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**VSOLE SOLAR ENERGY PVT. LTD.**



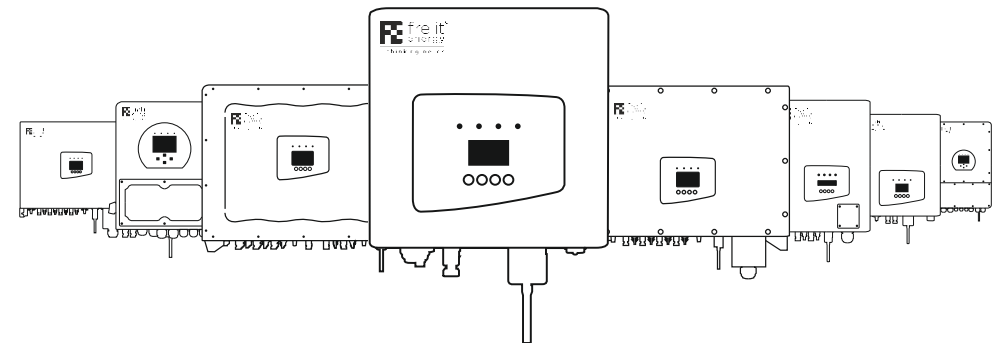
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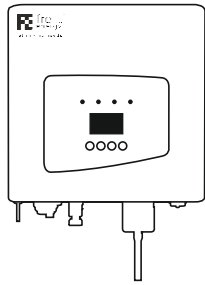
**USER MANUAL**

**Grid-Connected PV Inverter**

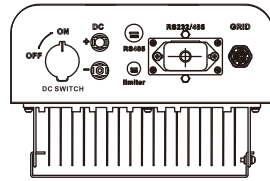
**1KW - 4KW - SINGLE PHASE**

# 1. Introduction

Single Phase String Power Inverter can convert solar panel DC power into AC power which can directly input to the grid. Its appearance is shown below.



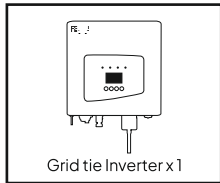
Pic 1.1 Front View



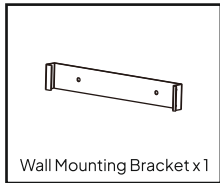
Pic 1.2 Bottom View

## 1.1 Part List

Please check the following table to see whether all parts are included in the package.



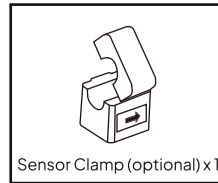
Grid tie Inverter x1



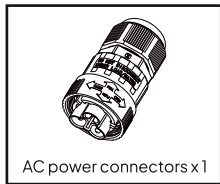
Wall Mounting Bracket x1



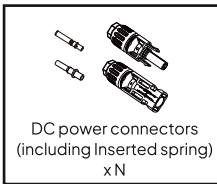
Mounting stainless steel screws (M4x12) x 4



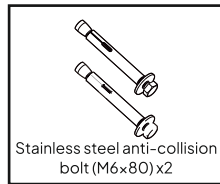
Sensor Clamp (optional) x1



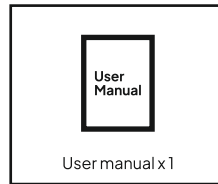
AC power connectors x1



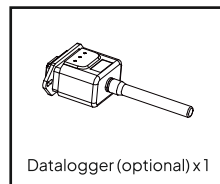
DC power connectors (including Inserted spring) xN



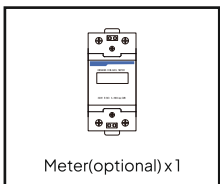
Stainless steel anti-collision bolt (M6x80) x2



User manual x1



Datalogger (optional) x1



Meter(optional) x1

# 2. Safety warnings & instructions

Improper use may result in potential electric shock hazards or burns. This manual contains important instructions that should be followed during installation and maintenance. Please read these instructions carefully before use and keep them for future reference.

## 2.1 Safety signs

Safety symbols used in this manual, which highlight potential safety risks and important safety information, are listed as follows:



### Warning

Warning symbol indicates important safety instructions, which if not correctly followed, could result in serious injury or death.



### Shock Hazard

Caution, risk of electric shock symbol indicates important safety instructions, which if not correctly followed, could result in electric shock.



### Safety Hint

Note symbol indicates important safety instructions, which if not correctly followed, could result in some damage or the destruction of the inverter.



### High Temperature Hazard

Caution, hot surface symbol indicates safety instructions, which if not correctly followed, could result in burns.

## 2.2 Safety instructions



### Warning

Electrical installation of the inverter must conform to the safety operation rules of the country or local area.



### Warning

Inverter adopts non-isolated topology structure, hence must insure DC input and AC output are electrical isolated before operating the inverter.

Strictly prohibit grounding the positive and negative poles of the PV string. Otherwise it will damage the inverter.



### Shock Hazard

Prohibit disassembling inverter case, there existing shock hazard, which may cause serious injury or death, please ask qualified person to repair.



### Shock Hazard

When PV module is exposed to sunlight, the output will generate DC voltage. Prohibit touching to avoid shock hazard.



### Shock Hazard

While disconnect the input and output of the inverter for maintenance, please waits for at least 5 mins until the inverter discharge the remnant electricity.



### High Temperature Hazard

Local temperature of inverter may exceed 80°C while under operating. Please do not touch the inverter case.

## 2.3 Notes for using

The string power inverter is designed and tested under related safety regulations. It can ensure the personal safety of the user. But as a electric device, it may cause shock or injury by incorrect operation. Please operate the unit under below requirements:

- Inverter should be installed and maintained by qualified person under local standard regulations.
- Must disconnect the AC side first, then disconnect DC side while doing installation and maintenance, after that, please wait at least 5 mins to avoid getting shocked.
- Local temperature of the inverter may exceed 80 ℃ while under operating. Do not touch to avoid getting injured.
- All electrical installation must be in accord with local electrical standards, and after obtaining the permission of the local power supply department, the professionals can connect the inverter to the grid.
- Please take appropriate anti-static measure.
- Please install where children can not touch.
- When starting the inverters, first close the circuit breaker at the grid side, then close the DC side; when closing the inverters, first disconnect the circuit breaker at the AC side, then disconnect the DC side.
- Don't insert or remove AC and DC terminals when the inverter is in normal operation.
- The DC input voltage of the inverter must not exceed the maximum value of the model.

## 3. Operation Interface

### 3.1 Interface View



### 3.2 Status Indicator

There are four LED status indicator lights in the front panel of the inverter. Please see table 3.1 for details.

Indicator	Status	Explanation
● DC	ON	Inverter detects DC input
	OFF	Low DC input voltage
● AC	ON	Grid Connected
	OFF	Grid Unavailable
● Normal	ON	Under normal operating
	OFF	Stop operating
● Alarm	ON	Detected faults or report faults
	OFF	Under normal operating

### 3.3 Buttons

There are four keys in the front panel of the Inverter(from left to right): Esc, Up, Down and Enter keys. The keypad is used for:

- Scrolling through the displayed options (the Up and Down keys);
- Access to modify the adjustable settings (the Esc and Enter keys).



### 3.4 LCD Display

The Liquid Crystal Display (LCD) is located on the front panel of the Inverter, which shows the following information:

- Inverter operation status and data;
- Service messages for operator;
- Alarm messages and fault indications.

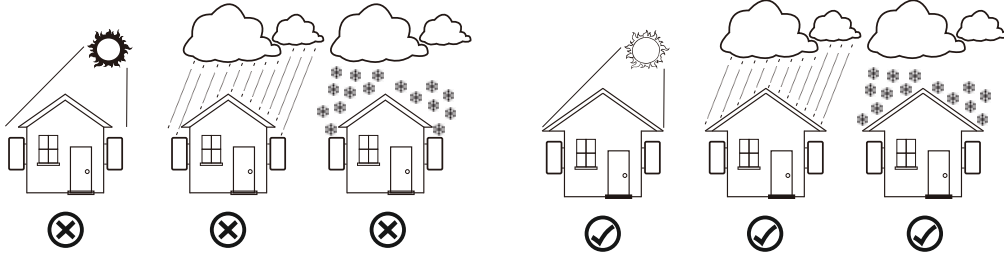
## 4. Product Installation

### 4.1 Select installation location

To select a location for the inverter, the following criteria should be considered:

#### WARNING: Risk of fire

- Do not install the inverter in areas containing highly flammable materials or gases.
- Do not install the inverter in potentially explosive atmospheres.
- Do not install in small closed spaces where air can not circulate freely. To avoid overheating, always make sure the flow of air around the inverter is not blocked.
- Exposure to direct sunlight will increase the operational temperature of the inverter and may cause output power limiting. It is recommended that inverter installed to avoid direct sunlight or raining.
- To avoid overheating ambient air temperature must be considered when choosing the inverter installation location. It is recommended that using a sun shade minimizing direct sunlight when the ambient air temperature around the unit exceeds 100°F/40°C.

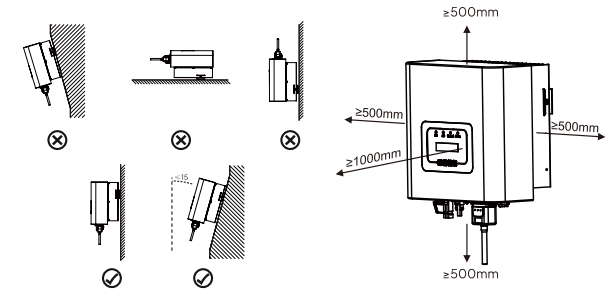


- Install on a wall or strong structure capable of bearing the weight.
- Install vertically with a maximum incline of +/-15°. If the mounted inverter is tilted to an angle greater than the maximum noted, heat dissipation can be inhibited, and may result in less than expected output power.
- If install more than one inverter, must leave at least 500mm gap between each inverter. And each inverter must be at least 500mm above and below. And must install the inverter at the place where children cannot touch. Please see picture.

- Consider whether the installation environment is helpful to see the inverter LCD display and indicator status clearly.
- Must offer a ventilate environment if inverter installed in the airtight house.

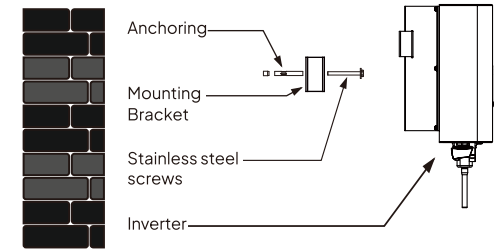


- **Safety Hint:**
- Do not place or store any items next to the inverter.



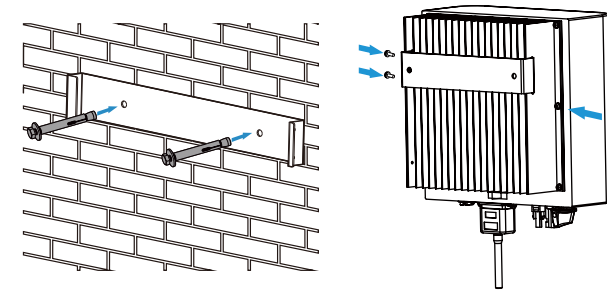
### 4.2 Inverter Installation

The inverter is designed according to the wall mounted type installation, please use the wall mounted (the brick wall of the expansion bolt) when installing.



#### Procedure shows below:

- Locate on the appropriate wall according to the bolt position on the mounting bracket, then mark the hole. On the brick wall, the installation must be suitable for the expansion bolt installation.
- Ensure that the position of the installation holes on the wall is in accordance with the mounting plate, and the mounting rack is horizontally placed.
- Hang the inverter to the top of the mounting rack and then use the M4 screw in the accessory to lock inverter heat sink to the hanging plate, to ensure that the inverter will not move.



## 5. Electrical Connection

### 5.1 DC input terminal connection

- Switch the Grid Supply Main Switch(AC)OFF.
- Switch the DC Isolator OFF.
- Assemble PV input connector to the inverter.



#### Safety Hint

Please don't connect PV array positive or negative pole to the ground, it could cause serious damages to the inverter.



#### Safety Hint

Before connection, please make sure the polarity of the output voltage of PV array matches the "DC+" and "DC-" symbols.

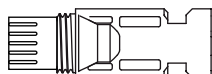


#### Safety Hint

Before connecting inverter, please make sure the PV array open circuit voltage is within the 550V of the inverter.



DC + Male Connector (MC4)



DC - Female Connector (MC4)



#### Safety Hint

Please use approved DC cable for PV system.

Cable Type	Cross section (mm <sup>2</sup> )	
	Range	Recommended Value
Industry generic PV cable (model: PV1-F)	4.0~6.0 (12~10AWG)	4.0(12AWG)

### 5.2 AC input terminal connection

Do not close the DC switch after the DC terminal is connected. Connect the AC terminal to the AC side of the inverter, the AC side is equipped with Three phase AC terminals that can be conveniently connected. Flexible cords are recommended for easy installation. Specifications as shown in Table.



#### Warning

Prohibit using a single circuit breaker for multiple inverters, prohibit the connection of load between inverter circuit breakers.

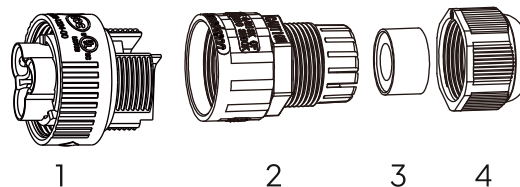
Cable CSA	Cable Outer Dia	AWG	Breaker	Max Cable Length
2.5 mm <sup>2</sup>	15-18 mm	12	10A-32A / 400V	Outside Cable (L+N+PE) 20m

The AC output connector is divided into three parts: matching socket, sleeve and sealing sleeve, as shown in picture below, the steps are as follows:

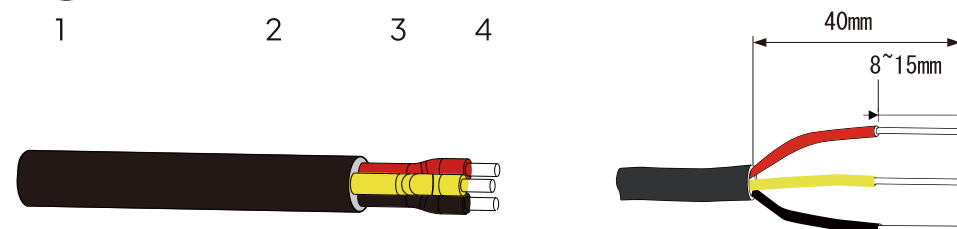
**Step 1:** Remove the cable sealing ring and sleeve in sequence from the AC connector.

**Step 2:** Separate the sleeve from the matching socket, as shown in picture below, the connector body has two locking holes, and press the locking valve in the hole inward to separate the matching socket from the sleeve.

**Step 3:** Use strippers to strip the protective sheath and insulation layer of the AC cable to the right length, as shown in Picture below.



1. Matching socket
2. Sleeve
3. Sealing core
4. Sealing nut



#### Warning

Be careful to distinguish the L, N and PE of the AC cables.

**Step4:** Insert the cable (L, N, PE) into the sealing sleeve and sleeve.

## 6. Error Codes

If there is any failure, the LCD screen will display an alarm message. In this case, the inverter may stop feeding energy into the grid. The alarm description and their corresponding alarm messages are listed Below:

Error Codes	Description	Ongrid - Single Phase
F01	DC input polarity reverse fault	Check the PV input polarity.
F02	DC insulation impedance permanent fault	Check the grounding cable of inverter.
F03	DC leakage current fault	Hardly appear the code. Never ever happened so far.
F04	Ground fault GFDI	Check the solar panel output connection.

Error Codes	Description	Ongrid – Single Phase
F05	Read the memory error	Failure in reading memory (EEPROM). Restart the inverter if the fault still exists, contact your installer.
F06	Write the memory error	Failure in writing memory (EEPROM). Restart the inverter if the fault still exists, contact your installer.
F07	GFDI blown fuse	Hardly appear the code. Never ever happened so far.
F08	GFDI grounding touch failure	Hardly appear the code. Never ever happened so far.
F09	IGBT damaged by excessive drop voltage	Hardly appear the code. Never ever happened so far.
F10	Auxiliary switch power supply failure	Hardly appear the code. Never ever happened so far.
F11	Ac main contactor errors	Hardly appear the code. Never ever happened so far.
F12	AC auxiliary contactor errors	Hardly appear the code. Never ever happened so far.
F13	Working mode changed/ Grid mode changed	Hardly appear the code. Never ever happened so far.
F14	DC firmware over current	Hardly appear the code. Never ever happened so far.
F15	AC firmware over current	<ol style="list-style-type: none"> <li>The internal AC sensor or detection circuit on control board or connection wire may loose.</li> <li>Restart the inverter, if the error still exists, please contact your installer.</li> </ol>
F16	GFCI(RCD) Ac leakage current fault	<ol style="list-style-type: none"> <li>This fault means the average leakage current is over 300mA. Check whether DC power supply or solar panels is ok, then check 'Test data' -&gt; 'diL' value is about 120; Then check the leakage current sensor or circuit (the following picture). Checking test data needs using big LCD.</li> <li>Restart the inverter, if the error still exists, please contact your installer.</li> </ol>
F17	Three phase current, over-current fault	Hardly appear the code. Never ever happened so far.

Error Codes	Description	Ongrid – Single Phase
F18	AC over current fault of hardware	<ol style="list-style-type: none"> <li>Check AC sensor or detection circuit on control board or connection wire.</li> <li>Restart the inverter or factory reset, if the error still exists, please contact your installer.</li> </ol>
F19	All hardware failure synthesis	<ol style="list-style-type: none"> <li>When inverter is running, wifi plug plugin, will occur F19.</li> <li>Restart the inverter or factory reset, if the error still exists, please contact your installer.</li> </ol>
F20	DC over current fault of the hardware	Not available.
F21	DC leakage flow fault	Hardly appear the code. Never ever happened so far.
F22	Crash stop (if there is a stop button)	Contact your installer for help.
F23	AC leakage current is transient over current	<ol style="list-style-type: none"> <li>This fault means the leakage current is above 30mA suddenly. Check whether DC power supply or solar panels is ok, then check 'Test data' -&gt; 'diL' value is about 120; Then check the leakage current sensor or circuit. Check test data needs using big LCD.</li> <li>Restart the inverter, if the fault still exists, contact your installer.</li> </ol>
F24	DC insulation impedance failure	<ol style="list-style-type: none"> <li>Check Vpe resistance on main board or detection on control board. Check PV panels is OK. Many times this issue is the PV problem.</li> <li>Check whether the PV panel (aluminum frame) is grounded well and inverter is grounded well. Open the cover of inverter and then check the inside ground cable is fixed well on the shell.</li> <li>Check if the AC/DC cable, terminal block are shorted to ground or the insulation is damaged.</li> <li>Restart the inverter, if the fault still exists, contact your installer.</li> </ol>

Error Codes	Description	Ongrid – Single Phase
F25	DC feedback fault	Hardly appear the code. Never ever happened so far.
F26	The DC busbar is unbalanced	Hardly appear the code. Never ever happened so far.
F27	DC end insulation error	Hardly appear the code. Never ever happened so far.
F28	Inverter 1 DC high fault	Hardly appear the code. Never ever happened so far.
F29	AC load switch failure	Hardly appear the code. Never ever happened so far.
F30	AC main contactor failure	<ol style="list-style-type: none"> <li>1. Check relays and AC voltage of relays.</li> <li>2. Check relays driver circuit.</li> <li>3. Check if the software is not suitable for this inverter. (Old inverter not have relays detection function)</li> <li>4. restart the inverter, if the fault still exists, contact your installer.</li> </ol>
F31	Dc boost soft start	Not available.
F32	Inverter 2 dc high fault	Hardly appear the code. Never ever happened so far.
F33	AC over current	AC current sensor or its circuit have issue. Check if the inverter type is not right.
F34	AC current over load	Hardly appear the code. Never ever happened so far.
F35	No AC grid	<ol style="list-style-type: none"> <li>1. Check AC grid voltage. Check AC voltage detection circuit. Check if the AC connector in good condition. Check whether the AC grid is normal in voltage.</li> <li>2. Restart the inverter, if the fault still exists, contact your installer.</li> </ol>

Error Codes	Description	Ongrid – Single Phase
F36	AC grid phase error	Hardly appear the code. Never ever happened so far.
F37	AC three-phase voltage unbalance failure	Hardly appear the code. Never ever happened so far.
F38	AC three-phase current unbalance failure	Hardly appear the code. Never ever happened so far.
F39	AC over current (one cycle)	<ol style="list-style-type: none"> <li>1. Check AC current sensor and its circuit.</li> <li>2. Restart the inverter, if the fault still exists, contact your installer.</li> </ol>
F40	DC over current	Hardly appear the code. Never ever happened so far.
F41	AC Line W,U over voltage	Check the AC voltage protection setting. & Check if the AC cable is too thin. Check the voltage difference between LCD & meter.
F42	AC Line W,U low voltage	Check the AC voltage protection setting. Check the voltage difference between LCD and meter. Also need to check whether AC cables are all firmly and correctly connected.
F43	AC Line V,W over voltage	Not available.
F44	AC Line V,W low voltage	Not available.
F45	AC Line U,V over voltage	Not available.
F46	AC Line U,V low voltage	Not available.
F47	AC over frequency	Check the frequency protection setting.

Error Codes	Description	Ongrid – Single Phase
F48	AC lower frequency	Check the frequency protection setting.
F49	U phase grid current DC component over current	Hardly appear the code. Never ever happened so far.
F50	V phase grid current DC component over current	Hardly appear the code. Never ever happened so far.
F51	W phase grid current DC component over current	Hardly appear the code. Never ever happened so far.
F52	AC inductor A, phase current DC current high	Hardly appear the code. Never ever happened so far.
F53	AC inductor B, phase current DC current high	Hardly appear the code. Never ever happened so far.
F54	AC inductor C, phase current DC current high	Hardly appear the code. Never ever happened so far.
F55	DC busbar voltage is too high	<ol style="list-style-type: none"> <li>1. Check PV voltage and Ubus voltage and its detection circuit. If the PV input voltage exceeds the limit, please reduce the number of solar panels in series.</li> <li>2. For Ubus voltage, please check the LCD display.</li> </ol>
F56	DC busbar voltage is too low	<ol style="list-style-type: none"> <li>1. It tells the PV input voltage is low &amp; it always happens in the early morning.</li> <li>2. Check PV voltage &amp; Ubus voltage. When inverter is running, then showing F56, maybe Loss of driver or need update firmware.</li> <li>3. Restart the inverter, if the fault still exists, contact your installer.</li> </ol>

Error Codes	Description	Ongrid – Single Phase
F57	AC reverse irrigation	AC reverse irrigation
F58	AC grid U over current	Hardly appear the code. Never ever happened so far.
F59	AC grid V over current	Hardly appear the code. Never ever happened so far.
F60	AC grid W over current	Hardly appear the code. Never ever happened so far.
F61	Reactor A phase over current	Hardly appear the code. Never ever happened so far.
F62	Reactor B phase over current	Hardly appear the code. Never ever happened so far.
F63	ARC fault	<ol style="list-style-type: none"> <li>1. Check PV module cable connection and clear the fault;</li> <li>2. Seek help from us, if can not go back to normal state.</li> </ol>
F64	IGBT heat sink high temperature	<ol style="list-style-type: none"> <li>1. Check temperature sensor. Check if firmware is suitable for the hardware. Check if the inverter is its right model.</li> <li>2. Restart the inverter, if the fault still exists, contact your installer</li> </ol>