USER MANUAL

PVG 3KVA-5.2KVA
SOLARINVERTER/CHARGER

Contents

ABOUT THIS MANUAL

Purpose

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

Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

SAFETY INSTRUCTIONS

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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **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.
3. 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.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. 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.
10. One piece of 150A fuse is provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following trouble shooting table, please send this inverter/charger back to local dealer or service center for maintenance.
14. **WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules. To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.
15. **CAUTION:** It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Inverter running without battery
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible to mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function

Basic System Architecture

The following illustration shows basic application for this inverter/charger. It also includes following devices to have a complete running system:
- Generator or Utility.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power all kinds of appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner.
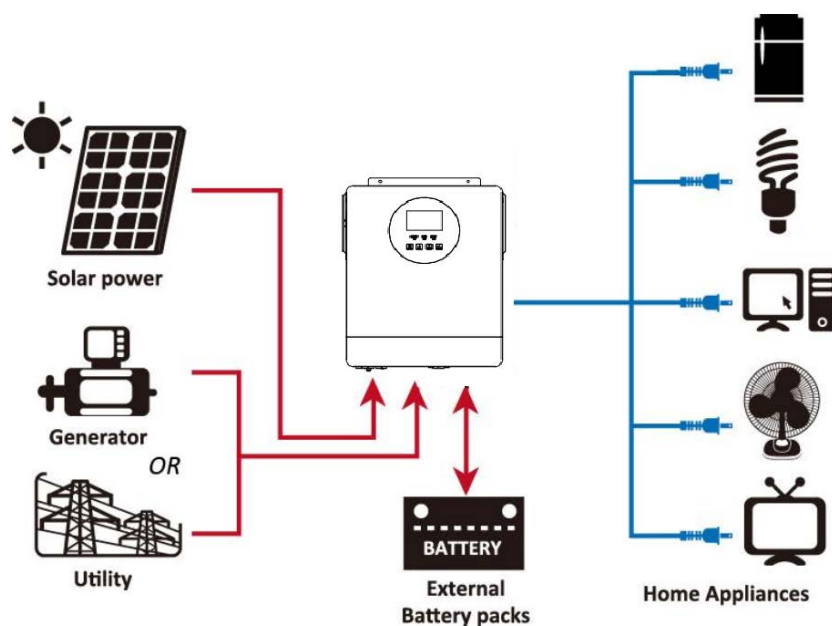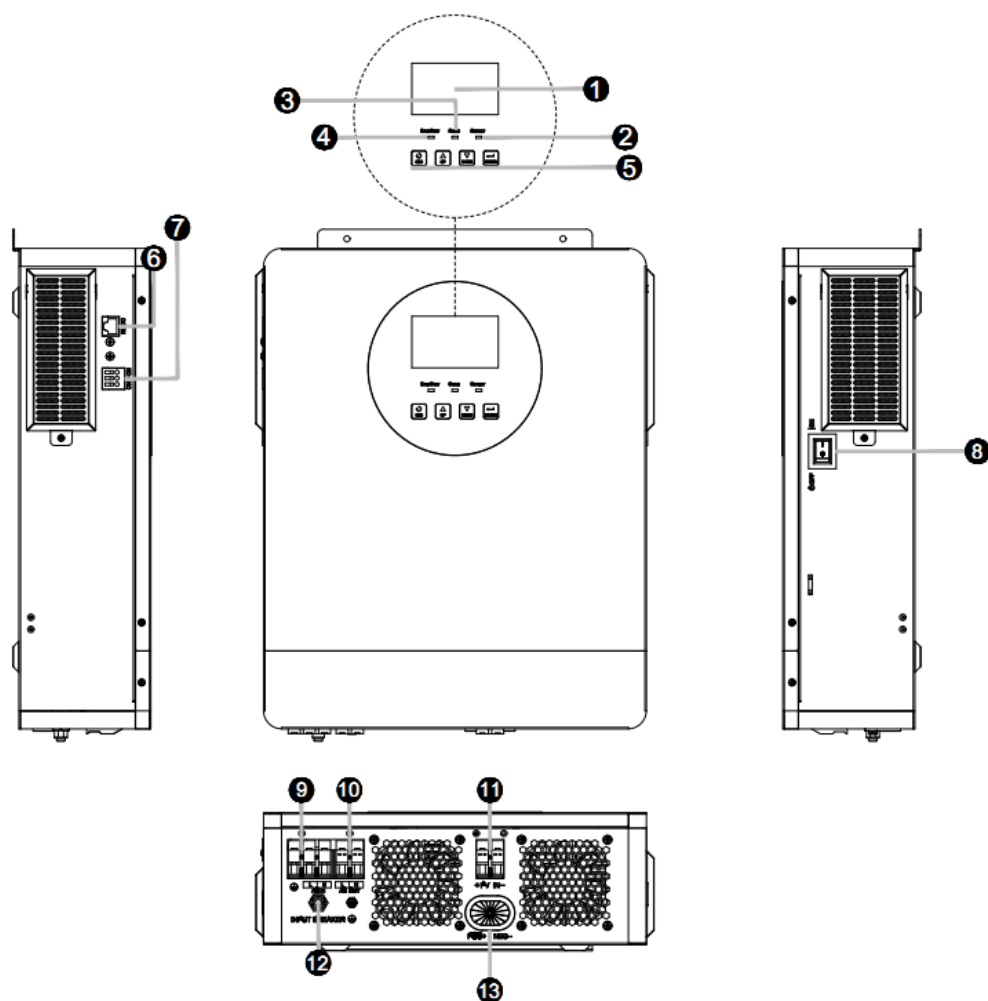


Figure 1 Hybrid Power System

Product Overview

1. LCD display
2. Fault indicator
3. Charging indicator
4. Status indicator
5. Function buttons
6. COMM communication port
7. Dry contact

8. Power on/off switch
9. AC input
10. AC output
11. PV input
12. Circuit breaker
13. Battery input

Communication port definition:

Pin number	1	2	3	4	5	6	7	8
definition	VCC	NC	NC	CAN-H	CAN-L	RXD	TXD	GND

| RS232	6:RXD , 7:TXD,8:GND
CAN	4:CAN-H,5:CAN-L
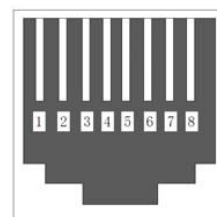
RJ45 Port

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 inside of package:

- The unit x1
- User manual x 1
- RS232 Communication cable x1
- DC Fuse x1
- Screws x8

Preparation

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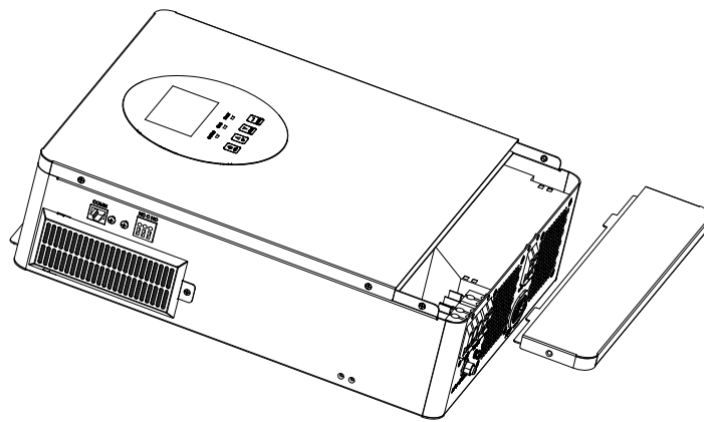

Mounting the Unit

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.
- For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit.
- 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 diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.
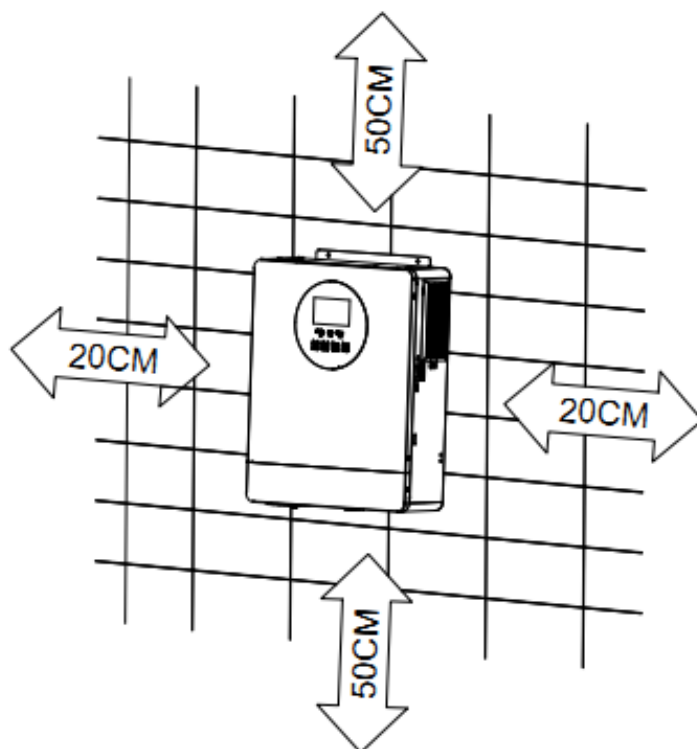
⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

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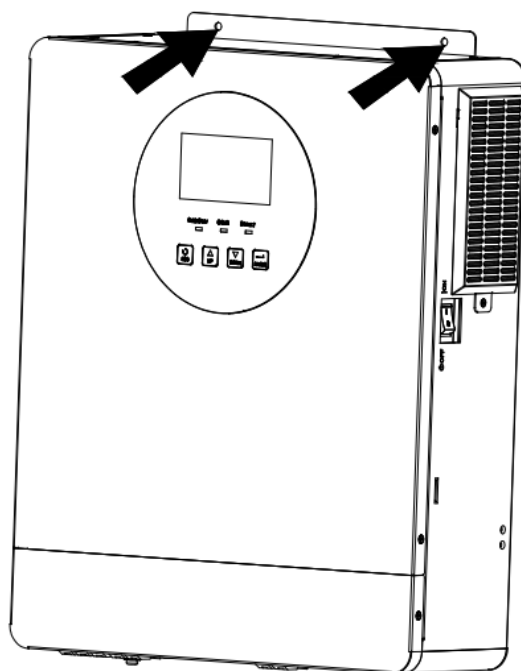
Battery Connection

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.

Ring terminal:

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 battery connection. To reduce risk of injury, please use the proper recommended cable as below.

Recommended battery cable size:
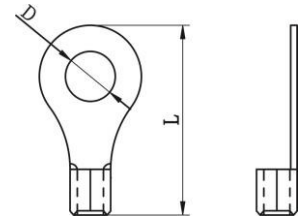
Model	Typical Amperage	Wire Size	Cable mm²	Ring Terminal Dimensions		Torque Value
				D(mm)	L(mm)	
3.0KW	142A	1*2AWG	38	8.4	39.2	
3.5KW	82A	1*4AWG	38	8.4	39.2	
5.0KW	118A	1*2AWG	38	8.4	39.2	5Nm
5.2KW	123A	1*2AWG	38	8.4	39.2	

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size. This step is only applied for 3KW/5KW models.
2. Connect all battery packs as units requires. It's suggested to connect at least 100Ah capacity battery for1.5KW/3KW model and at least 200Ah capacity battery for 5KW model.
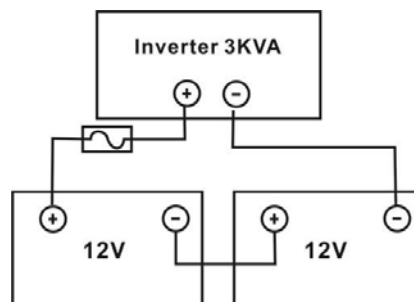

3KVA for 24V battery packs
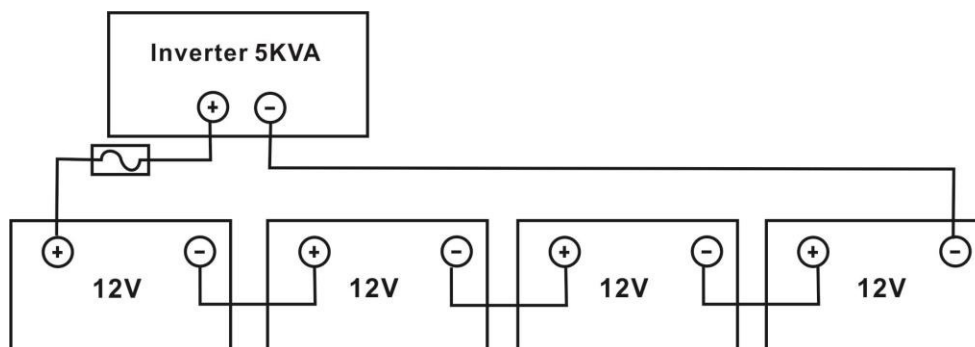
3.5KVA/5KVA/5.2KVA for 48V battery packs

Insert the battery cable horizontally into the battery terminal post of the inverter, and lock the battery cable

with a nut. The torque is 2nm. Make sure the battery and inverter/charger are polarity connected correctly, and the conductor is tightly screwed into the battery terminal. Recommended tool :13 socket
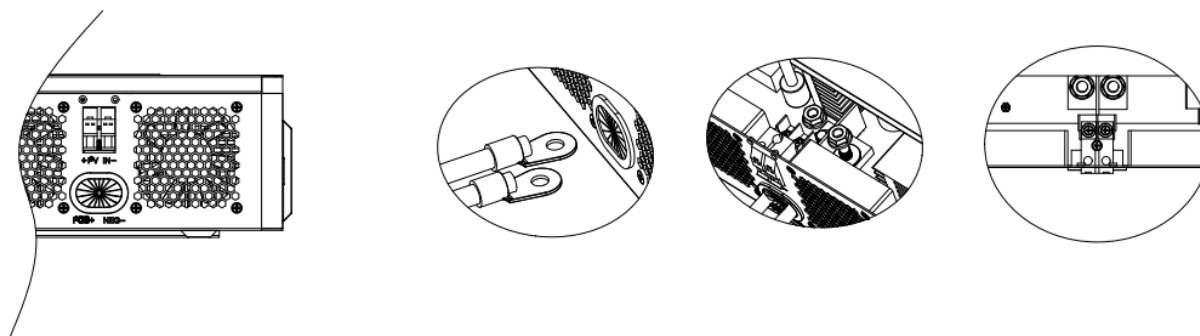
⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.

⚠	**CAUTION!!** Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, over heating 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/disconnected, 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 32A for 3KVA /3.5KVAand 50A for 5KVA/5.2KVA/5.5KVA.

    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	Cable (mm²)	Torque Value
3.0KVA	12 AWG	4	1.2 Nm
3.5KVA	12 AWG	4	1.2 Nm
5.0KVA	10 AWG	6	1.2 Nm
5.2KVA	10 AWG	6	1.2 Nm

Please follow below steps to implement AC input/output connection:
1. Before making AC input/output connection, be sure to open DC protector or disconnected first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3mm.
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)
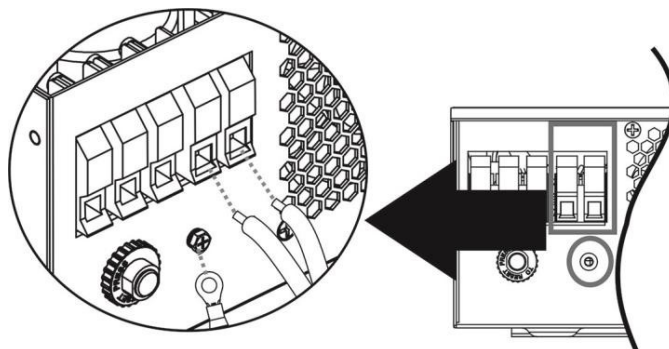**N→ Neutral (blue)**
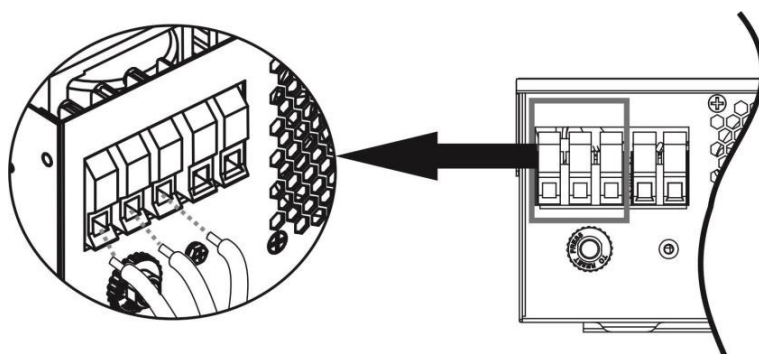
⚠ **WARNING:**
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

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: 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 manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will trig 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! 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	Wire Size	Cable (mm²)	Torque value(max)
3.0KVA	1 x 12AWG	4	1.2 Nm
3.5KVA	1 x 12AWG	4	1.2 Nm
5.0KVA	1 x 12AWG	4	1.2 Nm
5.2KVA	1 x 12AWG	4	1.2 Nm

WARNING: Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. **For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.**

CAUTION: It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

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.

INVERTER MODEL	3KVA/3.5KVA/5kVA/5.2KVA
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120Vdc~450Vdc

Take 250Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

Solar Panel Spec. (reference) - 250Wp - Vmp: 30.1Vdc - Imp: 8.3A - Voc: 37.7Vdc - Isc: 8.4A - Cells: 60	SOLAR INPUT (Min in serial: 6 pcs, max. in serial: 13 pcs)	Q'ty of panels	Total input power
	6 pcs in serial	6 pcs	1500W
	8 pcs in serial	8 pcs	2000W
	12 pcs in serial	12 pcs	3000W
	13 pcs in serial	13 pcs	3250W
	8 pieces in serial and 2 sets in parallel	16 pcs	4000W
	10 pieces in serial and 2 sets in parallel	20 pcs	5000W

PV Module Wire Connection

Please follow below steps to implement PV module connection:
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Suggest putting bootlace ferrules on the end of positive and negative wires with a proper crimping tool.

Please follow below steps to implement PV module connection:
3. Remove insulation sleeve 10 mm for positive and negative conductors.
4. Suggest putting boot lace ferrules on the end of positive and negative wires with a proper crimping tool.
5. Fix PV wire cover to the inverter with supplied screws as shown in below chart.
6. Check correct polarity of wire connection from PV modules and PV input connectors. Then, connect positive pole (+) of connection wire to positive pole (+) of PV input connector. Connect negative pole (-) of connection wire to negative pole (-) of PV input connector. Screw two wires tightly in clockwise direction. Recommended tool: 4mm blad screw driver

Final Assembly

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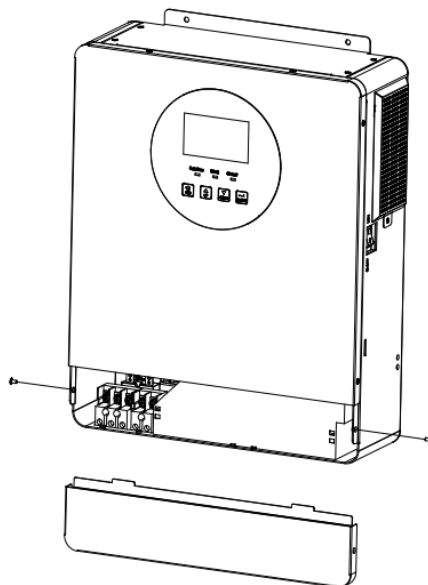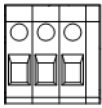

Communication Connection

Please use the included communication cable to connect the inverter and PC, RS232 communication, RS485 communication and CAN communication, and USB communication, there are rich communication connection functions.

Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. It could be used to deliver sign alto external device when battery voltage reaches warning level.

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 Battery power or Solar energy.	Output is powered from Utility.		Close	Open
		Program 01set as USB(utility first)	Battery voltage<Low DC Warning voltage	Open	Close
			Battery voltage>Setting value in Program 13 or battery charging reaches Floating stage	Close	Open
		Program01isset as SBU(SBU priority)or SUB (solar first)	Battery voltage<Setting Value in Program12	Open	Close
			Battery voltage>Setting value in Program 13 or battery charging reaches Floating stage	Close	Open

OPERATION

Power ON/OFF

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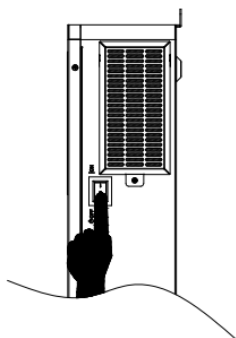
Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) to turn on the unit.

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.
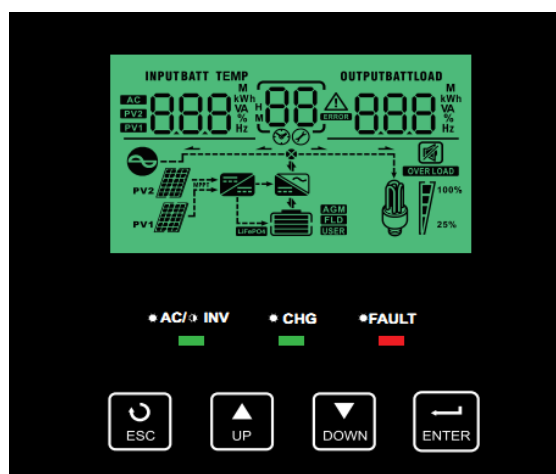
LED Indicator

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 Keys

Function Key	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
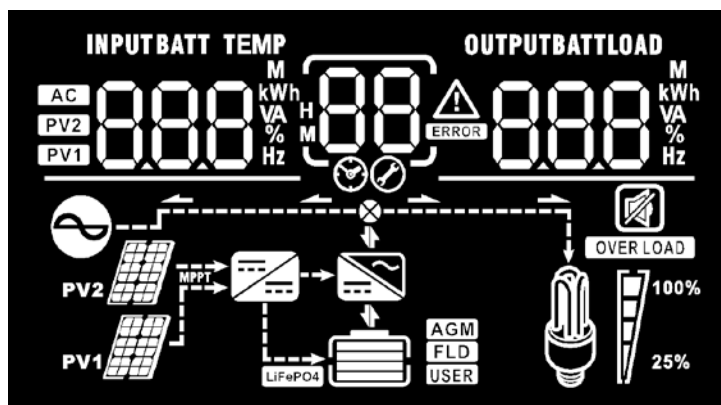
Icon	Function description
Input Source Information	
AC	Indicates the AC input.
PV1	Indicates the PV1 input
PV2	Indicates the PV2 input
INPUT BATT TEMP 888	Indicate input voltage, input frequency, PV voltage, charger current, charger power, battery voltage.
Configuration Program and Fault Information	
88	Indicates the setting programs and power-on countdown.
88 ERROR	Indicates the warning and fault codes. Warning: 88⚠ flashing with warning code. Fault: 88 ERROR lighting with fault code
Output Information	
OUTPUT BATT LOAD 888	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	
(battery icon)	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
AGM	Indicate Lead-acid battery
FLD	Indicate flooded lead acid battery
USER	Indicate user-defined battery
LiFePO4	Indicate LiFePO4 battery and CAN communication OK

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.

Load Percentage	Battery Voltage	LCD Display
Load >50%	< 1.85V/cell	
	1.85V/cell ~ 1.933V/cell	
	1.933V/cell ~ 2.017V/cell	
	> 2.017V/cell	
Load < 50%	< 1.892V/cell	
	1.892V/cell ~ 1.975V/cell	
	1.975V/cell ~ 2.058V/cell	
	> 2.058V/cell	

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

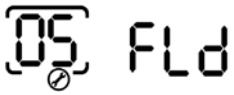|	
	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
	Indicates the DC converse circuit is working.
	Indicates the DC/AC inverter circuit is working.

Mute Operation
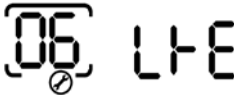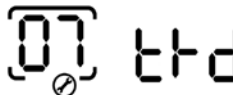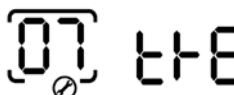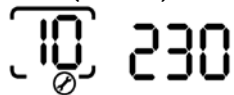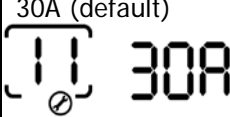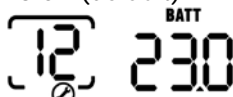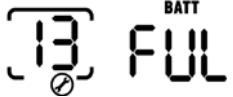
	Indicates unit alarm is disabled.
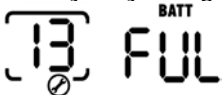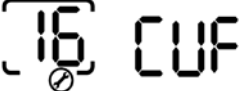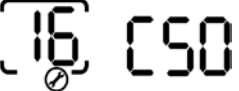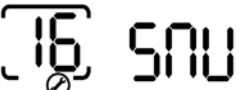
LCD Setting
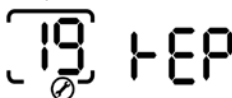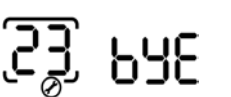
After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.
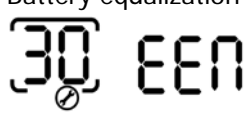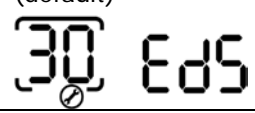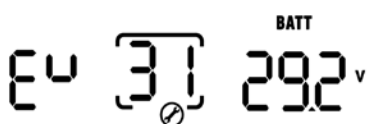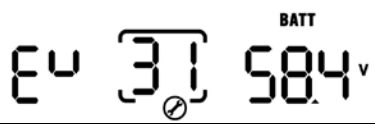
Setting Programs:
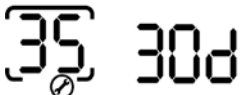
Program	Description	Selectable option	
00	Exit setting mode	Escape `00 ESC`	
01	Output source priority: To configure load power source priority	Utility first (default) `01 USb`	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only When utility power is not available.
		Solar first `01 Sub`	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the Loads at the same time.
		SBU priority `01 SbU`	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 program12.
02	Maximum charging current: To configure total charging current for solar and utility chargers.(Max. charging current =utility charging current + solar charging current)	60A (default) `02 60ᴬ`	Setting range is from 10A to 100A. Increment of each click is 10A.
03	AC input voltage range	Appliances (default) `03 APL`	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS `03 UPS`	If selected, acceptable AC input voltage range will be within 170-280VAC.

		AGM (default)	Flooded
05	Battery type	05 AGn	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 26, 27 and 29.
06	Auto restart when overload occurs	Restart disable (default) 06 Lrd	Restart enable 06 LrE
07	Auto restart when over temperature occurs	Restart disable (default) 07 trd	Restart enable 07 trE
09	Output frequency	50Hz (default) 09 50Hz	60Hz 09 60Hz
10	Output voltage	220V 10 220v	230V (default) 10 230v
		240V 10 240v	
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.	30A (default) 11 30A	Settingrangeis2A,then from10A to 80A.Incrementofeachclickis 10A.
12	Setting voltage point back to utility source when selecting "SBU priority" in program 01.	Available options in 3KVA model:	
		23.0V (default) 12 23.0v BATT	Setting range is from 22V to 25.5V. Increment of each click is 0.5V.
		Available options in 3.5/5.0/5.2KVA model:	
		46V (default) 12 46v BATT	Setting range is from 44V to 51V. Increment of each click is 1V.
		Available options in 3KVA model:	
		Battery fully charged 13 FUL BATT	27V (default) 13 27.0v BATT

13	Setting voltage point back to battery mode when selecting "SBU priority" in program 01.	Setting range is from 24V to 29V. Increment of each click is 0.5V.	
		Available options in 3.5/5.0/5.2KVA model:	
		Battery fully charged `13 FUL` BATT	54V (default) `13 54`v BATT
		Setting range is from 48V to 58V. Increment of each click is 1V.	
14	Setting the battery charging capacity and close the charging point	BSC `bSC 14 CON`%	Continuous charging.
		Disconnect the charging point(default) `bSC 14 100`%	The battery capacity disconnect charging when it reaches the setting value and resumes charging after a decrease of 5 percentage points
		Setting range is from 50% to 100%. Increment of each click is 1%.	
15	Setting the discharge capacity of the battery and disconnect the discharge point of the battery.	10%(default) `bSd 15 10`%	The discharge disconnect point is set to 10%, and the battery will stop discharging when the battery capacity is below this point.
		Setting range is from 5% to 50%. Increment of each click is 1%.	
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below:	
		Utility first `16 CUF`	Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		Solar first `16 CSO`	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Solar and Utility (default) `16 SNU`	Solar energy and utility will charge battery at the same time.
		Only Solar `16 OSO`	Solar energy will be the only charger source no matter utility is available or not.
		If this inverter/charger is working in Battery mode, only solar Energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
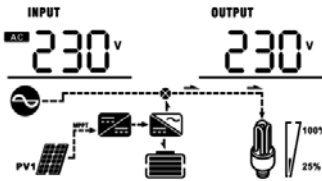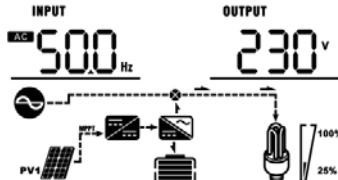
17	Grid-connected function Settings (Disable this function when connecting the generator)	Grid-connected disable (default) ⎾17⏋ Gгd	Grid-connected enable ⎾17⏋ GгE
18	Alarm control	Alarm on (default) ⎾18⏋ bОn	Alarm off ⎾18⏋ bОF
19	Auto return to default display screen	Return to default display screen (default) ⎾19⏋ ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is Pressed for 1 minute.
		Stay at latest screen ⎾19⏋ гEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) ⎾20⏋ LОn	Backlight off ⎾20⏋ LОF
21	Lithium battery wake-up function （If the function is turned on, there is no lithium battery communication, and when charging, it will wait for 5 minutes before charging）	wake-up function disable (default) ⎾21⏋ Lгd	wake-up function enable ⎾21⏋ LгE
22	Beeps while primary source is interrupted	Alarm on (default) ⎾22⏋ АОn	Alarm off ⎾22⏋ АОF
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) ⎾23⏋ bУd	Bypass enable ⎾23⏋ bУE
25	Record Fault code	Record enable (default) ⎾25⏋ FEn	Record disable ⎾25⏋ FdS
26	Bulk charging voltage (C.V voltage)	3KVA default setting: 28.2V C␣ ⎾26⏋ 28.2ᵥ	
		5.5KVA default setting: 56.4V C␣ ⎾26⏋ 56.4ᵥ	

		If self-defined is selected in program 5, this program can beset up. Setting range is from 25.0V to 31.5V for 3KVA model and 48.0V to 60.0V for 3.5/5.0/5.2KVA model. Increment of each click is0.1V.
27	Floating charging voltage	3KVA default setting: 27.0V FL⊔ 27 27.0ᵥ BATT
		3.5/5.0/5.2KVA default setting: 54.0V FL⊔ 27 54.0ᵥ BATT
		If self-defined is selected in program 5, this program can be set up. Setting range is from 25.0V to 31.5V for 3KVA model and48.0V to 60.0V for 3.5/5.0/5.2KVA model. Increment of each click is 0.1V.
29	Low DC cut-off voltage: If battery power is only power source available, inverter will shut down. If PV energy and battery power are available, inverter will charge battery without AC output.	3KVA default setting: 21.0V C0⊔ 29 21.0ᵥ BATT
		5.5KVA default setting: 42.0V C0⊔ 29 42.0ᵥ BATT
		If self-defined is selected in program 5, this program can be set up. Setting range is from 21.0V to 24.0V for 3KVA model and40.0V to 48.0V for 3.5/5.0/5.2KVA model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter Wat percentage of load is connected.
30	Battery equalization	Battery equalization 30 EEn Battery equalization disable (default) 30 EdS
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.
31	Battery equalization voltage	3KVA default setting: 29.2V E⊔ 31 29.2ᵥ BATT
		3.5/5.0/5.2/5.5KVA default setting: 58.4V E⊔ 31 58.4ᵥ BATT
		Setting range is from 25.0V to 31.5V for 3KVA model and 48.0V to61.0V for 3.5/5.0/5.2KVA model. Increment of each click is 0.1V.
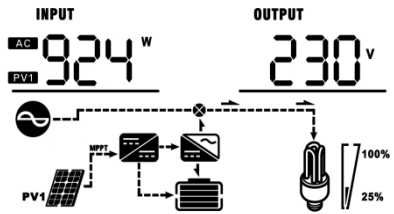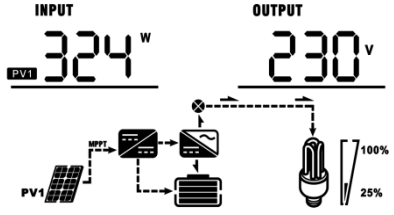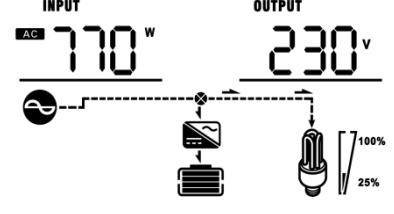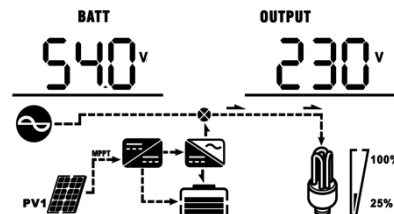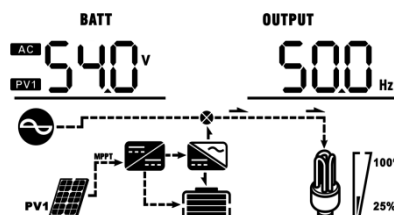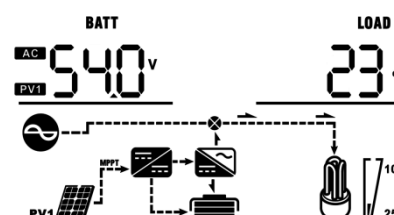
33	Battery equalized time	60min (default) ![33 60 icon]	Setting range is from 5min to 900min. Increment of each click is 5min.
34	Battery equalized timeout	120min (default) ![34 120 icon]	Settingrangeisfrom5minto900 min. Increment of each click is 5min.
35	Equalization interval	30days (default) ![35 30d icon]	Setting range is from 0 to 90 days. Increment of each click is 1 day
36	Equalization activated immediately	Enable ![36 AEN icon]	Disable (default) ![36 AdS icon]
		If equalization function is enabled in program 30,this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time,"P3"will not be shown in LCD main page.	
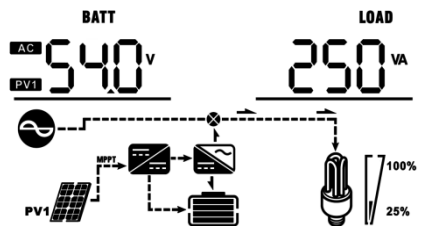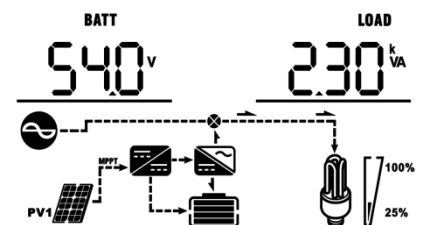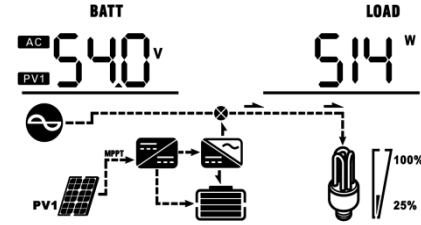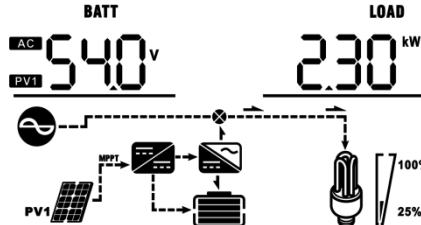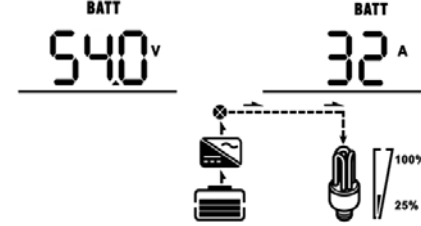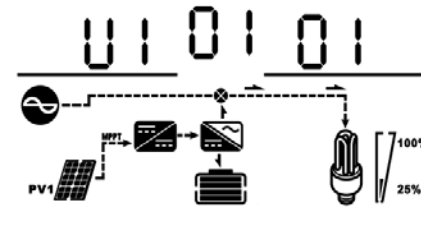
Display Setting

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, charging current, charging power, battery voltage, output voltage, output frequency, load percentage, load in Watt, load in VA, load in Watt, DC discharging current, main CPU Version.
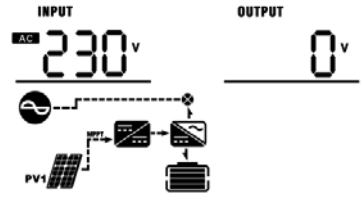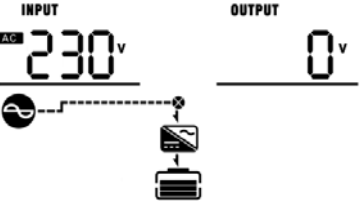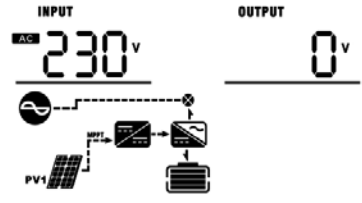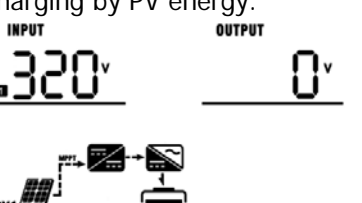
Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V ![LCD display showing INPUT 230V OUTPUT 230V]
Input frequency	Input frequency=50Hz ![LCD display showing INPUT 50.0Hz OUTPUT 230V]

PV voltage	PV voltage=320V
PV current	PV current = 9A
PV power	PV power = 995W
Charging current	AC and PV charging current=32A PV charging current=32A AC charging current=23A
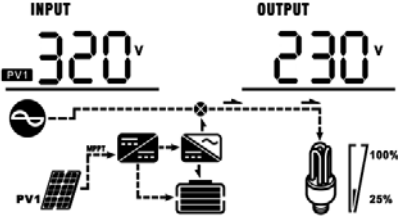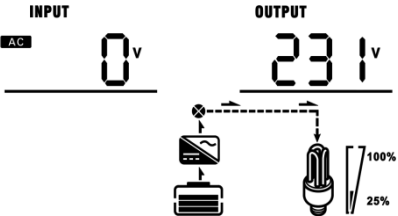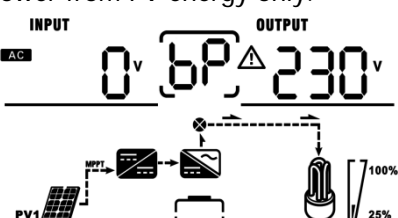
Charging power	AC and PV charging power=924W INPUT 924 W OUTPUT 230 V PV charging power=324W INPUT 324 W OUTPUT 230 V AC charging power=770W INPUT 770 W OUTPUT 230 V
Battery voltage and output voltage	Battery voltage=54.0V, output voltage=230V BATT 540 V OUTPUT 230 V
Output frequency	Output frequency=50Hz BATT 540 V OUTPUT 500 Hz
Load percentage	Load percent=23% BATT 540 V LOAD 23 %

Load in VA	When connected load is lower than 1kVA, load in VA will present xxx VA like below chart.
	When load is larger than 1kVA (≧1KVA), load in VA will present x.x kVA like below chart.
Load in Watt	When load is lower than 1kW, load in W will present xxx W like below chart.
	When load is larger than 1kW (≧1KW), load in W will present x.xkW like below chart.
Battery voltage/DC discharging current	Battery voltage=54.0V, discharging current=32A
Main CPU version checking	Main CPU version V01.01

Operating Mode Description

Operation mode	Description	LCD display
Standby mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy. INPUT 230 v OUTPUT 0 v Charging by utility. INPUT 230 v OUTPUT 0 v Charging by PV energy. INPUT 320 v OUTPUT 0 v No charging.
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and soon.	PV energy and utility can charge batteries.	Charging by utility and PV energy. INPUT 230 v OUTPUT 0 v Charging by utility. INPUT 230 v OUTPUT 0 v Charging by PV energy. INPUT 320 v OUTPUT 0 v No charging.

Operation mode	Description	LCD display
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy.
	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility.
		If "solar first" is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time.
		If "solar first" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads.
		Power from utility.
		Power from battery and PV energy.

Battery Mode	The unit will provide output power from battery and PV power.	PV energy will supply power to the loads and charge battery at the same time.
		Power from battery only.
	The unit will provide output power from PV power.	Power from PV energy only.

Battery Equalization Description

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also help store move sulfating that might have built upon the plates. If left unchecked, this condition, called sulfating, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

● **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting program 30 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program35.

2. Active equalization immediately in program36.

● **When to Equalize**

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.
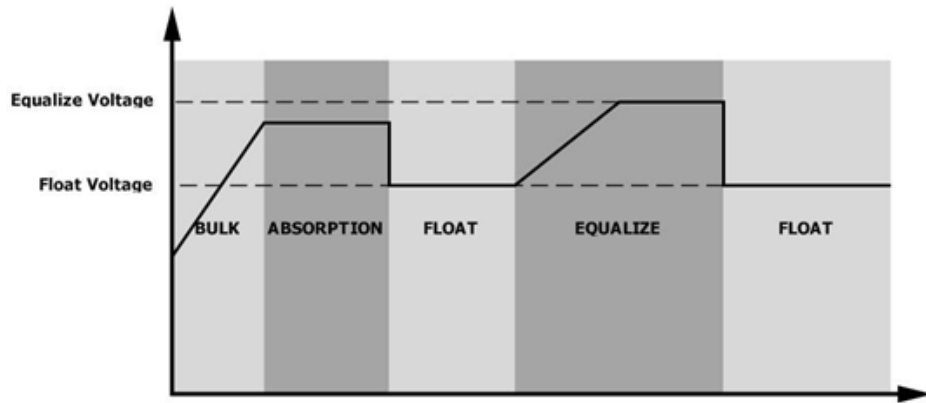
● **Equalize charging time and timeout**

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.
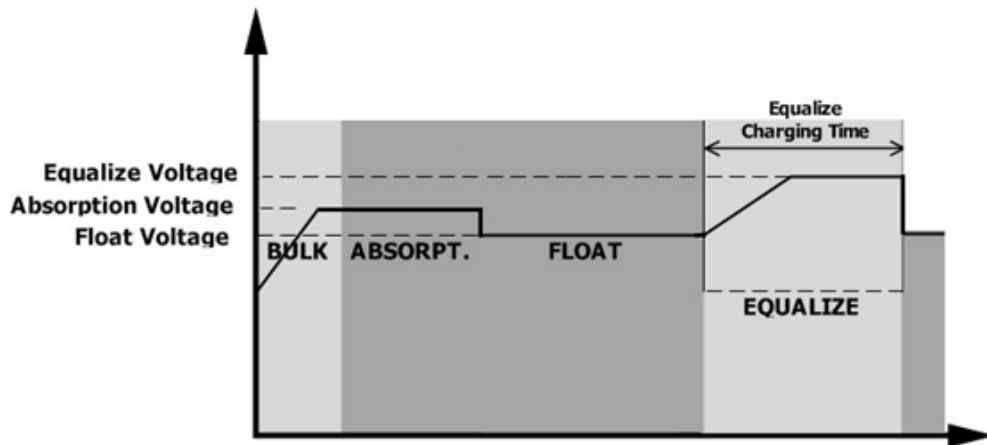
However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.
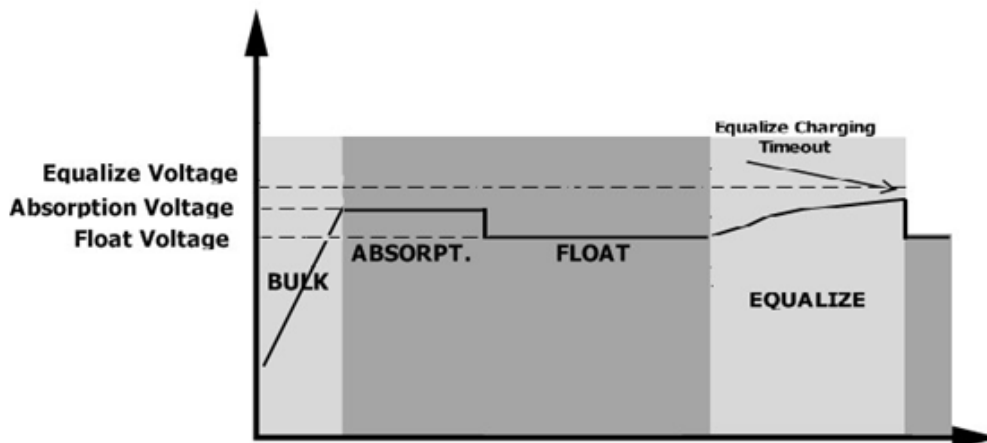
Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	01 ERROR
02	Over temperature or NTC is not connected well.	02 ERROR
03	Battery voltage is too high	03 ERROR
04	Battery voltage is too low	04 ERROR
05	Output short circuited or over temperature is detected by internal converter components.	05 ERROR
06	Output voltage is too high.	06 ERROR
07	Overload time out	07 ERROR
08	Bus voltage is too high	08 ERROR
09	Bus soft start failed	09 ERROR
51	Over current or surge	51 ERROR
52	Bus voltage is too low	52 ERROR
53	Inverter soft start failed	53 ERROR
55	Over DC voltage in AC output	55 ERROR
57	Current sensor failed	57 ERROR
58	Output voltage is too low	58 ERROR
59	PV voltage is over limitation	59 ERROR
63	PV Charging Over temperature	63 ERROR

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	01 ⚠
02	Over temperature	None	02 ⚠
03	Battery is over-charged	Beep once every second	03 ⚠
04	Low battery	Beep once every second	04 ⚠
07	Overload	Beep once every 0.5 second	07 ⚠ OVER LOAD
10	Output power derating	Beep twice every 3 seconds	10 ⚠
15	PV energy is low.	Beep twice every 3 seconds	15 ⚠
16	High AC input (>280VAC) during BUS soft start	None	16 ⚠
E9	Battery equalization	None	E9 ⚠

bP	Battery is not connected	None	bP⚠ ▭

CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

Overview

Every inverter is already installed with anti-dusk kit from factory. Inverter will automatically detect this kit and activate internal the rmalsensr to adjust internal temperature. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

Clearance and Maintenance

Step 1: Please loosen the screw in counterclockwise direction on the top of the inverter.
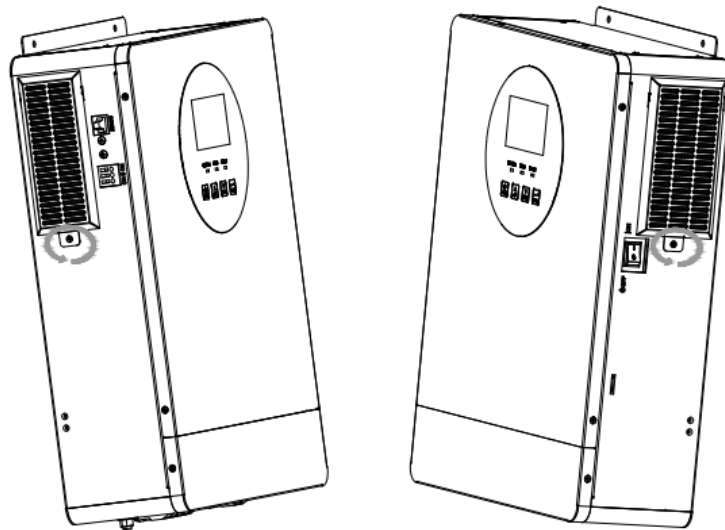
Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.
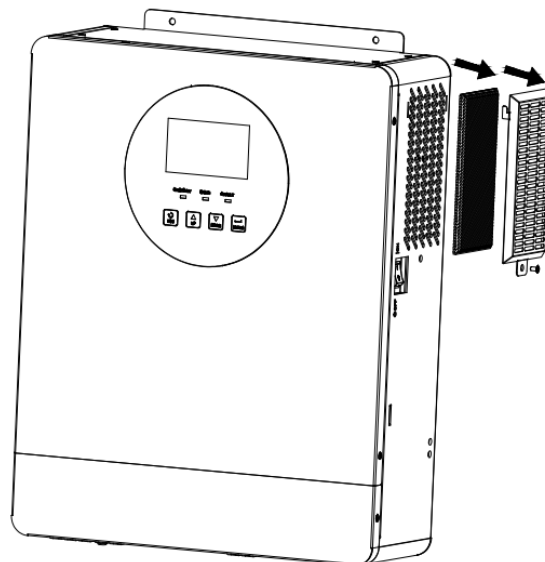
Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	3KVA	3.5/5/5.2KVA
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	Circuit Breaker	
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 170V, the output power will be derated.		

Table 2 Inverter Mode Specifications

INVERTER MODEL	3KVA	3.5/5/5.2KVA
Rated Output Power	3KVA/3KW	3.5KVA/3.5KW 5KVA/5KW 5.2KVA/5.2KW
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Regulation	230Vac±5%	
Output Frequency	50Hz	
Peak Efficiency	93%	
Overload Protection	5s@≥130% load; 10s@105%~130% load	
Surge Capacity	2* rated power for 5 seconds	
Nominal DC Input Voltage	24Vdc	48Vdc
Cold Start Voltage	23.0Vdc	46.0Vdc
Low DC Warning Voltage @ load < 50% @ load ≥ 50%	23.0Vdc 22.0Vdc	46.0Vdc 44.0Vdc
Low DC Warning Return Voltage @ load < 50% @ load ≥ 50%	23.5Vdc 23.0Vdc	47.0Vdc 46.0Vdc
Low DC Cut-off Voltage @ load < 50% @ load ≥ 50%	21.5Vdc 21.0Vdc	43.0Vdc 42.0Vdc
High DC Recovery Voltage	32Vdc	62Vdc
High DC Cut-off Voltage	33Vdc	63Vdc
No Load Power Consumption	<35W	<50W

Table 3 Charge Mode Specifications
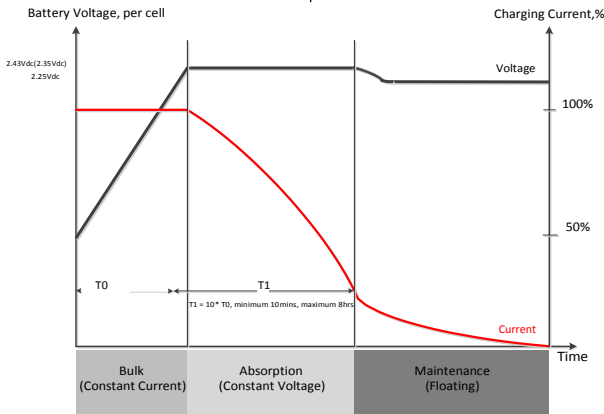
Utility Charging Mode		
INVERTER MODEL	**3KVA**	**3.5/5/5.2KVA**
Charging Algorithm	3-Step	
AC Charging Current (Max)	60Amp (@$V_{I/P}$=230Vac)	
Bulk Charging Voltage — Flooded Battery	29.2	58.4
Bulk Charging Voltage — AGM / Gel Battery	28.2	56.4
Floating Charging Voltage	27Vdc	54Vdc
Charging Curve		

MPPT Solar Charging Mode		
INVERTER MODEL	**3KVA**	**3.5/5/5.2KVA**
Max. PV Array Power	4000W	5000W
Nominal PV Voltage	350Vdc	350Vdc
Start-up Voltage	150Vdc +/- 10Vdc	
PV Array MPPT Voltage Range	120~450Vdc	
Max. PV Array Open Circuit Voltage	500Vdc	
Max Charging Current (AC charger plus solar charger)	80Amp	

Table 4 General Specifications

INVERTER MODEL	3KVA	3.5/5/5.2KVA		
Safety Certification	CE			
Operating Temperature Range	-10°C to 50°C			
Storage temperature	-15°C~ 60°C			
Humidity	5% to 95% Relative Humidity (Non-condensing)			
Dimension (D*W*H), mm	416 x 302 x 115			
Net Weight, kg	9	9.5	10.3	10.3

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. Internal fuse tripped.	1. Contact repair center for replacing the fuse. 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 07	Overload error. The inverter is overload 105% and time is up.	Reduce the connected load by switching off some equipment.
		If PV input voltage is higher than specification, the output power will be derated. At this time, if connected loads is higher than derated output power, it will cause overload.	Reduce the number of PV modules in series or the connected load.
	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.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 02	Internal temperature of inverter component is over 100°C.	
	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 01	Fan fault	Replace the fan.
	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 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 59	PV input voltage is beyond the specification.	Reduce the number of PV modules in series.

Appendix: Approximate Back-up Time Table

Model	Load (VA)	Backup Time @ 24Vdc 100Ah (min)	Backup Time @ 24Vdc 200Ah (min)
3KW	300	359	880
	600	176	420
	900	99.2	242
	1200	76	182
	1500	54	131
	1800	45	101
	2100	38	86
	2400	28	75
	2700	25	59
	3000	22	54

Model	Load (VA)	Backup Time @ 48Vdc 100Ah (min)	Backup Time @ 48Vdc 200Ah (min)
3.5KW	600	358	860
	900	202	491
	1200	161	368
	1500	110	265
	1800	96	210
	2100	84	168
	2400	58	154
	2700	54	118
	3000	45	109
	3500	33	67

Model	Load (VA)	Backup Time @ 48Vdc 100Ah (min)	Backup Time @ 48Vdc 200Ah (min)
5KW	500	490	1030
	1000	214	490
	1500	126	322
	2000	89	217
	2500	72	172
	3000	61	146
	3500	52	113
	4000	40	90
	4500	35	80
	5000	32	72

Model	Load (VA)	Backup Time @ 48Vdc 100Ah (min)	Backup Time @ 48Vdc 200Ah (min)
5.2KW	500	490	1030
	1000	214	490
	1500	126	322
	2000	89	218
	2500	73	173
	3000	62	146
	3500	53	114
	4000	40	91
	4500	35	80
	5200	30	69

Note: Backup time depends on the quality of the battery, age of battery and type of battery. Specifications of batteries may vary depending on different manufacturers.

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