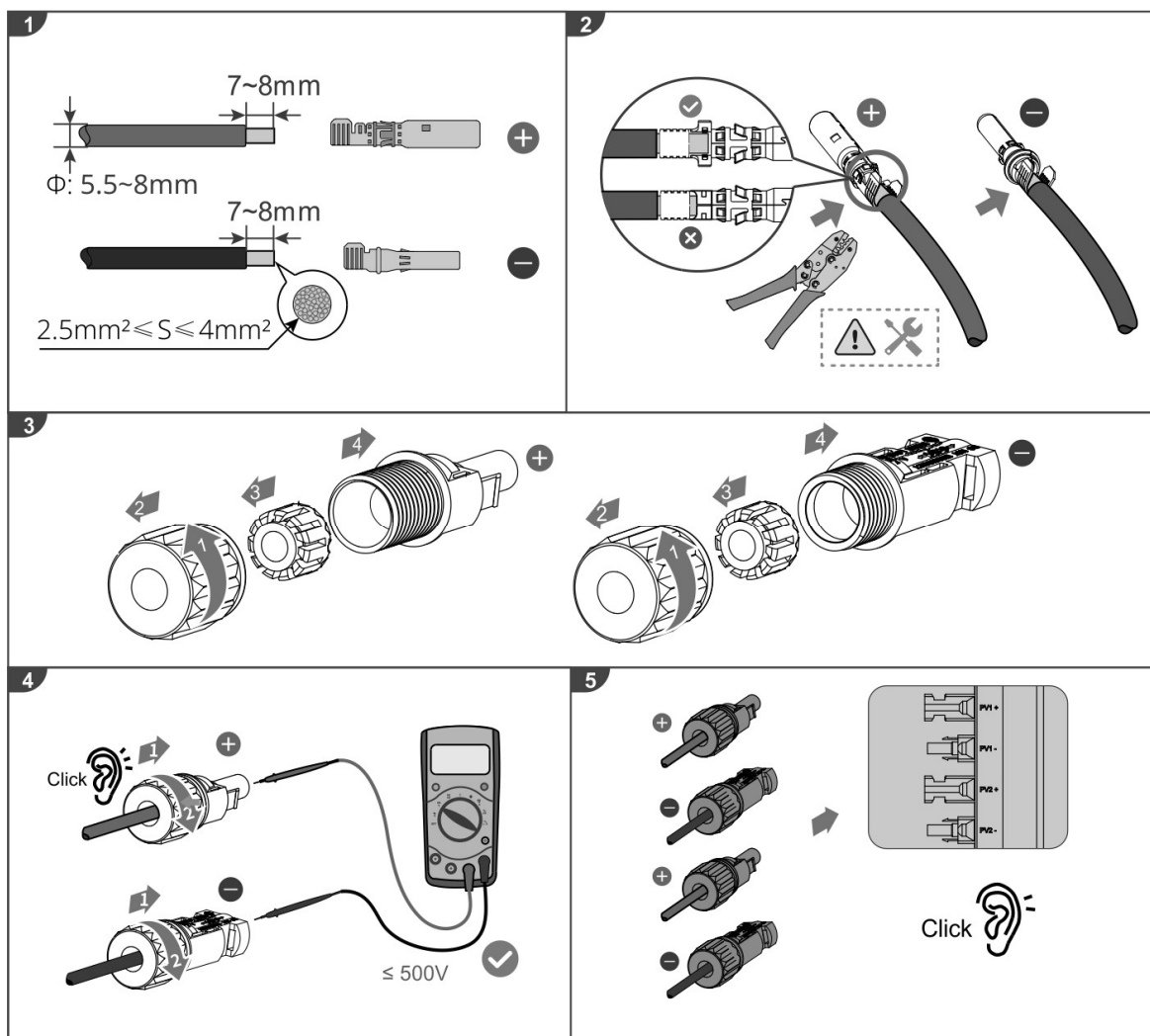
WARNING

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 ($R = \text{Max. Input Voltage} / 30\text{mA}$).

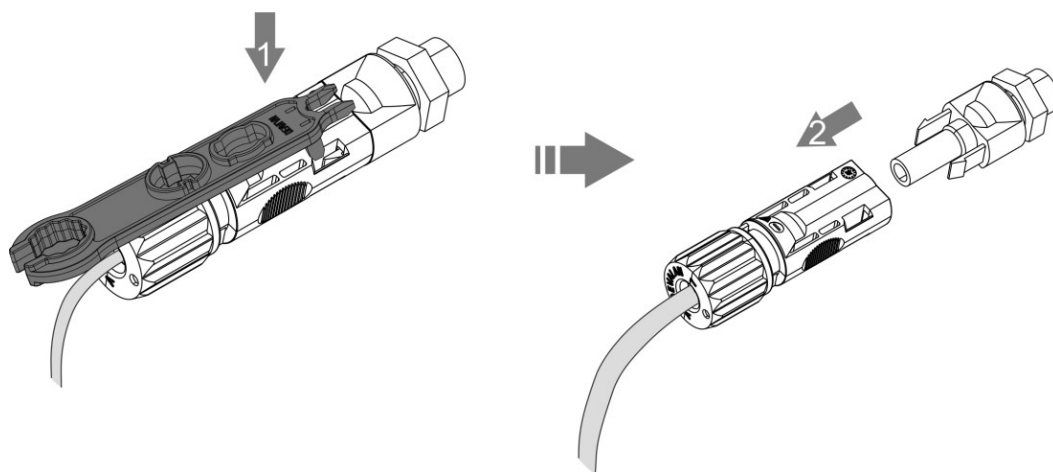
After completing the DC cable connection, ensure the cable connections are secure and not loose.

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.

Use the Staubli MC4 positive and negative metal terminals and Dc connectors delivered with the product. Using other positive and negative metal terminals and DC connectors may result in serious consequences, such as cable overheating, burning, and module damage. The resulting device damage is not covered by the product warranty.



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



6.4 Hybrid Inverter Expansion Overview

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.

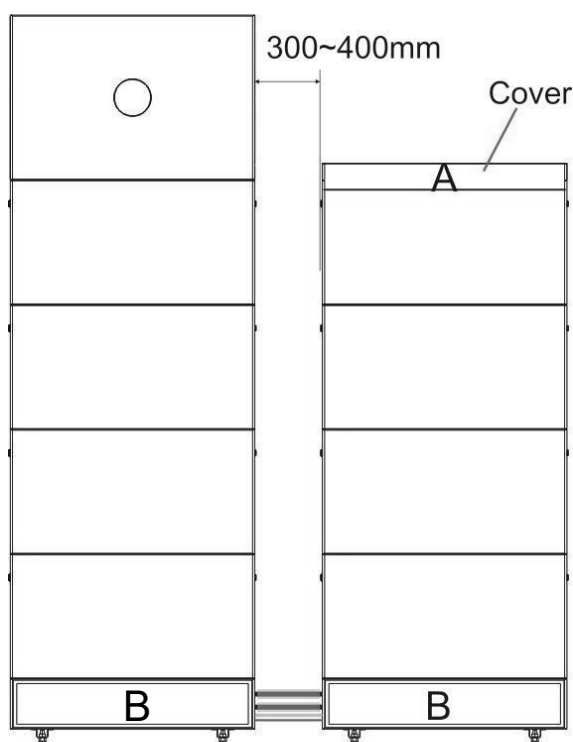
Please ensure that Battery open-circuit voltage is within the allowable range of Inverter.

Inverter heat sink surfaces and surrounding areas must remain free of wiring to prevent overheating damage to wire harnesses.

6.4.1 Hybrid Inverter Expansion Overview:

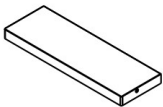
A: cover

B: Base with parallel port in Installation



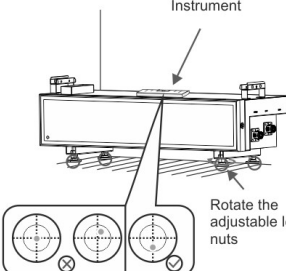
Eight Battery Packs

6.4.2 Dual-Tower Installation (Optional)

NOTE: ⚠ When 5 to 8 battery packs are used, the following additional accessories must be installed as a set. The unlocking tool is used for connector release operations.			
 Expansion Base	 Battery Top Cover	 Cables: 1 × Communication cable Power cables (1 × Black + 1 × Orange) 1 × PE cable (Grounding)	 Unlocking tool

1

Adjust the top to horizontal level

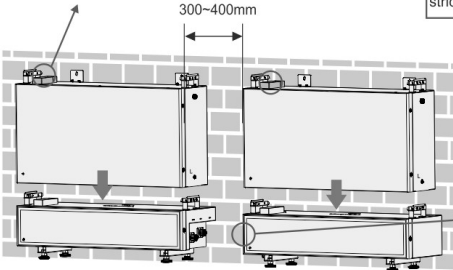


Leveling Instrument

Rotate the adjustable leveling nuts

2

Remove the top dust-proof film only after each battery pack is fully installed. This prevents dust from entering the battery connector.

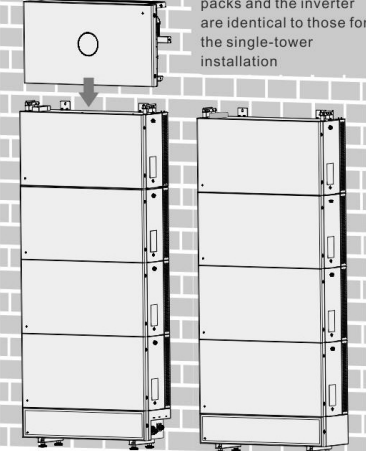


300-400mm

⚠ DANGER

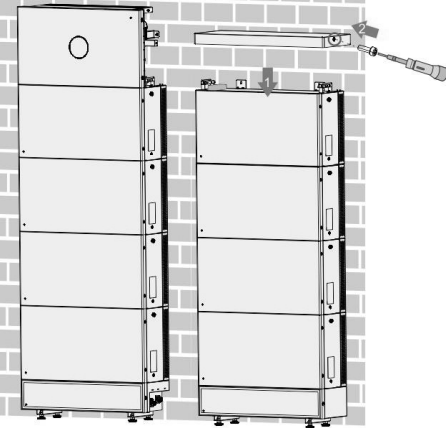
Failure to install the base may result in electric shock hazard. Operation without the base is strictly prohibited.

3



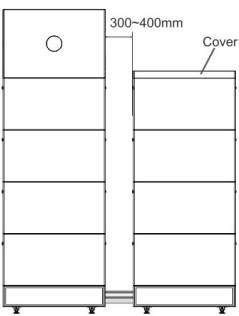
The installation steps for the dual-tower battery packs and the inverter are identical to those for the single-tower installation

4



M4 $\curvearrowright$ 1.5N·m

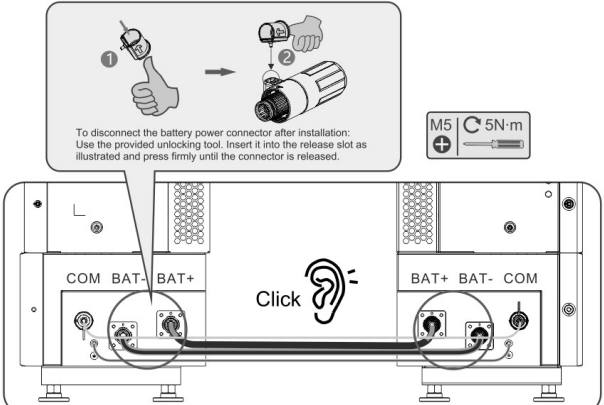
5



300-400mm

Cover

Eight Battery Packs



To disconnect the battery power connector after installation:
Use the provided unlocking tool. Insert it into the release slot as illustrated and press firmly until the connector is released.

M5 $\curvearrowright$ 5N·m

Click

6.5 AC Connection (Grid & EPS)

WARNING

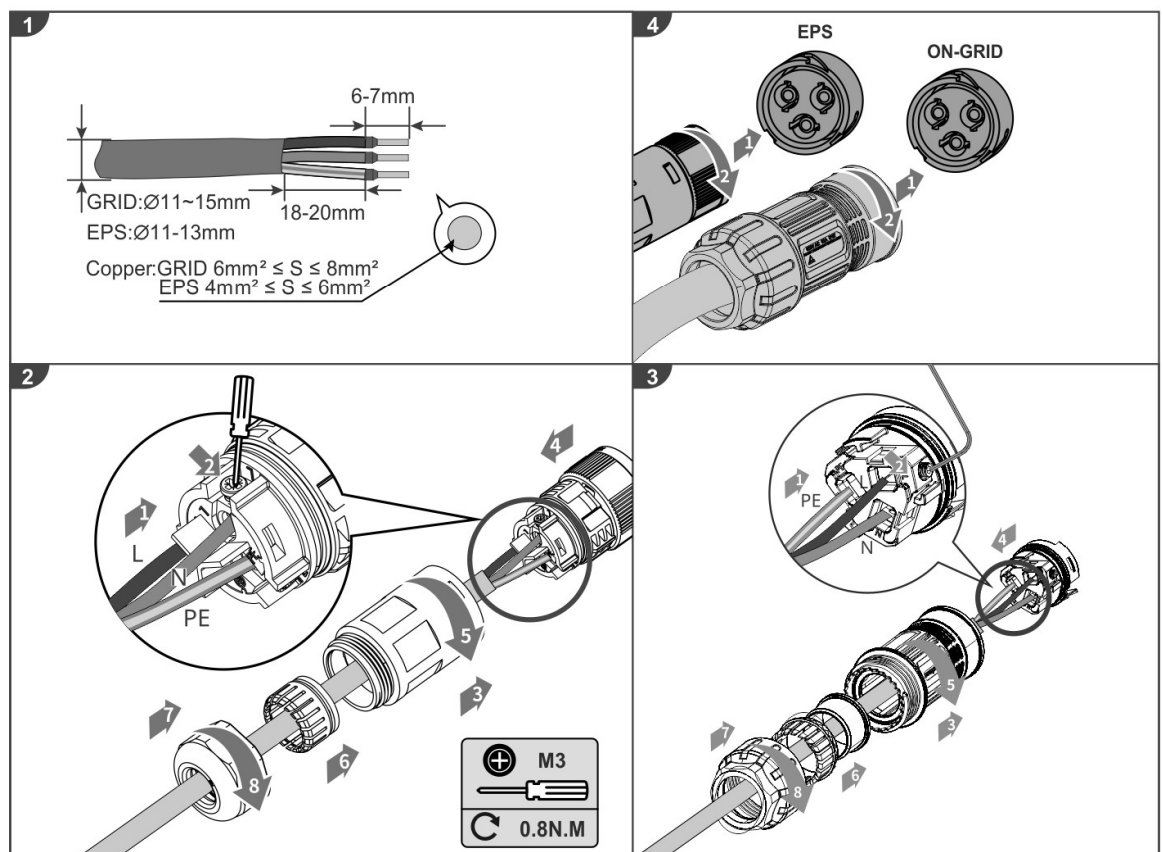
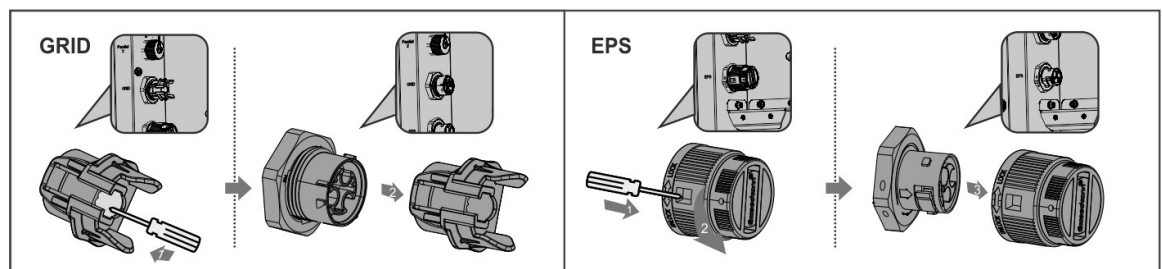
The inverter integrates a Residual Current Monitoring Unit (RCMU) internally to prevent the residual current from exceeding the specified value. When the inverter detects a leakage current greater than the permissible value, it will rapidly disconnect from the grid.

During wiring, ensure the AC cables fully match the "EPS" and "ON-GRID" grounding terminals of the AC terminal block. Incorrect cable connection will cause equipment damage.

Ensure the wire cores are fully inserted into the terminal connection holes with no exposed parts.

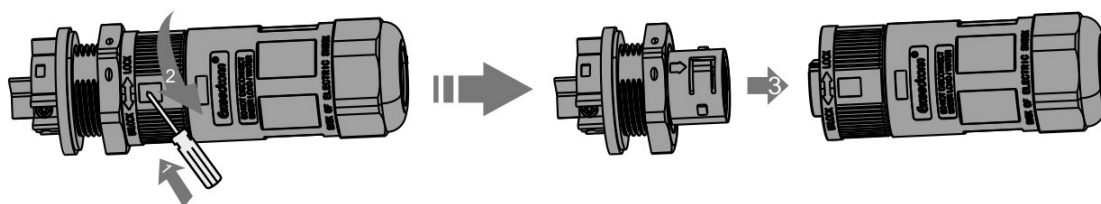
Ensure the insulation plate at the AC terminal block is securely fastened and not Loose.

Ensure all cable connections are tight, Otherwise, overheating of the terminals during equipment operation may cause equipment damage.

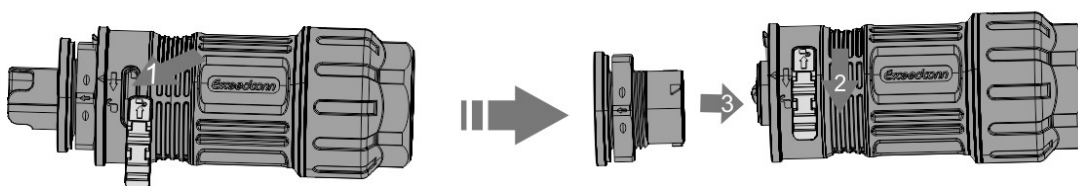


To disassemble the AC terminal, please refer to the following steps:

EPS



Grid



6.6 CT/Meter Connection



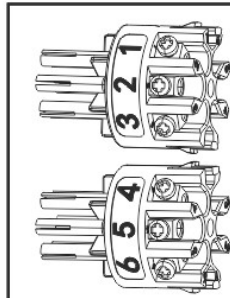
If multiple Inverter Parallel Networking units are required, please consult the manufacturer to purchase the meter separately.

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.

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.

CT/Meter



Pin 1: CT+

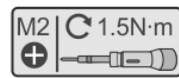
Pin 2: CT-

Pin 3: Meter RS485-A

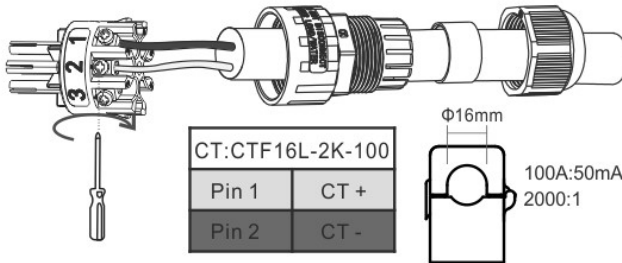
Pin 4: Meter RS485-B

Pin 5: RS485-B

Pin 6: RS485-A

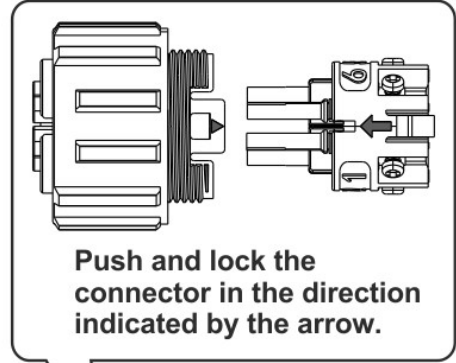


1

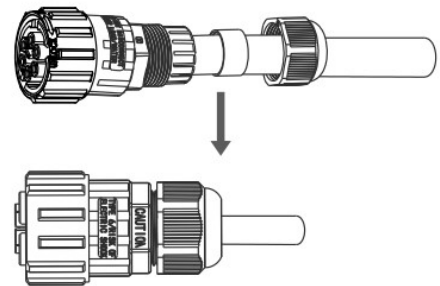


Φ16mm

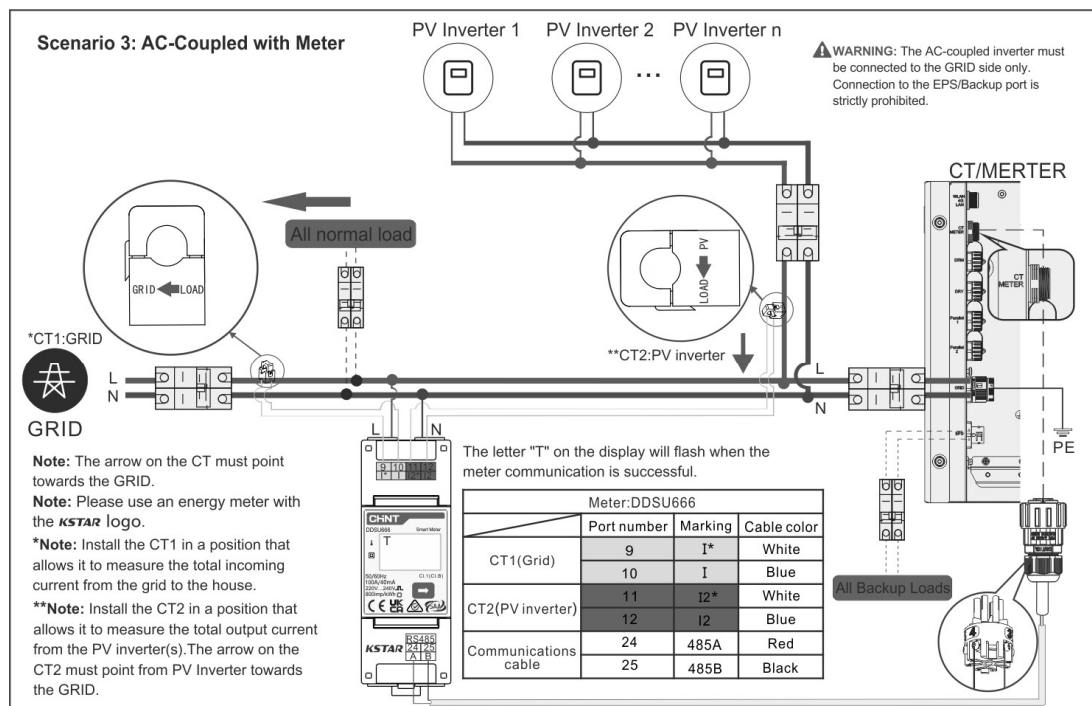
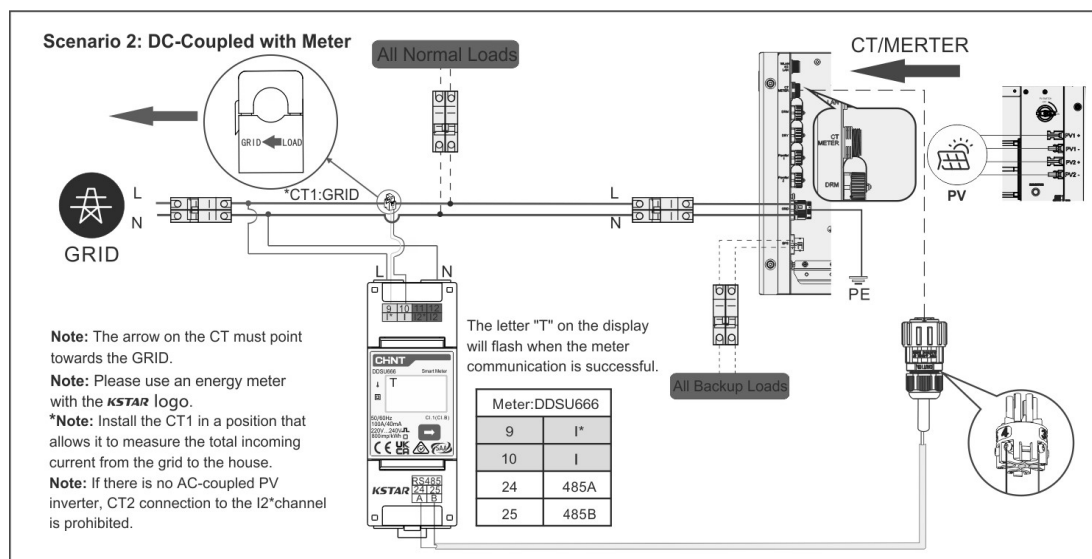
100A:50mA
2000:1



2



Supports connection to third-party monitoring platforms via the Modbus communication protocol. Users can implement the VPP function by connecting PIN5 and PIN6 in the CT/METER.

[illegible]

6.7 DRM Connection



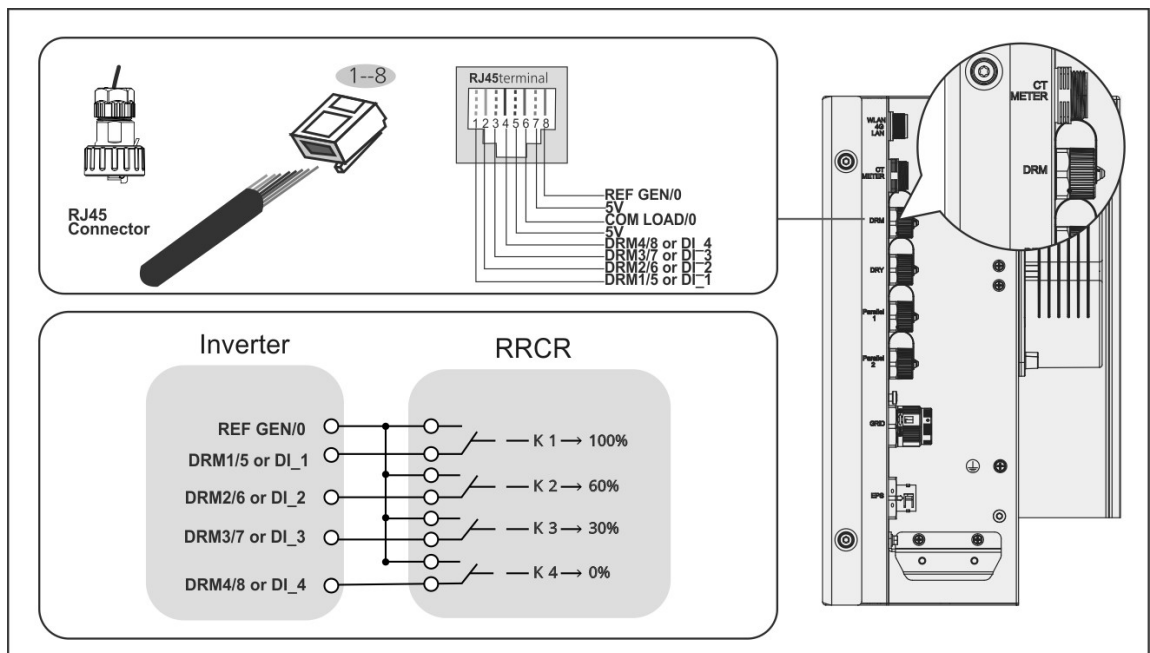
For use if required DRM Remote Shutdown function, please ensure the wiring is completed before proceeding. Sync App Enable this function.

If Not connected DRM not operate equipment or Remote Shutdown equipment while Sync App Enable this function, otherwise the Inverter cannot On-Grid operate.

In a parallel system, to implement the DRM and RRCCR functions, simply connect the DRM and RRCCR Communication cable to Master inverter.

To ensure the waterproof rating of the Inverter, do not dismantle the unused Water proof plugs on the Inverter.

Table-DRM Connector Pin Descriptions



7 System Commissioning

7.1 Pre-power Check

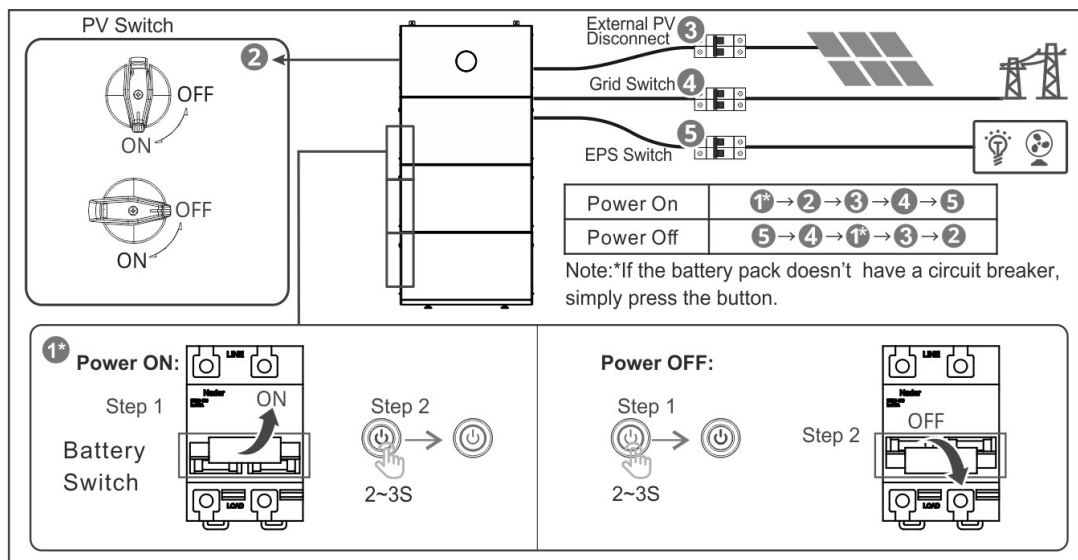
Check the following items before starting the inverter:

- .All equipment has been reliably installed.
- DC switch and AC circuit breaker are in the "OFF" position.
- . The ground cable is properly and reliably connected.
- . The AC cable is properly and reliably connected.
- The DC cable is properly and reliably connected.
- .The communication cable is properly and reliably connected.
- *The unused terminals are sealed
- The AC circuit breaker is selected in accordance with the requirements of this manual and local standards.
- The voltage and frequency at the connection point meet the inverter grid connection requirements.
- All warning signs & labels are intact and legible.

7.2 Power ON Procedure

DANGER

- When performing operation and maintenance on equipment in the system, please ensure the Power OFF the System is properly handled. Operating live equipment may cause equipment damage or electric shock DANGER.
- After the equipment is POWER OFF, the internal components Discharge require a certain amount of time. Please wait until the equipment is fully Discharge according to the time indicated on the label.
- Restart Battery should be performed using the circuit breaker power on method.
- When closing Battery system, strictly adhere to the Battery system power off requirements to prevent damage to Battery system.

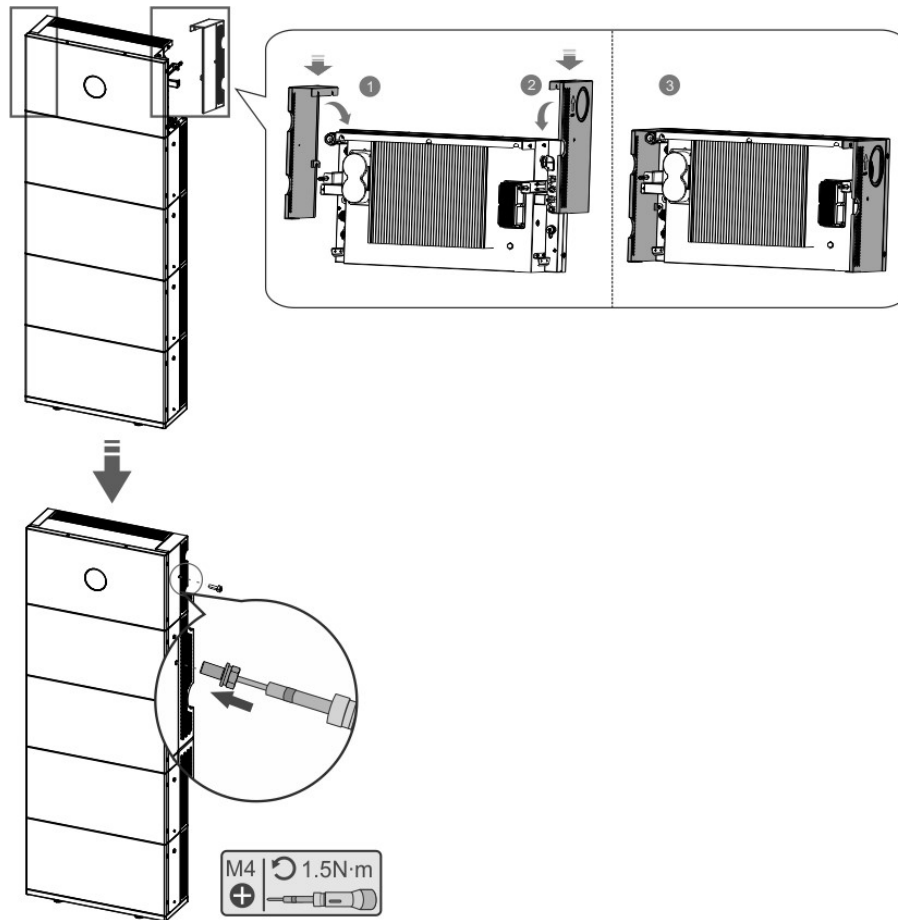


- First, flip the battery breakers of all battery packs upward to the ON position. Then, press and hold the battery button for 2-3 seconds until the battery button shows green and remains constantly lit.
- Rotate the PV switch of the inverter to "ON" position.
- Turn on the AC switch between the inverter and the power grid
- Turn on the EPS breaker

System Power-Off:

- Turn off the EPS breaker.
- Turn off the AC switch between the inverter and the power grid.
- Turn all battery pack circuit breakers downward to the OFF position. Then, press and hold the battery button for 2–3 seconds until the button LED light goes out from green. Rotate the PV switch of the inverter to "OFF" position.
- Rotate the PV switch of the inverter to "OFF" position.

7.3 Install Protective Covers



7.4 App Commissioning

Inverter supports connecting to mobile phones or WEB interfaces via 4G Bluetooth, WiFi, and LAN communication methods to set device-related parameters, view device operation information and error messages, and promptly understand system status.

- In a single-unit system, it supports Installation WiFi/LAN or 4G data logger.
- In the parallel system, each main Slave inverter must be equipped with a Installation WiFi/LAN data logger for networking.

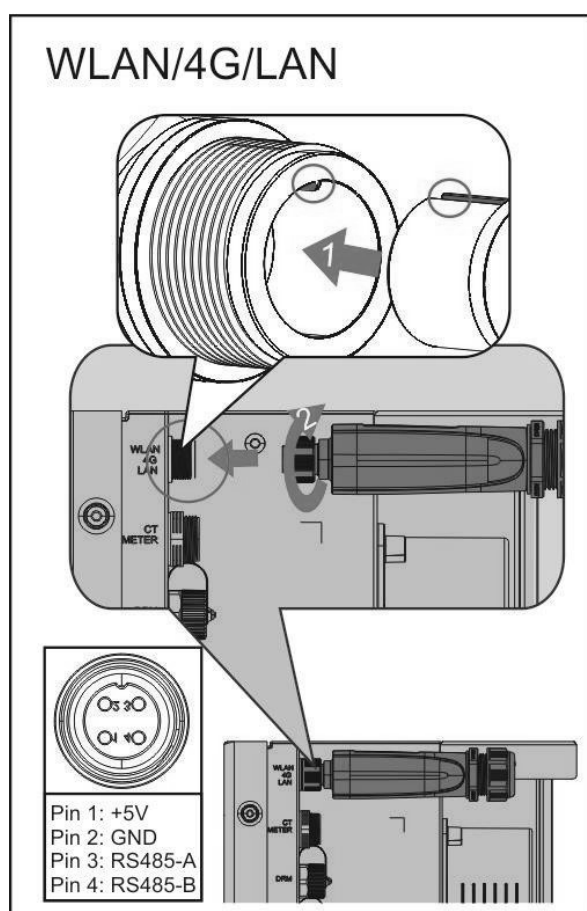
WARNING

Please remove logger after power off.

Data Logger Installation:

Step 1: Insert the data logger along the connector guide groove.

Step 2: Tighten the fastening cap clockwise.



7.5 Download APP

1. Android: Visit Google Play Store, search and download KSTAR Sync.
2. iOS: Visit App Store, search and download KSTAR Sync.
3. QR Code: Scan the QR code below to download KSTAR Sync.



7.6 Registration and Login

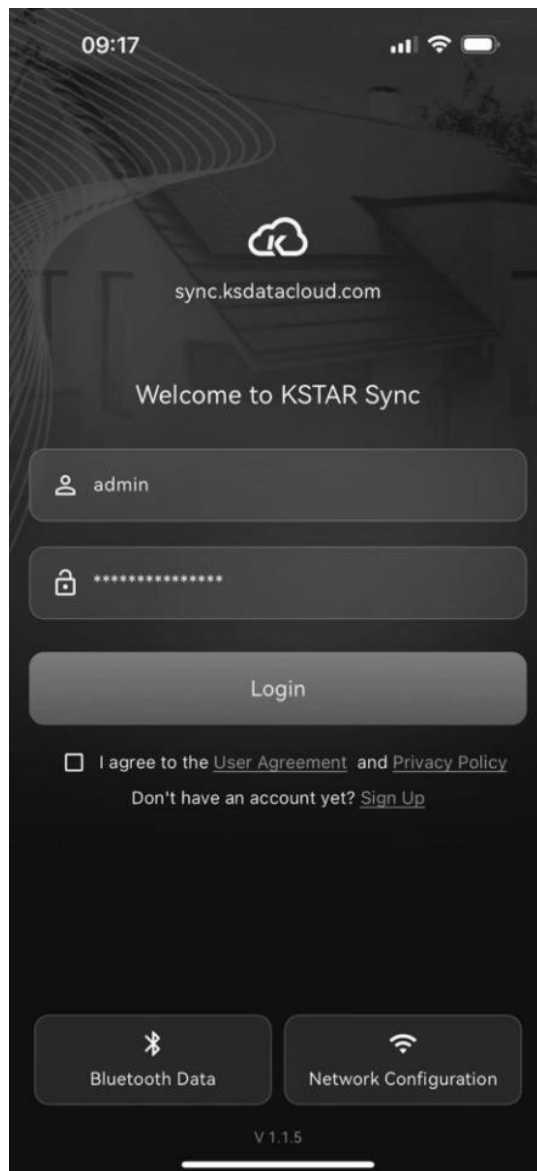
7.6.1 Registration

- Click the [Sign up] button on the login page to enter the registration page.
- Fill in the login account, password, verification email and other information according to APP requirements, and finally click the [OK] button to successfully register an end user account.

The image shows a mobile application registration screen titled 'Sign Up'. At the top, there is a status bar with the time '09:48' and signal/battery icons. Below the title, there are two tabs: 'End User' (selected) and 'Installer'. The form contains several input fields: 'Account Name *' with placeholder 'Please enter...', 'Nickname *' with placeholder 'Please enter...', 'Password *' with placeholder 'Please enter...', and 'Confirm Password *' with placeholder 'Please enter...'. There are also two dropdown menus for 'State *' and 'Country *', both with 'Select..' as the placeholder. Below these are fields for 'Email *' (placeholder 'Please enter...') and 'Verification Code *' (placeholder 'Please enter...'). A 'Send' button is positioned to the right of the verification code field. At the bottom of the form is a 'Contact Information' field with placeholder 'Please enter...'. A large 'OK' button is located at the very bottom of the screen.

7.6.2 Login

- Enter KSTAR Sync APP
- Enter account and password in the user login box
- Check to agree to the user agreement and privacy agreement, click the login button to successfully enter the APP.



7.7 Binding End User - Operator User Account

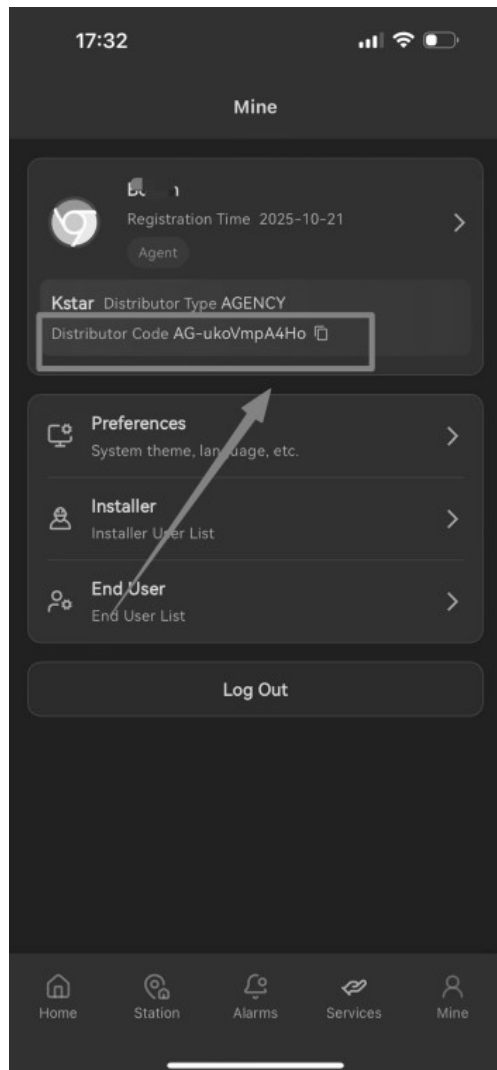
7.7.1 Precautions Before Binding Account

The account registered by the end user independently is an independent account and is not supervised by the operator. If the operator needs to view the end user's power station, the end user needs to bind the operator.

The account opened by the operator for the end user after logging into KSTAR Sync already has a binding relationship and does not require additional operations to bind the operator function.

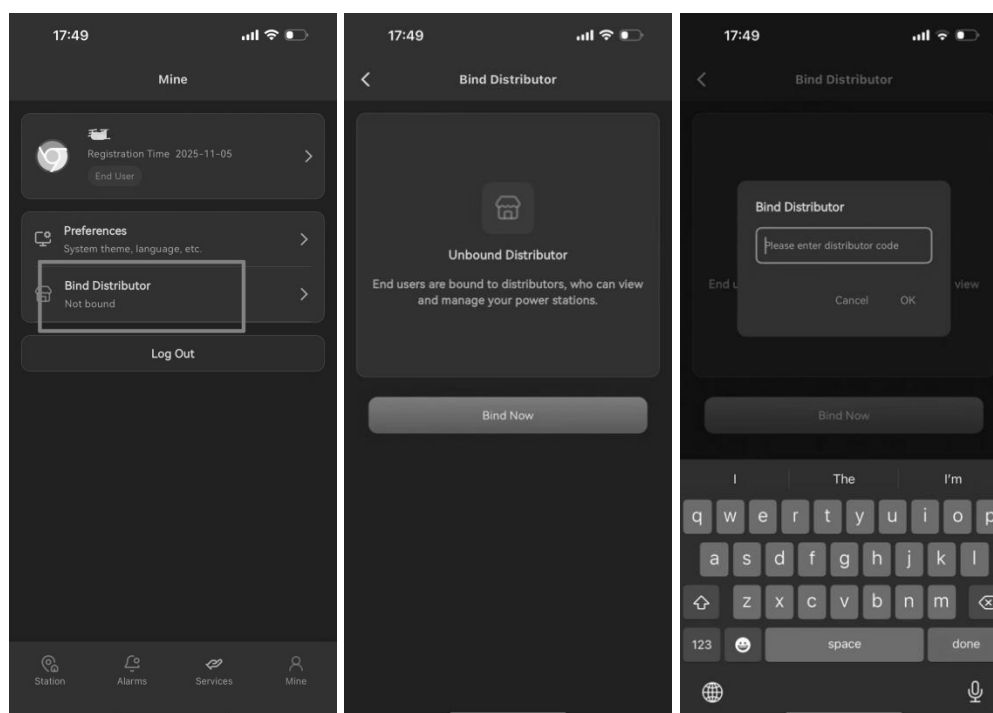
7.7.2 Finding Operator Code

After the operator logs into KSTAR Sync APP, enter the [Mine] page, the code displayed in the upper left corner of the page is the operator code, and the operator can copy the code.



7.7.3 End User Binding Operator Code

After the end user logs into KSTAR Sync APP, enter the [Mine] page, click [Bind Operator] - [Bind Now], enter the operator code, and click the [OK] button to successfully bind the operator account.



7.8 Create Power Station

7.8.1 Configuration Navigation for Creating Power Station

After logging in to the account, enter the [Station] page, click the [+] button in the upper left corner of the page to enter the new power station details page, and follow the system prompts to complete the power station information to successfully add a new power station.

Basic Information: Power station name, construction time, power station time zone, region/country, power station location, address, latitude and longitude (generated according to Google Maps selection or manually filled in), among which items marked with asterisks are required, while the more complete the other information is filled in, the more beneficial it is for you to manage the power station.

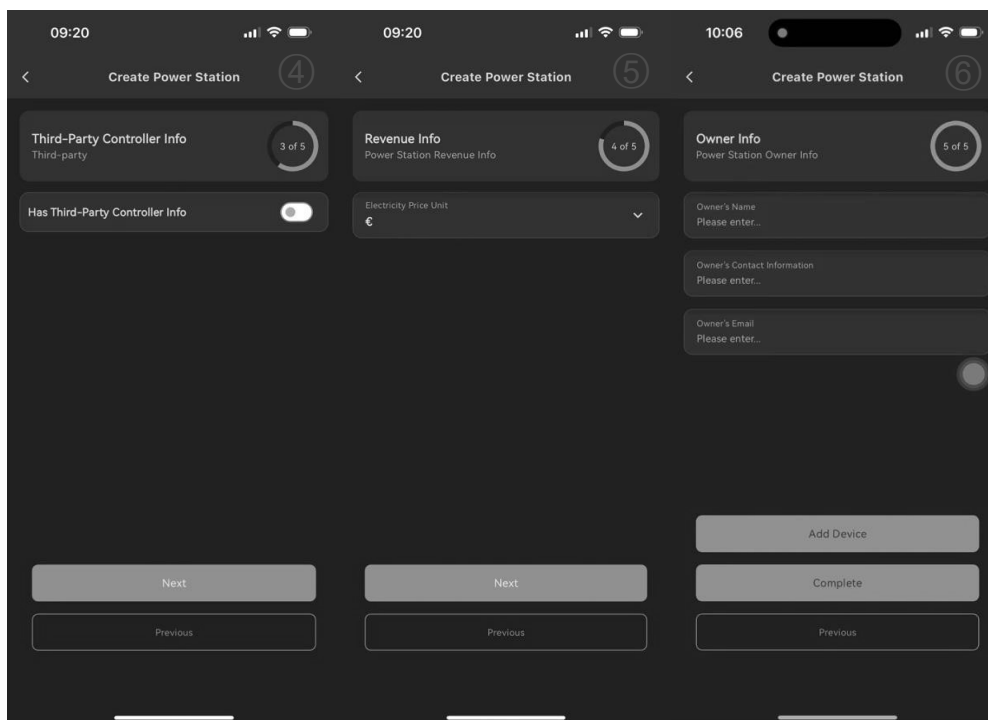
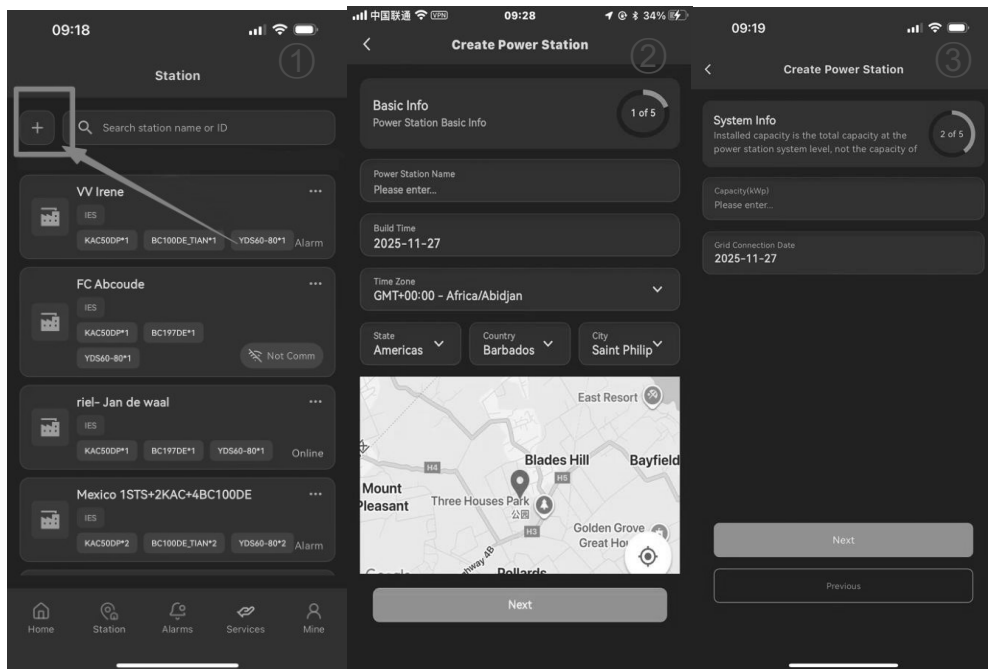
System Information: Installed capacity (kWp), grid connection date

Third-party Controller Information: Whether there is a third-party controller, third-party manufacturer name, contact person, contact person email.

Revenue Information: Electricity price unit.

Owner Information: Owner name, owner contact phone, owner email.

After filling in the information, click the [Complete] button to successfully create the power station. This marks the end of the power station creation process. To add a collector afterward, you will need to go to the power station page and click [Add Device] to continue with the operation.



By clicking the [Add Device] button, you will be able to proceed to the next step.

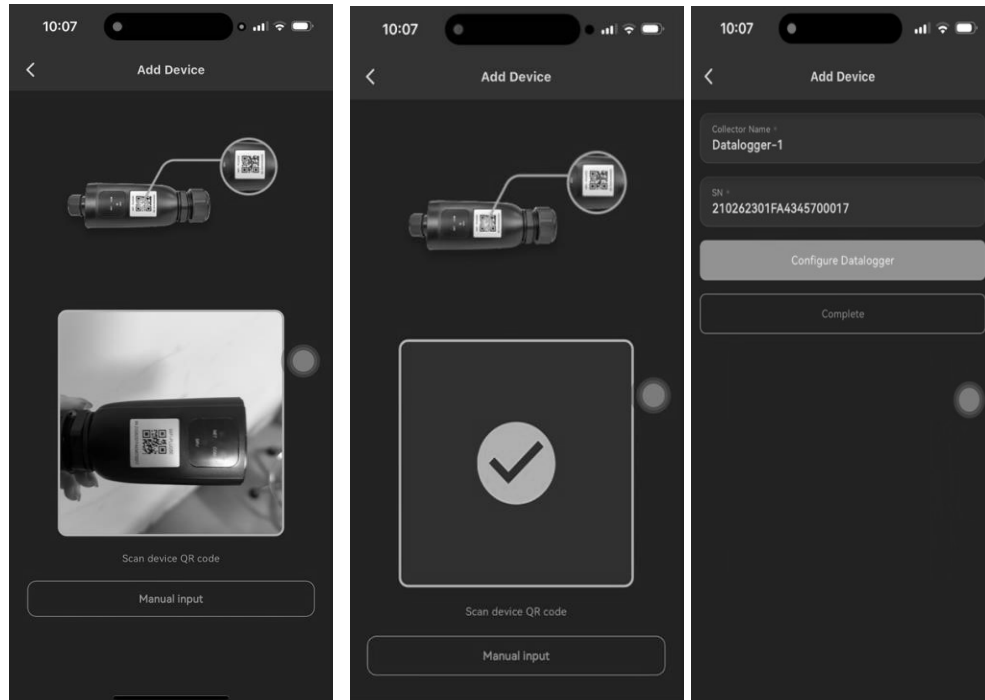
7.9 Add Device

Use your phone to scan the QR code on the collector. Once the scan is successful, a success indicator will appear on the screen, and the collector's SN will be automatically recognized. At the same time, you can also modify the collector's name if needed.

After confirming all the information, click [Complete], and the device will be successfully added. At the same time, a one-click power station setup process will be introduced. If users need to configure the collector later on, they will have to

return to the power station page and adjust the settings there.

By tapping the [Configure datalogger] button, users can seamlessly move on to the next stage. There, they can set up the collector's network connection, enabling the device to go online and connect to the KSTAR Sync server without any issues.



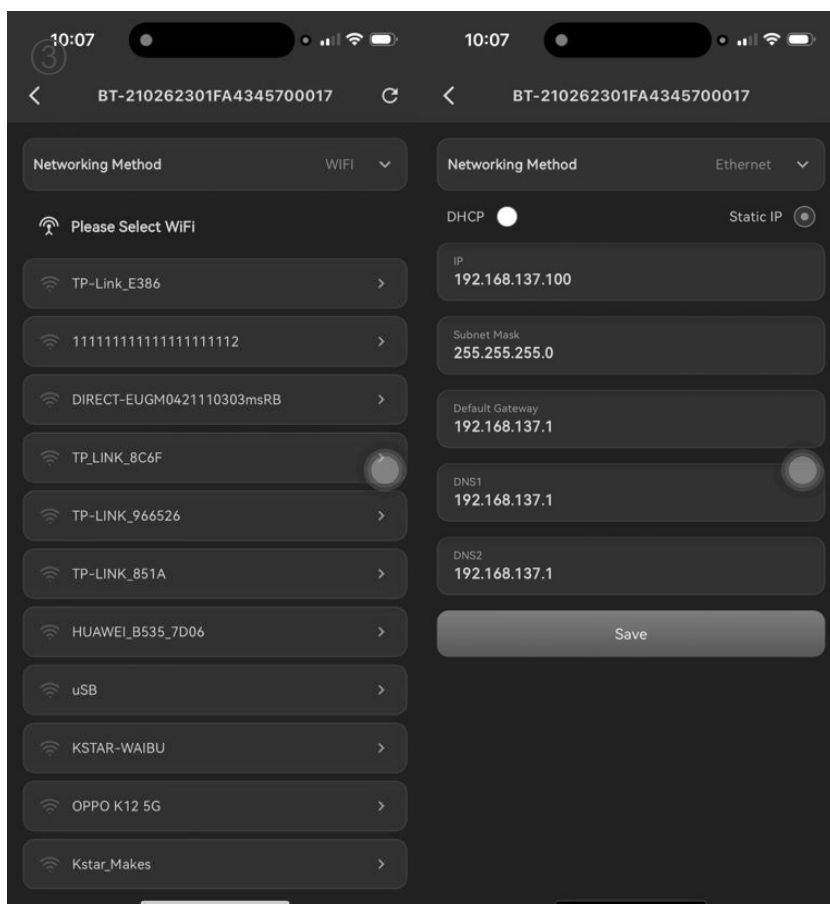
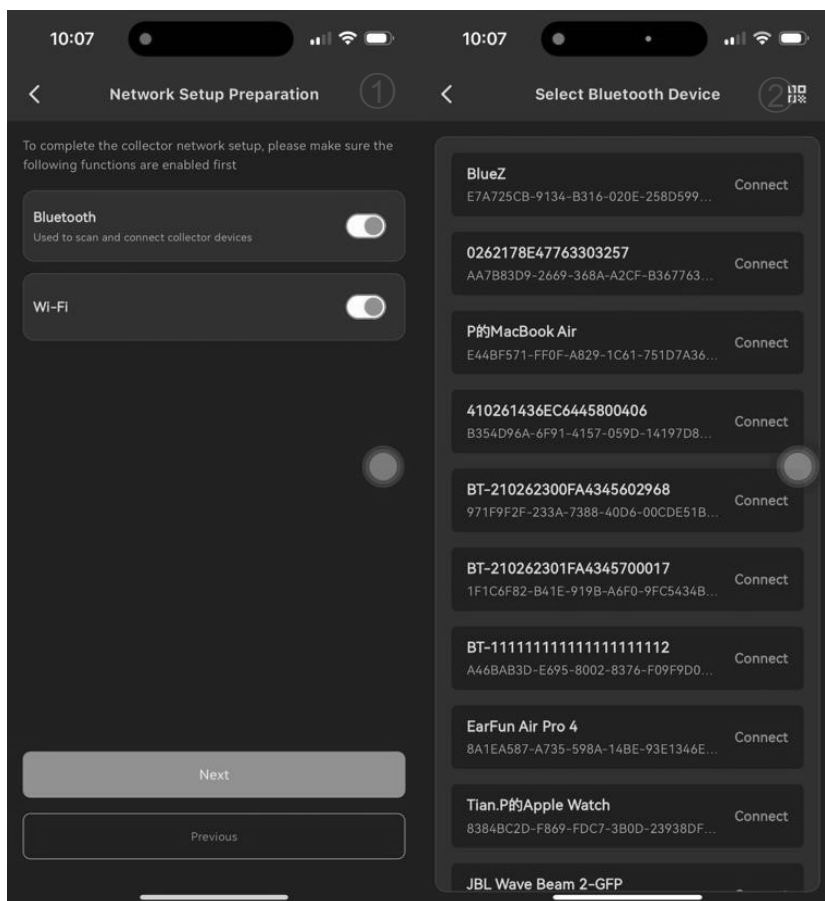
7.9.1 Network Setup Preparation

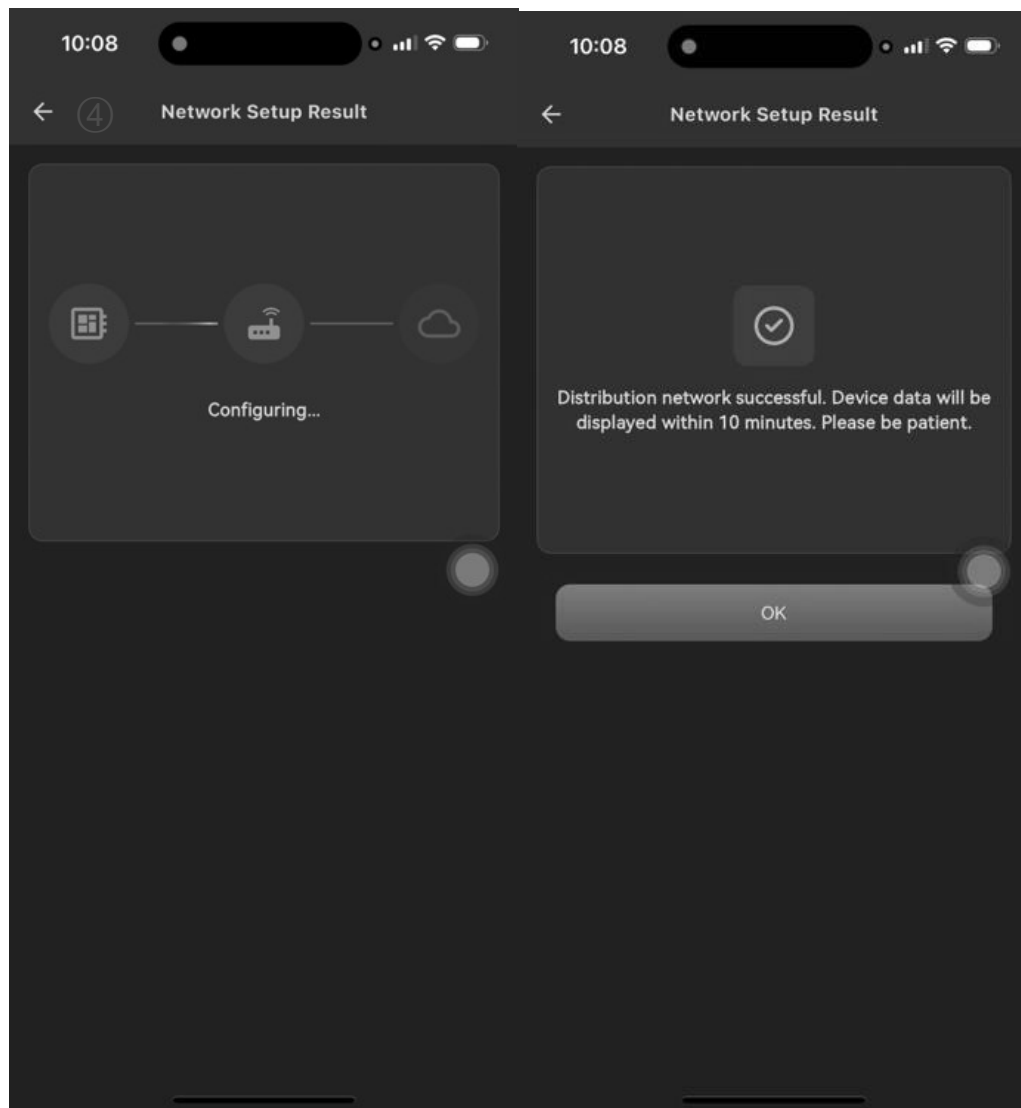
Before configuring the network, users need to first turn on both the Bluetooth and Wi-Fi switches on their phones. This allows the app to successfully detect and connect to the collector via Bluetooth, and also ensures that the device can connect to the Wi-Fi network smoothly when configuring the collector's network settings later on.

Once Bluetooth and Wi-Fi are enabled, click the [Next] button to begin configuring the collector's network.

The app will automatically scan for nearby Bluetooth devices. Users need to locate the Bluetooth device that corresponds to the collector — the Bluetooth name will match the SN printed on the collector. Once found, tap the [Connect] button.

The collector offers two networking options — Ethernet and Wi-Fi. Depending on the available network setup at the installation site, users can select the one that best suits their needs.





- For the Wi-Fi networking method: The app will automatically detect nearby Wi-Fi networks. Users simply need to select their own Wi-Fi name (SSID), enter the password, and the connection will be successfully established.
- For the Ethernet networking method: After physically connecting the network cable, the app will automatically detect network information such as the IP address. Users also have the option to manually enter IP address and other network parameters. Once the network settings are confirmed, simply click the [Save] button, and the collector will successfully connect to the network.

After a successful network connection, the collector will perform a network connectivity check to verify whether it can successfully connect to the internet and establish a connection to the KSTAR Sync server. Once the connection is confirmed, the page will display a success indicator, signaling that the collector configuration is complete. Then, click the [OK] button to proceed to the next step.

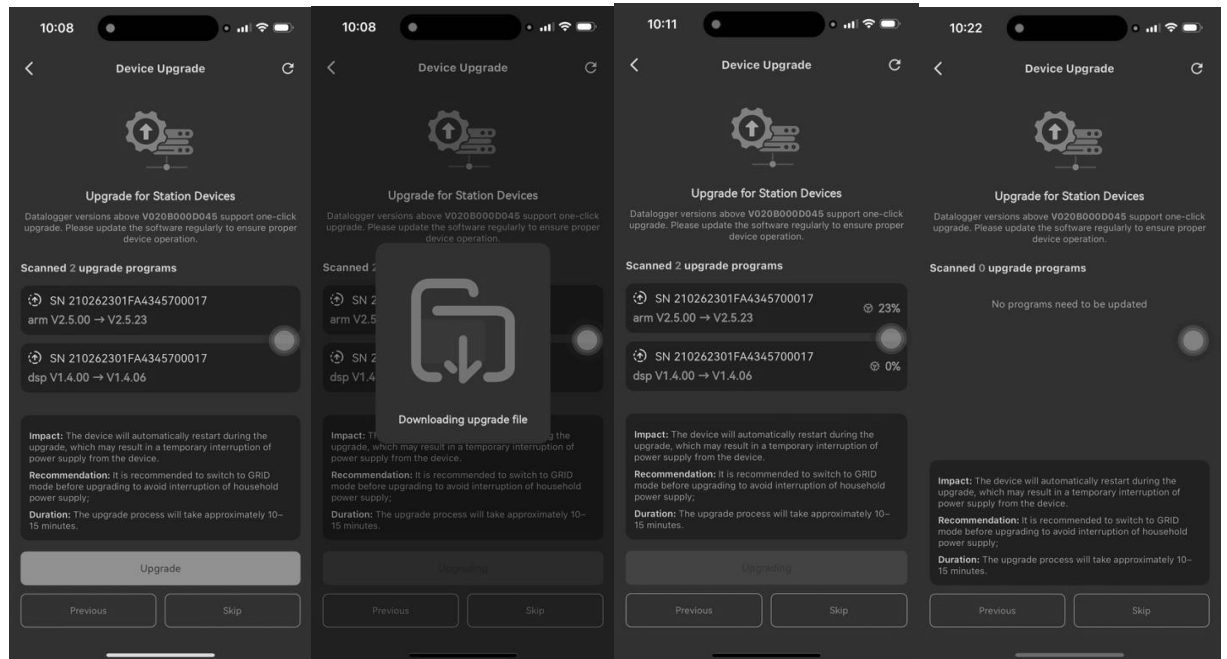
7.9.2 Device Upgrade

Once the network configuration is successful, the app will automatically check for available software upgrades, including ARM, DSP, and BMS. Users can perform a one-click upgrade. By tapping the [Upgrade] button at the bottom of the page,

the upgrade process will begin. First, the upgrade file needs to be downloaded, which may take some time — please be patient. After the file is successfully downloaded, the software upgrade will proceed automatically, and users can monitor the upgrade progress.

After the upgrade is successfully completed, users can proceed to the next step.

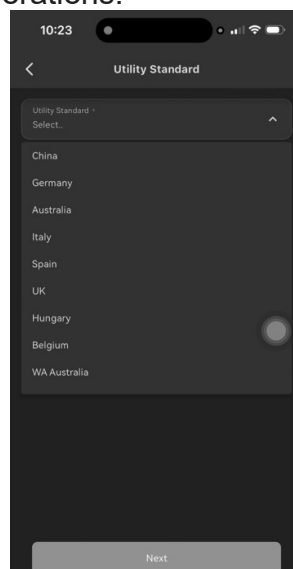
If users prefer not to proceed with the upgrade, they can click the [Skip] button at the bottom of the page to go directly to the next step.



7.9.3 Utility Standard

In the Grid Standard Configuration page, users are required to choose the appropriate local grid code or utility standard. This ensures that the device can communicate correctly with the electrical grid while meeting all relevant legal and regulatory requirements.

After selecting the appropriate grid standard, click the [Next] button to proceed with the subsequent operations.

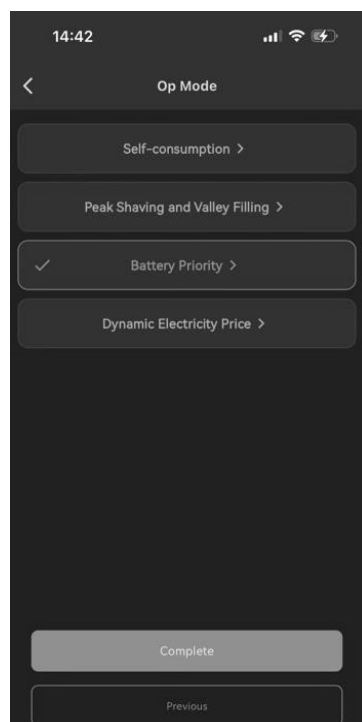


7.9.4 Op Mode

The operational strategy module serves as the intelligent control core of the system, offering four operational modes: Self-consumption, Peak Shaving, Battery Priority and Dynamic Tariff. This enables automated management of power station charging and discharging operations. Users can flexibly select the optimal strategy based on actual electricity demand, pricing policies, and grid requirements, achieving the comprehensive goals of improving economic efficiency, ensuring power supply security, and participating in grid dispatching.

- Self-consumption mode: Prioritizes consuming photovoltaic power generation, excess electricity is stored in battery, when insufficient, battery discharges, maximizing green electricity Self-consumption rate.
- Peak shaving and valley filling mode: Discharges during peak electricity hours to reduce grid demand, charges during load valley periods, smooths electricity curve, reduces capacity electricity fees.
- Battery priority mode: Prioritizes supplying load from battery (discharge), photovoltaic electricity is used for charging; if battery is insufficient, then uses power grid.
- Dynamic Tariff : The Hybrid Inverter will automatically sort all electricity prices for the day based on the high electricity price range and low electricity price range you have set, distinguishing between the high electricity price interval (red interval), low electricity price interval (green interval), and normal electricity price interval (intervals other than red and green). The system will automatically identify whether the current time falls within your preset intervals and operate according to the charge, discharge, or standby strategies you have configured for each interval.

After the operation strategy has been successfully configured, click the [Complete] button to proceed to the next step.



7.9.5 System Self-Check

The One-Click Self-Test function is used to automatically check the connection status and operational health of all key system components after equipment installation or maintenance. Before starting the self-test, users need to close the following physical switches:

- PV Switch
- Battery Switch
- Grid Switch
- BACKUP Switch

Once the self-test is completed, the system will detect and report the status of the following 5 core modules:

1. PV Self-Test

- ◆ Checks whether PV voltage and insulation impedance are normal
- ◆ Determines whether PV input is present

2. Battery Connection Status Detection

- ◆ Whether BMS communication is functioning properly
- ◆ Identification of the number of battery packs
- ◆ Whether battery voltage, current, and temperature are within allowable ranges
- ◆ Whether any alarms exist
- ◆ Whether SOC (State of Charge) and SOH (State of Health) readings are normal

3. Grid Self-Test

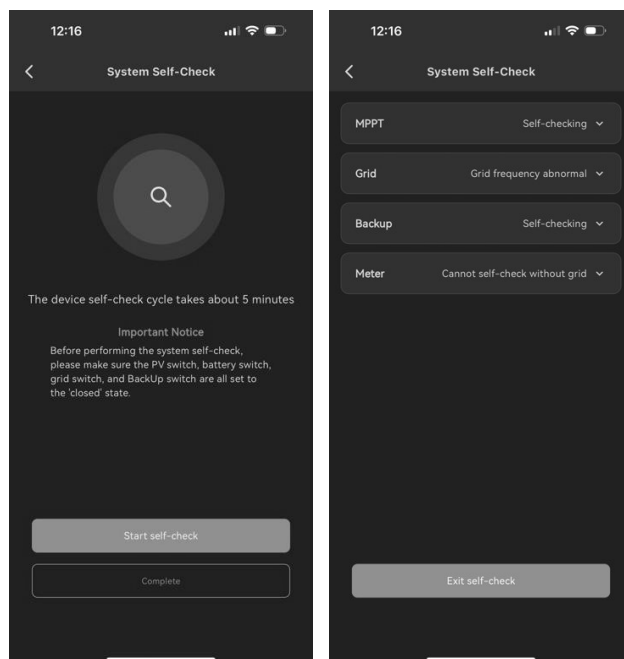
- ◆ Whether grid voltage is within the standard range
- ◆ Whether grid frequency is normal
- ◆ Whether phase sequence is correct
- ◆ Whether any overvoltage, undervoltage, overfrequency, or underfrequency faults exist

4. BACKUP Self-Test

- ◆ Whether output voltage is normal under grid bypass or off-grid mode
- ◆ Whether output current and power are normal (not overloaded)
- ◆ Whether output frequency is stable

5. Meter or CT Self-Test

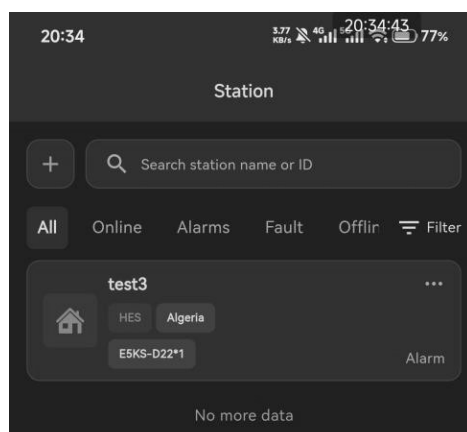
- ◆ Whether meter communication is functioning properly
- ◆ Whether CT wiring direction is correct (automatic correction is available if the direction is wrong)
- ◆ Whether the three-phase CT phase sequence is correct
- ◆ Whether the CT is damaged or not connected
- ◆ Whether charge/discharge power meets the required standard (1KW for single-phase, 3KW for three-phase)
- ◆ Whether power and energy metering data are normal



After the device self-test has finished, the whole station creation process is successfully concluded.

7.10 Power Station

The power station list module centrally displays and manages all power station data under your name, supporting adding power stations, querying, and detail viewing.



7.10.1 Overview of Power Station List Functions

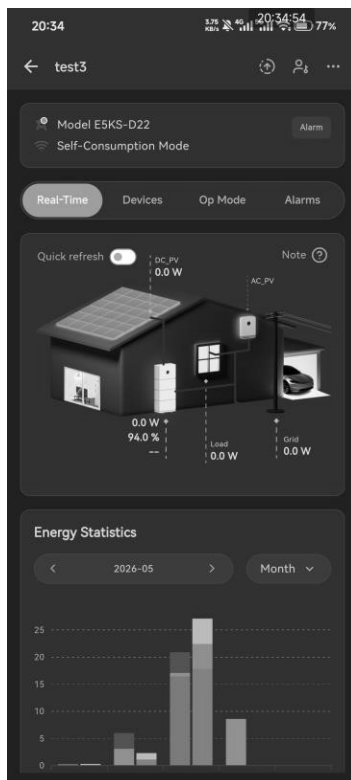
- Power station query: You can input power station name, collector SN to query power station data, the system will perform fuzzy query according to the power station name you input to quickly search corresponding power station information.
- Add power station: Click the [+] button in the upper left corner of the page, jump to the corresponding page, complete the power station information according to the prompts to complete the function operation of creating power station.
- Enter power station details: Click the power station name in the power station list, a new page will open to enter the corresponding power station interface.

7.10.2 Station Details

7.10.2.1 Real-time

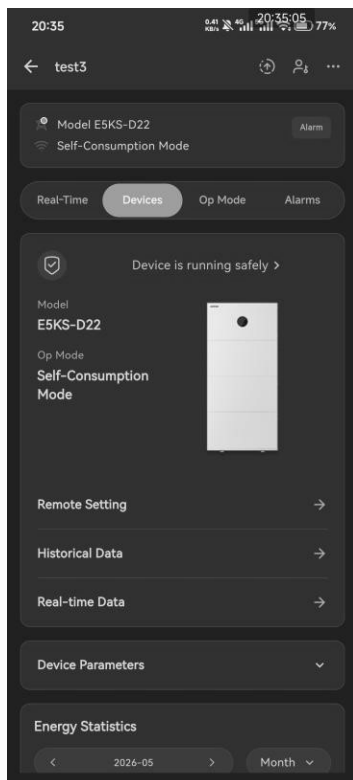
The real-time module provides users with a centralized monitoring view of residential energy storage power stations.

- In the form of system diagram, dynamically displays the real-time operation status of power stations, key functions include:
 - Current path visualization: Dynamically displays energy flow direction between photovoltaic, energy storage, electrical load and power grid.
 - Real-time presentation of key data: Accurately displays key parameters such as instantaneous power of core Device like inverters and batteries.
- Energy statistics are divided into 2 parts: power analysis, this week's energy trend.
 - Power analysis: Through multi-curve comparison chart, synchronously displays the power changes of photovoltaic, power grid, load, battery and battery SOC curve on the current day. Users can flexibly query detailed data of any historical date through date selector.
 - Weekly energy trend: In the form of bar chart or data table, statistics and displays cumulative energy data of the recent 7 days, key indicators include: photovoltaic power generation, grid power purchase, load electricity consumption and battery charge/discharge amount, helping you understand weekly energy consumption patterns.

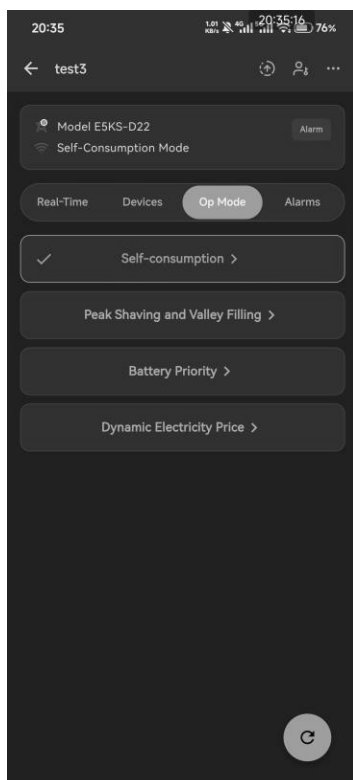


7.10.2.2 Device

- Basic information: Displays Device status, Device model, Device current operation strategy.
- Remote setting: Remote setting provides authorized users with cross-regional, high-efficiency Device control capabilities through cloud platform. This function allows operation and maintenance personnel or system administrators to directly perform parameter configuration, system soft reset and safety protection threshold adjustment operations on various Device in the power station without needing to arrive at the site. With this function, users can uniformly manage energy storage units distributed in different locations, achieving centralized remote monitoring and control from individual Device to power station clusters, effectively improving system operation and maintenance response speed and management precision.
- Real-time data: From 4 dimensions of PV&INV, battery, power grid, load, displays real-time power, photovoltaic power generation, battery charge and discharge amount, electricity consumption and other basic parameters of Device.
- Historical data: Device data is automatically saved to the system at a frequency of 5 minutes/time. Supports query and trend analysis, providing complete, traceable data basis for operation and maintenance optimization and decision-making.



7.10.2.3 Operation Strategy



Self-consumption

Charging Period Operation Strategy

During the charging period, the system executes the "PV Priority Charging" strategy. PV generation is prioritized for battery charging. When the available PV power is lower than the preset charging power limit, the system automatically

supplements power from the grid to ensure charging.

When the demand control function is enabled, the system will supplement power from the grid under the constraint that the sum of load power consumption and battery charging power from the grid does not exceed the demand current setpoint. Meanwhile, the actual battery charging power remains no higher than the preset charging power limit.

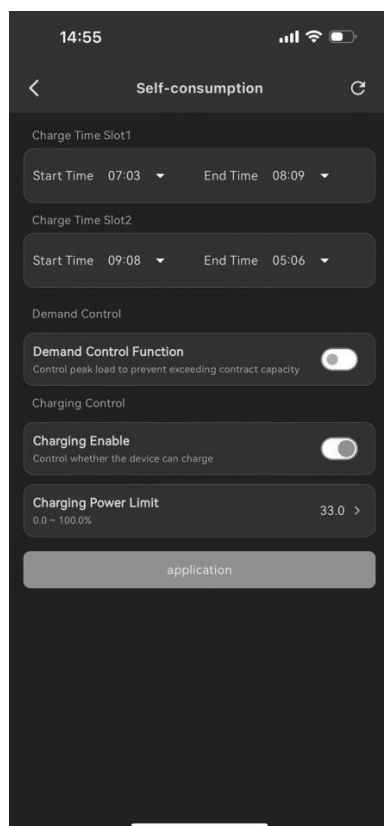
Non-Charging Period Operation Strategy

During the non-charging period, the system executes the "PV Priority for Load" strategy. PV generation is prioritized for powering loads. When PV power is insufficient to meet load demand, the Hybrid Inverter discharges to compensate. When the combined power of PV and storage is still lower than the load demand, the grid supplies the remaining shortfall.

When there is surplus PV power after meeting load demand, the surplus power is prioritized for battery charging. After the battery is fully charged, the system handles the situation according to the anti-reverse power flow function status:

Anti-reverse power flow function enabled: Limit excess PV output (PV curtailment).

Anti-reverse power flow function disabled: Allow excess PV power to be exported to the grid.

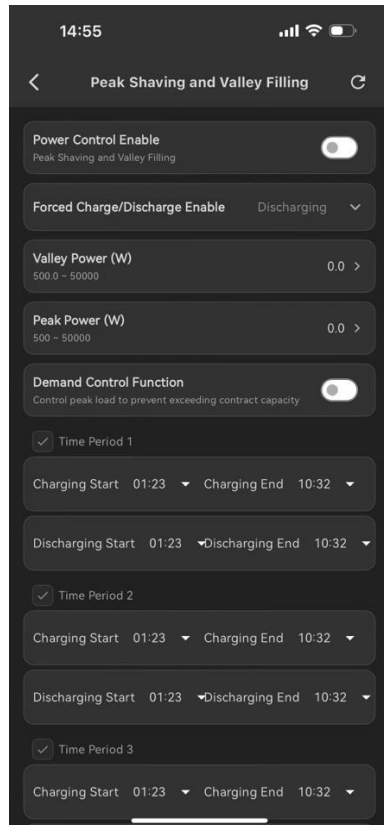


Peak Shaving

Time-of-Use Control: The battery charges and discharges according to the set time period. If the current time is outside the set period, the battery neither

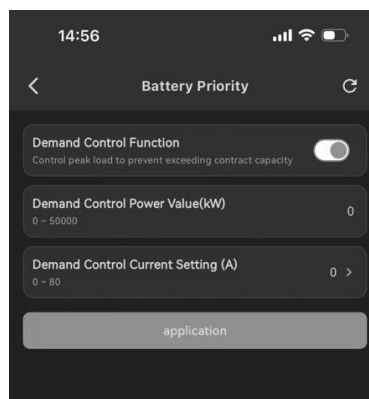
charges nor discharges, and PV power is exported to the grid.

Peak-Valley Power Control: When the grid power is between the peak and valley values, the load draws power from the grid, PV is used only for battery charging, excess PV power is curtailed, and the battery is charged to full while PV is curtailed. When the grid power is below the valley value, the battery actively draws power from the grid to maintain the grid power until the grid power reaches the valley value. When the grid power exceeds the peak value, the battery actively discharges to maintain the grid power at the peak value.



Battery Priority

PV power is prioritized for battery charging. Any remaining energy is then supplied to the load. When PV power is insufficient, power is drawn from the grid to charge the battery.



Dynamic Tariff

The Hybrid Inverter will automatically sort all electricity prices for the day based

on the high electricity price range and low electricity price range you have set, distinguishing between the high electricity price interval (red interval), low electricity price interval (green interval), and normal electricity price interval (intervals other than red and green). The system will automatically identify whether the current time falls within your preset intervals and operate according to the charge, discharge, or standby strategies you have configured for each interval.

High Electricity Price Interval Strategy

If you have set a discharge strategy:

The Hybrid Inverter will discharge to the grid at maximum power while ensuring that the discharge power does not exceed the Maximum Discharging Power limit you have set, and taking into account anti-reverse power flow conditions. The system will stop discharging and switch to standby when the SOC discharges to the Maximum Discharging Power SOC you have set.

If you have set a charge strategy:

The Hybrid Inverter will charge from the grid at maximum power while ensuring that the charge power does not exceed the Maximum Charging Power limit you have set, and taking into account demand limits. The system will stop charging and switch to standby when the SOC reaches the Charging SOC Upper Limit you have set.

If you have set a standby strategy:

The Hybrid Inverter will remain in standby mode.

Normal Electricity Price Interval Strategy

If you have set a discharge strategy:

The Hybrid Inverter will discharge to the grid at maximum power while ensuring that the discharge power does not exceed the Maximum Discharging Power limit you have set, and taking into account anti-reverse power flow conditions. The system will stop discharging and switch to standby when the SOC discharges to the Maximum Discharging Power SOC you have set.

If you have set a charge strategy:

The Hybrid Inverter will charge from the grid at maximum power while ensuring that the charge power does not exceed the Maximum Charging Power limit you have set, and taking into account demand limits. The system will stop charging and switch to standby when the SOC reaches the Charging SOC Upper Limit you have set.

If you have set a standby strategy:

The Hybrid Inverter will remain in standby mode.

Low Electricity Price Interval Strategy

If you have set a charge strategy:

The Hybrid Inverter will charge from the grid at maximum power while ensuring that the charge power does not exceed the Maximum Charging Power limit you have set, and taking into account demand limits. The system will stop charging and switch to standby when the SOC reaches the Charging SOC Upper Limit you have set.

If you have set a discharge strategy:

The Hybrid Inverter will discharge to the grid at maximum power while ensuring that the discharge power does not exceed the Maximum Discharging Power limit you have set, and taking into account anti-reverse power flow conditions. The system will stop discharging and switch to standby when the SOC discharges to the Maximum Discharging Power SOC you have set.

If you have set a standby strategy:

The Hybrid Inverter will remain in standby mode.

Negative Electricity Price Interval Strategy

When the electricity price is negative, the Hybrid Inverter will control the equipment to charge (with charging power not exceeding the customer-set Maximum Allowed Charging Power) while taking into account demand limits, and will suppress PV generation according to the customer-set PV Generation Inhibition Rate. The system will stop charging when the SOC reaches the customer-preset Charging SOC Upper Limit.

Dynamic Tariff Activation: Automatically sets the price threshold based on electricity prices in ascending order (user-defined range).

Customizable charge/discharge strategies for high, medium, and low electricity price tiers.

Set Dynamic Electricity Price Strategy:

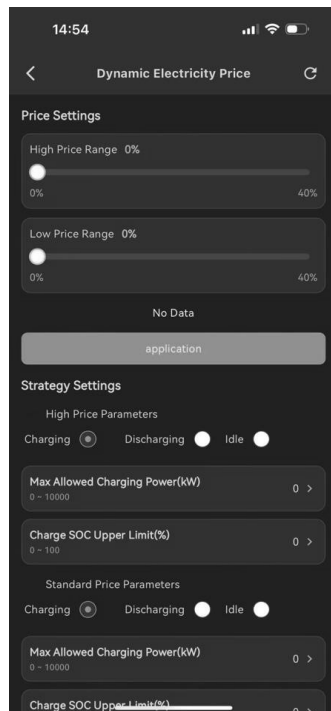
Enable the Dynamic Tariff module, Operation Steps: Go to the "Operation Strategy" → "Dynamic Tariff" module.

Electricity Price Settings are used to define the high electricity price range and the low electricity price range. When the electricity price falls within the red interval (high electricity price), the system will execute the high-electricity-price strategy; when the electricity price falls within the green interval (low electricity price), the system will execute the low-electricity-price strategy. The system automatically sorts the daily electricity prices in ascending order, with the high-electricity-price interval defaulting to the top 30%, the low-electricity-price interval defaulting to the bottom 30%, and the middle 40% serving as the normal electricity price interval. Users can customize the electricity price thresholds, which will take effect automatically in the future.

We provide configurable parameters for complex electricity pricing. The parameters you can set include: maximum allowable charging power, PV generation percentage limit required for the Hybrid Inverter, and battery SOC upper limit for charging during negative electricity price periods.

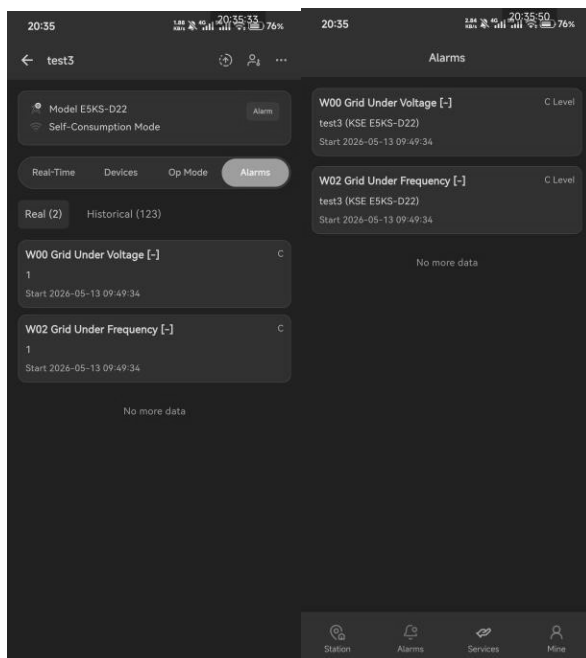
You can set the actions the system should take when the electricity price falls into the high, medium, or low intervals: charge, discharge, or standby. For charge and discharge actions, you need to set the maximum power threshold and the stop SOC threshold.

If you need to suspend dynamic electricity price operation, you can switch to one of the following operating modes: "Self-Consumption", "Peak Shaving", or "Battery Priority".



7.11 Alarms

The alarm module centrally displays unrecovered alarm data of Device from all power stations, and provides query, filtering, classification and other functional operations.



Alarm level description:

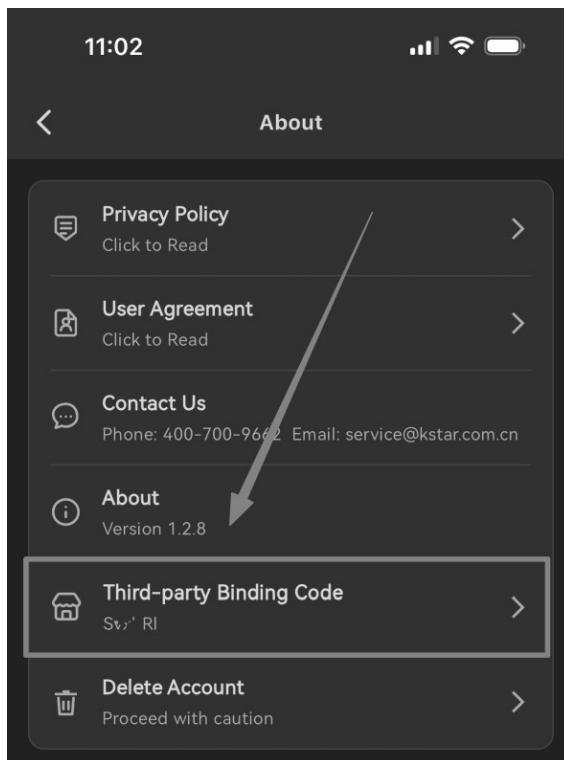
- Level A alarm: Refers to emergency alarms that may involve safety hazards
- Level B alarm: Refers to alarms for machine damage, requiring machine replacement
- Level C alarm: Refers to some faults/or restart requiring manual operation, alarms for restoring machine work
- Level D alarm: Refers to minor alarms that do not affect system operation

7.12 Finding Third-party binding code

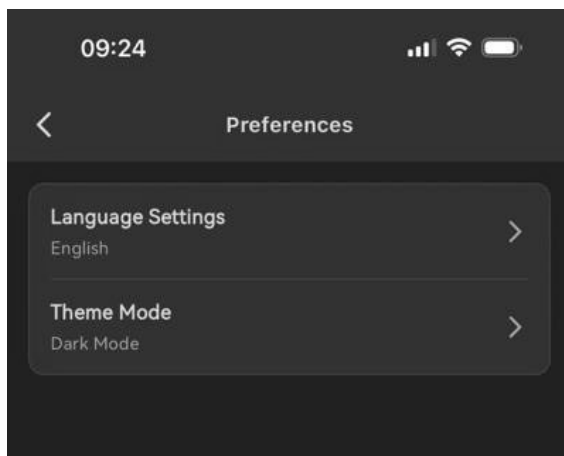
Power stations created in KSTAR Sync can be linked to the Third-party platform.

Users can bind their stations and associated devices to Third-party platform by Third-party binding code

On the **【About】** page that opens, your Third-Party Binding Code is displayed and available for copying.



7.13 Preference Settings



7.13.1 Language Settings

The system supports Chinese and English dual languages, click the language switching icon in the upper right corner of the page, users can switch the system language.

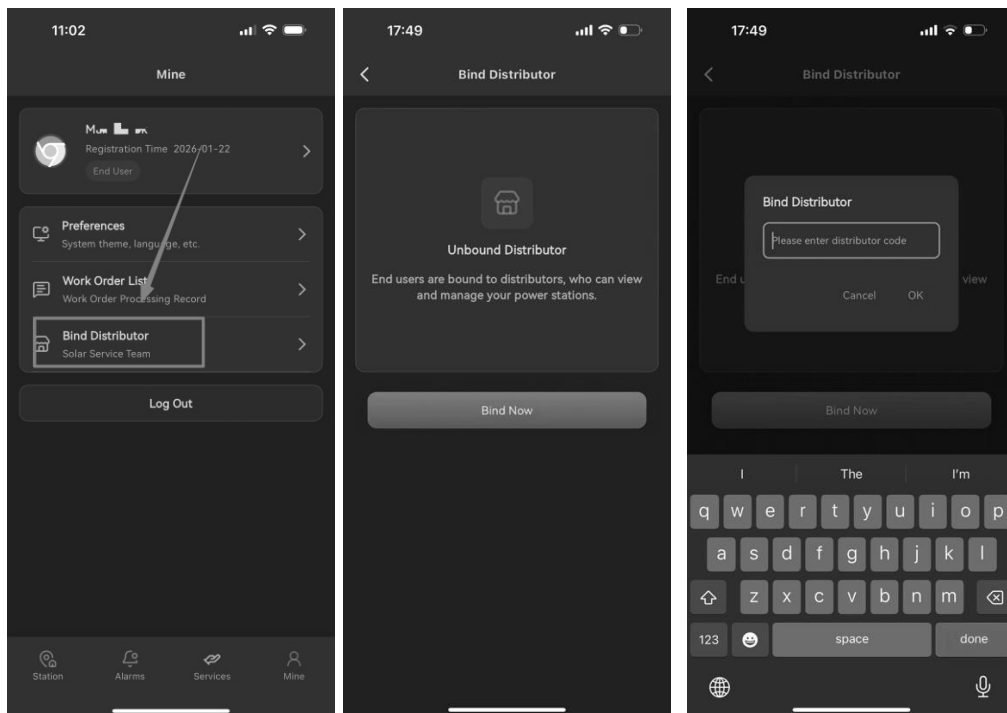
7.13.2 Display Theme

The system provides white and black two theme skins, click the theme icon in the upper right corner of the page, users can freely switch according to environmental lighting or personal habits. Light mode is fresh and bright, dark mode protects eyes and saves power.

7.14 Bind Distributor

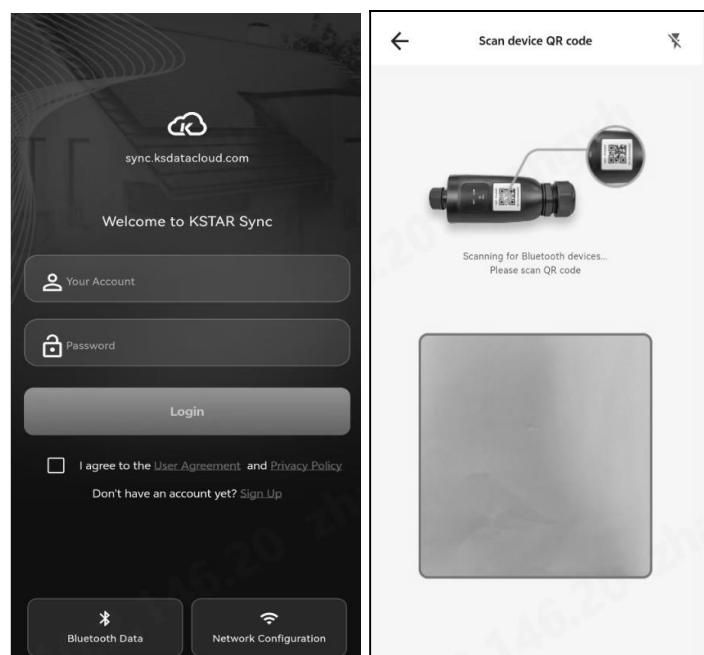
The account registered by end users through KSTAR Sync is an independent account and is not supervised by distributors. If distributors need to view the power stations of end users, the end users must bind with the distributor.

After logging into the KSTAR Sync APP, end users can go to the **【Mine】** page, click **【Bind Distributor】** - **【Bind Now】** , enter the distributor code, and click the **【Confirm】** button to successfully bind with the distributor's account.



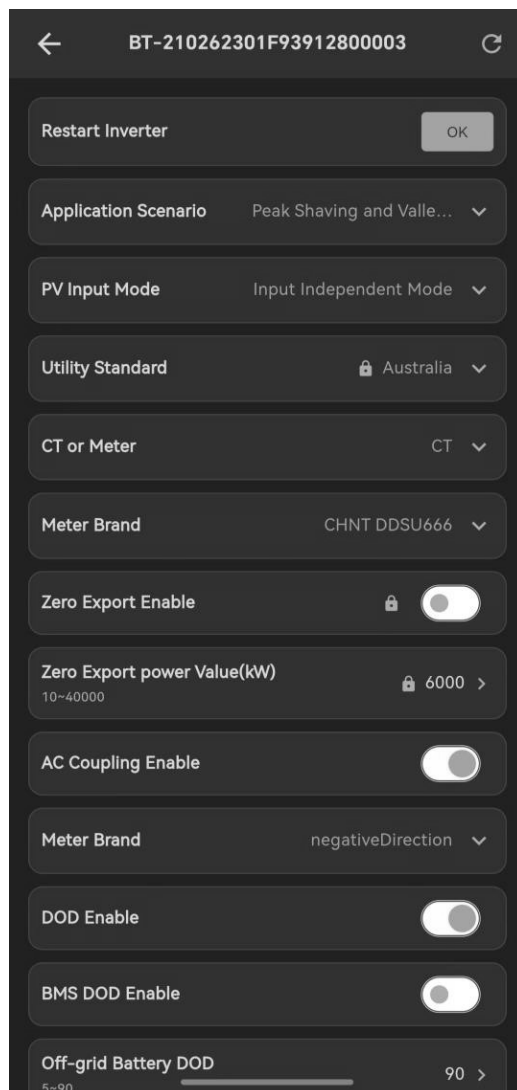
7.15 System Operation

Install the Stick Logger and power it on. Turn on Bluetooth on your phone and connect to Wi-Fi. Open the "KSTAR Sync" APP, tap Network Configuration, and proceed to the QR code scanning page as shown in the figure below.



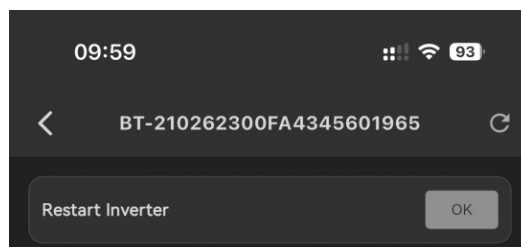
7.15.1 Local Mode

Once the communication between the inverter and the app is established, you can access the inverter settings interface.



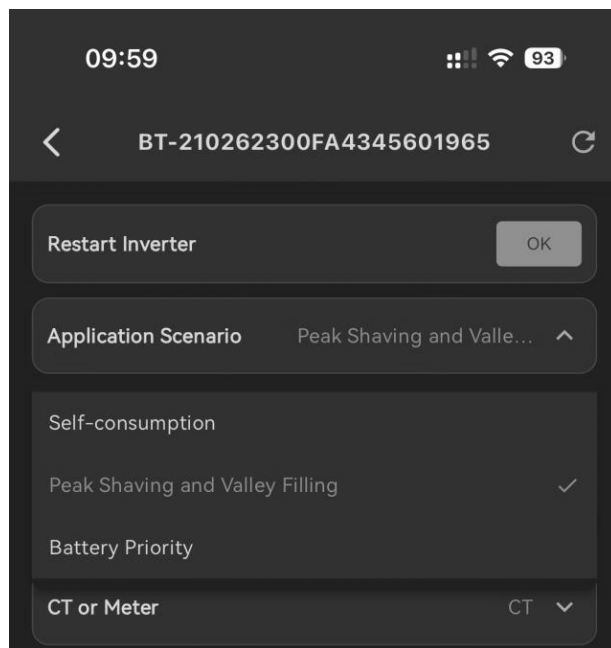
7.15.2 Restart Inverter

The command can be issued to restart the inverter.



7.15.3 Application Scenario setting

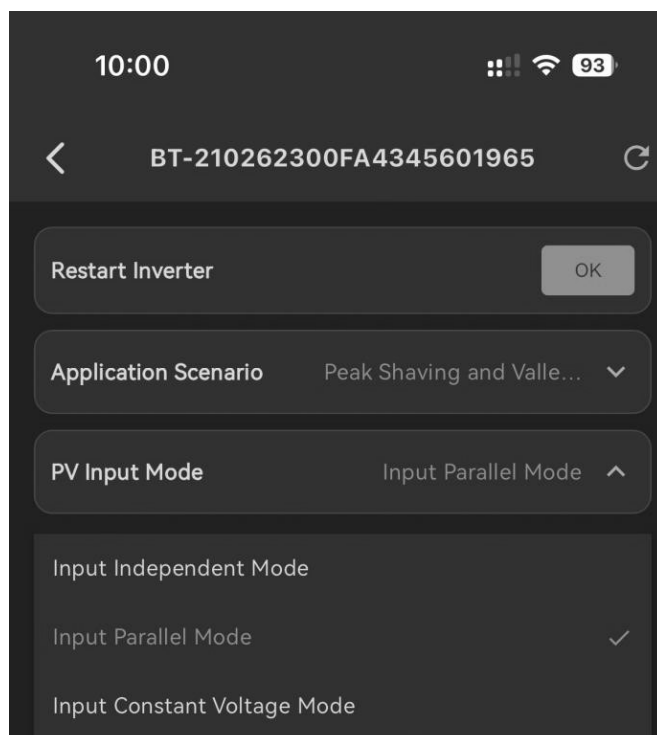
The E3.68KS-D22/E5KS-D22/ E6KS-D22 supports three working modes: SELF CONSUME, PEAK SHIFT, and BAT PRIORITY.



7.15.4 PV Input Mode

There are three modes for PV inputs: independent, parallel and constant voltage. Set the appropriate PV input mode based on the actual connection of the PV strings.

The default setting is INDEPENDENT. If independent mode is selected when the PV strings are actually connected in parallel, it results in an imbalanced distribution of power in the PV strings.



7.15.5 Utility Standard

When you select the grid standard in Utility Standard, these parameters are set automatically. During operation, when the inverter detects that these settings have been reached or exceeded, the inverter stops generating power.



Changing the setting of Utility Standard is not recommended. Utility Standard are password protected. Please contact your installer or distributor for access.

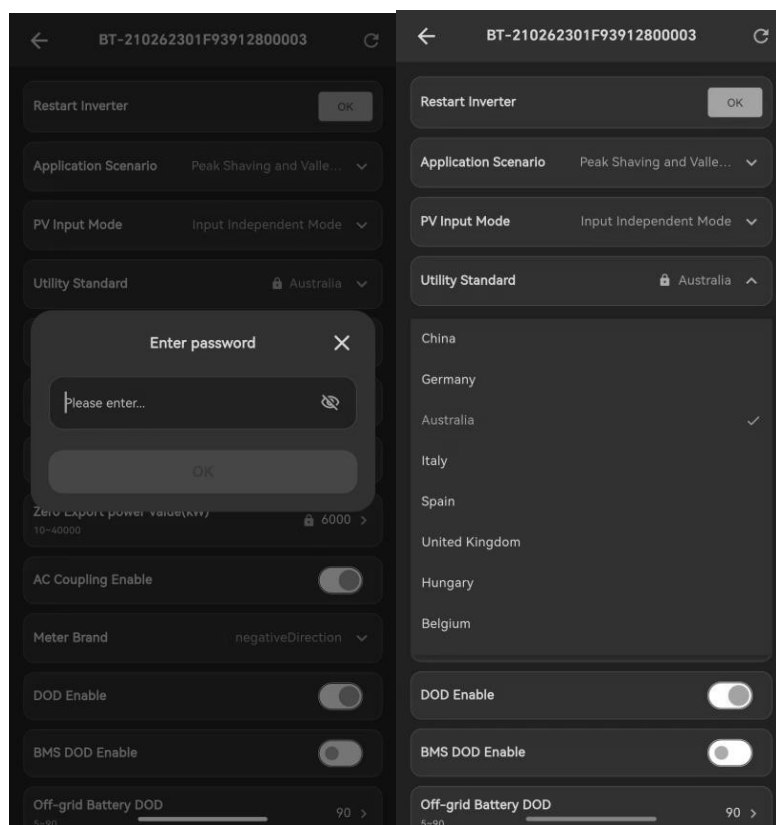


Table 7-1 lists the specifications of different utility standards.

Table 7-1 Grid Specifications

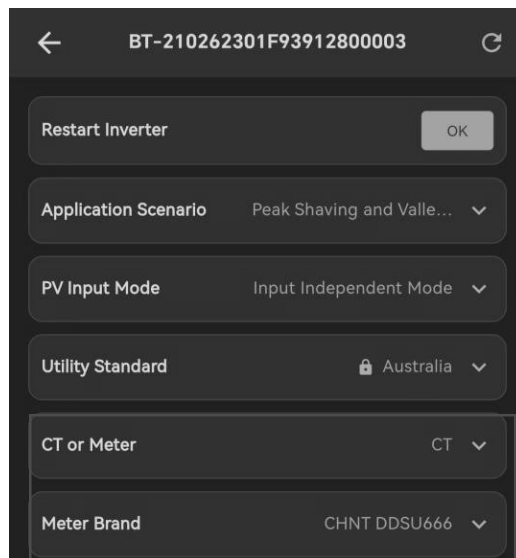
Grid		Output Voltage Range (VAC)	Output Frequency Range (Hz)	Start Delay (s)
1	China	187–252	49.5–50.2	30
2	Germany	184–264	47.5–51.5	60
3 Australia	AUS-A	180–265	47–52	60
	AUS-B	180–265	47–52	60
	AUS-C	180–265	45–55	60

4 Italy	CEI0-21	195–264	49.8–50.2	60
	CEI0-21 ACEA	195–264	49.8–50.2	60
5	Spain	196–253	48–50.5	180
6	U.K.	184–264	47–52	180
7	Hungary	196–253	49–51	300
8	Belgium	184–264	47.5–51.5	60
9	New Zealand	180–260	45–55	60
10	Greece	184–264	49.5–50.5	180
11	France	184–264	47.5–50.4	60
12	Bangkok	198–242	49–51	150
13	Thailand	198–242	47–52	60
14	South Africa	180–260	47.0–52	60
15	50549	184–264	47.5–51.5	60
16	Brazil	184–264	59.5–60.5	60
17	0126	184–264	47.5–51.5	60
18	Ireland	184–264	47–52	180
19	Israel	195.5–253	47.0–51.5	60
20	Poland	195.5–253	49.00–50.05	60
21 Chile	Chile-BT	176.0–242	47.5–51.5	60
	Chile-HD	198.0–242	49–51	300
	Chile-LD	198.0–242	49–51	300
22	Local	150–280	45.0–55	30
23	60Hz	184–264	59.5–60.5	60
24	Denmark	195.5–253.0	47.5–51.5	60
25	Sweden	195.5–253.0	47.5–51.5	60
26	Austria	184–264.5	47.5–51.5	300
27	Czech	195.5-253	47.5-52	60
28	Cyprus	184-253	47-51.5	180
29	Netherlands	184-253	48-51	60
30	Switzerland	184-276	47.5-51.5	60

7.15.6 CT OR METER

The E3.68KS-D22/E5KS-D22/ E6KS-D22 support connecting external CT or a smart meter for measuring the energy consumption.

By default, CT is selected. If you want to connect a smart meter, the CHINT DDSU666 is recommended.

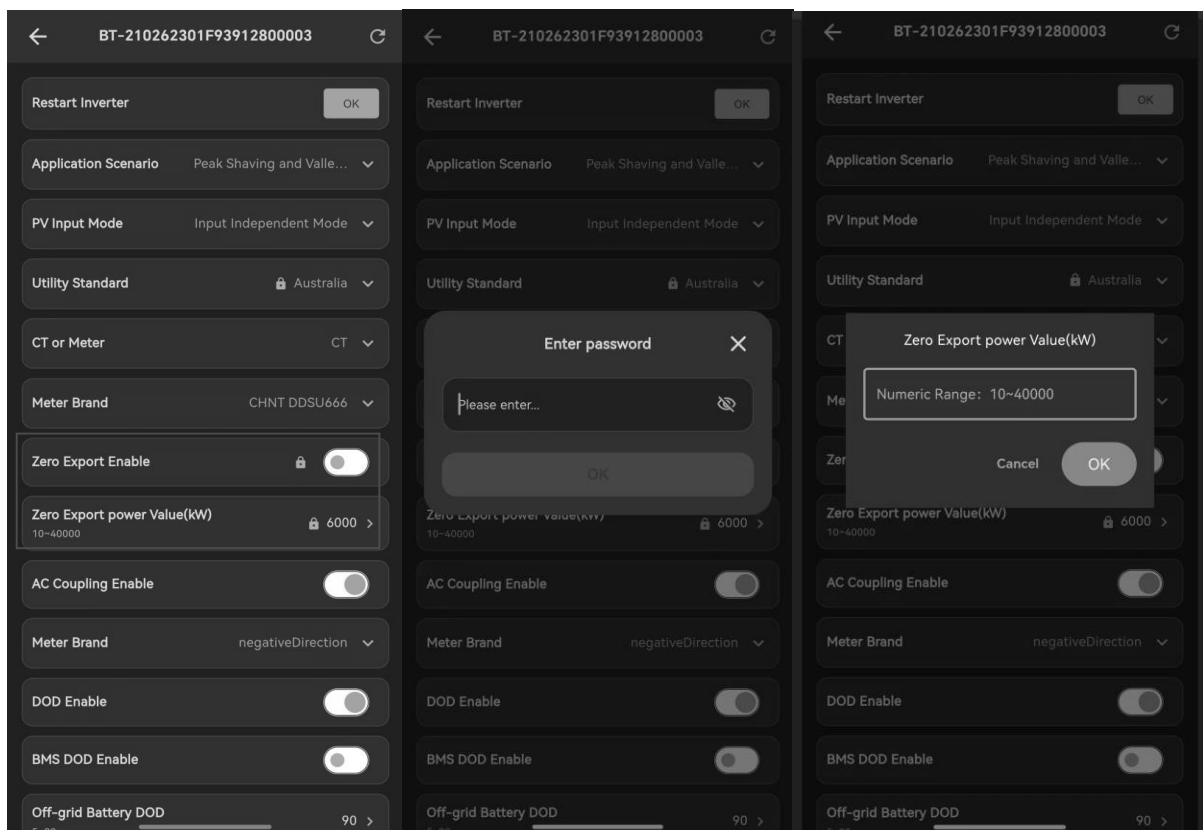


7.15.7 Export Limit Control

Export Limit Control feature is available to enable/disable the limitation of power export to grid .And the export power is configurable to certain power capacity for specific installation site.



Export Limit Control Configuration are password protected. Please contact your installer or distributor for access.

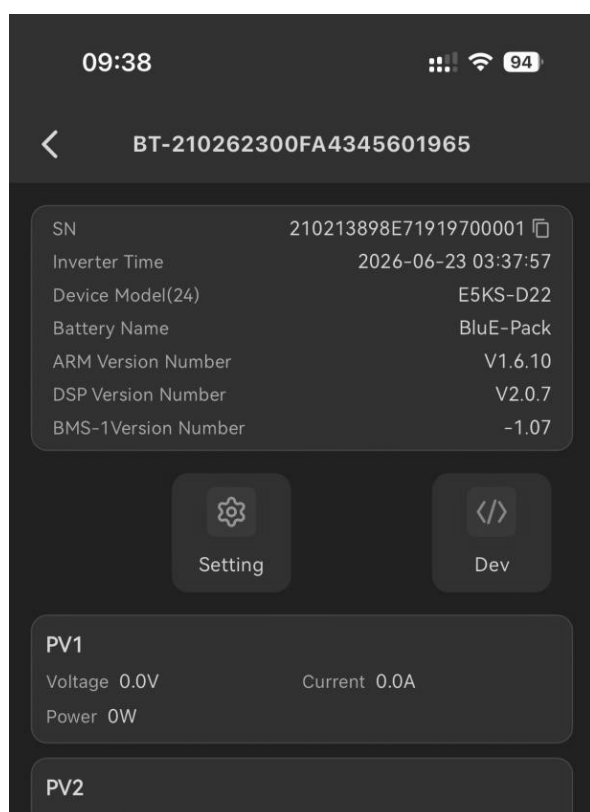


7.15.8 AC Coupling

If you want to connect an inverter to your PV panels to build an AC-coupling system, you must enable AC COUPLE. By default, this feature is disabled. For more information, see AC-coupling System

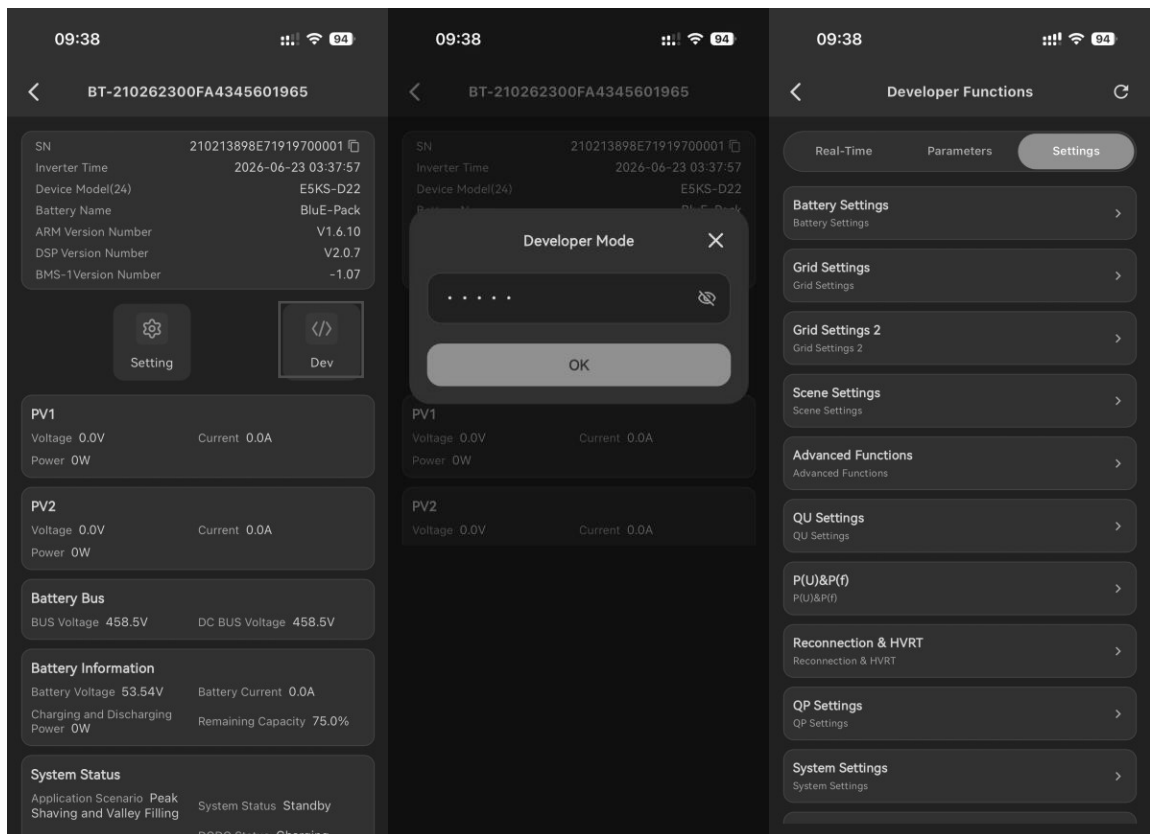
7.15.9 Equipment Basic Information

- FIRMWARE: The version of the firmware in ARM and DSP.
- MODEL SN: The serial number of the hybrid inverter in use.
- INV MODEL: The model of the hybrid inverter in use.
- Bat Name: The serial number of the battery in use.
- System Time: The date, and time of the system.



7.15.10 Grid Protection Setting and Power Quality Response Mode

Under Developer Functions Tab, and enter the Grid Settings option, will be able to view the Under/Over Voltage and Under/Over Frequency protection value. There are additional options to enable the Over-voltage/ Under-voltage Derating, Over-frequency/ Under-frequency Derating and relevant threshold value.



Enter the Advanced Function Setting, will get the options to view multiple Power Quality Response mode, Q(u), P(u), P(f), PF, Q control, Max_Power rate, QP control, etc.



Setting for power quality response are password protected. Please contact your installer or distributor for access.

8 Operation & Maintenance

Both users and certified professional personnel must maintain the E3.68KS-D22/E5KS-D22/ E6KS-D22 Hybrid Inverter to ensure the healthy and safe operation of the system.

In this section, you can find the following:

- The inspection checklist for users of the Hybrid Inverter.
- The inspection checklist for professional personnel.
- Error codes, alarm codes, and the possible solutions of the system and the BMS.

8.1 Inspection Checklist for Users

Inspection Activity	Interval
Check for visible damage to any part of the system.	Six months
Check the inverter and battery packs for signs of wear and tear, heat damage, discoloration, and unusual smells.	Six months
Check the warning signs and guidance signs on the inverter and the battery pack for signs of wear and damage, and make sure none have been removed or obscured.	Six months
Check whether any part of the system makes an abnormal noise when the system is running.	Six months
Monitor the temperature of the battery pack and clean the battery pack if necessary.	Six months to a year
Make sure that the ground around the system is clean and tidy.	Six months to a year
Check the maintenance access to make sure that it is clear and unobstructed.	Six months to a year
When the system is running, check the voltage, temperature, and other parameters of the battery packs.	Six months
When the system is running, check the parameters of the inverters.	Six months
Check the battery packs for ineffectiveness or damage.	Six months

8.2 Inspection Checklist for Professional Personnel

WARNING

- The equipment must be opened only by professional personnel that have been certified by KSTAR New Energy.
- During inspection and maintenance, wear protective personal equipment, including insulated gloves, protective shoes, and anti-noise earplugs.
- Follow local and international safety standards, regulations, and specifications to do the maintenance.
- Contact KSTAR New Energy promptly if you encounter anything not covered in this manual.

CAUTION

Before maintenance, disconnect all the electrical connections. Wait at least five minutes after disconnection, so that the residual voltage of the capacitors falls to a safe voltage. Use a multi-meter to make sure that the equipment is completely discharged.

Inspection Activities	Interval
Check electrical connections for looseness.	Six months to a year
Check cables for deterioration or damage.	Six months to a year
Check cable terminal screws for looseness.	Six months to a year
Check cable terminals for signs of overheating.	Six months to a year
Check the ground connection.	Six months to a year
Check whether the cable tie is attached to the cable.	Six months to a year
Check the EMS, KSTAR SYNC app, and other related equipment for failure or damage.	Six months to a year

8.3 Troubleshooting

When you see the red alarm light on the inverter, you can find possible solutions in this section. If the problem persists after trying these solutions, please contact KSTAR New Energy or an authorized distributor.

When a problem is successfully solved, after a period of time, the red LED alarm light turns off., but you can always view it in the error records. For more information, see Viewing INQUIRE.

8.3.1 Error Codes of the System

Code	Description	Possible Solutions
F00	Soft Time Out: Soft-start timeout.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F01	INV Volt Short: The inverter output is shorted.	1. Disconnect all power sources and shut down the inverters and the battery packs. 2. Disconnect the load. 3. Power on and restart all the inverters and the battery packs. 4. If no error is reported, it means the load is shorted. Check the load. If the code is still shown, contact Customer Service.
F02	GFCI Sensor Fault: A failure occurs to the Ground Fault Circuit Interrupter (GFCI) sensor.	1. Disconnect all power sources. 2. Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F04	Bus Volt Low: The bus voltage is low.	1. Check the settings of the input mode. 2. Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F05	Bus Volt High: The bus voltage is high.	
F06	Bus Short Circuit: The bus is shorted.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F07	PV ISO Under Fault: The insulation resistance of a PV panel is low.	1. Check the ground connection. 2. Check the ground resistance of PV+ and PV-: ▪ If the resistance is smaller than 2 MΩ, check the PV string for ground fault or poor ground insulation. If necessary, contact Customer Service. ▪ If the resistance is greater than 2 MΩ and the error code is still shown, contact Customer Service.

F08	PV Input Short Circuit: The PV input is shorted.	1. Check the settings of the input mode. 2. Disconnect the PV input. 3. Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F09	Bypass Relay Fault: A failure occurred to the bypass relay.	1. Disconnect the PV input. 2. Restart the inverter and wait until it runs correctly.
F19	EPS Relay Fault: A failure occurred to the EPS relay.	If the code is still shown, contact Customer Service.
F10	INV Curr Over: The output current on the inverter exceeds the threshold.	1. Wait five minutes for the inverter to restart automatically. 2. Check the EPS loads. If the load exceeds the rated output power of the inverter, disconnect some load. If the code is still shown, contact Customer Service.
F11	INV DC Over: The DC component of the output current of the inverter is too high.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F12	Ambient Over Temp: The ambient temperature is too high.	1. Restart the inverter. 2. Let the inverter cool for a few minutes and then restart it.
F13	Sink Over Temp: The temperature of the heat sink is too high.	3. Observe whether the inverter can run correctly. 4. Make sure that the ambient temperature is in the range of -25°C to 60°C. If the code is still shown, contact Customer Service.
F15	DisChg Curr Over: The battery is discharged with over current.	1. Wait five minutes for the inverter to restart automatically. 2. Check the EPS loads. If the load exceeds the rated output power of the inverter, disconnect some load. If the code is still shown, contact Customer Service.

Code	Description	Possible Solutions
F16	Chg Curr Over: The battery is charging with over current.	Check the battery wiring port for short circuits. Restart the inverter and the battery packs. If the code is still shown, contact Customer Service.
F17	Current Sensor Fault: A failure occurred to the current sensor.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F18	INV Abnormal: Abnormal output voltage or output frequency of the inverter.	Contact Customer Service.
F20	Always Over Load: The EPS load always exceeds the rated output power of the system.	Check the EPS loads. If the load is lower than the rated output power of the inverter and the error is still shown, contact Customer Service.
F22	Parallel Communicate Fault: A failure occurred to the communication between the inverters in a parallel system.	1. Check the parallel cable for connection. 2. Check the inverter address settings. In a parallel system, the address of the primary inverter must be set to 1, and the addresses of the other inverters must be set to 2, 3, or 4. If the code is still shown, contact Customer Service.
F23	Parallel Grid Abnormal: In a parallel system, some connections are incorrect.	1. Check the wiring at the grid end and make sure the wiring is correct. 2. Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
F24	EPS Air Switch Abnormal: An error occurred to activation of the air switch on the EPS load end.	1. Turn off all the switches on the EPS load end. 2. If the code is still shown, contact Customer Service.
F25	Parallel Power Imbalance: Power imbalance occurs to the parallel system.	1. Turn off all the switches on the EPS load end. 2. Restart the inverter and wait until it runs correctly.
F26	Parallel Inverter Grid Phase Sequence Abnormal	1. Make sure that the phase sequence at the grid end of the inverter is consistent. 2. If the code is still shown, contact Customer Service.

F32	DSP ARM SCI Fault: A failure occurs to the communication between DSP and ARM.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
------------	--	---

8.3.2 Alarm Codes of the System

Code	Description	Possible Solutions
W00	Grid Volt Low	Check the local voltage and frequency for their compliance with the inverter specifications: • If the voltage and frequency are within the acceptable range, wait two minutes for the inverter to run correctly. If recovery is not possible or the fault repeats, contact Customer Service. • If the voltage and frequency are beyond the range or are unstable, contact the local power company.
W01	Grid Volt High	
W02	Grid Frequency Low	
W03	Grid Frequency High	
W04	Solar Loss: No PV solar panels are connected to the system, or the input voltage from the PV solar panels is too low.	1. Check the PV connection. 2. Check the PV availability. If the connections are correct and the alarm code is still shown, contact Customer Service.
W05	Bat Loss: No battery packs are connected to the system, or the battery voltage is too low.	1. Check the battery connection. 2. Check the battery wiring port for short circuits. If the connections are correct and the alarm code is still shown, contact Customer Service.
W06	Bat Under Volt: Under voltage has occurred in the battery.	Check the battery packs for their availability. If the battery voltage is lower than the lowest battery terminal input voltage acceptable to the inverter, charge the battery until it reaches the acceptable battery input voltage of the inverter. If the code is still shown, contact Customer Service.
W07	Bat Volt Low: The battery voltage is too low.	

Code	Description	Possible Solutions
W08	Bat Volt High: The battery voltage is higher than 57.5 V and the battery has shut down because of the high voltage.	1. Check the battery for its compliance with its pre-settings. 2. If the battery complies with the pre- setting, restart it. If the code is still shown, contact Customer Service.
W09	Over Load: An overload has occurred because the connected load exceeds the rated power of the inverter.	1. Wait five minute for the inverter to restart. 2. If the EPS loads are higher than the rated output power of the inverter, disconnect some load.
W10	GFCI Over: High current leakage has occurred.	1. Check the PV string for direct or indirect grounding. If such grounding is discovered, correct it. 2. Check the peripherals of the inverter for current leakage. If current leakage is discovered, address it. If the code is still shown, contact Customer Service.
W12	Fan Fault: The fan has malfunctioned.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
W13	BAT Power Down: The battery has shut down because the SOC is low.	Check the SOC. Make sure that the SOC is not lower than the difference between 100% and the set DOD. If it is lower than the difference, charge the battery.
W14 W15 W16 W17 W18 W21 W22	BMS alarms.	For more information, see BMS ALARM Warnings.
W19	BMS Volt Imbalance: A voltage imbalance has occurred to the battery of the BMS.	Contact Customer Service.
W20	BMS Communicate Fault: The communication between the BMS and the inverter has failed.	Make sure that the COM cable between the inverter and the battery pack is in good condition and is connected correctly.

W23 W24	BMS protection warning.	For more information, see BMS PROTECTION Warnings.
Code	Description	Possible Solutions
W25	BMS Updating: The BMS is updating.	You can ignore this alarm. No action is required.
W26	BMS Program Version Err: The version of the BMS program is incorrect.	Contact Customer Service.
W27	BMS Program Update Fail: The BMS program has failed to update.	Check the network and try to update the program again.
W29	Grid Volt Lock Fail: The inverter has failed to synchronize with the grid.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
W30	PV Off: The PV string has requested a shutdown.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.
W31	System Reset: The system is reset.	Restart the inverter and wait until it runs correctly. If the code is still shown, contact Customer Service.

8.3.3 BMS Error codes and troubleshooting

Code	Description	Possible Solutions
BIT0	Battery cell overvoltage alarm	The warning unit overcharging voltage is 3650mV, where the inverter should stop charging and the BMS should not turn off the charging MOS.
BIT1	Battery cell under-voltage alarm	The warning unit over discharging voltage is 2800mV, where the inverter should stop discharging and the BMS should not turn off the discharging MOS.
BIT2	Battery PACK overvoltage alarm	The warning overall overcharging voltage is 57.6V, where the inverter should stop charging and the BMS should not turn off the charging MOS.
BIT3	Battery PACK under-voltage alarm	The warning overall over discharging voltage is 44.8V, where the inverter should stop discharging and the BMS should not turn off the discharging MOS.
BIT4	Charging overcurrent	The warning charging overcurrent is

	alarm	100A, where the inverter should stop charging and the BMS should not turn off the charging MOS.
BIT5	Discharging the overcurrent alarm	The warning current of discharging overcurrent 1 is 100A where the inverter should stop discharging and the BMS should not turn off the discharging MOS. This alarm will automatically stop after 1min or when the charging current is greater than 1A.
BIT8	Charging high temperature alarm (cell temperature)	The protective limit of charging high temperature is 57°C where the BMS should forcibly turn off the charging MOS.
BIT9	Discharging high temperature alarm (cell temperature)	The warning discharging high temperature is 55°C, where the inverter should stop discharging and the BMS should not turn off the discharging MOS.
BIT10	Charging low temperature alarm (cell temperature)	The warning charging low temperature is 2°C, where the inverter should stop charging and the BMS should not turn off the charging MOS.
BIT11	Discharging low temperature alarm (cell temperature)	The warning discharging low temperature is -18°C, where the inverter should stop discharging and the BMS should not turn off the discharging MOS.
BIT12	High ambient temperature alarm	The warning high ambient temperature is 65°C, where the inverter should stop charging and discharging and the BMS should forcibly turn off the charging and discharging MOS.
BIT13	Low ambient temperature alarm	The warning low ambient temperature is -15°C, where the inverter should stop charging and the BMS should forcibly turn off the charging MOS.
BIT14	MOSFET high temperature alarm	The warning MOS over-temperature is 90°C, where the inverter should stop charging and discharging and the BMS should not turn off the charging and discharging MOS.
BIT15	Low SOC alarm	The warning low battery SOC is less than 5%, where the inverter should stop discharging and the BMS should not turn off the charging and discharging MOS and should not alarm during charging.

8.3.4 BMS Protection codes and description

Code	Description	Possible Solutions
BIT0	Battery cell overvoltage protection	The unit overcharging protection voltage is 3700mV, where the inverter should stop charging and the BMS should forcibly turn off the charging MOS.
BIT1	Battery cell under-voltage protection	The unit over discharge protection voltage is 2500mV, where the inverter should stop discharging and the BMS should forcibly turn off the discharging MOS. After 30 seconds of over discharge protection, if the battery still cannot be restored, it will enter a low power consumption mode.
BIT2	Battery PACK overvoltage protection	The overall overcharge protection voltage is 59V, where the inverter should stop charging and the BMS should turn off the charging MOS.
BIT3	Battery PACK under-voltage protection	The overall over discharge protection voltage is 40V, where the inverter should stop discharging and the BMS should forcibly turn off the discharging MOS. After 30 seconds of over discharge protection, if the battery still cannot be restored, it will enter a low power consumption mode.
BIT4	Charging overcurrent protection	The protective limit of charging overcurrent is 120A, where the BMS should forcibly turn off the charging MOS. This state will be locked and not be exited automatically if it occurs continuously for 10 times.
BIT5	Discharging overcurrent protection	The protective limit of discharging overcurrent 1 is 130A and the protective limit of discharging overcurrent 2 is 200A with a delay of 100ms, where the BMS should forcibly turn off the discharging MOS. This state will be locked and not be exited automatically if it occurs continuously for 10 times.
BIT6	Short circuit current protection	The short circuit protection current is no less than 350A with a delay of 300us, where the BMS should forcibly turn off the discharging MOS.
BIT7	Charging overvoltage protection	The overall overcharge protection voltage is 59V, where the inverter should stop charging and the BMS

		should turn off the charging MOS.
BIT8	Charging high temperature protection (cell temperature)	The protective limit of charging high temperature is 57℃, where the BMS should forcibly turn off the charging MOS.
BIT9	Discharging high temperature protection (cell temperature)	The protective limit of discharging high temperature is 57℃, where the BMS should forcibly turn off the discharging MOS.
BIT10	Charging low temperature protection (cell temperature)	The protective limit of charging low temperature is 0℃, where the BMS should forcibly turn off the charging MOS.
BIT11	Discharging low temperature protection (cell temperature)	The protective limit of discharging low temperature is -20℃, where the BMS should forcibly turn off the discharging MOS.
BIT12	MOSFET high temperature protection	The protective limit of MOS over-temperature is 110℃, where the BMS should forcibly turn off the charging and discharging MOS.
BIT13	High ambient temperature protection	The protective limit of high ambient temperature is 70℃, where the BMS should forcibly turn off the charging and discharging MOS.
BIT14	Low ambient temperature protection	The protective limit of low ambient temperature is -25℃, where the BMS should forcibly turn off the charging and discharging MOS.
BIT15	Heating function fault	Reset the battery PACK; If the fault is not clear, contact the service engineer.

8.3.5 BMS Fault codes and description

Code	Description	Possible Solutions
BIT0	Charging MOSFET malfunction	Restart the battery PACK, if the fault still exists, contact the manufacturer and lock it until the technical personnel resolve the problem.
BIT1	Discharging MOSFET malfunction	Restart the battery PACK, if the fault still exists, contact the manufacturer and lock it until the technical personnel resolve the problem.
BIT2	Temperature sensor malfunction	Restart the battery PACK, if the fault still exists, contact the manufacturer and lock it until the technical personnel resolve the problem.
BIT3	Cell voltage sampling fault	Reset the battery PACK; If the fault is not clear, contact the service engineer.
BIT4	Battery cell malfunction	Restart the battery PACK, if the fault still exists, contact the manufacturer and lock it until the technical personnel resolve the problem.
BIT5	Front-end sampling communication failure	Restart the battery PACK, if the fault still exists, contact the manufacturer and lock it until the technical personnel resolve the problem.
BIT6	Heating control MOSFET fault	Reset the battery PACK; If the fault is not clear, contact the service engineer.
BIT14	Reverse DC connection	Check whether or not the wiring between the battery PACK and the positive and negative wires of the inverter battery is proper.

9 Technical Data

9.1 Hybrid Inverter

Dimension (W × H × D, mm)	725 × 390 × 245
Net Weight (kg)	25 (31kg with base)
Operating Temperature	-25°C to +60°C, Derated over 45°C
Operating Relative Humidity	0–95% (No condensation)
Operating Altitude	≤ 4000 m
Protective Class	Class I
Overvoltage Category	II (DC side), III (AC side)
Topology	Non-isolated (Solar) Isolated (battery)
Cooling	Natural Convection
Display	LED/APP
Communication Interface	RS485, CAN2.0, Wi-Fi, and 4G
Ingress Protection	IP66
Max. Conversion Efficiency (From Battery)	94.8%
Max. Conversion Efficiency (From PV)	97.2 %
Euro Efficiency	95.9% (3.68K) /96.4% (5K) /96.5% (6K)
MPPT Efficiency	99 %
Protection Function	• Short Circuit Protection • AC Leakage Fault Protection • Grounding Fault Protection • Anti-islanding Protection • Overload Protection • Surge Protection
Grid Regulation	• EN50549-10 • VDE-AR-N4105 • VDE0126-1-1 More grid regulation certifications are to be made available. Please contact KSTAR New Energy for the latest information.
Safety Regulation	• IEC/EN 62109-1&2 • IEC62040-1 • IEC62619

EMC	• EN61000-6-1 • EN61000-6-2 • EN61000-6-3 • EN61000-6-4 • EN61000-3-2 • EN61000-3-3 • EN61000-3-11 • EN61000-3-12
------------	--

9.2 Battery Terminal Input /Output

	E3.68KS-D22	E5KS-D22	E6KS-D22
Battery Type	LFP		
Voltage Range	42–58 VDC		
Rated Voltage	48 VDC		
Maximum Charge/Discharge Current	80 ADC/80 ADC	120 ADC/120 ADC	125 ADC/125 ADC
Maximum Charge/Discharge Power	3600 W/3900 W	5,000 W/5,400 W	6,000 W/6,400 W

9.3 PV Input

	E3.68KS-D22	E5KS-D22	E6KS-D22
Vmax. PV	500 VDC		
Rated Voltage	360 VDC		
PV Start Voltage	120 VDC		
MPPT Voltage Range	120–480 VDC		
MPPT Range (Full Load)	200–425 VDC	250–425 VDC	250–425 VDC
MPPT Tracker/Strings	2		
Max. Continuous PV Input Current	20 ADC × 2		
Isc PV	25 ADC × 2		
Max. Backfeed Current	0 ADC		
Max. Continuous PV Input Power	7,200 W	10,000 W	10,000 W

9.4 Grid Terminal Input / Output

	E3.68KS-D22	E5KS-D22	E6KS-D22
Rated Voltage	220/230/240 VAC		
Rated Frequency	50 Hz /60 Hz		
Maximum Continuous Input Current	32 AAC	40 AAC	40 AAC
Maximum Continuous Input Power	7,360 W	9,200 W	9,200 W
Rated Output Current	16 AAC	21.7 AAC	26.1 AAC
Maximum Continuous Output Current	16.7 AAC	22.7 AAC	27.3 AAC
Power factor (Cos phi), Adjustable	0.8 leading–0.8 lagging		
Rated Output Power	3,680 W	5,000 W	6,000 W
Maximum Continuous Output Apparent Power	3,680 VA	5,000 VA	6,000 VA
Grid Port Overcurrent Protection	63 A		

9.5 EPS Load Terminal Output

	E3.68KS-D22	E5KS-D22	E6KS-D22
Rated Voltage	230 VAC		
Rated frequency	50 Hz/60 Hz		
Rated Output Current	16 AAC	21.7 AAC	26.1 AAC
Maximum Continuous Output Current	16 AAC	21.7 AAC	26.1 AAC
Rated Continuous Output Power	3,680 W	5,000 W	6,000 W
Maximum Output Apparent Power	3,680 VA	5,000 VA	6,000 VA
EPS Load Overcurrent Protection	32 A		

9.6 Battery Pack

Battery specification			BP48100PF1A-G2
normal	Battery capacity		5.12 kWh
	Battery type		LFP
	Rated voltage		51.2V
	Operating voltage range		44.8–57.6V
Operations	Maximum charging current		80A (0.8C)
	Maximum discharging current		80A (0.8C)
	Operating temperature range	Charge	-10℃~+50℃
		Discharge	-10℃~+50℃
	Storage temperature range		0℃~+35℃
	Relative humidity		0%~95%(No condensation)
	Protective class		I
	Short circuit ratings		360A 300us
BMS	Maximum number of batteries		Maximum 8 batteries in parallel
	Monitored item		System voltage, current, battery voltage, battery temperature, PCBA temperature measurement
	Communication mode		CAN
	Ventilation mode		Passive and active cooling
Physical parameters	Weight (kg)		50.5
	Size (W×H×D) mm		725*370*165 (Excluding handles)
	Water resistance level		IP65
Reference to standards			IEC 62619 IEC 62477 IEC 62040 IEC61000-6-1//3 UN38.3

10 Quality Assurance

When product faults occur during the warranty period, his partner will provide free service or replace the product with a new one.

Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, company has the right to refuse to honor the quality guarantee.

Conditions

After replacement, unqualified products shall be processed by company.

The customer shall give company or his partner a reasonable period to repair the faulty device.

Exclusion of Liability

In the following circumstances, company has the right to refuse to honor the quality guarantee:

The free warranty period for the whole machine/components has expired.

The device is damaged during transport.

The device is incorrectly installed, refitted, or used.

The device operates in harsh environment, as described in this manual.

The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from company or his authorized partner.

The fault or damage is caused by the use of non-standard or company.

Components or software.

The installation and use range are beyond stipulations of relevant international standards.

The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of company.

11 Abbreviations

A

AC	Alternating Current
AFCI	Arc-Fault Circuit-Interrupter
App	Application
AWG	American Wire Gauge

B

BESS	Battery Hybrid Inverter
BMS	Battery Management System

C

CT	Current Transformer
----	---------------------

D

DC	Direct Current
DOD	Depth of Discharge
DRED	Demand Response Enabling Device
DRM	Demand Response Mode
DSP	Digital Signal Processor

E

EMI	Electromagnetic Interference
EMS	Energy Management System
BACK UP	Emergency Power Supply

G

GFCI	Ground Fault Circuit Interrupter
------	----------------------------------

I

ISO	Insulation
-----	------------

M

MPPT	Maximum Power Point Tracker
------	-----------------------------

P

PV	Photovoltaic
----	--------------

R

RCD	Residual Current Device
RESP	Response
RRCR	Radio Ripple Control Receiver

S

SCI	Serial Communication Interface
SOC	State of Charge

12 Appendix: Definition of DVC

Decisive voltage Classification (DVC)	Limits of working voltage V		
	a.c. voltage r.m.s. U_{ACL}	a.c. voltage peak U_{ACPL}	d.c. voltage mean U_{DCL}
A*	25 (16)	35.4 (22.6)	60 (35)
B	50 (33)	71 (46.7)	120 (70)
C	> 50 (> 33)	> 71 (> 46.7)	> 120 (> 70)
The table values in parentheses are to be used for PCE or portions of PCEs rated for installation in wet locations as addressed in 6.1 for environmental categories and minimum environmental conditions. *DVC-A circuits are allowed under fault conditions to have voltages up to the DVC- B limits, for maximum 0.2 s.			

The logo consists of the word "KSTAR" in a bold, white, sans-serif font, centered within a solid blue rectangular background.

Shenzhen Kstar New Energy Company Limited

Add:Kstar Industrial Park, Guangming Hi-Tech Park,
shenzhen ,P.R.CHINA

Tel:0755-21389008

Fax:0755-21389008

Web:www.kstar.com