



User Manual

Single-phase hybrid inverter

TB3K-H1P/TB4K-H1P/ TB4.6K-H1P/
TB5K-H1P/TB6K-H1P/

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1. Preface

This manual mainly introduces the product information, installation, electrical connection, commissioning, maintenance and troubleshooting of the single-phase hybrid inverter. Please read this manual carefully before using this product and keep it in a safe and accessible place. The contents of the manual may be updated and revised from time to time, and it is inevitable that there may be slight inconsistencies or errors with the actual product. Users should refer to the actual product they purchased, and can obtain the latest version of the information and more product information through the official website.

1.1. Applicable Products

This manual is mainly applicable to the following models of hybrid inverters:

- TB3K-H1P
- TB4K-H1P
- TB4.6K-H1P
- TB5K-H1P
- TB6K-H1P

1.2. Applicable Personnel

This manual is intended for professional technicians who need to install, operate, and maintain hybrid inverters and users who want to view hybrid inverter parameters.

1.3. Symbol Definition

This manual provides relevant safe operation information and uses corresponding symbols to highlight it. To ensure the user's personal and property safety while using this product, and to use it efficiently, please carefully read the following important information.



Danger

Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



Warning

Indicates a situation with moderate or deep potential hazard that, if not avoided, may result in personal injury or equipment damage.



Attention

Indicates a potential hazard that, if not avoided, may cause the equipment to malfunction or cause property damage.

1.4. Version Record

Version	Modification date	Modify content
V0.0	—	Initial preparation

2. Safety Instructions

- The safety precautions in this manual do not contain all the specifications that should be followed, and all work should be carried out based on the actual conditions on site.
- All operations on the hybrid inverter must be performed by professional and qualified electrical technicians. The technicians must be familiar with local standards and relevant safety regulations of electrical systems.
- The hybrid inverter manufacturer is not responsible for any losses caused by failure to follow the safety precautions in this manual. For more product warranty information, please visit the official website.

2.1. PV Safety



Danger

- Photovoltaic strings will generate dangerous voltages when exposed to sunlight!
- Personal protective equipment must be worn when performing electrical connection work.
- Before handling DC cables, ensure they are de-energized by using appropriate measuring equipment.



Warning

- Please use the DC connector/terminal block supplied with the box to connect the DC cable of the hybrid inverter. If you use other types of DC connectors/terminals, it may lead to serious consequences such as poor cable connection or increased contact resistance, which may cause damage to the hybrid inverter.
- After the DC cable is connected, make sure the cable connection is tight and not loose.
- Use a multimeter to measure the positive and negative voltages of the DC cable. They are within the allowable range of the hybrid inverter, and there is no reverse polarity.
- Do not connect the same PV string to multiple hybrid inverters, otherwise the hybrid inverter may be damaged.

2.2. Grid Safety



Attention

- Please follow local grid access guidelines
- All electrical connections must meet local and national electrical standards.
- Hybrid inverters may only be connected to the grid with permission from the local power authority

2.3. Battery Safety



Warning

- Batteries used with hybrid inverters must be approved by the hybrid inverter manufacturer. The list of approved batteries is available through the official website or APP.
- If the battery fails to start, please contact the after-sales service center as soon as possible. Otherwise, the battery may be permanently damaged.
- Use a multimeter to measure the positive and negative voltages of the DC cable. They are within the allowable range of the hybrid inverter, and there is no reverse polarity.
- Do not connect the same battery pack to multiple hybrid inverters, otherwise the hybrid inverter may be damaged.

2.4. Hybrid Inverter Safety



Danger

- Make sure the hybrid inverter box casing is intact and closed.
- Do not open the shell of the energy storage inverter when it is working or powered. If cause electric shock accidents or damage to the energy storage inverter by this. The manufacturer of the energy storage inverter is not responsible.



Warning

- All safety signs, warning labels and nameplates on the hybrid inverter body must be clearly visible and cannot be removed or covered.
- When the hybrid inverter is working, it is prohibited to plug or unplug the PV connector and AC connector.
- Before plugging or unplugging a PV connector or AC connector, make sure there is no voltage or current flowing through the connector.
- The protective ground wire of the hybrid inverter must be firmly connected to ensure that the impedance between the neutral wire and the ground wire is less than 10Ω .
- Ensure that the voltage and frequency of the grid access point meet the grid specifications of the hybrid inverter.
- It is recommended to add protective devices such as circuit breakers or fuses on the AC side of the hybrid inverter. The specifications of the protective device must be greater than 1.25 times the rated AC output current of the inverter.
- When overload protection occurs in the hybrid inverter once, the hybrid inverter will automatically restart; if it occurs multiple times, the restart time of the hybrid inverter

will be extended. If you need to restart the hybrid inverter as soon as possible, you can restart the hybrid inverter immediately through the APP.

- If the photovoltaic system is not equipped with a battery, do not use the BACK-UP function. The resulting risk of system power consumption is beyond the warranty coverage of the hybrid inverter manufacturer, the user assumes responsibility.
- When the hybrid inverter is running, it is strictly forbidden to touch hot parts of the equipment (such as radiators, etc.).
- After the hybrid inverter is shut down, there may still be a risk of burns. After the hybrid inverter has cooled down, you need to wear protective gloves before operating the hybrid inverter.



Attention

- Hybrid inverter country selection and protection parameters must be set by professional technicians according to local grid standards
- Wrong country/region setting may affect the normal operation of the hybrid inverter, and may also cause the hybrid inverter to be inconsistent with the country's certification.
- Do not touch the printed circuit board or other electrostatic sensitive components inside the hybrid inverter unless necessary. If you need to operate, please wear an anti-static bracelet and comply with electrostatic protection regulations.

2.5. Personnel Safety



Attention

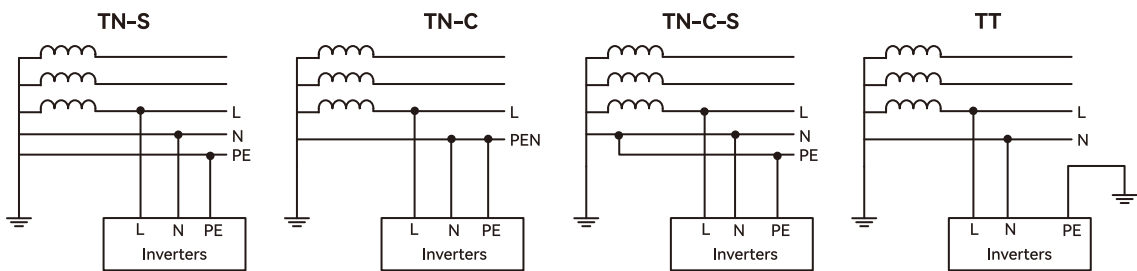
- All installation, commissioning, and maintenance must be performed by qualified Professional technicians or trained personnel only.
 - Professionals: People who are familiar with the principles and structure of equipment, have experience in training or operating equipment, and can understand the various potential sources of danger during equipment installation, operation, and maintenance.
 - Trained Personnel: Personnel who have received appropriate technical and safety training and have the necessary experience to be aware of potential hazards during operations and to take measures to minimize the risk to themselves or others.
- Replacement of equipment or parts must be done by authorized professionals.
- Be familiar with local standards and relevant safety regulations for electrical systems.

3. Product Description

3.1. Overview

Energy storage inverter is a hybrid inverter that integrates photovoltaic power generation, battery energy storage and inverter technology. It is a vital component of the photovoltaic power generation system. The Energy storage inverter can not only make full use of the photovoltaic system to convert AC power that meets the grid requirements and feed it into the grid, but can also store excess power in the energy storage battery for emergency needs.

Grid types supported by hybrid inverters are:

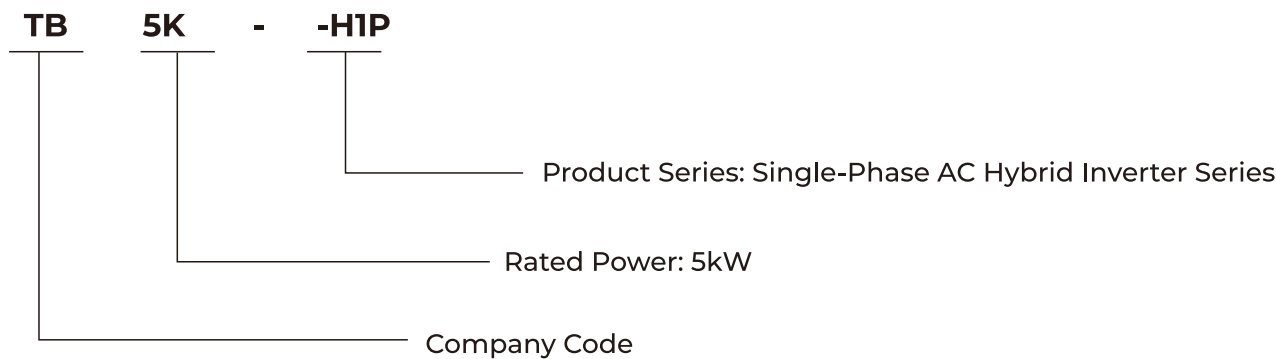


! Attention

- For grids with N wires, the N-to-ground voltage needs to be less than 10V.

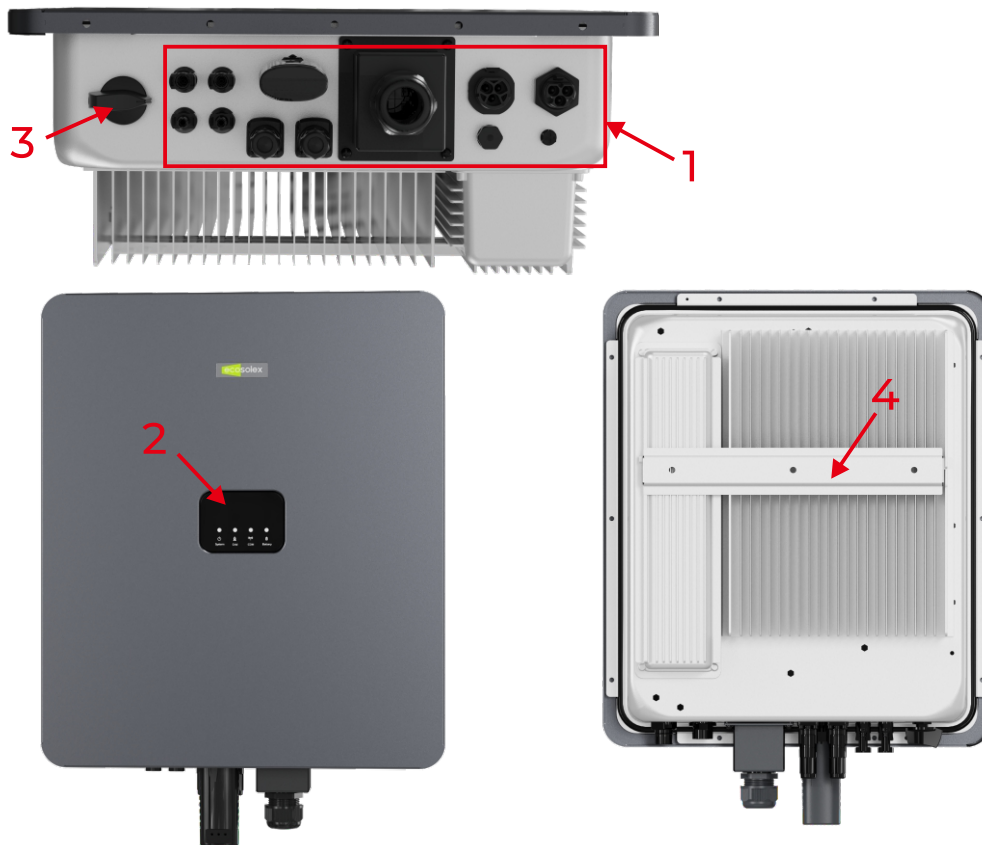
3.2. Product Model Description

Taking TB5K-H1P as an example, the hybrid inverter model description is as shown below.



3.3. Appearance Description

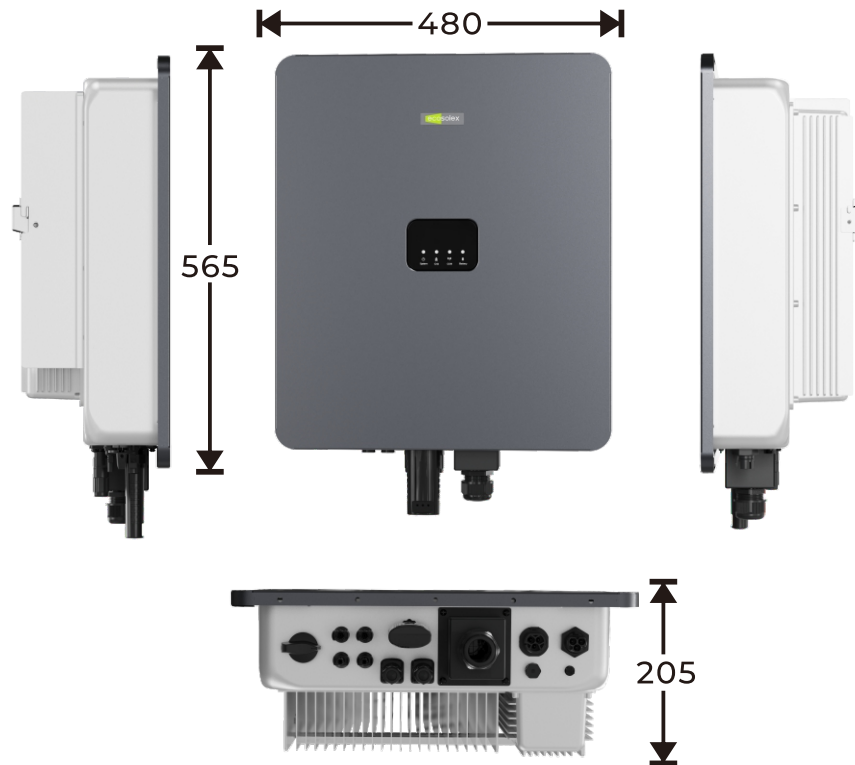
3.3.1. Appearance Introduction



(this picture is for reference only, please refer to the actual product received)

SN.	Name	Explanation
1	Wring area	Including DC input line, AC output line, protective grounding line and communication line
2	LED indicator light	Indicates the current working status of the inverter
3	DC switch	Used to control the shutdown of the DC input
4	Install the back panel	For fixed installation of the inverter on the wall

3.3.2. Product Size














3.3.3. Explanation of Symbols on the Fuselage

Symbol	Explanation
	Do not dispose of the hybrid inverter as domestic waste. The hybrid inverter should be disposed of according to local laws and regulations or sent back to the hybrid inverter manufacturer.
	Please read the instructions carefully before performing any operation on the hybrid inverter
	Comply with CE certification mark
	Before performing maintenance operations on the hybrid inverter, all external power supplies must be disconnected!
	There is high temperature on the surface of the hybrid inverter, be careful of burns!
	After the hybrid inverter is disconnected from the external power supply, you need to wait for 5 minutes before touching the internal conductive components.
	There is a fatal danger of high voltage! Only professional and qualified personnel may install and operate it!
	Protective earth connection point


3.3.4. Indicator Light Description

The LED indicator light on the front panel of the hybrid inverter can indicate the current working status of the hybrid inverter.

Indicator Light	State	Explanation
System	Always on: 	System is working
	Flashing: 	System is in standby
	Always on: 	System failure
Grid	Always on: 	The grid is normal
	Flashing: 	The grid is abnormal
COM	Always on: 	Communication is normal
	Always on: 	Communication with other devices is abnormal
	Flashing: 	WIFI communication is abnormal
Battery	Always on: 	Battery is normal
	Always on: 	Battery not connected
	Flashing: 	Battery is dead

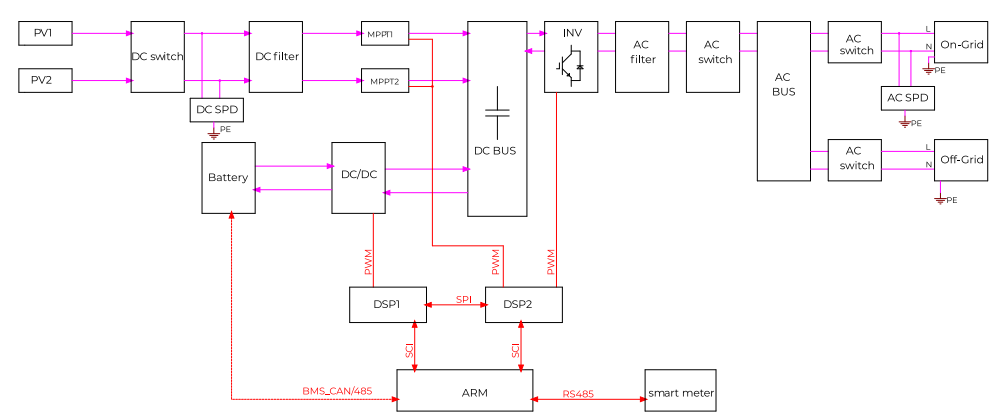
3.3.5. Nameplate Description

The nameplate is for reference only, please refer to the actual product.

ecoso le x		
Name: HybridInverter Model: TB6K-H1P		Trademark, product type, Product model
PVI input	U _{DCmax} :550V _{dc} *	
	U _{MPP} :120~550V _{dc} *	
	I _{DCmax} :13.5/13.5A _{dc} *	
	I _{SCPV} :16.9/16.9A _{dc} *	
Battery	U _{batt} :42~59V _{dc} Li-ion.	
	I _{battmax} (C/D):85/85A _{dc} *	
On-grid	U _{ACn} :230V _{ac} *	
	f _{ACn} :50/60H _z	
	P _{ACn} :6kW	
	I _{ACmax} :27.3A _{ac}	
	S _n :6kVA	
Back-up	U _{ACn} :230V _{ac} *	
	f _{ACn} :50/60H _z	
	I _{ACmax} :18.2A _{ac} *	
	P _n :4kW	
Others	Safety level:Class I	
	Ingress protection:IP65	
	Operation ambient temp: -25°C~+60°C	
	Power Factor: ~1(Adjustable from 0.8 leading to 0.8 lagging)	
	Inverter Topology:Non-isolated	
	Pollution Degree:III	
Over voltage Category:PV II/AC III		
		Product safety symbols certification marks
Importer:		Contact Information
Address:		
Telephone:		

3.4. Principle Description

The principle design of the hybrid inverter is shown in the figure below.



- The DC switch is used to safely cut off the DC current when necessary to ensure the safe operation of the hybrid inverter and personnel safety.
- DC filtering is used to filter out electromagnetic interference inside the hybrid inverter to ensure that the hybrid inverter can meet the requirements of electromagnetic compatibility standards.
- The hybrid inverter is equipped with two independent MPPTs for DC input, ensuring that maximum power can be obtained even under different photovoltaic input conditions.
- The inverter unit converts DC power into AC power that meets the grid requirements and feeds it into the grid.
- AC filtering is used to filter out the high-frequency components of the hybrid inverter output current to ensure that the output current meets the requirements of the power grid.
- The AC switch is used to isolate the AC output of the hybrid inverter from the grid, allowing the hybrid inverter to safely disconnect from the grid when the hybrid inverter fails or the grid fails.
- DC lightning protection provides a discharge circuit for the overvoltage energy that flows into the DC side of the hybrid inverter (photovoltaic modules are struck by lightning and generates surge voltage), preventing the DC side from being damaged by high-voltage impact on the internal circuit of the hybrid inverter.
- AC lightning protection provides a discharge circuit for the AC side overvoltage energy to prevent the impact of AC side overvoltage from causing damage to the internal circuit of the hybrid inverter.
- The charge/discharge control of the energy storage battery is realized through bidirectional DC-DC conversion.

3.5. Function Description

The functions of the hybrid inverter are summarized as follows:

(1) Inverter function

Hybrid inverters convert DC power into grid-compliant AC power and feed it into the grid.

(2) Battery charging function

When the energy storage battery is depleted, the hybrid inverter can be used to convert the DC power generated by the photovoltaic modules into DC power that meets the requirements of the energy storage battery, and charge it according to the charging curve of the energy storage battery.

(3) Data storage function

The hybrid inverter stores system information such as operating data and fault data.

(4) Parameter configuration

The hybrid inverter provides a variety of parameter configurations. Users can configure the parameters through the mobile phone APP to meet various needs or adjust its operating performance to the best.

(5) Communication function

Support setting the hybrid inverter parameters through RS485 near-end; connects to the cloud via 4G, WiFi to monitor the operating status of the hybrid inverter, power station operation, etc.

- 4G (optional): supports AT&T and T-Mobile mainstream operators
- WIFI: Supports 2.4G frequency band, the router needs to be set to 2.4G

(6) Protective function

The hybrid inverter has protection functions such as DC reverse polarity protection, AC short circuit protection, AC overcurrent protection, AC overvoltage protection, islanding protection, leakage current protection, and surge protection.

In order to ensure the safe operation of the hybrid inverter, the hybrid inverter will automatically reduce the output power under non-ideal operating environment conditions. The following may trigger power derating, please try to avoid them during use:

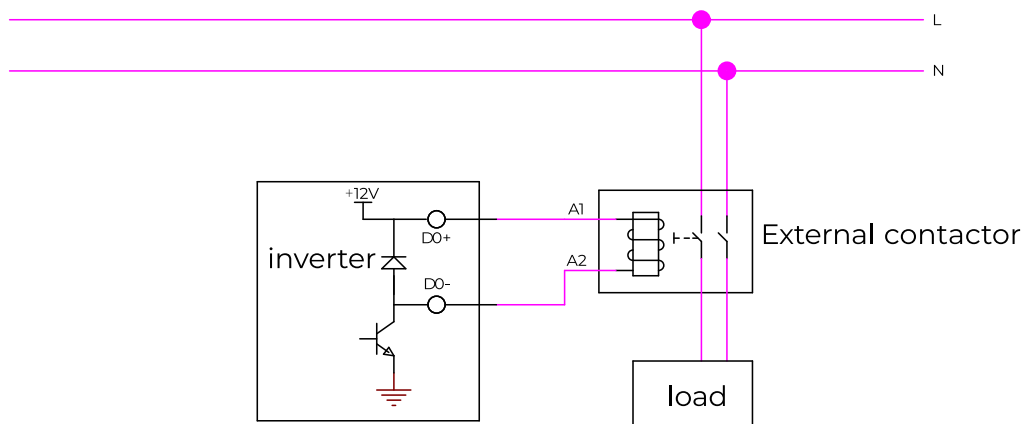
- Unfavorable environmental conditions, such as direct sunlight, poor ambient ventilation, high temperature, etc.
- The input voltage is higher.
- The input current is higher
- Grid voltage changes with frequency.
- The output power percentage of the hybrid inverter has been set.

(7) Power distribution control function (optional)

It supports the addition of extra contactors at the AC output end and the reserved DO dry contact control port of the hybrid inverter for intelligent load control.

The load control method is as follows:

- ① Schedule control: Set the time to control the load to turn on or off, and the hybrid inverter will automatically turn on or off the load within the set time period.
- ② Switch control: When the control mode is selected as ON, the load will be turned on; when the control mode is selected as OFF, the load will be turned off.
- ③ BACK-UP load control: In off-grid mode, if it is detected that the BACK-UP terminal is overloaded or the battery SOC value is lower than the battery off-grid protection setting value, the load connected to the DO port can be turned off.



(8) Other functions

- Supports dual MPPT inputs, with a maximum capacity ratio of 1.5.
- Flexibly switch between grid-connected mode and off-grid mode.
- Intelligent management provides multiple grid connection modes for users to choose.

3.6. Application Scenarios

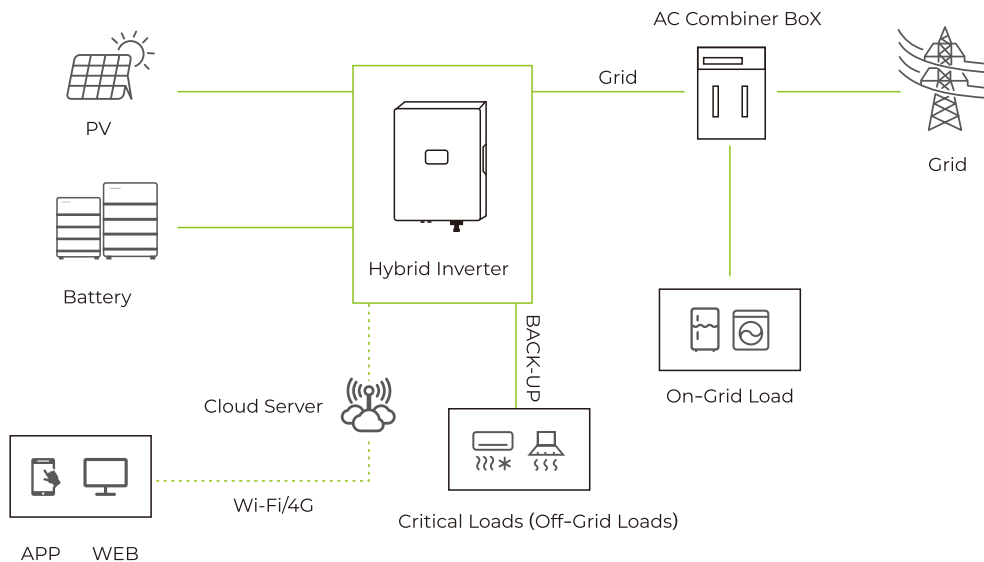


Warning

- The protective ground wire of the hybrid inverter must be firmly connected to ensure that the impedance between the neutral wire and the ground wire is less than 10Ω .
- Ensure that the voltage and frequency of the grid access point meet the grid specifications of the hybrid inverter.
- The hybrid inverter has UPS function and the switching time is $<10\text{ms}$. Please ensure that the BACK-UP load capacity is \leq the rated capacity of the hybrid inverter. Otherwise, the UPS function may not be activated when the power grid loses power.
- When overload protection occurs in the hybrid inverter once, the hybrid inverter can automatically restart; if it occurs multiple times, the restart time of the hybrid inverter will be extended. If you need to restart the hybrid inverter as soon as possible, you can restart the hybrid inverter immediately through the APP.
- If the photovoltaic system is not equipped with a battery, do not use the BACK-UP function. The resulting risk of system power consumption is beyond the warranty scope of the hybrid inverter manufacturer.

Scenario 1: DC coupled system

It is a standard energy storage system that comes complete with photovoltaic panels and energy storage batteries upon initial installation, allocating the necessary load capacity for the hybrid inverter. Meanwhile, the system also monitors energy flow, and manages the connection to the public grid through smart meters.





Attention

- To ensure that the off-grid load can continue to work when the hybrid inverter is powered off for maintenance, it is recommended to install a single-pole double-throw switch between the off-grid load and the grid-connected load.
- If you need to use the anti-reverse flow function, please ensure that the hybrid inverter supports the anti-reverse flow function.

Scenario 2: AC coupling upgrade and transformation system



Attention

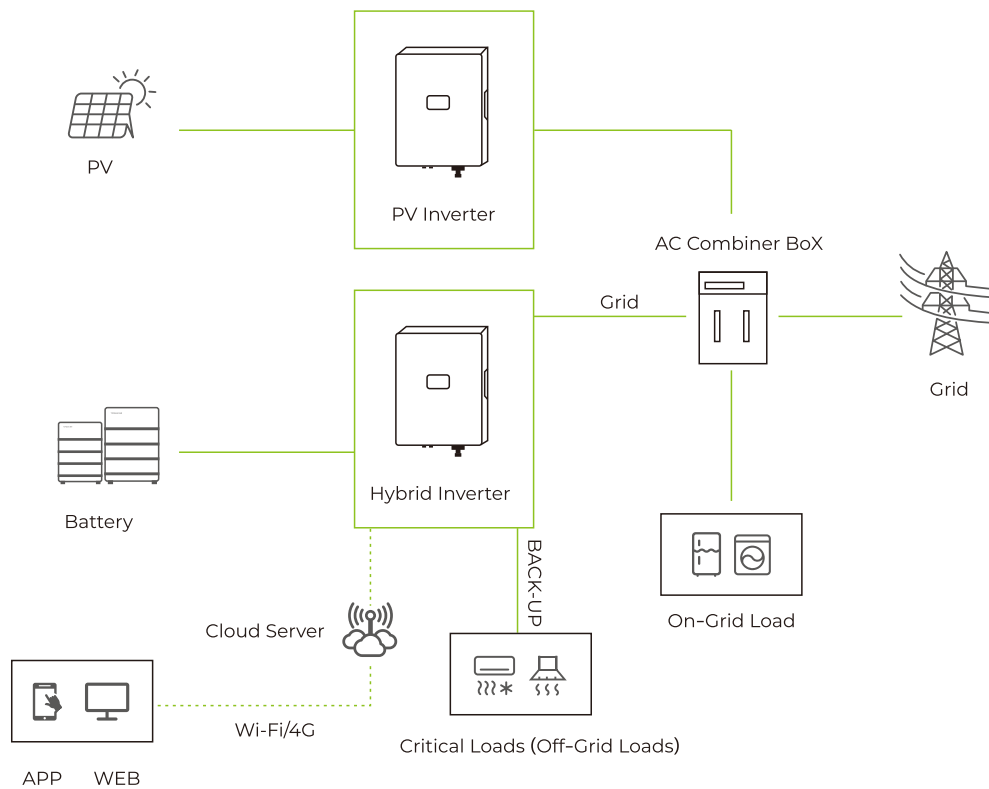
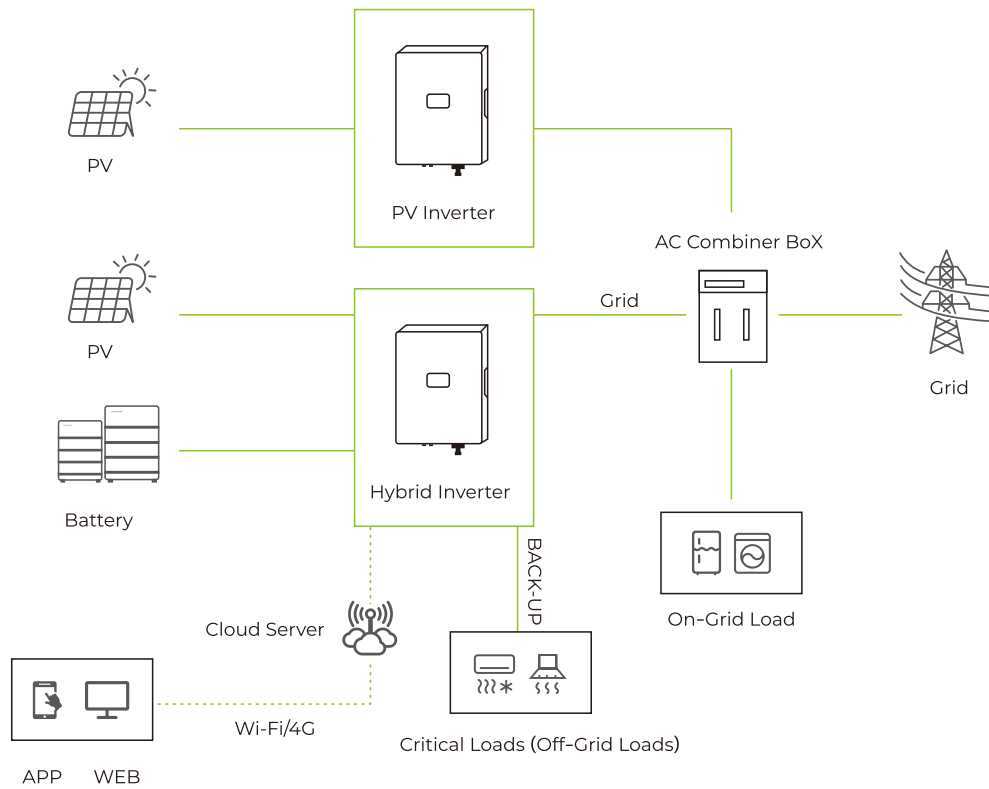
(1) This scenario is mostly used in the following scenarios:

- Photovoltaic grid-connected power generation systems already exist.
- It is necessary to increase the system capacity and improve the utilization rate of photovoltaic power generation.
- Energy storage is required and can be used as load backup in emergencies.

(2) If you need to use the anti-backflow function, please ensure that the photovoltaic grid-connected inverter and the anti-backflow function of the hybrid inverter are enabled.

(3) When using the anti-backflow feature, the system will purchase a small amount of power from the grid.

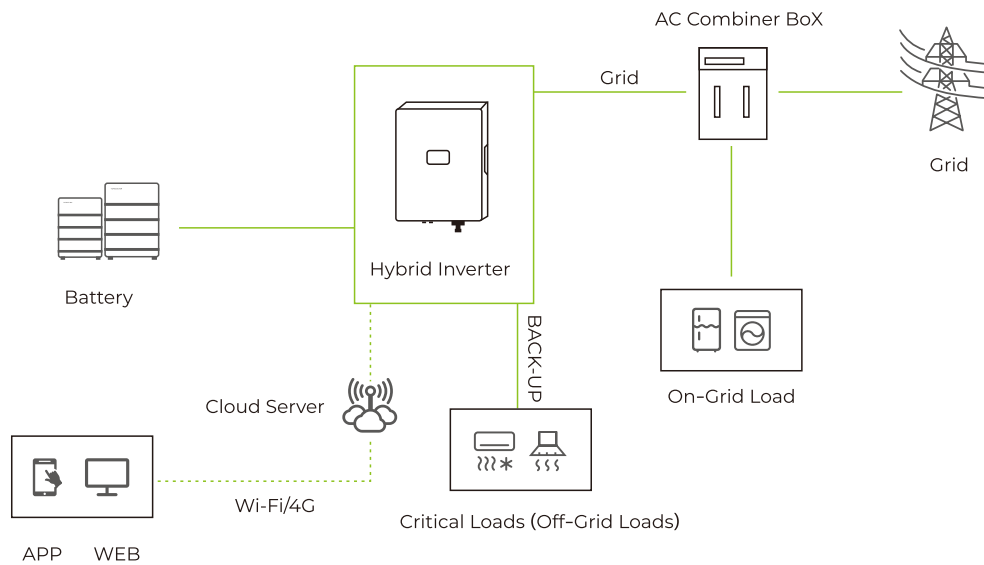
(4) If each machine has a smart meter, the communication address of smart meter 1 in the AC distribution box must be set to 1, and the communication address of smart meter 2 must be set to 2.



Scenario 3: Energy storage system without photovoltaic modules

! Attention

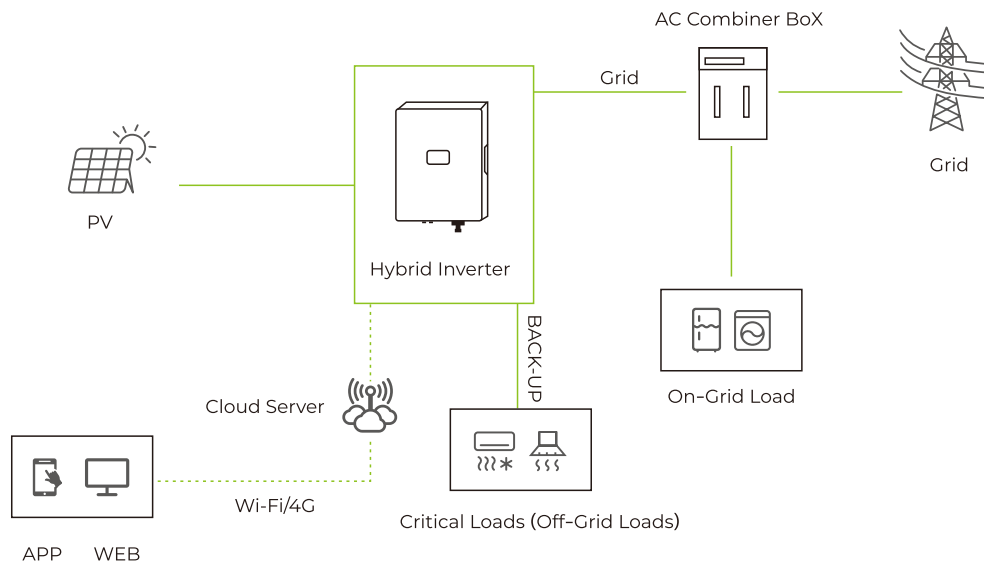
- Suitable for household storage systems that do not have space for photovoltaic installation or do not want to install photovoltaic modules



Scenario 4: Photovoltaic system without energy storage battery

! Attention

- Suitable for systems without energy storage batteries or that only require photovoltaic grid connection

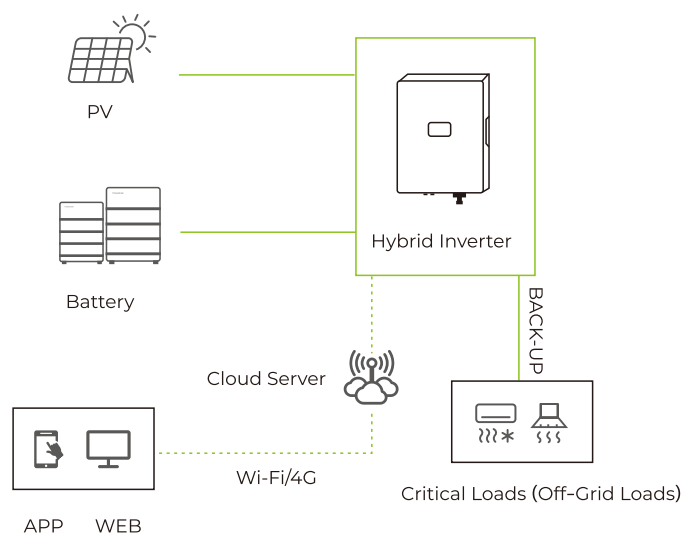


Scenario 5: Emergency power supply system



Attention

- Suitable for energy storage systems without grid or that only require off-grid mode



3.7. Operating Mode

Hybrid inverters have on-grid working modes and off-grid working modes according to the grid connection form. The on-grid working mode is divided into three working modes: load first mode, battery first mode and grid first mode according to the energy supply priority.

3.7.1. On-Grid Working Mode

(1) Load first mode

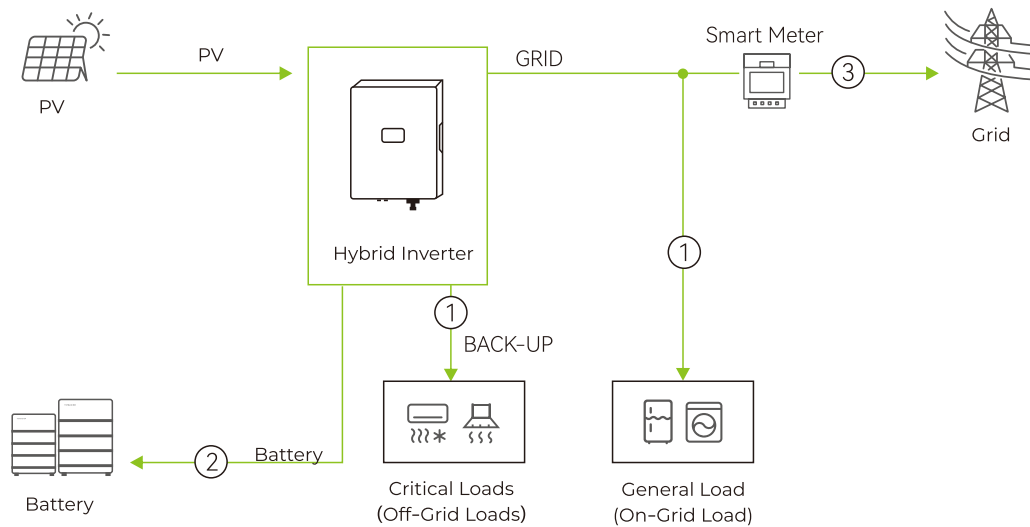


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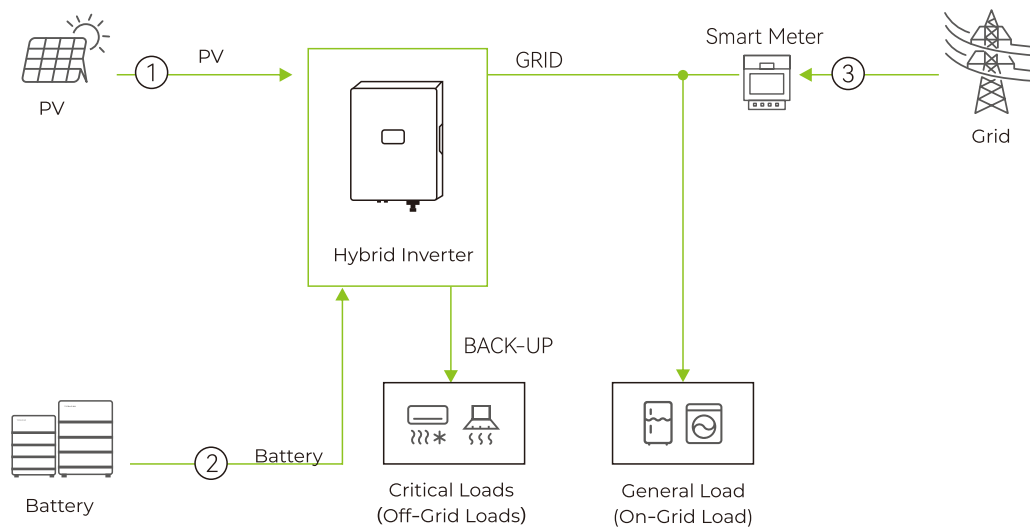
- In this mode, solar power generation gives priority to self-use, and the excess power is used to charge the battery; when there is no solar power generation at night, the battery is used to power the load; this increases the self-use rate of the solar power generation system and saves electricity bills.

● daytime

When the power generated by the photovoltaic system is sufficient, the power generated in the photovoltaic system is given priority to power household loads, the excess power is charged to the battery, and the remaining power is sold to the grid.

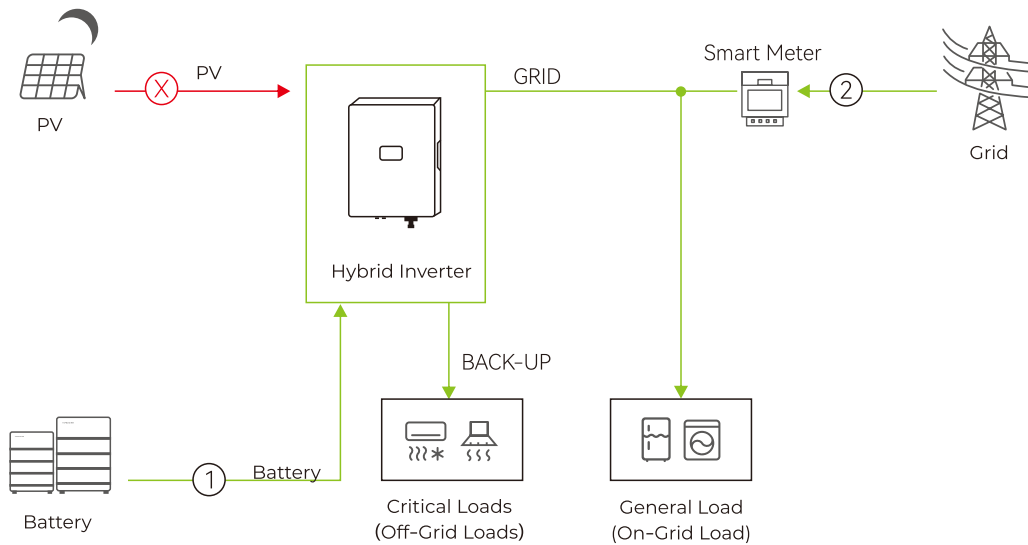


When the power generated in the photovoltaic system is insufficient, battery power is used first to power household loads. If the battery power is insufficient, the grid supplies power to the load.



- nighttime

If the battery power is sufficient, the battery will first power the load. If the battery power is insufficient, the power grid will supply power to the load



(2) Battery first mode

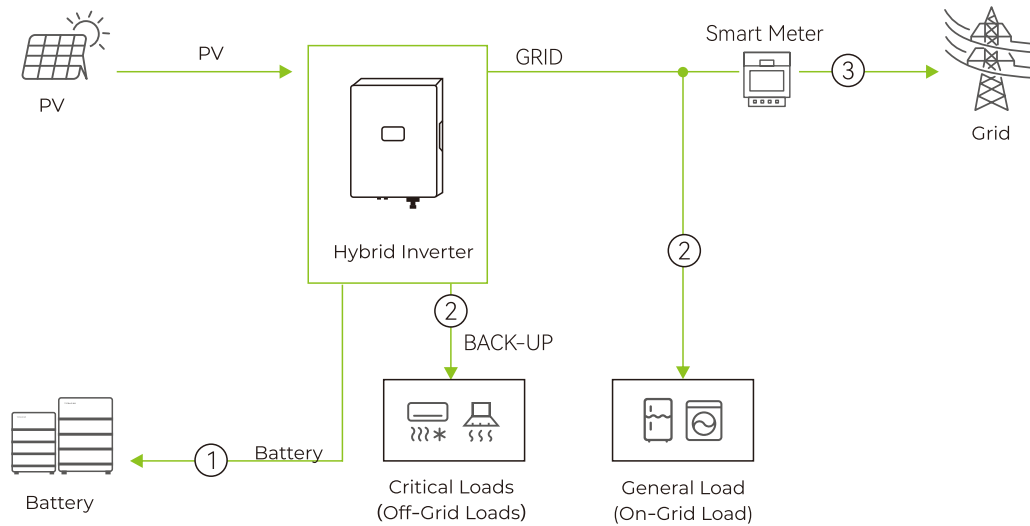


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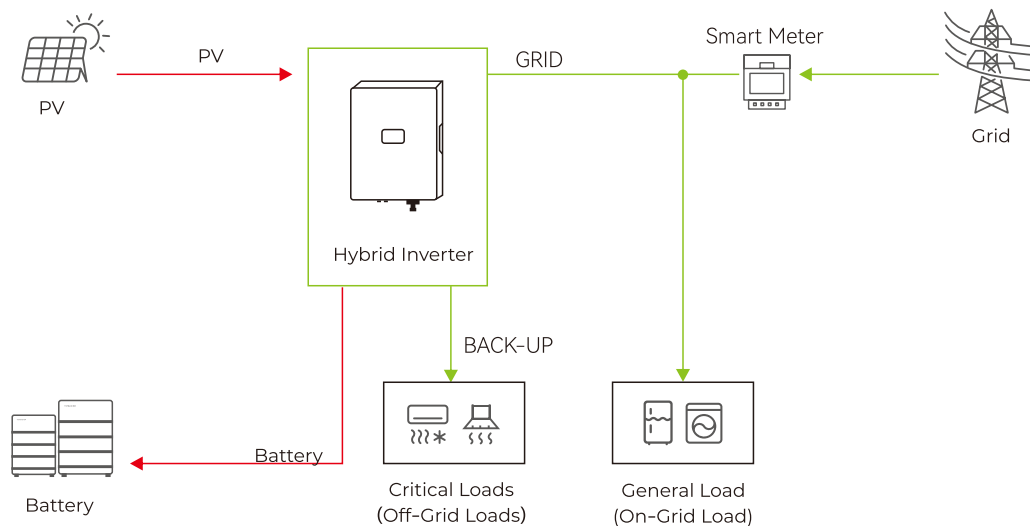
- This mode is mainly suitable for scenarios where the grid is unstable and there are important loads. When the grid is out of power, the hybrid inverter switches to off-grid working mode to supply power to the load; when the grid is restored, the hybrid inverter switches to on-grid working mode.

- daytime

When the power generated in the photovoltaic system is sufficient, the power generated in the photovoltaic system is first utilized to charge the battery, the excess powers is used by the load, and the remaining power is sold to the grid.

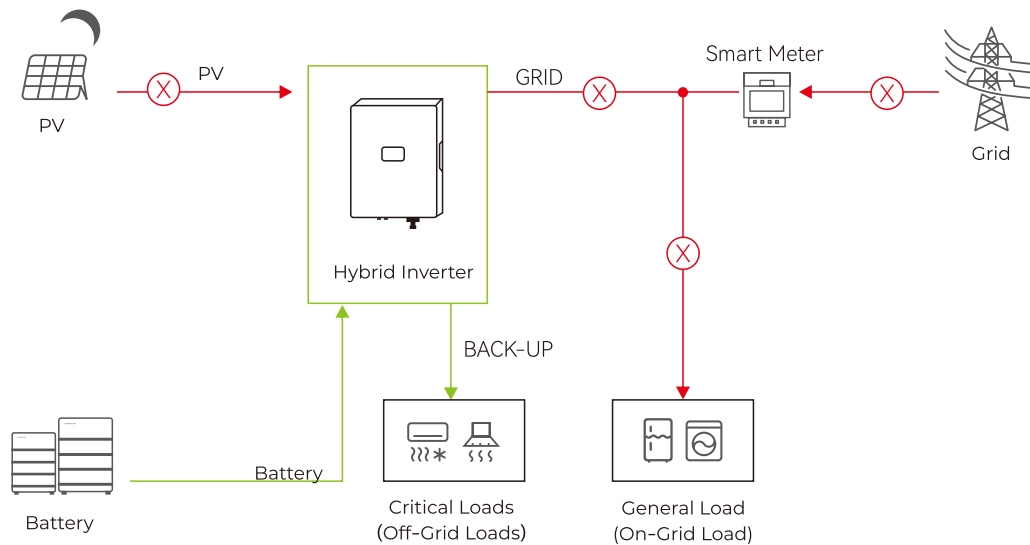
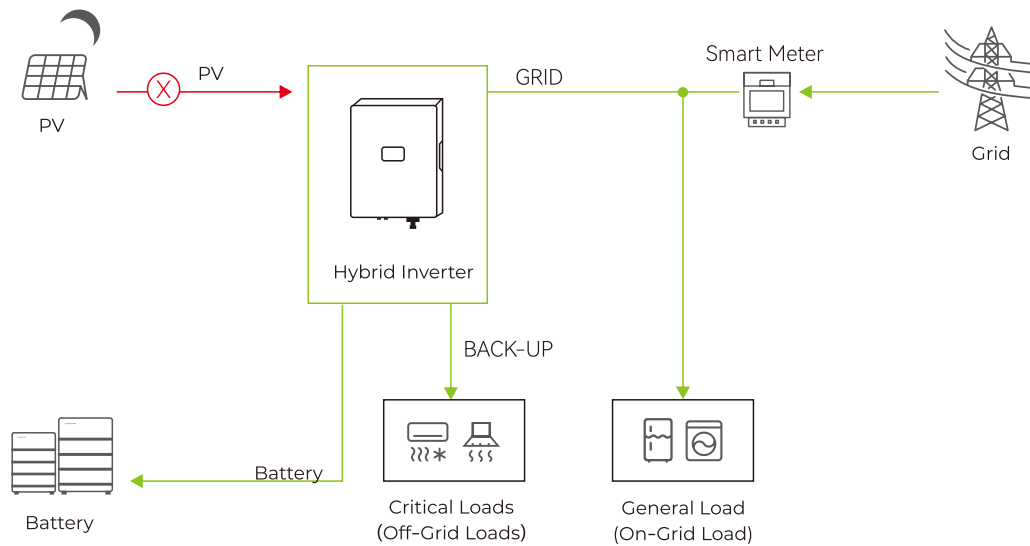


When the power generated in the photovoltaic system is insufficient, the power generated in the photovoltaic system is first utilized to charge the battery, and the load is maintained by the power grid.



- nighttime

When there is no electricity generated in the photovoltaic system, if the grid is normal, the grid will supply power to the load; if the grid is abnormal, the hybrid inverter will enter the off-grid mode and the battery will supply power to the load.

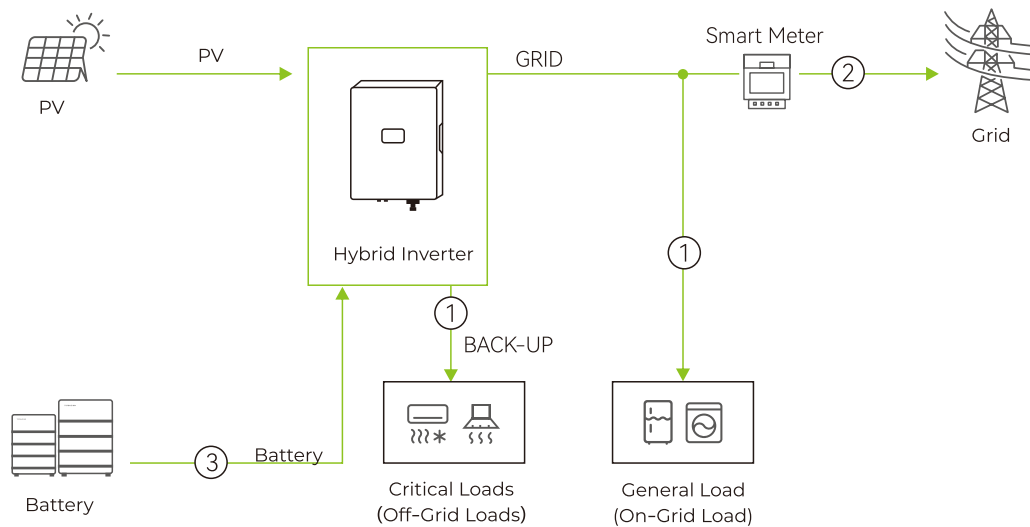


(3) Grid first mode

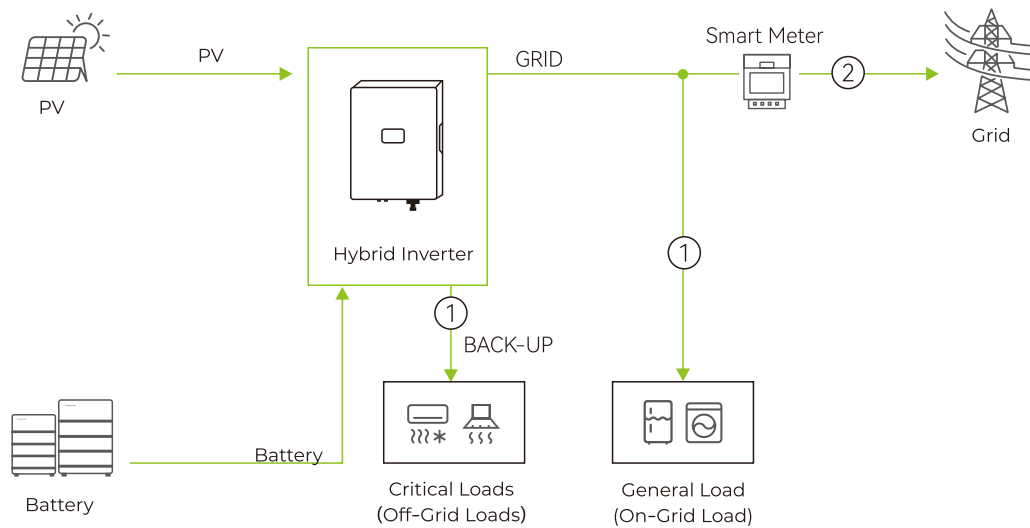
! Attention

- It is recommended to use this mode in scenarios where there is a large difference between peak and trough electricity prices.

When the power generated in the photovoltaic system is sufficient, the power generated in the photovoltaic system is prioritized and connected to the grid for power generation, and the excess power is used to charge the battery.

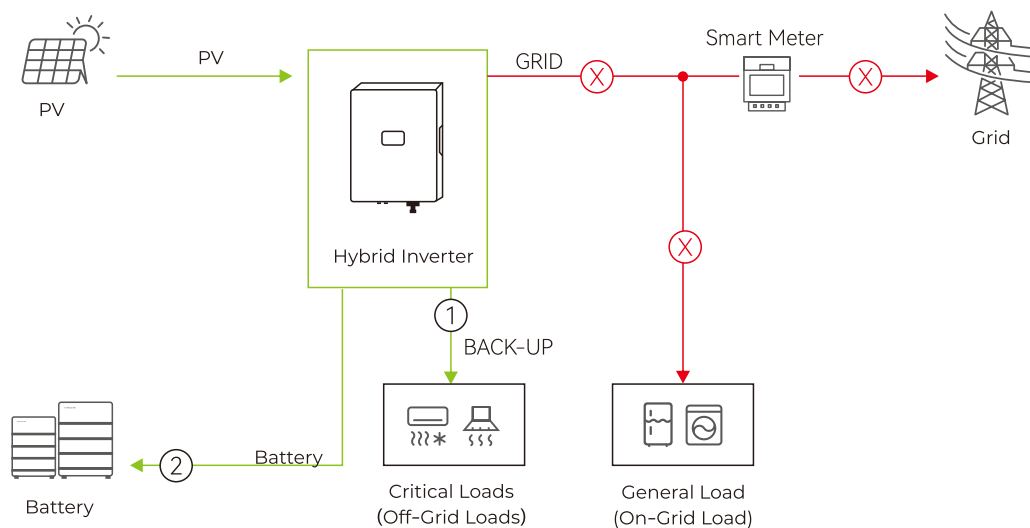


When the power generated by the photovoltaic system is insufficient, the system prioritizes connecting the available photovoltaic system power to the grid for power generation. Meanwhile, the battery supplements the additional power required for the grid-connected system.

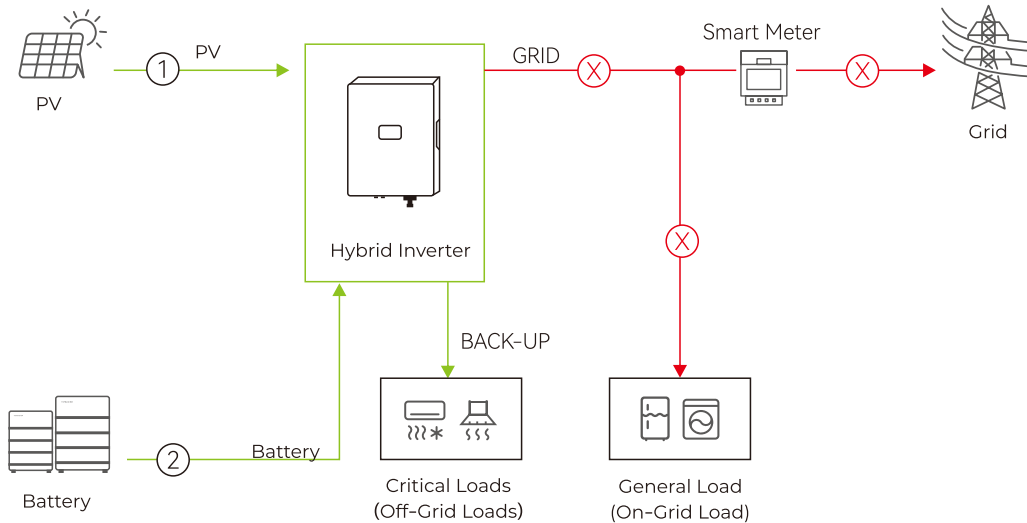


3.7.2. Off-Grid working mode

When the power generated by the photovoltaic system is sufficient, the system prioritizes powering the household loads, and the excess power is used to charge the battery.



When the power generated in the photovoltaic system is insufficient, battery power is used to power household loads.



3.8. Working Status

3.8.1. Fault Status

When a fault occurs during operation of the inverter and it enters the fault state, the indicator light panel of the inverter will turn yellow or red, and the user can read relevant fault information through the APP. Before entering the fault state, the inverter automatically stores relevant information. If the fault is a recoverable fault, the inverter will automatically resume work; if the fault is unrecoverable, the inverter will stop in the fault state until the relevant maintenance personnel troubleshoot the fault.

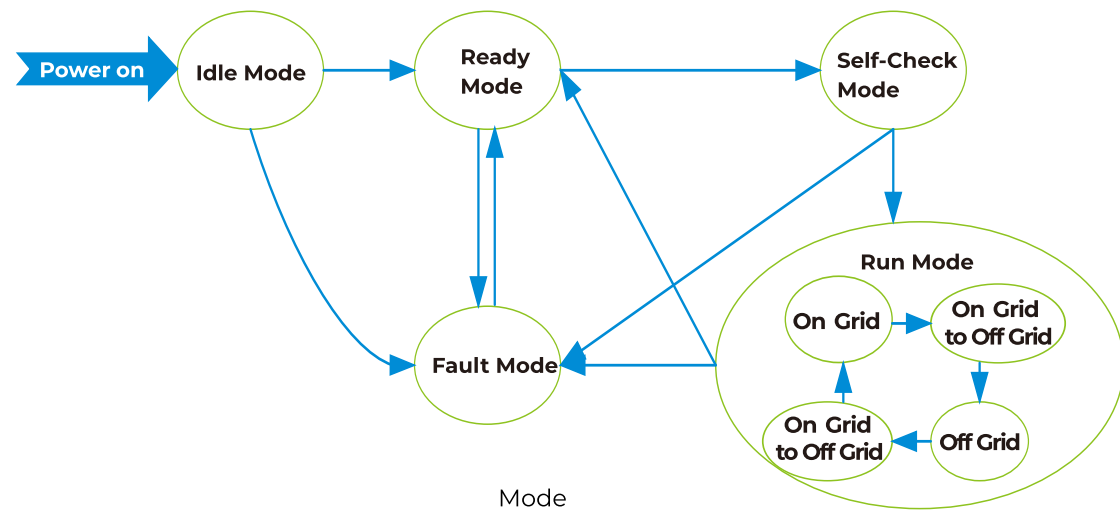
3.8.2. Self-test Status

After the inverter is powered on or restarted from a recoverable fault, it will enter the self-test state. If the self-test passes, the inverter will work according to the set working mode; if the self-test fails (fault or alarm occurs), the inverter will enter the fault state.

3.8.3. Waiting State

After powering on, if the inverter has no fault but does not meet the operating conditions, the inverter will enter the waiting state.

3.9. Run Process

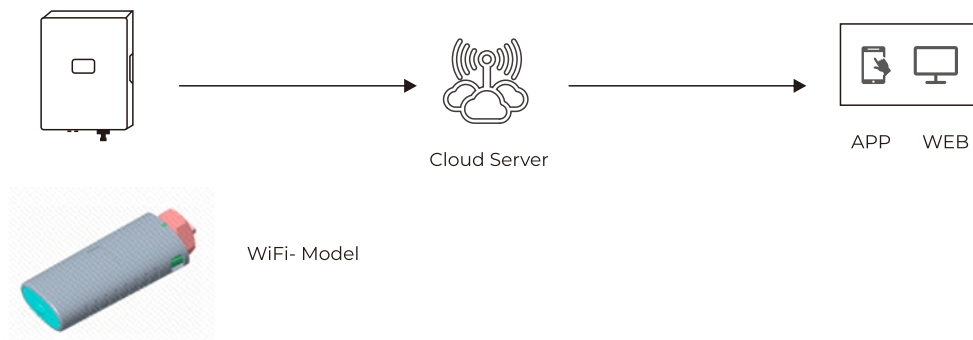


Serial number	Mode	Explain
1	Idle mode	<p>After the machine is powered on, it enters the idle mode</p> <ul style="list-style-type: none"> ● Perform the power-on self-test and configure internal parameters in idle mode. If the self-test passes and parameters are successfully configured, the system enters the ready mode. ● If the self-check fails or parameter configuration fails, the system enters fault mode.
2	Ready mode	<p>Ready mode indicates that the basic detection and configuration of the machine have been completed, and the machine is ready to start.</p>
3	Self-check mode	<p>Perform a self-test before starting up</p> <ul style="list-style-type: none"> ● If the startup self-test is successful, the system enters the running mode. ● If the power-on self-test fails, the system enters fault mode.
4	Run mode	<p>Normal running mode of the inverter</p> <ul style="list-style-type: none"> ● If the user sets the off-network mode, the device runs in off-network state. ● If the user sets the other mode, and the power grid is normal, it runs in the grid-connected state. ● If the operation is in the grid-connected state and then the power grid is abnormal, the state will be changed from grid-connected to off-grid state ● In the grid-connected to off-grid state, the relevant

		<p>configuration and the state of the relay have been set, then enter the off-grid state.</p> <ul style="list-style-type: none"> ● If the operation is in the off-grid state, the power grid is restored to normal, when the command for reconnection is received, it enters the off-grid to grid-connected state. ● In the off-grid to grid-connected state, the relevant configuration and the state of the relay have been set, then enter the grid-connected state.
5	Fault mode	If a fault is detected, the inverter enters the fault mode. After the fault is cleared, the inverter enters the ready mode.

3.10. Monitoring of Inverter

Users can monitor the inverter through the following communication solutions.

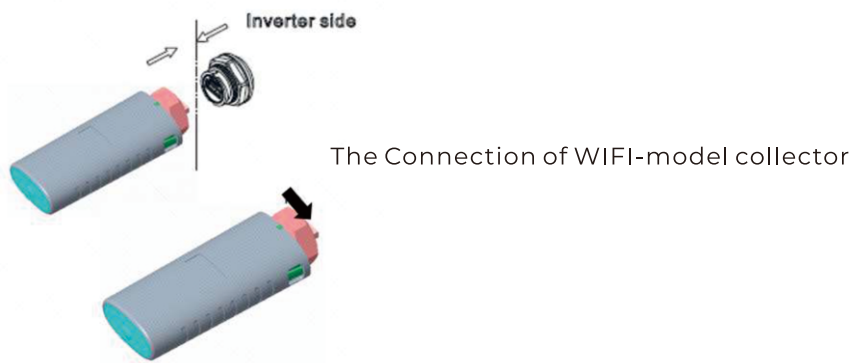


Attention:

This monitoring can only be used by our company's Top Solar monitor. WIFI-model uses a USB interface to monitor data using a computer terminal/mobile phone.

Before using the WIFI-model collector, make sure of reading following tips carefully:

- (1) Check the status of WIFI-model collector.
- (2) Connect the remote monitoring system, scan the QR code on the collector to download the APP.
- (3) After the download is complete, please follow the prompts for detailed instructions. For more information, please refer to the collector manual.



4. Unpacking and Storage

4.1. Unpacking and Inspection

The product has been fully tested and strictly inspected before leaving the factory, but damage may still occur during transportation. Please conduct detailed inspection before signing for the product. Check the following:




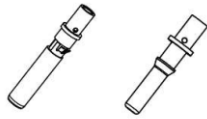
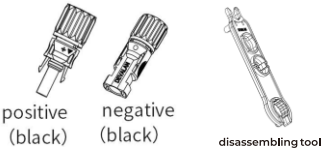
- (1) Check whether the outer packaging is damaged, such as deformation, holes, cracks or other signs that may cause damage to the product in the box. If there is damage, do not open the packaging and contact your dealer.
- (2) Check whether the hybrid inverter model is correct, if there is any discrepancy, do not open the package and contact your dealer.
- (3) After unpacking, check whether the type and quantity of goods inside are correct according to the packing list, and whether there is any damage to the appearance. In case of damage or incomplete goods, please contact your dealer.







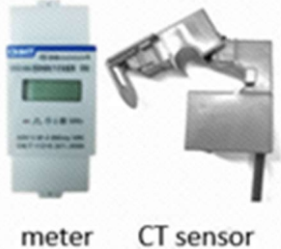



Attention

- Depending on the configuration of the hybrid inverter, the number of expansion screws, fastening screws, AC line connection terminals, and DC input terminals supplied with the box may vary. Please refer to the actual one.
- Please do not discard the original packaging of the product. It is best to store the product in the original packaging box after it is removed from service.

4.2. Packing List

SN.	Name	Quantity	Picture
1	Hybrid inverter	1pcs	
2	mounting plate	1pcs	
3	Ground wire OT terminal	1pcs	
4	DC input terminal	4pcs (2 positive and 2 negative)	 positive negative
5	PV DC connector	4pcs (2 positive and 2 negative)	 positive (black) negative (black) disassembling tool

6	Battery DC Connector	2pcs (1 positive and 1 negative)	
7	AC line connector (AC-BACKUP)	1pcs	
8	AC line connector (AC-GRID)	1pcs	
9	Communication connectors (CAN BMS)	1pcs	
10	Fastening screw	2pcs	
11	Hexagon Wrench	1pcs	
12	Expansion bolt	3pcs	
13	WIFI or 4G Optional	1pcs	
14	Smart meter	1pcs (contains 1 electric meter (optioal) and 1 CT sensors)	 meter CT sensor
15	Outlet box cable assembly	1pcs	
16	Product information	1pcs	

4.3. Product Storage

If the inverter is not put into service immediately, it needs to be stored under certain environmental conditions:

- (1) Repack in the original carton, retaining the desiccant.
- (2) Storage temperature ranges -30°C~70°C, relative humidity ranges 0~95%, no condensation. No erosion by rain or ground water is allowed.
- (3) When stacking multiple inverters, ensure that the stacking height and direction are in accordance with the instructions on the label on the packaging box.
- (4) The packaging box cannot be tilted or turned upside down.
- (5) If the inverter has been stored for over 6 months, it must be fully inspected and tested by professionals before any operation.

5. Mechanical Installation

5.1. Installation Precautions



Danger

- Before installing the hybrid inverter, it is important to ensure that the hybrid inverter does not have any electrical connections.
- Before drilling, make sure to avoid water and electricity lines inside the wall, and choose a stable wall to avoid danger.



Warning

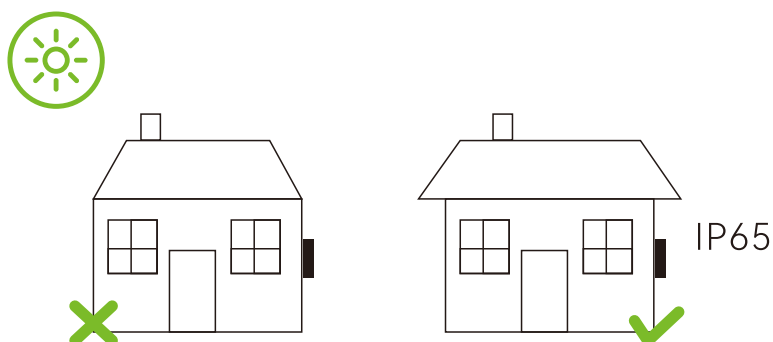
Improper handling may result in personal injury!

- The instructions in the manual must be followed when handling the product.
- Improper handling of the product may result in minor, serious injuries or contusions. Poor ventilation in the installation environment will affect system performance!
- The heat sink of the product must be kept unobstructed to ensure adequate cooling inside the product.

5.2. Select Installation Location

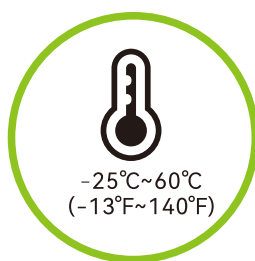
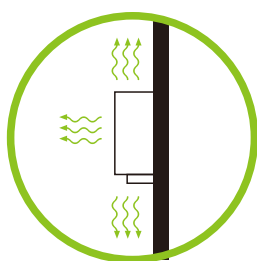
Choosing the best installation location for the hybrid inverter is important in its safe operation, life assurance, and performance assurance.

- The hybrid inverter has an IP65 protection and can be used for indoor or outdoor installation.
- The installation location should be convenient for electrical connection, operation and maintenance, and ensure that the hybrid inverter indicator lights and labels are easy to view.



(1) Installation Environment Requirements

- There must be no flammable, explosive or corrosive substances in the installation environment.
- The installation location must be out of the reach of children, and avoid installation in easily accessible locations.
- Protecting the hybrid inverter from direct sunlight, direct rain, and snow can extend the service life . It is recommended to install it in a sheltered location.
- Please install the hybrid inverter in a ventilated environment to ensure smooth ventilation and heat dissipation.
- The hybrid inverter will produce some noise when running so is not recommended for installation in living areas.
- The temperature and humidity of the installation environment of the hybrid inverter must be within a suitable range.
- Stay away from strong magnetic field environments and avoid electromagnetic interference.



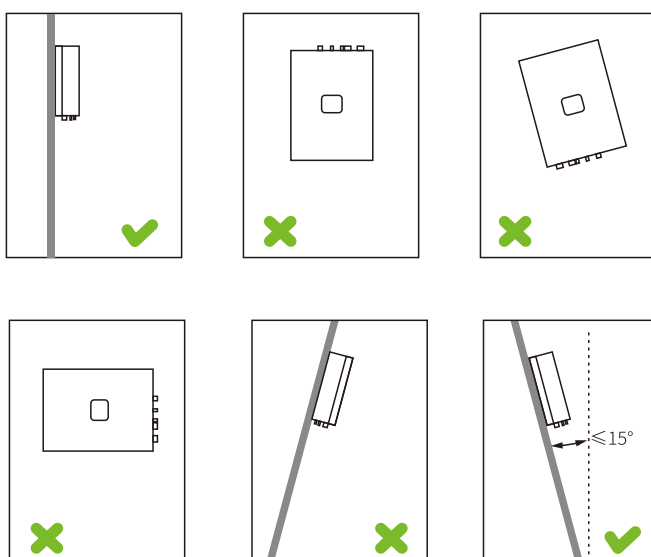


(2) Installation Carrier Requirements

- The installation carrier cannot be made of flammable materials and must have fireproof properties.
- Please ensure that the installation carrier is sturdy and reliable, with a load-bearing capacity of at least 4 times the weight of the hybrid inverter.

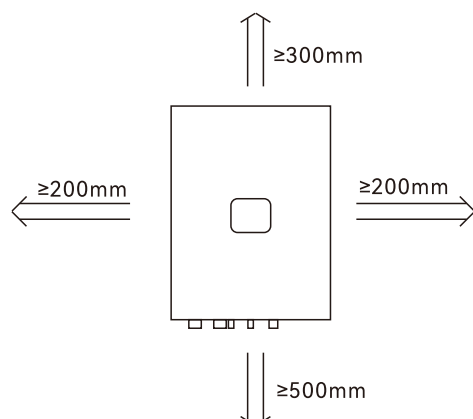
(3) Installation Angle Requirements

- Recommended installation angle of hybrid inverter: vertical or backward tilt $\leq 15^\circ$.
- The energy storage inverter cannot be tilted forward or backward beyond 15 degrees, upside down, horizontal and sideways installation.



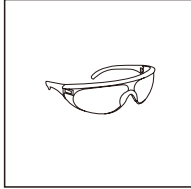
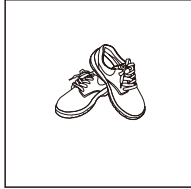
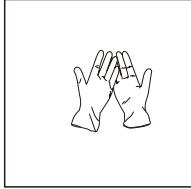
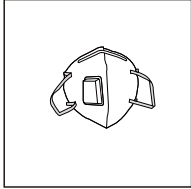

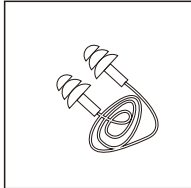
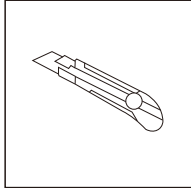
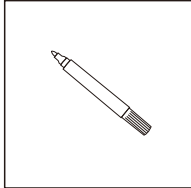
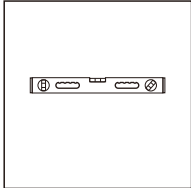
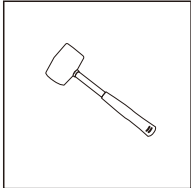
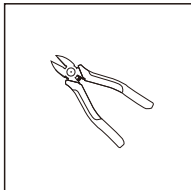
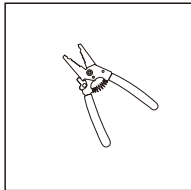
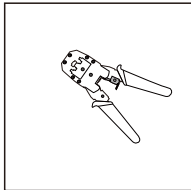
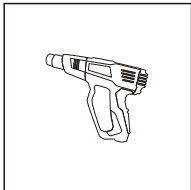
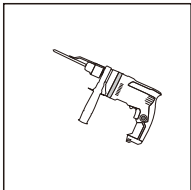
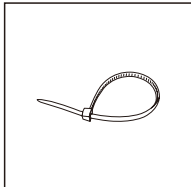
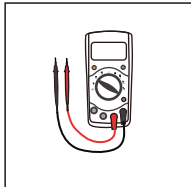
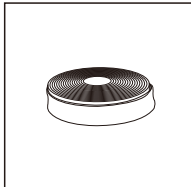
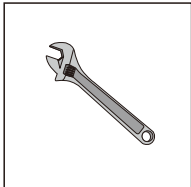
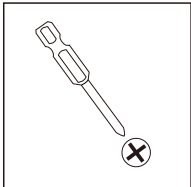
(4) Installation Space Requirements

Make sure there is enough space around the hybrid inverter to meet ventilation, heat dissipation and operating space requirements. The installation space requirements are as follows:



5.3. Installation Tools and Parts

Installation tools include but are not limited to the following recommended tools. If necessary, other auxiliary tools can be used on site.

protection goggle	insulated shoes	Insulated gloves	dust mask	Vacuum cleaner
				
anti-noise earplugs	Utility knife	marker pen	spirit level	rubber hammer
				
Diagonal pliers	Wire strippers	crimping pliers	heat gun	Impact drill
				
Cable ties	multimeter	Thermal casing	spanner	Phillips screwdriver
				

5.4. Moving Hybrid Inverters

Before installation, the hybrid inverter needs to be taken out of the packaging box and transported to the selected location. To avoid personal injury or equipment damage when moving the hybrid inverter, please follow the following guidelines:

- Please assign corresponding personnel according to the weight of the hybrid inverter to prevent the equipment from exceeding the weight range that the human body can carry and injuring people.
- Please wear safety gloves to avoid injury.
- Please ensure that the hybrid inverter is always balanced during transportation to avoid falling.
- Do not loosen the hybrid inverter unless it is firmly secured

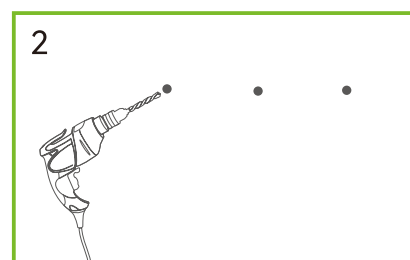
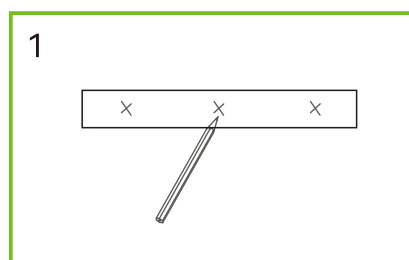
5.5. Install Hybrid Inverters

Attention

- When drilling, make sure the drilling position avoids water pipes, cables, etc. in the wall to avoid danger.
- When drilling, please wear protective glasses and a dust mask to prevent dust from being inhaled into the respiratory tract or falling into the eyes.
- There will be loud noise during the drilling process, so wear anti-noise earplugs.
- Make sure the hybrid inverter is installed securely to prevent it from falling and injuring people.

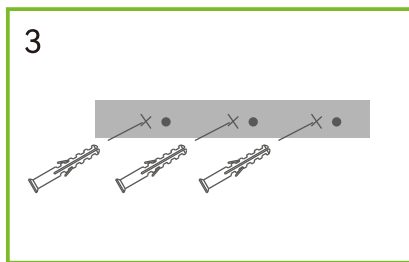
The installation steps are as follows:

1) Step 1: Place the mounting back panel horizontally on the wall and mark the drilling position using a marker.

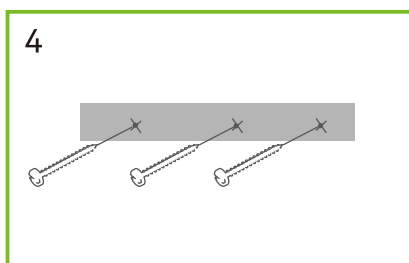


2) Step 2: Use an impact drill with a drill bit diameter of 10mm to drill holes according to the marks to a depth of 60~70mm, tighten the torque to $13\text{N.m} \pm 10\%$.

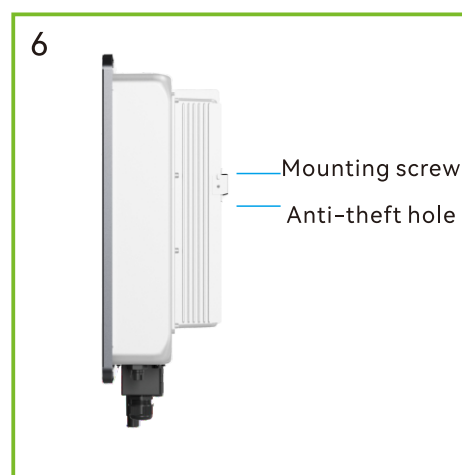
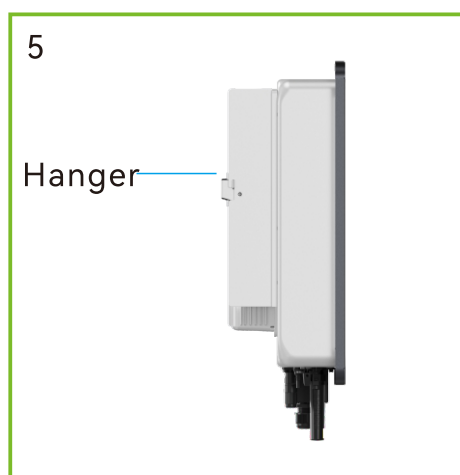
3) Step 3: Place expansion bolts with specifications (M8×60).



4) Step 4: Use expansion bolts to install the back mounting plate.



5) Step 5: Lift the inverter, hang the mounting ears on the back of the inverter to the hanging plate, and then use M5×12 Anti-theft screw to fasten the inverter to the hanging plate.



6. Electrical Connetions

6.1. Safety Precautions



Danger

- Photovoltaic strings will generate dangerous voltages when exposed to sunlight.
- Do not close the DC switch of the hybrid inverter before completing the electrical connection. Make sure the device is powered off and prevent misconnection.
- Make sure all cables are de-energized when making electrical connections.



Warning

- Please use the terminal blocks and connectors supplied with the box. Using other types of terminal blocks or connectors may lead to serious consequences such as poor cable connection or increased contact resistance, which may cause damage to the hybrid inverter.
- Wiring operations must be completed by professional technicians only.
- When making electrical connections, please wear safety shoes, safety gloves and other personal protective equipment as required.

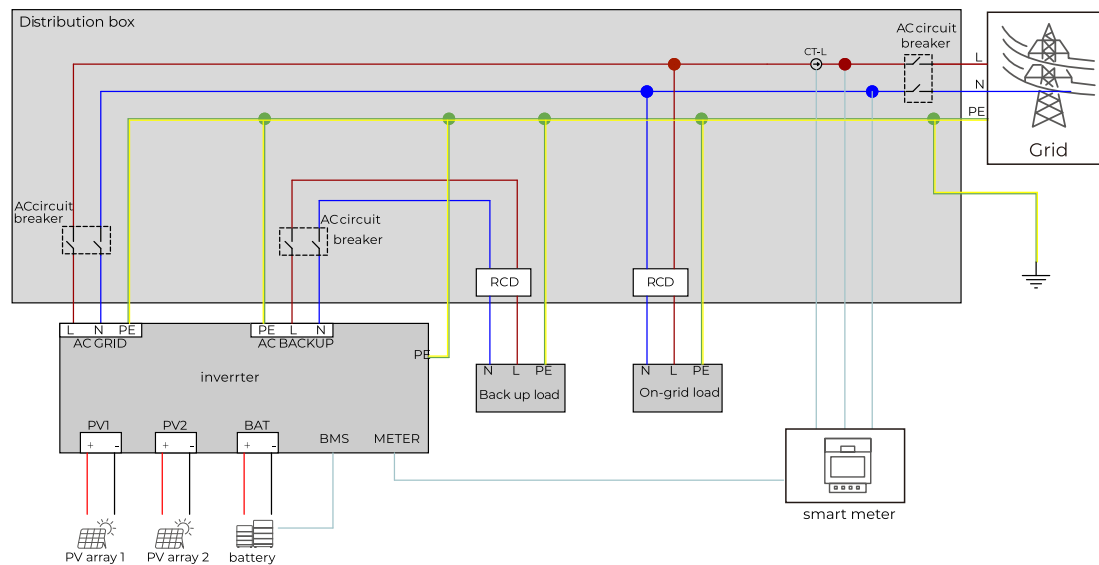


Attention

- The wiring process must follow the relevant rules of the local power grid and the relevant safety instructions of the PV string.
- All operations, cables and component specifications used during electrical connection must comply with local laws and regulations.
- Hybrid inverters can only be integrated into the grid with permission from the local power authority.
- In some areas, the power grid has specific local safety requirements, and it is necessary to ensure compliance with local safety requirements.

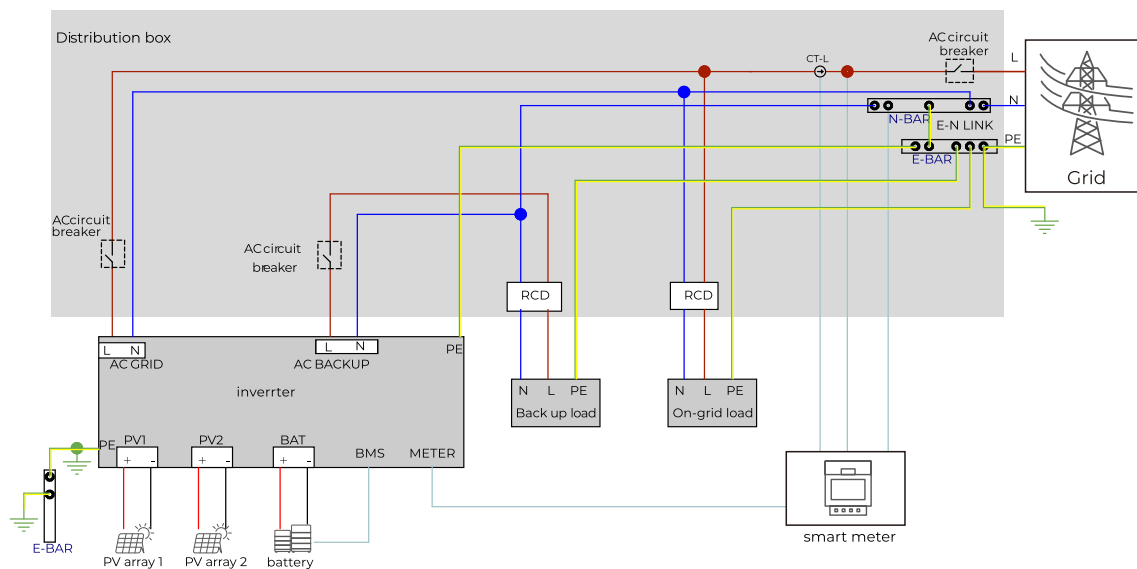
6.2. Electrical Wiring Diagram

(1) Electrical Wiring Diagram 1—Normal Default Connection Method



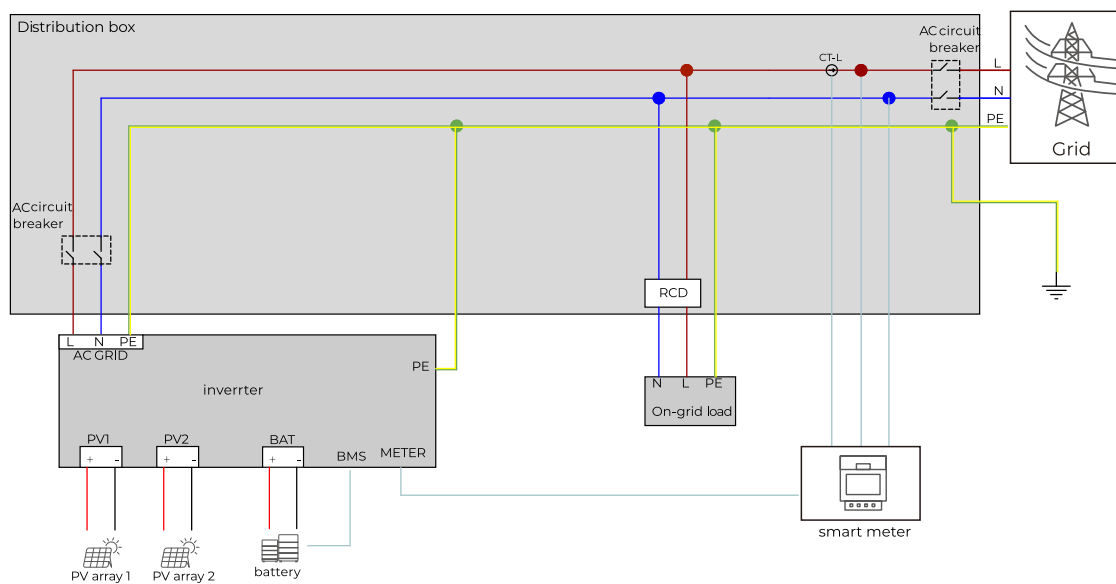
Note: This wiring diagram is suitable for areas where there are no mandatory requirements for neutral cables on the grid and off-grid sides.

(2) Electrical wiring diagram 2—system neutral wire and ground wire short-circuited



Note: This wiring diagram is only applicable to areas where the neutral cables on the grid-connected side and the off-grid side must be connected together, such as Australia, New Zealand, South Africa and other regions.

(3) Electrical wiring diagram 3—Only use On-grid storage system



Note: This wiring diagram is an example of only using the grid-connected storage system.

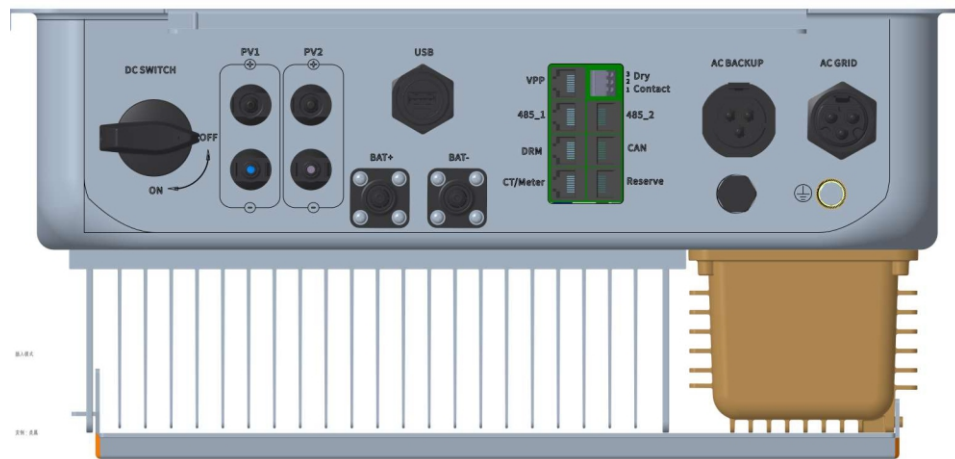
Attention

- If you want to use on grid only, please refer to the Diagram connect with AC grid and float Backup OUTPUT.
- If you have no battery now, you can also float BAT terminal, and this hybrid inverter will only work like a PV inverter.
- If you want to use both on grid power and backup power, please refer to the Diagram connect with AC grid and Backup OUTPUT like the Diagram show.
- On grid terminal and off grid terminal can't directly connect together.
- Off Grid terminal can't connect to grid.
- The first start of system needs Grid power.


NOTE: The inverter has the function of detecting residual current and protecting the inverter against residual current. If your inverter must equip a AC breaker which has the function of detecting residual current, you must choose a Type A RCD breaker with the rating residual current more than 300mA.

6.3. Introduction to Electrical Interface

The external wiring terminals are located at the bottom of the inverter, as shown in the figure below:



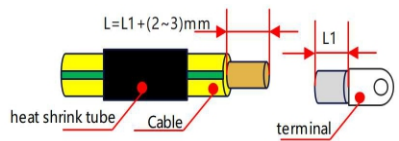
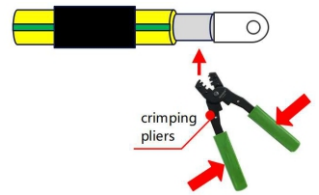
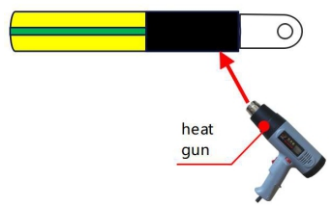
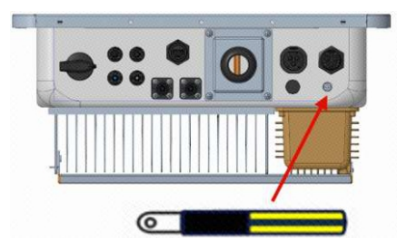
*This picture is for reference only, please refer to the actual product!

silk screen	name	Remark
PV1+、PV2+	PV input positive pole	Connect to PV
PV1-、PV2-	PV input negative pole	Connect to PV
BAT+	Battery input positive pole	Connect to battery system
BAT-	Battery input negative pole	Connect to battery system
BMS	Battery communication interface (CAN)	Connect to BMS in battery system
CT/METER	Smart meter communication interface (RS485)	Connect to the communication interface of the smart meter or connected to a current transformer
AC BACKUP	AC output interface (off- grid side)	Connect with BACKUP load
AC GRID	AC output interface (on-grid side)	Connect to the grid
	Protective ground connection	Secondary protective grounding for reliable grounding of the inverter

6.4. Connect Protective Earth(PE)

Attention

- The inverter is a transformerless type, which requires that neither the positive nor the negative pole of the photovoltaic array be grounded; otherwise, the inverter will not operate normally.
- Before AC side, photovoltaic array connection and communication connection, please make external ground connection first.
- In photovoltaic power generation systems, all non-current-carrying metal parts and equipment shells should be grounded (such as photovoltaic brackets, distribution cabinet shells, inverter shells, etc.).
- The protective grounding of the chassis shell cannot replace the PE connection in the AC output wiring, and both must be ensured to be reliably grounded.
- Please bring your own protective ground wire. It is recommended to use yellow-green outdoor single-core copper wire with a cross-sectional area of 4~6mm².
- It is recommended to apply silicone or paint on the ground terminal to improve its anti-corrosion performance.

Steps	Operation Content	Operation Icon
step 1	Use wire strippers to strip the insulation layer of the ground cable to an appropriate length and insert it into the insulating heat shrink tube.	
Step 2	Thread the ground cable into the OT terminal and use a crimping plier to tighten it.	
Step 3	Wrap the heat shrink tube around the crimping area of the OT terminal, and use a heat gun to blow against the heat shrink tube until it shrinks completely.	
Step 4	Remove the grounding screw on the inverter chassis and use a screwdriver to secure the cables	

6.5. Connect DC Input Cables(PV and Battery)



Warning

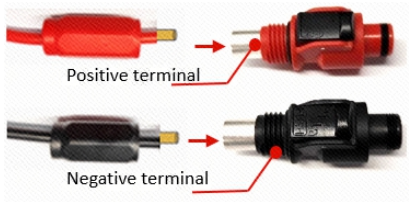


- Before connecting the PV array to the inverter, make sure the PV array is well insulated from ground.
- Please ensure that the positive or negative pole of the photovoltaic array is not short-circuited to the ground. If short-circuited, it may cause an AC or DC short circuit in the inverter and cause damage to the equipment.
- When connecting battery wires, please use insulated tools to prevent accidental electric shock or battery short-circuit (a battery short-circuit produces a large instantaneous current, releases a large amount of energy, and may cause a fire).



Attention

- Please ensure that the voltage and maximum short-circuit current of each PV array are within the allowable range of the inverter.
- Please ensure that the positive pole of the photovoltaic array is connected to the PV+ of the inverter and the negative pole is connected to the PV- of the inverter. If the input polarity is reversed, the inverter will be in a fault or alarm state and cannot operate normally.
- Before removing the positive and negative connectors, make sure the "DC SWITCH" on the chassis is turned to "OFF".
- Please ensure that the positive terminal of the battery is connected to the BAT+ of the inverter and the negative terminal is connected to the BAT- of the inverter.
- It is prohibited to connect a load between the inverter and the battery.
- It is recommended to use outdoor multi-core copper cables with a cross-sectional area of 4~6mm². It is recommended to use different colored cables to distinguish the positive and negative poles of the DC input.
- We suggest the distance between battery and inverter no longer than 1.5m, and the power line area must be larger than 5 AWG.

Steps	Operation Content	Operation Icon(PV)
step 1	Use wire strippers to strip 7~8mm of insulation from all DC cables.	
Step 2	Insert the positive and negative cables with the insulation layer stripped into the positive and negative metal terminals respectively, and use crimping pliers to compress the cables and terminals tightly.	
Step 3	Pass the crimped positive and negative cables through the connector locking nuts, and insert them into the corresponding connector insulating sleeves until they are fastened. Pull gently on the cable to make sure the connection is tight. Use a force of 2.6~2.9N·m to tighten the locking nut and the insulating sleeve.	
Step 4	Use a multimeter to check the polarity of the PV cable. Once confirmed, plug it into the PV input port of the inverter.	
Steps	Operation Content	Operation Icon(Battery)
step 1	Use wire strippers to strip 10~11mm of insulation from all DC cables.	

Step 2	Insert the positive and negative cables with the insulation layer stripped into the positive and negative metal terminals respectively, and use crimping pliers to compress the cables and terminals tightly.	
Step 3	Pass the crimped positive and negative cables through the connector locking nuts, and insert them into the corresponding connector insulating sleeves until they are fastened. Pull gently on the cable to make sure the connection is tight. Use a force of 2.6~2.9N·m to tighten the locking nut and the insulating sleeve.	
Step 4	Use a multimeter to check the polarity of the battery cable. Once confirmed, plug it into the battery input port of the inverter. When the connector plug is fully inserted, push the latch outward to lock.	

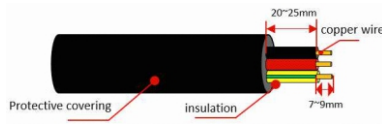




6.6. Connect the AC Output Cable


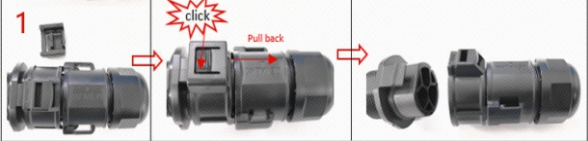
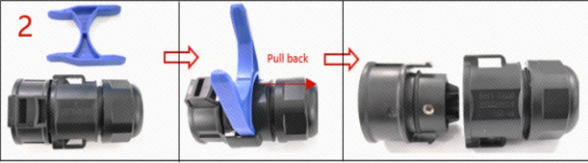
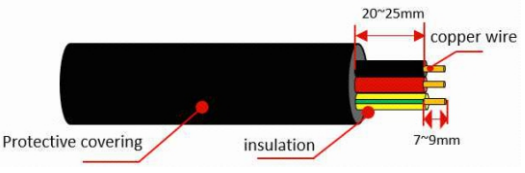

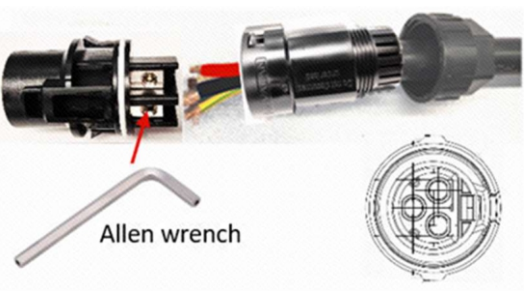





Attention

- The inverter output can be connected to the power grid only after obtaining the connection permission from the local power company.
- Before connecting to the grid, make sure that the grid voltage and frequency meet the inverter requirements.
- No load can be connected between the inverter and the AC circuit breaker directly connected to the inverter.
- The inverter integrates a comprehensive leakage current monitoring unit. When the inverter detects a leakage current greater than the allowable value, it will quickly disconnect from the grid.
- Pay special attention to the "PE" cable and "N" cable locations. If the phase wires are connected to the terminals of the "PE" or "N" cable, it may cause permanent damage to the inverter.
- When wiring, disconnect the AC side circuit breaker and prevent it from being accidentally reconnected.

- It is recommended to use outdoor multi-core copper cables with a cross-sectional area of 4~6mm². It is recommended to connect the AC-BACKUP cable first and then the AC-GRID cable.
- Remove the unlocking button of the AC Backup connector after use to avoid accidental removal.

Steps	Operation Content	Operation Icon(AC-BACKUP)
step 1	Use wire strippers to strip off a certain length of protective layer and insulation layer from the AC cable.	
Step 2	Take out the AC connector and unscrew the locking nut and sealing sleeve of the connector's waterproof joint in sequence.	
Step 3	After inserting the cable into the locking nut and sealing sleeve in sequence, connect the cable to the lock hole according to the mark on the connector, and tighten it with an Allen wrench.	
Step 4	Tighten the sealing sleeve to the connector, and the locking nut to the sealing sleeve in sequence.	
Step 5	Insert the AC connector pair into the AC-BACKUP position. Hear the click and connect in place.	

Loosen tool usage	<p>Figure 1, insert the loosen tool in the direction, press down and pull the connector back to release the AC plug; (The unlock button should not be left on the connector when the inverter is in normal use).</p> <p>Figure 2 , insert into the loosen tool in the direction, pull the connector back to release the sealing sleeve.</p>	  
Steps	Operation Content	Operation Icon(AC-Grid)
step 1	Use wire strippers to strip off a certain length of protective layer and insulation layer from the AC cable.	
Step 2	Take out the AC connector and unscrew the locking nut and sealing sleeve of the connector's waterproof joint in sequence.	
Step 3	After inserting the cable into the locking nut and sealing sleeve in sequence, connect the cable to the lock hole according to the mark on the connector, and tighten it with an Allen wrench.	

Step 4	Align the sealing sleeve with the AC connector slot, push it forward, and secure the waterproof lock nut to the sealing sleeve after hearing a snap.	
Step 5	Plug the AC connector pair into the AC-Grid position, push the AC connector forward, and lock it into place when you hear a click sound.	
Loosen tool usage	<p>Figure 1, insert the loosen tool in the direction and pull the connector back to release the AC plug;</p> <p>Figure 2 , clip into the loosen tool in the direction shown in and pull the connector back to release the sealing sleeve.</p>	

6.7. Connect Communication Line

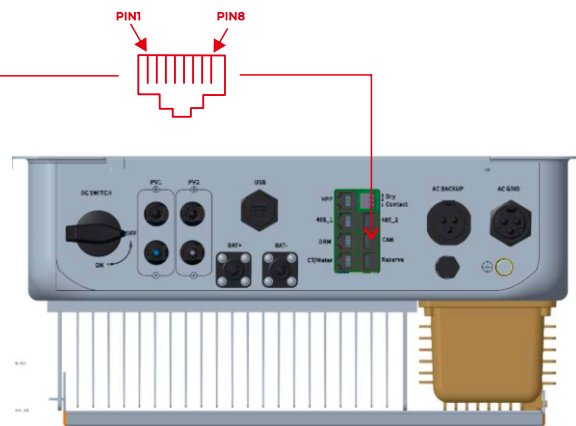
6.7.1. Connect BMS Communication Line



Attention

- The BMS communication line distributed with the inverter is 3m long. If the length is not enough, it can be extended to 5m. The communication line between the inverter and the battery cannot be longer than 5m.
- CAN communication is used between the inverter and the battery, and a standard RJ45 crystal head can be connected.
- The CAN battery communication and 485-2 battery communication can't be installed at same time, please select the correct communication method according to the battery manual.
- If the cable such as "485-2" cable or "CAN" cable not used, please do not remove the filler plug from the cable support sleeve

PIN Number	Color	CAN
1	Orange and White	NC
2	Orange	NC
3	Green and White	NC
4	Blue	CANH
5	Blue and White	CANL
6	Green	NC
7	Brown and White	CGND
8	Brown	CTRL COM



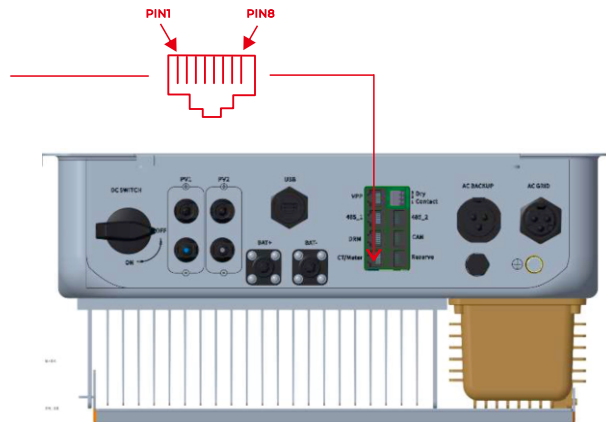
6.7.2. Connect the CT Sensor/Smart Meter Communication Cable



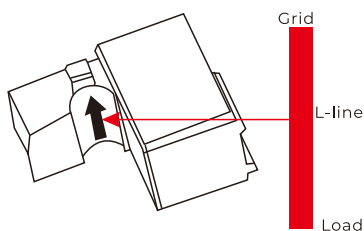
Attention

- The inverter can be connected to a CT sensor/smart meter to monitor the user's electricity usage.
- The electric meter and CT sensor are shipped with the inverter, and the relevant parameters have been preset at the factory. Please do not modify the related parameters of the electric meter and CT.
- The length of the CT sensor cable distributed with the inverter is 3m or 5m. Please install the meter and CT appropriately according to the actual situation, but the longest cable should not exceed 15m.
- The communication line connecting the meter to the inverter supports a maximum length of 100m and can be connected to a standard RJ45 crystal plug.

PIN Number	Color	CT/Meter
1	Orange and White	485_B
2	Orange	CT1
3	Green and White	CT1
4	Blue	CT1
5	Blue and White	485_A
6	Green	CT2
7	Brown and White	CT2
8	Brown	CT2



During the actual operation, please pay attention to the installation of current transformer as the diagram shows below:



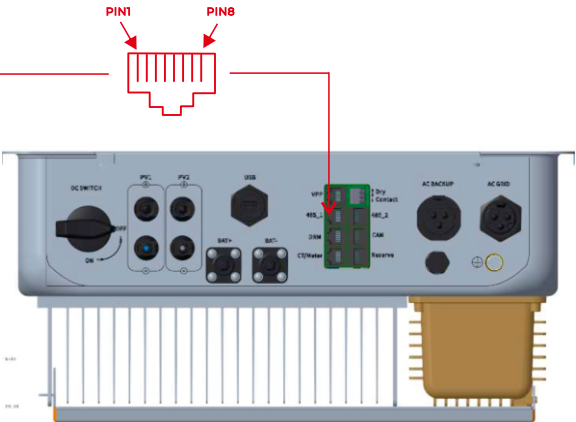
As illustrated above, open the current transformer and you can see an arrow labeled on it indicating the direction of current. Connect the energized conductor in the detection line to the current transformer. After latching the current transformer, the installation has been finished.

Notice:

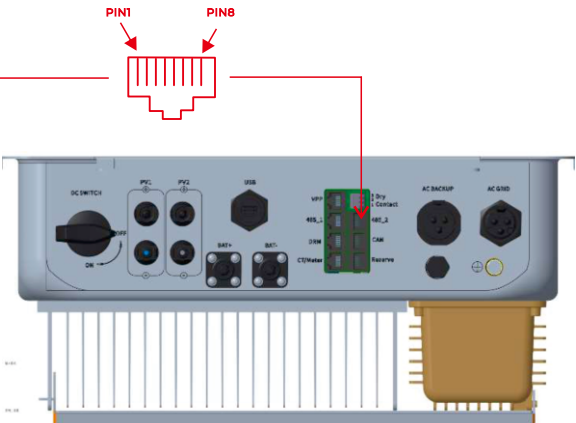
1. The current transformer/smart meter must be installed between the load and grid, and the sensor needs to be placed in the distribution cabinet.
2. The meter and CT cannot be installed at the same time. When selecting CT or electric meter, set relevant sensor model.
3. If the cable such as "CT" cable is not used, please do not remove the filler plug from the cable support sleeve.

6.7.3. Connect 485 Communication Line

PIN Number	Color	User Comm
1	Orange and White	485_B
2	Orange	NC
3	Green and White	NC
4	Blue	485_B
5	Blue and White	485_A
6	Green	NC
7	Brown and White	485-2/7
8	Brown	NC

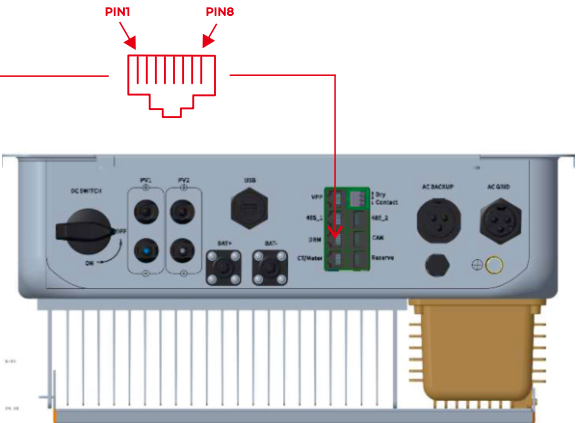


PIN Number	Color	User Comm
1	Orange and White	485_B
2	Orange	NC
3	Green and White	NC
4	Blue	485_B
5	Blue and White	485_A
6	Green	NC
7	Brown and White	485-1/7
8	Brown	NC



6.7.4. Connect DRMS Communication Line (Australia Only)

PIN Number	Color	DRM
1	Orange and White	DRM5
2	Orange	DRM6
3	Green and White	DRM7
4	Blue	DRM8
5	Blue and White	RefGen
6	Green	DRM0/COM
7	Brown and White	Pin_8
8	Brown	Pin_7



MODE	Rj45 socket asserted by shorting pins		Requirement
DRM0	5	6	Operate the disconnection device
DRM5	1	5	Do not generate power
DRM6	2	5	Do not generate at more than 50% of rated power
DRM7	3	5	Do not generate at more than 75% of rated power and sink reactive power if capable
DRM8	4	5	Increase power generation (subject to constraints from other active DRM's)

6.7.5. Connect VPP Communication Line

PIN Number	Color	VPP
1	Orange and White	485-B
2	Orange	CGND
3	Green and White	NC
4	Blue	485-B
5	Blue and White	485-A
6	Green	NC
7	Brown and White	NC
8	Brown	NC

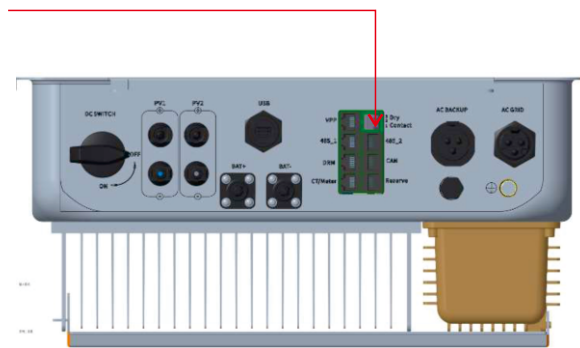
6.7.6. Remote ShutDown

PIN Number	Color	Reserve
1	Orange and White	CGND
2	Orange	CGND
3	Green and White	NTC_EXT
4	Blue	NTC_EXT
5	Blue and White	CGND
6	Green	CGND
7	Brown and White	EXT_SD
8	Brown	EXT_SD

Remote Shutdown: When there is an accident, short 5,6, and 7,8 pins can control the device to stop working(The remote shutdown function must be enabled first).

6.7.7. Dry Contact

PIN Number	Dry Contact
1	RLY_COTL_DO-
2	NC
3	RLY_COIL_DO+







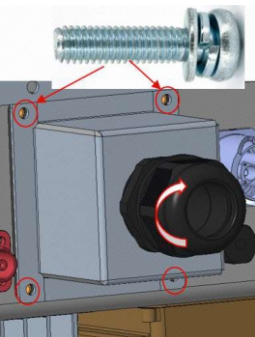
6.7.8. Fixed Cable Waterproof Connector



Attention

- The communication cables must be fixed to the support through the waterproof connector and then fixed to the inverter

Steps	Operation content	Operation icon
Step 1	Take out the cables waterproof connector and unscrew the locking nut ,sealing ring and sealing sleeve of the connector's waterproof joint in sequence.	
Step 2	Remove the five plugs in the seal ring.	

Step 3	Route the cables through the lock nut of the cable outlet box assembly, the sealing ring (the cable is inserted into the sealing ring through the opening of the sealing ring), and the sealing sleeve.	
Step 4	Tighten the nut on the cable waterproof connector and secure it to the support. Torque: 1.7N.m.	
Step 5	Insert the RJ45 plugs into the corresponding positions, secure the brackets to the chassis using M4X10 cross-slot pan head assembly screws, and secure the waterproof nuts.	

7. Trial Run

7.1. Inspection Before Trial Operation

Before turning on the inverter for the first time, you need to do the following checks:

- Check and confirm that all equipment is securely installed. Ensure that the installation location is convenient for operation and maintenance, the controls are designed to facilitate ventilation and heat dissipation, and the installation environment remains clean and tidy.
- Ensure that the DC switch and AC circuit breaker are in the "OFF" state.
- Ensure that the protective ground wire, DC input wire, AC output wire, and communication wire are connected correctly and securely.
- Make sure unused wiring ports are sealed.
- Make sure that the used wiring ports are sealed.
- Make sure no construction tools are left on top of the machine.
- Confirm that the voltage and frequency of the inverter's grid connection access point comply with the grid connection requirements.

7.2. Run Steps

Step 1: Close the AC circuit breaker between the inverter and the grid.

Step 2: If there is a DC switch between the inverter and the battery, close the switch.

Step 3: If there is a DC switch between the inverter and the photovoltaic array, close the switch.

Step 4: Close the AC circuit breaker between the inverter and the BACKUP load.

Step 5: Turn the DC switch on the inverter to "ON".

8. Shut Down/Dismantle/Discard the Inverter

8.1. Shut Down the Inverter



Warning

- After the inverter is shut down, there may still be a risk of burns on the surface of the chassis. After the inverter has cooled down, you need to wear protective gloves before operating the inverter.
- After the inverter is powered off, it takes time for the internal components to discharge. Please wait until the device is completely discharged according to the label time requirements.

Step 1: Disconnect the AC circuit breaker between the inverter and the grid.

Step 2: Disconnect the AC circuit breaker between the inverter and the BACKUP load.

Step 3: If there is a DC switch between the inverter and the battery, turn off the switch.

Step 4: If there is a DC switch between the inverter and the photovoltaic array, turn off the switch.

Step 5: Turn the DC switch on the inverter to "OFF".

8.2. Remove the Inverter



Warning

- After the inverter is disconnected from the power grid and photovoltaic array, you need to wait for at least 10 minutes before touching the internal conductive components.



Attention

- Before removing the inverter, both the AC side and DC side must be powered off.
- Please wear personal protective equipment when operating.

Step 1: Disconnect all electrical connections of the inverter, including: DC wires, AC wires, communication wires, and protective ground wires.

Step 2: Refer to "5.5 Installing the Hybrid Inverter" and follow the reverse steps to remove the inverter.

Step 3: Remove the back hanging board from the wall.

Step 4: If the inverter will be put into use later, please refer to "4.3 Product Storage" to properly store the inverter.

8.3. Discard Inverter



Attention

- Some parts of the inverter (such as capacitors) may cause environmental pollution.

When the inverter cannot be used anymore and needs to be scrapped, please dispose it according to the electrical waste disposal requirements of the regulations of the country/region where the inverter is located. Do not dispose of the inverter together with household waste.

9. Troubleshooting and Resolution

9.1. Fault Resolution

When the inverter fails, you can query the fault information (including fault code, fault name, etc.) through the mobile APP. Please troubleshoot according to "Table 9-1 Fault Information List". If the troubleshooting method cannot help you, please Contact the after-sales service center.



Attention

When contacting the after-sales service center, to facilitate quick resolution of the problem, please collect the following information:

- Inverter information, such as serial number, software version, equipment installation time, fault occurrence time, fault occurrence frequency, etc.
- Equipment installation environment, such as weather conditions and whether the photovoltaic array is blocked or shadowed. It is best to provide relevant photos, videos and other documents.
- Grid conditions.

Table 9-1 Fault information list

SN.	Fault Name	Problem Causes	Solution
1.	Grid blackout	1) The power grid is out. 2) The AC (on-grid side) line is disconnected	1) Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid. 2) Check the AC (on-grid side) lines: ① Check whether the

			<p>AC wiring is tight;</p> <p>② Check whether the AC cable is connected to the correct terminal (whether the live wire and N wire are connected reversely);</p> <p>③ Check whether the AC circuit breaker is closed;</p>
2.	Grid overvoltage protection	The grid voltage is higher than the allowable range, or the high voltage duration exceeds the high voltage ride-through setting value	1) If a fault occurs accidentally, it may be caused by a short-term abnormality in the power grid. Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid.
3.	10min overvoltage protection	The sliding average value of the grid voltage within 10 minutes exceeds the range specified by safety regulations.	<p>2) If faults occur frequently, please check whether the grid voltage is within the allowable range:</p> <p>① Measure the actual grid voltage. If the grid voltage is indeed higher than the set value, please contact the local power operator;</p> <p>② Check the inverter protection parameter settings through the APP, and modify the overvoltage protection value after obtaining the consent of the local power operator.</p>
4.	Grid undervoltage protection	The grid voltage is lower than the allowed range, or the low voltage duration exceeds the low voltage ride-through setting value.	1) If a fault occurs accidentally, it may be caused by a short-term abnormality in the power grid. Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid.

			<p>2) If faults occur frequently, please check whether the grid voltage is within the allowable range:</p> <p>① Check whether the AC wiring is tight;</p> <p>② Measure the actual grid voltage. If the grid voltage is indeed lower than the set value, please contact the local power operator;</p> <p>③ Check the inverter protection parameter settings through the APP, and modify the overvoltage protection value after obtaining the consent of the local power operator.</p>
5.	Grid overfrequency protection	The actual frequency of the power grid is higher than the local power grid standard requirements	<p>1) If a fault occurs accidentally, it may be caused by a short-term abnormality in the power grid. Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid.</p> <p>2) If faults occur frequently, please check whether the grid frequency is within the allowed range:</p> <p>① Measure the actual grid frequency. If the grid frequency is indeed higher than the set value, please contact the local power operator;</p> <p>② Check the inverter protection parameter settings through the APP, and modify the overfrequency protection value after obtaining the consent of the local power operator.</p>

6.	Grid underfrequency protection	The actual frequency of the power grid is lower than the local power grid standard requirements	<p>1) If a fault occurs accidentally, it may be caused by a short-term abnormality in the power grid. Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid.</p> <p>2) If faults occur frequently, please check whether the grid frequency is within the allowed range:</p> <p>① Measure the actual grid frequency. If the grid frequency is indeed lower than the set value, please contact the local power operator;</p> <p>② Check the inverter protection parameter settings through the APP, and modify the underfrequency protection value after obtaining the consent of the local power operator.</p>
7.	Island protection	The power grid has been disconnected. Due to the existence of the load, the grid voltage needs to be maintained, and the grid connection is stopped according to safety regulations.	<p>1) If a fault occurs accidentally, it may be caused by a short-term abnormality in the power grid. Generally, the alarm disappears automatically after the power grid returns to normal, and the inverter will be reconnected to the grid.</p> <p>2) If faults occur frequently, please confirm whether the power grid is lost.</p>
8.	30mA GFCI protection	The input-to-ground insulation resistance becomes low during inverter operation.	1) If a fault occurs accidentally, it may be due to an accidental abnormality in the
9.	60mA GFCI protection		

10.	150mA GFCI protection		<p>external circuit. Under normal circumstances, the alarm will automatically disappear after the fault is cleared, and the inverter will resume normal operation.</p> <p>2) If faults occur frequently, please check whether the impedance of the photovoltaic string and DC cable to ground is too low. If there is a short circuit or the cable insulation is damaged, please rectify it as soon as possible;</p>
11.	GFCI slow protection		
12.	DCI level 1 protection	<p>The DC component of the inverter output current is higher than the safety regulations or the machine's default allowable range.</p>	<p>1) If a fault occurs accidentally, it may be caused by an external fault (such as power grid abnormality, frequency abnormality, etc.). Under normal circumstances, the alarm will automatically disappear after the fault is cleared, and the inverter will resume normal operation.</p> <p>2) If faults occur frequently and affect the normal power generation of the power station, please contact the dealer or after-sales service center;</p>
13.	DCI Level 2 Protection		
14.	Low insulation resistance	<p>1) The photovoltaic string is short-circuited to ground;</p> <p>2) The photovoltaic string installation environment is</p>	<p>1) Use the APP to check whether the ISO impedance protection is too high and confirm that it meets local regulations;</p>

		humid for a long time and the circuits are poorly insulated from the ground.	<p>2) Check whether the impedance of the photovoltaic strings and DC cables to ground is too low. If there is a short circuit or the cable insulation is damaged, please rectify it in time;</p> <p>3) If the cable is normal and the fault is confirmed to have occurred on a rainy day, please reset the "insulation resistance protection" value of the inverter through the APP.</p>
15.	System grounding abnormality	<p>1) The protective ground wire of the inverter is not connected</p> <p>2) When the output of the photovoltaic string is grounded, the inverter AC output cables L and N are connected in reverse.</p>	<p>1) Check whether the protective ground wire of the inverter is connected properly;</p> <p>2) Check whether the AC cable is connected in the wrong sequence;</p> <p>3) Check whether the insulation between ground wire and live wire is normal.</p>
16.	Hardware anti-backflow protection	Abnormal load fluctuations	<p>1) If a fault occurs accidentally, it may be caused by an external fault. Generally, the alarm will automatically disappear after the fault is cleared, and the inverter will resume normal operation.</p> <p>2) If faults occur frequently and affect the normal power generation of the power station, please contact the dealer or after-sales service center;</p>
17.	Internal communication disconnected	<p>1) Frame format error</p> <p>2) Parity error</p> <p>3) can bus offline</p>	Turn off the AC output side switch and DC input side switch, and close the

		4) Hardware CRC check error 5) Send (receive) time control; Position is receive (send) 6) Transmitting to a unit that is not allowed	AC output side switch and DC input side switch after 5 minutes. If the fault persists, please contact your dealer or after-sales service center.
18.	AC sensor self-test abnormality	AC sensor has sampling abnormality	
19.	Leakage current sensor self-test abnormality	Leakage current sensor has sampling abnormality	
20.	Relay self-test abnormality	1) Relay abnormality (relay short circuit) 2) Control circuit abnormality 3) Abnormal AC test wiring(may be a virtual connection or short circuit)	
21.	Flash read and write error	Internal storage Flash exception	
22.	Bus overvoltage	1) PV voltage is too high 2) Inverter BUS voltage sampling abnormality	
23.	PV continues hardware overcurrent	1) Improper component configuration 2) Hardware damage	
24.	PV continuous software overcurrent		
25.	PV input overvoltage	The photovoltaic array configuration is incorrect and there are too many photovoltaic panels connected in series.	Check whether the open circuit voltage of the PV string is higher than the maximum input voltage of the inverter. If so, adjust the series configuration of the PV string to ensure that the

			open circuit voltage of the string is not higher than the maximum operating voltage of the inverter.
26.	PV1 short circuit	PV string reverse connection or short circuit	Check whether the PV string is reversely connected. If so, wait until the PV string current drops below 0.5A, turn off the DC switch, and adjust the polarity of the corresponding string.
27.	PV2 short circuit		
28.	Chamber temperature too high	1) The inverter installation location is not ventilated 2) The ambient temperature is too high, exceeding 60℃	1) Generally, the inverter will restart after the internal temperature or module temperature returns to normal; 2) If the fault occurs repeatedly, you need to check whether the usage environment meets the requirements: ① Check whether the inverter ambient temperature is too high; ② Check whether the inverter is in a place that is easy to ventilate. If so, please improve the ventilation and heat dissipation conditions; ③ Check whether the inverter is exposed to direct sunlight. If so, please provide appropriate shade.
29.	CT/Meter anomaly	CT/Meter communication is faulty	1) Check whether the wire connection between the instrument and the inverter is in good condition; 2) Check whether the distance between the CT

			<p>line and the inverter is within the specification range;</p> <p>3) Restart the inverter.</p>
30.	Bat Voltage High	Battery Voltage higher than 60V	<p>1) Check the voltage of battery is in the range of specification or not.</p> <p>2) Check the battery connection is right or not If battery is really higher than 60V. Please disconnect the connection of battery and check inverter.</p>
31.	Bat Voltage Low	Battery Voltage Lower than 42 V	<p>1) Check the real voltage of battery.</p> <p>2) Check the wire of battery and inverter is good or not.</p>
32.	BMS Error	BMS Error	<p>1) Check the warning information from lithium battery user manual</p> <p>2) If the fault occurs frequently, please contact the dealer or after-sales service center.</p>
33.	Backup Voltage Low	Backup output voltage low	<p>1) Check the load of Backup. If overload occurred, reduce load.</p> <p>2) Restart inverter again.</p>
34.	Backup Overload	If this warning occurs three times, the off-grid function will be locked for one hour and the output power will be re-enabled.	<p>1) Please reduce the backup output load.</p>

9.2. Maintenance

9.2.1. Maintenance Precautions



Danger

- Improper maintenance operations may result in personal injury or equipment damage.
- Always remember that the inverter is powered by multiple sources: PV strings, batteries and the common grid. Before doing anything, follow these steps:
 - ① First turn off the AC circuit breaker on the AC side, then turn off the DC switch
 - ② Wait at least 5 minutes until the internal energy storage element is discharged before performing any maintenance operations inside the device.
 - ③ Use testing equipment to verify that voltage and current are not present.



Attention

- Please do not replace the internal components of the inverter without authorization. If you need any maintenance services, please contact the after-sales service center. Otherwise, the inverter manufacturer will not bear any warranty and joint liability for any losses caused.
- The inverter can be restarted only after the faults that affect the safety performance of the inverter are eliminated.
- Avoid unnecessary contact with the circuit board. If contact is necessary, please abide by the electrostatic protection regulations and wear an anti-static bracelet.
- When performing electrical connection and maintenance work, it is recommended to post temporary warning signs or set up barriers to prevent unauthorized persons from entering the electrical connection or maintenance area.

9.2.2. Maintenance Plan

Check Content	Inspection Method	Maintenance Cycle
System cleaning	1) Check whether foreign matter, dust and other obstructions are attached to the heat sink, and clean the heat sink if necessary; 2) Please use a dry soft cloth or soft brush to clean the inverter. Remember not to use water, corrosive chemicals, cleaning agents or strong detergents.	1 time/half a year~1 time/year (depending on ambient dust content)
DC switch	Open and close the DC switch 10 times continuously to ensure that the DC switch functions normally.	1 time/year
Equipment cable entry hole	Check whether the equipment cable entry hole is incompletely sealed or has a large gap. If so, please re-block it.	1 time/year
Electrical connections	1) Check whether the cable connection is loose or fallen off. 2) Check whether the cable is damaged, especially whether there are cuts on the part in contact with the metal casing.	1 time/half a year~1 time/year

10. Appendix

10.1. Technical Data

Technical Parameters	TB3K-H1P	TB4K-H1P	TB4.6K-H1P	TB5K-H1P	TB6K-H1P
DC Input Side(PV)					
Maximum Input Power	6000W	8000W	9200W	10500W	11200W
Maximum Input Voltage	550V				
Rated Input Voltage	360V				
Starting Voltage	120V				
MPPT Operating Voltage Range	120V~550V				
Full Load DC Voltage Range	275V-440V	275V-440V	340V-440V	340V-440V	340V-440V
Maximum Input Current of Each MPPT	13.5A				
Max.Short-Circuit Current Per MPPT Trackers	16.9A				
MPPT Quantity	2				
Number of MPPT Input strings Per Channel	1				
Backfeed Current to the Array	0A				
DC Input Side(Battery):					
Battery Type	lithium battery				
Battery Voltage Range	42V~59V				
Rated Battery Voltage	51.2V				
Maximum Continuous Charging and Discharging Current	66A	85A	85A	85A	85A
Maximum Charging and Discharging Power	3000W	4000W	4000W	4000W	4000W
BMS Communication Method	CAN / RS485				
AC Input Side(ON-Grid):					
Rated Power	3000W	4000W	4600W	5000W	6000W
Maximum Apparent Power	3000VA	4000VA	4600VA	5000VA	6000VA
Maximum Current	13.6A	18.2A	20.9A	22.7A	27.3A
Maximum Output Fault Peak Current	65A(56uS)				
Rated Grid Voltage	230VAC, L/N/PE				
Rated Grid Frequency	50Hz/60Hz				
Grid Frequency Range	45Hz~55Hz/55Hz~65Hz				
Total Current Waveform Distortion Rate	<3%				
Power Factor	1 (0.8 lead ~ 0.8 lag)				
AC Output Side (BACKUP):					
Rated Output Power	3000W	4000W	4000W	4000W	4000W
Maximum Output Apparent Power	3000VA	4000VA	4000VA	4000VA	4000VA
Peak Output Apparent Power	3000VA @60s	4000VA @60s	4000VA @60s	4000VA @60s	4000VA @60s
Maximum output Current	13.6A	18.2A	18.2A	18.2A	18.2A
Rated Output Voltage	230VAC, L/N/PE				
Rated Output Voltage Frequency	50Hz/60Hz				

Voltage Frequency Range	45Hz~55Hz/55Hz~65Hz				
Total Voltage Waveform Distortion Rate (@Liner Load)	<3%				
ON/OFF-Grid Automatic Switching Time	<10ms				
Efficiency:					
Maximum Efficiency	97.2%	97.3%	97.4%	97.5%	97.6%
MPPT Maximum Efficiency	≥99.5%				
European Efficiency	97%	97.1%	97.1%	97.2%	97.2%
Maximum Efficiency of Battery Charging and Discharging	≥97.5%				
Communication Display:					
Human-Computer Interaction	LED+ APP				
BMS Communication	CAN / RS485				
Meter Communication	RS485				
Monitoring	485/WiFi / 4G (Optional)				
Protective Function:					
PV Insulation Resistance Detection	Yes				
Residual Current Monitoring	Yes				
PV Reverse Connection Protection	Yes				
Battery Reverse Polarity Protection	Yes				
Anti-Islanding Protection	Yes				
AC OverCurrent Protection	Yes				
AC Short Circuit Protection	Yes				
AC OverVoltage Protection	Yes				
DC Surge Protection	DC:II				
AC Surge Protection	AC:II				
DC Switch	Yes				
General Parameters:					
Working Temperature Range	-25℃~+60℃ (with derating above 45℃)				
Relative Humidity Range	0~100%				
Maximum Working Altitude	2000m				
Noise	≤25dB(A)				
Standby Power Consumption	<10W				
Topology	non-isolated				
Cooling Method	natural cooling				
Protection Level	IP65				
Weight	26kg				
Dimensions(Width×Height× Thickness)	480mm×565mm×205mm				
Installation Method	Wall mounting				
Warranty Period	5 years(Integrated) / 10 years(Optional)				

10.2.Top Solar App

Top Solar App is a mobile phone application software that can communicate with the inverter through WIFI module or GPRS module. The functions that can be achieved through the App are as follows:

- 1) View the inverter's operating data, software version, alarm information, etc.
- 2) Set the grid parameters, communication parameters, protection parameters, etc. of the inverter.
- 3) Maintenance of equipment.
- 4) Upgrade the software version of the device.

Contact information

If you have any questions while using this product, please contact us. In order to better provide you with better after-sales service, we need your assistance in providing the following information:

- 1) Device model
- 2) Device serial number
- 3) Fault code/name
- 4) Brief description of the fault phenomenon

Manufacturer: Shenzhen Topband Co., Ltd

Address: 413 Room,B Zone,Research Institute of Tsinghua University, high tech Industrial Park, Yuehai streets, Nanshan District, Shenzhen

Telephone: 0755-2765 1888 **E-mail:** topband@topband.com.cn **URL:** www.topband.com.cn