Star Charge

Vesta-(5.0-8.0)-S

User Manual

Version: A0

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Legal Notice

The information presented in this guide is subject to change without prior notice.

The technical specifications indicated here do not constitute a contractual obligation.
In case of any doubt regarding a subject described or if you discover an error in this manual, please contact us.

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1 Manual Description

1.1 Scope of Use

This manual describes the Vesta-5.0-S, Vesta-6.0-S, and Vesta-8.0-S (hereafter referred to as the inverter or PCS) in terms of their installation, electrical connections, commissioning, maintenance, and troubleshooting.

1.2 Intended Audience

This manual is intended for

- Sales engineers
- System engineers
- Technical support engineers
- End users

And specially for electricians with electrical operation certificates, and the operation content described in the manual must be operated and performed by trained and experienced electricians in accordance with basic electrical safety protection requirements.

1.3 Supplier

1.3.1 Europe

Star Charge Europe GmbH
Am Prime Parc 17, 3.OG, Raunheim 65479, Germany
Customer service hotline: +44 20 7096 1752
Customer service E-mail: Service.europe@starcharge.com
Homepage: www.starcharge.com

1.3.2 APAC

Starcharge Energy Pte., Ltd.
2 Kung Chong Road, #05-01 AA Centre, Singapore 159140
Customer service hotline: +60 15 4600 0603
Global customer service E-mail: service.global@starcharge.com
Homepage: www.starcharge.com

1.4 Symbol Description

The following are the symbol instructions and general information that may be used in this manual.

	**DANGER** "DANGER" means a highly potentially dangerous situation which, if not avoided, may cause death or serious injury.
	**WARNING** "WARNING" indicates a moderate potentially hazardous situation that may cause death or serious injury.
	**CAUTION** "CAUTION" indicates a lower hazardous situation that, if not avoided, may cause minor or moderate injury.
	**High temperature danger** The temperature of the inverter will increase during the operation process, and the contact should be avoided.
	**High-voltage danger** Due to the high voltage present in the inverter, it is very likely to endanger the life.
	**Capacitor discharge** The inverter must be disconnected from the grid and from the PV module before opening the cover. Wait at least 5 minutes for the storage capacitor to discharge completely.
	Read the user manual before performing any operation of the inverter.
	The product should not be treated as household waste.
	**Earthing identification** Protect the earth wire connection position.

2 Safety Instructions

2.1 General Safety

When installing, operating, and maintaining equipment, please read this manual first and follow all safety precautions marked on the equipment and in the manual.

The "instructions", "precautions", "warnings", and "dangers" in the manual do not represent all safety precautions that should be followed, but only serve as a supplement to all safety precautions. Our company does not assume any responsibility for violating general safety operation requirements or violating safety standards for design, production, and use of equipment.

This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment malfunction, resulting in equipment functional abnormalities or component damage, personal safety accidents, property losses, etc., which are not within the scope of equipment quality assurance.

Local laws, regulations, and specifications should be followed when installing, operating, and maintaining equipment. The safety precautions in the manual are only used as local laws and regulations supplement to regulations.

Our company shall not be responsible for any of the following situations:

- Not operating within the usage conditions specified in this manual.
- The installation and use environment exceeds the provisions of relevant international or national standards.
- Unauthorized disassembly, modification of products, or modification of software codes.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environments (such as earthquakes, fires, storms, etc.).
- Transportation damage caused by the customer’s own transportation.
- Damage caused by storage conditions that do not meet product documentation requirements.

Live operation is strictly prohibited during installation:

- It is strictly prohibited to install, use, and operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment and cables, plugging and connecting to outdoor signal interfaces, high-altitude work, outdoor installation, etc.) in adverse weather conditions such as lightning, rain, snow, and strong winds above level six.
- After installing the equipment, empty packaging materials in the equipment area, such as cartons, foam, plastics, cable ties, etc., shall be removed.
- If a fire occurs, evacuate the building or equipment area and press the fire alarm bell, or call the fire alarm number. Under any circumstances, it is strictly prohibited to re-enter a burning building.
- It is strictly prohibited to artificially alter, damage or obstruct the identification and nameplate on the equipment.
- When installing equipment, tools need to be used to tighten the screws to the specified torque.
- Fully familiar with the composition and working principle of the entire photovoltaic grid connected power generation system, as well as the relevant standards of the country/region where the project is located.
- Paint scratches that occur during equipment transportation and installation must be repaired in a timely manner, and long-term exposure of the scratched parts to the outdoor environment is strictly prohibited.
- Do not open the host panel of the device.
- Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.
- During equipment operation, if any faults are found that may cause personal injury or equipment damage, the operation should be immediately terminated, reported to the responsible person, and effective protective measures should be taken.
- Before using tools, please master the correct method of using them to avoid injury to people and damage to equipment.
- When the equipment is running, the shell temperature is high and there is a risk of burns. Please do not touch it.

2.2 Personnel Requirements

- Personnel responsible for installing and maintaining equipment must first undergo strict training, understand various safety precautions, and master the correct operating methods.

- Only qualified professionals are allowed to dismantle safety facilities and repair equipment.
- Personnel operating equipment, including operators, trained personnel, and professionals, should have local or national requirements for special operation qualifications, such as high-voltage operation, climbing, and special equipment operation qualifications.
- The replacement of equipment or components (including software upgrades) must be completed by professional or authorized personnel.

2.3 Electrical Safety

2.3.1 Earthing Requirements

- When installing equipment that needs to be earthed, the protective earth wire must be installed first; When dismantling equipment, the protective earth wire must be removed last.
- It is prohibited to damage the earthing conductor.
- It is prohibited to operate equipment without installing earthing conductors.
- The equipment should be permanently earthed for protection. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that it is reliably earthed.

2.3.2 General Requirements

Before making electrical connections, please ensure that the equipment is not damaged, otherwise it may cause electric shock or fire.

- All electrical connections must meet the electrical standards of the country/region where they are located.
- It is necessary to obtain permission from the power department of the country/region in order to connect to the grid for power generation.
- User provided cables should comply with local laws and regulations.
- When performing high-voltage operations, please use specialized insulation tools.

2.3.3 Wiring Requirements

It is forbidden to install or remove the power cord with live electricity. The moment the power cord core touches the conductor, it will generate an arc or electric spark, which can cause fire or personal injury.

- Before making electrical connections, turn off the disconnector on the upstream device to cut off the power supply if people may contact energized components.
- Before connecting a power cable, check that the label on the power cable is correct.

- If the equipment has multiple inputs and outputs, disconnect all the inputs and outputs before operating the equipment.
- The use of cables in high-temperature environments may cause aging and damage to the insulation layer, and the distance between the cable and the periphery of the heating device or heat source area should be at least 30 mm.
- Similar cables should be tied together, and different types of cables should be arranged at least 30 mm apart, and it is forbidden to entangle or cross them.
- Ensure that the cables used in a hybrid grid-tied PV and storage power system are properly connected and insulated and meet specifications.

2.4 Mechanical Safety

2.4.1 Handling Safety

- When carrying heavy objects, preparations should be made for load-bearing to avoid being crushed or twisted by heavy objects.
- When handling equipment by hand, protective gloves should be worn to avoid injury.

2.4.2 Using Ladders

- When electrical climbing operations may be involved, wooden or fiberglass ladders should be used.
- When using a herringbone ladder, the pulling rope must be firm, and someone must support the ladder during operation.
- Before using the ladder, please confirm that it is in good condition and its load-bearing capacity meets the requirements. Overweight use is strictly prohibited.
- When using a ladder, the wide foot should be facing downwards or protective measures should be taken at the bottom of the ladder to prevent slipping.
- Ladders should be placed in a stable place. The inclination of the ladder should be 75°.

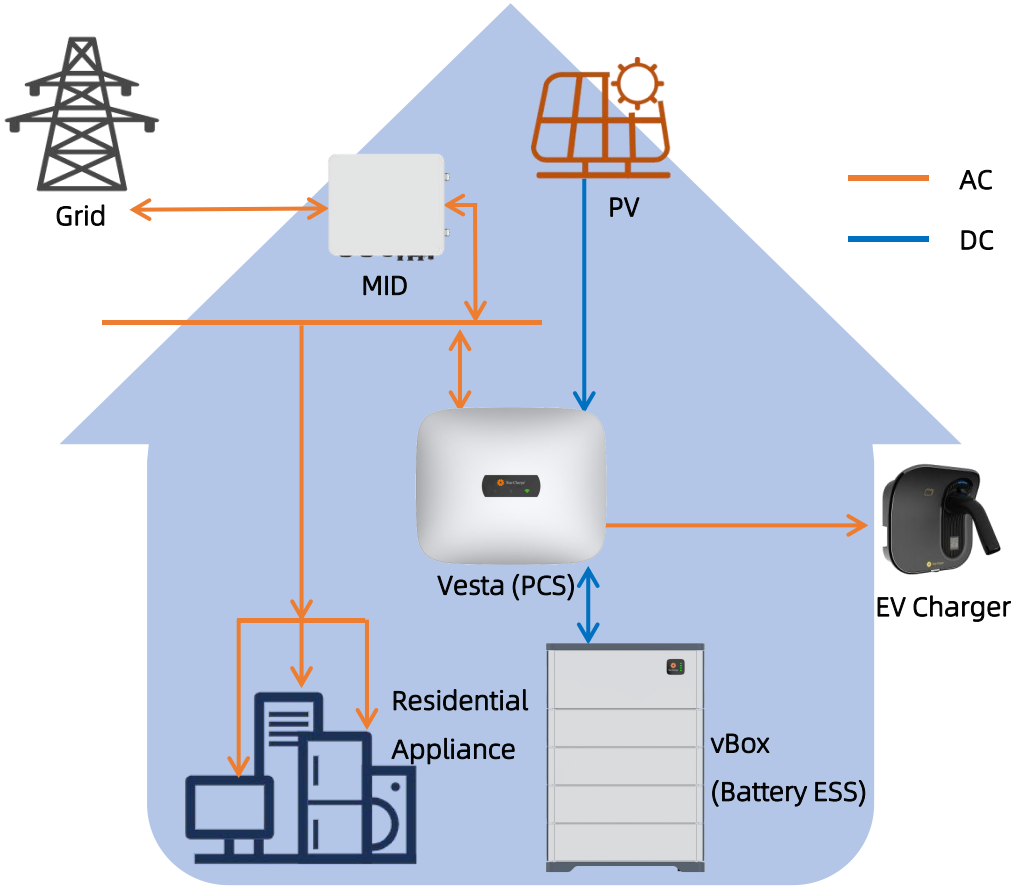
3 Introduction of Residential Energy Storage System

3.1 System Introduction

As electricity prices increase, time-of-use pricing, and tiered pricing, the photovoltaic with energy storage system can effectively reduce electricity costs. Moreover, when confronted with grid capacity limitations, grid instability, or even power outages, the system can better guarantee the household's electricity needs. With higher penetration of photovoltaic energy, self-consumption of green electricity has become a trend.

A complete residential solar energy storage and charging system integrates photovoltaic, energy storage, and EV chargers, utilizing solar power to supply electricity for household use and charge electric vehicles.

As shown below, the entire system typically includes photovoltaic (PV) facilities, smart inverters (PCS), energy storage batteries (vBox), micro-grid interconnect device (MID), EV chargers, energy management system (APP), and more. Depending on specific requirements, different configurations may be employed, and certain components can be adjusted or omitted based on actual circumstances. The diagram below illustrates the typical total solution for residential energy storage system.



With Star Charge, we offer a complete system solution, including the ESS vBox, Vesta inverter, EV charger, and MID. With these components, we can establish a complete residential PV, storage, and EV charger system. The key features of this system include combined and managed PV, Storage & Charger output/input with a single AC cable. The benefits are as follows:

- Save the grid input (main panel) capacity. The capacity would be the maximum capacity among PV, Storage & Charger, rather than the total capacity of them.
- Save the facility cost and construction fee, one step for the whole system.
- Improve self-consumption rate by introduce the EV as an additional storage device through EVSE and appliance management by EMS (Energy Management System).

3.2 Components Introduction

Vesta (PCS): An intelligent inverter in the residential energy storage system, designed and manufactured by Star Charge. It can simultaneously connect to the grid, photovoltaic panels, household loads, batteries, and EV chargers. It serves as the central component of the entire system, capable of performing rectification, inversion, and partial energy management functions. It offers various power options from 5kW to 8kW, and supports single-phase grid connection method.

vBox (Battery ESS): The battery in the residential energy storage system, designed and manufactured by Star Charge. It consists of a battery control module and 2-6 battery modules, with state-of-art LFP cells inside. It offers battery capacity options ranging from 6.9kWh to 20.7kWh. It can store electricity from the grid and photovoltaic panels for household or electric vehicle use.

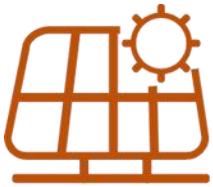
With Vesta and vBox together, we can offer several EMS functions such as TOU and self-consumption to improve the self-consumption rate of photovoltaic generation.

MID: An intelligent micro-grid interconnect device with metering function designed and manufactured by Star Charge. MID is an external device for generation control function. It can intelligently detect the grid status based on voltage levels and disconnects during grid outages, enabling off-grid operation of the residential energy storage system.

MID Model: TSSAU00

Manufacturer: Wanbang Digital Energy Co., Ltd.

EVSE: Electric Vehicle Supply Equipment, or electric vehicle charging equipment, provided by Star Charge with various product options. It allows charging electric vehicles at home. The EVSE is an optional device only needed when there is a requirement for EV charging.



PV: Photovoltaic panels, not currently manufactured by Star Charge. They can convert solar energy into electricity to power homes.

3.3 Application Scenarios

With different combination of components, we can fulfill requirements for different scenarios. In general, we can separate the Scenarios with 2 major categories, the new installation and retrofit installation which is with existing photovoltaic system. The EV charger Artemis would always be an option for every residential energy scenario if the electric vehicle is available.

The scenarios for new installation are as follows:

No.	Description	Required Components	Major Benefits (Support Functions)
1	Pure PV	Vesta Inverter PV Panels	PV generation to reduce electricity bill
2	Pure storage with backup	Vesta Inverter vBox ESS MID	TOU (some region) Backup during grid outage
3	PV with ESS with backup	Vesta Inverter vBox ESS MID PV Panels	PV generation to reduce electricity bill TOU (some region) Zero export Backup
4	EV charging (optional)	Artemis EV Charger	To charge electric vehicle

With existing PV system, the major scenarios for retrofit installation are as follows:

No.	Description	Required Components	Major Benefits (Support Functions)
5	PV with ESS with backup with existing PV system	Vesta Inverter vBox ESS MID	PV generation to reduce electricity bill TOU (some region) Zero export Backup
6	EV charging (optional)	Artemis EV Charger	To charge electric vehicle

4 Product Description

4.1 Basic Characteristics

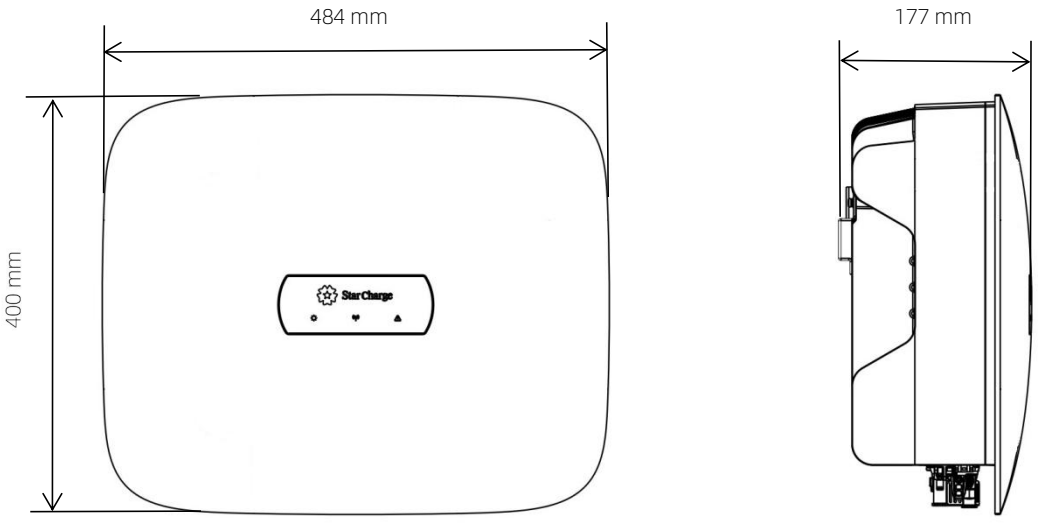
This product is a single-phase high-performance inverter with high efficiency and stable and reliable performance. The key features for this product is that combined and managed PV, Storage & Charger output/input together with single AC cable, thus we can save the AC capacity. Max. among PV, Storage & Charger, not total of them.

Besides, we can save the facility cost and construction fee, one step for all. And we can improve self-consumption rate by introducing the EV as an additional storage device through EVSE and appliance management by HEMS.

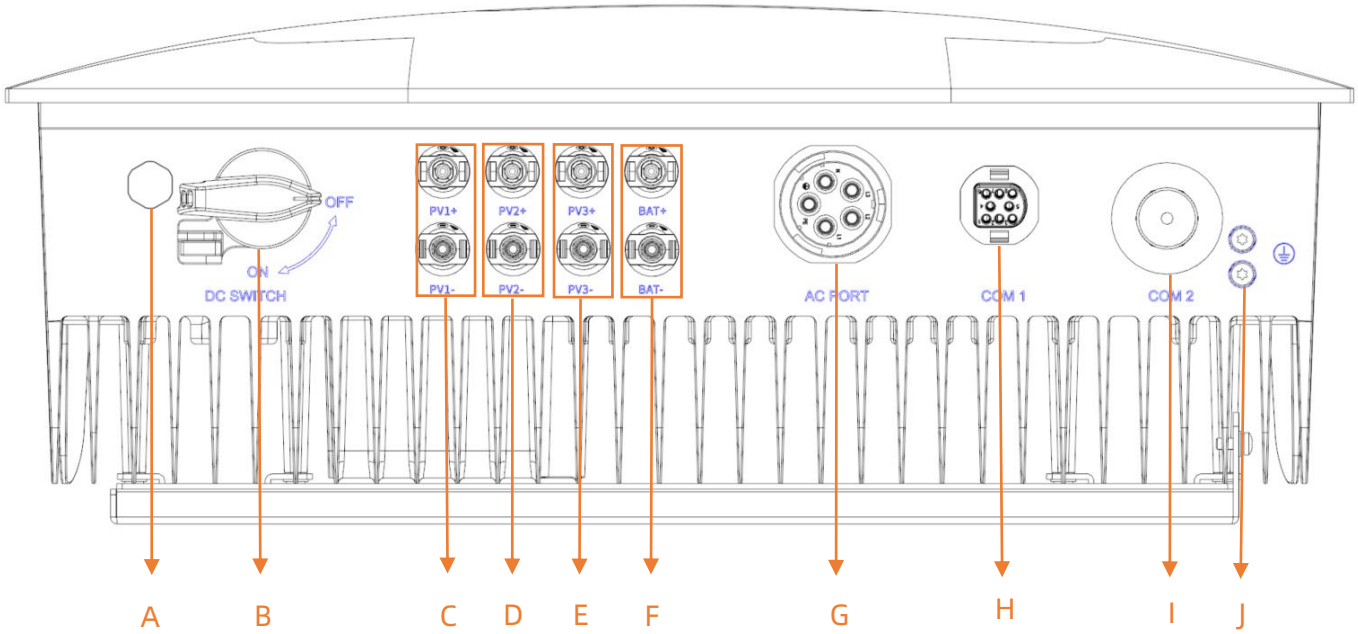
Features:

- Advanced DSP control technology.
- The latest high-efficiency power supply topology structure.
- Advanced MPPT technology.
- Extremely wide MPPT input range.
- Advanced anti-islanding solution.
- IP65 protection suit for either indoor or outdoor environments.
- The peak efficiency can reach 97.4%. Total harmonic distortion is <3% under full load.
- Safe and reliable: transformerless with hardware and software overvoltage and overcurrent protection.
- LED indication.
- Remote monitoring via PC or app.
- WiFi/Cellular (optional) data monitoring technology.

4.2 Dimensions



4.3 Overview of the Connection Area



No.	Description
A	Breather valve
B	DC disconnect switch
C	DC input terminal (PV1+/PV1-)
D	DC input terminal (PV2+/PV2-)
E	DC input terminal (PV3+/PV3-)
F	Energy storage terminal (BAT+/BAT-)
G	AC port
H	Communication port 1 (COM 1)
I	Communication port 2 (COM 2)
J	Earth screw terminal

Attention: Installation, operation, and maintenance are permitted only for professional or trained personnel.

5 Technical Parameters

5.1 Efficiency

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Peak efficiency	97.4%	97.4%	97.4%

5.2 Photovoltaic Input

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
PV maximum input voltage	600 V		
MPPT voltage range	80 V to 500 V		
PV Maximum input current (MPPT per channel)	13.5 A		
Short circuit current protection value	20 A		
Minimum starting voltage	100 V		
Maximum inverter backfeed current to array	0 A		
Number of MPPTs	2	3	3

5.3 DC Battery Input

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Battery type	LiFePO4		
Battery voltage range	360 to 480 V		
Nominal battery voltage	360 V		
Rated charge current (maximum continuous)	14 A	16 A	22 A
Rated discharge current (maximum continuous)	14 A	16 A	22 A

5.4 Output

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
AC input/output rated output power	5000 W	6000 W	8000 W
AC input/output rated apparent power	5000 VA/5000 VA	6000 VA/6000 VA	8000 VA/8000 VA
AC input/output rated voltage	230 V		
AC input/output rated frequency	50 Hz		
AC input/output rated current	21.7 A/21.7 A	26.1 A/26.1 A	34.8 A/34.8 A
Short circuit protection current	90 A		
Power factor	0.8 leading...0.8 lagging		
Current (inrush)	25 A	30 A	37 A
Maximum output fault current	85.4A	92.5A	103A
Maximum output overcurrent protection	106.9A	106.9A	106.9A
Maximum total harmonic distortion (rated power)	≤ 5%		

5.5 Protection and Characteristics

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Anti-island protection	Supported		
DC reverse connection protection	Supports physical reverse polarity protection		
Insulation resistance detection	Supported		
Residual current monitoring unit (RCMU)	Supported		
AC short circuit protection	Supported		
AC overcurrent protection	Supported		
Overheating protection	Supported		
DC surge protection	Supported		
AC surge protection	Supported		
AC overvoltage protection	Supported		

5.6 Communication and Display

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Display	LED indicator and WLAN+App		
WLAN	Supported		
RS485	Supported		
Communication expansion module	WLAN-FE (optional)/4G (optional)		

5.7 General Parameters

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Topology	Transformerless		
IP rating	IP65		
Overvoltage category	II (DC) / III (AC)		
Active anti-islanding method	AFD**PF**		
Cooling mode	Natural convection		
Dimensions (W x H x D, mm)	484 x 400 x 177		
Weight	17 kg		
Operating temperature	-25 ℃ to +60 ℃ (derated when the temperature is higher than 45 ℃ under rated load)		
Relative humidity	0%-95%		
Operating altitude	0-4000 m (derated when the altitude is greater than 2000 m)		

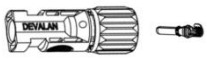
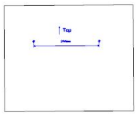
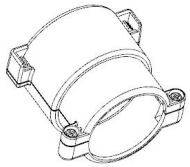
6 Installation

6.1 Visual Inspection

Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.

6.2 Packing List

Open the package and take out the product, please check the attachment first. The packing list is shown below.

No.	Name	Image	Qty	No.	Name	Image	Qty
1	Inverter		1	8	COM connector		1
2	Bracket		1	9	M4*10 screw		1
3	DC connector (F) with metal terminals		3	10	AC connector		1
4	DC connector (M) with metal terminals		3	11	Mounting indicator plate		1
5	Energy storage connector (F) with metal terminals		1	12	Expansion bolt		2
6	Energy storage connector (M) with metal terminals		1	13	AC protective cover		1
7	O-type terminal		2				

6.3 Installation

Please ensure that the installation location meets the following conditions:

Outdoor Requirements:

- Not in areas exposed to direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in a potentially explosive area.
- Not in a direct stream of cold air.

- Do not approach the TV antenna or other antenna cable.
- Not at an altitude higher than 4000 m.
- Avoid precipitation or humid environments.
- The ambient temperature ranges from -20°C to +60°C.
- A well ventilated environment.
- The slope of the wall should be within ±5°.

Indoor Requirements:

- Do not install the equipment in a place easily touched by children.
- Do not install the equipment in areas with difficult access (including but not limited to attic, basement, etc.).
- Please keep away from the daily work and living places (including but not limited to living room, bedroom, studio, lounge, study, etc.)
- The foundation of the installation will not be covered by water under raining or other conditions.
- Not in areas exposed to direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in a potentially explosive area.
- Not in a direct stream of cold air.
- Do not approach the TV antenna or other antenna cable.
- Not at an altitude higher than 4000 m.
- Avoid precipitation or humid environments.
- The ambient temperature ranges from -20°C to +60°C.
- A well ventilated environment.
- The slope of the wall should be within ±5°.

The walls of the inverter shall meet the following conditions:

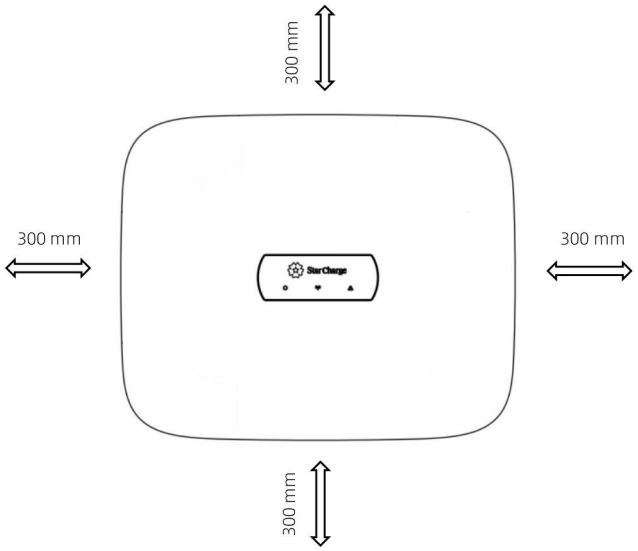
- It is a solid brick/concrete or installation surface with equivalent strength;
- For wooden walls, only hard wood is suitable for installation. Loose wood should not be used.
- If the strength of the wall is insufficient (such as column walls or walls covered with thick decorative layers), the inverter must be supported or reinforced.

Attention: Avoid direct sunlight, rain or snow during installation and operation.

Installation requirements:

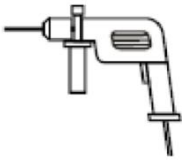
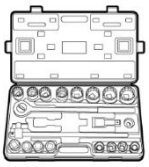
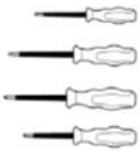
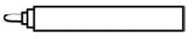
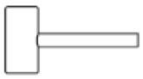
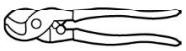
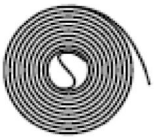
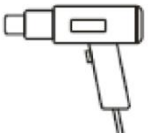
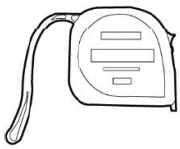
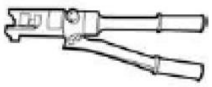
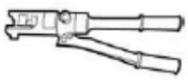
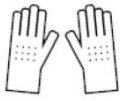
- It is recommended to install it at a height of more than 1 meter.
- There should be no obstacles within a 300 mm circumference around the inverter.
- During installation, if there is a vBox below, the bottom edge of the inverter should be at least 300 mm above the top of the vBox.

Installation space requirement



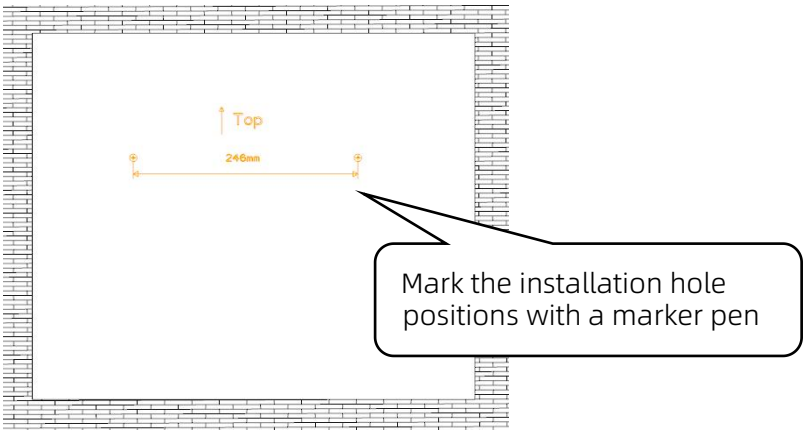
Direction	Distance
Left	300 mm
Right	300 mm
Top	300 mm
Bottom	300 mm

Installation tools and PPE (Personal protective equipment):

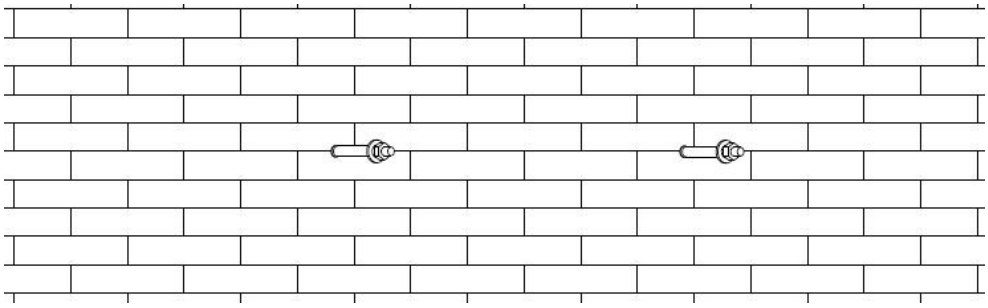
Type	Tool			
Installation Tools	 Impact drill Drill bit: Φ8 mm	 Socket wrench	 Screwdriver	 Diagonal pliers
	 Adjustable wrench	 Marker pen	 Rubber hammer	 Utility knife
	 Wire cutters	 Cable tie	 Multimeter DC voltage range ≥1100V DC	 Spirit level
	 Heat shrink tubing	 Heat gun	 Tape measure	 MC4 connector crimping tool (2.5-6 mm^2)
	 Heavy-duty crimping tool SATA 91142 (2.5-16 mm^2)	 Torque wrench		
Protective Equipment	 Dust mask	 Safety goggles	 Safety gloves	 Safety shoes

Step 1: Fix the hanging bracket to the wall

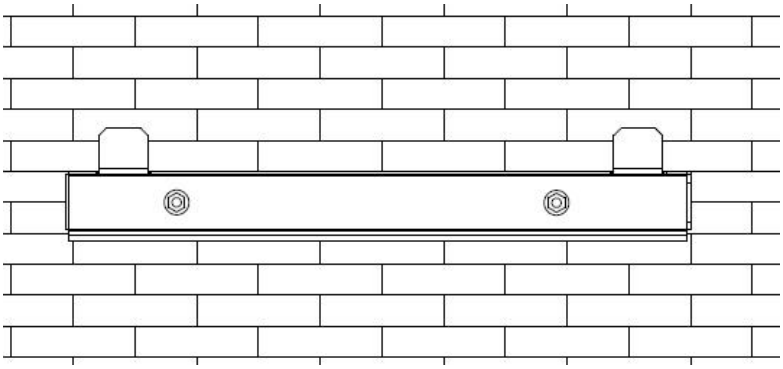
- Choose where you want to install the inverter, place the hanging bracket on the wall and mark the location of the 2 holes on the wall.



- Use an electric drill to drill a hole with a diameter of 8 mm and a depth of 45-50 mm in the wall, and clean the debris of holes.
- Tap the expansion bolts into the holes with a rubber mallet until the head washer of the expansion bolts is flat against the wall (if the length or quantity of the expansion bolts cannot meet the installation requirements, please prepare M6*60 mm stainless steel expansion bolts).
- After tightening the nut clockwise, then use a spanner to twist the nut 3-5 turns to fix the expansion bolt to the wall.
- Finally, screw down the nut, metal shrapnel, and washer counterclockwise, leaving the bolt and expansion tube fixed to the wall.



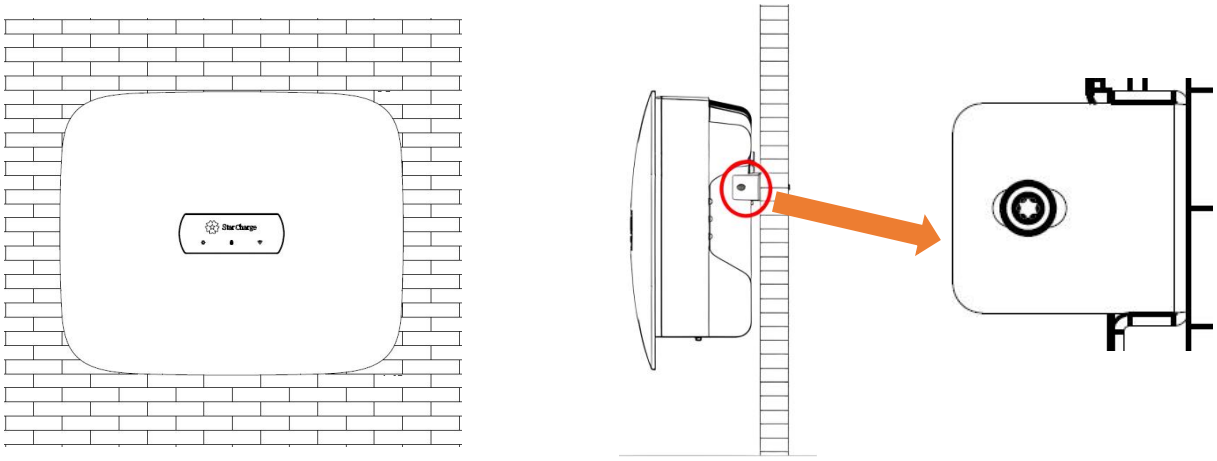
- Thread the mounting holes of the bracket into the expansion bolts of the wall and keep them flat against the wall, put in the washers and metal shrapnel in turn, screw in the nuts clockwise, and tighten them with a torque spanner (torque 5 N·m).



- Expansion screws should avoid penetrating through the fire-resistant layer.

Step 2: Assemble the inverter and the hanging bracket

- Hang the inverter on the bracket and make sure that both of them are installed in place. Take out the M4*10 stainless steel screw from the accessory bag, install it on the right side of the machine, and tighten it (torque 1.5 N·m).

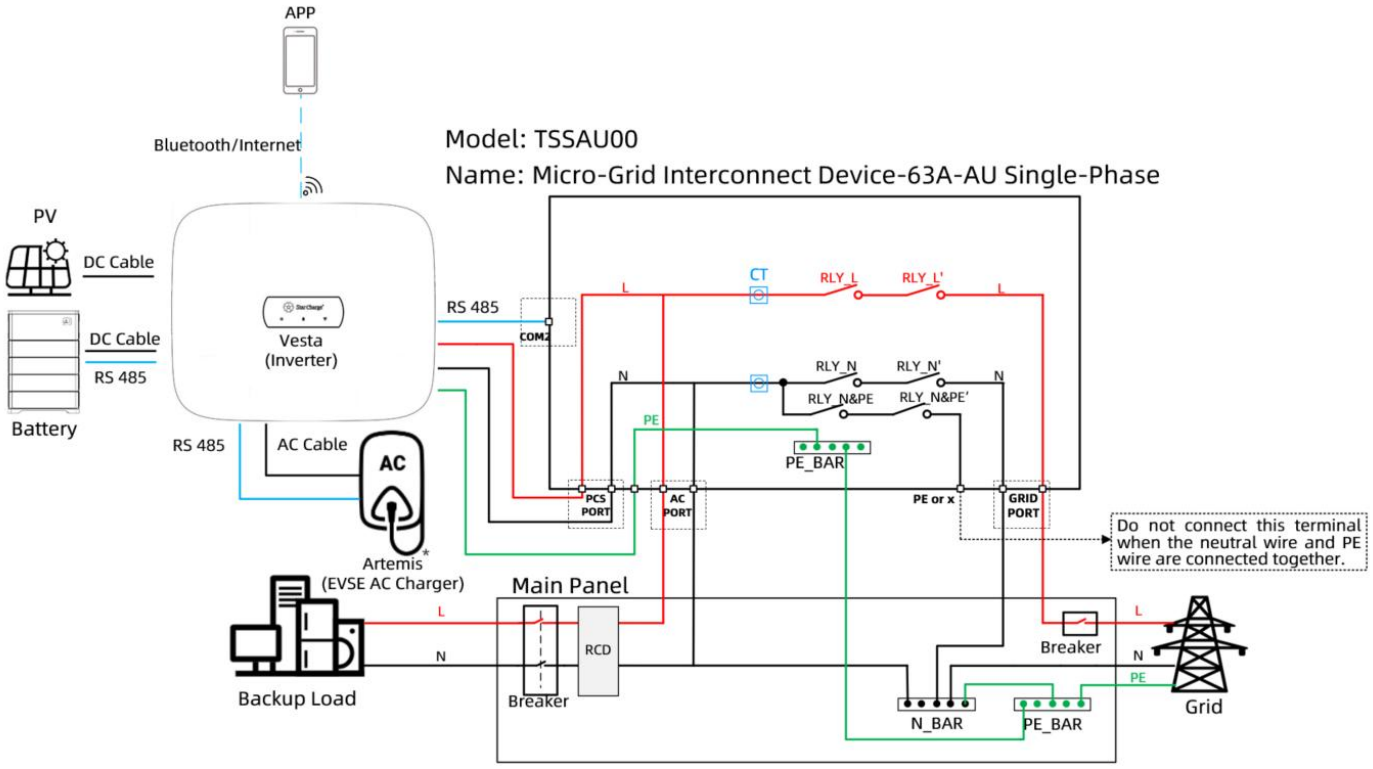


7 Electrical Connections

7.1 System Wiring Diagram

This diagram is an example for grid systems without special requirements on electrical wiring connection.

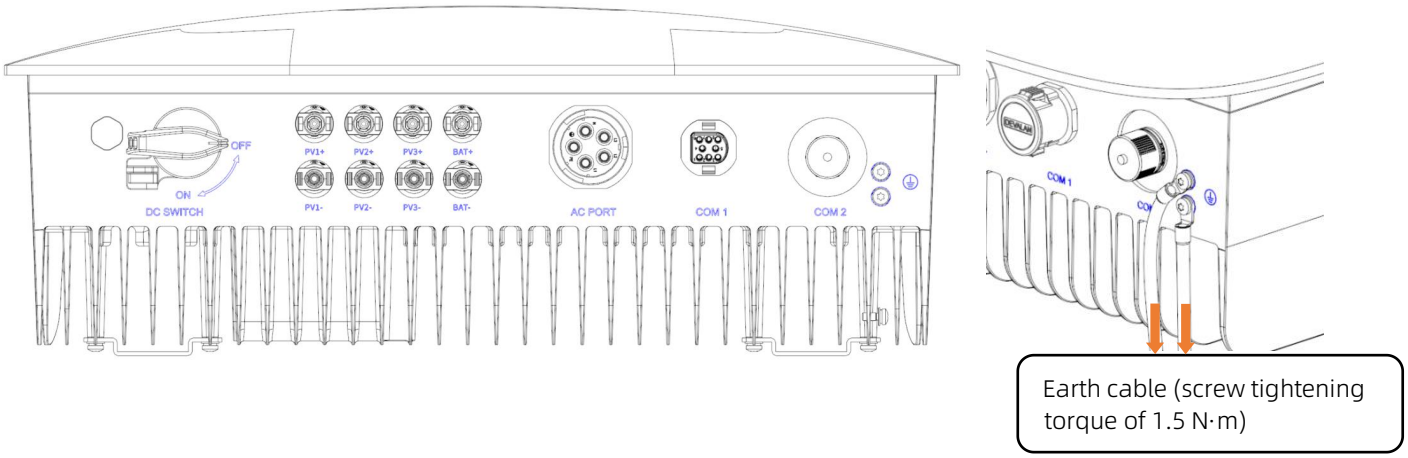
Note: The backup PE line and earthing bar must be earthed properly and effectively. Otherwise the backup function may be abnormal when the grid fails.



The diameter of the wire connected to the Main Panel and the N wire and PE wire in the Main Panel is 13.3 square millimeters, and the maximum current is 75A.

7.2 Earth Cable

Take out the O-type terminal from the accessory bag and crimp it to the earthing wire (6 mm^2 wire is recommended for earthing, crimp it using a heavy-duty crimping tool). Use a screwdriver to lock the earthing terminal of the crimped wire to the earthing hole of the machine, as shown in the figure below. In order to improve the corrosion resistance of the terminal, it is recommended to coat the earth terminal with silicone for anti-corrosion treatment after the earth cable is assembled.



CAUTION	**CAUTION** In order to remain safe in the event that the protective earth conductor is damaged or disconnected, the external earth wire must remain securely connected.

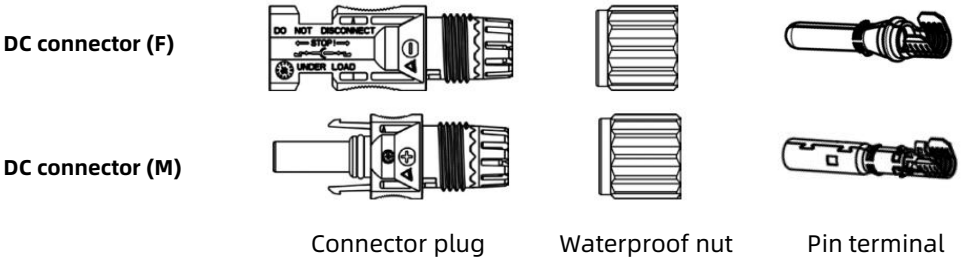
7.3 DC Connection

Please choose highly reliable and high-quality PV modules. The open circuit voltage of the connected module array should be less than 550V, and the operating voltage should be within the MPPT voltage range.

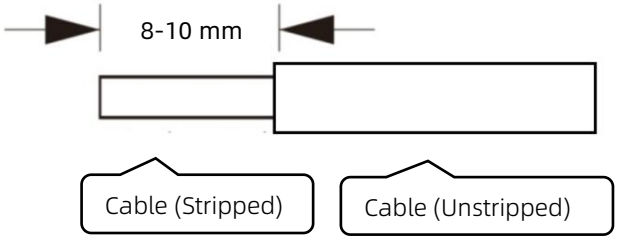
Note: The PV array is floating.

WARNING	**WARNING** The photovoltaic module voltage is quite high, falling within the range of dangerous voltages. please follow the electrical safety rules when connecting.
WARNING	**WARNING** Do not earth the positive or negative terminal of the PV.
CAUTION	**CAUTION** Make sure that the PV modules in the same system are of the same type, have the same output and specifications, and have the same tilt angle. To save on cables and reduce DC losses, we recommend installing the inverter as close as possible to the photovoltaic modules.

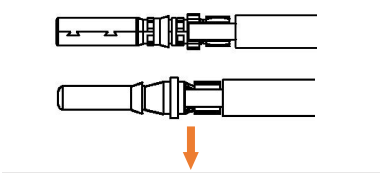
- Open the DC terminal package, the connector accessories are as follows:

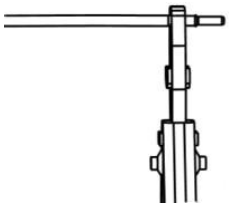


- Turn off the DC disconnect switch.
- Choose wires of appropriate diameter to connect the photovoltaic modules (we recommend using a copper wire with a cross-sectional area of 4 mm^2).
- Use wire strippers to remove the insulation sheath of the cable, exposing the conductor to approximately 8-10 mm.

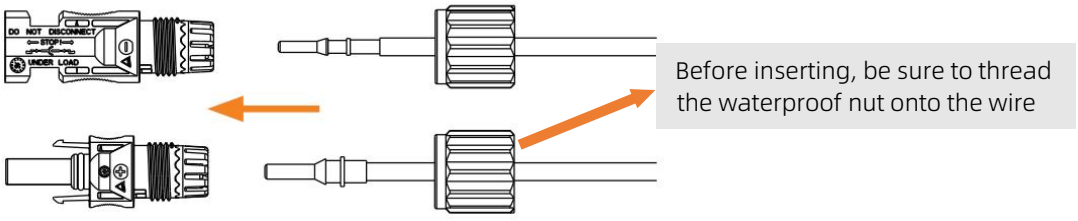


- Insert the exposed part of the cable into the pin terminal and ensure that all wire bundles are securely fastened within the pins.
- Use crimping pliers to crimp the pin contact points to ensure that the copper wires of the cable are firmly crimped to the pin terminals.

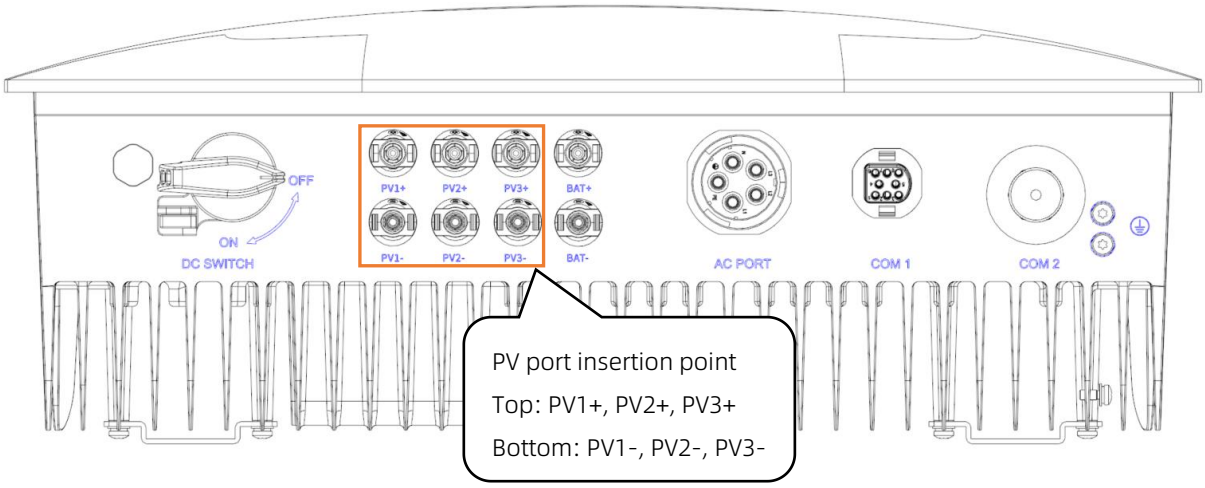


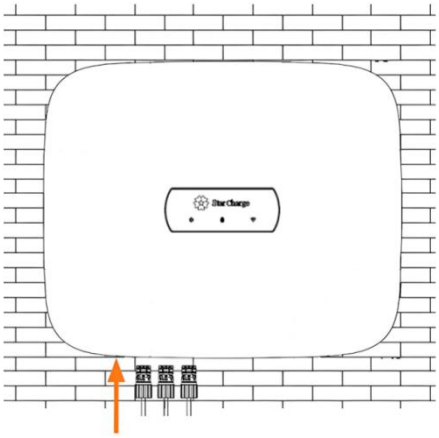

MC4 crimping tool for terminal

- Insert the crimped cable through the nut into the plug. When you hear a "click" sound, it indicates that the pin is correctly inserted into the connector plug.
- Tighten the waterproof nut clockwise (torque 2.6-2.9 N·m).



- Remove the dust cap from the PV connector socket of the inverter, and insert the connector into the socket to complete the snap fastening.

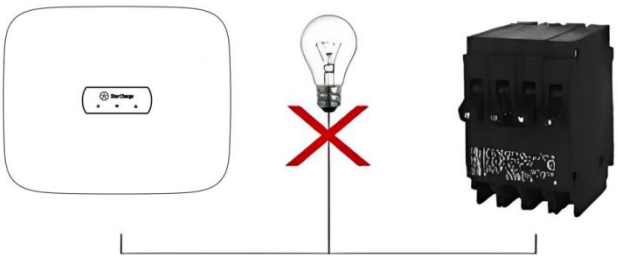




7.4 Grid Connection

The single-phase series inverter can be used for single-phase power grids. It is suitable for power grids with a rated phase voltage of 220 V/230 V and a frequency of 60 Hz/50 Hz.

Other technical requirements should be in line with the requirements of the local public grid.



Note: A miniature circuit breaker should be installed between the inverter and the grid or battery; no load should be connected directly to the inverter. The cross-sectional area of the external protective earthing conductor meets the surge absorption capability.

Technical Specifications	Vesta-5.0-S	Vesta-6.0-S	Vesta-8.0-S
Model	SI503SENA00	SI603SENA00	SI803SENA00
Recommended breaker (Battery port)	20 A	25 A	32 A
Recommended breaker (AC output port, on-grid mode)	32 A	40 A	50 A

Built-In DC Isolator Specification

Switch complies with IEC 60947-3, AS 60947.3:2018, within the inverter, is used as an isolating device. Please check the ratings below.

Applicant's name: SVRUI (Tianjin) Electrical Equipment Co., Ltd.

Address: No.17-1 Chaoyang East Road, Koudong Industrial Park, Baodi Economic Development Zone, Tianjin

Manufacturer: SVRUI (Tianjin) Electrical Equipment Co., Ltd.

Standard: IEC 60947-3:2020 in conjunction with IEC 60947-1:2020

Model: GHX5-32P

PV Category:

(i) Rated insulation voltage:1500V

(ii) Rated impulse withstand voltage:8000 V

(iii) Suitability for isolation: Yes

(iv) Rated operational current:32A

(v) Utilization category and/or PV utilization category: DC-21B, DC-PV1

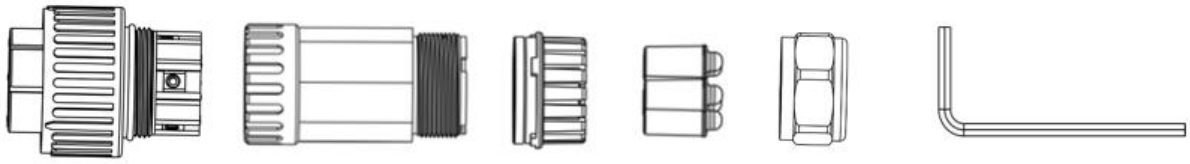
(vi) Rated short-time withstand current (Icw): 700 A

(vii) Rated short-circuit making capacity (Icm): 1400 A

7.5 AC Connection

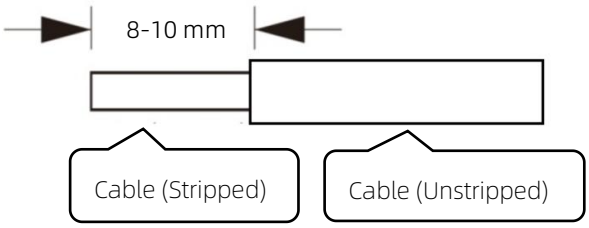
- Check the grid voltage and compare it with the permissible voltage range (refer to Chapter 4 for technical parameters).
- Disconnect all electrical connections and switches and secure to prevent reconnection.

Open the AC connector package, the connector accessories are as follows:

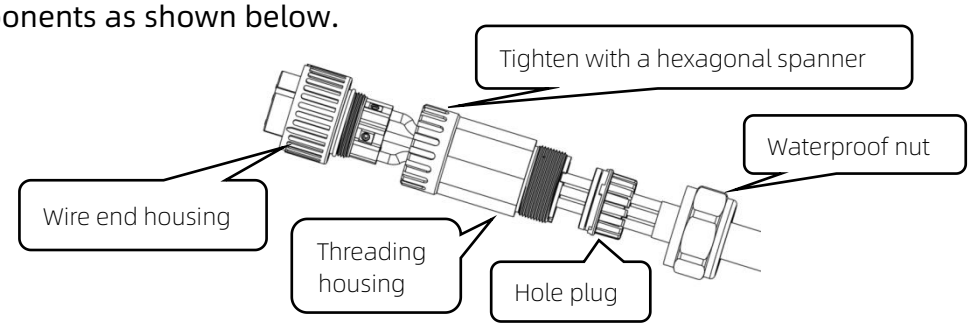


Wire end housing | Threading housing | Hole plug | Plug stick | Waterproof nut | Hexagonal wrench

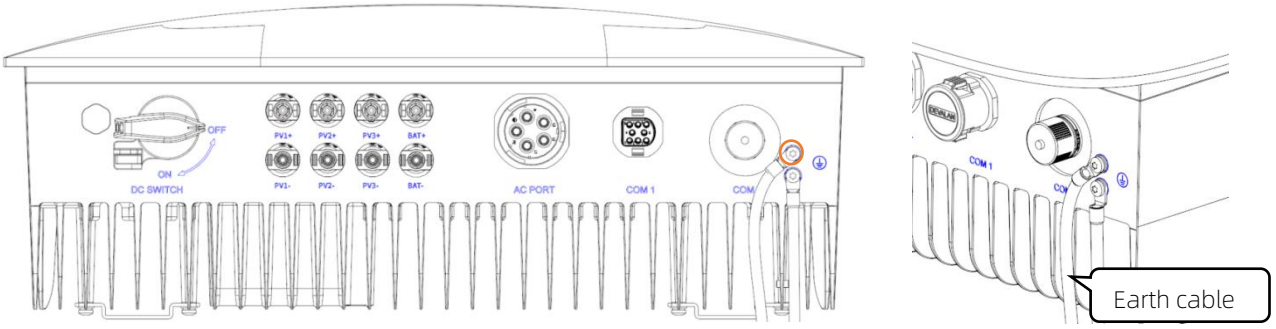
- Select a five-core cable with the appropriate wire diameter (recommended single-strand copper wire with a cross-sectional area of 6 mm^2).
- Strip the insulation sheath of the wire with wire strippers, exposing approximately 8-10 mm of the conductor.



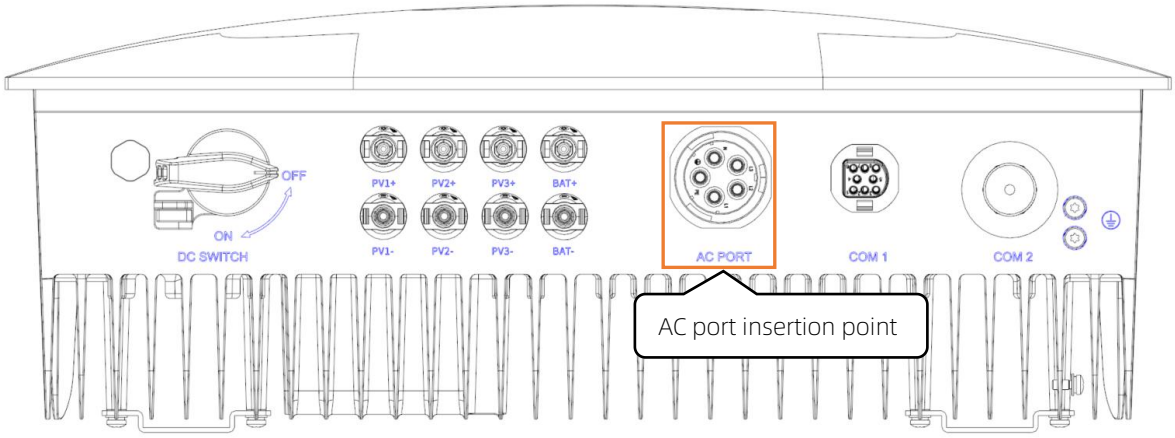
- Remove the AC wire end connector from the accessory, then route the AC cable through the components as shown below.

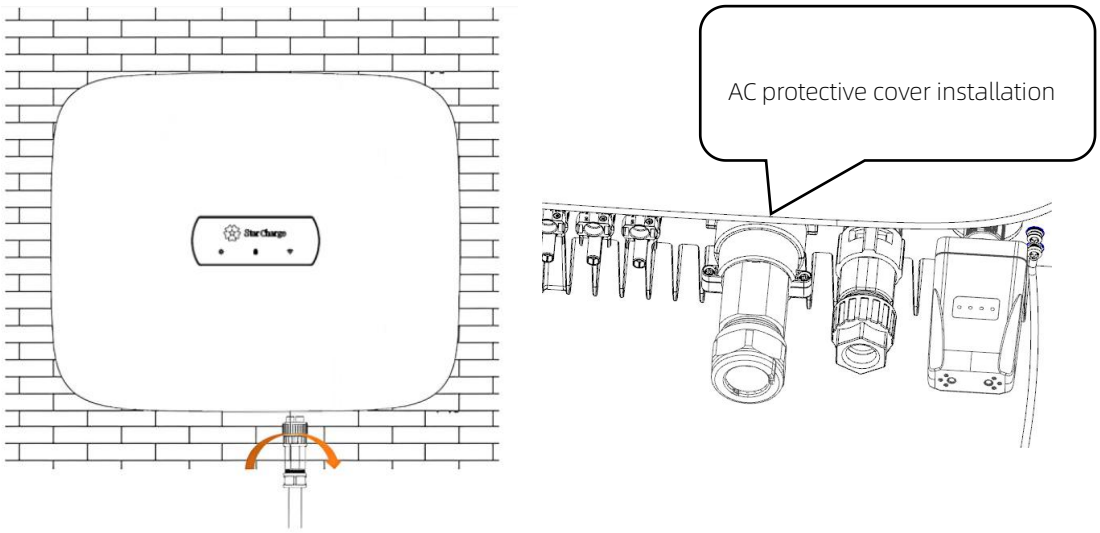


- Connect the L1, N1 and PE wires to the L1, N1 and PE wiring holes in turn, tighten the screws with a hexagonal wrench (torque 1.0-1.5 N·m), and tighten the threading plastic casing and the waterproof nut clockwise (torque 3.5-4 N·m).
- If you need to connect the EVSE (charger), refer to AC wiring, connect L, N wires to L2, N2 wiring holes in sequence, torque the screws (torque 1.0-1.5 N·m), and tighten the nuts (torque 3.5-4 N·m). Earthing can be selected from the position shown below.



- Remove the dust cap from the AC connector socket of the inverter, insert the AC connector into the socket, and tighten the connector wire end housing's fastening nut clockwise (torque 4-5 N·m) until it rotates into the limit slot of the socket.

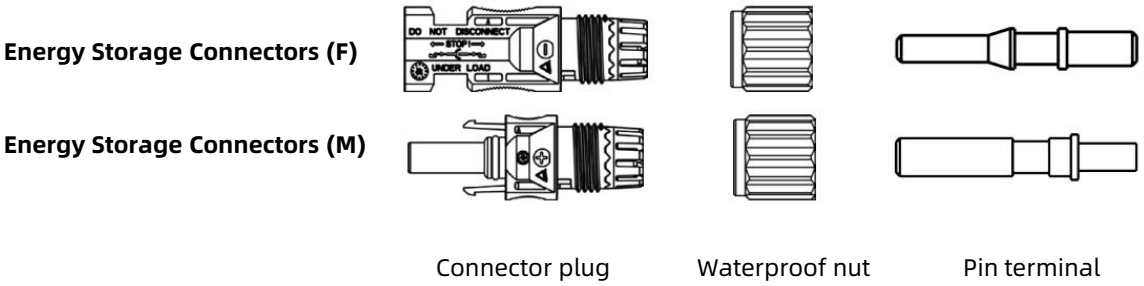




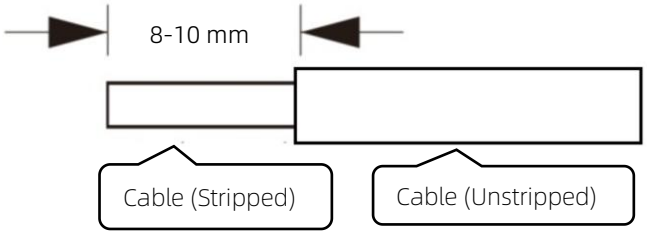
Note: The compatible RCDs are of type B with a rating of 300 mA.

7.6 Battery Connection

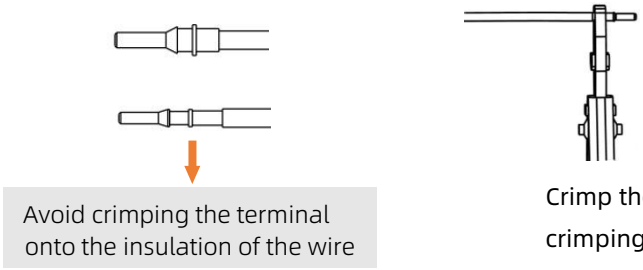
- Open the battery assembly terminal package and the connector parts are as follows:



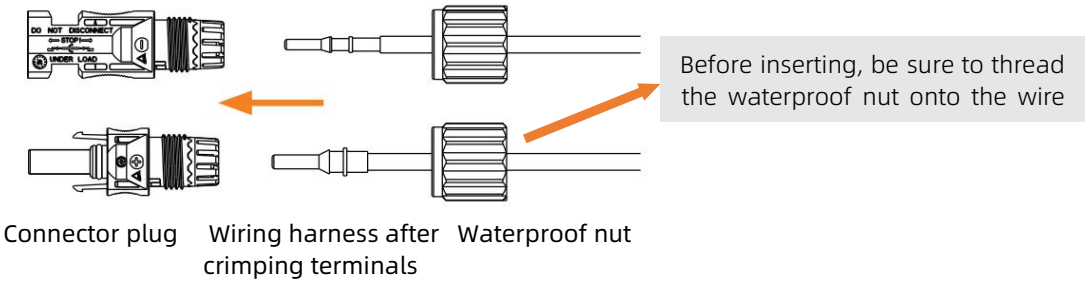
- Choose outdoor photovoltaic cables with appropriate wire diameter (we recommend using a wire with a cross-sectional area of 4 mm^2).
- Use wire strippers to remove the insulation sheath of the cable, exposing the conductor to approximately 8-10 mm.



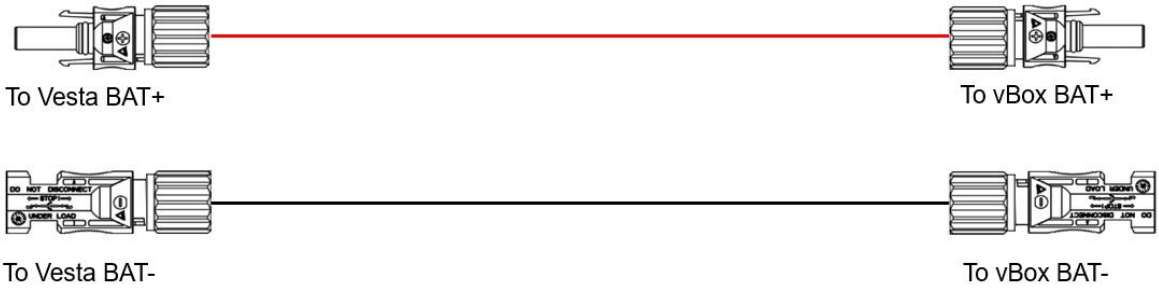
- Insert the cable wires into the pin terminals and ensure that the wire harness snaps into the pins.
- Use a crimping tool to securely crimp the copper wire of the cable to the pin terminal (recommended: SATA 91142 heavy-duty crimping plier).



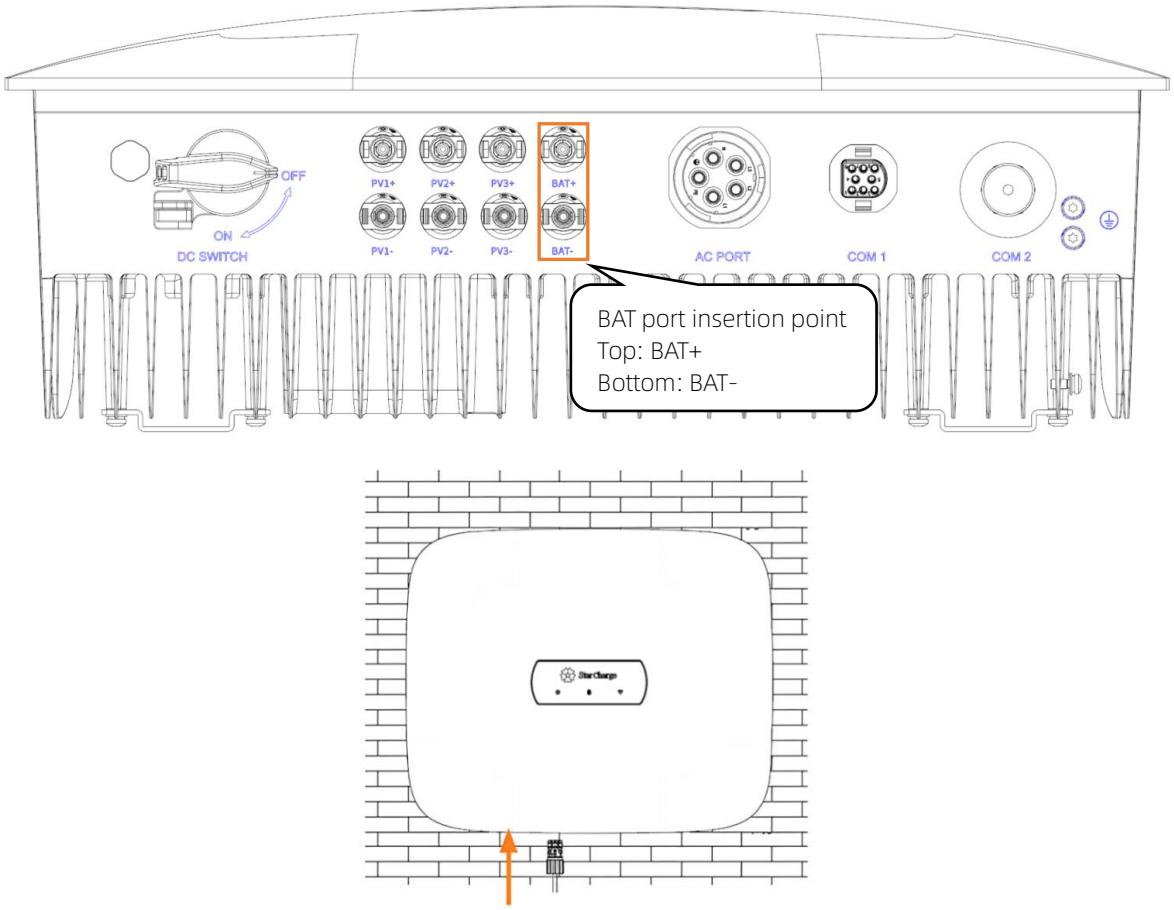
- Insert the crimped wire through the nut and insert it into the plug. When you hear a "click" sound, it indicates that the pin is correctly clamped in the plug.



- Tighten the waterproof nut clockwise (torque 2.6-2.9 N·m).
- After the wire harness assembly is completed, the overall effect is as follows: (please note that both ends of the BAT+ wire harness are male, and both ends of the BAT- wire harness are female).



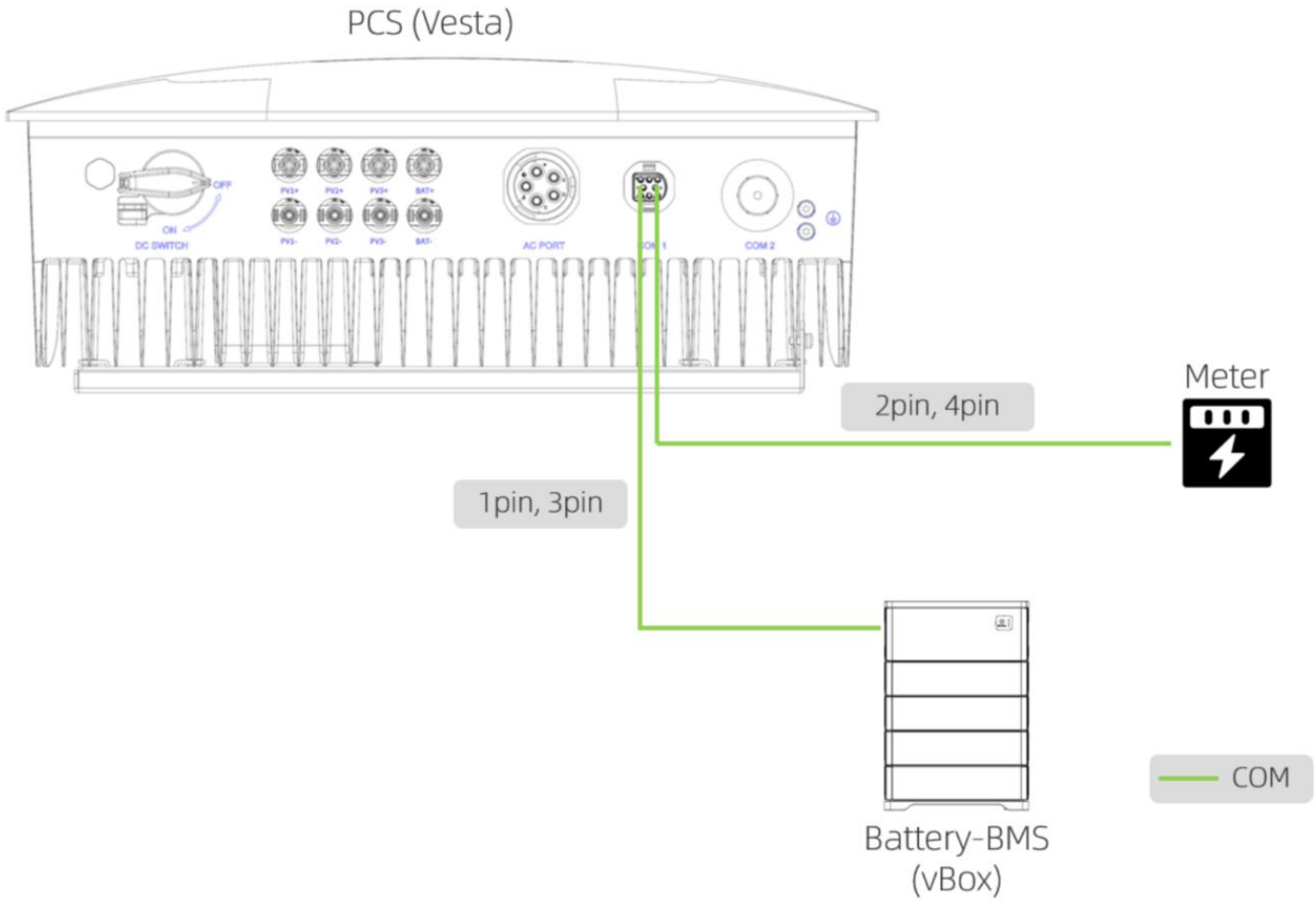
- Remove the dust cover on the BAT connector socket of the inverter, insert the connector into the socket, and securely lock it in place.



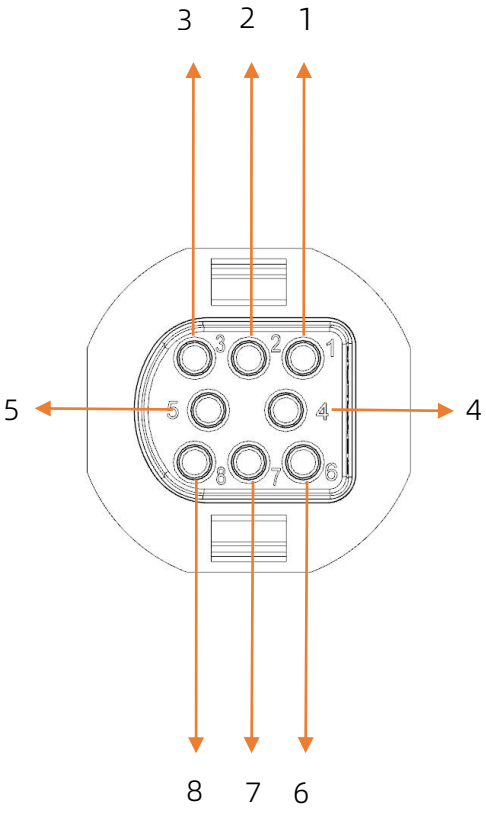
Note: The connection between the battery and PCS should not exceed 10 m.

7.7 Communication Connection

Communication Wiring Diagram:

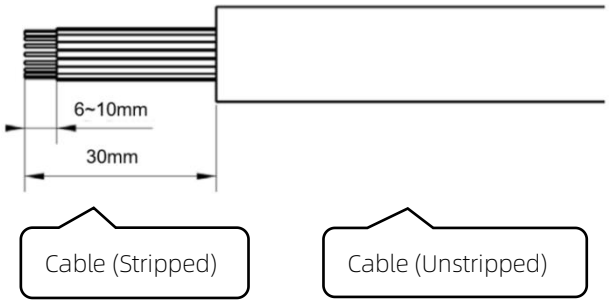


- The signal definitions for the communication interface:

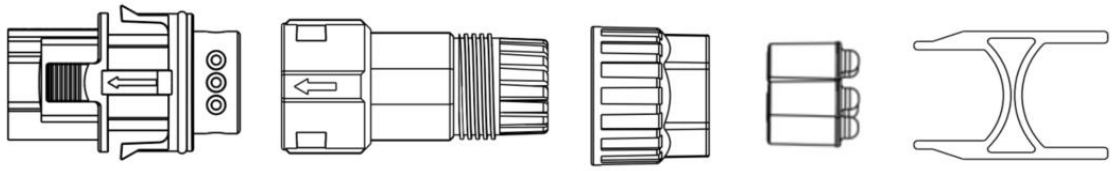


Pin	Name	Function	Description
1	RS485_1_A	RS485A RS485 differential signal+	RS485 signal interface for communication with battery BMS/Meter
2	RS485_1_A	RS485A RS485 differential signal+	RS485 signal interface for communication with battery BMS/Meter
3	RS485_1_B	RS485B RS485 differential signal-	RS485 signal interface for communication with battery BMS/Meter
4	RS485_1_B	RS485B RS485 differential signal-	RS485 signal interface for communication with battery BMS/Meter
5	RS485_2_A	RS485A RS485 differential signal+	RS485 signal interface for communication with HEMS/external controllers
6	RS485_2_B	RS485B RS485 differential signal-	RS485 signal interface for communication with HEMS/external controllers
7	CAN_L	C AN_L CAN communication low data line	CAN bus for communication with battery BMS
8	CAN_H	C AN_H CAN communication high data line	CAN bus for communication with battery BMS

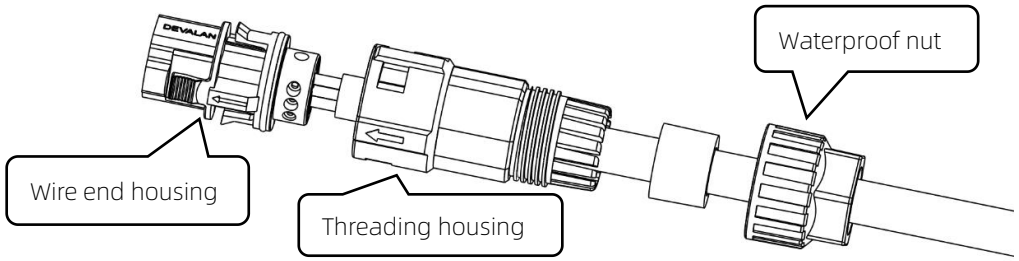
- Choose a multi-core communication cable with an appropriate conductor cross-sectional area (0.2-0.5 mm²) and strip the wires, leaving a length of 6-10 mm.
  1) If connecting to the vBox, a two-core communication cable can be used to connect communication port 1 and communication port 3.
  2) If connecting two devices simultaneously, such as the vBox and MID or electric meter, two two-core communication cables are required to connect interface 1 and interface 3, as well as interface 2 and interface 4. For example, if using ports 1 and 3 for the vBox connection, ports 2 and 4 should be used for the MID or electric meter connection.



- Open the communication terminal package, the connector parts are as follows.

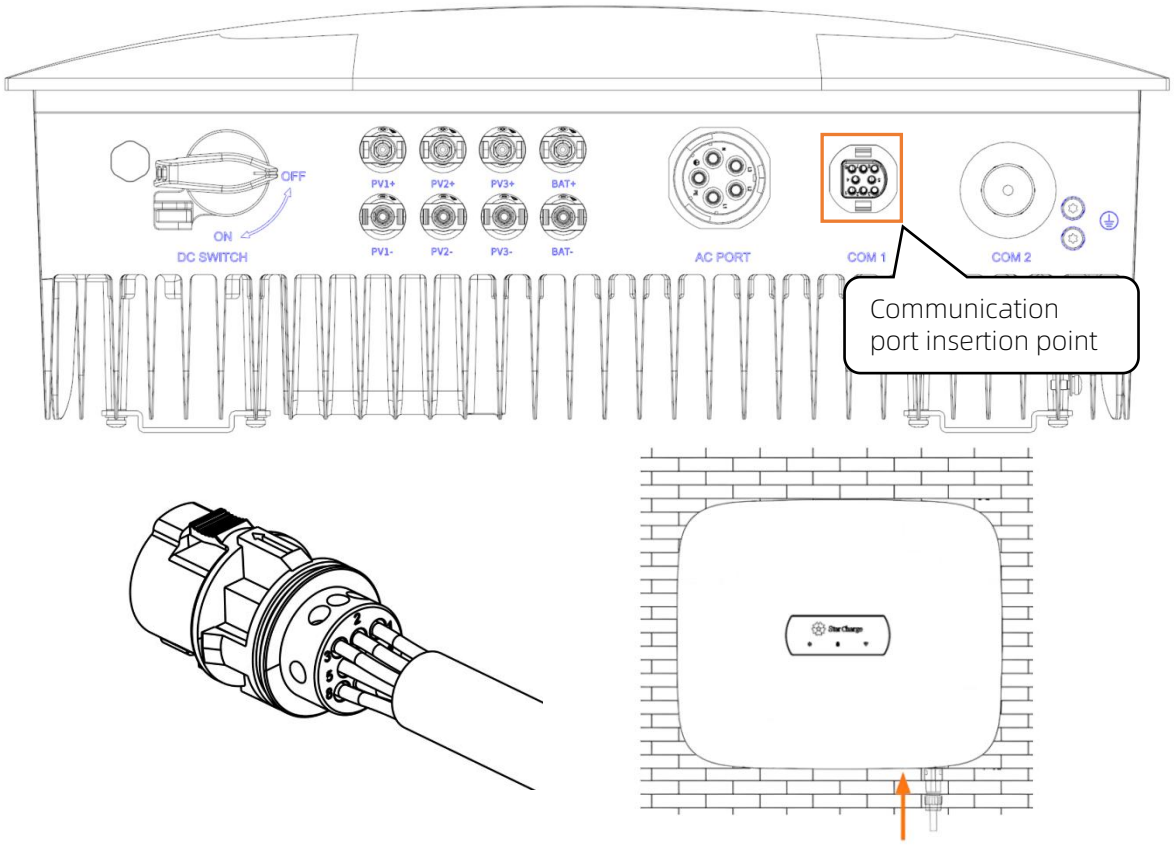


- Unscrew the nut and remove the corresponding plug stick, and pass the communication cable through the parts as shown in the figure below.



- Connect the communication cable into the wiring hole in sequence according to the signal definition, and tighten the screws (torque 0.2-0.4 N·m). The screws used are M2 screws (recommended: PH0 screwdriver bit).
- Connect the thread housing to the wire end housing, and when you hear a "click" sound, it indicates that the insertion is complete. Then, tighten the waterproof nut clockwise.

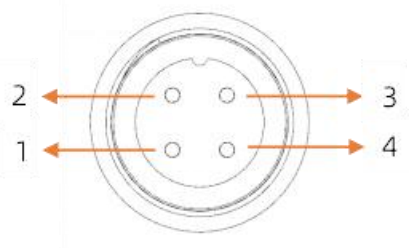
- Remove the dust cap from the COM connector socket of the inverter, and insert the connector into the socket to, and secure it with a latch.



7.8 Communication Equipment Installation

The inverter has a dongle interface. The dongle is an optional device for Vesta and is available in two versions: Wi-Fi version and 4G version. The inverter allows this device to collect information, including the operating status, performance, output voltage, current, frequency, fault information, and other information of the inverter. Users can choose one version of the dongle to monitor the inverter.

- The signal definitions for the communication interface:

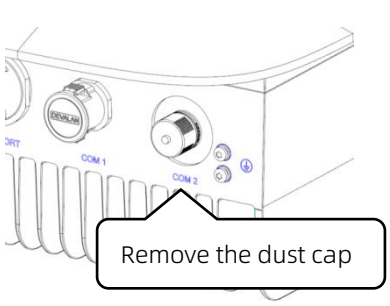


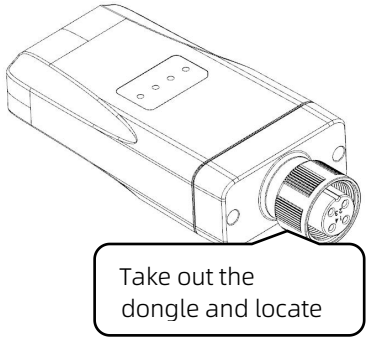
Front View of the Inverter Connector

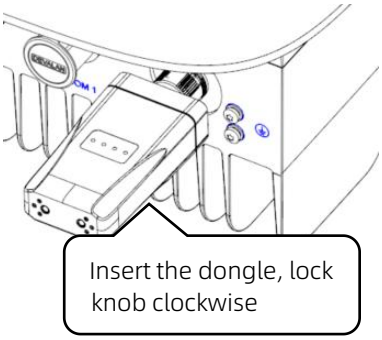
Pin	Name	Function	Description
1	5V+	Dongle power supply +	Power supply for the dongle
2	RESET	Dongle power supply -	Power supply for the dongle
3	IoT_1_P	IoT_A RS485 differential signal +	RS485 interface for communication with the dongle
4	IoT_1_N	IoT_B RS485 differential signal -	RS485 interface for communication with the dongle

Connection steps:

- Dongle (4G version): Insert a SIM card.
- Dongle (WiFi version): Connect WiFi with the local router to complete WiFi configuration.
- Create a site account on the monitoring platform.







8 Power-On

8.1 Checking Before Power-On

The inspection items and criteria are listed in the table below:

No.	Item	Criteria
1	Inverter installation	The inverter is properly and securely installed.
2	Dongle	The Dongle is installed correctly and securely.
3	Cable layout	The cables are arranged in a reasonable manner to meet the needs of the user.
4	Reliable earthing	The earth connection is proper and secure.
5	Disconnect the switch	The "DC SWITCH" and all switches connected to the inverter are "OFF".
6	Cable connection	The AC output line, DC output line, energy storage line and signal line are properly and securely connected.
7	Seal unused terminals and ports	Unused terminals and ports are fitted with waterproof covers.
8	Installation environment	Reasonable installation space, clean and tidy environment without construction leftovers.

8.2 Inverter Power-On

Procedure

- Turn on the external AC and DC connectors;
- If there is a DC switch between the PV string and the inverter, turn on the DC switch;
- Turn the "DC switch" at the bottom of the inverter to the "ON" position;
- Wait for 1 minute and observe the inverter indicator to check its running status.
- If the energy storage device is connected, turn on the vBox Battery ESS switch;
- Continuously press the "Black Start" button of vBox, the green button for around 10s to activate the vBox.

If the POWER indicator is not green, check the following:

- All connections are correct.
- All external disconnect switches are closed.
- The DC switch of the inverter is in the "ON" position.

Note: The inverter starts to work normally when the green light is on. At the same time, the energy is fed back to the grid.

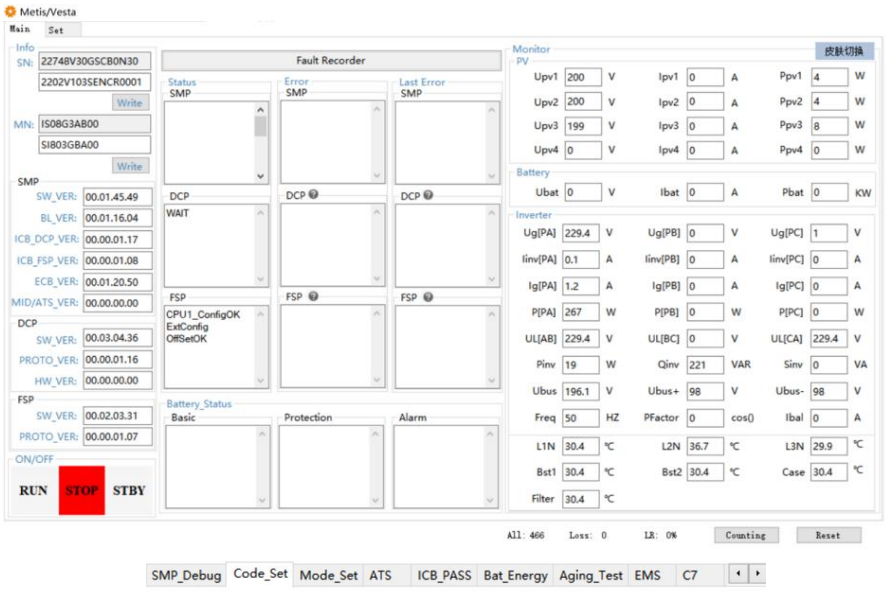
WARNING

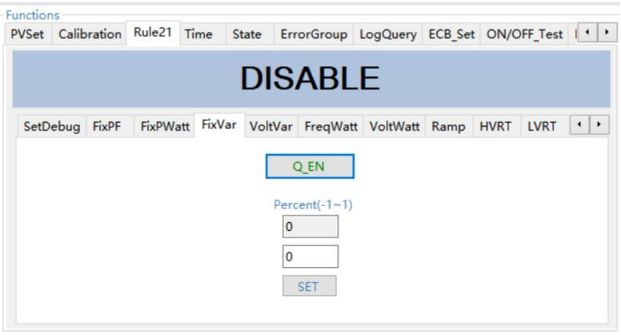
The power of the device can only be turned on after the installation is completed.

All electrical connections must be carried out by qualified personnel in accordance with the current laws of the country in which they are installed.

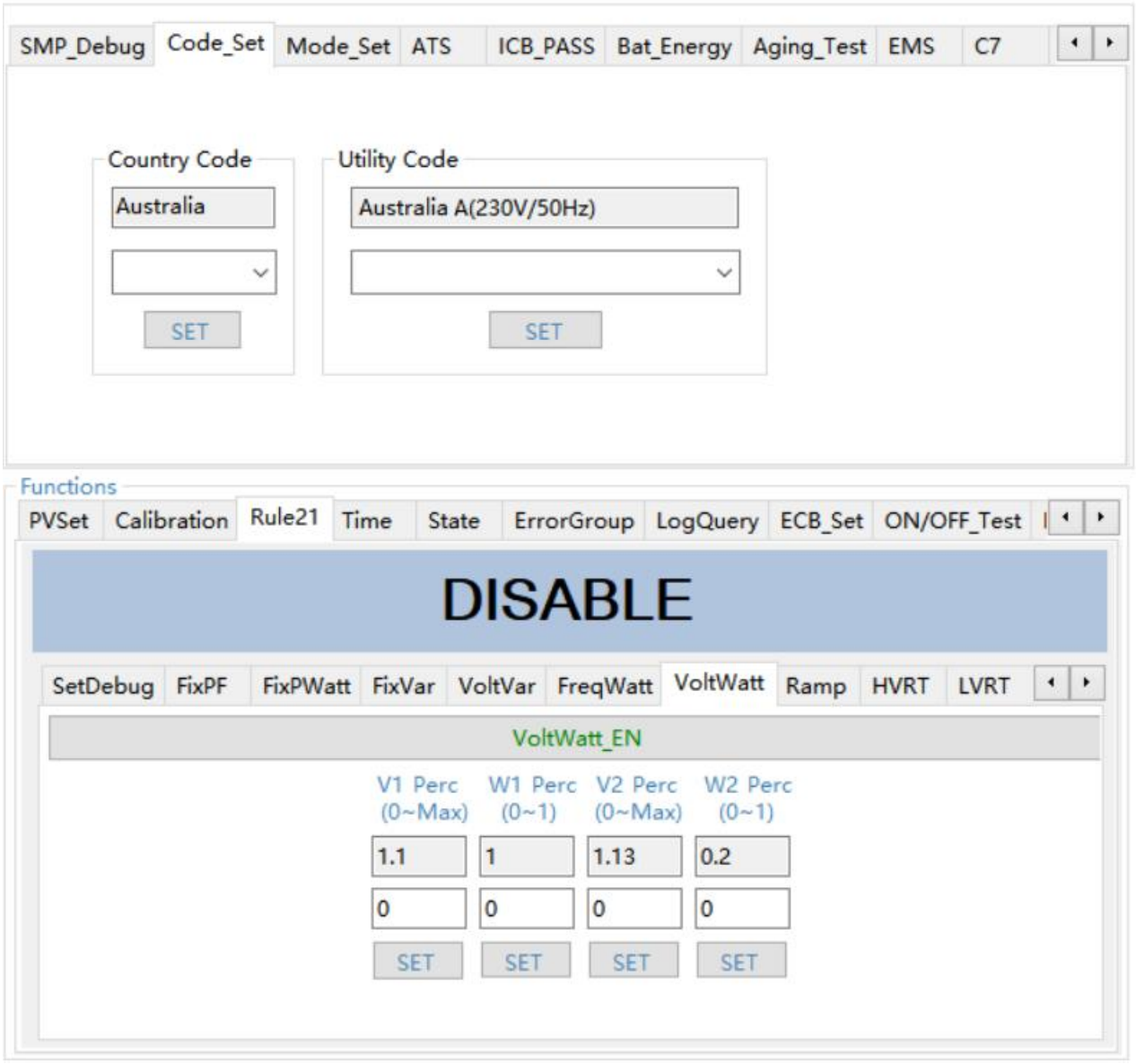
8.3 Working Mode Setting

The Vesta-S series products support reading the inverter firmware version, selected regional settings and any variations to the default inverter settings in read-only mode. For example, in the figures below, the DCP version is 00.03.04.36, the FSP version is 00.02.03.31 and the SMP version is 00.01.45.49, with the country and region set to Australia and Region A.

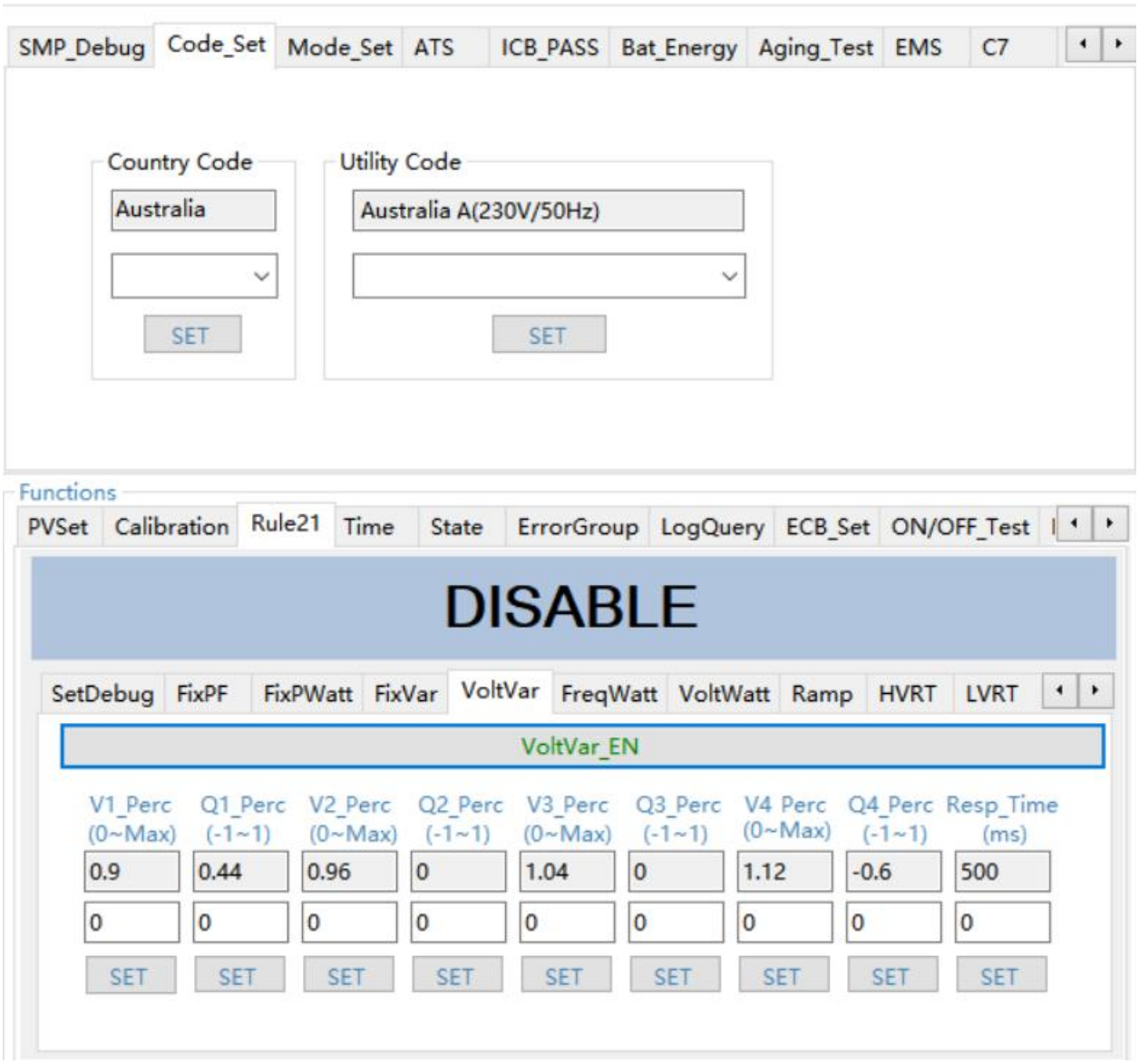




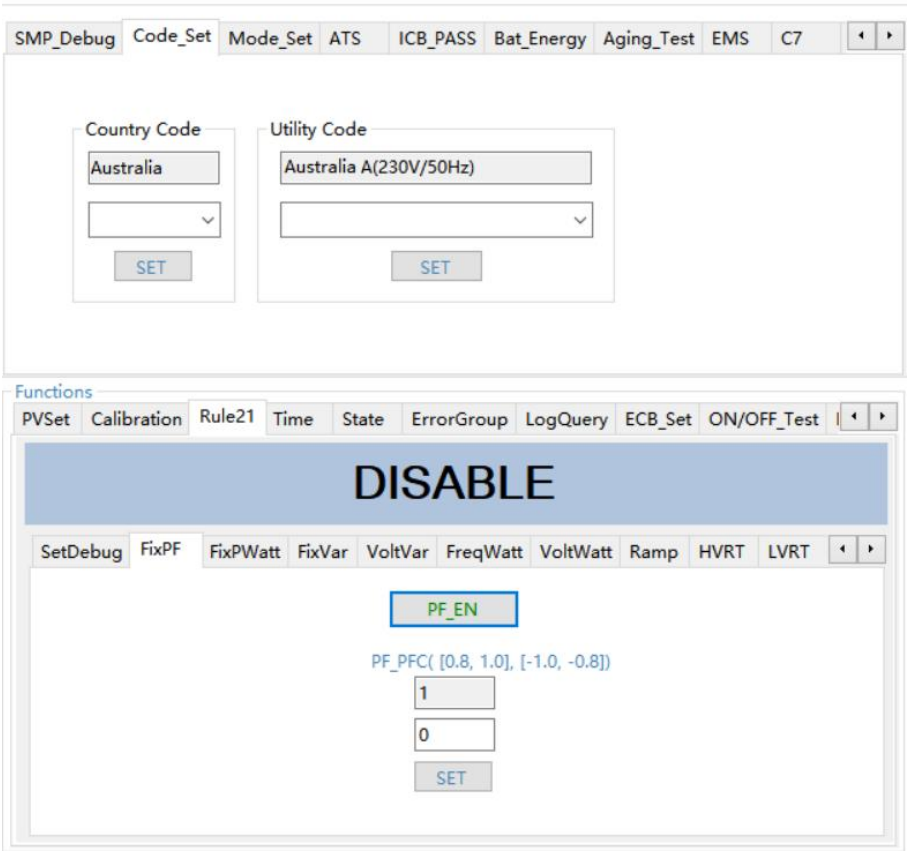
The Vesta-S series products support a variety of working mode settings. For example, the volt-watt response mode can adjust the active power in real time according to the grid voltage. The figure below shows that in Australia and Region A, the rated grid voltage (Vac) is 230V and the rated active power is P. When the voltage is greater than 253V (1.1Vac) and less than 260V (1.13Vac), the active power drops linearly from P to 0.2P.



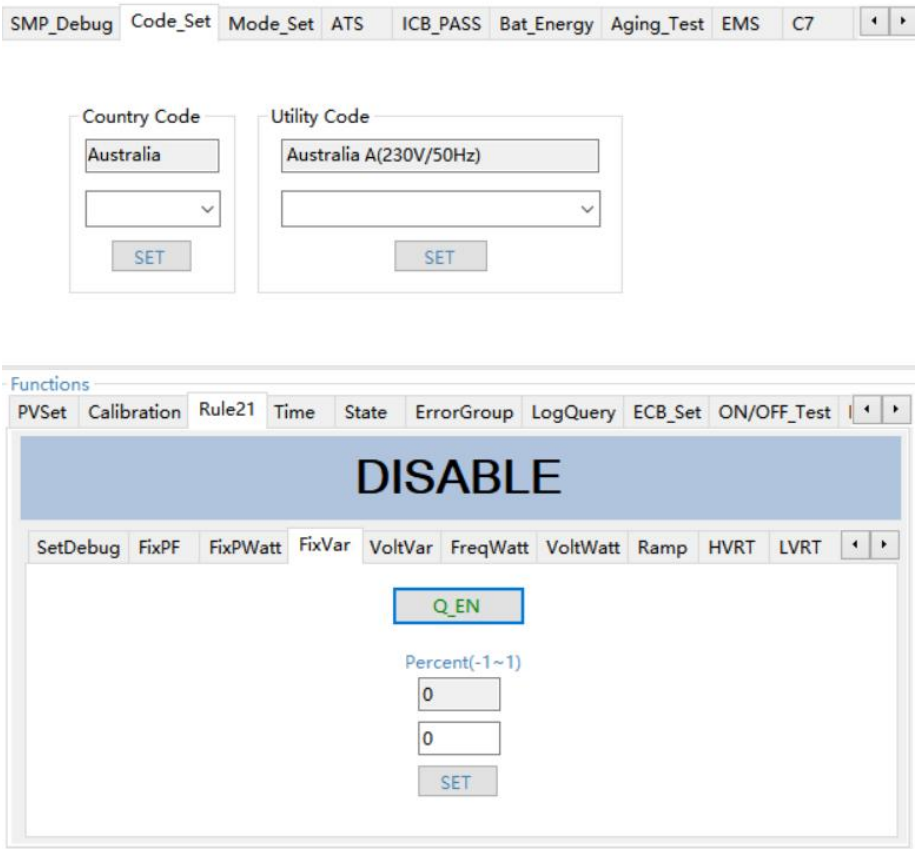
The volt-watt response mode can adjust the reactive power in real time according to the grid voltage. The figure below shows that in Australia and Region A, the rated grid voltage (Vac) is 230V and the rated active power is P. If the grid voltage is greater than 207V (0.9Vac) and less than 220V (0.96Vac), the inverter can release reactive power from 0.44P to 0. If the grid voltage is greater than 240V (1.04Vac) and less than 258V (1.12Vac), the inverter can absorb reactive power from 0 to 0.6P.



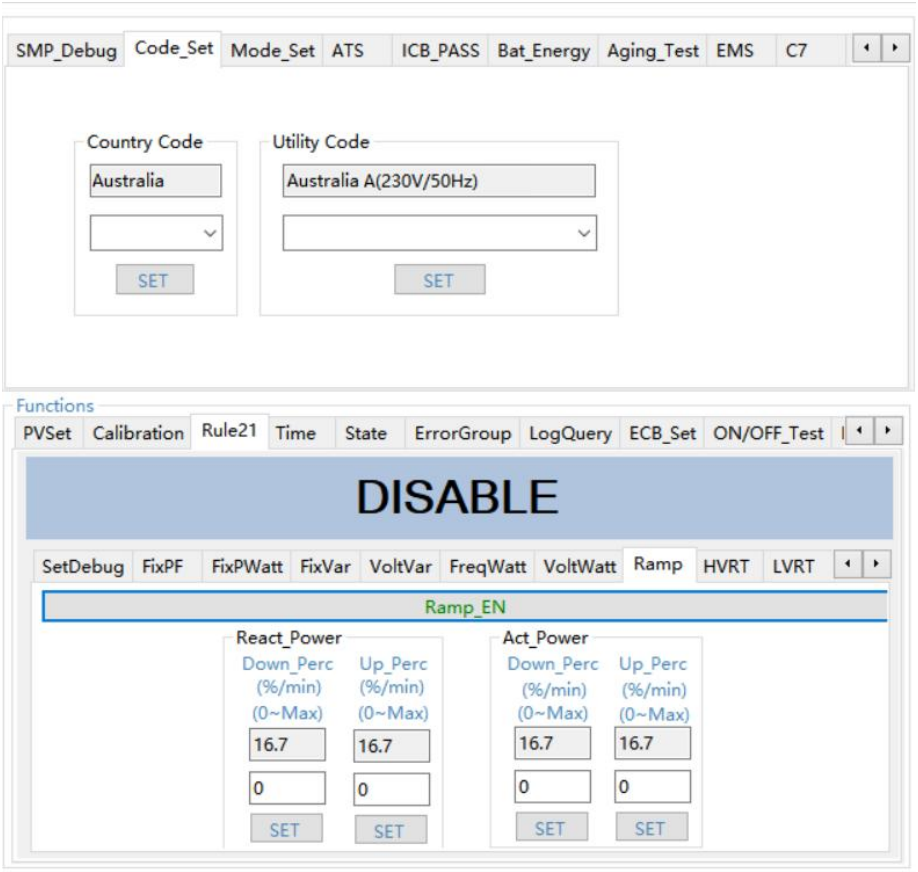
The fixed power factor mode can adjust both active power and reactive power by setting PF. The figure below shows that in Australia and Region A, the default value of PF is 1, and the range of PF is from -1 to -0.8 and from 0.8 to 1. If the PF is between 0.8 and 1, the inverter releases reactive power. If the PF is between -1 and -0.8, the inverter absorbs reactive power.



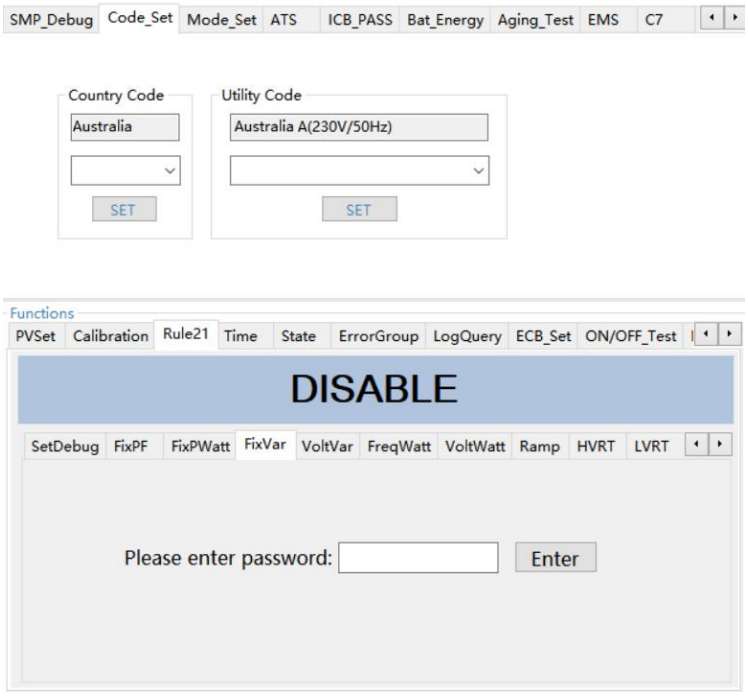
The fixed reactive power mode can adjust the reactive power. The figure below shows that in Australia and Region A, the default value of the reactive power setting is 0, and the adjustment range is from -1 to 1.



The power rate limit mode allows the output power to be changed at a fixed slope. The figure below shows that in Australia and Region A, the default slope is 16.7% of the rated power per minute for increase and decrease.



Region B, Region C, and New Zealand also have the above working mode. For unauthorized persons, the variations to the default inverter settings can be viewed in read-only mode. The figure below shows that, for authorized persons, entering the correct password allows changes to the default configuration.



9 Panel Display

There are three LED indicators on the front panel, the icons are as follows:

The color information available for LED lights is shown in the table below:

Indicator	Name	Color
☼	Power	Green
(•)	Communication	Green
⚠	Fault	Red

The status indications of the LED indicators are shown in the following table:

Indicator	Color	State	Behavior	Meaning	Explanation
POWER	Green	ON	Constantly on	On-grid	The device is in on-grid operation mode.
		Blink	1s on, 1s off	Off-grid	The device is in off-grid operation mode.
		Fast Blink	0.2s on, 0.2s off	Standby	The device is in self-check or grid synchronization.
		Medium-slow Blink	1s on, 2s off	Standby	The device is in standby operation mode.
		Slow Blink	1s on, 4s off	Power supplied but not running	The device is not running, but auxiliary power is supplied.
		OFF	Constantly off	No power or fault	The device has a fault or no auxiliary power is supplied.
COMMUNICATION	Green	Slow Blink	1s on, 4s off	CAN communication	The device receives CAN data.
		Medium-slow Blink	1s on, 2s off	ECB communication	The device receives ECB data.
		Blink	1s on, 1s off	IOT communication	The device receives IOT data.
		Fast Blink	0.2s on, 0.2s off	Firmware upgrade	The device is undergoing a firmware upgrade.
		OFF	Constantly off	No data interaction	The device does not receive communication data.
FAULT	Red	Fast Blink	0.2s on, 0.2s off	Earth fault	The device has an earth fault.
		ON	Constantly on	ARC fault	The device has an ARC fault.
		Blink	1s on, 1s off	Significant fault	The device has a significant fault.
		Slow Blink	1s on, 4s off	Minor fault	The device has a minor fault.
		OFF	Constantly off	No fault	The device has no fault.

Note: This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring. If an Earth Fault Alarm occurs, the inverter will not connect to the grid and the fault indicator will flash red. For the machine installed with Wi-Fi/GPRS, the alarm information can be received by the APP on the mobile phone.

10 Maintenance

10.1 Inverter Power-Off

Procedure

- (Optional) Turn off the external AC switch of the inverter.
- Turn off the DC switch and wait for 5 minutes until the inverter is fully discharged.
- If there is a DC switch between the inverter and PV string, turn off the DC switch.
- (Optional) Turn off the battery switch between the inverter and batteries.

10.2 Fault List

Fault levels are defined as follows:

Fault Level	Fault Definition
Significant	Faults occurring in inverters that involve potential risks to personal safety.
Secondary	Faults occurring in inverters that involve no risk to personal safety but may lead to device damage.
Minor	Faults occurring in inverters that typically involve no risks to personal safety or device safety.

The list of faults is as follows:

Fault Code	Fault Name	Fault Description	Fault Level	Fault Solution
200	HwInvAOcp	Inverter side A-phase current >106.9A or <-110.63 (single-phase 8kW/split-phase 10kW)/> 60.2A or <-57.8A (three-phase)	Secondary	The A-phase current is within the set range (single-phase -57.8-39.06A, split-phase -57.8-39.06A, three-phase -57.8A~60.2A), and it will recover after 5 seconds.
201	HwInvBOcp	Inverter side B-phase current > NA (single-phase 8kW) /> 106.9A or <-110.63 (split-phase 10kW) /> 60.2A or <-57.8A (three-phase)	Secondary	The B-phase current is within the set range (single-phase NA, split-phase -57.8-39.06A, three-phase -57.8A~60.2A), and it will recover after 5 seconds.
202	HwInvCOcp	Inverter side C-phase current >NA (single-phase 8kW/cracked-phase 10kW)/> 60.2A or <-57.8A (three-phase)	Secondary	The C-phase current is within the set range (single-phase NA, split-phase NA, three-phase -57.8A~60.2A), and it will recover after 5 seconds.
203	HwBusOvp	Bus voltage over > 520V (single-phase 8kW) / 623.4V (split-phase 10kW) / three-phase NA	Secondary	The bus voltage is lower than the set value (single-phase 426V, split-phase 523.6V, three-phase NA), and it will recover after 5 seconds.
204	HwBusXPOvp	Positive half-bus voltage > NA (single-phase 8kW)/311.7V (split-phase 10kW)/523.5V (three-phase)	Secondary	The positive half-bus voltage is lower than the set value (single-phase NA, split-phase 261.8V, three-phase 455.7V), and it will recover after 5 seconds.
205	HwBusXNOvp	Negative half-bus voltage > NA (single-phase 8kW)/311.7V (split-phase	Secondary	The negative half-bus voltage is lower than the set value (single-phase NA, split-phase 261.8V, three-phase 455.7V), and it will recover after 5 seconds.

		10kW)/525.7V (three-phase)		
206	HwDc12Ocp	1st/2nd PV current > 35.98A (single-phase 8kW & split-phase 10kW)/25.2A (three-phase)	Secondary	PV1 or PV2 current is within the set range(single-phase 12.08A, split-phase 12.08A, three-phase -25.2A~25.2A), and it will recover after 5 seconds.
207	HwDc34Ocp	3rd/4th PV current > 35.98A (single-phase 8kW & split-phase 10kW)/three-phase NA	Secondary	PV3 or PV4 current is within the set range(single-phase 12.08A, split-phase 12.08A, three-phase -25.2A~25.2A), and it will recover after 5 seconds.
208	HwBhbOcp	Balanced bridge current > NA (single-phase 8kW)/±12.5A (split-phase 10kW)/three-phase NA	Secondary	The current of the balance bridge is lower than the set value, and it will be restored after 5 seconds (household storage machine NA)
209	HwAuxOvp	Auxiliary supply voltage > 12.3V (single-phase 8kW & split-phase 10kW)/three-phase NA	Secondary	The auxiliary power supply voltage returns to the set voltage threshold range and recovers after 5 seconds (household storage machine NA)
210	SwInvAOcp	Inverter side phase A current > 103A (single phase 8kW) 107A (split phase 10kW) 55A(three phase)	Secondary	A-phase current below 3A, and it will recover after 5 seconds.
211	SwInvBOcp	Inverter side phase B current > NA (single phase 8kW) 107A (split phase 10kW) 55A(three phase)	Secondary	B-phase current below 3A, and it will recover after 5 seconds.
212	SwInvCOcp	Inverter side phase C current higher than NA (single phase 8kW) NA (split phase 10kW) 55A(three phase)	Secondary	C-phase current below 3A, and it will recover after 5 seconds.

213	SwBusOvp	Bus voltage > 540V (ISO boost in the process of check) & 530V (finish ISO boost in the process of check)&560V(other process) (single-phase 8kW) / 560V (split-phase 10kW) / 1040V (three-phase)	Secondary	The bus voltage is lower than the set value (single-phase 500V, split-phase 530V, three-phase 1020V), and it will recover after 5 seconds.
214	SwBusUvp	Bus voltage < 300V (single-phase 8kW)/320V (split-phase 10kW)/650V (three-phase)	Secondary	Automatically recover after 10 seconds
215	SwBusXPOvp	Positive bus voltage >275V (ISO Boost in the process of check) & 270V (finish ISO boost in the process of check)&285V(other process) (Single Phase 8kW) // 285V (Split Phase 10kW) / 500V (Three Phase)	Secondary	The positive half-bus voltage is lower than the set value (single-phase NA, split-phase NA, three-phase 480V), and it will recover after 5 seconds.
216	SwBusXNOvp	Negative bus voltage >275V (ISO Boost in the process of check) & 270V (finish ISO boost in the process of check)&285V(other process) (Single Phase 8kW) // 285V (Split Phase 10kW) / 500V (Three Phase)	Secondary	The negative half-bus voltage is lower than the set value(single-phase NA, split-phase NA, three-phase 480V),and it will recover after 5 seconds.
217	SwBusUnb	Positive and negative	Secondary	The positive and negative half bus

		bus difference > 50V (single-phase 8kW & split-phase 10kW) / 50V on-grid, 80V off-grid (three-phase)		voltage difference is lower than the set value(single-phase NA, split-phase NA, three-phase 30V),and it will recover after 5 seconds.
218	SwGridUvp	Grid-connected regulatory requirements	Secondary	The bus voltage returns to the set bus voltage threshold range(household storage machine NA), and it will recover after 10 seconds.
219	SwActIsland	Grid drops with frequency fluctuations > 0.1998Hz (single-phase 8kW & split-phase 10kW & three-phase)	Secondary	Automatically recover after 10 seconds
220	SwDc1Ocp	PV1 current > 30A (single-phase 8kW & split-phase 10kW)/20A (three-phase)	Secondary	PV1 current below 3A, and it will recover after 5 seconds.
221	SwDc2Ocp	PV2 current > 30A (single-phase 8kW & plit-phase 10kW)/20A (three-phase)	Secondary	PV2 current below 3A, and it will recover after 5 seconds.
222	SwDc3Ocp	PV3 current > 30A (single-phase 8kW & split-phase 10kW)/20A (three-phase)	Secondary	PV3 current below 3A, and it will recover after 5 seconds.
223	SwDc4Ocp	NA/NA/NA	Secondary	PV4 current below 3A, and it will recover after 5 seconds.
224	SWDc1Ovp	PV1 voltage > 500V (single-phase 8kW & split-phase 10kW)/950V (three-phase)	Secondary	PV1 voltage is less than the set value(single-phase 500V, split-phase 500V, three-phase 940V),and it will recover after 5 seconds.
225	SwDc2Ovp	PV2 voltage > 500V (single-phase 8kW & split-phase 10kW)/950V	Secondary	PV2 voltage is less than the set value(single-phase 500V, split-phase 500V, three-phase 940V),and it will

		(three-phase)		recover after 5 seconds.
226	SwDc3Ovp	PV3 voltage > 500V (single-phase 8kW & split-phase 10kW)/950V (three-phase)	Secondary	PV3 voltage is less than the set value(single-phase 500V, split-phase 500V, three-phase 940V),and it will recover after 5 seconds.
227	SwDc4Ovp	NA/NA/NA	Secondary	PV4 voltage is less than the set value(single-phase 500V, split-phase 500V, three-phase 940V),and it will recover after 5 seconds.
228	SwVrt	Grid-connected regulatory requirements	Secondary	Automatically recover after 10 seconds
229	SwBalOcp	NA/NA/NA	Secondary	The current of the balance bridge is lower than the set value, and it will be restored after 5 seconds (household storage machine NA)
230	SwDcLvp	NA/NA/NA	Secondary	The PV side voltage returns to the set startup voltage range (household storage machine NA), and it will recover after 5 seconds.
231	SwBusAcOvp	NA/NA/NA	Secondary	The AC side voltage returns to the set startup voltage range (household storage machine NA), and it will recover after 5 seconds.
232	SwOfgUnbOlp	two-phase load difference when offgrid > NA (single-phase 8kW & split-phase 10kW)/1000W (three-phase)	Secondary	When the grid-side current is lower than 3A, it will automatically recover, with a maximum time of 300s.
233	SwOfgOpp	Load power when offgrid > 1.03*Prated(single-phase 8kW)/1.03*Prated(split-phase	Secondary	When the grid-side current is lower than 3A, it will automatically recover, with a maximum time of 300s.

		10kW)/Prated+500W(three-phase)		
234	DspOff	DSP receives shutdown command	Secondary	Shutdown status record, cleared after the inverter is turned on
235	SwOffset	Offset value > ±0.07V (single-phase 8kW & split-phase 10kW)/±0.1V (three-phase)	Secondary	Automatically recover after 10 seconds
236	SwInvOstOcp	NA/NA/NA	Secondary	The grid-side current reaches the recovery threshold and recovers immediately
237	SwBatteryPole	NA/NA/NA	Secondary	Restore after the battery is reconnected correctly(household storage machine NA).
238	SwOfgGridVp	NA/NA/NA	Secondary	The grid-side voltage returns to the set threshold range and recovers after 5S (household storage machine NA).
239	SwInvNOcp	NA/NA/NA	Secondary	The N line current returns to the set threshold range and recovers after 5S (household storage machine NA).
240	bSwOverPower	NA/NA/NA	Secondary	The inverter side current is less than the set threshold and recovers within 5S (household storage machine NA).
241	bHwBusOcp	NA/NA/NA	Secondary	The bus current returns to the set bus current threshold range and recovers within 5S (household storage machine NA).
242	bSwBusOcp	NA/NA/NA	Secondary	The bus current returns to the set bus current threshold range and recovers within 5S (household storage machine NA).
243	bSwDc5Ocp	NA/NA/NA	Secondary	PV5 current is lower than 3A and recovers after 5S.
244	bSwDc5Ovp	NA/NA/NA	Secondary	PV5 voltage is less than the set value (single-phase 500V, split-phase 500V,

				three-phase 940V) and recovers after 5 seconds.
245	bSwIsrOvf	NA/NA/NA	Secondary	The interrupt occupancy rate is lower than the set occupancy rate threshold, and the system will resume after 5 seconds.
246	bSwPasIsland	Frequency fluctuation > 0.2Hz (single-phase 8kW)/0.166Hz (split-phase 10kW)/0.2Hz (three-phase)	Secondary	Automatically recover after 10 seconds
247	bSwOfgRmsOcp	The effective value of offgrid inverter current is too large	Secondary	Restore the effective value of the inverter side current to the set threshold range and restore it within 5 seconds (household storage unit NA)
248	bSwOfgRmsOvp	Offgrid mode inverter voltage effective value overvoltage	Secondary	The effective value of the inverter side voltage is restored to the set threshold range within 5 seconds (household storage unit NA)
249	bSwOfgRmsUvp	Offgrid mode inverter voltage effective value undervoltage	Secondary	The effective value of the inverter side voltage is restored to the set threshold range within 5 seconds (household storage unit NA)
250	bSwBatOcp	Battery side overcurrent	Secondary	The battery side current is less than the set threshold range, and it will be restored within 5 seconds (household storage unit NA)
251	bSwBatOvp	Battery side overvoltage	Secondary	The battery side voltage returns to the set threshold range and recovers within 5 seconds (household storage unit NA)
252	bSwBatUvp	Battery side undervoltage	Secondary	The battery side voltage returns to the set threshold range and recovers within 5 seconds (household storage unit NA)
253	bSwCarrErr	Abnormal carrier synchronization signal	Secondary	Check if the parallel communication line is connected correctly and contact the

				operation and maintenance (NA of the household storage machine)
264	L1nVoltLv1	Grid-connected regulatory requirements	Secondary	The L1 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
265	L2nVoltLv1	Grid-connected regulatory requirements	Secondary	The L2 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
266	L3nVoltLv1	Grid-connected regulatory requirements	Secondary	The L3 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
267	L1nVoltLv2	Grid-connected regulatory requirements	Secondary	The L1 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
268	L2nVoltLv2	Grid-connected regulatory requirements	Secondary	The L2 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
269	L3nVoltLv2	Grid-connected regulatory requirements	Secondary	The L3 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
270	L1nVoltLv3	Grid-connected regulatory requirements	Secondary	The L1 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
271	L2nVoltLv3	Grid-connected regulatory requirements	Secondary	The L2 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
272	L3nVoltLv3	Grid-connected regulatory requirements	Secondary	The L3 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
273	L1nTrans	Grid-connected regulatory requirements	Secondary	The L1 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
274	L2nTrans	Grid-connected regulatory requirements	Secondary	The L2 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.

275	L3nTrans	Grid-connected regulatory requirements	Secondary	The L3 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
276	L1nShort	Grid-connected regulatory requirements	Secondary	The L1 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
277	L2nShort	Grid-connected regulatory requirements	Secondary	The L2 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
278	L3nShort	Grid-connected regulatory requirements	Secondary	The L3 voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
279	L12VoltLv1	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
280	L23VoltLv1	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected regulations and recovers after 5 seconds.
281	L31VoltLv1	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
282	L12VoltLv2	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
283	L23VoltLv2	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected regulations and recovers after 5 seconds.
284	L31VoltLv2	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
285	L12VoltLv3	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
286	L23VoltLv3	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected

				regulations and recovers after 5 seconds.
287	L31VoltLv3	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
288	L12Trans	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
289	L23Trans	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected regulations and recovers after 5 seconds.
290	L31Trans	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
291	L12Short	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
292	L23Short	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected regulations and recovers after 5 seconds.
293	L31Short	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
294	FreqLv1	Grid-connected regulatory requirements	Secondary	The frequency returns to the range required by grid-connected regulations and recovers after 5 seconds.
295	FreqLv2	Grid-connected regulatory requirements	Secondary	The frequency returns to the range required by grid-connected regulations and recovers after 5 seconds.
296	ConnFreq	Grid-connected regulatory requirements	Secondary	The frequency returns to the range required by grid-connected regulations and recovers after 5 seconds.
297	ConnVoltL1n	Grid-connected regulatory requirements	Secondary	The L1 phase voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.

298	ConnVoltL2n	Grid-connected regulatory requirements	Secondary	The L2 phase voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
299	ConnVoltL3n	Grid-connected regulatory requirements	Secondary	The L3 phase voltage returns to the range required by the grid-connected regulations and recovers after 5 seconds.
300	ConnVoltL12	Grid-connected regulatory requirements	Secondary	The voltage on line L12 returns to the range required by grid-connected regulations and recovers after 5 seconds.
301	ConnVoltL23	Grid-connected regulatory requirements	Secondary	The voltage on line L23 returns to the range required by grid-connected regulations and recovers after 5 seconds.
302	ConnVoltL31	Grid-connected regulatory requirements	Secondary	The voltage on line L31 returns to the range required by grid-connected regulations and recovers after 5 seconds.
303	TempLo	Temperature < -26℃ (single phase/split phase/three phase)	Secondary	Recover when the temperature is higher than the set value (single phase -25℃, split-phase -25℃, three-phase -10℃).
304	TempHi	Temperature > (main board and control board 115℃, chassis 95℃) single-phase & split-phase / (control board 88℃, main board 86℃, right chassis 77℃, left chassis 82℃) three-phase	Secondary	Recover when the temperature is lower than the set value (single phase 75℃, split-phase 75℃, three-phase 60℃).
305	IsoBad	ISO calculated values > 100k	Significant	Automatic recovery (maximum time 600 seconds), re-self-test.
306	RcdBad	RCMU self-test failed	Significant	Automatic recovery (maximum time 600 seconds), re-self-test.
307	ResCurt300Ma	Continuous RCD value > 170mA (single phase & split phase)/290mA (three phase)	Secondary	The leakage current is lower than the set value (150mA) and recovers after 5 seconds.

308	ResCurtStep30Ma	RCD step value > 15mA (single phase & split phase)/30mA (three phase)	Secondary	The leakage current step size is lower than the set value (30mA) and recovers after 5 seconds.
309	ResCurtStep60Ma	RCD step value > 48mA (single phase & split phase)/60mA (three phase)	Secondary	The leakage current step size is lower than the set value (60mA) and recovers after 5 seconds.
310	ResCurtStep150Ma	RCD step value > 100mA (single phase & split phase)/150mA (three phase)	Secondary	The leakage current step size is lower than the set value (150mA) and recovers after 5 seconds.
311	ApsBad	NA/NA/NA	Secondary	No Action, recover automatically.
312	Cpu1Config	DCP and FSP configuration files do not match	Secondary	Contact R&D personnel to configure the program.
313	NlineCheck	NA/NA/NA	Secondary	Restore immediately after detecting N line access.
314	Offset	Offset value > ±0.1V (single-phase & split-phase & three-phase)	Secondary	Automatically recover after 10 seconds
315	ArcGenBad	Not supported at this time	Secondary	Automatically recover after 5 seconds
316	ArcMistrig	Not supported at this time	Secondary	Automatically recover after 5 seconds
317	AfciFault	Not supported at this time	Secondary	Manual recovery.
318	RelayA1c2Close	Relay A1C2 sticking	Secondary	Automatic recovery within 60 seconds
319	RelayB1a2Close	Relay B1A2 sticking	Secondary	Automatic recovery within 60 seconds
320	RelayC1b2Close	Relay C1B2 sticking	Secondary	Automatic recovery within 60 seconds
321	RelayD1d2Clos	Relay D1D2 sticking	Secondary	Automatic recovery within 60 seconds

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322	RelayFloat	Voltage difference between the front and rear of the relay after PLL > 30V	Secondary	Automatic recovery within 60 seconds
323	RelayOpen	Relay fails to latch	Secondary	Automatic recovery within 60 seconds
324	ResDCCurt6mA	DC leakage current Offset value 6mA	Secondary	The DC leakage current is lower than the set value (6mA) and recovers after 5 seconds.
325	ResCurtStep	RCD step	Secondary	The leakage current step size is lower than the set value (30/60/150mA) and recovers after 5 seconds.
350	Reseved	Reserved	Minor	Reserved
351	DcpProtoVerEr r	Dcp protocol version error	Minor	Upgrade the inverter program to the latest version.
352	FspProtoVerErr	Fsp protocol version error	Minor	Upgrade the inverter program to the latest version.
353	DspHndShake Err	Shakehand with dsp at powerup error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
354	DcpUpgFail	Dcp upgrade fail	Minor	Upgrade the system again. If the upgrade is still unsuccessful, contact the operations and maintenance team.
355	FspUpgFail	Fsp upgrade fail	Minor	Upgrade the system again. If the upgrade is still unsuccessful, contact the operations and maintenance team.
356	SmpUpgFail	Smp upgrade fail	Minor	Upgrade the system again. If the upgrade is still unsuccessful, contact the operations and maintenance team.
357	MidUpgFail	Mid/ats-1p/ats-3p upgrade fail	Minor	Upgrade the system again. If the upgrade is still unsuccessful, contact the operations and maintenance team.
358	E2promErr	e2prom read/erase/program	Minor	Restart the device. If there are still abnormalities after the restart, contact

		error		the operations and maintenance team.
359	ExtFlashErr	External flash read/erase/program error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
360	IntFlashErr	Internal flash read/erase/program error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
361	DcpCommErr	Dcp serial comm error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
362	FspCommErr	Fsp serial comm error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
363	EcbCommErr	Ecb serial comm error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
364	BatCommErr	Battery comm error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
365	MidCommErr	Mid/ats-1p/ats-3p serial comm with smp error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
366	MeterCommErr	Mid/ats-1p/ats-3p serial comm with meter error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
367	IotCommErr	Iot serial comm error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
368	CanRecvTimeout	Can-bus receive message timeout	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
369	FanErr	Fan error	Minor	Hardware error, please contact the operations and maintenance team.
370	RelayErr	Relay error	Minor	contact the operations and maintenance

				team
371	AteCalibErr	Ate calibration error	Minor	The device needs to be re-calibrated.
372	AteNmPltErr	Ate nameplate error	Minor	The device needs to have its nameplate information re-entered.
373	FaultRecErr	Fault recorder error	Minor	Hardware error, please contact the operations and maintenance team.
374	FaultLogErr	Fault log error	Minor	Hardware error, please contact the operations and maintenance team.
375	HistCleanErr	History clean error	Minor	Hardware error, please contact the operations and maintenance team.
376	DefRecoverErr	Default recovery error	Minor	Hardware error, please contact the operations and maintenance team.
377	FactCfgSetErr	Factory config set error	Minor	Hardware error, please contact the operations and maintenance team.
378	MidRlyStatErr	Ats relay status error	Minor	Hardware error, please contact the operations and maintenance team.
379	E2promParam Err	e2prom parameter error	Minor	Restart the device. If there are still abnormalities after the restart, contact the operations and maintenance team.
380	C7VerErr	C7 does not match the SMP version	Minor	Upgrade the battery to the latest version.
381	CanSendErr	Can-bus send message error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
382	EvseCommErr	Evse comm error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
383	BatMultComm Err	Battery mult comm error	Minor	Check if the wiring is correct. If there are still abnormalities, contact the operations and maintenance team.
384	BatMultReChg Err	Battery recharging failed	Minor	Restart the battery after checking that the system meets the grid-connection conditions

10.3 Troubleshooting

- Please check the fault code of the inverter on the APP or manual. If a prompt message is displayed, please record it before proceeding further.
- Please try the solution shown in the table above first.
- If the inverter indicator light is not on, check the following to ensure that the current state of the installation allows the device to operate normally:
  Whether the inverter is located in a clean, dry and well-ventilated place.
  Whether the DC disconnect switch is closed.
  Whether the cable size specifications are appropriate.
  Whether the input and output electrical connections are in good condition.
  Whether the equipment configuration meets your particular installation.
  Whether the indicator lights and Smart Dongle are properly connected and undamaged.

Attention: Contact customer service for further assistance with system installation details and the model and serial number of the product.

10.4 Regular Maintenance

Safety inspections should be conducted at least every 12 months by technical personnel, who must have received sufficient training and possess knowledge and practical experience. The data should be recorded in the device log. If the device cannot function properly or if any testing fails, it must be repaired.

During the use of the inverter, the responsible person should regularly inspect and maintain the machine. The required operations are as follows:

- Check if the heat sink at the back of the inverter has accumulated dust and dirt, and clean the machine if necessary. This work should be carried out regularly.
- Check if the indicator light of the inverter is normal at least every 6 months.
- Check input and output lines for damage or aging at least every 6 months.
- Clean the inverter panel at least every 6 months and check its safety.

Attention: Only professional personnel can perform these operations.

11 Handling the Inverter

11.1 Removing the Inverter

- Disconnect the inverter from the DC input and AC output. Wait 5 minutes for the inverter to power off completely.
- Disconnect communication and other optional monitoring modules.
- Remove the inverter from the wall mount plate, and if necessary, remove the hanging bracket together.

11.2 Packaging the Inverter

If possible, pack the inverter in its original packaging. If the original packaging is not available, an equivalent box that meets the requirements below may also be used.

- Holds up to 25 kg of weight.
- Handle included.
- Can be completely sealed.

11.3 Storage and Disposal

Store the inverter in a dry environment with a temperature between -40℃ and +70℃ at all times. When handling inverters or other related components, please be sure to comply with local waste disposal regulations.

11.4 Transport

During transportation, please follow these guidelines:

- During transportation, please ensure that the inverter is not damaged; the number of stacked cartons should not exceed 4.
- Handle with care, choose the corresponding handling method according to the weight, and pay attention to safety.
- During transportation, please keep the packaging away from dangerous sources and take water proof measures.

CUSTOMER SERVICE

For any questions, please contact customer service.

Before contacting the customer service:

View the troubleshooting measures described in the "Troubleshooting" section of this manual.

ABOUT US

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