

HSSP Series String Inverter

(HSSP3K-G01, HSSP4K-G01, HSSP5K-G01, HSSP6K-G01, HSSP8K-G01, HSSP10K-G01)

User Manual

Version: V1.0

HSSP Series String Inverter

(HSSP3K-G01, HSSP4K-G01, HSSP5K-G01, HSSP6K-G01,
HSSP8K-G01, HSSP10K-G01)

User Manual

Version: V1.0

Thank you for purchasing products designed and manufactured by Shenzhen Hopewind Technology Co., Ltd. (hereinafter referred to as "Hopewind"). We hope our products and this manual can meet your demands. Any suggestion for improvement shall be appreciated.

Shenzhen Hopewind Technology Co., Ltd. reserves the copyright of this manual, and it shall be subject to change without any further notice.

About This Manual

➤ For Readers




This manual is helpful for technicians who install, commission, operate and maintain the string inverters of Hopewind. Suggest you view this manual carefully before using relative devices.

Readers are required to have basic knowledge on electric components, wiring, signs and mechanical drawings.

➤ Outlines

Chapter	Contents
1 Safety Precautions	The precautions which must be observed when transporting, storing, installing, running and maintaining the Inverter.
2 Product Description	This chapter introduces the basic principles, naming rules, machine configuration and product data.
3 System Installation	Unpacking inspection, installation tools, installation environment, reserved space, fixing method and cable connection.
4 Commissioning Guide	Inspection before startup, commissioning and startup of the string inverter.
5 Maintenance and Troubleshooting	The chapter introduces the daily maintenance method, maintenance cycle and troubleshooting of the product.
6 Inverter Processing Guide	Basic requirements and precautions when disassembling, replacing, and scrapping the inverter.

➤ Warning Signs in This Manual

 DANGER	Major potential danger (especially a high voltage danger). Failure to observe the rules might cause serious personal injury or property loss.
 WARNING	Ordinary potential danger. Failure to observe the rules might cause personal injury or property loss.
 CAUTION	Ordinary potential risk. Failure to observe the rules might cause malfunction of the equipment or property loss.

➤ Glossaries and Abbreviations

Glossaries/Abbreviations	Description
MPPT	Maximum Power Point Tracking
PV string	Multiple series and parallel solar cells
EEPROM	Electrically Erasable Programmable Read-Only Memory
Hopelnsight	Hopewind Technology background monitoring and debugging software

Contents

1 Safety Precautions	1
1.1 Transport	1
1.2 Storage	1
1.3 Installation	2
1.4 Operating	2
1.5 Maintenance	3
2 Product Description	5
2.1 Product Introduction	5
2.1.1 Schematic Diagram	5
2.1.2 Operating Mode	6
2.2 System Configuration and Application	7
2.2.1 Application Description	7
2.2.2 Supported Grid Form	7
2.3 Naming Rules	8
2.4 Nameplate	8
2.5 Machine Configuration	9
2.6 Signs on Package	10
2.7 Warning Labels on the Inverter	11
2.8 Technical Data	12
2.9 Mechanical Parameters	13
2.10 Ambient Rquirements	14
3 System Installation	17
3.1 Unpack and Inspect	17
3.2 Installation Tool Preparation	17
3.3 Installation Environment Requirements	17
3.4 Reserved Space Requirements	18
3.5 Installation Method	18
3.6 Electrical Connections	19
3.6.1 Cable Requirements	19
3.6.2 Cable Selection	20
3.6.3 Torque Requirements	20
3.6.4 Preparation before Operation	20
3.6.5 Connect the Ground Wire	21
3.6.6 Connect the AC Output Cables	21
3.6.7 Connect the Communication Cables	22
3.6.8 Connect the DC Input Cables	22
4 Commissioning Guide	25
4.1 Check before Starting	25
4.2 System Power On	25
4.3 System Power Off	25
5 Maintenance and Troubleshooting	27
5.1 Maintenance Project and Cycle	27
5.2 Troubleshooting	28
6 Inverter Processing Guide	33
6.1 Remove the Inverter	33
6.2 Replace the Inverter	33
6.3 Package the Inverter	33
6.4 Scrap the Inverter	33

1 Safety Precautions

In this chapter, it describes the safety precautions that must be observed when installing, operating and maintaining the inverter. Please read them carefully before installation and maintenance and follow them in operation process, otherwise it may cause personal injury or damage to the converter, the generator as well as other related equipments.

When you use and operate the inverter, please take special attention to:



1. Only the qualified personnel are allowed to install, operate and maintain the inverters.
2. Do NOT incline or collide the product in transportation.
3. Do NOT make any liquid, sundries or rubbishes enter inside as they might cause short circuit inside the inverter.
4. Inverter must be disconnected with AC grid before completion of installation and maintenance.
5. Related protective measures are required to avoid electric shock or fire accident.



Please do not place inflammables and explosives around the inverter to ensure environmental safety.

1.1 Transport



1. When transporting, it is necessary to ensure that the inverter is packaged properly and the cabinet is fixed upwards to avoid strong vibration and collision.
2. In order to keep the inverter in good condition during transportation, it is important to use packaged transport and operate according to the labels on the package. For the meaning of the logos, please refer to [2.6 Signs on Package](#).
3. The transportation environment must meet the requirements. Please refer to [2.10 Ambient Requirements](#).

1.2 Storage



The storage environment of the string inverter must meet the corresponding requirements. Please refer to [2.10 Environmental Requirements](#).

About long-term storage:

Before or after the installation and commissioning, if the string inverter is in the no-power supply state for more than three weeks, it is regarded as long-term storage. Long-term storage of string inverters requires attention to the following issues:

- Put the desiccant into the cabinet and package the whole machine with packaging materials.
- When storing equipment, pay attention to ventilation and moisture. Stagnant water is strictly forbidden in the storage environment.
- Pay attention to the harsh environment, such as quenching, sudden heat, collision, dust, etc., to avoid damage to the string inverter.

- Regular inspections are required, usually not less than once a week. Check whether the packaging is intact to avoid pest bites. If it is damaged, it needs to be replaced immediately.
- If the storage time exceeds half a year, the package should be opened for inspection, repackaged, and desiccant replaced.
- It is strictly forbidden to store the device without packaging.

1.3 Installation



1. Before operating the internals of the string inverter, it must be confirmed that the input switch DC Switch of the string inverter and the circuit breaker corresponding to the AC side of the inverter are in the off state, and the housing of the inverter is reliably guaranteed.
2. The string inverter must be grounded according to the specifications. The size of the grounding conductor must meet the requirements of safety regulations to ensure the safety of personnel.



1. During installation, it is necessary to ensure that the string inverter's installation environment is well ventilated and heat-dissipating, and the device should not be directly exposed to sunlight.
2. The fixing of the string inverter is recommended by two people working together to avoid mechanical damage. During the installation process, safety measures should be taken to prevent bruises.
3. During installation and maintenance, it is necessary to prevent liquid, dust or debris from entering the inside of the string inverter. Conductive liquids and debris may cause internal short circuit of the string inverter, resulting in equipment damage.
4. When connecting the wiring of the external cable to the string inverter, the installation torque of the power cable must be ensured. Excessive torque may cause fatigue damage of the screw while too small torque may cause the contact resistance to become large, resulting in overheating.
5. The power cable terminals connected to the string inverter must comply with national standards. If the terminals are not in accordance with the standards, the power cable may be overheated. In severe cases, a fire may occur.
6. The installation site must meet the requirements of the operating environment. Please refer to [2.10 Environmental Requirements](#).

1.4 Operating



1. During the operation of the string inverter, it is necessary to ensure that the door panel of the string inverter is locked to prevent personal injury such as electric shock, and to prevent salt, moisture, dust or other conductive substances in the air from entering the string inverter.
2. When the string inverter is powered on, it is prohibited to touch the internal single boards, devices, cables and terminals of the string inverter and to plug and unplug the external terminals.
3. In case of any fault, abnormal smell or sound of the string inverter, please immediately switch off the DC Switch of the string inverter and the circuit breaker on the AC side of the inverter.



1. Power on the string inverter only after all installation work is completed and cables are not connected incorrectly.
2. It is prohibited to conduct any insulation resistance test or voltage withstand test on the string inverter. Wrong voltage withstand test will damage the string inverter.
3. When conducting insulation withstand voltage test on external equipment of the string inverter, the wiring

between the string inverter and the external equipment must be disconnected.

1.5 Maintenance



1. Before maintenance work, you must first disconnect the AC output side circuit breaker, then disconnect the input switch DC Switch, and wait at least 5 minutes before operating the string inverter.
2. During the maintenance process, try to avoid irrelevant personnel from entering the maintenance site.
3. Please maintain the string inverter under the condition that you are familiar with and understand the contents of this manual, and have suitable tools and test equipment.
4. For personal safety, please wear insulating gloves and anti-smashing shoes.



The string inverter must be checked and maintained regularly. For details, refer to [5 Maintenance and Troubleshooting](#).

--End of the chapter--

2 Product Description

2.1 Product Introduction

HSSP series single-phase string inverters are single-phase string grid-connected inverters independently developed by Hopewind Technology, mainly including six models: HSSP10K-G01, HSSP8K-G01, HSSP6K-G01, HSSP5K-G01, HSSP4K-G01, and HSSP3K-G01. HSSP10K-G01 and HSSP8K-G01 are inverters with 3 input interfaces. HSSP6K-G01, HSSP5K-G01 and HSSP4K-G01 are inverters with 2 input interfaces; HSSP3K-G01 is the inverter with one input interface; and the grid-connected voltage levels of the six models are all 220VAC. The maximum DC input voltage is 600VDC. The main function is to convert the direct current generated by the photovoltaic string into alternating current and feed it into the grid.

2.1.1 Schematic Diagram

HSSP10K-G01 and HSSP8K-G01 are connected to the string inverter through 3 PV interfaces (HSSP6K-G01, HSSP5K-G01 are inverters with 2 interfaces), and there are 2 MPPT circuits inside the inverter to track the strings. HSSP4K-G01 is connected to the string inverter through 2 string input interfaces (HSSP3K-G01 has only one interface), and there is a MPPT circuit inside the inverter to perform MPPT tracking on the string, and then convert the DC current to single-phase AC current through the inverter circuit. And there is a lightning protection function on the DC and AC sides. The schematic diagrams are shown below.

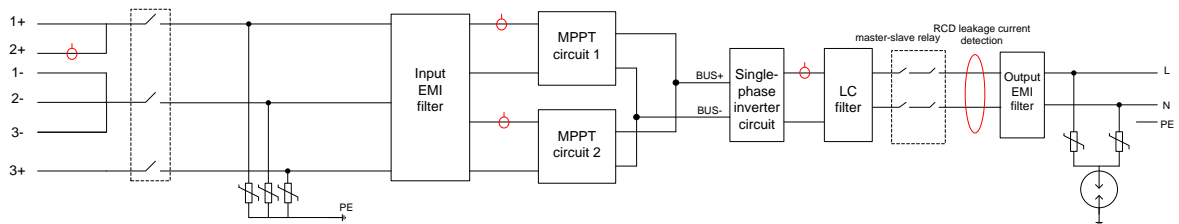


Figure 2-1 Schematic diagram of HSSP10K-G01 and HSSP8K-G01

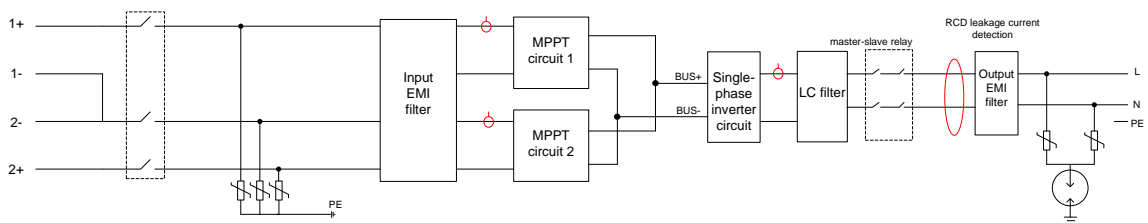


Figure 2-2 Schematic diagram of HSSP6K-G01 and HSSP5K-G01

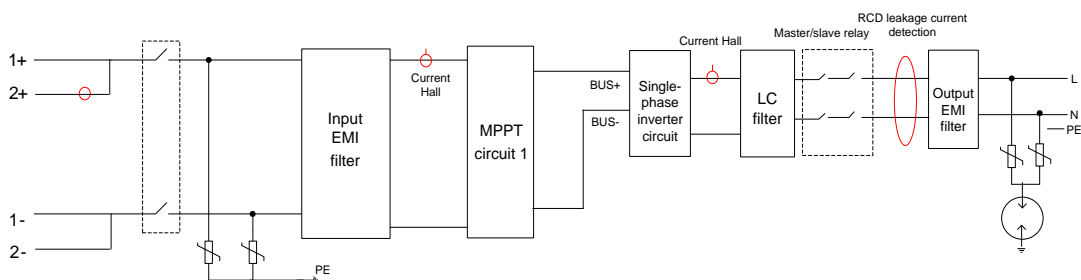


Figure 2-3 Schematic diagram of HSSP4K-G01

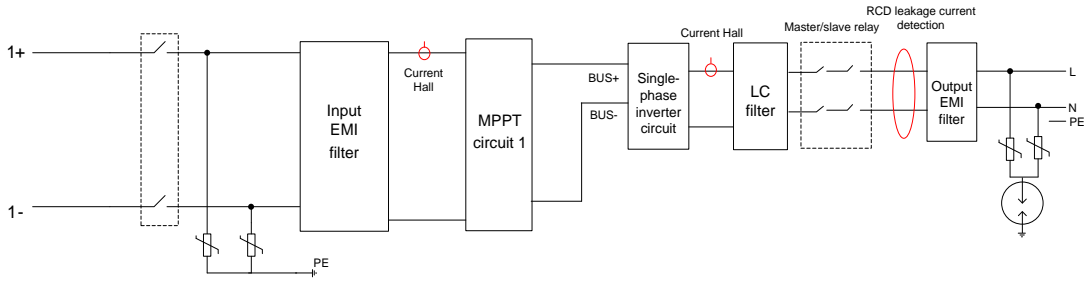


Figure 2-4 Schematic diagram of HSSP3K-G01

2.1.2 Operating Mode

HSSP3K-G01~10K series single-phase string inverter has three working modes: standby mode, running mode, and shutdown mode. The three mode switching conditions are shown as follows.

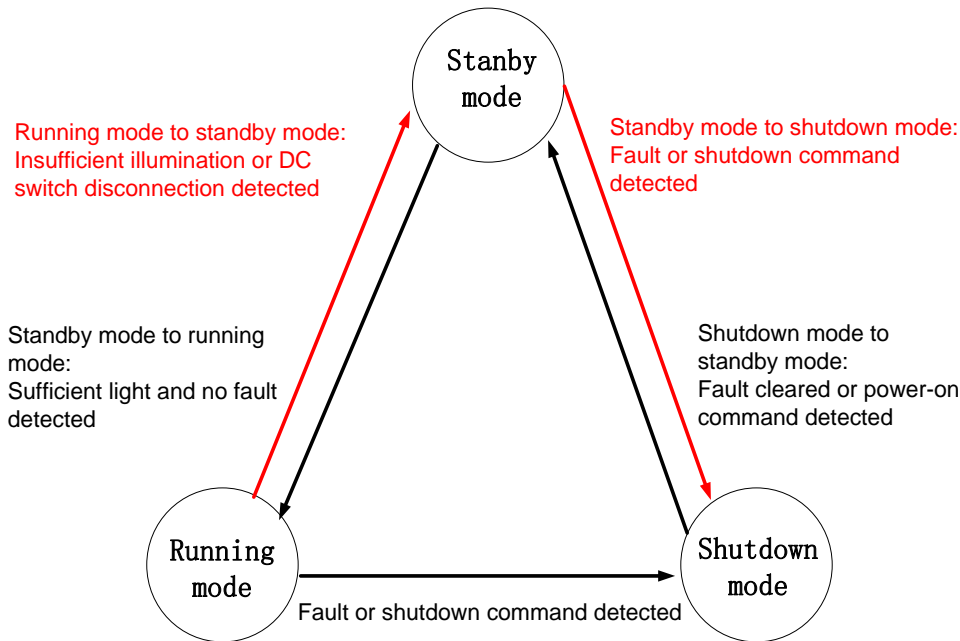


Figure 2-5 HSSP10K-G01 series inverter operating mode

Operating mode	Description
Standby	1) Standby mode mainly means that the external environment does not meet the operating conditions of the inverter such as insufficient light and the disconnection of DC input switch. In this mode, the inverter continuously self-tests and enters the operating mode once the operating conditions are met. 2) In the standby mode, if the inverter detects a shutdown command or finds a fault after the power-on test, it enters the shutdown mode.
Running	In the running mode The inverter converts the DC power of the PV string into AC power and feeds it into the grid. The inverter performs MPPT operation to make the PV string output maximum power. If the inverter detects a fault or a shutdown command, it enters the shutdown mode. If it is detected that the input power of the PV string is lower than the grid-connected power generation condition, it enters the standby mode.

Shutdown	<p>If the inverter detects a fault or a shutdown command during standby or operation, it switches to the shutdown mode.</p> <p>In the shutdown mode, if the inverter detects that the fault has been cleared or a power-on command, it enters the standby mode.</p>
----------	---

2.2 System Configuration and Application

2.2.1 Application Description

Figure 2-6 shows the application diagram of the string inverter. Figure 2-7 shows the design scheme of single-phase grid-connected system.

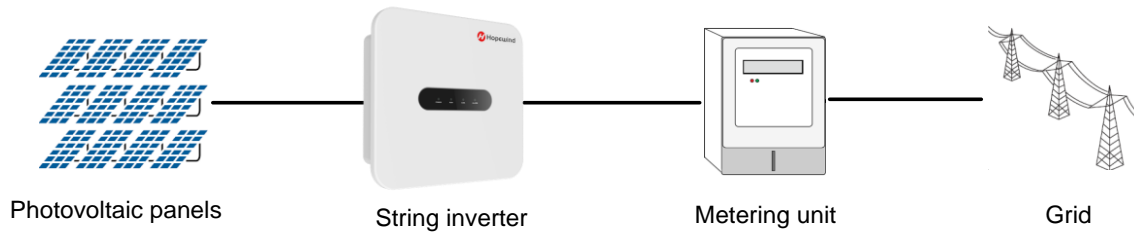


Figure 2-6 Schematic diagram of string inverter application

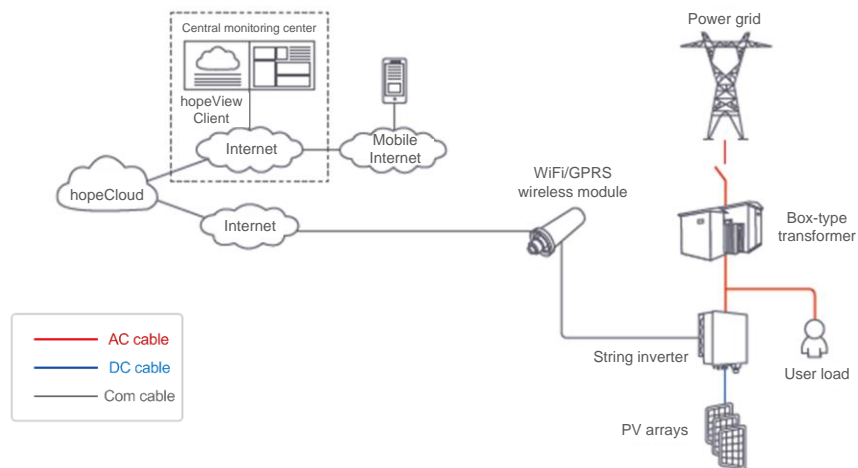


Figure 2-7 Design scheme of single-phase grid-connected system

2.2.2 Supported Grid Form

The power grid forms supported by HSSP3K-G01, HSSP4K-G01, HSSP5K-G01, HSSP6K-G01, HSSP8K-G01 and HSSP10K-G01 include TN-S, TN-C, TN-C-S and TT.

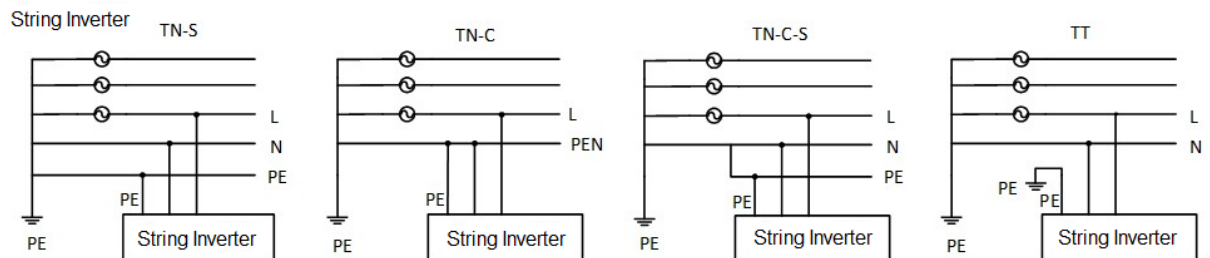


Figure 2-8 Schematic diagram of various power grid forms

2.3 Naming Rules

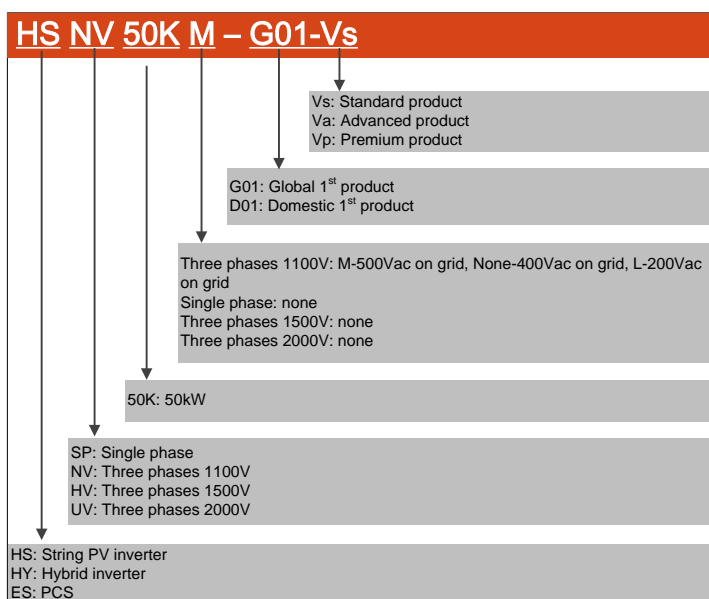
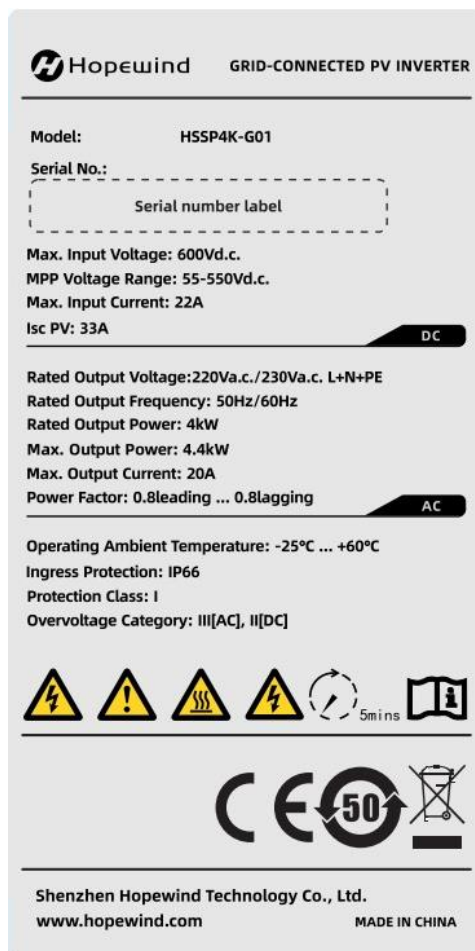


Figure 2-9 Naming rules

2.4 Nameplate



ⓘ Note: The data is only for reference. Please refer to the physical or technical agreement of the corresponding product.

2.5 Machine Configuration

This section shows the internal components, the back components and the bottom interfaces of the inverter.

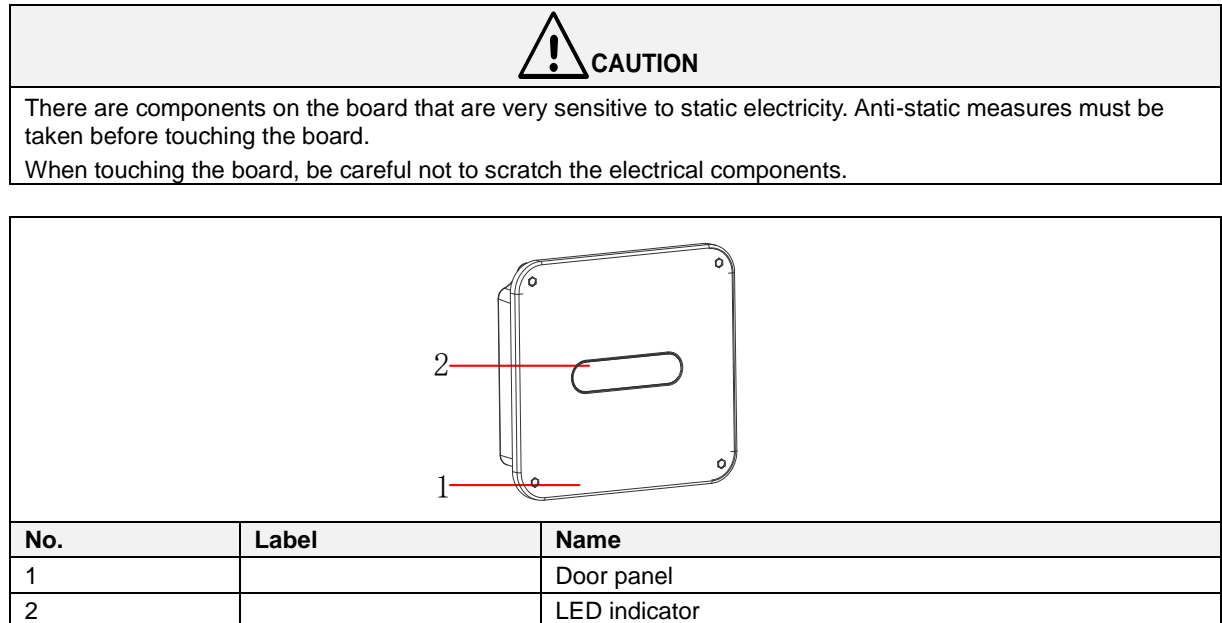

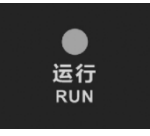


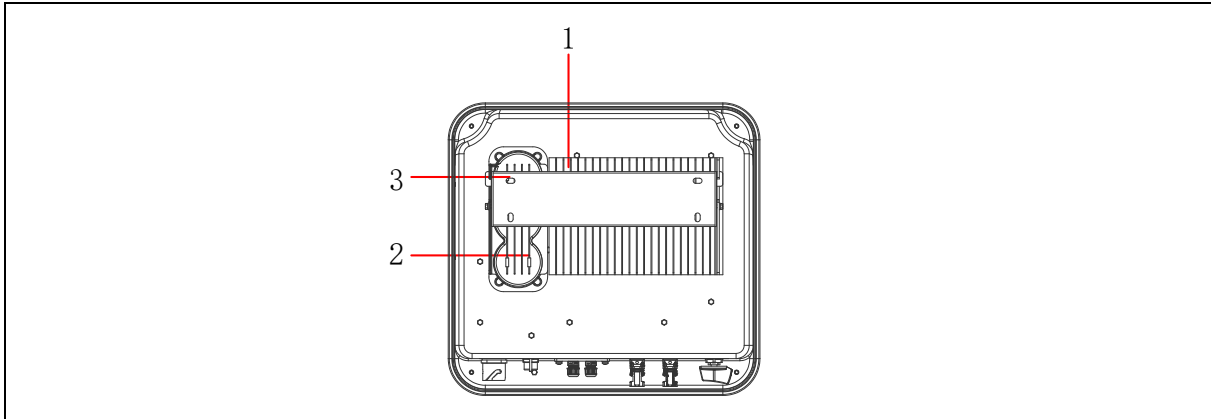


Figure 2-10 Front view of the machine

The LED indicators from left to right are described as follows:

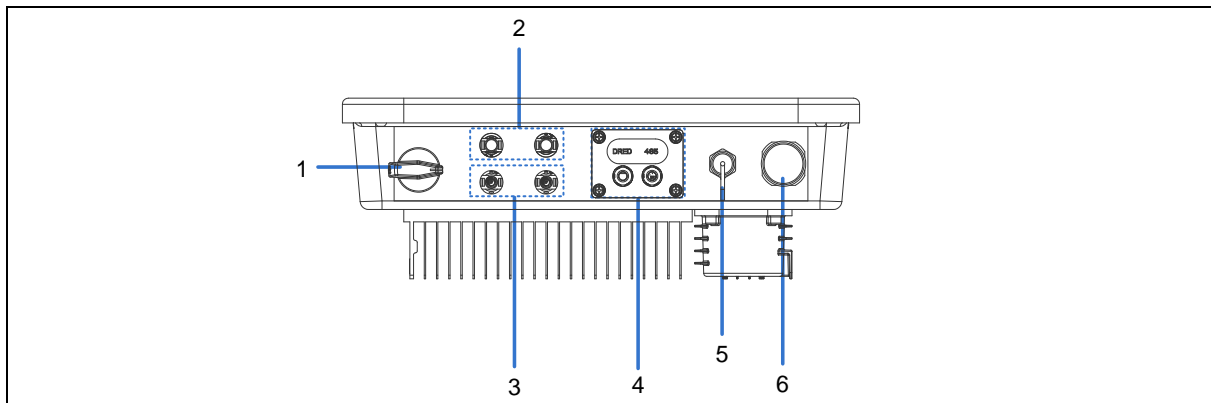
Table 2-1 LED Indicator description

Indicator	Description	State	Description
	PV and grid connection	On (blue)	The voltage of PV side is higher than 50V, and the power grid connection is normal.
		Slow blinking (blue)	The voltage of PV side is higher than 50V, and the power grid is not connected.
		Off	PV side is not connected.
	Grid-connected operation	On (blue)	Inverter is in grid-connected startup state.
		Off	The inverter does not start up in grid-connected status.
	Communication indication	Fast blinking (blue)	Normal communication
		Off	Abnormal communication
	Alarm indication	Fast blinking (red)	Abnormal Warning: conventional warning
		Solid on (red)	Serious Alarm: fault
Remarks: Slow blinking is defined as follows: 1 second bright, 2 seconds off. Fast blinking is defined as follows: 0.5 seconds bright, 0.5 seconds off.			



No.	Label	Name
1		Radiator
2		Inductor
3		Installation hanging plate

Figure 2-11 Back view of the inverter



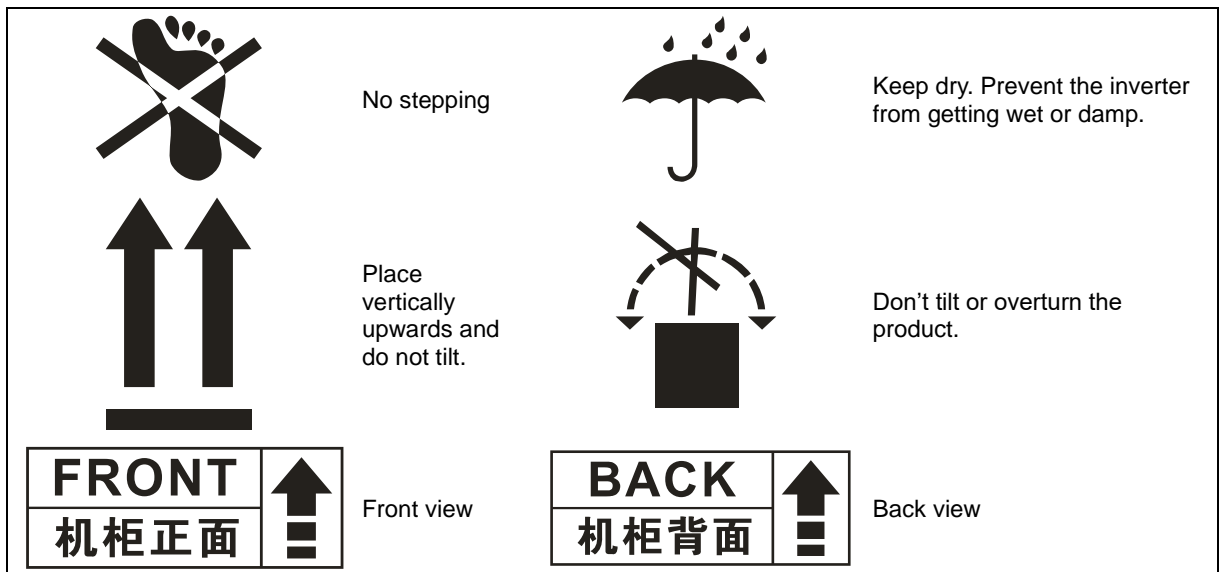
No.	Label	Name
1	DC SWITCH	DC SWITCH
2	1+ ~ 2+	PV+ terminals
3	1- ~ 2-	PV-terminals
4	DRED、485	DRED and 485 anti-backflow communication interface
5		Wi-Fi/GPRS communication interface
6	AC OUTPUT	AC output terminal

Figure 2-12 Bottom view of the inverter

2.6 Signs on Package

On the outer packaging of the product, there are some signs to guide the user to transport and store the product. The meanings of the labels are as follows:

	<p>No stacking or backlog</p>		<p>Handle with care to avoid damage to the string inverter caused by violent collision or friction during transportation and movement.</p>
---	-------------------------------	---	--



2.7 Warning Labels on the Inverter

In order to ensure the personal and property safety of users when using this product and avoid accidents, the following warning labels may be placed inside and outside the string inverter to remind users of safety precautions during operation.

	Protective earthing: PE terminals need to be reliably grounded to ensure the safety of both operation personnel and equipment.
	General warning: This part may have other potential dangers except high voltage danger. Please watch out!
	High voltage danger: This part may have high voltage danger. Please watch out!
	Hot surface: Pay attention to the hot surface to prevent burns.
	Refer to the user manual: Please refer to the corresponding instructions in the user manual before operation.
	Discharge identification: This equipment has an energy storage device. Before maintenance, it is necessary to wait for the energy storage device to discharge to prevent electric shock. The waiting time is not less than the indicated discharge time.

2.8 Technical Data

	Model	HSSP10K-G01	HSSP8K-G01	HSSP6K-G01	HSSP5K-G01	HSSP4K-G01	HSSP3K-G01
Input parameters	Maximum input voltage	600V					
	Minimum starting voltage	1) The starting voltage of the DC auxiliary voltage is set to 45V, and the shutdown voltage is 35V 2) The inverter startup voltage is 55V					
	MPPT working voltage range	55V~550V					
	MPPT full load working voltage range	260V-520V	210V-520V	235V-520V	200V-520V	210V-520V	170V-520V
	Rated input voltage	360V					
	Maximum input current per MPPT	26A/20A	26A/20A	20A/20A	20A/20A	22A	20A
	Maximum short circuit current per MPPT	39A/30A	39A/30A	30A/30A	30A/30A	33A	30A
	Max. inverter backfeed current to the array	0A	0A	0A	0A	0A	0A
	Maximum input path	3	3	2	2	2	1
	Number of MPPT	2	2	2	2	1	1
Output parameters	Rated output power	10kW	8kW	6kW	5kW	4kW	3kW
	Maximum output apparent power	11kVA	8.8kVA	6.6kVA	5.5kVA	4.4kVA	3.3kVA
	Maximum active power	11kW	8.8kW	6.6kW	5.5kW	4.4kW	3.3kW
	Rated output voltage	220VAC/ 230VAC L+N+PE					
	Output voltage range	165V~275V					
	Rated output frequency	50Hz/60Hz					
	Rated output current	45.5A	36.4A	27.3A	22.7A	18.2A	13.6A
	Maximum output current	50A	40A	30A	25A	20A	15A
	Current (inrush)	20A	20A	20A	20A	15.3A	15.3A
	Maximum output fault current	150A	150A	100A	100A	65A	65A
	Maximum output overcurrent protection	50A	40A	30A	25A	20A	15A
Power factor	0.8 (Leading.)~+0.8 (Lagging.)						
Maximum total harmonic distortion	<3%						

	Model	HSSP10K-G01	HSSP8K-G01	HSSP6K-G01	HSSP5K-G01	HSSP4K-G01	HSSP3K-G01
Efficiency	Maximum efficiency	97.80%					
	European Efficiency	97.20%		97.40%		97.10%	97.00%
Protection	Input DC switch	Supported					
	DC polarity reverse protection	Supported					
	DC surge protection	Class 2					
	Insulation impedance test	Supported					
	Output surge protection	Class 2					
	String fault detection	Supported					
	RCD detection	Supported					
Display and communication	Display	LED, WLAN + APP					
	WIFI module	WIFI module					
	PLC communication	Unsupported					
Conventional parameters	Dimensions (width * height * depth)	512*438*177mm		425*400*167mm		425*400*146mm	
	Weight	≤16kg		≤12kg		≤8kg	
	Working temperature	-25℃~+60℃					
	Maximum working altitude	≤4000m					
	Noise index	≤30dB					
	Cooling mode	Natural cooling					
	Protection grade	IP66					
	Protective class (I, II, or III)	I					
	topological structure	No transformer					
	Input terminal	MC4 plugging terminal					
Output terminal	AC plugging terminal						
Technical indicators	Standard of satisfaction	EN/IEC 62109-1					
		EN/IEC 62109-2					
		NB/T 32004-2018					

2.9 Mechanical Parameters

➤ Dimensions and Weight

Model	Width*Height*Depth (mm)	Transverse distance of installation holes (mm)	Longitudinal distance of installation holes(mm)	Weight (kg)
HSSP10K-G01	512*438*177	300	75	≤16
HSSP8K-G01				

Model	Width*Height*Depth (mm)	Transverse distance of installation holes (mm)	Longitudinal distance of installation holes(mm)	Weight (kg)
HSSP6K-G01	425*400*167	255	50	≤12
HSSP5K-G01				
HSSP4K-G01	425*400*146	255	50	≤8
HSSP3K-G01				

Note: The size does not include hanging ears, handles, foot pads, waterproof locks and other parts. Dimension error: ± 10mm.

➤ Structure Dimension of the Inverter

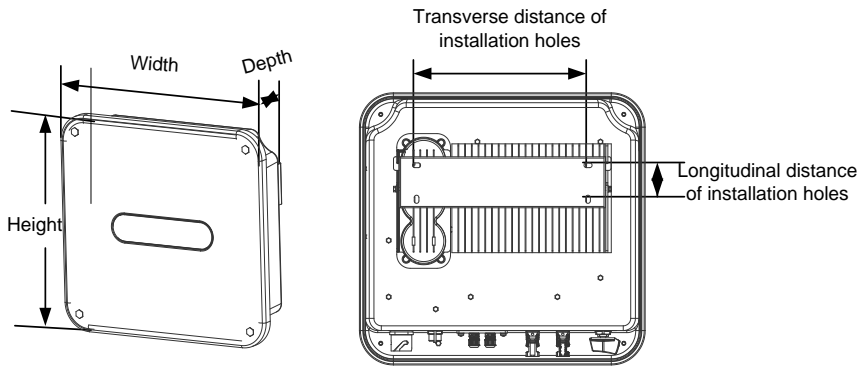


Figure 2-13 Structural Dimensions of HSSP Series

2.10 Ambient Rquirements

Transportation environment	Requirements	
Type of shipping	Waterways, railways, highways, aviation, etc.	
Ambient temperature	-25℃~+70℃	
Relative humidity	≤95%, at -25℃	
Mechanical condition	The vibration should not exceed the following limits: 2Hz≤f<9Hz, displacement 7.5mm; 9Hz≤f<200Hz, acceleration 20m/s ² ; 200Hz≤f<500Hz, acceleration 40m/s ²	
Storage environment	Requirements	
Storage place	Store the product in a warehouse with air circulation, no harmful gases, no flammable or explosive materials, and no corrosive materials. Avoid strong mechanical vibrations and shocks and stay away from strong magnetic fields.	
Ambient temperature	-40℃~+70℃	
Relative humidity	≤95%	
Mechanical condition	The vibration should not exceed the following limits: 10Hz≤f<57Hz, displacement 0.075mm; 57Hz≤f<150Hz, acceleration 10m/s ²	
Working environment	Requirements	
	Normal operation state	Shutdown state
Installation place	Do not install the inverter in an area where flammable or explosive	

Transportation environment	Requirements	
	materials are stored. The installation site can be indoors or outdoors, preferably in a well ventilated environment. Avoid direct sunlight, rain and snow to extend the life of the inverter. It is recommended to install it in a sheltered location. If it is not possible, install an awning.	
Ambient temperature	-25 °C ~ +60 °C (Derating is required while the temperature is above 40 °C)	-25°C ~ +70°C
Relative humidity	≤100%. Internal condensation is allowed.	
Altitude	≤4000m; derating is required for use above 4000m	
Mechanical condition	The vibration should not exceed the following limits: 10Hz≤f<57Hz, displacement 0.075mm; 57Hz≤f<150Hz, acceleration 10m/s ² .	

--End of the chapter--

3 System Installation

3.1 Unpack and Inspect

After confirming that the outer packaging is intact, please carry out the unpacking inspection. Unpack the packaging box and check whether the appearance of the string inverter is in good condition. When opening the package, be careful to use the tool to avoid scratching the string inverter.

Although the inverter has been strictly tested and inspected before leaving factory, accidental damage might happen during transportation. Please inspect and check the product as soon as you receive it. If there is any damage or omission, please contact us and we will help you as soon as possible.

3.2 Installation Tool Preparation

Tool or device	Purpose	Remarks
Phillips screwdriver (PH2/PH3)	Fasten the grounding screws and hanging plate screws	Bolt specifications: M4 and M6
Socket wrench	Fix the expansion screws	Bolt specification: M6
MC4 crimping pliers	Crimp the MC4 terminals	The input cable needs to be crimped into the MC4 terminal before it can be connected to the PV+/PV- terminal on the inverter
MC4 removal tool		
Wire stripper	Strip the wires	
Multimeter	Measure voltage to ensure wiring and installation safety	
Safety equipment	Necessary labor protection for construction	Insulating shoes, gloves, etc

3.3 Installation Environment Requirements

- The environmental requirements for the installation of string inverter are shown in [1 Safety Precautions](#).
- The installation mode and position must be suitable for the weight and dimension of the string inverter. See [2.9 Mechanical Parameters](#).
- The string inverter should be installed in a well ventilated environment to ensure good heat dissipation. Avoiding direct sunlight, rain and snow can prolong the life of the inverter. It is recommended to choose sheltered installation sites. If that cannot be satisfied, please set up a sun shading shelter (optional accessory).
- During the operation of the string inverter, the temperature of the chassis and the radiator will be relatively high, so do not install the inverter in the position that will be touched unintentionally.

3.4 Reserved Space Requirements

When installing the string inverter, the space around the string inverter must be reserved for heat dissipation and maintenance.

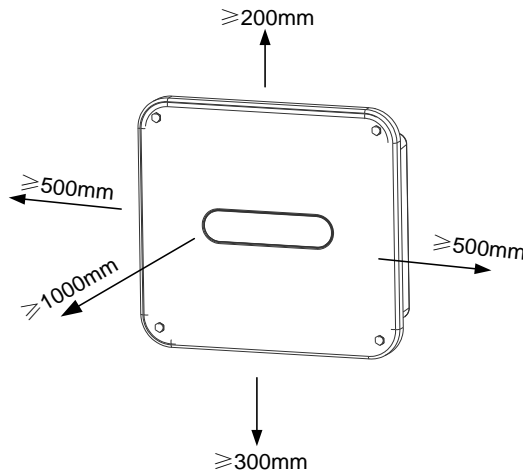



Figure 3-1 Reserved space requirements

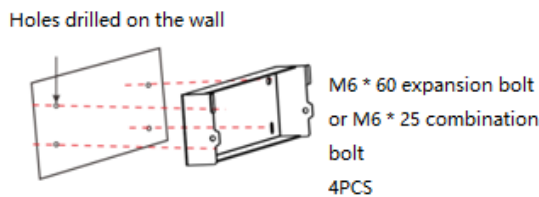
3.5 Installation Method

The package of the string inverter is attached with a hanging plate. During installation, the fixed hanging plate shall be installed first, and then the inverter shall be hung and fastened on the hanging plate.

 WARNING
<ol style="list-style-type: none"> 1. Please refer to 1 Safety Precautions for precautions during inverter installation. For installation environment requirements, please refer to 3.3 Installation Environment Requirements. 2. During installation, it must be confirmed that the site installation position can bear the total weight of the inverter and accessories to avoid falling during installation or use. 3. It is recommended that two people work together to fix the inverter to avoid mechanical injury. During installation, safety measures shall be taken to prevent injuries. 4. Please install it vertically or tilt it back 15 ° at most to facilitate heat dissipation of the machine. Do not tilt the inverter (tilt forward, tilt back too much, roll), horizontally or upside down. 5. If it is impossible to avoid direct sunlight, please add a sunscreen.

➤ **Steps**

1. Use a drill with a diameter of 8mm to drill on the wall or bracket according to the size of the hanging plate fixing hole, and the depth of the wall hole is 45 ± 5mm.
2. Install 4PCS M6 casing reinforced expansion anchor bolt. Alternatively, use M6 combination bolts to thread from the back of the bracket to the front, and fix it at the front with flat washers/nuts.



3. Then hang the inverter on the hanging plate, and lock the radiator and the hanging plate with M4 * 12 screws on both sides to prevent the inverter from shaking.

- Before hanging the inverter, please ensure that the installation surface is firm and meets the load bearing requirements.

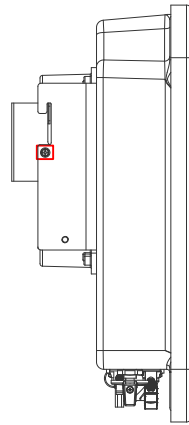


Figure 3-2 Position of fixing screws

3.6 Electrical Connections

3.6.1 Cable Requirements

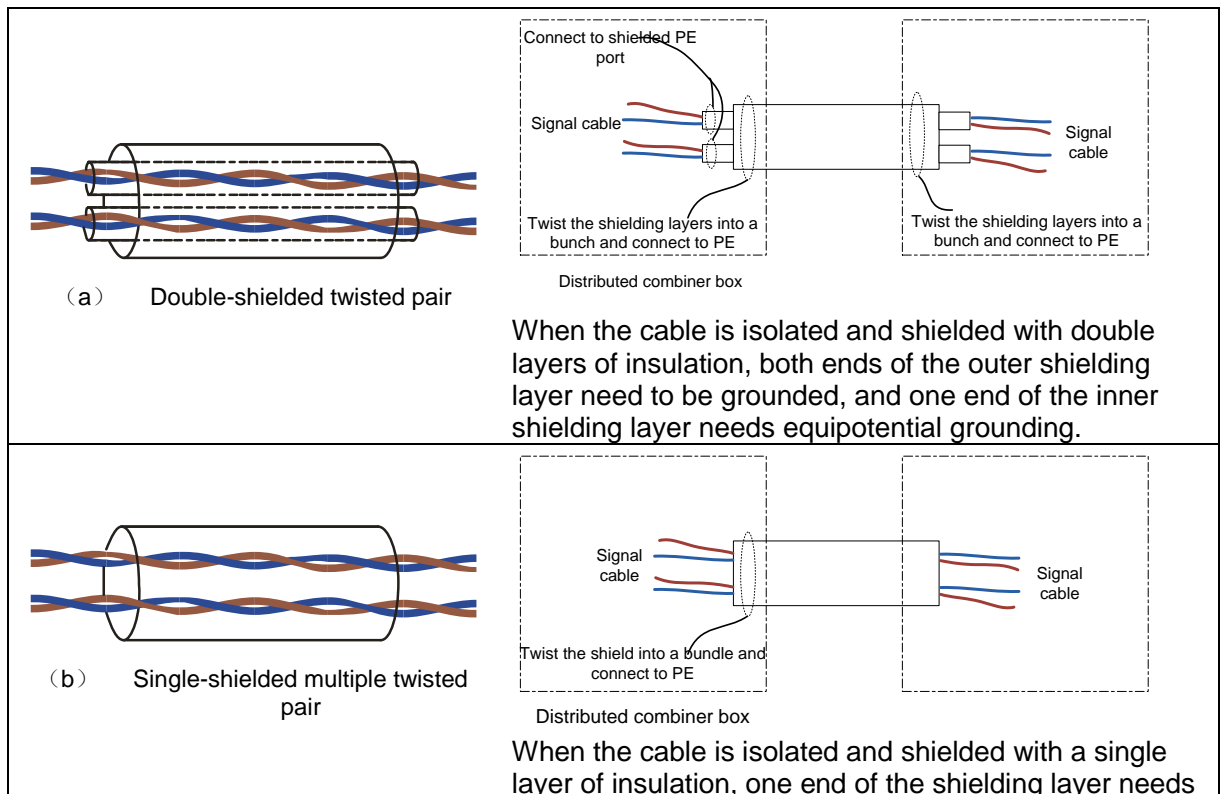
The choice of cable should comply with relevant national standards and meet the load requirements.

- Power Cable Requirements

Refer to the electrical data in the product data, and then consider the ambient temperature, current, margin and other factors to select the cable.

- Communication Cable Requirements

Since weak communication signals are susceptible to external interference, the communication cable requires a shielded cable with the shield grounded as shown in the following figure. Also refer to the relevant document *GB 50217-2007 Cable Design Specification*.



equipotential grounding in order to prevent the formation of potential difference.

Figure 3-3 Twisted pair with shielding layer

3.6.2 Cable Selection


Name	Tag Number	Recommended Cable Specifications	Remarks
PV branch input cable	1+~2+ 1- ~2-	Industry general photovoltaic cable, model: PV1-F It is recommended to use cables with a cross-sectional area of 4.0mm ² for each PV+ and PV- branch	None
AC output cable	L、N、PE	3K~6K: recommended sectional area of 3 core outdoor cable conductor: 2.5mm ² -6mm ² 8K~10K: recommended sectional area of 3 core outdoor cable conductor: 8KW not less than 6mm ² , 10KW not less than 8mm ²	3K~6K: The AC output has only one connector plug, and the OD specification is 8mm-14mm. 8K~10K: The AC output has only one connector plug, and the OD specification is 13mm-18mm.
RS485 communication cable		It is recommended to use a dedicated communication cable, or a 3-core or 2-core shielded twisted pair cable with a cross-sectional area no larger than 0.205mm ²	The RS485 communication input interface is a waterproof lock, and the OD specification is 3mm-6mm.
PE ground cable	PE	Use a fixed connection and the cross-sectional area of the protective grounding conductor is no less than 4mm ² (copper wire)	None

3.6.3 Torque Requirements


When tightening the cable connections, the tightening torque needs to meet the requirements of the table below.

Table 3-1 Tightening torque of thread connection

Thread specification	Performance level 4.8		Performance level 8.8		Unit
	General connection	High tightness connection	General connection	High tightness connection	
M3	6	8			kgf.cm
M4	12	14			kgf.cm
M5	25	30			kgf.cm
M6	50	60			kgf.cm
M8			110	150	kgf.cm
M10			300	390	kgf.cm
M12			550	650	kgf.cm
M16			1600	2000	kgf.cm

 Note: Inside the string inverter, the bolts with the nominal diameter of the external thread above 8mm are 8.8 Dacromet bolts.

3.6.4 Preparation before Operation



1. When connecting cables, do not operate when the product is energized and please follow the relevant requirements in [1 Safety Precautions](#).
2. Before connecting the cables, please complete the following preparations to avoid personal injury.
 - 1) Before electrical connections, please make sure that the "DC SWITCH" of the inverter is in the "OFF"

- state, otherwise the high voltage of the inverter may cause a shock hazard.
- 2) Determine the positive and negative poles of the input cable and mark them, and make sure that the input cable is disconnected from the PV string.
 - 3) Please confirm that the open circuit voltage of the PV string does not exceed the specified limit.
3. When connecting the input cable, please make sure that the positive and negative terminals of the input cable correspond to the positive and negative terminals of the PV inverter of the string inverter.

3.6.5 Connect the Ground Wire

Connect the inverter to the grounding bar through the protective earth wire to achieve the purpose of grounding protection. The PE mark is affixed to the PE terminal. Use a fixed connection and the cross-sectional area of the protective grounding conductor is not less than 4mm^2 . The bolt size is M6.

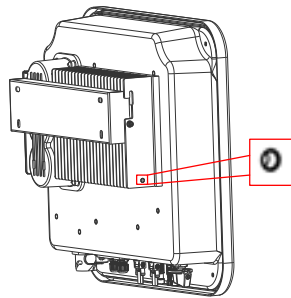


Figure 3-4 PE connection

For the grounding of multiple string inverters, use single-point grounding instead of winding the ground wire into a ring shape as shown below.

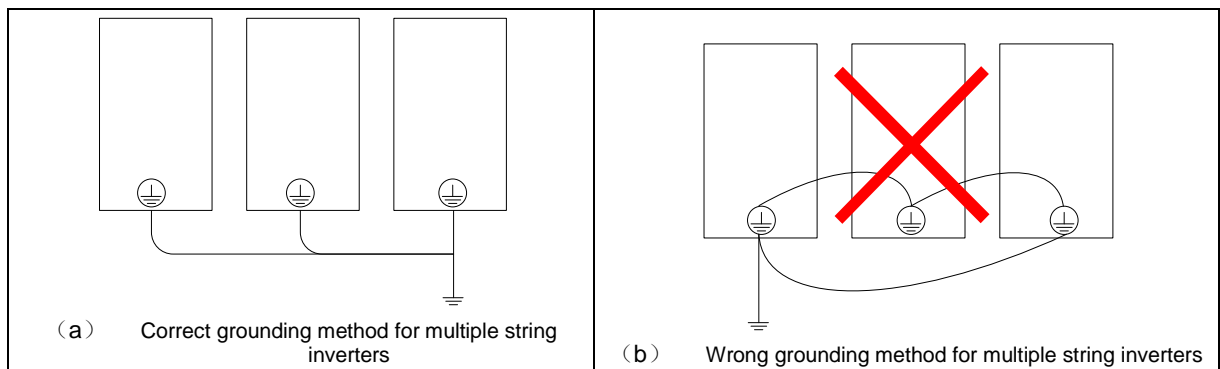


Figure 3-5 PE connection of multiple string inverters

3.6.6 Connect the AC Output Cables

➤ Precautions

- An independent single-phase circuit breaker must be configured outside the AC side of each inverter to ensure reliable disconnection of the inverter from the grid. And the circuit breaker specifications meet the technical requirements.
- It is forbidden to share one circuit breaker for multiple inverters.
- It is forbidden to connect the load between the inverter and the circuit breaker.
- Users should prepare cables with appropriate cross-sectional area according to different models (please refer to "3.6.2 Cable Selection" for more details).

➤ Steps

Unscrew the connector, correctly insert the cable into the AC connector plug according to the silk screen on the terminal, and then tighten the terminal.

3.6.7 Connect the Communication Cables


➤ Choice of Communication Method

The inverters support GPRS communication mode.

➤ Cable Connection Instructions

Connect the GPRS module in the delivery accessories to the 4-PIN port of the inverter, and pay attention to check whether it is firm to avoid loose installation. After the connection is completed, check whether there is a gap in the connection. If there are any gaps, plug them with fireproof mortar.

3.6.8 Connect the DC Input Cables

 In order to make full use of the DC input power, the PV strings of the same input MPPT should be identical in structure, including the same model, the same number of panels, the same tilt angle, and the same azimuth angle.



1. When the sun shines on the battery panel, it will generate voltage which may cause life-threatening dangers. Therefore, if the DC input line is connected under light conditions, you need to ensure that the input line is not charged (you can cover the panel with an opaque cloth and then proceed operating).
2. Before connecting the input cable, make sure that the DC side voltage is within the safe voltage range which is within 60VDC, and the DC switch is in the "OFF" state, otherwise the high voltage generated may cause a shock hazard.
3. When the inverter is running in the grid, it is forbidden to perform maintenance operations on the DC input cable, otherwise it will cause electric shock hazard.
4. If you want to remove the positive and negative connectors, make sure that DC switch has been placed in the "OFF" state and there is no current output from the PV branch.



- Please ensure that the following conditions are met, otherwise it may cause a fire hazard.
- Each component of the string in series is of the same specification.
 - The maximum opening voltage of each PV string cannot be greater than 600 VDC under any circumstances.
 - The maximum short-circuit current of each PV string shall not exceed 33A under any conditions.
 - Ensure that the polarity input on the DC input side is correct, that is, the positive pole of the PV module is connected to the positive pole of the DC input terminal of the inverter, and the negative pole is connected to the negative pole of the DC input terminal of the inverter.

➤ Precautions for Grounding the PV String

If the inverter is directly connected to the N cable of the power grid and connected to the PE cable (such as the low-voltage distribution grid or the N cable and ground-connected power grid), the positive or negative pole of the PV string is prohibited from being grounded, otherwise the inverter will not be able to work normally.

➤ DC Input Terminal Selection

Number of input channels	Combiner box DC input terminal
1	PV1
2	PV1、PV2
3	PV1、PV2、PV3

➤ Steps to crimp MC4 Terminal

The input cable needs to be crimped into the MC4 terminal for connection to the string inverter PV+/PV- terminals. Before operation, ensure that **3.6.4 Preparation before Operation** has been completed.

1. The positive and negative poles of the input cable are determined and identified.

Note: Please do not judge the positive and negative according to the cable color in this manual. Be sure to take the actual measurement as the standard.

2. Use a wire stripper to strip the wire.

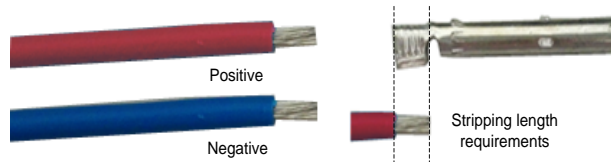


Figure 3-6 Strip the cable

3. Crimp the cable to the corresponding core with correct polarity.

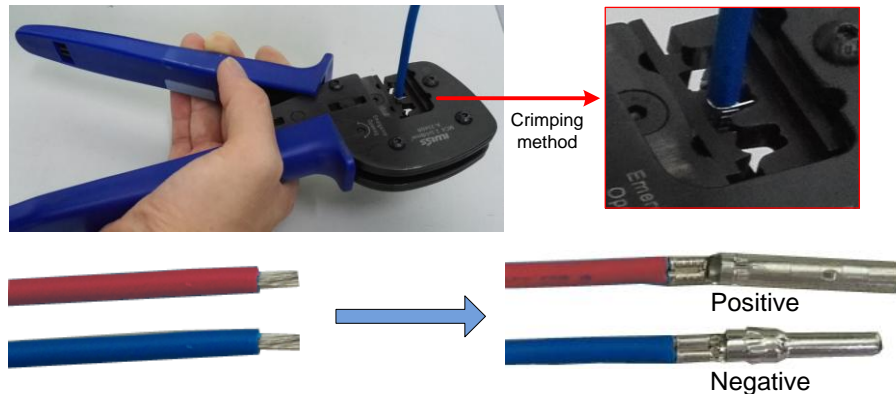


Figure 3-7 Crimp the terminal

4. Insert the cable cores into the male and female headers of the MC4 connector with the correct polarity and tighten the connector back cover.

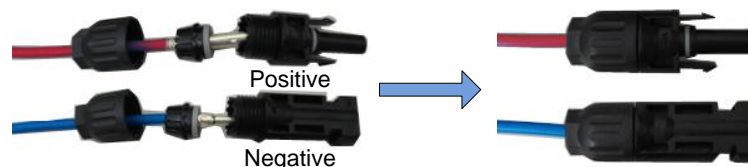


Figure 3-8 Assemble the connector

➤ Insert MC4 Terminals

Insert the positive and negative connectors into the positive and negative terminals of the DC input terminal of the inverter until you hear a click, indicating that the terminal is stuck in place.



After the cable connection of the string inverter is completed, check if there is a gap at the waterproof lock. If there is a gap in the waterproof lock, use a fireproof mud to block the gap. If there are unconnected input terminals, seal the unconnected input terminals.

-- End of the chapter--

4 Commissioning Guide

4.1 Check before Starting



- Please read [1 Safety Precautions](#) carefully and do a detailed check according to the table below before power on.
- Before operating or maintaining the internal metal parts, please use multimeter to measure their voltage to the enclosure (protective earthing) in order to avoid any danger.

Once the string inverter is installed, the following items need to be checked carefully before power on.

Mechanical inspection

- Please read [1 Safety Precautions](#) carefully.
- Ensure that the environmental safety of the string inverter.
- Check if there are any foreign objects left inside and on the top of the string inverter cabinet.
- Ensure that the string inverter has enough space reserved around for maintenance and heat dissipation.
- The cables are marked clearly and correctly.
- Check if there any condensation inside the string inverter. If there is, remove it with heating tools.
- Ensure that all wiring screws are tightened according to torque requirements.
- Ensure RS485 wiring is correct and reliable.
- Make sure there is no gap between the input terminal and the waterproof lock.

Electrical inspection

- Ensure that the connection of the string inverter is reliable and the polarity is correct.
- The power cables and signal lines are all in conformity with the electrical safety regulations.
- Signal terminals and power lines are properly matched with terminals.
- The isolation area and warning signs have been set up around the string inverter to prevent others from misoperation or proximity.

4.2 System Power On

To ensure that the electrical connection is completed, the power on operation can be performed and the inverter will be turned on.

Step 1: Set the DC SWITCH of the inverter to the “ON” state.

Step 2: Close the AC circuit breaker between the inverter and the power grid.

If the system does not have any faults and all the startup requirements are met after all the above steps have been carried out, the inverter will start automatically.

4.3 System Power Off

➤ Precautions

- After the inverter is powered off, there will be residual electricity and residual heat on the enclosure, which may cause electrical shock or burns. Therefore, please wait at least 5 minutes before you operate the inverter.

- When powering off the system, please follow the sequence of operation instructions and safety regulations in this chapter.

Step 1: Issue the shutdown command to the inverter through the data collector or near-end APP software.


Step 2: Disconnect the circuit breaker between the inverter and the power grid.

Step 3: Set the DC SWITCH of the inverter to the “OFF” state..

--End of the chapter--

5 Maintenance and Troubleshooting


5.1 Maintenance Project and Cycle

 DANGER	
1.	Please read 1 Safety Precautions carefully before maintenance, and use a multimeter and other relevant instruments to detect the voltage between the metal parts that need to be or maybe touched and the grounding copper bars so as to avoid electric shock.
2.	During maintenance, please pay attention to the warning labels of the string inverter to avoid personal injury due to high voltage.
3.	During maintenance, please make sure that the DC Switch is in off state, and the circuit breaker between the inverter and the grid is disconnected.
4.	After the maintenance, close the DC input switch of the inverter and the circuit breaker between the inverter and the grid.

String inverters need to be regularly maintained. Common maintenance items and cycles are shown in the table below.

Table 5-1 Maintenance items and cycles of the string inverters

Parts	Item	Description	Solutions	Maintenance Cycle
Overall inspection	Appearance	Observe whether the inverter appearance is damaged or deformed.	Please replace it in time when it is serious.	Once every six months to one year
	System cleaning	Check if there are dusts and foreign matters on the surface of the inverter.	Clean up the foreign matters and dusts.	
		The heat sink is covered with dust and dirt.	Remove occlusion and clean dusts	
System running	Operating state	Check if there is any abnormal noise while the inverter is running.	If the problem is serious, please replace it in time.	Once every six months to one year
	Operating parameters	When the inverter is running, check whether the parameters are set correctly.	Troubleshoot abnormal settings	
Connection parts	Fall off or loose	Check if the cable connection is disconnected or loose.	Tighten connections as specified	Once every six months to one year
	Damage	Check if there is any damage on the cable. Especially check the surface of the cable that is in contact with the metal surface for traces.	If the problem is serious, please replace it in time.	
		Terminal	Check if the waterproof covers of the unused RS485, RJ45 or other terminals are locked tightly	

 Note: Before wiping the heat sink, turn off the inverter normally, then disconnect the circuit breaker between the inverter and the grid, and then set the DC switch of the inverter into the OFF state. After powering off, wait at least 5 minutes before wiping the heat sink so as to avoid accidents.

5.2 Troubleshooting

➤ Boost Side

Fault word	ID	Fault/alarm name	Fault/alarm reason	Troubleshooting
Fault word 1	0	Auxiliary power supply overvoltage fault	$\pm 12V$ of auxiliary power supply is too high	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
	1	Auxiliary power supply undervoltage fault	$\pm 12V$ of auxiliary power supply is too low	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
	2	Output hardware overvoltage	The output voltage exceeds the protection point set by the hardware.	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
	3	Hardware overcurrent (secondary)	Unit inductor current is too large	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
	4	Unit 1 hardware overcurrent	Unit 1 current overcurrent and reaches the hardware wave-by-wave current limit time	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
	5	Unit 2 hardware overcurrent	Unit 2 current overcurrent and reaches the hardware wave-by-wave current limit time	1. Check whether it can work normally after reset. 2. If it occurs frequently, please contact the Hopewind technician.
Fault word 2	2	EEPROM parameters back to default values	EEPROM read and write error	Fault reset or power off
	3	Historical fault storage failed	Historical fault storage failed	Fault reset or power off
	12	Input polarity reverse	Input polarity reverse	Check whether the polarity of the connection is reversed
	13	Insulation fault of the positive bus to the ground	Abnormal insulation impedance of the positive bus to the ground	Check whether the positive bus has grounding fault
	14	Insulation fault of the negative bus to the ground	Abnormal insulation resistance of the negative bus to the ground	Check whether the negative bus has grounding fault
Alarm word 1	6	Boost side alarm	Boost unit open circuit	Please contact the Hopewind technician.
	7	Boost side short circuit alarm	Boost unit short circuit	Please contact the Hopewind technician.
	8	Abnormal alarm of battery string	Abnormal battery string	1. Check whether the battery string configuration is abnormal 2. Check whether the access of the battery board is abnormal 3. Check whether the current sampling of the battery string is abnormal
	9	Insulation alarm of the positive bus to the ground	Abnormal insulation impedance of the positive bus to the ground	Find out the cause of abnormal impedance
	10	Insulation alarm of the negative bus to the ground	Abnormal insulation impedance of the positive bus to the ground	Find out the cause of abnormal impedance

➤ Inverter Side

Fault word	ID	Fault/alarm name	Fault/alarm reason	Troubleshooting
System fault status word	0	RAM self test failed	Check RAM chip read and write error	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	1	EEPROM parameters back to default values	Add EEPROM parameter list and upgrade the code again. After initialization, the default value is different from that in EEPROM	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	2	EEPROM read and write failed		1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	3	FPGA version does not match	FPGA version does not match with that of DSP	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	4	Historical fault storage failed	Historical fault storage failed	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	5	Internal communication failure	Internal communication failure	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
Hardware fault status word	0	Hardware overcurrent (secondary)	Inductor current peak exceeds hardware protection threshold	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	3	Grid side hardware overcurrent	Phase A inductor current triggers wave-by-wave current limit protection	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	6	Busbar hardware overvoltage	Bus voltage exceeds hardware overvoltage threshold	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	7	Busbar midpoint overvoltage	Bus midpoint voltage exceeds hardware overvoltage threshold	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
Grid fault status word	0	Grid overvoltage	The grid voltage exceeds the overvoltage point set by the system	Confirm whether faults such as box transformer tripping occur at the AC side at the time of fault
	3	Grid undervoltage	The grid voltage is lower than the undervoltage point set by the system	Check whether the inverter has a phase loss or whether the box change contacts are suitable.
	6	Grid abnormality	Grid frequency and voltage exceed system setting range	1. Confirm whether the access to the grid is the nominal grid of the inverter; 2. Confirm whether the grid is connected
	7	Grid voltage imbalance exceeds limit	Grid voltage imbalance exceeds system threshold	Check whether the grid is abnormal

Fault word	ID	Fault/alarm name	Fault/alarm reason	Troubleshooting
	8	Grid overfrequency	The grid frequency exceeds the overfrequency point set by the system	1. Confirm whether the box transformer tripping and other faults occur on the AC side of the inverter through fault recording and event recording 2. Confirm whether the frequency range and the time setting is reasonable
	9	Grid underfrequency	The grid frequency is lower than the underfrequency point set by the system	1. Confirm whether the box transformer tripping and other faults occur on the AC side of the inverter through fault recording and event recording 2. Confirm whether the frequency range and the time setting is reasonable
	11	Island effect protection	Grid voltage loss	Detect the causes of grid voltage loss, such as box transformer tripping, etc.
	13	Grid voltage anomaly	Sudden change of grid voltage	Check if the grid is normal
	14	Low voltage ride through protection	Grid voltage exceeds LVRT protection threshold	Check if the grid is normal
	15	High voltage ride through protection	Grid voltage exceeds HVRT protection threshold	Check if the grid is normal
Inverter fault status word	0	Grid side software overcurrent	Inductor current effect value exceeds protection threshold	Reset the fault
	3	Module current imbalance	Three-phase current imbalance exceeds the threshold	Reset the fault
	5	Module temperature is too high	The radiator temperature is higher than the protection threshold.	Check whether the spoiler fan is normal
	6	High temperature inside the machine	Ambient temperature is higher than protection temperature.	Check whether the spoiler fan is normal
	9	Residual current abnormal	Residual current exceeds the limit	1. If it happens accidentally, it may be caused by the accidental abnormality of the external line. After the fault is cleared, it will resume work without manual intervention. 2. If it occurs frequently or cannot be recovered for a long time, please check whether the ground impedance of the PV string is too low.
Bus fault word status	1	Bus operation short circuit	Bus voltage sag exceeds limit	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	5	Bus operation over voltage	The bus voltage exceeds the set threshold	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	6	Bus operation under voltage	The bus voltage is below the set threshold	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician

Fault word	ID	Fault/alarm name	Fault/alarm reason	Troubleshooting
	7	The bus voltage is unbalanced.	Positive and negative bus voltage imbalance exceeds the setting threshold.	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	8	DC high input voltage	DC input voltage exceeds the setting threshold.	1. Check whether the components are over matched 2. Check whether the input voltage detection circuit is normal
	9	DC low input voltage	DC input voltage is below the setting threshold.	Check whether the switch is disconnected
Other	0	Grid-connected relay failure	Relay status error	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician
	4	Internal fan fault	Fan failure or abnormal feedback signal	1. Check whether it can work normally after reset 2. If it occurs frequently, please contact the Hopewind technician.

--End of the chapter--

6 Inverter Processing Guide

6.1 Remove the Inverter

Before operating, make sure that the circuit breaker between the inverter and the grid is disconnected, and the DC switch is placed in the OFF state.

- 1) Disconnect all electrical connections to the inverter, including the AC output line, RS485 communication line, DC input line and protective grounding.
- 2) Remove the inverter from the hanging plate.

6.2 Replace the Inverter

After disassembling the old inverter, if it is necessary to replace it with a new inverter, follow the operation sequence in Chapter 3 and 4.

6.3 Package the Inverter

- If you still keep the original package of the inverter, please put it into the original package and firmly seal the package with tape.
- If you can't find the original package, please use a hard carton suitable for the weight and dimension of the inverter to firmly package it.

6.4 Scrap the Inverter

- When the service life of the inverter expires or the inverter is replaced due to failure, it can be disposed according to the applicable electrical waste disposal laws of the place where the inverter is installed, or it can be handed over to Hopewind customer service personnel.

--End of the chapter--

➤ Warranty

If the product has any fault in the warranty period, we will provide cost-free repair or replacement service.

Any faults arising from the following conditions shall be out of the warranty:

- Dismantle the product without our permission or maintain in wrong way.
- Out of the warranty period.
- Use the product out of the application scope stipulated in related international standard.
- Fail to install and operate the product according to the user manual.
- Use the product in improper environment.
- Use non-standard or those components/software not provided by our company.
- Damaged due to the failure of external devices.
- Any accidental damage arising from personal dismantlement or maintenance by yourself.

When the client requires repair service for abovementioned faults, we will offer paid repair service after it's determined by our service department. Please contact us in advance if you want repair or alteration service.

➤ Contact Us

Shenzhen Hopewind Technology Co., Ltd

Address: Building 11, Guanlong No. 2 Industrial Park, Xili, Nanshan District, Shenzhen, PR.China

Website: www.hopewind.com

Email: hopewind@hopewind.com

Tel: +86-(0)755-8602 6786

Fax: +86-(0)755-2651 8311

Hotline: 400-8828-705



Add: Building No.11, 2nd Industrial Zone of Guanlong Village, Xili, Nanshan District,
Shenzhen, China 518055

Tel: +86-(0)755-8602 6786

Web: www.hopewind.com

Copyright © 2022 Hopewind, All rights reserved.