

User Manual

Off Grid Solar Inverter 1KVA-5KVA (MHP)



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Information on this Manual

Validity

This manual is valid for the following devices:

- ▶ Off grid solar inverter with MPPT controller, 1KVA;
- ▶ Off grid solar inverter with MPPT controller, 2KVA;
- ▶ Off grid solar inverter with MPPT controller, 3KVA;
- ▶ Off grid solar inverter with MPPT controller, 4KVA;
- ▶ Off grid solar inverter with MPPT controller, 5KVA;

Scope

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations.

Target Group

This document is intended for qualified persons and end users. Tasks that do not require any particular qualification can also be performed by end users. Qualified persons must have the following skills:

- ▶ Knowledge of how an inverter works and is operated
- ▶ Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations
- ▶ Training in the installation and commissioning of electrical devices and installations
- ▶ Knowledge of the applicable standards and directives
- ▶ Knowledge of and compliance with this document and all safety information

Safety Instructions






WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

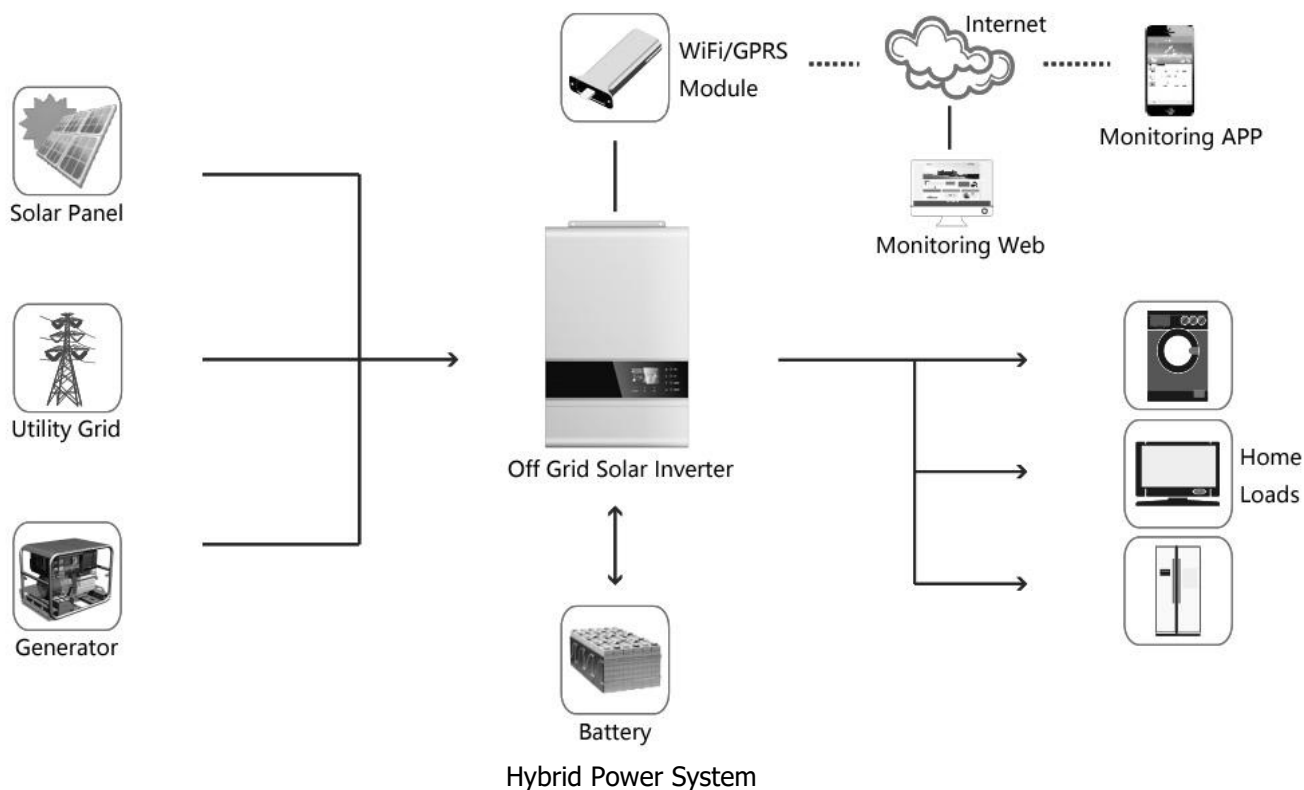
1. **CAUTION** – Only qualified personnel can install this device with battery.
2. Before using the unit, read all instructions and caution marks on the unit, understand the batteries and all appropriate sections of this manual.
3. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
4. **NEVER** cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
5. **NEVER** charge a frozen battery.
6. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
7. To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
8. Be very cautious when working with metal tools on or around batteries. A potential risk, such as dropping a tool to spark or short circuit batteries or other electrical parts, could cause an explosion.

9. For optimum operation of this off grid solar inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this off grid solar inverter.
10. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
11. GROUNDING INSTRUCTIONS –This off grid solar inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. Fuses (3 pieces of 40A, 32VDC for 1KVA, 4 pieces of 40A, 32VDC for 2KVA and 6 pieces for 3KVA, 1 piece of 200A, 58VDC for 4KVA and 5KVA) are provided as over-current protection for the battery supply.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this off grid solar inverter back to local dealer or service center for maintenance.

Symbols

| Symbol | Explanation |
|---|--|
|  | Indicates a hazardous situation which, if not avoided, can result in machine damage or people injury Refer to page 23 |
|  | Indicates a hazardous situation which, if not avoided, can result in machine damage or people injury Refer to page 24 |
|  | Indicates overload which, if not avoided, can result in machine damage or people injury Refer to page 24 |

Introduction



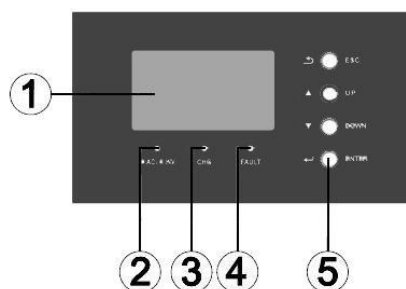
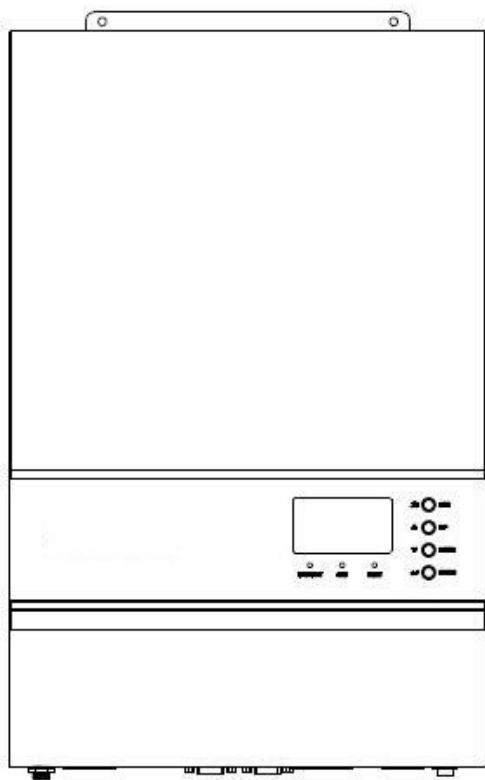
This is a multifunctional off grid solar inverter, integrated with a MPPT solar charge controller, a high frequency pure sine wave inverter and a UPS function module in one machine, which is perfect for off grid backup power and self-consumption applications. The transformerless design provides reliable power conversion in compact size.

The whole system also need other devices to achieve complete running such as PV modules, generator, or utility grid. Please consult with your system integrator for other possible system architectures depending on your requirements. The WiFi / GPRS module is a plug-and-play monitoring device to be installed on the inverter. With this device, users can monitor the status of the PV system from the mobile phone or from the website anytime anywhere.

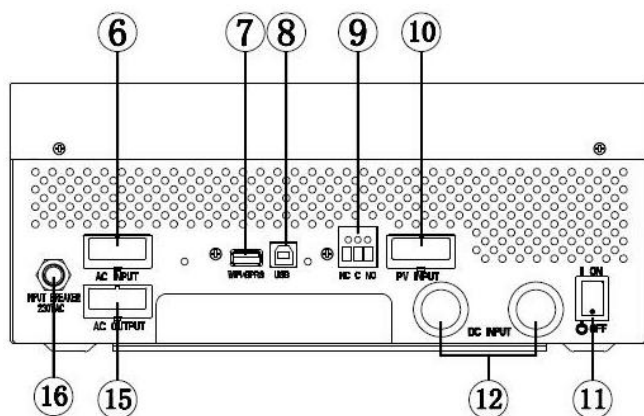
Features

- ▶ Rated power 1KW to 5KW, power factor 1
- ▶ MPPT solar charge controller to maximize the solar output
- ▶ High frequency inverter with small size and light weight
- ▶ Pure sine wave AC output
- ▶ Overload, short circuit and deep discharge protection
- ▶ Configurable AC/ solar input priority via LCD setting
- ▶ Compatible to mains voltage or generator power
- ▶ WIFI/ GPRS remote monitoring (optional)
- ▶ Parallel operation available for 4KW/5KW

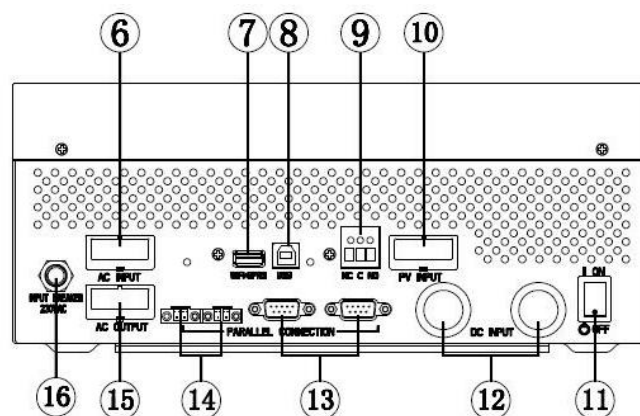
Product Overview



1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons



Single Model



Parallel Model

6. AC input
7. WiFi/GPRS communication port
8. USB communication port
9. Dry contact
10. PV input
11. Power on/off switch
12. Battery input
13. Parallel communication ports (only for parallel model)
14. Current sharing ports (only for parallel model)
15. AC output
16. Circuit breaker

NOTE: For parallel model installation and operation, please check separate parallel installation guide for the details.

Installation

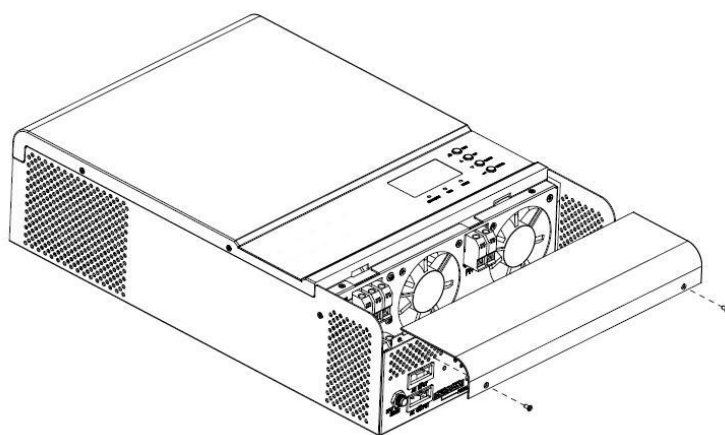
Unpacking and Inspection

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items in the package:

- ▶ The unit x 1
- ▶ User manual x 1
- ▶ Communication cable x 1
- ▶ Software CD x 1

Preparation

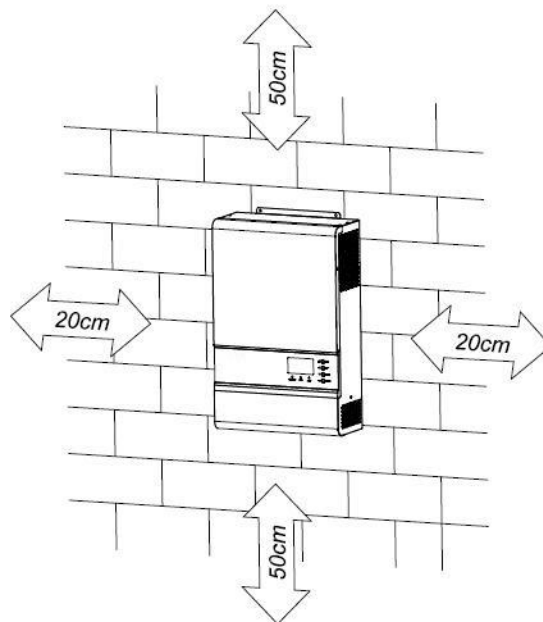
Before connecting all wiring, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

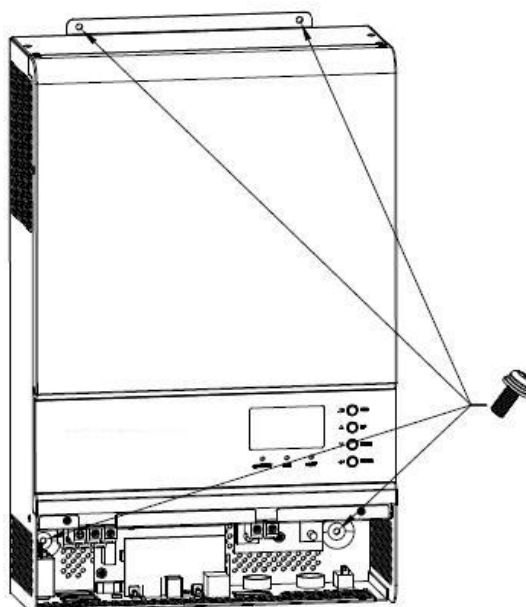
Consider the following points before selecting where to install:

- ▶ Do not mount the inverter on flammable construction materials.
- ▶ Mount on a solid surface
- ▶ Install this inverter at eye level in order to allow the LCD display to be read at all times.
- ▶ The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- ▶ The recommended installation position is to be adhered to the wall vertically.
- ▶ Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.

Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.



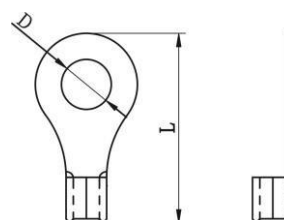
Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size.

WARNING! All wiring must be performed by a qualified person.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.

Ring terminal:

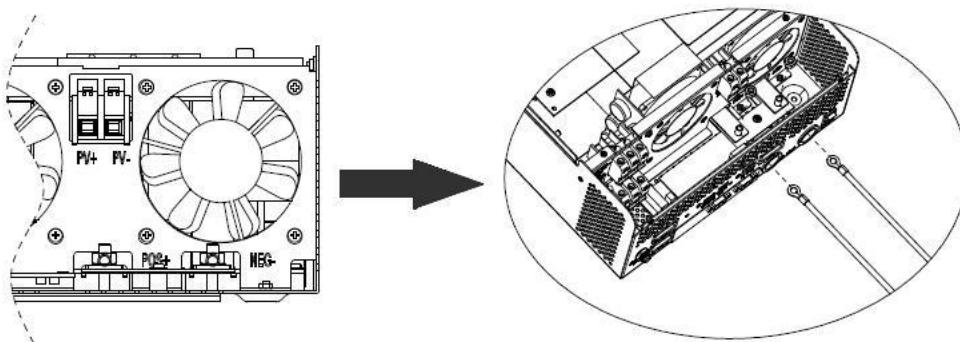


Recommended battery cable and terminal size:

| Model | Maximum Amperage | Battery capacity | Wire Size | Ring Terminal | | | Torque value |
|-----------|------------------|------------------|-----------|-----------------------|------------|--------|--------------|
| | | | | Cable mm ² | Dimensions | | |
| | | | | | D (mm) | L (mm) | |
| 1KVA/2KVA | 109A | 100AH | 1*4AWG | 22 | 6.4 | 29.2 | 2~ 3 Nm |
| | | | 2*8AWG | 16 | 6.4 | 23.8 | |
| 3KVA | 164A | 100AH | 1*2AWG | 38 | 6.4 | 33.2 | 2~ 3 Nm |
| | | 200AH | 2*6AWG | 28 | 6.4 | 29.2 | |
| 4KVA | 110A | 200AH | 1*4AWG | 22 | 6.4 | 39.2 | 2~ 3 Nm |
| | | | 2*8AWG | 16 | 6.4 | 33.2 | |
| 5KVA | 137A | 200AH | 1*2AWG | 38 | 6.4 | 39.2 | 2~ 3 Nm |
| | | | 2*6AWG | 28 | 6.4 | 33.2 | |

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Connect all battery packs as units requires. It's suggested to connect at least 100Ah capacity battery for 1-3KVA model and at least 200Ah capacity battery for 4KVA/5KVA model.
3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.



WARNING: Shock Hazard

Installation must be performed with care due to high battery voltage in series.



CAUTION!! Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.

CAUTION!! Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

CAUTION!! Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 10A for 1KVA, 20A for 2KVA, 32A for 3KVA, 40A for 4KVA and 50A for 5KVA.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

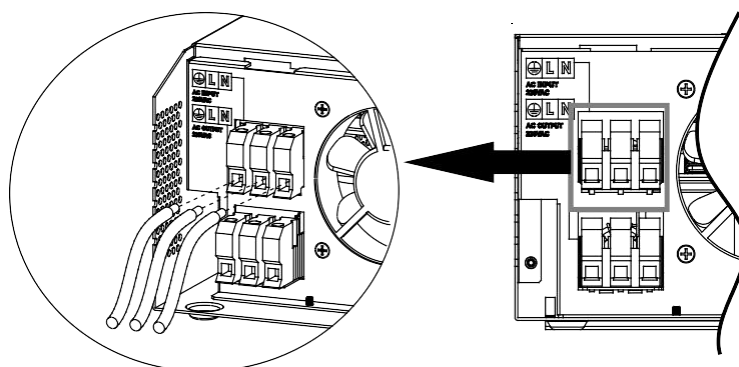
Suggested cable requirement for AC wires

| Model | Gauge | Torque Value |
|-------|--------|--------------|
| 1KVA | 16 AWG | 0.5~ 0.6 Nm |
| 2KVA | 14 AWG | 0.8~ 1.0 Nm |
| 3KVA | 12 AWG | 1.2~ 1.6 Nm |
| 4KVA | 10 AWG | 1.4~ 1.6Nm |
| 5KVA | 8 AWG | 1.4~ 1.6Nm |

Please follow below steps to implement AC input/output connection:

1. Before making AC input/output connection, be sure to open DC protector or disconnecter first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor (⊕) first.

⊕→**Ground (yellow-green)**
L→**LINE (brown or black)**
N→**Neutral (blue)**

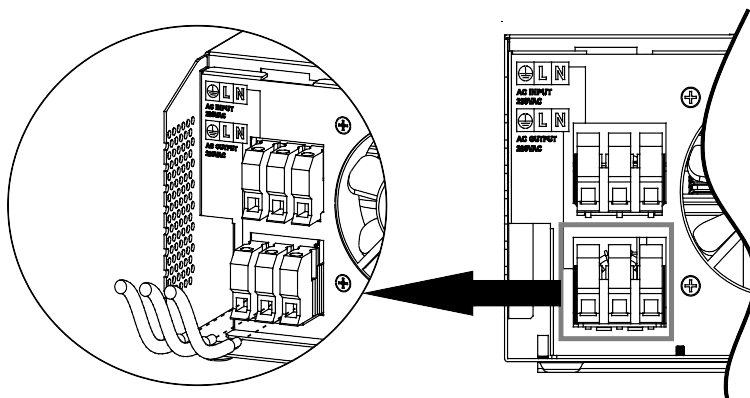


WARNING:

Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⊕) first.

⊕→**Ground (yellow-green)**
L→**LINE (brown or black)**
N→**Neutral (blue)**



5. Make sure the wires are securely connected.

CAUTION: Important

Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check with manufacturer of air conditioner that if it's equipped with time-delay function before installation. Otherwise, this off grid solar inverter will trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

PV Connection

CAUTION: Before connecting to PV modules, please install **separately** a DC circuit breaker between inverter and PV modules.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

| Model | Typical Amperage | Cable Size | Torque |
|--------------------|------------------|------------|------------|
| 1KVA / 2KVA / 3KVA | 40A | 10 AWG | 1.2~1.6 Nm |
| 4KVA / 5KVA | 80A | 6 AWG | 1.4~1.6 Nm |

PV Module Selection:

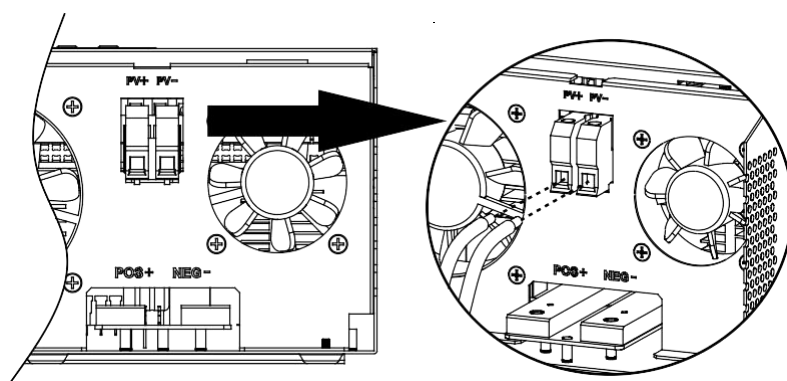
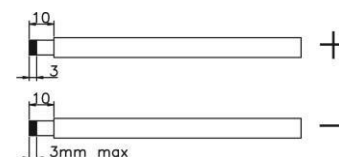
When selecting proper PV modules, please be sure to consider below parameters:

1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

| Solar Charging Mode | | | |
|------------------------------------|------------|-------------|-------------|
| INVERTER MODEL | 1KVA | 2KVA / 3KVA | 4KVA / 5KVA |
| Max. PV Array Open Circuit Voltage | 102Vdc max | 102Vdc max | 145Vdc |
| PV Array MPPT Voltage Range | 15~80Vdc | 30~80Vdc | 60~115Vdc |
| Min. battery voltage for PV charge | 8.5Vdc | 17Vdc | 34Vdc |

Please follow below steps to implement PV module connection:

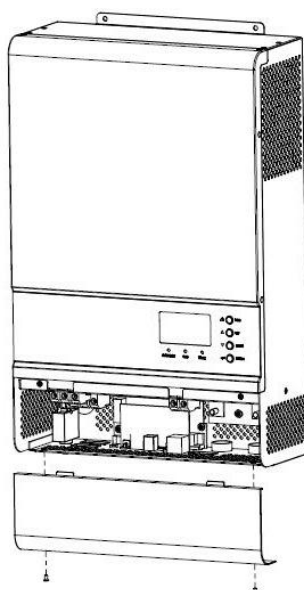
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.



3. Make sure the wires are securely connected.

Final Assembly

After connecting all wiring, please put bottom cover back by screwing two screws as shown below.




Communication Connection

Please use supplied communication cable to connect to inverter and PC. Insert bundled CD into a computer and follow on-screen instruction to install the monitoring software. For the detailed software operation, please check user manual of software inside of CD.

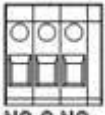
Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. When program 38 is set as "disable", it could be used to deliver signal to external device when battery voltage reaches warning level. When program 38 is set as "enable" and the unit is working in battery mode, it could be used to trigger the grounding box to connect neutral and grounding of AC output together.

When program 38 is set as "disable" (default setting):

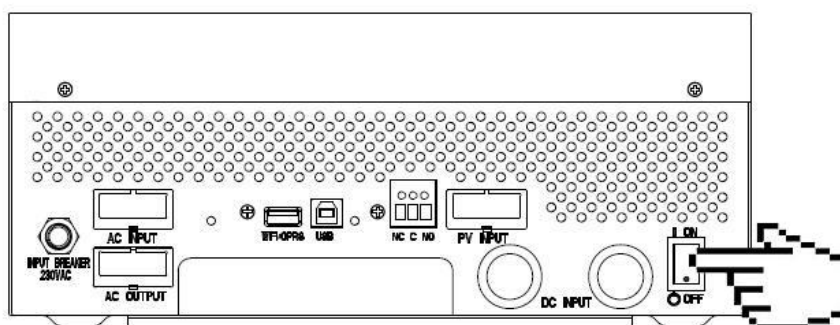
| Unit Status | Condition | | |  Dry contact port: NC C NO | |
|-------------|--|---|--|--|--------|
| | | | | NC & C | NO & C |
| Power Off | Unit is off and no output is powered. | | | Close | Open |
| Power On | Output is powered from Utility. | | | Close | Open |
| | Output is powered from Battery or Solar. | Program 01 set as Utility | Battery voltage < Low DC warning voltage | Open | Close |
| | | | Battery voltage > Setting value in Program 13 or battery charging reaches floating stage | Close | Open |
| | | Program 01 is set as SBU or Solar first | Battery voltage < Setting value in Program 12 | Open | Close |
| | | | Battery voltage > Setting value in Program 13 or battery charging reaches floating stage | Close | Open |

When program 38 is set as "enable":

| Unit Status | Condition | | |  Dry contact port: NC C NO | |
|-------------|---|--|--|--|--------|
| | | | | NC & C | NO & C |
| Power Off | Unit is off and no output is powered. | | | Close | Open |
| Power On | Unit works in standby mode, line mode or fault mode | | | Close | Open |
| | Unit works in battery mode or power saving mode | | | Open | Close |

Operation

Power ON/OFF

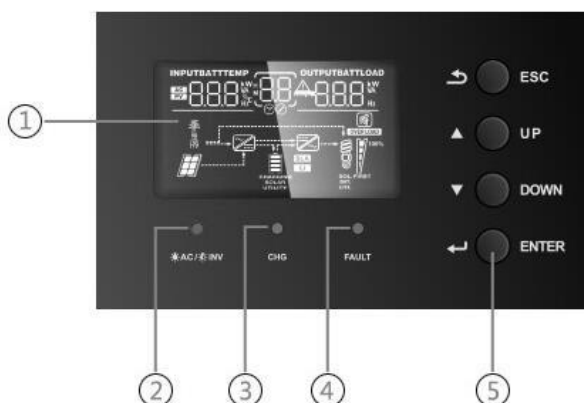


Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) to turn on the unit.

Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes three indicators, four function keys and a LCD display, indicating the operating status and input/output power information.

1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons



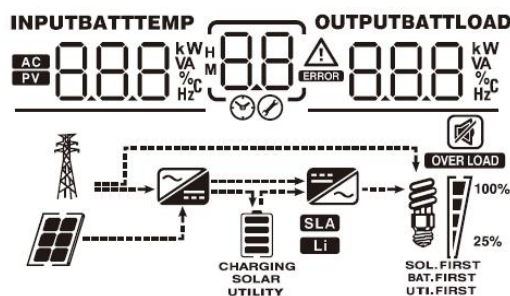
LED Indicator









| LED Indicator | | | Messages |
|---------------|-------|----------|---|
| AC / INV | Green | Solid On | Output is powered by utility in Line mode. |
| | | Flashing | Output is powered by battery or PV in battery mode. |
| CHG | Green | Solid On | Battery is fully charged. |
| | | Flashing | Battery is charging. |
| FAULT | Red | Solid On | Fault occurs in the inverter. |
| | | Flashing | Warning condition occurs in the inverter. |

Function Buttons













| Button | Description |
|--------|--|
| ESC | To exit setting mode |
| UP | To go to previous selection |
| DOWN | To go to next selection |
| ENTER | To confirm the selection in setting mode or enter setting mode |

LCD Display Icons


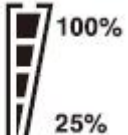






| Icon | Function Description | |
|---|--|--|
| Input Source Information | | |
|  | Indicates the AC input. | |
|  | Indicates the PV input | |
|  | Indicate input voltage, input frequency, PV voltage, battery voltage and charger current. | |
| Configuration Program and Fault Information | | |
|  | Indicates the setting programs. | |
|  | Indicates the warning and fault codes. Warning: flashing with warning code. Fault:lighting with fault code | |
| Output Information | | |
|  | Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current. | |
| Battery Information | | |
|  | Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode. | |
|  | These two signs indicate the charge priority. SOLAR indicates solar first. UTILITY indicate utility first. SOLAR blinking indicates solar only; SOLAR and UTILITY both on indicates combined charging. | |
| In AC mode, it will present battery charging status. | | |
| Status | Battery voltage | LCD Display |
| Constant Current mode / Constant Voltage mode | <2V/cell | 4 bars will flash in turns. |
| | 2 ~ 2.083V/cell | Bottom bar will be on and the other three bars will flash in turns. |
| | 2.083 ~ 2.167V/cell | Bottom two bars will be on and the other two bars will flash in turns. |
| | > 2.167 V/cell | Bottom three bars will be on and the top bar will flash. |
| Floating mode. Batteries are fully charged. | | 4 bars will be on. |





In battery mode, it will present battery capacity.

| Load Percentage | Battery Voltage | LCD Display |
|-----------------|--------------------------|---|
| Load >50% | < 1.717V/cell |  |
| | 1.717V/cell ~ 1.8V/cell |  |
| | 1.8 ~ 1.883V/cell |  |
| | > 1.883 V/cell |  |
| 50%> Load > 20% | < 1.817V/cell |  |
| | 1.817V/cell ~ 1.9V/cell |  |
| | 1.9 ~ 1.983V/cell |  |
| | > 1.983 |  |
| Load < 20% | < 1.867V/cell |  |
| | 1.867V/cell ~ 1.95V/cell |  |
| | 1.95 ~ 2.033V/cell |  |
| | > 2.033 |  |

Load Information

| | | | | |
|---|---|---|---|---|
| OVER LOAD | Indicates overload. | | | |
|   | Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%. | | | |
| | 0%~24% | 25%~49% | 50%~74% | 75%~100% |
| |  |  |  |  |

Mode Operation Information

| | |
|---|--|
|  | Indicates unit connects to the mains. |
|  | Indicates unit connects to the PV panel. |
| BYPASS | Indicates load is supplied by utility power. |
|  | Indicates the utility charger circuit is working. |
|  | Indicates the DC/AC inverter circuit is working. |
| SOL.FIRST BAT.FIRST UTI.FIRST | These three signs indicate the output priority. SOL.FIRST indicates solar first. BAT.FIRST indicates battery first. UTI.FIRST indicates utility first. |



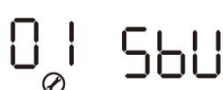

Mute Operation

| | |
|---|-----------------------------------|
|  | Indicates unit alarm is disabled. |
|---|-----------------------------------|

LCD Setting

After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

Setting Programs:

| Program | Description | Setting Option | |
|---------|---|--|---|
| 01 | Output source priority: To configure load power source priority | Solar first  | Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power the loads at the same time. Utility provides power to the loads only when any one condition happens: - Solar energy is not available - Battery voltage drops to either low-level warning voltage or the setting point in program 12. |
| | | Utility first (default)  | Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available. |
| | | SBU priority  | Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12. |
| 02 | Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current) |  48V model: default 60A, 10A~140A Settable 24V model: default 40A, 10A~70A Settable 12V model: default 40A, 10A~60A Settable | |

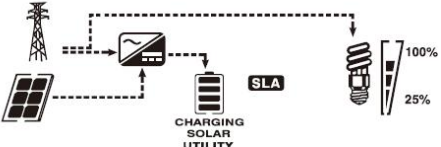

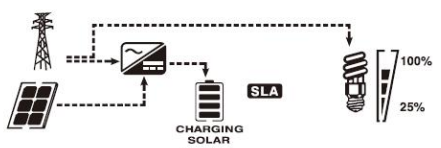
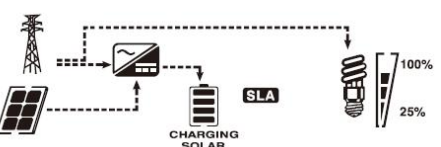
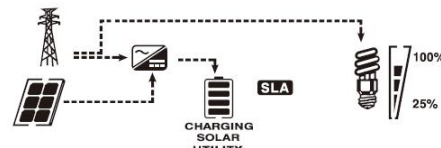
| | | | |
|----|---|--|--|
| 03 | AC input voltage range | 03 APL ⊗ Appliance (default) | If selected, acceptable AC input voltage range will be within 90~280VAC |
| | | 03 UPS ⊗ UPS | If selected, acceptable AC input voltage range will be within 170~280VAC |
| | | 03 GEN ⊗ Generator | If selected, acceptable AC input voltage range will be within 90~280VAC |
| 04 | Power saving mode enable/disable | 04 SDS ⊗ Saving mode disable (default) | If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected. |
| | | 04 SEN ⊗ Saving mode enable | If enabled, the output of inverter will be off when connected load is pretty low or not detected. |
| 05 | Battery type | AGM (default) 05 AGM ⊗ | Flooded 05 FLD ⊗ |
| | | User-Defined 05 USE ⊗ | If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21. |
| 06 | Auto restart when overload occurs | Restart disable (default) 06 LTD ⊗ | Restart enable 06 LFE ⊗ |
| 07 | Auto restart when over temperature occurs | Restart disable (default) 07 LTD ⊗ | Restart enable 07 LFE ⊗ |
| 08 | Output voltage | 230V (default) 08 230 ^v ⊗ | 220V 08 220 ^v ⊗ |
| | | 240V 08 240 ^v ⊗ | 208V 08 208 ^v ⊗ |

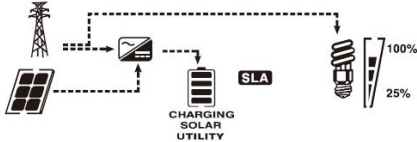
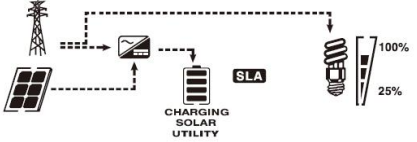
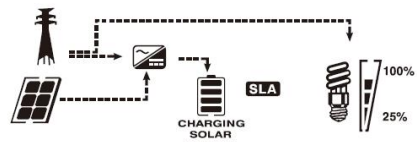
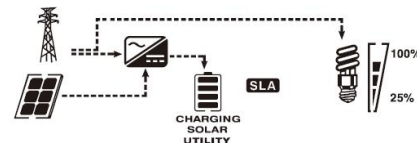
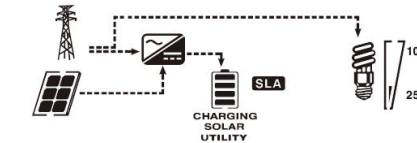
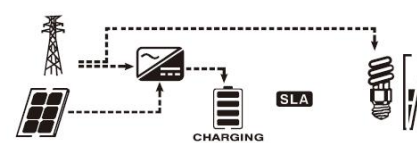
| | | | |
|----|---|--|--|
| 09 | Output frequency | 50Hz (default) 09 50 Hz | 60Hz 09 60 Hz |
| 10 | Number of series batteries connected | BATT 10 4 (e.g. Showing batteries are connected in 4 series) | |
| 11 | Maximum utility charging current | 11 30 A 48V model: default 30A, 10A~60A Settable 24V model: default 30A, 10A~30A Settable 12V model: default 20A, 10A~20A Settable | |
| 12 | Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01 | 12 46.0 V 48V model: default 46.0V, 44.0V~51.2V Settable 24V model: default 23.0V, 22.0V~25.6V Settable 12V model: default 11.5V, 11.0V~12.8V Settable | |
| 13 | Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01 | 13 54.0 V 48V model: default 54.0V, 48.0V~58.0V Settable 24V model: default 27.0V, 24.0V~29.0V Settable 12V model: default 13.5V, 12.0V~14.5V Settable | |
| 14 | Charger source priority: To configure charger source priority | If this off grid solar inverter is working in Line, Standby or Fault mode, charger source can be programmed as below: | |
| | | Solar first 14 C50 | Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available. |
| | | Utility first 14 CUE | Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available. |
| | | Solar and Utility 14 SNU | Solar energy and utility will both charge battery. |
| | | Only Solar 14 050 | Solar energy will be the only charger source no matter utility is available or not. |
| | | If this off grid solar inverter is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient. | |

| | | | |
|----|---|---|---|
| 15 | Alarm control | Alarm on (default) 15 60N ⊗ | Alarm off 15 60F ⊗ |
| 16 | Backlight control | Backlight on (default) 16 L0N ⊗ | Backlight off 16 L0F ⊗ |
| 17 | Beeps while primary source is interrupted | Alarm on (default) 17 A0N ⊗ | Alarm off 17 A0F ⊗ |
| 18 | Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode. | Bypass disable (default) 18 6Yd ⊗ | Bypass enable 18 6YE ⊗ |
| 19 | Bulk charging voltage (C.V voltage). If self-defined is selected in program 5, this program can be set up | CU 19 56.4V ⊗ 48V model: default 56.4V, 48.0V~58.4V Settable 24V model: default 28.2V, 24.0V~29.2V Settable 12V model: default 14.1V, 12.0V~14.6V Settable | |
| 20 | Floating charging voltage. If self-defined is selected in program 5, this program can be set up | FLU 20 54.0V ⊗ 48V model: default 54.0V, 48.0V~58.4V Settable 24V model: default 27.0V, 24.0V~29.2V Settable 12V model: default 13.5V, 12.0V~14.6V Settable | |
| 21 | Low DC cut-off voltage. If self-defined is selected in program 5, this program can be set up | COU 21 42.0V ⊗ 48V model: default 42.0V, 40.0V~48.0V Settable 24V model: default 21.0V, 20.0V~24.0V Settable 12V model: default 10.5V, 10.0V~12.0V Settable | |
| 22 | Solar power balance. When enabled, solar input power will be automatically adjusted according to connected load power. (Only available for 4KVA/5KVA model) | Solar power balance enable (Default): 22 56E ⊗ | If selected, solar input power will be automatically adjusted according to the following formula: Max. input solar power = Max. battery charging power + Connected load power. |
| | | Solar power balance disable: 22 56d ⊗ | If selected, the solar input power will be the same to max. battery charging power no matter how much loads are connected. The max. battery charging power will be based on the setting current in program 2. (Max. solar power = Max. battery charging power) |

Display Setting

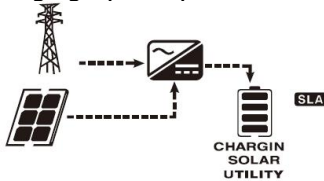
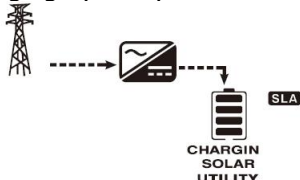
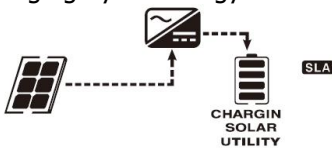


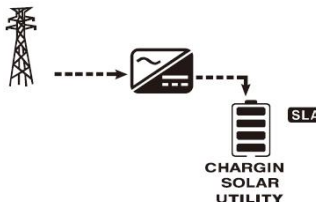


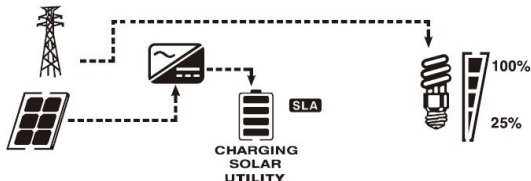
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load in VA, load in Watt, DC discharging current, main CPU Version and second CPU Version.

| Setting Information | LCD display |
|--|---|
| Input voltage/Output voltage (Default Display Screen) | <p>Input Voltage=230V, output voltage=230V</p> <p>INPUT AC 230 V OUTPUT 230 V</p>  |
| Input frequency | <p>Input frequency=50Hz</p> <p>INPUT AC 50.0 Hz OUTPUT 230 V</p>  |
| PV voltage | <p>PV voltage=60V</p> <p>INPUT PV 60 V OUTPUT 230 V</p>  |
| Charging current | <p>Current $\geq 10A$</p> <p>BATT AC PV 50 A OUTPUT 230 V</p>  <p>Current < 10A</p> <p>BATT AC PV 5 A OUTPUT 230 V</p>  |

| | |
|---|---|
| MPPT Charging power | <p>MPPT charging power=500W</p> <div> <div>BATT</div> <div>PV 500 W</div> <div>OUTPUT</div> <div>230 V</div> </div>  |
| Battery voltage/ DC discharging current | <p>Battery voltage=51.0V, discharging current=0A</p> <div> <div>BATT</div> <div>51.0 V</div> <div>BATT</div> <div>0 A</div> </div>  |
| Output frequency | <p>Output frequency=50Hz</p> <div> <div>BATT</div> <div>51.0 V</div> <div>OUTPUT</div> <div>50.0 Hz</div> </div>  |
| Load percentage | <p>Load percent=70%</p> <div> <div>BATT</div> <div>51.0 V</div> <div>LOAD</div> <div>70.0 %</div> </div>  |
| Load in VA | <p>When connected load is lower than 1kVA, load in VA will present xxx VA like below chart.</p> <div> <div>INPUT</div> <div>AC 230 V</div> <div>LOAD</div> <div>350 VA</div> </div>  <p>When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.x kVA like below chart.</p> <div> <div>INPUT</div> <div>AC 230 V</div> <div>LOAD</div> <div>1.50 kVA</div> </div>  |

| | |
|---------------------------------------|--|
| <p>Load in Watt</p> | <p>When load is lower than 1kW, load in W will present xxx W like below chart.</p> <div> </div> <p>When load is larger than 1kW ($\geq 1\text{kW}$), load in W will present x.x kW like below chart.</p> <div> </div> |
| <p>Main CPU version checking</p> | <p>Main CPU version U1-01-04</p> <div> </div> |
| <p>Secondary CPU version checking</p> | <p>Secondary CPU version U2-03-03</p> <div> </div> |

Operating Mode Description

| Operation mode | Description | LCD display |
|---|---|--|
| <p>Standby mode / Power saving mode</p> <p>Note:</p> <p>*Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.</p> <p>*Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected.</p> | <p>No output is supplied by the unit but it still can charge batteries.</p> | <p>Charging by utility and PV energy.</p>  |
| | | <p>Charging by utility.</p>  |
| | | <p>Charging by PV energy.</p>  |
| | | <p>No charging.</p>  |
| <p>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p> | <p>PV energy and utility can charge batteries.</p> | <p>Charging by utility and PV energy.</p>  |
| | | <p>Charging by utility.</p>  |
| | | <p>Charging by PV energy.</p>  |
| | | <p>No charging.</p>  |
| Line Mode | <p>The unit will provide output power from the mains. It will also charge the battery at line mode.</p> | <p>Charging by PV energy</p>  |







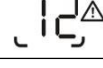





| | | |
|--------------|--|--|
| Line Mode | The unit will provide output power from the mains. It will also charge the battery at line mode. | <p>Charging by utility</p> |
| Battery Mode | The unit will provide output power from battery and PV power. | <p>Power from battery and PV energy.</p> |
| | | <p>Power from battery only.</p> |

Fault Reference Code

| Fault Code | Fault Event | Icon on |
|------------|---|---------|
| 01 | Fan is locked when inverter is off. | |
| 02 | Over temperature | |
| 03 | Battery voltage is too high | |
| 04 | Battery voltage is too low | |
| 05 | Output short circuited or over temperature is detected by internal converter components. | |
| 06 | Output voltage is abnormal. (For 1K/2K/3K model) Output voltage is too high. (For 4K/5K model) | |
| 07 | Overload time out | |
| 08 | Bus voltage is too high | |
| 09 | Bus soft start failed | |
| 11 | Main relay failed | |
| 51 | Over current or surge | |
| 52 | Bus voltage is too low | |
| 53 | Inverter soft start failed | |
| 55 | Over DC voltage in AC output | |
| 56 | Battery connection is open | |
| 57 | Current sensor failed | |
| 58 | Output voltage is too low | |

NOTE: Fault codes 51, 52, 53, 55, 56, 57 and 58 are only available in 4K/5K model.

Warning Indicator

| Warning Code | Warning Event | Audible Alarm | Icon flashing |
|--------------|--|-------------------------------|---|
| 01 | Fan is locked when inverter is on. | Beep three times every second |  |
| 02 | Over temperature | Beep once every second |  |
| 03 | Battery is over-charged | Beep once every second |  |
| 04 | Low battery | Beep once every second |  |
| 07 | Overload | Beep once every 0.5 second |  |
| 10 | Output power derating | Beep twice every 3 seconds |  |
| 12 | Solar charger stops due to low battery | Beep once every second |  |
| 13 | Solar charger stops due to high PV voltage | Beep once every second |  |
| 14 | Solar charger stops due to overload | Beep once every second |  |
| 15 | Parallel input utility grid different | Beep once every second |  |
| 16 | Parallel input phase error | Beep once every second |  |
| 17 | Parallel output phase loss | Beep once every second |  |

Specifications

Table 1 Line Mode Specifications

| INVERTER MODEL | 1KVA / 2KVA / 3KVA / 4KVA / 5KVA |
|--|--|
| Input Voltage Waveform | Sinusoidal (utility or generator) |
| Nominal Input Voltage | 230Vac |
| Low Loss Voltage | 170Vac±7V (UPS) 90Vac±7V (Appliances) |
| Low Loss Return Voltage | 180Vac±7V (UPS); 100Vac±7V (Appliances) |
| High Loss Voltage | 280Vac±7V |
| High Loss Return Voltage | 270Vac±7V |
| Max AC Input Voltage | 300Vac |
| Nominal Input Frequency | 50Hz / 60Hz (Auto detection) |
| Low Loss Frequency | 40±1Hz |
| Low Loss Return Frequency | 42±1Hz |
| High Loss Frequency | 65±1Hz |
| High Loss Return Frequency | 63±1Hz |
| Output Short Circuit Protection | Line mode: Circuit Breaker Battery mode: Electronic Circuits |
| Efficiency (Line Mode) | >95% (Rated R load, battery full charged) |
| Transfer Time | 10ms typical (UPS); 20ms typical (Appliances) |
| Output power derating: When AC input voltage drops to 95V or 170V depending on models, the output power will be derated. | <p>The graph illustrates the output power derating characteristics. The vertical axis represents Output Power, with markers for Rated Power and 50% Power. The horizontal axis represents Input Voltage, with markers at 90V, 170V, and 280V. The power remains at the Rated level until 170V, then decreases linearly to 50% of the Rated Power at 90V, and remains constant at 50% power until 280V.</p> |

Table 2 Inverter Mode Specifications

| INVERTER MODEL | 1KVA | 2KVA / 3KVA | 4KVA / 5KVA |
|--------------------------------------|-----------------------------------|----------------------|----------------------|
| Rated Output Power | 1KVA/1KW | 2KVA/2KW 3KVA/3KW | 4KVA/4KW 5KVA/5KW |
| Output Voltage Waveform | Pure Sine Wave | | |
| Output Voltage Regulation | 230Vac±5% | | |
| Output Frequency | 60Hz or 50Hz | | |
| Peak Efficiency | 90% | | |
| Overload Protection | 5s@≥150% load; 10s@110%~150% load | | |
| Surge Capacity | 2* rated power for 5 seconds | | |
| Nominal DC Input Voltage | 12Vdc | 24Vdc | 48Vdc |
| Cold Start Voltage | 11.5Vdc | 23.0Vdc | 46.0Vdc |
| Low DC Warning Voltage | | | |
| @ load < 20% | 11.0Vdc | 22.0Vdc | 44.0Vdc |
| @ 20% ≤ load < 50% | 10.7Vdc | 21.4Vdc | 42.8Vdc |
| @ load ≥ 50% | 10.1Vdc | 20.2Vdc | 40.4Vdc |
| Low DC Warning Return Voltage | | | |
| @ load < 20% | 11.5Vdc | 23.0Vdc | 46.0Vdc |
| @ 20% ≤ load < 50% | 11.2Vdc | 22.4Vdc | 44.8Vdc |
| @ load ≥ 50% | 10.6Vdc | 21.2Vdc | 42.4Vdc |
| Low DC Cut-off Voltage | | | |
| @ load < 20% | 10.5Vdc | 21.0Vdc | 42.0Vdc |
| @ 20% ≤ load < 50% | 10.2Vdc | 20.4Vdc | 40.8Vdc |
| @ load ≥ 50% | 9.6Vdc | 19.2Vdc | 38.4Vdc |
| High DC Recovery Voltage | 14.5Vdc | 29Vdc | 58Vdc |
| High DC Cut-off Voltage | 15.5Vdc | 31Vdc | 62Vdc |
| No Load Power Consumption | <15W | <25W | <50W |
| Saving Mode Power Consumption | <5W | <10W | <15W |

Table 3 Charge Mode Specifications

| Utility Charging Mode | | | | |
|---|-------------------|---|-------------|----------------------|
| INVERTER MODEL | | 1KVA | 2KVA / 3KVA | 4KVA / 5KVA |
| Charging Current (UPS) @ Nominal Input Voltage | | 10/20A | 20/30A | 10A/20/30A/40/50/60A |
| Bulk Charging Voltage | Flooded Battery | 14.6Vdc | 29.2Vdc | 58.4Vdc |
| | AGM / Gel Battery | 14.1Vdc | 28.2Vdc | 56.4Vdc |
| Floating Charging Voltage | | 13.5Vdc | 27Vdc | 54Vdc |
| Overcharge Protection | | 15.5Vdc | 31Vdc | 60Vdc |
| Charging Algorithm | | 3-Step | | |
| Charging Curve | | <p>The graph illustrates the 3-step charging algorithm. The left y-axis represents 'Battery Voltage, per cell' with marked values at 2.25Vdc and 2.43Vdc (2.35Vdc). The right y-axis represents 'Charging Current, %' with marked values at 50% and 100%. The x-axis represents 'Time'. The charging process is divided into three phases: Bulk (Constant Current), Absorption (Constant Voltage), and Maintenance (Floating). In the Bulk phase, the voltage rises linearly while the current remains constant at 100%. The time for this phase is T0. In the Absorption phase, the voltage is held constant at 2.43Vdc, and the current decreases exponentially. The time for this phase is T1 = 10 * T0, with a minimum of 10 minutes and a maximum of 8 hours. In the Maintenance phase, the voltage is held constant at 2.25Vdc, and the current drops to near 0%.</p> | | |

| Solar Charging Mode | | | |
|------------------------------------|------------|-------------|-------------|
| INVERTER MODEL | 1KVA | 2KVA / 3KVA | 4KVA / 5KVA |
| Rated Power | 500W | 1000W | 4000W |
| Efficiency | 98.0% max. | | |
| Max. PV Array Open Circuit Voltage | 102Vdc | 102Vdc | 145Vdc |
| PV Array MPPT Voltage Range | 15~80Vdc | 30~80Vdc | 60~115Vdc |
| Min battery voltage for PV charge | 8.5Vdc | 17Vdc | 34Vdc |
| Standby Power Consumption | 2W | | |
| Battery Voltage Accuracy | +/-0.3% | | |
| PV Voltage Accuracy | +/-2V | | |
| Charging Algorithm | 3-Step | | |
| Joint Utility and Solar Charging | | | |
| Max Charging Current | 60Amp | 70Amp | 140Amp |
| Default Charging Current | 30Amp | 30Amp | 60Amp |

Table 4 General Specifications

| INVERTER MODEL | 1KVA / 2KVA / 3KVA / 4KVA / 5KVA | | | | |
|-----------------------------|--|-----|-----|-----------------|----|
| Safety Certification | CE | | | | |
| Operating Temperature Range | 0°C to 55°C | | | | |
| Storage temperature | -15°C~ 60°C | | | | |
| Humidity | 5% to 95% Relative Humidity (Non-condensing) | | | | |
| Dimension, mm | 366 x 272 x 100 | | | 455 x 295 x 130 | |
| Net Weight, kg | 6.8 | 7.0 | 7.4 | 11 | 11 |

Trouble Shooting

| Problem | LCD/LED/Buzzer | Explanation / Possible cause | What to do |
|---|---|---|--|
| Unit shuts down automatically during startup process. | LCD/LEDs and buzzer will be active for 3 seconds and then complete off. | The battery voltage is too low (<1.91V/Cell) | 1. Re-charge battery. 2. Replace battery. |
| No response after power on. | No indication. | 1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed. | 1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery. |
| Mains exist but the unit works in battery mode. | Input voltage is displayed as 0 on the LCD and green LED is flashing. | Input protector is tripped | Check if AC breaker is tripped and AC wiring is connected well. |
| | Green LED is flashing. | Insufficient quality of AC power. (Shore or Generator) | 1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance) |
| | Green LED is flashing. | Set "Solar First" as the priority of output source. | Change output source priority to Utility first. |
| When the unit is turned on, internal relay is switched on and off repeatedly. | LCD display and LEDs are flashing | Battery is disconnected. | Check if battery wires are connected well. |
| Buzzer beeps continuously and red LED is on. | Fault code 01 | Fan fault | Replace the fan. |
| | Fault code 02 | Internal temperature of inverter component is over 100°C. | Check if the air flow of the unit is blocked or the ambient temperature is too high. |
| | Fault code 03 | Battery is over-charged. | Return to repair center. |
| | | The battery voltage is too high. | Check if spec and quantity of batteries are meet requirements. |
| | Fault code 05 | Output short circuited. | Check if wiring is connected well and remove abnormal load. |
| | | Temperature of internal converter component is over 120°C. (Only available for 1-3KVA models.) | Check if the air flow of the unit is blocked or the ambient temperature is too high. |
| | Fault code 06/58 | Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac) | 1. Reduce the connected load. 2. Return to repair center |
| | Fault code 07 | Overload error. The inverter is overload 110% and time is up. | Reduce the connected load by switching off some equipment. |
| | Fault code 08/09/53/57 | Internal components failed. | Return to repair center. |
| | Fault code 51 | Over current or surge. | Restart the unit, if the error happens again, please return to repair center. |
| | Fault code 52 | Bus voltage is too low. | |
| | Fault code 55 | Output voltage is unbalanced. | |
| | Fault code 56 | Battery is not connected well or fuse is burnt. | If the battery is connected well, please return to repair center. |